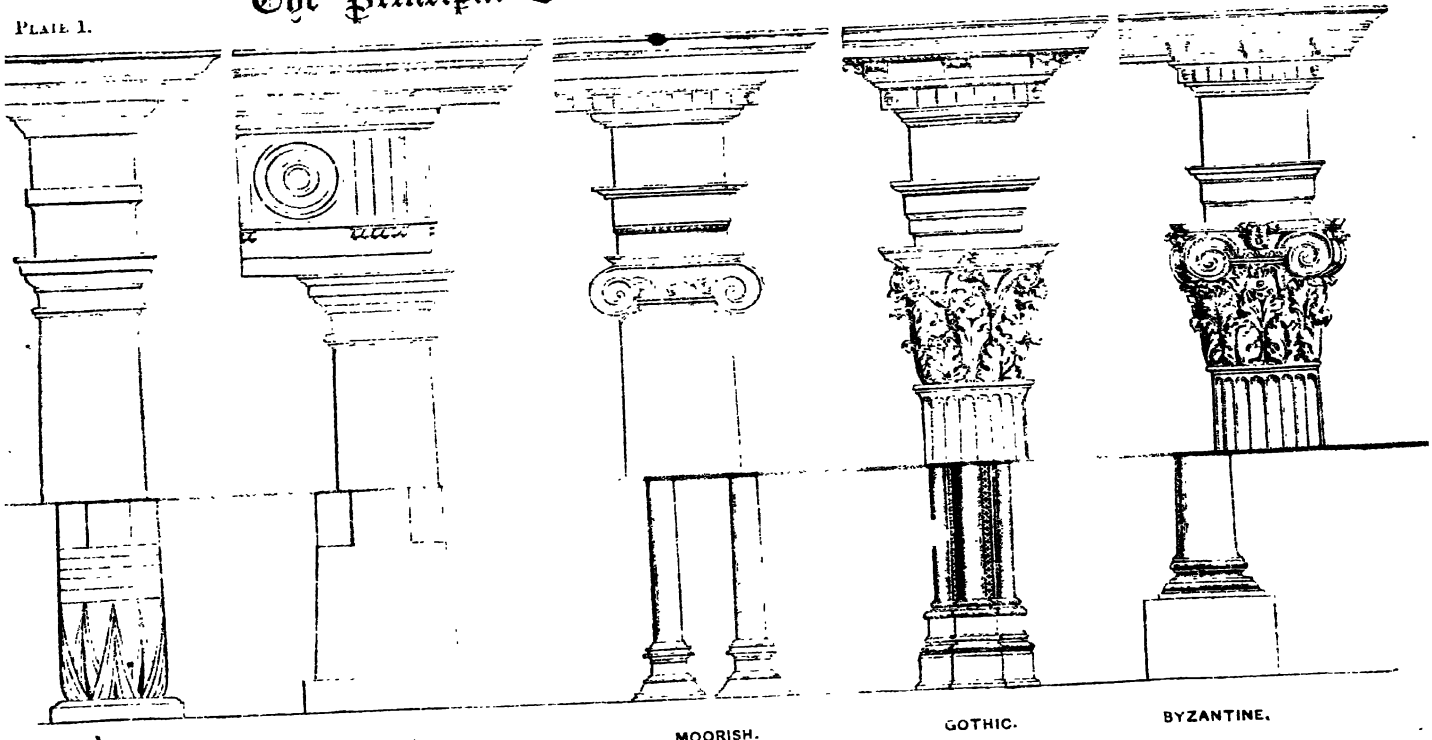
# The Principal Orders and Styles of Architecture.

PLATE 1.



EGYPTIAN. HINDÚ. MOORISH. GOTHIC. BYZANTINE.

LONDON: PUBLISHED BY S. O. BEETON, 248, STRAND, W.C.

BEETON'S

# DICTIONARY

OF

# UNIVERSAL INFORMATION;

Comprising

A COMPLETE SUMMARY OF THE MORAL, MATHEMATICAL, PHYSICAL, AND NATURAL SCIENCES;

A PLAIN DESCRIPTION OF THE ARTS;

AN INTERESTING SYNOPSIS OF LITERARY KNOWLEDGE;

WITH THE

PRONUNCIATION AND ETYMOLOGY OF EVERY LEADING TERM.

LONDON:

S. O. BEETON, 248, STRAND, W.C.

MDCCCXXVIII.

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COX AND WYMAN, PRINTERS, GREAT QUEEN STREET,
LINCOLN'S-INN FIELDS.

# PREFACE.

In the first volume of "BEETON'S DICTIONARY OF UNIVERSAL INFORMATION" is furnished a full and satisfactory account of Geography, History, Biography, Mythology, and Biblical Knowledge, together with a reliable Chronological Record. Its readers are supplied with information as to every person in sacred and profane history to whom the attention of mankind has been drawn, as well as with a succinct account of every place upon the globe of importance in a geographical, historical, or industrial sense. In brief, the first volume of "BEETON'S DICTIONARY" supplies a vast body of facts in so far as they relate to the *Names of Persons and Places*.

In this second volume of "BEETON'S DICTIONARY" is given to the non-scientific and general reader a full and faithful account of the forces which animate Nature, and which are incessantly acting upon mankind,—of the elements of which all things are composed,—of inventions of every kind, and of every art and process to which the genius of man has given birth; in other words, here is presented an immense and interesting body of facts, in so far as they relate to *Things*.

There already exist, it must be admitted, a great number of works which are intended to meet this want, such as the Dictionaries of Language, or Lexicons, and the many large Encyclopædias of various kinds; but the first of these works, by the very nature of their plan, can only supply a bare definition of words, without penetrating into the nature of the things which these words designate. In the Encyclopædias, which are professedly published to accomplish that which is beyond the province of the Lexicons,—long dissertations, complete technical treatises even, are given, rather than concentrated notices; the volumes attaining such vast proportions as to place them far beyond the reach of the great mass of the reading public. Too high in price, too slow in growth, too unhandy, unwieldy, and diffuse, these important tomes suggest a want that can only be supplied by a work which, without being as bare and unsatisfactory as the dictionaries of language, without being as bulky and expensive as the encyclopædias, nevertheless furnishes, in the closest, tersest, and most exact manner, the essence, the substance, the indispensable information upon each subject. By the employment of brevity of expression and a well-considered plan, this essential knowledge is collected into a single volume, cheap in price, portable in size, and convenient for reference; in a word, in a Practical Encyclopædia, where everything finds a place upon which something useful or interesting may be said.

In the compilation of the different articles in this Dictionary, a uniform plan is followed. Immediately after the name of each leading word there are placed its pronunciation and its etymology, to serve the double purpose of giving a clearer meaning to it, and as an aid to its remembrance. Next follows its scientific definition, an account of its essentials and characteristics, its divisions and usual classifications, its uses and appliances in Science, the Arts, or Literature. The article terminates, when there is occasion, with an historical notice, which gives an account of the origin and growth of each Science and Art, with the date of its discovery or first application. Finally, there are added to the principal articles bibliographical notices, which indicate the best works published on each subject.

As for the style, the very nature of the work demanded that the greatest number of facts should be grouped together in the fewest words,—that the motto should be, *Res, non verba*. It was indispensable, then, that the style should be laconic, without ceasing to be clear; also, it was necessary that it should be scrupulously exact. No weak, periphrastic mode of expression would serve to give a proper and forcible description of a mineral, a vegetable, an animal,—of the analysis of a substance, or the demonstration of a theorem.

The natural terms, as written by mineralogists, botanists, zoologists, chemists, and mathematicians, are here used; but in such a way that the ordinary reader is enabled to understand them, without missing a shade of their meaning. Further, especial care is taken, by means of cross-references, to explain in alphabetical order whatever terms might present any difficulty. Again, by the plentiful use of cross-references, the work is made more completely its own index than an Encyclopædia is in general found to be.

In order to insure harmony throughout this Dictionary, no less than to avoid those contradictions, omissions, repetitions, or false references, which too often disfigure works of the kind, it has been the duty of one of its editors to pay especial attention to these matters of detail—to revise all the articles, and to make all fit each other as the links of one chain.

It may be safely asserted, that this work, brought down to the latest stage of knowledge, will be found to present a combination of that scientific, literary, and artistic information, which is, at the present time, regarded as the indispensable condition of any education pretending to be serious and complete.

This work has been compiled with the care demanded by its importance. The extraordinary impulse which scientific knowledge has received within the last quarter of a century,—the grand discoveries which have been made,—the marvellous applications to which these discoveries have been turned, have opened the eyes of the people to the truth of the declaration that "knowledge is power," and have caused the study of science to become especially attractive to the minds of the great mass of the community.

To meet, then, this desire for scientific knowledge is the aim of "BEETON'S DICTIONARY." Collecting into an harmonious whole—into a single volume—all the precious information which is scattered through scores of learned treatises, or buried in the depths of vast encyclopædias, presenting it to its readers in the briefest, simplest, and most exact manner, this work brings within the reach of the many, that knowledge which has too long been reserved for the few. To the general reader it gives a full definition of those technical terms with which he is constantly meeting in the newspapers, in the magazines, in conversation even, and which are, too frequently, enigmas to him. It gives an account of machines and processes he every day sees without comprehending. It recalls to the mind of the student, sometimes perhaps even to the expert, the elements and the essential properties of a chemical combination; the distinctive characteristics of a class or of an order in botany, in zoology;—it points out to the uninitiated the nature and classification of the animal kingdom, and, in medicine, it defines the symptoms of those diseases which assail mankind. If it is not possible for it to give an exhaustive reply to every question, it does, at any rate, thanks to its bibliographical notices, point out to the earnest inquirer the sources where he may obtain an abundant response.

Designed, then, like the first volume, the Dictionary of Biography and Geography, to meet a real want, conceived in the same spirit, of the same form and proportions, executed by the same editors, with competent auxiliaries, the "DICTIONARY OF SCIENCE, ART, AND LITERATURE," becomes the inseparable companion of its predecessor. The two volumes, in a word, form the separate moieties of a complete whole,—each being incomplete without its fellow.

# THE PRONUNCIATION.

In this volume the Pronunciation, printed in *Italics*, immediately follows each leading Term. This pronunciation is shown, for the most part, by a combination of letters about the sound of which there can be no doubt. Here follow, however, together with the sounds they indicate, such letters as might seem to require explanation :—

## VOWELS.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Where | *a* | is used | .. | .. it is sounded as | .. | .. *a* | in *bar, car, omega, Africa.* |
| ,, | *ă* | ,, | | ,, | ,, | *a* | in *can, fan, tan.* |
| ,, | *ai* | ,, | | ,, | ,, | *a* | in *fate, hate, late, gray.* |
| ,, | *aw* | ,, | | ,, | ,, | *a* | in *fall, tall, wall;* and |
| | | | | | | *o* | in *for, lord, storm.* |
| ,, | *e* | ,, | | ,, | ,, | *e* | in *get, let, net.* |
| ,, | *ee* | ,, | | ,, | ,, | *e* | in *greet, steep, weep.* |
| ,, | *oi* | ,, | | ,, | ,, | *oi* | in *oil, broil;* and |
| | | | | | | *oy* | in *coy, deploy.* |
| ,, | *ou* | ,, | | ,, | ,, | *ou* | in *bound, hound, mound;* and |
| | | | | | | *ow* | in *bow, how, now.* |

## CONSONANTS.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Where | *c* | is used | .. | .. it is sounded as | .. | .. *c* | in *can, cot, cut.* |
| ,, | *ch* | ,, | | ,, | ,, | *ch* | in *birch, lurch;* and |
| | | | | | | *tch* | in *ditch, hitch.* |
| ,, | *g* | ,, | | ,, | ,, | *g* | in *gas, gone, big.* |
| ,, | *j* | ,, | | ,, | ,, | *g* | in *gentle, pigeon;* and |
| | | | | | | *j* | in *jade, jet, jot.* |

# LIST OF ABBREVIATIONS.

| | |
|---|---|
| Agr. | Agriculture. |
| Alch. | Alchemy. |
| Alg. | Algebra. |
| Anat. | Anatomy. |
| Ang.-Nor. | Anglo-Norman. |
| Ang.-Sax. | Anglo-Saxon. |
| Ant. | Antiquities. |
| Arab. | Arabic. |
| Arch. | Architecture. |
| Archæol. | Archæology. |
| Arith. | Arithmetic. |
| Astron. | Astronomy. |
| Bibl. | Bibliography. |
| Bot. | Botany. |
| Cap. | Chapter. |
| Charac. | Characters. |
| Chem. | Chemistry. |
| Civ. Eng. | Civil Engineering. |
| Civ. Law | Civil Law. |
| Com. | Commerce. |
| Conch. | Conchology. |
| Dipl. | Diplomatic Affairs. |
| Dram. Lit. | Dramatic Literature. |
| Du. | Dutch. |
| Dyn. | Dynamics. |
| Eccl. Law | Ecclesiastical Law. |
| Eng. | Engineering. |
| Ent. | Entomology. |
| Fam. | Family. |
| Fin. | Finance. |
| Flor. | Floriculture. |
| Fr. | French. |
| Gen. | Genus. |
| Gener. | Genera. |
| Geog. | Geography. |
| Geol. | Geology. |
| Geom. | Geometry. |
| Ger. | German. |
| Gr. | Greek. |
| Gram. | Grammar. |
| Hab. | Habitat. |
| Her. | Heraldry. |
| Hor. | Horology. |
| Hort. | Horticulture. |
| Hyd. | Hydraulics. |
| Hydros. | Hydrostatics. |
| Ichth. | Ichthyology. |
| Ital. | Italian. |
| Juris. | Jurisprudence. |
| Lat. | Latin. |
| Legis. | Legislation. |
| Lib. | Book. |
| Lit. | Literature. |
| Log. | Logic. |
| Mach. | Machinery. |
| Mar. | Maritime Affairs. |
| Math. | Mathematics. |
| Mech. | Mechanics. |
| Med. | Medicine. |
| Met. | Metaphysics. |
| Metall. | Metallurgy. |
| Meteor. | Meteorology. |
| Mil. | Military Art. |
| Min. | Mineralogy. |
| Mus. | Music. |
| Myth. | Mythology. |
| Nat. Hist. | Natural History. |
| Nat. ord. | Natural order. |
| Numis. | Numismatics. |
| Opt. | Optics. |
| Ord. | Order. |
| Orn. | Ornithology. |
| Paint. | Painting, Art of. |
| Path. | Pathology. |
| Persp. | Perspective. |
| Pharm. | Pharmacy. |
| Phil. | Philosophy. |
| Phys. | Physical Sciences. |
| Physiol. | Physiology. |
| Pol. | Politics. |
| Pol. Eco. | Political Economy. |
| Psychol. | Psychology. |
| Ref. | Refer to. |
| Rhet. | Rhetoric. |
| Rom. | Roman. |
| Sculp. | Sculpture. |
| Sp. | Spanish. |
| Surg. | Surgery. |
| Theol. | Theology. |
| Ther. | Therapeutics. |
| Var. | Variety. |
| Veg. Anat. | Vegetable Anatomy. |
| Veg. Phys. | Vegetable Physiology. |
| Vers. | Versification. |
| Vet. Surg. | Veterinary Surgery. |
| Zool. | Zoology. |

THE

# DICTIONARY

OF

# UNIVERSAL INFORMATION.

## A.

A, the first letter of the alphabet in almost every known language (the only exceptions, probably, being the Ethiopic and the Runic; in the former of which it occupies the thirteenth and in the latter the tenth place). This, doubtless, is owing to the great simplicity of its sound, it being the letter which is most easily and naturally uttered by the organs of speech. In the continental and Oriental languages it varies less than in English, where it has at least four distinct sounds, known as the long or slender, the broad, the short or open, and the middle; as in *name, call, man, father*. In Grammar, A is styled the indefinite article, and denotes one or any; as, *a* man. In Music, A is the nominal of the sixth note in the gamut: it is also the name of one of the two natural moods, and is the open note of the second string of the violin, by which the other strings are tuned and regulated. In Logic, A denotes a universal affirmative proposition; and in Algebra, *a, b, c* are used to represent known quantities, while the last letters, *x, y, z*, are generally taken to denote unknown quantities. As a numeral, *a'*, among the Greeks, denoted 1; and, with a mark under it, *a*, 1,000. With the Romans, A was 500; and, with a short horizontal line over it, Ā, 5,000. In trials of criminal causes among the Romans, A signified *absolvo*, I acquit; and was hence called *litera salutaris*, the saving letter. When put to bills of exchange in England, A signifies accepted. A 1 is a symbol by which first-class vessels,—that is to say, vessels whose hull and equipments are in an efficient condition,—are known and registered at Lloyd's for a certain number of years after being built. A A A, in Chemistry, signifies *amalgama*, to mix; and in Pharmacy, *ā*, or *āā*, denotes that the proportions of the ingredients to which it refers are to be equal. A is frequently used as an abbreviation. (*See* ABBREVIATION.)

AAM, or HAAM, *awm*, a Dutch liquid measure, containing 288 English pints.

AARD-VARK, *ard'-vark* (Du. earth-pig), in Zool., a genus of animals which belongs to the class *Mammalia*, and to the ord. *Edentata*. It feeds upon insects and roots, and burrows in the ground. It is nocturnal in its habits, and passes the greater portion of its time in eating and sleeping. Aard-Vark is the name given by the Dutch at the Cape of Good Hope to the *Orycteropus capensis*, a species now disunited from the *Myrmecophaga*, or Ant-eaters of Linnæus, with which it was formerly classed. It lives entirely upon ants, and in this respect resembles the Echidna of Australia, the Myrmecophaga of America, and the Pangolins of Asia; fulfilling the same purposes in Southern Africa which these species fulfil in their respective countries.

AARD-WOLF, *ard'-woolf* (Du. earth-wolf), a genus of digitigrade carnivorous mammals founded by Isidore Geoffroy St. Hilaire, and forming the link which connects the civets with the dogs and hyænas. It is an extremely singular animal, having externally the appearance and bone-structure of the hyæna united to the head and feet of the fox, with the intestines of the civet. It was brought from Africa to Europe some years ago by the traveller Delalande. Its size is about that of a full-grown fox, which it resembles in both its habits and its manners, being nocturnal, and constructing a subterraneous abode.

AB, *āb*, in Hebrew chronology was the fifth month of the ecclesiastical and the eleventh of the civil year, and always contained thirty days. It corresponded to the latter part of our July and beginning of August.

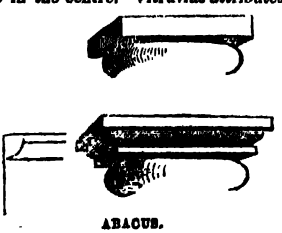
ABACA, *ai'-ba-ca*, a kind of flax or hemp grown in the Philippine Islands.

ABACISCUS, *āb-a-sis'-kus*, in Arch., a diminution of the term Abacus, only seldom used; but, when it is, chiefly applied to the tiles or squares of a Mosaic pavement.

ABACK, *ā-bāk'* (Ang.-Sax.), the situation of the sails when they are pressed against the masts by the force of the wind. Thus the sails are said to be "taken aback" when, by a change of wind or otherwise, they are placed in that position.

ABACOT, *āb'-a-kot* (deriv. uncertain), a cap of dignity, formerly worn by the kings of England.

ABACUS, *āb'-a-kus* (Lat. *abacus*, counting-table, level tablet, &c.), in Arch., a constituent part of the capital of a column, which supports the horizontal entablature. In the Tuscan, Doric, and Ionic orders, it is flat and square; but, in the Corinthian and Composite orders, its four sides are arched inwards, with, generally, a rose in the centre. Vitruvius attributes its invention to Callimachus (*see* VITRUVIUS and CALLIMACHUS, vol. I. of this work), who, observing a basket covered with a tile placed over the root of an acanthus plant (*see* ACANTHUS), was so struck with its appearance, that he imitated it in sculpture, by making the whole group the capital of a column, in which the tile was represented by the abacus, the growing leaves of the acanthus by the volutes, and the basket by the body of the capital. In Gothic architecture, the abacus was very variously employed, according to the fancy of the architect.



ABACUS.

ABACUS, in Arith., is the name of an instrument employed in England to teach the elementary principles of the science of numbers. The Pythagorean abacus is a term sometimes applied to the multiplication table. The ancient mathematicians also employed the term abacus to designate a table covered with sand, upon which they traced their diagrams.

ABACUS, Chinese, or SHWAN-PAN, *shwaun'-pan*, is also an instrument for facilitating arithmetical calculations. It consists of several series of beads or counters strung upon brass wires stretched from the top to the bottom

of an instrument, and divided in the middle by a cross-piece from side to side. In the upper compartment every wire has two beads, which each count for 5; in the lower space every wire has five beads of different values; the first being counted as 1, the second as 10, the third as 100, and so on. In this country, with our system of reckoning, such an instrument could not be made generally applicable to arithmetic; but in China, where the entire system is decimal, that is, where every weight and measure is the tenth part of the next greater one, the abacus is used with wonderful rapidity. A similar instrument was in use among the Greeks and the Romans; and the Russians calculate by strings of beads. In this country a chequer-board, such as is still sometimes to be seen hanging out as a sign at the doors of public-houses, was formerly used as an abacus. There is also a chemical abacus, which, in 1839, was introduced to the notice of the British Association by Dr. Reid. It was designed to give to students a more accurate knowledge of the elements of which the more important chemical compounds are constituted. It was constructed of a wooden frame with cross wires, upon which beads were strung. Each of the wires represented a chemical element, and each of the beads an atom, while, at the extremities of the wires, the names of the elements were placed.

**Abaft**, or **Aft**, *ă-baft'* (Ang.-Sax.), in Maritime language, signifies the hinder part of a ship; thus,—"abaft the main-mast," that is to say, between the main-mast and the stern. "Abaft the beam," signifies the relative situation of an object in some part of the horizon contained between a line drawn at right angles to the keel and the point to which the stern of the ship is directed.

**Abagi**, or **Abasi**, *a-ba-jee'*, a Persian coin, of about the value of eighteen pence English.

**Abandonment**, *ă-băn'-dun-ment*, a term made use of in marine insurances, where, prior to compensation being demanded for the loss of a ship or goods, the owner must abandon or make over to the insurer his entire interest in any portion of the rescued property.

**Abased**, or **Abaissé**, *ă-baised'* (lowered), in Heraldry, a term borrowed from the French, and applied to the wings of eagles, &c., when the tip inclines downwards to the point of the shield, or when the wings are shut.

**Abatement**, *ă-bait'-ment* (old Fr. *abater*, to beat down, to destroy), in Law, a term signifying the rejection of a suit on account of some fault either in the matter or proceeding. Hence, a "plea in abatement" is some exception alleged against the plaintiff's writ, declaration, &c., and praying that the plaint may abate or cease. It is the rule, however, that he who takes advantage of a flaw to plead an abatement, must not only indicate the flaw in question, but likewise point out its remedy. When the plea of abatement is granted, all writs in the process must begin *de novo*. Both public and private nuisances may be peaceably "abated," or overcome. Thus, if a person be unlawfully annoyed or done damage to, it is a private nuisance, and he may abate or destroy the nuisance, provided he shall not disturb the public peace, nor inflict further injury upon the thing than is necessary to get rid of the nuisance which annoys or damages him. An obstruction of a public road, such as a gate being thrown across it, constitutes a public nuisance, and a person may abate or overcome such nuisance, provided he does no more than is absolutely required for the accomplishment of his purpose. Coke, in his Comments upon Littleton, declares that it is "an abatement when a man dies seised of an estate of inheritance, and between the death and the entry of the heir a stranger doth interpose himself and abate."

**Abatement**, in Heraldry, is an accidental figure added to a coat of arms, to lessen its true dignity, and to indicate some stain in the character of the bearer.

**Abatement of Legacies.** (*See* Legacy.)

**Abatis**, or **Abattis**, *a-ba-tē'*, *ă-bat'-tis* (Fr. *abattre*, to knock down), a term used in Fortification, and signifying a work constructed of felled trees, placed side by side, with their branches, the stronger of which are left on, turned towards the enemy in such a way as to constitute a form of defence for the troops posted behind them.

**Abattoir**, *ab'-ă-twor* (Fr. *abattre*, to knock down), a term borrowed from the French, with whom it signifies a slaughter-house. The Abattoir system was, in 1818, adopted in France. There are at present near Paris five immense establishments of this kind, where butchers are provided with a place for slaughtering their cattle and keeping their meat in *store*. There are also places for supplying the beasts with water, receptacles for the fat, hoofs, blood, brains, &c. In the neighbourhood of the abattoirs there are manufactories of blood-manure, gelatine, glue, and the other products of the offal. In most of the continental towns, and in several of the larger cities of the American Union, slaughter-houses are placed under similar regulations to those which are in operation in Paris. In 1851 a large and commodious abattoir was established in Edinburgh. In 1855 the great cattle-market, which had been held in Smithfield for upwards of 500 years, was removed to the north of London, where a new market was built upon an area comprising 15 acres of ground. This large inclosure is capable of containing 6,600 oxen, 1,425 calves, 900 pigs, and about 35,000 sheep. It also can give lairage to 3,000 oxen and 8,000 sheep, and has excellent slaughter-houses. This is the only approach as yet made to the abattoir system in London.

**Abba**, *ab'-ba*, a Syriac term signifying 'father.' Among the Jews, it was a title of dignity. The Christians of the East apply it to their bishops.

**Abbé**, *ăb'-bai* (Fr. *abbé*), is the French term for an abbot. Before the Revolution, it was a title assumed by a very numerous class of persons, who had little or no connection with the Church. Some of them were distinguished men of letters, or rose to eminence in the state, while many of them were engaged, less prominently, in public or private tuition.

**Abbess**, *ăb'-bess* (Fr. *abbesse*), the superior of an abbey or convent of nuns. An abbess exercises the same authority over nuns that an abbot does over monks, spiritual functions alone excepted. It was decreed by the council of Trent, that an abbess, before entering upon her functions, should have attained the age of 40 years.

**Abbey**, *ăb'-be* (Fr. *abbaie*), a religious house, presided over by an abbot or abbess: when the superior was a prior, the establishment was called a priory; otherwise, there was little or no distinction between them. These houses were wholly abolished in England by Henry VIII., at the time of the Reformation. According to Bishop Tanner's "Notitia Monastica," 566 religious houses were then suppressed, the revenues of which amounted to about £132,000 per annum; but other authorities make their wealth much greater. In the early part of the French monarchy, dukes and counts, though secular persons, were termed abbots, in consequence of the possession of certain abbeys having been conferred upon them.

**Abbot**, *ăb'-bot* (Ang.-Sax. *abbod*), the chief ruler of a monastery, or abbey of monks. The term comes from the Hebrew *ab*, through the Greek *abba*, father. At first abbots were subject to the bishops, and even to the pastor of the parochial district within which they were established. Afterwards, however, they assumed greater power, and aspired to even equal rank with the bishops, which led to frequent vexatious disputes in the Church. Distinctions also arose among abbots;—as *mitred*, those privileged to wear the mitre, and exercise episcopal authority within their respective precincts; *crosiered*, so named from their carrying the crosier, or pastoral staff; *ecumenical*, such as exercised universal dominion; and *cardinal*, from their superiority over all others.

**Abbreviation of Fractions**, *ăb-bre-ve-ai'-shun* (Lat. *brevio*, I shorten), in Arith., a term signifying the reducing of fractions to the lowest terms, a process which is performed by dividing both the numerator and denominator by any term which will divide them without leaving any remainder; thus, $\frac{12}{18}$ becomes equal to $\frac{6}{9}$, to $\frac{2}{3}$, and, finally, to $\frac{2}{3}$, if divided in succession by 2.

**Abbreviation**, the contracting of a word or sentence, by omitting some of the letters or words, or by substituting certain marks or characters in their place. Abbreviations were much used by the earlier writers. The Greeks and Romans largely employed them, and, most of all, the Jewish rabbins. At the present time they are chiefly confined to titles, dates, and a few

| Abbreviation | |
|---|---|

phrases. Most of the arts and sciences, however, have sets of signs or abbreviations peculiar to themselves. The following is a list of the more important abbreviations in common use:—

A. Associate.
A.A. Associate of Arts.
A B. Able Seaman.
Abp. Archbishop.
A.C. (*Ante Christum*). Before Christ.
A.D. (*Anno Domini*). In the year of our Lord.
A.F.R.A. Associated Engraver of the Royal Academy.
A.H. (*Anno Hegiræ*). In the year of the Hegira.
A.M. (*Ante meridiem*). Before noon.
A.M. (*Anno mundi*). In the year of the world.
A.R.A. Associate of the Royal Academy.
A.R.S.A. Associate of the Royal Scottish Academy.
A.U.C. (*Ab Urbe condita*). From the building of the city, *i.e.* Rome.
B.A., or A.B. (*Artium Baccalaureus*). Bachelor of Arts.
B.C. Before Christ.
B.C.L. Bachelor of Civil Law.
B.D. Bachelor of Divinity.
B.M. Bachelor of Medicine.
Bp. Bishop.
Bt., or Bart. Baronet.
C. (*centum*). A hundred; chapter; commissioner.
C.A. Chartered accountant.
C.B. Companion of the Bath.
C.C. Caius College.
C.E. Civil Engineer.
Clk. Clerk.
C.M.G. Companion of the Order of St. Michael and St. George.
C.P.S. (*Custos Privati Sigilli*). Keeper of the Privy Seal.
Cr. Creditor.
Crim. Con. Criminal conversation.
Ct. Count.
Cwt. Hundredweight.
D. Five hundred.
D.C.L. Doctor of Civil Law.
D.D. Doctor of Divinity.
D.F. (*Defensor Fidei*). Defender of the Faith.
D.G. (*Dei gratiâ*). By the grace of God.
Do. Ditto. The same.
Dr. Doctor; debtor.
12mo. Duodecimo.
D.V. (*Deo volente*). God willing.
Dwt. Pennyweight.
E. East.
E.C.P. (*Evangelii Christi Prædicator*). Preacher of the gospel of Christ.
e.g., ex. gr. (*Exempli gratiâ*). For example.
Etc. (*Et cætera*). And the rest; and so on.
F.A.S. Fellow of the Antiquarian Society.
F.B.S. Fellow of the Botanical Society.
F.C.S. Fellow of the Chemical Society.
F.G.S. Fellow of the Geological Society.
F.L.S. Fellow of the Linnæan Society.
F.M. Field-marshal.
Fo. folio.
F.R.A.S. Fellow of the Royal Astronomical Society.
„ Fellow of the Royal Asiatic Society.
F.R.C.P. Fellow of the Royal College of Physicians.
F.R.C.S. Fellow of the Royal College of Surgeons.
F.R.G.S. Fellow of the Royal Geographical Society.
F.R.S. Fellow of the Royal Society (L. London, E. Edinburgh).
F.R.S.A. Fellow of the Royal Society of Arts.
F.S.A. Fellow of the Society of Antiquaries.
F.S.S. Fellow of the Statistical Society.
G.C.B. (Knight) Grand Cross of the Bath.
G.C.H. (Knight) Grand Cross of Hanover.
G.C.M.G. (Knight) Grand Cross of St. Michael and St. George.
Gr. Greek.
H.E.I.C.S. Honourable East-India Company's service.
H.M.S. Her Majesty's service or ship.
H.R.H. His or Her Royal Highness.
Ib. or Ibid. (*Ibidem*). In the same place.
Id. (*Idem*). The same.
i.e. (*Id est*). That is.
I.H.S. (*Jesus Hominum Salvator*). Jesus the Saviour of men.

| Abbreviation | |
|---|---|

I.H.S. (with a cross over the H) (*In hâc* [*Cruce*] *Salus*). In this (Cross) salvation.
Incog. (*Incognito*). Unknown.
Inst. (*Instante*). Instant, of the present month.
J.C. (*Juris Consultus*). Jurisconsult.
J.P. Justice of the Peace.
J.V.D. (*Juris utriusque Doctor*). Doctor of Civil and Canon Law.
K.B. Knight of the Bath.
K.C.B. Knight Commander of the Bath.
K.C.H. Knight Commander of the Order of Hanover.
K.C.M.G. Knight Commander of St. Michael and St. George.
K.G. Knight of the Garter.
K.H. Knight of Hanover.
K.M. Knight of Malta.
K.P. Knight of St. Patrick.
K.T. Knight of the Thistle.
Lb. (*Libra*). Pound.
L.C.J. Lord Chief Justice.
L.D. Lady Day.
LL.B. (*Legum Baccalaureus*). Bachelor of Laws.
LL.D. (*Legum Doctor*). Doctor of Laws.
L.R.C.S. Licentiate of the Royal College of Surgeons.
L.S. (*Locum sigilli*). The place of the seal.
L.S.A. Licentiate of the Society of Apothecaries.
L.S.D. (*Libræ, Solidi, Denarii*). Pounds, shillings pence.
M. (*Mille*). A thousand.
M.A. or A.M. (*Artium Magister*). Master of Arts.
M.D. (*Medicinæ Doctor*). Doctor of Medicine.
Messrs. (*Messieurs*). Gentlemen.
M.P. Member of Parliament.
M.R.C.S. Member of the Royal College of Surgeons.
M.R.I.A. Member of the Royal Irish Academy.
MS. Manuscript.—MSS. Manuscripts.
Mus.D. (*Musicæ Doctor*). Doctor of Music.
M.W.S. Member of the Wernerian Society.
N. North; noon; note.
N.B. (*Nota bene*). Mark well; observe.
Nem. con. (*Nemine contradicente*). Nobody contradicting; unanimously.
Nem. diss. (*Nemine dissidente*). Nobody dissenting.
N.P. Notary Public.
N.S. New Style.
8vo. Octavo.
O.S. Old Style.
Oxon. (*Oxoniensis*). Of Oxford.
oz. Ounce.
P. President, Professor, &c.
p. Page.—pp. Pages.
P.C. Privy Councillor.
P.C.S. Principal Clerk of Session.
Per ann. (*Per annum*). By the year.
Per cent. (*Per centum*). By the hundred.
Ph.D. (*Philosophiæ Doctor*). Doctor of Philosophy.
P.M. (*Post meridiem*). After noon.
P.P. Parish Priest.
Pro tem. (*Pro tempore*). For the time.
Prox. (*Proximo*). In the next (month).
P.S. (*Post scriptum*). Written after; postscript.
4to. Quarto.
Q. Query, or Question.
Q.C. Queen's Counsel.
q.d. (*Quasi dictum*). As if it were said.
Q.E.D. (*Quod erat demonstrandum*). Which was to be demonstrated.
Q.E.F. (*Quod erat faciendum*). Which was to be done.
Qr. Quarter.
Q.S. (*Quantum sufficit*). Enough.
q.v. (*Quod vide*). Which see.
R. (*Rex* or *Regina*). King or Queen.
R.A. Royal Academician, Royal Artillery.
R.E. Royal Engineers.
Reg. Prof. Regius Professor.
Rev. Reverend.
R.M. Royal Marines.
R.N. Royal Navy.
Rp. or ℞ (*Recipe*). Take.
R.S.A. Royal Scottish Academician.
Rt. Hon. Right Honourable.
R.W.M. Right Worshipful Master.
S. South; saint; seconds.
Sc. (*Scilicet*). Namely.

S.L. Solicitor at Law.
S.M. (*Sa Majesté*). His or Her Majesty.
S.P.Q.R. (*Senatus Populusque Romanus*). The Senate and People of Romo.
Sq. (*Sequens*). The following; plural, Sqq.
S.S.C. Solicitor before the Supreme Courts.
S.T.P. (*Sanctæ Theologiæ Professor*). Professor of Theology.
T.C.D. Trinity College, Dublin.
Ult. (*Ultimo*). In the last (mouth).
U.P. United Presbyterian.
U.S. United States, United Service.
V.D.M. (*Verbi Dei Minister*). Preacher of God's Word.
Viz. (*Videlicet*). To wit; namely.
W. West.
W.S. Writer to the Signet.
Xmas. Christmas.
Xtian. Christian.
& (*et*). And.
&c. (*et cætera*). And so forth.

ABDICATION, *ăb-de-kai'-shun* (Lat. *abdico*, I renounce, reject, refuse), in general signifies the renouncing or giving up of any trust before the usual or stated time of holding it is expired; but it is commonly applied to the renouncing of regal power. It differs from resignation in that the latter is done in favour of some one, whereas the former is done unconditionally. Abdications occur most frequently in absolute governments, as we find among the Roman emperors, the sultans of Turkey, and the czars of Russia. By the English constitution the sovereign cannot abdicate except with the consent of the two houses of parliament. It has been held, however (as in the case of James II., 1688), that the sovereign may, by acting subversively of the constitution, be regarded as having abdicated. In early times the most noted abdications were those of Sylla, the dictator (B.C. 79), and Diocletian, the emperor (A.D. 305). In more recent times we have the emperor Charles V. (1556); Christina of Sweden (1654); Philip V. of Spain (1724); Victor Amadeus II. of Sardinia (1730); Charles IV. of Spain (1808); Napoleon (1818); Victor Emmanuel V. of Sardinia (1821); Charles X. of France (1830); William I. of Holland (1840); Louis Philippe of France (1848); Louis Charles of Bavaria (1848); Ferdinand of Austria (1848); Charles Albert of Sardinia (1849).

ABDOMEN, *ăb-do'-men* (Lat. *abdo*, I hide), in Anat., the belly, or lower part of the trunk, separated from the chest or upper part by the diaphragm. It contains the stomach, intestines, liver, spleen, pancreas, kidneys, &c., and is lined within by a membrane called the peritoneum. For convenience of description, the abdomen is divided horizontally into three regions,—the upper, or epigastric; the middle, or umbilical; and the lower, or hypogastric. It may also be divided longitudinally by two lines, when the above terms are confined to the central portion, the epigastric having on each side the right and left hypochondriac, the umbilical, the right and left lumbar, and the hypogastric the right and left iliac. Abdomen, in Ent., signifies the whole lower portion of the body of an insect, united to the corselet, or thorax, by a thread.

ABDOMINALES, OR ABDOMINAL FISHES, *ăb-dom-i-nai'-lees*, the fourth class of animals in the Linnæan system. *Charac.* Ventral fins (those of the belly) placed behind the pectoral (those of the breast), in the abdomen, and the branchiæ or gills ossiculated. The arrangement of Linnæus is p , however, generally discarded, the term abdominales denoting a family or subdivision of malacopterygious or soft-finned fishes only.

ABDUCTION, *ăb-duk'-shun* (Lat. *ab*, from, and *duco*, I draw), in Law, is the illegal carrying off of the person of another, whether of child, heiress, wife, or woman in general. If a wife be taken off, either forcibly or by fraud and persuasion, the husband may obtain damages for her abduction, and likewise from any person persuading or enticing his wife to live apart from him without sufficient cause. In the case of an abduction of ward, the guardian may recover damages from such as take his ward from his keeping; but when the ward comes of age, the guardian must account to the ward for the damages received. If an heiress be taken away for the purpose of either marriage or defilement, the act becomes a felony, and the principal, or his aiders, abettors, or counsellors, may be punished by transportation for life, or not less than seven years. The abduction of a girl under 16 is a misdemeanour, the punishment of which is fine or imprisonment, and if a marriage shall have been brought about by violence, it may be set aside on that ground. To carry off and marry any woman by force is a felony, and in such a case, as well as in that of the abduction of an heiress, the rule that a wife may not be allowed to give evidence against her husband does not hold good, for these reasons,—that the prime ingredient in the marriage contract, the wife's consent, has been wanting, and likewise because it is an axiom of law, that "a man shall not take advantage of his own wrong," which would clearly be the case were a man, by forcibly marrying a woman, allowed thereby to prevent her appearing as a witness against him. Sir Walter Scott, in his Notes and Introduction to Rob Roy, informs us that the crime of abduction was at one time an ordinary offence on the border of the Scottish highlands. (*See* KIDNAPPING.)

ABDUCTION, in Logic, is a form of reasoning called by the Greeks *apagoge*, in which the greater extreme is contained in the medium; but the medium is not so evidently in the lesser extreme. *Ex.* Whatever God has revealed is certainly true: now God has revealed a future retribution; therefore a future retribution is certainly true. The use of this kind of reasoning, the minor propo , must be proved to be contained in the major, oth rwise the reasoning is inconclusive.

ABDUCTOR MUSCLES, *ăb-duk'-tor*, a term given in Anatomy to those muscles which draw one part of the body from another; as *adductor* muscles are those which draw one part of the body to another.

ABELE-TREE, *ab-ee'-le*, in Bot. called the *Populus alba*, a species of the poplar, having very large leaves.

ABELMESAK, *a-bel-me'-sak*, the musk-seed, which grows in the West Indies and in Egypt, and which is used as a perfume.

ABERDEVINE, *ab-er'-de-vine*, a song-bird, sometimes called the Siskin. It is the *Carduelis spinus* of Cuvier, and resembles the green variety of the canary-bird, with which it is often paired, to produce what are called mule birds. In its habits it is migratory, breeding in the north of Europe, and visiting Germany, France, and Britain, only in the autumn and winter.

ABERRATION, *ăb-er-ai'-shun* (Lat. *ab*, from, and *erro*, I wander), a term applied to three highly-important optical phenomena:—1. Aberration of Light, in Astronomy, designates a small apparent displacement of the fixed stars. It arises from these combined causes,—the progressive movement of light (travelling at the rate of 195,000 miles per second), and the movement of the earth in her orbit. Its effect is to give the fixed stars an apparent movement in space around their true place. The discovery of this remarkable fact was made in 1727, by the illustrious English astronomer Dr. Bradley; and it is one that affords an incontrovertible proof of the motion of the earth around the sun.—2. Aberration of Sphericity designates that deviation of the rays of light which takes place after they have passed through a curved lens, whereby the rays, instead of being collected into a single point, are extended over a small space; thus giving a rather confused image of the object. This deviation is due to the spherical form of the lens itself.—3. Aberration of Refrangibility is the term applied to that dispersion of the rays of light which happens after they have passed through a lenticular glass, and in consequence of which a variegated ring of colour is seen encircling the image, and thereby rendering it a confused one. This defect has, however, been remedied by the invention of achromatic lenses. (*See* ACHROMATIC.)

ABETTOR, *ă-bet'-tor* (probably from Saxon *betan*, to push forward or incite), in Law, one who instigates or sets on another to commit a crime. If the abettor is present at the time that the crime is committed, he is treated as a principal; if absent, as an accessary before the fact.

ABEYANCE, *ă-bai'-anse* (Norman-French, *bayer*, to expect), in Law, signifies that the fee-simple of lands is waiting, or in expectancy of an owner who has to be discovered. For example, if a certain C holds a grant for life, with the heirs of D as inheritors, the inheritance

remains in abeyance until the demise of D, as it is impossible that there can be an heir to a living person. A peerage is held to be in abeyance when the next inheritors are several females.

ABIES, *ai'-bi-ees* (Lat. *abies*, the fir-tree), in Bot., a genus of plants included in the natural order *Coniferæ*, or cone-bearing family. Several species of this genus are valuable timber-trees; as *Abies excelsa*, the spruce fir; *A. alba*, the white spruce; and *A. canadensis*, the hemlock spruce. The resins and gum-resins which these trees exude are extensively used in the arts. The spruce fir produces common frankincense, from which Burgundy pitch is prepared; the balm of Gilead fir (*A. balsamea*) yields Canada balsam; the silver fir (*A. picea*), Strasburg turpentine; and the common larch (*A. Larix*), Venice turpentine. Essence of spruce, used in the preparation of spruce beer, is formed by boiling the shoots of *A. nigra*, and some other species, in water, and afterwards concentrating the decoction.

ABIETINE *ai-bi'-e-tine* (Lat. *abietarius*, connected with firs), the neutral resin obtained from Strasburg turpentine and Canada balsam. It is insoluble in water, but soluble in alcohol. Its chemical formula is not known.

ABIETINEÆ. (*See* CONIFERÆ.)

ABJURATION, OATH OF, *ăb-ju-rai'-shun* (Lat. *ab*, from, and *juro*, I swear), a form of oath originally imposed by statute 13 William III., and regulated by 6 George III., by which the juror acknowledged the right of the present royal family of England to the crown, under the Act of Settlement. He who took this oath further promised to support the monarch to the utmost of his power; engaged to disclose all plots against him; and declared that the descendants of the Pretender, or son of James II., had no right to the crown of England. The oaths of abjuration were generally required to be taken at the same time with the oaths of allegiance and supremacy; but all these oaths have now been reduced to a single formula of a much simpler character than they formerly possessed.

ABJURATION OF THE REALM, in LAW, means the taking of an oath, by which the juror engages to renounce and quit the realm for ever. Popish recusants, or those who refused to acknowledge the supremacy of the king of England as head of the Church, were in former times constantly being called upon to take the oath of abjuration of the realm; but by the statute 31 George III., made in 1791, the Roman Catholics were relieved from this as well as other penal restrictions.—Abjuration signifies, likewise, a public and solemn recantation of opinion. The "abjuration of heresy" was an act frequently required by the Roman Catholic church. History affords several examples of this act. Henry IV. abjured the Protestant religion on ascending the throne of France, in 1593; the queen of Sweden abjured her religious opinions in 1655; Turenne in 1668; and Augustus II. of Poland in 1706. Galileo was obliged to abjure his philosophical opinions by the Inquisition in 1633.

ABLATIVE, *ăb'-la-tiv* (Lat. *ablatus*, taken away), the name given to the sixth case of nouns in Latin; so called from its implying "taking from," or "carrying away." The *ablative absolute* is applied to a noun occurring with a participle, independent of any other part of the sentence, and hence put in the ablative.

ABLUENT MEDICINES, *ăb-loo'-ent* (Lat. *abluo*, I wash away), a term formerly applied to those medicines which are used for purifying the blood.

ABLUTION, *ăb-lu'-shun* (Lat. *abluo*, I wash away), signifies, in a general sense, the washing or cleansing by water. The washing of the body, as being a fit emblem of purification, as well, doubtless, as from its importance in a sanitary point of view, came to form a more or less important part in almost every form of religious worship. It was enjoined in the Jewish economy, and we find our Saviour repeatedly censuring the excess to which it was carried by the Pharisees. In Mohammedanism and the religions of India ablution occupies a very important place.

ABNORMAL, *ăb-nor'-mal* (Lat. *ab*, from, and *norma*, a rule), in Bot., a term applied to aërial roots, like those of the mangrove, which help to support the stem.

ABOARD, *ă-bord'*, in Mar., signifies within the vessel. Also, when a ship gets foul of another, she is said to be "aboard" of her.

ABOLITION, *ăb-o-lish'-un*, in parliamentary language, signifies the repealing some statute or usage.

ABOLLA, *ă-bol'-la* (Lat. *abolla*, a cloak or garment without sleeves), the name of a loose woollen cloak worn by the Greeks and Romans. It was a smaller garment than the toga (*see* TOGA), and very closely resembled the pallium (*see* PALLIUM). It was fastened under the throat, or upon the shoulder, by a fibula or clasp.

ABOMA, *ă-bo'-ma*, a species of large serpent, inhabiting the morasses of South America. (*See* BOA.)

ABORIGINES. (*See* vol. I. of this work.)

ABORTIVE, *ă-bor'-tiv* (Lat. *abortio*, untimely birth). In Bot., the essential part of the stamen is the anther, and when this is absent the stamen is said to be abortive. The general term abortion is applied to the suppression or new development of any organ.

ABOU-HANNES, *a-boo' han'-nes*, an African bird, considered by some naturalists to be identical with the ancient ibis. Although solitary in its habits, it is sometimes seen in small bands of from six to ten, and is capable of a lofty and powerful flight. It has some resemblance to the curlew found in Britain, but has not been observed to run. In Egypt it is called by the inhabitants *Abou-Menuel*, which literally signifies "Father Sickle-bill," from the curved resemblance which it bears to that implement. The Ethiopic name, however, is *Abou-Hannes*, which means "Father John," and which, according to M. Dumont, is supposititiously applied to it because it arrives in Ethiopia about the day of St. John. The ibis, although so much associated with Egypt, does not breed in that country, but arrives as the waters of the Nile begin to rise, and disappears when these subside.

ABOUT, *ă-bout'*, in nautical language, signifies the alteration of a ship's course. In military language, "about" means a change in the position of a body of troops. "Right about" and "left about" are commands given to execute semicircular turns to the right or the left.

ABRACADABRA, *ăb-ra-ka-dab'-ra*, the name of an Assyrian god, which was formerly believed to have the power of curing diseases, especially slow and intermittent fevers. To accomplish this, the word was to be written many times in the form of a magical triangle, thus:—

A B R A C A D A B R A
A B R A C A D A B R
A B R A C A D A B
A B R A C A D A
A B R A C A D
A B R A C A
A B R A C
A B R A
A B R
A B
A

In modern times the term is for the most part used only in jest, without any particular meaning, like *hocus-pocus*.

ABRAMIS, *ă-brai'-mis*, a sub-genus of malacopterygious or soft-finned abdominales, of which the bream is a species.

ABRANCHIANS, *ă-brăn'-ke-ans* (Gr. *a*, without, and *branchia*, gills), an ord. of Anellidians, so called because they possess no organs of respiration.

ABRAXAS, *ă-brăx'-as*, a term used by the Gnostics, a philosophical sect, who, in the early ages of Christianity, endeavoured to reconcile the doctrines of Paganism with those of Christianity. It signifies the Supreme Being, under whom they placed 365 dependent deities.

ABRAXAS, a genus of nocturnal *Lepidoptera*, in which is included the common magpie-moth. Its colour is a yellowish white clotted with black, and a band of pale orange marks the wings. It deposits its eggs on the leaves of the currant and gooseberry in July or August, and the caterpillars are hatched in September. Its chrysalis is black.

ABREAST, *ă-brest'* (Ang.-Sax.), in maritime language, denotes the situation of two ships when they lie parallel to each other. Ships are spoken of as being "abreast" of a place when they are directly opposite to it.

ABRIDGMENT, *ă-brij'-ment*, in Literature, signifies

much the same thing as an epitome or compendium of a large work. The excellence of an abridgment lies in taking only what is material and substantial, and rejecting what is superfluous either in sentiment or style. In Law, it is the shortening of a count or declaration.

ABROMA, *ăb-ro'-ma*, in Bot., a genus of tropical plants in the *Byttneriaceæ*, or Chocolate order.

ABRUPT, *ăb-rupt'* (Lat. *abrumpo*, I break off), in Bot., a term applied to any main root which ends abruptly, as though the point had been bitten off.

ABRUS, *ai'-brus* (Gr. *abros*, elegant), in Bot., a genus of leguminous plants. The seeds of the *Abrus precatorius* are used as beads for making rosaries and necklaces: they are of a bright scarlet colour, with a black mark on one side.

ABSCESS, *ăb'-sess* (Lat. *abscedo*, I separate), the name given in Surg., to an accumulation of pus, or matter, in some tissue or organ of the human body. The pus is formed from the blood during the process of inflammation, and the production of it is termed suppuration. When an opening is formed in an abscess, and matter still continues to be discharged from it, it is styled an ulcer. There are few tissues or organs of the body in which abscesses may not form. Abscesses in some organs are comparatively unimportant; in others they are highly dangerous.

ABSCISS, or ABSCISSA, *ăb-sis'-a* (Lat. *abscindo*, I cut off), in Geom., a term signifying a segment cut off from a right line by an ordinate to a curve.

ABSCISSION, *ăb-sis'-shun*, in Rhet., a figure of speech by which the orator breaks off suddenly, in the middle of a sentence, or of his discourse, to make the deeper impression on his audience.

ABSENTEE, *ăb-sen-tee'*, in Polit. Econ., is a term applied to a person who derives his income from one country, but who resides and expends it in another. Whether the absence of a landlord be injurious to a country in an economical sense is a question which has been much debated of late years, more particularly in connection with Ireland. Some maintain that the amount which a landlord spends in a foreign country is so much clear loss to the country from which he derives his income, and so much encouragement withdrawn from its industry. Others, again, assert, that, in point of fact, the revenue spent by a landlord in a foreign country has precisely the same effect upon the industry of his own country as if it were expended at home. They argue, that an Irish landlord residing in Paris receives his remittances of rent in bills of exchange which represent the value of British goods imported into France; that the money, instead of being withdrawn from the country, is expended in the production of Irish goods suitable to the English or foreign market; and that thus a wider field of industry is developed for our native productions. The truth seems to lie between the two. Though it is not true that the whole revenue spent out of a country is so much clear loss to that country, yet there can be little doubt that it has a prejudicial effect. The profits of the foreign retailers, servants, and others, remain at least in the foreign country, and are so much abstracted from the absentee's country. But there is a higher point of view in which this subject is to be regarded; namely, the moral. The evils here are undeniable. It is the duty of the proprietor to regard the interests of his tenants, to set before them a good example, and to aid them in effecting local improvements.—*Ref.* McCulloch's *Treatise on Economical Policy*.

ABSINTHINE, *ăb-sin'-thene* (Gr. *a* without, and *psinthos*, pleasure), a crystalline principle obtained from the *Artemisia Absinthium*, or wormwood, an herb used in the preparation of absinthe and other liqueurs. (*See* ARTEMISIA.)

ABSIS, or APSIS, *ăb'-sis* (Gr. *apsis*, an arch), in Arch., a term used by the ancient ecclesiastical writers to denote that part of a sacred edifice where the altar was erected, or where the clergy took their seats. It was thus called on account of its having generally a domed or vaulted roof.

ABSOLUTE, THE, *ăb'-so-lute* (Lat. *absolutus*, adequate, that needs no addition), in Metaphysics, is a term employed to indicate that which exists without limitation of any kind. Another term, of the same meaning, is the Unconditional. The Absolute stands opposed to the Relative or Conditional. Absolute truths are truths which are necessary and universal, such as the axioms of mathematical science, and, in the estimation of certain schools of thought, the first principles of theology and morals. It is chiefly in Germany that the belief in such absolute truths exists. The English mind has always leaned in a contrary direction; and the greater number of English metaphysicians have believed in the relative or conditional nature of all truth whatsoever. Many thinkers, however, of the first order, have endeavoured to seek a Universal Postulate, *i. e.*, a truth so self-evident as to require no illustration, the latest effort of the kind in this country being that of Mr. Herbert Spencer, in his treatise on "Psychology."

ABSOLUTE, ABSOLUTISM, in Pol., a form of government in which the supreme head or sovereign is above the control of the law, and enjoys unrestricted power. (*See* DESPOTISM.)

ABSOLUTE NUMBER, is the known quantity which possesses one side of an equation; thus, in $x^2 + 12x = 24$, the absolute number is 24, which is equal to the square of $x$ added to $12x$.

ABSOLUTION, *ăb-so-lu'-shun* (Lat. *ab*, from, and *solvo*, I loose), in Civil Law, is an acquittal or sentence of a judge declaring the accused innocent of the crime laid to his charge. In Canon Law, it is a remission of sins pronounced by a priest in favour of a penitent. It is said that down to the 12th century the formula of absolution was, "May God," or "May Christ absolve thee," when it was changed into "I absolve thee from thy sin," the priest thus assuming to himself the power to forgive sins. This is still the doctrine of the Roman Catholic church, sanctioned by the council of Trent, and grounded on John xx. 23. The form that occurs in the Church of England Order for the Visitation of the Sick, "I absolve thee from all thy sins," is held to be only declaratory of the sinner's pardon upon the apparent evidences of a sincere repentance, and according to the best judgment of the priest. In the early church there were held to be five kinds of absolution,—sacramental, by baptism and by the eucharist; declaratory, by word of mouth and doctrine; precatory, by imposition of hands and prayer; judicial, by relaxation of church censures.

ABSORBENTS, *ăb-sorb'-ents* (Lat. *absorbeo*, I suck up), a name given in Anat. to certain small delicate vessels which imbibe fluids that come in contact with them, and carry them into the blood. They are denominated *lacteals* or *lymphatics*, according to the liquids which they convey.

ABSORBENTS, in Med., substances used to absorb or neutralise the acids sometimes formed in the stomach: chalk and magnesia are examples. In Surg., spongy substances used in dressing wounds, such as lint and amadou.

ABSORBENT GROUND, a term given in Paint. to a water-colour mixture, which is laid upon the canvas or wood, and, which, upon the oil-colours being applied, at once imbibes the oil, leaving the colours in which the design is made dry and brilliant.

ABSORPTION, *ăb-sorp'-shun*, is the interpenetration of certain bodies by other bodies or influences, which by this means disappear or become lost. There are several important examples of this in Physics.

ABSORPTION, in Bot., the chief function of the root, by which food is taken up in a state of solution for the uses of the plant. (*See* ENDOSMOSE.)

ABSORPTION, in Chem., the disappearance of a gaseous fluid on entering into combination with a liquid or solid; thus, when the gas, ammonia, is passed into water, absorption takes place, and the result is the liquid commonly called spirits of hartshorn.

ABSORPTION, in Physiol., a term employed to designate that natural function of the body which is exercised by the absorbent vessels; as the absorption of the chyle by the lacteal vessels.

ABSORPTION OF HEAT is where the heat-rays seem to disappear within the substances of bodies subjected to their influence, the effects differing greatly according to surface and colour. As this subject is closely connected with the phenomena of radiation and reflection, it will be considered at greater length under the article HEAT. (*See* HEAT.)

ABSORPTION OF LIGHT will be best explained by

considering the causes of transparency, opacity, and colour. Transparency in a body is caused by one part of the light striking on it being transmitted through its substance, another being reflected from its surface, and a third being absorbed or lost in its interior. When a body reflects the whole of the light, it is said to be *opaque*, in which case, however, a small portion is absorbed. Colour is produced in transparent media by part of the colour contained in white light being absorbed. For example, a piece of blue glass absorbs the red and yellow rays, and transmits the blue; a piece of orange glass acting just in a contrary manner, transmitting the red and yellow rays and absorbing the blue. The same thing happens with opaque-coloured bodies, with the exception that the unabsorbed ray is reflected instead of being transmitted. In a white opaque object, nearly the whole of the white light is reflected from its surface, a small portion being absorbed without any separation of the coloured rays. In a black opaque object nearly the whole of the white light is absorbed without suffering any change. No object is absolutely transparent or opaque, even air absorbing a small portion of light and colour, and gold and silver transmitting green and purple rays respectively, when procured in sufficiently thin films. Perfect absorption or reflection is also unknown, for the darkest substance reflects a little light,—otherwise it would be invisible; and the brightest speculum metal absorbs an infinitesimal portion. Philosophers are as yet in ignorance of the causes of absorption of light; several theories have been propounded, but they appear only to make the matter still more difficult of comprehension.

ABSTINENCE, *ăb'-sti-nense* (Lat. *abstineo*, I abstain), the act or habit of refraining from something to which we have a propensity, or in which we find pleasure; but it is more particularly applied to the privation or sparing use of food. Abstinence has been enjoined and practised for various ends, as sanatory, moral, or religious. Physicians relate wonderful cures effected by abstinence; moralists, as the Pythagoreans, Stoics, and others, recommend it as a means of bringing the animal part of our nature into greater subservience to the spiritual; and it is likewise enjoined by various religious sects. It was commanded to the Jews; and, when among the primitive Christians a dispute arose upon this subject, the apostle Paul gave his opinion of it in Romans xiv. 1—3. In England, abstinence from flesh on certain days has been enjoined even since the Reformation, and was renewed under Elizabeth; but it was then expressly declared to be a political law, to favour the consumption of fish, and to multiply the number of fishermen and mariners. — Ref. *English Cyclopædia*—"Arts and Sciences."

ABSTRACT MATHEMATICS, or PURE MATHEMATICS, *ăb'-stract* (Lat. *abstrahо*, I withdraw), signifies that branch of the science which deals with magnitude, figure, and quantity in general, and without reference to any particular magnitude, figure, or quantity. Abstract Mathematics is opposed to Mixed Mathematics, which deals with the application of mathematics to navigation, astronomy, optics, &c.

ABSTRACT NUMBERS, in Arith., a term which signifies numbers considered in themselves, and without being applied to any individual thing,—as 4, 8, 12, &c.,—in distinction from numbers applied, or in the concrete,—as 4 men, 8 feet, 12 ships, &c.

ABSTRACTION, *ăb-străk'-shun*, in Psychol., this name is given to that operation of the mind by which it takes cognisance of qualities separately from the thing in which they exist; as, for example, of *whiteness*, apart from snow, from lime, from milk, or from any other substance or liquid. "An abstraction" is the idea which is the result of the above process;—an abstract idea, which, however fugitive in itself, speedily clings to a word, and becomes incorporate with it. The question whether abstract ideas, such as Beauty, Truth, Time, Space, have any real existence, or are only forms of things and wholly relative, is, and always has been, the great bone of metaphysical contention. It was the point in dispute between the Realists and Nominalists of the Middle Ages, and still divides thinkers into two great schools. (*See* PERSONIFICATION.)

ABSURDUM, REDUCTIO AD, *ăb-sur'-dum re-duct'-she*, is a mode of argument which proves the truth of the thing asserted, by demonstrating that the contrary is impossible, or leads to an absurdity. It is much used in geometry.

ABUNDANT NUMBERS, *ă-bun'-dant* (Lat. *ab* from, and *unda*, a wave), in Arith., are those numbers the aliquot parts of which, added together, make more than the number itself: thus, the aliquot parts of 20 (1, 2, 4, 5, 10), on being added together, make 22.

ABUTILON, *ă-bu'-ti-lon*, a genus of plants, belonging to the natural order *Malvaceæ*. The most interesting species is the *Abutilon esculentum*, commonly called Benção de Deos, the flowers of which are boiled and eaten as vegetables in Brazil.

ABUTMENT, *ă-but'-ment* (Fr. *aboutir*, to abut), in Arch., a term signifying the pier from which an arch springs, when the arch is less than a semicircle; but when an arch of any other figure is supported by a pier, which forms a right angle with the water or ground beneath, it is termed an impost-pier. The piers of Waterloo and London bridges are impost-piers; those of Southwark and Vauxhall are abutments. The extremities of a bridge, resting on the sides of a river, &c., are always termed abutments.

ABUTTALS, *ă-but'-tals* (Fr. *abutter*, to bound or limit), the boundaries or limits of lands. These boundaries' or abuttals are, in the case of corporation and church lands, preserved by an annual procession.

ABYSS, *ă-bis'* (Gr. *bussos*, profound depth), a term used to denote, in general, anything profound or bottomless. In Scripture, it is employed to denote the deepest parts of the sea, from their being unfathomable; and in a figurative sense, it implies hell, or the bottomless pit.

ABYSSINIAN CHURCH, in Eccl. Hist., the name of a sect of the Christian church established in Abyssinia. It is said, that about the beginning of the 4th century of our era, Meropius, a learned Greek of Tyre, when on a voyage of discovery, had landed on the coast of Abyssinia. Here he was attacked by the natives, and himself and crew murdered, with the exception of two youths, Frumentius and Ædesius. These rose into great favour and influence in the country, and Frumentius was subsequently made bishop of Auxumas (the chief city of Abyssinia) by Athanasius, and laboured with great success. At present, the forms and ritual of the Abyssinian church are a strange compound of Judaism and Christianity, of ignorance and superstition. It is governed by a bishop, who is styled *Abuna*, and is sent into Abyssinia by the Coptic bishop of Alexandria. The Abyssinians have, at different times, expressed a desire to be reconciled to the church of Rome.

ACACIA, *a-kāsh'-e-a*, in Bot., a genus of plants, belonging to the natural order *Leguminosæ*, sub-order *Mimoseæ*. Many kinds furnish good timber and valuable gums. The *Acacia vera* yields gum arabic; and the inner wood of the *A. Catechu*, an Indian shrub, affords a kind of catechu, or cutch, rich in tannin, which is used for tanning, and, in medicine, as an astringent.

ACADEMY, *ă-kad'-e-me*, was the name of a place in the suburbs of Athens, laid out in walks and shady trees, and said to have been so called after its possessor, Academus or Ecademus. It became a favourite resort of the lovers of meditation and philosophy, and hither Socrates was wont occasionally to repair, to converse with his disciples. But it is chiefly in connection with Plato and his philosophy that the place has become famous; and hence his followers were termed Academics. In modern times, the term "academy" has come to have a somewhat different signification from that which it bore in ancient times. It is generally applied to a society of learned men, formed for the cultivation of science, literature, or the arts.

ACADEMY FIGURE, in Paint., a term used to signify a design, generally executed with black and white chalk, after a living model.

ACALEPHÆ, *ă-ka-le'-fe* (Gr. *akalephe*, a nettle), a class of marine invertebrate animals, comprehended in the sub-kingdom *Radiata*, and otherwise called *Sea-nettles*. It embraces an extensive number of animals, of which the genus *Medusa* of Linnæus may be taken as the type. This genus has a nervous system and senses; a muscular system; a reproductive system and development; the power of stinging when touched; and is phosphorescent. *Acalephæ* have been sepa-

rated into four families,—the *Pulmograda*, the *Ciliograda*, the *Cirrhigrada*, and the *Physograda*. These families exhibit a great variety of genera of peculiar structure and form. Some of them are extremely beautiful, and present an interesting study to the naturalist. (*See* JELLY-FISH and MEDUSA.)

ACANTHACEÆ, *ă-kăn-thai'-se-e*, in Bot., the *Acanthus* order. Herbs or shrubs found in most parts of the world, and abounding in the tropics. Many species have very beautiful flowers. The elegant lobed and sinuated leaves of the acanthus are stated to have suggested the capital of the Corinthian pillar. (*See* CAPITAL.)

ACANTHION, *ă-kăn'-thi-on*, in Zool., a genus of *Rodentia* known, at present, only by their osteology. The genus was established by M. F. Cuvier.

ACANTHODERMA, *ă-kăn-tho-der'-ma*, a fossil genus of fishes, from *Glaris*.

ACANTHODES, *ă-kăn-tho'-dees*, a genus of fossil Ganoid fishes, found in carboniferous strata, near Edinburgh, Scotland.

ACANTHOPHIS, *ă-kăn'-tho-fis*, in Zool., a genus of venomous serpents, allied to the vipers. From these, however, they are distinguished by their having a single series of plates beneath the tail, except towards the very end of it, where, in some instances, these are separated in two small rows. They are viviparous, and conceal themselves among the roots of trees, depending for their prey on the effects of the poison with which they are imbued.

ACANTHOPTERYGII, *ă-kăn-thof-te-ry'-je-i*, one of the three natural orders or primary divisions of fishes, divided by Cuvier into fifteen natural families.

ACANTHURUS, *ă-kăn'-thu-rus*, in Nat. Hist., a genus of fishes, of the order *Thoracici. Charac.* Teeth small, in most species lobated; tail aculeated on each side. It is a native of the Indian and Arabian seas, in the latter of which it is generally seen in large shoals of two or three hundred each, swimming with great strength, and feeding principally on different kinds of sea-weed. The genus contains a large number of species, many of which are extremely beautiful both in form and colour.

ACANTHUS, *ă-kăn'-thus*, in Bot., a genus of herbaceous plants, belonging to the order *Acanthaceæ* (which *see*). Most of the species are tropical, but two grow wild in Central Europe. These are *Acanthus mollis*, which has emollient qualities, and *A. spicatus*.

ACARUS, *ak'-ă-rus* (Gr. *akari*, a mite), the tick or mite, a genus of insects of the order of *Aptera*, or those without wings. It is oviparous, has eight legs, two eyes, and two jointed tentacula. It will live many months without food, and is very prolific. Of the species, there are, the domestic mite, the itch mite, the sugar-mite, the red spider, the sparrow-mite, the water-mite, and the ticks.

ACATALECTIC, *ă-kăt-a-lek'-tik*, a term applied in Ancient Poetry to such verses as have all their feet and syllables without any defect at the end; those which are not so, being called *catalectic*.

ACAULESCENT, *ă-kawl-es'-sent* (Gr. *a*, without, and *kaulos*, a stem), in Bot., a term applied to plants having very short or inconspicuous stems, as the sweet violet.

ACCALIA, *ăk-kai'-le-a*, festivals held among the Romans in honour of Acca Laurentia, the nurse of Romulus.

ACCELERATION, *ăk-sel-le-rai'-shun* (Lat. *acceleratio*, hastening), in Mech., is when the velocity of a moving body is continually increased. With whatever velocity a falling body moves in the first second, it will, at the end of two seconds, move with twice that velocity, and so on; the force of gravity increasing as the body approaches the earth. This is, however, not mathematically true, as a little time is lost through the increased density and consequent resistance of the air at each moment.

ACCELERATION OF THE STARS, a term applied in Ancient Astron. to the time by which the fixed stars anticipate the diurnal motion of the earth.

ACCELERATION OF THE MOON is the increase of the moon's mean motion from the sun, compared with the diurnal motion of the earth, which is calculated at about ten seconds in a century.

ACCELERATION AND RETARDATION OF THE TIDES are certain irregularities in the difference between the times of high water, which difference would be constant supposing the tides occurred at regular intervals. The tides are caused by the attraction exercised by the sun and moon on the waters of the earth. The earth being nearer to the moon than to the sun, it is by her that the greatest influence is produced. The moon takes 24 h. 50 m. to perform one revolution round the earth; high water ought, therefore, to arrive at exact intervals of 12 h. 25 m. This interval is, however, continually changing at different times and places, being influenced by three principal causes,—the relative distance of the sun and moon, of the earth and moon, and the moon's distance from the equator. Local circumstances, such as currents, prevailing winds, &c., are other causes of these irregularities. For instance, high water takes place at Ipswich at nearly the correct time; at Glasgow and Greenock too early; and at most other places too late. The proper recurrence of spring and neap tides is at the conjunction and opposition of the sun, and is also irregular. At London the highest spring tide occurs 2 days 10 hours after the proper time; this error itself being liable to the greatest irregularity.

ACCENT, *ăk'-sent* (Lat. *ad*, to, and *cano*, I sing), among grammarians, is the raising or lowering of the voice in pronouncing certain syllables of words. There are three kinds of accents; viz., the acute, the grave, and circumflex. The acute accent, marked thus (´), shows that the voice is to be raised in pronouncing the syllables over which it is placed. The grave accent is marked thus (`), and points out when the voice ought to be lowered. The circumflex accent is compounded of the other two, and marked thus (ˆ) or (˜); it denotes a quavering of the voice between high and low. Some call the long and short quantities of syllables, accents; but erroneously.

ACCENT, in Music, signifies a raising of the tone, in order to obtain variety and expression.

ACCEPTANCE, *ak-sep'-tance*. (*See* BILL OF EXCHANGE.)

ACCESSARY, or ACCESSORY, *ăk'-ses-so-re*, or *ăk-ses'-so-re* (Lat. *accedo*, I approach), in Law, signifies one who is guilty of a felonious offence, not principally, but by participation. There are two kinds of accessories,—"before the fact" and "after the fact." An accessory "before the fact" is he who, "being yet absent at the time of the crime committed, doth yet procure, counsel, or command another to commit a crime." An accessory "after the fact" is one who receives, assists, or relieves a felon of whose guilt he has knowledge. (*See* LAW, CRIMINAL.)

ACCESSARY, or ACCESSORY (Fr. *accessoire*), a term used in Paint., to signify those things introduced into a picture for the purpose of explaining and helping the principal objects in telling the story. The works of Hogarth furnish excellent examples of the advantages to be derived from the employing of accessaries.

ACCESSION, *ăk-ses'-shun* (Lat. *accessio*, going to or towards), in International Law, signifies the act of a power when it becomes party to a treaty concluded between other powers. It also means the period at which a prince assumes the sovereignty. In Med., it is synonymous with paroxysm.

ACCIDENCE, *ăk'-se-dense* (Lat. *accidens*, falling), a small book containing the first principles or rudiments of grammar.

ACCIDENT, *ăk'-se-dent* (Lat. *accidens*, falling), denotes, in a general sense, any casual event. Among logicians, it signifies,—1. Whatever does not essentially belong to a thing; 2. Such properties in any subject as are not essential to it; 3. In opposition to substance, all qualities whatever are called accidents: as sweetness, softness, hardness, &c. In Grammar, accident implies a property attached to a word without entering into its essential definition.

ACCIDENT, is that which does not follow from the nature of a thing, but from some qualities of it. It also signifies qualities as opposed to substances. In Heraldry, it is in coat-armour an additional mark, which may be omitted without effecting any change in the dignity. In Gram., it is something belonging to a word, but not essential to it; as gender, number, inflection.

ACCIDENTAL, *ăk-se-den'-tal* (Lat. *accidentalis*, hap-

pening by chance), in the language of philosophy, is employed to express the effect which proceeds from the cause happening by accident.—Accidental colours are those which depend on the affections of the eye. The term is applied to the ocular spectrum which is generally perceived after the eye has been for some time steadily fixed upon a coloured object. Thus, if we look for some time upon a yellow piece of cloth, and suddenly turn the eye from it, we will see the colour of indigo; red will give a bluish green, and so on. These colours are also called complementary colours, because, when taken in conjunction with those of the spectrum, they make up all the colours of a white light.—*Accidental point*, in Perspective, that point in the horizontal line where the projections of parallel lines meet the perspective plane.

ACCIPENSER, *ăk-se-pen'-ser* (Lat. *acipenser*, a sturgeon), in Ichth., a genus of fishes, of the order of *Amphibia nantes*. It has a single linear nostril; the mouth is in the under part of the head, and without teeth; the cirri are below the snout, and before the mouth. There are three species of this genus. 1. *Acipenser Huso*, the largest, is a native of Russia. The skin is so strong as to be used for traces in drawing vehicles. The isinglass of the shops is made from its sounds and scales.—2. *Acipenser Ruthenus* is also a native of Russia. —3. *Acipenser Sturio*, or the sturgeon, is frequent in our rivers. Isinglass is also made of the sounds of this fish. The sturgeon is sometimes found of the length of 18 feet, and weighing 700 lbs. It is oviparous, and spawns in water. (*See* STURIONIDÆ.)

ACCIPITRES, *ăk-nip'-e-trees* (Lat. *accipiter*, a hawk), an order of birds, having a crooked beak and powerful talons. In this order are classed the vulture, falcons, hawks, and owls.

ACCLAMATION, *ăk-la-mai'-shun* (Lat. *acclamatio*), among the ancient Romans, a shouting in concert, expressive of their public approbation of the conduct of their princes or generals. The acclamations of the theatres, at first rude and tumultuous shouts, became, in process of time, a species of regular concert. When Nero played in the theatre, a signal was given, upon which 5,000 soldiers began to chant his praises, which the spectators were obliged to repeat. In Archæol., the term is applied to those medals on which the people are represented as expressing their joy.

ACCLIMATIZE, *ăk-kli'-ma-tize* (Lat. *ad*, to, and *clima*, a climate), to accustom an animal or plant to a climate not natural to it. A change of climate induces a certain change in the constitution of the individual, greater or less, according to the amount of difference between the two climates. In cases where the difference is extreme, diseases and even death may be the result. The change produced by acclimation may be either an improvement or a deterioration. Some plants or animals possess the power of bearing changes of climate to a much greater extent than others; and, frequently, a change which cannot be effected in one individual, may be brought about more gradually in the course of a few generations. The power of bearing changes of climate is remarkable in the human species, particularly in the Anglo-Saxon race. An attention to diet, clothing, &c., does much in modifying the influences of climate.

ACCOLADE, *ăk-o'-lade* (Lat. *ad*, to, and *collum*, the neck), a term used to express an ancient mode of conferring knighthood, by the sovereign embracing the neck of the new-made knight. In England, it is generally considered as the slight blow given on the shoulder or cheek when the honour of knighthood is being conferred. Gibbon calls this blow "the emblem of the last affront which it was lawful for him to endure." Some antiquaries derive the origin of this custom from the blow given to the Roman slave by his master when giving him his freedom.

ACCOMMODATION BILL, *ăk-kom'-mo-da'-shun* (Lat. *ad*, to, and *commodum*, convenience), in Commerce, signifies a bill of exchange accepted by an individual for the convenience of the drawer, with whom it rests to take it up when at maturity.

ACCOMPANIMENT, *ăk-kum'-pan-e-ment* (Fr. *accompagner*), in Music, denotes the instruments which, in the subordinate part or parts, accompany the voice, either to give it fulness or relief, and to heighten the general effect. Thus, the piano and guitar are suitable instruments for the accompaniment of a song. In concerto, the instrument for which the principal part is composed is accompanied by the whole of the band.

ACCOMPANIMENT, in Her., denotes anything added to a shield by way of ornament, as the belt, mantling, supporters, &c. Accompaniment is also used for several bearings about a principal one, as a saltier, bend, fess, &c.

ACCORD, *ăk-kord'*, in Law, signifies an agreement entered into, whereby one party consents to receive from another something in satisfaction of a debt, or in recompense for an injury.

ACCORD, in Music. (*See* CONCORD.)

ACCORDION, *ăk-kor'-de-an*, a musical instrument, invented in Germany. It consists of a small oblong box, of from 8 to 20 inches in length, with an inside row of small elastic springs, or laminæ, fixed in a metallic plate at one end, in such a manner as to allow them to vibrate freely. A bellows, or folding apparatus, unites the upper and lower parts, and supplies the springs with the necessary air to put them in motion. To these the air is admitted by valves, which, in the same manner as in an organ, are acted on by the keys. A base note, or drone, is also added. The compass of the most perfect instrument is from G, the fourth space on the base cleff, to E, the seventh additional space above the treble, all the semitones inclusive. Previous to the introduction of the principle of this instrument to Europe, it was well known to the Chinese. The soft tones of the accordion have a great effect upon savage nations, as asserted by Roman Catholic missionaries, who carry with them accordions to attract the people to their discourses.—The FLUTINA is another species of accordion, and there is an ORGAN-ACCORDION recently invented.

ACCOUNT, or ACCOMPT, *ăk-kount'*, in general denotes all arithmetical computations. Among merchants it is used for the books in which their business is entered. (*See* BOOK-KEEPING.)

ACCOUNTANT, *ăk-koun'-tant*, a person skilled in mercantile accounts. Accountants are usually employed in investigating the accounts of traders, making up states of affairs, collecting accounts, &c. The official in a public office who has charge of the accounts is termed an accountant.—*Accountant in Bankruptcy* is an officer appointed by the lord-chancellor, having the control and management of the funds belonging to bankrupt estates.—*Accountant-General*, an officer in the court of Chancery, appointed for securing the moneys and effects of the suitors.

ACCOUNTS, CHAMBER OF, in the old French government, was a court similar to the Exchequer of England.

ACCOUNTS STATED, a title given to the common count in the declaration in an action, where, upon a balanced account between the parties, the plaintiff seeks to recover the amount due.

ACCOUTREMENTS, *ăk-koo'-tre-ments* (Fr. *accoutrement*), a term signifying, in military affairs, the dress, equipage, &c. of a soldier.

ACCRESCENT, *ăk-res'-sent*, in Bot., a term applied to a persistent calyx, that continues to grow after the flowering, so as to form a sort of bladder round the fruit, as in the winter cherry.

ACCROCHÉ, *ăk-ro'-shai*, in Her., denotes a thing being hooked into another.

ACCUBATION, *ăk-ku-bai'-shun*, a term used to express the posture taken by the ancient Greeks and Romans at their tables. This posture exhibited their bodies extended upon couches, with their heads resting on pillows, or on their elbows, supported by pillows.

ACCUMBENT, *ăk-kum'-bent* (Lat. *accumbere*, to lie down), in Bot., a term applied to cotyledons which are applied to each other by their faces, and have the radicle folded on their edges, as seen in the embryo of the wallflower. (*See* EMBRYO.)

ACCUMULATION OF DEGREES, *ăk-ku-mu-lai'-shun* (Lat. *cumulus*, a heap), in a university, is the taking of two or more together, or with small intervals between them.

ACCUMULATION OF POWER is applied to that kind of motion existing in some kinds of machines at the end of intervals of time, during which the velocity of the moving body has been constantly accelerated.

ACCUSATIVE CASE, *ăk-ku'-sa-tiv*, in Grammar, the fourth case, governed by an active verb or preposition; as, I love *him*; where *him* is the accusative of the pronoun *he*, and is governed by the verb *love*. It more peculiarly belongs to the Latin language, but has been introduced to the English, in which it survives only in pronouns. It comes after all prepositions, and is usually termed the objective case. (*See* GRAMMAR.)

ACE, *aise* (Lat. *as*, a unit), in games, signifies that side of the dice whereon one is marked. In cards, it denotes those which bear only one figure; as, for example, the "ace of hearts," which displays but one heart.

ACEPHALOUS, ACEPHALA, *a-sef'-a-lus* (Gr. *akephalos*, headless), in Zool., a class of molluscous animals which have no apparent head.

ACER, *ai'-ser*, in Bot., the most important genus of the natural order *Aceraceæ*. Many useful and ornamental trees are included in this genus.—*Acer saccharinum*, the sugar-maple, yields a great portion of the sugar used in America. Perforations are made in the trunk at the commencement of spring, and the saccharine sap which exudes is collected and boiled down to the crystallizing point.—*A. campestre* and *A. pseudo-platanus* are common timber-trees in Britain: the latter, commonly known as the sycamore, furnishes excellent wood for making charcoal.

ACERACEÆ, *ai-ser-ai'-se-e*, in Bot., the Maple order. The plants of this order are handsome trees, which furnish light and beautiful wood, much used in the arts. They are also remarkable for their saccharine sap. They grow in the temperate regions of Europe, Asia, and North America. (*See* ACER.)

ACERAS, ACERA, *ă-ser'-ras* (Gr. *a*, without, and *keras*, a horn), in Ent., a family of apterous insects.

ACERIC ACID, *ă-ser'-ick* (Lat. *acer*, the maple), in Chem., an acid obtained from the sap of the maple-tree.

ACEROSE, *ăs'-e-rose*, in Bot., a term signifying *needle-shaped*, applied to leaves that are very narrow and sharply pointed, as those of the common juniper.

ACERRA, *ă-ser'-ra*, a term applied by the ancients to a kind of altar placed near the bed of a dead person. Incense and other perfumes were consumed on it by fire previous to the funeral, and *Acerræ* were the pots in which the incense was burnt.

ACETABULUM, *ă-se-tab'-u-lum* (Lat. a small cup or dish), signifies, in Zool., the suckers of the arms of the cuttle-fish, as well as other dibranchiate cephalopods, which have on this account been termed acetabulifera.

ACETABULUM, in Anat., is the term applied to that deep cup-like cavity of the os innominatum which receives the head of the femur, or thigh-bone, thus forming the hip-joint.

ACETABULUM, in Ent., is a term signifying the cavity in the trunk in which the leg is fitted.

ACETAL, *ăs'-e-tal*, in Chem., a thin colourless fluid, boiling at 221° F., its specific gravity being ·821. It is one of the products of the slow oxidation of alcohol vapour under the influence of finely-divided platinum.

ACETABIOUS PLANTS, *ă-se-tair'-e-us* (Lat. *acetaria*, a salad), plants such as endive, mustard-and-cress, lettuce, &c., used for salads.

ACETATE, *ă'-se-tait*, in Chem., a compound formed by the union of a base with acetic acid. Many of the acetates are of great importance in the arts. These will be found under their respective bases. All the acetates are soluble in water.

ACETIC ACID, *ă-set'-ik*, in Chem., is produced by the oxidation or destructive distillation of organic bodies containing its elements,—carbon, hydrogen, and oxygen. When pure, it is a colourless liquid of specific gravity 1·064, which crystallizes at a temperature below 60° F. It has a pungent smell, and is highly corrosive. Vinegar and pyroligneous acid are impure varieties of acetic acid. All liquids susceptible of the vinous fermentation are capable of yielding vinegar. Of these, the most important is wine, which becomes vinegar by spontaneous acidification. The old method of making the best vinegar consists in partially filling a series of casks placed in a cellar kept at the temperature of 85° F., with a mixture of wine and ready-made vinegar. The latter, which acts as a ferment, is first put into the empty casks, and then a certain proportion of wine. After some days, more wine is introduced, and successive additions are made periodically. When the whole has become vinegar, a quantity equal to that of the wine employed is drawn off, and the process is recommenced. In England, an inferior sort of vinegar is made from an infusion of malt by first exciting in it the alcoholic fermentation, and subsequently inducing the oxidation of the alcohol. The fermented wort is sometimes transformed into vinegar by a process precisely similar to that described above, and sometimes by allowing it to remain for several months in half-filled and loosely-stopped casks, arranged in rows in an open field. The German, or quick-vinegar process, consists in passing the fermented liquor through a large vessel filled with beechwood shavings moistened with vinegar. In percolating through the apparatus, which is called the generator, the liquor passes over an immense surface exposed to the oxidizing influence of the air, and is rapidly converted into vinegar. The crude acetic acid, known as pyroligneous acid, is one of the liquid products of the destructive distillation of wood. Oak and beech are the woods most commonly used in the manufacture, and the distillation is generally conducted in large iron cylinders. By a beautiful but tedious process, the acetic acid contained in the impure product is made to unite with soda, so as to form pure acetate of soda. This salt, when distilled with concentrated sulphuric acid, yields a colourless liquid, which is acetic acid. A portion of this crystallizes at a temperature of from 40° to 50° F., constituting what is called *glacial acetic acid*. The chemical composition of acetic acid is represented by the symbol $C_4H_4O_4$. Its uses are numerous and important. In the Arts, it is employed for the preparation of the various acetates, especially those of iron and alumina, which are the chief mordants of the calico-printer, for dissolving gums in making varnishes, and for photographic purposes. In Medicine, it is used externally as a local irritant, and internally as a febrifuge.—Ref. *English Cyclopædia*—"Arts and Sciences."

ACETONE, *ă-se-tone'*, in Chem., a colourless volatile fluid, having the composition $C_6H_6O_2$, obtained by the distillation of the acetates of the alkaline earths. It has a peculiar odour, and is very inflammable. It is sometimes called *pyroacetic spirit*. As a remedy for asthma, it is occasionally used in medicine.

ACHÆAN LEAGUE, *ă-ke'-an*. (*See* vol. I. of this work.)

ACHÆNIUM, *ă-ke'-ne-um*, in Bot., a one-seeded fruit, having a dry shell, or pericarp, which is closely applied to the seed, though separable from it. This pericarp is indehiscent, that is to say, it remains closed, and the seed can only become free by its decay. Linnæus mistook achænia for seeds, and called the plants producing them *gymnosperms* (naked-seeded). Several achænia are formed by a single flower. The little hard bodies scattered over the surface of the strawberry, and those we find clustered together in the centre of the buttercup, are achænia.

ACHATMA, *ă-kăt'-ma*, in Zool., a genus of terrestrial gastropods.

ACHERONTIA, *ă-ke-ron'-she-ă*, a genus of Lepidopterous insects, fam. *Sphingidæ*, which embraces some of the largest European Lepidoptera, the most remarkable of which is the *Acherontia atropos*, or Death's-head Hawk-moth (which *see*).

ACHIEVEMENT, *ă-tsheev'-ment* (Fr. *achever*, to accomplish), in Her., is a term applicable to the shield of armorial bearings generally, as the heraldic symbols or badges depicted on it were originally the marks of some heroic act or great achievement of the bearer. The term, however, is commonly applied to the funeral achievement of a deceased person, affixed against the dwelling-house, to denote the death, rank, and station of the late occupant.—*Ref.* Berry's *Encyclopædia Heraldica*.

ACHILLEA, *ă-kil'-le-a*, in Bot., a genus of plants belonging to the natural order *Compositæ*. The *Achillea Millefolium*, commonly called the Yarrow, or Milfoil, is the most important British species. Its white, or rose-coloured flowers, adorn many of our meadows, particularly those with silicious soils, from June to September. From these flowers, which are occasionally

substituted for hops in brewing, an essential oil is obtained, and an infusion of the leaves and flowering heads is said to be a valuable stomachic. The pretty garden plant known as white bachelor's buttons is a cultivated variety of a species of achillea. The generic name is derived from Achilles, who is said to have discovered the medicinal properties of the milfoil while studying botany under Chiron.

Achilles, Tendon, *ă-kil'-leez ten'-don* (Lat. *tendo Achillis*), in Anat., a tendon which connects the soleus and gastrocnemius muscles of the calf of the leg with the bone of the heel. It takes its name from the fable of the mother of Achilles dipping him in the river Styx to render him invulnerable. During this operation she held him by the heel, and here he subsequently received his death-wound. (*See* Achilles, vol. I. of this work.)

Achilleum, *ă-kil'-le-um*, a genus of fossil *Spongiadæ*, of which there are two species found in the cretaceous strata of England.

Achlamydous, *ă-kla-mi'-de-us*, in Bot., a term applied to flowers which have only stamens and pistils, the floral envelopes being wanting. The naked flower of the common ash is an example. This consists merely of the essential organs of reproduction, and has neither calyx nor corolla.

Achras, *ă'-kras*, in Bot., a genus of plants, belonging to the order *Sapotaceæ*, or *Sappodilla* family. They are natives of the tropical parts of India, Africa, and America. Several species yield luscious fruits; thus, the *Achras sapota* produces the sappodilla plum, and the *A. mammosa* the marmalade. The barks of certain species are used medicinally in the treatment of fevers, and the milky juices of others yield substances resembling gutta-percha.

Achromatic, *ăk'-ro-mat-tik* (Gr. *a*, without, and *chroma*, colour), in Opt., a term applied to lenses which give images free from coloured and indistinct edges. Hall and Dolland discovered the mode of constructing these lenses, by perfectly independent investigations. They both found that the chromatic dispersion which common lenses produced could be done away with by using two lenses of different kinds of glass, joined together. (*See* Light, Lens, Prism, Chromatics, Refraction, Optics.)

Acicular, *ă-sik'-u-lar*, in Bot., a term signifying needle-shaped, applied to narrow leaves, like those of the fir. The term *linear* is more commonly used, and is to be preferred.

Acidaspis, *ăs-sid-ăs'-pis*, a genus of fossil *Crustacea*, of the group *Trilobites*, found in the Wenlock limestone.

Acidifiable, *ă-sid'-e-fi-a-bl*, in Chem., is applied to that which is capable of being converted into an acid. Such substances are also termed *radicals*, and acidifiable bases.

Acidimeter, *ăs-se-dim'-me-ter*, in Chem., an instrument for ascertaining the strength of acids.

Acidimetry, *ăs-se-dim'-me-tre*, in Chem., an expeditious method of ascertaining the quantity of free acid contained in any given liquid, based upon the law of definite proportions. It is employed as a means of determining the actual or intrinsic value of the crude acids met with in commerce. To facilitate this process, tables have been constructed by Dr. Ure and others. (*See* Volumetric Analysis.)

Acids, *ă'-sid* (Lat. *acidus*, sour), a numerous and portant class of chemical bodies, which are distinguished by the property of combining with bases to form salts. (*See* Base and Salts.) They are generally sour to the taste; in most instances they have a great affinity for water, and are soluble in it; they redden nearly all the vegetable blues; they unite with metals or their oxides, alkalies, and earths. It was long held that oxygen was contained in all the acids. This element does indeed enter into the composition of the greatest number; but it has been ascertained that in very many cases the acidifying principle is hydrogen. It has consequently been considered necessary to divide acids into *oxyacids*, formed by oxygen, and *hydracids*, formed by hydrogen. These, again, are subdivided into *anhydrous acids*, or acids without water, and *hydrated acids*, or acids containing water. According, however, to the latest researches of chemists, all acids are hydracids. The acids furnished by the mineral kingdom are termed *mineral acids*. *Metallic acids* are formed by the combination of oxygen and a metal; and *organic acids* are those which contain carbon, or are formed with organic substances. In the system of chemical nomenclature proposed by the eminent French chemists Guyton de Morveau and Lavoisier, the mineral acids are designated by an adjective formed out of the name of their elements, and terminating in *ous* or *ic*; thus, sulphurous acid, phosphoric acid, implying that the first is formed of sulphur and oxygen, and the second of phosphorus and oxygen. If the acid be formed of hydrogen, the term is commenced with *hydro*; thus, hydrochloric acid signifies that the compound contains hydrogen and chlorine. The two syllables *ous* and *ic* affixed to the names of acid compounds, indicate two different modifications; *ic* always denoting an acid which contains more oxygen than the acid whose name terminates in *ous*: for example, sulphuric acid has for its acidifying principle more oxygen than sulphurous acid. It was at first thought that a substance could not form with oxygen more than the two above-mentioned compounds; but cases were subsequently discovered wherein a substance was found to make with oxygen as many as five different combinations. In order to distinguish these combinations from the others, it was found necessary to employ three prefixes borrowed from the Greek; for example, *hypo* (under), *hyper* (above), or briefly *per* (in the highest degree). Thus hyposulphurous acid is an acid composed of sulphur and a smaller proportion of oxygen than sulphurous acid; perchloric acid contains more oxygen than chloric acid, &c. (For further details upon this subject, *see* Chemical Nomenclature.) The organic acids, which are very much more numerous than the mineral acids, and which all contain carbon and hydrogen, a large proportion oxygen, and some nitrogen, have no regular nomenclature. The most important of these chemical bodies are,—among the mineral acids, sulphuric, sulphurous, hydrosulphuric, nitric, phosphoric, arsenious, arsenic, chromic, hydrofluoric, hydrochloric, chloric, iodic, carbonic, boracic, and silicic; among the organic acids, formic, hydrocyanic, oxalic, acetic, malic, tartaric, succinic, benzoic, citric, &c. (*See* these words.) Acids are extensively employed in medicine, principally in cases of inflammation, fever, palpitation of the heart, and irritation of the skin.

Acinaciform, *ă-se-na'-se-form*, in Bot., a term signifying scimitar-shaped; applied to certain succulent leaves.

Acinus, *ăs'-e-nus*, in Bot., one of the divisions of the fruit of the raspberry.

Aclides, *ăk-li'-dees*, a missile weapon, supposed to have been a kind of dart or javelin, made use of by the ancient Romans. According to Scaliger, it was a globular weapon, and poised by a wooden stem.

Acmé, *ăk'-me* (Gr. *akme*, a point), the top or highest point of anything. Physicians use it to express the utmost violence or crisis of a disease; and in Rhet. it denotes the highest point of pathos, to which the mind is conducted by a series of impressions gradually rising in intensity.

Acology, or Akology, *ă-kol'-o-je* (Gr. *akos*, a remedy, and *logos*, a discourse), a term signifying the doctrine of remedies, or of the *materia medica*.

Acolyte, *ăk'-o-lite* (Gr. *akaloulhos*, disciple), in the Romish church, one of the inferior orders of the clergy, whose office it is to attend upon the deacons and subdeacons in the ministry of the altar, to light and hold the candles, to bear the incense, to present the priests with wine and water, &c. In the primitive church, the acolytes were in holy orders, and ranked next to the subdeacons; but at the present time, the duties of the acolyte are very often performed by laymen and chorister-boys.

Aconite, *ak'-o-nite*, in Bot., the poisonous plant familiarly known as the monkshood, or wolfsbane. (*See* Aconitum.)

Aconitic Acid, *ă-kon-ĭ'-tik*, in Chem., is prepared by the action of heat upon crystallized citric acid, and is found to be identical with that which occurs in the monkshood combined with lime. The salts formed by the union of this acid with different bases are termed aconitates.

Aconitine, or Aconitia, *ă-kon'-e-tine*, in Chem.,

a powerful vegetable alkaloid, prepared from the root of the *Aconitum Napellus*. It is one of the most virulent of poisons, but, at the same time, a very valuable medicine. Externally applied, it produces on the skin a prickling sensation, which is followed by a peculiar numbness. An ointment containing aconitine is often used in cases of neuralgia. The alkaloid consists of the elements carbon, hydrogen, nitrogen, and oxygen, its formula being $C_{66}H_{47}NO_{14}$.

ACONITUM, *ă-kon-ī'-tum*, in Bot., a genus of plants belonging to the natural order *Ranunculaceæ*, the Crowfoot or Buttercup family. Nearly all the species are poisonous; but when the extracts prepared from them are used in proper doses, their narcotic and diaphoretic effects prove highly beneficial. The flowers of many species are remarkable for their beauty, and resemble little helmets. The root of the *Aconitum ferox* is the principal source of the celebrated Indian poison *Bikh*, or *Bish*. The monkshood, *Aconitum Napellus*, is a native of Europe, and occurs in several parts of this country, particularly in Herefordshire, Devonshire, and Somersetshire, and is cultivated as a garden plant for the sake of its handsome purple flowers. This species is the officinal plant of our Pharmacopœia, and the preparations from it are used in the treatment of neuralgia, acute rheumatism, and diseases of the heart. Its active principle is aconitine (*see* ACONITINE). The root of the *A. heterophyllum* is said to possess no poisonous properties, and to have a high reputation in India as a febrifuge and antiperiodic medicine.

ACONTIA, *ă-kon'-she-a* (Gr. *akon*, a dart), a genus of serpents established by Cuvier, and forming a link between the true serpents and the common snakes. *Charac.* Without bones; the usual lizard or serpent head; body covered with small scales only, but without the horny plates which guard its under surface in the common serpents; without poison-fangs, and with gentle habits; in general, of a small size, and it feeds on worms and insects. It is found in almost every part of the old world.

ACORN, *ai'-korn* (Sax. *aac*, an oak, and *cern*, grain), in Bot., the fruit of the oak-tree. Acorns form excellent food for swine, and are said to have been used by man for food in the golden age. (*See* QUERCUS.)

ACORN, in Maritime affairs, a small piece of wood placed on the top of the spindle of the mastheads of ships, to keep the vane from flying off.

ACORUS, *ai'-ko-rus* (Gr. *a*, without, and *kore*, pupil of the eye), in Bot., the sweet flag, a member of the natural order *Orontiaceæ*. This plant grows in watery places, and abounds in the rivers of Norfolk, whence the London market was formerly supplied. It blossoms during the months of May and June, and is the only truly aromatic plant growing wild in this country. The thick creeping stem or rhizome, commonly called the root, is the valuable part of the plant, it is somewhat spongy and powerfully aromatic, and has a bitterish taste. It is used by the rectifiers to improve the flavour of gin, and is also employed to give a peculiar taste and fragrance to certain kinds of beer. Perfumers make use of it in the manufacture of hair-powder, and tanners in the preparation of peculiar sorts of leather. From the fresh rhizome a volatile oil is obtained by distillation, used in making aromatic vinegar, and for scenting snuff. In Med., the sweet-flag is sometimes used as an aromatic stimulant and a mild tonic, and many physicians speak highly of its beneficial effects in cases of ague. It grows in most parts of Europe, in Asia, and in the United States; and in Catholic countries it is used for strewing the churches at great festivals. It is supposed to be the *calamus* of the Song of Solomon: hence its botanical name, *Acorus Calamus*.

ACOTYLEDONS, ACOTYLEDONES, *ai'-ko-ti-lee'-dons* (Gr. *a*, without, *kotuledon*, seed-lobe), in Bot., are those plants which are propagated by spores, and not by true seeds. Cotyledons are the rudiments of the first leafy organs which make their appearance in the development of plants springing from seeds properly so called. These rudimentary organs do not exist in spores, which are accordingly said to be acotyledonous. The cryptogamous or flowerless plants of Linnæus are identical with the acotyledones of later botanists. The families composing this great class, are the ferns, horsetails, pepperworts, club-mosses, mosses, liverworts, charas, lichens, fungi, and algæ.

ACOUSTIC DUCT, *ă-koo'-stik*, in Anat., a term applied to the meatus auditorius externus, or external passage of the ear.

ACOUSTICS, *ă-koo'-stiks* (Gr. *akouo*, I hear), is that branch of Physics which treats of the laws which regulate the production and propagation of the atmospheric vibrations which are perceived by the organ of hearing. In other words, it is the science of sound. (*See* SOUND.)

ACQUITTAL, *ă-kwit'-tal* (Fr. *acquitter*, to free, or discharge), in Law, signifies a deliverance from a criminal charge. Thus, one who has been upon his trial for the commission of a crime, and is delivered from the charge by the verdict "not guilty," of a jury, is said to be acquitted. Should a person be indicted a second time on the same offence, he may always answer the charge by pleading this verdict, termed the plea of "autrefois acquit," by which he will be entitled to be set at liberty.

ACQUITTANCE, *ă-kwit'-tanse*, in Law, a written discharge for a sum of money that has been paid. An acquittance in full of all demands will discharge all debts, except such as are on specialty; viz., secured by bonds and instruments under seal. These latter can only be discharged by a deed.

ACRE, *ai'-ker* (Lat. *ager*, Gr. *agros*, a field), a measure of land, which, in the United Kingdom, has several values: but when used in a general sense, the English statute acre is to be understood. Its dimensions may be readiest ascertained by remembering that a square with its side of 22 yards is the tenth part of an acre. The chain with which land is measured is 22 yards long, and 10 square chains are equal to one acre, or 4,840 square yards. There are 640 acres in a square mile; thus—

| Acre. | | Roods. | | Perches. | | Square Yards. |
|---|---|---|---|---|---|---|
| 1 | = | 4 | = | 160 | = | 4,840 |
| | | 1 | = | 40 | = | 1,210 |
| | | | | 1 | = | 30¼ |

The Irish acre is larger than the English, 100 of the former being nearly equal to 162 of the latter. The Scotch acre is also larger than the English, 18 of the former being equal to 61 of the latter. In various parts of the country there are, besides those we have mentioned, local acres, such as the Cheshire acre of 8 yards to the pole.

ACRIDIANS, ACRIDIA, *ă-krid'-e-ans* (Gr. *akris*, a locust), a family of orthopterous insects.

ACRITES, ACRITA, *ă-krī'-tees* (Gr. *akritos*, indiscernible), the simplest and lowest division of the animal kingdom, which embraces the *Infusoria*, *Rhizopoda*, and Sponges. (*See* these words.)

ACROBAT, *ăk'-ro-bat* (Gr. *akron*, an extremity, and *baino*, I go), a name given by the ancients to rope-dancers, vaulters, &c. Acrobats perform both upon the tight and slack rope, or upon ropes placed horizontally, perpendicularly, or obliquely, and the exercise of their craft requires great strength, agility, and fearlessness. Acrobats are frequently mentioned by the writers of ancient Rome and Greece; and many, in the present day, have, by the extraordinary nature of their performances, acquired considerable popularity. For instance, Madame Saqui, Herr Hengler, and M. Blondin, who crossed the Falls of Niagara, carrying a man upon his back, upon a single rope, stretched and fastened to the opposite shore.

ACROCHORDUS, *ăk-ro-kor'-dus*, a genus of serpents discovered in Java. *Charac.* Head flat, and with the body covered with small scales; without poison-fangs, but possessing a double row of sharp-pointed teeth; throat capable of great extension; tongue thick and short; length from 8 to 10 feet.—It has been inferred that this serpent is frugivorous, a point doubted by Cuvier.

ACROGENÆ, *ăk-ro'-je-ne* (Gr. *akros*, summit, *gennao*, I produce), in Bot., those acotyledonous plants with visible stems and leaves. The stems of such plants are always acrogenous; that is to say, they grow only at their summits. (*See* STEM.) The tree ferns are examples.

ACROLEIN, *ăk'-ro-leen* (Lat. *acer*, sour, *oleum*, oil), in Chem., a highly volatile liquid, produced by the

action of heat on fat. Its vapour attacks the eye and the mucous membrane of the nose most distressingly. It is composed of the elements carbon, hydrogen, and oxygen, in the proportions expressed by the formula $C_7 H_4 O_2$. It was first isolated and examined by M. Redtenbacher, of Prague, in 1843.

ACROLITHS, *ăk'-ro-liths* (Gr. *akron*, extremity, and *lithos*, stone), in ancient Greek Sculpture, signified those statues the heads, arms, and feet of which were of stone, the trunk of the figure being of wood. According to Trebellius Pollio, Calpurnia caused an acrolithan statue of Venus to be executed. There was also an acrolithan statue of Mars in the temple of that god at Halicarnassus.

ACRONYCHAL, *ăk-ron'-e-kal* (Gr. *akron*, the highest point, and *nuktos*, of night), in Astron., applied to a star when it is opposite to the sun, or passes the meridian at midnight. A star is said to rise acronychally when it rises at sunset, and to set acronychally when it sets as the sun rises.

ACROPOLIS. (*See* vol. I. of this work.)

ACROSALENIA, *ă-kros-a-le'-ne-a*, a genus of fossil *Echinadermata*, occurring in the Isle of Sheppey.

ACROSPIRE, *ăk-ros-pire'* (Gr. *akros*, summit, *speira*, a spiral), in Bot., the sprout at the end of a seed which has commenced to germinate,—the *plumule* of modern botanists. Maltsters use this term to express the growing of the barley.

ACROSTIC, *ă-kros'-tik* (Gr. *akros*, beginning, and *stichos*, a verse), a poetical composition, disposed in such a manner that the initial letters of each line, taken in order, form a person's name or other complete word or words. By some authorities it is held to have been invented by Porphyrius Optatianus in the 4th century. This kind of poetical trifling was very popular with the French poets from the time of Francis I. until Louis XIV. Among other English writers, Sir John Davies, who lived in the 16th century, amused himself in this way. He produced twenty-six pieces, called "Hymns to Astrea," each of them forming an acrostic upon the words Elizabetha Regina. The following is an example:—

E ternal virgin, goddess true,
L et me presume to sing to you.
I ove, e'en great Jove, hath leisure
S ome times to hear the vulgar crew,
A nd hears them oft with pleasure.

B lessed Astrea! I in part
E njoy the blessings you impart,
T he peace, the milk and honey,
H umanity, and civil art,
A richer dow'r than money.

R ight glad am I that now I live,
E 'en in these days wherein you give
G reat happiness and glory:
I f after you I should be born,
N o doubt I should my birthday scorn,
A dmiring your sweet story!

In the Old Testament there are twelve Psalms written according to this principle. Of these, the 119th Psalm is the most remarkable: it consists of twenty-two stanzas, each of which commences with a Hebrew letter, and is called by its name.—*Ref.* Hook's *Church Dictionary*.

ACROSTICHUM, *ă-kros'-te-kum*, in Bot., a genus of ferns, of the *Polypody* sub-order. The species *Huacsaro* is used medicinally in Peru, and is much esteemed for its sudorific, diuretic, and febrifugal properties.

ACROTEMNUS, *ă-kro-tem'-nus*, a genus of fossil Ganoid fishes. One species is found in the chalk of Sussex.

ACROTERIA, *ă-kro-te'-re-a* (Gr. *akroterion*, the extremity of anything), in Arch., a term signifying the pedestals placed upon the sides and centre of pediments for the reception of statues. The term is sometimes applied to the small intervening spaces between the pedestal and the balusters of balustrades.

ACT, *ăkt* (Lat. *ago*, I act), in Pol., a term signifying any public act, such as an act of parliament, an act of grace for the pardon of offenders, &c.—*Act*, in Logic, denotes an operation of the human mind, as an act of the judgment, an act of the will.—*Act*, among lawyers, denotes an instrument or deed in writing, serving to prove the truth of some bargain or transaction.—*Act*, in the universities, is a thesis maintained in public by a candidate for a degree. At Oxford, the time when masters and doctors complete their degrees is called the Act, which is held with great solemnity.

ACT, in Dram. Lit., the division or part of a play. With the ancient writers, it was held that a play should be divided into five parts or acts, neither more nor less. Following this rule, tragedies, from the Elizabethan period downward, have been divided into five acts. Comedies, also, were generally divided into five parts; but at the present time this rule is considered, especially in the case of the lighter forms of dramatic literature, purely arbitrary, and some excellent dramas have had no more than three acts. As in the Greek drama the stage was never left empty from the beginning to the end of a performance, there were no acts. The chorus, during the absence of other actors, kept the stage, and continued the drama by their songs, which mostly formed an essential part of it, and carried on the action in the same way as the dialogue did. In the "Samson Agonistes" of Milton may be seen the exact copy of a Greek drama, where the performance is carried on from beginning to end, without any division of acts. Among the Romans, however, theatrical representations were differently conducted. On their stage there was no chorus, and the play was broken into parts, as in our own. The first products of the English dramatic genius were what were called "Mysteries" and "Moralities," which were not divided into acts. The earliest of the moralities which take the dramatic shape are dated from the commencement of the reign of Elizabeth. Down to 1574, it is believed that the scene of a "morality" never changed from the beginning to the end of the performance.

ACT OF FAITH (*auto da fé*), in Catholic countries, is a solemn day held by the Inquisition for the punishment of heretics, and the absolution of accused persons found innocent.

ACT OF PARLIAMENT. (*See* STATUTE.)
ACT OF SETTLEMENT. (*See* SETTLEMENT, ACT OF.)
ACT OF TOLERATION. (*See* TOLERATION, ACT OF.)
ACT OF UNIFORMITY. (*See* UNIFORMITY, ACT OF.)

ACTA DIURNA, *ăk'-tă di-ur'-nă* (Lat. daily proceedings), the title of a kind of public journal which Julius Cæsar ordered to be drawn up and published. It contained a record of the proceedings of the senate and the people, and therefore formed a species of Roman newspaper. The *Acta* continued to be published until the reign of the emperor Julian.

ACTÆA, *ăk-tee'-e*, in Bot., a tribe of plants belonging to the Buttercup order, or *Ranunculaceæ*. They have elegant flowers and succulent fruits. The most important species is the *Podophyllum peltatum*, the May-apple or wild lemon of North America, which is employed in medicine. The extract has a much more powerful cathartic effect than extract of jalap. The active principle has lately been isolated, and is termed *Podophyllin*.

ACTIAN GAMES. (*See* vol. I. of this work.)

ACTINIA, *ăk-tin' i-a* (Gr. *aktis*, a ray), in Zool., a genus of Polypes. (*See* COELENTERATA.) There are many British species, which are commonly known as *sea anemones*, from their resemblance to flowers. They are found on all rocky coasts, and they form the chief attraction of the marine aquarium. The body is conical or cylindrical, adhering to the rock by a broad disk-like base. The mouth, which is a simple opening into the internal cavity serving as a stomach, is surrounded by numerous tentacles, which are often beautifully marked. These organs are retractile, and, when not covered by water, the actinia appears as a smooth hemispherical lump of elastic matter, sometimes of a brilliant colour. The reproductive power of these plant-like animals is very great, for when one is cut across, new tentacles form in a few weeks on the lower half, and each piece becomes a perfect creature.

ACTINISM, *ăk'-tin-izm*, the chemical principle of light. Three distinct principles emanate from the sun,—light, heat, and actinism. Numerous examples of the effects of this influence occur daily, which are erroneously attributed to the light which we see. It is actinism which fades colours, bleaches linen, rots fabrics, tans the human skin, puts out the fire, and performs the operations of photography. It acts principally by abstracting oxygen from the bodies which it affects. Fire is extinguished by sunlight through the diminu-

tion of the amount of oxygen necessary for combustion; and photographic operations are mostly effected by the reduction of oxide of silver to the metallic state, by the abstraction of its oxygen. We may have actinism without light, or *vice versâ*. Yellow glass transmits the latter, but stops the former. Hence the photographer works in a yellow light. Dark blue glass, which transmits but little light, is quite pervious to actinism. Blue objects reflect great quantities of it, while red or yellow ones reflect but little, or none. For this reason, in photographs, red or yellow materials are always too dark, while blue ones are too light. The electric and lime lights give out great quantities of actinism, from their blue tinge; and gas and candles but very little, from their yellow colour. The amount of actinism received from the sun differs considerably, according to the time of year, being at its maximum about the end of March, and gradually diminishing until the end of December, when it arrives at its minimum. Actinism in large quantities is necessary to the proper condition of the human system. It has been noticed that when dark rooms have been coloured with yellow paint or paper, the inhabitants of them have been sickly and delicate; as soon, however, as the colour was changed to blue, a marked difference in their state of health took place. The germination of seed is greatly retarded by actinism; hence the maltster puts his grain into the dark, to malt or semi-germinate. For the same reason, seed is buried in the ground. As soon, however, as the young plant makes its appearance, a supply of actinism is necessary, and, by a wonderful provision of nature, this influence is at its height when young plants are beginning to show their heads above the earth. White, red, brown, and green sea-plants owe their colour to the different amounts of actinism they receive: the green, being near the surface, receive most; while the white, being at great depths, receive nearly none.

ACTINOCARPUS, *ăk-tin-o-kar'-pus*, a genus of aquatic plants, comprehended in the order *Alismaceæ*. *Chirac.* Floating leaves cordate and oblong, with white flowers.

ACTINOCRINITES, *ăk-tin-o-krin-i'-tees*, a genus of *Crinoidea*, comprehending a great many species. It is found in carboniferous and Silurian strata.

ACTINOLITE, *ăk-tin'-o-lite*, a crystallized mineral, found in masses in primary stratified rocks, and, occasionally, in trap rocks. It is of a green colour, and is a variety of hornblende.

ACTINOMETER, *ăk-tin-om'-e-ter*, an instrument invented by Sir John Herschel, to ascertain the intensity of the heat of the direct rays of the sun.—Ref. *Manual of Scientific Inquiry*, published by the Board of Admiralty.

ACTION, *ăk'-shun* (Lat. *ago*, I act), a term used in Mech. and Phys. to imply the pressure or percussion of bodies against each other. Action and reaction are equal; *i. e.*, the resistance of the body put in motion is equal to the force communicated to it.

ACTION, in Oratory, is the outward deportment of the speaker, or the accommodation of his countenance, voice, and gestures, to the subject of which he is treating. In Physiol., it is applied to the functions of the human body, whether vital, animal, or natural; in Paint. and Sculp., the attitude or position of the several parts of the body, as indicative of passion, &c.; in the Mil. Art, an engagement between opposing forces: hence the terms partial action, general action, &c. The "action of the mouth" is a term applied to the champing of the bit of a bridle by a horse.

ACTION and REACTION. (*See* MOTION, LAWS OF.)

ACTION AT LAW, is a demand made through the intervention of the law for that which is legally due, and has been defined to be a "lawful demand of one's right," or "the right of a man to prosecute by judicial proceeding that which is his due." Actions are either criminal or civil. Criminal actions are those which have judgment of death, as for murder; or judgment for damages to the party, fine to the monarch, imprisonment, &c. Civil actions are divided into real, personal, and mixed. Real actions are so termed because they have reference to real property, or lands. Personal actions are those whereby a party claims for a debt, for personal duty, or damages in lieu thereof; or seeks satisfaction for personal insults and injuries of nearly every description. Mixed actions partake of the nature of both the preceding, being brought for the recovery of some real property, and also for damages for a wrong sustained. In consequence of the difficulty and expense attending them, all real and mixed actions were abolished by the statute 3 & 4 William IV., except right of dower, dower (both brought by a wife for the recovery of her dower), *quare impedit* (brought to try the right to present to a benefice), and ejectment; which last is at the present time the common action for the trial of title to, or the recovery of, lands, &c. Personal actions are divided into actions of contract and actions of tort, and also into local and transitory. In a local action the trial must take place in the county where the cause of the action arose; a transitory action may be brought in any county. Action at law has now the more limited signification of a proceeding in a civil court. When it is brought in a court of common law, it bears the title of action; when it takes place in the court of Chancery, it is termed a suit in equity. —Ref. *English Cyclopædia*—"Arts and Sciences."

ACTIVE, *ăk'-tiv*, denotes something which communicates action or motion to another, in opposition to passive, which receives action. Active verbs in grammar not only signify doing or acting, but are followed by nouns, to which their action passes.

ACTIVE MOLECULES. (*See* MOLECULES.)

ACTOR, *ak'-tor*, one who performs a part or character in a play. Among the ancient Greeks, actors were so highly esteem as sometimes to be sent on embassies, and authors frequently performed in their own plays; but at Rome, if a person became an actor, he forfeited his right of voting as a Roman citizen. In England, actors were at first the servants of the higher nobility; and, when regular theatrical companies came to be formed, they placed themselves under the protection of some distinguished person. To this day, the players at the Drury-lane Theatre continue to style themselves "her Majesty's servants." Until after the Restoration, the female parts in each drama were performed by men. The last celebrated performer of women's parts was Kynaston. Two great authors were also actors, viz., Shakspere and Molière.

ACTS OF THE APOSTLES, *akts*, the fifth in order of the books of the New Testament, and the last of those properly of an historical character. It gives a narrative of events that happened to the early church during the thirty years immediately succeeding the death of Christ. It does not, however, narrate the "acts of the apostles" generally, being almost exclusively confined to those of Peter and Paul. The author of this book was Luke, and its authenticity is undoubted.

ACTS OF SEDERUNT, in the Law of Scotland, are statutes made by the lords of session, *sitting* in judgment; whence the term.

ACTS, TEST AND CORPORATION. (*See* TEST AND CORPORATION ACTS.)

ACTUARY, *ak'-tu-a-re* (Lat. *actuarius*, a clerk or notary), the manager of a joint-stock company under a board of directors, particularly an insurance company; also a person skilled in the doctrine of life annuities and insurances, and who is in the habit of giving opinions upon cases of annuities, reversions, &c.

ACULEI, *ă-ku'-le-i* (Lat. *aculeus*, a prickle), in Bot. (*See* PRICKLES.)

ACUMINA, *ă-ku'-me-na* (Lat. *acumen*, a point), omens taken by the ancients from the points of spears or swords.

ACUMINATE, *ă-ku'-me-nate* (Lat. *acumen*, the point of anything), in Bot., a term applied to the apex of a leaf when it is long and tapering. The leaf of the white willow has an acuminate apex.

ACUPUNCTURE, *ă-ku-punk'-ture* (Lat. *acus*, a needle, and *punctura*, a puncture), a surgical operation practised very extensively in the East. It is performed by puncturing the part affected with a gold or silver needle. It has been practised both in Paris and England with satisfactory results in different kinds of disease, but principally neuralgic pains and chronic rheumatism. In eastern countries, the needles employed are always made of the purest silver or gold; and in China the manufacture of these instruments forms a distinct trade, practised only by a few, and those few are licensed by the emperor.

ACUTE, *á-kute'* (Lat. *acutus*, sharp), the opposite of obtuse, is a term applied to various things to denote sharpness. Acute angle, in Geometry, signifies an angle which is less than a right angle. Acute diseases, in Medicine, are those which are attended by violent symptoms. In Music, a tone is Acute when it is sharp or high, in respect to another tone, and as opposed to the grave. In Grammar, an acute accent is that which elevates the voice.

ADACTED, *á-dak'-ted*, in Mil., a term signifying the stakes or piles driven into the earth by large malls shod with iron, to secure ramparts or pontoons.

ADAGIO, *a-dah'-je-o* (It. *adagio*, leisurely), in Music, a term signifying the slowest of all time, the grave only excepted. Sometimes it is repeated, thus—adagio, adagio,—to denote a still slower time.

ADAMANT, *ad'-a-mant* (Gr. *a*, not, *damao*, I break), a supposed impenetrable stone; a term applied to the diamond and other bodies of extreme hardness. (*See* DIAMOND.)

ADAMITES, *ăd'-am-ites*, in Eccl. Hist., a sect which arose in the 2nd century of the Christian era, and were so called from their pretending to the innocence of Adam at the time of his creation. They imitated his nakedness in their churches, which they called Paradise, and rejected marriage; living, or pretending to live, in continency. This sect did not last long; but it was revived, with additional absurdities, in the 12th century, by one Tandamus. About the beginning of the 15th century, these absurdities were again revived by one Picard, a native of Flanders. He propagated his views in Bohemia, whence they spread into Germany, Holland, Poland, and even into England.

ADANSONIA, *ă-dan-so'-ne-a*, in Bot., a genus of plants, named after Michael Adanson, a celebrated French naturalist, and belonging to the tribe *Bombaceæ*, of the Silk-cotton order, or *Sterculiaceæ*. *Adansonia digitata*, the baobab-tree, is the typical species. This is remarkable for its enormous size, and for its extraordinary longevity. One specimen has been found to have a trunk nearly 100 feet in circumference; and the age of this gigantic vegetable is probably many thousand years. The leaf of the baobab is digitate, branched into finger-like leaflets; hence its specific name. The fruit commonly known as monkey-bread, or Ethiopian sour-gourd, is a large oval capsule, containing a starchy pulp, having a slightly acid flavour, which forms a wholesome and agreeable article of food. Mixed with water, it makes an acid drink, which is highly esteemed as a specific in putrid and pestilential fevers, and is also employed by the Egyptian doctors in dysentery. The leaves have astringent properties; and, when dried and powdered, they form the condiment called *lalo*, which the Africans mix with their daily food as a preventive of excessive perspiration. The bark is said to be febrifugal, and its fibres are used by the African tribes living in the districts where the Boabab flourishes for the manufacture of cordage and various articles of dress. Adanson first described this remarkable plant.

ADAPIS, *á'-dap-is*, in Zool., the name of a genus of fossil pachydermatous (thick-skinned) mammals, first described by M. Cuvier, who deduced its existence and anatomical conformation from three fragments of the head, which had been discovered in the gypsum-quarries of Montmartre.

ADAPTER, *a-dap'-ter*, in Chemical Manipulation, a tube, generally of glass, rather wide at one end and small at the other, used for connecting a retort or any other distilling apparatus with a receiver. The wider end admits the neck of the first vessel, and the tapering part enters the other.

ADAR, *á'-dar*, the twelfth month of the ecclesiastical and the sixth of the civil year of the Jews. It comprehends a portion of February and the beginning of March.

ADDA, *ăd'-da*, the Arabic name for a small species of lizard found in Arabia, Egypt, and Nubia, wherever the smallest degree of moisture exists.

ADDER, *ad'-der*, the common viper. (*See* VIPER.)

ADDER'S-TONGUE, in Bot., the familiar name for a tribe of ferns. (*See* OPHIOGLOSSEÆ.)

ADDICTI, *ăd-dik'-ti*, a term among the Romans, applied to persons who, being unable to pay their debts, became the slaves of their creditors.

ADDICTION, *ăd-dik'-shun*, in the Roman Law, was the assignment to another of goods, which goods were called *bona addicta*.

ADDITION, *ad-dish'-un*, in Music, is the term applied to a dot placed on the right side of a note, to signify that it is to be sounded half as long again.

ADDITION (Lat. *addo*, I give to), in Arith., signifies the putting two or more quantities together so as to form one total. It is the first of the four fundamental rules of Arith., the operation of which consists in adding together first the units, then the tens, then the hundreds, and so on; thus substituting for the original operation of adding the entire number, several simpler and easier operations. When the quantities to be added consist of several denominations which divide themselves into each other, as in the case of shillings, pence, and farthings, hundredweights, pounds, and ounces, or yards, feet, and inches, the smaller denominations are first added together, and, should their product equal or exceed the quantity of a superior denomination, it is *carried* to the next column of figures denoting that superior denomination. In addition of fractions, the various fractions must be first reduced to the same denominator, in order that they may represent quantities of equal value; then add together all the numerators of the fractions so reduced, and give to their product the common denominator. In addition of algebraical quantities, they should all be written one after another, without changing any of the signs, and the terms which before had no sign, should be connected with the rest by the sign +. Thus $a + b$ and $a - 2b$ added, give $a + b + a - 2b$; or the sum may be reduced to a simpler form by observing that $b$ subtracted twice and added once, is equivalent to $b$ subtracted once, and that $a$ is added to $a$; the expression then becomes $2a - b$.

ADDITIONS, in Law, are those designations affixed to a person's name by way of title.—*Additions of degree*, are the same with titles of honour.—*Additions of estate*, such as yeomen, gentlemen, &c.—*Additions of mystery or trade*, are baker, mason, &c.—*Additions of place or residence*, are of London, Bristol, &c.

ADDORSED, *ad-dorsd'* (Lat. *ad*, to, and *dorsum*, the back), in Her., a term used when any two animals or other things are placed back to back.

ADDRESSES OF PERSONS OF RANK OR DISTINCTION:—

THE ROYAL FAMILY.

*Superscription.* — To the Queen's Most Excellent Majesty.

*Commencement.* — Madam; May it please your Majesty.

*Conclusion.*—I remain, Madam, with the profoundest veneration, Your Majesty's most faithful subject and dutiful servant.

PRINCES OF THE BLOOD ROYAL.

*The Sons and Daughters, Brothers and Sisters, Uncles and Aunts of the Sovereign.*

*Sup.*—To His (*Her*) Royal Highness the Prince of Wales (*Princess Helena*).

*Comm.*—Your Royal Highness.

*Con.*—I remain, with the greatest respect (I have the honour to be), Your Royal Highness's most obedient servant.

*Other branches of the Royal Family.*

*Sup.*—To His Royal Highness the Duke of Cambridge.

*Comm.*—Sir.

*Con.*—I remain, with the greatest respect, Your Royal Highness's most humble and obedient servant.

NOBILITY AND GENTRY.

*Duke or Duchess.*

*Sup* —To his Grace the Duke (*her Grace the Duchess*) of Cleveland.

*To*

*His Grace*

*The Duke of Cleveland.*

*Comm.*—My Lord Duke (*Madam*).

## Addresses

*Con.*—I have the honour to be, My Lord Duke (*Madam*), Your Grace's most devoted and obedient servant.

*Marquis or Marchioness.*

*Sup.*—To the Most Noble the Marquis (*Marchioness*) of Normanby.

*Comm.*—My Lord Marquis (*Madam*).

*Con.*—I have the honour to be, My Lord Marquis, Your Lordship's (*Madam, Your Ladyship's*) most obedient and most humble servant.

*Earl or Countess.*

*Sup.*—To the Right Honourable the Earl (*Countess*) of Sandwich.

*Comm.*—My Lord (*Madam*).

*Con.*—I have the honour to be, My Lord, Your Lordship's (*Madam, Your Ladyship's*) most obedient and very humble servant.

*Viscount or Viscountess.*

*Sup.*—To the Right Honourable Lord Viscount (*Lady Viscountess*) Palmerston.

*Comm.* and *Con.* same as Earl's.

*Baron or Baroness.*

*Sup.*—To the Right Honourable Lord (*Lady*) Byron.

*Comm.* and *Con.* same as Earl's.

YOUNGER *Sons of Earls, and* ALL *the Sons of Viscounts and Barons.*

*Sup.*—To the Honourable Walter Jocelyn.

*Comm.*—Honoured Sir.

*Con.*—I have the honour to be, Honoured Sir, Your most obedient and very humble servant.

*Baronet and His Wife.*

*Sup.*—To Sir William Welby, Bart. (*Lady Welby*).

*Comm.*—Sir (*Madam*).

*Con.*—I have the honour to be, Sir, Your most humble and obedient (*Madam, Your Ladyship's most obedient and very humble*) servant

*Knight and His Wife.*

*Sup.*—To Sir John Ratcliffe (*Lady Ratcliffe*).

*Comm.* and *Con.* as preceding.

*Esquire.*

This title is now given to every man of position and respectablity; but persons entitled to superior consideration are distinguished by "&c, &c. &c.," added to their superscription.

The wives of Gentlemen upon several of the same name are married, are distinguished by the Christian name of their husbands; as Mrs. *John* Harper, Mrs. *William* Seymour.

Privy Counsellors have the title of *Right Honourable*, which is prefixed to their name thus (the Esq. is omitted after their names):—

*Sup.*—To the Right Honourable William Ewart Gladstone, M.P.

*Comm.*—Sir.

*Con.*—I have the honour to be, Sir, Your most obedient very humble servant.

THE CLERGY.

*Archbishop.*

*Sup.*—To His Grace the Archbishop of York.

*Comm.*—Your Grace.

*Con.*—I remain, Your Grace's most devoted obedient servant.

*Bishop.*

*Sup.*—To the Right Reverend the Bishop of Lincoln.

*Comm.*—Right Reverend Sir.

*Con.*—I remain, Right Reverend Sir, Your most obedient humble servant.

*Doctor of Divinity.*

*Sup.*—To the Reverend James Williams, D.D., To the Reverend Dr. Vivian.

*Comm.*—Reverend Sir.

*Con.*—I have the honour to be, Reverend Sir, Your most obedient servant.

*Dean.*

*Sup.*—To the Very Reverend the Dean of St. Paul's; or, To the Very Reverend Henry Milman, D.D., Dean of St. Paul's.

*Comm.*—Mr. Dean; or, Reverend Sir.

*Con.*—I have the honour to be, Mr. Dean (or Reverend Sir), Your most obedient servant.

*Archdeacon.*

*Sup.*—To the Venerable Archdeacon Hale.

*Comm.*—Reverend Sir.



Addresses

*Con.*—I have the honour to remain, Reverend Sir, Your most obedient servant.

*Clergymen.*

*Sup.*—To the Reverend Thomas Dymoke.

*Comm.* and *Con.* same as the preceding.

*** If a Bishop or other Clergyman possess the title of *Right Honourable* and *Honourable*, it is prefixed to his Clerical title.

When Baronets and Knights have clerical titles, it is placed first.

*Sup.*—To the Right Honourable and Right Reverend the Lord Bishop of Bath and Wells.

*Sup.*—To the Right Honourable and Reverend the Lord Bishop of Carlisle.

*Sup.*—To the Right Honourable and Reverend Lord Wriothesley Russell, M.A.

*Sup.*—To the Honourable and Reverend Baptist Wriothesley Noel, M.A.

*Sup.*—To the Reverend Sir George Prevost, Bart., M.A.

No clerical dignitary confers title or rank on the wife of the dignitary, who is simply addressed *Mistress*, unless possessing a title in her own right, or through her husband, independently of his clerical rank.

JUDGES, &c.

*Lord Chancellor.*

*Sup.*—To the Right Honourable Lord Westbury, Lord High Chancellor of Great Britain.

*Rolls.*

*Sup.*—To the Right Honourable the Master of the Rolls.

*Chief Justice.*

*Sup.*—To the Right Honourable Sir William Erle, Chief Justice; or, the Right Honourable Lord Chief Justice of the Court of Queen's Bench.

*To*

*The Rt. Hon. Sr W. Erle,*

*Lord Chief Justice*

*of the Court of Common Pleas.*

The Chief Justice of the Court of Common Pleas, and the Chief Baron of the Exchequer, are addressed in the same form, and are all styled *My Lord.*

*Puisne Judges.*

The Puisne Judges, and the Barons of the Exchequer, are Knights; but the title of Judge being superior, they should be addressed thus:—

*Sup.*—To the Honourable Mr. Justice Williams.

*Sup.*—To the Honourable Baron Bramwell.

*Serjeant.*

*Sup.*—To John Wilkins, Esquire, Serjeant-at-Law.

NAVAL OFFICERS.

*Admirals* have the rank of their flag added to their own name and title, thus:—

*Sup.*—To the Honourable Sir Francis William Austen, Admiral of the White.

If untitled, they are simply styled *Sir.*

*Commodores* are addressed in the same way as admirals.

*Captains* are addressed either to "Captain John Adams, R.N.;" or if on service, "To John Adams, Esquire, Commander of H.M.S."

*Lieutenants* are addressed in the same way.

MILITARY OFFICERS.

All officers in the army above Lieutenants, Cornets, and Ensigns, have their military rank prefixed to their name and title.

*Sup.*—To *General* Sir George Brown.

*Subalterns* are addressed as *Esquire*, with the regiment to which they belong, if on service.

MUNICIPAL OFFICERS.

*Lord Mayor.*

*Sup.*—To the Right Honourable the Lord Mayor (*The Lady Mayoress*) of London, York, Dublin; The Lord Provost (*The Lady Provost*) of Edinburgh.

*Comm.*—My Lord (*Madam*).

*Con.*—I have the honour to be, my Lord, Your Lordship's (*Madam, Your Ladyship's*) most obedient humble servant.

The Mayors of all Corporations, with the Sheriffs, Aldermen, and Recorder of London, are styled *Right Worshipful;* and the Aldermen and Recorder of other Corporations, as well as Justices of the Peace, *Worshipful.*

AMBASSADORS.

Ambassadors have *Excellency* prefixed to their other titles, and their accredited rank added.

*Sup.*—To His Excellency Baron Brunow, Ambassador Extraordinary and Plenipotentiary from H.I.M. (His Imperial Majesty) the Emperor of Russia.

*Sup.*—To His Excellency The Right Honourable Sir Henry Lytton Bulwer, G.C.B., Her Britannic Majesty's Ambassador Extraordinary and Plenipotentiary to the Sublime Ottoman Porte.

> *To*
>
> *His Excellency*
>
> *The Rt. Hon. Sir H. Lytton Bulwer, G.C.B., H.B.M. Ambassador Extraordinary and Plenipotentiary*
>
> *To the Sublime Ottoman Porte.*

*Comm.*—Sir.

*Con.*—I have the honour to be, Sir, Your Excellency's most humble obedient servant.

The wives of Ambassadors have also Excellency added to their other titles.

Envoys and Chargés d'Affaires are generally styled Excellencies, but by courtesy only.

Consuls have only their accredited rank added to their names or titles, if they have any.

ADDRESSES TO GOVERNMENT DEPARTMENTS AND PUBLIC COMPANIES:—

*Queen in Council.*

All applications to the Queen in Council, the Houses of Lords and Commons, &c., are by *Petition*, as follows, varying only the title:—

To the Queen's Most Excellent Majesty in Council,
The humble Petition of M. N., &c., showeth
That your Petitioner . . . . . .
. . . . . .
Wherefore your Petitioner humbly prays that Your Majesty will be graciously pleased to . .
And your Petitioner, as in duty bound, will ever pray.

*Lords and Commons.*

To the Right Honourable the Lords Spiritual and Temporal (To the Honourable the Commons) of the United Kingdom of Great Britain and Ireland, in Parliament assembled,
The humble Petition, &c.
And your Petitioner (or Petitioners) will ever pray, &c.

*Treasury and Admiralty.*

*Sup.*—To the Lords Commissioners of Her Majesty's Treasury.

*Sup.*—To the Lords Commissioners of the Admiralty.

*Comm.*—My Lords.

*Con.*—I have the honour to be, my Lords.

*Navy Office and Ordnance.*

*Sup.*—To the Principal Officers and Commissioners of Her Majesty's Navy.

*Sup.*—To the Principal Officers of Her Majesty's Ordnance.

*Comm.*—Gentlemen.

*Con.*—I have the honour to be, Gentlemen, &c.

*Victualling and Auditing Offices.*

*Sup.*—To the Commissioners for Victualling Her Majesty's Navy.

*Sup.*—To the Commissioners for Auditing the Public Accounts.

*Comm.* and *Con.* same as preceding.

*Custom House.*

*Sup.*—To the Commissioners of Her Majesty's Customs.





*Excise Office.*

*Sup.*—To the Commissioners of Excise.

*Tax Office.*

*Sup.*—To the Commissioners of Taxes.

*Stamp Office.*

*Sup.*—To the Commissioners of Stamps.

*Bank of England.*

*Sup.*—To the Governor, Deputy-Governor, and Court of Directors of the Bank of England.

*East-India House.*

*Sup.*—To the Court of Directors of the United Company of Merchants of England, trading to the East Indies.

*Comm.* and *Con.* of the above same as Navy Office and Ordnance.

ADDUCTOR MUSCLES, *ăd-duk'-tor* (Lat. *adduco*, I draw towards), in Anat., are those muscles which draw the parts to which they are attached together. They are opposed to the abductor muscles. (*See* ABDUCTOR MUSCLES.)

ADELPHOUS, *ă-del'-phus* (Gr. *adelphos*, a brother), in Bot., a word used to denote the union of the filaments of the stamens in certain flowers. The number of bundles formed by the union of the filaments is indicated by a Greek numeral prefixed to the word. Thus, when all the filaments join together in a single bundle, as in the mallow, the stamens are *monadelphous*. When the filaments unite so as to form two bundles, the stamens are *diadelphous*. The formation of three bundles is expressed by the term *triadelphous;* and of any greater number, by *polyadelphous*.

ADEPT, *ă-dept'* (Lat. *adipiscor*, I obtain), in Alchemy, was the special title given to those alchemists who were supposed to have attained the grand object of their labours, or to have discovered the transmutation of metals, and the philosopher's stone.

ADFECTED EQUATIONS. (*See* AFFECTED EQUATIONS.)

ADHERENT, *ăd-he'-rent*, in Bot., a term applied to a calyx or perianth, the tube of which adheres more or less to the ovary, as in the flowers of the iris, gooseberry, and myrtle.

ADHESION, *ad-he'-shun* (Lat. *adhærere*, to stick to), in Phy., a term applied to the property possessed by certain fluids and solids of becoming attached to each other when brought into contact. Adhesion is frequently confounded with cohesion, which is generally taken to mean the force which keeps the particles of the same body in close union. The examples and uses of adhesion are too familiar and numerous to need mention in detail. It will be sufficient to notice those cases where it is likely to be confounded with cohesion, atmospheric pressure, or chemical affinity. If metals are dipped into mercury, an adhesion of the particles of mercury, differing in force in different metals, takes place. This is evidently the result of chemical affinity, as those metals which most readily form amalgams exercise the greatest attraction for the mercury, gold being at the top of the scale, and iron and cobalt at the bottom. If two pieces of lead are scraped clean and pressed together, they adhere with considerable force, from the cohesion of their particles. When two flat glass plates are pressed together, the cause of adhesion is evidently atmospheric pressure. Friction is the result of the adhesive force existing between bodies, and is generally greatest between those of similar constitution. In machinery, grease, oil, plumbago, or French chalk, is used to lessen the grinding action of moving bodies, on account of the small amount of cohesion existing between their molecules. When parts of machinery rub against each other, they are always made of different metals, for the reason above mentioned. Iron, working in gun-metal, is generally found to produce the least amount of friction. (*See* COHESION, FRICTION.)

ADHESION, in Surg., is the process by which parts, naturally separate, or separated by artificial means, become united. It is caused by the effusion of a lymph, or sticky fluid, produced by inflammation; and hence it is sometimes necessary to produce inflammation, by scraping or paring, in surfaces which it is desirable to unite. This tendency of inflamed surfaces to adhere when in contact is sometimes troublesome, as in inflammations of serous membranes.

ADHESIVE PLASTER, *plas'-ter*, commonly called strapping-plaster, is used to protect raw surfaces, and

for dressing cuts, wounds, and ulcers. It is a gentle external stimulant, and assists the healing process. It is composed of lead-plaster (a mixture of oxide of lead and olive-oil) melted over a slow fire, with powdered resin mixed with it in the proporton of six parts of lead-plaster to one part of powdered resin.

ADIANTUM, *ai-di-an'-tum* (Gr. *adianton*), in Bot., the Maidenhair genus of ferns, including some sixty species, mostly tropical. Two are found in temperate regions, namely, *Adiantum capillus-Veneris*, the true maidenhair; and *A. pedatum*, the Canadian maidenhair. The former, which has obtained its name on account of the colour and extreme fineness of its stem and nerves, is found in Scotland and Wales, growing on damp rocks; and its elegant fronds make it a great favourite with collectors. Syrup of capillaire is properly prepared by adding sugar and orange-flower-water to an infusion of maidenhair.

ADIAPHORITES, *ai-di-if'-o-rites* (Gr. *adiaphoros*, indifferent), a name given to Melancthon and the party of which he was the leader, because of their submission upon indifferent points to imperial edicts. The imposition, by Charles V., in 1548, of an edict called the Interim, proposing a temporary accommodation of the dissensions between the Protestants and Papists, till the dispute could be decided by a council, was the origin of the name. Flavius and the primitive Lutherans opposed Melancthon in the controversy. The two principal questions debated were,—first, whether it was lawful to submit to the opponents of truth, even in unimportant points; and, secondly, whether, granting that it was so, the matters upon which the Interim required submission were unimportant. The point in the edict chiefly insisted on was the doctrine of justification by faith. Melancthon, after the death of Luther, adopted more moderate views than the great Reformer. From this controversy other divisions sprung, and from these divisions many of the schisms among Protestants had their origin.

AD INFINITUM, *in-fi-ni'-tum* (Lat. *ad*, to, and *infinitus*, unlimited), interminable, without end.

AD INQUIRENDUM, *in-gui-ren'-dum* (Lat., to be inquired into), in Law, is a judicial writ commanding inquiry to be made of anything relating to a cause or matter depending in the queen's courts.—Ref. *Reg. Judic.*; Cowell; Blount.

ADIPOCERE, *ad'-i-po-seer* (Lat. *adeps*, soft fat, *cera*, wax), a term applied by the French *savans* of the last century to a product of the decomposition of animal substances in moist earth or under water. It is principally margarate of ammonia, and is a fatty body, somewhat resembling spermaceti. Immense masses of it were found on the removal of the bodies from the burial-ground called *la Cimetière des Innocens*, at Paris, in 1786 and 1787. Several interesting experiments were made on this substance by M. Fourcroy, at the time of this discovery, the results of which he laid before the Royal Academy of Sciences, in a memoir which he read in 1789.

ADIPOSE TISSUE, *ad'-i-pose* (Lat. *adeps*, soft fat), in Physiol., comprises an aggregation of minute cells filled with fat, which they appropriate from the blood. This tissue serves several important purposes in the animal body; filling up interstices, forming a pad or cushion for the support of the movable parts, and assisting in the retention of heat.

ADIT, *ad'-it* (Lat. *aditus*, an avenue, an entrance) in Mining, the entrance to a mine, generally driven horizontally into the side of a hill. Formerly mines were worked by vertical shafts, but now adits are always used where practicable.

ADJECTIVE, *ad'-jek-tiv* (Lat. *adjectus*, added to), in Gram., is the name of one of the parts of speech or classes into which grammarians have divided words. It is so called because it *adds to*, or qualifies, the meaning of the noun with which it is joined; as, a *good* man, a *large* house, a *white* horse. In English a noun frequently takes the place of an adjective; as, a *gold* watch, the *paper* duty.

ADJOURNMENT, *ad-jurn'-ment* (Lat. *ad*, to, and Fr. *jour*, a day), putting off a court or meeting to another time or place. Adjournments of parliament differ from prorogations in this,—that the houses can adjourn of themselves, but a prorogation is done only by the sovereign. (*See* PROROGATION.)

ADJUDICATION, *ad-joo-de-kai'-shun* (Lat. *ad*, to, and *judico*, I judge), a process known to the law of Scotland. It implies the means by which real property and its accessaries are transferred to a creditor by a debtor, from an heir to a devisee, or from a vendor, who may have failed or refused to convey, to the vendee. It is also the declaration of a commissioner in bankruptcy, that a person has become subject to the bankrupt law, and by which he adjudicates him bankrupt accordingly.

ADJUNCT, *ad'-junkt* (Lat. *ad*, to, and *junctus*, joined), a term used in Phil. to signify something added to another thing, between which there is no natural affinity. In the Academy of Paris, adjuncts were members attached to a particular science.

ADJUSTMENT, *ad-just'-ment* (Lat. *ad*, to, and *justus*, just), a term used in Marine Insurance to signify the ascertainment of the exact amount of indemnity to which the insured is entitled under the policy, when all deductions and proper allowances have been made.

ADJUTAGE, or AJUTAGE, *ad'-ju-taj* (Lat. *adjuvo*, I assist), in Hyd., signifies the tube of the mouth of a *jet d'eau*, through which the water is conveyed.

ADJUTANT, *ad'-ju-tant* (Lat. *adjutor*, an assistant), a military officer, whose duties are to assist the major in all matters relating to the ordinary routine of discipline in the regiment. The office confers no separate rank, but is usually given to one of the subaltern officers.—AN ADJ.-GENERAL stands in the same relation to a general that an adjutant does to a major, and is to the army what the adjutant is to a regiment.

ADJUTANT, *Orn.*, a gigantic crane, belonging to the *Ardeidæ* or Heron fam. Its scientific name is *Leptoptilos argala*. *Charac.* The adjutant stands five feet high; the neck and head are almost bare; the beak very large, long, and of extraordinary strength.



ADJUTANT.

Beneath the beak hangs a downy pouch like a dewlap, which the bird has the power of inflating. The upper part of the adjutant is of an ash-grey colour, the under part white. Its voracity is wonderful: it can swallow a fowl, a rabbit, or a leg of mutton, at a mouthful; and it is extremely useful in devouring all sorts of carrion. In Calcutta it is called the Scavenger, and any person wantonly killing one is fined 50 rupees. In their wild state these birds live in companies. Seen near a river, and from some distance, Dr. Latham remarks that they may "well be taken for canoes upon the surface of a smooth sea, or for men and women picking up shellfish or other things on the beach." *Hab.* The warmer parts of India.

AD LIBITUM, *lib'-i-tum* (Lat., at pleasure), in Music, a term signifying that the performer may introduce into the composition any addition of his own, according to his fancy.

ADMEASUREMENT, *ăd-mesh'-ure-ment* (Lat. *admensuratio, mensuro*, I mete or measure), in Law, is a writ which lies in dower. *Admensuratio dotis*, where a man's widow, after his death, holds more land as dower than of right belongs to her, or the heir or his guardian do not assign her dower within the term of *quarantine*, or forty days, or assign it unfairly, the writ then goes to the sheriff to assign it. It formerly was used also in cases of pasture (*admensuratio pasturæ*), where those who had common of pasture appendent to their freehold estates, or common by vicinage, and any one or more of them surcharged the common. The latter writ is abolished.—Ref. *Bl. Com.* vol. i. b. 2, pt. 1, ch. 4; vol. iii. b. 5, ch. 8; *Reg. Orig.* 156, 171; *Termes de la Ley*.

ADMEASUREMENT, in Mar., the measurement made to ascertain the tonnage of a ship.

ADMINISTRATION, and ADMINISTRATOR, *ăd-min'-is-trai'-shun* (Lat. *administratio*, aid, assistance, agency). The office of an administrator is to administer or distribute the goods of a person who has died without making a will; or, having made a will, without appointing an executor: in such cases, letters of administration are taken out of the principal or a district registry of the Court of Probate. Administration is likewise used for managing the affairs of minors, lunatics, &c. In ecclesiastical concerns, it means the temporal and spiritual powers of a beneficed clergyman. Among anatomists, it signifies the act of dissection, particularly of the muscles.

ADMINISTRATION, in Pol., denotes the persons in a state intrusted with the general superintendence of affairs and the execution of the laws. In England the term is usually employed to designate the Privy Council, especially that portion of it known as the Ministry.

ADMIRAL, *ăd'-mi-ral*, the title of the highest class of naval officers. The word is said to be derived from the Arabic *Emir* or *Amir*, lord or chief. In the British navy there are three kinds of admirals,—of the Red, of the White, and of the Blue; so called from the colour of their flags; whence they have all the general title of flag-officers. There are, further, three grades in each of these classes,—Admirals, who bear their flag at the main-top-gallant masthead; Vice-admirals, at the fore-top-gallant masthead; and Rear-admirals, at the mizen-top-gallant masthead. The title Admiral of the Fleet is merely an honorary distinction. A full admiral ranks with a general, and one who is actually the commander-in-chief of a fleet, with a field-marshal in the army; a vice-admiral ranks with a lieutenant-general, and a rear-admiral with a major-general in the army. The rates of full or sea-pay of admirals are,—admiral of the fleet, £8 per day; admiral, £5; vice-admiral, £4; rear-admiral, £3. An admiral commanding-in-chief receives £8 per day additional when his flag is flying within the limits of his station. By an order in council (1851), the number of active flag-officers was reduced to 99, exclusive of admirals of the fleet, of whom there is, at present, one; being, 7 admirals, 9 vice-admirals, and 17 rear-admirals in each class. Besides these, there are, at present, about 200 flag-officers on reserved half-pay, or retired.

ADMIRAL, in Conch., a beautiful shell of the Volute species, and comprising four kinds,—the Grand-admiral, the Vice-admiral, the Orange-admiral, and the Extra-admiral. The first is of a fine white enamel, with bands of yellow finely turned about the head, and the clavicle excited. It is principally characterized by a denticulated line along the centre of the large yellow band: this distinguishes it from the Vice-admiral. The Orange-admiral has more yellow; and the bands of the Extra-admiral run into each other.

ADMIRALTY, *ăd'-mi-ral-te*, the office of lord high admiral, or of the commissioners appointed to discharge that office. The Admiralty Court is usually termed the Instance Court, to distinguish it from the Prize Court, which is only constituted in time of war. It has cognizance of all civil maritime affairs, which are determined according to the civil law, so far as the same be not inconsistent with the common, statute, or international law.

ADMIRALTY DROITS (Fr. *droit*, right, prerogative), certain rights belonging to the Crown by virtue of its prerogative, and connected with the seas; as, *wreck found*.

ADMITTANCE, *ăd-mit'-tans* (Lat. *admissio, admitto*, I put in, I present with), in Law, is the giving possession of a copyhold estate; and is of three kinds:—1. Upon a voluntary grant by the lord of a manor, where the land has escheated or reverted to him.—2. Upon surrender by the former tenant.—3. Admittance by descent, which is where an heir is tenant immediately on the death of his ancestor. (Ref. *Wood*, b. 2, c. 1.)—*Admittance of a Clerk* is when a patron of a church being presented to it, the bishop, upon examination, admits the clerk by saying *Admitto te habilem*. It is, properly, the ordinary's declaration that he approves of the presentee to serve the cure of the church to which he is presented.—Ref. *Co. Litt.* 344a.

ADMONITIO FUSTIUM, *ăd-mo-nish'-i-o*, among the ancient Romans, a military punishment, not dissimilar to the modern whipping, except that it was performed with vine-branches.

ADMONITION, or MONITION, *ăd-mo-nish'-un* (Lat. *moneo*, I remind), a term used in Eccl. Law to denote the warning given to an offender before excommunication, or to a suitor before proceeding against him *in pœnam contumaciæ*, or for default.

ADNATE, *ăd'-nait* (Lat. *ad*, to, and *natus*, a growing), in Bot., a term applied to certain portions of a plant when they adhere to other portions; thus, when the stipules are united to the petiole, as in the leaf of the rose, they are called *adnate stipules*: when the anther is closely attached to the filament, as in the flower of the buttercup, it is said to be an *adnate anther*. The term *adherent* has the same signification.

ADONIC, *ă-don'-ik*, in Ancient Poetry, a verse which consisted of a dactyle and a spondee or trochee; as, *rārā jŭvĕntŭs*. It was so called from being first used in the elegies on Adonis, the lover of Venus. (*See* vol. I. of this work.)

ADONIC FESTIVALS, *ă-don'-ik* (Gr. *Adonis*, Adonis), certain festivals held yearly by the ancients on the banks of the Adonis, a river of Phœnicia, where Adonis, or Thammuz, as he is termed in the East, was supposed to have received his death-wound. (*See* ADONIS, vol. I. of this work.) At certain periods of the year this river becomes tinged with a high red colour, caused by the washing up of portions of red earth. This discoloration of the waters was ascribed by the ancients to a supposed sympathy possessed by the river for the death of the lover of Venus. Milton, in his "Paradise Lost," thus beautifully alludes to the fact:—

> "Thammuz came next behind,
> Whose annual wound in Lebanon allured
> The Syrian damsels to lament his fate,
> In am'rous ditties, all a summer's day:
> While smooth Adonis from his native rock
> Ran purple to the sea, supposed with blood
> Of Thammuz, yearly wounded."

*Ref.* Calmet's *Dictionnaire de la Bible*, art. "Thammuz."

ADONIS, *ă-do'-nis*, in Bot., a genus of plants belonging to the Buttercup order, or *Ranunculaceæ*. The common adonis, or pheasant's-eye, is a favourite annual in English gardens. Its flower is of a bright scarlet, with a black spot or eye in the centre.

ADOPTION, *ă-dop'-shun* (Lat. *ad*, to, and *opto*, I choose), the act whereby one man makes another his heir. It was a common custom among the Greeks and Romans, as it still is with the Turks and other eastern nations.

ADOPTION CONTROVERSY, a strife which arose in the Church, in Spain, towards the end of the 9th century. The leaders in this controversy were Felix of Urgellis and Elipandos of Toledo, who held that Christ in his human nature was the son of God only by adoption. This doctrine was condemned at an assembly summoned by Charlemagne, at Ratisbon, in 792; at the council of Frankfort-on-the-Maine, in 794; and at the synod of Aix-la-Chapelle, in 799. The controversy ceased on the death of the two leaders.

ADORATION, *ăd'-o-rai'-shun* (Lat. *ad*, to, and *oro*, I pray), a term denoting the act of worshipping the Supreme Being. It was anciently done by prostrating the body with the face to the earth, as an action naturally

flowing from the deepest humility of mind; the concealment of the face being strongly and most appropriately expressive of the worshipper's total unworthiness so much as to lift up his eyes before the great object of his worship.

ADOREA, *ăd-o-re'-a*, a term of various acceptation among the Romans, sometimes signifying grain in general, at others a kind of cake offered in sacrifice; and again it was used to denote the gratuitous distribution of corn; whence it became applied to all forms of reward.

ADOXA, *a-dox'-a* (Gr. *a*, without, and *doxa*, glory), in Bot., the Moschatel, a genus of plants belonging to the Ivy ord., or *Araliceæ*. The typical species, *A. moschatellina*, is a curious inconspicuous little plant, having a tuft of pale green flowers, found in moist shady situations.

AD QUOD DAMNUM, *dăm'-num* (Lat., to what damage), in Law, a term applied to a writ issued by the Crown, to inquire whether a royal grant, such as a market, fair, &c., would be to its damage.

ADRAGANT. (*See* TRAGACANTH.)

ADRIFT, *ă-drift'* (Ang.-Sax.), in Mar., a term signifying that a vessel has broken loose from her moorings, and is driven to and fro by the winds and waves.

ADSIDELLA, *ăd'-si-del'-la*, among the Romans, the table at which the flamens sat during the sacrifices.

ADULARIA, *ăd'-u-lar'-ri-a*, in Min., a kind of felspar, resembling clear transparent glass. It is found in volcanic districts.

ADULT, *ă-dult'* (Lat. *adultus*, grown up), in a general sense, a term signifying anything grown up to, or arrived at maturity. It is also applied to that period of human life which extends from manhood to old age.

ADULTERATION, *ă-dul-te-rai'-shun* (Lat. *adultero*, I falsify, corrupt), the introduction of cheap and often injurious materials into natural and manufactured products, for the purpose of increasing the profits on their sale. This practice is still unfortunately carried to a great extent, though a special act of parliament has been passed to check it. Full particulars of the most common adulterations will be found under the heads of articles of food. (*See* FLOUR, BREAD, ARROW-ROOT, &c.) When the adulteration consists of a mineral substance, its nature is readily determined by chemical analysis; but when it consists of an organic product, the aid of the microscope is required to find it out. The practice of adulteration has frequently led to fatal results.

ADULT-SCHOOLS, establishments for the instruction of those persons who have not been educated in their youth, in the elementary branches of knowledge. The Rev. T. Charles, a clergyman of Merionethshire, finding that several of the grown-up parishioners attending his Sunday-school, disliked to learn by the side of children, first formed an adult-school, in 1811; and at about the same time, though without any connection or correspondence with the establishment in Wales, Mr. W. Smith opened a school in Bristol. Smith was a doorkeeper at a dissenting chapel, and out of his weekly wages of 18*s.* gave 3*s.* towards the expenses of the school. A society was afterwards formed for the advancement of his benevolent intentions, and adult-schools were established in various parts of the country,—in Ipswich, Norwich, Salisbury, Sheffield, Plymouth, Uxbridge, and elsewhere. (*Ref.* Pole's *History and Origin of Adult Schools.*) In the present day adult-schools rather enable young men who have received the rudiments of education, to make further progress, than teach the totally unlettered. They are to be found in several mechanics' institutions, in the Working Men's College, and other places of a similar description. At King's College, London, the evening classes, which give the privilege of a university examination, are invariably well attended. To cite a proof of the necessity of such schools for the moral and intellectual culture of the labouring classes:—In 1841, 33 per cent. of the men, and 49 of the women, could not write their names on their marriage. In 1856, the percentage was reduced to 29 of the men, and 40 of the women.

ADUMBRATION, *ăd-um-brai'-shun* (Lat. *ad*, to, and *umbra*, a shadow), in Her., denotes that the shadow only of a figure is outlined and painted of a darker colour than the field.

AD VALOREM, *ăd-lor'-em* (Lat., according to the value), a term used for those duties or customs which are paid according to the value of the goods.

ADVANCE, *ăd-vans'*, in Com., a term applied to money paid in part, or wholly, before the delivery of goods purchased, the execution of work, or the performance of any business.

ADVANCED DITCH, or MOAT, a term used in Fort. to denote the trench surrounding the glacis or esplanade of a place.

ADVANCED GUARD, or VANGUARD, is the first line or division of an army, placed in order of battle. It also denotes a party of cavalry stationed before the main guard.

ADVENT, *ăd'-vent* (Lat. *adventus*, coming), a term applied by the Christian church to certain weeks before Christmas. Anciently, the season of Advent consisted of six weeks, and this is still the duration of it in the Greek church. In the Romish church, however, and in the Protestant churches that observe Advent, it only lasts four weeks, commencing with the Sunday nearest St. Andrew's day (Nov. 30), either before or after. It is appointed to be observed as a season of devotion, being intended to commemorate the coming of Christ in the flesh, and to direct the thoughts to his second coming. This season was observed with great austerity by the primitive Christians.

ADVENTITIOUS ROOTS, in Bot., roots which are not produced by the direct elongation of the radicle of the embryo. They generally spring from the true roots, from suckers, layers, bulbs, and other subterranean modifications of the stem. Adventitious roots are sometimes given off by the stems and branches, and are then termed aërial roots. In the Indian fig, or banyan, and the mangrove, these roots descend to the ground, and help to support and nourish the parent stems.

ADVENTURE, BILL OF, *ăd-ven'-ture* (Fr. *aventure*, hazard), a writing which is signed by a merchant, and which states that the goods on board a vessel are the property of another, who is to run all risk, the merchant only binding himself to account for the produce.

ADVENTURERS (Fr. *aventurier*), in Com., those traders who formerly undertook the discovery of distant lands, and the settlement of far-off colonies, and formed themselves into a company called the Merchant Adventurers. The term was also applied to a merchant vessel trading without a license within the boundaries of a company's grant.

ADVERB, *ăd'-verb*, in Gram., a part of speech, or class of words, so called from being generally joined to verbs, like adjectives to nouns, for the purpose of qualifying their meaning. Adverbs are also joined to adjectives and other adverbs. According to their signification, adverbs are divided into those of number, order, time, place, quantity, manner, &c.; as, *once, firstly, now, here, much, well.* Many adverbs are formed from adjectives by adding the termination *ly*; as, *wise, wisely.*

ADVERSA, *ăd-ver'-sa* (Lat. *ad*, to, and *versus*, turned towards), in Numis., a term applied to those coins wherein the heads are seen facing each other.

ADVERSARIA, *ăd'-ver-sai'-ri-a*, a term employed by the ancients to denote a kind of common-place book, or journal, in which were inserted remarkable occurrences. At the present day the term is more particularly used among men of letters, to designate a kind of common-place book, wherein is entered whatever may occur worthy of notice, whether in reading or conversation.

ADVERSATIVE, *ăd-ver'-sa-tif*, in Gram., a term denoting a difference between what precedes and that which follows it; as in this sentence, "He is benevolent, but poor;" the word *but* is an adversative conjunction.

ADVERTISEMENT, *ăd-ver'-tis-ment* (Fr. *avertissement*), an announcement or notice of any kind, generally such as are published in newspapers, &c. The first English advertisement that can be found is in the *Imperial Intelligencer* for 1648, and relates to stolen horses. In 1712 a tax was first imposed upon advertisements. In 1833 the tax was reduced from 3*s.* 6*d.* to 1*s.* 6*d.* in Great Britain, and from 2*s.* 6*d.* to 1*s.* in Ireland; and in 1853 it was abolished altogether. In 1832 (the year before the reduction) the total number of newspaper advertisements in the United Kingdom was 921,943;

viz., 787,649 in England, 108,914 in Scotland, and 125,380 in Ireland,—the duty amounting to £172,570. In 1841 the total number of advertisements was 1,778,957, and the duty amounted to £128,318; in 1851 the latter had risen to £175,694. Since the abolition of the duty, the number of advertisements has vastly increased, though there is no means of arriving at even a probable estimate of their number. The increase manifests itself not only in old-established papers, as the *Times*, which has more than doubled the number of its advertisements, but in the great number of papers that have sprung into existence since that time, some of which daily contain a great number of advertisements. One of these, the London *Daily Telegraph*, had on 13th November, 1861 (an average number), 586 advertisements. The *Times* (taking average numbers) contained, on 1st February, 1853, 1,086 advertisements; and on 21st November, 1861, 2,450. In almost every case it is the advertisements by which newspapers are supported, the sales even of the higher-priced papers being insufficient to pay for the paper, printing, editing, &c. The sums annually spent by some who issue advertisements are very considerable. We give the following, on the authority of the writer of an interesting article on this subject, in the *Quarterly Review* for June, 1855:—Holloway (pills, &c.), £30,000; Moses & Son, £10,000; Rowland & Co. (Macassar oil, &c.), £10,000; De Jongh (cod-liver oil), £10,000; Heal & Sons (bedsteads and bedding), £8,000; Nichol (tailor), £4,000.

ADVICE, *ăd-vice'* (Fr. *avis*), in Com., is information respecting trade communicated by letter; thus, an advice is generally sent by one banker or merchant to another, to inform him of the drafts or bills drawn on him, with full particulars of their sum, date, to whom made payable, &c. This document is termed a "letter of advice," and the practice prevents mistakes, and at times detects forgeries; for when bills are presented for payment or acceptance, they can be refused to be honoured for want of advice.

AD VITAM, AUT CULPAM, a phrase signifying that an office is to be held by a person till his death, or, more properly, during his good conduct.

ADVOCATE, *ăd'-vo-kait* (Lat. *advocatus*, one who gives legal assistance), among the Romans, one who pleaded the causes of others. The term is still used in those countries where the Roman law prevails. In the courts of civil law, in England, he is required, before discharging his duties, to take the degree of D.C.L. in one of the English universities. In Edinburgh there is a *Faculty of Advocates*, who constitute the Bar of Scotland. The *Lord Advocate* is a state officer in that country, who pleads the king's causes. The Advocates' Library, belonging to the faculty, is, perhaps, the third largest in the kingdom, that of the British Museum and the Bodleian only being considered superior. (*See* LIBRARY.)

ADVOCATE FISCAL (Lat. *fisci advocatus*), an officer under the Roman emperors. He pleaded causes belonging to the private treasury.—*Advocates consistorial*, officers in the consistory at Rome, who plead in cases of opposition to the disposal of benefices.

ADVOWSON, *ăd-vow'-son* (Ang.-Nor.), in Eccl. Law, the right of patronage, or of presenting to a benefice. The person enjoying this right is called the patron, who is bound to protect the interest of the church as well as the rights of the incumbent whom he has presented to it.

ADYTUM, *a-di'-tum* (Gr. *adyton*, a recess), in Arch., a term in use among the ancients, signifying the most sacred part of their temples, to which none but the priests had access, and from which the oracles were delivered. The Sanctum Sanctorum, or most holy place of the temple of Solomon, at Jerusalem, was its adytum. Strabo describes an adytum of an Egyptian temple under the name of *secos*. In the small temple at Pompeii there is an adytum in good preservation.

ADZE, *ădz* (Sax. *adeze*), a cutting-tool, of the axe kind, having its blade thin and arching, and its edge at right angle to the handle. It is principally used for taking thin chips off timber, and is rather a cooper's than a carpenter's implement.

ÆACEA, *e-ai'-se-a*, Grecian festivals celebrated at Ægina, in honour of Æacus, one of the judges of the invisible world. (*See* vol. I. of this work.)

ÆCIDIUM, *e-sid'-i-um*, in Bot., a genus of microscopic parasitic fungi. There are numerous species, some of which infest useful garden plants, such as the mint and the gooseberry.

ÆDES, *e'-dees* (Lat. a building), in Arch., among the Romans, signified an inferior kind of temple, dedicated to some deity, but not by the augurs.

ÆDILE, *e'-dile* (Lat. *ædes*, a building), the term applied to certain Roman magistrates, who had the superintendence of public buildings, highways, bridges, weights and measures, &c. They had also the charge of the public morals, and the regulation of theatrical performances and diversions. They were four in number, two plebeian and two curule; the former elected from the common people (*plebs*), the latter at first from the patricians, but afterwards from plebeians and patricians promiscuously. They were so called from their giving judgment on ivory seats (*sellæ curules*). Julius Cæsar added two more, termed *ædiles cereales*, who had the inspection of the granaries. The ædiles had great power in the state, and were allowed to use the robe of honour (*toga prætexta*).

ÆGAGRUS, *e-gag'-grus*, the Paseng of the Persians, a wild species of Ibex. (*See* GOAT.)

ÆGICERACEÆ, *e-ji-se-rai'-se-e*, in Bot., the Ægiceras order of dicotyledonous plants. This includes but one genus, of which there are five species. These plants grow near the sea in tropical regions, throwing out adventitious roots into the mud, like mangroves.

ÆGILOPS, *e'-ji-lops*, in Bot., a genus of *Glumaceæ*, the Grass order. The species *Ægilops ovata* was formerly supposed to be the origin of all the varieties of cultivated wheat; and it is undoubtedly true that a kind of wheat may be produced by the union of this plant with a species of *Triticum*. The hybrid, after about twelve years' cultivation, becomes a wheat-bearing grass.

ÆGINETAN ART, *e-ji-ne'-tan*, the fine arts as executed by the people of Ægina, especially sculpture, specimens of which, in the form of casts, are now in the Phigalian saloon of the British Museum. The originals are at Munich, having been purchased by the late king of Bavaria.

ÆGIS, *e'-jis* (Gr. *aigis*, a goat-skin coat), among the ancient Greeks signified the shield of Jupiter, by whom it was given to Minerva. According to Homer, the shield was covered with the skin of the goat Amalthea. Minerva afterwards fixed upon it the Gorgon's head (*see* GORGON, vol. I. of this work), and thus endowed it with the power of turning into stone all those who looked at it. The term was also employed to denote the breastplate of a god, and finally it came to be applied to the cuirass of distinguished persons. In the British Museum there is an armed statue of the emperor Hadrian, which affords an example of the use of the ægis as a breastplate.



ÆGIS.

ÆGLE, *e'-gle*, in Bot., a genus of *Aurantiaceæ*, the Orange order. The bark of the *Ægle marmelos*, or Indian bael, has been introduced into this country as a remedy for [illegible]. The rind of its ripe fruit

ÆGOMANTIA, *e-go-mă*[illegible] divination), a term used by the ancient to express a mode of divination, in which a goat the chief performer.

ÆGOPHTHALMUS, *e'-gof-thăl'-mus*, in Min., the goat's-eye stone. This term is generally applied to those gems in which the circular spots resemble the eye of a goat.

ÆNEID, *e'-ne-id*, the celebrated epic poem written by Virgil in the time of Augustus Cæsar, which relates

the wanderings of Æneas after the capture of Troy, his arrival in Italy, and his adventures previous to his marriage with Lavinia and settlement in Latium. The poem consists of twelve books. The first six contain a description of the wanderings of the hero; the others of his arrival in Italy, and the war between the Trojans and the natives. It was commenced about A.U.C. 724 or B.C. 30, the author continuing to labour upon it till his death, B.C. 20. (*See* VIRGIL, vol. I. of this work.)

ÆNIGMA, *e-nig'-ma* (Gr.), is a Greek term for what is commonly called a riddle. It denotes any dark saying or question, wherein some well-known thing is concealed under obscure or indirect language.

ÆOLIAN HARP, *e-o'-li-an* (Lat. *Æolus*, the god of the winds), a kind of harp formed of a number of catgut strings, tuned in unison, and stretched across a deal box, open at the sides. The box is placed on the sill of a window, and the sash shut down upon it; the wind blowing into the room across the strings produces an harmonious mixture of sounds, resembling a distant choir, rising or falling according to the strength of the blast. The same effect is produced on a grander scale by the wind passing through the wires of a line of telegraph. The Æolian harp is easily made, care being taken to preserve the strings in strict unison. It is generally supposed to be the invention of Father Kircher, the celebrated organ-builder.

ÆOLIC DIALECT, *e-ol'-ik*, among Grammarians, one of the five dialects of the Greek tongue, agreeing in most things with the Doric dialect.

ÆOLIC VERSE, in Pros., a kind of verse, consisting of an iambus or spondee, then of two anapests, separated by a long syllable, and lastly of one long or short syllable.

ÆOLIPILE, *e-ol'-i-pile* (Lat. *Æolus*, god of winds, *pila*, a ball), a hollow ball of metal, to which a pipe is attached. On being filled with water, and placed on the fire, the steam issues from the tube with sufficient force to turn a wheel placed within its power. Branca, an Italian mechanician of the 17th century, is supposed to be the first who applied the æolipile to useful purposes. A kettle, from the spout of which steam is issuing, forms a very good æolipile for experimental purposes, the lid acting as a safety-valve. In Italy, a form of æolipile is used to cure smoky chimneys, by creating an upward draught.

ÆON. (*See* GNOSTICS.)

ÆQUILATERUS. (*See* EQUILATERAL.)

ÆRA. (*See* ERA.)

ÆRARIUM, *e-rar'-ri-um* (Lat.), among the Romans, the term applied to the place where the public money was kept, the care of which devolved upon the quæstors. *Ærarium sanctum*, a place to contain the moneys arising from the twentieth part of legacies reserved for the use of the state. *Ærarium privatum*, the emperor's private purse. *Ærarium Illithiæ*, the place where the moneys which parents paid at the birth of each child were deposited.

AERATED WATERS, *ai'-e-rai'-ted* (Gr. *aer*, air).—This term is applied to drinks in which water is impregnated with gases by pressure. The best known of these is the so-called soda-water, which generally consists of plain water charged with carbonic-acid gas. This is effected by submitting the water to carbonic acid under a pressure of 30 or 40 lbs. to the square inch, and bottling it off without any diminution of the pressure. On uncorking the bottle, the imprisoned gas is released, and taken into the stomach in the form of bubbles Various mineral constituents, such as soda, potash, lithia, the salts of iron, and magnesia, are often introduced into the water with excellent medicinal effects. Aërated drinks, such as effervescing lemonade, are often impregnated with air only; but this is easily detected by the taste of the gas.

AERATION OF SOILS, *ai'-e-rai'-shun*, is the impregnating them with air, by ploughing, harrowing, &c., so that the air may enter the pores of the earth.

AERIAL BULBS, *ai-eer'-i-al*, in Bot., small conical or rounded bodies of the nature of bulbs, which grow in the axils of the leaves of certain plants. They may be seen in the bulbiferous lily and in the pilewort.

AERIAL IMAGES. (*See* MIRAGE and FATA MORGANA.)

AERIAL LEAVES, in Bot., leaves which grow in the air, as distinguished from submerged leaves, or those which flourish under water.

AERIAL PERSPECTIVE, a term used in Paint. to signify the diminution in the colour and brilliance of objects seen at a distance, and which causes them to look more or less remote.

AERIAL ROOTS, in Bot., those adventitious roots which are produced in the air. The little threads which spring from the stem of the ivy, the descending columns of the banyan-tree, and the green fibres thrown out by the curious air-plants, are examples.

AERO-DYNAMICS, *ai'-e-ro-di-nâm'-iks*, (Gr. *aer*, air, and *dynamis*, power), is the science which treats of properties of æriform fluids in a state of motion. The causes which disturb the quiescence of the air are very numerous. Currents are created in innumerable ways; amongst others, by the local change of temperature induced by the presence or absence of the sun; by the permanent difference of temperature between the polar and equatorial regions; and by the rotation of the earth on its axis. It is also effected by the evaporation of the sea and rivers. Aqueous vapour being much lighter than the air, causes motion in its passage to the cloud region. The science of aëro-dynamics is most important in the way of affecting the well-being of mankind. The researches of Admiral Fitzroy have proved that it is quite possible to predict the blowing of wind from any particular quarter; and, by aëro-dynamical calculations, the Admiralty is now able to forward telegrams to different parts of the coast, warning sailors of coming storms. The laws which govern projectiles are properly part of this science. (For a further consideration of this part of the subject, *see* PROJECTILES; *see also* RIFLE, GUNNERY, ANEMOMETER, ACOUSTICS.)

AEROGRAPHY, *ai-e-rog'-ra-fe* (Gr. *aer*, air, and *grapho*, I write), the description of the nature, properties, and phenomena of the atmosphere. (*See* ATMOSPHERE.)

AEROLITE (Gr. *aer*, air, and *lithos*, a stone), a stone which has fallen from the atmosphere; a meteoric stone. The source of these bodies has greatly puzzled philosophers. Many suppose them to have been projected from lunar volcanoes to such a distance as to come within range of the earth's attraction; others give them a terrestrial volcanic origin. The generally-received opinion is that started by Laplace, who supposes them to be masses of matter,—small planets, in fact,—revolving round the sun, and coming within range of the earth's attraction. This opinion is carried out by the fact of showers of meteors occurring at periodical intervals; for example, Aug. 7 to 12, Nov. 10 to 16, when large quantities of these bodies may be seen nightly in all directions. The heat caused by their passing at an inconceivably rapid rate through the air is sufficient to render them incandescent. They are mostly of uniform composition, consisting principally of silica, magnesia, and iron, with small quantities of nickel, sulphur, and chromium. Some of them are very large, weighing upwards of 300 lbs. Shooting stars are supposed to be meteoric stones which are consumed by the heat generated in their passage to the earth. Philosophers long disbelieved in their existence. The fact has, however, long been placed beyond doubt by the researches of Laplace, Chladni, and others.

AEROMANCY, *ai'-e-ro-mân-se* (Gr. *aer*, air, and *manteuo*, I divine), a term applied to a mode practised by the ancients of predicting future events from certain appearances in the air.

AEROMETRY, *ai'-er-om'-e-tre* (Gr. *aer*, air, and *metreo*, I measure), the art of measuring the air, so as to obtain a knowledge of its bulk, density, &c. The instrument employed to ascertain the bulk of gases, &c., is called an aërometer.

AERONAUT, *ai'-e-ro-nawt* (Gr. *aer*, air, and *nautes*, a sailor), one who travels in a balloon. The most celebrated aëronauts were the brothers Montgolfier, who were the first to make an ascent in this manner, in 1783; Blanchard, who first crossed the Channel in 1785; Garnerin, to whom we owe the invention of the parachute; Pilatre de Rozier, who lost his life by imprudently ascending in a Montgolfier balloon, above which was placed a second filled with hydrogen; Madame Blanchard, who was burned during a display of fireworks from the car; and, in our own day, Mr. Charles Green, who has crossed the Channel several times, and has made up-

wards of a thousand ascents; Cocking, who was killed by descending in a parachute made of tin tubes a few years since; and, lastly, Messrs. Godard and Poitevin, who risk their lives by ascending on the backs of lions, or swinging on ropes attached to the car.

AËROPHYTES, *aï'-e-ro-fites* (Gr. *aer*, air, and *phyton*, a plant), in Bot., plants having only aërial roots. (*See* AIR-PLANTS.)

AËROSTATION, *aï'-e-ros-tai'-shun* (Gr. *aer*, air, and *stao*, I stand), the art of raising bodies into the air by the aid of gases, &c. (*See* BALLOON.)

*Æruco*, *e-ru'-go*, the ancient name for a bright green rust or verdigris, produced by the action of the air upon copper, brass, and bronze. The Romans considered that the æruco added to the beauty of their statues.

ÆRUSCATORES, *e-rus-ka-to'-rees*, a name given by the ancients to those strolling beggars who obtained money by fortune-telling. The term was also applied to the priests of Cybele and the collectors of taxes.

*Æs*, *ees*, a bronze coin of the Romans, consisting of the *æs rude*, *æs grave*, and *æs signatum*. The two first were paid by weight, but the last in number. *Æs flavum*, among the Romans, was used to designate bronze of an inferior description.

ÆSCHYNOMENE, *ees'-ki-nom'-i-ne*, in Bot., a genus of leguminous plants. The species are numerous, and most of them natives of India. The stems of the *Æschynomene paludosa* furnish the shola, or Indian rice-paper, and, on account of their extreme lightness, are used for making floats and buoys. *Æ. cannabina* yields the fibre known as Duchai hemp.

ÆSCULUS, *ees'-ku-lus*, in Bot., the Horse-chestnut, a genus of the Soapwort order, or *Sapindaceæ*. *Æsculus Hippocastanum*, the common horse-chestnut, is the typical species. This is a remarkably handsome and very useful tree. Its timber is used for turnery and fuel, and its seeds have long been employed in Switzerland for feeding sheep. Its bark, which contains a peculiar principle called *Æsculin*, is febrifugal, and is occasionally used in medicine, while its young leaves are somewhat aromatic, and have been substituted for hops. In France, large quantities of starch are obtained from the seeds, which, in England, are considered worthless. A peculiar oil, which is said to be a wonderful remedy for rheumatism, is also extracted from these seeds. The roots and leaves of the American horse-chestnut, or buck-eye, are considered poisonous.

ÆSTHETICS, *ees-thet'-iks* (Gr. *aisthetikos*, perceptible to the senses), the science of the Beautiful in Art. The word was first employed about the middle of the 18th century by Alexander Baumgarten, a follower of Christian Wolf, and professor of philosophy in the university of Frankfurt-on-the-Oder; and, having been found both comprehensive and definite, it was generally adopted by the French and English art-writers. According to the theories of the soundest psychologists, human nature may be divided into the capacities of knowing, acting, and feeling; in other words, into intellect, will, and sensibility. To these capacities correspond respectively the ideas of the True, the Good, and the Beautiful. That which logic is to intellect, ethics to will, is æsthetics to sensibility. The laws of thinking are determined by logic, the laws of acting by ethics, and the laws of feeling by æsthetics. As the ultimate aim of thought is truth, as the ultimate aim of action is good, so is beauty the ultimate aim of sensibility. Philosophers, from the times of Aristotle and Plato downward, have endeavoured to place the laws of taste upon a definite basis, like those of ethics and logic. To fully explain and discuss the respective systems of æsthetics would require a volume; it will be sufficient here to indicate the two principal modes of treating æsthetics as a science. Those philosophers who have employed the *à priori* method have sought to analyze the æsthetic notions proper to the mind, and to erect upon their basis an abstract system, to which the artist, whether he be painter, architect, musician, sculptor, or poet, shall conform his creations. According to the second, or *à posteriori* method, all the great acknowledged works of art are selected to exhibit whatever in them constitutes a pleasing effect, from which are to be deduced practical rules. Pythagoras, Plato, Baumgarten, Kant, Schelling, Schiller, and Hegel, have been the great speculators in the *à priori* method, and in the *à posteriori*, Aristotle, Heinse, Lessing, Winckelmann, Bayle, Rousseau, and the greater portion of the Italian, French, and English writers upon the laws of taste. In England, however, the aim of the various philosophical speculators has been to discover, not the idea of the Beautiful, like the Germans, but the Beautiful itself.—*Ref.* Jouffroy's *Cours d'Esthétique*; Cousin's *Le Vrai, le Beau, et le Bon*; Schiller's *Treatise on Æsthetics*; Burke's *Treatise on the Sublime and the Beautiful*; Alison's *Essays on the Nature and Principle of Taste.*

ÆSTIVATION, *ees-ti-vai'-shun*, in Bot., a term signifying the summer state, is applied to the general arrangement of the different parts of the flower. When those parts are placed in a circle, and in nearly the same plane, the æstivation is said to be *circular*, and when they are placed at slightly different levels, so as to overlap each other, it is said to be *spiral*. The term *præfloration* is used by some botanists instead of æstivation.

ÆSTUARY. (*See* ESTUARY.)

ÆTHER. (*See* ETHER.)

ÆTHUSA, *e-thu'-sa*, in Bot., a genus of umbelliferous plants. *Æthusa Cynapium*, fool's parsley, is a common indigenous plant, highly poisonous, which has been frequently mistaken for parsley.

ÆTIOLOGY, *e'-ti-ol'-o-je* (Gr. *aitia*, a cause, and *logos*, discourse), in Rhet., a figure of speech, by which the causes of an event are developed in the narrative.

ÆTOBATES, *e-to-bai'-tees*, a genus of fossil fishes allied to the Rays, the species of which are found at Sheppey, in the London clay.

AFFA, *äf'-fa*, a weight in common use on the Gold Coast of Guinea, the half of which is called *eggeba*. They equal the English ounce and half-ounce. The negroes on the Gold Coast invariably give these names to these weights.

AFFAIR, *af-fair'*, any action or engagement not of sufficient magnitude to be termed a battle.

AFFECTED, or ADFECTED EQUATIONS, in Alg., are those in which the unknown quantity is found in two or more different powers; for example, $x^3 - px^2 + qxu + {}^1\!/_2 b$; in which are three different powers of $x$.

AFFETTUOSO, *af-fet-too-o'-zo*, a sign in Music, by which is intimated that the part to which it is applied must be played in a tender, moving manner, and rather slow than fast.

AFFICHE, *af'-feezh* (Fr. *affiche*), a word generally used by the French to describe posting-bills, or any advertisements, large or small, either posted upon walls or distributed by hand, to make anything known to the public.

AFFIDAVIT, *äf'-fi-dai'-vit* (Lat. *affido*, I pledge faith to), in Law, is a statement, in writing, of facts for the information of a court in a cause or matter pending, or about to be commenced therein; or to comply with particular statutes relating to the revenue and otherwise. Unless it be used in a cause or matter in court, or be made before the Commissioners of Inland Revenue, or exempted by statute, it must bear a stamp of 2*s.* 6*d.* Any person making a wilfully false statement in it, material to the question or subject which it is intended to support or disprove, is liable to be indicted for perjury. An action for libel will not lie for any defamatory statement contained in it; but the person made subject to the defamation may apply to the court to refer it to its officer to strike out the offensive matter. By the 5 & 6 Will. IV. c. 62, in all extra-judicial matters, affidavits are superseded by declarations, made before some person duly qualified to administer an oath, any wilfully false statement in which renders the party amenable to the same punishment as for perjury. (*See* OATH.)

AFFILIATION, *äf-fil'-i-ai'-shun* ((Lat. *af*, for *ad*, to, and *filius*, a son).—An order of affiliation, in modern usage, is that which a magistrate issues on the oath of a woman, to compel the father of an illegitimate child to provide for its maintenance. If the mother be of sufficient ability to maintain the bastard while it is dependent upon her, and neglect that duty, so that it becomes chargeable to a parish, she is liable, by 7 & 8 Vict. c. 101, s. 6, to be punished under the provisions of the Vagrant Act. If she be not of sufficient ability, the law will compel the father to supply a fund for its maintenance. By 7 & 8 Vict. c. 101 (amended by 8 & 9 Vict. c. 10), any single woman with child,

or delivered of a bastard child, may, either before the birth, or at any time within twelve months from the birth, make application to a magistrate, charging a person by name as the father of her child; and, where the alleged father has within twelve months paid money for its maintenance, such application may be made at any subsequent period. The magistrate, on the evidence of the mother, corroborated in some material particular by other testimony to his satisfaction, may make an order on the putative father for payment of costs, and of a weekly sum not exceeding 5*s.* per week for the first six weeks from the birth, and afterwards not exceeding 2*s.* 6*d.* per week, for the maintenance of the child; 10*s.* for midwife, and 10*s.* for funeral expenses, if the child die before making the order. The order will remain in force until the child attain the age of thirteen, or die, or the mother be married. If the mother allow the payments to remain in arrear for more than thirteen weeks, she cannot recover them for a longer period. The party charged may appeal from the order to the court of Quarter Sessions, upon entering into a recognisance to try the appeal and pay such costs as may be adjudged. In default of payment of the moneys provided for by the order, the putative father may have his goods distrained upon, or, if he have none, be committed to prison, and so from time to time. (*See* BASTARD.)

AFFINITY, *ăf-fĭn'-i-te* (Lat. *af*, for *ad*, to, and *finis*, a boundary or limit), in Law, is relationship by marriage, as *consanguinity* is by blood. Within the prohibited degrees, no person may marry. (*See* MARRIAGE.)

AFFINITY, or CHEMICAL ATTRACTION, is the force which causes the particles of dissimilar kinds of matter to combine together, so as to form new matter. This definition indicates the differences between affinity and *cohesion*, which is another modification of molecular attraction. Cohesion merely binds similar particles into a mass; affinity brings about the combination of heterogeneous particles, and causes them to lose their individual properties. The change of characters which follows the action of affinity is very wonderful;—for example, the inflammable metal *sodium* unites with the suffocating gas *chlorine*, and the compound thus produced is *chloride of sodium*, or common salt, a substance which does not bear the slightest resemblance to either of its components. Chemical combinations do not take place indifferently, but in accordance with certain strict rules or laws. One substance will unite with another in preference to a third, or in some cases in preference to any other. This preference is denoted by the term *elective affinity*. By means of this discriminating action of affinity, some combinations may be *decomposed*. If, for instance, there be a substance (X) composed of two elementary bodies (A and B) which have a slighter affinity for each other than one of them (A) has for a third element (C), then, if we bring this third body into connection with them under the requisite conditions, the one (A) which has the greatest affinity for it will leave the other (B), and unite with it to form another compound (Y). The decomposition of water by red-hot iron illustrates such a case; for if water, which is composed of the elements oxygen and hydrogen, be passed through a tube containing iron filings heated to redness, its oxygen will unite with the iron to form a kind of rust, and its hydrogen will be set free. In every case where one constituent is expelled by a new body, and thus liberated, the decomposition is said to be the result of *single* elective affinity; but, when two substances, each consisting of two constituents, act reciprocally upon each other so as to produce two new compounds, the decomposition is referred to *double* elective affinity. This double reaction takes place when a chloride of phosphorus is thrown into water; the chlorine leaves the phosphorus, and unites with the hydrogen of the water to form hydrochloric acid, while the remaining elements, phosphorus and oxygen, enter into combination and produce phosphoric acid. An idea formerly prevailed, that the affinity between any two substances never varied, and great labour was bestowed on the preparation of tables exhibiting the precedence of affinities. Modern chemists, however, do not regard affinity as a fixed and regular force, and the tables alluded to are now considered useless. The attraction of one body for another is greatly modified by the circumstances under which the two bodies are brought together. Alteration of temperature is one of the causes which influence the force of chemical attraction. When metallic mercury is heated nearly to its boiling point, and exposed in this condition to the air for a lengthened period, it absorbs oxygen, and becomes converted into a dark red crystalline powder. But this same oxide of mercury, when raised to a still higher temperature, parts with its oxygen, which leaves the mercury in its original metallic state. Insolubility and the power of vaporization are potent disturbing influences; they interfere in almost every reaction, and frequently turn the scale when the opposing affinities are nicely balanced. Thus, when a solution of lime in hydrochloric acid is mixed with a solution of carbonate of ammonia, a double reaction ensues; carbonate of lime and chloride of ammonium being generated. This result is brought about mainly by the insolubility of the carbonate of lime. Again, a mixture of dry carbonate of lime and chloride of ammonium, when heated in a retort, gives a sublimate of carbonate of ammonia, while chloride of lime remains behind. In this instance, the great volatility of the new ammoniacal salt determines the nature of the decomposition. What is called the *nascent state* is one very favourable to chemical combination. Thus, carbon and nitrogen refuse to combine with hydrogen under ordinary circumstances; but, when these gases are nascent or newly evolved, as when they are simultaneously liberated from some previous combination, they unite readily. Some remarkable decompositions are referred to a peculiar modification of chemical force, to which the term *disposing affinity* has been applied. The preparation of hydrogen from zinc affords a familiar example of such decompositions. A piece of polished zinc put into pure water remains perfectly bright for any length of time, and manifests no power of decomposing the liquid. On the addition, however, of a little sulphuric acid, the metal becomes oxidized, and hydrogen is freely disengaged. The acid dissolves the oxide as fast as it is produced, and thus keeps the surface of the metal exposed to the action of the water. This function of the acid is perfectly intelligible; but its disposing influence, under which the oxide is first formed, is not well understood. Affinity is generally much stronger between bodies which are very unlike each other, than between bodies which are closely allied. Thus, potassium and sodium tend strongly to unite with chlorine and iodine, but the bodies of each pair do not attract one another with sufficient force to enter into combination. The discoveries of Faraday and others have established the fact, that whenever two substances unite to form a compound, they are in opposite electrical conditions; one being electro-negative, and the other electro-positive. This and other facts go to prove that chemical affinity is a particular modification of electrical attraction. (*See* ELECTROLYSIS.) The word "affinity" appears to have been employed for the first time by Barkhausen, a German chemist, in his "Elements of Chemistry," published at Leyden in 1703. The elder Geoffrey issued the first table of affinities fifteen years later; and more extensive tables were afterwards compiled by Wenzel, Bergmann, Guyton-Morveau, and other chemists of the last century.

AFFIRMATION, *ăf-fĭr-mā'-shun* (Lat. *affirmatio*, from *firmo*, I support), in Law, signifies the ratifying or confirming a former law or judgment. Thus we say, the House of Lords, on an appeal, affirmed a decree of the lord-chancellor, or of the Court of Session, and the lord-chancellor, or the lords justices, affirmed the decree or order of a vice-chancellor, &c. It is also a solemn form of attesting the truth allowed to be used by the Friends or Quakers, instead of an oath, which they hold absolutely unlawful to take.

AFFIRMATION, in Gram., a term applied to such particles as affirm or assert, in opposition to such as deny a statement.

AFFIRMATIVE QUANTITY, in Alg., signifies a quantity to be added, in contradistinction to one that is to be taken away.

AFFIRMATIVE SIGN, or POSITIVE SIGN, in Alg., the sign of addition, marked +, meaning *plus*, or more. The early writers on algebra used the Latin word *plus*, or the Italian *più*, to signify addition, and afterwards the letter *p*, as an initial or abbreviation.

AFFIX, *ăf'-fix* (Lat. *af*, for *ad*, to, and *figo*, I fix), in Gram., a term applied to a syllable added to the end of a word, by which its form and signification are altered; as, *wealth*, *wealth-y*; *odd*, *odd-ly*.

AFFLATUS, *ăf-flā'-tus* (Lat., in a figurative sense, inspiration, enthusiasm), a term which, among the ancients, denoted the supposed inspiration of particular persons, such as poets.



AFFRONTÉ.

AFFRONTÉ, *ăf'-fron'-tā* (Lat. *af*, for *ad*, to, and *frons*, face). In Her., a term applied to animals facing each other on an escutcheon.

AFORE, *a-for'* (Ang.-Sax.) in Mar., denotes that part of the vessel which lies forward, or adjacent to the stem.

A FORTIORI, *for-shi-o'-re*, in Log., is a term employed in a chain of reasoning, to denote that what follows is a more powerful argument than that which has already been adduced.

AFRICAN ASSOCIATION, a society formed in London, in 1788, for the purpose of offering encouragement to travellers and scientific men to explore the interior of Africa, to introduce the arts of civilization among the natives, and to study their character and habits. The first person thus commissioned was Mr. John Ledyard, who died at Cairo, while preparing for his journey, in 1788. His successor was Mr. Lucas, who, in his turn, was succeeded by Major Houghton, who died, it was said, a violent death, in September, 1791. The celebrated Mungo Park was the next person engaged by the association. Two Germans, named respectively Horneman and Roentzen, were subsequently sent out; and the last missionary was John Louis Burckhardt, who died at Cairo in 1817. In 1831 the association was incorporated with the Royal Geographical Society.

AFRICAN COMPANY, in Com., a society of merchants established in the reign of Charles II., for trading to Africa, and incorporated by the act 23 Geo. II. c. 31, 1754. When the expenses of the company had to be defrayed out of the public purse, its charter was recalled by parliament (1 & 2 Geo. IV. c. 28, 1821), and the possessions of the company were annexed to Sierra Leone.

AFRICAN HEMP, fibres remarkable for their strength, produced by several species of *Sansevièra*, a genus of plants included in the Lily order, or *Liliaceæ*. These fibres are also known as bowstring hemp.

AFRICAN TEAK, the timber of the *Oldfieldia africana*, a tree belonging to the natural order *Euphorbiaceæ*. It is exceedingly strong and durable.

AFT. (*See* ABAFT.)

AFTER-DAMP, *ăf'-ter-dămp*, the familiar term for the suffocating gas, consisting chiefly of carbonic acid, which remains in a coal-mine after an explosion of "fire-damp." (*See* FIRE-DAMP.)

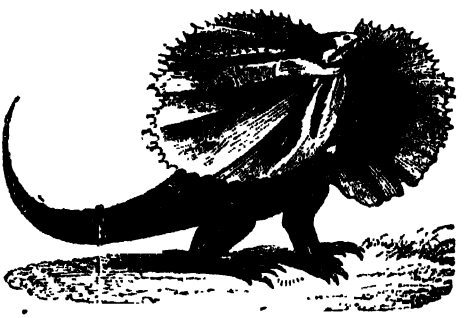
AFTERMATH, *ăf'-ter-măth*, in Agr., the grass which grows after the hay has been mowed and made. It is also called rowen, rowett, latter-math, and, when left long upon the land, fogg. When made into hay, it is inferior to the first crop, and is considered less injurious to sheep or cows than to horses.

AGA, or AGHA, *a'-ga*, a title borne among the Turks by military commanders; also by the superior officers of the seraglio.

AGALMATOLITE, *a-găl'-ma-to-lite* (Gr. *agalma*, statue, *lithos*, stone), in Min., a white, translucid, waxy-looking mineral, commonly known as *figure-stone*, brought from China, carved into little grotesque figures. It is usually delicately tinted with pink, grey, yellow, or green, and can be easily cut and modelled with a sharp instrument. It resembles soapstone, but it may be distinguished from that mineral by the want of *magnesia*, as it consists solely of silica and alumina, with a little carbonate of lime and

AGAMI, or GOLD-BREASTED TRUMPETER, *a-ga'-me*, *Psophia crepitans*. A bird about the size of a pheasant or large fowl, with long neck and legs, but a short tail. It is found in numerous flocks in South America; can run swiftly, and, when pursued, trusts less to its wings than to its legs. In its domesticated state, the agami is so fond, faithful, and jealous, that it will attack the dogs and other animals who venture near its master to share his caresses.

AGAMA, or AGAMIDÆ, *a-ga'-ma*, a fam. of Saurian reptiles. *Charac.* Short, broad, flat heads, and thick depressed bodies, enveloped in a loose skin, which is capable of being distended with air at the will of the animal. Different species of Agamidæ are found in Asia, Africa, Australia, and America. Some species can change the colours of their skin, which causes the natives of South America to call them chameleons. They are of diminutive size, and generally lurk among rocks, heaps of stones, and mouldering ruins. Some of the more active kinds, however, climb trees, play among the branches, and feed upon insects and other small animals. One tribe, found in India, is said to be herbivorous. The Frilled Agama, a native of Australia, is a very extraordinary looking animal. Around its neck, and covering its shoulders, it carries a frill, which, on the approach of danger, is elevated.



THE FRILLED AGAMA.

AGAPÆ. (*See* vol. I. of this work.)

AGAPANTHUS, *ăg-a-păn'-thus* (Gr. *agape*, love, *anthos*, flower), in Bot., plants belonging to a genus of the natural ord. *Liliaceæ*. The typical species is *Agapanthus umbellatus*, the African blue lily, a native of the Cape of Good Hope, whence it was brought to Holland, and, in 1692, it was cultivated at Hampton Court. It is now a favourite garden-plant. It grows nearly a yard high, and, in July, bears a handsome bunch of blue flowers, which have no scent.

AGAPEMONE, *ăg-a-pem'-o-ne* (Gr. *agape*, love, and *mone*, abode), the abode of love or charity, the name of an institution at Charlinch, near Taunton, founded in 1846, by Henry James Prince, formerly a clergyman of the church of England. Mr. Prince succeeded in inducing several ladies of fortune to adopt his views, three of whom were afterwards married to three of his disciples. In 1850 there were between 50 and 60 persons, male and female, living in community at this establishment. One of their leading tenets is community of goods, and they evidently have a goodly share of the good things of this life. The public have obtained occasional glimpses into the internal management of this "abode of love," in consequence of legal proceedings that have on several occasions been adopted against it.

AGAPETÆ, *ă-ga-pe'-tee* (Gr. *agape*, love), in Ecc. Hist., was a name given to certain virgins and widows in the ancient church, who associated themselves with, and attended on, ecclesiastics out of motives of piety and benevolence. The scandal which this gave rise to against the Church led to its suppression.

AGAR-AGAR, *ăg'-ar-ăg'-ar*, a name sometimes given to the alga commonly known as Ceylon moss, used for making jellies. (*See* GRACILARIA.)

AGARICUS, *a-găr'-i-kus* (Gr. *agarikon*, a fungus), in Bot., the mushroom, a genus of fungi, characterized by

the pileus, or cap, being distinct from the stalk, and having, on the under side, numerous flakes or gills radiating from the centre. The genus comprehends an immense number of species, many of which are edible. These fungi grow in wet and shady places in fields and woods, and on hotbeds prepared for their cultivation. The species of *Agaricus* commonly eaten in this country are *Agaricus campestris*, the common mushroom, and several cultivated varieties of the same; *A. arvensis*, *A. Georgii*, and *A. oreades*. The last is the Champignon, which is highly esteemed for its savoury qualities. Many genera of fungi allied to the one under consideration include edible species, which are extensively used for food in this and other parts of the world. Dr. Badham enumerates no less than thirty fungi, natives of Britain, which are eaten by himself and his friends; and complains of the prejudice existing against several species which might form dainty and nutritious articles of food. However this may be, fatal cases of poisoning by fungi are not uncommon, and great care should be taken to ascertain whether a fungus is or is not poisonous, before introducing it into the market as a wholesome vegetable. There are no certain characters by which the edible and poisonous species may always be distinguished; but there are some general characters which help us to separate the two groups. Professor Bentley has tabulated these general characters as follows:—

*Edible Mushrooms.*

1. Grow solitary, in dry airy places.
2. Generally white or brownish.
3. Have a compact brittle flesh.
4. Do not change colour, when cut, by the action of the air.
5. Juice watery.
6. Odour agreeable.
7. Taste not bitter, acrid, salt, or astringent.

*Poisonous Mushrooms.*

1. Grow in clusters, in woods and dark damp places.
2. Usually with bright colours.
3. Flesh tough, soft, and watery.
4. Acquire a brown, green, or blue tint, when cut and exposed to the air.
5. Juice often milky.
6. Odour commonly powerful and disagreeable.
7. Have an acrid, astringent, acid, salt, or bitter taste.

Professor Bentley suggests that we should avoid all fungi which insects will not touch, and those which have scales or spots on their surface; and, further, that whatever may be the apparent qualities of the fungi, we should use with caution all which have arrived at their full development, or when they exhibit any signs of change. By soaking doubtful fungi, cut into slices, for about an hour in vinegar, and afterwards washing them in boiling water, we get rid of any poisonous principles they may possess, and the process will not spoil them for the table. The edible fungi not included in this genus, such as the morel and the truffle, and also the most poisonous fungi, are described under the names of the genera to which they belong. (*See* Amanita, Boletus, Cyttaria, Morchella, Mylitta, Tuber.) The subterranean mycelium or spawn of some agarics develops in a radiating manner, and the remains of this spawn, by acting as a manure, give rise to the circles of luxuriant grass which country folks designate "fairy rings." Certain members of this great family give out a sort of phosphorescent light. The so-called *agarics* used for making German tinder, and other kinds of amadou which are employed in surgery, are now regarded as species of a distinct genus. (*See* Polyporus.)—*Ref.* Bentley's *Manual of Botany*.

Agate, *ag'-at* (Gr. *achates*), in Min., a semi-pellucid, variegated, and uncrystallised variety of quartz, named after Achates, a river in Sicily, whence the Greeks are said to have first procured it. Chemically, it consists almost entirely of silica, coloured by metallic oxides. The colours of agate are generally arranged in parallel or concentric bands, but sometimes form spots, clouds, and moss-like stains. These colours can be artificially heightened by boiling the stone in oil, and afterwards in sulphuric acid, and by other ingenious but fraudulent processes which have been devised by the lapidary. Agates occur in nature as rounded pebbles, and are brought into this country from Oberstein, in Saxony, from Arabia, and India; some varieties, however, are found in Perthshire and other parts of Scotland. The Scotch pebble, or fortification agate, so called from its zigzag pattern, is one of these varieties. Agates take a high polish, and their beautiful colours adapt them for many ornamental purposes. They are cut into brooches, seals, bracelets, and similar objects, and are largely employed for mosaic work. In the useful arts, agates are employed as burnishers, and, when sufficiently large, they are made into mortars for chemical purposes. The moss agate, or Mocha-stone, is curiously marked with figures resembling growing tufts of moss. These markings were, until quite recently, supposed to be produced by vegetable structures imbedded in the stone; but Professor Göppert has proved that they are merely deposits of oxide of iron.

Agathodæmon, *ag-a-tho-de'-mon* (Gr. *agathos*, good, and *daimon*, a spirit). (*See* Dæmon.)

Agathophyllum, *ag'-a-tho-fil-lum*, in Bot., a genus of plants in the natural order *Lauraceæ*. The species *A. aromaticum* yields the Ravensara nut, or clove nutmeg of Madagascar; used as a spice.

Agave, *a-gai'-ve* (Gr. *agauos*, admirable), in Bot., a genus of monocotyledonous plants of the Amaryllis order, or *Amaryllidaceæ*. The typical species is *Agave americana*, the American aloe or maguey. This plant is cultivated by the Mexicans, who obtain from it a favourite drink, called *pulque*, *octli*, or agave wine. The plant is of slow growth; but when fully developed, its leaves, which spring directly from the ground, attain a height of from five to eight feet. From the midst of the great cluster of leaves a flower-stem arises, and from this numerous flower-bearing branches spring, so that the whole plant has somewhat the appearance of a candelabrum. It was formerly erroneously supposed that the agave lived a hundred years before flowering; hence it was frequently called the hundred years plant. It really flowers only once in about ten years, and the planter has to wait patiently for the flowering season to obtain a supply of pulque, as this liquor is formed from the juice contained in the young flower-stalk. As soon as this organ makes its appearance, the planter makes a deep cut in it, and scoops out the whole heart or middle part, leaving nothing but the outside rind. A natural basin, about two feet in depth, is thus formed, and into this basin, the sap which was intended to feed the shoot flows so rapidly, that it is necessary to remove it twice, and sometimes three times a day. To make this more easy, the leaves on one side of the basin are cut away. This sap, before it is fermented, has a very sweet taste, and is called *aguamiel*, or honey-water. It ferments spontaneously, and forms the pulque, which is a refreshing, slightly-intoxicating drink, which has a pleasant acid taste, but a very disagreeable odour. From pulque an ardent spirit is distilled, which is known by the name of *mexical*, or, less commonly, *aguardiente de maguey*. From the leaves of this and other species of the agave genus, the useful fibre called aloe-fibre, *pita*, or *pité* hemp, is obtained.

Age, *aij* (Fr. *âge*), in Physiol. During the progress of life from infancy to manhood, and from manhood to old age, the body undergoes certain marked changes, which distinguish the different periods or stages of life. These are usually denominated ages, and are properly seven in number, though some make them fewer. They are—1. Infancy; 2. childhood; 3. boyhood or girlhood; 4. adolescence; 5. manhood or womanhood; 6. age; 7. old age. The first age commences at birth, and extends to the end of the second year, by which time the first dentition is generally completed; the second extends to the end of the seventh or eighth year, when the second dentition is commonly over; the third extends to the age of puberty, which varies in different countries, but with us is from twelve to fourteen in the female, and from fourteen to sixteen in the male; the fourth extends to about the twentieth year in the female, and the twenty-fourth in the male; the fifth period extends in the female to about the forty-fifth or fiftieth year, when the power of procreation usually ceases, and in the male to about the forty-ninth or fiftieth year; the sixth period extends to the sixty-

third year, when the seventh and last period of life commences.

**Age**, in Law, is that time when persons are enabled to do what for want of years they are prohibited doing, or to become responsible for their acts. The age of legal capacity is twenty-one; but it arrives for some purposes much earlier. In criminal cases a person of the age of fourteen years may be capitally punished for any capital offence, but not under the age of seven. At twelve a male may take the oath of allegiance; at fourteen he is at years of discretion, and may enter into a binding marriage, or consent or disagree to one contracted before, or choose a guardian. A female at twelve is at maturity for those purposes. An infant above fourteen is liable to suffer for a breach of the peace, riot, battery, or the like, and for perjury or cheating. A tenant of gavelkind lands, in parts of Kent, is of sufficient age to aliene his estate by feoffment at the age of fifteen. The law presumes a child at fourteen to be a competent witness; but if under that age, if it be aware of the nature of an oath, its evidence will be received. No one under twenty-one can serve as a member of parliament, be ordained a priest, or be admitted to practise as an attorney, solicitor, proctor, or notary public. A bishop cannot be consecrated before thirty. A contract of an infant may be ratified on attaining the age of twenty-one. Full age in male or female is twenty-one years, which age is completed on the day preceding the anniversary of a person's birth, who, till that time, is an infant, and so styled in law.—Ref. 1 *Co. Litt.* 78; 1 *Bl. Com.* 463. (*See* INFANTS.)

**Age of Animals.**—It has been stated that the duration of an animal's life is generally seven or eight times longer than the period it takes to arrive at its full growth, a rule that applies moderately well to domestic animals, such as dogs, horses, sheep, oxen, and even elephants and camels, but is not applicable to man, or to the majority of quadrupeds, fishes, birds, or reptiles. The age of the horse may be calculated by an examination of the incisive teeth or nippers; but at ten years old these marks are lost, and no accurate calculation can be arrived at. Deer shed their horns every year, and, in the males of some species, each year adds a branch to the horns, until a certain size is attained. In sheep, oxen, antelopes, and goats, a ring is annually added to the base of the horn up to a certain age. There are no certain indications by which the duration of life of birds, fishes, and reptiles can be ascertained. The Indians assert that the elephant lives 300 years. Dogs live from 12 to 14 years, sheep 8 or 9, oxen about 20, horses, if well treated, from 25 to 30, camels from 40 to 50. Eagles have lived more than a century, and many instances are recorded of ravens having exceeded that period. Swans, also, have been known to live 100 years, parrots 60 and 80; pheasants and domestic poultry seldom reach more than 12 or 15 years. Among fish, the carp has been known to live 200 years. River trout have been confined in a well for 30 and 50 years. A pike has been known to exist in a pond 90 years. A story is related of one caught in a lake near Haslerun, in Suabia, which had attained the age of 267 years. Of reptiles, the tortoise is said to be the longest lived; but this may be doubtful, as nothing is known of the duration of life of the various tribes of serpents. Of the ages of insects but little is known. The life of the caterpillar or grub, in its first period, extends to several months; but after the attainment of their perfect form, they live but a few days or weeks. As a general law of nature, early maturity indicates shortness of life.

**Age of the Moon**, a term signifying the number of days elapsed since the last new moon.

**Age of Trees.**—As in the case of animals, trees are subject to the laws of growth, reproduction, and decay; and as some forms of animal life begin and terminate their career in a day, while others are continued during a century, like the elephant, or even three or four centuries, like the whale; so some kinds of vegetable life run through their career in a year, whilst others live during centuries, and even tens of centuries, before they die. The age of trees has been computed in a twofold manner,—first by comparing them with other old trees whose rate of growth had been ascertained, and secondly by removing a portion of the trunk from the circumference to the centre, and counting the number of concentric rings, each of which, in exogenous trees, marks a year's growth. The oriental plane, the baobab, and the chestnut, are calculated to live during several thousand years. Yews, in some cases, are calculated to be flourishing at the age of from 1,500 to 2,000 years. Oaks are reputed to attain, under favourable conditions, the age of 1,200 years. On Mount Etna there are three famous sweet-chestnut trees, which measure respectively 180 feet, 70 feet, and 64 feet in circumference, and are said to be as old as 5,000 years. In the valley of Buyukdere, near Constantinople, there is an oriental plane-tree measuring 150 feet in circumference, which is held to be at least 5,000 years old. Upon the Mount of Olives, at Jerusalem, there are eight olive-trees, which were flourishing when the Turks took Jerusalem, 800 years since. At Fountains Abbey, in Yorkshire, there grows a yew-tree which is reported to have attained a green old age when the abbey was built, viz., in the year 1132. Near Staines there is a yew-tree older than the meeting of the English barons at Runnymede, in 1215, the date of the signature of Magna Charta. Wallace's oak, at Ellersley, near Paisley, in Scotland, is held to be upwards of 700 years old, and it is still flourishing. The following is a list of the ages to which certain trees may attain:—

Palm, 200—300 years.
Elm, 355.
Cypress, 383.
Ivy, 448.
Maple, 516.
Larch, 203—576.
Chestnut, 300—620.
Oranges, Lemons, &c., 400, 500, 610.
Plane, 720.
Cedar, 200—800.
Walnut, 900.
Lime, 364, 530, 800, 825, 1,076.
Spruce, 1,200.
Oak, 600, 800, 860, 1,000, 1,600.
Olive, 700, 1,000, 2,000.
Yew, 1,214, 1,466, 2,588, 2,880.
Baobab, 6,000.
Dragon-tree, 6,000.

**Agemoglans**, *a-jem-o-glänz'*, a term applied to those children of the Christians who were taken by the Turks at the end of every three years by way of tribute. These children were instructed in the Mahometan religion, and trained to be janizaries.

**Agenda**, *ai-jen'-da* (Lat., things to be done), a term applied in the Roman Catholic church to certain offices or services, as, for example,—*Agenda matutina et vespertina*, morning and evening prayers; *Agenda diei*, the office of the day; *Agenda mortuorum*, the service for the dead, &c. *Agenda* was likewise applied to the volume containing the ritual or church service of the Romish church.

**Agenda**, in Com., a term signifying a pocket- or memorandum-book, in which a merchant sets down what is to be done during the day. The name has likewise been given to a pocket almanac.

**Agenhine**, *a'-jen-hine* (Ang.-Sax.), in the old writers, signified a guest who had lodged at the same inn for three consecutive nights, after which time he was considered one of the family, and the host became answerable for him if he committed any offences against the king's peace.

**Agent**, *ai'-jent* (Lat. *agens*, doing, acting), in Law, as in other matters, is one who conducts the affairs, or is intrusted with the commission of another. He may be constituted either by express appointment or by implication of law, arising from the circumstances in which the parties are placed. In the following cases his appointment must be in writing:—To grant a lease of land for above three years; to create or assign any uncertain interest in land, or (except in copyholds) to surrender the same. An agent for a corporation aggregate must, in general, be constituted, not only by writing, but by deed; and in every case where a deed is to be executed by one man as agent or attorney for another, the agent or attorney must himself be authorized by deed for that purpose. An agency is determined by the death of the principal, or it may be revoked in his lifetime, except in cases where an authority is given in pursuance of a contract

with another party. An agent may be *general* or *special*. The acts of a general agent bind his principal, although the agent may violate his private instructions. The power of a special agent is limited by the authority he has actually received. An agent, without special authority, cannot appoint another person to act in his stead.

AGENT, in Dip., a general term applied to several ranks, as envoys extraordinary, and ministers plenipotentiary, ambassadors, ministers resident, *chargés d'affaires*, secretaries of legation, &c. In ordinary language, the principal representative of one power at the court of another is termed the agent of that power at that particular court.

AGER, *ā'-jer* (Lat., a field), a term in use among the ancient Romans to signify a portion of land allotted to each citizen. The writers of the Middle Ages employed the word *ager* to denote an acre of land.

AGES OF THE WORLD.—By the Greek and Roman poets the history of the world was divided into four periods or ages, which they termed the Golden, Silver, Brazen, and Iron ages. In the first, or golden age, Saturn reigned in heaven, the earth yielded her fruits spontaneously, and men lived in a state of perfect innocence and happiness. When Saturn was expelled from heaven, the silver age commenced; men then began to deviate from the paths of virtue, and, in consequence, their lives were less happy. The brazen age was marked by a still further deviation from virtue, and was succeeded by the iron age, which now exists, when the stubborn earth demands cultivation, and sin and misery prevail. The history of the world is sometimes divided into three great epochs, or ages;—1. The age of the law of nature, from Adam to Moses; 2. the age of the Jewish law, from Moses to Christ; and 3. the age of grace, from Christ to the present time.

AGGLUTINANTIA, *ăg'-glu-ti-nănt'-shē-a* (Lat. *agglutino*, I glue or cement to), in Med., a term applied to such applications as tend to unite parts which have too little adhesion.

AGGREGATE FRUITS, *ăg'-gre-gait*, in Bot., fruits formed by the combination of several flowers, as the pinenapple and the mulberry. The term *anthocarpous* is more generally used. Some botanists apply the term aggregate to a compound fruit, consisting of numerous achenia, borne by a single flower; as the fruit of the ranunculus or the raspberry.

AGIO, *āj'-i-o*, in Com., a term used to express the difference between the value of metallic and paper money in a country, or between the metallic moneys of different countries.

AGISTMENT, *ă-jist'-ment* (old Fr., license for cattle), a legal term implying the pasturing of a person's cattle in the royal forests. It is also applied to the tax paid for such pasturing.

AGLAIA, *ăg-lai'-a*, in Ast., one of the group of small planets revolving between Jupiter and Mars. (*See* ASTEROIDS.)

AGLAIA, *ăg-lai'-a*, in Bot., a genus of dicotyledonous plants, order *Meliaceæ*. The flowers of *Aglaia odorata* are used for perfuming certain varieties of tea.

AGNATI, *ăg-nai'-ti* (Lat. *nascor*, *natus* [originally *gnatus*], born to), the relations by the father, who, by the Roman law, were preferred to the *cognati*, or relations by the mother, till the edict of the emperor Justinian (Nov. 118) abolished all distinctions between them. The *agnati*, or relatives *ex parte paternâ*, are preferred in descents to the *cognati*, or relatives *ex parte maternâ*, which agrees with the laws of the Hebrews and Athenians; though among the Greeks, in the time of Hesiod, when a man died without wife or children, all his kindred, without any distinction, divided his estate amongst them. The English law is conformable to the customary law of ancient Normandy.—Ref. 1 *Bl. Com.* b. 2, pt. 1, ch. xi., and the authorities there cited.

AGNOMEN, *ăg-nō'-men* (Lat. *ag*, for *ad*, to, and *nomen*, name), in Rom. Antiq., was a kind of honorary name given to a person on account of some distinguishing circumstance in his life. It was the fourth in order of the Roman names, the others being the *prænomen*, corresponding to our Christian name; the *nomen*, or name of the clan; and the *cognomen*, or name of the family; as in Publius Cornelius Scipio Africanus.

AGNUS DEI, *ăg'-nus dē'-i* (Lat., Lamb of God), in the Roman Catholic church, is the name of a prayer in the Mass, introduced by Sergius I. in 688, and beginning with the words *Agnus Dei*. It is also the name of a hymn commencing with these words, sung at the elevation of the Host. Agnus Dei is likewise the name given to a round piece of wax, stamped with the figure of a lamb, supporting the banner of the cross. These are consecrated by the pope, and distributed among the people, and are supposed to possess great virtues.

AGONALIA, *ăg'-o-nai'-li-a*, festivals celebrated by the Romans in honour of Janus. (*See* vol. I. of this work.)

AGONISTARCH, *ăg'-o-nis'-tark* (Gr. *agonistes*, a combatant, and *archos*, the chief), the superintendent or president of the sacred games, who exercised authority over the athletæ, inspected their discipline, and awarded the prizes to the victors. In the Olympic, Pythian, and other great public games, these presidents represented different states, or were chosen by and from the people in whose country the games were celebrated.

AGOUTI, *ă-goo'-te*, in Zool., the *Chloromys* of F. Cuvier, the *Dasyprocta* of Illiger, a genus of animals belonging to the class *Mammalia*, ord. *Rodentia*, and fam. *Hystricidæ*. *Charac.* Toes armed with long and very strong claws, and completely separate from each other; hind legs very much longer than the fore; head large, forehead and face convex; eyes full and black; ears short, round, and almost entirely denuded of hair; hair for the most part coarse and bristly, but in some species nearly as fine as the fur of the rabbit; twenty teeth. At the first settling of the West-India islands they were very numerous, and were an article of constant consumption by the Indians; but the planters, finding them too destructive to the sugar-canes, of the roots of which they are extremely fond, have destroyed them in great numbers. Whilst eating, these animals sit upon their hind quarters, and hold their food between their fore-paws. They are exceedingly voracious, and, when they have satisfied their appetite, will hide the remainder of their food for another meal. They live under decayed trees and fallen timber, are very prolific, and produce young more than once a year. Their flesh is good eating, and they hold in S. America the same place as the hare or rabbit in Europe. There are seven perfectly ascertained species; viz., the common agouti (*Dasyprocta Aguti*), known also by the name of the long-nosed, or yellow-rumped cavy; the black or crested agouti (*Dasyprocta cristata*), sometimes termed the black-crested agouti; the acouchy, or olive agouti (*Dasyprocta Acuchi*); the white-toothed agouti (*Dasyprocta croconata*); the *Dasyprocta prymnolopha* the sooty agouti (*Dasyprocta fuliginosa*); AZARA agouti. *Hab.* The hotter parts of S. America, the West-India islands, and Guiana.

AGRARIAN LAW, *ă-grai'-ri-an* (Lat. *agraria lex*), a Roman law for the distribution of lands among the common people. The object was only the distribution of lands which were the property of the state; first, to have a check upon the conquered people; secondly, to have a protection against the incursions of an enemy; thirdly, to augment their population; fourthly, to free the city of Rome from an excess of inhabitants; fifthly, to quiet seditions; and, sixthly, to reward their veteran soldiers. It contained various provisions: it described the land which was to be divided, and the classes of people among whom, and their numbers; and by whom, and in what manner, and by what bounds, the territory was to be parcelled out.

AGRARIAN STATIONS (Lat. *agrarius*, from *ager*, a field), among the Romans, were advanced guards placed in the fields.

AGREEMENT, *ă-gree'-ment* (Fr. *agréer*), in Law, is where a promise is made on one side, and assented to on the other; or where two or more persons enter into engagement with each other, by a promise on either side. If such contract is by deed, it is called either a contract by deed or a contract by *specialty*; if not by deed, a parole or simple contract. The latter may be either *written* or *verbal*. In order to prevent perjury, the Statute of Frauds and Perjuries, 29 Charles II. c. 3, s. 4, enacts that no verbal promise shall be sufficient to ground an action upon, unless it be in writing, and signed by the party to be charged therewith, or some person thereunto by him lawfully appointed. 1. Where an executor or administrator promises to answer dam-

ages out of his own estate. 2. Where a man undertakes to answer for the debt, default, or miscarriage of another. 3. Where any agreement is made upon consideration of marriage. 4. Where any contract is made of lands, tenements, or hereditaments. 5. Where there is an agreement that is not to be performed within a year from the making thereof. In all these cases a mere verbal promise is void. An agreement is void if there be no consideration for it, or it be against public policy or morality; and is voidable if obtained by fraud, force, or misrepresentation. The performance of an agreement may be enforced, or the breach of it restrained, by a court of equity, or damages for the breach may be recovered in an action at law. It is a common mistake to suppose that an agreement for letting or granting a lease of property requires only a common agreement stamp. If the term does not exceed seven years, the same duty is payable as for a lease for a like term and consideration (if any). Agreements other than the above (not under seal), and containing not more than 2,160 words, where the matter is of the value of £5 and upwards, and not accompanied with a deposit of deeds (in which case it would require the same stamp as on a mortgage), are only liable to a duty of sixpence, which may be either impressed or adhesive. If the latter, the stamp must be cancelled, under a penalty of £20 for default, by the person signing the agreement, writing upon the stamp, at the time of execution, his name and the date; such cancelling to be a necessary part of the evidence of the agreement. An agreement under seal requires the same stamp as a deed. If there are letters to prove an agreement, it will be sufficient, if one of them be stamped with a shilling duty. An agreement chargeable with the duty of sixpence may be stamped within fourteen days after date, without penalty; after that period, on payment of a penalty of 20*s.*, if the value of the matter be under £20, or £10 if above. A deed or instrument unstamped or insufficiently stamped may be given in evidence, on payment to the officer of the court of the amount of duty required, and the penalties (if any), together with an additional penalty of £1. (*See* CONTRACT,—Master and Servant.)

AGRICULTURAL CHEMISTRY. (*See* CHEMISTRY AS APPLIED TO AGRICULTURE.)

AGRICULTURAL IMPLEMENTS are the instruments used in tillage and the various operations necessary for the proper cultivation of the soil; comprising implements for harvesting, stock-feeding, land-draining, preparations for market, the application of steam-power to agriculture, &c. (*See* PLOUGH, HARROW, ROLLER, CLOD-CRUSHER, SOWING, DIBBLE, DRILL, TOP-DRESSER, MANURE-DISTRIBUTOR, HOE-REAPING MACHINE, HORSE-RAKE, THRASHING-MACHINE, WINNOWING AND DRESSING MACHINE, TURNIP-CUTTER, CHAFF-CUTTER, DRAINING, &c.)

AGRICULTURAL SOCIETIES, INSTITUTIONS, SOCIETIES FOR THE PROMOTION OF AGRICULTURE.—The improvement of every branch of knowledge in agriculture has been largely developed by the establishment of agricultural societies. The Board of Agriculture, which owed its existence to the exertions of Sir John Sinclair, was incorporated in 1798, and received an annual grant from parliament. In 1816 it was dissolved. The Smithfield Cattle Club was commenced at the end of the last century, and the Bath and West of England Society published its "Transactions" before that time. The celebrated Royal Agricultural Society of England was established in 1838, and received its charter of incorporation in 1840. At its outset it consisted of but 466 members, but in a year its numbers swelled to 1,104. Its first meeting was held in 1839, when twenty-three agricultural implements were exhibited; and the great success of the institution led to the revival of existing associations and to the formation of new ones. In the United Kingdom there are 450 local agricultural societies, some of which hold an annual show in the different towns of their parent county. The Society of Improvers in the Knowledge of Agriculture, in Scotland, was established in 1723; it is now entitled the Highland and Agricultural Society of Scotland: its proceedings and constitution are similar to those of the English society. In 1844, the Agricultural Museum at Edinburgh was aided by a parliamentary grant of £5,000. The Royal Agricultural Improvement Society of Ireland was established in 1841. Abroad, various institutions have been designed for the improvement of agriculture; and at Hohenheim, six miles from Stuttgard, an old palace has been converted into an agricultural college. In Bavaria, a model farm is attached to the royal palace of Schleishosheim; and in twenty European kingdoms there are not less than 353 agricultural schools.

AGRICULTURE, *ăg-re-kul'-ture* (Lat. *ager*, a field, and *cultura*, a tending, taking care of), is the science which explains the mode of cultivating the ground, that it may produce, in plenty and perfection, those vegetable products which are necessary to the subsistence of man, and such animals as are reared by him for food or labour. The vast improvements which the discoveries in chemistry and physiology have recently introduced into it, have lifted it from the position of a merely manual art, and conferred upon it the dignity of a science. It is no longer a pursuit in which only the humble engage for business or profit. The peer and the peasant now alike occupy themselves with the practice of agriculture, and even the Prince Consort of Great Britain has his Highland farm, and deeply interests himself in the produce of the soil. These circumstances are sufficient to indicate the importance into which the science has risen; whilst Marshall observes, that "it is a subject which, viewed in all its branches, and to their fullest extent, is not only the most important and the most difficult in rural economics, but in the circle of human arts and sciences." In this article, we will give a brief historical notice of the progress of agriculture from the earliest times, cursorily review its present state amongst various European nations, and finally touch upon some of the most permanent features in its practice.

*Egyptian Agriculture.*—If the theory of Sir Isaac Newton be correct, corn was first cultivated on the banks of the Nile. Lower Egypt is the locality fixed upon by him; but natural circumstances have induced other speculators on this subject to adopt Upper Egypt as the country in which corn was probably first cultivated. Among these is Stillingfleet, who considers both the situation and the natural phenomena of Upper Egypt better adapted for the invention of cultivation than the low country; "for while Lower Egypt was a marsh," says he, "formed by the depositions of the Nile, the principal part of Upper Egypt was a valley, several miles broad, bounded by mountains, and, on both sides, declining to the river. Hence it was overflowed only for a certain time and season; the waters rapidly declined, and the ground, enriched by the mud, was soon dry, and in a state fit to receive seed. The process of cultivation in this country was also most obvious and natural; for the ground, being every year covered with mud brought by the Nile, and plants springing up spontaneously after its recess, must have given the hint that nothing more was necessary than to scatter the seeds, and they would vegetate. Secondly, the ground was prepared by nature for receiving the seeds and required only stirring sufficiently to cover it. From this phenomenon, the surrounding nations learned two things;—first, that the ground, before sowing, should be prepared and cleared from plants, and, secondly, that the mixture of rich mould and sand would produce fertility. What is here stated may appear without foundation as to Upper Egypt; because, at present, in the vicinity of Thebes, water is raised by art. But this objection is obviated by the testimony of Dr. Pococke, who is of opinion that formerly Upper Egypt was overflowed, in the same manner as Lower Egypt was afterwards, and is to this day." Whether corn was first cultivated in Egypt, or not, is a question which it may be now very difficult to decide; if, however, reliance may be placed on a general concurrence of testimony, we are made aware that the culture of the soil was brought to a greater degree of perfection in Egypt than in any other country of antiquity. The country was, and still is, traversed by canals and drains; the lakes Moeris, Behire, and Mareotis formed so many large reservoirs for the superfluous waters; irrigation was industriously pursued, and the most elevated ridges by the sides of the hills were watered by means of wheels, turned by oxen. Of the practice of agriculture by the Egyptians we know but little. Their first implement for turning up the soil

with, was a kind of pick, which, by degrees, was improved into a sort of plough. With this instrument they turned up the soil in ridges, in a manner similar to our own practice in Britain, and then sowed the land broadcast from a basket. The process of harrowing is mentioned in our translation of the Scriptures (Job, xxxix.); but Hebrew scholars affirm that this was not practised; and Russell, speaking of the modern inhabitants of the country in the neighbourhood of Aleppo, says that "no harrow is used; but the ground is ploughed a second time after it is sown, to cover the grain." That they had hoes and mattocks for the extirpation of weeds, is certain; for the prophet says, that "on all hills that shall be digged with the mattock, there shall not come thither the fear of briars and thorns." When the corn was ripe, they mowed it with a scythe, or cut it with a sickle; then bound it into sheaves, and conveyed it in a cart to the thrashing-floor in the barn. They never stacked it; whilst the thrashing-floors were, as they still are, level plots of ground in the open air. The mode of thrashing, and the instruments employed in it, were various, as we find by the following passage in Isaiah, xxviii. 27, 28: "Fitches are not thrashed with a thrashing-instrument, neither is a cart-wheel turned about upon the cummin; but the fitches are beaten out with a staff, and the cummin with a rod. Bread-corn is bruised, because he will not ever be thrashing it, nor break it with the wheel of his cart, nor bruise it with his horsemen." Of the manures employed by the Egyptians, we possess little or no knowledge; and although it is said that they despised the profession of a shepherd, yet do we find Pharaoh expressing a wish to Joseph to have a Jewish bailiff for the supervision of his flocks:—"If thou knowest any men of activity among them, then make them rulers over my cattle." (Genesis, xlvii. 6.) In reference to the landed estates of the Egyptians, we find that they grew to be very large. Uzziah, king of Judah, "had much, both in the low country and in the plains; husbandmen, also, and vine-dressers in the mountains and in Carmel, for he loved husbandry." (2 Chron. xxvi. 10.) We also find that Job had "14,000 sheep, 6,000 camels, 1,000 yoke of oxen, and 1,000 she-asses." (Job, i. 3; xlii. 12.) He was the greatest man in the East; but, in the time of Isaiah, the accumulation of landed property had risen to such an extent, that a curse was uttered against the practice. "Woe unto them," says the prophet, "that join house to house, that lay field to field, till there be no place, that they may be placed alone in the midst of the earth." (Isaiah, v. 8.) [For some valuable and interesting notes in connection with Scriptural history, see "Beeton's Illuminated Family Bible."]

*Greek Agriculture.*—Of the agriculture of those nations which were contemporary with the Egyptians and Greeks, nothing is distinctly known; and what has been learned of the modes of cultivation practised by the Greeks is chiefly derived from the poem of Hesiod, entitled "Works and Days." This author flourished in the 10th century B.C. (*see* vol. I. of this work), and resided at Askra, a village built at the base of Mount Helicon, in Bœotia. Here he tended his flocks, and cultivated a soil described by himself as "bad in winter, hard in summer, and never good." The ground, it would appear, received three ploughings,—one in autumn, one in spring, and another immediately previous to throwing the seed into the ground. The seed was sown with the hand, and afterwards covered by means of a rake. Corn was reaped with a sickle, thrashed, and fanned by the wind, as it still is in modern Greece, Italy, and some other parts of the continent. Manures were used, and hedges of thorns and other plants procured from the woods were set. The implements in use were a plough, a rake, a sickle, and an ox-goad; but nothing is said of the form or construction of spades or any other instruments that may have been employed. In the time of Hesiod every citizen was a husbandman, and the products of Grecian agriculture were the grains and legumes in present cultivation; besides the grape, fig, olive, apple, date, and other fruits. The live-stock comprised cattle, sheep, goats, swine, horses, mules, and asses. Wood was used for fuel, and timber for construction; but we have no knowledge whether artificial grasses or herbage plants were in use. According to Homer, who was contemporary with Hesiod, the corn was thrashed by the treading of oxen; and, in order to clear the grain from the straw, Xenophon remarks, "the men take care to shake up the straw as they see occasion, flinging into the way of the cattle's feet such corn as they observe to remain in the straw." Such are the principal features of Grecian agriculture, the practice of which subsequently served, to some extent, as a model for the Romans. [For an enumeration of the various tutelary deities that presided over the growth of the crops of Greece and Rome, *see* "Mrs. Beeton's Book of Household Management."]

*Roman Agriculture.*—With the conquests of the Romans, the arts generally increased and improved. Their successes in Egypt, Persia, Greece, Carthage, and Macedon, brought under their notice the improvements which the civilization of these nations had attained to in the arts, and these they carried with them into their own country, and added to the general stock of knowledge. When they, in their turn, were conquered by other nations, the victors necessarily became acquainted with their knowledge, and carried it with them into those countries in which they became permanently settled. Upon the state of agriculture among the early Romans, we have little or no information; but of its state when Rome had arrived at the acme of her greatest prosperity, we are in possession of ample knowledge. Cato in the 2nd, and Varro in the 1st century previous to the Christian era; Virgil at the time of the birth of our Saviour; Pliny and Columella but a few years subsequently; and Palladius in the 2nd or 4th century, have all entertained us with works on agriculture, and not only given us correct, but minute information upon the state of this art at the periods when they severally wrote. The works of all these writers on agriculture have been transmitted to us entire, with the exception of those of Columella; and it is surprising to see the accuracy of information manifested in this art, at so remote a period. Among the Romans it was held in the greatest esteem. Cincinnatus was the ploughman of his own four acres, and the Samnite ambassadors found Curius Dentatus preparing his own vegetable repast in an earthen vessel. Several of the noblest families obtained their patronymics from some of their ancestors who were famous for the cultivation of some special vegetable. Such were the Fabii, Lentuli, Ciceriones, &c. These were the days of Roman agricultural glory. "When they praised a good man," says Cato, "they called him an agriculturist and a good husbandman: he was thought to be very greatly honoured who was thus praised." For improving the soil they employed manures, and the dung of animals was especially esteemed. "Study," says Cato, "to have a large dunghill," an advice pretty closely acted upon, even in this country, at the present day. When in Gaul and in Britain, they made use of both lime and marl; and a system of both covered and open drainage was employed to carry off the superfluous waters of soils. The implements used consisted of the plough, spades, rakes, hoes, mattocks, harrows, and such instruments as necessity or convenience suggested to a people far advanced in intelligence regarding the arts of life. Ploughing was performed with two oxen, and they sometimes ploughed in ridges and sometimes not. They usually fallowed their land every other year; and sowing was, as by the Greeks, done by hand, and from a basket. The choice of seeds, the quantity to be sown, and the time of sowing, were circumstances to which the Roman agricultural mind gave especial attention. The crops consisted of wheat, spelt, barley, oats, beans, peas, kidney-beans, lupines, lentils, tares, sesame, turnips, grapes, olives, melons, flax, and the like. They made hay by a similar process to that practised in modern times. The usual mode of cutting the cereal crops was by reaping and mowing; but a toothed machine, called *batillum*, was sometimes used. It is supposed to have been a sort of wheeled cart, which, upon the principle of the modern rake, gathered up the ears of the grain between its teeth. It was pushed through the field by oxen. Thrashing was performed by the treading of oxen and horses, and dressing by means of a sieve or fan, as well as by a shovel, with which the grain was thrown into the air, and freely exposed to the action of the wind. The animals in use were horses, oxen, mules, asses,

sheep, goats, and swine. The poultry comprised hens, pigeons, pea-fowls, pheasants, geese, ducks, and swans. Bees were reared, and their honey esteemed a valuable product on many Roman farms. Of the relative degrees of profit obtained on the various kinds of crops cultivated, Cato has bequeathed to posterity the following judgment:—"If you can buy 100 acres of land in a very good situation, the vineyard is the first object, if it yields much wine; in the second place, a well-watered garden; in the third, a melon-plantation; in the fourth, an olive-ground; in the fifth, a meadow; in the sixth, a corn-ground; in the seventh, an underwood, or a plantation for yielding poles to train the vine; and in the ninth, a wood where mast grows." Such was Roman agriculture, which, in reality, differs little from our own practice. We have superior implements, superior varieties of corn, are superior in the management of stock, and in our system of rotation crops. Beyond these, however, there is little difference between the modern English agriculturist and the ancient Roman. They are equal in intelligence, in enterprise, and perseverance. "What is good tillage?" asks Cato,—"to plough. What is the second?—to plough; and the third is to manure. The other part of tillage is to sow plentifully, to choose your seed judiciously, and in the season to eradicate as many weeds as possible." "Nature," he further observes, "has presented to us two paths which lead to a knowledge of agriculture. These are experience and imitation. Preceding husbandmen, by making experiments, have established many maxims: their posterity generally imitate them; but we ought not only to imitate others, but make experiments, not directed by chance, but by reason." Excellent advice, and wisely delivered!

*Mediæval Agriculture.*—The darkness which succeeded the fall of the Roman empire in the 5th century, spread itself universally throughout Europe, and agriculture was either neglected, or entirely abandoned for such other modes of subsistence as lawless and troublesome times might suggest. Accordingly, for nearly ten centuries, we know little or nothing of the progress of Agriculture; it then began to revive, first in Italy, and afterwards in Germany, France, and England. There is, however, nothing either useful or interesting to record regarding its advancement throughout this long succession of ages. War was the principal occupation of the various nations of the earth, and it was not till about the beginning of the 16th century that the serious business of tilling the soil seems to have received that degree of consideration to which its importance is entitled. By that time, some steps in advance had been made in Tuscany and Lombardy. In France a tract had appeared, written by a potter, and entitled "Les Moyens de devenir Riche," which contained remarks on rural and domestic economy, and which is the first agricultural work produced in France. In Germany, Conradus Heresbachius, who died in 1576, produced his work, entitled "De Re Rustica," which was published at his death, but which gives no information as to the state of agriculture in his time. This was the first book on agriculture produced in Germany; and now that we have arrived at England, a more specific notice of its agriculture is demanded from us.

*English Agriculture.*—When Cæsar arrived in ancient Britain, 55 B.C., he found that the Cantii and the Belgæ, severally inhabiting the modern counties of Kent, Somerset, Wilts, and Hants, cultivated the soil, and used marl as a manure. He also found that they stored their corn, but in an unthrashed state, only performing this operation when necessity required it of them. These conditions indicate a considerable amount of intelligence; but, besides these, the Roman conqueror found the country well peopled, and abounding in buildings, resembling those of the Gauls, with great abundance of cattle. He also found that they ate neither hens, geese, nor hares, notwithstanding that they took great pleasure in breeding them. Whatever were the impressions which his visits to Britain made upon Cæsar, it is to Agricola that its ancient inhabitants were mostly indebted for the improved arts and civilization of the Romans. He reduced them to a state of slavery by refining their pleasures; and, amongst other arts, improved their modes of agriculture to such an extent as to enable them to store very large proportions of their cereal produce. That this was the case is attested by the fact, that in the 4th century the emperor Julian had stored in granaries which he had erected, such a quantity of tributary corn as filled a fleet of 600 large vessels. Upon this fact, Gibbon, in his "Decline and Fall of the Roman Empire," makes the following comment: "If," says he, "we compute those vessels at only 70 tons each, they were capable of exporting 120,000 quarters; and the country which could bear so large an exportation, must have attained an improved state of agriculture." The early inhabitants of Britain, thus thoroughly initiated into the Roman practice of agriculture, never lost it. Although Saxons, Danes, and Normans, have grafted themselves on the various populations of the island, the love of agriculture has still been preserved and followed with an assiduity and enterprise which never was at a greater height than it is at present.

*Modern Continental Agriculture.*—Generally speaking, the continental countries are far behind ourselves in agricultural practice. In order, however, to convey a general idea of the present state of European cultivation, we will notice the practice as it is pursued by several of those nations which are the most advanced, and which necessarily devote themselves more to the culture of the earth than those who are in a more backward, and, consequently, in a less comfortable condition. Much instruction, however, cannot be obtained even from a lengthened detail of the various modes of husbandry pursued. All methods are pretty much alike, and even the implements employed bear a considerable resemblance to each other. These circumstances supersede the necessity of our doing more, here, than briefly indicating a few of those agricultural points in which some of the principal followers of the science differ, in practice, from ourselves. For the products cultivated in the various countries specified, the reader is referred to the geographical articles in vol. I. of this work.

*Flemish Agriculture.*—The agriculture of the provinces of Belgium, being founded on their manufactures and commerce, and being exempted from those changes to which these are incident, still continues to be the most fruitful source of wealth. The whole of Flanders is cultivated like a garden. Its farmers were our first tutors; and from the middle of the 17th to the end of the first quarter of the present century, the system of Flemish husbandry was a model of neatness and economy. The Flemings were the first among the moderns to grow crops for no other purpose than to plough them in when growing, and they follow this practice to a greater extent than any other nation. The system might have been suggested to them by the original barrenness of large portions of their soil, a great proportion of which consisted of harsh and barren sands, producing nothing but heath and fir. This, doubtless, also suggested the careful collecting of every kind of manure calculated to enrich the earth. "The care of the Flemish farmers," says Murray, in his "Encyclopædia of Geography," "in collecting manure was early conspicuous. The use of liquid manure, collected in large reservoirs, is common to this country, with China, and not known in any other part of Europe, except, perhaps, Norway. Turf ashes, especially those imported from Holland, are in high estimation, and are said to produce an almost magical effect on the vegetation of clover. In general, the Flemish agriculture is conducted on a careful, economical, antique practice, the farmers not having adopted any modern improvements in the arrangement of husbandry, such as the crossing of the breeds of cattle, and the use of machinery, which have been adopted in England with such happy effect. But this system of agriculture, after supplying the most dense population in Europe with the standard productions of the soil, yields several articles, such as madder, rape, clover, mustard-seed, hops, &c., for exportation."

*Dutch Agriculture.*—The husbandry of Holland is almost exclusively confined to stall-feeding and the dairy. This is forced upon the inhabitants by the natural humidity of their climate. The country, from its geographical conditions, may be considered as nothing more than one great meadow intersected by

numerous canals, and traversed by rows and groups of trees. In summer the cattle are kept grazing continually in the open air, and in winter they are stalled and fed on hay, turnips, &c. Thus the great source of agricultural wealth to the Dutch husbandman is the produce of the dairy, which he has brought to such perfection as to have become an object of exportation. Both the cheese and butter of the Dutch enjoy a high reputation throughout Europe.

*German Agriculture.*—The agricultural population of Germany are mostly little farmers or small proprietors, who cultivate the soil with their own hands, and who, in the Teutonic states, form a class called *bauer*, or peasants. The consequence is, that although farming is pursued with great diligence, it is neither on such an extensive scale, nor with an equal amount of the intelligence with which it is carried on in England. With the exception of some of the mountain districts of Salzburg and the Tyrol, where the spade is used, the plough is the universal instrument of cultivation. In the south the ox is the animal employed in tillage, and the horse in the north. In Holstein and Westphalia, hedges divide the fields; but in other parts the fields stretch out in an almost limitless expanse, apparently presenting to the eye an uncircumscribed boundlessness of vegetable fertility and beauty.

*Italian Agriculture.*—In Italy, the productiveness of the farm is said, by Mr. Forsyth, to be invariably in proportion to the smallness of the property. This is a result the very opposite of that which obtains in England, where, however, there is a less complicated and more upright system of management than that which exists among the Italians. Whether the recent revolutions may affect the existing forms of copartnership amongst Italian agriculturists, remains to be seen; but, at present, the stock of a farm is furnished half by the landlord, and half by the tenant; and the produce is divided equally between them. This lease or contract holds only from one year to another; but if the tenant pays his rent, and lives in peace, he is rarely ejected from his holding. The system of irrigation which obtains in Lombardy and Tuscany is, perhaps, the most remarkable feature in Italian agriculture; and the opulence of these districts is mostly to be attributed to those works which, at an early period, the genius of the people constructed for the purpose of supplying their soil with water. "The aqueducts, sluices, and other works connected with them," says Murray, "are still the admiration of engineers. They are now so divided and subdivided, as to convey the means of irrigation almost into every field; and in this southern clime, where nothing, scarcely, but water is wanted, the increase of fertility is almost incredible. The produce is sometimes more than tripled; and grass may be mown three, four, and five times in the year." Where water is of so much value, it is natural to suppose that regulations would be imposed for its proper distribution and employment. Accordingly, every newly-discovered spring is appropriated by the proprietor of the ground in which it appears, and is immediately converted into a little canal. In the vale of the Arno, irrigation is pursued on a most elaborate system. This is evidenced in the terraces which are formed on the sides of the steepest mountains, where the naked rock is covered with earth, and where the torrents of the Apennines are confined within walls, and made to render fruitful that which, before, was sterile. Canals now permeate every field, and could only have been made when the Florentine merchants were at the height of their prosperity. These works, at the present day, are maintained and kept in repair at an expense sufficiently great to be felt to press heavily upon the people.

*French Agriculture.*—France is said to be the most favourable country in Europe for agriculture, yet are its inhabitants less forward in it than those of Great Britain. Their implements are, in general, rude, and the operations of the common farmer lack the intelligence of the same class in Britain. The French farmer performs most of his labours without the employment of extra hands, his wife and daughters—if he has them—reaping, thrashing, and doing almost every part of the farm and garden work indifferently. Such farmers, according to Neill, prefer living in villages; society and the evening dance being nearly as indispensable to them as their daily food. If the farm be distant, the farmer and his servants of all descriptions set off early in the morning in a light waggon, carrying with them their provisions for the day. Large farms are rare in France; but where they do exist, they have generally farmeries upon the lands, where the work is mostly done by labourers, who, with the herdsmen employed, are frequently paid in kind. All the plants cultivated by the British farmer are also cultivated by the French, with the exception of the turnip, which is not generally grown, especially in the warm districts, where it does not bulb. Perhaps one of the most remarkable features in French agriculture, and of most warm countries, is the use of the leaves of trees as food for cattle. These are supplied in autumn by the mulberry, the olive, the poplar, the vine, and other deciduous plants, when their colour begins to change. During the winter they are given to the cattle and sheep like hay, and are, sometimes, boiled with grain or bran for cows.

Such is a sketch of the progress and state of agriculture in those countries which approach nearest to our own in the practice of that science. Every nation, however, being generally less advanced than ourselves, no instruction can be furnished by giving an account in detail of their defective systems. For a consideration of the practical part of agriculture as pursued in England, *see* Soil, Manure, Drainage, Crops, Farm-Animals, Ploughing, &c.

Agrimonia, *ăg'-ri-mo'-ni-a*, in Bot., the Agrimony, a genus of dicotyledonous plants, belonging to the Rose order, or *Rosaceæ*. The species *A. Eupatoria* is one of our common roadside plants, and is found in flower about June. The leaves are very handsome, being large and deeply cut at the edge, and divided even down to the main stalk; the flowers are yellow, arranged on a long simple spike, with a little leaf at the base of each, and the fruit is beset with bristles. This plant has been used in medicine as a vermifuge and an astringent.

Agrionia, *ăg'-ri-o'-ni-a* (Gr. *agrios*, rustic, rude), among the ancients, an annual festival in honour of Bacchus, which was usually celebrated during the night. According to Plutarch, it was so named on account of the rudeness and intemperance which generally attended its celebration.

Agrostemma, *ăg'-ros-tem'-ma* (Gr. *agros*, a field, *stemma*, a crown), in Bot., a genus of dicotyledonous plants of the Pink order, or *Caryophyllaceæ*. The species *A. githago* is the common corn-cockle, a well-known ornamental plant in our cornfields.

Agrostis, *ăg-ros'-tis*, in Bot., a genus of Grasses, including numerous species, all furnishing excellent forage.

Aground, *ă-ground'* (Ang.-Sax.), in Mar., a term signifying the situation of a ship, whose bottom, or any part of it, hangs or rests upon the ground, so as to render her immovable till a greater quantity of water shall float her off, or till she shall be drawn out into the stream by the application of mechanical powers.

Ague, or Intermittent Fever, *ai'-gu* (Fr. *aigue*, sharp), in Med., a disease generally occasioned by exhalations arising from marshy grounds, stagnant water, or decaying vegetable substance. It is characterized by a series of separate attacks, occurring at regular intervals of one or more days, according to which it is termed quotidian, tertian, or quartan. Each attack is divided into three stages, which follow each other in regular succession. The first, or cold stage, is characterized by a feeling of extreme cold and languor, and an uncontrollable tremor over the whole body. This is followed by the hot stage, when the skin becomes hot and dry, the pulse quick and full, and the features flushed. In the sweating stage, a profusion of sweat breaks out over the whole body, which continues for some time, and then the attack terminates. During the cold stage, warm baths, diaphoretic drinks, and such-like means, are to be adopted; in the hot stage, saline draughts and diaphoretics should be administered; and in the last stage, the patient is to be kept cool, and, if very weak, may receive a little wine or brandy-and-water. The general treatment in ague is to strengthen the system by means of tonics, such as quinine or Peruvian bark.

Ahead, *ă-hed'* (Ang.-Sax.), in Mar., a term signi-

fying further onward than the ship, or at any distance before her, lying immediately on that point of the compass to which her stem is directed. It is used in opposition to *astern*, which expresses the situation of an object behind the ship.

AHRIAN, *ăr'-i-an*, in Geol., a term applied to the middle group of the series of Devonian rocks belonging to Belgium and the Rhine. This group includes bluish grey grits, sandstones, and shales.

AHULL, *ă-hul'* (Ang.-Sax.), in Mar., a term signifying the situation of a ship when all her sails are furled, and her helm lashed on the lee-side: she then lies nearly with her side to the wind and sea, her head being somewhat turned to the direction of the wind.

AI. (*See* BRADYPUS.)

AICHMALOTARCH, *aik'-ma-lo-tark* (Gr. *aichmalotarches*, chief of the captives), in Ecc. Hist., a title given by the Jews to the prince by whom they were governed whilst in captivity at Babylon. According to the Hebrew writers, he was always of the tribe of Judah. It has, however, been doubted whether such a dignitary held office previous to the 2nd century, when Huna was appointed aichmalotarch.

AID, *aid* (Fr. *aide*), in Law.—Aids were originally mere benevolences granted by the tenant to his lord, in times of difficulty and distress; but, in process of time, they grew to be considered as a matter of right, and not of discretion. These aids were principally three:—1. To ransom the lord's person, if taken prisoner. 2. To make the lord's eldest son and heir-apparent a knight. 3. To marry the lord's eldest daughter, by giving her a suitable portion.—*Ref.* Bracton; 2 *Bl. Com.* 63.

AIDE-DE-CAMP, *aid'-de-kan*, a Mil. term, taken from the French, and denoting an officer employed to receive and convey the orders of a general.

AIGLET, *ai'-glet*, in Zool., a young eagle. (*See* EAGLE.)

AIGRET, or EGRET, *ai'-gret*, in Bot., a term formerly applied to a little feathery crown or tuft attached to the seed-case or fruit of the dandelion, the scabious, and many other plants, and by means of which the seed is transported through the air to a distance. This peculiar appendage is now called a *pappus*. (*See* PAPPUS.)

AIGUILLETTES, or AIGLETS, *ai'-glets* (Fr.), the metal sheathings or tags at the end of the ribbons used to tie different portions of the costume worn in the 16th and 17th centuries. The aiguillettes were sometimes gold and silver, and elaborately chased. The pictures of Holbein, and the portraits of his time, give many examples of their form, and Shakspere and many of the elder dramatists allude to them.

AIGUISCH, *ai'-gis-sai* (Fr.), in Her., a term employed to denote a cross which has the two angles at the ends cut off, so as to terminate in two points, in opposition to the cross *fitché*, which tapers to a point.

AILETTES, or AILERONS, *ai'-lets* (Fr., little wings), the original design from which the modern epaulette was taken. Their object was to furnish a protection for the neck and shoulders, and, for actual service, they were made of leather, and ornamented with a personal badge or device, or the heraldic bearings of the wearers. They came into fashion in the earlier portion of the reign of Edward I., and ceased to be worn during the reign of Edward III. Dress ailettes were made of leather covered with silk or cloth, with fringes, and were laced to the shoulders of the hauberk with cords of silk.

AIM FRONTLET, *aim frunt'-let*, in Mil., an instrument formerly used by gunners to level and direct their pieces.

AIR, *air* (Gr. *aer*, air).—This term is generally taken to mean the atmosphere with which our globe is surrounded; but in the chemical works of the last century it is often applied to bodies known at the present day as gases. Air is a *mechanical* mixture of two gases, oxygen and nitrogen, in the proportion, by measure, of 20·61 oxygen to 79·19 nitrogen; or by weight, 23·01 oxygen to 76·99 nitrogen. Besides nitrogen and oxygen, it contains small quantities of carbonic acid and aqueous vapour, differing according to the locality and weather. Air, in common with all other bodies, has a perceptible weight. This is proved by weighing a flask before and after it has been exhausted of its air. According to Biot, 100 cubic inches weigh 31 grains. Heat causes air to expand, cold to contract. The cupping-glass is a familiar instance of the former fact. If a bladder is half-filled with air, and held near a fire, it will expand until the bladder is quite full; on being taken away, it contracts gradually to its former bulk. Air being elastic and compressible, it follows, that the higher we go, the lighter the air becomes. (For a fuller explanation of this, *see* BAROMETER.) Air dissolves a definite amount of aqueous vapour at different temperatures; hence the sudden formation and disappearance of clouds. In large masses air has a blue tinge. The distant hills appear of this colour, from being seen through several miles of air, and the sky appears blue from the same cause. As stated above, air consists of oxygen and nitrogen. Were it composed of oxygen only, we should breathe away our bodies too fast, while nitrogen alone would kill us. By the mixture, a proper strength of air necessary to life is kept up. The perfect mechanical mixture of the two gases which form air is an excellent example of the diffusion of gases. When two gases are united, they gradually mix with each other until perfect diffusion takes place. The air, therefore, that is analyzed at the foot of Chimborazo has the same composition as that analyzed at its summit, though it differ materially in density. Dr. Frankland has lately discovered that combustion takes place in proportion to the density of the air. A candle, weighing an ounce, took a longer time to burn at the top of Mont Blanc than one of the same size and weight which was burnt in the valley of Chamounix. From this it follows, that human beings must breathe slower in valleys and quicker at greater altitudes. The air is continually being rendered impure by the breathing of animals, the oxygen it contains being transformed into carbonic acid. This, however, lasts but a short time, being quickly separated into carbon and oxygen by plants, which retain the former body for their own nourishment, releasing the latter to serve again as support for animal life.

AIR, in Music, a term which, when applied to vocal music, signifies a composition for a single voice. It is synonymous with "melody."

AIR-BALLOON. (*See* BALLOON.)

AIR-BEDS.—An air-bed consists of a sack, in the shape of a mattress, divided into a number of air-tight compartments, a projection at one end forming the bolster. Each compartment is provided with a valve, and can be inflated with air by means of a bellows. Air-beds were known at the commencement of the 18th century; but, being manufactured of leather, were of considerable cost. They are now made of mackintosh cloth and vulcanized india-rubber. Their advantages are coolness, elasticity, and portability; and they are especially valuable to invalids.

AIR-BLADDER, an organ which, in fishes, generally adapts the specific gravity of their bodies to the weight of the water in which they are at different depths.

AIR-CUSHIONS are conveniences of similar construction to air-beds, but less complicated, and cheaper.

AIR-ENGINE.—A machine analogous to the steam-engine, in which rarefied or condensed air takes the place of steam. Many engines of this kind have been patented and used experimentally. There are many difficulties in connection with the employment of air in lieu of steam, which prevent them from coming into general use.—Under CALORIC ENGINE will be found accounts of several, which have been successfully worked by means of hot air.

AIR-GUN.—An instrument through which bullets are propelled by means of the sudden escape of compressed air. In appearance they are similar to ordinary arms, the stock of the gun being the reservoir into which the air is forced by a condensing syringe. There is a valve immediately behind the bullet, through which a small quantity of compressed air rushes as soon as it is opened, by pressing the trigger with the finger. As soon as the trigger is released, the valve closes again. There are too many objections to their use, for air-guns ever to gain a higher position than that of destructive philosophical toys. The amount of force required to be expended in condensing the air, the gradual diminution of power after each shot is fired, and their liability to get out of order, effectually

preclude their general use. It is said that they were invented by Marin, a native of Lisieux, in France, who presented one to Henry IV.

Air-Jacket, a garment, formerly made of leather, and now of other materials, having several bags communicating with each other, which were filled with air by a leather tube, furnished with a brass stop-cock, by which means a person may float without learning to swim.

Air-Passages and Air-Cells, in Bot., are large intercellular passages and spaces occurring in the stems and leaves of some monocotyledonous plants, especially those which are aquatic.

Air-Pipes, commonly called Sutton's air-pipes, from the name of the inventor. They are formed on the principle, that air is necessary for the support of fire, and were contrived to cleanse the holds of ships of foul air. This was done by closing the two holes under the copper or boiler, and in their room laying a copper or leaden pipe from the hold into the ash-place, by which means the foul air was discharged from the hold, and a supply of fresh air from the hatches allowed to take its place.

Air-Plants, in Bot., are those members of the vegetable kingdom which derive nourishment entirely from the air by means of slender aërial roots. Most of the Orchids and Tillandsias, which grow on the trunks and branches of trees in warm climates, are true air-plants. The term *epiphytes* is sometimes applied to such plants.

Air-Pump.—As its name indicates, an air-pump is a machine for extracting the air from a closed vessel, so as to form as near an approach to a vacuum as possible. It is composed of a cylinder, in which works a piston, furnished with a valve opening upwards. At the bottom of the cylinder is another valve, also opening upwards, and closing or opening a tube connected with the plate upon which is placed the vessel to be exhausted. If the piston is raised when it is at the bottom of the cylinder, the air pressing on the valve belonging to it keeps it closed, and a partial rarefaction of the air takes place. On lowering it, the air presses on the valve at the bottom of the cylinder, cutting off the communication between it and the receiver, and opening the valve in the piston. The piston, on being raised once more, again rarefies the air in the receiver, and continues to do so at each successive stroke of the pump. An absolutely perfect vacuum can never be made in this way, as, at a certain point, the rarefied air becomes too attenuated to lift the piston-valve. In most air-pumps two cylinders are used, to save time; the piston of one descending while that of the other is ascending. Connected with the tube leading to the receiver is a shortened barometer, the height of the mercury in which shows the exact degree of rarefaction. The air-pump was invented by Otto Guericke, in 1690.

Air-Sacs, in Bot., small membranous pouches filled with air, which form the floating apparatus of the Bladder-wort (*see* this word).

Air-Shafts, in Mining, holes made from the surface to the adits, to furnish fresh air to the miners.

Air Thermometer.—This instrument, which is seldom used, consists of a capillary tube, open at one end, and terminating at the other with a large bulb, full of air, which is separated from the external atmosphere by a liquid index of coloured sulphuric acid, which rises and falls as the air in the bulb contracts or expands.

Air-Threads, a term in Nat. Hist., applied to those filaments which float in the air in autumn. They are made by the long-legged field spiders.

Aisle, *ile* (Fr. *aile*, wing), in Arch., denotes that lateral division of a church which forms the side of the edifice. Thus, when a church is divided into three compartments, the middle or principal compartment is called the nave, and the two outlying compartments form the aisles. English churches have seldom more than two aisles; but in foreign ecclesiastical edifices there are often as many as four aisles, two on each side of the nave. Sometimes the term aisle is given to all the compartments of a church, which is then spoken of as "three-aisled," the nave or body of the building forming the middle aisle, and the side compartments the side-aisles. (*See* Church, Transept, Nave.)

Ajuga, *a-joo'-ga*, in Bot., the Bugle, a genus of plants belonging to the Labiate order. *A. reptans* is a common plant in moist pastures. The stem is creeping, but the flowering part erect. This part has many leaves or bracts of a purplish hue, proceeding from each whorl of labiate flowers: the latter are generally blue, sometimes white or flesh-coloured. The plant was formerly thought good for wounds.

Akee Fruit, *a-ke'*, in Bot., the produce of a species of soapwort growing in the West Indies. (*See* Cupania.)

Aki, *ai'-ki*, in Bot., the native appellation for the *Lignum vitæ* of New Zealand. This and other species of the genus *Metrosideros* afford valuable timber, used by civilized races in many of the peaceful arts, and by the South-Sea Islanders to form their terrible clubs. The genus belongs to the Myrtle order, or *Myrtaceæ*.

Alabama Beds, *ăl-a-ba'-ma*, in Geol., a group of rocks in North America, placed by Sir Charles Lyell among the productions of the middle Eocene period.

Alabaster, *ăl-a-bas'-ter*, in Min., a white substance used for ornamental purposes. Its name is derived from Alabastron, in Egypt, whence the ancients obtained a supply of the stone, and where it was manufactured into vases and other small vessels. The ancients made use of these vessels to hold a certain kind of perfume, with which, according to Horace, it was the custom to anoint the heads of the guests at a feast. Mary, the sister of Lazarus poured a "very precious ointment" from an alabast[illegible] box upon the head of our Saviour whilst seated at [illegible]per. In the British Museum there are several of these ancient alabaster vessels. There are two varieties of alabaster; one a carbonate of lime, and the other gypsum, or sulphate of lime, the latter being that which is generally known as alabaster. It is a soft stone, may be scratched with the nail, and is beautifully white and semi-transparent. Being easy to work, large quantities of vases, lamps, and toys, are made from it. The finest sort of alabaster is obtained from Valterra, in Tuscany, and it is also found in Derbyshire and Staffordshire.

Alabastrus, *ăl-a-bas'-trus*, in Bot., a name sometimes given to the flower-bud.

Alæ, *ai'-lee* (Lat., wings), in Bot., the two lateral petals of a papilionaceous or butterfly-shaped corolla.

Alangiaceæ, *ăl'-an-ge-ai'-se-e*, in Bot., the *Alangium* order of monocotyledonous plants, including four genera and eight species, which are trees or shrubs, natives of various parts of the East Indies, and North America. The fruits of most of these plants are edible; that of the *Nyssa capitata* is used as a substitute for lime-fruit, and is sometimes called the *Ogechee* lime.

Alaraf, *a'-la-raf*, is the name given by Mahometans to the wall which they say divides heaven and hell.

Alares, *a-lair'-eez*, in Rom. Mil. Antiq., a kind of militia; but, according to some, they were the cavalry, stationed as the two wings or *alæ* of the army.

Alaria, *a-lair'-i-a*, in Bot., a genus of fucoideous sea-weeds. One British species is known, *A. esculenta*, a common sea-weed, having a large flat and narrow leaf-like frond, with a thick midrib, or prolongation of the stalk by which it is attached to the rocks. It grows from four to twelve feet long, and is sometimes employed for food. Its common names are Bladderlocks, Hen-ware, and Honey-ware.

Alarm, *a-larm'*, a sudden surprise occasioning fear or terror; an outcry intimating the approach of danger. In Mil., it denotes either the apprehension of being attacked, or the notice given of a sudden attack, as by firing a rifle, &c.

Alarmists, *a-larm'-ists*, in Pol., a term applied generally to those persons who are easily alarmed at the first whisper of bad news, who industriously circulate it, and exaggerate its probable consequences. In Politics, it particularly designates those individuals who fear any change of policy, or alteration of received forms.

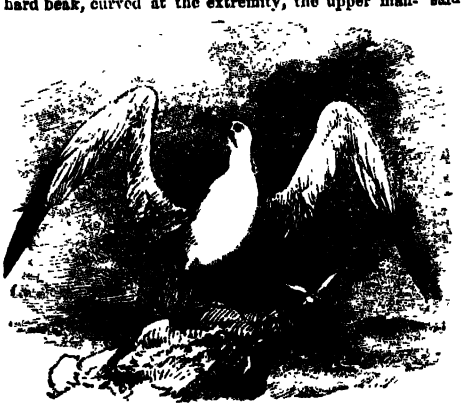
Alauda, *a-law'-da* (Lat. *alauda*, a lark), in Orn., the lark, a genus of birds, belonging to the conirostral tribe of the order *Passeres*, and fam. *Fringillidæ*. *Charæ*. Beak cylindrical; nostrils concealed; head crested; tail forked; wings long; no spurious quill; the first, second, and third quills longest, and nearly equal; the rest considerably graduated. Various species of larks are found in all quarters of the globe.

The skylark, or laverock (*Alauda arvensis*), is the best known in this country. He is unrivalled as a songster, and has been a theme for poets from the earliest ages. The male alone is gifted with melody; the female makes her nest among the herbage or corn, and devotes herself almost constantly to the process of incubation. They are granivorous birds, of migratory habits, and, instead of washing, shake dust among their feathers. They are considered a great delicacy for the table. The season for catching larks commences, in this country, in the middle of September, and terminates at the end of February. More than 4,000 dozen are annually supplied to the London markets alone. The *Alauda arvensis*, or skylark, and the *Alauda arborea*, or woodlark, are the only ones that sing when flying. The skylark rises perpendicularly, the woodlark in widely-extended circles; and they sometimes soar to an enormous height, and sing for an hour together. The shorelark (*Alauda alpestris*) is frequently found in North America, and generally breeds near the sea-shore. The calandra lark (*Melanocorypha calandra*) is a larger bird than the skylark, and possesses a more sonorous voice. In Italy, a good singer is compared to a calandra. Among other species, there are the *pratensis*, or titlark, which frequents meadows;—the *arborea*, or woodlark, distinguished by a white fillet about the head. It is less than the skylark; the colours are paler, and the voice less varied, but sweet. The *campestris* has half of the chief feathers of the wings brown, except two, which are white, and the throat and breast yellowish. The *trivialis*, whose tail is partly brown and partly white, is a native of Sweden. The *cristata*, a native of Europe, and sings like the skylark. The *spinoletta*, a native of Italy. The *magna*, common in Africa and America. The New Zealand lark, which inhabits Charlotte Sound, where it is named *kogoo aroure*.

ALB, *ălb* (Lat. *albus*, white), an ecclesiastical vestment of great antiquity, made of white linen, of sufficient length to hang down to the heels, open in front like a surplice, tight in the sleeves, and girded at the loins. In the ancient church, the newly-baptized persons wore a white vestment or alb; whence the Sunday after Easter, the day upon which the catechumens received baptism, came to be called *Dominica in albis*;—whence Whit-Sunday.

ALBATA. (*See* NICKEL.)

ALBATROSS, *ăl'-ba-tross* (*Diomedia*), a gen. of web-footed birds, of which there are three species,—the common albatross, *D. exulans*; the albatross of China, *D. fuliginosa*; and the yellow-and-black-beaked albatross, *D. chlororynchos*. *Charac.* A long, hard beak, curved at the extremity, the upper mandible composed of several articulated pieces, the lower mandible smooth and short; the nostrils lateral, and placed like small rolls in the furrow of the mandible; feet short, with the three toes long and completely webbed; wings long and narrow. The common albatross, which is often met with in the seas of Southern Africa, is the largest sea-bird known; its weight varying from 12 to 29 lbs. A specimen in the Leverian Museum measured 13 feet between the extremity of the extended wings. One remarkably large bird, shot off the Cape of Good Hope, measured from wing to wing 17½ feet. The top of the head is a ruddy grey, the rest of the plumage, with the exception of several transverse black bands on the back, and a few of the wing-feathers, is white; the bill is of a pale yellow, and the feet and membrane of a deep flesh-colour. Towards the end of June these birds hover in immense flocks about Behring's Straits and Kamtschatka, attracted thither by the shoals of fish, whose migrations the albatross perseveringly follows. So great is their voracity, that they will swallow a salmon of 5 lbs. weight; they do not, however, limit their diet to fish, but will prey on any sea-animal; and Captain Cook's sailors caught them with a line and hook. They never attack other sea-birds, but are often attacked by gulls, who are vastly their inferiors in strength; their flesh is dry and tough. The Kamtchatkadales use their entrails as buoys for nets, and their wing-bones as tobacco-pipes.



ALBATROSS.

ALBIGENSES, *ăl'-bi-jen'-sees*, was a common name given to the different sects that existed in the south of France in the latter half of the twelfth and beginning of the thirteenth century. They differed among each other in their particular tenets, but agreed in denying the authority of the pope in spiritual matters, and in opposing the discipline and ceremonies of the church of Rome. They were so called from the town of Alba, or Albyi, in and around which they were most numerous. In 1163, Alexander III. published a decree against these sects in a council at Tours, and another in 1179. On the accession of Innocent III. to the papal chair, in 1198, he sent two Cistercians, Rainer and Guido, to proceed against the heretics. They were to endeavour to convince them by arguments, and, if these failed, to pronounce the ban upon them. Their goods and property were to be confiscated, and themselves banished from the country. These proceedings, however, were followed by little success; and the assassination, in 1208, of one of the pope's delegates, Peter of Castelnau, who had rendered himself odious by his cruelties, gave rise to many years of a most bloody war, in which the worst outrages of fanaticism and cupidity were practised against the inhabitants of these districts. Raymond VI., count of Toulouse, was leader of the Albigenses, and Simon, count of Montfort, commanded the expedition against them. At the taking of Beziers, it is said that 60,000 of the inhabitants were put to the sword; and it is said that one of the pope's legates, when asked how they were to distinguish the heretics from true Catholics, replied, "Kill all, and God will find out his own." Montfort lost his life at the siege of Toulouse, in 1218, and Raymond, his adversary, died in 1222. The war was prosecuted by their successors, until Raymond VII., pressed on all sides, was obliged to make peace in 1229, giving up two-thirds of his estates to the king, promising submission to the pope, and paying a large sum to the Church. He died soon after, and in him the house of the counts of Toulouse became extinct, and its territories reverted to the French crown. When peace was obtained, the Inquisition was established at Toulouse, and those who escaped from the sword died by the hands of the Inquisition, until the Albigenses were totally exterminated. — Ref. Sismondi's *Hist. des Français*; Neander's *Church History*.

ALBINOS. (*See* vol. I. of this work.)

AL-BORAK, *al bo-rak'* (Arab., shining whiteness), the name given, in Mahometan tradition, to an imaginary animal, which was said to have carried Mahomet upon his journey from Jerusalem to the heavens.

ALBUM, *ăl'-bum* (Lat. *albus*, white), among the Romans, was a white board or register, on which the names of persons or public transactions were inscribed. The term is now usually applied to a book for receiving autographs or other manuscript contributions of friends or celebrated individuals.

ALBUMEN, *ăl-bu'-men* (Lat. *albus*, white), in Chem., a whitish viscous matter slightly salt to the taste, and

an important element in vegetable and animal organic substances. It is distinguished by its peculiar property of becoming coagulated or insoluble at a high temperature. White of egg and serum of blood consist almost entirely of albumen. The hair and nails contain large quantities of it in its coagulated state. Pure albumen is insoluble in water. White of egg and serum contain a certain amount of free alkali, in which it is dissolved; hence its precipitation when acids are added. It is also precipitated when salts of mercury, copper, silver, lead, &c., are added to its solution, forming with them definite insoluble compounds. This property renders it valuable as an antidote to metallic poisons. Tannin, gallic acid, and extractive matter behave with it in a similar manner; for which reason it is used much in the arts as a clarifying agent. It is greatly used in photography, for giving depth and intensity to photographic prints. Its chemistry is very complex, and requires investigation. Its composition is given below, the presence of sulphur being rendered familiar to all by the effects of cooked eggs upon silver spoons.

| | |
|---|---|
| Carbon | 53·5 |
| Hydrogen | 7·0 |
| Nitrogen | 15·5 |
| Oxygen | 22·0 |
| Phosphorus | 0·4 |
| Sulphur | 1·6 |
| | 100·0 |

ALBUMEN, in Bot., a term used to denote the cellular structure which surrounds the embryo of a seed. It is not present in every case; for sometimes the embryo alone forms the nucleus of the seed, as in the pea, the bean, and the wallflower. When it is present, the amount of space it occupies is in inverse proportion to that occupied by the embryo; in other words, the larger the embryo the smaller the albumen. A seed entirely devoid of this structure is said to be *exalbuminous*, and one which includes it, *albuminous*. The cells of the albumen contain nutriment for the germinating embryo in the form of starch, of oil, or of cellulose. Sometimes the cells are thickened by secondary deposits, and the whole structure becomes horny; thus, vegetable ivory is nothing more than the albumen of the seed of a species of palm. The stone of the date and the nut of the areca palm are further examples of hardened albumen. In the seed of the coffee plant, the albumen is the horny portion which is so familiar to us as the "coffee berry." When a seed contains no albumen, the cotyledons supply the nutriment required by the growing portions of the embryo. Some botanists use the term *perisperm* for this structure, as the word *albumen* has a totally different signification in chemistry.

ALBURNUM, *ăl-bur'-num* (Lat.), in Bot., the sap-wood, the white and comparatively soft part of an exogenous stem, between the inner bark and the *duramen*, or heart-wood. The difference between these two kinds of wood is often very striking. Thus, in the ebony-tree the duramen is black and the alburnum pale. All the vital functions are performed by the sap-wood, as is proved by the vigorous growth of many a hollow tree.

ALCA, or AUK. (*See* AUK.)

ALCAIC, *ăl-kaï'-ik*, a name given to a kind of verse, said to have been invented by the Greek poet Alcæus. It is formed of four feet, with a cæsura in the middle. The first foot is a spondee, rarely an iambus; the second an iambus; then the cæsura, followed by two dactyls; as—

Dŭlce ĕt | dĕcō|rum ĕst | prō pătrĭă mŏrī.
It is sweet and glorious to die for one's country.

ALCAIDE, or ALCAYDE, *al-Laïd'*, a Spanish word, derived from the Arabic *kada*, to head or govern, and used by the Moors, Spaniards, and Portuguese for a governor, usually of a fortress or castle.

ALCALDE, *al-kal'-dai*, is, in Spain, the title of a judge appointed by the government, or elected by the towns, to administer justice within a certain district.

ALCANTARA, KNIGHTS OF, *al-kan-ta'-ra*, an order of Spain, uniting in themselves both religious and military duties. They took their denomination from the town of the same name, on the Tagus, and had their rise about the beginning of the 13th century.

ALCARRAZAS, *al-kar-ra'-zas*, a name given to a species of coarse pottery, manufactured in Spain, and used for cooling wines. This is effected by means of its extreme porosity, the wine passing through the pores, when a copious evaporation takes place from the small portion of water which penetrates to the outside. It is made of clay, consisting of sixty parts of calcareous earth, mixed with alumina, and a little peroxide of iron, and thirty-six of silicious earth, mixed with a little alumina; to which a quantity of salt is added in the mixing. The vessels are only half, or at least not wholly baked.

ALCAVALA, *al-ka-va'-la*, in Com., a custom-house duty paid in Spain, on imported goods, at the rate of 6 per cent. upon the value of the commodity.

ALCEDO, or KINGFISHER, *al-se'-do*, a family of birds belonging to the fissirostral tribe of the ord. *Passeres. Charac.* Bill long, thick, pointed, and quadrangular; tongue short, and slightly arrow-shaped at the point; nostrils at the side of the base of the bill; legs short; three toes, the outer joined to the middle one as far as the second joint; wings with the first and second quills nearly equal. Only one species of kingfisher is indigenous to Britain, though there are sixty other species described by naturalists. This bird was known to the ancients by the name of Halcyon. They supposed that its nest was built upon the surface of the sea, and that during incubation it had the power of calming the troubled deep; the days on which they were presumed to exercise this power were called Halcyon days. The Ostiacs and Tartars preserve the skin of the alcedo about their persons in a purse, as a charm against every evil. The feathers they use as love-amulets, and they believe that a woman touched by a feather which has floated on the water, will fall in love with the man who uses it. The most remarkable among the species are:—1. *Alcedo galbula*, or green jacamar, about the size of a lark; bill square and black, and sharp at the point; plumage a bright green, glossed with copper and gold. This species is found in Guiana and Brazil, and feeds on insects.—2. *Alcedo ispida*, or common kingfisher, about the size of a swallow; bill long, and the shape inelegant; top of the head and the coverts of the wings of a dark green, spotted with light blue; back and tail of a bright azure; the under side of the body orange. It feeds on fish.—3. *Alcedo paradisea*, or paradise jacamar, of the same size as the preceding; throat, front of the neck, and under wing-coverts, white, the rest of the body a dull green, slightly shaded with black, violet, and copper. It is a native of Surinam.—4. *Alcedo rudis*, or Egyptian kingfisher, about the size of the Royston crow; bill black; head, shoulders, and back, brown; throat and belly dusky white; tail ash-coloured; the legs of a pale green, and the claws black. It is a native of Egypt, and feeds on frogs, insects, and small fish.—5. *Alcedo cayanensis*, about the size of a starling; back of a blue colour, the under parts white, and the legs red. It is a native of Cayenne and Guiana.—6. *Alcedo torquata*, or cinereous kingfisher, about the size of a magpie; colours, a bluish ash, chestnut, white, black, and yellow. It is a native of the West Indies.

ALCES, *ăl'-sees*, the Elk. (*See* DEER.)

ALCHEMILLA, *ăl-ke-mil'-la*, in Bot., the Lady's-mantle, a gen. of plants in the nat. ord. *Rosaceæ*, subord. *Sanguisorbeæ*. Three British species are known,—*A. alpina*, *A. vulgaris*, and *A. arvensis*,—the mountain, common, and field lady's-mantles. They have small green flowers arranged in bunches. The latter species is thought to be diuretic.

ALCHEMY, *ăl'-kim-e* (Arab. *al*, the, Gr. *chemeia*, chemistry).—The term alchemist is generally applied, in an opprobrious sense, to the ancient chemists, who are vulgarly supposed to have been mere visionaries, searching only after chimeras. Although many of the alchemists were impostors, working upon the minds of the unenlightened for their own ends, still there were many more really great men amongst them, who, by their genius and labours, have laid the foundations of modern chemistry; men who made discoveries amidst inconceivable difficulties, that we nowadays have no notion of. Such men as Paracelsus, Raymond Lully, Glauber, Friar Bacon, Van Helmont, Albertus Magnus, Basil Valentine, and a host of others, have left behind them enduring monuments of their greatness, in the form of medicines and preparations,

## Alcohol

indispensable to the chemist and pharmacist, even in these enlightened days. The great end of all their researches was the discovery of the philosopher's stone, which was to have the power of transmuting all metals into gold. Their ideas in this matter were perfectly reasonable and logical. They found, that by burning and melting, at a great heat, a dull, heavy, earthy body, they obtained a brilliant metal; and further, that by treating in the same way lead ore, a semi-metal, they



ALCHEMIST, AT WORK.

produced a perfectly metallic substance. From these facts, they reasoned that gold and silver were pure forms of baser metals, and their experiments tended to the discovery of the agent which was to work this change. In the same way, following out this train of reasoning, they imagined that this great purifier of metals would play the same part with the human subject, and purify it so effectually as to prolong life indefinitely; hence the search after the elixir of life. The idea of the universal solvent is not so absurd as it is made to appear. Their notion in this was to obtain a solvent for *all metals*, and not for all substances, as is generally supposed.

ALCOHOL, *al'-ko-hol* (Arab. *al*, the, *kvohl*, any volatile substance).—If a solution of sugar be exposed to the air for any length of time, no change will take place; but if vegetable or animal organic matter be present, fermentation commences, and a fresh principle is formed, which may be separated by distillation. The first distillate is comparatively weak: but by the use of caustic potash, which has a powerful affinity for water, absolute alcohol is obtained. Pure alcohol is colourless and limpid, pungent to the taste and smell. Its specific gravity at 60° is ·793. It boils at 173°, and has been rendered gelatinous by cold, but has never been frozen. It is very inflammable, and burns without smoke. It mixes with water in all proportions, and has a great attraction for it. Its solvent powers are great, especially with respect to resins and resinous gums. The strength of alcohol is in exact proportion to its density, which is estimated by means of an hydrometer. Excise proof spirit has a specific gravity of ·918, and contains 49½ per cent. of absolute alcohol. Wine, beer, and spirits owe their intoxicating properties to alcohol. The chemical composition of alcohol is $C_4H_6O_2$, and it is regarded by chemists as a hydrated oxide of the organic base ethyl; *i.e.*, $C_4H_5O+HO$. In like manner, methylic alcohol is hydrated oxide of methyl, $C_2H_3O+HO$, amylic alcohol $C_{10}H_{11}O+HO$, hydrated oxide of amyl, and so on, to $C_{20}H_{21}O+HO$, capric alcohol; the simple oxides being ethylic, methylic, amylic, and capric ethers. (*See* ETHER.) The alcohols are very numerous, their number being increased daily. Alcohol of different strengths is much used in the arts, as a solvent for varnishes, resins, and essential oils; as a fuel in spirit-lamps, as an antiseptic, and as a stimulant in medicine.

ALCOHOLOMETER. (*See* ALCOHOLOMETRY.)

ALCOHOLOMETRY, or ALCOOMETRY, *al-koo'-me-tre*, (Arab. *alcohol*, and Gr. *metron*, a measure), is the art of determining the proportion of alcohol contained in any liquid. As the commercial and excisable value of

## Aldehyde

wine and spirits depends mainly on the amount of alcohol they contain, it is of the greatest consequence that it should be easily and quickly found. In the case of spirits, which consist mainly of alcohol and water, this is comparatively easy, the specific gravity being in direct proportion to the amount of alcohol in the mixture. A specific-gravity bottle, or a hydrometer, is used in this instance; but in the case of wine, which contains saccharine and other substances besides the alcohol, which materially influence its density, recourse is obliged to be had either to distillation or to one of the following methods:—1. By determining the boiling-point of the liquid; 2. the amount of dilatation it undergoes when its temperature is raised from 60° to 212°; or 3. by evaporating half the liquid in the open air, and restoring it to its original bulk by adding water, the difference of specific gravity, taken before and after the evaporation, will indicate the amount of alcohol. None of these processes are absolutely correct; if, therefore, perfect accuracy is required, regular chemical analyses must be performed. The following tables give the amount of alcohol in various liquids:—

| *Spirits.* | |
|---|---|
| Hollands | 57·60 |
| Scotch Whisky | 54·32 |
| Irish ditto | 53·90 |
| Rum | 53·68 |
| *Wines.* | |
| Brandy | 53·39 |
| Raisin | 25·12 |
| Marsala | 25·09 |
| Sherry (Brown) | 23·01 |
| Port | 22·96 |
| Madeira | 22·27 |
| Sherry (Amontillado) | 20·05 |
| Claret | 15·10 |
| Burgundy | 14·57 |
| Champagne | 12·61 |
| Hock | 12·08 |
| Orange | 11·26 |
| Elder | 8·79 |
| Cider | 5·21 to 9·87 |
| Ale (Burton) | 8·88 |
| ,, (Edinburgh) | 6·29 |
| Stout | 6·80 |
| Porter | 4·29 |
| Small Beer | 1·28 |

*Proportions of Alcohol in Mixtures of different Specific Gravities.*

| 100 parts | | Spec. Grav. at 60° | |
|---|---|---|---|
| Alc. | Water. | | |
| 100 | 0 | 0·790 | Absolute Alcohol. |
| 75 | 25 | 0·858 | |
| 50 | 50 | 0·917 | |
| 49 | 51 | 0·920* | |
| 25 | 75 | 0·967 | |
| 0 | 100 | 1·000 | Water. |

* Proof spirit.—Spirit stronger or weaker is said to be above or below proof.

ALCORAN, or KORAN. (*See* vol. I. of this work.)

ALCORNOQUE BARK, *al'-kor-noke*, several kinds of astringent bark imported into this country for the use of the tanner are thus named. The American alcornoque bark is the produce of a species of *Bowdichia* and o. the species of *Byrsonima*; the European is obtained from the younger branches of the cork-oak, *Quercus Suber*.

ALCOVE, *al'-kove* (Arab. *alcaut*, a sleeping-chamber), in Arch., a term applied to a recess in a chamber where a bed is or can be placed. In countries where beds are not commonly made in such recesses, it may be used to describe any recess in any sort of apartment.

ALCYONIDÆ, *al-se-on'-i-de*, a gen. of animals belonging to the fresh-water polyzoa, or ascidian zoophytes. (*See* ANTHOZOA, CORALS, POLYPES, SPONGES.)

ALDEBARAN, *al-de-ba'-ran*, in Astron., a name given by the Arabs to a bright star of the first magnitude, situate in the southern eye of the constellation Taurus.

ALDEHYDE, *al'-de-hide*.—When alcohol is submitted to any process by which hydrogen is extracted from it (deoxidation, for instance), it becomes an aldehyde, every alcohol having its corresponding aldehyde. Ethylic, or vinous aldehyde, is limpid and colourless, with a peculiar and characteristic odour. Its density is ·790; it boils at 72°, and is neutral to test-paper. On exposure to the air, it absorbs oxygen, and resolves into acetic-acid. These reactions are as follows:—

$C_2H_6O_2 - H_2 = C_2H_4O_2$
(Alcohol) (Aldehyde)
$C_2H_4O_2 + O_2 = C_2H_4O_4$
(Aldehyde) (Hydrated acetic acid)

ALDER. (*See* ALNUS.)

ALDERMAN, *al'-der-man*, a term derived from the comparative degree of the Ang.-Sax. word *eald*, old, and *man*. Earls, governors of provinces, and other persons of distinction, were generally termed aldermen by the Anglo-Saxons. The title is now applied to certain magistrates or officers in municipal corporations. By 5 & 6 Will. IV. c. 76, the resident burgesses elect councillors, who, from their own number, choose a certain number of aldermen, who hold office for six years, one half going out every three years. One fourth of the municipal council consists of aldermen, and three fourths of councillors. In the corporation of London, which was not affected by the above act, there are twenty-six aldermen, including the lord-mayor, twenty-five of whom are elected for life by such freemen as are householders in the twenty-five wards. The twenty-sixth alderman, who belongs to the dependency of Southwark, is appointed by the other aldermen, who generally, when a vacancy occurs, select the senior from among themselves, and a new alderman is elected for the ward for which he sat.

ALDINE EDITIONS, *ăl'-dine*, in Bibliography, a term applied to those editions of celebrated authors which came from the press of the family of Aldus Manutius. In 1490, the first of that name established his printing-press at Venice, and posterity is indebted to him for many of the first editions of Greek authors, and other valuable works. In his edition of Virgil, of 1501, the italic characters used in Roman printing first appear; and from that date, a number of classical works, in both the Greek and Latin tongues, were produced from his press in a duodecimo form. These are what is generally understood as the Aldine Editions. In 1597, after producing 908 editions, the family press was said to have been broken up; but several Venetian publications, bearing the imprint of the Aldine family, an anchor and a dolphin engraved on the last page, and which appeared early in the 17th century, would seem to contradict the report. For a short time a branch of the Aldine Press was established in Rome. (*See* MANUTIUS, Aldus, vol. I. of this work.)

ALE, *ail* (Sax. *eala*, *eale*, or *aloth*), the name formerly given to unhopped malt-liquor, but now applied to every strong and comparatively light-coloured beer. The hop was brought into this country from the Netherlands, in the reign of Henry VIII., and the word *beer*, from the German *bier*, was then employed to distinguish the hopped liquor from the more ancient beverage. The connection between hops and the word beer is indicated by the old couplet:—

"Hops, reformation, bays, and beer,
Came into England all in one year."

Again, Parkinson, in 1640, writes:—"The ale which our forefathers were accustomed only to drink, being a kind of thicker drink than beer, is now almost quite left off to be made, the use of hops to be put therein altering the quality thereof, to be much more healthful or rather physical, to preserve the body from the repletion of gross humours which the ale engenderoth." Ale made from malt alone was a favourite beverage of the ancient Germans even in the time of Tacitus. It was, moreover, highly esteemed by the Danes and Anglo-Saxons, being even thought worthy of slaking the thirst of the mighty heroes in the Hall of Odin. It is expressly named as one of the liquors provided for a banquet given by Edward the Confessor. Isidorus and Orosius state that the ancient Britons and other Celtic nations drank ale, which they made by a process very similar to our modern brewing. They inform us that the grain was first steeped in water and made to germinate; it was then dried and ground; after which it was infused in a certain quantity of water, and the whole fermented. Ale was formerly regarded in England as an absolute necessary of life, and various ordinances or assizes have been passed for regulating its price and quality. Thus, in 1251, during the reign of Henry III., an assize of bread and ale was struck, which settled the price of the latter article as follows:—"A brewer may sell two gallons of ale for a penny in cities, and three or four gallons for the same price in the country." The penny of that time was worth about threepence of of our currency. Some centuries since, ale took the place of our tea or coffee at breakfast. The earl of Northumberland, in the reign of Henry VIII., lived in the following manner:—"On flesh-days throughout the year, breakfast for my lord and lady was a loaf of bread, two manchets, a quart of *beer*, a quart of wine, half a chine of mutton, or a chine of beef, boiled." The same allowance of beer was included in the bill of fare for meagre days, when salt fish and buttered eggs were substituted for beef or mutton. Ale, as now distinguished from porter and small beer, is prepared from pale malt, and, except in the case of bitter ale, a comparatively small proportion of hops. Strong ale is made from the best malt and the finest kinds of hops, such as the goldings and white-bines of Kent and Surrey, or the mild-flavoured flowers of Worcestershire. The fermentation is allowed to proceed slowly until the yeast is exhausted, and perfectly separated. The Scotch ales are remarkable for the very small quantity of hops which they contain. Burton ale is a very strong and wine-like product, which is highly esteemed. The bitter ales of Bass and Allsopp only differ from this chiefly in having a larger quantity of hops, which imparts a pleasant bitter, and renders them less prone to turn in hot climates. Strong ales contain from 5½ to 10 per cent., by weight, of alcohol.—*Ref.* Johnston's *Chemistry of Common Life*. (*See* BREWING, HOPS, MALT.

ALE-CONNER, *ăl'-kon'-ner*, ale-kenner, or one who kens or knows what good ale is. The office is of great antiquity. Ale-conners and ale-tasters were chosen every year in the court-leet of each manor. Similar officers were appointed in towns and boroughs. In the city of London there are four ale-conners, who are appointed by the liverymen in common-hall on Midsummer-day.

ALECTRYOMANCY, *ă-lek'-tri-o-măn'-se* (Gr. *alektryon*, a cock, *manteia*, divination), among the ancients, a mode of divination by means of cocks. It was performed by writing the twenty-four letters of the alphabet in the dust, upon each of which a grain of corn was laid. A cock was then let loose among the letters, and those out of which the bird picked the corn being joined together, were supposed to disclose what was required to be known. In this manner Jamblichus, the master of Proclus, is said to have divined that a person named Theodosius, Theodotus, or Theodorus, would succeed the emperor Valens, who, upon hearing of the matter, put to death several persons whose names began with those letters, and obliged Jamblichus to seek a voluntary death by poison, in order to escape his resentment.

ALEE, *a-lē'* (Ang.-Sax.), in Mar., the term used when the wind, blowing across the line of a ship's course, makes the sails and masts incline to what is then called the lee-side, or to leeward. It also means the situation of the helm when pushed close down to the lee-side of the ship, in order to put the ship about, or to lay her head to windward.

ALEHOUSES, *ail'-hous-es* (Sax. *eala* or *eale*, ale, and *hus*, house), houses in which ale and beer are sold. As early as the year 1496 the inconveniences arising from the assemblage of numbers of riotous persons, and of the excessive drinking in alehouses, became so great as to make them the subject of legislation. In the second year of the reign of Henry VII. an act was passed against "vacabounds and beggers," empowering two justices of the peace "to reject and put away comen ale-selling in tounes and places where they shall conveyent (convene), and to take suretie of the keepers of alehouses of their gode behaving by the discrecion of the said justices, and in the same to be avyed and aggreed at the tyme of their sessions." The 5 & 6 of Edw. VI. c. 25, gave to magistrates the power of forbidding the selling of beer and ale at such alehouses, and it was enacted "none should be suffered to keep alehouses unless publicly allowed at the sessions, or by two justices." This statute, which was the first act of the legislature that placed alehouses under the control of local magistrates, formed the commencement of the system of licenses. An act was passed in 1604, 2 Jac. I. c. 9, to restrain the "inordinate haunting and tippling in inns, alehouses, and other victualling-houses." Other statutes were enacted in the reign of James, one of which imposed a penalty on each person convicted of tippling in

an alehouse, of 3*s.* 4*d.* for each offence, and, in default of payment, punishment in the stocks for four hours. Other alterations were made in the 7 Jac. I. c. 10, the 21 Jac. I. c. 7, the 1 Car. I. c. 4, the 3 Car. I. c. 3; and, in 1654, during the Commonwealth, it was ordered, at the London sessions, that no new licenses should be granted for two years. After the Restoration, in 1682, it was ordered that no license should in future be granted to alehouse-keepers who frequented conventicles. In Locke's second Letter on Toleration he alludes to their having been driven to take the sacrament for the sake of obtaining licenses to sell ale. In 1729 the sale of spirituous liquors had become so common that an act was passed, 2 Geo. II. c. 28, enacting that no license should in future be granted but at a general meeting of the magistrates acting in the division in which the applicant dwells. This provision was evaded by men hawking spirits about the streets in wheelbarrows, and exposing them for sale on bulks, sheds, and stalls; and in 1753 a statute was passed, by the provisions of which, with some trifling amendments, the licensing of alehouses continued to be regulated for the remainder of that century. By a statute passed in 1808, 48 Geo. III. c. 143, a difference was introduced into the mode of licensing, for purposes connected with the collection of the revenue. In 1828 a general act was passed (9 Geo. IV. c. 61), which repealed all former statutes on this subject. Since then various regulations have been made, of which the following are the most recent and important. By the 3 & 4 Vict. c. 61, a license can only be granted to the real occupier of the house in which the beer or cider is to be retailed, and every person applying for a license must produce a certificate from the overseer of his being the real occupier of the house. Licensed victuallers and keepers of beershops who sell ale to be drunk on the premises, are liable to have soldiers billeted upon them. The 11 & 12 Vict. c. 49, and the 18 & 19 Vict. c. 118, regulate the sale of beer and other liquors on Sunday, Christmas-day, and Good Friday.

ALEMBIC, *a-lem'-bik* (Arab., *al*, the, *anbiq*, corrupted from the Greek word *ambix*—a cup or vase), a vessel formerly employed for distilling, that is to say, for separating volatile liquids from substances less volatile. (*See* DISTILLATION.) The alembic is one of the most ancient instruments of chemical research, and may be regarded as the type of all distillatory apparatus. In its original form, it is seldom used in the modern laboratory; but it must be confessed that it was admirably adapted to the processes in vogue among the alchemists, by whom it was chiefly used. It consisted of two portions, capable of being separated; the lower—known as the body, cucurbit, bolthead, belly, or chamber,—was a gourd-shaped vessel (whence the name "cucurbit," Lat. *cucurbita*, gourd), well fitted for being cleansed, or to have materials introduced. The head, or capital, was also singularly perfect in shape for the intended uses; it had a kind of channel all round to convey the liquid condensed in it to the beak, which was connected with the receiver. Several modifications of the alembic are used in the chemical arts.

ALEMBROTH, SAL, *a-lem'-brawth*, a famous preparation of the alchemists, now known to be a double chloride of mercury and ammonium, having the composition expressed by the formula $HgCl+NH_4Cl+HO$.

ALEURITES, *al-w'-ri-tees*, in Bot., a genus of dicotyledonous plants, belonging to the order *Euphorbiaceæ*. The most interesting species is *A. triloba*, the candlenut tree, the seeds of which contain the oil called *kukiu*, or *kekuna*, which is used in some parts of the world for illuminating purposes, and which has been recommended as a substitute for castor-oil in medicine.

ALEXANDERS, *al-ex-an'-ders*, a name given to an esculent umbelliferous plant, *Smyrnium olusatrum*, which was formerly cultivated like celery.

ALEXANDRIAN LIBRARY.—This was, probably, the largest library that had existed before the invention of printing. It was founded at Alexandria, about 284 B.C., by Ptolemy Soter, at the suggestion of Demetrius Phalerius, who had seen the public libraries at Athens. Agents were employed in different parts of Asia and Greece to seek out and purchase the rarest and most valuable works; so that, at length, the Alexandrian library is said to have comprised 700,000 volumes. At first, the books were contained in the museum in the Bruchcion quarter of the city; but, when they amounted to 400,000 volumes, a new library was formed, within the Serapeum, or temple of Serapis, where, at length, 300,000 were collected. During the plunder of the city, after its capture by Julius Cæsar, the old library was accidentally destroyed by fire. That in the Serapeum, however, still remained, and was subsequently largely augmented, particularly by the Pergamean collection, amounting to 200,000 volumes, presented by Mark Antony to Cleopatra, till it at length surpassed the former in the number and value of its contents. When the temple of Serapis was destroyed, in A.D. 390, by Theophilus, patriarch of Alexandria, under Theodosius the Great, a great part of the library was destroyed or lost; but it was not till the taking of Alexandria by the Saracens, in 642, that it was utterly destroyed. It is said that when Amrou, the victorious general, applied to the caliph Omar for instructions regarding the library, he was answered,—"If these writings of the Greeks agree with the Koran, or Book of God, they are useless, and need not be preserved; if they disagree, they are pernicious, and ought to be destroyed." Accordingly, it is said, the works were employed to heat the 4,000 baths of the city; and such was their number, that they lasted for six months.

ALEXANDRIAN MANUSCRIPT, *Codex Alexandrinus*, the name of a Greek manuscript of the Old and New Testaments, now in the British Museum. It was sent as a present to Charles I., from Cyrillus Lucaris, patriarch of Constantinople, by Sir Thomas Rowe, ambassador from England to the Porte. It is contained in four volumes quarto, of which the New Testament occupies the last, and is written on vellum, in double columns. The New Testament is, however, less perfect than the Old. It contains all the canonical and most of the apocryphal books, with several others. Critics are much divided as to the date of this work; but it seems most probable that it was written about the 5th century. A fac-simile of the New Testament was published by Dr. Woide, in 1786, and more recently one of the Old Testament has been published by the Rev. H. Baber.

ALEXANDRIAN SCHOOL.—When ancient Greece lost her glory and independence, literature and science found a refuge in Alexandria, under the munificent patronage of the Ptolemies. Ptolemy Soter, or his successor Ptolemy Philadelphus, established at Alexandria a *Museum*, whither learned men were invited from all parts, and maintained at the public expense, with every facility for cultivating the various branches of literature and science. At first it was principally distinguished as a school of grammar and criticism, producing correct editions of the ancients, and writing learned commentaries upon them. In poetry, the writers of this school are distinguished for correctness, purity, and elegance of style; but the more important part, the spirit and genius which characterized the earlier poetry of the Greeks, is almost entirely wanting. In philosophy, the Alexandrian school was a species of eclecticism, being an attempt to blend the systems of the East and West,—to unite the religious opinions of the East with the Greek dialectics. (*See* NEOPLATONISTS.) In the mathematical and physical sciences this school became very distinguished, having such men as Euclid, Apollonius, Eratosthenes, and Ptolemæus, the geographer. Alexandria continued to be distinguished as a seat of learning until its capture by the Saracens.

ALEXANDRINE VERSE, a species of verse, so called from its being first used in an old French poem on Alexander the Great, belonging to about the 12th century. Ronsard, however, was the first to render it popular, and it is now the regular heroic verse of the French. It consists of twelve syllables, broken into two regular hemistichs, i.e. every sixth syllable terminating a word. In English, the Alexandrine verse is rarely used throughout a whole poem, and the rule of dividing into hemistichs is occasionally violated. The second of the following lines is an Alexandrine:—

"A needless Alexandrine ends the song,
Which, like a wounded snake, drags its slow length along."

ALGÆ, *ăl'-jee* (Lat., seaweeds), in Bot., this great class of Thallogens (*see* this word) comprehends the sea-weeds and the multifarious green vegetable forms of simple cellular structure met with in fresh water and in permanently damp situations. The humblest members of the vegetable kingdom belong to this class. Algæ are flowerless, and consequently seedless. They are propagated in various ways by reproductive particles, called spores or sporules. The class comprehends a vast variety of plants, exhibiting a wonderful multiplicity of forms, colours, sizes, and degrees of complexity in structure. These plants have, however, been arranged into three groups or orders, which have certain striking distinctive characters. These three orders are named *Rhodosporeæ*, or *Florideæ*; *Melanosporeæ*, or *Fucoideæ*; *Chlorosporeæ*, or *Confervoideæ*. *Rhodosporeæ*, or red-spored algæ, grow in salt water, and are generally rose-red or purple, rarely brown-red or greenish-red. *Melanosporeæ*, or dark-spored algæ, are marine plants of an olive-green or brown colour. *Chlorosporeæ*, or green-spored algæ, are generally green, rarely red or livid purple, found sometimes in sea-water, but more frequently in fresh-water ponds, streams, and ditches, and on damp surfaces. Professor Bentley roughly estimates the number of species of algæ at 2,500. Many are used for food in different parts of the world, their nutritious properties being due to the presence of starch, mannite, mucilage, albumen, and gelose. The ashes of several kinds of sea-weeds form *kelp*, formerly extensively used for the preparation of carbonate of soda. Iodine is obtained from sea-weeds. None of the plants in this great class are known to be poisonous.

ALGAROBA, or ALGAROBILLA, *ăl-ga-ro-bil'-la*, the legumes of a species of mimosa used in the process of tanning. (*See* PROSOPIS.)

ALGAROTH, POWDER OF, *ăl'-ga-roth*, a mixture of the terchloride and teroxide of antimony, invented by Victor Algarotti, a Venetian chemist, formerly much used in medicine.

ALGEBRA, *ăl'-je-bra* (Arab. *al-djaber*, i.e. science of restitutions), the science of numbers considered generally. Arithmetic treats of the facts connected with figures, algebra of the laws that govern them; for instance, that 5 multiplied by 4 gives the same product as 4 multiplied by 5, is but an arithmetical fact; but to establish as a general principle that the product of any two numbers whatever is the same, no matter in what order they be multiplied, is an algebraical proposition. In algebra, numbers are represented by letters. It is a method of performing calculations of all sorts of quantities by means of general signs or characters.

Known quantities are generally represented by the first letters of the alphabet, as, *a*, *b*, *c*, &c. Unknown, by the last; as, *x*, *y*, *z*.

The sign + (*plus* or more) is the mark of addition. Thus, $a + b$ means that the quantities represented by *a* and *b* are to be added together. When no sign is prefixed, + is understood.

The sign − (*minus* or less) denotes subtraction; as, $a - b$, that is, the number represented by *b* is to be subtracted from that represented by *a*.

Quantities with the sign + prefixed are called positive or affirmative; and those with the sign − negative quantities.

The sign × (or multiplied *by*) denotes multiplication; as, $5 \times 4$ means that 5 is to be multiplied by 4.

÷ is the mark of division; thus, $a \div b$ means that *a* is divided by *b*.

A number prefixed to a letter is called a numeral coefficient. When no number is expressed, 1 is understood; i.e., 1 is the numeral co-efficient of such letter.

A simple quantity consists of one part or term, as $+a$, $-abc$; a compound quantity of more than one, connected by the signs + or −; as, $a + b$, $a - b + c$, are compound quantities. If there are two terms, it is called a *binominal*, if three, a *trinominal*, &c.

Like quantities consist of the same letters repeated; thus $+5b$, $-5ab$, are like quantities; but $+a5$, and $+a^2b$ are unlike quantities.

The powers of algebraic quantities are expressed by placing a *small figure* (equivalent to the number of factors, and called the index or exponent of the power) at the right-hand side of the letter. Thus $a \times a$, or the square of *a*, is expressed by $a^2$; $b \times b \times b$, or the cube of *b*, is expressed by $b^3$; $x \times x \times x \times x$, or the fourth power of *x*, is expressed by $x^4$; $\overline{a+b} \times \overline{a+b} \times \overline{a+b}$, or the cube of $a + b$, is expressed by $\overline{a+b}^3$, and so on.

The *roots* of quantities are expressed by the sign $\surd$, with the proper index annexed: thus; $^2\surd a$, or $\surd a$ expresses the square root of *a*; $^3\surd b$, the cube root of *b*; $^4\surd a+x$, expresses the biquadrate root of $a + x$, &c.

The sign = placed between two or more quantities, expresses the *equality* of such quantities; thus, $a + b = c + d$, means that $a + b$ is equal to $c + d$; and $ax + by = cx + dy = 2x + fy$, mean that the quantities $ax + by$, $cx + dy$, and $ex + fy$, are all equal to each other.

In algebraical operations the word *therefore*, or *consequently*, often occurs. To express this word the symbol ∴ is commonly used; thus, the sentence, "therefore, $a + b$ is equal to $c + d$," is expressed by $\therefore a + b = c + d$.

The symbol 7 placed between two unequal quantities signifies that the first is greater than the last; thus, $a \gtrdot b$, intimates that *a* is greater than *b*; but when the character is inverted, it signifies that the first quantity is less than the second; thus, $a \lessdot b$, intimates that *a* is less than *b*.

The operations of algebra are the same as those of arithmetic,—addition, subtraction, multiplication, division, extraction of roots, &c. In its application to the resolution of problems, the problem must first be translated out of common into algebraic language, by expressing all the conditions and quantities, both known and unknown, by their proper characters, arranged in an equation (*see* EQUATIONS), or several equations, if necessary, and treating the unknown quantity as if it were a known one: this forms the composition. Then the resolution, or analytic part, is the disentangling the unknown quantity from the several others with which it is connected, so as to retain it on one side of the equation, while all the known quantities are collected on the other side. This process is called analysis or resolution; and hence algebra is a species of analytic art. The mode of applying algebra to the resolution of problems may be seen in the following example:—From the given sum and difference of two numbers, to find the numbers themselves. Let *x* and *y* be the numbers, and *a* and *b* their sum and difference respectively:—

$$x + y = a \text{ and}$$
$$x - y = b$$

Adding the quantities on both sides of the symbol =, we have—

$$2x = a + b$$
$$x = \frac{a+b}{2}$$

Again, subtracting the quantities on both sides of the symbol −, we have—

$$2y = a - b \text{ and}$$
$$y = \frac{a-b}{2}$$

And hence arises the general algebraical truth, that the greater and less of two numbers are respectively equal to half their sum and half their difference. For particular cases, we have only to substitute the respective numbers instead of *a* and *b*, in order to have immediately the corresponding values of *x* and *y*. The origin of algebra cannot be determined with exactitude. In the middle of the 4th century, when the mathematical sciences were declining, Diophantus wrote a treatise on arithmetic, in thirteen books, of which seven only remain to us. Hypatia, the daughter of Theon, who fell a victim to the fury of a mob, in the early part of the 5th century, wrote a commentary on the work of Diophantus: this, however, is also lost. In the 10th century, the works of Diophantus were discovered in the Vatican library at Rome. They were written in the Greek language, and were translated into Latin by Xylander, in 1575. A more complete translation, by Bachet de Mezeriac, appeared in 1621. In 1670, the French mathematician Fermot published notes of his own on the writings of Diophantus. The important invention of algebra, as well as numeral characters and decimal arithmetic, was first made

known in Europe by the Arabians, who had collected the works of the Greek mathematicians, and translated them. By means of the Arabic tongue, Euclid was first introduced into Western Europe. The Arabians award the invention of algebra to their famous mathematician Mahommed Ben-Musa, or Moses, who was also called Mahommed of Buziana, in the 9th century, a copy of whose treatise on the subject is preserved in the Bodleian library at Oxford. The science of algebra was originally introduced into Italy by Leonardo, a merchant of Pisa, who had spent his youth in Barbary, and there become acquainted with the Indian method of computing by nine numeral characters. He composed a treatise on Arithmetic in 1202, which he afterwards revised in 1228, two centuries before the invention of printing. The manuscript was discovered in the middle of last century, in the Magliabecchian library at Florence. The first book on algebra that ever was printed was written by Lucas Paciolus, or Lucas de Borgo, a Minorite friar. It appeared in 1494 and again in 1523. It is called "Summa de Arithmetica, Geometria, Proportione, et Proportionalita." Not only are we indebted to Italy for the first European knowledge of algebra, but it was there that it received its earliest improvements at the hands of Scipio Ferreus, Florido, Tartalea of Brescia, Cardan, Lewis Ferrari, and Bombelli. Stifelius and Scheubelius, two German mathematicians, were contemporary with Cardan and Tartalea. Stifelius introduced the characters which denote addition and subtraction, and the symbol for the square root. The first treatise on algebra, in English, was from the pen of Robert Recorde, a mathematician and physician of Cambridge. Vieta was the first who introduced general symbols, applicable to all problems of the same kind, without the labour of repeating the same process of analysis for each; thus happily applying algebra to geometry.—*Ref.* Bonnycastle's translation of Bossut's *Histoire des Mathématiques;* the *Histories* of Montucla, Corsali, and Libri; and Hutton's *Mathematical Tracts.*

ALGORITHM, *ăl'-go-rithm*, derived from the Arabic, the root being a word which means or refers to calculation or reckoning. Among many authors, and especially the Spanish, the word is naturalized, as meaning the science of numbers, or system of notation: thus, there is an algorithm of the differential calculus, an algorithm of function, &c. Though sometimes used by English writers, our language does not need it, the word *notation* being an exact equivalent.

ALGUACIL, *ăl-gwa'-seel*, in Spain, is the general name of officers for the apprehension of criminals. The alguacil-mayor is a higher officer, with similar functions.

ALHAGI, *ăl-hai'-gi*, in Bot., Camel's-thorn, a gen. of leguminous plants in the sub-ord. *Papilionaceæ.* The species *A. maurorum*, a native of Persia, yields a kind of manna, which is used as food for cattle. The manna is obtained by shaking the branches of the tree.

ALHAMBRA, *ăl-haw'-bra* (a corruption of the Arab. *kulat al-hamra*, the red castle), the name of a celebrated fortress, which formed the acropolis, or citadel, of the city of Granada, and in which was situate the palace of the ancient Moorish kings of Granada. It was fortified in the strongest manner, and was capable of containing 40,000 men. The emperor Charles V. also commenced erecting a palace within its walls, but it was never finished. The fortress is surrounded by noble woods and delicious gardens; the wall which encompasses it being more than a mile in circuit. The magnificent Moorish palace inside the wall was commenced by Ibnu-l-ahmar, in 1248, and continued to receive additions during the next hundred years. Portions of this building still remain, and are at the present day called by the Spaniards the Casa Real. The Court of the Lions is the grand apartment of the palace; it is so termed from a splendid fountain, supported by lions, entirely built of marble and alabaster, and ornamented with the most graceful fretwork and arabesques. The court is 100 feet long, by 50 broad, and has 128 columns of white marble. The windows are chiefly towards the interior, the Arabian architect giving his reasons for this peculiarity of construction in an inscription reading thus:—"My windows admit the light and exclude the view of external objects, lest the beauties of Nature should divert your attention from the beauties of my work." Over the walls, ornaments are profusely scattered, in colours of gold, pink, light blue, and dusky purple. Although no longer inhabited, this beautiful example of mediæval architecture is preserved as a work of art, and is placed under the charge of a governor and a number of invalid soldiers. Some of its beauties have been reproduced in the "Alhambra Court" of the Crystal Palace at Sydenham.—*Ref.* the works of Washington Irving for its history, and Owen Jones's *Alhambra* for a complete description of its ornamentation and architecture.

ALHAMBRAIC, *ăl-haw'-brai-ik*, a term given to a particular style of ornamental art, which is founded upon the decoration of the celebrated Moorish palace of the Alhambra, at Granada (*see* ALHAMBRA). In this style all imitations of men and animals are omitted, while the floral and vegetable forms employed bear only a distant resemblance to nature. Rich metallic elaboration and gorgeous colouring are the chief characteristics of the Alhambraic style; but, so exquisite was the taste of the Moorish artists who invented it, that it was always harmonious.

ALIAS (Lat., otherwise), a word used to denote a name or title that has been assumed by, or accidentally given to, a person; as, Thomas, *alias* Jones. An alias may be assumed by any one, but does not absolve him from the responsibility of an act committed under his assumed name. It is also a second writ issued from the courts at Westminster, where the first has been issued, and returned without effect.

ALIBI, *ăl'-i-bi* (Lat., elsewhere, in another manner), in Law, is a term used to express that defence in a criminal prosecution, where the party accused, in order to prove that he could not have committed the crime charged upon him, offers evidence that he was in a different place at the time of its commission.

ALIEN, *aï'-li-en* (Lat. *alienus*, another man's, of another country), generally speaking, is one born in a foreign country, out of the allegiance of the king or other executive of that in which he is for the time resident or staying. In order to ascertain the nature of an alien, it will be better to consider who are natural-born English subjects. They are persons born within the allegiance, power, or protection of the crown of England, which terms embrace not only persons born within the dominions of her majesty or of her homagers, and the children of subjects in her *service* abroad, and the queen's children and heirs of the crown, all of whom are natural-born subjects by the *common law*, but also under various statutes, all persons, though born abroad, whose fathers or grandfathers by the father's side were natural-born subjects at common law, unless the father or paternal grandfather through whom the claim is made was, at the time of the birth of such children, liable, in case of his return into this country, to the penalties of treason or felony, for was in the service of any foreign prince then at enmity with the crown of England, excepting always from the benefit both of the common law and the statutes those artificers and manufacturers who are declared aliens by 5 Geo. I. c. 27. Artificers, however, may now go abroad (5 Geo. IV. c. 97). Persons born in transmarine territories belonging to the queen of England in any other right than that of the English *crown* (as formerly the Hanoverians), and persons doing service to the queen as officers of transmarine territories, are *not* natural-born subjects. A child born out of the allegiance of the crown of England is not entitled to be deemed a natural-born subject, unless the father be, at the time of the birth of the child, not a subject only, but a subject by birth. An alien born could not, till lately, hold anything except a lease of his house. But now, by 7 & 8 Vict. c. 66, s. 3, every person born out of her majesty's dominions, of a mother being a natural-born subject, is capable of taking and holding any property; and by sec. 5, every alien residing in any part of the United Kingdom, and being the subject of a friendly state, may take and hold any lands or tenements for the purpose of residence or occupation by him or his servants, or for business purposes, for a term not exceeding twenty-one years. A license to purchase,

take, or hold property may, however, be obtained from the crown. An alien cannot sit in parliament or privy council, nor hold grants or offices of trust under the crown, nor act as a juryman, except in cases where an alien is to be tried, who is entitled to have a jury composed of half Englishmen and half foreigners. An alien enemy is the subject of another state at actual war with our own, and does not possess even the bare right of residence, or the power of enforcing any contract or suing for any debt due to him. But where a foreigner is resident in England, and afterwards a war breaks out between his country and ours, his goods are not liable to be seized; and if a contract be made with him during peace, the right of action is not absolutely forfeited by the occurrence of a war, though it is suspended. As to the removal of disabilities of alien friends, *see* DENIZATION, NATURALIZATION.

ALIENATION, *ai-li-e-nai'-shun* (Lat. *alienatio*, *alieno*, I alienate, pass away, discard), in Law, any method whereby estates are voluntarily resigned by one man and accepted by another, whether it be by sale, gift, marriage settlement, devise, or other transmission of property, by the mutual consent of the parties. All persons are *primâ facie* capable both of conveying and purchasing, unless the law has laid them under any particular disabilities. Ecclesiastical persons are enabled, for particular purposes, and subject to certain conditions, and by consent of proper parties, to make dispositions of their benefices. Such lay corporations as are called municipal (viz., corporated towns) may dispose of the corporation estates, with the approbation of the lords of the Treasury, or any three of them, and on such terms as they may think fit to approve. Lay corporations aggregate, in general (subject to the restraint imposed on such as are municipal), have a right to alienate freely their lands of inheritance. Conveyances by idiots and insane persons, except during a lucid interval, are void, except feoffments, which are only voidable. Conveyances by infants are in general not void, but voidable, either by themselves in their lifetime, or by their representatives after their death; but if confirmed by the infant on coming of age, cannot afterwards be impeached by his representative. Their disposition by will is, however, void altogether. Conveyances by persons under duress are voidable, and may be affirmed or avoided when the duress ceases. Conveyances of her estate by a married woman (except as far as regards her equitable interest in land settled to her separate use) are absolutely void, unless made in such particular method as the law has specifically appointed for the purpose.

ALIMENTARY CANAL, or DUCT, *ăl-i-men'-ta-re* (Lat. *alimentum*, nourishment, food), is the name given to that great canal or conduit in animal bodies through which the food passes from the mouth to the anus. It distinguishes animal from vegetable life, plants having no common receptacle for their food nor canal for carrying off the excrements. In the human subject, it comprises the pharynx, œsophagus or gullet, stomach, and large and small intestines, being, in a full-grown individual, nearly forty feet in length.

ALIMENTS, *ăl'-i-ments* (Lat. *alimentum*, from *alo*, I nourish), a term applied to those substances which, upon being taken into the stomach, are capable of affording nourishment to the body. Every aliment must be derived from either the animal or vegetable kingdom, as the capacity of affording nourishment to the animal system would appear to belong exclusively to organized matter, or that which has possessed life. Nevertheless, certain substances appertaining to the inorganic kingdom, although incapable of themselves to form an aliment, have yet the power, when taken in conjunction with aliments, of assisting in the process of nutrition. These inorganic substances are principally water, salt, lime, &c. Aliments have been distinguished into nine classes. The first, or *Farinaceous* class, includes barley, wheat, oats, rice, maize, potatoes, haricots, lentils, peas, &c. The second, or *Mucilaginous* class, comprehends melons, cabbages, turnips, beet-root, carrots, asparagus, &c. The third, or *Sweet* class of aliments, includes dates, apricots, dried grapes, figs, the various sorts of sugars, &c. In the fourth, or *Acidulous* class, there are grapes, strawberries, raspberries, mulberries, pears, prunes, apples, cherries, oranges, gooseberries, &c. In the fifth, or *Fatty* class, there are animal fats, oils, butter, cocoa, nuts, walnuts, olives, sweet almonds, &c. The sixth, or *Caseous* class, includes the various sorts of milk, cheese, &c. In the seventh, or *Gelatinous* class, there are, several kinds of fish, the flesh of young animals, calf's-foot, &c. In the eighth, or *Albuminous* class, there are included brain, eggs, &c. The ninth, or *Fibrinous* class, comprehends the flesh and the blood of various animals. To these nine divisions a tenth may be added, comprehending the *Condiments*, as pepper, salt, mustard, vinegar, horseradish, &c. Certain liquids, or *Drinks*, should also be reckoned among the aliments, as water of various kinds (spring-water, well-water, river-water), the infusions of tea and coffee; the various kinds of fermented liquors, as cider, perry, beer, wine, &c.; the alcoholic liquors, as gin, whisky, brandy, &c. As a rule, aliments require to be prepared by cooking, so as to be made more agreeable to the palate, or more easy of digestion, but few aliments being used in an undressed or natural condition.—*Ref.* Hooper's *Lexicon Medicum*; Mrs. Beeton's *Book of Household Management*.

ALIMONY, *ăl'-i-mun-e* (Lat. *alimonia*, sustenance), in LAW, is a provision made for the support of a wife pending a suit instituted by her or her husband, either for a dissolution of marriage or a judicial separation. By the Divorce Act, 20 & 21 Vict. c. 85, s. 32, the Court on Divorce may order the husband to secure to the wife a sum of money, in gross or by annual payments, for any term not exceeding her own life, as, having regard to her fortune, the ability of her husband, and the conduct of the parties, it shall deem reasonable, and to enforce this by deed. The court has also the power, pending the suit, to make interim orders for payment of money to the wife, by way of alimony or otherwise. If the suit be instituted by the husband, the court can suspend its decree until the provision be secured.

ALIQUANT PART, *ăl'-i-kwant* (Lat. *aliquanta pars*), in Arith., a number which cannot measure any other without some remainder. Thus, 5 is an aliquant part of 12; for twice 5 wants 2 of 12, and three times 5 exceeds 12 by 3. The exact reverse of aliquot.

ALIQUOT, *ăl'-i-kwot* (Lat. *aliquoties*, how many times), a number or fraction which divides another number or fraction, without leaving a remainder. Thus, 6, 4, 3, 2, 1½, ⅔, and ½, are aliquot parts of 12, being contained in it 2, 3, 4, 6, 8, 28, and 96 times. At one time aliquot parts, expressed by vulgar fractions, were frequently used in arithmetic; but, now, the employment of decimals has, to a great extent, superseded their use.

ALISMACEÆ, *ăl-is-mai'-se-e*, in Bot, an ord. of monocotyledonous plants, in the sub-class *Petaloideæ*. Swamp or floating plants, with parallel-veined leaves. Their flowers are perfect, or very rarely unisexual. The perianth is inferior, that is to say, it does not adhere to the ovary, and is arranged in two whorls, each consisting of three parts; the outer whorl being green, the inner coloured. The stamens vary in number, and there are several ovaries. Plants belonging to this order are principally found in the northern parts of the world. The typical genus is *Alisma*, the water-plantain, some species of which are well adapted for aquaria.

ALIZARINE, *a-liz'-a-reen*, the pure colouring matter of madder. Purpurin and garancine are also found in this dye-stuff.

ALKAHEST, *ăl'-ka-hest*, in Alch., a term applied to the long-sought-for universal solvent, or menstruum of the ancient chemists, touching which Kunkel asks, —"If it dissolve all substances, in what vessels can it be contained?" There is little doubt but that the alchemists had sufficient sense to ask the same simple question. Paracelsus, Van Helmont, and Glauber call sulphate of ammonia by this name, but they never pretended that it was a universal solvent. The derivation of the word is, according to some, from the Arabic; according to others, from the German *al*, all, and *geist*, spirit.

ALKALI, *ăl'-ka-li* (Arab. *al-kali*, soda).—This term is applied, in Chem., to a class of substances characterized by the energy with which they combine with acids, by their acidity and caustic property, and by their action on vegetable colours. The ancient chemists

included only three substances under this name,—vegetable alkali, or soda; mineral alkali, or potash; and volatile alkali, or ammonia. To these modern chemists add three alkalies proper—lithia, cæsia, and rubidia, and the alkaline earths — lime, strontia, baryta, magnesia, and a number of others too rare to need mention. With the exception of ammonia, these alkalies are all oxides of metals, called alkaline and alkaline-earth metals. The pure form of these oxides is called the caustic state, from the burning properties possessed by them all when not combined with any acid. When they are in combination with carbonic acid, which is a very weak acid, they are said to be in their mild form, and still preserve, in a minor degree, many of their characteristics as alkalies. Many vegetable substances, such as bark, opium, nightshade, and others, possess crystalline principles which, from behaving like alkalies, have been named alkaloids. Quinine, morphine, and atropine, are examples of these. Most of them form salts with acids; for instance, we have desulphate of quinine, acetate of morphine, and so on.

ALKALIMETER, *ăl-ka-lim'-e-ter* (Arab. *al-kali*, and Gr. *metron*, a measure). (*See* ALKALIMETRY.)

ALKALIMETRY, *ăl-ka-lim'-e-tre*, the art of determining the proportion of caustic alkali, or alkaline carbonate, contained in commercial potash or soda, upon the amount of which depends their value for manufacturing purposes. The method by which this is effected, is by adding to a certain amount of the potash or soda dissolved in water, enough dilute sulphuric acid of definite strength to exactly neutralize the alkali, and noting this quantity. For instance, if it is found that one dram of the test acid will neutralize seven grains of pure alkali, it is evident that, if six drams are required to neutralize fifty grains of impure potash, there are only forty-two grains, or 84 per cent., of pure alkali in the sample, the other 16 per cent. being combined with another acid, or replaced by some neutral compound.

ALKALINE EARTHS.—Baryta, strontia, and lime are so called to distinguish them from the earths proper. Their solutions are alkaline to test-paper, and their carbonates are insoluble in water; this latter fact distinguishing them from the alkalies proper, magnesia, and alumina.

ALKALOIDS, VEGETABLE, *ăl'-ka-loids* (Arab. *al-kali*, Gr. *eidos*, likeness).—The discovery of these substances is one of the most remarkable of modern chemistry. They are salifiable bases, found in various vegetable substances, and are similar in their actions to the mineral alkalies mentioned above, uniting with acids to form salts. They are all violent poisons, highly nitrogenous, sparingly soluble in water, but more so in alcohol and dilute acids. They are prepared by boiling the substance containing them in dilute hydrochloric acid, neutralizing by a mineral alkali where the alkaloid is precipitated in an insoluble form. The following is a list of the principal vegetable alkaloids, and the substances from which they are derived. They are of the greatest value in medicine, the exhibition of the fraction of a grain being attended with the most marked curative results. They are often found in books with the termination *ine* instead of *ia*, the latter being the more correct.

Morphia, from opium.
Quinia, Cinchonia } from Peruvian bark.
Strychnia, from nux vomica.
Veratria, from hellebore.
Atropia, Hyocyamia } from belladonna.
Nicotnia, from tobacco.
Aconita, from aconite.

ALKANET-ROOT, *ăl'-ka-net*, a dye-stuff, giving a red colour, used for staining woods and for colouring oils and spirits used in perfumery. It is the root of the plant named by botanists *Anchusa tinctoria*.

ALKORAN. (*See* KORAN, vol. I. of this work.)

ALLA, *ăl'-la* (Ital., in the), a term used adverbially in Mus., in various ways; as, *Alla-* or *Al-antica*, 'in the old style,' as applied to compositions of a preceding age, no longer fashionable. *Alla-breve*, 'quick time,' wherein the notes take but half their general length; the noble fugue in the "Messiah," entitled "And with his stripes we are healed," is written in this measure. *Alla Capella*, 'in the church style.' *Alla Zoppa*, or *Alsop*, 'in an affected style.' *Alla-* or *Al-loco*, 'in its place,' a term which denotes, in violin music, that the hand, having been shifted, must return to its position. *Alla-* or *Al-ottava*, 'in the octave,' applied to voices or instruments where the parts lie, note for note, an octave above or below. *Alla-* or *Al-reverso*, 'the reverse,' applied to parts in a contrary direction. *Al-improvista*, 'extemporaneous.'

ALLAH, *ăl'-la* (Arab. *al*, the, and *ilah*, deity), is the Arabic name of the Supreme Being, which, through the Koran, has been adopted by all nations that have embraced the Mohammedan faith.

ALLANITE, in Min. (*See* ORTHITE.)

ALLA-PRIMA, *ăl'-la pre'-ma* (Ital., all at once), in Paint., a term applied to that method of applying all the colours upon the canvas *at once*, without any retouching. Many of the finest works of the old masters were painted in at once in this way; but the method demands too much artistic skill, knowledge, and decision to be generally employed.—*Ref.* Hundertpfund's *Art of Painting restored*.

ALLECRET ARMOUR, *ăl'-le-cret* (Ger., all-strength), a convenient armour, much worn in the 16th century. It consisted of a casque, breastplate, and gussets, which sometimes reached to the middle of the thigh, and sometimes below the knees. The Swiss were the first infantry that cased themselves in steel; and so famous did they become, that the opinion respecting foot-soldiery underwent a total change, and the services of the Swiss infantry were eagerly sought by all the continental monarchs. In the paintings and prints of the period the Swiss soldiers are commonly depicted in this armour.



ALLECRET ARMOUR.

ALLEGIANCE, *ăl-le'-jănse* (old Fr., from Lat. *ad ligare*, to bind to), is the natural, lawful, and faithful obedience which every subject owes to his prince. It is either perpetual, where one is a subject born, or has the right of a subject by naturalization, &c.; or it is temporary, by reason of residence in the state or country. To subjects born, it is an incident inseparable, and as soon as born, they owe, by birthright, obedience to their sovereign; and it cannot be confined to any kingdom, but follows the subject wherever he goes. The subjects are hence called *liege people*, and are bound by this allegiance to go with the king to his wars as well within as without the kingdom. By the common law all persons above the age of twelve years were required to take the oaths of allegiance in courts-leet; and there are several statutes requiring such oath to be taken on being appointed to certain offices, and otherwise.

ALLEGORY, *ăl'-le-gor-e* (Gr. *allegoria*, a parable), in Rhet., is the description of a subject, or the representation of a train of thought by means of another subject having similar properties. Thus Menenius Agrippa made use of an allegory when, in addressing his fellow-citizens at Rome, he described their rebellion under the figure of a conspiracy of the several members of the body against the stomach. Allegory has been a favourite mode of expression in all ages and countries, particularly among the Orientals; and it is sometimes the fittest or most available means of giving a lively or intelligible representation of certain subjects or notions.

ALLEGRETTO, *al-lai-gret'-to*, the diminutive of allegro, a term used in Mus. to denote that the time is not so quick as that of allegro.

ALLEGRO, *al-lai'-gro* (Ital., merrily, sportively), in Mus., a term denoting the third degree of quickness. It is also used in combination with other terms; for example, *allegro agitato*, quick and agitated; *allegro furioso*, vehemently quick; *allegro assai*, more quickly; *allegro di molto*, very quickly; *allegro non molto*, not very quick; *allegro ma non presto*, quick, but not extremely so.

ALLEMANDE, *al-le-mand'* (Fr., *German*), a term applied to a dance supposed to be of German origin; whence the name. Formerly it was a slow dance; but at the present time it is understood to be moderately quick. By Handel and others of his contemporaries it was composed in four-crotchet time.

ALL-FOURS, *all-forez'*, a game of cards, played usually by two persons, but sometimes by four, with a complete pack, and so named from the four chances therein, for each of which a point is scored, and which, joined in the hands of either of the party, are said to make *all fours*. The chances are,—*high*, the best trump out; *low*, the smallest trump dealt; *Jack*, the knave of trumps; *game*, the majority of pips reckoned from such of the following cards as the respective players may have in their tricks,—every ace counting 4, king 3, queen 2, knave 1, and ten 10. Low is always scored by the person to whom it is dealt; but Jack, being the property of whoever can win or save it, the possessor is allowed to revoke and trump with that card, and, when turned up as trump, the dealer scores. It is also allowable for the player who lays down a high or low trump to inquire whether the same be high or low. After cutting for deal, six cards are given to each player, and the 13th turned up for trump. If the eldest does not like his cards, he may, for once in a game, say *I beg*, when the dealer must either give a point or three more cards to each, and turn up the 7th for trump; but if that should prove of the same suit as the first turned up, then three more cards are to be given; and so on, till a different suit occurs. The cards rank as at whist, and each player strives to secure his own tens and court cards, or to take those of his adversary. Ten or eleven points form the game.

ALLIANCE, *ăl-lī'-anse* (Fr. *alliance*), in International Law and Pol., a league between two or more friendly powers. An alliance may be either offensive and defensive or defensive only. Politicians divide them into three classes,—those in which the allied states undertake to prosecute a war with their whole force; those in which auxiliary states furnish a principal state with a certain fixed contingent of men, arms, money, &c.; and those in which one power undertakes to furnish troops to another power for stated subsidies.

ALLIGATION, *ăl-li-gal'-shun* (Lat. *ad*, and *ligare*, to bind together, or unite). A rule of Arith., by which the price of a mixture is found when the cost of the ingredients is known. This rule is divided into two cases,—alligation medial and alligation alternate. The following question would belong to alligation medial. Suppose 8 gallons of brandy, at 2*s.* per gallon, to be mixed with 12 gallons at 3*s.* per gallon, what would be the price of a gallon of the mixture? But if the question were reversed, and it were required how many gallons of brandy, at 3*s.* per gallon, must be mixed with 8 gallons at 2*s.* per gallon, to make the cost of the mixture 30*s.* per gallon, it would belong to alligation alternate. Questions of this sort are most easily resolved by the use of elementary algebra.

ALLIGATOR. (*See* CROCODILE FAMILY.)

ALLIGATOR TORTOISE. (*See* TORTOISE.)

ALLITERATION, *ăl-lit'-e-rai-shun* (Lat. *ad*, to, *litera*, a letter), an ornament chiefly used in poetry, consisting of the repetition of the same letter at certain intervals; as,—

"Apt alliteration's artful aid;"

or,—

"An Austrian army, awfully array'd,
Boldly, by battery, besieged Belgrade."

In Anglo-Saxon, Scandinavian, and old German poetry, alliteration served a purpose similar to that of rhyme in modern verse.

ALLIUM, *ăl'-li-um* (Lat., garlic), in Bot., a gen. of plants belonging to the nat. ord. *Liliaceæ*, the Lily tribe. Many species are very familiar plants, being largely cultivated for the sake of their nutritious and piquant bulbs; such are *Allium Cepa*, the onion; *A. sativum*, the garlic; *A. Porrum*, the leek; and *A. ascalonicum*, the shalot. All the species are characterised by a strong, and, to most people, an extremely disagreeable odour. *Allium ursinum*, the common ramps of our meadows, diffuses its peculiar odour through the air, and imparts its unpleasant flavour to the milk of the cows that feed upon it. The substance which gives the garlic and onion their pungent smell and flavour is a compound oil, called by chemists *sulphide of allyle*. (*See* ALLYLE.) In England, the onion is used much more frequently than any other species. In France, the garlic is held in great esteem, and employed to flavour almost every savoury dish. In Spain and Portugal, the two bulbs are employed rather as every-day articles of food than as mere condiments; while the Arab, Moorish, and Ethiopian tribes are even greater devourers of garlic and onions than the inhabitants of the Peninsula. Among the ancient Egyptians the onion formed an object of worship, and their modern descendants assign it a place in their Paradise. The different species of Allium, when cultivated in warm climates, lose much of their pungency; hence the mild flavour of the Spanish onion. The bulb of the common garlic, *Allium sativum*, though rarely used by the medical practitioner, is known to have properties which might render it a valuable agent in the treatment of some diseases. When taken internally, it is tonic, stimulant, expectorant, and diuretic. Externally it acts as a local irritant and resolvent, and is employed as an antispasmodic liniment for infantile convulsions.

ALLOCATION, *ăl-lo-cai'-shun* (Lat. *allocatio*), admitting an article of account, especially in the Exchequer. It is, more properly, a placing or adding to a thing.

ALLOCATUR, *ăl-lo-cai'-tur* (Lat., it is allowed), in Law, a practical term applied to the certificate of allowance of costs, by the master of the court, on taxation.

ALLOCHROITE, *ăl-lok'-ro-ite*, in Min., a variety of garnet. (*See* GARNET.)

ALLOCUTION, *ăl-lo-cu'-shun* (Lat. *al*, for *ad*, to, and *locutio*, a speaking), is an address, usually of a formal nature, and particularly applied to an address delivered by the pope at the College of Cardinals, on matters of importance to the Church.

ALLODIUM, *ăl-lo'-di-um* (Lat. from the Ger. particle *an*, and *lot*, land obtained by lot).—When the barbarous nations had invaded the Roman empire, the vassal's estate became certain for life, then went to all his descendants. Opposed to feudal property is allodium, which is a possession held in absolute independence, without any acknowledgement of a lord paramount. There are no allodial lands in England, all being held, either mediately or immediately, of the queen. Allodium obtained among our Saxon ancestors, and gave birth to gavelkind (which *see*). Instances of the term occur in Domesday Book, where it signifies a free manor; and Alsdorii, lords of free manors, or lords paramount. — Ref. 1 *Co. Litt.* 5; Cowell; Blount; *Rob.* vol. i. ch. v. note 8.

ALLONGE. (*See* LUNGE.)

ALLOPHANE, *ăl'-lo-fain* (Gr. *allos*, other, *phaino*, I appear), in Min., the name given to a clayey mineral, of a pale blue or greenish colour. Chemically, it is a hydrated silicate of alumina. It loses its colour before the blowpipe: hence its name.

ALLOTROPISM, *ăl-lot'-ro-pism* (Gr. *allotropos*, capable of being turned from one thing into another), in Chem., a term applied to a modification in the properties of a body, not resulting from chemical combination, but from the arrangement of its molecules. Phosphorus, in its usual state, is a waxy, semi-transparent body, of a pale lemon-colour, which is so inflammable that the heat of the hand is sometimes sufficient to kindle it; but, by a simple though dangerous process, this substance can be procured in an allotropic state, when it is an infusible substance of a dark-red colour, which will not take fire until heated to 500° F., when it is reconverted into ordinary phosphorus. Again, iodide of mercury, when freshly sublimed, is of a lemon-yellow colour, but it becomes scarlet if pressed or agitated. Sulphur can be made to take several allotropic forms. The diamond,

graphite or plumbago, and soot, are allotropic forms of the element carbon. Silica is soluble in water in one allotropic state, and insoluble in another. In all these cases, the change of properties is not due to the addition or subtraction of anything, but to some inexplicable molecular action.

ALLOY, *ăl-loi'* (Fr. *allier*, to mix), a natural or artificial mixture of two or more metals. Alloys appear, from the experiments of Boussingault, Crookewitt, Hunt, and others, to be definite chemical compounds. This view is confirmed by several facts. Native alloys generally occur in atomic combination. Alloys are always different in colour, density, and other physical properties, to those that would be possessed by a mere mechanical mixture of their constituent metals. Brass, for instance, is a yellow compound of a red and white metal. Speculum metal is so brittle, that it may be pounded in a mortar; while its constituents, tin and copper, are malleable metals. The principal alloys will be noticed in detail, under their respective metals or names. The word alloy, at one time, was used in a depreciatory sense, and was applied to the mixture of gold or silver with a baser metal; but it has since received an extended signification, meaning the union of two or more metals, except when mercury is one of them, the word *amalgam* (which *see*) being used in this case. The principal alloys used in the arts are pewter, brass, bronze, electrum, solder; German and nickel silver; bell, Britannia, gun, speculum, and type metal.

ALL-SAINTS' DAY (in old English, *All-Hallows*, *All-Hallowmas*, or simply *Hallowmas*), a festival of the Roman Catholic church, celebrated on the 1st of November, in commemoration of all the saints in general. The saints had become so numerous in the Church, that a day could not be set apart for each of them; in fact, there were not days enough in the year for that purpose; and hence, in 835, the 1st of November was appointed for all such as had not special days for themselves. The popular usages which in our own and other countries have come to be connected with this day, or rather the preceding eve or night, are evidently of pagan origin, and came afterwards to be sanctioned by the Church.

ALL-SOULS' DAY, a festival of the Roman Catholic Church, held on the 2nd of November, for the souls that are suffering in purgatory. It was first instituted at Cluguy, by Odilo, abbot of that place, towards the end of the 10th century, and soon came to be observed by the Church generally.

ALLSPICE, *awl'-spice*, the dried unripe fruit of the *Eugenia Pimento*, a plant of the Myrtle order. It is much used as a spice, and is thought to combine the flavours of cinnamon, cloves, and nutmegs; hence its common name. It is sometimes called Jamaica pepper, from the island in which it is chiefly cultivated, and sometimes pimento.

ALLUSION, *ăl-lu'-zhun* (Lat. *al'lusio*, a playing or sporting with), in Rhet., a figure by which is denoted something as applied to, or understood of another, on account of some similitude between them.

ALLUVION, *ăl-lu'-vi-on* (Lat. *ad*, to, and *luo*, I wash upon,—an accretion), in Law, is where land is gained from the sea by the washing up of sand and earth, so as in time to make *terra firma*.

ALLUVIUM, *ăl-lu'-vi-um* (Lat. *a'luere*, to wash upon), in Geol., a name formerly given to those accumulations of sand, earth, and loose stones or gravel brought down by rivers, which, when spread out, form what are called alluvial plains and deltas. The term is seldom employed by modern geologists. (*See* FLUVIATILE DEPOSITS, DELTA.)

ALLYLE, *ăl'-lil*, in Chem., a hypothetical organic radicle, having the composition $C_6H_5$, supposed to exist in the fetid oil obtained from garlic. This oil is called by chemists *sulphide of allyle*, its composition being $C_6H_5S$, or six equivalents of carbon, five of hydrogen, and one of sulphur. To the presence of this compound the odour of the whole onion family (*see* ALLIUM) is due. Assafœtida also contains this strong-smelling oil.

ALMACANTAR, or ALMUCANTAR, *ăl-ma-can'-tar* (Arab. *almocantharat*), in Astron., a term formerly applied to all the small circles parallel to the horizon. Thus, any two stars having the same almacantars have the same altitude.

ALMACANTAR'S STAFF, in Astron., an instrument formerly used at sea for observing the sun's amplitude at rising or setting, whereby to determine the variations of the compass, &c.

ALMAGEST, *ăl'-ma-jest*, the name of a celebrated book composed by Ptolemy; being a collection of a great number of the observations and problems of the ancients, relating to geometry and astronomy, but especially the latter. It is the first work of this kind which has come down to us, and contains a catalogue of the fixed stars, with their places, besides numerous records and observations of eclipses and the motions of the planets.

ALMA MATER, *ăl'-ma mai'-ter* (Lat., a nourishing mother), a term applied to a university by those who have studied at it, to distinguish it from inferior schools of learning.

ALMANAC, *ăl'-ma-năk* (Arab. *al*, the, and *manah*, to count), is an annual publication, giving the civil divisions of the year, the movable and other feasts, the times of the various astronomical phenomena, and other useful or entertaining information. Almanacs existed among the Alexandrian Greeks in or after the time of Ptolemæus. The time of their first appearance in Europe is not known. The first of any note was that by Purbach, 1450-61. The first printed almanac was that of Regiomontanus, which appeared from 1475 to 1606. In England the universities and the stationers' company possessed a monopoly of the trade in almanacs from the time of James I. to 1775, when a decision of the court of Common Pleas in favour of one Carnan, a bookseller, abolished it. The *Nautical Almanac*, published by the Admiralty, for the use of astronomers and seamen, is brought out two or three years in advance. The stamp duty, of fifteen pence per copy, to which almanacs were long subjected, was abolished in 1834. (*See* CALENDAR.)

ALMANDINE, *ăl-man'-deen*, in Min., a gem found in Greenland, Ceylon, and the Brazils. It is an iron garnet, and consists of silica 36·3, alumina 20·56, protoxide of iron 43·2.

ALMAYNE RIVETS, *ăl'-main*.—In the 17th century almayne rivets were introduced as a means of holding together the overlapping plates of armour worn as a defence to the person. The thigh-pieces of the mailed suit in which the Swiss soldier shown at p. 51 is attired, were secured together by these rivets, which, being constructed to move in slits, allowed of a freer motion to armour than it formerly had. They were invented in Germany; whence the name, almayne being the mediæval word for Germany.—*Ref.* Hewitt's *Ancient Arms and Weapons in Europe*; Skelton's *Illustrations of the Goodrich-Court Armoury*.

ALME, or ALMA, *ăl'-me*, are a class of girls in Egypt, whose occupation it is to amuse company with singing and dancing, and who, like the Italian *improvisatori*, can occasionally pour forth their thoughts in unpremeditated verse. They are called Alme from having received a better education than other girls.

ALMOND, *'a'-mond*, in Bot. (*See* AMYGDALUS.)

ALMONER (formerly called *almatour*), *a'-mo-ner* (Fr. *aumoner*, to pay a fine for the poor), in the primitive sense of the word, denoted an officer in a religious house, to whom belonged the management and distribution of the alms of the house. By the ancient canons, all monasteries were to spend at least a tenth part of their income in alms to the poor. The almoner of St. Paul's was to dispose of the moneys left for charity according to the appointment of the donors, to bury the poor who died in the neighbourhood, and to breed up eight boys in singing, for the use of the choir. By an ancient canon, all bishops are required to keep almoners.—*The Almoner* (*le Grand Aumonier*) *of France* was the highest ecclesiastical dignitary in that kingdom before the Revolution. To him belonged the superintendence of all hospitals and houses of lepers. The king received the sacrament from his hand, and he said mass at all grand solemnities. Almoner is also a fashionable title given by some writers to chaplains. In this sense we meet with almoner of a ship, almoner of a regiment, &c.—*Almoner, Lord*, or *Lord High Almoner of England*, is an ecclesiastical officer, generally a bishop, who had formerly the forfeiture of all deodands (which are now abolished), and the goods of *felos-de-se*, which he was to distribute

amongst the poor, and his office was to give the king's alms every day. He also had the power of giving the first dish from the king's table to whatever poor person he pleased.—*Ref. Fleta*, lib. 2, cap. 23.

ALMS, *ams* (Sax. *almes*), denotes what is given out of charity to the poor.

ALMSHOUSE, an edifice, or collection of tenements, erected generally by a private individual, and endowed with a revenue, for the maintenance of a certain number of poor, aged, or disabled persons.

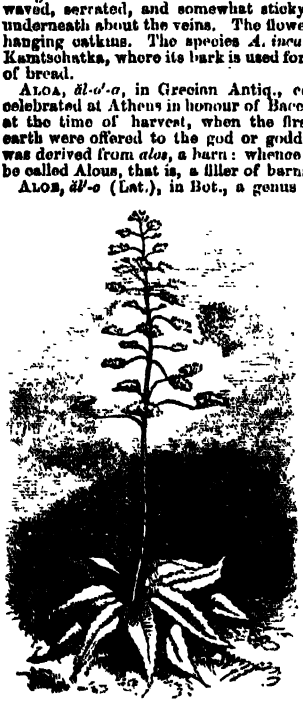
ALNAGE, *ăl'-nāj* (Fr. *aulnage*), a measure, particularly the ell.—*Ref.* Cowell; Blount.

ALNAGER, or AULNAGER, *ăl'-na-jer* (Fr. *aîner*), is properly a measure by the ell, and the word *aune*, in French, signifies an ell.—Alnager was also an officer of the king, who, by himself or his deputy, looked to the assise of all the cloth made of wool throughout the land, and to put a seal for that purpose ordained, and he was to be accountable to the king for every piece of cloth that was so sealed in a fee or custom appertaining to it.—*Ref.* Cowell; Blount; *Termes de la Ley*.

ALNUS, *ăl'-nus*, in Bot., the Alder, a genus of plants belonging to the Birch order *Betulaceæ*. The species *A. glutinosa* is a well-known tree. Its timber resists the destructive action of water for a long time, and on this account is much used for the piles of bridges. Its bark is astringent, and has been employed in medicine and for tanning; it is also used as a dye-stuff, giving a red colour when alone, and black when added to a solution of copperas. It is a low tree with a rugged bark, and grows in moist situations. The leaves are roundish, waved, serrated, and somewhat sticky, being downy underneath about the veins. The flowers grow in long hanging catkins. The species *A. incana* is found in Kamtschatka, where its bark is used for making a kind of bread.

ALOA, *ăl-o'-a*, in Grecian Antiq., certain festivals celebrated at Athens in honour of Bacchus and Ceres, at the time of harvest, when the first-fruits of the earth were offered to the god or goddess. The term was derived from *alos*, a barn: whence Ceres came to be called Alous, that is, a filler of barns.

ALOE, *ăl'-o* (Lat.), in Bot., a genus of monocotyledonous plants, belonging to the nat. ord. *Liliaceæ*, the Lily tribe. There are several species, all natives of warm climates, but capable of being cultivated in colder regions as ornamental garden plants. The leaves are succulent, and edged with spines; they yield the juice which, when inspissated, constitutes the bitter drug called aloes (*see* this word). The flowers are usually red, growing in a bunch at the top of the stem.



AMERICAN ALOE.

ALOE, the American. (*See* AGAVE.)

ALOES, a drug used medicinally in small doses as a tonic, and in larger doses as a purgative and an emmenagogue. It is the inspissated juice of the leaves of various species of *Aloe*. There are several commercial varieties imported, but the origin of some is not accurately determined. Barbadoes aloes is obtained from the species *Aloe vulgaris*. Both socotrine and hepatic aloes are probably prepared from *A. soccotrina* and *A. purpurascens*; for the difference between the two kinds may be accounted for by a difference in the mode of treating the juice. Thus, when the juice from the species *A. soccotrina* is inspissated by artificial heat, the product resembles socotrine aloes; but when it is allowed to dry up without the aid of artificial heat, it resembles hepatic aloes. Cape aloes is chiefly obtained from *A. spicata*; Indian aloes from *A. indica*; but the varieties known as horse or caballine aloes. Mocha aloes, and Curaçoa aloes, have not been traced to their respective sources.

ALOETIC ACID, *ăl-o-et'-ik*, an acid formed by the action of nitric acid upon aloes, used in dyeing.

ALOFT, *ă-loft'*, in Mar., signifies at the masthead, or in the tops or higher part of the rigging.

ALONGSIDE, *ă-long-side'*, in Mar., a term importing that a ship is parallel to another, or to a wharf.—*Along-shore*, navigating a vessel along the shore or coast.—*Along-shore Owner* is one who sends his vessel to sea in want of stores and provisions.

ALONSINE or ALPHONSINE TABLES, *a-lon'-sin*,' an astronomical work which appeared in the year 1252, under the patronage of Alonso X., reputed by some to be constructed by Isaac Ben Said, a Jew; by others, by Al Cabit and Aben Ragel, the preceptors of Alonso. —*Ref.* Delambre, *Histoire de l'Astronomie du Moyen Age*.

ALOYSIA, or LIPPIA, *ă-loi'-si-a*, in Bot., a gen. of plants belonging to the nat. ord. *Verbenaceæ*. *Aloysia*, or *Lappia citrio[illegible]*, is the sweet verbena or lemon-plant of our gar[illegible].

ALPACA, *ăl-pa'-ca*, in Zool., a species of the gen. Lama, with which it is so closely allied, that by some it is set down as being only a variety of it. The alpaca inhabits the mountainous parts of Peru, and obtains its aliment from the coarse and scanty herbage growing on the sterile soil of those elevated regions. Its general form bears a close resemblance to that of the sheep, but its head and neck are more graceful. The upper part and sides of this animal's body are covered with light chestnut-brown wool, which hangs down in slightly curled meshes almost a foot in length. This wool is extremely soft and elastic, and is nearly as fine as that of the Cashmere goat. The face, up to the posterior margin of the jaws, has short smooth hair; but, from the forehead, a stiff silky hair falls over the eyes. The shearing of the wool takes place annually, from 10 to 12 lbs. of wool being obtained from a single animal.

ALPACA WOOL, *ăl-pāk'-a*.—This wool is obtained from the alpaca, or paco, an animal half sheep, half goat, inhabiting the mountains of Peru. Great efforts have been made to naturalize it in this country, in Germany, and in Australia. In the latter country, the experiment has been attended with great success. The wool of the alpaca is long, lustrous, and silky. Its manufacture into textile fabrics was begun in 1843, at Bradford, in Yorkshire, and has since progressed at such a rate, that Mr. Titus Salt, of that town, has built one of the largest and most splendid factories in the world, which in itself constitutes a town called Saltaire, a compound of the name of its founder and that of the river upon which it stands.

ALPHABET, *ăl'-fa-bet* (from *alpha* and *beta*, the names of the two first letters of the Greek alphabet), is a term applied to the letters of which a language is composed, in their natural or accustomed order. In spite of the extreme diversity of languages, most alphabets present, in the number, order, and even form of their letters, decided evidences of a common origin. It has been disputed, whether to the Egyptians, Chaldeans, or Phœnicians, belongs the honour of having invented the written characters. The common opinion, however, is, that we are indebted for them to the Phœnicians. Cadmus is said to have brought the Phœnician alphabet, consisting of 15 letters, into Greece, about 1493 B.C. This was subsequently altered and added to, and became the ground of the Roman alphabet, which is now in use over Europe. The English language comprises 26 letters; French, 25; Italian, 20; Spanish, 27; German, 26; Russian, 41; Latin, Hebrew, Chaldee, Syriac, 22; Greek, 24; Arabic, 28; Persian, 32; Turkish, 33; and Sanskrit, 50. The Chinese have, properly speaking, no alphabet; but they have 214 radical or elementary characters.

ALPINIA, *ăl-pin'-i-a* (from Prosper Alpin, a celebrated botanist), in Bot., a gen. of aromatic herbaceous plants, in the nat. ord. *Zingiberaceæ*, the Ginger tribe. The roots of the species *A. galanga* and *A. chinensis* constitute respectively the Java and Chinese, or greater and lesser galangals. These roots have similar properties to ginger, and are used for the same purposes. The ovoid China cardamum, used in veterinary medicine, is the fruit of *A. alba*. The seeds of this plant are commonly employed as a condiment by the Chinese.

ALSINEÆ, *ăl-sin'-e-e*, in Bot., the Chickweed sub-ord. of *Caryophyllaceæ*. There are numerous genera; *Alsine*, *Cerastium*, *Arenaria*, and *Stellaria*, being examples. (*See* CARYOPHYLLACEÆ.)

AL SIRAT, *se-rat'* (Arab., the path), according to the belief of some of the Mahometan sects, is the name of the bridge which spans Hades, and over which every one must pass in order to enter Paradise. It is said to be as narrow as the edge of a razor. Those who are unencumbered with the weight of sin may pass over it with the rapidity of a steed in full course; but those whose iniquities bear them down, will tumble from it into the infernal depths beneath.

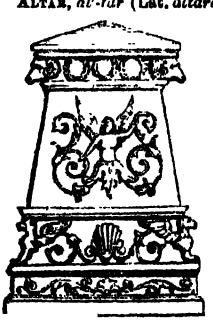
ALSODEÆ, *ăl-so'-de-e*, in Bot., one of the two sub-orders into which the nat. ord. *Violaceæ* has been divided. The species have regular flowers, with anthers not furnished with appendages. (*See* VIOLACEÆ, VIOLEÆ.)

ALSTONIA, *ăl-sto'-ne-a*, in Bot., a gen. of dicotyledonous plants, belonging to the nat. ord. *Apocynaceæ*, the Dog-bane tribe. The species *A. scholaris* has a bitter tonic astringent wood, and is a native of South America.

ALSTRŒMERIA, *ăl-stre-meer'-i-a*, in Bot., a gen. of plants belonging to the Amaryllis ord., or *Amaryllidaceæ*. The species are all South American. Their leaves are twisted, so that what should be the upper surface becomes the lower; their roots are succulent, and rich in starch. The starch is extracted, and used as a kind of arrowroot by the inhabitants of the districts wherein these plants flourish.

ALT, *ălt* (Lat. *altus*, high), in Mus., a term applied to that part of the scale which commences with F, the fifth line in the treble clef, and ends at E, the third ledger line above the same clef.

ALTAR, *ăl'-tar* (Lat. *altare*), a place erected to offer sacrifice upon. The first altar of which we have any notice was that erected by Noah when he quitted the ark. In the tabernacle, and afterwards in the Temple, two altars were erected, one for sacrifices the other for incense. The table for shewbread is also sometimes called an altar. Among Christians, the altar is a square or oblong table, or tablet, placed at the east end of the church, for the celebration of the mass in Roman Catholic, or of the sacrament in Protestant churches.



ALTAR.

ALTAR-PIECE, is a painting in churches, placed over the altar. They seem not to have been introduced until about the end of the 4th century.

ALTERATIVES, *ăl'-te-ra-tivs* (Lat. *altero*, I change), in Med., is a term employed to denote a class of remedies that have the power of gradually changing the state and condition of the functions, secretions, &c., of the human body. Alteratives are usually administered in frequent small doses; and in this way some of our most active and even poisonous drugs produce very beneficial effects.

ALTERNATE, *al-ter'-nait*, in Her., a term used in respect to the situation of the quarterings. Thus, the first and fourth quarters, and the second and third, being generally the same, are called alternate quarters.

ALTERNATION, *al-ter-nai'-shun*, in Math., a term applied to the changes of orders in any number, called also permutation. It is found by a continual multiplication of all the numbers; thus, to know how many changes can be rung on six bells, multiply the numbers 1, 2, 3, 4, 5, 6 continually into one another, and the last product is the answer.

ALTERNATION OF GENERATIONS. (*See* GENERATIONS, Alternation of.)

ALTERN BASE, *ăl'-tern*, in Math., a term used in contradistinction to the true base. Thus, in oblique triangles, the true base is either the sum of the sides (the difference of the sides then forming the true base), or the true base is the difference; in which case the sum is the altern base.

ALTHÆA, *ăl-the'-a* (Gr. *altheo*, I heal), the marsh-mallow, a gen. of plants belonging to the nat. ord. *Malvaceæ*. The species *A. officinalis*, the common marsh-mallow or wymote, is an indigenous perennial, growing in salt marshes near the sea, and on the banks of rivers, blossoming during August and September. Its flowers, which are rather large and rose-coloured, are arranged, three or four together, on axillary stalks. The leaves are hoary, green, odourless, soft, and downy, having a mucilaginous taste. The whole plant abounds in mucilage, particularly the root, which is used in medicine. In France, marsh-mallow is a favourite demulcent. The famous *pâte de Guimauve* is composed of the substances obtained from the root, with gum-arabic, sugar, and white of egg. Buchner states that the chief constituents of the marsh-mallow root are a fatty oil, starch, glutinous matter, uncrystallizable sugar, althein, and mucilage. Its chief principle, *althein*, is identical with *asparagine*. It is crystallizable, odourless, and almost tasteless. *A. rosea*, the hollyhock of our gardens, is another well-known species. It has similar properties to the common marsh-mallow, and its flowers are officinal in Greece. From the leaves, a blue colouring matter resembling indigo is extracted. Strong fibres suitable for cordage have been obtained from the stem.

ALTITUDE, *ăl'-ti-tude* (Lat. *altitudo*, height), in Astron., is the height of a celestial body above the horizon. It is measured by the angle which a line from the eye to the star or planet makes with the horizontal line. An altitude may be *true* or *apparent*. If it be taken from the real horizon, the altitude is true; if from the apparent or sensible horizon, the altitude is apparent; or rather, the apparent altitude is that which appears to our observation, and the true is that from which the refraction is subtracted. The true altitudes of the heavenly bodies differ but little from their apparent altitudes, on account of their distance from the earth's centre, and the smallness of the earth's semi-diameter compared thereto. In observatories, altitudes are taken by means of telescopes attached to graduated circles, and at sea, by instruments called sextants. (*See* ASTRONOMY.)

ALTITUDE, in Geom., one of the dimensions of a body, being the same with what is commonly called height. The altitude of a figure is the distance of its vertex from its base; in other words, it is the length of a perpendicular line let fall from the vertex to the base. The altitude of a cone is measured by a line perpendicular to the plane of the base, drawn between the vertex and base of the cone.

ALTO, *ăl'-to*, in Mus., a term applied to the highest male voice, the ordinary compass of which is from F, the fourth line in the bass, to C, the third space in the treble.

ALTO CLEF. (*See* CLEF.)

ALTO RELIEVO. (*See* RELIEVO.)

ALUDEL, *ăl'-u-del.*—The aludels of the ancient chemists were pear-shaped glass vessels, open at both ends, which were joined together to form a series.

ALUM, *ăl'-um* (Lat. *alumen*), a salt consisting of sulphate of alumina in combination with sulphate of potash, soda, or ammonia. Potash and ammonia alum are used in dyeing, in calico-printing, in paper-making, in the manufacture of colours, and in medicine. Alum is obtained by submitting alum-shale, which consists of alumina, iron pyrites, and coaly matter, to the action of fire in enormous heaps for one or two years. During the combustion, the sulphur of the iron pyrites (sulphide of iron) combines with the oxygen and alumina, forming sulphate of alumina, which is dissolved out of the cooled mass by water. This solution is then converted

into alum by the addition of either sulphate of potash or sulphate of ammonia, the latter being most generally used on account of its cheapness. The principal sources of alum-shale are at Hurlet and Campsie, near Glasgow, and at Whitby, in Yorkshire. Alum is also manufactured in great quantities by Spence's process from various materials derived from coal and from the coal strata. Sulphuric acid is, in the first place, made from the iron pyrites with which the coal-measures abound. This, when heated with roasted coal-shale, which contains alumina in large quantities, forms sulphate of alumina, with excess of sulphuric acid. The ammoniacal liquor of gas-works is boiled, and the vapour conducted through the hot solution of acid sulphate of alumina, the acid being neutralized by the formation of sulphate of ammonia. The ammonia alum crystallizes in large masses, and is purified by redissolving and recrystallizing. Ammonia alum is more valuable than potash alum, from containing 11·90 per cent. of alumina, which is the active ingredient, while potash alum contains but 10·82 per cent. About 20,000 tons of alum are now annually manufactured in the United Kingdom. Mr. Peter Spence, of Manchester, manufactures about one-third of this quantity. Soda alum is not used in the arts. The great use of alum in dyeing and printing is on account of the property possessed by alumina of uniting with and precipitating certain vegetable substances in an insoluble form. These, when made into pigments, form lake. (*See* Dyeing, Calico-Printing, and Lakes.) Muslin dipped in a solution of alum is rendered incombustible.

Alumina, *a-lu'-mi-na* ($Al_2O_3$), the sesquioxide of the earth-metal aluminium, the principal constituent of clays. The hydrate is obtained in the form of a gelatinous precipitate, by adding ammonia, or carbonate of ammonia, to a solution of alum. By drying and igniting, it is changed into the anhydrous sesquioxide, insoluble in water, but soluble in acids and alkalies. Mr. Walter Crum has discovered a modification or allotropic condition of alumina, produced by igniting bi-acetate of alumina, which is soluble in water, and forms a translucent coagulum with dye-woods. By the addition of a small quantity of acid, alkali, or even neutral salt precipitation of alumina, in a third allotropic condition takes place; this form being insoluble in acids, but soluble in alkalies.

Alumina, Acetate of.—The acetate of alumina is much used in the arts on account of the easiness with which it parts with its alumina. It is formed by adding acetate of lead to sulphate of alumina, and filtering off the insoluble sulphate of lead.

Alumina, Silicate of.—The chief ingredient in common clay.

Alumina, Sulphate of.—This salt is now used extensively in the arts, under the name of "aluminous cake," "patent alum," and "concentrated alum." It is made by treating the calcined clays of Devonshire and Dorsetshire with sulphuric acid, precipitating the iron, in the form of Prussian blue, by prussate of potash. This substance promises to supersede alum, being cheaper and containing a larger percentage of alumina.

Aluminium, *al-u-min'-i-um*, in Chem., a metal, which has lately attracted much attention from its peculiar lightness. It was discovered by Wöhler in 1827. Its preparation has been very much simplified by the celebrated French chemist Deville, and it is now regularly prepared as a commercial product in the following manner:—Anhydrous alumina is mixed with charcoal and oil, and ignited in a covered crucible. When cold, the mass is broken to pieces, and exposed at a red heat to the action of chlorine gas. Chloride of aluminium is formed, and, when cold, is mixed with half its weight of chloride of sodium and fluor spar. This mixture is placed in a crucible with one-eighth of metallic sodium, and heated to the melting-point of the materials employed. The sodium seizes on the chlorine, leaving the aluminium in a reguline state. Aluminium thus prepared is a bluish-white metal, similar to silica. It becomes as hard as iron on being hammered and rolled. Its extraordinary lightness, 2·5 (the specific gravity of glass) has already led to its employment in jewellery; and, as the manufacture becomes cheaper, many more uses will arise. It forms a hard gold-coloured alloy with copper, called aluminium bronze, which promises to be useful. It consists of 90 per cent. of copper and 10 per cent. of aluminium. Its other alloys are very promising, and are under investigation. Added to iron in the proportion of 25 per cent., it prevents the oxidation of that metal by moist air. Its price has decreased from £3 to 5*s.* per ounce during the last four years; and, being four times as light as silver, it only costs one quarter the price of that metal, weight for weight.

Alum-Root, a name given to the root of the *Geranium maculatum*, which contains much tannin. It is used in North America as an astringent.

Alums, in Chem.—Common alum is the type of a series of double salts, consisting of an alkaline sulphate in combination with the sulphate of a metallic sesquioxide, but which do not necessarily contain alumina. The principal alums are:—

Sulphate of potash and alumina.
" ammonia "
" soda "
" potash and iron.
" " manganese.
" " chromium.

The alums crystallize in cubes or octahedræ, and contain 24 equivalents of water of crystallization.

Alumstone, or Alunite.—A mineral found near Civita Vecchia, in Georgia, at Pic-de-Lancy, in France, and in the Grecian archipelago. It consists of alumina 37·13, sulphuric acid 38·53, potash 11·34, and water 13. is one of the principal sources of alum.

Alveola, *al- ē'-o-la* (Lat. *alveolus*, a small hollow vessel), in Bot., a term applied to any little pit or socket, but particularly to a cavity in the receptacle where the seed is placed.

Alyxia, *a-lix'-i-a*, in Bot., a gen. of dicotyledonous plants, belonging to the Dog-bane ord. *Apocynaceæ*. The species *A. stellata* has an aromatic bark, resembling in properties that of canella.

Amadou, *am'-a-doo* (Lat. *ad manum dulce*, soft to the touch), a spongy substance, generally known as German tinder, which can be ignited by a spark from a flint-and-steel. It is prepared by soaking thin slices of the fungi *Polyporus igniarius* and *fomentarius* in a solution of nitrate of potash (saltpetre), after they have been softened by beating with a mallet. Similar slices not treated with the salt are sometimes used in Surg. to give support to affected parts, and also to restrain hemorrhage. When impregnated with gunpowder, the prepared fungus forms black amadou. Slices of the species *Polyporus squamosus* and *betulinus* are pressed, rubbed with pumice, and formed into razor-strops. (*See* Polyporus.)

Amalgam, *a-mal'-gam* (Gr. *malagma*, that which is made soft).—Mercury mixed with any metal with which it will combine, forms a pasty or fluid mass called an amalgam, and is, in fact, an alloy of mercury. (*See* Alloy, Gilding, Gold.) The property which mercury possesses of dissolving gold is taken advantage of, in the various processes for extracting this metal from its powdered ore. The mercury is afterwards distilled off, leaving the gold in a pure form. Amalgam for electrical machines is made by adding tinfoil in small pieces to mercury, until they form a paste.

Amanita, *am-a-ni'-ta*, in Bot., a gen. of fungi, thus named from Mount Amanus, in Cilicia, where they were very abundant. The species have a close resemblance to some edible fungi, and are not unlike the common English mushroom. *Amanita muscaria* is a very poisonous kind, though the natives of Kamtschatka are in the habit of eating it for the sake of its narcotic effects. It grows very abundantly in some parts of Kamtschatka, and is collected and dried by the natives. When steeped in the expressed juice of the whortleberry, it imparts to the liquid the intoxicating properties of strong wine, and when swallowed alone, it speedily produces drunkenness. One or two small fungi are a common dose to cause a pleasant intoxication for a whole day. In too large doses it induces violent spasms.—*Ref.* Johnston's *Chemistry of Common Life*.

Amaranthaceæ, *am-a-ran-thā'-se-e*, in Bot., the Amaranth ord. of dicotyledonous plants. There are 46 genera and 486 species, herbs or shrubs, nearly all natives of tropical regions.

AMARANTHUS, *ăm-a-răn'-thus*, in Bot., the typical gen. of the nat. ord. *Amaranthaceæ*. Some of the species have bright-coloured persistent flowers, and have been introduced into this country as ornamental garden plants. The best-known are *A. caudatus* (Love-lies-bleeding) and *A. hypochondriacus* (Prince's-feathers).

AMARYLLIDACEÆ, *ăm-a-ril'-li-dăl'-se-e*, in Bot., the Amaryllis ord. of monocotyledonous plants. There are 68 genera and 400 species, natives of many parts of the world, but most abundant at the Cape of Good Hope. Several of these plants have poisonous properties, and some yield excellent fibres.

AMARYLLIS, *ăm'-a-ril'-lis*, in Bot., the typical gen. of the nat. ord. *Amaryllidaceæ*. Several beautiful garden and greenhouse plants are included in this genus. They are remarkable for their brilliant and symmetrical flowers, which exhale a sweet perfume. Each plant consists of a bulb, from which the leaves are produced, so as to issue directly from the soil; and from the midst of these leaves springs a stem, which is terminated by one or many lily-like flowers, either red, yellow, or pink.

AMAUROSIS, *ăm'-aw-ro'-sis* (Gr. *amauros*, obscure), in Path., is a blindness or obscurity of vision, proceeding from a diseased state of the optic nerve, or of that part of the brain in connection with it. It generally comes on gradually, with dimness or confusion of sight, variations of colour, or the presence of floating objects called *spectra*. It is commonly occasioned by long-continued over-excitement of the organs of vision, or by sudden exposure to a bright light, or it may proceed from a disordered state of the stomach. It is also sometimes hereditary. It may be permanent, or only temporary. In a full habit, it is to be treated by depletion; in the weak, by tonics and alteratives. Counter-irritants are also to be used; as, blisters behind the ears, or a seton in the back of the neck, or on the temples.

AMAZONS. (*See* vol. I. of this work.)

AMBASSADOR, *ăm-băs'-sa-dor* (Fr. *ambassadeur*), in Diplom. signifies an agent, sent by one sovereign power to another to treat on affairs of state and matters affecting the interests of his country. Ambassadors are of two kinds; those that reside regularly at the court to which they are accredited, and those that are sent there on a special occasion, the latter being styled "ambassadors extraordinary." The duties of an ambassador are to watch over the interests of his own country at the foreign court; to negotiate for treaties and alliances; to enforce the performance of existing treaties, to protect his countrymen from injury or injustice, and to aid them in case of need. Ambassadors, together with their families and suites, enjoy perfect security of person, and their property is protected against all legal process. They are usually, also, exempted from custom duties and from all taxes, and are allowed the free exercise of their religion.

AMBER, *ăm'-ber* (Fr. *ambre*, Sp. *ambar*, Gr. *elektron*), a resinous mineral solid, of a fine yellow colour, which, on being rubbed, becomes strongly electric. It has given its name to the science of electricity, being the first substance which was found to possess such properties. It is much used for jewellery and pipe mouthpieces. Dissolved in chloroform, it forms one of the best photographic varnishes. It is found abundantly on the shores of the Baltic, and, occasionally, in Greenland, England, Italy, Spain, Sicily, Siberia, and China. It is supposed to be a fossil gum or resin, from its constituents and properties, and from containing the bodies of insects inclosed in its mass.

AMBER, ACID OF. (*See* SUCCINIC ACID.)

AMBERGRIS, *ăm'-bĕr-gris* (Fr. *ambre*, amber, *gris*, grey).—Ambergris is a morbid secretion of the sperm whale, much used in perfumery, found floating on the sea, or deposited on the coast. Although possessed of little scent, it imparts a delicate odour to other perfumes.

AMBREINE, *ăm'-brine*, the fragrant principle of ambergris.

AMBROSIA, *ăm-bro'-zhe-a* (Gr. *a*, not, and *brotos*, mortal), in Heathen Myth., was the name given to the food of the gods, as distinguished from *nectar*, which was their drink. It was supposed to endow them with eternal youth and immortality; and mortals who were permitted to partake of it were in some measure assimilated to the gods, receiving an increase of strength and beauty. Ambrosia was also the name of certain festivals observed in Greece in honour of Bacchus, during the vintage.

AMBRY, *ăm'-bre* (Lat. *armarium*, a storehouse, locker, cupboard), the place where the arms, plate, vessels, and everything which belonged to housekeeping, were kept.

AMBULANCE, *ăm'-bu-lans* (Lat. *ambulo*, I walk), a term derived from the French, and applied to those moving hospitals which accompany every army, or division of an army, in the field, furnished with all the requisites for the succour of the sick or wounded. It is also applied to the waggons or carts provided for conveying the wounded from the field of battle. The latter are termed by the French *ambulances volantes*, and were first introduced in 1703, by Larrey, the celebrated French military surgeon. (*See* LARREY, vol. I. of this work.) During the late Russian war, improved ambulance-carts were constructed and sent out to the Crimea.

AMBUSCADE, *ăm'-bus-kaid*, in Mil., a term derived from the Italian *imboscare*, to lie in bushes or concealed, and signifying the lying in wait or in concealment of a body of troops to attack an enemy unawares.

AMELANCHIER, *ăm-e-lăn'-she-er*, in Bot., a gen. of plants belonging to the sub-ord. *Sanguisorbeæ*, of the nat. ord. *Rosaceæ*. The species *A. canadensis* is a native of the arctic regions, and its fruit, called the shad-berry, or service-berry, is used for mixing with pemican.

AMEN, *ai'-men'*, a word derived from the Hebrew, and signifying, properly, firm or faithful. In the beginning of a sentence, it is used by way of emphasis, as, *verily*, or *truly*; and at the end, especially of prayers or hymns, it signifies *so be it*, or *so let it be*.

AMENDE HONORABLE, *a-mand' hon-o-rabl'* (Fr.), a kind of punishment inflicted in France upon traitors, parricides, or sacrilegious persons. It was thus inflicted: the offender being delivered into the hands of the hangman, he was stripped of his shirt, and a rope put about his neck, and a taper in his hand; he was then led into court, where he was obliged to beg pardon of God, the king, the court, and his country. Sometimes the punishment ended here; but sometimes it was only a prelude to death or banishment to the galleys.

AMENDMENT, *a-mend'-ment* (Lat. *emendatio*, an emendation, or strengthening), in Law, is the correction of an error in the process, which may be amended, even after judgment. Such correction cannot be made where the error lies in giving the judgment itself. In such case, it is not amendable, but the judgment may be reversed or corrected by a majority of the judges of a court of error, composed of the judges of the different courts, or such of them as can attend, upon a writ of error sued out by the party aggrieved by the judgment.

AMENDMENT in Pol. (*See* BILL IN PARLIAMENT.)

AMENTACEOUS, *ă-men-tā'-se-us*, in Bot., a term applied to those plants which bear catkins (*see* AMENTUM), as the oak, willow, poplar, birch, and walnut.

AMENTUM, or CATKIN, *ă-men'-tum*, in Bot., a kind of spike, which only bears barren flowers, that is, only stamens or pistils; these being separated from each other by bracts. The whole amentum usually falls off in one piece, soon after flowering or fruiting. The species of willow called palm in England has very fine catkins, and the young branches bearing them were formerly used to deck churches on Palm Sunday.

AMERCIAMENT, *ă-mer'-si-a-ment* (Lat. *amerciamentum*), in Law, signifies the pecuniary punishment of an offender against the queen, or lord of a franchise, in her or his court, that is found to be in *misericordia*, i.e., to have offended, and to stand at the mercy of the queen or lord. It was the usual punishment inflicted by the court leet for public nuisances committed within its jurisdiction; but as these courts are seldom held, and their powers have fallen into desuetude, in consequence of the ready justice afforded by courts of law, amerciaments may be now considered as obsolete.

AMERICANISMS, *ă-mer'-i-ka-nisms*, words or phrases used in the United States of America, but not current in England, occuring chiefly in conversation or in epheme-

ral writings, the works of standard American authors containing very few of them. The number of new words introduced in America is comparatively small. The Americanisms are chiefly words or phrases used in a different sense from that which they have in England; as, *I guess* or *reckon*, for I *think* or *suppose*. In some instances, words that have become obsolete, or whose meanings have changed in England, are preserved in America, and fall under this class.

AMETHYST, *ăm'-e-thist* (Lat. *amethystus*), a var. of crystallized quartz, having a violet tint, due to a small quantity of manganese. The most beautiful specimens are obtained from Ceylon, India, and Persia. It is also found near Cork, in Saxony, and in Transylvania. The Oriental amethyst is a purple variety of the sapphire, and consists of alumina, with a small portion of oxide of iron.

AMI. (*See* AMY.)

AMIABLE, or AMICABLE, NUMBERS, *ăm'-i-ka-bel*, in Arith., are those which are mutually equal to the sum of each other's aliquot parts. Thus, 220 and 284 are amicable numbers: the aliquot parts of 220 are, 1, 2, 4, 5, 10, 11, 20, 22, 44, 55, 110, which are equal to 284; and those of 284 are 1, 2, 4, 71, 142 = 220.

AMIANTHUS, *ăm-i-ăn'-thus*, a fine variety of sabestos. (*See* ASBESTOS.)

AMICUS CURIÆ, *a-mi'-kus ku'-ri-e.*—It not unfrequently happens that a counsel, not retained in a cause before the court, mentions some case within his knowledge which has been decided, bearing on the point under discussion, or makes a suggestion in aid of the argument. He is then styled *amicus curiæ*, or friend of the court.

AMIDES, *ăm'-i-dees*. The amides are compounds formed from ammonia by the substitution of one or more equivalents of a metalloid, a halogen, or an acid base, for one or more equivalents of the hydrogen.

| Ammonia. | Trichloramide. | Diniodamide. | Acetamide. |
|---|---|---|---|
| $N\left\{\begin{matrix}H\\H\\H\end{matrix}\right.$ | $N\left\{\begin{matrix}Cl\\Cl\\Cl\end{matrix}\right.$ | $N\left\{\begin{matrix}I\\I\\H\end{matrix}\right.$ | $N\left\{\begin{matrix}C_4H_3O_2\text{ (acetyl)}\\H\\H\end{matrix}\right.$ |

Inorganic amides are not very numerous; but the number of acid bases in organic chemistry being almost endless, the organic amides are correspondingly numerous. (*See* AMINES.)

AMIDINE, *ăm'-i-dine*, the soluble portion of starches.

AMIDOGEN, *a-mid'-o-jen*, a hypothetic base, containing two equivalents of hydrogen to one of nitrogen.

AMINES, *ăm'-i-nees*.—The amines are compounds formed from ammonia, in the same way as the amides, by the substitution of a metal or salifiable compound radicle.

| Ammonia. | Potassamine. | Trizincoline. | Ethylamine. |
|---|---|---|---|
| $N\left\{\begin{matrix}H\\H\\H\end{matrix}\right.$ | $N\left\{\begin{matrix}K\\H\\H\end{matrix}\right.$ | $N\left\{\begin{matrix}Zn\\Zn\\Zn\end{matrix}\right.$ | $N\left\{\begin{matrix}C_4H_5\text{ (ethyl)}\\H\\H\end{matrix}\right.$ |

Metallic amines are less numerous than those formed from organic bases. (*See* AMIDES.)

AMMON, or AMUN, *ăm'-mon*, in Heathen Myth., was the name of a celebrated deity of the Egyptians, who was considered by the Greeks to be synonymous with their Jupiter. His chief city was Thebes, which was thence called the city of Ammon (*No-Ammon*, in the Old Testament), and by the Greeks Diospolis, or city of Jupiter. In the temples of the holy city he is represented as sitting upon a throne, holding the symbols of life and power, and wearing a crown with a peculiar ornament of two feathers and a long band behind, falling down to his feet. He is also sometimes represented with a ram's head, or with the head of a ram and the body of a sphinx.

AMMONIA, VOLATILE ALKALI, ANIMAL ALKALI, or SPIRITS OF HARTSHORN, *ăm-mo'-ni-a*. — Ammonia is a gaseous compound, possessing the properties of the alkalies proper,—potash and soda. It was first isolated by Priestley, in the year 1774, who named it alkaline air. He procured it from sal-ammoniac; whence its name. By submitting it to heat, he found it to consist of three parts of hydrogen to one of nitrogen. It is difficult to form it by the direct union of these gases; but wherever nascent hydrogen and nitrogen are eliminated by any chemical action, a portion of ammonia is always found in the resulting compound. During the decomposition of water containing air by the electric current, a small quantity of ammonia is formed; also when a mass of moistened iron filings is exposed to the air; but it is formed in the greatest quantities when nitrogenous organic matter putrefies, or is submitted to destructive distillation. Ammonia is also formed during the distillation of coal in gas-works, the ammoniacal liquor produced in this way being the great source of ammonia for commercial purposes. Formerly it was made from the ammoniacal liquor produced in the manufacture of bone-black. It is generally prepared in the laboratory by the action of caustic lime on some salt of ammonia.

$$NH_4O + CaO = CaCl + HO + NH_3.$$

The gas evolved is collected over mercury, or else by displacement, as it is gradually absorbed by water. Ammonia is easily liquefied by the combined action of a pressure of 6½ atmospheres and a temperature of 32°. By submitting this liquid to the action of solid carbonic acid, solid ammonia is produced. Ammonia does not support either combustion or life, and inflames with difficulty. It is decomposed into its elements by passing through it a series of electric sparks, or by transmitting a current of it through a red-hot tube. Ammonia is readily absorbed by water, which takes up 670 times its own volume of the gas, forming the liquor ammoniæ of the chemist, or liquid ammonia, as it is generally improperly called. Ammonia is found in very small quantities in the air, being evolved during the decomposition of animal substances, more especially excrements and urine. Ammonia forms an infinite number of salts with the different acids, most of them similar in their properties to the corresponding salts of potash and soda.

AMMONIA, ACETATE OF, or SPIRIT OF MINDERERUS, used in medicine as a refrigerant and diaphoretic.

AMMONIA, CARBONATE OF.—The sesqui-carbonate of ammonia forms the smelling-salts of the chemist's shop, generally called Preston salts. Solution of carbonate of ammonia is sometimes used as an emetic. It is also used in the manufacture of unfermented bread. It is used in medicine as a stimulant.

AMMONIA, NITRATE OF.—This salt is used in the laboratory for the production of nitrous oxide, or laughing-gas. The crystals are melted in a retort, at a gentle heat, nitrous oxide being given off, and water remaining behind.

$$NH_4ONO_5 = 2NO + 4HO.$$

AMMONIA, SULPHATE OF.—This salt, which is much used as a cereal manure, is obtained in great quantities by neutralizing bone- or gas-liquor with sulphuric acid, evaporating and crystallizing.

AMMONIAC, GUM.—This substance, which is often confused with the salts of ammonia, is a concrete juice, procured from an unknown tree growing in Persia and Abyssinia. It occurs in agglutinated masses called *tears*, and is used in medicine as a stimulant and expectorant. When softened with vinegar, it forms a plaster, which has been used for the last 2,000 years, and has survived all changes in medicine.

AMMONIAC, SAL. (*See* AMMONIUM, CHLORIDE OF.)

AMMONIACUM, *ăm'-mo-ni'-a-kum*, a fetid gum-resin used in Med. It exudes from the stem of an umbelliferous plant known to botanists as *Dorema ammoniacum*, which grows in Persia and the adjacent parts of Asia. It is occasionally prescribed as an expectorant, and is applied externally to promote the absorption of tumours and chronic swellings of the joints.

AMMONIÆ AQUA, AMMONIA (LIQUID), AMMONIÆ (LIQUOR), AMMONIA (SOLUTION OF).—The solution of gaseous ammonia in water is called by all the above names. As stated under AMMONIA, water absorbs 670 times its volume of ammoniacal gas, forming a colourless transparent liquid, having a characteristic pungent smell, a burning caustic taste, and a strong alkaline reaction. At its greatest strength its specific gravity is ·850, and it can only be kept in closely-stoppered bottles. It is made by passing the gas through distilled water kept near freezing-point by means of ice. It is of great use in the laboratory as a re-agent, dissolving many oxides and salts insoluble in water. It is employed in medicine as a stimulant. There are two degrees of strength used,—the liquor ammoniæ fortior, of ·850; and the ordinary liquor ammoniæ, or spirits of hartshorn, of ·960. Mixed with

oil, with which it forms a soap, it is used as a rubefacient, under the name of soap-liniment.

AMMONITE, *ăm'-mo-nite*, in Conch., a gen. of fossil shells allied to the living gen. Nautilus. In shape they resemble a ram's horn,—whence their name, from their supposed likeness to the horns upon the statue of Jupiter Ammon. Having, also, very much the appearance of a coiled snake, they are vulgarly termed petrified snakes. They are found plentifully in the



AMMONITES.

oolite formations, and are so abundant in some parts of Burgundy, that the roads are paved with them. The animal that inhabited this shell was provided with air-sacs, by means of which it could rise or sink in the water; and its shelly covering, necessarily delicate in order to float, was made strong enough to bear the pressure of great depths by its tubular form and internal ribs or supports.

AMMONIUM.—The existence of a hypothetic compound metal called ammonium, and having the constitution $NH_4$, has been assumed as the only method of explaining the perfect analogy that exists between the salts of ammonia and those of the various metals. An

of ammonia united to an equivalent of water

to form the oxide of this metal, $NH_4+HO$

corresponding to potassa, the oxide of potassium KO. The following comparison between the compounds of ammonia and those of other metals will show the working of this theory at a glance.

| | |
|---|---|
| K..... Metal. | $(NH_4)$ .....Metal. |
| NaO .....Oxide. | $(NH_4)O$ .....Oxide. |
| AgCl .....Chloride. | $(NH_4)Cl$ .....Chloride. |
| LiI ... .. . .Iodide. | $(NH_4)I$.....Iodide. |
| $CaO, NO_5$ . Nitrate. | $(NH_4)O, NO_5$...Nitrate. |
| $BaO, SO_3$ ..Sulphate. | $(NH_4)O, SO_3$...Sulphate. |

The theory of the existence of a compound metal is borne out not only by analogy, but by actual experiment. If a few globules of mercury are immersed in a solution of chloride of potassium, and an electric current be passed through them, the mercury gradually swells up into a pasty mass, which experiment has proved to be an amalgam of mercury and potassium. If chloride of ammonium be substituted, the same effect takes place, the only difference being, that the bulk of the mercury is much more increased, and at last floats on the solution, from its lightness. The formation of this amalgam seems not only to demonstrate the existence of ammonium, but also to show that it is a metal, non-metallic amalgams being unknown. When thrown into water, these amalgams form solutions of potash and ammonia respectively, with the evolution of hydrogen.

$$Hg_x K+HO=Hg_x+KO+H$$

$$Hg_x(NH_4)+HO=Hg_x+(NH_4O)+H$$

AMMONIUM, CHLORIDE OF.—This salt is ordinarily called sal-ammoniac, or muriate of ammonia. It is made extensively by neutralizing bone-liquor or gas-liquor with hydrochloric acid, evaporating, crystallizing, and subliming. It was formerly manufactured by subliming the soot produced by a mixture of coal, salt, animal matter, and clay. It was first made from the soot produced by burning camels' dung in Libya, near the temple of Jupiter Ammon, whence its name. It is much used in the arts, more especially in tinning iron, copper, and brass. It may be formed directly by the union of dry ammonia and chlorine.

AMMONIUM, IODIDE OF, *ăm-mo'-ni-um*.—This salt is much used in photography for iodising collodion, on account of its great solubility in alcohol. Its manufacture is very difficult; it should, therefore, be bought of a respectable chemist.

AMMUNITION, *ăm'-mu-nish'-un* (Lat. *munitio*, a fortification), in Mil., is a term applied to all warlike provisions, but more particularly to shot, shell, powder, fuses, and other projectiles and explosive substances. The chief kinds of ammunition will be found described under their proper headings.

AMNESTY, *ăm'-nes-te* (Gr. *amnestia*, forgetfulness of wrong), is an act of oblivion, by which crimes and offences against the government up to a certain time are so obliterated that they cannot again be brought against the guilty parties. An amnesty may be either absolute, or it may be limited, excepting certain persons, or classes of persons; as the act of indemnity passed on the accession of Charles II., which excluded the persons actually concerned in the execution of his father.

AMNIOS, or AMNION, *ăm'-ni-os*, in Midwifery, is the membranous bag in which the fœtus is inclosed in the womb, and which also contains the *liquor amnii*. It is composed of three membranes; an outer, or filamentous one, called *decidua*; a middle, named the *chorion*; and an inner, called the *amnion*.

AMOMUM, *ă-mo'-mum*, in Bot., a gen. of plants belonging to the nat. ord. *Zingiberaceæ*, the Ginger family. Several species have aromatic seeds, which are used medicinally and as spices in many parts of the world. *A. meleguela* is a native of Western Africa, and yields the so-called grains of Paradise, or Guinea pepper, used in this country in veterinary medicine, and for giving pungency to beer, wine, spirits, and vinegar. Most of the fruits called cardamoms, so largely employed in medicine as stimulants, are produced by plants included in this genus; thus, *A. cardamomum* yields the round cardamoms; *A. maximum*, the Java; *A. Korarima*, the kurarima; and *A. globosum*, both the large and small round China cardamoms.

AMORPHA, *ă-mor'-fa*, in Bot., the bastard indigo, a gen. of plants belonging to the nat. ord. *Leguminosæ*. The typical species, *A. fruticosa*, is a native of South Carolina, and is cultivated in English gardens. Its flower is purple or violet, and very irregular, the corolla wanting both wings and keel; its leaf is very dark green. The root, when peeled, is sometimes chewed as a remedy for toothache. A blue dye-stuff resembling indigo, but much inferior, may be obtained from this plant: hence the common name for the genus.

AMORPHOUS, *ă-mor'-fus*, in Chem. and Min., substances are said to be *amorphous* when they do not assume any crystalline form.

AMORTIZATION, *ă-mor-ti-zai'-shun* (Lat. *amortizatio*), in Law, an alienation of lands or tenements in mortmain, viz., to any corporation or fraternity and their successors. (*See* MORTMAIN.)

AMPELIDEÆ, *ăm-pe-li'-de-e* (Gr. *ampelos*, vine), in Bot., a name given by some botanists to the Vine ord. (*See* VITACEÆ.)

AMPELOPSIS, *ăm-pe-lop'-sis*, in Bot., a gen. of plants belonging to the nat. ord. *Vitaceæ*, the Vine fam. The species constitute the climbing shrubs called Virginian creepers. They are remarkable for the crimson tints assumed by their foliage in autumn, and for their curiously formed tendrils.

AMPHIBIA, *ăm-fib'-i-a* (Gr. *amphi*, both, and *bios*, life), in Zool., an ord. of the class of Reptiles. In ordinary language, the term amphibious has been applied:—to animals such as frogs, which at one period of their existence are aquatic, breathing by means of gills, and which at another period of their life respire air, and are frequently on land; to animals such as seals, which, although breathing by means of lungs, are yet capable of remaining under water for some time; to various terrestrial animals, such as the hippopotamus, which frequent an aquatic medium. But if the term amphibious be taken in its literal sense, viz. as denoting the power of living both on land or in the water indifferently, it will be found to apply to only four genera of batrachian reptiles, which, according to Cuvier, are the only known truly amphibious animals, inasmuch as they alone possess simultaneously both lungs and gills. These animals are the Axolotls, the Menobranchi, and

the Sirens, inhabiting the American rivers and lakes, and the Proteus, whose habitat is the underground streams which connect some lakes in Carniola and Hungary. In the system of Linnæus the amphibia comprehended the whole of the animals now known as reptiles; such as serpents, frogs, tortoises, and lizards, and even the cartilaginous fishes; but according to the most philosophical of the later naturalists, the term amphibia has been restricted to that order of reptiles called Batrachians; for this reason, that these animals breathe by means of gills in their earliest or tadpole condition, and afterwards acquire lungs, and respire air on assuming their perfect form as reptiles.—*Ref.* Todd's *Cyclopædia of Anatomy and Physiology*; *English Cyclopædia*, "Natural History." (*See* BATRACHIANS, FROG, SIREN, SALAMANDER, PROTEUS.)

AMPHIBOLE, *ăm-fĭb'-o-lē*, a double silicate of alumina and magnesia, often coloured black or green by the substitution of oxide of iron for the latter.

AMPHIBOLOGY, *ăm'-fĭb-ol'-o-je* (Gr. *amphibolia*, doubt, and *logos*, discourse), is a term used to denote a phrase susceptible of two different interpretations, arising either from the order of the phrase, or from the ambiguous meaning of a word. The answers of the oracles were frequently of this nature, as in that received by Pyrrhus from the oracle,—*Aio te Æacida Romanos vincere posse*, where the meaning may be either that you will conquer the Romans, or that the Romans will conquer you.

AMPHIBRACH, *ăm'-fĭ-brăk* (Gr. *amphi*, both, about, on both sides, and *brachys*, short), in Poetry, the name of a foot of three syllables, of which the middle one is long, and the first and last short.

AMPHIBRYA, *ăm-fĭb'rĭ-a* (Gr. *amphi*, around, *bryo*, I grow), in Bot., the name given by Endlicher to a section of the vegetable kingdom. The character common to all the members of this great group is the possession of a stem increasing only at the circumference. The *Amphibrya* of Endlicher therefore correspond with the *Monocotyledones* of Jussieu, and with the three divisions *Rhizogens*, *Endogens*, and *Dictyogens*, of Lindley.

AMPHICTYONIC COUNCIL, *ăm'-fĭk-tĭ-on'-ĭk*, a politico-religious court of ancient Greece, said to have been founded by, and to have taken its name from, Amphictyon, son of Deucalion; but, according to Strabo, it was instituted by Actæus, king of Argos. It was probably at first a religious assembly, but it subsequently came to be of great political importance. It was composed of two representatives from each of twelve Greek states, who met twice a year for the purpose of protecting their common interests, and preserving their religious institutions. As individual states became powerful, and strove for the first rank, the influence of this council declined, and in the time of Demosthenes it had ceased to command respect.

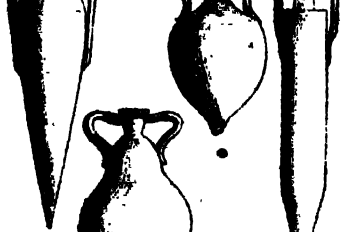
AMPHIMACER, *ăm-fĭm'-a-ser* (Gr. *amphi*, and *makros*, long), in Poetry, the name of a foot of three syllables, of which the middle one is short, and the first and last long.

AMPHISARCA, *ăm'-fĭ-sar'-ka*, in Bot., an indehiscent many-celled fruit like that of the Baobab.

AMPHISCII, *ăm-fĭs'-i-i* (Gr., double-shadowed), a term applied by astronomers to the inhabitants of the tropics, whose shadows alternately point north and south at noon, at opposite times of the year.

AMPHITHEATRE, *ăm'-pi-thē'-a-ter*, among the ancient Romans, was a species of structure designed for the exhibition of combats of gladiators, wild beasts, and other sports. Its name is formed from the two Greek words *amphi*, on both sides, and *theatrŏn*, a theatre, and would thus denote a double theatre. In the theatre, which was internally arranged somewhat in the form of a semicircle, were heard music and recitations. The amphitheatre, in the form of two semicircles, or rather an ellipse, was devoted to spectacle. Indeed, the first amphitheatre that we read of was literally a double theatre, being so constructed upon pivots that the two halves could be either placed back to back, to form two theatres, or face to face, to form an amphitheatre. The first amphitheatres were of wood. The first stone edifice of this kind was that erected by Statilius Taurus, in the reign of Augustus; but, from its being destroyed at the burning of Rome in the reign of Nero, a portion of it must have been of wood. Several others of a similar nature, or of wood, were constructed till the reign of Vespasian, when the *Amphitheatrum Flavium* was commenced; a work which has been the admiration of all subsequent ages. It is also called the Coliseum, or Colosseum, and was completed by Titus about A.D. 80, when, at its dedication, 5,000 animals were slaughtered. We cannot better describe this magnificent building than in the words of the historian Gibbon:—"Posterity admires, and will long admire, the awful remains of the amphitheatre of Titus, which so well deserved the epithet of Colossal. It was a building of an elliptic figure, 564 feet in length and 467 in breadth, founded on fourscore arches, and rising, with four successive orders of architecture, to the height of 140 (157) feet. The outside of the edifice was encrusted with marble, and decorated with statues. The slopes of the vast concave which formed the inside were filled and surrounded with sixty or eighty rows of seats, of marble likewise, covered with cushions, and capable of receiving with ease fourscore thousand spectators. Sixty-four *vomitories* (for by that name the doors were very aptly distinguished) poured forth the immense multitude; and the entrances, passages, and staircases were contrived with such exquisite skill, that each person, whether of the senatorial, equestrian, or plebeian order, arrived at his destined place without trouble or confusion. Nothing was omitted which in any respect could be subservient to the convenience and pleasure of the spectators. They were protected from the sun [illegible] rain by an ample canopy, occasionally drawn over their heads. The air was continually refreshed by the playing of fountains, and profusely impregnated by the grateful scent of aromatics. In the centre of the edifice the *arena*, or stage, was strewed with the finest sand, and successively assumed the most different forms. At one moment it seemed to rise out of the earth like the garden of the Hesperides, and was afterwards broken into the rocks and caverns of Thrace. The subterraneous pipes conveyed an inexhaustible supply of water; and what had just before appeared a level plain might be suddenly converted into a wide lake, covered with armed vessels and replenished with the monsters of the deep. In the decoration of these scenes the Roman emperors displayed their wealth and liberality; and we read on various occasions that the whole furniture of the amphitheatre consisted either of silver, or of gold, or of amber. The poet who describes the games of Carinus in the character of a shepherd, attracted to the capital by the fame of their magnificence, affirms that the nets designed as a defence against the wild beasts were of gold wire; that the porticos were gilded, and that the *belt*, or circle which divided the several ranks of spectators from each other, was studded with a precious mosaic of beautiful stones."—*Ref.* Gibbon's *Decline and Fall of the Roman Empire*; Smith's *Dictionary of Greek and Roman Antiquities*.

AMPHORA, *ăm'-fo-ra* (Gr. *amphoreus*, from *amphi*,



on both sides, and *phero*, I carry), in Antiq., is the name of a vessel commonly of earthenware, so called

from having a handle or ear on each side of the neck. Its form and size varied, but it was usually long and narrow, frequently about 2 or 2½ feet in height, by about 6 inches in diameter, terminating at the lower extremity almost in a point, to admit of insertion into a stand or the earth, in order to keep it upright. They were generally used for preserving oil, wine, honey, grapes, or other fruits; but also as cinerary urns. Homer mentions amphoræ both of gold and stone, and in later times glass amphoræ were not uncommon. Earthen amphoræ of the Roman period have occasionally been found in England. The amphora was also a measure of capacity among the Greeks and Romans. The Roman amphora contained 48 sextaries, or about 7 gallons 1 pint English wine measure; the Attic or Grecian about one third more. Among the Romans the amphora was also a dry measure, containing about 3 bushels. The Venetians still have a liquid measure of this name, containing about 16 quarts.—*Ref.* Smith's *Dictionary of Greek and Roman Antiquities.*

AMPLEXICAUL, *ăm-plex'-i-kawl* (Lat. *amplecti*, to embrace, *caulis*, a stem), in Bot., a term applied to a leaf which is enlarged at its base, so as to clasp the stem from which it springs, as in fool's parsley.

AMPUTATION, *ăm-pu-tat'-shun* (Lat. *amputo*, I prune or lop off), in Surg., is a term applied to denote the operation of cutting off a limb or some part of the body. The human frame is so constituted that if one member be diseased, the whole body suffers with it; and frequently the life of an individual may depend upon the removal of an injured or diseased member. The ancients, while they saw the necessity of cutting off a limb, shrank from the operation with dismay, for they knew of no means of stopping the hemorrhage but red-hot irons and boiling oil or resin; and hence, besides the suffering entailed upon the patient, their operations were seldom successful. The advance of modern surgery is here very marked, not only in the improved methods and appliances for operating; but, from their increased knowledge of the human body, surgeons are now able to determine with far greater accuracy when an operation is necessary, or, by a minor operation, are able frequently to save a limb, little or at all impaired, which even half a century ago would have been ruthlessly sacrificed; while the recent introduction of anæsthetics has been of inestimable value to the patient. An amputation may be performed by what is termed the circular, the double-flap, or the single-flap operation. In proceeding to amputate, the patient is first placed in a convenient position, and the main artery is compressed by the tourniquet (*see* TOURNIQUET) or by the hand of a skilled assistant. The circular operation is performed by first detaching the skin a short distance below where the amputation is to be made. It is then drawn upwards, and the muscles divided down to the bone, which is then sawn through. The arteries are then seized with a small forceps, drawn slightly out, and tied with a thread, after which the skin is brought over the wound, and either stitched or held together by strips of adhesive plaster. The double-flap operation differs from the above, in that the skin and muscles are cut down in a slanting manner, on opposite sides, so as to form two flaps, which are then drawn up, and the knife carried round the bone, dividing any flesh that may still be adhering to it; after which the surgeon saws the bone. It is objected to this method, that it makes a greater wound, and that the arteries, from being cut obliquely, will be less securely tied; but it is in favour with many, who maintain that there is little force in these objections, and that they are more than compensated for by the greater protection afforded by the flaps to the bone. The single-flap operation is seldom resorted to, unless where a portion of the limb is destroyed on one side, and it becomes necessary to take the flap from the opposite side.—*Ref.* Ferguson's *Manual of Surgery.*

AMULET, *ăm'-u-let* (Arab. *hamalet*, something suspended), is an object hung round the neck, or carried otherwise about the person, as a charm from accidents, diseases, witchcraft, &c. They are usually stones, metals, or plants; sometimes sentences or words, arranged in a particular order. They are much used by savage or semi-civilized races, as among the savages of America and Africa, the Arabs, Turks, &c. From the Chaldeans and Egyptians they passed to Greece and Rome; and that they prevailed in the early Christian church, we learn from the frequent denunciations against them. Even at the present time, in some parts of England, faith in the virtue of certain charms has not entirely ceased.

AMY, *ai'-mi* (Lat. *amicus*, friend). In Law, a *prochein* (next) *amy* is the next friend (not the guardian) suing for an orphan or infant, or for a married woman, neither of whom can personally institute a suit. The next friend is liable for costs if an adverse decision be come to against the party for whom he acts. *Alien amy* is a foreigner here, subject to some private in friendship with us. (*See* ALIEN.)

AMYGDALEÆ, or DRUPACEÆ, *ăm'-ig-dal'-le-e*, in Bot., a sub-ord. of the nat. ord. *Rosaceæ*. This division includes most of our stone-fruit trees, as the almond, the plum, and the cherry. The seeds, flowers, leaves, and young shoots of many of the *Amygdaleæ*, when moistened with water, yield hydrocyanic, or, as it is commonly termed, prussic acid. Their barks have generally astringent and febrifugal properties, and yield a kind of gum.

AMYGDALIN, *ăm-ig'-da-lin*, a white crystalline solid, found in bitter almonds, peach-kernels, and laurel-leaves. By the action of the alkalies, amygdalic acid may be formed. Sweet almonds contain no amygdalin.

AMYGDALUS, *ăm-ig'-da-lus* (Gr. *amygdale*, almond), a gen. of plants belonging to the nat. ord. *Rosaceæ*. The typical species is *Amygdalus communis*, the almond-tree, of which there are two varieties; namely, *A. communis*, var. *dulcis*, yielding sweet almonds, and *A. communis*, var. *amara*, which produces bitter almonds. The almond-tree grows wild in Syria and other parts of Asia, also in northern Africa, and is extensively cultivated in the southern parts of Europe. In England it is grown more for the sake of its early spring blossoms than for its fruit, which seldom comes to perfection. A fixed oil, commonly known as oil of almonds, is obtained by expression from sweet almonds, and the residue, which contains gum, vegetable albumen, and emulsion, is sold under the name of almond-powder. Bitter almonds, when merely subjected to pressure, yield a similar oil. They also contain emulsion, and, in addition to this and the other constituents of sweet almonds, a nitrogenous substance, called *amygdalin*. When bitter almonds are moistened with water, the emulsion and amygdalin mutually re-act upon each other, and form a poisonous volatile oil, which is known as the essential oil of bitter almonds, and which is used, in small quantities, for flavouring custards and pastry, also for scenting soaps. *Amygdalus persica* is the peach-tree of our gardens, and a variety of the same species produces the nectarine. Peach-blossoms have been employed in medicine as a vermifuge, and the kernel of the fruit may be used for the same purposes as the bitter almond.

AMYL, *ăm'-il* ($C_{10}H_{11}$), a compound radicle, discovered by Frankland, by acting on iodide of amyl with zinc. It is an oily liquid, boiling at 311°, and homologous with methyl, ethyl, &c. Like them, it forms an oxide or ether, and a hydrated oxide, or alcohol. $\left.\begin{matrix}C_{10}H_{11}\\H\end{matrix}\right\}O_2$, amylic alcohol, is formed during the distillation of common alcohol from grain or potatoes by the decomposition of the starch contained in them; hence its name. The fusel, or fousel oil of potato-spirit, consists almost entirely of amylic alcohol. It is this substance that gives to many spirits their noxious properties. It may be easily recognized by rubbing a few drops of the spirit on the hands; the vinous alcohol and water evaporate first, leaving the amylic alcohol behind, which is easily recognised by its characteristic odour. It gives to spirits a fiery acrid taste, and is most commonly found in inferior rum. When distilled with dilute sulphuric acid and bichromate of potash, it yields valeric acid (which see), the salts of which are much used in medicine. Heated with dry phosphoric acid, a hydrocarbon, called amylene, is formed, which has been much used as an anæsthetic.

AMYLAMINE. (*See* AMINES and AMYL.)

AMYLENE. (*See* AMYL.)

AMYLIC ALCOHOL. (*See* AMYL.)

AMYRIDACEÆ, *ăm'-i-ri-dāi'-se-e*, in Bot., the Myrrh and Frankincense ord. There are about 50 species known, all natives of tropical regions. The most important are described under the heads of the genera to which they belong.

AMYRIS, *ăm'-i-ris*, in Bot., a gen. of tropical plants belonging to the nat. ord. *Amyridaceæ*. Many species yield fragrant resins, and *A. balsamifera* is said to furnish, besides, a kind of rosewood.

ANA, *ai'-na, a'-na*, is a termination added to the names of remarkable men, to designate collections of their sayings, extracts from their writings, or, generally, any particulars concerning them. It is put in the form of the Latin neuter plural, and signifies properly matters or things about, or relating to, the person to whose name it is annexed.—*Examples:* Johnsoniana, Walpoliana.—*Ana*, *āā*, or *ā*, in medical prescriptions, denotes that an equal quantity of each of the ingredients is to be taken.

ANABAPTISTS, *ăn-a-bip'-tists* (Gr. *ana*, again, and *baptizo*, I baptize), a term applied generally to such Christians as hold that baptism is only to be administered to adults, and insist upon the necessity of a second baptism to all who join their communion. The name, however, is properly applied to a sect of religious fanatics that sprang up in Germany soon after the commencement of the Reformation. Not only did they insist upon re-baptism, but they pretended to divine revelations, and held many absurd or dangerous heresies, as independence of all civil authority, equality of rank, community of goods, plurality of wives, &c. The leader of this sect was one Thomas Münzer, a pastor in Alstedt, in Thuringia, who, after having adopted the principles of the Reformation, turned aside to these heresies. He subsequently went to Waldshut, on the borders of Switzerland, which became the chief seat of the body; whence their doctrines spread through Switzerland, Westphalia, Holstein, and the Netherlands, in spite of the severest persecutions. The rising of the peasantry in Franconia, in 1525, fell in with their views, and, in a battle which was fought soon after, Münzer was taken prisoner and slain. The sect, however, still continued to gain ground, and, in 1532, a body of them, under John Matthias, a baker, of Haerlem, and John Boccoldt, a tailor of Leyden, surprised and took the city of Münster. Here they gave themselves up to the greatest extravagances, and Matthias proclaimed himself king of Mount Zion, the name given to Münster. Matthias was cut off in a sally which he headed against the bishop of Münster's troops, and was succeeded by Boccoldt. At length, the city was taken by the bishop, in 1535, and Boccoldt and many others were put to death. The principles of the Anabaptists had taken deep root in various parts, particularly in the Netherlands. Here Menno Simon, a native of Friesland, and a man of great eloquence, while maintaining the opinions of the Anabaptists upon baptism, preached against their extravagances, and founded the sect of Mennonites. (*See* MENNONITES.)

ANABASIS, *ăn-ăb'-a-sis* (Gr. *anabasis*, an ascent, an expedition), the name of two ancient historical works. 1. The Anabasis of Cyrus, by Xenophon, giving an account of the unfortunate expedition of the younger Cyrus against his brother, the Persian king Artaxerxes, and of the retreat of the Ten Thousand Greeks under Xenophon. (*See* XENOPHON, vol. 1. of this work.)—2. The Anabasis of Alexander, by Arrian, giving an account of the campaign of Alexander the Great.

ANACARDIACEÆ, *ăn-a-kar'-di-ai'-se-e*, in Bot., the Cashew-nut, or Sumach ord. of plants. There are 40 genera and about 100 species, nearly all of which are natives of tropical regions. They yield, by exudation, resins and gums, or acrid and occasionally poisonous juices. The fruits and seeds of some species are edible.

ANACARDIUM, *ăn-a-kar'-di-um* (Gr. *ana*, with, *kardia*, the heart), in Bot., a gen. of plants belonging to the nat. ord. *Anacardiaceæ*. The species *A. occidentale*, the cashew-nut, a native of the West Indies, is remarkable for its large fleshy peduncle, which is eaten as a fruit, and its juice, when fermented, forms a kind of wine. Each peduncle bears a small kidney-shaped nut, the pericarp of which is very acrid, but the seeds are edible. By roasting the nut, the acridity may be destroyed, and the seed will greatly improve in flavour. The milky juice will stain linen black.

ANACHRONISM, *ăn-ăk'-ro-nism* (Gr. *ana*, upwards, *chronos*, time), is a name given to an error in chronology, by which the date of an event is placed earlier than it really happened. Anachronisms are not unfrequently to be found in works of art, and are sometimes introduced for the sake of effect; as where Schiller, in his "Piccolimini," speaks of a "lightning-conductor," although not invented till 150 years later. An error on the other side, where an event is placed later than it should be, is called a *parachronism*.

ANACONDA. (*See* SNAKES.)

ANACYCLUS, *ăn-a-si'-klus* (Gr. *ana*, in the form of, and *kyklos*, a circle), in Bot., a gen. of plants belonging to the nat. ord. *Compositæ*. The root of *A. pyrethrum*, pellitory of Spain, is employed in medicine as an energetic local irritant and sialogogue, its properties depending on the presence of a volatile oil.

ANÆMIA, *ă-ne'-mi-a* (Gr. *a*, not, and *aima*, blood), in Path., a term used to denote a deficiency of the red globules or colouring matter of the blood. It is characterised by a pale waxy complexion, and a pallor in those parts, as the lips, which are generally suffused. It is to be treated with pure air, nourishing diet, and tonics, such as iron.

ANÆSTHETICS, *ăn'-es-thet'-iks* (Gr. *a*, privative, and *aisthanomai*, I feel), a term given to those substances which produce insensibility in the whole or part of the human body generally by acting on the nervous system. The most familiar instance of anæsthesia is that produced by an overdose of alcohol, in the case of drunken people, who become utterly insensible to pain. Nitrous oxide, or laughing-gas, was the first anæsthetic which was used for the production of insensibility to pain under surgical operations. This was superseded by ether, which in turn gave way to chloroform. (*See* CHLOROFORM.) Amylene has been much employed as an anæsthetic, but has been abandoned. Kerosolene, a product of coal tar, is much used and recommended by American practitioners. It is almost impossible to overrate the advantages attendant upon the judicious use of anæsthetics in surgical operations. Countless lives have been saved by them, and operations have been performed under their influence undreamt of by surgeons twenty years ago. The injurious effects attributed to chloroform are so few and far between, as to be nothing in comparison with the benefits arising from its use. This latter remark applies specially to its administration during childbirth.

ANAGRAM, *ăn'-a-grăm* (Gr. *ana*, backwards, and *gramma*, a letter), is the formation of a new word or phrase out of another word or phrase, by the transposition of the letters; as, *evil, live; Galenus, Angelus; Horatio Nelson, Honor est a Nilo.*

ANAGYRIS, *ăn-aj'-i-ris* (Gr.), in Bot., a gen. of leguminous plants. The seeds of *A. fœtida* are very poisonous.

ANALCIME, *ă-năl'-seem*, a silicate of soda and alumina, remarkable for peculiar optical properties possessed by it. (*See* POLARIZATION OF LIGHT.)

ANALEPTICS, *ăn-a-lep'-tiks* (Gr. *analepsis*, resuming, recovery), a term in Med., applied to those means that are resorted to, to restore the body to a state of health, whether medicines, diet, or regimen.

ANALOGY, *ă-năl'-o-je* (Gr. *analogia*, the same ratio or proportion), properly signifies a similarity of ratios or relations, though it is frequently applied, also, to a similarity of things. A ratio or relation between two objects denotes that they are compared together in reference to some quality which they both possess in common, or to some manner in which the one is affected by the other. In this way we speak of one thing being greater, smaller, or more beautiful than another; of the relation of a child to his parents; of a prince to his people. It is, however, only when we come to compare relations, when we find that the relation or ratio of two things is like the relation of two other things, that we properly have an analogy. *A* may resemble *B*, but there is no analogy between them; but if *A* bears the same relation to *B* that *C* does to *D*, then there is analogy. In relation we have only two terms or objects of comparison; in analogy we must have four, though it is not necessary that all the four be different; for *A* may bear the same relation

to *B* that *B* does to *C*. Two things may be connected by analogy, though they bear in themselves no resemblance to each other; for, in analogy, all other attributes are kept out of view but those in which they agree. Thus, the bark of a tree is analogous to the skin of an animal, though there is no resemblance between them. In reasoning from analogy, we proceed upon the assumption that things which have many observed attributes in common have other not observed attributes, also in common. If we have observed that two or more things agree in several internal and essential characters, we are disposed to conclude that they agree likewise in all other essential characters,—that they belong to the same class. Analogy concludes from something observed to something not observed; from something within the sphere of actual experience to something beyond it. Analogy can only give us a high degree of probability, for the simple reason, that it is impossible, under any condition, to infer the unobserved from the observed. "Analogy," says Sir W. Hamilton, "is certain, in proportion—1. to the number of congruent observations; 2. to the number of congruent characters observed; 3. to the importance of these characters and their essentiality to the object; and 4. to the certainty that the characters really belong to the objects, and that a partial correspondence exists. Like induction, analogy can only pretend, at best, to a high degree of probability. It may have a high degree of certainty, but it never reaches to necessity."—*Ref.* Hamilton's *Logic*; Mill's *Logic*; *English Cyclopædia*.

Analysis, *a-nal'-i-sis* (Gr. *analyo*, I loosen or untie), in Log., is a method of reasoning by which we resolve or separate a whole into its constituent parts, and is opposed to *Synthesis*, in which the parts are collected into a whole.

Analysis, in Chem., is the term applied to that important branch of research which has for its object the determination of the constituent parts of compound substances. The word is also used, in a restricted sense, to denote a series of operations for ascertaining the constituents of a single compound. We may, therefore, speak generally of chemical analysis, or refer particularly to the analysis of a certain salt. Analysis being the separation of the component parts of a substance, is directly opposed to *synthesis*, which may be defined as the putting together of elements so as to form a compound. In most analytical operations, however, the chemist works by synthesis, as he usually separates two bodies by means of a third, which unites with one of them. (*See* Affinity.) It is not always necessary to actually separate the component parts in order to ascertain their nature, as occasionally changes of colour, or other results, on the addition of the proper tests, indicate the constituents. If the analyst merely seeks a knowledge of the general *nature* of the substance under examination, he is satisfied when, by the application of certain tests, and by the performance of certain operations, he has obtained evidence of the presence of those elements of which the compound is made-up, and the analysis he performs is called a *qualitative* one; but if he desires to ascertain not only the nature but the actual *amount* of the elements present, he must separate the constituents of the compound completely from each other, and obtain them either pure, or in some well-known form of combination; he then appeals to the balance or measure, and the analysis he performs is called a *quantitative* one. The balance was formerly employed whenever great accuracy was required; but of late, methods of volumetric analysis have been brought to great perfection. By *volumetric analysis* is understood the use of measured bulks of test-liquids, containing known quantities, by weight, of certain substances capable of producing, with a solution of the assay, sufficiently marked effects to show with precision the complete conversion of the body sought to be estimated, into a compound, the nature of which is perfectly known. The methods employed for determining the amount of real acid or alkali in certain commercial products, will be fully described in another portion of the work. (*See* Volumetric Analysis.) Minerals may be analyzed qualitatively by means of the blowpipe. (*See* Blowpipe.) An analysis is said to be *proximate* when the compound substance is resolved into components which are themselves compound, and *ultimate* when the decomposition is carried to its furthest limits, that is to say, when the compound is resolved into its elements, or the simplest forms of matter. Thus, wheat flour, when subjected to proximate analysis, yields gluten, albumen, starch, sugar, gum, oil, and saline matter; but each of these proximate principles is a compound, and may be further divided by ultimate analysis; the gluten and albumen into the elements carbon, hydrogen, oxygen, nitrogen, sulphur, and phosphorus; and the starch, sugar, gum, and oil, into the first three of these elements. (*See* Chemistry, Test.) *Ref.* (Elementary work), Bowman's *Practical Chemistry*; (complete manual), Fresenius's *Chemical Analysis*.

Analysis, Eudiometrical. (*See* Eudiometry.)

Anamirta, *an-a-mir'-ta*, in Bot., a gen. of plants belonging to the nat. ord. *Menispermaceæ*. The species *Anamirta paniculata*, or *cocculus*, is a beautiful climbing plant, which is a native of the Malabar coast and the Indian archipelago. Its fruit is poisonous, and is extensively employed by poachers for taking fish and game, and by dishonest publicans for adulterating malt liquors. (*See* Cocculus Indicus.)

Ananassa, *an-a-nas'-sa*, in Bot., a gen. of plants, belonging to the nat. ord. *Bromeliaceæ*. The species *A. sativa* furnishes the delicious fruit known as the pine-apple. A large number of pine-apples are now brought to England from the Bahama Islands, but in flavour and lusciousness they are much inferior to those cultivated in hothouses. The fibres obtained from the thick leaves of the plant have been made into paper, cordage, and textile fabrics.

Anapæst, *an'-a-pest*, in Greek and Latin Metre, is a foot consisting of two short syllables followed by a long one.

Anarchy, *an'-ar-ke* (Gr. *a*, not, and *archo*, government), is a term applied to a society living without any regular government; it may be as savages, in a state of nature, or a people who have thrown off the sovereign power.

Anas. (*See* Duck.)

Anastatica, *an-a-stat'-i-ka* (Gr. *anistemi*, I rise again), in Bot., a gen. of cruciferous plants. The principal species is *A. hierochuntina*, the rose of Jericho, which is found in the deserts of Egypt and Syria. This plant is remarkable for its hygrometric properties; thus, when full grown, and its branches have become dry and withered, it contracts so as to assume the form of a ball, in which state it is blown hither and thither by the winds; but, if it again meets with any moisture, it uncoils and for a time seems to regain life.

Anastatic Printing.—This process is founded on the principle that oil repels water, and *vice versâ*; that metals repel water more than oil, a weak solution of gum, or phosphoric acid, and that new print will transfer itself by means of pressure to any smooth surface. A printed page or engraving is moistened with a weak solution of phosphoric acid in gum-water, and pressed with considerable force on a sheet of zinc. The oily printing-ink leaves its impression on the plate in the form of a *fac-simile* of the original, the space between the letters or lines being filled up with water. An inked roller is passed over the plate, and leaves the ink only on the impression; the rest of the plate being wet, repelling the oily matter. Any number of impressions may be pulled, all perfect *fac-similes* of the original. (*See* Lithography and Zincography.)

Anastomosis, *an'-as-to-mo'-sis* (Gr. *ana*, through, and *stoma*, a mouth), a term used in Anat. to denote the communication of the blood-vessels with each other. The necessity of a constant supply of blood to every part of the human body has led to a wise provision, by which, though even one of the larger arteries become obstructed, there are numerous smaller ones communicating with the same part, which, by the increased pressure upon them, become enlarged, and supply its place.

Anathema, *a-nith'-e-ma*, a term derived from the Greek, and signifying properly something set apart for holy purposes, usually an offering or present made to some deity, and placed in a temple. It also denoted an animal offered in sacrifice to the gods, and hence

came to signify a person devoted to destruction. In the Church the term came to be used as a form of excommunication, but differed from simple excommunication in being attended with execrations and curses. When a heretic renounced his errors, and was received into the bosom of the Church, he was accustomed to declare his heresy "anathema," or a thing accursed.

ANATOMY, *a-năt'-o-me*, is a term derived from the Greek verb *anatemno*, I cut up, and properly signifies the separation of a thing into parts by cutting. All material substances either are or have been, or are not and have not been, possessed or endowed with life. The former have an organized structure, in which, in the living state, changes take place, and processes are carried on necessary to their existence. The latter are composed of homogeneous particles, and are subject only to mechanical or chemical changes. In the former are comprehended all plants and animals, in the latter all mineral or inorganic substances. It is to the former of these two great divisions that the term anatomy is applied. It is the art of dissecting organized bodies for the purpose of ascertaining their internal structure; it is also the science which deals with the knowledge thus acquired, and deduces general principles from it. As organized bodies naturally form themselves into two distinct classes,—plants and animals; so we have vegetable anatomy, or the anatomy of plants, and animal anatomy, or the anatomy of animals. Animal anatomy, again, is subdivided into comparative anatomy, which treats of the structure of all animals except man, and human anatomy, which deals with the structure of man only. It is to this last that the general term anatomy is usually applied. Human anatomy, or anatomy proper, then, treats of the several parts and organs of the human body, in respect to their form, structure, and relation to each other. It is usually divided into general, descriptive, and pathological. General anatomy treats of the nature and general properties of the separate substances of which the body is composed, not as these exist combined in special organs, but as they form distinct and peculiar substances. Descriptive anatomy comprehends a description of the several parts and organs of the body, with an account of their situation, connections, and relations, as existing in the natural and healthy state. Pathological, or morbid anatomy, traces and describes the changes produced by disease upon healthy structures, whether existing in individual organs, or in the primitive or common substances of which these organs are composed. As an account of the various parts and organs of the human body, as well as of the diseases to which they are subject, will be found under their several names, in other parts of this work, it is unnecessary to do more here than give a short summary of the subject, referring to these articles for more special information.

*General Anatomy.*—The human body consists of solid and fluid substances, the fluid bearing to the solid parts a general ratio of from 7 to 1 to 9 to 1. The fluids of the body are various, but may be divided into three classes:—the circulating nutritious fluid called the blood; the fluids which are incessantly poured into it for its renewal, viz. the chyle and lymph; and the fluids which are separated from it by secretion, as saliva, bile, gastric juice, &c. The blood is that well-known red fluid which, by means of the heart, arteries, and veins, circulates through all parts of the system, and supplies the waste that is constantly going on. The chyle is a milky fluid, separated from the chyme or digested food after it has passed from the stomach into the small intestines, and become mixed with the bile and pancreatic juice. It is absorbed by the lacteals, and conveyed by ducts or canals to the receptaculum chyli, where it is taken up by the thoracic duct, and poured into the blood. The lymph is a colourless fluid, like water, taken up by the lymphatic vessels, which pervade almost every part of the body. It seems to differ little from chyle, except that the latter contains a greater preponderance of fatty matter. The greater portion of the lymph is poured into the receptaculum chyli, where it becomes mixed with the chyle, and is carried with it into the blood; that, however, collected from the right side of the head and chest, and right upper limb, is conducted into the right subclavian vein, by the right lymphatic or right thoracic duct. The secretions are those fluids secreted or separated from the blood. The term is sometimes used to include the excretions which are thrown off from the body as useless or noxious, as urine from the bladder, perspiration from the skin; but it is properly applied only to such products as are secreted from the blood, but still retained in the system for the performance of certain subordinate actions. These are,—1. saliva, secreted by the salival glands of the mouth; 2. gastric juice, by the stomach; 3. pancreatic juice, by the pancreas; 4. bile, by the liver; 5. tears, by the lachrymal gland; 6. milk, by the mammary glands; 7. semen, by the testes; 8. oil, by the vessels of the adipose tissue; 9. synovia, by the synovial glands of the joints; and 10. mucus, by the mucous glands.

The organized solids of the human body are usually divided into the following seventeen elementary tissues:—1. Bone, or osseous tissue, which forms the framework of the body, to which the other structures are attached, or in which they are contained. 2. Muscular tissue, consisting of fine fibres, which are for the most part collected into distinct organs called muscles, by means of which the active movements of the body are performed. 3. Adipose tissue, which constitutes the fat of the body as well as the marrow of the bones. 4. Areolar, cellular, or connective tissue, a soft filamentous substance of considerable tenacity and elasticity, which is extensively distributed over the body, and forms the connecting medium of all the other tissues. 5. Fibrous tissue, formed of a number of minute fibres running chiefly parallel to each other, and sparingly supplied with blood-vessels or nerves, and used for connecting, enveloping, or binding together, various parts of the human body, as tendons, ligaments, fasciæ, periosteum, perichondrium, dura mater. 6. Elastic, or yellow tissue, characterized by possessing a high degree of elasticity, and employed wherever that quality is required, as in forming the spinal ligamenta subflava. 7. Cartilage, an opaque substance, usually of a pearly or bluish-white colour, but sometimes yellow, covering the articular extremities of the bones, connecting the surfaces or margins of immovable bones, or lining the walls of certain cavities, also found in the ear, nose, larynx, &c. Fibro-cartilage is, as its name indicates, a structure intermediate between fibrous tissue and cartilage, partaking, in some measure, of the firmness of the one with the elasticity of the other. 8. Nervous tissue, which goes to form the nervous system. 9. Blood-vessels, comprising the arteries by which the blood is conducted from the heart to all parts of the body; the veins, by which it is brought back again to the heart; and the capillaries, minute vessels by which it is carried from the extremities of the one to those of the other. 10. Absorbent vessels and glands, comprising the lacteals and lymphatics, together with the glands in connection with them. 11. Serous and synovial membranes, which resemble each other in general form and structure, but are distinguished by the nature of their secretions; the former lining the cavities of the body which have no outlet, as the peritoneum in the abdomen, the pleuræ and pericardium in the chest, and secreting a transparent and nearly colourless fluid, which moistens the surface; the latter lining the cavities of the joints, and secreting a viscid fluid which lubricates their surface. 12. Mucous membrane, which lines those internal passages of the body exposed directly or indirectly to contact with the atmosphere, and secretes a fluid of a more consistent and tenacious character than the serous membranes. 13. Secreting glands, a class of organs widely differing from each other in their nature and form, but all devoted to the function of secretion. 14. Vascular or ductless glands, so called from their general resemblance to secreting glands, but differing from them in having no duct for the conveyance of their secretions, which are reabsorbed or filtered through the tissues, or find an outlet by bursting. 15. Skin,—cutis vera, derma, or corium, the innermost of the three structures that go to make up what is commonly termed the skin, and which covers the whole body. 16. Pigment, a black or dark-coloured substance occurring in various parts of the body, and giving colour to the skin of the negro and other dark races. 17. Epithelium, a thin transparent structure covering the whole surface of the

body, as well as the walls of the different cavities, and named differently, according to the parts which it covers; as, *epidermis*, covering the skin; the epithelium of mucous membranes, &c.

*Descriptive* or *Special Anatomy*, is commonly divided into several branches, according as it regards the bones (*Osteology*); the articulations; the muscles (*Myology*); the blood-vessels and absorbents (*Angiology*); the nervous system (*Neurology*); the organs of sensation, respiration, digestion, &c. (*Splanchnology*).

*Osteology.*—The number of bones in the human body is variable; but in the adult they are estimated at about 244. They are usually divided into long, flat, and irregular;—long, as in the thigh and leg; flat, as in the skull and pelvis; irregular, as in the hands and feet. Bones are covered with a peculiar membrane called the periosteum, which serves to conduct the blood-vessels and nerves. The osseous skeleton is divided into head, trunk, upper and lower extremities. The head comprises the bones of the cranium and those of the face, including three common to both. The bones of the cranium are eight in number,—the frontal, in the fore part of the skull; the two parietal, forming a portion of its sides and all its superior part; the occipital, forming its lower and back part; the two temporal, forming the lower part of the sides and part of the base; the sphenoid, in the middle of the base; and the ethmoid, in the middle of the fore part of the base. The bones of the face are fourteen in number,—the ossa nasi, which form the arch of the nose; the ossa lacrymalia, at the fore part of the inner edge of the ocular orbits; the malar bones, forming the prominences of the cheeks; the upper maxillary bones, forming the upper jaw, and containing the upper teeth; the ossa palati, situated at the posterior part of the palate, the nose, and the orbits; the vomer, a flat bone, forming part of the septum of the nose; the ossa turbinata inferiora; and the lower maxillary bones, forming the lower jaw, and containing the under teeth. There are thirty-two teeth,—sixteen in each jaw; viz., four incisors or front teeth, two cuspidati or canine, four bicuspidati, and six molares. The last molar on each side is called the *dens sapientiæ*, or wisdom-tooth, from not appearing till about the age of twenty-one. The os hyoides, or hyoid bone, is placed in the anterior and upper part of the neck, and has no osseous connection with any other bone. The trunk is divided into the spine, thorax, and pelvis. The spine is a pyramidal column, extending from the head to the pelvis, and is composed of twenty-four bones, termed vertebræ. Each vertebra consists of a body and seven processes, and has a foramen, or ring, through which the spinal cord passes. They are divided into three classes,—the cervical, including the first seven; the dorsal, consisting of twelve, which are larger than the cervical, and are distinguished by having their sides and transverse processes depressed for connection with the ribs; and the lumbar, consisting of five, which are larger than any other. The first two cervical vertebræ differ from the others, and are known as the atlas and the axis, or vertebra dentata. There are likewise five so-called false vertebræ, on account of their being separate in early life, but afterwards uniting to form the os sacrum, which constitutes the posterior part of the pelvis. The thorax, which contains the principal organs of circulation and respiration, is the largest of the three great cavities connected with the spine, and is formed by the sternum and costal cartilages in front, the twelve ribs on each side, and the dorsal vertebræ behind. The sternum is a flat narrow bone, situated in the anterior part of the thorax, and connected with the ribs by means of the costal cartilages. The ribs are twenty-four in number, twelve on each side, of which the first seven are termed vertebro-sternal, or true ribs, and are attached to the sternum; three are attached to the costal cartilages, and are called vertebro-costal; and two are termed vertebral or floating ribs, from their anterior extremities being free. The pelvis, or lower cavity of the trunk, consists of four bones,—the os sacrum and os coccygis behind, and the two ossa innominata on either side. The os coccygis, which forms the terminal bone of the spine, is sometimes regarded, like the os sacrum, as composed of four false vertebræ, which are at first distinct, but afterwards become united. The ossa innominata are two irregularly-shaped bones, situated one on each side of the pelvis, and consisting of three parts, the ilium, ischium, and pubis, firmly united in the adult, but distinct in the young subject. Each of the two upper extremities is composed of the bones of the arm, the forearm, and the hand, and is united to the trunk by means of the scapula and clavicle, which form the shoulder. The scapula is a flat triangularly-shaped bone, placed upon the upper and back part of the thorax. The clavicle, or collar-bone, is a long bone, something in the form of the italic letter *f*, and situate between the top of the sternum and the acromion process of the scapula. The arm has only one bone, the os humeri, which extends from the scapula to the bones of the forearm. The forearm consists of two bones, the radius and ulna, which are parallel, and play upon each other; thus admitting of freer motion in that part. The radius, so called from its resemblance to the spoke of a wheel, is situate on the outer side of the forearm. Its upper end is small, and forms only a small part of the elbow-joint, while its lower extremity is large, and forms the chief part of the wrist-joint. The ulna is placed at the inner side of the forearm, and differs from the radius in being larger at the upper than at the lower extremity. The bones of the hand are divided into the carpus, the metacarpus, and phalanges. The bones of the carpus, or wrist, are eight small bones, arranged in two rows, the upper row comprising the scaphoid, semilunar, cuneiform, and pisiform,—the lower, the trapezium, trapezoid, os magnum, and uniform. The metacarpal bones, or bones of the palm, are five in number, and correspond to the fingers. The phalanges, or bones of the fingers, are fourteen in number, each finger, with the exception of the thumb (which has only two), having three of them. The upper and lower extremities bear a great resemblance to each other in the nature and form of their bones. Like the upper, each of the lower extremities consists of three distinct parts—the thigh, leg, and foot. The thigh is composed of a single bone, the os femur, which is the longest and largest in the body. The upper part forms a round head, which is inserted into a deep cup-like cavity of the os innominatum, called the acetabulum: the lower terminates in two protuberances, known as the inner and outer condyles, separated posteriorly by a deep fossa, called the inter-condyloid. The leg consists of three bones,—the patella, tibia, and fibula. The patella, or knee-pan, is a small, flat, triangular bone, of a spongy texture, situated at the anterior part of the knee-joint, between the femur and the tibia. The tibia and fibula in the leg resemble the radius and ulna in the forearm; the tibia is, after the femur, the largest bone of the body; it is situate at the anterior and inner side of the leg, articulating with the femur above and the astragalus below. The fibula is considerably smaller than the tibia. Its upper extremity is small, and placed below the level of the knee-joint, but the lower extremity projects below the tibia, and forms the outer ankle. The foot, like the hand, is composed of three classes of bones,—the tarsus, the metatarsus, and the phalanges. The tarsus is composed of seven bones,—the os calcis, astragalus, cuboid, scaphoid, and three cuneiform. The metatarsal bones are long small bones, five in number, connected at the one extremity with the tarsal, at the other with the phalangeal bones: these last go to form the toes, each of which has three, except the great toe, which has only two.

*Articulations.*—The different bones of the skeleton are connected together in various ways, and such connections are termed articulations. They are of various kinds, but are usually divided into immovable, movable, and mixed. Immovable articulations exist where flat and broad bones are united to inclose important organs, as in the cranium and pelvis. In some parts the edges indent or interlock each other; in others they are brought into close contact, or are united together by a thin layer of cartilage. The movable articulations are of various kinds, according to the kind of motion required. In such cases, the bony surfaces brought into contact are covered with cartilage, bound together by ligaments, and lined by synovial membrane. Mixed articulation prevails where only a slight degree of motion is required, combined with great strength, as in the vertebræ. The

bones of the head and face are connected together by immovable articulation, except the inferior maxillary, the condyle of which articulates with the anterior part of the glenoid cavity of the temporal bone and the anterior root of the zygoma. The movements permitted by this articulation are very extensive. The different vertebræ of the spine are connected together by ligaments and the inter-vertebral substance; the latter a fibro-cartilaginous, slightly elastic substance, interposed between the adjacent surfaces of the different vertebræ, from the axis to the sacrum, and forming the chief bond of connection between these bones. It varies in shape, size, and thickness, in different parts of the spine. The articulations of the first and second vertebræ are different, and much more complicated than the others, in order to admit of the various movements of the head. In the articulations of the ribs to the vertebræ, the heads of the ribs are connected with the bodies of the vertebræ by one set of ligaments, and the necks and tubercles of the former with the processes of the latter by another set, admitting of a limited upward and downward motion, and a very slight motion backwards and forwards. The cartilaginous articulation of the ribs with the sternum admits only of a very slight motion upwards and downwards. In the pelvis, the articulation of the sacrum with the last of the true vertebræ, and of the coccyx with the sacrum, are similar to that of the vertebræ with each other. The lateral surfaces of the sacrum and ilium articulate with each other by means of an irregular lamella of cartilaginous structure and several sets of ligaments. The sacrum is also connected with the ischium by two ligaments, known as the great sacro-sciatic and lesser sacro-sciatic. The two pubic portions of the ossa innominata articulate in front by means of an elongated piece of cartilage interposed between the osseous surfaces, and connected with each; the union being strengthened by ligaments. In the upper extremity, the sterno-clavicular articulation is formed by the sternal end of the clavicle, the upper and lateral part of the head of the sternum, and the cartilage of the first rib. The motion here is almost in every direction—upwards, downwards, backwards, forwards, as well as circumductive. The scapula-clavicular articulation is formed between the outer extremity of the clavicle and the upper edge of the acromion process of the scapula, and the movements are gliding and rotatory. At the shoulder is what is termed a ball-and-socket joint, the large globular head of the humerus being inserted into the glenoid cavity of the scapula, and admitting extensive motion in almost every direction. The hinge-joint at the elbow is formed by the lower extremity of the humerus and the upper extremities of the radius and ulna, and allows extensive flexion and extension movements. The rotatory movements of the forearm arise from the connections of the radius and ulna; at the upper extremity the inner side of the head of the radius rotates within the lesser sigmoid cavity of the ulna,—at the lower the head of the ulna rotates upon the sigmoid cavity at the inner side of the radius; while the middle portions of the two bones are connected by two ligaments, forming what is termed the middle radio-ulnar articulation. The wrist-joint is formed by the radius and the inter-articular fibro-cartilage, which separates it from the ulna and the three first bones of the carpus, and admits of flexion, extension, abduction, adduction, and circumduction. The bones of the carpus are united by special ligaments so as to form two rows, and the rows are connected together by ligaments to form a joint. The articulations of the carpal with the metacarpal bones admit only of a slight gliding motion of the different surfaces upon each other, except in the case of the thumb, where it is much more varied. The carpal extremities of the last four metacarpal bones articulate with one another at each side, and are bound together by ligaments to form the palm of the hand. The articulations of the metacarpal bones with the phalanges, and of the phalanges with each other, form hinge-joints. In the lower extremity the head of the femur is received into the acetabulum, or cup-shaped cavity of the os innominatum, and connected by strong ligaments to form the hip-joint. The knee-joint is formed by the lower extremity of the femur articulating with the head of the tibia and the patella, and gives flexion and extension with a slight rotatory motion. The tibia and fibula are connected together, like the radius and ulna, by various ligaments, and their upper and lower extremities brought into contact; and have a slight gliding motion upon each other. The ankle-joint is formed by the inferior extremities of the tibia and fibula, united so as to form an arch, into which the superior convex surface of the astragalus is received, and allows of flexion and extension. The articulations of the tarsal, metatarsal, and phalangeal bones, do not differ materially from those of the hand, except that their ligaments are generally stronger, and admit of less motion.

*Muscles.*—The muscles, with their appendages, the fascia and tendons, constitute the active organs of motion. They serve also to protect the walls of large cavities, and to give form and symmetry to the whole body. Muscular tissue is of two kinds, distinguished by structural peculiarities and mode of action. The one class comprises the muscles of voluntary or animal life; the other of involuntary or organic life. The muscles of animal life, or striped muscles, are all those that are capable of being exerted or controlled by the will, and include not only the so-called voluntary muscles, but all the muscles of the ear, those of the larynx, pharynx, tongue, and upper half of the œsophagus, the heart, and the walls of the large veins, at the point where they open into it. The muscles of organic life, or unstriped muscles, form the muscular coat of the digestive canal from the middle of the œsophagus to the internal sphincter ani, of the urinary bladder, the trachea and bronchi, the ducts of glands, the gall-bladder, arteries, &c. The muscles are named from their situation, direction, use, shape, or points of attachment; as, tibialis, obliqui capitis, adductor longus, deltoid, sterno-hyoid. In the human body there are sixty-six muscles at each side of the head and neck; ninety at each side of the trunk, and two single ones; fifty-three in each of the upper extremities; and fifty-six in each of the lower. The limits of the present article preclude our attempting to give details of the situation, relations, &c., of this numerous class of organs, which, besides, would have little interest for the general reader. (*See* Muscle.)

*Angiology.*—The blood-vessels of the human body are the heart, arteries, veins, and capillaries. The heart is a conical muscular organ, lying obliquely beneath and behind the sternum, with its tip pointing downwards, forwards, and towards the left. It is divided by a longitudinal septum into a right and left half, the former containing venous, the latter arterial blood; and each half is again subdivided into two portions communicating with each other, the upper being termed the auricle, the lower the ventricle. From the right ventricle, the blood is sent, by means of the pulmonary arteries, to the lungs, whence it is returned by the pulmonary veins into the left auricle, passes into the left ventricle, and is thence conveyed by the aorta to every part of the body. The aorta, commencing at the left ventricle, ascends for a short distance, then arches over the root of the left lung, descends along the vertebral column within the thorax, passes through the diaphragm into the abdomen, and divides, opposite the fourth lumbar vertebra, into the right and left common iliac arteries. These last subsequently divide into two branches, named the internal and external iliac arteries; the former being distributed to the walls and viscera of the pelvis, the latter proceeding to the lower limbs, after sending two important branches to the walls of the abdomen. The branches sent off from the arch of the aorta are five in number,—the two coronary arteries which supply the heart; the innominate artery, dividing afterwards into the right carotid and subclavian arteries; the left carotid, and the left subclavian. Each of the carotids afterwards separates into the external and internal carotid; the former being distributed to the external parts of the head and face, the latter to the internal parts of the cranium. The subclavian artery supplies the upper extremity, giving off, as branches, the vertebral, the internal mammary, thyroid axis, and the superior intercostal arteries. From the thoracic portion of the aorta numerous branches are given off, chiefly of small size, and known as the pericardiac, bronchial, œsophageal, posterior mediastinal, and intercostal arteries. The abdominal

aorta gives off numerous branches, which may be divided into two sets,—those which supply the viscera, and those which are distributed to the walls of the abdomen; the former comprising the coeliac artery (which shortly divides into the gastric, hepatic, and splenic arteries), the superior mesenteric, the inferior mesenteric, the capsular, the renal, and the spermatic arteries; the latter, the phrenic, lumbar, and middle sacral arteries. The veins which return the blood from the capillaries to the heart are of two kinds,—the pulmonary, conveying arterial blood from the lungs to the left auricle of the heart, and the systemic, carrying venous blood from all parts of the system back to the right auricle of the heart. The pulmonary veins are four in number, two for each lung, and differ from other veins in being destitute of valves. The systemic veins are usually arranged into three groups, according to their mode of termination in the heart:—1. Those of the head, neck, thorax, and upper extremities, which terminate in the superior vena cava; 2. those of the abdomen, pelvis, and lower extremities, which terminate in the inferior vena cava; and 3. the cardiac veins, returning the blood from the substance of the heart, and opening directly into the right auricle. The veins, in their general form and distribution, correspond to the arteries. The vena cava superior is a short trunk formed by the junction of the two venæ innominatæ, and terminating in the upper parts of the right auricle. The vena cava inferior is formed by the junction of the two common iliac veins between the fourth and fifth lumbar vertebræ, and terminates in the lower and back part of the right auricle. The capillaries (from *capillus*, a hair) are minute vessels pervading every part of the body, and uniting the extreme points of the arteries with those of the veins. Their diameter varies in different parts, but is usually about $\frac{1}{1000}$th part of an inch. We have already said something about the absorbent system, and must refer, for further particulars, to the heads LACTEALS and LYMPHATICS.

The *Nervous System* consists of two parts, known as the cerebro-spinal and the sympathetic or ganglionic systems. The former includes the brain and spinal cord, with the nerves proceeding from them, and is regarded as the nervous system of animal life; the latter consists of a double chain of ganglia, running along the spinal column, whose functions seem to be less directly connected with the mind, and chiefly bearing upon the animal life. The cerebro-spinal system is divided into the encephalon, or portion contained within the cranium, and the spinal cord, inclosed within the vertebral canal. The encephalon comprises the cerebrum, the cerebellum, the pons Varolii, and the medulla oblongata, and is covered with three membranes, called the dura mater (or outermost), the arachnoid membrane, and the pia mater. The substance of the encephalon is of two kinds,—a cineritious or greyish substance, called also corticle, from forming the outer part of the cerebrum and cerebellum; and a white or medullary matter, forming the inner substance of the cerebrum and cerebellum, but the outer of the medulla oblongata and pons Varolii. The cerebrum, or brain proper, forms by far the largest portion of the encephalic mass. Its upper surface is divided into a right and left hemisphere, by a longitudinal fissure lodging the falx cerebri. The under surface of each hemisphere is marked off into three lobes, called the anterior, middle, and posterior. The entire surface of each hemisphere presents a number of convoluted eminences, separated from each other by depressions of various depths. The cerebellum, or little brain, is situate beneath the hinder part of the cerebrum, from which it is separated by the tentorium cerebelli. It is likewise divided into two lateral hemispheres; but its surface is not convoluted, but laminated. It is connected with the rest of the encephalic masses by means of connecting-bands, called crura or pedunculæ, two of which ascend to the cerebrum, two descend to the medulla oblongata, and two unite in front to form the pons Varolii. This last occupies a central position on the under surface of the encephalon, and constitutes the bond of union between the other parts, being connected above by crura from the cerebrum, at each side by crura from the cerebellum, and being in contact below with the medulla oblongata. This last extends from the lower border of the pons Varolii to the upper part of the spinal cord. It is pyramidal in form, with its broad extremity directed upwards, and measures about an inch and a quarter in length. By means of two fissures, it is divided into two lateral and symmetrical halves. The spinal cord is situate within the vertebral canal, and extends from the foramen magnum of the occipital bone to the first or second lumbar vertebra, where it terminates in the cauda equina, an aggregation of nervous cords occupying the remainder of the canal. The spinal cord, like the encephalon, is inclosed by the three membranes,—the dura mater, arachnoid, and pia mater. It is composed of white and grey matter; the former external, the latter internal. The grey substance is found, on making a section, to be arranged in a crescental shape in each hemisphere of the cord, the posterior corners being much longer than the anterior. From the spinal cord spring thirty-one pairs of spinal nerves, corresponding to the number of true and false vertebræ, between which they issue, except that there are eight pairs of cervical nerves and one coccygeal. Each spinal nerve arises by two roots,—an anterior, or motor, and a posterior, or sensitive. These approach one another, and, with few exceptions, unite in the corresponding inter-vertebral foramen into a single cord, which almost immediately divides into two branches, one of which proceeds to the muscles, &c., of the back, the other to the anterior parts of the body. Besides the spinal nerves, there are nine pairs of nerves that issue from the encephalon to different parts of the head and face. They are connected with the organs of seeing, hearing, taste, smell, &c.; and are hence named optic, auditory, olfactory, &c. They are also distinguished numerically, as first, second, third, &c., according to the part of the brain from which they spring. The sympathetic, or ganglionic nervous system, is composed of a series of ganglia, or nervous centres, extending along the spinal column from the base of the skull to the coccyx, connected with each other by filaments, and also communicating in various parts with the cerebro-spinal system. They are regarded as the nerves of organic life, and principally supply the various viscera and blood-vessels.

*Splanchnology.*—Regarding the anatomy of the various organs of sensation, respiration, digestion, &c., we must refer to the accounts given under their proper names, in other parts of this work.

*History.*—Some knowledge of the internal structure of the human body was doubtless obtained at a very early period. The ancient Egyptians are said to have acquired great anatomical skill from their practice of embalming, and Homer displays a considerable amount of knowledge of the human body in his description of wounds, in the "Iliad." Hippocrates, who flourished about 400 years B.C., is regarded as the first author who treated anatomy as a science. Erasistratus, and Herophilus of Alexandria, are considered as the first that dissected and described the human body, nearly 300 years B.C. Galen, however (A.D. 131 A.D.), is the author of antiquity that displays the most intimate knowledge of the human body; and even he evidently obtained a great part of his knowledge from dissections of apes and other animals, there being a law in Rome which forbade the use of dead bodies. During the dark ages, anatomy, like the other sciences, made little progress. The interest in anatomy began to revive about the 13th century, and, in the beginning of the 14th, Mundinus dissected and demonstrated the different parts of the human body, at the university of Bologna, and published a work which formed the text-book in Italy for nearly 200 years. During the next 200 years, the interest in anatomy continued to increase, and, within that period, there are several respectable names in connection with it; as Gabriel de Zerbio, Achillini, Berenger, and Massa. The errors of Galen, however, still prevailed till the time of Vesalius, who flourished about the middle of the 16th century, and boldly, by dissections of the human body, pointed out the errors into which he had fallen. He is regarded as the father of modern anatomy. His great work, *De Corporis Humani Fabrica*, was published before he was twenty-eight years of age. He gave a great impulse to human dissection; and, among his contemporaries, or immediate successors, were

Fallopius, Eustachius, Varoli, and Fabricius. In the 17th century the progress of anatomy was rapid. In 1619 Harvey's great discovery of the circulation of the blood was announced. Asellius, in 1627, gave out his discovery of the lacteals; and in 1651 Rudbeck discovered the lymphatics. Among the other distinguished anatomists of this century were Bartholin, Pecquet, Jolyffe, Wharton, Swammerdam, Willis, Malpighi, and Ruysch. In the 18th century we have many eminent names. In Italy, which still retained a first place, were Valsalva, Santorini, and Morgagni; in France, Winslow, Vicq d'Azyr, and Bichat (the founder of General Anatomy); in Germany, Haller, Meckel, Zinn, and Soemmerring; in Holland, Boerhaave, Albinus, Camper, and Bonn; and in England, Cheselden, the two Hunters, Charles Bell, and the Monroes of Edinburgh. The present century has been specially characterized by the great advance made in minute or microscopic anatomy. Among the names of this period may be mentioned Cloquet, Magendie, Müller, Quain, Goodsir, Bowman, Todd, Sharpey, Ellis, Wilson, Gray, and Holden.—*Ref.* Quain's *Anatomy*; Gray's *Anatomy*; Holden's *Human Osteology*; Wilson's *Anatomist's Vade-Mecum*.

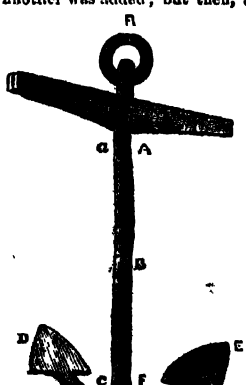
ANATOMY, COMPARATIVE. (*See* ZOOLOGY.)

ANATOMY, VEGETABLE. (*See* BOTANY.)

ANCESTOR, *an'-ses-tor* (Lat. *antecessor*, from *ante*, before, and *cedo*, I go), one from whom a person is descended, either on the father or mother's side, at any distance of time. All nations in any way civilized respect the memory of their ancestors, and some have even offered them religious homage. The feeling is natural, and akin to that which produces respect for parents. It is, however, apt to lead to error, in attaching undue importance to their knowledge and experience. All eastern nations are proud of a long line of ancestors.

ANCESTOR, in Law, one who goes before in order of time, and from whom we descend by birth and lineage. The law makes a difference between an ancestor and a *predecessor*; the one being applied to a natural person and his ancestors, and the other to a corporation and their predecessors. (*See* PREDECESSORS.)

ANCHOR, *an'-kor* (Lat. *anchora*), an instrument of iron used by ships to hold them to their moorings. Their invention is ascribed to various persons. Anchors originally were large stones or pieces of wood, loaded with heavy weights. The first anchors that approached the present shape had but one fluke; afterwards another was added; but then, as appears from monuments, they had no stock; which addition may be considered the last step to their present form. The technical parts of an anchor are as follows:—R, the ring; ABC, the shank; A, the small; C, the throat; B, the trend; DCFE, the arms; D, the palm, or fluke; E, the bill, or peak, or pea. The *shank* is the central shaft; the *small*, the end of the shaft near the top; the *throat*, the end of the shaft near the bottom; the *trend*, two-thirds down the length of the shank; the *ring* is at the upper end; the *stock* spreads out beneath the ring; the *arms* branch out at the other end of the shank; the *palms*, or *flukes*, are the flat portions at the ends of the arms; the *bill*, or *peak*, or *pea*, is the extreme end of each palm; the *crown* is the part furthest from the ring. Men-of-war and very large ships carry two large anchors of equal size at the bows, hence called bower anchors; and two others of the same size, which are called the sheet and




the spare anchors; besides two or three smaller ones. When the anchor is let go from the ship's bow or side, and enters the water, it will generally arrive at the bottom of the sea in an upright position, in consequence of the resistance of the water on the stock; it then is turned or canted over, and rests on the crown, the end of the stock, and the corner of a fluke. Anchors are made of flat broad bars forged together. Mr. Pering introduced the improvement of forming the shanks of bars of equal breadth and depth. He has also invented other alterations, and it is upon his plan that anchors have lately been constructed. When one anchor is down, the vessel is said to be at single anchor; when two are used, the vessel is generally said to be moored. When the anchor is dragged by the pulling of the cable, it is said to come home; when the cable is twisted round the anchor or stock, the anchor is said to be foul; when the anchor is lifted out of the ground, it is said to be aweigh; when hove up to the surface of the sea, it is said to be awash. The weight of an anchor in men-of-war may be roughly estimated at 1 cwt. to each gun; in merchant-vessels, about 1 cwt. to each 20 tons. Within the last quarter of a century several improved forms of anchors have been introduced, the most important of which have been those of Porter, Lieut. Rodgers, Honiball, and Trotman. The most efficient anchor in use at the present time would appear to be Trotman's, which is an improved form of the anch patented by Porter. In 1852 the Board of Admir ordered a series of experiments to be made with the view of testing the qualities of the best anchors then in use. These were tested in respect to the following qualities:—Strength, weight, facility of stowing, quick holding, sweeping, &c. The result of these experiments was that the palm of greatest efficiency was awarded to Trotman's anchor.

ANCHORITE, *an'-ko-rite* (Gr. *anachoreo*, I withdraw or retire), a hermit, or one who withdraws himself from society, in order to avoid the temptations of the world, and to devote himself to religious duties. They lived in caves or desert places, and usually practised great austerities, subjecting themselves to the inclemencies of the weather without proper clothing or habitation, restricting themselves to coarse and scanty fare, maintaining painful postures, and wearing iron rings or chains. They sometimes obtained great



fame for sanctity, and were visited for their blessing, or from a belief that they possessed the power of curing diseases. Many of the early Christians had to retire to solitary and desert places, in order to avoid persecution; the order of Anchorites, however, arose in the 4th century, and Paul the Hermit, Antony, and Hilarion, are said to have been the first. As convents began to increase, these came generally to be preferred as places of retreat.

ANCHOVY, *an-cho'-ve*, or *an'-cho-ve* (Fr. *anchois*), in Ichth., a gen. of abdominal malacopterygious fishes, comprehended by Linnæus in the Clupea, or Herrings, but separated from them by Baron Cuvier. (*See*

CLUPEIDÆ.) With the exception of the common anchovy, they all inhabit the tropical seas of America and India. The common anchovy is found in the Atlantic, along the shores of France and Portugal. It is sometimes taken off the coasts of Holland and England; but is abundant in the Mediterranean, where, off the island of Gorgona, to the west of Leghorn, it is very plentiful. The months of May, June, and July are the periods when they quit the deep seas, and visit the shores of the Mediterranean, which they enter in immense shoals by the Straits of Gibraltar. The Romans compounded from them a favourite sauce, which they termed *garum*. In modern times, the anchovy is also regarded as an appetizing morsel in the form of pastes, &c. *Charac.* Colour, bluish-brown on the back, and silvery white on the belly; anal fin short, and the dorsal placed immediately above the ventral. *Size*, about three inches.—For Anchovy recipes, see Mrs. Beeton's *Household Management*.



ANCHOVY.

ANCHOVY PEAR. (*See* GRIAS.)

ANCHUSA, *ăn-choo'-sa*, in Bot., a gen. of plants belonging to the nat. ord. *Boraginaceæ*. The calyx is divided into five segments; the corolla is funnel-shaped, the mouth of the tube being closed with five scales; the stamens are five in number; the stigma is obtuse; and the achænia, which are ovate, are surrounded by a thick ring. The species are herbaceous plants, growing in temperate climates, and are all characterized by short stiff hairs on the leaves and stems. Two are inhabitants of Great Britain; namely, *A. officinalis* (the common alkanet or bugloss) and *A. sempervirens*. The roots of the former, when boiled, yield a demulcent drink, which was once much used as a medicine. Both plants have spikes of blue flowers, very similar to those of the forget-me-not. The most important species is *A. tinctoria*, a native of the Levant and of the southern parts of Europe. It is cultivated for its root, which contains a resinous red colouring matter, and is much used in the arts. (*See* ALKANET ROOT.) *A. paniculata* and some other species are grown as ornamental garden-plants.

ANCHUSIC ACID, or ANCHUSIN, *ăn-choo'-sik*, the resinous colouring matter of alkanet root. The solubility of this principle in oil renders alkanet root useful for colouring that substance. Hair-oil is generally coloured pink with alkanet root.

ANCHYLOSIS, *ăn-ki-lo'-sis* (Gr. *agkuloo*, I bend), a term used in Med. to denote an immovable or fixed state of a joint. This condition may attack any joint of the body, and instances have been known of the whole body thus becoming anchylosed. In complete or true anchylosis, no motion whatever takes place, the heads of the bones being connected together by osseous or bony matter. In incomplete or false anchylosis, the immobility arises from adhesion of the synovial membrane, or a thickening of the parts about the joint, and usually admits of some degree of motion. Anchylosis frequently occurs after sprains, dislocations, or fractures near a joint, and, indeed, may be occasioned by anything that keeps a joint long motionless. In order to prevent anchylosis, the joint is to be exercised as much as the state of the surrounding parts will admit; if it cannot be prevented, the joint is to be kept in the most convenient and natural position. Anchylosis is sometimes very desirable as a termination of painful diseases of the joints.

ANCIENT, *aïn'-chent* (Fr. *ancien*, Lat. *antiquus*), usually signifies very old, and is applied to something that existed or happened long ago. It is said that *old* relates to a thing itself, as an *old house*; *ancient*, to time in general, as an *ancient custom*; but this distinction is not always observed. In a more limited sense, it is applied to that period of the world's history which preceded the overthrow of the Roman empire in the West, and, in this sense, it is opposed to modern, which applies to the period since that event; but even this distinction is not always observed. The term *ancients* is sometimes used as including only the Greeks and Romans; as when we speak of the philosophy of the *ancients*. In speaking of a thing which existed formerly, but which has now ceased to exist, the term *ancient* is frequently used.

ANCIENTS, gentlemen of the inns of court and chancery. In Gray's Inn, the society consists of benchers, *ancients*, barristers, and students under the bar; and here the *ancients* are of the barristers of the longest standing. In the Middle Temple, such as have gone through, or are past their readings, are termed *ancients*. The inns of chancery consist of *ancients* and students, or clerks; and from the ancients, one is yearly chosen the principal or treasurer.

ANCILE, *ăn-si'-le* (Lat.), in Roman Antiq., a sacred shield, which was believed to have fallen from heaven during the reign of Numa Pompilius. It was an object of veneration, more especially on account of the tradition, which declared that so long as Rome possessed it the empire of the world should be hers. This holy buckler was placed in the keeping of twelve priests, in the temple of Mars; and in order that it should be the more effectually preserved, eleven other shields were made, so much like the true ancile, as not to be distinguishable from it. The ancile was held to have descended to the earth upon the calends of March, and, consequently, the twelve ancilia were once every year, at this period, carried round the city in solemn procession.

ANCILLA, or ANCILLARIA, *ăn-sil-lai'-ri-a*, in Zool., a term given by Lamarck to a gen. of molluscs. They are somewhat numerous, principally found in tropical climates. Some of them are furnished with a small tooth, which is placed at the end of a groove crossing the front of the shell. The most common species is the ivory-shell: this and some others are distinguished from the genus in general, by having the front of its axis deeply pierced. The shells are usually very smooth, as if polished.

ANCONEUS, *ăn-ko'-ne-us* (Gr. *agkon*, the elbow), in Anat., a small triangular muscle, situated immediately beneath and behind the elbow-joint. It is connected with the humerus above, and the ulna below, and assists in extending the fore-arm.

ANCYLUS, *ăn-si'-lus*, in Zool, a mollusc, commonly known as the fresh-water limpet. It is common in stagnant water and rivulets in Europe, America, and the West Indies, adhering to stones and plants. It is closely allied to the pond-snail, differing principally in the conical form of the body and shell. It agrees with it in having two compressed triangular tentacles, with the eyes sessile on the outer base. A cavity in the middle of the back serves for the purposes of respiration, and an aperture closed by a valve opens in the middle of the left side. These shells are occasionally mistaken for those of the *Syphostoma*; but they may be readily distinguished by their being sinistral, very thin, and covered with a hairy periostraca.

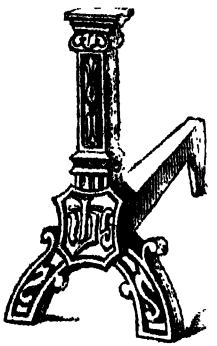
ANDA, *ăn'-da*, in Bot., a gen. of plants belonging to the nat. ord. *Euphorbiaceæ*. The species *A. brasiliensis* is a tree which grows in Brazil, having large yellow flowers, and producing fruit about the size of an orange, but of an angular form. Each fruit contains two roundish seeds, resembling small chestnuts. These seeds, called *Purga dos Paulistas*, yield a very purgative oil, used medicinally in Brazil, the ordinary dose being twenty drops. The seeds are also used for the same purpose as the oil. The bark, when thrown into ponds, is said to stupefy fish; and this part of the tree, roasted, forms a favourite remedy for diarrhœa brought on by cold. No other species is known.

ANDANTE, *ăn-dan'-tai* (Ital.), in Mus., a term used to imply a time somewhat slow, and a performance distinct and exact. It forms the third of the five divisions of musical movement, and may be said to be the medium between the extremes of quick and slow. It is likewise used substantively, thus:—an "Andante of Haydn," &c. *Andante affettuoso*, slow and with feeling; *andante con moto*, a little faster than andante; *andante grazioso*, slow but gracefully; *andante largo*, or *largo andante*,—by this expression is understood that the performance of the movement to which it is prefixed is to be slow, distinct, and exact; *andante maestoso*, slow with majesty; *andante non troppo*, slow,

but not too much so; *andante pastorale*, slow and with pastoral simplicity.

ANDIRA, *ăn-dī'-ra*, in Bot., a gen. of plants belonging to the nat. ord. *Leguminosæ*, sub-ord. *Papilionaceæ*, characterized by a one-celled one-seeded pod, almost orbicular. The species *A. inermis* is a native of the West Indies, and is commonly known as the Cabbage-bark tree. The bark, called either cabbage-bark or worm-bark in commerce, was formerly much used medicinally as an anthelmintic (*see* this word). It possesses cathartic, emetic, and narcotic properties. In large doses it is poisonous. The tree is said by some authors to furnish the partridge-wood of the cabinet-makers; but a plant belonging to another order is named by others as the source of this ornamental wood. (*See* HESPERIA.) The species *A. retusa*, a native of Surinam, yields a bark with similar properties, which is commonly known as Surinam bark.

ANDIRON, or HANDIRON, *ănd'-i-ron* (Teutonic *andena* or *andela*; SAX. *brand-isen*), in Arch., a contrivance which was, in old English houses and halls, made use of to assist in the burning of the logs of wood placed upon the hearth. In old inventories of furniture, the s frequently employed; and at the present time is sometimes used for what is more commonly called a fire-dog. The andirons were used in pairs, one on each side of the hearth. The logs of wood were placed upon the horizontal bars, the upright portion, or standard, being merely ornamental. The standard frequently bore the armorial bearings of its owner; and sometimes arabesques, or other designs, were traced upon it in silver, particularly in the reign of James I. At a later period, the upright portion of the andiron was often fashioned to represent a human figure. In the hall at Penshurst, Kent, a large andiron it still to be seen standing upon the hearth.



ANDIRON.

ANDREACEÆ, *ăn-dre-a'-se-e*, in Bot., Split mosses, a fam. of terminal-fruited mosses, characterized especially by the peculiar mode of splitting of the fruit, or, more correctly speaking, the *sporangium*. This urn-shaped capsule divides perpendicularly, when ripe, into four or eight valves, which remain attached together at their upper and lower points. The few British species which constitute the gen. *Andræa* are natives of rocky and usually mountainous districts.

ANDRENIDÆ. (*See* BEES.)

ANDREW'S DAY, ST., *ăn'-droos*, is the day observed by the churches of England and Rome in honour of this saint. It is the 30th November, the day, according to some, on which he suffered martyrdom, according to others, on which his relics were brought to Constantinople, in 359.

ANDROECIUM, *ăn-dre'-shi-um* (Gr. *aner*, a male, *oikion*, habitation), in Bot., a term applied to the stamens or male organs of a flowering plant, taken collectively.

ANDROGYNOUS, *ăn-droj'-i-nus*, in Bot., a term signifying male-female, sometimes applied to that kind of inflorescence which exhibits distinct male (staminal) and female (pistillate) flowers.

ANDROIDES, *ăn-droi'-i-dees* (Gr. *andros*, of man, and *eidos*, form), a term used in Mech. to denote an automaton in the figure of a human being, which, by means of a combination of springs, levers, &c., skilfully contrived, either walks or performs other external functions of a man. The most celebrated of these that have been exhibited in modern times, were, the flute-player of Vaucanson (*see* VAUCANSON, vol. I.), constructed and exhibited at Paris in 1810; and the chess-player of M. de Kempelen, of Presburg. (*See* AUTOMATON).

ANDROMEDA, *ăn-drom'-e-da*, in Astron., a constellation named by the Greeks after the mythical daughter of Cepheus and Cassiopeia. (*See* vol. I. of this work.) This constellation is composed of fifty-nine stars, and occupies a considerable region of the heavens below Cassiopeia, by which it may be easily found. A line drawn through the brightest star of the five forming the latter constellation and the Pole-star passes through a star of the first magnitude, named Alpheratz, in the head of Andromeda. This constellation is represented in the celestial planisphere by the figure of a chained woman.

ANDROPHORE, *ăn'-dro-for* (Gr. *aner*, male, *phoros*, brought into), in Bot., a name given to a tube or column formed by the union of the stamens by their filaments, as in the flower of the mallow.

ANDROPOGON *ăn-dro'-po-gon* (Gr. *aner*, man, *pogon*, beard), in Bot., a gen. of grasses, or nat. ord. *Gramineæ*. A tufted root, thought to resemble a man's beard, is one of the characters of the genus; hence its botanical name. Many species are remarkable for their fragrance, which is due to the presence of volatile oils, some of which are used in perfumery and medicine. There is considerable uncertainty, however, as to the particular species which yield the different oils. *A. Iwarancusa* is supposed by some to have furnished the precious spikenard oil of Scripture; and *A. calamus aromaticus* has been pointed to as being probably the plant termed the sweet calamus and sweet cane. The oil known in India as *roshé grass* oil, and, in England, as Turkish essence, or oil of geranium, and oil of ginger-grass, is reputed to be the produce of the latter species; but, in all probability, it is derived from several Indian andropogons. This oil is employed by the Turks to adulterate otto of roses, and is considered by some to be identical with the grass-oil of Nemaur. The species *A. citratum*, Indian lemon-grass, is most likely the source of the oil of lemon-grass of the shops, which is much employed in perfumery, under the name of oil of verbena, from its odour resembling that of the sweet verbena, or lemon-plant. Citronelle, or citronella oil, is also the produce of this, or of an allied species. The leaves of the Indian lemon-grass have been used as a substitute for tea, and the centre of the stem is employed for flavouring curries. *A. muricatus*, vittie-vayr or cuscus, also yields a fragrant oil, which is much used medicinally in India, and there known as kuskus oil. Its root, which is imported into this country for scenting baskets and other articles, has been employed medicinally as a gentle stimulant and antispasmodic.

ANDROSÆMUM, *ăn-dro-se'-mus*, in Bot., a gen. of plants belonging to the nat. ord. *Hypericaceæ*. The species *A. officinale* has tonic and astringent properties, which render it useful in medicine.

ANDROUS, *ăn'-drous*, in Bot., a term signifying a stamen, which is affixed to the Greek numerals, in order to form names used in describing flowers, when it is desirable to indicate the actual number of stamens they contain. Thus, the presence of only one stamen makes a *monandrous* flower, as in the Hippuris; if two male organs are present, the flower is *diandrous*, as in the Ash and Privet. To complete the list in as small a space as possible, we will merely give the terms, number of stamens, and examples, thus:—*triandrous*, three, most of the grasses; *tetrandrous*, four, Holly and Plantain; *pentandrous*, five, Cowslip and Convolvulus; *hexandrous*, six, Lily and Tulip; *heptandrous*, seven, Æsculus and Trientalis; *octandrous*, eight, Ivy and the Heaths; *enneandrous*, nine, Flowering Rush; *decandrous*, ten, Pink and Saxifrage; *dodecandrous*, twelve, Asarabacca; *icosandrous*, twenty, Strawberry; *polyandrous*, numerous stamens, Poppy and Water-lily. In the old Linnæan system of classification, many of the classes were determined by the number of stamens in the flower, and these terms were in constant use. The natural system has, however, quite superseded that arrangement; but the terms have been retained in descriptive botany, on account of their expressiveness.

ANECDOTE, *ăn'-ek-dote* (Gr. *a*, not, *ekdotos*, given out or published), signifies literally a thing not given out or published; and hence it is a term sometimes applied to *secret histories*. Procopius gave this title to his secret history of the emperor Justinian and his wife Theodora. It is also applied to works of the ancients that have not before been published, as the *Anecdota*

*Grace* of Muratori. In common language, an anecdote is a detached incident or fact of an interesting nature, usually connected with the life of a distinguished individual.

ANELECTRIC, *an-e-lek'-trik*, in Phys., a term sometimes applied to a body in which, under ordinary circumstances, electricity cannot be excited by friction. It is synonymous with the more familiar word *non-electric*. Anelectrics have the power of transmitting or conducting electricity. The best conductors, or the most perfect anelectrics, are metallic bodies, charcoal, and saline fluids. (*See* ELECTRICITY.)

ANEMOMETER, *an-e-mom'-e-ter* (Gr. *anemos*, the wind, *metron*, a measure), an instrument for measuring the force of the wind. Of the many anemometers which have been devised, that of Dr. Lind is the best for ordinary observations. It consists of a curved tube of glass, partially filled with water and attached to a scale. The tube is bent into somewhat the shape of the letter U, and the bore is considerably contracted at the bottom, as a check on the oscillations to which the water is subject from slight variations in the force of the wind. One leg of the tube is rather longer than the other, and its upper part is bent at right angles, so that the wind may blow into it horizontally. The wind, by acting upon the water in the one leg, causes it to rise in the other, until the pressure of the column of liquid balances the force opposed to it; consequently, the height at which the water stands indicates the strength of the wind. Another common anemometer consists of four small metal vanes fixed to a horizontal axis, and made to revolve like the sails of a windmill. On the axis is a perpetual screw, which turns a vertical cog-wheel round a second axis placed transversely to the former. To the second axis is attached a bar, on which a weight is fixed, so that the sails cannot turn without moving round the bar in a vertical circle. When the wind acts upon the sails, the bar rises, and this continues until the increased leverage of the weight furnishes a counterpoise to the moving force of the wind. The number of degrees through which the bar is moved to produce this effect is measured on a dial, the hand of which turns on the axis of the cog-wheel. By an ingenious instrument, which has been recently invented, the fluctuations of the wind are registered on a sheet of paper made to pass by clockwork under a pencil connected with a movable plate on which the wind acts. (*See* AERODYNAMICS.)

ANEMONE, *a-nem'-o-ne* (Gr. *anemos*, the wind), in Bot., a gen. of plants belonging to the nat. ord. *Ranunculaceæ*, characterized by an involucre of three divided leaves, more or less remote from the flower; a petaloid calyx, scarcely distinguishable from the corolla; and soft woolly achenia, which in some species have silky tails. As many of the species flourish in very exposed situations, they have been called wind-flowers. The most remarkable English species are *A. nemorosa* and *A. pulsatilla*. The first, which is commonly known as the wood-anemone, is one of our earliest spring flowers, and may be met with in full bloom during March and April in almost any wood. It is a perennial plant, with knobby roots and a short stem, having one or two dark green deeply-cut leaves. The stalk bears a single flower, the calyx of which is white, delicately tinged on the outside with purple. The species *Pulsatilla* is the beautiful pasque-flower found growing wild on exposed downs in several parts of England. It has finely-cut hairy leaves, and large purple flowers, very silky on the outside. The various garden anemones which exhibit so many brilliant colours, are cultivated varieties of the species *A. coronaria* and *stellata*, both natives of the Levant. The natural size of each flower is increased by cultivation, and many of the stamens are often changed into small petals, or, in other words, the flower becomes double. The anemones have, in common with other *Ranunculaceæ*, very acrid properties. Thus the leaves of the pasque-flower will raise blisters of the skin, and, if chewed, will produce irritation of the throat and tongue. The acridity of the roots of this species is so great, that, when administered in very small doses, it occasions nausea, and sometimes causes violent vomiting.

ANEMONE, SEA, the popular name for the plant-like animals formerly included in the gen. *Actinia*, but now distributed in several genera. (*See* ACTINIA.) They are found on all shores, generally attached to the rocks which are only exposed at low tide. A great number of beautiful species are common to our English coasts, but the larger and more brilliant ones occur in tropical seas. When fully expanded, their tentacles, which are usually richly coloured and arranged in regular circles, greatly resemble the petals of some of our most symmetrical simple flowers, such as the marigold, carnation, and anemone; or, still more closely, the florets of composite flowers, such as the daisy and chrysanthemum. This resemblance suggested the names *sea-anemones* and *animal-flowers*, by which they are commonly known. Since the invention of the aquarium (which *see*), these humble creatures have become household pets, and their habits have been carefully studied. It is only in the aquarium that they can be seen to advantage; for when exposed on their native rocks by the fall of the tide, they appear



SMOOTH SEA-ANEMONE.

either like smooth lumps of opaque jelly or as mere sand-coated excrescences. In each hemispherical or conical lump, however, a puckered hole, indicating the position of the mouth, can generally be detected. When placed in their proper element, and allowed to remain undisturbed, the sea-anemones gradually unfold their tentacles, and prepare to take into their elastic stomachs any dainty morsels which come within their reach. They are extremely voracious, and though apparently mere masses of jelly, they can digest almost anything. The tentacles seem to have the power of benumbing the prey, for little worms seized by them struggle for a few moments, and then become paralyzed. A slight tingling or pricking sensation has been felt by some observers on touching the tentacles with the hand, and the microscope has revealed the existence of little coiled-up threads, which are believed to be the stinging organs. A strong light annoys these curious creatures, though no special organs of vision have been detected in them. The sea-anemones have an extraordinary power of reproduction; they may be cut perpendicularly or across, and each cutting will give origin to a new animal. They produce living young, which issue from the mouth, and fix themselves upon adjacent rocks. They also have the power of reproducing their kind by gemmation, or budding. The commonest British species is *Actinia mesembryanthemum*, the



THICK-HORNED SEA-ANEMONE.

smooth sea-anemone, which is usually dark red or green. When left by the tide, it appears like a tiny mould of jelly, but if touched, it is found to be of a leathery texture, firm enough to withstand considerable pressure. The tentacles are slender and very numerous; and around the margin of the mouth there

is a circle of azure tubercles, resembling turquoise beads. The species *Actinoloba dianthus*, so called from its resemblance, when fully expanded, to the carnation, or *dianthus*, is generally pure white, or slightly tinted with cream or rose-colour. It is considerably larger than the smooth sea-anemone, and is the most coveted species of sea-side naturalists. *Tealia crassicornis*, the thick-horned animal-flower, has fewer tentacles than the creatures we have mentioned, and these organs are beautifully translucid, and marked with coloured rings. It is one of the largest, and certainly the most curious of our British sea-anemones. There are a great number of species, besides the three named above, found on our coasts.—*Ref.* Gosse's *History of British Sea-Anemones*; Johnston's *British Zoophytes*.

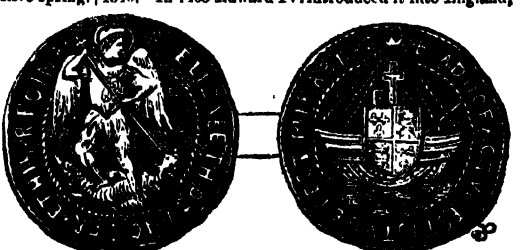
ANEROID BAROMETER, *ăn'-e-roid* (Gr. *a*, without, *neros*, watery, and *eidos*, form), the name given to an ingenious instrument for indicating the variations of atmospheric pressure without the aid of a liquid, as in ordinary barometers. Its action depends on the principle, that if a very thin metallic tube be coiled, any internal pressure on its sides tends to uncoil it, and any external pressure to coil it still more. The instrument essentially consists of a thin metallic tube, curved so as to form about seven-eighths of a circle. This tube, being exhausted of air and hermetically closed, is fixed by its middle, so that whenever the atmospheric pressure diminishes, it uncoils; and, on the other hand, whenever the pressure increases, it contracts. The ends of the tube are connected by levers with a needle, which travels over a scale, on which are marked divisions corresponding to the inches on the scale of the mercurial barometer. In another modification of the aneroid barometer, the pressure of the atmosphere acts upon a circular metal box, about three inches in diameter and a quarter of an inch deep, which has been nearly exhausted of air and then soldered air-tight. The sides of this vacuum-box are very elastic, being corrugated in concentric rings, and they approach to or recede from each other, according as the pressure of the atmosphere is great or little: in fact, the metal box may be regarded as an extremely sensitive spring. The index hand in this instrument, as in the other, is connected with the essential part by an ingenious arrangement of levers and springs. (*See* ATMOSPHERE, BAROMETER.)

ANEMORHIZA, *ăn'-e-mo-ri'-za*, in Bot., a gen. of plants belonging to the nat. ord. *Umbelliferæ*. The species *A. capensis* is cultivated as an esculent vegetable at the Cape of Good Hope.

ANETHUM, *a-ne'-thum* (Lat. *anethum*, dill, anise), a gen. of plants belonging to the nat. ord. *Umbelliferæ*. The species *A. graveolens* is commonly known as the Dill. The fruits — improperly termed seeds—of this plant are imported into this country in large quantities every year from the south of France. They have carminative properties, due to the presence of an essential oil, contained chiefly in the *vittæ* of the pericarp. They are used in medicine, and, it is said, in the manufacture of London gin. Attempts have been made to cultivate the plant in England, but they have not proved successful.

ANEURISM, *ăn'-u-rism* (Gr. *aneurysma*, I widen or dilate), in SURG., is generally defined to be a pulsating tumour, containing blood, and communicating with the interior of an artery. It is a tumour formed by a preternatural dilatation of a part of an artery, or by an extravasation of arterial blood in the cellular membrane, in consequence of a rupture or wound of the coats of an artery. The former is termed true, the latter false or spurious aneurism. If the external membrane of an artery is injured, and the internal protrudes through it and forms a sac, it is called a mixed aneurism. Aneurisms arise partly from too violent motion of the blood, partly from preternatural weakness in the membranes of the artery. They are most frequent in the adult, between the ages of 30 and 50, and occur oftener in the male than in the female; but no age is wholly exempt from them. They may be met with in any part of the body, and are usually divided into external and internal; the former occurring on the limbs, neck, or external part of the head; the latter form in any of the cavities of the body, as the thorax or abdomen, and generally affect the aorta or some of its principal branches. In the early stage of aneurism, if external, a small pulsating tumour is observed, which entirely disappears when compressed, but returns as soon as the pressure is removed. It continues to grow larger, and as it increases in size its pulsations become weaker, partly on account of its greater distance from the course of the blood, and sometimes also from the accumulation of fibrine within the cyst. Sometimes this fibrine consolidates, and becomes connected with the walls of the cavity, which it at length fills up, occasionally bulging into and choking up the artery. This, however, is a termination of aneurism that is unfortunately rare. In most cases, the dilatation of the sac goes on until, if not arrested, the inclosing membranes give way, and the patient expires from loss of blood; or death may be produced by pressure upon important parts, as the trachea, œsophagus, nerves, &c. The cure of aneurism consists in applying a ligature to the artery above the tumour: the ingress of blood into the sac is thus prevented, and its contents are gradually absorbed. The blood, being interrupted in its course through the artery, passes with greater force into the collateral branches, permanently enlarging them; and thus the necessary circulation to the parts beyond the obstruction is carried on. Internal aneurisms not admitting of such treatment, recourse must be had to such means as moderate the action of the heart, and depress the general circulation, thus inducing the formation of fibrine within the sac, which may gradually fill it up. These consist of repeated bleedings, low diet, perfect rest, and the administration of gentle laxatives and medicines which moderate the action of the heart; as digitalis, &c.

ANGEL, *ain'-jel*, an ancient gold coin in England, which was so named because it bore upon its obverse the figure of the archangel Michael piercing a dragon. It appears to have been first coined in France, about 1340. In 1465 Edward IV. introduced it into England,



ANGEL.

where it continued to be coined until the close of the reign of Charles I. Its value differed in different reigns, but is now only an imaginary sum, or money of account, implying ten shillings.

ANGEL, a term which is derived from the Greek *aggelos*, signifying an envoy or messenger. It is thus properly the name of an office, without reference to the person employed; and hence human beings, as prophets, priests, &c., are sometimes called angels. The Jews, however, and after them the Christians, have regarded angels as a class of intelligences superior to man, employed in carrying out the Divine commands. They have on several occasions revealed themselves to man. Before the captivity of Babylon, no angel is mentioned by name. After that time the names of Raphael, Gabriel, and Michael, occur in Scripture. The Jews divided them into different classes and ranks; and Dionysius the Areopagite, in his *Heavenly Hierarchy*, divides them into three classes, each containing as many orders. Most hold that angels were created before the visible world; others, on one of the six days; for, even on what day it took place, they are not agreed. Swedenborg gives a classification and detailed account of angels.

ANGEL-FISH (*Squatina Angelus*).—This curious fish, which is common on the British coasts, derives its

name of angel-fish from its pectoral fins having some resemblance to wings. It is remarkably ugly, having a large head and capacious mouth, set with five rows of teeth, which are broad at the base, and sharp and pointed above. Like the rest of the shark tribe, these teeth, by the aid of muscles, are capable of being raised and depressed. It has small eyes, set in a crescent-shaped orifice. The back is very rough, and of a grey colour; the belly is white and smooth. It is an extremely voracious fish; and, lying at the bottom of the water, preys upon the smaller fish which abound there. It measures about eight feet in length, and weighs about a hundred pounds. Formerly its flesh was considered a delicacy; but modern epicures pronounce it coarse and unpalatable. The skin of this fish is used by cabinet-makers for polishing purposes, and is also made into a fine kind of shagreen. The peculiar structure of this fish has gained for it two other names, by which it is frequently known. By some it is called the monk-fish, because its head appears to be enshrouded in a hood. The term fiddler-fish has also been given it, although its shape bears little resemblance to that musical instrument. A species (*Squatina aculeata*), which has a row of spines along the back, is found in the Mediterranean.

ANGELIC ACID, *ăn'-jel'-ik*.—This acid is met with in the roots of the different species of angelica. From the possibility of distilling it, and from its high fusing-point, it is supposed to belong to the oleic series.

ANGELICA, in Bot. (*See* ARCHANGELICA.)

ANGELICA TREE. (*See* ARALIA.)

ANGELICI, or ANGELICS, *ăn-jel'-iks*, an ancient sect of heretics, supposed to have been so called from their worship of angels. The council of Laodicea denounced this error, stating that "Christians ought not to forsake the church of God, and go aside, and hold conventicles, to invoke or call upon the names of angels, which things are forbidden."

ANGELITES, *ăn'-jel-ites*, a sect of heretics which existed in the reign of the emperor Anastasius, about 494, and were so called from Angelium, a place in the city of Alexandria, where they held their first meetings. They held that the persons of the Trinity are the same; that none of them exists of himself and of his own nature; but that there is a common God existing in them all; and that each is God by a participation of this deity.

ANGER, *ăn'-ger*, an emotion of the mind, occasioned by an injury done or offered to a person, or some one in whom he feels interested, and accompanied by a desire of revenge. Like the other mental passions, anger has its use and its abuse. "In morality, and in preserving the order of the world, resentment is a powerful instrument. Not merely the hurt that anger prompts to, but the very expression and aspect of the passion, inspire dread, and make men exert themselves to avoid causing it. Our anger is a wall of fire around us. In the government of human beings, the display of angry feelings suffices very often to check disobedience." (Bain's *Emotions and Will*.) The abuse of the passion is when it is occasioned by trivial or insufficient causes, or when it is continued too long. "Let not the sun go down upon your wrath" is one of those sayings of Scripture that contain volumes of philosophy. The proper government of this passion, which all should strive after, consists not in suppressing it, but in repressing that desire of revenge to which it gives rise. The effects of anger upon the physical system are very marked. The action of the heart is much increased, and the circulation of the blood is accelerated; the face becomes red and swollen, the brows knit, the eyes startle, and the whole body is in violent agitation. It frequently gives rise to diseases of the heart, brain, or other organs; but remarkable cures are also reported to have been effected by it, as ague, paralysis, gout, &c.

ANGINA PECTORIS, *ăn-ji'-na pek'-to-ris*, literally signifies a contraction or tightening of the chest, and in Med. is the name of a disease of the chest, characterized by a feeling of painful constriction at the lower part of the sternum or breastbone, inclining to the left side, and extending to the left arm. The pain is very acute, accompanied with a difficulty of breathing, irregular action of the heart, and a feeling of approaching dissolution. The paroxysms last from a few minutes to half an hour or more, and come on suddenly, at irregular intervals. They are often excited by violent exercise, strong mental emotion, or a derangement of the digestive organs; but frequently make their appearance without any manifest exciting cause. It is met with chiefly in the middle-aged or old, and is more frequent in males than females. Physicians are by no means agreed as to the seat and nature of this disease, and dissection has shown almost every disease of the thoracic viscera in connection with it. It seems most probable, however, that it primitively arises from a disordered state of the nerves in connection with the lungs and heart, which produce organic changes in these organs, or in the large vessels communicating with them. It is the nature of this disease to proceed from bad to worse, until at last the patient expires during a paroxysm of more than usual severity or duration, or falls a victim to some of the many organic lesions of the heart with which it is so often attended. Where the patient is young, or of good constitution, and where there are no symptoms of organic affection, success frequently attends early, active, and judicious treatment. Violent exercise and strong mental emotions are to be avoided, as well as long fasting or too full meals, and sudden exposure to great heat or cold. In fact, the patient "must lead a sober, quiet, and temperate life, in which neither the emotions of the soul are to disturb the functions of the body, nor corporeal affections are allowed to disturb the serenity of the mind."

ANGIOSPERMS, *ăn'-je-o-sperms* (Gr. *aggeion*, a vessel, *sperma*, seed), in Bot., flowering plants having their ovules or rudimentary seeds incased, or in ovaries. The ovules are fertilized indirectly by the action of the pollen on the stigmas. Plants with naked ovules are distinguished as *Gymnosperms* (*see* this word). In the system of classification adopted by Professor Bentley, the great class of *Dicotyledones* are divided into angiospermous and gymnospermous plants.



FRUIT OF AN ANGIOSPERM.

The first division, which is termed *Angiospermia*, is by far the more comprehensive, and embraces the sub-classes *Thalmifloræ*, *Calycifloræ*, *Corollifloræ*, and *Monoclamydeæ*. The second division, called *Gymnospermia*, forms a single sub-class. (*See* BOTANY, OVULE, SEED.)

ANGLE, *ăng'-el* (Lat. *angulus*, a corner), in Geom., the inclination of two lines meeting one another in a point. These lines are also called the "legs" of an angle. It is not upon the length of these lines or legs, but upon the degree of their separation, that their definition depends. A pair of compasses will afford a practical illustration of different angles: half-way between shut and straight they exhibit a *right angle*; close them a little, and they contain an *acute angle*; open them a little, and they contain an *obtuse angle*. A right angle is an angle of 90 degrees. (*See* GEOMETRY.)

ANGLER, *ăng'-ler*, a term applied to one who fishes with an angle, an instrument consisting of a rod, line, and hook, by means of which fish are taken.

ANGLER-FISH (*Lophius piscatorius*).—The angler-fish is known also as the sea-devil, fishing-frog, and toad-fish. Judging from its appearance, the name fishing-frog would seem to be the more correct appellation, as it more resembles a gigantic tadpole than anything else, and a very ugly tadpole to boot, as it is, almost without exception, the most ungainly-looking fish in creation. Its head, which forms quite half of its body, is flattened on the top, and the mouth extends nearly the whole width of the head, on the top of which are placed, pretty closely together, its two large black eyes. The nostrils have no external orifice, but two internal ones, answering the same purpose. The lower jaw of the angler is considerably longer than the upper; both are provided with rows of sharp conical teeth. The upper parts of the body are of a brown colour, the lower parts white. The pectoral and ventral fins are of the same colour, and the tail is nearly black. The angler, being a voracious fish, and at the same time far from an industrious one, is compelled to resort to artifice to obtain a living, and the

*modus operandi* is somewhat singular. Affixed to the front of its head are two bony filaments, the foremost one dilated at the tip, and having a silvery lustre. Firstly, *Lophius piscatorius* settles itself comfortably



ANGLER-FISH.

at the bottom of the water, and, shaking up the mud or sand a bit, makes the water somewhat turbid. Having thus hid its ugly person from the gaze of squeamish fish, who might take an objection to its appearance, and hence keep clear of its locality, it lazily flutters the appendage aforesaid to and fro in the water. The bait easily takes, and small fish, who imagine they are about to make a meal of the little shining worm find themselves, in a twinkling, in the capacious jaws of the angler. Not always, however, does it obtain its food in the manner described; but sometimes exhibits a boldness which certainly seems more in unison with its bloodthirsty appearance. Mr. Yarrell relates two such instances. In one case, a cod had been hooked by a fisherman, and on being drawn to the surface, he was astonished at finding an angler hanging to it. So tenacious did it keep its grip on the cod, that he was compelled to strike it a severe blow before it would quit its hold. Another time, an angler had seized a conger eel, and the latter had wriggled itself into the bronchial aperture of its captor. In this condition, they were both brought to the surface. The average size of the angler is about three feet, although it has been known to attain a length of five feet. In itself, the fish is of no value; but many of the fish found in its stomach are generally quite uninjured, sometimes alive; and the fishermen frequently make a little money by exhibiting the fish itself to seaside visitors, generally accompanying their exhibition with a most doleful lamentation upon the ravages committed by their not very prepossessing captive. Closely allied to the foregoing species are several others:—1. The Cornish angler (*Lophius cornubicus*); 2. the muricated angler (*Lophius muricatus*); 3. the beaked angler (*Lophius rostratus*); 4. the harlequin angler (*Lophius histrio*); 5. the striped angler (*Lophius striatus*); 6. the marbled angler (*Lophius marmoratus*). — *Ref.* Dallas's *Hist. of Animal Kingdom.*

ANGLING, *ang'-ling*, the occupation of a fisherman, particularly applied to the art of taking fish in fresh water, rivers, ponds, and brooks, with a rod, line, and hook, to which is attached a natural or artificial bait or lure. There are two methods of angling—fly-fishing and bait-fishing. The former is chiefly practised during the summer months, when insects are most plentiful, by those who are really fond of a sport requiring considerable skill, and affording no small degree of excitement, and angle for salmon and trout, and those fish which are usually found in rapid rivers and swift-running streams. Bait-fishing is generally followed in deep sluggish rivers and large pond-like pieces of water, which are frequented by perch, roach, carp, pike, dace, tench, gudgeon, &c. The necessary fishing-tackle for an angler comprises a rod and reel, lines, hooks, silkworm gut, and artificial flies; a fishing or tackle book especially, for the reception and preservation of these articles when not in use; baits of various kinds, boxes, floats, and a basket. The most useful rod is one fitted with different top-joints, which will serve for the purposes of throwing a fly, dibbing or dapping with a worm, fernweb, bluebottle-fly, or grasshopper, or trolling with a minnow or stickleback. A salmon rod should be seventeen or eighteen feet long, stout, strong, and tolerably stiff; for trout, a shorter, lighter, and more elastic rod should be used. The most convenient rod is made in pieces, about three feet or more in length, fitted together with joints, with a spear screwed into the bottom of the butt or stock of the rod, which should be hollow, to hold extra top-joints. The reel commonly used is a small brass multiplying one, which may be attached to the rod at pleasure, by rings sliding on the butt, allowing the angler to wind or unwind his line with greater rapidity and without check. The best line for general purposes is made of hair; but, for trolling, a silk line is preferable. It should be white, or of a reddish colour, for clear streams; and grey, or black and white, for deep and muddy water. A line should be about thirty or forty yards in length, and taper from the end attached to the reel. The best are woven or plaited together in one piece, and thus are free from knots, which prevent the line from running freely through the rings attached to the rod. A collar of silkworm gut, consisting of many strands firmly knotted together, is attached to the end of the line for fly-fishing, to which are fastened the artificial flies best suited for the season or the fish the angler desires to take. Hooks are made of various sizes, numbered from 1 to 13, ranging from some inches in length to half an inch, or even less. The best are manufactured at Redditch. Floats are made of cork or quill, heavier at one end than the other, to remain upright in the water. The basket is peculiar in shape, large at the bottom and smaller at the top; hollowed behind, to rest with comfort on the angler's back, and suspended across the chest and shoulder by a strap of leather. In addition to these, a gaff and landing-net are sometimes carried, to secure fish of some weight when they have been brought into shallow water. The natural baits commonly used by anglers are gentles, which are the larva of the common blowfly; the larva of the *phryganea*, called caddy or caddice-worms; the common earth-worm, found in gardens and grass-fields; brandlings and red-worms, found in dunghills; the larva of the gadfly, found under cow-dung; caterpillars of various kinds, and different pastes or compositions, which are now considered to be of little use. These are baits for ground fishing, and must be sunk to touch the bottom, or nearly so; for which purpose split shot are attached to the gut-line, a little above the hook. Artificial flies are made from the hackles of fowls and the feathers of various birds, coloured wool, the flax of the hare and rabbit, and the fur of mice and other animals. These materials are neatly tied to the shank of the hook with silk, to present some resemblance to the insect it is intended to imitate. Among the most common are the red palmer-fly, the blue dunfly, the brown fly or dundrake, the spider-fly, and the green drake or May-fly. For salmon-fishing, large flies are required, made of brilliant and gaudy materials.—With the description of the various fish that frequent the rivers and lakes of the United Kingdom, Norway, Canada, and other countries, information will be found respecting the locations and seasons in which they may be taken, and the baits best suited for the purpose. (*See* SALMON, TROUT, PIKE, &c.)—*Ref.* Izaak Walton's *Complete Angler*; Stoddart's *Angler's Companion*; Colquhoun's *Moor and Loch*; Stewart's *Practical Angler.*

ANGLO-CATHOLIC OR ANGLICAN CHURCH, *ang'-li-kan*, a term employed to designate those churches which embraced the principles of the Established Church of England. It includes the United Church of England and Ireland, the Episcopal Church in Scotland, the Colonial Episcopal churches, and the American Episcopal Church. When and by whom Christianity was introduced into England is not ascertained; but, according to some, it was in the time of the Apostles or their immediate successors. When the Britons were conquered by the Anglo-Saxons, who were heathens, the Church was persecuted, and its adherents driven into Wales, or reduced to a state of slavery. St. Augustine was, about the year 596, sent by Pope Gregory I., along with some forty others, into Britain, in order to convert the Anglo-Saxons. When Christianity began to spread among the Saxons, the conversion of the king of a Saxon state was immediately followed by the elevation of his benefactor to a bishopric, the limits of which were usually conterminous with those of his kingdom. Subsequently, some

of the larger dioceses were divided, and new bishoprics created; and, with the exception of some changes effected in the reign of Henry VIII., and a few of recent origin, the present bishoprics are the same as those established in Anglo-Saxon times. At first, the church in England existed in a state of comparative freedom and purity; but gradually, and at length completely, she became assimilated in doctrine and practice to the church of Rome, and subject to her domination. From the time of Wycliffe to the reign of Henry VIII., nearly every parliament adopted measures to resist pontifical supremacy; and they even several times suggested to the sovereign the appropriation of church property to secular objects. From 1534 England may be said to have possessed a national church; for ever since, except during the brief reign of Mary, the civil laws by which Christianity has been established and expounded have derived their force entirely from the sanction of the government of the state. In 1536 the Convocation passed, and the king adopted, certain articles, in which the Bible and the three Creeds are set forth as the foundation of belief; baptism, penance, confession, and belief in the corporal presence, are declared essential to salvation; and justification is said to be obtained by the union of good works with faith. Images were to be used as examples, not as idols; saints were to be honoured, not worshipped; the use of holy water was allowed, but its efficacy denied; indefinite prayer was permitted for the dead; and the existence of an unspecific purgatory was affirmed. In the following year the king put forth a fuller exposition of belief, in a book adopted by the Convocation, and entitled "The Institution of a Christian Man." In 1539 the law of the Six Articles was passed; these were—1. The doctrine of the Real Presence; 2. the communion in one kind only; 3. the perpetual obligation of vows of chastity; 4. the utility of private masses; 5. celibacy of the clergy; 6. the necessity of auricular confession. Death by fire, and the forfeiture of all possessions, were the penalties enacted for controverting the first article, and imprisonment or death for the rest; but in 1544 these penalties were somewhat modified, though the numbers that suffered death under them were still very great. During the brief reign of Edward VI. the doctrines of the Reformation made rapid progress; the law of the Six Articles was repealed; the celebration of private masses was prohibited; the laity were allowed the communion of the cup; marriage was permitted to the clergy; images were removed from the churches; altars were converted to communion-tables; and, finally, in 1563, the Forty-two Articles were issued, establishing the doctrines of the Church nearly as they stand at present. A new communion service, differing but slightly from that now in use, was produced in 1547, and in 1549 the English Liturgy was first introduced, and, after being revised and somewhat altered, was confirmed by parliament in 1552. During the short reign of Mary, Romanism was re-established, and about 300 persons paid for their opinions with their lives. On the accession of Elizabeth, Protestantism was restored. In 1559 the Act of Uniformity re-established, with little variation, the Book of Common Prayer; and in 1571 the Articles of Religion were adopted in their present form, and confirmed by act of parliament. (*See* ARTICLES, THIRTY-NINE.) The doctrines of the Church of England are embodied in her Articles and Liturgy (which *see*); the Book of Common Prayer prescribes her mode of worship; and the Canons of 1603 contain, so far as the clergy are concerned, her code of discipline.—Ref. *Religious Census of England and Wales in* 1851, by Horace Mann.

ANGLOMANIA, *ăng'-lo-mai'-ni-a*, a term used in France and Germany to denote a desire to adopt, or an admiration for, the manners, customs, institutions, &c., of England. "We have less reason," says the German *Conversations Lexicon*, "to complain of the German Anglomania of the present day, than we had of the Gallomania of a former period:"

ANGLO-SAXON ARCHITECTURE. (*See* ARCHITECTURE, ANGLO-SAXON.)

ANGLO-SAXON LANGUAGE. (*See* ENGLISH LANGUAGE.)

ANGLO-SAXONS, *ăn'-glo săx'-ons*, the general historic name given to the Angles, Jutes, and Saxons, tribes from the north of Germany that arrived in England at intervals from 449 to 547, under Hengist and Horsa, and numerous other chiefs, and gradually subjugated the greater part of the country, founding the Saxon heptarchy. The Saxons are supposed to have colonised the south-eastern coast long before this period, and, if this be the case, it is probable that the frequent intercourse of the German tribes with these settlements led them to conceive the idea of taking possession of the entire country after the departure of the Romans. The Jutes first, coming from Schleswig, made themselves masters of Kent, part of Hampshire, and the Isle of Wight; the Saxons, shortly after, took the central and remaining southern parts of England; while the Angles, arriving in bands in 527 and subsequent years, settled in Norfolk and Suffolk, the country north of the Humber, and the lowlands of Scotland. These invaders divided the territory that they had gradually wrested from the Britons into seven states, known as the Heptarchy (*see* HEPTARCHY, vol. I. of this work), and formed a federal league for mutual protection against foes from without, under a leader to whom the title of Bretwalda was given. (*See* BRETWALDA.) These states were united in 827, by Egbert, king of Wessex, who thus became king of England, or the land of the Angles. The Anglo-Saxons were the dominant power in England from 449 to the Norman conquest in 1066, except during the short time the country was under Danish rule, from 1017 to 1042. They were converted to Christianity by Augustine, who was sent to England as a missionary in 596, by Pope Gregory I. The laws and customs of the Anglo-Saxons were derived from their German ancestors; but these were modified and improved by Alfred the Great, who laid the foundation of the unrivalled constitution of this country. The cyning, or king, was the first person in the state: his office was at first elective, but afterwards became hereditary, though subject, in a great measure, to the will of the people. The king was assisted in the government by an assembly called the Witenagemote (*see* WITENAGEMOTE), composed of the leading men in the kingdom among the nobles and clergy; and, without the consent of this body, the king could not levy taxes, or commence or end any war. The next in rank to the king and athelings, or persons related by blood to the sovereign, were the ealdormen, or aldormen, men possessed of great power and influence in civil and military affairs, who governed large tracts of land, or shires, as lieutenants of the king. The thanes, or inferior nobles, held a position in the social scale between these and the ordinary mass of the people, who were termed ceorls: these were free men. The slaves, or theows, sometimes called thralls, formed a still lower class, and belonged to the holder of the land on which they were born, and from which they never moved, the transfer of an estate from one possessor to another necessitating the purchase of the slaves. Composition was made for homicide and theft, and crimes of all kinds, by payments in money or cattle, the amount of remuneration in all cases being regulated by the station in life of the man to whom the wrong had been done. The kingdom was politically divided into districts called shires; each shire into hundreds, and each hundred into tithings, ten in number, the tithing containing ten families, the members of which were mutually bound for each other's good conduct and observance of the laws. Scirgemotes, or assemblies of the leading men in each shire, under the ealdorman, were held half-yearly.—*Ref.* Sharon Turner's *History of the Anglo-Saxons*; Kemble's *Saxons in England*; Knight's *Popular History of England*.

ANGORA CAT. (*See* CAT.)

ANGORA GOAT, *ăn-gor'-a*, a beautiful animal, native of Angora, a mountainous city in Asia Minor. These goats have fine, soft, silky hair, quite eight inches in length. From this goat-hair a sort of yarn, called camel-yarn and Turkish yarn, is made. The term *camel* is often erroneously supposed to be derived from the name of that animal; it comes, however, from the Arab. *chamal*, fine. The skin of the Angora goat also yields that fine kind of leather known as oriental morocco. (*See* ANGORA, vol. I. of this work.)

ANGRECUM, *ăn-gre'-kum*, in Bot., a gen. of plants belonging to the nat. ord. *Orchidaceæ*, the Orchis family. The dried leaves of the species *A. fragrans*

form Faham or Bourbon tea, used in the Mauritius for making a beverage somewhat resembling the infusion of ordinary Chinese tea.

ANGUILLA. (*See* EEL.)

ANGUIS. (*See* BLIND-WORM.)

ANGUSTURA BARK, or CUSPARIA BARK, *ăn-gus-tu'-ra*, a valuable drug, imported directly or indirectly from South America. In small doses it acts as a stimulant, tonic, and febrifuge; while, in large doses, it is somewhat emetic and purgative. This bark is the produce of different species of *Galipea* (which *see*), and its characteristic properties depend on the presence of an active principle, to which the name *Cusparin* has been given. It has fallen into disrepute on the continent, in consequence of the substitution for it of a very poisonous bark obtained from the *Strychnos nux-vomica*. At one time the substitution was so common, that the importation of Angustura bark into Austria was prohibited, and the whole of it then found was ordered to be destroyed. At the present time such a substitution is happily very rare, though it was detected a few years since in Dublin.

ANHINGA. (*See* DARTER.)

ANHYDRIDE, *ăn'-hi-dride* (Gr. *a*, without, and *udor*, water), a term applied to an anhydrous acid by the followers of Gerhardt's theory of chemical nomenclature, according to which all oxy-acids are supposed to consist of their respective anhydrides, *plus* an equivalent of water. Thus nitric acid is supposed to be $NO_5+HO$, or $HNO_3$, $NO_5$ being *nitric anhydride*. This view is borne out by the fact, that the various anhydrides, both organic and inorganic, are destitute of any acid reaction. Some are even capable of being dissolved in water without showing any of the characteristics of an acid. Salts, according to this view, are formed by the substitution of an atom of metal for an atom of hydrogen in the acid. Thus, nitrate of potash, or nitrate of potassium, as it would be called according to this theory, would be $KNO_5$, or nitric acid with an atom of hydrogen replaced by an atom of potassium. In like manner, sulphate of potash would be $KSO_4$, sulphuric acid $HSO_4$, and sulphuric anhydride $SO_3$. The theory is carried out in wonderful perfection throughout the series of organic acids; in fact, it was in investigating these that the theory was first conceived. Organic anhydrides bear the same relations to their acids that ethers bear to alcohols; that is to say, they differ by one equivalent of water. Acetic anhydride is formed by distilling anhydrous acetate of potash and oxychloride of phosphorus. It is a colourless mobile liquid, with a smell resembling, but still different from, that of acetic acid. On being thrown into water, it falls to the bottom in oily drops, which slowly dissolve, forming acetic acid. The anhydride theory has been somewhat dwelt upon in consequence of Gerhardt's system growing daily more and more into use through the teaching of Hofmann, Brodie, Williamson, Odling, and other eminent chemists.

ANHYDRITE, *ăn'-hi-drite*, a mineral found in the Tyrol in long rectangular prisms. It consists of anhydrous sulphate of lime.

ANHYDROUS, *ăn-hi'-drus*.—Oxides and salts containing no water are said to be anhydrous. Water possesses the property of forming compounds called hydrates, with different salts and oxides. Thus we have hydrate of potassa, of lime, of oxide of chromium, &c. The affinity possessed by many metallic oxides for water is so strong, that, when once the hydrate is formed, the water cannot be separated but by the addition of an acid. Caustic potassa, for instance, contains one atom of water which is not separated even by a red heat. (*See* WATER.)

ANILINE, *ăn'-i-line* (Hindostanee *anil*, indigo), KYANOL, PHENYLAMINE, PHENYLIA, or CRYSTALLINE. This compound, discovered as a product of the distillation of indigo by Unversorben, has of late received great attention, from being the source of most of the coal-tar series of dyes, of which mauve and magenta are familiar examples. Aniline, $C_{12}H_7N$, is a clear transparent liquid, with an agreeable wine-like odour and a burning taste. It is very acrid and poisonous. It boils at 360° F. and freezes at 4° F. It is rather heavier than water, in which it readily dissolves. It is a true organic base, forming well-defined crystallizable salts with acids. It may be procured in several ways:—1. By acting on indigo with hydrate of potassa, and distilling the product. 2. It is contained in small quantities in the products of the distillation of coal. 3. Nitrobenzole is converted into aniline and water by the action of acetic acid and iron, or some other deoxidising agent. Aniline is very interesting from a chemical as well as a commercial point of view, the investigation of its properties having thrown great light upon many mysteries of organic chemistry. A short time since aniline existed only in a few laboratories in small quantities; now it is manufactured in tons for the purpose of being converted into the various dyes.

ANILINE DYES.—The principal aniline dyes, or coal-tar dyes, as they are often called, are mauve, or Perkin's purple, magenta, red, or fuchsine, violine, and several others. Aniline purple was discovered by Mr. W. H. Perkin, while endeavouring to form artificial quinine. On treating sulphate of aniline with bichromate of potash, he obtained a dense black precipitate, which, on further examination, was found to contain the purple in question in large quantities. This laid the foundation for further researches, the result of which has been the discovery of a series of the most splendid dyes, constant in colour and brilliant in tint. Their commercial manufacture is briefly as follows:—Benzole, a well-known product of the distillation of coal, and nitric acid, are combined to form nitro-benzole, which, being acted on by acetate of iron, is resolved into aniline, water, and other compounds. Solutions of sulphate of aniline and bichromate of potash are mixed and allowed to stand until the precipitation of the black powder mentioned above is complete. The precipitate is thrown on a filter and washed. It is then digested in coal-tar naphtha, and afterwards in alcohol, which dissolves out the dye. Violine is formed nearly in a similar manner, by means of the combined action of sulphuric acid and oxide of lead. By combining sulphate of aniline and oxide of lead, rosoine is formed. By substituting bichloride of tin, or nitrate of mercury, fuchsine, or magenta, is obtained. "Bleu de Paris" is made by altering the proportions of bichloride of tin, and performing the operation in a closed tube heated for thirty hours to about 400° F. It was long known to chemists that aniline compounds were capable of yielding coloured products with chloride of lime and other salts, but it was Mr. Perkin who first succeeded in making the production of aniline dyes a commercial manufacture. The manufacture of aniline colours in England is rapidly developing into a most important branch of commerce, and from the facility and cheapness with which coal products are obtained, there is but little doubt that we shall shortly become the colour-exporting nation of the world, instead of having to rely on Turkey and Holland for madders and other dye-stuffs.

ANIMA MUNDI, *ăn'-i-ma mun'-di* (Lat., soul of the world), in Phil., the name of a certain pure ethereal substance or spirit, held by some ancient philosophers to be diffused throughout nature, and to constitute the living principle of the world. This doctrine was held by the Stoics and Stratonicians, and is closely allied to pantheism. Plato and his followers believed in this *anima mundi*, but held that there was an infinitely pure and perfect being above it. Many philosophical and philosophico-religious sects have entertained the same opinion under different forms.

ANIMAL, *ăn'-i-mal*.—The law distinguishes animals into such as are *domitæ* and such as are *feræ naturæ*, some being of a tame, and others of a wild disposition; the former consisting of such animals as we generally see tame, and are therefore seldom or never found wandering at large; and the latter of such as are usually found at liberty.

ANIMAL CHEMISTRY.—That branch of science which treats of the different changes going on in the living animal; such as the change of the egg, consisting of white, yolk, and shell, into the flesh, blood, bones, and feathers of the young bird. The processes of respiration, digestion, and assimilation of food, are purely chemical operations. The principal chemical substances necessary for the support of the different functions of the animal system, are oxygen, hydrogen, carbon, nitrogen, sulphur, phosphorus, and chlorine, and the metals iron, sodium, potassium, lime, and magnesia. These are all received into the system in the

form of food, and become distributed to the different parts of the body during the process of digestion and assimilation; as for example, the iron to the blood and hair, the lime and phosphorus to the nails and bones. If any of these substances are wanting, the system suffers, and they must be restored to the patient. For instance, rachitis, or rickets, in children is caused by the bone containing too little lime; and the best remedy therefore, in its earliest stage, is plenty of lime-water, or some other substance containing lime. The following analysis of different parts of the human system will be interesting, as showing the destination of these different substances:—

| Bone. | | Hair. | |
|---|---|---|---|
| Animal matter | 31 | Carbon | 51 |
| Phosphate of lime | 58 | Hydrogen | 7 |
| Fluoride of calcium | 2 | Nitrogen | 17 |
| Carbonate of lime | 7 | Sulphur | 3 |
| Phosphate of magnesia | 1 | Oxygen | 22 |
| **Blood.** | | **Flesh.** | |
| Water | 779 | Coagulated fibre. | |
| Fibrine | 2 | Water, three-fourths. | |
| Fatty matter | 2 | Albumen. | |
| Albumen | 69 | Phosphoric acid. | |
| Iron and salts | 7 | Phosphates. | |
| Blood corpuscles | 141 | Chlorides. | |

The modern discoveries of animal chemistry have thrown great light upon the vital functions, and the laws governing them. The researches of Liebig and others have also tended to purge medicinal science of much of its rubbish, and prescriptions are now compounded by men knowing the chemical value of their ingredients. (*See* Blood, Bone, Respiration, &c.)

Animal Flower, the gen. *Actinia*. It bears some resemblance to a flower with a radiated disk; its tentacula are disposed in regular circles, tinged with a variety of beautiful bright colours, as the marigold, anemone, &c. (*See* Anemone, Sea.)

Animal Heat is that heat which is generated in the bodies of living animals, by which they are enabled to maintain a certain temperature, independent of that of the atmosphere or other medium by which they are surrounded. Heat is one of the conditions necessary to life, and, when that is reduced below a certain point, all vital activity ceases. The sun is the great source of heat, and on it vegetables and the greater number of tribes of animals principally depend. There are certain tribes of animals, however, especially birds and mammals, which possess the power of generating heat within themselves to such a degree as to render their vital functions almost entirely independent of external influences; and there is probably no species that can exercise this power more effectually and through a greater range of conditions than man. Judging merely from our sensations, we should be led to conclude that our bodies undergo very considerable changes of temperature. Such, however, has been proved not to be the case. From a series of 114 observations made by Dr. John Davy on persons of different ages and sexes, and in various latitudes, it was found that the mean temperature of the body was 100°, in a mean atmospheric temperature of 74°; the highest temperature of the body being 102°, while the highest atmospheric temperature was 82°, and the lowest temperature of the body 96·8°, while the lowest temperature of the air was 60°. The mean age of all the individuals was 27. In favourable circumstances, the temperature of infants is somewhat higher than that of adults; but, in their power of resisting the depressing influence of external cold, the former are much inferior to the latter. External cold reduces the temperature of the body considerably, especially if at rest. Thus Dr. Davy found the temperature of his own body reduced, on an average of four observations, to 96·7°, with the average temperature of the surrounding air at 37°. An increase of temperature takes place after exercise, as well as after a meal. The usual temperature of the body occasionally undergoes considerable change in disease, from 106° in fever to 67° in cholera. The mean temperature of birds is rather higher than that of mammals, averaging about 109°, while mammals average about 101°. Animal heat arises from the various changes that are constantly going on within the bodies of the animals. Every change that takes place in the condition of the organic components of the body, in which their elements enter into new combinations with oxygen, is necessarily a source of the development of heat. By the union of the oxygen of the atmosphere with the carbon and hydrogen of the body, a species of combustion takes place, and heat is evolved. Hence we find that the more rapidly this combustion is carried on, the greater the amount of heat produced; and hence exercise increases the heat of the body. Some have held that combustion was not sufficient to account for the total amount of heat generated in a living body; but the most recent authorities are now generally agreed that such is the case, especially when we take into account the small quantities of sulphur and phosphorus which also undergo oxidation within the system. But, while a low degree of heat destroys vital activity, not less destructive to it is a high degree of heat. By a wise provision, therefore, the body has the power of maintaining itself in a moderate state of heat, even when surrounded by a very hot medium. Thus Banks, Blagden, and Fordyce exposed themselves to a heat of nearly 260°, and found that their bodies had preserved nearly their own temperature. This is owing to the cutaneous and pulmonary evaporation which takes place. Animals placed in a hot atmosphere so saturated with humidity that no evaporation could take place, could not support a heat but little greater than their own without perishing.

Animal Kingdom.—This term is commonly applied to one of the three primary divisions of Nature, the other two being called respectively the *Vegetable kingdom* and the *Mineral kingdom*. All organized beings are included in the first and second, and all inorganic bodies in the third division. This arrangement of natural objects into three great departments is very ancient; indeed, there is every reason to believe that it was one of the earliest classifications devised by the human mind. The general differences between animals, plants, and minerals are so striking, that they could not long have escaped the attention of wondering and thoughtful man. With the increase of knowledge, however, the line of demarcation between the two organic kingdoms has gradually been obliterated; and at the present time we may seek in vain for a character by which an animal may at once be distinguished from a plant. The mineral kingdom can easily be defined, as no inorganic body has the characters which we may recognize in any organized being. A plant or an animal, however lowly, may be distinguished from a mineral by its cellular structure. All its parts originate in and are formed out of cells (*see* Cell); and each part so produced is dependent on the others. A mineral body is merely an aggregate of homogeneous particles, and it has no special parts or organs. Again, a plant or animal exists as an individual being for a certain time, and has the power of producing other beings to take its place when that time has expired. A mineral, on the other hand, has no definite period of existence, but will remain unchanged as long as it is not acted upon by external forces sufficiently powerful to overcome the cohesion of its particles. The distinction between plants and animals, though evident enough when we regard those which are highly organized, is scarcely perceptible when we compare the lowest links of each chain of life. Indeed, many unpretending forms of life seem to occupy neutral ground, and may be claimed by the botanist and zoologist with equal right. Aristotle was the first naturalist who sought a distinction between plants and animals; and, in stating that an animal possessed a mouth while a plant had no such organ, he gave, perhaps, the simplest and most generally applicable definition that exists. The microscope has, however, quite upset the notion that the mouth is a necessary part of an animal. Linnæus attempted to define the three kingdoms by the following dictum:—"Minerals grow; plants grow and live; animals grow, live, and feel." To apply this definition, we must first define life and feeling; and this cannot be done in such a way as to effect the object of the naturalist. Cuvier thought the possession of a stomach a sufficient distinction for

the animal kingdom; but, since his time, we have become acquainted with numerous microscopic creatures that have no special receptacles for food. Until very lately, chemical distinctions were much relied upon, as it was believed that the presence of cellulose (*see* this word) or of starch was a certain characteristic of a plant. This belief has, however, been proved to be erroneous by the discovery of these common vegetable constituents in the tissues of animals. Though we cannot give any absolute rule for distinguishing an animal from a plant, we can point to many striking differences between the two kingdoms, when we consider the functions performed by the members of each taken collectively. It is only in comparing particular individuals that we encounter difficulties. In a general sense, animals consume organic matter derived directly or indirectly from the vegetable kingdom, while plants obtain their nourishment from the mineral kingdom. Animals, by the process of respiration, absorb oxygen and breathe out carbonic-acid gas; while plants take carbonic acid from the atmosphere and eliminate oxygen. Thus the great functions of animal and vegetable life are antagonistic, and between them the circulation of matter is constantly kept up. Other characters of a more evident kind may be given, by which animals may generally be distinguished from plants. Thus animals have the power of voluntary motion, and wander about in search of food, which they digest in internal cavities or stomachs. Plants, on the contrary, are stationary, and absorb the substances by which they are nourished through their external surfaces. These characters, as we have before stated, are not absolute marks of distinction; for there are many animals that pass their existence in fixed positions, and many that are stomachless; while, on the other hand, there are many plants which move from place to place, as if gifted with volition.

In studying zoology,—that part of natural history which treats of the structure, habits, and habitations of all animals, from man to the humblest animalcule,—we find that a general plan or system underlies the innumerable diversiform beings included in the first kingdom of nature. To discover this plan has always been the highest object of the scientific naturalist, and the many beautiful schemes of classification which have been devised are the results of investigations undertaken with this view. A very cursory inspection of the forms and structures of the different tribes of animals which are constantly presenting themselves to our notice, might satisfy us, that amongst all there are resemblances and differences; between some the similarity being the prevailing feature, whilst between others the differences are most obvious. In a crude shape, zoological classification must have been employed by the earliest human inhabitants of the globe. The first observers of nature must have seen that animals could be placed in natural groups, as the distinctions between quadrupeds, birds, fishes, and insects, are very obvious. Minor divisions must also have been made at a very early period; for instance, the division of beasts into herbivorous and carnivorous groups, and of birds into granivorous and carnivorous. Until the time of Aristotle, who has justly been termed the father of natural history, zoological classification was based upon obvious external characters, and was necessarily very imperfect. Aristotle's system was the first founded on the only sure basis—the organization or physiological character of each animal. His method has been followed by all his successors, but we need scarcely say that his classification no longer holds a place in zoology. Between the systems of Aristotle and Linnæus, those of Ælian, Pliny, Athenæus, Albertus Magnus, Belon, Gesner, Aldrovandus, Johnston, Ray, and Buffon, were successively introduced; but as all these have long since been discarded, we need not consider their respective merits. By Linnæus the animal kingdom was arranged in six great classes; namely, *Mammalia* (sucklers), *Amphibia* (reptiles), *Fishes*, *Insects*, *Vermes* (worms). The primary distinctions between these classes are given in the following table:—

| | | |
|---|---|---|
| Heart bilocular (having two cells). Blood warm, red. | Viviparous (producing young alive) | *Mammalia.* |
| | Oviparous (producing eggs) | *Birds.* |



| | | |
|---|---|---|
| Heart unilocular (one-celled). Blood cold, red. | Arbitrary lungs | *Amphibia.* |
| | External gills | *Fishes.* |
| Heart unilocular. Circulating fluid cold, white. | With antennæ | *Insects.* |
| | With tentacula | *Vermes.* |

The Linnæan system gave place to that of Cuvier, which is now followed so far as it agrees with recent discoveries. By Cuvier the animal kingdom was divided into four sub-kingdoms—*Vertebrata*, *Mollusca*, *Articulata*, and *Radiata*. Recent authorities have, however, divided it into five sub-kingdoms, by splitting the Radiata into two, and rearranging some of its constituents. The distinguishing characters of Cuvier's great divisions may be thus stated:—

*Vertebrata.*—The animals of this sub-kingdom are characterized by the presence of a backbone and bony skeleton. The blood is red, the heart muscular, and the mouth is furnished with two jaws, placed one either before or above the other. They have distinct organs of sight, hearing, and smell, situated in the cavities of the face, and they have never more than four limbs. The sexes are always distinct. In the nervous system we distinguish two great centres of power, the brain and spinal cord.

In the other three sub-kingdoms, which may be grouped together under the general head of *Invertebrata*, we place animals void of backbone and bony skeleton.

*Mollusca.*—The animals belonging to this great group have no internal skeleton, the muscles being attached only to the skin, which constitutes a soft contractile envelope. The nervous system is contained within this general envelope, together with the viscera, and is composed of several scattered masses connected by nervous filaments. Of the four senses, only those of taste and vision can be distinguished, and the latter sense is frequently wanting. Snails, slugs, oysters, and mussels, are molluscous animals.

*Articulata.*—The nervous system of the third type of animal life consists of two long cords running longitudinally through the abdomen, dilated at intervals into knots, or ganglia. The organs of taste and vision are usually well developed. The envelope of the trunk is divided by transverse folds into a certain number of rings, to the interior of which the muscles are attached. The trunk often bears on its sides articulated limbs, but is frequently unfurnished with them. Worms and insects are included in this sub-kingdom.

*Radiata.*—In the radiate type the organs of sense and motion, instead of being arranged symmetrically on two sides of an axis, are disposed in rays round a centre. There is no very distinct nervous system, nor are there any organs of particular senses. This sub-kingdom embraces all those animals known as zoophytes, the star-fishes, and other lowly forms of life.

The following classification is taken from that given by Mr. Jukes, in his "Manual of Geology," and which was supplied to him by Professor Huxley. The classification of the mammalia is that recently devised by Professor Owen. In examining this comprehensive scheme, the student must be guarded against taking the arrangement as strictly a linear one. The highest animals are doubtless placed first, and the lowest last, and this idea of subordination runs throughout; but it is impossible to carry it out accurately in detail, since many of the orders should be arranged side by side, or, still more properly, in circles, in order strictly to express their mutual relations:—

SUB-KINGDOM—VERTEBRATA.

Class I.—MAMMALIA.

Sub-Class—*Placentalia.*

| *Orders.* | *Examples.* |
|---|---|
| Bimania | Man. |
| Quadrumana. | |
| Catarhini | Old-world monkeys. |
| Platyrhini | American monkeys. |
| Strepsirhini | Lemurs. |
| Carnivora. | |
| Digitigrada | Lion, wolf, hyena, weasel. |
| Plantigrada | Bear, racoon, badger. |
| Pinnigrada | Seal, morse. |

## Animal Kingdom

| *Orders.* | *Examples.* |
|---|---|
| Artiodactyla. | |
| Nonruminantia | Hippopotamus, pig. |
| Ruminantia | Camel, stag, sheep, cow. |
| Perissodactyla. | |
| Solipedia | Horse. |
| Pachydermata | Rhinoceros, hyrax, tapir. |
| Proboscidea | Elephants. |
| Sirenia | Dugong, manatee. |
| Cetacea | Whale, porpoise. |
| Cheiroptera. | |
| Frugivora | Pteropus. |
| Insectivora | Bat, vampire. |
| Insectivora | Hedgehog, shrew, mole. |
| Bruta, or Edentata | Sloth, armadillo, ant-eater. |
| Rodentia | Rat, hare, squirrel, beaver, porcupine. |

Sub-Class—*Implacentalia.*

| | |
|---|---|
| Marsupialia | Kangaroo, wombat, opossum. |
| Monotremata | Platypus, echidna. |

Class II.—AVES.

| | |
|---|---|
| Raptores | Eagle, hawk, vulture, owl. |
| Scansores | Woodpecker, cuckoo, parrot |
| Passeres | Thrush, sparrow, swallow, crow, lark. |
| Columbæ | Pigeon, dove. |
| Gallinæ | Fowl, grouse, partridge, turkey, peabook. |
| Cursores | Ostrich, emu, apteryx, bustard. |
| Grallatores | Crane, heron, plover, snipe. |
| Palmipedes | Duck, albatross, gull, puffin, pelican. |

Class III.—REPTILIA.

| | |
|---|---|
| Chelonia | Turtle, tortoise. |
| Crocodilia | Crocodile, alligator. |
| Lacertilia | Lizard. |
| Ophidia | Snakes. |

Class IV.—AMPHIBIA.

| | |
|---|---|
| Batrachia | Frog, toad. |
| Saurobatrachia | Proteus, siren. |
| Ophiomorpha | Cecilia (blind-worm). |

Class V.—PISCES.

| | |
|---|---|
| Dipnoi | Lepidosiren. |
| Elasmobranchii | Shark, ray. |
| Ganoidei | Sturgeon, lepidosteu. |
| Teleostei | Perch, cod, salmon. |
| Marsipobranchii | Lamprey. |
| Pharygobranchii | Amphioxus. |

SUB-KINGDOM—ANNULOSA.

Class I.—INSECTA.

| | |
|---|---|
| Hymenoptera | Saw-fly, ichneumon. |
| Coleoptera | Beetles. |
| Neuroptera | Dragon-fly, white ant. |
| Strepsiptera | Stylops. |
| Lepidoptera | Butterfly, moth. |
| Diptera | House-fly. |
| Orthoptera | Cricket, locust, earwig. |
| Hemiptera | Bug, cicada, aphis. |
| Aptera | Flea. |

Class II.—MYRIAPODA.

| | |
|---|---|
| Chilopoda | Centipede. |
| Chilognatha | Millipede. |

Class III.—ARACHNIDA.

| | |
|---|---|
| Pulmonata | Scorpion. |
| Amphipneusta | Spiders. |
| Trachearia | Acarus. |
| Pycnogonida | Pycnogonum. |

Class IV.—CRUSTACEA.

| | |
|---|---|
| Podophthalmia | Lobster, crab. |
| Edriophthalmia | Isopoda, amphipoda, lemodipoda. |
| Branchipoda | Phyllopoda, daphnia, apus. |

## Animal Kingdom

| *Orders.* | *Examples.* |
|---|---|
| Copepoda | Cyclops, pastorial crustacea. |
| Ostracoda | Cythere, cypris. |
| Cirripedia | Barnacles. |
| Xiphosura | King-crab. |

Class V.—ANNULATA.

| | |
|---|---|
| Polychæta | Nereis, serpula, lob-worm. |
| Oligochæta | Earth-worm. |
| Discophora | Leech. |
| Tardigrada | Arctiscon. |
| Sagittida | Sagitta. |

Class VI.—SCOLECIDA.

| | |
|---|---|
| Trematoda | Fluke. |
| Taniada | Tape-worm. |
| Acanthocephala | Echinorhynchus. |
| Nematoidea | Thread-worm. |
| Gordiacea | Hair-worm. |
| Turbellaria | Planaria. |
| Rotifera | Rotifer, brachionus, lacinularia. |

Class VII.—ECHINODERMATA.

| | |
|---|---|
| Holothuridæ | Sea-cucumber, trepang. |
| Echinidea | Sea-urchin. |
| Ophiuridæ | Sand-star. |
| Asteridea | Star-fish. |
| Crinoidea | Feather-star, stone-lily. |

SUB-KINGDOM—MOLLUSCA.

Class I.—CEPHALOPHORA.

| | |
|---|---|
| Dibranchiata | Squid, argonaut, poulpe. |
| Tetrabranchiata | Nautilus. |
| Pulmonata | Snail, slug. |
| Pteropoda | Clio, carinaria. |
| Gasteropoda dioecia, or Prosobranchiata. | Whelk, periwinkle, limpet, cowry. |
| Gasteropoda monoecia, or Opisthobranchiata. | Tornatella, bulla, doris. |

Class II.—CONCHIFERA.

| | |
|---|---|
| Lamellibranchiata, or Accephala. | Cockle, mussel, oyster, venus, and all ordinary bivalve shells. |

Class III.—MOLLUSCOIDEA.

| | |
|---|---|
| Brachiopoda, or Palliobranchiata. | Lamp-shell, crania, orbicula, lingula. |
| Polyzoa, or Bryozoa | Flustra, eschara, retepora. |
| Ascidioida, or Tunicata | Ascidia, botryllus, salpa. |

SUB-KINGDOM—CŒLENTERATA.

Class I.—ACTINIZOA.

| | |
|---|---|
| Alcyonaria | Alcyonium. |
| Zoantharia | Sea-anemone, six-starred coral, beroe. |

Class II.—HYDROZOA.

| | |
|---|---|
| Lucernaroida | Sertularia, and similar zoophytes. |
| Hydroida | Medusa, hydra. |

SUB-KINGDOM—PROTOZOA.

Class I.—STOMATODA.

| | |
|---|---|
| Noctilucida | Noctiluca. |
| Infusoria | Paramœcium, vorticella. |

Class II.—ASTOMATA.

| | |
|---|---|
| Spongiadæ | Sponge. |
| Foraminifera | Ilotalia, nodosaria. |
| Thalassicollidæ | Sphærozoum, thalassicolla. |
| Gregarinidæ | Gregarina. |

For an account of the distribution of animals over the globe, *see* DISTRIBUTION OF ANIMALS and PHYSICAL GEOGRAPHY. For the special distinctions of different classes of animals, refer to each of the names given in the above table.

ANIMAL MAGNETISM.—The mysterious influence which one man, by an effort of the will, can exercise upon the body of another man, and which, undoubtedly, gives

rise to many very remarkable phenomena, has been rashly ascribed to a peculiar modification of magnetic force. Those few who have studied mesmeric manifestations in a scientific spirit have, however, very wisely discarded the term *animal magnetism*, as it pretends to define an agent that is at present quite incomprehensible. (*See* MESMERISM.)

ANIMAL STRENGTH, the power which can be exerted by human beings, horses, oxen, &c., to produce certain effects, with or without the aid of machinery. Animal strength can be employed as motive power in different ways, but varies according to the conditions and circumstances under which it is exerted; and, although the powers of individual animals of the same species are widely different, it is important to gather general data, from which it may be ascertained what amount of work may be obtained from any animal agent without injury to bodily health or powers, by undue fatigue or exertion. The greater the load an animal draws or carries, the less can be the speed with which it proceeds; and, conversely, the greater the speed, the less the weight an animal can bear. There must then be a certain weight which an animal can just set in motion or support, or which will exactly balance the motive power of the animal, and there must be a certain speed at which it can proceed without any burden whatever, which will be lessened in proportion to the quantity which it may be compelled to bear or draw. No useful effect, for instance, can be obtained by allowing a horse to gallop at its utmost speed without rider or burden of any kind, or to be attached to a load which it cannot set in motion, or barely move. There must, then, be a certain relation between the speed and load which will give the greatest amount of useful work; and this will differ for different animals, and even for the same animal under different conditions. In measuring the effect of action, Coulomb obtained his expressions of strength by multiplying the weight of the burden carried by the distance to which it could be conveyed in eight hours, that time being taken as the average duration of a working day. In determining comparative expressions of strength, care must be taken to adopt the same unit of weight and distance in all cases. The pound avoirdupois is generally taken as the unit of weight, while the unit of distance is either a foot, yard, or mile. For the sake of explanation, suppose a man to be able to walk 30 miles daily without any load, and his weight to be 160 lbs., we get the following numerical expressions of his strength, taking a mile, yard, and foot, successively, as the unit of distance:—

$$160 \times 30 \times 1 = 4800$$
$$160 \times 30 \times 1760 = 8448000$$
$$160 \times 30 \times 5280 = 25344000$$

the result 4,800 indicating that his strength is equivalent to a motive power that would move 4,800 lbs. one mile in a day, or 1 lb. 4,800 miles in a day; the next showing that he can exert a force sufficient to move 8,448,000 lbs. one yard in a day; and the third a force that can move 25,344,000 lbs. one foot in a day. It has been found, however, that a man of average strength can carry 120 lbs. 10 miles in a day, giving 1,200 as the expression of the useful maximum effect of a man's strength, taking a mile as the unit of distance, and neglecting the weight of the man. The strength of a horse is generally considered to be equivalent to the strength of seven men, the horse being attached to a wheel such as is used for applying motion to threshing-machines, cider-presses, &c., and the men working at a windlass; a horse exerting a tractive force of 125 lbs. for 24 miles in a day, would exert power equivalent to a machine moving 3,000 lbs. one mile in a day; but 33,000 is generally used to denote the average power of a horse, showing the weight in pounds that can be drawn one foot in one minute for eight consecutive hours; for Boulton and Watt determined that a horse can draw 125 lbs. 3 miles in one hour, giving 3,000 as the number of pounds drawn one mile in one day, or 33,000 as the number of pounds drawn one foot per minute for eight hours, by the following process:—

$$\frac{3000\text{ (lbs. drawn 1 m. in 1 d.)} \times 5280\text{ (feet in 1 m.)}}{480\text{ (minutes in 1 day of 8 h.)}} = 33000$$

The following are the comparative estimates of the labour of animals, the effect of a man's labour being taken as the unit, according to the calculations of Hassenfratz:—In carrying loads on a level surface, man and dog 1, reindeer 3, ass 4, horse 8, dromedary 25, camel 31, elephant 147; in drawing loads on a level surface, reindeer 0·2, dog 0·6, man 1, ass 2, ox 5·5, horse 7.

ANIMAL SUBSTANCES.—The animal substances used in manufactures are extremely numerous, and may be divided into edible, industrial, and medicinal. The edible animal substances will easily suggest themselves to the reader. Those used in manufactures are wool, silk, hair, bristles, skins, furs, whalebone, feathers, oils, wax, tallow, horn, tortoiseshell, pearls, shells, corals, sponge, glue, gelatine, ambergris, musk, civet, animal blacks, lacs, and cochineal. Those used in medicine are not so numerous. The principal ones are, Spanish fly, codliver-oil, and a few others. For information on the subject of the source or manufacture of these different substances, consult the articles under their respective headings.

ANIMALCULES, *ăn-i-măl'-ku-lees* (Lat. *animalculum*, a little animal).—This is a general term for animals so exceedingly minute that they cannot be studied without the aid of the microscope; such as the species of *Infusoria* and *Rotatoria*. (*See* INFUSORIA, ROTATORIA.)

ANIMALS, AGE OF. (*See* AGE OF ANIMALS.)

ANIMALS, CRUELTY TO.—Various statutes have been passed for preventing cruelty to animals. By the 12 & 13 Vict. c. 92, it is enacted, that if any person shall cruelly beat, ill-treat, overdrive, abuse, or torture the animals therein enumerated (which includes all domestic animals), he shall forfeit a sum not exceeding £5; and if the animal be injured, a further sum, not exceeding £10, to the owner or person injured. The act also inflicts penalties in the case of conveying any such animal in such a manner or position as to subject it to unnecessary pain or suffering, and also in the case of bull-baiting, cock-fighting, and the like; and makes a variety of humane provisions for the regulation of the business of slaughtering horses and other cattle not intended for butcher's meat; and for providing cattle impounded, with food and water. The 17 & 18 Vict. c. 60, extends the powers of the former statute in the case of impounded cattle, and prohibits the use of dogs for purposes of draught, under a penalty of 40*s.* for the first offence, and not exceeding £5 for any subsequent offence.

ANIMALS, WORSHIP OF. (*See* IDOLATRY.)

ANIME, *ăn'-i-me*.—This substance, called also *gum anime* and *East-Indian copal*, is extensively used in the preparation of varnishes, and is supposed to be the produce of the West-Indian locust-tree, *Hymenæa Courbaril*. The resin which exudes from the piny dammar (*Vateria indica*) is sometimes confounded with anime.

ANIMÉ, *ăn'-i-mai* (Fr.), a term used in Her., to denote that the eyes of a rapacious creature are borne of a different tincture from the creature itself.

ANIONS, *ăn'-i-ons* (Gr. *ana*, upward, *ion*, going), a term introduced by Faraday to distinguish the elements which go to the *anode*, or positive pole, in decomposing chemical compounds by the electric current. (*See* ELECTROLYSIS, CATHIONS.)

ANISE, *ăn'-eez* (Gr. *anison*, Lat. *anisum*), an umbelliferous plant, cultivated in Egypt, Malta, Spain, and Germany, for the sake of its fruit, called aniseed, which is extensively used for flavouring liqueurs and confections, and medicinally as a carminative. The botanical name of the plant is *Pimpinella Anisum*. Star or Chinese aniseed is the fruit of the *Illicium anisatum*, a small tree in the nat. ord. *Magnoliaceæ*. It has a starlike form,—hence its name, and a flavour similar to that of the common aniseed. This is imported into Europe from China and Singapore. Oil of aniseed is obtained by distilling the fruit, and even the stems and leaves, of the common anise. For this, a similar product, yielded by the star aniseed, is frequently substituted. The true oil and its substitute have the aromatic properties of the fruits, and are employed for the same purposes.

ANISIC ACID, *ă-ni'-sik*, obtained, in almost insoluble crystals, by acting on oil of anise with nitric acid. It is easily soluble in ether and alcohol.

ANISOIN, *ăn'-i-zoin*, obtained by acting on oil of anise with sulphuric acid. It is analogous in properties to benzoin.

ANISOL, *ăn'-i-sol*, a colourless mobile fluid, prepared by distilling anisic acid with caustic baryta. It boils at 306° F.

ANISOMEROUS, *ăn-i-som'-e-rus* (Gr. *anisos*, unequal, *meros*, a part), in Bot., a term applied to a symmetrical flower, in which the number of parts in every whorl of organs is not the same, as in the flower of the *sedum*, which has five sepals, petals, and carpels, but ten stamens. (*See* ISOMEROUS, FLOWER.)

ANISOSTEMONOUS, *ăn'-i-sos-tem'-o-nus* (Gr. *anisos*, unequal, *stemon*, a stamen), in Bot., a term applied to a flower in which the stamens are not equal in number to the sepals or petals. (*See* ISOSTEMONOUS.)

ANNALS, *ăn'-nălz* (Lat. *annus*, a year), a term usually employed to denote a plain narrative of historical facts, arranged under the particular years in which they happened. It differs from history, inasmuch as the events are strictly arranged in the order in which they occurred, those of one year being completed before those of another are begun. It differs also in being usually a bare narrative of events, without, as in history, the author's opinions and remarks being interspersed. Annals require brevity; history demands ornament. Annals may be said to furnish the elements or materials out of which history is composed.

ANNATTO, *ăn-năt'-to*, also called *annotto* and *arnotto*. An orange-coloured dye-stuff, obtained from the seed of the *Bixa orellana*, and brought to this country in rushes from South America. It is soluble in alkalies, by which means it is fixed in cloth. Nankeen is dyed with this substance.

ANNEALING, *ăn-ne'-ling* (Sax. *anælan*, to kindle or inflame), a process of gradual cooling, which is applied to glass and certain metals, to prevent them cracking or breaking under any sudden alteration of temperature. Glass vessels are often improperly annealed by being cooled too quickly; hence they crack in all directions when hot water is poured into them. Good housewives should therefore *boil* all glass vessels, and allow them to cool very gradually, before using them for hot liquids. The glass beakers used by chemists are so perfectly annealed, that they may be removed from the fire and placed at once on a cold slab without cracking. Brittleness in glass and metals is evidently caused by an approach to the crystalline state, which is destroyed by gradual cooling. (*See* STEEL.)

ANNELIDA, *ăn-ne-lī'-da* (Lat. *annulus*, a ring; Gr. *eidos*, form), in Zool., a division of animals of the worm species, first proposed for distinct classification by Cuvier, who attached such importance to the fact of their possessing red blood, that he placed them at the head of the articulate series, above the crustaceæ, the arachnidæ, and the insects. It is, however, generally agreed that the annelida represent but the larval condition of insects, and can hardly be regarded as higher in organization than the perfect insect. The name of the class is derived from *annulus*, a *ring*; because the animals arranged under this division always have their bodies formed of a great number of small rings, as in the earth-worm. (*See* EARTH-WORM.) For the most part, the annelida are oviparous. In their mode of life there is little variety: some live in fresh, others in salt water; some, like the hair-worm (*Gordius*), are amphibious. The body is divided into numerous segments, marked by transverse lines, and generally furnished with a series of bristly appendages, which serve as legs. The said bristles are usually sharp, and sometimes barbed, serving not only to attach the animals to soft substances, and to hold firmly on to rocks and other solid bodies, but to aid their movements through the water.

ANNIHILATION, *ăn-nī'-hi-lai'-shun* (Lat. *ad*, to, *nihil*, nothing), the act of destroying or reducing any created being into nothing. It is opposed to creation, which is the making of something out of nothing. Much difference of opinion has existed on the subject of annihilation. According to some, nothing is more difficult; it can only be effected by the infinite power of the Creator: according to others, nothing is more easy. The latter maintain that existence is a state of violence; that all things are constantly striving to return to their primitive nothingness; and that it requires an infinite power to prevent it. Be this as it may, we know that the changes we see taking place in the bodies around us, are mere alterations of form, and not annihilation. According to Dr. Burnet, the idea of annihilation arose from the Christian theology, and that, in its present sense, it was unknown to the Hebrews, the Greeks, and the Latins. The ancient philosophers, in effect, denied all annihilation, as well as creation, resolving all the changes in the world into new modifications, without supposing the production of anything new or the destruction of anything old. Some Christians hold that God will annihilate the souls of the damned after a certain period of punishment, and that this annihilation is the second death. That the human soul is not subject to annihilation, but, after this life, passes into another state of existence, is a doctrine founded both on reason and revelation. There is, perhaps, no race, however savage or uncivilized, that has not some idea of a future existence. Without such a belief, the present state of man becomes inexplicable. He is endowed with faculties and capacities fitting him for a sphere of existence far transcending the present, which otherwise must have been created in vain; while the moral government of the world can only be understood by regarding it in connection with a future state of being.

ANNIHILATOR, FIRE, *ăn-nī'-hi-lai'-tor*, in Mech., a machine for extinguishing fires, invented by Mr. Phillips, and bearing his name. It consists of a case containing water, within which is a smaller case filled with a mixture of chlorate of potash and sugar. Dipping into the latter is a small tube containing sulphuric acid. When this tube is broken, the chlorate of potash and sugar become ignited, throwing off large quantities of mixed gases which are non-supporters of combustion. The action is maintained by the water in the outer case becoming heated. The apparatus seems to be of great use in extinguishing *flame*, but appears to have no action on red-hot materials. It has been used with much advantage in extinguishing fires on board ship, when applied at an early period.

ANNIVERSARY, *ăn-ni-ver'-sa-re* (Lat. *annus*, a year, and *eversum*, turned), is a term applied to the yearly return of any remarkable day. Literary and scientific associations usually celebrate the anniversary of their institution; and in domestic life it is usual to observe the birthdays of the different members of a family. The birthday of the reigning monarch is generally observed as a holiday. Anniversary days are festivals celebrated by the Romish church in honour of the saints.

ANNO DOMINI, *ăn-no dom'-i-ni* (Lat., in the year of our Lord), a term used in chronology to denote a year since the incarnation of our Saviour. It was first adopted in 525, and is usually contracted A.D. The period from the birth of Christ is termed the Christian or the Vulgar era. (*See* ERA.)

ANNODATED, *ăn-no-dai'-ted*, is a term used in Her. to denote anything bent somewhat in the form of an S. The serpents in the caduceus of Mercury are said to be annodated or entwined about the mace or staff.

ANNOTATION, *ăn-no-tai'-shun* (Lat. *annotatio*, from *ad*, to, and *notatio*, a marking), a term commonly used in the plural, and applied to remarks, notes, or commentaries on certain passages of a book, designed to illustrate their meaning. An annotated edition of a work is an edition having such annotations.

ANNUAL, *ăn'-nu-al* (Lat. *annus*, a year), in Bot., a plant which passes through all its successive stages of development in a single year. Such a p
flowers and fruit only once, and perishes
has become ripe. A plant which springs from the seed one year, but which does not flower until the next year, is called a *biennial*; and a plant which lives for several years a *perennial*. The duration of the life of a plant is greatly affected by accidental circumstances; and an annual is frequently converted into a biennial, and occasionally into a perennial. The annuals cultivated in our gardens are very numerous, and many of them produce lovely flowers.

ANNUAL REGISTER is the name of a well-known annual publication, which first appeared in 1759, and which is still carried on. Various works of a similar nature had previously been published, as Boyer's *Political State of Europe*, from 1711 to 1739; and the *Historical Register*, from 1716 to 1738. The *Annual Register* was projected by Robert Dodsley, the bookseller, assisted

by Edmund Burke, who for some years wrote the historical narrative; and it is said that much of it was written from his dictation for about thirty years. In 1781 was published the first volume of the *New Annual Register*, projected and edited by Dr. Kippis; but it never attained the reputation of its rival, and came to a close in 1825. The *Edinburgh Annual Register* was commenced in 1808 and terminated in 1827. The historical narrative was for some years written by Sir Walter Scott, and afterwards by Southey. A French work, in imitation of the *Annual Register*, appeared at Paris in 1825, for the year 1818, under the title of *Annuaire Historique Universel*, and is still continued the last volume, which was for 1856, being published in 1861. The first volume of the *Annuaire des Deux Mondes*, in connection with the well-known review of that name, appeared in 1851. An American *Annual Register* is published at New York.

**Annuals**, the name of a class of books that were for some years very popular in this country. They were usually of a light literary nature, tastefully got up, and illustrated with finely-engraved prints, and appeared about Christmas. The first of them, *Forget-me-not*, was begun in London in 1822; and the following year two others, *Friendship's Offering* and *The Graces*, made their appearance. The *Literary Souvenir* was commenced in 1824 by Alaric A. Watts, and was a great improvement upon its predecessors. The *Keepsake* was commenced in 1827, under the editorship of W. H. Ainsworth. In 1829 no fewer than seventeen different annuals were published; in 1840 the number had dwindled to nine. Of the *Literary Souvenir*, ten vols. were published; of the *Forget-me-not*, twenty-two; the *Keepsake*, the last of the race, appeared finally in 1856. The place of those annuals may be said to be now occupied by the illustrated editions of popular works, which many of the publishers bring out about Christmas; but they have formidable rivals in the Christmas numbers of *All the Year Round*, the Christmas double numbers of the *Illustrated London News* and *Queen*, and the *Christmas Annual* put forth by the publisher of this Dictionary, &c. There indeed appears a possibility that these last fruits of publishing enterprise will usurp the place of the "illustrated editions," or "table-books," just as the latter came to occupy the position left vacant by the old "annuals."

**Annuity**, *ăn-nu'-i-te* (Lat. *annus*, a year), is a certain annual sum of money, which may be paid annually or at certain fixed periods of the year, as half-yearly, quarterly, monthly, &c. There are various kinds of annuities, as for a certain number of years, for one or more lives, or in perpetuity. Deferred annuities are such as are not payable till after a certain period or event. From the great variety in the nature of annuities arise many complicated calculations in connection with them. An annuity is usually raised by the present payment of a certain sum, in consideration of which the person making the payment, or some one named by him, becomes entitled to an annuity for a stipulated number of years, or till a certain event, which is usually the death of the annuitant. If money did not bear interest, the value of an annuity for a certain number of years would simply be the annual sum multiplied by the number of years for which it was to be paid,—as an annuity of £10 for ten years would simply be £100. But, while paying the annuity, the person engaging for it is drawing the interest of the price. Thus, if £100 were paid for an annuity of £10, the interest being at 5 per cent., he would have the interest of £100 for the first year, =£5; the interest of £95 for the second year, =£4. 15*s.*; the interest of £90. 15*s.* for the third year; and so on. In this way, the present value of an annuity of £10 for one year (interest being at 5 per cent.) is £9. 10*s.* 6*d.*; for two years, £18. 11*s.* 10½*d.*; three years, £27. 4*s.* 8*d.*; four years, £35. 9*s.* 2½*d.*; five years, £43. 5*s.* 11*d.*; ten years, £77. 4*s.* 6½*d.*; twenty years, £124. 12*s.* 5½*d.*; for ever, £200. Where the annuity is dependent upon the life of an individual, the calculation is much more complicated; for here it becomes necessary to ascertain, not only the present value of the annuity, but also the probable duration of the life of the individual. Of course, in the case of one person, he may die within the first year, or may live to extreme old age; but it is found that, where a number of persons are concerned, the average duration of life may be calculated with great nicety. Various tables of mortality have been constructed. The best known are the Northampton Tables of Dr. Price and the Carlisle Tables of Mr. Milne, the latter being regarded as the more accurate of the two. The government annuities are valued according to a table calculated by Mr. Finlaison from the mortality found among the different classes of government annuitants, and which distinguishes males from females. From this last we give the following table of the value of a life annuity of £1 at different periods of life, the rate of interest being 4 per cent.:—

| Age. | Male. | Female. | Age. | Male. | Female. |
|---|---|---|---|---|---|
| 1 | 19·0686 | 19·6135 | 40 | 14·8752 | 16·1560 |
| 2 | 19·1912 | 19·6984 | 45 | 13·7975 | 15·2686 |
| 3 | 19.3642 | 19·8512 | 50 | 12·4299 | 14·1610 |
| 4 | 19·2880 | 19·9795 | 55 | 11·0382 | 12·7904 |
| 5 | 19·2699 | 20·0008 | 60 | 9·7207 | 11·2809 |
| 10 | 18·7817 | 19·7014 | 65 | 8·2163 | 9·5765 |
| 15 | 18·0044 | 19·0594 | 70 | 6·7745 | 7·8580 |
| 20 | 17·2048 | 18·6130 | 75 | 5·4103 | 6·2840 |
| 25 | 16·9400 | 18·1273 | 80 | 3·8117 | 4·9359 |
| 30 | 16·4438 | 17·5456 | 85 | 2·9495 | 3·7511 |
| 35 | 15·7488 | 16·8795 | 90 | 1·3346 | 2·1133 |

**Annuity** (*i veditus annuus*, an annual return or income), in Law, is a yearly sum, chargeable only upon the person of the grantor, and is distinguished from a rent-charge, which is a burden imposed upon or issuing out of land. Formerly, certain acts of parliament imposed checks on the grant of life annuities, but they were repealed by 17 & 18 Vict. c. 90, which nevertheless provides for their registration in a mode similar to the registration of judgments to affect or charge real estate.

**Annular Cells and Vessels**, *ăn'-nu-lar* (Lat. *annulus*, a ring), in Bot. The various parts of a plant are made up of little membranous sacs and tubes called *cells* and *vessels*. These are often strengthened by delicate threads or bands called fibres, formed by secondary deposits on the inner surfaces of the primary membranes. When these fibres exist as rings or hoops, the cells and vessels containing them are said to be *annular*.

**Annulata Sedentaria**, *ăn'-nu-lat'-ta sed'-en-tair'-i-a*, a carnivorous tribe of worm-like animals, inhabiting a tube-shaped shell, which they never quit. They are usually found adhering to marine substances.

**Annulate**, *ăn'-nu-luit* (Lat. *annulus*, a ring), in Bot., a term applied to those ferns which have ringed sporangia (cases containing spores). The annulus or ring surrounding each sporangium is elastic, and its pressure causes the organ to burst when ripe, and release the spores. Those ferns which have sporangia not encircled by rings are said to be *exannulate*.

**Annulated Root**, *ăn-nu-lat'-ted* (Lat. *annulus*, a ring), in Bot., a root having a number of ring-like expansions, so as to present the appearance of a string of thick rings, as in the ipecacuanha.

**Annunciation**, *ăn-nun'-si-ai'-shun* (Lat. *annuntiare*, to announce), the name of a festival celebrated March 25th, in commemoration of the announcement made by the angel Gabriel to the Virgin Mary, that she was to become the mother of our Lord. It is also called Lady-day, and was instituted, according to some, in the 4th, according to others, not before the 7th century.

**Anoa**, *ăn'-o-a*, a ruminating animal of Sumatra, but so imperfectly known, that zoologists are undecided how it should be classed. Judging, however, from the materials imported, merely a few bones and fragments of skull, it would seem to be a species intermediate between the buffalo and antelope.

**Anobium.** (*See* Death-Watch.)

**Anode**, *ăn'-ode* (Gr. *ana*, upward, *odos*, a way), a term introduced by Faraday to designate the positive pole of any electrical arrangement for decomposing a chemical compound. The anode, or positive pole, is the surface by which the electric current enters the body undergoing decomposition. (*See* Electrolysis, Cathode.)

**Anodyne**, *ăn'-o-dine* (Gr. *a*, without, *odune*, pain),

a medicine which allays pain. The term is usually applied only to a medicine which acts upon the nervous system, so as to decrease sensibility and induce sleep, or a state of partial unconsciousness. The most important anodynes are preparations of opium. Anodyne pills, each consisting of one-eighth of a grain of acetate of morphia and half a grain of extract of hyoscyamus, have lately been extensively employed by medical practitioners.

ANOGENS, *ăn'-o-jens*, in Bot, this term has been used to designate a division of the vegetable kingdom, including the liverworts and mosses, which are usually classed with the *Acrogens*.

ANOINTING, *ă-noin'-ting*, signifies the pouring on of oil, a custom which was, and still is, very prevalent in the East. The custom doubtless arose from the health and comfort which, in hot climates, result from the pouring or rubbing oils upon the person. The oils were usually highly scented. To anoint a guest was to show him one of the highest marks of respect. Among the Jews, anointing was considered necessary as the preparation of the person for rare and great occasions. It also denoted the consecration to a sacred office, as that of king or priest; and even vessels for the service of the tabernacle were anointed before being used. The custom of anointing priests still exists in the Roman Catholic church, and that of anointing kings in Christian monarchies. (*See* CORONATION.) The ancient athletæ anointed themselves in order to render it more difficult for their antagonists to get hold of them. The anointing of oil was also regarded as a means of restoring the sick; and, in the present day, it is said to be of use in consumption, rheumatism, &c.

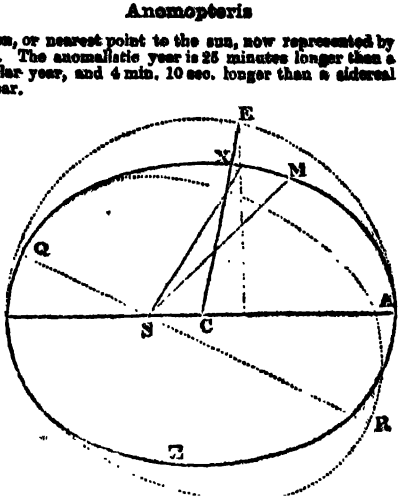
ANOLIS, or ANOLIUS, *a-no'-li-us*, a reptile peculiar to America, supplying in many respects the place which the chameleon occupies in the old world. The colour of the skin, especially that about its loose baggy throat, assumes an endless succession of ever-varying hues, as the animal is disturbed by love or anger. The anolis, however, is more slenderly built than the chameleon,



ANOLIS.

and more active in its movements. It varies from seven or eight inches to a foot in length, and is extremely tame and harmless. Its food consists of flies and other small insects. The head is long, straight, and flattened; the body and tail slender; and both are covered with small round scales, which give the skin the appearance of fine shagreen.

ANOMALISTIC YEAR, *ă-nom'-a-lis-tik* (Gr. *anomalos*, irregular), in Astron., the time which the earth takes in passing through its orbit from its perihelion, at which it is at its least distance from the sun, until it again arrives at that point. Under the disturbing influences of the planets, the perihelion of the earth advances 11″·8 yearly, following the direction of the earth's path. In the figure, let S represent the sun, one of the foci of the ellipse described round that body by the earth, A the earth's aphelion, P its perihelion, at opposite extremities of AP the greater axis of the ellipse. Now if the earth travelled round the sun in the fixed path of the ellipse PQAZ, it would accomplish its revolution in 365 d. 5 h. 48 m. 49 s., the length of a solar or tropical year; but, owing to the advance of the perihelion from P to Q, by the revolution of the axis PA into the position QR through an angle PSQ of 11″·8, the earth, after passing from P over the whole path of the ellipse until it arrives at P again, has to move over the additional space PQ before it arrives at its perihelion, or nearest point to the sun, now represented by Q. The anomalistic year is 25 minutes longer than a solar year, and 4 min. 10 sec. longer than a sidereal year.




ANOMALISTIC YEAR.

ANOMALOUS, *ă-nom'-a-lus* (Gr. *a*, without, *nomos*, a rule), in Bot., this term is applied to all parts of a plant when they have very irregular or unusual forms.

ANOMALY, *ă-nom'-a-le* (Gr. *anomalos*, irregular, unequal), in Gram., signifies an irregularity, an exception or deviation from rule. Anomalous verbs are such as are not conjugated conformably to the rules of their conjugation, as, *lego* in Latin, *to give* in English.

ANOMALY, used in Astron. to denote the angle made by lines drawn from the perihelion of a planet and its position in its orbit at any time, which meet in that focus of the ellipse described by the planet which denotes the position of the sun. Thus, in the figure in the article upon anomalistic year, X being the position of any planet in its orbit, P its perihelion, and S the sun, the angle PSX is the anomaly. This is sometimes termed *true* anomaly, to distinguish it from mean and eccentric anomaly. The true anomaly is the angle at the sun, between the position of a planet at any point of its orbit and its perihelion, the planet moving in its orbit at a varying rate of speed, quicker when at its perihelion, and slower at its aphelion. Now the mean anomaly is the angle at the sun between the perihelion and an imaginary position of the planet, being the place in its orbit where it would be, supposing it to move always at its mean or average speed, instead of the position it actually occupies at the same time, moving at its variable rate of progression; while the eccentric anomaly is the angle at the centre of the ellipse between the perihelion and a point in the circumference of a circle described from the centre of the ellipse with a radius equal to half its greater axis, determined by a perpendicular drawn from the actual position of the planet to the axis, and produced to cut the circle. Thus in the figure, supposing X to be the position of any planet travelling at its variable rate of progression at any given time, and M the position it would occupy at the same time if it had travelled from its perihelion at its mean speed, the angle PSX is the true anomaly, the angle PSM the mean anomaly, and the angle PCE the eccentric anomaly.

ANOMŒANS, *ăn-o-me'-ans* (Gr. *anomoios*, different), in church history, the name by which the pure Arians came to be distinguished in the 4th century. They were so called from their maintaining that Christ had a nature different from, and in nothing resembling that of God; whereas the Semi-Arians held that there was a resemblance between the two natures. The Anomœans were condemned by the Semi-Arians at the council of Seleucia, A.D. 359; but the former avenged themselves by condemning the latter at a council at Constantinople, a year after.

ANOMOPTERIS, *ăn-o-mop'-te-ris* (Gr. *anomos*, without rule, *pteris*, fern). In Geol., this term is applied to

a genus of fossil ferns peculiar to the new red sandstone. The plants differ from all recent and fossil ferns; hence the generic name, which signifies 'anomalous fern.'

ANONA, *a-no'-na*, in Bot., the custard-apple, a gen. of plants belonging to the nat. ord. *Anonaceæ*, and composed of small trees and shrubs growing in the West Indies and South America, where they are cultivated for the sake of their delicious fruits. The most important species are *A. squamosa* and *A. muricata*. The first, commonly known as the sweet sop, is found in all the West-India islands. The fruit is covered with greenish scales, and has the appearance of a young pine-cone. The edible portion consists of a thick, sweet, and luscious pulp. *A. muricata*, the sour sop, which is also a native of the West Indies, is a picturesque small tree, bearing a yellowish-green fruit, weighing from 1 lb. to 3 lbs., and covered with weak prickles. Its pulp is perfectly white, and has a most agreeable acid taste. *A. reticulata* yields the netted custard-apple, a large dark-brown fruit, filled with yellowish or reddish pulp of about the consistence of custard. *A. cherimolia* is cultivated in Peru, on account of the excellence of its fruit, which is called the cherimolia. Two other important species have been described,—*A. sylvatica* (the *Araticu do Mato* of Brazil) and *A. palustris*, both of which furnish light and handsome wood, used for turnery.

ANONACEÆ, *ăn-o-nai'-se-e*, in Bot., a nat. ord. of dicotyledonous plants, of which the type is the gen. *Anona*. They are trees or shrubs, with leaves alternate, simple, and without stipules. In the flower we find a calyx of three sepals, and a corolla of six leathery petals, arranged in two whorls. The carpels are usually numerous, distinct or united; the styles short, the stigmas simple, and the ovules inverted. The fruit is composed of a number of dry or succulent carpels, sometimes distinct, but oftener united, so as to form a fleshy mass. The plants of this order are almost entirely confined to the tropical regions of Asia, Africa, and America, none being found in Europe. They are generally aromatic and fragrant in all their parts, and some are very useful. (*See* ANONA, CALOCLINE, DUGUETIA, XYLOPIA.)

ANONYMOUS, *ă-non'-i-mus*, a term derived from the Greek, and signifying literally without a name, or nameless. It is applied to books which do not bear the name of the author. When an assumed name is given, the term *pseudonymous* is used. It is frequently a matter of importance in literature to know the author of an anonymous work; and hence several excellent works have appeared in Germany and France on this subject; as, Placcius "De Scriptis et Scriptoribus Anonymis et Pseudonymis Syntagma," Hamburg, 1674; and "Thesaurus Anonymorum et Pseudonymorum," Hamburg, 1708; and the excellent work of Barbier, "Dictionnaire des Ouvrages Anonymes et Pseudonymes," second edition, 4 vols., Paris, 1822-25, giving the names of about 24,000 works, with their known or assumed authors. In this country, political articles, as well as most of those that appear in periodicals, are anonymous, a system which, while it secures greater freedom to the writer, occasionally leads to abuse. The sending of anonymous letters demanding money or denouncing persons was made felony by 9 Geo. I. (1722), 8 Geo. IV. c. 29 (1827), and 1 Vict. c. 87 (1838).

ANOPLOTHERIUM, *ăn'-o-plo-the'-ri-um* (Gr. *a*, without, *oplon*, weapon, *therion*, beast), in Geol., a gen. of extinct quadrupeds, established by Cuvier from bones found in the Paris tertiaries. Several species have been determined, the smallest having been little larger than a guinea-pig, and the largest about the size of a small ass. From the situations in which their remains have been discovered, these ancient inhabitants of our globe appear to have lived in herds in swamps and marshes. They all had slender legs and feet, with but two toes, as in the ruminants, and were the earliest bi-hoofed animals known to have existed on the earth. In some the tail was short and thick, and was probably made use of in swimming; in others it was short and slender. The dentition of the genus appears to have been very peculiar, each jaw having had six incisors, on each side of which was a small canine, and behind these, without leaving any interval, seven molars, resembling those of the rhinoceros. The common anoplothere (*A. commune*) has been taken as the type of a small natural family,—the *Anoplotherida*, which appear to form a connecting link between the pachyderms, or thick-skinned mammalia, and the ruminants. Cuvier, in describing this typical species, showed that in one respect it stood between the rhinoceros and horse, and in another, between the hippopotamus and camel. The restorations of the anoplotheres and other ancient animals, by this great comparative anatomist, from the mutilated remains found in the gypsum-beds near Paris, may be regarded as one of the most splendid achievements of palæontology. The name *Anoplotherium*, which signifies 'weaponless beast,' was given to the genus from the fact that all the species seem to have been destitute of organs of defence, as tusks, claws, or horns.

ANOPLURA, *ăn-o-plu'-ra*, a fam. of insects, in which are comprehended the *Aptera* of Linnæus and the many varieties of *Pediculus* (*see* PEDICULUS), as well as the parasitic insects of other writers. About 500 different forms of *Anoplura*, all of them parasitic—all of them bearing a close resemblance to the human parasite, the louse, have been described. As a rule, only one species of anoplura attacks a single species of animal; but in eagles and gulls as many as five different species have been discovered.—*Ref.* Denny's *Anoplura Britannica*.

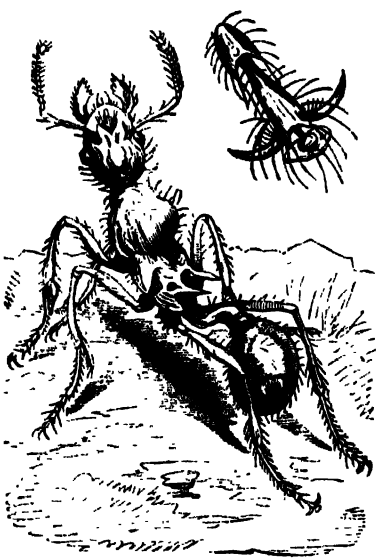
ANORTHITE *ăn'-orth-ite* (Gr. *a*, without, *orthos*, right), a species of felspar, containing lime instead of potash combined with silicate of alumina.

ANSERES, *ăn'-se-rees* (Lat. *anser*, a goose), the third order of the Linnæan class *Aves*, thus characterized:—A smooth beak, covered with skin, gibbous at the base, and broader at the point; feet formed for swimming, having palmated toes, connected by a membrane; the legs thick and short; the body bulky, plump, and downy. Food—fishes, frogs, aquatic plants, &c. (*See* GOOSE.)

ANSWER, *ăn'-ser* (Etym. unsettled; Gothic, *andswor*; Danish, *ansuers* or *answarer*; Sax. *anshairan*; to reply to a question, objection, or assertion; to justify), in Law, is a pleading or reply, whereby an allegation in a bill of complaint in chancery, or inquiries arising thereout, or in a libel or articles in the ecclesiastical and other civil courts, is or are replied to or rebutted. In chancery, the interrogatories were formerly included in the bill; but now the practice is for the plaintiff to exhibit separate interrogatories, which the defendant is bound to answer upon oath, or, in the case of a peer or peeress, upon honour; and the party may be called on to answer *viva voce* (except in criminal cases), or on interrogatories exhibited. But in no case can a man be compelled to give an answer which might criminate or degrade him. And any party to a suit may put forth interrogatories to be answered by any one or more of the others.

ANT, *ant* (Lat. *Formica*), a well-known genus of hymenopterous insects, which from the very earliest period of the world's history have attracted attention on account of their social and industrious habits, their love of order and subordination, and unremitting economy. They are distinguished from other *Hymenoptera* by their habit of residing underground in numerous societies, and by the existence of *neuters* among them, by which class the labours of the community are chiefly performed. Although so small, their muscular strength is extraordinary, and they will carry loads at least ten times their own weight, displaying meanwhile considerable activity. They have a triangular head; the antennæ are geniculate; the jaws strong; the ligula, or lower lip, small, rounded, or spoon-like; the thorax compressed at the sides; the abdomen nearly oval, the pedicle which joins it to the thorax forming in some kinds a single and in some a double scale or knot. A community of ants, whatever the species may be, consists of males, which have always four wings; of females, much larger in size than the males, which only possess wings during the pairing season; and of a sort of barren females, which have been variously termed neuters, workers, or nurse-ants, and which, so far as is known, have never been observed to have wings in any stage of their existence. The nests of ants are differently constructed in the different species; all, however, are very curiously and regularly arranged. "If an ant-

hill be examined any time after midsummer up to the close of autumn, there may be seen mixed with the wingless workers a number of both males and females furnished with white glistening wings. These, however, are neither kings nor queens in the state, at least so far as freedom of action is concerned; for they are not allowed to move without a guard of workers to prevent them leaving the boundaries; and, if one straggles away unawares, it is for the most part dragged back by the vigilant sentinels, three or four of whom may in such cases be seen hauling along a winged deserter by the wings and limbs. The workers, so far from ever facilitating the exit, much less the departure of the winged ones, more particularly the females, guard them most assiduously in order to prevent it, and are only forced to acquiesce when the winged ones become too numerous to be either guarded or fed. There seems, indeed, to be a uniform disposition in the winged ones to desert their native colony; and, as they never return after pairing, it would soon become depopulated in the absence of females. The actual pairing does not seem to take place within the ant-hills; and we have observed scouts posted all around ready to discover and carry back to the colony as many fertile females as they could meet with. Nay, we are quite



ANT.

(MAGNIFIED, WITH END OF CLAW MORE HIGHLY MAGNIFIED.)

certain that whole colonies have thus been dispersed; and, when they did not find fertile females near their encampment, they have gone farther and farther, till they found them; and, if they had gone very far, never returned, but commenced a number of new establishments, according to their convenience. It is probable that, soon after pairing, the males die, as do the males of bees and other insects; for, as the workers never bring any of them back nor take any notice of them after leaving the ant-hill, they must perish, being entirely defenceless, and destitute both of a sting and of mandibles to provide for their sustenance. It was supposed by the ancients that all ants at a certain age acquired wings, but it was reserved for the younger Huber, in particular, by means of his artificial formicaries, to trace the development of the wings in the females, from the first commencement till he saw them stripped off and laid aside like cast clothes."—(*Broderip.*) The eggs of ants are so small as to be scarcely visible to the naked eye. Contrary to what takes place in most insects, the eggs when laid are not glued to any fixed place, but are dropped at random by the mother in her progress through the nest, and carefully collected by the workers, several of whom sedulously attend her during her period of laying. The collected eggs are taken to the various apartments of the nest adapted for the purpose, and there left for hatching. Heat being indispensable, the eggs are placed carefully during the day near the surface of the ant-hill, but so sheltered from the direct influence of the sun, as to prevent the too rapid evaporation of their moisture. As night approaches, the experienced insects to whom the care of the precious ova is intrusted, remove the eggs to warmer quarters, to prevent the escape of the heat they naturally possess. Nor does the care of these tender nurses cease when the little ants come into life. At night they are carefully stowed away in the innermost chambers of the nest, every aperture being closed to prevent the ingress of cold air. But as soon as the rays of the morning sun fall upon the surface of the nest, the workers busily commence carrying their infants to the upper chambers, where, close under the roof, they may enjoy the genial warmth. Not unfrequently, they even place them for a time on the outside of the nest, exposed to the direct rays of the sun. During their grubhood, the little creatures are fed by the nurses, or by the mother herself, by a liquid disgorged from the stomach. When the grubs are full grown, they spin cocoons of a membranous texture, and of a brownish-white colour, in appearance not unlike barleycorns, for which, indeed, they were mistaken by early observers. Hence, doubtless, arose the belief that the insect laid up a store of grain in the summer season, to serve for its support in the winter. It is certain, however, that our European ants are carnivorous in their habits. Says the Rev. J. G. Wood, "Ants do not, as has been frequently said, lay up stores of corn for the winter, for they are in a state of torpidity during the winter months, and require no food. Moreover, an ant would find as much difficulty in eating and digesting a grain of corn as we should in devouring a truss of straw." Colonel Sykes, however, observed an ant in India, that laid up a large store of millet-seed; and it is possible that other species may have the same habit. The vegetable substance which ants appear chiefly to use as food, is sugar, and to this, wherever it is to be found, they seem to be guided by a very acute sense of smell. *Honey-dew*, the saccharine excrescence of the *aphides*, is a favourite food of many species. Not only do the ants climb plants on which *aphides* are to be found, but should they find the creature and not his saccharine produce, they will, with their antennæ, pat the aphis on either side of the abdomen until the desired drop is yielded, and then pass on to another. Linnæus quaintly styles the aphis the ant's *milch-cow*. It is even related that the ant seems to regard the aphis as his particular property, and is prepared to do battle to the death with any other ant that seeks to dispute its title; and that the *Aphis radicina*, which derives its food from the roots of grass and other plants, is not uncommonly taken into custody by the yellow ant (*Formica flava*), and maintained in its nest, as a farmer might procure a herd of cows and house them in his sheds. That these stories are beyond dispute is not insisted, still, when the wonderful instinct of the ant is considered, it is too much to reject them as altogether incredible. Indeed, it should be sufficient to find Huber among those who mention this farmer-like habit of the ant, to entitle the statement to serious consideration. The habitations of ants are very curiously constructed, and display great ingenuity. Houses built by the common wood-ant (*Formica rufa*) are sometimes as large as a small haycock. They are generally found in the vicinity of some large tree on the bank of a stream; such a site affording them both food and the moisture requisite for building purposes. The ant-hill is of a conical shape, and composed of leaves, scraps of wood, earth, &c. At the commencement the nest is simply an excavation made in the earth; a number of the labourers wander about in quest of materials suitable for the superstructure, others carry out particles of earth from the interior, which are replaced by the bits of wood and leaves other labourers bring in, and which the builders properly arrange. Care is taken that space is left for the galleries that lead to the interior, while the dome contains a number of spacious apartments communicating with each other by means of galleries similarly con-

structed. To the superficial observer the exterior of an ant colony presents the appearance merely of a careless heap, the result rather of chance than of design. Minute inspection, however, would invariably discover it to be the very perfection of architecture, in which the attacks of enemies, the effect of wind and flood, and the rays of the sun, have been thoroughly provided against in the building. "I was in the habit of visiting almost daily a nest of red ants, of which a large flat stone formed the roof. During my visits for the first three weeks, scarcely a drop of rain had fallen, and the nest seemed considerably injured by the continued falling of loose earth, which these little creatures, with amazing industry, removed whenever it happened that any of the avenues were blocked up. No attempt was ever made towards reparation; but what was my surprise, on visiting my little friends after two days' heavy rain, to find that the repairs were already completed, and that the upper surface of their habitation presented as smooth an appearance as if a trowel had been passed over it. Yet all their work they had industriously effected by kneading with the rain-water the loose earth into a sort of paste. From the nest being situated in the midst of an extensive heath, where there could be no supply of water, and from its remaining unrepaired during the dry weather, it amounts to a full conviction, that ants employ no other cement than water in the construction of their varied habitations. I have often been surprised at the ingenuity of these little creatures in availing themselves of contiguous blades of grass, stalks of corn, &c., when they wish to enlarge the boundaries of their abode. As these are usually met with in the erect position, they are admirably calculated for pillars; they therefore coat them over with a fine paste of earth, giving them, by additional layers, the solidity they judge necessary for the work on which they are engaged; they then leave them to be consolidated by the wind, and afterwards spring a number of arches from pillar to pillar, and thus form an extensive saloon. Should they be at any time in want of small apartments, they have only to prepare a quantity of moistened earth, and by placing this between the pillars, and carrying it up to the roof, leaving here and there an aperture for entrance, their object is completely attained."—(*Dr. J. R. Johnson.*) Ants are very pugnacious, and many dreadful battles take place among them. Party meets party, and after the fray may be found limbless trunks, and trunkless heads, and combatants fast locked in each other's embrace, and quite dead. More extraordinary than all, however, is the fact that some species of ants go on regular forays to carry off the eggs and grubs of other species, which they carry into captivity, and rear as bond ants and slaves for the rest of their lives. The best known of these marauders are the Sanguinary Ant (*Formica sanguinea*) and the Amazon Ant (*Formica rufescens*). It has been noticed as a rather singular circumstance, that in both cases the kidnappers are red or pale-coloured ants, and the captives jet black. The tyrants march forth attended by scouts, and when the unsuspecting colony of negro ants is reached, there ensues a tremendous fight, in which the negroes are certain to be worsted. Thereupon, the conquerors assail the now undefended ant-hill, rend its walls with their powerful mandibles, seize the pupæ in their mouths, and march home again in triumph. The slaves are not ill-treated, but live as do human slaves, the only reward for the labour of their lives, being such food and lodging as their masters please to bestow.—*Ref.* Gould's *English Ants*; the works of Baron de Geer, Huber, Latreille, Kirby and Spence's *Entomology*, &c.

ANT, WHITE, in Zool., an extensive and important fam. of the *Neuropterous* ord., chiefly confined to the tropics, where they perform no inconsiderable share in the necessary business of removing from the earth's surface the carrion that cumbers it. Like the common ant, the white ants live in communities, and are, like them, omnivorous. Like the familiar "little brown ant," too, the white tropical insect is, at a certain period of its existence, furnished with wings to expedite its emigration. At no time, however, does the general form of the two insects agree. The antennæ of the white ants are thread-shaped, and composed of about twenty joints, and the eyes are rather small, but prominent; the body is depressed, and the mouth very similar to that of the *Orthoptera*, with the four-cleft lower lip, the wings slightly transparent, and the legs short. As destroyers, they certainly deserve place next to the locusts. Should they attack a building composed wholly or partly of wood, it is doomed;—truly, when they leave it, as being of no further use to them, it will not have altered much in appearance; but examination will discover the substantial beams to be mere shells, and the pillars as hollow and unstable as reeds. Your gun that hangs against the wall will drop barrel from stock at the slightest handling, and your sword show itself naked, through its leather sheath being eat up. Nothing is safe from the white ant's insatiable appetite. Their tactics in attacking a building are very peculiar. While some of them are busy gutting the timbers that support it, others ascend from them, entering a rafter or some other part of the roof, in search, as it would seem, of the thatch, which they appear to relish more than any other portion of a house. If they find it, they bring up wet clay, and build galleries through the roof in various directions as long as it will support them. In this manner a wooden house is speedily destroyed, and all that is contained in it is, at the same time, subjected to their ravages. "In carrying on this business, they sometimes find, by some means or other, that the post has a certain weight to support, and then, if it is a convenient track to the roof, or is itself a kind of wood agreeable to them, they bring their mortar, and as fast as they take away the wood, replace the vacancy with that material, which they work together more closely and compactly than human art could ram it. Hence, when the house is taken to pieces in order to examine if any of the parts are fit to be used again, those made of the softer sorts of wood are often found to be a mere shell; and almost all of them are transformed from wood to clay, as solid and as hard as many kinds of stone used for building purposes."—(Smeathman's *Account of the Termites of Africa*.) It is of this "mortar"—earth or sand agglutinated together—that are built those wonderful edifices known as ant-hills. When Dr. Livingstone was engaged in his first African exploration, he witnessed several instances, not only of this mysterious insect architecture, but also of the important part they play in the scheme of nature. He tells us that the country between Linyanti and Seabella is flat, except patches elevated only a few feet above the surrounding level. "There are also many mounds, where the gigantic ant-hills of the country have been situated, or still appear. These mounds are evidently the work of the *Termites*. No one who has not seen these gigantic structures can fancy the industry of these little labourers. They seem to impart fertility to the soil which has once passed through their mouths; for the Makolo find the sides of the ant-hills the choice spots for rearing early maize and tobacco. In the parts through which we passed, the mounds were generally covered with wild date-trees." The fecundity of the female of this species is truly wonderful. She and her partner are incarcerated in a cell by the neuters, and are there regularly supplied with food; and, after impregnation, on the enlargement of the ovaries, her abdomen swells to the enormous size of nearly *two thousand* times the rest of her body. As soon as she begins to lay eggs, they are conveyed away by the neuters to the prepared cells, which, in conjunction with the magazines of provisions, occupy the interior of their nests. It is said that she lays as many as 80,000 of these eggs in the course of twenty-four hours. So marvellous a fecundity would speedily overwhelm the earth, did it not happen that comparatively few reach maturity, and that birds, beasts, and fishes devour them in shoals. The true ants, however, are their worst enemies, and prey on them with the most savage voracity, especially at the period of their swarming. When roasted, they are said to be palatable as food, and as such to be highly esteemed by the natives. A Bayeye chief, who paid a ceremonial visit to Dr. Livingstone's camp, was offered some bread and apricot jam. "Did you ever eat anything so good?" inquired the doctor. "Ah!" responded the chief, "you should try roast white ants."

ANTACID, *ănt'-as-id* (Gr. *anti*, against, and *acid*), a term applied to such medicines as possess the quality of correcting acidity or sourness in the stomach. The

principal antacids are potash, soda, magnesia, lime, and their carbonates.

ANTAGONIST MUSCLES, *ăn-tăg'-o-nist* (Gr. *anti*, against, *agonistes*, a combatant), in Anat., are those muscles which act in opposition to each other; as flexors and extensors, abductors and adductors.

ANTALKALI, *ănt'-ăl'-ka-li* (Gr. *anti*, against, and *alkali*), a name applied to such medicines as tend to counteract the presence of alkalies in the system. The antalkalies in most common use are muriatic, nitric, and citric acid.

ANTANAGLASIS, *ănt'-an-a-klăs'-sis* (Gr. *antanaklao*, I drive back), in Rhet., is a term denoting the repetition of a word in a different sense, or as a different part of speech, from that in which it has already been employed, in order to attract attention or give expressiveness to the phrase; as, "Whilst we *live*, let us *live*." It is also the returning to a subject after a long parenthesis, by repeating, in the same words, part of what went before.

ANTANAGOGE, *ănt'-an-a-goje* (Gr. *anti*, against, and *anagoge*, the bringing up), a figure in Rhet., applied to the case of an opponent, when not able to answer the accusation of his adversary, replying by accusing him of the same or other crimes. It is usually called recrimination.

ANTARCHISM, *ănt'-ar-kism* (Gr. *anti*, against, and *archo*, government), an opposition to all government or legal restraint.

ANTARCTIC, *ăn-tark'-tik* (Gr. *anti*, against, or opposite to, and *arktos*, the Bear, or northern constellation), an expression applied to the south pole and Southern Ocean, as opposite to the north pole and Northern or Arctic Ocean, and especially to the region which lies around the antarctic or south pole, within a circle distant 23° 28′ from that pole; corresponding to an area similarly circumscribed which surrounds the north or arctic pole.

ANTARES, *ăn-tair'-eez*, a bright double star in the constellation Scorpio, marked *a*, and known as *Cor Scorpii*, the Scorpion's heart. It is remarkable for its brilliant red appearance.

ANTE, *ăn'-te*, a Latin preposition signifying 'before,' and much used in the composition of English words. In composition it signifies before, either in place or in time. The Greek preposition *anti* is likewise frequently used in composition, and denotes *against, opposite, contrary to.*

ANT-EATER, GREAT (*Myrmecophaga jubata* of Linnæus).—This curious creature, sometimes called the ant-bear, is an inhabitant of most of the tropical parts of South America east of the Andes. It is the largest of the edentata, measuring four feet and a half from the tip of the snout to the root of the tail; while the latter member measures nearly three feet in length. These, at least, were the dimensions of the full-grown female lately at the Zoological Gardens. The head of the great ant-eater extends to a long snout covered with skin, with only a very small opening at the tip for the protrusion of the tongue: its ears are very minute; its legs, especially the anterior ones, very stout and strong, and armed each with four long claws, which turn inwards against the sole of the foot. The hind feet are provided with a broad sole, and it is probably from this circumstance that the animal derives its occasional name of ant-bear. The body is covered with bristly hair, which, on the tail, grows to such a length as to sweep the ground. When composing itself for sleep, the ant-eater curls its body, and so enwraps itself in its bushy tail, as to present the appearance of a heap of withered grass rather than a living animal. It is said that the animal resorts to the shelter of its tail as a protection from the rain, and that the Indians, on overtaking this sort of game, make a rustling among the forest foliage, to resemble the pattering of rain; whereon the ant-eater hastens to wrap itself in its tail, rendering it an easy matter for the stealthy savage to approach and knock it on the head. This precaution is not unnecessary; for, despite the animal's harmless appearance, it has a habit of suddenly rising, bear-fashion, and clasping its assailant round the waist, lacerating him fearfully with its powerful claws. The natural food of the ant-eater is the white ant that abounds on the banks of lakes and rivers in tropical South America. Assailing the nests of the industrious little insects with its heavy-armed fore-paws, it puts the entire colony in confusion, and then thrusting amongst them its nimble tongue, capable of protrusion to the extent of a foot and a half, withdraws the adherent ants into its maw, repeating the operation till they are all consumed, or the ant-eater's appetite satisfied. The ant-eater's tongue is composed almost solely of ring-like muscles, and is



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altogether worm-like in appearance. The surface is endued with a viscous matter, to which the ants and termites become helplessly attached at the slightest contact. Without this providential arrangement, the animal would find subsistence next to impossible, as its mouth is extremely small, and it possesses no teeth. The latter is the case with the majority of the edentata.

ANTECEDENT, *ăn'-te-sē'-dent* (Lat. *ante*, before, and *cedo*, I go), in Gram., is the noun which goes before the relative, and to which it refers. In Log., it is that part of a conditional proposition on which the other, which is called the consequent, depends. In the relation of cause and effect, the cause is the antecedent, the effect the consequent.

ANTECEDENTIA, *ăn'-te-se-den'-shi-a* (Lat. *antecedere*, to precede, to go before).—When the motion of any heavenly body appears to be in a direction contrary to the course of the signs of the zodiac, or from east to west, it is said by astronomers to move *in antecedentia*.

ANTECHAMBER, *ăn'-te-chaim-ber* (Lat. *ante*, before; Fr. *chambre*, room, apartment), literally the room before the chamber; that which leads to the principal apartment.

ANTEDILUVIAN, *ăn'-te-di-loo'-vi-an* (Lat. *ante*, before, and *diluvium*, a flood), a term applied to whatever existed or happened in that period of the world's history which preceded the Flood. The length of this period is variously given. According to the Hebrew text, it comprised 1,656 years, being only 692 years less than the period from the Flood to the birth of Christ, or 206 years less than that from the birth of Christ to the present time. The Samaritan and Septuagint texts, and Josephus, however, according to Hales and Jackson, make it no fewer than 2,256 years. All our authentic information respecting this long and interesting period is contained in forty-nine verses of Genesis (iv. 16 to vi. 8), more than half of which are occupied with a list of names and ages, invaluable for chronology, but conveying no particulars regarding the primeval state of man.—*Ref.* Kitto's *Biblical Cyclopædia.*

ANTELOPE, *ăn'-te-lope* (Lat. *antilope*), a large group of ruminating mammals, comprising many species; and, although differing in many particulars, agreeing in certain important characteristics. These are principally as follows:—In the form of the horns, which are without angles and ridges, as in the sheep and goat, but of a round and annulated nature. Excepting in this particular, the horns of the antelope genus widely differ: while those of one species are perfectly straight, another will exhibit curved or spiral horns. In some species they are peculiar to the male alone; in others, the female is endowed with these handsome appendages as well as its mate. All the antelopes are

remarkable for their delicate sense of smell. It has been supposed that this is owing to their possession of "lachrymal sinuses," or "tear-pits," and that these organs communicate with the nostrils. The anatomy of the parts fully proves that this theory is incorrect, and that there is no internal communication between the lachrymal sinus and the nose. Although the antelopes are not the only animals which possess suborbital sinuses, they are the only members of the hollow-horned family that exhibit this character. The females are furnished with two and sometimes four teats, and the period of gestation varies from five to eight months. One, and occasionally two, are brought forth at a birth. From the most remote ages, the eyes of this genus have been a peculiar theme. The Greek and Roman name of the gazelle, *dorcas*, is derived from the verb *derkomai*, I see. Even the English name of the genus, antelope, is a corruption of the term *anthelope*, literally 'bright eyes.' We are, moreover, informed by Bochart, that the Scriptural name, *tabitha*, is derived from *tzebi*, the Hebrew name of the gazelle, which alludes to the brightness of its eyes. The same image is



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frequently employed by Eastern poets, and also by our modern versifiers, the soft and subdued beauty of the gazelle's eyes often being compared to those of the timid and blushing maiden. As a rule, the hair of the antelope is smooth and short, and of an equal length; but, in some species, they have manes on the neck and shoulders; others, as the gnu, are provided with a beard on the throat and chin. The ears are long and pointed, growing in the inside of which are long white hairs, forming five longitudinal lines, with four black spaces between. The tails are short, tufted at the extremity. This genus, as a rule, is gregarious, uniting in large flocks of thousands; but, in some instances, spending their lives in solitary pairs. When associating in large numbers, great caution is taken to prevent surprise, and sentinels are constantly kept on the alert. Their wariness in this particular, combined with their acute sense of smell and sight, renders them somewhat difficult game, tasking the patience and temper of the hunter to the fullest extent. The hunting-grounds of Africa contain the largest number of these animals; Asia furnishes several species; Europe supplies but a small quota; and the gigantic extent of pasture-land in the New World can boast of but a single species. Australia and Madagascar are totally destitute of antelopes, and all indigenous ruminants. With regard to the habitat of the antelope, it is far from a uniform nature; the general characteristics are as variable as the structure of the animals. While some species delight in the parched and arid desert, feeding upon such bulbous plants as the nature of the soil affords, others find a home on the open plains, on the steppes of Central Asia, or karroos of Southern Africa. Another species prefers the mountainous districts, and exhibits all the ease and agility of the wild goat in their rocky home. The dense and mighty forests of tropical Africa provide a home for some other species. The whole of the antelopes were at one time included under the general head *Antilopeæ*. Modern discoveries have so largely augmented the group, that it has been necessary to class them into subdivisions, as follows:—1. True antelopes; 2. bush antelopes; 3. capriform (or goat-like) antelopes; 4. bovine (or ox-like) antelopes. The two great divisions into which they are divided are, the *antelopes of the field* and the *antelopes of the desert*. They are principally distinguished in the former by the absence of hair on the nostrils, whilst the same organs of the latter division are covered within with hair or bristles. It is true, the subdivisions have been quadrupled by modern zoologists; but, as an eminent authority remarks, "the genus antelope has become a kind of zoological refuge for the destitute, and forms an incongruous assemblage of all the hollow-horned ruminants together. So diversified are its forms, and so incongruous its materials, that it presents not a single character which will either apply to all its species, or suffice to differentiate it from conterminous genera." The antelope would appear to be the connecting link between the deer and the goat. In the peculiarity of never shedding their horns they resemble the goat; on the other hand, their fleetness, the colour and texture of their hair, their general structure, in fact would place them near the deer tribe. The general colour of the antelope is brown on the back, and white under the belly, variegated with black stripes. With regard to the size of the antelope, while one of the largest species are some five or six feet in height, there is a singular little variety,—the pigmy antelope, which scarcely measures nine inches. The whole tribe amount to about eighty species. Antelope flesh forms a considerable portion of the native's larder, as well as affording food to some thousands of the carnivora. In cases of severe drought, they have been known to sweep down on the cultivated fields of the colonists in such flocks as to cause fearful devastations.—Ref. *English Cyclopædia*—Nat. Hist.

ANTELUCAN, *ăn-te-loo'-kan* (Lat. *ante*, before, and *lux*, light), before light, a term applied by ecclesiastical writers to things done in the night, especially used in reference to the assemblies of Christians which were held during the night in the early times of persecution.

ANTEMERIDIAN, *ăn-te-me-rid'-i-an* (Lat. *ante*, before, and *meridies*, noon or mid-day), before noon or twelve o'clock in the day, used in its abbreviated form A.M. to denote any time between midnight and noon.

ANTENNÆ, *ăn-ten'-ne* (Lat., a yard-arm), in Ent., those slender bodies with which the heads of insects are furnished, being synonymous with what are called feelers or horns. (*See* BEE, INSECT, &c.) For the several varieties of antennæ,—*Ref.* Kirby and Spence's *Introduction to Entomology*.

ANTEPENULT, *ăn'-te-pe-nult'* (Lat. *ante*, before, *pene*, almost, and *ultimus*, the last), is used in Gram. to denote the last syllable of a word except two,—the one before the penult.

ANTERIOR, *ăn-te'-ri-or*, before either in time or place. In Anat. it is often used to designate parts which are situated before others, and is thus opposed to posterior; as, the anterior lobes of the brain, the *anterior intercostal nerve*.

ANTHELIX, *ăn-the'-lix* (Gr. *antihelix*, from *anti*, opposite to, and *helix*, a spiral), in Anat., is an eminence on the cartilage of the ear, situated before, or more properly within, the helix, or outer circle of the ear. It consists of two ridges as its upper part, which unite as they descend.

ANTHELMINTICS, *ăn-thel-min'-tiks* (Gr. *anti*, against, and *elmins*, a worm), a term applied to such medicines as have the effect of destroying worms in the stomach and intestines. They are of various kinds, but may be divided into three classes,—those which, by increasing the peristaltic motion of the intestines, tend to displace the worms, and may thus occasion their expulsion, —as purgatives of various kinds; those which tend to strengthen the stomach and intestines, and the system generally,—as tonics or analeptics; and those which act specially upon the worms, dislodging, weakening, or killing them. These last are anthelmintics, properly so called. Of this class, the oil of turpentine is generally the best medicine that can be employed, and is,

perhaps, the only one that unequivocally acts as a direct poison on the worms.

ANTHEM, *ăn'-them* (Gr. *anti*, against, and *humnos*, a hymn), properly signifies a hymn sung in alternate parts, as being anciently sung alternately by the two sides of the choir. At present the name is applied to a species of musical composition, introduced into the service of the English church in the beginning of the reign of Queen Elizabeth, the words being taken from the Psalms or other suitable portion of the Scriptures or Liturgy. There are three kinds of anthem,—*solo*, *verse*, and *full* anthem. The solo anthem has only one voice to a part; the verse consists chiefly of chorus, but there are also verse parts for single voices; the full anthem is wholly chorus, and sung by all the voices. The anthem can only be heard to perfection in cathedral service.

ANTHEMIS, *ăn'-the-mis* (Gr., the Chamomile plant), in Bot., a gen. of plants belonging to the nat. ord. *Compositæ*, sub-ord. *Tubilifloræ*, and distinguished by having the scales surrounding the flower-heads membranous at the borders, like those of a chrysanthemum, from which genus it, in fact, differs chiefly in the receptacle of the flower being furnished with little chaffy projections. The most important plant of the genus is *A. nobilis*, the common chamomile, which is extensively cultivated for the sake of its flowers. It is an indigenous perennial, flowering from June to September, and growing on open gravelly pastures and commons. The *capitula*, which are commonly termed flowers, are each composed of a number of tubular yellow florets, arranged on a receptacle, and surrounded by a circle of ligulate white florets. The double variety is produced at the expense of the tubular florets, which become converted into ligulate florets. The single flowers are to be preferred for medical purposes, as the central yellow florets contain much more volatile oil than the white ones. Chamomile is cultivated for the London market at Mitcham and in some parts of Derbyshire. Both leaves and flowers possess a strong but not unpleasant aromatic odour, and a nauseous bitter taste. The principal constituents of the flowers are volatile oil, tannin, and bitter resinous matter. The oil, which is procured by distillation, is stimulant and antispasmodic, and is frequently used in the preparation of tonic and cathartic pills, and to relieve flatulence, griping, and eructation. The dried flowers have the same properties as the oil, and are used for the same purposes. They are also employed externally for fomentations. The chamomile flowers of the German pharmacologists are the produce of a species of *Matricaria*, a genus very closely allied to the *Anthemis*. On the continent *A. nobilis* is called the Roman chamomile, to distinguish it from *M. Chamomilla*, which is there generally known as the common chamomile. Two other species of *Anthemis* may be noticed,—*A. Cotula*, the May-weed, a common wild plant, sometimes mistaken for the chamomile; and *A. tinctoria*, which yields a yellow dye, much used in France by the dyers.



ANTHER, *ăn'-ther* (Gr. *antheros*, belonging to a flower), in Bot., an essential portion of the stamen, being the bag or case (*e*) which contains the pollen. It is generally supported on the summit of a little column or stalk called the *filament* (*d*). The pollen is discharged at certain periods through little slits or holes formed in the anther. (*See* STAMEN.)

ANTHERIDIA, *ăn-the-rid'-i-a* (Gr. *anthos*, a flower), in Bot., the general name applied to all the various structures in which, certainly or probably, the fertilising function of reproduction resides in flowerless plants, and which consequently correspond physiologically to the anthers of flowering plants. All these organs have one character in common,—namely, that of producing extremely minute bodies endowed with spontaneous motion when placed in water. These moving bodies from the antheridia are called spermatozoids, antherozoids, or spermatic filaments. (*See* SPERMATOZOID.)

ANTHESIS, *ăn-the'-sis* (Gr., *flowering*), in Bot. this term is sometimes used to indicate the period at which the flower-bud opens.

ANTHOCARPOUS, *ăn-tho-kar'-pus* (Gr. *anthos*, flower, *karpos*, fruit), in Bot., a general term for fruits formed by the combination of several flowers. Such fruits usually consist not only of the carpels of the flowers, but of their bracts and floral envelopes as well, a fact indicated by the derivation of the term *anthocarpous*. The terms *multiple*, *aggregate*, and *collective*, have also been applied to these fruits. The most important anthocarpous fruits are, the *cone*, which is seen in the fir, larch, spruce, and other plants of the order *Coniferæ*; the *galbulus*, seen in the cypress and juniper; the *strobilus*, seen in the hop; the *sorosis*, in the pineapple; and the *syconus*, in the fig. These different kinds of fruits are fully described under their respective heads.

ANTHOCEROTÆ, *ăn-tho-se-ro'-te*, in Bot., a sub-ord. of the nat. ord. *Hepaticaceæ*, the liverworts, distinguished by having valved pod-shaped sporangia.

ANTHODIUM, *ăn-tho'-di-um*. (*See* CAPITULUM.)

ANTHOLOGY, *ăn-thol'-o-je* (Gr. *anthos*, a flower, and *logia*, a collection), in Lit., is a collection of choice passages from various authors, either in prose or verse, but generally in the latter. It is more particularly applied to certain collections of Greek epigrammatic poems. Meleager, the Syrian, who lived probably about the middle of the 1st century before Christ, is generally regarded as the first that produced a work of this kind. Subsequently, similar collections were made by Philip of Thessalonica, Diogenianus of Heraclea, Strato of Sardis, and Agathias; but all these ancient works are lost. Many of the pieces, however, are preserved in the later works of Constantine Cephalas, who lived in the 10th century, and Maximus Planudes, who flourished in the 14th. Of the latter, the first printed edition is that of Lascaris, at Florence, 1494. The last edition, with a Latin metrical translation by Grotius, is that commenced by Bosch, and finished by Lennep, in 5 vols., Utrecht, 1795—1822. In 1606 a manuscript copy of the earlier collection of Cephalas was discovered by Salmasius in the Heidelberg library. It was taken to Rome during the Thirty Years war, and subsequently to Paris; but was restored to Heidelberg in 1816. It is much the richer and better of the two, and has been frequently edited. In imitation of the Greek anthologies, several Latin anthologies have been made by Scaliger, Pithœus, Burmann, and others. Oriental literature, particularly the Arabian, is very rich in anthologies.

ANTHOTAXIS, *ăn-tho-tăx'-is*. (*See* INFLORESCENCE.)

ANTHOXANTHUM, *ăn-thox-ăn'-thum* (Gr. *anthos*, a flower, and *xanthos*, yellow), in Bot., a gen. of grasses. The species *A. odoratum* is commonly known as the sweet vernal grass, and greatly esteemed for its sweet smell, which causes much of the well-known fragrance of new-mown hay.

ANTHOZOA, *ăn'-tho-zo'-a* (Gr. *anthos*, flower, *zoon*, animal), a class of that division of the animal kingdom termed *zoophyta* (animal-flowers). The *anthozoa* are divisible into three orders,—*A. hydroida*, *A. asteroida*, and *A. hellanthoida*. These so-called animal-flowers apparently, but not in reality, combine the animal and vegetable in their nature; for they possess the sense of touch, the power of voluntary motion, and usually feed on matters which they have swallowed or sucked in, digesting them in an internal cavity; thus completely exhibiting the attributes of an animal. (*See* ACTINIA and ZOOPHYTES.)

ANTHRACITE, *ăn'-thra-site* (Gr. *anthrax*, coal).—Anthracite, stone-coal, culm, or coal-glance, is a very hard, lustrous kind of coal, found in the lowest parts of the carboniferous strata. It contains 90 to 96 per cent. of carbonaceous matter, and burns almost without flame, with a steady glow. Being the oldest of coals, it differs considerably from other kinds. It is nearly devoid of structure, and contains no impressions of plants. Its fracture is somewhat lamellar when broken in the direction of its bed, but irregularly conchoidal when broken across. Some specimens exhibit a beautiful play of colours, and are thence called peacock-coal. Being difficult of combustion, from its extreme hardness, it can only be burnt in a strong current of air. The coke obtained from it is very similar to the original coal both in bulk and weight. It is much used for steam-boilers, and for various metallurgical operations, where a strong current of air is easily procured, and an

intense heat is required. Anthracite is very abundant in the Welsh coal-field, where excellent qualities are found. It also occurs in enormous quantities in North America; but much of it is so compact that it cannot be used as fuel.

ANTHRACOTHERIUM, *ăn'-thra-ko-the'-ri-um* (Gr. *anthrax*, coal, *therion*, beast), a gen. of fossil pachydermatous animals, that seems to stand intermediate between the river-hog and the hippopotamus. The remains of the anthracotheria were first found in the tertiary lignites, or wood-coals of Liguria; hence the name given to this extinct animal.

ANTHRISCUS, *ăn-thris'-kus*, in Bot., a gen. of plants belonging to the nat. ord. *Umbelliferæ*, and characterized by possessing little or no calyx, with heart-shaped petals bent down at their points; and by producing a fruit narrowed below the short beak, and without any ridges. The species *A. vulgaris*, the common beaked parsley, grows wild in waste places, and is sometimes confounded with hemlock, but may be easily distinguished by its paler colour, the slight hairiness of the leaves, and by the absence of spots on the stem, and the swelling under each joint. The species *A. cerefolium*, the garden chervil, was formerly cultivated as a potherb. *A. sylvestris*, the wild chervil, is a common weed in hedges and banks throughout England.

ANTHROPOLITE, *ăn-throp'-o-lite* (Gr. *anthropos*, man, *lithos*, stone), in Geol., a term which has been applied to the petrified human bones from Guadaloupe, and elsewhere. "These remains," says Mr. Page, "can scarcely be considered *fossil*, or even *sub-fossil*; but must be regarded in the same light as any recent petrifaction produced by the action of calcareous waters."

ANTHROPOLOGY, *ăn-thro-pol'-o-je* (Gr. *anthropos*, man, and *logos*, a discourse), is the name of that science which in its widest sense treats of human nature both physically and mentally. It thus includes anatomy, physiology, psychology, ethnology, and even history, theology, æsthetics, &c. It is often, however, limited to the relations existing between the soul and body in man. This science has been little cultivated among us; but it is otherwise in Germany.—*Ref.* Kant's *Anthropologie in pragmatischer Hinsicht*, 4 edit., by Herbart, 1833; Staffen's *Anthropologie*, 1822; Burdach's *Anthropologie für das gebildete Publicum*, 1837; Birnbaum's *Lehrbuch der Anthropologie*, 1842.

ANTHROPOMORPHISM, *ăn'-thro-po-mor'-fism* (Gr. *anthropos*, man, and *morphe*, form or shape), literally signifies the representation of human form, and in theology, is used to denote those conceptions of the nature and attributes of God, which we form and express by words derived from human or terrestrial qualities or objects. As finite beings, it is impossible for us to form true conceptions of what is infinite; we can only judge and speak of it from what we find within and around us; hence we read in Scripture of the eye, ear, hand of God, as well as of his remembering, forgetting, &c. It was necessary that the divine revelations addressed to mankind should be clothed in language adapted to their inferior capacities; but it is evident that it is necessary to guard against being led into too gross and material notions by such language.

ANTHROPOMORPHITE, *ăn'-thro-po-mor'-fite*, a sect of ancient heretics, called also Audæans, which arose in the 4th century, and, taking everything spoken of God in Scripture in a literal sense, especially that passage in Genesis where it is said that "God made man after his own image," maintained that God had a human form.

ANTHROPOPHAGI, *ăn-thro-pof'-a-ji* (Gr. *anthropos*, and *phago*, I eat), cannibals, or man-eaters. (*See* CANNIBALS.)

ANTHYLLIS, *ăn-thil'-lis* (Gr. *anthos*, flower, *hulos*, beard), in Bot., the kidney vetch, a gen. of plants belonging to the nat. ord. *Leguminosæ*. The silky appearance of the heads of flowers suggested the botanical name. *A. Vulneraria* is recommended as a herbage plant by some writers on agriculture.

ANTIARIN, *ăn'-ti-a-rin*, the poisonous principle of the upas-tree (*Upas antiar*). It is extracted from the gum resin of the tree. Introduced into a wound, it brings on violent vomiting and convulsions.

ANTIARIS, *ăn'-ti-a-ris*, in Bot., a gen. of plants belonging to the nat. ord. *Artocarpaceæ*. The species *A. toxicaria* is the celebrated antejar, or upas poison-tree of Java, concerning which many fabulous and absurd stories have been told by travellers. (*See* UPAS.) The bark of *A. saccidora*, a tree growing in India, is used for cordage and matting. Sacks are also manufactured from it by a very simple process. A branch is cut corresponding to the length and diameter of the sack wanted. It is soaked a little, and then beaten with clubs till the liber separates from the wood. This done, the sack formed of the bark is gradually turned inside out and pulled down, as the wood is sawn off in slices. A thin slice is left to form the bottom of the sack. These bark sacks are commonly used for carrying rice.

ANTI-ATTRITION, *ăn-ti-ăt-trish'-un* (Gr. *anti*, against; Lat. *attritio*, a rubbing, wearing away), black-lead mixed with four times its weight of tallow or fat. It is used to prevent friction in machinery.

ANTIBURGERS, *ăn-ti-bur'-gers*, were a sect of Scottish Presbyterian dissenters, who differed from the established church chiefly in matters of church government. They differed from the Burgers, with whom they were originally united, regarding the lawfulness of taking the burgess oath. They have since become united with various other sects of dissenters into what is known as the United Presbyterian Church.

ANTICHLORE, or ANTICHLORINE, *ăn-ti-klo'-rine*.—Sulphate of soda lately become a commercial product under the above name, and is much used to clear bleached fabrics from any excess of chlorine that may remain in them. The chlorine in the presence of water seizes on an atom of hydrogen, leaving the remaining atom of oxygen free to join the *sulphurous* acid of the salt to form *sulphate* of soda. It is occasionally used as a deoxidizing agent in analysis. Hyposulphite of soda is also extensively employed as an antichlore, and acts in a similar manner as the sulphate.

ANTICHRIST, *ăn'-ti-kriste* (Gr. *anti*, against, and *Christos*, Christ), literally signifies the opponent or adversary of Christ, and is the name given to the great enemy of true religion, who is to appear before the second coming of Christ. The name only occurs in the First and Second Epistles of St. John, where it is said that every spirit that confesseth not that Jesus Christ is come in the flesh, is that spirit of antichrist, whereof ye have heard that it should come, and even now already is it in the world. Antichrist is generally regarded, however, as "that man of sin" spoken of by St. Paul as "the son of perdition who opposeth and exalteth himself above all that is called God, or that is worshipped; so that he as God sitteth in the temple of God, showing himself that he is God" (2 Thess. ii.); and the beast spoken of by St. John in the Apocalypse as a beast rising out of the sea and making war upon the saints, with seven heads and ten horns, and ten crowns upon his horns, and upon his heads the name of blasphemy. False teachers are sometimes called antichrists. Protestants generally hold that the Roman Catholic church is antichrist.

ANTICLIMAX, *ăn-ti-klī'-max* (Gr. *anti*, and *klimax*, gradation), in Rhet., denotes a sentence or discourse which descends from great to little, being opposed to climax, which ascends from little to great.

ANTICLINAL, *ăn-ti-klī'-nal* (Gr. *anti*, opposite, *klino*, I bend), in Geol., this term is applied to strata which dip in opposite directions from a common ridge. This ridge is termed an *anticline*, or *saddleback*. (*See* SYNCLINAL.)

ANTI CORN-LAW LEAGUE was a league formed of the various existing anti corn-law associations, at a meeting held at Manchester in 1839, with a view to bring about a repeal of the corn-laws. A central office was established at Manchester, lecturers were employed, and publications issued, advocating their view; and great public meetings were held at various times in Manchester, London, and other places. Large sums of money were also raised for the purpose of bringing about free trade in corn; and, at a great meeting in Manchester in December, 1845, it was proposed to raise a quarter of a million sterling. The passing of the bill for the repeal of the duty on corn, however, rendered this unnecessary, and the league was formally dissolved on July 2, 1846. The efforts of Mr. Cobden in this cause were rewarded by a national subscription amounting to nearly £90,000.

ANTIDOTE, *an'-ti-dote* (Gr. *anti*, against, and *dotos*, given), in Med., is a term applied to remedies or preservatives against sickness; but more strictly to substances which counteract the effects of poison.

ANTI-FRICTION WHEELS, *an-ti-frik'-shun*, small wheels used in machinery to prevent the grinding or rubbing of surfaces moving in contact with each other. They are placed between the surfaces, and are sometimes fixed in axles, but more frequently left to run free. The wheels of castors and carriages are to all intents friction-rollers in principle. (*See* WHEELS.)

ANTIMONIC ACID. (*See* ANTIMONY.)

ANTIMONIOUS ACID. (*See* ANTIMONY.)

ANTIMONY, *an'-ti-mo-ne*, in Chem., symbol Sb, from the Latin *stibium*; atomic weight 129, specific gravity 6·7. Antimony is a brilliant bluish-white metal. It fuses at 850° F. It is so brittle, that it may be reduced to powder by being pounded in a mortar. It occurs in commerce in crystalline cakes, and is generally very impure. It volatilizes at a red heat. It is a bad conductor of electricity and heat. When heated in air, it burns, and gives off copious white fumes, consisting of teroxide of antimony. It is also oxidized by nitric and sulphuric acid, and dissolved by aqua regia. In its chemical relations, it is allied to nitrogen, phosphorus, and arsenic, and forms, with the last, one of the connecting links beween the metallic and non-metallic elements. It forms three oxides, viz.,—1. Teroxide of antimony, $SbO_3$, a greyish-white powder, which is procured by boiling the metal with sulphuric acid, and evaporating to dryness, which gives the anhydrous form, or by adding carbonate of soda to a solution of the terchloride. 2. *Antimonic acid*, $SbO_5$, a pale yellow powder, tasteless and insoluble, made by adding nitric acid to the tersulphide, and driving off the excess of nitric acid by heat. Antimonic acid forms definite compounds with the alkalies and some of the metallic oxides. The pigment known as Naples yellow is an antimoniate of lead. 3. *Antimonious acid*. If antimonic acid be heated strongly, a compound is produced containing antimonic acid combined with teroxide of antimony. This is erroneously called an acid, but it is really either a tetroxide of antimony or an antimoniate of antimony, *i.e.*, either $SbO_4$, or $SbO'_3$, $SbO_5$. *Terchloride of antimony*, or *butter of antimony*, $SbCl_3$, is formed by heating the tersulphide with hydrochloric acid. It is very deliquescent, and forms a buttery mass, whence its commercial name. It is used as a caustic by veterinary surgeons, and for browning gun-barrels. It also forms a pentachloride, $SbCl_5$. *Tersulphide of antimony* occurs native in grey lead-coloured masses, and is the only ore from which antimony is procured. It is much used for adulterating common plumbago for lead-pencils. It may be easily detected by heating the lead, when the sulphur soon renders its presence apparent, or by the mark on paper being inefaceable by India-rubber. It is used in pyrotechny for making Bengal lights. The hydrated tersulphide, mixed with the teroxide, is an amorphous red powder, and is used in medicine under the name of *Kermes's mineral*. *Antimoniuretted hydrogen*, $SbH_3$, is formed when zinc and antimony are heated with sulphuric acid. It is supposed to be an ammonia, corresponding to $PH_3$, phosphamine. *Tartrate of antimony and potassa*, or *tartar emetic*, is a valuable medicinal remedy. It is used in small doses as a sudorific and expectorant; in large doses, as an emetic. It is also used in eruptive fevers, and is a frequent and valuable remedy in catarrhal affections, as it induces the secretion of fluids on the surfaces of all mucous membranes. The *Glass*, *Crocus*, and *Liver of Antimony* are impure oxysulphides, and are formed by roasting the native tersulphide with access of air. The native tersulphide is called in commerce *antimony*, the metal being called *regulus of antimony*. The compounds of antimony are easily recognised in solutions, by giving a characteristic orange precipitate with sulphuretted hydrogen.

ANTIMONY, METALLURGY OF.—Antimony is found pretty abundantly in nature, under the form of the grey ore, or tersulphide. The other ores of antimony are rare and unimportant. The reduction of antimony to the reguline state consists of two distinct operations. The crude ore is first melted on an inclined plane, in a reverberatory furnace. The melted sulphide fuses, and flows away from the slag, or *gangue*, as it is called. The sulphide is again roasted, and mixed with carbonate of soda and charcoal. On heating this mixture in a crucible, a quantity of the metal is formed at the bottom. The unreduced oxysulphide which remains on the top is afterwards used for preparing Kermes' mineral. Antimony is never employed alone in the arts; but it forms several very useful alloys. It is chiefly used to harden other metals or alloys, and to communicate to them the power of swelling as they cool, a property extremely valuable in casting type, &c. *Type metal* is composed of four parts of lead and one of antimony. *Music type* contains in addition a small portion of tin. *Britannia metal* is a mixture of brass, antimony, bismuth, tin, and lead, in different proportions. Antimony was known to the ancients in the form of the tersulphide, and was used by them as a pigment to blacken the eyelids. It was first reduced to the metallic state by Basil Valentine, towards the end of the 15th century.

ANTINOMIANS, *an-ti-no'-mi-ans* (Gr. *anti*, and *nomos*, law), in Theol., a name given to such as hold that Christians, being justified by faith, are freed from the observance of moral laws and the performance of good works. This error probably arose from a misunderstanding of the distinction made by the apostle Paul in the Epistle to the Romans, between faith and the works of the law. Various sects arose in the early church who might be termed Antinomians; but the name was first used by Luther at the time of the Reformation, and applied by him to the opinions advocated by John Agricola. The latter afterwards recanted, and, from that time, little has been heard of Antinomianism on the continent. During the time of the Commonwealth in England, certain advocates of this doctrine appeared, and, since that time, the term has been applied by way of reproach to various sects, with little regard to its original or proper meaning. Indeed, an extreme of Calvinism tends to a species of Antinomianism, in so far as religion is considered chiefly as a matter of faith, with little regard to practice, manifestly overlooking the apostle's doctrine, that "faith without works is dead, being alone."

ANTIPEDOBAPTISTS, *an-ti-pe'-do-bap'-tists* (Gr. *anti*, *paidos*, of a child, and *baptizo*, I baptize), in Theol., is a term applied to those who object to infant baptism. They are generally known in this country as Baptists. (*See* BAPTISTS.)

ANTIPATHY, *an-tip'-a-thy* (Gr. *anti*, and *pathos*, feeling), in its widest sense, denotes the natural dislike or aversion which an animate being entertains for some particular object; as the antipathy of sheep to wolves, of a turkey-cock to the colour red. In the human species we frequently meet with remarkable cases of antipathy by certain individuals to objects which are grateful or indifferent to the generality of mankind. Thus, some have an antipathy to certain kinds of food, as butter or eggs; to certain animals, as toads, mice, spiders; to certain tastes, smells, sounds, &c. In some cases the antipathy is so strong as to produce sickness or fainting. Doubtless, many of these feelings may be traced to early training, as when children are frightened with certain objects, or nauseated with certain kinds of food. But antipathy is not always a conscious caprice which may be removed by an effort of the will, or by habit, for it is sometimes found that the effects of the presence of these objects are manifested on the individual, though their presence was unknown, and that substances for which he feels an antipathy, when partaken of unconsciously, may produce in him exactly the same symptoms as if he had partaken of them knowingly. It is difficult to account for this, except on the principle that there lie beyond the sphere of our consciousness, feelings and impressions which only become known to us by their effects.

ANTIPATHY, in Ethics, is applied to that aversion or repugnance which the mind feels against certain kinds of actions.

ANTIPHLOGISTIC, *an-ti-flo-jis'-tik* (Gr. *anti*, and *phlogoris*, inflammation), is a term applied in Med. to such remedies as tend to remove, lessen, or prevent inflammation; as bloodletting, purgatives, low diet, &c.

ANTIPHRASIS, *an-tif'-ra-sis* (Gr. *anti*, and *phrasis*, a form of speech), in Rhet., is applied to an expression used in a contrary sense to what it has in appearance; or to a kind of irony wherein we say a thing by deny-

ing what we ought rather to affirm it to be; as, 'It did not displease me,' meaning, 'I was pleased with it.'

ANTIPODES, *ăn-tip'-o-dees* (Gr. *anti*, and *pous*, a foot), is a term applied to those who live on opposite sides of the earth, and, consequently, have their feet turned towards each other. They are in similar but opposite latitudes, and their longitudes differ by 180°; and, consequently, while they have similar climates so far as dependent upon latitude, their seasons, as well as their days and nights, are reversed.

ANTIPOPE, *ăn'-ti-pope*, one who assumes the title and functions of a pope without valid election. Antipopes elected by a sovereign, or by a faction, have frequently arisen in the Roman Catholic church, and have led to long protracted struggles. The emperors of Germany were the first to set up popes of their own nomination, in opposition to those that the Romans had elected without consulting them. In many cases, both competitors—sometimes there were even three or four—for the papal chair, were equally antipopes, that is, their claims were equally good. Each was frequently supported by whole nations, and the schism was nothing else than the struggle of adverse political interests. During the 12th, 13th, and 14th centuries, there were numerous antipopes; but the most remarkable of these schisms in the Church, is that which took place on the death of Gregory XI., in 1378, and divided and agitated the Church for fifty years. The Italian party elected Urban VI. to the papal chair, and the French cardinals retired from Rome and elected one of their own number as pope, under the title of Clement VII. The claims of the latter were recognized by France, Spain, Savoy, and Scotland, while Italy, Germany, England, and the countries in the north of Europe, supported Urban. Clement established himself at Avignon, and there he and his successor, Benedict XIII., held their court, while Urban and his successors continued at Rome. The schism caused great scandal in the Church; the two popes excommunicated each other, and did not hesitate to compromise their sacred character by the most cruel outrages and the grossest insults. At length, a general council was held at Pisa in 1409, when both Gregory XII. and Benedict III., the successor of Urban, were deposed, and Alexander V. elected in their stead. Peace, however, was not established till the council of Constance in 1415, when all the three popes were deposed, and Martin V. elected in their room.

ANTIQUARIES, SOCIETY OF.—The Society of Antiquaries was first established in 1572, when Archbishop Parker, Sir Robert Cotton, and some others, united their efforts for the preservation of the ancient monuments of their country. James I. regarding the meetings of the society with apprehension, thought fit to dissolve it in 1604, and the society remained in abeyance till the beginning of the 18th century. In 1707 its operations were resumed, and in 1751 it obtained a charter of incorporation from George II. The total number of members is about 650. Each member pays an entrance-fee of £5. 5s., and an annual subscription of £2. 2s.; or £26. 5s., in addition to the entrance-fee, to become a life member.

ANTIQUARY, *ăn'-ti-qua-re* (Lat. *antiquarius*, from *antiquus*, ancient), is one who studies and searches after monuments and remains of antiquity, as old medals, books, statues, sculptures, and inscriptions, and, in general, all curious pieces that may afford any insight into antiquity. In a wider sense, it is one who makes the manners and customs of earlier times a special subject of inquiry, or who deduces history from the relics of the past. *Antiquarii* was also a name given in the Middle Ages to copies of old books, especially in convents. The keeper of an antiquarium, or cabinet of antiquities, was also styled an antiquary. In Italy, the cicerони who point out the antiquities of a place are termed antiquaries, as are also, in Germany, those booksellers who deal in old or second-hand books.

ANTIQUITIES. (*See* ARCHÆOLOGY.)

ANTI-RATIONALISTS, *răsh'-on-a-lists*, in Theol., a term sometimes applied by way of reproach to such as unduly depreciate the application of reason in matters of religion. There are some doctrines of Christianity which are manifestly above our comprehension, and which, as Pascal said, we must believe because they are impossible, and receive that as a chief argument of their divine origin; there are others which are amenable to reason, and to be judged of accordingly. The difficulty is to know when reason and when faith is to be the guide, so that the one may not trench upon or usurp the province of the other. Those that unduly magnify reason, making it the chief or only guide, are termed Rationalists; those that unduly depreciate it, Anti-Rationalists.

ANTIRRHINUM, *ăn-tir-rī'-num* (Gr. *anti*, similar, *rin*, nose), a gen. of plants, so named because the flowers of most of the species resemble the snouts of some animals. *A. majus* (commonly known as the snapdragon), and its varieties, are popular border flowers, which can be cultivated without trouble in any dry soil. The genus belongs to the nat. ord. *Scrophulariaceæ*, the Figworts.

ANTI-SABBATARIANS, *ăn-ti-săb-ba-tair'-i-ans*, in Theol., is a term applied to those that are opposed to the observance of the Christian sabbath, on the ground that the sabbath was merely a Jewish ceremonial institution, and consequently abolished by the coming of Christ.

ANTISCORBUTICS, *skor-bu'-tiks* (from *anti*, against, and *scorbutus*, a barbarous Latin word for scurvy), in Med., is a term applied to remedies against scurvy. (*See* SCURVY.)

ANTISEPTICS *ăn-ti-sep'-tiks* (Gr. *anti*, against, *sepein*, to putrefy), are the means or substances by which the decay or putrefaction of dead vegetable or animal substances is prevented or checked. There are three conditions which favour putrefaction:—1. A certain degree of warmth; 2. air; 3. moisture; by the absence of one or more of which its progress is retarded or arrested. The preservative power of cold is observable in animal or vegetable substances imbedded in the ice; and the packing of fish in barrels with ice is a common means adopted for preserving them. The exclusion of air is another means of checking putrefaction. In this way, meats are frequently preserved by being put into tin canisters, which, after the air is carefully extracted, are soldered down. Again, substances may be preserved by the abstraction of moisture; as in plants, dried fish, bacon, &c. The more important chemical antiseptics are alcohol, salt, nitre, alum, creosote, arsenic, corrosive sublimate, sulphate of copper, and chloride of zinc.

ANTISPASMODICS, *ăn-ti-spăs-mod'-iks* (Gr. *anti*, and *spasmos*, a spasm), in Med., are those remedies which are employed to allay or remove spasms or cramp. (*See* SPASM.)

ANTISTASIS, *ăn-tis'-ta-sis* (Gr. *anti*, and *stasis*, a position), in Rhet., is a term applied to what is in Latin called *comparativum argumentum*, and is that species of defence of an action which is founded on the assertion that if it had not been done, worse would have ensued. In this way, a general may defend an inglorious capitulation, by asserting that, except for it, the whole army must have perished.

ANTISTROPHE, *ăn-tis'-stro'-fe* (Gr. *anti*, against, and *strophe*, a turning), was a term applied by the ancients to that part of a song or dance before the altar, which was performed by turning from west to east, in opposition to the *strophe*, which was performed by moving from east to west. Hence *strophe* and *antistrophe* came to be applied to certain stanzas of an ode, together with *epode*, which was applied to that part which was sung when the chorus stood still. In Gram., *antistrophe* is applied to the changing of things mutually dependent upon each other; as, 'The master of the servant,' and 'The servant of the master.'

ANTITHESIS, *ăn-tith'-e-sis* (Gr., opposition), in Rhet., is the bringing together or contrasting things that are opposed to each other; as in that passage from Cicero, "On the one side stands modesty, on the other impudence; on the one fidelity, on the other deceit; here piety, there sacrilege; here continency, there lust." In the same way, when it was said of a book that it contained much, both new and true, but that the new it contained was not true, and the true was not new. When judiciously introduced, this figure gives vigour and liveliness to style; but its frequent introduction becomes tedious.

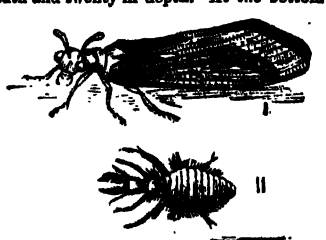
ANTI-TRINITARIANS, *ăn-ti-trin-i-tair'-i-ans*, in Theol., are those who deny the doctrine of the Trinity, and

hold that there are not three persons in the Godhead. There have been various kinds of Anti-Trinitarians; but, in the present day, the term is principally applied to the Socinians or Unitarians.

ANTITYPE, *ăn'-ti-tipe*, is a Greek word, literally signifying a figure formed after or corresponding to some other type or figure. A type is a pattern according to which a thing is to be made; antitype is a thing formed according to a model or pattern. In a theological sense, the antitype is that in which a type is fulfilled; as the paschal lamb is the type of which Christ is the antitype. By the early fathers, the bread and wine in the Eucharist are styled the antitypes of the body and blood of our Lord.

ANTLER, *ănt'-ler*, in Zool., the term applied to the horn of the *Cervidæ*. Until the deer is a year old, nothing but a slight protuberance marks the places where the antlers sprout. In the second year the horn appears, and is called the *brow antler*; the next year it has a branch, and is known as the *bay antler*; the fourth year it has two branches, and is a *tray antler*; the fifth, another branch and a new name, *crockets*; and again, at the sixth year, when the antler is perfect, and is called a *beam antler*. The deer's antlers are shed in the spring; and, considering their size and weight, are renewed in an astonishingly short time. A full-grown stag's horn probably weighs twenty-four pounds; yet this large mass of true bone is reproduced in about ten weeks. The development of the deer's antlers is intimately connected with the sexual system. (*See* DEER.)

ANT-LION, *ănt'-li-on* (Gr. *murmex*, ant, and *leon*, lion) (*Myrmeleon formicaleo*), an insect of the ord. *Neuroptera*, celebrated for its wonderful ingenuity in constructing a pitfall for the destruction of its prey. As soon as the young larvæ are hatched, they at once set about providing for their future sustenance. This is effected by turning round and round in the sand till a small cavity is made, which, as the animal increases in size and strength, grows broader and deeper, till it measures about thirty inches in breadth and twenty in depth. At the bottom of this



I



II



III

ANT-LION.

pit the ant-lion patiently remains, till some unsuspecting insect, arriving at the edge of the trap, thinks there can be no harm in exploring it. The sides of the pit, however, are so arranged as to afford foothold not even to the tiniest insect, and down rolls the little victim into the trapper's clutches; or, should it manifest any intention of escaping, a shower of sand, thrown up by the ant-lion, at once arrests its progress, and brings him tumbling to the bottom again. It is entirely on the juices of insects that this voracious creature lives. The empty carcases are not allowed to encumber his abode. As soon as he has exhausted their fluids, he balances them in his strong jaws, and tosses them out. The larva remains in this condition during two years; at the end of which time, having attained its full growth, it spins a cocoon, and takes the chrysalis form. Three weeks afterwards, it emerges a perfect insect. The ant-lion is, when full-grown, about half an inch in length, and somewhat resembles the dragon-fly, except that it is much smaller. It has a very large abdomen and a very small head, which, however, is furnished with a pair of formidable incurved mandibles. It has six legs, but is incapable of rapid locomotion, and generally moves backwards. The perfect insect deposits its eggs in dry sandy situations, when the young larvæ, immediately after being hatched, begin, as we have seen, to exercise an astonishing instinct in luring insects to their doom. The *Myrmeleon formicaleo* is not found in England, but occurs in many parts of the continent, as France, Germany, Spain, &c. In the accompanying illustration are shown—I. The perfect insect; II. The larva of the insect; III. The pit of the larva, and an ant being attacked.

ANTONOMASIA, *ăn-to-no-mai'-si-a* (Gr. *anti*, and *onoma*, a name), is a term used in Rhet. to denote the substitution of an appellative for a proper name; as when Moses is called the Lawgiver, Aristotle the Stagyrite, or Shakspere the Bard of Avon.

ANTOSIANDRIANS, *ăn-to-si-ăn'-dri-ans*, in Eccl. Hist., were a sect of rigid Lutherans, and were so called from their being opposed to the doctrines taught by Osiander regarding justification. They held that man is not really made just, but only pronounced to be so; that he is not made essentially, but only putatively just.

AORIST, *ai'-o-rist* (Gr. *a*, not, and *oros*, a limit), in Gr. Gram., is the name of an indefinite kind of tense of the verb, which usually expresses past time, but sometimes the present or future.

AORTA. (*See* ANATOMY.)

APARTMENTS, *ă-part'-ments*.—(For the law of letting them, *see* LANDLORD AND TENANT.)

APATHY, *ăp'-ă-thi* (Gr. *a*, without, and *pathos*, feeling), denotes a privation of feeling, a want of passion or emotion. The ancient Stoics affected an entire apathy, considering it as the highest wisdom to enjoy perfect calmness or tranquillity of mind, incapable of being ruffled, and above the reach of any sense either of pleasure or pain; whilst Epicurus taught his followers to seek happiness in a kind of indolent ease, or freedom from labour and pain. In the first ages of the Church, the term apathy was employed by the Christians to express a contempt for all earthly concerns,—a state of mortification such as the Gospel prescribes. Clemens Alexandrinus, in particular, brought it greatly into use, expecting thus to draw to Christianity the philosophers who aspired after such a sublime pitch of virtue.

APATITE, *ăp'-a-tite* (Gr. *apatao*, I deceive).—Apatite has received its name from the fact that it is continually mistaken for beryl, fluor spar, and several other minerals, according to its colour and lustre, which vary considerably. It crystallizes in hexagonal prisms, modified sometimes on the edges, at others on the angles. It is a scarce mineral in England. Fine specimens are found in Moravia, Bohemia, and Saxony. It is a triphosphate of lime, combined with a variable quantity of fluoride or chloride of calcium.

APAUME, or APPAUME, *a-pome'* (Fr. *a*, and *paume*, palm of the hand), in Her., means a hand, showing the palm extended, with the thumb and fingers at full length.

APE, *aip* (*Pithecus* of Linnæus), a gen. of quadrumanous (four-handed) mammalia, a class of animals which, commonly speaking, are divided into four sections:—*Apes*, or such as are destitute of a tail; *baboons*, or such as have muscular bodies, elongated muzzles, and whose tails are usually short; *monkeys*, whose tails are in general long; and *sapajous*, or monkeys with prehensile tails, which can at pleasure be twisted round any object. (*See* MONKEY.) According, how-

ever, to the scientific zoological definition, the gen. Ape, or *Pithecus*, comprehends only those four-handed mammals whose teeth are similar, both in number and form, to man's, and which have neither tails nor cheek-pouches. The worship of apes and monkeys has



APE.

been common among pagan nations from a period of remote antiquity, and still prevails in Japan and India, and certain parts of Africa. An ape's tooth, kept in a temple at Ceylon, was regarded with peculiar reverence, and immense wealth was accumulated through the continual offerings of the worshippers; but the temple was plundered and the tooth carried away by the Portuguese, in 1554. (For a notice of the most remarkable apes, *see* GORILLA, OURANG-OUTANG, CHIMPANZEE, &c.; for an account of species, &c., *see* SIMIADÆ, QUADRUMANA.)

**APEAK**, *a-peek'*, in Mar., a term implying that the ship's cable is drawn so tight as to bring the vessel immediately over her anchor, which is then said to be "apeak."

**APERISPERMIC**, *a-pe-ri-sper'-mik*, in Bot., a term synonymous with exalbuminous, which see.

**APETALOUS**, *a-pet'-a-lus* (Gr. *a*, without, and *petalon*, leaf), in Bot., a term applied to a flower having but one whorl of floral envelopes; in other words, having a calyx, but no corolla. Jussieu named one of his proposed divisions of the vegetable kingdom *apetalæ*, and included in it all dicotyledonous plants bearing apetalous flowers.

**APEX**, *ai'-pex* (Lat.), the vertex or summit of anything. Among the Romans it was also the name of a kind of conical cap, worn by the priests, or, more properly, of a small stick, with a tuft of white wool attached, which was fastened to the top of it. The crest of a helmet was also called *apex*. In Gram. it is applied to a mark placed over a syllable to denote that it is to be pronounced long; especially used when a word has a different meaning, according as it is pronounced long or short; as, in Latin, *mâlus* signifies ill; *malus*, an apple-tree.

**APHÆRESIS**, *a-fee'-e-sis* (Gr. *aphaireo*, I take away), is a term used in Gram. to denote the taking away of a letter or syllable at the beginning of a word; as, *it's*, for *it is*; *'gainst*, for *against*. A like retrenchment at the end of a word is called apocope.

**APHANITE**, *a-faint'* (Gr. *a*, priv., and *phainein*, to appear), a tough compact rock, containing hornblende, quartz, and felspar, mixed so intimately as to be imperceptible;—whence the name.

**APHELION**, *a-fe'-li-on* (Gr. *apo*, from, and *helios*, the sun), in Astron., that point in a planet's orbit at which it is at its greatest distance from the sun. The rapidity of a planet's motion is least at its aphelion, and begins to increase after leaving that position, until it attains its maximum speed at the perihelion. (*See* PERIHELION, PLANET.)

**APHIDES**, *ăf'-i-dēz* (Gr. *aphis*, a vine-fretter).—These creatures, commonly known as plant-lice, live by sucking the juices of plants, upon which they may be seen congregated in immense numbers. When attacked, the plant grows sickly, the leaves curl up, and the fruit of the plant, if not utterly destroyed, is certain to be seriously impaired. The cultivation of hops is notoriously an uncertain business, and this uncertainty may in great measure be attributed to the prevalence of the hop-fly (*Aphis Rumuli*). So great are their devestations in some seasons, that the amount of duty paid upon hops has varied from £15,000 to £480,000; indicating, of course, a proportional variation in the crop. There is an aphis that particularly affects turnips and cabbages, and one (*Aphis vastator*) that has earned for itself a world-wide fame,—though it is doubtful if it ever deserved it,—as a blighter of potatoes. Most of the aphidæ are green; but that which attacks the bean (*Aphis Fabæ*) is black. They have a proboscis, by which they pierce and suck plants, and, at the extremity of the abdomen, two horn-like spines, from which exudes a saccharine fluid called *honey-dew*. The legs of aphides are long, and they move very slowly. Some are winged, and some are wingless, without distinction of sex. "Their manner of propagation is very curious. . . In the autumn, male and female insects are found furnished with perfect generative organs, and the females lay eggs, which are hatched in the following spring. But, instead of producing insects of both sexes, these eggs give birth only to females, which, in their turn, produce living young without any congress with the male. The brood thus brought forth again produces young in the same manner; and this goes on throughout the whole summer, without the appearance of a single male insect."—*Ref.* Dallas's *Animal Kingdom*.

**APHONIA**, *a-fo'-ni-a* (Gr. *a*, without, and *phone*, voice), in Med., is a deprivation or loss of voice. It is generally occasioned by an affection of the muscles or nerves employed in speech; and its cure is to be effected by removing the disorder from which it proceeds.

**APHORISM**, *ăf'-o-rism* (Gr. *aphorizo*, I separate), is a maxim, or a short sentence, containing a moral precept or rule of practice, forcibly expressed in few words; as, 'It is always safe to learn from our enemies; seldom safe to instruct even our friends.' It is also applied in Med. and Law to certain truths laid down, but not treated argumentatively; as the aphorisms of Hippocrates, Sanctorius, or Boerhaave; aphorisms of the civil law, &c. It is likewise applied to a figure in rhetoric, whereby something that has been said is limited or corrected.

**APHRITE**, *ăf'-rite* (Gr. *aphros*, foam), carbonate of lime occurring in scaly masses, having a peachy lustre and greasy feel; also called foam-spar. This mineral must not be confounded with *meerschaum* (sea-scum), which is an amorphous carbonate of magnesia.

**APHRODITA.** (*See* SEA-MOUSE.)

**APIACEÆ**, *ai-pi-ai'-se-e*, in Bot., a name sometimes given to the nat. ord. *Umbelliferæ*, which *see*.

**APIARY.** (*See* BEES.)

**APIOCRINITE**, *ai-pi-ok'-ri-nite* (Gr. *apion*, a pear), in Geol., this term is applied to a kind of encrinite peculiar to the chalk and oolitic formations, and distinguished by a pear-shaped receptacle. (*See* ENCRINITE.)

**APIS**, *ai'-pis.*—The Bee. (*See* BEES.)

**APIUM**, *ai'-pi-um*, in Bot., a gen. of plants belonging to the nat. ord. *Umbelliferæ*. The common celery, *A. graveolens*, is the only important species. This plant grows wild in almost every part of Europe; but it is quite unfit for food until cultivated with absence of light, when the stem and petioles become succulent, white, and wholesome.

**APOCALYPSE**, *a-pok'-a-lips* (Gr. *apokalupto*, I reveal or discover), the name of the last in order of the sacred books of the New Testament, the Revelation of St. John. It was written, according to Irenæus, about the year of our Lord 96, in the island of Patmos, whither John had been banished by the emperor Domitian; but, according to Sir Isaac Newton, it was written earlier, during the reign of Nero. The author-

ship of this book is commonly ascribed to John the son of Zebedee, and brother of James; but some, certainly not without reason, ascribe it to another John, commonly called the Presbyter. It has sometimes been attributed to the arch-heretic Cerinthus; and hence it has not always been held as canonical. There were certain churches in Greece, as St. Jerome informs us, that did not receive it; and it does not occur in the catalogue of canonical books prepared by the council of Laodicea, nor in that of St. Cyril of Jerusalem; but Justin, Irenæus, Origen, Cyprian, Clemens of Alexandria, Augustine, Jerome, Tertullian, and all the fathers of the 4th, 5th, and following centuries, quote the Revelation as a book then acknowledged to be canonical. The controversy regarding it was revived at the time of the Reformation, and Luther expresses himself very vehemently against it. The reformers of Geneva, however, Calvin and Beza, received it as canonical; and these have been followed by Protestants generally. This book embraces two distinct ranges of subjects:—1. The things which then were, or the state of Christianity as then existing in the seven Asiatic churches; and, 2. "the things which should be hereafter," or the constitution and fate of the Church through its several periods of propagation, corruption, reformation, and triumph, from its commencement to its final consummation in glory. The general design of the prophetic part of it is to show the final triumph of Christianity over all enemies and opposers, its universal prevalence in the world for a long series of years, and its termination in an endless period of glory and happiness. "Christianity is, in a manner, personified, and it appears on the scene of action engaged in a contest with the powers of darkness so violent that the struggle must evidently end in the extermination or utter subjugation of one of the parties. Successively, one and another bitter and bloody enemy of the Church is overcome; then follows a long period of peace and prosperity, during which the influence of Christianity is so widely diffused, that no apparent hostility disturbs it. After this, the powers of darkness renew their assault with exasperated malice and rage; but the interposing hand of Heaven smites them down, and puts a final end to the contest. The peaceful and universal reign of the Christian religion then succeeds, and continues down to the final consummation of the Messianic kingdom on earth, when the resurrection and judgment day introduce a new and perfect order of things, which is to continue through ages that have no end."—*Ref.* Moses Stuart's *Commentary on the Apocalypse*. There have been several spurious apocalypses; as those of Moses, Peter, Paul, Stephen, Thomas, &c.; but most of these are now lost.

Apocarpous Fruits, *ăp'-o-kar'-pus* (Gr. *apo*, separate, *karpos*, fruit), in Bot., are those fruits which are each formed of a single carpel, but of which several are produced by a single flower. The simple solitary fruits are generally included under the same head; but the most philosophical botanists have kept them distinct. Three kinds of apocarpous fruits are distinguished, and these are respectively termed the *Follicle*, the *Achænium*, and the *Etærio*. (*See* these words.)

Apocope. (*See* Aphæresis.)

Apocrenic Acid, *ăp'-o-kre-nik*, an acid found in vegetable mould, which retains ammonia with great tenacity, thus affording nourishment to the plants in its vicinity. Crenic, geic, ulmic, and humic acids, are found in similar situations, and possess similar properties.

Apocrypha, *a-pok'-re-fa* (Gr. *apokrupha*, hidden, secret), a term used in Theol. in various senses, to denote certain books claiming a sacred character. Among early Christian writers it was frequently applied to anonymous or pseudonymous works. It was also applied to dangerous works, composed by ancient heretics to favour their views, or by Catholics under fictitious signatures. At present, the name is commonly applied to certain books which are not canonical, but which have sometimes been regarded as such, and are generally held as useful for instruction and edification. These books were not received by the Jews as any portion of the Old Testament, and they are not cited or alluded to in any part of the New. Neither were they regarded as canonical by the early fathers, though they were generally considered worthy of reverence and esteem, till the council of Trent, in 1545, adjudged that they were to be held as canonical by the Catholic church. At the Reformation, Protestants generally rejected them; but they soon began again to be read in public worship. The Church of England enumerates the apocryphal books in her XXXIX. Articles, as books which "the Church doth read for example of life and instruction of manners, but yet doth it not apply them to establish any doctrine." By the other Protestant churches in England and America, they are rejected from public worship. The apocryphal books are, I. and II. Esdras, Tobit, Judith, Esther, Wisdom of Solomon, Ecclesiasticus, Baruth, Song of the Three Children, History of Susannah, Bel and the Dragon, Prayer of Manasses, I. and II. Maccabees. In old editions of the Bible, the Apocrypha is sometimes to be seen bound up between the Old and New Testaments; but not in the recent authorized editions. Besides these, there are a number of other so-called apocryphal books, which, however, have never been regarded as canonical. Among these, are the third and fourth books of Esdras, the book of Enoch, the Testament of the Twelve Patriarchs, the Assumption of Moses, the third, fourth, and fifth books of Maccabees, &c. Of the New Testament, there exist a number of spurious gospels, acts of apostles, and epistles. These works have been collected and published by Fabricius, in his *Codex Pseudepigraphus Veteris Testamenti*, and his *Codex Apocryphus Novi Testamenti*.

Apocryphal Controversy.—What was known as the Apocryphal Controversy arose about thirty years ago, in connection with the British and Foreign Bible Society, and was occasioned by the discovery that part of the funds of the society were expended in the circulation of the Apocrypha on the continent of Europe. On the one hand, this was defended on the ground of expediency; on the other, it was opposed as contrary to the constitution of the society, and to the principles of Christianity. At length, in 1826, the committee of the society resolved, "That the funds of the society be applied to the printing and circulation of the canonical books of Scripture, to the exclusion of those books and parts of books which are termed apocryphal." The controversy, however, was still carried on for some years with much vehemence and acrimony, until the apocryphalists were completely defeated.

Apocynaceæ, *ă-pok-i-nai'-se-e* (Gr. *apo*, against, *kuon*, dog), in Bot., the Dogbane order of dicotyledonous plants, included in the sub-class *Corollifloræ*,—trees or shrubs generally having milky juices. The leaves are entire, and destitute of stipules. The calyx is 5-parted and persistent; the corolla 5-lobed. There are five stamens alternate with the lobes of the corolla; the filaments being distinct, the anthers united to the stigma, and the pollen granular. The ovary is composed of two carpels, which are generally merely in contact; when united, they form a 2-celled ovary; styles 2 or 1; stigma contracted in the middle, and expanded at the base and apex, so as to resemble in shape an hourglass, or a dumb-bell; ovules numerous. Fruit sometimes one or two follicles, sometimes a capsule, drupe, or berry. Seed very rarely exalbuminous. The Dogbanes are natives principally of tropical regions, a few only occurring in northern latitudes. *Vinca*, the periwinkle, is the only British genus. There are 108 genera and 570 species. Some of the plants of this order are intensely poisonous, and all are to be suspected, though a few yield edible fruit. Some are drastic purgatives, and in some the bark is tonic and febrifugal. They have usually large showy flowers, and are on that account cultivated in our hothouses. Caoutchouc, or India-rubber, is prepared from the milky juice of several species.

Apocynum, *ă-po-ky'-num*, in Bot., the typical gen. of the nat. ord. of plants *Apocynaceæ*. *A. cannabinum* is the Canadian hemp, an herbaceous plant from four to five feet in height, with an unbranched stem bearing oblong leaves, and cymes of whitish flowers. It yields a very strong fibre, which the Indians of North America employ for making twine and coarse cloth. The roots of this species and *A. androsæmifolium* are emetic, and slightly purgative.

Apodictic, *ăp-o-dik'-tik* (Gr. *apodeiktikos*, demonstrative), is a term applied in Log. to those judgments or

conclusions which are necessarily true, from the opposite being impossible. An apodictical argument, therefore, is one which excludes the possibility of the opposite.

APOGEE, *ăp'-o-je* (*Gr. apo*, from, and *ge*, the earth), means the greatest distance of any heavenly body from the earth; but it is applied more particularly to the sun and moon. The former is in its apogee in its apparent course when the earth is in its aphelion; the moon is in its apogee when it reaches that point in its orbit which is most distant from the earth.

APOLLINARIANS, *a-pol'-li-nai'-ri-ans*, an ancient sect of heretics which arose in the latter half of the 4th century, and were named after Apollinaris, bishop of Laodicea. They denied that our Saviour had a reasonable soul, and asserted that its place was supplied by the Logos, or divine nature. This doctrine was condemned as heretical by various councils, including that of Constantinople, in 381. The Apollinarians were also forbidden by imperial edicts, in 388 and 397, from holding religious assemblies, and in 428 from having pastors, or residing in cities; and they at length entirely disappear.

APOLLO BELVIDERE, *a-pol'-lo bel'-vi-deer*, the name commonly borne by a beautiful statue of the heathen divinity Apollo or Phœbus (*see* APOLLO, vol. I. of this work), which, about the close of the 15th century, was found in the ruins of the ancient Antium. Pope Julius II. brought it, and had it placed in the Belvidere of the Vatican at Rome; whence the name. It is generally admitted to be the most magnificent work of art in existence, a copy of it being used in every European school of art as a drawing-model for students. In this *chef-d'œuvre* of Grecian art, the divinity is seen in a standing position, almost nude; over his right shoulder is suspended a quiver, upon his extended left arm he carries his pallium, and in his hand is seen the remnant of a bow, from which an arrow is supposed to have been discharged at the serpent Python. The whole statue is characterized by a combination of grace, beauty, and symmetry of proportion.

"Or view the lord of the unerring bow,
The god of life, and poesy, and light,—
The sun in human limbs array'd, and brow
All radiant from his triumph in the fight;
The shaft has just been shot—the arrow bright
With an immortal's vengeance:—in his eye
And nostril, beautiful disdain, and might,
And majesty, flash their full lightnings by,
Developing, in that one glance, the deity."

By some critics it is held that Pliny makes allusion to this beautiful figure; but the more generally received opinion is, that the sculptor is entirely unknown. For a time the statue was kept in Paris, whither it had been conveyed by the emperor Napoleon I.; but at his downfall, this marvel of antique art was restored to its former home in the Vatican.

APOLOGETIC, *a-pol-o-jet'-ik* (Gr. *apologeomai*, I speak in defence of), is a term applied to designate something said or written by way of excuse or apology for any action or person; as an apologetic essay.

APOLOGETICS, *a-pol-o-jet'-iks*, in Theol., is a term applied to that branch of divinity which has for its object a systematic arrangement of those external and internal evidences of Christianity by which Christians are enabled scientifically to justify the peculiarities of their faith. Apologetics defend the fundamental principles of Christianity against unbelievers; polemics defend one particular belief, or class of beliefs, against others. Apologies for certain doctrines of Christianity, or defending it from charges brought against it by its opponents, have appeared from very early times; as the apologies of Tertullian, Justin Martyr, Origen, and others; but it was not till the 18th century that apologetics came to be regarded as a distinct branch of theological science. The name was first brought into use by J. G. Planck, in his *Einleitung in die theologischen Wissenschaften*, 1794. The first work, however, which can be said to have treated the subject of apologetics in a scientific manner is that of P. E. Müller, published at Copenhagen in 1810, and entitled *Kristelig Apologetik eller Videnskabelig Udvikling af Grundene for Kristendommens Guddommelighed* (Christian Apologetic; or, a Philosophical Exposition of the Arguments for the Divine Origin of Christianity). Since that time, various works have appeared on this subject, particularly in Germany. The fundamental principle of apologetics is the necessity of a supernatural revelation. It treats of the logical, moral, and metaphysical possibility of a revelation; of the necessity of a revelation; and demonstrates, from internal and historical evidence, the truth of revelation.

APOLOGUE, *ăp'-o-log* (Gr. *apologos*, a fable), is a fable, parable, or short fictitious story, designed to convey some moral truth. The fables of Æsop are of this class.

APOLOGY, *ă-pol'-o-je* (Gr. *apologia*, a defence, apology), originally denoted a defence made in a court of justice in favour of one accused. As these were frequently carefully written out, and afterwards made public, it came to be applied to works written in defence of any particular person or doctrines. Of this nature are the apologies of Socrates, attributed to Plato and Xenophon. The word was adopted by the Christian fathers, and applied by them to works in defence of certain doctrines of Christianity. (*See* APOLOGETICS.) In ordinary language the word is used at present in the sense of asking pardon or excuse for some offence.

APOPHTHEGM, *ăp'-o-them* (Gr. *apophthegma*, an utterance), a short pithy saying or maxim, conveying a great moral truth in few words. The wise men of antiquity, and the oracles of the gods, frequently expressed themselves in this way. Among the best-known collections of apophthegms are those made in ancient times by Plutarch, and those in modern times by Bacon.

APOPHYLLIC ACID, *a-paf'-il-lik*, an acid obtained from narcotine, the crystals of which resemble those of apophyllite; whence its name.

APOPHYLLITE, *a-paf'-il-lite* (Gr. *apophullizo*, to strip of leaves), called also the "fish-eye stone," a mineral occurring in white, pearly, square prisms or pyramids. It is a silicate of lime and soda, and is found in the magnetic iron deposits of Sweden and Norway.

APOPLEXY, *ăp-o-plek'-se* (Gr. *apoplexia*, a sudden blow, a privation of sense and motion), in Path., is the name of a disease characterized by a sudden abolition or great diminution of the powers of sensation and voluntary motion, while the organic functions of the body,—circulation, respiration, secretion, &c.,—are still carried on, but usually in a more or less impaired state. The attack is sometimes instantaneous; at other times it comes on by degrees. The face is generally flushed, the breathing slow, deep, and stertorous, the pulse fuller, stronger, and slower than natural, and the skin covered with a cold clammy perspiration; sometimes, however, the pulse, instead of being full and strong, is weak and intermitting, and the face pale and dejected. Apoplexy springs from a diseased condition of the brain, and is occasioned by whatever unduly impedes or accelerates the circulation of the blood within the brain, or exerts a certain degree of pressure upon it. Hence, violent exertion, either of mind or body, great mental anxiety, intemperance in eating or drinking, are among the exciting causes of it. Males are much more liable to it than females, and it is most common between the ages of 50 and 70. A man of a sanguine plethoric temperament, with large head and full neck, is most liable to its attack, though lean persons are also frequently among its victims. Though the attack is usually so sudden, it is not without its premonitory symptoms, which, though numerous and diversified, are yet obvious and easily understood. Among these, are excessive drowsiness, giddiness and headache, with frequently dullness of hearing, imperfect or disordered vision, noise in the ears, loss of memory, &c. Sometimes the attack is preceded by paralysis affecting the speech, hands, feet, or other part of the body, and frequently it is succeeded by paralysis. When judicious remedies are adopted in time, an attack may generally be averted or rendered comparatively mild. Much necessarily depends upon the patient himself; upon his avoiding those states and modes of life that predispose to it, taking regular and moderate exercise, and attending to the state of his bowels. The active treatment to be adopted during or preceding the attack differs according to the causes that may have induced it. In some cases the abstraction of blood may be indispensable;

in others stimulating remedies are what may be required. In all cases, however, the patient's head should be raised, the head and neck bared, and the freest circulation of fresh air promoted; and, as soon as possible, purgative medicines should be administered. The attack may last from a few hours to two or three days; and even when it does not destroy life, it usually gives a shock to the constitution, which is seldom entirely recovered from.

APORIA, *a-por'-i-a* (Gr. *aporeo*, I doubt), is the name of a figure in Rhet., by which the speaker seems to be in doubt whether to say anything or not, or where to begin in a multitude of arguments; as, 'Of what shall I first complain?' 'Where shall I seek for help?' This figure is sometimes used with great effect.

APOSIOPESIS, *a-po'-si-op'-e-sis* (Gr. *aposiopao*, I am silent), is a figure in Rhet., in which the speaker breaks off abruptly in the middle of a sentence, leaving his hearers to supply what he was going to say; as, 'His conduct was—but we must not lose time in words.' It usually denotes great anger or grief.

APOSTACY, *a-pos'-ta-se* (Gr. *apostasis*, a forsaking, desertion), is a going away or defection from one's original profession or party. In Theol., it is a forsaking or renouncing of one's religion, either openly or virtually. The primitive Christian church distinguished several kinds of apostacy:—1. Those who went entirely from Christianity to Judaism; 2. those who complied with the Jews in many of their unlawful ceremonies, without making a formal profession of their religion; 3. those who mingled Judaism and Christianity together; and 4. those who relapsed into paganism.

APOSTACY, in Law, a total renunciation of Christianity, by embracing either a false religion, or entertaining no religion at all. The offence can only take place in such as have once professed the Christian religion. Heavy penalties, including loss of life, formerly attached to apostacy. Now, by 9 & 10 Will. III. c. 32, it is provided that if any person educated in, or having made profession of the Christian religion, shall, by writing, printing, teaching, or advised speaking, deny the Christian religion to be true, or the Holy Scriptures to be of divine authority, he shall, upon the first offence, be rendered incapable to hold any office or place of trust, and, for the second, be rendered incapable of bringing any action, being guardian, executor, legatee, or purchaser of lands, and shall suffer three years' imprisonment without bail. To give room, however, for repentance,—if, within four months after the first conviction, the delinquent will in open court publicly renounce his error, he is discharged *for that once* from all disabilities.

APOSTASIACEÆ, *a-pos'-ta-si-ai'-se-e*, a nat. ord. of plants, named after the gen. *Apostasia*, and belonging to the class *Monocotyledones* and sub-class *Petaloideæ*. Herbs with regular hermaphrodite flowers, growing in the damp woods of tropical India. There are three genera and five species. Their properties are altogether unknown.

APOSTATE, *a-pos'-tait* (Gr. *apostasis*, a desertion), one who openly abandons the true religion. In Eccl. Hist. it is applied, by way of special imputation, to the emperor Julian, who, though at first professing Christianity, when he came to the throne openly renounced it, and did all in his power to re-establish paganism.

A POSTERIORI. (*See* A PRIORI.)

APOSTLE, *a-pos'-el* (Gr. *apostolos*, a messenger), properly signifies one sent or delegated by another upon some business. In Theol. it denotes, by way of eminence, one of the disciples specially commissioned by Christ to preach the Gospel. Out of the number of his disciples, our Lord selected twelve to be invested with the apostleship. Their names were Simon Peter, and Andrew, James the Greater, John, Philip, Bartholomew, Thomas, Matthew, James the Less, Jude, surnamed Lebbeus or Thaddeus, Simon the Canaanite, and Judas Iscariot. About eight months after their solemn election, and in the third year of our Lord's public ministry, they were sent out by two and two to declare to the people of Israel (not going to the Samaritans or Gentiles) that the kingdom of heaven was at hand, and to confirm their doctrine by miracles. They were to make no provision for their subsistence on their journey. After the resurrection of our Lord, the place of Judas was supplied by Matthias, and the apostles received a new commission of a more extensive nature,—"To go and teach all nations, baptizing them in the name of the Father, and of the Son, and of the Holy Ghost." Paul, and, according to some, Barnabas, were subsequently added to the list of apostles, without regard to the number twelve. After they had exercised their ministry for some years in Palestine, it is said they resolved to disperse themselves to different parts of the world, and determined by lot what parts each should take; but of their travels and subsequent labours we have little reliable information. It was essential to an apostle—1. That he should have personally seen Christ; 2. that he should have been immediately called and chosen by Christ himself; 3. that he should have been divinely inspired and fully instructed in the mysteries of the kingdom of heaven, so as to be secured against all mistakes in teaching divine truth; and 4. that he should have the power of working miracles in attestation of his commission, and of the truth of his doctrine. They were not restricted, like bishops and pastors, to any particular church; and they had no successors in office. The respective badges or attributes with which the several apostles are usually represented are, St. Peter with the keys; St. Paul with a sword; St. Andrew with a cross; St. James the Less with a fuller's pole; St. John with a cup and a winged serpent flying out of it; St. Bartholomew with a knife; St. Philip with a long staff, whose upper end is formed into a cross; St. Thomas with a lance; St. Matthew with a hatchet; St. Matthias with a battle-axe; St. James the Greater with a pilgrim's staff and a gourd-bottle; St. Simon with a saw; and St. Jude with a club. St. Paul is sometimes styled, by way of eminence, the Apostle of the Gentiles, as St. Peter was called the Apostle of the Circumcision. The appellation of apostle was sometimes given to the ordinary travelling ministers of the Church; as where the apostle Paul speaks of Andronicus and Junia as of note among the apostles. According to some, Barnabas was an apostle in this sense; though others hold that he was one in the highest sense. This was also a title given to those sent by the churches to carry their alms to the poor of other churches. Thus St. Paul, in writing to the Philippians, tells them that Epaphroditus, their apostle, had ministered to his wants. Apostle is also thought by many to have been originally used for bishop before that name was introduced. Among the Jews, it was the name of an officer sent into the different parts of the country to see that the laws were duly observed, and to collect the moneys for the temple. In like manner, it is frequently applied to one that has first planted Christianity in a place; as Xavier, the Apostle of the Indies. In the Greek Liturgy, apostle is the name of a book containing the epistles of St. Paul, printed in the order in which they are to be read in churches throughout the course of the year.

APOSTLES, ACTS OF. (*See* ACTS OF THE APOSTLES.)

APOSTLES' CREED (Lat. *credo*, I believe), is the name of a formula of summary of the Christian faith, drawn up, according to some, by the apostles at Jerusalem shortly after our Lord's ascension; and hence its name. There are many reasons for doubting this; but that it is very ancient is evident from the fact, that it is to be found as it now stands in the works of St. Ambrose and Rufinus, both of whom flourished in the 4th century.

APOSTOLIC, or APOSTOLICAL, *ip-os-tol'-ik*, is a term applied to something relating to, connected with, or descended from the apostles; as, the apostolic age, the apostolic doctrine, the apostolic character. The *Apostolic Canons* are certain rules or laws for the government of the Church, held by some to have been drawn up by the apostles themselves. There is no sufficient ground for believing that this was the case: they probably belong to the 4th or 5th century. The *Apostolic Constitutions* consist of eight books; of which the first six contain directions for the whole of Christian life, and were probably written about the end of the 3rd century. The seventh book is essentially an abridgment of the others, and belongs probably to the beginning of the 4th century. The eighth book, which relates only to the sacred offices, and is written for the priests, belongs probably to the

middle of the 4th century. There are, however, numerous later interpolations. *Apostolic Churches* was anciently a name given to those churches which were supposed to have been founded by the apostles. In after-times, other churches assumed this title, principally on account of their supposed conformity with the doctrines of the churches planted by the apostles. The term Apostolical was first applied to bishops in the 6th century. Afterwards, the title was assumed by the popes of Rome, as being the successors of the chief apostle, Peter. Hence the terms Apostolic Church, Apostolic See, Apostolic Chair, Apostolic Blessing, &c. *Apostolic Fathers* is an appellation usually given to the writers of the 1st century, who employed their pens in the cause of Christianity. They were Clement, Barnabas, Ignatius, Polycarp, and Hermas.

APOSTOLICAL SUCCESSION, *ăp-os-tol'-i-kal*, in Theol., is a term applied to the line of unbroken succession in which the ministry of the Church has been continued from the days of the apostles to the present time. "The clergy of the Church of England can trace their connection with the apostles by links, not one of which is wanting, from the times of St. Paul and St. Peter to our own."—Hook's *Church Dictionary*.

APOSTOLICS, or APOSTOLICI, *ăp-os-tol'-iks*, in Eccl. Hist., is the name of three different sects, who professed to imitate the manner and practice of the apostles. The first of these, called also *Apotactici*, or *Apotactitæ*, sprang from the Encratites and Cathari, and flourished in the 2nd and 3rd centuries. They professed to have all things in common, to abstain from marriage, and the use of wine, flesh, &c.; but little more is known respecting them. The second sect belongs to the 12th century. They are said to have been free from error in doctrine, and to have been irreproachable and exemplary in their lives and manners. They were peculiar in holding it unlawful to take an oath, in permitting their hair and beards to grow to an enormous length, in preferring celibacy to wedlock (calling themselves the chaste brothers and sisters), and in each man having a spiritual sister, with whom he lived in a domestic relation. The founder of the third sect was Gerhard Segarelli, of Parma, who, in 1260, assumed an apostolic garb, and went forth as a preacher of repentance; and gradually a number of others joined him. There being nothing startling in their doctrines, they were, for upwards of twenty years, allowed to pursue their course unmolested, and they extended their labours beyond the limits of Italy. At length the rapid spread of their doctrines excited the attention of the Church, and Honorius IV., in 1286, issued a bull against them, which was followed four years later by another, by Nicholas IV. Opposition, however, only led them to inveigh more boldly against the errors and corruptions of the Church of Rome, which they described as the Babylon of the Apocalypse. They were now persecuted as heretics, and many of them perished at the stake; and among others, Segarelli, in 1300. He was succeeded by Dolcino, a man much his superior in education and mental qualities. After travelling for some time in Italy, spreading the tenets of his sect, but everywhere dogged by the Inquisition, he retired for safety to Dalmatia. After a time he again made his appearance in Italy; but being still an object of persecution, he established himself, with about 2,000 of his adherents, male and female, on the mountain Zebello, in the diocese of Vercelli. In 1305 a crusade was proclaimed against them, and for two years Dolcino, with consummate skill and bravery, defended himself against his enemies, till famine effected what force could not accomplish, and the remnant of famished Apostolics were compelled to surrender. Dolcino, after undergoing the most cruel tortures, which he bore with the greatest fortitude, was put to death. In Lombardy and the south of France remnants of the sect existed till 1368. The Apostolics repudiated all rights of property and all inequalities of condition. They were not bound together by any formal vows, nor, by rules, to obedience to any superiors; but were united together by the spirit of brotherly love.—*Ref.* Krone's *Frà Dolcino und die Paterener*, Leip. 1844; Neander's *Church History*; Mosheim's *Ecclesiastical History*.

APOSTOOLIANS, *ăp-os-too'-li-ans*, in Eccl. Hist., were a sect of Mennonites which sprang up in the year 1664, and took its name from Samuel Apostool, an eminent minister among the Mennonites.—*Ref.* Mosheim's *Ecclesiastical History*.

APOSTROPHE, *a-pos'-tro-fe* (Gr. *apostrophe*, a turning away, or breaking off), is the name given to a figure in Rhet., when a speaker breaks off suddenly in the course of his speech, and addresses directly a person absent or dead, or an inanimate object, as if present and listening to him. It is also frequently used by the poets; and when well managed, it has a very striking effect; as, "O thou sword of the Lord! how long will it be ere thou be quiet? put thyself up into the scabbard, rest and be still." It denotes strong passion, or emotion.—In Gram., it is used to denote the omission of a letter or letters in a word; as *boro'* for *borough*. The comma employed to mark such omission, or which is used in genitives, is termed an apostrophe.

APOTHECARIES' COMPANY, *a-poth'-e-ka-ree*. — The company of Apothecaries, which is one of the most important guilds of the city of London, was established in the early part of the 17th century. The Apothecaries were first incorporated with the company of Grocers in the year 1606. Eleven years after, they were separated from the Grocers, and incorporated by a charter granted by King James I., as "The Master, Wardens, and Society of the Art and Mystery of Apothecaries of the City of London." This charter was granted by the king at the advice of his physicians Gideon de Laune, Mayerne, and Akins; and it was enacted that no grocers or others should retail any medicine without the company's consent, within the city, or seven miles thereof; at the same time, the company obtained full permission to seize all unlicensed drugs. By the statutes of William III. and Anne, "Apothecaries of the city of London are exempted from the offices of constables, scavengers, overseers of the poor, and other parish, ward, and leet offices, and of and from serving upon juries or inquests." Towards the close of the 17th century, the apothecaries of London began to prescribe as well as to dispense medicines, and, by way of retaliation, the College of Physicians established a dispensary for the sale of medicines at prime cost. The privileges of the Apothecaries' Company were subsequently greatly enlarged, and the right of members to prescribe in a certain restricted sense was confirmed by an act of parliament, 55 Geo. III. c. 194. (*See* CHEMIST AND DRUGGIST.) Apothecaries' Hall is situated in Union Street, Blackfriars, and is a large plain brick building. Great quantities of pure medicine are prepared at the Hall, and retailed in a shop adjoining, at low prices. The relations between the Apothecaries' Company and the general body of chemists and druggists are explained in another part of this Dictionary.

APOTHECARIES' WEIGHTS AND MEASURES. — The system of weights used by physicians and apothecaries (chemists and druggists) in prescribing and compounding medicines differs materially from that used in general commerce. The term *apothecaries' weight* is usually applied to the one system, and *avoirdupois weight* to the other. In the London, the Edinburgh, and the United States pharmacopœias, every preparation is expressed in apothecaries' weight, or, to adopt a pharmaceutical phrase, this system of weights is *officinal*. In the Dublin pharmacopœia, avoirdupois weight is employed. There is also a third system, called *troy weight*, which is used by jewellers, and at the mints, in the exchange of the precious metals. These three systems can be adapted to each other through the *grain*, or common unit of weight; but the inconvenience attendant on the use of separate sets of weights has long been complained of, and it is to be hoped that one comprehensive system will soon be introduced. It seems very absurd to compel a chemist and druggist to use one set of weights in buying and selling medicines, and another in making up prescriptions. In each system there is a pound and an ounce; but the apothecaries' pound contains 1,240 grains *less* than the avoirdupois pound, and the apothecaries' ounce contains 42½ grains *more* than the avoirdupois ounce. Thus, the officinal system has the larger ounce, and the commercial the larger pound. Troy weight agrees with apothecaries' weight in the ounce and pound. The following table displays, in a simple and comprehensive manner, the value of each

denomination in apothecaries' weight, and the relation of these to each other:—

20 grains = 1 scruple = 20 grains.
60 grains = 1 drachm = 3 scruples.
480 grains = 1 ounce = 8 drachms.
5,760 grains = 1 pound = 12 ounces.

Measures of capacity are used for liquids in mixing medicines. The table employed is either wine measure or imperial measure. The *minims*, as the units of these systems are called, differ slightly; that of wine measure being equal to about ·95 of a grain of pure water at 60° F., and that of imperial measure being equal to ·91 of a grain of the same fluid. In the latter system, which has of late been used in England, the relation between the fluid ounce and the solid avoirdupois ounce is much closer than in the former. The minim is multiplied as follows:—

60 minims = 1 fluid drachm = 60 minims.
480 minims = 1 fluid ounce = 8 fluid drachms.
9,600 minims = 1 pint = 20 fluid ounces.
76,800 minims = 1 gallon = 8 pints.

In prescriptions, the weights and measures are generally expressed by signs or symbols, with Latin numerals affixed. These signs, with the Latin and English words which stand for them, are given below:—

♏ Minim, $\frac{1}{60}$th part of a fluid drachm.
gtt Gutta, a drop.
℈j Scrupulus, a scruple.
ʒj Drachma, a drachm.
fʒj Fluid drachma, a measured drachm.
℥j Uncia, an ounce (480 grains).
f℥j Fluid uncia, a measured ounce.
℔j Libra, a pound (5,760 grains).
Oj Octarius, a pint.
gr Granum, a grain.
ss Semis, half, affixed to any of the above signs.

The numerals j, ij, iij, iv, v, &c., show the number of grains, ounces, pounds, &c., to be taken; thus, ♏lx denotes 60 minims, ʒvii, 7 drachms, and ℥j, 1 ounce.

Apothecary and Apothecaries' Act. (*See* Chemist and Druggist.)

Apothecia, *ăp-o-thē'-shi-a* (Gr. *apotheke*, a repository), in Bot., the term applied to the spore-fruits of lichens. These contain the *theca*, or spore-cases, and occur either as little nodules and raised lines, or as round, shield-shaped, and cup-shaped bodies scattered over the fronds.

Apotheosis, *ăp-o-thē'-o-sis* (Gr. *apotheosis*, a deification), in ancient Myth., is a term applied to the change which a mortal was supposed to undergo when he was raised to a god. Among the ancient Greeks and Romans, there prevailed a belief that certain of their heroes were, after death, raised into the order of the gods; as Hercules, Romulus, Julius Cæsar, &c. In later times the term was more especially used to signify the ceremony by which the Roman emperors were deified after their death. It was in this manner:—A waxen figure representing the dead man was made, and placed on a lofty ivory couch in the vestibule of the palace. For seven days it was regarded as sick, and attended by physicians. When considered dead, it was carried to the old forum, where hymns and songs were sung in praise of the deceased. It was afterwards taken to the Campus Martius, and deposited in a wooden erection four stories in height, and richly adorned with hangings, pictures, gold and ivory images, &c. Fire was applied to the edifice, and while it was burning an eagle was let loose from the top, and was supposed to carry the soul of the emperor up to heaven, after which time he was worshipped with the other gods.

Apparent, *ăp-păr'-ent* (Lat. *apparere*, to appear), an expression used in Astron. to denote things as they seem to be to an observer, in contradistinction to their actual or real state. The term is applied principally to diameter, distance, figure, and motion. The apparent diameter of a body is the angle formed by two lines drawn from opposite points in the circumference of its disk to the eye; and the apparent magnitude of a body is similar, being the angle formed by two lines drawn to the eye from its opposite extremities. The apparent diameter and magnitude of bodies vary according to their distance from the eye. Apparent distance is the distance at which we judge or imagine heavenly bodies to be from us. The apparent distance of the heavenly bodies appears to us to be the same, or nearly so, in all cases, though really so widely different. Apparent figure is the shape which an object presents when viewed under different circumstances. Apparent conjunction is when one heavenly body comes directly in the line between another heavenly body and the eye of an observer. The apparent horizon is the circle which appears to bound the view on all sides, seen most perfectly at sea. Apparent noon at any place is the time when the sun is on the meridian of the place, in contradistinction to true or mean noon, when the sun would be on the meridian if it moved in its apparent orbit with uniform velocity. Apparent motion is that which bodies appear to have to an observer who is himself also moving. The motions of the sun in the heavens are apparent motions.

Apparent Time. (*See* Time.)

Apparent, Heir. (*See* Heir Apparent.)

Apparition, *ăp-pa-rish'-on* (Lat. *apparere*, to appear).—Phantoms or spectral appearances, assuming various forms, in many cases those of departed relatives and friends, which have become visible to the beholder under different circumstances, leading them to believe that they have actually seen the disembodied spirits of those who have been removed from earth. To assert that such visitations are impossible, would be to deny the omnipotence of God; but, in the great majority of recorded cases, it is difficult to assign a sufficient reason for the appearance of the phantom; and a well-regulated mind recoils from the idea that such things would be permitted by the Almighty, unless He wills to work through such agency for some good and beneficent end. While the belief in the *possibility* of the appearance of apparitions is perfectly justifiable, and may be supported by passages from Holy Writ, for the apparition of Samuel was raised, unexpectedly perhaps, by the Witch of Endor, and recognized by Saul, yet the greater number of stories of spiritual or ghostly appearances that have been related, may be traced to a diseased and disordered state of body acting on the brain, through the nerves, exciting certain impressions and sensations in a manner so vivid, that those who have experienced these sensations, resulting entirely from an unhealthy state of the system, have believed, without doubt, that the impressions produced have positively been brought about from the actual vision of those objects which an excited imagination has pictured. Dr. Samuel Hibbert has advanced a theory that these spectral appearances are entirely the result of an abnormal condition of the organism of those who see them, and that they are visible only to those labouring under some temporary derangement of the system, or who have become weakened by illness, or by any means which have caused a reduction of the natural strength of the body, producing a corresponding injury of rational mental power. He substantiates his theory by the case of Nicolai, a bookseller of Berlin, a man of highly imaginative powers, who, after an illness, saw continually whole troops of spectres about him, and even fancied that he heard some of them speak to him. There are, however, many cases, dismissing all those caused by over-indulgence in eating and drinking, fear, and a morbid state of the brain, in which persons sane in body and mind, whose veracity cannot be questioned, have seen apparitions, and at such times when it seems but too probable that they should have the power to appear; yet it may be with justice asserted in support of the theory above mentioned, that even in these cases, the truth of which it is so difficult to question, the phantom has been seen by *one* person only, and may consequently be considered as an illusion of the brain; but how can Dr. Hibbert's theory stand good in the case of an apparition seen by two persons at once, and which was afterwards visible at the same time to four human beings and a dog. The story to which allusion is here made, is related in Gilbert's *History of Cornwall*, and copied from the MS. account written by Dr. Ruddell, then minister of Launceston, of the appearance of a woman to himself and others in

1865. One day visiting a family residing near Launceston, he found father, mother, and son, in a state of the deepest dejection; on inquiry, he discovered that the son asserted that he saw, in a certain field, every day, when crossing it on his way to school, the apparition of a woman. This the parents disbelieved, thinking the statement to be fabricated by the boy to escape attendance at school. He persevered, however, in declaring his story to be true, and the minister offered to visit the field in which the occurrence was said to take place, in company with the boy; he did so, and the spectre was visible to both; he then persuaded the parents to come to the spot with himself and their son, when the apparition was distinctly seen by these four witnesses, and recognized by the parents as the apparition of a woman who had formerly lived in the neighbourhood, while a dog which had accompanied them, ran away in abject terror. The clergyman, at another time, held some conversation with the spirit, after which it never again appeared; but it is to be regretted that he had a repugnance to record what had passed between them. —*Ref.* Ennemoser's *History of Magic*; Dr. Hibbert's *Sketches of the Philosophy of Apparitions*; *English Cyclopædia*—Arts and Sciences.

APPEAL, *ăp-peel'* (Fr. *appeler*), in Law, is the removal of a complaint of an inferior to a superior court, being in the nature of a writ of error. The *House of Lords* is the superior court of appeal to rectify any injustice or mistake in law committed by the courts below. The *Lord Chancellor* has jurisdiction in appeals from the inferior equity judges. The *Lords Justices* form a court of appeal from the judgments of the master of the rolls, vice-chancellors, and inferior equity tribunals, and commissioners in bankruptcy. The *Exchequer Chamber* forms a court of error in judgments given by the three courts of common law at Westminster, and is composed of the judges of two of the courts below, not parties to the judgment supposed to be erroneous. The *Judicial Committee of the Privy Council* sit on appeals from the ecclesiastical courts, the Admiralty, and from the colonies. The full court of Probate hear appeals from the court of the Judge Ordinary. In matters cognizable by justices of the peace, an appeal (unless prohibited by statute) lies to the *Quarter Sessions*, and now, by 20 & 21 Vict. c. 43, an appeal from their judgments or decisions on points of law may be had to one of the superior courts of law at Westminster. In certain cases in the *County Courts* appeals are made to a similar tribunal, and in cases of probate entertained therein, to the court of Probate, whose decision is final. The court of Queen's Bench has jurisdiction over justices of the peace and the court of Quarter Sessions by certiorari (which *see*). The court of Common Pleas decides disputed cases before revising barristers on the claims of voters for members of parliament. The archbishop of each province is the judge of appeals from the archdeacons' and consistory courts.

APPEARANCE, *ap-peer'-ăns* (Lat. *appareo*, I appear or give attendance). In Law, the term *appearance* has reference to an ancient state of practice, by which the litigant parties personally, or by their respective attorneys, actually confronted each other in open court. The object is now effected by the party causing a minute or memorandum to be filled in the office of the court, which he may do in person or by his attorney. If he appear in person, he must state on the minute his address, in order that he may be served with any subsequent proceedings. If a writ be served on a defendant, he must cause an appearance to be entered for him within eight days, inclusive of the day of service; otherwise, the plaintiff may sign judgment against him by default. But if the action be brought to recover money on a bill of exchange or promissory note, the defendant is not allowed to enter an appearance unless he obtain leave from a judge within twelve days after the service of the writ, inclusive of the day of service. Leave can only be obtained on an affidavit of facts sufficient to convince the judge that the defendant has a good defence against the whole or part of the claim upon the merits.

APPELLATIVE, *ăp-pel'-la-tiv* (Lat. *appellatio*, a naming), in Gram., denotes a common, as distinguished from a proper name. An appellative is applied to a whole class, a proper name only to an individual; thus, city is an appellative, and London, Paris, and Vienna proper names.

APPENDANT, *ăp-pen'-dant* (Lat. *appendens*, hanging, fixing, or fastening to), in Law, is a thing of incorporeal inheritance, belonging to another inheritance that is more worthy; as an advowson, common, court, or the like, which may be *appendant* to a manor; common of fishing appendant to a freehold; land appendant to an office; a seat in a church to a house. Ref. *Co. Litt.* 121.—(*See* APPURTENANCES.)

APPENDIX, *ăp-pen'-dix* (Lat. *ad*, to, and *pendeo*, I hang), is something appended or attached to another, In Lit., it is applied to a supplement, notes, or remarks placed at the end of a work. In Anat., it denotes a part attached to, yet in some measure distinct from another.

APPERCEPTION, *ăp'-per-sep'-shon* (Lat. *ap*, for *ad*, to, *perceptio*, perception), is a term applied in Phil. to that state or kind of perception which reflects upon itself, by which we are conscious of our perceptions and can reflect upon the operation of our own minds. The term was first introduced by Leibnitz.

APPETITE, *ăp'-pe-tite* (Lat. *appeto*, I desire), denotes a desire of enjoying something that is apprehended or felt to be necessary or conducive to happiness. In its primary sense, and as used by the Latins, it comprehended every species of desire, whether of a mental or corporeal nature; now, however, it is usually applied only to corporeal desires. According to Dr. Reid, "every appetite is accompanied with an uneasy sensation proper to it, which is strong or weak in proportion to the desire we have of the object. Appetites are not constant, but periodical, being suited by their objects for a time, and returning after certain periods. Those that are chiefly observable in man, as well as in most other animals, are hunger, thirst, and lust." Appetites are distinguished from passions in being directed to general objects, while the latter are directed to special objects. Thus we speak of an appetite for fame, glory, or riches. They are also distinguished from passions in the latter having no existence till a proper objected be presented; whereas the former exists first, and then is directed to an object. Natural appetites are given for the preservation of the individual or the propagation of the species. In a moral point of view, there is neither virtue nor vice in acting from natural appetite; yet there may be much of either in the management of the appetites. Besides the appetites which nature has given to us for useful and necessary purposes, we may create others which nature never gave, and which are often very hurtful. Appetites seek their gratification without the aid of reason, and often in spite of it. In common language, the term frequently means hunger.

APPIAN WAY, *ăp'-pi-an*, the oldest and most celebrated of the Roman roads, was commenced by Appius Claudius Cæcus, whilst censor, 313 B.C. It formed the great line of communication between Rome and Capua, and was 125 miles in length. In the construction of this great highway, hills and solid rock were pierced, hollows filled up, ravines spanned by bridges, swamps covered with embankments, and so stupendous was the whole design, so vast the sums expended upon it, that it became known as the "queen of roads." Large portions of the Appian Way may still be seen at Terracina, and other places, and all those travellers that have described it, concur in praising its excellent workmanship.

APPLAUSE, *ăp-plawz'* (Lat. *ad*, to, and *plaudo*, I clap my hands), properly signifies an approbation of something, expressed by clapping the hands. The ancients distinguished it from acclamation, which was expressed by the voice. Among the Romans there were three different kinds of applause; viz., *bombus*, which was a confused noise, made either by the hands or mouth; and *imbrices* and *testæ*, made by beating a sort of sounding vessels placed in the theatres for that purpose. Persons were instructed in the art of giving applause, and there were masters for teaching it. Proficients let themselves out for hire to actors and others, and were disposed among the audience, so as to give it with effect. They were divided into *chori*, and placed opposite to each other, like the choristers in a cathedral.

APPLE, *ăp'-pel* (Eng.-Sax. *appl*), the fruit of the

*Pyrus Malus*, a tree belonging to the nat. ord. *Rosaceæ*. (*See* PYRUS.) All the different kinds of apple-trees now in cultivation are usually regarded as mere varieties of the one species which in its wild state is known as the crabtree. This plant is a native of Britain, and is found in most of the temperate parts of the northern hemisphere. Its fruit is austere and uneatable, but is sometimes collected for the sake of its acid juice, which, when fermented, forms the liquid called *verjuice*, used in cookery and for purifying wax. The cultivated tree was probably introduced into Britain by the Romans, who are said to have had twenty-two varieties. At the present time it is, perhaps, the most widely-diffused and most valuable of all fruit-trees; and the varieties, which are adapted to almost every soil, situation, and climate in the temperate zone, have become extremely numerous. The apple-tree seldom reaches a greater height than thirty feet; but its large round head makes up for the want of height; and, altogether, it is a noble-looking tree, especially when in full blossom. The flowers grow in bunches, and are very fragrant. They are white inside, and delicately tinged with pink externally. The tree is not always permitted to ramify in a natural manner, but is sometimes trained as an espalier, or as a wall-tree. New varieties are continually being developed; and, as they are generally propagated by grafting, the old ones gradually die out. The variety that produced the *costard*, which was formerly a favourite kind of apple, does not exist at the present time, though we still retain the name of costermongers (*costard-mongers*) for itinerant sellers of apples. The apple is usually grafted on apple or crab stocks; but sometimes hawthorn stocks are used. For producing dwarf trees, stocks of the paradise apple, a very diminutive variety, are generally employed. The apple (we now allude to the fruit, and not to the tree producing it) varies greatly in size, form, and colour. It is regarded by botanists as the type of the kind of fruit to which they have applied the term *pome*. (*See* POME.) The eatable part has a more or less aromatic, sweet, or sub-acid taste, and contains starch, grape-sugar, and malic acid. Apples are commonly divided into dessert, baking, and cider fruits, the first being highly flavoured, the second such as become soft in baking or boiling, and the third those which are hard and austere. Apples are also classed under the general names of Pippins, Pearmains, Rennets, Calvilles, Russets, Codlins, &c. Large quantities of apples are imported into England from France, Canada, and the Northern States of America. The uses of the apple,—for the dessert, for puddings and pies, for preserving and making jelly,—are sufficiently well known. Cider, the fermented juice of the apple, is a favourite drink in many parts of England and France. Malic acid, extracted from the apple, has long been used in medicine, and has latterly been largely employed as a mordant in dyeing. (*See* CIDER, MALIC ACID.)—*Ref.* For recipes, Mrs. Beeton's *Book of Household Management*.



APPLE AND BLOSSOM.

APPLE OF LOVE. (*See* TOMATO.)

APPLEBERRY. (*See* BILLARDIERA.)

APPLE-MOTH (*Carcocopsa pomonella*), one of the most destructive enemies of the apple crop in this country. It lays its eggs in the eyes of the newly-formed fruit, within which the larva feeds. The result is the premature falling of the apple.

APPLICATION, *ăp-pli-kai'-shon* (Lat. *ad*, to, and *plico*, I fold or knit together), is the act of bringing things together, or laying one thing on another. It is frequently used to denote the use that is made of one science for understanding or improving another. In Theol., it is applied to the act whereby our Saviour





transfers or makes over to us what he had earned or purchased by his holy life and death, and by which we are justified and entitled to grace and glory. In sermons, the application is that part of the discourse in which the principles before laid down and illustrated are applied to practical uses.

APPOGIATURA, *ap-poj'-a-too'-ra* (Ital. *appogiare*, to lean upon). In Mus., a small note which precedes a larger one of greater duration, and which is touched lightly before sounding the principal note. The small note borrows one half, and sometimes only one quarter of the duration of the note preceding it.

APPOINTMENT, *ăp-point'-ment* (Fr. *appointement*, from Lat. *ad punctum*, to a point), in Law, is generally considered as one of the common-law conveyances or modes of disposition, and is a deed, will, or instrument of a derivative nature, relative to or dependent on some precedent deed or assurance, in which a power to appoint to certain uses, or in favour of particular persons, or to divert the property or fund into such channels as the appointer, by the power given, is authorized or enabled to do. It is also a term used in bankruptcy on the choice of assignees, who are thereupon appointed; and in arbitration cases, on the choice of arbitrators, &c. The term is also applied to an office, employment, or place of profit, which is called an appointment, and to the act of investing with or placing a person in an official employment, emolument, or place of profit, which is called an appointment thereto.

APPORTIONMENT, *ăp-por'-shon-ment* (Lat. *apportionmentum*, Old Fr. *apportioner*, from Lat. *ad portionem*, to settle the share, part, or allotment of each), in Law, is a dividing of rent or income into parts, according as the land out of which it issues is divided among two or more; as, if a stranger recovers part of the land, the tenant shall pay, having regard to that recovered and what remains in his hands; but, in general, a rent-charge, or things that are entire, cannot be made the subject of apportionment; and, by 4 & 5 Will. IV. c. 22, it is provided that in cases of all fixed periodical payments, payable under any instrument executed when the interest of the recipient determines, by death or otherwise, the payments shall be apportioned so that he or his representatives, and the person entitled by succession or reversion, or in remainder, shall have their respective proportions up to and from the time at which the prior title or interest ceased. But this does not apply to rent reserved by lease of lands or tenements, as the party liable under the lease is still to make payment of the whole to the party who would be entitled if the statute had not been made; the latter, however, being liable to account to the person claiming the apportionment.

APPOSITION, *ăp-po-sish'-on* (Lat. *ad*, to, and *pono*, I place), denotes literally the act of putting or applying one thing to another. In Gram., two or more substantives are said to be in apposition when they are in the same case, without any copulative conjunction between them.

APPRAISEMENT, *ăp-praiz'-ment* (Fr. *apprécier*, to value, set a price upon).—The act of rating, valuing, or setting a price on estates or effects, or dilapidations or repairs, by a person who is a competent judge, and who, for certain purposes, must be licensed. When a distress is levied for rent, before the goods can be sold to satisfy the distraint, the distrainer must cause them to be appraised or valued by two appraisers, who must be previously sworn by a constable to put a true value on them according to the best of their judgment. In accounting for legacy duty, the commissioners of inland revenue require an inventory and appraisement of goods or property remaining unsold, in order to ascertain the value upon which the duty in respect thereof shall be charged, which inventory is retained by them unless it be stamped. The duty payable on appraisements is as follows:—

| | | | |
|---|---|---|---|
| Valuation not exceeding | £50 ..... | 2 | 6 |
| " " | 100 ..... | 5 | 0 |
| " " | 200 ..... | 10 | 0 |
| " " | 500 ..... | 15 | 0 |
| If exceeding | 500 ... .....1 | 0 | 0 |

Appraisements made for legacy duty are exempt, but not if made for increase or return of probate duty.

Apprehension, *ap-pre-hen'-shon* (Lat. *ad*, to, and *prehendo*, I seize or lay hold of), literally signifies the taking hold of or grasping with the hand. In Phil., it is applied to that act of the mind by which it conceives of a thing without passing any judgment upon it. Hence it is used to express an inadequate or imperfect idea of a thing, and is opposed to comprehension. There are many truths which we apprehend, but which we cannot comprehend; as the great mysteries of our faith. "It belongs to the idea of God that he may be apprehended, but not comprehended by his reasonable creatures." If he were not so, he would not be God, or the being that comprehended him would be God also.

Apprentice, *ap-pren'-tis* (Fr. *apprendre*, to learn).—In Law, apprentices are usually bound by indentures for a term of years, with their own consent, without which the transaction is not binding, except in the case of *parish* apprentices, who may be bound with the consent of two justices till twenty-one years of age. A variety of statutes regulate the manner in which parish apprentices are to be bound, assigned, registered, and maintained. This subject is now placed under the paramount custody of the poor-law commissioners, who have power to introduce new rules from time to time as they may think fit; and provisions are made by which justices of the peace are empowered to settle disputes between such apprentices and their masters, and to discharge the former from their indentures upon reasonable cause shown. Similar powers also belong to the justices in the case of all other apprentices. They may commit them to prison for three months for breach of duty, in cases in which not more than £25 premium is paid. In usual cases, the terms are arranged between the master and the friends of the apprentice, as to the hours of service and maintenance, and remuneration of the apprentice. A master cannot legally compel his apprentice to work an unreasonable length of time, to do an unlawful act, or to work on Sunday. The bankruptcy or death of the master is a discharge of the indentures. But by the *custom of London*, if a master die, the apprentice is bound to continue his services to the widow, provided she carry on the same trade; and by the like custom a freeman may turn over his apprentice to another freeman. If in the indentures there be any covenant by the master or friends of the apprentice for maintenance, the executor or administrator of the deceased party is bound to make provision for the same as far as the assets will allow. A master may administer reasonable corporal chastisement to his apprentice for a breach or neglect of his duty, but he cannot discharge him. It is, however, advisable for the master to apply to the justices rather than take the law into his own hands. He may bring an action against the parent or other person who has by the indenture agreed for the due performance of the stipulations. There is no remedy by action against the apprentice himself, if he be an infant, except by the *custom of London*. An action lies by the master for enticing away or harbouring his servant or apprentice. An apprentice is not liable to serve his master after he attains twenty-one years of age; but the master has his remedy over against the party who has covenanted that the apprentice shall serve his time. If the premium be less than £10, and the apprentice absent himself from his master's service, he is liable to serve beyond his term for so long a time as he shall have absented himself, or make satisfaction, or be imprisoned for three months; and the remedy is cumulative. The apprentice is entitled to the indenture bearing the stamp-duty chargeable in respect of the premium.

Approach, *ap-proche'* (Fr. *approcher*), in Mil., is a term applied to the covered road or trench made by a besieging army to enable them to approach the walls of the fortress, without being exposed to the enemy's fire. Approaches consist generally of trenches excavated in the ground, the earth being thrown up on the side next to the fortress. Where this cannot conveniently be done, as on rocky or marshy ground, bags of earth, stuffed gabions, woolpacks, or such-like materials, are had recourse to.

Approbation, *ap'-pro-bai'-shon*, is that act or disposition of the mind by which we assent to a thing with some degree of pleasure or satisfaction. Moralists are divided as to the motive which determines us to approve or disapprove. According to some, it is self-interest; according to others, sympathy. According to Dr. Reid, it includes "not only a moral judgment of the action, but some affection favourable or unfavourable towards the agent, and some feeling in ourselves." In some cases the feeling predominates; in others the judgment is more prominent.

Appropriation, *ap-pro'-pri-ai'-shon* (Lat. *appropriatio*, applying or taking to one's own use).—In Law, a parson has, during his life, the freehold, in himself, of the parsonage-house, the glebe, the tithe rent-charge, and other dues; but these are sometimes *appropriated*; *appropriation*, therefore, signifies the perpetual annexing of a benefice to some spiritual corporation, either sole or aggregate, being the patron of the living or benefice.

Approver, *ap-proo'-ver* (Lat. *probator*, prover), is a person who, indicted of treason or felony, and arraigned for the same, confesses the fact before plea pleaded, and appeals, or accuses his accomplices of the same crime, in order to obtain his pardon. He has to take an oath to reveal all treasons and felonies that he knows of. The accomplice, or *appellee*, is equally bound to answer it; and if he has no reasonable and legal exceptions to make to the person of the approver, he must be tried, and, if found guilty, suffer judgment, and the approver shall have his pardon *ex debito justitiæ*. If the appellee be acquitted, the approver receives judgment for the crime confessed, the condition of his pardon having failed; viz., the convicting some other person. The doctrine of *approvement* has fallen into desuetude, and the object is attained by admitting one accomplice as a witness for the crown, or, as it is commonly called, queen's evidence against the others. (*See* Evidence.) Bailiffs of lords, in their franchises, are called their approvers; and in the statute 1 Edw. III. c. 8, sheriffs are called the king's approvers.

Approximation, *ap-prox'-i-mai'-shon* (Lat. *ad*, to, *proximus*, next), in Arith. and Alg., the coming nearer and nearer to a root or other quantity sought, without finding, or expecting to be ever able to find it exactly,—the operation employed to discover a quantity that cannot be positively determined. It is most frequently used to find the bi-quadrate and cube roots of numbers that would leave a remainder when the nearest bi-quadrate or cube root was found. By approximation the value of a quantity may be found, if not to the utmost degree of exactness, sufficiently so for practice; thus:—$\sqrt{2}=1{\cdot}41421356$, &c.=the approximating series $1+\frac{4}{10}+\frac{1}{10^2}+\frac{4}{10^3}+\frac{1}{10^4}+$, &c., or, supposing $x=\frac{1}{10}$, equal to the series $1+\frac{4}{x}+\frac{1}{x^2}+\frac{4}{x^3}+\frac{1}{x^4}+$, $=1+4x^{-1}+x^{-2}+4x^{-3}+2x^{-4}+$, &c.

Appui, *ap-pwe'* (Fr., support, prop), in Mil., a term applied to any particular point or body upon which troops are formed, or by which they are marched either in column or line. This is termed the *point d'appui*.

Appurtenances, *ap-pur'-te-nan-sez* (Lat. *pertinentia*; Fr. *appartenir*, to belong to), in Law, are things, both corporeal and incorporeal, appertaining to another thing as principal; as, hamlets to a chief manor; and common of pasture, piscary, &c.; also liberties and services of tenants, and outhouses, yards, orchards, and gardens, are appurtenant to a house or messuage. (*See* Appendant.)

Apricot, *ai'-pri-kot* (Lat. *præcox*, blossoming early), the popular name for *Prunus Armeniaca*, a fruit-tree belonging to the same gen. as the plum. It is a native of Armenia and the countries eastward, to China and Japan. It blossoms at the very commencement of spring, and bears a fruit resembling the peach, but with yellow flesh. It appears, from Turner's "Herbal," that the apricot was cultivated in Britain in 1562; and in Hakluyt's "Remembrancer," 1582, it is affirmed that it was first brought here from Italy, by Wolfe, a French priest, gardener to Henry VIII. Upwards of twenty varieties are now in cultivation. The trees are generally budded on plum stocks and trained against walls. The dried fruits are exported from Italy and the south of France.

April, *ai'-pril* (Lat. *Aprilis*, from *aperio*, I open), is the fourth month of our year, and was so called from the earth beginning at this time to open her bosom for the production of fruits. It contains thirty days.

## April Fool

**April Fool** is one who is sent on a vain errand, or otherwise imposed upon, on the 1st of April, a custom well known in England and some other countries. It is believed by some to be connected with a similar custom which prevails among the Hindoos in India during the Huli festival, which is held towards the end of March. The origin of the custom is unknown; but some consider that it has an allusion to the mockery of our Saviour by the Jews about this time.—The 1st of April is usually termed in England "All Fools' Day."

**A priori**, *pri-or'-i*, is a term in Logic, taken from the Latin, and signifying, literally, 'from a thing before,' as opposed to *à posteriori*, 'from a thing after.' They distinguish the two different methods of reasoning, the former being applied to arguments from cause to effect, the latter from effect to cause; the one lays down some previous self-evident principles, and then descends to the several consequences that may be deduced from them; the other begins by regarding the phenomena themselves, traces them to their original, and, by developing the properties of these phenomena, arrives at the knowledge of the cause. In modern times, the term *à priori* has come to be extended to any abstract reasoning from a given notion to the conditions which such a notion involved; as, for example, the title *à priori* bestowed on arguments for the existence of deity, drawn from the phenomena that we observe around us: thus, Clarke's *à priori* reasoning for the existence of God is, properly, an argument *à posteriori*. Kant applies the term *à priori* to knowledge which is absolutely independent of all experience, as opposed to empirical knowledge, or knowledge derived *à posteriori*, through experience. In this sense, the terms are now commonly used by philosophers. "If there are any truths which the mind possesses, whether consciously or unconsciously, before and independent of experience, they may be called *à priori* truths, as belonging to it *prior* to all that it acquires from the world around. On the other hand, truths which are acquired from observation and experience, are called *à posteriori* truths, because they come to the mind *after* it has become acquainted with external facts. How far *à priori* truths or ideas are possible, is the great *campus philosophorum*, the great controverted question of mental philosophy."—Thomson's *Laws of Thought*.

**Apsides**, *ăp'-si-deez* (Gr. *apsis*, arch, connection), the points in the orbit of a planet, or any heavenly body, at which it is at its least and greatest distance from the sun or body round which it revolves as a centre. The apsides of a planet are its aphelion and perihelion, and those of the moon its apogee and perigee. The diameter of the planet's orbit, which joins these extreme and opposite points, passing through the centre of the same,—the sun in the case of the planets, and the earth with reference to the moon,—is called the line of apsides or apses. This line always forms the greater axis of the ellipse in the path of which any planet revolves. (*See* Aphelion, Perihelion, Apogee, Perigee.)

**Apteryx**, *ăp'-te-rix* (Gr. *a*, without, *pteryx*, wing),



APTERYX.

a gen. of birds allied to the ostrich and emu, and, perhaps, more nearly to the extinct dodo. It has a long spike-like bill, of which it makes use in supporting itself when at rest. Its wings are simple rudiments,—a mere stump, terminated by a hook. Its feathers fall loosely, like those of the emu. Only one species is known, about the size of a goose, a native of New Zealand. The name *kiwi-kiwi* is given it by the natives, who use its skin in making clothing.

## Aquarium

**Aquafortis**, *ai'-qua-for'-tis* (literally, strong water), the common name for the impure nitric acid of commerce.

**Aquage**, *ăi'-kwaj* (Lat. *aquagium*, from *aqua*, water), a water-course.

**Aquamarine**, or **Beryl**, *ai-qua-ma-reen'*, a precious stone, of a greenish-blue tinge, much valued as a jewel, from its lovely colour and great hardness. It is sometimes yellowish, and occasionally almost colourless. Its finest crystals come from Brazil and Siberia. The opaque aquamarine is greenish or yellowish white, and is found in North America, in prisms four feet long, their planes being five inches in breadth. At Limoges, in France, they also occur of great size. The beryl is closely allied to the emerald, both being double silicates of alumina and glucina, and differing only in their colouring matter, which is oxide of iron in the beryl, and oxide of chromium in the emerald.

**Aqua Regia**, *ai'-kwa re'-ji-a* (Lat., royal water), in Chem., a substance, called, from its property of dissolving gold, the royal metal; the commercial name for nitro-hydrochloric acid. It is made by mixing one part of nitric acid with two or three parts of hydrochloric acid. The acids decompose each other, chlorine and nitrous acid being liberated, the former of which attacks the gold or other metal acted upon, forming a chloride. It is much used by chemists, as a solvent for gold, platinum, iridium, osmium, and other metals.

**Aquarium**, *ai-quair'-i-um*, a vessel containing water, either salt or fresh, in which living specimens of aquatic animals and plants are maintained in a healthy state. The words *vivarium* and *aquavivarium* have been employed by certain writers to denote the same thing. Aquaria, both fresh-water and marine, have become exceedingly common, and numerous works have been written on their management. As many of these treatises are utterly untrustworthy, having been compiled in haste, by men knowing little or nothing of the habits of the creatures adapted for aquaria, a few practical directions for stocking and keeping up these pleasing and instructive arrangements will doubtless be acceptable to many readers of this work. Before entering into practical details, we will briefly sketch the history of the aquarium, and describe the principles upon which it depends. To Mr. Warrington must be awarded the thanks of all lovers of nature, for having first produced a perfect aquarium. In 1850 this gentleman communicated to the Chemical Society the result of a year's experiments "On the adjustment of the relations between the animal and vegetable kingdoms by which the vital functions of both are permanently maintained." To illustrate this adjustment, Mr. Warrington kept for many months, in a vase of unchanged water, two small gold-fish and a plant of *Vallisneria spiralis*; and afterwards he made a similar experiment with sea-water, weeds, and anemones, which was equally successful. Before this, several attempts had been made to preserve fresh-water and marine organisms by naturalists. Mr. Ward, whose ingenious discovery of the method of growing ferns and other delicate plants in closed cases (*see* Wardian Case) had already earned for him a world-wide reputation, stated, as early as June, 1849, at a meeting of the British Association, that he had succeeded not only in growing sea-weeds in sea-water, but in sea-water artificially made. Seven years earlier, Dr. Johnston succeeded in preserving the delicate pink coralline in a living state for eight weeks, in unchanged sea-water. The list of workers in the aquarium cause would be incomplete without the name of Mrs. Thynne, a lady living in London, who frequently surprised the scientific societies by exhibiting beautiful specimens of rare marine animals which she had kept for many months, having merely adopted the simple expedient of aërating the sea-water, by pouring it from one vessel into another. Before Mr. Warrington published his paper, Dr. Lankester had kept stickle-

backs, gold-fish, and other fresh-water animals, in jars containing growing sprigs of *Valisneria*. Mr. Gosse, the well-known marine zoologist, also laboured in the same field, and his efforts to domesticate his favourite sea-anemones were tolerably successful. The fact of his being ignorant of Mr. Warrington's experiments proves that science had already smoothed the way to the discovery of that beautiful contrivance now universally known as the aquarium, by the aid of which the naturalist, sitting in his parlour or conservatory, may study the natural habits of the strange and interesting inhabitants of the deep.

The great principle involved in the aquarium is the constant interchange of elements between the animal and vegetable kingdoms. (*See* ANIMAL KINGDOM.) Water has the power of absorbing certain quantities of atmospheric air and other gases. In every natural water, whether fresh or salt, we find a proportion of carbonic acid, which is a compound formed of oxygen and carbon. The leaves of plants, when acted upon by light, decompose this gas, and, having no necessity for oxygen, they merely absorb the carbon. Animals, on the other hand, require oxygen, for the purpose of removing the waste carbon of their bodies; and the process of respiration causes the two elements to combine in the form of carbonic acid. The vegetable world is therefore continually absorbing carbon, while the animal world is giving it off; and a balance is thus preserved between the two great divisions of organized beings. The other elements which enter into the composition of animal and vegetable structures circulate in a more obscure manner, but with equal regularity. A vessel containing a supply of aquatic plants and animals must be looked upon as a little world, in which the interchange of elements represents those vast phenomena that preserve the balance of life in the great world; the few water-weeds take the place of the vast forests, the green prairies, and the dense jungles; and the gold-fish, minnows, newts, and snails, stand for the earth's fauna. To form an aquarium, we have merely to imitate nature. A good supply of plants must be planted, to decompose the poisonous carbonic acid gas, and keep up a continuous supply of the vivifying oxygen; while particular care must be taken not to overcrowd the tank with animals.

The vessels used for aquaria are constructed, either wholly or partly, of glass: a common propagating-glass, such as is used by gardeners, is often employed. These glasses can now be obtained, fitted with proper stands, and manufactured from a clearer kind of glass than formerly. Glass tanks, of a rectangular form, are, however, preferable to vases, as they do not distort the objects seen through their sides, and are less liable to breakage. The glass vase is extremely fragile, and an unlucky blow ruins it at once, and, perhaps, destroys the labour of many weeks; whereas, a cracked side in a rectangular tank can be easily replaced. The most perfect form of tank is that invented by Mr. W. Alford Lloyd, and known as the "slope-back tank." One side only of this tank is formed of glass, the other three being composed of slate. The back slopes downwards, from the source of illumination to the lower edge of the glass front, an arrangement which enables objects to be seen in a slanting light, which exhibits their form and colour to the greatest advantage. Whatever kind of tank is used, it should be provided with a cover of sheet-glass, to keep out dust, and to prevent the more adventurous creatures making their escape. A layer of well-washed shingle or sand is laid at the bottom of the aquarium, and in this the roots of such plants as are provided with these organs are imbedded. A few irregular blocks of stone, placed upon the shingle, look much better than any fantastic minarets of sham rockwork, formed of cement, and afford sufficient shelter for all animals of a retiring disposition.

The *fresh-water aquarium* is filled with ordinary river or spring water, and serves to exhibit the animals and plants found in ponds and ditches. The best and most lasting plant is the spiral Valisneria (*Valisneria spiralis*), which is a fine grassy-looking weed, having perennial roots. Its long green leaves rapidly decompose the carbonic acid in the water, and consequently make it a capital purifier. The American water-weed (*Anacharis alsinastrum*) is another good aquarium plant, but it must be frequently thinned, as it grows extremely fast. The different species of Duckweed (*Lemna*) and Pondweed (*Potomageton*) are all applicable to the purposes of the aquarium naturalist. No animals should be introduced into the tank until the plants have been established sufficiently long (say three or four days) to properly aërate the water. Of the animals suited for the fresh-water tank, fishes rank first. All the different kinds of Carp, including the gold-fish, are easily domesticated. The Tench, the Miller's-thumb, the Minnow, the Sticklebuck, and the Grig Eel, are also suitable fish. The interesting class of Batrachia are generally represented by the common frog, the smooth newt, and the crested triton. Small water-tortoises and salamanders have lately been imported for aquaria. Some members of the class *Mollusca* are absolutely indispensable in a fresh-water aquarium, as they act as scavengers, and carefully remove the green film which forms upon the glass, and which, in their absence, would soon obscure the contents of the tank. The best mollusks are the pretty coil-shells (*Planorbis corneus* and *carinatus*), the marsh-shell (*Paludina vivipara*), and the eared mud-shell (*Limnea auricularis*). It is doubtful whether insects ought to be admitted into aquaria which are intended merely for parlour ornaments; but the naturalist ought not to consider his tank complete unless the important class of insects is properly represented. Considerable care, however, must be bestowed on the selection, as some of the members of the beetle tribe are so blood-thirsty that they will even venture to attack the smaller fish. Some writers on the aquarium recommend artificial aëration; but when the balance of vegetable and animal life is properly adjusted, there is no necessity for resorting to any extraordinary means to insure a copious supply of oxygen.

The *Marine Aquarium* affords us the means of observing some of the most curious forms of animal life. The tank is filled with sea-water, which should be conveyed to its destination in clean stone jars, or in casks perfectly seasoned. When real sea-water cannot be got at (though this emergency must now be a very rare one), *artificial sea-water* may be used, after having been prepared for the reception of animals by growing marine plants in it. Mr. Gosse has given the following simple formula for the preparation of this artificial sea-water:—

| | |
|---|---|
| Common table-salt ..... | 3½ ounces. |
| Epsom salts .. . . . ..... | ¼ ounce. |
| Chloride of magnesium ..... | 200 grains troy. |
| Chloride of potassium ..... | 40 „ |

These materials are to be added to a little less than four quarts of water. The specific gravity of the solution, when properly prepared, will be found to be 1·026. The green and red sea-weeds are the plants used, the dark-coloured weeds being inapplicable for aquarium purposes. (*See* ALGÆ.) The animals which form the glory of the marine tank are the sea-anemones (*see* ANEMONES) and madrepores. Besides these, the star-fishes, the sea-urchins, the barnacles, and the beautiful plumed worms called serpulæ and sabellæ, generally gain admission. The crab family furnish the humorous element in the aquarium; and it is impossible to observe the clumsy antics of some of them, particularly the hermits, with a serious countenance. The free swimmers are shrimps, prawns, and certain small fishes; but, as few of these can be preserved for long in the aquarium, they are generally omitted altogether. The scavengers of the marine tank are the periwinkles, cockles, whelks, limpets, and tops. In the marine aquarium it is particularly necessary to guard against overcrowding. Every animal requires a certain amount of room, a certain amount of air, and a certain amount of solid nourishment; therefore we cannot exceed these natural limits without injury to our whole stock. Artificial aëration may be resorted to with some show of reason, as it is only imitating what is constantly taking place in the ocean. The waves, the rising and falling of the tide, and the action of the wind, all help to supply the creatures of the deep with the life-supporting element; and we may, therefore, mimic these grand mechanical agents by blowing air into our tank, or allowing a quantity of water to drip into it from a considerable height; but

it is far better to keep the number of our animals within moderate limits, and to trust to the algæ for a proper amount of oxygen. Sometimes the water in an aquarium will suddenly become turbid from no easily-explained cause; and it will be found necessary to remove the animals to a temporary vessel, and to filter the water through sponge or powdered charcoal. Mr. Lloyd discovered that the opacity of the water could be destroyed by placing it in a dark closet.—*Ref.* Gosse's *Aquarium*; Lankester's *Aquavivarium*; Lloyd's *Practical Instructions for Tank Management.*

AQUARIUS, *a-quair'-i-us* (Lat., water-bearer), a constellation, and the eleventh sign of the zodiac, giving a name to that part of the ecliptic in which the sun is in the latter part of January and beginning of February. It may be found by drawing a line through the stars in the head of Andromeda and wing of Perseus, which will pass through the stars in the shoulders of Aquarius; it is also distinguished by four stars of the fourth magnitude, near the urn forming the letter Y. The sign is supposed to have been so called because the weather is generally rainy when it appears on the horizon.

AQUATIC PLANTS, *á-quat'-ik.*—All plants growing in water may be termed *aquatic*; but, by botanists, the term is usually applied only to those found in *fresh* water, either stagnant or running; as, *Sagittaria*, arrowhead; *Nymphæa*, water-lily; *Potamogeton*, pondweed; *Sabularia*, awlwort; *Utricularia*, bladderwort; *Stratiotes*, water-soldier; *Lemna*, duckweed; the *Confervæ*, and the *Oscillatoriæ*. Some of these root in the soil, and appear above the surface of the water; others root in the soil and remain submersed; while others, again, swim freely on the surface, without rooting below.

AQUATINTA, *aï'-qua-tin'-ta* (Lat. *aqua*, water, *tinctus*, stained or dyed), a peculiar style of etching on copper or steel, in imitation of drawings in sepia or Indian ink. It was invented by a German named Le Prince; but, since the introduction of lithography and colour-printing, it has nearly fallen into disuse. The plate is covered with a ground of black resin and spirits of wine, to which the design is transferred, with a blunt instrument, from the paper on which it has been traced. The high lights are then stopped out with a varnish of Canada balsam and oxide of bismuth; and the various shades and gradations of tint are procured by submitting the different parts of the design to the action of nitric acid and water for a greater or less period of time, according to the depth of shade required.

AQUA TOFANA, *aï'-qua to-fa'-na*, a celebrated liquid poison, said to have been invented at the close of the 17th century, by a Palermitan woman, named Tofana; whence the term. This compound was retailed in small phials, labelled "Manna of Saint Nicholas of Bari," and was supposed to have a miraculous power in curing various diseases. Its effect, however, was to kill those to whom it was administered; on which account it was much sought after by married women who were anxious to get rid of their husbands. In 1659, so great was the mortality amongst married men, that suspicion was awakened, and a horrible secret society was discovered, at the head of which was an old hag named Spara, who, with several of her guilty companions, was executed. The woman Tofana fled to a cloister for asylum, and escaped punishment during many years; but was, in 1709, torn from her place of refuge, and, on being put to the torture, confessed to having been instrumental to the death of 600 persons. By some it is asserted that she survived till 1730, but others declare her to have been strangled. The Aqua Tofana is said to have been a limpid, inodorous fluid, six drops of which sufficed to cause death. The experiments made by chemists at a subsequent period lead to the belief that it was mainly a solution of arsenic.

AQUEDUCT, *ăk'-que-dŭkt* (Lat. *aqua*, water, and *ducere*, to lead), a channel with a gentle inclination, for the transmission of water from one place to another. The term is generally applied to the arched bridge-like structures of stone constructed by the engineers of Rome to convey water across valleys for the supply of the imperial city. Even many of the inferior cities of Italy, and colonies founded by the Romans, were supplied with water by aqueducts; but water in the present day is generally conveyed in pipes hidden underground. There are, however, two aqueducts of modern date worthy of notice,—that of Croton, conveying water to New York from the Croton river over a distance of 38 miles, completed in 1842; and the Lisbon aqueduct, about nine miles long, which spans a valley with a portion of its course, nearly half a mile in length, on arches 250 feet high and 150 broad. The remains of the aqueduct at Nismes, in Provence, in excellent preservation, furnish the best example of this class of engineering works. "It consists," says the author of Murray's *Handbook for France*, "of three rows of arches raised one above another, each smaller than the one below it; the lowest of six arches, the centre tier of eleven, and the uppermost of thirty-five. . . It is by its magnitude and the skilful fitting of its enormous blocks that it makes an impression on the mind. . . The highest range of arches carries a small canal, about four and a half feet high and four feet wide, just large enough for a man to creep through, and still retaining a lining of Roman cement. It is covered with stone slabs, along which it is possible to walk from one end to the other, and overlook the valley of the Gardon. The height of the Pont du Gard is 188 feet, and the length of the highest arcade 873 feet." The only use of this immense structure was to convey the water of two springs twenty-five miles distant to Nismes.

AQUEOUS HUMOUR, *aï'-que-us*, in Anat., is the name given to that watery fluid of the eye which is situated between the back of the cornea and the front of the lens. (*See* EYE.)

AQUEOUS ROCKS, in Geol., are those which have been formed by deposition from water; in other words, they are the *sedimentary* or *stratified* rocks. The unstratified rocks which have arisen through fusion, are termed, in contradistinction, *igneous.*

AQUIFOLIACEÆ, *aï'-qui-fo'-li-aï'-se-e* (Lat. *aqua*, water, *folium*, leaf), in Bot., the Holly fam., a nat. ord. of dicotyledonous plants, in the sub-class *Corolliflorœ*. They are evergreen trees or shrubs, with coriaceous and simple leaves, which have no stipules. The flowers are small, axillary, and sometimes unisexual; the fruits fleshy and indehiscent. There are 11 genera and 110 species, which are widely, although sparingly, distributed over the globe. Only one species, the common holly, is found in Europe. Bitter, tonic, and astringent properties are commonly possessed by plants of this order. Some are emetic and purgative, while others are largely used as substitutes for China tea. (*See* ILEX.)

AQUILA, *ă'-qui-la* (Lat., eagle), in Astron., the name of a constellation in the northern hemisphere, above the signs of Aquarius and Capricornus. It is on the meridian, at an elevation of about 40°, early in the evening, about the middle of September. The constellation Antinous is generally joined to Aquila, and considered to form part of it.

AQUILARIACEÆ, *a-qui-lair'-i-aï'-se-e*, in Bot., a nat. ord. of dicotyledonous plants, in the sub-class *Monochlamydeæ*. There are but six genera and ten species, all natives of tropical Asia. They are handsome trees, with smooth branches and very tough barks. The typical gen. is *Aquilaria*, certain species of which yield the fragrant eagle-wood, or aloes-wood, supposed to be the calambac or agallochum of the ancients, the ahalim or ahloth of the Old Testament, and the aloe or aloes of the New. This wood was formerly held in high repute as a medicinal agent in Europe; but its use is now obsolete.

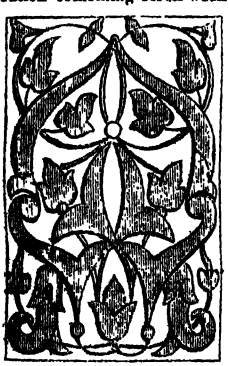
AQUILEGIA, *ă-qui-le'-ji-a* (Lat., a gutter), in Bot., a gen. of plants belonging to the nat. ord. *Ranunculaceæ*. The name *Aquilegia* was given to the genus by the ancients, because the leaves are so shaped that they collect the rain which falls upon them, and retain it for some time. The species are commonly called columbines, and several of them are cultivated in flower-borders, being handsome perennials. The petals are curiously formed, having each a long curved horn or spur at the base. Linnæus affirms that children have been poisoned through eating portions of the common columbine (*A. vulgaris*).

AQUITANI, *ă-qui-tan'-ni*, in Anc. Hist., was the name of a people of Gaul, whose country extended from the

Garonne to the Pyrenees. They were distinct from the Celtæ, or Gauls, and are supposed to have belonged to the Iberian race. Under Cæsar, Aquitania was invaded by Crassus; but it was not finally subdued till 28 B.C., when Augustus sent M. V. Messala into the country. Augustus extended the limits of Aquitania northward as far as the Loire. Under the later emperors, the Aquitania of Augustus was divided into three provinces; viz., 1. *Aquitania Prima*, whose capital was Avaricum (now Bourges); 2. *Aquitania Secunda*, a chief town Burdigala (now Bordeaux); and 3. *Novem Populana*,—chief town Elimberris (now Auch). This division continued till the country was taken possession of by the Visigoths, in 419, who made Tolosa their capital. In 507, Clovis, king of the Franks, defeated the Visigoths in a great battle near Poitiers, killing their king, Alaric II., and added Aquitania to his territory. In 628, Dagobert erected Aquitania into a separate kingdom for his brother Caribert. It was afterwards changed to a duchy, and had its own dukes down to 768, when it was conquered by Pepin, and re-united to the French crown. Charlemagne, in 778, erected it into a kingdom, and conferred it on his son Louis le Débonnaire. It was afterwards governed by dukes, and its name came to be changed into Guienne, which is evidently a corruption of Aquitania. In the mean time, the Vascones, a people who had come over from Spain, and settled in the south of Aquitania, formed themselves into an independent state, which became united with Guienne in the 11th century. The district of Gascony is named after them. In 1137, the marriage of Eleanor, daughter of William, last duke of Guienne, with Louis VII. of France, united, for a time, this duchy to the crown of France; but being repudiated by him, she subsequently married Henry, duke of Normandy, afterwards Henry II. of England; and thus this territory came to England, and led to long wars between the two countries. It was finally united to France in 1453.

ARA, *air'-a* (Lat., altar), in Astron., a constellation in the southern hemisphere, not visible in our latitude: it is situated near the constellations of Pavo and the Southern Triangle.

ARABESQUE, *ăr-a-besk'* (Fr., after the manner of the Arabians), is a term synonymous with Mauresque, and is applied to any fanciful style of decoration combining scroll-work interlaced with flowers, fruit, leaves, and tendrils, and occasionally figures of men and animals. This style of ornamentation is supposed to have originated in the hieroglyphic emblems and figures used by the Egyptians to decorate their public buildings, dwellings, and utensils. It was borrowed from them by the Arabians, who, under the name of Saracens and Moors, overran Asia Minor and the north of Africa and Spain. The Moors have left beautiful specimens of this decorative style in the Alhambra in Spain, faithful copies of which may be seen in the Alhambra court at the Crystal Palace, Sydenham. They were obliged by the tenets of the Koran to confine themselves to the representation of the productions of the vegetable kingdom. The Etruscans ornamented their pottery and dwellings in this manner, introducing figures of men and animals; and the walls of the baths of Titus, discovered in the time of Leo X., were adorned with arabesque-work, from which it is said that Raphael derived his idea of decorating the famous gallery of the palace of the Vatican in a similar manner. The Renaissance style of architectural adornment in vogue about the time of Louis XV. of France, furnishes elaborate examples of arabesque enrichment. The accompanying illustration is copied from the decoration of the Alhambra.—*Ref.* Owen Jones's *Alhambra*.



ARABESQUE (FROM THE ALHAMBRA).



ARABIAN ARCHITECTURE, *ă-rai'-bi-an*, the style of architecture introduced into Europe by the Moors, the chief features of which are the peculiar horseshoe arch, and the elaborate system of ornamentation with which the walls of their buildings are adorned. (*See* ALHAMBRA and ARABESQUE.) The Arabs had no buildings of any architectural pretensions before the time of Mahomet; but after this period they had mosques built for public worship, which were designed by architects from Constantinople, who would naturally follow the leading features of Byzantine architecture. (*See* BYZANTINE ARCHITECTURE.) These features were gradually altered and amalgamated with the various styles already adopted in the public buildings of northern Africa and Spain, with the addition of ornament and brilliant colouring, arising from the exuberant imaginative powers of the Moors, ample evidence of which is given in their literary productions, until Arabian architecture reached its perfection in the Alhambra. Many attribute the introduction of modern Gothic architecture to the Moors, specimens of the light and elegant shafts and pointed arches of that style being found in the mosques and palaces of Fez, and cathedrals in Spain built before the adoption of the pointed arch in central Europe. The horseshoe arch of the Moors, from its contraction at the base, unfitted to support any great weight.

ARABIAN LANGUAGE AND LITERATURE.—The Arabic language is one, with the Ethiopic, the southern branch of that great stock of languages commonly known as the Semitic, from being spoken by the descendants of Shem, the son of Noah. It is divided into two principal dialects,—the southern and the northern. The former, called also the Himyarite, though probably the source of the Ethiopic, is now all but extinct, and chiefly known by a few inscriptions; the latter is the language of the Koran, and is the spoken and written language throughout the whole of the Arabian dominions. The Arabic language is noted for the abundance of its roots, the great variety of its formations, and the syntactical delicacy of its construction. It has different dialects in different parts; as in Syria, Egypt, the Barbary states, &c. The best Arabic is spoken by the upper classes in Yemen. Its grammar was little cultivated until a century or two after the time of Mahomet. By war and conquest the Arabic was made the spoken and written language of the whole of Western Asia, of Eastern and Northern Africa, of Spain, and of some of the islands of the Mediterranean, in all which places it has left traces of its former occupancy. It is still the language of religion throughout Persia, the Turkish empire, and all countries in which the Mahometan religion prevails. Of the early literary culture of Arabia we know little. That poetry flourished there at an early period, may readily be inferred from the natural character of the people. They are described as bold, valiant, fond of adventure, proud, and desirous of glory. Even in Solomon's time, the queen of Sheba (probably *Arabia felix*) was noted for her acute sayings. The nomadic tribes, who, under their sheiks, wandered through the territories of Arabia Felix, had everything to favour the growth of poetry,—quick feelings and a warm fancy, fostered and strengthened by their mode of life and the circumstances by which they were surrounded. Even before the time of Mahomet, the Arabs had their poets, who sang of the feuds of the tribes, the deeds of their heroes, and the beauty of their women. During the great fairs held at Mecca and Okadh, in the 5th century after Christ, poetical contests took place. The poems to which the prize was awarded were written in letters of gold, and hung up in the kaaba at Mecca. They were called *modsahabât*, *i.e.* gilt; or *moallakat*, *i.e.* suspended. Of these, seven poems have come down to us, and are characterized by deep feeling, high flights of fancy, richness of imagery and sentiment, a spirit of freedom, and an ardent feeling of revenge and love. The brilliant period of Arabic literature, however, commences from the time of Mahomet, whose doctrines of faith and life were collected and subsequently published, and constitute the Koran. This fired the character of their language, and gave a new stimulus to their literature. Mahomet succeeded in infusing the native valour of the people by an enthusiastic zeal

for religion, and gave them a constitution at once religious and military. In eighty years after his death, his followers had extended their power from Egypt to the Indies, and from Lisbon to Samarcand. Contact with more civilized nations tended to soften their rude character; but it was not till about 750, when the family of the Abassides became caliphs, that the arts and sciences began to progress. These were fostered at the splendid court of Almansar, at Bagdad (754-75); but it was Haroun-al-Raschid (786—808) that infused into his people an enduring love for them. He invited learned men from all parts to his kingdom, and munificently rewarded them. He caused translations to be made of the most celebrated works in Greek, Syriac, and other languages, and circulated them by numerous copies. The caliph Al-Mamun (813-33) offered to the Greek emperor five tons of gold and a perpetual treaty of peace if he would send the philosopher Leo for a time to instruct him. Under his reign, excellent schools and large libraries, at Bagdad, Alexandria, and other places, were established. But while the dynasty of the Abassides were fostering learning at Bagdad, that of the Ommaiades were similarly engaged at Cordova, in Spain, which, particularly in the 10th century, was the chief seat of learning in Europe. Students came from France and other parts of Europe to study, especially mathematics and medicine, at Cordova. Besides the educational institutions at Cordova, the Arabs had established fourteen academies and numerous elementary and middle schools throughout the country. At a time when learning found scarcely any support or encouragement anywhere else, the Arabs were collecting and diffusing it to all parts of the world; indeed, the progress of the Arabs in learning is scarcely less remarkable than their success in conquest. In geography, history, mathematics, medicine, and physics, they have rendered important services, and many of their words are still to be found in the physical and mathematical sciences; as, algebra, alcohol, almanac, azimuth, zenith, nadir, &c. Geography is not a little indebted to the labours of the Arabs; they considerably extended the boundaries of the then known world by their expeditions of discovery; while the geographical treatises of Abulfeda, Edrisi, and others, are still interesting and valuable. After the 8th century, history came to be a favourite subject of study with them. Among their works of this class are the universal histories of Masudi, Tabari, Eutychius, the Christians Abulfaraj and Elmakin, and Abulfeda, Nuvairi, Soyuti, &c. Upon the history of the Arabs in Spain there are numerous works in the Arabic language. For further information on this subject, see Von Hammer's *Encyclopädischen Uebersicht der Wissenschaften des Orients*, 2 vols., Leipsic, 1804. Theology and law, which is nearly related to it, were derived chiefly from the Koran, and formed the chief part of public instruction. They began to speculate on the contents of the Koran during the Ommaiade dynasty, which, with the introduction of the works of Aristotle, led to the formation of various sects of believers. The most celebrated exegeses of the Koran are by Samakhshari and Baidhawi. Their philosophy was related to the Koran in the same way that the scholasticism of the Middle Ages was to the Scriptures. It was of Greek origin, and was drawn chiefly from the works of Aristotle. Among their most distinguished philosophers were Avicenna and Averroes, both of whom have written commentaries upon Aristotle. Many of the Arabian philosophers were also physicians, and they made considerable advances in chemistry, botany, and the knowledge of diseases. Anatomy, however, made no progress with them, as dissections were prohibited by the Koran. Schools of philosophy and medicine were established, and flourished in various parts; as, Bagdad, Alexandria, Ispahan, Cordova, &c. The philosophers Avicenna and Averroes have both written able works upon medicine. On natural history wrote Damiri, Ibn-Baitar, and Kaswini. In mathematics the Arabs made great advances. In arithmetic they introduced the numerals now in use and decimals; and in trigonometry they adopted sines instead of chords. They simplified the trigonometrical operations of the Greeks, and extended the application of algebra. Astronomy was eagerly studied, for which they had famous schools and observatories, at Bagdad and Cordova. But with their progress in the sciences the Arabs did not neglect to cultivate poetry. Their verse gradually allied itself to the prevailing culture, and in their most advanced period of civilization it took a highly artistic form. Except the dramatic, there is no kind of poetry which they have left unattempted; and they doubtless exerted a powerful influence upon modern European poetry. Romances and legendary tales also abounded, the most famous of which are the *Arabian Nights' Entertainments* (*see* next article), the exploits of Antar, the exploits of the Champions, and the exploits of the Hero. It is sad to contrast the position held by the Arabs in the civilized world in the Middle Ages with their present state. As their military glory departed, so seems also to have passed away their intellectual culture. Now they are sunk in stupid indolence, and have no literature worthy of notice.—*Ref.* Brockhaus' *Conversations-Lexikon.*

ARABIAN NIGHTS' ENTERTAINMENTS, a well-known and very popular collection of eastern tales, first made known to Europe by Antony Galland, a French orientalist, under the title of "Les Mille et Une Nuits" (The Thousand and One Nights), 12 vols., Paris, 1704. The work speedily became popular, and was translated into all the European tongues. Improved and more complete editions have since appeared. The best English translation is that by Edward William Lane, which was published in 1839. These tales had long existed in the East before they became known to Europeans: they are supposed to be of Persian origin. Persian tales began to be translated into Arabic about the 8th century, and probably, soon after this time, many of the tales may have been collected, though they were doubtless subsequently added to and improved. The great popularity of the work in Europe is to be accounted for from the great simplicity and vigour of its style, and the powerfully-drawn sensuous pictures with which it abounds,—its gilded palaces, charming women, lovely gardens, and exquisite repasts; while the fearless courage of the Arab knight, his love of adventure, his dexterity and skill, his love and revenge, the craft of the women, the hypocrisy of the priests, and the venality of the judges, are all powerfully delineated. The story that forms the union of the tales is, that the Sultan Schahriar, exasperated by the faithlessness of his bride, made a law that every one of his future wives should be put to death the morning after marriage. At length, Sheherazade, the daughter of the grand visier, by the charm of her stories induced the sultan to defer her execution from day to day, till a thousand and one nights had passed away. By this time, Sheherazade was the mother of three children, whom she led before the throne of her husband, and so induced him to spare her life.

ARABIC, GUM. (*See* GUMS.)

ARABICI, *a-rāb'-i-si*, a sect which sprang up in Arabia about the year 207, who held that the soul died with the body, and also rose again with it. Origen is said to have refuted their error, and prevailed upon them to abandon it. It originated in an opinion then held by many in the early church, that the soul of man was material. There were some revivals of this doctrine in the Middle Ages.

ARABIC NUMERALS.—The characters or figures 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, which should properly be termed Hindoo or Indian numerals; for they were borrowed, as well as the system of decimal notation, by the Arabs from the Hindoos. It is said that Gerbert, afterwards Sylvester II., learned their use from the Moors in Spain in the 10th century. According to another account, Leonardo of Pisa introduced them into Italy in 1202. (*See* ALGEBRA.) Their employment was not general before the invention of printing, and considerable time elapsed before they came into general use. Accounts were kept in Roman numerals up to the 16th century.

ARABIN, *ār'-a-bin*, in Chem., the term for pure gum-arabic. (*See* GUMS.)

ARABLE LAND, *ār'-a-bel* (Lat. *arare*, to plough), ground fit for cultivation, or brought into cultivation by the use of the plough and other agricultural implements. It is the most important of the several divisions under which land may be classed,—viz., arable land, grass land, wood land, common, and waste,—as it

furnishes, with due care in its management, abundant cereal crops, roots, and vegetables for the sustenance of man and animals. An account of the various sorts of soil, with their respective natures and properties, together with information as to the best method of preparing and improving the land, and the rotation of crops most advantageous to the farmer, will be treated elsewhere (*see* SOILS, CULTIVATION OF SOIL, ROTATION OF CROPS, MANURE, TILLAGE, &c.); notices of the most important agricultural implements will also be found under their respective headings. (*See* PLOUGH, HARROW, SCARIFIER, &c.) The principal component parts of all soils are earths, chiefly clay, sand, and lime, mingled in various proportions; the oxides of metals, especially the protoxide and peroxide of iron, the former giving a black and the latter a red colour to the land; saline substances, as potash, soda, &c.; decayed animal and vegetable matter, and water.

ARACEÆ, *a-rai'-se-e*, in Bot., the Arads or Arum family, a nat. ord. of monocotyledonous plants, in the sub-class *Petaloideæ*,—herbs or shrubs with acrid juices and subterranean tubers, corms, or rhizomes. Their leaves are sheathing, usually net-veined and simple, but in rare instances compound. Their flowers are monœcious (male and female organs in separate flowers), and they are arranged on a spadix within a spathe. The order embraces 30 genera and 170 species. The Arads abound in tropical countries, and some few occur in cold and temperate regions. They are all more or less acrid, and often highly poisonous. The type of the order is the genus *Arum* (which *see*).

ARACHIS, *ar'-a-kis*, in Bot., a gen. of plants belonging to the nat. ord. *Leguminosæ*, sub-ord. *Papilionaceæ*. The species *A. hypogæa*, a native of the tropical portion of America, is remarkable for ripening its legumes under the surface of the ground, which characteristic is indicated by the names *underground kidney-bean* and *ground-nut*, commonly given to it. After flowering, the flower-stalks elongate and bend towards the earth, into which the pods penetrate. Each pod contains two, three, or four seeds, which, when ripe, are about the size of hazel-nuts. These seeds are used as food in various parts of the world; for the plant is now cultivated in Africa, Asia, and certain portions of Europe, as well as in its native regions. On being subjected to pressure, these seeds yield a fixed oil, which is extensively employed for cooking in India, where it is called katchung oil. Being a very liquid oil, it has been used in this country for watches, and other delicate machinery, as well as for burning, and other purposes.

ARACHNOID, *ă-răk'-noid* (Gr. *arachnoides*, from *arachne*, a spider, and *eidos*, form or likeness), literally signifies cobweb-like. In Anat., the *arachnoid membrane* is the name of one of the three membranes which envelop the brain and spinal cord. It is situate between the dura and the pia mater, and is a thin glistening membrane. The tissue of the virtreous humour of the eye has also this name.

ARÆOSTYLE, *aï'-re-o-stile* (Gr. *araios*, wide, and *stulos*, a column), a term in Arch., used by Virtruvius to indicate one of his five species of Grecian and Roman temples. It refers to the distance at which the columns of a portico or colonnade should be placed apart, which should be from four to five times the diameter of the columns. Thus, if the columns be a foot in diameter, the distance between them should be from four to five feet This proportion of intercolumniation is assigned more particularly to the Tuscan order of architecture

ARÆOSYSTYLE, *ai-re-o-sis'-tile* (Gr. *araios*, wide, *sun*, together, and *stulos*, a column), applied in Arch. to the proportioning of the space between columns arranged in pairs, with a wide interval between each pair. The columns at the western entrance to St. Paul's Cathedral are arranged in this manner.

ARALIA, *a-rai'-li-a*, in Bot., a gen. of plants belonging to the nat. ord. *Araliaceæ*. It contains a considerable number of species,—trees, shrubs, and herbs, some of which yield useful products. *A. nudicaulis* is a native of North America, where its roots are used popularly in the treatment of rheumatic affections. They are commonly known as false, or American sarsaparilla, and are sometimes forwarded to this country. The bark of *A. spinosa*, the angelica or toothache-tree, and also a native of North America, is used as a stimulant diaphoretic. From the pith of *A. papyrifera* the Chinese prepare their so-called rice-paper. Several species of *Aralia* yield aromatic gum-resins.

ARALIACEÆ, *a-rail-i-ai'-se-e*, in Bot., Ivy-worts, a nat. ord. of dicotyledonous plants, in the sub-class *Calycifloræ*,—trees, shrubs, or herbs closely allied to the umbelliferous plants, but not possessing, in the slightest degree, the poisonous properties so commonly found in those plants. There are 21 genera and 160 species, which are universally distributed; being found in tropical, sub-tropical, temperate, and the coldest regions. The most interesting genera are described under their respective botanical names. (*See* ARALIA, HEDERA, IVY, PANAX.)

ARAMÆAN, or ARAMAIC LANGUAGE, *ăr-a-me'-an*, the language of the country of Aram, a name literally signifying 'high land,' as distinguished from Canaan, or 'low land,' and applied to that district of country which comprised Syria, Babylonia, and Mesopotamia. The Aramaic belongs to the Semitic class of languages, and is divided into two principal dialects,—the Western Aramaic or Syriac, and the Eastern Aramaic or Babylonian. There are also, as minor dialects, the Samaritan and Palmyrene. The Aramæan language is peculiarly interesting, as having been generally spoken by the inhabitants of Palestine, from the Babylonian captivity to the final dispersion of the Jews. As a spoken language, it now exists only in some remote valleys of the mountains of Kurdistan. The Aramaic is generally the harsh, poorest, and least cultivated of the Semitic languages.

ARAUCARIA, *ă-raw-kair'-i-a*, in Bot., a gen. of plants belonging to the nat. ord. *Pinaceæ*, or *Coniferæ*, the Pines, consisting of gigantic trees, natives of the southern hemisphere, and distinguished by having the male and female flowers on separate plants. The species are all evergreen, and their leaves are considerably broader than those of the ordinary pines and firs. *A. excelsa*, commonly called the Norfolk-Island pine, is a most majestic tree, growing to a height of from 160 to 220 feet, and having sometimes a circumference of more than 30 feet. Its timber is white, close-grained, but remarkably heavy, and seldom sound for a great length: the bark abounds in turpentine. This tree occurs in Norfolk Island, New Caledonia, and some parts of Australia. *A. imbricata*, the Chili pine, has been introduced into this country as an ornamental tree, and is now frequently planted on lawns and in shrubberies. Its seeds are edible, and are extensively used for food by the natives of Chili and Patagonia. It is said that the fruit of one large tree will maintain eighteen persons for a whole year. This tree was first found growing on the mountains of the Araucanian Indians, in South America; whence the name of the genus. *A. Bidwillii*, found at Moreton Bay, has also edible seeds.

ARAUCARITE, *a-raw'-ka-rites*, in Geol., a term applied to specimens of fossil wood, resembling in structure that of living Araucaria. These fossils are common in the chalk, wealden, oolite, and lias of Great Britain.

ARBALEST, *ar'-ba-lest* (Lat. *arcubalista*, a crossbow), a weapon of war, the precise date of whose first introduction is unknown; but, according to some, it was in use in the Roman armies as early as the time of Constantine. It is supposed to have been introduced into England by the Normans. It was disused in England, as a weapon of war, in the reign of Henry VIII. The bowmen were distinct from the arbalesters, or crossbowmen. The arrows used with the crossbow were short and thick, and were called quarrels, from the French *carreaux*.

ARBITRATION, *ar-bi-trai'-shon* (Lat. *arbitrium litis*), in Law, is where contesting parties submit the action, suit, or any or all matters in dispute, to the judgment of an indifferent person or persons, called an *arbitrator* or *arbitrators*, to decide the controversy; and where more than one is appointed, it is usual to appoint, or leave the arbitrators to appoint, an umpire (*imperator* or *impar*), to whose sole judgment it is then referred. The decision, in any of these cases, is called an *award*, which is final if not set aside by a court for informality.

ARBOR DIANÆ, *ar'-bor di-ăn'-e.*—The Arbor Dianæ, or silver-tree, is made by dropping a few globules of

mercury into a clean glass bottle, containing a solution of nitrate of silver. If left undisturbed for a few days, beautiful arborescent forms of metallic silver rise from the surface of the mercury, continuing to increase as long as there is any nitrate of silver left in the liquid.

ARBORESCENT, *ar-bo-res'-ent* (Lat. *arbor*, a tree), in Chem., a term applied to crystals that assume a tree-like form. A small quantity of milk added to a solution of any salt will alter its crystallization to the arborescent form. Very beautiful arborescent metallic crystals may be formed for the microscope by placing an atom of copper in a drop of nitrate of silver, placed on a glass slide. (*See* CRYSTALLIZATION.)

ARBORICULTURE, *ar'-bor-i-kul-ture* (Lat. *arbor*, tree), the art of cultivating trees. The term is usually restricted to the planting and management of timber-trees; the cultivation of fruit-trees being regarded as a branch of horticulture. The ancients obtained their timber from natural forests, and only practised arboriculture in landscape-gardening, or in forming public walks near their cities. In America, tree-felling, instead of tree-planting, occupies the time of the improvers of land; and it will be long before arboriculture will be practised on an extensive scale on a continent so thickly wooded. The cultivation of timber-trees is unnecessary whilst natural forests are abundant. In England, plantations for timber and fuel were first established in the 16th century; and from that period arboriculture has steadily advanced. In the 17th century, the publication of Evelyn's *Sylva* did much to promote the taste for the art; and the greatly-increased demand for oak for shipbuilding gave a new impulse to its practice. No extensive plantations were made in Scotland until the beginning of the 18th century, or in Ireland until the close of that century. In France and Germany, and in other parts of Europe, economical arboriculture has not made much progress, and is still almost confined to the management of natural forests. In this department, however, the continental peoples, particularly the Germans, have made great strides, and have developed to their fullest extent the resources of their vast timber districts. Plantations are usually formed in Britain with seedlings,—young trees raised from seed in nurseries; but sometimes, also, by sowing the seed on the ground which is intended for the plantation. Some authorities pronounce the latter plan to be the better of the two, believing that finer trees are produced when the seedlings are permitted to remain undisturbed on the ground in which they passed through their first stages of development. The gaps formed by the removal of timber in the natural forests of France and Germany are invariably filled up by sowing the seed. Trees may be conveniently classified according to their uses. The following is the system usually adopted:—1. Resinous or coniferous trees,—the pines and firs. These yield straight timber for masts and long planks. 2. Hard-wooded trees; as the oak, ash, elm, beech, chestnut, walnut, sycamore, birch, thorn, hickory, holly, and box. Most of these trees furnish handsome, strong, and durable timber, such as is suitable for shipbuilding, household furniture, carts, tools, and various mechanical purposes. Some of them—the oak and chestnut, for instance—afford crooked pieces of timber for knees or bends in the ribs of ships; others, such as the thorn and hickory, give pieces of remarkable toughness. 3. Soft-wooded trees; as the poplar, lime, horse-chestnut, alder, and willow, which yield wood suitable for turnery, basket-work, fuel, and a variety of useful purposes. In this class we may include the trees which are grown for flexible suckers and spray, to form hoops, baskets, besoms, and poles. —*Ref.* Brown's *Forester;* Chambers's *Information*—Arboriculture; *Traité des Arbres et Arbustes*, par Duhamel du Monceau, Veillard, Saint-Hilaire, Mirbel et Poiret.

ARBOR VITÆ, *ar'-bor vi'-te* (Lat., tree of life.) (*See* THUJA.)

ARBUSCULUS, *ar-bus'-ku-lus*, in Bot., a term employed to denote a tree of small size.

ARBUTUS, *ar-bu'-tus*, in Bot., a gen. of plants belonging to the nat. ord. *Ericaceæ*, consisting of small trees and shrubs, most of them natives of America. The fruit is fleshy and many-seeded; in some species resembling in shape and colour that of the strawberry. The corolla is urn-shaped. The most remarkable species is *A. unedo*, which is a native of the south of Europe and the Levant, but now found also in Asia and America. It is cultivated as an ornamental evergreen-tree in Britain, where it frequently attains the height of nearly twenty feet. It is commonly called the strawberry-tree. The most interesting specimens in the British isles are at the Lakes of Killarney, where they form lovely groves. *A. Andrachne*, the Oriental arbutus, is even more elegant than the common species; but, at the same time, it is much more delicate, and will not thrive in our variable climate. *A. furens* is a small shrub growing in Chili, and yielding a fruit having strong narcotic properties.

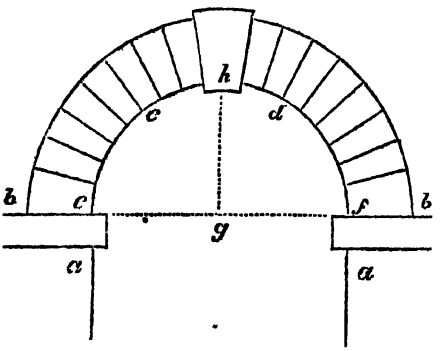
ARC, *ark* (Lat. *arcus*, a bow), in Geom. signifies any part of a curve line. The straight line which joins the extremities of the arc, is called its chord. The practical operation for finding the length of an arc is as follows:—Divide the arc into a number of smaller arcs, making the number large in proportion to the degree of accuracy required, then add together the chords of the smaller arcs. The sum of the chords will differ but little from the arc, even when the subdivisions are not numerous. For example,—the arc of the quadrant of a circle whose diameter is 10,000,000 of inches is 7,853,982 inches within half an inch. Divide this quadrant into ten equal parts, and the sum of the chords is 7,845,910 inches; divide the quadrant into fifty parts, and the same sum is 7,853,659 inches, which is not wrong by more than one part out of 24,316. For only twenty subdivisions the sum of the chords is 7,851,963 inches, wrong only by one part out of 3,890; therefore, for every practical purpose, an arc of a circle—and the same may be said of every other curve—is the polygon made by the chords of a moderate number of subdivisions of the arc.

ARCADE, *ar-kaid'* (Fr.), in Arch., a term applied to a series of arches of any form supported on pillars either inclosing a space before a wall or any building which is covered in and paved, or, when used as an architectural feature, for ornamenting the towers and walls of churches entirely closed up with masonry. The cloisters of the old monasteries and religious houses were, strictly speaking, arcades; and the covered walk round Covent-Garden Market is an arcade, wrongly called a piazza. The term is also applied to a covered passage, with shops on either side, as the Lowther and Burlington Arcades in London. Beautiful specimens of the ornamental arcade may be found in many of our cathedrals and churches, as well as in many ruins; among which may be mentioned the striking and magnificent remains of Glastonbury Abbey, Somersetshire.

ARCANUM, *ar-kai'-num* (Lat., a secret), a term frequently employed by the old alchemists and philosophical writers, and usually used to designate any substance the mode of preparing which was kept secret. Thus, the ancient chemical philosophers called the red oxide of mercury, which was produced by the action of nitric acid, *arcanum corollanum;* sulphate of potash was termed, by the same writers, *arcanum duplicatum*, &c.

ARCH, *arch* (Lat. *arcus*, a bow, a curved line), a structure, generally of stone or brick, in a curved form, over an open space, the pieces of which are arranged in a manner calculated to bind them closely together by the pressure of one against another, rendering them capable of supporting a great weight of masonry above them. The ends of an arch are supported on columns or sides of masonry, called *abutments* or *piers* (*a*, *a*), rising perpendicularly from the ground; the arch is said to spring from its piers, and the first stones resting on the piers on either side (*b*, *b*) are sometimes called the *springing-stones*. The upper part of the arch is called the *crown* (*c*, *d*), and the stone in the centre (*k*), in the form of a wedge, which locks or binds the arch together, is termed the *keystone*. The sides of the arch (*ec*, *df*), between its crown and piers, are called its *haunches*, or *flanks*. The stones which compose the arch, all wedge-shaped, smaller at the under end than at the upper, are called *voussoirs*, while the under ends of the stones are called the *intrados*, or *soffit*, and the upper ends the *extrados*, or *back*. The line joining the extremities of the arch (*ef*) is called its *span*, and one drawn perpendicular

to the span, from its central point to the centre of the bottom of the keystone (*gk*), its rise. These lines are also called the *chord* and *versed sine* of the arch. The Egyptians and Assyrians are said to be the first nations who used the arch in their buildings; arches, both of stone and brick, having been found by Belzoni, Wilkinson, and Layard, at Thebes, Gizeh, Nimroud, and Khorsabad. The form of the arch is supposed to have been known to the Greeks, although there is no evidence, in the remains of their temples, to show the truth of the supposition. The Romans were fully acquainted with its constructive value, and were probably the means of introducing it, in its most simple and primary form—that of a semicircle—into European architecture. The Britons and their priests, the Druids, were entirely ignorant of its use; the Saxons, however, approached the form of the arch by placing two stones in a slanting position against each other, like the sides of an equilateral triangle, supporting them on piers. The only forms used, until the adoption of the pointed arch in Mediæval architecture, in the 12th century, were the semicircle, segment of a circle, and ellipse. The horse-shoe form, peculiar to Arabian architecture, was probably derived from the segment of a circle greater than a semicircle. The pointed arch was used by the Arabs as early as the 9th century, and is supposed to have been introduced into Europe at the close of the first crusade, and adopted, in various forms, as a prominent feature in Gothic architecture. The mechanical principles of the construction of arches will be treated elsewhere. (*See* Bridge and Equilibrium of Arches.)



ARCH.

Arch, Triumphal, was a structure raised by the Romans to celebrate a victory, some grand historical event, or to add a greater lustre to the commemoration of the military deeds of a victorious general. These monuments had their origin in the custom of adorning with the spoils of war the gate by which a successful military leader entered Rome on his return from the battle-field. In time, these temporary monuments gave place to others of an enduring nature, such as stone or bronze. The *arcus triumphalis*, as this kind of structure was termed by the Romans, was generally erected in some main thoroughfare. The design was commonly either one large arch, or one large central arch, with one or two smaller ones at each side. In every case the fronts and sides of the structure were ornamented with trophies, the entablature being surmounted with some piece of sculptural allegory, beneath which was an inscription narrating the deeds of the hero in whose honour the arch was erected. Many of these celebrated structures are still in existence, the most remarkable being,—the arch of Augustus, at Rimini; the arch of Trajan, at Beneventum, and another at Ancona; at Rome, those of Constantine, Septimius Severus, Drusus, Gallienus, and Titus; the most beautifully-proportioned, and at the same time the oldest, being that of Titus, whose conquest of Judæa it was built to celebrate. The triumphal arch which is in the most perfect state of preservation is that of Constantine. Many similar monuments of departed Roman greatness are in existence in various parts of France, Greece, Spain, and Egypt. In modern days France has the greater number of these structures. Paris possesses the triumphal arches of the Porte St. Denis and St. Martin, built respectively in 1673 and 1674, to celebrate the victories of Louis XIV. The fine Arc du Carrousel, forming the western entrance of the Tuileries, erected to the honour of the French armies, was commenced in 1806, and finished in 1809, its height being 47 feet, its breadth 55. Surmounting the structure is a grand equestrian group, formed of a chariot, to which four horses are yoked, the steeds being guided by the allegorical statues of Peace and Victory. But the grandest and most colossal triumphal arch erected by the moderns is that standing at the end of the Avenue des Champs Elysées, at Paris. It was erected in commemoration of the victories of Napoleon I. and his armies, and, although commenced in 1806, was not completed till after the revolution of 1830. It has three arches, the height of the central one being 95 feet: In the interior are graven the names of the most celebrated French generals, with that of their leader. The English capital possesses only two structures of this kind,—the arch at Hyde Park, upon which the equestrian statue of the duke of Wellington is placed, and the Cumberland Gate.

Archæocidaris, *ar'-ke-o-sid'-a-ris* (Gr. *archaios*, ancient; *kidaris*, turban), in Geol., a gen. of turban-shaped sea-urchins, found in a fossil state, in carboniferous and Permian strata. (*See* Cidaris.)

Archæoniscus, *ar'-ke-o-nis'-kus* (Gr. *archaios*, ancient; Lat. *oniscus*, woodlouse), in Geol., a gen. of fossil crustaceans, occurring in the Purbeck strata, and bearing considerable resemblance to the common woodlouse.

Archæology, *ar-ke-ol'-o-je* (Gr. from *archaios*, old, ancient, and *logos*, a discourse), the name of the science which causes us to become acquainted with the antiquities of nations that have risen and fallen, and the remains of various kinds which throw a light upon the history of those that exist at the present time. Almost every kingdom now boasts its national archæological society; and in England there are many local associations, the members of which are sedulously engaged in the study and discovery, as well as the preservation, of the antiquities in their immediate neighbourhood, and in the counties in which they have been instituted. The term is capable of a very widely-extended signification, including everything that is connected with the rise and progress of any nation, its history, laws, religious observances, public and private buildings, manners, and customs of all classes of the people, the arts in use among them, and the extent of their acquirements in science and scientific discoveries. The archæologist seeks to study and preserve any materials which tend to elucidate the subjects already mentioned, and these materials naturally resolve themselves into three great classes, each capable of further subdivision. The first class may be considered to consist of all records, written or printed, legal documents, old chronicles, diaries of a public or private nature, state papers, letters, &c. The second may be termed oral, or traditional, in contradistinction to the first, which may be broadly called written archæology, and consists of the ballads, legends, and folk-lore of a people, their sports, superstitions, and the rise and origin of local customs, proverbs, and expressions. The third, termed monumental archæology, consists of works of art, paintings, sculpture, coins, medals, glass, pottery, utensils of wood, metal, and other materials; tools of every description, armour, weapons, carriages, boats, roads, canals, walls, encampments, burial-places, earthen mounds for purposes of defence or sepulture, and even human remains and those of animals. The British Museum contains an abundant store of Egyptian, Assyrian, Greek, Roman, British, and other antiquities; and in many local collections, both of a public and private character, there are ample gatherings for the study of archæology; but they are principally materials of a monumental nature. Additions to these collections are continually being made by exploration. In the great works now constructing under London itself, many feet below the present surface, tesselated pave-

ments, coins, tools, walls, and other remains, are constantly laid bare, which, in conjunction with such discoveries as that of the buried Roman city of Uriconium, or Wroxeter, lately found near the borders of Wales, are invaluable in illustrating the habits of a people that once held Great Britain as a tributary province, unrolling a page in which the antiquary can read many a fact traced in characters which cannot be mistaken. Societies such as the Roxburgh, Bannatyne, and Maitland clubs, have principally turned their attention to the preservation and reproduction of old printed records, and the publication of old writings of all sorts; while Sir Henry Ellis may be considered as one of the most active promoters of the preservation of traditional archæology, or folk-lore, as his edition of Brand's "Popular Antiquities," published some twenty years since, will fully show. The government of this country, which formerly looked with suspicion on the enrolment of a society of archæologists, now offers every facility and inducement to encourage the study of this science. The Society of Antiquaries, the parent society of all the associations now in existence in England, was founded in 1572, and broken up about thirty years after, by order of James I. It was revived in 1707, and the members received a charter of incorporation in 1751. In 1780 the Scottish Society of Antiquaries was founded, and, six years after, the Royal Irish Academy, instituted for a similar purpose. All these societies have given their attention to the collection of archæological records of all sorts, and possess valuable museums. Among other societies of a similar nature on the continent, may be mentioned the Royal Society of the North, at Copenhagen. The museums of Paris and Naples possess fine collections of Egyptian, Greek, and Roman antiquities, the officers of the latter especially collecting Roman remains from the excavations made on the sites of the cities of Pompeii and Herculaneum, buried by an eruption of Vesuvius in the year 79. Every country possesses, in a greater or less degree, relics of antiquity of the greatest interest to the archæologist. From the sculptured stones and obelisks of Egypt and Assyria, records have been unravelled by Rawlinson, Layard, and others, that throw great light on the early history of these countries, and offer convincing testimony to the indisputable truth of Holy Writ. In Mexico and Central America, evidences have been traced of the existence of a clever and ingenious people that had passed from the surface of the earth before the discovery of the Western hemisphere by Columbus. In all countries, especially those under British rule, collections of antiquities are eagerly made; and in proportion to the encouragement and advance of archæology, history will become the record of a people's customs and household words, instead of a stern catalogue of bloody wars and the ruthless deeds of kings and ambitious men who sought to make the people stepping-stones by which they might gain the objects of their desire.

ARCHAISM, *ar'-kai-ism* (Gr. *archaios*, ancient), is a term employed in Lit. and Rhet. to denote the use of an obsolete word or phrase, in order to give an air of antiquity to the passage in which it occurs.

ARCHANGEL, *ark'-ain-jel* (Gr. *archē*, chief, and *aggelos*, an angel), a term employed to denote a high order of angelic beings. In Scripture the term is only applied to Michael, and is nowhere employed in the plural. Holy Writ seems to indicate that there are different degrees and orders among angelic beings, but gives no specific information on the subject.

ARCHANGELICA, *ark-an-jel'-i-ka*, in Bot., the herb Archangel, a gen. of plants belonging to the nat. ord. *Umbelliferæ*. The species are mostly herbaceous and perennial, natives of the cold and temperate regions of the northern hemisphere. *A. officinalis*, the garden angelica, is an indigenous biennial, growing in watery places, but somewhat rare in this country. It grows in moist situations, and flowers from June to September, the blossoms being greenish-white. Its root is large and fleshy, resinous, and pungently aromatic. It is imported from Hamburg in the dried state for medicinal purposes, being stomachic and carminative. The fruit, improperly termed the seed, has similar properties. The tender stems and mid-ribs of the leaves are boiled in syrup, and, when dried, constitute candied angelica, which, taken as a dessert, is a very agreeable stomachic. The plant is cultivated for the purpose of candying in the neighbourhood of London. Large quantities of angelica are consumed by the rectifiers in the preparation of London gin and the liquor known as "bitters."

ARCHBISHOP, *arch-bish'-op* (Gr. *archē*, chief, and *episkopos*, bishop), is the title given to a bishop who, besides exercising episcopal authority in his own diocese, has an admitted superiority, and a certain jurisdiction, over the bishops in his province, who are sometimes called his suffragans. He is also sometimes called primate or metropolitan. The title came into use in the 4th century. At first the term was considered as equivalent to patriarch, or bishop of an imperial diocese; as Rome, Constantinople, Antioch, Alexandria, Ephesus. After the 6th century the archbishop of Rome assumed the title of Pope. In England there are two archbishops, of whom the one has his seat at Canterbury, the other at York. The archbishop of Canterbury is styled Primate of all England, and is the chief medium of communication between the crown and the clergy, being consulted by the ministers on all questions touching the ecclesiastical part of the constitution. He has precedence of all temporal peers except those of the blood royal. The Lord-Chancellor takes precedence after the archbishop of Canterbury, and before the archbishop of York, who is styled Primate and Metropolitan of England. His province consists of the six N. counties, with Cheshire, Nottinghamshire, and the Isle of Man, and he has six suffragans—the bishops of Durham, Carlisle, Chester, Ripon, Manchester, and Sodor and Man. The rest of England constitutes the province of the archbishop of Canterbury. The precise amount of superintendence or control which may be exercised by an archbishop over the bishops of his province does not seem to be very accurately defined; but if a bishop introduces irregularities into his diocese, or is guilty of immoralities, the archbishop may call him to account, and even deprive him of his office. In Ireland there are two Protestant and four Roman Catholic archbishops. Of the former, the archbishop of Armagh is styled Primate of all Ireland, and has five suffragan bishops; the archbishop of Dublin is Primate of Ireland, and has also five suffragan bishops. The election of an archbishop does not differ from that of a bishop (*see* BISHOP); but while a bishop is only installed in his office, an archbishop is enthroned. An archbishop is styled "Grace," and "Most Reverend Father in God;" and writes himself "by Divine Providence;" a bishop is styled "Lord," and "Right Reverend Father in God," and writes himself "by Divine Permission." During the vacancy of a see, the archbishop is guardian of the spiritualities; and he also nominates to the benefices or dignities at the disposal of the bishops in his province, if not filled up within six months. Every bishop, whether created or translated, is bound to make over by deed the next presentation of such benefice or dignity belonging to his see, as the archbishop may choose. The archbishop of Canterbury claims the right of placing the crown upon the head of a king at his coronation; and the archbishop of York claims to perform the same office for the queen consort.—*Ref.* Knight's *English Cyclopædia*.

ARCHDEACON, *arch-de'-kon* (Gr. *archē*, chief, and *diakonos*, a servant or officer), is an ecclesiastical dignitary next to a bishop. Each diocese comprises one or more archdeaconry, over which one of the clergy is appointed to preside. He must be a priest of at least six years' standing; and his duty is to visit his archdeaconries from time to time; to see that the churches, and especially the chancel, are kept in repair, and that everything is done conformably to the canons; and to receive from the churchwardens representations of any matter of public scandal. The visitation may take place yearly, but must be within three years. He has power to hold a court within his archdeaconry to hear ecclesiastical causes; but an appeal lies to the higher court of the bishop. The income from an archdeaconry is now so small, that the office is generally held by those who have also benefices or other preferment in the Church. The archdeacon was originally merely the chief of the deacons, who were the attendants and assistants of the bishop in church

affairs. His functions were confined to attending upon and assisting the bishop in the discharge of his spiritual duties, and the management of his diocese, without having at first any jurisdiction. There are sixty-seven archdeaconries in England and Wales.—*Ref.* Knight's *English Cyclopædia.*

ARCHDUKE, *arch-duke'*, a duke whose authority and power is greater than that of other dukes. In France, in the reign of Dagobert, there was an archduke of Austrasia; and, at a later period, the provinces of Brabant and Lorraine were termed archduchies. The dukes of Austria assumed the title of archduke in the year 1156; but the dignity was not confirmed till 1453. In the present day, none but the princes of the house of Austria affect the title.

ARCHEGOSAURUS, *ar'-ke-go-saw'-rus* (Gr. *archegos*, beginning, *sauros*,' lizard), in Geol., the name signifying 'primeval lizard,' given by Goldfuss to a reptile of the Carboniferous era, allied to the existing reptiles, the proteus and lepidosiren.

ARCHER. (*See* ARCHERY.)

ARCHER-FISH, *ar'-cher fish*, a curious little fish inhabiting the Chinese seas. Lurking near the surface of the water, it awaits the approach of an insect, and then suddenly squirts at it a drop of water, which infallibly brings it down. It is about seven inches long, and has a wide mouth, with the lower jaw considerably prolonged. The Chinese keep these fishes in jars, and amuse themselves by watching the effect of suspending a fly above a jar with a thread.

ARCHERY, *ar'-che-re*, the art of shooting with a bow and arrow, so called from the Latin word *arcus*, a bow. With respect to the origin of archery, we know nothing more than that it must have been practised at a very early period; for we are told that Hagar, in order not to see her son die, set herself down a good way off, as it were a bow-shot; and soon after it is said that Ishmael dwelt in the wilderness, and became an archer. The bow and arrow are frequently mentioned in Scripture, more particularly in the accounts of the wars of the Jewish people. Indeed, down to the introduction of gunpowder, the bow-and-arrow was an implement of warfare among all nations in all states of civilization. Great dependence was usually placed upon the archers in war; and frequently the success of a battle has been attributed to their means, as at Cressy, Poitiers, and Agincourt. It is believed that the long-bow was common in England long before the Saxon invasion. The Saxons were expert archers, both in battle and in field sports. The Normans brought with them the arbalest, or crossbow; but, from the reign of Edward II., the long-bow, the favourite national weapon, seems to have been fully established. Edward III. directed the sheriffs of shires to see that the people exercised themselves in their leisure time in archery, in place of following useless or unlawful games or amusements. Chaucer, in his prologue to the Canterbury Tales, gives the following carefully-drawn picture of an archer of his day:—

> "And he was clad in coat and hood of green;
> A sheaf of peacock arrows, bright and keen,
> Under his belt he bare full thriftily.
> Well could he dress his tackle yeomanly;
> His arrows drooped not with feathers low,
> And in his hand he bare a mighty bow.
> His head was like a nut, with visage brown:
> Of woodcraft all the ways to him were known.
> An arm-brace wore he, that was rich and broad,
> And by his side a buckler and a sword;
> While on the other side a dagger rare,
> Well sheathed, was hung; and on his breast he bare
> A large St. Christopher of silver sheen.
> A horn he had, the baldric was of green,—
> A forester truly, was he, as I guess."

Under Edward IV. a precept was issued, commanding that every Englishman and Irishman in England should have a bow of his own height; and butts were ordered to be set up in every township for the inhabitants to shoot at; and, if any one neglected the use of his bow, he was subject to a fine. In the reign of Henry VIII. it was ordained, that every man under sixty, except spiritual men, justices, &c., should use shooting with the long-bow, and have a bow and arrows continually in his house; that every father shall provide a bow and two arrows for his son when he shall be seven years old; and that every servant above seventeen and under sixty years of age shall pay 6*s.* 8*d.* if he be without a bow and arrows for one month. Latimer, in one of his sermons before Edward VI., published in 1549, strongly enforced the practice of archery, saying,—"In my time my poor father was as diligent to teach me to shoot as to learn me any other thing; and so, I think, other men did their children. He taught me how to draw, how to lay my body in my bow; and not to draw with strength of arms, as other nations do, but with strength of the body. It is a godly art, a wholesome kind of exercise, and much commended in physic." After the destruction of the Spanish Armada, fears being entertained lest the king of Spain should send an emissary to attempt the life of Queen Elizabeth, a number of noblemen of the court formed themselves into a body-guard, for the protection of her person, and, under the denomination of the "Companie of Liege Bowmen of the Queene," had many privileges conferred upon them. Upon the accession of James I. this company was disbanded, although those who composed it retained the privileges which had been conferred upon them by Elizabeth. Upon the breaking out of the civil war, Charles I. reorganized this body-guard, which attended him against the parliamentary forces, and afterwards emigrated with Charles II. At the Restoration this company was maintained, and, under the title of the "Royal Company of Archers," received a new charter; it afterwards merged in the Artillery Company of London. Recently, archery has come to be revived as an amusement, and societies have been formed for the practice of it in various parts of the country. The Toxophilite Society of London was first established in 1781. One of the largest and most flourishing of these societies is the "Royal Company of Archers of Scotland." It is said to owe its origin to the commissioners appointed by James I. of Scotland to superintend and regulate the practice of archery throughout the country, when a number of the most expert archers were selected to form a body-guard for the king. They claimed the honour of acting in this capacity on the occasion of the visits of George IV. to Edinburgh, and they now constitute part of the royal household in Scotland. The principal instruments of archery are the bow, string, arrow, glove, and brace. Bows are of two kinds, called self-bows and back-bows. Self-bows are those that are made of only one piece of wood, the best being foreign yew. Back-bows are composed of two kinds of wood, being strengthened by a piece of ash or other tough wood, firmly glued to the



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back. The length of a bow should be adapted to the strength of the individual that is to use it. As a general rule, it should be about his own length. Ladies' bows are in general about 5 feet long; men's bows from 5 ft. 6 in. to 5 ft. 10 in. The strength of a bow is usually calculated by the number of pounds weight suspended from the bowstring it takes to draw the bow down to the length of the arrow. Fifty pounds is the standard weight; and to draw a bow of sixty pounds requires more than an ordinary degree of strength. The bowstring is generally made of Italian hemp, strongly twisted, and dressed with gum or Indian glue, to preserve it from wet. The arrow, or shaft, as it is commonly called, has three principal parts,—the stele or wooden portion, the head or pile, and the feather. Ascham enumerates no less than fifteen kinds of wood of which steles are made; the best, however, are made of ash. An arrow is furnished with three feathers, one of which, of a different colour from the others, is placed uppermost on the string, and is called the cock-feather. The piles or heads are made either blunt or sharp; the advantage of the former kind being, that they are more easily extracted than the latter. The weight of the arrow should be proportioned to the strength of the bow. For bows of 5 feet, arrows of 24 inches are commonly used; and for those of 5 feet 9 inches, arrows of 28 or 29 inches. The nock of the arrow is usually cased with horn, and should be made so as to exactly fit the string. The shooting-glove is used to protect the fingers from being injured by the string, and consists of three finger-stalls, back-slips, and a cross-strap buttoned round the wrist. The brace is a piece of stout polished leather, buckled round the bow arm, to protect it from the string, as well as to allow the string to glide sharply and quickly over it. Besides these, there are the quiver, a tin case for holding the arrows not immediately in use, and the belt, worn round the waist, from which are suspended the tassel for wiping the arrows, and the grease-box, containing a composition with which the fingers and brace are occasionally anointed, and which has also a pouch for holding arrows intended for present use. To be a good archer demands long and continuous practice. The muscles of the body must be brought into a certain degree of strength and firmness, the mind must be calm and collected, and the eye steadily fixed upon the mark. The principal points to be attended to in practice are standing, nocking, drawing, holding, and loosing, on each of which much useful information will be found in the *Toxophilus* of Roger Ascham. The distance to which an arrow can be sent by a good archer is generally from 200 to 250 yards. In target-shooting, the face of the target has a gold centre, with red, inner white, black, and outer white circles surrounding it. The value of the hits is ascertained by multiplying those in the centre by nine, in the red by three, in the inner white by two, by adding a fourth to those in the black, while those in the outer white remain unaltered; as thus:—

| | *Gold.* | *Red.* | *Inner White* | *Black.* | *Outer White* | *Total.* | *Value* |
|---|---|---|---|---|---|---|---|
| A | . | ... | ..... | ..... | ..... | 37 | 61 |
| | | | .. | ..... | ..... | | |
| | | | | . | ..... | | |
| B | .. | ..... | ..... | ..... | ..... | 37 | 74 |
| | | . | .. | .. | ..... | | |
| | | | | | ..... | | |

—*Ref.* Blaine's *Encyclopædia of Rural Sports.*

ARCHES, COURT OF, *ar'-ches* (Lat. *curia de arcubus*), the chief, and most ancient consistory court, belonging to the archbishop of Canterbury, for debating of spiritual causes, whereof the judge (who sits as deputy to the archbishop) is called the *Dean of the Arches;* because he anciently held his court in the church of St. Mary-*le-Bow*, in Cheapside (*Sancta Maria de Arcubus*), though all the principal courts are now holden at Doctors' Commons. Bow Church is so named from the steeple, which is raised by pillars built archwise, like so many bent bows.

ARCHETYPE, *ar'-ke-tipe* (Gr. *archetupos*, from *arche*, chief, and *tupos*, form), properly signifies the pattern or model after which anything is made. In Phil. the term was used by Plato to denote the idea or pattern of the world which existed in the mind of Deity previous to its creation, and according to which it was made. Hence, all things were formed after original archetypes in the Divine mind, which thus possessed within itself an archetypal world corresponding to this sensible world; while our minds, as partaking of the nature of the divine, also have archetypal forms of sensible objects.

ARCHIL, or ORCHIL, *ar'-kil* or *arch'-il.*—The red, violet, and blue colouring matters known in commerce by the names of archil or orchil, cudbear and litmus, or turnsole, are obtained from the *Rocella tinctoria*, and other lichens growing on the rocks of the Canary and Cape de Verde Islands, the Cape of Good Hope, the Pyrenees, and other parts of the world. The colouring matter, which is termed by chemists *erythrene*, does not exist in the lichens ready formed; but they contain certain acids, which, under the influence of alkalies, are transformed into colouring matter. The lichens are first cleaned and made into a paste with stale urine, to which lime has been added. This mixture is exposed to the air for some weeks, fresh urine being added from time to time. The paste thus obtained is dried, and constitutes the archil of commerce. Cudbear is obtained similarly from the *Lecanora tartarea*. Litmus is prepared from *Rocella tinctoria*, carbonate of potash and carbonate of ammonia being substituted for the urine. It is made up for the market into little cubes with chalk or plaster of Paris. These dyes are rarely used alone, from their want of permanence; but they are extremely valuable in imparting bloom and force to other dyes.

ARCHIMANDRITE, *ark'-i-măn-drite* (Gr. *arche*, chief, and *mandra*, a fold or monastery), in the Greek church is the title of the superior of a monastery, and is equivalent to abbot.

ARCHIMEDEAN SCREW, or SPIRAL PUMP, *ar-ki-me'-de-an*, a machine invented by Archimedes, the celebrated Syracusan philosopher, while studying in Egypt. (*See* ARCHIMEDES, vol. I. of this work.) Observing the difficulty of raising water from the Nile to places where the flood tide could not reach, he is said to have devised this screw as a means of overcoming the obstacle. It consists of a pipe twisted spirally round a cylinder, which, when at work, is supported in an inclined position. The lower end of the pipe is immersed in water, and when the cylinder is made to revolve on its own axis, the water is raised from bend to bend in the spiral pipe until it flows out at the top. The Archimedean screw is used in Holland for raising water and draining low grounds. The Dutch water-screws are mostly large, and are moved by the wind: one windmill furnishes the motive power to several screws.

ARCHIMEDES, PRINCIPLE OF, *ar-ki-me'-dees*, a celebrated principle in the science of Hydrostatics, the discovery of which is attributed to the Syracusan philosopher whose name it bears. This important theorem may be thus expressed:—When a solid is immersed in a fluid, it loses a portion of its weight, and this portion is equal to the weight of the fluid which it displaces, that is, to the weight of its own bulk of the fluid. An experimental proof of this highly-important principle is obtained in the following manner:—From one of the arms of a balance is suspended a hollow cylinder, having a cylindrical mass of any substance capable of exactly fitting into it hanging from it by means of a thread. From the other arm of the balance hangs a scale-pan, into which weights are placed until the solid cylinder and the hollow one are exactly counterbalanced. Water is then poured into a vessel around the solid cylinder, until it is completely immersed; upon which the weights in the scale-pan will preponderate, the solid cylinder seeming to have lost a considerable portion of its weight. The balance will, however, be once more brought into equilibrio if water be poured into the upper hollow cylinder until it is quite full. Now, as this hollow cylinder is of such a size that the solid mass exactly fits its interior, it follows that the water with which the hollow cylinder is filled is precisely equal in bulk to the solid cylinder, which proves that the apparent loss of weight suffered

by the latter is precisely equal in weight to a mass of water equal in bulk to itself. This very ingenious method forms one mode—not the most exact, however—by which the specific gravity of solids is ascertained. (*See* SPECIFIC GRAVITIES.) A wonderful story is told in connection with the discovery of this celebrated principle. Hiero, king of Syracuse, intending to make an offering to the gods of a crown, commissioned a goldsmith to manufacture one of pure gold. After a time, the crown was brought home, of the full weight; nevertheless, it was suspected that a part of the gold had been stolen, and a like weight of silver substituted. Archimedes was desired to devise a means of detecting the fraud, and while engaged in solving the difficulty, he happened to go into the bath, where, observing that a certain quantity overflowed, equal to the bulk of his body, he instantly saw that what Hiero sought to know might be obtained. Carried away by his ardour and delight, he is stated to have hastened home without waiting to dress, crying out, "*Eureka! eureka!*" (I have found it! I have found it!)

ARCHITECT, *ar'-ke-tect* (Gr. *architekton*, the chief fabricator), a person skilled in architecture, or the art of building, who forms plans and designs for edifices, and under whom the work is conducted to completion. A thorough knowledge of mathematics is an indispensable qualification in an architect; he should also be expert in perspective-drawing. His emoluments are generally 5 per cent. on the amount of money expended. Perhaps the most remarkable instance of a departure from this established principle was made in the case of the late Sir Charles Barry, the architect of the Westminster Palace. Some time after the commencement of this structure, it was arranged that the architect's remuneration should consist of £25,000, a sum which, although subsequently increased, was immeasurably below that which he would have received had the ordinary rate of requital been followed.

ARCHITECTURE, *ar-ki-tek'-ture* (Lat. *architectura*, art of building; Gr. *archos*, chief, and *tekton*, a builder or workman), the science of building or construction, consisting of three principal divisions,—civil, naval, and military architecture. Civil architecture is that branch of the science which instructs us in the art of erecting buildings of a public and private character, bridges, and other works, in wood, iron, and masonry; the construction of buildings, such as churches, theatres, and houses of all kinds, belonging to architecture, properly so called; while that of bridges, docks, harbours, tunnels, breakwaters, &c., is the especial province of the civil engineer. Naval architecture, in which the English particularly excel, treats of the different methods of building ships and vessels of all kinds, with reference to speed, strength, and capacity for stowage (*see* SHIPBUILDING); while military architecture, or fortification (*see* FORTIFICATION), is the art of constructing works of defence, such as citadels, fortresses, and their outworks, and other constructions used for protection in warfare, by means of which we may most effectually guard against the attack of an enemy, that might be made by sea or land, on any place in which government stores are kept, naval and commercial harbours and ports, and towns situated on the frontier line of continental powers. There are five orders of architecture, known as the Tuscan, Doric, Ionic, Corinthian, and Composite, proceeding from forms of extreme simplicity to others of great beauty and elegance in design, replete with highly-elaborated ornamentation. There are also numerous styles of this important art, notices of which will be found under their respective headings. (*See* ARABIAN; ASSYRIAN, BYZANTINE, CELTIC, EGYPTIAN, GOTHIC, GREEK; HINDOO, NORMAN; RENAISSANCE; ROMAN; ARCHITECTURE, &c.) The science generally may be broadly considered under three grand divisions,—ancient, mediæval, and modern; in the first of which it may be traced from its origin to its improvement under the Greeks and Romans; in the second, its state and style under the Goths, Saxons, and Normans; and in the third, the present practice of the art, and its adaptation to the requirements of our own times. Architecture in its early stages seems to have advanced with civilization. The necessities of man would at first induce him to seek for some means of shelter and protection from the heat of the sun, the cold wind, and drenching rain, in the construction of the simple cone-shaped hut of poles, interlaced with osiers and twigs, covered with bark, and plastered with mud; or the adaptation of the rude cage, which chance had thrown in his way, as a temporary retreat from the inclemency of the weather. After a while, when the first germs of society and social life appeared, and small communities were formed by families living in close proximity to each other, for mutual protection,—when the earliest principles of trade and barter began to be understood, attention was naturally directed to the construction of edifices, presenting, at first, greater durability and convenience, and afterwards some rude attempts at decoration; that the dwelling of the chief of the associated families, or the building in which any ceremonies of a religious or public nature were performed, might be distinguished from the huts of the community at large, even as we may see in our own times, in the kraals of the Hottentots and South-African tribes, the wigwams of the North-American Indians, and the huts of the Maoris, or New Zealanders. The straight upright trunks of trees would then have been used as columns to support the poles which formed the framework of the roof, covered with bark or rushes, secured and bound together with pliant twigs and ropes formed of the twisted stalks of climbing plants that were sufficiently tough for the purpose. From the rough saplings laid on the tops of the trunks of trees so used, would be derived the *architrave*; and, as human progress furnished tools to shape and fashion blocks of rugged stone into forms of symmetry and elegance, the trunks themselves of the trees would suggest the shapely column, with the *torus*, or swell above the *plinth*, a flat stone on which the base of the wooden pillar rested, as a foundation more solid and stable than the earth itself. The lower ends of the branches of a tree, cut off a little above the spot where they began to grow outwards from the trunk, would give the first notion of the *capital*, presenting, from its spreading form, a wider basis, to receive the superincumbent beams of the roof; and the *abacus* would have originated in a flat stone, placed on the top of the wooden shaft, to prevent any settlement of rain in the hollow at the top. Materials twisted together, to bind and secure the columns, would furnish ideas for the *astragal* and *fillet*; while the frieze and cornice, and their various ornaments, would be derived from boards fastened to the ends of the transverse beams that formed the ceiling, decorated with such simple devices as short billets of wood might furnish, that were attached to the woodwork in patterns suitable to the form of the material at hand.

*Ancient Architecture.*—The most simple structures in stone that can be mentioned are the circular and oblong inclosures made by the Druids and priests of the Celtic nations, of rough, unhewn, upright blocks, surmounted by similar pieces laid transversely from top to top of these rude columns. They bear some resemblance to the undressed altars, and stones of remembrance and witness, that the worshippers of God, in the patriarchal times, and even after the entrance of the Israelites into the promised land, were accustomed to erect in his honour; and these may be taken as the general types of the commencement of the science among all nations, and in all ages. The next step would be the construction of rough irregular walls, exemplification of which may be found in the cyclopean walls of Tiryns, built by the Pelasgi, and the defensive works round Mycenæ. These Grecian structures, and the tomb of Atreus, near Mycenæ, adorned with rude figures supposed to represent lions, with similar remains in Italy, such as the Etruscan walls at Fiesole, represent the second stage in the constructive art of building, which would rapidly advance from this point. The Egyptians, Assyrians, and Persians, the rulers of the known world in early ages, soon discovered the convenience and comfort of dwellings made of brick and stone, and in a short time carried their architectural works to an incredible extent. At this period, ornament began to be combined with mere building in stone; and from this combination architecture may be considered to be produced; for ornament is essential to architecture, and without the appliance of decorative features no building can be said to possess any architectural design. The

pyramids, supposed to have been built in honour of the sun; the ruins of Andera in Upper Egypt; the remains of Persepolis, so vast and grand 1,800 years after its destruction by Alexander the Great, that the Arabs of that date imagined the city to have been built by the agency of evil spirits; the discoveries at Nimroud and Khorsabad; the sculptured relics of past ages that still exist throughout the land of Egypt, all these bear silent testimony to the constructive powers, and wonderful mechanical contrivances, of men whose buildings, for extent, and grandeur, and sublimity of conception, far surpass any structures of our own times, though they are unequal to them for harmony of proportion and symmetrical beauty. That architecture was brought to great perfection by the Jews, the temple and palaces built by Solomon furnish abundant proof, and the gates and fortifications of the sacred city; and after this period Assyrian architecture reached its culminating point under Nebuchadnezzar, the most magnificent buildings of that empire having been raised by him after models and ideas probably suggested by the grand and gorgeous works of the inspired architect at Jerusalem. From Egypt and Assyria, the Greeks, in all probability, derived their knowledge of architecture; the rows of columns in a Grecian temple, surmounted by the flat and massive architrave, bearing a strong resemblance to the heavy square roofing of the Egyptian palaces and banqueting-halls, raised on sculptured supports of massive size and cumbrous appearance. But the gloomy magnificence of the buildings of Egypt was not copied by the Greeks, who substituted forms of beauty and symmetry, and were influenced by a due regard for proper proportion of length, breadth, and height, in making designs for their temples and public buildings. They also changed the stiff, almost grotesque imitations of the human figure, as it appears in specimens of Egyptian sculpture, into copies of men and animals, faultless in outline, for the adornment of frieze and portico; and for the colossal images that were hewn by the Egyptians out of the living rock with infinite labour and toil, they produced exquisitely chiselled statues, which are still renowned as models of perfect elegance, combining beauty with majesty of expression, and strength with symmetry of form. Grecian architecture may be considered to have reached its height about 440 B.C., when the sculptor Phidias flourished, and Pericles, one of the first of Grecian statesmen, lived. In an ancient province of Italy, then called Etruria, now named Tuscany, there lived a people who had attained, some 360 years prior to this period, a high degree of civilisation, proofs of which are given in the figures, vases, cups, sarcophagi, and other articles made by them, which still exist. From this nation, the Romans doubtless derived the greater part of their customs and ceremonies; they were well skilled in building, and Tuscan architects designed and built, and Tuscan artists adorned, the temples of the gods and great public works of ancient Rome under her seven kings. The temple of Jupiter Capitolinus, and the arched sewer (the Cloaca Maxima), as well as the aqueducts that were first built to supply Rome with water, show that they well understood the science and practice of building, and made practical application of the utility of the arch, which the Egyptians and Greeks neglected, although evidence exists to show that the former nation at least were well acquainted with, though they rarely used, the principles of its construction. When Greece was conquered by the Romans, the knowledge that they had acquired of the science of building was extended by their intercommunication with the Greeks, who had improved the art to the utmost extent of their powers by blending utility with elegance; and from the combined skill of the Greeks and Romans we derive the five established orders of architecture,—the Tuscan, Doric, Ionic, Corinthian, and Composite—distinguished from each other by difference of proportions, as well as by the form of the column, base, capital, and entablature.

*Tuscan Order.*—This order generally has the first place assigned to it in treatises on architecture, on account of its extreme simplicity. Its general character seems to be that it has few parts, is devoid of ornament, and appears able, from its massive construction, to support the heaviest burden. It derives its name from the province Tuscany, as the Tu were found of introducing it into every edifice of great size. It is considered by some to be debased Doric, but there is great uncertainty respecting its origin. Vitruvius does not give a single example of structures of this order in his work, although he mentions its proportions. The following are the comparative proportions of the order, according to Sir William Chambers, taking the diameter of the base of the column as the unit of measurement:—Height of column 7, including base 1, capital 1, and shaft, with upper cincture and astragal, 6; entablature 1½, which is divided into 10 parts,—3 for architrave, 3 for frieze, and 4 for cornice. The diminution at the top of the column should be never more than ⅓, or less than ¼ of the diameter at the bottom; and this proportion is observed by some in all the orders. (*See* Plate I.)

*Doric Order.*—This is considered to be the most ancient of the five orders, and takes its name from Dorus, who, according to Vitruvius, built a temple of this order to Juno, in the ancient city of Argos. At first its proportions were far more massive than at present; remains still existing in which the height of the columns does not exceed four or five times the diameter of the base. The old form of the Doric had no projecting base; and, from this circumstance, the statement made above seems to be substantiated, that the first idea of a stone column was taken from the trunk of a tree; the flutings, which appear in very early specimens, being suggested by the splitting of the bark, from heat or other causes. In the very form of the ornamentation peculiar to it, it retains more of the primitive hut than any other order; the triglyph, its characteristic mark, giving the idea of the projecting joists sawn off close, and ornamented with triangular billets of wood, or pieces with the edges chamfered, and the mutules, or indentations, like the teeth of a cog-wheel, under the cornice, representing the ends of the rafters. The space between the triglyphs is generally enriched with ornaments, the skull of an ox and fillets or garlands being the most common. The theatre of Marcellus is always mentioned as affording the best proportions for this order. The height of the column, taking, as before, the base as the unit of measurement, is 8, including base 1, capital 1, or a little more, shaft 7; entablature 2, divided into 9 parts, being 2 for the architrave, 3 for the frieze, and 3 for the cornice. In the second stage of the Doric order the proportion of the column was taken from the height of a man, which is, as nearly as possible, six times the length of his foot, in all cases. (*See* Plate I.)

*Ionic Order.*—This order is named after Ion, the son of Xuthus, who is said to have built a temple to Diana, seeking to imitate, in the columns which adorned it, the grace and elegance of the female form. It seems to have gained favour among the early Greek architects because the proper adjustment of the various parts of the Doric entablature was attended with considerable difficulty. The column was lighter than that of the Doric order, being eight times the diameter of the base. A base was added, and the capital adorned with volutes (*see* Volute); the shaft of the capital was also fluted. In the ancient Ionic columns the volutes were parallel to each other; but, in the modern form, the volutes project in an angular manner, as in the Composite order. Michael Angelo was considered to have originated this change; but one or two specimens have been discovered at Rome of columns with the volutes projecting angularly. The base and [illegible] are often enriched; but it is, for the most p[art] in character. The modern proportions of the[se] as follows:—Height of column 9, including base 1, capital 1, and shaft 6; or, according to the mode of measurement used by architects, in which the diameter of the base of the column is divided into two parts called modules, and each module into thirty minutes, the capital measures 21 modules; the height of the entablature is 2½ (diameters of the base), which is divided into 10 parts,—3 for the architrave, 3 for the frieze, and 4 for the cornice. (*See* Plate I.)

*Corinthian Order.*—This order is similar to the Ionic in many respects, the same form of base being used, and a similar entablature. The great point of difference [is] the capital, which is richly ornamented with the leaves of the olive or acanthus, although the acanthus is said to belong rather to the Composite order. The

proportion between the column and entablature is the same, the entablature being one-fourth the height of the column; but the column itself is more slender and graceful than those belonging to the orders already described, being 10 diameters in height. The base is half a diameter, and the capital rather more than a diameter, or about 70 minutes. It is said that the Corinthian capital was originated by Callimachus, a sculptor of Corinth, who flourished about 540 B.C.; and that it was suggested to him by the beautiful appearance of the leaves of a root of the acanthus growing round the sides of a basket which had been placed upon it. The basket had been covered with a tile, and, when the leaves reached it, they had curled over in an outward direction, forming a kind of volute. The extent of enrichment of the column depends on the degree of adornment given to the entablature. In interior decorations the fluting of the column is sometimes filled up to about one-third of the entire height with what is termed "cabling," which may be carved in various forms. From the delicacy of its proportions and the richness of its decorations, it has been called the Virginal order by Scamozzi. (*See* Plate I.)

*Composite Order.*—This order, sometimes called the Roman order, is exactly similar to the Corinthian in its proportions, but possesses greater capabilities for enrichment. It is supposed to have been formed by the Roman architects that flourished under the Cæsars, by the union of the Ionic and Corinthian orders, as the capital partakes of both styles, having the enrichment of acanthus-leaves which surround the capital, surmounted by the angular Ionic volute, ornamented with the same description of foliage. This arrangement tends to give a form of greater boldness and elegance to the Composite order. The best examples are found in the triumphal arch at Rome, erected in honour of Vespasian and Titus. (*See* Plate I.)

The national character of a people has a marked influence on the style of architecture peculiar to it. The poetic temperament and national pride of the Greeks were plainly shown in the beauty of design exhibited in their temples; while the ambition of the Romans appeared in their vast public works and private dwellings, all indicating a desire for worldly power, and individual, as well as national greatness. But with the rise and spread of Christianity, architecture soon received new features, and a striking difference was shortly perceptible between heathen temples and Christian churches, the horizontal lines that marked the sacred architecture of Greece and Rome giving place to the light and free appearance of the pointed architecture of Christian Europe.

*Mediæval Architecture.*—As the styles of architecture originated during the mediæval period will be noticed separately under their respective headings, it will be sufficient here to point out, that with the advance of the Christian religion, and the division of the empire of Rome into the Eastern and Western empires, fresh modes of building were rapidly produced. At Constantinople, or Byzantium, as it was then called, Byzantine architecture assumed a marked character, and was, in its turn, the parent style from which Arabian architecture sprung. At Rome, a style of building was conceived which has been called Romanesque; then came the Goths from the north, asserting their supremacy over the effeminate people of Southern Europe, and bringing with them architectural forms of strength and solidity which harmonized well with their rude customs and unpolished manners. These styles were gradually amalgamated and improved, and this blending of modes produced, about the 13th century, the Pointed or Gothic style, modifications of which have been generally adopted by the architects of all European nations. The origin of the term Gothic is unknown; but Bloxam says that it appeared "about the close of the 17th century, when it was employed by such writers as Evelyn and Wren, as an epithet [illegible] to convey a feeling of discsteem for the [illegible]tures of mediæval architecture." It is generally [illegible] to denote the modes in which all buildings of the Middle Ages were constructed, referring more particularly to those styles in which the pointed form of arch was especially used. It is applied to all forms of English ecclesiastical architecture, from the 6th to the 17th century. (*See* NORMAN, SEMI-NORMAN, EARLY ENGLISH, DECORATED ENGLISH, FLORID OR PERPENDICULAR ENGLISH, and DEBASED ENGLISH styles.)

*Modern Architecture.*—To the decay of the feudal system, and the subsequent suppression of the monasteries by Henry VIII., may be traced the gradual decline and fall of Gothic architecture, until, in the time of Elizabeth, it had assumed a form which rapidly passed into what is called Debased English, in which the use of the arch was almost superseded by the adoption of the architrave. There was then a perceptible inclination to return to the old classic styles of Greece and Rome, and this tendency is plainly shown in the churches, museums, theatres, and other public edifices that have been erected since the reign of Charles I.; among which may be mentioned St. Paul's Cathedral, built by Sir Christopher Wren. In the present century there has been a reaction in favour of the Gothic style of architecture, which, although pre-eminently suited for buildings of an ecclesiastical character, is not well adapted for the construction of public offices or private dwelling-houses, as the comfort of the interior is too often disregarded for the sake of the symmetry of the exterior. The architecture of every country and age must be adapted to the requirements of the times and general progress, and every building, whatever it may be, must be especially contrived to suit the purposes for which it is required; and, although it may be produced out of any of the styles of architecture that have previously existed, it should never be designed with slavish adherence to the accepted rules for the construction of either of them, but to suit every needful demand for convenience and utility, modified in outward appearance, in all cases, to suit the locality in which it may be placed and the objects by which it may be surrounded. In exemplification of this, no better proof can be adduced than that peculiar form of building, always marked, and often picturesque in character, which has sprung up since the introduction of railways, and may, with propriety, be termed railway architecture. The more important architectural features will be found under their several heads (*see* ARCH, COLUMN, CORBEL, &c.); while buildings of a particular nature (*see* AMPHITHEATER, BASILICA, &c.), and parts of buildings (*see* BASEMENT, ROOF, &c.), will also be separately described.—*Ref.* Bloxam's *Gothic Architecture; Glossary of Architecture; English Cyclopædia*—Arts and Sciences.

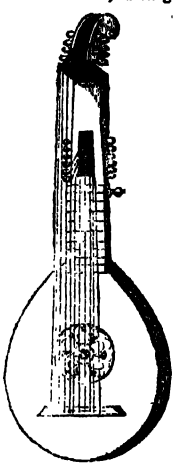
ARCHITECTURE, ANGLO-SAXON.—The period during which this style of building prevailed in England extends from the arrival of St. Augustine, in 597, to the middle of the 11th century, or the Norman invasion. It is characterized by great simplicity. The following are its peculiar features:—The semicircular arch of brickwork similar to the arches of the Romans; the walls formed of rough masonry or rubble-work, with a tie or bond of hewn stone at the angles, and narrow ribs of the same material running up the wall at intervals, dividing it into long and narrow sections resembling panels; the doorways and recesses generally with semicircular headings, though many are found with headings of a triangular form, rudely constructed with long blocks of stone, inclined towards each other, and supported on imposts projecting over the jambs. The belfry windows are also peculiar in form, consisting of two semicircular-headed lights, divided by a column resembling a rude baluster. They are distinguished from windows of the Anglo-Norman style of similar construction by the double splay of the jambs, the space from side to side of the whole aperture being narrow in the centre and becoming wider both towards the exterior and interior of the wall. There are many old churches in Northamptonshire, among which may be named those of Brixworth and Barnack, that afford excellent examples of the ecclesiastical architecture of the Anglo-Saxons.—*Ref.* Bloxam's *Principles of Gothic Architecture.*

ARCHITRAVE, *ark'-i-trav* (Gr. *archos*, chief; Lat. *trabs*, a beam), in Arch., the beam, or portion of the entablature that rests immediately on the columns. The architrave is a prominent feature in the Egyptian, Greek, and Roman styles of building: it was superseded by the arch in mediæval architecture. The use of the architrave and arch respectively forms the most striking point of difference between ancient archi-

tecture and the different styles of the Middle Ages. The architrave of a door is the moulding and woodwork surrounding the opening, the head being called the *lintel*, and the sides the *jambs*.

ARCHIVES, *ar'-kives* (Gr. *archeia*, public registries), strictly, the record office in which public papers and documents are kept; but, by a common figure, the term is also applied to the papers or documents themselves. Some derive the word from *arca*, 'a chest,' wherein the records, charters, and other papers and evidences of a state, house, or community, are preserved. The archives of ancient Rome were in the temple of Saturn. The principal depositories in England for public records are the Record Office, the Tower of London, and the British Museum. (*See* RECORDS.)

ARCH-LUTE, a large lute, or double-stringed theorbo, formerly used by the Italians for the base parts, or as an accompaniment to the voice. In Corelli's sonatas, the base staff is assigned to the violone; *i.e.* double base, or *arcilento*. According to Kircher, this instrument was about five feet in length, and proportionately large in the body. It had fourteen notes, the highest whereof was A, the fifth line of the base; and the lowest, the double G below. It is supposed to have been invented in the 16th century, and, in the beginning of the last century, was much in use. Handel himself employed it in several of his earlier operas. In the Chapel Royal, the office of lutenist still continues a part of the establishment, although its duties have ceased for nearly a hundred years.



ARCH-LUTE.

ARCHOGRAPH. (*See* CYCLOGRAPH.)

ARCHON, *ark'-on*, is a Greek term, signifying literally a ruler or commander, and was the title given by the Athenians to their chief magistrate. On the abolition of the regal government in Athens, after the death of Codrus, the chief power was vested in his son Medon, with the title of archon. He held the office for life, and it was continued in his family for a considerable time. They were, however, responsible to the people for the acts of their government. In 752 B.C., the term of office was limited to ten years, and, in 714, the exclusive right of the Medon family to the office was abrogated, and it was thrown open to all persons of noble birth. About 683 the duration of the archonship was limited to one year, and eight others were associated with him in a council of state, who were also termed archons. The first was called the *archon*, and had also the title of *eponymos*, or name-giver, because the year in which he served was named after him; the second was styled *basileus*, or king, and had the care of religious matters; the third was *polemarchos*, or commander-in-chief; and the remaining six were styled *thesmotheta*, or lawgivers. Solon made the qualification of archon to depend not on birth, but on property; and Aristides abolished the property qualification altogether, and threw open the archonship and other magistracies to all the citizens. From the time of Solon downwards, the popular assembly continued to encroach more and more upon the powers of the archons, who at length sunk from ministers of state into high municipal officers. They appear to have been originally elected by suffrage, the franchise being probably confined to the noble class from which they were taken. The right of suffrage was probably enlarged by Solon, and, in later times, the election was made by lot—*Ref.* Smith's *Dictionary of Greek and Roman Antiquities*; *English Cyclopædia*.

ARCTIA CAJA. (*See* TIGER-MOTH.)

ARCTIC, *ark'-tik* (Gr. *arktos*, a bear), in Astron., a term applied to the north pole, or the pole raised above our horizon. It receives its name from the constellation of the Little Bear, the last star in the tail of which nearly points out the north pole.

ARCTIC CIRCLE, in Astron., a circle of the sphere parallel to the equator, and distant from the north pole 23° 30′. This and its opposite, the Antarctic Circle, are also called the Polar Circles, wherein the longest day and longest night are 24 hours, and within which at one time of the year the sun never sets, and at the opposite season never rises.

ARCTIC FOX. (*See* FOX.)

ARCTOSTAPHYLOS, *ark-tos-taf'-i-los*, in Bot., a gen. of plants belonging to the nat. ord. *Ericaceæ*. The species *A. uva-ursi*, the common bear-berry, is found wild in the mountainous parts of England and Scotland, and generally over the whole of Northern Europe. It is a trailing shrubby plant, with leathery dark-green leaves. The flowers are white, tinged with pink, small, and in clusters; the berries small and red, resembling those of the hawthorn. The whole plant possesses astringent properties, and is sometimes used in tanning, and for dyeing a greyish black. The leaves are frequently employed as medicinal agents in those cases where vegetable astringents are required; they have also been used as an antidote in poisoning by ipecacuanha.

ARCTURUS, *ark-tu'-rus* (Gr. *arktos*, the bear, and *oura*, tail), a star of the first magnitude, in the constellation Boötes, or *Arctophylax*. The star is so called because it is situated near the tail of the Bear. It was supposed to be the nearest star to our system visible in the northern hemisphere; but this idea is now exploded.

ARDEA. (*See* HERON.)

ARE, *ar*, the modern French measure of surface, which forms a portion of the new decimal system adopted in France. It is obtained as follows:—The metre, or measure of length, being the 40,000,000th part of the whole meridian, as determined by the survey, is 3·2809167 English feet; and the *are* is a square, the side of which is 10 metres long. The *hectare* is generally used in the measurement of land. It is 2·4711005 English acres; or 40⅓ hectares make 1,000 acres English measure.

AREA, *air'-e-a*, denotes the same thing as superficies, or quantity of surface; but is applied exclusively to plane figures: thus, we say, the *surface* of a sphere; the *area* of a triangle. The word is also used to signify any open space; whence, in modern houses, that portion of a site which is not built upon is generally termed the *area*. In Math., the measuring unit of every area is the square described upon the measuring unit of length: thus, we speak of the square inches, square feet, or square miles which an area contains.

ARECA, *a-re'-ka*, in Bot., a gen. of plants belonging to the nat. ord. *Palmaceæ*—the Palms, containing two species, each remarkable for the purposes to which it is applied: *A. Catechu*—the betel-nut palm, has been described as the most beautiful palm in India. The stem is remarkably straight, and often from 40 to 50 feet high, and generally about 20 inches in circumference. It is cultivated throughout India for the sake of its seeds, which are known as betel, areca, and pinang nuts. The nut is one of the ingredients in the famed masticatory of the East called betel (which *see*). Charcoal prepared from the nuts, and termed areca-nut charcoal, is used in this country as a tooth-powder; but it is doubtful whether it is in any way superior to ordinary charcoal. An extract is made from the nuts in the south of India; and this constitutes one of the commercial varieties of catechu (which *see*). The timber, the leaf-stalks, and the spathes of this palm are made use of for various purposes; and in Malabar an inebriating beverage is prepared from the sap. *A. oleracea*, the cabbage-palm, is a native of Jamaica and other West-India islands. The trunk, which is seldom more than six or seven inches in diameter, grows to a height of from 100 to 200 feet. This majestic palm is frequently cut down for the sake of the single terminal bud, called the cabbage, which is eaten either raw or boiled as a vegetable.

ARENA, *a-re'-na*, is a Latin term signifying literally sand, and was applied to that part of the amphitheatre where the combats of gladiators and wild beasts took place, from its being usually covered with sand. It is

now frequently used in a general sense to denote a place where any contest or display of power takes place.

ARENACEOUS ROCKS, *ăr-e-nā'-shus* (Lat. *arena*, sand), in Geol., are those composed of grains of sand, or which contain sand in any notable degree, as grits and sandstones. Compound rocks containing sand are termed *Arenaceo-argillaceous*, *Arenaceo-calcareous*, and so on, according to their composition.

ARENG. (*See* GOMUTO.)

ARENICOLITES, *ăr'-en-i-ko-lī'tēz*, in Geol., a term applied to circular holes or markings which have been observed on the upper surface of many sandstones, and which are supposed to have been worm-burrows, like those of the arenicola or lob-worm.

AREOLA, *a-rē'-o-la* (Lat., a small open space or circle, diminutive of *area*), in Anat. and Physiol., is applied to the small interstices of minute cellular or other tissues, through which the smallest vessels and nerves pass. It is also applied to the small red or brownish circle which surrounds the nipples of females, or the ring which surrounds the pustule of small or cow-pox.

AREOMETER, *ăr-e-om'-e-ter* (Gr. *araios*, thin, *metreo*, I measure), a term sometimes applied to the instrument commonly called hydrometer. (*See* HYDROMETER.)

AREOPAGUS, *ăr-e-op'-a-gus* (Gr. *areios pagos*, hill of Mars), was the name of a hill or rocky eminence lying to the west of the Acropolis at Athens, and was the place of meeting of the chief court of judicature of that city, hence called the Council of Areopagus. It was of very high antiquity, and existed as a criminal tribunal long before the time of Solon. He, however, so far changed its character and constitution, as to be in some measure entitled to be called its founder. He enlarged its sphere of jurisdiction, and gave it extensive powers of a censorial and political nature. He made it to consist of exarchons, who had passed with credit the scrutiny they were subjected to at the termination of their period of office. As a court of justice it took cognisance of capital crimes, as murder, arson, &c.; and it also exercised a certain control over the ordinary courts. Its censorial duties were of a very extensive and inquisitorial nature, for the preservation of order and decency. Religion was also within its jurisdiction, and impiety in any form was punished by it. Pericles succeeded in greatly diminishing the power of this council, and deprived it of many of its hereditary powers. It still, however, seems to have retained a great degree of power; but in later times, when corruption of manners came to prevail among the people, it necessarily pervaded also the members of the council, which thus, in a great measure, lost its moral influence and authority; but it continued to exist down to a very late period. Some hold that the apostle Paul was taken before this council; but the Scripture does not bear out this idea. It seems rather that the Athenians had taken him to the hill in order to hear him expound his new doctrines.

AREOLA LEPTOPTILOS. (*See* ADJUTANT.)

ARGALI, *ar'-ga-li* (*Ovis Ammon*), in Zool., a species of wild sheep inhabiting the mountains of Siberia, Kamschatka, and the higher regions of the Himalayas. Dr. Hooker, in his *Himalayan Journal*, thus describes the animal:—"We came suddenly upon a flock of gigantic wild sheep feeding on scanty tufts of dried sedge and grass: there were twenty-five of these enormous animals, of whose dimensions the term sheep gives no idea; they are very long-legged, stand as high as a calf, and have immense horns, so large that the fox is said to take up his abode in their hollows when detached and bleaching on the barren mountains of Thibet." The horns of the male of this species of wild sheep are about 4 feet in length and 14 inches in circumference at their triangular-shaped base. The name of the animal is Mongolian. The Rocky-Mountain Sheep, or Big-horn, has also been termed the American Argali. (*See* SHEEP.)

ARGAND LAMP, *ar'-gănd*, a kind of lamp invented by M. Argand, a Frenchman. It consists essentially of a reservoir, from which proceeds a tube carrying the oil to the burner. The burner is a cylindrical tube, within which is inserted another tube of similar form, the diameter of which is a quarter of an inch less than that of the outer one. Between these two is placed the wick, which is also tubular, and can be raised or lowered by means of a screw or rack. To the lower part of the burner is screwed a cap to prevent the oil falling through, but with holes in the upper portion to allow the air to pass upwards. A glass tube with a shoulder is fitted over the burner, and creates a draught both inside and outside the wick, which is still further concentrated upon it by means of the shoulder just mentioned. The draught causes an increased supply of oxygen, and consequently a more complete combustion and a brighter flame. The same principle is applied to gas. Dr. Frankland has lately contrived an argand burner in which the air passes the heated portion of the glass tube before reaching the flame, which thus becomes supplied with hot air instead of cold. This contrivance effects a saving of 50 per cent. of fuel, whether oil or gas. Efforts have been made to construct candles in this way, but as yet without success. Furnaces made on the argand principle,—*i.e.* with streams of air introduced into the centre of the flame,—are now much used in metallurgical operations.

ARGEL. (*See* SELONOSTEMMA.)

ARGEMONE, *ar-gem'-o-ne*, in Bot., a gen. of plants belonging to the nat. ord. *Papaveraceæ*, the Poppy family. *A. mexicana*, the Mexican or gamboge thistle, is an annual herbaceous plant, with large yellow flowers, and sessile, waved, and sinuated spiny leaves. It is a native of Mexico, but is cultivated in England and other parts of Europe as an ornamental plant. The seeds possess narcotic and purgative properties; and an oil is obtained from them which has been recommended as a remedy for cholera. In the West Indies the seeds are used as a substitute for ipecacuanha.

ARGENT, *ar'-jent* (Lat. *argentum*; Fr. *argent*, silver), in Her., a term from the French, to express the metal silver in armorial bearings. It is generally left white in the fields and charges of all coats of arms, whether coloured or engraved.

ARGENTAN, *ar-jen'-tan*, German silver, 2 parts of copper, 1 of nickel, and 1 of tin.

ARGENTIFEROUS, *ar'-jen-tif'-e-rus*, silver-bearing. A term applied to minerals, veins, or metals containing silver.

ARGENTITE, *ar'-jen-tite*, one of the most important ores of silver. It is occasionally found in crystals, but more frequently in malleable blackish lead-coloured masses. It is found in granite and porphyry in different parts of the world, and consists of 86 parts of silver to 14 of sulphur.

ARGENTUM DEI, *ar-jen'-tum de'-i* (God's penny), was anciently the name given to earnest-money, or money given to bind a bargain. In some places it is called *arles*, or *erles*, and by civilians and canonists, *arrhæ*.

ARGIL, or ARGOIL, *ar'-jil* (Gr. *argillos*, a white pure earth, from *argos*, white), clay, lime, and sometimes gravel; also the lees of wine gathered to a certain hardness.—Ref. *Law, Fr. Dict.*; Cowell; Blount.

ARGILE PLASTIQUE, *ar'-zheel plas-teek'* (Fr., plastic clay), in Geol., the term applied to extensive deposits of sand, with occasional beds of clay, used for pottery, near the base of the tertiary system in France.

ARGILLACEOUS ROCKS, *ar-jil'-lā'-she-us* (Lat. *argilla*, clay), in Geol., are those composed of clay, or having a notable proportion of clay in their composition; as roofing-slate and shale. All such rocks emit a peculiar odour when breathed upon. Compound clayey rocks are described as *argillo-calcareous*, *argillo-arenaceous*, and so on.

ARGO, or ARGO NAVIS, *ar'-go*, the ship *Argo*, a constellation, the greater part of which lies in the southern hemisphere. It is of considerable extent, and is divided by astronomers into four parts or regions. For the mythological derivation of the name, *see* vol. I. of this work.

ARGOL, *ar'-gol*, the crude tartar which is deposited by all wines as a crust upon the inside of the casks in which they are stored. Argol is the source from which are obtained tartaric acid and common cream of tartar, which is a tartrate of potash. Argol is dissolved in hot water, which, when cold, deposits the cream of tartar in small oblique rhombic prisms. (*See* CREAM OF TARTAR.)

ARGONAUTA. (*See* PAPER-NAUTILUS.)

ARGONAUTIC EXPEDITION, *ar-go-naw'tik*, in the Anc. Hist. of Greece, is an event frequently referred to by ancient writers; but the accounts given of it are very different. Generally, it was an expedition undertaken by Jason in the ship *Argo*, to bring back the golden fleece from Colchis, and is usually said to have taken place about the middle of the 13th century before Christ. (*See* JASON, MEDEA, ÆETES, &c., vol. I. of this work.)

ARGOSIE, *ar'-go-se*, is a name given by old writers to a ship of great burden, whether for war or commerce. It occurs in Shakspere, Beaumont and Fletcher, and others, and was probably derived from *Argo*, the name of the vessel in which Jason sailed in quest of the Golden Fleece.

ARGUMENT, *ar'-gu-ment* (Gr. *argos*, clear; Lat. *argumentum*), signifies properly that through which a conclusion is established; or, generally, it means any piece of reasoning expressed in intelligible language. *a*. Logicians have divided arguments according to their *forms*, into syllogisms, enthymemes, inductions, &c.; and specially recount various kinds of arguments which are usually reckoned as fallacies, but which are not necessarily so. They can only be accounted sophistical when they are employed with the intention to deceive the listener; that is, when they are unfairly used. Such are the *argumentum ad hominem*, or personal argument, where an appeal is made to the peculiar character and opinions of the opponent; the *argumentum ad verecundiam*, or appeal to our sense of reverence for some respected authority, or for some venerable institution; the *argumentum ad populum*, where an appeal is made to the prejudices and passions of the crowd; the *argumentum ad rem*, or *ad judicium*, which bears directly upon the real question at issue. *b*. Rhetoricians again divide their arguments with respect to the topics from which they are drawn, irrespective of whether they are logically classified or not. These arguments are usually divided as follows:—1. Into regular and irregular; 2. into probable or moral, and demonstrative or necessary; 3. into direct or indirect (the latter is largely used by geometricians as the *reductio ad absurdum*); 4. into those from example, from testimony, from cause to effect, from analogy, &c. Many of these rhetorical arguments will be found, on examination, to contain each other; but this the rhetorician does not regard, as his business is to touch the feelings of his audience, and not properly to convince them, which is the sphere of the logician. *c*. The argument prefixed to a book, as to one of the divisions of Milton's *Paradise Lost*, is that which shows the purport or contents of it; and the same holds good for the devices on shields, &c., as the buckler of Milton's rebel angel, which was "various with boastful *argument* portraid." *d*. Lastly, an argument in astronomy is a quantity upon which an equation or other circumstance relating to the motion of a planet depends.

ARGUS PHEASANT, *ar'-gus* (*Argus gigantæus*), a rare and beautiful bird, native of many parts of the Indian islands. The adult male measures between five and six feet from the beak to the extremity of the tail, and the plumage is wonderfully varied and elegant.

ARIADNE, *ár-i-ád'-ne*, one of the asteroids, or group of small planets, revolving between Mars and Jupiter. (*See* ASTEROIDS.) It is the forty-third in order of discovery, and was first noticed by Mr. Pogson, at Oxford, April 15, 1857. (For the mythological derivation of the name, *see* vol. I. of this work.)

ARIANS, *air'-i-ans*, a name usually given to all who adhere to the opinions advanced by Arius, a bishop of Alexandria, respecting the relation of the Father and the Son in the Holy Trinity. Athanasius alleges, in his second oration (§ 24), that Eusebius of Nicomedia and Asterius agreed with Arius in maintaining that God, being willing to create the universe, and seeing that it could not be subject to the working of his Almighty hand, made first a single being, whom he called Son, or *Logos*, to be a link between God and the world, by whom the whole universe was created. In other words, the followers of Arius maintain that Christ, the son of God, is the most exalted of all created things, but inferior to God the Father, and produced by his free will. The opinion itself was first broached about 318 A.D., and it was publicly condemned at the council of Alexandria, which was held in 320 A.D., and in the council of Nice, which was held in 325 A.D. The orthodox church maintained the perfect equality of essence of both Father and Son, and could only express their relation by terming it eternal generation. The articles of both the Nicene and the Athanasian creeds arose out of this great Arian controversy. Arius and his party were banished by the former council; but as he had powerful adherents, he soon found means to return, at the express command of the emperor Constantine. He was on his way to receive the oath of ministerial allegiance to the orthodox views of the church at Constantinople, when he died, very suddenly, some said by poison, in 336 A.D. His followers gained great accessions after his death, and the emperor Constantine is said to have been baptised into the Arian communion a short time before his decease, in 337 A.D. Under Constantius, Arianism became the religion of the court; and it penetrated as far as Rome, which was obliged to receive into its communion an Arian bishop, Felix. But the divisions among the Arians themselves prepared for the Catholic church an easy victory over them, and led to their final extinction. The first split in the Arian faith took place in the western part of the Roman empire, where all opponents of the doctrine of Athanasius, that the Son was *homoousios*, or of the *same* essence with the Father, were called Arians; but some of these opponents clung to the doctrine already taught in the school of Origen, that the Son was *homoiousios*, or of *similar* essence with the Father. These received the name of Semi-Arians; but the sect broke up into some ten or twelve separate communions before it finally disappeared from the history of the Church. But the Arians made a bold struggle for existence. They ascended the throne with Valens, in 364 A.D.; but Theodosius hurled them to the ground, and restored the dominion of the ancient church. The creed was altogether extinct in the Roman empire at the beginning of the 6th century. It continued to flourish among the Goths, the Suevi in Spain, the Burgundians, the Vandals, and the Lombards, among which latter people it survived down to 662 A.D. In England the doctrine was partially revived by Dr. Samuel Clarke and by William Whiston, and may still be occasionally met with in certain remote corners of society; but, generally, the name Anti-Trinitarians, or Unitarians, is preferred to the old creed of Arianism, which both of those sects profess to avoid.

ARIES, *air'-i-sees* (Lat., a ram), the first of the twelve signs of the zodiac, and a constellation giving its name to a space of 30° of the ecliptic, which the sun enters in March, measured from the vernal equinox. Owing to the constant change of the position of the vernal equinox, arising from the precession of the equinoxes, the sign Aries no longer corresponds with the constellation of that name, but has moved about 30° to the westward of it.

ARILLUS, *á-ril'-lus*, in Bot., the term applied to an integument which is occasionally found covering, wholly or partially, the *testa*, or outer coat of a seed. The seed of the Passion-flower exhibits this covering, which commences at the base and proceeds towards the apex. In the nutmeg, the additional coat proceeds from above downwards, and constitutes the substance called mace, which is extensively employed as a spice.

ARISÆMA, *ár-i-se'-ma*, in Bot., a gen. of plants belonging to the nat. ord. *Aroideæ*, the Arum family. The species *A. atrorubens*, Dragon-root, or Indian Turnip, is a native of North America. From the tuber a nutritious fecula is obtained. In medicine, the tuber is also occasionally used, being given internally as a stimulant in rheumatism and bronchial diseases, and being also employed as an application to asthous affections in children.

ARISTA, or AWN, *a-ris'-ta*, in Bot., a solitary pointed bristle, growing in the flower of a grass, either from a glume or from a palea. (*See* GRAMINACEÆ.)

ARISTOCRACY, *ár-is-tok'-ra-se* (Gr. *aristokratia*, the rule of the best; from *aristos*, best, and *kratein*, to rule), in its original acceptation, denotes that form of government in which the ruling power is vested in the best men, whether by birth, wealth, or personal distinction. Personal excellence, however, was usually regarded as

a necessary element in the character of those constituting an aristocracy. It was opposed to *oligarchy*, which was regarded as a perversion of aristocracy, and in which the dominant power was in the hands of a few, who ruled for their own advantage. In the idea of aristocracy, therefore, was included that the administration of affairs should be for the general good, and not for any one class. In modern times, those governments have usually been termed aristocratic in which a small privileged class of noble or wealthy persons either governed absolutely or shared the government, in various proportions, with the sovereign or the people. In a more general sense, it is applied to any form of government in which a minority of adult males constitute the ruling class; and is opposed to democracy, in which the ruling power is vested in a majority of adult males. Lord Brougham's definition is somewhat different. "Where," says he, "the supreme power in any state is in the hands of a portion of the community, and that portion is so constituted that the rest of the people cannot gain admittance, or can only gain admittance with the consent of the select body, the government is an aristocracy; where the people at large exercise the supreme power, it is a democracy. Nor does it make any difference in these forms of government that the ruling body exercises its power, by delegation to individuals or to smaller bodies. Thus, a government would be aristocratic in which the select body elected a chief, to whom a portion, or even the whole of its power, should be intrusted." Sometimes the word aristocracy is applied not to any form of government, but to a particular class of persons in a state. In this sense it was never used in ancient times; but it is common with modern writers. The former distinction is dropped, and an aristocracy in this sense is not necessarily connected with the government, and may exist under any form of rule. It is in this way sometimes used as synonymous with nobility; in a wider sense, it is applied generally to the rich as distinguished from the rest of the community.

**Aristolochiaceæ**, *ăr-ist-to-lo-ki-ā'-se-e*, in Bot., a nat. ord. of plants of the class *Dicotyledones*, sub-class *Monoclamydeæ*, consisting of herbs or shrubby climbers, which are sparingly distributed in several parts of the world, but are very common in the tropical portion of South America. There are nine genera and 130 species. The typical gen. *Aristolochia*, Birthwort, is distinguished by a tubular oblique perianth, generally inflated at the base, the mouth dilated on one side, and by stamens adherent to the style. Several species of this genus have been employed for centuries in medicine, principally on account of their supposed emmenagogue properties; and hence the name Birthwort. The roots of *A. longa*, *A. rotunda*, and *A. clematitis* are most commonly used. They have all stimulant and tonic properties. The powdered root of *A. longa* is one of the ingredients in the duke of Portland's powder for the gout. *A. angicida* is supposed by Lindley to be the celebrated guaco of the Columbians. The juice of the root is said to stupefy snakes, so that they may be handled and played with. The rhizome and root-fibres of *A. serpentaria*, commonly called serpentary, or Virginian snake-root, are officinal. Serpentary was originally introduced as an antidote to snake-bites, but it is now known that it has no efficacy in such cases. It is a valuable stimulant, tonic, and diaphoretic, and is especially useful in fevers of a low or typhoid character. The roots of *A. reticulata*, *A. tomentosa*, and *A. hastata* are said to be mixed in commerce with those of *A. serpentaria*. Several species of this important genus are cultivated in hothouses as ornamental plants.

**Aristotelia**, *ăr-is-to-te'-li-a*, in Bot., a gen. of plants belonging to the nat. ord. *Tiliaceæ*, the Lime-tree or Linden family. The most important species is *A. Maequi*, which produces an edible fruit, from which a kind of wine is prepared.

**Aristotelian Philosophy**, *ăr-is-to-te'-li-an*, is one of those systems of speculation which arose from the teachings of Socrates, and which, from the unity and grandeur of the genius of its founder, took a strong hold of the mind of Greece, and, since the revival of letters, of Western Europe. Aristotle attempted in his philosophy to steer a middle course between the high ideality of his master Plato and the low sensationalism of the physical school of Elea. It is said that he listened to Plato's lectures in the Academy for twenty years; that Plato was accustomed to call him, by way of eminence, "the Thinker;" and that he was of small stature, and vain of his personal appearance. Whether the latter facts can be substantiated or not, he was unquestionably, perhaps, the foremost scientific thinker that ever lived. His genius was wide as nature. He studied everything, and seemed to know everything better than every other body. His knowledge was quite amazing; and he extended the boundaries of science almost to an encyclopædic extent. Abstract science and physical science—nothing came wrong to him. His genius was at once lofty and minute, highly speculative and curiously detailed. Aristotle combated with much keenness the ideal theory of Plato, or that which expounded the Deity as holding in himself the archetypal ideas after which the world was fashioned, and which it was the business of Reason and Science to discover. But, while denying these ideas of his master, he nevertheless agreed with him in the view, that knowledge contains an element radically distinct from sensation. He differed again from the Eleatics and the Epicureans, inasmuch as he denied that sensation could account for the whole of knowledge; but maintained, with them, that without this sensation, knowledge would be impossible. The celebrated maxim, that "there is nothing in the intellect which was not previously in the sense," if not Aristotle's, at least expressed well a side of his doctrine; but, when he insists upon the distinction between the necessary and the contingent, the absolute and the relative, he rises altogether above the sphere of Sensation, and takes his place emphatically with the Reason. Thus he steered a middle course between what he regarded as the Scylla and Charybdis of speculation,—idealism and sensationalism; but in what precise line he moved is by no means clear. He nowhere has expounded his doctrines, and he is very chary of definition; so that no two Aristotelians of the present day are agreed respecting the details of his philosophy. Perhaps the best characterization of it is to say, that it was a system of empiricism, or one based upon experience, modified, often considerably, by the rationalism of Plato. The language in which his philosophy is couched is brief, pregnant, and peculiar; and his system not only has afforded a test of the critical acumen of those who have taken to studying him, but it has afforded, besides, a nice test of advancement in the knowledge of the Greek language, to read Aristotle with intelligence and promptitude. Philosophy, according to Aristotle, is properly science arising from the love of knowledge. There are two sorts of knowledge,—mediate and immediate. From immediate knowledge, which we gain through the experience of particulars, we derive mediate knowledge, by means of argumentation, whose theory it is the office of logic properly to expound. Logic is therefore the instrument of all science; but only *quoad formam*, for it is experience which supplies the *matter* to be worked upon. The *formal* part of reasoning he accordingly expounds better than any man either before or since his time. He created logic indeed; and this system stands erect through the crumbling waste of centuries, like an Egyptian pyramid, which heat and moisture cannot wear away. He nowhere defines logic; but the book which contains it is ordinarily called the *Organon*. His successors have only damaged when they have tried to improve his system of argumentation; and, down to the period of Sir William Hamilton, it remained nearly destitute of a single modification or addition. He bases his logic most profoundly upon the laws of contradiction, and of excluded middle, and he even recognizes that of sufficient reason as a regulative principle in the evolution of truth. After logic he took up nearly all the sciences, rational, empirical, and mixed, except one alone; viz., history. He seems to have divided philosophy into logic, physics, and ethics, or into speculative and practical knowledge. 1. Speculative philosophy contemplates the real order of things, irrespective of human control; practical philosophy deals with affairs voluntary and accidental. Real substances are either invariable or variable; while sublunary affairs are variable and perishable; the Deity alone is imperishable and unchangeable. Do men pur-

sue the real in an abstract way? Then (*ta meta ta phusika*) Metaphysics and Mathematics emerge. Do they pursue knowledge as to its objects? Then Physics, Cosmology, Psychology, and Theology emerge. 2. Practical philosophy again comprehends Ethics, Politics, and Economy. A word or two on each of these heads; and, first, of Speculative Philosophy. I. Physics, or natural philosophy.—Nature is the sum of all existences which are disclosed to us by our perceptive faculties. The knowledge of nature is properly the knowledge of the laws of bodies in motion. Nature, cause, accident, end, change, infinitude, space, time, and motion, are included in this science. The three elements of existence are matter, form, and privation; and change is possible as respects substance, quantity, quality, and place. Motion, like time, has neither beginning nor end; and the first thing to which motion was applied was the heavens. In his *Cosmology* Aristotle discusses astronomy, using that term in its widest signification. It appears to the modern reader obscure and inconsistent, and is by no means satisfactory. *Physiology* is indebted to Aristotle for its first essay. The soul is, according to him, the active principle of organized life. It is distinct from the body, yet, considered as its form or entelechy, it is inseparable from it. Its faculties are production, nutrition, sensation, thought, and will, or impulse. His remarks on the principle of Common Sense, on Consciousness, on Imagination, on Memory, and on Recollection, nearly all of which he was the first distinctly to recognize, are very valuable, and will repay a careful perusal even at the present day. *Metaphysics*, or, more properly, the first philosophy, according to Aristotle, is his attempt to science Being in the abstract. The leading characteristics of the latter existence he analyzes into the ten categories of substance, quantity, quality, relation, time, place, situation, possession, action, passion. With this arrangement he connected the question of the First Being, whose felicity is alone complete, and whose existence is alone immutable. II. The ruling idea of his *Practical* philosophy was that of a sovereign good, and final end or aim of action. This final end he denominated happiness, which is the result of the perfect energies of the soul, and is the highest of which our nature is capable. It arises from the perfect exercise of reason, and is ordinarily called virtue. This he describes as the mean between two extremes, which is the character of nearly the whole of his philosophy. He distinguishes the moral virtues into the seven cardinal ones, of which Justice, in a sense, embraces all the rest. Under the head of Right, he distinguishes that belonging to a family from that belonging to a city. A perfect unity of plan reigns throughout his Morals, Politics, and Economics. Both of the latter have for their object to show how this perfect virtue, already described, may be attained in the civil and domestic relationships, through a good constitution of the state and the household. The principle of the science of Politics is expediency, and its perfection consists in the suitableness of means to the end proposed. By this principle Aristotle proves the legality of slavery; and all education he refers to the ultimate end of political society. Of Aristotle's successors, the only one deserving to be mentioned is Theophrastus, author of the *Characteristics*. This system long maintained its ground as distinct from that of Plato. In the Middle Ages it became degraded into a noxious system of barren formularies, which were in the end swept away by the revival of Platonism. All except his Logic, which will live for ever, is now nearly forgotten, except by a few devoted students.

ARITHMETIC, *á-rith'-me-tik* (Gr. *arithmetike*, derived from *arithmos*), the science of numbers, or that portion of mathematics concerned with the properties of numbers. Every number is a ratio or relation; that is to say, every magnitude, compared with another magnitude, is either equal, or greater, or less, and, therefore, has a certain relation to that with which it is compared. Arithmetic is the art of combining these relations with one another, using for the purpose the signs themselves, by which the numbers are distinguished; thus, the four operations of addition, subtraction, multiplication, and division, include the entire science. For the facilitating of calculations and for commercial purposes, other useful rules have been invented; such as proportion, interest, discount, decimals, extraction of roots, &c.; but they are but different applications of the four elementary rules. The origin of arithmetic is extremely obscure. According to Plato and Diogenes Laertius, arithmetic and geometry are of Egyptian origin; on the other hand, Josephus affirms that Abraham, during his stay in Egypt, taught the inhabitants the use of numbers. The precise epoch in which numerical signs and the first methods of computation and calculation were discovered, is enveloped in equal mystery; but there can be little doubt that the decimal system, or method of calculation by tens, originated from the custom of children reckoning by the fingers. (*See* DECIMALS.) Arabian philosophers were of opinion that it was from the people of India, during the 9th or 10th century, that they borrowed the signs which we call Arabic, but which they call Indian numerals. It was not till the commencement of the 13th century that the science of arithmetic became disseminated in Europe. The Greek monk Planude, John Halifax, better known under the name of Sacro Bosco, and, since the invention of printing, Lucas de Burgo and Nicolas Tartaglia in Italy, Clavius and Ramus in France, Stifellus and Henischius in Germany, and Buckley, Digges, and Recorde in England, may be cited as the principal European arithmeticians at the first dawn of the science. The employment of the Arabic or Indian numerals, and the facilities afforded by algebra, have been the chief causes of the immense progress and development of modern mathematical calculations. (*See* ALGEBRA.) Arithmetic acquires several distinctive appellations from the particular manner in which it is used.—*Decimal Arithmetic* requires a series of ten characters, the progression proceeding according to the powers of 10. The invention of decimal fractions, which has doubled the practical efficiency of our arithmetical system, is generally ascribed to Regiomontanus.—*Duodecimal Arithmetic*, in which the multiples and divisors of unity proceed according to the powers of 12. This method is commonly used by artificers.—*Political Arithmetic* is the application of arithmetic to researches connected with the government of a country; such as its number of inhabitants, produce of soil, quantity of food required for consumption, &c.—*Universal Arithmetic* is the term applied by Newton to algebra, or the calculation of magnitudes in general.

ARK, NOAH'S, *ark*, the name given to the vessel built by Noah for the preservation of himself, family, and the several species of animals during the Deluge. Much labour and ingenuity have been spent in attempting to determine the form, size, materials, &c., of the ark, but with very little result. As it was not intended for sailing, but merely to float idly upon the waters, there can be little doubt that its form was not that of a ship, but rather of a large floating house. We are told that it was 300 cubits in length, 50 cubits in breadth, and 30 cubits in height; but, from the great variety of measures of this name, it is impossible to determine its dimensions with any degree of certainty. It was made of gopher-wood, pitched within and without with pitch, and had three stories. It contained, besides the eight persons of Noah's family, one pair of every unclean beast and seven pairs of every clean beast, and of fowls of the air also seven pairs. (*See* DELUGE; also NOAH, in vol. I. of this work.)

ARK OF THE COVENANT, in the religious ceremonial of the Jews, was a box or coffer of shittim-wood, made by Divine direction by the children of Israel in the wilderness, and afterwards deposited in that part of the temple called the Holy of Holies. It was of an oblong form, two cubits and a half in length, and a cubit and a half in breadth and height; that is, according to the common estimate of the length of a cubit, 3 feet 9 inches in length, and 2 feet 3 inches in breadth and height. It was overlaid within and without with pure gold, and had on its upper surface a crown or border round about. At each of the four corners was a ring of pure gold, into which were inserted the two staves of shittim-wood, overlaid with gold, by which it was borne, and which remained there perpetually, even after it was deposited in the temple. The lid or cover of the ark, called also the Mercy-seat, was of the same length and breadth, and was made of

pure gold. Over it, at the two extremities, were two seraphim, with their faces turned towards each other, and inclined a little to the lid. Their wings, which were spread out over the top of the ark, formed the



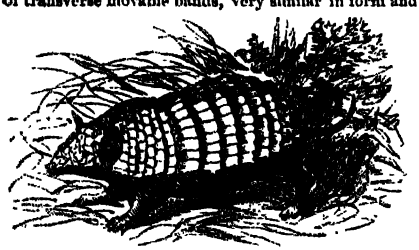
ARK OF THE COVENANT.

throne of God, while the ark itself was his footstool. There was nothing within the ark save the two tables of stone on which were inscribed the ten commandments.

ARM, *arm* (Lat. *brachium*), is that part of the upper extremity of the body which extends from the shoulder to the wrist. It consists of two portions,—the arm, or *brachium*, properly so called, and the fore-arm, *anti-brachium;* the former having one bone,—the humerus; the latter two bones,—the radius and ulna. (*See* ANATOMY.)

ARMADA, *ar-mai-da*, or *ar-ma'-da*, a Spanish word, signifying a naval armed force or fleet of war, but specially applied to the great Spanish fleet sent by Philip II. of Spain against England in 1588. It was composed of 150 vessels, carrying 2,650 guns, and having on board 20,000 soldiers, besides volunteers, and 3,000 seamen. It was styled by the Spaniards the "Invincible Armada." For an account of the disaster that overtook and dispersed this vast armament, *see* vol. I.

ARMADILLO, *ar-ma-dil'-lo* (*Dasypus*), a gen. of mammiferous quadrupeds, intermediate between the sloths and ant-eaters, and characterised by the possession of molar teeth only. Instead of hair, the armadillos are covered with a species of hard bony crust, forming three bucklers, on the rump, shoulder, and head, respectively; the two latter being connected by a number of transverse movable bands, very similar in form and



ARMADILLO.

appearance to the plate-armour of the Middle Ages, from which, indeed, these animals have acquired their name of armadillos,—a name of Spanish origin, and adopted by English writers. The anterior surface of the body not covered by the buckler, is clothed with coarse scattered hairs, of which some are also seen to issue forth between the joints of the armour. It has rather a pointed snout, long ears, short and thick limbs, and stout claws, which are in every respect adapted for digging and burrowing. So rapid, indeed, do the armadillos perform this operation, that they easily bury themselves in the earth beyond the reach of the hunter, who has no other resource but to smoke out his obstinate game. Once brought to the surface, however, the animal becomes an easy prey, as its only defence is to roll itself up hedgehog-wise, and await an assault. They are, however, by no means easily unkennelled, and have been known to allow a hunter to hack their tails off while they held on in the depths of their burrow by their powerful claws. The animal never attempts to bite any one by whom it is attacked. Its food consists of roots, fallen fruits, and worms. Azara informs us that where armadillos abound, ants are sure to be scarce, as the animals break into the ant-hills and devour the insects as greedily as the ant-eater itself. It will not reject carrion, and has no scruples about violating a human grave, should an opportunity occur. The tropical and temperate regions of South America are the original and proper habitat of all the known species of the armadillo.

ARMAMENT, *ar'-ma-ment* (Lat. *arma*, arms), denotes a force equipped for war, either naval or military. It is also applied to weapons of war employed either in sea or land service.

ARMATURE, *arm'-a-ture* (Lat. *armatura*, armour), in Phys., a term applied to a piece of soft iron affixed to the extremities or poles of a magnet, in order that its magnetic power may be preserved; for when a magnet is allowed to remain long without an armature, a considerable diminution of its strength takes place, owing to the disturbing influence of terrestrial magnetism. (For an explanation of this phenomenon, *see* MAGNET, MAGNETISM.)

ARMED AT ALL POINTS, a term which, in the military language of the feudal age, was given to



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a knight, baron, or other warrior, who was clothed from head to foot (Fr. *cap-à-pie*) in armour, and was

also provided with every weapon necessary for attack. Thus perfectly equipped for either defence or offence, he was said to be armed at all points. (*See* ARMOUR, and the respective terms there mentioned.)*

ARMENIAN CHURCH, *ar-me'-ni-an*, is a term applied to that section of the Christian Church which was established in Armenia. As early as the 2nd century Christianity is said to have been introduced into the country, but it was not firmly established there till the 4th century, by the exertions of Bishop Gregory; and in the 5th century the Bible was translated into the Armenian language by Miesrob. In the controversy respecting the two natures of Christ, the Armenians declared for the Monophysites, and formed themselves into a separate church, which they termed the Gregorian, after Bishop Gregory. They believe that Christ had only one nature, and that the spirit proceeds alone from the Father. They hold the "seven sacraments;" but in baptism, with which they conjoin confirmation, they sprinkle three times, and dip as often. At the communion they use pure wine and leavened bread. Extreme unction is only administered to ecclesiastics, and that immediately after, and not before, death. They believe in the worship of saints, but not in purgatory. The head of the Church, called *Catholikos*, resides at the monastery of Etschmiadzin, near Erivan; and to this place must every Armenian perform a pilgrimage once in his life. The secular priests must marry once, but are not allowed to have a second wife. The Armenians, as a body, have always resisted all the attempts of the Roman Catholics to become united with them; yet there are certain of them in Italy, Poland, Galicia, Persia, and some parts of Russia, that have come under the papal supremacy; but they still have their own form of church government. From the wide dispersion of the Armenians, their doctrines are considerably diffused.

ARMENIAN LITERATURE dates from the introduction of Christianity into the country, and its most flourishing period was from the 4th to the 14th centuries. Their writings are chiefly theological works and chronicles, and a great part of them are translations of Greek and Syrian authors, some of which are now only preserved to us through the Armenian; as the Chronicle of Eusebius; some of the writings of Philo; homilies by Chrysostom, Severianus, and Basil the Great, &c. The Bible, which was translated by Miesrob and his scholars, A.D. 411, is still regarded as the finest specimen of the classic style. The best edition is that published at Venice, 1805. Of Armenian historical and geographical works, several have been preserved to us. The most important theological and philosophical authors are David, the translator and commentator of Aristotle, and Esnik, both of whom flourished in the 5th century; Joannes Osnjensis, in the 8th; Nerses Klajensis, in the 12th; and Nerses Lampronensis. In poetry, the literature is very poor. With the 14th century, Armenian literature begins to sink, and only a few important works have since appeared at distant intervals. Yet have the Armenians, even down to the present day, taken an active interest in their national literature; and in all their settlements the printing-press is to be found in operation. The most interesting of their settlements is that of the Mechitarists, on the island of San Lazaro, near Venice. The Armenian language belongs to the Indo-Germanic stock. The old Armenian, the language of literature, is no longer a living tongue; while the new, or vulgar Armenian, is split up into four dialects, and is much corrupted by Turkish.

ARMERIA, *ar-meer'-i-a*, in Bot., a gen. of plants belonging to the nat. ord. *Plumbaginaceæ*. Thrift is the common English name for this genus, which includes many pretty species suitable for growing on rockwork and in pots. The dried flowers of the common thrift, *A. vulgaris*, are diuretic.

ARMIGER, *ar'-mi-jer* (Lat. *arma*, arms, and *gerere*, to bear), literally one who bears arms. The expression was formerly applied to the attendant or esquire of a knight. It is a term of dignity now obsolete, entitling the bearer to hold rank above a gentleman, but below a knight. (*See* ESQUIRE.)

ARMILLARY SPHERE, *ar-mil'-la-re* (Lat. *armilla*, a bracelet), an instrument representing the great circles of the celestial sphere, the equator, ecliptic, tropics, equinoctial colure, &c. It is constructed of rings of metal, representing these circles, fastened together in their relative positions, and movable on an axis passing through the poles: it is furnished with an horizon and meridian similar to those attached to the terrestrial and the celestial globes. It was formerly much used by the early astronomers, but is now superseded by the celestial globe. The earth on which the observer stands is supposed to be in the centre of this skeleton sphere, the rings representing the imaginary circles above named, traced on the apparent sphere of the heavens around him, by which the position of any star may be determined. (*See* ASTROLABE.)



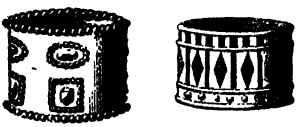
ARMILLARY SPHERE.

ARMINIANS, *ar-min'-i-ans*, are the followers, or those who entertain the opinions of, Arminius, a Protestant divine, who flourished in Holland about the beginning of the 17th century. He maintained that God had predestinated the salvation or condemnation of individuals only from having foreseen who would and who would not accept of offered mercy. His chief opponent was Gomar, who, with the Calvinists, asserted that God had from all eternity, of his free good pleasure, elected some to everlasting life, while he had left others to unbelief and perdition. After his death, in 1609, his followers rapidly increased, and were vehemently attacked by the Calvinists. In 1610 they addressed a petition to the States of Holland for protection, from which they got the name of Remonstrants. The Calvinists put forth a counter-remonstrance, and, in 1614, the States issued an edict granting full toleration to both parties. This displeased the Calvinists, who continued their persecutions, and at length, in 1619, the doctrines of the Arminians were condemned by the synod of Dort, and their clergy were driven from their churches, and forbidden to exercise the ministry in public. In consequence of this decision, many left the country, and took refuge in France, England, and other places. The views of the Arminians are summed up in the following five articles:—1. That God had, from all eternity, determined to save all who, he foresaw, would persevere in the faith, and to condemn all who should continue in unbelief. 2. That Christ died for all men; but that only those who believe are really saved by his death. 3. That man is of himself incapable of true faith, and therefore must be born again, of God, through Christ, by the Holy Spirit. 4. That all good works are to be attributed to the grace of the Holy Spirit, which, however, does not force a man against his own inclination. 5. That God gives to the truly faithful the power to resist sin. With respect to the possibility of a fall from the state of grace, Arminius and his immediate followers were undecided; but his followers came afterwards to believe that it was possible. After 1630, the Arminians were again tolerated in Holland; but, from this time, their opinions underwent a considerable change. They have inclined more and more to freedom of thought and the rejection of creeds and confessions. They build chiefly upon the necessity of moral duties and good works, and allow each one to interpret the Holy Scriptures for himself. They reject many articles of faith, and do away almost entirely with the necessity of succour from the Holy Spirit. The Arminians have, however, dwindled away to a very small body; but their tenets, more especially regarding predestination, have been adopted by various other denominations, as the Wesleyan Methodists, as

well as by numerous individual members of other churches.

ARMISTICE, *ar'-mis-tis* (Fr.), is a truce or suspension of hostilites between two armies or nations at war, by mutual consent. It sometimes takes place when both parties are exhausted; at other times it is had recourse to with a view to arrange terms of peace. It may be either general or partial; the former between two countries, the latter limited to particular places, as between two armies, or between a besieged fortress and the besiegers. The former in general requires ratification, but the latter is in the power of the commanders of the troops.

ARMLET, *arm'-let* (Lat. *armilla*), a bracelet or large ornamental ring worn by the ancients upon the wrist or arm. With the Medes and Persians, it was worn by both the male and female sex; but, with the Greeks, it appears to have been adopted by the women only. The wearing of the armilla, or armlet, is of high antiquity; and we read in 2 Sam. i. 10, that the Amalekite who slew Saul "took the crown that was upon his head, and the bracelet that was upon his arm." Although it was regarded as a mark of effeminacy for a Roman to wear this ornament, it was nevertheless a custom with the Roman generals to bestow armillæ upon soldiers, as a mark of respect for extraordinary deeds of valour. The materials out of which the



ARMLETS.

armillæ were made were as various as the designs into which they were fashioned, a twisted serpent being one of the most favourite forms. The Danes, Norsemen, and Anglo-Saxons also wore the armlet. William of Malmesbury states that when, in 1040, Earl Godwin made peace with Hardicanute, he ratified it with a splendid present,—a ship the stern of which was inlaid with gold, and on board which were eighty magnificently-equipped soldiers, each wearing an armlet of pure gold weighing 16 ounces. Armlets of gold have been dug out of the bogs of Ireland, and several have been found in England.

ARMORACIA, *ar-mo-rai'-si-a*, in Bot., a gen. of plants belonging to the nat. ord. *Cruciferæ*. The species *A. rusticana* is cultivated for the sake of the root, which is the common *horseradish*, so much used as a condiment. The plant is frequently met with, growing wild by the sides of ditches and on the banks of rivers. A volatile oil, resembling oil of mustard, may be obtained from horseradish by distillation, and there can be no doubt that all the valuable properties of the plant depend on this principle. The odour of the oil is extremely powerful, that arising from a single drop being sufficient to fill a whole room. The root is considered to be antiscorbutic, anti-rheumatic, stimulant, diaphoretic, and diuretic, and is frequently used in medicine. Applied to the skin, it produces vesication. A syrup, made with an infusion of the root and sugar, has been used, with success, as a remedy for hoarseness, arising from relaxation. Burnett states that horseradish steeped in milk forms one of the best cosmetics. As a dietetic, it is used scraped, or in the form of a sauce, with roasted meat and fish. When eaten on an empty stomach, it is deleterious. Some lamentable cases of poisoning have occurred from the substitution of aconite, or monkshood root, for horseradish, which it is supposed to resemble. In the *Pharmaceutical Journal*, Bentley gave the following distinctions between the two roots: —"*Aconite*—root conical in form, and tapering perceptibly to a point; coffee-coloured, or more or less brownish externally; odour merely earthy; taste at first bitter, but afterwards producing a disagreeable tingling and numbness. *Horseradish*—root slightly conical at the crown, then cylindrical, or nearly so, and almost of the same thickness for many inches; white, or with a yellow tinge; odour especially developed upon scraping, when it is very pungent and irritating; taste, bitter or sweet, according to circumstances, and very pungent. The roots of monkshood and horseradish may also be distinguished by the different appearances they present when scraped with a knife. The former will then be observed to be of a succulent character, and the scraped portions soon acquire a pinkish, or reddish hue; whilst the latter scrapes firm and dry, and does not alter in colour."

ARMORIAL BEARINGS, *ar-mor'-i-al*, a term applied, collectively, to the shield and its charges, the crest, helmet, and motto, belonging to any gentleman entitled to bear arms. The supporters, belonging, with very few exceptions, solely to peers of the realm, are also included in this expression. It is, however, properly applied to the devices on the shield only. The assessed taxes on armorial bearings for persons chargeable with house-duty, or for any carriage taxed at the rate of £3. 10*s.* annually, amount to £2. 12*s.* 9*d.* per annum, but for persons not so chargeable, 13*s.* 9*d.*

ARMOUR, *ar'-mor* (Lat. *armor*), the name for all such habiliments as were used to protect the person of the wearer from the weapons of an enemy. From the earliest dawn of the historic era, we find mention of this defensive covering. Those ancient nations who were the most civilized, employed leather, brass, iron, and even gold, in the fabrication of their defensive clothing. Goliath of Gath, as is recorded in 1 Sam. xvii. 6, put on greaves to protect his legs, and Homer tells us, that at the siege of Troy the Grecians were "well-greaved." Even at the early period, the greatest skill and care were lavished upon the decoration of the armour of military leaders. According to Homer, the golden armour of Glaucus was worth a hundred oxen; and, from the description in the Iliad, we may gather how highly ornamented was the shield of Achilles. The Elgin Marbles likewise frequently exhibit a Greek warrior wearing a beautifully-wrought helmet and cuirass. Nor was the war-dress of an ancient Greek less complete, in a defensive sense, than its elaborate ornamentation. In proof of this, we have only to give a minute description of the attire of a heavy-armed Greek soldier. Having his tunic already upon his body, he put on, 1. his greaves, or leg-guards; 2. his cuirass, or thorax, which, being composed of a back and breast plate, formed a defence for his chest, back, and abdomen; 3. his sword, which was suspended upon his left side by a belt passing over his right shoulder; 4. his massive round shield; 5. his helmet; 6. he took up his spear. For further information as to these articles, *see* their respective headings. With the Egyptians, metal armour appears to have been worn only by the monarchs and nobility, the soldiery being defended by helmets of quilted linen, their shields being usually of wood. Among the Romans, the lorica, or cuirass, was originally of leather; but subsequently it was made of brass, like the rest of the Roman body-armour. The attire of a Roman soldier was substantially the same as that of the Greek warrior, already described. By Servius Tullius it was decreed that the military equipment of a Roman soldier should consist of six articles, —the ocrea or greave, the lorica or cuirass, the ensis or sword, the clipeus or shield, the cassis or helmet, and the hasta or spear (*see* these words). All these portions, except the spear, are alluded to in a celebrated passage of St. Paul (Eph. vi. 17). With respect to the armour worn in England, it is supposed that the early Britons had scarcely any other defensive armour than a shield. The Anglo-Saxons, however, possessed a more complete equipment. From old illuminated manuscripts, one of the laws of Athelstan, and other data, we learn, that at various periods they wore the shield, helmet, neck-guard, and breastplate, the whole of which is believed to have been made of leather or rough hides. They are also stated by Alcuin to have worn a well-fitting linen tunic, which was sufficiently light to enable them to direct the dart, poise the shield, or wield the sword. When the Danes first arrived in Britain, their defensive covering appears to have consisted of a broad leather collar, encircling their neck and chest, and shin-pieces; but during the reign of Canute, they borrowed from their kinsfolk, the Norsemen, a tunic with long sleeves, and a hood and chausses, or pantaloons, all of which were strengthened by a network of perforated steel lozenges, called macles

or muscles. On their head they also wore a conical skull-cap, probably of leather, from which pieces could be let down, and thereby afford a perfect protection for the whole of the face. This helmet was surmounted by an apex or circular knob, from which, as a centre, a painted circle of star-rays radiated. For offensive arms, they had battle-axes, swords, and spears. In the Norman period, an entire suit of armour, frequently termed *harness*, consisted of a casque or helmet, a gorget, cuirass, gauntlets, tasses, brassets, cuisses, and leg-coverings (*see* these words). This was the usual wear of feudal lords, knights, and cavaliers, whether in battle or in the tournament, and was called armour *cap-à-pie*. It underwent various changes during the reigns of Rufus, John, Henry III., and Edward III. Until the time of the last-mentioned monarch, armour was generally of chain-mail; but, in the 14th century, plate-armour came into use, and, becoming more and more elaborate and richly-ornamented, reached its climax of splendour during the reign of Richard III., when it was often beautifully damascened and inlaid with gold. Fluted and engraved armour was much in fashion in the days of Henry VII. and VIII.; but, in the reign of James I., the general use of armour fell into disrepute, and the steel coverings for the lower limbs were almost wholly laid aside. Charles I. endeavoured to revive the fashion of wearing a complete suit of armour; and we may learn how much attached he was to iron habiliments, from his being so often represented in them in paintings. The only armour worn in the days of the Protectorate was the helmet and cuirass, both of which are, by the way, still retained in several *élite* corps of the European armies, such, for instance, as the English life- and horse-guards, the cent-gardes of France, the imperial guard of the czar of Russia, &c. These remnants of an iron-clad age may, however, be said to be less serviceable than showy. An interesting paper, communicated to the Society of Antiquaries by Sir Samuel Meyrick, explains the mode in which a knight attired himself in his suit of steel. He commenced with his feet, and, proceeding upwards, put on—1. his sabatynes, or steel clogs; 2. his greaves, or shin-pieces; 3. his thigh-pieces, or cuisses; 4. his breech of mail; 5. his tuillettes, or overlapping pieces below the waist; 6. his cuirass, or breastplate; 7. his vambraces, or coverings for the arms; 8. his rerebraces, or coverings for the remaining portions of his arm to the shoulder; 9. his gauntlets; 10. he hung his dagger; 11. he put on his short sword; 12. he donned his cloak; 13. his bacinet; 14. his long sword; 15. he took into his left hand his pennoncel; 16. he took up his shield.—When thus "locked up in steel," the knight was said to be armed *cap-à-pie*, an old French phrase for 'head to foot;' in other words, he was armed at all points, either for offence or defence.—*Ref.* Meyrick's *Critical Inquiry into Ancient Armour*; Gough's *Sepulchral Monuments*; Hewitt's *Ancient Arms and Armour*; *English Cyclopædia*—Arts and Sciences.

ARMOURER, *ar'-mor-er*, in the British army, is a soldier whose duty it is to keep in repair the barrel, stock, lock, and other parts of the rifles, pistols, or carbines of the troop of cavalry or company of infantry to which he belongs. His remuneration for these services is regulated by a tariff of prices, and he is also paid by the captain of his troop or company a penny a month for each soldier's rifle or carbine, the lock of which he is required to take to pieces and clean. In the British navy, the armourer is a warrant officer, assisted by a subordinate who is called armourer's mate. On ship-board the armourer has under his care all the pistols, rifles, cutlasses, boarding-pikes, &c.

ARMS, *arms* (Lat. *arma*), or weapons of offence, may be divided into two principal classes,—those that act by explosion, and those that do not. To speak first of the earliest of these arms, those wielded without the assistance of gunpowder, the simplest and most natural perhaps of all arms is the club; but the earliest offensive weapons, properly so called, were the bow and arrow, and we read in Holy Scripture of Isaac telling Esau to take his bow and quiver, and go forth into the field and take venison (about B.C. 1760). Employed at the beginning as a means of obtaining food by the slaughter of wild animals, its effect as a destructive weapon led to its being required as a weapon of war. The sling was, in all probability, its successor in military operations. Lucretius, tracing the progress of offensive arms, says:—

"Arma antiqua, manus, ungues, dentesque fuere,
Et lapides, et item sylvarum fragmina rami,
Et flammæ, atque ignes postquam sunt cognita primum;
Posterius ferri vis est, ærisque reperta;
Et prior æris erat quam ferri cognitus usus."

("Man's earliest arms were fingers, teeth, and nails,
And stones, and fragments from the branching woods
Then fire and flame they joined, detected soon,
Then copper next; and last, as latest, traced
The tyrant iron, than the copper vein
Less freely found, and sturdier to subdue.")

After the bow and arrow, the pike, lance, spear, dart, javelin, dagger, mace, axe, chariot-scythe, dirk, bayonet, sword, &c., came to be employed. The balista, catapulta, and battering-ram, may be said to be the precursors of the modern artillery. The invention of gunpowder led to the introduction of an immense variety of weapons of offence, acting by the agency of this destructive compound. As most of these arms will be severally described at length under their own headings, it will not be necessary to furnish more than a brief enumeration of them in the present article. The hand-cannon, probably the earliest in date, was a simple tube fixed on a straight stock of wood, and furnished with a touch-hole and trunnions, like the large cannon of the present time. The hand-gun was cast in brass, and was used in England as far back as the year 1440, and rendered important service at the siege of Constantinople in 1453. The arquebus, or harquebus, is mentioned as early as 1476. The harquebut, hakebut, or haqbut, differed from the arquebus in having a bent stock, an improvement which enabled it to be brought nearer to the level of the eye. The demi-haque was a long pistol with a butt curved almost into a semicircle. The musquet was invented by the Spaniards, and was first used at the battle of Pavia. The Italians invented the rose-lock, or wheel-lock, and introduced it into warfare about the time of Henry VIII., as an improvement upon the matchlock. The snaphaunce superseded the wheel-lock, but was commonly used in the reign of Elizabeth, and was in turn supplanted by the caliver, carabine, escopetta, and fusil. This latter,—from which the term fusiliers, applied to certain of our English infantry regiments, was derived, was invented by the French in 1630. During the reign of Charles II. the blunderbuss, so called from the Dutch *donderbus* (thundering gun), seems to have been imported from Holland. Somewhat resembling this latter weapon was the dragon, so called from having the muzzle ornamented with a dragon's head. The conjecture is, that the modern term d derived from this weapon. The musket, a of firelock, continued to be used until qu date in military operations; but, at the present time, the rifle, the most complete portable weapon of offence acting by explosion, has become general throughout the armies of England, France, &c. The rifle is not, however, a newly-invented weapon, although it has lately been so wonderfully improved. (*See* RIFLE, BAYONET, &c.) For an account of non-portable explosive weapons, *see* ARTILLERY.)—*Ref.* Grose's *Military History*; Sir S. Meyrick's *Memoir on the Introduction of Fire-arms*.

ARMS, in Her. (*See* ARMORIAL BEARINGS.)

ARMS, BELLS OF, in Mil., a conical-shaped tent, which is pitched in the field, to contain the whole of the arms of a company of infantry. They are also called "bell-tents," and are usually painted with the colours of the regiment and with the royal arms.

ARMS, MESSENGER AT. (*See* MESSENGER-AT-ARMS.)

ARMS, SERGEANT AT. (*See* SERGEANT-AT-ARMS.)

ARMS, STAND OF, in Mil., denotes a complete set of arms for a single soldier, whether of infantry or cavalry; as, rifle, bayonet, cartridge-box, belts, &c.

ARMSTRONG GUN, *arm'-strong*, a weapon of g power and wonderful precision, first used in the with China, in 1860, with remarkable effect, invented by Sir William G. Armstrong during the Russian war, in 1854. The following are the chief characteristics

and qualities of the Armstrong gun, which render it peculiarly valuable in modern warfare:—1. Its lightness in comparison with every description of cannon in general use, which it is rapidly superseding; the weight of an Armstrong 32-pounder and one of the ordinary kind being about 26 cwt. and 57 cwt. respectively. 2. The economy effected in the consumption of powder, half the quantity used to charge an ordinary cannon being sufficient for an Armstrong gun of the same calibre. 3. The great length of range attained, shot and shell having been thrown by this arm to a distance of more than [illegible] miles. 4. Its non-liability to injury arising from repeated firing, from the peculiar method used in making the gun. 5. The great accuracy of aim to be attained, objects of small size being hit nine times out of ten, at a distance of 4,000 or 5,000 yards, at which they are but just perceptible to the naked eye, the *apparent* size, at that distance, of an object ten feet square, being less than a postage stamp. 6. The adaptation of the convenient method of loading at the breech of the gun. And lastly, the peculiar construction of the elongated shells formed of separate pieces, fifty in number, fitted together in an external covering of iron, and provided with fuses that can be regulated with such exactness, that the missile can be fired through a thick mass of solid timber without injury to itself, or that explosion can be insured with the slightest degree of concussion, or at any point of its path between the muzzle of the gun and the object at which it is directed. To insure strength, coupled with lightness and durability, the gun is made of pieces of the very best wrought iron, which are put together in a manner similar to that used in making gun-barrels out of nails, horseshoes, and pieces of iron rods, which are twisted round a steel bar, and hammered together. The bars used for the Armstrong guns are flat, and about two inches wide. They are brought to a white heat, twisted round a steel core, and then welded together; more bars are then twisted over these in a contrary direction, and the process is repeated until the required degree of thickness is attained. The hollow cylinders of welded iron thus formed are about three feet long, and, from these pieces, guns of any desired length can be made, by fitting the ends carefully together, and joining them with rings of wrought iron. The bore of the gun is rifled by machinery, with a large number of small grooves close together. These grooves form a complete twist round the bore in a distance of ten feet, and there are as many as forty in a gun of 2½ inches bore. It differs in this respect from an ordinary rifled gun, which has only two, three, or four grooves, and from the Lancaster and Whitworth guns, the former of which has an oval, and the latter a polygonal bore. The shot and shell used for the Armstrong guns are elongated, the length being about three times the diameter. Bands of thin lead are attached to them, that they may take the form of the rifled interior of the bore when forced forward by the explosion of the charge, and acquire a rotatory motion as soon as they have left the muzzle. In order to load the gun at the breech, an aperture is cut into the bore at the breech end from the upper side, rather wider than the bore itself, and long enough to admit the shot or shell, with the charge of powder, which is pushed forward into the bore by the hand. After loading the gun, this aperture is closed by a movable breech-piece, faced with a disk of copper, at the end next the charge. This disk is forced into the bore immediately behind the charge, by a screw which passes through the breech end of the gun, and presses forward the breech-piece when turned by the hand-lever attached to it: the copper expands at the moment of explosion, and prevents all escape of gas. The end of the breech-piece nearest the charge, as well as the copper disk, is bored to receive a small discharging cartridge; and the touch-hole for the detonating plug which fires this cartridge is formed in the upper side of the breech-piece, and passes into the bore which contains it; so that when the gun is to be discharged, the detonating plug is struck, and the small discharging cartridge thereby fired, which communicates its fire to the charge. Many of our men-of-war and fortresses are furnished with Armstrong guns of very large calibre, some capable of discharging shot 100 lbs. in weight. The lightness of the 9- and 12-pounders renders them well suited for field batteries and horse artillery.

**Army**, *arm'-e*, is a term formed from the French word *armée*, and denotes a body of men trained and disciplined for military service, under the command of a chief or leader, with a regular gradation of subordinate officers. This term is usually applied to the regular or standing army of a nation; sometimes, however, it is employed to include also the militia and volunteers. A number of regiments sent out on a particular expedition under the command of one person is also called an army. The person in command is termed the general or commander-in-chief; when two or more allied armies are under the chief direction of one officer, he is usually styled generalissimo. A general has under him lieutenant-generals, major-generals, colonels, lieutenant-colonels, majors, captains, and subalterns. An army is composed of a certain number of corps, each consisting of brigades, regiments, battalions, and squadrons. Though people must have gone to war with each other at a very early period of the world's history, and must have soon recognised the importance of a certain amount of skill in carrying on their operations, yet it must have been some time later before they could be said to have had armies. The possession of a body of men trained and disciplined for attack or defence, denotes a comparatively high state of civilization. The earliest trained army of which we have any account was that of Sesostris, king of Egypt, who flourished about sixteen hundred years before Christ. It was organized for the purpose of conquering the world, and consisted, according to Diodorus Siculus, of 600,000 infantry, 24,000 cavalry, and 27,000 war-chariots. In the reign of David, who increased the standing army which Saul had introduced, the Jews acquired considerable skill in the military art. Solomon introduced cavalry into the army, and also chariots. Subsequently, the Persians came to be distinguished for their military achievements. The strength of their army, however, consisted in its cavalry, who were noted for their bravery, and impetuosity in attack. Their infantry seems to have been little better than an armed mob, and hence the repeated defeats that they sustained from comparatively small bodies of Greeks. The army with which Xerxes invaded Greece is said, including the sea forces, to have amounted to upwards of two millions and a half of fighting men. According to Arrian, Darius brought into the field against Alexander 1,000,000 infantry, 40,000 cavalry, 200 chariots armed with scythes, and 15 elephants. Allowing for the exaggerations in these numbers, they still may be taken as evidence that the Persian army was very great. In Greece, split up as it was into a number of petty states, a warlike spirit was early engendered. Hence we find that one great object of their rulers was to organize a physical training and an education specially fitting them for war. To the institutions of Lycurgus the Spartans were indebted for the military pre-eminence which they held among the states of Greece. They were taught to accustom the body to hardships and the mind to suffering, to despise luxury and refinement, and to practise abstinence and self-denial. Indeed, the entire training of a Spartan was with a view to making him a good soldier; so that for skill and a high state of discipline, the Spartans were unrivalled among the Greeks. They paid great attention to arrangement, and were the first to introduce the phalanx, a particular mode of arranging the infantry. The Spartan phalanx was eight files in depth, the files in open or marching order being six feet apart; in close order, three feet; and in locked order, for receiving an attack, a foot and a half. The military system of the Athenians agreed in its leading features with that of the Spartans, but was carried out with less exactness. The Spartan was steady, devoted, and firm; the Athenian bold, enterprising, and dexterous. They had three classes of troops,—the heavy-armed infantry, who fought in phalanx, armed with spears, swords, corslets, and shields; the light-armed infantry, armed with light spears and shields; and a kind of irregular infantry, for harassing an enemy on the march, being armed with javelins, bows and arrows, and slings, but with no defensive armour. As regards the military strength of the Athenians, we are told that they had 10,000 heavy-armed troops at Marathon,

and 8,000 heavy-armed, and as many light-armed, at Platæa. Philip of Macedon made several improvements in the arms and arrangement of his soldiers. He made the phalanx deeper and closer than it had been among the Spartans, and introduced spears 24 feet in length; so that in the phalanx the spears of the fifth rank projected three feet beyond the first rank. He also organized bodies of cavalry, and was the first to maintain a standing army in Greece. The Macedonian army was further improved by his son Alexander, in the train of whose army we, for the first time in Greek history, find artillery in the shape of *ballistæ* and *catapultæ*. The strength of the Macedonian army in the time of Philip probably did not exceed 30,000 fighting men. During the reign of Alexander, however, it was much increased; and, at the battle of Arbela, the Macedonian army consisted of 32,000 heavy-armed infantry, 16,000 light-armed infantry, and 4,000 cavalry, besides several thousand auxiliaries; making in all probably about 60,000 fighting men. The army of the Carthaginians differed from the Greek armies in that it was composed chiefly of mercenary troops, or at least levies from different countries; and yet these troops defeated the Romans in several pitched battles. Livy tells us that Hannibal set out on his expedition against Italy at the head of 100,000 foot and 10,000 horse; but that he lost 30,000 men in crossing the Alps. This seems to be an overstatement; for, according to Livy himself, Hannibal at Trebia had only 30,000 infantry and 10,000 cavalry, and at Cannæ 40,000 foot and 10,000 horse. Seeing, however, that Hannibal left two armies in Spain, the Carthaginian forces may be moderately estimated at, at least, 100,000 men. The Roman army in its best days surpassed in organization and discipline that of any nation that preceded it. The military age was from 17 to 46 or 50; and, in pressing emergencies, every citizen between these ages was obliged to serve as a soldier; but usually the more youthful of the population were preferred. Their training was of the severest description, not being confined to mere military matters, but directed also to the development of their physical and mental powers, inuring them to labour, fatigue, and hardships, and inspiring them with boldness and self-reliance. The basis of the Roman army was the legion, which comprised both infantry and cavalry, and at first consisted of about 3,000 men; but afterwards the number was increased, till, in the later period of its history, it amounted to from 5,000 to 6,000 men. The legions were formed annually by the magistrates choosing from the different tribes of citizens those whom they considered best fitted for military service. A legion was commonly composed of from 1,200 to 1,500 or 1,800 *hastati*, who were young men in the flower of youth, and who were placed in the first line in battle; a like number of *principes*, or men of middle age, who formed the second line; and about 600 *triarii*, or veterans, who constituted the third line. Besides these, each legion had 300 cavalry and about 1,200 *velites*, or light infantry, who were the youngest men in the legion, and were armed with bows, slings, and javelins for harassing the enemy. When drawn up in order of battle, the *hastati* formed 10 corps, each corps having 16 men in front and 10 deep; the *principes*, or second line, were drawn up in the same manner; the *triarii* were also divided into 10 corps, but had only 10 men in front and 6 in depth. The *velites* had no particular station. Afterwards the legion came to be divided into cohorts, without regard to the lines. There were 10 cohorts in a legion, 3 manipules in a cohort, and 2 centuries in a manipule. Accordingly, in a legion of 6,000 men, a century consisted of 100; and hence its name. The cavalry were divided into 10 *turmæ*, or troops, and each *turma* into 3 *decuriæ*, or bodies of 10 men. The distinguishing characteristic of the legion was its astonishing mobility, by which it was enabled to adapt itself to every change and every variety of circumstance. It was admirably suited either for attack or retreat. The arms of the heavy-armed infantry were a sword, the *pilum*, or heavy dart, and the pike. The *pilum* was originally a weapon only of the veterans, but afterwards was used also by the *hastati* and *principes*. The pike was used only by the veterans. Their defensive armour consisted of a large buckler or shield, 4 feet in length by 2½ in breadth, made of wood and covered with a bull's hide; a helmet or head-piece of brass for covering the head, and formed so as to protect likewise the neck and shoulders; a cuirass, or breastplate, made of brass, and about a foot square; and the *ocreæ*, a boot or greave fortified with iron, and worn for the protection of the right leg. The light infantry had swords and javelins, and were also furnished with bows and slings. The cavalry had nearly the same armour as the heavy-armed infantry. The total number of Roman legions under Augustus was 25, under Alexander Severus 32; but, during the civil wars, the number was much greater. In the latter days of the empire, the luxury, corruption, and love of ease which characterized the Roman people, soon manifested itself in the army. Their manners were corrupted and discipline was relaxed, till at length their splendid army degenerated into a feeble militia, unable to withstand the attacks of the barbarians of the North, by whom the empire was at length overthrown. After the subversion of the Roman power, the feudal system which was introduced was hostile to great military achievements, or the establishment of large armies. Military service was the tenure by which occupiers held their lands; and, while the barons enjoyed unlimited authority over their vassals, and were frequently at war with their neighbours, there were no great armies. In the 11th century the Crusades roused the minds of men, and called forth the whole energy of Europe. Mighty armies were marched into Asia to deliver the Holy Land from the dominion of the infidels. Many sanguinary battles were fought; but the combatants on both sides were little better than tumultuous masses impelled by fanaticism to deeds of valour. Charles VII. of France was the first to introduce standing armies in Europe, after the fall of the Roman empire. After his war with England (1445), under pretence of keeping always in readiness a force sufficient to defend the kingdom against sudden invasion, when he disbanded his other troops, he retained under arms a body of 16,000 infantry and 9,000 cavalry. He appropriated funds for their support, and appointed officers to command and discipline them. This occasioned an important change in the affairs and policy of Europe. By depriving the nobles of that direction of the military force of the state which had raised them to such power and importance, a deep wound was given to the feudal aristocracy; while the establishment of a national force always at the command of the sovereign was a new and powerful engine for repressing their turbulence and strengthening the authority of the crown. The kings of France were enabled to carry on operations with greater vigour and to a greater extent than formerly; and the expedition of Charles VIII. into Italy confirmed the superiority and reputation of a standing army. This led to an entire change in the military system of Europe. Those who had to contend with France had to adopt similar establishments, till at length standing armies became general all over Europe. Before this time the introduction of firearms had in a great measure changed the organization and equipment of the army. Personal courage, strength, and dexterity lost their exclusive importance, and the individual came to be more and more lost in the mass. The advantages of regular tactics began to be felt, and war came to be more and more reduced to a system. —It is usual to divide the history of armies in modern times, or since the invention of gunpowder, into seven periods. The first period begins with the employment of cannon, and extends to the campaign of Charles VIII. in Italy. The second period extends from the latter event to the commencement of the wars in the Netherlands, or from the end of the 15th to the middle of the 16th centuries. It comprises the wars of the French, Germans, and Spaniards in Italy. The third period comprehends the great war of independence carried on by the Netherlands in order to throw off the yoke of Spain, and extends from 1568 to the general suspension of hostilities in 1609. This war led to great improvements in the organisation and tactics of armies. By skill and discipline, a people, mostly merchants and manufacturers, bowed down by oppression, were able to cope with and at length ignominiously expel from their country, the forces of the first power in Europe. The fourth period comprises the Thirty Years' war in

Germany, and extends from 1618 to 1648. In this war Gustavus Adolphus greatly changed the character and tactics of armies. He departed from the dense formation of his predecessors, introduced lighter weapons, and made many improvements in the artillery, by which quicker and more complicated movements became practicable. The fifth period comprehends the wars of the French in Italy, in Germany, and in the Netherlands, as well as the Northern and Turkish wars, and embraces a period of ninety years, namely, from 1648 to 1738. In the wars of Louis XIV., during this period, great improvements were introduced in the art of carrying on military operations, under such generals as Turenne, Luxembourg, and Condé, while opposed to them were Marlborough, Eugene of Savoy, and other eminent generals. Standing armies now attained an extent hitherto unexampled. Instead of the 14,000 men maintained by Henry IV., Louis XIV., after the peace of Nimeguen, had an army of 138,000 men. To this period, too, belong the wars of Charles XII., under whom the Swedish infantry attained a high degree of perfection. The sixth period includes the three Silesian wars, and extends from 1740 to the breaking out of the French revolution in 1792. The Prussians had been for some time increasing their standing army and improving their military discipline, so that when Frederick the Great ascended the throne, in 1740, he found himself at the head of an army of about 80,000 men, in a high state of efficiency. This army he greatly increased and improved during his successive wars, till Prussian tactics became a pattern for all the other states of Europe. The seventh and last period extends from the period of the French revolution to the present time. The standing armies and the military science of this period far outnumber and surpass those of any one preceding.—We shall conclude this article with a short account of the armies of the principal states, beginning with our own. The British army, according to the army estimates for 1860-61, consists in all of 235,852 men, of whom 92,490 are on the Indian establishment. They are thus divided:—

| *Cavalry.* | *Officers.* | *Non-Com. Officers.* | *Rank & File.* | *Total.* |
|---|---|---|---|---|
| Royal Horse Artillery... | 66 | 110 | 1,557 | 1,723 |
| Life and Horse Guards... | 99 | 189 | 1,053 | 1,338 |
| Cavalry of the Line..... | 520 | 884 | 8,019 | 10,329 |
| *Infantry.* | | | | |
| Royal Artillery ..... | 819 | 1,601 | 18,532 | 20,952 |
| Royal Engineers ..... | 393 | 383 | 3,954 | 4,730 |
| Military Train..... | 123 | 259 | 1,638 | 2,020 |
| Foot Guards ..... | 261 | 439 | 5,600 | 6,300 |
| Infantry of the Line ..... | 3,330 | 6,029 | 75,350 | 84,709 |
| Army Hospital Corps ... | 2 | 396 | 604 | 1,002 |
| Commissariat Staff Corps | — | 41 | 284 | 325 |
| West-India Regiments | 180 | 239 | 3,000 | 3,419 |
| Colonial Corps ..... | 249 | 405 | 4,719 | 5,394 |
| *Staff, &c.* | | | | |
| General Staff (exclusive of officers on regimental full-pay)..... | 159 | — | — | 159 |
| Commissariat Staff..... | 198 | — | — | 198 |
| Medical Staff ..... | 386 | — | — | 386 |
| Staff of Depôt Battalions, &c..... | 112 | 87 | — | 199 |
| Staff of Recruiting Districts ..... | 35 | 62 | — | 97 |
| Commissioned Chaplains | 82 | — | — | 82 |
| Total | 7,010 | 11,121 | 125,231 | 143,362 |
| *The British forces in the East Indies are:—* | | | | |
| Royal Horse Artillery... | 22 | 39 | 561 | 622 |
| Cavalry of the Line..... | 385 | 642 | 6,216 | 7,243 |
| Royal Artillery ..... | 175 | 307 | 4,378 | 4,860 |
| Royal Engineers ..... | — | — | — | — |
| Military Train ..... | — | — | — | — |
| Infantry of the Line..... | 2,483 | 4,599 | 59,200 | 66,282 |
| Army Hospital Corps... | — | 6 | 57 | 63 |
| Depôts of regiments in India, stationed in Britain ..... | 384 | 956 | 12,060 | 13,420 |
| Total | 3,449 | 6,549 | 82,492 | 92,490 |
| Total of H.M.'s forces ... | 10,459 | 17,670 | 207,723 | 235,853 |

The cavalry consists of the Royal Horse Artillery, two regiments of Life Guards, the royal regiment of Horse Guards, seven regiments of dragoon guards, and eighteen regiments of dragoons. The infantry includes the Royal regiment of Artillery, comprising eighteen brigades, the Royal Engineers, Military Train, Grenadier Guards, Coldstream Guards, Scots Fusilier Guards, one hundred regiments of foot, Rifle Brigade, Army Hospital Corps, Commissariat Staff Corps, three West-India regiments, and several colonial corps.——The Austrian army has sixty-two infantry regiments of the line, fourteen regiments and one battalion of border-infantry, and one regiment and twenty-five battalions of chasseurs, having in all about 250,000 men; but when put on a war footing, about double that number. The cavalry have always held a high place in the Austrian army. It consists of eight cuirassier and eight dragoon regiments of the line, twelve regiments of hussars, and twelve of hulans. When on a war footing, the cavalry amounts to 70,000 men. The artillery has been reorganized and improved since 1849; it now consists of twelve regiments of field-artillery, having, on a war footing, 48,000 men, one regiment of coast-artillery of 3,439 men, and a rocket regiment of 3,850 men. The Engineers form the fourth branch of the service, of whom there are twelve battalions, numbering in all 11,232 men, besides six battalions of pioneers, numbering, on a war footing, 10,000 men. Besides these, there are fourteen companies of sanitary corps, amounting to 3,470 men. —The French infantry comprises three regiments of grenadiers, numbering, on the war footing, 12,000 men, four regiments of voltigeurs, with 16,000 men; a hundred and two regiments of infantry, of 408,000 men; twenty-one battalions of chasseurs, 33,000; four regiments of Zouaves, 15,000; three battalions of African light infantry, 2,400; two regiments of foreign troops, 8,000; and four regiments of Algerian tirailleurs, 15,000; making in all, on a war footing, 510,000 men. The cavalry consists of the Cent-Gardes (a personal escort), 221 men; two regiments of carabiniers, 3,000; twelve regiments of cuirassiers, 18,000; thirteen regiments of dragoons, 19,500; nine regiments of lancers, 13,500; thirteen regiments of chasseurs, 19,500; one regiment of guides, 1,500; eight regiments of hussars, 12,000; three regiments of chasseurs d'Afrique, 4,500; three regiments of spahis, 4,500 men. Thus, the total strength of the French cavalry, if raised to a war footing, would amount to about 100,000 men. The artillery is regarded as the finest arm of the French service. It consists of six regiments of foot artillery, five regiments of horse artillery, seven regiments of field artillery, one regiment of pontonniers, twelve companies of workmen; and numbers in all 68,544 men. There are also four regiments of engineers, numbering 15,448 men. Besides these, the gendarmerie numbers about 27,000 men.——The Prussian army has, of infantry, two regiments of guards, two regiments of grenadiers, four regiments of landwehr of guards, two battalions of chasseurs of guards, thirty-two regiments of the line, eight regiments of reserve, thirty-two regiments of landwehr, eight combined battalions of reserve, and eight battalions of chasseurs; with four brigades of guards, thirty-two brigades of infantry of the line; giving a total for war service of about 360,000 men. The Prussian cavalry is divided into heavy, middle, and light. The heavy cavalry is composed of one regiment of guards, one regiment cuirassiers of the guard, eight regiments cuirassiers of the line; giving a total of about 7,410 men. The hulans, or middle cavalry, consist of two regiments of guards, eight regiments of the line, and eight landwehr regiments; in all, 11,800 men. Of light cavalry there are thirteen hussar regiments, five dragoon regiments, twelve landwehr hussar regiments, and four landwehr guard regiments; total, 23,472 men. The Prussian army is weak in artillery, amounting only to 36,000 men. The pioneers would number about 7,000. The difference between the peace and war establishment of Prussia is greater than in any other European nation. The Prussian army on the peace-footing amounts only to about 160,000 men; while, on the war establishment, about 300,000 could take the field, leaving behind about 100,000 as depôts, &c.——The Russian infantry comprises twelve guard, eight grenadier, four carabinier, forty-two line, and forty-two chasseur regiments;

besides a number of separate battalions and miscellaneous troops, amounting in all to 340,000 men. There are also twelve heavy, thirty-eight light, and eleven dragoon regiments of cavalry, with about 80,000 men. The whole artillery forms nine foot and two horse divisions, with about 44,000 men.——The army of the German Confederation amounted in 1858 to 395,697, contingent and reserve,—31,900 chasseurs, 73,975 cavalry, 48,846 artillery, 11,530 engineers and pioneers, and 2,487 general officers; making in all 569,735 men. In 1859 the number was raised to above 600,000 men.——The Danish army on the peace establishment consists of one battalion of foot-guards, seventeen battalions of line infantry, and five corps of chasseurs, twenty-five squadrons of cavalry, two regiments of artillery, and one corps of engineers; numbering in all about 23,000 men. In the time of war this number could be largely increased.——The Swedish army is composed of enrolled or recruited troops, 7,693; of incorporated troops, 33,405; Gothland militia, 8,000; and conscription troops, 95,295; making in all 144,013 men. Norway possesses a separate army, consisting of 11,924 infantry, 1,070 cavalry, 1,330 artillery, and 9,160 landwehr.——The Belgian army consists of 56,550 infantry, 8,202 cavalry and gendarmerie, 6,700 artillery, 578 pontonniers, &c., and 1,680 engineers; making in all 73,718 men, which, on a war footing, could easily be raised to 100,000 men.——The Dutch army consists of one regiment of grenadiers and chasseurs, eight regiments of the line, five regiments of dragoons, five regiments of artillery, a corps of pontonniers, &c.; making in all 60,600 men.——The army of the newly-constituted kingdom of Italy comprised, on the 10th of June, 1861, an active effective force of 327,290 men. ——Spain possesses an army of about 232,000; Portugal about 24,500. The armies of the other states do not demand particular notice.—Before the present war, the United States of North America possessed a very small army, amounting only to about 12,000 men; but at present the North have in the field an army of 500,000 or 600,000, while that of their opponents in the South is probably not much inferior in numbers.

ARMY AGENTS, are persons authorized by government to manage the monetary affairs of the different regiments in the army. Every regiment has its army agent, selected by the colonel, who draws money from the War Office, and applies it to the regular expenses of the regiment. Army agents further pay soldiers' remittances to their families, distribute prize-money, and manage the sale and purchase of commissions.

ARMY LIST, is the name of a publication issued monthly by authority of the War-office, and containing the names of all the commissioned officers in the British army, the Royal Marines, militia, yeomanry, and volunteers, with the dates of their commissions, and other information of a like nature. The *Annual Army List* is a work of a similar kind, published also by authority, and giving "a list of the officers of the army, and of the corps of Royal Marines, on full, retired, and half-pay." The *New Army List*, published by H. G. Hart quarterly and annually, is a non-official work, but gives much more information, containing, besides the list of officers in the army and militia, with the dates of their commissions, "a statement of the war services and wounds of nearly every officer in the army, ordnance, and marines."

ARMY SCHOOLS.—Of late years much has been done in the way of establishing regimental and garrison schools, for the education of our soldiers and their children. In 1860 upwards of 200 schoolmasters, and a like number of schoolmistresses, were so employed; and the annual sum expended in connection with these schools is nearly £40,000. Besides these, there are certain army educational establishments for the instruction of the officers, and for increasing the military efficiency of the men. The principal of these are the Royal Military Academy at Woolwich, the Royal Military College at Sandhurst, the Royal Hibernian Military School, the establishment at Chatham, for the instruction of the Royal Engineers, &c., in military field-works, sapping, mining, pontooning, &c., and the school's of musketry at Hythe and Fleetwood.

ARMY ESTIMATES are estimates which are prepared in the spring of each year by the War Office, of the probable expenses of everything connected with the





army, for the ensuing twelve months. In the preparation of these, the secretary of state for war applies to the heads of the various departments under him for estimates of their probable requirements, and these are then incorporated as a whole, and submitted to the Treasury for approval. They are then presented to the House of Commons, when the various items are scrutinised, and it may be some of them rejected or reduced. The general plan of the estimates is the same from year to year, comprising the following great headings:—1. Forces; 2. Civil establishments; 3. Supplies; 4. Works and buildings; 5. Educational; 6. Non-effective. The following table gives the estimates of the expenditure under each division of these six headings for the year, from April 1, 1860, to March 31, 1861. The total number of her Majesty's forces were 235,852; but of these 92,490 were on the East-Indian establishment, leaving 143,362 men and 14,432 horses to be provided for by the estimates:—

| | | |
|---|---|---|
| I.—Land forces, pay and allowances | £4,499,636 | |
| Land forces, miscellaneous charges | 698,792 | |
| Embodied militia | 300,000 | |
| Volunteer corps | 68,000 | |
| | | £5,566,428 |
| II.—Departments of the secretary of state for war, and the of general commanding-in-chief | 196,224 | |
| Manufacturing establishments, military storekeepers, barrack-masters, lodging-money, rents, &c. | 374,005 | |
| Wages of artificers, labourers, &c. | 944,371 | |
| | | 1,514,600 |
| III.—Clothing and necessaries | 342,000 | |
| Provisions, forage, fuel, and light, barrack-furniture, bedding, &c. | 1,281,077 | |
| Warlike stores, for land and sea service | 2,168,389 | |
| | | 3,791,466 |
| IV.—Fortifications | 645,355 | |
| Civil buildings | 266,500 | |
| Barracks | 707,607 | |
| | | 1,559,462 |
| V.—Educational and scientific Branches | ... | 275,697 |
| Total effective services | | £12,707,652 |
| VI.—Rewards for military service | 25,390 | |
| Pay of general officers | 75,860 | |
| Pay of reduced and retired officers | 492,357 | |
| Widows' pensions and compassionate allowances | 184,523 | |
| Pensions and allowances to wounded officers | 44,123 | |
| In-Pension | 30,638 | |
| Out-Pension | 1,144,895 | |
| Superannuation allowances, &c. | 136,837 | |
| | | 2,134,623 |
| Total of estimates for 1860-61 | | £14,842,275 |
| Ditto 1859-60 | | 12,859,297 |
| Increase for 1860-61 | | £1,982,978 |

ARMY-WORKS CORPS.—A suggestion was made in 1854, during the Crimean war, that a number of skilled labourers, such as railway navigators, miners, and others, should be enlisted, and formed into a corps for the purpose of assisting the British army which was obliged to winter outside Sebastopol. There was no proper road between the harbour of Balaclava and the camp; and the labour and expense incurred in making the railway between the two places first suggested the formation of an army-works corps. Sir Joseph Paxton raised and organised the first body of men who went out. They numbered 1,000 good and efficient work-

men; but Lord Raglan soon perceived the value of their services, and wrote home for reinforcements. At the close of 1855 the Army-works Corps comprised 3,500 men. No drilling nor tedious instructions were necessary to teach these men their duty. They entered upon their work fully acquainted with it; and the experiment was altogether useful and satisfactory, as showing how an army in action can be materially assisted by ordinary workmen.

ARNEE, *ar-ne'* (*Bos Arni*), an inhabitant of the highlands of Hindostan, and closely allied to the common wild buffalo. It is remarkable for strength and courage, qualities admirably seconded by a pair of horns measuring from four to six feet in length, and arching in the form of a bold crescent. In Bengal this animal is known as *Arnia*.

ARNICA, *ar'-ni-ka*, in Bot., a gen. of plants belonging to the nat. ord. *Compositæ*. The most important species is *A. montana*, known by the names of Mountain-tobacco, and German Leopard-bane. It is a perennial herbaceous plant, found growing in the meadows of the cooler parts of Europe, and also of the western states of North America. The florets are of a yellow colour, tinged with brown. The whole plant, when fresh, possesses a strong and disagreeable odour and an acrid, bitter taste. All parts of the plant have striking medicinal properties, but the flowers constitute the part generally preferred. The preparation known as tincture of Arnica, which is obtained by macerating the flowers with alcohol, is now largely employed by the public as an external application for bruises; and notwithstanding the contempt with which its powers have been spoken of by eminent members of the medical profession, it has gradually gained ground among practitioners, and will probably be included with other novelties in the revised *Pharmacopœia*. The flowers, though not much used internally in this country, have been occasionally employed as a substitute for Peruvian bark, and are said to have proved beneficial in cases of amaurosis and chronic rheumatism. Preparations of arnica are much used by the homœopathists.

AROMA, *á-ro'-ma* (Gr., pleasant perfume), the principle in plants or other substances which constitutes their fragrance. In some plants this resides in a volatile oil; but in others the portion containing this principle cannot be detected. It is of an extremely subtle nature, filling the air of rooms, or even the whole atmosphere around gardens; and, although constantly being imparted for years,—as it may be, for instance, in the case of the musk, so as perpetually to fill the air of a well-ventilated room,—yet never causing to the substance from which it emanates any diminution of weight. The aroma of plants is imparted to oils and spirits by maceration.

AROMATICS, *á-ro-mat'-iks*, substances, as plants, drugs, and medicines, which emit agreeable odours, and are usually characterised by a warm pungent taste. Such are the spices ginger, cinnamon, pepper, balsams, frankincense, &c. They generally contain a peculiar volatile oil, mixed with resinous substances. The animal kingdom furnishes some aromatics, as ambergris, musk, civet, &c. They are employed in the manufacture of perfumery, and in medicine as antispasmodics, &c.

AROMATIC VINEGAR, a very popular perfume, the base of which is acetic acid. One of the best recipes for it is—

| | | |
|---|---|---|
| Concentrated acetic acid | ... | 8 oz. |
| Otto of English lavender | ... | 2 drachms. |
| ,, ,, rosemary | ... | 1 drachm. |
| ,, cloves ... ... | ... | 1 ,, |
| ,, camphor ... | ... | 1 oz. |

The bruised camphor to be first dissolved in the acetic acid; the perfumes are then added. After being allowed to stand during a few days, with occasional agitation, the compound is to be strained, after which it is ready for use. The most popular of the aromatic vinegars is that of Dr. Henry, the recipe for which is as follows:—Dried leaves of rosemary, rue, wormwood, sage, mint, and lavender-flowers, each ½ oz.; bruised nutmeg, cloves, angelica-root, and camphor, each ½ oz.; rectified alcohol, 4 oz.; concentrated acetic acid, 16 oz. The materials to be macerated for a day in the spirit; the acid then to be added, allowing the whole to digest during a week.—*Ref.* for several recipes of a similar kind, *The Art of Perfumery*, by G. W. S. Piesse.

ARPEGGIO, *ar-ped'-e-o* (Ital., from *arpa*, harp), in Mus., signifies reiterated successions of the several notes which compose any chord. The violoncello, viola, violin, and all instruments played upon with a bow, are capable of performing an arpeggio; but it is to the harpsichord and pianoforte that its execution more particularly appertains.

ARPENT, or ARPEN, *ar'-pain(g)* (Fr. *arpent*), an acre or furlong of ground. According to Domesday-book, 100 perches make an arpent. Some account it but half an acre. The old French arpent contained 100 perches, of 18, 20, or 22 French feet each.

ARQUEBUS, or HARQUEBUS, *ar'-kwe-bus* (Ital. *archibuso*, iron bow), was a kind of hand-gun used before the invention of the musket. The earliest hand-guns were fired by applying a match with the hand to the touch-hole. Afterwards a contrivance, suggested by the trigger of the crossbow, was introduced, by means of which the burning match could be instantaneously applied. This was called an squebus, and is first mentioned by Philip de Comines, in his account of the battle of Morat, in 1476. On the formation of the Yeomen of the Guard, in 1485, many of them were armed with arquebuses.

ARRACACHA, *ar-ra-ka'-ka*, in Bot., a gen. of plants belonging to the nat. ord. *Umbelliferæ*. It includes one spec · of great importance, namely, *A. esculenta*, a plant · ch cultivated in the tropical regions of South A..erica for the sake of the root, which is a very valuable article of food. This is about the size of a parsnip, which it somewhat resembles in flavour. It has been recommended as a substitute for the potato, and attempts have been made to cultivate it in Britain, but without any very satisfactory results. The starch obtained by rasping and washing the root is similar to arrowroot.

ARRACK, *ăr'-rik*, the name given in eastern countries to any kind of ardent spirit, but which is generally understood to apply to a spirit made either from rice, or from the juice of a palm-tree. (*See* RICE, TODDY.)

ARRAIGNMENT, *ar-rain'-ment* (Lat. *ad rationem ponere*; Old Fr. *ad reson*, or, abbreviated, *a rem*, to call to account or answer), in Law, is the calling of the offender to the bar of the court to answer the matter charged upon him. In *felonies* it is absolutely necessary that the prisoner should attend his trial personally, though it is not so in *misdemeanours*. The indictment must be read to him distinctly in English, although he has had a copy delivered to him. He is then called upon to plead "Guilty" or "Not Guilty." If he refuse to plead, the court may order a plea of not guilty to be recorded. (*See* TRIAL.)

ARREST, *ăr-rest'* (Lat. *arrestum*; Fr. *arrêter*, to stop or stay), in Law, is the beginning of imprisonment, where a man is first taken and restrained of his liberty by power of the law, with or without the process of some court or legal functionary. Arrests are either in *civil* or *criminal* cases, with this difference, that none shall be arrested for any cause of action, suit, or other civil matter, but by virtue of a precept or commandment out of some court; but for treason, felony, or breach of the peace, every man has authority to arrest without warrant or precept. For contempt of a superior court, the person may be attached or given into the custody of an officer of the court, until the contempt be purged by compliance, or the offended dignity of the court be appeased or satisfied with the punishment undergone. A clergyman cannot be arrested (except in a criminal matter) in the church or churchyard while attendant there, or in going to or returning from the same for the purpose of Divine worship; and it is a misdemeanour in the party arresting, if he knew the clergyman was on his way to perform Divine service. Barristers, attorneys, and witnesses are privileged from arrest in going to, staying at, and returning from a court or an arbitration in a cause or matter in which they are actually engaged. Peers, by virtue of their dignity, are exempt from arrest in civil cases at all times; and members of the House of Commons are also privileged during the sitting of the House, and for forty days after every prorogation, and forty days before the next appointed meeting. Arrest in all civil

cases before judgment is abolished, except the plaintiff can by affidavit show to a judge of a superior court, or of a county court, a reasonable presumption for believing that the defendant means to go abroad shortly, and to reside abroad; in which case he will grant leave for his arrest by writ of capias, directed to the sheriff. The claim must, however, be £20 or upwards. An action will lie for a malicious arrest. No person can be arrested in a civil case on Sunday. (*See* INQUEST, JUDGMENT.)

ARREST OF JUDGMENT.—For defects in substance, appearing plainly upon the face of the record, not amendable nor cured by verdict, the court will in general arrest the judgment. After argument on demurrer, the party cannot move in arrest of judgment for any defect or objection of which he might have availed himself on the argument of the demurrer. The motion in arrest of judgment must be made after the expiration of four days from the time of trial, if there are so many days in term; but it cannot be made after the expiration of the term. Defects may be amended. (*See* JUDGMENT NON OBSTANTE VEREDICTO.)

ARRONDISSEMENT, *ar-rond'-is-mawn* (*q*) (Fr.), a term employed in France to distinguish any portion of land held under the control of civil, military, or ecclesiastical authority. France is divided into departments, which are subdivided into arrondissements, and named accordingly; as the arroudissement of the Justice of Peace, the Maritime Arrondissement, &c. Paris is divided into twelve arrondissements, or mairies, equivalent to the wards of the city of London.

ARROW. (*See* ARCHERY.)

ARROWHEAD. (*See* SAGITTARIA.)

ARROWHEADED CHARACTERS. (*See* CUNEIFORM INSCRIPTIONS.)

ARROWROOT, *ăr'-ro-root*, the name given to various kinds of starch used as food by man. True West-Indian arrowroot is obtained from rhizomes or root-stocks of the plant *Maranta arundinacea*, and is one of the purest and best-known of the amylaceous substances. It forms a very firm jelly with boiling water, and, thus prepared, is a common article of diet for invalids and children. The name arrowroot is derived from the fact of the bruised rhizomes of the plant being employed by the native Indians as an application to the poisoned wounds inflicted by arrows. East-Indian arrowroot is obtained from the rhizomes of *Curcuma angustifolia*, and is sometimes called curcuma starch. The West-Indian plant is, however, cultivated to some extent in the East, and supplies of the true arrowroot are brought from Singapore. Tahitian arrowroot is obtained from the plant named *Tacca oceanica*, and the substance called Portland arrowroot is extracted from the *Arum maculatum*, a common hedgeweed in this country. In all these cases, the fecula consists of starch-grains, which are produced in great quantity, before the season of rest, in the succulent rhizomes or root-stocks of the plants. These grains are separated from the cellular tissue, and often acrid juices, by a very simple process, which consists simply in washing the grated root-stocks. Arrowroot is frequently adulterated with potato-starch and refined sago-flour, sometimes with rice-starch, and the starch of common wheaten flour. The granules of these inferior starches can readily be distinguished under the microscope by their different forms and sizes. (*See* STARCH.)



ARROWROOT PLANT (*Maranta arundinacea*).

ARSENAL, *ar'-se-nal* (Lat. *arx*, *arcis*, a citadel), is applied generally to any place where naval or military stores are kept, more particularly to a large public establishment where the munitions of war are manufactured and stored. The great English arsenals are Woolwich, Portsmouth, Plymouth, Deptford, Sheerness, and Pembroke. In France, the principal are Cherbourg, Brest, and Toulon.

ARSENIC, *ars'-nik* (Gr. *arsenikos*).—The substance which, in commerce, goes by this name, is the oxide of the metal arsenic, or arsenious acid. Arsenic was known in different combinations by the ancients, but has only lately been shown to be of metallic origin. It is, however, so unlike a metal in many of its properties, that certain French chemists consider it as belonging to the non-metallic elements. It conducts electricity, and possesses metallic lustre, and is very much allied to phosphorus. Arsenic is prepared in the state of arsenic acid or oxide, by roasting the arsenical sulphide of iron. Metallic arsenic possesses a brilliant grey lustre, which is unmistakably metallic. It may be reduced to powder in a mortar. When heated in close vessels, it sublimes unaltered; but in a current of air, it absorbs oxygen, and burns with a bluish flame, depositing a white mealy powder. A minute quantity of arsenic is added to lead, to diminish its cohesion, during the manufacture of shot. The only important combinations of arsenic are,—*arsenious acid*, $As_2O_3$, the white arsenic of the shops; *arsenite of copper*, or Scheele's green, a poisonous pigment which ought to be legally prohibited; the *Schweinfurth green*, which is a double acetate of arsenic and copper; the *bisulphide*, or *realgar*, which is used in pyrotechny; and the *tersulphide*, or *orpiment*, which is the king's yellow of the artist. Arsenic also forms a terhydride with hydrogen, analogous to the ammonia-like compounds formed by antimony and phosphorus. (For testing for arsenic, *see* TESTS.) Arsenic forms the connecting link between the non-metallic elements and antimony, which is certainly only a little more metallic than itself. In cases of poisoning by arsenic, freshly-precipitated hydrated oxide of iron, or calcined magnesia, should be at once administered. The influence of a minute quantity of arsenic on the human frame is a very curious question. In Styria, it is a common thing for the peasants to take twelve or thirteen grains per day of white arsenic, to improve their wind. It appears to do them no harm, as long as they relinquish the use of it gradually when they reach 50 or 60 years of age. They begin by taking a single grain per day, increasing the dose until they arrive at their maximum. If the doses are discontinued suddenly, death, with all the symptoms of arsenical poisoning, is the result.

ARSON, *ar'-son* (Lat. *ardeo*, I burn), at Common Law, is the maliciously, voluntarily, and actually burning the house or outhouse of another man, or wilfully setting fire to one's own house, provided one's neighbour's house is thereby also burnt; and all, not only the bare dwelling-house, but all outhouses that are parcel thereof, though not contiguous thereto, nor under the same roof, as barns and stables, may be the subject of arson. The statute law has made the malicious or wilful setting fire to almost every description of building or property subject to the same punishment as attached to the crime of arson.—*See* statute 24 & 25 Vict. c. 97, ss. 1 to 10.

ART, *art* (Lat. *ars*), as distinguished from Science, consists of the truths disclosed by that species of knowledge disposed in the most convenient order for practice, instead of the best order for thought. Art proposes to itself a given end, and, after defining it, hands it over to Science. Science, after investigating the causes and conditions of this end, returns it to Art, with a theorem of the combination of circumstances under which the end desired may be effected. After receiving them, Art inquires whether any or all of those scientific combinations are within the compass of human power and human means, and pronounces the end inquired after attainable or not. It will be observed here, that all that Art supplies is the major premiss, or the assertion that the given aim is one to be desired. The grounds of every rule of Art are to be found in the theorems of Science. An Art can then only consist of rules, together with as much of the speculative propositions (which lose all their speculative look as soon as they come into the artist's hands) as comprises the justification of those rules. Though Art must assume the same general laws as Science does, yet it follows them only into such of their detailed consequences as have led to certain practical rules, and pries into every secret corner, as well as into the open stores of the household of

Science, bent on finding out the necessities of which she is in search, and which the exigencies of human life demand. Hence, as Edmund Burke wisely remarks, in his treatise on the *Sublime and Beautiful*, "Art can never give the rules that make an art." It must always owe them to Science. Whatever speaks in precepts or rules, as contrasted with assertions regarding facts, is Art; and hence it always adopts the imperative mood, whereas Science nearly always adopts the indicative. Science is wholly occupied with declarations, while Art is wholly engaged with injunctions, that something should be done. Thus, the builder's art desires to have houses, the architect's art desires to have them beautiful, and the medical art desires to cure diseases in the human body.—For further information on this subject, *see* Mill's *Logic*, vol. ii. c. xi.; and Dr. Brown's *Horæ Subsecivæ*.

ART AND PART (Lat. *ars*, cunning, invention; *pars*, a party in), in Law, is a term used in Scotland and the north of England, when one charged with a crime, in committing the same was both a contriver of and acted his part in it.

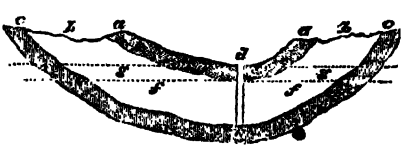
ARTANTHE, *ar-tăn-thē*, in Bot., a gen. of plants belonging to the nat. ord. *Piperaceæ*. The species are natives of the tropical regions of America. The dried leaves of *A. elongata* are much used in medicine. (*See* MATICO.) The dried fruits of *A. adunca* are employed as a substitute for pepper. The spikes of fruit of *A. crocata* are used for dyeing yellow.

ARTEMISIA, *ar-tē-miz'-i-a* (from *Artemis*, one of the names of the goddess Diana), in Bot., a gen. of plants belonging to the nat. ord. *Compositæ*, and comprehending several interesting and valuable species. *A. Absinthium*, the common wormwood, is an indigenous perennial, often met with in waste places and by roadsides. The flowers are arranged in globular heads, and are of a buff or yellowish colour, blossoming in August. The principal constituents are a volatile oil, a bitter principle called absinthin, and carbonate of potash. The latter was formerly known as "salt of wormwood;" but it possesses no specific virtue other than belongs to carbonate of potash generally: it is still, however, regarded as a patent remedial agent by the ignorant. The dried herb, or flowering-top, under the name of wormwood, is used as an aromatic bitter tonic, and as an anthelmintic. It is also employed in the preparation of liqueurs. The species *A. Abrotanum* is the southernwood, a fragrant plant employed on the Continent in making beer. The Persian species *A. acetica* is said to have the odour of strong vinegar; hence its name. The species *A. alba* and others are said to serve as nourishment to the herds of the Kirghese and Calmucs. The anthelmintic known by the names Semen-seriphii and Barbotine consists of the flower-heads of *A. cærulescens*, a Mediterranean plant. *A. chinensis*, and other species, are stated by Lindley to yield the Mexa of China. It is prepared from the cottony or woolly covering of the leaves, and used as a cautery, by burning it upon parts affected with gout and rheumatism. (*See* MOXA.) *A. Dracunculus* is the tarragon, the leaves of which are used for flavouring vinegar in pickles and salads. *A. gallica*, termed in France sanguerite or sanguerite, possesses similar properties to the species *cærulescens*. *A. indica* and *madraspatana*, both Indian species, are much used by the native doctors. *A. mutellina* and *spicata*, both Alpine plants, are said to furnish between them the famous liquor called *crême d'absinthe*, which a modern French writer styles "the emerald poison." The substance sold as wormseed, and known under the names of semen-contra, semen-cinæ, and semen-santonicum, consists of the broken flower-stalks, involucres, and flower-buds of *A. contra*, *pauciflora*, *lercheana*, *sieberi*, and *valiana*. It is employed as a vermifuge.

ARTERIOTOMY, *ar-tē'-ri-ot'-o-me* (Gr. *arteria*, an artery, and *temno*, I cut), in Surg., is the term applied to the opening of an artery for the purpose of drawing blood, and is distinguished from phlebotomy, or venesection, which is the opening of a vein. In ordinary cases, the latter is always preferable to the former; but sometimes, when it is necessary to take a large quantity of blood from the system very rapidly, as in apoplexy, arteriotomy is adopted, and then it is generally the temporal artery that is selected.

ARTERY, *ar'-te-re* (Gr. *aer*, air, and *tereo*, I keep), is literally an air-duct, and was a name applied by the ancients to certain vessels of the human body, which were believed by them to contain air, from their being found empty after death. The arteries are those vessels which convey the blood from the heart to all parts of the system. They are membraneous cylindrical tubes, composed of three coats; viz., the external, which is firm, strong, and elastic; the middle, which is muscular, contractile, and brittle; and the internal, which is brittle, smooth, and transparent, and lined with epithelium on the side washed by the blood. The action of the arteries called the pulse corresponds with that of the heart, and is effected by the contraction of their muscular coat and the great elasticity of their outermost one. Besides the arteries which carry the purified blood from the heart to all parts of the body, there is the pulmonary artery, which emerges from the right ventricle of the heart, and carries the impure blood from the heart to the lungs. The other arteries all spring from the aorta. (*See* ANATOMY.) The principal arteries will be found noticed under their respective names.

ARTESIAN WELL, *ar-tē'-zi-an*, a well from which water is obtained at a very great depth below the surface of the ground, by boring through strata of various kinds through which water cannot pass, such as clay, to others of a light and porous character, which are charged with water. The flow of water is obtained by hydrostatic pressure. The principles of an artesian well, and the way by which the water is obtained, may be better understood by reference to the accompanying diagram, from which it will be presently seen that it would be useless to attempt to bore an artesian well on hills or elevated ground; but that they can only be made with satisfactory results in basin-shaped hollows of considerable extent, the porous strata of which, that contain the water, crop out or come to the surface of the land above the level to which the water is required to rise. Let the figure represent the section of a basin-shaped tract of country, such as the London or Paris basin, and suppose *aa* to be a stratum of clay through which water cannot make its way; *bb*, an underlying stratum of light



ARTESIAN WELL.

sandy formation, or porous chalk-beds, which will contain water; and *cc*, another stratum impervious to water, like *aa*. Now all the rain which falls on the surface of the porous stratum at *bb*, and on all ground above it in elevation, and sloping towards it, from which, if impermeable to water, the rain will trickle down to the porous stratum, will be absorbed by it and held in the same, as the clay stratum *aa* prevents the rising of any springs to the surface of the ground between the points *aa*, and the stratum *cc*, of a similar character, prevents the water from oozing away below. In a basin such as that described above, some miles in extent, having impermeable strata lying immediately under the thin surface of the soil, there must necessarily be a deficiency in the supply of water, and it is for these districts that artesian wells are especially serviceable; for if a hole be bored from *d* to *e*, the pressure of the water in the parts of the porous stratum *bf*, *bf*, above the level *ff*, will cause the water accumulated below that level to rush through the bore in considerable quantities, and rise to some height above the level *gg*, the level of the ground at the mouth of the well. Artesian wells are said to derive their name from the province of Artois, in France, water having been obtained there from wells of this kind from a very early date. There are many in the neighbourhood of Vienna, and in the basins of London and Paris; among which may be mentioned those which supply the fountains in Trafalgar Square, and the famous well of Grenelle, near Paris, from which, after boring for eight years, with frequent interruptions

arising from the obstructions and accidents that occurred during the prosecution of the work, water was obtained at the depth of 1,800 feet below the surface, a distance of 1,700 feet below the sea-level. The water from this well rushes upwards with such force as to rise 30 feet above the level of the surface, and it is said to have risen at first to four times that height. The temperature of this water never varies, and is about 81° Fahrenheit, or a little more. The French government have caused many artesian wells to be sunk in different parts of Algeria, round which some of the wandering Arab tribes have settled, and formed villages. The operation is performed by rods from 15 to 20 feet in length, which can be attached to each other by male and female screws. A boring-tool is fastened to the end of the lowest rod, and, to the uppermost one, a lever turned by hand, by which the whole machine is turned round. The machine somewhat resembles a gigantic auger or gimlet, and operates in a similar manner.

ARTHRON, *arth'-ron*, is a Greek word signifying a joint, and, in composition, is used in a number of medical terms; as, *arthrosis*, an articulation; *arthritis*, inflammation of a joint, the gout; *arthrodynia*, pain in a joint; *arthropuosis*, a collection of pus in a joint; *arthrodia*, a species of articulation, in which the head of one bone is received into the superficial cavity of another, so as to admit of motion in every direction.

ARTHRODIC, *ar-thro'-dik* (Gr. *arthrosis*, articulation), in Anat., a term applied to a connection of bones, in which the head of one fits into a shallow cavity in another; by which means motion in nearly every direction is admitted of; as, for example, in the joint between the humerus and the scapula.

ARTHRODIREÆ, *ar-thro'-di-e* (Gr. *arthron*, a joint), a term applied to such algæ as possess an articulated structure, like Conferva and Oscillatorias.

ARTICHOKE, *ar'-ti-choke* (Fr. *artichaut*). — This delicate esculent is the young succulent receptacle of the flower-head of *Cynara Scolymus*, a perennial plant growing wild in the south of Europe, and extensively cultivated in this country. On the continent the artichoke is frequently eaten raw, with salt, pepper, and oil; but in England it is generally boiled before it is sent to the table. (*See* CYNARA.) The esculent tubers of a species of sunflower, *Helianthus tuberosum*, are known as Jerusalem artichokes; the term Jerusalem being a corruption of the Italian *girasole*, 'sunflower.' (*See* HELIANTHUS.)

ARTICLE, *ar'-ti-kel*, in Gram., is a part of speech prefixed to substantives in order to render their meaning more or less definite. It is derived from the Latin *articulus*, or Greek *arthron*, signifying a joint, a term applied by the Greek grammarians to the definite particle, as well as the relative pronoun, as connecting together the parts of a sentence; as in 'I gave you *that* (or *the*) book that you asked for;' the former they called the prepositive article, the latter the postpositive. The Greeks had only the definite article; the Latins had none, but used, instead, the demonstrative pronouns. In English there are two articles,—the definite *the*, and the indefinite *a* or *an*.

ARTICLE, in Law, signifies a complaint exhibited in the ecclesiastical court by way of libel or declaration.

ARTICLES OF THE PEACE are a complaint exhibited in the courts at Westminster, in order to compel the defendant to find sureties of the peace.

ARTICLES OF THE NAVY are rules and orders made for the government of the royal fleet.

ARTICLES OF WAR are certain regulations incorporated in the annual Mutiny Act, for the government of the military forces of the country, it being considered requisite for the maintenance of exact discipline, that soldiers who shall mutiny, or stir up sedition, or shall desert her majesty's service, or be guilty of any of the other offences specified in the act, should be brought to more exemplary and speedy punishment than the usual forms of law will allow. For the enforcement of such articles of war, power is given to the crown to convene, or to grant authority to convene, courts-martial, with power to try and punish such offences according to the provisions of the act. There are similar articles of war issued for the government of the marines and navy; but those applicable to the latter are not included in the annual Mutiny Act.

ARTICLES, THE SIX, in the ecclesiastical history of England, were certain articles of faith imposed by act of parliament in 1539. (*See* ANGLO-CATHOLIC CHURCH.)

ARTICLES, THE THIRTY-NINE, are the articles of religion of the Church of England, agreed upon by the archbishops and bishops of both provinces, and the whole clergy, in the convocation held at London in the year 1562, for the avoiding of diversities of opinions, and for the establishing of consent touching true religion. The substance of these articles was first promulgated in the reign of Edward VI., and formed forty-two in number. Under Henry VIII. a committee had been appointed for the formation of ecclesiastical laws, which was renewed under his successor. It was composed of Cranmer, Ridley, and others, who drew up the forty-two articles above referred to, and which were issued by the king's authority in 1553. On the accession of Elizabeth, Parker, archbishop of Canterbury, remodelled these articles, rejecting four of them entirely, and introducing four new ones, and more or less altering seventeen others. The four new ones are the fifth, twelfth, twenty-ninth, and thirtieth, as they now stand. When laid before the convocation of 1562, further alterations were made, and the thirty-ninth, fortieth, and forty-second of King Edward's were rejected. In 1571 the articles were once more revised and ratified. The following is a summary of the several articles:—1. That there is but one true God, and three Persons in the Godhead, of one substance, power, and eternity. 2. That Christ the Son took upon him man's nature in the womb of the blessed Virgin, uniting the two natures in one person, never to be divided; and was crucified, dead, and buried, to reconcile his Father to us, and as a sacrifice for sin. 3. That he went down into hell. 4. That he rose again from the dead and ascended into heaven, taking with him his human body. 5. That the Holy Ghost is one in substance, majesty, and glory with the Father and the Son. 6. That the Holy Scriptures contain all things necessary to salvation. 7. That the Old Testament is not contrary to the New. 8. That the three creeds,—the Nicene, Athanasian, and the Apostles',—are to be received and believed. 9. That original sin is the fault and corruption of the nature of every man that naturally is engendered of the offspring of Adam. 10. That in consequence, man cannot, without the grace of God, do what is pleasant or acceptable to God. 11. That we are accounted righteous before God only for the merit of Jesus Christ by faith, and not for our own works. 12. That good works, the fruits of faith, cannot put away sin, yet are pleasing and acceptable to God. 13. That works done before justification are not pleasing to God. 14. That works of supererogation, or voluntary works, over and above God's commandments, cannot be taught without arrogance and impiety. 15. That Christ was made like unto us in all things, except in that he was without sin, from which he alone was free. 16. That repentance is not to be denied to such as fall into sin after baptism, or after receiving the Holy Ghost. 17. That God hath from eternity decreed to deliver from curse and damnation those whom he hath chosen in Christ. 18. That men can only be saved through Christ; and not, as some say, by the law or sect which they profess, if they be diligent to frame their lives according to that law and the light of nature. 19. That the visible church of Christ is a congregation of faithful men, in which the pure word of God is preached, and the sacraments duly administered according to Christ's ordinance. 20. That the Church hath power to decree rites or ceremonies, and authority in controversies of faith. 21. That things ordained by general councils as necessary to salvation have no strength or authority, unless it may be declared that they be taken out of Holy Scripture. 22. That the Romish doctrines of purgatory, pardons, the worshipping and adoration of images or relics, and the invocation of saints, have no warranty in Scripture, but are rather repugnant to it. 23. That those only can lawfully take upon them the office of public preaching, or ministering the sacraments, who are chosen and called to this work by men having public authority in the congregation so to do. 24. That it is repugnant to the word of God and the custom of the primitive church, to have public prayer,

or to minister the sacraments, in a tongue not understood by the people. 25. That the sacraments are not mere *badges* or tokens of profession, but rather witnesses and signs of grace and God's goodwill towards us, by which he, working invisibly in us, not only to quicken, but also to strengthen and confirm our faith in him. That there are two sacraments,—baptism and the Lord's supper; and that those five commonly called sacraments, — viz., confirmation, penance, orders, matrimony, and extreme unction,—are not to be counted as such. 26. That the effect of Christ's ordinance is not taken away though ministered by evil men, inasmuch as they do it not in their own name, but in Christ's; and their ministry may be used both in hearing the Word and in receiving the sacraments. 27. That baptism is not only a sign of profession, but also a sign of regeneration, or new birth, whereby they that receive it rightly are grafted into the Church, and the promise of forgiveness of sin and adoption to be sons of God, are visibly signed and sealed. 28. That the Lord's supper is not only a sign of the love that Christians ought to manifest towards each other, but is rather a sacrament of our redemption by the death of Christ; and that transubstantiation is repugnant to the plain words of Scripture. 29. That the wicked, though they do carnally and visibly partake of the Lord's supper, are in nowise partakers of Christ, but rather eat and drink to their own condemnation. 30. That the cup of our Lord is not to be denied to the lay people. 31. That the one oblation of Christ is perfect redemption, propitiation, and satisfaction for all the sins of the whole world, both original and actual; and that the sacrifices of masses are blasphemous fables and dangerous deceits. 32. That bishops, priests, and deacons are not forbidden to marry. 33. That an excommunicated person ought to be regarded by the faithful as a heathen and publican until he be again openly reconciled by penance and received into the Church. 34. That it is not necessary that traditions and ceremonies be in all places alike; for every particular or national church hath authority to ordain, change, and abolish ceremonies or rites of the Church ordained only by man's authority; but that he who, through his own private judgment, doth willingly and openly break the traditions and ceremonies of the Church which are ordained and approved by common authority, and not repugnant to the word of God, ought to be openly rebuked, as he that offendeth against the common order of the Church. 35. That the second Book of Homilies doth contain a godly and wholesome doctrine, as doth the former Book of Homilies, set forth in the time of Edward VI., and are therefore to be read in churches. 36. Of consecration of bishops and ministers according to the Book of Consecration, set forth in the time of Edward VI. 37. That the queen hath the chief power in ecclesiastical as well as in civil matters. 38. That the riches and goods of Christians are not common; yet every man ought, according to his ability, to give liberally of his goods to the poor. 39. That though vain and rash swearing is forbidden, yet a man may swear when the magistrate requireth, so that it be done in justice, judgment, and truth.

ARTICULATA, or ARTICULATED ANIMALS, *ar-tik-u-lat'-a* (Lat. *articulatus*, jointed), according to the classification of Cuvier, the third great division of the animal kingdom. The great French naturalist subdivided the *Articulata* into four classes, to which later writers have added four others. The first four of the following classes are those of Cuvier:—1. Annelida, as leeches, earthworms, &c.; 2. Crustacea, as lobsters, crabs, prawns, &c.; 3. Arachnida, as spiders, mites, scorpions, &c.; 4. Insecta, as butterflies, beetles, flies, &c.; 5. Myriopoda, as centipedes; 6. Cirrhopoda, as barnacles and sea-acorns; 7. Rotifera, wheel-shaped animalcules, aquatic; 8. Entozoa, lowest of the worms, parasites upon or within other animals. (*See* these words.) The *Articulata* derive their names from the fact of their being composed of segments articulated or jointed together, each segment being formed of one or more rings.

ARTICULATE SOUNDS. (*See* LETTERS.)

ARTICULATION, *ar-tik-u-lat'-shon*, in Gram., is a term applied to a consonant, or that portion of a word which can be pronounced by a single movement of the organs of speech. Hence a good articulation consists in giving every letter and syllable of a word its due pronunciation. Exactness in articulation corresponds to propriety in spelling, and is an object that ought to be aimed after by all. The Greeks and Romans paid particular attention to this subject, which constituted a principal branch of instruction; and the smallest error in pronunciation was regarded by them as disgraceful. An indistinct articulation usually arises from too great precipitancy of speech, or from an improper use of the vocal organs. The latter of these may be cured by attending to the proper position of the tongue, lips, &c., in the formation of each letter; the former is to be got over by continued practice in reading aloud slowly and distinctly.

ARTICULATION, in Anat., is applied to the connection of the bones of the skeleton by joints. (*See* ANATOMY.)

ARTICULI CLERI, *ar-tik'-u-li kle'-ri*, are statutes containing certain articles relating to the church and clergy, made in the 11th Edward III.

ARTIFICER, *ar-tif'-i-ser* (Lat. *ars*, art, and *facio*, I make), is, literally, one who makes according to art; hence, a skilful workman, a contriver. It is frequently used, however, as synonymous with artisan or mechanic, one who practises manual labour. In this country a mechanic, after serving an apprenticeship, enters at once as a journeyman; but in Germany there intervenes a sort of transition period, during which he has to visit and practise his trade in other places. In many parts of Germany an apprentice cannot obtain his freedom and become a master until he has spent a certain number of years in following his calling beyond his native country. He is furnished with a book, in which his various employers insert certificates of his service and conduct. In his wanderings he is generally assisted and succoured, not only by the trade to which he belongs, but also by the general public. While this system has its evils, it certainly tends to give to the young artisan a greater amount of varied and extensive observation than he could have obtained at home. Latterly, however, the custom has, on account of the evils to which it gives rise, been going out of use; and indeed, from the numerous facilities for obtaining knowledge in the present day, there is not the same necessity for it as there was when it was first instituted by the trade guilds in the Middle Ages.

ARTIFICIAL HORIZON, *ar-ti-fish'-al* (Lat. *ars*, art, and *facere*, to make; Gr. *orizein*, to define), a contrivance by which the altitude of a star, or any heavenly body, is taken by the aid of a sextant or reflecting circle. It is generally made in the form of a circular cup with a flat bottom, about three inches in diameter and half an inch deep, which is filled with quicksilver, on the surface of which a piece of glass is placed. It is generally protected from the action of the wind by a covering of glass placed in a metal framework. The surface of the quicksilver forms a plane parallel to the rational horizon (*see* HORIZON) of the position of the observer, and the angular elevation of any object above the true horizon is the angle between the plane of the quicksilver and a line drawn to it from the object, due correction being made for refraction and parallax. To make use of this instrument, the observer must place himself in a position which will enable him to see the object the altitude of which is required and its reflection in the quicksilver at the same time. The angular distance between the object and its reflected image is then measured by means of a sextant, and this result, when corrected for the index error, must be divided by 2, since the reading obtained is double the altitude of the object, as, by the laws of reflection, the image is as much below the plane of the quicksilver as the object itself is above it; and the quotient will express the apparent altitude of the object observed. Very accurate observations can be taken on land by aid of the artificial horizon; but it is of little service at sea, owing to the unsteady motion of the vessel.

ARTIFICIAL FLOWERS.—This manufacture has lately been carried to wonderful perfection, the imitation of natural flowers being so perfect as to mislead even artists. The greatest ingenuity is displayed in the imitation of certain flowers; even a common twopenny sprig consisting of several materials well put together

and arranged. The leaves and petals are generally made of silk or cambric punched out to proper shapes and sizes. These are tinted with a brush and colour, and, if necessary, glazed with gum or sprinkled with fine flock, to imitate the glossy or velvety surface of natural flowers. The ribs, where present, are indented with a warm iron. The stamens and pistils are formed of wire covered with silk, and dipped in gum-water to form the anthers. The stalk is then made of wire, coated with green paper, and fixed to the stamens and pistil, around which are attached the petals, and, lastly, the calyx. Buds are made of cotton or glass balls covered with cambric of a proper colour. The French excel in this manufacture, and annually export £40,000 worth of these pretty frivolities. Above 4,000 girls, of different ages, are engaged in London, making blue roses, crimson corn, pink ivy, and other monstrosities, only to be found in the English artificial flower-market. Worse than all, however, the colouring matter used for these articles is often nothing less than the deadly poison arsenic. Hoffmann and other chemists have shown that the most terrible effects may spring from the employment of these arsenical compounds; and it is to be hoped that their use will be speedily discontinued.

Artificial Fuel. (*See* Fuel.)

Artificial Limbs, &c.—Ingenious mechanical contrivances for supplying substitutes for those limbs or other organs of the body which accident or misfortune has removed; such as hands, arms, or legs. The skill of the dentist, or the unerring nicety of calculation required by the operator who fixes in an artificial eye, is rather a surgical operation than an anatomical contrivance; but by artificial limbs is generally meant those combinations of steel-framework, screws, springs, cork, leather, caoutchouc, and gutta-percha, which imitate the form, and, to some extent, the motion and practical utility of the real limb. For instance, in 1847, the son of one of Sir George Cayley's tenants lost a hand by accident. Sir George, who possessed considerable inventive talent for mechanical contrivance, made him an artificial hand, the use of which lessened the severity of his privation. The stump of the boy's arm was introduced into a case or sheath, to one end of which was fixed a spiral spring, and to the other end a bent lever; the middle of the lever was connected with a mechanism of rods which moved the artificial thumb and fingers. By this arrangement the boy had to use his real hand to work his artificial one. By pressing a little button connected with the bent lever, the artificial fingers and thumb opened to receive any object that he might wish to grasp; and when the pressure from the real hand was removed, the grasp took effect without further effort till released by a contrary movement. Afterwards, as it was found inconvenient to take away the real hand from anything else that it had to perform for the purpose of directing the motion of the artificial hand, Sir George Cayley invented an ingenious method of working the mechanical limb by the movement of the shoulder and upper part of the arm.

Artificial Stone. (*See* Cements.)

Artillery, *ar-til'-ler-re* (Fr. *artiller*, to fortify), in the most appropriate application of the word, means the cannon, mortars, howitzers, and other large pieces for discharging shot and shell by the expansive force of inflamed gunpowder. In a more general sense, it denotes engines of war of all sorts, ancient and modern, by which darts, stones, bullets, &c., were shot forth in battle. (*See* Cannon, Gun, Mortar, Ordnance.) In the English service, the term signifies the guns and their equipment, the troops serving them, the scientific principles of their construction and employment. Artillery is divided into land artillery and marine artillery. The former is subdivided into field, coast, garrison, and siege artillery. Field artillery accompanies cavalry and infantry, or arms any field-works that may be thrown up; coast, garrison, and siege artillery consist of the heaviest guns that can be brought to bear in each particular case. The term artillery has, since the invention of gunpowder, been restricted to such large ordnance as cannons, howitzers, mortars, and rockets, but including also the troops required for their working, the carriages, ammunition, &c. But, in its broadest signification, the term implies all kinds of missiles employed in warfare, with the machines used in propelling them. The earliest of these military engines were probably used for casting stones of enormous weight. In 2 Chron. xxvi. 15, we read of Uzziah, that "he made in Jerusalem engines invented by cunning men to be upon the towers and upon the bulwarks to shoot arrows and great stones withal." From the writings of Cæsar, Cicero, Livy, Seneca, and Tacitus, we gather that the principal engines of artillery of the Romans were the ballista, or ballista, for casting stones, and the catapulta, for propelling darts and arrows. Pliny assigns the invention of the balista to the Phœnicians, and the catapulta to the Syrians; but other writers—among them Plutarch and Diodorus—declare that both machines were invented in Sicily, about the same time as the battering-ram, a date not anterior to B.C. 300. We learn from Appian, that when the consul Censorinus marched against Carthage, 2,000 engines for propelling darts and stones were surrendered to him. Engines of artillery do not seem to have been known in England earlier than the invasion of the Normans; but the latter appear to have introduced such machines, in the form of contrivances for propelling arrows, at the battle of Hastings. Soon afterwards, inventions for assaulting and defending places became greatly multiplied; and, if the statements of the middle-age chroniclers may be credited, many of these engines possessed enormous powers. According to Hemingford, Edward I. employed engines at the siege of the castle of Stirling in 1303, throwing stones of 300 lbs. in weight. Although it can be shown that the explosive force of gunpowder was understood in the East much earlier than the 12th century, the date of its being known to Roger Bacon, yet it was not until long afterwards that firearms superseded the ancient engines of war we have hitherto included as artillery. Colonel Cheney, in his "Observations on Firearms," thus traces the introduction of the new form of artillery into Europe:—The Moors, according to Condé, used artillery against Saragossa in 1118, and, in 1132, a culverin of 4 lbs. calibre, named Salamonica, was made. In 1157, when the Spaniards took Niebla, the Moors defended themselves by machines which threw darts and stones by means of fire; and, in 1157, Abdalmumen, the Moorish king, captured Mokadin, a fortified city near Bona, from the Sicilians, by the same means. In 1260 artillery was used against Cordova, and, in 1306 or 1308, Ferdinand IV. took Gibraltar from the Moors by means of artillery. Ibn Nassau ben Bin, of Granada, mentions that guns were adopted from the Moors, and were used in Spain in the 12th century, and that balls of iron were thrown by means of fire in 1331. Barbour, in his "Metrical Life of Robert Bruce," says that cannon, or "crakys of war," as he terms them, were employed by Edward III. in his earliest campaign against the Scots in 1327. Du Cange asserts that cannon were used by the French at the siege of Puy Guillaume, in 1338; but Rapin, on the other hand, relates, that so unacquainted were the French with these engines of destruction, that four small cannon used by Edward III. at the battle of Cressy, in 1346, contributed, as much by the surprise as the slaughter they created, to the success of the day. The earliest cannon were clumsy and ill-contrived machines, wider at the mouth than at the chamber, and consisting generally of a series of iron bars soldered together lengthwise, and hooped about with iron rings. The projectiles were made of stone. Cannon were first cast in England in 1521; and in 1535, as Stowe informs us, "John Owen began to make brass ordnance, as cannons, culverines, and such-like. He was the first Englishman that ever made that kind of artillery in England." Certain foreign workmen in the service of Henry VIII. were the first to cast mortars in England. It was usual, about this period, to apply to cannon the names of certain birds and beasts, in fanciful allusion to their swiftness or cruelty. Thus arose the terms falcon, falconet, culverin, saker, basilisk, siren, dragon, &c. At the present day, cannon are named according to the weight of the ball they propel. Thus a cannon which carries a ball of 12 lbs. is termed a 12-pounder; one that propels a ball of 32 lbs. a 32-pounder; and so on. We find mention first made of shells as a projectile at the siege of Naples by Charles

VIII., in 1435. The howitzer, an improved form of mortar, was invented by Belidor, and first used at the siege of Ath in 1697. The carronade, the invention of General Robert Melville, was first used about 1779. They take their name from having been first cast at the Carron iron-works. Iron rockets, or, as they are now termed, Congreve rockets, were invented by Sir William Congreve, and were employed at the bombardment of Copenhagen. (For an account of the most important of the modern engines of war which come under the head artillery, *see* ARMSTRONG GUN, WHITWORTH GUN, LANCASTER GUN, &c. For the theory of artillery, *see* GUNNERY. For a description of the various cannon employed in the English and some of the foreign armies, *see* ORDNANCE. For a description of the present mode of casting cannon, *see* CANNON.)

ARTILLERY COMPANY, THE HONOURABLE, of the city of London, originated about the year 1585, when a number of the citizens, during the fear of a Spanish invasion, voluntarily formed themselves into a company for the defence of the city. When the panic subsided, the company fell into decay; but, in 1611, it was revived by warrant from the privy council, and in a short time it numbered 6,000 volunteers. In 1640 the company was presented by the corporation of the City with a piece of ground, near Moorfields, for military exercise. The members are elected by ballot, and pay an annual subscription of one guinea to the funds of the company. They protected the Bank of England during the "Gordon riots" in 1780.

ARTILLERY PARK is the place in a camp, or the rear of an army, where the artillery is placed. The artillery is drawn up in lines, one of which is formed by the guns, the others by the ammunition-waggons, pontoons, &c.; and the whole is usually surrounded by ropes. This name is also applied to the whole guns, waggons, ammunition, &c., necessary for siege or field operations.

ARTILLERY TRAIN, a number of pieces of ordnance mounted on carriages, with all their furniture ready for marching.

ARTIST, *ar'-tist* (Fr. *artiste*), one who is skilled in the exercise of any art, such as painting, sculpture, music, &c.; the professor of any liberal or mechanical art. The term is especially applied to those who follow painting as a profession. In early times, the expression was used to denote a proficient in the seven liberal arts which formed the complete course of study at the universities; namely, grammar, logic, rhetoric, arithmetic, music, geometry, and astronomy. By Paracelsus it is used to signify a chemist, or rather alchemist. At Vicenza, an old custom existed of allowing any skilful artificer, convicted of a capital offence for the first time, to save his life if he could show himself to be a workman of consummate skill in the exercise of his craft or calling.

ARTOCARPACEÆ, *ar'-to-kar-pai'-se-e* (Gr. *artos*, bread, *karpos*, fruit), in Bot. a nat. ord. of dicotyledonous plants, consisting of 30 genera and about 60 species,—trees or shrubs, found only in tropical regions, having a milky juice, which contains caoutchouc, or India-rubber, dense heads of unisexual flowers, and, generally, fruits of the sorosis form. The typical genus, *Artocarpus*, or Bread-fruit, includes two very important food-producing trees, namely, *A. incisa* and *A. integrifolia*. The first species is a native of the Moluccas and islands of the Pacific: it yields the nutritious bread-fruit which supplies the place of corn to the natives of the regions in which it flourishes. This fruit is green, and of the size of a large melon. Several varieties are known, the best being that which is free from all spines on the surface. The nuts found inside the fruit are roasted and eaten; but these are not so highly valued as the fleshy receptacle, which forms the bread of the South-Sea Islanders. When roasted, this becomes soft, tender, and white, resembling the crumb of a loaf; it must, however, be eaten new, as, by keeping, it becomes hard and choky. The bread-fruit tree was introduced by the British government into the West Indies, where it is still cultivated; whence it has been carried to the American continent. The species *A. integrifolia* yields the Jak, or Jack-fruit, which is largely used as food in Ceylon and some other parts of the East. This is very prickly, and weighs from 60 to 70 lbs. It has a rather offensive odour, and is little relished by Europeans; the nuts, however, when roasted, are generally liked. The inner wood of the tree is used to dye the robes of the Buddhist priests yellow. The bread-fruit and jack-fruit are good examples of the sorosis, and each affords an instance of a fruit which grows most freely, and becomes best adapted for food in proportion to the absence of seeds. (*See* SOROSIS.) The nat. ord. *Artocarpaceæ* includes other interesting genera, which are noticed under the botanical names. (*See* ANTIARIS, BROSIMUM, PHYSOCRENE.)

ARTS, DEGREES IN. (*See* DEGREES.)

ARTS, FINE. (*See* FINE ARTS.)

ARTS, MANUFACTURING.—This term is employed to distinguish a certain class of manufactures of a scientific and ingenious nature, from others which only require manual skill and dexterity. The line of demarcation between the fine arts and the manufacturing arts is undefined, and in many respects they blend together. From the period of the 17th century, science and art have been drawn more closely together, and in later years have made rapid progress, each mutually assisting the other. The establishment of schools of art in connection with manufactures is only of recent date in England; but the manner in which all classes have aided and supported the various schools of design and mechanics' institutions shows that the nation appreciates the value of cultivating manufacturing art. We see the same thing, also, in the great success which has attended the production of popular works on science in modern times. The discoveries of photography and electro-plating form closer bonds between science and art. For the last twenty-five years, the British government has applied annually for a grant in aid of scientific and artistic education, which has been variously applied; but the Museum at South Kensington, which was suggested and carried out by the late much lamented Prince Consort, is the most important result of late years. By means of this institution, and others of a like character, a knowledge of science and art is disseminated among the workmen and workwomen of the kingdom. Another step in the same direction is the appointment of eminent sculptors and painters, in order to design models and patterns for manufactures. Although it is only recently that this country has turned its attention to the furthering of manufacturing art, other nations in Europe have long acknowledged its importance. The Great Exhibition of 1851, by bringing our workmen in contact with foreign workmen and their work, gave a decided impulse to our skilled manufactures. In France, more attention is paid to the artistic education of artisans than in any other country, and we see it reflected in all their handicraft. The Conservatoire des Arts et Métiers, in Paris, is a most remarkable institution. It consists of a number of large halls, each of which is devoted to some particular trade, or branch of manufacture, and contains a perfect collection of the raw and the manufactured produce, together with all the implements employed in the process. A lecturer is appointed to each hall, for the instruction of the people. It has been in existence more than sixty years, and was first suggested by the celebrated philosopher René Descartes, early in the 17th century. The government is so convinced of the importance of this establishment, that it supports it with an annual grant of 150,000 francs. The selection and arrangement of the objects in these halls are very interesting, since, by exhibiting the implements and machines that have been used from mediæval times up to the present day, the gradual improvement can be noted at once. In one department, porcelain and china ware in all stages of its manufacture can be seen; in another, the process of making clocks and watches. There are models of every variety of steam-engine and machine: one hall is devoted to electricity and chemistry, and displays all the apparatus employed, from the crude and clumsy objects of a hundred years ago, to the delicately-finished implements of the manipulator of to-day. Some of the rooms have the ceilings, floors, and walls decorated, to illustrate ornamental art; and there is an excellent library in connection with the institution. Too much praise cannot be bestowed on such an

undertaking as this, and the Museum of Science and Art at Kensington is a step in the same direction. England, however, took the initiative in the Exhibition of 1851, and her example was followed by most of the principal nations in Europe, and also by America. The usefulness of such meetings was acknowledged, and now it is felt that if the workman receives sound instruction in science and art, it not only adds to his intelligence and comfort, but also secures the prosperity of our manufacturing arts.

ART-UNIONS, institutions formed with the object of promoting a more liberal patronage of, and a livelier interest on the part of the general public in, the fine arts. The original notion or foundation of art-unions belongs to France, in the days of the first Napoleon. They were afterwards established in Belgium, and, ten years later, were encouraged and adopted in Germany. The art-union of Malines commenced its operations in 1812; that of Munich in 1823. The eminent Alexander von Humboldt, who took great interest in these institutions, recommended their adoption; and his advice was carried into effect in Leipsic, Dresden, Berlin, Halberstadt, Breslau, and other towns and cities, and, in 1833, nearly every important town in Germany could boast of its art-union. Since then, groups of associations, each including several towns, such as Hanover, Cassel, Brunswick, Gotha, Halberstadt, Magdeburg, and Halle, have been formed for the encouragement of works of the highest class of art; and the influence of these æsthetic associations in improving and refining the general public taste, by the collection and distribution of modern works of art, has been most powerful and beneficial. From Germany art-unions were introduced into England, where they were formed in the hope of offering to artistic genius and talent a higher aim and purpose than mere imitation. Portraits had long formed the principal means of subsistence to the painter. Pictures of Scriptural, classical, historical, or romantic subjects, were uncared for. The public neglected ideal art, and were indifferent to everything but the reproduction of the objects most familiar to them. A witness examined before a select committee of House of Commons in 1845 stated, that before the the establishment of the art-union in Dublin, "in four years, during the exhibition of the works of the Royal Hibernian Academy, 30*s.* only were expended on the patronage of art." "30*s.* annually?" inquired the chairman. "No," replied the witness; "30*s.* was the entire sum expended in the four years." As a proof of the success that has attended art-unions, in 1850 they expended the sum of £1,000,000 sterling in the encouragement of art; in addition to which extraordinary fact, the purchases of private individuals greatly increased. The constitution of art-unions, which, with some few exceptions, is common to all, is as follows:—Every member pays an annual sum,—in England usually one guinea,—in return for which he receives an acknowledgment, which serves the purpose of a ticket in the lottery, by means of which the pictures, statues, and other works of art purchased with the whole sum thus contributed, are distributed among the different members. A certain amount of the money is generally kept in hand, and applied to the execution of an engraving, a copy of which is presented to each of those members who have drawn a blank in the lottery. This engraving is usually the work of a local engraver. An exhibition of the works of local artists, though lately the majority of associations have admitted those of strangers, takes place once a year. The method of distributing the funds of the unions varies in different places. In London the money itself is distributed by lot, and the holders of prizes are compelled to expend it on the pictures exhibited, the selection being left to their own judgment. On the Continent, the whole sum collected for the year is placed in the hands of a committee of gentlemen, elected for their artistic tastes and acquirements, who select works of art, which are distributed to the subscribers by lot. Considerable controversy has arisen between the partisans of the two systems, and it may be presumed that each method is best adapted for its locality. On the Continent and in Edinburgh, the members of art-unions prefer to have their prizes chosen for them by competent judges; in England the prizeholders choose for themselves according to their own tastes and feelings.



ARUM, *air'-um* (formerly *aron*, supposed to be an ancient Egyptian word), in Bot., the typical gen. of nat. ord. *Araceæ*. The only British species is *A. maculatum*, the common Cuckoo-pint, Wake-Robin, or Lords-and-Ladies, and probably the Long Purples of Shakspere. This curious perennial is found growing in shady places, hedge-banks, rough grounds, and groves. The flowers, which come to perfection in April and May, are monœcious; that is, the sexes are contained in different flowers on the same plant. They are arranged on a succulent axis, terminating in a club-shaped receptacle termed a spadix, of a purple or yellowish-white colour, and inclosed in a membranous sheath denominated a spathe. The berries are of a fine scarlet colour, and help to adorn our hedges in autumn. They are very poisonous, and the whole plant contains acrid and poisonous juices. The tubers, which are filled with starch, are dried, powdered, and used in France as a cosmetic, under the name of cypress powder. The starch, separated from acrid juices, forms Portland arrowroot, which was formerly prepared in large quantities in the island of Portland, where the plant grows in great profusion. In the fresh state, the tubers are stimulant, diaphoretic, and expectorant, and were formerly used in the form of an emulsion in obstinate rheumatism.

ARUNDELIAN MARBLES, *ăr-un-de'-li-an*, a collection of specimens of Greek and Roman sculpture, made between the years 1607 and 1614, by Thomas Howard, earl of Arundel and Norfolk. His grandson Henry Howard, who subsequently became duke of Norfolk, presented part of this valuable gathering of the relics of antiquity to the university of Oxford, in 1667, at the suggestion of the celebrated John Evelyn, who, with Mr. (afterwards Sir William) Petty, was engaged by the earl to render assistance in the laborious undertaking. The collection in its entire state numbered 37 statues, 128 busts, and 250 pieces of marble bearing inscriptions; besides altars, sarcophagi, and fragments of various kinds, and a cabinet of gems, medals, and intaglios, acquired at Venice for the sum of £10,000. Lord Arundel left England for Antwerp at the commencement of the civil war between King Charles I. and his parliament, taking with him the more portable portion of his collection, such as his gems and smaller pictures. After the death of Charles, a great number of the statues and paintings still remaining in Arundel House fell into other hands at the general confiscation of royalist property ordered by the Commons, and only a small part of the original collection, including the famous Parian chronicle, was handed over to the university of Oxford. The specimens that still remained in the possession of the Arundel family were disposed of at various sales, and some were purchased by Sir William Fermor, whose son became first earl of Pomfret, and were afterwards presented to the university of Oxford, in 1755, by Henrietta Louisa, dowager-countess of Pomfret, when they were placed with the inscribed marbles that had previously come into the possession of that body. The Parian chronicle was acquired by purchase at Smyrna, by Sir William Petty. It contained in its perfect state a chronological table of the leading events in Grecian history, from 1582 B.C. to 264 B.C. A part is lost, and the remainder is much injured and defaced in many places. It is supposed to have been cut in the isle of Paros, about 263 B.C., the period of time at which the record ends.—*Ref.* Selden's *Marmora Arundelliana*, 1628; Prideaux's *Marmora Oxoniensa*, 1676; Chandler's *Marmora Oxoniensa*, 1763.

ARUNDO, *ă-run'-do* (probably Lat. *arundo*, reed, or from Celtic *aru*, water), in Bot., a gen. of grasses, the species of which frequently attain a considerable size, and are found in many climates. *A. phragmites*, the common reed, is a well-known species, the culms being largely employed for thatching and other useful purposes.

ARYAN, or ARIAN, LANGUAGES. (*See* INDO-GERMANIC LANGUAGES.)

AS, *ăs*, with the ancient Romans, a weight of a pound of twelve ounces (*uncia*); its name being derived from *æs*, a piece of copper or brass. *As* was also a coin of copper, or, more properly, of the mixed metal termed *æs*. It varied both in weight and composition at different periods; but it was originally of the weight of

twelve ounces, or one pound. The oldest form of the as,—that coined in the reign of Servius Tullus,—bore the figure of either a bull, ram, sow, or boar upon it. Afterwards asses had upon one side the two-faced head of Janus, and upon the other the prow of a ship; whence the phrase made use of by Roman boys when tossing up,—"Capita aut navim" (heads or ship). In the first Punic war, 264—241 B.C., the as, which till then had weighed twelve ounces, was coined of the same weight as the sextans, or two ounces; and Pliny informs us, that by this means the republic was enabled to liquidate its debts. Under the dictatorship of Q. Fabius Maximus, 217 B.C., the weight of the as was diminished to one ounce. Previous to the reduction to two ounces, ten asses were equal to a denarius, the principal silver coin among the Romans,—that is, to about 8½*d.* English. (*See* DENARIUS.)

ASAGREA, *as-a-gre'-a*, in Bot., a gen. of plants belonging to the nat. ord. *Melanthaceæ* or *Colchicaceæ*. The most important species is *A. officinalis*, a native of Mexico, and the principal, if not the only source of the *Sabadilla*, *Cevadilla*, or *Cabadilla* of the shops, which consists of the fruits and seeds. The seeds are officinal, and yield the alkaloid veratria, which has been used externally as a rubefacient in rheumatism, gout, and neuralgic affections, and also internally in similar cases, in doses of one-twelfth to one-sixth of a grain. It is a most powerful poison. Sabadilla seeds have been employed as an anthelmintic. They are called *lice-seeds* by the Germans; because, when powdered and applied externally, they destroy vermin.

ASAFŒTIDA, or ASSAFŒTIDA, *as-sa-fe'-ti-da* (Persian, *asa*; Lat. *fœtidus*, fetid), the name of a fetid gum-resin, used in medicine on account of its antispasmodic and more or less stimulating properties, and extensively employed in Persia and the adjacent countries as a condiment, just as garlic and other allied plants are employed in Europe. The umbelliferous plant *Narthex*, or *Ferula asafœtida*, yields the greater part of the asafœtida of commerce; but, in all probability, other species of *Ferula*, and also other plants, yield the drug. Royle suggests that *Prangos pabularia* may be one of the sources. The peculiar, and, to Europeans, offensive odour of asafœtida, is attributed to the presence of sulphur in combination with allyle. (*See* ALLYLE.)

ASAPHUS, *as'-a-fus* (Gr. *asaphes*, obscure), in Geol., a name given to a gen. of trilobites, on account of the obscurity which long rested on the true nature of these fossil crustaceans. In this genus the carapace is wide and much depressed; the middle lobe distinct; the head-shield rounded in front, and terminating posteriorly in a sharp process on each side. The eye is compound, consisting of several thousand lenses. (*See* TRILOBITE.)

ASARABACCA. (*See* ASARUM.)

ASARUM, *as'-a-rum* (Gr. *a*, not, *saron*, feminine), in Bot., a gen. of plants belonging to the nat. ord. *Aristolochiaceæ*. The species *A. europæum*, a native of Europe, is a rare plant in the woods of Britain. The root which forms the drug asarabacca contains a camphor-like principle, and a bitter principle called *asarin*, which is combined with gallic acid. It was formerly much employed as an emetic; but has been superseded by ipecacuanha, which is milder and safer. It is still occasionally used as an errhine,—that is, a medicine to be snuffed up the nose, in headache and ophthalmia, and is supposed to be the chief ingredient in the powder sold as cephalic snuff. The species *A. canadense*, the Canada snake-root, or wild ginger, is another medicinal plant, the rhizome being used in the United States as a tonic, diaphoretic, and aromatic stimulant.

ASBESTOS, *as-bes'-tos* (Gr. *asbestos*, incombustible), a fibrous variety of hornblende, so soft that it can be spun and woven into fabrics. It is remarkable for being incombustible; and for this reason it was used by the ancients for wrapping up their dead before placing them on the funeral pile, in order that none of their ashes might be lost. They also used it for napkins, which, when soiled, were passed through the fire. They likewise used it for lamp wicks. It has received but few applications in modern times. Chemically it is a silicate of magnesia and alumina. The localities in which it is found are numerous. It was so plentiful in Corsica some years ago, that it was used for packing instead of tow.

ASCARIDES, *as-kar'-i-dez* (Gr. *askarizo*, I jump), parasitic worms which inhabit the intestines of animals. They belong to the genus *Entozoa*, and are ranked in the order of *Nematoidea*. One of the commonest species, the *A. lumbricoides*, which is very like the common earthworm, is found frequently in the intestines of men, and of horses, oxen, &c. They have been observed fifteen inches in length, and they are often the cause of severe disease, which has sometimes proved fatal. The mouth of this worm is only formed for suction; hence it is unable to injure the coating of healthy intestines. In a very young state, ascarides have never been found either in man or the other animals. Persons living in damp valleys are said to be most liable to suffer from them. The *A. vermicularis*, or threadworm, is very common among young children. It is white, and about half an inch long. It infests the lower part of the intestines in great numbers. (*See* VERMIFUGE, THREADWORM.)

ASCENDANT, *as-sen'-dant* (Lat. *ascendere*, to rise upwards), a term in Astrol., applied to the first or strongest house in the scheme of any person's nativity. The ascendant is so called from containing the eastern point of the horoscope, or the degree of the ecliptic rising on the horizon at the time of birth. This was imagined to exercise considerable influence on a person's life and career, according to the supposed nature or power for good or evil of the planet or sign of the ecliptic about to rise at that time, and the relative position of these and other heavenly bodies to each other in all parts of the heavens at that moment. (*See* ASTROLOGY.)

ASCENSION, RIGHT, *as-sen'-shun* (Lat. *ascendere*, to rise upwards), a term in Astron. The right ascension of any heavenly body is the arc of the celestial equator intercepted between the first point of Aries and the meridian or circle of declination passing through the object, or the distance east from the meridian, passing through the first point of Aries measured on the equinoctial or celestial equator. It corresponds with longitude on the terrestrial globe; and as the position of any place on the earth is determined by its longitude and latitude, so the position of any object in the heavens is determined by its right ascension and declination. (*See* DECLINATION.) The right ascension of any heavenly body is ascertained by the aid of a transit-instrument and sidereal clock, the former showing its passage across the meridian, and the latter indicating the time when the passage takes place. The sidereal clock beats seconds, and is so constructed and regulated, that the hour hand describes a complete revolution in 24 hours from the time of the passage of any star across the meridian to its return to the same point. The hands are set at 0h. 0m. 0s., when the first point of Aries is on the meridian, and the time shown by the clock when any other celestial body passes the meridian is therefore its right ascension, or distance from the first point of Aries in time; and if the time shown be multiplied by 15, the distance in degrees, minutes, and seconds is obtained. Oblique ascension is the arc of the celestial equator intercepted between the first point of Aries and that point of the equator which rises at the same time with any heavenly body. Ascensional difference is the difference between the right and oblique ascension of any object. The terms oblique ascension and ascensional difference are old expressions, seldom used in the present day: the latter was chiefly applied to the sun, because the sun's ascensional difference converted into time shows how much he rises before or after six o'clock.

ASCENSION-DAY, one of the great religious festivals of the Episcopal as well as of the Roman Catholic church. As its name denotes, it is intended to commemorate the ascension of our Lord into glory, after his last appearance upon earth. Ascension-day has been observed in the Church from the earliest times, and is believed by some to have been instituted by the Apostles themselves, or their immediate successors. It is held on the Thursday next but one preceding Whit-Sunday; and is hence also termed Holy Thursday. The week in which it occurs is usually called Rogation week, from the rogations (petitions or litanies) which

were anciently used by the minister of each parish in perambulating his district, which he did on Ascension-day, or on one of the three days immediately preceding it.

ASCETICISM, *ăs-sĕt'-i-sĭzm* (Gr. *askeo*, I exercise), signifies nowadays those who *exercise* themselves in the contemplation of divine things; but among the Greeks, with whom the word originated, it was applied to those athletes and wrestlers who were accustomed, by rigid abstinence from all sensual and effeminating indulgences, to harden their bodies for the personal contest in the public games of the country. This is the primary signification of the word; but it soon came, among those with whom it originated, to bear a deflected or secondary meaning. In the schools of philosophy, and particularly among the Stoics and Cynics, it came to be applied to that severe discipline to which those persons subjected themselves, by mastering their passions and desires for the sake of that ideal virtue which they all sought. From these philosophers it gained a tertiary signification in passing to the Christians. Among them it was applied to all who wrestled with Satan, with the world, and with the flesh, and thus endeavoured to exalt themselves by a severe course of personal renunciation above this world, where they were strangers and sojourners. But the earliest ascetics we read of had an eastern origin. The Brahmins and other sects in Asia carried this practice to a monstrous extent, since long before authentic history begins. The yogis and fakirs of the present time, the suicides in the sacred Ganges and under the wheels of the car of Juggernaut, are only a repetition, in a civilized age, of what was done by their remote ancestors long anterior to any authentic record we have of the country. The Buddhists, who generally dwell considerably to the east of India, carried the principle of asceticism to a great height. They despised the world; they lived a life of solitude and beggary; they mortified the flesh, and abstained from all uncleanness. And so they do to the present day. The Chinese, the Persians, and even the Egyptians, have contemplated life usually in a much more just way, and have not carried their asceticism to anything like the same extreme. In the early centuries of Christianity, the adherents of the comparatively new religion were more exemplary for purity of morals than for the practice of ascetic severities. But before long, in Egypt and elsewhere, they endeavoured to escape from the sinful world in which they lived, and, by fasting and prayer, sought for divine aid around the shores of Lake Mareotis and in other parts of the Christian world. Asceticism assumed a more intellectual shape among the Neo-Platonists of Egypt than it has ever done in any other part of the world. Its greatest names are Philo, the Jew, the father of the system, Plotinus, Porphyry, Iamblichus, and Proclus. Philo has left us a history of it in his *De Vitâ Contemplativâ*. Even in the 2nd century of the Christian era we find societies of men and women living together under vows of continence. The tendency to outward manifestation and to inward and spiritual life began to decline in Christian communities. This gave rise to the wholesale system of monasticism, which withdraws men and women from the world, under the mistaken idea that thereby they can promote better the aim and end of human life; and immures them in separate establishments, and within separate inclosures, under the idea that they are there kept away from the evil that is in the world. The Greek church has kept much freer from ascetic practices than the Romish one; and even the Mahomedan system has melted to some extent under the thawing tendency of modern civilisation. The Waldenses of the 11th century, the Mennonites and the Shakers, the Methodists and the Quakers, and the modern Sisters of Mercy, have all had more or less of an ascetic spirit clinging to them.

ASCIANS, *ăsh'-i-ans* (Gr. *a*, not, and *skia*, shadow), a term applied to those inhabitants of the globe who at certain times of the year have no shadow. Such are the inhabitants of the torrid zone, where the sun being twice a year in its zenith,—in other words, being perpendicular to their heads,—no projecting shadow is thrown.

ASCIDIANS, *ăs-sid'-i-ans*, a term usually employed to distinguish a genus of molluscous animals, found in all seas, belonging to Cuvier's order *Acephala*, without shells. They have two orifices, by means of which they breathe and feed: one is branchial, the other anal. They are encased in a soft leathery tunic, inclosing a second mantle or tunic, which is muscular, and adheres to the first only near the orifices. Their nature is very apathetic, and they remain fixed to a rock or a piece of seaweed, living upon the animalcules which are drawn in with the water that is constantly passing through their ciliated respiratory organs. The action of the *cilia* seems to be involuntary. The sexes of ascidians are distinct; and their chief nervous centre is situated between the openings of the muscular tunic. In 1828 MM. Milne-Edwards and Audouin discovered that an ascidian does not begin life as a fixed animal, but was able to move about like tadpoles, by means of a vibrating tail. After a time it attaches itself to a plant or rock, and the tail disappears. Many of the ascidians are splendidly coloured, and often cling about seaweed like bunches of strange fruit. They are divided into two classes,—compound and solitary ascidians. (*See* ZOOPHYTA, POLYPE.)

ASCITES, *ăs-sī'-tees* (Gr. *askites*, from *askos*, a bottle), a term employed in Med. to denote abdominal dropsy, or dropsy in the belly. (*See* DROPSY.)

ASCLEPIAD, *ăs-klē'-pi-ad*, in Ancient Poetry, is the name of a species of verse, so called after Asclepiades of Tragilos, in Thrace, a scholar of Isocrates. He wrote some tragedies, fragments of which still remain. The verse consists of four feet, of which the first is a spondee, the second a choriambus, and the third and fourth dactyls, as in the following line from Horace:—

Mæcēnās ătāvīs | ēdītē | rēgĭbŭs.

ASCLEPIADACEÆ, *ăs-klē-pi-a-dā'-se-ē*, in Bot., the *Asclepias* or Milkweed ord. of dicotyledonous plants, included in the sub-class *Corollifloræ*,—shrubs or trees commonly lactescent, and frequently with twining stems. The order is at once distinguished by a curiously-formed five-cornered stigma, and by the grains of pollen cohering in wax-like masses, which, when the anther dehisces, become attached to glands at the angles of the stigma. There are 157 genera and about 930 species, which are mostly tropical, abounding in South Africa, India, and equinoctial America. Some are cultivated in British gardens and hothouses for the sake of the beautiful or curious flowers they bear. Of these the most familiar are different species of *Asclepias*, or Swallow-wort, the beautiful and fragrant *Stephanotis floribunda*, and the climbing *Hoya carnosa*. Nearly all the plants of this order have acrid juices, which render them stimulating, emetic, purgative, and diaphoretic medicinal agents. The milky juices of many species contain caoutchouc or India-rubber. Some species yield useful fibres, others edible tubers, and one (the cow-plant of Ceylon) a nutritious milk, which is used as food. (*See* ASCLEPIAS, CALOTROPIS, CYNANCHUM, HEMIDESMUS, GYMNEMA, and MARSDENIA.)

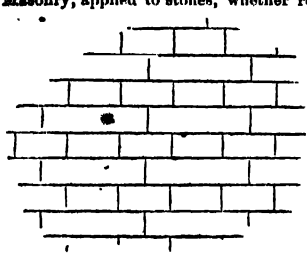
ASCLEPIAS, *ăs-klē'-pi-as* (Gr. name of Æsculapius, the god of medicine), in Bot., a gen. of plants, the type of the nat. ord. *Asclepiadaceæ*. The common English name for the gen. is Swallow-wort. The species are mostly American, and many of them possess powerful medicinal qualities, as one might expect from the generic name. They are herbaceous plants, seldom of a twining habit, with opposite, whorled, or alternate leaves, and flowers arranged in simple umbels between the leaf-stalks. The corolla is five-parted and reflexed. The stamens, five in number, alternate with the lobes of the corolla, and have curious horn-like appendages. The species *A. syriaca*, Syrian or Virginian swallow-wort, was formerly thought to be a native of Syria, but is now regarded as an American plant. The white acrid juice of this plant contains caoutchouc. The seeds are covered with down, which is frequently employed in America for making wadding and for stuffing pillows and mattresses. The stalks furnish a very tough fibre, which is used for the manufacture of thread, cloth, ropes, and nets. *A. curassavica*, the bastard ipecacuanha, is another important species. It is a native of the West-Indian islands, where the root is employed by the negroes as an emetic, and is occasionally sent to England as ipecacuanha. From the stems of *A. tenacissima* the Jetee or Ton-

goose fibres are obtained. The root of *A. tuberosa* is much esteemed by the American doctors, particularly by those styling themselves eclectics, as a diaphoretic and expectorant. The last-named plant, which is commonly known as the butterfly-weed or pleurisy-root, is frequently cultivated as an ornamental garden-flower. In Arabia the young shoots of *A. stipitaceæ* are eaten like asparagus.

Ash. (*See* Fraxinus.)

Ashes, *ăsh'-es*, the non-volatile remains of any burnt body. The ashes of vegetables contain large amounts of potash; hence the derivation of the word. The *ashes* found under the *pot* were at first used as a detergent; and at last the alkali potash was regularly abstracted from them by lixiviation. (*See* Potash.) The ashes of the burnt branches of trees, the trunks of which are used for timber, are the principal sources of commercial potash. The ashes of land-plants contain potash, while those of seaweeds contain soda. (*See* Soda.) Coal ashes have a different character, according to the coal which produces them. Somersetshire coal gives a red ash, while that from Staffordshire coal is white. Durham and Newcastle coal generally gives a cinder that may be burnt again. Animal ashes are chiefly valuable from their consisting almost entirely of phosphate of lime, and are much used as manure. Bone ashes are used in the preparation of cupels for assaying purposes. (*See* Assaying.) The ashes of the Boghead mineral (which *see*) consist principally of silicate of alumina, and are used in the manufacture of Dahlke's patent silicated carbon-filters. (*See* Filters.)

Ashlar, or Ashler, *ăsh'-lar* (Ang.-Sax.), a term in Masonry, applied to stones, whether rough, as when taken from the quarry, or dressed, when used for the facing of walls, which may be plain, tooled, or rusticated. In Nicholson's *Architectural Dictionary*, the word *ashlaring* is used to signify the operation of bedding the slabs of stone employed for facing brick or rubble walls; and *ashlering* as a technical term in Carpentry for the short pieces of upright quartering used in garrets to cut off the acute angle between the floor and the sloping rafters of the roof.



ASHLAR.

Ashore, *ă-shor'*, in Mar., a term used to signify on land, as opposed to aboard. A ship is said to be ashore when she has run upon the ground or on the sea-coast, either by accident or design.

Ash-Wednesday is the name given to the first day of Lent, from the Roman Catholic ceremony of strewing ashes on the head as a sign of penitence. The ashes used on this day are said to be those of the palms consecrated on the Palm-Sunday before. The ashes are first consecrated on the altar, then sprinkled with holy-water, and afterwards strewed on the heads of the priests and the assembled people, the officiating priest repeating the words, "Remember that thou art dust, and shalt return to dust." The ceremony is said to have been introduced into the Church by Pope Gregory the Great. In the Church of England a commination service is appointed to be read on this day, containing the curses denounced against impenitent sinners.

Asiatic Societies, *ai-shi-ăt'-ik*, are certain societies that have been formed for investigating the languages, literature, history, antiquities, &c., of Asia. Some of these exist in Asia, others in Europe. The oldest society of this kind is the Bataviaasch genootschap van Kunsten en Wetenschapen, founded in Batavia in 1781. It was speedily followed by the Asiatic Society of Calcutta, which was founded by Sir William Jones, for the purpose "of inquiring into the history, civil and natural, the antiquities, arts, sciences, and literature of Asia." The first volume of its proceedings was published in 1788, under the title of the *Asiatic Researches*, and the series was continued up to vol. xx., published in 1836. In 1832 the society issued vol. i. of the *Journal of the Asiatic Society of Bengal*, a work which is continued down to the present time. In 1804 the Literary Society of Bombay was instituted, under the presidentship of Sir James Mackintosh, and was followed by the Literary Society of Madras. The first Asiatic Society founded in Europe was the Société Asiatique of Paris, which, in 1822, commenced the publication of the *Journal Asiatique*, a work which still appears regularly. In 1823 the Royal Asiatic Society of Great Britain and Ireland was founded, and in 1824 received a royal charter: since 1834 it has regularly issued a Journal of Transactions. In 1845 the German Oriental Society, Deutsche Morgenländische Gesellschaft, was instituted at Leipsic: it publishes annually a journal of proceedings. In 1842 an American Oriental Society was founded at Boston. The most recent of this class is the Société Asiatique, established at Constantinople in 1852. Most of these societies, besides their journals, publish, from time to time, translations or editions of oriental works.

Asp, *ăsp* (Lat. *aspis*), a name confined by naturalists to the *Vipera aspis*, a venomous snake, peculiar to the European Alps, but commonly applied to several species of poisonous serpents. The asp is often mentioned by both Greek and Roman writers; but the most common and celebrated would seem to be that called by the Arabs Haje Naschen. This animal measures from three to five feet in length, is of a dark green colour, marked obliquely with bands of brown. The haje is closely allied to the cobra capello, or spectacled snake of India. Forskoel, a Swedish naturalist, who has written on the animals of Egypt, tells us that the jugglers of Grand Cairo have the art of taming the haje, taking care, however, to deprive it of its poisoned fangs, though even then they avoid its bite when irritated. The habit which this serpent has of erecting itself when approached, made the ancient Egyptians imagine that it guarded the places it inhabited, and accordingly they have represented it on their temples sculptured on each side of a globe.



ASP.

Asparagus, *as-păr'-a-gus* (probably from Gr. *sparasso*, I tear), in Bot., a gen. of plants belonging to the nat. ord. *Liliaceæ*, the Lily family. The species are herbaceous, or shrubby plants, growing wild in the southern parts of Europe and in Africa. *A. officinalis*, the common asparagus, has long been cultivated for the sake of the young succulent shoots called *turios*, which form a much-esteemed article of food. In the wild state the shoots are slender and tough, but by cultivation they are obtained thick and extremely tender. The ancient Romans were well acquainted with this delicate culinary vegetable; and Pliny mentions a variety which grew near Ravenna, producing shoots so large that three weighed upwards of a pound. It is now cultivated in all the temperate regions of the world, and to a very great extent near London, Paris, and Vienna. In no part of Europe is it grown to such perfection as in the market-gardens round London. The asparagus of Mortlake is par-



ASPARAGUS.

ticularly large and succulent, and has long been prised by epicures. On the continent, great pains are taken in preparing the soil for this plant, by forming excavations, and filling them with layers of turf, bones, wood-chips, sand, loam, and fresh manure; but though plantations on such beds last longer than those formed by English gardeners, they do not yield better shoots; and it may justly be questioned whether they are equally profitable to the cultivators. There are many local varieties of asparagus, but they may all be regarded as slight modifications of two well-marked sorts, namely, the red-topped and the green-topped. In the kitchen-garden asparagus is generally grown in beds four feet broad, and in rows a foot or eighteen inches apart, with the space of nine inches between every two plants in the rows. The plants are either raised from seed where they are to remain, or raised on a seed-bed the preceding year, and transplanted. The value of the crop depends on the soil being dry, sandy, well trenched, and powerfully manured. The trenches should be from two and a half to three feet deep. During the winter the beds are covered with dung or litter, to protect the shoots from the frost; in spring, this covering is raked off into the alleys and dug in, while the beds are stirred with a fork to admit the air, heat, and rain to the young shoots. Asparagus from seed may be cut the third year, is in perfection during the fifth, and will continue good for ten or twelve years. The season for cutting is from the middle of April to the middle of June. Asparagus is often forced, generally by placing the roots on dung or tan-beds, but sometimes by covering the beds with dung. The earliest crops are obtained by the first mode, but the roots are lost. The culinary preparations of asparagus are few, the delicate flavour being easily overpowered. It is best boiled alone, and served on toast with melted butter. It is sometimes introduced into soup, and into delicate made dishes. Asparagus-shoots contain a peculiar crystalline principle, to which the name *asparagin* has been given: this has a specific action on the urinary organs, and its properties have caused asparagus to be popularly employed as a lithic. In medicine, the shoots, roots, and flowering stems of *A. officinalis* are occasionally employed as diuretics. The roasted seeds have been used as a substitute for coffee. The young shoots of the species *A. tenuifolius*, *A. acutifolius*, and *A. albus*, are eaten in the south of Europe. — *Ref.* for recipes, Mrs. Beeton's *Book of Household Management*.

Asparagin, *as-pär'-a-jin*, a crystalline body, procured from the young shoots of the asparagus, from the roots of the marsh-mallow and liquorice, and from other plants of a similar nature. The juice is expressed and evaporated, and the brown impure crystals are redissolved and treated with animal charcoal. On being recrystallised, the asparagin forms in perfect octahedra or rhombic prisms.

Aspartic Acid, *as-par'-tik*.—An acid obtained from asparagin. When an aqueous solution of asparagin is heated under pressure, aspartate of ammonia is formed, which, if heated with baryta, forms the aspartate of that earth: the baryta is then precipitated by sulphuric acid. On evaporation, the aspartic acid crystallizes in thin rectangular tables.

Aspen. (*See* Populus.)

Asperula, *ăs-pe-ru'-la* (diminutive of Lat. *asper*, rough), in Bot., a gen. of plants belonging to the nat. ord. *Galiaceæ*, the Madder family. The species *A. odorata*, the woodruff, is one of the most fragrant plants found in our woods: it contains the natural perfume to which chemists have given the name of *coumarin*. *A. cynanchica*, another indigenous species, is commonly called Quinsy-wort, on account of its supposed value as a remedy in sore throat.

Asphalt, Asphalte, or Asphaltum, *ăs'-fălt* (Gr. *asphaltos*), a bituminous substance, found in the tertiary strata in different parts of the earth, evidently produced from coal by the action of heat. It is much used as a pavement when mixed with certain proportions of lime, sand, gravel, or pounded stone. It is insoluble in alcohol, but is readily dissolved by turpentine, with which it forms a coarse varnish. From being found on the shores of the Dead Sea, it was formerly called "Jews' pitch." The finer sort, dissolved in turpentine, is much used by artists; but is apt to crack under the influence of variable temperature. Asphalt pavement was first introduced into this country by Mr. Claridge, who obtained the asphalt from Seyssel, in the Jura Mountains. It has not succeeded in London, being speedily worn out by the enormous traffic. Asphalt, when distilled, gives rise to numerous products, one of which, the so-called paraffin oil, has lately risen to great commercial importance. Coal-tar is artificial asphalt. (*See* Bitumen, Petroleum.)

Asphaltin, *as-fălt'-in*, a black substance, dissolved out of asphalt by oil of turpentine, insoluble in alcohol and ether.

Asphodelus, *ăs'-fo-de-lus* (Gr. *a*, not, *sphallo*, I supplant), in Bot., a gen. of plants belonging to the nat. ord. *Liliaceæ*, the Lily family. It includes several beautiful perennials, with fleshy finger-like roots and upright annual stems covered with long leaves. The yellow and white asphodels, *A. luteus* and *A. albus*, have long been cultivated in Britain as garden-flowers. Immense tracts of land in Apulia are covered with the latter species, which affords good nourishment to the sheep. In ancient days it was sacred to Proserpine, and used in funeral ceremonies.

Asphyxia, *ăs-fĭk'-i-a* (Gr. *a*, not, and *sphuxis*, pulsation), literally signifies cessation of pulsation, and is used in Med. to denote that state of body during life in which the pulsation of the heart and arteries cannot be perceived. In asphyxia, the action of the lungs is suspended, and the blood no longer undergoes that purifying process so necessary to life. Hence the body becomes filled with impure blood, the powers of sensation and voluntary motion are suspended, and, if the proper means of restoration are not resorted to, death will speedily ensue. Asphyxia may be produced by various causes; as by whatever prevents the access of air to the lungs, as strangulation, drowning, choking, &c.; or whatever interferes with the action of the nerves that are concerned in respiration, as paralysis, cold, stroke of lightning, &c. It may also be produced by breathing an impure or a too rarified atmosphere. (*See* Drowning, Strangulation, Suffocation, &c.)

Aspidium, *ăs-pid'-i-um* (Gr. *aspidion*, a little buckler), in Bot., a gen. of ferns (which *see*). The fronds of the species *A. fragrans* possess aromatic and slightly bitter properties, and have been used as a substitute for tea.

Aspidura, *ăs-pi-du'-ra* (Gr. *aspis*, shield, *oura*, tail), in Geol., a gen. of fossil star-fishes, so named from the buckler-like arrangement of the bony plates which protect the arms. They are peculiar to the muschelkalk of Germany, and are closely related to the existing ophiura.

Aspirate, *ăs'-pi-rait* (Lat. *spiritus asper*, harsh breathing), in the Gr. Gram., is a name given to a certain mark or accent (thus ') placed over the initial vowel of certain words to indicate that it is to be pronounced roughly or harshly, as if preceded by an *h*. All words beginning with a vowel have either a rough or soft breathing,—the *spiritus asper* or the *spiritus lenis* (thus '), because a word beginning with a vowel can only be distinguished in the pronunciation from the preceding word by in some measure drawing the breath. Certain consonants are likewise called aspirates, from the harsh breathing entering into their pronunciation: these are $\phi$, $\chi$, $\theta$ (*phi*, *chi*, *theta*).

Asplenium, *as-ple'-ni-um* (Gr. *a*, not, *splen*, spleen), in Bot., a gen. of ferns, included in the sub-ord. *Polypodieæ*. Many species are common in Great Britain, being known as spleen-worts. They were formerly used in medicine, but have now fallen into disuse. *A. Ruta-muraria* is popularly known as wall-rue. *A. Trichomanes* is an elegant little fern, common on rocks and old walls: it is often cultivated in cases and on garden rockwork.

Asportation, *as-por-tai'-shon* (Lat. *ad*, to, and *porto*, I carry), in Law, is the carrying away of goods. Thus, in all felonies, there must not only be a taking, but a carrying away: *cepit et asportavit* was the old law Latin. But the least displacement, by law, amounts to an asportation or carrying away.

Ass, *as* (Lat. *asinus*; Fr. *âne*, for *asne*; Ital. *asino*), (*Equus asinus*), an animal too well known, at least in a domestic state, to need description here. It is found wild in the same parts of Asia as the horse,

and it is here that we find it make the best figure in a state of domestication. In these countries it would seem that the ass was tamed before the horse; and to this day, in the East, asses are far more generally used as beasts of burden and draught than horses. There, however, instead of being despised and neglected, care is taken to cultivate the breed, by crossing the finest specimens. Even the wild ass is procured for this purpose. "The asses of Arabia," says Chardin, "are, perhaps, the handsomest animals in the world. Their coat is smooth and clean; they carry the head elevated, and have fine and well-formed legs, which they throw out gracefully in walking or running. They are used only for the saddle, and are imported in vast numbers into Persia, where they are frequently sold for 400 livres, and, being taught a kind of easy ambling pace, are richly caparisoned, and used only by the rich and luxurious nobles." The *ass* is, properly speaking, a mountain animal. Its hoofs are long, and furnished with an extremely hard rim, leaving a hollow in the centre, by which means he is enabled to tread with more security on the slippery sides of hills and craggy places. Its most general colour is mouse-colour, with a blackish stripe extending along the spine to the tail, and crossed by a similar stripe over the shoulders. The female goes with young eleven months, and seldom produces more than one foal at a time.

ASSAFŒTIDA. (*See* ASAFŒTIDA.)

ASSAI. (*See* EUTERPE.)

ASSASSINATION, *as-sas'-si-nai'-shon* (Etymol. uncertain), is strictly the murdering a person for hire. The term is also applied to killing by treachery or sudden violence.

ASSASSINS, *as-sas'-sins*, those who kill, by treachery and violence, persons unprepared for defence. The word *assassin* is said to have originated from a certain prince of the family of Arsacidæ, popularly called Assassins, who lived in a castle between Antioch and Damascus, and trained, in blind obedience to his commands, a number of young men, whom he employed in murdering the princes with whom he was at enmity. According to Colonel Chesney, the Assassins, or Ismaili, still hold their chief seat at Kalat-el-Masryad, in Persia, and have several strongholds in the mountains of Tripoli. They are called Assassins from their immoderate use of *haschischah* (henbane), which produces an excitement amounting to fury. The first chief and law-maker of this singular tribe was Hassan Ben Sabah, to whom the Orientals gave the name of Sheikh-el-Jebeis, but who was better known in Europe as the Old Man of the Mountain, a wily impostor, who made fanatical and implicit slaves of his subjects, by imbuing them with a religion compounded of that of the Christians, the Jews, the Magi, and the Mahometans. The principal article of their belief was that the Holy Ghost was embodied in their chief, and that his orders proceeded from the Deity, and were declarations of the Divine will. They believed assassination meritorious when sanctioned by his command, and courted danger and death in the execution of his orders. In the time of the Crusades, they mustered to the number of 60,000. So great was the power of the sheikh, or chief, that the sovereigns of every quarter of the globe secretly paid him a pension; and Philip-Augustus, king of France, understanding that the sheikh had ordered his assassination, instituted a new body-guard, distinguished for their courage and activity, called *sergens d'armes*, who were armed with bows and arrows and brass clubs; and he himself never ventured in public without a club loaded with gold or iron. The Knights-Templars alone dared bid defiance to this terrible and subtle foe. Among the victims of their daggers was Conrad, marquis of Montferrat, who was murdered in the market-place at Tyre, in 1192, although some historians have attributed the crime to Richard I. For a long time this fearful sect reigned in Persia and on Mount Lebanon. Holagoo, or Hulaku, a Mogul Tartar, in 1254, dispossessed them of several of their strongholds; but it was not till some years after that they were completely extirpated by the Egyptian forces sent against them by the great sultan Bibars.

ASSAULT, *as-solt'* (Lat. *assultus*, from Fr. *assaillir*, to assault, assail, fall upon), in Law, is an attempt or offer, with force and violence, to do a corporal hurt to another, whether from malice or wantonness; as by striking at him with or without a weapon, though the party striking him misses his aim. So, drawing a sword; throwing a missile with intent to wound or strike; presenting a gun at a person within the distance to which it will carry, or pointing a pitchfork at a person standing within reach; holding up one's fist at him in a threatening or insulting manner; or with such other circumstances as denote, at the time, an intention (coupled with a present ability) of using actual violence against his person. There are many other acts which will, in law, amount to an assault; but they are too numerous to be inserted in a work of this nature. For an assault, an action for damages will lie, or the aggressor may be indicted at the quarter sessions, or proceeded against by summons or warrant of justices of the peace.

ASSAULT, in Mil. Language, is a sudden and general attack made by a besieging army to obtain possession of a fortified post.

ASSAYING, *as-sai'-ing* (Fr. *essayer*, to try), a quantitative analysis performed for the sake of discovering the amount of one particular constituent in a compound. The term is generally applied to the determination of gold or silver in alloys of these metals; but it is also used to denote any process for determining the commercial value of any substance by the separation of its valuable portion. Thus lichens and indigo are assayed for their colouring matter, galls and oak bark for their tannin, and ores for their metal. The assaying of gold and silver is generally performed by the process of *cupelling*. Bone-ash is mixed with water, made into a little cup, and dried. This is called the *cupel*, and has the property of absorbing oxides when they are combined with oxide of lead in a state of fusion. Silver is assayed by mixing it with a certain quantity of lead, determined by the amount of impurity suspected to exist in the alloy. The mixture is melted in the *cupel* in a current of air, until the whole of the lead is converted into oxide, which dissolves the other impurities, and carries them down with it into the cupel, the silver being left behind in a pure state. Silver alloys are also assayed by dissolving them in nitric acid, and precipitating the silver in the form of chloride by a standard solution of chloride of sodium. This method is now adopted in the English, French, and Belgian mints, as well as in those of the United States. Gold is generally assayed by the process of *quartation*. It is mixed with three times its weight of silver, and nine times its weight of lead, and *cupelled* as described above. The whole of the impurities are thus got rid of, and an alloy of silver and gold remains. This is beaten into thin plates, which are thrown into nitric acid, which dissolves out the silver and leaves the gold untouched. The large amount of silver is added to prevent any particles of that metal existing in the gold from being protected by it from the action of the acid, and remaining undissolved. For the assaying of the other metals,—*Ref.* Percy's *Metallurgy*.

ASSEMBLE, *as-sem'-ble*, is a term formed from the French *assemblée*, which signifies literally the meeting together of a number of persons in one place for the same object or design. In a more limited sense, it is applied to important meetings of a political or ecclesiastical nature. These have usually other names, under which the more important of them will be found noticed; as, councils, convocations, synods, comitia, &c.

ASSEMBLY, NATIONAL, was the name assumed, on 17th June, 1789, by the commons, who formed the third estate of the general assembly convoked by Louis XVI. of France on 5th May, 1789. They constituted themselves a national assembly, to which the deputies of the nobles and clergy afterwards adhered; and framed a constitution, whence they are also termed the Constituent Assembly. They dissolved on the acceptance of the constitution by the king, on the 30th of September, 1791, and were succeeded by the Legislative Assembly, which was to reform the civil and criminal laws, in accordance with the spirit of the new constitution. It commenced its sittings on 1st October, 1791, but was principally engaged in a war against the remnant of regal power, which ended in the overthrow of the throne and the suspension of royal authority, on 10th August, 1792. It was dissolved on

September 21st, 1792, having first summoned a national convention, which met on the same day. This last was invested with sovereign power to decide the fate of the monarchy, and to introduce a new form of government.

ASSEMBLY OF DIVINES, WESTMINSTER, was an assembly of 121 clergymen and thirty laymen, distinguished for learning and piety, summoned by an ordinance of parliament in 1643 to meet at Westminster, "for settling the government and liturgy of the Church of England, and for vindicating and clearing the said church from false aspersions and interpretations." There were also four clerical and two lay representatives from the Church of Scotland. The first meeting of the Assembly took place on the 1st July, 1643, and the last on 22nd February, 1649, during which they had met 1,163 times. The chief fruits of their labours were,—1. An humble advice to parliament for ordination of ministers and settling the presbyterian government; 2. a directory for public worship; 3. a confession of faith; 4. a larger and shorter catechism; 5. a review of some of the Thirty-nine Articles. Among the more distinguished members of this assembly were Usher, Saunderson, Lightfoot, Selden, Gataker, Greenhill, Arrowsmith, Reynolds, Calamy, and Twiss. The four Scotch divines were Henderson, Gillespie, Rutherford, and Baillie.

ASSEMBLY, THE GENERAL, of the Church of Scotland, is the highest ecclesiastical court of Scotland, which meets annually at Edinburgh in the month of May, and sits for about ten days. It consists of representatives, clerical and lay, from the several presbyteries of the church, and a few other members. Its deliberations are presided over by a moderator, elected annually; and there is also present at its sittings a royal commissioner, representing the crown, but who takes no part in its proceedings. It forms the court of appeal from the presbyteries and synods. Since the disruption in 1843, the Free Church of Scotland has also its general assembly, which likewise meets annually at Edinburgh in May, and otherwise resembles the other, except that it has no royal representative.

ASSEMBLY, UNLAWFUL (Fr. *assembler*, to flock together). An unlawful assembly is the meeting of three or more persons to do an unlawful act, whether they do it or not.

ASSENT, *as-sent'* (Lat. *ad*, to, and *sentio*, I think), in Phil., is that act of the mind by which we accept something as true. It is the work, not of the understanding, but of the reason; and is *free*, when it is not the unavoidable result of evidence; *necessary*, when the withholding of it involves a contradiction.

ASSENT, ROYAL, THE, by which bills that have passed the Houses of Parliament become law, and without which they are null, constitutes one of the highest prerogatives of the crown. It is no mere form, but a *bond fide* exercise of legislative functions, though there has not for many years been an instance of its being withheld: the last is said to have been in the reign of Queen Anne. The royal assent may be given by the sovereign in person, robed, crowned, and seated on the throne in the House of Peers, with the Commons standing at the bar, or by commissioners appointed for that special purpose, and for that single occasion. Of late years, except in the case of bills augmenting the royal income, the practice has been to give the royal assent by commission; but, in the former case, the sovereign usually prefers a personal manifestation of thanks. The commissioners are usually three or four of the great officers of state. The royal assent to each bill is announced by the clerk of parliament in Norman-French. Having read the title, he says, if it is a bill of supply,—*Le roi (or la reine) remercie ses loyal subjects, accepte leur benévolence, et ainsi le veut*; if any other public bill,—*Le roi le veut*; and if a private bill,—*Soit fait comme il est desiré*. Should the sovereign refuse assent, it is in the form of *Le roi (or la reine) s'avisera*. In the case of acts of grace or amnesty which originate with the crown, and which are signed by the sovereign before being laid before parliament, and are only read once in each house, the clerk addresses the throne as follows:—*Les Prélats, Seigneurs, et Communs en ce present Parliament assemblés, au nom de tout vous autres subjects remercient très humblement votre Majesté, et prient à Dieu vous donner en santé bonne vie et longue.*

ASSENTION, *as-sen'shon* (Lat. *ad*, to, and *sero*, I join), is a term employed in Logic to denote the affirmation or denial of something.

ASSESSED TAXES, *as-sesd'*, are certain taxes raised upon houses, servants, horses, carriages, dogs, &c., under various acts of parliament. The date of their first introduction has been variously stated, and their nature and amount have varied according to the exigencies of the state. Including the land-tax, they amounted, for the year ending Dec. 31, 1860, to £3,126,090. They are under the management of the commissioners of inland revenue.

ASSESSOR, *as-ses'sor* (Ital. *assessare*, to set to, to impose a tax), in Law, one who assesses public taxes, by rating every person according to his estate; also an adviser to an archbishop or bishop, or other magistrate, in matters of law, sitting by him on the bench.

ASSETS, *as'-sets* (Fr. *assez*, enough), in Law, are either real or personal. Where a man has lands in fee-simple, and dies seized thereof, the lands which come to his heir are *assets real*; and where he dies possessed of any personal estate, the goods which come to his executor or administrator are *assets personal*. Assets are also divided into *assets per descent* and *assets inter maines*. 1. Assets by descent are lands which descend to the heir of a person dying seized thereof, and owing specialty or simple-contract debts. In that case, the estate is considered as assets to be administered in a court of equity for payment of the debts, the specialty debts having preference. 2. Assets inter maines are where a man indebted makes executors, and leaves them sufficient to pay his debts and legacies; or where some commodity or profit arises to them in right of the testator, which are called assets in their hands. This term is also applied commercially to any available property for the payment of a man's debts.

ASSIENTO, *as'-se-an'-to* (Span., treaty), is a term specially applied to a treaty between the Spanish government and some other nation, by which the former, in consideration of certain payments, grants the latter a monopoly of supplying the Spanish colonies in America with negro slaves from Africa. As early as the reign of Charles I. of Spain, a treaty of this kind was concluded with the Flemings. Similar compacts were entered into with the Genoese (1580), Portuguese (1666), and with the French Guinea Company (1702), which then took the name of the Assiento Company. In 1713 the celebrated Assiento treaty with Britain was concluded at Utrecht, and was made over by the government, for thirty years, to the South-Sea Company. One of the conditions of this treaty was, that the company had a right to send yearly to these Spanish colonies a vessel of 500 tons, laden with all sorts of merchandise. The misunderstandings that arose out of this led to a war between the two countries in 1739. At the peace of Aix-la-Chapelle, in 1748, the company had their rights for the remaining four years guaranteed to them; but they relinquished them at the convention of Madrid, in 1750, in consideration of a sum of £100,000.

ASSIGNAT, *as'-seen-ya* (Lat. *assignatus*, assigned), the name of the paper currency issued by degree of the National Assembly of France, with the approbation of the king, April 1, 1790, and so called from the national property being assigned as security. At first, 400,000,000 francs were issued; but, a few months later, 800,000,000 more were issued, and subsequent issues increased the number to about 45,000,000,000 francs. The consequence was that they became of almost no value, and at length, in 1796, they were withdrawn from the currency.

ASSIGNEE, *as-si-ne'* (Lat. *assignatus*, from *assigno*, *ad* and *signo*, I mark or sign), one who is assigned or appointed by another to do any act or perform any business. It also signifies one who takes any right, title, or interest in property, by an assignment from an assignor, or by act of the law. Assignees are *by deed or in law*. An assignee by deed is when a lessee of a term, or the owner of personal property, sells or assigns the same to another; that other is his assignee by deed. Assignee in law is he upon whom, by law, the property devolves, without any appointment of the parties; thus, an executor is assignee in law to the testator, and the persons upon whom the title to

and disposal of a bankrupt's estate devolves, is an assignee in law of the bankrupt, by virtue of the statute which vests the property in him on his appointment.

ASSIGNEE OF A BANKRUPT.—In order to convert the estate of a bankrupt into money for division amongst the creditors, an assignee or assignees are appointed. In the first instance, an *official* assignee is appointed by ballot by an officer of the Court of Bankruptcy, who, immediately on the adjudication of bankruptcy, takes possession of the estate, and retains possession of it until the appointment of a creditors' assignee. The *creditors' assignee* is chosen at the first meeting of the creditors under the bankruptcy, or an adjournment thereof, by a majority in value of the creditors who have proved their debts; and, upon his appointment, all the estate of the bankrupt, both real and personal, is divested out of the official assignee and vested in him. The powers and duties of such assignees are regulated by "the Bankruptcy Act, 1861."

ASSIGNMENT, *ăs-sine'-ment* (Lat. *assignatio*), in Law, is the transferring and setting over to another of some right, title, or interest.

ASSIMILATION, *ăs-sim-i-lat'-shon* (Lat. *adsimilatio*, from *ad*, to, and *similis*, like), the act of organized bodies, by which they convert foreign substances into their own proper substance, by which food is converted into nutriment. (*See* NUTRITION.)

ASSIZE, *ăs-size'* (Lat. *assessio*; Fr. *assis*, part. past from the verb *asseoir*, to sit).—The term, in its present acceptance, implies a court, place, or time when and where the writs and processes, whether civil or criminal, are decided by judge and jury. The counties, for the purpose of holding the assizes, are divided into eight circuits, and judges are assigned by commission to hold their assizes twice a year in every county, except London and Middlesex. The judges sit by virtue of four several authorities. 1. The commission of the peace. 2. A commission of *oyer and terminer*, directed to the judges and gentlemen in the county, by which they are empowered to hear and determine treasons, felonies, and misdemeanours, by whomsoever committed. 3. A commission of *general gaol delivery*, directed to the judges and clerk of the assize associate, to try every prisoner in the gaol committed for any offence whatsoever; but none but prisoners in gaol, and to discharge such against whom no bill is preferred or found. 4. A commission, or writ of *nisi prius*, which is a consequence of the ancient commission of *assize* being annexed to the office of justices of assize, by the Statute of Westminster the second, 13 Edw. I. c. 30, by which the judges are empowered to try all questions of fact issuing out of the courts at Westminster that are then ripe for trial by jury, and in which the venue is laid in the county. These commissions are accompanied by writs of *association*, by which certain persons are directed to associate themselves with the justices and serjeants, that a sufficient supply of commissioners may not be wanting. But, to prevent the delay of justice by the absence of any of them, there is also issued a writ of *si non omnes*, directing that, if all cannot be present, any two of them (a justice or serjeant being one) may proceed to execute the commission. In law the assizes are but as one day, and the entry of every proceeding at them refers to the first day of assize.

ASSOCIATION, *ăs-so'-si-ā'-shon* (Lat. *ad*, to, and *socius*, a companion), is a union of persons or a society formed for mutual assistance, or for the joint carrying out of some definite object. The value of combined effort in carrying out objects where individual exertions would utterly fail, is very manifest. Many undertakings, in which it would be impossible for individuals to work, we see carried on with success around us by means of associations. More particularly is the term applied to a union of individuals for the accomplishment of great social, political, or scientific objects. Association is one great feature of civilization, and is one of the most marked characteristics of the present age. "Men have learned," says Dr. Channing, "what wonders can be accomplished in certain cases by union, and seem to think that union is competent to anything. You can scarcely name an object for which some institution has not been formed. Would men spread one set of opinions and crush another,—they make a society. Would they improve the penal code or relieve poor debtors,—they make societies. Would they encourage agriculture, or manufactures, or science,—they make societies. Would one class encourage horseracing and another discourage travelling on a Sunday,—they make societies." But, while combinations may be mighty engines for good, they also may be made great engines for evil; as, where they attempt to put down opinions, whether true or false, by mere force of numbers; and thus interfere with or subvert that freedom of thought on which all truth depends. (For associations for the purpose of controlling the rate of profits or of labour, *see* COMBINATIONS.) Associations, too, are often injurious in interfering with free thought and action among the individual members; as, in order to joint co-operation, it is necessary for each to abandon a portion of his own individual views and adopt those of the majority of his co-associates. They are for the most part passive bodies, guided solely by the will and management of a few individuals among them.

ASSOCIATION, AFRICAN. (*See* AFRICAN ASSOCIATION.)

ASSOCIATION OF IDEAS, in Mental Phil., is the name given to that principle of the human mind by which certain ideas,—thoughts, feelings, or emotions, become connected together in such a way, as that they afterwards tend to recall or reproduce one another. A good illustration of this is given by Coleridge, in his *Biographia Literaria*. "Seeing," says he, "a mackerel, it may happen that I immediately think of gooseberries, because I, at one time, ate mackerel, with gooseberries as the sauce; the first syllable of the latter word being that which had co-existed with the image of the bird so called, I may then think of a goose. In the next moment, the image of a swan may rise before me, though I had never seen the two birds together. In the first two instances, I am conscious that their co-existence in time was the circumstance that enabled me to recollect them; and equally conscious am I, that the latter was recalled by me, by the joint operation of likeness and contrast. So it is with cause and effect; so, too, with order." Various philosophers have attempted to define these laws of mental association. According to Aristotle, they are three,—resemblance, contrast, and contiguity. Hume, who has generally been followed by modern philosophers, makes them resemblance, contiguity, and causation. Some have endeavoured, again, to reduce all the phenomena of association to one great law. The first attempt of this kind was made by Augustine, who said that thoughts that had once co-existed in the mind, are afterwards associated together. Sir William Hamilton states, that all the laws of association may easily be reduced to two,—simultaneity, and resemblance or affinity; under the former, including thoughts that are in the mind together, or in immediate succession; under the latter, all that have such a connection existing between them as that the thought of the one involves the thought of the other. These two he then reduces to one, which he calls the law of redintegration, or totality, including, in the first place, those thoughts which arose at the same time, or in immediate consecution, and in the second, those thoughts which are bound up into one by their mutual affinity. "Thoughts or mental activities having once formed parts of the same total thought or mental activity, tend, ever after, immediately to suggest each other." It seems evident that all the phenomena of mental association may be reduced to one great law,—that of *contiguity*, by which ideas that have been in the mind together, or in close succession, ever after manifest a tendency to recall or reproduce each other. In persons of few ideas—the uneducated or ignorant—this principle is very marked; Shakespeare's Mrs. Quickly is an admirable instance of this, as she narrates with amusing minuteness the various incidents that happened at the time when Sir John Falstaff made her a promise of marriage. When, however, the mind has become possessed of a number of ideas, those that have been frequently before it become associated in various ways with numerous other ideas; and here we observe a law of mind analogous to the law of attraction in matter, by which an idea, instead of recalling all the ideas with which it may have been associated, which would result in endless confusion, selects only certain

of them. That some, rather than others, are selected, depends upon a variety of circumstances; as, the frame of mind of the individual at the time, their recentness, or the frequency or length of time they may have been associated together. Another principle of association is that of a part suggesting a whole, or a whole one or more of its parts. Most of our ideas are made up of a number of others, any one of which may suggest the whole idea, or the whole idea may suggest one or more of them. Thus, paper may suggest whiteness or smoothness, or any of these may suggest paper. In like manner, a word may be resolved into its component parts or syllables, any one of which may suggest other words of which it forms a part. In this way, one word suggests another word having the same primal or terminal syllables; and hence the rhythmical terminations of the lines in poetry make it much more easily remembered than prose; and the alliteration so frequent in proverbs renders them easy to be recalled. It seems that by this principle of mental analysis the law of similarity or resemblance may be explained; the mind, as it were, separating an idea into its component parts, till it obtains one feature which exactly corresponds to a feature that goes to make up another idea. One idea may suggest another idea with which it had never previously been associated: this is done by means of a third idea common to both. Thus, Hannibal may suggest Napoleon, though they may have never been associated together in the mind, from their having both crossed the Alps under similar circumstances. The intermediate idea is here evident; but frequently it is not perceived, though in every case its influence may be traced. To this same principle, we think, may be referred contrast, or that tendency of the mind to proceed from one idea to its contrary; as, from virtue to vice, from light to darkness, from riches to poverty; there being, in every such case, an intermediate idea common to both, of which the one denotes an abundance, the other a deficiency. It is upon the association of ideas that memory depends. (*See* MEMORY.)

ASSONANCE, *ăs'-so-nănce* (Lat. *ad*, to, and *sono*, I sound), is a term used in Poetry and Rhet. to denote that the words of a phrase or verse have the same sound or termination, yet without making proper rhyme. This is commonly a fault in English, but the Romans sometimes used it with elegance; as,—"Militem comparavit, exercitum ornavit, aciem lustravit."

ASSONANT RHYMES, *ăs'-so-nănt* (Lat. *ad*, to, *sono*, I sound), is a term applied to a kind of verse common among the Spaniards and Portuguese, where the vowels only are required to rhyme.

ASSUMPTION, *ăs-sum'-shon* (Lat. *ad*, to, and *sumptus*, taken), is the name of a festival celebrated by the Roman Catholic and Greek churches on the 15th of August, in honour of the miraculous ascent of the Virgin Mary into heaven.

ASSUMPTION, in Logic, is the name given to the minor or second proposition in a categorical syllogism. It is sometimes also applied to the consequence drawn from the propositions of which an argument is composed. Thus we say the premises are true, but the assumption is captious.

ASSURANCE, LIFE. (*See* INSURANCE.)

ASSYRIAN ARCHITECTURE, *ăs-sir'-i-an*. — It is impossible to give any detailed account of the style of architecture adopted by the Assyrians; but from the important discoveries made by Botta at Khorsabad, and Layard at Kouyunjik, we are enabled to form some idea of the general features that characterized the buildings they raised as temples for their gods and palaces for their kings. It appears that when a site for any structure of great size and importance had been determined on, the first thing that was done was to raise an enormous mound, several acres in superficial extent, and from twenty to forty feet in height: they did this to obtain an imposing elevation for their buildings. The country through which the Tigris and Euphrates take their course is perfectly flat, and their palaces, which seem to have been low in proportion to their length and the extent of ground they covered, would have appeared dwarfed in height, and comparatively insignificant, if they had been raised on the level of the soil itself. These artificial platforms were not merely heaps of earth, but were systematically constructed of sun-dried bricks, with an outer facing of hard calcareous stone, brought from the distant mountains, and cut in regular blocks. The dimensions of the mound of Khorsabad, which is supposed to have formed the north angle of the city of Nineveh, may be given here to show the immense extent of these constructions, and the labour and time which must have been expended in piling them together. It was formed of two rectangles, in the shape of the letter T, that which is represented by the transverse part being 975 feet long and 442 feet broad, rising 20 feet above the level of the plain; while the other, on which the palace stood, was 650 feet long and 553 feet deep, being 10 feet above the surface of the lower platform. The superficial area of the two rectangles was nearly 18 acres. Botta states the height to have been from 40 to 50 feet. The mound at Kouyunjik was 7,800 feet in circumference, and its area more than four times as large as that of Khorsabad. Access to these terraces was gained by flights of broad low steps adorned with sculptured figures; and the platforms themselves were undoubtedly gardens, like the famous hanging gardens of Babylon, built by Nebuchadnezzar for his wife Amytis, which rose one above another on terraces supported by piers and arches, until they equalled the height of the outer walls of the city. The buildings raised on these mounds were quadrangular in form, with portals in each façade, flanked with sculptured winged bulls of great size. The walls were of brick faced with panels or slabs of gypsum, adorned with figures in bas-relief larger than life. The pavement of the apartments consisted of sun-dried or kiln-baked bricks, but the principal passages were floored with broad flags of stone. The state rooms in these palaces were of great size, many in the palace of Khorsabad being about 118 feet long, and from 23 to 33 feet in breadth; while at Kouyunjik, an apartment was discovered which was 200 feet long and 45 feet broad. The walls of Assyrian cities were of enormous thickness, being, in some cases, 45 feet in width; they were lofty, and were surmounted by square towers at intervals, with battlements for the protection of the archers who were engaged in defending any beleaguered town. The walls of their palaces were also of great width, being as much as 16, 18, and even 21 feet in breadth: galleries are supposed to have been constructed on the tops of these broad walls by raising rows of dwarf columns on the inner and outer edge, and adding a flat terrace-roof plastered on the upper surface. There are no windows in any of the palaces that have yet been discovered, and it is conjectured that they must have been lighted by apertures in the roof, which must have been flat, and formed of horizontal beams supported on rows of columns placed at intervals in the rooms below: a flooring, or rather ceiling, of wood was afterwards added, and covered with layers of sun-dried bricks. The openings in the roof would probably be surrounded by open parapets, or rows of columns surmounted by a similar kind of roofing. Such a method of construction would afford protection from the rain as well as sufficient light and good ventilation; and the strong glare of the summer sun could be moderated by the use of curtains. The immense thickness of the walls would render the rooms cool in summer and warm in winter. It must be remembered that the above description of the method used for roofing these buildings is, to a great extent, hypothetical; but all the Assyrian palaces that have been explored bear traces of having been destroyed by fire; and this could not have been the case unless a considerable quantity of wood had been used in their construction in the manner above indicated. Layers of bitumen were spread between the earth and the bricks and stones which composed the pavement, and also placed behind the alabaster slabs with which the walls were coated, to prevent injury arising from damp. Semidirular-headed openings in buildings represented on some of the bas-reliefs show that the Assyrians were acquainted with the principles of the arch; but th
not use this form for the roofing of
although Layard has discovered a bric
ber among the ruins at Nimroud. It is to be regretted that this highly imaginative people were not enabled to use more lasting materials for their grand and massive structures than the soil of the country mixed with

chopped straw and hardened by exposure to the sun. All in life and animation in every part of their buildings; not a plain unsculptured slab is to be seen. They introduced rich colouring into their decorations; and from the fragments found on the floors, and among the heaps of rubbish that fill the rooms, it appears that the brick walls above the carved slabs were faced with enamelled tiles of the richest hues, and that these alabaster panels were set in a brilliant bordering of figures and arabesque patterns common to Eastern architecture. This colouring was most probably carried through the enrichments of the ceilings and the wooden columns that supported them. No stone columns have hitherto been discovered in any of the palaces that have been mentioned above, and they do not seem to have been introduced into Assyrian architecture of the age to which the cities of Nineveh and Babylon belong. Simple in conception and design, massive in construction, and elaborate in ornamentation, the architecture of the Assyrians derived its chief grandeur and imposing appearance of stability and power from the broad base and lofty piles of successive terraces on which their public buildings were always erected.—*Ref.* Bonomi's *Nineveh and its Palaces.*

ASSYRIAN SCULPTURE.—Although the architecture of the Assyrians was simple enough, yet this people reached a high pitch in the excessive richness of their sculpture. They seldom made statues or representations of the human form or animals in a complete and perfect state, but confined themselves to sculpture in bas-relief, embossing figures on the surface of the slabs of marmoriform gypsum, with which the sides of their rooms and passages were coated. These bas-reliefs were intended to be pictorial representations of the manners and customs of the people, and, more particularly, of the history of the nation, giving an account of the remarkable events in the reign of any monarch, very much in the style of the Bayeux tapestry, allowance being made for the difference of material. On some of these gypsum panels, which are about nine feet high and from three to nine feet broad, carefully joined to present a continuous surface round the walls of any room or passage, some royal personage is represented, attired in richly-ornamented robes, with a tiara on his head, surrounded with a numerous retinue of priests, warriors, eunuchs, and attendants; on others, the attack and defence of a fortified city is depicted, the pursuit of a flying foe, the torture and death of captives, and all the varied episodes of war; while banquets, the chase, lion and bull hunts, and the arts of peace, form subjects with which those already mentioned are occasionally interchanged. On some, the eagle-headed figure of Nisroch, and those of other Assyrian deities appear. Some of these are represented with four wings, and accompanied by what is termed the sacred tree; the priests are generally represented with the symbolic flower, apparently taken from this tree, in one hand. The jambs of the portals of their palaces and chambers were usually carved into the figures of winged bulls and lions with human heads; the head, fore-legs and fore part of the body as far as the shoulders being entirely finished, and the remainder in high relief on the side of the block which formed the jamb. One great peculiarity about these figures is, that they are represented with five legs, that they may appear complete, whether viewed in front or at the side. A figure of a man fifteen feet in height was found between bulls of this sort flanking the portals of the palace of Khorsabad: it was strangling a lion apparently in mortal agony, and was supposed to represent "the mighty hunter" Nimrod himself. Representations similar to the figure in the annexed engraving are frequently found on the bas-reliefs at Nimroud and Khorsabad: that from which the engraving was copied was found at the latter place, the only perfect figure remaining in the court in which it was discovered. Bonomi imagines it to be "a diviner or magician, one of the four orders of Chaldeans mentioned in Daniel (ii. 2), of whom it was the custom for the kings of Assyria to require the interpretation of dreams." The figure seems to be that of a priest, with the hair and beard carefully dressed, and the head bound with a fillet or circlet, with rosettes in front and at the sides. It carries the symbolic flower in the left hand, while in the right it bears a wild he-goat or ibex, similar in form to those which are found in the mountains that surround Mesopotamia. The long flowing robe is adorned with deep fringes and ornamented borders, and the short tunic which appears below it is trimmed in a similar manner. Bonomi expresses his belief that these Chaldeans and priests were the sculptors and painters of the time. All the specimens of Assyrian sculpture that have been found show that they were faithful observers of nature, although they were not sufficiently good draughtsmen to accomplish faithful reproductions of all they saw around them. The predominance of representation of battles and victories, and cruelties practised towards their prisoners taken in war, furnishes ample proof that they were a proud and imperious people, vainglorious, and boastful, as, indeed, we learn in Holy Scripture; and this is supported by the arrogant character of the cuneiform inscriptions accompanying their sculptures, which have been deciphered by the skill and ingenuity of Grotefend, Rawlinson, and others versed in oriental languages and literature.—*Ref.* Bonomi's *Nineveh and its Palaces; Buried City of the East.*



ASSYRIAN SCULPTURE.

ASTER, *ăs'-ter* (Gr., a star), in Bot., a gen. of plants belonging to the nat. ord. *Compositæ*, and containing a great number of species, growing in all parts of the world. One species only, *A. Tripolium*, the sea-starwort, is a native of Britain. Some of the asters are favourite garden-flowers; namely, the New England aster (*A. Novæ Angliæ*), the Michaelmas daisy (*A. Tradescanti*), and the China aster (*A. chinensis*). The last is the most valued, and is one of the most showy annuals in cultivation. It was brought from China in the early part of the 18th century, and an immense number of varieties, exhibiting great diversities of form and colour, have been developed by British and continental florists. The genus *Aster* has lately been split into six or seven distinct genera, which together form the tribe *Asteroideæ*.

ASTERACEÆ, *ăs-ter-ā'-se-e*, the name given by some botanists to the Composite order of plants. (*See* COMPOSITÆ.)

ASTERISK, *ăs'-ter-isk* (*Gr. aster*, a star), is a mark in the form of a small star (*), placed over a word or sentence to refer the reader to the margin, or elsewhere, for an explanation, quotation, or the like.

ASTERISM, *ăs'-ter-izm* (*Gr. aster*, a star), a group of stars, a term formerly applied to the collection of any heavenly bodies forming an entire constellation, and used instead of that expression. It is now taken to denote any small cluster of stars, whether forming part of a constellation or a distinct group.

ASTERN, *ă-stern'*, in Mar., any distance behind a ship, as opposed to ahead, which signifies before her; thus, if south is ahead, or on the line to which the stem is directed, north will be astern. It also signifies in or at the hinder part of a ship, or towards the hinder part; as, 'to go astern.'

ASTEROIDS, *ăs'-ter-oids* (*Gr. aster*, a star, and *oides*, like), a number of small planets revolving between the orbits of Mars and Jupiter, four of which were discovered in the first decade of the present century, and the remainder since 1845. They are sometimes called *planetoids*, an expression meaning 'like a planet,'

which conveys a better idea of their character, in contradistinction to fixed stars and *extra-zodiacal planets*, because their orbits, unlike those of the larger planets, are not confined within the zodiac. The entire number discovered up to the present time (1862) is sixty-nine. Flora, the eighth in order of discovery, is nearest to the sun, with a mean distance of 200,170,000 miles; and Euphrosyne, the thirty-first, the most distant, being about 360,000,000 miles from the centre of our solar system. The great space that intervenes between the orbits of the planets Mars and Jupiter led Kepler to imagine that there must be a planet revolving between them which had hitherto escaped observation through the smallness of its size; and this supposition was subsequently strengthened by the discovery of a formula known as Bode's law (*see* Bode's Law), by which the respective distances of the planets from the sun were represented by certain numerical values, the approximate truth of which is shown by reference to their actual mean distances.

Asterolepis, *ăs'-ter-o-lē'-pis* (Gr. *aster*, star, *lepis*, scale), in Geol., the star-scale, a gigantic fossil ganoid fish of the Old Red sandstone, so named from the star-shaped markings on the strong plates which protect the head. The structure of this creature is minutely described in Hugh Miller's work "Footprints of the Creator; or, the Asterolepis of Stromness."

Asterophyllites, *ăs'-ter-of'-il-lītes* (Gr. *aster*, star, *phullon*, leaf), in Geol., fossil plants found abundantly in the Coal-measures, Lias, and Oolite, characterized by star-like whorls of narrow leaves surrounding the jointed stems, as in the existing genera *Hippuris* and *Equisetum*.

Asthma, *ăzth'-ma* (Gr. *asthmaso*, I breathe with difficulty), in Med., is a disease of the lungs, characterized by difficulty of breathing, which comes in paroxysms, accompanied by a wheezing noise and a feeling of tightness across the chest. The fit occurs most frequently during the night, suddenly awaking the patient from sleep, who is obliged to assume an upright posture, to prevent suffocation, and to struggle and pant for breath while the paroxysm continues, which is usually for two or three hours. Though a terrible, it is seldom, in itself, a fatal disease. It is frequently hereditary, or it may arise from some inflammatory affection of the respiratory organs. Among the other causes that may give rise to it, are dwelling in a moist or impure atmosphere, cold, indigestion, mental anxiety. The paroxysms are generally preceded by languor, flatulency, headache, sickness, a feeling of anxiety, and a sense of tightness and fulness about the chest. Physicians usually distinguish three kinds of asthma,—the humid, dry, and spasmodic, according as they are, or are not, attended with cough and expectoration. During the paroxysms, gentle aperients and anti-spasmodic medicines are recommended. A blister on the chest, bathing the feet in warm water, a cup of hot coffee, or the smoking of stramonium, are frequently of use. To prevent the return of a paroxysm, the exciting causes are to be avoided; the bowels to be kept gently open, the food to be light and nourishing, sudden changes of temperature to be avoided, regular and moderate exercise to be taken, and a change of climate or of situation to be tried. As regards this last, it has been found that some have been least subject to asthma in the country, others in the centre of a town.

Astrea. (*See* Coral, Madrepore.)

Astræa, *ăs-trē'-a*, the name of one of the asteroids or planetoids revolving between Mars and Jupiter. It was discovered by Hencke, an amateur astronomer, at Driesen, in Germany, Dec. 8, 1845. (*See* Asteroids.)

Astragal, *ăs'-tra-gal* (Gr. *astragalos*, a heel-bone), in Arch., a moulding, the section of which is a complete semicircle, projecting from a perpendicular diameter, so called from its resemblance to the projection of the heel of the human foot. It is principally used at the upper ends and bases of the shafts of columns, and in the entablatures of the Ionic, Corinthian, and Composite orders of architecture, and also in Roman Doric. It is the most simple of all mouldings, being the only one that can project from a plane surface without the aid of a fillet. Its chief use seems to be to bind the different parts of columns and entablatures together, being generally found at the junction of the shaft of a column with the capital and base. The Egyptians sometimes divided their columns into sections by clusters of astragals surrounding the shaft at intervals. It is generally plain, but sometimes carved into successive reels bound together with a ribbon, leaves, and beads of various forms. In Gunnery it is a moulding encircling a cannon about six inches from its mouth.

Astragalus, *ăs-trag'-a-lus* (Gr. *astragalos*, a die), in Anat., is the name of the ankle-bone, or first bone of the foot, upon which the tibia moves. It is so called from being shaped like the die used by the ancients in their games.

Astragalus, in Bot., a gen. of plants belonging to the nat. ord. *Leguminosæ*, sub-ord. *Papilionaceæ*. More than 250 species have been described, and most of them are hardy plants, either shrubby or herbaceous. The best-known British species are *A. hypoglottis*, the purple milk-vetch, and *A. glycyphyllos*, the liquorice-vetch. The species *A. verus*, *A. gummifer*, *A. creticus*, and some others, furnish gum-tragacanth, or, as it is frequently termed in the shops, *gum-dragon*. Tragacanth exudes naturally from all parts of the above plants, or from wounds made in the stems. It is used by British manufacturers for stiffening crape and other light fabrics, and by the perfumers for making bandoline. In medicine it is employed for its demulcent and emollient properties, and as a vehicle for the exhibition of more active substances. *A. boëticus*, an annual species, is cultivated in Hungary, Germany, and other parts of Europe, for the seeds, which are roasted, ground, and used as a substitute for, or an improver of, coffee.

Astral Spirits, *ăs'-tral* (Gr. *astron*, a star; Lat. *spiritus*, a spirit), spirits that were supposed by those who studied demonology and witchcraft in the 15th century to hold the first place among demons and spirits of evil. The Chaldeans, and those who worshipped the stars and fire in the early ages of the world, believed that every object in the heavens possessed an animating spirit, as the human body possesses a soul. In the Mediæval times the notion arose that these spirits were either fallen angels, or the souls of the dead, or spirits deriving their origin from fire, whose location was the air. They were thought to exercise an influence for good or evil on every member of the human race. Paracelsus and the old alchemists believed that every one had an astral spirit peculiar to him.—*Ref.* Chambers's *Encyclopædia*.

Astringents, *ăs-trinj'-ents* (Lat. *ad*, to, and *stringo*, I tie fast), substances which have the property of contracting or drawing together the muscular fibre, and which are employed medicinally for the purpose of checking fluxes, hæmorrhage, and diarrhœa. The drugs most commonly used as astringents are alum, acetate of lead, catechu, oak-galls, and rhatany-root. Most vegetable astringents contain tannin.

Astrocaryum, *ăs-tro-kar'-i-um* (Gr. *astron*, a star, *karuon*, a nut), in Bot., a gen. of palms, including about sixteen species, all natives of tropical America, and remarkable for the formidable spines with which the stems, leaves, and other parts are armed. The fruits of *A. Tucuma* and *A. murumuru* are eatable. The species *A. vulgare*, the Tucum-palm, is cultivated by the Indians of the Amazon for the sake of the epidermis of the unopened leaves, which they make into strong and fine thread by twisting thin strips together. Beautiful hammocks are made of this tucum thread. The Ucuum-palm is much more lofty than the mucuna-palm.

Astrolabe, *ăs'-tro-lāb* (Gr. *astron*, a star, and *lambanein*, to take), an instrument somewhat similar in purpose and construction to the armillary sphere, used by the old Greek astronomers to take the altitude of the stars, as its name implies. The astrolabe of the astrologers was merely a graduated circle, with sights attached, which they used for the same purpose. It was similar to the instrument so called, which was used for taking altitudes at sea before the invention of Hadley's sextant. Hipparchus, an astronomer who flourished at Alexandria, in Egypt, about 150 B.C., is supposed to be the inventor of the astrolabe. He was also the first who joined circular rings together to represent the equator, the meridian, and the tropics; thus originating the armillary sphere. About the year 1600

the term was used to signify a projection of the circles of the sphere on a plane surface, which is now called a planisphere. (*See* PLANISPHERE.)

ASTROLOGY, *as-trol'-o-je* (Gr. *astron*, a star, and *logos*, a word or discourse), an expression literally meaning the doctrine or science of the stars, but especially taken to signify the art of foretelling future events, and the good or evil fortune likely to befall any man during his lifetime, from the aspect of the heavens and the relative position of the planets and other heavenly bodies at the time of his birth. This art, which is commonly understood by the term astrology, is properly called judicial astrology; for, in the early ages of the world, astrology included the science of astronomy, as well as the art of making predictions from the motions of the stars; the early astronomers, or rather astrologers, making astronomical observations entirely for the sake of acquiring an insight into futurity, as they imagined. The history of the rise and progress of astrology is nearly the same as that of astronomy. Its decline may be dated from the time of Copernicus, who showed that the sun was the centre of our solar system, and not the earth, as it had been formerly supposed; and, although this is no argument against the truth of the science, yet the fact that all calculations with regard to the motion of the heavenly bodies had hitherto been based on erroneous suppositions, was mainly instrumental in disabusing the minds of men generally of any reliance that they had previously placed on the deductions derived from the exercise of the art. All astronomers, including Kepler himself, up to his time, have been more or less infected with the idea that their science gave them the power of foretelling events that were about to happen; and remarkable instances have occurred of the verification of astrological predictions; but no one, on reflection, can assert in earnest that the aspect of the heavens at the time of birth can have the slightest influence on a man's character, disposition, and fortunes. If it were so, all who are born at the same moment (and it is calculated that about sixty births occur throughout the world every minute) must necessarily run the same career; and consequently all those who were born at the same time as the emperor Napoleon or the duke of Wellington should have met with similar fortunes. Although at the present time all the people of Eastern nations are believers in astrology, especially those who profess the Mahomedan faith, it is astonishing that this pretended science should even now be practised in England, and that so many are credulous enough to purchase almanacs and other works which profess to foretell coming events, and even to place reliance on the statements put forth in them. The practice of astrology was universal among the Oriental nations at a very early age; and, although its origin is involved in obscurity, it may probably be attributed to the Chaldeans. The Hindoos and Chinese have always attached the greatest importance to it, and the Arabs sedulously cultivated the art, as well as the astronomers who flourished in Egypt before and after the birth of our Saviour, at which period it is considered to have been introduced into Western Europe. The Jews practised it after the return from the captivity in Babylon. It appears that the Greeks were the only ancient nation that gave no credence to the revelations of its professors. As many expressions are met with in the works of our old English authors and dramatic writers which are unintelligible without some idea of the broad outlines of the science, it may not be out of place to give a brief sketch of its leading principles and the manner in which it was practised. The heavens above and below the horizon were divided by imaginary circles, drawn through its north and south points, into twelve equal parts, which were called the twelve houses of heaven. They were numbered in order from the division in the east immediately below the horizon which contained the part of the heavens about to rise into view. The lines of division were supposed to remain immovable, so that every part of the heavens passed through each house successively once in twenty-four hours. The term horoscope was given to the point of the ecliptic about to rise. The first house was called the ascendant: it was the strongest, and also known as the house of life; the second was the house of riches; the third, of brethren; the fourth, of parents and relatives; the fifth, of children; the sixth, of health; the seventh, of marriage; the eighth, of death; the ninth, of religion; the tenth, of dignities (this house ranked next in importance to the first); the eleventh, of friends; the twelfth, of foes. To each division one of the heavenly bodies was assigned as its lord, who was most powerful in his own house. The position of a planet in any house was its distance from the boundary circle or cusp of the house measured on the zodiac; and the part of the zodiac which chanced to be in each house was a point which especially demanded the attention of the astrologer in his consideration of the aspects of the various divisions. The relative position of the heavenly bodies in the different houses at any particular moment was called a theme; and to cast the nativity of any one was to form a plan of the heavens in the manner above indicated at the moment of birth.—*Ref.* Sibly's *Occult Sciences; English Cyclopædia*—Arts and Sciences.

ASTROLOMA, *as-tro-lo'-ma* (Gr. *astron*, a star, and *loboe*, a pod), in Bot., a gen. of plants belonging to the nat. ord. *Epacridaceæ*. The species *A. humifusa* yields the Tasmanian cranberry. This fruit is about the size of a blackcurrant, but is of a green or yellowish colour, sometimes tinged with red, and consists of a viscid apple-flavoured pulp, inclosing a large seed. The flowers are of a beautiful scarlet.

ASTRONOMY, *as-tron'-o-me* (Gr. *astron*, a star, *nomos*, law, rule the science which gives us an insight into the wonderful construction of the universe, and makes us acquainted with the motions and relative positions of the heavenly bodies. It may be considered as consisting of two great divisions,—practical astronomy and theoretical astronomy. Under the former may be classed the labours of the astronomer in his observatory, surrounded by instruments of various kinds, that have been brought to the greatest perfection by the accumulated experience of a long series of years, acquired by the careful observation and research of human intellect of the first order; while under the latter must be placed the calculations of the mathematician, who can correct, by computation, the slight errors to which observations made by the best instruments are always liable, and determine the distance, shape, size, orbits, and even weight, of the numerous celestial bodies, as well as the occurrence of eclipses and other phenomena, and construct tables of the rising and setting and other ephemerides of the sun, moon, and planets for years in advance, such as those which are found in the Nautical Almanac, for the instruction and guidance of sailors, who find them of the utmost value in determining the position of their vessels and their course from one part of the world to another. Practical astronomy requires an intimate knowledge of the construction and working of the various instruments by which observations are made. Notices of these are to be found under their respective headings. (*See* CIRCLE, SIDEREAL CLOCK, EQUATORIAL, TRANSIT-INSTRUMENT, PENDULUM, TELESCOPE, &c.) Theoretical astronomy, which includes, with the operations of the mathematician, that branch of the science which has been called physical astronomy, or the consideration of the observations of astronomical phenomena so that the causes of these phenomena may be discovered, and the laws of nature which influence them may be deduced, is also treated under the names of the principal subjects which particularly belong to it. (*See* ABERRATION, GRAVITATION, GEODESY, LIBRATION OF THE MOON, PARALLAX, PRECESSION OF THE EQUINOXES, REFRACTION, TIDAL THEORY, &c.) Definitions of astronomical terms, and the nature of the heavenly bodies, as far as the limited power of man has hitherto been able to determine them, are also given in their respective places. (*See* ASTEROIDS, COMETS, MOON, PLANETS, FIXED STARS, SUN, SOLAR SYSTEM, ZODIAC, &c.) The early history of astronomy is involved in considerable obscurity; but of all the sciences that have occupied the research of man, it is certainly the most ancient. The minds of the first inhabitants of the earth were doubtless soon directed to the wonderful recurrence of the phenomena of day and night; the sun in the full blaze of his meridian glory, now scorching the eastern plains with the intensity of his heat, now veiled with mists and clouds that hid for a season his welcome light and

warmth from those who, after a while, ignorantly worshipped his very presence. The changes in the pale moon, gliding over what was imagined to be a vault of azure crystal studded with countless stars, from the silver streak of the horned crescent to the broad shield of her orb at the full, would also be noted with wonder and amazement. Men would soon begin to remark the regularity of these changes, as well as the motion of some stars and the apparent immobility of others; and then records of these observations would be made, and the first link forged of the long chain of discoveries, among which those of Tycho Brahe, Copernicus, Galileo, Kepler, and Newton are the most important, reaching to the addition of member after member to our planetary system, and the great improvements in the science which have been made and are still making in our own times. The Chaldæans are, perhaps, the first nation that cultivated astronomy, although the Chinese, Hindoos, and Egyptians equally claim to take rank as the originators of the science. The Greeks, also, were efficient astronomers, and did much for its advancement; they also have the merit of having followed up their observations for the sake of the science itself, while all the above-named people applied it to furnish means of inquiry into the future, and (with the exception of the Chinese, who made it subservient to state purposes), closely connected it with religious, or rather superstitious observances. It may not be out of place to note briefly the claims of the contending nations to the honour of having originated the science. The Chaldæan priests observed and placed on record the rising and setting of the celestial bodies, and eclipses of the sun and moon, from a very remote period, as it is stated by Diodorus; they understood the Metonic cycle (*see* METONIC CYCLE); they used the clepsydra, or water-clock, to mark the lapse of time, and the gnomon and hemispherical dial, for determining solstices and the positions of the sun respectively. Alexander the Great, according to the old writers Simplicius and Porphyry, found at Babylon a list of eclipses from 2234 B.C., more than 1,900 years before the conquest of Babylon by that monarch, and sent them to Aristotle. The astronomer Ptolemy mentions a few of these in his writings, the earliest of which is dated 720 B.C. They are, as may be imagined, but roughly made, the time being given in hours only, and the part of the diameter eclipsed within a quarter of an hour; but they happen to be the earliest recorded observations on which any dependence can be placed; and, by comparing them with observations of his own time, Halley was led to the discovery that the moon moves round the earth with greater rapidity now than in the early ages of the world. The division of the ecliptic into twelve equal parts (the twelve signs of the zodiac), and that of the day and night into twenty-four hours, are ascribed to the Chaldæans. The Chinese records of astronomical observations claim to go back to the year 2857 B.C. Nothing of importance is noted in them; a bare list of eclipses of the sun and the appearance of several comets is all that is given. That they were notoriously incorrect fully appears from the circumstance that many eclipses mentioned in this record have been recalculated, and not one prior to the time of Ptolemy can be verified with anything approaching exactness. The Chinese were acquainted with the Metonic cycle and the motions of the planets; but they knew nothing about the precession of the equinoxes until about 400 A.D. The Hindoos rest their claim on a series of observations known as the "Tables of Tirvalore," which are assumed to date from the year 3102 B.C., the beginning of the iron age of Hindoo mythology, when an extraordinary conjunction of the sun and moon and all the planets is said to have taken place. These tables are believed by competent judges to have been fabricated from data derived by the Hindoo astronomers from the Greeks and Arabs. It is, however, fair to add that there are many who contend that they were compiled from actual observations made by the Hindoos themselves, although commenced at a much later date than the epoch assigned for the beginning of the record. There is much in them that is correct; but they appear to be in many points a mean between the tables of an eminent Arabian philosopher, Albategnius, and those of Ptolemy, which seems to furnish strong presumptive evidence of their compilation from these authorities. The Greeks derived their astronomical knowledge from the Egyptians in the first place; but the Egyptians have left no records of their observations. The pyramids, which are placed exactly north and south, are supposed to have had some astronomical use; and it has been a matter of doubt whether the division of the zodiac should not be rather attributed to the Egyptians than the Chaldæans. With the Greek philosopher Thales, who flourished about 640 B.C., the real and reliable record of facts connected with the history of astronomy may be considered to commence. Thales is said to have predicted a total eclipse of the sun, which happened at the time he had foretold; but it is a question whether his success in this instance was purely accidental or accomplished by the aid of the Chaldæan Saros. (*See* CHALDÆAN SAROS.) He was the first to show that the earth was a sphere, and not a plane surface, as the ancients imagined; and he also gave the Grecian sailors some idea of shaping their course by the stars. Pythagoras, who flourished about 500 B.C., did not consider the earth to be the centre of the universe, but, as it was afterwards shown by Copernicus, that the earth and other planets revolved round the sun. The only improvements and additions to the science before the Alexandrian school, which flourished in Egypt under the Ptolemies some 200 years later, are the introduction of the Metonic or luni-solar cycle, of nineteen years, by Meton, 432 B.C., which was improved by Calippus about a hundred years afterwards; the first computation of the year of 365¼ days, by Eudoxus of Cnidus, 370 B.C.; and the idea of the daily revolution of the earth upon its axis, which was taught by Nicetas, a philosopher and astronomer of Syracuse, although the notion is said to have occurred to Anaximander some centuries before, who also asserted that the light afforded by the moon was caused by the reflection of the sun's rays from that body. Hitherto everything connected with the science had been vague and unsatisfactory, mere guesses at truth,—guesses which, in the majority of cases, fell very wide of the mark; but with the astronomers of the Alexandrian school, a regular system of observation was commenced. The paths of the planets in their orbits were determined; the relative positions of the fixed stars clearly laid down, and the constellations or clusters of stars in various regions of the heavens, that had been grouped together and denoted by fanciful outlines of figures of beasts, and birds, and human beings, referring, in many cases, to subjects connected with the old Greek mythology, were duly mapped out and catalogued. The first Alexandrian school of philosophy may be considered to have existed for 176 years, from the time of Timocharis and Aristyllus, who flourished about 300 B.C., to the death of Hipparchus of Bithynia, the greatest of all the astronomers that lived before the Christian era. The second school commenced with Ptolemy, about 130 A.D., and ended with Pappus and Theon of Alexandria, early in the 5th century, when the Goths had crossed the Mediterranean, and extended their ravages into Egypt and Northern Africa. The most celebrated astronomers in the first of these Alexandrian schools were Timocharis and Aristyllus, whose joint observations proved of as much importance to Hipparchus as the rough records of eclipses observed at Babylon were to Halley, enabling the clever Greek to discover the precession of the equinoxes. Contemporary with these was Euclid, better known to us as a mathematician, but whose name must not be omitted here, since his clear and logical reasoning must have done much to pave the way for future discoverers, particularly those who turned their attention to the theory of the science. Some years later came Aristarchus of Samos, remarkable for being the first who attempted to ascertain the magnitude of the earth and its distance from the sun and moon: he was also a believer in the Pythagorean theory, that the earth revolved round the sun. Another celebrated astronomer of this school was Eratosthenes, who also turned his attention to the determination of the magnitude of the earth, and the angular obliquity of the ecliptic to the equator; he also made observations with astrolabes of his own construction, which existed at Alexandria in the time of Ptolemy. But the master mind of the

Alexandrian astronomers was found in Hipparchus of Bithynia, who flourished from 160 to 125 B.C., the Newton of his age. He made a catalogue of 1,061 stars, determining the latitude and longitude of each, which is the first list on which any reliance can be placed, as those attributed to Eratosthenes and others are devoid of bearings by which they can be recognised and identified. He fixed, with greater approximation to exactness than any of his predecessors, the length of the year, and demonstrated the inequality of the sun's motion. He made most important discoveries respecting the moon, determining her mean motion, her apogee and perigee, her parallax, and inclination of her orbit. He calculated eclipses, and discovered the precession of the equinoxes, as it has been remarked; and he was the first who gained an insight into the principles of plane and spherical trigonometry, or measurement by triangles. He also used right ascension and declination for determining the places of the stars; but afterwards fixed their positions by latitude and longitude in preference, applying this method to ascertain the relative situations of places on the earth, thereby rendering as great a service to the science of geography as he had to that of astronomy. We may well wonder when we consider how much this old astronomer effected, and that all he did was done without aid from those instruments and appliances which prove such powerful auxiliaries to modern research. From the death of Hipparchus to the time of Ptolemy, a period of about 250 years, no astronomer of eminence is met with, and no discovery of any practical utility was made. Ptolemy followed closely in the footsteps of Hipparchus, substantiating or altering the various theories which his predecessor had propounded. Among his chief discoveries were the libration of the moon and the refraction of light. He made a catalogue of the stars, based, most probably, on that of Hipparchus, with the positions corrected by the improvements he had been enabled to effect: he also invented a planetary system known as the Ptolemaic system (*see* PTOLEMAIC SYSTEM), which was generally considered to be the true principle of the motion of the universe, until Copernicus revived and extended the system originated by Pythagoras. He wrote at great length on astronomy and mathematics, as well as on other sciences, embodying the result of his observations and his various dissertations in a work called "Megale Syntaxis," or the Great Collection, and, by the Arabs, the *Almagest*. (*See* ALMAGEST.) His successors, with the exception of Pappus, who wrote a commentary on his works, and Theon of Alexandria, were men of little or no note. After the death of these philosophers, the second school of Alexandrian philosophy may be considered to have ceased, or, perhaps, to have languished until its total destruction by the Arabs, then called Saracens, about the middle of the 7th century. Fortunately, the Arabs preserved the writings of Ptolemy, and, in the year 762 A.D., commenced a diligent prosecution of the study of the science, under the fostering encouragement of the Arabian caliphs; and although astronomy under the Arabs was not extended by any great discoveries, yet the careful observations made by these people led to the correction and more accurate determination of many elements of the science that had been sought out by the inquiring minds of the old Greek astronomers. The most distinguished of the Arabian astronomers were Albategnius, or Al Batani, who flourished about 880, Ebn-Yunis, and Abul-Wefa. The first-named of these found out the motion of the sun's apogee. (*See* ANOMALISTIC YEAR.) He also made corrections in the calculation of the precession of the equinoxes, and advanced to a great extent in the knowledge of trigonometry, making use of sines and versed sines. Ebn-Yunis, who lived 1000 A.D., left many tables and results of observations, and was the first to employ subsidiary angles in his calculations. Abul-Wefa, who lived at the same time, did much for the improvement of trigonometry, using tangents, co-tangents, and secants, in addition to the sines and versed sines of Albategnius, and left tables of tangents and co-tangents. The use of the cosine was introduced by Gebir, a Spaniard, some years later. In Persia astronomy had not been neglected. Nassir-eddin compiled tables of observations, and gave them to the world in 1270; while Ulug Beg, a grandson of Timour the Tartar, made observations at Samarcand about the year 1433, and constructed the most correct catalogue of stars that had appeared up to his own time. This prince was as eminent as a geographer as he was as an astronomer. From this time, however, the study of astronomy has gone down among Asiatic nations; their knowledge of the science being solely kept up for the sake of the assistance derived in the prosecution of the study of astrology. In the early part of the 13th century, the attention of European nations was again turned to astronomy. Frederick II., emperor of Germany, ordered a translation of the *Almagest* to be made during his reign; and Alphonso X., king of Castile, collecting a great number of the most notable astronomers of the age about him, caused a set of tables to be compiled in the year 1252, which are known as the Alphonsine tables. (*See* ALONSINE or ALPHONSINE TABLES.) It was this monarch who was so puzzled by the intricacies and anomalies of the Ptolemaic system, that he gave vent to the remark, that if he had been consulted at the creation of the universe, he would have managed things far better and much more simply. From this time until 1500, nothing is worth recording in the history of astronomy. Copernicus was then twenty-seven years of age, and, attracted by the interest attaching to the study of this science, entered on his laborious researches with the eager and ardent thirst for fame and knowledge so common at his period of life in minds like his. The result of his investigations was a table of the motions of the planets, and a work on the *Revolution of the Heavenly Bodies*, in which he endeavoured to show the fallacy and error of the system of Ptolemy, introducing in its place what has since been known as the Copernican system (*see* COPERNICAN SYSTEM), which is the true theory of the motion of the universe. He met with great opposition in the promulgation of his views; and his theory was not esteemed at its true and proper value, because he was unable to answer certain objections that were made to it, which have since been fully explained away. For thirteen years he boldly contended for the truth of his system; but he died, worn out in mind and body with the wearing toil of thought and anxiety, a few weeks after his great work had been given to the world in a printed form. Many astronomers, of all climes and countries, laboured and wrote during the time that elapsed between the death of Copernicus and the year 1600; but of all these the most famous was Tycho Brahe, born 1546. Commencing the study of astronomy at a very early age, he soon determined to devote his life to the prosecution of the science; and in 1582 he began his observations on an island in the Baltic, near Copenhagen. He did not adopt the system that had been suggested by Copernicus, but substituted a theory of his own, known as the Tychonic System, in which he asserted that the earth was the centre round which the sun moved, but that all the other planets moved round the sun, continually circling about him as he moved onwards in his course round the earth. This theory of Tycho Brahe was received more favourably than that of Copernicus, as there was no argument against it that could not be answered; and it explained all the phenomena of nature fully as well as the theory it was intended to supersede. In addition to the invention of the Tychonic system, he effected great improvements in the instruments then in use. He produced a catalogue of the fixed stars considerably more accurate than any which had preceded it, and made the first table of refractions. He also added greatly to what was already known of the motions of the moon, discovering the moon's variation and annual equation (*see* EQUATION, ANNUAL), the changing motion of her nodes, and the inclination of her orbit. He improved his tables by neglecting what was called the trepidation of the precession of the equinoxes, and made very important researches into the nature, course, and distance from the earth of comets, which were previously imagined to be atmospheric bodies. The next astronomers of eminence who rendered important service to the advancement of the science were Kepler and Galileo; the former of whom was born 1571, died 1630, and the latter born 1564, died 1642. The lives of these philosophers bring the history of

astronomy to the middle of the 17th century. Building on the discoveries of Tycho Brahe, and his own investigations of the orbit of the planet Mars, Kepler was led to the conclusions demonstrated in what are called his First and Second Laws (*see* KEPLER'S LAWS), that the courses in which the planets move round the sun are ellipses, having the sun as one of the foci, and that the areas of the orbits are proportional to the times of revolution. His Third Law, that the squares of the periodic times of the planets are proportional to the cubes of their relative distances from the sun, was enunciated in 1618, nine years after the discovery of the first and second laws. Kepler did much to establish the system of Copernicus, and to answer the arguments that had been previously urged against it. His last work was the compilation of the Rudolphine Tables, published about four years before his death. During the life of Kepler, two inventions, invaluable to the prosecution of the science, were made. The telescope was first constructed in Holland by an optician named Lipperhey; and logarithms were invented in Scotland by Napier of Merchistoun, from whom the clever and gallant Napiers, that have made themselves famous in our own times, were lineally descended. Galileo greatly improved the original telescope, making one which magnified to the extent of a thousand times. With the aid of this instrument, he soon discovered the satellites of Jupiter, the ring of Saturn, and the phases of Venus resembling those of the moon, as well as the hills and valleys on the moon's surface. He also asserted the truth of the system of Copernicus, which drew on him the displeasure of Paul V., the monarch-priest of Rome at that time; and, in the subsequent reign of Urban VIII., in 1633, subjected him to the tender mercies of the familiars of the Holy Inquisition, who wrested from him a recantation of the views he had so ably advocated. It will be impossible to do more than glance rapidly at the salient points in the growth of the science which appear previously to the discovery of gravitation, which has immortalised the name of Sir Isaac Newton. Gassendi, in 1631, had watched the transit of Mercury across the disc of the sun; Descartes, an eminent mathematician, had published his Cartesian theory; Vernier had invented an instrument, which bears his name, to determine the smallest subdivision of space (*see* VERNIER); Norwood had measured the meridian from London to York with great accuracy; Gascoigne, Auzout, and Picard had, independently of each other, applied the telescope to the quadrant, and the micrometer to the telescope; Huyghens had constructed the first pendulum clock, and Moreton had made use of the pendulum to assist him in his observations of the differences of the right ascension of the heavenly bodies; Gregory, in 1663, had constructed a reflecting telescope; and Cassini, with many other valuable discoveries, had ascertained the period of the rotation of Jupiter, and compiled the earliest tables of the satellites of that planet. Newton, who was born in the year in which Galileo died, was now twenty-four years old, and had already conceived a notion of the theory of gravitation, to which he is said to have been led by a train of thought arising from the observation of the fall of an apple. (*See* GRAVITATION.) It was many years before he could satisfy himself of the truth of his speculations, and determine the laws on which his wonderful discovery rested; but he ultimately published it in his *Principia*, in 1687. By observations of the comet of 1680, Newton found that, in accordance with the laws propounded by Kepler, the orbits of comets about the sun were elliptic. He also invented fluxions, determined the form of the earth, and showed the influence of the moon upon the ebb and flow of the tides. In 1668 he constructed his first reflecting telescope. He ended his useful life as an astronomer, mathematician, and philosopher, in 1727. Contemporary with Newton were Halley and Flamsteed, who held the post of first astronomer royal in the Observatory at Greenwich, founded in 1675. Flamsteed was as eminent a practical astronomer as Newton was skilled in physical astronomy. In 1680 he determined the laws of the moon's annual equation; and fourteen years later, in conjunction with Newton, he commenced a series of observations for the improvement of the theories then held respecting the moon's motions, and the laws which Newton had arrived at respecting the reflection and refraction of light. He made a long catalogue of stars, in which important additions were made to those that had already been published, and many series of astronomical observations, which were given to the world in his valuable *Historia Celestis*, which was brought out six years after his death. His successor Halley, who had made researches in the southern hemisphere at St. Helena, discovered the accelerated mean motion of the moon by the aid of the eclipses recorded at Babylon, and preserved in the Great Collection of Ptolemy. He also added considerably to our knowledge of the revolutions of comets and their nature. He was succeeded in his turn by Bradley, who discovered the aberration of light in the year that Newton died; thus giving incontrovertible proof of the truth of the Copernican system, by determining the fact of the earth's annual revolution round the sun. (*See* ABERRATION.) It is impossible to give anything approaching to a clear and detailed account of the discoveries that succeeded each other with great rapidity from the death of Newton to the close of the 18th century, and the list of honourable names that added these discoveries to those of their predecessors, by their skill, perseverance, and research. In 1731 Hadley invented the quadrant; in after-years Bradley observed the phenomenon of nutation. Lacaille, Euler, D'Alembert, and Cassini produced valuable tables, and extended the valuable researches that had already been made in the theories of the motions of the planets, precession, nutation, libration, and the advancing motion of the sun's apogee. Maskelyne, the fourth astronomer-royal, originated the Nautical Almanac in 1767. In 1781 Herschel discovered the planet Uranus, and Laplace calculated the elements of its orbit. Six years after, Herschel constructed his 40-foot telescope, with which he discovered two of Saturn's satellites and the rotation of his ring, as well as the satellites of Uranus. He also found that the Milky Way consisted of closely-serried groups of countless stars, and that the motion of the satellites of Uranus was retrograde. The astronomical labours of the 18th century may be considered to be closed with the catalogue of nebulæ and clusters of stars found by Herschel, and the commencement of the great work of Laplace, the *Mécanique Céleste*. Among the other notable inventions of the same century must be noticed the chronometers constructed by John Harrison, a mechanic of Foulby, near Pontefract, for which he received rewards that had been offered by parliament, amounting to about £23,000. In the opening years of the present century the discovery of the first four asteroids (*see* ASTEROIDS) between the orbits of Mars and Jupiter was made by Piazzi, Olbers, and Harding; and since that time no less than sixty-five have been added to this group; fully substantiating the idea entertained by Kepler, in consequence of the undue space intervening between the orbits of the primary planets above mentioned, that one or more smaller ones must exist having their path between them. In 1846 the planet Neptune was discovered by a Frenchman named Le Verrier; but the credit of the discovery really belongs to Mr. Adams, of the university of Cambridge, who had acquainted Mr. Challis, professor of astronomy at that seat of learning, with the results of his investigations a twelvemonth before the publication of the calculations of Le Verrier. This planet was first seen in the field of the heavens by Mr. Challis soon after he had learned the suspicions entertained of its existence by Mr. Adams; but M. Galle, of Berlin, was the first to place his observations of the newly-discovered heavenly body on record. In 1859 a new primary planet, having its orbit between Mercury and the Sun, was found by a physician named Lescarbault: to this the name of Vulcan was appropriately given. Among the principal astronomical publications of the present century may be enumerated Piazzi's Catalogue of the Stars, the most complete that we have; Herschel's Catalogues of Stars and Nebulæ, and Brisbane's List of the same. Bubbock's researches on the Lunar Theory and his star maps are s important; and the numerous publications o Laplace, Challis, and Lalande. Among the j instruments constructed since the year 18 noted Troughton's Mural Circle, put up at In 1812, and the telescope erected at Pu

Ireland, by the earl of Rosse. (*See* TELESCOPES.)—Ref. *English Cyclopædia*—Arts and Sciences; Chambers's *Encyclopædia*; Lardner's *Handbook of Astronomy*, and *Museum of Science and Art*.

ASYLUM, *a-sï'-lum* (Gr. *a*, not, and *sulao*, I rob), a sanctuary or place of refuge to which criminals might fly for safety, and from which it was considered the greatest impiety to take them by force. The Israelites, by God's own appointment, set apart six cities as cities of refuge, to which those guilty of any unpremeditated offence might fly and find protection. The altar of burnt offering was also considered as a place of refuge. Among the Greeks, Thebes and Athens each claimed to have established the first asylum; that at Thebes by Cadmus, that at Athens by the descendants of Hercules. Romulus established an asylum at Rome, between the two groves on the Capitoline hill. The temples, altars, statues, and tombs of heroes, were also anciently regarded as asylums, the temples being held as the most sacred and inviolable refuge. Under Constantine the Great, all churches were made asylums; and by the younger Theodosius, the privilege was extended to all courts, gardens, walks, and houses belonging to the churches. In 681 the synod of Toledo extended the limits to thirty paces from every church. At length these asylums led to such abuses, that they were generally abolished. (*See* SANCTUARIES.) The term asylum is now applied to certain institutions whose object is to alleviate the condition of the blind, deaf, and dumb, lunatics, and the destitute.

ASYMPTOTE, *ă'-im-tote* (Gr. *asumptotos*, not falling together), in Geom., a line which approaches continually nearer and nearer to some curve, whose asymptote it is said to be, without ever meeting it. It is a property appertaining to the hyperbolic curve.

ATAXIA, *ă-tăk'-s-a* (Gr. *a*, not, *taxis*, order), a term used in Med. to denote want of regularity in the symptoms of a disease or in the functions of the body.

ATCHEVEMENT, in Herald. (*See* ACHIEVEMENT.)

ATELES, *ăt'-e-leez* (Gr., incomplete), in Zool., a gen. of American monkeys, of that division of the Quadrumana termed *Sapajous*. The most distinctive characters of the genus are, long, slender, but powerful prehensile tails; fore-hands almost entirely without thumbs, or possessing only the merest rudiment of the organ,—whence the name of the genus; a dental system which, in common with all the American Quadrumana, consists of two molar teeth more than are possessed either by man or by corresponding genera in the Old World. Other prominent characters of the ateles are round small heads, limbs remarkably long and slender, corpulent bodies. These characteristics have obtained for the genus the name of spider-monkeys. Possessing neither cheek-pouches nor callosities, they are, in these respects, nearly allied to the real apes. Their entire physical conformation fits them to an exclusively arboreal life. Their mode of locomotion upon the earth is slow, awkward, and uncertain. Sometimes they crawl along in a vacillating fashion, by using their long fore-arms as crutches; sometimes they urge themselves forward by poising themselves upon their hind-legs, and making use of their long arms and tail as a means of balancing themselves in this, to them, unusual position. Naturalists and travellers relate many wonderful stories of their docility, intelligence, and affectionate disposition. Unlike the common monkey, they are grave even to melancholy, are neither fickle nor mischievous, and, in a domesticated state, are capable of exhibiting the strongest attachment towards a kind owner. Acosta, in his "History of the West Indies," gives the following anecdote of a quata, one of the species of the genus: he says, "They sent the quata to the tavern for wine, putting the pot in one hand and the money in the other. They could not possibly get the money out of his hand before his pot of wine was full. If any children met him in the street, and threw stones at him, he would put his pot down and cast stones among the children, till he had secured his way. Then would he return to carry home his pot; and, what is more, although he was a good bibber of wine, yet he would never touch it till leave was given him." The genus *Ateles* comprehends the following species:—1. *Ateles panisous*, or quata; 2. *Ateles marginatus*, or ohuva; 3. *Ateles ater*, or cayou; 4. *Ateles Belzebub*, or marimonda; 5. *Ateles melanocheir*; 6. *Ateles arachnoides*, or brown quata; 7. *Ateles hypoxanthus*, the mono or miriki; 8. *Ateles subpentadactylus*, or chameck.

ATELIERS NATIONAUX, or NATIONAL WORKSHOPS, *a-tel'-e-ai năsh'-i-o-no.* — Since the year 1845, it was the custom in France, during severe winters, or in times of distress caused by stagnation of trade, to open temporary workshops, in order to give employment to labourers who were out of work. These workshops were called Ateliers de Charité, until the year 1848, when the provisional government of the republic reopened a vast number of these establishments, under the name of Ateliers Nationaux. They were under the control of a department called "The Committee of the Government for the Workmen;" they were all, however, badly organized, and failed calamitously. The principle on which they were conducted was, that every workman should have a living provided for him on a fixed scale. The result was, that workmen soon left private employers and entered the national workshops. The numbers who flocked in soon became alarming. More than 100,000 men enrolled themselves, and insubordination soon began to show itself. Danger was imminent, and the National Assembly ordered the dissolution of the Ateliers Nationaux; an act which became the pretext for the terrible insurrection which ensanguined Paris in June, 1848.

A TEMPO, or A TEMP, *a-tem'-po*, in Mus., a term signifying 'in time;' of similar signification with *a battuta*, and, like that expression, seldom used but when the regular measure has been desiguedly interrupted. When there has been some short relaxation in the time, *a temp* or *a tempo* denotes that the performer must return to the original degree of movement.

A TEMPO GIUSTO, in Mus., a term signifying 'in equal and just time;' an expression generally applied to the manner of performing a steady sound movement, —a movement less directed to the feelings than to the judgment, more scientific than impassioned.

ATEUCHUS. (*See* BEETLE and SCARABÆUS.)

ATHANASIAN CREED, *ăth-a-nai'-shi-an*, a formulary or confession of faith, said to have been drawn up by Athanasius, bishop of Alexandria, in the 4th century, to justify himself against the calumnies of his Arian enemies. That it was really composed by this father seems more than doubtful; and modern divines generally concur in the opinion of Dr. Waterland, that it was written by Hilary, bishop of Arles, in the 5th century. It is certainly very ancient; for it had become so famous in the 6th century, as to be commented upon, together with the Lord's Prayer and Apostles' Creed, by Venantius Fortunatus, bishop of Poitiers. It was not, however, then styled the Athanasian Creed, but simply the Catholic Faith. It is supposed to have received the name of Athanasius, on account of its agreeing with his doctrines, and being an excellent summary of the subjects of controversy between him and the Arians. The true key to the Athanasian Creed lies in the knowledge of the errors to which it was opposed. The Sabellians considered the Father, Son, and Holy Spirit as one in person; this was "confounding the persons:" the Arians considered them as differing in essence; this was "dividing the substance:" and against these two errors was the creed originally framed. The most exceptionable part of the creed is what is termed the "damnatory clauses:"—"Whosoever will be saved, before all things it is necessary that he hold the Catholic faith; which faith except every one do keep whole and undefiled, without doubt he shall perish everlastingly. And the Catholic faith is this,—that we worship one God in Trinity, and Trinity in Unity, neither confounding the persons nor dividing the substance." This creed is appointed to be read in the Church of England on certain days; and, regarding the "damnatory clauses," the commissioners appointed in 1688 to review and correct the liturgy, say that they "are to be understood as relating only to those who obstinately deny the substance of the Christian faith."

ATHEISM, *ā'-the-izm* (Gr. *a*, without, *theos*, God), a word of comparatively modern invention as applied to that system of belief which professes to discard the existence of a deity. Many persons, both in ancient and modern times, and on very various grounds, have had the name of atheist applied to them; but it may be

justly questioned whether any sane man ever adopted such a principle. No doubt many men have repudiated altogether the ordinary ideas of the Deity, both as to his character, and as to the methods of establishing the proof of his existence; and in a comparatively ignorant age, or among a comparatively ignorant race of people, such persons would very likely be set down as atheists by those who did not understand their peculiar tenets. Again, such atheists as those among the Greek philosophers, as Leucippus, Democritus, and Protagoras, who went mainly upon the assumption that they had no proper idea of such an existence, were not really so far from certain modern Christians as might be imagined. From Kant to Dr. Mansel, of Oxford, philosophers like Sir William Hamilton have maintained what is commonly called *speculative* atheism; but this, as is well known, is only a name invented by their opponents, who profess to hold on by the dogmatic view of the existence of Deity, and who believe they can *demonstrate* his being. Everybody at all acquainted with the question knows that no demonstration,—no *à priori* proof,—of such an existence is possible, inasmuch as no notion can be formed of a higher generality than infinitude, to serve as the major premiss on which this alleged syllogism can rest. And hence, while no demonstration of such a being can be offered, ample speculative proof of his existence can be inductively reached. Without doubt, vulgar prejudice has had much to do with the atheism of many eminent thinkers, from Socrates downwards; but the Frenchmen of the 18th century made a boast of this creed, and vaunted it openly in the streets, as well as advocating it secretly in the closet. The remark of Lord Bacon was quite true, that though a smattering of philosophy might lead a man into atheism, a deep draught of it will assuredly bring him back to the belief in a God and in a divine providence.

ATHELING, ÆTHELING, or ETHELING, *ăth'-ling* (Sax. *athel-* or *ethel-boren*, noble-born), a term employed in the Saxon period of our history to denote a particular kind of nobility. The atheling was originally a nobleman who possessed a certain amount of free lands, and was thus distinguished from the nobleman who owed service to the king, or held his lands under servitude. As, however, the king's retainers gradually acquired a supremacy over the landholding freemen, it is probable that the title atheling was transferred from the one to the other. This title was also applied to the eldest son of the reigning monarch, or the heir-presumptive to the throne, to whom some believe that the term was confined. Lands were usually given to the atheling while still in his minority; probably in order to give the athel dignity.—Ref. *English Cyclopædia—Arts and Sciences.*

ATHENÆUM, *ăth-e-ne'-um* (Gr. *athenaion*), in Antiq., a public place frequented by professors of the liberal arts, and where rhetoricians declaimed, and the poets read aloud their works. At Athens these assemblies first took place in the temple of Minerva (in Gr., *Athene*),—whence the name. The Athenæum at Rome was founded upon the Capitoline hill, by the emperor Adrian. It was a school or college, furnished with a complete staff of professors for the several branches of study. Like its Athenian prototypes, this establishment was frequented by the Roman orators, poets, and other learned men, who there declaimed their compositions, the emperors themselves frequently honouring the assembly by their presence. At a subsequent period, another celebrated athenæum was erected at Lyons. These institutions, generally, appear to have retained their high reputation until the 5th century. At the present time, the term has been revived as a name for certain establishments connected with learning, as well as for clubs and libraries. It is also the title of three weekly literary journals; one published in London, one in Paris, and one in Germany.

ATHERINE, *ăth'-e-rin* (Lat. *atherina*), a gen. of fishes, formerly classed with the Mullet fam., but now separated from them. They rarely exceed six inches in length, and have a rather flat upper jaw. Some possess very small teeth, while others are entirely toothless. All the known species have a silvery stripe on each side of the body. In the Mediterranean they are very numerous, and they also abound on the southern coast of England; upon the eastern coast of England, as well as in certain parts of Ireland, they are also to be met with. At Brighton the atherine is called the sand-



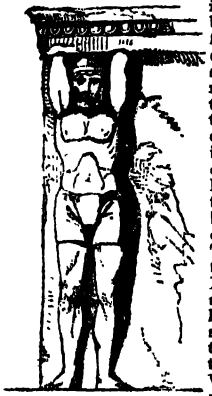
smelt; and in several market-towns of England where the smelt is unknown, the atherine is commonly sold under that name.

ATHEROSPERMACEÆ, *ăth'-e-ro-sper-mai'-se-e*, in Bot., the Plume Nutmeg family, a nat. ord. of dicotyledonous plants in the sub-class *Monochlamydeæ*. There are but three genera, namely, *Atherosperma* and *Doryphora* belonging to Australia, and *Laurelia* to Chili. Only four species are known, and these are all handsome and fragrant trees. Each produces fruit, consisting of a number of achænia inclosed in the tube of the calyx, and having persistent styles which have grown into feathery awns. The achænia of *Laurelia* have an odour very similar to that of the common nutmeg. *Atherosperma moschata* furnishes valuable timber, also an aromatic bark, which is used in some parts of Australia as a substitute for China tea.

ATHLETÆ, *ăth-leet'* (Gr. *athletai*), were those persons who, among the Greeks and Romans, contended for prizes (*athla*) at the public games, in boxing, wrestling, running, leaping, and throwing the disc. Unlike the agonistæ, who only pursued gymnastic exercises as a means of improving their health and bodily vigour, the athletæ devoted their whole lives to preparing for the contests at the public games. For these they were trained with the utmost care. They were constantly undergoing a course of the most severe exercise, in a gymnasium set apart for the purpose, under the superintendence of the gymnasiarch. An officer named the aliptæ directed their diet, which, although regular in its nature, was enormous in quantity. They usually slept for a very long time. At first the athletes, when struggling for the prize, wore a girdle round their loins; but afterwards they contended in a nude state. Before commencing wrestling encounters, their bodies were covered with sand, that they might grasp each other the more firmly. In other games they were anointed with oil by the aliptæ. An athlete who gained the prize at either of the four great public games,—viz., the Olympian, Isthmian, Nemean, or Pythian, was received by the state to which he belonged with the greatest honours. A breach was made in the city walls specially to allow of his entrance in a chariot drawn by four white horses. On entering within the city, he was conducted to the temple of the presiding deity, where hymns were chanted in his praise. A successful athlete was absolved from the payment of taxes; often his statue was set up in a public spot; and in battle he fought in a distinguished place. Athletes were, it is stated, introduced from Greece into Rome by M. Fulvius, at the close of the Ætolian war, 186 B.C. They speedily became highly popular; and, under the emperors, their contests were admired by the nation to a degree bordering upon passion. Under Nero an enormous number of athletes lived in Rome, where, however, they were hirelings, and lived separately, forming, by themselves, a distinct corporation. The athletæ were an entirely different class from the gladiators. (*See* GLADIATORS.) Among the Greeks there were no gladiators.

ATHWART, *a-thwort'*, in Mar., across the line of a ship's course; as, "a fleet was discovered standing athwart our course,"—that is to say, steering across our way. Athwart-hawse is the situation of a ship when she is driven by the wind, tide, or other accident, across the stem of another, whether they bear against or are at a short distance from each other. Athwart the fore-foot is a term usually applied to the flight of a cannon-ball, as fired from one ship across the line of another's course, but ahead of her, as a signal for the latter to bring to.—Athwart-ships, reaching across the vessel from side to side, or in that direction.

ATLANTES, or ATLANTIDES, *at-lăn'-teez* (Gr. *Atlas*).



ATLANTIDES.

in Arch., a name given by the Greeks to male figures used instead of columns or pilasters to support entablatures. The name was derived from the idea of Atlas bearing the heavens on his shoulders. The Egyptians were in the habit of attaching colossal figures of this kind to the columns of their temples, which probably suggested the use of them to the Greeks. These figures are sometimes called Telamones or Persians. In the modern architecture of Italy, Atlantes are frequently to be seen, supporting the entablature above the entrance of a great building. When female figures are made use of for the like purpose, they are termed Caryatides. (*See* CARYATIDES.) In Astron., the name Atlantides is applied to the Pleiades, seven stars representing the daughters of Atlas, supposed to have been turned into a constellation after death.

ATLANTIC TELEGRAPH, *at-lăn'-tik* (Lat. *atlanticus*; Gr. *telos*, far, distant, and *graphein*, to write).—The success of various attempts to send messages by electric agency through cables lying under water for short distances, induced Professor Morse, of New York, to suggest the possibility of uniting England and America by a submarine cable, laid from shore to shore throughout the Atlantic Ocean. In 1845, Mr. J. W. Brett registered an association, under the name of the General Oceanic Telegraph Company, to carry out the object above mentioned, and to connect England with the continent in various parts. The latter part of his design was successfully accomplished in 1851, and public attention was, in consequence, again directed to the junction of England and America by similar means of intercommunication. Newfoundland had already been united to the mainland of America by submarine cable; and, in 1856, the Atlantic Telegraph Company was formed, with the design of laying a cable between St. John's, Newfoundland, and Valentia, in Ireland, along the bottom of the Atlantic in its most shallow part, which had been pointed out for the purpose by Capt. Maury, and called by him the Telegraphic Plateau. Pecuniary assistance was guaranteed to the company by the respective governments of Great Britain and the United States, and both powers agreed to furnish ships for taking out the cable and placing it in its destined bed. On Aug. 5, 1857, H. M. S. *Agamemnon* and the United States frigate *Niagara*, with the cable on board, commenced operations at Valentia. The cable broke twice, and the vessels returned to England after the failure of the second attempt. Another trial, in the month of June, 1858, was frustrated by a violent storm; but on the 29th of July, the parts of the cable in each vessel were united about the middle of the Atlantic, and the ships parted company, the *Agamemnon* for Valentia, and the *Niagara* for Trinity Bay, Newfoundland. On Aug. 5 both vessels had arrived at their destination without accident, and a chain of communication was thus completed between the great commercial nations of the Eastern and Western hemispheres. Unfortunately, early in September there was a perceptible difficulty in the transmission of signals, which continued to increase until they became totally unintelligible, and the cable has since been entirely useless; it is supposed that it must have received some injury about 300 miles from Valentia.

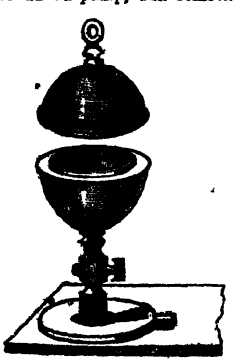
ATLAS, *ăt'-las*, a name given to any number of maps collected in the form of a volume, probably because old works of the kind had a figure of Atlas bearing the world on his shoulders engraved on the title-page. Boucher imagines the name to be derived from the German *atlass*, satin; because maps were usually printed on soft with a glossy surface like

ATLAS, in Anat., is the name of the first vertebra, so called either from the Greek verb *atlao*, I sustain, or from Atlas, who was fabled to support the world upon his shoulders. It differs from the other vertebræ in having its body small and thin, and its foramen very large, being in form somewhat like a ring. It is connected above with the condyles of the occipital bone, and receives the tooth-like process of the second cervical vertebra from below, the former admitting of moving the head up and down, the latter from side to side.

ATMOMETER, *ăt-mom'-e-ter* (Gr. *atmos*, vapour, *metron*, a measure), an instrument for measuring the quantity of water evaporated under given circumstances. If it were not for the variety of causes which influence the process of evaporation at the earth's surface, an atmometer would be a simple instrument. A quantity of water, after being weighed, would have to be exposed in a measured vessel to the action of the atmosphere; the difference in weight, after the experiment, would give the amount of evaporation. But meteorological and other causes so affect vaporous exhalations at the surface of the earth, that no accurate atmometer has hitherto been constructed.

ATMOSPHERE, *ăt'-mos-feer* (Gr. *atmos*, vapour, and *sphaira*, sphere), the name given to the gaseous envelope of the earth. It partakes of the rotatory motion of our planet, and would remain unmoved relatively to terrestrial objects were it not for local circumstances, which produce winds, and are constantly disturbing its equilibrium. The composition and most of the chemical properties of the atmospheric ocean are described in another portion of this work (*see* AIR); but some additional particulars may be given here. It has been calculated that the atmosphere contains 2,551,586 billions of pounds of oxygen, and that the yearly consumption of this single gas by men and animals (*see* RESPIRATION), together with the quantity abstracted in the ordinary processes of combustion, must amount to two and a quarter billions of pounds. Thus, in a hundred years, the consumption of oxygen would only reach 220 billions of pounds,—that is, not even the ten thousandth part of the whole. Carbonic acid exists in the atmosphere in very small proportion. At ordinary elevations there are only about two gallons of this gas in every 5,000 of air, or $\frac{1}{2500}$th part of the whole. It increases, however, as we ascend; so that, at heights of 9,000 or 10,000 feet, the proportion is nearly doubled. Even this increased quantity is very small; and yet the presence of carbonic acid in the atmosphere is essential to the existence of vegetable life on the surface of the earth. (*See* VEGETABLE KINGDOM.) Carbonic acid is being continually produced by the respiration of animals, the processes of combustion, and the decomposition of organic substances; so that there is no danger of the supply required by growing plants ever falling short. Boussingault has estimated that the quantity of carbonic acid produced in Paris every twenty-four hours amounts to nearly a hundred and six millions of cubic feet. The atmosphere, as a chemical agent, acts principally by oxidizing bodies exposed to its influence, more especially metals. The amount of ammonia, one of the products of the decomposition of animal substances, averages from 1 part to 6 in every 10,000 parts of air. Sulphuric acid and sulphuretted hydrogen, products of the combustion of coal, are found in proportions varying from 0 to 42 parts in 10,000. Hydrochloric acid is also found in appreciable quantities over the sea. The amount of moisture in the air increases its chemical effect. It varies according to weather and locality. The chemical influence of the air is seen in the disintegration of the hardest granitic and felspathic rocks, which gradually crumble away under its action, forming the kaolin or China clay of the potter. The combined effects of air and moisture on magnesian limestone are woefully apparent in the condition of the new Houses of Parliament. Wood decays when exposed to the air by slow combustion at ordinary temperatures, or *eremacausis*, as it is called by Liebig. A certain amount of moisture and heat is necessary in this case, as perfect dryness and a temperature below freezing-point arrest this slow oxidation or decay. Linen damped and

exposed to the air gradually loses weight; the carbon of the fibre uniting with the oxygen of the air to form carbonic acid. After a time, the fibres become so disintegrated, that they fall to powder, or become rotten. Metals for the most part rust, or become converted into oxide, in moist air; giving rise to precisely the same compound, as if they were burnt in the fire. Iron is easily rusted; hence it is galvanised,—*i.e.*, covered with a coating of zinc or tin, these metals having much less affinity for oxygen. The decay of iron is much aided by the presence of another metal. Thus the lead by which railings are attached to stonework sets up a galvanic action as soon as it is wetted; the result being, that the iron decays very quickly at the point where it joins the lead. The action of the air on metallic paints containing lead is very marked; they become speedily tarnished by the absorption of sulphur. Even glass is affected in this way, lead-glass especially becoming covered with a film of oxide or sulphide, from prolonged exposure to air and damp. Gold, aluminum, and one or two other metals, remain untarnished by exposure to air; but silver soon becomes covered with a film of sulphide. From the above facts, the reason for gilding, plating, and painting metals and wood is made apparent. The atmosphere exercises an immense pressure on the whole surface of the earth. At the ordinary sea-level this pressure equals nearly 15 lbs. on every square inch. On ascending above the sea-level, the pressure diminishes; and, on descending below,—in a coal-mine, for instance,—it increases. The atmospheric pressure was first determined in 1643 by Torricelli, a pupil of Galileo. (*See* Barometer.) By virtue of the expansive force of air, it might be supposed that the molecules would expand indefinitely into space; but, in proportion as the air expands, the expansive force decreases, and is further weakened by the low temperature of the more elevated regions; so that, at a certain height, an equilibrium is established between the expansive force which separates the molecules and the action of gravity which draws them towards the earth. It is therefore concluded that the atmosphere is limited. From the weight of the atmosphere and its gradual decrease in density, and from the observation of certain phenomena of twilight, its height has been estimated at from thirty to forty miles. At that height the air is extremely rarefied; and, at the height of sixty miles, it is assumed that there is a perfect vacuum. Recent observations made by Liais, a French *savant*, in the tropical zone, have, however, proved that the atmosphere extends to a much greater height,—in fact, to between 198 and 212 miles. The pressure of a column of air upon the upper surface of a body is balanced by the expansive force of the air acting upon the under surface. Thus, the weight of the air supported by the hand can only be made sensible by placing the hand over the mouth of the open receiver of an air-pump, and removing the sustaining air.



MAGDEBURG HEMISPHERES.

With a piece of bladder tied over the mouth of the receiver, the crushing force of the atmosphere may be illustrated in a very striking manner. As soon as a tolerable vacuum is produced in the receiver by working the air-pump, the bladder is depressed by the weight of the atmosphere above it, and finally bursts with a loud report, caused by the sudden entrance of the air. Of the many forms of apparatus which have been devised to demonstrate the existence of the atmospheric pressure, none equal the *Magdeburg hemispheres*, invented by Otto Guericke. This well-known arrangement consists of two hollow copper hemispheres, of 4 to 4½ inches diameter, the edges of which are ground to fit closely, and well greased. One of the hemispheres is provided with a stopcock, by which it can be screwed on the air-pump or to an exhausting syringe, and the other is provided with a handle. As long as the hemispheres contain air they can be separated without any difficulty, for the external pressure of the atmosphere is balanced by the elastic force of the air in the interior; but when the internal air is pumped out, the hemispheres cannot be separated without a powerful effort; and, as this is the case in whatever position they are held, it follows that the atmospheric pressure is transmitted in all directions. The average pressure at the sea-level is usually taken at 14·6 lbs. avoirdupois on the square inch, or just sufficient to support a column of mercury 30 inches in height; hence a column of 60 inches will be equal to two atmospheres, a column of 90 inches to three, and so on. It is customary to estimate the force of steam and other fluid pressures by *atmospheres*;—that is, in round numbers, at the rate of 15 lbs. per square inch for every atmosphere. (For information respecting other points connected with the atmosphere, *see* Air, Fluid, Sound, Metrorology, Dew, Rain, Temperature, Wind, Anemometer, Barometer, Hygrometer, Rain-Gauge, Thermometer.)—*Ref.* Ganot's *Physics*.

Atmosphere of the Planets.—From a great variety of analogous circumstances proving the common origin of the earth and the other heavenly bodies, there is strong reason for believing that many, if not all, of the planets are surrounded with gaseous envelopes or atmospheres. It is not, however, assumption alone that leads to this opinion; the telescope reveals to us such changes in the appearance of many of the planets as can only be accounted for by the fact that they have atmospheres. Mars, Jupiter, and Saturn have, in this way, been proved to possess a transparent atmosphere, varying at different times and places, like that of our own planet. Upon the earth, air is essential to the existence of living beings, and there is a probability almost amounting to a certainty, that the other worlds revolving round our sun have inhabitants, whose existence is supported by an atmosphere similar to our own. The varied distances of the planets from the sun, and the vast difference in the amount of heat received by each, present the greatest difficulties when we try to imagine the inhabitants of these far-off spheres. Neptune only receives $\frac{1}{900}$th part of the heat which we receive, while Mercury and Venus must receive much more than we do. However, it has been argued by scientific philosophers, that the diathermanous nature of the earth's atmosphere is such, that it regulates the amount of heat transmitted to us from the sun, the temperature being in proportion to the height of the atmosphere. Similarly they argue, that according to the height or depth of the atmospheres surrounding the other planets, their mean temperature might be the same as our own. Mr. Hopkins, of Cambridge university, calculated, that if the planet Mars had an atmosphere of 15,000 feet higher than that of the earth, the average temperature would be similar to ours; and if the atmosphere of Venus was 10,000 feet less than that of the earth, the same effect would be produced. Schroeter calculated that the atmospheres of Ceres and Pallas were 668 and 495 miles, respectively, in height. (*See* Planets and Radiant Heat.)

Atmospherical Clock. (*See* Clock.)

Atmospheric Electricity. (*See* Electricity, Atmospheric.)

Atmospheric Engine, *at-mos-fer'-ik*, an engine in which the piston is raised by the force of the steam which is admitted at the bottom of the cylinder. As soon as the piston reaches the top of the cylinder, which is open, the steam is condensed, and the piston is forced down by the pressure of the atmosphere. These engines are but rarely used in the present day.

Atmospheric Railway.—Several plans have, at various times, been devised for producing locomotion by means of atmospheric pressure. Most of these, when brought into action, have been found to be commercial failures. The most successful of these schemes was the Dalkey and Kingstown Atmospheric Railway, which was worked for more than twelve years by Messrs. Clegg and Samuda, but eventually

abandoned in favour of steam. The line was very steep in some parts, and, one terminus being much higher than the other, the carriages performed the return journey by the force of their own gravity. The method of working was as follows:—A tube 15 inches in diameter was laid the whole length of the line. Along the top of this tube was a slit covered by a flap of leather, strengthened by two pieces of iron. Within the tube was a piston, to the centre of which was fixed a piston-rod. To the end of this rod farthest from the piston was attached the connecting-bar of the carriage, which passed upwards through the slit in the tube. The flap being opened at a distance of say four feet from the piston, did not interfere with the air-tightness of the portion of the tube before the piston. To the connecting-bar of the carriage was fixed a little roller, which closed the flap as soon as the connecting-bar passed, and a heater at the same time glided over the flap, melting the composition of wax and tallow with which it was soaked, rendering the tube once more air-tight for another carriage. The piston was set in motion by exhausting the air before it with a powerful pump worked by a steam-engine. A line was also laid between London and Croydon; but it has been long abandoned. A scheme is afloat for the conveyance of parcels by atmospheric pressure. In this case, the tube is intact, and the box containing the articles to be forwarded is attached to the piston. The great objection to this mode of locomotion is the obvious waste of power, the same stationary engine being kept at full work whether the load is large or small. The liability of the flap or valve to get out of order was very great, a small stone or bit of stick falling into it during the passage of the train being enough to prevent a vacuum being formed when next required. The advantages, however, are also great. The impossibility of collisions, the ease with which gradients are descended or ascended, obviating the necessity of cuttings or embankments, are benefits that are scarcely neutralized by the disadvantages stated.

**Atomic Theory, Atomic Weight,** *a-tom'-ik* (Gr. *a*, not, *temno*, I cut).—Every body is supposed to consist of atoms, of unknown size, form, and weight, which being infinitely hard, cannot be further subdivided. The atoms of elements are simple, those of compounds are compound. No atom has ever been seen, even by the most powerful microscopes, although particles of bodies less than 50000th of an inch in diameter have been discerned by their aid; the forms of atoms are, therefore, unknown. Although the *actual* size and weight of the ultimate atoms of bodies cannot be ascertained, it is easy to discover their *relative* size and weight. For instance, it is found by experiment that one grain of hydrogen combines with eighty grains of bromine to form a definite compound, and never in any other proportion; it is therefore supposed that the *number* of atoms of each body is the same, but that the *weight* of each atom is as 1 to 80. This is borne out by the fact that bromine is exactly 80 times as heavy as hydrogen, a cubic inch of one uniting with exactly one cubic inch of the other. The numbers 1 and 80, therefore, represent the weight of the atoms or the atomic weights of these bodies; and it follows that 81 is the atomic weight of the compound formed by their union. These numbers are also termed the *chemical equivalent* or *combining proportion* of these substances. All the other elements have their *combining proportions* or *atomic weights*, and are subject to the same laws as hydrogen and bromine. It often happens that double, treble, and quadruple atoms of one element will unite with a single atom of another element to form a compound; for instance, the following compounds of nitrogen and oxygen occur:—

| | | | |
|---|---|---|---|
| Nitrogen, 14 grains; | | Oxygen, 8 grains. | |
| ,, 14 | ,, | ,, 16 | ,, |
| ,, 14 | ,, | ,, 24 | ,, |
| ,, 14 | ,, | ,, 32 | ,, |
| ,, 14 | ,, | ,, 40 | ,, |

Here we find one atom of nitrogen uniting with a single, double, treble, quadruple, and quintuple atom of oxygen, and *never in any other proportion*,—N. 15 to O. 8, or N. 14 to O. 7, for example. This is called the doctrine of definite proportions, and is a consequence of the theory of atoms of a constant size and weight laid down above. It was first put forth by John Dalton, of Manchester. It has been said above, that the atoms of the same body are of constant size; but it happens in several cases that the atoms of different bodies are of different sizes. Thus, though it is found that one cubic inch of hydrogen unites with one cubic inch of bromine, it by no means follows that equal volumes of carbon and iron unite in chemical combination. There is great diversity in the relative sizes of elementary atoms, those of carbon being only half the size of those of iron. The weight of an atom of carbon would be 6, and that of an atom of iron would be 28; but the quantity of carbon would only take up half the space of the quantity of iron. It has been found that bodies with the same *combining volume* agree strongly in their properties. Iodine, chlorine, and bromine, are very similar in their reactions; and there are several other groups of elements formed on the same basis. (*See* Atomic Volume.) To sum up, atomic weight is the relative weight of the atoms of bodies, or, which is the same thing, the proportion in which they unite. Reasoning on this theory, tables have been constructed of the atomic weights of all the elements, the atomic weight of compounds being evidently the sum of the atomic weights of their constituents. Hydrogen has been taken as the unitary body by English chemists, from being the lightest of all known substances. The continental chemists have taken 100 parts of oxygen as the standard number. This latter arrangement, by increasing the figures in each number, renders it much less convenient to work with the continental than with the English scale.

*Atomic Weights, Combining Proportions, or Chemical Equivalents, of the Elements.*

| Name. | Hydrogen=1. | Oxygen=100. |
|---|---|---|
| Aluminium | 13·672 | 170·9 |
| Antimony | 129·03 | 1612·9 |
| Arsenic | 75· | 937·5 |
| Barium | 68·64 | 858 03 |
| Bismuth | 212·56 | 2660·75 |
| Boron | 10·9 | 136·2 |
| Bromine | 79·97 | [illegible] |
| Cadmium | 55 7·4 | 696·76 |
| Cæsium | 128 4 | 1605· |
| Calcium | 20·12 | 251·31 |
| Carbon | 6· | 75· |
| Cerium | 46· | 575· |
| Chlorine | 35·49 | 443·67 |
| Chromium | 26·27 | 328·38 |
| Cobalt | 29·49 | 368·65 |
| Copper | 31·65 | 395·6 |
| Didymium | 48· | 600· |
| Erbium | | |
| Fluorine | 19· | 237·5 |
| Glucinum | 6·97 | 87·12 |
| Gold | 98·33 | 1229·16 |
| Hydrogen | 1· | 12·5 |
| Ilmenium | | |
| Iodine | 126·88 | 1585·99 |
| Iridium | 98·56 | 1232·08 |
| Iron | 28·04 | 350·5 |
| Lanthanum | | |
| Lead | 103·57 | 1294·64 |
| Lithium | 6·53 | 81·66 |
| Magnesium | 12·05 | 158·14 |
| Manganese | 27·57 | 344·68 |
| Mercury | 100·10 | 1251·29 |
| Molybdenum | 47·69 | 596·1 |
| Nickel | 29·54 | 369·33 |
| Niobium | | |
| Nitrogen | 14· | 175·06 |
| Osmium | 99 41 | 1242·63 |
| Oxygen | 8· | 100· |
| Palladium | 53·24 | 665·47 |
| Phosphorus | 32·02 | 400·3 |
| Platinum | 98·86 | 1232·08 |
| Potassium | 38·96 | 487· |
| Rhodium | 52·16 | 651·96 |
| Rubidium | 85·36 | 1067· |
| Ruthenium | 52·14 | 651·39 |
| Selenium | 39·63 | 495·28 |
| Silicon | 21·33 | 267· |
| Silver | 108·0 | 1350· |

| | | |
|---|---|---|
| Sodium | 22·97 | 287·17 |
| Strontium | 43·84 | 548·03 |
| Sulphur | 16· | 200·0 |
| Tantalum | | |
| Tellurium | 64·08 | 801·70 |
| Terbium | | |
| Thorium | 59·50 | 743·86 |
| Tin | 58·82 | 735·29 |
| Titanium | 24·12 | 301·55 |
| Tungsten | 94·84 | 1183·3 |
| Uranium | 60·0 | 750·0 |
| Vanadium | 68·46 | 855·84 |
| Yttrium | | |
| Zinc | 32·52 | 406·59 |
| Zirconium | 33·58 | 419·73 |

Those elements with no numbers against them are as yet too rare in their occurrence to have had their atomic weight properly investigated. The above numbers, or equivalents, as they are generally termed, for the sake of shortness, have been determined with almost mathematical accuracy by various chemists of celebrity. When once a standard was fixed on, it was easy to determine the equivalents of other elements, by uniting a definite portion of the standard substance with that whose equivalent was sought, and weighing the result. Thus, 1 grain of hydrogen was exploded with, say, 13 of oxygen. A certain portion of the oxygen united with the hydrogen to form water, another portion remaining uncombined. On weighing the water, it was found to weigh 9 grains, showing that the equivalent or combining proportion of oxygen was 8, which was further confirmed on weighing the uncombined oxygen. Analysis, as well as synthesis, was also used to determine or confirm equivalents. One hundred grains of water were decomposed by voltaic electricity, and the resulting oxygen and hydrogen weighed, the amounts being found to be, hydrogen 11·111 grains, oxygen 88·889 grains. The accuracy necessary in these determinations is so great, that the most eminent chemists shrink from engaging in these researches, although there are several elements,—boron, for instance,—the equivalents of which are acknowledged to be not quite correct.

ATOMIC VOLUME.—Atomic volume is the relative *size* of the combining proportions or atoms of bodies, just as atomic weight is the relative *weight* of their combining proportions or atoms. It is determined by dividing the atomic weight by the specific gravity. As the principal researches on atomic weights have been made in Germany, the oxygen standard is generally used in calculating them. As before stated (ATOMIC WEIGHT), substances fall into several well-marked groups, possessing analogous properties, and giving isomorphous compounds. The following table will be sufficient to show this fact:—

| | Equiv. O = 100 | Atom. vol. | Sp. Gr. |
|---|---|---|---|
| Cobalt | 369 | 44 | 8·39 |
| Iron | 350 | 44 | 7·95 |
| Nickel | 369 | 44 | 8·39 |
| Iridium | 1232 | 57 | 21·6 |
| Osmium | 1244 | 57 | 21·8 |
| Platinum | 1232 | 57 | 21·6 |
| Gold | 2458 | 128 | 19·2 |
| Silver | 1350 | 129 | 10·53 |
| Tellurium | 800 | 128 | 6·25 |
| Bromine | 1000 | 320 | 3·12 |
| Chlorine | 443 | 320 | 1·38 |
| Iodine | 1587 | 320 | 4·95 |

It has been shown by Kopp that those elements which are isomorphous possess the same atomic size. This is true of numerous isomorphous compounds. Sulphate of magnesia and sulphate of zinc crystallize in the same forms, and have the same atomic size, although the atomic size of magnesium and zinc are different. The mysterious relations existing between the atomic volumes of different compounds and elements has lately received particular attention from many eminent chemists, great light having been thrown on the subject by the researches of Kopp, Schröder, Pelhol, Playfair, and Joule.

ATONEMENT, *a-tone'-ment*, is a term derived from the old English verb to atone,—*i.e.*, to reconcile; and hence atonement,—*i.e.*, at-one-ment,—denotes the being reconciled or agreed. In Theol. it is the reconcilement of God with man, by virtue of the death of Christ. According to the Articles of the Church, the Son, one in substance with the Father, took upon him the nature of man, becoming very God and very man, "truly suffered, was crucified, dead, and buried, to reconcile his Father to us, and to be a sacrifice, not only for original guilt, but also for actual sins of men." Neither the nature nor limits of the present work admit of our noticing the different views that have been held by divines on this subject, or the numerous finely-spun theories to which it has given rise. They are wiser who hold with Bishop Butler, when speaking of the efficacy of Christ's sacrifice to secure the pardon of sin, says,—"How and in what particular way it had this efficacy there are not wanting persons who have endeavoured to explain; but I do not find that Scripture has explained it."



ATONY, *ăt'-o-ne* (Gr. *a*, not, and *tonos*, tone), is a term used in Med. to denote deficiency in power or tone, generally applied to muscular power.

ATRIP. (*See* ANCHOR.)

ATRIUM, *ai'-tri-um* (Gr. *aithrios*, exposed to the air), the entrance-hall and most splendid apartment of a Roman house. It consisted of a large covered court, with an opening in the centre of the roof, termed the compluvium, through which the rain-water descended into a cistern let into the floor beneath. It was the most highly-decorated apartment in the whole house. Upon the walls were drawings representing incidents from the ancient mythology, surrounded by borders formed of elegant arabesques. Even the floors were frequently enriched with pictures executed in mosaic. The owner of the house here received his morning visitors; here the mistress superintended the labours of her female slaves, whilst engaged in weaving or other occupations. The temples, also, had atria, where the senators and others sometimes held meetings. (*See* HOUSE, ROMAN.)

ATROPA, *a-tro'-pa* (Gr. *Atropos*, the name of one of the Fates), in Bot., a gen. of plants, formerly included in the ord. *Solanaceæ*, but now regarded as the typical gen. of a nat. ord. to which the name *Atropaceæ* has been given. The most important species is *A. belladonna*, the common Dwale, or Deadly Nightshade. This plant is a native of Greece and Italy, and also indigenous to Britain, but not common. It is perennial, and grows in hedges and waste grounds on a calcareous soil, but is only met with in a comparatively few localities. It blossoms from June to August, the flowers being about an inch long, drooping, bell-shaped, and of a lurid purple colour. The fruit is a berry of a shining violet black colour when ripe, about the size of a small cherry. The berries have a most tempting appearance, and children have frequently been poisoned by them. They are powerfully narcotic; and one of the first symptoms of their deadly action on the human frame is an appearance of the most besotted drunkenness. The dried leaves, or an infusion of the leaves, will act in a similar manner. Even a small dose causes an extravagant delirium, which is usually of an agreeable character. The delirium is sometimes accompanied by excessive and uncontrollable laughter, sometimes by excessive talking, but occasionally by a complete loss of voice. The state of mind sometimes resembles somnambulism, as in the case of a tailor, who, for fifteen hours, was speechless and insensible to external objects, and yet went through all the operations of his trade with great vivacity, and moved his lips as if in conversation. The best antidote to the virulent effects of this poison is *vinegar*, when promptly administered; but, if practicable, the stomach-pump should be at once used. When death ensues from its effects, the body soon putrefies, and swells in a remarkable manner, being covered with livid spots; and blood sometimes exudes from the mouth, nose, and eyes. Extract of belladonna is employed to dilate the pupil of the eye during surgical operations, to allay pain and nervous irritation, and as an antispasmodic. It is to be feared that it is a common ingredient in specifics for sparkling eyes sold by perfumers. The active principle of the plant is the alkaloid *atropia*.

ATROPACEÆ, *a-tro-pa'-se-e*, in Bot., a nat. ord. of dicotyledonous plants, of the sub-class *Corollifloræ*. The thirty-eight genera included in this order were

separated by Miers from the *Solanaceæ* and *Scrophulariaceæ*. The species are very numerous, and abound in tropical regions; but some are found in most parts of the world. Many have powerful narcotic properties, as, for instance, the tobacco-plant, the thorn-apple, henbane, deadly nightshade, and the mandrake. (*See* NICOTIANA, DATURA, HYOSCYAMUS, ATROPA, and MANDRAGORA.)

ATROPHY, *át'-ro-fe* (Gr. *a*, not, and *trophe*, nourishment), in Med., denotes a wasting, from deficient nutriment, either of a part or of the whole body. In order to the maintenance of the healthy state of the body or of any of its organs, a certain supply of nutrition is required to meet the waste that is constantly going on. When, from any cause, the supply of nutrition is not able to meet this waste, the natural dimensions of those parts are reduced. In a healthy condition of body, an exact balance is maintained between the waste and the supply; but in every morbid condition this balance is more or less disturbed, in consequence of which the whole body, or certain parts of it, receive too little or too much nourishment. The first state, from whatever cause it arises, is termed *atrophy*, the latter *hypertrophy*. Atrophy may thus arise from a vast variety of causes. It may be occasioned by merely withholding the necessary supply of nutritious food, without any actual disease. Among the diseases capable of producing atrophy, the most common are those of the digestive organs, by which the aliment is taken up and prepared for assimilation. Disease of the organs of assimilation, may produce atrophy as effectually as disease in the primary organs of digestion. A frequent instance of this is in consumption, when the lungs become so diseased as not to be able to receive a sufficient quantity of air. Atrophy may result also from a want of activity in an organ, or in the whole body; so that when the nutritive particles are conveyed to them in the blood, they have not power to appropriate a sufficient quantity of them. When the vital activity of an organ is small, the nutritive particles are taken up slowly and languidly; while the affinity existing between them being also weak, they are sooner removed by the process of absorption than in health, and the parts thus circumstanced are rapidly wasted. Hence a due supply of nervous stimulus is necessary to the vital activity of an organ; while the cessation of action in any organ is invariably followed by atrophy. The first change that takes place in an atrophied organ, from whatever cause, is diminution of the quantity of blood sent to it; and next to this, and chiefly owing to it, is greater paleness of colour. Subsequently, the organization becomes more completely changed; so that frequently all traces of its original conformation are lost, and, in some cases, it at last disappears altogether. In all cases atrophy arises from the diminution or perversion of the vital energies, generally the former; and hence, by exciting the natural vital energies of an organ, we tend to remove atrophy. In order to its cure, it is necessary to discover in what organ or organs the deficiency or perversion exists. The discovery of this is often difficult, and the removal of it, when discovered, is often more difficult.

ATROPIA, ATROPINE, *á-tro'-pi-a*, a vegetable alkaloid found in the deadly nightshade (*Atropa belladonna*), and the seeds of the *Datura Stramonium*. It is extracted by adding sulphuric acid to a strong decoction of either plant; filtering, saturating with potash, and dissolving the precipitate, which is the atropia, in hot water, from which it crystallizes in long silky needles. The preparation of the alkaloid causes a peculiar dilatation of the pupils of the eyes, which continues for several hours. It is one of the most violent acrid poisons known, the only antidote being a vigorous and immediate application of the stomach-pump, emetics being utterly useless, from the paralysed condition of the stomach.

ATTACHÉ, *át-tásh'-a* (Fr., attached), in Dipl., is a name given to certain young gentlemen who are attached to embassies in the capacity of *assistants*, with a view to their being made familiar with the duties of the office, in order to their afterwards holding appointments in that department of the public service.

ATTACHMENT, *át-tátch'-ment* (Fr. *attacher*, to attach, tack, or fasten unto), in Law, is a process that issues at the discretion of the judges of a court of record against a person, for some contempt, either actual *or* by disobeying its order, for which he is committed. It may be awarded by them upon a bare suggestion, or on their own knowledge, without any appeal, indictment, or information. The cases in which it is issued are where witnesses do not appear on a subpœna to attend a court, or on an order before an arbitrator, or refuse to be sworn and examined, or prevaricate in their evidence; for non-observance of an award duly made; for non-payment of moneys, or neglect or refusal to perform an act pursuant to an order; unduly perverting the proceedings of the court; writing privately to a judge on a case in court; or for doing any act derogatory to the authority of the court or the respect due to it. *Foreign attachment* is a process peculiar to the city of London and some other places, issued out of the lord mayor's or sheriff's court, in the nature of a notice to a person who has moneys or effects in his hands belonging to a debtor, not to part with them without license from the court. This person is called the *garnishee*. It has been considered that the lord mayor's court has jurisdiction over the garnishee if he can be served with the notice within the city, although he has no residence or office within the city, and the goods or moneys are not in the city; but this question is now before the court of Queen's Bench, which has not yet delivered its judgment. Unless the debtor settle the demand, or he or the garnishee successfully defend the action, the plaintiff recovers judgment against the garnishee to the extent of the assets in his hands for the amount of his claim. If the action be not defended, the claimant must give a bond to return the value of what he recovers from the garnishee, if the debtor should come in within a year and a day, and defend the action and recover judgment.

ATTACK, *át-ták'*, in Mil. Lan., denotes an advance upon an enemy, with a view of driving him from his position. It may be made either upon an adverse army in the field, or upon a fortress. In every age, the most experienced generals have generally preferred making an attack, to protracting the war by tedious and indecisive manœuvres, which harass and dispirit their troops. The army making the attack, especially if unexpected, possesses manifest advantages over the enemy, which generally more than counterbalance even very considerable advantages on the other side. Hence, an experienced general always chooses, if possible, to keep his enemy on the defensive. The nature of the attack depends upon the condition and position of the enemy, upon the purpose of the war, upon the time, place, and other circumstances.

ATTAINDER, *át-táin'-der* (Old Fr. *attaindre*, from Lat. *tangere*, to touch, catch, or take, or *tingere*, to stain, to impute, charge, or accuse), in Law, is the immediate consequence when sentence of death is pronounced. The criminal is then called attaint, attinctus, stained, or blackened. He is no longer of any credit or reputation; he cannot be a witness in any court; neither is he capable of performing the functions of another man; for, by an anticipation of his punishment, he is already dead in law. He is often confounded with conviction; but a man may be convicted, and not receive judgment for a time, or the conviction may be erroneous. To be attainted, he must have judgment of death. A person attainted of high treason forfeits all his lands, tenements, and hereditaments; his blood is corrupted, and he and his posterity were formerly rendered *base*; but by 54 Geo. III. c. 145, 3 & 4 Will. IV. c. 106, and 4 & 5 Will. IV. c. 23, the former rigour of the law was modified. By the first act, except for treason or felony, the attainder will affect only the offender for his natural life, and will not extend to disinherit or prejudice the right or title of any other persons after his death. By the second act, when the person from whom the descent of any land is to be traced shall have had any relation who, having been attainted, shall have died before any such descent shall have taken place, then such attainder shall not prevent any person from inheriting such land who would have been capable of inheriting the same by tracing his descent through such relation, if he had not been attainted. By the third act, the attainder will not affect land, chattels,

or stock vested in any person attainted, upon any *trust*, or by way of *mortgage*, or any profits thereof. Persons may be attainted by act of parliament. The attainder may be reversed or falsified by writ of error or by plea. If by writ of error, the consent of the crown to the writ must be obtained; and when by plea, it may be by denying the treason, pleading a pardon by act of parliament, &c.

ATTALEA, *it-tal'-lé-a*, in Bot., a gen. of palms comprising numerous species, nearly all natives of the tropical parts of America. They have in general tall and smooth cylindrical stems; but a few species are stemless. The leaves are large and pinnate; the fruit a nut, with three seeds and three cells, inclosed in a dry husk. The species *A. funifera* is the most important member of the group. The fruits constitute the Cequilla nuts of commerce, which are largely imported into this country. The pericarp of this fruit is very hard, and forms a kind of vegetable ivory, adapted for handles of doors, drawers, walking-sticks, and umbrellas. The pendulous fibres of the leaf-stalks are much used for cordage; the ropes made from them being very strong, and extremely durable in salt-water. The fibre resembles piassaba very closely; and, in fact, until quite recently, the two kinds of fibre were thought to be identical. (*See* LEOPOLDINIA, the Piassaba palm.) From the seeds of *A. Cohune* a fatty oil may be obtained. *A. compta*, the Pindova palm, produces a fruit about the size of a goose's egg, the kernels of which are eatable.

ATTAR, or OTTO, OF ROSES, *it'-tar*, an essential oil obtained from the petals of three species of rose,—namely, *Rosa centifolia*, *moschata*, and *damascena*. The rose-gardens at Ghazeepore have long been famed for the production of the precious liquid. These gardens are large fields, planted with rows of small rose-bushes. The blossoms, which unfold in the morning, are all gathered before noon; and their petals are at once transferred to clay stills, and distilled with twice their weight of water. The rose-water which comes over is placed in shallow vessels covered with moist muslin, to exclude dust, and exposed all night to the cool air. In the morning the thin film of oil which has collected on the top is carefully swept off with a feather and transferred to a small phial. This process is repeated morning after morning, till nearly the whole of the oil is seperated from the water. Heber says that about 20,000 roses are required to yield a rupee weight (176 grains) of attar; and this quantity is worth £12. Attar of roses is imported from Smyrna and Constantinople; but it rarely, if ever, arrives in this country pure. It is commonly adulterated with spermaceti and a volatile oil, which appears to be derived from one or more species of Andropogon (*see* this word), and which is called in London oil of ginger-grass, or oil of geranium.

ATTENTION, *it-ten'-shon* (Lat. *attentio*, from *ad*, to, and *tendo*, I stretch), is a term used in Mental Phil. to denote a steady exertion or due application of the mind to any object of sense or intellect, in order to its being thoroughly understood, and afterwards remembered. When we see, hear, or think of anything, and feel a desire to know more of it, we attempt to keep the mind fixed upon it; and this fixing of the mind is called attention. In other words, it is that effort of the mind to keep before it an idea or perception, and to exclude for the time all other objects that solicit its notice. According to Stewart, it is a distinct faculty of the mind; and, though this view does not seem to be the correct one, yet his remarks on this subject are acute and valuable. Sir William Hamilton combats this opinion, and maintains that attention is not a special faculty of the mind, but only "consciousness concentrated." "It is," he says, "consciousness applied by an act of will or desire under a particular law." This law he terms the law of limitations, which is "that the intensity of our knowledge is in the adverse ratio of its extension: in other words, that the fewer objects we consider at once, the clearer and more distinct will be our knowledge of them." The greater the number of objects to which the mind is at the same time directed, the smaller is the intensity with which it is able to consider each, and, consequently, the less vivid and distinct will be the information it obtains regarding them. Though attention is generally, yet is not always, a voluntary act; for sometimes it is seized upon and fixed by an object of interest beyond the power of control. According to Sir W. Hamilton, there are three degrees or kinds of attention,—"the first, a mere vital and irresistible act; the second, an act determined by desire, which, though involuntary, may be resisted by our will; and the third, an act determined by deliberate volition." Considered in its highest degree as an act of the will, the power of concentrating attention is of the utmost importance. Every idea is vivid in proportion to the degree of attention that is given to it; and it is only by the attention that is given to any object that we can form a distinct notion of it, or discover its nature, attributes, or relations. It is also one of the greatest aids to memory, to which it seems to be essential that the perception or idea which we wish to remember should remain in the mind for a certain space of time, and be exclusively contemplated by it. One may obtain the same command over his mind that he has over the muscles of his body, and may learn to be attentive as he learns to walk or to write. The stronger one's power of attention, the longer and more steadily will he be able to follow out the same train of thought, and the greater will be the success a his labours. "Genius," says Helvetius, "is nothing but a continued attention;" and Sir Isaac Newton, when complimented upon his great discoveries, remarked, "that if he had made any improvements in those sciences, it was owing more to patient attention than to any other talent."

ATTENTION, a cautionary word used in the British military service as preparatory to any particular exercise or manœuvre: *gare-à-vous* has the same signification in the French service. Upon receiving this command, the infantry soldier, whether of the line, volunteers, or militia, assumes the following position:—Shoulders square to the front; heels kept together; toes turned outward; feet forming an angle of sixty degrees; arms depending straight from the shoulders; palms of the hands falling flat upon the thighs; body straight, but with a trifling inclination forward, in order that its weight may principally fall upon the fore part of the feet; head kept erect, but without being thrown back; eyes looking straight to the front; the whole position being perfectly easy and unconstrained, without any rigidity or awkwardness.—*Ref.* Rifle-drill, in *Boy's Own Magazine*.



ATTENTION.

ATTENUATED, *it-ten'-u-at'-ed* (Lat. *attenuo*, I make thin), in Bot., tapering gradually to a point.

ATTESTATION, *it-tes-tai'-shon* (Lat. *attestor*, from *ad*, and *testor*, I call to witness), of a deed, will, or other instrument, is the execution of it in the presence of witnesses, who indorse or subscribe their names under a memorandum, to the effect that it was signed or executed in their presence. In general, one witness is sufficient to attest a deed or other legal instrument; but if it be executed in pursuance of a power which directs it to be done in the presence of a given number of witnesses, it will be void unless it be attested by such number. The execution or acknowledgment of a will must be attested by at least two witnesses, who must both or all be present at the time of the execution or acknowledgment of it by the testator, and must subscribe their names as witnesses thereto in his presence, and in the presence of each other.

ATTIC, *it'-tik* (Gr. *attikos*, belonging to Attica), a term in Arch., applied to a low parapet-wall surrounding the top of a building, and placed on the entablature. It is generally plain, but sometimes broken with pilasters, before which figures in high relief are placed, as in the Arch of Constantine. It was intended to conceal the roof, and give a more imposing appearance to the building. In ancient architecture its height varied greatly, but in modern times it is generally made equal to that of the entablature. In Building, the term is applied to rooms made in the roof of a house. An attic base, in Arch., is that which

consists of an upper and lower torus, separated by a scotia and fillets, measuring in height one-third the diameter of the column it supports It is commonly applied, *now*, to the rooms built in the roof of modern dwellings The expression is also variously employed in other ways Thus, sharp and subtle wit is often called Attic seasoning or salt; a witness that is incorruptible, an Attic witness

ATTIC DIALECT, THE, is that dialect of the Greek language which was spoken in Attica It was the most refined and polished of all the dialects of ancient Greece; and in it wrote Solon the lawgiver, Thucydides and Xenophon the historians, Aristophanes the comic poet, Plato and Aristotle the philosophers, and Demosthenes the orator. When, after the Macedonian conquest, Greek became the language of literature and diplomacy in most parts of the civilised world, the Attic came to be that dialect of the Greek which was generally adopted

ATTITUDE, *ăt'-ĭ-tude*, in Paint and Sculp, the position and gesture of a figure, by which the sentiment or passion of the person represented is denoted Attitude is to the limbs the same as expression to the features, and should be natural, unconstrained, and varied. In a group of figures, the attitudes should be contrastive, and so composed as to balance and set off each other

ATTORNEY, *ăt-tur'-ne* (Let *attornatus*, *ad*, *torno*, and Fr *attourner*, to turn), is one man set in the place of another, and who has authority given to him to act in the stead and place of him by whom he is delegated, in private contracts, agreements, and other matters of business His authority must be by deed, which is called a letter or power of attorney, which requires a stamp of 20s (*See* AGENT)

ATTORNEY-AT-LAW answers to the proctor of the civilians. Formerly, every suitor (as now the defendant in criminal cases) was obliged to appear in person To remedy this inconvenience, and to regulate the admission and government of attorneys, several statutes have from time to time been passed, the first of which was the statute of Westminster, the 2nd, c 10 (*temp* Edward I) The following will apply as well to a solicitor as an attorney He must be articled, and serve his articles, for a term which has been fixed as follows —One who has taken a degree (specified in 23 & 24 Vict c 127) at a university, or been called to the bar, or been for ten years a *bond fide* clerk to an attorney, three years, in other cases, five He must be sworn to demean himself honestly, be admitted and enrolled, and take out an annual certificate, without which he cannot duly practise nor recover his fees Before admission, he must pass an examination, to show he is qualified No action can be commenced for his fees until one month after his bill, signed by him, or his executor, administrator, or assignee, or, in the case of a partnership, by any of the partners, either with his own name or the name or style of the partnership, be delivered to the party to be charged therewith, or sent by the post to, or left for him at his counting-house, office of business, dwelling-house, or last known place of abode, or be inclosed in or accompanied by a letter, signed in like manner, referring to such bill. His bill is subject to deduction or taxation by an officer of the court; and if it be taxed by the client, and more than one-sixth be taken off, the attorney is liable to pay the costs attendant on the taxation Being an officer of the court, he is amenable to it for any malfeasance or misappropriation of moneys or securities, or for improper conduct in his character of attorney, and the court may order payment or restitution, or fine, or commit him for contempt, suspend him from practising, or strike him off the rolls of the court. In the last two cases, the other courts in which he has been admitted will deal with him in a similar manner. If he be convicted of any offence, although not in his character of an attorney, which would materially affect his standing or position in society, the court would also strike him off the rolls Neither an infant, a married woman, nor an infant, can appoint an

ATTORNEY-GENERAL, a great law officer of the crown, whose business is to exhibit informations, and prosecute for the crown in matters criminal, and institute suits in the Exchequer for anything concerning



the queen in inheritance or profits. His proper place in court, upon any special matters of a criminal nature wherein his attendance is required, is under the judges, on the left hand of the clerk of the crown; but this is only upon solemn and extraordinary occasions, for usually he does not sit there, but within the bar, in the face of the court The queen consort is also privileged to have an attorney general

ATTORNEY OF THE DUCHY COURT OF LANCASTER is the second officer in that court, placed as assessor to the chancellor of the court

ATTORNMENT, *ăt-turn'-ment* (Let *attornamentum*; Old Fr *attourner*, to turn over to), in *Law*, is the act of professing or agreeing to become tenant to a new landlord, on the alienation of property, or on its being recovered in an action of ejectment. In the latter case, the attornment is to prevent the necessity of the tenant being actually turned out of possession, under the process, to give possession to the plaintiff, by virtue of the judgment in the action

ATTRIBUTE, *ăt'-trĭ-bute* (Let *attribuo*, from *ad*, to, and *tribuo*, I give or bestow), is properly a quality or property ascribed to or belonging to a person or thing Of the several attributes belonging to any substance, some are termed *essential*,—those that are necessary to it, and go to form its character, as extension and attraction to matter, others are termed *accidental*, as roundness in wood, or learning in a man. In Theol, it denotes the several qualities and perfections which we conceive in God, and which constitute his proper essence, as justice, goodness, truth, wisdom, &c Some distinguish them into negative, and positive or affirmative, the former being such as remove him from whatever is imperfect in the creature, as infinity, immutability, immortality; the latter being such as assert some perfection in him, which is in and of himself, and which, in the creature, in any measure, is from him, as goodness, holiness, wisdom Others divide them into absolute and relative, or into communicable and incommunicable —In Log, the attributes are the predicates of any subject, or what may be affirmed or denied of anything

ATTRIBUTES, *ăt trĭ butes* (Let *ad*, to, and *tribuo*, I give), a term used in the Fine Arts, to signify certain symbols which accompany, distinguish, and characterize certain figures and allegories Thus, the eagle and thunderbolt are the attributes of Jupiter, the caduceus is the attribute of Mercury, the trident of Neptune Love is always represented with a bow and quiver; Justice with a balance and sword, &c

ATTRIBUTIVES, *ăt trĭb'-u tĭve*, in Gram, are words which are significant of attributes, as adjectives, verbs, and participles, which are attributes of substances, and adverbs, which denote the attributes only of attributes Mr Harris calls the former attributives of the first order; the latter attributives of the second order

ATTRITION, *ăt-trish'-on* (Let. *attritus*, worn or rubbed down), in Geol, the wearing and smoothing of rock-surfaces by the passage of water charged with gritty particles, by the descent of glaciers, or by the passage of sand-drift

ATWOOD'S MACHINE (*See* GRAVITATION.)

AUCKLANDIA, *awk-lănd'-e a*, in Bot, a gen. of plants belonging to the nat ord *Compositæ* The most interesting species is *A. hispida*, a native of Cashmere, the root of which is supposed to have constituted the *costus* of the ancients This root is commonly known in the north-western parts of India by the name of orris-root. It must not, however, be confounded with the true orris-root, which is furnished by a plant belonging to a very different order. (*See* IRIS)

AUCTION, *awk'-shon* (Let *augeo*, *auctum*; Gr. *auxo*, increase; Let *auctio*, an increasing), a method of selling property by competition Sales by auction are conducted on different principles, according to the custom affecting particular trades, localities, or effects. The most general mode is for a professional man, called an auctioneer, to offer the property for sale to persons assembled together by advertisement, who compete for the purchase by biddings, or offers of sums of money; and the person who bids last, or the highest amount, is declared the purchaser. Sales of this nature are governed by conditions which bind both the seller and purchaser. A bidder may retract his

bidding before the fall of the hammer. If a person by any means prevent other persons from bidding against him, he cannot compel the delivery of the lot, although he may have paid a deposit. If a vendor employ agents at a sale, to bid solely for the purpose of exciting competition, and without any intention of purchasing, he must announce it, or the sale is void. If any wilful or fraudulent misrepresentation of the property or chattel put up for sale be made, either in the description or otherwise, the purchaser is not bound to complete the sale, and he can compel a return by the auctioneer of the purchase or deposit money, or such part of it as will make up the deficiency in value. In a Dutch auction, the auctioneer commences by naming a high price, and gradually reduces it until some person closes with his offer. In some cases, auction sales, or biddings, are effected by a minute-glass or inch of candle, and the bidder immediately preceding the running out of the sand, or the extinguishment of the light, is declared the purchaser.

AUCTIONEER, *awk'-sho-neer*, a person licensed to sell property by public biddings. He may vary the conditions of sale before a bidding is made. He is the agent both of the vendor and purchaser, and, as such, may bind both. He is entitled to hold the purchase or deposit money as stakeholder for both parties, until the contract be completed, without paying interest for it, and he is personally liable to the purchaser if he pay it to the vendor before completion. If both parties set up a title to the deposit, he can compel them to interplead to establish the right. He has a special property in goods sold, and may maintain an action against the purchaser for the price. If he sell without declaring who is his principal, the purchaser can compel him to complete the contract.

AUCUBA, *aw-ku'-ba*, in Bot., a gen. of plants belonging to the nat. ord. *Cornaceæ*. The only known species is *A. japonica*, which, as its name implies, is a native of Japan. It was introduced into Britain as a hot-house plant, but was soon found to be hardy enough to flourish in exposed situations. It is now a very common ornamental shrub, especially in the parks and suburban gardens of large towns. It is remarkable for its shining pale-green leaves mottled with yellow, which have obtained for it the common name of Variegated Laurel. The plant is dœcious, that is to say, the male and female flowers are produced by separate individuals. The female plant is alone known in this country; hence it never yields seed, and can only be propagated by layering, or by slips or cuttings.

AUDIENCE, *aw'-di-ense* (Lat. *audio*, I hear), denotes the attention that is given to a person while speaking, or persons listening to a public speaker, singer, or other performer. The ceremony of the admission of ambassadors or public ministers to a king to deliver the credentials of their sovereign is likewise called an audience. In History it is the name of certain tribunals or courts of justice established by the Spaniards in America.

AUDITOR, *aw'-di-tor* (Lat. *audio*, I hear), in a general sense, one who listens or attends to anything; in English Law, an officer of the crown or some great person who makes a yearly examination of the accounts of the under-officers. Receivers-general of fee-farm rents are called auditors. The auditors of the imprest were officers of the Exchequer appointed to take the accounts of the receivers of public revenues. The present Board of Commissioners, exercising the duties formerly divided between various departments of the Exchequer, was constituted in 1806. In France, the members of the Chambre des Comptes were divided into *conseillers-maîtres* and *conseillers-auditeurs*. In Com., auditors are persons appointed to examine, vouch, and certify the correctness of the accounts of a public company or body.

AUDITORY, *aw'-di-to-re*, in Anat., is a term applied to certain parts of the organs of hearing; as the auditory nerve, meatus auditorius, &c. (*See* EAR.)

AUDITORY (Lat. *auditorium*, an audience), an assemblage of persons gathered together for the purpose of hearing a preacher, lecturer, &c. In the ancient churches, the term auditory, or auditorium, was applied to that part of the building where the people stood to be instructed, and hear the Gospel: it is now called the nave.

AUGEAN STABLES. (*See* AUGEUS, vol. I. of this work.)

AUGER, *aw'-gur* (Du. *avegaar*, Sax. *nave-gar*), an instrument used for boring large holes by carpenters, wheelwrights, shipwrights, and others. It consists of an iron blade, terminating in a steel bit, with a handle placed at right angles with the blade. When the auger has a straight channel or groove, it is sometimes called a "pod auger;" when it has a spiral channel, it is termed a "screw auger." A large kind of auger is used in agriculture for boring the earth in order to ascertain the nature of the subsoil, minerals, or whether water is existing in a certain place.

AUGITE, *aw'-jite*, a species of hornblende, known also as *pyroxene*. It is found in many volcanic rocks, such as basalt and porphyry, and consists of silicate of lime and magnesia. It is greenish-black or entirely black, and is generally more or less translucent, according to the amount of manganese and iron contained in it. It crystallizes in hexagonal prisms, terminated by dihedral summits.

AUGMENTATION, COURT OF. (*See* COURTS.)

AUGSBURG CONFESSION, *awgs'-boorg*, in Eccl. Hist., is the name given to that important profession of faith of the Lutheran church which was laid before the great diet of Augsburg in 1530. The emperor Charles V., in order to bring about an amicable settlement of the religious differences that were then existing in Germany, summoned a diet of the empire to meet at Augsburg, and requested the Protestants to bring before it a short summary of those doctrines in which they differed from the church of Rome. John, elector of Saxony, therefore applied to his Wittenberg theologians, at whose head was Luther, to draw up articles of their faith, and to lay them before him at Torgau. These Torgau articles formed the basis of the Augsburg Confession, which was drawn up at Augsburg, by Melancthon, assisted by other distinguished theologians, and approved of by Luther, who, however, could not appear at Augsburg, but remained at Coburg, not far distant, being under the ban of the empire. It is characterized by the clear methodical style of Melancthon, as well as by that gentle conciliatory spirit for which he was distinguished. His evident intention was to approximate as much as possible to the doctrines of the church of Rome, defining, at considerable length, the heretical errors which they both agreed in rejecting, and moderating, as much as possible, the points of difference between them. He sought to establish the doctrines of Protestantism, not only on the authority of Scripture, but also on that of the Fathers, especially Augustine, from whom the Romanists could hardly dissent, and who could not be accused of heresy. It consists of twenty-eight articles, twenty-one of which state the principles of their belief as regards faith and doctrine; the remaining seven treat at some length of those points in which they differ from the church of Rome. The following are the subjects of the several articles:—1. Of God; 2. of original sin; 3. of the person and mediation of Christ; 4. justification; 5. preaching and the sacraments; 6. faith; 7 and 8. the Church; 9. baptism; 10. the Lord's Supper; 11. confession; 12. repentance; 13. the use of sacraments; 14. church government; 15. rites of human institution to be observed; 16. secular occupations; 17. Christ's second coming; 18. free will; 19. God not the author of sin; 20. faith and good works; 21. saints to be respected, not worshipped. The abuses that had crept into the Church were—22. Denying the sacramental cup to the laity; 23. imposing celibacy on the clergy; 24. of the mass; 25. of confession; 26. of fasts and other ceremonies of human invention; 27. of conventual vows; 28. of civil and ecclesiastical power. Its authors evidently had no intention of making it a permanent or immutable standard of faith, but simply gave it out as a statement of the belief then held. "Our churches teach," "it is taught," "it is unanimously taught," "such and such opinions are falsely imputed to us," are the expressions used. These articles were read before the diet on the 25th of June, 1530. The papal theologians, headed by Faber, wrote a confutation of the Confession, which was also read before the diet, in the month of August of the same year. Melancthon answered it in his "Apology for the Augsburg Con-

fession," which was published in 1531. Zwinglius, and the other Swiss and French reformers, did not concur in the *Confession* of Augsburg, as they differed from it on several points, particularly in denying the real presence of Christ in the Eucharist, which the Lutherans believed (Art. 10). Melancthon subsequently made various considerable alterations in the Confession, particularly in that Latin edition of it which he published in 1540. The alterations which he then made on the tenth article, with a view to unite the Lutherans and Calvinists, gave rise to much controversy; the Lutherans repudiating the alterations, and holding by the unaltered Confession; while the reformed churches accepted the altered one.

AUGURIES, *aw'-gu-rees*, the ceremonies, superstitions, predictions, signs, answers, and announcements made by the Roman augurs, and which constituted their supposed science and inspiration. Public auguries were,—1. Appearances in the heavens, as thunder and lightning. The augur marked the place where the flash of lightning originated, and where it disappeared. He stood on an elevated place, where he had a full view of all around him. After the sacrifices had been made, and solemn prayers offered, he took his station, his face towards the east, his head covered, and pointing with his staff to that portion of the heavens within the limits of which he proposed to make his observations. On the left were the propitious, on the right the unpropitious omens. 2. The cries and the flight of birds. Predictions founded on the observations of birds were properly called *auspices*, and were common among the Greeks, who took them from the Chaldeans. They afterwards became so important, that, among the Romans, nothing of consequence in peace or war was undertaken without consulting birds, whose continual flight was supposed to give them universal knowledge. They were propitious or unpropitious, either from their species, or from the circumstances in which they appeared. The birds of a prophetic character were divided into two principal classes,—those whose flight and those whose cry was indicative of future events. In the latter class were included the raven, the crow, the night-owl, and the cock; in the former were the eagle, the crow, the raven, the kite, and the vulture. The two last were always unpropitious. The eagle, on the contrary, was propitious when he flew from left to right; the crow and the raven were propitious on the left, and unpropitious on the right. Thirdly, the willingness or unwillingness of chickens to eat was considered ominous. The former was interpreted as a good omen, the latter as a bad one. Chickens were made use of particularly in war. Besides these three principal classes, certain omens were drawn from quadrupeds; such as a beast crossing a path, or being seen in an unusual place; or from occurrences more or less uncommon; as sudden melancholy, sneezing, spilling the salt upon the table, &c. Although the augurs explained the majority of the signs, and taught how the gods could be appeased, yet the right of inquiring how war would terminate belonged only to the commander-in-chief; and its fortunate or unfortunate issue was attributed to him alone. —Ref. *English Cyclopædia*—Arts and Sciences.

**Augurs**, *aw'-gurs* (Lat. *augures*).—Among the people of ancient Italy, in common with all rude nations, it was imagined that in every occurrence which could not be understood there was a special manifestation of the will of the gods. The power of reading and interpreting these signs was supposed to be a peculiar gift conferred on the favoured mortal from his birth. A superstition offering so strong a hold upon the minds of the people was turned to account by the astute politicians of Rome, and the College of Augurs was instituted at the very earliest period of Roman history. Augurs were a certain sort of priests, who predicted future events and announced to the people the will of the gods. They were consulted both in public and private affairs, and their influence in the state was very great. By merely pronouncing the words *Alio die* (another day), they could dissolve the assembly of the people, and annul all the decrees that had been passed at the meeting. The original number of augurs is stated differently by Cicero and Livy. Cicero, that an augur, says that Romulus associated three, and that Numa added two. The Ogulnian law, which was passed 307 B.C., opened the pontifical and the augural colleges to the plebeians. In the latter, five plebeians were associated with four patricians; and this number remained to the time of Sulla, 81 B.C., who increased it to fifteen. In 29 B.C. the extraordinary power was conferred upon Augustus of electing augurs at his pleasure.—Ref. *English Cyclopædia*—Arts and Sciences.

AUGUST, *aw'-gust*, in Chron., is the name given to the eighth month of our year. It was named by the Roman emperor Augustus, after himself, as he regarded it as a fortunate month for him, being that in which he had gained several important victories. Before this time it was called *Sextilis*, or the sixth month, the year beginning with March. The name of July had, in like manner, been *Quintilis*, before it was changed by Julius Cæsar; and as it contained thirty-one days, the senate, in order that Augustus might not be behind Cæsar, decreed that August also should have thirty-one days, and that, for that purpose, a day should be taken away from February.

AUGUSTINE MONKS, *aw-gus'-tin*, a religious order in the church of Rome, who follow the pretended rule of Augustine prescribed to them by Pope Alexander IV., in 1256. There had arisen, previous to that time, several religious orders, which Innocent IV. formed the design of uniting into one congregation; and this was carried out by his successor. At present, the order is divided into several branches; as the Hermits of St. Paul, the Jeronymitans, monks of St. Bridget, and the Barefooted Augustines, the last being instituted by a Portuguese in 1574, and confirmed by Pope Clement VIII. in 1600 and 1602. The pretended rule of St. Augustine is, briefly, that the monks are to have all things in common; that the rich who enter into the order are to sell their possessions and give them to the poor; that nothing is to be received without leave of the superior; that they are never to eat but in their monastery; that when they go abroad, they must go two together in company; that they are to employ the first part of the morning in labouring with their hands, and the rest in reading. They have Saturday allowed them to provide themselves with necessaries, and are permitted to drink wine on Sundays; and if at any time they are obliged to retire through persecution, they are to betake themselves immediately to the place whither their superior is withdrawn. These, with several other precepts relating to charity, modesty, chastity, and other Christian virtues, constitute what is called the Rule of Augustine, which was read to the monks once a week. The Augustines are clothed in black, and make one of the four orders of mendicants. The degeneracy of the order in the 14th century led to the formation of new societies, among which was the Saxon, one to which Martin Luther belonged. Since the French revolution, the order has been entirely suppressed in France, Spain, and Portugal, and partly in Italy and South Germany; and even in Austria and Naples it has been decreasing. It is most powerful in Sardinia and America.

AUK, GREAT, *awk* (*Alca impennis*).—Although this bird has occasionally been met with on the British coast, the northern latitudes are more congenial to its habits; and hence, owing to our limited acquaintance with the inhabitants of the Arctic regions, it is not very well known. In the collection of the British Museum there is a male specimen of this bird, which was sent to Mr. Bullock during his tour in the Orkneys. This was one of a solitary pair seen in those regions: the female was killed a little time previous to Mr. Bullock's arrival. That gentleman took part in a long chase of the male, but was unsuccessful; the auk, although pursued by a six-oared boat, making its way under water with remarkable celerity. The wings of the great auk are but partially developed. In length it measures about three feet, and its wings scarcely exceed four inches. Though the wings are almost useless for aërial locomotion, they are well adapted for assisting the bird's progress under water. How far north these birds may be found is not known: so far, however, as our Arctic explorers have penetrated, the great auk has always been seen. Its movements on land are somewhat awkward; and, indeed, it is altogether adapted for an aqueous existence. Except at the breeding season, it rarely visits the shore. While

walking on *terra firma*, it keeps itself nearly in a vertical position. Their food consists of fish and crustacea, and other marine productions.



THE GREAT AUK.

AUK, LITTLE (*Uria Alle*), is the most diminutive of the auk tribe, and the hardiest. The colder and wilder the region, there do they seem to congregate in larger flocks, and enjoy the inclement weather with as much relish as their human companions the Esquimaux. In the locality of Baffin's Bay they are found in large flocks; also at Melville Island. On the inhospitable wilds of Spitzbergen and Greenland thousands of these birds find a home. Here they watch for the breaking up of the ice, and then swarm down in myriads, and busily search for the crustacea in the fissures of the broken ice. It very rarely visits this country; indeed, those that have been seen are more probably storm-blown castaways than visitors in search of a home for the season. The little auk is a compact, stout bird, about nine inches in length. The upper parts of the plumage are mostly black, the cheeks and under-parts white, the legs yellowish-brown, the bill black. In summer the front of the neck, which during the winter is black, assumes a paler hue. It lays one egg, of a pale bluish-green, and, like the preceding, affects the highest cliffs.

AUK, RAZOR-BILLED (*Alca torda*), larger than the preceding; when full grown, it measures about fifteen inches in length and twenty-seven across the wings. This species is found also in the Arctic regions; but, unlike the great auk, is a frequenter of warmer climates, including the coasts of Great Britain, France, Holland, and Germany. These birds take up their abode on the highest cliffs attainable, and live together in large flocks, associating with the guillemots and kittewakes. About May the auk colonies begin their task of incubation, sitting closely together in rows, one above the other. It is very remarkable, that, although the razor-billed auk lays but one egg, and so many hundreds are accumulated on the cliffs at one time, without any kind of covering to denote their respective owners, no inconvenience is occasioned; every auk knows its own egg, and probably in no instance is the paternity of a young bird questionable. It has occasioned some wonder how the eggs of the auk are kept so secure on the small ledges on which they are laid; and it is remarked, that if a human hand were to remove one, the most delicate artifice would fail to replace it in so secure a position. The balancing powers of the auk are, however, considerably overrated; for it has been ascertained that the egg is attached to the spot by a glutinous substance, with which it is, when newly laid, covered. The razor-billed auk is very common in Scotland, and in the Hebrides are several breeding-places. "One of the most interesting is the little island of Berneray, called by mariners Barray Head, about ninety miles distant from the coast of Scotland on the one hand, and St. Kilda on the other, and one of a group of islets named the South Isles of Barray." These breeding-places are of considerable extent. The foregoing authority makes mention of a precipice, "to the extent of half a mile, covered with these birds for the purpose of breeding. These birds inhabit the cliffs, not promiscuously, but with a degree of regularity and distinctness which seems not a little wonderful. On the grassy summits breed the puffins, burrowing in the turf. From thence to half-way down is the place selected by the auks; while in the remaining division are stationed the guillemots and kittewakes, the latter coming almost to high-water mark."—*Macgillivray.*

AULIC COUNCIL, *aw'-lik* (Lat. *aula*, a hall), was the name of a council of the old German empire, called, in German, the *Reichshofrath*. It was next in power to the Imperial Chamber, which was the highest court in the empire. When the Estates obliged the emperor, in 1495, to establish the court of the Imperial Chamber, he still retained about his court persons for looking after the affairs of his crown lands, and for preparing matters for the Imperial Chamber. In the appointment of these, the emperor would not allow the Estates the same influence that they possessed in the Imperial Chamber. The members of the Aulic Council also came to take cognisance of judicial processes, and the Estates frequently complained of this after 1502. In 1559 its organization was more determined, and, by the peace of Westphalia, it was recognised as the second of the two supreme courts of the empire, and equal in dignity to the Imperial Chamber. It was composed of a president, a vice-president, and eighteen councillors, all chosen and paid by the emperor; but a part of them, at least, were to be taken not from Austria, but from the other states of the empire; and six were to be Protestants. If the Protestant councillors were unanimous upon any point, the votes of the rest could not overthrow them. The councillors were divided into a bench of counts and lords, and a bench of learned men, with no distinction, except that the latter, who were generally raised to the rank of nobles, received a higher salary. The vice-chancellor of the empire, appointed by the elector of Mainz, had also a seat in the council and a voice after the president. Under the exclusive jurisdiction of this court were—1. All feudal questions in which the emperor was immediately concerned; 2. all questions of appeal on the part of the Estates, from decisions in favour of the emperor in minor courts; 3. all matters concerning the imperial jurisdiction in Italy. Its decisions were submitted to the emperor for his approbation, on which they became law. It did not in any way interfere in the political or state affairs of the empire. The council ceased at the death of each emperor, and had to be reconstructed by his successor. It finally ceased to exist on the extinction of the German empire, in 1806.

AURANTIACEÆ, *aw'-rān-ti-ā'-se-e*, in Bot., the Orange fam., a nat. ord. of dicotyledonous plants, consisting of trees and shrubs, often of great beauty. The order is included in the sub-class *Thalamifloræ*. There are twenty-three genera, and about ninety-five species, chiefly natives of the East Indies, but generally distributed by the agency of man throughout the warmer regions of the globe. Their flowers are regular, and usually odoriferous; their fruits succulent and sub-acid, being examples of the *hesperidium* (which *see*). The plants abound in receptacles containing essential oils, which are much used in perfumery, for flavouring, and for other purposes. The oils are especially abundant in the leaves, the petals, and the rind of the fruit. The latter also contains a bitter tonic principle. The edible fruits known as the orange, lemon, lime, shaddock, citron, pompelmoose, forbidden fruit, Indian bael, and wampee-fruit, are the produce of this order. (*See* CITRUS, ÆGLE, FERONIA, COOKIA.)

AURELIA. (*See* CHRYSALIS.)

AUREOLA, *aw-rē'-o-la* (*Lat.*, of the colour of gold), in Paint., the glory with which ancient painters encircled the heads of the Holy Family, saints, martyrs, and confessors, in their pictures.

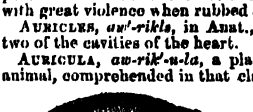
AUREUS, *aw'-re-us* (Lat. *aurum*, gold), a Roman gold coin, the value of which, according to Tacitus, was 16s.; other writers, however, make it of different values, between 12s. and £1. 4s. Its weight was nearly 2¼ os. avoirdupois.

AURIC ACID, *aw'-rik* (Lat. *aurum*, gold, terminal *ic*) (Aul),.—Teroxide of gold, when hydrated, readily

combines with the alkalies, the earths, and metallic oxides, forming salts termed *aurates*. The alkaline aurates are soluble in water, and crystallize in yellow needles. *Aurate of potash* is used in electro-gilding. The compounds of auric acid with the earths and oxides are mostly insoluble. *Aurate of ammonia* is unknown. When auric acid is added to a solution of ammonia, a fulminating compound is obtained, supposed to be a sub-aurate of ammonia. It explodes with great violence when rubbed or heated.

AURICLES, *aw'-rikls*, in Anat., is the name given to two of the cavities of the heart. (*See* HEART.)

AURICULA, *aw-rik'-u-la*, a plant-eating molluscous animal, comprehended in that class of Gastropods to which the common snail belongs. Its organs of respiration are formed for breathing air, but some have the power of living in water for a long time. It inhabits a shell somewhat oval in shape, and marked by wide plaits. The fancied or real resemblance of the shell to the ears of certain animals accounts for the animal's vulgar appellation of Midas' ear.



AURICULA.

AURICULA, in Bot., the name given to a species of Primrose (*see* PRIMULA) much cultivated in flower-gardens. It grows wild in the Alpine and sub-Alpine regions of Italy, Switzerland, and Germany; also on the Caucasus and the mountains of Syria. In the wild state it has comparatively small flowers, generally yellow, but occasionally red or purple. These have short stalks, and grow in an umbel on one scape or leafless stem. The leaves, which spring from the crown of the root, are of a dark green colour, and are usually covered with a mealy powder. The scape and the flowers are also dusted over with this peculiar meal. The auricula has been cultivated in Britain since the close of the 16th century; and an immense number of varieties, many of exquisite beauty and fragrance, have been developed. The culture of this charming flower is a favourite amusement of the operatives of manufacturing towns, who often manage to save large sums for the purchase of new varieties. Some of the most perfect flowers, in form, colour, and shading, have been raised in little gardens belonging to the factory-men of Lancashire.

AURICULAR CONFESSION. (*See* CONFESSION.)

AURICULATE, *aw-rik'-u-lait* (Lat. *auricula*, little ear), in Bot., a term applied to a leaf having two small ear-like lobes at the base. The leaf of the Woody Nightshade (*Solanum Dulcamara*) is an example.

AURIFEROUS, *aw-rif'-e-rus* (Lat. *aurum*, gold, *fero*, I yield), in Geol., a term used to signify that certain rocks and veins yield or contain gold; hence the terms 'auriferous veins,' 'auriferous sands,' &c.

AURIGA, *aw-ri'-ga* (Lat. *auriga*, a charioteer), the name of a constellation in the Northern Hemisphere, between Perseus and Gemini, represented by a man in a posture resembling sitting, with a goat and kids in his left arm, and a bridle in his right hand. The most remarkable star in this constellation is one of the first magnitude, in the body of the Goat, called Capella.

AURIST, *aw'-rist* (Lat. *auris*, the ear), is a term applied to one who studies and professes to cure diseases of the ear.

AURORA BOREALIS, *aw-ror'-a bor'-e-al'-lis* (Lat. *aurora*, the morning, or light preceding sunrise, *borealis*, belonging to the north), a magnificent luminous phenomenon which appears in the northern heavens. In this country it is rarely seen, and never in its full splendour; still the appearances observed are sufficiently striking and beautiful to excite our wonder and admiration. Long shooting streamers are seen to dart across the sky, and these are generally attended by a beautiful glow of diffuse light, varying from green to deep purple, violet, and red. In days gone by, the *merry dancers*, or *northern lights*, as these appearances were commonly named, gave birth to many absurd superstitious terrors; and even now they are regarded as evil omens by some country folk. In the Arctic zone the aurora is frequently seen; indeed, it serves to break the monotony of the long dreary night, of some months' duration, which falls upon the inhabitants of that gloomy region every winter. There the meteor assumes a character of the greatest imaginable splendour. It first appears as an arch of light of a bluish-white colour, resting at each end on the horizon, and inclosing a dark segment. This luminous arch, which remains visible for several hours, may be considered to be a part of a luminous ring, elevated at a great distance above the earth's surface, and having its centre corresponding with some point near the North Pole. The bow of light does not remain stationary, but rises and falls, extends towards the east or the west, and breaks, now in one place, and then in another. After a while it generally shoots forth quivering rays towards the zenith. When such rays are projected from every part of the arch, and do not rise too high, the aurora presents the appearance of a comb. When the rays are of great length, they culminate in a point near the zenith, and form what is called the *boreal crown*. Then the whole heavens towards the east, west, and north present the appearance of a vast cupola of fire, supported by columns of coloured light. These phenomena are said to be accompanied by a crackling sound, like the crackling of sticks when fractured, and very like the sound produced when a powerful electrical machine is excited. Some observers have likened the sound to that of a display of fireworks, and state that the dogs of the Siberian hunters, on hearing it, crouch with terror to the ground, and cannot be made to move. The early observers of the aurora supposed it to occur at very considerable elevations above the surface of the earth, in regions where the air was indefinitely rare. Euler estimated the altitude at some thousands of miles. Recent observations, however, go far to prove that the meteor is seldom more than ninety miles from the earth. Franklin, at Fort Enterprise, in 1821, determined the altitude of an aurora, and found it to be less than that of the denser clouds. The aurora borealis is intimately connected with the magnetism of the earth. The vertex of the luminous arc is always situated in the plain of the magnetic meridian of the place of observation. The centre of the boreal crown is invariably found at a point in the heavens indicated by the prolongation of a freely-suspended magnetic needle; and during the occurrence of the phenomenon the magnetic needle is always greatly disturbed, sometimes deviating several degrees from its normal position. There seems, moreover, to be a connection between the magnetic poles of the earth in regard to the aurora, for, so far as can be ascertained, the meteor occurs simultaneously at both. The southern auroras have been witnessed by many navigators, and are said to resemble precisely the auroras of the north. The origin of the aurora borealis is as yet a matter of conjecture. Many scientific men confidently ascribe the phenomenon to the discharge of electricity through air more or less rarefied. This view is supported by the appearances produced by sending a series of sparks from an induction-coil through a vacuous tube. The coloured flashes of light and diffuse glow form a perfect miniature aurora, near the north pole.

AURUM MUSIVUM, *aw'-rum mu-si'-vum* (Lat.), Mosaic gold, is a gold-coloured metallic-looking substance, used for *bronze powder*. It is a bisulphide of tin, and is prepared in the following manner:—An amalgam of 12 parts of tin and 6 parts of mercury is formed, and mixed with 7 parts of flowers of sulphur and 6 of sal ammoniac. The mixture is heated in a glass flask to redness, until the white fumes at first formed cease to be disengaged, the bisulphide remaining behind in the form of hexagonal plates of light golden-yellow metallic appearance.

AURUM POTABILE, *po-tăb'-i-le*.—If ether is added to a solution of terchloride of gold, it abstracts the whole of the salt from the water, and floats upon the top in a yellow layer. This compound, which is simply a solution of terchloride of gold in ether, was formerly used medicinally under the above name.

AUSCULTATION, *aw'-kul-tai'-shon* (Lat. *auscultare*, to listen), in Med., is a term applied to the method of ascertaining the healthy or diseased state of certain organs, by attending to the sounds they produce, either on being struck, or in the natural performance

of their functions. In a stricter sense, the term auscultation is confined to the latter of these cases, the former being termed percussion. Auscultation is either immediate or direct, by the unassisted ear, or mediate, by means of instruments. This is one of the most important discoveries of modern medical science; for, though Hippocrates gives directions how, by auscultation, fluids are to be detected in the thorax, yet the subject seems to have attracted no attention for many centuries. In 1761, Leopold Avenbrugger, a physician of Vienna, published a small volume in Latin, entitled *Inventum novum ex percussione thoracis humani, ut signo, abstruses interni pectoris morbos detegendi*. The work, however, excited little notice till it was translated into French in 1808 by Corvisart. Soon after this the practice of percussion became general in France and other parts, and was attended with results far more precise and certain than had been anticipated. In 1816 the subject received an immense impetus from Laennec's invention of the stethoscope. (*See* Stethoscope.) Auscultation is chiefly valuable as throwing light upon the diseases of the organs of circulation and respiration in the chest. By carefully studying the varieties of sound (often extremely slight) produced by the organs in health and disease, the skilful physician is able to judge of the condition of these organs with the greatest accuracy, and thus detect and adopt the best means of arresting incipient disease.

Auspicium. (*See* Auguries.)

Australian Manna, *aws-trai'-li-an măn'-na*, a saccharine substance, exuded spontaneously by the leaves of several species of *Eucalyptus*, or gum-tree, natives of Australia. It resembles manna, but does not contain mannite, the sweet principle being a peculiar kind of sugar, to which the name *melitose* has been given. It is said to drop from the leaves of *E. mannifera* in pieces sometimes as large as almonds.

Austral Signs, *aws'-tral* (Lat. *australis*, southern, *signum*, a sign), an expression applied to the last six signs of the zodiac; namely, the autumnal signs Libra, Scorpio, and Sagittarius, and the winter signs Capricornus, Aquarius, and Pisces, because they lie to the south of the equinoctial.

Authentic, *aw-then'-tik* (Gr. *authentikos*, authentic, warranted), is a term applied to something of established authority, something which is what it appears or professes to be. It is usually applied to a writing or document, written by the person, at the time, or under the circumstances, that it asserts or implies. Sometimes a distinction is made between authentic and genuine; the former referring to the statement made by an author, the latter to the authorship itself; but this distinction is not very generally observed. To determine the authenticity of a document is often of the utmost importance, and it belongs to the highest kind of criticism. The proof is of two kinds,—internal, from the form and contents of the document itself, and external, from the evidence of others.

Author, *aw'-thor* (Lat. *auctor*; Fr. *auteur*), is applied to one who creates or produces anything, or one who writes upon any subject, as opposed to a translator or compiler. It is given by way of eminence to God, as the Author of the universe. The term is also sometimes applied to the original inventor or discoverer of any new art or principle.

Authority, *aw-thor'-i-te* (Lat. *auctoritas*), generally denotes a right or power to command and make oneself obeyed; as royal authority, parental authority. In ecclesiastical or religious matters, it is the assumed right of dictation attributed to certain fathers, councils, or church courts. "Authority," says Bishop Hoadley, "is the greatest and most irreconcilable enemy to truth and argument that this world ever furnished." It was by authority that the Jews and heathens combated the truths of Christianity; and it was by the same means that the Roman Catholics attempted to show the falsehood of the principles of the Reformation. Charles II. sagely remarked "that those of the established faith make much of the authority of the Church in their disputes with dissenters; but that they take it all away when they deal with papists." A certain respect for authority, however, which has been termed the "anchor of society," is right and proper. It is when it is put forward with the view of suppressing all freedom of thought or action that it becomes blamable.

Auto, *aw'-to*, is a prefix which enters into the composition of many English words, derived from the Greek pronoun *autos*, self; as *autocrat*, *autobiography*. In some cases it is applied to the subject, as *autocrat*, *automaton*; in others to the object, as *autobiography*, *autocritic*; and sometimes it denotes a mere reference to the subject, as *autochthon*. These differences of meaning sometimes lead to ambiguity; as in *autograph*, which means either a machine that writes of itself, or a writing done by one's own hand.

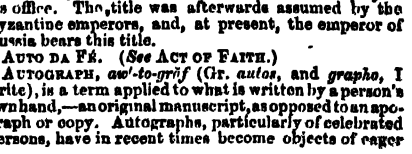
Autobiography, *aw'-to-bi-og'-ra-fe* (Gr. *autos*, self; *bios*, life; and *grapho*, I write), is a biography or life of a person, written by himself. If a well-written biography be interesting and instructive, much more so is a well-written autobiography. In the former case the actions of the individual are looked at from a distance, and their motives judged of by appearance; in the latter the actions are at hand, and the motives are in general well known. In the latter case we learn how the man himself viewed his actions and motives; in the former, how they appeared to others. It is almost impossible, and, perhaps, undesirable, that an autobiographer should disclose with unflinching impartiality the whole particulars of his life, and unveil the real motives of his actions; but even the attempt to conceal them becomes of itself a species of disclosure. He betrays himself when he least suspects it; and the more cautious he is to conceal his weaknesses, the more manifest do they appear. The chief merits of an autobiography lie in its being made as sincere and complete as possible. In this way it becomes valuable in a psychological point of view, as throwing light upon the mental conditions of man. Among the most celebrated works of this class are the "Confessions" of Augustine and Rousseau. The autobiography of Göthe (*Wahrheit und Dichtung*), as a work of this class, is of comparatively little value, as it was written in his old age, long after the events, and as it is believed to partake too much of the poetic elements. Another kind of autobiography is that in which the writer does not so much relate the events of his own life, as that of the period in which he lived, or the persons with whom he came in contact. This belongs rather to the sphere of general history.

Autocracy, *aw-tok'-ra-se* (Gr. *autos*, self; *kratos*, power), is that form of government in which the sovereign exercises uncontrolled power, uniting in himself the legislative and executive powers of the state. Almost all Eastern states have this form of government.—In Phil., the term is used by Kant to denote the mastery of the reason over the rebellious propensities.

Autocrat, *aw'-to-krăt* (Gr. *autos*, self; *kratos*, power), a person vested with absolute independent power; a sovereign who rules uncontrolled. The title was first given by the Athenians to a commander-in-chief, vested with undisputed powers, and not liable, like others, to be called to account at the expiry of his office. The title was afterwards assumed by the Byzantine emperors, and, at present, the emperor of Russia bears this title.

Auto da Fé. (*See* Act of Faith.)

Autograph, *aw'-to-grăf* (Gr. *autos*, and *grapho*, I write), is a term applied to what is written by a person's own hand,—an original manuscript, as opposed to an apograph or copy. Autographs, particularly of celebrated persons, have in recent times become objects of eager



AUTOGRAPH.

pursuit, and form a branch of literary trade. The autograph of Shakspere now in the British Museum cost £100; that in the library of the city of London

6158. In general the value of an autograph depends upon the eminence of the individual, the scarcity of specimens of his handwriting, and the contents of the writing. Lithography has been very useful in affording the means of making facsimiles of autographs. The first English work in which a series of facsimiles of autographs appeared, was Sir John Fenn's "Original Letters from the Archives of the Paston Family," 1787. Among the best works of this class are, "Autographs of Royal, Noble, Learned, and Remarkable Personages conspicuous in English History from the Reign of Richard II. to that of Charles II.," by John Gough Nichols, folio, 1829; "Iconographie des Hommes Célèbres," 3 vols., Paris, 1828-30, Supplement, 1830; "Autographen-Prachtalbum zür 200 jährigen Gedächtnissfeier des Westfälischen Friedenschlusses," folio, Leipsic, 1848. Lavater believed that the character of an individual was shown by his handwriting; and recently persons have professed to be able to determine characters in this way. There are, however, generally so many circumstances that have an influence in forming one's handwriting, independent of self, that it is but seldom that it can afford much insight into character.

AUTOMALITE, *aw-tom'-á-lite*, a species of corundum, found in octohedra. It consists principally of alumina and oxide of zinc, and generally occurs associated with zinc-blende and glance.

AUTOMATIC ACTIONS, *aw-to-măt'-ik*, is a term applied in Psychol. to certain muscular movements which are influenced simply by sensation, and not at all by the will; as winking.

AUTOMATON, *aw-tom'-a-ton* (Gr. *autos*, self, and *mao*, I move), a machine so constructed as to move in imitation of the actions of living animals. The term *android* (from the Gr. *anor*, a man) is also applied to pieces of mechanism built in the form, and imitating the motions of man. The ingenuity expended upon some of these remarkable contrivances is very surprising. Four hundred years before the Christian era, Archytas of Tarentum is said to have constructed a wooden pigeon that could fly. Albertus Magnus made an automaton to open his door when any one knocked. The speaking head of Roger Bacon is a familiar tradition. Regiomontanus invented a wooden eagle, that flew from the city to welcome the emperor's return, and an iron fly, that flew about the room, and then returned to his hand. These ancient instances are no doubt exaggerated, if not entirely untrue; but, in modern times, the construction of many extraordinary automata has been well authenticated. The flute-player of Vaucanson is fully described by M. d'Alembert in the *Encyclopédie Méthodique*, art. Androide. It was exhibited in Paris in 1738. It played on the flute after the exact manner of a living performer, and commanded three octaves, the fullest scale of the instrument, containing several notes of great difficulty. Its height was nearly six feet, with a pedestal, in which some of the machinery was contained. Two automaton flute-players, of the size of life, were exhibited in this country some years ago. They performed ten or twelve duets. M. Camus constructed an automaton group for the amusement of Louis XIV. It consisted of a coach and horses, with a coachman and page, a lady inside, &c. When opposite the king, the horses stopped, the page got down and opened the door, the lady alighted, presented a petition, and re-entered the carriage; the page then shut the door, the carriage drove away, and the servant ran after and jumped up behind it.—(*Ref.* Hutton's *Mathematical Recreations*, vol. ii. p. 95.) In 1741 Vaucanson produced a flageolet-player, which beat a tambourine with its right hand while it played the flageolet with its left. He also constructed a duck, which swam, drank, dabbled in the water, and quacked like a real duck, raised and moved its wings, dressed its feathers with its bill, took barley from the hand, swallowed it, and even digested its food by means of materials provided for its solution in the stomach. The inventor made no secret of the machinery employed. Maelzel, the inventor of the metronome, exhibited an automaton trumpeter at Vienna, which is described in the *Journal des Modes* for 1809. It was a martial figure, attired as a trumpeter of the Austrian dragoon regiment Albert, and played, not only the Austrian cavalry march, and all the signals of that army, but also a march and an allegro by Weigl, which was accompanied by the whole orchestra.—(*Ref. Dictionary of Musicians*, London, 1827.) Many other automata are described by Hutton, one of which drew likenesses, another played on the pianoforte, &c. The famous chess-playing automaton is considered a solved mystery,—a boy was concealed inside the figure. The last remarkable automatic group was exhibited in London in 1856. A monkey clapped his jaws together as he held a violin; a hare browsed upon a cabbage; a goat uttered an audible cry; a child that had been sleeping in a cradle woke up uneasily, and screamed loudly for its "pa" and "ma." All these figures were excellent imitations of the originals, except the child, which was a failure.

AUTONOMY, *aw-ton'-o-me* (Gr. *autos*, self, and *nomos*, law), denotes that kind of government in which the citizens of a state make their own laws and manage their own public affairs. In Phil., the term was used by Kant to denote the sovereignty of reason over all our actions, as opposed to heteronomy, in which our actions are directed by motives or desires contrary to the dictates of reason.

AUTOPSY, *aw'-top-se* (Gr. *autopsia*, from *autos*, self, and *opsis*, sight), denotes personal observation, and is applied to the knowledge which one acquires by ocular observation, in contradistinction to that which is communicated to him by the accounts of others.

AUTREFOIS ACQUIT, *otr(e)'-fwaw ak-it* (Fr., previously acquitted), in Law, is a plea by a person indicted of a treason or felony, that he was heretofore acquitted of the same treason or felony; for no one shall be brought into danger for the same offence more than once. An acquittal upon an indictment for murder may be pleaded in bar of another indictment for manslaughter, because the defendant might have been convicted of manslaughter on the first indictment. On this plea, in cases of felony, the prisoner must plead over to the felony at the same time, so that he may be tried for the latter if the former be not allowed. In cases of *misdemeanours*, as the defendant cannot plead over, the judgment upon a plea of *autrefois acquit*, which is in bar, is final, and sentence will be pronounced against him, if the plea be not sustained.

AUTREFOIS CONVICT (Fr., previously convicted).—A man convicted of an offence may plead such conviction in bar of any subsequent indictment for the same offence of which he was convicted.

AUTUMN, *aw'-tum* (Lat. *autumnus*), is the name of one of the four seasons of the year,—that in which the fruits of the earth are gathered in. Astronomically speaking, it is the period during which the sun is passing from the autumnal equinox to the winter solstice (from 23rd September to 21st December). The inhabitants of the southern hemisphere have spring when those of the northern have autumn.

AUTUMNAL EQUINOX. (*See* EQUINOX.)

AUXILIARY SCREW. (*See* SCREW-PROPELLER.)

AUXILIARY VERBS, *awx-il'-ya-rz* (Lat. *auxiliari*, to help or assist), in Gram., are those helping verbs by which other verbs are principally conjugated. They are also termed relational verbs, as denoting the relations of action, and as distinguished from notional verbs, which imply notions of action. They are divided into auxiliary verbs of tenses, and auxiliary verbs of mood. The modern languages, particularly our own, abound in such forms; and the ancient languages of Greece and Rome were not without them.

AVA, *a'-va*, an intoxicating liquor used by the South-Sea islanders. It is also known under the names of Cava and Arva. In Tahiti, the use of it is said to have swept off many of the inhabitants. In the Tonga islands it is prepared and drunk on every festive occasion; and in the Feejee islands the preparation of the king's morning drink of ava is one of the most solemn and important duties of the courtiers. The use of ava was forbidden in the Sandwich islands some years ago. The liquor is prepared by a very disgusting process from the root of the intoxicating long-pepper shrub, the *Macropiper methysticum* of botanists. The root, either fresh or dried, having been scraped clean and cut into small pieces, is handed to the ava-makers, who at once commence to chew it with great formality. The pulp obtained by the chewers, who are required to have good teeth and clean mouths, is

thrown into a bowl and mixed with cold water. After this mess has stood for a little while, the liquor is strained from the chewed fibre through cocoa-nut husks, and is then ready for use. Professor Johnston, in describing the preparation of *ava*, suggests that the saliva may produce a chemical change in the ingredients of the root, and that the intoxicating properties of the liquor may depend, in some measure, upon such change.

AVALANCHE, *áv'-a-lansh* (Fr., from the Lat. *ad*, to, and *valles*, valley), an accumulation of snow descending from the precipitous slopes of a high mountain into the valley below. Avalanches generally result from the partial melting of the snow in spring. The earth, warmed by the rays of the sun, melts the under layer, and thus destroys the adhesion of the mass to its surface. The least agitation of the air will sometimes cause the fall of an avalanche; and for this reason experienced Alpine travellers generally preserve strict silence when in the neighbourhood of dangerous masses of snow. In Switzerland avalanches are common, and sometimes destroy entire villages. Four kinds of avalanches are distinguished. A *drift* avalanche consists of loose and powdery snow, set in motion by a strong wind; a *rolling* avalanche is that produced by a detached mass of snow rolling down the steep, and licking up the snow over which it passes; a *sliding* avalanche consists of an immense mass which has lost its adhesion to the surface through partial melting; lastly, a *glacial* avalanche is that made up of masses of frozen snow and ice from the higher regions of the mountain.

AVANTURINE, *a-vänt'-u-rine*, a chocolate-coloured variety of quartz, containing spangles of gold-coloured mica, which give it a peculiar play of colour, as if metallic particles were dispersed through its mass. It is now made artificially by mixing copper filings with glass while in a state of fusion. Artificial avanturine is far more lustrous than the real mineral. Avanturine felspar owes its glitter to particles of Titanic iron. "The name Avanturine," says Jackson, in his "Minerals and their Uses," "is said to be derived from the following circumstance:—A French workman having by accident, or *par aventure*, dropped some copper filings into a vitreous mixture in fusion, gave the name *Avanturine* to the sparkling mass which was thus produced; and it is still by a similar process, though greatly improved, that the artificial production is now manufactured, to be employed for various ornamental purposes. The artificial far exceeds in brilliancy the natural avanturine. A species of avanturine is also produced by heating pieces of quartz to a certain degree and suddenly cooling them; this occasions a number of minute fissures in the mass, which, by the unequal refraction of the light, gives the stone the desired appearance."

AVARI, OR AVARES, *a-vair'-i*, in Early Hist., is the name of a Mongolian race that, about one hundred years after the Bulgarians, made their appearance in the countries about the Don and Volga. They have been conjectured to be the Aorsi, or Adorsi, of Strabo. A portion of them remained at the Caucasus, while another portion of them, about the middle of the 6th century, passed on to the Danube, and settled in Dacia. Here they served in Justinian's army, assisted the Lombards to destroy the kingdom of the Gepidæ, and gradually conquered, towards the end of the 6th century (especially under the powerful khan Bajan), the region of Pannonia. Afterwards they conquered Dalmatia, made devastating incursions into Germany as far as Thuringia, and into Italy, where they combated the Franks and Lombards, and extended their dominion over the Schavonians, dwelling on the Danube and northwards, as well as over the Bulgarians on the Black Sea. At length, these various nations rose against them, and, in 610, drove them out of Dalmatia. Confined to Pannonia, they were subdued by Charlemagne in 796, and afterwards were nearly extirpated by the Moravians and Petscheneges; so that after 837 they disappear from history. They were wont to surround their settlements with circumvallations of stakes and earth, of which, in the countries which they inhabited, traces are still to be seen, and are known by the name of Avarian rings.—*Ref.* Brockhaus' *Conversations-Lexikon.*

AVAST, *a-vast'* (Aug.-Sax.), in Mar., is an order to stop or pause in any exercise; thus, seamen use the phrase "avast heaving," to desist from drawing in the cable or hawser by means of the capstan.

AVATAR, *a'-va-tar*, in Hindoo Myth., is applied to the incarnations of the deities, or their appearance in some manifest form upon the earth. The word is Sanscrit, and properly signifies a descent, or the act of descending. The number of avatars related of Vishnu and the other deities is very great.—Ref. *English Cyclopædia*—Arts and Sciences.

AVELLANE, *áv-el-lain* (Fr. *avellane*; Lat. *avellana*, a filbert-nut).—In Her., the name given to a peculiar form of cross composed of four hazel nuts or filberts inclosed in their perisparmium or shell.

AVE MARIA, *a'-ve ma-ri'-a* (Lat., Hail Mary), a prayer of the Roman Catholic church to the Virgin Mary, so called from the words with which it commences. It is also called *Angelica Salutatio*, or the Angelic Salutation; these words being the beginning of the salutation which the angel addressed to Mary, as he announced to her that she was to be the mother of the Saviour. The invocation was first used by the priests during mass on the fourth Sunday after Advent, by an ordinance of Gregory I. With the extended worship of the Virgin since the 11th century, the Ave Maria has come to be a lay prayer nearly equal in use with the Pater Noster, and was sanctioned as such at the end of the 12th century. In the first half of the 16th century the prayer came generally to receive, as a conclusion to the earlier formula, the words "Holy Mary, mother of God, pray for us sinners, now and at the hour of our death. Amen." John XXII., in 1326, ordained that every Catholic should, at the ringing of the bells, morning, noon, and night, repeat three aves. The aves are reckoned by the small beads of the rosary, which are hence called Ave Marias, while the large beads are used in the Pater Nosters. To this custom Byron alludes in the following beautiful lines:—

> "Ave, Maria! blessed be the hour,
> The time, the clime, the spot, where I so oft
> Have felt that moment in its fullest power
> Sink o'er the earth so beautiful and soft;
> While swung the deep bell in the distant tower,
> Or the faint dying day-hymn stole aloft,—
> And not a breath crept through the rosy air,
> And yet the forest leaves seem'd stirr'd with prayer."

AVENA, *áv-e'-na*, in Bot., the Oat, a gen. of grasses (nat. ord. *Graminaceæ*). *A. sativa* is the botanical name for the common oat, many varieties of which are cultivated in the north of Europe for the grains. Oats are extensively used as food for man and domestic animals. When deprived of the husks, and coarsely ground, they form oatmeal. When merely divested of their integuments, they are called groats; and these when crushed constitute Embden and prepared groats. Oats are also employed for the production of alcohol. The recent experiments of Professor Buckman, of the Royal Agricultural College, show that the cultivated varieties of the oat are derived from the wild oat, *A. fatua*. This parent species attains the height of from three to five feet, and is a mischievous weed in cornfields. The seeds are covered with stiff bristles of a brown colour, and each is furnished with a long bent awn. About ten years since, Professor Buckman collected some of these seeds, and in the following spring commenced the cultivation of the wild oat in the experimental plots of the Royal Agricultural College. Year by year the seeds were saved, and the interesting transformation of a weed into a productive cereal grass was traced through all its successive stages. In the first year, a lighter-coloured fruit was obtained; in the second, the fruit exhibited a less degree of hairiness; in the third, a greenish, straight, and slender awn took the place of the black rigid one, bent at right angles, which characterizes the wild plant; in the fourth, the fruits were much more plump, owing to the greater development of grain; in the fifth year, the ripe fruit separated from the floral envelope less readily than in the case of *A. fatua*. These changes were reported in 1855, and the professor was encouraged to continue his experiments for a few more seasons. Accordingly, in the spring of 1856, seed, the produce of the pre-

ceding year, was sown in a prepared bed, and the result was a large admixture of two forms or types of crop-oats, one with the flowers all round the stem,—the *potato-oat* form of the farmers, and the other with the flowers all drooping to one side,—the so-called *Tartarian oat*. Since then, Professor Buckman has grown the two sorts so derived, in the field, and with a gradual improvement in point of productiveness and weight per bushel. The same acute observer has lately watched the production of *wild* oats as a gradual degeneration from cultivated ones. The hairy seeds of the wild oat are sometimes used by anglers instead of artificial flies.—*Ref.* Buckman on *Corn*, in *Popular Science Review*.

AVENGER OF BLOOD, *ă-ven'-jer*.—In the early ages, the penalty of death for the crime of murder was not inflicted by any legal tribunal or public authority, but it was considered the duty of the most immediate relative of the victim to hunt and slay the murderer. The Hebrew word *Goël* signified the avenger of blood; it had also a wider signification. The Mosaic law placed this recognized institution of the rude social condition of the times under certain regulations, prohibited the murderer from purchasing by money a ransom for his life, and appointed cities of refuge for the manslayer not guilty of positive murder. The doctrines of the Koran permit the avenging of blood by the nearest kinsman, but allow him to receive money as a commutation for the murder. The Arabs follow the primitive custom to this day. Hereditary feuds of clans, families, and tribes, have always originated in the avenging of blood, of which the Vendetta of Corsica is the most modern and familiar example in Europe.

AVENUE, *ăr'-e-nu* (Lat. *ad*, to, *venio*, I come), an opening, entrance, or passage, by which anything may be introduced. The term is also used in landscape-gardening, in order to distinguish the path leading from some other road, and forming the direct approach to a house. Any broad walk or road, bordered on either side with trees, is also called an avenue. In the latter case the trees may either be in rows on the sides or in clumps at some distance from one another. The trees mostly used in England for avenues are the English elm, the lime, the horse-chestnut, the common chestnut, and the beech. A wide straight street is also called an avenue, as in Washington, in America.

AVERAGE, GENERAL, *ăv'-e-raj* (Fr. *avoir*, to have or possess), in Com., whatever loss or damage is incurred by any portion of a ship or cargo for the preservation of the rest. When such damage accrues, the several persons interested in the vessel, freight, and cargo, each contribute their proportion to indemnify the owner of the part in question, against the damages or expense which has been incurred for the general benefit. It is understood that this allowance is for loss or damage that happens accidentally, and is not a voluntary and purposed loss or damage. General average also implies that the whole adventure has been in jeopardy. Every description of loss incurred on any portion of a cargo during a voyage is denominated average, or, sometimes, particular average.

AVERNUS, LAKE. (*See* vol. I. of this work.)

AVERRHOA, *ăv-er-ro'-a*, in Bot., a gen. of plants belonging to the nat. ord. *Oxalidaceæ*, and consisting of two species, both being small trees growing in the East Indies. They produce sour fruits, which are much eaten by the natives, but which are not relished by Europeans, except when in pickles. The botanical names of the species are *A. bilimbi* and *A. carambola*, and the fruits are known respectively as the Blimbing and the Carambole.

AVES. (*See* BIRDS.)

AVICENNIA, *ăv-i-sen'-ni-a*, in Bot., a gen. of plants belonging to the nat. ord. *Myoporaceæ*. The species are natives of Australia and America, and grow, like the mangroves, in salt marshes. The bark of *A. tomentosa*, commonly called the white mangrove, is much used in Brazil for tanning. *A. resinifera*, which grows in New Zealand, yields a green resinous substance, which is eaten as food by the natives.

AVICULA, *a-vik'-u-la*, a gen. of marine conchifera, the shell of which is imported in considerable quantities, and used, under the name of mother-of-pearl, in the construction of buttons, knife-handles, &c. The real commercial value, however, of this peculiar oyster rests on the real pearls often found in its interior.

AVICULOPECTEN, *a-vik'-u-lo-pek'-ten*, in Geol., a gen. of fossil bivalve molluska, peculiar to the carboniferous limestone, and often so well preserved that even the colours of the living shell are retained.

AVOCADO PEAR. (*See* PERSEA.)

AVOCAT, *ăv'-o-ka* (Fr., from Lat. *ad*, to, and *vocare*, to call).—An advocate in French law answers, in some measure, to a barrister or counsel in ours, with this difference, that the latter cannot, according to the etiquette of the English bar, undertake any matter or cause in which his advice or assistance is required, except through the instructions and retainer of a solicitor or attorney; whereas an avocat corresponds with his client, and acts in the double capacity of counsel and attorney. (*See* BARRISTER, COUNSEL.)

AVOCET, or AVOSETTA, *ăv'-o-set*.—The chief peculiarity of this aquatic bird is the form of its bill. It is very thin, flexible, of a substance like whalebone, and turns hookwise, but in an opposite direction from the hawk and other tribes. The plumage of the avocet is black and white. Buffon makes the bird's bill a subject for lamentation on the blundering of Nature in so ill providing a creature with a means of sustenance. Mudie, however, takes a contrary and a proper view of the matter, and demonstrates that for scooping, probing, and beating the water, while the mandibles act as a strainer and retain the finny prey, the avocet's bill is most admirably adapted. A few years ago, and in the fen-bird season, it was no uncommon thing to find the avocet in the London poultry-market; now, however, they are seldom, if ever, seen so cheaply exposed.

AVOIDANCE, *a-voi'-dans* (Ang.-Nor.), in Law, in the general signification, is where a benefice is void of an incumbent, in which sense it is opposed to plenarty. (*See* BENEFICE.)

AVOIRDUPOIS, or AVERDUPOIS, *ăv-or-du-poiz'* (probably Fr. *avoir du poids*, to have weight), the name given to the system of weights used both in England and America in general commerce. The ounce contains 437½ grains; whereas the ounce in both troy and apothecaries' weights contains 480 grains. There is fortunately but one grain which may be taken as a common unit in comparing the three systems of weights used in Britain. The value of the grain is set forth in the act of parliament 5 Geo. IV. c. 74, in the following words:—"A cubic inch of distilled water weighed in air, by brass weights, at the temperature of 62° of Fahrenheit's thermometer, the barometer being at 30 inches, is equal to 252 grains and four hundred and fifty-eight thousandth parts of a grain." The pound avoirdupois contains 7,000 such grains. The lowest term in avoirdupois weight is the dram, which contains 27⅓ grains. The dram is, however, seldom, if ever used now, small weights being expressed either in grains or in fractions of the ounce. The following table displays the comparative values of the different denominations in avoirdupois weight:—

| *Ounces.* | | *Pounds.* | | *Quarters.* | | *Hundredweights.* | | *Ton.* |
|---|---|---|---|---|---|---|---|---|
| 16 | = | 1 | | | | | | |
| 448 | = | 28 | = | 1 | | | | |
| 1792 | = | 112 | = | 4 | = | 1 | | |
| 35840 | = | 2240 | = | 80 | = | 20 | = | 1 |

The usual contractions are as follows:—ounce, oz.; quarter, qr.; pound, lb.; hundredweight, cwt. There is a very useful rule for reducing a large number of pounds to hundredweights roughly, which may be given here. This rule may be thus briefly expressed:—*From all but two figures take all but three. Example:* 17,684 lbs. contain 159 cwt., the sum being got at thus:—

176 (all the figures except two)
17 (all the figure except three)

159

When the number of hundredweights exceeds 100, the error can never be greater than two. In compounding and prescribing medicines, and in weighing the precious metals and precious stones, other systems of weights are used. (*See* APOTHECARIES' WEIGHT, TROY.)

AWARD, *a-ward'*, in Law, is the finding or decision of an arbitrator or arbitrators, or their umpire, on matters in dispute between parties, before or after litigation. No precise form of words is necessary to

constitute an award; it is sufficient if the arbitrator express by it a decision upon the matters submitted to him. If the matters are submitted to the determination of two or more arbitrators, the award should be executed by all, at the same time, and in the presence of each other. The award must be made within the time limited by the order, bond, or agreement of reference, or within such enlarged time as the arbitrators may fix, in cases where such power is reserved to them. The publication of the award dates from the time of its execution. An award may be set aside if it appear manifestly, from the merits, that the arbitrators have acted dishonestly or corruptly; but not if the decision be contrary to law, unless the mistake appear on the face of the award or of another paper delivered with it; nor will the court set aside an award absolutely void or doubtful, unless it is capable of being enforced without suit, but will leave the party to his action upon it. The following are the usual grounds upon which an award may be set aside:—1. That the arbitrators have not pursued the submission in every material point, or have in any other respect exceeded their authority; 2. that the award is uncertain or ambiguous; 3. that it is not final, either by reason of not deciding all the matters referred, or otherwise making subsequent proceedings necessary; 4. that it is inconsistent; 5. that it is illegal; 6. that the proceedings were irregular or fraudulent; 7. that the arbitrators have misconducted themselves; 8. that it appears *on the face* of the award that the arbitrators have mistaken the law; 9. that it is bad in part not separable from the residue. The performance of an award may be enforced,—1. By action, where there is no cause in court, or the instrument of reference does not contain a clause that the submission shall be made a rule of court; 2. where the submission contains such a clause, by action, attachment, or execution, as the practice of the court in either case may warrant. An award must be stamped with the following duty:—where the amount or value in dispute shall not exceed £50,—2*s.* 6*d.*; £100,—5*s.*; £200,—10*s.*; £300,—15*s.*; £750,—£1; £1,000, and in all other cases not provided for, £1. 15*s.* (*See* ARBITRATION.)

A-WEATHER, *weth'-er* (Ang.-Sax.), in Mar., a term signifying that the situation of the helm is to the weather side of the ship, in contradistinction to *a-lee*.

AWEIGH. (*See* ANCHOR.)

AWN. (*See* ARISTA.)

AWNING, *awn'-ing* (Gothic, *hulyan*, to cover), in Mar., a canopy of canvas or tarpaulin spread over a boat or the ship's deck, as a protection to officers and crew against too great solar heat, or to preserve the deck. The awning is generally supported by a range of light posts called stanchions, erected along the right and left sides of a ship: in the middle it is supported by a complication of small cords called a crowfoot. The term is also applied to that part of the poop deck which is continued forward beyond the bulkhead of the cabin.

AXE, *ax* (Sax. *æex*), an iron instrument, generally used with both hands in hewing timber and chopping wood. It consists of a head with an arching edge, and a handle. There are several forms of the axe, the two principal being the broad axe for hewing, and the narrow axe for cutting and rough-hewing. The hatchet is a smaller form of the axe, and is used with one hand.

AXE-STONE, a green variety of jade found in New Zealand and on the banks of the Amazon, and used by the natives for making hatchets.

AXIL, AXILLARY, *ax'-il* (Lat. *axilla*, armpit), in Bot., the upper angle formed by the leaf with the stem is called the *axil*, and everything arising at that point is said to be *axillary*. Buds are usually axillary. Anything springing from the stem, either above or below the axil, is *extra-axillary*; if above, it may be described as *supra-axillary*; if below, as *infra-axillary*.

AXILLA, *ax-il'-la* (Lat.), is applied in Anat. to that cavity under the upper part of the arm called the armpit. Hence the term axillary is applied to the arteries, veins, glands, &c., of this part.

AXINITE, *ax'-e-nite* (Gr. *axine*, an axe), a variety of garnet found in mica-schist in Dauphiné and Cornwall; so called from the axe-like form of its crystals.

AXIOM, *ax'-i-om* (Gr. *axioma*, worth, authority), is properly a self-evident proposition of a theoretical character. It was originally applied to geometry by Aristotle, in which science it means a proposition which it is necessary to take for granted; yet Euclid did not employ the term. What we now call axioms were denominated by him *common notions*. It came into pretty general use in the 17th century in this country. A consideration of the reasoning process is sufficient to indicate the necessity for general axioms; for, whether we deduce or induce, we must either begin with the indemonstrable or end in it. Lord Bacon himself employed the term axiom to denote an empirical law, gained by an induction from particulars. This use of the word is somewhat irregular. In any process of demonstration, the deduction of propositions from the comparison of other propositions must begin somewhere, so that there must be at least two propositions to begin with, whose evidence must be derived from other sources than reasoning. They must at last fall back upon the native intuitions, or instincts, or data of the mind for these first principles or axioms of all reasoning. Every attempt which has been made to dispense with these primary data of consciousness has failed; and the persons who have made the attempt have only been wiled on to their own destruction by some subtle paralogism. The axioms, or, more properly, the "common notions," employed by Euclid in geometry have been for the most part employed by other writers, and are obviously constructed with no very close regard to the distinctions of metaphysics. Among them, or attached to them, we usually include the postulates, or things demanded to be done. The whole of these axioms of geometry may be conveniently divided into three classes,—1. Those in which the truth is asserted in the direct meaning of the words employed, and which it is impossible to deny until the meaning of the words is altered. Such are the 8th and 9th of Euclid's axioms. 2. Those which are true of all magnitudes and spaces alike, with no exclusive reference to geometry. Such are those from 1 to 7 of the axioms of Euclid. 3. Those which have a direct bearing on geometry itself; as the three postulates and the last three axioms of Euclid. Many other assumptions are to be met with in the reasonings of Euclid not to be found in this formal announcement of the axioms or common notions. But these are so trivial, that no one, except a close scientific reasoner, will be likely to find fault with them, if he can discover them at all. Every science has its axioms, elementary principles, or leading ideas, around which all the rest gravitate as towards a centre. This is essential to the existence of any body of knowledge, without which it would crumble down into a series of empirical details.

AXIS (Lat., a pole, or axle-tree), a term common to all the sciences, being applied to any line about which objects are symmetrical, around which they turn, or to which they have some common relation. In Astron., the term is applied to an imaginary line passing through the centre of a heavenly body in a direction perpendicular to the plane of rotation. The axis of the earth is that diameter about which it revolves with a uniform motion from west to east. The poles of the earth are the points where the axis meets the surface. The sphere of the heavens, that is the imaginary spherical surface of infinite radius of which the earth is the centre, necessarily appears to revolve about the same axis, but in an opposite direction. The poles of the heavens are the points of this imaginary sphere to which the earth's axis is directed. The axes of the horizon and equator are lines drawn through the centres of these great circles, and at right angles to their planes.—In Bot., the term axis is applied to the central part both above and below ground, around which the whole plant may be said to be arranged. The stem is called the *ascending axis*; the root, the *descending axis*.—In Geom., the word axis is used to denote a right line around which a plain figure revolves to produce a solid. Thus, a semicircle, by moving round its diameter, describes a sphere, the axis of which corresponds to the diameter; a right-angled triangle, by turning round on its perpendicular, in like manner describes a cone, of which the axis is that perpendicular. The word is generally employed to designate a line which we may conceive to be drawn from the summit of a regular figure to the centre of its base.—In Phys., the

word is used in many different senses. The *axis of a lens* is an imaginary line joining the centres of the two opposite surfaces of the glass. The *axis of a telescope* or *microscope* is a right line which passes through the centres of all the lenses in the tube. The *axis of the eye*, or *visual axis*, is the right line passing through the centres of the pupil and crystalline lens. The *axes of a crystal* are imaginary lines, about which the planes are symmetrically arranged. The *axis of rotation* is the line around which a body turns when revolving. The *axis of oscillation* is a line passing through the point about which an oscillating body—a pendulum, for instance—makes its vibrations.

Axis Deer, *ăx'-is* (*Cervus axis*), a deer peculiar to India. It is about the size of the fallow-deer; its ground-colour is pale red; a white line runs along its sides, dividing the under from the upper parts of the body, which is prettily spotted with white spots. Hunting the axis is a favourite sport, and its flesh is esteemed a great dainty.

Axle-tree, *ăx'-l-tre* (Sax. *eax*, and *tree*), a piece of timber, or bar of iron, fitted for insertion in the hubs or naves of wheels, on which the wheels turn. Since the general use of locomotives, elaborate inquiries have arisen among engineers as to the theory of axles. Mr. Yorke, in 1843, contended for the superior strength of hollow axles; but his opinion is disputed by others. Among the recent improvements in form and mechanical action, may be mentioned Hardy's patent axles which have shown such a remarkable degree of toughness that, in 1849, the privy council granted a continuation of the patent. In a treatise on railway axles, Mr. Bessemer attributes the cause why the axles of railway carriages break more frequently than those of a road carriage, in spite of the fact that the one go upon smooth rails while the other pass over rough and uneven surfaces, to the oscillation of a railway carriage, and proposes the use of a compound axle so formed that its two halves may yield a little during oscillation. Rowair's patent axles were invented to reduce the amount of friction usually excited by the action of the wheel. For the axle in common use is substituted a small centre-revolving arm, along which are fitted five or six rollers closed at each end: the sheath over the small roller revolves with very little friction. The arm is turned truly parallel, with a bevelled shoulder to fit a corresponding bevel on the rollers, and a screw-nut is fitted in the extremity of the arm, having also a bevelled shoulder. The rollers are fitted into and carried by two rings in such a manner that they are perfectly free to move on their centres, and, when placed on the arm, are free, also, to move round it without lateral motion, being confined by the bevels. By this contrivance the bearing is transferred to the surfaces of the rollers, and does not affect their centres.

Axolotl, *ăx'-o-lotl* (*Siren piscifórmis*), an amphibious animal, chiefly peculiar from possessing, at the same time and always, both gills and lungs, thus enabling it to breathe air and water, according to pleasure or exigence. It is about 9 inches long; head broad and flat; the eyes situated near the muzzle; the tail nearly as long as the entire body, and compressed at the sides, like that of the common water-newt. It is of a uniform brown colour, thickly mottled with small black spots. The axolotl is very common in the lakes of Mexico, and, according to Humboldt, likewise inhabits the cold waters of mountain lakes at much greater elevation above the level of the sea than the plains surrounding that city. Dressed after the manner of stewed eels, it is sold commonly in the market-places of Mexico.



AXOLOTL.

Axotomous, *ăx-ot'-o-mus*, in Min., a term applied to minerals cleavable in the direction of their axis.

Axe-axe, *ai-ai* (*Cheiromys madagascariensis*).—This animal, in many accounts confounded with the *ai*, or sloth, has lately attracted much attention, and is now regarded as a connecting link between the Rodents and the Quadrumana. When first discovered, it was supposed to be a species of squirrel. It burrows underground, and is altogether a nocturnal animal. It has large flat bat-like ears, and its tail is long and bushy.



AYE-AYE.

Each fore-hand has five fingers, the third being singularly attenuated, and provided with a strong claw. The hind-legs are also furnished with prehensile hands. The entire body is clothed with long smooth hair, beneath which is an under-coat of a woolly nature. It measures about eighteen inches from nose to tail, and is found only in the forests of Madagascar, where it feeds on worms and insects.

Ayuntamento, *a-joon-ta-men'-to*, is the name given in Spain to the councils or governing bodies of the towns and villages. This has ever been the most cherished and carefully-preserved institution of the Spanish people; and its existence may be traced to the earliest period of their history. In 1512 much of its influence was lost, and under the Bourbons it was entirely taken away; but, in 1812, the leading features of the old system were restored by the Cortes. On the return of Ferdinand VII. the ayuntamentos were abolished; but they were again restored by the Cortes in 1823. During the civil war they were once more set aside; but in 1837 the constitution of 1812 was restored. The attempt made in 1840 to restrict their powers led to the expulsion of the queen; but the measure was carried in 1844, by which their functions are limited to municipal matters.

Azalea, [illegible] habitat of the [illegible] to the nat. [illegible] consisting of shrubs remarkable for the beauty and fragrance of their flowers. Many of the species are extensively cultivated as ornamental plants: of these, the most common is *A. pontica*, a shrub from three to five feet high, with orange, red, or nearly white flowers. It is a native of the countries around the Black Sea, growing luxuriantly on the mountain-slopes, and often giving great brilliancy to the landscape. The whole plant is narcotic, and Trebizond honey owes its poisonous properties to the bees feeding on the flowers. The poisonous honey mentioned by Xenophon in his account of the "Retreat of the Ten Thousand" was of a like nature. Some of the finest species in cultivation are natives of North America: of these, the most deserving of notice are *A. nudiflora*, called, on account of its sweet odour, the upright honeysuckle, and *A. viscosa*, which, with *A. pontica*, have become the parents of numerous beautiful hybrids. The delicate azalea of the greenhouse, *A. indica*, is, as its name implies, a native of India. This species has lately met with a rival in

*A. lodifolia*, an evergreen, which has been brought to this country from China. The azaleas are closely allied to the rhododendrons.

AZIMUTH, *ăz'-e-muth* (Arab. *al samt*, the way, tract, or quarter).—The azimuth of any heavenly body is the angular distance between the north or south point of the horizon and another point in the same, where it is cut by a vertical circle, or circle of altitude, passing through the heavenly body itself and the zenith of the observer. It is taken by aid of an altitude and azimuth instrument and a theodolite. The term azimuth circle is sometimes applied to vertical circles, the planes of which are perpendicular to the plane of the horizon. The magnetic azimuth is the angular distance between the point in the horizon cut by the azimuth circle of any heavenly body and the meridian of the magnetic pole. The sun's magnetic azimuth is found at sea by means of an azimuth compass. (*See* COMPASS.) An azimuth, or analemmatic dial, is one in which the dial-plate is parallel to the plane of the horizon, and the gnomon, or stile, at right angles to it: the hour-points are marked in the periphery of an ellipse.

AZOBENZIDE, *ă-zo-ben'-zide*, a substance obtained by the action of an alcoholic solution of potash on nitrobenzole. It crystallizes in large reddish-yellow crystals. It must not be confounded with nitrobenzole or nitrobenzide, which is benzole in which an atom of hydrogen is replaced by an atom of peroxide of nitrogen; whereas, in azobenzide, it is replaced by an atom of nitrogen only.

AZOLITMIN, *ă-zo-lit'-mi-um*, the principal constituent of litmus: it is amorphous, of a brown-red colour. It is insoluble, or nearly so, in alcohol and water, but dissolves readily in ammonia, with which it forms a blue solution.

AZOTE, *ăz'-ote* (Gr. *a*, not, and *zoe*, life), the old name for nitrogen. Nitrogen was so called from being destructive to life; but as numerous other gases have the same properties, the word has been almost given up by English chemists, except in such words as *azotized*, *azobenzole*, &c. The French, however, still use *azote*, *azotique*, *azotate*, &c., for nitrogen, nitric acid, and nitrate.

AZTEC CHILDREN, *ăz'-tek*.—In 1853 two children, a boy and a girl, were brought over to this country from America. Their ages were said to be respectively seventeen and eleven; but their appearance warranted a supposition of their being much younger. Their height was not three feet. Their figures were slight and well-proportioned, and their faces of remarkable peculiarity. Their foreheads and chins receded almost abruptly; and their noses, which were of the Jewish type, were singularly prominent. Their eyes were dark and expressive, and their complexions a transparent olive-colour. They possessed great animal spirits, and were fond of music. They were exhibited to the public as curiosities, and attracted a number of spectators. They spoke no known language, but understood a few words of English. The exhibitor represented them to be descendants of the ancient Aztecs, and related a most improbable story of their having been stolen from the city of Ixamaya, where they were worshipped as gods. A Señor Velasques, with a Canadian and an American, explored the interior of a portion of Central America, where they formed the acquaintance of the priest under whose guardianship these diminutive deities lived. This priest was so impressed with the tales told by the travellers of the wonders of the exterior world, that he resolved to carry off the gods of his country. The priest, the Canadian, and the American, either perished by the way or were lost in the forests, and Velasques alone remained to tell what story he pleased, without the fear of contradiction. Professor Owen pronounced the two singular specimens of humanity to be merely dwarfs, or monstrosities of Indian parentage; and this opinion becoming general, all interest in the exhibition of the Ixamayan child-gods ceased. (*See* MEXICO, ANTIQUITIES OF.)

AZURE, *ă'-zhure* (Fr., light blue), in Paint. a sky-coloured blue. The colour made of lapis lazuli, called ultramarine, is held in great estimation by painters. —In Her., a term used to denote the blue colour in armorial bearings. In heraldic engraving it is distinguished by parallel lines crossing the field or charge in an horizontal direction. The old heralds considered it the symbol of truth and constancy.

AZURE-STONE. (*See* LAPIS LAZULI.)

AZURITE, *ă'-zhur-ite*, a mineral found in mica-schist, so named from its colour. It is also called *lazulite*, from its faint resemblance to *lapis lazuli*, with which it must not be confounded. It consists of phosphate of alumina, magnesia, and protoxide of iron.

AZYGOS, *az'-e-gos* (Gr. *a*, not, and *zugos*, a yoke), in Anat., is applied to certain parts of the human body that have no yoke or fellow,—that, in other words, are single.

## B.

B, the second letter in the alphabet of all European and most other languages. It belongs to the order of labials; so called because the lips are the principal organs employed in their pronunciation, and it is the medial letter of the order. It is closely allied to the other labial letters, *p* and *v*, with which it readily interchanges. In modern Greece, Spain, and some parts of France, *b* is pronounced like *v*; and hence the sarcastic remark, that in Gascony *vivere* (to live) and *bibere* (to drink) are the same thing. As a numeral, B was used by the Greeks and Hebrews to denote 2; but among the Romans it denoted 300, and with a dash over it, 3,000.

BAAL, *bai'-al* (Heb., lord, owner), a god of the Chaldeans, Babylonians, and Phœnicians, and, indeed, the principal deity of many of the Oriental nations. The Israelites often abandoned the worship of the true God to adore this idol. Incense was the offering most commonly presented; but we read in the Bible that human sacrifices were sometimes made to him. There were a number of idols of a secondary rank bearing the name of Baal; such as Baal-Berith, "the covenant lord," a divinity of the people of Sechem; Baal-Peor, the Priapus of the Midianites and Moabites; and Baalzebub, the Philistine idol at Ekron.

BABA, *bă'-ba*, is a Turkish word, signifying 'father.' In Persia and Turkey it is prefixed, as a title of honour, to the names of distinguished ecclesiastics. It is often also annexed, by way of courtesy, to the names of other persons; as Ali-Baba.

BABBLING THRUSH. (*See* THRUSH.)

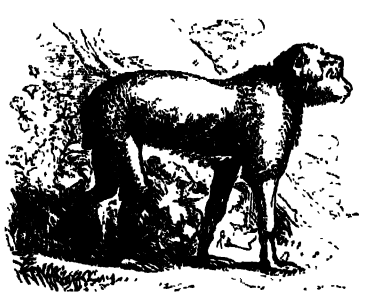
BABEL, TOWER OF, *bai'-bel* (Heb. *babel*, confusion). —The descendants of Noah, hoping, probably, to make a place of refuge for themselves in case of a second deluge overspreading the earth, are mentioned in Genesis xi. as building this tower of brick, cemented with bituminous slime, in the plains of Shinar, in the year 2247 B.C. The Almighty, to punish them for their act of impiety, and their want of faith in his promise that he would not destroy the world again by water, confounded their languages, so that the words used by the men of one party became utterly unintelligible to those of another. A separation of the different groups immediately took place, and in this is found the origin of the various nations that are so widely spread over the earth's surface. Eastern travellers have assigned the position of the Tower of Babel to three different masses of ruined brickwork in the plains of Babylon. Two of these are near the town of Hillah, on the Euphrates, which is supposed to be built on or very near the site of ancient Babylon; namely, the *Birs Nimroud*, six miles to the south-west of the town, and the Mujellibe, five miles north of it, and rather more than half a mile from the Euphrates, on its east bank. The third place which claims to represent it is the tower of Nimroud, near Akkerhuf. The majority of those who have made researches in Babylonia are in favour of the Birs Nimroud. The superstructure stands on an immense platform, similar to those usually constructed by the Assyrians for the elevation of their public buildings, which bears traces of the destructive influence of time and long exposure to the elements. It is built of fire-baked bricks, well-cemented together, and is oblong in form, measuring about 760 yards round the base. The height on the eastern side is reduced to about 60 feet; but on the west it is about 200 feet high, towering upwards in the form of a cone; and on the top of this is an irregularly-

shaped mass of brickwork, separated by rents and fissures extending from the summit to its base. Huge bricken fragments, rent from the original building, and bearing the appearance of having been subjected to the action of fierce heat, lay in confusion on all parts of the mound, which has led Sir R. K. Porter to the conclusion, that the destruction of the tower was effected by means of lightning from heaven. It is supposed that a temple, in honour of Belus or Nimrod, was built on the remains of the Tower of Babel, which has in turn met with total destruction, and added to the ruins which encumber the platform.

BABIANA, *bāb-e-ā'-na*, in Bot., a gen. of plants belonging to the nat. ord. *Iridaceæ*, and including numerous species, all natives of the Cape of Good Hope. The name is derived from *Babianes*, a word employed by the Dutch colonists to distinguish these plants, because their round subterraneous stems are greedily devoured by baboons. The leaves of all the species are narrow, plaited, and sword-shaped; the flowers are very similar to those of the gen. *Gladiolus*, and are usually yellow, but sometimes purple, or even scarlet.

BABOOL, *bā-bool'*, the Indian name for the astringent barks of the *Acacia arabica* and *A. Catechu*. (*See* ACACIA, CATECHU.)

BABOON, *bā-boon'* (Fr. *babouin*) (*Cynocephalus*), a gen. of Quadrumana, in which the tail is always short and often rudimentary; the nose is prolonged uniformly with the jaws, and the nostrils open at the end of it, exactly as in the dog. Indeed, in shape of head, the resemblance the baboon bears to the dog is its chief distinctive peculiarity. It has a long and truncate muzzle, cheek-pouches, and sharp claws, and is certainly the fiercest and most repulsive of the Quadrumana. The common baboon (*Cynocephalus papio*) is a native of the coast of Guinea. It is of a uniform yellowish-brown colour, with a shade of light red on the head, shoulders, and extremities, the face, ears, and hands being naked, and entirely black. It is furnished with whiskers, which have a backward direction, but do not conceal the ears. The variegated baboon, or mandril, is the



most remarkable of the genus. The head of this creature is grotesquely large, its face long; it possesses scarcely any forehead, and its snout is blunt and abrupt. The eyes, which are very small, are sunk deeply in the head, and the cheek-bones very prominent, and tinted with violet, purple, and scarlet. The hair rises above the forehead to a peak; and beneath the chin there is a small beard of orange-colour. Round the back of the neck the hair is long, and inclines forward. The hinder parts of the animal's body, commencing from the loins, are marked with a soft violet, which gradually expands to the most vivid red; and very singular does its little stumpy tail look, sticking bolt upright in its crimson setting. Many years ago a mandril was kept at Cross's menagerie, in London. "Happy Jerry" the brute was named; and it was taught to simulate a relish for tobacco and beer. This animal ever retained its natural ferocity with strangers, but was particularly sociable with its keepers. "Happy Jerry's" stuffed skin now adorns the British Museum. Besides the baboons mentioned, there are the zelada of Abyssinia, the chacma of the Cape of Good Hope, and several others.

BABYLONIAN ANTIQUITIES, *bāb-e-lō'-ne-an*. — The archæological remains of the ancient and powerful kingdom of Babylon, except those of their architecture (*see* BABYLONIAN ARCHITECTURE), are but few in number, and of a nature that tends to throw but little light upon the history, manners, and customs of a people that once held predominant sway among the nations of the East, an account of which is chiefly gathered from the historians Josephus and Herodotus. The long level plains of the country, intersected by broad rivers that rapidly overflowed their banks when swollen by rains pouring from the mountain districts to the north, rendered it needful that the land should be protected from injury by lines of embankments, and irrigated at pleasure, to insure fertility, by means of canals and smaller artificial water-courses. Traces of these works are to be found in many places; but the most perfect is the canal now called Nahr-el-Melik, which is supposed to have afforded a means of passage between the Tigris and Euphrates. It fell into neglect and disuse after the occupation of the country by the Saracens, in the 7th century. From the want of stone for building, few monumental records remain to the present day, with the exception of those that lie buried in the ruined masses of mouldering brickwork that represent the stately palaces and temples of the land, some of which have been explored by Layard, Botta, and Rawlinson. Bricks have been discovered bearing names and inscriptions, and carved writings on tablets and circular pillars, in cuneiform or wedge-shaped characters, which, when deciphered, afford scanty landmarks of the history of the monarchy during a long series of years. From these inscriptions, Sir Henry Rawlinson has ascertained that the Babylonians belonged to the Semitic group of nations, speaking an Aramaic dialect which much resembled the Syriac. Astronomical observations were taken and preserved at Babylon, some of which are recorded in the "Great Collection" of Ptolemy, and historical annals were written; but there is much that is uncertain and even mythical about Babylonish history, and the inscribed bricks and stones that have yet been found do not go far to corroborate the long traditional lists of successive imperial dynasties that have been handed down to us. The Babylonians, like the Assyrians, attained a high degree of civilization, which brought about their ruin and final absorption into the Persian empire, by inducing habits of pride, effeminacy, and luxury. The government was carried on by viceroys, called *satraps*. There were three different courts of law for the due administration of justice. They carried on an extensive trade by land and sea with the surrounding nations, and Babylon itself was famous for the manufacture of richly-dyed cloths and carpets. They were an idolatrous people, chiefly worshipping the sun, the god Baal, and the goddess Baaltis, whose rites were similar to those performed in honour of Astarte, the goddess of the Phœnicians. The Chaldeans formed a separate section of the nation, resembling the Levites among the Jews; and to this body belonged the especial care of education and religion, and the advancement of the arts and sciences, which we may reasonably conclude had reached a limit corresponding with that attained by their neighbours the Assyrians. (*See* ASSYRIAN SCULPTURE.)

BABYLONIAN ARCHITECTURE.—The intimate connection between the countries of Babylonia and Assyria, and their respective capitals Babylon and Nineveh, caused a corresponding similarity in their architecture. The same kind of low massive buildings, raised on artificial platforms that towered one above another, connected with flights of broad steps richly ornamented with sculpture, and adorned with magnificent gardens, replete with every flower, fruit, and shrub that could be gathered from the fertile regions of the East, characterised both. (*See* ASSYRIAN ARCHITECTURE.) It will be sufficient here to give a brief description of the general architectural design of the city, as it has been handed down to us by the Greek historians Herodotus and Diodorus and the geographer Strabo. The original city was said to have been founded by Belus or Nimrod; but Semiramis,

the queen of Ninus, who succeeded her husband on the throne of Assyria, was the real founder of Babylon, adding greatly to the city as it stood in her time, surrounding it with a wall, and building many splendid palaces and temples. Its grandeur was subsequently restored and greatly augmented by Nebuchadnezzar, about 600 B.C. According to Herodotus, the city was square in form, with the river Euphrates running through the centre of it. The circumference of the outer walls was 60 miles, which would make each side of the city to be about 8 miles in length. The streets in the centre were broad and straight, cutting each other at right angles, like those of many American towns in the present day. A bridge over the Euphrates connected the two portions of the city on either side of the river. The surrounding walls were said to have been 300 feet in height and 75 feet broad, with 100 gates of brass at equal intervals. This statement must, however, be regarded with suspicion, particularly with regard to the great height assigned to the walls. The chief architectural points of interest in ancient Babylon must have been the great temple of Belus, built on the ruins of the Tower of Babel (*see* BABEL, TOWER OF), now called the Birs Nimroud; the Mujellibe, which has been conjectured by some to be the imperial citadel of the monarchs of Babylon; and the renowned Hanging Gardens, said by some to have been constructed by Semiramis, and, by others, to have been raised by Nebuchadnezzar for his queen Amytis. They were five in number, containing an area of about 20 acres between them. They were in terraces one above another, sustained on arches and columns until they equalled the height of the walls of the city. Broad flat stones were laid on the tops of the arches, and these were in their turn covered with layers of bitumen and plates of lead, on which a considerable depth of earth was placed. The site of these gardens is supposed to be a mound on the east side of the river, called by the Arabs El Kasr. The bricks used in the various structures that adorned the city were better than those prepared at Nineveh, being hardened by fire in kilns, instead of being merely dried in the sun, and, in consequence, more durable, and better adapted to preserve names and inscriptions imparted to them while in a plastic state.

BABYLONISH CAPTIVITY, a term applied to the compulsory residence of the principal families of the kingdom of Judah in Babylon, under Nebuchadnezzar and his successors. In the reign of Zedekiah, king of Judah, about 600 B.C., Nebuchadnezzar first invaded the Jewish territories, and laid siege to Jerusalem. Retiring into his own country, he renewed the attempt to subjugate the Jews, 587 B.C., and succeeded in taking the city, and destroying the fortifications and the temple built by Solomon. Zedekiah had his eyes put out, and, with the chief of his people, was carried captive to Babylon. After the overthrow of the Babylonian empire by Cyrus the Persian, 536 B.C., the Jews were permitted to return to their native land, and the Babylonish captivity, which is reckoned to have lasted from the first invasion under Nebuchadnezzar, was thus brought to an end. The Jews were not in a state of intolerable servitude during this period, but many of them rose to offices of high standing and honour in the court of Babylon, as may be learnt from the histories of Daniel, Esther, Mordecai, and others.

BABYROUSSA, *bāb-i-roos'-sa* (*Sus Babirussa*), an animal of the hog gen., found in a wild state in India and the Indian islands. The animal's chief peculiarity is the possession of two protruding and curved tusks, turned upwards and backwards, so as very nearly to describe a semicircle. The object of this peculiar arrangement is not known, though some of the older naturalists gravely tell us that the use of the tusks is to afford the babyroussa an opportunity of hanging itself to any convenient projection, should it fancy a quiet nap. The same authorities, however, ascribe to the horns of the chamois the same use. The animal is still further distinguished from the common hog by its slender build and the fineness of the bristles that cover its body. It is said that, when closely pursued, the babyroussa will, without hesitation, take to the water, and, by alternately swimming and diving, speedily elude its enemy. Its food is vegetable, and its flesh, according to travellers, superior to dairy-raised pork.

BACCA, or BERRY, *bāk'-ka*, in Bot., a many-seeded pulpy fruit, *inferior* (adherent to the calyx) and *indehiscent* (not opening to allow the seeds to escape). Examples may be found in the gooseberry and currant. The fruit of the grape is called a *uvaculanium*; but it only differs from the bacca in being *superior* (free from the calyx). The name bacca is applied by some botanists to any fruit of a pulpy nature.

BACCHANALIA, *bāk'-ka-nai'-li-a*.—Festivals held at Rome in honour of Bacchus. The institution of these feasts, which were similar to the Dionysia of the Greeks, was first introduced from Greece to Etruria, and thence into Rome. They were held four times annually, and were originally only celebrated by women. The great amount of immorality and debauchery that soon characterized their proceedings called forth the intervention of the senate in the year 568 A.U.C.; it was then discovered that more than 7,000 persons had been initiated, and had bound themselves by oaths of secrecy. The Senate at once decreed that the saturnalia should be abolished throughout Italy, and the festivals were, shortly afterwards, entirely suppressed. (*See* DIONYSIA.)

BACCHANTES. (*See* vol. I. of this work.)

BACHELOR, *bātch'-e-lor* (Fr. *bachelier*; Lat. *baccalaureus*), is one of those words of doubtful etymology which have given rise to many absurd conjectures. Among the various meanings of this word, it denoted, —1. those who cultivated certain lands, called *baccalaria*; 2. ecclesiastics of a lower grade than the other members of a monastery; 3. persons of a military order inferior to knights, who, from want of age, poverty, or other cause, had not yet raised their banner in the field; 4. any young unmarried person; 5. an academical degree. As an academical title, it was first introduced in the theological faculty of the University of Paris in the 13th century, being applied to a candidate who, having passed his examination, was entitled to lecture, without being of the rank of an independent docent or master. Afterwards the word was used in the other faculties as the lowest kind of academical honour. In many countries laws have been enacted against bachelors or unmarried persons. In Greece, by the laws of Lycurgus, and also by those of Solon, celibacy was regarded as a crime; and in Rome unmarried persons were placed under certain disabilities. In this country taxes have been imposed upon bachelors and widowers, and married persons with children in some measure relieved; but more apparently with the view of raising money than from any other object. In 1695 an act was passed, entitled "An Act for granting to his Majesty certain rates and duties upon marriages, births, and burials, and upon bachelors and widowers, for the term of five years, for carrying on the war against France with vigour." Bachelors above the age of 25, and widowers without children, paid 1s. yearly and upwards, according to their rank. In the tax on servants, first imposed by Mr. Pitt in 1785, and continued to the present time, a higher rate is charged for the servants of bachelors; and, in the income-tax of 1798 certain deductions were allowed to those who had children.

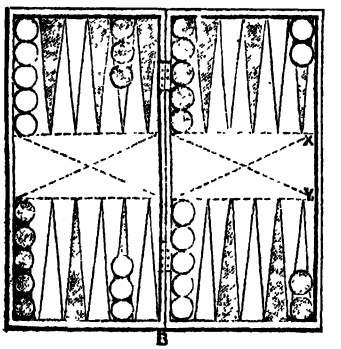
BACILLARIA, *bā-sil-lair'-i-a* (Lat. *bacillum*, little stick), gen. of *Diatomaceæ* (which *see*), consisting of silicious frustules of a prismatic form united into a brilliant chain, often in a zigzag manner. They form beautiful microscopic objects.

BACK, *bāk* (Ang.-Sax.), is that portion of the human body which extends from the neck to the loins, and includes the dorsal vertebræ, the posterior portions of the ribs, and the muscles and skin pertaining thereto. Pains in the back may proceed from a variety of causes; as rheumatism, an affection of the spine, disease of the kidneys, &c.

BACK AND FILL, in Mar., an operation generally performed in narrow rivers, by keeping the ship in the middle of the stream, by advancing ahead from one shore and moving backwards from the opposite shore.

BACKGAMMON, *bāk-gām'-mon* (Sax. *bac*, back, and *gamen*, a game), a game of chance, played by two players, with fifteen black and the same number of white pieces or men, on tables divided into twenty-four points. The movement of the pieces from point to point is regulated

by casting dice alternately from little boxes, with one of which each player is provided. The arrangement of the board and pieces will be more readily understood by reference to the accompanying diagram, in which the men are set in readiness to commence the game; the player using the black men being seated at the upper end of the board, at A, and the one using the white pieces at B. It is the object of the player at A to get all his men into the section of the tables on his *left* hand, or "home," as it is technically called, and "bear" or remove them from the board in accordance with the numbers indicated by the successive castings of the dice, before his adversary can do the same, after getting his pieces into the section on his *right*. The dice are cubes, spotted on the sides from one to six; and, as they are thrown together, any



BACKGAMMON-BOARD.

combination of two numbers can be thrown, from two aces to two sixes. The terms for the numbers on the dice are as follows:—1, ace; 2, douce; 3, trè or tray; 4, quatre; 5, cinque; 6, size. If doublets are thrown, or similar numbers on each die, double the number of points are reckoned. Thus, if two cinques be thrown, twenty points are counted. The points on the board are counted from one to six in each of the four sections respectively, each player commencing from the point in the table opposite to him, on which two men are seen to be placed in the right of the diagram. Thus the player using the white men counts from the point marked X, and his adversary using the black pieces from the point marked Y. Two men can be advanced at once, one for each number turned up on the dice; or one man may be moved forward as many points as the numbers on the dice amount to taken together. When any point is covered by two of an opponent's men, the player cannot put any of his upon that point; but if one only be there, which constitutes what is called a blot, that man may be removed and placed on the centre ledge of the board, and the point occupied. This man must be entered on any vacant point in the "home" section of the tables belonging to the opponent of the player whose man has been taken up, provided the number turned up on either die corresponds with that point, and must then be brought round from the commencement like the men on the ace-points in either table. To win a hit is to remove all your men from the table before your adversary has removed his: this counts one. To win a gammon, which counts two, is to remove all your men before your adversary has brought all of his home; and if your men are entirely removed while your antagonist has one remaining in your home section of the tables, you win a backgammon, which counts three. The Welsh claim to have invented the name, deriving its title from the Welsh words *back*, little, and *gammon*, a battle. The etymology given at the head of this article is that of Bishop Kennett, and is also adopted by Strutt in his *Sports and Pastimes*.—*Ref.* Hoyle's *Games*.

**Backing Warrants**, in Law, is the signing of an authority on the back, by a magistrate of a different county from that mentioned in the body thereof, empowering the officer to execute the same in such other county.

**Backstaff**, *bák'-staff*, in Mar., an instrument used before the invention of the quadrant and sextant, for taking the sun's altitude at sea, and so called from the back of the observer being turned to the sun while making the observation. It was invented by Captain John Davis, a Welch mariner, about the year 1590.

**Back-stays**, *bák-stáis'*, in Mar., long ropes, extending from the top mastheads to the starboard and larboard sides of the ship, their use being to second the efforts of the shrouds in supporting the masts. They are usually distinguished into breast-back stays and after-back stays, the intent of the first being to sustain the mast when the ship sails upon a wind; the second to enable her to carry sail when the wind is farther aft.

**Back-the-Oars**, in Mar., to manage the oars in a direction contrary to the usual method, so that the boat shall move with her stern forward.

**Bacon**, *bai'-kon* (Sax. *bacun*, to bake, or Ger. *backe*, a wild sow), salted and dried pork, made from the sides and belly of a pig. The process of curing is effected by impregnating the flesh with salt, and allowing it to remain in the brine for some time. It is then taken out, dried, and smoked. Bacon-hams are the cured hind-legs. The working classes of England are more particular about the quality of the bacon they consume, and give a higher price for it, than the working classes of any other nation. York, Hants, Berks, and Wilts, are the counties most celebrated for bacon and hams in England; and Dumfries, Wigtown, and Kirkcudbright, in Scotland. Bacon is largely imported into this country from the United States and the Hanse towns.

**Baconian Philosophy**, *ba-ko'-ni-an*, is that system of inductive inquiry inaugurated by the celebrated Francis Bacon, and which consists much more of a Method than of developed scientific results. If the experimental method which he introduced to the notice of the world was neither absolutely new, nor very directly useful, yet it possessed some really novel elements, and had the effect on his immediate successors of overthrowing the old methods of research, and thus of heralding a new era of scientific discovery. The mind of this man (we speak not here of his moral character), as Lord Macaulay has felicitously phrased it, was like the tent the fairy Peribanou gave to Prince Ahmed,—"fold it, and it seemed a toy for the hand of a lady; spread it, and the armies of powerful sultans might repose beneath its shade." If Bacon's Method has not proved quite so useful down to the present time as men might desire, they forget that the author of it had during his day no science exactly developed in the inductive method to act as a model to guide him in laying down his directions for future discovery. No doubt his conception of a scientific Method was magnificent; and the general rules, aphorisms, and wise reflections which dropped from his capacious brain, have served as sign-posts to all subsequent explorers, which they have never ceased to quote with devout admiration. The importance of what Bacon did is not to be measured by his scientific discoveries, for he made almost none, but wholly and solely by the clearness and even novelty of his scientific method. The experimental method has been accused, both by Count Joseph de Maistre, the renowned author of the *Soirées de St. Pétersbourg*, and by Lord Macaulay, in his celebrated Essay on Bacon in the *Edinburgh Review*, of being old, of being useless, and of being afloat in the scientific spirit of the age in which the philosophy appeared. Now there is a shade of truth, but nothing more, in the whole of these objections. To take up the first. No doubt the illustrious Albertus Magnus had previously insisted on some portions of the experimental method, and Bacon's great predecessor and namesake had done so, much more; but no man had, previous to his time, taken into account the radical difference which subsists between "simple enumeration," which belongs to every mind in the world, and the circumspect scientific method which alone renders discovery possible. Roger Bacon had said that "experience alone gives accurate knowledge; reasoning concludes, but establishes nothing." Many philosophers, from the days of Socrates, had insisted strenuously

on induction; but the only system contemplated by them was that which Francis Bacon denominates "induction by simple enumeration," which consists in setting down as general truths all propositions which we have found to be true in every instance. This is the natural and instinctive action of every mind, as we may easily ascertain for ourselves, by watching the talk of the first person we meet. Now Lord Bacon's method was altogether different from this. It consisted of a much wider and more circumspect way of verifying scientific facts than had been disclosed to the world before. His method consisted of "interrogating" nature by observation and experiment; whereas the ordinary way in which induction was gone about previous to his time consisted in the "anticipation," and, of course, in countless instances, the misconception of nature. Man he proclaimed to be the "minister and interpreter of nature," in the first aphorism to his *Novum Organum*, which contains nearly all of his direct contributions to the science of method. He says, again (in Aph. 14), "A syllogism consists of propositions, propositions of words, and words are the signs of notions; therefore, if our notions, the basis of all, are confused, and *over-hastily taken from things*, nothing that is built upon them can be firm: whence our only hope rests upon *genuine induction*." And this genuine induction he explains further on (Aph. 19): he says, "It constructs its axioms from the senses and particulars, by ascending *continually and gradually*, till it finally arrives at the most general axioms, which is *the true but unattempted way*." The uselessness of this method has been answered already; and the third objection, as quite valid, though a little captious, needs no reply. Such, then, are the general characteristics of the Baconian method of induction. A few words as to the details of this method. Before entering on the rules which he lays down for the guidance of future discoverers, he occupies a good number of aphorisms in enumerating the causes of error. These *idols* (*idola*, Gr. *eidola*, which Hallam takes to mean a *false appearance* or divinity, while Playfair and the rest of them adhere to the ordinary meaning of the word *idol*) he divides into four classes,—idols of the tribe, of the den, of the forum, and of the theatre. 1. The *idols of the tribe* are the causes of error founded on human nature in general. Among the idols of this class is the propensity which there is in all men to find a greater degree of order, simplicity, and regularity in things than an accurate observation will warrant. To take an example:—As soon as men perceived that the orbits of the planets returned into themselves, they immediately jumped to the conclusion that they moved in perfect circles, and not in ellipses, as Kepler was the first to demonstrate. 2. The *idols of the den* are those which rise up from the peculiar character of the individual observer, whether natural to him or acquired. Some minds are adapted to note the differences of things; others to catch their resemblance. While one man carefully dissects everything to the minutest detail, another man, of a more active temperament, bounds off on the wings of a resemblance. They both err by excess; the one by being too detailed, the other by not being detailed enough. 3. The *idols of the forum* are those which arise out of the forms of language and from the intercourse of society. Men believe that their thoughts always govern their words; but it often happens to be all the other way. This is provoking; for, words being to a large extent the formation of the rude multitude, we find, when we examine them, little of that delicacy and precision requisite for the processes of science. 4. The *idols of the theatre* are the deceptions which have arisen from the dogmas of different philosophical schools. This last class differs from the other three, inasmuch as it does not arise naturally and spontaneously in the mind, but must be acquired often at the expense of great labour and study. Having now completed these preliminary and very necessary cautions, he proceeds to describe and exemplify the nature of his peculiar method. Our first object, he says, must be to prepare a *history of the phenomena to be explained, in all their modifications and varieties*. This history is not to be without *experiments instituted for the sake of discovery*. Such a record of the phenomena of any occurrence he denominates its *Natural History*. This being ascertained, we must next contrive to discover the *cause* or *form* of these phenomena. The *form* of any quality in a body is convertible with the existence of that quality. Thus, if transparency be the quality which we are inquiring after, of course the *form* of this quality will exist wherever transparency is to be found. *Cause* differs somewhat from *form* in this way; that, while *cause* is only applied when we wish to speak of some change having taken place, form is applied to any permanent quality. Two other subjects which Bacon discusses with considerable minuteness, are those of what he calls the *latent process* and the *latent schematism*. We have an example of the former in the firing of a cannon. The short time that elapses between the application of the match and the expulsion of the ball, constitutes a latent process of a curious and complicated character. The latter, or the latent schematism, is the invisible structure of bodies, on which so many of their properties depend. Thus, the internal structure of plants, or that of crystals, is the internal schematism of those objects. Bacon, besides, insists on the collection of what he calls "negative instances," or those cases in which the form inquired after does not appear. To take our former quality, that of transparency, he would tabulate such occurrences as the following in this inquiry. Pounded glass is not transparent, while glass unpounded is; collections of vapours are not transparent, while a single vapour is; and so on. After a great many exclusions have been made, one of the remaining principles may be assumed as the cause in trying to investigate the origin of any process or phenomenon in nature. We are to reason from this assumed principle, and try if it will account for the phenomenon. So important did this process of exclusion appear to the mind of Bacon, that we find him saying, "It may, perhaps, be competent to angels or superior intelligences to determine the form or essence directly, by affirmations from the first consideration of the subject; but it is certainly beyond the power of man, to whom it is only given to proceed at first by negatives, and in the last to end in affirmatives." Men can now *predict*, whereas, before, they could only vaguely guess. Such is a brief sketch of the wonderful experimental philosophy, which has transformed the world so far since Bacon's day. The benefits which it has effected for mankind, Lord Macaulay sums up as follows: "It has lengthened life; it has mitigated pain; it has extinguished diseases; it has increased the fertility of the soil; it has given new securities to the mariner; it has furnished new arms to the warrior; it has spanned great rivers and estuaries with bridges of form unknown to our fathers; it has guided the thunderbolt innocuously from heaven to earth; it has lighted up the night with the splendour of the day; it has extended the range of the human vision; it has multiplied the power of the human muscles; it has accelerated motion; it has annihilated distance; it has facilitated intercourse, correspondence, all friendly offices, all dispatch of business; it has enabled man to descend into the depths of the sea, to soar into the air, to penetrate securely into the noxious recesses of the earth, to traverse the land in cars which whirl along without horses, and the ocean in ships which sail against the wind. These are but a part of its fruits, and of its first-fruits. For it is a philosophy which never rests, which has never attained, which is never perfect. Its law is progress. A point which yesterday was invisible is its goal to-day, and will be its starting-post to-morrow."

**Bactrian Coins**, *bāk'-tri-an*.—It must be first stated that Bactria is the ancient name of a province now called Balkh, which is situated directly north of Afghanistan, and separated from it by the western part of the Hindoo-Koosh Mountains. It was a powerful country in the early ages of the world; but nothing certain is known of its history. When Alexander the Great overran Asia with his Macedonian and Greek troops, he established a Greek colony there, and fortified a city for its protection. Bactria was tributary to Persia for *fifty years* after the death of Alexander; but was afterwards annexed to the great Syrian empire formed by Seleucus Nicator, about 312 B.C. The Greek element infused into the province of Bactria by Alexander soon became predominant; and in the reign of Antiochus II., surnamed Theos, which lasted from 261 to 246 B.C., Theodotus, the Greek governor of the

country, threw off the yoke of the Seleucidæ, and established the new Greek kingdom of Bactria, ascending the throne under the title of Theodotus I. The records of this comparatively new kingdom are as scanty as those of the ancient one. It was merely known to have existed for about 160 years, and then to have been overthrown by the Scythians, who took possession of the country. The discovery of some Bactrian coins, bearing dates of this period, in burial-places in various parts of Afghanistan, led to a further search, which resulted in the collection of many thousand pieces of money, from which lists of the Greek rulers of Bactria have been compiled by Messrs. Wilson and Prinsep. The following is a list of the first six kings, who seem to have held the country under undivided control until 150 B.C.:—

| B.C. | B.C. |
|---|---|
| 1. 256 Theodotus I. | 4. 190 Demetrius. |
| 2. 240 Theodotus II. | 5. 181—178 Eukratides. |
| 3. 220 Euthydemus. | 6. 155—147 Heliocles. |

From this time until the final subjugation of the country by the Scythians, the different Bactrian coins, bearing names of different persons exercising sovereign power at the same date, or within intervals of two or three years of each other, seem to indicate that the territory was either split up into independent districts, or that internal anarchy and dissension prevailed, and that the ambition of the leading men in the state led to a continual struggle for the sovereignty. The coins are divided by numismatists into two classes,—pure Greek, bearing legends in Greek letters only, including the coins of the first five kings given in the above list; and bilingual, or coins with inscriptions in Greek and Prakrit, a dialect of the Sanscrit language. Many of the bilingual coins are square in form; and the introduction of the elephant and elephant's head, and many regal emblems peculiar to India, show the evident decline of the Greek power, and the introduction of foreign influence into state affairs. There are only two gold coins of the Greek kings of Bactria known to be in existence,—one of Theodotus I., in the Imperial Cabinet of Paris; the other of Euthydemus. All the other pieces of money that have been found are in silver and copper, or billon, a mixture of these two metals.—Ref. *English Cyclopædia*—Arts and Sciences.

BACTRIS, *bāk'-tris*, in Bot., a gen. of Palms, consisting of numerous species, all natives of tropical America. They are mostly small trees, with slender reed-like stems. The fruits, which are small, soft, and sub-acid, are greedily devoured by small birds. Tough fibres, used for making nets, are obtained from the stems of some of the species.

BACULITE, *bāk'-u-lite* (Lat. *baculum*, a staff), in Geol., a straight, many-chambered, conical shell, of the Chalk epoch. In its internal structure it resembles the ammonite. From its prevalence in the chalk of Normandy, that rock has been termed the baculite limestone.

BACULOMETRY, *bak'-u-lom'-e-tre* (Lat. *baculus*, a staff; Gr. *metron*, a measure), the act of measuring distance or altitude by a staff or staves.

BADGE, *bādj*, in Her., a mark of distinction or cognizance, assumed or conferred by royal authority. To the latter class belong the various emblems of the orders of the United Kingdom of Great Britain and Ireland, and other European countries, conferred by their respective reigning monarchs, and all marks of honourable distinction, such as medals, ribbons, and crosses, given by the crown for military prowess, or services rendered by any one to the state in a civil capacity. Under the former class may be reckoned the different crests and distinctive bearings assumed by nations, tribes, and families, in early and mediæval history, which can now be rightfully borne by a grant from the Herald's College only. The earliest mention of heraldic badges is to be found in the Bible, in which each of the twelve tribes of the children of Israel are spoken of under their respective cognisances; such as the lion of Judah, the wolf of Benjamin, and the serpent of Dan. The eagle was the badge of the empire of Rome, and subsequent imperial dynasties have frequently adopted the royal bird as their distinctive emblem. The white horse, now borne in the royal arms of Hanover, was the badge of the Saxons; the raven that of the Northmen and Danes. The white rose was the badge of the house of York; the red rose, that of the rival house of Lancaster; the Tudor family combined the white and red rose, as emblematic of the union of the antagonistic houses. A white hart with a collar round its neck, and a chain, was the badge of Richard II.; a boar, that of Richard III.; a crown in a thorn-bush, that of Henry VII.; the bear and ragged staff, that of the Nevilles, or house of Warwick; the garb, or wheatsheaf, and sickle, that of the Hungerfords. The badges of the different orders of knighthood will be found under their respective headings. (*See* BATH, ORDER OF THE; GARTER, ORDER OF THE; STAR OF INDIA, ORDER OF THE.) The badges of the United Kingdom of Great Britain and Ireland are as follows:—England, a red and white rose, with the royal crown; Scotland, a thistle and crown; Ireland, a harp, and trefoil as well, with the crown; Wales, on a mount vert, a dragon passant, with uplifted wings, gules. The badge of the prince of Wales is three ostrich-feathers, with the motto "Ich dien." The serving-men and retainers of a lower class belonging to noble houses, and the servants attached to gentlemen's families, usually wore their master's crest or badge embroidered on the left arm of the blue coat, that was commonly worn in former days instead of the parti-coloured liveries of modern times.

BADGER, *bādj'-er* (*Meles Taxus*), a carnivorous quadruped inhabiting most parts of Europe and Asia. The badger was placed by Linnæus among the bears, but very properly separated from that group by succeeding naturalists. It is a slow and heavy animal, passing the day in sleep within its complicated burrow, and emerging at night in search of food, which consists indifferently of animal or vegetable matter. It is said sometimes to dig up wasps' nests; and Buffon, who mentions this habit, attributes it to the animal's fond-



ness for honey; but as wasps do not collect honey, the great French naturalist is in error. The badger measures about two and a half feet in length; its legs are very short, and its body flat; its eyes are very small; its neck short and thick; its tail stumpy; and its hide loose and tough. It was this last quality that in ancient times recommended the badger to folks of brutal mind as a fit subject to pit against mastiffs. Badger-baiting used to be a very favourite sport in England; and despite its many disadvantages, the badger's strong jaws and loose skin made it a formidable antagonist for a dog. No matter what part of the badger's body was seized, it could turn and fix its teeth in its assailant, and inflict on it a terrible bite. The flesh of the badger is eaten in Italy, France, and China, and may be converted into hams and bacon. The skin, when dressed with the hair on, is impervious to rain, and is, therefore, considerably used in covering travelling-boxes. Its bristles are made into painters' brushes. To this family also belong the Ratels, or Honey-badgers (*Mellivora*). The best-known species is the Cape Ratel (*Mellivora capensis*), which closely resembles the badger both in size and form, but is, perhaps, heavier in its appearance, and has the nose less developed. Its colours are grey above and black beneath. It burrows like the badger, not only to provide itself with a habitation, but also in search of the nest of the wild bees, of whose honey it is passionately fond. It has the same loose hard skin as the European badger, and in this leathery armour it is said to attack the citadels of these irritable insects with impunity.

BAGASSE, *ba-gas'*, a term applied to the refuse of

the sugarcane, left after the expression of the saccharine juice. It is used as fuel in heating the boilers and pans in the sugar-manufactory.

Baggage, *bág'-gej* (Fr. *bagage*), in Mil., is a term applied to the clothes, tents, provisions, and other necessaries of an army. By the ancient Romans the baggage of an army was termed *impedimenta*, impediments or hindrances. The ancient soldier on the march was always heavily laden; and, in this respect, the ancient and modern systems present a striking contrast to each other. The modern soldier is freed from every unnecessary encumbrance, and waggons are attached to each battalion for conveying the baggage. In our army, no private soldier is allowed to carry anything except what his knapsack and other accoutrements can hold, with the exception of those that are married with consent, who are allowed one small chest each, of a fixed size, which must be carried at their own expense on a march. Staff and pay-sergeants are also allowed one small chest each.—*Ref.* Walshe's *Military Catechism and Handbook*.

Bagnio, *ban'-yo* (Ital. *bagno*), is a bath or bathing-house. It is applied to the prisons in Constantinople, where the slaves or convicts who are employed on the public works are confined at night. The term *bagnes*, applied to the convict prisons of France, is derived from the same root. By older English writers *bagnio* is used for a house of bad fame.

Bagpipe, *bág'-pipe*, a wind instrument of high antiquity, in use with the Hebrews and Greeks, and a favourite piece of musical apparatus with the people of Europe during the Middle Ages. In Scotland, where it is said to have been introduced by the Danes and Norwegians, it is so generally played that it may be called the national instrument of the people. Under various forms, it is still played by the natives of Ireland, the south of France, Italy, Poland, &c. The Scottish bagpipe consists of three parts; first, a leathern bag, which is inflated by means of a tube fitted into it, and stopped by a valve; secondly, four pipes, three called drones, and one the chanter, which latter has finger-holes, and upon which the melody is played. This latter alone emits the wind at the bottom and at the finger-holes. The three first-mentioned pipes, all of which are tuned into a chord, are fastened together in a fan-shape by cords or ribbons, and are so inserted into a socket as, when inflated, to lie up against the left shoulder and arm: from these pipes the wind passes out at the top. The third portion of the instrument consists of a sort of wooden nave or socket, into which the (fixed) ends of the pipes are inserted, and to which the lower end of the bag is firmly attached by wrapping. There is a great difference between the Scottish and the Irish bagpipe. The former is supplied with wind from the lungs of the player; the latter from a small bellows fastened with straps underneath, and worked by, one arm, a tube passing from it in front of the breast to the bag, which is under the other arm. All the pipes in an Irish bagpipe point (slantingly) downwards, one of these having one or more keys upon it, worked by the wrist of the performer, so that the chord may be varied. The tone of the Irish bagpipe is low and sweet. In the Highland regiments of the British service, the bagpipe is played by pipers attired in their national costume. There are, also, certain Highland societies for promoting the skilful playing of the instrument. The annexed illustration will serve to show the form of the bagpipe played by peasants from the mountains before the image of the Virgin during the time of Advent. Within the last few years the instrument has likewise made its appearance in London, where it is played upon by certain picturesquely but dirtily-clad Italian rustics, called *pifferari*.



ITALIAN BAGPIPE.

Bags, *bágz* (Norm. *bage*, a bag), in Mil., filled with sand or earth, are used in field-fortification or other defensive works. Sandbags, which are generally sixteen inches in diameter and thirty high, and filled with sand or earth, are used to repair breaches in the embrasures of batteries when damaged by the enemy's fire or the blast of the guns. They are also placed on parapets, so arranged as to form a covering for men to fire through. Earth-bags contain about a cubic foot of earth, and are used in raising a parapet in haste, where the ground is rocky, or does not afford ready materials for that purpose.

Bagshot Sands, *bág'-shot*, in Geol., a series of lower tertiary beds, consisting chiefly of light yellow sands reposing on the London clay, and occupying extensive tracts around Bagshot, in Surrey, and in the New Forest, Hampshire. They correspond to the Brocklesham beds (which *see*).

Bail, *bail* (Fr. *bailler*, to deliver), signifies the delivery of a man out of custody, upon the undertaking of one or more persons for him that he shall appear at a day limited, to answer and be justified by the law. In civil cases the bail may render their principal at any time; in criminal cases they cannot, unless he fly, or they have reasonable doubt that he will do so. In such case the defendant may be detained and brought before a justice, who may commit him in discharge of his bail, or put him to find new sureties. In civil cases, the bailing is by bond to the sheriff, or by consent given to a judge or commissioner; in criminal matters it is effected by entering into a verbal recognizance. In the former the bail are liable for the amount of the debt, or damages and costs recovered; in the latter, to the amount of their recognizance.

Bailey, *bail'-le* (Lat. *ballium*, probably a corruption of *vallum*, a rampart), originally meant an outer bulwark, but came afterwards to be applied to the area or courtyard within one. It denoted the space inclosed within the walls of a castle. Where there were double walls, the area between the two was called the outer, the area within the inner wall, the inner bailey.

Bailiff, *bail'-liff* (Lat. *ballivus*; Fr. *baili*), according to Sir Edward Coke, is an old Saxon word, which signifies a keeper or protector; and although there are several officers called *bailiffs*, whose offices or employments seem quite different from each other, yet something of keeping or protection belongs to them all. Hence the *sheriff* is considered as *bailiff* to the crown, and his county, of which he has the care, and in which he is to execute the queen's writs, is called his *bailiwick*, and the officers who, by his precepts, execute writs and other process, are called his *bailiffs*. There are, likewise, *bailiffs* of liberties, who are officers under lords who have franchises exempt from the jurisdiction of the sheriff. There are, likewise, *bailiffs* of lords of manors, who collect their rents, levy their fines, attend their courts, and execute their warrants of seizure of escheated property and heriots. There are also bailiffs of forests, and those to whom the queen's castles are committed; as, the bailiff or constable of Dover castle. The chief magistrates in divers ancient corporations are also called *bailiffs*; as in Ipswich, Yarmouth, Colchester, and other places. In common parlance, a bailiff is a person who has the management of an estate or farm, and superintends the same for the owner; and persons who are employed to distrain for rent are called *bailiffs*.

Bailiwick, *bail'-i-wik* (Lat. *balliva*; Fr. *bailliage*), is not only taken for the county, but signifies, generally, that liberty which is exempted from the sheriff of the county, over which the lord of the liberty appoints a bailiff, with such powers within his precinct as an undersheriff exercises under the sheriff of the county; such as the high bailiff of Westminster, Southwark, &c. The queen's writs, however, can be executed by the sheriff or his bailiffs, in a liberty, if they contain a *non omittas* clause, commanding him that, notwithstanding any liberty in his county, he enter the same, and execute the writ, without which he would have no jurisdiction to do so.

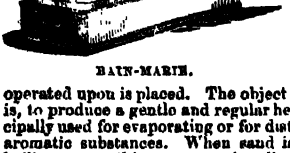
BAILMENT, *bail'-ment* (Fr. *bailler*, to deliver, or put into the hands of), in Law, is a delivery of goods in trust upon a contract, expressed or implied, that the trust shall be faithfully executed on the part of the bailee; as, if cloth be delivered, or (in legal dialect) *bailed* to a tailor to make a suit of clothes, he has it upon an implied contract to render it again when made, and that in a workmanlike manner; and, so, in the case of goods delivered to a carrier, or at some place appointed by him, for transit to a third party; and either generally or in a particular manner, an implied contract is raised that the goods shall be delivered accordingly. The varieties of bailments are so numerous that it is scarcely necessary to define them. As to the liabilities of bailees, it may be taken as a general rule that where the bailment is for the mutual benefit of bailor and bailee, the latter is liable for *negligence*; viz., for the omission of that degree of care which a man of common prudence takes of his own concerns; secondly, that upon a bailment from which the bailee derives no benefit, nothing short of *gross* negligence will make him responsible; thirdly, that upon a bailment for his own exclusive benefit, he will, on the other hand, be chargeable even for *slight* negligence; and lastly, that he is liable in none of these cases for a robbery or other casualty in no degree attributable to his own fault. A bailee has a qualified property in the goods transferred to him, against any stranger or third person. A bailee may have a general or particular lien on the goods intrusted to him. This subject will be treated under the word LIEN.



BAINBERGS.

BAINBERGS, *bain'-bergs* (Germ. *bein*, leg, *bergen*, to conceal), a term employed to distinguish the greaves worn over chain-mail armour as an additional protection to the leg. They seem to have been first adopted in the 13th century, as they do not appear in monumental effigies before that time. Their adoption led ultimately to the use of entire plate-armour. The illustration shows the mixture of plate-armour and chain-armour, and represents part of the equipment of a knight of the reign of Edward III.

BAIN-MARIE, *bain(g)'-ma-re'*, a bath much used in culinary operations in France, and so called from the name of the inventor. It is also largely employed in chemistry, and mostly consists of an outer vessel containing water, or some other fluid, in a state of ebullition: within this is another vessel, in which the substance to be operated upon is placed. The object of the bain-marie is, to produce a gentle and regular heat, and it is principally used for evaporating or for distilling volatile and aromatic substances. When sand is substituted for boiling water, this apparatus is called a *sand-bath*, and when boiling water is employed, it is called a *vapour-bath*.



BAIN-MARIE.

BAIRAM, *bair'-am*, is the name of a Mohammedan festival which follows the Ramadan, or month of fasting, corresponding to our Lent. As the Mohammedans reckon by lunar months, this festival runs through all the seasons every thirty-three years. It commences with the appearance of the new moon of the month Shawall, and, as marking the termination of four weeks of fasting and restraint, it is looked for with great eagerness. At Constantinople it is announced by the discharge of guns and the sounding of trumpets and drums: the rejoicings usually last for two or three days. Another festival, called the Lesser Bairam, is celebrated 60 days after this one; but it is observed with much less ceremony.

BAITING, *bait'-ing* (Sax. *bate*, contention), is the act of smaller or weaker animals attacking and harassing greater and stronger ones; as the baiting of bulls or bears by mastiffs or bulldogs. Bull-baiting was once a very favourite pastime in England; but the barbarity of the sport has led to its being given up in almost all civilized countries, except Spain, where it is still very popular. The chief aim of the dog is to seize the bull by the nose, and to avoid being tossed by it. For this purpose, when properly trained, the dog creeps on his belly; while the bull endeavours to defend his nose by keeping it close to the ground, and attempts to toss the dog with its horns.

BAIZE, *baiz* (Ang.-Nor.), a kind of coarse open woollen cloth, with a long nap. It is sometimes frized on one side. It is without wale, and is wrought in a loom, like flannel. Edward III., in trying to stimulate the woollen trade of England, brought over a number of skilled workmen from the Netherlands, and distributed them over the country. The various branches of the trade were confined to certain localities: thus the manufacture of baize was restricted to the county of Suffolk, where it remained for some time. It is now principally manufactured in and about Halifax, in Yorkshire. (*See* WOOLLEN MANUFACTURE.)

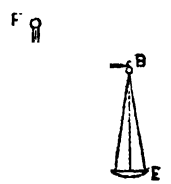
BAJADERES, or BAYADERES, *ba-ya-deers'*, a name given by the Portuguese to the singing and dancing-girls of Hindostan. They are of two kinds,—those who are employed as priestesses in the temples, and those who go about the country. The former celebrate with song and dance the festivities of the gods; the latter are employed by the grandees of India to delight and cheer them at their feasts.

BAKING, *bak'-king* (Sax. *bacan*).—This term is applicable to almost any process of drying or hardening by heat; but is commonly restricted to the mode of cooking food in a heated chamber or oven. For making bread, baking is resorted to by almost every section of the human race. It is also a common mode of dressing animal food; but is less effective than roasting, unless it be carried on in ovens through which air is allowed to pass freely. In reviewing the different modes of cooking meat, Lewes says, "Baking exerts some unexplained influence on the meat which renders it both less agreeable and less digestible. Those who have travelled in Germany and France must have repeatedly marvelled at the singular uniformity in the flavour, or want of flavour, of the various 'roasts' served up at the *table d'hôte*. The general explanation is, that the German and French meat is greatly inferior in quality to that of England and Holland, owing to inferiority of pasturage; and, doubtless, this is one cause; but it is not the chief cause. The meat is inferior, but the cooking is mainly at fault. The meat is scarcely ever *roasted*, because there is no coal, and firewood is expensive; the meat is therefore *baked*; and the consequence of this baking is, that no meat is eatable, or eaten, with its own gravy, but is always accompanied by some sauce, more or less piquant. The Germans generally believe that in England we eat our beef and mutton almost raw; they shudder at our gravy, as if it were so much blood. I have ascertained that it is really the cooking, and not the meat, which is in fault; for, at the tables of great people, or resident English, where *roast* meat is served, the flavour is excellent. . . . . In the inferior eating-houses, the meat is also baked, for the sake of economy, and is notoriously deficient in that agreeable flavour which roast meat possesses. If it were baked as thoroughly as it is in Germany, the meat in such eating-houses would be as tasteless."—*Physiology of Common Life*. Meat cooked in the improved ventilating ovens which have lately been introduced has all the sapidity and digestibility of roast meat; in fact, the mode of cooking by means of such ovens is now generally distinguished as *oven-roasting*. (*See* OVEN.) The baking of bread, and the most important baking processes in the useful arts, are alluded to in other portions of this work. (*See* BREAD, BRICKS, POTTERY, STONEWARE.)—For recipes in baking, *see* Mrs. Beeton's *Household Management*.

BALÆNA. (*See* WHALE.)

BALA LIMESTONE, *ba'-la* (from Bala, in Merionethshire), in Geol., a series of limestone beds, alternating with slaty shales, constituting a portion of the Lower Silurian formation of Wales.

BALANCE, *bil'-anse* (Fr. *balance*; Sp. *balanza*), an instrument for determining the relative weights of bodies. There are several varieties. The ordinary balance, or *pair of scales*, consists of a lever of the first kind (*see* LEVER), which is called the *beam* (A, C, B), with its fulcrum (C) in the middle, and two *scales* (D and E) suspended, one from each extremity of the beam. The substance to be weighed is placed in one scale, and the counterpoise, usually consisting of metal weights, in the other, the instrument being suspended from a ring (F) immediately above the fulcrum. In the most delicate balances of this description, the fulcrum consists of a steel prism, which traverses the beam, and rests with its sharp edge upon two supports, formed of agate or polished steel; moreover, a needle or pointer is fixed to the beam, and oscillates with it in front of a graduated arc. If the two arms of a balance be not precisely of the same length, the scale appended to the longer arm will turn with a less weight than that hanging from the shorter arm; so, also, if one arm of the lever be heavier than the other, the scale on that side must preponderate. With such an imperfect pair of scales, however, the true weight of a substance may be ascertained, by weighing it first in one scale and then in the other, and deducting from the greatest weight half the differen of the weights indicated. The *chemical balance* is an instrument of extraordinary delicacy. It is merely a pair of scales made with the greatest possible precision and accuracy, and is used for weighing portions of substances separated by analysis. It is also used to weigh bodies to be united by synthesis. The whole theory of modern chemistry may be said to rest upon the perfection to which the chemical balance has been brought. It is as necessary to the chemist as the transit-instrument and telescope are to the astronomer. Being so important and delicate an instrument, it is one of the most difficult to use, the slightest carelessness being sufficient to nullify an observation made by its means. It consists essentially of the beam, the fulcrum, the points of suspension, and the pans. The beam is generally made of brass, in the form of a long rhomboid. At an exactly equal distance from each end is fixed the fulcrum, which is generally a steel knife-edge, supported by agate planes. A contrivance is used for raising the beam, so as to keep the fulcrum from resting on the planes of support when not in use, in order to prevent the possibility of the knife-edge becoming worn. The object of having a sharp, hard knife-edge resting on hard planes is to decrease friction as much as possible; it being obvious that sensibility increases as friction diminishes. The fulcrum should be fixed just above the centre of gravity, yet not too much so, as, the greater the distance between it and the fulcrum, the greater will be the stability of the balance; or, in other words, the balance will be less sensible, from the greater difficulty with which the beam is moved. Most balances have a contrivance for raising or lowering the centre of gravity. The points of suspension are at each end, and are formed of hard steel knife-edges, working on agate planes, as in the case of the fulcrum. The points of suspension must be at absolutely equal distances from the fulcrum, otherwise, according to the properties of the lever, the weight indicated will be different in each pan. The pans are generally coated with platinum, to avoid corrosion, and are suspended by silver wires. To the centre of the beam is attached a needle index, which indicates the equality of weight in each pan by the equality of its vibrations on each side of the centre of a scale placed behind it. In some balances an index is fixed on the end of the beam, and viewed through a microscope in its passage upwards and downwards over a fine scale attached to a fixed arm at a little distance from it. The whole is inclosed in a glass case, to preserve it from the action of gases or dust. Caustic lime is always placed inside the case, to absorb any moisture that might settle on the working parts of the balance. Balances have been brought to marvellous perfection by Ramsden, Kater, Robinson, Oertling, Secré, and others. M. Stas, in his researches on the atomic weights of certain elements, employed a balance made by M. Secré, which turned with the ten-millionth part of the weight in each pan. Another, used by the same philosopher, weighed true to the two-thousandth of a grain. The weights used in such balances are made with the same precision: they will be described under WEIGHTS. A small piece of platinum wire, called a rider, slides along the beam, which is graduated, and indicates by its position a very small weight, on the principle of the steelyard; thus obviating the necessity of using weights that are almost invisible from their smallness. Warm substances should be allowed to cool before weighing, as the upward currents caused by their heat would vitiate the result. (For other varieties of the balance, *see* STEELYARD, SPRING-BALANCE, WEIGHING-MACHINE.)



BALANCE.

BALANCE OF POWER, in Pol., is applied to that relative condition of different states towards each other, so that none of them may possess such power or influence as would endanger the independence of the others. In order to maintain this balance of power, it is not necessary that there should be anything like an equality among all the different states. It is generally sufficient that a few of the leading powers counterpoise each other; and in this way the safety of the smaller states is secured, as none of the others would be disposed to allow its rival to add to its power by absorbing any of those minor states. We find the states of ancient Greece frequently guided in their conduct by a desire to maintain the balance of power among them; but it is only in modern times that the principle has come to be distinctly recognised and acted upon. In Europe it first became a distinct object of policy in the early part of the 15th century among the numerous small states and republics in Italy. Their jealousy of each other made them watch with the greatest keenness every movement or measure which might tend to increase the power of their neighbours; and, from a constant attention to this principle, they were able to maintain peace and general independence. When Charles VIII. of France invaded Italy, in 1494, Germany and Spain entered into a confederacy with the Italian states against him; and "from this era," says Ferguson, "we can trace the progress of that intercourse between nations which has linked the powers of Europe so closely together, and can discern the operations of that provident policy, which, during peace, guards against remote and contingent dangers, and in war has prevented rapid and destructive conquests." The attempt to maintain the balance of power among the different states of Europe has doubtless caused some wars, but it has unquestionably prevented more. It is this that has led to that great confederacy that exists among all the states of Europe, and keeps in awe the ambitious designs of any one of them that might desire to encroach upon the rights of its neighbours. At present the balance of power in Europe is principally maintained by the five great powers. "The grand and distinguishing feature of the balancing system is the perpetual attention to foreign affairs which it inculcates; the constant watchfulness over every nation which it prescribes; the subjection in which it places all national passions and antipathies to the fine and delicate view of remote expediency; the unceasing care which it dictates of nations most remotely situated, and apparently unconnected with ourselves; the general union which it has effected of all the European powers, obeying certain laws, and actuated

—Brougham's *Colonial Policy*.

BALANCE OF TRADE, in Com., denotes the difference between the aggregate amount of a nation's exports and imports, or the balance of the trade of one nation with another. The theory of a balance of trade is founded upon the position, that a nation can only be enriched by an excess of its exports above its imports, which must be received in money; and that unless the money thus acquired shall be retained in the country,

it might as well not have been imported. The theory is founded upon the assumption, that the precious metals alone constitute the wealth of a country; and hence, that when the moneyed value of the imports of any country exceeds that of the exports, the country is so much a loser by trade. This theory received the sanction even of Lord Bacon, who, in speaking of the trade of England with foreign parts, says that care must be taken "that the exportation exceed in value the importation; for then the balance of trade must of necessity be returned in coin or bullion;" and a large proportion of the restraints imposed on the freedom of commerce during the last three centuries grew out of this notion. The Prohibition Act, 1 Will. & Mary, by which the trade with France was declared a *nuisance*, was founded on the fact that the value of the imports from that kingdom considerably exceeded the value of the exports. The balance was termed a *tribute* paid by England to France; and it was sagaciously asked, what had we done that we should be obliged to pay so much money to our deadly enemy? Sounder views now prevail on this subject, and national wealth is not judged merely by gold and silver, which, indeed, are nothing but commodities, like other articles of trade. But the theory is erroneous, not merely from the false notions entertained of the nature of money, but also from the idea that excess of exports is excess of income. The value of the commodities imported by every country which carries on an advantageous trade invariably exceeds the value of those which she exports; otherwise there would be no fund whence the merchants and others engaged in foreign trade could derive either profit or return.—*Ref.* McCulloch's *Commercial Dictionary*.

Balance of a Watch.—The movements of a watch are governed by a wheel called the *balance*, to which a vibratory motion is given. This wheel is impelled in one direction by the crown-wheel of the escapement (which *see*), and in the other by a fine spiral spring. The *balance-spring*, as this latter portion of the machine is called, consists of a coil of steel wire so delicately manufactured that 4,000 of them scarcely weigh more than an ounce. As the rate of vibration greatly depends on the diameter of the balance, marine chronometers, and some of the finest watches, are furnished with compensation balances, which do not increase in diameter with increase of temperature. In the compensation balance, the circumference of the wheel is made of two metals having different rates of expansion, fast soldered together, the most expansible being on the outside. The compound ring is cut through in two or more places, and is weighted at opposite points. When exposed to a high temperature, the ring expands, but, owing to the unequal dilation of the metals, each segment assumes a sharper curve, whereby its centre of gravity is thrown inwards, and the expansive effect completely compensated. Under Mr. Dent's patent, both balance and balance-spring are occasionally coated with gold by the electro-metallurgic process.

Balancers, *băl'-an-sers*, in Orn., a term applied to two slender membranous appendages, inserted on either side of the metathorax of insects belonging to the class *Diptera*. They are always small and movable, and vary much in size and form, according to the class of insects by which they are possessed. They usually consist, however, of an elongated style with a small rounded head. Entomologists differ greatly as to the use of these organs. It is generally believed now, that they are the representatives of the posterior pair of wings, and are attached to the true metathorax. This, however, is disputed by some entomologists, who say that they are attached to the segment, which bears a pair of spiracles, and that they are connected with the function of respiration. The former is the opinion most generally held, and is probably correct. All dipterous insects possess balancers; and as they keep them in constant motion, they are evidently of great importance to them.

Balanite, *băl'-a-nite* (Lat. *balanus*, a barnacle), in Geol., any fossil of the Barnacle family. The cirripeds, or barnacles, are not found in a fossil state beneath the Oolite.

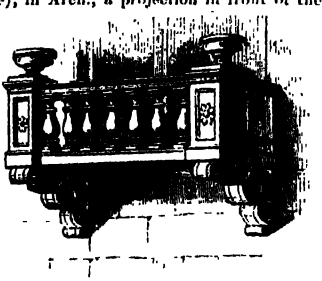
Balanites, in Bot., a gen. of plants belonging to the nat. ord. *Amyridaceæ*. The most important species is *B. ægyptiaca*, which is cultivated in Egypt for sake of the seeds, which yield, by expression, a fixed oil called *zachun*. The leaves are slightly acid, and are reputed to be anthelmintic. The fruits when unripe are bitter and purgative, but when ripe, are eatable.

Balanophoraceæ, *băl'-a-no-fo-rā'-se-e*, in Bot., a nat. ord. of dicotyledonous plants in the sub-class *Monochlamydeæ*. These plants are parasites, and are found growing on the roots of various woody plants, especially in the tropical and sub-tropical mountains of Asia and South America. They have no leaves; their stems are of various colours, but never green; their peduncles are naked or scaly, bearing spikes of flowers, usually white. Dr. Hooker enumerates thirty-seven species, which are divided into fourteen genera. Many are remarkable for their astringent properties; others are edible, and a few secrete a kind of wax. Two plants of this order are worthy of note; namely, *Cynomorium coccineum*, and *Langsdorffia hypogæa*. The first is the *fungus melitensis* of pharmacologists, formerly highly valued as a styptic; the second yields large quantities of wax, which is used for making candles by the inhabitants of New Granada.

Balantium, *ba-lăn'-ti-um*, in Bot., a gen. of ferns. The species *B. chrysotrichum* is a native of Java, and furnishes the silky hairs which are imported under the name of *Pakoe Kidang*, and occasionally used as a styptic.

Balausta, *ba-law'-ta*, in Bot., the name given to a kind of fruit of which the pomegranate is the only example. It is inferior (*i.e.* adherent to the calyx), many-celled, many-seeded, and indehiscent, and has a tough rind. It is formed of two rows of carpels placed above each other, and surrounded by the calyx; the seeds are attached irregularly to the walls or centre.

Balcony, *băl'-ko-ne* (Ital. *balco* or *palco*, the box of a theatre), in Arch., a projection in front of the windows of house, supported on brackets of wood or stone. The floor of the balcony is generally level with that of the room, and the windows reach to the ground, and open like doors, to afford easy access to it. Balconies are generally finished in front with balustrades or cast-iron railings, and sometimes covered with a light ornamental roof. The derivation of the name shows it to be an Italian invention. In Naval Arch., a balcony is a gallery outside the stern of a large ship, with access from the cabins of the admiral and captain.



BALCONY.

Baldachin, *bal-da-chin'* (Ital. *baldachino*, from *Baldach*, the Eastern name for Bagdad), a tent-like covering or canopy, of wood, stone, or metal, either supported on columns or suspended from above, and placed over doorways, statues, altars, thrones, &c. They were formerly very common in this country over fireplaces, and many elaborate specimens still exist. In the Gürzenich Hall, at Cologne, there are some beautiful examples of baldachins over the fireplaces, which are similar in design to those placed over the altar and font in the cathedral of Regensberg. The largest and most celebrated baldachin is that over the bodies of St. Peter, and St. Paul in St. Peter's at Rome; it is made of bronze, and is the work of Bernini. The baldachin is of Eastern origin, and the term was first applied to the square canopy or umbrella, supported by four poles, and carried over the heads of Oriental magnates, partly as a protection from the heat of the sun, and partly as a symbol of their power. During the early part of the Middle Ages, baldachins of brocaded silk, or some other costly material, were often sent as presents by the princes of the East to those of the West. Charlemagne received a rich gift of this kind from Haroun-al-Raschid. At

the present day, the baldachin is principally used in Europe, in the processions of the Roman Catholic church. It is generally held over the head of the priest who carries the Host.

BALDNESS, *bawld'-ness* (Ang.-Sax.), the loss of hair on a portion or over the whole head. It sometimes occurs in early years, but generally it takes place in old age. It frequently also occurs after febrile or other severe illnesses. It is caused by an atrophy of the follicles on which the hairs depend for nutrition, and generally commences on the crown of the head. Many nostrums are recommended for the cure of baldness; but they are seldom attended with any good result, and frequently do harm. The means to be employed are such as tend to increase the circulation in the scarp to greater activity, as frequent rubbing with a hard towel or hair-brush, and the application of stimulants, as Spanish-fly ointment. Frequent shaving of the head is often attended with successful results.



BALDRICK.

BALDRICK, or BAUDRICK, *bawl'-drik* (Fr. *baudrier*), a military band or girdle, much worn by the warriors in feudal times. It encircled the waist, or was suspended from the right shoulder, and usually sustained a sword. It was often highly ornamented, and is to be seen on many effigies of knights.

BALDWIN'S PHOSPHORUS, *bawld'-wins* (in Chem.)—If nitrate of lime is fused and exposed to the sun's rays, it will emit a phosphorescent light for a long time if taken into the dark. This phenomenon is purely physical, as no chemical change takes place. The reaction is as yet unexplained. (*See* FLUORESCENCE, PHOSPHORESCENCE.)

BALE, *bail* (Fr. *bale*), a package or bundle of goods in a cover, corded or otherwise prepared for carriage or transportation. Bales are always marked or numbered by the merchants they belong to, and the marks and numbers correspond with those in the bill of lading. Selling "under the *bale*" is a term used on the continent for selling goods wholesale, unopened and without sample.

BALL, *bawl*, in Mil. art, is applied to any round substance of lead or iron discharged from fire-arms. For small arms, as pistols and muskets, they are of lead; for the artillery, of iron. The term ball, with a prefix sufficiently expressive of its purposes, denotes a composition of various combustible ingredients, as fire-balls, light-balls, smoke-balls, stink-balls. The projectiles bearing these names are used either for giving light, or for harassing the enemy, by giving out a dense smoke or suffocating fumes. Although the term *ball* is applied to all missiles of this description, many of them are not spherical in shape, and they are generally fired out of mortars, and seldom out of guns. *Light-balls*, which are used in order to disclose the position or movements of the enemy at night, are composed of painted canvas stretched over a framework. They are

...ile period. *Smoke-balls* are composed of successive layers of strong paper, and are filled with gunpowder, saltpetre, powdered coal, tallow, and pitch. After ignition they give out dense fumes of blinding smoke for more than half an hour. *Stink-balls* are filled with a chemical composition which, when burning, diffuses a noxious suffocating odour around.

BALL, GAME OF, a gymnastic exercise of high antiquity. In the "Odyssey," we find Phæacian damsels playing ball to the sound of music. It was the principal exercise of the Spartans; and so highly was it esteemed by the Athenians, that they set up a statue to Aristonicus for his skill in it. The Romans of all ages and degrees played it, and Pliny describes old Spurinna as warding off decrepitude by practising the game. The Greeks and Romans had four kinds of balls: two of leather inflated with air, and played upon the earth, by many running after it at once,—consequently similar to our football; one a small ball, played like our shuttlecock; and one stuffed with feathers, and played by three persons in a triangle. In the Middle Ages, ball-playing was a regular amusement with the students of France, Germany, and Italy; and, at the present time, there are public places for ball-playing in Italy and Germany. The American Indians are especially fond of playing with the ball. In England, ball-playing has been a favourite exercise from an early date, one variety of game at ball giving its name to a celebrated west-end street of the metropolis,—Pall-Mall. The ball is still played in various ways; such as being kicked by the foot, knocked by a bat, thrown by the hand. (*See* CRICKET, TENNIS, GOLF, &c.)

BALLAD, *bäl'-lad*, the name usually applied to a simple versified narrative, whether tragic or comic, often rude in style, adapted to be sung or accompanied by an instrument. It is thus properly a species of epic poetry, and from its peculiar style of rhythmical handling, it belongs to the lyrical class of compositions. (*See* EPIC and LYRIC.) It is sometimes used as synonymous with *song;* but the latter word, when properly employed, is always applied to a lyrical composition, while the ballad has always something of the historical or epical in it. The word is considerably deflected from its original signification. At first the name, which is of Italian origin (*ballate*, Med. Lat. *ballare*, and Gr. *ballizein*, to dance), was applied to a dance-song; and, indeed, the word has been used in nearly all ages in a very loose and vague way. Now it was applied to what were properly known as romances both in Italy and Spain; again it was used to designate epic narratives, and again, lyrico-epic, which is taken here to be its proper application. There is one general distinction, which runs through the whole of the ballad poetry of the European nations. This is the natural distinction which invariably occurs, almost as exactly as the latitude of the places, or the thermometric indications of climate, by which the lyrical or sunny element predominates in the ballads of Italy and Spain, while in those of the north, the gloom of the atmosphere and scenery has transferred itself to the affections of the people, and rendered their ballads much more epic and tragical than those in more southern latitudes. Among the Scandinavians and the Scotch, for example, there is plenty of comicality in their ballad poetry; but it is generally of a grim, and even wild humour, bordering much more on the realms of tragedy than among the southerns. There can be no doubt that ballads have formed the first rude attempts at verse among all nations; and that the earlier heroic poems, or even epics, such as those of the Spanish Cid, and the Nibelungen Lied of Germany, grew out of some such simple beginnings. Old Fletcher of Saltoun said if he were permitted to make the ballads of a nation, he cared not who should make its laws (Political Works, 1749), so strong a belief had he in the revolutionizing tendency of an heroic ballad or song. The northern Scalds, the Scottish and English minstrels, and the continental troubadours, all composed heroic ballads, or chanted lays of love. The word *lay* itself (Ger. *leich*) was long applied to such compositions in Germany, before the Italian word *ballad* came into use among them. Some-

...poetry of the country was reserved merely for the humorous and burlesque, and the term ballad was brought by custom to signify a comic story, told in low, familiar language, and accompanied by a droll trivial tune." This occurred about the period known as the Restoration, between the reign of Charles II. and the times of Swift and Prior. It is generally allowed among well-read men, that the best specimens known of the old popular ballad are to be found in Scotland, or more

...subject, that many of these traditionary ballads, still current all over the kingdom of Scotland, date as far back as the arrival of the Cimbri in Britain. No doubt,

in numerous instances, these old ballads had their integrity tampered with, and they were not transmitted from one generation to another without innumerable transformations. A large proportion of them have doubtless been preserved by oral tradition, and during every successive stage which the race made in advancement, one could trace this progress in the very ballads which they had transmitted, by the linguistic changes which their speech had undergone. To take a single example, almost everbody believes that "that grand old ballad of Sir Patrick Spens," as Coleridge called it, derives its origin from a very early age; and yet it is remarkable the number of variations to which it has been subjected. Any one can easily satisfy himself on this point by a comparison of the different versions of it which are now to be found; such as Bishop Percy's, Sir W. Scott's, Jamieson's, Finlay's, Motherwell's, Bell's, and Aytoun's; and yet a sagacious eye will have very little difficulty in detecting the genuine old composition from its more modern and spurious interpolations. But the ordinary question of genuineness and spuriousness becomes, in the region of these old ballads, more a problem for personal ingenuity than for anything more solid. For aught we can tell, the original forms of those old compositions may have been the gradual accretion of centuries, and of various authors, rather than the production of any single individual. Very likely, every one of them is not only of diverse authorship, but various hands may have touched up the different poems, each according to his fancy. The English Robin Hood ballads are another instance in point. Nobody at the present day can say when or where, or by whom, those rich old lays were transmuted; and yet there can be no doubt that they have been so. "Fair Helen of Kirkconnel Lea," an old Scottish ballad, presents as much of the elements of true tenderness and wild passion as we can find in the whole range of modern poetry. "Chevy Chase" and the "Battle of Otterburne" are epic narratives on a much larger scale than usual. "Adam Bell," and "Clim o' the Clough," and "William o' Cloudesley," stand between the latter poems and such simple ballads as those of "Johnny Armstrong" and "Edom o' Gordon." The earliest English ballad now remaining, according to Ritson, an excellent authority, is a "Cuckoo Song" of the latter part of the reign of Henry III., beginning, "Sumer is icumen in, Lhude sing cuccu." The earliest specimen of the Scottish ballad, after that nation became English-speaking, is given in the "Rhyming Chronicle" of Andrew Wyntoun, prior of Lochleven, about the year 1420, in which he relates the song that was made on Alexander III. of Scotland, who was killed by a fall from his horse in 1286. No modern nation has cultivated the composition of ballad poetry so assiduously as the Germans. No doubt we have many specimens of the modern ballad; as Goldsmith's "Edwin and Angelina," Aytoun's "Lays," and the "Bon Gaultier Ballads;" but there is nothing like the classical turn given to those old popular compositions which we meet so often in modern days in Germany. The best English representation of this sort of ballad is to be found in Coleridge's "Ancient Mariner," containing many more sustained imaginative flights than the old ballad could pretend to, and analyzing, with a much more incessant acuteness, the feelings and passions of the human heart. Yet this exquisite poem is the simple ballad all over in its style. The "Lenore" of Bürger brought in a new era of ballad-writing in Germany. He confined the name 'ballad,' as Coleridge has also done in imitation of him, to an epic narrative, with something fabulous and supernatural in the background, but still possessing enough of earth to interest the mass of humanity. Schiller, Göthe, and Uhland have followed in his wake; and the latter, who, we believe, still survives at Tübingen, has done much in modern times to familiarize the German mind with this species of composition. The ballad poetry of the northern nations, particularly those of Iceland, of the Faroe Isles, of Denmark, and Norway and Sweden, retain their ancient character to the present day. There is a peculiarly close affinity between many of these Scandinavian ballads and those of Scotland and England, which has been noticed by various writers, both in this country and on the continent. Not only have Pinkerton and Jamieson alluded to this close relationship, but even Nyerup, Geijer, and W. C. Grimm have specially commented on it. This resemblance is to be traced both in the general plan and spirit of the poems and in the actual material basis on which the structure of the ballad is reared. Whether we are to ascribe this similarity to so remote a cause as the emigration into this country of the ancient Scandinavian peoples, or whether we are not rather to lean to the conviction of the ready transmission of fact or fiction of a stirring kind from one country to another, must ever admit of considerable doubt. The most complete collection of English and Scottish ballads in existence is an American one now in course of publication.

BALLAST, *bäl'-last* (Ang.-Sax.), in Mar., a certain portion of iron, stone, gravel, or such weighty material, placed in the bottom of a ship when she has either no cargo, or too little to bring her sufficiently low in the water. In the royal navy, iron ballast alone is used, in pigs of about 3 cwt. Iron ballast possesses the advantages of lying in a small compass, and of being, from its greater cleanliness, more healthy for the crew than shingle, gravel, &c. When a vessel has no other loading, she is said to be *in ballast*. The quantity of ballast, and its method of stowage, differ in different vessels. Masters of vessels are compelled to declare their amount of ballast, and to unload it at certain places.

BALL-COCK, *bawl'-kok*, a hollow sphere of thin metal, attached by a small rod to the cock of a water-cistern. When the cistern is empty, the water flows in at the tap, but, with the rising water, the hollow sphere, the ball-cock, is buoyed up, and by this means the tap is turned off when the cistern is full.

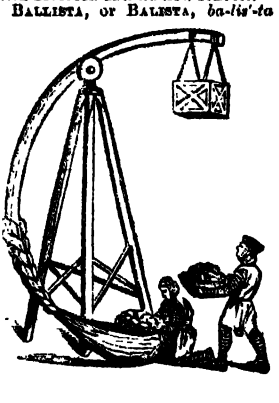
BALLET, *bal'-lai* (Gr. *ballizein*, to dance; Ital. *ballare*, to dance; Fr. *ballet*), an entertainment on the stage, in which a story is represented by dancing and pantomimic gestures, accompanied by appropriate music. In operatic performances a dance is frequently introduced under this name, such as the famous *Pas des Patineurs*, in Meyerbeer's opera "Le Prophète." The intricate figure-dances of the subordinate dancers are generally pleasing and well done; but the bounds, leaps, and pirouetting of the principal performers seem rather to be wonderful feats of strength and activity than actual dancing. Among the Greeks, the art of expressing passion and sentiment by dancing was brought to a great degree of perfection. The modern ballet was originated in Italy, by Count Aglio, of Savoy. Baltagerini, a musician, introduced it at the court of France, in the time of Catharine de' Medici. Since that time the ballet has retained possession of the stage, to the detriment of dramatic performances of a more elevated nature. Noverre, a Frenchman, brought the ballet to its greatest degree of perfection about 1750.

BALLING PROCESS, *bawl'-ling*, in Chem., a term applied to the process by which sulphate of soda is converted into carbonate of soda. Sulphate of soda, limestone (carbonate of lime), and small coal are intimately mixed, and subjected to heat in a reverberatory furnace. Sulphide of sodium is at first formed, carbonic acid escaping in large quantities. By carefully regulating the heat, the limestone gives up its carbonic acid to the soda, receiving sulphur in exchange. The resulting mixture is termed *black ash*, or crude soda, and contains carbonate of soda, lime, and sulphide of calcium. (*See* SODA.)

BALLIOL COLLEGE, *bail'-li-ol*, Oxford, was founded by John Balliol, of Bernard Castle, Durham, and Dervorguilla, his wife (parents of John Balliol, king of Scotland), between 1263 and 1268. Its revenues were soon augmented by the munificence of succeeding benefactors, particularly Sir William Fenton and Sir Philip Somervyle. It has at present ten fellowships and ten scholarships, open to all candidates, without regard to the place of their birth, residence, or education; also two fellowships and two scholarships, confined to persons elected from the grammar-school at Tiverton, in the county of Devon. There are also the Snell exhibitions, ten in number, tenable for five years, the nomination to which is vested in the principal and professors of Glasgow University, who appoint two annually; the Jenkyns exhibitions, two in number, tenable for four years, filled up by competition among those members of the college who have not exceeded

sixteen terms of academical standing; two exhibitions, tenable for four years during residence, annually offered by the college for competition among candidates who have not completed the eighth term from their matriculation; and the Warner exhibition, for natives, or those whose fathers were natives, of Scotland, and with a particular view to support the cause of episcopacy in that country. There are also exhibitions connected with Tiverton and Ludlow schools.

BALLISTA, or BALISTA, *ba-lis'-ta* (Gr. *ballein*, to throw), is the name of a military engine used by the ancients for throwing stones, as the catapulta was used for throwing heavy darts and arrows. The particular construction of the ballista is not exactly understood, or, rather, it seems to have been made in different ways. One sort was constructed with levers and bars, and another with pulleys, another with a crane, and others with a toothed wheel.



BALLISTIC PENDULUM, *bal-lis'-tic*, an instrument invented by Robins, for measuring the velocity of cannon or musket-balls. It consists of a large, heavy block of wood, plated with iron at the back, and fixed to an iron bar, which, at the other extremity, is attached to a transverse bar of iron, which serves as an axis of suspension. To the lower end of the pendulum is attached a riband, passing loosely through an orifice in an horizontal bar in the framework. The length of the riband drawn out by the pendulum, on being struck, shows the extent of the vibration, which, being known, together with the weight of the shot, the length, &c., of the pendulum, the velocity may be calculated.

BALLISTRARIA, *bāl-lis-trair'-i-a*, were cruciform apertures in the walls of a stronghold, through which the bowmen discharged their missiles. It was also applied to a projecting turret, such as is commonly seen on old castles.

BALLIUM, *bil'-yum*, in Arch., the courtyard or open space of a fortified castle, built in the Middle Ages. (*See* BAILEY.)

BALLOON, *bul-loon'* (Fr. *ballon*), in Aëronautics, a large globe or pear-shaped bag, made of paper or varnished silk, and filled with rarefied air or hydrogen gas. As the contents, in either case, are lighter than common air, the balloon rises, and is able to carry up weights along with it in its ascent. The first balloon was made in 1782, by Stephen and Joseph de Montgolfier, paper-manufacturers, who lived near the town of Lyons. It was composed of paper; and the interior atmosphere was rarefied by means of fire placed under an orifice at the bottom of the balloon. M. Pilâtre de Rosier was the first person who ever risked his life in a balloon. This event occurred in Paris in 1783. He made the ascent in a *Montgolfier* balloon 70 feet high, 46 feet in diameter, and with a capacity of 60,000 cubic feet. During the same year hydrogen balloons, made of silk, were invented; and in 1784 Vincenzo Lunardi, an Italian, made the first ascent in England in a balloon of this kind. In 1785, M. Pilâtre de Rosier, accompanied by M. Romain, ascended in a *Montgolfier* balloon from Boulogne, with the intention of crossing over the Channel to England. The balloon took fire at the height of 3,000 feet, and the adventurous travellers fell to earth and were killed on the spot. Since then several scientific balloon ascents have been made. One of the earliest was accomplished by MM. Gay-Lussac and Biot, in 1804. They ascended to a height of 4¼ English miles. Their experiments were principally connected with magnetism. Many aërial voyages have been made in late years; but no direct advantage has accrued to science from any of them. Mr. Green, the well-known aëronaut, first applied coal-gas to balloons. In 1836, accompanied by two friends, he travelled from London to Nassau, a distance of 500 miles, in eighteen hours. During the Italian war, in 1800, the emperor of the French employed balloons for the purpose of reconnoitring the enemy.

BALLOT, *bal'-lot* (Fr. *ballote*, a little ball), is a term employed to denote a secret method of voting; so called from being usually done by means of little balls, which are put into a box, and afterwards counted; thereby to disclose the opinion of the majority, without discovering that of any individual voter. Usually the balls are of different colours,—white and black, the white being "for" and the black "against;" and hence the expression to "blackball" one. Sometimes, in place of the balls being of different colours, the box is divided into two compartments, one of which represents the *pros*, the other the *cons*; and sometimes, in place of balls, folded pieces of paper are used, either containing simply "yes" or "no," or the name of the candidate or candidates whom the elector supports. In clubs, societies, and other similar bodies, voting by ballot is the mode usually adopted in the election of members or office-bearers. The term, however, is principally important in its political sense, as applied to the great question of secret or open voting in the election of members of the legislature. Secret voting was practised by the ancient Greeks by means of balls, stones, or shells, with marks. Among the Romans, *tabulæ*, *tabellæ*, or tickets, were chiefly used; and different laws were from time to time passed regarding the system of secret voting,—the *Gabiana Lex*, for the election of magistrates, dating from about 140 B.C. In modern times, the ballot was long in use in the Venetian senate. A tract, entitled, "The Benefit of the Ballot," said to have been written by Andrew Marvell, was published in the "State Tracts," 1693; and the ballot was first proposed to be used in the election of members of parliament in a pamphlet published in 1705. In France, secret voting existed in the Chamber of Deputies from 1840 to 1845, and was employed after the *coup d'état* of 1851. It has also been adopted in many of the United States of North America, and became part of the electoral law of Victoria in 1856. The subject of the ballot has occasioned frequent discussions and divisions in parliament, and since 1835 it has been an open question in all Whig governments. On June 30, 1857, the House of Commons rejected the ballot by a majority of 69,—189 being for and 257 against it; and on April 23, 1861, a motion to bring in a bill on this subject was negatived by 279 against 154, majority 125. Our limits necessarily preclude our entering upon the arguments that are advanced on either side. There are, doubtless, evils connected with the present open system of voting; but would these be done away with, or, rather, would not their place be occupied by others of a worse nature, if the ballot were adopted? This is a question that must necessarily be considered. Would all intimidation and bribery cease if secret voting were had recourse to? or would these be carried on as before, from a reliance upon the general good faith and honesty of mankind? Might the landlord not still ask his tenant how he intended to vote, and would the tenant escape by silence, or would he purchase peace by a falsehood? If the latter, then, certainly, the ballot affords him a means of avoiding detection which the present system does not. While it might prevent bad influence being exerted over the good, would it not destroy the good influence which publicity exercises over the bad? Publicity is, further, an essential element in the British constitution. In all other matters, persons who are charged with a duty have to perform that duty in public;—are there sufficient reasons for departing from it in this case? But the principal argument against the ballot, and that which its supporters have never yet satisfactorily answered, is, that the suffrage is a trust vested in certain classes of the people for the benefit of the whole. Every elector is hence bound to use his suffrage, according to his best and most conscientious judgment, for the good of the public; and every one of the public has a right to know in what way that suffrage has been exercised, and has

just cause to consider himself wronged if it is performed otherwise than honestly and carefully. "I contend," said Lord John Russell, in a speech on this subject, "that the whole community, whether electors or non-electors, have a deep interest in knowing how the votes are given which elect those who are to dispose of the welfare of the state." One of the ablest men and clearest thinkers of the present day, Mr. John Stuart Mill, in writing upon parliamentary reform, says:—"Thirty years ago it was still true, that, in the election of members of parliament, the main evil to be guarded against was that which the ballot would exclude—coercion by landlords, employers, and customers. At present, I conceive a much greater source of evil is the selfishness, or the selfish partialities, of the voter himself. A base and mischievous vote is now, I am convinced, much oftener given from the voter's personal interest or class interest, or some mean failing in his own mind, than from any fear of consequences at the hands of others; and to these influences the ballot would enable him to yield himself up, free from all sense of shame or responsibility."—Ref. *On Representative Government*, by John Stuart Mill. 1861.

BALM. (*See* MELISSA.)

BALM OF GILEAD. (*See* BALSAMODENDRON.)

BALNEUM. (*See* BATHS.)

BALSAM, *bawl'-sam* (Gr. *balsamon*), a name formerly given to almost every oily or resinous substance exuding from trees; but now used by scientific men to denote a vegetable product containing either benzoic or cinnamic acid. The true balsams are much used in medicine on account of their stimulating, expectorant, and tonic properties. The most important are the balsams of Peru and Tolu (*see* MYROSPERMUM), benzoin (*see* STYRAX), storax, and gum-wax (*see* LIQUIDAMBER). All those substances are very fragrant. They vary much in their consistence. Thus benzoin is solid, hard, and brittle; Peruvian balsam is fluid; and Tolu is intermediate, being a very soft and readily-fusible solid. Copaiva, commonly called balsam copaiva, is not a true balsam, but belongs to the class of oleo-resins. The same may be said of Canada balsam. Several medicinal mixtures, in which oils enter, are commonly included under the head of balsams. Thus the preparation known as balsam of sulphur, used as an application to foul ulcers, consists simply of flowers of sulphur in olive-oil.

BALSAM. (*See* IMPATIENS.)

BALSAMIFLUA, *bal-sa-mif'-lu-a*, in Bot., a nat. ord. of dicotyledonous plants, consisting of only one genus. The species are balsamiferous trees found in the warmer parts of India, North America, and the Levant. By some botanists the order is named *Altingiaceæ*. (*See* LIQUIDAMBER.)

BALSAMINACEÆ, *bal'-sa-mi-nai'-se-e*, in Bot., the Balsam family, a nat. ord. of dicotyledonous plants, in the sub-class *Thalamiflorœ*. There are but two genera, *Impatiens* and *Hydrocera* (*see* these words), which include 110 species. These are scattered over the globe, but are chiefly natives of India, growing in damp shady places, and where the temperature is moderate. They are all herbaceous plants, with succulent stems containing much watery juice. The flowers are very irregular, and the petals often finely coloured. The fruit is five-celled, and usually bursts with elastic force so as to scatter the seed over a considerable area. The plants are said to have diuretic properties, but they are never used in medicine.

BALSAMODENDRON, *bal-sa-mo-den'-dron*, in Bot., an important gen. of plants belonging to the nat. ord. *Amyridaceæ*. The species are natives of the East, and are remarkable for the odoriferous gum-resins which exude from their trunks. *B. myrrha*, a small tree growing in the north-eastern parts of Africa, as well as in the adjoining parts of Arabia, is believed to be the principal, if not the only source of the fragrant gum-resin known in commerce under the name of *myrrh*. This is called in Hebrew *mor* or *mur*, and is mentioned in the Old Testament for the first time in Gen. xxxvii. 25: hence it must have been in use more than 3,500 years ago. It is at first soft, oily, and of a yellowish-white colour; on exposure to the air, it soon acquires the consistence of butter, and in time becomes much harder, and changes to a reddish hue. Medicinally, myrrh is regarded as a tonic, stimulant, expectorant, and anti-spasmodic, when taken internally; as an external application, it is astringent and stimulant. It is an ingredient of the incense burnt in Roman Catholic chapels, and of some kinds of pastiles which are used for fumigation. The substance called *balm of Gilead*, or *balm of Mecca*, and which is supposed to be the *balm* of the Old Testament, is said to be procured from *B. gileadense*; some authors, however, name *B. opobalsamum* as its source. This substance was, in ancient times, regarded as a cure for almost every disease; but it is seldom used at the present day. The gum-resin, known as *Indian bdellium*, or *false myrrh*, and supposed to be identical with the *bdellium* of Scripture, is probably the produce of two species of this genus; namely, *B. mukul*, and *B. pubescens*. It is the *googul* or *guggur* of the Beloochees, and the *mukul* of the Persians. It is very similar to myrrh. *African bdellium*, another of the gum-resins of commerce, is said to be an exudation of the species *A. africanum*.

BALUSTER, *bāl'-us-ter*, in Arch., a term used to indicate the little columns which are used to fill the openings in parapet-walls on the tops of houses, or which, when surmounted by a rail, form a balustrade to any long passage or gallery open on one side, and thus partially inclosed, for the sake of ornament or protection. The upright rails of a staircase supporting the hand-rail are called balusters, and sometimes balliasters or banuisters. The word is of doubtful origin. Nicholson, in his *Architectural Dictionary*, derives it from *balaustrium*, a railed inclosure in the old Roman baths; others derive it from *balaustrion*, the Greek for the flower of the wild pomegranate; while the derivation adopted in the *English Cyclopædia* is the Latin *balista*, an engine of war used for hurling large stones and beams, which was placed in a space railed in, called the *balistarium*; and hence the rails inclosing stairs, communion-tables in churches, terraces, &c., came to be called balusters. The ornamental form of the baluster is that of a dwarf column, with plinth and abacus, ornamented with bands and a swelling projection near the lower end.

BALUSTRADE, *bāl'-us-traid* (Sp. *balaustrado*), a row of balusters surmounted by a cornice or hand-rail, used to give a finished appearance to the tops of large buildings of some architectural pretension; or for the inclosure of stairs, balconies, parapets of bridges, &c. (*See* BALUSTER.) The balustrade in the Villa Conti, at Frascati, is nearly 700 yards long. Good examples of the architectural balustrade may be seen at the Villa Albani (Rome), Whitehall, and St. Paul's Cathedral.

BAMBOO. (*See* BAMBUSA.)

BAMBUSA, *bam-bu'-sa*, in Bot., the Bamboo, a gen. of plants belonging to the nat. ord. *Graminaceæ*, the Grass family. The species are numerous, and are found in the tropical and sub-tropical regions of both eastern and western hemispheres. They are graceful and noble-looking plants; for though they are merely grasses, according to the botanical meaning of the term, their jointed stems sometimes reach the height of from 20 to 100 feet. The stems in each species arise from a strong-jointed subterranean creeping root-stock, which is the true



BAMBOO.

trunk of the bamboo, the shoots being the branches. These are hard externally, being coated with flint, and are hollow, except at the nodes, where strong partitions exist, and so divide the interior into a

number of closed-up cylinders. The cavities thus formed are usually filled up with soft loose pith, which may be easily withdrawn from any cutting. A peculiar flinty secretion, called *tabasheer* (which *see*), is found in the joints of some species. The stems of different species of bamboo are applied to such a multitude of useful purposes, that a large volume might be devoted to a complete account of them. Good paper is made from them in China and other parts of the world. The very young shoots are boiled and eaten like asparagus, and are also used for pickles and sweetmeats. As for the hollow stems, they may be said to be used as materials for houses, furniture, clothing, musical instruments, tools, and weapons, in all the countries where they flourish. Dr. Hooker says that in some districts a very large kind of bamboo is used for water-buckets, another kind for quivers, a third for flutes, a fourth for walking-sticks, a fifth for basket-work, a sixth for arrows, and so on. In China we find the bamboo used for water-pipes and fishing-rods, and for making hats, shields, umbrellas, soles of shoes, baskets, ropes, paper, scaffold-poles, trellis-work, sails, covers of boats and katamarans.

Bampton Lectures, The, *bimp'-ton*, are named after their founder, the Rev. John Bampton, canon of Salisbury, who left certain estates to the university of Oxford, for the endowment of eight divinity lecture-sermons, to be preached annually at St. Mary's, Oxford, and afterwards published at the expense of the foundation. The preacher must be at least a M.A. of Oxford or Cambridge, and the same person can never preach them twice. The lectures are to be on one of the following subjects:—to confirm and establish the Christian faith, and to confute all heretics and schismatics; upon the divine authority of the Holy Scriptures; upon the authority of the writings of the primitive fathers; as to the faith and practice of the primitive church; upon the divinity of Jesus Christ; upon the divinity of the Holy Ghost; upon the articles of the Christian faith as comprehended in the Apostles' and Nicene creeds. The first course was delivered in 1780; and among the more distinguished persons who have held this office are Mant, Heber, Whately, Milman, Hampden, and Mansel.

Ban, *bän*, is a word which occurs in various senses in many of the modern languages of Europe. Its primary signification, however, and that which runs through all the others, is that of proclamation or publication; as in *banns*. (*See* Banns of Marriage.) It is used both as a substantive and verb by the early English writers, in the sense of cursing or denouncing woe and mischief against an offender. When a grant of land was made for a religious purpose, the transaction was proclaimed with certain ceremonies, and curses were denounced against any one who should hereafter violate the deed. Persons who escaped from justice, or who opposed themselves to the sentence of the Church, were also sometimes banned. In Germany, persons or cities who opposed themselves to the general voice of the confederation were, by some public act, placed under the ban of the empire. In France, in feudal times, the barons who held of the king, when summoned to attend him in time of war, were called the *ban*, and the tenants of the secondary rank the *arrière ban*. In the Sclavonic tongues, *ban* means lord, and was the title given to some of the military chiefs who were over certain of the frontier provinces of Hungary; hence termed *banats*.

Banana. (*See* Musa.)

Banc, or Banco, *bän'-ko* (Lat. *bancus*; Fr. *banque*), in Law, a tribunal or judgment-seat. Hence, *Bancus Reginæ*, or Queen's Bench; and *Bancus Communium Placitorum*, or Common Bench, or Common Pleas. The judges of the three superior courts of common law sit *in banc* or *banco*, that is, on the bench, of their respective courts at Westminster, during term-time, and for a short period after, for the purpose of deciding questions of law coming originally before them, or by way of reference or appeal from the decision of a single judge at *nisi prius*, and otherwise. (*See* Appeal.)

Band, *bänd* (Sax. *band*; Du. *bende*), in Arch., a broad flat moulding projecting a little beyond the surface of the building or column to which it is applied. It is sometimes placed along the front, or completely round buildings, and serves to indicate the different floors; but it is principally used in the basements of large edifices. The band of a column is sometimes moulded in various forms, and is then called a shaft ring.

Band, in Mil., denotes a body of musicians attached to a regiment or battalion, usually about twenty in number, and distinguished by a particular uniform.

Bandage, *bänd'-aje* (Fr.), in Surg., is a piece of linen, calico, or flannel, used for binding up a wounded limb, or to retain dressings upon wounds. Bandages are of various kinds, according to the purpose they are intended to serve. The most common form is a long strip of stout calico, varying in breadth from two to six or eight inches. Previous to its application it is rolled up; and hence it is commonly termed a *roller*. There are also the T bandage, so called from its resemblance to the letter T; the 18- or many-tailed bandage, composed of one longitudinal piece, with number of transverse pieces, or tails, to fold over the injured part; the suspensory bandage, &c. Much frequently depends upon the proper use and application of a bandage. The great object is to give equal and uniform pressure and support to the part, and to adjust it so that it may not be displaced or deranged by any movement of the patient. Of late years, elastic bandages have been much used. Flannel bandages are used where warmth as well as support is required.



Bandaleer, or Bandoleer, *bän-do-leer'* (Sp. *bandolera*), in Mil., was a large leathern belt thrown over the right shoulder, and hanging down under the left arm. It was worn by the ancient musketeers, for sustaining their firearms and for the carriage of their musket-charges, which, in small tin or wooden cases, were hung, to the number of twelve, to each bandaleer.

Bandana, or Bandanna, *ban-dän'-na*, a method of printing calico, in which white or coloured spots are produced on a dark ground. The process seems to have had its origin in India, where it was practised by the Hindoos from time immemorial. The mode employed was that of binding up securely with thread those parts of the cloth which were required to remain white or yellow, and then exposing the whole to the action of the dye. Bandana handkerchiefs are now largely made in Europe, and have quite superseded in beauty and precision the Oriental patterns. The process by which they are made was invented by M. Koechlin, of Mühlhausen, in 1810. The usual method employed is as follows:—The pattern desired is cut out in two sheets of lead, which are placed at the top and bottom of a pile of handkerchiefs, mostly dyed with Turkey-red. Bleaching-liquid is then forced, by means of a powerful Bramah press, through the perforations in the top sheet of lead, through the pile of handkerchiefs, and out of the perforations in the lower sheet. The bleaching liquor in its course discharges the colour from the cloth and leaves the pattern. Bandana handkerchiefs are not so popular as they were at one time; but M. Koechlin's process is valuable in many other ways.

Banded, *bän'-ded*.—In Her., any charge, such as a wheatsheaf or bundle of arrows, is said to be banded when it is tied together with a band of a different colour from the charge itself. Thus a golden wheatsheaf tied with a red band would be thus expressed in heraldic terms:—A garb *or* banded *gules*.

Bande Noire, *band nwaw* (Fr., black band), was a name given in France to certain societies of speculators, formed during the first French revolution, for the purchasing of ecclesiastical and other edifices which were for sale at that time. These they pulled down and sold the materials; and hence they received this opprobrious name.

Banderole, *bän'-drol*, in Her., a little streamer or ribbon attached to the shaft of a crosier, and folding over it like a label. In the Arch. of the Renaissance period, the term is applied to the ribbon-moulding used

to receive names or inscriptions. In Mil., it means any little flag or pennon attached to a spear, and the fringed flag hanging from the straight trumpet used by cavalry, or sounded before the heralds when making any proclamation. It is sometimes written bandro and bannerol.

BANDICOOT, *bän-di-koot* (*Perameles*), a marsupial animal, indigenous to Australia. In some respects it is analogous to the opossum and kangaroo; but its hinder legs, though much longer than the anterior ones, do not present so great an apparent disproportion as in the last-mentioned animal. It is a nocturnal animal, and burrows for itself a dwelling in the soft earth, for which purpose its claws are well adapted. The flesh of the bandicoot is said to resemble that of the rabbit; but the food of the former is generally of a very different nature, consisting chiefly of insects and grubs. Its gait consists of a series of hops, in which, like the rabbit, it is said to use its fore feet.

BANDIT, *ban-dit* (Ital. *bandito*, an outlaw, from *bandire*, to banish), literally signifies a banished or outlawed person; hence one who is at war with civilized society, a highway robber, a hired murderer. The banditti in Italy formerly formed among themselves a kind of guild, with very stringent laws, and carried on a constant warfare against civilized society. The strong measures which the papal government, in 1820, took against the banditti and their abettors broke up their lurking-places, and rendered them in a measure homeless. In many parts of Italy, however, particularly about Naples, the banditti are peasants of the country, who, besides being engaged in agriculture, employ themselves in robbery and murder. Peter of Calabria, one of the most celebrated of their chiefs, in 1812 assumed the titles of "Emperor of the mountains, King of the forests, Protector of the conscribed, and Mediator of the highways from Florence to Naples." The government of Ferdinand I. was obliged to enter into treaties with this monarch. The banditti are quite distinct from common robbers, who are called *malviventi*. More recently the banditti, by being joined by adventurers of all kinds, had become so strong and troublesome, that the Austrian troops who occupied Naples had to send large bodies of men against them. In Sicily they are most numerous in the Val Demone, where they were formerly so powerful that the prince of Villafranca, for political and other reasons, declared himself their patron, and treated them with much confidence, which they never abused. The revolution of 1848-9 added greatly to their numbers and strength. Recently many of the banditti rendered good service to the cause of freedom in Italy, and are said now to have returned to a more honourable course of life.—*Ref.* Brockhaus' *Conversations-Lexikon*.

BANDOLINE, or FIXATURE, *bän'-do-leen*, a preparation sold by perfumers, and much used by ladies for stiffening and fixing the hair. It is merely a thick mucilage, obtained either from Carrageen moss or gum-tragacanth, scented with eau de Cologne or other perfumed spirit. A very delicate bandoline may be prepared by soaking quince-seeds in cold water for a day or two, and then straining the mucilage.

BANDORE, *bän'-dor* (Sp. *bandurria*), a stringed musical instrument, bearing a strong resemblance to a lute. It was invented by John Rose, in the fourth year of the reign of Queen Elizabeth.

BANE, *bain* (Sax. *bana*, a murderer), denotes poison, or any cause of destruction or overthrow; as, "My bane and antidote are both before me."

BANEBERRY, *bain'-ber-e*, in Bot., a name given to a species of *Actæa*, the root of which is sometimes used medicinally, on account of its antispasmodic, expectorant, and astringent properties. It is a perennial herbaceous plant, from one to two feet high, with triternate leaves, the leaflets of which are deeply cut and serrated. The flowers are in racemes; the berries are black and poisonous. This plant (*A. spicata*) is also known by the name of Herb Christopher. It belongs to the nat. ord. *Ranunculaceæ*.

BANERET. (*See* BANNERET.)

BANGORIAN CONTROVERSY, *bän-gor'-i-an*, one of the most remarkable controversies that has arisen in the Church of England. It was occasioned by a sermon preached by Hoadley, bishop of Bangor, before George I., March 31, 1717, on the text, "My kingdom is not of this world." In this discourse he descanted upon the true nature of that kingdom which Christ came to establish upon earth; that it was wholly intellectual and spiritual; that he had not delegated his power, like temporal lawgivers, to any vicegerents or deputies upon earth; and hence, that the Church did not, and could not, possess the slightest degree of authority under any commission, or pretended commission, derived from man; that the Church of England and all other national churches were merely civil or human institutions, established for the purpose of diffusing and perpetuating the knowledge and belief of Christianity; and that the truths of Christianity did not differ in their nature from other truths, except by their superior weight and importance, and were to be inculcated in a manner analogous to other truths, only demanding, from their higher import, a proportionably greater degree of care, attention, and assiduity in the promulgation of them. The publication of this sermon immediately produced a great commotion in the Church: it was condemned by a committee of Convocation, and the proceedings of Convocation were arrested by an order from government; Drs. Snape and Sherlock wrote confutations of it, for which these divines were removed from their offices of chaplains to the king. With the king and the government on the one side, and the church party on the other, the controversy was carried on with great animosity for many years.

BANIAN, *bai'-ni-an*, a general name given in India to a merchant, more particularly to the great merchants of Western India at Bombay, Surat, Cambay, &c., who carry on an extensive caravan trade with the interior of Asia, even to the borders of Russia and China. Mercantile establishments of Indian Banians are to be found in almost every important commercial city of Asia. The Banians form a particular caste in India, and are distinct from the Brahmins, Cuttery, and Wyse, the three other castes. The name Banian was at first given by Europeans to all the Hindoos, they being the class with which they had most frequent intercourse; and hence the term was used in contradistinction to Mohammedan. The Banians are very strict in the observance of the fasts prescribed by their religion, and in refusing to eat flesh.

BANIAN DAYS, a cant term among sailors, denoting those days on which they have no meat served out to them, derived from the practice of the Banians, who never eat flesh.

BANISHMENT, *bän'-ish-ment* (Sax. *ban*, a proclamation, afterwards a curse), is the expulsion, by the judgment of some court or other competent authority, from any country or place, for some real or supposed offence, —it may be for life, or only for a limited period. The term is also applied to the fleeing from one's own country to avoid some punishment or danger, when it is usually called voluntary banishment. Banishment, as a mode of punishment, has been prevalent in most civilized countries, ancient as well as modern. Among the ancient Greeks, banishment was mostly voluntary, the removing from the country of one accused of an offence; and laws were laid down defining its limits, duration, and legal consequences. The Greek name for banishment was *phuge*; whence is our word fugitive. *Phuge*, in a general sense, denoted every kind of banishment; but in a more particular sense it was distinguished from *ostracism*, inasmuch as those who were under *phuge* (for life) lost their property by confiscation, while the ostracised did not; the former, also, had no fixed place of abode, and no time of return assigned; the latter had. In fact, ostracism was not, properly, a punishment for an offence, but rather the banishment, for a time, of such as were supposed to be too powerful or to have too much influence in the state. "Democratical states," says Aristotle, "used to ostracise, and remove from the city for a definite time, those who appeared to be pre-eminent above their fellow-citizens, by reason of their wealth, the number of their friends, or any other means of influence." Ostracism was for ten years; but at Syracuse, where the term *petalism* was given to it, it was only for five years. Among the Romans, *exilium* was the general term used to express banishment, of which there were three kinds: 1. *relegatio*; 2. *exilium* proper, or *interdictio aquæ et ignis*; and 3. *deportatio*. *Relegatio* was the mildest form of banishment, by which the offender

was interdicted from living in Rome or any particular province, or was compelled to reside in some assigned place, either for a definite or an indefinite period; but the sentence did not involve loss of property or citizenship. The *interdictio aquæ et ignis*,—interdiction of fire and water, while it did not directly expatriate the culprit, or deprive him of citizenship, had the effect of incapacitating him from obtaining the means of existence in his own country, and thus indirectly compelled him to seek refuge in another. The third mode,—*deportatio*, was the severest of all, and was introduced under the emperors in place of the *interdictio aquæ et ignis*. By it, the criminal was deprived both of property and of the rights of citizenship, and not unfrequently he was conveyed to some remote island, where, loaded with fetters, he was compelled to labour for the rest of his life. During the first French revolution, banishment (*déportation*) was introduced, and was substituted for the guillotine; and towards the end of Robespierre's administration it became very general. It still forms part of the French code, where it is classed in the third degree of infamous punishments, and when for life, it gives rise to civil death. Previous to 1848, however, this mode of punishment had long been in abeyance, imprisonment being usually substituted; but since that time it has been much employed as a means of getting rid of political offenders. As a punishment for crimes, compulsory banishment was unknown to the ancient law of England, although voluntary exile, in order to escape other punishment, was sometimes permitted. It is said to have been first introduced as a criminal punishment in the 39th year of Elizabeth, when a statute was enacted declaring that "such rogues as were dangerous to the inferior people should be banished the realm." But it was not till a much later period that this mode of punishment came into general use and obtained the sanction of the legislature. (*See* TRANSPORTATION.)

BANK, *bank* (deriv. uncertain).—The term bank having several significations, renders it difficult to assign to it a common derivative. It has two principal distinct meanings, one in reference to commerce; the other to geography and rural economy, implying an elevation of the earth, either natural or artificial, and either below or above the surface of the water, in rivers as well as in the ocean. It is further a technical term in law; the judges of the supreme courts of law, when sitting in judgment collectively, are said to sit in bank, banque, or banco. It is also a military term, denoting an elevation of earth within the parapet of a fortification, generally between two and three feet high, or more, according to the height of the parapet, being about four feet and a half lower than the top of the parapet, three feet broad, ascended at intervals by steps, by which the garrison get up to fire on, or to observe the proceedings of, the besiegers. Junius derives the word from the Dutch *bancke*, which signifies to beat, to strike; as the waves perpetually strike against the shores of the sea, and the current of the river presses against its sides. Skinner and Johnson agree that it comes from the Ang.-Sax. *banc, tumulus*; Wachter has *banc*, a hill, mound, heap, and any eminence or rising place. It is transferred, he adds, to all eminent or rising places for sitting or lying; as banks of oars were not on the same level in ancient ships, but seats raised above one another. It may thus be applied to the table or counter of merchants, traders, or money-changers, who, being the most eminent persons amongst those who formerly carried on their commercial transactions in the open market-places, would naturally assume a more elevated position than the common traders or chapmen. (*See* further on this subject under the word BANKRUPT.)

BANK AND BANKING.—In a commercial sense, bank is a receptacle for money, to be always ready at the will or direction of the depositor. Banking, doubtless, first took its rise in the lending of money at interest; but the origin of this practice is so remote, that it does not come within the range of authentic history. From the restrictions laid by Moses upon the Israelites with respect to lending money at interest, we are justified in inferring that it was at that time a common practice among the nation from which the Israelites came out. After the return of the Jews from captivity, we read that the practice of lending out money at usury prevailed to a very great extent, and that much general distress was occasioned thereby. In New Testament times, we have evidence that a system of depositing money with p— sons at interest existed; as, in the parable of Talents, the idle servant is rebuked for not put the money to the exchangers, and then, says master, "I should have received mine own with usury."—(Matthew xxv. 27.) Little, however, is known with certainty regarding the nature of the money dealings of the ancient Jews. In the time of Demosthenes, banking operations were carried on to a great extent in Athens. They exchanged foreign moneys, received deposits at interest, and gave loans. The rate of interest charged on loans is said to have been usually as high as 36 per cent. The bankers were generally of low origin, such as freedmen and aliens; but they frequently rose to great wealth and eminence. One Pasion, a manumitted slave, is frequently mentioned by Demosthenes and contemporary orators, and more than once was the state indebted to his liberality. He is said to have owned land to the value of 20 talents (£4,875), to have had 50 talents (£12,187) of his own out at interest, and to have had 11 talents (£2,681) in deposits from his customers. He was a man of undoubted integrity, and his friendships and connections extended through the whole of Greece. The Athenian bankers are supposed to have been the first that invented the system of *discounts*, that is, of retaining the profits at the time of making the advance. The first mention that occurs of banking at Rome is in the year 352 B.C., when, the plebeians being in great distress, the state appointed certain persons to lend out the public money upon security; and this system was adopted from time to time, for a limited period, in times of monetary distress, throughout the republican period. Besides these, there were three principal classes of bankers at Rome: the *Negociatores*, who lent money upon interest to the inhabitants of the provinces, by which means they were enabled to realize a larger profit (the *Lex Sempronia de fœnore*, 560, was aimed at this), as they were not limited there by any laws. The private bankers, *Argentarii*, with whom individuals opened accounts (*mensæ rationes, tabulas accepti et expensi*), and by whose intervention (*in foro et de mensâ scripturâ*) money was paid. They attended in particular to the payments of Roman citizens living in the provinces, as they might become due at Rome.—(*Cic. ad Quint.* ii. 12.) The *Mensarii*, who were the bankers of the republic (*Lex Minucia*, 537), and were created for the purpose of abating usury:—"Novi consules fenebrem quoque rem"—"levare aggressi, solutionem alieni æris in publicam curam verterunt."—(*Liv.* vii. 21.) Under the emperors, the two words *Argentarii* and *Mensarii* were used without distinction. Thus C. Octavius, the father, is called *Argentarius* (*Suet. Aug.* c. 3), and *Mensarius* (*ibid.* c. 4, fin.). There was also a class of moneylenders of an inferior description, called *Nummularioli*. The *Nummularii* were also a sort of bankers or dealers in money, who combined with their dealings the business of assayers; for which purpose they were appointed to estimate the goodness or value of money, as to its weight, fineness of metal, and intrinsic worth. The *Argentarii* introduced one of the greatest conveniences in banking,—that of making payments by means of cheques or written orders, called *præscriptiones* or *attributiones*. During the Middle Ages, when commerce was but little developed, there was little field for banking operations; but the business was first established in Europe by the Lombard Jews in Italy, A.D. 808, of whom some settled in Lombard Street, London, where many bankers still reside. It seems to have been revived at Florence during the early part of the twelfth century. From the success that attended the commercial enterprises of the Florentines, that city became the centre of the money transactions of every commercial country of Europe, and her merchants and bankers accumulated great wealth. At one time, Florence is said to have had 80 bankers; and we find that between 1430 and 1433, 76 bankers at Florence lent the state 4,815,000 gold florins. The earliest public bank in modern Europe was that of Venice, founded in 1157, or, as some say, 1176. It originated in the financial difficulties of the state, which, in order to extricate itself, had recourse to a forced

loan from the citizens, promising them interest at the rate of four per cent. The stock was made transferable, and a body of commissioners, called the *Camera degli Imprestiti*, was appointed to manage the transfer of stock and the payment of interest. This is believed to be the earliest instance on record of the funding system, and the first example in any country of a permanent national debt. This Chamber of Loans, as originally instituted for the purpose of managing the public debt, could scarcely be called a bank; and it does not appear to have carried on anything like a banking business for several centuries. Venice being the centre of an enormous commerce, foreign coins, usually in a very worn or clipped condition, were in circulation, to the great inconvenience of merchants; and hence the state had recourse to the expedient of authorizing the Chamber of Loans to receive coins of all sorts, and to pay for them in notes an amount corresponding to the real amount of bullion deposited. These notes promised to pay the bearer on demand a definite quantity of bullion of the proper fineness. The bank, however, does not seem to have discounted bills on its own account. Its only advantage was to save the wear and tear of the coinage, and to insure a uniform standard in mercantile transactions. Its notes always bore a premium as compared to the current money of the city; and it continued to exist until the fall of the republic in 1797. About 1350, the Cloth-Merchants of Barcelona, then a wealthy body, added the business of banking to their other commercial pursuits; and in 1401 a public bank was opened by the magistrates of the city, which Spanish writers claim as being the first real bank in the modern sense of the term. It received deposits, for which the public property of the city was pledged, and discounted the bills of merchants; but it does not appear that it issued notes or used cheques. Almost at the same time with the Bank of Barcelona, that of St. George, at Genoa, was instituted. It was planned in 1345, but was not fully established and in operation till 1407. Like the Bank of Venice, it originated in the exigencies of the state. The republic had become indebted in large sums to a number of the citizens, and at length the whole was consolidated into one capital stock, to be managed as a bank, under the direction of eight protectors, chosen annually by the stock-holders. This bank was pillaged by the Austrians in 1746, and never recovered its former prosperity. The Bank of Amsterdam was established in 1609, like that of Venice, to remedy the inconvenience arising from the great quantity of clipped and worn foreign coin that was in circulation. It received coins of all sorts at their weight in bullion, and, after deducting a small per-centage for the expenses of coinage and general management, gave credit for the remainder. It was enacted that all bills of 600 guilders (£52. 10s.) and upwards,—afterwards reduced to 300,—should be paid in bank money. It professed to lend out no part of its deposits, and to possess bullion to the full amount of the credits given in its books; but, when the French took possession of Amsterdam, in 1796, it was discovered that the bank had lent nearly a million sterling to the States of Holland and Friesland; and this caused its ruin. In 1814 a new bank was established, called the Bank of the Netherlands. The Bank of Hamburg was founded in 1619, upon the same principles as that of Amsterdam, and has continued to flourish. The Bank of Stockholm was founded in 1668, and is remarkable as being the first, according to Law and Hume, that invented bank-notes in Europe (the Chinese having the credit of having been the first to invent bank-notes, in A.D. 807).

*Bank of England.*—Previous to the formation of the Bank of England, in 1694, the business of banking in London was carried on by the goldsmiths, who borrowed money from their customers at a certain rate of interest, and lent it to government and private individuals at a higher rate. The Bank of England was projected by Mr. William Paterson, a Scotch gentleman, and obtained its charter of incorporation on 27th July, 1694, in consideration of £1,200,000 (the then amount of its capital) being lent to government, who were to pay interest for the same at the rate of 8 per cent., with a further allowance of £4,000 a year for management. The first charter was granted for eleven years certain; and it has been from time to time renewed down to the present time. At each renewal, some advantage was given by the Bank to the government, in the shape of an advance of money at a low rate of interest, or without any interest. In this way the debt due by the government to the Bank was increased in 1708 to £3,375,000, in 1738 to £9,100,000, in 1781 to £11,686,000, and in 1816 to £14,686,000. At the renewal of the company's charter, in 1833 (3 & 4 Will. IV. c 98), provision was made for repayment on the part of the government of one fourth part of the debt due to the Bank. This act directs that in future the Bank shall deduct £120,000 a year from their charge, on account of the management of the public debt. At present the amount due by the public to the Bank is £11,015,000. In order to meet these several advances, the capital of the company had to be increased from time to time by new subscriptions. In 1708 it amounted to £4,402,243, in 1746 to £10,780,000, in 1782 to £11,642,400, and in 1816 to £14,553,000, which is its present amount. From its commencement, the Bank of England has enjoyed several important privileges. The chief of these was conferred upon it in 1708, by an act prohibiting any company of more than six partners from being established for the issue of notes payable on demand in England or Wales. This act was partially repealed in 1826, so as to admit of such companies being formed beyond sixty-five miles from London. The Bank is expressly prohibited from engaging in any commercial undertakings except such as are purely and legitimately connected with banking operations; such as the buying and selling of coin, bullion, or bills of exchange. By the original charter the Bank was allowed to issue notes or bills of credit to an amount not exceeding £1,200,000, the amount of its capital. At first, none of its notes were below £20; but, in 1759, it began to issue notes for £10; and £5 notes were first issued in 1793. The act 7 & 8 Vict. c. 32, declares that from and after the 31st of August, 1844, the issue department of the Bank of England shall be separated from the banking department; that the issuing department may issue notes to the extent of £14,000,000, upon securities set apart for that purpose, of which the debt of £11,015,100, due from the government to the Bank, shall form a part; that no amount of notes above £14,000,000 shall be issued, except against gold coin and bullion. From her first establishment down to 1797, the Bank of England had always been able to pay its notes regularly when presented; but in the early part of that year, in consequence of rumours of a French invasion, the demands upon the Bank for cash were so great, that on 26th February an order of council was issued, prohibiting the directors from paying their notes in cash until the sense of parliament was taken upon the subject. When the matter was brought before parliament, an act was passed continuing the restriction until six months after the signature of a definitive treaty of peace. A report, drawn up by a committee of the House of Commons, to examine into the affairs of the Bank, showed that she possessed a clear surplus, after meeting all demands, of not less than £15,513,000. This report, and the fact that Bank of England notes became practically legal tender, restored confidence. In 1801-3, their issues are stated to have been so much increased, that the notes fell to a discount of from 8 to 10 per cent. In 1809-10, from the same cause, the discount rose from 13 to 16 per cent. The issues of country bank-notes were also much enlarged, and in 1814 the discount on Bank of England notes was as high as 25 per cent. In 1816, no fewer than 240 of the country banks stopped payment; and this, together with the declaration of peace, raised the value of the Bank of England note to nearly a par with gold. In 1821, the directors resumed specie payments. In the latter end of 1825, the demand upon the Bank for cash was so great, that the directors applied to government for an order in council restricting specie payments; but this the government refused to grant, and the pressure was at length got over. During the great commercial panics of 1847 and 1857, the demand upon the Bank was so great, that the government took the responsibility of authorizing the directors, if necessary, to infringe the act of 1844, by issuing more notes than they were entitled to do; and on the latter of these occasions it was found necessary to take the benefit of this authority. Any

person is entitled to demand notes from the issuing department in exchange for gold bullion, at the rate of £3. 17s. 9d. per ounce. Should any banker discontinue his issue of notes, the Bank of England may, upon application, be empowered, by an order of council, to increase her issue upon securities to the extent of two-thirds of the issue thus withdrawn; but all the profit of this increased issue must go to the government. In 1857 permission was in this way granted to issue an additional sum of £475,000; so that the Bank can now issue notes to the extent of £14,475,000, against which sum she has securities set apart for that purpose; and besides this, she can issue to the amount of gold and silver she possesses in terms of the above-mentioned act. By this act a weekly statement of the affairs of the Bank is required to be published in the *London Gazette*. Bank of England notes are declared to be a legal tender in all cases except when tendered by the Bank herself. All the notes which are at any time in circulation from the issue department must either be in the banking department, or in the hands of the public. The amount in the banking department is called by the directors "the reserve;" the amount in the hands of the public, "the active circulation." It is by the amount of reserve that the directors profess to regulate their changes in the rate of interest. When the reserve is low, they increase the rate of discount; when high, they raise it. The amount of reserve depends chiefly upon changes made in the issue circulation;—when the issue circulation is high, the reserve is high; and when low, the reserve is low. The Bank of England receives deposits, but allows no interest upon them; nor does she permit any account to be overdrawn. The rates of discount vary considerably, according to the state of the money-market; but, generally speaking, they average from 2½ to 5½ per cent. Within the last few years they have been as low as 2 and 2½, and, in November, 1857, they rose as high as 10 per cent. The Bank transacts the whole business of the government, and has always on hand a large amount of the public deposits, amounting sometimes to several millions sterling, on which she pays no interest. She receives the public revenue, and pays the dividends upon the national debt, for which she receives a certain annual per-centage. The profit on the issue department is the interest of 3 per cent. paid by government upon the £14,000,000 for which she has notes in circulation uncovered by specie. From this has to be deducted the cost of maintaining the issue, estimated at £113,000, and the sum of £180,000, which is deducted from the sum allowed for the management of the national debt, on account of the exclusive privileges allowed to her, and the exemption from stamp duties, leaving a clear profit of about £127,000. The Bank has also a profit of 1½*d.* per ounce upon her bullion transactions; she also derives large profits, like other banks, from her deposits, with which she makes investments in public and private securities. The Bank of England is a central bank of deposit for all the London banks that are members of the clearing-house. They have all deposits here, and settle their claims upon each other by transfers to or from their different accounts. (*See* CLEARING-HOUSE.) The following is a statement of the affairs of the Bank for week ending February 5, 1862, issued pursuant to act of parliament:—

*Issue Department.*

| | | | |
|---|---|---|---|
| Notes issued | £29,765,080 | Govmt. debt | £11,015,100 |
| | | Other securities | 3,634,900 |
| | | Coin and bullion | 15,115,080 |
| | £29,765,080 | | £29,765,080 |

*Banking Department.*

| | | | |
|---|---|---|---|
| Proprietors' capital | £14,553,000 | Gov. securities | £11,301,802 |
| Rest | 3,396,343 | Other ,, | 17,435,550 |
| Public deposits | 5,789,441 | Notes | 9,030,425 |
| Other deposits | 14,179,919 | Gold and silver coin | 841,823 |
| Seven-day and other bills | 692,897 | | |
| | £38,609,600 | | £38,609,600 |

In 1826 the directors agreed to establish branches in certain of the larger towns of England, in order to extend to the provinces the advantages of a secure circulation. At present, therefore, there are branches of the Bank at Manchester, Swansea, Birmingham, Liverpool, Bristol, Newcastle-on-Tyne, Hull, Plymouth, Portsmouth, Leicester, Leeds, and at the west end of London. The weekly statements published include the whole establishment,—the branches as well as the head-offices. The payment of notes issued in London can be demanded only at the London office; but those issued at the branch offices may be demanded either at the office where issued or at London. The management of the Bank is, in terms of the original charter, vested in a governor, deputy-governor, and twenty-four directors. The governor must hold at least £4,000, the deputy-governor £3,000, and each of the directors £2,000 of the capital stock of the company. They are selected from the mercantile classes of London, virtually by the other directors, who form what is called a "House List," containing the names of certain persons whom they recommend as directors; and this recommendation is always followed by the proprietors. Thirteen of the directors, of whom the governor or deputy-governor must be one, form a court, which meets every Thursday for the transaction of business, and for receiving a report of the state of the Bank for the preceding week. The court half-yearly declares to the stockholders the dividend due on the capital and profits. The committee of the treasury is composed of those directors who have held the office of governor, together with the existing governor and deputy-governor, and the director who is intended to be the next deputy-governor. This committee meets once a week, and at such other times as it may be called together specially by the governor. It was the rule that every director should take his turn for becoming governor; but recently it has been determined to place in that office him whom the other directors shall, by ballot, think the best qualified. Four general courts are held every year, in the months of September, December, April, and July. The secretary is the official organ of the corporation, and to him all correspondence should be addressed.

*Private Banks and Joint-Stock Banks.*—The restriction in favour of the Bank of England confining the number of partners in other banks to six, acted very unfavourably upon other establishments. However, numerous private banks, with not more than six partners, sprung up in various parts of England, and in 1792 their number is supposed to have exceeded 350. Many of them were destroyed by the crisis of that year; but, subsequently to 1800, they began rapidly to increase. In 1809 they amounted to 782, and in 1814 there were no fewer than 940. In the difficulties which followed, 240 of these establishments stopped payment. Since the abolition of the restriction to places beyond sixty-five miles from London, many joint-stock banks have been established in different parts of England, some with very large bodies of proprietors. The Bank Act of 1844 contained various enactments regarding private banks, by which they are at present regulated. It enacts that no banker, except he were issuing notes on the 6th of May, 1844, was in future to issue notes in any part of the United Kingdom, and the issue of each bank was to be strictly limited to the average amount of notes which it had in circulation during a period of twelve weeks preceding 27th April, 1844. Every issuing banker has to transmit weekly to the Stamp-office an account of his notes in circulation on each day during the week preceding. Banking companies on the joint-stock principle, but with the liability of the shareholders limited to the amount of the shares, may now be established in terms of the Limited Liabilities Act (21 & 22 Vict. c. 91); otherwise, holders of stock in any English bank, except the Bank of England, are liable, not only for the amount of their shares, but for the whole debts of the company, whatever may be their amount. All notes are made payable on demand, and, since 1826, no notes for less than £5 have been allowed to circulate. The number of private banking establishments in London is 54, in the country 243. Of these last, 153 are banks of issue, having a fixed issue of £4,404,935; while their actual issue is about a million less. It being discovered, about 1833, that the restriction against the establish-

ment of joint-stock banks in or near London had reference only to the issuing of notes, several joint-stock banks of deposit have been instituted since that time. There are at present, in all, ninety-five joint-stock banks of England and Wales, ten of which are in London. Of those in the provinces, sixty-three are authorized to issue notes to the amount, in all, of £3,909,357. Besides the Bank of England and its branches, there are, in all, in England and Wales, 392 banks and about 849 branches.

*Banks in Scotland.*—The first banking establishment in Scotland was formed in 1695, under the name of the Governor and Company of the Bank of Scotland. The original capital was £1,200,000 Scots, or £100,000 sterling, in shares of £1,000 Scots, or £83. 6s. 8d. sterling. At present its subscribed capital is £1,500,000, of which £1,000,000 has been paid up. It began to establish branches in 1696, and to issue notes for £1 in 1704. In 1727 the Royal Bank of Scotland was established, with a capital of £151,000, which has been increased to £2,000,000, all of which is paid up. The British Linen Company was incorporated in 1746, for, as its name implies, the purpose of undertaking the manufacture of linen; but these views were speedily abandoned, and it became a banking company only. None of the other banking establishments in Scotland are chartered, with limited responsibility; and hence the partners are liable for the whole debts of the company. The following table gives the names and various particulars regarding the banks in Scotland:—

| Institt. | NAME. | Paid-up Capital. | Authorized Circulation. | Average Circulation, 1860. | Coin, 1860. |
|---|---|---|---|---|---|
| | | £. | £. | £. | £. |
| 1695 | Bank of Scotland | 1,000,000 | 300,485 | 456,725 | 248,921 |
| 1727 | Royal Bank | 2,000,000 | 183,000 | 461,728 | 391,210 |
| 1746 | British Linen Company | 1,000,000 | 438,024 | 510,058 | 361,244 |
| 1810 | Commercial Bank | 800,000 | 374,880 | 547,987 | 290,210 |
| 1825 | National Bank of Scotland | 1,000,000 | 297,024 | 450,229 | 268,420 |
| 1830 | Union Bank of Scotland | 1,000,000 | 454,346 | 627,757 | 284,493 |
| 1825 | Aberdeen Town and County Bank | 130,605 | 70,183 | 132,147 | 81,930 |
| 1836 | North of Scotland Bank | 200,000 | 154,319 | 201,224 | 96,978 |
| 1763 | Dundee Banking Company | 60,000 | 33,451 | 45,827 | 24,578 |
| 1838 | Eastern Bank of Scotland | 113,440 | 33,636 | 39,363 | 19,206 |
| 1838 | Clydesdale Banking Company | 807,[illegible] | 240,685 | 325,433 | 159,606 |
| 1839 | City of Glasgow Bank | 670,[illegible] | 72,921 | 294,924 | 255,960 |
| 1838 | Caledonian Banking Company | 125,[illegible] | 53,434 | 66,028 | 30,768 |
| 1834 | Central Bank of Scotland | 78,125 | 42,933 | 60,069 | 32,928 |
| | | Total ... | 3,087,300 | 4,219,569 | 2,552,361 |

In 1857, the Western Bank, with capital of £1,500,000, and an authorized circulation of £337,938, suspended payments; but neither the note-holders nor depositors sustained any loss, the shareholders, about 1,300 in number, some of them very wealthy, being liable for all the debts. Soon after, another Scottish establishment, the Edinburgh and Glasgow Bank, having an authorized circulation of £136,657, had to wind up its affairs, with the entire loss of its capital; but in this case an arrangement was made by which its authorized circulation was handed over to the Clydesdale Bank; so that it was not lost to the country, as was the case with the authorized circulation of the Western Bank. In both cases the stoppage arose from gross recklessness in advancing moneys. The Scotch banks all issue notes as low as £1. The issue is regulated by act 8 & 9 Vict. c. 38, by which the power of issuing notes is confined to those banks that issued notes during the year preceding May 1, 1845, and the authorized amount of each is the average amount of notes that it had in circulation during that year. While the English joint-stock and private banks cannot by any means exceed their authorised circulation, the Scotch banks can do so to any extent, provided they have at the head-office gold and silver coin to the amount of the excess of issue; but the amount of silver must not be more than a quarter of that of the gold. All the banks, except the Bank of Scotland, the Royal Bank, and the British Linen Company, are required to send annually, in the month of January, a list of the names of all their partners, and such list must be afterwards published in some newspaper circulating in the town or county in which the head-office or principal place of issue is situated. All the banks have numerous branches throughout the country; so that there is hardly a town or village in Scotland without several of them. The number of such branches is in all about 600. The Scotch banks all allow interest on deposits, and even on the balances of current accounts. In 1856 the total amount of deposits in the Scotch banks was estimated at not less than £50,000,000. Besides making advances in the way of discounts and loans, they advance money on what are called cash accounts or cash credits. By this means, a person granting a bond, with approved securities, becomes entitled to draw upon the bank to the extent of the sum stipulated, and he makes deposits at his convenience for the liquidation of the same. These accounts are balanced yearly, like current accounts. These cash accounts are found to be very advantageous to traders, by supplying an additional capital, for the use of which they pay only in proportion to the amount of it which they employ. Cheques are not used to nearly the same extent in Scotland as in England, accounts being generally settled by bank-notes. A merchant usually draws at once from the bank as much as he thinks that he will require during the day, and pays in what balance he may have in the afternoon. In this way, cheques are much fewer, and they seldom extend to shillings and pence.

*Irish Banks.*—In 1783 the National Bank of Ireland was established, with similar privileges to those enjoyed at that time by the Bank of England. Its capital is £3,000,000 Irish, or about £2,800,000 sterling, of which £2,630,769 sterling is lent to the government. The "rest" formed from the accumulated profits is £1,043,000. The authorized issue of the bank is £3,738,000. It allows no interest on deposits. The other issuing banks of Ireland are the Provincial Bank of Ireland (founded in 1825), the National Bank of Ireland, the Belfast Banking Company, the Ulster Banking Company, and the Northern Banking Company. The aggregate authorized issue of all these is £2,616,000. The authorized issue of each bank is fixed by the act of 1845; and all issues beyond that must be made against a corresponding value of bullion. The Irish, as well as the Scotch banks, issue £1 notes; and the joint-stock banks all allow interest on deposits. There are non-issuing joint-stock banks and private banks in Ireland; and there are numerous branches extending over the country.

From what has been already said, it will be seen that the term Bank is applied to establishments of very different kinds. Banks are usually divided into three classes, as they are merely for the custody or issue of money, or for both. The first class, or the banks of deposit, are, strictly speaking, those early banks which received money or valuables for custody, and kept them in their coffers till called for; but now the term is generally applied to those establishments that receive money from their customers and lend it out to others at a higher rate of interest. Banks of issue are those that issue their own notes for circulation; but as all of these, in this country at least, likewise receive deposits, the term is generally applied to what forms the third class of the division. Were the duties of banks limited to the safe-custody of money, they

would still be of immense advantage to the public. Every one who has had the care of large sums of money knows the anxiety which attends their custody, and the risks to which they are subjected; and hence the value of a place of security in which to lodge them. This gave rise to the first formation of public banks. But, were the money merely to lie idly in the coffers of the bank, it is evident that the depositor would not only not receive any interest upon it, but would have to pay for the trouble and expense of keeping it; while the money thus kept was so much withdrawn from the trading capital of the country. The advantages of combining a system of lending money with that of receiving it soon became apparent; and banks were established for the purpose of both receiving and lending money; the interests received on the sums being considered sufficient to cover all expense connected with its management, or the risk of losing it; and, indeed, as already seen, almost all banks pay interest upon their deposits. By this means, numerous small sums of money, which would have remained unproductive in the hands of individuals, are collected into large sums in the hands of the bankers, who employ it in granting facilities to trade and commerce, and in this way increase the productive capital of the nation. Thus a million of money, in place of lying useless in small sums in the hands of the owners, or in one large sum in the coffers of a bank, is lent out to increase the capital of manufacturers and traders; and thus the world is made one million richer, or at least is saved from being one million poorer. Besides the money which a banker receives in deposits from his customers, he must be possessed of a certain capital of his own in order to carry on business, and to insure confidence in his stability; for no one would lend money to a banker if he knew that he was possessed of no capital. The interest derived from this capital forms part of the profits of the banker; but it is evident that the profit in this case is not the same as that which he derives from trading with the capital of others; in other words, that the interest is not greater than if he had lent out his money in any other way equally safe, and involving the same amount of trouble. The capital of the banker ought properly to be invested in government securities yielding three per cent., which can readily be converted into money in the event of an unexpected demand upon him by his customers for their deposits. The deposits, over and above a certain sum which he must have at hand to meet daily claims, he advances in various ways as loans. The best and safest mode of employing such funds is considered to be in the discounting of good mercantile bills of exchange; that is, bills representing *bonâ-fide* transactions of trade and commerce. A banker sometimes makes advances upon the deposit of exchequer bills or other government securities, railway debentures, bills of lading, dock warrants, and such-like; but, except the government securities, the others are generally avoided by prudent bankers. Loans are usually divided into short loans and dead loans, the former having a fixed time for their repayment, the latter no fixed time. Loans of the latter class are generally avoided. Advances upon deeds, except in agricultural districts, are always objectionable. If depositors have the power of demanding the amount of their deposits at any time from the banker, while he usually makes his advances for a fixed or definite period, it is evident that he must always have on hand, uninvested, a considerable sum to meet such claims. The amount necessary for this purpose may generally be pretty nearly estimated. It depends upon a number of circumstances; as the state of the money-market, the amount and nature of the deposits, the average amount of daily payments, and such-like. If a banker is at liberty to issue bank-notes to a certain amount, it is evident that the profit derived therefrom is equal to the interest upon the difference between the average amount in circulation and the amount of specie required to be kept on hand to meet them, less the expense of their manufacture. If, however, a banker were obliged to keep dead stock or bullion equal to the amount of his notes in circulation, he could make no profit. But for a banker in good credit it is considered that a fourth or a fifth part of this sum is usually sufficient. Besides serving as places for the safe-custody for money, and allowing interest on deposits, banks are of great use in affording a safe and rapid transference of money from one place to another. A debtor in Edinburgh, or Dublin, pays to his banker there the sum which he wishes to convey to his creditor in London. The banker, for a small commission, furnishes him with a draft or letter of credit for the amount, to be paid by a banker in London, from whom the creditor, on presenting the draft, receives the amount. Thus, then, the disposable means of a bank are,—1. The amount of paid-up capital; 2. the amount of money lodged by customers; 3. the amount of notes in circulation; 4. the amount of money in course of transmission,—that is, money received for the purpose of being repaid in some distant place at a future time. These means are employed,—1. In discounting bills; 2. in advances of money in the form of cash credits, loans, or overdrawn accounts; 3. in the purchase of government and other securities; 4. a part retained in till to meet current demands. Of these four ways of employing capital, three are productive, and one, namely the last, unproductive. The profits are that portion of the total receipts of the bank, including discount, interest, dividends, and commissions, which exceeds the amount of the expenses. A great saving is also effected, by the use of notes and cheques, of wear tear, and upon the coinage of the country. Frequently the banker performs the duties of cash-keeper to his depositors, making all their money payments beyond their small daily expenditure, and receiving the money payable to them. The merchant, by sending all the bills due to him to his banker, to be presented, and noted if not duly paid, is saved a great amount of trouble, and the risk of making mistakes in the presentation of the bills, the banker being always liable for any mistakes that may be committed through him. But it is in the use that the banker makes of the money that is intrusted to him that he is of the chief benefit to society,—in his loans, discounts, and cash credits. It is here that he requires to exercise his greatest ability and skill, so that he may be the means of furthering the prosperity of the country, by aiding honest industry, and exposing rogues and reckless speculators. "From motives of private interest," says Gilbart, "they (the bankers) encourage the industrious, the prudent, the punctual, and the honest; while they discountenance the spendthrift and the gambler, the liar and the knave. They hold out inducements to uprightness, which are not disregarded by even the most abandoned. There is many a man who would be deterred from dishonesty by the frown of a banker, though he might care but little for the admonitions of a bishop."—Ref. *English Cyclopædia*—Arts and Sciences; McCulloch's *Commercial Dictionary*; Gilbart's various works on *Banking*; Dunning McLeod's *Theory and Practice of Banking*, and *Dictionary of Political Economy*; Lawson's *History of Banking*; Smith's *Wealth of Nations*.

Bank-Note Manufacture.—In order to prevent the forgery of bank-notes, a great deal of ingenuity and art has been expended on their production. The principal features of the manufacture are,—a peculiar kind of paper and water-mark; an elaborate design, printed with a peculiar kind of ink, and certain private marks, known only by the bank officials. Until 1807, bank-notes were produced by copper-plate printing; after which time, by means of Messrs. Perkins & Heath's invention, they were reproduced without fresh engraving. They employed the following method:—The note was first engraved on a soft steel plate, which was afterwards hardened. The impression was then transferred to a soft steel roller, which, in its turn, was also hardened, and the impression remained there in relief. From this roller any number of freshly-engraved plates could be produced. In 1855 Mr. Snow, the surgeon to the Bank of England, introduced the principle of electrotype-printing; and, since that time, all their notes have been produced by that means. (*See* Electrotype.)

Bankrupt, *bank'-rupt* (*Fr. banqueroutier, banqueroute*; Ital. *banco rotto*).—The title of the first English statute relative to bankrupts,—the 34 Hen. VIII. c. 4, which is said to be against "such persons as do make bankrupt,"—is a literal translation of the French [illegible] *faire banque route*. The old French word [illegible] *banque* and *route*,—*i.e.*, a counter or table and track or sign. Thus a counter is the sign where the

cart-wheel has gone; and *bankrupt* is metaphorically taken from the sign left in the earth, of a table once fastened to it and taken away. The original seems to have sprung from the Roman bankers or money-changers, called *Mensarii*, who had their *tabernas* and *mensas*,—their booths and tables,—in certain public places (as, in Italy and Spain, they now have, or lately had, them openly in the market-places); and, when they failed and fled, they left only the signs of their banks, benches, or tables, behind them. The use of tables by money-changers also prevailed in the time of our Saviour. (*See* Matt. xxi. 12.) Others derive the word from the Italian *banco rotto*, broken bench; it being the custom in Italy, when a banker failed, to break his bench, by which the public was informed that the person to whom the bank belonged was no longer in a condition to continue his business. The 3rd of Elizabeth was the second English statute, all the provisions of which were incorporated in 1 James I., which was for a considerable period the leading act relating to bankrupts. According to these statutes, a bankrupt was considered a criminal or offender. In 1731 an act was passed, by which a bankrupt who secreted his property or books was made punishable by death; and John Perrot was, under this law, hanged in 1761. At the present time the laws of bankruptcy are calculated to operate for the general benefit of trade, but nevertheless they impose penalties on fraudulent or dishonest persons. Before "the Bankruptcy Act, 1861," only certain traders could become or be made bankrupts; and relief to persons in difficulties or in confinement, and not subject to the law of bankruptcy, could only be obtained under the provisions of various acts of parliament passed from time to time for the relief of insolvent debtors. But by this statute, sec. 69, all debtors, whether traders or not, are subject to its provisions; but a non-trader cannot be adjudicated bankrupt, unless, with intent to defeat or defraud his creditors, he shall depart the realm, or, being out of the realm, with such intent remain abroad; or with such intent make any fraudulent conveyance, gift, delivery, or transfer of his real or personal estate; or unless he commit the other acts of bankruptcy after-mentioned; and, by the same statute, it is enacted that the following shall be considered acts of bankruptcy:—a trader lying in prison for debt for fourteen days, and a non-trader for two calendar months, or, in either case, escaping out of prison; a debtor, whether a trader or not, filing a declaration that he is unable to meet his engagements, a trader debtor suffering an execution to be levied; any debtor, on being summoned in respect of a debt amounting to £50, and not paying the debt and costs, or securing or compounding for the same to the satisfaction of the creditor: And any debtor may petition for adjudication of bankruptcy against himself. In cases where persons are imprisoned for debt, a registrar is to attend at the gaol, and examine the prisoner, and, after the expiration of fourteen days, or two calendar months, as the case may be, and as before mentioned, he may make an order of adjudication, grant him protection, and order his release. If the prisoner refuse to conform, or to sign his examination, the court may commit him to the common gaol of the county, there to be kept, with or without hard labour, for any time not exceeding one month. The object of the statute is to administer the whole of the bankrupt's estate for the benefit of his creditors, to discharge him from imprisonment and further liability, on his fairly and honestly giving up his estate, and making a full disclosure of his affairs. But, on the other hand, it declares the bankrupt shall be guilty of a misdemeanour, and be liable, at the discretion of the court before which he shall be convicted, to imprisonment for not more than three years, or to any greater punishment attached to the offence by any existing statute, for either of the following offences:—If he shall neglect to surrender or be examined, or refuse to or not fully discover his property and the mode of its disposal; or, after adjudication, or within sixty days prior thereto, with intent to defraud his creditors, remove, conceal, or embezzle any part of his property to the value of £10 or upwards; or not disclose, within one month after, his knowledge or belief that a false debt has been proved under his bankruptcy; or wilfully or fraudulently omit from his schedule any effects or property, or conceal or withhold the production of any book, deed, paper, or writing relating to his property, dealings, or affairs; or, after or within three months before adjudication, conceal, destroy, alter, mutilate, or falsify, any book, paper, writing, security, or document relating to his estate, dealings, or affairs; or make, or be privy to the making, of any false or fraudulent entry in, or omission from, any book, paper, document, or writing relating thereto; or, within the like time, knowing that he is unable to meet his engagements, fraudulently, and with intent to diminish the sum to be divided amongst the general body of his creditors, have made away with, mortgaged, encumbered, or charged any part of his property; or if, after adjudication, he shall conceal any debt due to or from him. Similar penalties attach to a *trader* in the following cases:—If he shall, under his bankruptcy, or at any meeting of his creditors within three months next preceding the filing of the petition for adjudication, have attempted to account for any of his property by fictitious losses or expenses; or if, within the like time, under the false colour and pretence of carrying on business, and dealing in the ordinary course of trade, have obtained on credit, from any person, any goods or chattels, with intent to defraud; or, with intent to defraud his creditors, within the like time, pawn, pledge, or dispose of, or otherwise than by *bonâ-fide* transactions in the ordinary way of his trade, any of his goods or chattels which have been obtained on credit and remain unpaid for. Although the statute contains 232 sections, the former laws applicable to bankrupt traders remain in force, except where they are altered by the law now under notice. The whole of the bankrupt's effects pass to his assignees, and he is bound to assist them by making such disclosures as will enable them to divide the same amongst his creditors. In a work of this nature we cannot enter more fully into the law of bankruptcy; nor should we have treated of it at such length, except for the radical change effected by the late statute. (*See* Assignee of a Bankrupt.)

Banks, Savings. (*See* Savings Banks.)

Banksia, *bănk'-si-a*, in Bot., a gen. of plants belonging to the nat. ord. *Proteaceæ*, and so named in honour of Sir Joseph Banks. The species are bushes and small trees, found in all parts of Australia. They have hard dry leaves, dull green above and almost white beneath. The branches bear, towards their extremities, long heads of very numerous flowers. The flowers secrete much honey; hence the name honeysuckle-trees commonly given to these plants by the colonists. Several species are much cultivated in British conservatories.

Bannatyne Club, *băn'-a-tine*, a literary club instituted at Edinburgh, in 1823, by Sir Walter Scott, who was its first president. It takes its name from George Bannatyne (1545—1607), compiler of the celebrated MS. in the Advocates' library, entitled, *Corpus Poeticum Scotorum*. It consisted originally of only 31 members; but as many persons of rank and literary distinction were anxious to join it, the number, in 1828, was increased to 100. Its object is the printing of rare works illustrative of the history and antiquities of Scotland, for distribution among the members, each of whom pays an annual subscription of five guineas. Since its commencement, it has published upwards of 100 quarto volumes of rare and interesting works.

Banner, *băn'-ner*, is a piece of cloth attached to the upper end of a pole or staff, and usually bearing some device or emblem. Banners or standards have been in use from the earliest times. We find them mentioned in Numbers ii., where the children of Israel are directed every man to "pitch by his own standard with the ensign of their father's house." The earliest standards were probably not banners, but representations of some animal or other object fixed on the top of a pole, as the Roman eagle or the Athenian owl. The chief use of the standard or banner in all times must have been to serve as a rallying-point to soldiers in battle. Hence they have always been regarded as an emblem of national honour, which the warrior was ever ready to defend at the risk of his life; and hence, banners taken from an enemy have always been regarded as special trophies of victory.

Banneret, *băn'-ner-et*, was the title of a knight who was entitled to bear a banner in the field, or who

was able to bring into the field a sufficient body of men to have their own leader. The banneret was created on the field of battle, on account of distinguished services. He took precedence of all other knights after barons. The dignity has not been conferred for a long time.

BANNOCK. (*See* CAKE.)

BANNS OF MARRIAGE, *bānz*, the public proclamation of the names and designation of persons about to be married, made in church; the object being that those who have objections to the marriage may have an opportunity of stating them. According to the law of England, the proclamation must be made on three successive Sundays in the church during the time of the celebration of public worship; and if the marriage be not performed within three months after the last proclamation, the same process must be repeated. The proclamation of banns may be dispensed with by obtaining a license from some one authorized by the bishop of the diocese to grant it, by a special license granted by the archbishop of Canterbury, or by a certificate from the superintendent registrar of the district. (*See* LICENSE and MARRIAGE.)

BANQUETTE, *ban-ket'*, in Fort., is a step or small terrace of earth constructed along the inner side of a parapet for the musketeers to stand upon when the parapet is too high to fire over. It is usually made about four feet wide, and raised to within 4½ feet of the crest of the parapet.

BANTAM COCK. (See COCK.)

BANYAN-TREE. (See ADANSONIA.)

BAPTISIA, *bap-tiz'-i-a*, in Bot., a gen. of plants belonging to the nat. ord. *Leguminosæ*, sub-ord. *Cæsalpiniæ*. The species *B. tinctoria* yields the dye-wood known in commerce as wood or yam-wood. This dye-stuff is employed, in connection with sulphate of iron, to produce the dark red colour of the English bandana handkerchiefs.

BAPHOMET, *baf'-o-met*, the name of a mysterious symbol, or idol, which the Templars were accused of worshipping in their secret rites. The term is generally supposed to be a corruption of Mahomet, to whose faith the members of the order were accused of having an inclination. Von Hammer, however, derives the name from the Greek *baphe*, baptism, and *metis*, wisdom, and believes that it denotes certain small human figures, found in some of the continental collections, with two heads, and covered with emblems.

BAPTISIA, *bāp-tiz'-i-a*, in Bot., a gen. of plants belonging to the nat. ord. *Leguminosæ*, sub-ord. *Papilionaceæ*. The species are numerous, and chiefly natives of North America. *B. tinctoria* is the wild indigo of the United States, yielding a blue dye, resembling, but much inferior to, indigo. This plant is used medicinally; the root and herbage being stated to possess antiseptic, sub-astringent, cathartic, and emetic properties.

BAPTISM, *bāp'-tizm* (Gr. *baptizo*, I wash or dip), is a sacrament of the Christian church, consisting of the application of water to a person in the name of the Father, the Son, and the Holy Ghost, by which he becomes initiated into the visible church. It is an institution ordained by Christ himself, when he commissioned his disciples to go and teach all nations, baptizing them in the name of the Father, and of the Son, and of the Holy Ghost. The rite, however, is believed to be much more ancient. Baptism, or purification by water, is said to have formed part of the ceremony of admitting proselytes into the Jewish church; and it is also said to have been the first ceremony performed at initiation into the Eleusinian mysteries. Doubtless, as a fit and natural emblem of purification, washing by water may be supposed to have existed from a very early period. Grotius, indeed, is of opinion that it derived its origin from the Deluge, having been instituted in memory of the world having been purified by water. Various controversies have arisen in the Church as to how baptism is to be administered, and who are the proper subjects of it; whether it is to be done by sprinkling, by affusion or pouring, or by immersion or dipping; whether it is to be administered only to adults, or also to infants. The Baptists are the most important sect that hold to adult baptism and immersion. (*See* BAPTISTS.) There is no direct evidence to be obtained in Scripture on





any of these points. It is even doubtful whether infant baptism was practised in the earliest age of the Church. According to Neander, "baptism, at first was administered only to adults," and "there does not appear to be any reason for deriving infant baptism from an apostolical institution." It is first alluded to by Irenæus, and was afterwards strongly opposed by Tertullian, a proof, says Neander, "that the practice was not universally regarded as an apostolical institution." The doctrine, however, continued to gain ground in the Christian church; but it was not till about the 5th century that it was fully established. Infant baptism, however, seems to be in accordance with the general spirit of Christianity, which makes the children partakers of the blessings bestowed upon their parents, and to be a necessary consequence of the doctrine of original sin. We also find the apostles baptising whole households, of whom it may readily be supposed that infants formed a part. Many writers, too, regard baptism as corresponding with circumcision in the Jewish establishment, being the badge of distinction between the Church and the world; and hence some of the fathers have held that it should not be administered till the eighth day. In the primitive church, the office of baptising was vested principally in the bishops and priests, or pastors of the respective parishes; but, with the consent of the bishop, it was allowed to the deacon, and in cases of necessity, even to laymen to baptize. It was administered only on the two solemn festivals of the year, Easter and Whitsuntide. The place of baptism was at first unlimited, but afterwards *baptisteries*, or *fonts* (which *see*), were erected in or near churches for that purpose. By the Church of Rome baptism is defined to be "a sacrament instituted by our Saviour, to wash away original sin, and all those we may have committed; to communicate to mankind the spiritual regeneration and the grace of Christ Jesus, and to unite them to him as the living members to the head." In the Articles of the Church of England baptism is said to be "not only a sign of profession, and mark of difference, whereby Christian men are discerned from others that be not christened; but it is also a sign of regeneration, or new birth, whereby, as by an instrument, they that receive baptism rightly are grafted into the Church: the promises of the forgiveness of sin, of our adoption to be the sons of God by the Holy Ghost, are visibly signed and sealed, faith is confirmed, and grace increased by virtue of prayer to God." The Church prescribes that baptism be administered only on Sundays and holydays, except in cases of necessity. She requires sponsors for infants,—for every male child two godfathers and one godmother, and for every female child two godmothers and one godfather. Some of the early Church believed that baptism had the effect of washing away all previous sin, actual as well as original; and hence the administration of it was sometimes deferred till near the close of life, that all their transgressions might thus be removed.

BAPTISTERY, *bāp-tis'-ter-e* (Gr. *baptisterion*, a large basin or bath), the name given to the building in which the sacrament of baptism was administered in the early ages of the Christian church. They were at first separated from the churches or basilicas to which they belonged, as they were required to accommodate a number of adult persons desirous of receiving the rite, and who were subjected to total immersion, after the manner in which John the Baptist baptised in the Jordan, at certain times appointed for the purpose. They were circular in form; but at first were constructed in an hexagonal or octagonal shape, paved with marble, with large basins of the same material, generally three feet deep, either raised above the surface of the pavement and entered by steps, or sunk below the level. Some were of most elaborate architectural design; such as the circular baptistery of Pisa, 116 feet in diameter, three stories in height, and surmounted by a dome; and the baptistery of Florence, built of black and white marble, 100 feet in diameter, and magnificently adorned with mosaics by Andrea Tafi, and bronze doors of beautiful workmanship executed by Andrea of Pisa and Lorenzo Ghiberti. The largest ever built is the one attached to the church of St. Sophia, at Constantinople. Other baptisteries are those of S. Giovanni in Fonte, and S. Mi-

vansi Laterano, at Rome; and those at Ravenna, Asti, and the principal cities of Tuscany. It is supposed that the polygonal chapter-houses attached to English cathedrals were once baptisteries, and it is probable that the stone edifice at Glastonbury known as the Abbot's Kitchen served for a similar purpose. The places provided in Baptist chapels for the total immersion of adult members of that body are called *baptisteries*.—Ref. *English Cyclopædia*—Arts and Sciences.

BAPTISTS, *bâp'-tists*, a religious sect, who hold that baptism is not to be administered to adults, but only after a personal profession of faith, and that it is to be administered by immersion, not by sprinkling. The question of infant baptism (*see* BAPTISM) agitated the Church at a very early period, and about the end of the 2nd century Tertullian declared against it. Several of the later fathers entertained similar views; but the doctrine of infant baptism continued to spread, and in the 5th century the opposite opinions were condemned as heretical by several councils. In the Middle Ages, the doctrines of the Baptists continued to gain ground notwithstanding persecution; so that, according to Mosheim, the number who professed them in the beginning of the 12th century amounted to 800,000. From this time to the commencement of the Reformation, Germany was the chief seat of the Baptists, whence they spread over Holland and other parts. Little, however, is known of them in England before the 16th century. They were persecuted in the reigns of Henry VIII. and Elizabeth, and several of them suffered at the stake. The first Baptist church was formed in London in 1608, and in 1851 they had in England and Wales no fewer than 2,789 places of worship. In Scotland and Ireland, they have also many places of worship; but in the United States they are much more numerous, constituting the most numerous denomination in the country, with the exception of the Methodists. Though all Baptists agree in holding that baptism is only to be administered on a profession of faith in Jesus Christ by the recipient, and that the only scriptural mode of administering it is by immersion, yet they differ among themselves on many other points, and are split up into several minor sects. The chief body in this country are the Particular Baptists, who are Calvinistic in their views, and hold that Christ died only for an elect number. The General Baptists maintain that Christ died for all men; and these are again divided into the Old Connection or Unitarian, and the New Connection or Trinitarian, the latter by far the more numerous. There are likewise several smaller sects. Baptists differ among themselves also as to the admission of those who have not been baptized in their way to communion with them at the Lord's table, and to membership; the one class being termed open, the other strict, communionists. The Baptists were among the foremost in the field of foreign missions, and they have ever been very zealous in that cause. They have colleges at Bristol, Bradford, Pontypool, Haverfordwest, Nottingham, and Regent's Park, London.

BAR, *bar* (Ang.-Sax. *bairgan, beorgan, birgan, byrgan*), literally, to prevent, keep out or obstruct, to guard, to secure, to fortify, to prohibit.

BAR, in Mus., a perpendicular stroke drawn across the lines of a piece of music, to divide it into equal portions or measures of time. According to Sir John Hawkins, the use of bars is not to be traced further back than 1674, though bars are to be found in the "Ayres and Dialogues" of Henry Lawes, published in 1661.

BAR, in African traffic, is used for a denomination of price; payment being formerly made by the negroes almost wholly in bars of iron.

BAR, of gold or silver, is a lump or wedge from mines, cast in a rough mould and never wrought.

BAR, in Her., one of the nine *honourable* charges or figures placed upon the field or escutcheon, called *ordinaries*, and consists of two lines drawn across the field. It differs from the *fess* in this: the fess occupies a third part of the field, and is confined to the centre; whereas the bar contains only a fifth, is not limited to any part, and is never borne singly. It has two diminutives,—the *closet*, which is half the width of the bar, and the *barrule or barrulet*, which is half the width of the closet. Of the closet, there may be five in one field, but the barrulet can be borne only in couples. *Bars-gemelles* are so called when they stand in couples. When the shield contains a number of bars of *metal* and *colour*, alternate, of even number, that is called *barry* of so many pieces; as, barry of six *argent* and *gules*.

BAR, in Phys. Geog., an obstruction, consisting of sandbanks or rocks, which prevents the entrance of vessels into a harbour at low water. They are, for the most part, formed by the accumulation of earth, mud, and sand, washed away and brought down by the water of a river on its way to the sea. The rush of water, however, generally keeps clear one or two deep narrow channels in the mass for the entrance and exit of vessels; but in some cases, the entrances to rivers have to be kept open by the continual removal of the accumulating detritus by dredging-machines constructed for the purpose.

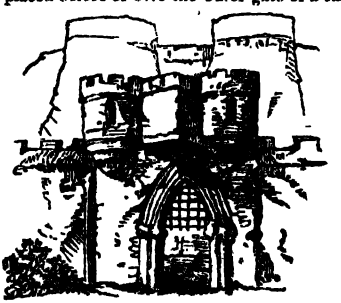
BAR, in Courts of Justice, is an inclosure or place in which counsel or barristers-at-law stand to plead causes in court. It is also applied to the benches where the advocates are seated; because, anciently, there was a bar to separate pleaders from attorneys and others. Hence our lawyers who are called to the bar are termed barristers, an appellation equivalent to licentiates in other countries. (*See* BARRISTER.) It is also the place to which prisoners are brought to answer their indictments, &c.

BAR, in Law.—Pleas in bar, or peremptory pleas, are founded on some matter tending to impeach the right of action itself, and their effect, consequently, is to defeat the plaintiff's claim altogether. Pleas in bar are subject to various divisions. For, first, they comprise the class of *general issues*, which are denials (expressed in a particular form by ancient precedent) of the whole matter in the declaration, or, at least, of the principal fact upon which it is founded; while all other pleas in bar are distinguished by the term of *special pleas*. All these pleas are governed by particular rules of practice; as they involve much legal technicality and nicety, they are generally drawn by pleaders or barristers. In criminal pleading, a special plea in bar goes to the merits of the indictment, and gives a reason why the prisoner ought to be discharged from the prosecution. They are principally of four kinds: a former acquittal; a former conviction; a former attainder; or a pardon. (*See* AUTREFOIS ACQUIT, AUTREFOIS CONVICT, ATTAINDER.)

BARALIPTON, *bâr-a-lip'-ton*, a term employed by old logicians to denote the first indirect mode of the first figure of syllogisms. A syllogism in *baralipton* is when the first two propositions thereof are universal affirmatives, and the third a particular affirmative, the middle term being the subject in the first and the predicate in the second proposition. For example: BA, Every evil ought to be feared. RA, Every violent passion is an evil. LIP, Therefore, something that ought to be feared is a violent passion.

BARB, *barb*, the name given to a fleet and vigorous breed of horses reared by the Moors of Barbary. They are usually nervous and long-winded, but, as a rule, are not remarkable for symmetrical beauty.

BARBACAN, *bar'-ba-kan* (Fr. *barbacane*), a watch-tower placed before or over the outer gate of a castle-



BARBACAN.

yard, forming an advanced work to protect the castle, or, with regard to cities, a tower or outwork placed at

any important point of the surrounding walls. Also, an aperture made in the wall of a fortress to fire through upon an enemy. Also, a fort at the entrance of a bridge, or the outlet of a city, having a double wall with towers. The barbacan of the castle was a point from which the drawbridge affording the principal way of egress and ingress across the surrounding moat could be readily defended by the guard constantly kept there to prevent surprise or a night attack from hostile troops. The barbacan before Walmgate Bar, York, is a good specimen of this old style of fortifying the entrances to towns; and remains of this defensive outwork, as applied to castles, may be seen in the ruins of those at Canterbury and Framlingham, and, in a more perfect state, attached to the castles at Warwick, Carlisle, Alnwick, and Scarborough. The origin of the word is doubtful; but the Norman-French are considered to have derived its use from an Arabic word, and to have introduced it into England at the time of the Conquest.

Barbadoes Cherry. (*See* Malpighia.)

Barbadoes Gooseberry. (*See* Pereskia.)

Barbadoes Lac, *bar'-bā-dose lāk*, a commercial name for the petroleum found in Barbadoes and several other of the West-India islands. (*See* Petroleum.)

Barbara, *bar'-ba-ra*, a term employed by logicians to denote the first mode of the first figure of syllogisms. A syllogism in *barbara* is one whereof all the propositions are universal and affirmative, the middle term being the subject in the first proposition, and attribute, or predicate, in the second; as, BAR, All beings who, on reflection, approve virtue, are beings conscious of obligation to act virtuously. BA, All men are beings who, on reflection, approve virtue. RA, Therefore, all men are beings conscious of obligation to act virtuously.

Barbarian, *bar-bair'-i-an*, is a term derived from the Greek, and was applied by that people to all that were not Greeks. The Greeks being at that time superior in civilization to their neighbours, the term implied a sense of inferiority. When the Romans first adopted the term, they applied it to themselves, but afterwards to all who were neither Greeks nor Romans. After the fall of the Western empire, it was applied to the Teutonic races, and subsequently to the Moors; hence the name Barbary, given to a district of North Africa. At present, the word is used in the sense of savage, rude, uncivilized.

Barbarism, in Lit., consists in the employment of unusual or antiquated words or phrases, or the assigning to terms a different signification to that which usage has conferred upon them.

Barbary Ape, Pigmy Ape, Magot, *bar'-ba-re*, in Zool., a species of ape. It is specially interesting, as it is the only one now left in Europe. It is about the size of a large cat, and is greenish-grey in colour, paler underneath. It has no tail, and is sometimes called the tail-less monkey. The muzzle is not so much elongated as in the baboons, and the facial angle is much higher than theirs. It has small, round, reddish, lively eyes, and its ears resemble those of a human being. The face is nearly naked, and somewhat wrinkled. It usually walks upon four feet; but it can be tamed and taught to walk, though clumsily, on two. They are found in large numbers at Gibraltar, and inhabit the precipitous sides of the rock. They are gregarious, and live in parts of the rock inaccessible to man; but they are often seen in great numbers, the females carrying their young ones on their backs. They are very seldom destroyed, on account of the amusement they afford by their gambols and tricks. The Barbary ape probably came to Gibraltar from the north of Africa, where it is very abundant, and inhabits rocky mountains. Bands of them will often plunder gardens, while one of the number keeps a keen look-out. This species of ape possesses a considerable amount of intelligence, and is often seen tame in this country. They must, however, be taught when young, as they often grow sullen and vicious as they grow old.

Barbel (*Barbus vulgaris*), *barb'-el*, a fish frequenting the quiet and deep parts of rivers, and swimming with considerable strength and activity. It derives its name from the barbs or wattles attached about its mouth. It is now and then found measuring three feet in length; but its average is two feet, and its weight about ten pounds. The Thames produces barbel of a large size. "So numerous are they about Shepperton and Walton," writes Mr. Yarrel, "that 150 lbs. weight have been taken in five hours; and on one occasion it is said that 280 lbs. weight of large-sized barbel were taken in one day."



BARBEL.

Barber, *barb'-er* (Lat. *barba*, a beard), is one whose occupation it is to shave or trim the beards of other people. The profession of barber, like many others, is an institution of civilized life, and is only known among those nations that have made a certain progress in civilization. We do not read of barbers at Rome till about the year 454 of the city; but there, as elsewhere, when once introduced, they became men of great notoriety, and their shops were the resort of all the loungers and newsmongers in the city. Hence they are alluded to by Horace as most accurately informed in all the minute history both of families and of the state. For the entertainment of waiting customers, newspapers being then unknown, the barber's shop was usually furnished with a lute or other musical instrument. But, in early times, the operations of the barber were not confined, as now, to shaving, hair-dressing, and the making of wigs, but included the dressing of wounds, blood-letting, and other surgical operations. (*See* next article.)

Barber-Chirurgeon, *shir-ur'-jon*, was, in former times, the designation under which the distinct and not very similar occupations of barber and surgeon were carried on. In England, a company was formed under this name in 1308, and the London company was first incorporated by Edward IV., in 1461. Afterwards, a voluntary association was formed by certain persons, for the practice of surgery; but by 32 Henry VIII. c. 42, 1540, these two bodies were united into one body corporate, under the name of the Barbers and Surgeons of London. This act, however, also separated the two crafts, declaring that "No person using any shaving or barbery in London shall occupy any surgery, letting of blood, or other matter, except only drawing of teeth;" and surgeons were strictly prohibited from exercising "the feat or craft of barbery or shaving." Four governors or masters, two of them surgeons and two barbers, were to be chosen, who were to see that the spirit of the act was observed. This company continued to exist till the incorporation was dissolved by 18 Geo. II. c. 15, and the barbers and surgeons of London formed into two distinct corporations. The barber-chirurgeon's sign, which is still retained, consisted of a striped pole, from which was suspended a basin; the fillet round the pole indicating the riband or bandage twisted round the arm previous to blood-letting, and the basin the vessel for receiving the blood. In Edinburgh, the barbers were united with the surgeons in one corporation, till about the year 1720, when, in consequence of some disputes about precedency, a process was commenced in the Court of Session, which ended in a total separation of the two bodies, the surgeons being found entitled to retain the charter and privileges of the incorporation. Eighty years ago, according to Mr. Creech, in his "Statistical Account of Edinburgh," barbers and perfumers were very numerous in that city, and had splendid shops in all the principal streets. Some of them advertised the keeping of bears to kill occasionally for greasing ladies' and gentlemen's hair, and there was a professor who advertised a hair-dressing academy, and gave lectures "on that noble and useful art."

Barberry. (*See* Berberis.)

Barbet, *bar'-bet*, a fam. of birds, belonging to the Climbing ord., and distinguished by their large conical beaks, and by being bearded with fine tufts of bristles directed forward. They inhabit Java, Sumatra, &c.

Barbette, *bar-bet'* (Fr.).—In Mil. language, cannon are stated to be *en barbette*, when they are placed in such a position that they may be discharged

over the crest of the parapet, instead of the more common mode, through the embrasures.

BARBICAN. (*See* BARBACAN.)

BARBITOS, *bar'-bi-tos*, a stringed instrument resembling the lyre, but exceeding it in the number of its strings, the invention of which has been ascribed to Anacreon.

BARBLES, or BARBS, *bar'-bels*, a term employed in farriery to denote the knots of superfluous flesh which grow up in the channels or intervals underneath the tongue of a horse.

BARCAROLLE, *bar'-ca-roal* (Ital. *barcaruolo*, a boatman), certain songs composed by the Venetian gondoliers, and sung by them in their boats. The style of these airs is simple and natural, like the manners of the people who produce them; and they possess a kind of artless beauty which not only strikes common ears, but delights even the *virtuosi*. The Venetian gondoliers have the liberty of visiting all the theatres gratis, which gives them an opportunity of cultivating their ear and taste without expense. The gondolier songs are many of them so graceful and pleasing, that the musicians of Italy pride themselves on knowing and singing them.

BARCLAY AND PERKINS' BREWERY.—This establishment, which is situated in Park Street, Southwark, is one of the largest breweries in the world. It was originated by Henry Thrale, the friend of Dr. Johnson, in 1773, and was purchased by Messrs. Barclay and Perkins, at his death, for £135,000. At present, the establishment is of gigantic proportions: more than 600,000 gallons of water and 2,000 quarters of malt are used weekly. The brewing-coppers will hold 120,000 gallons, and the fermenting-vessels will contain 1,600 barrels of beer. Two steam-engines, equal to 75-horse power, are employed to work the machinery; and in order to distribute the ale and porter amongst the retail sellers in London, more than 200 horses and drays are employed.

BARD, *bard* (Celt. *bard*, a poet), a word of rather uncertain derivation, but most commonly applied to the professional poets among the Celtic nations. Tacitus (*Germ.* 3) tells us that the ancient Germans sought to infuse military ardour into their warriors by the songs of bards; and Strabo and Ammianus Marcellinus say that the songs and hymns of the bards were famous in their day among the Celtic peoples. They seem to have belonged originally to all the warlike nations of Western Europe; and it was only as civilization advanced that they were compelled to retire to the mountain retreats before the march of progress. Accordingly, we find them strongest in Wales and Ireland. Warton (in his *History of English Poetry*, vol. i. p. 37) tells us the British bards were originally an appendage of the Druidical hierarchy; but it is pretty well established, that long after the Druids were extinct, the bards, who had attained a sort of civil capacity, continued to flourish for a long period among the Celts. It is even related of Edward I., that the more thoroughly to aid his conquest by the sword, of the ancient Welsh, he gave orders to have all their bards destroyed, that, when the source of inspiration was cut off from them, their warriors might the more willingly succumb to English sway. By the laws of Hoel Dha, given about the year 940, among the Welsh, it was enacted that the court bard was to be a domestic officer of the prince, and to occupy the eighth place in his court. The bard was, besides, to hold his lands free. The prince was to allow him a horse and a woollen robe, and the queen a linen garment. When invested with office, he received from his prince a harp of rare workmanship, and from his queen a ring of gold, neither of which he was to part with on any account. He was to lodge with the prefect of the palace; and on the three annual festivals he had the privilege of sitting next this functionary, who was enjoined to deliver the harp into his hand. Any person who injured this royal bard had to pay a fine of six cows and 120 pence; and any one who murdered him had to pay 126 cows. These bards had enormous memories, were first-rate genealogists, and not unfrequently flattered the vanity of the courtiers to a great degree by their highly-coloured narratives of the public and private transactions of the nation to which they belonged. They were consequently reverenced almost as much by the Welsh heroes as if they had possessed powers of divine inspiration. They were reformed and regulated by Gryffyth ap Conon, king of Wales, in 1078 A.D. Periodical eisteddfods, or sessions, of the bards, and their successors the minstrels, have continued in Wales down to our own time. The Irish bardic history begins with the Milesian invasion. There were three classes of them in Ireland,—those who turned the tenets of religion into verse, and who in battle raised the war-song; those who sat in the open air and chanted the laws of the nation; and those who sang history and the exploits of heroes. Their profession was hereditary. Their songs are strongly marked by traces of Scaldic imagination, which they infused into the Welsh poetry when Gryffyth brought them over, early in the 11th century, for the purpose of improving the Welsh songs.—*Ref.* The works of Warton, Pennant, Walker, Jones, and Beauford.

BARDESANISTS, *bar-de'-sa-nists*, a sect of early heretics in the East, who took their name from Bardesanes, a native of Edessa, in Mesopotamia, who flourished about the year 170. They held that Christ was not born of a woman, but brought his body with him from heaven; that the devil was not created by God, but was a self-existent independent being; and that there was no resurrection of the body.

BAREBONES PARLIAMENT, *bair'-bones*, a name given by way of reproach to what is otherwise called the Little Parliament, summoned by Cromwell after the dismissal of the Long Parliament. It was so called after Mr. Praisegod Barbone, a "leather-merchant in Fleet Street," who was one of its members. (*See* BARBONE, vol. I.) It met on the 4th of July, 1653, and of the 140 members summoned to attend, only two did not come up. Very mistaken ideas long prevailed as to the character of this assembly. The members were said to have been chosen from the lowest, meanest, and most ignorant of the people,—the very dregs of fanatics. The works of Mr. T. Carlyle and others have served to put their character in a very different light. "They were men got together by anxious consultation of the godly clergy and chief Puritan lights in their respective counties, not without much earnest revision and solemn consideration in all kinds." They were, indeed, a body of most sincere and earnest men, only too eager in their efforts to accomplish a great national reformation; and failed because they attempted too much, rousing a storm of hostility from all classes whose interests they threatened. The great business they set themselves to accomplish was "no less than introducing the Christian religion into real practice in the social affairs of this nation." "They had decided on abolishing tithes; on supporting a Christian ministry by some other method than tithes; nay, far worse, they had decided on abolishing the court of chancery." These questions not only raised storms without, but led to dissensions and intrigue among themselves; so that they at last resigned their power into the hands of Cromwell, on the 12th of December, 1653, after having sat for five months and some odd days.—Ref. *Cromwell's Letters and Speeches*, by Thomas Carlyle.

BARE POLES, *bair poles*.—The term bare poles implies a ship lying-to, without any sail set whatever, in a gale of wind, generally speaking, in consequence of being on a lee shore.

BARGAIN AND SALE, *bar'-gain* (Fr. *barguigner*), in the English law, is a contract whereby the bargainer, for consideration, actually, or by the deed admitted to have been paid, bargains and sells,—that is, contracts to convey the land to the bargainee, and becomes by such bargain a trustee for, or seised to the use of, the bargainee; and the Statute of Uses completes the purchase, or, as it has been expressed, the bargain first vests the use, and then the statute vests the possession. But, as it was foreseen that conveyances thus made would want all those benefits of notoriety which the old common law assurances were calculated to give, to prevent clandestine conveyances of *freeholds*, it was enacted by statute 27 Hen. VIII. c. 16, that such bargains and sales should not enure (be available) to pass a freehold, unless made by indenture, and enrolled within six months in one of the courts of Westminster Hall, or with the custos rotulorum or clerk of the peace of the county. Clandestine bargains and sales

of chattel interests, or leases for years, were thought not worth regarding, as such interests were very precarious till about six years before, which also occasioned them to be overlooked in framing the Statute of Uses; and therefore such bargains and sales are not directed to be enrolled. This omission gave rise to the species of conveyance by lease and release. Before the adoption of this last mode of assurance, the usual method of transferring freehold estates was by a deed of feoffment, which was executed on the land; and corporeal possession was given by the feoffer delivering to the feoffee a clod of earth, in the name of the whole estate, which was called *livery of seizin*. This was done in the presence of several witnesses, who attested the fact by signing their names under a memorandum indorsed on the deed. To obviate this, the plan of lease and release was invented. A lease was granted, or a bargain and sale made, by the transferrer to the transferree for one year, by which he became invested with the possession, and by the release the property was conveyed to certain uses thereby declared. But now a release of freehold estate is declared to have the same effect as a lease and release by the same parties; and therefore the deed of bargain and sale, so far as affects freeholds, has become obsolete. Bargain and sale of *copyhold estates* is still a mode adopted to enable a purchaser to take admission without a surrender, when a testator merely directs a sale of his estate to be made, instead of devising it to his trustees upon trust to sell. The trustees can in such case execute a bargain and sale without being admitted and surrendering to the purchaser. A similar plan is adopted in the case of bankrupts' copyhold estates, the bargain and sale being executed by the commissioner to the purchaser. A bargain and sale, or an assignment of *chattels personal*, may in general be by parol,—that is, either by mere writing or by word of mouth, and does not require the solemnity of a deed, nor the actual delivery of possession. But instruments *in writing* are frequent, and in some cases essential, and are either in the form of a note or memorandum, or of a regular assignment or *bill of sale*. In the case of goods sent from abroad, the transfer is effected by a *bill of lading*, which is in its form a receipt from the captain of the vessel to the shipper, undertaking to deliver the goods (on payment of freight) to some person whose name is therein expressed, or indorsed thereon, by the shipper; and the delivery of this instrument (independently of the actual delivery of the goods) will suffice to pass the property in them to the party so named, or to any other person to whom he may think fit to indorse it over. A contract in writing is necessary to make binding a contract for the sale of goods to the value of £10 or upwards, where no payment or delivery is made under it, or earnest given. It is also necessary, on the grant and assignment of life annuities, the transfer of ships, and the assignment of a copyright or patent right; and a bill of exchange, promissory note, or cheque, or draft on a banker, when payable to the order of a particular person, can be assigned by him only under a written indorsement of his name.

Barge, *barje* (Du. *bargie*), a boat of state or pleasure, with elegant apartments, canopies, and cushions, equipped with a band of rowers, and adorned with flags and streamers, generally used for processions on the water by officers of state, magistrates of great cities, &c. There are also barges of a smaller kind, for the use of admirals and captains of men-of-war. These are of a lighter frame, and may be easily hoisted into and out of the ships to which they belong. (*See* Boat.) It is also the name of a flat-bottomed vessel of burden, used on rivers for conveying goods from one place to another, for loading and unloading ships, and has various names; as a West-country barge, a sand-barge, a row-barge, &c.

Barge-board (Ger. *berge-board*).—In Goth. Arch., the slate or tile projection over the gables of a building is called the barge-course; and, by way of ornament, or to protect the plaster, which is applied under the barge-course between the roofing and the wall, from injury from the weather, boards, sometimes richly carved and ornamented, technically called barge-boards, are fastened to the ends of the rafters that lie on the gable end. Good specimens of these decorative boards may be seen in Coventry, Oxford, and many old English towns. The terms barge-board and barge-course seem to be a corruption of *parge-board* and *parge-course*, taking their names from the *parge* or plaster of the latter.

Barilla, *ba-rill'-la* (Sp.).—The commercial name applied to the impure soda-ash procured by calcining various species of *Salsola*, *Salicornia*, *Chenopodium*, and *Atriplex*. The plants grow near the sea, in salt marshes, and are extensively cultivated in Spain, Sicily, and the Canary Islands. The seed is sown at the end of the year, and the plants are gathered towards the end of autumn, dried, and burned. Barilla is a grey semi-fused mass of ashes, and contains about 30 per cent. of carbonate of soda. The importation of barilla into Great Britain was formerly very large, but has been reduced to nothing of late years, by the various improved methods of manufacturing soda from common salt. (*See* Soda.)

Baritone. (*See* Barytone.)

Barium, *bair'-i-um* (atomic weight 68·5, symbol Ba), in Chem., the metallic base of the alkaline earth *baryta*. This metal was discovered by Davy in 1809, and was named *barium*, from the Greek word *barus*, heavy, on account of the excessive density of its compounds. It may be formed, by voltaic decomposition, from the anhydrous chloride, or by passing the vapour of potassium over red-hot baryta contained in an iron tube, a mixture of oxide of potassium and barium is formed, which is amalgamated with mercury. On distilling off the mercury in an atmosphere of hydrogen, the metal barium is left behind in a somewhat impure state. Owing to the difficulty with which it is prepared, little is known of its properties. Its specific gravity is said to be 4. It is a white, slightly malleable metal, decomposing water at ordinary temperatures. It quickly tarnishes in the air, from the absorption of oxygen. When moderately heated, it burns with a deep-red flame. It forms two oxides,—the protoxide acid, BaO, and the peroxide, $BaO_2$: the former only forms salt.

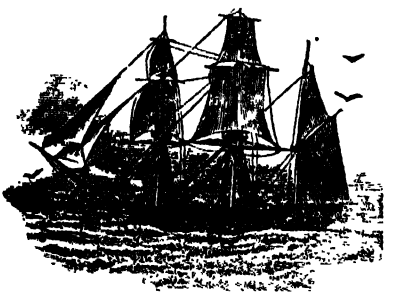
Barium, Chloride of, in Chem., made by dissolving carbonate of baryta in hydrochloric acid, evaporating and crystallizing. It is a colourless salt, crystallising in flat four-sided tables, and dissolving in three parts of cold and two parts of hot water. Its solution forms the usual test for sulphuric acid, which it indicates by forming a white precipitate insoluble in nitric acid.

Barium, Peroxide of.—The peroxide or binoxide of barium is much used in chemistry, it being prone to give up its second equivalent of oxygen to carbon, phosphorus, boron, and metals, at a red heat. Hence its use in forming rare peroxides of certain metals. It is formed by passing oxygen over anhydrous baryta at a red heat, or by heating to redness a mixture of equal parts of chlorate of potash and pure baryta. The chloride of potassium is washed out, and the hydrated binoxide remains behind in the form of a white powder. It has been proposed by Boussingault to prepare oxygen cheaply by passing a current of atmospheric air over heated baryta. The binoxide of barium formed is heated, and parts with the oxygen absorbed, leaving baryta behind, which is again submitted to the oxidizing process just mentioned. These processes are repeated *ad infinitum*, always using the same portion of baryta. The method does not, however, appear to have been made commercially available.

Bark, *bark* (Dan.), in Bot., the external coating of an exogenous or dicotyledonous stem and its branches. It is distinguished from the *rind* or *false bark* of an endogenous or of an acrogenous stem, by its mode of growth, and by the ease with which it may be separated from the wood beneath. The bark presents three distinct layers, independently of the epidermis which is common to it, with other external parts of the plant. These three layers, proceeding from within outwards, are known as the *liber*, or *inner bark*; the *cellular envelope*, or *green layer*; and the *suberous*, or *corky layer*. Some botanists apply to these three layers, respectively, the Greek terms, *endophlæum*, *mesophlæum*, and *epiphlæum*. The bark is connected organically with the wood by means of the medullary rays and cambium-layer. (*See* Stem.) It develops in an opposite direction to that of the wood; for while the latter increases by additions to the outer surface, the bark increases by additions

to the inner. Each layer of the bark grows separately, the two outer layers, constituting the cellular system of the bark, rarely continue to grow after a few years, but become dead structures on the surface of the tree. The inner bark, however, continues to grow throughout the life of the individual, by the addition of annual layers on its inner surface from the cambium-layer of the wood. In some trees, the oak for example, up to a certain age, these liber layers may be readily observed (*See* LIBER.) The outer layers of the bark, from the distension to which they are exposed by the growth of the wood beneath, generally become cracked in various directions, and give a rugged look to the trunk, as in the elm and cork-oak. In some trees, however, as the beech, the bark always remains smooth, owing partly to the small development of cellular layers, and partly to the great distensibility of the layers. There are several kinds of bark which enter largely into commerce, being used for processes in the arts, or for medicines. These will be found noticed in separate articles, under the botanical names of the genera which include the plants producing them. For oak-bark, quercitron-bark, and cork (*see* QUERCUS); Peruvian bark (CINCHONA); cabbage-bark, Surinam bark (ANDIRA); cascarilla bark (CROTON); wild-cherry bark (CERASUS).

BARK (Irish, *bare*; Fr. *barque*), a general name given to small ships. It is, however, peculiarly appropriated by seamen to those which carry three masts without a mizen-topsail. It is also used by mariners



BARK.

trained in the coal-trade to indicate a broad-sterned ship without a figure-head. A long-bark is a small vessel without a deck, and longer and lower than the common bark. It is built after the model of a sloop, and is in many places called a double sloop.

BARKER'S MILL. (*See* TURBINE.)

BARKING-BIRD, *bar'-king* (*Pteroptochos*).—A native of the South-American archipelago, building its nest close to the ground, among the underwood and fallen branches. Says Mr. Darwin, "Its name is well applied: I defy any one, at first, to feel certain that a small dog is not yelping somewhere in the forest. Just as with the cheucau, a person will sometimes hear the bark close by; but in vain may endeavour, by watching, and with still less chance by beating the bushes, to see its author; yet at other times the 'guid-guid' comes fearlessly near."

BARKS, WATER, small vessels used in Holland for the carriage of fresh water, and for fetching sea-water to make salts of, with a deck, up to which they are filled with water.

BARK-STOVE, in Gardening, a pit built of brick in a hothouse or house of glass, filled with refuse bark from a tanyard, in which potted plants are plunged which require *bottom-heat*, or heat round the roots, and a moist atmosphere. The heat and moisture are produced by the fermentation of the bark. These bark-beds or stoves are used for the culture of all tropical plants, such as pines, palms, &c., and for striking cuttings of all sorts. They are principally valuable for the regular bottom-heat they supply, which varies from 60° to 70° Fahrenheit, as soon as the fierce heat produced in the early stages of fermentation has subsided.

BARLAAM AND JOSAPHAT, *bar'-lam, jos'-a-fat*, is the name of one of the most widely-spread religious romances of the Middle Ages, which relates the conversion of an Indian prince, Josaphat, by the hermit Barlaam. It was written originally in Greek, not by John Damascene, as some have supposed, but by an Eastern, probably an Ethiopian, Christian. A German translation of the original was published by Liebrecht (Münster, 1847). From a Latin version which was extensively circulated in the Middle Ages, were made three verse and several prose translations in French. From a Provençal original in the beginning of the 14th century sprang the Italian "Storia di S. Barlaam;" and in Germany, Rudolf von Ems took his poem "Barlaam and Josaphat" from the Latin version. It was also translated into Spanish by Juan de Arze Solorzano; into Bohemian and Polish; and into Norwegian ("Barlaams och Josaphats Saga"), by King Hakon Sverresson (Christiana, 1852). It has even been translated into the Talaga language of the Philippines, and there printed (Manilla, 1712).

BARLEY. (*See* HORDEUM.)

BARLEY-BREAK, *bar'-le-brek*, the name of a popular pastime very common in the time of James I., and which is frequently referred to by older writers. It was played by six persons, three of each sex, who were formed into couples. A piece of ground was then divided into three parts, the centre one being called *hell*. One of the couples was stationed in this hell, and their effort was to catch either of the other couples in crossing from the one side to the other, when the couple caught had to take up their place in the centre. The couple in the centre were bound to keep together; but the others, when hard pressed, might sever. When all had been taken, the game was ended; and the last couple taken was said *to be in hell*, their punishment appearing to have consisted in kissing each other. Games of a similar kind, more or less modified, are still practised by young persons both in England and Scotland.

BARM. (*See* YEAST.)

BARMECIDES, or BARMEKEIDES, *i. e.* children of Barmek, *bar'-me-sides*, is the name of a celebrated Persian family, amongst the wealthiest and most powerful in the province of Khorasan, which played an important part in history under the earlier of the Abbaside califs. Kaled-ben-Barmek, son of Barmek, the first of whom we have any authentic accounts, was the prime minister of Abul Abbas Saffah, the first Abbaside calif, and his influence did not diminish during the reigns of Al-Mansur and El Mahdi, the latter of whom intrusted him with the education of his son, afterwards so celebrated under the name of Harun Al Raschid. Yahia, the son of Kaled, according to Eastern historians, was possessed of the most distinguished virtues, and rendered the most eminent services to the calif Harun, who, upon his accession, in 786 A.D., nominated him his vizier. Equally versed in civil matters and in all that pertained to the art of war, he contributed greatly to the prosperity of the reign of Harun Al Raschid. Yahia had several sons, of whom the best known are Fadhl and Djafar (the *Giafar* of the Arabian Nights), both of whom partook of the fortune and favours of their father. Fadhl had the administration of justice, and to Djafar was confided the superintendence of the palace of the calif and the education of his son, Al Mamun. After a period of unequalled prosperity, this family was (in 803) stripped of all its power and wealth, and treated in the most cruel manner by the very calif who was so much indebted to it. Djafar was put to death at the age of 37; Yahia and his son Fadhl were both imprisoned in a remote part of the country; and all the relatives or friends of the Barmecides were involved in the same disgrace, some being massacred, others imprisoned and deprived of their goods. The causes assigned for the sudden and terrible reverse of fortune are very various. According to some, Harun was jealous of the power and influence of the Barmecides; according to others, Djafar had disobeyed the calif's orders in setting at liberty Prince Alide, whom he had commanded to be put to death; while, according to others, Djafar had married or seduced a sister of the prince, the beautiful Abassa. The misfortunes of the Barmecides have afforded the Oriental poets materials for numerous songs, and have also formed the subject of several tragedies; among others, that of La

Harpe, entitled, "The Barmecides," which appeared in 1778. An able and learned article on the Barmecides is to be found in the German Encyclopædia of Ersch and Gruber.

BARNABAS, THE EPISTLE OF ST., *bar'-na-bas*, an apocryphal work ascribed to Barnabas, the companion and fellow-labourer of St. Paul. This epistle lays greater claim to canonical authority than most of the other apocryphal writings. It is cited by Clemens Alexandrinus, Origen, Eusebius, and Jerome, who admit it to be the work of Barnabas, but declare that it ought not to be esteemed of the same authority as the canonical works. It is published by Archbishop Wake among his translations of the works of the Apostolical Fathers, in the preliminary dissertation to which he gives the arguments adduced to prove it to be the work of St. Barnabas. It is, however, generally believed to have been written by some converted Jew in the 2nd century, and seems to have been addressed to the unconverted Jews. It is divided into two parts. In the first part, the writer shows the unprofitableness of the old law, and the necessity of the incarnation and death of Christ. He cites and explains allegorically certain passages relating to the ceremonies and precepts of the law of Moses, applying them to Christ and his law. The second part is a moral instruction, under the notion of two ways,—the way of light, under which is given a summary of what a Christian is to do that he may be happy for ever; and the way of darkness, with the different kinds of persons who shall be for ever cast out of the kingdom of God.

BARNABAS, GOSPEL OF ST., an apocryphal work ascribed to Barnabas. It relates the history of Christ very differently from the Evangelists, and is believed to be a forgery of some nominal Christian, and afterwards altered and interpolated by the Mohammedans, the better to serve their purpose. It corresponds with those traditions which Mahommed followed in the Koran.

BARNABAS DAY, ST., a Christian festival, celebrated on the 11th of June.

BARNABITES, *bar'-na-bites*, the name of a religious order founded in the 16th century by three Italian noblemen of Milan, who had been advised by a famous preacher of those days to read carefully the epistles of St. Paul; and hence they were also called Clerks of the order of St. Paul. They took the name of Barnabites from having performed their first exercise in the church of St. Barnabas, at Milan. They were confirmed by Pope Clement VII. in 1533. The order dress in black, like the secular clergy, and devote themselves to missions, preaching, and the instruction of youth. It only exists at present in some parts of Italy.

BARNACLE, *bar'-na-kel* (Port. *bernaca*), a marine animal, which attaches itself to ships' bottoms and other submarine substances. To such an extent will these little creatures adhere to the sides and bottoms of floating vessels, as to impede their progress and render necessary their docking and cleansing.

BARNACLE GOOSE. (*See* GOOSE.)

BAROCO, *ba-ro'-ko*, in Log., is a name given to the fourth of the second figure of syllogisms. A syllogism in *baroco* has the first proposition universal and affirmative; but the second and third particular and negative, the middle term being the predicate in the first two propositions; as, BA, Every man is a biped. RO, Every animal is not a biped. CO, Therefore, every animal is not a man.

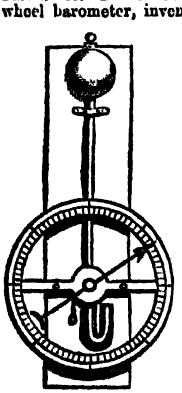
BAROLITE, *bar'-o-lite* (Gr. *barus*, heavy, *lithos*, stone), carbonate of baryta, or witherite. It contains 80 parts of barytes and 20 of carbonic acid. It is found at Alston Moor, in Cumberland, and at Anglesack, in Lancashire. It is much used in the North for poisoning rats.

BAROMETER, *ba-rom'-e-ter* (Gr. *baros*, weight, *metron*, a measure), an instrument for measuring the weight or pressure of the atmosphere. It may be said to be the invention of Torricelli, who first demonstrated the existence of the atmospheric pressure by means of a column of mercury contained in a glass tube. The story of the invention cannot be too often re-told, as it illustrates in a most striking manner the triumph of inductive philosophy over deep-rooted error. Up to the time of Torricelli no one thought of investigating the phenomena of a common pump. The rising of the water on the withdrawal of the air was accounted for by the ancient dictum "Nature abhors a vacuum," which was universally accepted as a great truth. By much importance to some meaningless phrases as to actual facts. To question Nature's abhorrence of a vacuum was a kind of scepticism, which must have appeared to the contemporaries of Torricelli almost as reprehensible as religious doubt. The sages of antiquity had declared that a vacuum was repugnant to Nature, and any one who ventured to dispute this point was clearly guilty of an attempt to subvert the noble and perfect system of philosophy taught by those sages. The first observation which led Torricelli to ask Nature experimentally why she abhorred a vacuum, was said to have been made by some pump-makers of Florence, who found that water would not rise higher than thirty-two feet, or thereabouts, when the air was exhausted. They applied to Galileo, who was regarded as a cunning man in mechanics, for a solution of this problem, and he, not having got rid of the old metaphysical conception of Nature, gave them the simple answer, that the power of Nature to contend against a vacuum ceased when she had destroyed one thirty-two feet high. It is not unlikely that this answer of Galileo was ironical, for it is certain that he afterwards rejected the theory of Nature's horror altogether, though without substituting another. His pupil Torricelli was left to work out the problem, and to him the happy idea occurred, that the weight of the atmosphere might be the counterpoise to the thirty-two feet of water in the pump. He determined to test this hypothesis by experiment, and hit on the beautiful expedient of employing mercury or quicksilver to counterpoise the weight of the air. It is not difficult to trace the line of reasoning which led to the adoption of mercury. He saw that, provided it was the weight of air which balanced the column of water, it would necessarily sustain a much shorter column of mercury; in fact, that the height of the column would be reduced in the proportion in which the liquid metal is heavier than water. Thus, mercury being about fourteen times heavier than water, bulk for bulk, the fourteenth part of thirty-two feet, or about two feet four inches, would supply the place, and produce the effect of the water. Torricelli's experiment was conclusive, and the notion that water rises in a pump through Nature's abhorrence of a vacuum ceased to retard the progress of discovery. The experiment is thus performed: a glass tube about a yard long and a quarter of an inch internal diameter, is sealed at one end, and completely filled with mercury. The aperture being closed by the thumb, the tube is inverted, the open end placed in a vessel containing mercury, and the thumb removed. The tube being in a vertical position, the column of mercury sinks, and after oscillating some time, it finally comes to rest at a height which, at the level of the sea, is about thirty inches above the mercury in the vessel. The weight of the column of mercury in the tube is supported by the pressure of the atmosphere on the mercury in the open vessel. There is no contrary pressure on the mercury thus supported, because the upper end of the tube is closed; but if it be opened, the atmosphere will press equally inside and outside the tube, and the mercury will at once sink to the level of that in the vessel. (*See* ATMOSPHERE.) Torricelli died shortly after having thus devised a simple means of weighing the atmosphere. He left this discovery incomplete; for though he had satisfactorily proved that the weight of the water in the pump and that of the mercury in the tube each formed a counterpoise to something, he had not confirmed his correct surmise that this something was the pressure of the atmosphere. To Pascal the world is indebted for this confirmation; he first proposed that Torricelli's experiments should be made at different heights above the sea-level, to see whether the column of mercury would indicate, by falling or rising, any decrease or increase of pressure. Experiments made by his request, at the base and on the summit of Puy-de-Dôme, in Auvergne, proved beyond a doubt that it was really the weight of the atmosphere which supported the mercury; for the column at the top of the mountain was three inches lower than that observed in the valley.

The straight glass tube inverted into a vessel of mercury, as in the experiment of the Florentine philosopher, may be regarded as the simplest form of the mercurial barometer. To render this instrument more portable, the cistern containing the mercury, into which the open end of the tube dips, is covered in, the external air being only admitted through a very small hole. The tube is usually fixed in a mahogany frame, on the upper part of which there is a scale graduated in inches from the level of the mercury in the cistern; a movable index shows on the scale the level of the mercury. A thermometer is generally attached to the same frame: the annexed figure shows such an arrangement. There is one serious fault in a barometer of this kind: the fixed scale does not always indicate the true height of the column above the surface of the mercury in the cistern, for this surface necessarily rises as the column sinks. If the diameter of the cistern is large relatively to that of the tube, the error from this source is lessened. In Fortin's barometer the base of the cistern is made of leather, and can be raised or lowered by means of a screw. This contrivance enables the observer to obtain a constant level, and it greatly increases the portability of the instrument. In travelling, it is only necessary to raise the leather till the mercury, which rises with it, completely fills the cistern; the barometer may then be inclined, or even inverted, without any fear that a bubble of air enters, or that the shock of the mercury cracks the glass. The siphon barometer is a bent glass tube, one of the branches of which is much longer than the other. The longer branch, which is closed at the top, is filled with mercury, as in the cistern barometer, while the shorter branch, which is open, serves as a cistern. The difference between the two levels is the height of the barometer. For indicating good and bad weather, the wheel barometer, invented by Hook, has long been used, but it is a very imperfect instrument. It is merely a siphon barometer connected with a needle, which moves round a graduated circle. The annexed figure shows the instrument before the mercury is introduced. In the shorter leg of the siphon a float is placed, which rises and falls with the mercury. A string attached to this float passes round a pulley, to which the needle is fixed, and at the other end there is a small weight, somewhat lighter than the float. When the pressure varies, the float sinks or rises, and moves the needle round to the corresponding points on the scale. The barometers in domestic use, which are called weather-glasses, are of this kind. The words *rain*, *fine*, *variable*, &c., generally appear on the graduated circle; but they do not afford any reliable indications of the weather. Change of weather frequently coincides with change of pressure; and experience has proved that the barometer may be used as a weather-indicator, but cannot always be depended on. As a rule, a falling barometer prognosticates rain; a rising barometer, fair weather. When the column of mercury is unsteady, it indicates an unsettled condition of the atmosphere; a steady barometer indicates that the weather at the time will last. If cuttings occur be low, the weather will remain bad; for the reg ury be high, the weather will continue fair. From 60° to alling of the barometer almost invariably produced a storm. The connection between the variations of the barometer and the weather and the pressure of the atmosphere is a subject very ill understood. For determining altitudes, the barometer is an invaluable instrument. In ascending mountains, the mercury is found to sink about a tenth of an inch in 90 feet; so that, if the mercury fall an inch, we have ascended near 900 feet; but this is subject to variations from change of temperature and other causes, which render various corrections necessary. The most important barometric measurements of late years are those which have been made by Professor Guyot on the Appalachian mountains, and which have greatly advanced physical geography. There are many forms of the mercurial barometer, but they are all modifications of the siphon or the cistern. The instruments for measuring the pressure of the atmosphere without employing liquids are described under the head of ANEROID BAROMETER.



CISTERN BAROM.



WEATHER-GLASS.

BAROMETZ. (*See* CIBOTIUM.)

BARON, *bär'-on* (Fr. *baron*; Ital. *barone*), a title denoting the lowest rank in the peerage, the degree of nobility next below that of viscount. The etymology of the word is very doubtful, but it is probably derived from the Latin word *baro*, which at first signified a dull, stupid fellow, and afterwards, by some strange transmutation, came to denote a person of distinction. Originally, the name baron was applied in England to all the nobility, of whatever rank; because all noblemen were barons, even although they occupied a higher rank in the peerage. But it s sometimes happened, that when an ancient baro d been raised to a new degree of peerage, in the c se of a few generations the two titles have descended differently; one, perhaps, to the male descendants, the other to the heirs general, whereby the earldom or other superior title has subsisted without a barony; and there are also modern instances where earls and viscounts have been created without annexing a barony to their honours; so that now the rule does not hold universally, that all peers are barons. The origin and antiquity of barons have occasioned great inquiries among English antiquaries. The most probable opinion seems to be that they were the tenants in chief of the crown, persons who held lands of the crown by military or other services, and who were bound to personal attendance in the king's court when he should please to summon them, to do homage to him, and to assist in the administration of justice and in the transaction of other business that was done in the court of the king. Thus, originally, all lords of manors, or barons that held of the king *in capite*, had seats in the great council or parliament. In the reign of King John, however, the conflux of them became so great and troublesome, that the king was obliged to divide them, and summon in person only the greater barons, leaving the smaller ones to be summoned by the sheriff, and, as it is said, to sit by representation in another house, which gave rise to the separation of the two houses of parliament. By degrees, the title came to be confined to the greater barons, or lords of parliament only, and as these were summoned by writ, the production of that writ constituted their right to sit and vote. Hence, actual proof of a barony by tenure became no longer necessary to constitute a lord of parliament; but the record of the writ of summons to him or his ancestors was admitted as a sufficient evidence of the tenure; and hence, too, the acquisition of territory no longer, as originally, ennobled its possessor. Another class of barons—barons by patent—was constituted by Richard II. (the first being Beauchamp, of Kidderminster), who received it as a title of honour, irrespective of the tenure of lands. In barons by writ, the dignity descends to heirs general; in barons by patent, it goes according to the tenour of the patent. When a person, who was a baron by tenure, received the king's writ to repair to the parliament, the receipt of the writ, and obedience to it, created in him a dignity as a lord of parliament, which adhered to him during his life, and was transmitted to his heir. Some, however, are of opinion that there must be at least two writs of summons, and a sitting in two distinct parliaments, to evidence an hereditary barony; but there have at least been many adjudications of claims to dignities made in accordance with the former view. The mere writ, however, does not ennoble a man unless he has actually taken his seat in the House of Lords. In consequence of the inconvenience thus attending it, creation by letters patent is now usually adopted, ex-

cept in the case of the eldest son of a peer, there being here no danger of the children losing their nobility, even should their father never take his seat. Creation by letters patent is perfect and complete as soon as the great seal is affixed; but it labours under this disadvantage, that the course of descent by which it is intended that the dignity should pass must be specifically laid down in the patent, otherwise it ceases with the life of the grantee. It has recently been decided, in the case of Lord Wensleydale, that a patent, expressly granting the dignity only for life, does not entitle the holder to a seat in the House of Lords. When a baron is summoned to the House of Peers by writ of summons, the writ is in the name of the sovereign, who enjoins him to come to the parliament appointed to be held at a certain time and place, and there to advise with his sovereign, the prelates and nobles, about the weighty affairs of the nation. The ceremony of his admission into the House of Lords is thus: He is brought into the house between two peers of his own rank, who conduct him up to the lord chancellor, his patent, or writ of summons, being carried by Garter king-at arms, who presents it to his lordship. The lord chancellor directs the same to be read, which, being done, the oaths are administered, and the peer takes his seat, from which he again rises, and returns to the chancellor, who congratulates him on becoming a member of the House of Peers. The coronation robes of a baron differ from those of the other peers in having but two rows of spots on the mantle, and the parliamentary robes in having but two guards of white fur, with rows of gold lace. The right of wearing a coronet was first conferred on barons by Charles II. It is adorned with six pearls, set at equal distances, of which four are usually shown. Barons are styled "right honourable," and addressed officially by the Crown as "right trusty and well-beloved." Their children enjoy the prefix of "honourable."

Baronage, *bär'-o-nāj*, a collective noun, signifying the whole body of the barons; but used also in a wider sense, to comprise the whole of the nobility, without regard to the distinction of dukes, marquises, earls, viscounts, and barons. It is used in this latter sense by Sir William Dugdale, in his able and learned work, "The Baronage of England" (1675-6); for an account of which see the *English Encyclopædia*—Arts and Sciences.

Baron and Feme (old Fr.), terms used in the old law books for husband and wife. (*See* Husband.)

Baron Court. (*See* Court Baron.)

Baronet, *bär'-o-net*, an English title of dignity, which properly signifies 'a little baron.' It has been said, in the article Baron, that, in the reign of King John, two classes of barons were formed,—the greater and the lesser, the former of whom only were summoned in person to parliament. To the latter, or lesser barons, we find the title of baronet frequently given; but it was not until the reign of James I. that the dignity was formed to which the title of baronet is now applied. This monarch, being in want of money, hit upon the expedient of creating this new dignity, in 1611, and offered it to 200 gentlemen of good birth, possessing a clear estate of £1,000 a year, upon condition that each should pay into the royal exchequer, in three equal instalments, a sum equivalent to three years' pay of thirty soldiers, at 8*d.* a man per day, or about £1,095, the first instalment to be paid on delivery of the patent. The money was professedly for the purpose of settling and improving the province of Ulster, in Ireland, which had become vested in the crown by the attainder of its previous owners; and hence these baronets had the right of adding to their family arms those of that province, familiarly known as "the bloody hand." It was stipulated, on the part of the king, that the number of baronets should never exceed 200, and that, as the number was diminished by the extinction of families, or otherwise, no new creations should be made to supply their places. This stipulation has long been disregarded, and new baronets are created every year. It was also stipulated that no hereditary dignity should ever be created to intervene between baronets and the peerage. Payment of money will no longer obtain the title; but the ancient form of the patent is still retained, as when money was given for it; and it is always accompanied by a discharge from the Exchequer, as if the stipulated sum had actually been paid in. Baronets are entitled to the prefix of *Sir*, and the affix of *Baronet*; and their wives are styled *Lady*, *Madam*, or *Dame*, according to usage. The rank of baronet is the last of the hereditary titles; but a baronet has no robes, coronet, or distinctive badge whatever, except in the case of Scottish baronets, who, in 1629, were granted the privilege of wearing an orange riband and badge. In 1619 the dignity of baronet was created in Ireland, upon the same terms as in England; and shortly before the death of King James, the plantation of the province of Nova Scotia, in North America, was assigned as a cause for extending the same offers to Scotland. The king did not live to fulfil his intention; but Charles I., soon after his accession, created the first baron of Nova Scotia. From the Union, in 1706, baronets created in England or Scotland became baronets of Great Britain; and those created since 1800 are baronets of the United Kingdom. The only instance of a baronetcy being conferred upon a female occurs in the case of Dame Mary Bolles, of Ashurton, who, in 1635, received that dignity, with remainder to her heirs whatsoever.

Barons of the Cinque Ports were, previous to the passing of the Reform Bill, members of the House of Commons, elected by the five ports, two for each port. Formerly, the principal citizens of London were honoured with the title of baron, as were also the mayors of Corfe Castle, in Devonshire.

Barons of the Exchequer are the judges of the court of Exchequer, five in number, consisting of one chief and four puisne barons. Selden (Tit. of Hon., 2, 5, 16) conjectures that they were anciently made out of such as were barons of the kingdom, or parliamentary barons, and thence to have derived their name; which conjecture receives great strength from Bracton's explanation of Magna Charta, c. 14, which directs that the earls and barons be amerced by their peers; that is, says he, by the *barons of the Exchequer*. —Ref. *Bract.* l. 3, tr. 2, c. 1, s. 3.

Barony, *bär'-o-ne* (Lat. *baronia*, or *baronagium*), is that honour and territory which gives title to a baron, comprehending not only the fees and lands of temporal barons, but of bishops also, who have two estates,—one as they are spiritual persons, by reason of their spiritual revenues and promotions; the other grew from the bounty of our English kings, whereby they have baronies and lands added to their spiritual livings and preferments. Manors were formerly called baronies, as they still are lordships; and the manor court is still called Court Baron (which *see*).

Baroque, *bar'-oak* (Fr., rough, irregular), in Mus., a term applied to a composition, the harmony of which is false and overcharged with modulation, while the intonation is forced and unnatural.

Baroscope, *bär'-o-skope* (Gr. *baros*, weight, *skopeo*, I perceive), a term sometimes applied to the barometer, but which ought strictly to be reserved for such an instrument as may show a change in the weight of the atmosphere without accurately indicating the pressure. The ordinary weather-glass, or wheel barometer, is, in accordance with this definition, merely a baroscope.

Baroselenite, *bär'-o-sel'-e-nite* (Gr. *barus*, heavy, *selene*, lustre), in Min., native sulphate of baryta, or heavy spar. It occurs in modified rhombic and rectangular prisms; also in compact granular or fibrous masses. It is much used, when ground, for adulterating white lead. It contains 66 parts of baryta and 34 of sulphuric acid.

Barosma, *bär-os'-ma*, in Bot., a gen. of plants belonging to the nat. ord. *Rutaceæ*. The leaves of several species, such as *B. crenata*, *crenulata*, and *serratifolia*, are used in medicine for their aromatic, stimulant, antispasmodic, and diuretic properties. They seem also to have a specific influence over the urinary organs. The plants yielding them are natives of the Cape of Good Hope. In commerce they are known as Buchu-leaves, and are thus named in the British Pharmacopœias. They contain a peculiar bitter principle called *Diosmin* or *Barosmin*, and a powerfully-scented volatile oil.

Barouche, *bär-oosh'* (Fr.), a four-wheeled carriage, furnished with seats, as in a coach, and provided with a top that can be raised or lowered at pleasure.

Barracan, *bär'ra-can* (Ital. *baracane*), a sort of

thick strong stuff resembling camlet, but rather coarser in texture. It is used for making cloaks and other outer clothing.

Barracks, *bär'-răks* (Span. *barraca*, a cabin or hut), a term in Mil., applied, in its modern meaning, to ranges of buildings erected for the reception and accommodation of large bodies of soldiers, including quarters for officers and men, officers' mess-rooms, guard-rooms, stables, hospitals, and various other requisite premises. It originally meant a rough wattled shed, hastily put up for cavalry; those of a similar construction designed for infantry being called huts. During the Crimean war the French and English troops wintered in huts of this description. Formerly soldiers were billeted on public-houses and the residences of private families; and few barracks, in the modern acceptation of the word, existed prior to the year 1792, when the ministry then in power wrung a reluctant consent from parliament to erect barracks for the soldiery in and near many important towns and cities, which was carried into effect in subsequent years, under the superintendence of Lieut.-General De Lancy, as barrackmaster-general, with a staff of subordinate officers. The office of barrackmaster-general was soon abolished; and the duke of Wellington, when commander-in-chief of the forces, about 1820, placed the barracks under the management of the Board of Ordnance, making an officer, known as the resident barrack-master, responsible for the care of the buildings, and all articles issued from the barrack-office for each soldier's use,—consisting of an iron bedstead, paillasse, bolster, rug, two blankets, and a pair of sheets,—and furniture and utensils necessary for each separate mess or barrack-room, which is under the charge of a sergeant or corporal, and is inspected by a lieutenant or ensign daily. When the Board of Ordnance was broken up in 1855, the barrack department of the service was placed under the direct control of the War-office, the Royal Engineers having to take charge of the buildings, and to see that all necessary repairs are efficiently executed. Among the improvements in the condition of soldiers in barracks, effected in consequence of the royal commission in 1857, under the presidency of Lord Herbert of Lea (then Mr. Sidney Herbert), may be mentioned the extension of the number of cubic feet of space allotted to each soldier, varying from 600 to 1,000 feet, as in the new cavalry barracks at Aldershot (*see* Camp at Aldershot), and 1,200 feet in hospitals. Subaltern officers are allowed a room each, two sharing an apartment between them in former times; staff-sergeants and married sergeants have a room each; unmarried sergeants a room between two; about twelve or twenty-four privates are placed in each barrack-room, according to size; married men are placed in separate quarters, and sergeants are allowed a separate mess-room. Great care is taken that the rooms shall be properly ventilated, and the provisions, well cooked. Attention is also paid to the establishment of bath-rooms, reading-rooms, libraries, lecture-rooms, racket and tennis-courts, and other things necessary for the soldier's health, instruction, and amusement, which may tend to elevate his social condition, and gradually wean him from the debasing influences of drink and other temptations that he is, generally speaking, too prone to yield to when leading a comparatively idle life in times of peace. The expense for building and repairing barracks in the United Kingdom of Great Britain and Ireland since 1793 is very nearly as follows: —From 1793 to 1804, £4,115,000; from 1804 to 1819, £3,221,000; and from 1819 to 1862, about £8,000,000; giving a total of about £15,336,000. It has been ascertained that the cost per man in the erection of un-different barracks has varied as much as from £30 to depend according to the manner in which they were ticates rain [illegible]. *English Cyclopædia*—Arts and Sciences.

dnes column oon, *bär'-ra-koon*, a station or depôt on beds of ed condi Africa, where captured slaves are collected plants, dicated guarded until they are removed by the cuttings d curi eir vessels.

for the regu ry, *bär'-ra-tre* (Old Fr. *barat*, from which from 60° t alined *baratour*, a cheat; from the Dano-produced s *svig-ret*), in Law, is the offence of *frequently* gided. 10 d stirring up suits and quarrels between her Barra er, subjects, either at law or otherwise; the punishment for which is fine and imprisonment. In marine insurance, barratry is where the master of the ship or the mariners defraud the owners or insurers, whether by running away with the ship, sinking her, unlawfully deserting her, or embezzling the cargo. To the offence of barratry may be referred another offence of equal malignity and audaciousness—that of suing another in the name of a fictitious plaintiff, either one not in being at all, or one who is ignorant of the suit. If the offence be committed in any of the superior courts, it is considered a high contempt, and punishable at the discretion of the court. In courts of a lower degree, it was by 8 Eliz. c. 2, s. 4, directed to be punished by six months' imprisonment, and treble damages to the party injured. (*See* also Champerty, Maintenance.)

Barrel, *bär'-rĕl* (Fr. *baril*; Sp. *barril*), in Com., a measure of capacity; also the name of a vessel principally containing ale or beer. The barrel has more length than breadth, with a bulging in the middle, and is made of staves and headings, and bound with hoops. In the metropolis, a barrel of beer formerly held 32 ale or 32½ imperial gallons. It was, however, enacted by 43 Geo. III. c. 69, that a barrel of beer should consist of 36 gallons. By a later enactment, it was decided that whenever any gallon measure is mentioned in any excise law, it should always be deemed and taken to mean an imperial gallon. Consequently, the barrel [illegible] nifles, at the present time, 36 imperial gallons.

Barrel, [illegible]. (*See* Gun-Barrel.)

Barren land, *bär'-ren* (Sax. *bare*), in Agr., a term applied to soil in which trees, plants, or grasses of any kind cannot attain perfection, from a deficiency of the proper constituents necessary to their development and growth. When sterility arises from lightness of soil or an undue proportion of sand in the composition of the ground, it may be removed by proper irrigation and the addition of heavy earth, mixed with rich loamy soil. In heavy clay lands, on the contrary, the soil must be well drained and lightened by the admixture of sand, lime, and decayed animal and vegetable matter. The acid properties of some soils, which produce coarse rank grass, sedge, and rushes, and the presence of metals, such as sulphur and the peroxide and protoxide of iron, in too great quantities, in combination with acids, are most readily corrected by the use of lime, which is also beneficial in removing the tannin, an injurious element in the composition of soils of an astringent nature, such as peat lands, consisting of vegetable substance, the decay and change of which into loam is prevented by the astringent element just mentioned. The want of many mineral substances in soils is obviated by the use of artificial manures.

Barricade, *bär-ri-kaid'* (Fr.), in Mil., a term employed to distinguish the temporary defences raised in order to obstruct the attacks of an enemy in the field. It is still more generally employed to denote the defences thrown up in towns during a time of revolution or insurrection. At such times barricades are composed of whatever substances are nearest at hand; carts filled with stones, baskets of earth, household furniture, and bales of wool or cotton, have all been employed for this purpose. During most of the revolutions in Paris, the populace have made barricades by raising up and piling together the paving-stones of the streets. The present emperor, however, has, during his reign, caused all the principal streets to be macadamized, and all the footpaths to be made of asphalte. The term barricade is occasionally applied to the barriers which defend a fortress.

Barricade, in Mar., a term denoting a strong wooden rail, supported by stanchions, which extend across the foremost part of the quarter-deck. The upper part contains a double rope netting above the rail, and is stuffed full with hammocks, the spaces between the stanchions being filled with pieces of cork, old cables, mats, &c., to prevent the execution of small shot during a naval engagement.

Barricarri Seeds, *bär'-ri-kar-re*, the produce of the *Adenanthera pavonia*, a leguminous plant. They are of a bright red colour, and are employed in the northern parts of South America as beads for making necklaces.

Barrier, *bär'-ri-er* (Fr. *barrière*), in Fortification, a piece of woodwork or fence, which presents an ob-

stacle to passing through any entrance where it is fixed. Barriers of this kind are generally composed of great stakes four or five feet high, placed at a distance of eight or ten feet from each other, with transoms or overthwart rafters. Their purpose is to prevent the entrance to any passage or intrenchment of horse or foot. In the middle is a movable bar, which can be opened or shut as required. The term barrier is also used to signify a fortification or strongly-guarded place on the frontiers of a country. The barrier fortresses of Flanders are instances.

Barrier Act is the name given to an act of the General Assembly of the Church of Scotland, passed in 1697, to prevent the too hasty adoption of any important measure. The proposal of any alteration in the rules or constitution of the church must first be brought before the General Assembly in the form of an overture, when, if approved of, it is then transmitted to the several presbyteries for their consideration, with injunctions to forward their opinions to the next General Assembly, by which it may be passed into law only if it have obtained the concurrence of the majority of the presbyteries.

Barrier Reef, a name given to any coral reef which runs parallel to the shore, but separated therefrom by a channel. The great barrier reef along the north-east coast of Australia is composed of a chain of huge masses of coral rock, and is more than 1,000 miles long and from 10 to 90 miles in width. (*See* Coral Reef.)

Barrier Treaty is the name given to a treaty entered into between the Dutch and the emperor of Germany in 1715, shortly after the peace of Utrecht. In terms of this treaty, Austria received possession of all the provinces which had belonged to Spain, with the addition of the greater part of the places taken during the war with France. A large force, consisting of not less than 30,000 men, was to be maintained in the country, whereof the emperor was to furnish three-fifths, and the States the remainder. The annual sum of 500,000 crowns was to be paid by the emperor towards the payment of the Dutch troops; and he solemnly engaged not to transfer these provinces to a prince of the house of Bourbon, either by sale, marriage, or otherwise.

Barring-out, *bar'-ring*, a practice, which was of frequent occurrence in schools in former times, of securing the doors and windows of the school-room, when a suitable opportunity presented itself, against the entrance of the head master and his assistants. It was generally done a short time before the vacations, to secure some additional holidays, or to obtain the removal of some fancied wrong. The boys managed to lay in a store of eatables to sustain themselves during the siege, and obtained their demands if they were able to prevent the master from effecting a forcible entrance within three days. It is said of Addison, that he managed a barring-out when a boy of twelve years of age at school at Lichfield. At a barring-out at the High School, Edinburgh, in 1595, fatal results ensued; one of the city magistrates, under whose patronage the school happened to be, being shot dead by one of the boys, in an attempt on the part of the authorities to force an entrance. Sir John Deane, founder of Witton school, Cheshire, ordered the pupils to observe the custom twice a year,—a week before Christmas and Easter.—*Ref.* Brand's *Popular Antiquities*; Chambers's *Encyclopædia*.

Barringtonia, *bär-ring-to'-ni-a* (in honour of the Hon. Daines Barrington), in Bot., the typical gen. of the nat. ord. *Barringtoniaceæ*, consisting of small trees conspicuous for their beauty. *B. speciosa*, the Moordilla, a native of Ceylon, has dark glossy leaves, and white flowers delicately tinted with crimson. Sir Emerson Tennent says that the stamens, of which there are nearly a hundred to each flower, when they fall to the ground, might almost be mistaken for painters' brushes.

Barringtoniaceæ, *bär'-ring-to'-ni-a'-se-e*, in Bot., a small nat. ord. of dicotyledonous plants, in the sub-class *Calycifloræ*. They are usually placed among the *Myrtaceæ*, which they resemble in most essential particulars. The species are all natives of tropical regions, and most of them have poisonous properties. The bark of *Strwadium racemosum* is said to be febrifugal; the fruit of *Careya arborea* is edible; while that of *Gustavia brasiliana* is emetic, and produces an intoxicating effect upon fish.

Barrister, *bär'-ris-ter* (from *bar*, or *barr*, and Old Fr. *ester*, to remain or continue: thus the combination of the two forms, *barrester*, one who takes his station at a bar; who continues there, that is, who carries on his profession at the bar; a pleader of causes).—Barristers were first styled *apprentices* (*apprenticii ad legem*), from Fr. *apprendre*, to learn, who answered to the bachelors of the universities, as the state and degree of a *serjeant* (*servientes ad legem*) did to that of doctor. Apprentices or barristers seem to have been first appointed by an ordinance of King Edward I., in parliament, in the 20th year of his reign. (Spelm. *Gloss.* 37; Dugdale, *Orig. Jurid.* 55.) The time before they ought to be called to the bar, by the ancient orders, was eight years (afterwards reduced to five); and the exercises done by them (if they were not called *ex gratiâ*) were twelve grand moots, performed in the inns of chancery, in the time of the grand readings; and twenty-four petty moots, in term time, before the readers of the respective inns of court. The privilege of conferring the rank or degree of barrister-at-law is exclusively enjoyed by the inns of court, which are the Inner Temple, the Middle Temple, Lincoln's Inn, and Gray's Inn. The possession of this rank (or of the higher degree of serjeant) constitutes an indispensable qualification for practising as an advocate in the superior courts at Westminster. No other means of obtaining it exist but that of becoming enrolled as a student in one or the other of these inns, and applying, after a certain period, to its principal officers (or *benchers*) for *a call to the bar*. As a qualification for a call, the student must have kept commons for three years (*i. e.* twelve terms), by dining in the hall of the society at least three times in each term; and it is further required by the society of Lincoln's Inn that he should have been a member for five years, unless he have taken the degree of master of arts or bachelor of law in the universities of Cambridge, Oxford, or Dublin, or unless he shall apply to be examined in law, and pass a sufficient examination therein, in which case three will be sufficient. The benchers have the power of conferring the honorary degree of barrister on whom they will, without these requirements, as in the case of the present Prince of Wales, who was lately called to the bar by the society of the Middle Temple. The qualification above alluded to involves nothing of academical discipline or institution, nor is it necessary for the applicant for a call to the bar to be subjected to any previous examination as to his professional knowledge. But lately, lectures have been instituted, and an annual (*optional*) examination in law and high degrees of academical learning established, of students proposed for the bar, with prizes and certificates for the most distinguished. The business of legal education has been long conducted in private channels, a method which experience has proved to be efficacious; the usual plan being to obtain admission into the chambers of a practising barrister, conveyancer, or special pleader, where, in addition to the opportunities of observing the course of practice, the pupil enjoys for some time the advantage of tuition in the grounds and principles of the law. As to the privilege of barristers from arrest, *see* Arrest; and as to their duties and general privileges, *see* Counsel.

Barrow, *bär'-ro* (Sax. *berewe*), in Archæol., a name given to large artificial mounds of earth raised over the graves of warriors and men of renown in bygone ages. There are many barrows in Great Britain, particularly in Wiltshire and Dorsetshire. Some of these have been explored, and human remains have been discovered in them, deposited in a rough stone coffin, or, in cases where the body had been previously burnt, in a sepulchral urn made of clay. Flint arrow-heads, weapons of brass and iron, coins, bracelets, and cups, have also been found in them. The barrow called Silbury Hill, near Marlborough, in Wiltshire, is one of the largest in this country, being about 170 feet in height, and covering an area of nearly six acres. When barrows of this enormous size were raised, it is probable that they were intended to commemorate some great battle or other important event, and must be considered as serving a monumental purpose, for which we should use an obelisk or column in the present day.

**Barry**, *bar'-re*, in Her., when the shield is divided by horizontal lines into more than five equal parts, it is described as *barry* of so many pieces as there are divisions. The field of a shield is described as *barry-bendy* when it is divided evenly into lozenge-shaped pieces by the intersection of transverse and diagonal lines; and *barry-pily* when it is divided by diagonal lines from left to right and right to left, into pieces of the form of a wedge.

**Bars**, *bars*, in the menage, are the upper part of the gums, between the tusks and grinders, which bear no teeth, and to which the bit is applied, and by its friction the horse is governed.

**Bar-Shot.** (*See* Shot.)

**Barter**, *bar'-ter* (Sp. *baratar*), in Com., is the exchanging of one commodity directly for another, without the employment of money or any other medium of exchange. This is the usual mode of exchange among savage or uncivilized races, and it is likewise generally adopted by civilized nations in trading with savages: thus the traders with the North-American Indians purchase skins by bartering guns, powder, axes, and such-like. The term seems to be derived from the Italian word *barattare*, which signifies to cheat as well as to barter. A system of barter can only exist in the earliest commercial state of a people; for as commercial intercourse extends, the necessity of a standard of value becomes apparent, not only to facilitate operations, but to prevent that species of over-reaching which necessarily attends barter. The exchanges of a civilized people amongst themselves, or with other countries, are principally carried on by means of bills of exchange, so that the actual money payment in a country by no means represents the amount of its commercial transactions. In some parts of England, particularly in the mining districts, wages are paid in articles of consumption instead of money; and this is termed "trucking," from the French word *troc*, which signifies barter. It is, however, illegal.

**Bartholomew Fair**, *bar-thol'-o-mu*, was first held in the year 1133, and was conducted by the monks and priests of the church and priory of St. Bartholomew, which was situated in West Smithfield. The first charter was granted to a monk named Rayere, who had been jester to Henry I. In addition to the usual buying and selling, the fair was distinguished by the miracle-plays and mysteries of the priests, by athletic sports and games, and by the public disputations of the scholars from the London schools. In the middle of the 15th century the fair had greatly increased, and had become an important market for cattle, cloth-stuffs, leather, &c. It was always held on the 24th August, St. Bartholomew's day, and the variety of exhibitions, booths, mountebanks, and theatrical performances, made the gathering very popular. Henry VIII. suppressed the priory of St. Bartholomew, and the charter was then transferred to the corporation of London. After that time the fair began to lose its character, and towards the close of the 18th century a row of houses was built on the site of the cloth fair. The name is retained still. In 1593, the year of the great plague, the fair was not held. The proceedings usually lasted three days; but after the restoration of Charles II. they were prolonged to fourteen days. In 1701, however, the fair was represented as a nuisance; and the traffic gradually lessened from that period: it became an annual exhibition of debauchery and dissipation. Many unsuccessful attempts were made to suppress it, but it was not until 1840 that it was removed to Islington, where it struggled feebly for existence. It was finally abolished in 1855.

**Bartholomew's Day**, a festival of the Church, observed on the 24th of August, in honour of St. Bartholomew.

**Bartholomew, St., Massacre of**, an atrocious carnage that took place in France, on the night of St. Bartholomew's day, 1572. The king, Charles IX., at the instigation of his mother, Catherine de Medicis, the queen dowager, invited to Paris, under a solemn oath of safety, the principal Protestants of the kingdom, in order to celebrate the marriage of the king of Navarre with the sister of the French king. On a given signal, at midnight, the massacre commenced; men, women, and children were involved in one common destruction. The city resounded with the groans of the dying; the dead bodies were cast into the streets, and the channels flowed with blood. In Paris alone, it is said that more than 10,000 persons were put to death on that night. But the butchery was not confined to Paris: at Orleans, Rouen, Meaux, and other places throughout France, similar cruelties were perpetrated; so that in all, according to Sully (whose account is the received one), 70,000 persons were massacred on this occasion.

**Bartholomites**, *bar-thol'-o-mites*, a religious order founded at Genoa in 1307, but suppressed by Pope Innocent X. in 1650, in consequence of the irregularites of the monks. In the church of the monastery of this order, at Genoa, is the image pretended to have been sent by Christ to King Abgarus.

**Bartizan**, *bar'-ti-zan*, in Mediæval Arch., a small round turret, with an arrow-slit or very narrow window, generally projecting from the angle of a square tower, on the corner of a gable of a building, and supported on a corbel or bracket. Its chief use when thrown out near the top of a tower seems to have been for the purpose of enabling any one on guard to keep a look-out on persons approaching the castle, from a place of shelter and safety; or, when placed over or near a gateway, for defensive purposes.

**Barton Beds**, *bar'-ton*, in Geol., a group of tertiary beds, included in the Bagshot series. They consist of greenish-grey sandy clay below, passing up into bluish-green and brown clay, interstratified occasionally with beds of sand and lear

**Baru.** (*See* Sag[illegible]us.)

**Baruch, the Pr[illegible]ecy of**, *bair'-uk*, is the name of one of the apocryphal books subjoined to the canon of the Old Testament. Baruch was the disciple and amanuensis of the prophet Jeremiah, and this book has been reckoned part of Jeremiah's prophecy, and is often cited by the ancient fathers as such. It is said, in the preface to the book, to have been written by Baruch at Babylon, by the appointment of the king and the Jews, and in their name; that it was afterwards read to them for their approbation, and then sent to Jerusalem, with a collection of money, to Joachim, the high priest, and to all the people. The Jews rejected this book, because it did not appear to have been written in Hebrew; nor is it in the catalogue of sacred books given us by Origen, Hilary, Rufinus, and others. St. Cyril of Jerusalem, however, and the Laodicean council, held in 364, mention Baruch among the canonical books of Scripture, and join it with the prophecy of Jeremiah. There are three ancient copies of this book extant,—one in Greek, the other two in Syriac; but in which of these languages, or whether in any of them, it was originally written, is uncertain.

**Barwood.** (*See* Baphia.)

**Barystrontianite**, *bar-i-stron'-shan-ite*, in Min., a mineral found in Orkney, containing a mixture of carbonate of strontia and sulphate of baryta. It is also known as Stromnite.

**Baryta**, or **Barytes**, *ba-ri'-ta* (Gr. *barus*, heavy), in Chem., one of the alkaline earths, discovered by Scheele, in 1774. It is met with, combined with sulphuric acid, in *cawk* or *heavy spar*, and combined with carbonic acid in *witherite*. It may be formed by decomposing the nitrate by a red heat. It is very similar in its properties to caustic lime. It is greyish-white; becomes hot when moistened with water, falling to a fine white powder, forming the hydrate. Its specific gravity is about 4. It has an extremely acrid caustic taste, and is very poisonous. It dissolves in 20 parts of water, forming baryta-water, much used as a chemical re-agent. Boiling water dissolves half its weight of baryta, and deposes, on cooling, four- or six-sided prismatic crystals, containing 10 equivalents of water.

**Baryta, Carbonate of**, found native as *witherite*. It is used as the source of many baryta salts. It is a dense white powder, falling as a precipitate when a soluble carbonate is added to a solution of baryta salt. It is nearly insoluble in water, but dissolves readily in acetic, nitric, hydrochloric, and several other acids.

**Baryta, Nitrate of**, in Chem., formed by dissolving the carbonate of baryta in very dilute nitric acid, and evaporating and crystallising. It forms white, translucent octahedra, which are anhydrous. It is soluble in 8 parts of cold and 3 parts of boiling water. It is used principally in the preparation of baryta for chemical purposes, and for detecting acids in analysis.

BARYTA, THE SALTS OF, are readily recognized by giving a dense white precipitate, insoluble in the acids on the addition of a soluble sulphate. The carbonate and all the soluble salts are powerful acrid poisons. The best antidote is sulphate of soda or magnesia. The salts not enumerated above are unimportant.

BARYTA, SULPHATE OF, found native in the form of *heavy spar*. It may be readily formed by adding a soluble sulphate to a soluble salt of baryta. It is a dense white powder, insoluble in acids, and is sometimes used as a pigment, under the name of *permanent white*. Sulphate of baryta, or *heavy spar*, found in the lead-mines of the North of England, is the source of most of the baryta salts. The insolubility of sulphate of baryta in acids renders the salts of baryta valuable tests for the presence of sulphuric acid in any compound.

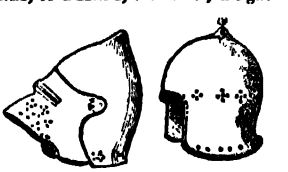
BARYTO-CALCITE, *ba-ri'-to-kăl'-site*, in Min., a mineral containing carbonate of baryta and carbonate of lime; also called Alstonite, from being found in the lead-mines of Alstone Moor.

BARYTONE, or BARITONE, *băr'-i-tone* (Gr. *barus*, heavy, and *tonos*, tone), in Mus., a tone of the voice the compass of which lies between the bass and tenor. It is the lowest but one of the six registers into which the human voice is divided, and is the commonest kind of male voice. The mezzo-soprano, or middle female voice, corresponds with it an octave higher.

BASALT, *ba-solt'* (from *basal*, an Ethiopian word for iron), in Geol., a close-grained, hard, black, or dark-brown rock, of igneous origin, occurring both in the Trap and the Volcanic series. It is one of the Dolerites or Augitic lavas, and consists essentially of augite and felspar, the former being in excess. It often contains crystals of the olive-green mineral *olivine*, grains of magnetic iron, and other bodies. Masses of basalt are frequently found divided into columns or prisms, with three, five, or more sides. That this columnar structure is the result of contraction on consolidation, is shown by the prisms usually being at right angles to the greatest extension of the mass,—that is to say, being vertical in an horizontal bed, and horizontal in a vertical dyke,—proving that the fissuring commenced at the cooling surfaces, and struck thence directly towards the centre of the mass. Sometimes it is found that the two sets of prisms thus originating at each surface did not exactly fit when they met in the centre. At other times, however, the prisms proceed uninterruptedly from side to side, the two sets either having coalesced, or one surface having cooled before the other, and given rise to divisions that were carried right across the mass. In addition to these prismatic joints, other irregular joints, more or less nearly at right angles to the prisms, also occur; and in very regular columnar basalt the columns are articulated, or separated at regular or irregular intervals, into short blocks, by divisions, which are sometimes quite flat, and sometimes curved into concave and convex surfaces, forming an approach to the ball-and-socket joint. The origin of this structure is explained by the celebrated observations of Gregory Watt. If a mass of basalt be melted in a furnace and allowed to cool again, the following results are observed:—If a small part be removed and allowed to cool quickly, a kind of slag-like glass is obtained, not differing in appearance from obsidian: if it cool in larger mass, and more slowly, it returns to its original stony state. During the cooling, small globules make their appearance, which increase by the successive formation of external concentric coats, like those of an onion; and the simultaneous obliteration of the previously-formed internal coats, so that, ultimately, a number of solid balls are formed. As these balls continue to increase in size, their external coats at length touch, and then they mutually compress each other. Now in a layer of equal-sized balls, each ball is touched by exactly six others, and if all be squeezed together by an equal force acting in every direction, each ball will necessarily be converted into a regular hexagon. The same result will also follow from an equal expansive force acting from the centre of each ball, or from the tendency to indefinite enlargement in their concentric coats. Thus each spheroidal mass, under favourable circumstances, will assume the form of a short hexagonal pillar. If there are many layers of balls, each ball resting directly and centrically on the one below it, a long column of these hexagonal joints will be formed, and the top and bottom of each joint will be flat, convex, or concave, according to variations in the amount and direction of the pressure at the ends of the columns. There is no apparent reason why, in a cooling mass of basalt, the balls should be arranged so that their centres should be in straight lines, and that the hexagonal joints should form straight continuous pillars, rather than separate discontinuous pavements. This, however, is probably the result of the simultaneous tendency of the mass to split into prisms on consolidation. The pillars of basalt are usually from six to eighteen inches in diameter, and vary in length from five or six to 100 or 150 feet. Basalt is rarely, if ever, found as an underlying rock, but generally occurs as a dyke or as an overlying mass. The most celebrated plateau of basalt is that in the north-east of Ireland, covering almost the whole county of Antrim. This entire mass is 300 or 400 feet in thickness, and 50 miles long by 30 wide. The basalt occurs in three or four sheets, in many places beautifully columnar, and interstratified with beds of volcanic ash, or "ochre," as it is called. One of the columnar beds dips gradually into the sea on the north coast, and is known as the Giant's Causeway. The basalt of the West of Scotland is very remarkable for the beauty and regularity of its columns. At Fingal's Cave, in the island of Staffa, the arrangement of these basaltic columns was long regarded as the masonry of a race of giants.—*Ref.* Jukes's *Manual of Geology*.

BASANITE, *băs'-a-nite* (Gr. *basanos*), a species of schistose hornblende, used for testing the purity of gold. The gold is rubbed on the stone, and the mark is touched with aquafortis. The amount of copper contained in the gold may be easily guessed at by the change of colour the streak undergoes.

BASCINET, BASINET, or BASNET, *băs'-i-net*, a light helmet sometimes having a vizor, but more often without one, and *basin*-shaped,—whence the name. During the reigns of Edward II. and Edward III. it was the common form of defensive head-dress adopted by the English infantry.



BASCINET.

BASE, *bass* (Lat. *basis*, a foundation; Fr. *bas*, low), in Arch., that part of a column on which the shaft is placed, consisting generally, in the five orders of architecture, of a square plinth and mouldings, formed of tori, fillets, cavettos, and astragals, in various combinations, between the plinth and the bottom of the shaft. The height of the whole base, including plinth and mouldings, is about half the diameter of the shaft at its lowest or broadest end. The Greek Doric column is the only form of pillar that has no base. In Gothic architecture, the base became higher and more varied in form than in examples of orders of the classic period.

BASE, in Chem., a term applied to those bodies which unite with acids or halogens to form salts or bodies analogous thereto. The basic property of an element is not absolute, but only relative; as the same body may act as a base or an acid with a different element. Thus we find chromium acting as a base in the form of sesquioxide, but as an acid in the form of teroxide or chromic acid. The bases in inorganic chemistry are generally oxides, the organic bases being analogous to them. (*See* ORGANIC BASES.) (For the relative basic relations of bodies, *see* AFFINITY.)

BASE, in Fort., the exterior side of the polygon, or that imaginary line which is drawn from the flanked angle of a bastion to the angle opposite to it.

BASE, in Mus. (*See* BASS.)

BASE COURT (Fr. *cour basse*) is any inferior court that is not of record; as the Court Baron, &c.—*Ref.* Kitch. fol. 95, 96.

BASE FEE, is one of the three kinds of estates in fee-simple, and has a qualification subjoined thereto, which

must be determined whenever the qualification annexed to it is at an end. As in the case of a grant to A and his heirs, *tenants of the manor of Dale*, in this instance, whenever the heirs of A cease to be tenants of that manor, the grant is entirely defeated; so, when Henry VI. granted to John Talbot, lord of the manor of Kingston-Lisle, in Berks, that he and his heirs, lords of the said manor, should be peers of the realm, by the title of barons of Lisle, here John Talbot had a base or qualified fee in that dignity (Co. Litt., 27 a); and the instant he or his heirs quitted the seignory of this manor his dignity was at an end. The estate is a fee-simple because it is limited to the heirs general, and may by possibility endure for ever; yet, as that duration depends upon the concurrence of collateral circumstances which qualify the duration, it is, therefore, not an absolute, but a qualified or base fee. It is proper to observe, with respect to this term of *base* fee, that it has usually a more restricted application, viz., to that species of qualified fee which is created where a tenant in tail conveys his estate by bargain and sale, &c., and which Lord Coke describes as a determinable fee derived out of an estate tail; and in the act for abolition of fines and recoveries, 3 & 4 Will. IV. c. 74, its meaning is, by express provision, confined (so far as that act is concerned) to the estate created by the alienation of the tenant in tail where the issue are barred, but those in remainder or reversion are not.

Base Knights, an order of knights inferior to barons and bannerets.

Base-Line, in Persp., is a line drawn at the extremity of the principal visual ray, and perpendicular to it. The base-line, in *Surveying*, is a principal line measured with the greatest precision on which a triangle or a series of triangles may be constructed, whereby other positions may be determined.

Base of a Solid Figure is its lowest plain side, or that on which it stands; and if the solid has two opposite parallel plain sides, and one of them is the base, then the other is also called the base. *Base of a triangle*, or any other plain figure, is usually that which lies the lowest; but any side may be the base, according to the position in which it may be conceived to be lying or standing.

Base Services, under the feudal system, were such as were fit only for peasants or persons of a servile rank; as to plough the lord's land, to make his hedges, to carry his manure, or other mean employments.

Basel, Council of, *bal*, is the name given to an important ecclesiastical council held in the city of Basel, in Switzerland. It was summoned by Pope Martin V. and his successor Eugenius IV., in conformity to a decree of the council of Constance, and met on December 14, 1431, under the presidency of the cardinal-legate Julian Cesarini. The two great objects of the council were the reconciliation of the Hussites to the Roman Catholic church, and the reformation of abuses in the Church itself; and the council was opened with an eloquent speech by the president. The former of these objects was contrary to the wish of the pope, who soon after issued his bull for the dissolution of the council. The members, however, maintained that the pope had no power of dissolving a general council once lawfully convoked and assembled, and, on his continuing to issue bulls against them, they summoned Eugenius to appear at their bar. Notwithstanding the papal bulls, the council concluded a peace in the name of the Church with the Hussites, to whom they allowed the use of the cup in the Lord's Supper. Through the intercession of the emperor Sigismund, a reconciliation was effected between the council and the pope, the latter revoking the bulls which he had issued against the council, and gave forth another, dated December 15, 1433, solemnly ratifying all its decrees. The council next proceeded to the reformation of abuses in the Church. The powers of the pope were much diminished and his revenues curtailed, and punishments were appointed for certain immoralities of the clergy. These proceedings greatly exasperated Eugenius, who summoned another council at Ferrara, and issued a bull for the dissolution of that at Basel. He was again cited to appear at their bar, and, on his failing to do so, was declared contumacious, and afterwards, in 1439, they decreed his suspension from the popedom, and elected Amadeus VIII., of Savoy, under the name of Felix V., in his room. Many of the members had by this time withdrawn from the council, and these proceedings were generally disapproved of by the Catholic world. The assembly, however, went on to hold its sessions at Basel for five years longer. Its last session there was held in May, 1443. Subsequently, it continued to meet at Lausanne till 1449, when, after the death of Eugenius and the resignation of Felix, an amnesty was offered to them by the new pope, Nicholas V., which they gladly accepted, and declared the council at an end. The decrees of the council of Basel are not admitted into any of the Roman collections, and are considered of no authority by the Roman lawyers. They are, however, recognized in points of canon law in France and Germany; and though some later concordats have modified the application of them, they have never been formally and entirely annulled.

Basel, Treaties of, the name given to two important treaties of peace concluded at Basel on the 5th April and 22nd July, 1795: the former of these was between France and Prussia, the latter between France and Spain, by which Prussia and Spain withdrew themselves from the coalition against France, and acknowledged the republic. Prussia gave up to France all her possessions beyond the Rhine, while Spain ceded her portion of the island of San Domingo.

Basellaceæ, *bas-el-lai'-se-e* (from *basella*, its Malabar name), in Bot., the Basella family, a small natural order of dicotyledonous plants, in the sub-class *Monochlamydeæ*. They are climbing herbs or shrubs, closely allied to *Chenopodiaceæ* (which *see*), but readily distinguished by having a coloured calyx, with two rows of sepals and perigynous stamens. There are four genera and twelve species, all of which are tropical plants. *Basella rubra* and *alba* are used in the East Indies as substitutes for spinach. From the former species a purple dye may be obtained. The fleshy roots of *Ullucus tuberosus*, or *Melloco tuberosa*, a native of Peru, contain a great deal of starch, and are edible.

Basement, *bais'-ment* (Ang.-Nor.), in Arch., the lowest story of any building, generally sunk beneath the surface of the ground, in private houses containing the kitchens and cellars. In public buildings of any architectural pretensions the base is, for the most part, low and of massive appearance, formed of "rusticated" masonry or stones, the outer surface of which is hewn into a rugged indented form, with a projecting band above, or cornice, which serves as a support to pilasters running up the walls of the building between the windows.

Whitehall, London. There is no strict rule for the height of the basement story; but it is generally regulated by the purposes for which it is intended, and the various uses to which the ground-floor above is applied.

Bashaw, Basha, or Pasha, *ba-shaw'* (Arab. *basha*, head or master), a Turkish title of honour conferred on viceroys, provincial governors, and other distinguished men. The badge of a bashaw's authority, as well as the emblem of his rank, is the horse-tail, and he takes precedence according to the number of these on his banner: the highest is the bashaw of three tails. These bashaws exercise supreme civil and military authority in their respective provinces, and many of them owe little more than a nominal subjection to the Porte.

Bashi-Bazouks, *ba'-she-ba-zooks'*, are irregular cavalry troops in the Turkish service. In the late war in the Crimea they were frequently engaged with the enemy; but they were turbulent and insubordinate, and plundered whenever occasion offered, so that they were generally more troublesome to their friends than to the enemy. W. H. Russell, in describing these "wild cavaliers," says, "it would have been difficult to find more picturesque-looking scoundrels if the world was picked for them from Scinde to Mexico. Many of them were splendid-looking fellows, with fine sinewy legs, beautifully-proportioned muscular arms, and noble well-set heads of the true Caucasian mould; others were hideous negroes from Nubia, or lean malignant-looking Arabs, with sinister eyes and hungry aspect; and some were dirty Marabout fanatics from Mecca, inflamed by the influence of their hadj, or pilgrimage."

BASIL. (*See* OCYMUM.)

BASILIAN MONKS, *ba-sil'-i-an*, in Eccl. Hist., were monks of the order of St. Basil, who lived in the 4th century. He retired into a desert in the province of Pontus, where he founded a monastery for the accommodation of himself and his numerous followers, and, it is said, drew up certain rules, amounting to several hundreds, for the better regulation of this new society. This new order soon spread all over the East; nor was it long in extending also into the West. Some assert that Basil saw himself the spiritual father of more than 90,000 monks in the East only; but this order, which flourished for more than three centuries, was considerably diminished by heresy, schism, and a change of empire. It is said to have furnished 14 popes, 1,805 bishops, 3,010 abbots, and 11,085 martyrs. It likewise boasts of several emperors, kings, and princes who have embraced its rule.

BASILICA, *ba-sil'-i-ka* (Gr. *basilike*, a royal residence, a palace), a term applied to the large buildings erected in Rome, and other cities of the Roman empire, for the administration of justice. They also served the purpose of an exchange, in which merchants transacted their business, being generally built in the immediate neighbourhood of the forum. The following was the method of construction generally adopted. A large central space, about twice or three times as long as it was wide, was surrounded with columns, on which a roof, called the *testudo*, was supported. On either side of this space porticos were added, covered with a roof sloping from the columns of the testudo, and supported on the outer side by another row of smaller columns at a distance of about one-third of the breadth of the central space from those that held the main roof; a wall was afterwards substituted for the outer columns of the portico, to afford shelter to those within the building. The portico was divided into two parts by a floor, the upper part forming a gallery for the accommodation of those who were looking on at what was passing below, or perhaps for the exposure of commodities for sale, or for carrying on some handicraft trade. There was a vestibule, or large porch, at one end, and at the other a tribunal for the administration of justice, with a semicircular recess, or apse, for the judge's seat, with *chalcidica*, or chambers for the use of the judge, counsel, &c., on either side of it. Basilicæ were unknown in Rome until about B.C. 200, but after that time they were generally built in towns in all parts of the Roman empire. The best example we have of the old basilica, or hall of justice, is that at Pompeii, built on the south-west side of the forum, occupying an area of about 300 feet long and 110 feet broad, including the external walls. The vestibule, at the lower end, is 100 feet by 30; the testudo, or central area, about 192 feet by 54; the porticos surrounding the testudo being 24 feet wide, while the tribunal, at the upper end, is 54 feet by 30, with chalcidica on either side about 30 feet by 24. On entering the vestibule at the left-hand side, there is a staircase leading to the galleries of the porticos. The early Christian churches, and, indeed, the churches of the present day, bear a strong resemblance to the old basilicas in their general arrangement; and it is probable that many of these old halls of justice and exchange at Rome were converted into places of worship by the first professors of Christianity in the imperial city. The central area corresponds to the nave; the porticos to the aisles, which are commonly furnished with unsightly galleries; the vestibule to the space usually occupied by the tower at the west end of a church, or to the great western entrance in a cathedral; and the tribunal of the Roman magistrate to the chancel and railed space inclosing the communion-table. In the old churches the resemblance was more striking, as the bishop's throne was placed in the semicircular apse immediately behind the high altar, which was placed under a canopy in what was called the sanctuary. Among the most famous at Rome may be mentioned Trajan's Basilica, and those of St. Peter, built A.D. 330; St. Paul, 386; St. Agnes, 625; and St. Maria in Trastevere, 1135. Of modern Italian basilicas, used for the same purposes as those of ancient Rome, the best specimens are those of Vincenza (built by Palladio about 1550), Padua, and Brescia.—*Ref. English Cyclopædia*—Arts and Sciences.

BASILICAN CODE, OR BASILICA, a Greek translation of the *Codex Justinianus*, a code of laws collected together by Justinian I., emperor of Rome, in 527. The design of reducing this code of laws into one Greek book was first commenced by Basil I., the Macedonian, emperor of the East, in the 9th century. The Basilican code, however, was not reduced to its present form till the early part of the 10th century, by Constantine VII., when it was published under the title of "Basilica repetita Prælectiones." From that period it became the common code of laws for the East.—*Ref.* Hanbold's *Manuale Basilicorum*.

BASILICON, *ba-sil'-i-kon* (Gr. *basilikos*, royal, or of great virtue), in Phar., the name sometimes given to an ointment, composed of 5 parts resin, 8 parts lard, and 2 parts yellow wax. It is much used as a stimulant dressing to blistered surfaces, with a view to keep up the discharge; and as a vehicle for other stimulating substances, such as savin and Spanish flies. It is called *ceratum resinæ* in the Pharmacopœia. Formerly basilicon was prepared with yellow wax, pitch, resin, and olive-oil, and was hence named *unguentum tetrapharmacum*, 'the ointment with four drugs.'

BASILICON DORON, (Gr., royal gift), the title of a work written by James I. for the instruction of his son, Prince Henry. It is divided into three books. The first is entitled "Of a King's Christian Duty towards God;" the second treats of "A King's Duty in his Office;" the third expatiates upon "A King's Behaviour in Indifferent Things." This work, in common with the other productions of the regal author, possesses at present no great degree of interest, otherwise than as a literary curiosity.

BASILIDIANS, *bas-i-lid'-i-ans*, in early Eccl. Hist., is the name given to a religious sect founded by Basilides, a Gnostic of Alexandria, who flourished in the earlier half of the 2nd century. The two great dogmas which formed the groundwork of his system were those of emanation and dualism. He held that the unrevealed God evolved out of himself the several attributes which express the idea of absolute perfection, being the intellectual powers, the mind, the reason, the thinking power, wisdom, might, and, lastly, the moral attributes. These seven powers, which he regarded as living, self-subsistent, and ever-active, together with the primal ground out of which they were evolved, constituted the first *ogdoad*, or octave, the root of all existence. Each of these spiritual essences proceeded to evolve out of itself continually numberless gradations of existences, each lower one being still the impression, the *antitype*, of the immediate higher one. As he had in his system seven homogeneous natures in each gradation of the spiritual world, so he is said to have held that there were 365 such regions or gradations of the spiritual world, answering to the days of the year. One grand idea of this system was, that in different degrees, and under different forms of application, one law pervades all stages and kinds of existence; and that everything, from the highest to the lowest, is governed by a single law. How he accounted for the existence of evil does not seem clear; but he held that everywhere, as rust deposits itself on the surface of iron, darkness and death cleave to the fallen seeds of light and life,—the evil to the good, the ungodlike to the godlike; without, however, the original essence being thereby destroyed. The whole course of this present world he considered as intended for such an end; that the godlike may be cleansed from all impurities, and restored to its original purity. He considered the development of the human race as a process of purification, which was to be perfected by Christianity. His great aim was to lead men to consider the whole universe as one temple of God. Faith in the justice and goodness of God rose in his mind above everything else; and when he was perplexed with difficulties, his last words ever were, "I will say anything sooner than doubt the goodness of Providence." The development of this system led Basilides and his followers into many erroneous opinions, particularly with respect to the character and mission of Christ, whom he did not regard as the Redeemer; and held that he differed from other men only in degree, and, like the rest, himself stood in need of redemption.—*Ref.* Neander's *History of the Christian Religion*, vol. ii.

BASILISK, *bis'-i-lisk* (*Basiliscus*).—Although this

creature has no affinity to the terrible serpent believed by the ancients to inflict death by its gaze, yet it is sufficiently ugly to engender an uncomfortable sensation. It is found in South America, and occasionally attains a length of three feet. Instead of the comb-like ridge of the iguana, the basilisk is furnished with a broad membrane running down its back, and a second, still broader, on the upper surface of its tail. This process is capable of either expansion or contraction. The hind part of the basilisk's head bears a remarkable pointed hood. Notwithstanding its unsightly appearance, the basilisk is a perfectly harmless reptile.

Basilisk (Gr. *basiliskos*, from *basileus*), a fabulous serpent, said to have been able to kill with its breath or sight only. According to Galen, its colour inclined to yellow; and it had three small eminences on its head. They were speckled with whitish spots, and presented the appearance of a crown. Ælian says that its poison is so penetrating as to kill the largest serpents with its vapour only; and that it will kill a man by merely biting the end of his stick. The sound of its hissing is enough to frighten away all other kinds of serpents. According to Pliny, the basilisk is able to kill all those who look upon it. It is also called a cockatrice, from the belief that it was generated from a cock's egg, brooded upon by a serpent. All these details are put forth by Matthiolus, Galen, Dioscorides, Pliny, and Erasistratus. The absurdity of all the statements has since that time been thoroughly exposed. In some apothecaries' shops, formerly, little dead serpents were exhibited, which were said to be basilisks. These were, however, only small birds without feathers, having their heads raised, wings like a bat's, eyes large, and necks very short. At Venice, and other towns on the continent, animals are shown which are called basilisks. They are, however, only small thornbacks, with their fins stretched out, and artificially arranged so as to resemble young cocks. This Calmet says he observed in an apothecary's shop in Paris.

Basilisk, a kind of ordnance used in ancient times, and so called from its supposed resemblance to the fabulous serpent bearing the same name. It is now completely out of use; but, during the wars of Hungary, it was much employed by the sultan Solyman. The basilisk cannon threw a 200-pound iron ball.

Basilosaurus. (*See* Zeuglodon.)

Basin, *bat'-sin* (Fr. *bassin*), in Geol., a term applied to any dipping or disposition of strata towards a common centre, which has resulted from the upheaval and subsidence of the earth's crust. The tertiary formations often occupy limited areas, and fill up the basins of the older strata; hence the use of such phrases as "London basin," "Paris basin," &c.

Basin of a Dock, a place where the water is confined by double floodgates, or a caisson, and thereby prevented from running out at ebb tide. The use of it is to contain ships either before they enter, or after they come out of the dock in which they are repaired. Basin also implies some part of a haven, which opens from a narrow channel into a spacious receptacle for shipping.

Basket, *bat'-ket*, an article of domestic use, made principally of the interwoven twigs of willow or birch-trees, and often of straw, rushes, or other articles. They are made in every variety of quality, and in every kind of shape, and are used for holding all sorts of dry goods. The value of the baskets imported into England during the year 1857 was £35,348. A large quantity of material for making baskets is also imported into this country.

Basking Shark, *bâsk'-king shark*, a large, immensely strong, but still harmless species of shark. By the Irish it is called the sunfish. (*See* Shark.)

Basque Language, *bask*, is the name given to the language spoken by the inhabitants of the Basque provinces of Spain and of part of Spanish and French Navarre. The people call themselves *Euscaldunac*, their country *Euscalerria*, and their language *Euscara*. For a long time the Basque language was supposed to exist a dialect of the Celtic; but later researches have at length shown that this is not the case, and that there is some ground for supposing it to be an ancient language, and, distinct from any of the other European languages; and after it is said by some to have an affinity to certain of the Asiatic tongues. It seems to have been at one time the language of the whole of the Spanish peninsula; for we find traces of it in the names of mountains, rivers, &c., in almost every part of the country. The Basque language possesses a great variety of terminations. According to some, the noun has six cases; according to others, eleven. The verbs are said to have eleven moods and forty-six tenses. The structure of the sentences is very simple. The substantive is always placed first; then the article; then the adjective; next the adverb; then the verb; and lastly the object, with the preposition affixed to it.

Bas-Relief. (*See* Relievo.)

Bass, Base, or Basso, *bâss* (Ital. *basso*), in Mus., are terms all of which have the same meaning, and signify the lowest or deepest part. The bass, or lowest part, is, with sound musicians, the most important of all the parts: it is, indeed, the foundation of harmony,—the support of the whole superstructure of the composition. The word *bass* is technically used in various ways; as, *thorough bass*, *fundamental bass*, *ground bass*, *figured bass*, &c. A *figured bass* is a bass with figures written over or under each note, to indicate the accompanying harmonies. The term *figured bass* is used as synonymous with *figurative bass*, meaning a bass not confined to the plain *canto-fermo* style, but moving with more freedom, and with a melody of its own: for instance, the bass in Bach's arrangement of the Old Hundredth. *Fundamental bass* is that bass which forms the tone or natural foundation of the incumbent harmony, and from which, as a lawful source, that harmony is derived. To explain this by example:—If the harmony consists of the common chord of C, C will be its fundamental bass, because from that note the harmony is deduced; and if, while that harmony is continued, the bass be changed to any other note, it ceases to be fundamental, because it is no longer the note from which that harmony results and is calculated. *Ground bass* is used sometimes as synonymous with *fundamental bass*, and sometimes as a bass which starts with some subject of its own, and continues to be repeated throughout the movement, while the upper part or parts of the composition pursue a separate air, and supply the harmony. This kind of bass was greatly in fashion about half a century since, but has for some time been rejected, as an unnatural restraint upon the imagination, and productive of a monotonous melody. *Thorough bass* is the art by which harmony is superadded to melody, and includes the fundamental rules of composition. This branch of musical science is twofold,—theoretical and practical. Theoretical thorough bass comprehends the knowledge of the connection and disposition of all the several chords, harmonious and dissonant, and includes all the established laws by which they are formed and regulated. Practical thorough bass is conversant with the manner of *taking* the several chords on an instrument, as prescribed by the figures placed over or under the bass part of a composition, and supposes a familiar acquaintance with the powers of these figures, a facility in taking the chords they indicate, and judgment in the various applications and effects of those chords in accompaniment. The bass is that part of a concert which is the most heard, which consists of the gravest and largest sounds, or which is played on the longest pipes or strings of a common instrument, or on instruments larger than common for the purpose.

Bass, Counter. (*See* Contra-Bass.)

Basse, or Sea-Perch, *bâss*, a marine fish, the *Labrax Lupus* of Cuvier. The fishes of this gen. belong to the fam. *Percidæ*, or Perches, with whom they are closely allied. The basse is to be met with along the British and Dutch shores, and abundantly in the Mediterranean. By the ancient Greeks and Romans it was highly esteemed as an article of food. On account of its voracity, it was called by the Romans *lupus* (wolf), a name still retained as a designation of the species. It was held to be the most cunning of fishes; and Aristotle declares that when encompassed by a net, it would effect its escape by digging a tunnel for itself in the sand. Its length is generally from a foot to a foot and a half; but it has been found of a much larger size. There is an American species of basse, which is termed by Cuvier *Lupus macronatus*.

Basset, *bâs'-set*, a term applied by miners to the

emergence at the surface of different mineral strata from beneath each other. It is also applied to openings from or into mines from the surface.

Basset, a game at cards, played in a manner similar to that of the modern faro. It was formerly very much played in France. The mode of playing is as follows:—The banker deals the cards in pairs, and each punter, or player, has a *livret* of thirteen cards, from which he selects one or more, and stakes on them. The principle of the game depends upon the corresponding card in the banker's pack turning up in an odd or an even place. When a player wins, he may either take his money or go on, risking his stake and gains. The first time this is done it is called *paroli*, or double; the second time, *sept et la va*, seven and it goes; the third time, *quinze et la va*, fifteen, &c.; the fourth time, *trente et la va*, thirty-one, &c.; and on the fifth risk, *soixante et la va*, sixty-three, &c. In all cases the odds are greatly in favour of the banker: it is 1,023 to 1 against the player winning ten successive times. Louis XIV. issued some very severe decrees against the game of basset, and after that time it was played under the name of *pour et contre*.

Basset Horn (Ital. *corno di bassetto*; Fr. *cor Anglais*), an instrument now but seldom used. Its tone is very sweet, and in solo passages it is capable of producing very striking effects. It resembles a hautboy of a large size, a little bent at the top. Its real compass comprises the notes contained between F bass and B alt, except the note F sharp, which is deficient. As the person who plays the hautboy generally takes this instrument, the part for it is usually written a fifth higher than its real pitch.

Bass Horn.—This instrument, formerly a great deal used in bands, has declined much since the introduction of the ophicleide, which it somewhat resembles. The player of the bass-horn should possess a quick and correct ear, and a knowledge of thorough-bass, in order to perform acceptably. The instrument has been found rather imperfect, and is not now much used.

Bassia, *bäs'-si-a*, in Bot., a gen. of plants belonging to the nat. ord. *Sapotaceæ*. The species are trees, natives of tropical or sub-tropical regions. They are remarkable for their fleshy flowers and oily seeds. In India, the fatty oils procured from the ripe kernels of *B. latifolia*, the Madhuca-tree, and *B. longifolia*, the Elloopa-tree, are made use of for burning in lamps, for culinary purposes, for making soap, and, medicinally, for external applications in cutaneous affections. The fleshy flowers and fruits are used as food, and from the former an alcoholic liquor is distilled. The wood of *B. longifolia* and other species is very hard and durable. The Shea or Galam butter, which forms an important article of internal commerce in Central Africa, is thought by some to be the produce of a species of *bassia*.

Basso. (*See* Bass.)

Bassoon, *bäs-soon'* (Fr. *basson*), a musical wind instrument, made of wood, and played by means of a bent mouth-piece and reed. It is supposed to have been introduced into England by Handel, as a kind of help to the hautboy, which it so nearly resembles in tone as to make it the natural bass of that instrument. The compass of the bassoon extends from double B flat up to B flat in alt, three octaves, including all the intermediate semitones except B natural. When the bassoon ascends very high, the notes are generally written in the tenor clef.

Bassora Gum, *bäs'-sor-a*, a whitish or yellowish substance brought from the neighbourhood of Bassora. It differs from most gums in being nearly insoluble in water. The plant yielding it is believed to be a species of *Mimosa*. It contains a peculiar principle, called Bassorin, which also exists in gum-tragacanth.

Bass Viol. (*See* Violoncello.)

Bast, or Bass, *bäss*, a name commonly given to the inner bark of trees. Russian mats are manufactured from the bast of the lime-tree. (*See* Liber.)

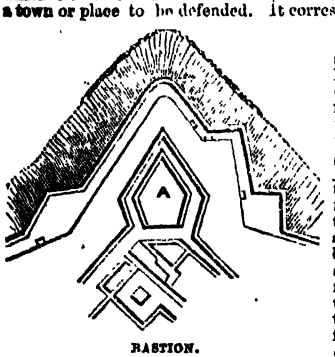
Bastard, *bäs'-tard* (Welsh, *bastardd*; Fr. *bâtard*, of low birth; from Ang.-Sax. *base*, mean, disgraceful, and *ord*, source, origin).—In English Law, bastards are such children as are not born in lawful wedlock, or within a competent time after its determination, and are held to be *nullius filii*, the sons of nobody. If children be born in ever so short a time after marriage, they are legitimate; but, notwithstanding they be born during marriage, they may be proved bastards where the husband be out of the kingdom of England for such time as will shut out the presumption of access to his wife, and by other cogent evidence; as by proof of the impotency of the husband, or that he and his wife had no opportunity (though both within the realm) of sexual intercourse within such period as is consistent with their being the parents, or even by proof of circumstances tending strongly to the inference that no such intercourse (supposing it to be possible), in fact, took place. So in a divorce, after a decree of judicial separation, if the wife afterwards have children, they are bastards; for the law will presume the husband and wife live conformably to the sentence of separation, unless access be proved. And after a decree for dissolution of the marriage on the ground of adultery, all children of the woman not born within due time thereafter, even though they may be begotten by the husband from whom she has been divorced, are illegitimate. And in case of a decree of nullity of marriage, all the issue born even before the divorce are bastards, because such divorce is always upon some cause which rendered the marriage unlawful and null from the beginning. But except where a divorce has taken place between the married parties, or evidence is given of facts sufficient to disprove their sexual intercourse, the law always presumes in favour of the legitimacy of a child born to the wife during the marriage. Upon the same principle, too, legitimacy will always be presumed (subject to the same exceptions) with respect to children born after the coverture has ceased, by reason of the husband's death, unless the birth takes place so long afterwards that the child clearly could not be begotten by him. The extreme period is a point which the law has not exactly determined, and is left to the decision of a jury, who are to judge of it according to the circumstances and the testimony which persons of experience may give of the course of nature on this subject. Bastards are incapable of being heirs. The civil law differs from ours on this point, and allows a bastard to succeed to an inheritance, if, after its birth, the mother was married to the father; and also, if the father had no lawful wife or child, then, even if the concubine was never married to the father, yet she and her bastard son were admitted each to one-twelfth of the inheritance; and a bastard was likewise capable of succeeding to the whole of his mother's estate, although she was never married, the mother being sufficiently certain, though the father is not. (*See* Affiliation.)

Bastille, *bäs-teel'*, the name formerly used in France to denote a fortress or state prison defended by towers or bastions. There were three buildings of this sort in Paris,—the Bastille de St. Antoine, the Bastille de St. Denis, and the Bastille du Temple. The first is the most celebrated, and was built by Hugues d'Aubriot, mayor of Paris in 1369, at the Porte St. Antoine, and was originally intended as a defence against the English. It consisted, at first, of two towers, between 70 and 80 feet high, with a gateway between them. It was soon changed from a fortress to a state prison, and two other towers, similar to the first, were built parallel to them, and the whole connected with massive walls. In 1383 two more towers were added, at equal distances to the first, and also united with strong masonry. The towers were each divided into four stories, and the summit of each was fortified with cannon. The whole building was surrounded with a deep moat; and the road into the inner courtyard was over a drawbridge. The unfortunate prisoners, who principally consisted of noblemen and men of letters, were confined within the towers, or in dungeons below the level of the ground. The walls of the towers were six feet thick; and light and air were admitted to the dungeons through narrow slits towards the moat; and the rooms in the towers had glazed windows strongly grated. A daily sum was allowed to the governor for the maintenance of each prisoner; and this sum, which was given by the king, varied according to the rank of the prisoner. The principal officers in command of the Bastille were the governor and the *lieutenant du roi*. The mode of arresting prisoners was by *lettres de cachet*, sometimes signed by the king himself, and countersigned by one of the ministers. After a prisoner was immured, his name

was never mentioned; he was always known by the number of the cell or dungeon in which he was confined. Thus many persons became so shut out from the world, that some of them were forgotten; and in some cases it was found impossible to discover who they were, and why they had been sent there. The most extraordinary captive in the Bastille was "the man with the iron mask." He was brought from the island of St. Marguerite to the Bastille in 1698, by M. de St. Mars, the newly-appointed governor. His face was never seen, and his fare was the most sumptuous that could be provided. The governor never sat down in his presence. He died Nov. 19th, 1703. There are many conjectures as to who this mysterious prisoner could have been; the most probable supposition is, that he was the twin brother of Louis XIV., whose birth had been concealed by Cardinal Richelieu. The French mob attacked the Bastille in 1789, and it was yielded up to them, after a few hours, by M. de Launay, the governor, who was immediately afterwards murdered and then beheaded. Seven prisoners were found inside, one whom was Englishman, and he was deranged. The whole buildi was soon after demolished, by a decree of the mayor and committee.

BASTINADO, *bäs-ti-na'-do* (Ital. *bastonare*, to beat with a stick), a punishment attended with great pain, and often with bodily injury, consisting, in the strict sense of the term, in the infliction of blows on the soles of the feet with a thick stick. It is sometimes applied to beating administered on the body and limbs. Turk and Russia are the only European nations in which this mode of punishment is sanctioned by law, and in both countries it is carried to a most unjustifiable extent, the sufferers being frequently maimed and injured for a considerable period, if not for life. I Russia, the instrument of torture is a heavy whip, called the knout. The bastinado is a common kind of punishment in China, as well as in Persia and all Eastern nations professing the Mahommedan faith, blows being ordered by the Koran for many offences of a minor character.

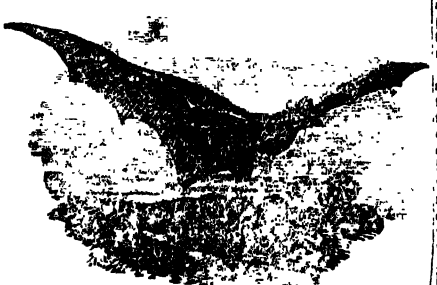
BASTION, *bäst'-yon* (Fr.), a large mass of earth, usually faced with brickwork, or stones, and forming a tower which stands out from the ramparts surrounding a town or place to be defended. It corresponds with the bulwark of the ancients. It is formed of two faces, two flanks, and two demi-gorges. The junction of the two faces forms the salient angle of the bastion; and the faces, together with the flanks, form the *épaules*, or shoulders. The time when bastions were first introduced into fortification is not known; they probably originated in the projecting towers on the walls of fortresses, used for the purpose of observing the enemy when close to the foot of the ramparts. After the year 1500 they were well known and much used. The town of Turin, in 1546, was defended by complete fortifications, including four bastions. The Italian engineers soon became celebrated for their skill in military fortification after the invention of bastions. During the reign of Queen Elizabeth an Italian engineer, named Genebelli, was employed in order to superintend the formation of a bastioned rampart round the castle of Carisbrook, in the Isle of Wight. Bastions are now made of various kinds,—solid, hollow, regular, &c. Solid bastions are entirely filled up with earth up to the level of the platform of the guns, while hollow bastions have the interior level with the ordinary ground. Regular bastions are those which have their faces, flanks, &c., in due proportion. A demi-bastion, or *épaulement*, has only one face and one flank. A double bastion is when one bastion is raised within and upon the plane of another bastion. A flat bastion is one built in the middle of the curtain or wall connecting the two angles of a rampart. A composed bastion is one in which the sides of the interior polygon are unequal; thus making the gorges also unequal. A bastion is called deformed or irregular when the faces, flanks, &c., are not in symmetrical proportion; and a cut bastion, or bastion with a *tenaille*, is one whose salient angle has been cut off, and has, instead, an angle opening inwards, with two points outward. If the angle of a bastion is less than 60°, it is found to be too small for the use of guns; besides, being so acute, it is easily battered down by the enemy.



BASTION.

BAT, *bat* (*Chiroptera*).—So much does this singular creature appear to partake of the character of the feathered tribe, that naturalists of an ancient date experienced a difficulty as to its proper classification in the system of nature. The anatomical and intestinal structure of bats, however, combined with their viviparous nature, their hair, &c., without doubt entitles them to be ranked as quadrupeds. Although the appellation "flying" has been given to certain groups of this class, owing to their mode of flight, they only possess the power of gliding from one point to another by the agency of an expanded skin, which serves to buoy them in their aerial motion, consequently, differs only in extent from the leap of an ordinary mammal. With the bats, however, the anterior members are as completely organized for true flight as those of a bird. As in the birds, the bones supporting the anterior members are large, the humerus rather short, and the bones of the fore-arm long; but the latter are quite separate and movable, as in the human arm. The bones of the fingers, however, instead of being amalgamated, so as to form a single series, are all quite distinct, and, when extended, radiate widely from the wrist, the bones of which are of small size. The thumb is short, but the other four fingers excessively elongated: the first finger is the shortest, and the others of nearly equal length. The four long fingers and the bones of the arm are united by a delicate leathery membrane, which is also united to the sides of the body as far as the extremities of the hind-legs, and sometimes fills up the space between them; and it is by the agency of the broad wings, formed by the extension of the arms and fingers, that the bats are enabled to flutter through the air. The thumbs of the anterior feet are small, free, and furnished with sharp curved claws, by which the animals can suspend themselves to any convenient projection. The thumbs of the anterior hands and the hind feet are the only means by which the bat can progress along the ground, where, as might be expected, it is very awkward in its movements. Dentition varies in the different families, according to the peculiar nature of the creature's food. The body is covered with a soft down, but the membrane of the wings only exhibits a few scattered hairs. The teats are placed on the breast, and the young, when sucking, cling to that part of the mother's body, and are carried about by her. Their senses of smell, hearing, and feeling, are very acute, and in some the nose is furnished with a membraneous foliation of most delicate structure, by which the sense of smell is greatly enhanced. The ears, in many kinds, are expanded, and capable of being folded down; while their full wings and the tissues of the ear and nose are so amply furnished with nerves as to enable them, even though deprived of sight, to pursue their flight through the narrowest passages without danger. On the approach of winter, the bat relapses into a state of lifeless inactivity, and in selecting a spot for hybernation, appears to regard security from molestation before any other consideration. "The hybernation of these animals," writes Mr. Bell, "is, indeed, one of the most interesting points in their economy. At an earlier or later period of autumn, according to their species, they retreat, generally in large congregations of various species together, to the most retired places, as under the roofs of houses and churches, in caverns, in the hollows of trees, and similar situations, where they suspend themselves by their hinder claws, with their head downwards. Here they crowd together, hold-

ing not only by the surface of the walls of their retreat, but by each other, one crowding over another so closely that it appears scarcely possible for such numbers to occupy so small a space." The common bat, or flitter-mouse (*Vespertilio pipistrellus*), is more frequently met in this country than any of the others. It makes its appearance in the twilight of fine summer evenings in lanes and shady places, or haunts the vicinity of quiet streams, where any sort of nocturnal insects abound. Although not more than two and a half inches long, or about the size of the common brown mouse, it is very voracious, and must in a single evening consume a vast number of insects. In dull weather, no matter though it be the middle of summer, the flitter-mouse keeps within doors as though it were mid-winter. The long-eared bat (*Plecotus auritus*), like the flitter-mouse, is also commonly found in the vicinity of buildings. It is the most elegant of the bats, and certainly most easily tamed, learning to come at a whistle and take flies from the hand. The ears are very long and transparent; when the animal is sleeping they are concealed under the wings, whilst the inner lobe of the ear still projects, giving the creature the appearance of possessing short slender ears. The mouse-coloured bat (*Vespertilio murinus*), the long-eared bat (*Plecotus auritus*), and the great bat (*Vespertilio noctula*), also count among the well-known British bats. The horse-shoe bat (*Rhinolophus*) resembles the common bats in its general habits, but is even more nocturnal, being satisfied with nothing short of absolute darkness for its place of retreat. The animal derives its name from the possession, above its nose, of a singular leaf-like membraneous appendage, shaped somewhat like a horse-shoe. The



BAT.

horse-shoe bats are abundantly distributed over the warmer regions of the earth, but Britain numbers but two of them,—the great and little horse-shoe bat. The largest of these two measures two and a half inches in length, while the lesser is one of the smallest British species of the order. The most terrible of all the bats is the one that has earned for itself the title of Vampyre (*Phyllostoma spectrum*). Like the horse-shoe bat, it is furnished with a nose-crest; the canine teeth are large, and in almost all the species there are four incisors in both jaws. Some of them are so large as to measure two and a half feet across the extended wings. There can be little doubt that their favourite food is blood; but the narratives of olden naturalists, that "they attack men while they sleep, opening an artery and sucking the blood, lulling their victims the while by gently fanning them with their broad wings, and so continuing till the fountain of life is exhausted," is, to say the least, open to discussion. Captain Stedman was himself bitten, and he thus describes the operation:—"Knowing, by instinct, that the person they intend to attack is in a sound slumber, they generally alight near the feet, where, while the creature continues fanning with its enormous wings, which keeps one cool, he bites a piece out of the tip of the great toe, so very small, indeed, that the head of a pin could scarcely be received into the wound, which is consequently not painful; yet through this orifice he continues to suck the blood till he is compelled to disgorge." Darwin, Swainson, and Waterton, agree in considering the bat in question dangerous to life; and the latter attests that he has repeatedly seen both men and beasts who have been sucked, and has minutely examined their bleeding wounds. This authority, however, confesses that, although a constant observer in the vampyre's country for the space of eleven months, he could never discover *how* the vampyre draws the blood. "I slept alone in the loft of a woodcutter's abandoned house in the forest; and though the vampyre came in and out every night, and I had the finest opportunity of seeing him, as the moon shone through the apertures where windows had once been, I never could be certain that I saw him make a positive attempt to quench his thirst from my veins, though he often hovered over my hammock." Azara states, that the inhabitants of Paraguay have no dread of these animals, though they frequently enter the house and suck the blood of those who may incautiously expose any part of their body.

BATATAS, *ba-tat'-tas*, in Bot., a gen. of plants belonging to the nat. ord. *Convolvulaceæ*. The most important species is *B. edulis*, the Sweet Potato, a native of the East Indies, but now cultivated in all tropical and sub-tropical countries for its tubers, which, when roasted or boiled, form a wholesome and highly-nutritious article of food. Next to maize, the sweet potato is the principal food of the poorer classes in America.

BATH AND BATHING, *bath*.—Bathing, in its most general acceptation, denotes the application to the surface of the body, or a part of it, of a medium different, or of a different temperature, from that by which it is usually surrounded. The substance which constitutes this medium is, in Med. language, termed a bath. Baths are of various kinds, and are distinguished according to the substances of which they are composed, as water, vapour, air, sand; according to their temperature, as cold, tepid, hot; according to the mode of their application, as plunge, shower, douche; according as they are general or partial, natural or artificial. Undoubtedly the custom of bathing dates from the earliest existence of the human race. At first they would use such natural baths as the rivers or seas afforded; but doubtless, in no long time, they came to employ artificial ones; and we find the warm bath mentioned as early as the time of Homer. Afterwards both public and private baths came to be common among the Greeks; but we know little of their construction and arrangements. The public baths were mostly in connection with the gymnasia, and were taken immediately after their athletic exercises. It was not until the reign of Augustus that the public baths at Rome came to assume that magnificence and splendour which afterwards characterized them. They were termed *thermæ*, or hot baths; but they also contained cold baths. In the latter period of the empire, Rome contained an immense number of baths, in various parts of the city. Different authors reckon upwards of 800 of them; but the most celebrated were those of Agrippa, Antoninus, Caracalla, Diocletian, Domitian, Nero, and Titus. Those of Diocletian are said to have been capable of accommodating 1,800 bathers. The vestiges of these buildings that are still to be seen indicate the great magnificence of the original structures. Mr. Fergusson, in his "Handbook of Architecture," says, "There is nothing in the world which, for size and grandeur, can compare with these imperial palaces of recreation." "St. George's Hall, in Liverpool, is the most exact copy, in modern times, of a part of these baths;" but the whole building "is less than one-fourth of the size of the central mass of a Roman bath." Their pavements were mosaic; the ceilings vaulted, and richly gilt and painted; the walls incrusted with the rarest marbles, and adorned with the most valuable paintings and statues. They stood among extensive gardens and walks, and were often surrounded by a portico. The main building contained extensive halls for swimming and bathing; others for conversation; others for various athletic and manly exercises; with lecture-rooms, libraries, &c. The principal parts of a Roman bath were,—the *Apodyterium*, or heating-room, on the ground-floor, which served for heating the bath-rooms above and the water for bathing. Above the heating-room was an apartment in which three copper kettles were walled in one

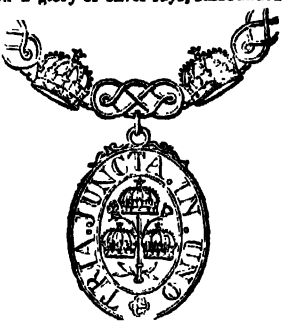
above another; so that the lowest (*caldarium*) was immediately over the fire, the second (*tepidarium*) over the first, and the third (*frigidarium*) over the second. From these, boiling, tepid, or cold water could be obtained respectively; and they were so connected with pipes, that the void in the one was supplied from that immediately above it. The *apodyterium* was the name given to the room for undressing in, and it was also a place for meeting and conversation. The terms *frigidarium*, *tepidarium*, and *caldarium*, were likewise applied to the bathing apartments in which the cold, tepid, and hot baths were placed. These bathing-rooms had, in the centre of each, a large marble basin, with cold, tepid, or hot water. The *caldarium* had hollow walls, and the floor rested on low pillars over the *hypocaustum*; so that it was surrounded on all sides with heated air. At one end of this apartment, which was usually twice as long as it was wide, was the *laconicum*, where a vase for washing the hands and face was placed, called *labrum*; and at the other end was the hot bath, called *lavacrum*. Round the walls of the bathing-rooms were seats or benches, which, in the *caldarium*, were raised one above another, as in an amphitheatre, in order to give the bathers a choice of temperature, from the higher, of the upper part of the room, to the more moderate, lower down. The *unctuarium*, or *elæothesium*, was an apartment containing ointments of various kinds for anointing the body. The usual time of bathing with the Romans was about two o'clock in summer, and three in winter. Their mode of bathing was as follows:—After undressing, the body of the bather was anointed with a cheap coarse oil; on which he proceeded into the *sphæristerium*, a very large apartment, devoted to exercises of various kinds, the most common of which was the ball. After taking a sufficient amount of exercise, he went into the adjoining warm bath, where he washed, and scraped the surface of his body with instruments called *strigiles*, usually of horn or bronze. His body was then anointed with perfumed oils. He then passed into the *tepidarium*, and thence into the *frigidarium*, in order to soften the transition from the intense heat of the *caldarium* to the open air. As the baths were much frequented, they were resorted to for amusement or conversation. Poets sometimes read their compositions there, and philosophers delivered lectures; and latterly, libraries were attached to them for the use of the studious. On the fall of the Roman power, however, these customs passed away, and the magnificent edifices fell into decay. The Turkish bath of the present day is essentially that of the ancient Romans. The *Hamam*, or Turkish bath, as it exists in Constantinople, is described by Dr. W. J. Erasmus Wilson, in his work entitled "The Eastern or Turkish Bath." It is a large building, with a domed roof, a square massive body, from which minarets shoot up, and against which wings abut containing side apartments. The essential apartments are three in number,—a great hall or *mustabi*, a middle, and an inner chamber. The *mustabi* is a large circular or octagonal hall, perhaps a hundred feet high, with a domed roof open in the centre. In the middle of the floor is a basin of water, with a fountain playing in the centre, and around it are plants and trellises. Around the circumference of this hall is a low platform, from four to twelve feet in breadth, and three feet high, divided by dwarf balustrades into small compartments. These compartments are the dressing-rooms; and each of them contains one or more couches, shaped somewhat like a straddling letter W, the angles being adapted to the bends of the body. The bather here disrobes and assumes the bathing garb, a long Turkish towel being wound turban-wise round his head. When he is ready, two attendants place wooden pattens on his feet, and lead him into the middle apartment. This second chamber is low, dark, and small, and feels warm, without being hot or oppressive; and the air is moistened with a thin vapour. It is paved with white marble, and a platform eighteen inches high occupies its two sides; while the space between serves as a passage from the *mustabi* to the inner hall. A mattress and cushion are laid on the marble platform; and here the bather reclines, smoking his chibouque, sipping his coffee, and conversing in subdued and measured tones with his neighbour. Here the bather courts a natural and gentle flow of perspiration; and to this end are adapted the warm temperature, the bath coverings, the hot coffee, and the tranquil rest. After a time the bath-attendant arrives; and, if he finds the skin sufficiently moist and softened, the bather is again taken and ushered into the third or inner apartment. The temperature of this apartment—the *caldarium* or *sudatorium* of the Romans—is considerably higher than that of the middle room. The atmosphere is filled with curling mists of gauzy and mottled vapour, the steam being raised by throwing water on the floor. In the middle of this apartment is an extensive platform of marble slabs; and on this the bather is laid on his back, his scarf being placed beneath him to protect his skin from the heated marble, and the napkin that served as a turban being rolled up as a pillow under his head. Here he is subjected to a process of shampooing; his muscles being pressed and squeezed, his joints being forcibly bent in all directions, and stretched until they snap. After the shampooing, the bather is brought to the side of the hall, around which are placed marble basins about two feet in diameter, supplied, by means of taps, with hot and cold water, and is made to sit on a board near to one of these basins. The attendant draws on a camel's-hair glove. "He stands over you, you bend down to him, and he commences from the nape of the neck in long sweeps down the back till he has started the skin; he coaxes it into rolls, keeping them in and up till with his hand they gather volume and length; he then assiduously strikes and brushes them away, and they fall right and left as if spilt from a dish of macaroni. The dead matter which will accumulate in a week forms, when dry, a ball of the size of the fist." In the course of his frictions he pours water from the basin over the skin to rinse off the impurities. The body is then thoroughly soaped and washed twice over from head to foot; and, as a *coup de grâce*, a bowl of water is dashed over the entire body. The wet clothes are then removed, and an attendant approaches with warm napkins, which supply their place. The bather is then conducted to the outer hall, or *mustabi*, where he stretches himself on the couch of repose. Coffee is poured out and presented, the pipe follows, and, if so disposed, he may have sherbet or fruit, or even a meal. The hall is open to the heavens; but, nevertheless, a boy with a fan of feathers or a napkin drives the cool air upon him. The linen is twice changed; and, when the cooling process is complete, "the body has come forth shining like alabaster, fragrant as the cistus, sleek as satin, and soft as velvet. The touch of the skin is electric." The time occupied is from two to four hours, and the operation is repeated once a week. The process of bathing, then, as practised by the Turks, consists of five distinct processes. There is—1. the seasoning of the body in the outer chamber, by which the skin becomes warm, soft, and moist; 2. the shampooing, or manipulation of the muscles; 3. the rubbing up and removal of the surface-layer of the scarf-skin; 4. the soaping and rinsing; and 5. the process of cooling and drying, which takes place in the outer hall. The modern Turkish baths differ from those of the ancient Romans in making use of vapour in place of warm water. There is also the absence in the Turkish bath of the cold douche or plunge with which the Romans concluded. The Egyptian bath is an offshoot of the Turkish, and the process, though somewhat different, preserves the general characteristics of the parent. A full description of it is given by Lane, in his "Account of the Manners and Customs of the Modern Egyptians." The Russian bath is well described by Kohl, in his account of Russia, from which work we gather the following particulars:—"The Russians are great lovers of the vapour-bath, and in St. Petersburg there are an immense number of them. On a Saturday evening, troops of mechanics and labourers, whole families of men, women, and children, may be seen eagerly traversing the streets, with towels under their arms and birch twigs in their hands. On entering the bath," he says, "we first come upon an open space, in which a number of men are sitting in a state of nudity on benches, all dripping with water and perspiration, and as red as lobsters, breathing deep, sighing, puffing, and gossiping, and busily employed in drying themselves and dressing. These have already

bathed; and even in winter, I have seen these people, all melting from the hot bath, drying and dressing in the open air, or at most in a sort of booth forming an outhouse to the baths. Round it are the doors leading to the bathing-rooms, large wooden apartments, in which a heat of from 122° to 145° Fahr. is maintained. There are to be seen a number of persons, from fifty to a hundred, employed apparently in inflicting torture upon themselves. On the platforms, raised in the form of an amphitheatre, lie a number of bodies on their backs or stomachs; if not dead, they certainly seem as if struggling with death, for the air they are breathing can only serve to stifle. Others, their tormentors, are employed in scourging them with birchen rods steeped in cold water, as if to increase the smart. Others are standing by the glowing stoves, as if they wished to be roasted; and others, again, descending from the upper platforms, steaming at every pore, have ice-cold water poured over them by the pailful, of which there are tanks at hand for the purpose. The pleasurable sensation is felt," he continues, "when the first disagreeable effect of the heat is overcome, and the transpiration commences in full activity; then the beneficent spirit of warmth pervades the whole frame; a divine sense of pleasure is all that remains to us of our existence; our whole being seems dissolved in fleeting vapour; all pain and stiffness vanishes from the limbs; we feel light and buoyant as feathers. The rubbing and flogging with birchen twigs increases the transpiration, and consequently the enjoyment. All bodily pain, be it what it may, disappears in these baths; of headache, toothache, cramps, convulsion in the limbs or face, gout, and rheumatism, not a trace remains. It is an extraordinary excitement, a kind of intoxication of the whole nervous system." Bathing, besides serving the great ends of bodily cleanliness and comfort, is a very important agent in the preservation and restoration of health. (*See* HYDROPATHY.) The most common medium employed in bathing is water, at different degrees of temperature, from 33° up to about 112° Fahr. Baths are divided into different kinds, according to their temperature. The simplest division is into cold and hot; including in the former all that communicate a sensation of cold, and in the latter a sensation of heat to the body. This test, however, is very variable, differing in different individuals at the same time, and in the same individual at different times; but, in most cases, it will be found to be between 84° and 88° Fahr. On entering a cold bath, a healthy person feels a sensation of cold, accompanied with a slight shuddering, and, if the change is considerable, a shock; the skin becomes pale and contracted, and the respiration hurried and irregular. In a few seconds the colour and warmth return to the skin, and a glow is diffused over the whole body. If the person remains more than ten or twelve minutes, the glow disappears, and is succeeded by a general feeling of chilliness. As the great object of cold-bathing is to produce this glow, the bather should always leave the water before it goes off. Hence cold-bathing always does harm when the powers of the body are too languid to bring on a reaction, and the chilling effects remain unopposed. In the same way it is not proper to bathe while the body is in a chilled state, or exhausted by bodily or mental exertion; as in these cases a reaction is doubtful. When one is strong and in health, the morning, before breakfast, is the best time for bathing; but for weak and delicate persons the best time is about noon. If one feels cold, languid, and drowsy after bathing, it is an indication that it does not agree with him; and it would be well for him to resort to the tepid bath for some time, until the vigour of his constitution is in some measure restored. Delicate persons should make a shorter stay in the bath than others. No one should bathe immediately after a full meal. Cold-bathing is particularly valuable in all cases of great nervous irritability and sensibility, accompanied with general debility. In cases of weakness of the limbs, torpor, and loss of power, it is also of much service.—The *tepid* bath, which is intermediate between the cold and hot, and may be said to include the highest degrees of the one and the lowest degrees of the other, ranges from about 85° to 94°. The difference between it and the general temperature of the body is so small, that it can exercise but a slight effect upon the circulation. Its influence is chiefly confined to the skin, which it softens and cleanses, and promotes insensible perspiration. It is very soothing and salutary when the skin is dry or parched, and is sometimes had recourse to in cases of fever. It is also used as preparatory to the cold bath in persons of delicate constitution. The *warm or hot bath* ranges from 94° up to about 112°, but generally not above 98° or 100°; or, more properly, the warm bath ranges from 94° to 98°, and the hot bath from 98° to 112°. The primary effect of a warm bath is to stimulate and enliven; the circulation and respiration are quickened, and the surface of the body expands. Gradually, however, the pulse becomes fuller and slower, the energy of the muscles disappears, and a tendency to sleep succeeds. It is of great use in alleviating local or general irritation, and is much resorted to in spasmodic and convulsive diseases. It is had recourse to in the case of weak and irritable constitutions, which could not support the shock of cold immersion. It ought, however, to be employed as a remedial agent only, as it is too enervating for ordinary use. It may be prolonged so as to produce fainting, which is sometimes done, in order to relax the tension of muscles and sinews, for the reduction of dislocations, opening of constricted passages, and such-like.—The *vapour-bath* is the most powerful means of applying a great heat to the surface of the body. It attracts the blood more speedily to the surface; and, being followed by a more profuse perspiration, it is more powerful than the hot bath. It is employed as a remedy in gout and rheumatism, and in some chronic affections of the nervous system and organs of respiration. Vapour-baths, as we have already seen, are much used in the East and in Russia; and they have recently been introduced into this country. The following is recommended as a cheap and easy way of obtaining a vapour-bath. A pretty large fire-brick is made red-hot, and then laid on an iron tray, supported on short feet. Over this is to be placed a wooden chair, on which the person who is to take the bath is seated. A four-leaved screen, covered with painted canvas or cloths, is then put round him, and a blanket or thick cloth thrown over the top, so as to convert it into a small chamber. The person being provided with a small jug or watering-pan of hot water, pours the water slowly over the red-hot brick, which, being immediately converted into steam, fills the inclosure, and induces a profuse perspiration.—*Medicated baths.*—Although it is certain that the most important effects of baths depend upon their temperature, yet it cannot be doubted, in comparing the effects of a bath of simple water with those of mineral waters, or of the sea, that the chemical components of the materials used in bathing are of considerable importance. Sea-water and mineral waters, particularly such as contain sea-salt or iron in solution, are more tonic, stimulant, and bracing than simple water. Hence, when the object is to strengthen and brace the system, as is almost always the object of cold-bathing, sea-water is to be preferred to fresh; and if this cannot be procured, the water, where practicable, should be rendered artificially saline, by the addition of common salt. The beneficial effects of certain substances when in this way mixed with the water in bathing, have led to the introduction of what are termed medicated baths. Baths of this kind are partly imitations of natural mineral waters and partly other remedial mixtures. The substances thus mixed with the water are, to some extent, absorbed by the skin, and thus carried into the system. These may be of various kinds:—mineral, as salt, potash, sulphur, iron; vegetable, as wine, vinegar, bark; or animal, as milk. In the case, also, of vapour-baths, medicaments are sometimes added with good effect; as, sulphur, mercury, &c.—*Partial baths* are such as are applied only to a part of the body; and they are, of course, of various kinds, their number being limited only by the number of parts of the body to which water can be locally applied.—The *Shower-bath* differs from the ordinary plunge-bath, in that the water comes from above, and falls principally on the head and shoulders. The shock from the shower-bath is greater than that obtained from simple immersion, more particularly if the quantity of the water is great, its temperature low, and its fall considerable. In certain affections, particularly those connected with

the head, this form of bath has decided advantages over every other, from the refrigeration being applied directly, and in the first place, to the head. It is sometimes of advantage in the shower-bath to have the feet in warm water during the process.—The *douche* or dash-bath consists of a small stream of water directed with considerable force from a tube upon some particular part of the body. It varies in power, according to the diameter of the stream, the temperature of the water, and the force with which it is projected on the body. This is, perhaps, the most powerful of all refrigerants, owing to the incessant and rapid change of the particles of the fluid applied to the part, and also to the compression upon the capillaries produced by the mechanical impulse of the stream. (*See* HYDROPATHY.)

BATH, ORDER OF THE, an order of knighthood, so called from bathing having anciently formed part of the ceremony previous to installation. To this order is usually attributed a very high antiquity. That bathing, from the earliest times, formed part of the ceremony to be undergone previous to receiving the honour of knighthood, is well known; but we meet with no mention of a distinct order of this name previous to the coronation of Henry IV., when that monarch conferred the honour upon forty-six esquires, who had watched all the night before in the Tower of London, and then bathed themselves. Afterwards, it became customary for the English kings to confer this dignity at the time of their coronation, or on other great occasions; as on the coronation of their queens, the inauguration of the prince of Wales, birth or marriage of royal children, &c. The last knights of the Bath created in the ancient form were made at the coronation of Charles II., in 1661, from which time the order was discontinued till it was revived by George I., in 1725, who ordered a book of statutes to be drawn up for its government. By this, the number of knights was fixed at thirty-eight; viz., the sovereign, a prince of the blood-royal, a grand-master, and thirty-five knights companions. At this time it was a regular military order; and in 1815, the prince-regent, being desirous to commemorate that auspicious termination of the long and arduous contests in which the country had been engaged, and to mark in an especial manner his sense of the valour, perseverance, and devotion manifested by the officers of the king's forces both by sea and land, extended the limits of the order of the Bath, and ordained that thenceforth it should be composed of three classes, differing in rank and degree of dignity. The order was still purely military; but, in 1847, it was extended to the admission of civil knights. The *first class* of the order consists of knights grand cross (K.G.C.); the number not to exceed, for military service, 50, exclusive of the sovereign, princes of the blood-royal, and such distinguished foreigners as may be nominated honorary K.G.C.; and, for civil

2. *Second class*—knights commanders (K.C.B.); number not to exceed, for military service, 102; for civil service, 50, exclusive of foreigners. The members of this class, as well as of the first, are entitled to *Sir*, and take precedence of knights bachelors. *Third class*,—companions (C.B.); number not to exceed, for military service, 525, and for civil service, 200. They take precedence of esquires; but are not entitled to the appellation, style, &c., of knights bachelors. No officer can be nominated to the military division of the third class of the order unless his services have been marked by special mention of his name in the *London Gazette*, as having distinguished himself in action against the enemy; and the order has never been conferred on any officer below the rank of major in the army or commander in the navy. The badge for the military classes of the order is a gold Maltese cross of eight points enamelled, argent, having in each of the four angles a lion passant-guardant; in the centre, the rose, shamrock, and thistle, and three crowns; the whole encircled with the motto of the order, *Tria juncta in uno* (three joined in one), and a laurel wreath, with the legend *Ich dien* (I serve) inscribed below. It is worn by the grand crosses pendent from a red ribbon across the right shoulder; by the knights commanders, from the neck; and by the companions, from the buttonhole. The collar is of gold, an inch and an eighth in depth, and weighing 30 oz. It is composed of nine imperial crowns, eight gold roses, thistles and shamrocks, enamelled in colours, and tied or linked together with seventeen gold knots enamelled white, having the badge of the order pendent therefrom. The star of the military grand crosses is formed of rays or flames of silver, thereon a gold Maltese cross, with, in the centre, three crowns, surrounded by the motto of the order, a laurel wreath, and having underneath, *Ich dien*. The star of the civil K.G.C. is of silver, formed with eight points or rays, charged with three crowns upon a glory of silver rays, surrounded with a red circle, upon which is the motto of the order, the laurel wreath, and underneath, *Ich dien*. Their badge is of gold, composed of a rose, thistle, and shamrock, issuing a sceptre between three crowns, encircled by the motto. The civil K.C.B. wear the same badge, of a smaller size, round the neck, by a red ribbon; and the civil C.B., the same, but of a still smaller size, from the buttonhole, pendent from a red ribbon. The star of the K.C.B. is in the form of a cross-patée of silver, having the same centre as the grand crosses, but without a gold Maltese cross thereon. The star of the civil K.C.B. is of the same form and size, only omitting the laurel wreath and the *Ich dien*. The officers of the order are the dean, the genealogist and blanc coursier herald, the Bath king-of-arms, the registrar and secretary, the gentleman usher of the scarlet rod and Brunswick herald, and the messenger.



ORDER OF THE BATH.

BATHOS, *bat'-thos* (Gr., depth), is a term employed in Lit. to denote an unconscious descent from the sublime to the ridiculous, from a lofty idea to a mean one; as in the well-known lines—

> "And thou, Dalhousie, the great god of war
> Lieutenant-general to the earl of Mar."

BATH-KOL, *bath-kol'* (Heb., daughter of the voice), the name given to a species of oracle employed by the Jews, and frequently mentioned in the Talmud. After the death of Malachi, the spirit of prophecy ceased among the Jews; and they then had recourse to another kind of revelation, called the daughter of the voice, because it succeeded the oracular prophecy. It was, in fact, a method of divination similar to the *Sortes Virgilianæ* of the Romans. As, in the latter case, the first words they happened to dip into in the works of that poet were regarded as a kind of oracle, whereby they predicted future events, so with the Jews, when they appealed to Bath-Kol, the first words they heard from any one's mouth were looked upon as a voice from heaven, directing them in the matter they inquired about. Even Christians in former times were not free from this superstition, often making the same use of the Scriptures that the Romans did of the works of the Mantuan bard.

BATHS AND WASH-HOUSES.—In the early part of the present century the want of proper accommodation in the houses of the poorer classes in large towns and cities for washing clothes and the person, which is so very needful, and eminently conducive to health, led many benevolent individuals, of a practical turn of mind, interested in what is now termed "social science," to consider what should be done to remedy the evil. Remembering, doubtless, the public baths, which were deemed the most necessary and important institutions in Rome and the cities of her numerous dependent provinces, remains of which are to be seen in the present day, which were built in old London under the Romans, it was taken into consideration whether establishments of a less pretentious but equally useful character could not be brought into operation at a moderate cost, which should furnish the

working classes with the means of obtaining a hot or cold bath, as well as the use of washing-apparatus, for cleansing, drying, and ironing linen in a comparatively short period of time; thus removing the discomfort and unhealthy dampness which must always exist in the dwelling of the artisan, often limited to one or two rooms in a building, or rather barrack, occupied by many families, on days appropriated to the necessary but most disagreeable process of washing. In 1844 the first practical steps were taken to initiate the movement; and, at a meeting held at the Mansion House, a society was formed, under the name of the "Association for Promoting Cleanliness among the Poor," with which the name of Mr. Bowie, a surgeon, who was mainly instrumental in bringing about a result so desirable, will always be honourably connected. Subscriptions having been raised for the purpose, an old house in Glasshouse Yard, Upper East Smithfield, near the London Docks, was taken and opened in the following year, amply furnished with baths, coppers, and the necessary appliances for bathing and washing, where bathers and washers were admitted without charge; and that the boon was fully appreciated by those who lived in the immediate neighbourhood, may be gathered from the fact, that during the first year 61,219 persons availed themselves of the privileges offered by the association. The society, in 1846, proceeded to erect model premises in Goulston Street, Whitechapel, the general principles of which, as regards construction and arrangement, have been closely followed in all other similar institutions. In the same year another company erected and opened an establishment in George Street, Euston Square; and an act was introduced and passed (which was amended in 1847), by which, with the consent of the inhabitants, parochial vestries, and town-councils of corporate and borough towns, were empowered to build public baths and wash-houses, borrowing money for the purpose, to be refunded by payments to be made out of the borough or poor-rate. The charges were fixed at 1*d.* for a cold bath and 2*d.* for a hot one; and the use of the washing-apparatus at not more than 3*d.* per hour. The prices for baths of a higher class were not to exceed three times the sum charged for the lower class. Many parishes in London promptly availed themselves of the advantages offered under this act; that of St. Martin-in-the-Fields being the first to do so. This example was quickly followed in Liverpool, Manchester, Bristol, Birmingham, and many of the more important towns in the United Kingdom; and shortly after the closing of the Great Exhibition in 1851, the governments of France, Sweden, and Belgium, and the municipal authorities of many continental cities, as well as New York, having seen the benefits resulting from such establishments in England, applied for information on the practical working of the scheme, and statistics connected with it, with a view to the erection of similar institutions in their own capitals and towns. There are about twenty of these public baths and wash-houses in London, and about 2,000,000 bathers and 500,000 washers take advantage of the accommodation offered in these, at an average cost of rather more than 3*d.* each. With the exception of the institution in Goulston Street, which commenced operations hampered by a heavy debt, the baths and wash-houses work well, and generally pay their own expenses, or nearly so; and there can be no doubt that all will become fully self-supporting in the course of a few years. It has been found that persons belonging to the middle classes avail themselves of the conveniences offered by the wash-houses to a much greater extent than the poor, for whose benefit these establishments were intended; which is to be regretted, as the primary end aimed at by the original promoters of the movement thereby falls short of attainment; it is thought, however, that funds might be produced by affording better accommodation, and charging higher rates, for those who are possessed of better means, which would enable the managers to open a third class for the poorest people gratuitously, or at a nominal charge. The following is a general description of the principal features in these establishments. The baths of both classes are placed in a large open room, resembling a shed, lighted from openings in the roof and by gas at night; those for men are placed on one side of the building, and those for women on the other. Each bath-room is about 7 feet by 6, separated by partitions, generally of slate, about 10 feet high; the bath, which is for the most part made of zinc or iron, with an enamelled surface, resembles a large trough, and holds from 40 to 60 gallons, being in some cases sunk below the level of the floor, and in others above it. Hot or cold water can be supplied by an attendant, as the bather may order, by means of a contrivance placed in each room for the purpose of allowing him to make his requirements known. Two towels are generally allowed for a first-class bath, the charge for which is 6*d.* hot and 3*d.* cold; and one for a bath of the second class, which may be had for 2*d.* hot and 1*d.* cold. Soap may be purchased of the attendants who supply the towels. At some of these establishments shower and vapour baths are to be found, as well as large swimming-baths filled with tepid and cold water. The washing-rooms are similar in construction to those containing the baths, being divided into rows of compartments resembling stalls in a stable, each being about 6 feet long by 3½ wide, by slate partitions about 8 feet high. Each division contains a wooden trough, to serve as a boiler, and a washing-tub, which are supplied with hot or cold water, or emptied, by taps arranged for the purpose: steam is admitted into the wooden boiler whenever it is desired to make the water boil. The bottom of the compartment is covered with a wooden rack, on which the washer stands. The steam arising from the ranges of boxes is carried off to a ventilating-shaft. The clothes are dried in a wringing-machine made of galvanized wire, to which a rapid rotatory motion is imparted by turning a handle, the water being driven out by centrifugal force. After being wrung, the clothes are taken to a room called the drying-chamber, also divided into compartments and heated with hot air: each compartment is furnished with a horse, on which the linen is hung: it is generally quite dry in about a quarter of an hour. Some institutions have a room provided with boards covered with flannel, irons, and stoves, for ironing. Soap and soda must be provided at the expense of the washers. The use of the apparatus in wash-houses having first-class compartments furnished with a rinsing-tub, and being rather larger in size, is 2½*d.* per hour first class, and 1½*d.* second class; the general charge is, however, 1½*d.* per hour, although, in some places, 1*d.* only is charged. It is found that two or three hours are sufficient to enable a good washer to wash and dry the whole of the linen used in a small family.—Ref. *English Cyclopædia*—Arts and Sciences.

Bath Stone. (*See* Oolite.)

Batideæ, *bāt-i'-de-e*, in Bot., the Batis ord. A single succulent and shrubby plant, *Batis maritima*, constitutes this supposed distinct order. It is a native of the West Indies, where it is occasionally used as an ingredient in pickles. The order is closely allied to *Empetraceæ*, the Crowberries.

Batman, *baw'-man*, in Mil., a soldier who has been told off to perform certain duties which are not the ordinary regimental duties. For instance, when troops are in the field, each field-officer has a batman; the staff have one likewise, and every company has two. These batmen take charge of the horses for carrying the camp equipage. Neither batmen nor bat-horses are allowed to troops while on duty in the United Kingdom.

Baton, *ba-tawn(g)*, (Fr., a staff), is a staff or club employed to denote dignity or power. It is the name given to the short staff presented by the French sovereign to each field-marshal on his appointment, as an indication of his power.

Batrachia, *bā-trak'-ki-a*, soft and naked-skinned reptiles, such as frogs and toads, who in the early stage of existence respire by means of gills.

Batracholites, *bat-trak'-ko-lites* (Gr. *batrachos*, a frog, *lithos*, stone), in Geol., fossil remains of frogs and other animals of the same order. The skeletons, vestiges of the soft parts, and imprints of the feet of several genera of true batrachians, occur in the tertiary strata. In the pliocene deposits on the banks of the Rhine at Œningen, and in the paper-coal of the Eifel, several species of frog, toad, and newt have been found. Fossil frogs of a small species very similar to the recent abound in a dark shale overlaid by basalt, in the vicinity of Bombay.

BATRACHOMYOMACHIA, *bāt-ra-ko'-mī-o-mai'-ki-a* (Gr. *batrachos*, a frog; *mus*, a mouse; *mache*, a battle), literally signifies a battle of frogs and mice, and is the title of a Greek mock heroic poem usually ascribed to Homer, but without any good foundation. It seems to be indeed a parody upon the Iliad; and the contests of the beasts, their single combats, the intervention of the gods, and other Homeric incidents, are described with much humour.

BATRACHUS. (*See* FROG-FISH.)

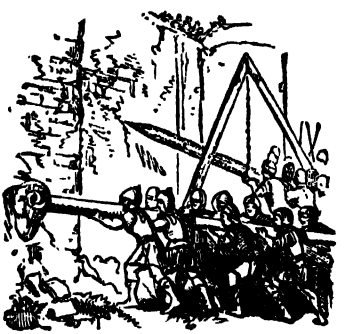
BATTA, *bāt'-ta*, in Mil., was an allowance made to the officers in the service of the late East-India Company above their regular pay. The officers of the Queen's regiments were also placed upon an equality with the East-India Company's officers, by having batta allowed them by the latter. Full batta was allowed to officers, whether in garrison, field, or cantonment, provided they were stationed beyond 200 miles' distance from the seat of government. The full batta of a lieutenant-colonel was about 608 rupees (£60) per month; a major's full batta was 456 rupees; a captain's, 182; lieutenant's, 122; ensign's, 92. When a regiment was in garrison or cantonments within 200 miles of the seat of government, of either of the three presidencies, only half-batta was allowed, but with an addition for house-rent. The effect of the amalgamation of the East-India and royal regiments has been to cause an entire alteration in the system of batta allowances.

BATTALION, *bāt-tāl'-yon* (Fr. *bataillon*), in Mil., is a division of the infantry in an army, commanded by a colonel. Two or more battalions (frequently only one) constitute a regiment; two or more regiments, a brigade; two or more brigades, a division; two or more divisions, a corps d'armée; and two or more corps d'armée, a grand army. A division corresponding to a battalion exists in most of the armies of Europe. The object in a battalion is not to make it too small, and yet not to make it larger than that all the men of it can hear the voice of the commander. The number is usually from 600 to 1,000 men. The Prussian and Austrian battalions are, on the war footing, each 1,000 strong, and are in the former divided into four, in the latter into six companies. In the British army a battalion usually consists of about 750 men; and, in most cases, one battalion constitutes a regiment. During war, however, the British army is increased, not by adding to the number of regiments, but by adding battalions to a regiment, and companies to a battalion. A battalion is generally divided into ten companies, each company into two equal parts, and each of these into sections. The company of grenadiers occupies the extreme right, and the light-infantry company the extreme left of the battalion, while the other eight companies, each designated by a number, are drawn up between them.

BATTENS, *bāt'-tens*, in Mar., signify thin pieces of oak or fir nailed to the mastheads and to the midship part of the yards. Battens of the hatches are a sort of long narrow laths, scantlings of wooden stuff, or straightened hoops of casks. They serve, by the help of nailing, to confine the edges of the tarpauling close down to the sides of the hatchways, to prevent the water from penetrating the lower apartments of a ship during a storm.

BATTENS.—In Carpentry, this term is applied to pieces of fir-wood about 14 or 16 feet long, not more than 7 inches wide, and 2½ inches thick. They are used for making floors, and when cut into six lengths they are used as uprights on which to nail laths, where plastering is required. The best battens come from Christiana, in Norway, and an inferior kind is imported from North America.

BATTERING-RAM, *bat'-ter-ing*, a military engine of high antiquity, which was used for beating down the walls of besieged fortresses. It consisted of a massive beam of timber, with an iron or bronze mass upon one end, generally of the shape of a ram's head. In its earliest and rudest form it was worked by soldiers, who supported it in their hands. More generally, however, it was slung from a cross-beam, with an alternate motion communicated to it by means of ropes. It was in many cases covered by a rude form of shed, which served as a protection to those working the ram. Justus Lipsius speaks of one battering-ram as 180 feet in length, a diameter of nearly 2½ feet, while the iron head weighed a ton and a half. Supposing this engine to be worked by 100 soldiers, it would acquire a momentum equal to that of a 36-pounder. This very ancient weapon of destruction is mentioned by Ezekiel. Thucydides speaks of it as being used in the Peloponnesian war, B.C. 429; and Dionysius the Elder certainly employed it a hundred years later at the siege of Motya. The Romans, who derived it from the Greeks, used it constantly and with great effect. It was sometimes, but not very frequently, used in the Middle Ages.



BATTERING-RAM.

BATTERY, *bāt'-te-re* (Fr. *batterie*), in Mil., a number of pieces of ordnance mounted upon a raised platform behind an elevation of earth. A battery of this sort is principally used in order to defend or retain a position. There are, however, many kinds of batteries, distinguished by names, referring either to their position or the duties which they are required to perform. In gun and howitzer batteries there are embrasures through which the firing takes place; but mortar-batteries have no openings. In field operations, a battery mostly consists of six pieces of ordnance, with gunners, horses, ammunition, &c., complete. A battery of foot-artillery is usually called a field-battery, in order to distinguish it from that of the horse-artillery, which is called a horse-battery. A field-battery often decides a battle. At the battles of Alma and Inkermann, the former was decided when the British troops reached the Russian batteries; and the successful retention of a sand-bag-battery at Inkermann ultimately left the victory with the allied troops.

BATTERY, in Law. (*See* ASSAULT.)

BATTERY, ELECTRICAL.—The term usually applied to a combination of several electrical jars, which may be charged and discharged as one great jar. The construction of the simple jar, or Leyden phial, will be fully explained further on (*see* JAR, ELECTRICAL), but a short description of this important instrument may be given here. It consists of a wide-mouthed jar of thin glass, coated externally and internally with tinfoil to within a few inches of the top, and provided with a wooden cover, through which passes a stout wire connected with the inner coating, and terminating above in a brass knob or ball. Such a jar is charged by connecting the outer coating with the earth, and bringing the knob in contact with the conductor of an electrical machine. To discharge the jar, it is necessary to complete a conducting communication between the exterior coating and the knob. The extent of such communication, which is termed an electrical circuit, may be almost indefinite. If the discharge be effected through a short circuit of bent wire, terminating in brass balls, there occurs an exceedingly bright spark, accompanied by a loud snap. If a portion of the living frame be included in the circuit, then a powerful shock ensues, the intensity of which depends on the amount of the charge. To obtain very powerful effects, an extensive surface of coated glass is required. Such a surface may be afforded by one huge jar or by a battery. Very large jars are, however, seldom employed, as they are inconvenient and expensive. A battery is formed by joining together all the charging-rods or inner

coatings of several jars, which are then united externally by being placed on a common conducting-base. When charged from the conductor of the machine, and discharged in the usual way, these jars all act together in mass; hence we have a means of multiplying electrical accumulation to an almost unlimited degree, provided we can obtain a sufficient charging power. With a battery of 100 jars, each about 13 inches in diameter, 2 feet high, and exposing altogether about 550 square feet of coated glass, the Dutch electrician Van Marum obtained a tremendous action: when this battery, after having been fully charged by a very large double-plate machine, was discharged through and upon various kinds of matter, its force was irresistible. Steel bars, 9in. in length, $\frac{1}{6}$ inch wide, and $\frac{1}{12}$th inch thick, included in the circuit, became powerfully magnetic; a piece of boxwood 4 inches square was rent in pieces; various metallic substances were melted and dispersed in all directions; an iron wire, 25 feet in length, and about the $\frac{1}{140}$th part of an inch in diameter, fell, under the shock, into red-hot balls; a piece of tin wire, 8 inches long and $\frac{1}{70}$th of an inch in diameter, disappeared in a cloud of blue smoke, from which fell red-hot globules of the metal. The electrical battery, as sold by the philosophical-instrument makers, is a compact and elegant apparatus. It consists of a number of small jars, each occupying a separate compartment, in a strong wooden case lined throughout with tinfoil, all the jars being connected by cross brass rods terminating in balls. Sir W. Snow Harris recommends a much more simple arrangement, in which jars of comparatively large dimensions are employed. Five, seven, or any other convenient number of the jars, are arranged in a group upon a circular conducting-base, and the knobs of the external jars are connected with the charging-rod of the central jar by short brass wires. If very great power is required, a number of such groups may be united by joining their central jars. The management of electrical batteries requires very great caution. The jars are easily charged by connecting the central rod with the machine, as the charge will then pervade the whole series through the connecting-wires. Several ingenious contrivances are employed for discharging electrical batteries without danger to the operator. The best of these consists of two insulated balls, one in communication with the inner coatings, and the other with the common conducting-base, which balls can be brought in contact at any instant, by touching a glass handle placed at a safe distance from the charged jars. When certain substances are exposed to the action of the battery, they are placed on an insulating-table between two directing wires, which may be adjusted conveniently for the particular experiment. The instrument termed the *universal discharger* is generally employed in such operations. In this, the two directing-rods slide through short spring tubes supported by glass pillars, with which they are connected by movable joints; the insulating-table is placed between these rods, and is supported by a glass leg, which fits into a socket of compressed cork, in such a way that the table may be maintained at any required height.—Ref. *Rudimentary Electricity*, by Sir W. Snow Harris.

BATTERY, FLOATING. (*See* FLOATING BATTERY.)

BATTERY, VOLTAIC or GALVANIC, an arrangement for producing a current of electricity by chemical action. The two forces electricity and chemical affinity are so intimately connected, that one may be assumed to be either the cause or the effect of the other. The chemical effects which result from the passage of electricity through different substances will be considered under the head of ELECTROLYSIS; and the electrical phenomena attending chemical changes, under the head of ELECTRICITY, VOLTAIC. In explaining the principles of the voltaic battery, it will, however, be necessary to direct attention to many points bearing on the correlation of the two forces. If a piece of zinc and a piece of copper be attached one to each end of a wire, and the two be then plunged in a vessel containing water acidulated with sulphuric acid, the whole arrangement will constitute a *simple circuit*, or *voltaic pair*, in action. The action is dependent on the different chemical affinity of the liquid for the respective metals. It will attack the zinc rather than the copper; and this unequal action has the effect of disturbing the electrical equilibrium. The polarity or disturbance may be considered to commence at the surface of the zinc, or *active element*, to be propagated through the liquid to the copper, or *inactive element*, and thence back again by the conducting-wire. Positive electricity is assumed, for the sake of simplicity, to be *the* electricity, and, in common parlance, it is said that the *electric current* of every battery in action starts from the metal attacked, passes through the liquid to the second metal, or conducting body, and returns by the wire or other channel of communication. It must not be forgotten, however, that a current of negative electricity takes place at the same time in an opposite direction. It is necessary, moreover, to guard against the idea which the term *current* naturally suggests, of an actual bodily transfer of something through the substance of the conductors, like water through a pipe. The real nature of the phenomena of the voltaic circuit is entirely unknown, and may, perhaps, remain so; still such expressions as *electric current*, *passage of electricity*, &c., are so convenient, that it would be foolish to reject them; and so long as they are used strictly in a figurative sense, they are unobjectionable. In every voltaic combination, the passage of the electricity (*i.e.* the positive modification of the force) *is the liquid* is *from* the active element *to* the inactive element: in the simple circuit above described, for instance, it is from the zinc to the copper. If this simple fact be borne in mind, it will decide in every case the question which confuses so many; namely, which is the positive and which is the negative end of a battery? The positive is the end where the electricity leaves the battery; the negative where it re-enters it. The direction taken by the current being ascertained by the mere inspection of the relative situations of the two elements in a cell, the other points follow as a necessary consequence. Thus, if the wire connecting the copper and zinc of the single pair be broken, and the circuit completed by interposing some apparatus between the broken ends, an examination of the arrangement will at once show that as the electricity passes from the zinc to the copper, it will leave the battery by the wire attached to the copper, and, passing through the interposed apparatus, will return to the battery by the wire attached to the zinc: the copper, therefore, forms the positive end, and the zinc the negative end. The current produced by a simple circuit is too feeble to produce any striking effects; but by arranging a number of pairs in a connected series, in such a manner that the direction of the current shall be the same in each, the intensity may be greatly exalted. The two instruments invented by Volta, called respectively the *pile* and *crown of cups*, depend on this principle. The voltaic pile is never employed now; but as it was the first battery constructed, it may be described here. Upon a plate of zinc is laid a piece of cloth rather smaller than itself, steeped in dilute acid, or other liquid capable of acting chemically on the zinc; upon this is placed a plate of copper, silver, or platinum; then another piece of zinc, another cloth, and another plate of inactive metal, until a pile of about twenty alternations has been built up. If the two terminal plates of such a pile be touched with wet hands, the sensation of the electric shock will be experienced; but, unlike the momentary effect produced by the discharge of an electrical jar, the sensation will be prolonged and continuous; and, with a pile of one hundred pairs, excited by dilute acid, it when connection is made between them by wires, armed with points of coke or hard charcoal, discharge takes place in the form of a bright enduring spark or stream of fire. Volta's second battery, called the crown of cups, is merely a compound circuit, made up of a number of simple pairs similar to that described above. The cups or glasses are arranged in a row or circle, each containing a piece of active and a piece of inactive metal, with a certain quantity of exciting liquid,—zinc, copper, and dilute sulphuric acid, for example. The copper of the first cup is connected with the zinc of the second, the copper of the second with the zinc of the third, and so on to the end of the series. On establishing a communication between the first and last plates, by means of a wire or otherwise,

discharge takes place as in the case of the pile. The principle of the compound battery is well seen in this arrangement. By each alternation of zinc fluid and copper, the current is urged forwards with increased energy; but, though its *intensity* is augmented, the actual *quantity* of electrical force, as estimated by the decomposing power of the current, is not increased. The difference between intensity and quantity can only be touched upon here, but will be fully explained in the article on voltaic electricity. The intensity of a current of electricity, which is increased by multiplying the alternations, is its power of overcoming obstacles and passing through imperfect conductors. The quantity of electricity generated by any battery is measured by the chemical effects it is capable of producing, and is never greater than that developed by the smallest and least active pair of plates. In the crown of cups, the beautiful regularity of action common to all batteries may be observed. Whatever the number of cells, precisely the same amount of action occurs in each. The same weight of zinc is dissolved in the same time in every cell; and the strength of the electrical current in one part of the circuit is invariably equal to that in any other part. If the zinc forming the active elements be perfectly pure or amalgamated, the dilute acid has no action upon it while the circuit remains broken; but the moment the connection completed, torrents of hydrogen gas arise from t surface of the copper, while the zinc undergoes oxidation and solution. Common zinc is very readily d solved by dilute sulphuric acid, owing to the formatio of a multitude of little voltaic circles, by the aid of particles of foreign metals, or plumbago, partiall embedded in the zinc. This gives rise in a battery t what is called *local action*, by which much of the metal is often consumed, without contributing in the least to the general electrical effect. This evil may be got rid of by amalgamating the surface. *To amalgamate z. plates* it is merely necessary to place them in a dish containing dilute sulphuric acid, and rub them with rag, at the same time allowing a few drops of mercury to fall on them. The rubbing will cause the mercury to spread; and it may in this manner be made to entirely cover the whole surface of the plates. They should then be rinsed with clear water, and put aside in a vertical position to allow the excess of mercury to drain off. By this means the surface of the zinc acquires a beautiful frosted appearance, and local action is prevented. Zinc, either amalgamated or pure, is almost invariably used for the active element in voltaic arrangements; and opposed to it, as the inactive element, we generally find one of the four metals, copper, platinum, silver, and iron, or the non-metallic substance carbon. Of the many different forms of battery devised since Volta's time, the most noteworthy are those of Cruikshank, Wollaston, Daniell, Grove, Bunsen, Callan, and Smee, which will now be separately described.

*Cruikshank's Battery.*—The apparatus invented by Mr. Cruikshank is a convenient modification of Volta's original pile. The zinc and copper plates, instead of being laid one upon the other, are soldered together in pairs, and placed in vertical grooves cut in the sides of a mahogany trough lined with pitch. Each pair is firmly secured in its groove by cement; and the whole trough is thus divided into a series of water-tight cells or compartments, capable of receiving the exciting liquid, which may be dilute sulphuric acid or a solution of common salt.

*Wollaston's Battery.*—In this arrangement every copper plate is doubled round a zinc plate, and the two metals are kept apart by pieces of cork or wood; consequently, both surfaces of the zinc are exposed to the action of the liquid, which is contained in an earthenware trough, divided by partitions into as many cells as there are pairs. The zinc of one pair is connected with the copper of the next; and all the pairs are firmly attached to a bar of dry mahogany, so that they can be readily lifted out or plunged into the acid. The great objection to this battery, and to the other contrivances previously described, is the rapid decrease of power. The current, however strong at first, soon becomes weak, and, after a certain time, is hardly perceptible. This loss of power may be easily explained. In the first place, the exciting fluid, sulphuric acid, is gradually changed to sulphate of zinc, which has no action on the zinc;—ndly, bubbles of hydrogen adhere to the copper, and, of necessity, prevent portions of the metal from being in actual contact with the liquid;—thirdly, the dissolved zinc is partially precipitated in a metallic state on the copper, and thus gives rise to counter currents.

*Daniell's Battery.*—The first constant battery,—that is to say, an arrangement capable of maintaining a regular current for many hours,—was devised by Professor Daniell. Each cell of this battery consists of a copper cylinder, 3½ inches in diameter, and of a height varying from 6 to 18 inches. In this copper cell, which forms the inactive element, is placed a cell of porous earthenware; and in this is suspended the active element, which consists of a rod of zinc ⅜ of an inch in diameter, carefully amalgamated. The porous cell, when moist, offers little resistance to the passage of the electrical current, but effectually prevents the deposition of zinc upon the copper. It is filled with a mixture of one part, by measure, of sulphuric acid, and eight of water; while the exterior space is filled with the same liquid saturated with sulphate of copper. A little perforated shelf or colander is fitted to the upper part of the outer cell, and on this crystals of sulphate of copper are placed, so that the strength of the solution may be kept up. The copper cylinder and zinc rod are provided with binding screws; and, when a communication is made between them by wires, a current is produced, the intensity of which may be augmented to any degree by connecting a sufficient number of cells, on the principle of the crown of cups, the copper of the first being attached to the zinc of the second. Ten such cells constitute a very powerful apparatus, which has the great advantage of retaining its energy for a lengthened period. When the circuit is incomplete, the dilute acid exerts no action on the zinc; but, directly the opposite poles are connected, action commences. The zinc is slowly dissolved, while at the same time metallic copper is deposited on the surface of the copper forming the outer cells; and as long as the solution of sulphate of copper remains saturated, there is no evolution of hydrogen. By this admirable arrangement the principal defects of the ordinary zinc and copper battery are removed; for, in the place of hydrogen and metallic zinc, pure copper is alone deposited on the inner surface of the copper cell.

*Grove's Battery.*—In this, the most powerful of all voltaic arrangements, platinum is used for the inactive element, and the evolution of hydrogen at its surface is prevented by the oxidizing action of nitric acid. A single cell of Grove's battery consists of a vessel of stoneware, within which a cylinder of amalgamated zinc is placed; and this surrounds a porous cell containing a slip of platinum-foil. To excite the battery, strong nitric acid is put into the porous cell, and dilute sulphuric acid into the outer vessel. With a series of ten or twelve cells, the electric light between charcoal points may be exhibited with great brilliancy. When the platinum slips are only 2½ inches long by 1 inch broad, and the zincs 4 inches high by 2½ in diameter, four cells decompose water rapidly, and give a current of sufficient power to heat a fine platinum wire to redness. The battery is very compact and portable, and to a great extent constant in its action. The zinc, as in the case of Daniell's battery, is only consumed while the current passes; so that the apparatus may be arranged an hour or two before it is required for use. The nitric acid suppresses the whole of the hydrogen, becoming thereby slowly deoxidized and converted into *nitrous* acid, which at first remains dissolved, but after a while begins to be disengaged from the porous cells in dense red fumes. This constitutes the only serious drawback to Mr. Grove's excellent apparatus.

*Bunsen's Battery.*—This form of battery, which is much used on the continent, resembles that last described, save that the inactive elements in contact with the nitric acid are formed of carbon. They are made of various shapes, by heating in proper moulds a strongly-compressed mass formed from a mixture of powdered coke and caking coal, rendered plastic by strong syrup.

*Callan's Maynooth Battery.*—This is another modifi-

cation of Grove's battery, in which cast-iron is substituted for platinum. The most brilliant effects may be produced by means of a large number of zinc and iron pairs; and the cheapness of both metals renders such a battery accessible to those who cannot afford to invest much money in platinum plates.

*Smee's Battery.*—For most practical purposes this apparatus may be advantageously used. It is less powerful than most of the arrangements already described, and in constancy it is decidely inferior to Daniell's battery; but the ease with which it can be constructed and repaired, the fact of its only requiring one exciting liquid, and never evolving any unpleasant or corrosive vapour, render it a most valuable and convenient instrument. Each cell contains three plates,—two of active and one of inactive metal. The two active plates are of amalgamated zinc, and are tightly clamped to a wooden frame by a screw, which, being of brass, serves to connect them electrically. The inactive plate is a thin sheet of platinized silver, and is held in the frame between the two zincs. Before platinizing the silver, its surface is roughened by a momentary immersion in nitric acid, or by placing it between two pieces of sand-paper, and subjecting the whole to pressure. The silver thus prepared is then attached to a wire connected with a plate of zinc in a porous cell, and immersed in an outer cell which contains dilute sulphuric acid mixed with a weak solution of chloride of platinum. By pouring weak sulphuric acid into the porous cell, an electric current is produced, and finely-divided platinum is precipitated on the silver, just as copper is deposited in the electrotype process (*See* ELECTROTYPE) The particles of platinum attached to the silver facilitate the liberation of hydrogen when the plate is used in the battery. Instead of adhering to the metal and interrupting the action, the gas escapes with a loud hissing noise. To excite the battery, a mixture of one part, by measure, of sulphuric acid, and twelve parts of water, is employed. This ingenious contrivance was appropriately named the chemico-mechanical battery by its inventor. (For a full account of the uses of the voltaic battery, *see* ELECTRICITY, VOLTAIC.)

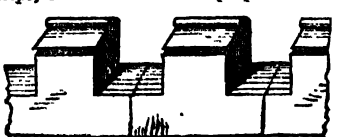
BATTLE, *b.-tl* (Fr. *bataille*), in Mil., is a hostile encounter between two large bodies of troops or two armies. In early times a battle was a fierce tumultuous contest between bodies of men, without order or discipline, the issue of which depended upon the physical strength or courage of the combatants. Gradually, however, the superiority of discipline, united effort, and the use of improved implements of war as opposed to mere physical strength, began to be seen, and led to the changes that have since taken place in the training of armies and the conduct of engagements. The issue of a battle now depends upon a variety of circumstances, which renders it always a matter of difficulty to determine beforehand what may be the result. These circumstances are constantly changing; and sometimes events, that no human wisdom could have foreseen, may occur in the course of a battle to defeat the wisest plans and the most skilful arrangements. It is in foreseeing and providing for the various circumstances of each particular case that the great skill of a general consists; and though he may meet with occasional reverses, in the long run, success is generally on the side of him who forms his plans with the greatest sagacity, and executes them with corresponding vigour and ability. It is the skill of the general, rather than the courage of the soldier, that now determines the event of a battle. There is, perhaps, no position that calls for greater mental qualities than that of a general during a battle. With a consciousness of the great issues that depend upon him at that trying moment, amid scenes of tremendous agitation and bloodshed, he must remain firm and collected, carefully observing the movements that are going on, ready to circumvent the intentions of the enemy, and to take advantage of any favourable circumstance that may present itself. Battles are either offensive or defensive; and, of course, a battle which is offensive on the one side is defensive on the other. In operations which are purely defensive, an army waits for its opponent in a strong position, without any other object than that of maintaining it against him. In offensive operations again, the enemy is sought for, harassed, and attacked on the first favourable opportunity. A battle is usually divided into three periods,—the disposition, the combat, and the decisive moment. The general first examines the strength, reconnoitres the position, and endeavours to learn the intention of the enemy. He ought to know the nature of the enemy's ground, as well as his own; the strong or weak points which it presents; by what local advantages his own flanks can be supported, or those of the enemy attacked; and also be acquainted with the weak points of his own and his antagonist's disposition; so that he may be prepared to strengthen the one or to assault the other. It forms part of the tactics of a good general to make the enemy conform to his plans, and to avoid the necessity of having to conform to the plans of the his opponent. If the enemy conceal his position and plans, skirmishes and partial assaults are often advisable, in order to disturb him, to obtain a view of his movements, to induce him to advance, or make prisoners, from whom information may be obtained. According to the knowledge thus acquired, and the state of the troops, the plan of the battle, or the disposition, is made. Dispositions ought to have for their object to insure at once solidity and mobility; and hence they ought neither to be too extended nor too deep. The plan of the battle itself, the position of the troops, &c., is called the order of battle. When each division of troops has taken its position and received its orders, then comes the second period,—the combat. It commences either on several points, at a given signal, as is the case when the armies are very large, and a general attack is intended, or by skirmishes of the light troops, which is most commonly done. Before the battle, the general places himself upon an elevation from which he can see the conflict. The plans and orders of a general reach only to a certain point; the commanders of battalions must do the great work of the battle. They ought, therefore, to have as much knowledge of the business of the day as will enable them to vary their movements according to circumstances, when in such situations as that the commander himself cannot direct their operations. The commander-in-chief receives the reports of the generals under him, and gives orders from time to time; disposes of the troops not yet in action; strengthens weak points; throws his force upon the enemy where he sees him waver; or changes, if necessary, with a bold and ingenious thought, the whole order of battle. He sometimes sends one of his aides-de-camp to take instant command of the nearest body of cavalry, in order to execute an order which must be carried into effect quickly. The general also uses every means to bring on the third period,—the decisive moment. This cannot always be the result of calculation: it often takes place much sooner than was expected, and is often protracted by accidents or want of energy. Sometimes the operations are drawing to the end which the general aimed at, when an unforeseen accident suddenly gives a new impulse to the enemy. Everything depends upon a moment,—upon a thought; and the skill of the general is shown in the use he makes of the one, or the means he has at command for carrying out the other. Perhaps it is all-important to break at once the enemy's centre; to pour down cavalry in a certain direction, or to concentrate the fire of artillery upon a certain point. When the enemy begins to waver or retreat, it is of the utmost importance to follow up the victory with every possible vigour and dispatch. Of the numerous battles that have taken place there are a few that stand prominently out as having had a material effect on the world's subsequent history. Historians differ as to the title of some battles to be so characterized; but we give those enumerated by Sir E. S. Creasy, in his "Fifteen Decisive Battles of the World:" these are,—1. the battle of Marathon, B.C. 490, 2. the defeat of the Athenians at Syracuse, B.C. 413; 3. the battle of Arbela, B.C. 331; 4. that of Metaurus, B.C. 207; 5. the victory of Arminius over the Roman legions under Varus, A.D. 9; 6. the battle of Châlons, 451; 7. that of Tours, 732; 8. that of Hastings, 1066; 9. Joan of Arc's victory over the English, at Orleans, 1429; 10. the defeat of the Spanish Armada, 1588; 11. the battle of Blenheim, 1704; 12. the battle of Pultowa, 1709; 13. the victory of the Americans over Burgoyne, at Saratoga, 1777; 14. the battle of Valmy, 1792; and 15. that of Waterloo, 1815.

**Battle**, or **Battel**.—Trial by a wager of battle,—a species of judicial combat formerly practised by individuals, and sanctioned by law in the Middle Ages. Any person accusing another of a crime was admitted to prove it by witnesses or by single combat. Although in England the right prevailed, it had fallen into desuetude; but it was unexpectedly revived in a celebrated case, which was the cause of its being abolished. In 1817 a young maid, Mary Ashford, was believed to have been violated and murdered by Abraham Thornton, who in an appeal claimed his right by his wager of battle, which the court allowed; but the appellant (the brother of the maid) refused the challenge, and the accused escaped, being ordered "to go without day," 16th April, 1818. The argument before the court of King's Bench occupied several days; and, as the case brought out a vast amount of research as to the history of duelling and judicial combat, and is well worthy the attention of the antiquary and historian, we cannot do better than refer the reader to it. It will be found in 1 Barnewall & Alderson's Reports, K.B. 405. See also Chauncey's "Historical Antiquities of Hertfordshire," *sub verb.* Baldock, in Ind. The statute 59 Geo. III. c. 46, abolished this right of appeal or trial.

**Battle-axe**, *bătt'-tel-ax*, an ancient military weapon of offence. This weapon, which appears to have been used from the most remote periods in warfare, was made in two forms. The first had a single edge only, and was similar to the modern hatchet; the second had two edges, and was sometimes called the Amazonian axe, from a supposition that weapons of this kind were used by the female warriors. Axes were much employed as offensive weapons by the Celtic and Scandinavian nations. Among the Roman armies the battle-axe was not much used; it was considered the weapon of uncivilized nations. At the siege of the Roman Capitol by the Gauls, Brennus is represented as being armed with a battle-axe; and Ammianus Marcellinus, several centuries afterwards, describes an armed body of Gauls as being all furnished with battle-axes and swords. In the Bayeux tapestry the English are represented as using the battle-axe. The *pole-axe* was introduced by the Normans; it had an edge on one side and a sharp point on the other. In the year 1415, at the battle of Agincourt, the Welsh infantry employed this weapon in order to dispatch those whom the archers had wounded with their arrows. It was also used at an early period in naval warfare for the purpose of cutting the ropes and rigging of vessels. The battle-axe fell into disuse towards the close of the 16th century.

**Battledoor**, *bătt'-tel-door* (Sax. *battle*, to beat, *door*, a flat board), a small bat or raquet, used in play for striking up a ball or shuttlecock. It is composed of a palmor flat board and a thin handle. The palm is sometimes of wood and sometimes of stretched parchment.

**Battlement**, *bătt'-tel-ment*, in Arch., a wall or parapet on the top of a building, with notches or indentures, in the form of embrasures, to look through or to discharge missiles from, for the annoyance of an enemy. The rising parts of the parapet are called *merlons* or *copes*, and the open spaces are called *crenels, loops*, or *embrasures*. The purpose of the contrivance is, that a soldier may shelter himself behind the *merlon* while he shoots or observes the enemy through the *crenels*. The device is of great antiquity: it has been found represented in various forms in the bas-reliefs of Nineveh and Lycia, and in the Egyptian paintings, and exists in many remaining walls and towers of the Greeks and Romans, besides those of the mediæval period. Battlements were also largely given to ecclesiastical and civil buildings in the Middle Ages by way of ornament, where they are often richly panelled or pierced with circles, trefoils, quatrefoils, &c. On fortifications, the battlements are generally quite plain, or pierced only with a very narrow cruciform or upright opening, the ends of which sometimes terminate in circles called *œillets*, through which archers could take aim. Sometimes the coping on the top of the *merlons* is carried over the *embrasure*, producing the appearance of a pierced parapet. The use of this ornament is almost entirely confined to the English styles of Gothic architecture.



BATTLEMENT.

**Battle-piece**, *bătt'-tel-peece*, in Paint., a picture which represents a battle, exhibiting large masses of men in action. A painter of battle-pieces ought to have an accurate knowledge of the appearance of horses and men, and, if possible, to have seen a battle. The armour of the ancients, and the whole array and action of their battles, afford subjects more favourable to the artist than the straight lines, condensed columns, and firearms of the moderns. Some of the greatest pieces of this kind are the battle of Constantine, of which the cartoons were drawn by Raphael, and which was executed by Giulio Romano; Lebrun's battles of Alexander; and the battles of the Amazons by Rubens. From these may be distinguished the skirmishes, surprises, &c., which have been represented with so much skill by Antonio Tempesta, John Snellink, Jos. van der Velde, John Asselyn, Peter Sneyders, Robert von Hoek, Fulcone, called *oracolo delle battaglie*, Horace Vernet, Edwin Landseer, and others.

**Battue**, *băt'-too* (Fr. *battre*, to beat), an expression used to denote an unsportsmanlike method, adopted by owners of large estates in the autumn and winter months, of killing a great quantity of game which has been preserved for the purpose. The wholesale slaughter is unaccompanied by any exhibition of the skill that may be shown, or endurance of fatigue that must be encountered, in the pursuit of game in a fair and legitimate way. A party of ten or a dozen gentlemen, each with two guns, which are loaded for them by attendant keepers, surround a copse or plantation in which a great number of pheasants, hares, and rabbits are known to harbour. Men armed with long sticks are then sent in, who beat the bushes in all directions, which causes the game to quit their retreat and make for other covers. As they come out into the open space, they are shot down in all directions as fast as the guns can be discharged. Sometimes the owner of the estate derives a considerable annual sum from the sale of the game shot at these periodical battues.

**Bauhinia**, *baw-hin'-i-a* (so named by Plumier, in honour of the brothers Bauhin, botanists of the 16th century), in Bot., a gen. of plants belonging to the nat. ord. *Leguminosæ*, sub-ord. *Cæsalpiniæ*. The species are natives of the warmer regions of both hemispheres. Most of them are twining plants, which stretch from tree to tree in tropical forests, like living cables; but a few are small trees, with erect self-sustaining stems. The leaves are generally divided into two equal lobes, which circumstance is said to have suggested the idea of naming the genus after the two brothers. The flowers of some are large and very beautiful; but they rarely show themselves in the hot-house. The genus contains several very useful species. Thus *B. parviflora, racemosa*, and *valilii* yield tough fibres employed for making ropes; *B. retusa* and *emarginata* each produce a kind of gum; *B. variegata* has an astringent bark used in medicine, and for tanning and dyeing leather; the buds and dried flowers of *B. tomentosa* are also astringent, and are much employed by the Indian doctors in dysenteric affections. The snaken rod of Æsculapius is said to have had its origin in a portion of the stem of *A. scandens*, which had twined around a smaller stem. The Mopané-tree of South Africa is a species of *Bauhinia*. During the heat of the day the leaves of this tree fold up and become almost erect, so as to afford but little shade to the sun-oppressed traveller.

**Baxterians**, *băx-te'-ri-ans*, in Eccl. Hist., is a term applied to those who adopted the peculiar theological tenets of Richard Baxter. His system was liberal and conciliatory. He attempted to unite the different sects

and parties in the Church by moderate and conciliatory measures. By striking into a middle path between Calvinism and Arminianism, he endeavoured to reconcile both creeds. He held with Calvin that the merits of Christ's death are to be applied to believers only; but he also asserted that all men are in a state capable of salvation. In his desire to conciliate all, and in the many modifications, concessions, and alterations that were extorted from him by men of different religious tenets, he sometimes incautiously showed himself to be more Calvinistic than Calvin, at others more Arminian than Arminius. His opinions have been held by a number of great and good men, but there never at any time existed a separate denomination or sect known by his name.

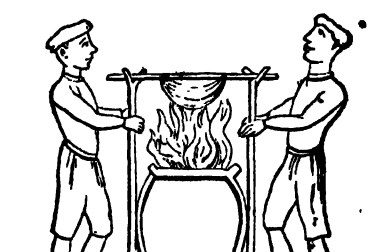
BAY, *bai*, in Phys. Geog. (*See* vol. I. of this work.)

BAY. (*See* LAURUS.)

BAYADERES. (*See* BAJADERES.)

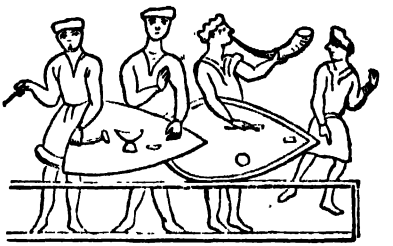
BAYBERRY. (*See* MYRICA.)

BAYEUX TAPESTRY, *bai'-yu(r)*, (Fr. *tapis*, carpet), a long piece of cloth, or rather canvas, 214 feet in length and 20 inches broad, preserved in the Hôtel de Ville at Bayeux. It is embroidered in coloured yarns, with figures of men, animals, houses, ships, &c., with a border above and below the central portion, formed of emblematic devices; and forms a pictorial history of the events which preceded and brought about the conquest of England by William I. It is divided into seventy-two compartments, each bearing an inscription in Latin explaining its subject; and many of the figures have the names of the persons they are intended to represent attached in the same language. It contains 1,512 figures in all; namely, 623 men, 202 horses, 55 dogs, 37 houses, churches, and castles, 41 ships and boats, 49 trees, and 505 smaller animals, birds, and sphinxes, principally in the borders. It is supposed to have been worked for the cathedral of Bayeux, under the superintendence of Matilda, the queen of William the Conqueror, and presented to his brother Odo, the bishop of that place, as an acknowledgement of the services he had rendered in the conquest of England. It went exactly round the nave of the building, where the ecclesiastical authorities, according to Ducarel, in his "Anglo-Norman Antiquities," 1767, were accustomed to hang it up on St. John's day in every year, and allow it to remain there for the eight days immediately following; but, from



COOKS—FROM BAYEUX TAPESTRY.

the inventory of the various things belonging to the cathedral taken in 1476, it seems probable that it was originally suspended round the nave on October 15, the day on which William won the battle of Hastings. M. Lancelot, in 1724, was the first to call attention to this elaborate piece of needlework, having found a coloured drawing of a portion of it in the library of M. Foucault, formerly intendant of Normandy. He communicated his discovery to the Academy of Inscriptions and Belles-Lettres, and showed its evident connection with the events of the Norman conquest. This led to a search for the original, which was found in the cathedral at Bayeux, and copied for publication in the work of the French antiquary Père Montfaucon, which appeared in 1730. It narrowly escaped destruction at the hands of the mob during the French revolution, and shortly after was brought to Paris, and exhibited there by order of Napoleon. When it was sent back to Bayeux it was kept rolled up on a large wooden roller, but it may now be seen, protected by a covering of glass, in the public library. In 1816 careful drawings of it were made by Mr. Stothard for the Society of Antiquaries, which were published in vol. vi. of the "Vetusta Monumenta." It has been a matter of discussion whether it was worked by Matilda, queen of William the Conqueror, or Matilda, empress of Germany, the daughter of his son Henry I.; but there is much evidence in the tapestry itself to show that it was embroidered shortly after the occurrence of the events it is intended to commemorate. The following is a brief summary of the principal scenes in this pictorial history, which affords invaluable information to the archæologist and historian, respecting the manners, customs, costume, mode of warfare, &c., at the time of the Conquest. In the first compartment Harold is shown taking leave of Edward the Confessor prior to his departure for Normandy. He is then seen quitting Bosham, in Sussex; and, having crossed the Channel, he lands in the territories of Guy, earl of Ponthieu, by whom he is detained as a prisoner. Messengers come from William of Normandy to Guy and Harold; and the release of the latter is ordered. Guy conducts Harold to William, who brings him to his palace. Harold then renders assistance to William in his quarrel with Conan, earl of Bretagne. The flight of Conan to Rennes is shown, the attack of the Normans on Dinant, and the surrender of the town. William rewards Harold's services by a present of armour, and the two proceed to Bayeux, where Harold swears to aid William in his project of gaining the English crown on the death of Edward the Confessor. Harold then returns to England, and is shown relating his adventures to Edward, whose death occurs shortly afterwards. The people offer the crown to Harold, who accepts it, regardless of his oath to William. The appearance of a comet betokens some disastrous event likely to befall him. The news is conveyed to William who holds a consultation with Odo, and orders instant preparations to be made for the invasion of England. The embarkation of arms, men, and stores, and the passage of the Norman troops, are next depicted; their landing at Pevensey and march to Hastings, and the subsequent fortification of a camp, and the erection of a castle. The coming of Harold and his army is made known to William; and the Norman soldiery are shown laying waste the country with fire and sword. The approach of the hostile armies, and the results of the reconnoitring on either side, are next shown; and William appears addressing his soldiers previous to the conflict. Next comes the battle of Hastings, with the episodes of the death of Harold's brothers Leowine and Gurth, the prowess of Odo, the slaughter of Harold's body-guard, and the fall of Harold himself; and the work is finished with the total defeat and rout of the Saxon army. It is supposed that it was originally intended to continue the history up to the coronation of William; but, although the chain of events seems abruptly broken by its termination at this point, the embroidery is complete, and bears no marks of having had any portion destroyed.—*Ref. Vetusta Monumenta,*



SERVANTS CARRYING UP DINNER—FROM BAYEUX TAPESTRY.

vol. vi.; *Pictorial History of England*; Bruce's *Bayeux Tapestry Elucidated*.

Bay-Leaves.—From remote antiquity bay-leaves have been used in the customs and ceremonies of various nations. An honorary crown or wreath composed of these leaves was bestowed as a prize on men who were distinguished for any literary or military merit. Thus Spenser—

"So him they led through all their streetes along,
Crown'd with garlands of immortal *baies*;
And all the vulgar did around them throng
To see the man whose everlasting praise
They all were bound to all posteritie to raise."

There was a superstition that bay-leaves were able to protect the wearer in a thunderstorm. And in an old play, called *The White Devil*, there are the following lines:—

"Reach the *bays*;
I'll tie a garland here about his head,—
'Twill keep my boy from lightning."

The fading of bay-leaves was looked upon formerly as an omen of death. At the present day they are used along with other evergreens in decorating houses and churches at Christmas. They are also used for flavouring in cookery.

Bayonet, *bai'-o-net* (supposed to be derived from Bayonne, the town where it was first made), a steel dagger, or short spear, attached to the muzzle of a rifle or similar weapon. Bayonets are made very rapidly, and in large quantities, at the government rifle-manufactory at Enfield. The process of making them is as follows:—A square bar of the very best cast steel, 7 inches long and ⅜ inch thick, is welded on to a wrought-iron bar inches long and 1 inch thic The steel forms the blade, and the wrought iron forms the handle of the bayonet. The welded metal is submitted to the action of a forging-machine, where it is got into a rough outline; it is then cut into shape by the action of a swaging-machine, with dies which come down, and counter-dies which come up, with great force upon the metal. The rough bayonet is then annealed, turned in a cutting-machine, cut to a proper length, and the handle made square. It is then drilled and bored to make the socket-handle hollow, shaped and furrowed along the blade, bent a little at the neck, and then hardened and tempered. Before it is quite complete, the bayonet has still to go through a variety of minor processes. The first bayonets were used in France in 1671, and were called *bayonets-à-manche*: they had handles which fitted into the muzzles of the guns. *Bayonets-à-douille*, or socket-bayonets, were a later invention. It seems very probable that the first bayonets consisted of short daggers, which the infantry were in the habit of sticking into the muzzles of their muskets when attacked by cavalry. The use of pikes went out as the value of the bayonet began to be appreciated. The bayonet, as an offensive weapon, has been of great importance in modern warfare; and the bayonet-charge, in which every nation thinks that it excels, is one of the most terrible manœuvres of infantry soldiers. The sword-bayonet is a more modern invention, and, when detached from the gun, can be used as a weapon by itself. With respect to its different parts, the blade is shown at 1; 2 is the hilt; the guard and ring are marked 3; 4 is the spring which secures the sword to the rifle; the scabbard of the weapon is shown at 5.

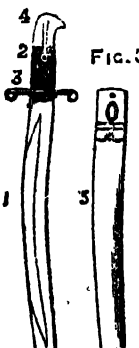
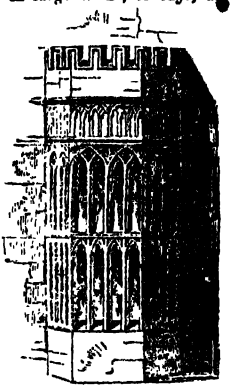


Fig. 3

Sword-Bayonet.

Bay-Salt, *bai'-salt*, coarse salt obtained by the evaporation of sea-water in large tanks, or *baye*, as they are technically termed.


Bay-Window.

Bay-Window, in Arch., a window which forms a bay or recess in a room. It may project outwards from the wall either in a rectangular, polygonal, or semicircular form, which latter has often been incorrectly termed a *bow*-window. Windows of this kind are very common in the Perpendicular style. Examples of them may be seen in the halls of the colleges at Cambridge and Oxford, as well as in the old halls of the English nobility and gentry. Chaucer makes the following allusion to them:—

"With *ba* ndows, goodly as may be thought."

Bazaar, or Bazar, *ba-zar'*, is a term derived from the Arabic, and literally signifies the sale or exchange of goods. Among the Turks and Persians it is applied to a market-place, either open or covered, where goods are exposed for sale, and where merchants meet for the transaction of business. The name has recently been adopted in London, Paris, and other great cities, and is applied to places opened for the sale of various articles, chiefly fancy goods.

Bazoche, or Basoche, *ba-zosh'*, a French term, the exact etymology of which is rather doubtful, but most agree in considering it a burlesque translation of the Latin word *basilica*, a royal palace. When justice was administered in the royal palace of the French kings, the judges, advocates, procurators, and others who were connected with this department, were termed *clercs de la bazoche*. Afterwards, when the administration of justice became a separate department, a distinction was made between those noblemen who formed the royal train, and were called *courtiers*, and those connected with the court of justice, who were called *clercs de la bazoche*, or *basochuns*. But as the term *bazoche* implied the having a king, a mock one was appointed, who had his officers of state, court, and other paraphernalia of royalty. In the beginning of the 14th century Philippe le Bel conferred on this community certain important privileges. Henry III. suppressed the title of king, and conferred the rights and privileges attached to that office on the chancellor. Still the *bazoche* continued to exist as a body, and retained its pomp and its forms. It met twice a week, and heard and decided all processes and debates that arose among the clerks. At public festivals the bazochians took a prominent place; and at the carnival they united themselves to the prince of fools, and took part in the acting of low farces and mysteries. In their turn they acted a kind of satirical morality, in which they took great liberties in railing at the vices of the age, and in insulting the favourites of fortune. This naturally produced a great outcry against them, and at length, in 1540, they were entirely suppressed.—Ref. *Encyclopédie des Gens du Monde*.

Bdellium. (*See* Balsamodendron.)

Beach, *beech* (Ang.-Sax.), in Geog., a shelving tract of sand or shingle washed by the sea or a fresh-water lake, interspersed between the water and the land on which vegetation grows. The sea-beach is the space between low and high water-mark, particularly that part of it which is dashed by the waves; and the beach of a lake lies between the highest and lowest water-marks of its ordinary level.

Beaches, Raised.—Banks of sand and shingle, with shells, found following the bays and recesses of the coast, at various heights above the existing beach or sea-margin. These give evidence of either elevation of the land or depression of the ocean, and point to

times when sea and land stood at these successive levels. Along the coasts of Great Britain there are several notable examples, at heights about 10, 20, 40, and even 60 feet above the present sea-level.

BEACON, *be'-kon* (Sax. *beacn*, a sign; *beacnian*, to make a sign to), the name given in former times to signal-fires lighted on the tops of hills or any elevation that could be seen from a great distance, to convey intelligence of the approach of an enemy, or any other desired information, by preconcerted signs. Beacon-fires are of great antiquity, being mentioned in Jeremiah vi. 1, and by the Greek tragedian Æschylus, in his "Agamemnon," as conveying the intelligence of the fall of Troy to the Greeks. In England, the beacons were formerly piles of faggot-wood, but afterwards poles were erected, to which iron pots were attached, filled with pitch and other combustibles. Intelligence was speedily conveyed in this manner: the beacons on the frontier between England and Scotland were always carefully watched, and, in the reign of Elizabeth, a line of beacons was erected on the headlands and hills on the south coast, to signal the approach of the Spanish Armada. Lord Macaulay, in his ballad on this subject, describes in forcible language how the news of the coming of the Spaniards' fleet was flashed from Plymouth to London, and round the eastern coast, in the dark night, the red blaze of beacon after beacon springing from hill, and down, and tower, rousing the slumbering might of England into life and action. These iron beacons were often erected on church-towers, and one is still to be seen on the tower of the parish church of Hadley, in Middlesex.—In Mar., a beacon is an erection at the entrance of a harbour or river, to indicate sunken rocks, sand-banks, or parts where navigation is dangerous. It is generally a pole secured by chains to the rock on which it is placed, with a large ball formed of iron hoops at the top. Vessels anchored in certain places, exhibiting lights at night, are called floating beacons. The light-houses built at various points to render navigation less hazardous are also beacons. (*See* LIGHTHOUSE.)

BEAD, *bede*, in Arch., a small moulding whose vertical section is semicircular, sometimes cut into pearls and other ornaments in Grecian and Roman architecture, in which it is more frequently used than in the Gothic. It is also called an astragal. (*See* ASTRAGAL.)

BEADLE, or BEDEL, *be'-del* (Sax. *bydell*, a messenger; Fr. *bedeau*; Span. *bedel*; Du., *bedelle*).—Junius derives it from *bidd*, *beadan*, to bid, to tell, to order; because he proclaims and exercises the will of his superiors. In this sense, bishops, in some ancient MSS. in the Saxon tongue, are called *bedels of God* (*Dei bedelli*). The term beadle, as now commonly accepted, is an officer chosen by the vestry of a parish, and whose business it is to attend the vestry, to give notice of its meetings to the parishioners, and execute its orders. The church beadle was formerly a kind of verger, whose station, in the 13th century, was at the door of the church, his dress being, as now, a blue gown. The name has since been changed, and he is now called a summoner or apparitor. In the universities, the bedel is an officer who walks before the masters at all public processions, &c., with a mace.

BEADS, *beeds* (Ang.-Sax. *bede*, prayer), among Roman Catholics, are small balls of glass, ivory, or other substance, strung upon a thread, and used to count the number of prayers repeated. The beads are distinguished by their size and shape; the larger ones being for Paternosters, the smaller for Ave-Marias.* (*See* ROSARY.) A *beadsman* is a prayer-man, one who prays for another; and a *bidding of the beads* is a charge given by a priest to his parishioners, at certain times, to say so many Paternosters upon their beads for a soul departed:—

> "Tell your beads, says the priest, and be fairly trussed up;
> For you surely to-night shall in paradise sup."

BEADS.—The manufacture of beads is carried on principally at Murano, near Venice, and at Birmingham. Glass tubes, of different colours, are first drawn out to various sizes; they are then chipped into small cylindrical pieces, which are put into a mixture of sand and charcoal, and stirred about until the holes in them are filled; they are then placed in a pan heated to dull redness, and stirred about till they assume a rounded form, from their edges becoming partially melted. When cool, the sand and charcoal, which have prevented them from collapsing, is cleared out. Bugle-beads are simply cylinders of glass four or five times their diameter in length, which are cut from a long tube, and used without any further preparation. Beads are also made of various hard seeds by drilling a hole through their centre. They are also turned from coral, ivory, bone, amber, and hard woods. Beads of all kinds are much used as articles of commerce in trading with savage nations, by whom they are much sought after for purposes of ornament. Beads were anciently much used as ornaments, and are, at least, as old as the Egyptians.

BEADS, ST. CUTHBERT'S, a popular term for the detached bead-like joints of the fossils called *encrinites* (which *see*). They are found in great abundance on many parts of our coast. The legend associating St. Cuthbert with these fossils is thus alluded to by Sir Walter Scott:—

> "On a rock by Lindisfarne,
> St. Cuthbert sits and toils to frame
> The sea-born beads that bear his name."

BEAGLE, *be'-gel*, a small hound, more remarkable for perseverance than speed, employed in hare-hunting. The precise history of the beagle is involved in some obscurity. By Skinner the term is derived from the French *bugler*; and Menage is of opinion that as the hound was sent from Britain into Gaul, the name may be of British origin. Says Blaine, in the "Encyclopædia of Rural Sports," "there are even now several varieties of beagles, but formerly there appear to have been several more, from the deep-flewed diminutive type of the old southern hound, to the fleet and elegant foxhound beagle; to which may be added the pigmy breed called lapdog beagles. Beagles were formerly distinguished by the rough and the smooth. The rough wire-haired, or terrier beagle, is now seldom met with, though it was a hardy and altogether a vermin-loving breed, and very strongly formed. We were once travelling on horseback along a turnpike-road, when our ears were struck with a screeching, and the unmusical



Ικαιν παραμυθια των πονων, και πανλαν

raffle of a pack of full-sized rough beagles, and we shall not easily forget how gallantly they rushed through both hedges, and how true to the line they carried the scent across the next field. We were told, on inquiry, that 300 guineas had been refused for this pack." The North-country beagle is a nimble and vigorous hound; he pursues the hare with impetuosity, giving her time to double; and should the scent be high, he will with ease run down two brace before dinner. Colonel Thornton, an eminent English sportsman, owned a valuable breed of minute lapdog beagles, and George IV., while prince of Wales, was in the habit of hunting with packs of well-selected dwarf beagles. Another well-known English sportsman, the late Colonel Hardy, once had a pack of beagles amounting to ten or twelve couples, and so diminutive in size that they were always carried to and from the sporting field in a large pair of panniers slung across a horse. This curious pack was lost to the colonel in a rather singular manner. It was kept in a barn, which was one night broken open and all the hounds and the panniers stolen; and notwithstanding the most diligent search, no trace of either

could ever be discovered.—*Ref.* Blaine's *Encyclopædi of Rural Sports*; Brown's *Anecdotes of Dogs*.

BEAK, or BEAK-HEAD, *beek*, that external part a ship before the forecastle which is fastened to th stem and supported by the main-knee. It was mad of wood and brass, and affixed to the prow, for th purpose of damaging the vessels of the enemy. Sinc the invention of gunpowder, these strong projectin pointed beakors have fallen into entire disuse, an beak-head now signifies a small platform at the fore part of the upper deck, generally placed the sam height from the deck as the port-sills.

BEAKERS, *bee'-kers* (Ger. *becher*).—Glass vessels a cylindrical shape, well annealed, and perfectly eve in their substance, used by chemists for boiling o heating solutions. They should be very thin, an without any *purity-mark*, or inequality at the bottom

BEAM, *beem* (Sax. *beam*, a tree).—The beams of ship are strong thick pieces of timber, stretching across the ship from side to side to support the decks and retain the sides together. The main-beam is next the mainmast. The greatest beam of all is called the mid ship beam. When a ship inclines so much to one sid that her beams approach to a vertical position, she i said to be on her beam-ends. In the measurement o a ship, the term beam is used to signify breadth at th wales. (*See* TONNAGE.) In naval affairs, "on th starboard beam" signifies any point out at sea which viewed from the stern, is at a right angle with the keel and upon the starboard or right side of the ship. I like manner, "on the larboard-beam" signifies o the larboard or left side; "on the weather-beam" signifies that side of the vessel which is towards th wind.

BEAM, in Arch., may be either a large piece o timber or metal used for sustaining a weight, or t counteract two equal and opposite forces. Generally it is the largest and principal piece in a building; anc one of its most common uses is to support the main rafters.

BEAM-COMPASS. (*See* COMPASS.)

BEAM-ENGINE.—A steam-engine which communi cates motion by the top of the piston-rod, being con nected with a beam or lever moving on a central pivot, the other end of the beam being in similar connection with the crank of the driving-wheel. In the direct action engine no beam is used, the piston working the crank.

BEAM-TREE. (*See* PYRUS.)

BEAN, *been* (Sax.), the common name for several le guminous plants yielding pulse. These will be described under the names of the genera to which they belong thus, for broad-bean, *see* FABA; kidney-bean, scarlet runner, and haricot (PHASEOLUS); ordeal-bean (DOLI CHAS); Tonquin-bean (DIPTERYX).

BEAN-CAPER. (*See* ZYGOPHYLLUM.)

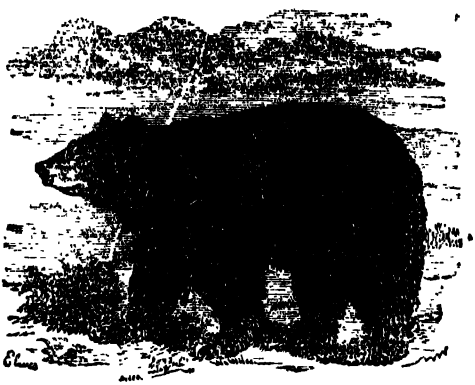
BEAN-KING, in the early customs of this country, was the title of the person who was chosen as king of the social festivals on the evening of the Twelfth-day. The mode of election is thus described:—A cake is baked with a bean and a pea concealed in it, and is divided among the company present, when he that receives the bean is king of the ceremonies, and she that has the pea is queen. (*See* TWELFTH-DAY.)

> "Now, now the mirth comes,
> With the cake full of plums,
> Where bean 's the king of the sport here;
> Besides, we must know
> The pea also
> Must revell as queen of the court here."
> *Herrick's Hesperides.*

A like custom prevails in other countries. In France the twelfth-cake is plain, with only a bean, the drawer of the bean being king or queen of the feast. In Germany, the feast of the Three Kings (in allusion to the wise men of the East), on Twelfth-night, is of a similar kind, and attended with similar ceremonies.

BEAR, *bair* (*Ursus*).—Bears are generally inhabitants of the wooded districts of mountainous countries, and occur in all parts of both hemispheres, with the exception of Australia. Of all the carnivora, they are the most omnivorous in their diet, some of them living almost entirely on animal food. Roots, berries, worms, insects (especially ants), are equally relished by the bear; but, more than all, he delights in honey, to get at which he will climb trees and assault the strongholds of wild bees, though not uncommonly compelled to beat a retreat before the tiny sting-bearers. Generally, the bears are large heavy animals, with an awkward and shuffling gait. Their anterior limbs, however, are possessed of considerable mobility, and, despite their bulk and great weight, they exhibit great dexterity in climbing. The bear was not so meanly treated by our ancestors as by us; by them, his strength and fierceness were acknowledged, and a stone castle was built for his lodging. To bait him with savage mastiffs was thought fit game to set before the king; and, to this end, there were founded, at Southwark, in Paris Gardens, as it is still called, two circular buildings, somewhat after the style of the ancient Roman amphitheatre. The buildings were unroofed, and contained tiers of seats for the company, with a pit in the centre. The admission to the ordinary part of the bear-garden was one halfpenny. In the reign of James I. it was under the protection of royal patent, granted to the holders "for the sole practising and profit of the fighting and combating of wild and domestic beasts in England, for the term of fourteen years." Edward Alleyn, the celebrated actor and founder of Dulwich College, enjoyed this patent for several years. The practice of granting a bear-fighting license was abolished in 1642, and the bear-master for the time being committed to Newgate for the crime of threatening to cut the throat of any man who voted it a bear-garden a nuisance."—*Wild Sports of the W* . The feet of the bear are armed with formidable curved claws, equally available for tearing a carcass or digging up a root. In the grisly bear (*Ursus ferox*) these claws possess the singular property of independent action, each separate claw being as capable of distinct movement as the fingers of the human hand. The strength of this last-mentioned animal is so prodigious, that it can bear off an ox or bison weighing a thousand pounds. Should it find a carcass, and, being already full, have no immediate appetite for it, the grisly bear will dig a pit and bury it. This propensity to bury is very peculiar. Bear-hunters suddenly overtaken by the animal have stretched themselves along the earth and feigned death; whereon the shaggy sexton has immediately set about excavating a pit, into which the hunter was rolled and covered with earth. It is said that wolves, however famished, will not touch a body buried by a grisly bear, though they will devour any and the vilest offal chance may throw in their way. Another peculiarity of the animal in question is, that he does not hug his prey. His claws are broad, of great length, and edged like a chisel. Eyeing the object of attack intently for a moment, he rushes at it, rears, and strikes with his tremendous fore-paws. Sir John Richardson mentions the case of a hunter who was completely scalped, the skull being laid bare, and the hair turned right over the face, by a blow of the grisly bear's paw. The polar bear equals in size and strength the grisly bear; indeed, Lamont, the most recent of Arctic explorers, was assured by the Spitzbergers that a full-grown polar bear would attack and kill a bull walrus three times its own size; the bear's hunting tactics being to conceal itself behind an ice-hillock, and watching till the walrus came floating past, spring on its back, and holding on by its teeth to the creature's neck, batter in the skull with repeated blows of its tremendous fore-paws. The polar bear, whose whole life, almost, is passed on the slippery ice, has the soles, as well as the rest of its feet, covered with hair. The respect with which, in some countries, the bear is treated is very curious. When the Lap starts on a bear-hunt, he does so with as great a show of solemnity as if he were going to the funeral of a dear relative. When the bear is discovered, and the attacking party are driving at it with their spears, they, the while, chant a supplication that the bear will not take it amiss, and imploring him not to hurt them. There is no such thing as rejoicing over the death of their enemy. They are afraid even to mention him by name, and allude to him, when obliged, as the "old man in the fur cloak." Sir John Richardson relates a story of an old Indian and his wife, who, while sitting on the bank of a narrow stream, looked up to a monstrous bear facing them on the other side. Having no weapon wherewith to attack the animal, the Indian

made an appeal to its better nature. "Oh, bear," said he, "I never did you any harm; I always had the highest respect for you and all your relations. Pray go away and do not molest us." And the bear went away, moved, as the Indian firmly believed, by his eloquence. Sir Emmerson Tennent relates, that among the Cingalese there exists a belief that certain charms are efficacious in protecting them from the violence of bears; and that those accustomed to expose themselves to encounters carry a talisman, either attached to their



BEAR.

necks or enveloped in the folds of their hair.—(*Ceylon*, vol. i.) The black bear of America (*Ursus americanus*) is smaller than most of the family. Its head is narrower than that of the common brown bear, its ears wider apart, its muzzle more prominent, and it lacks the depression over the eyes. The fur is composed of short smooth hairs, which are of a glossy black for the greater part of their length, instead of possessing the shaggy and woolly character of the comparatively grizzled fur of the brown bear. The value attached to the skin of the black bear,—a value that has very much decreased, for the skin that once fetched from twenty to forty guineas is now worth scarcely as many shillings,—and the high esteem in which the Indians held their flesh, caused great havoc amongst them. The importation into England in 1783 was 10,500 skins, and ascended gradually to 25,000 in 1803, since which time there appears to have been a considerable decline; as, in a table of exports and imports of skins into Great Britain, published in the catalogue of the first Great Exhibition, the number of bear-skins is 9,500. Of these, 8,000 are again exported; so that the annual consumption in Great Britain is 1,500 only. It is chiefly used in this country for military purposes; as for caps, pistol-holsters, &c. For this reason the animal is frequently called the "army" bear. Inhabiting the Cordilleras of the Andes, in Chili, there is a bear called the Spectacled bear (*Ursus ornatus*), on account of two semicircular marks round the eyes, reminding the beholder of spectacles. This animal is entirely black, with the exception that its muzzle is tawny yellow, and the upper part of the breast inclined to gray. The Syrian bear (*Ursus syriacus*) is probably the oldest on record. This bear it was that avenged the scoffing of the children at the prophet Elisha. The colour of the Syrian bear is stated by some to be brown, and by others to be white, spotted with fulvous white. These changes, however, are supposed to have been occasioned by the abrasion of the long hair, whereby the woolly fur beneath becomes exposed. It is a ravenous beast, and will without scruple attack and destroy the smaller mammalia. The sloth bear is one of the most singular of the family. When first introduced to this country, about sixty years ago, it was supposed to be a sloth, and was so named. Bewick, in his "Quadrupeds," gives a portrait of the sloth bear as an animal that had hitherto escaped the observation of naturalists. It is about the bulk of the brown bear; but its



ragged-looking hide gives it the appearance of being larger. The fur of the sloth bear is black, with here and there some brown spots, and two white streaks under the side of the neck, bearing some resemblance to the letter V. The cartilage of its nose is capable of extension, and the lips of considerable protrusion. Its food consists of wild fruits, honey, and white ants; and it generally selects for its home some rocky and solitary cavern.

BEAR, TO.—To bear down upon the enemy, to have the advantage of the wind; or being to windward, to approach the enemy by sailing large, or from the wind. To bear in with the land, implies to steer a ship towards the land; to bear off from the land, signifies to steer a ship from the land, lest she should accidentally run aground when under sail. To bear up, or bear away, is to change the course of a ship, in order to make her run before the wind after she had sailed some time with a side wind. To bear a hand, implies to make haste, to use dispatch.

BEAR, on the Stock Exchange, is a term applied to one who, having sold stock or shares which he does not possess, is anxious that such securities should decline in value, so that he may be enabled to buy at a profit. The term is said to take its origin from the story of the man who sold the bear-skin before he had killed the bear. The term *bearish* is also used to denote a man's opinion that prices will fall.

BEAR-BAITING. (*See* BAITING.)

BEAR-BERRY. (*See* ARCTOSTAPHYLOS.)

BEAR-GARDEN, was the name given to the place where, formerly, bears were kept and publicly baited; and in the present day it is sometimes applied to a rude turbulent assembly.

BEAR LEADER. — Formerly at fairs and country festivities one of the great attractions was a dancing bear, which was muzzled and led about by a man who was called the bear-leader. The practice is now abolished on account of its dangers. The term of bear-leader, however, is still applied in a facetious sense to a tutor or guardian who takes charge of a young man of wealth or title in his travels.

BEAR'S GREASE, a commodity which, as its name implies, is made from the fat of bears, and is one of the most nourishing things it is possible to obtain for the hair. It is so scarce, however, in this country, that most of those pomades which are so tastefully done up for sale by London perfumers and others, consist mostly of beef marrow, hog's lard, or calves' fat, nitric ether, and essence of ambergris, &c. The fictitious bear's grease is thus composed, according to the best recipes:—Washed hog's-lard, 1 lb.; flowers of benzoin, ½ oz.; and balsam of Peru, ½ oz. Melt together, pour off the clear portion, and stir until nearly cold. Soft calves' fat, ½ lb.; nitric ether, ½ fluid oz.; essence of ambergris, 10 drops; ½ lb. each of lard and veal suet; olive-oil, 1¼ oz.; compound tincture of benzoin, ½ oz.

BEARD, *beerd* (Ang.-Sax.), the hair growing upon the chin, and other adjoining parts of the face, in man; and sometimes, though very rarely, in women. It is thicker than the hair of the head, but longer, when suffered to grow, than the hair on the other parts of the body. It is usually of the same colour as the hair of the head, but always the same as that of the eyebrows. The beard is most abundant among those of the Caucasian race; and many persons, natives of Africa, America, and Australia, have little or no beard. The earliest notice on record regarding this manly ornament is in the Bible (Levit. xix. 27), where the lawgiver of the Jews warns them not to "mar the corners" of their beards, but to let them grow after the Egyptian fashion, leaving a little tuft of hair at the extremity of the chin. These Hebrews, who are as tenacious of ancient customs as the Chinese, continue to the present day to let the entire beard grow, when mourning, for the period of thirty days. The beard was held in great estimation among the Jews, as it is until the present day among the Arabians. "By the beard of Aaron," or "By the beard of the Prophet," is looked on as the most solemn oath of a Jew or a Mahomedan. Nearly all the Eastern peoples prided themselves upon the

fashion and form of their beards; and we have it expressly on record, that the Assyrians and Persians indulged in very long beards; and that often, and particularly their kings, they interwove the hair, the lower lip, and chin, with matted gold.—(*See* St. Chrysostom, *Opera*, xi. 378, ed. Mont.; Hill's *Ottoman Empire*, p. 45, 1709; and Layard's *Nineveh and Persepolis*.) A good many of the ancient Egyptians, and particularly their kings, are often figured in the delineations of them which have come down to us, as entirely without beards. Beard-cases were often, as in the Memnon's head in the British Museum, employed to conceal all the hair that was permitted to grow on the faces of this people. Among the Greeks, and especially among the Greek philosophers, this ornament was held in high estimation. Athenæus tells us that the Greeks wore the beard until the time of Alexander the Great, who ordered his Macedonian soldiery to shave it off, lest the growth of it might give a ready handle to their enemies in battle. Philosophers have nearly always affected the beard as a mark of gravity, and even venerableness; and Strabo tells us that the Gymnosophists of India wore it long. Socrates and Plato were honoured with the distinction of "bearded master" by their pupils; and the origin of the proverb, *ek pogon oi sophoi* (wise men, from their beards), arose from this class of wise men among the Greeks indulging always in this ornament. The Romans wore the beard until the 5th century A.U.C., when Publius Ticinus Mena brought over a colony of barbers from Sicily to exercise their profession on the Roman chins. Augustus, and the Roman emperors till Hadrian, shaved their beards; and Plutarch says that Hadrian allowed his to grow to hide the scars on his face. All the imperial personages after Hadrian grew their beards. It was customary, on the assumption of the *toga virilis* among the Roman youth, to consecrate the first-fruits of their beards to some deity. Homer and Virgil, Chrysippus and Pliny the younger, Plutarch and Strabo, Diodorus and Juvenal, Perseus and Prudentius, all celebrate this ornament on the faces of persons distinguished for the length or whiteness of their beards. The most curious story of long beards is that of a Middle-Age personage,—John Mayo, the *bearded* by pre-eminence, who was an exceedingly tall man, and nevertheless, when he untied his beard, it flowed down upon the ground; and the emperor Charles V. is said to have been greatly amused by the wind making it fly in the faces of the lords of his court. The Lombards (or *Longbeards*), the early French, the ancient Britons, and the Anglo-Saxons after they conquered Britain, all nourished the growth of their beards with peculiar care. The English clergy by-and-by (*see* Knight's *History of England*, vol. i. pp. 136 and 165), probably in imitation of those of Western Europe, began to shave the beard, and until the time of William the Norman, the whole of whose army shaved the beard, there prevailed a bearded class and a shaven class, a laity, in short, and a clergy in England. When Duke William conquered England, he insisted rigorously upon carrying out the Norman custom of shaving; and he thus constrained many of the high-spirited Britons rather to abandon their country than their whiskers. But by-and-by they got the advantage of their ruthless conquerors; and the higher classes indulged in the moustache, or the entire beard, from the reign of Edward III. down to the time of Charles II. Beards of particular cut were often characteristic of a profession. Thus, there is the *steelette* beard, and the *spade* beard, and the "beard of the general's cut," of Shakespeare. (*See* Henry V., iii. 6.) Taylor, the "water-poet," in his odd, humorous way, thus speaks of the beards of his time in his "Whip of Pride"—

"Some like a spade, some like a fork, some square,
Some round, some mowed like stubble, some stark bare,
Some sharp, stiletto-fashion, dagger-like,
That may, with whispering, a man's eyes outpike," &c.

In the reign of Charles II. the entire face was often shaven; sometimes a slight moustache was tolerated, and sometimes the whiskers or hair on the cheeks was grown. In France it went out of fashion in the reign of Louis XIII., to be inaugurated again by Napoleon's soldiers. In Russia it was highly fashionable until Peter the Great's time, who cleaned all the faces in his empire. "But such a veneration," remarks Dr. Giles Fletcher, "had this people for these ensigns of gravity, that many of them carefully preserved their beards in their cabinets, to be buried with them, imagining, perhaps, that they should make but an odd figure in their grave with their naked chins." During the last fifty years growing the whole beard has become very common in most European nations. First the practice began in Bonaparte's army, then it extended to Italy, then to Germany, then to Spain and Russia, and lastly, to England, where it is now very greatly on the increase.—(*See* the Lexicons of Hoffman and Pitiscus, the *English Cyclopædia*, the *Encyclopædia Britannica*, &c.)

Bearer, *bair'-er*, in Arch., a post, or brick wall, between the ends of a piece of timber, to support it.

Bearing, *bair'-ing*, in Mar., an arch in the sky intercepted between the nearest meridian and any distant object, either discovered by the eye and referred to a point on the compass, or resulting from nunical proportion. It is also used to mark the situation of any distant object in connection with a ship's position. Sailors often take the bearings of another ship, or some object on shore, to save themselves the trouble of referring to the compass.

Bearing-Notes.—In the tuning of keyed instruments, harps, &c., bearing-notes signify those notes between which the most erroneous or highly-tempered fifth is situate, on which, also, the *wolf* is said to be thrown. Many tuners begin at C and tune upwards, through the progression of fifths, C, G, D, A, E, B, *Gb*, *Db*, and *Ab*, and then stop, and again at C, the octave above the former note, and tune downwards through the fifths F, *Bb*, and *Eb*, and thus the resulting fifth *Ab*–*Eb* produces *bearing-notes*, owing to each fifth having been made more or less flat than the system of twelve notes will bear, the *least sum* of all their errors or temperaments being the *diaschisma*. Some tuners are in the habit of throwing their *wolf* into the fifth *Ab*, *Db*, and others into that of *Db*, *Gb*, which last, as being nearest to the middle of the whole progression of fifths, seems its most appropriate place for general use.

Bearing the Bell, an expression conveying the idea of excelling in any art or pursuit. He that takes the lead in anything, or gains the prize in any contest, is said to bear away the bell from the rest of the competitors. The phrase originated from a custom in vogue in the 17th century, of giving a little bell of gold or silver to the winner of a horse-race.

Beasts of Park or Chase, are, properly, buck, doe, fox, martin, and roe; but in common and legal sense extend likewise to all the beasts of the forest, which, besides the others, are reckoned to be hart, hind, hare, boar, and wolf, and, in a word, all beasts of venery or hunting.—Beasts of warren are hares, conies, and roes.

Beat, or Battement, *beet* (Fr.), a transient grace or ornament in the performance of a note, denoting that a kind of shake is to be made, by beginning with the *half-tone below* the given note, and quickly repeating the given note and that: on the contrary, the shake marked *tr* is effected by beginning on the note *above* the given one (whether a half or whole tone distant), and repeating the given note and it alternately. The *turn* differs from both these in using the notes above and below the given one. When, therefore, a whole tone lies below any note marked for a beat, an accidental sharp is supposed to be on the lower note, except that A is seldom thus sharpened in a beat. The beat is therefore the reverse of the shake (but without the turn), and is generally at the distance of a semitone below; and all the notes excepting C and F require the note below to be sharpened for the beat. The beat upon B natural, however, is seldom with A sharp, on account of the great harshness arising from the vicinity of the semitone BC. In some cases of regular accent it is recommended not to make the beat with the semitone, unless particularly so marked.

Beatification, *be-at'-i-fi-kat'-shon* (Lat. *beatus*, happy, and *facio*, I make), in the Roman Catholic church, is an act by which the pope declares a person beatified or blessed after death. It is the first step to *canonization*, and no person can be beatified till 50 years after his death. All certificates or attestations of virtues and miracles, the necessary qualifications for sainthip, are

examined by the Congregation of Rites; and this examination often lasts for several years; after which the pope pronounces the beatification. The corpse and relics of the future saint are forthwith exposed to the veneration of the superstitious, his image is crowned with rays, and a particular office is set apart for him. Beatification differs from canonization, in that, in the former case, the pope only grants a privilege to certain persons to pay religious worship to the beatified, without determining judicially upon his state; in the latter case, the pope speaks as a judge, and determines *ex cathedra* upon the state of the person canonized.

Beating, *beet'-ing*, in Mar., the operation of making progress at sea against the wind in a zigzag line, or traverse. It is generally understood to be turning to windward in a storm or fresh wind.

Beating the Bounds.—On Ascension Thursday it is an old custom throughout England for the clergyman of the parish, accompanied by the churchwardens, to survey the old landmarks which show the boundaries of the parish. In this perambulation they are accompanied by the boys of the parish school and their master. The boys carry willow wands, with which they strike the various boundary-marks. From this practice arises the term "beating the bounds." It was the custom in earlier times to whip a boy or boys at stated places on the boundary-line, in order that the remembrance of the place might not pass away when he grew up.

Beating Time, in Mus., that motion of the hand or foot used by performers themselves, or some person presiding over the concert, to specify, mark, and regulate, the measure of the movements. If the time be common or equal, the beating is also equal; as, down, left up right, or one down and one up; if the time be triple or unequal, the beating is also unequal; as, down, left up, &c.

Beatings.—Those regular pulsative heavings or swellings of sound produced in an organ, by pipes of the same key, when they are not exactly in unison, *i. e.* when their vibrations are not perfectly equal in velocity, not simultaneous and coincident, which, as Mr. Emerson observes, occasions a repetition of noises like *a aw, aw, aw, aw, aw*, or *ba, ya, ya, ya, ya*. These are called *beats* by Dr. Robert Smith, Mr. Emerson, and we believe every other mathematical writer that notices the phenomena. Earl Stanhope, in a letter in the *Philosophical Magazine*, vol. xxviii. p. 150, has laboured to make a distinction between the meaning of *beats* and *beatings*, in order to identify the former with the pulses or *vibrations* of the sounds themselves, and to denominate the above phenomenon by the exclusive use of the term *beatings*.

Beatitude, *be-at'-i-tude* (Lat. *beatitudo*, blessedness), denotes the highest kind of felicity or happiness of which human nature is susceptible,—that state in which the soul attains the utmost excellence and dignity of which it is capable,—the fruition of God in a future life.

> "Above him all the sanctities of heaven
> Stood thick as stars, and from his sight received
> Beatitude past utterance."
>
> *Milton.*

The *Beatitudes* is a term applied to Christ's Sermon on the Mount, from the *blessedness* that he there pronounces upon certain characters of persons.

Beat or Drum, in Mil.—Many of the movements and manœuvres of soldiers are indicated by a particular method of drum-beating. There is a great variety of beats, of which the principal are as follows:—the *general*, giving notice to troops that they are to march; the *assembly*, ordering troops to a rendezvous, or to join their colours; the *march* is the command to move, always with the left foot first; the *tattoo*, or *taptoo*, is the order to retire to quarters. The *réveille* is always beaten at dawn, and gives notice to the soldiers to rise, to the sentinels to desist from challenging, and that leave is given to come out of quarters. *To arms* beats when soldiers are dispersed, in order to bring them together; and the *retreat* is a signal to retire from before the enemy; the *retreat* is also beaten in camp and garrison a little before sunset, and orders the soldiers to retire to their quarters. The *alarm* gives notice of sudden danger; and the *parley* demands a conference with the enemy. There are several other beats; such as the chamade, the long roll, the rogue's march, the pioneer's call, the call to church, &c.

Beats.—The audible phenomenon attending the sounding of two notes at the same time, which approach within certain limits to the producing of a concord with each other, which the late Dr. Robert Smith, in his "Harmonics," has applied with the happiest effect to the practical tuning of instruments, according to any given system or arrangements of the intervals. The phenomenon of beats forms also the means by which practical tuners unacquainted with theory or the exact comparative magnitudes of intervals, adjust the notes of organs, pianofortes, harps, &c., by the judgment of their ear, in the daily exercise of the tuning profession.

Beatsonia, *beet-so'-ni-a*, in Bot., a gen. of plants belonging to the nat. ord. *Frankeniaceæ*. The leaves of one species are used at St. Helena as a substitute for tea.

Beau, *bo* (Fr.), is applied to one who pays too much attention to his dress and personal appearance: satirically he has been described as being "a woman everything but the sex,—a man in nothing except the sex."

Beauty, *bu'-te* (Fr. *beauté*).—The Beautiful, the Sublime, and the Picturesque go to form a portion of every theory of taste. No exact definition of beauty has ever been given, and we may be satisfied with a sentence descriptive of it. Beauty, then, is that which gratifies the taste of all. It springs most subtilly from our capacity of enjoyment, or from our sense of the pleasurable; and hence the unparalleled diversity of opinion which has always existed regarding it. The view which appears to us liable to fewest objections is that of the late Sir William Hamilton, which is as follows. He holds, with Aristotle, that pleasure, from which the sense of beauty ultimately springs, is the invariable concomitant of the unimpeded energy of a power. The most general causes which contribute to raise or lower the intensity of our energies, and, of course, by doing so, to exalt or diminish our sense of the Beautiful, in particular, are,—1. Novelty; 2. Contrast; 3. Harmony and Discord; and 4. Association. Taking up the feelings of man, and viewing them entirely as results or as effects of this energy, there is a contemplative class of them which springs from the combined action of the imagination and of the understanding, which gives rise to the pleasurable emotion which men ordinarily denominate beauty. The feeling of beauty is, then, the result of the combined energy of these two powers, the Understanding and the Imagination. But how do these powers act? The imagination, for example, presents the various objects in various lights to the understanding, which it, according to a natural and inalienable law, combines into a whole, or into a unity. In contemplating a building, for example, which is reared pretty high from the margin of the pavement on which we walk, the imagination once singles out its pillars, and turrets, and pinnacles, which the understanding at once, by leading their various properties up to its natural unity, pronounces the one beautiful, perhaps, and the other, it may be, deformed; and this altogether apart from their subserving any useful function in the building. Let us now step to the other side of the street, and survey the building from this point of view. Here one's eye can take in the whole building; and the mind now, instead of merely dwelling on isolated pillars, &c., hastens to take up the whole in its natural way, and pronounces it a beautiful or ugly design. Now there are various kinds of beauty, both of detail and of complexity, observable in this building, which must be dwelt upon. Take a pillar, for example: any one seeing it for the first time would pronounce it absolutely beautiful, irrespective of its having been the workmanship of human hands, and of its being probably designed to adorn and support some portion of a stately edifice. This is the *absolute* beauty of the pillar. But when it is regarded in all those subordinate lights, or, it may be, only in one of them, this is *relative* or dependent beauty. It is the latter species of beauty which is variable, not the former. All men admire the absolute beauty of a rose, without being told that it has a complex apparatus of organs, all finely adapted to the nourishment and propagation of the plant. No doubt, as

soon as the botanist informs us of these circumstances, we add this new form of enjoyment, which has accidentally arisen round the rose, to our previous pleasure at its contemplation, and enhance in this way our original perception of its beauty. But, on the former occasion, it was the absolute beauty of the rose which we admired; now, it is the dependent or relative beauty of it. Probably, indeed, the gratification which we feel in the contemplation of a beautiful, of a sublime, or of a picturesque object, arises from a consideration of the individual object before us. No dependent feelings, such as those which we have specified, or those of the desire of its possession, or of satisfaction at being the owner of it, should be allowed to interfere, at least with the free analysis of taste. The greater the number of parts in an object which the Imagination holds up to the Understanding, and the quicker the latter power can unify them, the greater will be the pleasure afforded in the exercise, and, *ceteris paribus*, the more beautiful will be the object. Now, this principle not only affords the *rationale* of what beauty is, it likewise enables us to explain the differences of different individuals in the apprehension of this quality in objects. Thus, if an individual of a quick, vigorous, cultivated mind, be presented to a beautiful scene, there can be no doubt as to his judgment of it; while, if a person of slow, rude, uncultivated powers, as a boor, be presented to the same scene, he will likely take no interest in it, or, it may be, he may pronounce it positively ugly. It is this principle, acting under the peculiar law of association, which explains all the diversities of taste between a Chinese and an Englishman, for example. Peculiarities of climate or of historical association, &c., combine themselves with the native sense of taste of each nation; so that, what one would call beautiful, another would call deformed; and what one would designate peculiarly agreeable, another would say was particularly ugly. It is, besides, another law of taste, that it is quite a different thing to separate a whole into its parts, and to separate a whole into its lesser wholes. Thus, nothing but disgust would be produced if we would think of anatomizing a beautiful face into its integuments, muscular fibres, and blood-vessels, &c.; while we can readily analyze the same face into its various features of brow, eyes, nose, cheeks, and mouth, and, it may be, put those different parts together again with more delight than we analyzed them. The feeling of pleasure in the Sublime is essentially different from the feeling we experience of the Beautiful In the latter, one enjoys unmingled pleasure; in the former, this pleasure is mixed with pain. Magnitude is an essential condition of sublimity, whereas with beauty it is an impediment. The vast, the wild, the formless, are often sublime, while they are by no means beautiful. Sublimity is threefold,—the sublime of Space, the sublime of Time, and the sublime of Power. The Picturesque again stands in somewhat of a similar relation to the Beautiful as the Sublime does. When the imagination and the understanding, combined, cannot get forward to that ultimate unity in which they rest in the case of the Beautiful, and are yet, nevertheless, allured on to make the attempt, but always break down among the endless varieties which such objects are apt to involve, such an object is designated picturesque. And it is to be remarked, that it is generally those minds who have a greater love for *variety* than *unity* that love the picturesque. They are rather men of a poetical than of a scientific temperament, who delight in curious old bridges, in old gnarled trees, in ruined towers, and in quaint buildings. Such is an outline of the most complete theory we have of the Beautiful, &c., not entirely unobjectionable, yet more so than any one else. The following is a rapid view of the various theories which have been propounded on the subject by men of distinction in their various walks.

[illegible] tual unity given to objects by the mind. Crouzas, who cut up Pope's "Essay on Man," and at whom Pope sneered in turn in his "Dunciad," held that it depended on the five elements of variety, unity, regularity, order, and proportion. Père André accepted these elements, but distinguished them into essential, natural, and artificial. Lord Shaftesbury, author of the "Characteristics," ascribed this feeling to an internal sense; while Hutcheson, of Glasgow, who followed Shaftesbury closely, said nearly the same thing. Dr. Gerard, of Aberdeen, said it depended on a natural variety and uniformity, to which Dr. Reid added the quality of novelty. Burke, who wrote a special treatise on the subject, said that all objects appear beautiful that have the power of producing a peculiar relaxation of our nerves and fibres, and thus inducing a certain degree of bodily languor and sinking. Diderot, of the *Encyclopédie*, said that it arose from the idea of relation, and the beauty of an object was in proportion to the number and the clearness of the relations suggested or perceived. Père Buffier held that it consisted in mediocrity or conformity to that which was most usual. Alison, in his book on *Taste*, made all beauty depend on association; and Lord Jeffrey followed in his wake. Payne Knight modified this doctrine considerably by introducing the primitive and natural beauty of colours, sounds, &c. Kant ascribes it wholly to the judgment; and Cousin ascribed it to the reason acting under the forms of unity and variety. Dr. Thomas Brown said that it was pleasing as an emotion, and that it was always identified with the object that excited it. Thus we have nearly every possible form of this doctrine maintained by men of eminence. Some say that it is a judgment, others make it a feeling; some say that it belongs wholly to the mind thinking, others that it belongs wholly to the object thought about; some make it simple, while others make it complex; some aver that it is original, while others declare that it is derived. The theory of the Picasurable, briefly described in this article, is the only one we know which vindicates its own truthfulness by explaining the phenomenon.

BEAVER. (*See* HELMET.)

BEAVER, *be'-ver* (*Castor Fiber*), a rodent animal easily distinguished from the rest of the order by its peculiar tail, which is of a nearly oval form, horizontally flattened. The usual length of this animal is about three feet, exclusive of its caudal appendage. In colour, the beaver is reddish-brown, sometimes deepening into black; the hair is of a glossy and smooth nature. The hind-feet are webbed, and adapted to the element in which the animal usually lives. The incisor teeth are remarkably hard and sharp, and act like a chisel. According to Sir John Richardson, the Indians always used these teeth to cut bone and other substances,



until the introduction of iron caused their disuse. The same authority says, "When the beaver cuts down a tree, it gnaws it all round, cutting it, however, somewhat higher on the one side than the other; by which the direction of its fall is determined. The stump is conical, and of such a height as a beaver, sitting on his hind-quarters, could make. The largest tree I observed cut down by them was about the thickness of a man's thigh, that is, six or seven inches in diameter; but Mr. Graham says that he has seen them cut down a tree which was ten inches in diameter." The sagacity and industry of the beaver have been the favourite theme of naturalists from the time of Buffon to the present day.

## Beaver

North America is the great breeding-place of the beaver, and it is there found in considerable numbers. Some thousands of their skins are annually imported into this country. When the beavers are numerous, they are found to inhabit lakes, ponds, and rivers, as well as those narrow creeks which connect the numerous lakes with which N. America abounds; but the two latter are chosen by them when the depth of water and other circumstances are suitable, as they have then the advantage of a current to convey wood and other necessaries to their habitations, and because, in general, they are more difficult to be taken than those that are built in standing water. The materials made use of are driftwood, green willows, birch, and poplars, if they can be got; also mud and stones intermixed in such a manner as must evidently contribute to the strength of the dam; but there is no other care or method observed in constructing the dams, except that the work is carried on with a regular sweep, and all the parts made of equal strength. The beaver-houses are built of the same materials as their dams, and are always proportioned in size to the number of inhabitants, which seldom exceeds four old and six or eight young ones. Instead of order or regulation being observed in rearing their houses, they are of a much ruder construction than their dams; for, notwithstanding the sagacity of these animals, it has never been observed that they aim at any other convenience in their houses than to have a dry place to lie on; and there they usually eat their victuals, which they occasionally take out of the water. So far are the beavers from driving stakes into the ground when building their houses, that they lay most of the wood crosswise and nearly horizontal, and without any other order than that of leaving a hollow or cavity in the middle. When any unnecessary branches project inward, they cut them off with their teeth, and throw them in among the rest, to prevent the mud from falling through the roof. It is a mistaken notion to suppose that the woodwork is first completed and then plastered; for the whole of their houses, as well as their dams, are, from the foundation, one mass of mud and wood, mixed with stones if they can be procured. The mud is always taken from the edge of the bank, or the bottom of the creek or pond, near the door of the house; and though their fore-paws are so small, yet it is held close up between them, under their throat. Thus they carry both mud and stones; while they always drag the wood with their teeth. All this work is executed in the night; and they are so expeditious, that in the course of one night they will collect as much as amounts to some thousands of their little handfuls. As they are frequently seen to walk over their work, and sometimes to give a flap with their tail, particularly when plunging into the water, this has, without doubt, given rise to the vulgar opinion that they use their tails as a trowel, with which they plaster their houses; whereas that flapping of the tail is no more than a habit, which they always preserve, even when they become tame and domesticated, and more particularly so when they are startled. The beaver is found in Europe as well as America, although differing in one important respect, viz., in the building of its house. Until very recently, it was supposed that the European species did not build its habitation like the American beaver, but burrowed along the banks of rivers. It is, however, now known that the American beaver living near the settlements acts in precisely the same manner as its European brethren, and, moreover, that in certain places which are secluded, the latter build their houses after the fashion of their Transatlantic friends. At some remote period beavers are supposed to have been common in Scotland; and tradition implies that Beverley, in Yorkshire, took its name from the circumstance of beavers abounding in the neighbouring river Hull. Giraldus Cambrensis briefly alludes to the Welsh beaver in the 12th century. Indeed, considering all the evidence, traditionary and recorded, there is little doubt that the beaver at one time was common in Britain. Even in America, where it is so abundant, such is the demand for beaver-skins, that it is very probable that the writer who may record its history some few centuries hence, will write the history of an extinct animal.—*Ref.* Dallas, Hearne, Richardson.

BEAVER-TREE. (*See* MAGNOLIA.)

BEBEERU, or BIBIRU. (*See* NECTANDRA.)

BECALM, *be-kam'* (Du. *kalm*), in Mar., a term used to denote the position of a ship at sea when there is no wind stirring, or when the current is interrupted by some object so as to render the ship's sails useless. In this state she lies like a log in the water, because having nothing to propel her, she can move neither forwards nor backwards. One of the great advantages of a steam-vessel is that she cannot be becalmed; for if there be no wind to fill her sails, she can always be worked by her engines.

BECK, *bek* (Ang.-Sax.), denotes a brook or small stream of water issuing from some spring or rill. It enters into the composition of the names of many English places; as, Walbeck, Bournbeck, &c. The German word *back* has the same signification, and in like manner forms part of the names of various places; as, Griesbach.

BED, *bed* (Ang.-Sax.), an article of furniture upon which to recline for repose or sleep. In the early ages it was the practice of mankind to stretch themselves upon the skins of animals, which was the custom of the Greeks, the Romans, and of the ancient Britons before the Roman invasion; after which event the skins spread for this purpose on the floor of the apartments were changed for heath and rushes; and, in the course of time, the introduction of agriculture supplied the central Britons with the greater convenience of straw beds. The beds at the inns of this period were filled with the soft down of reeds, and those of the Roman patricians with feathers. For many ages the beds of the Italians had been composed of straw; and from them it is probable our countrymen learnt its application. In Wales, the beds of the humbler classes were stuffed with rushes as late as the end of the 12th century, and straw was used in the royal chambers of England at the close of the 13th. Beds appear to have been the chief domestic glories in England during the 14th century, and were considered of sufficient importance to be named in the wills of our



BED OF EDWARD II.

sovereigns and the chief nobility. Anne, countess of Pembroke, for instance, in 1367, gave to her daughter a bed, "with the furniture of her father's arms." In 1368 Lord Ferrers left to his son his "green bed with his arms thereon;" and to his daughter his "white bed, and all the furniture, with the arms of Ferrers and Ufford thereon." Edward the Black Prince bequeathed to his confessor, Sir Robert de Walsham, a large bed of red camora, with his arms embroidered at each corner; while to another friend he left another bed of camora, powered with blue eagles; and, in 1385, his widow gave "to my dear son, the king, my new bed of red velvet, embroidered with ostrich feathers of silver, and heads of leopards of gold, with boughs and leaves issuing out of their mouths."—*Ref. Englishwoman's Domestic Magazine*—Domestic History of England. In many parts of the country agricul-

tural labourers now sleep on chaff beds; and in the Highlands heath is very commonly employed. In Italy and France straw beds are still in general use. The modern bed is a case or sack of ticking, filled with chaff, wool, feathers, or any other soft material, and placed upon a raised wooden or iron framework, which is called the bedstead.

Bed, in Geol, the term usually applied to a stratum of considerable thickness, and of uniform homogeneous texture; as in such expressions as "bed of sandstone," "bed of clay," &c. Originally, however, the term *bed* referred to the surface-junction of two different strata.

Bed, in Mining, a term applied to an horizontal layer of ore, stone, clay, &c., of considerable thickness.

Bed, Dining (in Antiq., *lectus triclinaris* or *discubitorius*), a couch running round three sides of a table, for reclining upon at meals, in use among the Greeks and Romans. These dining-couches or beds were four or five feet high, and three of them were ordinarily placed against a square table, in such a manner that one of the sides of the table remained open and accessible to the waiters. Among the Romans, the usual number occupying each couch was three; so that the three couches of a triclinium afforded accommodation for a party of nine. It was the rule of Varro that the number of guests ought not to be less than that of the Graces, nor to exceed that of the Muses; sometime however, as many as four lay on the couch. Among the Greeks it was usual for only two persons to recline on each couch.

Bed of Justice (Fr. *lit de justice*) is, literally, the seat or throne occupied by the French monarch when he attended the deliberations of parliament. Historically, it denotes a solemn proceeding resorted to by the monarch, in order to carry some measure against the will of the parliament. If any royal decree was opposed by the parliament and the king insisted upon carrying it, he proceeded to hold a *lit de justice*, i. e. he went to parliament in person, attended by the chief officers of his court, and there, mounting the throne (*lit*), caused the decrees to be registered in his presence; and decrees so registered were considered of greater authority than decisions of parliament. The last bed of justice was held by Louis XVI. at Versailles, Sept. 20th, 1787, at the commencement of the French Revolution, in order to enforce upon parliament the adoption of certain obnoxious taxes.

Bedchamber, Lords of the, are officers of the royal household under the groom of the stole. They are usually twelve in number, and wait a week each in turn upon the sovereign. The groom of the stole only attends his majesty on state occasions. There are, also, thirteen grooms of the bedchamber, who likewise wait in turn. During the reign of a queen, all these offices are held by ladies. The appointments are in the royal nomination, and they all have salaries attached to them. At present (1862) her Majesty has eight ladies of the bedchamber, and three extra; and eight bedchamber women, and one extra. In 1839 Sir Robert Peel, on forming a new ministry, made the unusual request to be permitted to change the ladies of the bedchamber, a request which he said circumstances justified. This being declined, he resigned his premiership.

Bede-house, *beed'-house* (Sax. *bede*, a prayer), was a name given to an hospital or almshouse, from the poor people who enjoyed the benefit of them being expected to pray for their benefactors. Hence, a bede-man was one who lived in a bede-house, or was supported by the funds appropriated for that purpose.

Bedesman, Bedeman. (*See* Beadsman, and Bede-house.)

Bedlam, *bed'lăm*, a corruption of Bethlehem, the name of a religious house in St. George's Fields, London, which, after the dissolution of the religious houses by Henry VIII., was converted into an hospital for lunatics, but still retained its former name. In 1675 the old building was taken down, and a new one erected in Moorfields, at the cost of nearly £17,000. In 1814 this second hospital was taken down, and the patients transferred to a new and more commodious building, erected in St. George's Fields, having accommodation for 198 patients; and in 1838 a new wing was added to it, capable of accommodating 166 additional patients. The whole buildings now cover, it is said, 14 acres.

Bedlam Beggars. — Great improvements have taken place during late years in the treatment of the insane at Bedlam or Bethlehem Hospital. Formerly a cure was seldom effected, and now more than half the inmates are sent out cured. It was also the custom in former years to exhibit the patients publicly in cages, like wild beasts. The funds of the hospital were very small, and many of the patients only partially cured were sent out with badges of tin on their arms, with an inscription explaining their state. These wretched beings went about seeking charity, and were called Bedlam-beggars, or Tom-o'-Bedlams. In *King Lear*, Edgar, as poor Tom, simulates before the blind monarch that he is a Bedlam beggar. They were put a stop to in 1675, when an order appeared in the *London Gazette*, cautioning the public not to give alms to persons pretending to be Bedlam beggars.

Bedouins, or Bedowens, *bed'-oo-ins* (Arab., inhabitants of the desert), a numerous Mahometan race which dwells in the deserts of Arabia, Egypt, and Northern Africa. It is still doubtful whether they belong to the same race as the Arabs or differ from them, but as they do in their manner of living. The [illegible] live at a distance from cities and villages, [illegible] families under sheiks, or in tribes under emirs. [illegible] dwellings are huts, tents, ruins, [illegible] With their herds and their beasts of burden, which carry what little property they possess, they wander in search of fresh water and pasture. They are good horsemen, and generally fond of hunting. The pastoral tribes exchange horses and fat cattle for arms and cloth with neighbouring nations. Other hordes are open robbers; and it is dangerous to travel through their country without a guard or a passport, which the different chiefs sell. Terrible encounters have been the consequence of travellers refusing to part with their property without resistance. Notwithstanding this, even the predatory Bedouins hold the rights of hospitality sacred; and the most defenceless enemy is sure of their protection if they have once allowed him shelter. But the Bedouin considers every one his enemy who is not his brother, kinsman, or ally. Ever careful of his own safety, he attacks no camp or caravan without being [illegible] of his superiority. To a de[illegible] id saves himself by speedy flight. A terror to the neighbouring nations, the rapacious Bedouin lives in a state of continual watchfulness,—poor, ignorant, wild, rude, but free and proud of his liberty. He is remarkable for a temperance in food amounting almost to abstinence.

Bed-straw. (*See* Galium.)

Bee, *be* (Ang.-Sax.).—Under this name, in England alone, are included about 250 species of insects of the ord. *Hymenoptera*. They are divided into two large groups,—the *Andrenidæ* and the *Apidæ*. The species of *Andrenidæ* are very extensive, and most abundant in the spring. The females construct their nests underground in a singular manner. Usually selecting a sandy situation, they burrow in the ground to the depth of about eight or nine inches. This hole, which is cylindrical, is only of sufficient dimensions to admit the bee. The bottom, with the aid of some glutinous substance, is made tolerably smooth. This labour accomplished,—and, considering the soil is only removed a grain at a time, it is no small labour,—it sets forth in search of pollen. This the bee procures from flowers, and carries to her cell on her hind legs, which are thickly covered with long hairs. With the addition of a little honey, the pollen is made into a small paste-ball, in which the egg is deposited, and the mouth of the cell hermetically sealed. In time the egg becomes a larva, and devours the pollen in which it has been enveloped; the larva turns to a pupa, and then the next transformation produces a bee. It, however, remains in a torpid state till the next year. The *Apidæ* are a more important group; and the habits of the species belonging to it are more variable than the *Andrenidæ*. To this group belongs the hive or honey-bee, which demands particular attention. In the earliest records may be found notices of this insect. Xenophon, who lived more than 2,000 years ago, and who is famous for his remarkably clear and perspicuous narrative, makes particular mention of it in connection with the injury his men received by eating honey of bees which had fed on deleterious plants. Both Aris-

totle and Virgil were observers of its habits. Pliny tells us that the philosopher Aristomachus spent fifty-eight years in investigating bee-nature; and Philiscus devoted the whole of his life to this branch of study. Indeed, from the time of the earliest philosophers down to the age of the pious Dr. Watts, it has been a favourite theme. The principal modern labourers in this field of science are Swammerdam, Réaumur, Bonnet, Schirach, Thorley, Hunter, and lastly, and greater than all, the blind naturalist Francis Huber (1750 to 1831). The patient and ingenious investigations of Huber were the means of bringing some most important evidence on the nature and habits of the bee before the world, which had hitherto been involved in considerable obscurity. But the subject is far from exhausted; and although it has engaged the attention of numerous men of science since Huber's time, it is still at the present time (1862) a subject on which the rays of science, guided by the hand of some future skilful explorer, may throw considerable light. Let us, however, be thankful to those men who have devoted their whole lives to the investigation of so humble a particle of animated nature, and take a brief and rapid survey of the result of their labours.







BEES.

A beehive contains three classes of inhabitants,—the *working-bees*, the *drones*, and the third order, represented by only one member,—the *queen-bee*. The first class is the most important. They are believed to be undeveloped females; consequently, incapable of taking part in the reproduction of their species. The drones are the males, and exist but for the propagation of their kind. The queen-bee is the *mother-bee* of the whole colony, and lays about 200 eggs a day through the whole season, from early spring to September. The anatomy of the working-bee forms one of the most interesting portions of entomology. Its body is about half an inch in length, of a blackish-brown hue, and is covered with thick hairs, which serve the insect for the purpose of collecting pollen. The most singular part of the body is that which is called the *proboscis*. This instrument, if casually observed, appears to be a single tail, and formerly it was considered so to be by naturalists. Examined through the microscope, however, it appears a slender projection composed of some forty cartilaginous rings, fringed with fine hairs. It is formed of five parts, a central stalk, and four lateral ones,—two on each side. The central part, used for collecting honey, is aided by the fringed hairs lapping up, like a tongue, anything to which the proboscis is applied, and then conveyed to the pharynx, or honey-bag, whence, in due time, it is disgorged into the cells of the comb. The structure of the other portions of the mouth are beautifully adapted to their several uses. The bee has three pairs of legs, the anterior ones being the shortest, and the posterior the longest. The latter have a cup-like cavity on the fore-leg, which the bee uses to contain the pollen it collects. The legs are all covered with hairs, and more particularly the ones which carry the pollen. There is a pair of hooks attached to each foot, which enable the bee to walk on the roof of the hive. It was clearly demonstrated by Huber that respiration was as essential to the bee's existence as that of any warm-blooded animal. Situated behind the wings are *spiracles*, or air-openings, which admit air for the purpose of oxygenating the circulating system. That these *spiracles* were the instruments of respiration, Huber proved by immersing a bee in water: so long as the air-openings were free, the insect lived; immediately they were placed under water, the bubbles which escaped from them proved their use, and the bee ceased to exist. The abdomen contains the honey-bag, the stomach, the wax-bag, the venom-bag, and the sting. The honey-bag, though occasionally called the first stomach, is not used for the purpose of digestion; it is a small bag, about the size of a pea, with two pouches behind, and is properly only an enlargement of the gullet. This receptacle receives the honey from the proboscis, as already stated. A small passage thence leads to the stomach, which receives and digests the food of the bee. It was formerly supposed that the wax of the bee was the pollen elaborated in the stomach, and afterwards ejected by the mouth. The celebrated anatomist John Hunter discovered two small pouches in the lower part of the abdomen; and it was found that the wax is derived from the saccharine matter consumed by the bee, and that it is secreted from vessels on the surface of these pouches. After the wax has remained there for a time, it appears externally in scales, usually eight in number, below the medial rings of the abdomen, and is removed by the bee itself or one of its fellows. One of the most important and beautifully developed organs is the *sting*, which lies close to the abdomen. Viewed through the microscope, it presents one of the most elaborate and exquisitely defined pieces of mechanism to be found in the wondrous workshop of Nature. It consists of two long darts, adhering longitudinally, and protected and encased by one sheath. The fineness of this apparatus may be shown by the fact that the sheath itself, which is not nearly so sharp as the darts, placed under a magnifying lens exaggerating its proportions some two hundred fold, is, towards the point, quite invisible. When wishing to use the sting, the sheath is first protracted and inserted; then the two fine darts follow, and are also inserted. The puncture being made, the poison is conducted in a groove to the end of the sheath. And now the most singular part of the business follows. The long darts are armed with nine or ten barbs at the end, and this prevents them from being too quickly withdrawn. Immediately the poison flows in, the darts are withdrawn, and the deadly liquid has a cavity to enter, which soon festers, and produces death. The nature of the poison is not known; it possesses, however, a certain acidity, which will redden vegetable blues. With regard to the other senses of the bee, the evidence is far from satisfactory. It has five eyes in all,—three on the top of the head, and two in front. Springing from between the latter are two tubes, curving outwards on each side: these are called the *antennæ*, and serve the insect for the ordinary purposes of vision. The *antennæ* are extremely sensitive, and, indeed, the most useful organs of the bee. By their aid it builds its cells, feeds the young, and stores the hive. They are also used as a medium of recognition with its kind. The combs of a beehive comprise a congeries of hexagonal cells, built by the bees as a receptacle for honey and for the nurseries of their young. Each comb in a hive is composed of two ranges of cells backed against each other: the base, or partition, between the double row is so disposed as to form a pyramidal cavity at the bottom of each. There is a continued series of these double cells in every well-filled hive, the spaces between them being just sufficient to allow two bees, one on the surface of each comb, to pass without touching. Each cell is hexagonal, the six sides being perfectly equal. This figure insures the greatest possible economy of material and space. The outer edges of the cells are slightly thickened, in order to gain strength. The same part is also covered with a beautiful varnish, which is supposed to give additional strength. The construction of several combs is generally going on at the same time. No sooner is the foundation of one laid, with a few rows of cells attached to it, than a second and a third are founded on each side, parallel with the first; and so on, till the hive is filled, the combs which were commenced first being always in the most advanced state, and, therefore, the first completed. The design of every comb is sketched out, and the first rudiments laid, by a single bee. This foundress bee forms a block out of a rough mass of wax,

drawn partly from its own resources, but principally from those of other bees, which furnish wax from small sacs, in which it has been secreted, that are situated between the segments of the body of the bee, taking out the plates of wax with the hind-feet and conveying it with their fore-feet to their mouths, where it is moistened, and rendered soft and ductile. The mass of wax prepared by the assistants is applied by the foundress bee to the roof or bottom of the hive, and thus a slightly double convex mass is formed. When of sufficient size, a cell is sculptured on one side of it by the bees, who relieve one another in the labour. The cells intended for the drones are considerably larger, and more substantial, than those of the workers, and being formed subsequently, they usually appear nearer the bottom of the comb. Last of all are built the royal cells for the queens: these are situated in the very centre of the hive, and number from three to twelve. When the cells are ready, the queen begins to lay her eggs. The fecundation of the queen-bee is very extraordinary. It has been pretty clearly ascertained that no connection takes place with the drones *in the hive*. The question naturally arises, why this large number of drones in a hive? Huber's investigations have to a certain extent cleared away the mystery. According to this eminent naturalist, fecundation takes place by contact in the air; and it is consequently essential that the number of drones should be large, that the queen-bee may be sure of meeting them when going abroad. One intercourse is sufficient to render the queen-bee fruitful for two seasons. It is estimated that she gives birth to 100,000 bees in a single season. The eggs which are to produce working-bees are laid first. These are carefully watched; and, when they are hatched, the larva is fed with mixed honey, pollen, and water, by what are called *nurse-bees*, whose whole work is to *nurse* the young bees. Not until eleven months have elapsed in laying working-eggs, does the *mother-bee* commence laying the male and royal eggs. The *nursing* of the latter is managed on a grand scale. The royal larva disdains simple honey or pollen; it must have rich *jelly*, and in such quantities that her highness's cell is saturated with it. This waste is rather contradictory of the bee's frugality; but bees are wonderfully loyal creatures. From the egg to her majesty bee, the whole time occupied in the metamorphosis is about sixteen days. Now the bees only require one queen at a time; indeed, most monarchical institutions would find it extremely inconvenient to have more. So these newly-hatched majesties must be kept confined until the throne is vacant. There is also another important reason why they are not set at large. When two queen-bees meet, it is certain death to one. At the same time they cannot manage without a queen; and each time a swarm take their departure, a queen is always at their head. There are generally too many royal bees; hence, when they are brought together, a fight ensues, and the number is diminished. Perhaps the most singular phenomenon in bee history is the *making of a queen*. On extraordinary occasions, when the hive by some accident is deprived of a queen, and destitute of royal larvæ, a wonderful provision is resorted to. One of the working-larvæ is selected, deposited in a royal cell, fed on the same food which is administered to the royal larva, and it ultimately becomes a queen. The only explanation that can be given is, that the peculiar food provided has the effect of rendering the honoured insect fertile. Towards the beginning of August, a good stock of eggs having been laid, the drones are no longer required; and winter, long and dreary, is before the industrious bees. What must be done with the lazy ones? They are massacred by the workers. A buzzing commences in the hive; the heavy drones and the nimble workers grapple and hug; but the strength of the lazy drones avails them nothing; the sharp stings of the workers pierce them through, and presently the ground is heaped with the slain. The law relating to bees is peculiar. The insects are, according to Blackstone, wild by nature; but, when hived and properly reclaimed, are regarded in the nature of property, belonging to the person on whose ground or soil they have swarmed. In support of this doctrine, Blackstone refers to the Charter of the Forest, 9 Henry III. c. 13, which allows every freeman to be entitled to the honey found within his own woods. The qualified property which may be thus held in bees continues while the swarm remains on the soil, and, in the event of flight, so long as the owner can pursue it. Indeed, so clearly are they considered, in law, of the nature of property, that it has been decided in England that bees may be the subject of larceny. According to Scotch law, as propounded by Mr. Erskine, bees who abandon their hive without being observed and followed, are understood to have recovered their original liberty: any one, in such a case, may hive and claim them. In the illustration upon the preceding page are figured:—I. the queen-bee; II. the drones; III. the working-bee. For details of management, *see* BEEHIVE and KEEPING OF BEES.)

BEECH. (*See* FAGUS.)

BEE-EATER, *be-e'-ter* (*Merops apiaster*).—These birds are found in large numbers in the southern and eastern provinces of Europe and the northern districts of Africa. They build their nests in clay and sand banks, and associate so closely together, that the earth appears like a honeycomb. There is some analogy between these birds and the swallows: indeed, in the neighbourhood of the Cape, where they most abound, they are called by the Dutch mountain swallows. In certain parts of Africa they are much respected by the natives, who have a belief, that by following one of them, the discovery of a store of honey will be the certain result. They are larger than the common swallow, and have a long and slightly-curved beak. Their colour is a blending of white, and brown, and green.



BEE-EATER.

BEEF. (*See* FOOD, ANIMAL.)

BEEF-EATER, a gen. of birds only found in Africa. This bird belongs to the ord. *Insessores*, tribe *Conirostres*. They have short bills, swelling towards the point, and square at the base. They subsist upon the larvæ of gadflies, which they find in the hides of buffaloes, camels, and other large quadrupeds. They perch upon the backs of these animals, and Dr. Livingstone states, with regard to one of the species,—the buffalo-bird, that as their sight is keener than that of the buffalo, they see the approach of danger first. When the buffalo perceives that the birds are flying away, he is warned that he is in peril, and begins to look around him. The beef-eaters are sometimes called ox-peckers.

BEEF-EATERS, *beef'-e-ter*, a name popularly given to the yeomen of the guard. Differences of opinion exist as to the origin of this term; but it is generally derived from the French *buffetier*, from their waiting at the royal table on great occasions. They were first constituted by Henry VII. in 1485, and have continued as a royal institution, and with nearly the same costume, to the present day.

BEEF TEA, *beef-te'*, a light soup or broth made from ox-flesh. In all preparations of soup, the raw meat should be put into cold water, which should be very gradually brought to the boiling point. By this means the juices of the flesh are extracted from the first moment, and, with these, lactic and phosphoric acids, two of the principal components of the gastric juice. The best method of preparing beef tea is to take finely-chopped raw beef, as lean as possible, and allow it to soak for ten minutes or more in its own weight of cold water; then heat it gradually to boiling. After boiling for two or three minutes, it should be strained through a cloth. When properly seasoned, it makes one of the very best soups that can be made.—*Ref.* Mrs. Beeton's *Book of Household Management*.

BEEFWOOD. (*See* CASUARINA.)

BEEHIVE, *be'-hive* (Ang.-Sax. *hyfe*, a house).—A term applied to the habitation of bees. They are

usually made of straw or wood. The former substance is most common, as the honey is liable to melt in wooden hives during hot weather. Glass hives, or hives with glass doors or windows, so as to observe the motions of the bees, are now much used, and in Greece and Turkey the hives are principally made of earthenware. The shape of a beehive is not of much consequence, but it is considered of importance to have the hive so constructed as to be enlarged above or below at pleasure. Beehives should always be situated in the neighbourhood of flowers. Honey made from heather-flowers is much esteemed in Scotland; and when the season of the heather-bloom comes on, a large number of hives are removed to the moors and hills. In Egypt hives are removed from place to place on the Nile in barges, in order to reach the places where particular flowers are in season. Beehives are usually about eighteen inches above the ground, and are generally protected with a shed or straw hood, to protect the bees from the rain.

Beehive-House, a term employed to distinguish small, round, stone huts which are found in Ireland. They are very rudely built, and are supposed to be the relics of the most ancient architecture of the island. The doors have flat tops, and are wider down below than above, as in the buildings of Egypt. When a beehive-house is found alone, it is mostly near the site of an ancient oratory. This favours the notion that they were the dwellings of the priests. When two or three beehive-houses are clustered together, they are usually connected by a passage, and are often underground, resembling the Picts' houses or earth huts found on the north-east coast of Britain. Ruins of beehive-houses exist in the western islands of Scotland.

Beemaster, one who keeps bees. (*See* Keeping of Bees.)

Beer. (*See* Ale, Brewing, Porter.)

Beer Acts. (*See* Alehouses.)

Beer-Money, *beer'-mon-e.*—In the year 1800, the duke of York induced the English military authorities to add one penny per day to the pay of the British troops while on home service, in lieu of the beer and spirits which had formerly been issued. This allowance received the name of "beer-money;" and to this day it figures as a distinct item in the military accounts.

Beesha, *be'-sha*, in Bot., a gen. of grasses nearly allied to the Bamboo, but differing from it in having the seed inclosed in a fleshy pericarp. Two species are known, both natives of the East Indies.

Beeswax, *bees'-waks.*—This substance has been investigated by numerous chemists. It appears, from the researches of Brodie, that wax is a true animal secretion; for bees fed on sugar only, continue to deposit it in large quantities. At ordinary temperatures, beeswax is a tough solid yellow substance, having a specific gravity of 0·96, and fusing at about 145°. When exposed to the air in thin sheets, it becomes bleached; but nitric acid is generally employed for this purpose. Chlorine cannot be used for this purpose, as it is eliminated in suffocating fumes of hydrochloric acid when the wax is burned. Wax consists chemically of myricine, insoluble in boiling alcohol; cerine, a crystalline substance dissolved by boiling alcohol; and ceroleine, which is dissolved in cold alcohol. Wax is imported in large quantities from Germany, Russia, Portugal, Zanzibar, East and West Indies, and North America. The wax from these countries bleaches readily; while that from Gambia, Cuba, and the Gaboon, seldom reaches a good colour; notwithstanding which, the major portion of wax imported into England comes from the first-named locality. The process for bleaching wax is simple but tedious. The wax is cut in pieces, melted, and agitated with a small portion of very dilute sulphuric acid, which facilitates the separation of impurities. When perfectly clean and bright, it is sliced by a cutting-machine into very thin sheets, and exposed to light and air for eight or ten weeks, during which time it is remelted once or twice. (*See* Candles, Vegetable Wax.)

Beet. (*See* Beta.)

Beet-Fly (*Anthomyia Betæ*), an insect not so large as a common fly, which deposits its eggs on the leaves of beetroot or mangel-wurzel. When the larvæ leave the eggs, they devour the soft parts of the leaves, giving the plant a scorched and blistered appearance. It is a dipterous or two-winged insect, and belongs to a genus whose larvæ infest and feed upon the roots of cabbages, turnips, &c. (*See* Cabbage-Fly, Turnip-Fly, Pomace-Fly.)

Beetle, *be'-tel.*—The term is frequently used to designate the large tribe of insects called *Scarabæides*, but it is more frequently and correctly used as the name of those insects which are covered with a strong horny substance, and have the abdominal part of the body guarded by two sheaths, under which the wings are folded. Hence the word is often used in works on natural history as the ordinary designation for coleopterous insects. This, however, is not correct, as it would bring under the title of Beetle, cantharides, weevils, fire-flies, &c. (*See* the articles Coleoptera, Scarabæides, Stag-Beetle, Tiger-Beetle, Bombardier-Beetle, Burying-Beetle, Goliath-Beetle, Rose-Beetle, Cockroach, &c.

Beetle-Stones.—In a cliff composed of shale, at Newhaven, as well as upon the beach in the vicinity, there are found certain indurated nodules of clay ironstone. These minerals are selected by the lapidaries of Edinburgh to be fashioned into articles of ornament; as, letter-weights, &c. When highly polished, these stones present a very attractive appearance. The term is said to have owed its origin to a fancied resemblance of the nodules to a fossil beetle. Although some of these minerals exhibit proofs of an animal origin,—a fossil fish, for instance,—the nucleus of the nodules is never that of a fossil beetle.

Beetling, a process applied to cotton shirting, in which the yarn is so treated as to give the cloth a hard appearance, in imitation of linen. It was first employed upon linen shirting. A number of wooden stampers, placed in a row, strike upon the cloth as it passes under them, producing the effect required.

Beetroot Sugar. (*See* Sugar.)

Befana, or Beffana, *be-fa'-na*, a corruption of *Epiphania* (Epiphany), is the name of a custom which prevails in Florence and other parts of Italy on Twelfth-night. Befana is said to have been an old woman, who, when the wise men of the East passed by, was busy in cleaning her house, and excused herself from going out to see them, on the ground that she would see them on their return. They, however, went home another way, [illegible] she is said to be still on the outlook for them. She is carried in effigy through the streets, amid great shoutings and rejoicings. It is generally supposed to be a remnant of some Middle-Age mystery ceremony. The word is also used as a bugbear to frighten children.

Beffroi, or Belfry, *bef'-frwaw*, a movable tower used in ancient and Mediæval sieges. It was as high as the walls of the fortress to be besieged, and was composed of various stages, the highest one being provided with a drawbridge, which could be let down upon the ramparts of the place attacked. Similar towers, but lower in height, were used for covering the approach of troops. They all moved on wheels, and were either pushed forward or drawn with ropes. They were used by Julius Cæsar, in Gaul; and at the siege of Jerusalem the Crusaders made a beffroi, put it together at a short distance from the walls, and then pushed it up to the ramparts. A beffroi was also made by the royalists in the time of Charles I., when attacking a fortress held by the roundheads. It was, however, captured before the king's party could make use of it. In more ancient times, these movable towers were often covered with raw hides, to protect the inclosed soldiers from the boiling oil, &c., thrown at them by the besieged; and the lower story was often provided with a battering-ram (which *see*).

Beg, or Bey, *bai*, is a Turkish title, literally signifying lord or chief, and is applied generally to governors of smaller districts, higher military officers, and other persons of rank.

Beggar, *beg'-gar*, is one who solicits charity. These must necessarily exist in every country certain persons who have not the means, ability, or, perhaps, the will, to earn a livelihood for themselves, and who are thus dependent for subsistence upon the charity of others. These constitute the poor: when they have to solicit charity, they are beggars. In the Levitical law, Moses made abundant provision for the poor; but he does not appear to say anything with respect to beggars. The first express mention of them occurs

in Psalm cix. 10, and from that time they are frequently mentioned in Scripture. During the time of Christ, mendicants were found sitting in the streets, at the doors of the rich and at the gates of the Temple but there do not appear to have existed at that time vagrant beggars, or those who solicit alms from door to door. During the early and middle ages of our era mendicity prevailed to a great extent, and several religious orders sprang up who derived their subsistence in this way. There is much in the life of a beggar that renders it to many persons preferable to one of labour and hence it is necessary for the state to limit or suppress it. In England, the earliest statute of that kind was made in the 23rd year of Edward III. (1349), and it enacted, "That, because many valiant beggars, as long as they may live of begging, do refuse to labour, giving themselves to idleness and vice, and sometimes to theft and other abomination, none, upon pain of imprisonment, shall, under the colour of pity or alms give anything to such as may labour, or presume to favour them in their sloth; so that thereby they may be compelled to labour for their necessary living." In 1376, complaints are made by the Commons that servants and labourers quitted service on the slightest cause, and then led an idle life in towns or wandered in parties about the country, "many becoming beggars, others staff-strikers, but the greater number taking to robbing;" and by 12 Rich. II. c. 3, it was enacted, "That no servant or labourer, be he man or woman, shall depart, at the end of his term, out of the hundred, rape, or wapentake where he is dwelling, to serve or dwell elsewhere," without special license; "and if any servant or labourer be found in any city or borough, or elsewhere, wandering without such letter, he shall be taken and put in the stocks, and kept until he hath found surety to return to his service, or to serve and labour in the town from whence he came." The same statute declares that every person that goeth begging, and is able to serve or labour, it shall be done of him as of him that departeth out "of the hundred or other place without letter testimonial, as afore is said;" and "that beggars, impotent to serve, shall abide in the cities and towns where they be dwelling at the time of the proclamation of this statute; and if the people of the cities and towns will not or may not suffice to find them, that then the said beggars shall draw them to other towns within the hundred, rape, or wapentake, or to the towns where they were born, within forty days after the proclamation made, and there shall continually abide during their lives." The statute 27 Henry VIII. c. 12, after stating that "vagabonds and beggars have of long time increased, and daily do increase, in great and excessive numbers," enacts that justices of the peace and other officers shall, within the limits of their authority, grant letters to aged, poor, or impotent persons, authorizing them to beg within a certain prescribed limit; and if any one be found begging beyond his limit, or without such letter of authority, he shall be set in the stocks or whipped. Able-bodied persons, found begging or vagrant, to be taken to the next market-town, or other place most convenient, and there tied to the end of a cart and beaten with whips throughout the same till the body be bloody; and, after such punishment, "he shall be enjoined, upon his oath, to return forthwith the next straight way to the place where he was born, or where he last dwelled the space of three years, and there put himself to labour like as a true man oweth to do." Five years later another act was passed, providing that mayors, bailiffs, and other head officers of cities, towns, and parishes, shall most charitably receive and provide for such poor persons or sturdy vagabonds as shall come into their districts, and shall succour, relieve, and keep the said poor people by way of voluntary charitable alms in such wise as none of them shall of necessity be compelled to wander and go openly in begging; and also shall cause the said sturdy vagabonds and valiant beggars to be set and kept to continual labour in such wise as they may get their own living with the continual labour of their own hands. For absenting themselves from such labour, they were not only to be again whipped, but to have "the upper part of the gristle of the ear clean cut off," and such a one afterwards apprehended wandering in idleness to be indicted and tried at the next quarter sessions; and, if found guilty, shall be adjudged to suffer death as a felon. It further provides, that children above five and under fourteen years of age were to be taught some craft by which they might get their livings when they came of age. Notwithstanding these severe enactments, the number of idle beggars and vagabonds seems to have increased; and 1 & 2 Edw. VI. c. 3, after repealing all previous enactments, declares that every loitering and idle wanderer who shall refuse to apply himself to honest labour is to be taken as a vagabond; and if he continue idle, and refuse to labour, or run away from work set him to perform, he is to be branded with the letter V, and be adjudged a slave for two years to any person who shall demand him, to be fed on bread and water and refuse meat, and caused to work in such labour, how however it be, as he shall be put to, by beating, chaining, or otherwise. If he run away within the two years, he is to be branded in the cheek with the letter S, and adjudged a slave for life; and if he run away again, he is to suffer death as a felon. Provisions were made by this statute for impotent beggars and children, similar to those under 27 Henry VIII. The number of vagrants, however, seems still to have increased; and Strype relates, that letters having been issued by the privy council to the sheriffs of the different counties to search for and apprehend "all vagabonds and sturdy beggars commonly called rogues or Egyptians," 13,000 masterless men" were taken up. In 1566 a book was published, entitled "A Cavest, or Warning for Common Cursetors, vulgarly called Vagabonds," by Thomas Harman (reprinted 1814), which gives a curious and graphic account of the hordes of vagabonds who then infested the country. He classes the male vagabonds under fifteen separate designations; the female under nine. In the former case he begins with the "Ruffiar," as being "the worthiest of this unruly rabblement." "The Upright Man" is the "second in sect of these ranging rabblement of rascals." The third is "the Hooker or Angler," described as a "perilous and most wicked knave." The fourth is a rogue, "neither so stout or hardy as the upright man" The fifth, a "Wild Rogue," is "more subtile and more given by nature to all kinds of knavery than the other." 6. "A Prigger of Prauncers," or Horse-stealer; 7. the Palliards or Clapper-dogens; 8. Fraters; 9. Abraham-men; 10. Fresh-water Mariners, whose "ships were drowned in the great slam of Salisbury;" 11. Counterfeit Kranke, who counterfeit the falling sickness; 12. Demmeras; 13. Drunken Tinkers; 14. Swadders, or Pedlars; 15. Jarke-men and Patricios. All of them, both men and women, are described as thieves by profession, and as living most dissolute and licentious lives. They have a slang language of their own, of which the writer gives a specimen in a dialogue between two of them; and he further gives a long list of the most notorious and wicked street-walkers "that are living now at this present, with their true names, as they be called and known by." During the reign of Elizabeth various attempts were made to ameliorate the condition of the poor and suppress vagrancy; and various statutes were passed on the subject. In some of these the notion of a parochial fund for the relief of the poor, and the principle of taxing the parishioners for that purpose, are distinctly recognized. It was seen, that in order to justify severity against vagrancy and mendicity, it was necessary to provide the means of relieving that destitution which was the ready and plausible excuse for both, as well as to provide labour for able and sturdy beggars, and to compel them to work. Hence it was enacted, that in every city, town, or other place that may be appointed, a competent stock of wool, hemp, flax, iron, or other stuff, be provided by taxation of the inhabitants, and given out to be wrought by the poor; and that houses of correction be established. The statute 39 Elizabeth, c. 3, provides for the appointment of overseers of the poor in each parish, who are empowered to raise, weekly or otherwise, by taxation of every inhabitant and every occupier of lands in the said parish, in such competent sum and sums of money as they shall think fit, a convenient stock of flax, hemp, wool, thread, iron, and other necessary ware and stuff, to set the poor on work;

and also competent sums of money for and towards the necessary relief of the lame, impotent, old, blind, and such other among them being poor and not able to work; and also for the putting out of such children to be apprentices, &c. This act was followed by the 43 Elisabeth, c. 2, which is the foundation and text-book of English poor-law, and under the provisions of which all relief of the poor in England and Wales has been administered for more than two centuries and a half. (For an account of this and the subsequent statutes bearing upon the provisions for the poor, *see* Poor Law.)—*Ref.* Nicholl's *History of the English Poor Law*; Blackstone's *Commentaries*, by Kerr.

Beggar my Neighbour.—A simple and easy game at cards. The whole pack is dealt out to two players, and the cards are held with the backs upward; each player then turns up a single card in turn. When you play an ace, your adversary must give you four cards; three for a king, two for a queen, and one for a knave: and when the requisite number are laid down, you win the trick, and place the cards so won at the bottom of those in your hand. If, however, your opponent turns up an honour while paying for that which you have previously paid, you must pay for it in a similar manner, according to its value, and so on until a complete payment is made on either side. The player who first exhausts his adversary's hand, and gets all the cards into his own, is said to beggar his neighbour.

Beghards, *beg'-hards*, in Eccl. Hist., was a name applied to a certain class of half-monks who followed the third rule of St. Francis. By some the name is derived from St. Begga, by others from the old German verb *beagen* (now *begehren*), to beg, and *hardt* or *hart*, hard, with importunity. They arose in Germany in the beginning of the 13th century, whence they spread into the Netherlands, France, and Italy, where they were known as *Bizochi* and *Bocasoti*. As they belonged to no monastic order, they were regarded as laymen; and, from their irregular mode of life, they were looked upon with disfavour, and subjected to persecution. It formed a kind of refuge for heretics and persons of loose character, so that it came to comprise a number of sects or bodies who differed widely from each other in their opinions, discipline, and mode of life,—some given to prayer, others to profligacy. At length the Beghards were compelled to disperse, or to join the orders of the Dominicans or Franciscans. In the Netherlands, where they preserved a better character, they continued to subsist longer; but there they disappeared about the end of the 14th century.

Beglerbeg, *bai'-ler-bai*, is a Turkish title, literally signifying prince of princes, or lord of lords, and is applied to the governors-general of provinces who are next in rank to the vizier, and have under them several begs, agas, &c. In particular, the governors of Roumelia, Anatolia, and Syria, have this title.

Begonia, *be-go'-ni-a* (so named after Michel Bégon, a French botanist), in Bot., the typical gen. of the nat. ord. *Begoniaceæ*. The species are natives of tropical regions, but many are now cultivated as ornamental plants throughout Europe. The leaves are oblique or unequal (more developed on one side of the midrib than on the other), and are often richly tinged with crimson. The flowers are of a delicate pink colour, and grow in cymes. The young stems and leaves of the species *B. malabarica* and *tuberosa* are used as potherbs in the countries where they grow wild. Of the numerous species which adorn our conservatories, *B. argyrostigma* and *discolor* are perhaps the most beautiful. The first of these, the silver-spotted begonia, was brought to this country from Brazil in the early part of the present century; the leaves, which are long and pointed, are red beneath and spotted with white above. *B. discolor*, or two-coloured begonia, is a Chinese species, and is remarkable for the very rich crimson of the under-surface of the leaf, which is short and broad.

Begoniaceæ, *be-go-ni-ai'-se-e*, in Bot., the Begonia fam., a nat. ord. of dicotyledonous plants in the subclass *Monochlamydeæ*, consisting of four genera and 160 species, natives chiefly of India, South America, and the West Indies. The species are herbs or low succulent shrubs, with alternate leaves which are oblique at the base and have large dry stipules. The flowers, which grow in cymes, are uniscxual, the perianth coloured, with four unequal divisions in the male flower, and five or eight in the female. The stamens are numerous; the fruit is membranous, winged, three-celled, bursting by slits at the base; the seeds are very small. The plants are more remarkable for their handsome leaves and neat flowers than for useful properties. They are reputed, generally, to possess astringent and bitter qualities, and occasionally to be purgative.

Beguins, *beg'-u-ins*, in Eccl. Hist., were a class of women who, without taking any vows or following the rules of any order, united themselves together for devotional or charitable purposes. They appeared in Germany and the Netherlands as early as the 11th century, and are said to have taken their name from St. Begga. They lived generally in small separate cottages, under the direction of a superior, and were distinguished from the rest of the laity only by their industry, piety, and secluded habits, and their great attention to the education of the young. They continued to exist in Germany to the time of the Reformation, and in the Netherlands down to the close of the 18th century. There are still to be met with in some parts of Holland, Belgium, and Germany, what are called *Beguinen-häuser*; but these are little more than almshouses for poor spinsters. The most famous is at Ghent, which is said to comprise 800 inmates, who devote themselves to attendance on the sick and the education of young females.

Beheading. (*See* Decapitation.)

Behemoth, *be'-he-moth*, an animal of great strength, described in Job xl. 15—24, and nowhere else mentioned in Scripture. Commentators are very much divided as to what animal is meant. By some it is understood to be the elephant, by others the hippopotamus; the general opinion seems to be in favour of the latter.

Behmenites, *be(r)'-me-nites*, a religious sect which flourished in Germany and other parts of Europe in the 17th century. They took their name from Jacob Behmen, Boehme, or Boehm, a celebrated German mystic or theosophist, born near Görlitz, in Upper Lusatia, 1575. His parents being poor, he received but little education, and learned the trade of a shoemaker. Naturally of a serious turn of mind, he was given to studying the Holy Scriptures; and that passage seems deeply to have fixed itself upon his mind,—"My Father in heaven will give his spirit to them that ask him." He then gave himself more earnestly to the study of divine things, and became the subject of divine revelations. On one of these occasions, in the 25th year of his age, he says that he was surrounded by a divine light; and viewing the herbs and grass in the fields in his inward light, he saw into their essences, uses, and properties. In like manner, he had revelations of God, nature, the creation, evil, &c., which he embodied in his numerous writings. His death took place in 1624. It was no part of Behmen's intention to found a sect. His object was merely to exhort Christians to true and pure life, and to instruct them in the mysteries of the true faith. He himself lived and died a genuine Protestant, a member of the Lutheran church. Formerly the doctrines of Behmen were viewed with great contempt by all but his own immediate followers; but latterly this unlettered rustic, this man of earnest principle and pious heart, has come to occupy a high place among the philosophers of his country. Hegel places him at the head of modern speculative philosophers, and Tieck and Novalis were enthusiastic admirers of his writings. Professor Maurice, in his article on Moral and Metaphysical Philosophy (*Encyclopædia Metropolitana*), says "that his obscurity was in a great degree the effect of unacquaintance with scientific language; but that through it all may be traced deep thoughts respecting God and man, by which philosophers might be greatly profited." After Behmen's death, his opinions spread over Germany, Holland, and England. His works were translated into English by the celebrated William Law, of Oxford. Henry More has written upon the views of Behmen, and it is said that many autograph extracts from the works of Behmen were found among the papers of Sir Isaac Newton. During the Commonwealth, the doctrines of Behmen spread greatly in England, much to the annoyance of the Puritan clergy. Richard Baxter describes the Behmenites as men of greater meekness and more self-control than any of the other sectaries. Though

Behmen has still many devoted admirers in the present day, especially in Germany, the Behmenites, as a religious sect, may be said to be extinct. It is impossible, within the limits of an article like the present, to give an intelligible account of the system of Jacob Behmen, and we must therefore refer the reader to Vaughan's *Hours with the Mystics*, or Francis Ootley's *Memoirs, &c. of J. Behmen*, Northampton, 1780.

BEING, *be'-ing*, is a term used in philosophy to denote whatever has a being or existence, either actually in the outer world, or ideally in the mind itself. Not only have the fictions of our mind a being, but even, according to some philosophers, nothing can be said to have a being.

BEIRAM. (*See* BAIRAM.)

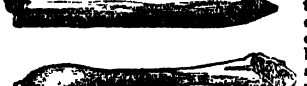
BEIT, *bite*, an Arabic word signifying a tent, hut, or other abode of men. It corresponds to the Hebrew *beth*, and forms a frequent compound in the names of places; as, *Beit-al-Harám*, the 'house of the sanctuary,' or 'sacred house.'

BEL AND THE DRAGON, *bel*, is the name of an apocryphal and uncanonical book of Scripture. It was always rejected by the Jewish church, and is extant neither in the Hebrew nor Chaldee language, nor is there any proof that it ever was so: hence St. Jerome terms it "the fable of Bel and the Dragon."

BELAY, *be-lai'*, in Mar., signifies to fasten a rope by winding it several times round a cleat, belaying-pin, or clevel.

BELAYING-PINS are wooden pins, made of ash and turned in a lathe, 10 inches long and 1¾ inch in diameter at the upper end.

BELEMNITES, *bel'-lem-nites* (Gr. *belemnos*, a dart), in Geol., fossil remains of extinct naked cephalopods allied to the squid and the cuttle-fish. They are found in large numbers in the Chalk and Oolite, generally as straight, solid, dart-like stones. These relics of creatures which thronged the seas of the secondary period have ever been objects of wonder, and the wildest speculations have been advanced to explain their origin. The popular names for them, such as devil's fingers, spectre-candles, arrow-heads, picks, and thunderbolts, indicate the different views taken of their nature by the ignorant. To the philosophers of the last century the belemnite was a standing puzzle, and the guesses which were called forth from time to time appear to us to be scarcely less absurd than the popular beliefs. It was said to be a product of electric action, and given the learned name of *lapis fulminans*, or thunderstone. According to other hypotheses it was a stalactite, a crystal, petrified amber, and lastly, when fossils began to be looked upon as actual organic remains, it was held to be the tooth, or perhaps the spine, of some unknown creature. It is now known to be the internal bone or shell of a cephalopod, and corresponds to the slender and insignificant *pen* of the common squid. Although the most common belemnites are mere tapering stones, some have been found so well preserved that naturalists have been able to form from them a vivid image of the living mollusk. "The belemnite," writes the unknown author of "Vestiges of Creation," "is an elongated conical shell terminating in a point, and having, at the larger end, a cavity for the residence of the animal, with a series of air-chambers below. The animal, placed in the upper cavity, could raise or depress itself in the water at pleasure, by a pneumatic operation upon the air-tube pervading the shell. Its tentacula sent abroad over the summit of the shell searched the sea for prey. The creature had an ink-bag, with which it could muddle the water around it, to protect itself from more powerful animals; and, strange to say, this has been found so well preserved, that an artist has used it in one instance as a pigment wherewith to delineate the belemnite itself." One genus of the Belemnite family, called *Belemnotcuthis*, and occurring in the Lias and Oolite, is occasionally discovered with the remains and impressions of the soft parts; namely, the mantle, body, and tentacles.



BELEMNITES.

BELIEF, *be-leef'*, is that state of mind in which one acquiesces in some truth, real or supposed. No doubt, every man in the world who believes in anything, even the most superstitious idea that ever found credence, does so because he has some kind of a vague perception that the object of his belief is real and true. But the act of belief itself has puzzled the wise throughout all ages exactly to describe its character. One man alleges the act is *intellectual*, another says it is *moral*, a third affirms that it is *emotional*, and a fourth, who is likely as near the truth as any of the previous three, avers that it bears all those various characters at different times, and when applied to different subjects. Now it is intellectual, now it is moral, anon it is emotional; and it is as easy to describe it as it is to give a definition of instinct or of intuition. The reason of this apparent obscurity in the meaning of this word, is because men have no more general term that they are accustomed to apply to the same object. It is, accordingly, impossible to *get behind* belief, so as intelligibly to describe its character. It is emphatically "the light of all our seeing." There are, properly, four sources from which the sound beliefs of men are made up:—1st. there is intuition or instinct; 2nd. there is our ordinary experience; 3rd. there are our scientific convictions, derived from the exercise of the two sources of knowledge, deduction and induction; 4th. there is testimony. These constitute the sources of our real convictions; but feeling and imagination have a great share in giving rise to illusory notions and superstitious beliefs in the minds of men. Man is responsible for every belief, real or illusory, which he maintains, provided, always, it was possible for him to discipline himself properly in the various kinds of knowledge in which he exercises his beliefs. This arises from the fact that we have all power over our minds in directing them to one object or another of study; and if this act, which is admitted on all hands to be voluntary, be really so, for every voluntary act we commit, either directly or indirectly, we are entirely responsible. Belief is, no doubt, *indirect* in its connection with the conscience, but it is not, therefore, wholly irresponsible. Lord Brougham broached the irresponsible view of belief some years ago, in an inaugural address as lord rector of the Glasgow University; since which time it has been much discussed by inquirers into such matters.

BELIEVERS, *be-lee'-vers*, an appellation first given to the disciples of Christ, but, towards the close of the 1st century, applied to those Christians that had been admitted into the Church by baptism, in contradistinction to catechumens who had not been baptized, and, consequently, were not entitled to church privileges. At present, the word is commonly used as synonymous with Christians.

BELL, *bel* (SAX. *bellan*, to bawl or bellow), a metallic instrument which gives out a musical sound, caused directly by its own vibrations. The use of bells in religious ceremonies is of great antiquity. Amongst the Jews the high priest wore small gold bells on the hem of his tunic. The practice of tinkling a bell at the raising of the host probably owes its origin to this circumstance. Large bells were first introduced into the Christian churches at the town of Nola, in Campania, about A.D. 500; and Benedict, abbot of Wearmouth and Jarrow, first employed them in England in A.D. 680. Formerly all large bells were used only for religious purposes, and were manufactured by the monks. The process of casting was made a religious ceremony; and, when complete, they were sprinkled with water and christened. A set of bells in perfect



BELL.

harmony is called "a maiden peal." Slight defects in the tone of a bell can be remedied afterwards. If the sound is too sharp, the bell is turned thinner; if too flat, the diameter of the bell is lessened by cutting the edge. The quality of a bell depends very much upon its shape. Bells with very fine tones have been made of glass; but the nature of the substance is too brittle to admit of constant blows from the clapper. Steel bells also give a good sound; but the vibrations only last for a short time. Ringing changes on peals of bells has always been a favourite amusement in England. It is reckoned that twelve bells would give 479,001,600 changes, which would take ninety-one years to ring at the rate of two strokes to a second. The great bell at Moscow is the heaviest in the world: it was cast in 1653, and was broken in 1737. It is 198 tons in weight. (*See* Acoustics, Bell-Metal.)—Ref. *Quarterly Review*, Sept. 1851—Church Bells.

Bell, Diving. (*See* Diving-Bell.)

Belladonna. (*See* Atropa.)

Belladonna Lily, *bel-la-don'-na*, a very beautiful species of *Amaryllis* (which *see*). It is a native of the Cape of Good Hope, and was introduced into England in the early part of the last century. The flowering-stem is about eighteen inches in height, and bears at its summit a cluster of drooping flowers of a delicate rose-colour.

Bell-Bird (*Arapunga alba*), a native of Guinea, and distinguished by a fleshy cylindrical appendage above the base of the bill. Generally, this appendage is decorated with a few fine feathers. Its voice is very peculiar, and much resembles the tolling of a bell. Waterton asserts that the sound it emits may be heard at a distance of three miles. It is of a pure white colour, and about a foot in length.

Bell, Book, and Candle. (*See* Excommunication.)

Belle-de-Nuit, *bel'-de(r)-nue* (Fr., beauty of night), the name given by the French to the Marvel of Peru (*Mirabilis jalapa*), on account of the flowers expanding at night. The name *Belle-de-jour* (beauty of day) is sometimes given to a species of *Convolvulus*, the flowers of which close at nightfall. (*See* Mirabilis, Convolvulus.)

Bellerophon, *bel-ler'-o-fon*, in Geol., a gen. of fossil shells occurring in the Silurian, Devonian, and Carboniferous strata. As in the existing argonaut, the shell consists of a single chamber.

Belles-Lettres (Fr.) is a vague, indefinite term, adopted from the French, and may be said to correspond to the Latin *literæ humaniores*, or the English *polite literature*. It is difficult to say what branches of knowledge are comprised under this term and what are not, for most of them have at one time been included in, at another time excluded from it. Generally speaking, it comprises those branches of knowledge with which the imagination and taste are chiefly concerned,—those that relate to beauty, harmony, grandeur, and elegance, that tend to soothe the mind, gratify the fancy, or move the affections. Poetry, rhetoric, history, and philology, are generally understood to come within the sphere of *belles-lettres*; logical and ethical studies belong to a higher sphere. "The exercise of taste, and of sound criticism," says Blair, "is, in truth, one of the most improving employments of the understanding." "They are very intimately connected with the knowledge of ourselves. They necessarily lead us to reflect on the operations of the imagination and the movements of the heart, and increase our acquaintance with some of the most refined feelings which belong to our frame." "They present human nature under a different aspect from that which it assumes when viewed by other sciences. They bring to light various springs of action which without their aid might have passed unobserved, and which, though of a delicate nature, frequently exert a powerful influence on several departments of human life." "Such studies have also this peculiar advantage, that they exercise our reason without fatiguing it. They lead to inquiries acute but not painful; profound, but not dry nor abstruse. They strew flowers in the path of science; and while they keep the mind bent in some degree, and active, they relieve it at the same time from that toilsome labour to which it must submit in the acquisition of necessary erudition, or the investigation of abstract truth."

Bell-Flower. (*See* Campanula.)

Bell-Gable, or Bell-Turret, or Bell-Cot, in Arch.—In some small churches and chapels where there are no towers, there is frequently a bell-gable or turret at the west end of the structure, in which the bells—sometimes only one, sometimes two or three—are hung. A few of these erections are of Norman date, but the larger number are later, and many of them are Early English. They are extremely picturesque, and are well placed on small churches and chapels where the funds are insufficient to provide towers. Besides the bell-gable, a smaller erection of a similar kind is often provided for the *sanctus bell*, on the apex of the eastern end of the roof of the nave.

Belligerent, *bel-lij'-e-rent* (Lat. *bellum*, war, and *gerere*, to carry on), is a term applied to nations waging or carrying on war against each other.

Bellis, *bel'-lis*, in Bot., the Daisy, a gen of plants belonging to the nat. ord. *Compositæ*, sub-ord. *Corymbiferæ*. The receptacle is without scales, and upon it are arranged two kinds of flowers,—ligulate, or strap-shaped, and tubular. The ligulate flowers, which are white in the common daisy, form the ray, or outer circle. They have no stamens, but each has a single pistil, which, at the top, divides into two branches, forming stigmas. The yellow tubular flowers clustered together within the ray are hermaphrodite; that is to say, they have both stamens and pistils. The involucre is composed of two rows of bracts. The fruit found at the base of every little flower, whether ligulate or tubular, is without a pappus, and contains a single seed. The best-known species is *B. perennis*, the common daisy. The roots of this are perennial; the leaves are obovate, spathulate, single-ribbed, crenate, and dentate. (*See* Leaf.) It blossoms nearly all the year round, and is constantly found with opened flowers from March to October. In a charming essay upon this wild plant, Mrs. Lankester writes:—"Throughout Great Britain we find its tiny bright flowers springing up on every lawn and grassy plot, by waysides, on mountain-slopes; and in almost every country in Europe may we find—

> "'These pearl'd Arcturi of the earth,
> The constellated flowers that never set.'

In the extreme north of Europe, however, and in America, it is not common, and is there treasured as a garden flower. Though not exclusively a British plant, yet so closely is the daisy associated with the earliest recollections of every native of the British isles, that we can scarcely wonder that it is especially dear to the wanderer from home in distant lands, and that it brings back recollections of rural scenes, such as cannot be met with elsewhere. There is an old Celtic belief that each new-born babe taken from earth became a spirit, which scattered down on the land it had left some new kind of flower to cheer its bereaved parents. The tale is thus told:—'The virgins of Morven, to soothe the grief of Malvina, who had lost her infant son, sang to her,—'We have seen, oh Malvina! we have seen the infant you regret, reclining on a light mist; it approached us, and shed on our fields a harvest of new flowers. Look, oh Malvina! among these flowers we distinguish one with a golden disk, surrounded by silver leaves; a sweet tinge of crimson adorns its delicate rays; waved by a gentle wind, we might call it a little infant playing in a green meadow; and the flower of thy bosom has given a new flower to the hills of *Cromla*.' Since that day, the daughters of Morven have consecrated the daisy to innocence. It is called the flower of innocence—the flower of the new-born." Varieties of the common daisy are developed even in the wild state; sometimes all the florets are found ligulate, and, more rarely, all tubular. In the double varieties cultivated in gardens, ligulate florets are alone produced, and these assume various tints of red; so that little remains to remind one of the wild flowers. In the variety called "hen and chickens," little flower-buds are formed in the axils of the bracts; sometimes as many as ten or twelve of these minute daisies surround the parent flower, thus suggesting its familiar name.—Ref. *Popular Science Review*—the Daisy, by Mrs. Lankester.

Bell-Metal.—Science and experience together have shown that an alloy of 80 parts of copper and 20 parts

of tin makes the best bell-metal. Bells, however, are made of brass, antimony alloyed with tin, German silver, silver, and gold. The hand-bells found by Mr. Layard at the palace of Nimroud were composed of 1 part of tin and 10 parts of copper. Probably these bells, being of Phœnician manufacture, contained tin which had been obtained in Britain 3,000 years ago. Indian gongs contain 80 parts of copper and 20 of tin. In ordinary bells, lead and zinc are often substituted for tin. When silver is mixed with bell-metal, it injures the tone of the bell.

Bellows, *bel'-lose* (Sax. *bilig*), a machine for propelling air forcibly through a tube. The most ordinary kinds consist of two boards, of a circular or oval form, each provided with a projecting handle, and two or three hoops are bent between the boards. To the edges a piece of leather is nailed, broad in the middle, in order to cover the hoops, and thus form a small chamber, which can be dilated or contracted by moving the handles. A pipe is fastened to the lower board, passing into the chamber, and there is also a round hole in this board, which is covered with a leathern valve opening inwards. By dilation and contraction, air is inhaled by the valve-hole, and then forced through the nozzle of the pipe in any direction that may be desired. It is used in private dwellings for the purpose of blowing a fire into greater activity: it is also used for forges and furnaces. Strabo attributes the discovery of the bellows to Anacharsis the Scythian. The principle of the hydrostatic bellows, an instrument made for the purpose of showing that the pressure of fluids is as their perpendicular heights, has been applied in the construction of the hydrostatic press. Many operations in manufacturing art require a very high temperature. Formerly this was entirely effected by the bellows; the hot-blast is, however, now generally employed. (*See* Blowpipe, Metallurgy.)

Bells, in Mar.—On board ship the time is divided into periods of four hours each, and as each half-hour passes it is marked by striking on a bell. This bell is usually hung to the beam of the forecastle, but sometimes it is attached to a beam near the mizen-mast. One stroke on the bell denotes that half an hour has passed, two strokes that an hour has passed, and so on, adding a stroke for each half-hour. Thus, "five bells" would signify that two hours and a half had passed, and "eight bells" signifies that the four hours, or complete "watch," is over. The bell on which the time is struck is sometimes used during foggy weather to show that the ship is on a starboard tack; when she is on a port-tack, a drum is beaten.

Belly. (*See* Abdomen.)

Belomancy, *bel'-lo-man'-se* (Gr. *belos*, an arrow, and *manteia*, prophecy), denotes a species of divination by means of arrows, common among the Arabs and other eastern nations. It is practised in various ways; but the most common is to shoot off a number of arrows with inscriptions attached to them, and to be guided by the inscription upon the arrow which is first found.

Belopteba, *be-lop'-te-ra* (Gr. *belos*, dart, *pteron*, wing), in Geol., a fossil resembling a belemnite, but less pointed, and having a wing-like projection or process on each side. It occurs in Tertiary strata, and was evidently the internal bone of a cephalopod. The name *Belosepia* (Gr. *sepia*, cuttle-fish) is given to another kind of belemnite found in Tertiary deposits; and that of *Belotenthis* (Gr. *teuthis*, squid) to one shaped like a spear-head occurring in the Lias.

Belt, *belt* (Lat. *balteus*, a baldrick or girdle), in Astron., a term applied to some dark stripes or zones that appear on the surface of the planet Jupiter parallel to its equator. (*See* Jupiter.) Orion's Belt is figured by three stars in a direct line with each other, situated horizontally in the centre of the constellation.

Beltein, Beltane, or Bealtine, *bel'-tain*, the name of a great heathen festival, once common to all the Celtic nations, and traces of which still exist in some parts of Scotland and Ireland. The name is derived from *tine*, fire, and *Beal*, or *Bel*, the sun, or god of light; and in the Irish language the month of May is still called *Bealtine*. The festival was held on the 1st of May: large fires were kindled on the summits of the highest hills, and cattle were driven through them. It is said to protect them from contagious disorders; but doubtless they were originally sacrificed. All the inhabitants of the district quenched their fires on that day, and rekindled them from these fires. A similar festival seems also to have been held on the 1st of November. (*See* Mayday.)

Beluga, *be-lu'-ga*, a gen. of *Cetacea* belonging to the *Delphinidæ*, or Dolphins. It has a broad blunt head, and no produced snout; thus differing from the rest of the family to which it belongs. Its form is principally characterized by the softness of its curves, and the clear white colour of its skin, which is so tender that it often fails to retain the harpoon. The beluga also differs from the ordinary family of dolphins in having fewer teeth, which fall out before the animal is old, and it has no dorsal fin. It usually attains the length of thirteen feet, and feeds principally on fish.

Belvedere. (*See* Kochia.)

Belvidere, or Belvedere, *bel-ve-deer'* (Ital. *bella*, fair, beautiful; Lat. *videre*, to see), a name given, in Arch., to a place erected on the top of any building, from which a good prospect of the country around can be obtained. The structure is of Italian origin, and is commonly found in houses at Rome. The Belvidere at the Vatican is one of the most remarkable in existence, being built in the form of a horseshoe, having a gallery inclosed at the back running round the semi-circular part, and a balustrade in front. It commands a magnificent view of the country about Rome, extending as far as the Apennines. In France and England the term is applied to summer-houses or buildings erected in gardens and parks, from some of which a good view of the surrounding scenery can be obtained.

Belvisia, *bel'-vis-i-as'-se-a* (from the gen. *Belvisia*, named after its discoverer, P. de Beauvois), a small nat. ord. of dicotyledonous plants, in sub-class *Calycifloræ*, comprehending only two genera, namely, *Asterantheæ* and *Napoleona*, or *Belvisia*. These include four species, which are large shrubs, with smooth leathery leaves, all growing in tropical Africa. The [illegible] of the leaf and are extremely curious. The calyx is a thick leathery cup, divided into five segments. The corolla consists of three distinct whorls of united petals; the outer one turning back over the calyx; the second one is a narrow membrane divided into numerous segments; and the third forms an erect cup, and contains the stamens, which are united, so as to make a sort of inner cup. The fruit is a soft berry, with large kidney-shaped seeds. The pulp of the fruit is edible, and the pericarp contains much tannin.

Bembridge Beds, *bem'-bridj*, in Geol., the name given to an important group of upper eocene strata, resting on the Osborne or St. Helen's series, and capped by the Hempstead beds. In the Isle of Wight this group is principally developed. Beginning at the bottom, we find the Bembridge limestone. This bed consists of a pale yellow or cream-coloured limestone, interstratified with clay or crumbling marl, and is from 20 to 25 feet thick. Upon this we find the oyster-bed, a few feet of greenish sands, containing oysters (*Ostræa rectensis*) in great abundance, capped by a band of hard septerian stone. Resting on this are unfossiliferous mottled clays, alternating with fossiliferous laminated clays and marls. The latter contain the characteristic shell *Cyrena pulchra*. Lastly we come to marls and laminated grey clays containing *Melania turritissima*; for immediately above these we find the *black band*, forming the base of the Hempstead series.

Ben, *ben* (Heb., son), is a Hebrew word that enters into the formation of many proper names; as, *Ben-hadad*, the son of Hadad; *Benjamin*, the son of the right hand.—In names of places in Scotland, the Gaelic *beann*, *beinn*, *beinne*, a hill, mountain, summit, pinnacle; Irish, *beann*; Welsh, *bann* and *pen*, are used in a similar manner.

Ben, Oil of, an oil obtained from the fruit of the *Moringa pterygosperma*. It is a thick yellowish fluid, possessing the property of seldom turning rancid, which renders it of great use in perfumery.

Bench, *bench*, in Law. (*See* Banc.)

Benchers, *bensh'-ers*, in the inns of court, are the senior members of the society of each house or inn, to whom the government of its affairs is committed; and out of the number one is annually chosen as treasurer. The sole power of calling students to the bar, by which

they become *barristers*, and of disbarring them, and thereby depriving them of their qualification, for misconduct, is vested in them, subject to an appeal to the judges as *visitors* of the inn. These inns are four in number; viz., the Inner Temple, the Middle Temple, Lincoln's Inn, and Gray's Inn.

BEND, *bend* (Sax. *bendan*), in Her., one of the nine principal ordinaries, occupying a fifth part of the field when uncharged, but a third part when it has any device or charge upon it. It is formed by parallel diagonal lines, drawn from left to right, or from the dexter chief to the sinister base. When the term bend is mentioned without any addition, the bend dexter is always meant. The bend has four diminutives,—the bendlet, half the width of the bend; the garter; the ribbon; and the cost, or cotice, a narrow stripe generally borne on either side of the bend.



BEND.

Charges are said to be *in bend*, or *per bend*, when they are placed in the direction of the bend from the dexter chief to the sinister base.

BENDING, *bend'-ing*, in Mar., the tying of two ropes or cables together: thus, to bend the sail is to make it fast to the yard; to bend the cable, to make it fast to the ring of the anchor.

BEND SINISTER (Lat. *sinister*, the left), one of the nine principal ordinaries, being exactly the reverse of the bend, similarly formed, but by lines drawn from the sinister chief to the dexter base, or from right to left. It has two diminutives; the scarp, half the width of the bend, and the baton, used as an abatement to denote the illegitimacy of the bearer of the coat.

BENEDICITE, *ben'-e-dis'-i-te* (Lat.), is the name given to the hymn or song of the Three Children in the fiery furnace, from the Latin version of it, beginning, *Benedicite omnia opera Dominum*. The singing of the Benedicite in the Christian churches is very ancient, for it appears to have been in universal use as early as the time of Chrysostom. In the English church, the Benedicite was, by Edward VI.'s First Book, prescribed to be used during Lent; but, by the present Prayer-book, it may be said or sung at the morning service, instead of the *Te Deum*, whenever the minister thinks fit.

BENEDICTINE FATHERS, is the name given to celebrated editions of the works of the Fathers, from their having been edited by some of the most celebrated of the Benedictine monks in France.

BENEDICTINES, *ben'-e-dik'-tins*, an order of monks taking their name from their founder, St. Benedict, who flourished in Italy in the early part of the 6th century. They spread very rapidly, and for the next three centuries, almost all the monks in the West might be said to be Benedictines. At first they had no distinctive dress, but afterwards they wore black; whence they came to be called also Black friars. The decline of monastic discipline led to the reforms of Benedict of Aniana in the 8th century, and of the abbot of Cluny in the beginning of the 10th. The Cluniacs, in place of the discordant and uncertain rules that had hitherto existed, made fixed regulations concerning the hours of worship, the obedience, discipline, and government of their monasteries, which were soon imitated throughout Europe. The rules of St. Benedict, as observed by the English monks previous to the Reformation, were as follows: they were obliged to perform their devotions seven times in twenty-four hours, and always to go two and two together; every day during Lent they were obliged to fast until six in the evening, and to diminish their usual time of sleeping and eating; but they were not allowed to practise any voluntary austerity without the consent of their superior; they never conversed in their refectory at meals, but were obliged to attend to the reading of the Scriptures; for small faults they were shut out from meals; for greater, they were debarred religious commerce and excluded from the chapel; while incorrigible offenders were expelled from the monastery. About 1354, it was found that since its rise this order could boast of 24 popes, nearly 200 cardinals, 7,000 archbishops, 15,000 bishops, 15,000 abbots of renown, above 4,000 saints, and upwards of 37,000 monasteries; besides 20 emperors, 10 empresses, 47 kings, above 50 queens, 20 sons of emperors, 48 sons of kings, about 100 princesses. In the 15th century, this order had 15,107 monasteries, of which, after the Reformation, only about 5,000 were left, and at present there are only about 800. This order has produced a great number of learned men, and it did much in the way of fostering and spreading Christianity, civilization, and learning in the Middle Ages.

BENEDICTION, *ben'-e-dik'-shon* (Lat. *benedico*, I speak well), is the invoking of the divine blessing upon individuals, sometimes, also, upon animals and things. The ceremony of blessing is of very remote antiquity, for we read of the Jewish patriarchs, before they died, invoking the blessing of God upon their children. At a later period, the priests were commanded to bless the people; and Christ himself sanctioned the custom, in that, before parting from his disciples after his resurrection, "he lifted up his hands and blessed them." In the ritual of the Roman Catholic church the benediction, in different forms and words, occupies an important place; and it constitutes an essential part of many of its ceremonies. One of the most imposing of these is when the pope, on Easter Sunday, after mass, in full pontificals, and attended by the cardinals and prelates, pronounces his benediction *urbi et orbi* (the city and the world), from the great gallery in front of St. Peter's church, before many thousands of kneeling spectators. In the liturgy of the Church of England there are but two benedictions, and in the Church of Scotland only one, pronounced at the end of the service.

BENEDICTUS, *ben'-e-dik'-tus* (Lat., blessed), the name of one of the hymns ordered to be said or sung after the second lesson in the morning service of the Church of England. It is so called from its beginning with that word in the Latin version.

BENEFICE, *ben'-e-fits* (Lat. *beneficium*, a good deed, a favour), in authors of the Middle Age, is used for a fee, sometimes more peculiarly denominated *beneficium militare*. In this sense, benefice was an estate in land, at first granted for life only; so called because held *ex mero beneficio* of the donor; and the tenants were bound to swear fealty to the lord, and to serve him in his wars. In after-times, as these tenures became perpetual and hereditary, they left their name of benefice to the livings of the clergy, and retained to themselves the name of feuds. Benefice, in an ecclesiastical sense, is a church endowed with a revenue for the performance of divine service, or the revenue itself assigned to an ecclesiastical person, by way of stipend for the service he is to do to that church. All church preferments except bishoprics are called benefices, and all benefices are, by the canonists, sometimes styled dignities; but they now ordinarily distinguish between benefice and dignity, applying dignity to bishoprics, deaneries, archdeaconries, and other offices, and benefice to patronages, vicarages, and dominatives. Benefices are divided by the canonists into simple and sacerdotal. In the first, there is no obligation but to read prayers, sing, &c. Such are canonries, chaplainships, chantries, &c. The second are charged with the cure of souls, or the direction and guidance of consciences; such as vicarages, rectories, &c. The Romanists again distinguish benefices into regular and secular. Until the 4th century, the revenues of the Church consisted principally in alms and voluntary contributions, and were distributed under the directions of the bishop; but when the Church came to possess lands, part thereof were assigned for the subsistence of the clerks, and called benefices, of which we find some traces in the 5th and 6th centuries. But it does not appear that the allotments were positively defined till about the 12th. At first each was contented with a single benefice; but pluralities were by degrees introduced, on a plea that in some places a single benefice was not thought a competency. By a return to parliament in 1617, the number of benefices in England were stated to be 10,421. (*See* LIVING, TITHES, PARSON.)

BENEFICE IN COMMENDAM is that, the direction and management of which, upon a vacancy, is given or recommended to an ecclesiastic for a certain time, till he may be conveniently provided for.

BENEFICIARY, *ben'-e-fish'-a-re*, is applied to the holder of a benefice. In a more general sense, it denotes one who receives a benefit, or one who enjoys

an interest in any funds or estate held in trust by another.

**Benefit of Clergy**, *ben'-e-fit*, originally denoted the privilege or exemption which was possessed by the clergy from secular jurisdiction. In early times, clergymen were in certain cases exempt from punishment by secular judges, and could claim their *privilegium clericale*. This privilege, however, did not extend to high treason. Afterwards, reading, as being at that time almost solely confined to the clergy, came to be the test of one's being entitled to the benefit of clergy. On a condemned man demanding "to be admitted to his book, the judge commonly giveth him a Psalter, and turneth to what place he will. The prisoner readeth so well as he can (God knoweth sometimes very slenderly); then he (the judge) asketh of the bishop's commissary, '*Legit ut clericus?*' (Does he read like a clergyman?). The commissary must say '*Legit*' or '*Non legit*;' for these be words formal, and our men of law be very precise in their words formal. If he say *legit*, the judge proceedeth no farther to sentence of death; if he say *non*, the judge forthwith proceedeth to sentence." In 1488, when reading had become a less rare accomplishment, a distinction was made between the clergy and those who were merely able to read; so that one of the latter class, after having once been admitted to the benefit of clergy, was not allowed to claim the privilege a second time, unless he produced his orders; and those who had once claimed the privilege were burned on the hand, in order to mark them. The formality of reading was done away with by 5 Anne, c. 6, which enacted that the benefit of clergy should be extended to all who are entitled to it, without requiring them to read. Benefit of clergy had previously been adopted as a term to express freedom from *capital* punishment for a felony. It was not till 7 & 8 Geo. IV. c. 28, that the benefit of clergy was entirely abolished.—Ref. *Englich Cyclopædia*—Arts and Sciences.

**Benefit Societies.** (*See* Friendly Societies.)

**Benevolence**, *be-nev'-o-lens* (Lat. *benevolentia*, from *bene*, well, and *volens*, wishing), in Ethics, denotes an earnest desire for the good of mankind, manifesting itself, as ability and opportunity may offer, in acts of kindness and charity towards all. Some philosophers attribute this affection to self-love; others to an instinct inherent in our nature. "It is the benevolent passions only," says Adam Smith, "which can exert themselves without any regard or attention to propriety, and yet retain something about them that is engaging."

**Benevolence**, in Eng. Hist., was a means of raising money formerly resorted to by the kings of England, in violation of the Magna Charta. As the name implies, it was nominally a gratuity; but in reality it was a forced loan, exacted with or without the condition of repayment. Edward IV. had frequent recourse to this means of raising money; but by a statute of his successor, Richard III., it was declared to be illegal. Benevolences were, however, exacted by Henry VII., and occasionally, by means of circulars under the privy seal, by his successors. 13 Charles II. stat. 1, c. 4, provides that no voluntary aid can be raised on behalf of the sovereign but by the authority of parliament; and the Bill of Rights, in 1688, declares that the levying of money for or to the use of the crown, by pretence of prerogative, without grant of parliament, is illegal.

**Bengal Army.** (*See* Army.)

**Bengal Light**, or **Bengal Fire**, *ben-gawl'*, a mixture composed of one part of tersulphide of antimony, two parts of sulphur, and six of nitrate of potash. The materials are reduced to a fine powder, and thoroughly mixed. When ignited, the mixture burns, giving out a remarkably brilliant and searching light. It is used in cases of shipwreck, and is capable of illuminating the air for a considerable space around. As the mixture contains antimony, the fumes are poisonous; consequently, the Bengal light cannot be used with safety in inclosed or covered places; it is, however, much used in pyrotechny.

**Bengalee Language.** (*See* Hindostan, Languages of.)

**Benish Days**, *be'-nish*, among the Egyptians, is a term applied to three days of the week (Monday, Wednesday, and Saturday), from their being days of less ceremony in religion than the other four. They are named from the *benish*, a garment of common use, not of ceremonious.

**Benison.** (*See* Benediction.)

**Benjamin, Gum.** (*See* Benzoin.)

**Bent Grass**, the common name for the gen. *Agrostis* (which *see*).

**Benzile**, *ben'-zil*, in Chem., an oily solid, crystallizing in hexagonal prisms, formed from benzoine by the action of chlorine.

**Benzine**, *ben'-zine*, another name for benzole. (*See* Benzole.)

**Benzoene**, *ben'-zo-ene*, another name for toluyl, (which *see*). This word has been abandoned by English chemists on account of its being easily confounded with *benzoine*.

**Benzoic Acid**, *ben-zo'-ik* ($C_{14}H_5O_2HO$).—An acid obtained from gum-benzoin. It is also found in the balsams of Tolu and Peru, in storax, and in the urine of herbivorous animals. It is easily prepared by sublimation. The powdered gum-benzoin is placed in a shallow iron pan which is covered with a cone of bibulous paper. A heat of 300° Fahr. is applied to the pan, and the whole apparatus is covered by a second cone much larger than the first, made of non-absorbent paper. The vapours of benzoic acid rise through the bibulous cone, and condense on the inside of the larger one; being thus prevented from falling back into the heated gum-benzoin. Benzoic acid forms white glistening needles, having an agreeable aromatic odour, and a hot, bitter taste. It melts at 248°, sublimes at 293°, and boils at 462°. Its vapour may be kindled, burning with a smoky flame. It dissolves in 200 parts of cold water and 25 of hot. It is readily soluble in ether and alcohol. It combines with the alkalies, earths, and metallic oxides, forming benzoates. It forms sulpho-, nitro-, and chloro-benzoic, by the substitution of atoms of sulphuric acid, peroxide of nitrogen, and chlorine, for atoms of hydrogen. Its other compounds are too numerous and unimportant for mention here.

**Benzoic Alcohol**, the alcohol of the benzoic series, —the hydrated oxide of toluyl, *i.e.*

$$C_{14}H_7 + O + HO = C_{14}H_8O_2$$

Toluyl, or benzoene. Benzoic alcohol.

It bears the same relation to benzoic acid that vinous alcohol does to acetic acid. Oxidizing agents convert it into benzoic acid. It is a colourless oily fluid, rather heavier than water, and boiling at 400°.

**Benzoic Ether.**—Oxide of benzoene, or toluyl. It is procured by heating benzoic alcohol and anhydrous boracic acid together in a closed vessel for some hours.

**Benzoic Group.**—One of the groups of the benzoic series (which *see*). The members of the benzoic group are analogous to those of the vinic or ethylic group, being all derived from a primary radical *benzoyl*, as those of the latter group are from *ethyl* (which *see*). They are nearly all obtained from oil of bitter almonds.

**Benzoic Series.**—A very perfect and numerous series of organic compounds, containing eight groups:—

| | |
|---|---|
| 1. Phenylic group. | 5. Anisic group. |
| 2. Quinonic ,, | 6. Cinnamic ,, |
| 3. Benzoic ,, | 7. Naphthalic ,, |
| 4. Salicylic ,, | 8. Indigotic ,, |

The benzoic series has lately been rendered very important from containing benzoic and aniline, the sources of the coal-tar dyes.

**Benzoin**, *ben-zo'-in*, or **Benjamin, Gum**, a resin which hardens by exposure to the air. Two kinds are distinguished in commerce by the names of *Siam* and *Sumatra benzoin*. The former is most esteemed in England. Benzoin is used in medicine as a stimulant expectorant. It is, however, principally employed for the preparation of *benzoic acid*, and as an ingredient in the incense used in Greek and Roman Catholic churches. It is also an ingredient in fumigating pastiles and court plaster. The agreeable odour produced by burning benzoin is due to the evolution of the vapour of benzoic acid.

**Benzoine**, *ben-zo'-ine*.—This compound must not be confounded with *benzoin* and *benzoene* (both of which *see*). It is isomeric with essence of bitter almonds, hydride of benzoyl, from which it is produced by the action of an alcoholic solution of potash, the oil being slowly changed into a crystalline mass.

**Benzole**, *ben'-zole* ($C_{12}H_6$).—A hydrocarbon of considerable importance, derived from coal tar. It was first obtained by Faraday from a liquid produced by compressing oil gas, and was called by him *bicarburetted hydrogen*. Mitscherlich afterwards obtained it from benzoic acid; and latterly Mansfield has procured it in large quantities from coal-naphtha and gas-liquor. It is a limpid, volatile, colourless, and mobile liquid, with a peculiar odour, having a specific gravity of 0·85, and boiling at 177°. Exposed to a temperature of 32°, it condenses into crystalline masses, which melt at 40°. It is insoluble in water, but dissolves freely in alcohol, ether, and oil of turpentine. It is greatly used in the arts, being an excellent solvent for india-rubber, gutta-percha, wax, camphor, and fats. The property of dissolving fats and oils, added to its great volatility, renders it very useful for removing grease-stains from articles of dress. It is sold for this purpose under the name of "benzine collas," at about three or four times its real value. It has lately received a most important application as the source of aniline (which *see*). It forms substitution compounds with bromine, chlorine, and iodine, by the replacement of one, two, or three atoms of hydrogen by one, two, or three atoms of these bodies, giving rise to mono-, bi-, and tri-chlorbenzole, &c. It also forms similar compounds with peroxide of hydrogen, the most important of which is nitro-benzole, or artificial oil of bitter almonds. It is made by adding benzole very gradually to fuming nitric acid. On cooling, the nitro-benzole separates as an oil, and is purified by washing and redistillation. It is a yellowish oil, which solidifies in needles at 37°, and boils at 415°. It has a sweet taste, and its odour closely resembles that of bitter almonds. It is much used in perfumery under the name of "essence of mirbane." Its principal use is in the manufacture of aniline for dyeing purposes, by passing sulphuretted hydrogen through it, or by acting on it with protacetate of iron. Benzole is also known as *benzine* and *phene*.

**Benzoyl**, *ben'-zoil* ($C_{14}H_5O_2$), the oxygen radicle of the benzoic group, from which all its members are derived, as all the members of the vinous group are derived from othyl. The following examples will show this analogy:—

$C_4\ H_5O_2 + HO + O$ = Acetic acid.
$C_{14}H_5O_2 + HO + O$ = Benzoic acid.
$C_4\ H_5O_2 + H_2$ = Alcohol.
$C_{14}H_5O_2 + H_2$ = Benzoic alcohol.

**Benzoyl, Hydride of** ($C_{14}H_5O_2H$), *essence or oil of bitter almonds*.—The bitter-almond cake, left after the extraction of the fixed oil, is mixed with water and fermented, until the whole of the amygdalin is decomposed. The mass is then distilled, and the distillate is purified by agitating it with milk of lime and chloride of iron. The hydro-cyanic acid contained in it is thus transformed into Prussian blue. Pure hydride of benzoyl is not poisonous. It is a limpid, highly-refractive, inflammable liquid, which boils at 356°, and dissolves in 30 parts of water. Alcohol and ether dissolve it in all proportions. Exposed to the air, it gradually absorbs oxygen, and becomes converted into benzoic acid. It is the aldehyde of benzoic alcohol:—

$$C_{14}H_5O_2 - H_2 = C_{14}H_5O_2$$
Benzoic alcohol. Hydride of benzoyl.

**Berberidaceæ**, *ber'-ber-i-dai'-se-e*, in Bot., the Barberry fam., a nat. ord. of dicotyledonous plants, in the sub-class *Thalamifloræ*, consisting of shrubs and herbaceous perennials. The leaves are alternate and compound; frequently they appear to be simple; but, in such cases, it will be found that the blade is articulated to the petiole, which is evidence of their compound nature. The stem is often spiny, but generally free from hairs. The spines are nothing more than the hardened veins of some of the leaves between which the parenchyma is not developed. The flowers are sometimes solitary, sometimes in racemes or panicles. The calyx consists of three, four, or six deciduous sepals; the petals are hypogynous, and either equal to the sepals in number, and opposite to them, or twice as many; the stamens are equal to the petals in number, and opposite to them; the anthers are two-celled, each cell opening by a curious recurved valve from the bottom to the top; the carpel is solitary, and has but one cell; the fruit is either a berry or a capsule. The order includes twelve genera, which together contain 100 species, natives of the temperate parts of Europe, Asia, and America, some being exceedingly common in the mountainous regions of the north of India. The plants have acid, astringent, and bitter properties: their acidity is due to the presence of oxalic acid.

**Berberis**, *ber'-be-ris*, in Bot., the typical gen. of the nat. ord. *Berberidaceæ*, consisting of numerous species, found in temperate climates in most parts, except Australia. These are shrubs, often spiny, with yellow flowers and acid berries. The three whorls of organs in the flower are each made up of six parts: thus, there are six sepals in the calyx, six petals in the corolla, and six stamens. The latter are remarkable for their irritability; for if touched at the base by an insect, or even with the point of a pin, they start up from their natural reclining position, and close upon the pistil. The most interesting species is *B. vulgaris*, the common barberry, which is usually a bush from four to six feet high, but which, in Italy, sometimes becomes as large as a plum-tree. It is a very ornamental plant, especially when covered with fruit. The berries are of an oval shape, and, when ripe, generally of a bright-red colour, but sometimes whitish, yellow, or almost black. They are very acid, and not fit to be eaten raw; but when boiled with sugar, they form a most refreshing preserve. They are sometimes pickled, to be used for garnishing dishes, and occasionally they are put into sugar-plums or comats. The bark and stem are very astringent, and yield a bright yellow dye. A fungus, which has been named *Æcidium berberidis*, is frequently found on the underside of the leaves; and the common, but erroneous opinion, that the minute spores of this parasite will produce *rust* in corn, has prevented the general employment of the barberry as a hedge-plant, for which it is admirably adapted. Of the numerous species of *Berberis* which are cultivated in Britain as ornamental shrubs, the finest is undoubtedly *B. aristata*, the bristle-leaved barberry. This is a hardy evergreen, producing excellent fruits. It is a native of Nepaul, and was introduced into this country about forty years ago.



BARBERRY.

**Berbers**, *ber'-bers* (Lat. *barbari*).—The inhabitants of the northern part of the Great Desert and the mountainous districts of Barbary. The whole of these scattered tribes are the descendants of the aboriginal inhabitants of Northern Africa. Their number is calculated to be at the present time between three and four millions. They are of the middle stature; their complexion varies from red to yellowish-brown; and they are strongly and compactly made. The head is much more European than African in type. Their eyes and hair are dark, and they are cruel, suspicious, and implacable in their disposition. In ancient times the Berbers formed the largest part of the population dwelling on the northern coast of Africa; but upon the great Arabian immigration, in the 11th century, they were driven back to the mountains and desert regions, where they now live. In Algeria they are called Kabyles, and are as yet unconquered by the French. In Morocco they are called Shellooh; and in Tripoli they only pay a nominal allegiance to the Turks. The Berbers who inhabit the desert have become much mixed with the negro race, and are called Tuaric, or Tawárek, by the Arabs. The whole race, at the present day, seem to possess a wild spirit of independence, which prevents them from uniting together or making any decided progress in civilization. They are constantly fighting, either amongst themselves or with their neighbours. Their dwellings are mostly clay huts and tents; but they have some stone houses in their villages. The mines of lead and iron ore in the

Atlas Mountains are worked by them. They have water-*mills* and *oil-presses*, and many of them have large herds and flocks of cattle and sheep. They are also agricultural, and have an especial liking for the rearing of fruit-trees. The Berbers were formerly Christians; but since the Arab invasion they have all become Mahometans.

**Berchta**, *bairg'-ta* (Old Ger. *perahta*, lightning, shining; whence the name Bertha), in German Myth., is a spiritual being, probably the same, under a different name, as the Hulda of North Germany; but in North Germany, Hulda is regarded as a benign spirit; whereas, in South Germany, Berchta is looked upon as a malevolent being, and her name is made use of to frighten disobedient children. Berchta is especially charged with the overlooking of spinners.—*Ref.* Brockhaus' *Conversations Lexikon.*

**Berbans**, *be-re'-ans*, in Ancient Church Hist., were the inhabitants of Berea. They are highly commended in Scripture for their ready reception of the Gospel, upon a fair and impartial examination of its agreement with Old Testament prophecies.

**Berbans**, in Modern Church Hist., a sect of dissenters from the Church of Scotland, who take their name from, and profess to follow, the example of the ancient Bereans, in building their system of faith and practice upon the Scriptures alone, without any regard to human authority. Their founder was Mr. John Barclay, who, in 1773, left the Church of Scotland because he had not been presented to the parish church of Fettercairn, though the people were unanimous in his favour. The Bereans agree with the great body of Christians respecting the doctrine of the Trinity, and with the Calvinists regarding predestination and election. They differ from other sects in rejecting all natural religion; in holding faith to be a simple credence of God's word, and always accompanied with a personal assurance of salvation; in considering unbelief as the sin against the Holy Ghost; and in interpreting almost all the Psalms as typical or prophetical of Jesus Christ, and reckon it a perversion to apply any psalm to individual spiritual experience. The Bereans were at one time pretty numerous in Scotland, but they are now nearly extinct.

**Berengarians**, *ber-en-gair'-i-ans*, in Eccl. Hist., a denomination that arose in the 11th century, and adhered to the opinions of Berengarius, archdeacon of Angers, who opposed the Roman Catholic doctrine of transubstantiation, and asserted that the bread and wine in the Lord's Supper were not really and essentially, but only figuratively, changed into the body and blood of Christ. The Roman Catholics ranked the Berengarians among the most dangerous of heretics.

**Bergamot, Oil or Essence of**, *ber'-ga-mot*, a fragrant essential oil, obtained by expression or distillation from the rind of the Bergamot orange. (*See* Citrus.) It is extensively employed in perfumery for scenting pomades, and as an ingredient in most compound essences; such as *eau de Cologne*, *eau de millefleurs*, and Jockey-club bouquet.

**Berg-Mehl**, *bairg'-mal* (Swedish, mountain-meal).—The name given to a whitish earth, consisting almost entirely of the flinty shields of microscopic plant-growths. (*See* Diatomaceæ.) It occurs in bog and ancient lake deposits in many parts of Northern Europe, and, during times of great scarcity, it has been, mixed with flour, eaten as food. Some writers assert that hundreds of cart-loads are consumed every year by the inhabitants of the north of Sweden. From analysis, it does not appear to contain any positive nutriment.

**Beriberi**, *ber-e-ber-i'*.—A disease common in Ceylon and other parts of the East Indies, characterized by difficulty in breathing, weakness, stiffness, and a sensation of numbness in the lower limbs, a bloated appearance of the face, and dropsical swelling of the whole body. The disease commonly comes on slowly, and terminates in the course of three or four weeks; but sometimes it attacks suddenly, and destroys the patient in from six to thirty hours. The causes of this disease are not well understood. It is generally supposed to arise from exposure to cold damp air, and the want of stimulating and nourishing diet. Great difference of opinion also exists as to the best mode of treating this disease, some regarding it as a disease of debility, and, consequently, have recourse to stimulants; others, considering it to arise from increased internal action, resort to blood-letting, &c. This mode appears to be that most generally recommended. The chronic, paralytic affection, termed *barbiers*, also common in India, was, until recently, confounded with this acute disease. Barbiers is a disease of nervous debility, and, therefore, to be treated with tonics, cordials, and nutritive diet. It commences with weakness, trembling, and a pricking sensation of the legs, thighs, and arms. Loss of appetite, indigestion, and emaciation, soon follow, and at length, if the disease continues, the muscles become paralytic.

**Berlin Porcelain**, *ber-lin'*.—A peculiarly hard white porcelain manufactured at Berlin, and much prized by chemists for its valuable properties. Tubes, capsules, crucibles, and other vessels used for chemical purposes, are made of a wonderfully thin and white variety. They do not crack when heated, and remain intact under the action of the most powerful chemical agents. They replace platinum when required for the ignition of precipitates, containing easily-reduced metals which would destroy a platinum crucible. They are also of great value in testing, where the resulting precipitate is small, but coloured.

**Berlin-Wool-work.** (*See* Embroidery.)

**Berme**, or **Berm**, *berm* (Fr. *berme*), in Mil., a piece of ground projecting horizontally from the foot of a rampart on the outside, forming a sort of pathway between the rampart itself and the scarp of the ditch surrounding the fortification. It is generally about three feet in width; if broader than this, it is called the *chemin des rondes*, and serves for the passage of troops from one part of the works to another outside the walls, or for officers when going their rounds to see that the sentries and guard are doing their duty. Sometimes the berme has a low wall on the edge of the ditch, or a row of palisades sloping outwards. A broad berme tends to prevent the ditch from being filled with rubbish when the rampart is exposed to an enemy's fire; but it has its disadvantage in offering a place on which the assailing party may effect a lodgement, and plant their ladders for taking the place by escalade.

**Bernardines**, *ber'-nar-dins*.—An order of monks named after St. Bernard, a celebrated Franciscan friar of the 14th century, by whom the order was reformed, but not founded. Their origin dates from the 12th century, and they differ little from the Cistercians. (*See* Cistercians.)

**Bernicle Geese**, *ber'-ni-kel*.—The bernicle geese are marine in their habits, and feed almost entirely on algæ and grass-wracks (*Zostera marina*). Like the common goose, they are only winter visitors to our climate, and pass during the summer to the highest northern latitudes. The bird owes its name to a ridiculous notion. It was formerly believed (it can scarcely be said that the belief is to this day entirely abandoned) that these birds were produced from the common bernacle, or barnacle, the latter originating, in their turn, from the fruits of a particular tree, whose branches dipped into the water. "There is," says Gerard (who lived in the reign of Queen Elizabeth), "a small island in Lancashire called the Pile of Foulders (on the west side of the entrance into Morecombe Bay, about fifteen miles south of Ulverston), wherein are found the broken pieces of old and bruised ships, and also the trunks and bows, with the branches of old and rotten trees cast up there likewise, whereon is found a certain spume or froth, that in time hardeneth unto certain shells in shape like those of the muskle, but sharper pointed, and of a whitish colour, wherein is contained a thing in form like a lace of silke finely woven, as it were, together; one end whereof is fastened into the inside of the shell, even as the fish of oisters and muskles are; the other end is made fast into the belly of a rude masse or lump, which in time cometh to the shape and form of a bird: when it is perfectly formed the shell gapeth open, and the first thing that appeareth is the aforesaid lace or string; next come the legs of the bird hanging out, and as it groweth greater it openeth the shell by degrees, till at length it is all come forth, and hangeth only by the bill. In short space after it cometh to full maturitie, and falleth into the sea, where it gathereth feathers, and groweth to a fowl bigger than a mallard, and lesser than a goose, which the people of

Lancashire call by no other name than a 'tree-goose;' which place aforesaid and all those parts adjoining do so abound therewith that one of the best is bought for three pence."

BERRY, in Bot. (*See* BACCA.)

BERSARII, *ber-sair'-i-i*, is a term used by writers of the Middle Ages to denote a kind of hunters who pursued wild beasts. The derivation is doubtful; by some it is said to come from *bersare*, to shoot with a bow, by others from *berva*, the fence of a park.

BERTH, *berth*, in Mar., the station in which a ship rides at anchor; also an apartment where any number of the officers or ship's company mess and reside. In a man-of-war there is generally one of these between every two guns.

BERTHOLLETIA, *ber-tol-lo'-ti-a* (so named in honour of Berthollet, the French chemist), in Bot., a gen. of plants belonging to the nat. ord. *Lecythidaceæ*. The only species known is *B. excelsa*, a majestic tree, growing to the height of 100 or 120 feet, which forms vast forests on the banks of the Orinoco. The leaves of this plant are about two feet long and five or six inches wide. Its fruit is a round woody pericarp, filled with seeds or nuts, and so strong that it cannot be broken without a sledge-hammer. The seeds more or less approach a triangular shape, and have hard wrinkled shells. These constitute, in fact, the well-known *Brazil nuts* of the shops, also known in commerce as *Juva*, *Castanha*, and *Para nuts*. They yield an oil well adapted for burning; but the 50,000 bushels imported annually into this country from Brazil are chiefly used as food. The kernels are said to be delicious when quite fresh; but, unfortunately, they are apt to become rancid, on account of the quantity of oil they contain.

BERYL. (*See* AQUAMARINE.)

BERYLLIANS, *be-ril'-li-ans*, in Eccl. Hist., a sect of heretics that arose in the 3rd century, and took their name from Beryllus, an Arabian bishop of Bozrah. They held that Christ did not exist before Mary; but that a spirit, issuing from God himself, a portion of the divine nature, was united to him at his birth.—*Ref.* Mosheim's *Ecclesiastical History*.

BESTIARII, *bes-ti-air'-i-i*, men who fought with wild beasts in the Roman amphitheatre, or who were exposed to them by a decree of law. They were different from the gladiators, who only fought with each other. The bestiarii were regularly trained and paid for their services, and greatly increased during the Empire.



The illustration is copied from an ancient bas-relief.

BESSEMER'S PROCESS FOR REFINING IRON, *bes'-se-mer*.—This is a process patented by Mr. Bessemer in 1856, for converting pig-iron more rapidly into malleable iron and steel. The ordinary methods for accomplishing this object were very slow and tedious; and air was admitted very sparingly to the metal. Mr. Bessemer, on the contrary, in his operations forces air into and upon the iron. In the first place, he conveys the liquid metal direct from the blast-furnace to a large covered wrought-iron vessel, lined with fire-clay; atmospheric air is then forced through the liquid iron by means of a fire-clay pipe passing through the vessel and dipping into the fluid metal. This pipe is connected with a hot blast; and, as the air passes through the iron, its oxygen comes in contact with the carbon and other impurities, and carries them off. This is continued for some time, and the iron is run out and cooled. When hard, it is broken up and conveyed to a *puddling*-furnace, where jets of steam and air are forced into and upon the iron, when it becomes molten. The steam and air together act upon the metal, the oxygen converting the carbon into carbonic acid. The steam is decomposed and the hydrogen escapes, while the oxygen unites with the iron, forming oxide of iron, which is again decomposed, the oxygen uniting with the carbon to form carbonic oxide; while at the same time the iron is reduced to the metallic state. If there is any sulphur present, it is converted into sulphurous acid and sulphuretted hydrogen. Mr. Bessemer also invented a process by which he converted pig-iron into wrought-iron and steel in one operation. The principles of the invention were those above described; and, although right theoretically, the invention has not proved successful. The reason for this is, that a great quantity of good iron is oxidised and lost in the process.

BETA, *be'-ta*, in Bot., the Beet, a gen. of plants belonging to the nat. ord. *Chenopodiaceæ*, and characterized by a 5-cleft perianth, five stamens inserted on a fleshy ring surrounding the ovary, and the fruit adhering to the calyx, and collected in clusters of two or three. The species are found in Europe, the north of Africa, and the western parts of Asia. *B. vulgaris*, the common beet, grows along the whole coast of the Mediterranean, and is cultivated in European gardens for its sweet, tender, and dark-red root, which is chiefly used in England as a salad, but in France and Germany as a common table vegetable. It is also cultivated on a large scale in many parts of the world as a source of sugar; and it is believed at the present time that about 400,000,000 lbs. of beetroot sugar are annually produced in Europe. (*See* SUGAR.)



BEETROOT.

The beet used for this purpose is considered to be a variety of *B. vulgaris*, and is known as the sugar-beet. The mangel-wurzel, so valuable as a field-crop for feeding cattle, is another variety, and is distinguished by botanists as *B. vulgaris*, var. *campestris*. The white beet cultivated in gardens for the sake of its leaves, which are used as a substitute for spinach, is also merely a variety of the same plant.

BETEL, *be'-tel*.—The name usually given to a narcotic masticatory, used by the Malays and other Eastern races. It is prepared by rolling up long pieces of the betel-nut (*see* ARECA) in the leaves of the betel-pepper (*see* CHAVICA), previously dusted on one side with the quicklime of calcined shells. When chewed, the betel promotes the flow of saliva, and lessens the perspiration from the skin. It stains the mouth, teeth, and lips red; an effect which, though disgusting to Europeans, is considered ornamental by the natives. It imparts an agreeable odour to the breath, and is supposed to fasten the teeth, cleanse the gums, and cool the mouth. The juice is generally swallowed. The narcotic effects of this masticatory have not been experimentally investigated by travellers. To one not accustomed to betel-chewing, the nut is powerfully astringent in the mouth and throat, while the quicklime often removes the skin and deadens the sense of taste. After a while it causes great giddiness. On those accustomed to use it, however, the betel produces weak, but continuous and sustained, exhilarating effects; and that these are of a most agreeable kind may be inferred from the very extended area over which the practice of betel-chewing prevails. Professor Johnston believed that the coveted effect on the system is the result of the combined influence, first, of the constituents of the nut; second, of those of the fresh pepper; and third, of the substances which are produced or evolved in the mouth in consequence of the chemical action of the lime and of the saliva upon the ingredients of both nut and leaf. In Luçon, one of the Philippines, Mey— found in every corner of the house a little box or di in which are kept the betel-rolls, or *buyos*, pre for the day's consumption; and a buyo is there c

to every one who enters, just as a pinch of snuff or pipe is in other countries. Travellers, and those who work in the open air, carry the betel for the day in little boxes or bags. The preparation of the betel falls on the female members of the family, who, during the forenoon, may generally be seen lying on the ground making betels. These are consumed very rapidly; for every man who can afford it puts a fresh one in his mouth at least every hour. "We have no means," writes Professor Johnston, "of estimating the absolute quantity of this nut which is consumed yearly by the Asiatic nations; but it must be very great. It is chewed by probably not less than fifty millions of men. If we allow to each chewer ten pounds-weight a year, which is less than half an ounce a day, this would give the enormous consumption of five hundred millions of pounds-weight every year! Only tobacco, among the narcotics in common use, is used in larger quantity than this."—Ref. *Chemistry of Common Life*.

Bethesda, to lie at the pool of, *be-thes'-da*, is a colloquial phrase in Germany, employed in speaking of theological candidates who are waiting for a living.

Bethlehemites, *beth'-le-mites*, called also Star-bearers, an order of monks that appeared in England about the middle of the 13th century. But little is known respecting them. They were distinguished by a red star having five rays, which they wore on their breast, in memory of the star which appeared to the wise men of the East. They had a settlement at Cambridge. Another order of the same name was founded on the island of Teneriffe, which has forty houses, chiefly in the Canary islands; but they are also to be found in the Spanish West Indies.

Betrothment, *be-trothe'-ment* (Goth. *trauan*, to trow), is a mutual engagement or promise by a man and woman, with a view to a future marriage. The word literally denotes the giving one's troth, that is, true faith or promise. Among the ancient Jews, the betrothing was performed either by a writing or a piece of silver given to the bride. Frequently, the engagement was entered into very early in life, though the actual marriage did not take place till the parties were of a proper age, and generally a twelvemonth or more elapsed between the betrothment and the marriage. During this interval, the young people had liberty to see each other, which was not accorded to them before; and the woman was considered as the lawful wife of him to whom she was betrothed. The engagement could not be broken off by the man without a bill of divorce; and if the woman was unfaithful, she was treated as an adulteress. Betrothment amounts to the same with what is called by civilians and canonists *sponsalia* or *espousals*, sometimes *despônsation*, and by the French, *fiançailles*. Betrothment is either solemn, made in the face of the church, or private, made before witnesses out of the church. To betroth by giving *arrhæ*, or earnest, is called by Middle-Age writers *subarrare*. Betrothment being of the nature of a contract, is subject to the same laws and conditions as other contracts. It can only be recognized as valid between persons legally capable of entering into such an engagement, and is vitiated if effected through force, fraud, or intimidation. In Germany, where betrothment is still common, there are various laws in force regarding it. The consent of the parents is always necessary if the parties are under age; but if the parents withhold their consent unreasonably, the permission of the judge may be obtained to enter into the contract. If the opinions of the parents are diverse, the law gives effect to that of the father. In some parts of Germany, the consent of the relatives and the presence of witnesses are required to render the contract valid; in others, such a contract is not only invalid, but the parties to it are punishable. By the common law of Germany, however, betrothments are valid in every case in which consummation or consecration by the priest has taken place. The parents, in such cases, are not allowed to apply for a dissolution of the contract, nor can they refuse their consent, except for highly important reasons. In case of refusal to fulfil the contract by marriage, the injured party is allowed an action at law, to compel its performance; but from the evils that result from unhappy marriages, the means resorted to to compel its fulfilment are never great,—usually a small fine or a short imprisonment. The betrothment generally takes place in a small circle of relations and friends. In Russia, the betrothment now forms part of the marriage ceremony. In England, formal betrothments were usual down to the time of the Reformation. The ceremony is said to have consisted in "the interchangement of rings, the kiss, the joining of hands, to which is to be added the testimony of witnesses." Whoever, after betrothment, refused to proceed to marriage, was liable to excommunication, till that species of punishment was abolished by 26 Geo. II. c. 33. The only remedy now for the aggrieved party is an action at common law for breach of promise of marriage.

Betting. (*See* Gaming.)

Betula, *bet'-u-la*, in Bot., the Birch, a gen. of trees or shrubs belonging to the nat. ord *Betulaceæ*. With the exception of *B. antarctica*, an evergreen shrub found in Terra del Fuego, all the species flourish beyond the tropic in the northern hemisphere. *B. alba*, the common birch, is one of the most beautiful of our forest trees, and is found in most of the northern parts of Europe and Asia. Under favourable circumstances it grows to the height of sixty or even seventy feet; but as it approaches both the northern and southern limits of its native region, it gradually decreases in size, and ultimately appears as a mere bush. The leaves are small, of an ovate-triangular shape, and doubly serrated. The bark is smooth and silvery white, and the outer layers are thrown off as the trunk increases in diameter. This tree yields useful timber for turnery, hoops, fish-barrels, cattle-yokes, and other articles in which lightness is of more importance than durability; the wood is also employed for making charcoal. The bark is valuable as a dye-stuff, and, being exceedingly tough, is turned to a variety of uses by the poor of Northern Europe. Light boats, or canoes, are formed of it by the Russians on the Volga; it is sometimes employed instead of slates for roofing houses, sometimes twisted into ropes, and is even used for making hats, shoes, and drinking-vessels. The outer layers yield an oil which is much prized by the tanner; it is this which gives Russia leather its peculiar odour. In the spring the sap of the birch contains much sugar, it forms, when fresh, an agreeable beverage; when fermented, it constitutes what is called birch wine, a liquor employed medicinally in domestic practice for stone and gravel. The young twigs are in general use for besoms. In former days they were thought to be indispensable instruments of education, and, in the school-boy's mind, were ever associated with the Latin grammar. The graceful tree known as the weeping-birch, and which will be suggested to all by the last sentence, is generally regarded as a mere variety of *B. alba*; but a few botanists view it as a distinct species, and name it *B. pendula*. *B. nigra*, the black birch of North America, yields a fine-grained valuable timber, and, like the common birch, a saccharine juice. *B. papyracea*, the paper birch, is a native of the more northern regions of the same continent; it is remarkable for its tough bark, which is used by the Indians as a substitute for paper, and for constructing canoes, boxes, and baskets. *B. lenta*, another American species, commonly known as the cherry-birch, yields the timber called mountain mahogany: its bark is one of the sources of the volatile oil called oil of winter green. (*See* Gualtheria.) The bark of the Asiatic species, *B. bhujapaltra*, is used in India as paper, and for lining the tubes of hookahs.

Betulaceæ, *bet-u-lai'-se-e*, in Bot., the Birch fam., a nat. ord. of dicotyledonous plants, in the sub-class *Monochlamydeæ*. All the species are either trees or shrubs. The flowers are unisexual, the fertile being in one catkin and the barren in another. In each, small scales take the place of a true calyx. The fruit is dry, indehiscent, and one-celled, with a single seed. There are but two genera, *Betula* and *Alnus* (which *see*), and about sixty-five species, almost all natives of the colder regions in the northern hemisphere. Many of these are very valuable either for their timber, or for their astringent, tonic, and febrifugal barks.

Between Decks (Ang.-Sax.), in Mar., signifies the space contained between any two whole decks of a ship.

Bevel, or Bevil, *bev'-el*, a term used by builders to express a surface sloping from another, as an angle

greater or less than a right angle: thus, if the edge of a thick board or stone, in which the upper or lower surface and the surface of any of the sides are at right angles to each other, be taken off with a plane or any instrument, to present a new surface sloping at an [illegible] to either of the other surfaces, it is said

of steel working in a groove at one end, so that it may form any angle with the wood less than two right angles. The steel plate can be fastened with a tightening screw when it has been brought to the required [illegible]

BEVERAGE, *bĕv'-ĕr-ĭj* (Lat. *bibere*, to drink), a term applied to all liquids which are used either to quench the thirst, stimulate the stomach, or cause a healthy internal action. There are several kinds of beverages; such as cooling, refreshing, tonic, stimulating, &c. In the Middle Ages, *beverage*, *beveragium*, or *biberagium*, was the money given to a workman, over and above his ordinary wages, for the purpose of buying drink. The afternoon and evening potations at colleges were formerly called *beverages*; it was also a term applied to a treat upon wearing a new suit of clothes; and the drink given by a prisoner upon entering a debtor's gaol was generally called a beverage, or *garnish*.

BEY. (*See* BEG.)

BEZÆ CODEX, *bĕ'-ze ko'-dex* (Beza's Codex), a celebrated manuscript of certain books of the New Testament, presented in 1581, by Theodore Beza, to the university of Cambridge; whence it is sometimes also called *Codex Cantabrigiensis*. It is a thick quarto volume, and contains the four gospels and the Acts of the Apostles, written in Greek, upon vellum, with a corresponding Latin text on every opposite page. In 1793 a facsimile edition of this codex was published, in two vols. folio, under the editorship of Dr. Thomas Kipling, entitled "Codex Theodori Bezæ Cantabrigiensis Evangelia, et Apostolorum Acta complectens, quadratis literis Græco-Latinus." The text of this MS. deviates more from the received [illegible] from the principal MS. authorities than any other, and in critical weight it ranks the lowest of the four leading MSS. The other three are the *Codex Alexandrinus*, in the British Museum; the *Codex Vaticanus*, in the Vatican library; and the *Codex Regius Parisiensis*, in the Imperial Library at Paris. The Beza MS. is very ancient. Dr. Kipling was of opinion that it must have been written before the 3rd century; but the general opinion now is, that it belongs to the latter end of the 5th or 6th century.—Ref. *English Cyclopædia*—Arts and Sciences.

BEZANT, *bĕ-zănt'*, in Numis., a gold coin struck by the emperors of Constantinople, deriving its appellation from Byzantium, the former name of that city. They were the only kind of gold coin current in Europe for a long period of time. It appears that there were various kinds of bezants, differing in size, weight, and the quantity of alloy that was added. The common bezant of Constantinople was worth about nine shillings: it is often found in the form of a flat dish, with the head of our Saviour upon it. The name was afterwards given to gold coins struck in many European countries, and in England up to the time of Edward III. silver bezants were also coined at Constantinople, similar in size to those of gold; and silver coins so called are mentioned in old records to have been current in this country in the reigns of Stephen and John. The only silver coins in the collections of numismatists known by this name are pieces of money struck at Constantinople, about 1100, and at later periods.—Ref. *English Cyclopædia*—Arts and Sciences.

BEZANT, in Her., one of the nine roundlets; a circular charge representing a piece of gold, taking its name from the old Byzantine coin so called. In blazoning armorial bearings in which these charges are found, the metal is not described, as the bezant is always *or*, or gold, and the name itself is therefore sufficient.

BEZANTY, or BEZANTÉE, *bĕ-zănt'-te*, in Her., a shield or charge is said to be bezanty when it is strewed or spotted with a great number of bezants. A cross bezanty is a cross composed of bezants.

BEZOAR STONES, *bĕ-zor'* (Persian, *pa-zahar*, antidote to poison), concretions found in the stomachs of various animals. They are brittle egg-shaped masses, about the size of a small walnut, and are mostly dark olive in colour. On being cut open, they present the appearance of a nucleus surrounded by concentric deposits. They occur principally in the stomachs of oriental goats, deer, and antelopes, and were formerly looked upon as possessing supernatural properties. They cured all diseases, and acted as antidotes against every poison; and were so much sought after as to be worth ten times their weight in gold. The most valued of these was obtained from the wild goat of Persia, and was called the *Lapis Bezoar Orientalis*. They are found, more or less, in all herbivora, and sometimes occur in the stomachs of persons living much on farinaceous food. They contain litho-tellic and ellagic acids.

BHAGAVAD-GÎTÂ, *bah'-ga-vad ge-tà'* (*i.e.* Revelations of the Deity), is the name of a very celebrated religio-philosophical didactic poem, dating from about the 1st century of the Christian era, and which is interwoven as an episode in the great Indian epic poem of the Mahâbhârata. It comprises a complete system of the religious philosophy of India. The best edition of the text, with a Latin translation, is that of A. W. von Schlegel (Bonn, 1846). There is an English translation of the work by Wilkins (London, 1785), and one by Thomson (1855); and a German translation by Peiper (Leipsic, 1848).—*Ref.* W. von Humboldt, *Ueber die unter dem Namen Bhagavad-Gîtâ bekannte Episode des Mahâbhârata*. Berlin, 1827.

BHANG, *bang*, the common Indian name for the seed-capsules and larger leaves of the native hemp employed for making the celebrated narcotic called *Hashisch* (which *see*). The Indian hemp is a species of the genus *Cannabis* (which *see* also).

BI, *bi* (Lat. *bis*, twice), a syllable signifying twice or double, and used as a prefix in certain compound names; as *biceps*, two-headed; *bicuspis*, two-pointed; *bi-carbonate*, a carbonate with two equivalents of carbonic acid to one of base.

BIBASIC ACID, *bi-bas'-ik*, in Chem., an acid which requires *two* equivalents of a protoxide of a base to form a neutral salt, such as the pyrophosphoric, lactaric, and malaceic acids.

BIBIRU. (*See* NECTANDRA.)

BIBLE, *bi'-bel* (Gr. *ta biblia*, the books), is the name first applied by Chrysostom, in the 4th century, to that collection of sacred writings which is regarded by Christians as the revealed word of God. These writings are divided into two parts, the Old and the New Testament, the former containing 39 books, the latter 27. The Old Testament only is regarded as sacred by the Jews; but both the Old and New Testament are held as sacred by Christians. The term testament is a translation of the Latin *testamentum* of the Vulgate, which, in turn, is a translation of the Greek word *diatheke*, a covenant. In the New Testament, the Old Testament writings are designated as the Scripture, the Scriptures, or the Holy Scriptures. About A.D. 150, the term Holy Scriptures is used to include the Gospels; and frequently calls the whole collection of the books of the Old and New Testament the divine Scriptures and the Lord's Scriptures. The Old Testament is a name used by St. Paul (2 Cor. iii. 14), being a translation of the Greek expression *palaia diatheke*, old covenant.

*The Old Testament*.—The Jews divided the books of the Old Testament differently from the present method, so as to make only 22, and thereby to correspond with the number of letters in their alphabet. They divided them into the Law, the Prophets, and the Hagiographa or holy writings. The Law comprised the five books of Moses. The Prophets were divided into the earlier prophets, Joshua, Judges, Samuel, and Kings, and the later prophets, which were again subdivided into the greater prophets, Isaiah, Jeremiah, and Ezekiel, and the 12 lesser prophets. The Hagiographa, or holy writings, contained the Psalms, Proverbs, Job, Song of Songs, Ruth, Lamentations, Ecclesiastes, Esther, Daniel, Ezra, Nehemiah, and Chronicles. The first three of these books were called the poetical books, or

truth; the rest, the five rolls, from being read, on certain festivals in their synagogues, from manuscript rolls. As to the arrangement of the different books, the Jews not only differed from the Christians, but are not even agreed among themselves. The arrangement followed by Protestants generally is that adopted by Martin Luther. The Old Testament was written in Hebrew, with the exception of certain later portions in Chaldee. Little is known of the history of the sacred books previous to the time of the Jewish captivity. According to the command of Moses, "the book of the law" was "put in the side of the ark." It is probable that to the same sanctuary were consigned, as they were produced, the other sacred books. After the completion of the temple, Solomon directed that these books should be removed into it, and, also, that the future compositions of inspired men should be secured in the same place. On the capture of Jerusalem by Nebuchadnezzar, and the consequent destruction of the temple, the autographs of the sacred books are supposed to have perished; but, doubtless, numerous copies of them existed at that time, some of which were carried by the Jews to Babylon; for we find Daniel (Dan. ix. 2, 11—13), when in captivity, referring to the law, and also expressly mentioning the predictions of Jeremiah, which he could not have done if he had not seen them. After their return from captivity, we are told that the people requested Ezra to bring forth "the book of the law of Moses, which the Lord had commanded to Israel" (Neh. viii. 1). Accordingly, Ezra is said to have collected as many copies of the sacred writings as he could, and from them to have prepared a correct edition. From the time of Ezra, the Hebrew canon is generally considered to have been completed, and Josephus affirms that from the time of Artaxerxes down to his own day, no one had dared either to add to, or to take from, or to alter, anything in the sacred books. Great care was taken by the Jews to preserve the accuracy of the sacred text, and from an early period they were in the habit of numbering the words and even letters of each book. In the Talmud a digest of Jewish laws compiled between the 2nd and 6th centuries, an enumeration of the various readings in different MSS., as well as the words and letters in the Bible, is given. When the Talmud was completed, the Masorites of Tiberias commenced their labours. They were named from *masora*, tradition, as their annotations were the oral traditions which had been handed down from previous centuries. They are said to have first divided the different books and sections into verses, and to have invented the vowel-points and accents. They marked the number of verses in each book, and the number of words and letters in each verse. They noted the verses where they thought something was forgotten, the words which they believed to be changed, the letters which they thought superfluous, the repetitions of the same verses, the different readings, the words which are redundant or defective, the number of times that the same word is found in the beginning, middle, or end of a verse, the different significations of the same word; such were some of the labours of the Masorites to insure the accuracy of the text. As to the value of the labours of the Masorites, biblical critics are much divided in opinion. Some maintain that we are greatly indebted to them for preserving the purity of the sacred text, while others are of opinion that they corrupted the text by substituting for the ancient and true reading of their forefathers, another more favourable to their prejudices, and more opposed to Christianity. The general opinion, however, is, that they discharged their duties in a fair and conscientious manner. The oldest versions of the Hebrew Scriptures are the Samaritan Pentateuch, and the Septuagint or Greek translation. The former of these is supposed to date from about the time of the Babylonish captivity; for it is not likely that, after that time, on account of the enmity that existed between the two peoples, they would have translated and adopted the books of the Jews. The Samaritan Pentateuch now extant is said to be a version from the earlier Hebrew Samaritan, into the more modern Samaritan, and was made before the time of Origen. Much difference of opinion has existed as to the value of the Samaritan Pentateuch; but it is now generally agreed that it is on the whole much inferior to the Hebrew MSS. The Septuagint is said by some to have been so called from having been approved by the Sanhedrim, or great council of the Jews, who were seventy in number. According to another account, Ptolemy Philadelphus, when founding his library at Alexandria, wished to have a copy of the Jewish laws, and applied to Eleazar, the Jewish high-priest at Jerusalem, for proper persons to translate the Hebrew Scriptures into Greek. Eleazar accordingly sent six elders from each of the twelve tribes, seventy-two in all,—whence the work was termed Septuagint, seventy being a round number. There is no doubt that the version of the Septuagint was written at different times, and by different hands. The Pentateuch was first translated probably in the reign of Ptolemy Lagus, or of his son Philadelphus, and it is allowed to have been done with great fidelity and accuracy. Next in point of excellence is the version of the Proverbs. The Psalms and the Prophets have been very indifferently executed. The Septuagint version was in great esteem among the Jews in the time of Christ; and very many of the quotations in the New Testament are made from it. Josephus, too, makes more use of the Septuagint than of the Hebrew text; but at a later period, when the Christians employed the Septuagint, the Jews rejected it. Fragments of three Greek translations of the Old Testament, all of, or near the 2nd century of the Christian era, are preserved in the Hexaple of Origen known as those of Aquila, Theodotion, and Symmachus, of which the first is the most valuable. The principal of the other early translations are the Syriac or Peshito (literal), from the Hebrew, made about the end of the 1st century, and embracing both the Old and New Testaments; the Coptic, from the Septuagint, probably about the 3rd century, and including the New Testament; the Ethiopic, from the Septuagint, probably in the 4th century, including also the New Testament; the Armenian, by Miesrob, from the Septuagint, in the beginning of the 5th century; the Italic, from the Septuagint, in the 1st or 2nd century, embraced also the New Testament,—but only fragments of it now exist; the Vulgate, which is the great authority with the Roman Catholics, was made from the Hebrew by Jerome, A. D. 390; the Gothic version of Ulphilas, of the 4th century, but of which only a part only has come down to us. From a belief in the absolute integrity of the Hebrew text, in consequence of its supposed preservation from error by the Masora, it was not until the 17th century that any extensive collation was made of the various Hebrew MSS. Among the first to call attention to this subject was Louis Capell, who, in his "Critica Sacra," published at Paris in 1650, called attention to the differences that existed between the Hebrew and Samaritan Pentateuch, and between the Hebrew text and the Septuagint version. At length the necessity of a collation of Hebrew MSS. began to be generally acknowledged; and some attempts to that purpose were made by several subsequent editors of the Hebrew Bible. The first great attempt made for that purpose, however, was that of Dr. Kennicott, commenced about 1760. The first volume was published in 1766, the second in 1780. The total number of *Codices* collated by or for Dr. Kennicott was 694, of which 634 were MSS., 43 printed editions, and the remaining 17 were copies of the Talmud, rabbinical works, and collections of various readings. Of these, about 250 MSS. were collated by Dr. Kennicott himself, and nearly 400 by his coadjutor M. Bruns, of the university of Helmstadt. Of these, some were collated throughout; others only in a few select passages, from being written in conformity with the same standard. In the opinion of Dr Kennicott, fifty-one of these MSS. were from 600 to 800 years old, and 174 from 400 to 600. Soon after this, Professor De Rossi, of Parma, published his various readings of the Old Testament in 4 vols. 4to, entitled, "Variæ Lectiones Veteris Testamenti ex immensa Manuscriptorum editorumque Codicum congerie hauste et examinatæ" (Parmæ, 1784-88), to which a supplement was added in 1798. He re-examined many of the MSS. collated for Dr. Kennicott, and verified the extracts from them, besides examining numerous additional MSS. and printed editions; so that the total number of MSS. and editions examined by him amounts to about 1,200. Of the immense mass of

various readings which these collations exhibit, multitudes are insignificant, consisting frequently of the omission or addition of a single letter in a word. They serve, however, to show the authenticity and integrity of the sacred text in all that constitutes the proper essence and substance of divine revelation,—its doctrines, moral precepts, and historical relations.

*New Testament.*—The books of the New Testament were originally written in Greek. They were composed at different times, and for different purposes. They must have for some time circulated singly, but when or by whom they were collected into one book is uncertain; it seems, however, to have been done by degrees, and that some books were much longer in being received into the canon than others. The first evidence that we have of the existence of the collected books is in the Muratorian canon of the West, evidently written about A.D. 170. It is only a fragment, mutilated both at the beginning and the end; but it commences with a clear reference to St. Mark's gospel, and then passes on to St. Luke as the third, then St. John, the Acts, and the thirteen epistles of St. Paul. The epistle of Jude, the two epistles of John, and the Apocalypse of St. John, are mentioned in the text. The canon of the Peshito forms a remarkable complement to this catalogue. It includes the four gospels and the Acts, fourteen epistles of St. Paul, 1 John, 1 Peter, and James, omitting Jude, 2 Peter, 2 & 3 John, and the Apocalypse. Up to this point, therefore, 2 Peter is the only book that is not recognized as an apostolical and authoritative writing. (*See* Smith's *Dictionary of the Bible*, art. *Canon*.) The testimony of Eusebius as to the received books of the New Testament in his day is of value. He divides them into two classes, the acknowledged books and the disputed books. In the former class are the four gospels, the Acts of the Apostles, the fourteen epistles of St. Paul, 1 John, and 1 Peter; the disputed books he divides into two classes,—those which are generally recognized as authentic, and those which are considered spurious; the former comprising the epistles of James, Jude, 2 Peter, and 2 & 3 John; the latter the Acts of Paul the Shepherd, the Apocalypse of Peter, and the Apocalypse of John (if not a work of the apostle). Down to the time of the invention of printing, the books of the New Testament were preserved in manuscript; but the vigilance produced by the constant controversies between the Catholics and heretics has served to maintain its general purity. Of the MSS. of the New Testament, upwards of 1,400 are known to scholars, and have been collated without any essential differences being found between them; numerous errors, however, had crept in, from the commutation of letters, transposition of words, seeing and hearing incorrectly, abbreviations, attempts at correcting the text or making it clearer. Modern critics reckon no fewer than 80,000 discrepancies in the various MSS. The oldest MSS. belong to about the 4th century, and are written in the uncial characters; the modern, from the 10th century downwards, are in the cursive characters. The most important MSS. are the Codex Alexandrinus, in the British Museum; the Codex Vaticanus, in the Vatican, at Rome; the Codex Regius Parisiensis, in the imperial library at Paris; and the Codex Bezæ, or Cantabrigiensis, in the library of Cambridge university. The first printed edition of the entire New Testament was that of the Complutensian Polyglot, published at the cost of the celebrated Cardinal Ximenes. It was commenced in 1502, and the printing of the book was finished in 1514, but the publication was delayed till 1522. Meanwhile, Erasmus, in 1516, published his first edition of the New Testament. Stephens' first edition appeared at Paris in 1546. The first attempt at a critical edition was made by Beza; and the first edition was published in 1565. The first truly critical edition is that of Dr. John Mill (Oxford, 1707), in which are gathered together 30,000 various readings. Bengel, Wetstein, Griesbach, and Scholz, followed in the same field. Scholz's first volume appeared in 1830, and the second in 1836; he describes no less than 674 different MSS., of which 331 were, for the first time, collated by himself.

*English Bible.*—It is probable that soon after the introduction of Christianity into this country, portions of the Scriptures were translated into the language of the people. The earliest version of which we have any account is a translation of the Psalms into the Saxon language, by Aldhelme, or Adhelme, first bishop of Sherborne, about the year 706. A Saxon version of the four gospels was made by Egbert, bishop of Lindisfern, who died 721. By some writers, Bede is said to have made a complete translation of the whole Bible; but this seems doubtful, though he certainly did translate portions of it. King Alfred executed a translation of the Psalms, and Elfric, archbishop of Canterbury, is said to have executed a translation of the Pentateuch and certain other portions of Scripture, about 995. The first English translation of the whole Scriptures is supposed to have been made in the 13th century; and towards the end of the 14th century, one John de Trevisa, a native of Cornwall, is said to have made a translation of the entire Bible. This was, at any rate, done by his celebrated contemporary John Wickliffe, rector of Loughborough, in Leicestershire. With the aid of various assistants, he, about the year 1350, translated the entire Bible from the Latin Vulgate into English. A complete edition of this translation was published in 1851, at the Oxford University Press, under the editorship of the Rev. Josiah Forshell and Sir Frederick Madden. The New Testament from this version had previously been published by John Lewis, a clergyman of Margate, in 1731, and by Mr. Baber, of the British Museum, in 1810. From the time of Wickliffe, the authorities of the English church did all they could to discountenance the circulation of the Scriptures in the language of the people; so that it was not till 1526 that a Bible or Testament was printed in English, and then only at a foreign press. William Tyndale resolved to accomplish this object, and, with this view, he went over to the continent. In 1526 he completed an English translation of the New Testament, which was printed in two editions, one in quarto, the other in duodecimo. Copies of these were secretly conveyed into England, where they were immediately bought up and burned; but this only stimulated Tyndale to greater exertions, and enabled him to carry on his operations. He next proceeded to prepare a version of the Old Testament, and published a translation of the Pentateuch and the book of Jonah. He did not, however, issue a complete translation of the Bible. The first English version of the whole Bible is that by Mark Coverdale, a friend of Tyndale, and which was printed at Zurich in 1535, and dedicated to Henry VIII. It was favourably received by the court, and it was enjoined that a copy of this translation should be laid in the choir of every parish church in England, for every one to read at his pleasure. Reprints of this edition were published in 1838 and 1847. The next English Bible, also printed abroad, is known

Matthew's Bible, from Thomas Matthew, the assumed name of the editor (John Rogers), also a friend of Tyndale. It was published in 1537, and the text is that of Tyndale and Coverdale, slightly altered. The Great Bible, or Cranmer's, so called from the preface being written by that prelate, was published in 1539: the text is Coverdale's revised. In the same year appeared the Traverner's Bible, by Richard Traverner, the text of which is based upon that of Matthew's Bible. The next important translation was the famous Geneva Bible, which appeared in 1557. During the reign of Mary, several of the more prominent Reformers took refuge in Geneva; among whom were Coverdale, Gilby, and Whittingham. They employed themselves in preparing a new edition of the Bible, accompanied with notes. From the strong leaning which it showed to the views of Calvin and Beza, it was long the favourite Bible of the English Puritans and the Scotch Presbyterians. This edition is frequently called the Breeches Bible, on account of the rendering of Genesis iii. 7, "and they sewed fig-tree leaves together, and made themselves breeches." The Bishop's, or Parker's Bible, so called from Matthew Parker, archbishop of Canterbury, who, with eight bishops, and several other scholars of reputation, revised the previous translations, and compared them with the originals. This edition appeared in 1568. The Douay Bible, which is the Roman Catholic version of the Scriptures, is a translation of the Vulgate: the New Testament was published at Rheims in 1582, and the Old Testament at Douay in 1609-10. King James's Bible, the one

still in universal use in this country, was prepared in the reign of James I. At a conference of divines at Hampton Court, in the beginning of 1604, for settling the peace of the Church, the importance of a new translation of the Scriptures was brought prominently forward. It met with the approval of the king, and arrangements were at once made for carrying out the project. Fifty-four scholars, most distinguished for that kind of learning which this duty required, were selected for the work, and finally forty-seven of them undertook it. These were divided into six companies, to each of which a certain portion of Scripture was assigned. Each person of a company was to prepare a translation of the whole portion committed to that company, and these several translations were then revised at a general meeting of the company. When a company had in this way agreed upon their version, it was to be transmitted to each of the other companies, so that no part was to be without the sanction of the whole body. Two of the companies sat at Westminster, two at Oxford, and two at Cambridge. The final revision of the whole was conducted in London by two delegates from each of the six companies. These twelve scholars were occupied for nine months in the discharge of their critical duties. The work of translation and revision occupied from 1607 to 1610, and it came forth from the press of Robert Barker in 1611. The best evidence of the excellency of this translation is that it has remained in general use to the present time. Many are, indeed, of opinion that the time has now arrived when a new translation is necessary, and that, from our improved knowledge of the originals, and our better understanding of the general principles of translation, a greatly improved version would be the result; but such opinion has not yet met with a general response. There have, however, been many translations of particular books by private individuals. —*Ref.* Davidson's *Biblical Criticism;* Horne's *Introduction to the Holy Scriptures;* Kitto's *Biblical Cyclopædia;* Smith's *Dictionary of the Bible;* Eadie's *Ecclesiastical Dictionary;* Knight's *English Cyclopædia.*

Bible Prohibition.—The prohibition of the Bible to the laity, as held by the Roman Catholic church, took its rise in the Middle Ages; for there is abundant evidence showing that it did not exist in the early ages of the Church. From the time that Gregory VII., in 1080, declared that the Latin language should be the language of the Church, the Vulgate became the scripture text; and, consequently, the public use of vernacular copies of the Scriptures ceased. It was not, however, till 1199 that Innocent III., with a view to check the spread of the reformed principles of the Waldenses, prohibited the private possession or reading of the Scriptures without the permission of the Church. Similar prohibitions were issued at Toulouse (1229), at Beziers (1233), and at the synod of Oxford (1383), when the principles of Wickliffe were spreading. Since that time, numerous enactments of the Church have been made on this subject, one of the latest being that of Leo XII. (1824), in which he condemned Bible societies.

Bible Societies are associations formed for circulating copies of the Holy Scriptures. Among the earlier and more important of these associations were the Society for Promoting Christian Knowledge, established in 1698; the Society for sending missionaries to India, established in Denmark 1705; the Society for Promoting Christian Knowledge in the Highlands and Islands of Scotland, formed in Edinburgh 1709; the Moravian Missionary Society, founded in 1732; the Book Society for Promoting Religious Knowledge among the Poor, formed in London 1750; and the Naval and Military Bible Society, established in the year 1780. The efforts, however, of all these societies were still far from being equal to the object in view. The first idea of establishing the British and Foreign Bible Society arose from the great scarcity of Bibles in Wales; and the earliest steps towards its formation were taken in 1802. On March 7, 1804, a public meeting of about 300 persons of various religious denominations was convened; and it was then resolved that a society be formed, under the designation of the British and Foreign Bible Society, the sole object of which shall be to encourage a wider diffusion of the Holy Scriptures. A committee of thirty-six individuals, of various religious opinions was also named to carry out the arrangements. One of the rules then passed was that the governing body was to consist of 36 laymen, of which 15 were to be churchmen, 15 dissenters, and 6 foreigners resident in or near the metropolis. Every clergyman or dissenting minister who is a member of the society is entitled to attend and vote at any of the meetings of the committee. One of the fundamental rules of the society was, that it was to promote the circulation of the Scriptures, without note or comment, both at home and abroad. This subsequently gave rise to several controversies; at one time certain divines of the Church of England insisting that the Prayer-book ought to be given along with the Bible; and, more recently, the circulation of the Apocrypha on the continent, along with the canonical books of Scripture, led to a prolonged controversy. (*See* Apocryphal Controversy.) The British and Foreign Bible Society soon became the parent of numerous other associations for the circulation of the Holy Scriptures; and at present there are in connection with it about 700 auxiliary societies, a like number of branch societies, and about 2,000 associations. The income of the society for the year ending 31st March, 1861, was £250,850; of which £167,164 was derived from subscriptions, donations, legacies, interest, &c.; £82,909 from receipts for Bibles, Testaments, and drawbacks of duty; and £777 from special contributions to the Chinese New Testament and India fund. The total expenditure for that year was £165,162; and the number of Bibles, or portions of Bibles, issued from London during that year was 1,787,398. From the establishment of the society down to 1861, they had issued no fewer than 39,315,226 copies of the Bible, or portions of it. The Society for Promoting Christian Knowledge ranks next to the British and Foreign Bible Society in its efforts to diffuse copies of the Holy Scriptures, although its operations are not confined to that object. The average annual issue of this society is about 150,000 Bibles, 75,000 New Testaments, and 300,000 Common Prayer-books; besides other books and tracts amounting to about 4,000,000. Like the Bible Society, it issues translations of the Scriptures in foreign languages, and has its agents for promoting the diffusion of the Scriptures abroad. The Edinburgh Bible Society was instituted in 1809. Its average annual income is about £4,000; and it distributes annually about 3,500 Bibles, a large portion of which are in the Gaelic language, and are circulated in the Highlands and islands of Scotland, and in the colonies. In the United States of America the first Bible Society was that established at Philadelphia, in 1808. In 1817 the American Bible Society was formed at New York. It has now about 1,200 auxiliary societies in all parts of the United States, and has an annual income averaging about £80,000; of which rather more than one-half is derived from the sale of Bibles and Testaments; the rest from donations, collections, &c. It issues annually upwards of 700,000 Bibles, Testaments, or portions of Scripture. Its head-quarters, the Bible-house, is a large and magnificent building, erected by public subscription. On the continent of Europe, the first foreign Bible society was that formed at Nürnberg, 1804; but the seat of its operations was subsequently transferred to Basel. In 1805 a Bible society was formed in Berlin, which subsequently became merged in the Bible Society of Prussia, established in 1814. This is the most flourishing of the German societies: and it has issued upwards of 2,000,000 copies of the Bible and New Testament. In 1813, the Russian Bible Society was established in St. Petersburg. It carried on its operations with great activity; but it was suppressed, by order of Nicholas, in 1826. A Protestant Bible society has since been formed for the purpose of supplying Protestants in Russia with the Holy Scriptures. In Paris, a society was formed in 1818, and still exists, under the name of the French Protestant Bible Society. There are similar societies at Stockholm, Copenhagen, Hamburg, Lubeck, Dresden, Frankfort-am-Main, Stuttgart, &c.

Biblia Pauperum, *paw'-pe-rum* (Lat., Bible of the poor).—Before the invention of printing, a copy of the Bible being rare and expensive, the principal subjects of the Old and New Testament were represented in some forty or fifty pictures, with a short explanation or

texts of Scripture underneath each. This was called the "Biblia Pauperum." It and a similar, but more extended work, called "Speculum Humanæ Salvationis" (the Mirror of Human Salvation), in a great measure took the place of the Bible in the Middle Ages, and were the chief text-books used by the clergy in addressing the people. Many copies of these works still exist.

BIBLICAL ANTIQUITIES, or BIBLICAL ARCHÆOLOGY, *ar-ke-ol'-o-je*, is the name given to that science which treats of the antiquities, the political constitution, customs, manners, &c., of that people with whom the Holy Scriptures originated, or those to whom it refers. A knowledge of biblical archæology is indispensably necessary to a right understanding of many parts of Scripture. Though this study primarily regards the Jewish people, yet the manners, customs, &c., of the neighbouring Semitic nations necessarily form part of it. The principal sources of this knowledge are the Old and New Testaments, the books of Josephus on Jewish antiquities and the wars of the Jews, the writings of Philo, the Talmud and the Rabbinical works, the Greek, Roman, and Arabian writers, ancient monuments, and the works of modern travellers. For the first work on Hebrew archæology we are indebted to Dr. Thomas Godwyn, whose book, "Moses and Aaron, or Civil and Ecclesiastical Rites used by the Ancient Hebrews," appeared at Oxford in 1616. The Germans have particularly distinguished themselves in this department, and among the more recent works that have appeared, are Warnekro . 'Entwurf der hebr. Alterthumer" (Weimar, 1781, 5th edit. 1832); Jahn, "Bibl. Archæologie" (5 vols. Vienna, 1796—1805); Bauer, "Lehrbuch der hebr. Alterthumer" (Leipsic, 1797); De Wette, "Lehrbuch der hebr. jüd. Archæologie" (Leipsic, 1814, 2nd edit. 1830); Rosenmüller, "Handbuch der Bibl. Alterthumskunde" (Leipsic, 1823); Winer, "Bibl. Realwörterbuch" (3rd edit. Leipsic, 1847). In English, there are a translation of an abridgment of Jahn's "Biblical Archæology," by Professor Upham (1827); Horne's "Introduction to the Holy Scriptures" (vol. 3); Kitto's "Pictorial Bible;" and the cyclopædias of Kitto, Smith, Eadie, &c.

BIBLICAL CRITICISM is that science which concerns itself with the origin, history, and present state of the original text of Scripture. It comprises a critical knowledge of the languages in which the Scriptures were originally written; the composition, collection, and preservation of the different books; the age, character, and relationships of the various MSS.; the various readings; and the different philological and historical means to be employed, in order to determine what the text was as it proceeded from the different penmen. Its tendency is not, as is said by some, to weaken or destroy the foundations of Christianity, but, on the contrary, to strengthen and increase them, by proving the authenticity and genuineness of the Holy Scriptures. It is divided into two kinds, a lower and a higher,—the former merely concerning itself with the words as they stand in the various MSS or printed texts; the latter implying the exercise of the reason in judging of the texts from the context, from the circumstances of the writers, &c. Of these two, the former is the more important and reliable; the l . being more open to conjecture, is liable to be abused. Biblical criticism is of comparatively recent origin. It arose, partly at least, in consequence of the contro- in which men became involved on subjects, and the necessity of h to which to refer. It is utterly i... ble for human caution and diligence to guard against the slightest departure fro uthe al rds ceribing, and, consequently, in the course of many centuries, and by being frequently transcribed, numerous different readings had arisen, which it became necessary to decide between, and to weigh the evidence by which they were respectively supported. The authentic reading must be determined by authorities, and these authorities are judged of by certain rules. Biblical criticism, then, in its strict and proper sense, comprehends "the sum and substance of that knowledge which enables us to discover a wrong reading, to remove it from the text, and to obtain, as nearly as possible, the original words of the Bible." It is distinct from interpretation, but it forms the basis of it; for before we try to ascertain the meaning of an author, we should be careful to see that we have his words. "There are five sources," says Dr. Davidson, "from which criticism derives all its aid in ascertaining the changes that have been made in the original text of the Bible, and replacing authentic readings excluded by them." These are—1. Ancient versions of the Sacred Scriptures; 2. Parallels, or repeated passages; 3. Quotations; 4. MSS., or written copies; 5. Critical conjecture. (*See* BIBLE.)—*Ref.* Dr. Davidson's *Treatise on Biblical Criticism*; Porter's *Principles of Textual Criticism*.

BIBLICAL INTERPRETATION, or SACRED HERMENEUTICS, is the science of teaching or expounding the meaning of the Sacred Scriptures. When the interpreter has obtained a pure text by the results of criticism, he enters upon another and a more important field,—that of its interpretation. He has now a twofold duty to perform: first, to associate in his own mind, with the terms, the exact idea which the Spirit intended they should symbolize; and, secondly, to excite the same idea in others by means of spoken or written signs. He has to apprehend the meaning of Scripture, and to exhibit it when apprehended, so as to be intelligible. Biblical interpretation is either grammatical or historical,—grammatical, when the meaning of the words, phrases, and sentences, is made out from the *usus loquendi* and the context; historical, when the meaning is illustrated and confirmed by historical arguments, which serve to evince that no other sense can be put upon the passage, whether regard be had to the nature of the subject or to the genius and manner of the writer. (*See* HERMENEUTICS.)—*Ref.* Davidson's *Sacred Hermeneutics*.

BIBLICISTS, or BIBLE DOCTORS, *bibl'-li-sists*, in Eccl. Hist., was a name given, in the 12th and 13th centuries, to those doctors or learned men that made the Holy Scriptures the chief subject of their study and the text of their lectures. The scholastics, on the other hand, brought all the doctrines of faith, as well as the principles and precepts of practical religion under the dominion of philosophy. The scholastics came to be regarded as men of much more ability and ingenuity than the biblicists, and their lectures were flocked to and admired by the young; and, consequently, the Bible doctors were despised. They had few scholars, and had not even a stated time for reading their lectures in any of the famous European universities. The scholastic theology, with its trifling biblities, prevailed in all the universities and colleges of Europe down to the Reformation.

BIBLIOGRAPHY, *bib-li-og'-ra-fe* (Gr. *biblion*, a book, *graphe*, a writing), may be defined to be the science of books. Anciently, the term *bibliographia* denoted the writing or transcription of books, and a writer or copyist was termed *bibliographos*. When the transcribing of books ceased, after the introduction of printing, bibliography came to signify an acquaintance with ancient manuscripts, and a skill in the deciphering of the The term was not used in its present signification till about the middle of the 18th century, and it was first introduced in France. Bibliography (for which *bibliology* or *bibliognosy* would be more appro- ) denotes a knowledge of books, with reference to their constituent parts, their different editions and degrees of rareness, their subjects, authors, classes, &c. There are some who would include under bibliography many other branches of k ledge, indeed, so ide ible to lay down any limits for the nce at all The sphere and duties of the bibliographer are well and clearly laid down in the "It sit of the biblio- the trace the history of books in regard to their forms and other constituents, and consequently to trace the beginnings and progress of typography. It belongs to him in a particular manner to mark the differences of editions, and to point out that edition of every book which is esteemed the most correct and valuable. In the case of books published anonymously or under feigned names, it is his business to indicate the names of their real authors, in as far as the discoveries of literary history may furnish the means of doing so. All remarkable facts attaching to the history of books, such as the number of their editions, their rareness, their having been condemned to the flames, or sup-

pressed, *belong* to the province of bibliographical inquiry. Further, every one who engages in any particular line of study must, of course, wish to know the books that have been published in regard to it, or in regard to any particular point that interests his curiosity; and it is the business of the bibliographer to furnish this most useful species of information; in other words, the compilation of catalogues of those books which have appeared in the various branches of knowledge, constitutes another department or bibliography. It is by means of such catalogues that the student comes to know what has been written on every part of learning; that he avoids the hazards of encountering difficulties which have already been cleared; of discussing questions which have already been decided; and of digging in mines of literature which have already been exhausted." (Art. *Bibliography*, by Macvey Napier, in *Encyc. Brit.*) The number of bibliographical works that have appeared in our own and other countries are so numerous that we can only afford to notice a few of the principal of them. One of the earliest attempts to present a complete survey of printed literature was made by Conrad Gesner, whose "Bibliotheca Universalis," in 1 vol. folio, appeared in 1545. The works are arranged according to the names of their authors; but it is limited to works in Greek, Latin, and Hebrew; so that even in his day it could not be said to be universal. The "Bibliotheca Britannica" of Dr. Robert Watt of Glasgow is, with all its imperfections, a most meritorious and useful work. It was published in 4 vols. 4to (Edinburgh, 1824), in two of which the works are arranged alphabetically, according to their titles, and in the other two according to their authors. It professes to be "a universal catalogue of all the authors with which this country is acquainted; embracing every description of authors, and every branch of knowledge and literature;" and it also gives a large number of work other languages. The other labourers in this field of literature, however, have generally confined themselves within narrower limits. Some confine themselves to books written upon one particular department of knowledge, to works belonging to a particular period, or issuing from a particular press; to anonymous or pseudonymous works, or to rare or curious books. Of these we may mention Lowndes's "Bibliographer's Manual of English Literature," giving an account of rare, curious, and useful books, 4 vols. 8vo, London, 1834 (a new and improved edition of this work is in course of publication, under the editorship of Mr. H. G. Bohn); Darling's "Cyclopædia Bibliographica," a library manual of theological and general literature and guide to books (London, 1857-8); "A Critical Dictionary of English Literature and British and American Authors," by S. A. Allibone, 1 vol. 8vo (Philadelphia, 1859); Horne's "Manual of Biblical Bibliography;" Dibdin's "Library Companion," 1824; Brunet's "Manuel du Libraire et de l'Amateur des Livres," 4th edition, 5 vols. 8vo (Paris, 1842-44) (a new and enlarged edition of this most valuable and useful work is now in course of publication); Querard's "La France Littéraire," 10 vols. (Paris, 1827-42); De Bure's "Bibliographie Instructive, ou, Traité de la Connoissance des Livres rares et singuliers, contenant un Catalogue raisonné de la plus grande partie de ces livres précieux qui ont paru successivement dans la République des Lettres depuis l'invention de l'imprimerie," 7 vols. 8vo (Paris, 1763-8); M. Barbier's "Dictionnaire des Anonymes et Pseudonymes," 4 vols. 1806-9; Ebert's "Allgemeines bibliographisches Lexikon," 2 vols. (Leipsic, 1821-30) (an English translation of this work has appeared in 4 vols. 8vo, Oxford, 1837); Heinsins' "Allgemeines Bücherlexikon," with supplements, 11 vols. (Leipsic, 1812-52); Ersch's "Handbuch der deutschen Literatur," 2nd edition, 4 vols. (Leipsic, 1822-40) (3rd edition, by Geissler, 1845); Vater's "Literatur der Grammatiken Lexika, und Wörtersammlungen aller Sprachen der Erde," 2nd edition (Berlin, 1847).

**Bibliomancy**, *bib-li-o-man'-se* (Gr. *biblion*, a book, and *manteia*, divination), an attempt to gain an insight into futurity by opening the Bible and taking the passage which first offers itself as a means from which guidance or advice may be derived with regard to any worldly matter about which the diviner may be in doubt. Some practised it by going into a place of worship, and taking the first verse of Scripture that might be read after their entrance. The practice of this art was prohibited by some of the councils of the Church in the 5th and 6th centuries. It was introduced into England about 1070, and was much in vogue with the fanatic enthusiasts that were found among the troopers of Cromwell and the soldiers of the parliament, who used this unsatisfactory method of procuring what they imagined to be the divine approbation or disapproval of their plans with reference to the most trifling matters in every-day life. Another method of divining by selecting passages at random from a book, was the *Sortes Virgilianæ*, in which a copy of the works of the Latin poet Virgil was used instead of the Bible.—*Ref.* Chambers's *Encyclopædia*.

**Bibliomania**, *bib-li-o-mā'-ni-a* (Gr. *biblion*, and *mania*, madness,—book-madness), is a word recently formed from the Greek, to denote a passion for the possession of rare and curious books. The true bibliomaniac is not guided in his selection of books by their mere utility or the value of their contents, but rather by some accidental circumstances connected with them. With him, rarity is what gives its chief value to a book; so that he is ever searching after books of which only a few copies have been printed, or are known to exist,—early editions, works that have issued from a particular press, printed in a particular manner, on vellum or on large paper,—books bound in a particular way by a particular binder. The editions of the classics by the Elzevirs and the Foulises are much prized; of the Italian classics, by the Academy della Crusca; the books printed by the Elzevirs and Aldus; those bound by Derome, Bozerian, Lewis, or Payne. At the sale of the library of the duke of Roxburghe, in 1812, a copy of the first edition of Boccaccio's "Decameron," published by Valdarfer in 1471, was sold for the enormous sum of £2,260. This led to the formation of the Roxburghe Club, for the printing of rare or hitherto unedited books, the members of which agreed to dine together annually on the anniversary of the sale of the Boccaccio. (*See* Roxburghe Club.) Dr. Dibdin, in his "Bibliomania; or Book-madness, containing some account of the history, symptoms, and cure of this fatal disease," after giving an account of the eminent book-collectors who have fallen victims to it, describes, as its *symptoms*, a passion for—1. large-paper copies; 2. uncut copies; 3. illustrated copies; 4. unique copies; 5. vellum copies; 6. first editions; 7. true editions; 8. black-letter editions; and prescribes for its cure—1 reading useful works; 2. reprints of scarce and valuable works; 3. editing our best ancient writers; 4. erecting of public institutions; 5. encouragement of bibliography.

**Bibliotheca**, *bib-li-o-the'-ka* (Gr. *biblion*, and *theke*, a repository), properly signifies a library, or repository of books. In literature, it denotes a treatise giving an account or list of all the writers on a certain subject: thus, we have bibliothecas of theology, law, philosophy, &c. There are, likewise, universal bibliothecas, which treat indifferently of all kinds of books; such as Watts's "Bibliotheca Britannica;" also, select bibliothecas, giving an account of none but authors of reputation. (*See* Bibliography.)

**Bicapsular**, *bi-kap'-su-lar* (Lat. *bis*, twice, *capsula*, a capsule), in Bot., having two capsules containing seeds to each flower.

**Bicarburetted Hydrogen**, *bi-kar-bu-rat'-ted*.—Olefiant gas. Also a name applied by Faraday to oil gas. (*See* Carbon.)

**Bice**, or **Bise**, *bise* (Ang.-Nor.), in Paint., a pale-blue colour, which is prepared from the *Lapis armenius* (smalt), and is inclined to be sandy. Bice bears the best body of all bright blues used in common work, but requires good and careful grinding, and is, after ultramarine, one of the best of colours. A green, formed by mixing the blue with orpiment, bears the same name, as do also certain compositions of indigo and verditer with chalk.

**Biceps**, *bi'-seps* (Lat. *bis*, twice, *caput*, a head), in Anat., is a common name applied to several muscles of the human body, from their having two distinct origins or heads. The principal of these are the biceps flexor cruris and the biceps flexor cubiti, the former situated on the hind part of the thigh, the latter on the fore part of the os humeri.

BICÊTRE, *be'-saitr*, a castle and village in the neighbourhood of Paris, situated on a hill, and commanding one of the finest prospects of the capital, of the course of the Seine, and of the environs. Louis XIII. erected the castle for the residence of invalids. When Louis XIV. afterwards built the Hôtel Royal des Invalides, Bicêtre became a great hospital, for which it is well adapted by its healthy situation. Water alone was wanting in its vicinity; to obtain which a well was dug in the rock. Bicêtre contains, also, a house of correction (*maison de force*) for dissolute persons, thieves, swindlers, &c. Since the revolution of 1793, a prison has been erected for those criminals condemned to the galleys, who are afterwards sent to the public dockyards. Both in the prison and in the house of correction are shops for the grinding of glass, and for other kinds of work in which the prisoners are usefully employed. In the hospital, several hundred beds are allotted to aged patients. None are admitted under the age of 70 years: they are attended with the greatest care, and spend their leisure in the construction of little toys of wood or bone. Bicêtre also contains a large hospital for incurable madmen.

BICORNIS, *bi-kor'-nis* (Lat. *bis*, and *cornu*, a horn), is a term sometimes applied in Anat. to the hyoid bone, from its having two processes like horns. Formerly, it was also applied to muscles that had two terminations.

BICUSPIDES, or BICUSPIDATI, *bi-kus'-pids* (Lat. *bis*, and *cuspis*, a spear), in Anat., is applied to the two first pairs of molars in each jaw, from their having two spearlike tubercles.

BIDAL, or BIDALE, *bid'-al* (*bid* and *ale*), an ancient custom in England, by which friends are invited to drink ale at some poor man's house, and there to contribute something to his relief.

BIDDING PRAYER, *bid'-ding*.—It was part of the duty of deacons in the early Christian church to act as monitors and directors of the people in the exercise of their public devotions; hence they made use of certain forms or words to give the worshippers or hearers notice when each part of the service began. Bishop Burnet informs us that before the Reformation, when the priest had announced his text, he called on the people to go to their prayers, telling them what they were to pray for. "Ye shall pray," says he, "for the king, for the pope, for the holy Catholic church, &c." When this was done, the people repeated their prayers, counting them upon their beads, in perfect silence, the priest kneeling down likewise and saying his. The rising of the priest was the signal for all to cease their devotions, and the sermon was then proceeded with. The 55th canon of the Church of England enjoins that before all sermons, lectures, and homilies, the preachers and ministers shall move the people to join with them in prayer in a certain form. This form is known as the bidding prayer, or bidding of prayer, because in it the preacher is directed to bid the people to pray for certain specified objects. It is now rarely used, the practice of reading a collect or some short prayer before sermon being generally substituted for it. The form "Let us pray," repeated before several prayers in the English Liturgy, is taken from this practice of the early Church.

BIELA'S COMET, *be'-la's* (Gr. *kome*, hair), a comet discovered in the month of February, 1826, by a Prussian named Biela, at Josephstadt, in Bohemia. It accomplishes its elliptic revolution round the sun in rather more than six years and a half. It approaches the earth's orbit more closely than any other cometary body that has yet been observed, passing through the descending node of its own path, at a comparatively short distance from the orbit of the earth, and, in consequence, a collision between the comet and the earth was very much feared at one time, until careful calculations of the comet's orbit were made, and all alarm on the subject shown to be groundless. In 1846 the comet was observed to be separated into two parts, which travelled in company, at a distance of about 150,000 miles apart. It was not seen in its perihelion passage in 1859, as the circumstances attending its motion were unfavourable for its observation; but this also occurred in 1839, when it passed without notice. When last observed, in 1852, the two fragments into which it had been divided by some inexplicable means, were plainly noticed travelling onwards through space, at the same relative distance from each other as in 1846.—*Ref. English Cyclopædia*—Arts and Sciences; Lardner's *Handbook of Astronomy*.

BIENNIAL, *bi-en'-ni-al* (Lat. *bis*, twice, *annus*, year), in Bot., a term applied to a plant which springs from the seed one year, but does not flower and seed until the second year, when it perishes. The biennial root is commonly enlarged at the close of the first season, by an accumulation of nutriment intended for the support of the plant during its flowering and fruiting. The carrot or the turnip is a familiar example of such a root.

BIFFIN, *bif'-fin*, an apple baked slowly and pressed flat. Norfolk is celebrated for it.

BIGAMY, *big'-a-me* (Lat. *bigamia*), in Law, is an offence against the holy state of matrimony, and consists of a second marriage, having a former husband or wife still living. Such second marriage is simply void and a mere nullity, by the ecclesiastical law of England; and yet the legislature has thought it just to make it felony, by reason of its being so great a violation of the public economy and decency of a well-ordered state. By the laws both of ancient and modern Sweden, it is punished with death. With us, the statute 9 Geo. IV. c. 31, makes the offence punishable with penal servitude for seven years, or imprisonment with or without hard labour for not more than two years.

BIGHT, *bite* (from the Sax. *bygan*, to bend), the double part of a rope when it is folded, in contradistinction to the end.

BIGNONIA, *big-no'-ni-a* (named after the Abbé Bignon, librarian to Louis XIV.), in Bot., the Trumpet-flower, the typical gen. of the nat. ord. *Bignoniaceæ*. The species are trees or shrubs, usually of a climbing habit, and furnished with tendrils. The leaves are opposite, and generally ternate, pinnate, or conjugate. The flowers are mostly in terminal or axillary panicles. The corollas are trumpet-shaped, and are coloured variously, white, yellow, orange, purple, or rose. All the species are magnificent plants when in blossom, and have long been cultivated by florists. They are, with few exceptions, too delicate to withstand our climate, and will only grow freely in stoves. From the leaves of the species *B. chica*, the Indians of South America obtain a red dye called *chica*, or *carajura*, which they use for painting their bodies and their arrows. This chica must not be confounded with the beverage of the same name. (*See* ZEA.)

BIGNONIACEÆ, *big-no-ni-ai'-se-e*, in Bot., a nat. ord. of dicotyledonous plants, in the sub-class *Corolliflorœ*. They are usually trees or shrubs, often twining or climbing; rarely herbs. They flourish in the hotter parts of Asia, Africa, and America, being unknown in Europe except in a cultivated state. The chief interest of these plants lies in their beautiful trumpet-shaped flowers. There are 44 genera and 450 species.

BIGOT, *big'-ot*, a word applied to a person perversely and obstinately wedded to some practice or opinion, but especially to one who adheres with vehemence to any peculiar notions or extraordinary dogmas upon questions of religion. According to Camden, the use of the word dates from the time when Gisla, daughter of Charles the Foolish, was given in marriage to Rollo, duke of Normandy. When Rollo had received the investiture of the dukedom, he was desired to kiss Charles's foot; but he refused to comply, and on his friends urging him to submit to the ceremony, he replied, in the English tongue, "*Ne se, by God!*" for which the king and his courtiers derided him, and, repeating his answer with imperfect pronunciation, called him *bigot*. After this occurrence, the Normans were ordinarily called *bigots*, or *bigots*.

BIKH. (*See* ACONITUM.)

BILBERRY. (*See* VACCINIUM.)

BILBOES, *bil'-boze*, long bars or bolts of iron, with shackles sliding on them, and a lock at the end, used on some occasions to confine the feet of prisoners, as handcuffs confine their hands.

BILE, *bile* (Lat. *bilis*, said to be derived from *bis*, twice, and *lis*, contention, as being the supposed cause of anger and dispute), is a peculiar oily fluid secreted from the blood by the liver. In man it is generally of a yellowish-brown colour, and has a bitter taste. According to Berzelius, its constituents

are, in 1,000 parts, 908·4 water, 80 picromel, 3 albumen, 4·1 soda, 0·1 phosphate of lime, 3·4 common salt, and 1 phosphate of soda. The primary cells of the liver separate the bile from the blood of the portal vein, and discharge it into small ducts, which unite to form larger ones, terminating in the ductus communis choledochus, whence it is conveyed into the duodenum. It there mixes with the digested food, and performs the important office of fitting it for absorption into the system. The bile thus mixed with the elements of nutrition becomes in part also absorbed; the excrementitious portion passing out of the body, with the other indigestible materials, and imparting their peculiar colour to them. When digestion is not going on, the bile ascends through the cystic duct to the gall-bladder, where it is stored for future use. The principal use of the bile is to separate the chyle from the chyme. It also aids in exciting the peristaltic motion of the intestines, and thus causes them to evacuate their contents sooner than they would otherwise do; for, when there is a deficiency of bile, the bowels are in general extremely torpid. When, owing to some functional derangement, the bile is absorbed into the blood and carried through the system, it imparts yellow tint to the surface of the skin. (*See* JAUNDICE.) When from any cause the bile is in excess in the blood, or when the liver only imperfectly performs its function of secreting it, the person is said to be bilious. (*See* BILIOUS and LIVER.)

BILGE, *bilj* (Ang.-Sax.), of a ship, the bottom of her floor, or the breadth of the part she rests on when aground. Bilge-water is the water which lodges on her floor below the level of the well of the pump, and bilge pumps, or burr-pumps, are those that carry it off. A vessel is said to be *bilged* when her bulge is broken, and she springs a leak.

BILIARY CALCULI (Lat. *calculus*, a small stone). —These are sometimes called gall-stones, and are often found in the human gall-bladder in large quantities. They are either semitransparent and crystalline, or strongly coloured with the bile. They mostly consist of cholesterin deposited on a nucleus of phosphate of lime.

BILIARY DUCTS, *bil'-ya-re*, in Anat., are those ducts or canals which convey the bile from the liver to the duodenum.

BILIOUS, *bil'-yus*, is applied to any complaint proceeding from the bile. It is often indiscriminately used by patients for any derangement of the digestive organs; but though these often proceed from the bile, they do not always do so. Bilious complaints are indicated by a bitter, nauseous taste in the mouth, a foul tongue, and the appearance of the fæces. The best treatment for an ordinary attack of bile is, first, to act upon the bowels by some gentle mercurial purge,—a few grains of calomel or blue pill, followed in four or five hours by a saline draught, so as to freely move the bowels. Tonics should afterwards be resorted to till the digestive organs have recovered their tone. The term bilious is also applied to certain kinds of food which have a tendency to produce bilious affections.

BILIOUS FEVER. (*See* FEVER.)

BILIOUS TEMPERAMENT. (*See* TEMPERAMENT.)

BILL, *bil* (Ang.-Sax. *bill*, a beak), in Orn., the beak or hard horny mouth of a bird, consisting of two mandibles. There is no appearance of lips either in the upper or lower jaw; and, except in the cases of parrots in the fœtal state, and some varieties of waterfowl, they are not furnished with proper teeth. In the two exceptions mentioned, the rudiments of teeth have been observed. A portion of the bill at the base of the upper mandible is covered with a membrane, which is called the *cere*, from the waxy appearance which it presents in some species of birds. It is sometimes covered with feathers, and sometimes it is naked; but it is often found protected by hairs or bristles. The nostrils of a bird are usually situated in the *cere*, but in some cases they are placed so far forward as hardly to be observable. The bills of birds vary in shape according to their habits and the different substances upon which they feed. The bills of birds of prey are very strong, the upper part being hooked, and very sharp, so as to be able to tear and cut to pieces the flesh of the animals upon which they seize. A strong short bill, with the edges sharp and notched, is the usual indication of courage in a bird, and a sign that it preys upon living animals. The great variety in the modification of the forms of bills is very interesting, and is treated of under the names of the different species of birds; such as crop-bills, spoon-bills, horn-bills, parrots, &c. In the case of those birds which live upon insects, the bill is very seldom found hooked, but usually short and slender. The bills of those birds which catch insects flying, are remarkable for their deep division, which enables them to gape widely. Birds which live upon seeds have short but powerful bills, with which they can crush their food. Aquatic birds have, as a general rule, broad sensitive bills, which are provided with laminæ on the inner edge, for the purpose of straining the muddy water, from which they take the principal part of their food. The bills of every species of bird which extracts its food from mud, are modified according to the nature of the food it seeks. Besides the general use of tearing or crushing food, the bills of birds are used when fighting with each other, and also for the purpose of dressing their plumage, building their nests, and for other functions. Many fishes and reptiles have mouths resembling bills, and the *Ornithorhynchus paradoxus* is a singular specimen of a quadruped with a bill.

BILL, a kind of hatchet, made in various forms, and used by plumbers, basket-makers, gardeners, and others. When short, it is called a hand-bill; when long, a hedge bill. The bill is so called from its hooked point, which resembles the beak of a bird. It was formerly used in warfare by the infantry, as a kind of battle-axe. The billmen were principally employed in dispatching the wounded when the enemy was routed.

BILL (from Lat. *bulla*, a seal), a term originally applied to any sealed letter or document, but now used to denote any formal written statement of any kind. (*See* the articles which follow for the particular technical uses of the word BILL.)

BILL, in criminal cases, is an indictment or written accusation of one or more persons, of a crime or misdemeanour preferred to or presented upon oath by a grand jury. When this jury have heard the evidence, if they think it an accusation groundless, or not sufficiently supported by the witnesses called before them, they used formerly to indorse on the back of the bill or indictment *Ignoramus*, or 'we know nothing of it;' intimating that though the facts might possibly be true, that truth did not appear to them; but now they assert in English, more absolutely, "not a true bill," or (which is the better way) "not found;" and then the bill is said to be thrown out, and the party is discharged without further answer (and, by the 8 & 9 Vict. c. 114, without fees); but a fresh bill may afterwards be preferred to a subsequent grand jury, but not at the same assizes or sessions, for the same offence. If they are satisfied of the truth of the accusation, they then indorse upon it, "a true bill" (anciently *ulla vera*). The indictment is then said to be found, and the party stands indicted. To find a bill, there must, at least, twelve of the jury agree. The indictment, when so found (or not found, as the case may be), is then returned, or publicly delivered into court, and the finding of the jury openly proclaimed, and the accused person is called up to plead to it. If he plead guilty, sentence is at once passed; but if he plead not guilty, the case is tried by the petit jury; and if they acquit him, he is discharged, but otherwise he receives the sentence of the court.

BILL IN CHANCERY was formerly the first commencement of a *suit* in the court of Chancery, which is analogous to an action in the common-law courts. There are now two other modes of instituting a suit in Chancery, viz., by claim and summons, according to the matters brought before the court. The bill is in the style of a petition to the lord chancellor. This is in the nature of a declaration at common law, or a libel and allegation in the spiritual courts, setting forth the circumstances of the case at length, as some fraud, trust, or hardship, and *praying relief*: and if the object of the bill be to stay waste or other injury, an injunction is also prayed. Besides bills seeking *equitable relief*, that is, redress in a court of equity, there are others which are merely ancillary to an action at law, of which the object is not to obtain relief in equity,

but only evidence to be used in a court of common law in support or defence of an action brought or to be brought. These are called bills for *discovery*. If such a bill be filed by the defendant in the action, it further prays an injunction to stay proceedings at law in the mean time. As, however, the common-law courts have now the power to order parties to be examined on interrogatories, and to stay proceedings in the mean time, a bill for discovery is not resorted to except in some very special cases.

BILL IN PARLIAMENT. (*See* STATUTE.)

BILL OF ADVENTURE. (*See* ADVENTURE, BILL OF.)

BILL OF ATTAINDER is an act of parliament to attaint particular persons of treason or felony; but, although in former times such a process may have been resorted to, our present laws would scarcely permit such an innovation. It was also in the nature of a writ after judgment against a jury of twelve men that had given false judgment in any court of record. But the practice of setting aside verdicts upon motion, and granting new trials, has so superseded the use of it, that there is hardly any instance of an attaint for this cause later than the 16th century.

BILL OF COSTS. (*See* COSTS.)

BILL OF EXCEPTIONS.—If a judge of a superior court of common law, either in his directions or decisions, misstates the law by ignorance, inadvertence, or design, the counsel on either side may require him publicly to seal a *bill of exceptions*, stating the point wherein he is supposed to err; and this he is obliged to seal by the Statute of Westminster the 2nd (13 Edw. I. c. 31), or if he refuse so to do, the party may have a compulsory writ against him commanding him to seal it, if the fact alleged be truly stated; and if he return that the fact is untruly stated, when the case is otherwise, an action will lie against him for making a false return. This bill of exceptions is in the nature of an appeal, examinable, not in the court out of which the record issues for the trial at *nisi prius*, but in the next immediate superior court, upon a writ of error, after judgment given in the court below. Bills of exceptions are not at present so much in use as formerly, since the more frequent extension of the discretionary powers of the court in granting a new trial, which is now very commonly had for the misdirection of the judge at *nisi prius*.

BILL OF EXCHANGE is a security originally invented among merchants in different countries for the more easy remittance of money from one to the other, and has since spread itself into almost all pecuniary transactions. It may be defined as "an open letter of request from one man to another, desiring him to pay a sum named therein to himself, or to a third person on his account;" and by this method, a man at the most distant part of the world may have money remitted to him from any trading country. If A. lives in Jamaica, and owes B., who lives in England, £1,000, and C. be going from England to Jamaica, he may pay B. the £1,000, and take a bill of exchange drawn by B. in England upon A. in Jamaica, and receive it when he comes thither. Thus does B. receive his debt, at any distance of place, by transferring it to C., who carries over the money in paper credit, without danger of robbery or loss. In common speech, such a bill is frequently called a *draft*; but a *bill of exchange* is the more legal, as well as mercantile, expression. These bills are either *foreign* or *inland*,—foreign, when drawn by a person residing abroad, or in Scotland or Ireland, upon his correspondent in England, or *vice versâ*; and inland, when both the drawer and drawee reside in England. If a bill be made payable (as is most usually the case) *to order*, that is, either to A. B., *or his order*, or merely *to the order* of A. B. (which is in all respects equivalent), it is said to be *negotiable*, a term applied, in law, to *any* instrument, the right of action on which is, by exception from the common rule, freely assignable from man to man; and the payee may, by indorsement, or writing his name in *dorso*, or on the back, assign over his interest in the bill. Such indorsement may either be in *blank* or in *full*. In the former case, the payee simply writes his own name; in the latter, he also names the intended assignee, as the person to receive payment, and to him, in either case, he delivers over or sends the instrument so indorsed; and such assignee (or *indorsee*, as he is called) may indorse in like manner to another; and so on, *in infinitum*. If the bill be payable (as it may be) simply to a person named, and not to order, it is not negotiable; and, on the other hand, if made payable to *bearer* (as is always the case in that species called a *cheque* on a banker), it is negotiable without any indorsement, and by mere delivery; and the case is the same where a bill, payable to order, is indorsed in *blank* by the payee; for it may afterwards be transferred, either by a new indorsement and delivery, or by simply delivering it to the intended transferee. A bill of exchange is *due* (or *at maturity*) on the third *day of grace* after the time expressed for payment on the face of it, unless it be drawn payable *on demand*. If the third day of grace fall upon a Sunday, Christmas-day, Good Friday, or a day of public fast or thanksgiving, it becomes due the day before. At any time before it becomes due, the holder may present it to the drawer for his *acceptance*, which must, in case of an *inland* bill, be by writing on the instrument; but, in case of a *foreign* one, it may be either written or verbal. After acceptance, if the bill be not paid on arriving at maturity, the holder has a right of action against any or either of the parties whose names appear thereon antecedently to his; but such right is subject to the condition that he shall have presented it to the drawee on the day it became due, and that he give reasonable notice of its dishonour or non-payment; that is, under ordinary circumstances, notice on the following day, or, to persons not residing in the same town, by the post of that day, or in case of a foreign bill, by the next ordinary post or conveyance, to all the parties whom he intends to charge, or at least to him whose name was last placed on the bill, in order that the latter may give the like notice to the party next before him; and so in succession, each party being allowed in turn a similar time for the purpose. The original payee can only resort to the drawer. If the drawee *refuse* acceptance,—a refusal which the law will imply, unless he accepts immediately on presentment, or within twenty-four hours after the bill is left with him for the purpose,—the drawer and indorsers are liable to make immediate payment, though the bill has not arrived at maturity; but notice of the non-acceptance must be given, as before stated in reference to the case of non-payment. After this notice, the holder may hold it, and present it for payment when it comes to maturity, without waiving his right of recourse against the other parties. The bill need not, however, be presented for acceptance, unless it be drawn payable at a specified time *after sight* or *after demand*. Where the ceremony of presentment for acceptance is (except in the cases last mentioned) omitted, the bill must be presented for payment; and the same law of proceeding against the drawer and indorsers will then apply, as already stated in reference to the case where an accepted bill is presented for payment. The most common form of a bill of exchange is for the drawer to address it to the intended payer or accepter, who accepts it at once. It then becomes subject to all the incidents above mentioned in the case of an accepted bill. (*For* the law as to *protest*, and acceptance *supra protest*, for honour *of the drawer*, or any *indorser*, and other matters connected with bills of exchange, consult the following writers on this subject:—Chitty, Bayley, Byles.)

BILL OF HEALTH is a certificate or instrument granted by a consul, or other competent authority, to the master of a ship at the time of her clearing out from any port or place suspected of being liable to infectious disorders, declaring the state of health in the place at that time. A *clean* bill imports that at the time the ship sailed, no infectious disorder was known to exist; a *suspected*, or *touched* bill, denotes that there were rumours of an infectious disorder, but that it had not yet actually appeared; a *foul* bill, or the *absence of clean* bills, imports that the place was infected when the vessel sailed. If the ship brings a clean bill of health, the passengers and goods are not subject to any quarantine; but, if a foul or suspected bill, they are subject to quarantines of different duration, according as the plague is known or only suspected to have existed in the country at the ship's departure. (*See* QUARANTINE.)—*Ref.* McCulloch's *Commercial Dictionary*.

BILL (or ACT) OF INDEMNITY.—These are acts of parliament occasionally passed to indemnify persons who have, through forgetfulness, inadvertence, or other causes, done or omitted to do certain acts whereby they have incurred penalties.

BILL OF INDICTMENT. (*See* INDICTMENT.)

BILL OF LADING is an acknowledgment signed by the master of a ship, and given to a merchant or consignor, containing an account of the goods which the master has received on board from him, with a promise to deliver them at an intended place, on payment of freight. Each bill of lading must be treble,—one for the merchant who loads the goods, another to be sent to the consignee, and the third to remain with the master of the ship. A bill of lading is only used when the goods sent are only part of the cargo; for, when a merchant loads the whole of the vessel on his own personal account, the instrument passed between him and the master of the ship is called a *charter-party* (which *see*).

BILL OF RIGHTS was the important statute, the second of the first year of William & Mary, so called as being declaratory of the rights of British subjects. It was delivered by the Lords and Commons to the prince and princess of Orange, February 13, 1688, before they were raised to the throne. The rights declared are as follows:—1. That the pretended power of dispensing with laws, by regal authority, without consent of parliament, is illegal. 2. That the pretended power of dispensing with laws, or the execution of laws, by regal authority, as it had been then of late assumed and exercised, is illegal. 3. That the commission for erecting the Court of Commissioners for Ecclesiastical Causes, and all other commissions and courts of like nature, are illegal and pernicious. 4. That levying money for or to the use of the crown, by pretence of prerogative, without grant of parliament, for longer time or in other manner than the same is or shall be granted, is illegal. 5. That it is the right of the subject to petition the king; and all commitments and prosecutions for such petitioning are illegal. 6. That the raising or keeping a standing army within the kingdom in time of peace, unless it be with consent of parliament, is against law. 7. That the subjects which are Protestants may have arms for their defence suitable to their conditions, and as allowed by law. 8. That elections of members of parliament ought to be free. 9. That the freedom of speech, and debates or proceedings in parliament, ought not to be impeached or questioned. 10. That excessive bail ought not to be required, nor excessive fines imposed, nor cruel and unusual punishments inflicted. 11. That jurors ought to be duly impanelled and returned; and jurors which pass upon men in trials for high treason ought to be freeholders. (This provision respecting the qualification of jurors in cases of treason is repealed by the Jury Act, 6 Geo. IV. c. 50.) 12. That all grants and promises of fines and forfeitures of particular persons before conviction are illegal and void. 13. And that, for redress of all grievances, and for the amending, strengthening, and preserving of the laws, parliaments ought to be held frequently. It concludes in these remarkable words:—"And they do claim, demand, and insist upon all and singular the premises, as their undoubted rights and liberties." And the act of parliament itself recognises all and singular the rights and liberties asserted and claimed in the said declaration, to be the "true, ancient, and indubitable rights of the people of this kingdom." These liberties were again asserted at the commencement of the 18th century, in the Act of Settlement, 12 & 13 Will. III. c. 2, whereby the crown was limited to her present majesty's illustrious house; and some new provisions were added, at the same fortunate era, for better securing our religion, laws, and liberties, which the statute declares to be the "birthright of the people of England, according to the ancient doctrine of the common law." Some of these new provisions have been since repealed. The principal which are now in force may be shortly stated thus:—The possessor of the crown shall join in communion with the Church of England, as by law established, and, if not a native of England, this nation shall not be obliged to engage in war, to defend any dominions which do not belong to the crown of England, without the consent of parliament; that the judges shall not be removed whilst they properly demean themselves, except upon the address of both houses of parliament, and their salaries shall be ascertained and established (and by 1 Geo. III. c. 23, their commissions are continued, notwithstanding the demise of the crown); that no pardon under the great seal shall be pleadable to an impeachment by the Commons in parliament.

BILL OF SALE is a deed under seal, which passes the right and property in chattels from one to another; and, being under seal, and therefore a solemn contract, the seller cannot, as he might in the case of a mere parol contract, show that it was made without good or valuable consideration, and that, therefore, in law, the property did not pass, and no action can be maintained to recover it. By the statute 13 Eliz. c. 5, every grant or gift of chattels (as well as lands) with intent to defraud creditors or others, shall be void as against the persons to whom such fraud would be prejudicial, and all persons partakers in, or privy to, such fraudulent grants, shall forfeit the whole value of the goods, one moiety to the queen, and the other to the party aggrieved, and also, on conviction, shall suffer imprisonment for half a year. The retaining possession by the original owner contrary to the purport of his assignment, is one of the principal badges of fraud, entitling the creditors of the original owner to impeach the transaction. And now by the 17 & 18 Vict. c. 36, it is enacted that every bill of sale shall be deemed fraudulent and void as against creditors, where the person executing the deed remains in possession of the property, unless the bill of sale, or a copy of it, and every schedule thereto, with an affidavit of its execution, in which the address and addition or occupation of the assignor, and of every witness to its execution, with the actual day of its execution, be set forth and filed in the court of Queen's Bench within twenty-one days from the time of its execution.

BILL OF VICTUALLING. (*See* VICTUALLING-BILL.)

BILLARDIERA, *bil-lar'-di-er-a* (from the French botanist Labillardière), in Bot., a gen. of plants belonging to the nat. ord. *Pittosporaceæ*. The species are climbing shrubs, natives of Australia and Tasmania, where they are commonly known as apple-berries. They have simple alternate evergreen leaves, and axillary pendulous flowers. The fruits are soft berries, which, when ripe, are of a bluish colour, and have a pleasant sub-acid taste. A few species are cultivated in the conservatories of this country, for the sake of their handsome flowers.

BILLBERGIA, *bil-ber'-ji-a* (from the Swedish botanist Billberg), in Bot., a gen. of plants belonging to the nat. ord. *Bromeliaceæ*. The species are all natives of South America. From the roots of *B. tinctoria* the Brazilians obtain a yellow dye.

BILL-BROKERS are persons who engage in the purchase and sale of bills of exchange and promissory notes. They sell bills for those drawing on foreign countries, and buy bills for those remitting to them. It is their business to know the state of the exchange, and the circumstances that are likely to elevate or depress it. The rate of exchange on bills is, as in other things, regulated by the law of supply and demand; for when there is a scarcity of bills drawn upon a certain country, their value will rise; and when there is a superabundance, it will necessarily fall. When the value of the exports to any country in a given period is equal to the value of the imports from the same country in the same period, the bills drawn in each country upon the other will be equal in amount, and, consequently, will be about par. Bill-brokers are distinct from bill-discounters,—those who discount bills that have some time to run before they become due. (*See* BROKERS.)

BILL-CHAMBER, a department of the Court of Session in Scotland, in which summary petitions and applications, and other branches of business requiring unusual dispatch, are disposed of. The last-appointed lord-ordinary officiates in the Bill-Chamber during session, and all the judges, with the exception of the lord-president and lord-justice clerk, officiate in rotation during vacation. In general, all cases requiring the immediate interposition of judicial authority, such as suspensions of decrees or of diligence, and suspensions and interdicts of threatened wrongs, are pro-

ceeded with, in the first instance, in the Bill-Chamber. An interim interdict, by which the proceeding complained of is arrested till it can be inquired into and discussed by both parties, is granted on the applicant making out an *ex-facie* case of injury, and becoming responsible for any injury which may be occasioned by the interdict, should it ultimately be recalled. In general, he has also to find caution for the expenses of the process. The greater number of the proceedings are sanctioned by the judge as a matter of form, on the clerks finding that the papers presented ask the usual powers in the usual manner. If a question of law is involved in the application, the point is discussed as in an ordinary action. Matters of bankruptcy or sequestration are also adjudicated on in this department. (*See* COURT OF SESSION.)

BILLET, *bil'-let* (Fr. *billot*, a block, or small log of wood).—In Arch., when any moulding, either square or circular in form, but more generally the latter, is divided into short sections, and every other piece then cut away, the remaining projections, which resemble short blocks of wood, are called billets. It is peculiar to Roman architecture. When several rows of mouldings one above another are ornamented in this manner, the billets are placed interchangeably; that is to say, the hollowed spaces in one line of moulding come by the side of the projections in the moulding next to it; and so on.

BILLET, *bil'-lai* (Fr. *billet*, a letter), in Her., a charge resembling a brick or letter in its oblong rectangular shape. By English heralds it is considered to represent a letter; and hence the derivation here given; but foreign heralds are inclined to consider it as representing a brick or tile.

BILLETING, *bil'-le-ting* (Fr. *billet*, a letter), in Mil., the means by which food and lodging are provided for soldiers when on the march, or during a temporary stay in any town in which there are no barracks for their accommodation. Prior to the passing of the Mutiny Act in 1689, private persons were compelled to receive soldiers in their dwellings without any redress at the hands of the civil authorities, as the men or their officers might demand; but after this, an equitable distribution by the authorities of the place was enjoined in all cases; and since 1745 it has only been compulsory on innkeepers of all classes, persons keeping beer and cider-shops, and those licensed to sell wine and spirits, or let horses for hire. Remuneration for food and lodging is given at the rate of 10*d*. per day for each man, and 9*d*. for the keep of a horse. The innkeeper is bound to give the soldier the means of cleaning his arms and accoutrements, and to provide him with one hot meal in the course of each day. It is the duty of the officers to visit daily every house where the soldiers are quartered, to see that this is not evaded by any private arrangement with the soldier, or purposed neglect. When it is found necessary to provide accommodation for troops in a town for a short time, the officer in command communicates with the mayor of the town or chief magistrate of the district, mentioning the number of men for whom food and lodging will be required. The magistrate then distributes the men as equally as possible among the various innkeepers in the town or district, and causes letters, or *billets*, to be prepared, assigning a certain number to each public-house. Non-commissioned officers are generally sent on in advance, who receive these billets and distribute them to the troops as they arrive.

BILLIARDS, *bil'-yards* (Fr. *billard*, the stick or mace with which the ball is struck), a game played with ivory balls upon a rectangular table, usually made of slate and covered with fine green cloth. The size of a billiard-table varies; but it is generally about 12 feet long and 6 feet broad, and is surrounded with "cushions" made of india-rubber, in order to keep the balls on the table and make them rebound. Two of the ivory balls employed are white, and one red. At each corner of the table, and in the centre of each of the longest sides, is an opening provided with a pocket or hazard-net; and the object of the player, in an ordinary game, is either to make a cannon—that is, to hit the other white ball and the red with his own white ball,—or to make a hazard—namely, to place his own ball into a pocket, after striking the red or white ball,—or to play so as to thrust the red or white ball into a pocket. The former is called a losing hazard, and the latter a winning hazard. The stick or cue with which the balls are struck is a straight wooden rod tipped with leather, between five and six feet long, and tapering towards its smaller extremity. The balls are sometimes struck with a mace, a straight slender stick with a broad head attached to it; the mace, however, is seldom used except by ladies and beginners. For a long period it was the only instrument used in England; but gradually it was superseded by the cue, which is played over the left hand, on a "bridge" made by the fingers and thumb. The leathern point of the cue is usually chalked before playing, in order to prevent its slipping. Before commencing to play, a fine chalk-line is drawn across the lower end of the table, nearly two feet distant from it. From the centre of this line, a semicircle is drawn, about one foot and a half in diameter, with the convex side towards the lower end of the table. The space included between the line and the semicircle is called the *baulk*, from which the first player always begins. In the centre of the table, at the high end, about a foot from the cushion, is a mark, upon which the red ball is placed. The game, which is generally scored by a non-player, or marker, was originally 21; but it is often played to 50, 63, 84, 100, or 1,000. It can be played by two, three, four, or more persons, and there are many varieties of the game. According to Hoyle, the different games played upon a billiard-table are as follows:—The White Winning game, which is played with two white balls, and is scored independently of forfeitures, from winning hazards only: 12 scores the game when two persons are playing, and 15 when four play. The White Losing game, which is the reverse of the former, is scored from losing and double, or winning and losing hazards: 12 is the score in this also. The White Winning and Losing game is a combination of the two preceding: all balls put in by striking the adversary's ball first reckon towards the game. Choice of Balls.—In this game the player chooses his ball each time. The Bricole game.—Here the player must first make his ball strike a cushion, whence it must rebound so as to hit that of his adversary. The Bar-hole game, so called when the player is debarred from playing at one pocket or hole. One-hole is a game in which only the balls which go into one pocket are counted. Hazards, a game resembling Pool, which depends entirely on the making of hazards, a fixed sum being paid to the player for each hazard. The Doublet game is played with two balls, usually against the white winning game. No hazard is scored in it, unless made by a rebound from the cushion. The Commanding game, where the adversary fixes upon the ball which the player has to strike, is generally played by a superior player against the ordinary game. The Limited game is played by drawing a line across the table, and if the player's ball passes beyond it, he pays forfeit. The Red Winning and Losing Carambole game, which is the game most commonly played, is reckoned from winning and losing hazards and caramboles or cannons. The cannons and white hazards score two, and the red hazards score three. The Winning Carambole, or Red game, is played with winning hazards and cannons only. The Losing Carambole, nearly the reverse of the winning, is played with cannons and losing or double hazards. The Russian Carambole is a variety of the same game. The Caroline or Carline game is played with five balls,—two white, one red, and another blue, and the Caroline ball, which is yellow. The red ball is placed on its usual spot, the Caroline ball in the centre of the table, and the blue ball at the lower end. The striking-place is at the upper end, in a line with the three balls. The yellow ball, when pocketed in the Caroline or middle pocket, scores six, the red hazard counts three, and the blue two. The game score is forty-two. The four game consists of two partners on each side at any of the ordinary games. They play in succession after every winning hazard lost. The cushion game consists in the striker playing his ball from the top of the baulk-cushion, instead of following his stroke upon the table. Fortification Billiards is a complicated game, in which ten little wooden forts, made in the form of castles, and arches, with balls suspended in them, are used. In the game of billiards as generally played, one is scored for a miss; two for a

the first order of Mammalia, containing in it containing the human species only. The hands are adapted to man in his upright position, and allow him the hands which form the characteristics of the four limbs or arms. No other animal except man possesses two hands. The wonderful action and distinguished by having thumbs at each of the four extremities of their limbs, and are consequently called quadrumanous, or four-handed animals. Man, as an intellectual being, is considered so far above the brute creation, that the term *Bimana* is not inserted in many zoological systems; but as the name only relates to the bodily structure of the human being, it is very generally used by zoologists.

BINARY ARITHMETIC, *bi'-na-re*, a kind of notation in which only unity, or 1 and 0, is used. It was the invention of Leibnitz, who proved it to be an expeditious method of discovering the properties of numbers and of constructing tables. M. Dangeocourt, in the History of the Royal Academy of Sciences, gives a specimen of its operation in arithmetical progressionals, in which he shows that, as in binary arithmetic only two characters are used, the laws of progression may be more easily discovered by it than by common arithmetic. In binary arithmetic, all the characters used are 0 and 1, and the cipher multiplies everything by two, as in the ordinary arithmetic is done by 10. Thus, 1 is 1; 10, 2; 11, 3; 100, 4; 101, 5; 110, 6; 111, 7; 1,000, 8; 1,001, 9; 1,010, 10. It is remarkable that this system is identi with that used 4,000 years ago by the Chinese, and it was an enigma by Fo-Hi, the founder of their empire.

BINARY COMPOUND. (*See* CHEMICAL NOMENCLATURE.)

BINARY MEASURE, in Mus., is a measure which is beaten equally, or where the time of rising is equal to that of falling. It is usually called *common time*.

BINARY NUMBER is that which is composed of two units.

BINARY THEORY, in Chem. (*See* SALTS.)

BINDWEED. (*See* CONVOLVULUS.)

BINNACLE, *bin'-na-kel*, in Mar., a wooden case used on board ship to hold the compasses, log-glasses, watch-glasses, and lights, to show the compass at night. On board a man-of-war there are always two binnacles,—one for the use of the man who steers the vessel, and another for the officer or sailor who superintends the steerage.

BINOMIAL, *bi-no'-mi-al*, in Alg., an expression consisting of two members, connected by the sign + or −. Thus, $a+b$ and $8-3$ are binomials, consisting of the sum and difference of these quantities. The powers of any binomial are found by a continual multiplication of it by itself. For example, the cube, or third power of $a+b$ will be found, by multiplication, to be $a^3+3a^2b+3ab^2+b^3$; and if the powers of $a+b$ are required, they will be found the same as the preceding, only the terms in which the exponent of $b$ is an odd number will be found negative. Thus, the cube of $a-b$ will be found to be $a^3-3a^2b+3ab^2-b^3$; where the second and fourth terms are negative, the exponent of $b$ being an odd number in these terms. In general, the terms of any power of $a-b$ are positive and negative by turns. (*See* ALGEBRA.)

BIOGRAPHY, *bi-og'-ra-fe* (Gr. *bios*, life, and *graphe*, a writing), the history of a life, the name given to that department of literature which treats of the lives of individuals. Biography differs from history in that the former is confined to an account of the actions and fortunes of individuals, while history deals with large communities of men, states, or nations. History may, indeed, be said to be the essence of innumerable biographies. Some of the earliest records that are extant are works of Biography, for Biography and History dominated. In the historical books of the Old Testament we meet with numerous lives of individuals; as Abraham, Joseph, David, &c. Of purely biographical works, the earliest valuable that has come down to us from the Greeks, is the "Parallel Lives" of Plutarch, a work of the highest interest, which contains "The Lives of the Philosophers," by Diogenes Laertius; "The Lives of Illustrious Men," by Cornelius Nepos; and "The Lives of the Emperors," by Suetonius. Of the other principal works of this kind in the Latin language, Of these, we may mention: of Plutarch,

and of Apollonius of Tyana, by Philostratus. The principal biographical works of the Romans are, "The Lives of Eminent Greek and Roman Commanders," by Cornelius Nepos; and "The Lives of the Twelve Cæsars," by Suetonius; the latter being necessarily in some degree historical. Tacitus has also written an admirable life of his father-in-law Agricola. Of modern biographical works the name is legion. Among the most prominent may be mentioned Vasari's "Lives of the Painters" (1550); Tillemont's "Mémoires pour servir à l'Histoire Ecclésiastique des six premiers Siècles de l'Eglise," 16 vols. 4to (Paris, 1693, &c.); Stanley's "History of Philosophy," containing the lives, opinions, actions, and discourses of the philosophers of every sect, 4 vols. (London, 1655-62); Bayle's "Dictionnaire Historique et Critique," 2 vols. folio (Rotterdam, 1697); "Biographia Britannica," 5 vols. (London, 1747-66); Johnson's "Lives of the Poets" (1781); "Biographie Universelle," 52 vols. (1810-28); Knight's "English Cyclopædia"—Biographical section, 6 vols. (1856-7); and the Biographical section of this Dictionary. Of single lives, Boswell's "Life of Johnson" is regarded as the best in our language. In all civilized countries biography has always formed a favourite subject of study. Account for it as we may, there is to man something amazingly bewitching in human nature. He has a far more intense and restless curiosity in regard to this than to any other subject of study. Every one finds in a biography something that he can understand and sympathize with; for, after all, one man is pretty much the same as another. One may have a little more of this faculty and a little less of that, more reason and less imagination, higher intellectual and lower moral faculties than another; but, after all, there is much in common between them, the variety being sufficient to afford every one matter for comparison, it may be to feed his self-love, or it may be to strengthen and encourage him in his onward course. "Samuel Johnson, or perhaps another," says Thomas Carlyle, "dead to say there was no man on the streets whose biography he would not like to be acquainted with. No ratest mortal walking there who has not seen and known experimentally something which, could he tell it, the wisest would hear willingly from him. . . How inexpressibly comfortable to know our fellow-creature; to see into him, understand his goings forth, decipher the whole heart of his mystery; nay, not only to see into him, but even to see out of him, to view the world altogether as he views it; so that we can theoretically construe him, and almost practically personate him." "Biographies," says Lord Jeffrey, "are naturally of three kinds, and please or instruct us in at least as many different ways. One sort seeks to interest us by an account of what the individual in question actually did or suffered in his own person; another by an account of what he saw done or suffered by others; and a third by an account of what he himself thought, judged, or imagined—for these too, we apprehend, are *acts* of a rational being, and acts frequently quite as memorable and as fruitful of consequences as any others he can either witness or perform. Different readers will put a different value on each of these sorts of biography; but, at all events, they will be in no danger of confounding them. The character and position of the individual will generally settle with sufficient precision to which class his memoirs should be referred; and no man of common sense will expect to meet in one with the kind of interest which properly belongs to another. To complain that the life of a warrior is but barren in literary speculation, or that of a man of letters in surprising personal adventures, is about as reasonable as it would be to complain that a song is not a sermon, or that there is but little pathos in a treatise on geometry." In the first class he includes, in its higher department, "the lives of leaders in great and momentous transactions,—men who, by their force of character or the advantage of their position, have been enabled to leave their mark on the age and country to which they belonged;" and, in a lower and more private department, "the lives of individuals whom the ardour of their temperament or the caprices of fortune have involved in strange adventures, or conducted through a series of extraordinary and complicated perils." "The second class is chiefly for the compilers of diaries and journals,—autobiographers





who, without having themselves done anything memorable, have yet had the good luck to live through long and interesting periods, and who, in chronicling the events of their own unimportant lives, have incidentally preserved memorials of contemporary manners and events." "The last class is for philosophers and men of genius and speculation,—men, in short, who were, or ought to have been, authors, and whose biographies are truly to be regarded either as *supplements* to the works they have given to the world or *substitutes* for those which they might have given. These are histories, not of men, but of minds, and their value must, of course, depend on the reach and capacity of the mind they serve to develop, and in the relative magnitude of their contributions to its history."

BIOLOGY, *bi-ol'-o-je* (Gr. *bios*, life, and *logos*, a discourse), is the science of life. In its widest sense, it includes life in all its forms on earth, and thus comprehends within its sphere all living organized beings. In a more restricted sense, it regards man only, and in this view it may be said to correspond with Physiology. (*See* PHYSIOLOGY.)

BIOTHANATUS, or BIATHANATUS, *bi-o-thán'-a-tus* (Gr. *bios*, life, or *bia*, violence, and *thanatos*, death), in Med., denotes one who dies a violent death, or very suddenly, as if there were no space between health and death. The term was also applied by way of reproach to the Christians in the early ages of the Church, on account of their enduring even unto the death; and were thus looked upon as little better than self-murderers.

BIPAPILLARIA, *bi-pap-pil-lair'-i-a* (Lat. *bis*, twice, *papilla*, a nipple), a term applied by La Marck to a gen. of marine Molluscs, described and illustrated by Peron in his manuscript notes. La Marck defines it as possessing a naked body, of a shape between oval and globular, terminated posteriorly by a tail, having at its extremity two conical papillæ,—whence the name.

BIPED, *bi'-ped* (Lat. *bis*, twice, and *pes*, *pedis*, a foot), an animal having two feet; as man, bird.

BIPES, *bi'-peez* (Lat. *bis*, twice, *pes*, a foot), a gen. of reptiles belonging to the ord. *Sauria*, or Lizards. It is interesting as showing the gradation between one type of animal form and another, and is the connecting link between the Lizard and the Serpent. One of the species, the *Bipes lepidopodus* of Lacépède, was dissected by Cuvier, who found that though its posterior and only apparent pair of feet had merely the external form of two scaly plates, the integument, in reality, covered a femur or thigh-bone, a tibia and fibula, leg-bones, and four metatarsal or finger-bones. He, however, found no phalanges or terminal finger-bones; and also noticed that one lung was larger than the other by one half. The *Bipes lepidopodus* of Lacépède has the body and tail very slender and almost cylindrical, and bears a resemblance to the common blind-worm or slow-worm (*Anguis fragilis*), so common in many parts of England. These reptiles also possess the rudiments of limbs in their skeletons. The *Bipes lepidopodus* has the upper part of its head protected by nine large scale-plates; its eyes being surrounded with small scaly globules. Its teeth are equal and small, its mouth large, and its tongue, which is long and flat, is not notched. The organs of hearing are situated above the angle of the lips. The scales on the under-part of the belly and tail are hexagonal and smooth, but the scales on the back are lozenge-shaped, striated, and small, especially those in the highest part. About the centre of the reptile, two rudimentary feet, with no appearance of fingers, and covered with small scales, can be observed. Its colour is greenish, with small black blotches scattered over it. It is a native of Australia. Lacépède says of it, "This reptile, like the other species of Bipes, ranks between the oviparous quadrupeds and the serpents. It is related to the latter by its general form as well as by the figure, proportion, and distribution of the scales, while it approaches the former by its auditory apertures, and by the hollow tubercles near the anus."

BIPUPILLATE, *bi-pu'-pil-late* (Lat. *bis*, twice, *pupilla*, a pupil), in Bot., a term applied to that spot upon the wing of a butterfly resembling an eye, and having two dots or pupils of different tints within it.

BIQUADRATIC POWER, *biquad'-rat-ik* (Lat. *bis*, twice, and *quadratus*, squared), in Alg., the fourth

power or squared square of a number or quantity; as 16 is the biquadratic power of 2; for 2×2 is 4, and 4×4 is equal to 16.—BIQUADRATIC ROOT OF A NUMBER is the square root of its square root; thus the biquadratic root of 81 is 3; for the square root of 81 is 9, and the square root of 9 is 3.—BIQUADRATIC EQUATION, an equation where the unknown quantity of one of the terms has four dimensions. Any biquadratic equation may be generated by the multiplication of four simple equations; or by that of two quadratic equations.

BIRCH. (*See* BETULA.)

BIRD-BOLT, *bird'-bolt*, an old form of arrow, to which Shakspere, in "Much Ado about Nothing," thus alludes: "And my uncle's fool, reading the challenge, subscribed for Cupid, and challenged him at the bird-bolt." Stevens, in a note upon "Much Ado about Nothing," explains that the bird-bolt was "a short, thick arrow, without point, spreading at the extremity so much as to leave a broad flat surface, about the breadth of a shilling. Such are to this day in use to kill rooks with, and are shot from a cross-bow."

BIRD-CATCHING, the art of taking birds or wild fowl alive. It is performed in a variety of ways, according to the season of the year or the species of bird intended to be caught. Some birds are taken by burning sulphur at night under the trees upon which they have been observed to perch. Pheasants are sometimes caught in this way. If wheat or any other grain, steeped in a mixture of wine-lees and hemlock-juice, be scattered in places where birds resort, they become intoxicated after eating, and are easily taken.



BRICK-TRAP.

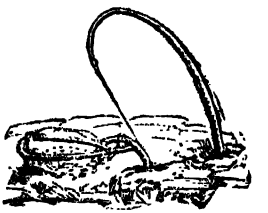


SIEVE-TRAP.

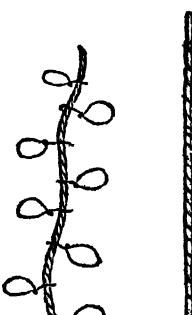
Birds are also taken by means of birdlime (which *see*). The principal methods employed in catching birds, however, are by means of traps and nets. Like everything else, the trapping and catching of birds is a matter of practice, study, and experience. The most primitive form of trap is the common brick-trap, represented in the illustration. It consists of two bricks placed lengthwise upon their narrow sides, a third across their extremities, and a fourth at the opposite end, so as to form a sort of lid. In the central opening a stout piece of stick is driven, and between this and another similar piece supporting the lid, a forked twig is placed. When the bird alights on one of the forks of the twig, the other two sticks give way, and the lid falls, securing the bird. The next easiest of construction is the sieve-trap, shown in the accompanying woodcut. An ordinary sieve is propped up by a slight stick at an angle of about 45 degrees; some seeds or crumbs of bread are strewn under the sieve, and a string attached to the supporting stick is held by the birdcatcher, who remains concealed at a short distance. When the birds gather round the food, the string is pulled, the sieve falls, and the birds are caught. The next bird-catching machine, the springle, is more difficult to construct. At the smaller end of a hazel switch four feet long, which is called the spring, a piece of string about fifteen inches long is tied. Nearly at the end of this string, the catch, which is a little piece of wood half an inch long, about half as broad, and one quarter as thick, is fastened. A small piece of the wood is shaved off one side of this catch, in order to adapt it for a notch in another part of the springle; a loose slip-knot made of two long stout horsehairs is then fastened to the end of the string below the catch. A smaller switch, about a foot and a half in length, is bent back at the smaller end, and fastened within an inch or so of the thicker end, in which a notch is cut, in order to receive the end of the catch: this is called the spread. A stump and a bender, which is another pliant bit of switch, each a foot and a half in length, complete the springle. It is set in the following manner:—The stump, No. 1 in the engraving, is thrust into the ground; the bow of what is called the spreader is placed over it, as No. 2; and then, about the length of the spreader from the stump, the two ends of the bender are pushed securely into the ground, as No. 3. The thick end of the long switch or spring is then planted at a convenient distance from the bender. It is bent down until one end of the catch can be put upward on the inside of the bender. After lifting the spreader an inch from the ground, the smaller end of the catch is placed in the notch, and the springer is retained from springing up. The hair slip-knot is lastly laid round the spreader, and some crumbs or seeds laid in the inside of the trap and scattered about its neighbourhood. The springle is then set, and appears as in the illustration. When the bird alights upon the spreader, it falls with its weight, the catch is released, the springer flies up, and the bird is caught by the neck, wings, body, or legs, in the horsehair slip-knot. A number of birds are caught by horsehair



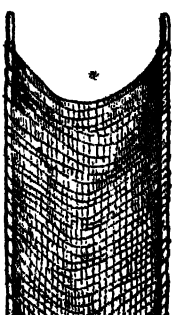
SPRINGLE (OPEN).



SPRINGLE (SET).



HORSE-HAIR LOOP.



loops which are fastened to a long string, which is laid in a series of rings winding outward from the centre, so that the space of ground is covered with them. When disposed in a place where birds resort, it generally occurs that if a bird gets his foot into a loop, he draws it tightly round his leg, and is thus caught.

Another mode of catching birds is by what is called "bat-fowling" and "bush-beating." The methods described above are employed by daylight, and with the assistance of decoy-birds, which, trained for the purpose, are placed in cages, about six or eight yards apart, and covered with branches to hide them. Their call-note allures the wild birds. Bat-fowling is pursued at night-time, some two or three hours after the birds have gone to roost. A large net, of the shape shown in the engraving, is mounted on two long poles, which are carried by two persons. Some of those engaged in the sport walk in front of the net, beating the bushes, ivy, &c. Others walk behind the net, carrying a dim light in a bull's-eye lantern. The birds being disturbed, fly out naturally towards the light, and, in so doing, fly against the net, which is quickly doubled over, and they are caught. Vaillant, in his "Travels in Africa," states that, in order to take certain birds alive, he put into his fowling-piece, above the powder, the end of a candle, ramming it well down. He then filled the barrel with water, with which he fired at the birds, and captured them alive and uninjured. In the Orkney Islands, eggs and young birds are collected by the inhabitants in a most daring and hazardous manner, climbing up rocky precipices, and sometimes being suspended by ropes, over the verge of cliffs 300 to 400 feet high. In the Faroe Islands, still further north, the fowlers employ a similar method. The cliffs are 1,200 feet high, and a rope 600 feet long is tied round the waist of one man, who is lowered down the precipice by six associates. A piece of board is laid upon the margin of the rock to prevent the rope from being cut by the friction. In Mexico and China, empty gourds are left continually floating in the inland lakes where aquatic birds resort. The bird-catcher enters the lake with his body under water, and his head covered with a gourd. He quietly approaches the birds as they are swimming, and pulls them under water. In many parts of Russia, the gellinotte, or grouse, is taken in large quantities by means of an ingenious trap, made of birch twigs in a conical shape, with a movable wheel at the top. In Italy, the wild pigeons, on their return from the northern and western parts of Europe, are caught by means of nets, which are stretched across the hollows of the mountains through which the birds direct their course. A variety of other modes of catching birds will be found described in Pennant's "Birds of Great Britain," Buffon's "Histoire des Oiseaux," and in an article entitled, "Birds: how to trap and catch them," in Beeton's *Boy's Own Magazine*.

Bird-catching Spider (*Mygale auricularia*), an immense black hairy spider, a native of Cayenne and Surinam. It is nearly two inches in length, and its feet, when stretched out, cover a surface of nearly a foot in diameter. The hooks of its mandibles are conical and very strong. It does not construct a web for the capture of its prey, as do other spiders, but builds in clefts of rocks or hollows among trees, a funnel-shaped cell of a transparent tissue, resembling fine muslin, and which it itself provides. There it lurks till insects, or, as is reported, even small birds, approach, when the spider darts out and secures its victim. Dampier mentions a spider of this genus, found at Campeachy, the fangs of which were "black as jet, smooth as glass, and at their small end sharp as a thorn." These fangs, according to the last-mentioned authority, are worn by some persons in their tobacco-pouches to prick their pipes with, and to be, by others, used as toothpicks, in the belief of their having the power to expel the toothache. There are several bird-catching spiders besides the one in question, and they are found in America, the East Indies, and Africa. As a rule, they make a web like the common European spider, but of such tough threads, that a thrush would scarcely be able to force a passage through. It is even declared, that, in certain tropical forests where these spiders abound, their nets will often impede the progress of the traveller. The bite of the larger species of this genus is said to be dangerous to human life.

Bird-Cherry. (*See* Cerasus.)

Birdlime, *bird'-lime*, a glutinous substance, generally prepared from the inner bark of the holly, and used for catching birds. The bark is bruised, boiled with water till very soft, and then placed in pits to ferment. After two or three weeks, a curious viscid mass is found in the place of the soft bark: this is boiled with a fresh quantity of water, and evaporated to a proper consistence. Birdlime may also be prepared from the berries of the mistletoe, from the young shoots of the elder; and from the cellular portions of other plants. When used, it is spread on twigs or wire-netting, and the wild birds are often drawn to the sticky perches by the treacherous singing of a decoy bird, placed in a cage near to them.

Bird of Paradise, Genatee, *pâr'-a-dice* (*Paradisea major*).—These natives of New Guinea may be justly regarded as the most magnificent of the feathered tribes. Concerning them the most fanciful conjectures have been indulged in, not the least curious being one encouraged by Buffon, that the bird, having no feet, and being unable to walk or swim, was compelled to live entirely on the wing. This error, doubtless, took root in the fact that the legs of the bird being its least ornamental parts, were detached from the skin before they were prepared for exportation. They have great diversity of beauty. Some of them have thinly-barbed feathers to cover the closed wing, so prolonged as to form immense tufts, and extending far backward beyond the body. The greater bird of paradise is rather longer than the common thrush. Its general colour is a deep cinnamon, with the exception of the top of the head and the back of the neck, which is a deep yellow; the feathers which decorate the base of the breast, and cover the whole of the throat, are of a pure emerald green. In the male bird, there springs from each side of the chest a full plume, from sixteen to eighteen inches long, composed of slender shafts, with loose, delicate webs. In some specimens they are bright yellow at the base, fading gradually into straw-colour. From the tail-coverts spring two slender, naked shafts of great length, which taper gradually to a point, and are of a rich brown. The Magnificent Bird of Paradise (*Magnifica*) is somewhat smaller than that above-described, and is chiefly distinguished by a double sort of ruff, composed of slender plumes that spring from the back of the neck. More of purple and blue enter into the plumage of this bird than the former. The King Bird of Paradise (*Regia*) is the smallest and the most precious of the family, both on account of its rarity and its splendid colours. It is scarcely as large as a sparrow. The upper parts of its body are of the richest chestnut-brown, and the under parts dazzling white. A zone of golden green extends across the chest; from the sides spring two fan-like plumes, consisting of six or seven dusky feathers of the richest golden green. From the tail-coverts spring two long, slender shafts, each elegantly terminating in a broad emerald web, rising from one side only of the shaft, and disposed into a flat spiral curl. The breast and legs are yellowish-brown. These birds fly in flocks of about thirty or forty, led, it is said, by a single bird. They fly against the wind, lest their plumage should be discomposed. When flying, they make a noise like starlings; but their common cry is little more melodious than that of the raven. They are captured by birdlime and blunted arrows. No pains are taken to preserve them alive: as soon as they are captured they are killed, embowelled, their feet cut off, the plumed skins impregnated with sulphur, and then dried for sale. The skin, to which a great part of the flesh is allowed to remain attached, is always much contracted by this drying process, and a very erroneous idea is sometimes formed of the size of the bird. With respect to their food, scarcely anything certain is known. Mr. Shaw, drawing the inference from the strength of the beak and legs of some of these birds, thinks it likely that they prey on the smaller of the feathered tribe. Some naturalists assert that they live on fruits and berries; and Linnæus, that they devour the larger butterflies. Bennet, in his "Wanderings," gives an account of one of these birds he saw in Mr. Beale's aviary at Macao, where it had been confined nine years, giving no appearance of growing old. It ate insects in a living state, but would not touch them dead. When an insect was thrown into its cage, it contrived to catch it with great agility. It washed itself regularly twice a day, and after having performed its ablutions, threw its delicate feathers up over its head hood-wise. Its chief food during confinement was boiled rice and egg,

with an occasional bit of plantain, and a grasshopper or other insect. The Zoological Society of London have just enriched their collection by two young males of the Lesser Bird of Paradise (*Paradisea papuensis*), brought from New Guinea in good health and fine condition.

Bird's-eye View.—The representation of a building, town, or any tract of country, as if seen from a considerable height immediately above it. The method of presenting a bird's-eye view of any place, in the common acceptation of the term, is to fix the horizontal line containing the point of sight (*see* Perspective) considerably above the drawing, which renders it nothing more than a common perspective view, which is seen under circumstances which can scarcely be considered natural. The view so obtained is that which would be seen by a spectator standing on the top of a very high tower or mountain, and looking directly before him. In a true bird's-eye view, a ground-plan would be represented with great exactness, with all the objects that appear in it, at their relative distance from each other. In such a drawing, no side-view of a building, or any object rising from the surface of the ground, could be obtained. A correct idea of what true bird's-eye perspective would be may be gained by placing a small model of a hollow cube, or any building with its outhouses and surrounding walls and fences, on the floor of a room or a table, and looking down upon it while standing over it. It will be seen, as the eye is above the picture and looking down upon it, that the plane of the picture is parallel to the natural horizon, instead of being perpendicular to it; but that the rules which govern the relative position of all objects shown in the picture so formed are exactly the same as those adopted in ordinary perspective, the difference being in the position of the spectator only; as, in making a drawing in true bird's-eye perspective, he must consider himself as being above his picture, while, in the latter case, he is supposed to be standing directly opposite to it.

Bird's-mouth, in Arch., a small angle entering into any moulding, or a notch cut in the end of a piece of timber, to allow it to fit and rest upon the edge of another piece bearing on the upper surface, and on one side, as rafters are sometimes cut to bear on the wall-plate.

Birds (Ang.-Sax.), feathered vertebrated and oviparous bipeds, which are generally so constructed as to be able to support themselves in the air, and make progress through it. Every place in nature is furnished with its proper inhabitants. Both the land and the ocean are filled with living creatures, each of which is so constituted as to be especially adapted to the course of life through which it is to pass. The great realms of air have their special occupants—the birds, whose extreme beauty, variety, swiftness of motion, and buoyancy on the wing, are admired by all. Elegant and symmetrical as the outward form of the bird is, it is surpassed by the internal construction, which is peculiarly adapted to its habits and mode of living. The large head, broad shoulders, deep chest, and sinewy limbs of the quadruped, are replaced in birds by the pointed beak, the long supple neck, the gently-swelling shoulder, the expansive wings, the tapering tail, and the light, bony feet, all of which assist them in their motion through the atmosphere. Their bodies are protected from the intense cold in the air by a soft and delicate plumage, and their wings, although made of the lightest materials, are so powerful as to be able to strike the air with great force; their tails also serve as rudders, steering them in any direction they please. Internally, the frame of a bird is quite as wonderfully and appropriately constructed. All the bones are thin and delicately formed, except the sternum, or breast-bone, which is very large and strong. The clavicles, or collar-bones, are generally joined, forming the bone called the merrythought, which, together with two bones called the coracoid bones, keep the shoulders apart, and serve to resist the compressing action of the wings. All the muscles, except the pectoral muscle, are small and light. In men and in quadrupeds, the pectoral muscles are small when compared with those of birds, which are very strong, and are situated on either side of the breast-bones. These muscles are used for moving the wings. The anterior extremities of birds are always wings, and never arms or legs. In the cases of birds whose wings are too small to enable them to fly, they are used either as paddles in the water or to assist them in running. The great auk is an instance of the former, and the ostrich of the latter. The lungs of a bird are situate close to the backbone and ribs. The air, entering them from the windpipe, passes through, and is conveyed to a number of membranous cells which lie upon the sides of the pericardium, and communicate with those of the sternum. These cells are in some birds continued down the wings, and even to the pinions and thighs, and other parts of the body. They can be filled with air at pleasure, and by this means the bird can render his body heavy or light, when necessary, either in flying, swimming, or running. The vertebral column in birds is usually rigid in the central parts and flexible at both extremities. By this means the ribs are strengthened, and the free motion of the neck and tail assisted. In birds which do not fly, the vertebræ retain some amount of motion throughout the back; but, in general, they become ankylosed, or firmly united and cemented together by bone. The skull differs from that of the mammalia; the cranial bones are consolidated, and there are no sutures in the skull of a bird. It is articulated to that part of the vertebral column called the neck by one condyle or joint, which is situated at the front margin of the great occipital opening, through which the brain descends into the vertebral column, being prolonged as it were into the spinal cord. It is by this peculiar formation that birds have so free a motion of the head and neck, especially in a horizontal direction. The wryneck is a special instance of this faculty; and many a youthful bird-nester has been scared from a wryneck's nest when he has seen her twist her head completely round, hissing all the time like a snake. Birds generally sleep with the head turned back and nestled under the wing. In mental capacity, birds fully equal quadrupeds, and in some respects, indeed, surpass them. In some of the songsters, the brain has been said to exceed that of man, when considered with reference to the comparative size of the head and body. The size of the brain of an eagle in relation to its body has been reckoned to be $\frac{1}{215}$th part, that of a canary-bird $\frac{1}{17}$th, and that of a man $\frac{1}{185}$nd to $\frac{1}{212}$rd part. Parrots and starlings retain many words and phrases fixed in their memories, and some singing-birds remember whole melodies. Birds of passage, after travelling thousands of miles, and after being absent for a great length of time, remember the exact spot where their nests were previously located, or where they were reared. Prudence, cunning, and docility, are practically exemplified in the different positions in which birds build their nests, some in the neighbourhood of human beings and some in uninhabited places. Sight, smell, and hearing, are the most acute senses in birds. There are two classes of birds,—the carnivorous and the granivorous; and there is a middle kind, as in quadrupeds, which partakes of the nature of both. The carnivorous class is provided with long wings, furnished with very powerful muscles, in order to be able to fly great distances. They have strong hooked beaks, and sharp formidable claws; they have large heads, short necks, and strong, sinewy limbs; their sight is wonderfully acute, so as to enable them to see their prey at a great height in the air; and they swoop down upon their victims with an unerring aim. Carnivorous birds are solitary and sullen, and seldom live together in flocks. Granivorous birds, whose food consists of grain of various sorts, have larger intestines than carnivorous birds, and their digestive organs are more complicated. The form of the bill varies, according to the kind of food which the bird subsists on. (*See* Bill.) The food is passed from the bill into the stomach, which consists of three parts,—the crop, which lies in front of the breast-bone, the membranous stomach, and the gizzard. In the crop, the food undergoes a partial dilution from a fluid furnished by the glands. In the membranous stomach it is still further diluted, and then passes into the gizzard, which acts as a powerful mill, and in which the food is ground down and triturated. The action of the gizzard is strengthened by small hard stones, which many birds swallow with their food. The digestive powers of the gizzard are very extraordinary. An ex-

periment was tried upon a turkey-cock, when a ball of lead, studded with twelve small lancets, was forced down his throat. After eight hours had passed, the gizzard was opened, and the ball was found by itself, the whole of the lancets being broken to pieces. In the London museum of the College of Surgeons there is a large bottle entirely filled with pebbles, &c., taken from the stomach of an ostrich. In some experiments tried upon a hen, it was found that a louis d'or, after being swallowed for four days, lost sixteen grains; and the weight of an onyx was diminished one-fourth. In carnivorous birds the muscles connected with the gizzard are very weak. The liver of domestic birds is much larger than that of wild birds. It is considered a delicacy among gourmands; and *pâtées de foie gras* are made from the enlarged livers of geese. The eyes of birds are admirably adapted for sight. The impression of external objects is rendered more vivid and distinct by a particular modification of the optic nerve. They have three eyelids, two of which, the upper and lower, are closed in most species by the elevation of the lower one. This may be noticed in domestic fowls. A small number of birds, such as the owl and goat-sucker, can depress the upper eyelid. The third eyelid, a thin semi-transparent membrane, lies, when at rest, in the inner corner of the eye, with its loose edge nearly vertical. It can be drawn over the eye like a curtain; and by its means the eagle is said to be able to look at the sun. Were the eyes of birds less perfectly formed, on account of the rapidity of their flight, they would be liable to fly against any object in their way. The voices of birds distinguish them from all the rest of the animal world. The organs of the voice closely resemble certain musical instruments. At the bifurcation of the windpipe is a glottis furnished with appropriate muscles, where the voice is formed. The gift of song is only possessed by male birds, and their notes are generally expressive of love. They are silent when in ill health, in sadness, or during rough weather; but when they are cheerful they always sing. They express different feelings with varied modulation; and the fear of approaching danger, hunger, love, longing for their mates, &c., are all expressed by changes in the tone of the song. This faculty is possessed by no other animal. Every form which the most lively fancy could create, and every hue that the imagination could conceive, are to be found in the feathers of birds. Two changes occur in the feathers,—one in the spring and another in the autumn. In the former case the change occurs just before the breeding-time, and the bird gains a number of new feathers without losing the old ones. In the latter, or moulting season, the old feathers fall off and new ones appear. The feathers of the wings are larger and stronger than those on other parts of the body. They are called wing-feathers, quill-feathers, or quills. At the base of each quill are small feathers called wing-coverts. The tail-feathers are also provided with coverts above and below. Many birds have very ornamental plumage in their tails; and the feathers often take other remarkable forms in different parts of the body; such as shoulder-tufts, ruffs, crests, &c. When spring approaches, wild birds begin to pair and to make arrangements for their young. The notes of the male bird at this time are very loud; and the marriage contract then entered into is for the season faithfully adhered to. In case one of the pair dies, its mate does not survive it long. The reproduction of the species among birds is carried on by means of eggs, which pass from the body of the female and are afterwards hatched. The warmth necessary for incubation is usually derived from the body of the bird, which sits upon the eggs. This duty is generally performed by the female bird; but in some cases it is undertaken by the male. (*See* Egg, Hatching, Reproduction.) Many sea-fowl make no nests, but deposit their eggs on the bare rock, or in rough holes scratched out of the earth or sand. The ostrich allows her eggs to be hatched by the heat of the sun in warm climates; but she sits and broods over them where the temperature is colder. Birds generally brood once in the year, but some brood twice; and the number of eggs they lay varies from one to twenty. The cuckoo and a small number of other birds lay their eggs in the nests of other birds, in order to be hatched by them; and several birds are able to run about and find food as soon as they leave the nest, while others remain in the nest for days and weeks before they can venture out. During this period the parent birds find food for them. At the breeding-season birds are often gregarious, and sometimes live together in one large nest. Birds' nests are constructed with such delicate and exquisite art and ingenuity, as to call forth the admiration of every observer. Birds of the same species, wherever they may be found, build their nests with the same kind of materials and in the same manner. The situations they select, the materials they use, and the form in which they build, are wonderfully adapted to the particular nature and necessities of the bird. They are generally lined with moss, wool, fine hair, or down, and have an exterior composed of straws, twigs or roots, and dry grass, mixed with clay. Birds that build early in the spring, such as the blackbird and thrush, line their nests with loam, in order to keep out the cold air. The common sparrow, who builds four or five nests in the year, is not particular as to the situation he chooses. Sometimes he locates himself in ivy, sometimes in trees and hedges, and often under the eaves of houses. Some birds carefully conceal their nests, and some leave them open and apparent; some, like the jay, build them so loosely that the eggs can be seen through the twigs; and some very compactly, such as the golden-crested wren, which constructs its nest with small pieces of moss and spiders' web interwoved. It is nearly an inch in thickness, and is lined with a profusion of soft downy feathers. While hatching, all birds, as a general rule, resort to those places where their particular food is plentiful, and where there is an abundance of the proper material with which to construct their nests. Some water-fowls pluck the down from their own breasts, in order to line their dwellings; but they usually build in out-of-the-way places, since their food is not that which is gathered by ordinary birds. While hatching, the female bird is remarkably patient. She is usually plump when she begins to sit; but before the eggs are hatched she is almost reduced to a skeleton. Neither hunger nor danger will make her leave her post of duty; but if, after being absent, the male and female birds perceive that their nest has been meddled with, they will often leave, and build in a securer place. After the young are fledged and flown, the nest is generally deserted. Many small birds live upon worms, caterpillars, &c.; and it has been remarked, "that a single pair of sparrows, during the time they are feeding their young, will destroy about four thousand caterpillars weekly; they likewise feed their young with butterflies and other winged insects, each of which, if not destroyed in this manner, would be productive of many thousands of caterpillars." The sparrow is usually believed to be the gardener's enemy; but this would seem to show the reverse. Whilst moulting or changing their feathers, many birds turn sickly, and often die. Every country and climate have birds which are peculiar to them; but many migrate to distant lands when the season becomes too severe for them. Near the equator the birds are remarkable for their brilliant and varied plumage; but their voices are usually harsh and discordant. In the frigid zone, where fish is plentiful, they are mostly aquatic, and their plumage consists of soft, warm, downy feathers. In all countries birds live longer, comparatively, than either men or quadrupeds in the same place. Many kinds of birds are important in an economical sense. A large profit is derived from the rearing of domestic fowls; and the flesh and eggs of most birds can be eaten. The flesh of fish-eating birds and birds of prey is considered unpleasant. Feathers are employed in many useful and ornamental ways, and the dung of birds is useful for manure. (*See* Guano.) From the earliest periods birds have been objects of interest. Amongst the ancient Romans and Greeks, their habits and customs were not only well known to the husbandmen and augurs, but even to the general mass of people. Several poets refer to them as the harbingers of various seasons; and the title of one of the plays of Aristophanes is "The Birds." Aristotle, in his History of Animals, describes the classes and habits of birds accurately and philosophically; and in Pliny's Natural History the subject is also treated in a very learned manner. Pierre Belon, in 1555, was the first zoologist of note who wrote upon the subject of

birds in later times. He placed the rapacious birds first, the waders second, the swimmers third, and the birds which build their nests in trees or on the ground fourth. About forty years afterwards, Aldrovandus of Bologna produced his work called "Ornithology." He followed the same arrangement as Belon, and added many new particulars of the habits and haunts of the several birds described. Francis Willughby, an English gentleman, was the first naturalist in modern times who reduced ornithology to a system. His "System of Ornithology," edited by Ray, the celebrated Cambridge professor, is a work of great merit. In it, birds are divided into two general classes,—"land birds" and "water birds." The former are divided into those which have crooked and those which have straight beaks and talons; the latter are divided into three sections,—first, the waders; secondly, those which are of "a middle nature between swimmers and waders, or, rather, that partake of both kinds, some whereof are cloven-footed and yet swim, others whole-footed, but yet very long-legged, like the waders." The third class of water-birds consisted of palmated birds, or swimmers. Ray's edition of Willughby was again revised and edited by Dr. Derham in 1713; and upon the works of these three naturalists Linnæus formed his ornithological system; and the orders in his class *Aves* are as follows:—

1. *Accipitres.*—Birds of prey, properly so called.
2. *Picæ.*—Woodpeckers, crows, humming-birds, kingfishers, &c.
3. *Anseres.*—Swimmers.
4. *Grallæ.*—Waders.
5. *Gallinæ.*—Gallinaceous birds; such as grouse, partridges, and domestic fowls.
6. *Passeres.*—Sparrows, swallows, finches, doves, thrushes, &c.

In the year 1760 Brisson introduced his system, in which birds were divided into two classes,—those whose toes were furnished with membranes through their entire length, and those whose toes were without membranes. Buffon published his work upon birds in 1770, and Scopoli another in 1771. Cuvier, in 1817, published a new method, dividing birds into six classes, at the same time expressing an opinion that all the systems he had seen were wrong. At the present day, it is also true that a correct arrangement has not yet been made. About 5,000 species of birds are known to exist; and the Dodo is a remarkable instance of a genus of birds which has recently become extinct. (*See* DODO.) Under the title ANIMAL KINGDOM, in Class II. of the sub-kingdom *Vertebrata*, will be found one of the best modern arrangements. Amongst the most celebrated writers on the natural history of birds in Britain may be numbered Pennant, Lewin, White of Selborne, Bewick, Montagu, Donovan, Selby, Mudie, Macgillivray, Thompson, Meyer, and others. In America and the West Indies the principal authors in ornithology have been Hernandez, Marcgrave, De Azara, Sloane, Catesby, Vieillot, Wilson, Spix, C. L. Bonaparte (prince of Canino), Audubon, Richardson, Swainson, and Nuttall; while the birds of Europe have been learnedly treated of by Temminck, Meyer, and Wolff. Gould has written several valuable works, not only upon the birds of Europe, but upon the birds of Australia, the humming-bird, the toucan, &c. Several other illustrious authors have distinguished themselves in their works upon ornithology; amongst whom may be mentioned Buffon, Cuvier, Illiger, Strickland, Syme, and Yarrell. (*See* ORNITHOLOGY.)

BIRDSNESTS, EDIBLE, the nests of a small Indian swallow, which are considered a delicacy, and are frequently mixed among soups. On the seacoasts of China and in Java, at certain seasons of the year, vast numbers of these birds are seen. At their breeding-time they leave the inland country to build in the rocks. They construct their nests out of a substance which they find upon the shore. This gelatinous matter is supposed by Kempfer to be molluscs or sea-worms; according to M. le Poivre it is fish-spawn; and according to Linnæus, a kind of medusa or jelly-fish, called by fishermen *blubbers* or *jellies*. The nests are of a hemispherical shape, and about the size of a goose's egg; and in substance bear a strong resemblance to ichthyocolla or isinglass. They are gathered by the Chinese, and sent to all parts of the world, and are esteemed a great luxury. Mr. Marsden found great quantities of these nests in the island of Sumatra, particularly about Croe. A large cave, situated four miles up the river of that name, contains vast numbers. The white nests are more valuable than the black, being found in the proportion of only one to twenty-five. Marsden says:—"The white sort sell in China at the rate of 1,000 to 1,500 Spanish dollars the peul; the black is usually disposed of in Batavia for about twenty dollars the same weight, where it is chiefly converted into glue, of which it makes a very superior kind." The same authority considers that the difference of colour is owing to the mixture of feathers with the viscous substance of which the nests are formed; and deduces that opinion from the experiment of steeping the black nests for a short time in hot water, when they are said to become in a great degree white. When the natives take the nests, they enter the cave with torches, and by means of a ladder, made of a single bamboo notched, ascend and pull down the nests, which adhere in numbers together, from the side and top of the rock. The more regularly and frequently the cave is stripped, the larger the proportion of white nests found. On this experience, the natives destroy the old nests, that they may find white ones in their stead at their next search.—*Ref.* Count Hogendorp's *Coup d'Œil sur l'Ile de Java;* and Crawfurd's *Eastern Archipelago.*

BIRDS OF PASSAGE, are those birds which migrate from one country to another at certain times, depending on the seasons. Availing themselves of their power of flying, many birds remove themselves, at certain periods of the year, to places where the temperature is more congenial and the supply of food more abundant. Even in the tropics, some birds, like the bird of paradise, migrate from island to island, according to the change of seasons from the dry to the wet monsoon. In the temperate and colder regions, however, birds of passage usually migrate from south to north or from north to south, as winter passes into summer or summer into winter. They are usually divided into classes,—winter and summer birds of passage, the term being applied according to the time when they make their appearance. Hence the summer birds of passage in one country are the winter birds of passage in another. The approach of spring is always heralded by the arrival of summer birds of passage, and their appearance is always connected with pleasant and cheerful associations. During the winter season, large numbers of winter birds of passage, such as wild swans, geese, and other water-fowls, leave the frozen waters of the north and migrate to the shores of Great Britain. Woodcocks, fieldfares, redwings, and many other birds which breed in northern countries, also make their appearance regularly. The migrations of the pigeons in America are very extraordinary, on account of the vast numbers which compose the flocks. The return of some birds of passage can be depended on almost to a single day; and in some places, such as St. Kilda, where the inhabitants depend for their existence on the sea-fowl, their return is almost punctually on the same date every year. It has been observed that some birds of passage leave at the regular time, while others seem dependent upon the weather and temperature. Nearly all birds of this species have long and powerful wings; but some are short-winged. They can pass over great distances in a very short period of time; and as they can fly with ease at the rate of 50 to 150 miles an hour, they often arrive at their destination with comparative ease; but some birds, such as the woodcock, are often found much exhausted after their flight. That birds of passage return to the same places which they formerly inhabited, has been clearly proved in the case of swallows. At one time it was believed by many ornithologists that swallows hybernated; but this opinion has latterly been completely overthrown, and their annual migrations have been completely ascertained. The subject of the migration of birds is very interesting when taken in reference to the instinct which guides them. When a bird of passage is confined in a cage, or otherwise, it shows great inquietude and restlessness whenever the time of migration arrives.

BIRDS OF PREY, a term usually employed to distinguish the order of birds called *Accipitres* by Linnæus.

They have remarkably keen sight, and great perfection in the sense of smell. Many birds, however, which follow and prey upon other birds, do not belong to this order; and those which live upon fishes, worms, and insects, are not reckoned as birds of prey. There are two sections into which birds of prey are divided, —the diurnal and the nocturnal: the latter division is composed entirely of owls.

Birrus, *bir'-rus* (Gr. *beros*, a coat), the name given to the ordinary outer habit worn by Christians in Africa in the time of St. Augustine. In those early ages neither bishops nor presbyters were accustomed to wear any distinguishing habit but what was peculiar to all Christians; and when Eustathius adopted the *pallium*, or philosophic cloak, the council of Gangra decreed that "If any one uses the *pallium*, or cloak, upon the account of an ascetic life, and, as if there were some holiness in that, condemns those that with reverence use the *birrus*, and other garments that are commonly worn, let him be anathema."—*Ref.* Eadie's *Ecclesiastical Cyclopædia.*

Birth, *birth* (Ang.-Sax. *beorthe*; Germ.' *burt*, from the verb *baren*, to bear), the act of introducing or leading into life of animals and vegetables. It is figuratively used for extraction, lineage, rank by descent. It also means to sustain or bear. A ship's station when riding at anchor is called a *birth*, or *berth*; so is the place on board in which chests, &c., are stowed, called the *birth* of the mess.

Birth, Concealment of. (*See* Concealment of Birth.)

Birthday, *birth'-dai.*—Literally the day on which any one is born; but more generally used to designate the anniversary of that day. It corresponds with what the ancient Greeks called *genethlion*, and the Romans *natalitius dies*. Many of the ceremonies connected with the religion of the ancients were celebrated on birthdays; and the omens by which they estimated the felicity of the coming year were also taken on the same days. The birthdays of gods, emperors, poets, and great and illustrious men, were celebrated with great pomp and splendour. The mode of celebrating these days was by wearing a splendid dress, and putting on rings, only worn on these occasions. The men offered up sacrifices of frankincense and wine to their genius, and the women to Juno. Costly suppers were also provided, and treats given to their friends and clients, who, in return, made them presents, and offered vows and good wishes for the many happy returns of the same day. The birthday of Virgil was held with great ceremony by the wits and poets who succeeded him: Pliny states that Silius kept it with more solemnity than he did his own. The inhabitants of Rome and Constantinople celebrated the birthdays of their respective cities with great pomp and magnificence. The birthdays of emperors were commemorated with public sports, feasts, vows, and medals struck for the occasion. But the ancients had other sorts of birthdays than the days on which they were born; indeed, the word *natalis* among the Romans was extended to all feast-days. Amongst the ancients, the day of their adoption was always considered as a birthday, and celebrated accordingly. Three birthdays were observed by the emperor Adrian, —the day of his nativity, the day of his adoption, and the day of his inauguration. It was generally considered, in those times, that when men arrived at the highest honours in the state, they were born again; and the day was thenceforth celebrated as a birthday. The birthdays of the saints and martyrs denote the days of their deaths.

Births, Marriages, and Deaths. (*See* Vital Statistics and Registration.)

Birthworts. (*See* Aristolochiaceæ.)

Bis, *bis* (Lat., twice, or double).—The Latin root of the prefix *bi* or *bis*.

Bis, in Mus., a term which always implies that the bar or bars included with it in the same curve (drawn under or over the notes) are to be sung or played twice before the performer proceeds to the succeeding bar or bars.

Biscuit, *bis'-kit* (Fr., twice-baked), a kind of bread, usually made in the form of small flat cakes. Formerly biscuits were subjected to two bakings,—whence the name; but this is not found necessary at the present day. The most common sort is the ordinary sailors' biscuit. It is an article of very great importance on board ship, where, in long voyages, ordinary bread would become mouldy and unfit for food. Sailors' biscuits are made from a dough of coarse wheat, water, and common salt. After being well kneaded, the dough is rolled out into a sheet of the required thickness for the biscuit. Each biscuit is then cut out and placed in a hot oven for a quarter of an hour. Immediately after baking, biscuits are removed to heated rooms, where they remain for two or three days, in order that all the moisture may be thoroughly expelled from them. It is for the same reason that they are all formed in the shape of flat cakes. The dough of captains' biscuits is partially fermented before baking, and is made of finer flour. Water-biscuits are composed of flour and water, with an addition of butter, eggs, sugar, or spices. There are many other varieties of biscuits; and the name is applied to several kinds of sweet cakes, such as sponge-biscuit, &c. Several of the large manufactories make more than twenty tons of biscuits weekly.

Biscuits, Meat, are made with a certain quantity of meat and flour, prepared and baked in the form of cakes. They are generally made by boiling slowly large pieces of raw meat in a small portion of water. After a time the fat is skimmed off, and the remaining soup boiled down still further, when flour is added. The mass is then rolled out to the required thickness, and then baked and dried like ordinary ship-biscuits. Meat biscuits, when boiled with twenty times their own weight of water, and then properly seasoned, make excellent soup; and they can also be eaten like ordinary biscuits. They generally contain half a pound of flour and the soluble part of five pounds of meat. They have been the means of preserving a large quantity of fresh meat, which the inhabitants of Australia and the Argentine republic were in the habit of throwing away, as they had no market for it. Meat biscuits were first introduced into Britain in 1851, at the Great Exhibition, by Mr. Borden, an American.

Biscuit-ware, *bis'-kit-weir.*—Before porcelain or any other earthenware is dipped into the liquid glaze, it is fired to a certain extent previously, in order to render it porous and capable of absorbing water with avidity. The porcelain is called biscuit-ware after being thus once burnt. The unglazed bottles used for keeping water cool are specimens of biscuit-ware.

Bish. (*See* Aconitum.)

Bishop, *bish'-op*, is a corruption of the Greek term *episkopos*, which literally signifies a superintendent or inspector. It was employed both by the Greeks and Romans to designate certain civil officers who exercised some species of superintendency. On the introduction of Christianity, it came to be appropriated to ecclesiastical offices. It has long been a great question in the Church what kind of superintendency originally belonged to the bishop; whether it was of a church or body of Christians merely, or of a number of churches or pastors. The Presbyterians, Congregationists, and others, hold to the former opinion; while the Established Church of England and the Roman Catholics maintain the latter. In the English church the bishop is the highest of the three ministerial orders, and exercises oversight over a certain district, called his see or diocese. The bishop performs the functions of ordination, consecration, confirmation, and excommunication. He exercises a superintendence over the pastors in his diocese in regard to their morals, the performance of their duties, &c. The bishop is elected by the chapter of his cathedral church; but the nomination is virtually in the crown. The sovereign, on a vacancy being notified, sends to the chapter a missive letter *congé d'élire*, that they proceed to elect a successor, at the same time naming the person they are expected to elect. If they do not proceed with the election within a short time, the king may nominate by his own authority; or, if they elect any other than the person named, they incur the penalty of a *præmunire*, which includes forfeiture of goods, outlawry, and other evils. A bishop must be at least thirty years of age. He is said to be installed in his bishopric, writes himself by Divine permission, and has the title of lord and right reverend father in God. The English bishops are, by virtue of their bishoprics, lords of parliament, and sit in the Upper House. They

claim all the privileges enjoyed by the temporal peers, except that they cannot be tried by their peers upon indictment for treason or felony, nor sit upon such trials in the court of the lord high steward. They are also practically excluded from sitting on trials for capital offences; for they are prohibited by the canons of their church from being judges of life and death. The bishop of Sodor and Man has no seat in the House of Lords; and, since the recent creation of the bishopric of Manchester, the last appointed of the other bishops has no seat (except those of Canterbury, York, London, Durham, or Winchester); so that the number of lords spiritual sitting in parliament might not be increased. In England there are in all twenty-eight bishops, including the archbishops of Canterbury and York, each of whom has his own see or diocese, in which he exercises ordinary episcopal functions. The bishops of his province, over whom he exercises a certain jurisdiction, are called his suffragans. The term originally, however, denoted a titular bishop appointed to assist the bishop of any diocese in his spiritual functions, and to supply his place when absent. The archbishop of Canterbury is styled *Metropolitanus et Primus totius Angliæ*, and takes precedence of all the nobility of the realm after the blood royal. The archbishop of York is styled *Primus et Metropolitanus Angliæ*, and has precedence of all dukes not of the blood royal, and all the great officers of state except the lord chancellor. (*See* Archbishop.) The bishops of London, Durham, and Winchester take precedence of all the other bishops, who rank after them according to their seniority of consecration There are twenty bishops in the province of Canterbury, and six in that of York. Formerly the incomes of the sees differed very much in amount; but latterly the ecclesiastical commissioners have been from time to time, on the avoidance of sees, attempting to adjust their incomes. The present income of the archbishop of Canterbury is £15,000; of York, £10,000; of the bishop of London, £10,000; Winchester, £10,500 (on next voidance, £7,000); Durham, £8,000; Ely, £5,500; the others from £4,000 to £5,000, except Sodor and Man, £2,000. In Ireland there are two archbishops and ten bishops; one archbishop and three bishops, who take their seats by rotation, representing the Irish church in the House of Lords. Colonial bishoprics in connection with the established church have from time to time been created by the crown in the principal British colonies. The first of these was the bishopric of Nova Scotia, created in 1787; and at present the number amounts to thirty-nine. The salaries are in some cases voted by the imperial parliament from the consolidated fund; in others they are paid from the colonial funds, or are secured by bequests or contributions from the colonial bishoprics fund, or other charitable funds; or they are made up from two or more of these sources. There are seven bishops of the Episcopal Church in Scotland; viz., of Edinburgh; Argyll and the Isles; Brechin; Moray and Ross; St. Andrew's; Dunkeld and Dunblane; Aberdeen; Glasgow and Galloway. There are fourteen Roman Catholic bishops in England, four in Scotland, and four archbishops and twenty-four other bishops in Ireland.

**Bishop**, a beverage composed of hot or cold burgundy, claret, or other red wine, poured upon ripe bitter oranges, and then adding sugar and spices according to taste. It is drunk either hot or cold, and its quality depends entirely upon the excellence of the wine employed. In order to make bishop properly, the oranges ought to be well selected, and the white part between the peel and the pulp rejected. It is called *cardinal* when made with white wine, and *pope* when made with tokay. Its present name was bestowed upon it in the 17th century; but it was known, under other names, in Germany, during the Middle Ages. It was imported into Germany from France and Italy.

**Bishop, Boy.** (*See* Boy Bishop.)

**Bishopric** is equivalent to see or diocese, and denotes the district over which a bishop's superintendence extends. At the time of the Conquest there were two archbishoprics and thirteen bishoprics in England. In the reign of Henry I. two new bishoprics were formed,—Ely and Carlisle. To these Henry VIII. added six new bishoprics, viz., Westminster, Chester, Gloucester, Peterborough, Bristol, and Oxford; but the see of Westminster was soon afterwards united to that of London. From that period down to 1836 no change was made in the diocesan distribution of England; but by 6 & 7 Will. IV. c. 77, a new bishopric was created, and the union of the bishoprics of Bristol and Gloucester provided for; and by 10 & 11 Vict. c. 108, the bishopric of Manchester was created. No change appears to have taken place in the distribution of the four bishoprics of Wales,—those of Bangor and St. Asaph in North Wales, and of St. David's and Llandaff in South Wales; and the bishopric of Man is said to date from the 5th century. At present, the province of Canterbury comprises the bishoprics of Canterbury, Rochester, London, Winchester, Norwich, Lincoln, Ely, Chichester, Salisbury, Exeter, Bath and Wells, Worcester, Lichfield, Hereford, Llandaff, St. David's, Bangor, St. Asaph, Gloucester and Bristol, Peterborough, and Oxford. The province of York comprises the bishoprics of York, Chester, Durham, Carlisle, Ripon, Manchester, and Sodor and Man.

**Bishop's, or Consistory Court**, is an ecclesiastical court held by the bishop's chancellor or commissary in his cathedral church, or other convenient place in his diocese, for the hearing and determining of matters and causes of ecclesiastical cognizance happening within his diocese. An appeal lies from the decisions of this court to the court of the archbishop of the province. The functions of the bishop's court are now rarely called into action, as proceedings against the beneficed clergy now take place under the Church Discipline Act, 3 & 4 Vict. c. 86, and against curates under 1 & 2 Vict. c. 106.

**Bismillah**, *bis-mil'-la* (Arab.), a solemn phrase made use of by the Mahometans at the commencement of all their books, &c. It signifies "in the name of the most merciful God."

**Bismuth**, *biz'-muth* (Ger. *bismut*), in Chem., symbol Bi; atomic weight 213; specific gravity 9·8,—a metal of a greyish-white colour, with a strong characteristic tinge of red. It is hard, brittle, and but slightly malleable. It fuses at 507°, and is obtained in fine cubical crystals by slow cooling. The peculiar property it possesses of expanding as it cools, renders its alloys of great use to the typefounder and die-sinker. It also increases the fusibility of other metals with which it is united. The remarkable alloy known as "fusible metal" contains one equivalent of bismuth, one of lead, and two of tin; fuses below 212°, and, by a certain admixture of cadmium, can be melted at a still lower temperature. (*See* Cadmium.) It is also occasionally employed in cupellation, and some of its compounds are used as pigments, the hydrated oxychloride being used as a cosmetic under the name of *pearl-white*. Bismuth occurs in nature principally in the metallic form in the clay-slate and gneiss formations, its principal source being Schneeberg, in Saxony: it is also found in Cumberland and Cornwall. Bismuth is extracted from the ore by heating it in inclined cast-iron tubes with cups attached. The tubes are brought to a white heat, and the bismuth flows into the cups, which are at the lowest part of the incline. Bismuth forms two oxides,—the teroxide, $BiO_3$, and an acid oxide, $BiO_5$, or bismuthic acid. *Teroxide of bismuth* may be obtained by heating the nitrate to low redness: it is a yellow insoluble powder. The *hydrated teroxide*, which is white, may be obtained from a salt of bismuth by precipitation with ammonia. *Bismuthic acid*, or peroxide of bismuth, is formed when hydrated teroxide of bismuth is digested with a concentrated solution of potash, through which chlorine is passed. A red solution of bismuthate of potash is formed, and a red precipitate falls to the bottom, which, on being well washed and digested in cold nitric acid, leaves behind a red powder, which is the hydrated acid. *Nitrate of bismuth* is prepared by dissolving the metal in dilute nitric acid with the aid of heat, which gives rise to four-sided prisms, which are decomposed by water into an acid nitrate, which remains in solution, and a basic nitrate, the *trinitrate of bismuth*, falls as a precipitate. It is used as a pigment, and also as a cosmetic. This salt was formerly called *magistery* of bismuth. The other compounds of bismuth are too unimportant to be described. Bismuth occurs in

nature associated with cobalt, silver, tin, and arsenic; also as an oxide, in *bismuth ochre*; as a sulphide, in *bismuthine*, or *bismuth glance*; as an arsenide, a carbonate, and a silicate, in *bismuth-blende*.

BISON, *bi'-son* (Lat. *Bos Bonasus*).—The principal European regions where this animal is found are the marshy forests of Poland, the Carpathian mountains, and Lithuania. Its chief abiding-place in Asia is in the neighbourhood of Mount Caucasus. It is as large as an English bull, but looks much larger, on account of its wealth of shaggy hair, and is ten times as formidable, because of its tremendous strength and intense ferocity. Its head is small; its horns short, sharp, and strong; and its eyes red and fiery. The colour of its hide is rufous-brown. The American bison (*Bos americanus*), commonly called the American buffalo, is larger, shaggier, and fiercer even than the European species. The hair about its neck and shoulders is bushier, and of a fine texture. The hump, which is oblong, diminishes in height towards the tail, lending a considerable obliquity to the outline of the back. On the crown of the head the hair rises in an immense mass, and shows in thick, close curls before the horns; below the chin the hair grows like a beard, and falls as low as the knees. According to Catlin, and other travellers in North America, this maned buffalo affords not only food, but every creature-comfort to *three hundred thousand* people. Its flesh is their meat; its skin serves them for coats, and beds, and boots; and walls for their tents, and tiles for the roof; and for saddles, and bridles, and lassos. The bones are converted into saddle-trees, into war-clubs, into whistles, and into musical instruments. Of the horns are made pins, needles, ladles, spoons, and spear-heads; the sinews serve as strings to their bows, thread to stitch their buffalo-robes and to form their tent-cloths, and for the attachment to their persons of scalps and such pleasing mementos as they may set store by. The bison's feet and hoofs, when stewed down, yield a superior glue, largely used in the construction of hunting-spears and arrows. The mane of the animal is twisted into ropes and horse-halters, and the tuft at the extremity of its tail is used as a fly-brush. The brains even are not wasted, but used in the preparation of leather from the bison's hide. The number of bisons roaming the vast North American prairies is said to grow less year by year; still herds consisting of thousands exist at the present writing. During the pairing season, the roaring of the bulls is terrific, and the combats that take place between them are unequalled even among the carnivora. They swim broad rivers in nearly the same order as they traverse plains, viz., in a dense animated mass, pressing so close at each others' heels that the foremost dare not stop from peril of being trodden to death. The Indians profit by this peculiarity, and, creeping up to a herd, drive them forward, with hideous shouts and yells, to the verge of a precipice, over which a score or so will certainly topple.

BISSEXTILE, *bis-sex'-til* (Lat. *bissextilis*, from *bis*, twice, *sextilis*, sixth), in Chron., is the name given to that year which contains 366 days, called, also, leap-year. In the Roman calendar, as reformed by Julius Cæsar, the length of the year was fixed at 365¼ days; but in order that the year should always begin with the beginning of a day, it was directed that every fourth year should have an additional day, the others having only 365. This additional day was given to February, as being the shortest month, and was inserted between the 24th and 25th. By their mode of reckoning, the 24th was the sixth day before the calends, or 1st of March, hence called sexto calendas Martii; and in order to preserve the same enumeration, the intercalary or repeated day was termed *bissextus dies*, or the second sixth day, and the year in which it occurred *bissextilis*. In legal reckoning as to the birth of a child, the two sixth days were regarded as one. In our reckoning, the intercalary day is made the 29th of February. (*See* CALENDAR.)

BISTORT. (*See* POLYGONUM.)

BISTOURY, *bis'-too-re* (Fr. *bistoire*), in Surg., is a small curved knife used for opening abscesses, and for other surgical purposes.

BISTRE, *bis'-ter* (Fr. *bistre*, brown), the name of a rich and warm brown colour, prepared from the soot of wood: beechwood is considered the best for the purpose. The following is the method of preparing the pigment. Infuse a pound of the soot in two quarts of water, and boil it for thirty or forty minutes; the mixture must then be allowed to settle, and the clear fluid poured away from the sediment that has collected at the bottom. The liquid thus obtained must be evaporated until what substance there is remaining in the vessel is perfectly dry: this is called bistre, and is made into cakes for water-colour painting by the addition of a little gum-water. Bistre is used in the same way as Indian ink and sepia for making water-colour drawings to show the effect of light and shadow.

BIT, or BITT, *bit*, in Mar., strong but short pieces of timber projecting vertically from the deck of a vessel, in the fore-part, close to either side, and strongly secured to the beams on which the deck-planks are laid. They are placed in pairs, and are principally used for fastening the cable when the ship is at anchor or moored alongside a quay. There are many kinds of bitts used for different purposes in shipbuilding, and distinguished by various names.

BITTERN, *bit'-tern* (Du. *butoor*) (*Botaurus stellaris*).—This bird is generally found throughout the entire Eastern hemisphere. In summer it chiefly affects the north of Europe and Siberia, at other seasons the mild regions skirting the Mediterranean, in China, India, and even in Southern Africa. It was formerly plentiful in this country; but the universal drainage of marsh land has driven it to seek a locality more congenial to its nature. When alarmed, the bittern emits a peculiar cry, by no means pleasant to hear; but on the approach of the breeding season the sounds it utters are of the most hollow and melancholy kind. The provincial English names are "Mere-drum," "Night-raven," and "Bull of the Frog." On the breast of some of this family an extraordinary light is said to be visible. "Most, if not all the birds of the heron genus, especially our common heron, have on their breasts a considerable space void of feathers, filled up by tufts of down, to which adheres a sort of clammy oily substance. It is not, therefore, unlikely that this oily matter may, either by smoothing the water or in some other way, enable the bird to attract, or, when attracted, to strike its prey with greater certainty."—(Stanley's *History of Birds.*) The length of the common bittern is about thirty inches, and its voracity remarkable. Mr. Yarrell found in the stomach of one the bones of a good-sized pike.



BITTERN.

BITTERN, the mother-liquor left after the extraction of salt from sea-water by crystallization. It contains sulphate of magnesia, or Epsom salts, in large quantities, and is one of the principal sources of that salt.

BITTERS, *bit'-ters* (Ang.-Sax.), the common name for an infusion of bitter herbs, which is consumed in large quantities as a stomachic, generally mixed with ardent spirits. The plant usually selected for the preparation of bitters is the garden *Angelica* (*see* ARCHANGELICA), the roots and seeds being used. Chamomile-flowers, coriander-seeds, and other vegetable tonics and stimulants, are occasionally employed.

BITTERSWEET. (*See* SOLANUM.)

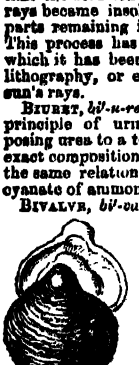
BITTERWOOD. (*See* XYLOPIA.)

BITUMEN, *bit'-u-men* (from Gr. *pitus*, the pitch-tree, because it resembles pitch), is a term which includes many fossil bodies of a resinous nature. True bitumen is fossil tar, and is the product of the action of an elevated heat upon vegetable bodies. The surrounding stratum, which is generally tertiary, is mostly impreg-

nated with bitumen, giving rise to bituminous clay, shale, or coal, according to its nature. In many cases, bitumen occurs in nature as a regular deposit, forming beds like true coal. Lignites (which *see*) contain bitumen imbedded in them in small quantities. Asphalt is a finer sort of bitumen, much used in the preparation of paving-material. Bitumen is closely allied in its properties to coal-tar, which is produced by the destructive distillation of coal. (*See* ASPHALT, PETROLEUM, COAL-TAR.) The first process for obtaining pictures by means of light was founded upon the fact that the bitumen of Judea when exposed to the sun's rays became insoluble in oil of lavender, whilst those parts remaining in shadow preserve their solubility. This process has of late received a modification by which it has been applied to the purposes of photo-lithography, or engraving on stone by means of the sun's rays.

BIURET, *bi'-u-ret* (Lat. *bis*, twice, and *urea*, a chemical principle of urine), a compound, prepared by exposing urea to a temperature of 300° Fah. It has the exact composition of bicyanate of ammonia, and bears the same relation to that substance that urea does to cyanate of ammonia.

BIVALVE, *bi'-valv* (Lat. *bis*, double, *valvæ*, valves), in Conch., a term given to those kinds of shell-fish which possess two shells, in contradistinction to those which possess but one, and which are termed univalve. (*See* MOLLUSCA.) As familiar examples of bivalves may be mentioned the mussel, cockle, and oyster. Bivalve shells form the testaceous envelope of molluska, and are composed of two concave plates connected by a hinge, having an elastic ligament.



BIVALVE.

BIVOUAC, *biv'-oo-ak* (Ger. *beiwachen* or *bewachen*, to watch over), in Mil., a term formerly applied to videttes of cavalry thrown out as outposts to watch the movements of the hostile force, and to prevent any attempt at a night attack. From the circumstance of these videttes passing the night in the open air without any protection, the word was at last taken to signify the state of an army passing the night on the field without tents or any kind of shelter. The practice was commenced by the French soldiery during the wars that followed the French revolution, who, for the most part, were without tents and the incumbrance of baggage, remaining on the field *en bivouac*, as they termed it, that their movements from place to place might be made with greater rapidity. Their example was afterwards generally followed by the European armies, and by the English in the Peninsular war; but it is preferable to provide shelter for the soldier in the shape of tents or huts whenever it is practicable, as his health suffers from exposure to the night air, and cold and wet, especially in the early part of a campaign. When troops are in a bivouac, rows of large fires are lighted at intervals, round which the men group themselves, after piling their arms. These fires are kept up through the night, and the country around is searched for straw, on which the soldiers lie, after contriving some temporary shelter of boughs or boards, if they can be procured, to keep off wind and rain. Allowing about a dozen men to each fire, the fires of a bivouac sometimes afford the enemy the means of calculating the numbers of the force to which they are opposed.—Ref. *English Cyclopædia*—Arts and Sciences.

BIXACEÆ, or FLACOURTIACEÆ, *bix-ai'-se-e*, in Bot., a nat. ord. of dicotyledonous plants in the sub-class *Thalamiflorœ*. They are shrubs or small trees, with alternate leaves, usually entire and leathery, and very often dotted. The flowers are polypetalous or apetalous, the stamens being hypogynous, and equal in number to the petals, or some multiple of them. The fruit is one-celled, dehiscent or indehiscent, having a thin pulp in its centre. The seeds are numerous, usually enveloped in a covering formed by the withered pulp. The plants of this order are almost confined to the hottest parts of the East and West Indies and Africa. There are 34 genera and about 90 species. Many are feebly bitter and astringent, and have been used as stomachics. The bark of *Aphloia* is said to be emetic. The fruits of *Ouecke* and of some species of *Flacourtia* are edible and wholesome. The most important plant of the order is *Bixa orellana*, which yields a red dye. (*See* ANNATTO.) The reddish pulp covering the seeds is the source of this colouring matter.

BIXIN, *bix'-in* (from *bixa*, the name of the tree whence annatto is derived), an orange-red colouring matter, found in annatto, to which it owes its dyeing properties. It is a resinous substance, soluble in alcohol and ether, but sparingly so in water. The alkalies dissolve it, producing a deep red colour, but, on neutralizing, it falls as an orange precipitate. It is also soluble in fixed oils.

BIZARRE, *be-zar'* (Lat. *bis*, twice, and *variare*, to vary), is a term derived from the French, and signifying odd, capricious, or fanciful. A person is said to be *bizarre* when his character, tastes, or opinions are incessantly changing and differing from those of other men, and who is characterized by attempting always to say and do what is singular. Bizarre is also applied to something that is extraordinary or singular.

BIZARRE, a term applied by florists to a carnation with a white ground, marked with two or more colours. (*See* DIANTHUS.)

BLACK, *blăk* (Sax. *blac*).—The total absorption of all the rays of light constitutes black. (*See* COLOURS, LIGHT.) Among the mediæval illuminators, black signified evil, error, and woe; and the figures in their paintings are represented in black drapery when any of these subjects are portrayed. Thus, in the picture of the Temptation, Christ is represented in black robes. In heraldry, black, or sable, is symbolical of wisdom or prudence. From very ancient times, black has been worn as the emblem of mourning. In some of the Oriental countries, black is looked upon as a badge of servitude or low birth. The principal black pigments used in the arts are generally composed of carbon. They are vegetable blue-black, ivory-black, cork-black, and lamp-black.

BLACK ACT.—Previous to the statute 9 Geo. I. c. 22, the king's forest near Waltham, in Hants, was infested by lawless persons, who disguised themselves and blackened their faces, and were hence called *Waltham Blacks*. They committed great devastations on the deer; to prevent which, and similar offences, the statute enacted that persons hunting, *armed* and *disguised*, and killing or stealing deer, or robbing warrens, or stealing fish out of any river, &c., should be guilty of felony without benefit of clergy. The act was repealed by the 7 & 8 Geo. IV. c. 27.

BLACK ALDER. (*See* RHAMNUS.)

BLACK ANT. (*See* ANT.)

BLACK ART, a name given to *magic*, as it was superstitiously imagined that all who exercised the art were aided by the devil in the accomplishment of the effects produced. As the pursuit of magic was deemed sinful in the extreme, and black was the emblem of wickedness and evil in the Middle Ages, so the term "black art" became applied to it. (*See* MAGIC.)

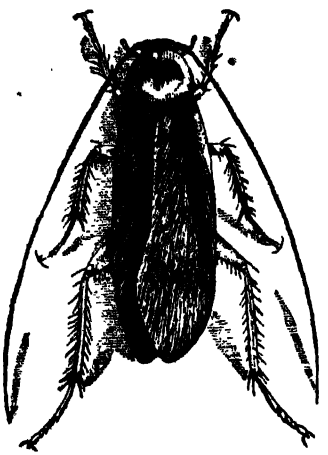
BLACK ASH.—Impure soda, contaminated with sulphide of calcium, charcoal, and other impurities, formed in the manufacture of soda from sea-salt. By lixiviation, filtration, and evaporation, the ordinary soda of commerce is produced. (*See* SODA.)

BLACK ASSIZE is the name given to an assize held in the old town-hall of Oxford in 1577, on account of an extraordinary and fatal pestilence which broke out during it. It is said that judgment had just been passed upon one Jencks, a bookbinder, for sedition, who was sentenced to lose his ears, when there arose such an infectious damp or breath among the people, that many were then smothered, and others so deeply infected, that they lived not many hours after. Above 600 sickened in one night; and, from the 6th of July to the 12th of August, 510 persons are said to have died in Oxford and the neighbouring villages. It was popularly regarded as a divine judgment on the cruelty of the sentence; but it was probably owing to the filthy condition of the neighbouring gaol where the prisoners had been kept. A similar pestilence is said to have broken out at Cambridge during an assize held there in 1521.—*Ref.* Anthony à Wood's *History and Antiquities of the University of Oxford*.

BLACK BAND, a clayey carbonate of iron found in

Scotland. It contains sufficient carbonaceous matter to allow of its being calcined without any additional fuel. It is found principally in the Scotch coal-fields, and is the most important ore of iron in those districts. (*See* IRON.)

BLACK-BEETLE, *blǎk'-bēt-tl* (*Blatta orientalis*).—These insects, though now common throughout Europe, are supposed to have been originally natives of India, and, by the progress of commerce, carried thence westward. On board merchant-ships the black-beetle is very commonly found; and it is said to be more plentiful in seaport-towns than other places. Their habits are too unpleasantly familiar to us all to need description here. All sorts of matter, vegetable or animal, suits the appetite of these insects. The curious way in which insects of this genus lay their eggs is



BLACK-BEETLE.

worth mention. Instead of emerging singly from the abdomen of the female, they are inclosed in a horny case almost half as large as the abdomen of the parent. Within this the eggs are ranged in two rows, separated by a partition which runs down the middle of the case; each egg is also separated from the next by a similar partition. This *egg-case* is attached to the wall or floor with a strong adhesive liquid furnished by the mother. When the larvæ are hatched, they emit from their mouths a fluid which dissolves the walls of their prison, and they are set free. The extrusion of the ponderous egg-case is sometimes a difficult matter with the mother; and she may be sometimes seen labouring about, and presenting the disagreeable appearance of having been cruelly maimed.

BLACKBERRY. (*See* RUBUS.)

BLACKBIRD, *blǎk'-bird* (*Turdus Merula*).—This familiar bird furnishes a fair example of the general size and appearance of the typical thrushes. Like the corvine or crow family, — of which, indeed, the thrushes but representatives, — these birds make their way upon the ground, in the air, and among trees, with equal facility; and this perfection of foot is more or less prevalent throughout the family. It builds a large cup-shaped nest, composed of grass, roots, and stems externally, coated inside with mud, and lined with soft

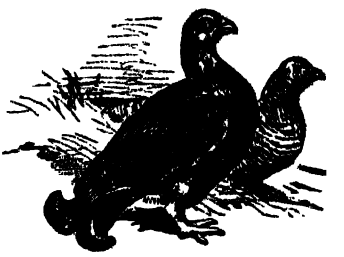


grasses. It lays five eggs, generally of a light blue. There is sometimes, however, so little difference between the eggs of the blackbird and the common thrush, as to make it impossible for any one but an accomplished ornithologist to distinguish between them.

BLACK BOOK OF THE ENGLISH MONASTERIES was a book compiled by order of the visitors of these establishments, under the reign of Henry VIII. It detailed the scandalous enormities practised in the religious houses, with a view to blacken their character, and to hasten their dissolution. Hence the phrase "to set one down in the black book."

BLACK BOOK OF THE EXCHEQUER.—The *Liber Niger Scaccarii*, or *Liber Niger Parvus*, appears to have been compiled in the reign of Henry III., and is now preserved among the other records of the Exchequer. It gives a description of the court of England as it stood in the reign of Henry II.; the rank, wages, powers, and perquisites of the different officers of the court; the revenues of the crown, will of Henry II., &c. It has been printed by Hearne, Oxford, 1728.

BLACKCOCK, *blǎk'-kok* (*Tetrao tetrix*), a species of the Grouse family, rarely seen in England, but abundant in Scotland. In its habits the blackcock closely resembles the capercalzie, inhabiting the low-



lying districts, and feeding chiefly on the young shoots of shrubs, and seeds, and berries. According to Yarrell, in the winter time the bird's crop is frequently found filled with the young shoots of fir.

BLACK DEATH is the name given to a most destructive pestilence, which, towards the middle of the 14th century, extended itself over all parts of the known world. It took its name from the black spots which appeared on the skin. It was an intense form of the oriental plague, and, like it, was characterised by buboes and carbuncles. It is said to have taken its rise in China, and to have thence travelled westward to Europe, where it made its appearance in 1348. Some accounts state that the impure air was actually visible as it approached with its burden of death. Historians of that time give a most horrible picture of the sufferings and deaths that were occasioned by it. In Europe alone, during the three years that it prevailed, it is said to have carried off 25,000,000 persons, London having lost over 100,000. It was looked upon as a judgment of Heaven; and many thought to save themselves by giving their goods to the Church, or by personal chastisements. The Jews were also looked upon as the cause of it; and, in consequence, great numbers of them suffered death. In the city of Mayence alone 12,000 of them were cruelly murdered. The black death has several times made its appearance in Europe since that time, but never with the same virulence. Boccacio, in the introduction to his "Decameron," has given a lively description of its physical and moral effects in Florence; and a full and interesting account of it is to be found in Hecker's *Epidemics of the Middle Ages*.

BLACK-FLUX, *blǎk'-flux*, a compound, containing carbonate of potash mixed with carbon, much used in the laboratory as a reducing or deoxidizing agent. It is prepared by heating tartrate of potash (cream of tartar) in a covered vessel until a charred mass remains. (*See* BLOWPIPE.)

BLACK FRIARS. (*See* DOMINICAN FRIARS.)

BLACKGUARD, *blǎg'-ard*, was a name originally given to the scullions and coal-carriers in great houses

and palaces. In the journeys of the families to which they belonged, they usually rode in the carts with the pots and kettles; and people in derision gave them the name of blackguards. The term is now usually applied to a coarse, low fellow.

Black-hole, *blák-hole*, the term given to the place of confinement in which soldiers undergo short terms of imprisonment for minor offences against military discipline; and hence applied to the old village "lock-up," or "cage," the cells of a police-station, or any place in which persons are temporarily lodged in durance. In history, the "Black-hole of Calcutta" was a place about 18 feet square, lighted and ventilated by two small windows several feet from the ground, in which 146 English merchants and soldiers, who belonged to the garrison and factory that had been lately established at Calcutta, were imprisoned by order of the Nabob Surajah Dowlah, on the evening of June 19, 1756. These unfortunate men, suffering from want of air, unbearable heat, and intense thirst, and exhausted by the continual struggle to reach the narrow air-slits, sank one by one through the long hours of that terrible night, until morning brought release and renewal of existence to twenty-three only, who had existed through the horrors that had caused the death of their fellow-sufferers.

Blacking, *blák'-ing*.—The manufacture of this familiar article is of comparatively recent date. The Romans, however, appear to have had a composition similar to that known at the present day as "dubbing." In digging the foundation of the new Royal Exchange, pieces of Roman leather were found, imbued with a substance akin to our modern blacking. Blacking consists principally of bone-black, sugar or treacle, sperm-oil, oil of vitriol, and strong vinegar. According to Mr. W. C. Day, the method of making the famous "Day & Martin's" blacking is as follows:—The bone-black in a state of powder is mixed with the sperm-oil until the two are thoroughly incorporated. The sugar or treacle is then mixed with a small portion of the vinegar, and added to the mass. The oil of vitriol is next added, and when all effervescence has ceased, vinegar is poured in, until the mixture is of a proper consistence. This constitutes the liquid blacking of Day & Martin, by the manufacture of which thousands of pounds have been made by themselves and their descendants. Paste-blacking is made in the same way, except that the last portion of vinegar is not added. To give some notion of the business carried on by this firm, it may be stated that as many as *one thousand dozen* bottles are sent out daily.

Black-Jack, sulphide of zinc, or zinc-blende (which *see*).

Black-Jack, a vulgar term for a drinking-cup of tin japanned over, formerly much used in England.

Black-lead.—The common commercial name for graphite, or plumbago, given to that substance from its metallic leaden-grey lustre. It is, however, nearly pure carbon, and contains no lead. (*See* Graphite, Plumbago, Carbon, Pencils.)

Black-lead Pencils.—The manufacture of black-lead pencils was at one time almost exclusively confined to this country, from the circumstance that the best black-lead was found at Keswick, in Cumberland, only, in pieces sufficiently large for cutting into pencil-lengths. The invention of Mr. Brockedon, for producing large blocks by compression, has of late greatly extended this important manufacture. By compressing a mass of finely-powdered pure black-lead, without any cementing substance, Mr. Brockedon procures blocks hard enough to be sawn into the square prisms which, when placed in grooves in wood, form the black-lead pencils of commerce. By adding portions of very finely-ground clay, black-lead of different shades is formed, varying from the triple H of the engineer, the mark of which is hardly perceptible, to the quadruple B of the artist, fit for filling-in the deepest shades of his drawing. By Mr. Brockedon's process all possibility of grit is avoided, the black-lead being first ground to an impalpable powder. A good black-lead pencil should make a perfectly even mark,—one easily effaced by bread-crumb or India-rubber. The slightest trace remaining on the paper after a vigorous application of the latter material, proves that the lead has been adulterated with soot, lamp-black, or, as is most generally the case, with sulphide of antimony. The best substitute for Cumberland lead is that from Bohemia and Bavaria. It is also found at Rhodes, in France, in Spain, Ceylon, and Mexico; but is of a very inferior quality, being hard, gritty, and difficult to grind. By the process of Professor Brodie the most untractable graphite may be reduced to the finest powder with great ease. The mineral is coarsely powdered and mixed with ¼th of chlorate of potash, to which mixture is added twice its weight of sulphuric acid. Chloric acid is disengaged, and, after the mass has cooled, it is well washed, dried, and heated to redness. During the latter operation, the plumbago swells and becomes reduced to so fine a powder that it will swim upon water.

Black Letter is the name commonly given in this country to the old English or modern Gothic letter. What are called Roman letters were employed in the writings of Western Europe from the 5th to about the close of the 12th century, when the Gothic characters came to be adopted. When printing was first introduced, the object was to imitate writing; and the first printed books were disposed of as manuscripts, the imitation being so perfect that it required great discrimination to distinguish the printed from the written. Books printed before the year 1500 are generally in the black-letter characters, when, in most European countries, they came to be superseded by the Roman. The old Gothic is still in general use in Germany, but now many books are printed there also in Roman characters. Books in the black letter are highly prized by antiquaries and bibliomaniacs, as being the earliest.

Black List is a name popularly given to certain printed lists privately circulated among subscribers, giving lists of insolvents and bankrupts, protested bills, judgments for debt, and other matters affecting the credit of firms and individuals, and intended for the guidance of merchants and others in trade. The best-known of these are "The Mercantile Test," and "Perry's Bankrupt and Insolvent Weekly Gazette."

Black Mail.—Previous to the rebellion of 1745, the Highlands of Scotland were in a very lawless condition. The stealing and carrying off of a neighbour's cattle was a system of plunder practised even by persons of standing and influence. To obviate this state of things, a class of men rose up who professed to take upon themselves the duty of protecting the property of individuals, upon payment of a certain annual sum, which was called "black mail." They generally also took care that the cattle of those who refused to pay black mail should be carried off. When, however, any one of the payers of black mail lost his cattle, the levier either recovered them or made them good. The celebrated Rob Roy was a notorious levier of black mail in the western Highlands. After the rebellion, the law was more vigorously enforced in the Highlands, and black mail ceased.

Black Rod, Usher of the. (*See* Usher of the Black Rod.)

Black Rood of Scotland, in Scottish Hist., is the name given to a golden cross about a span long, elaborately wrought in the form of a casket, and containing what was believed to be a piece of the true cross. It was brought to Scotland by Margaret, the Anglo-Saxon princess, on her marriage with Malcolm Ceanmore, about 1070, and came to be regarded with great veneration by the people. It was taken possession of by Edward I. of England, in 1291, but was subsequently restored. When David II. invaded England, in 1346, he carried the black rood along with him; and, on his defeat by Sir Ralph de Neville, it became the property of the conqueror, who deposited it in Durham Cathedral, where it remained till the Reformation, but subsequently disappeared.—Ref. *Chambers's Encyclopædia*.

Blackthorn. (*See* Prunus.)

Black Wad.—A dense black earthy mineral used as a pigment, also in glazing pottery, and in the manufacture of glass and chlorine. It is a hydrated peroxide of manganese mixed with various impurities.

Black Watch.—The body of men so called were regularly enrolled, about 1729, for the purpose of watching the disaffected Highlanders, who were seeking an opportunity to renew the revolt against the government of the house of Hanover in the person of George II., which had been previously attempted in

1715, a twelvemonth after the accession of his father, George I. A few Highlanders had been intrusted with arms by the government about four years previously, but a greater number were now enlisted from the Campbells, Grants, and other clans well affected towards the government, and divided into six companies, three of 100 men each, under a captain, and the remainder of 70 men each, under a lieutenant. As these men wore tartans consisting of dark colours, they were called the Black Watch. In 1739 these companies, which had hitherto acted independently of each other, were incorporated into the famous 42nd regiment, the command of which was given to the earl of Crawford. They were then relieved from the duty of watching the Highlanders, who took the opportunity to organize the rebellion of 1745.

Bladder, *blăd'-der* (Sax. *blader*, from *blawan*, to blow), in Anat., is a thin membranous bag, which serves as a receptacle for the urine secreted by the kidneys, until it is voided through the urethra. It is situated in the pelvis, and is kept in its place by ligaments, which are usually divided into true and false, the latter being formed of folds of the peritoneum. It is composed of three coats or membranes,—the external or fibrous membrane, the middle or muscular membrane, and the internal or mucous membrane. Its figure is nearly that of a short oval. It is broader on the fore and back than on the lateral parts; rounder above than below, when empty; and broader below than above, when full. It is divided by anatomists into the fundus or upper portion, the body, and the neck,—that portion which is constricted by a sphincter muscle, and communicates with the urethra. On each side, rather below its middle, it receives the two ducts called ureters, which convey the urine from the kidneys into the bladder. The bladder, like every other organ of the body, is liable to certain diseases, one of the most common of which is inflammation, or cystitis. It chiefly affects the mucous coat of the bladder; but all the other coats may be implicated; and it is either chronic or acute. The acute form is known by great pain in the region of the bladder, attended with fever and hard pulse, and a frequent and painful discharge of urine, or a retention. The disease runs its course with rapidity, and subsides, or carries off the patient, in a few days. It is to be treated by local bleeding and hot fomentations, together with opiates. The chronic form of this disease is best treated by tonics and sedatives. The causes of this disease are various. It often arises from calcarious secretions, which in that case must be removed. (*See* Lithotomy.) Irritability may exist in the bladder, unaccompanied by inflammation, and may arise from over-distention or from nervousness. It is to be treated by the administration of tonics. The bladder may be affected with paralysis, resulting either from accident, from disease of the nervous centres, or from over-distention. It gives rise to incontinence of urine, which, however, is to be distinguished from that which sometimes arises from irritability, inasmuch as in this case the bladder is full, and has no power to evacuate; so that it must be drawn off by the catheter. Retention of urine may be caused by mechanical obstacles to its exit, by paralysis, or by a want of power over the muscles.

Bladderlocks. (*See* Alaria.)

Bladder Senna. (*See* Colutea.)

Blade, *blaid* (Ang.-Sax.), the cutting part of an instrument, distinct from the handle; as the blade of a sword, a knife, or scythe. Damascus was famous for the manufacture of sword-blades, which are even now, in consequence of their celebrity, of great value.

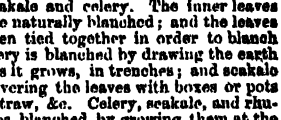
Blade, in Bot., a term generally applied to the expanded portion of a leaf. It is the part which is usually the most highly developed, and which is popularly known as the leaf. The terms *lamina* and *limb* are also applied to this part. (*See* Leaf.)

Blanchimeter, *blăn-chim'-e-ter* (Fr. *blanchir*, to blanch; Gr. *metron*, a measure), an instrument used in ascertaining the bleaching powers of chloride of lime and potash.

Blanching, *blănch'-ing*, a term applied to the process of whitening anything. In coinage, the operation of blanching is performed by annealing, washing, and cleansing the money. The process of covering iron plates with a thin coat of tin is also called blanching. In cookery, the term is applied to the peeling and whitening of almonds, &c.

Blanching, a process adopted by gardeners for the purpose of keeping portions of the leaf or leaf-stalk of a plant protected from the action of light. Under the influence of the sun's rays, the leaves of plants decompose carbonic acid, the carbon of which goes to form many of the substances which give them their individual character. Amongst other things, wool-fibre cannot be formed without the action of light. When light is excluded from plants, they remain almost white, and lose nearly all their coarseness and bitterness, as in the cases of seakale and celery. The inner leaves of the cabbage are naturally blanched; and the leaves of lettuce are often tied together in order to blanch the interior. Celery is blanched by drawing the earth up to the plant, as it grows, in trenches; and seakale is blanched by covering the leaves with boxes or pots surrounded with straw, &c. Celery, seakale, and rhubarb are sometimes blanched by growing them at the bottom of coal-mines. Although simple and easy, blanching is a very important branch of gardening, as many plants depend upon it for their usefulness.

Blancmange, or Blancmanger, *lla-monj'* (Fr., white food), a preparation of milk, cream, sugar, and isinglass, which are boiled together. After being flavoured with lemon-peel, brandy, &c., the fluid is run into a mould and allowed to stiffen. The illustration represents a blancmange thus cast.



Blancmange

Blank Cartridge, *blink*, a charge of powder for a rifle or other gun, containing no ball or shot. It is usually used for firing salutes and in exercising troops. (*See* Cartridge.)

Blanket, *blăn'-ket* (Fr. *blanchet*, the blanket of a printing-press), a soft, loosely-woven woollen stuff, principally used for bed-coverings and wrappers. In addition to those sold in the United Kingdom, five or six million yards are annually exported to other countries. The manufacture of blankets is carried on principally at Dewsbury, Wakefield, and Witney. (*See* Woollen Manufacture.) Among printers, the term is applied to a woollen cloth or fine baize, which is laid between the tympans of a press. To toss in a blanket, by way of punishment, is a very ancient custom. The emperor Otho used to go forth upon dark nights, and if he found a drunken man, he would order the discipline of the blanket to be administered.

Blank Verse, is verse without rhyme, — verse where, according to Dr. Johnson, "the rhyme is blanched or missed." The verse of the Greeks and Romans,—at least all of it that has come down to us, is without rhyme. The Goths are said to have introduced rhyme from the East into the languages of modern Europe, and in the Middle Ages it came to be commonly employed in poetical composition, both in the Latin and vernacular tongues, by most of the nations of Europe. About the 15th century, when the passion for imitating classical models became general, attempts were made in Italy, France, and other countries, to reject rhyme as a barbarous innovation. The first attempt at blank verse in English appears to have been a translation of the first and fourth books of the Æneid by the earl of Surrey, who was executed in 1547. Its suitability for the drama was at once felt, and it was in general use in dramatic composition before Shakspeare began to write, which is supposed to have been about 1591. It was, however, almost entirely confined to the drama down to the appearance of "Paradise Lost," by Milton, in 1667. In an advertisement to the second edition of this work, the author, in answering objections to the want of rhyme, says: "This neglect of rhyme is so little to be taken for a defect, though it may seem so, perhaps, to vulgar readers, that it is rather to be esteemed an example, set the first in English, of ancient liberty recovered to heroic poem from the troublesome and modern bondage of rhyming." Since Milton's time, blank verse has

come into use in various kinds of poetry besides the dramatic; but it is principally in the heroic metre of ten syllables that blank verse is used, and, indeed, by some the term is restricted to that kind of metre. As an example of blank verse:—

Of man's | first dis | obe | dience, and | the fruit
Of that | forbid | den tree | whose mor | tal taste
Brought sin | into | the world, | and all | our woe.

Frequently, in dramatic blank verse, a supernumerary syllable occurs at the end of the line; as,—

To be, | or not | to be, | that is | the ques | tion.

In blank verse, the poet is less encumbered than in any other species of versification; and hence it is particularly adapted for subjects calling forth sublime and noble emotions. "The constrained elegance of this kind of versification (rhyme), and the studied smoothness of the sounds, answering regularly to each other at the end of the line, though they be quite consistent with gentle emotions, yet weaken the native force of sublimity; besides that, the superfluous words which the poet is often obliged to introduce, in order to fill up the rhyme, tend farther to enfeeble it."—(*Blair.*) It is also free from the full close which rhyme forces upon the ear at the end of each couplet, and allows the lines to run into each other without constraint. The German language admits of the greatest variety of blank verse, for it seems to be used in every kind of metre.

Blaps, *blăps*, in Ent., the typical genus of the fam. *Blapsidæ*, of that ord. of insects named *Coleoptera*. The blaps is the only insect of the fam. *Blapsidæ* to be met with in this country. Its scientific name is *Blaps mortisaga*, its common one the Churchyard Beetle. It is of moderate size, sometimes of a dark, but more frequently of a black colour, and is generally to be found in murky, damp situations, or the dirty parts of dwelling-houses. Mr. Westwood makes the following extraordinary statement with regard to these insects:—"Several instances have been noticed in which the larvæ have been discharged from the stomach. Of these the most remarkable account is that published by Dr. Pickells in the Transactions of the Associated Physicians in Ireland, of a case of a woman, aged 28, who emitted as many as two thousand larvæ of this insect at various times, as well as one pupa and one imago; and which probably originated in an absurd and superstitious practice which she had for some time followed, of drinking daily, for a certain time, a quantity of water mixed with clay taken from the graves of two Catholic priests, and eating large pieces of chalk. One of these beetles was immersed repeatedly into spirits of wine, but revived after remaining therein all night, and afterwards lived three years." Fabricius states that the women in Egypt eat the *Blaps sulcata* cooked with butter, in order to attain that corpulent condition of body so highly esteemed as an element of female beauty by the orientals.

Blasphemy, *blăs'-fe-me* (Gr. *blasphemia*, from *blapto*, I hurt, and *pheme*, reputation), literally means defamation or evil-speaking, and at first was used to denote simply the blaming or condemning of a person or thing. Afterwards, however, it came to be restricted to an indignity offered to the Deity, either by words or writing. Hence Augustine says,—"Jam vulgo blasphemia non accipitur, nisi mala verba de Deo dicere." In the early Christian church blasphemy was regarded as of three kinds,—1. The blasphemy of apostates, whom the heathen persecutors obliged not only to deny, but to curse Christ; 2. the blasphemy of heretics and other profane Christians; and 3. the blasphemy against the Holy Ghost. The first sort of blasphemers were such as, after making a profession of Christianity, turned apostates, and blasphemed Jesus Christ; this being the usual test administered to them by their persecutors. The second were such as made a profession of Christianity, but yet, either by impious doctrines or profane discourses, derogated from the majesty and honour of God and his holy religion. For the third kind of blasphemy, that against the Holy Ghost, see subsequent article. Under the Mosaic law, blasphemy was punished with death; and the same punishment was also awarded to it by the civil law and the laws of many civilised countries. By the canon law, blasphemy was punished only by a solemn penance; and subsequently the corporal punishment came to be commuted into a pecuniary fine. Blasphemy is usually defined to be an injury offered to God, by denying that which is due and belonging to him, or attributing to him what is not agreeable to his nature. According to Angelus Clavasius, it is threefold; viz., 1. when something is ascribed to God which is not suitable to his nature, called by divines a sin *contra misericordiam*; 2. when some attribute essential to his Godhead is denied,—a sin *contra justitiam*; and 3. when that which is only proper to the Divine Creator is attributed to the creature,—a sin *contra majestatem Dei*. "Three things," says one, "are essential to this crime,—1. God must be the object; 2. the words spoken or written, independently of consequences which others may derive from them, must be injurious in their nature; and 3. he who commits the crime must do it knowingly." According to Blackstone, the offence of "blaspheming against the Almighty, by denying his being or providence, or by contumelious reproaches of our Saviour Jesus Christ, is punishable at common law by fine and imprisonment, or other infamous corporal punishment; for Christianity is part of the laws of England." The first statutory enactment against blasphemy is 9 & 10 Will. III. c. 32, entitled, "An Act for the more effectually suppressing of blasphemy and profaneness." It states that "many persons have of late years openly avowed and published many blasphemous and infamous opinions, contrary to the doctrines and principles of the Christian religion, greatly tending to the dishonour of Almighty God, and may prove destructive to the peace and welfare of this kingdom;" and enacts that any person or persons having been educated in, or having made a profession of the Christian religion within this realm, "shall by writing, printing, teaching, or advised speaking, deny any one of the persons of the Holy Trinity to be God, or shall assert or maintain that there are more gods than one, or shall deny the Christian religion to be true, or the Holy Scriptures of the Old and New Testament to be of divine authority," shall, for the first offence, be adjudged incapable of holding any office or employment, ecclesiastical, civil, or military; and, on a second conviction, shall be disabled to sue, prosecute, plead, or use any action in any court of law or equity, and shall also suffer imprisonment for three years. The main provisions of this act remain still in force; but by 53 Geo. III. c. 160, those who deny the doctrine of the Trinity are exempted from its penalties. In 1841 the law against blasphemy was enforced upon Mr. Moxon for publishing an edition of Shelley's "Queen Mab;" but the sentence was merely nominal. In Scotland, blasphemy was, by acts of the Scottish parliament passed in 1661 and 1695, punishable by death; and the last who suffered capital punishment for this crime in Scotland was Thomas Aikenhead, a student of divinity, who was executed 1696. These severe statutes were, however, repealed by 53 Geo. III. c. 160, which made the punishment arbitrary. By act 6 Geo. IV. c. 47, the publication of blasphemy was punishable by fine and imprisonment, and by banishment for a second offence; but this last was repealed by 7 Will. IV. c. 5, which rendered the punishment only fine and imprisonment. In 1843 a person was tried before the High Court of Justiciary at Edinburgh, for publishing books denying the truth and authority of the Holy Scriptures, and tending to bring contempt upon the Christian religion, and, being found guilty, was sentenced to fifteen months' imprisonment.

Blasphemy against the Holy Ghost.—Divines are very much divided in opinion as to what the nature of this sin was. Christ says, in Matthew xii. 31 (and to the same effect in Mark iv. 29 and Luke xii. 10), "All manner of sin and blasphemy shall be forgiven unto men; but the blasphemy against the Holy Ghost shall not be forgiven unto men." In the early church some applied it to the sin of lapsing into idolatry; others to a denial of the proper Godhead of Christ; others to a denial of the divinity of the Holy Ghost. Augustine resolves it into obstinacy in opposing the methods of divine grace, and continuing in this obduracy to the end of life. None of these cases, however, did the Church reckon to be beyond the power of

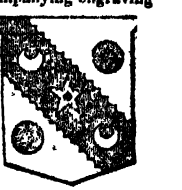
forgiveness; for they did not refuse to receive into their body any one who professed repentance for his sins. The general opinion now is, that it consisted in the imputing of the miracles wrought by the Holy Spirit to the power of the devil, and that it was directly against the Jews. The saying of Christ was directly called forth by the Pharisees having said, "This fellow doth not cast out devils but by Beelzebub, the prince of the devils;" and was specially addressed to them.

BLAST-FURNACE, *blâst' fur-nace* (Sax. *blæst*, blast; Fr. *fourneau*, furnace), a furnace used in metallurgical operations, in which the combustion of the fuel is increased to an enormous extent by a blast blown from a bellows, or by means of fans. A smith's forge is a blast-furnace on a small scale. Blast-furnaces are used principally for smelting iron ores, and consist essentially of a long narrow funnel inverted upon another shorter funnel, the whole being built of solid masonry. They are usually 50 feet high by 15 feet in diameter at the largest part. At the bottom of the lower cone is a cylindrical hole, from which lead the *tuyères*, or blast-pipes, and the channel for the passage of the melted slag, which rises on the top of the metal and overflows. At the lowest part is the tap-hole for drawing off the melted metal. At the top is a gallery for the conveyance of fuel and ore. The blast-furnace being lighted with coal, the roasted ore, combined with a flux of limestone, is thrown in; upon this is thrown another layer of coal, and so on; as the fuel burns away, the mass sinks, and is replenished with fuel, flux, and ore from the top. (*See* IRON.)

BLASTING (Aug.-Sax.)—An operation in Mining, &c., by which large masses of rock are separated by means of the explosion of gunpowder or gun-cotton. A small opening is bored in the rock or stone, and filled with gunpowder or gun-cotton, and is fired by means of a fuse or train. In engineering operations of large magnitude, chambers, and even galleries, are formed in the rock, bags of powder being inserted, and fired by means of the galvanic current. By this means enormous masses of rock, weighing thousands of tons, are removed with the greatest ease. One of the largest blasting operations known was that in which 400,000 cubic yards of cliff at Folkestone were removed at one time by the explosion of 18,000 lbs. of powder, during the construction of the South-Eastern Railway. Blasting is also much used for removing submerged wrecks: the raising of the wreck of the *Royal George*, at Spithead, was effected by means of submarine blasting. The charges in this instance were fired by divers, the powder being ignited by a galvanic current. The sale of the recovered brass guns more than paid for the expenses of the operations. Submerged rocks are removed in a similar manner.

BLATTIDÆ, *blât'-ti-de* (Lat. *blatta*, an insect that eats away clothes), a fam. of insects belonging to the ord. *Orthoptera*. The insects of this family are extremely active and voracious. According to Mr. Stephens, there are only seven species indigenous to this country, among the most disagreeable of which is the well-known Cockroach or Black-beetle. (*See* BLACK-BEETLE.) In hot climates, where the number of species of this family is very large, their ravages are exceedingly great. The largest of the genus is the *Blatta gigantea* of Linnæus, which is indigenous to the warmer parts of Asia, South America, and Africa, where "they plunder and erode all kinds of victuals, dressed and undressed, and damage all sorts of clothes, especially such as are touched with powder, pomatum, and similar substances; everything made of leather, books, paper, and various other articles, which, if they do not destroy, at least they soil, as they frequently deposit a drop of their excrement where they settle, and some way or other, by that means, damage what they cannot devour. They fly into the flame of candles, and sometimes into the dishes; are very fond of ink and of oil, into which they are apt to fall and perish; in which case they soon turn most offensively putrid; so that a man might as well sit over the cadaverous body of a large animal as write with the ink in which they have died. They often fly into persons' faces or bosoms, and their legs being armed with sharp spines, the pricking excites a sudden horror not easily described. In old houses they swarm by myriads, making every part filthy beyond description wherever they harbour, which, in the daytime, is in dark corners, behind clothes, in trunks, boxes, and in short every place where they can be concealed. In old timber and deal houses, when the family is retired at night to sleep, this insect, among other disagreeable properties, has the power of making a noise which very much resembles a pretty smart knocking with the knuckle upon the wainscoting. The *Blatta gigantea*, in the West Indies, is therefore frequently known by the name of the Drummer. Three or four of these noisy creatures will sometimes be impelled to answer one another, and cause such a drumming noise, that none but those who are very good sleepers can rest for them. What is most disagreeable, those who have not gauze curtains are sometimes attacked by them in their sleep; the sick and dying have their extremities attacked, and the ends of the toes and fingers of the dead are frequently stripped both of the skin and flesh." The *Blatta americana*, or American cockroach, is another member of this troublesome family. Its size is somewhat larger than that of the black-beetle; but its destructive powers are little less. It is now becoming common in England, especially in seaport-towns, where it is brought with merchandise from abroad. The *Blatta lapponica* is a smaller species, which is to be found in Lapland in great numbers. When very numerous, instances have been known where they have devoured the whole of the natives' winter provision of dried fish.

BLAZONRY, *blâ'-zon-re* (Sax. *blæsan*; Ger. *blasen*, to blow a horn; Fr. *blasonner*, to blaze about, make public), the art of painting and describing armorial bearings in heraldic phraseology. The term originated in the custom of sounding a trumpet when a knight entered the lists at a tournament, after which the officiating heralds proclaimed his title, and the distinctive bearings on his shield, with his crest, badge, and motto. The principal rules for blazoning coats-of-arms, according to English usage, are as follows; but on the continent they are not all observed with strict adherence. 1. In marshalling coats-of-arms it is false heraldry to place mets upon metal, or colour upon colour. 2. Begin with mentioning the metal or colour of which the field is composed, stating the direction of the lines by which it may happen to be divided; as, *per bend*, *per fess*, *quarterly*, &c., and if they assume other forms than the simple straight lines (*see* ENGRAILED, WAVY, RAGULY, &c.), and then proceed to the principal and secondary charges in order. 3. Shorten the description as much as possible, and avoid all repetition of the names of metals and colours, mentioning a charge of any colour or metal that has been named before, as *of the first*, *of the second*, &c. Thus, the coat-of-arms in the accompanying engraving would be described as *Argent, on a bend engrailed gules, between two hurts, a mullet or, pierced of the second between two crescents of the first*; in which the field is first mentioned; then the principal charges on the field; and thirdly, the charges on the ordinary, in their proper metals and tinctures, without repetition. 4. In describing charges in a field or on an ordinary, between others of a different nature, always name that charge first which is nearest to the centre of the shield. Thus, in the above example, it is correct to say a mullet between two crescents, not two crescents with a mullet between them. 5. When animals, plants, &c., are represented in their natural colours, they must be described as *proper* only, without naming any metal or colour: thus we must say a swan proper, not a swan argent.



BLEACHING, *bleech'-ing* (Sax. *blæcan*; Germ. *bleichen*, to bleach), a process by which substances are rendered white. The term is more especially applied to the extraction of the natural colour of silk, wool, flax, or cotton, when these substances are made into fabrics. The operation was formerly performed by the combined agency of light (or rather actinism), air, and moisture; and it occupied many months to effect what modern chemistry enables us to perform in a few hours. The process of bleaching linen

is very ancient, particularly in Egypt, where *white* linen was greatly prized. Previous to the middle of the last century, the method of bleaching was unknown in England; and the linen manufacturers of the North sent their fabrics to Holland to be bleached, whence they received them in eight or nine months. The Dutch method of procedure consisted in soaking the linen for several days in potash lye, which was used whilst boiling. The linen was then washed, and put into tubs containing buttermilk, for several days. It was afterwards spread on the grass for some months, being continually sprinkled with water during this time. The linen was returned to England in a nearly white condition, and went by the name of brown Holland, a name still preserved by a partially bleached linen fabric. The first improvement in this tedious process was made by Dr. Home, of Edinburgh, who, by substituting weak sulphuric acid for the buttermilk, succeeded in reducing the time required to six or seven weeks. In 1787, however, a most important change was made by the discovery of Berthollet that the gas chlorine obtained by the action of hydrochloric acid on binoxide of manganese formed a very perfect bleaching agent. Chlorine was first used in solution; but it was not found to answer the purpose in this condition. In 1798, Mr. Tennant, of Glasgow, took out a patent for impregnating dry hydrate of lime with chlorine gas, forming what is known as chloride of lime, or bleaching-powder. (*See* BLEACHING-POWDER.) The bleaching-works of England and Scotland are on a par with the demand for their use caused by the enormous amount of calico and other cotton fabrics now manufactured in this country; and it is not too much to say, that the supremacy enjoyed by England as the great cotton-fabric producing country is due almost as much to the perfection with which bleaching is carried on, as to any other cause. The process of bleaching is briefly as follows:—Pieces of cotton cloth, or calico, are sewn together into a continuous web seven or eight *miles* long. This, being united at the ends, forms an endless band, which passes over rollers, like the endless band of a lathe. It is first drawn over a heated cylinder, which singes off the loose fibres: it is then washed, to remove the dressing, and afterwards passed through a hot solution of lime. It is once more washed, to remove the lime, and then run through a weak solution of sulphuric acid. It is washed a third time, boiled in a solution of soda, washed again, and rinsed in a weak solution of bleaching-powder. It then lies for some time in a heap, to allow the chlorine to act; after which it is again dipped in acid, washed, steeped in soda, washed again, dipped in bleaching solution, dipped in acid once more, washed for the last time, dried, and folded, after having been ripped once more into pieces. The perfection of the machinery and method of working the chemical part of bleaching must be very great when a piece of calico 28 yards long undergoes so many complicated processes for a pence! In 1803 the charge for the same amount of work was 7*s.* 6*d.* Hardly a week passes without some improvement in bleaching taking place, and the list of patents is full of contrivances of all kinds for still further cheapening this important manufacturing process. The consequence of this activity is, that more fabrics are bleached in a few hours in a space a few feet square, than were bleached formerly in many months and spread over many acres of ground. The colouring matter of fibres seems to be a kind of resin, which is dissolved partly by means of the alkali used, and partly by the chlorine and dilute sulphuric acid. Silk, straw, feathers, ginger, and certain spices, are generally bleached by means of sulphurous acid. WAX, however, is bleached by the combined action of light, moisture, and air. (*See* BEESWAX, PAPER.)

BLEACHING-POWDER.—Of all bleaching compounds, chloride of lime is the most important. It is prepared by exposing slaked lime to the action of chlorine gas. Slaked lime may be made to combine with half its weight of chlorine. Chemists are divided as to the true composition of this valuable compound, some looking on it as a hypochlorite of lime, CaO.ClO, united with chloride of calcium, CaCl, while others regard it as a combination of chlorine with oxide of calcium, in the form of an oxychloride, CaOCl. Chloride of lime is a white, moist powder, continually giving off hypochlorous acid. Its principal use is as a bleaching agent; but it is also employed as a disinfectant with great success. (*See* LIME, CHLORIDE OF.)

BLEAK, *bleak* (*Leuciscus alburnus*), a little silvery-scaled fish, well known to British anglers. It is said that the scales of the bleak are used in the manufacture of imitation pearls.

BLEEDING, or BLOOD-LETTING, *bleed'-ing* (Sax. *bledan*, to bleed), in Surg., is the removing of blood from the body, with a view to the prevention or cure of disease. It is divided into general and local: venesection and arteriotomy are instances of the former; scarification, cupping, and the application of leeches, of the latter. General bleeding is had recourse to when the object is to lessen the whole mass of the circulating fluid; local, when the object is to lessen the quantity in some particular part of the body. Venesection is the mode usually had recourse to in general bleeding, and the veins most commonly selected for the purpose are those at the bend of the elbow. In proceeding to open a vein, a bandage is first placed moderately tight round the arm, above the elbow, to obstruct the return of the venous blood; and when the veins begin to swell, the operator selects one, and pressing the thumb of his left hand upon it, at a short distance below the spot where the opening is to be made, presses the lancet into the vein, and gives a slight cut upward in withdrawing it as to make the opening sufficiently large to allow blood to flow out in a thin stream. When a sufficient quantity of blood has been abstracted, the operator's thumb should be placed on the cut in the vein and the bandage removed, when a folded piece of lint, placed over the wound and secured by a figure of 8 bandage, will be sufficient to prevent the bleeding, and the wound will speedily heal. It should be borne in mind, however, that bleeding is always a dangerous operation, even apart from the evils that may be produced from the abstraction of too much blood, and should never be performed, except in very urgent cases, by any but a skilful surgeon. For local bleeding, leeches are always the safest, and are most generally had recourse to. In dealing with leeches, it is well to remember that they are cold-blooded animals, and that heat is highly injurious to them, and unfits them for the performance of their office. Hence, when there is a difficulty in making them fix readily, the part should be cooled with a cloth dipped in cold water, or moistened with cream or milk, or a single drop of porter, and the leeches confined in the proper situation under a small glass. In former times, bleeding was much more practised than it is at present. It was resorted to in almost every disease, particularly such as were inflammatory, or were thought to be so; and even where no disease existed, it was regarded as an excellent precautionary measure to have a vein opened once or twice a year. Some contend that this mode of proceeding was then necessary, and that, since that time, a great change has taken place in the physical constitution of the people. Doubtless, there is some truth in this; but we cannot believe that the constitution of the people ever was such as to justify the wholesale bleeding that was at one time practised. For bleeding, or a flow of blood from any of the organs, *see* HÆMORRHAGE.

BLENDE, *blend* (Ger. *blenden*, to dazzle), a term applied to several minerals possessed of a peculiar glittering lustre, such as *hornblende*, *bismuth-blende*, &c. The term, by itself, is generally applied to zinc-blende, or sulphide of zinc.

BLENHEIM SPANIEL. (*See* SPANIEL.)

BLENNIUS, *blen'-ni-us* (Gr. *blenna*, mucus), a gen. of fishes belonging to the section *Acanthopterygii* and



THE BLENNY.

the fam. *Gobioidæ*. The fishes of this genus are principally recognisable from their having the ventral fin

placed before the pectoral. They congregate in small shoals upon rocky coasts, where, upon the reflux of the tide, they may be often found in pools among the crevices of the rocks. Mr. Yarrell states that five species frequent the English coasts. These are,—Montagu's, or the Diminutive Blenny; the Ocellated Blenny, or Butterfly-fish; the Gattoruginous Blenny; the Shanny; and the Crested, or Yarrell's Blenny.

BLENNORRHŒA, *blen-nor-rē'-a* (Gr. *blenna*, mucus; *rheo*, I flow), is a term used in medicine to denote an unusual discharge of mucus from any of the mucous membranes.

BLESBOK, *bles'-bok* (*Gazella albifrons*), a fleet antelope of Southern Africa.

BLIGHT, *blite* (Sax. *belihtan*, to fall upon), a general term for a certain class of diseases which affect the cultivated grasses, especially the cerealia. It is generally limited to the disease to which wheat and other grains are liable, when the outside of the plant remains green and flourishing while the interior is filled with a powder having a very fœtid smell. This powder consists of a microscopical fungus in the shape of balls, so minute that four millions of them may be present in a grain. This disease is also called smut-balls, bunt, pepper-braud, and stinking rust. The name of blight has been applied to every kind of disease incidental to plants through changes in the state of the atmosphere, the condition of the soil, ravages of insects, parasitic fungi, &c. The name has also been given to diseases of plants which have arisen through errors in cultivation. Insects and parasitic fungi attack unhealthy plants first; and often when the evil has been ascribed to them, the true cause has been some mistake in manuring the soil. A competent authority on the subject observes, "There is a kind of blight sometimes very prevalent, which has been referred to fungi, but which is, in fact, nothing more than an excessive development of the epidermal cells, which are no longer kept within bounds by the real cuticle," but become "elongated, and frequently branched in various ways, so as to form spongy or mealy patches, which are sometimes in such abundance as from their bright colour or peculiar aspect to attract general notice." This species of blight does little damage to the plant on which it is found, and is most commonly observed on woody plants, such as vines and hawthorn. A similar effect sometimes appears on a few herbaceous plants.

BLIND, *blinde* (Ang.-Sax.), a screen or shade attached to either the inside or the outside of a window, as a protection against the sun. The most common form of inside window-blind consists of a plain hanging of union holland or linen. The wire-blind, another kind of inside window-blind, consists of a frame of woven wire-gauze, or of perforated zinc, and is frequently painted, and sometimes also lettered and figured. Outside window-blinds are called Florentine, Venetian, Spanish, and shutter-blinds. There are also other blinds for shop-fronts, skylights, &c., known by various names; as, common roller, spring-patent, &c.

BLIND, is a term applied to one who is deprived of the use of sight. There is none of the senses that affords such an endless variety of perceptions, such a fund of materials for the mind,—the imagination, to work upon, as that of sight. When one considers the infinitely greater amount of information that is received by the eye than by the ear, he is naturally led to the conclusion that the blind must be in a much more helpless and pitiable condition than the deaf. In reality, however, this is found not to be the case; and various attempts have been made to account for it. The blind, as a class, are lively and cheerful; the deaf, shy and melancholy, often morose and suspicious. "Take," says Dr. Watson, "a boy, it may be, of 9 or 10 years of age, who has never seen the light, and you will find him conversible, and ready to give long narratives of past occurrences, &c. Place by his side a boy of the same age who has had the misfortune to be born deaf, and observe the contrast. The latter is insensible to all you say; he smiles, perhaps, and his countenance is brightened by the beams of 'holy light;' he enjoys the face of nature, nay, reads with attention your features, and, by sympathy, reflects your smile or frown. But he remains mute; he gives no account of past experience or of future hope. You attempt to draw something of this sort from him; he tries to understand, and to make himself understood; but he cannot. He becomes embarrassed; you feel for him, and turn away from a scene too trying, under the impression that, of these two children of misfortune, the comparison is greatly in favour of the blind, who appears by his language to enter into all your feelings and conceptions, while the unfortunate deaf-mute can hardly be regarded as a rational being; yet he possesses all the advantages of visual information as direct sensation." The cause is not that the blind possess a greater, or anything like an equal, stock of materials for mental operations, but that "they possess an invaluable engine for forwarding these operations, however scanty the materials to operate upon,—artificial language," which is the medium of thinking; and "its value to a man is nearly equivalent to that of his reasoning faculties." The truth is, that the deaf are far more isolated all their lives from those that hear than the blind are from those that see. "Our interest in each other," says Dr. Wilson, "far exceeds, and ought to exceed, our interest in the world; and from all this human sympathy the deaf are almost totally cut off; while the blind, excused from many duties which the seeing can only discharge, are peculiarly free to indulge in gossip with their more favoured neighbours, and can largely exchange opinions with them. Moreover, the blind can scarcely fail to find their own tastes suited in some portion of the talk of their neighbours;" "whilst the deaf, unless they have a great aptitude for such occupations as employ the eye and the hand, are far more narrowed in their circle of studies, and much more solitary than the blind." There have been blind travellers, like Holman; blind poets, like Homer, Milton, and Blacklock; blind divines, like Lucas and Troughton; blind mathematicians, like Saunderson and Moyes; blind naturalists, like Huber; blind historians, like Prescott; blind musicians, blind sculptors, blind mechanicians; indeed, Dr. Reid asserts that "sight discovers almost nothing which the blind may not comprehend." But their conceptions of many things must, at least, be very imperfect; light, colour, and space, must ever be words which they cannot fully realize. The blind are able to make up, in great measure, for their want of sight by the greater development of their other senses. By assiduous application and attention, the senses of touch and hearing become much more delicate and acute. It has even been said that some have been able to distinguish colours by means of touch; but this seems very doubtful. By accurately distinguishing the various kinds and modifications of sound, they are able to form correct ideas on many subjects. Much, too, depends upon the memory, which, from exercise, becomes much more retentive than in ordinary cases. "It is a remarkable fact," says Mr. Anderson, who has had large experience among the blind, "that they scarcely ever hurt themselves, either against furniture or in play. At Edinburgh, they were constantly walking about the crowded streets. There were four or five messengers, whose business it was to carry home all the goods sold,—baskets, mattresses, rope-mats; and not only did they do this with the greatest exactness, but they were daily in the habit of going to all parts of the city,—Leith, Portobello, and environs, to take measurements for bedding. I have many times had the dimensions of two and even three beds brought to me, all on memory, with a precision not exceeded by the most expert workman, including the exact allowance of so many inches to be cut out for the bedposts."—(Ref. *Observations on the Employment, Education, and Habits of the Blind*, by T. Anderson; *The Lost Senses*, by Dr. John Kitto; *The Five Gateways of Knowledge*, by Dr. George Wilson.) It is estimated that there are no fewer than 3,000,000 of blind persons in the world at the present time. Of this vast number, 87,000 are in France, about 45,000 in Germany, upwards of 70,000 in Russia, about 3,000 in Holland, 5,700 in Sweden, upwards of 2,000 in Norway, and about 29,000 in the British isles. According to the census of 1851, there were, in Great Britain and the islands of the British seas (exclusive of Ireland), 21,497 (11,273 males and 10,214 females) persons totally blind. In proportion to the population, there was 1 blind person in

every 975 in Great Britain; 1 in 979 in England and Wales; 1 in 960 in Scotland; and 1 in 837 in the Channel Islands and the Isle of Man. In Ireland there was 1 blind for every 864 persons. As compared with other countries, it is found that in the level portions of Europe, comprising Belgium, Hanover, parts of Germany, and the plains of Lombardy and Denmark, the average is nearly the same as that of Great Britain, being 1 in every 950 inhabitants. In more elevated regions, the proportion is considerably lower, except that in Norway it is as high as 1 in every 482 inhabitants. The number of blind persons in early life is not large. Of the 21,487 blind persons in Great Britain, only 2,029, or less than 1¼ per cent., were under 14 years of age (a circumstance tending to show that cases of blindness at birth are not very common); between 20 and 60 years of age, there were 8,456 persons, or about 39 per cent.; while 10,102 persons, or 47 per cent., were above 60 years of age; showing that in many cases it had arisen as an infirmity of old age. It has been thought that blindness has been increased by many of the employments followed in populous manufacturing towns, and that crowded dwellings and other circumstances attendant upon dense populations, by inducing diseases of the organs of sight, have caused a greater amount of blindness in towns than in rural localities. It is clear, however, from the census returns, that a much larger proportion of blind persons exist in the agricultural than in the manufacturing and mining counties. For example, in Wilts, Dorset, Devon, Cornwall, and Somerset, there was an average of 1 blind in every 768 inhabitants; whereas in the West Riding of Yorkshire, there was 1 in every 1,231; in Cheshire and Lancashire, 1 in 1,167; in Durham, 1 in 1,163; and in Staffordshire, 1 in 1,082. This may partly arise from the greater age attained in the agricultural districts; but it is also to be borne in mind that the institutions for the reception and education of the blind are located in our principal cities and towns. In London, the proportion of blind is 1 in 1,025; in Leeds, 1 in 1,209; Birmingham, 1 in 1,181; Sheffield, 1 in 1,141; and Manchester, 1 in 1,107. We are of opinion that the greater proportion of blind in the rural districts is owing in some measure to the constant exposure of the eye to the sun and the inclemencies of the weather which out-door pursuits involve.

Blind, Education of the.—It was not till towards the close of the last century that any effort was made for the education of the blind. The first school established for that purpose was that of Paris, founded in 1784. It was followed by those of Liverpool, Edinburgh, and London, established in 1790, 1791, and 1800, respectively. Since that time schools have been established in most of the large cities and towns of the kingdom. One great obstacle in the way of the education of the blind, are the numerous systems that at present are in use for teaching them to read. M. Hauy was the inventor of the art of printing in relief; but various attempts had been made before his time to give them a knowledge of letters. The French system of M. Hauy was subsequently much improved upon by Mr. James Gall, of Edinburgh, who employed only one alphabet in place of two (capital and small letters), and excluded curves and circles, substituting angles and straight lines. He published several preparatory books in this style for the use of the blind. A few years later, in 1832, the Society of Arts in Scotland offered their gold medal for the best alphabet and method of printing for the use of the blind, which was awarded to Dr. Fry. Mr. Alston, of Glasgow, subsequently made various improvements upon Dr. Fry's system, so as to render the letters sharper and more tangible. The systems at present in use may be divided into two classes,—the alphabetical and the arbitrary. The alphabetical comprise,—1. Alston's system of Roman capitals; 2. the American system of smaller capitals, with serrated edges; 3. the French alphabetical; and 4. Alston's modified. The arbitrary systems are,—1. Lucas's; 2. Frere's; 3. Moon's; 4. le Système Braille; and 5. le Système Carton. Each of these systems has its advocates and adherents. Books are printed in them; and, as few blind persons ever master more than one system, the books of every other system are unintelligible to them. Mr. E. C. Johnson, in his "Tangible Typography," thus lays down the conditions to be satisfied in any system employed in the teaching of the blind:—"The system of embossed printing for their use should embrace at least the following features: it must resemble as nearly as possible the type in ordinary use among those who have eyesight; (*a*) that the blind scholar learning to read may have every possible help from words which he may have formerly seen, but which now his fingers must decipher; (*b*) that he may derive help in learning from any one who can read an ordinary book, or, if needful, that his friend may be able to read to him. 2. It must present the words correctly spelt in full, that, when he learns to write, he may do so in a correct manner, which others can read. 3. The raised characters must be clear, sharp, and well-defined, which the finger hardened by long work and the keen touch of the little child may be able alike to discern." The system of Mr. Alston is that which seems to meet with most favour, as being that which is most easily learned and most nearly allied to ordinary letters. He has simply adopted the ordinary Roman letters in such a form as to be most easily felt. The Americans adopt Alston's system, but with a smaller type, which renders their books more difficult to read, though it lessens the cost of them. In what are called the arbitrary systems, in place of the ordinary letters of the alphabet, arbitrary characters are adopted. One of the principal of these is the system of Mr. M. T. Lucas, which proposes to be to a blind person what stenography is to a seeing person. His alphabet is composed of thirty-six characters, ten of which represent double letters. Not only are all letters omitted that are not necessary to the sound, but in many cases single letters stand for words; as *t* for the; *y*, yet; *e*; *b*, by, &c. The advantage claimed for this system is the saving of types, paper, and labour in the printing of books; but this is found not to be the case, for the characters occupy more space than if the words were all written at full length in Roman capitals; while it must be much more difficult to master, and must give rise to frequent confusion. The New Testament in Alston's system is comprised within 623 pages; whereas in Lucas's it occupies 841. The system of Frere is also stenographic, founded on Gurney's shorthand, as that of Lucas was on Byrom's. Its distinctive feature, as compared with Lucas's, is that it is phonetic, the characters being intended to represent the simple sounds of the English language, rather than the letters; and each word is represented according to its pronunciation. The alphabet is composed of thirty-two characters, to each of which is attached a short description intended to fix more strongly in the memory of the learner the force of the character. The vowels are represented by simple dots, which, in different positions, represent the different vowels, and are divided into five long and five short. There are also twelve rules in verse for teaching the learner how to supply the omitted vowels correctly. Mr. Moon's system is certainly the best of the arbitrary systems. His alphabet consists of "the common letters simplified;" in other words, six of the Roman letters remain unaltered; twelve others have parts left out, so as to be open to the touch; the rest are new and simple forms. It will be found, however, on examination, that the resemblance between Mr. Moon's letters and the Roman capitals is by no means so great as one might expect from his statement. "A letter," he says, "must consist of only one or two lines, to be felt by the thick finger of an adult." The words are all spelt at full length. Mr. Moon's system is, however, the most cumbrous and expensive that has yet been devised,—circumstances which are much against its popularity. An ingenious "string alphabet," for enabling the blind to read and write or correspond with each other, was invented some time ago by David Macbeath and Robert Milne, two inmates of the Edinburgh Asylum, and has been found to answer its purpose remarkably well. The different letters of the alphabet are represented by different kinds and combinations of knots on a cord. They are distributed into seven classes, each class comprehending four letters, except the last, which has only two. The first, or A class, is distinguished by a large round knot; the second, or E class, by a knot projecting from the line; the third, or I class, by a series of

links, vulgarly called "the drummer's plait;" the fourth, or M class, by a simple noose; the fifth, or Q class, by a noose with a line drawn through it; the sixth, or U class, by a noose with a net-knot cast on it; and the seventh, or Y class, by a twisted noose. The first letter of each class is denoted by the simple characteristic of that class; the second, by the characteristic and a common knot close to it; the third, by the characteristic and a common knot half an inch from it; and the fourth, by the characteristic and a common knot an inch from it. The mode of teaching the blind by means of raised music is now little practised, it being found, from their great strength of memory, that they are able to learn very long pieces by means of the ear alone. Embossed maps and globes are employed for teaching them geography; and in addition to raised maps of the heavens, various ingenious contrivances have been resorted to for making them acquainted with different branches of astronomical knowledge. They are instructed in arithmetic by means of a board containing a series of pentagonal holes, which receive pentagonal pins, representing the ten digits. By the use of such boards, they may be carried to any extent in arithmetical knowledge. They may be taught mathematics by means of a board full of small holes, with a few pins fitted to them, so as to represent certain letters; while, with a cord extended from the different points, are formed the lines of the figure or diagram. The success of Saunderson, Moyes, and others, sufficiently proves that blindness is no great impediment to a knowledge of mathematics; indeed, according to some, the blind possess great advantages. In the various educational establishments for the blind, they are instructed in sundry manual occupations, as in the making of baskets, mats, rugs, shoes, and such-like; for, in the words of Dr. Lettsom, "He who enables a blind person, without any excess of labour, to earn his own livelihood, does him more real service than if he had pensioned him for life." For an account of the principal educational establishments for the blind throughout the country, *see* Knight's *English Cyclopædia*—Arts and Sciences.

BLINDAGE, *blinde'-aj* (Sax. *blind*), in Mil., any temporary construction to secure soldiers from the fire or the observation of an enemy. It consists principally of beams of timber, against which fascines are piled, which are covered with earth, turf, and raw hides. When a fort is besieged, and it happens to be without casemates for the protection of the soldiers, covered sheds of this kind are sometimes made, which serve them for a retreat, and a secure place in which they may lodge their provisions and ammunition. These are generally built by placing beams at an angle of 45° at short intervals from each other, against any wall fit for the purpose, or the revetment of the counterscarp, and covering them with fas[illegible] and earth. Sometimes blindages are made by putting timbers against each other like the roof of a house, and covering them as before; and sometimes they are made by inclosing a small space with palisades, and piling up a thick flat roof of beams, earth, and sods upon them. These defences can be made bomb-proof. Artillerymen working guns on the ramparts are protected from ricochet and vertical fire by blindages, made by fixing palisades on either side of every gun, and forming a thick roof above it with the materials above-named; the blindage is open to the rear, and the gun can be worked through the embrasure without hindrance. Soldiers in the trenches, engaged in making the approaches to a besieged fort, and exposed to a heavy fire from the ramparts, are protected by placing a blindage over the trench, constructed by frames of timber, rising perpendicularly from the sides of the trench which support a roof made in the usual way.

BLIND COAL, a common name for those varieties of coal containing little or no bituminous matter, and which are said to burn blindly, from giving out neither flame nor light. (*See* ANTHRACITE.)

BLINDING, *blinde'-ing*, a kind of punishment formerly inflicted upon perjurers, thieves, and adulterers. The early Christians were also frequently subjected to it. It was performed in various ways. Sometimes boiling vinegar, or a mixture of lime and vinegar, was dropped into the eyes; often a cord was twisted round the head until the eyes started from their sockets. The most common method of administering this horrible punishment during the Middle Ages was by placing a red-hot metal basin before the eyes.

BLINDNESS, *blinde'-ness*, is a more or less complete deprivation of vision, in consequence of a diseased state of the organs of sight. Some of the blind retain a slight perception of light, or are able to distinguish the general outlines of bodies, or very bright colours, while others are entirely deprived of the faculty. Some are blind from birth; others become so in consequence of disease. In those that are born blind, the eyelids are sometimes united to each other, or to the eyeball itself; sometimes a membrane or film covers the eye; sometimes the pupil is closed, or adheres to the cornea: and sometimes the opening of the pupil is not in the right place, so that the rays of light do not fall in the middle of the eye. It may also arise from some defect of the optic nerve, or of the brain in connection with it. Blindness may result from disease of the optic nerve, or of the brain; or from an abnormal condition of the humours or coats of the eye, intercepting the passage of the light to the optic nerve. Among the diseases of the brain that may produce blindness are hydrocephalus, inflammation, congestion, softening or wasting of that organ. The eye itself may be injured by inflammation, suppuration, or cancer; spots, films, or tumours may form on the cornea, and so destroy its transparency; the humours of the eye may become thick and turbid; or the opening of the pupil may be destroyed. Blindness often arises from debility of the optic nerve, occasioned frequently by long-continued overstraining of the sight. It is in this way that certain kinds of occupations are so injurious to the sight, and often cause blindness. Hence it is, too, that in the northern regions, where the country is long covered with snow, which reflects the sun's rays, and in the sandy deserts of Africa, blindness is common. In old age blindness is usually occasioned by a drying up of the humours of the eye, a thickening of the cornea or crystalline lens, or atrophy of the optic nerve. *Day blindness* is an inability to see during the day in a bright light. Those who have been long immured in dark cells are often affected in this way. *Night blindness* is that state in which blindness comes on towards evening. This may be continued for some time; but at length the eyes become weak during the day also, and it terminates in amaurosis. Proceeding as blindness does from such a variety of causes, it is impossible to say anything here regarding its treatment, which will be found noticed in other parts of the work. (*See* AMAUROSIS, CATARACT, OPHTHALMIA, EYE, SIGHT.)

BLINDNESS, COLOUR. (*See* COLOUR BLINDNESS.)

BLINDWORM, a small reptile belonging to the fam. *Anguidæ*. There is a great variety of the species in Europe, and one of the genus is well known in many parts of Britain. It is perfectly harmless, and in no species are there any poison-fangs. Its teeth are very small, and, when irritated, it attempts to bite, but is unable to pierce the skin. Its eyes are very small, and in consequence it is believed to be blind by the ignorant; hence the name. The blindworm lives in holes, in rocks, under stones, &c., and feeds on live worms and insects. It will not touch them when it finds them dead. Its length varies from 11 to 18 inches, and its thickness is equal throughout its length. Its colour is silvery gray, with a black line along the back. The body is singularly brittle; the tail is easily broken off, but soon sprouts out afresh, and at the end of a year is quite renewed. The blindworm, or *slow-worm* as it is often called, remains torpid during the winter, and casts its skin at the beginning of summer. It is ovoviviparous, and the number of young varies from seven to twelve at a birth. One of the most interesting facts in connection with the blindworm is that it forms one of the connecting links between lizards and serpents. The bones of the head of a blindworm connect it with the lizard family; and although there are no external traces of limbs in the skeleton, there are the bones of the shoulder, the sternum or breastbone, and the pelvis, all existing in a rudimentary state.

BLISTER, *blis'-ter* (Ang.-Sax.), a pustule or thin watery bladder on the skin containing serum. It is formed by raising the cuticle, and may be occasioned

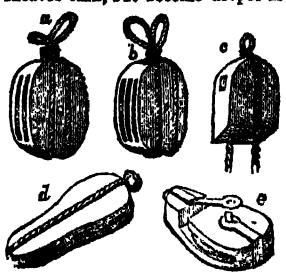
by a burn or other injury, or by a vesicatory. The term is also applied to the separation of the film or skin of plants, and to the marks on the surface of steel that has undergone carbonization.

Blister, a medicinal agent, which, when applied to the skin, causes the cuticle to rise in small vesicles filled with a serous fluid. The most ordinary blister in use is made from the Spanish fly, Blister-fly, or Cantharis. It is mixed with a definite proportion of lard and wax, and used as a plaster. Blisters, however, are applied either in the form of a plaster, or in the liquid state, as may suit the convenience of the operator. Their object is to draw away, by counter-irritation, any inflammatory action from a part to which direct remedies cannot be applied. Latterly they have been greatly used for the purpose of dispersing glandular tumours, and also for indolent ulcers. Blisters made from cantharides, when applied for too great length of time, produce distressing affections of the urinary bladder. A piece of silver-paper, or gauze wet with vinegar, is often laid between the blister and the skin when it is applied to children and thin-skinned people. Tincture of cantharides, croton oil, strong liquid ammonia, and mustard, are the blisters generally used. Mustard blisters are seldom kept on long enough to produce blisters. In every case a blister should not be kept long applied, and great cleanliness is necessary in dressing the part. Sores which have taken an unhealthy action have often been produced by keeping blisters too long upon children.

Blistered Steel is manufactured by heating bars of malleable iron with cement-powder, in boxes made of fire-brick or earthenware. Cement-powder is composed of nine parts of charcoal, mixed with one part of common salt and wood ashes. A layer of this powder an inch thick is laid at the bottom of each box, and upon that a row of iron bars is placed; more cement-powder is laid over them, and then another row of bars, until the box is nearly filled. A layer of four or five inches of fine sand or loamy earth is placed upon the top of all. The box is then gradually heated to redness, and in about four days it is fully heated through, and the furnace attains its maximum heat. This temperature is maintained for two or three days, when the first test bar is drawn out. The heat is afterwards regulated according to the degree of hardness which may be required. The bars, in this process of cementation, remain eight days for soft steel, and nine to eleven days for harder purposes. When the bars are taken out of the box, their surfaces are found covered with blisters; hence the name. Whilst the iron is being heated with the cement-powder, it undergoes a chemical change. The malleable iron absorbs and combines with about 1½ per cent. of carbon; while a small amount of carbon combines with a portion of oxygen in the iron, and forms carbonic oxide, which, in its escape from the metal, gives rise to *blisters* on the surface. Blistered steel is generally employed in the manufacture of hardware. When this process was discovered is not known; but at a very early period it was known that charcoal hardened iron, and gave it a more permanent and better cutting edge. Blistered steel is more fusible than malleable iron; its texture is not fibrous, and when a bar is broken, it shows a close fine grain.

Blister-Fly, or Cantharis (*Lytta vesicatoria*), an insect common to the south of Europe. Its body is used for medicinal purposes, having the effect of raising a blister when applied to the skin. It has been observed that the efficacy of the insect increases according to the heat of the country inhabited by it.

Block, *blok* (Fr. *bloc*; Ger. *block*), in Mar., an adaptation of the principle of the pulley, used in the rigging of ships. By means of blocks, sailors are enabled to raise the sails, and tighten or loosen ropes in different parts of the vessel, with greater facility. They are of various kinds, being called single, double, triple, &c., according to the number of sheaves contained in them. They also receive different names from some peculiarity in their shape; such as the "long-tackle block" and the "clue-line block;" or from the position in the rigging in which they happen to be placed. There is a great difference in the size and capability of blocks used on board ship, and for various purposes in which such mechanical appliances are required. The component parts of a block are the shell, the sheave, the pin, and the strap. The shell is the piece of wood in which the sheave, or pulley, works: it is generally made of elm. Its common form is oval, somewhat resembling a spheroid, flattened at the sides, and perforated with one or more chambers, or mortises, according to the number of sheaves it is intended to receive, in a direction parallel to the sides. The sides of the shell are grooved in two places on either side of the pin, to receive the rope by which the block is to be suspended. The grooves are shallow near the pin on which the sheaves turn, but become deeper as they approach the top and bottom of the shell. The sheaves are circular pieces of lignum vitæ, of different thickness, according to the size of the rope that is intended to work over them; and the circumference is grooved, to prevent the rope from slipping away from it. A hole is bored in the centre of the sheave, in which a piece of gun-metal, called the coak, is introduced and riveted to the wood; a hole is then made in the coak, exactly in the centre of the sheave, through which the pin by which it is secured in the shell, and on which it revolves, is introduced. The pin is made of iron, polished as highly as possible, to prevent friction. The strap which surrounds the sides of the block is made of rope or iron, generally of the former: it is formed into a loop at the top of the block, to afford the means of suspending it in any required position. Blocks without sheaves, perforated with holes only to admit of the passage of a rope, are used in fastening the standing rigging and shrouds of a ship: they are technically called "dead-eyes." Great nicety is required in the construction of blocks, that they may work with facility: they were formerly made entirely by hand, and block-making was quite a separate branch of manufacture, or carried on by those who were engaged in making masts. During the present century, blocks for the navy have been made by machinery; for, in 1801, Mr. Brunel, who had turned his attention to the subject, produced the working model of a machine by which the various parts of a block could be made and fitted with far greater exactness than by hand. The government, which clearly saw the importance of the invention in this case, caused machines to be erected at Portsmouth, under the superintendence of Mr. Brunel, for the manufacture of blocks for the navy; and in the year 1808, after considerable delay, owing to the intricacy and delicate construction of the machinery, they were brought into thorough working order. Since that time, block-making machines have been put up at Chatham and in other dockyards. The first machine erected at Portsmouth, under the management of ten workmen, turned out about 500 blocks a day, at an average cost of about 7*s.* 6*d.* per block, effecting a saving of upwards of £20,000 per annum to the country during the height of the war with France in the early part of the present century. Mr. Brunel received £20,000 for his invention. The method of operation by the machines is as follows:—The elm is first cut into pieces, according to the size of the blocks required, by a straight saw, working horizontally; the slices thus formed are cut into rectangular parallelopipeds by the action of a vertical circular saw, called the ripping-saw. The piece of wood is then secured immovably to an iron table by the pressure of screws, and two perforating instruments, or borers, working horizontally, or parallel to the plane of the table, and at right angles to each other, are applied to it: one forms the hole from side to side, through which the pin on which the sheave revolves is inserted; and the other makes a hole forming one extremity of the



BLOCKS.

chamber, or chambers in the case of double and triple blocks, with which the shell is to be pierced. When this has been done, the chambers themselves are rapidly cut out by the action of a steel chisel, the motion of which, as well as that of the block, to enable it to receive the chisel's successive strokes, is regulated by very elaborate and ingenious mechanism. The corners of the block are then taken off by a circular saw, and it is afterwards brought to its oval shape by what is called the shaping-machine; the grooves in the sides of the block are finally hollowed by the scoring-machine, and the shell is then ready for the reception of the sheave, which is fashioned by machinery of less complicated construction. In the illustration given upon the preceding page, are figured,—*a*, the double block; *b*, the treble block; *c*, the clue-line block; *d*, the long-tackle block; *e*, the snatch block.—Ref. *English Cyclopædia*—Arts and Sciences.

BLOCKADE, *blok-aid'*, in Mar., the close observation of any port or harbour on the seaboard of an enemy's country, to prevent the entrance and egress of vessels engaged in commerce, or an attempt to relieve the beleaguered town by the introduction of men or provisions. It is effected by stationing men-of-war at a short distance outside the blockaded port. —In Mil., towns and forts that are difficult of investment and regular approach by trenches, through being situate in a commanding position on a hill or eminence, are blockaded by being surrounded with a cordon of works or redoubts established on the surrounding heights, at the distance of half a mile or more from each other, according to circumstances and the nature of the country. The great object in both cases is to starve the inhabitants and garrison into submission, and thus effect the reduction of the place besieged. Sometimes a blockade must be carried on by sea and land at the same time to render it complete and efficient; but the term is more particularly applicable to the investment or watching of a port by ships of war. The following is the definition of the word blockade, in the words of Sir William Scott, afterwards Lord Stowell:—"A blockade is a sort of circumvallation round a place, by which all foreign connection and correspondence is, as far as human power can effect it, to be entirely cut off." A summary of the chief points in international law affecting the relative rights of neutrals and belligerents in the case of the blockade of the coast of one belligerent power by another, will be found below.

BLOCKADE, LAW OF.—The law of blockade, as affecting the rights of neutral states which are in any way connected with that belligerent power whose ports are closed by another that has declared war against it, is one of the most intricate subjects in international law, owing to the difficulty of determining on the one hand to what extent belligerents shall be restricted in the exercise of the rights of war as far as neutrals are concerned, and, on the other, to what limits neutrals may proceed, in their relations with the country whose ports are blockaded, without bringing themselves under the power of its adversary. A declaration of war made by one power against another, accompanied by an official notification of the blockade of the ports of one or both of the belligerents, is always attended with serious injury to the commercial intercourse between neutral states and the power or powers whose ports are closed. As soon as a blockade is notified, all intercourse between the power whose ports are blockaded and neutral states is at once stopped; but a certain time is given to allow ships belonging to neutral states to clear out of the blockaded ports with the cargoes they have already taken on board, and for the merchant vessels of that power to return home prior to the date from which a strict observance of the blockade commences. For any power to take steps to render intercourse between an enemy's ports and neutral states impracticable, is perfectly consonant with justice, even though such an act be attended with loss and detriment to the commerce of such states; and it is equally fair and right to consider any vessel that attempts to enter an enemy's port, after notice of the blockade has been given, in the light of an enemy's ship, and to treat it accordingly; or to prevent any other power from holding direct intercourse with that whose ports are closed, as the neutral vessel may be engaged in carrying in munitions of war and provisions; and the power insisting on freedom of intercourse be giving moral support, at least, to the enemy's cause; thus frustrating the designs of the blockading power to a certain extent, and perhaps thwarting a more speedy settlement of the quarrel that might ensue if the blockade were strictly enforced and observed by all parties, whether directly or indirectly concerned. That a blockade may be really effective, there must be a sufficient number of ships surrounding the port to render the ingress and egress of vessels either impracticable, or attended with danger of capture or destruction. It is not sufficient for one power to say that it has notified the blockade of the ports of another power, and to leave those ports unguarded by men-of-war; if so, the right and privilege of capturing any vessel which touches, or even has touched, at any port thus nominally blockaded, which a belligerent closing the ports of another power asserts, would be unlimited and insupportable. Such a blockade would be merely nominal, and any neutral power would be justified in taking no notice whatever of a mere notification, unless supported by the means of carrying the same into effect by an armed force. An effective blockade depends, therefore, on the actual fact, accompanied by a proper notification of the same. A mere notification, without armed vessels stationed at the ports which are closed, has been already stated to be useless. There are, then, two kinds of blockade: one, without notification, which ceases on the withdrawal of the ships from the blockaded port, unless caused by accident or a mere change of wind, obliging the blockading vessels to abandon their position for a while; and another, when notification of a blockade has been given to neutral states, and supported by the investment of the enemy's ports by vessels of war. In the latter case, all states are obliged to respect the blockade until an official report of the raising of the same has been received; and this should be made by the blockading power immediately after the cessation of hostilities, although no means exist by which any power may be called to account for neglecting this observance. Vessels belonging to neutral states, that happen to be in any port with their cargoes already on board before notification of the blockade has been made, are at liberty to quit the harbour, even after notification has taken place, under certain restrictions; but they must not take in any additional cargo, nor is it admissible for the master to make any purchases at that port, except what may be absolutely necessary for the maintenance of himself and his crew. After notification of a blockade has been made, it is manifestly a breach of blockade for a vessel to attempt to enter or come out from any closed port. Any vessel may be lawfully captured which is approaching the harbour with the view of running the blockade at some convenient opportunity; and some assert that a vessel may even be taken and condemned which has just set sail from a neutral port with the intention of entering a port of the enemy's, although it would be a difficult matter to prove that such was the intention of the master, as well as the owners of the ship and cargo, unless the belligerent power effecting the capture had managed to institute a system of espionage at the port from which the vessel had sailed, and at the other principal ports of the neutral state to which it belonged. When any neutral vessel has managed to run the blockade, it is liable to capture, until it has reached its own port, or any other in which it may take shelter; but it is still liable to be taken on again leaving that port, until the cessation of hostilities has caused the blockade to be raised. When a neutral ship is captured in an attempt to violate a blockade, or after having done so, it must be taken [illegible] as the case may be. If the capture prove to be illegally made, the owners can claim an indemnity for detention, and any injury done to the cargo; but if it can be satisfactorily proved that a sufficient blockade of the enemy's ports exists, and that some actual breach of the blockade has taken place, with the knowledge and connivance of the master and owners of the ship and cargo, the vessel and its contents are formally condemned and sold for the

benefit of the captors; if, however, it can be proved that the master of the ship is alone implicated in the breach of the blockade, while the owners of the cargo with which his vessel is freighted are not in any way privy to or cognisant of the offence, the cargo is given up; while, on the contrary, if the owners of the cargo can be proved to be the only parties that are guilty, and that the master or owners of the vessel have not intentionally violated the blockade, the cargo alone is taken and the vessel restored. It is perfectly lawful for neutral states to carry on intercourse with a blockaded port by any inland means of communication, and their vessels may land their cargoes at the nearest port belonging to some neighbouring power, and transmit the goods overland. The law of blockade was carried to its highest pitch, and enforced with the utmost rigour and severity, during the struggle between France and Great Britain, in the early part of the present century. The emperor Napoleon issued his famous decrees of Berlin and Milan in 1806 and 1807, by the former of which all vessels trading to British ports were declared subject to capture; and, by a supplementary decree, that any vessels whatever, not possessing certificates from the French consuls at the ports from which they sailed, that no part whatever of the cargo which they had on board was British; and further, all countries were prohibited from trading in British productions or manufactures of any kind whatever. The English government retaliated by the "orders in council," 1807—1809; but this restrictive policy with regard to neutrals proved so injurious to the trade of this country, that it was subsequently abandoned, in compliance with the representations of the merchants of London and the large mercantile towns, who had petitioned for a repeal of these orders. The present acceptation of the law of blockade may be considered to be founded on the clear and lucid judgments delivered during this period, and up to the close of the war in 1815, by Lord Stowell, then Sir William Scott, in his capacity as president of the High Court of Admiralty. A statement of the laws affecting the right of belligerents to search vessels belonging to neutral states suspected of carrying "contraband of war" will be found elsewhere. (*See* SEARCH, RIGHT OF.)—*Ref.* Wheaton's *Elements of International Law*; Hazlitt and Roche's *Manual of the Law of Maritime Warfare*; *English Cyclopædia*—Arts and Sciences.

BLOCKHOUSE, *blok'-hous*, a work of defence, formed principally, as the name implies, of logs of timber. It may be built by itself, in which case it may be looked on as a small independent fort; or it may be situated in the interior of field-works, when it becomes a retrenchment, used for the same purposes as orections of a somewhat similar nature called blindages. (*See* BLINDAGE.) The blockhouse is generally built in countries where there is plenty of timber, and in situations where light artillery cannot be brought to bear directly upon it. It is for the most part of one story only, and rectangular in form. Strong timbers are fixed in the ground perpendicularly at the angles of the blockhouse, to which the sides are attached, formed of horizontal logs strongly fastened together, and pierced at a convenient height with loopholes, from which a fire of musketry can be kept up against assailants. It is generally surrounded with a ditch, the earth taken from which is piled against the lower part of the building, and used to form the roof, being heaped on an interior covering of logs and faggots. The ditch is useful in preventing the close approach of the enemy to set fire to the blockhouse. The entrance, if in the side, is protected by blindages; but it is generally made in the roof, and entrance and egress obtained by means of a ladder. If an upper story be added to the blockhouse, it is usually built so that its four sides overlook the angles of the lower story, being parallel to its diagonals. This enables the defenders to direct their fire against any one approaching the angles of the lower story, which are necessarily out of the line of fire directed from its faces. When the roof is intended to resist artillery and to be shell-proof, it must be made of earth well rammed together, at least four feet in thickness. The American backwoodsmen and trappers have found these log-forts of great service in their conflicts with the Indians; and they are very skilful in constructing them. Sometimes the blockhouse, which, in its simplest form, is about eighteen or twenty feet square, assumes a more important character, and is erected for the purpose of resisting artillery. In this case it is built with re-entering angles, which permit a flanking fire of musketry to be kept up to defend the sides of the work, and the walls are made of a double row of upright timbers about two or three feet apart, with the intervening space filled with earth.

BLOCK-SHIP, in Mar., an old ship which, having become useless as a sea-going craft, has been utilised as a defence for great ports or arsenals. The many and rapid improvements that have taken place in naval architecture have caused a large number of English war-vessels to be unavailable otherwise than as block-ships.

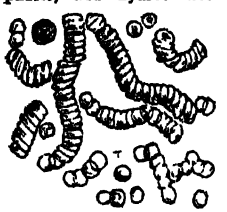
BLOCK TIN.—This term is applied very erroneously to the better qualities of tinned iron; but it really means the impure quality of metallic tin, the pure kind being called *grain-tin*.

BLOOD, *blud* (Sax. *blod*; Germ. *blut*; Lat. *sanguis*), a red fluid circulating through the heart, arteries, and veins of animal bodies, serving for the nourishment of all their parts, and the support of life. This nutritive fluid, called scientifically the *liquor sanguinis*, consists firstly of water, holding, in a dissolved condition, fibrine, albumen, potassium, and sodium, together with phosphoric acid and other substances; secondly of corpuscles, or globules, which float in the *liquor sanguinis*. When drawn from the body, the blood undergoes a remarkable change. By degrees it gelatinizes, and forms spontaneously coagulum and serum. Coagulum consists of the fibrine and the corpuscles; serum, of water, albumen, and the various saline matters. The corpuscles are of two kinds—red and white, the red being the more numerous. In man, a red corpuscle varies in size from $\frac{1}{3200}$ of an inch to $\frac{1}{5000}$ of an inch. The discovery of the globules of the blood is due to Leuwenhoeck and Malpighi, whose researches were made soon after the microscope was invented. Blood is termed arterial or venous, according to the vessel in which it circulates. Arterial blood is a florid red, with a stronger odour and less specific gravity than the venous fluid. Venous blood is of a dark purple. The scarlet, or arterial blood, which is one degree warmer than venous blood, owes its colour to its undergoing contact with atmospheric air in the lungs; it circulates in the pulmonary veins, the left cavities of the heart, and the arteries, by which it is distributed to the different organs throughout the body. The dark purple blood circulates in the veins, in the right cavities of the heart, and the lungs. (*See* CIRCULATION OF THE BLOOD, RESPIRATION.) There is, again, a difference between arterial and venous blood in respect to the gases which they contain: the first holds a supply of oxygen, the second is rendered impure by the carbonic acid with which it is loaded. (*See* ARTERY and VEIN.) Blood is the product of the elaboration of chyle; it acquires all its nutritive and life-giving qualities in respiration. By means of the arterial vessels, it penetrates to all the organs, distributing nutrition to every organic tissue. It is, moreover, the principal source of animal heat; from it, also, the secretive organs derive their various products, such as saliva, bile, urine, &c. The average quantity of blood in an adult man has been calculated at 28 lbs. or pints. It has been shown that the composition of the blood undergoes a change in various diseases; and, after repeated bleedings, the number of corpuscles becomes permanently diminished. The colour, as well as the composition of the blood, varies in different sections of the animal kingdom: red in the Vertebrates and Annelides, it is white and transparent as water in Insects and Crustaceans; bluish-white in Molluscs, yellowish in Holothurians and some other Invertebrates. This difference in colour arises from the corpuscles, which are red in some cases, and in others white or straw-coloured, or bluish-white. The temperature of the blood of various animals, according to the researches of Rudolphi and Tiedemann, is—

| | Deg. of Fahrenheit. |
|---|---|
| Great Titmouse | 111·25 |
| Swallow | 111·25 |
| Ducks and Geese | 108 to 111 |
| Common Hen | 102 to 109 |
| Eagles, Hawks, &c. | 104 to 109 |
| Pigeon | 106 to 109 |

| | |
|---|---|
| Gull | 100 |
| Bat | 103 |
| Squirrel | 103 |
| Ox | 104 |
| Ape | 103 |
| Dog | 101 |
| Cat | 98 to 103 |
| Elephant | 99 |
| Horse | 98·24 |
| Man | 98 |

The chemical constituents of blood, when in a healthy condition, are,—albumen, fibrin, hæmatin or colouring matter, oleic, stearic, lactic, phosphoric, sulphuric, and hydrochloric acids, in combination with soda, potash, ammonia, lime, magnesia, and a small portion of phosphorized fat. The blood also contains oxygen, nitrogen, and carbonic acid. In considering the chemical constitution of the blood, it may be regarded as consisting of two parts,—the *liquor sanguinis*, and the blood corpuscles floating therein. The *liquor sanguinis* is composed of serum, holding a small quantity of fibrin in solution. The following table of the composition of these two parts of the blood is based on the analyses of Schmidt and Lehmann, and is a modification of that quoted in Miller's *Elements of Chemistry*, vol. iii. p. 689.—



BLOOD CORPUSCLES.

Specific gravity of blood corpuscles, 1·0855.

*Composition of Blood Corpuscles.*

| | |
|---|---|
| Water | 688 |
| Solid constituents— | |
| Hæmatin | 16·75 |
| Globulin and cell membrane | 282·22 |
| Fat | 2·31 |
| Extractive matter | 2·60 |
| Chlorine | 1·686 |
| Sulphuric acid | 0·066 |
| Phosphoric acid | 1·134 |
| Potassium | 3·328 |
| Sodium | 1·052 |
| Oxygen | 0·697 |
| Phosphate of lime | 0·114 |
| Phosphate of magnesia | 0·073 |

Specific gravity of liquor sanguinis, 1·028.

*Composition of Liquor Sanguinis.*

| | |
|---|---|
| Water | 902·90 |
| Fibrin | 4·05 |
| Albumen | 78·84 |
| Fat | 1·72 |
| Extractive matters | 3·94 |
| Chlorine | 3·644 |
| Sulphuric acid | 0·115 |
| Phosphoric acid | 0·191 |
| Potassium | 0·423 |
| Sodium | 3·341 |
| Oxygen | 0·403 |
| Phosphate of lime | 0·311 |
| Phosphate of magnesia | 0·222 |

Taking the blood as a whole, Liebig gives its component parts as follows:—

| | |
|---|---|
| Water | 80 |
| Solid matter | 20 |

The solid matter, on being incinerated, gives 1½ to 1¾ per cent. of ash, which consists of one-half sea-salt, one-tenth of peroxide of iron, and the rest of lime, magnesia, potash, soda, phosphoric acid, and carbonic acid. (For a description of the chemical substances obtained from blood, *see* HEMATIN, HEMATOIDIN, and GLOBULIN.) — *Ref.* Todd's *Cyclopædia of Anatomy and Physiology*, *English Cyclopædia*—Arts and Sciences.

BLOOD (in Manf.).—The uses of blood in manufactures are principally as a manure (*see* MANURES); its value, in this instance, consisting in the amount of phosphates contained in it; and as a cheap source of albumen for calico-printing. An effort has been made by M. Brocchierri to utilise the nutritive portions of the blood of animals, by reducing it to a dried and concentrated state. Combined with flour, the cream-mentum, or clot of blood, is made into light cakes and biscuits, and by the addition of sugar, into delicious bon-bons. The larger masses, preserved without flour or sugar, form the basis of soup of a very nutritious quality. Blood is also employed, in conjunction with other animal substances, in the manufacture of prussiate of potash. (*See* POTASH, PRUSSIATE OF.)

BLOOD-BAPTISM.—In the early Church, when any one suffered martyrdom without having been baptised, he was considered to have been blood-baptized; and hence martyrdom was termed blood-baptism. When baptism was regarded as essential to salvation, martyrdom was also considered as giving a title to heaven, from Matt. x. 39, and similar passages.

BLOOD, CORRUPTION OF. (*See* ATTAINDER.)

BLOOD, EATING OF.—Under the Old Testament dispensation, the eating of blood was forbidden to the Jews; and in apostolic times the gentiles are exhorted to abstain "from things strangled and from blood" (Acts xv. 20); but this last seems to have been advised in order to meet the prejudices of the Jews of that period, who were contending that the gentiles should be commanded to keep the law of Moses. For some centuries after, the Christian church continued to abstain from blood; and when it was alleged against them that they were in the way of drinking human blood, they replied that it was not lawful for them to drink even the blood of animals. After the 4th century, however, the injunction came to be considered as merely of a temporary character, and so ceased to be binding.

BLOOD-FLOWER. (*See* HEMANTHUS.)

BLOOD-HORSE. (*See* HORSE.)

BLOODHOUND, *blud'-hound* (blood; and Dan. *Aand*, hound) (*Canis sanguinarius*), a dog of such exquisite and peculiar scent as to be able to follow the trail, for many miles, of any body bearing about it traces of fresh-shed blood. The genuine bloodhounds are large, strong, and broad-chested; the upper lip large and pendulous; the general colour a deep tan, marked with



BLOODHOUND.

a spot of black over each eye. Formerly this creature was used in recovering escaped criminals. Such matters, at least in England, have become traditions of a past age, and the instincts of the bloodhound have been turned to the more humane and profitable business of the chase.

BLOOD OF OUR SAVIOUR, was a order of knighthood instituted in Mantua, by Duke Vincent Gonzaga, in 1608, on the occasion of the marriage of his son with a daughter of the duke of Savoy. The name was derived from the belief that the church of St. Andrew, in Mantua, contained drops of our Saviour's blood. The number of knights was restricted to twenty, besides the grand-master.

BLOOD OF ST. JANUARIUS. (*See* JANUARIUS, ST., vol. I. of this work.)

BLOOD-ROOT. (*See* SANGUINARIA and HÆMODORACEÆ.)

BLOODSTONE, *blud'-stone*, a variety of chalcedony, of a fine dark-green colour, variegated with small bright-red spots; whence its name. It is also called *heliotrope*. Being very hard and compact, it is highly valued by seal-engravers, the devices engraved upon it being much sharper and finer than those engraved on other stones of a similar kind. Hæmatite, a brown-red mineral, consisting of sesquioxide of iron, is sometimes erroneously called *bloodstone*.

BLOOM, *bloom* (SAX. *bloma*, a mass or lump), a mass of iron that has undergone the first hammering, called the blomery. After this process it requires many more hammerings or rollings to render it suitable for the use of the smith.

BLOOM, in Paint., is a term applied to an appearance upon pictures which resembles the bloom upon the peach or plum; whence the name. It is probably due to moisture in the varnish used in the painting, and may be got rid of by hot camphine being sponged over the surface of the work, afterwards placing the painting in the sunshine to dry.

BLOOMERISM, *bloom'-er-ism*.—In the year 1849, Mrs. Ann Bloomer, a lady who had been an active promoter of the "Woman's Rights movement" in America, appeared in New York dressed in a novel and fanciful costume. It partly resembled the male attire, and consisted of a jacket with loose sleeves, a skirt which descended a little below the knee, and a pair of Turkish trousers. The grounds upon which Mrs. Bloomer advocated this alteration in ladies' dress were, that since they had resolved to take their places in the world as fellow-workers with men, they ought not to wear a dress that prevented free muscular action. Only a small number of ladies followed the example of Mrs. Bloomer, and those only of the most strong-minded class. Those who were timid and prudent declined to brave the unpopularity and ridicule which the dress brought upon its adherents. Nevertheless, the name of bloomerism attached itself to the principles which actuated all who belonged to the Woman's Rights movement. The first convention of this movement was held in New York, about a year after the costume appeared, under the presidency of Mrs Lucretia Mott. It had for its object the more liberal education of females, advocated their being brought up to trades and professions, and their rights to the social and political privileges possessed by the other sex. In New York, the *Sibyl*, a monthly journal, is still devoted to the advocacy of a reform in ladies' dress; and the editress, a married lady, and several contributors, wear a modification of the Bloomer costume. It is very awkward-looking and ungraceful.

BLOUSE, *blous* (Fr.), a loose sack-like frock, made of coarse partially-bleached linen, and worn as an overgarment by workmen and peasants in France. The piece of attire called in England the "smock-frock" bears a close resemblance to the blouse. It is principally worn by waggoners, brewers' draymen, and farm labourers. The butchers of England, the south of Scotland, France, and Germany, all wear the blue blouse; France, however, is the country where it is most universally worn, as, indeed, France is the country where it was first adopted; for it is nothing else than a modification of the *sayon* of the Gauls. Under the empire of the first Napoleon, the rural and citizen militia wore the blouse. The French workmen wear it of different colours, but a white blouse is always put on as Sunday dress. A kind of blouse, made of better material than the English smock-frock or continental blouse, is often adopted by tourists.

BLOW-FLY, *blo'-fli* (Ang.-SAX.) (*Sarcophaga carnaria*; GR. *sarx*, flesh, *phago*, I eat).—A dipterous, or two-winged insect, of the fam. *Muscides*, of which the common house-fly is the most familiar example. The blow-fly, which is very common in Britain on heaths, in gardens, &c., has a hairy body, with wings that have an expanse of an inch. The face is yellow, the thorax grey with three small stripes, and the abdomen is dark brown, which in certain lights has a blue tinge, and is covered with shining yellow spots. The eyes are always widely separated in both sexes. The larvæ of the blow-fly feed upon the flesh of animals, either living or dead. Sometimes they are found in meat, the carcasses of dead animals, the bodies of living earthworms, and very often upon sheep. The maggots eat their way into the skin of the sheep, which soon die, after suffering great torment. Some parts of England are more infested with these pests than others, and their appearance requires the most untiring attention of the shepherd. Many blow-flies are ovoviviparous, the eggs being hatched within the body of the insect, and their reproduction is very rapid. There is a particular species of this genus which haunts burial-vaults: it is called *Sarcophaga mortua*.

BLOWING-MACHINE, *blo'-ing*, are contrivances, of various kinds, for producing and maintaining a strong current of air for increasing combustion in metallurgical and other processes, requiring intense heat. The simplest form of blowing-machine is the ordinary domestic bellows, which is in principle quite inapplicable to metallurgical purposes, from the stream of air being intermittent. By enlarging it, and adding to it an additional expanding chamber, by the rising or falling of which a constant stream of air is maintained, we get the ordinary smith's bellows. This kind, however, is apt to wear out quickly, and has been entirely superseded in all cases where a strong and steady blast is required. The principal kinds of blowing-machine used for blast-furnaces are these:—The first is simply an air force-pump, worked either by water or steam-power, the air being alternately drawn into and expelled from large cylinders: these generally force the air into a large air-chest, from which proceed tubes to different parts of the factory, leading the blast to various forges or furnaces. The blast is turned off or on by taps inserted in the tubes near the fire-place. In another sort of blowing-machine, much used in iron-smelting, the blast is produced by a series of fans, which revolve at an enormous rate, sucking the air into a tube connected with an air-chest, as in the preceding form. Another kind, in common use on the continent and in America, is called the *water-blowing engine*, or *trombe*. Water, in a finely-divided state, is allowed to fall down a tube, the sides of which contain a series of holes. In falling, the water draws with it a great quantity of air, the accumulation of which causes a draught: the action is analogous to that of the wind produced by a shower of rain. There are several other descriptions of blowing-machines, but the above are the most important.

BLOWPIPE, *blo'-pipe*, an instrument used by workers in metal for soldering on a small scale. It consists essentially of a conical tube, eight or ten inches long, the interior diameter of which varies from half an inch to an aperture the size of a pin-hole. At an inch or so from the small end, it is bent at right angles. It is employed by workmen to direct the flame of a lamp, (generally formed of a bundle of rushes dipped in tallow), upon the portion of solder they are using. It acts by increasing the intensity of the heat of the flame, in the same manner that the current of air driven through a blast-furnace causes intense combustion of the fuel employed, by increasing the supply of oxygen. In 1738 it was first applied to chemical purposes by Swale, a Swedish counsellor of mines. By the use of the blowpipe there is scarcely a mineral the constituents of which may not be easily discovered. This is effected by combining a small portion of the mineral with a flux, and observing the colour produced, by noticing the effect of heat alone on the mineral, or by reducing it to the metallic state by means of charcoal, carbonate of soda, or some other reducing agent. The blowpipe has of late years become an indispensable adjunct to the laboratory; and the excellent treatises on its use by Berzelius, Plattner, and others, show how much it is valued by chemists of the greatest eminence. The chemist's blowpipe is a modification of that used by the jeweller. The most ordinary form is Dr. Black's, which consists of a straight conical japanned tin-plate tube, two-thirds of an inch in diameter at the largest end, which is closed, and one-third of an inch wide at the narrow end, which is open. A small pipe is adapted to the tube at an inch from the broad end; to this is attached the jet, containing a hole the size of a pin, or smaller. By this modification the moisture produced by the breath, which in the common form is ejected as

it is poured through the tube into the flame, is collected and retained in the lower part of the conical tube. It is necessary that the hole in the jet should be perfectly smooth and round, otherwise an irregular blast is produced. The lamp used with the blowpipe is a simple cylindrical gas-tube, about one-fourth or one-fifth of an inch in diameter; or an oil lamp, with a large wick cut slightly slanting away from the operator. The method of using the blowpipe is very clearly described by Dana, in his "Manual of Mineralogy." He says, "It is necessary, in using the blowpipe, to *breathe* and *blow* at the same time, that the operator may not interrupt the flame in order to take breath. . . . Let the student first breathe a few times through his nostrils while his cheeks are inflated and his mouth closed. After this practice, let him put the blowpipe into his mouth, and he will find no difficulty in breathing as before, while the muscles of the inflated cheeks are throwing the air they contain through the blowpipe. When the air is nearly exhausted, the mouth is again filled with air from the nostrils, without interrupting the process of blowing." To understand the management of the blowpipe in mineral investigations, it is necessary to study the properties of the different parts of a flame. On examining a clear candle-flame, it will be found to consist of the following parts:—the bright blue base, merging into a nearly colourless flame surrounding the mass of burning carbon, within which is contained the tallow or wax absorbed by the wick, and converted into a gaseous state by the heat. On directing the current of air through the flame, about the eighth of an inch above the wick, it becomes much elongated, and, owing to the quicker combustion of carbon, much less luminous. The long flame will be seen to consist of two parts,—one bluish, the other yellow, at the junction of which is the point of greatest heat. The blue portion of the flame has the property of withdrawing oxygen from bodies submitted to its action, and is thence called the deoxidising or reducing flame. The yellow portion, having a contrary effect, is called the oxidising flame. Deoxidation or reduction is produced in the greatest perfection by using a small orifice, and by keeping the substance under examination surrounded by the flame, so as to defend it from the action of the atmospheric air. Good practice is obtained by fusing a piece of tin, the size of a pea, on charcoal, and submitting the melted globule to different parts of the flame. By varying the strength of the blast and the position of the globule, much experience will be gained in reducing or oxidizing, as the metal shows instantly, by its brilliance or dulness, which of the two actions is going on. The chief articles used in blowpipe analysis are—charcoal, well burnt and pretty hard; platinum wire, as thick as a stout horsehair; platinum foil; and hard glass tubes, both closed and open. The principal re-agents are carbonate of soda, black flux (which *see*), cyanide of potassium, borax, microcosmic salt (phosphate of soda and ammonia), all in fine powder. A strong solution of nitrate of cobalt is also useful. The first four are used as reducing agents; the last four for producing characteristic coloured beads or flames. Reductions are generally performed on charcoal supports. The beads are formed by dipping the end of a platinum wire turned into a hook into the powdered flux, and fusing it in the flame two or three times, to insure the bead being colourless. If it is at all coloured, some impurity must have been taken up. Having procured a colourless



BLACK'S BLOWPIPE.



METHOD OF USING THE BLOWPIPE.

TABLE OF BLOWPIPE RE-ACTIONS.

| | Borax. | | Mic. Salt. | |
|---|---|---|---|---|
| | *Red.* | *Oxide.* | *Red.* | *Oxide.* |
| Potash | Colourless | Colourless | Colourless | Colourless. |
| Soda | " | " | " | " |
| Baryta | " | " | " | " |
| Strontia | " | " | " | " |
| Lime | " | " | " | " |
| Magnesia | " | " | " | " |
| Silicio Acid | " | " | " | " |
| Manganese | " | Violet | " | Violet. |
| Iron | Green | Red (hot)<br>Yellow (cold) | Red (hot)<br>Yellow (cold) | Yellow (hot).<br>Brown (cold). |
| Cobalt | Blue | Blue | Blue | Blue. |
| Nickel | Opaque | Violet (hot)<br>Red-brown (cold) | Colourless<br>Or in change | Brown-red (hot).<br>Red-yellow (cold). |
| Zinc | White enamel | Colourless | White enamel | White enamel. |
| Lead | Colourless | Yellow (hot).<br>Colourless (cold) | Grey | Colourless. |
| Cadmium | " | Yellow-white | Colourless | " |
| Bismuth | Grey | Colourless | Grey | " |
| Uranium | Green | Red (hot)<br>Yellow (cold) | Green | Green. |
| Copper | Opaque red | Green (hot)<br>Blue-green (cold) | Dark-green (hot)<br>Red-brown (cold) | Green (hot).<br>Blue (cold). |
| Silver | Grey | Enamel | Enamel | Yellow. |
| Mercury | Volatilized | Volatilized | Volatilized | Volatilized. |
| Platinum | Reduced | Reduced | Reduced | Reduced. |
| Gold | " | " | " | " |
| Tin | Colourless and reduced | Colourless, or enamel | Unchanged | Colourless. |
| Antimony | Reduced and volatilized | Colourless | Reduced and volatilized | " |
| Chromium | Green | Yellow-green | Colourless | Red-green (hot).<br>Green (cold). |

bead, moisten it slightly, dip it into the assay, and re-fuse it in the oxidizing or reducing flame, as required. Wires are cleaned by melting off as much of the glass as possible, and afterwards soaking them in water. The preceding table from Plattner gives the reactions in the two flames, with microcosmic salt and borax, of the more common metallic oxides. It will be noticed that the alkalies, earths, and silicic acid give colourless beads under all circumstances. Their presence is generally tested by the colour imparted by them to the flame. For more particular details, the student is referred to Plattner's treatise on the Blowpipe, a work of wonderful completeness. Potash moistened with hydrochloric acid gives either flame a purple tinge; lithia, red; soda, yellow; strontia, crimson; lime, red, but feebler than strontia; magnesia, with solution of nitrate of cobalt, red; alumina, with nitrate of cobalt, blue. Baryta cannot be detected easily with the blowpipe. Ammonia is easily discover[illegible]ntly heating the suspected substance with caustic lime, and holding near it a rod dipped in hydrochloric acid. If ammonia is present, characteristic white fumes of chloride of ammonium are produced. (For the other uses of the blowpipe in the laboratory, *see* FURNACES and GLASS-BLOWING.)

BLUBBER, *blub'-ber* (Ang.-Sax.), the fat of whales and other large sea-animals. Properly speaking, it is the *adeps* of the animal, and lies immediately beneath the skin and over the muscular flesh. In the porpoise it is a firm and fibrous mass, usually about an inch thick; in the whale its thickness is generally six inches: about the under lip it is two or three feet thick. The quantity of blubber yielded by one of these animals is generally from twenty to thirty tons, from which from fifteen to twenty-two tons of oil may usually be extracted. The use of the blubber to the animal seems to be partly to poise the body, and render it equiponderant to the water, partly to keep the water at some distance from the blood, and so prevent chill, and partly to reflect the hot steams of the body, and so redouble the heat; since all fat bodies are less sensible of cold than lean ones.

BLUE, *bloo* (Sax. *bleo*; Ger. *blau*), one of the primary colours. (*See* COLOUR.) A great variety of blue pigments are used in the arts: they are obtained from both mineral and vegetable sources. Prussian blue, one of the most generally used, is made from a mixture of prussiate of potash and a salt of iron. Indigo is also much used when dissolved in sulphuric acid. The Covenanters, in Scotland, chose blue for their colour, in contrast to the red of the king's troopers; and at the battle of Bothwell-bridge their standard had a deep edging of blue. From that time blue was adopted by the Whigs as the distinctive colour of their party: hence the term "true blue." After the landing of William III., orange, or buff, was added to the blue, in compliment to the house of Hanover; and these two colours have been retained by the liberal party ever since. The cover of the "Edinburgh Review," and the banners at contested elections, are examples of this party feeling.

BLUEBEARD, *bloo'-beerd*, is the name of a well-known old French tale of fiction. The hero of the story is a Chevalier Raoul, who had a blue beard, whence his designation. In order to test his wife's curiosity, he intrusts her during his absence on a journey, with the key of a chamber which she is by no means to enter. Unable to stand the test, however, he discovers on his return what she has done, and puts her to death. Several other wives share the same fate, until the seventh, who is rescued by her brothers when about to be put to death; and Blueheard is slain. The German author Tieck has worked up these materials into a drama, entitled "Phantasus."

BLUE-BIRD (*Sialia sialis*).—An American bird, closely resembling in its habits the English robin.

BLUE BOOKS is a name frequently given to the reports and other documents printed by parliament, from their being usually covered with blue paper. The practice of printing their proceedings was first adopted by the House of Commons in 1681, and since that time [illegible] have increased and extended, till now the printed [illegible] occupy 60 or 70 large [illegible] volumes. They comprise reports of committees and commissions of inquiry, colonial reports, accounts and papers relating to trade and finance, the estimates and accounts of public moneys, the votes and proceedings of the house, public bills, &c. The papers of each session are arranged so that they may be bound up in regular order, and have an index, by means of which any paper may be at once found. General indexes have also been published from time to time, extending over a series of years. The blue books contain an extraordinary amount of information in all departments of legislative inquiry;—in law, history, the privileges of parliament, negotiations with foreign powers, and every variety of statistics. These are, however, so mixed up with much that is of little or no value, that they are in a great measure buried. The statistical returns, in particular, are by no means so useful as they might be made if they were prepared in a regular and uniform manner. They are moved for at different times and for particular objects: one dates from 1st January, another from 5th April; one calculates the value of exports by the official, another by the declared or real value; one shows the gross, another the net revenue; one includes the United Kingdom, another extends only to Great Britain. In order to obviate in some measure these defects, the statistical department of the Board of Trade was formed in 1832, for preparing regular accounts of the revenue, commerce, and navigation of this and other countries. With a view further to improve the character of parliamentary returns, the printing c[illegible]mittee, in 1841, suggested—"1. That every member [illegible]e recommended, before he gives notice of a motion for a return, to consult the librarian of the House of Commons; 2. that, after the order for a return has been made by the house, the librarian do prepare, when necessary, a form, to be submitted to Mr. Speaker for his approval, and that such form shall be forwarded, with the order, in the usual manner; 3. that, before any return which has been presented to the house shall be ordered to be printed, it shall be inspected by the librarian and approved by Mr. Speaker." These recommendations have since been repeated by the printing committee. The heavy expense incurred in printing is another great objection to the present system of preparing the blue books. Many maintain that properly-prepared abstracts would be infinitely more useful than the reports as at present issued. "I speak from some personal observation," says Lord Stanley, "when I say that, at a cost hardly greater than that of those desultory, fragmentary, isolated returns, it would be possible to present to the nation such a yearly *résumé* of administrative statistics as should, to a very great degree, supersede the present system (if system it can be called) of moving for returns as and when they are wanted. . . . I think a statistical department desirable, instead of a statistical branch in every department; because the former method gives better security for unity of plan, and because the work will be best done by those whose sole and undivided business it is."—*Speech at British Association*, 1856.

BLUEBOTTLE-FLY. (*See* FLESH-FLY)

BLUE-BREAST (*Motacilla suecica*), one of the English names of a pretty bird which forms the link between the redstart and the lapwing. It resembles both birds closely, and is sometimes called the blue-throated robin, and sometimes the blue-throated redstart. The blue-breast is found in the same countries where the red-breast is found, and particularly on the borders of forests. It is very rare in this country: in Yarrell's "British Birds" mention is made of four cases in which blue-breasts have been shot in England. The song of the blue-breast is very agreeable: it resembles two voices,—one deep like the humming of a violin string, and the other soft, like the sound of a flute. The blue-breast builds its nest in bushes and in the holes of trees, and lives upon flies, worms, and the larvæ of insects. It is also said to feed upon elder-berries. It lays six eggs, which are of a greenish-blue colour.

BLUE-COAT SCHOOL. (*See* CHRIST'S HOSPITAL, LONDON.)

BLUE COPPER, a fine blue mineral, consisting of sulphide of copper. It is also known as indigo-copper.

BLUE COPP[illegible] [illegible] distinguish[illegible] of iron. (*See* COPPER, SULPHAT called blue vitriol and blue-stone.

Blue Gowns, a name commonly given to a privileged class of beggars in Scotland, who were King's Bedesmen, and received a small royal bounty.

Blue John, a name given by miners to the blue variety of Derbyshire or fluor spar. It occurs in cubical crystals or in granular crystalline masses, and is much used for making vases, cups, and other ornaments. It is found principally at the Blue John mine at Castleton, in Derbyshire, and in the lead-mines of Alston Moor, in Cumberland. (*See* Fluor Spar.) This material is daily becoming scarcer. It requires great skill in working, owing to its brittleness.

Blue Mantle, the heraldic title of one of the pursuivants-at-arms attached to the Herald's College. (*See* Pursuivant.)

Blue-Stocking is a name given to a female who gives herself up to learning and literature, to the neglect of her womanly duties, and makes a show of her acquirements in a pedantic manner. The name originated in London about 1780. It was much the fashion at that time for ladies to have evening assemblies, where they might mingle in conversation with literary and other distinguished men. An eminent member of these societies was a Mr. Stillingfleet, who always wore blue stockings; and such was the excellence of his conversation that, when absent, the ladies were wont to say, "We can do nothing without the blue stockings." Hence these societies came to be called Blue-Stocking Clubs.—*Ref.* Boswell's *Life of Johnson.*

Blue-stone.—Sulphate of copper. (*See* Blue Copperas.)

Blue Tits. (*See* Tits.)

Blue Verditer, a fine blue pigment, with a slightly greenish tinge, prepared by precipitating the hydrated oxide of copper from the nitrate of copper solution left as a by-product in silver-refining, by means of potassa. Care must be taken to add an excess of potassa, otherwiee a basic salt of a different colour is produced. Blue verditer is much used by paper-stainers and artists, but its use as a pigment should be avoided, as it is very liable to turn black when exposed to the action of sulphuretted hydrogen.

Blue Vitriol.—Sulphate of copper. (*See* Blue Copperas.)

Bluff, *bluf* (Ang.-Sax.), a high bank, almost perpendicular, projecting into the sea; a high bank, presenting a sharp front.

Bluing, the process of heating steel or iron until it assumes a blue tint. (*See* Steel Manufactures.)

Blunderbuss, *blun'-der-bus* (Ang.-Sax. *blunder*, and Du. *bus*, a tube), a short fire-arm of large calibre, widening towards the muzzle, adapted for discharging many bullets at once, so that, without any exact aim, there is a chance of one or more of the bullets hitting the mark.

Blushing, *blush'-ing* (Dan. *blussen*, to blaze or glisten), is a sudden suffusing or reddening of the face, excited by a sense of shame, confusion, or surprise. It is produced by an increased flow of blood into the capillary vessels of the face and neck; and besides reddening, it creates a sensation of heat in those parts. It is occasioned by the mental shock acting upon the brain, and, withdrawing the nervous energy which ordinarily contracts the muscular coats of the bloodvessels of these parts, whence the blood is permitted to flow with greater violence through the vessels.—*Ref.* Chambers's *Encyclopædia.*

Boa Constrictor, *bo'-ă con-strik'-tor.*—This enormous reptile is found in the interminable marshes of New Guinea, and other hot portions of the American continent, in India and the Indian islands, and in Africa. The branches of the upper and lower jaw of this creature, as well as the bones of the palate, are armed with recurved and pointed teeth, forming four rows above and two below. The pedicle of the lower jaw is movable, which itself is almost wholly suspended to another bone, analogous to the mastoid, attached to the skull by muscles and ligaments. The branches of the lower jaw are not united, and those of the upper jaw are attached to the inter-maxillary bone only by ligaments, so that these animals can expand the mouth sufficiently to swallow bodies much larger than themselves. The ground-colour of the boa is most frequently a yellowish-grey; and disposed along the entire length of the back is a series of chain-like reddish-brown variegations, leaving large open oval spaces of the ground-colour at regular intervals. Boas have been reported, by credible authorities, as reaching the enormous length of thirty feet; and it is no uncommon thing to read of their reaching *sixty* feet in length. Indeed, if we go back to the period when Rome was a great city, we shall read of one that had its lair on the shores of the Bagradas, and that measured a *hundred and twenty* feet in length. All the weapons the army of Regulus was able to bring against the monster were of no avail, and it was not slain till it had destroyed several battalions, and the siege-engines, loaded with ponderous stones, were levelled against it. It is certain, however, that this boa, if not a pure invention, has been lengthened outrageously. Actually, the boa constrictor possesses enormous strength, appetite, swallow, and powers of digestion. They have been known to swallow whole goats and pigs, beginning the prey at the muzzle and gradually sucking it down. In December, 1801, a boa constrictor, confined in the Jardin des Plantes, swallowed the blanket provided for its warmth, and, after retaining the indigestible meal for four weeks, disgorged it: it died shortly afterwards. There are several other of the boa species, besides the above. The spotted boa (*Boa scytale*) of South America, the ringed boa (*Boa canchria*) of the same country, the embroidered boa (*Boa Perygia*) of the East Indies, the canine boa (*Boa canina*), and the garden boa (*Boa hortulana*). The embroidered boa is supposed to be the most splendid of the tribe; it is about four feet long, the ground-colour is white, the back tinged with golden-brown, while along the whole of the upper part is a series of black variegations bearing a striking resemblance to embroidery.

Boar, *bore*, the male of swine. (*See* Hog.)

Boar, Wild (*Sus scrofa*).—All the varieties of the useful gen. *Sus* that are now seen in civilised countries, owe their origin to the wild boar, which is a native of nearly all the temperate parts of Europe and Asia. It was formerly a beast of chase in the woods of this country, and, at the present day, it is hunted in India and in many parts of Europe. It is generally more gaunt and bony than the common hog, and its muscular strength is greater. When about a year or two old, the hide has a yellowish-brown hue; but, in time, this changes to a dark brindled grey. There is a fine soft hair, of a woolly nature, next the skin, between the bristles. The snout of the wild boar is rather longer than that of the common hog; but the chief difference lies in the savage disposition of the former and the extraordinary length of his tusks. The *females* are mild, except when their young are attacked. The tusks of the wild boar are long, curved, and sharp, and are capable of inflicting severe and fatal wounds. After they are five years old, however, these tusks begin to turn up, and are not such formidable weapons. Buffon says of wild boars: "These animals, when they have young, form a kind of flock, and it is upon this alone that their safety depends; when attacked, the largest and strongest front the enemy, and by pressing all round against the weaker, force them into the centre." On account of the excitement and danger connected with wild-boar hunting, it has been at all times a very favourite sport. The ancient Romans used to hunt them on foot with large spears. In later times, William the Conqueror punished, with the loss of their eyes, all persons convicted of killing the wild boar, the stag, or the roebuck. (*See* Hog, Sus.)

Board, *bord* (Sax. *bord*, a table; Fr. *bureau*), is a term usually applied to certain individuals who, in a collective capacity, are intrusted with the management of some public office or department. Thus, the lords of the Treasury, the commissioners of customs, when met together for the transaction of the business of their respective offices, are styled the Board of Treasury, Board of Customs. It is also used to designate the persons appointed by competent authority to manage any private business or speculation,—as a bank, railway, or such like; the directors of which are styled Board of Directors.

Boarding, *bord'-ing*, an expression applied to the attempt to carry an enemy's vessel by assault. It was of frequent occurrence during the war with France, in the early part of the present century. After the cannonade and fire of musketry has continued for

some time, and the contending vessels have drifted closely together, in the course of the action, an opportunity is sought to attach the ships together by means of grappling-irons. A party of seamen and marines, already told off for the purpose, then spring on board the enemy's ship, and a furious hand-to-hand encounter takes place, with cutlasses, pistols, and pikes, which is speedily terminated by the success or repulse of the attacking party. The French soldiery dreaded to cross bayonets with the English troops during the Peninsular war, and turned as soon as they were near enough to see the eyes of the approaching human avalanche, so the French sailors could seldom withstand the irresistible rush and hearty cheering of the British as they swept the decks of their paralysed defenders, and drove them pell-mell below. Boarding is generally adopted by privateers in the capture of merchant vessels. It is thought by competent judges, among whom is Sir Howard Douglas, author of a work entitled "Warfare with Steam," that boarding will be as much resorted to when steam vessels of war approach closely to each other in an engagement, as in the smart frigate-actions of former days. It is therefore recommended that all vessels should be well provided with the necessary appliances for attack by, and defence against, boarding, for the latter of which a plan is suggested of barricading the quarter-deck and forecastle, to afford means of continuing resistance, should the main deck be carried. But in consequence of the results of the battle of Hampton Roads (March 9, 1862), between the *Merrimac*, of the Confederate States navy, and the *Monitor*, of the United States navy, both ironclad ships, heavily armed, and protected with iron shields and defences, under cover of which the guns worked, which battered each other with heavy ordnance for five hours without material injury on either side, an entire change in naval warfare and tactics must take place; and as low iron ships, with cupola shields, on Captain Coles's plan, in which the men who navigate the vessel and work the guns are out of sight, will now take the place of wooden ones in our own navy, as well as in the navies of all maritime powers, it is manifest that boarding can never again be put in practice in vessels built on these principles, but that it must be numbered among the traditions of past times.

Boarding-Pike, in Mar., a weapon formed of an iron spike fixed on an ashen staff, used by sailors in boarding an enemy's ship. It is frequently called a *half-pike*, from its having a much shorter staff than the whole pike.

Board of Admiralty. — A department of the government which has the management of all matters connected with the royal navy. It exercises the powers which formerly were vested in the lord high admiral; and its members are styled the "Lords Commissioners of the Admiralty." They are six in number; and the first lord is always a member of the cabinet. It is the first lord that principally exercises the powers of the office. He is to all intents and purposes the lord high admiral, the other lords acting merely as his advisers and council. It is he that is held responsible in parliament for the conduct of this branch of the public service. Of the five junior lords, four are always naval or sea lords, two of them generally admirals, and the fifth is a civil lord. This board has the management of everything connected with the navy, both in war and in peace. By their orders ships are built, repaired, sold, or broken up; put into commission or out of commission; armed, stored, and provisioned; employed at home or on foreign stations. Repairs, alterations, and improvements in the dockyards are under their direction; and all inventions and experiments relating to naval matters are laid before them for approval. All orders and instructions to officers emanate from them; and all official returns from the fleet, and every practical detail respecting the condition and discipline of the ships, are addressed to them. All naval honours, promotions, and appointments emanate from this board; and by their recommendation all pensions, gratuities, and superannuations are granted. Under the six lords are two secretaries-in-chief, who manage the daily work of the office. The lords of the Admiralty resign with the ministry,—an arrangement that gives rise to many evils. The salary of the first lord is £4,500, and his official residence is the Admiralty, Whitehall. Each of the junior lords has a salary of £1,000, and an official residence, or, in lieu thereof, £200 additional.

Board of Ordnance.—A department of the government, which has now been abolished, but which had the management of all matters relating to the artillery and engineering corps of the British army. It consisted of the master-general of the ordnance, who was usually a distinguished military officer, and who, in all matters connected with the discipline, regulation, and distribution of these corps, exercised supreme authority; the surveyor-general, the clerk of the ordnance, and the principal storekeeper, all of whom held their appointments under the great seal during pleasure. During the Crimean war the defects of this board became very manifest, and it was accordingly dissolved, and the duties of the master-general distributed among the different departments of the War-office.

Board of Trade and Plantations.—A department of the government which may be said to have originated in 1660, when Charles II. erected two separate councils, one for trade and another for plantations. After sundry subsequent changes, the present department was established by order of council in 1786. In reality the board is a permanent committee of privy council, constituted for the consideration of all matters specially relating to trade and the colonies. It consists of a president and vice-president, appointed by the queen in council, and certain other members, who have *ex officio* places at the board. These are the lord chancellor, the first lord of the Treasury, the principal secretaries of state, the chancellor and the under-treasurer of the Exchequer, the speaker of the House of Commons, chancellor of the duchy of Lancaster, paymaster of the forces, master of the Mint, and such officers of state in Ireland as are privy councillors in England. The president and vice-president form nominally the board, and transact on their own responsibility all such general duties as relate to the trade and commerce of the United Kingdom, and advise with the other departments of the government upon these matters. They also superintend the conduct of all bills and questions before the parliament as relate to commerce, and exercise some control over private bills so far as the protection of the public is concerned. Another department has also been added to the Board of Trade,—that of the regulation and control of railways. They appoint inspectors of railways, approve or disallow by-laws, and require detailed returns of traffic and of the rates charged. They have also the general superintendence of all matters relating to merchant ships and merchant seamen. A department for the collection of statistics was formed in connection with this board in 1832. The president has a salary of £2,000; the vice-president, who is also paymaster-general, has for both offices £2,000; and the two joint secretaries £1,500 each.

Boards, Sacred, were small pieces of wood, which were struck together for the purpose of assembling the people to worship, before the use of bells. In some Roman Catholic countries such boards are still employed during Passion-week, as the noise of bells is considered to be unsuitable for the occasion; and they return to the bells on the first day of Easter.

Boar-Fish (*Capros*), a fish of the Dory fam., which takes its name from the resemblance borne by its mouth to the snout of the hog. Its fins are covered with rough scales, and it has no spines along the dorsal or anal fins. The eyes are very large, and placed far forward. It is of a carmine colour, lighter below, and with seven transverse orange bands on the back. It is a well-known inhabitant of the Mediterranean, and is very rarely seen on the British coast. Its flesh is of poor quality.

Boar's Head, in our ancient customs, was the first dish on Christmas-day, and was carried up to the principal table in the hall with great state and solemnity. A carol which was sung on this occasion was as follows (*See* Christmas.)

"The bore's head in hande bring I
With garlandes gay and rosemary;
I pray you all synge merily,
*Qui estis in convivio.*

The bore's head I understande,
Is the chefe servyce in this lande;
Loke wherever it be fande,
*Servite cum cantico.*

Be gladde, lordes, both more and lasse,
For this hath ordayned our stewarde,
To chere you all this Christmasse,
The bore's head with mustarde."

**Boat**, *bote* (Sax. *bat*), a small vessel propelled on the water by rowing or sailing. There are a great many kinds of boats, the construction and machinery of which are very different, according to the purposes for which they are intended. Thus, they are occasionally slight or strong, sharp or flat-bottomed, plain or ornamented; as they may be designed for swiftness or burden, for deep water or shallow, for sailing in harbour or at sea, and for convenience or pleasure.



BOATBILL.

**Boatbill**, *bote'-bill* (*Cancroma cancrophaga*), an inhabitant of Cayenne, Guiana, and Brazil. It is about the size of the domestic hen. Its beak resembles a boat reversed, having a strong keel-like ridge down the middle of the upper mandible. The food and general habits of this bird place it among the herons. It chiefly lives by the sides of rivers.

**Boathook**, *bote'-hook*, an iron hook, with a sharp spike on its hinder part, fixed upon a long pole or shaft, by the help of which a person in a boat may either hook anything to confine the boat in a particular place, or push her off with the point.

**Boating**, *bo'-ting*, was a severe punishment inflicted by the ancient Persians on capital offenders, in the following manner:—The condemned person being laid on his back in a boat, and having his hands stretched out and tied fast on each side of it, had another boat put over him, his head being left out through a hole made for that purpose. In this posture they fed him, till the worms which were bred in the excrements he voided as he thus lay, entirely consumed his bowels, and so caused his death, which usually took about twenty days, the criminal lying all the time between the boats, enduring the most terrible torments.

**Boating.**—A boat is managed or propelled by either sails or oars. When the art is pursued by means of sails, it is termed yachting; when the propelling power is that of oars, the art is termed rowing. (*See* Rowing and Yachting.)

**Boat-lowering Apparatus.**—Every ship of war carries along with her boats for particular services; and every passenger-vessel is compelled by law to carry a certain number of boats. The ropes and pulleys used in letting down these boats from the cranes or davits into the water constitute the boat-lowering apparatus. The means by which boats were formerly lowered were very inefficient; but great improvements have taken place of late years. When boats had to be lowered in any emergency, such as a shipwreck, great difficulty was found in extricating them, and they often capsized in their descent, plunging their occupants into the water. Lacon's friction-break and Kynaston's disengaging-hooks were two of the earliest attempts at amelioration. By the former, one man can regulate the rate of a boat's descent, and by the latter, boats can be both raised and lowered more quickly. Clifford's apparatus, which is now supplied to many ships of war, passenger-ships, and merchant-ships, is considered one of the most valuable. By means of it, the boat is lowered and disengaged by one man seated in the boat. Experiments were tried on board of H.M.S. *Princess-Royal*, in 1856, by order of the Admiralty. Twelve men got into the starboard cutter when she was hanging from the davits. She was quickly and steadily lowered by one man into the water, a distance of 40 feet. The boat, the men, and the gear weighed nearly three tons. Many lives have been saved by the use of this apparatus.

**Boatswain**, *bote'-swa*, a warrant officer in a ship, who has charge of the boats, sails, rigging, colours, anchors, cables, and cordage. It is the business of this officer to summon the crew to their duty, and to assist with his mates in the working of the ship.

**Boatswain's Mate** is an assistant to the boatswain in all the above-mentioned duties, with the disagreeable addition of inflicting all punishments to which the men are subjected.

**Bobbin-net.** (*See* Lace Manufacture.)

**Bobstay**, *bob'-stai*, in Mar., a rope used to confine the bowsprit downwards to the stem or cutwater, and to counteract the force of the stays of the foremast, which it draws upwards. It is fixed by passing one of its ends through a hole bored in the fore part of the cutwater, both ends being spliced together, so as to make it twofold, or like the link of a chain. A dead-eye is then fixed in it, and a lanyard passed through, which communicates with another dead-eye upon the bowsprit. This is then drawn extremely tight by the help of mechanical powers.

**Boc, Bock-land**, or **Bookland**, in the Saxon time, was what we, at the present day, call freehold land, or land held by charter; and it was by that name distinguished from *folk-land*, which was copyhold land.

**Bode's Law**, *bodes'-law*, in Astron., an arithmetical formula which approximately expresses the distances of the planets from the sun. Kepler led the way to its discovery in an attempt to find a general law by which the distances of the planets from the sun were governed, by showing that there was an undue space between the orbits of Mars and Jupiter, in comparison with the relative distances of the planets from the sun. This caused him to conjecture that a planet hitherto unobserved really existed, having its orbit between those of Mars and Jupiter; and in 1772, this formula, known as Bode's law, was enunciated by Bode, who boldly declared that Kepler's idea would be found to be an actual fact. The law itself is as follows:—Supposing 4 to represent the distance of Mercury from the sun, the distance of the other planets is obtained by adding to this number a geometrical series, of which 3 is the first term, increasing by the ratio 2. Thus, the distances of the planets from the sun are respectively represented as follows; and, for the sake of comparison, the actual mean distances from the sun are given in another column, calculated on the supposition that the distance of the earth is represented by 10.

| Name of Planet. | Distance according to Bode's *Law*. | | | Actual Mean Distance. |
|---|---|---|---|---|
| Mercury | 4 | = | 4 | 3·87 |
| Venus | 4 + 3 | = | 7 | 7·23 |
| The Earth | 4 + (3 × 2) | = | 10 | 10·00 |
| Mars | 4 + (3 × 4) | = | 16 | 15·23 |
| Supposed Planet (asteroids) | 4 + (3 × 8) | = | 28 | 26·25 |
| Jupiter | 4 + (3 × 16) | = | 52 | 52·03 |
| Saturn | 4 + (3 × 32) | = | 100 | 95·39 |
| Uranus | 4 + (3 × 64) | = | 196 | 191·83 |
| Neptune | 4 + (3 × 128) | = | 388 | 300·00 |

That there must be some truth in the system above given, is proved by the discovery of the sixty-nine asteroids (*see* Asteroids) since 1800, which fill the place that Kepler supposed to be occupied by a planet. There is no very great deviation from the numbers arbitrarily laid down, except in the case of Neptune. The satellites which revolve round Jupiter and Saturn follow a similar law in their respective distances from their planets.

**Bodies, Regular**, *bod'-es*, in Geom., a term applied to five solids; as the icosahedron, with twenty regular pentagonal faces; the dodecahedron, with twelve triangular faces; the octahedron, with eight triangular faces; the cube, or hexahedron, with six square faces; and the pyramid, or tetrahedron, with four triangular faces.

**Bodkin**, *bod'-kin* (Ang.-Sax.), a large kind of needle used by the women of antiquity for the same purposes as they now are, and also in fastening the hair. It was termed *belone* with the Greeks, and by the ancient Romans *acus*. These instruments were made not only of metal but also of bone, wood, and ivory. The fashion of fastening up the hair behind by means of the bodkin

still prevails in Italy and parts of Germany. The term bodkin applies, at the present time, more particularly to a sharp pointed instrument used for piercing holes in cloth. Formerly the term was given to a dirk or dagger; and in Shakspere, Hamlet is found saying "Who would bear the whips and scorns of time; The oppressor's wrong, the proud man's contumely, . . . . When he himself might his quietus make with a bare bodkin." It is also the name of an instrument with an eye, for drawing tape, thread, or ribbon through a loop, &c.



BODKIN.

BODLE, or BODDLE, *bo'-del*, an ancient Scottish copper coin, of the value of two pennies Scots, or the third part of a halfpenny sterling. It is said to have been named after a master of the mint of the name of Bothwell.

BODLEIAN LIBRARY, *bod'-le-an*, the public library of the university of Oxford, so called from Sir Thomas Bodley, by whom it was restored in 1597. He presented to it a large collection of books purchased on the continent, and valued at £10,000. Other collections were sent in to such an extent that the old building soon became insufficient to contain them; and a new wing was added to it by Sir Thomas, the foundation-stone of which was laid in 1610. He also on his death, in 1612, left a considerable estate to the university, in lands and money, for salaries, repairs, and new books. Among the more important collections that have since been added to it are those of the earl of Pembroke, John Selden, Archbishop Laud, Sir Thomas Roe, Sir Kenelm Digby, General Fairfax, Richard Gough, and Francis Douce. The library has also been largely increased by purchases, and by being entitled to a copy of every work printed in the United Kingdom. At present it is estimated to contain about 265,000 printed volumes, and upwards of 22,000 in manuscript. All members of the university who have taken a degree are admitted to the use of the library; and literary persons properly recommended are also allowed to consult the books. No books are allowed to be taken out of the library. It is open between Lady-day and Michaelmas from 9 in the morning to 4 in the afternoon, and between Michaelmas and Lady-day from 10 to 3. In terms of a statute passed in 1856, a reading-room has been attached to the library, open throughout the year from 10 in the morning to 10 in the evening. —Ref. *Memoirs of Libraries*, by Edward Edwards.

BODY, *bod'-e* (Ang.-Sax.), a term very variously used. In Phys. it denotes a solid, extended, palpable substance of three kinds; as a soft body,—one which, yielding to a blow, undergoes a change; a hard body,—one which remains unaltered after being struck; an elastic body,—one whose form changes upon being struck, but recovers again when the impelling force is removed. With respect to animals, body signifies the frame, the material substance, in contradistinction to the living principle in beasts and the soul in man; in other words, matter as opposed to spirit.

BODY COLOURS, pigments used in executing heraldic paintings and illuminated work, in which the colour is required to be laid on in such a manner that it may form a thick uniform coating over the paper or vellum on which the outline is traced, utterly devoid of transparency. Body colours for these purposes are generally sold in the form of powder, and require to be mixed with a little gum-water. They can be made, however, by the mixture of any simple water-colour with flake-white or Chinese white; thus, the heraldic azure is obtained by mixing ultramarine or cobalt-blue with either of these pigments. Body colours prepared in this manner are used by painters to produce brilliant effects in water-colour drawings, and form high lights, such as those reflected from armour, which cannot be obtained so clearly by putting on the colouring shade by shade, or by wiping out with rag or chamois leather.

BODY OF A CHURCH, the name usually given to the nave of a church, as distinct from the side-aisles and chancel. (*See* NAVE.)

BOEHMERIA, *be(r)-meer'-i-a*, in Bot., a gen. of plants belonging to the nat. ord. *Urticaceæ*. From several species valuable fibres are obtained. *B. frutescens*, or *puya*, a plant growing wild in Nepaul and Sikkim, is the source of the celebrated Poonah fibre, which rivals the best European flax for tenacity. This species attains the height of six or eight feet; but the stem is usually very slender. It is cut down for use when the seed is formed; the bark is then peeled off, dried, boiled with wood-ashes, and beaten with mallets, to separate its component fibres. *B. speciosa*, the wild rhea, also yields a very strong fibre, which is much used in the East. *B. nivea*, the Tchon Ma of the Chinese, is now known to yield the fibre used in the manufacture of the beautiful fabric called Chinese grass-cloth. The species constituting this genus were formerly regarded as species of *Urtica*, the nettle.

BOERHAAVIA, *be(r)-ha'-vi-a* (so named after Boerhaave, the celebrated physician), in Bot., a gen. of plants belonging to the nat. ord. *Nyctaginaceæ*. The species are employed medicinally, both in Peru and the East Indies, having emetic and purgative properties. *B. tuberosa*, a native of Peru, is employed as a culinary vegetable.

BOG, *bog* (Celtic, soft), the name commonly given to a wet spongy morass, composed, for the most part, of decayed vegetable matter. The Bog of Allen is the most extensive of the numerous bogs found in the British isles. Chat Moss, in Lancashire, is another celebrated bog, having twelve square miles in extent. The origin and composition of bogs will be found to be fully treated of under the head PEAT.

BOG-BEAN. (*See* MENYANTHES.)

BOG-HEAD MINERAL, also known as the Torbane-head mineral (which *see*).

BOG IRON-ORE, a ferruginous deposit found at the bottom of bogs. It consists mainly of peroxide of iron, and is formed by the subsidence of the iron oxides and carbonates held in solution by the bog water. It occurs in some parts of America in such large quantities as to be commercially valuable. It is of a reddish-brown colour, and has been occasionally used as a pigment. Some varieties of bog iron-ore contain phosphates.

BOGNOR BEDS. (*See* LONDON CLAY.)

BOG-OAK, BOG-WOOD, a name applied to the trunks and large branches of oaks, fir, and other trees found in the Irish and Scotch bogs. It derives its intense black colour from being impregnated with iron. It is very hard, and is capable of receiving a high polish. It is much used in Ireland, in combination with gold and silver, for articles of jewellery.

BOGOMILI, *bog-om'-i-le*, in Eccl. Hist., was the name of a sect which appeared in the 12th century, founded by Basil, who was burned by Alexius Comnenus in 1118. The name is derived from the Bulgarian *bog*, lord, and *milui*, have mercy. Their creed resembled the doctrines of the ancient Gnostics and Manichæans. They believed in two principles in the universe, a good and an evil; that the soul or spirit emanated from the good principle, but that the body and all material things were created by the evil one. Hence, they viewed the body as the prison-house of the immortal spirit, and believed that it ought to be enervated by fasting, contemplation, and other exercises, so that the soul might gradually be restored to its primitive liberty. They were also opposed to marriage. They denied the reality of Christ's body, and rejected the law of Moses. They used no prayer but the Lord's Prayer, and rejected all sacraments. This sect was subjected to great persecution, but continued to exist down to the 13th century.

BOG-TROTTER, a term of contempt frequently applied to the lower classes of the Irish agricultural labourers, and founded on the singular ability they have acquired, by long custom and practice, of passing securely over the extensive quagmires or bogs of their native country. Where strangers would sink and sometimes perish in the treacherous morass, their habits and instincts teach them to find a safe footing,—a facility which formerly was often employed to elude the pursuit of soldiers, police, and officers of law.

BOHEMIAN, or MORAVIAN BRETHREN, *bo-he'-mi-an*, a sect of Christians, so called from the countries in which they originally existed, but who designate themselves "The Union of Brethren" (*Unitas Fratrum*).

## Bohemian Brethren.

They arose in Prague, the capital of Bohemia, about the middle of the 15th century, and were formed of certain remnants of the Hussites who differed from the Calixtines, another party of Hussites, in being more opposed to the errors of popery, and of stricter general discipline. In 1453 they betook themselves to the borders of Silesia and Moravia, where they formed themselves into separate communities, and distinguished themselves from the rest of the Hussites by the name of Brothers of the Law of Christ, the Unica of Brethren, or United Brethren. They suffered great persecutions, both from the Calixtines and the Roman Catholics; but they suffered unresistingly, opposing nothing but reasonable remonstrances and prayer to the rage of their persecutors. They were often confounded by their opponents with the Waldenses and Picards, and, on account of their being frequently compelled to conceal themselves in caverns and solitary places, they were called Cave-dwellers (*Grubenheimer*). In spite of persecution, however, from the steadfastness of their faith and the purity of their morals, their numbers greatly increased, and in 1500 they numbered 200 parishes, most of whom had chapels connected with them. It being against their principles to engage in strife, they refused to take up arms in the Smalcaldic war against the Protestants, and, in consequence, Ferdinand deprived them of their churches; and in 1548 about 1,000 of them retired into Poland and Prussia, where they at first settled at Marienwerder. The agreement which these exiles entered into at Sentomir with the Polish reformers in 1570, and, still more, the Dissenters' Peace Act of the Polish Convention in 1572, secured them toleration in that country; while the subsequent persecutions of Sigismund III. united them still more closely to the Reformers, with whom they have maintained a connection to the present day. Those who remained in Moravia and Bohemia obtained some degree of liberty under Maximilian II., and had their chief seat at Fulnek, in Moravia. The Thirty Years' War, which terminated so disastrously for the Protestant cause, occasioned the entire destruction of the Bohemian churches and broke up their societies. Their last bishop, Amos Comenius, took refuge in England, and commended the cause of his people to their pious brethren of the Church of England. About this period, some of the persecuted refugees obtained protection and privileges from the English government, and the church of Austin Friars, in the centre of London, was granted to one of their ministers. Again, in the reigns of Charles II. and George I., the case of these sufferers was recommended to the people of England, and moneys collected for their aid in the churches throughout the kingdom, with the express sanction of two successive archbishops of Canterbury. Those that remained in their own country continued to meet secretly and by stealth, until, at last, a number of them found refuge on the estates of Count Zinzendorf, in Lusatia, where they built an humble village, and named it *Herrnhut* (the Lord's shelter), and which is still the principal settlement of the society. They first appeared as a body in England shortly before the middle of the last century. They laid their case before parliament, when their doctrines, discipline, and history were scrupulously investigated by committees of both houses; and two bills were passed (20 Geo. II. c. 44, and 22 Geo. II. c. 30) in 1747 and 1748, exempting them from taking oaths and bearing arms in certain cases. The early Brethren attempted to restore the primitive purity of the Christian church, and framed their constitution according to the accounts that remain of the Apostolic churches. They took the Scriptures as the ground of their doctrines, and exercised a strict system of superintendence over their members, extending even to the minute details of domestic life. For that purpose, they had a number of officers of different degrees,—viz. ordaining bishops, seniors and consenors, presbyters or preachers, deacons, sedles, and acolytes,—among whom the management of the ecclesiastical, moral, and civil affairs of the community was distributed. They had three classes of members,—beginners, proficients, and the perfect, and three degrees of excommunication, and made a careful separation of the sexes. When the number of emigrants from Bohemia and Moravia to Herrnhut had considerably increased, and when many religiously-disposed persons from other quarters came to settle among them, the consequent diversity of sentiments suggested the propriety of their having some rules drawn up for their direction and guidance. Accordingly, with the assistance of Count Zinzendorf (who is justly considered to have been in some measure the founder of that society, to which he devoted his life, property, and energy), certain articles of union were drawn up, which, leaving all the distinctive doctrines of the various Protestant denominations entirely out of the question, adopted, as articles of faith, only those fundamental Scripture truths on which they all agreed, and, at the same time, introduced a system of social compact and church discipline resembling that of the ancient church of Bohemian Brethren. These articles were, after mature deliberation, adopted by all the inhabitants of Herrnhut, who pledged themselves mutually to their observance, under the name of a Brotherly Agreement, in 1727. They admit among them individuals from all Protestant denominations, without renouncing their original church or creed. In fact, they strenuously object to being considered a separate sect or denomination, maintaining that their union is founded exclusively on general Christian doctrines, and that their peculiarities relate solely to their social organization, by which they attempt to put truly Christian principles of life and conduct into actual practice. They profess a general adherence to the Augsburg Confession, but avoid discussions respecting the speculative doctrines of Christianity. At a general synod held at Barby in 1775, it was agreed that they steadfastly maintain the following five points, without lessening the importance of any other article of the Christian faith:—1. The doctrine of the universal depravity of man, and that, since the fall, he has no power whatever left to help himself. 2. The doctrine of the divinity of Christ. 3. The doctrine of the atonement and satisfaction made for us by Jesus Christ; and that by his merits alone we receive freely the forgiveness of sin and sanctification in soul and body. 4. The doctrine of the Holy Spirit and the operation of his grace; that it is he who worketh in us conviction of sin, faith in Jesus, and pureness in heart. 5. The doctrine of the fruits of faith; that faith must evidence itself by willing obedience to the commandments of God, from love and gratitude. Their church is episcopal in form, and they have three orders of clergy,—bishops, presbyters, and deacons. The bishops alone are authorised to ordain ministers; but they possess no authority in the government of the church, except such as they derive from some other office. The presbyters are the ordained stated ministers of the communities. The degree of deacon is the first bestowed upon young ministers and missionaries, by which they are authorized to administer the sacraments. It is a general principle of the society, that their social organization is in no case to interfere with their duties as citizens and subjects of the governments under which they live. Where they form separate communities, they do not allow the permanent residence of any persons as householders who are not members in full communion, and who have not signed the Brotherly Agreement; but they freely admit to temporary residence among them of such persons as are willing to conform to their external regulations. According to these, all kinds of amusements considered dangerous to strict morality are forbidden, —as balls, dancing, plays, gambling of any kind, and all promiscuous assemblies of the youth of both sexes. In the continental communities to which unmarried men and boys not belonging to the families of the community resort, in order to prepare themselves for missionary or other labours, these reside under the care of an elder of their own class, in a building called the Single Brethren's house, where usually divers trades and manufactures are carried on for the benefit of the house or community; for it is a general rule with them that every member of the society devote himself to some useful occupation. A similar house, under the guidance of a female superintendent, is called the Single Sisters' house; and in larger communities there are also similar houses for widows who may wish to live retired. Each division of sex and station is placed under the special guidance of elders of their own description, whose

province it is to assist them with good advice and admonition, and to attend to their general interests. There are also special elders charged with the education of the young, as well as with attending to the spiritual welfare of the married people. All these elders of both sexes, together with the stated minister and the persons to whom the economical concerns of the community are intrusted, form together the board of elders, in whom rests the government of the community, with the concurrence of the committee elected by the inhabitants for all temporal concerns. This committee superintends the observance of all regulations, has charge of the police, and decides differences between individuals. Matters of general interest are submitted to a meeting of the whole community. The female elders, though they attend the board of elders, have no vote in their deliberations. The most distinguishing feature of this body is their earnest and unremitting efforts to diffuse a knowledge of Christianity to the most remote and neglected portions of the globe. It is this that has more particularly gained them the esteem of so many great and good men. "Who," says Dr. Chalmers, in reviewing the good that had been effected by their means, "would not long to be in possession of the charm by which they have wrought this wonderful transformation,—who would not willingly exchange for it all the parade of human eloquence, and all the confidence of human argument." In 1851 the number of their chapels in England and Wales was 32, with 9,305 sittings. Though the entire number of members in that year did not exceed 12,000 in Europe, nor 6,000 in America, they had 294 missionaries and 70 settlements distributed among the Hottentots, Greenlanders, Esquimaux, Indians, Australian aborigines, and the negroes of the West Indies and America. The number of converts belonging to the missionary congregations was about 70,000. The annual expense of carrying on this great work is only about £13,000, three-fourths of which are raised by other Christian bodies (principally by the Church of England), who appreciate the value of their labours.

BOHEMIAN LANGUAGE AND LITERATURE.—The Bohemian language, termed by the people themselves the *Czechish*, is a branch of the Slavonic, and is spoken by about 7,800,000 of persons in Bohemia, Moravia, and Upper Hungary. It is one of the best dialects of the West Slavonic, and is distinguished from its sister dialects by the number of its roots, its great flexibility, precision of expression, and elegant grammatical construction. Like all the Slavonic tongues, however, it wants a proper form of the passive voice. It is the most powerful and manly, but at the same time the harshest of the Slavonic languages. It is also distinguished by its precise and regular orthography, established in the 15th century by John Huss, in which, by means of the Roman alphabet, every sound has a particular character assigned to it. What, however, chiefly distinguishes it from most of the other European languages is, that here, as in the ancient tongues, the quantity prevails, while in the modern tongues it is the accent that governs. It is thus particularly well adapted to represent the various kinds of Greek and Latin metres. No other tongue can so completely and forcibly, and yet so naturally, convey the meaning of the ancient classics in translation as the Bohemian. Its grammar is more difficult to master than that of most other European languages, on account of its complicated forms and construction. The Bohemian literature is older than that of any of the other Slavonic tongues, ascending at least as early as the 10th century. Of the earliest period of its history, or that preceding the time of John Huss, several remains still exist. In 1817, Mr. Hanka, keeper of the National Museum, discovered at Königinhof part of a collection of epic and lyric poems of the 13th century, which are said to be characterised by great power, feeling, and tenderness. There remain, besides, of this period, about twenty poetical, and over fifty prose works, great or small. Among these are Dalimil's "Bohemian Chronicle," in rhyme (1314); Thomas of Stitny's "Lehrbuch für Laien" (1376); the still popular fable of the "Fuchs und Bär" (Reineke Fuchs); Andrew of Duba's work on the Ordinal Constitution of Bohemia (1382); and the comedy of the "Mastičkář" (Quacksalber), about the beginning of the 15th century. John Huss, like Martin Luther, was a reformer in language as well as in religion, and from his time dates a new period of Bohemian literature (1409–1526). He revised and improved the Bohemian translation of the Bible, and was the author of twenty books besides. Yet his influence on them, is ture arose less by what he wrote than by the rivals which he imparted to it. In the old libraries and archives lie, unknown and disregarded, almost innumerable tracts and treatises, dogmatic, political, and ascetical, by the different sects of Hussites of the 15th century. Poetry sank almost to mere rhyme, though some of the church hymns of the Hussites are not without poetical merit. The prose, however, of this period became more fixed and expressive, and was the only medium of all public transactions. The state papers, as well as the correspondence of the statesmen of this period, are excellent specimens of a curt, clear, terse, and expressive style. It is particularly rich in national works; and of the historical works of this period, a number have been edited by Palacky in his *Scriptores Rerum Bohemicarum* (1829). The period from 1520 to 1620 is called by the Bohemians the golden age of their literature. During it, particularly under the reign of Rudolph II. (1576—1611), all the sciences and arts were studied with diligence, and an attachment to the same was publicly manifested by all classes of society. Education was much attended to, and in Prague alone there were two universities and sixteen other seminaries of education, among which were several girls'-schools; while throughout the country there were numerous gymnasiums and parish schools. The language reached its highest point, both grammatically and socially; and the number of works of every kind and character that appeared during this period is very remarkable. Yet it cannot be said that the works of this time display any great amount of originality or genius. The fourth period begins with 1620 and ends with 1774, when, after the battle of the White Mountain, the whole Bohemian nation submitted to the conqueror. Perhaps never did a people so speedily fall from a high state of cultivation into the deepest barbarism. The leading men of the nation mostly perished by the sword; the clergy, scholars, nobility, and in general all the more cultivated part of the nation, left the country. Their places were supplied by Italian, Dutch, Spanish, German, and other adventurers, who came in troops, and possessed themselves of all dignities and offices. Jesuit missionaries went from place to place and house to house, accompanied by soldiers, in order to take and destroy all books suspected of heresy. This unfortunate destruction of books was continued far into the 18th century; and even so late as 1750 the Jesuit Antony Tonisa boasted that he had destroyed 60,000 Bohemian books. It is therefore matter of wonder that we still possess so much as we do of the ancient literature." In the early part of this period there were still some writers who, indebted for their culture to the previous period, continued to shed a kind of light on this deep darkness; and many of them published works in Amsterdam, Berlin, Dresden, and other places, and sent them to Bohemia. One of the last of these bright stars was Johann Amos Comenius, the last bishop of the Bohemian Brethren, and who is still known as a writer on education. In 1774 an imperial decree ordered the establishment of German schools—normal, high, and elementary—throughout Bohemia; and in 1784 it was decreed, that in the higher schools instruction should only be given in German; so that one could only obtain the rudiments of learning in his mother tongue. This, which seemed to be a death-blow to the language, had in reality a contrary effect. It stirred to new life the slumbering energies of patriotism in behalf of their mother tongue. General Count Franz Kinsky and the historian Pelzel were among the first to come forward and vindicate the claims of the unfortunate language; and they at length succeeded in obtaining some slight modifications of the decree, so that in the higher military schools instruction might be given in the Bohemian tongue. A number of [illegible] writers also arose, who made use of the language. Pelzel, the historian, whose work [illegible] Bohemia (1791–96) is one of the best [illegible] of Bohemian history; the monk F. P. [illegible], Wenzel M. Kramerius, Dobrowsky, and others. The labours of these individuals at length led

to an improvement in the state of matters; and in 1818 a decree was issued recommending the use of the Bohemian language in the gymnasiums. Since that time a love of the old dialect has been rapidly spreading, and a knowledge of it has been diffused through all classes of society. In poetry and belles-lettres, among the names that have recently arisen are Czelakovsky, Kollar, Holly, Langer, Schneider, and others; in philology, Jungmann, Schafarik, Hanka, and Presl; in history, Palacky and Tomek; in archæology, Schafarik and Wocel; in geography, Schadek and Zap; in physics, technology, &c., Sedlaczek, Smetana, Amerling, and others. Since 1831 there has been, in connection with the Bohemian museum at Prague, a special committee for the cultivation of Bohemian literature, numbering in 1849 4,000 members. It has aided in the publication, among other works, of Schafarik's "Slavonic Antiquities," and Jungmann's "Lexicon" and his "History of Literature." In 1851 there were published twenty-two Bohemian journals, of which eleven appeared in Bohemia, five in Moravia, four in Hungary, and two at Vienna.—*Ref.* Brockhaus' *Conversations Lexikon.*

BOHEMIAN WAXWING, *wăx'-wing* (*Bombycivora garrula*), a bird which is a winter visitant to Britain. The country in which the young are reared is not known with certainty. M. Temminck, however, states that the European waxwing breeds in the eastern part of the north of Europe, and lives in the northern parts of Asia. The waxwing is about the size of the starling, and is distinguished more for its pretty plumage and graceful form than for superior vocalization.

BOIL, *boil*, called also *furunculus*, from the Latin *furo*, I rage, on account of the violent heat and inflammation attending it, is a hard painful tumour of the skin and the subjacent cellular tissue. It makes its appearance as a small hard inflamed spot on the skin, and gradually enlarges into a painful tumour, having a white conical centre, surrounded by a hard inflamed base, and varying in size from the bulk of a pea to that of a pigeon's egg. It proceeds to suppuration, and discharges a few drops of purulent matter commonly mixed with blood, and a central mass called the *core*. This last often lies deep, and causes considerable pain before coming away; but, without its removal, the abscess will not heal. Boils, though generally very troublesome, are not attended with danger. They occur mostly in young and vigorous persons; but they also occasionally break out upon the weak and delicate. They sometimes follow each other in rapid succession, and are most common in the spring. They all take their rise in some disordered state of the digestive organs; and hence it is necessary that the bowels be at first freely opened, and then regulated by gentle unirritating laxatives. The diet should be plain and simple, and stimulants ought to be avoided. In delicate constitutions a course of sarsaparilla will be found of great use. In dealing with the boil itself, suppuration is to be hastened and perfected by means of linseed-meal poultices; and as soon as the prominent part of the swelling becomes soft, a free opening should be made into it with a lancet, and as much matter as can be pressed out of it by tolerably firm pressure should be removed, together with the core; or the poultices should be continued until the core is drawn out, when the wound will speedily heal.

BOILER, *boil'-er*, a name applied to vessels in which water or other fluids are exposed to heat, for the purpose of evaporation, or for the formation of steam. Small boilers are mostly made of copper; larger ones of the best wrought iron. They are of various shapes, being generally constructed so as to obtain the largest heating surface with the smallest cubical contents. (*See* STEAM-ENGINE, LOCOMOTIVE, SUGAR-REFINING.) By the continual evaporation of the water in steam boilers, the saline matter contained in it at last becomes so concentrated, as to form a deposit upon the sides and bottom. In many instances, especially when the water used is greasy, this deposit has been the cause of explosions, from covering the iron so tightly as to allow it to become red hot all through. The incrustation, on being exposed to such a temperature, cracks, and the water, suddenly submitted to the heat of the red-hot metal, bursts into gas, an explosion being the result. Many remedies are in use for





the purpose of preventing the formation of these incrustations. The addition of chloride of ammonium to the water in the boiler, as proposed by M. Bitterbrandt, is very effectual. The chlorine combines with the lime, and the carbonic acid with the ammonia, forming chloride of calcium and carbonate of ammonia, two very soluble salts. Chloride of tin and alkaline carbonates are also used for this purpose.

BOILING-POINTS, *boil'-ing points.*—A liquid is said to boil when it is made to assume a constant state of ebullition by the formation of bubbles of its vapour by means of heat. The boiling-points of liquids differ according to their chemical constitution; in many instances, in direct ratio to the differences in their composition. The boiling-point of the same liquid may vary under different circumstances; such as the pressure on its surface, the amount of attraction exerted by the vessel containing it, or by salts held by it in solution. Boiling, or the emission of steam in bubbles, consists in the formation of a vapour of equal elasticity to that of the atmosphere, which exerts its pressure on the surface of the liquid. It therefore follows, that any lessening or increasing of the pressure of the air is accompanied by a corresponding depression or elevation of the boiling-point. This fact is made evident by the familiar experiment of placing warm water under the receiver of an air-pump, when, on exhausting the air, ebullition takes place, from the diminished pressure. Liquids, in general, boil from 60° to 140° lower than their ordinary boiling-point when heated *in vacuo*. This property is made use of in the manufacture of certain medicinal preparations, the properties of which would be destroyed by exposure to a temperature of 212°. Advantage has been taken of this property of fluids in the measurement of heights. M. Saussure found that on the summit of Mont Blanc, which is nearly three miles above the level of the sea, water boiled at 185° Fah.; and M. Wisse observed the boiling-point of water to be 185° Fah. on Mount Pechinchа, while the barometer stood at 17 inches. From these facts it has been calculated that for every difference in height of 596 feet, a variation of 1° Fah. in the boiling-point is produced. It has also been ascertained that a variation of one-tenth of an inch in the barometer produces a difference of more than a twentieth of a degree Fah. in the boiling-point. The contrary property of increase of pressure causing elevation of the boiling-point, is evident from the above considerations. Papin's digester is an example of this. By confining water in an air-tight vessel, it may be heated to a temperature only limited by the strength of the vessel. This property is taken advantage of in the preparation of gelatine from bones, which are heated to a temperature much higher than 212° Fah. By this means the gelatine is easily separated from the earthy matter, although the bones might be boiled for hours at 212° Fah. without any such effect taking place. The attraction of a fluid for the surface of the vessel in which it is boiled has a great influence on the boiling-point. Water boils at 212° in a metallic vessel, in a glass vessel at 214°, while in a vessel varnished inside with shell-lac the heat may be raised to 228° without ebullition taking place. The influence of salts held in solution is very marked. A saturated solution of chlorate of potash, *i. e.* containing 61·5 per cent. of the salt, boils at 220° Fah.; a saturated solution of chloride of calcium, containing 326 per cent. of the salt, boils at 355° Fah.; while a saturated solution of acetate of potash, containing 798 per cent. of the salt, boils at 336° Fah. It will be seen from these examples that the quantity of salt contained in the liquid does not directly influence the boiling-point. From the experiments of Kopp and others, it has been discovered that an exact ratio exists between the chemical constitution of certain liquids and their boiling-points at the same pressure. Thus methylic, ethylic, propylic, and butylic alcohols differ from each other by an increment of $C_2H_2$, and their boiling-points differ by an increment of 31·4° Fah. Another example of this is shown in the hydrocarbons benzole, toluole, xylole, and cumole, the difference in their composition being $C_2H_2$, while the difference of their boiling-points is 41° Fah. The same relation runs through the acids, ethers, aldehyds, and salts of these bodies. The following table of the boiling-points of different liquids is partly

*compiled from those given in the first and third volumes of Miller's "Elements of Chemistry," to which work the student is referred for very complete details on these points.*

| | | |
|---|---|---|
| Protoxide of Nitrogen | — | 157 |
| Carbonic Acid | — | 108 |
| Cyanogen | — | 7 |
| Sulphurous Acid | + | 17·6 |
| Chloric Ether | | 51·9 |
| Aldehyd | | 60·4 |
| Ether | | 94·8 |
| Bromic Ether | | 105·8 |
| Bisulphide of Carbon | | 118·5 |
| Terchloride of Silicon | | 138·2 |
| Bromine | | 145·4 |
| Wood Spirit | | 149·9 |
| Acetic Ether | | 164·9 |
| Alcohol | | 173·1 |
| Benzole | | 176·8 |
| Dutch Liquid | | 184·7 |
| Water, B. 29 92 ins. | | 212·0 |
| Formic Acid | | 221·5 |
| Acetic Acid | | 243·1 |
| Fousel Oil | | 269·8 |
| Terchloride of Arsenic | | 273·0 |
| Butyric Acid | | 314·6 |
| Terbromide of Phosphorus | | 347·5 |
| Sulphur | | 609 |
| Sulphuric Acid | | 619 |
| Mercury | | 662 |
| Water *in vacuo* (Thomson) | | 98 |
| ,, B. 16·6 ins. | | 194 |
| ,, B. 20·6 ins. | | 194 |
| ,, B. 25·4 ins. | | 204 |
| ,, B. 31·7 ins. | | 215 |
| ,, under a pressure of 2 atmospheres | | 249 |
| ,, ,, ,, 10 ,, | | 356·6 |
| ,, ,, ,, 20 ,, | | 415·4 |
| Saturated Solution of common Salt | | 227 |
| ,, ,, Nitre | | 240 |
| ,, ,, Nitrate of Lime | | 304 |
| ,, ,, Acetate of Potash | | 336 |
| ,, ,, Chloride of Calcium | | 355 |

(*See* EBULLITION.)

BOILING SPRINGS, or GEYSERS, the name given to certain springs in Iceland, where boiling water is



BOILING SPRINGS.

thrown up. They are very numerous, and are principally situated in the western part of the island, in a small plain, sixteen miles north of the village of Skalholt. Some of these springs throw up a column of boiling water 200 feet high and 10 feet in diameter. The silicious deposits of the Great Geyser have formed for





it a nearly circular basin, upwards of fifty feet in diameter: it slopes towards the centre like a saucer, and has an average depth of five feet. In the middle is a cylindrical passage, about seventy feet deep and twelve feet in diameter, up which the boiling water rises and the eruptions burst forth. These eruptions occur at periodical intervals, and are preceded by a loud report like that of artillery. Sir John Stanley, in describing this spring, says that the water in the basin was first violently agitated, and the ground shaken; the air was then filled with volumes of steam, rolling over each other as they ascended in a manner inexpressibly beautiful, through which columns of water, shivering into foam, darted in rapid succession to the height of nearly 100 feet. It has been ascertained that the boiling springs of Iceland have been playing for the last 600 years; but very material changes have taken place from time to time amongst them. They have doubtless a connection with the volcanoes which abound in the island; and their temperature varies from 188° to 212° Fahrenheit. The inhabitants of Iceland use them for bathing when their position suits, and also for boiling fish, evaporating sea-water, and such-like purposes.

BOLDERBERG BEDS, *bol'-der-berg*, in Geol., a typical group of tertiary sands and gravels occurring in the Bolderberg hill, about 10 miles from Brussels.

BOLE, ARMENIAN, *bole* (Swed. *bol*), a dark-red hydrated silicate of alumina, mixed with peroxide of iron in large quantities. It also contains traces of lime and magnesia. It is occasionally used for coarse paint and for stage purposes. When the amount of magnesia is such as to cause it to feel greasy, it is termed *mountain soap*, or *fett-bol*.

BOLE, in Geol., a term sometimes applied to any friable clayey shale or earth coloured red or brown by peroxide of iron.

BOLERO, *bo-lair'-o* (Span.), a Spanish national dance, usually accompanied with the castanets and the cithern, and sometimes with the voice. The dance is intended to represent a love-story, commencing with coyness and diffidence, and gradually rising to the expression of passionate ecstasy. It is in the time of a minuet, and has a marked and singular rhythm.

BOLETUS, *bo-le'-tus*, in Bot., a gen. of *fungi*, which may be distinguished from *Agaricus* by the absence of gills, the under-side of the cap or pileus being covered by a porous layer composed of innumerable short tubes united together. Some of the species are edible, though they are all set down as mere toadstools by the mushroom-gatherers of this country. *B. edulis*, the *Ceps ordinaire* of the French markets, is much used throughout the European continent. It grows in woody situations and attains a considerable size, the cap being usually six or seven inches across. The colour of the cap ranges from light brown to brownish-black, while that of the layer of tubes beneath is at first white, then yellow, and finally yellowish-green. The stem is thick, solid, and beautifully reticulated. To prepare the fungus for the table, the layer of tubes, the skin, and the stem, must be thrown away, for nothing but the firm and delicate flesh of the cap is to be eaten. This may be either eaten raw with salt and pepper, or cooked like a common mushroom. Many other species are usually found exposed for sale in the French markets.

BOLLANDISTS, *bol'-Land-ists*, a society of Jesuits at Antwerp, who are celebrated from having undertaken the publication of a work entitled "Acta Sanctorum," which was to give all that was known concerning the saints of the Roman Catholic church. The work was projected by Heribert Rosweyde, but he died before any part of it was ready for the press, and was succeeded by John Bolland, who gave his name to the society, and by whom the two first volumes (for January) were published in 1643. The three for February appeared in 1658, and the three for March in 1668. In consequence of the suppression of the order of Jesuits in 1773, this society removed to the Augustine abbey of Caudenberg, at Brussels, where it continued till the accession of Joseph II., which led to its dissolution. In 1789 the Premonstraten abbey of Tongerloo, in Brabant, took up the colossal task of carrying on the publication of the "Acta Sanctorum;" but scarcely had the 53rd volume of the work appeared

(1794) when the French occupation put an end to their labours. In 1837 a new Bollandist association of Jesuits was instituted by the Belgic government, which set aside an annual sum of 6,000 francs for carrying on the work; and in 1845 the 54th volume appeared. Since that time two more volumes have been published, the last in 1858, bringing the work down to the 22nd of October; and, when finished, it is expected to occupy 70 large folio volumes. It was estimated that the 53 volumes published before the French revolution contain upwards of 25,000 lives of saints. From being carried on by so many different hands, the work is of very unequal merit, and though abounding in legends and absurdities, they contain much valuable historical information, and the documentary evidence is often very ably and honestly criticised.

Bollards, *bol'-lards* (Ang.-Sax.), in Mar., are large posts sunk in the ground on each side of a dock. On docking or undocking ships, large blocks are fastened to them, through which are passed the transporting hawsers to be brought to the capstans.

Bologna Phosphorus, *bo-lone'-ya.*—Sulphate of baryta on being ignited with a small portion of carbon, and exposed to the sun's rays, acquires phosphorescent properties, and is called Bologna phosphorus, from having been first discovered in that city. The explanation of this phenomenon is not very clear.

Bolognese School of Painting, *bo-lone'-yese.*—The expression "school of painting" is used to indicate a resemblance in style and manner among painters who have become masters of their art in any locality, during a series of ages, whose works present a similarity of treatment, not arising from a deficiency of original ideas, but from the influence of situation and general associations, and the example of great minds that have risen to a point considerably above the level of those who have gone before them, who have thus contributed to establish a higher degree of excellence, which is worthily imitated and adopted by their followers and successors. But merely considering the term to point out the associated names of a certain number of painters of celebrity, who either claim a town renowned for the production of brilliant works of pictorial art for their birthplace, or, coming from elsewhere, have settled and wrought there, associating their names inseparably with the place which they have chosen as the scene of their studies and labours,—whose various productions, for reasons above stated, have become imbued with a similarity of style, feeling, and expression,—it will manifestly be requisite only, in the present article, to glance briefly at the various masters who adorned the Bolognese school in successive centuries, pointing out their progress towards excellence, by a judicious selection and adoption of the most meritorious points in the productions and styles of eminent masters of other schools, and the time at which the highest degree of perfection was attained. In the 14th century, Franco of Bologna, called the Giotto of the Bolognese school, attained a high reputation as an illuminator of missals. He also painted pictures of some considerable size, and is esteemed by historians of the fine arts as the founder of the school of his own era, with whose style and spirit the works of his contemporaries and successors became deeply imbued. Specimens of their works still exist in the church di Mezzarata. At the commencement of the 15th century, Lippo Dalmasio, whose chief subject was the Virgin, from which predilection he is known as Lippo delle Madonne, or Lippo of the Madonnas, attained a reputation for the expression of piety, combined with grandeur of treatment, that he threw into his works, caused, most probably, by the influence which the Byzantine school of art exercised over the early Italian painters. (*See* Byzantine Sculpture.) An attempt made subsequently to introduce the style of treatment adopted by Venetian artists, by Marco Zoppo, who painted between 1470 and 1500, seems to have failed; and the name of Francesco Francia, a contemporary of Rafaelle, whose history bears certain points of similarity to that of Quentin Matsys, as both were originally artificers in metals, and adopted painting as a profession in after-life, closes the century as the most celebrated of his school, famous for the holy and pure expression of countenance given to his Madonnas: he has been classed by some writers, though improperly, with contemporary painters who reached far greater eminence in other schools. The next painters of reputation in the Bolognese school who flourished in the 16th century, were Romenghi (named Bagnacavallo), Innocenzio da Imola, Primaticcio, and Pellegrino Tibaldi. The first of these introduced an imitation of the style of Rafaelle into his works, which was copied by his pupils; while the last-named, after passing his early years in the studio of Bagnacavallo, studied under Michael Angelo at Rome, and infused much of the spirit of this wonderful painter and sculptor into his works. But the excellence of the Bolognese school, that had hitherto only sought to combine the successful modes of treatment adopted by Rafaelle, Michael Angelo, and other artists of eminence, in a manner approaching servility and mere superficial mannerism, was shortly to reach its culminating point in the productions of Ludovico Caracci (*see* Caracci, vol. I. of this work), and his cousins, Agostino and Annibale, as well as in those of their scholars and contemporaries, Guido and Domenichino, who had previously studied under Denis Calvart, a painter of Antwerp, who had settled in Bologna, and had introduced a taste for landscape-painting, which exercised a manifest effect on the works of the painters that have just been mentioned. Ludovico Caracci, who seems to have been influenced in a great degree by the paintings of Correggio, regarded at that time by all existing schools as a model of excellence well worthy of imitation, after studying at Venice and Parma, determined on the introduction of a new style, in which his cousins were persuaded to assist. The chief characteristics of this new element in the Bolognese school seem to have been a careful observation of nature and natural effects in conjunction with the imitation of the various styles of the great masters, and a proper attention to correct outline-drawing, perspective, and the anatomy of the human figure, which had been neglected by the predecessors of the Caracci. An impulse in a fresh direction was thus given to the art of painting, and the labours of Ludovico at Bologna, and of Annibale at Rome (the best exemplification of whose powers as an artist, and of the peculiar characteristics of the Caracci school, is to be found in the Farnese palace, in a series of frescoes), imparted a new colouring, and exercised a decided influence over works of art produced about 1600, and for many years subsequently, throughout Italy. The leading features of Ludovico Caracci's paintings, as given by Sir Joshua Reynolds, are—great breadth of light and shadow; simplicity of colouring, which has the merit of not drawing away the attention of the spectator from the subject of the painting; and a mellow twilight effect that seems to be diffused over his pictures, and is in perfect harmony with the grave and dignified subjects which he chose for treatment. Domenichino was brought into notice by Poussin and Annibale Caracci, though this painter, as well as his cousin Ludovico, was jealous of the superior talents of his pupil Guido, who combined the dark peculiar style of Caravaggio with that of his former masters, but afterwards adopted a lighter and more lustrous tone which pervades his best productions. Among other followers of the Caracci and painters of the Bolognese school may be enumerated Guercino, Lanfranco, Tiarini, Lionello Spada, and Cavedone. Since the middle of the 17th century no painter of eminence has been found in this school to sustain the reputation which had been acquired for it by the Caracci and their pupils, with the exception of Carlo Cignani, who was mainly instrumental in founding the Clementine Academy of Bologna, in which he sought to combine the study of the old masters with a careful observation of nature and attention to anatomical science. The following is a list of some of the paintings by Bolognese masters in the National Gallery, affording good examples of their different peculiarities of style and method of execution.

| Name of Painting. | Name of Artist. | Born. | Died. |
|---|---|---|---|
| St. Dominic, as Institutor of the Rosary | M. Zoppo...fl. circ. | 1470 | 1530 |
| Virgin and Child, surrounded by Saints ... | Francesco Francia | 1450 | 1510 |
| Susannah and the Elders ..... | Ludovico Caracci | 1555 | 1619 |
| Cephalus and Aurora ... | Agostino Caracci | 1558 | 1602 |

| Name of Painting. | Name of Artist. | Born. | Died. |
|---|---|---|---|
| St. John in the Wilderness | Annibale Caracci | 1560 | 1609 |
| Temptation of St. Anthony | " | | |
| Martyrdom of St. Stephen | Domenichino | 1581 | 1641 |
| Ecce Homo | Guido | 1575 | 1642 |
| Venus attired by the Hours | " | | |
| Angels weeping over the dead body of Christ | Guercino | 1590 | 166[illegible] |
| Repose of the Holy Family | Pietro F. Mola | 1612 | 1668 |

—*Ref.* Vasari's *Lives of the Painters*; *English Cyclopædia*—Arts and Sciences.

**Bolster**, *bole'-ster* (Sax.), a long cushion used for supporting the heads of persons lying in bed. In saddlery, bolsters are hose parts of a saddle raised upon the bows or hinder part, to hold the thighs of the rider. In Mar., certain cushions or bags stuffed with tarred canvas are called bolsters. They are used to protect the stays from being chafed or worn by the motion of the masts during the rolling of the ship at sea.

**Bolt**, *bolte* (Sax. *bolt*; Goth. *bollt*, a fetter).—In Mar., bolts are short cylindrical pieces of iron or copper, varying in diameter from half an inch to three inches, and of various lengths, used for securing the timbers of a ship to the ribs, and for fastening the knees, beams, and various parts of the vessel together. These bolts differ in form according to the purpose for which they are designed, and are distinguished by shipwrights according to the form of the head. The term "bolt" is variously applied; a sliding bar of iron fitting into a socket to secure a door, and the short arrow with a weighty head discharged from a cross-bow, are so called. An iron fetter is sometimes called a fetter-bolt, particularly in Her.; and a piece of sailcloth twenty-eight ells in length is called a bolt of canvas.

**Bolthead**, *bolt'-hed*, a glass vessel consisting of a globe with a long narrow neck, used in chemical operations for boiling and subliming.

**Bolt-Ropes**, in Mar., the name applied to ropes which are attached to the edge of a sail to prevent the canvas from splitting and tearing when there is a heavy strain upon it. That part which runs along the upper edge of the sail is called the head-rope, that along the lower edge the foot-rope, while that which is sewn to the edge on either side is termed the leech-rope.

**Bolus**, *bo'-lus* (Gr. *bolos*, a mass), a large soft kind of pill, larger than a common pill, but yet not too large to be swallowed at once. It might be composed of any of the ingredients used for pills; but it was an inconvenient form, and is now generally discarded.

**Bomb**, *bom* (Gr. *bombos*, a loud noise), a very destructive missile used in warfare. It is usually in the form of a hollow sphere or shell, made of cast-iron, and filled with combustibles. There is a communication between the interior and exterior by a vent-hole, through which a fusee passes. When a bomb is fired out of a mortar or gun, the fusee is lighted and burns slowly, only reaching the interior powder as the bomb falls; the mass of metal then bursts, the fragments working great havoc as they fall amongst the enemy. Bombs were formerly only fired from mortars; but since the late improvements in artillery they have been much fired from guns and bowitzers. The name of shell, or bomb-shell, is principally used to distinguish this kind of implement, notwithstanding the shape has changed in some cases from the sphere to the cylinder or cylindrical cone. (*See* Shell, Armstrong Gun.) The Venetians claim the invention of the bomb as early as 1378; but it did not come into common use in warfare until 1634, and then only between the Dutch and Spanish armies. An English engineer named Malthus is said to have first introduced bombs into France at the siege of Collioure in 1793.



BOMB.

**Bomba**, *bom'-ba*.—After the cruel bombardment of Messina, in 1849, when so many lives were lost and so much property destroyed, Francis II., king of Naples and Sicily, received the nickname of Bomba. His son, who succeeded him, is sometimes called Bombalino. After considerable resistance, he was driven from his throne by Garibaldi and Victor Emmanuel, who took the title of king of Italy. (*See* Francis II., &c., vol. I.)

**Bombacem**, *bom-bā'se-e*, in Bot., a group of plants, now usually regarded as a tribe of the nat. ord. *Sterculiaceæ*. It comprises several interesting genera; namely, Adansonia, Bombax, Cheirostemon, Durio, Eriodendron, and Ochroma, which are separately described in this work.

**Bombardier**, *bom-bar-deer'*, a non-commisioned officer in the artillery, corresponding in rank to a lance-corporal in the line, and distinguished by wearing one chevron on the left arm. In former times artillery-men so entitled were especially employed in filling shells and grenades, and preparing fusees, as well as in serving mortars and other pieces of ordnance from which shells are thrown during the siege of a town.

**Bombardier Beetle**, a name applied to many coleopterous insects of the tribe *Carabidæ*. They are divided into two genera,—the *Brachinus* and the *Aptinus*; the latter has no membranous wings under the wing-sheath. Those found near the tropics are large and brilliantly coloured, but those found in this country are generally small. They are called bombardier beetles on account of a remarkable property they possess of violently expelling from the anus a pungent acrid fluid, which, if the species be large, has the power of producing discoloration of the skin, similar to that produced by nitric acid. It also changes blue vegetable colours to red, and then to yellow. The most common English species is little less than half an inch long: if irritated, it will make more than twelve rapid discharges. Each expulsion of the fluid is accompanied by a very loud report, considering the size of the insect. The bombardier beetle is generally found under stones, and occurs plentifully in chalky districts.

**Bombardment**, *bom-bard'-ment* (Ital. *bombardamento*), the expression applied in Mil. to the act of throwing red-hot shot, shells, and congreve rockets into a fortified town, to effect the destruction of powder-magazines, dockyards, warlike stores, buildings of a public character, and private dwelling-houses. A bombardment is invariably attended with terrible destruction of human life and property, and is resorted to in order to induce the governor or officer in command to save the inhabitants from death and ruin by capitulation. It finds little favour with military and naval men, on account of the misery with which such a process is attended to those who are not actually in arms against the attacking force; and is seldom put in practice unless the place cannot be reduced by a regular siege. During the siege of Sebastopol, in 1854-5, a furious bombardment of the town and defensive works was kept up for some days, at six successive periods of the investment, in the last of which, justly characterized by the Russian governor, in his dispatches to the emperor, as a *feu d'enfer*, about 28,500 red-hot shot and shells, with other missiles, were hurled into the heart of the city and against the fortifications. Some idea of the expense attending a bombardment may be conceived from the fact that nearly 252,000 rounds of shot and shell were expended during the siege, besides those fired from the vessels surrounding the entrance to the harbour, which represents a mass of above 8,000 tons of iron, supposing each shot to average three-quarters of a hundredweight. Among the most famous bombardments mentioned in history, are those of Gibraltar, by the French and Spaniards, from 1779 to 1783; Havre, by Admiral Rodney, and Lille, by the Austrians, in 1792; Copenhagen, by Lord Nelson, in 1801, and again by Lord Cathcart and Admiral Gambier, in 1807; and Algiers, by Lord Exmouth, in 1816.

**Bombast**, *bom-bāst'*, in Lit., is an attempt to raise an ordinary or trivial object to the rank of the sublime, or to exalt a sublime object beyond all natural or reasonable bounds,—

> "My roof receives me not; 'tis air I tread,
> And at each step I feel my advanced head
> Knock out a star in heaven."—*Ben Jonson.*

BOMBAX, *bom'-bâx*, in Bot., a gen. of plants, the type of the tribe *Bombaceæ*. The species are natives of South America and India, and are commonly known as silk-cotton trees, owing to their seeds being covered with long silky hairs. These hairs cannot be spun into thread, like those of ordinary cotton; but they are sometimes used for stuffing beds and cushions. The American tree *B. Ceiba*, and the Indian tree *B. pentandrum*, are remarkable for their prodigious height. The bark of the latter is said to be emetic.

BOMBAZINE, *bom'-ba-zeen* (Gr. *bombyx*, a silkworm), is a woven fabric, the warp of which is silk and the weft wool. The manufacture was introduced at Norwich by some Dutch weavers, who settled there in 1575. Bombazine was at first made in different colours; but of late years it is only used in deep mourning.

BOMBIC ACID, *bom'-bik*, an acid formed by silkworms, analogous to, and most likely identical with, that obtained from ants, and called formic acid. (*See* FORMIC ACID.)

BOMB-KETCH, a vessel built and strengthened with large beams, equipped with two masts, and fitted with all the conveniences and appliances for the use of mortars at sea. These vessels are usually about 100 to 250 tons burden. (*See* MORTAR-VESSEL.)

BOMB-PROOF, a term applied to military structures which are so constituted that any missile discharged from a gun, as a bomb-shell or cannon-ball, cannot penetrate them. Magazines are constructed bomb-proof, and are generally made very strong; and casemates are bomb-proof vaults in fortresses, for the security of the defenders.

BOMBYX. (*See* SILKWORM.)

BONA FIDES, or BONA FIDE, *bo'-na fi'-dees* (Lat., good faith, or in good faith), an expression frequently used to denote a thing done with an honest intention, in opposition to one done with a bad or deceitful intention, said to be *malâ fide*. The phrase originated with the Romans, who classed under *bonæ fidei* obligations a great variety of contracts, as well as of legal acts. Actions *bonæ fidei* were distinguished from those *stricti juris*; the former having regard to the honesty of the intention, the latter to the strict legal terms of the deed. The distinction was somewhat analogous to that which prevails between courts of law and courts of equity in England.

BONA NOTABILIA.—Where a person dies, having, at the time of his death, goods in any other diocese besides his goods in the diocese in which he dies, amounting in value to £5 in the whole, he is said to have *bona notabilia*. They consist of simple-contract debts, specialties, judgments, leases of lands or houses, &c.

BONASSUS. (*See* BISON.)

BOND, *bond* (Sax. *bond*, bound or tied), in Arch., a term applied to certain methods of laying bricks (*see* BRICK-WORK), and to timbers built into or attached to the walls of a house for various purposes. Stones are called bond-stones when they are introduced longitudinally into a wall built of small rough stones or rubble-work. Bond-heart, in building, is when one stone is placed in the centre of a thick wall, over the joint formed by two others, the outer faces of which appear opposite to each other on either side of the wall. Bond-timbers are pieces of wood let into the sides of openings for doors and windows, to which the window-frames, jambs, and architrave of the doors and architrave-mouldings, may be nailed, and the long slips of timber built into a wall in a horizontal direction, at intervals of eighteen inches or more, to which the battens are attached.

BOND, or Writing Obligatory, a kind of contract in very extensive use, being adopted, in a great variety of cases, where the object is to obtain security for the payment of money, or the performance of any other act; being a deed, or instrument under seal, whereby a party from whom a security is intended to be taken, obliges himself to pay a certain sum of money to another at a day specified. If this be all, the bond is called a *single* one (*simplex obligatio*); but there is generally, indeed in practice invariably, a condition added, that if the obligor does some particular act, the obligation shall be void, or, else, shall remain in full force. The nature of this act depends upon the particular object intended to be secured. Thus, it may be the repayment of a principal sum borrowed of the obligee, with interest, the periodical payment to him of an annuity, the faithful performance, by a third party, of the duties of an office or employment under the obligee, the performance of covenants by the obligor, the indemnity of the obligee against loss, or the consequences of certain acts, and a variety of other matters; but whatever the nature of the act, the *penal sum* (or *penalty*) mentioned in the obligatory part of the bond becomes forfeited, or absolute in law, and charges the obligor, while living, and, after his death, his executor or administrator, and (subject to certain distinctions) is also capable of being enforced against his heir or devisee. If the condition of a bond be impossible at the time of making it, or be uncertain or insensible, the condition alone is void, and the bond shall stand single and unconditional; for it is the folly of the obligor to enter into such an obligation, from which he can never be released. But if the condition be to do a thing which is either illegal at common law, or contrary to the provision of an act of parliament, the whole bond is void; for the whole is an unlawful contract, and the obligee shall take no advantage of such a transaction. If the condition, at the time when the bond is executed, be possible and legal, and afterwards becomes impossible by the act of God, or that of the obligee himself, or becomes by any means illegal, the penalty of the obligation is, in any of these cases, saved, and the obligor discharged from all liability; for no prudence or foresight on his part could guard against such a contingency. But although the whole penalty, by breach of the condition, may become payable, the courts will confine the liability to the actual amount due, or the actual damage sustained by the breach.

BOND, POST OBIT, is a bond in which the main condition is, that it only becomes payable *after the death* of some person whose name is therein specified.

BONDAGE, *bond'-âj*, properly denotes a state of servitude or slavery, and by English law-writers it is used in the same sense as villenage. *Bondage by the forelock* was when a freeman renounced his liberty and became the slave of some great man, which was done by cutting off a lock of hair on the forehead and delivering it to his lord. Such an one, if he reclaimed his liberty or escaped from his master, might be drawn again to his servitude by the nose; whence the phrase, To pull a man by the nose. The Romans had two kinds of bondmen,—the *servi*, who were either bought, taken in war, or acquired in some other lawful way; and *vernæ*, those born of their bondwomen. Justinian mentions a third class, called *adscriptitii glebæ*, or *agricensiti*, who were a species of serfs or boors, not bound to the person, but to the ground or place, and belonged to him who possessed the land. These, by our law, are termed *villains regardants*.

BONE, *bone*, in Anat., is a hard complex structure, forming the framework or skeleton of the body in man and the higher animals. It is confined to vertebrate animals; and even in the lowest order of this class, the cartilaginous fishes, it is entirely wanting. The bones form a framework for the moulding and adequate support of the soft parts of the body; cavities for the lodgment and protection of delicate organs; joints for locomotion, and levers for the action of the muscles. They are always in the interior of the body, and even when they approach the surface are covered by some soft membrane, muscle, skin, &c. The first development of bone is commonly—though not always, as in the bones of the head—preceded by the formation of a cartilaginous structure, occupying the place which the bone is afterwards to take. It has commonly been said that the bone is formed by the ossification of the cartilage; but this, for various reasons, is thought not to be the case. The process of bone-formation always commences in the immediate neighbourhood of blood-vessels, which pass down into canals excavated in the substance of the cartilage, and lined by a continuation of its investing membrane. Hence the spots where these vascular canals are especially developed are termed centres of ossification. One of these is usually found in the centre of the shaft of a bone, and one at each end, with an additional one for any considerable projection or process. In the flat bones there is generally one in the middle of the surface, and one in each of the principal processes. Until the bone

attains its full dimensions, the parts which contain distinct centres are not connected by osseous union, but only by cartilage, so as to allow an increase in the size of the bone by the growth of cartilage between its detached portions, which gives place to bony structure when there is no further need of increase. There exists a close correspondence between the number of ossific centres in the early condition of the skeleton of all vertebrated animals. The growth of bone is effected by the addition of new tissue in three different modes:—1. By the development of new bone in the cartilage between the parts yet remaining separated; 2. by the development of new bone in the membrane covering the surface; and 3. by the interstitial formation of new layers within the canals of the osseous fabric already developed. The perfect reparation of bone after severe injuries, effected by the development of new osseous tissue in the substance of membrane or cartilage formed in the seat of injury, is one of the most remarkable features of its character. Bones are so constituted that a constant process of deposition and absorption is carried on in them, as in the softer tissues, modelling the shaft into its requisite proportions during the successive stages of growth. It is much more actively carried on in youth than in middle life, and is greater in the vigour of manhood than in old age. Bones increase in length not so much by interstitial deposit, as by addition to their ends; that is, by progressive ossification of the layers of cartilage which intervene between the ends of the shaft and the epiphyses. Bones are largely supplied with blood-vessels. The solid osseous texture which forms the cylindrical shafts of the long bones and the thick external plates of the denser flat bones is penetrated by a series of large canals, termed Haversian (after their discoverer), which form a network in its interior, and serve for the transmission of blood-vessels into the interior. These canals, in the long bones, run for the most part in a direction parallel to the central cavity, and communicate with this, with the external surface, and with each other, by frequent transverse branches. They vary in diameter from $\frac{1}{150}$ to $\frac{1}{300}$ of an inch, averaging about $\frac{1}{250}$; and are smallest near the outer surface, where the bone is most compact; but become gradually larger towards the interior. In the long bones of man and of most mammalia there is a central cavity, which is filled with the fatty substance known as marrow; and the space in which the marrow lies is called the medullary canal. This cavity does not exist in the bone in its early state, but is formed by the removal of the cancellated osseous tissue first developed in its interior. Among birds, however, the central cavity, instead of being occupied by marrow, is filled with air, and communicates with the lungs; so that the membrane lining it becomes an auxiliary organ of respiration; whilst the lightening of the bones thus produced diminishes their specific gravity. Bones are covered externally by a strong fibrous membrane termed the periosteum, which serves to protect the blood-vessels entering them. The medullary canal is also lined by an extremely delicate membrane, termed the medullary membrane, which supports the marrow, and provides a stratum for the subdivisions of the medullary artery before they penetrate the contiguous osseous substance. The Haversian canals are also lined by a similar membrane. Though bones possess little sensibility in health, yet, when diseased, they become highly sensitive, a manifest indication that they are supplied with nerves. These may, indeed, be traced into some of the minute foramina on the shaft of a long bone, but more easily into the articular ends. A nerve also enters the medullary canal with the nutrient artery of the medulla, and divides, like the artery, into an ascending and a descending branch. Bone is composed of a basis of animal matter, impregnated with "bone-earth," or phosphate of lime. The first ingredient makes it tenacious and elastic; the second gives it the requisite hardness. These may be separated from each other: the latter may be entirely dissolved away, by soaking the bone in dilute muriatic or nitric acid, when a substance of cartilaginous appearance is left; the former, by subjecting the bone to a heat sufficient to decompose the animal matter, when we obtain the whole calcareous substance *in situ*. The animal portion of a bone forms about one third, the earthy about two thirds; and the relative proportion of the two elements is said to differ little in different classes of animals. It is not yet a settled point whether the proportions vary at different periods of life; but the general opinion is that they do, the animal element predominating in early life, the earthy in old age. The bony framework of the higher classes of vertebrate animals presents very nearly the same chemical characteristics in most individuals. Bones, when dried at 212° until they cease to lose weight, consist of one third ossein, or organic matter, and two thirds of phosphate and carbonate of lime and phosphate of magnesia. Ossein, when boiled in water, gradually dissolves, leaving a small quantity of fatty and vascular matter floating on the solution, which, on cooling, gelatinizes, forming a weak glue or size, consisting of nearly pure gelatine. The earthy matter may be separated from the ossein, either by means of an acid, or else by boiling in water in a Papin's digester, at a temperature over 300°, the gelatine being only dissolved at that heat (*See* Boiling-Points). The mineral constituents of bone are used as manure and in the manufacture of cupels. (*See* Bone-Ash.) When bones are distilled in close vessels, at a gradually increasing temperature, oily matters, mixed with carbonate of ammonia, pass over, leaving behind bone-black, or animal charcoal. (*See* Bone-Black, Bone-Liquor.) The following are the analyses of ox-bone by Berzelius, and of the human fore-arm by Lentz:—

| | Ox bone | Human fore-arm |
|---|---|---|
| Animal matter | 33·30 | 31·11 |
| Phosphate of lime | 55·15 | 59·14 |
| Carbonate of lime | 3·85 | 6·32 |
| Phosphate of magnesia | 2·05 | 1·20 |
| Fluoride of calcium | 2·20 | 2·23 |
| Potash and soda salts | 2·15 | |

The great value of ground bones as manure depends upon the quantity of phosphate of lime contained in them: hence battle-fields are notably fertile. Ground bones are now generally prepared for manure by adding a certain portion of sulphuric acid to them, by which means a superphosphate of lime is formed, which is soluble and easily absorbed by the plants to which it is applied. (*See* Anatomy.)—*Ref.* Carpenter's *Principles of Physiology*; Holden's *Human Osteology*; Quain's *Anatomy*.

Bone (in Manf.).—Bones, in a great variety of ways, give employment to manufacturing skill. They are used by turners and cutlers, but their oil must be previously extracted by boiling, and they afterwards bleached in the sun or with chloride of lime. This, unfortunately, renders them more brittle and less easy to turn. The form and nature of most bones, with their large cavities for marrow, are also unfavourable to their being worked into common articles of domestic use, such as knife-handles, brushes, &c. The hartshook and shin-bones of the ox and calf are the bones most generally used. Common bone articles, such as nail and tooth-brushes, are often polished with slaked lime used wet on flannel or woollen cloth. Bones are also used for making animal charcoal; and, when calcined, bone-ash. (*See* Bone-Ash.) The scrapings, parings, and sawdust of bones, are much used in making gelatine for the confectioner, and also in case-hardening small objects in steel. In Manchester, bones are boiled in open pans for twenty-four hours, when the fat is skimmed from the surface and sold to soap and candle manufacturers. The *size* which is left is boiled down until it is of sufficient consistency for stiffening the goods for which it is intended. The *size* liquor when exhausted is used as manure for the pasture and grass lands, and the residual bones are readily bought up by the farmers. A very good liquid manure is also made by digesting burnt bones in weak sulphuric acid. This affords a direct solution, containing superphosphate and sulphate of lime, which is useful for grass lands or fields of rising corn. If pearl-ash is added to this acid solution, and the mixture dried up by adding powdered charcoal or mould, an excellent top-dressing manure is formed. (*See* Superphosphate of Lime.) In old pasture-lands the application of bone-manure has been known to raise the value from 10*s.* to 40*s.* per acre. In 1839 Great Britain imported

nearly 85,000 tons of bones, valued at £500,000. In the barren steppes of Tartary and in the Pampas of South America bones are used as fuel; and in Norway and Sweden, in times of scarcity, fish-bones are browned on a gridiron till they are friable, and with salt and pepper form palatable food. (*See* IVORY.)—Ref. *Trans. of the Society of Arts*—"On Bone and its Uses," by Henry Aitken.

BONE-ASH, the mineral constituents of calcined bones, containing the whole of the earthy matter. Bone-ash consists principally of phosphate and carbonate of lime, with a small quantity of phosphate of magnesia and chloride of sodium. By dissolving bone-ash in hydrochloric acid, and precipitating by means of ammonia, its most valuable component, phosphate of lime, is procured nearly pure. Bone-ash is largely used in the preparation of artificial manures, and in making cupels for assaying purposes.

BONE-BLACK.—When bones are subjected to destructive distillation, a black granular earthy mass is left behind in the retort. This contains phosphate of lime, carbonate of lime, and charcoal, and is extremely valuable, from the property it possesses of decolourizing vegetable substances. It is therefore much used as a decolourizing agent in various processes, but more particularly in sugar-refining, for decolourizing the brown syrup. When used for chemical or pharmaceutical purposes, it is digested with hydrochloric acid until nothing remains but nearly pure carbon. This property is due to its very fine state of division. The coarser varieties of bone-black are used in the manufacture of blacking. (*See* CHARCOAL.)

BONE-LIQUOR.—The liquor which distils over during the preparation of bone-black divides into two parts,—one a mixture of various oils, and the other a solution of carbonate of ammonia, or *bone-liquor*, as it is called the production of which is one of the principal objects of the manufacture.

BONFIRE, *bon'-fire* (Fr. *bon*, good; Sax. *fyr*, fire), is a fire made for some public rejoicing, usually in some conspicuous place; as on the top of a hill, or in an open part of a town, so as to be visible from a distance. The etymology of the term is very doubtful; some suppose it to have been so called from being generally made of bones; others consider it to mean a contribution fire, one to which every one of the neighbourhood contributed a certain portion of materials; others derive it from *baon* or *bon*, good, and fire. The practice of kindling bonfires in this country is one of great antiquity. (*See* BELTEIN.)

BONHOMMES, *bon'-om*, an order of hermits of simple lives and manners, who made their appearance in France about 1257. The prior of the order was called by Louis VI. *le bon homme*, whence they derived their name. They made their appearance in England in 1283.

BONITO, *bon'-e-to* (Sp.), a name applied to several fishes belonging to the fam. *Scombridæ*. There are two varieties,—the *Thynnus pelamys*, the *Pelamys vulgaris*, or belted Bonito, and the *Auxis vulgaris*, or Plain Bonito. The *T. pelamys* resembles the tunny, and is not unlike a large mackerel. In tropical climates it is found in large numbers, and is well known to sailors as one of the fishes constantly seen in pursuit of the flying-fish. It is a very pretty fish, of a rich blue colour, with four dark lines stretching from the pectorals to the tail, on either side of the belly. Its average length is about two feet, and it is generally caught with an imitation flying-fish as a bait. The belted bonito is common in the Mediterranean and Black Sea. The plain bonito is also found in the Mediterranean, where its flesh is salted or pickled, and used for food; but it is never eaten when fresh.

BONNET, *bon'-net* (Fr. *bonnet*, cap), in Mil., the elevation of the parapet about the salient angle of a bastion or ravelin above the general level of the work. The name is also given in permanent defensive works to a little outwork with two faces, forming a salient angle, intended to protect the angle of a ravelin (*see* RAVELIN), the faces of which are defended by tenaillons or lunettes. (*See* TENAILLON, LUNETTE.) An outwork of a similar kind, used in field fortification, having three salient angles instead of one, is called a *bonnet de prêtre*, or priest's bonnet.

BONNET, a covering for the head, of which there are many varieties. It is applied to the head-dress of either sex. In Scotland the "blue bonnet" was at one time the national characteristic of the Lowland Scotch, and was famous both in song and story. It was manufactured of thick milled woollen, and was broad, round, and flat in appearance, with a small red tuft on the top. It is still worn to a considerable extent by the peasantry of that country.

BONY PIKE, *pike* (*Lepidosteus osseus*), an elongated pike-like fish, inhabiting the warmer lakes of America. The jaws of this fish are usually produced into a long narrow snout, presenting considerable resemblance to that of the Gangetic crocodile. The vertebral column presents a structure such as is met with in no other fishes, the bodies of the vertebræ being regularly articulated together.

BONZES, *bonz'-es* (Japanese *Busso*), the name by which the priests of Buddha or Fo are usually designated in Japan. They form a very numerous class in that country, and are composed of all ranks of society. They are divided into various sects, and comprise both males and females. There are convents for the male as well as for the female bonzes, some maintained by voluntary contributions, others having their own fixed revenues. The principal moral precepts which they inculcate are five; namely, not to kill, not to steal, chastity, veracity, and abstinence from spirituous liquors. The term bonzes is also frequently applied by Europeans to the priests of Buddha in China, the Burmese empire, and other parts of eastern Asia.

BOOBY, *boo'-be* (*Sula fusca*), a name given to a large bird, a species of gannet. It is not quite so large as a solan goose, and it inhabits the desolate islands and unfrequented coasts of most warm climates. It has received its name in consequence of its apparent stupidity, in sitting quietly and allowing itself to be knocked on the head, or be taken away by any one attempting it. It is very powerful on the wing, and feeds on fishes, which it watches while flying close to the surface of the water, and then catches by suddenly diving down upon them. Its colour is dark brown, rather white underneath. Its bill is much longer than its head, and its gullet is so expansible that it is able to swallow fishes of large size. The male and female resemble each other closely in appearance, and the latter only lays one egg. The flesh of the booby, like that of all birds that live on fish, is not agreeable when cooked. (*See* GANNET.)



THE BOOBY.

BOOK, *book* (Sax. *boc*), is a general name given to almost any kind of literary composition, but in a more limited sense to such as are large enough to form one or more volumes. When short, occupying only a few sheets, sewed or stitched together, it is called a pamphlet. Certain divisions of a literary work are also sometimes designated by this name; as the Books of Homer's Iliad, or of Virgil's Æneid. In ancient times books were commonly written upon prepared stripe of the Egyptian plant papyrus. They were wound round small cylinders or rollers,—whence the Latin term *columna*, and our word volume. Plates of lead and copper, wood, the bark of trees, and even bricks and stone, have been employed as materials in the construction of books. Leather and parchment were also used by the ancients, and when, by the capture of Egypt by the Arabs, in the 7th century, papyrus could no longer be obtained, the use of parchment became general. During the Middle Ages the plan of rolls was discontinued, and the form of leaves sewed or bound together came into use. The manufacture of books was for the most part in the hands of the different orders of monks, many of whom spent a great part of their lives in the transcribing of them. In the earlier part of the Middle Ages the

scarcity of books was so great that often in a whole town there was not one to be found, and even rich monasteries possessed little more than a missal. The labours of the monks, however, did much to improve this state of things; while the general introduction of paper about the 13th century, followed by the invention of printing, have been of incalculable benefit in the circulation of knowledge. Books may now be had for a few shillings, which would formerly have cost hundreds of pounds. (*See* BOOK-TRADE.)

BOOKBINDING (Ang.-Sax.).—Books were formerly preserved in the form of rolls, consisting simply of the leaves pasted or glued together in one long sheet, at each end of which was fixed a roller with handles. The roll was read by unwinding one roller and winding the other. This form of binding was afterwards superseded by the square form, as we now possess it. This was a marked improvement, and was adopted for manuscripts long before the invention of printing. The first bound books being chiefly copies of the Scriptures, and other works of a religious nature, they soon began to have their bindings enriched in various ways. Many of these rich bindings exist to the present day. They were executed principally by jewellers, who incrusted precious stones, ivory, and metal-work upon covers of vellum, wood, or silver. The greatest taste has been shown in all ages in the matter of bookbinding; and whether we examine the gorgeous but clumsy covers of the 11th and 12th centuries, the splendidly-bound books of the Renaissance period, or the modern works of Rogers, Leighton, Bedford, and a host of others, there is always something to charm the fancy and gratify the taste. As a mere manufacture, bookbinding has been obliged to keep pace with the marvellous increase in the number of books produced; and, by means of machinery, such houses as Remnant's or Leighton's are able to bind 1,000 volumes, in cloth gilt, in six hours! In binding a book, whether it be a ten-guinea folio by Owen Jones, or a 2*s.* 6*d.* volume of the Boy's Magazine, the number of operations is three; viz. 1. Preparing, 2. Binding, 3. Finishing. The sheets as printed are first "gathered," that is, placed in their order of pagination, folded into four, eight, or twelve leaves, as the case may be; they are then stitched and sewn to strings or bands placed at the back of the volume. A saw-cut is, in some instances, made to receive the string; in others the string is left to form a rib, which is used as an element of ornament in finishing the book. The sheets being all sewn together, the back edges are glued together by brushing them lightly with thin glue. The strings are cut off within half an inch of the volume, and the back is rounded in the following manner:—The workman holds the volume flat, and beats it with a flat hammer, at the same time drawing the sheets so as to cause the rounding of the edges. A groove is then formed by pressure close against the back edge to receive the board of the cover, otherwise it would be liable to project beyond the edge of the volume, and be both unsightly and inconvenient. A machine for rounding the backs of books has been lately introduced. The top, bottom, and front edges are then cut level, and the boards are fixed to the volume by the ends of the strings being passed through small holes and glued firmly to the inside. When the book is cloth-bound, the cloth is applied to the boards before they are attached to the volume; in other cases the coverings are put on after the boards are attached. The book is then ornamented with gilding, inlaying of different-coloured leather, or blind tooling, *i. e.* plain stamping by heated stamps or dies, and the edges are left plain, or gilt, or sprinkled. Books are said to be "boarded" when bound in cloth, "half-bound" when the back and corners are in leather, and "whole-bound" when nothing but leather is used. It is generally considered that boarded books will be afterwards bound in leather, according to the taste of the possessor; they are, therefore, mostly left uncut, and the putting together is more or less slight. A method of binding without stitching has lately been much used: the four edges of the book are cut, separating it into single leaves; India-rubber solution is then applied to the back edge, whereby the leaves become firmly cemented together. It is very useful when the book is required to be laid open flat, as in the case of atlases, ledgers, music-books, &c. The following is a list of the most common sizes of books, with familiar examples to fix them on the memory:—*Folio*, the volume of 100 plates to Layard's "Monuments of Nineveh;" *quarto*, the "Encyclopædia Britannica," and "Beeton's Family Bible;" *octavo*, "Beeton's Universal Dictionary;" 12*mo*, the "Boy's own Magazine;" 16*mo*, Peter Parley's Tales; 18*mo*, Pinnock's Catechisms, and Knight's Weekly Volumes; 24*mo*, Routledge's "American Poets;" 48*mo*, Pickering's "Diamond Classics."

BOOK-KEEPING (Ang.-Sax.) is the art of keeping accounts,—the art of recording in a regular, concise, and accurate manner, the business transactions of merchants or others, in a set of books kept for the purpose. Of the early history of book-keeping little is known. In the 15th century the double-entry system was practised by the merchants of Venice and other towns of Italy, then the great mercantile country of the world, whence it has obtained the name of the Italian method. In the early part of the 16th century it had been introduced into France; and the first treatise in England upon the subject was by Hugh Oldcastle, a schoolmaster, and was published in 1543. Since that time more than 150 different works have been published in this country upon book-keeping. Books are kept either by single or by double entry. The system of *single entry* is the simplest method of keeping accounts; but it is only suitable for retail dealers, or such as carry on but a small business, being wholly inadequate to the recording of complex transactions. It receives its name from each item being entered only once in the ledger. The only books necessary for it are a journal, or day-book, and a ledger. In the former the merchant enters all his transactions as they occur in the course of business; in the latter he arranges them under their several accounts, carrying his sales to the debit of his customers, and his purchases to the credit of the merchants who supply him with goods. The system of *double entry* is so called from each item being entered twice in the ledger, being debited to one set of accounts and credited to another. It proceeds upon the principle, that every business transaction is twofold,—that there can be no sale without a purchase, no payment without a receipt; and hence, by entering each transaction on both sides of the ledger, a system of checks is established, inasmuch as the entries on the credit side must be equal to the entries on the debit side, otherwise the books will not balance. Although book-keeping is a system beautiful and complete in itself, yet its details necessarily vary according to the nature and extent of the actions to be recorded. It is alike applicable to the accounts of merchants, manufacturers, or public companies; but the mode of carrying out the details will vary in each case. Its object is to secure a clear and condensed statement of every fact and transaction connected with the business, so that it may be at once understood, and that accuracy may be secured. Unless a merchant knows how his affairs stand,—the amount of his income and expenditure, of his debts and his liabilities,—it is evident that he must proceed upon vague and possibly erroneous conclusions, which may result in insolvency. The number of books required in double entry will depend upon the nature and extent of the business. In the case of merchants the books commonly used are the day-book, invoice-book, cash-book, bill-book, and ledger. In the *day-book*, sometimes called the *invoice-book outwards*, is entered a daily account of all the goods sold on credit, with the prices and the names of the purchasers. The *invoice-book*, called sometimes the *credit day-book*, contains an account of all goods bought on credit, with the name of the seller and the amount. In the *cash-book* is kept an account of all the cash received and paid, and of the discount received and allowed. On the left-hand page is entered the cash received, and in an inner column the discounts allowed; and on the right-hand page the cash paid, and in an inner column the discounts received. At the close of business for the day, the amounts on both sides are summed up and balanced. The *bill-book* contains in one part an account of all the "bills receivable,"—*i.e.*, bills of which he is to receive payment; and in another an account of all "bills payable,"—*i.e.*, those that have to be paid. It contains a statement of the dates, amounts, when due, and other particulars of the

several bills. All these books are very simple in their character, and are usually termed "subsidiary books," the *ledger* being the principal book in a business. It contains an abstract of the entries scattered through the various subsidiary books, all arranged methodically under the names of the different persons standing in the relation of debtors or creditors to the merchant. Two sets of columns are assigned to each account, one for Dr., the other for Cr. Besides these accounts, which are termed personal, from being made out in the names of the persons with whom the merchant has dealings, there are what are termed real and fictitious accounts. *Real accounts* are made out to show the merchant where, how, and in what proportions his property is invested, under such heads as cash, merchandise, bills receivable, and the like. *Fictitious accounts* are such as are made out to show his gains and losses, under the heads, charges, profit and loss, balance, &c. The fundamental principle of double entry, that every item carried into the ledger must be entered twice, must be entered on the Dr. side of one account, and the Cr. of another, leads to the result that the aggregate amount of all the entries on the Dr. side must exactly balance those on the Cr. side of the ledger. The account giving out the item is always the Cr., and the account receiving it always the Dr. The copying of the items from the subsidiary books into the ledger is termed "posting." To facilitate the posting of the ledger, an intermediate book called the *journal* is sometimes used. Its object is to indicate to what accounts, and to which side of each account, the transactions recorded in the subsidiary books are to be carried. It is also found most useful in practice as a check against posting entries to the wrong accounts in the ledger. The *balance-sheet* is a condensed statement of the merchant's assets and liabilities, drawn up in order to show the state of his affairs. His assets are found in the balances on the Cr. side of the ledger accounts, and these are put on the Dr. side of the balance-sheet. His liabilities are the balances appearing on the Dr. side of his ledger accounts, and these are brought to the Cr. side of the balance-sheet. The difference between his assets and his liabilities is his present worth. A proper balance-sheet ought to show the manner in which the capital was invested, as money, stock, debts, &c.; also the expenses at which the business had been conducted, and the money drawn out on private account. "Let no man," says Dr. Johnson, "venture into large business while he is ignorant of the method of regulating books; never let him imagine that any degree of natural abilities will enable him to supply this deficiency, or to preserve a multiplicity of affairs from inextricable confusion."

Book of Life, or The Lamb's Book of Life, is one of those descriptive phrases of which there are so many in Scripture, by means of which a knowledge of divine things is communicated by referring them to objects or customs of daily life. It was the custom with princes to have a list of all the distinguished persons about their court, or in their service; and hence, when it is said that one's name is written in the book of life, it means that he particularly belongs to God, and is enrolled among his friends and servants. On the other hand, to have one's name blotted out of the book of life signifies erased from the list of God's friends and servants, as those who were guilty of treachery were struck off the roll of officers belonging to a prince.

Booksellers' Marks or Signs.—Many of the early printers, or booksellers, in place of putting their name on the title-page of their books, adopted a certain mark or sign; and hence a knowledge of these marks is of use in distinguishing different editions of works. The anchor is the mark of Raphelengius at Leyden; the anchor with a dolphin twisted round it, that of Manutii at Venice and Rome; the Arion, of Oporinus at Basel; the caduceus or Pegasus, of the Wechelnses at Paris and Frankfort; the cranes, of Cramoisy; the compass, of Blantin at Antwerp; the fountain, of Vascosan at Paris; the sphere in a balance, of Janson and Blaew at Amsterdam; the lily, of the Juntas at Venice, Florence, Lyons, and Rome; the mulberry-tree, of Morel at Paris; the olive-tree, of the Stephenses at Paris and Geneva, and the Elzevirs at Amsterdam and Leyden; the bird between two serpents, of the Frobeniuses at Basil; the Truth, of the Cornelius's at Heidelberg and Paris; the Saturn, of Colinæus; the printing-press, of Badius Ascensius.

Book Societies, or Book Clubs, are associations for the purchase and circulation among themselves of new books as they issue from the press; after which they are usually disposed of by auction among the members, or sold to the public. Book societies are by no means so common as, from the many advantages of them, they might be expected to be. "Book clubs, or reading societies," says Lord Brougham, in his "Practical Observations on the Education of the People," "may be established by very small numbers of contributors, and require an inconsiderable fund. If the associates live near one another, arrangements may be easily made for circulating the books so that they may be in use every moment that any one can spare from his work. Here, too, the rich have an opportunity presented to them of promoting instruction without constant interference; the gift of a few books as a beginning will generally prove a sufficient encouragement to carry on the plan by weekly or monthly contributions."

Book-Trade.—The business of dealing in books is of a comparatively recent date. In early times, when books were scarce and had all to be transcribed, those who copied them usually also disposed of them. In the later period of Roman history, however, there arose a class of persons termed *bibliopolæ*, who acted as a kind of middle-men, employing or purchasing books from the transcribers and disposing of them to the public. In the reign of Augustus, the brothers Sosii were celebrated in this way. With the establishment of several universities in the 12th century, the trade in books was much increased, particularly in such towns as Paris and Bologna. In 1323, a statute of the University of Paris distinguishes between *stationarii*, or booksellers proper, those who buy from one party and sell or lend to another, and *librarii*, those who merely buy and sell books on commission. After 1342, no one could deal in books in Paris without the permission of the university, who had special officers to examine the manuscripts and fix the price. It was not, however, till after the invention of printing that the book-trade attained any importance. At first, the printers were likewise booksellers; and John Fust and Peter Schoffer disposed of the productions of their press in Paris and Frankfort-on-the-Main. Some instances of the division of the two branches occur in the 15th century. The first booksellers were usually termed stationers, either from the Latin word *stationarius*, or from having only stalls or stations in the streets and market-places of the towns, as is still to be seen in the case of dealers in old books. Now, the term stationer usually denotes a dealer in paper and other writing-materials. At first, the civil magistrates took little concern with the booksellers, leaving them to the control of the universities, of which they were supposed to be the immediate retainers, and which, accordingly, gave them laws and regulations, examining the correctness of their books and fixing the prices of them. This, however, was soon changed, and the trade of bookselling was put under various restrictions. In 1556, the Stationers' Company of London was incorporated. It was composed of printers and booksellers, who exercised a kind of censorship over the press. In 1662 the famous licensing act was passed, which prohibited the publication of any book unless entered in the register of the Company of Stationers or licensed by the lord chancellor. (*See* Stationers' Company and Copyright.) The book-trade is, properly speaking, carried on by two distinct classes of persons,—the publishers, who prepare and dispose of the books wholesale; and the booksellers, by whom they are retailed to the public. According to the census of 1851, the number of persons engaged as booksellers and publishers in England and Wales was 6,905, and in Scotland 1,466. The great centre of the book-trade in the United Kingdom is London, though a considerable number of works are also published in Edinburgh, Dublin, Oxford, Cambridge, Glasgow, and other provincial towns. Many provincial publishers, however, have branch establishments in London, and all of them have agents there, to whom they consign a certain number of copies of every work they publish, and to whom they also address their orders for copies of such books

as they may have occasion for. The booksellers of Edinburgh and Dublin also act as agents for those of London, and supply the Scotch and Irish trade with the metropolitan publications. The London publishing trade centres chiefly in Paternoster Row (popularly known as "the Row") and the courts adjoining. "In 1860 there were connected with the book-trade, within the bounds of the metropolitan Post-office district, 211 booksellers who were also publishers, 668 booksellers alone, besides 23 foreign booksellers and 12 law booksellers; total, 812."—(*Chambers.*) Many of the publishers and booksellers restrict their attention chiefly to certain classes of books; as theological, law, medical, general literature, &c. The average number of volumes of new works, exclusive of pamphlets, published annually in the United Kingdom exceeds 5,000; and of new editions, upwards of 1,200. In 1852, the booksellers of London formed a kind of trade-union, by which they attempted to compel retailers to sell books only at the regular fixed price; but the attempt entirely failed, and retailers may now sell books at any price they please. The deduction allowed by the publisher to the retailer is usually 25 per cent., or 3*d.* per shilling. It is also placed on a half-yearly or yearly account, from which, if settled by cash within a month after being rendered, a discount of 2½ per cent. is allowed. Frequently, a work is "subscribed" for among the trade; *i. e.* booksellers put down their names for a certain number of copies of a work before it is published, it being then offered at a somewhat lower rate than is afterwards allowed. In order to get rid of remainders of books, trade-sales are often had recourse to, when they are either offered in small quantities at a very reduced price, or sold in the lump by auction. Publishers wishing to dispose of a portion of their stock sometimes issue to the trade sale-catalogues, in which they offer certain books at a greatly reduced price. Trade dinners are not so frequent now as formerly, though it is still the practice with some of the larger publishers to invite their acquaintances in the trade to a dinner at a tavern, when those present have an opportunity of subscribing for a certain number of copies of the books offered for sale at the stated price. The terms of the agreement entered into between a publisher and an author are various, depending chiefly upon the character of the author and the nature of the book. Sometimes the publisher purchases the copyright for a fixed sum, and takes the whole responsibility of the sale upon himself; sometimes the author retains the copyright, undertakes all risks, pays all expenses, and allows the publisher a certain commission on the sales; sometimes the publisher agrees to take all the risk of printing and publishing a certain number of copies, and to divide the profits with the author, who still retains the copyright of the work. Authors are apt to complain of the hard terms that are usually meted out to them by publishers, and in some cases, perhaps, not without reason. But it is to be borne in mind that there is always considerable outlay, and no little risk, connected with bringing out a new book, especially by an unknown author. The following is the estimated cost of bringing out 750 copies of a work of 500 pages:—

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|---|---|
| Printing and corrections..... | £85 |
| Paper ..... | 30 |
| Boarding in cloth ..... | 24 |
| Advertising..... | 30 |
| | £169 |

Were all the copies sold (after deducting those for presentation) at 7*s.* 6*d.* each (*i. e.* the trade price of 10*s.*), 25 counting as 24, there would remain about £90 for interest on capital and publisher's and author's profit. But this is rarely the case, and frequently the sale does not meet the actual outlay for printing and paper. Not more than one book in eight ever reaches a second edition. There have been instances (we fear rare) of publishers handsomely increasing the stipulated remuneration, when the sale of a work largely exceeded their expectations. The Messrs. Blackwood, of Edinburgh, at first gave the Rev. J. Caird £100 for his sermon "Religion in Common Life," but the sale so exceeded their expectations, that they subsequently presented the author with £400 in addition; and the publisher of the present work brought out an edition of "Uncle Tom's Cabin," which was so successful, that he voluntarily presented the authoress with £500, and subsequently increased his gift by £250. (Of this book it has been calculated that 1,500,000 copies were sold in England, Mr. Beeton's firm alone issuing 607,000.) The epoch of cheap literature may be said to have commenced, however, partially in 1827, when Constable issued his "Miscellany," and the Society for the Diffusion of Useful Knowledge their "Library of Useful Knowledge." On the 4th of February, 1832, appeared the first number of "Chambers's Edinburgh Journal," and, on the 31st of March following, "The Penny Magazine." Soon after was commenced "The Penny Cyclopædia" of the Society for the Diffusion of Useful Knowledge, a work not more remarkable for its cheapness than for the ability with which it was conducted. Forty thousand pounds was distributed amongst the authors and artists engaged in its production, of which sum more than three-fourths had been laboriously earned by the diligence of the writers. Cheap publications are now the order of the day. Not only are cheap editions brought out of works unprotected by copyright, but even publishers of the first class find it their interest to bring out cheap editions of popular books the copyright of which is secured to them. Among the names chiefly entitled to honourable mention in the field of cheap literature, we may, without detracting from the merits of others, give those of Charles Knight *facile princeps*, Chambers' of Edinburgh, Bohn, and Routledge. It is now usual to stereotype cheap books and periodicals of which the sale is expected to be considerable, or to extend over a considerable time; and this course is adopted even with large books like the "Encyclopædia Britannica." The old-book trade, or the sale of second-hand books, is carried on to a considerable extent in all the larger cities and towns of the United Kingdom; but London is its principal seat. Many of these dealers prepare periodically price catalogues of their books, which they circulate through the country, and in this way dispose of a great many of their books. The price of old books is very fluctuating and capricious, depending in some measure upon their condition or intrinsic value; but frequently equally good copies of the same work may be had at a half or third of the price in some shops that they can be obtained for in others. In Germany, the great centre of the book-trade is Leipsic, where two great book-fairs are held annually, at Easter and Michaelmas respectively. These fairs are not so important or so largely attended now as formerly, a great part of the business being effected by means of agents or commissioners. Every bookseller in Germany has his commissioner at Leipsic, to whom he transmits copies of all his new publications, and who distributes them among the other commissioners, for being transmitted to their employers. At the end of the year the unsold works are sent back by the same means to their several publishers. The great advantage of this system is that every new book is, within a few weeks of publication, made known throughout Germany without having recourse to the expensive and imperfect system of advertising. The accounts of the various booksellers are also usually settled by means of the commissioners. In France the book-trade is carried on much in the same way as in England, and centres in Paris. In the United States of America, the book-trade is carried on to a large extent, and on account of non-existence of international copyright, the books of this country are largely reprinted there. It is indeed asserted that while, in 1820, of the number of books published in the United States, 70 per cent. were reprints of British publications, in 1856 the proportion was only 20 per cent. But it is undeniable that the best books of this country are still reprinted without authority in the United States. From the low price at which reprints of popular English books can be produced, the sale is often four or five times greater than in England. It is said that in five years there have been sold in the United States 80,000 vols. of the 8vo edition of "Modern British Essayists," 60,000 vols. of Macaulay, 100,000 of "Jane Eyre." The sale of Thackeray's works in the States has been quadruple that in England; and that of Dickens's works counts by millions of volumes.

"In 1853," according to Trübner's "Bibliographical Guide to American Literature" (1859), "there were 355 book-publishing establishments in the United States." At present the number is more than 400. About three-fourths of these are located in New York, Philadelphia, Baltimore, and Boston, the rest being principally in Cincinnati, Charleston, New Orleans, Buffalo, Auburn, Albany, Louisville, Chichago, St. Louis, and Hartford. There are more than 3,000 booksellers, who dispense the publications of these 400 publishers, besides 6,000 or 7,000 general dealers, who connect the trade in books with the ordinary stock of a country store." The book-trade of 1858 is estimated at 16,000,000 dollars. An interesting article on this subject, by Mr. W. Chambers, will be found in "Chambers's Encyclopædia." (*See* also "Bookselling," in *Encyclopædia Britannica*; "Books," in McCulloch's *Commercial Dictionary*; Trübner's *Guide to American Literature*; and *The Old Printer and the Modern Press*, by Charles Knight.

Boom of a Harbour, *boom* (Du.), a term applied to a strong iron chain or cable fastened to a number of spars or poles, and drawn across the mouth of a harbour, for the purpose of preventing the entry of an enemy's ships of war. This chain or cable may be raised or lowered above or below the surface at pleasure, by means of capstans and other mechanical contrivances.

Boomerang, *boom-e-r-ng'*, a missile instrument used by the aborigines of Australia, in war, sport, and the chase. It consists of a piece of hard wood of a bent form, with the curve of a parabola, is about 2 feet long, 2½ inches broad, ¼ inch thick, and is rounded at the extremities. One side is flat, the other convex, and it is brought to a bluntish edge. It is discharged by the hand by one end, the convex edge being forward and the flat side upward; and it is thrown as if to hit an object in advance; instead, however, of going forward, it ascends into the air with a rapid rotatory motion, until it reaches a considerable height, when it begins to retrograde, and finally passes over the head of the projector and falls to the ground behind him. This singular motion is produced by the air impinging on the bulged side of the instrument. The boomerang, the invention of which would have done honour to the most celebrated man of science, has long been a common weapon among almost the lowest races of savages upon the earth, and was first made known in this country by Professor McCullagh, in 1837: since then it has been endeavoured to apply the principle of the boomerang to the propulsion of ships.

Boor, *boor* (Du. *boer*; Ger. *bauer*), properly signifies a countryman, or one who is employed in agricultural labour; and from that it has come to be used in a secondary sense, to denote a coarse, uneducated, clownish person.

> "The boorish driver leaning o'er his team
> Vocif'rous and impatient of delay."
>
> *Cowper.*

Boot, or Bordekin, *boot*, a mode of torture used in former times in this country, but more especially in Scotland, in order to extort confession from persons accused of crimes. This instrument of torture, which was applied to the leg, was of various kinds. Sometimes it was composed of parchment applied moist, and then brought near the fire, so as by shrinking to cause great pain and uneasiness; sometimes it consisted of four thick strong boards bound tightly round either one or both legs with cords, and then tightened by means of wedges, until, occasionally, the bones of the unfortunate sufferer's legs were broken: This barbarous piece of torture-apparatus is also said to have been made of iron.

Boot and Shoe Manufacture.—This useful manufacture, as now followed in London and other large towns, is divided into many branches. There is the shoe-closer, who is generally a woman,—she prepares the upper-leathers of the shoe; the shoeman, who attaches the sole part to the upper-leather; the boot-closer, who prepares the leg and vamp portion of the boot; the bootman, who attaches the sole part to the leather, similarly to the shoeman; the jobber, who is a shoemender; the cobbler, who is his own master; the blocker, clicker, runner, cleaver-up, &c. Many persons of both sexes are employed in the manufacture of boots and shoes in this country. Till 1849 it was an ordinary handicraft; but, since that time, the manufacturers of Northampton and Stafford have introduced sewing-machines, by means of which much of the former labour is dispensed with. These two towns have for many years been the principal sources from which the London market has been supplied; and their boots and shoes are considered to be equal to any of those made in Paris or London. Many of the so-called French boots are made by English manufacturers with French *fronts*, which they import in large quantities from France; and there is also a considerable importation of French boots and shoes. In 1858 there were 165,466 pairs of boots, shoes, and goloshes imported, and 609,506 pairs of boot-fronts. The first processes in the manufacture of boots and shoes are the cutting and sewing of the leather, which are merely mechanical. M. Lefebre, of Paris, has made an improvement in boot and shoe-making, which he has patented. By means of machinery the sole and heel are fastened to the welt by brass screws, which keep them in contact with a pressure equal to two or three hundredweight. A specimen of this machinery was shown at the Exhibition of 1851. Mansell's blocking apparatus is another of the many improvements introduced into this manufacture of late years. It effects the blocking of a boot in less time than the usual process, and does not injure the leather so much. A piece of leather cut into the proper shape for the front of a boot is soaked in water; the part which corresponds with the instep is then rubbed with an oily paste called "dubbing," and the whole is laid upon two iron cheeks. By means of a winch and two cog-wheels, the leather is brought down between the cheeks by a plate of zinc; and this process is repeated according to the strength of the leather. By a patent taken out by Waite, a London manufacturer, some years ago, the necessity of using clickers in cutting out the leather for women's and children's shoes was superseded. By this process the inventor states that 7,200 boot-bindings can be prepared for the binders at a less expense, and in one-tenth part of the time required in the ordinary plan. Waite has also patented a machine by which instep-pieces for women's and children's boots and shoes are modelled. By a process invented by Marsden, small holes, kept open by metallic plates, are inserted at the sides, for ventilating purposes. The use of india-rubber and gutta-percha in boot and shoe-making has produced very great changes. Gutta-percha, although not serviceable in hot climates, is very useful in withstanding moisture, when applied to the under-leather. There is also a process, patented by Hetley, in which india-rubber and gutta-percha, mixed with leather raspings, were pressed into blocks and sliced. This substance was then used as shoe-leather. India-rubber is often applied to various parts of the boot or shoe, in order to give lightness or elasticity. A pair of boots were made for a racing jockey almost entirely of this material: they only weighed four ounces. Several terms are employed in order to distinguish the various boots made with india-rubber; such as resilient, siccopodean, and tel-ideioelasticon, &c. American over-shoes, or goloshes, made of vulcanized india-rubber, are much worn, in order to protect boots or shoes in wet or cold weather. The boots worn by soldiers were formerly produced with great rapidity, by a process invented by Sir M. I. Brunel: this process, however, fell into disuse. The defective way in which they were made added greatly to the suffering of the British troops in the Crimes. They are now made with an elastic piece between the heel and the sole, which causes the shoe to accommodate itself to the bending of the foot while walking. Many unsuccessful attempts have been made by workmen and trades unions to prevent the introduction of sewing-machines into this manufacture; but they are gradually coming more and more into use.

Bootes, *bo-o'-tes* (Gr. *bous*, an ox), a constellation in the northern hemisphere, called Arctophylax by the old Greek astronomers. It is represented on the celestial globe by the figure of a man holding a club in his right hand and a string in his left, which holds two hounds. Arcturus, a brilliant star of the first magnitude, is found in this constellation.

**Booth**, *booth* (Fr. *boutique*), denotes a tent or stall in a fair or market for the sale of goods. The term is also applied to any temporary structure of wood or boughs designed for shade and shelter. In early times throughout Europe, trade was principally carried on at fairs by means of booths:—

"Booths sudden hide the Thames, long streets appear,
And numerous games proclaim the crowded fair."
*Gay.*

**Boots**, shoes, and other coverings and protections for the feet, have been made of different substances, and in different forms, from very remote times. The ancient Greeks and Romans, however, did not use them universally. The heroes of Homer are represented as going to battle without shoes, and Cato and Socrates both went about with bare feet. The boots and shoes which were then worn may be divided into two classes, those in which the sole only was attached to the sole of the foot by straps, or coverings of the toe or instep, and those which ascended until they covered the ankle, the calf, or the whole of the leg. The former correspond to the sandals and slippers of the present day, and the latter to the boots and shoes. The form and colour of these boots and shoes indicated the rank and office of the wearer. Before the invasion of the Romans, the ancient Britons wore shoes made of raw cowhide, with the hair turned outwards. They reached as far as the ankles. The Roman influence soon produced a change



BOOTS.

in the costumes of the British. Among the early Saxons shoes were made upon the Roman model, and boots reaching to the middle of the leg, and laced up in front, were also in common use. They were generally of leather. The sandal also began to be used; but it was not suited to this climate: it was principally worn by the clergy. The boots of the later Saxons were very similar to the half-boots of modern times. Boots with wooden soles were much worn by men of high rank at that period. The boots of Bernard, king of Italy, the grandson of Charlemagne, had "the soles of wood and the upper parts of red leather, laced with thongs." The Normans wore boots similar to the Saxons. During the reigns of William II., Henry I., and Stephen, the toes of boots and shoes were lengthened to an extravagant extent. The illustration in the left-hand lower corner represents a boot of that period. From that time until the reign of Edward III., the boots generally worn by the higher classes were ornamented profusely. During the reign of Richard II., the length of the toes increased still more, so that it is even said that the wearers were in the habit of fastening the tips to their knees, in order to allow them to walk freely. In the reign of Edward VI., long boots, coming up to the knee, were worn, and half-boots, with long toes, laced up the side. During the latter part of this reign, the long toes were banished altogether, and short broad-toed boots took their place. These hardly covered the feet, and were made of kid leather, slashed, in order to show the coloured hose beneath. In Henry VIII. and Elizabeth's reigns slashed shoes, and others ornamented with rosettes or gold and silver lace, were worn. This fashion obtained till the time of Cromwell. Russet boots, coming close to the knee, with large stiff *tops*, then came into fashion. A flap of leather protected the instep; and they were broad-toed and had thick, clumsy heels. Large, cumbrous boots were worn both by the royalists and roundheads. The courtiers of Louis XIV. wore very extravagant boots, with very wide tops, which were decorated with a profusion of costly lace. The dandies in Charles II.'s reign adopted boots of this kind, one of which is represented in the annexed illustration. During the reign of William III. shoes with high heels, broad toes, and large ties, were worn. Small buckles also came into fashion at the same time. The stiff jack-boot, also represented in the engraving, was also introduced at this time. They were high in the heel, and the instep was covered with a large piece of leather, to which the heavy spur was fixed. They were only worn when riding, and all cavalry soldiers were furnished with them. The jack-boot may be considered the origin of the top-boot and all the other varieties of long boots now worn. Boots with yellow tops were much worn in the 18th century in England; and the duke of Orleans and other revolutionists, who affected sympathy with the English, wore top-boots ostentatiously. They are now only seldom worn, except by hunters and jockeys. The Hessian boot superseded the top-boot; it was worn with tight pantaloons, and was a very handsome leg-covering. The Hessian boot, which had a tassel in front, is represented in the illustration; as is also the Chinese boot, one of the strangest forms of foot-covering ever adopted. The soles are composed of many layers of thin flannel compressed together. The upper portions are made of a pliable but waterproof fabric.

**Booty**, *boo'-te* (Swed. *byte*; Dan. *bytte*), the spoil taken from an enemy in war. The Greeks divided their booty among the army in common, reserving to the general only a larger share. One of the prerogatives of a Grecian general was the distribution of the plunder taken from a vanquished enemy. We read in Homer that the valuable armour usually fell to the share of the leaders, whilst the common soldiery were permitted to gather the spoils of the dead. Among the Lacedæmonians, however, the soldiery were forbidden to plunder the conquered, although, in certain instances, a portion of the spoils was dedicated to the gods, whilst some other parts were reserved for the highest commanders. After the battle of Platæa, which took place 800 years subsequently to the Trojan war, the spoils of the Persians were regulated by the generals, who, after setting apart a portion for the decoration of the temples, shared the remainder amongst the soldiery. From that time the plunder was sold, the proceeds being applied to the decoration of the temples, to the soldiers, and to the generals and their friends. By the military discipline of the Romans, spoils taken from the enemy belonged to the republic, particular persons having no right to them. The generals, who piqued themselves on their probity, carried it intact to the public treasury. Sometimes, indeed, they divided it among the soldiery, to animate them, and to serve in lieu of reward; but this distribution depended entirely upon the generals, who were bound to conduct themselves in its distribution with great equity and moderation; otherwise it became a crime of peculation to lay hands upon the pillage, which was considered as the rightful property of the state. The consuls Romulius and Veturius were condemned for having sold the booty taken from the Æqui. Booty among the Jews was divided in equal parts between the army and the people, though, under the kings, a different mode of distribution obtained.—(Num. xxxi. 27.) According to Calmet, the Mahometan practice was to allow two-thirds of the booty to the army, the other third to God, to Mahomet and his descendants, and to orphans, pilgrims, and the poor. In the English army of the present day, the victor's share is generally termed prize. According to the regulations concerning prize-

distribution issued in 1831, two prize-agents are nominated by letters of attorney, one of these agents being selected by the field officers, and the other by the subordinate officers. The agents collect the booty, and, having converted it into money, they pay over the proceeds to the authorities. The persons who are entitled to share in this property are named by the commander who has directed the expedition in which it was acquired. *See* further upon this subject, PRIZE.

BOPEEP, *bo-peep'*, denotes a kind of advancing and retiring, of looking and hiding the face, as is sometimes done with children for their amusement.

BORACIC ACID, *bo-ras'-ik* (from Arab. *baurac*, species of nitre), ($BO_3$).—This acid, which may be regarded as a teroxide of boron (*see* BORON), is the only known compound of oxygen and boron. It occurs in nature in certain volcanic districts, where it issues from the earth in jets mixed with steam. In Tuscany, these jets, or *fumerolles* as they are called, are conducted into artificial basins or small ponds. The boracic acid remains dissolved in the water, which is periodically removed, and evaporated in shallow leaden pans, which are heated by other *fumerolles* in the neighbourhood. During the evaporation, great quantities of sulphate of lime are deposited, which require removal from time to time. About 750 tons of crude boracic acid are annually exported from Tuscany. The crude acid is contaminated with 25 per cent. of sulphate of ammonia and alumina, and other saline impurities. Boracic acid is used principally for making borax, or biborate of soda. (*See* BORAX.) Boracic acid is formed in the laboratory by dissolving purified borax in four parts of boiling water, and adding to the hot solution a quantity of sulphuric acid, equal to one-fourth the borax used. On cooling, boracic acid crystallizes out in pearly scales, containing three equivalents of water. These crystals contain a small quantity of sulphuric acid, from which they are freed by washing, drying, and fusing them in a platinum crucible. On redissolving the fused acid in four parts of water, and recrystallizing, it is obtained perfectly pure. Boracic acid, on being strongly heated, becomes anhydrous; and at a red heat it fuses into a transparent glass, which remains clear as it cools. It soon crumbles to pieces by absorbing water from the air. Boracic acid communicates to its compounds the property of fusibility; hence the use of many borates, more especially the biborate of soda, as fluxes. It dissolves in three times its weight of boiling water, but is very insoluble in cold. The solution is remarkable for possessing the properties of an alkali when tested with turmeric-paper, which it changes to a deep brown. Even to litmus it only gives a slight reddish-purple tinge. When a solution of boracic acid is evaporated, a certain quantity of the acid rises with the steam; and this is the cause of the *fumerolles* described above as existing in Tuscany. Anhydrous boracic acid is but slowly volatilized by heat. It enters into combination with alkaline bases in several proportions, resembling silicic acid in this as well as in other particulars. A sexborate and triborate of potash have been obtained; and, although one contains six equivalents of acid and the other three, they possess the property of restoring the colour of reddened litmus like an alkali. Boracic acid dissolves in alcohol, and burns with a characteristic green flame, with the exception of biborate of soda. The borates are not very important salts, and need not be alluded to here, further than to mention that, as a rule, alkaline borates are freely soluble, while those of the other bases are either insoluble or very sparingly so.

BORACITE, *bor'-a-site*, in Min., an anhydrous borate of magnesia, found at Luneberg, in Lower Saxony, and one or two other localities in that neighbourhood. It occurs in cubical crystals, and, when heated, possesses electric properties, the opposite angles of the cube being found to develop opposite forms of electricity.

BORAGINACEÆ, *bo-raj'-i-nai'-se-e* (from *borago*, the name of the gen.), in Bot., the Borage fam., a nat. ord. of licotyledonous plants in the sub-class *Corollifloræ*, characterized by an ovary deeply divided into four lobes, from the middle of which a single style arises. The species are herbs or shrubs, with alternate leaves, usually rough with hairs. The flowers are regular and symmetrical; the calyx is persistent, and divided into either four or five segments; the corolla has the same number of lobes, and usually scales in the throat; the stamens rise from the corolla, are equal in number to its lobes, and alternate with them. The fruit consists of two or four distinct achænia placed at the bottom of the persistent calyx. There are 54 genera, which include nearly 700 species, chiefly natives of the temperate regions in the northern hemisphere. Among them we find many well-known plants; such as the Forget-me-not, Borage, Comfrey, and Alkanet. (*See* MYOSOTIS, BORAGO, SYMPHYTUM, ANCHUSA.) The various species are remarkable for their mucilaginous properties; some have roots which are valuable dyeing agents.

BORAGO, *bo-ra'-go* (*bor*, for Lat. *cor*, the heart, *ago*, I cheer; because it was believed to exhilarate the heart), in Bot., a gen. of plants forming the type of the nat. ord. *Boraginaceæ*. The species *B. officinalis*, commonly known as Borage, is now naturalized in England and most of the countries of Europe, but was at a remote period confined to Asia Minor. It is characterized by a wheel-shaped corolla with a very short tube, the mouth of which is closed by scales; by five stamens with forked filaments, the inner arms of which support the anthers; and by these anthers being connivent around the style, in the form of a cone. The entire plant is rough with hairs, and has rather a coarse appearance; but its flowers are very beautiful, being of a fine blue colour. The young leaves were formerly always added to a *cool tankard*, or draught made of wine or cider, with water, lemon, and sugar. The flowers are used on the continent to ornament salads, and the tender tops are sometimes boiled in soups.

BORASSUS, *bo-ras'-sus* (Gr. *borassos*, the skin of the date), in Bot., a gen. of Palms, consisting of but one species, which is found in every part of India. This has been named *B. flabelliformis*, and is commonly known to the European inhabitants as the Palmyra. Its stem attains a height of from 25 to 40 feet, and bears upon its summit a magnificent coronal of fan-shaped leaves. The fruit is about the size of a child's head, and, when very young, contains a sweet pulp, which may be eaten. From the juice obtained from this plant, large quantities of an intoxicating drink are prepared by the natives. (*See* TODDY.) The fibres of the leaves are used for cordage, and the outer wood of the stem for bows.

BORAX, *bor'-ax* (Arab. *baurac*, a species of nitre), a compound containing boracic acid (which *see*) and soda. It was formerly imported from the East in the crude state, under the name of *tincal*, which contained borax in combination with various substances of a saponaceous nature. It was purified by being heated with lime or soda until the whole of the soapy matter and other impurities were separated. Borax is now mostly prepared by fusing two parts of boracic acid, obtained from the Tuscan lagoons (*see* BORACIC ACID), with one part of soda-ash. The mixture is thrown on the floor of a reverberatory furnace, and heated until all effervescence has ceased. The fused mass is lixiviated and boiled until the impurities are precipitated: it is then decanted, and set aside to crystallize slowly. It crystallizes in rectangular hexagonal prisms, containing 10 equivalents of water. A new source of borax has lately been discovered in a deposit of borate of lime, occurring in the interior of Peru. Great pains are taken to crystallize the solution in regular crystals of a large size, as such only are marketable. Borax is of great use in the arts as a flux. Having the property, when melted, of dissolving metallic oxides, it is used in soldering to clean away the film of oxide that would otherwise prevent the metals from uniting. It is sprinkled on the metallic surface, and melts with the solder. It is also used in gold and silver refining, and in making enamel, to render the compound more fusible. It is extensively employed in the manufacture of certain kinds of glass, and for fixing colours on porcelain and stoneware. To the chemist it is very valuable in blowpipe analysis. (*See* BLOWPIPE.) Borax may be made to crystallize in octahedral crystals, containing only 5 equivalents of water, by carefully evaporating a solution, of specific gravity 1·256, at a temperature between 133° Fah. and

174° Fah. Octahedral borax is preferred for soldering purposes, as, from containing less water, it does not intumesce so much as the ordinary prismatic form.

**Borborians**, or **Borborites**, *bor'-bo-rites*, a sect of Gnostics, who arose in the 2nd century, and led very licentious lives, denying the doctrine of the last judgment.

**Bordarii**, *bor-dair'-i-i*, a class of agricultural occupiers of land in this country, frequently mentioned in Domesday Book. They were distinct from the servi and villani, and seem to have been in a less servile condition, having a bord, or cottage, with a small parcel of land, allowed to them, upon condition of their supplying the lord with poultry, eggs, or other small provisions for his board. They seem to have been a kind of cottagers, many of them being bound to render service to their lord in cutting wood, drawing water, threshing, and such-like; and, indeed, the term is often used to denote menial servants employed in such offices on an estate. According to Spelman, they were inferior to the villani, who were employed in the tillage of lands. Their condition probably differed on different manors. The number of bordarii in the different English counties noticed in Domesday Book is 82,034.—*Ref.* Ellis's *General Introduction to Domesday Book.*

**Border, The**, *bor'-der* (Ang.-Nor., the outer edge), in the earlier histories of England and Scotland, is applied to a large tract of debatable territory which lay between the two countries, the inhabitants of which were almost constantly at war with each other. Many a daring feat and many an heroic deed of these men have been celebrated in song and story, and furnished materials for numerous tales of fiction. There is a strange mixture of courage, honour, and generosity, in the accounts transmitted to us of these border-fights. According to Froissart, "Englishmen on the one party, and Scotsmen on the other party, are good men of war; for when they meet, there is a hard fight, without sparing; there is no hoo (*i.e.* cessation for parley) between them, as long as spears, swords, axes, or daggers will endure; but they lay on each upon other, and when they be well beaten, and that the one party hath obtained the victory, they then glorify so in their deeds of arms, and are so joyful, that such as be taken they shall be ransomed ere they go out of the field; so that each of them is so content with other, that, at their departing, courteously they will say, 'God thank you.' But in fighting one with another there is no play nor sparing." The females also caught the warlike spirit of the times, and appear often to have mingled in battle. In order to repress some measure the turbulence of the people, as well as to maintain some show of regal authority over them, the guardianship of the border of each country was intrusted to certain officers of high rank, entitled Wardens of the Marches. There were three marches in each country,—the East, West, and Middle; and generally each march had a distinct warden; but occasionally two of them were united under one. The duties committed to the wardens were of a twofold character,—the maintenance of law and good order among the people under their juri-diction, and the protecting them from their enemies on the opposite border. Unfortunately the trust was usually confided to some person of great weight and influence within the jurisdiction, and they were too often private encouragers of those disorders which it was their duty to suppress. During the reigns of Elizabeth and James VI., strenuous efforts were made to repress the warlike spirit of the borderers; and after the union of the two crowns, peace was in some measure established. The most intractable of them were formed into a body of troops, and conducted by Buccleuch to the Belgic wars. The border counties were disarmed, excepting such weapons as were retained by gentlemen of rank and repute: and the moss-troopers, who continued to exercise their former profession, experienced in great numbers the unsparing and severe justice of the earl of Dunbar. In the civil wars of Charles I., the borderers resumed their licentious habits, particularly after the war had been transferred to Scotland; and the exploits of the moss-troopers flourish in the diaries and military reports of the time. In the reign of Charles II. it was found that they still existed, from the statutes that were framed against them; and it was only by the strict administration of justice which followed the legislative union of the two countries in 1707, that the marauding tendencies of the people were entirely repressed.—*Ref. Essay on Border Antiquities*, by Sir Walter Scott.

**Border-Warrant**, in the law of Scotland, is a warrant issued by the sheriff of a county, or the magistrate of a royal burgh on the borders, for the apprehension of a person who has incurred debt in Scotland, but who is resident in England. It is granted on oath being made to the debt; but in practice these warrants are now little used.

**Bordure**, *bor'-dure* (Fr. *bord*, the edge, coast), in Her., a narrow space, running round the edge of the shield, and properly containing the fifth part of the whole field. It was originally used as a mark of difference, to distinguish different branches of the same family. The inner edge of the bordure is sometimes varied, according to the different forms of lines of division and boundary used in heraldry.

**Bore**, *bor* (Ang.-Sax.), in Mil., the cylindrical cavity of any weapon used for the projection of shells, shot, bullets, or any missiles of a similar nature. The fowling-piece and the soldier's old weapon, "Brown Bess," are termed smooth bores, in contradistinction to fire-arms with rifled or grooved barrels. Formerly, the bore of cannon and guns of every description was cylindrical: but in the Lancaster gun an oval form is adopted, and in the Whitworth gun the bore is polygonal. In the Enfield rifle and Armstrong gun there are a number of grooves twisting spirally along the interior surface of the barrel. The operation of boring cannon and gun-barrels is one requiring great care and nicety, and is effected by the rapid revolution of a steel tool called a cutter, attached to a shaft which is turned by machinery; sometimes the gun itself is made to revolve while the boring-tool remains stationary. In guns that are cast hollow, or made of metal rods welded together on a core like the Armstrong gun, boring is necessary to bring the whole length of the interior to a uniform calibre. From 1750 until of late years, cannon were cast in a solid mass, and the interior cavity bored afterwards. The word bore is sometimes used in a similar sense to "calibre," to denote the diameter of the interior.

**Borer**, *bor'-er*, a name given to many very small coleopterous insects of the genus *Ptinus*. Their name is derived from the fact that their larvæ, small white maggots, eat their way into old wood, &c., by means of strong cutting jaws, called *maxillæ*. These holes, which they are constantly making in old furniture, have all the appearance of having been produced by a fine gimlet or drill. After working its way into the wood, the borer fills up the drill-hole in its passage with a fine powder, and forms a cocoon, from which it afterwards emerges in the form of a small winged beetle. The *Anobium tessulatum*, one of the same genus, is remarkable for a loud ticking noise which it makes at night, and which has gained for it the title of the Death-watch. The *Anobium striatum* is also remarkable for the persistent way in which it simulates death.

**Boring**, *bor'-ing*, the act of perforating or making a hole throughout the entire length or thickness of a solid body. It is a term most usually employed to designate the processes used in sinking artesian wells (which *see*), in seeking for minerals, and in perforating wood in carpentry, as well as metal, in the manufacture of guns and tubes. The application of the process, in so far as it relates to the boring of cannon and of cylinders for the steam-engine, will be treated of elsewhere. (*See* Cannon-Foundry, Cylinder.)

**Boring the Tongue**, like nailing the ear, pinching the nose, branding the cheek or forehead, was a species of punishment anciently inflicted in Scotland upon criminals, but which has now long ceased. The last of the kind on record is that of Jean Spence, a notour (*i.e.* notorious) thief, who was sentenced in 1728 to be pilloried, her lug (*i.e.* ear) nailed, and her nose pinched.

**Boro Buddor**, *bor'-o bud'-dor*, a temple in Java, of most elaborate construction, dedicated to Buddha (*see* Buddhism), remarkable for being the finest specimen of Buddhist architecture that is known. The building is supposed to have been erected in the 14th century. It is pyramidal in form, rising from a square base, the sides of which are 400 feet in length. The

façade of the base is ornamented with a continuous bas-relief, in which various occurrences in the life of Siddhartha, the founder of Buddhism, are represented. The base itself is about 16 feet in height, and forms a terrace from 40 to 60 feet in width, to which access is obtained by flights of steps. On this platform five successive terraces, varying from 8 to 12 feet in height, and from 16 to 20 feet in breadth, rise one above another. On the edges of these terraces a great number of pinnacles and cupolas are built, the larger cupolas forming as many as 436 arched niches, in each of which a statue of Buddha, of life size, is placed. The spaces between the niches are filled up with bas-reliefs of the same nature as those which surround the base. The ornamentation of the inner sides of these rows of buildings is more diversified, and of greater minuteness in detail, than that on the outside. On the fifth terrace, which is square, corresponding in form to the base, three more, circular in form, are built, on which are placed at intervals 72 small domes, each containing a statue of Buddha. On the top of this huge terraced pile there is a dome, about 40 feet in diameter, surmounted with a spire; and immediately beneath it a sort of pit, or sunken chamber, 10 feet in depth, which is supposed to have contained some relic of Buddha.—*Ref.* Fergusson's *Handbook of Architecture.*

Borofluoric Acid, *bor-o-flu-or'-ik*, or Fluoboric Acid, as it is generally called, is formed in combination with potassium by saturating hydrofluoric with boracic acid, and neutralizing by carbonate of potash. The compound is washed, dried, and heated with an equal weight of potassium. Borofluoride of potassium is used in the preparation of boron.

Boroihme's Harp, *bo-ro-eem'.*—This ancient musical instrument formerly belonged to the great Irish monarch Brian Boroihme, who met his death at the battle of Clonturf, A.D. 1014, when it descended to his son and successor Donah. The latter prince being deposed soon after by his nephew (whose father he had assassinated), fled to Rome, taking with him his harp and crown. These relics were kept in the Vatican until the harp was given by Pope Clement to Henry VIII., who soon after presented it to the first earl of Clanricarde, in whose family it remained until the beginning of the 18th century, when it passed through a female branch of the De Burghs to the MacMahons of Glenagh, and thence into the possession of Counsellor Macnamara of Limerick. In the year 1782 it was presented to the Rt. Hon. William Conyngham, by whom it was deposited in Trinity College Museum, where it still remains. This curious instrument is about thirty inches in height, and richly ornamented, the sounding-board being of oak, and the arms of red sally. It contains a large crystal set in silver, under which was formerly another stone, which is now lost.

Boron, *bor'-on*, in Chem. (symbol B, equivalent 10·9), a combustible element, closely allied in its properties to carbon and silicon (both of which *see*). In nature it occurs in combination with oxygen, in the form of boracic acid, in a few localities. It was first obtained by Davy in 1808, by submitting moistened boracic acid, inclosed between platinum plates, to the action of the voltaic current. A brownish substance appeared at the negative pole, which, conceiving to be a metal, he termed *boracium*. By further experiment he proved it to be a non-metallic body, resembling carbon in its properties, and altered its name to *boron*. It was, however, but imperfectly known until Thenard and Gay-Lussac obtained it more readily by heating boracic acid with potassium. The metal combined with the oxygen of the acid to form potash, which was washed away with water, leaving the boron behind. A still more ready method of preparing it is by heating a mixture of potassium and borofluoride of potassium in an iron crucible. Boron and fluoride of potassium are formed, the latter substance being washed away with a weak solution of chloride of ammonium. Boron thus prepared is a brownish-green powder, dissolving slightly in water, forming a yellowish-green solution. It is rendered insoluble by being heated in close vessels; its specific gravity being at the same time changed from 1·183 to 1·844. It suffers no change, being neither volatilized nor fused. It may, however, be melted by the heat generated by a powerful galvanic battery. Like silicon, it is a non-conductor of electricity. Alkalies and acids (except nitric acid) produce no effect on it. Nitric acid converts it into boracic acid. It does not decompose water at any temperature, and is constant under the action of air or oxygen until the temperature reaches 600°, when it burns brilliantly, forming boracic acid by the absorption of oxygen. Prepared in the above way, boron is amorphous; but MM. Deville and Wöhler have obtained it in garnet-red transparent crystals, by fusing boracic acid with 60 per cent. of metallic aluminium in a powerful furnace. The crystals are extremely hard, scratching sapphire and corundum, and yielding only to the diamond, which is generally injured by the operation. Crystallized boron has never been fused, and resists the action of oxygen at very high temperatures. Boron is obtained in a graphitic form when borofluoride of potassium is decomposed by aluminium. It bears a close relation to the graphitic form of carbon, or ordinary graphite. Boron combines with several elements, forming borides with the metals. The close relation always supposed to exist between boron and carbon has been curiously confirmed by the fact of both of these elements being capable of assuming the amorphous, crystalline, and graphitic forms. The only important compound of boron is boracic acid (which *see*).

Borough, *bur'-o* (Fr. *bourg*; Lat. *burgus*; Sax. *borhor*).—A borough is a city or other town that sends burgesses to parliament. (1 Bl. Com. 114; *Litt.* s. 164; Co. Litt. 108 b; *see* also Reform Act, 2 Will. IV. c. 45, s. 79.) The word, however, was originally used in a more extensive sense. (*See* Co. Litt. by Harg. 108 b, n. (4).) In Jacob's Law Dictionary, v. Borough, the term is taken to mean a town sending burgesses to parliament, and *not being a city*. But see the authorities first cited; also Co. Litt. 109 a. In the Municipal Corporation Act, 5 & 6 Will. IV. c. 76, "borough" is used in a sense peculiar to that statute, and expresses a corporate town, whether sending representatives to parliament or not. Among our Saxon and Norman ancestors, all places which were called boroughs were fenced or fortified. In the reign of Henry II. they had great privileges. If a boudman or servant remained in a borough a year and a day, he was by that residence made a free man.—(*Glanvil.*) Why these were called *free burghs*, and the tradesmen in them *free burgesses*, was from a freedom to buy and sell, without disturbance, exempt from toll, &c., granted by charter. Parliament boroughs were generally by charter, or towns holden of the king in ancient demesne.—(*Brady.*) English boroughs first sent representatives to parliament in the reign of Henry III., 1265. Burgesses were first admitted into the Scottish parliament by Robert Bruce, in 1326, and into the Irish in 1365.—For an account of the rise and progress of boroughs and other municipal jurisdictions in Europe, consult "A View of the Progress of Society in Europe," in the Introduction to Robertson's *Charles the Fifth*, and *The History of Civilization in Europe*, by Guizot.

Borough was the name also given to a certain division of land under the Saxon kings. A borough or tithing comprised a district containing ten heads of families, and ten tithings constituted a hundred. The head man of the borough was called the borough-head, headborough, borsholder, or tithing-man, and was answerable for the conduct of people of his borough. The ten householders of the borough formed a corporation, of which the headborough was president; and no man was allowed to reside above forty days in England without being enrolled in some borough. (*See* Tithing.)

Borough, in Scotland. (*See* Burgh.)

Borough-English (Sax. *borhoe Englise*) is a customary descent of lands (formerly held in ancient burgage) to the youngest son, or, if the owner hath no issue, to his younger brother, and extends to collaterals in some instances. The custom prevails in several cities and ancient boroughs, and districts of smaller or larger extent adjoining to them, in different parts of the kingdom, and governs the descent of copyhold land in various manors. It is called borough-English in contradistinction, as it were, to the Norman customs, and which is taken notice of by Glanvil, lib. 7, c. 3, and by Littleton, s. 165. The reason given by Littleton is, because the younger son, by reason of

his tender age, is not so capable as the rest of his brethren to help himself. Other authors (3 Mod. Rep. pref.) have, indeed, given a much stranger reason for this custom, as if the lord of the fee had anciently the right of concubinage with his tenant's wife on her wedding night; and that therefore the tenement descended not to the eldest but to the youngest son, who was more certainly the offspring of the tenant. But it is not known that ever this custom prevailed in England, though it certainly did in Scotland (under the name of *mercheta* or *marcheta*) till abolished by Malcolm III.; and perhaps a more rational account than either may be fetched (though at a sufficient distance) from the practice of the Tartars; amongst whom, according to Father Duhalde, this custom of descent to the youngest son also prevails. That nation is composed totally of shepherds and herdsmen; and the elder sons, as soon as they are capable of leading a pastoral life, migrate from their father with a certain allotment of cattle, and go to seek a new habitation. The youngest son, therefore, who continues latest with the father, is naturally the heir of his house, the rest being already provided for; and thus we find that among many other northern nations it was the custom for all the sons but one to migrate from the father, which one became his heir.—(Walsing. *Upodigm. Neust.* c. 1.) So, possibly, this custom, wherever it prevails, may be the remnant of that pastoral state of our British and German ancestors which Cæsar and Tacitus describe. —Ref. *Third Real Property Report*, p. 8; *Year-Book*, 36 Hen. VI. 20; *Co. Litt.* by Hargrave, 10 a, n. (3), n. (4).

Borough Fund is a fund instituted by the Municipal Corporations Act, 5 & 6 Will. IV. c. 56, which declares that the rents and profits of all hereditaments the interests, dividends, and annual proceeds of al moneys, dues, chattels, and valuable securities, belonging to the former body corporate of such borough named in the schedules A and B, or to any member or officer thereof in his corporate capacity, and every fine and penalty for any offence against this act, the application of which is not otherwise therein provided for, is to be paid to the treasurer of the borough, and to be carried by him to the account of a fund to be called "the Borough Fund." After the payment of all the lawful debts due by the late body corporate, this fund is to be applied towards the payment of the salary of the mayor, and of the recorder, and the police magistrate (where the latter functionaries shall be created), the salaries of the town clerk, treasurer, and every other officer appointed by the council; and other borough expenses specified in the act.

Borough Rate is a rate levied within a borough by order of the council of the same, in terms of act 5 & 6 Will. IV. c. 56, which declares that when the borough fund shall not be sufficient for the purposes aforesaid, the council of the borough is hereby authorized and required from time to time to estimate, as correctly as may be, what amount will be sufficient for the payment of the expenses to be incurred; and in order to raise the amount, the council is authorized and required, from time to time, to order a borough rate in the nature of a county rate, to be made within their borough, for which purpose the council shall have all the powers within their borough that justices of the peace, assembled at their general or quarter sessions, have within their jurisdiction. Persons considering themselves aggrieved by the rate may appeal to the recorder at the next quarter sessions for the borough; or, in the of no recorder within the borough, to the justices at the next quarter sessions for the county.

Borrellians, *bor-rel'-li-ans*, a sect of Christians in Holland, so called from their founder, Borrell, who was a man of some learning, particularly in the Greek and Hebrew languages. They reject all public acts of worship, public prayer, and the use of the sacraments. They assert that the Christian churches have degenerated, because they have suffered the Word of God, which is infallible, to be interpreted by fallible men. They are said to lead austere lives, and to devote a considerable portion of their goods to charity.

Borrowing Days, *bor'-ro-ing*, in the popular antiquities of Scotland, and some parts of England, is the name given to the last three days of March, from the popular notion that they were borrowed or taken from April. In this view they were to be characterized by wind, rain, snow, and sleet; and the broken weather that usually prevails about that time gave some colour to the notion.

Borsholder. (*See* Borough.)

Bos. (*See* Bovidæ.)

Bosjesman, *bos-jes'-man* (Du., bush-man), an exceedingly diminutive variety of the Hottentot race, perfectly uncivilized and very savage in disposition. They inhabit that portion of Africa which lies north of Cape Colony. Some individuals of this tribe were exhibited in this country a few years ago.

Boskoi, *bos'-koi* (Gr., the grazers), was the name given to a class of ascetic monks who lived in Syria and Mesopotamia, and are said to have subsisted solely upon roots and herbs. They did not inhabit any house, and professed to spend their time in the worship of God, in prayers and hymns.

Boss, *boss* (Fr. *bosse*), in Arch., an ornamental projection covering the intersection of wooden ribs that cross each other, generally at right angles, dividing the surface of a flat or vaulted ceiling into compartments. The boss is often beautifully carved into foliage or fretted work, and sometimes shields with armorial bearings are introduced, and representations of the human face, and heraldic emblems. It is most frequently introduced in buildings belonging to the Decorated English and Perpendicular English styles of architecture. The name is also given to the projection sometimes found in the centre of a shield.



boss.

Bostanji, *bos'-tan-ye* (Turk. *bostan*, a garden), literally signifies gardeners, but is applied to a class of men in Turkey who, in addition to acting as the sultan's gardeners, perform a variety of other functions, such as mounting guard in the seraglio, rowing the sultan's barge, and attending on the officers of the palace. Their head or chief, the *bostanji-bashi*, is one of the grand dignitaries of the empire; he has the rank of a pasha, is governor of the seragho and the other imperial residences, steers the sultan's barge, and has the jurisdiction of the shores of the Bosphorus and the Sea of Marmora. This office is only conferred upon personal favourites of the sultan. The bostanji, at one time, amounted to 5,000 men, but at present their number does not exceed 600. They formerly did military duty in the field with the janissaries, and in war their strength was raised to 12,000 men.

Boswellia, *bos-wel'-li-a*, in Bot., a gen. of plants belonging to the nat. ord. *Amyridaceæ*. The most important species is *B. thurifera*, a tree which grows to a large size, in hilly situations, from the Coromandel coast to the central parts of India. This plant is the source of the valuable gum-resin known as Indian olibanum. (*See* Olibanum.) *B. papyrifera*, a native of Abyssinia, also yields a fragrant gum-resin, and is further remarkable on account of its inner bark, which peels off in thin white layers like paper.

Botany, *bot'-a-ne* (Gr. *botane*, an herb), that part of natural history which relates to the vegetable kingdom. In its widest sense, botany comprehends all that is known of plants, and, therefore, forms a boundless field of inquiry. The student has to consider the external configuration of plants,—their structure, the functions which they perform, the relations which they bear to each other, and the uses to which they are subservient. Many are deterred from studying botany by a misconception of its scope and nature. Imagining that its sole object is to name and classify the various vegetable productions of the globe, they conclude that the study is confined to the acquisition of certain dry details and a vocabulary of hard words. Eighty-four years ago, some time before the natural system of Jussieu was promulgated, that remarkable man, Gilbert White of Selborne, whose ideas have not yet become old-fashioned, alluded to this misconception, and clearly explained the true mission of the botanist. "The standing objection to botany," writes he of Selborne,

"has always been, that it is a pursuit that amuses the fancy and exercises the memory, without improving the mind or advancing any real knowledge; and where the science is carried no farther than a mere systematic classification, the charge is but too true. But the botanist that is desirous of wiping off this aspersion should be by no means content with a list of names; he should study plants philosophically, should investigate the laws of vegetation, should examine the powers and virtues of efficacious herbs, should promote their cultivation, and graft the gardener, the planter, and the husbandman on the phytologist. Not that system is by any means to be thrown aside,—without system, the field of Nature would be a pathless wilderness,—but system should be subservient to, not the main object of, pursuit." To facilitate investigation, Botany has been divided into several departments, which may be regarded as separate sciences. The objects and scope of each of these sub-sciences will now be explained.

1. *Structural Botany*, or *Organography*, includes everything relating to the organization of plants. It describes the different kinds of tissue which enter into the composition of plants; it explains the structure of every organ; and it also teaches the relation that one organ bears to another. That branch of structural botany which has reference to the elementary tissues is sometimes distinguished as *Vegetable Histology*. The microscope has shown that the various tissues are composed of little membranous sacs or vesicles, varying in form and size, and united in different ways. (*See* CELL.) The study of these elementary organs cannot be prosecuted without the aid of costly instruments, but much may be learned from the clear descriptions and excellent illustrations given in modern botanical works, particularly those of Lindley, Balfour, and Bentley. Some plants consist of simple cells only, which continue throughout life to produce new cells, and to perform all the vital functions. A flowering plant, however, although originally cellular, produces organs composed of cells and vessels, variously modified and arranged, and covered by an epidermis (which *see*). These compound organs may be divided into *nutritive*, or those concerned in the nourishment of the plant, and *reproductive*, or those which are employed in the production of new individuals. The former are the *stem*, *root*, and *leaf*; the latter, the *flowers* and *fruit*. (*See* these words, also OVULE, PISTIL, SEED, STAMEN.) Leaves occupy various positions on the stem and branches, and their arrangement forms a subject for special study. (*See* PHYLLOTAXIS.) The arrangement of flowers on the floral axis and its ramifications, has also to be considered. (*See* INFLORESCENCE.) The term *Morphology* has been applied to that portion of Organography which treats of the abnormal modifications of the different organs. The researches which have been made in this department during the last forty years, have confirmed the doctrine advanced by the German poet Göthe, namely, that all those parts familiarly known as leaves, flowers, and fruit, are constructed on a simple uniform plan, out of one kind of organ in different states of modification and combination; and that there is no other difference between the flower of a rose and that of a nettle, than what arises from modifications and combinations of this typical organ, which is the leaf. In elucidating this doctrine of the unity of type, which constitutes the basis of the theory of botany, Lindley says, "We are so accustomed to talk of plants bearing leaves, and flowers, and fruit, and it is so evident to our senses that extremely different organs do exist under such names, that it seems inconceivable that parts so very dissimilar should be only leaves in different states; that the pure white petals of the lily, the rich red flowers of the rose, the sweet-smelling blossoms of the jasmine and orange, or the long trumpet-shaped corollas of the honeysuckle, should all be leaves; that the stamens in which the fertilizing powder is locked up, the pistils which are destined to receive the influence of the pollen, the ovula that they contain, and, finally, that the fruit which is the result of the action of the two last, are all so many parts formed out of one common organ, which in a particular and very frequent state is what we call a leaf. Botanists do not mean to say that he who eats an apple, or an orange, or a peach, is in a state of mental delusion, and that while he fancies himself to be enjoying the pleasure of gratifying his palate by the most delicious flavours, he is really only chewing the leaves of these plants; but they assert that those appendages of a plant which are commonly called the leaves have a peculiar anatomical structure, and a certain relation to the stem on which they are borne, and, being developed according to certain fixed laws, are always arranged upon a certain and uniform plan with respect to each other; and that all the other organs, whether calyx, corolla, stamens, pistils, or fruit, have an anatomical structure essentially the same, bear the same relation to the axis that they grow upon, are developed according to the same laws, are arranged upon the same certain and uniform plan with respect to each other, and, finally, are constantly becoming transformed into leaves of the ordinary appearance; thus losing the condition in which they are usually found, and reverting to their structural type." Morphology is a most attractive subject for study, but less important in a practical point of view than that part of Organography which has reference to the ordinary forms of organs, and the manner in which they are arranged. No systematic arrangement can be understood without a knowledge of the laws upon which the symmetry of plants depends, and a practical acquaintance with the structure of every kind of organ.

2. *Physiological Botany* treats of plants in a living or active state, and of the manner in which their functions are performed; it explains how they are influenced by the several agencies of light, heat, air, and moisture; and it describes their various secretions and the nutriment afforded by the soil. It need scarcely be said that any attempt to investigate the laws of vegetable life would be abortive without a perfect acquaintance with the more important details of organization. Plants, not being endowed with voluntary motion, derive their food either from the soil in which they are fixed, or from the atmosphere by which they are surrounded. The nutriment, consisting of water, generally holding salts in solution, is absorbed, by the aid of endosmose, by the extremities of the root. It then passes from cell to cell, and ascends the stem, dissolving, in its course, some of the organic matter stored up in the vegetable tissue. Arrived at the green shoots and surfaces of the leaves, which are covered with minute openings, or *stomata*, the sap is exposed to the influence of light, heat, and air. About two-thirds of the moisture taken up is now evaporated and exhaled; the remainder, which, of course, becomes thickened, undergoes certain chemical changes, and then begins to descend by the under-surface of the leaf, and along the bark. It takes either a direct or a circuitous course downwards, communicating with the centre of the stem by the medullary rays, depositing various secretions, more especially in the bark, and giving origin to substances which are destined to nourish and form new tissues. Finally it reaches the extremity of the root, where absorption had commenced: a small portion is there excreted, while the remainder mixes with the newly-absorbed fluids, and again circulates in the sap. (*See* SAP, ENDOSMOSE, SECRETIONS.) The circulation of the sap has been adduced as an example of the vital processes elucidated by physiology, because it is due to the combined action of all the organs of nutrition, and may therefore serve instead of several illustrations. The study of the special functions of the various organs necessarily precedes that of the general physiological phenomena, such as circulation, assimilation, respiration, fertilization, and germination. Under the names of the different organs of nutrition and reproduction, the reader of this work will find full particulars respecting their functions. The physiology of reproduction is treated of at length under the heads POLLEN and EMBRYO.

3. *Systematic Botany*, or *Taxonomy*.—This department includes the principles of classification, which are based on the observations which have been made on the structure and physiology of plants. It cannot, therefore, be prosecuted successfully until the student has acquired a complete knowledge of Organography. The object of systematic botany is to name, describe, and arrange plants in such a manner that the botanist may readily ascertain the name of any specimen, and, at the same time, get an insight into its true nature

and general properties. When it is considered that there are some 120,000 known species of plants, it is obvious that there must be a definite nomenclature and classification, were it only to facilitate reference and communication. Before plants can be classified, their peculiarities of structure must be clearly defined: hence the necessity of the technical language which is employed in descriptive botany. This language ought not to deter the lover of nature from studying the principles of classification; for, in acquiring a knowledge of the numerous technical terms, he will, at the same time, fix in his mind the ideas which they represent, and thus, in reality, become acquainted with important elementary facts. Botanists are blamed for using so many hard words; but it should be remembered that they have to explain very minute points of structure, and must employ a language more rigorously defined than that of ordinary conversation. "Botany," says Dr. Hooker, "would be the most lovely of the sciences, if botanists had not made its nomenclature so dry and repulsive. All the world would study it, if it was addressed less to the memory and more to the intelligence." The remarks of Mr. Page on the use of technical terms in geology may be fairly set in opposition to the observation of the French writer:—"Scientific terms, when once thoroughly comprehended, are quite as easily remembered as those derived from the language of every-day life; while, being chiefly compounds of Greek and Latin, they constitute a nomenclature intelligible to the scholars of every country. There is nothing more perplexing than a multiplicity of local and provincial terms; and one can easily imagine the confusion and obstruction that would arise were every country and district adhering to its own vernacular, instead of adopting a uniform system of terminology. The technicalities of science, often so ignorantly inveighed against, are, in fact, the instruments by which it effects its progress. New objects require new names, and new facts new phrases to express their relations; and the sooner the student can make himself familiar with those terms and their applications, the more rapid and pleasant will be his onward progress." That part of Systematic Botany which relates to the technical language of the science is sometimes called *Glossology*. The principles of classification constitute what is properly called *Taxonomy*, though this term is often applied to the whole department. There have been two great plans proposed for the classification of plants, one denominated *artificial*, and the other *natural*. The first is founded on characters taken from certain parts of plants only, without reference to others; while the second takes into account all the parts of plants, and involves the idea of *affinity* in essential organs. In both artificial and natural systems, the lower divisions, namely the genera and species, are the same, the great difference between them consisting in the manner in which the genera are grouped into orders, and the orders i... classes. (*See* Species, Genus, Order, Class.) The plants in one of the higher divisions of an artificial system, such as that of Linnæus, have no necessary affinity, and are connected only by certain characters, more or less superficial, which have been selected as the signs of that division. Such a system may, therefore, be compared to a dictionary, in which words are arranged, for convenience of reference, in alphabetical order, adjacent words not necessarily agreeing with each other, further than in commencing with the same letter. In a natural order, on the contrary, all the genera will be found to have a true family likeness; for their association is the result of a careful consideration of the structure of every organ. The classes in the natural system have been formed upon the same principle, by uniting orders which possess many important characters in common. The Linnæan system leads to little more than a knowledge of names, and can only be looked upon as an index to the genera. Though superior to every artificial scheme previously promulgated, its day has gone by, and the more philosophical system has taken its place. Linnæus himself never intended it to be anything more than a provisional arrangement, and distinctly stated that a natural method was the great object of scientific inquiry. The general principles of the Linnæan, or Sexual system, may be explained in a few words. Twenty-four classes are founded on the number, position, relative lengths, and connection of the stamens; while the orders in these classes depend on the number of styles, the nature of the fruit, the number of the stamens in the classes where this character is not used for distinguishing them, and the perfection of the flowers. The twenty-fourth class includes plants having inconspicuous flowers, and in it the orders are formed according to natural affinities. Under these classes and orders, all the known genera and species are arranged. Even as an artificial method for discovering the names of plants, the Linnæan system has many imperfections. Being based upon the more obvious characters of the reproductive organs, it cannot be of the least use when the plants are not in full flower, with all the stamens and styles perfect. The different flowers on the same plant often vary as regards the number of the stamens. Again, if the classification were carried out rigidly, it would separate, in many instances, the species of the same genus; but so sensible was Linnæus of the importance of maintaining the natural character of his genera, that he sacrificed the symmetry of his scheme for the sake of keeping all the species together. The natural system of classification is based upon the real affinities of plants, and necessarily takes into account all the organs. Though it can never be perfect until all the plants of the globe have been examined, it has already reached a very high point of development, and a great number of the orders which have been determined are quite as natural as the orders in the animal kingdom. For example, those groups of plants designated as *Ranunculaceæ*, *Gentianaceæ*, and *Atropaceæ*, are as distinct in their characters as those animal groups named *Cetacea*, *Cheiroptera*, and *Rodentia*. (*See* Animal Kingdom.) Such being the case, it follows that a knowledge of one species is to a great extent the knowledge of many; for an individual, if well selected, will exhibit the most important characters of all the other plants in the same natural group. Thus, by studying the common radish (*see* Raphanus), or the mustard (*see* Sinapis), the botanist may obtain a general knowledge of about 1,600 species which constitute the order *Cruciferæ*, and which are all formed, as it were, on the same type. The properties of plants accord in a very remarkable manner with their structure; and, as a general rule, the position of a plant in the natural arrangement indicates its properties. For example, if a botanist, on examining a plant, finds all the structural peculiarities of the order ...st mentioned, he may feel confident that it is not ...isonous, but most likely anticorbutic or pungent. If, however, he should meet with one of the *Atropaceæ*, he might safely set it down as a plant possessing poisonous narcotic properties. Enough has been said to ...ove that the natural system is much more than a ...ere index to the names of plants. It reveals to a ...rtain extent the plan of creation, and is at once an ...id to research and a record of discovery. Several schemes based upon the natural affinities of plants have been devised. These may be regarded as so many versions of the one true system; for, though they have been worked out by different methods, they agree in nearly all their grand divisions. The characters by which the primary groups have been determined are furnished by the elementary tissues, and the most important organs of vegetation and reproduction. Regarding only the elementary structure, plants may be arranged under the heads of *Cellular* and *Vascular*, according to the absence or presence of regular vessels. (*See* Tissue, Cell, Vessel.) A more satisfactory arrangement results from a consideration of the different modes by which plants are propagated. Some spring from true *seeds*, containing the rudimentary organs called cotyledons; while others are developed from *spores*, in which no distinct organs can be traced. The former are said to be *cotyledonous*, and the latter *acotyledonous* (*i. e.* without cotyledons). As the number of cotyledons forms a natural distinctive character, the first group of plants is subdivided into *monocotyledonous*, having one cotyledon, and *dicotyledonous*, having two cotyledons. The mode in which the root is produced affords characters which confirm this arrangement. The young root of an acotyledon is *heterorhizal*, that of a monocotyledon is *endorhizal*, and that of a dicotyledon *exorhizal*. (*See* Embryo.) The three

groups are further characterized by the stems; those of the first being *acrogenous*, those of the second *endogenous*, and those of the third *exogenous*. (*See* STEM.) Stemless plants are said to be *thallogenous*, and form a distinct section of the acotyledonous group. The venation of the leaves establishes the same great natural divisions; and similar results are obtained from a consideration of the flowers; monocotyledons and dicotyledons being *phanerogamous*, or flowering, and acotyledons *cryptogamous*, or flowerless. The following table exhibits the relation of the different characters:—

| Embryo. | Radicle. | Stem. | Flower. |
|---|---|---|---|
| Acotyledonous ... | Heterorhizal | Acrogenous | Cryptogamous. |
| Monocotyledonous | Endorhizal | Endogenous | Phanerogamous. |
| Dicotyledonous ... | Exorhizal | Exogenous | Phanerogamous. |

The arrangement adhered to in this dictionary is that adopted by Professor Bentley in his excellent "Manual of Botany." It is founded upon the schemes of Jussieu, De Candolle, and Lindley, and may be thus described:—The vegetable kingdom is divided into two sub-kingdoms,—Phanerogamia, flowering or cotyledonous plants; and Cryptogamia, flowerless or acotyledonous plants.

### Sub-Kingdom PHANEROGAMIA.

Plants which have evident flowers, and which are propagated by seeds containing cotyledons.

#### Class I.—DICOTYLEDONES.

Embryo dicotyledonous; germination exorhizal; the stem exogenous; leaves with reticulated venation; flowers with a quinary or quaternary arrangement. In this class there are two great divisions:—

Division 1. *Angiospermia*.—Ovules inclosed in an ovary, and fertilized indirectly by the action of the pollen on the stigma. In this division there are four sub-classes:—

Sub-Class 1.—*Thalamifloræ*, or plants with flowers usually furnished with both calyx and corolla, the latter composed of distinct petals inserted on the thalamus; stamens hypogynous, or adherent to the sides of the ovary.

Sub-Class 2.—*Calycifloræ*, with flowers having usually calyx and corolla, the latter mostly with distinct petals and inserted on the calyx; stamens either perigynous or epigynous. This sub-class is divided into—1. *Perigynæ*, in which the calyx is free, or nearly so; the stamens usually perigynous, and the ovary superior. 2. *Epigynæ*, in which the calyx is more or less adherent, and the ovary inferior.

Sub-Class 3.—*Corollifloræ*, flowers having both calyx and corolla, the latter with united petals, stamens inserted on the corolla or ovary, or free and arising from the thalamus. Subdivisions:—1. *Epigynæ*, in which the calyx is adherent, and the ovary consequently inferior. 2. *Hypostaminæ*, in which the stamens are inserted into the thalamus, and do not adhere to the corolla; ovary superior. 3. *Epipetalæ*, or *Epicorollæ*, in which the corolla arises from the thalamus, and has the stamens attached to it; ovary superior.

Sub-Class 4.—*Monochlamydeæ*, or *Apetalæ*, flowers having either a calyx only, or without both calyx and corolla.

Division 2. *Gymnospermia*.—Ovules naked, or not inclosed in an ovary, being fertilized directly by the action of the pollen.

#### Class II.—MONOCOTYLEDONES.

Embryo monocotyledonous; germination endorhizal; stem endogenous; leaves usually with parallel venation; flowers with a ternary arrangement. In this class there are three sub-classes:—

Sub-Class 1. *Dictyogenæ*.—Leaves with a reticulated venation, deciduous; rhizome and root with the wood arranged in a concentric manner; floral envelopes verticillate.

Sub-Class 2. *Petaloidæ* or *Floridæ*.—Leaves with a parallel venation, permanent; floral envelopes (perianth) verticillate, and usually coloured, rarely scaly, sometimes absent. Subdivisions:—1. *Epigynæ*, in which the flowers are usually hermaphrodite; perianth adherent; ovary inferior. 2. *Hypogynæ*, with flowers usually hermaphrodite; perianth free; ovary superior. 3. *Dictines*, in which the flowers are usually unisexual; perianth either absent or consisting of a few scales.

Sub-Class 3. *Glumaceæ*.—Leaves parallel-veined, permanent; flowers glumaceous, that is, having no proper perianth, but consisting of imbricated bracts.

### Sub-Kingdom CRYPTOGAMIA.

Plants which have no flowers, and which are propagated by spores. This sub-kingdom constitutes a class by itself, viz.

#### Class III.—ACOTYLEDONES.

Other characters besides those which define the sub-kingdom may be enumerated. The germination is indefinite or obscure; the stem is sometimes present and sometimes absent,—in the former case, when present, it is acrogenous; the leaves, when they exist, have forked veins; no true flowers are produced. There are two sub-classes:—

Sub-Class 1. *Acrogenæ*.—Plants with stems and leaves distinguishable, and possessing stomata.

Sub-Class 2. *Thallogenæ*.—Plants with no distinct stems or leaves; stomata absent.

For a full explanation of the above classes and sub-classes, the reader is referred to the separate articles given under the different heads. The scheme devised by Professor Lindley is more symmetrical, and in many respects more philosophical, than any other; but the names given to the different groups have not been adopted by many botanical writers. The seven classes of this beautiful arrangement are distinguished by the following characters:—

Class I. THALLOGENS.—Asexual or flowerless plants, without proper stems or leaves.

Class II. ACROGENS.—Asexual or flowerless plants, with stems and leaves.

Class III. RHIZOGENS.—Sexual or flowering plants, with acotyledonous embryos and fructification springing from a thallus.

Class IV. ENDOGENS.—Monocotyledonous flowering plants, with endogenous stems, parallel venation, and ternary symmetry.

Class V. DICTYOGENS.—Monocotyledonous plants, with reticulated venation.

Class VI. GYMNOGENS.—Polycotyledonous exogens, with naked seeds.

Class VII. EXOGENS.—Dicotyledonous plants, with seeds in a seed-vessel. These are arranged in four sub-classes.

Under the above heads Lindley places all the natural orders, which he arranges in groups termed Alliances.

A brief notice of the progress of systematic botany may conclude this attempt to elucidate its leading principles. One of the earliest methodical arrangements was that of Cæsalpinus, a Roman physician attached to the court of Pope Sixtus V. This was entirely artificial; and the same may be affirmed of the several systems of Gesner, Morison, Rivinus, and Tournefort. That propounded by Tournefort was for a long time adopted by the French school, but was ultimately displaced by the attractive scheme of Linnæus, who must be looked upon as the great promulgator of the artificial method of classification. The first attempt at arranging plants according to their natural affinities was made by our great countryman John Ray, in the year 1682. His scheme was necessarily very imperfect, for the number of plants then known was comparatively small; still it was in its leading features correct, and has really formed the foundation of every later system. It was long neglected, and did not receive the attention it deserved until Jussieu entered the field, and developed Ray's views of the natural affinities in the vegetable kingdom. Jussieu's method was first made known in the year 1789, just eleven years after the death of Linnæus. Since that time, the natural method has been advanced by the labours of De Candolle, Brown, Endlicher, Lindley, and many others.

4. *Geographical Botany* treats of the manner in which plants are affected by climate and station, and endeavours to determine the conditions under which parti-

cular families or species of plants are confined to certain zones of latitude and altitude. It is a study of great interest, and one which cannot be successfully prosecuted without an intimate acquaintance with most of the sciences. Of course, so long as there are vast tracts of continents unexplored by botanical travellers, the knowledge upon which this department is founded must be imperfect. (*See* DISTRIBUTION OF PLANTS.)

5. *Fossil Botany* investigates the nature of the plants found in a fossil state in the various geological formations. It is therefore at once a branch of botany and of geology. (*See* PALÆONTOLOGY.)

The practical bearings of botany are most important, and are sometimes treated separately in manuals of the science, under the head of *Economic Botany*. All the principal plants affording food, timber, medicine, fibres, dye-stuffs, and other useful products, are noticed in this work under the names of the genera which include them. Many arts and sciences closely connected with botany are explained in separate articles. (*See* MATERIA MEDICA, AGRICULTURE, HORTICULTURE, ARBORICULTURE, GARDENING, PHYSICAL GEOGRAPHY.)—*Ref.* Lindley's *Vegetable Kingdom* and *School Botany*; Balfour's *Manual of Botany*, *Class-book of Botany*, and *Botanist's Companion*; Bentley's *Manual of Botany*; Babington's *Manual of British Botany*; Catlow's *Popular Field Botany*.

BOTANY-BAY KINO. (*See* EUCALYPTUS.)

BOTE, *bōte*, is an old Saxon word signifying help, succour, aid, advantage, recompense, satisfaction, or amends; and is equivalent to *estover*, which is derived from the Fr. *estoffer*, to furnish. It is an allowance of wood for fuel, repairs, and the like, and which every tenant for life, unless restrained by covenant or agreement, may, of common right, take upon the land for his reasonable service, without being impeachable for committing waste. The word is generally conjoined with another to express its nature; as *bridge-bote*, which is an allowance for making or repairing a bridge; *fire-bote*, or *house-bote*, for fuel; *plough-bote* and *cart-bote*, for making and repairing implements of husbandry; *hay-bote*, or *hedge-bote*, for repairing hedge and fences, &c. The term *bote* and its compounds, however, though technically proper, have in modern times somewhat fallen out of use.

BOT-FLY, *bot'-fli* (*Œstridæ*).—Although most of these insects are incapable of taking nourishment when in their perfect state, from the obsolete nature of their mouths, they are nevertheless to be regarded as among the greatest pests that afflict cattle. During their larva state they are all parasitic upon the various herbivorous animals, some of them harbouring in the skin, and others in the internal cavities of their bodies. In horses these pests are called *bots*; in sheep, *maggots*; and in oxen, *wornibs*. Of the internal parasites, some live in the frontal sinuses of sheep and deer, the parent laying her eggs in the nostrils of the animal, whence the larva creeps up to its destined abode; whilst others (the bots) make their way to the very core of the animal's intestines. The eggs of these latter are laid upon the skin of the horse in such positions as are easily reached with his tongue. This selection of situation, however, is not invariable, nor, according to Newman, need it be, to insure the bot's purpose. He says, "All naturalists must have observed how commonly the eggs of the bot are deposited on that part of a horse's shoulders which he can never reach with his mouth; and thus, to a casual observer, it would seem that they must perish, and fail in the object for which their parent designed them. Now there is a provision of nature which exactly counteracts this difficulty. When horses are together in a pasture, and one of them feels an irritation on any part of the neck or shoulder which he cannot reach with his mouth, he will nibble another horse on the corresponding part of his neck or shoulder, and the horse so nibbled will immediately perform the kind office required of him, and begin nibbling away at the part indicated." After the eggs have remained among the hair of the horse's hide four or five days, they arrive so near maturity that the least additional heat is sufficient to hatch them. This additional heat is supplied by the application of the friendly horse's lips and tongue; the larvæ are liberated, and, adhering readily to the moist surface of the horse's mouth, are conveyed straight to his intestines. It is satisfactory to learn that opinion is at least divided as to whether the bot-fly in the horse's stomach is hurtful. The horse has an instinctive horror of this insect, and, as soon as it flies near him, he gallops round the field or inclosure until he is in a profuse perspiration, and then comes to a sudden stop, in a state of tremor. The fly makes a most delicate poise on the wing, and then suddenly darts at the horse and deposits an egg. This is repeated until several hundreds are affixed to the hairs, generally of the leg. When the larvæ become perfect, they pass from the body of the animal with the dung, in which they remain until they are matured into a fly. They frequently attach themselves, by a hook-like process, near the anus of horned cattle, and drop with the dung. In the summer months oxen frequently stand in a pond or pool for a considerable time, their instinct leading them to this course in order that they may effectually get rid of their future enemy.

BOTHIE, *both'-e* (Gaelic *bothag*, a cot), is a name given in the Highlands of Scotland to a hut, or the meanest sort of cottage; but latterly the name has come to be applied to the houses in which the unmarried farm-labourers are lodged, in different parts of Scotland. These last are usually of the most wretched description. Frequently a number of young men [illegible] thus crowded together in a single apartment, where they have to cook, sleep, dress, and prepare their own meals. They [illegible] thus without any control, and great laxity of morals is the consequence. In some places there are also bothies for unmarried female farm-servants, which are still more reprehensible. During the last few years, popular attention in Scotland has been much directed to the evils of the bothie system, both through the platform and the press, and it has been almost universally condemned. No one has done more to overthrow this system than the Rev. Dr. Begg, of Edinburgh.

BOTHRODENDRON, *both'-ro-den'-dron* (Gr. *bothros*, pit, *dendron*, tree), in Geol., a gen. of fossil stems, with dotted surfaces, occurring in the coal-measures, and distinguished from *Sigillaria* and *Stigmaria* by two opposite rows of deep oval pits, which appear to be the scars left by large cones or seed-bracts.

BOTONOMANCY, *bot'-o-no-măn-se* (Gr. *botane*, a plant, *manteia*, divination), a method of inquiry into the future by means of plants. The plan, sometimes adopted by young ladies, of picking off the petals of a flower, one by one, to see whether a certain event will or will not happen, is one way of practising botonomancy. This species of divination was anciently practised by writing a number of letters or words upon leaves, and then exposing them to the wind, when the answer was attempted to be made out of those that remained. Sometimes the noise or crackling of leaves when crushed between the hands or cast into the fire was the mode resorted to.

BOTRYCHIUM, *bo-trik'-i-um* (Gr. *botrus*, a bunch of grapes), in Bot., a gen. of ferns of the division *Ophioglossæ*. The only British species is *B. lunaria*, commonly called Moonwort, a little fern common on mountain pastures. *B. virginicum* is found in many parts of America, Asia, and Africa; but in Europe it is strangely confined to Norway. Its fronds, which are large and succulent, are boiled and eaten in the Himalaya, New Zealand, and a few other parts.

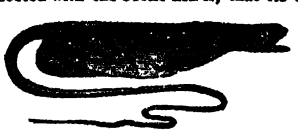
BOTRYOIDAL, *bot'-ri-oi-dal* (Gr. *botrus*, a bunch of grapes), in Min., a term applied to masses occurring in a concretionary form resembling bunches of grapes. Certain limestones and hæmatites are found in this form.

BOTRYOLITE, *bot'-ri-o-lite* (Gr. *botrus*, a bunch of grapes, *eidos*, like), datholite or boro-silicate of [illegible] occurring in a *botryoidal* form at Arendahl, in Norway. It is also found near Lake Superior in such large quantities, that it has been used as a flux for copper, and as a source of boracic acid.

BOTRYTIS, *bot'-ri-tis* (Gr. *botrus*, a cluster of grapes), in Bot., a gen. of fungi, comprising many of those microscopic plants which, in their fully-developed condition, form the different kinds of mould found on bread, cheese, preserves, fruits, paper, and other substances. Many of the species are peculiarly destructive to living animals and plants: thus the disease in the silkworm known by the

name of *muscardine*, is produced by one or more; a disease to which turnips are particularly liable is connected with the growth of the species *B. parasitica*; and the much-dreaded potato disease is confidently ascribed by many observers to *B. infestans*.

Bottle-Fish (*Saccopharynx ampullaceus*), a very singular fish, belonging to the gen. *Saccopharynx*. Only two specimens of the genus have been taken, and, with the exception of size, they realize many of the fabulous accounts of the sea-serpent. One was caught in the entrance to Davis' Straits, and measured four feet and a half, and the other between Iceland and Labrador,—it was six feet long. The most singular fact connected with the bottle-fish is, that its body is capable of being inflated like a leathern bottle, and it has a long slender tail like a whiplash. It has a pointed snout, and its mouth is furnished with long sharp teeth. Under the small pectorals the three branchials can be seen through the irregularly-shaped gill-openings; and the extensibility of the jaws is greater than that of the serpent tribe. It has a slightly granular, but soft, loose, and slimy skin, and is very voracious; one of the examples referred to was discovered to have swallowed a fish longer than its own body, and the other a sea-perch thicker than itself.



BOTTLE-FISH.

Bottle Papers, *bot'-tel*, is a term applied to those papers that are inclosed in bottles and cast into the sea. Sometimes intelligence of the sinking or destruction of a vessel is communicated in this way; but they are commonly made use of in showing the drifts and currents of the ocean. In such cases the ship's name, the latitude, longitude, date, &c., are written down on a slip of paper, which is then put into a bottle, properly secured, and cast into the sea. These papers are frequently drifted away into very distant localities, and, when picked up, often supply useful information to the hydrographer.—Ref. *Nautical Magazine* for Sept., 1857.

Bottles (Fr. *bouteilles*). — The manufacture of bottles is one of considerable importance. This may be seen from the fact that France uses annually over 60,000,000 of bottles for wine alone. The bottle manufacture of Great Britain is very flourishing. After supplying our own wants, which are enormous, we export common bottles annually to the amount of over £300,000. Bottles destined to contain acid, or effervescing wines, are made with particular care, a machine having been invented for testing their strength. Before this the loss of champagne bottles by bursting was nearly 30 per cent. For acid wines the glass should contain a slight excess of silica; otherwise, the lime or alkali left uncombined is acted upon, and the bottle corroded. For more information on this subject *see* Glass Manufacture.

Bottom, *bot'-tom*, a term frequently used in commercial language to denote a ship, as when we speak of goods imported in foreign *bottoms*, or in British *bottoms*. The word is derived from the Dutch *bodem*, which originally signified the bottom or keel of a ship, but came afterwards to be used also for the whole vessel. The term is also used in both senses in English.

Bottom Beds, in Geol., the name sometimes given to some partially or doubtfully fossiliferous strata which immediately underlie the Silurian system in Wales.

Bottomry, *bot'-tom-re*, in Law and Com., is in the nature of a mortgage of a ship, and is said by Blackstone to have originally arisen from permitting the master of a ship, in a foreign country, to hypothecate the ship, in order to raise the money to refit.—(2 Bl. Com. 457.) It arises when the owner takes up money to enable him to carry on his voyage, and pledges the keel or *bottom* of the ship (*partem pro tanto*) as a security for the repayment; in which case it is understood that, if the ship be lost, the lender loses the whole of his money; but if it returns in safety, then he shall receive back his principal, and also the premium or interest agreed upon, however it may exceed the legal rate of interest, it being considered in the nature of an insurance, and not usury. And this is allowed to be a valid contract in all trading nations. In this case, the ship and tackle, if brought home, are answerable (as well as the person of the borrower) for the money lent. But if the loan is not upon the vessel, but upon the goods and merchandise, which must necessarily be sold or exchanged in the course of the voyage, then only the borrower, personally, is bound to answer the contract, who, therefore, in this case, is said to take up money at *respondentia*. These terms are also applied to contracts for the repayment of money borrowed, not on the ship and goods only, but on the mere hazard of the voyage itself; when a man lends a merchant £1,000, to be employed in a beneficial trade, with condition to be repaid with extraordinary interest, in case such a voyage be safely performed; which kind of agreement is sometimes called *fœnus nauticum*, and sometimes *usura maritima*. But as this gave an opening for usurious and gaming contracts, especially upon long voyages, it was enacted by the statute 19 Geo. II. c. 37, that all moneys lent on bottomry or *respondentia*, on vessels bound to or from the East Indies, shall be expressly lent only upon the ship, or upon the merchandise; that the lender shall have the benefit of salvage; and that if the borrower have not an interest in the ship, or in the effects on board, equal to the value of the sum borrowed, he shall be responsible to the lender for so much of the principal as hath not been laid out, with legal interest and all other charges, though the ship and merchandise be totally lost. The observation above as to the rate of interest applies to the laws of each particular country fixing the legal rate to be taken, the usury laws in England having been repealed.

Bottonny, *bot'-ton-ne* (Gr. *botane*, a plant), in Her., the name given to a cross the ends of which terminate in three semicircular projections, giving them an appearance resembling the trefoil in form.

Boudoir, *boo'-dwaw* (Fr.), a lady's small private apartment, in which she receives only her most intimate friends. Boudoirs became very fashionable in France during the reign of Louis XIV., and were frequently adorned in the most luxurious and fantastic manner.

Bouget, *boo'-zhai* (Fr. *bouget*), in Her., a charge of peculiar form, representing an ancient vessel used for the purpose of carrying water.

Bought and Sold Notes, in commercial transactions, are notes of sale signed by a broker employed to sell goods, and by which the bargain is completed. They contain the conditions of the bargain, and are afterwards delivered to the principals for implement.

Bougie, *boo'-zhe* (Fr.), a surgical instrument used for opening obstructed passages of the body; as the urethra, rectum, œsophagus, &c. It is long and slender in form, solid or hollow, stiff or flexible, according to its particular use, usually varying from $\frac{1}{4}$th to $\frac{1}{2}$th of an inch in diameter. It is made of various substances, as German silver or pewter, gum-elastic, catgut, &c. One kind is also made by dipping a fine cord or thread of flax or silk in melted wax until it has acquired a sufficient thickness, when it is rolled smooth and firm on a marble slab. Bougies require to be employed with skill and caution, as there is always a considerable degree of danger attending their use. If used at all by inexperienced hands, the utmost caution should be observed, as much injury may arise from any hasty or violent efforts to remove the resistance that may present itself; it is rather to be overcome gradually and by repeated attempts, so as not to excite much pain or irritation.

Boulder Clay. (*See* Drift.)

Boulders, *bole'-ders* (Sax.), in Geol., any rounded or waterworn blocks of stone too large to be included under the heads of "pebbles" and "gravel." The term *erratic boulders* is generally applied to the detached masses of rock which are found lying upon the surface, and which have been washed out of the clays of the Glacial epoch, or brought separately from their original sites by icebergs. They are often found resting on hill-tops, which during the Glacial period were banks and shallows in the sea, and so arrested the laden icebergs in their course. The largest boulder known in the British islands is near the head of the Devil's Glen in

county Wicklow. It is 27 feet long by 18 wide, and 15 high. It is of granite, resting on Cambrian grits and slates, six or eight miles from the nearest granite *in situ*, with a wide shallow valley between the hill on which it now stands and the granite district. Very large erratic blocks of Scandinavian rocks are scattered over the plains of Denmark, Prussia, and northern Germany. The monolithic pedestal of the statue of



ERRATIC BOULDERS.

Peter the Great at St. Petersburg was hewn out of a boulder weighing 1,500 tons, that lay on a plain not far from the city. (*See* DRIFT, GLACIER, PLEISTOCENE.)

BOULEVARD, or BOULEVART, *bool'-vard* (Ger. *bollwerk*; Eng. *bulwark*), is a French term denoting the outer fortifications or ramparts of a town. Many of these have now been levelled, the ditches filled up, and the space laid out in public gardens, parks, and promenades finely shaded with trees, but still retaining their old name. The boulevards of Paris are the most magnificent of their kind.

BOULIMUS, *bool'-li-mus* (Gr. *bou*, great, and *limos*, hunger), is a word used in medicine to denote a canine or voracious appetite. The terms *canina* or *bovina fames* (Lat. *canis*, a dog, or *bos*, an ox, and *fames*, hunger), are sometimes used in the same sense.

BOUNDARIES OF CITIES AND BOROUGHS, *boun'-da-ries* (Nor. *bounse*, a limit), in England, are declared by the Municipal Corporations Act, 5 & 6 Will. IV. c. 76, to be the same as those settled and described in 2 & 3 Will. IV. c. 64, being entitled "An Act to settle and describe the divisions of counties and the limits of cities and boroughs in England and Wales, so far as respects the election of members to serve in parliament." This act was, in some points, subsequently amended by 6 & 7 Will. IV. c. 103. Act 7 Geo. IV. c. 64, declares that when any felony or misdemeanour shall be committed on the boundaries of two or more counties, or within 500 yards of such boundaries, or shall be begun in one county and completed in another, such may be dealt with and tried in any of the counties.

BOUNDARIES OF PARISHES depended upon ancient usage, and were not limited by act of parliament until the passing of the statutes after mentioned; and where these have not been applied, the usage still exists; and in many places great care is taken to perpetuate the memory of the boundaries by perambulations from time to time, which are called *beating the bounds*. In some places parishes seem to interlere, when some place in the middle of one parish belongs to another that is distant; but this has generally happened by a unity of possession, when the lord of the manor was at the charge to erect a new church, and make a distinct parish of his own demesnes, some of which lay in the compass of another parish. Some lands were never at all united to any parish, and remain to this day extra-parochial. The custom of perambulating parishes during *Rogation week* (the next but one before Whit-Sunday) was first introduced, with other Romish ceremonies, by Claudius Mumertus, a French bishop of Vienne, in the year 550, whose precedent was soon afterwards repeated by Sidonius, bishop of Clermont, and at length established by the *council of Orleans*. The regulation of Queen Elizabeth relating to the English *ambarvalia*, or *processions*, is as follows:—"The people shall once a year, at the time accustomed, with the curate and substantial men of the parish, *walk about the parishes*, as they were accustomed (with willow wands), *and at their return to church, make their common prayers*; provided that the said curate, in the said common perambulations, as heretofore in the days of Rogations, at certain convenient places, shall admonish the people to give thanks to God, in the beholding of God's benefits, *for the increase and abundance of his fruits upon the face of the earth*, with the saying of the hundred and fourth Psalm, 'Benedic anima mea,' &c., at which time also the same minister shall inculcate this and such-like sentences, '*Cursed be he which translateth the bounds and doles of his neighbour*,' or such other order of prayer as shall be hereafter appointed." Parishioners being legally entitled to make these perambulations, it has been held that they may justify going on a man's land, or into his house, if on the neighbouring track. In the case of Taylor v. Devey, 7 Ad. & E. 408, 412, Lord Denman, in giving the judgment of the court, said,—"The right to perambulate parochial boundaries, to enter private property for that purpose, and to remove obstructions that might prevent this from being done, cannot be disputed. It prevails as a notorious custom in all parts of England, is recorded by all our text-writers, and has been confirmed by high judicial sanction." In the city of London the custom is, in most parishes, exercised yearly on Ascension-day, or Holy Thursday; and the gates of court and other extra-parochial places *bar out*, by shutting their gates. By the statute for commutation of tithes, 2 & 3 Vict. c. 62, the tithe commissioners are authorized to adjust the ancient boundaries between parishes and townships, or to define a new boundary, as they shall think fit; which adjustment is declared to be binding for all purposes whatever. And by 8 & 9 Vict. c. 118, s. 39, similar powers are intrusted, under certain circumstances, to the inclosure commissioners for England and Wales. The boundaries of the township and parish of Wolverhampton were, in many parts, marked out by what are called *Gospel trees*, from the custom of having the Gospel read under or near them by the clergyman attending the parochial perambulation.

BOUNDARY SURVEY OF IRELAND. (*See* SURVEY, ORDNANCE.)

BOUNDING CHARTER, or INFEFTMENT, *boun'-ding*, in Scotch Law, is a charter or infeftment which describes the lands by their boundaries or marches. Such a description confers right to all within the bounds, and, on the other hand, excludes whatever lies beyond. If described as bounded by certain walls, these will not be held as conveyed, unless this be expressly stated; and where it is intended that the wall should be mutual, this must be expressed.

BOUNTY (*Fr. bonté*), in Pol. Ec., is a premium paid by government to the producers, exporters, or importers of certain commodities, with the view of encouraging the prosecution of these branches of industry. The system arose out of the notion that there were certain kinds of industry which it was specially the interest of the government to encourage or to prevent from falling into decay. Bounties were at one time very numerous in this country; but since the appearance of Adam Smith's "Wealth of Nations," wherein their impolicy is clearly pointed out, the system has fallen into disrepute, and is now almost universally condemned. According to that author, a trade is only in a natural condition when its produce is sold for a price which replaces the whole capital expended in production, and leaves something over in the shape of profit. When this is not the case, and when the goods can only be sold at a loss, the manufacturer will cease to produce an unprofitable article, unless the government comes forward with a bounty to establish an equilibrium be-

tween the cost of production and the market price. "The bounty," says Adam Smith, "is given in order to make up this loss, and to encourage a man to continue, or, perhaps, to begin a trade of which the expense is supposed to be greater than the returns; of which, every operation eats up a part of the capital employed in it, and which is of such a nature, that if all other trades resembled it, there would soon be no capital left in the country. . . The effect of bounties, therefore, can only be to force the trade of a country into a channel much less advantageous than that in which it would naturally run of its own accord." The system of bounties entirely ceased in this country in 1830, unless one may class under this head the large parliamentary grants made to certain steamboat companies to run boats for the carriage of the mails. Analogous to, and closely connected with bounties, is the system of drawback of duties allowed upon the exportation of certain articles, which still continues to some extent. (*See* DRAWBACK.)

BOUNTY, or QUEEN'S BOUNTY, is a sum of money given by government to persons enlisting in the army or navy, in order to induce men to enter these services. The amount of bounty naturally varies with the demand for men, being sometimes as low as £2 or £3; while at other times, as during the war against Napoleon, it has been as high as £20 or upwards. Formerly, great part of the bounty was usually kept back, under the plea of being payment for certain articles furnished; but recently an outcry was made against this practice, and now the recruit receives the whole amount of the bounty in cash.

BOUNTY, QUEEN ANNE'S.—The profits of the first-fruits and tenths which were anciently given to the pope here, by Henry VIII., appropriated to the crown. Queen Anne restored this source of revenue to the church, and caused a perpetual fund to be established, the revenue of which, after payment of certain charges and pensions, was vested in certain trustees for the augmentation of poor livings under £50 per annum. This fund has been further regulated by subsequent statutes. The trustees are certain dignitaries of the church, and other official persons for the time being, and are incorporated under the name of "the Governors of the Bounty of Queen Anne, for the augmentation of the maintenance of the poor clergy." They have authority to make rules for the distribution of the fund, which are to be approved by the king under his sign manual. The sum received by the governors of this bounty for the year ending 1858 was £233,076, and they expended £214,136.

BOUQUET OF WINE, *boo'-kai* (Fr.), the odorous principle or perfume in all wines, partly derived from the grape and partly from fermentation. It has some of the characters of an essential oil, and in some wines is present in small quantities, and is very evanescent; while in others it is abundant and persistent. According to Pelouze and Liebig, the bouquet of wines, which they consider to be a substance formed during fermentation, is a true *ether*, namely, a combination of oxide of ethyle with œnanthic acid.

BOURBON TEA. (*See* ANGRÆCUM.)

BOURGEOISIE, *boorzh'-waw-ze* (Fr. *bourg*, a town), is a French term, literally signifying the inhabitants of a town, and is employed to denote a class of society in France who inhabit the towns, and are intermediate between the nobility and the lowest class of the people, including merchants and manufacturers down to master tradesmen. Under the ancient monarchy it comprised all those who were called upon to partake in the duties or participate in the expenses of the town in which they were domiciled. The bourgeoisie of the large towns have often played an important part in the history of the country. They are not to be confounded with the *citoyens*, a general term applied to all who are members or citizens of the state.

BOURIGNONISTS, *boo'-reen-yo-nists*, in Eccl. Hist., a religious sect named after Antoinette Bourignon, who was born at Lisle, in France, 1616. She pretended to particular inspirations, and set herself up as a religious reformer, publishing a great number of books filled with very singular notions. She found a number of followers, one of the principal of whom was Peter Poiret, an able and learned man, who, in his "Divine Economy," attempted to reduce the substance of Bourignon's fancies to a regular system. One Dr. Gordon, of Aberdeen, who wrote an apology in their favour, was condemned and deposed by the General Assembly in 1701. The works of Bourignon were published by Poiret at Amsterdam, 1676-84 (2nd edition 1717), and occupy 25 volumes.

BOURNONITE, *boor'-no-nite*, a mineral occurring at Endellion, in Cornwall, in steel-grey tabular crystals, or massive granular aggregations. It is a mixed sulphide of antimony, copper, and lead. It is often found in masses resembling a cogged wheel, and is thence called *wheel-ore*. It is also known as *Endellionite*.

BOURNOUSE, *boor'-noose*, a large woollen mantle with a hood, which is thrown over the head in wet weather. It is worn by the inhabitants of Algeria and other parts of Northern Africa. The bournouse is put over the rest of the attire, and is coloured so as to suit the fancy of the wearer. White, however, is the principal colour. The name is Arabic, but amongst the Spaniards this garment has long been known under the name of *albornoz*. Since the conquest of Algeria by France, the term has been applied to a lady's cloak with a hood attached behind, which somewhat resembles the Arabian bournouse.

BOURSE. (*See* EXCHANGE.)

BOUSTROPHEDON, *boo-strof-e'-don* (Gr. *bous*, an ox, and *strepho*, I turn), a term used to denote that mode of writing which was practised by the Greeks in the earlier period of their history. Instead of each line proceeding from left to right, they proceeded from left to right and right to left alternately, so that each line commenced at the side at which the previous one terminated, like oxen in ploughing; and hence the name.

BOUSY, *bow'-se* (Ang.-Sax.), is applied to one who is intoxicated or who drinks lavishly. It is said to be derived from *bouse*, the Dutch name of a large drinking-cup with two handles.

> "With a long legend of romantic things,
> Which in his cups the *bousy* poet sings."
>
> *Dryden.*

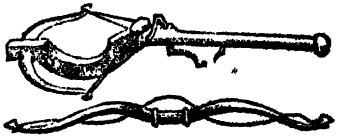
BOUTS RIMÉS, *boo-re'-mai* (Fr., rhymed endings), a social amusement, which consists in making lines to suit certain rhythmical terminations which are given. It is said to have originated with one Dulot, a French mediocre poet of the 17th century, and was at one time extremely popular in that country. In fixing the bouts, it is usual to choose such as seem the remotest and the least connection.

BOUZA, *boo'-za*, a kind of beer made from the grains of an Abyssinian corn-plant called Teff. (*See* POA.)

BOVIDÆ, *bo'-vi-de* (Lat. *bos*, *bovis*, an ox), the hollow-horned ruminating animals belonging to the class *Mammalia*, order *Ruminantia*. The species belonging to this family are hoofed, their stomachs being adapted for chewing the cud. Their frontal bones are usually provided with hollow horns. In this family are included,—*Bovina*, the oxen; *Giraffina*, the giraffes; *Cervina*, the deer; *Moschina*, the musk-deer; and *Camelina*, the camels.

BOW, *bou* (Ang.-Sax.), in Mar., is that portion of a ship's side which forms an arch towards the stem. There are two kinds of bows; viz., *lean*, or narrow, and *laff*, or full bows. The former of these is best calculated for swift sailing.

Bow, one of the oldest of weapons, in the use of which the English, during the Middle Ages, were extraordinarily expert. In the annexed illustration are shown the long-bow and the arbalest, or cross-



BOWS.

bow. The former of these weapons was that generally preferred by the English bowmen. It was considerably less cumbrous than the cross-bow, and more than twelve arrows could be discharged from it whilst one was being impelled from the cross-bow. The price of a long-bow, in the reign of Edward III., was from 1s.

to 1s. 6d., a sheaf of arrows costing from 1s. to 1s. 2d. Some long-bows were made of the shape shown in the cut,—a double arch connected by a straight piece. (*See* ARBALEST, ARCHERY.)

BOW, in Mus., a stick of hard elastic wood, along which are stretched horse-hairs, the tension of which is regulated by a screw. It is used for playing upon instruments of the violin kind, and varies in size, the double-bass and violoncello bow being much stiffer and stronger than that of the violin.

BOWDICHIA, *bo-dik'-i-a*, in Bot., a gen. of plants belonging to the nat. ord. *Leguminosæ*, sub-ord. *Papilionaceæ*. The only species requiring notice is *B. virgilioides*, the bark of which, with that of one or more species of *Byrsonima*, forms the American alcornoco bark of commerce. (*See* BYRSONIMA.)

BOWIE-KNIFE, *bo'-e*, the name of an American sharp pointed weapon, bearing a close resemblance to the French *couteau de chasse*, or English butchers'-knife. A story is told of its having been introduced into America by a certain Col. Jim Bowie, of Texas, who acquired great notoriety by the skilful manner in which he wielded the weapon in his hand-to-hand encounters with Mexicans and others. In the Southern States of America it was commonly carried in a sheath secreted somewhere about the person.

BOWING, or WORSHIPPING TOWARDS THE EAST, was the practice of the Church from a very early period. Various reasons have been assigned for this custom; as, the appearing of the star in the east at the birth of Christ; the rising of the sun in the east being emblematic of the rising of the Sun of Righteousness; the belief that Christ would make his appearance in the east when coming to judge the world. Hence it became customary to place the altar and other sacred symbols at the eastern extremity of the church. The west, on the other hand, was regarded as the place of Satan and darkness; and hence, when they renounced their sins, they looked towards the west, and then turned about to the east to make a covenant with Christ.

BOWING THE HEAD, in the early Christian church, was considered as a posture of worship, and intermediate between standing and kneeling. It was observed principally in receiving the bishop's blessing, and in all direct and formal addresses to God for his mercy and favour upon the people. In the early church it was also usual to bow the head whenever the name of Jesus occurred in the service, and in the Church of England this is still done in repeating the Creeds.

BOW-LINE, in Mar., a rope fastened near the middle of the leech, or perpendicular edge of the square sails, by three or four subordinate parts called bridles. It is only used when the wind is so unfavourable that the sails must all be braced sideways, or close-hauled to the wind.

BOWLS, *boles* (Fr. *boule*), a favourite game in Britain, played upon a smooth, grassy surface, either square, circular, or oblong, used only for the purpose, and called a bowling-green, which is surrounded by a trench about half a foot deep. Bowls are made from a black, green wood, called lignum vitæ (*Guaiacum officinale*); they are nearly round, and have a diameter of six or eight inches, with a bias to one side. The party playing may consist of two, four, six, or eight, and is generally chosen after tossing up a coin to decide who shall have the first choice. The sides being selected, each player has two bowls, which are marked with numbers, thus distinguishing the players. The sides being selected, the leader of the game sends off a small white ball from one end of the bowling-green to any distance he pleases. This small white ball is called the *jack*, and the leader throws his first bowl so as to place it as near the jack as possible. He is then followed by one of the adverse party, the partner of the first following, and so, in rotation, till all the bowls are played. The game is won by the side whose bowls are nearest the jack. The number of points required to make the game is arranged beforehand; 7, 14, 21, or 31, are the numbers usually fixed. Great disappointment often happens to a player when his bowl, after being placed close to the jack, is removed by a blow from a subsequent player's bowl. This is called a "rub." Hence the old adage, "He that plays at bowls must expect rubs." Bowls are weighted or biassed on one side, in order that the player may be able to bowl towards the jack in a curved direction. A *fore-hand* bowl is played with a curve from the right, and a *back-hand* bowl with a curve from the left. If a bowl goes into the ditch without striking the jack, it does not score; but if it strikes the jack and goes into the ditch, it reckons as if it were upon the green. When the jack itself is knocked into the ditch, it is replaced upon the green, in the place nearest to where it lay in the ditch. The game of bowls was prohibited in England during the reign of Henry VIII. by act of parliament; that law, however, was repealed in 1845. It has always been a favourite pastime in the British isles.

BOWLS, AMERICAN, is a game of modern invention, recently introduced into England from across the Atlantic. It is played in saloons fitted with alleys of from fifty to sixty-five feet in length, and about four in width. The alley has a "gutter," as it is called, on each side, and is very slightly convex in the centre, regularly bevelled to the sides. At the further extremity of the alley are set up, in the form of a pyramid ten pins, usually of ash-wood, about a foot in height and 2 lbs. in weight. The apex of the pyramid is turned towards the bowler, who rolls wooden balls, generally of lignum vitæ, with the object of knocking down as many of the pins as possible at each roll. The pins, when set up, are called a frame, and at each frame the bowler rolls the balls, when the number of pins down is counted to , and the frame is set up again for the next bowler. A game ordinarily consists of ten frames, or thirty balls. If the bowler takes all the pins with his first ball, he counts ten; the frame is again set up for his second ball, when, if he again takes all, he counts ten more, and the frame is again set up for his third, when, whatever number he scores with the three balls, count to him as if all had been made off one frame. If he take all the ten pins with his first two balls, he is entitled to a fresh frame for his third or last ball. This is technically called getting a spare, or double spare. The above is the strio game, as played in the bowling-saloons of the Broadway of New York; but in England sometimes it is played somewhat differently.

BOWSPRIT, *bo'-sprit*, in Mar., a large boom or mast, which projects over the stem at an angle of about 36 degrees, for the purpose of carrying the sail forward, to govern the fore-part of a ship, and counteract the force of the after-sails, or those extended behind. A bowsprit is otherwise of great use, as it is the principal support of the fore-mast, by confining the stays (or ropes stretching from the top of the mast to the bowsprit), by which it is secured and enabled to carry sail.

BOW-WINDOW. (*See* BAY-WINDOW.)

BOX, in Bot. (*See* BUXUS.)

BOX-DAYS, in the legal phraseology of Scotland, are two days appointed by the judges of the Court of Session in each of the spring and autumn vacations, and one day in the Christmas recess, on which papers ordered by the court, or by the lords-ordinary, towards the close of the previous session, are usually appointed to be lodged.

BOX-HAULING, *box'-haul'-ing*, in Mar., a particular method of veering a ship when the swell of the sea renders tacking impracticable.

BOXING. (*See* PUGILISM.)

BOXING-DAY, in England, is the day after Christmas, and is so called from the custom of giving Christmas-boxes, or presents to servants and others, on that day.

BOXING THE COMPASS is a sea phrase denoting the repetition of the several points of the mariner's compass in their proper order.

BOYAR, BOJAR, or BOYARD, *bo-yar'* (Sclavonic, a free possessor of land), was a general name applied to the class of nobility in Russia. They were originally distinguished warriors in the armies of the early conquerors of the country, and hence they received large grants of territory, and came to acquire great power. They were next in order to the ruling princes of the country, and stood in somewhat the same relation to them that the lesser English knights in feudal times did to the great barons. They held, exclusively, the highest civil and military offices, and preserved to themselves very extensive privileges and immunities. Under Ivan, a number of these privileges were taken from them; but, at the same time, offices were be-

stowed upon many of them about court, which, by degrees, withdrew them from their allegiance to the princes, and led to the overthrow of the latter. Peter the Great finally abolished the order of the boyars, by stripping them of their remaining privileges, and giving them a place among the Russian nobility. In Moldavia and Wallachia, boyars still exist, and have a seat and voice in the council of the prince.

Boy-Bishop, *boi bish'-op.*—Anciently, on St. Nicholas's day, December 6, it was the custom for the choir-boys in the cathedral churches to choose one of their number to maintain the state and authority of a bishop. For this purpose he was habited in rich episcopal robes, had a mitre on his head and a crosier in his hand, and his fellows for the time being assumed the character and dress of priests, yielding him canonical obedience. They took possession of the church, and performed all the ecclesiastical ceremonies and offices except mass. The office and authority of the boy-bishop lasted until the 28th, being Innocents' day. By a proclamation of Henry VIII., dated July 22, 1542, the show of the boy-bishop was abrogated; but, in the reign of Mary, it was revived, with other Romish ceremonials, to cease in the reign of Elizabeth.—*Ref.* Brand's *Popular Antiquities*, by Ellis.

Boyeau, *bwoi'-yo* (Fr. *boyau*, bowels).—The name given in Mil. to any covered line of approach made towards the defensive works, during the siege of any place, by the attacking party. Boyeaux are termed parallel or zigzag, according to their direction with reference to the front of the work against which the attack is directed.

Boyle's Fuming Liquor, *boils*, so called from having been invented by Robert Boyle, one of the fathers of chemistry in England. It is obtained by distilling one part of sulphur, two parts of chloride of ammonium, and two parts of lime. It is a mixture of several sulphides of ammonium and water. It is a yellowish oily liquid, with an intensely fœtid odour. It is very rarely used in medicine under the name of *Liquor fumans Boylii.*

Boyle's Lectures, a course of eight annual lectures founded by the Hon. Robert Boyle in a codicil annexed to his will, dated 1691. For the support of this lecture he assigned the rent of his house in Crooked Lane to some learned divine within the bills of mortality, to be elected for a term not exceeding three years. The fund proving precarious, the salary was ill paid, and to remedy this, Archbishop Tennison procured a yearly stipend of £50 for ever, charged on a farm in the parish of Brill, Buckinghamshire, to be substituted. The design of the lectures, as expressed by the founder, is to prove the truth of the Christian religion against infidels, without descending to any controversies that may exist among Christians themselves. He is further to assist and encourage all companies in any undertaking for propagating the Christian religion. To this foundation we are indebted for many elaborate defences of natural and revealed religion. A collection of these sermons, from 1692 to 1732, was published under the title of "A Defence of Natural and Revealed Religion, 3 vols. folio; and in 1737 an abridgment of many of the lectures was published by Gilbert Burnet, vicar of Coggeshall, in 4 vols. 8vo. Since that time a number of the series have been published.

Brabanciones, or Brabançons, *bra'-ban-sawngs*, in the Middle Ages, were a kind of irregular soldiery of the Netherlands, who were infamous for rapine, being little better than commissioned banditti, and who hired themselves to fight for whoever would pay them best. Sometimes they were in the service of one prince or baron, and sometimes of another; but they often acted in an independent manner, setting governments at defiance, infesting highways, pillaging the open country, and disturbing the public peace. They formed a kind of society or government among themselves, disregarding every other authority. The greatest monarchs were not ashamed, on occasion, to have recourse to their assistance; and as their manner of life gave them experience, hardihood, and courage, they generally composed the most formidable part of those armies which decided the political quarrels of princes. Henry II. of England enlisted numerous troops of them in his service; and as their manner of life rendered even such banditti the only forces on whose fidelity he could repose any confidence. (*See* Hume's *History of England*, vol. i. chap. 9.) The name is variously written, but all the historians of the time derive it from the country of Brabant, which was the chief nursery of these troops.

Brabançonne, *bra'-ban-son*, the national song of the Belgians, which was sung during the revolution of 1830. Its author was a young French actor of the name of Jenneval, and it was set to music by Campenhout. Each verse ends with the refrain—

"La mitraille a brisé l'orange
Sur l'arbre de la liberté."

Bracæ, or Braccæ, *brăk'-se*, the name given to trowsers, pantaloons, and other articles of armour and dress worn by the nations encircling the ancient Roman and Greek populations. The Latin word *braccæ* corresponds with the Scotch word *breeks*, and the English word *breeches*. Trowsers, or bracæ, were worn by the Medes and Persians, the Parthians, the Phrygians, the Sacæ, the Sarmatæ, the Dacians and Getæ, the Teutones, the Belgæ, the Britons, and the Gauls. The Persian and Cossack trowsers of the present day differ very slightly from those which were worn in ancient times. In ancient monuments the names mentioned above are all represented in trowsers, in order to distinguish them from Greeks and Romans. The illustration represents two Sarmatians, and is taken from Trajan's Column. Bracæ were principally made of woollen materials, but they were sometimes made of silk and leather. They were sometimes striped, and ornamented with a woof of various colours. The ancient Greeks never wore them, but they were generally adopted by the Romans in the 2nd century of the Christian era.



BRACCÆ.

Brace, *braise* (Fr. *embrasser*, to embrace, bind together), in Arch., a piece of timber placed in a slanting direction, and fastened at either end to the principal timbers of the roof of a house to add to their strength and stability. The brace was formerly used in typography to connect three lines of poetry forming a triplet.

Brace ( ⌒ ), in Mus., is a double curved line, which is placed vertically at the beginning of the stave of any composition, and which is used to bind the harmonizing parts together, in order to guide the eye with greater facility from one set of staves to another. When more than two staves are joined together, either for part-singing or playing in concert, it is usual to draw a smaller brace within the large one, in order to distinguish each part. This union of braces is called a score.

Braced.—In Her., when three chevronels are drawn interlacing each other, they are said to be braced.

Bracelet, *brāsw'-let* (Lat. *brachium*, an arm), an ornament generally worn encircling the wrist, but sometimes on the arm above the elbow. (*See* Armlet.)

Brachinus. (*See* Bombardier Beetle.)

Brachiopoda, *brā-ki-op'-o-da* (Gr. *brachion*, an arm, *pous*, a foot).—A term applied to certain molluscous animals having bivalve shells. They derive their name from the remarkable organs by which they procure their food. From the sides of the mouth project two long arms, disposed wholly or partly in spiral curves when not used for seizing the prey. These organs are not only used for obtaining food, but also in maintaining the necessary current for respiration. They are

usually furnished with a number of vibratory filaments. The *Brachiopoda*, or *Pallio-branchiata*, differ from the great majority of recent molluscs with bivalve shells, both internally and externally. The species now existing are very widely diffused, and are all marine; one of them, the *Crania personata*, has been brought up from a depth of more than 400 yards.

BRACHIUM, *brā'-ki-um* (Gr. *brachion*, the arm), in Anat., is the name given to the arm, or that part of the upper extremity which extends from the shoulder to the wrist. The term *brachial*, hence, forms part of the name of certain portions of the arm, as the brachial muscle, the brachial artery. The *brachial muscle*, or *brachialis internus*, is situated on the fore part of the os humeri. It rises fleshy from the middle of the os humeri at each side of the insertion of the deltoid muscle, covering the inferior and fore part of this bone, and is inserted by a strong short tendon into the coronoid process of the ulna. Its use is to bend the fore-arm. The *branchial artery* is a continuation of the axillary artery, which takes this name as it passes behind the tendon of the pectoralis major. It runs down the inner side of the arm, along the inner edge of the biceps muscle, behind the vena basilica, giving off several small branches in its course. Below the bend of the arm it divides into two branches,—the cubitalis and radialis.

BRACHYSTOCHRONE, *bra-kis'-to-krone* (Gr. *brachus*, short; *stoichsion*, a line), a term employed to designate the curve described most rapidly, between two points in its course, by a falling body. The term was first used by John Bernouilli, professor of mathematics at Groningen, in 1696, who first drew the attention of philosophers to it. The curve is commonly called "the line of swiftest descent."

BRACKET, *brak'-et* (Lat. *brachium*, an arm), a term applied to any projection, plain or ornamental, suspended against, or fastened to a wall, for the support of a clock, statue, lamp, &c. The pieces of wood that are often used to support shelves are so called. The word bracket should not be taken as synonymous with "corbel" (*see* CANTILEVER, CORBEL) as the latter, although serving a similar purpose, is invariably built into the wall, and not merely fastened to it. In Mar., the knees which support the stern galleries of a ship are called brackets, and in gunnery, the expression is used to denote the cheeks of the carriage of a mortar.



BRACKET.

BRACKETS are marks used by printers for inclosing words or sentences; thus, [ ].

BRACKLESHAM BEDS, *brak'-el-sham*, in Geol., the lower tertiary sands and clays immediately overlying the London clay, so called from being well exposed at Bracklesham Bay, near Chichester. They contain the gigantic *cerithium* (which *see*), volutes, cowries, bones of fishes, crocodiles, and sea-serpents.

BRACT, BRACTEA, or FLORAL LEAF, *brākt* (Gr. *bracho*, I precipitate), in Bot., a modified leaf from the axil of which a flower-bud arises. Strictly speaking, the term bract should only be applied to the leaf from which the primary floral axis, whether simple or branched, springs; while the leaves which are produced on the axis between the bract and the outer envelope of the flower should be distinguished as *bractlets* or *bracteoles*. In ordinary descriptions, however, the term bract is used to indicate either kind of floral leaf. Bracts are sometimes large, and similar to the ordinary leaves of the plants upon which they are placed, as in the white dead-nettle. Such bracts are termed *leafy*, and can only be distinguished from the true leaves by their position with regard to the flower-stalk or flower. In general, however, bracts differ greatly from ordinary leaves. When the flower is sessile, the bracts are often applied closely to the calyx, and may thus be confounded with it. Again, when bracts become coloured, they may be easily mistaken for parts of the corolla. In some instances they form part of the fruit, becoming incorporated with other organs: thus, the cones of the fir and the strobili of the hop are composed of bracts arranged spirally, and inclosing fertile flowers; and the scales on the fruit of the pine-apple are of the same nature. When bracts grow in a whorl or circle round a single flower, as in the mallow, or a head of flowers, as in the daisy, they are said to form an *involucre*; and when a number grow together, as in the cup of the acorn, they then constitute a *cupule*. Though the bract is generally a small and inconspicuous organ, it occasionally acquires a considerable size, and may actually surround all the flowers of a plant so as to completely inclose them when in a young state. A sheathing bract of this description is called a *spathe*; it is very remarkable in the common arum. In the grasses and sedges little bracts called *glumes* and *palece* inclose the essential organs of reproduction. From the word bract several adjectives are formed; namely, *bractiscent*, assuming the appearance of a bract; *bracti'-l*, furnished with bracts; *bractiolate*, having little bracts.

BRADFORD CLAY, *brād'-ford*, in Geol., a member of the Oolitic system. It is a blue unctuous clay, occurring at Bradford, and extending for a few miles around that town. It is nowhere more than sixty feet in thickness, and is full of the fossils called *Apiocrinites*.

BRADSHAW'S RAILWAY GUIDE, *brād'-shaw*, a well-known monthly periodical, projected by the late Mr. George Bradshaw, of Manchester, and which made its first appearance in December, 1841. It gives official information of the time of departure and arrival of the different trains on all the lines of railway in Great Britain and Ireland, with fares, &c.; also a general steam-packet directory, alphabetically arranged, giving the daily official sailings of all the steam-vessels during the month to and from every port in the United Kingdom; together with a travelling map of the railways of Great Britain and Ireland, and a variety of valuable and local information. The number for March, 1862, contains 237 pages of information on railways and steamboats, and about 60 pages of advertisements, and is sold for sixpence. The success of this guide has induced others to enter upon the same field; but it still maintains its position as the cheapest and most useful of its class. Subsequently, Mr. Bradshaw attempted to do for the continental railways what he had already done for the British, and in 1817 issued the first number of his "Bradshaw's Continental Guide," a work which is still carried on. It attempts also, by giving much general and local information, to supply in some measure the place of a travelling guide for the Englishman on the continent.

BRADYPUS. (*See* SLOTH.)

BRAG, *brăg* (Welsh *bragiaw*, to brag), a game at cards, deriving its name from the efforts of the players to impose upon the judgment of their opponents by boasting of better cards than they possess. As many persons may play as the cards will supply, the dealer giving to each player three cards, turning up the last card all round. Three stakes also are put down by each player. The first stake is taken by the best card turned up in the dealing round. The peculiarity which gives the game its denomination occurs chiefly in winning the second stake. Here the knaves and nines are called "braggers," and all cards falling into the hands of the players assimilate to these. For example, one knave and two aces, two knaves and one ace, and two aces and one knave, all count three aces. The nines operate in the same way. The third stake is won by the person who first makes up the cards in his hand to thirty-one, with the privilege to draw, or not to draw, as he pleases, from the pack.

BRAGI, *brā'-ji*, in Scandinavian Myth., was the son of Odin and Frigga, and the god of eloquence and poetry. He was represented as an old man with a long flowing beard, like Odin; yet with a serene and unwrinkled brow. His wife was Idunna.

BRAHMA, *brā'-ma*, is the name of the Supreme Being in the religious system of the Hindoos. When the terminal vowel is short or elided, *Brahmā* or *Brahm*, it denotes the essence of the Supreme Being apart from his personal existence. This is not an object of worship by the Hindoos, but only of devout contemplation. Brahmā is regarded as the great source from which all things have sprung, and into which they will

all ultimately be again absorbed. *Brahmá*, on the other hand, is an individual deity, regarded as the creator of the universe, and constituting, with Vishnu, the preserver, and Siva, the destroyer, the three principal gods of the Hindoos. Brahmá does not seem to occupy now the high place that he once did in the Hindoo system. There are no exclusive worshippers of him, or temples dedicated to him alone; he only receives homage in conjunction with other deities. The Hindoos lavish their adoration upon those deities from whom they expect to derive some immediate advantage—upon those who are engaged in preservation or destruction. Brahma is usually represented with four heads and four hands, either reclining upon a lotetree (the emblem of creation among the Hindoos) or riding upon a swan.

Brahmin Bull (*Bos indicus*), a species of Asiatic ox, chiefly distinguished by a fleshy hump rising from the withers. Its ears are pendulous, and its dewlap largely developed. It varies very much in size. In many parts of India it is used as a beast of burden, and is said, when harnessed to a carriage, to travel with ease thirty miles a day. The Hindoos regard them with veneration; and, though they put them to heavy labour, consider it sinful to slaughter them.

Brahminism. (*See* Hindooism.)

Brahmins, The, *brá'-mins*, constitute the first or highest of the four castes into which the Hindoos are divided. They are the learned or sacerdotal class of the people. Anciently, all the learning of India centered in them; and many of the Grecian sages travelled thither to be instructed by them. The modern Brahmins, however, are sadly deteriorated from their early representatives; their learning is, in a great measure, confined to their sacred books, on which they write subtle disquisitions. Their conduct is characterized by falsehood, dishonesty, and the most vile and licentious practices; and yet they maintain a more extensive sway over the people than the priests of any other nation. Their chief privileges consist in reading the Veda, or sacred volume, in instituting sacrifices, in imparting religious instruction, and in exemption from capital punishment. (*See* Hindooism.)

Brain, *brain*, is the name given to a soft pulpy substance, which in man and the higher orders of animals constitutes one of the great central masses of the nervous system (which *see*). As was to be expected, it is found most perfectly developed in man, in whom, with its membranes, vessels, and nerves, it constitutes the whole of the matter inclosed within the bones of the skull, and is, hence, termed the *encephalon*. In males, the average weight of the full-grown human brain is about 49 or 50 oz.; in females, 44. It varies, however, considerably in different individuals. In a series of 278 cases, the maximum weight of the adult male brain was found to be 65 oz., and the minimum 31; in 191 cases, the maximum weight of the adult female brain was 56, and the minimum 31 oz. The brain of the naturalist Cuvier is said to have weighed upwards of 64 oz., and of that of the late Dr. Abercrombie, 63 oz. avoirdupois. Anatomists differ as to the size or weight of the brain at different periods of life. Soemmerring believed that the brain reached its full size as early as the third year; the Wenzels and Sir William Hamilton fixed the period about the seventh; and Tiedemann, between the seventh and eighth year. Gall and Spurzheim were of opinion that the brain continued to grow until the fortieth year. From a series of observations, however, "it appears that in general the weight of the brain increases rapidly up to the seventh year, then more slowly to between sixteen and twenty, and then more slowly to between thirty-one and forty, at which time it reaches its maximum point. Beyond that period there appears a slow, but progressive, diminution in weight of about 1 oz. during each subsequent decennial period."—(Quain's *Anatomy*.) The only animals that possess absolutely a larger brain than man are the elephant and whale. In the former, it is said to weigh between 8 and 10 lbs., and in the latter it was found, in a specimen 75 feet long, to weigh upwards of 5 lbs. Generally speaking, as compared to the weight of his body, the brain of man is heavier than that of the lower animals; but there are some slight exceptions to this rule, as in the case of certain species of small birds and in the smaller apes. The proportionate weight of the human brain to the body is greatest at birth, being about 1 to 5·85 in the male, and 1 to 6·5 in the female. At the tenth year, it is about 1 to 14½ at the twentieth, about 1 to 30; and after that age it averages about 1 to 36·5, with a trifling decrease in advanced life. In general, the size of the brain bears a certain relation to the mental powers of the individual, and a certain amount of it is always necessary to sound mental action. The brain is divided by anatomists into the cerebrum, or brain proper; the cerebellum, or little brain; the pons Varolii, and the medulla oblongata. The *cerebrum* occupies the whole of the superior portion of the cavity of the cranium, or skull, and is by much the largest portion of the brain, averaging, in the male, nearly 44, and in the female, about 38½ oz. The *cerebellum* occupies the lower and back part of the cranium, and is next in size to the cerebrum, weighing, in the male, about 5½, and in the female, about 4½ oz. The *pons Varolii* and *medulla oblongata* occupy the base of the brain, and together average about 1 oz. in weight, being rather larger in the female than in the male. The former occupies a central position on the under surface of the brain, and is connected with the cerebrum by two cords or peduncles, termed *crura cerebri*, with the cerebellum with two similar cords, termed *crura cerebelli*, and is also in contact with the medulla oblongata. This last is that portion of the encephalon which connects it with the spinal cord. It is of a pyramidal form, having its broad extremity turned upwards, and connected with the pons Varolii, while its under portion is united with the spinal cord. The brain is covered by three membranes, two of which, the outer and inner, are termed *matres*, from the old notion that they gave rise to the other membranes of the body. The outermost of these membranes, from being of a firmer texture than the others, is termed the *dura mater*, and incloses the brain with its appendages, lining also the whole internal surface of the cranium. Its outer surface, which adheres to the bones of the cranium, as the periosteum does to the other bones, appears to be rather rough and irregular; but the inner surface is smooth and shining, and is lubricated by a fluid which is secreted by it. This membrane is the densest and strongest of the whole body, its component fibres interlacing each other in all directions. It sends off several folds or processes, which descend between certain portions of the brain. The principal of these is the superior longitudinal process, or *falx cerebri*, as it is termed, from its supposed resemblance to a sickle or scythe, which extends from the fore to the back part of the skull, and descending into the substance of the brain, divides it into two portions, called the right and left hemispheres. Where it terminates behind, there is a large lateral expansion of the same membrane, extending across the back part of the skull, and separating the cerebrum from the cerebellum: it is called the *tentorium cerebelli*. From the middle of the tentorium another membranous expansion takes its rise, and descending downwards between the lobes of the cerebellum, terminates at the edge of the foramen magnum, or great occipital hole. It is termed the *falx cerebelli*. The second, or middle, of the three membranes, is an extremely thin and delicate substance, and from its fancied resemblance to a spider's web, it receives the name of *arachnoid*. It is transparent and colourless, and is spread uniformly over the surface of the brain. The third investing membrane, the *pia mater*, is also very delicate and tender, but differs from the arachnoid in its abounding in blood-vessels, whereas no blood-vessels have yet been discovered in the latter. The blood-vessels with which every part of this delicate membrane is covered are the nutrient arteries of the brain. They subdivide and ramify to an extreme degree upon the surface of this membrane, so that the blood may enter the substance of the brain only in very minute quantities. As the pia mater contains and supports the nutrient vessels of the brain, it is not only, like the others, spread over its entire surface, but it also penetrates between all its convolutions, and lines every cavity which it contains. The nervous matter of the brain is composed of two distinct substances, differing from each other both in colour and consistence. One of these is the *grey* or *cinerilious substance*, termed also, where it forms the outer covering, as in the cere-

brum and cerebellum, the *cortical* substance, from its surrounding the inner part like the bark of a tree. The cineritious substance is of a softer consistence than the other, and is composed almost entirely of blood-vessels, connected and sustained by exceedingly fine cellular membrane. It forms an outer covering to the entire surface of the cerebrum of generally about one-tenth of an inch in thickness. The *white* or *medullary substance*, which constitutes the internal portion of the cerebrum and cerebellum, is of firmer consistence, and is composed of microscopic fibres arranged into laminæ and bundles, between which intervening vessels ramify. In the cerebrum these fibres run, in general, in such a direction as to converge towards the base of the brain. The *cerebrum* is of an ovoid shape, but irregularly flattened on its under side. It is divided into two lateral halves, termed hemispheres, separated from each other through a great portion of their extent by the great longitudinal fissure, into which is inserted the falx cerebri. This fissure, both before and behind, passes quite through to the base of the cerebrum; but in the middle it is interrupted by a transverse portion of white substance termed the *corpus callosum*, which connects together the two hemispheres. Each hemisphere is subdivided into an anterior, middle, and posterior lobe, but it is only on the under surface of the brain that these lobes are properly marked off. The anterior and middle lobes are separated from each other by a deep fissure, named the *fissura sylvii*, which extends obliquely backwards to a considerable depth. The middle and posterior lobes are not so distinctly marked off; but anatomists regard as the posterior lobe that portion of the cerebrum which lies over the cerebellum. The surface of the cerebral hemispheres is not plain and uniform, but presents numerous tortuous eminences, named convolutions or *gyri*, which are separated from each other by deep grooves or furrows, termed *sulci*. These are generally about an inch in depth, but they vary considerably in different brains, and even in different parts of the same brain; and, indeed, those of one side frequently differ from those of the other. The convolutions are more marked as the brain is better developed, and are more numerous and manifest in man than in the lower animals. As the cortical substance of the brain is continuous over the whole surface of the hemispheres, in the fissures as well as upon the convolutions, it follows that the greater the number and depth of these, the greater is the superficial extent of the grey matter which is generally regarded as the seat of all the nervous manifestations, as sensation, volition, &c. On slicing away the substance of the hemispheres to a level with the *corpus callosum*, it will be seen to be formed by the converging fibres of the two hemispheres, whence it has been termed the *commissura magna*, or the great commissure of the brain. Under the corpus callosum are the two great cavities termed the *lateral ventricles*, distinguished into right and left. They are very irregular in shape, and are described as each consisting of a body and three horns, or *cornua*,—the anterior, posterior, and middle. They are separated from each other by the septum lucidum, which descends from the lower surface of the corpus callosum, and consists of two laminæ, between which is the very small cavity of the septum lucidum. It rests upon the *fornix*, a triangular medullary body, having its apex directed forwards and its base backwards. Posteriorly it is connected with the corpus callosum, and it divides laterally into a posterior cornu on each side, which terminates in, or rather is continuous with, the *tænia hippocampi*, and the *hippocampus major* and *minor*. The sides of the fornix slightly overlap the optic thalami, while its inferior surface covers the third ventricle, from which it is partly separated by the *velum interpositum*. The third ventricle is a small narrow cavity lying between the *optic thalami*. These last are two large firm oblong bodies nearly an inch and a half long by three-fourths of an inch wide and deep. Anteriorly the optic thalami are continuous with the corpora striata, and posteriorly they are connected by small peduncles with the Pineal gland, and with the nates. The *corpora striata* are two grey pear-shaped bodies, but internally they are streaked with white matter,—whence their name. In front they are obtuse, and approach each other; but they separate and narrow as they proceed backwards. The *Pineal gland* is a small portion of grey matter about the size of a small pea. It was supposed by Descartes to be the seat of the soul. The *corpora quadrigemina* are four small white round bodies intimately connected with each other, of which the anterior and superior pair are called the *nates*, the posterior and inferior being named the *testes*. The anterior commissure is a medullary band uniting the corpora striata; the middle commissure is composed of grey matter, and connects together the two optic thalami, as does also posteriorly the posterior commissure, which is a rounded white cord. The *crura cerebri* are two short, thick, rounded cords connecting the optic thalami with the pons Varolii. They are composed principally of medullary matter, but in their interior is a semilunar mass of dark grey matter. The *cerebellum*, or little brain, consists of a body and three pairs of crura or peduncles, by which it is connected with the rest of the encephalon; and it is not covered with convolutions like the cerebrum, but appears to be formed of a number of lamellæ, or plates, with sulci between them. When cut across, the grey and white matter are seen to be arranged somewhat in the form of a tree, the white substance forming the stalks, and the grey the leaves; and hence it has been termed *arbor vitæ*. The two peduncles of the cerebellum connect it with the testes of the cerebrum, and are known as the *processus e cerebello ad testes*; the inferior peduncles—*processus e cerebello ad medullam*—pass downwards to the back part of the medulla oblongata, and correspond with the restiform bodies; the middle two are the crura cerebelli, which pass from the middle of the cerebellum, round the outer side of the crura cerebri, and meet in front in the pons Varolii, constituting its transverse fibres. The space between the cerebellum behind and the medulla oblongata in front is named the *fourth ventricle* of the brain, or the ventricle of the cerebellum. The *pons Varolii*, or annular protuberance, is a comparatively small portion of the brain, and occupies a central position on its under surface, above and in front of the medulla oblongata, with which it is continuous. It consists of transverse and longitudinal white fibres, interspersed with a quantity of diffused grey matter. The transverse fibres, with few exceptions, communicate with the cerebellum by means of the middle crura; while the longitudinal fibres are those which ascend from the medulla oblongata into the crura cerebri. The *medulla oblongata* is that part of the encephalon which is immediately connected with the upper end of the spinal cord, and has an inclination obliquely downwards and backwards towards the foramen magnum. It is pyramidal in form, tapering towards its connection with the spinal cord. It is marked longitudinally by an anterior and posterior fissure, which are continuous with those of the spinal cord, and by which it is partially divided, like the cord, into two lateral and symmetrical halves. On the upper part, however, a new arrangement takes place; for, on each side of the median line, the lateral fissures disappear, and the surface of each half of the medulla presents four eminences or columns, which, commencing at the anterior fissure, and proceeding backwards each way to the posterior fissure, are met with in the following order,—the anterior pyramids, the olivary bodies, the restiform bodies, and the posterior pyramids. From the under-part of the brain issue a number of nerves, known as the cranial, and pass through foramina in the base of the skull. They are usually reckoned as forming nine pairs. (*See* Nerves.) The following is the proportions of the different substances that compose the grey and white matter of the brain:—

| | Grey. | White |
|---|---|---|
| Water | 85·2 | 73·0 |
| Albuminous matter | 7·5 | 9·9 |
| Colourless fat | 1·0 | 13·9 |
| Red fat | 3·7 | 0·9 |
| Osmasome and lactates | 1·4 | 1·0 |
| Phosphates | 1·2 | 1·3 |
| | 100·0 | 100·0 |

On the functions of the brain and its several parts, some notice will be taken in treating of the subject Phrenology (which *see*). In comparing the brain of man with that of the other mammalia, the most obvious distinction is its much greater size in proportion

to the size of the body. In the dog the brain bears an average proportion to the body of about 1 to 120; in the horse, 1 to 450; in the sheep, 1 to 750; and in the ox, 1 to 800. The convolutions, too, which are so marked on the human brain, are few, or altogether wanting, on the brains of animals. In particular, in animals, the medullary matter of the brain predominates in every part, while the cineritious is deficient. The nerves of sense, too, in animals are usually much more largely developed than in man. In man the olfactory nerve is not one-fourth of the size of that of the horse, though the brain is so much larger. In the smaller quadrupeds the comparative size of the brain approaches nearer to that of the human, being in the mouse about a forty-third part of the weight of the animal; but it is composed almost entirely of medullary matter. In birds, the brain is in general a much less complex organ than in mammals, presenting no convolutions on its surface, and having only a very small quantity of cineritious matter. Though its bulk is in general proportionally much smaller than the human brain, yet in some of the smaller birds, as the chaffinch and the redbreast, it approaches that of the latter. In fishes the brain is yet more diminished; in the chub being only 1 to 842, and in the lamprey 1 to 1,425. It consists merely of two pairs of gangha and a single one. The two anterior ganglia or lobes are the olfactory lobes, immediately behind which are two others, generally of larger size, called the optic lobes; while behind these is a single ganglion, or lobe, situated in the median line, and termed the cerebellum.—*Ref.* Quain's *Anatomy;* Carpenter's *Human and Comparative Physiology;* Solly *On the Brain;* Todd *On the Brain and Nerves;* Huschke, *Schaedel, Hirn, und Seele des Menschen, und der Thiere, nach Alter, Geschlecht und Race*, Jena, 1854.

Brain, Diseases of the.—The brain, which is the most delicate and exquisitely-formed of all the organs of the human body, is subject to a great variety of disorders, most of which will be treated of under their proper heads in other parts of this work, but some of which it will be necessary to notice here. Inflammation is one of the most common diseases to which the brain is subject, and may result from a number of causes,—from external injuries, as blows or falls, the symptoms of which may not manifest themselves for many days; from the improper use of narcotics or stimulants, exposure to the cold or the action of the sun's rays, protracted study, excessive joy, or other mental emotion; as well as less directly from diseases of the digestive or other organs of the body. It is characterized by more or less violent pain of the head, with suffusion or prominence of the eyes, the countenance generally tumid or flushed, and delirium or stupor. In the treatment of this disease, general and local bleeding are usually had recourse to; the latter by means of leeches applied about the head, or by cupping. The head is also usually shaved, and kept cool by rags wet with cold or iced water. Frequently, in children, inflammation leads to a form of disease known as water in the head, or hydrocephalus (which *see*). Softening of the brain is caused by the want of a proper supply of nourishment to the cerebral substance, and may arise from various causes. It is characterized by lowness of spirits, headaches, giddiness, the loss of memory, and at length imbecility and paralysis. Unfortunately, this is a disease which little can be done to remedy, especially when it results from a disordered state of the nutritient organs themselves, as from disease or obstruction in the arteries which convey the blood to the cerebral substance. Frequently it is occasioned by over-anxiety or excessive study; in which case everything is to be done to get rid of the predisposing cause. Every thought, every mental effort, destroys a certain portion of the cerebral matter; and hence, if destruction takes place more rapidly than renewal, a wasting or softening of the brain is the result. The blood-vessels, particularly in the aged, are also liable to be ruptured. (*See* Apoplexy, Convulsions, Insanity, Delirium Tremens, Paralysis.)

Brake, or Break, *brāk*, in Mach., a block of wood applied by lever or screw pressure to the circumference of a wheel, to slacken or arrest the moving power of a machine, by the production of a large amount of friction. By extension of meaning, it now signifies the railway-carriage in which is placed the brake intended to retard or stop the train when needed. Brakes are sometimes used in the form of bands of metal or leather passing round a wheel, by the tightening of which the necessary amount of friction is produced.

Brake, or Bracken. (*See* Pteris.)

Braman Lock. (*See* Lock.)

Braman Press. (*See* Hydrostatic Press.)

Bramble. (*See* Rubus.)

Brambling, *brămb'-ling* (*Fringilla montifringilla*), also called mountain-finch. This bird is rather larger than the chaffinch. The tail is forked, and its prevailing colour black, white, and yellow.

Bran, *brăn*, the skins or husks of corn, especially of wheat ground, separated from the corn by a sieve, or boulted. Large quantities of wheat bran are used for making starch. The dyers reckon bran among the non-colouring drugs, and use it for making the sour waters with which they prepare their dyes. Bran is also used as food for horses and cattle.

Branch, *bransh* (Fr. *branche*), in Bot., that part of a plant which is produced from a lateral leaf-bud on the primary axis or stem. It is looked upon as part of the stem, and not as a distinct organ. A branch generally produces secondary branches, and these give rise to minor ramifications, called *branchlets* or *twigs*. The different modes in which branches spring from the stem give rise to the various forms of trees; such as pyramidal, spreading, and weeping. Thus, in the Italian poplar and cypress, the branches are erect, forming acute angles with the upper part of the stem; in the oak and cedar they are spreading, each forming nearly a right angle; in the weeping ash and elm the angles are oblique; while in the weeping willow and birch the branches are pendulous, from their flexibility. The comparative length of the upper and under branches also gives rise to great differences in the contour of trees, as seen in the conical form of the spruce, and in the umbrella-like shape of the Italian pine. (*See* Stem.)

Branchiæ. (*See* Gills.)

Branchiopoda, *brăn-ki-op'-o-da* (Gr. *branchia*, gills, *pous*, a foot), an ord. of small crustacea, belonging to the division *Entomostraca*, which usually abound in still fresh waters. These animals have thin mouths, furnished with jaws fitted to masticate their food; and their name is derived from the peculiarity which they possess in having the *branchiæ* or gills, which are numerous, attached to the feet. They swim freely; but their feet are not generally adapted for locomotion. The antennæ, in some cases, serve as organs of motion. While swimming, they keep their feet constantly moving, and thus prevent the water from becoming stagnant.

Brandenburg, Confession of, *braṅ'-den-boorg*, in Eccl. Hist., is the name given to a formulary or confession of faith, from the city of Brandenburg, where it was drawn up by order of the elector, with a view to reconcile the differences in the tenets of Luther and Calvin, and to put an end to the disputes occasioned by the Confession of Augsburg. (*See* Augsburg, Confession of.)

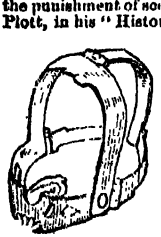
Brandeum, *braṅ'-de-um*, a term used in the Middle Ages to signify the silk or linen in which the bodies of the saints, or their relics, were laid. The name was also applied to linen clothes which had been laid on the bodies, and were thus believed to be endowed with great virtues.

Branding, *brănd'-ing* (Ang.-Sax.), a mode of punishment formerly inflicted in England for various offences. It was done by means of a hot iron applied to the face or hand. Formerly, all who were admitted to benefit of clergy were burnt with a hot iron in the brawn of the left thumb. The punishment of burning on the hand, however, being found to be ineffectual, it was changed, by 10 & 11 Will. III. c. 23, into burning in the most visible part of the left cheek nearest the nose; but this mode was repealed by 5 Anne, c. 6. It, however, continued the burning in the hand; and this last was not entirely abolished until 1823, by 3 Geo. IV. c. 38. The branding still in force for desertion from the army is not done by a hot iron, but with ink, gunpowder, or some other preparation, so as to be *visible*, and not liable to be obliterated. The mark is the letter D, not less than an inch in length, and is marked on the left side two inches below the armpit.

**Brandon**, *bran'-don* (Ger. *brand*, fire), a name sometimes given to the first Sunday in Lent, from the custom, which at one time is said to have prevailed in many places, of the peasants passing through their orchards and vineyards on that day with lighted torches, and threatening to cut down and burn the trees if they did not bear fruit in the coming year.

**Brandy**, *bran'-de*, a spirituous liquor, separated from wine by distillation. The word is derived from *brantwein*, a German word signifying *burnt wine*. It is prepared from wine in most wine-growing countries; but France, and, most notably, the town of Cognac, in the Charente, has always been considered the great brandy-producing locality. Cognac brandy is esteemed from the absence of a certain fiery flavour found in other brandies, which is caused by a very small quantity of an acrid oil contained in the skin of the grape. Brandy, when newly distilled, is as clear and as colourless as water; but, on being put into oak casks, it acquires a yellowish-brown colour, from dissolving a portion of the tannin contained in the wood. This colour is generally simulated in inferior kinds by the addition of a small quantity of caramel, or burnt sugar. British brandy, which has been the subject of numerous patents, is an attempt to produce, by fictitious means, a spirituous liquor bearing a close resemblance to foreign brandy. The best malt spirit is flavoured and coloured by various substances, ranging from French plums to oak shavings, each manufacturer having his favourite recipe. The quantity of brandy made in France is about 20,000,000 gallons, of which about 3,000,000 gallons are imported by England. Chemically speaking, brandy consists of spirit of wine coloured by tannin or burnt sugar, and flavoured by a small quantity of volatile oil that passes over during distillation.

**Branks**, *brangks*, an instrument formerly adopted for the punishment of scolds in England and Scotland. Dr. Plott, in his "History of Staffordshire," says, that it so effectually and safely corrects scolds, "that I look upon it as much to be preferred to the cucking-stoole, which not only endangers the health of the party, but also gives the tongue liberty 'twixt every dipp, to neither of which this is at all liable: it being such a bridle for the tongue as not only quite deprives them of speech, but brings shame for the transgression and humility thereupon before it is taken off: which being put upon the offender by order of the magistrate, and fastened with a padlock behind, she is led round the town by an officer, to her shame; nor is it taken off till after the party begins to show all external signs imaginable of humiliation and amendment." It was of various forms, but was usually composed of several hoops of iron, one or more of which passed over the head, and one round by the mouth, into which was inserted a plate of iron so as to press upon the tongue. The whole closed behind by hinges, and was secured by a padlock.



BRANKS.

**Brasenose College**, *brazz'-nose*, the name of one of the colleges of Oxford, founded in 1509, by the joint benefaction of William Smith, bishop of Lincoln, and Sir Richard Sutton, of Prestbury, in Cheshire. It was originally established for a principal and twelve fellows, natives of the old diocese of Lichfield and Coventry, failing whom natives of the diocese of Lincoln; and if none of these be eligible, then the most fit and learned that can be found in the university of Oxford. Eight fellowships were afterwards added, by various benefactors, between 1522 and 1886, subject to various restrictions; but, by an ordinance of the commissioners, under 17 & 18 Vict. c. 81, five of the fellowships were suppressed, and the rest thrown open. The scholarships and exhibitions of this college are numerous. Some of the open scholarships are of the value of at least £60 per annum, and are tenable for five years. The Hulme exhibitions, fifteen in number, to which undergraduates of three years' standing are capable of being nominated, are each worth £120 per annum, besides £35 to be spent in books, to be selected by the principal.

**Brash.** (*See* Rubble.)

**Brass**, *brăss* (Sax. *bræs*), a compound metal or alloy containing zinc and copper in varying proportions, according to the purpose for which it is to be used; the general composition is, however, two-thirds copper and one-third zinc. The use of brass is very ancient, the Romans having been accustomed to make it under the name of *æs*. Brass was formerly made by the following process:—Copper was first cast in shot-like masses called *shot copper*, by pouring the melted metal into water. Forty-five parts of this were mixed with sixty parts of powdered calamine (carbonate of zinc), and a quantity of charcoal powder was added to the whole. The mixture was then placed in crucibles, and subjected to the heat of a furnace for seven or eight hours, and the resulting metal was cast in granite moulds. Brass is now generally made by the direct union of its component metals. Brass is of a fine yellow colour, susceptible of a high polish. It is malleable and ductile when cold, and is more fusible and harder than copper. Great difference appears to exist amongst metallurgists as to the best proportion of copper and zinc; and the analyses of specimens of brass of known quality give very different results, varying from 63 to 81 per cent. of copper to 17 to 9 per cent. of zinc, mixed with 1 or 2 per cent. of tin or lead. The uses of brass in the arts are very numerous. The facility with which it may be cast, or worked in the lathe renders it particularly valuable for the manufacture of philosophical instruments. *Brass wire* is used exclusively for pins. *Latten* is sheet brass, and *Dutch metal* is brass beaten into thin leaves. Birmingham is the chief seat of the brass manufacture in England.

**Brassarts**, *bras'-sarts* (Fr *bras*, the arm), pieces of defensive armour which protected the arm from the shoulder to the elbow: when the front part, or outside only, of the arm was protected, the single piece that covered it was called a demi-brassart. Brassarts are sometimes called rere-braces, or arrière-bras. The brassart was worn by the Persians. In Europe, during the Middle Ages, its use, like the other parts of a suit of mail, was general. The term brassart was also applied by the people of that period to any ornament or badge worn upon the arm.



A BRASSART.

**Brasses, Monumental**, *brăs'-ses*, plates of brass of different forms, but for the most part consisting of representations of the human figure, or highly-ornamented crosses, let into slabs of stone or marble to serve as sepulchral records of the dead. The slab on which the brass was placed, forming, in some cases, part of the pavement of the church or chapel, and in others, the upper part of an altar-tomb, or the back of the recess in which the altar-tomb itself was sometimes placed under a richly-carved canopy of stone, was carefully hollowed in accordance with the outline of the brass with which it was to be inlaid, to admit of the insertion of the metal sufficiently deep to bring its upper surface on a level with that of the slab. The brass was then bedded in pitch, and fastened to the stone with rivets. The forms in which the monumental brasses were designed were various, and differed greatly in point of decoration and elaborate execution. The figure of the person commemorated by the monument was generally placed in the centre of the slab, the features, armour, folds of the dress, &c., being marked by lines deeply cut into the metal, and filled with some black substance; sometimes a canopy supported by pillars surrounded the figure, adorned with armorial bearings, which were occasionally shown in their proper colours, the metal being cut away, and the field or charges being filled with coloured enamels, a white metal being inserted to represent *argent*. Inscriptions were added, either on labels of brass let into the stone outside the canopy, or on that part of the brass immediately below the feet of the figure. These brasses were often gilt or highly polished, and when first put down they must have presented a beautiful appearance, the burnished metal contrasting with the stone in which it was inlaid, which was generally of grey marble, or

stone of a dark colour. On the continent the whole surface of the stone is covered with a plate of brass, and the figures are shown in outline on it; and in this respect the continental brasses differ from those found in this country. The most beautiful to be found abroad are in the churches of Belgium and the north of France, formerly known as Flanders, from which country the art is supposed to have been introduced into England by Flemish artists subsequently to the Norman conquest. The oldest brasses known at present in this country are those of Sir John d'Abernoun, at Stoke d'Abernon, 1277; Sir Roger de Trumpington, at Trumpington, near Cambridge, 1289; and Sir Richard de Bushngthorpe, at Bushngthorpe, Lincolnshire, 1290. This form of sepulchral memorial was much in vogue until the close of the 16th century, particularly in the eastern counties; but after this time brasses were less frequently used, falling into disrepute with the magnificent Gothic architecture of the mediæval period, and giving place, after the 17th century, to the unmeaning mural tablets that disfigure the walls of so many of our churches and cathedrals. Of the thousands of brasses that formerly existed in England little more than two thousand now remain; many were ripped from the slabs to which they were fastened, and destroyed at the suppression of the monasteries by Henry VIII., and many more during the civil war, when the Puritan soldiers of the parliament wantonly destroyed numberless ecclesiastical memorials of bygone times. To show the wholesale manner in which these valuable monumental records have been made away with, it is stated in Paley's "Manual of Gothic Architecture," that of the one hundred and twenty brasses that adorned the pavement of York Minster in 1612, only one now remains. In monumental brasses the figure is generally represented in a reclining position, with the hands on the breast as if in prayer; the head on a pillow or cushion, and the feet on the figure of an animal, a dog being generally represented at the feet of a lady, and a lion at those of a nobleman or knight. Great attention is always paid to the various details of costume, and, for this reason, these brasses present features of peculiar value to the archæologist and historian, and are invaluable in showing the style of dress and the form of armour and weapons used at various periods of the mediæval history of England. The inscriptions are generally in black letter, or letters of Gothic character, peculiar to the period in which the brass was cut: they are for the most part in Latin or Norman-French. With the revival of Gothic architecture, which is now rapidly supplanting the classic style of building introduced by Sir Christopher Wren, and followed by architects of a subsequent period, the use of brasses as sepulchral records has again been introduced, and several memorials in this form have been lately laid down both in England and on the continent. The following is the process used in taking facsimiles of brasses, or rubbings, as they are called;—White paper, tolerably thick and soft, which is made for the purpose, or cartridge-paper, is laid upon the brass, and rubbed over with heelball, a composition of beeswax, tallow, and lampblack. The incisions in the brass appear in white relief on a black ground, the heelball covering the paper with a dark coating in every part, except where the hollows in the brass offer no resistance to the rubber. Sometimes a paper of a dark colour is used, and the rubbing taken with an adhesive composition coloured with a yellow powder; and, by these means, a far better representation of the brass is obtained, as the yellow substance used imparts a metallic appearance to the paper, excepting where the incisions appear, which, from the dark colour of the paper used, resemble in colour, as well as form, the incisions in the brass itself. The following plan is sometimes adopted to obtain a durable facsimile, although the process is attended with considerable trouble:—The rubbing is pasted on a thin well-seasoned deal board, which has previously been painted in flattened colour to resemble brass as closely as possible, and brought to a very smooth surface. The white parts in the paper, corresponding to the incisions in the brass, are then carefully cut away with a graving-tool, and some of the wood below taken out with them. Hollows are thus obtained corresponding to those in the brass, which, after the paper remaining on the board has been damped and removed, are filled with black, or, in the case of armorial bearings occurring in the brass, coloured composition. The earliest collection of impressions from monumental brasses was made by Sir John Cullum, the Rev. T. Cole, and Mr. Craven Ord. It was purchased by Sir Francis Douce, and given by him to the British Museum, where it may now be seen in the print-room.—*Ref.* Paley's *Manual of Gothic Architecture;* Waller's *Series of Monumental Brasses from Edward I. to Elizabeth;* Boutell's *Monumental Brasses of England; Oxford Manual of Brasses; English Cyclopædia*—Arts and Sciences.

BRASSICA, *bras'-si-ka* (from *bresic*, the Celtic name of the cabbage), in Bot., a gen. of plants belonging to the nat. ord. *Cruciferæ*, and containing several species, which are commonly cultivated as food for man and cattle. *B. rapa* is the common turnip. The species *B. campestris* is regarded by some as the source of the Swedish turnip; but others consider this vegetable to be a hybrid between *B. campestris* and *B. rapa, or napus*. The species *B. oleracea* is supposed to be the common origin of all the different kinds of cabbage, cauliflower, broccoli, and kohl-rabi, the different varieties having been produced by the art of the gardener. Broccoli and cauliflowers are deformed inflorescences; the kohl-rabi is produced by the stem enlarging above the ground into a fleshy knob, resembling a turnip. On comparing the original plant, as found on our shores, with wavy green leaves, no appearance of head, and flowering like wild mustard or charlock, say with the red cabbage or the cauliflower, the difference is astonishing. *B. napus* yields the rape, cole, or colza seeds, from which a large quantity of bland fixed oil, much used for burning and other purposes, is expressed. The cake left after the expression of the oil constitutes the well-known oil-cake used for feeding cattle. The seeds of *B. chinensis* yield Shanghai oil.

BRATTICE, *brit'-tis*, a wooden wall or partition made in the shaft of a mine to prevent the escape of gas or water, or to assist in the ventilation, by creating an upward and downward current of air.

BRAUNITE, *brown'-ite*, a protoxide of manganese, occurring in Piedmont and Thuringia, in dark-brown square octahedrons. It contains 79 per cent. of manganese.

BRAVI, *bra'-vi* (Ital. *bravo*, brave), is a name given Italy to a certain class of individuals who engage themselves for money to perform the most hazardous enterprises, frequently murder.

BRAVO! *bra'-vo*, a term of exclamation, adopted from the Italian, and signifying excellent, or well done. It is used in English without regard to gender or number, but the Italians use *brava* for the feminine, and *bravi* for the plural. The superlative is *bravissimo*.

BRAVURA, *bra-voo'-ra* (Ital.), in Mus., a term generally applied to a song of considerable spirit and execution; but sometimes it is also applied to the performance of such a song.

BRAWLING, *brawl'-ing* (Fr. *brailler;* Belg. *brallen*, to roar), in Law, is the offence of quarrelling, chiding, or unduly, indecorously, or irreverently speaking in a church (including the vestry) or in the churchyard. The sanctity of places dedicated to the solemn offices of public worship has always been protected from violation, and from time immemorial, the *courts Christian* established in this country have been permitted to take cognizance, not only of actual breaches of the peace, but of the use of violent or abusive words, tending to induce persons to commit a breach of it. There was a time when disturbances in the church were of frequent occurrence, and sometimes carried to great extremities. In the early ages of the Reformation, disturbances were too apt to arise between the professors of different religions. To repress these, the statute 5 & 6 Edw. VI. c. 4, was passed, by which it was enacted, "That if any person shall, by words only, quarrel, chide, or brawl in any church or churchyard, it shall be lawful for the ordinary of the place where the same shall be done, and proved by *two* lawful witnesses, to suspend any person so offending, if he be a *layman*, from the entrance of the church, and if he be a *clerk*, from the ministration of his office, for so long as the said ordinary shall think meet, according to the fault." This act did not create the offence, as it sub-

sisted by the common law before the statute was enacted. A party, therefore, may proceed either upon the statute or upon the ancient law. In the latter event, one witness is sufficient to prove the fact. With regard to what may constitute the offence, there is a discretion in the court which would induce it to consider *time* and *place*. That might be chiding and brawling in a church which might not be so in the vestry. The latter is a place for parish business, and the court would not interpose further than might be necessary to preserve order and decorum. Therefore, it has been held, that in a vestry meeting for civil purposes, as a full latitude of discussion must be allowed, mere coarse expressions do not constitute brawling. But even there parties must not press their opinions in an indecorous and irreverent manner.

BRAYERA, *brai-é'-ra*, in Bot., a gen. of plants belonging to the nat. ord. *Rosaceæ*, sub-ord. *Rosaceæ*. The only interesting species is *B. anthelmintica*, a native of Abyssinia, the flowers of which constitute the drug known as Kousoo, which has lately been employed in both France and England with considerable success for expelling tapeworm. The flowers are apetalous and dicœcious, and are imported in a dried state. The mode of administering the Kousoo is peculiar About half an ounce is infused in a glass of warm water, and taken thus, flowers and water together, on an empty stomach. The flowers contain a considerable quantity of tannin, and an odorous principle to which the anthelmintic property is probably owing.

BRAZIL NUT. (*See* BERTHOLLETIA.)

BRAZIL and BRAZILETTO WOODS. (*See* CÆSALPINIA.)

BRAZING, *braize'-ing*, the soldering or joining two pieces of iron together by means of thin plates of brass melted between the pieces that are to be united.

BREACH, *breech* (Fr. *brèche*; bax. *breccan*, Ger. *brechen*, to break), in Mil., a term used to denote an opening made in any part of the rampart of a citadel or fortress by a continuous cannonade directed against that particular part by the besieging forces, in order to obtain an entrance over the ruins and debris of the shattered wall. As soon as the breach is effected, and the stones as well as the rubbish and earth behind the wall are brought by the firing into the form of a rough inclined plane, a storming party is told off, and the works are carried by assault. To effect a breach, the breaching-battery is brought as close to the walls as circumstances will admit, that the fire may be directed in a line almost perpendicular to the face of the rampart. Sometimes the desired purpose is attained by mining. The attack and defence of a breach is obstinately conducted on both sides, and is always attended with considerable bloodshed and loss of life. At the siege of St. Sebastian, during the Peninsular war, about 100 feet of the curtain between two bastions was brought down after a fire kept up for nearly seven weeks, during which 13,000 shots were fired; it was then taken by storm, the assaulting column being under the command of General Graham, afterwards Lord Lynedoch, August 31st, 1813. The French gave the storming-column a warm reception, having defended the breach with strong chevaux-de-frise, consisting of sword-blades and bayonets fastened to beams of wood, and shells, and powder-barrels, which were fired by means of a train communicating with them, while the rugged slope was strewn with planks and pieces of wood, studded with spikes and nails and sharpened iron. Under the system introduced by General Todtleben at the siege of Sebastopol, of constructing earthworks on an extensive scale, for the defence of a besieged town, a breach can be more readily repaired, although the enormous projectiles that can be hurled against any defensive works from the rifled cannon of the present day, will render the formation of a breach a more easy task, and sooner accomplished than it was formerly.

BREAD, *bred* (Ger. *brod*, or, Ang.-Sax. *brayed*, from *brey*, to pound in a mortar), a very important article of food, made by baking, in an oven or pan, a mass of dough composed of the flour of different grains mixed with water. Bread has been used as food by mankind from the very earliest times. The necessities of man's nature have been the origin of many of our useful arts; and the discovery that grain when moistened and afterwards heated could be made into a palatable, durable, and nutritious food, must have been considered a very important one. This is probably the earliest form in which bread was made. The next step would be the pounding of the grain between stones, and the formation of flour; the last step would be the baking of loaves or fermented bread. It is mentioned in the Scriptures that Abraham made unleavened bread; and also that, in the time of Moses, leavened bread was used (Exod. xii. 15). The baking of unleavened bread is a very simple matter to understand, —the ordinary sailor's biscuit is an example (*see* BISCUIT); but the baking of leavened or fermented bread is a complicated although common process. Bread is made from the flour of any of the cereals—wheat, rye, barley, oats, &c.; but as wheat is the most nutritious grain, it is most generally used. It is also the only grain from which a light porous bread can be made. Wheaten dough, cleared from the bran or husks of the grain, consists of water, gluten, starch, sugar, and dextrine, or British gum. If dough is left by itself in a temperature between 80° and 120°, fermentation slowly takes place. The starch is first converted into sugar, and then into alcohol and carbonic acid; if baked at this period, a light bread with an agreeable relish is procured; if, however, the fermentation goes on too long, acetic acid is formed, and a heavy bread with a sour taste is the result. In order to procure a more perfect fermentation, a *leaven* is employed. The leaven is either a piece of dough in a fermenting state or yeast, a substance produced in beer while in the act of fermentation. Yeast is most generally used, as it is quicker and more certain in its action than the leaven of dough. In order to bake a loaf of bread, a small quantity of yeast is well kneaded into a mass of dough, and allowed to remain in a moderately warm place. Fermentation begins to take place; and, as the carbonic acid and alcohol are disengaged, they struggle up through the elastic mass, and the loaf begins to "rise." It is then put into the oven, where the increased heat causes the further expansion of the inclosed gas and vapour. The process of fermentation is soon checked by the high temperature, and a light porous bread is at last produced. Well-baked bread is known by its lightness, and the regularity of the size and distribution of the small cells formed by the carbonic acid gas and alcohol. Home-made bread is mostly sweeter, lighter, and more retentive of moisture than bakers' bread. The following process is largely employed in the trade:—Mashed potatoes, water, and patent yeast are mixed together to form a *ferment*. After the quantity of flour required has been put into a trough and mixed with water, not too cold, the *ferment* is added and well stirred with the hands. It is then strained through a sieve, more flour added, and the whole well mixed; after a little flour is sprinkled over the top, the dough is allowed to stand for five or six hours. During this time, the *sponge*, as the dough is called, rises twice. The first rising is allowed to break and fall down; but upon the second rising, just before breaking, a quantity of water is poured into the sponge, together with salt, and sometimes alum. The whole is then well mixed together again, and, after standing for some time, is divided into the necessary sizes and conveyed to the oven. The amount of potatoes added to the flour in this process is very small, the proportion being 8 lbs. of potatoes to every 280 lbs. of flour; but some cheap-bread bakers use a much larger quantity. It is technically called *fruit* in the trade. It is a comparatively harmless adulteration; but the alum, or *stuff*, is a more objectionable addition. By using alum, a much whiter quality of bread is produced; how this bleaching operation is effected is not thoroughly understood. Alum also causes the loaves to break from each other with a much smoother surface than when bread is baked without it. Common salt is also used for the same purpose; and on the continent small quantities of sulphate of copper have been used by the bakers. It not only produces a white bread from inferior kinds of flour, but adds greatly to the retentive capabilities of bread for water. Sulphate of copper has never been discovered in English bread. Besides being much adulterated with mashed potatoes, rice flour is often found in bread. Rice flour absorbs and retains a large quantity of water. Carbonate of magnesia is

also used; it improves the colour of the bread, and also enables it to absorb more water. In these latter cases the consumer is cheated out of a quantity of nutritious flour, and presented with water in its place. Another class of adulteration is that of certain earthy substances, which are white and tasteless, and only add to the weight of the bread; such as chalk, bone-dust, plaster of Paris, white clay, &c. These are all easily detected by chemical tests. When wheat flour is adulterated with rice flour, barley flour, or any other inferior flour, the adulteration can be discovered readily with the microscope. The presence of mineral substances can also be ascertained in the same manner. The different varieties of bread are made from the various qualities of wheat flour. (*See* Flour, Wheat.) None of the bread made from the other cerealia is so nutritious as that made from wheat. Brown bread is made from wheat meal in which the husks have been ground up with the rest of the grain. It is considered by Dr. Liebig and other chemists to be much more nutritious and wholesome than ordinary white bread.

Bread, Day of (Lat. *dies panis*), was one of the names given in early times to the Lord's day. Chrysostom says that it arose from the general custom observed in the primitive church of meeting together on that day to break bread and to receive the communion.

Bread-Fruit. (*See* Artocarpus.)

Bread-room, *bred'-room*, a name given to the place where the biscuits are stored on board ship. It is always protected from damp, and kept warm.

Breadth, *bredth* (Sax. *brad*), a term in Paint., used to denote a method of treatment by which harmony of effect, and a judicious and proper blending of distant light and shadow, is obtained in the background of a picture, without entirely neglecting detail and throwing it into a hazy, confused, undefined mass, as was the custom of the early landscape-painters, in the background of whose pictures nothing could be distinguished. Of Turner's paintings, Mr. Ruskin observes, that "the conception of every inch of distance is absolutely complete and clear in the master's mind . . . but yet, clearly and fully as the idea is formed, just so much of it is given, and no more, as nature would have allowed us to feel or see . . . not one line out of the millions there is without meaning, yet there is not one which is not affected and disguised by the dazzle and indecision of distance. No form is made out, and yet no form is unknown." Mr. Ruskin further remarks, that "breadth is not vacancy," and tells us that "generalization is unity, not destruction of parts; and composition is not annihilation, but arrangement of materials. The breadth which unites the truths of nature with her harmonies is meritorious and beautiful; but the breadth which annihilates those truths by the million is not painting nature, but painting over her." Proper breadth of treatment is therefore obtained by a truthful adherence to natural effects, and in the production of masses of distance, which are the results of "right concords and relations of details," instead of such as result from the disappearance of details altogether.—*Ref.* Chambers's *Encyclopædia*.

Breakers, *brak'-kers* (Sax. *bræcan*, to break), in Mar., a term applied to a peculiar kind of billows that may be easily distinguished by the white foam with which they cover the surface of the sea, and the terrible roaring noise which they produce. Breakers are generally found in shallow parts of the ocean, where rocks lie hidden below the surface, over which they break with great violence; and when once a ship is driven amongst them, it is almost impossible to save her, as every billow that heaves her up serves to dash her down again with additional force, when it breaks over the rocks or sands beneath.

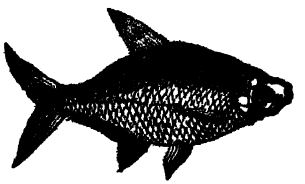
Breaking Bulk, *brai'-king*, in the law of Scotland, is when a buyer makes use of an article, or a portion of it, after which he cannot object to it on the plea of inferiority, or return it to the seller. Traders ought invariably to challenge on ascertaining defect in a commodity; else delay will exclude the objection, however well founded.—*Ref.* Bell's *Principles of the Law of Scotland*.

Breaking Ground, in Mil., a term applied to the opening of trenches and commencing the operations of a siege.

Breaking-up of Ships, is a term applied to the operation of ripping off the planks and general demolition of a vessel when, from any circumstance, she becomes unserviceable.

Breakwater, *brak'-wau-ter*, a barrier or artificial bank of stone, so placed as to break the force of the sea, before the entrance into a roadstead or harbour. Plymouth Breakwater is a very extraordinary example of this kind of barrier. The sound or opening into the harbour of Plymouth was very much exposed to the heavy seas of the Channel, whenever there were gales from the south-west. Many ships and many lives were lost through its exposed state. The formation of a breakwater was first proposed by Lord St. Vincent to Lord Howick, then first lord of the Admiralty, in 1806; but it was not until 1812 that Messrs. Rennie and Whidby's plan was adopted and the work commenced. The mode of proceeding was that of depositing in mid-channel large blocks of limestone obtained from a neighbouring quarry. These stones were conveyed to the site of the breakwater in vessels of peculiar construction, having openings in the stern, out of which the stones were cast into the sea. In the year 1841, 3,000,000 tons of stone had been deposited. The breakwater, which is thrown across the middle of the sound, lies almost due east and west, and is completely isolated, leaving a channel of half a mile on either side. The centre portion, which is straight, is 1,000 yards in length, and there are two wings 350 yards long respectively, which incline towards the north at an angle of 120 degrees to the straight portion. The breakwater stands three feet above the level of the highest spring tide, is 120 yards broad at the base, 16 yards at the top, and has an average height of 14 yards. The sides, which have a considerable slope, and the top are faced with masonry. The efficiency of the breakwater as a protection to the harbour has often been proved, and two years after it was commenced, ships of all sizes began to take shelter behind it, although only 800 yards of the work were then just visible at low water. The breakwater at Civita Vecchia, which was constructed by Trajan about A.D. 100, is remarkable, as it appears, according to Pliny the younger, that it was made in a very similar manner to that at Plymouth.—(Plin. lib. vi. epist. 31.) Portland Breakwater, which is at present in course of construction, will be a very important protection to shipping when completed. It is composed of freestone from the neighbouring promontory of Portland Isle. The work, which is almost entirely accomplished by convicts, was commenced in 1847. The breakwater, which stretches southward from Portland Bill, will be two miles in length when completed. It is so built as to be of service to shipping as a quay or pier. There will also be openings, at intervals, to allow vessels to pass through. The current round Portland Bill, commonly called Portland Race, was very dangerous, and the present breakwater, by breaking its force, will make Portland Road and Weymouth Bay more secure harbours of refuge. Dover Breakwater, which has been many years in construction, has made very little progress, and has cost the nation an enormous sum of money. The water is very deep, there being seven fathoms at low water; and as there is no stone in the neighbourhood with which to make a mound, as at Portland, the workmen are obliged to build it up from the bottom, in diving-bells, with blocks of granite secured with concrete. Holyhead Breakwater, built in order to protect the harbour of Holyhead, is constructed similarly to that of Plymouth and Portsmouth. A harbour of refuge and breakwater have also been constructed on the north side of the island of Alderney. The breakwater is an extensive work, and is constructed in deep water, twelve fathoms at low tide. Cherbourg Breakwater is the most gigantic work of the kind, and has cost, since its commencement, 67,300,000 francs. It was commenced in 1783, under Louis XVI., was recommenced by Napoleon I. in 1802, and was finally completed in 1854, under Napoleon III. This breakwater, which is 2¼ miles in length and 65 feet in depth, stretches with a slight curve, the convex to the north, across the mouth of the bay, leaving a passage 1,000 yards wide on either side. It is principally built of granite and sandstone. (*See* the towns and places *referred to* in vol. I. of this work.)

**Bream**, *breem* (Fr. *brème*) (*Abramis Brama*), a fish of the Carp fam., found in deep and still parts of rivers. In proportion to the length of the body, this fish is extremely deep and thin. In length, it is about two *feet*. Its flesh is not in very high repute.

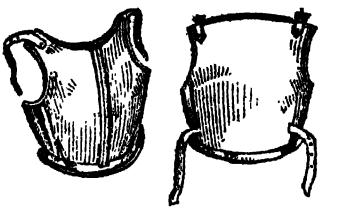


BREAM.

**Breast**, *brest* (Sax. *breost*), in Anat., is a term applied to the whole of the anterior part of the thorax. In a more restricted sense it is applied to the two globular fleshy protuberances adhering to the antorior and lateral regions of the thorax of females, and containing the mammary or lacteal glands. On the middle of each breast is a projecting portion termed the *papilla* or nipple, in which the excretory ducts of the glands terminate, and around which is a coloured orb or disc called the *areola*. The use of the breasts is to secrete milk for the nourishment of newly-born infants. They are composed of common integuments and adipose tissue, in which are lodged numerous ducts radiating from the nipple, and afterwards dividing and subdividing into branches and twigs until they terminate in very minute vessels. The enlargement of the breasts is one of the signs of womanhood. Their fullest development commences in the earlier stages of pregnancy, and they continue to increase in size until about the time of delivery, when they are filled with the lacteal fluid, which passes readily on suction into the mouth of the child. The breasts of females are subject to a variety of disorders, one of the most common of which is inflammation. It may be produced by various causes, as, a blow, exposure to cold or wet, great mental excitement, excessive accumulation of milk, or undue pressure on the parts. It occurs most frequently within the first three months after parturition, and is characterized by great heat, pain, redness, and swelling of the breasts. The pain is intense, and of a throbbing nature, and often extends to the axillary glands. The breasts become tense, heavy, and painful to the touch; and there is high inflammatory fever. The treatment consists in the application of leeches and warm fomentations to the part, and the administration of purgatives. If the inflammation do not subside in a few days, suppuration may be expected. In general the abscess may be left to nature; but when it occasions much pain, it is advisable to get rid of it by a free incision. Chronic inflammation sometimes seats in the breast, in which case stimulant applications will be found useful. Where this is attended with abscess, it should be opened, so as to give free exit to the pus, and pressure applied to the part. The breast is also subject to various kinds of tumours, some of which may be got rid of by simple pressure, and attendance to the general health. Sometimes some of the lactiferous ducts are blocked up, producing an enlargement termed lacteal tumour. It is to be remedied by puncturing the duct, and keeping it open for some time. Occasionally great pain and uneasiness is felt in the breast from sympathy with other parts of the system. There is no inflammation, swelling, or external alteration of the mamma, and yet the pain is sometimes excessive, usually intermittent. In this case the general health is chiefly to be looked after. Women are frequently subject to *sore nipples* after childbirth, occasioning great pain. In such cases care is to be taken to keep the nipples as dry as possible; and an application of glycerine is generally found useful. Nipple-shields of ivory or glass, with India-rubber teats, should also be used when the nipples are too tender to bear the application of the child's mouth. (For cancer of the breast *see* Cancer.)

**Breast**, in Min., a term used by miners to denote the mass of coal or ore upon which they are working.

**Breastplate**, *brest'-plait* (Sax. *breost*, breast; Du. *plaat*, plate), a piece of defensive armour, made of steel or iron, formerly used to protect the chest. Breastplates, termed cuirasses, are still worn by the Life-guards and Horse-guards in this country, and by the magnificent Cent-gardes of the emperor of France. They are ornamental, but expensive, and far from useful, as they are not ball-proof. The breastplate was first adopted instead of chain-mail by the Florentines, in the early part of the 14th century, and before 1400 its use had become general throughout Europe. In mediæval armour it was attached to the back-plate by buckles and straps of leather. It was often made of



BREASTPLATE. BACKPLATE.

highly-polished steel, and damaskeened, or inlaid with gold. Specimens may be seen in the collection of armour in the Tower of London. The hinder half of this article of defensive armour is called a backplate. Among the ancient Jews, the breastplate formed part of the ornaments of the high priest, and was composed of richly-embroidered stuff. It was about ten inches square, and had upon it twelve precious stones set in gold, on each of which was engraved the name of one of the tribes of Israel: they were arranged in four rows, three in each row. The breastplate was fastened on the breast of the high priest by the four corners; those at the top to each shoulder-piece, by a golden hook or ring at the end of a wreathed chain, and those below to the girdle of the ephod, by two blue strings or ribbons, which had likewise two rings and hooks. This ornament was never to be separated from the priestly garments, being designed to remind the priest how dear those tribes should be to him whose names he bore upon his heart; and hence it was called "the memorial." It was also called "the breastplate of judgment," probably because it contained the Urim and Thummim, and revealed the judgment and will of God.

**Breastplough**, *brest'-plow* (Sax. *breost*, breast, *ploge*, plough), a plough driven by the breast, used to cut or pare turf.

**Breast-wheel**, *brest'-wheel* (Sax. *breost*, breast, *hweol*, wheel), a variety of water-wheel, which may be divided into two classes,—the high breast-wheel and the low breast-wheel. In the former case, the wheel is moved by the *weight* of the water, which it receives a little above the height of its axis. In the latter case, the wheel is moved by the *impulse* of the water, which it receives a little below the level of its axis. (*See* Waterwheel, Hydrodynamics.)

**Breastwork**, *brest'-work* (Sax. *breost*, breast, *weorcum*, *wyrm*, work), in Mil., a mound of earth, with a dry ditch in front, formed by the excavation from which the earth that makes the mound is taken, hastily thrown up for the protection of troops on outpost duty or in any exposed situation. A row of gabions filled with earth, for the shelter of men in the trenches or elsewhere, is also called a breastwork. An effective breastwork may be readily extemporized by felling a few trees, interlacing the branches, and filling the interstices with sods and earth. The breastwork must not be confounded with the epaulement and parapet. (*See* Epaulement, Parapet.)

**Breath**, *breth* (Sax. *bræth*), is the air which is inhaled and expelled in respiration. (*See* Respiration.) Much can be gathered by the skilful physician as to the condition of the internal organs from the manner of breathing,—if it be short and rapid, slow and laboured, painful, &c. *Fetid*, or *offensive breath*, to which some people are subject, may arise from a variety of causes, and is to be treated in as many different ways. Sometimes it is owing to a deranged state of the digestive organs, and in this case purgatives and tonics are to be administered. Occasionally it arises from a diseased

condition of parts about the mouth or nose, as decayed teeth or morbid secretions about the tonsils. In such cases, the teeth should be frequently cleaned, and the mouth should be washed with a weak solution of chloride of lime or soda. Inhalation of steam from hot water, into which some creosote has been dropped, is recommended in cases in which the cause resides in the nose and respiratory passages. The injection of a lotion of sulphate of zinc or copper, by means of a syringe, into the nostrils will frequently be of use when the disorder has its seat there. Fetid breath may also arise from a diseased state of the lungs. Where it cannot be remedied, it will be well for the patient to chew a little cinnamon occasionally, or to take some of the aromatic pills prepared for the purpose.

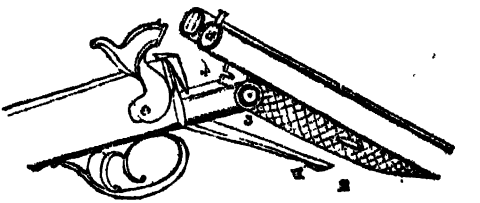
Breath-Figures (Sax. *brath*, breath; Lat. *figura*, figure).—If a clean surface of glass or any other polished substance be written on with a blunt-pointed instrument, and the surface be afterwards breathed upon, the characters written will become visible; or if the surface be first breathed upon, and the characters then marked upon it, they can be again made perceptible by breathing again upon the surface. These form what are called *breath-figures*, which may be produced in several ways. In 1813 Moser informed Humboldt that "if any two bodies be brought sufficiently near each other, and face to face, one of them impresses its image on the other;" thus, if a coin be placed for any length of time upon a piece of polished metal, the metal will retain an impression of the coin, and exposure to the vapour of water, iodine, or mercury, will make it visible. A glass used to protect an engraving will receive an impression of the engraving on its inner surface, although it is not in absolute contact with it. Engineers have remarked that those parts of machines which are in contact with, or near each other, rapidly and easily impress themselves upon each other. The famous Parisian watchmaker Breguet has stated that the letters and inscription on the back of the inner cases of his watches have been often found impressed on the inside of the outer cases. Perfect impressions of objects may be produced by means of electricity; and remarkable varieties of roric figures can be impressed upon glass surfaces by means of a small electrical machine, a Leyden jar, and a discharging-rod. Photographers know that the state of the breath has a very considerable influence on the plates they use; and its effect upon other arts has been remarked in the *Dict. des Arts et Métiers*, Lyon, 1801. Artists in enamel-painting are taught that no one should be allowed to approach their work who has been taking mercurial medicines or eating garlic.

Breccia, *brech'-cha* (Ital., a crumb or fragment), in Geol., a rock consisting of angular fragments bound or cemented together by calcareous, ferruginous, or silicious matter. Such a rock differs from a *conglomerate*, or *puddingstone*, in having its component fragments irregular and sharp, whereas the pebbles of the latter are rounded and water-worn. (*See* Conglomerate.)

Breech of a Gun. (*See* Gun.)

Breeches Bible. (*See* Bible.)

Breech-loading, *breech-lo'-ding* (Fr. *brèche*, Ger. *bruch*, a breach; Sax. *klad*, to load), in Gunnery, an expression applied to the method of making heavy pieces of ordnance and field-pieces, as well as rifles and fowling-pieces, with a movable breech, to admit of the charge being inserted at the breech end of the gun instead of the muzzle. Breech-loading guns are infinitely superior to those constructed on the old principle, as they can be loaded with much greater rapidity, and can be cleaned with greater readiness and safety; the bore of the gun can also be more accurately grooved in the case of rifled pieces, and the calibre exactly preserved in the construction of smooth bores; and the bullet or projectile can be better adapted to fit the grooves of the piece or calibre of the bore. The addition of mechanism is required to secure the breech to the main part of the gun, and to insure sufficient strength to resist the explosive force of the powder. This renders a weapon constructed on this principle more expensive; but the outlay is counterbalanced by the saving effected in metal, expenditure of powder, and the facility with which the pieces composing a field battery can be moved from one place to another, as rifled breech-loading guns are not more than half the weight of pieces of ordinary construction and of the same calibre. Among heavy ordnance constructed on this principle may be named the Armstrong and Whitworth guns (*see* Armstrong Gun, Whitworth Gun), and, among rifles and fowling-pieces, the French *crutch gun*, or *le Faucheux*, a comparatively old invention, the Prussian needle-gun, and Jacob's and Henry's rifles. (*See* Henry's Rifle, Jacob's Rifle.) The



Breech-loader.

accompanying illustration shows,—1. A lever which opens the mechanism, but at other times lies flat against the gun. 2. A slide that assists in the opening and closing. 3. A central pivot round which the movement is made. 4. A notch, which allows the barrels to be so placed as to be easily loaded at the breech when a hook is liberated. 11 is a pin which, when struck by the hammer, transfers the blow to a cap inserted in the cartridge.

Breeding, *brede'-ing* (Sax. *bredan*, *brædan*, to breed), is the method of multiplying and improving the quality of domestic animals rapidly. Great attention has been paid to the subject of breeding since the commencement of the present century, one notable result being that within the last thirty years the weight of mutton produced has nearly been doubled in proportion to the number of sheep. If a proper supply of food is furnished, any breed of animals will perpetuate itself: the various breeds of wild animals are instances of this fact. But when assiduous attention is paid to the breeding of domestic animals, varieties are produced which are more useful and profitable than the wild breeds, on account of particular properties which they possess. The first point of importance in breeding is the selection of the animals with which to propagate a useful race. These should always be the finest animals possible; and great improvements in the stock existing on a farm are often produced by the introduction of males of a superior quality. In breeding, the purposes for which an animal is reared must always be taken into account. The breeding of horses has occupied attention much longer than that of oxen and sheep. One class of horses is bred for speed, another for conveying rapidly between different places, another for mere labour, or to assist human strength. By attention to the breeding, great excellence has been arrived at in each of these varieties. Strength and speed in their extremes are never present in the same animal; but a combination of the two is most useful. (*See* Horse.) The properties desired in sheep and oxen are very different from those required in horses. The fleeces and hides of the former are used as raw materials for manufacture, and their flesh as food. The breeder of oxen and sheep sometimes has the perpetuation of good qualities in view, and sometimes the production of the largest quantity of beef or mutton possible. Since attention has been paid to the breeding of these animals, they have been sent to market at a much earlier age. Sheep and oxen which have been thus improved are both distinguished by small heads, small bones, short legs, and fine skin. Wild animals have precisely opposite qualities. In breeding any domestic animal, a near relationship should always be avoided. The principal points to be observed in breeding are as follows:—The kind of animal from which the breed is desired should have distinguishing points, which ought always to be kept in view. The most perfect forms should be selected, and all defects should be corrected with patience and perseverance. Sudden

should always be avoided, and, if possible, two

or more families of the same kind should be bred distinct, only occasionally crossing them together. The more improved a breed becomes by this means, the more difficult becomes the selection of the animals by which to continue it, and very often, on account of this difficulty, a highly-improved breed will degenerate. (*See* OXEN, SHEEP.)

BREEZE, *breeze*, small cinders mixed with ashes, used as fuel in brick-kilns. The word is apparently a corruption of the French word *braise*, live coal.

BREEZE (It. *brezzia*), in Mar., a shifting wind that blows during certain hours of the day and night, from sea and land alternately, and is only sensibly felt near the coast. The sea-breeze generally rises about 9 in the morning, proceeding slowly, in a fine curl on the water, towards the shore, gradually increasing until 12, and dies away about 5, when it is succeeded by the land-breeze, which also continues increasing until midnight, and is again followed, in the morning, by the sea-breeze. Breezes differ from *etesiæ*, or trade-winds, inasmuch as the former have their periods daily and nightly, and are only found near the coast, while the latter are annual, and blow at a distance from land.

BREEZE-FLY. (*See* BOT-FLY.)

BREHON LAWS, *bre'-hon* (Lat. *brehonicæ leges*), were the general rules of law observed in Ireland by the Brehons, at the time of the conquest of that country by Henry II. The Brehons were the provincial judges among the ancient Irish. By some writers they are said to have been a distinct tribe, having competent lands allowed to them in inheritance; by others to have been hereditary magistrates attached to various tribes. Their decisions were generally made in the open air, on the tops of hills; where particular spots are frequently called, to this day, Brehon chairs. In criminal cases the Brehon had the eleventh part of all the fines, which could not but be considerable at a time when murders, rapes, robberies, and the like offences, were only subject to pecuniary commutations. When the conquest above mentioned was effected, the laws of England were received and sworn to by the Irish nation assembled at the council of Lismore; and afterwards, King John, in the twelfth year of his reign, went into Ireland, and carried over with him many able sages of the law; and there, by his letters patent, in right of the dominion of conquest, is said to have ordained and established that Ireland should be governed by the laws of England, which letters patent Sir Edward Coke apprehends to have been there confirmed in parliament. But to this ordinance many of the Irish were averse to conform, and still adhered to their Brehon law; so that both Henry III. (A. R. 30; 1 Rym. Fœd. 442) and Edward III. (A. R. 5; 3 Pryn. Rec. 1218) were obliged to renew the injunction; and at length, in a parliament holden at Kilkenny, 40 Edward III., under Lionel, duke of Clarence, the then lieutenant of Ireland, the Brehon law was formally abolished, it being unanimously declared to be indeed no law, but a lewd custom crept in of later times; and yet, even in the reign of Queen Elizabeth, the wild natives still kept and preserved their Brehon law, which Spenser describes as being "a rule of right unwritten, but delivered by tradition from one to another, in which oftentimes there appeared great show of equity in determining the right between party and party, but in many things repugnant quite both to God's laws and man's." The latter part of this character is alone ascribed to it by the laws of Edward I. and his grandson. Spenser was wrong in speaking of the Brehon laws as an unwritten code; for several fragments of them are still in existence in public and private libraries in Ireland, Belgium, and England. A translation of these laws has for the last eight or ten years been in course of preparation for publication at the expense of the English government. The greatest number of manuscripts of the Leges Brehonicæ brought together were those in the Chandos collection, containing twenty-two sheets and a half closely written, full of abbreviated words, and not very legible. Spenser and some modern writers have stigmatised these laws as most wicked, because murder was compounded by bribery. But the principle of pecuniary compensation for all crimes pervaded equally the Anglo-Saxon laws and those of all the German nations. —*Ref.* 4 *Inst.* 388; Edmund Spenser's *State of Ireland*, p. 1513, edit. Hughes; Pryn. on 4 *Inst.* 249; 2 *Pryn. Rec.* 85; *Co. Litt.* 141; Rymer's *Fœdera*; 3 *Pryn. Rec.* 1218.

BRENT GOOSE. (*See* GOOSE.)

BRESSUMMER, *bres'-sum-mer* (Fr. *sommier*, a lintel), the name given to any large beam used to support a superincumbent mass of masonry; such as the beam placed over a shop-window to receive the weight of the front of the building that rises over it. A beam placed across the ceiling of a room, to support a partition above it, is also a bressummer. The word is sometimes spelt *breastsummer* and *brestsummer*.

BRETHREN, *breth'-ren* (plural of SAX. *brother*), a term frequently applied to each other by the professors of the Christian religion. It occurs frequently in the New Testament, and was current in the early church. Subsequently it came to be applied to the complete members of the church, as distinguished from the catechumens. It came, also, to form part of the name of several religious sects; as, the Bohemian Brethren, Plymouth Brethren, &c.

BRETHREN AND CLERKS OF THE COMMON LIFE, was the name assumed by a religious fraternity that made its appearance about the end of the 15th century. They lived under the rule of St. Augustine, and are said to have been eminently useful in promoting the cause of religion.

BRETHREN AND SISTERS OF THE FREE SPIRIT, in Eccl. Hist., the name of a sect which sprang up towards the close of the 13th century, and gained many adherents in Italy, France, and Germany. They took their name from Rom. viii. 2, 14, and maintained that the children of God enjoy through the Spirit a perfect freedom from the obligations of the law. They were pantheistic in their creed, holding that all things flowed by emanation from God, that rational souls were portions of the Deity, and that by the power of contemplation they became united to him, being thereby freed from sinful lusts and the common natural instincts, and acquiring a glorious and sublime liberty. Hence they concluded that the person who was thus absorbed in the Deity became a part of the godhead, and was freed from the obligations of all laws human and divine. They treated with contempt all Christian ordinances and all external acts of religion, as unsuitable to the state of perfection at which they had arrived; and many of them are said to have lived very licentious lives. Many edicts were published against them, but, notwithstanding the severities practised against them, they continued to exist till about the middle of the 15th century.—*Ref.* Mosheim's *Ecclesiastical History*.

BRETHREN OF THE CHRISTIAN SCHOOLS (Fr. *Frères des Ecoles Chrétiennes*, also *Frères de la Doctrine Chrétienne*), a religious order instituted at Rheims in 1681, by Abbé de la Salle, and approved by Benedict XIII. in 1724. Its object was to afford gratuitous instruction to the children of the poorer classes, in the elements of religion and primary education. The members take upon themselves the vows of chastity, poverty, and obedience, taken at first for three years, and then renewed for life. This order has been of the utmost benefit in the cause of of education down to the present time. In 1856 it numbered no fewer than 1,235 schools with 252,215 pupils in France, and 88 schools with 16,799 pupils in Belgium; besides numbers in other countries. They have from time to time modified their instruction to the wants of the classes whom they teach, and instruction in many of the higher branches of education is now communicated.

BRETHREN OF THE HOLY TRINITY, an order of monks founded in France towards the close of the 12th century. They were also called Mathurines, and Brethren of the Redemption of Captives, the redemption of Christian captives from Mohammedan slavery being one of the principal objects of their institution.

BRETHREN, PLYMOUTH. (*See* PLYMOUTH BRETHREN.)

BRETHREN, UNITED, MORAVIAN, OR BOHEMIAN. (*See* BOHEMIAN BRETHREN.)

BRETHREN, WHITE (Lat. *Fratres Albati*), in Eccl. Hist., was the name given to the followers of a priest from the Alps, who made their appearance about the beginning of the 15th century, and were arrayed in white garments. Their leader carried about a cross, and endeavoured to persuade the European nations to renew the holy war. He practised many acts of mor-

tidation and penance, and pretended to divine revelations; and from his apparent sanctity and devotion drew together a great number of followers. He was ordered to be apprehended by Boniface IX., and was committed to the flames, upon which his followers dispersed.

**Brets and Scots, Laws of the,** *brets*, was the name given to the code of laws in use in Scotland in the 13th century, and which was proscribed by Edward I. of England, after his subjection of the country in 1305. The Brets were the descendants of the ancient Romanized Britons, who inhabited the southern portion of the country. The Scots, properly so called, appear to have come from Ireland about the 4th century, and to have settled originally on the west coast, whence they overran the northern parts of the country. These two races became united under one king in the early part of the 12th century. Of the laws of the Brets and Scots only a small fragment has been preserved, reprinted by Sir John Skene in his *Regia Majestas*, and more recently in the "Acts of the Parliament of Scotland." It fixes the value of each one's life, which, if he were slain, was to be paid to his kindred. Thus, the value of the king's life was 1,000 cows, or 3,000 pieces of the coin called *ores*, each of which was equal to sixteen pennies. The king's son, or an earl, was valued at 150 cows; an earl's son, or a thane, at 100 cows; the son of a thane, 66⅔ cows. The value of a married woman was one-third less than that of her husband; and of an unmarried woman the same as her brother. Other laws fix the amount of fine to be paid for drawing blood, according to the rank of the wounded person and the place of the wound.—Ref. *Chambers's Encyclopædia. Scotland in the Middle Ages*, by Cosmo Innes. 1860.

**Brettice.** (*See* Brattice.)

**Bretwalda,** *bret-waul'-dă*.—After the division of England into the Heptarchy under the Anglo-Saxons, each kingdom was governed by its own monarch. It is supposed, however, that they sometimes united together under one head or chief, called the Bretwalda. He was a temporary war-king, who governed the whole of the Saxons in the seven kingdoms, and led the troops to battle against their common foes, the Celts. (*See* Anglo-Saxons.)

**Breve,** *breev* (Ital., from Lat. *brevis*, short).—This note (much used in ancient music) was, according to the notation of Guido d'Arezzo, equal in duration to two whole bars; its present value, however, is equivalent to two semibreves, four minims, or eight crotchets. It was formerly written of a square figure, but at the present time is the same shape as a semibreve, with the addition of two lines on each side. It is seldom or ever used now, except in cathedral music.

**Brevet,** *bre-vet'* (Fr. *brévet*, a writ, warrant).—General promotion by brevet, applicable to captains in the army and marines, and commanders in the navy, and all officers above the ranks named in each service respectively, conveys increase of pay, as well as position at the same time, which brevet rank does not. (*See* Brevet Rank.) Since the reign of James II. it has formed part of the system of promotion in the army. Formerly it was resorted to at least once in six years; but latterly it has been conferred only on particular occasions, such as the accession of a sovereign, a coronation, the birth of a prince, the commencement or conclusion of a war, &c. A brevet adds to the expenses of a nation without increasing the efficiency of the army; and an officer might possibly gain step after step in succession until he filled a high grade in the service without having been engaged in actual service in the field. It has, however, the utility of recruiting the list of general officers with men whose age better fits them for active service. General promotion by brevet took place in the years 1837, 1838, 1841, 1846, 1851, and 1854, during the reign of our present sovereign; and the average increase of expense to the country at each brevet was from £15,000 to £20,000; while the last naval brevets have cost a similar sum in increased half-pay. The average increase of pay to each officer at a general brevet has been calculated at about £30 per annum.—Ref. *Chambers's Encyclopædia.*

**Brevet Rank,** a kind of promotion in the army by which lieutenant-colonels, majors, and captains only, gain a step in rank without any additional pay. It is not applicable to officers in the navy, although a captain in command of a ship can confer temporary rank, by making a midshipman, for instance, acting lieutenant, should occasion require it, which promotion may be afterwards confirmed by the Admiralty at home. Brevet rank gives an officer a higher position in the army generally, but not in his own regiment, unless it be joined for a time with another for some particular purpose; as, in service on courts-martial confined to his own regiment only, or with any detachment of the same, he takes rank according to the date of his commission in his regiment; while in service on courts-martial, or otherwise, in conjunction with officers of other regiments, he takes precedence according to the date of his brevet commission. Brevet command is a command entitling an officer to hold a certain rank within the limits of any country during a war. Thus many officers of an inferior grade in our service held rank as field officers in the Turkish contingent and Bashi-Bazouks during the Crimean war.

**Breviary,** *bre'-vi-a-re* (Fr. *bréviaire*), is the name of the daily service-book of the Church of Rome, so called from its being an abbreviated compilation of various books anciently used in the service. It is composed of matins, prime, tierce, sext, none, vespers, and the complines, that is, of seven hours, according to the saying of David, "Seven times a day will I praise thee;" whence it is sometimes called *Horæ Canonicæ*, canonical hours. Originally the breviary contained only the Lord's Prayer and the psalms which were used in the divine offices, and to which were subsequently added lessons out of the Scriptures, in order to diversify the service. Various additions were subsequently made by several of the popes, with lives of saints, abounding with improbable legends. This gave occasion to a number of subsequent revisions, particularly by the councils of Trent and Cologne, and popes Gregory IX. Nicholas III., Clement VIII., and Urban VIII.; as likewise by some cardinals. At first the obligation of reading the breviary every day was universal, but by degrees it came to be limited to the beneficed clergy alone, who are bound to do it on pain of being guilty of mortal sin, and of refunding their revenues in proportion to their delinquencies.

**Brevier,** *bre-veer'*, a small kind of printing-type, so called, probably, from its having been first used in printing breviaries; or perhaps it may have been derived from the Latin *brevis*, short, on account of its comparative smallness.

**Brevi Manu,** *bre'-vi-mal'-nu* (Lat., by short hand), is an expression used in Scots law to denote the performance of an act by a party on his own authority, without legal intervention. Thus it was anciently the practice in Scotland for an heritable proprietor on his own authority to pound a tenant's movables for payment of his rent, without an application to any judge.

**Brevipennes,** *brev'-i-pen-nes* (Lat., short-winged).—A term applied to several birds of Cuvier's order of *Grallatores*. Their wings are too short to enable them to fly, but are useful as an assistance in running. Their bodies are massive, and the muscles of the thighs and limbs are enormously thick, and they are generally able to run with great rapidity. The ostrich, emu, and cassowary belong to the brevipennes; and the gigantic *Dinornis*, and other fossil birds, belonged to the same class. All the brevipennes shun the presence of man, and generally inhabit desolate and solitary localities. Many of them, such as the emu and cassowary, are becoming very rare. The extinct Dodo belonged to the same order.

**Brewing,** *broo'-ing* (Sax. *briwan*, to brew).—Brewing is the art of extracting a saccharine solution from grain, and afterwards partially converting the sugar formed into alcohol. The art of making fermented beverages from grain appears to be very ancient, being mentioned by Herodotus, and, five centuries later, by Tacitus. Brewing is really a chemical operation, and has lately been much improved by the application of chemical principles to its various processes. Any of the cereals, wheat, beans, peas, &c., may be used in brewing; but barley is the best adapted to the manufacture of beer. The ancient Egyptians and Greeks seem to have discovered this fact at a very remote period. Nearly all seeds contain a large quantity of starch; and when they begin to germinate, a

peculiar nitrogenous substance called *diastase* is formed. This product, acting as a ferment, converts the starch into sugar. This process is called malting, and the subsequent partial conversion of the sugar into alcohol is called brewing. The two processes are intimately connected together. In malting, the barley is first placed in a large tank or trough, and water is then run in, until there is sufficient to cover the grain. The barley then absorbs the water, and swells up; the amount of water absorbed showing the excellence of the barley. After remaining in the trough for about forty hours, the water is drained off, and the grain is thrown out on the floor. It lies in a heap, *or couch* as it is called, for twenty-six hours. During this time more of the superfluous water drains away, and the grain rises about 10 degrees in temperature. This is caused by the incipient germination of the barley. A primitive stem and little rootlets begin to appear. This process is technically called "sweating;" and as soon as the temperature rises high enough, the partial germination is stopped by a process called "flooring." The warm grain is spread along the floor to a depth of 15 inches, and is repeatedly turned and re-turned with spades over a larger space, until the layer is only six inches deep. After undergoing this process, in which the radicles attain their greatest length, the grain is removed to a drying-kiln, and submitted to various [illegible] of heat, according to the quality of malt required. During the heating, the *corninga*, or shoots, fall off: they are afterwards separated from the [illegible] by wire sieves. (*See* MALT.) The different varieties of malt, known under the names of pale, amber, and brown, can be produced from the same kind of barley by varying the heat of the drying-kiln. Pale malt is produced at the proper temperature; amber malt is slightly scorched; and brown malt is scorched to the full extent that the kiln will permit. Pale, amber, or brown malt is selected according as the beer is to be pale ale, brown ale, or porter. Before 1730 the ordinary malt liquors in London were *ale*, *beer*, and *twopenny*. It was a common custom to call for a tankard of *three threads*,—meaning an equal mixture of three kinds of malt liquor. This was very troublesome to the publican; and a brewer named Harwood invented a beverage which united the flavours of beer, ale, and twopenny. It was called *entire*, or the *entire butt*; and as it was a healthy, nourishing liquor, very suitable for porters and working men, it received the name of *porter*. In brewing, the malt undergoes six processes:—1. the grinding; 2. the mashing, or infusing with hot water; 3. the boiling of the worts with hops; 4. the cooling; 5. the fermenting; 6. the clearing, storing, &c. In the first process the dried malt is ground into a coarse powder. When ground into fine powder, it is liable to coagulate into heaps, while undergoing the second operation, namely, the mashing with hot water. This is conducted in a large receiver, called a mash-tun, made with wooden staves and hoops. Water previously heated to 160° Fahr., in a copper, is run into this mash-tun, and the crushed malt is shaken into it until there is sufficient to absorb the whole of the water, when thoroughly stirred up either with long poles or with stirrers worked by machinery. Diastase, which was slightly formed during the process of fermentation, is at this period of the process again developed, and the starch contained in the grain is rapidly converted into grape sugar. As the temperature of the water falls to 140° Fahr., a fresh supply of water, at 190° Fahr., is added to the mixture; after remaining from two to three hours on the malt, the water, which assumes a very sweet taste, is run off into a vessel called an *underback*. This running is termed the first mash, and the tun is filled up with a fresh supply of hot water, called the second mash: these two mashes are afterwards run together. The mixed fluids in the underback are called the *sweet worts*. In order to brew a definite quality of beer, it is necessary that the brewer should prepare his worts in a regular manner. The quantity of saccharine matter present is ascertained by means of an instrument called a *saccharometer*, similar in principle to the hydrometer. (*See* SACCHAROMETER.) When the sweet worts are reduced to the proper strength, they are pumped up from the underback into a covered boiler, when they are boiled for some time, together with a certain quantity of hops. When the boiling is complete, the hops are drained off, and the boiled wort is set to cool in large shallow pans or vats, and is then ready for fermentation. For this purpose, the wort is run into fermenting-vats, a certain quantity of yeast being added. When fermentation has proceeded sufficiently far, it is stopped by skimming off the surface froth until the beer stops working. The beer is now run into vats, or casked into casks, and nothing remains to complete the operation but the fining process, which is effected by adding to the beer a solution of isinglass dissolved in acid beer. There is hardly a substance sold which is more frequently adulterated than beer. Large quantities of quassia are annually imported for no other purpose than to replace hops in the manufacture of bitter ale. Adulteration of beer has of late become so systematized, that there are men who make a regular trade of beer-doctoring. Amongst the hundreds of ingredients used for this purpose may be reckoned quassia, gentian, and wormwood, to give bitterness; ginger, orange-peel, and caraway, to impart pungency; alum and blue vitriol, to enable the beer to preserve a frothy head; cocculus indicus, nux vomica, and tobacco, to intoxicate; and salt, to promote thirst. Home-brewing is very much carried on in England, and the processes employed are similar to those described: the apparatus employed, however, is simpler, and often very rough. Many other countries brew in different manners, and from different substances. Beer is very largely manufactured in Bavaria; there are about 5,000 breweries in the kingdom, and their annual produce is estimated at 90,000,000 gallons. The *unter-heft*, or German yeast, a product of these breweries, is much used in this country as a leaven in baking. The natives of Abyssinia, and many tribes of Africa, brew beer from millet-seed, and also from the seeds of the *Poa abyssinica*. Millet-seed is also used as a source of brewing beer by the inhabitants of the lower Himalaya, the Crim Tartars, and the natives of Sikkim. Long before the landing of the Spanish in South America, the Indians brewed maize-beer, or *chica*: it is still made by them, and has a bright yellow colour and an agreeable acid taste.

BREWSTERITE, *broo'-ster-ite*.—A numeral partaking of the characters of a zoolite, named after Sir David Brewster. It occurs in short aggregated prismatic crystals, and contains silica, alumina, baryta, strontia, lime, and water.

BREXIACEÆ, *brex-i-ai'-se-e*, in Bot., a small nat. ord. of plants, in the sub-class *Thalamiflorœ*, comprising four genera; namely, *Brexia*, *Ixerba*, *Argophyllum*, and *Rousea*, belonging principally to Madagascar. The properties and uses of the plants are altogether unknown. They are trees with coriaceous, alternate, and simple leaves; the flowers are green, in axillary umbels; the calyx is five-parted and persistent; the petals and stamens are hypogynous, and equal in number to the divisions of the calyx; the fruit is drupaceous, five-cornered, and five-celled.

BRIBERY, *brī'-be-re* (from Goth. *bry fa*, Sax. *bred fix*, a bribe), that is, a perverting fee or gift, something added to the simple demands of justice, with a view to influence its decisions; a boon to prevent honesty, given to the worthless in high places. (*See* "Minutes of Evidence before the House of Commons," art. Irish Magistracy.) The Glossary to Chaucer explains *briborie* as a thief, *briben*, to decoy; while a bribe is probably what is given to a beggar, what is given to an extortioner or cheat. To bribe is to corrupt by gifts, to hire; bribery, the crime of giving or taking rewards for evil practices. *Bribour* in some of our old statutes signifies one that pilfers other men's goods. (28 Edward II. c. 1.) Bribery is an offence against public justice, and is committed when a judge, or other person concerned in the administration of justice, takes any *undue* reward to influence his behaviour in his office. In the East it is the custom never to petition any superior for justice, not excepting their kings, without a present. This is calculated for the genius of despotic countries, where the true principles of government are never understood; and it is imagined that there is no obligation from the superior to the inferior, no relative duty owing from the governor to the governed. The Roman law, though it contained many severe injunctions against bribery, as well for

selling a man's vote in the senate or other public assembly, as for the bartering of common justice, yet, by a strange indulgence in one instance, it tacitly encouraged this practice, allowing the magistrates to receive small presents, provided they did not in the whole exceed one hundred crowns in the year, not considering the insinuating nature and gigantic progress of this vice, when once admitted. Plato, therefore, more wisely, in his ideal republic (De Leg. 1, 12), orders those who take presents for doing their duty to be punished in the severest manner; and, by the laws of Athens, he that offered was also prosecuted, as well as he who received a bribe.—(Pott. Antiq. b. 1, c. 23.) In England this offence of taking bribes is punished, in inferior officers, with fine and imprisonment; and in those who offer a bribe, though not taken, the same. But in judges, especially the superior ones, it has been always looked upon as so heinous an offence, that Thomas de Wayland was banished in 1288, and William de Thorpe, chief justice of the King's Bench, was sentenced to be hanged for it in the reign of Edward III. Blackstone says he was actually hanged, but Lord Coke (3 Inst. 145) denies that he was or could be hanged for this offence, though he was certainly condemned to this punishment; and he cites the parliament rolls, 10 Ric. II. 24, to show that he was then pardoned and restored to all his lands. By a statute of Henry IV. all judges and officers of the king convicted of bribery were to forfeit treble the bribe, be punished at the king's will, and be discharged from the king's service for ever; and some notable examples have been made in parliament of persons in the highest stations, and otherwise very eminent and able, but contaminated with this sordid vice. Lord (Bacon) Viscount St. Albans, lord high chancellor, was fined £40,000, and sent to the Tower, declared incapable of any office or employment in the state or commonwealth, and never to sit in parliament or come within the verge of the court; but part of the sentence was afterwards remitted. Mr. Walpole, secretary at war, was sent to the Tower in 1712; and Lord Strangford, in 1784, was suspended from voting in the Irish House of Lords for soliciting a bribe.—Ref. *Blackstone's Commentaries*, by Stephen, vol. iv. b. 6, c. 9, s. 18; and *see* Deut. xvi. 19, and 1 Sam. viii. 3.

Bribery in Elections for Parliament.—The offence of bribery in elections for members of parliament is one at common law, and the offender may be proceeded against by indictment. Besides the Corrupt Practices at Elections Bill (15 & 16 Vict. c. 57), the act 17 & 18 Vict. c. 102, which was passed in 1854, and consolidated and amended the laws relating to bribery, treating, and undue influence at elections, contains some stringent provisions for securing the freedom of elections. By the latter act, an offender is made guilty of a misdemeanour, and in addition, liable to forfeit £100 to any person who shall sue for it, if such offender shall, directly or indirectly, by himself or any other person on his behalf, give, lend, or agree to give or lend, or offer, promise, or promise to procure, any money or valuable consideration, or any office, place, or employment, to or for any voter, or to or for any person in behalf of any voter or any other person, to induce any voter to vote or refrain from voting, or corruptly do any such act as aforesaid, on account of any voter having voted or refrained from voting at any election, or to or for any person, to induce such person to procure, or endeavour to procure, the return of any person to serve in parliament, or the vote of any voter at any election. The same liability extends to every person who shall, upon or in consequence of any suit, gift, loan, offer, promise, procurement, or agreement, procure, or engage, promise, or endeavour to procure, the return of any person to serve in parliament, or the vote of any voter at any election, or who shall advance or pay, or cause to be paid, any money to or to the use of any other person, with the intent that such money, or any part thereof, shall be expended in bribery at any election, or who shall knowingly pay, or cause to be paid, any money to any person, in discharge or repayment of any money wholly or in part expended in bribery at any election. This enactment is, however, not to extend to any money paid, or agreed to be paid, for or on account of any legal expenses *bonâ fide* incurred at or concerning any election. And any person who shall, before or during any election, directly or indirectly, by himself or by any other person on his behalf, receive, agree, or contract for any money, loan, or valuable consideration, office, place, or employment, for himself or for any other person, for voting or agreeing to vote, or for refraining or agreeing to refrain from voting, or who shall, after any election, directly or indirectly, by himself or by any other person on his behalf, receive any money or valuable consideration, on account of any person having voted or refrained from voting, or having induced any other person to vote or to refrain from voting, shall be guilty of a misdemeanour, and also liable to forfeit £10, &c. It defines and prohibits treating, and sec. 5 defines what is undue influence. The member returned through bribery is also liable, upon petition, to be dispossessed of his seat. The taint of bribery seems to have affected so generally the whole system of parliamentary representation, as to render it difficult, if not impossible, to eradicate it. The assumed virtue of the House of Commons is from time to time, and frequently at an enormous expense, vaunted and puffed up by most futile proceedings, in the vain attempt to show its incorruptibility; and its vanity has been appeased by an occasional disfranchisement of some poor borough, whereas others of more importance have appeared to defy its power, or have escaped from the effect of its censure. More than a century ago, we find Mr. Justice Blackstone acknowledging and lamenting the extent of bribery and corruption existing in his day; and that truly distinguished and sagacious judge has left on record, in his Commentaries, thus expression of his opinion, as though he had been wearied with observing the failure of all means existing devised to check the evil:—"It might not be amiss if the *members elected* were bound to take the oath against bribery and corruption, which, in all probability, would be much more effectual than administering it only to the electors." And that eminent and upright judge, Mr. Justice Coleridge, in his edition of the same Commentaries, has expressed his own opinion thus:—"It is probable that no measure will be effectual till the simple and obvious one suggested by the author be adopted,—of tendering the bribery oath to the candidate rather than to the electors."

Bribery of Officers.—In the Customs and Excise, officers and persons making collusive seizures, or taking bribes, are, by the 16 & 17 Vict. c. 107, s. 263, liable to a penalty of £500, and incapacitated from serving her Majesty in any office, civil or military; and every person offering the bribe is liable to a penalty of £200. In the court of Chancery, officers taking any fee, gift, gratuity, or emolument, other than what is allowed or directed to be taken by them, are [illegible] 3 & 4 Wm. IV. c. 94, s. 41, liable to a penalty of £ [illegible]. In Municipal Elections, by 5 & 6 Wm. IV. c. 76, s. 54, if any person who shall have or claim a right to vote in any election of mayor, councillor, auditor, or assessor of any borough, shall ask or take any money, or other reward, by way of gift, loan, or other device, or agree or contract for any money, gift, office, employment, or other reward, to give or forbear to give his vote in any such election; or if any person, by himself or any person employed by him, shall by any gift or reward, or by any promise, agreement, or security for any gift or reward, corrupt or procure, or offer to corrupt or procure, any person to give or forbear to give his vote in any such election, he shall, for every such offence, forfeit £50 and costs of suit; and, on being convicted of the offence, shall be disabled from voting in any election in such borough, or in any municipal or parliamentary election in any part of the United Kingdom; and shall for ever be disabled to hold, exercise, or enjoy any office or franchise to which he shall be or become entitled as a burgess of such borough, as if he were naturally dead.

Bricks, *briks* (Fr. *brique*).—The material used in making bricks is clay, which is worked into a plastic state by kneading, and then moulded into a rectangular form, 9 inches long, 4½ wide, and very nearly 3 inches thick. These pieces are afterwards dried, and then hardened by baking in a kiln or in stacks. Bricks have been used in building from a very early period; the tower of Babel was a structure of kiln-baked bricks, and the imposing buildings of Nineveh and Babylon,

reared on huge mounds of many acres in extent, and the pyramids of Egypt, were all built of the same material. The Greeks and Romans also used bricks in many of their public works; and it is probable, from the inscriptions stamped on those of Babylon, and the various marks on those of Greece and Rome, that all were formed in moulds before they were hardened by the sun or fire. One peculiarity to be noticed with respect to the Roman bricks, many of which are found in Roman remains in England, is that they are but a little thicker than an ordinary tile, and longer and wider than ours. Bricks were little used during the mediæval period, although it is to this time that we owe the introduction of glazed bricks for ornamental work. For the last 300 years bricks have been extensively used in England, particularly in districts where clay is plentiful, and it is difficult and expensive to procure stone. There are many different kinds of bricks, which may be divided into three classes, as follows:—1. Bricks used for walling; 2. Fire-bricks; and 3. Clinkers, or Paving Bricks. There are two methods of burning bricks for walling, and they are accordingly called "kiln-burnt bricks" or "clamp-burnt bricks." The latter bricks are the most common, and are generally known as "common bricks." They are made of coarse stiff clay, which requires sand to be mixed with it to allow it to be worked with facility. These bricks are burnt in clamps or stacks of 500,000 to 1,000,000 in number, with the fuel interspersed among them, that every brick may be thoroughly exposed to the action of the fire. If the fire is too strong, it causes the bricks to fuse and run together, and form hard irregular masses, called clinkers; but if the fire is not strong enough, the bricks turn out to be soft, and therefore unfit for building purposes. About one-tenth of every clamp is lost by the unequal action of the fire and breakage. When the clamp is sufficiently baked, the bricks are divided into classes, known as "cutters," fine close-grained bricks, rather soft, and better suited for work in which the bricks require cutting; "picked stocks," bricks of a uniform red tint; "paviours," hard bricks fit for paving; "common stocks," or ordinary bricks; "grizzles," or soft bricks; and "burrs." The bricks also vary in colour, according to the degree of heat to which they are exposed. Kiln-baked bricks, also called "malm bricks," are made of a finer clay, which contains a considerable quantity of carbonate of lime; for which reason great care is taken to prevent the air getting to the bricks while they are baking, for this would cause the lime to pass into a caustic state; and, when exposed to the action of the atmosphere, it would absorb moisture, which would cause it to swell and burst the brick in pieces. These malms are slowly burnt in kilns; they are better for ornamental purposes, being of a pretty buff colour, but they are not so durable as the common bricks. The bricks made of Suffolk clay, which contains a great proportion of carbonate of lime, are nearly white in colour. From 20,000 to 30,000 are baked at once. The best malms come from Erith, in Kent, and Ware, in Hertfordshire. Fire-bricks are made of clay containing a considerable quantity of silicate of alumina, and as free as possible from lime, in any form, or iron. The clay is carefully prepared, and the bricks are exposed to an intense heat in kilns, as they are required for building up furnaces, and other purposes, for which it is necessary that they should be able to withstand the action of fire. The best fire-bricks are made at Stourbridge, Newcastle, and Edinburgh. Paving bricks are made of clay which contains a great amount of silica, that fuses when the bricks are burnt, and causes them to become very hard. Good paving bricks are made at Birmingham and Uppingham, but the best are brought from the Netherlands, made from the mud of the Yssel, and known as Dutch clinkers. Bricks were originally subject to a tax, which was first imposed in 1784, at the rate of 2*s.* 6*d.* per thousand, and increased by degrees to 5*s.* 10*d.* Glazed and polished bricks paid duty at the rate of 12*s.* 10*d.* per thousand for those of ordinary size, and £1. 4*s.* 2*d.* for large ones. The duty was removed in 1850. Bath bricks are made at and about Bridgewater, of the sand of the river Parret, moulded into a rectangular form and dried; they are used, when powdered, for cleaning knives, brass, and metal-work.—*Ref. English Cyclopædia—Arts and Sciences.*

BRICK-MAKING.—To render the clay fit for making bricks of a good quality, it is necessary that it should be dug in the autumn and exposed to the air in small heaps, sometimes called "curfs," that the action of the rain and frosts of winter may ripen the clay, rendering it what the workmen call "mellow," and causing it to become more tenacious and plastic after it has undergone the process of kneading. Sand or ashes must be mixed with the clay before kneading, which has the effect of making the bricks stronger and more durable; the mixture is then worked or kneaded in what is called the "pug-mill," a great improvement on the old system, by which the clay was kneaded by means of the workmen or cattle trampling on it, in a manner similar to the plan adopted for pressing grapes in wine countries, or threshing corn by oxen in the East. The pug-mill is a large cylinder, with many arms projecting from the inner side towards the centre, up which a shaft passes, from which other arms project, passing between those that are fastened to the sides of the cylinder. These arms, or knives, as they are technically called, are fitted to the cylinder and shaft in such a manner that the clay may be pressed from top to bottom of the machine in a spiral direction by the revolution of the shaft: the material is thrown in at the top, and comes out at the bottom in a state perfectly fit for the moulder's use. Formerly, the clay thus kneaded was taken to the moulder in lumps, who fashioned them into the required form by the aid of a wooden box of the proper size, into which, when sprinkled with sand to prevent adhesion, the clay was pressed, and then shaken out, in the shape of a brick, on a board, which sometimes had a projecting piece fastened to it to make a depression in the brick into which the mortar might enter, and so bind the brickwork more closely together. At the present time, however, the operations of kneading and moulding are combined, and effected by the same machine. After passing through the part which acts as the pug-mill, the clay is discharged into a box, from which it is pressed by the action of a shaft rising and falling vertically into a mould of the required size; the moulding-frame then slides over an opening in the board which forms the bottom of the mould when under the shaft that fills it, and the brick is pressed out by the descending action of another shaft on a board placed to receive it, from which it is removed by a boy whose duty it is to watch the machine. The bricks are then piled up in such a manner as to leave room for the passage of the air between them, and allowed to dry; they are afterwards removed to a kiln for baking, or hardened by burning in stacks with fuel thrown between the successive layers of bricks. The above method of making bricks by machinery is that introduced by Messrs. Cook and Cunningham about 1840, whose machines will turn out about 1,800 bricks an hour. There are, however, many other machines, differing slightly in principle of action from that which has been described, and far more complicated in construction; among which may be named that of Messrs. Heaton, of Birmingham, in which the bricks are made in metal moulds revolving on a wheel, and pass through successive stages of formation during the revolution, until the brick comes from the mould perfectly formed and ready for removal; that of M. Terrason, in which the clay is pressed into long troughs of the width and thickness of a brick, and cut, when discharged from the troughs, into pieces of the requisite length by a frame, across which wires are stretched to effect the cutting process, after which the bricks are conveyed by machinery acting on an inclined plane to any desired distance, for stacking, drying, and burning; and that of Mr. Jones, in which the clay is mixed to a stiffer consistency, and therefore requires less time for drying when formed into bricks. There is also a method, originated by Mr. Prosser, of turning out bricks almost dry from metal moulds, in which the clay has been subjected to very great pressure.—*Ref. English Cyclopædia—Arts and Sciences.*

BRICKWORK.—The thickness of walls of houses built of brick is regulated by the length of the brick, which is nine inches; walls, therefore, are spoken of as being half a brick, a brick, a brick and a half, &c., in thickness. In houses, generally, the outer walls are from

one brick to two in thickness, and the partition walls only half a brick thick. In public buildings, and walls in which great strength is required, they are sometimes more than four bricks thick; but it is considered good substantial work when they are made of the thickness of three bricks well bonded together. Garden walls are half a brick or a brick in thickness; they are often strengthened by the addition of piers, about 10 or 12 feet apart, and about 18 inches in width, projecting 4½ inches or 9 inches from the face of the wall; they are finished with a coping of bricks laid on the side. In loose soil it is necessary to form a foundation for the wall by filling a deep trench with stone and rubbish, which is often cemented together with concrete. In bricklaying, care must be taken that the bricks are well bonded, that is, that the successive layers of bricks may be so placed that no joint in any layer shall come immediately over another joint in the layer below it. Each layer of bricks is called "a course." When bricks are laid with the side facing outwards, and lengthwise in the course, they are termed stretchers, and the course is called a stretching-course; but when the end appears in the face of the wall, they are called headers, and the course a heading-course. There are four principal methods of bonding bricks together, called English bond, Flemish bond, herring bond, and garden bond. English bond consists of stretching-courses and heading-courses alternately; Flemish bond, in laying a stretcher and header alternately in each course. Herring bond is used for the core of thick walls, alternate courses of bricks being laid between the outer and inner faces diagonally, at an angle of 45° to the face, each course being also laid in an opposite direction to that on which it rests; this leaves triangular spaces between the core and the face of the wall, but it is supposed to give strength to walls the faces of which are built on the principle of the Flemish bond: hoop iron is sometimes laid between the courses of Flemish bond to give strength to the wall and tie it together. Garden bond consists of three stretchers and a header in every course: it is only used for walls of the thickness of one brick. Arches of brickwork are always constructed on wooden centring, which is afterwards removed. The formation of groined work, or the intersection of arches in a vault, with bricks, is difficult, as in this, as well as in every other kind of arch, elliptical, segmental, and straight, except those that are semicircular in form, every brick has to be bevelled at a different angle to fit the curve of the arch. The bricks are cut by the bricklayer to the required shape by the brick-axe, and are afterwards brought to an even surface by rubbing on the "banker," or rubbing-table. Neat workmanship is required in shaping and putting together the bricks in any kind of arch. That the settlement of brick walls may be the same in all parts, they should be built up to the same level in all parts at once. Mortar, made of lime and sand, is used for cementing brickwork together; twice as much sand as lime is the proportion generally used in the composition of mortar, rather more being required for mortar made with stone-lime than for that made with chalk-lime. To give a finish to brickwork, it is sometimes pointed with blue or white cement or plaster. When the pointing is on a level with the surface of the brickwork, it is called "flat-joint pointing;" when it is raised above it, it is termed "tuck-joint pointing;" the former is generally done in blue mortar, and the latter by adding a raised line of white cement on the surface of the blue mortar that is first inserted between the courses. A rod of brickwork consists of 272 square feet of walling a brick and a half thick; this will be found to be 306 cubic feet. The weight of a rod of brickwork is calculated to be about 16 tons, consisting of 4,500 bricks, weighing on an average 10 tons, and 5 tons of mortar, composed of 80 cubic feet of sand and half that quantity of chalk-lime. Many fine specimens of brickwork are to be seen in continental cities; the most curious is that in the Marien Kirche in Brandenburg, in North Prussia. In and near London, Hampton Court, St. James's Square, the Thames Tunnel, the fine warehouses in New Cannon Street, near St. Paul's, and the viaducts of the various railways, may be mentioned as the best examples of English brickwork; and the enormous factory chimneys in Lancashire, Yorkshire, and about Glasgow, some of which tower upwards to the height of 400 feet. —Ref. *English Cyclopædia*—Arts and Sciences; Nicholson's *Dictionary of Architecture*.



Bride and Bridegroom, *bride, bridegroom*.—Various derivations have been given of these words. According to Tooke, bride is the past participle of the Ang.-Sax. verb *bredan*, to nourish or cherish, and groom the past participle of *gyman*, to take care of, guard, or attend; so that the bride is a woman nourished and cherished, and the bridegroom is one by whom she is attended, served, and protected. They denote respectively a newly-married woman and man,—married persons on the first day of their wedded life. The enjoyment of these titles being necessarily brief, they have always being associated with numerous ceremonies. Among the ancient Greeks the bride was usually conducted to her future home in a chariot drawn by mules, with her husband on one side and his most intimate friend on the other, the bridal party forming a procession with torches and singing. On reaching the end of their journey, the axle-tree of the chariot was broken, to signify that she was to remain there. The marriage feast was then celebrated, after which the bride was conducted by the bridegroom to her apartment, where, by the laws of Solon, they were required to eat a quince together, while the *epithalamium*, or bridal-song, was sung by the young men and maids outside. The day after the marriage presents were made to the newly-married couple by their friends. Among the Romans the bride was conducted to the house of the bridegroom by a procession resembling that among the Greeks, bearing in her hands the emblems of diligence,—a distaff and a spindle with wool. She was lifted over the threshold by two married men, and received by the bridegroom within with fire and water, symbols of purification. The keys of the house were then presented to her, and the ceremonies concluded with a feast, after which she was conducted to her apartment by matrons who had only had one husband, and minstrels and friends sang *epithalamia* without during the night. Usually there was a pretended seizure and carrying off of the bride from her parents, in memory of the rape of the Sabines. Formerly it was the custom to drink wine in the church after the cup had been first blessed by the priest; and among the Jews wine-drinking at marriage is still universal, the glass being broken after the bride and bridegroom have partaken of it, to remind them of the perishableness of all earthly things. The *bridal kiss* is of unknown antiquity, and is enjoined as an essential part of the marriage ceremony in the old missals long before the "Common Prayer-Book." It was always done in the church, and, at one time, liberty to kiss the bride was among the perquisites of the priest. In ancient times wheat was sprinkled upon the head of the bride, indicative of a hope that the newly-married pair may always be supplied with an abundance of the good things of this life; but in later times the wheat has taken the more presentable shape of a cake. In England and Scotland the *cake* was formerly broken over the head of the bride, but it now takes the form of a highly-ornamented piece of confectionery. It consists of a rich cake as a basis, surmounted by a light superstructure of various devices, the whole being covered with a preparation of white sugar. *Bride favours* are small knots of white ribbons pinned to the breasts of all who are in attendance at weddings, a knot, among the ancient northern nations, being a symbol of love, faith, and friendship: formerly the ribbons were of various colours. The use of *bridemaids* at weddings appears as old as the time of the Anglo-Saxons, among whom, as Strutt informs us, "the bride was led by a matron, who was called the bride's woman, followed by a company of young maidens, who were called the bride's maids." In later times it was among the offices of the bridemaids to lead the bridegroom to church, as it was that of the bridegroom's men to conduct the bride thither. Part of the duties of the bridemaids consisted in dressing and undressing the bride; and the bridegroom's men performed the same offices to the bridegroom. Bridemaids, as more ceremonious attendants at marriages, are still in use in England, and the bridegroom is usually attended only by one confidential friend. The giving of gloves at marriages is a custom of remote antiquity. In the north of England a custom formerly prevailed of the

young men present at a wedding, immediately after the ceremony, striving who should first pluck off the bride's garters from her legs, and whoever were the victors on this occasion wore them about the church in triumph. *Bride ale, bride bush*, and *bride stake*, are nearly synonymous terms, and all derived from the custom of the bride's selling ale on the wedding day, for which she received, by way of contribution, whatever price the friends assembled chose to pay for it; the expenses of a wedding feast were in this way discharged among the friends and relations of a couple who were not in circumstances to bear it. Somewhat of the same kind was the *penny wedding*, which was formerly not unfrequent among the poorer classes of Scotland, when the friends of the newly-married pair each contributed a certain sum to the expenses of the feast, and any one might be admitted to it on payment of a certain sum. *Flinging the stocking* was also among the customs generally observed on the marriage night in England. It consisted in the young men taking the bride's stockings, and the young women those of the bridegroom, and each, sitting at the foot of the bed, threw a stocking over their heads, endeavouring to make it fall upon that of the bride or her spouse; and if the bridegroom's stockings, thrown by the young women, fell upon the bridegroom's head, or those of the bride upon her head, it was taken as a sign that they themselves would soon be married. The *sack posset*, too, was also a custom that generally prevailed among our ancestors: it was a kind of caudle, made up of milk, wine, yolks of eggs, sugar, cinnamon, and nutmeg, and had to be eaten by the newly-married pair after being put to bed. Among the numerous practical jokes that were not unfrequently put in force on such an occasion was the sewing up the bride in one of the sheets,—

"But, since it must be done, dispatch and sowe
Up in a sheet your bride."

*Hesperides.*

**Bridewell**, *bride'-well*, denotes, generally, a house of correction. The name is derived from St. Bride's Well, in Blackfriars, London, which was anciently much resorted to by pilgrims, and on the site of which an hospital was founded by Edward VI. in 1553. It was given over to the city of London to be used as a workhouse for the poor, and a house of correction for the idle and vagrant. It afterwards came to be used as a place of punishment for criminals. As belonging to the city of London, it is under the control of the lord mayor, and not under the sheriff.

**Bridge**, *bridj* (Sax. *brigge*; Ger. *brücke*).—A structure of wood, stone, or iron, thrown across a river, or any channel in which water flows, for the transit of passengers and goods from one side to the other, or over a railway, to carry a roadway above it at a higher level. Bridges thrown across a valley for the purpose of conveying water are called aqueducts (*see* Aqueduct), and those for carrying a railway or roadway over a valley are called viaducts (*see* Viaduct). Different terms are given to bridges according to any difference in their construction or difference of purpose. They may be broadly classified as fixed or movable. Among the fixed bridges are the ordinary bridge, the suspension bridge, the tubular bridge, the frame bridge, the lattice bridge, and the skew bridge, a variety of the ordinary bridge, introduced by modern engineers to allow a railway to pass over a road or river at an angle otherwise than a right angle, without altering the direction of either, or placing the piers otherwise than parallel to the direction of the stream (*see* Suspension, Tubular, Frame, Lattice, Skew Bridge); and, among movable bridges, are the floating bridge, flying bridge, draw-bridge, and swing-bridge. (*See* Ferry, Floating Bridge, Drawbridge.) Military bridges are of an entirely different nature, and are noticed under another head. (*See* Bridge, Military.) The technical terms employed in bridge-building with regard to the arch will be found under the general description of the arch (*see* Arch); but it must be added, that the masses of masonry erected at either end of the bridge, which generally sustain the thrust of the whole series of arches, are called the abutments; those in the bed of the stream, from which the arches spring, the piers; and the filling in between the top of the arches and the roadway, the spandril. It may also be remarked, that the term arch is applied to the structure of that form when made of stone, brick, or cast iron; while, in bridges of wood and wrought-iron, it is called the bay. The bridges of the ancients appear to have been clumsily and unskilfully made of broad stones or planks resting on perpendicular piers, although they were able to construct efficient temporary bridges for the transportation of large bodies of troops across rivers and pieces of water of considerable breadth, as evinced in the passage of the Hellespont by Xerxes, 480 B.C., when he led across an immense army of Persians and auxiliary troops for the invasion of Greece. Bridges about Rome were made of wood, even after the Cloaca Maxima, or great sewer of Rome, had been successfully arched over. The famous wooden bridge that Horatius Cocles so bravely defended when Lars Porsenna menaced Rome, was made of wood; and it appears that the earliest known bridge of stone over the Tiber, and, perhaps, the first stone bridge ever built, was the Pons Senatorius, now the Ponte Rotto, built by C. Flavius Scipio, 127 B.C.; but in later ages, the magnificent bridges and viaducts built under the Cæsars in various parts of the empire, give the Roman people the credit of having introduced the art of bridge-building into Europe, and, indeed, show them to have been the originators of the art with respect to the application of the arch to such a purpose, although the Chinese claim to have constructed arched bridges at a far earlier period, which is a matter of doubt, owing to the uncertainty that exists with regard to the truth of their chronological records. Among the numerous bridges built by the Romans may be mentioned that which was erected by Trajan over the Danube, consisting of twenty semicircular arches, with a span of 180 feet, springing from abutments 64 feet wide and 85 feet thick, at a height of 46 feet above the surface of the river. This bridge no longer exists, having been destroyed by Hadrian to prevent the Dacians from using it as a means of making incursions on the Roman territory. With the decline of the Roman empire, bridge-building was neglected until the time of Charlemagne, who instituted a society known as the order of the *Frères du Pont*, or Brethren of the Bridge, whose duty it was to see to the erection and repairs of bridges and the establishment of ferries in various parts of France and Germany, among whose earliest works are reckoned the bridge of Avignon, over the Rhone, and that of Ratisbon. A fresh impulse was given to bridge-building in France by the establishment of the corps of the *Ponts et Chaussées*, about 1720, who built the Pont de la Concorde at Paris, and many other notable bridges at Blois, Orleans, and Saumur, and in various parts of the country. In England, the first stone bridge built was that of Bow, near Stratford, in 1087, followed by old London Bridge, in 1176. Old Westminster Bridge, completed in 1750, was once considered the finest in the world; but it is surpassed by the new structure which has been erected in its place. In 1775, Mr. Pritchard, of Shrewsbury, commenced the construction of cast-iron bridges by putting up one at Coalbrookdale; and this example of the adaptation of iron-work to the formation of bridges was followed by Wilson, of Sunderland, and Telford. Since the commencement of the present century, the art of bridge-building has rapidly developed itself under the requirements produced by the introduction of railways and the increased facilities of locomotion, and the result is shown in the new forms of the suspension bridge, the wrought-iron girder bridge, the lattice bridge, and the tubular bridge, as exemplified in the Menai and Chelsea suspension bridges, the High Level Bridge at Newcastle, and the Britannia, Conway, and Saltash tubular bridges, the last named of which is also known as the Albert Bridge. The bridge over the Delaware at Trenton, in America, and the Niagara suspension bridge are also magnificent bridges; and the Victoria Bridge over the St. Lawrence, in Canada, is the largest tubular bridge in the world. There are many points of great importance to be considered before designing and commencing the construction of a bridge across any piece of water, and the form and nature of the bridge should depend mainly on the results derived from a careful inquiry into these points. For instance,

a slow, sluggish stream, flowing through a flat country at the rate of a little more than a quarter of a mile per hour, would not require a bridge with high piers and lofty arches with a broad span to guard against the sudden rush of a heavy flood, which would carry down large trees and accumulated masses of *débris*, that might stick fast under or against the bridge and prove the means of its destruction; on the other hand, a bridge of this construction would be absolutely necessary for a rapid river deriving its supply from a watershed of many miles in superficial extent, and flowing between steep banks. The points, then, to be first considered, are the extent of waterway that is necessary, and the form that the bridge should take with reference to the character of the stream. The extent of waterway depends on the superficial extent, shape, and geological formation of the country that feeds the river over which the bridge is to be thrown. Bridges built in flat countries, or over rivers which flow through lands of a porous or sandy nature, in which the volume of water passing under is subject to little variation, require but little waterway; while those which run through land which is steep and hilly in character, and contains underlying strata of granite, limestone, and slate, or beds of thick clay and loam, which will not absorb any surplus fall of rain, require a waterway of considerable extent. Thus, under the former conditions, the waterway of a bridge would not require a greater depth than one inch for every square mile of ground that supplies the river that passes under it; while in countries where the ground is very steep and mountainous, the strata non-absorbent, and the rains heavy and frequent, producing sudden floods, a waterway equivalent to four feet and a half per square mile of watershed is requisite. It must be remembered that these dimensions form the opposite extremes of a scale, or the greatest and least depth of waterway required per square mile, according to circumstances, and that, although a sufficient amount of waterway would be secured in the case where the depth allowed is of such narrow limits, bridges are seldom built, even in flat countries, such as Holland, with so small an allowance for depth, or in mountainous and hilly districts with so much. Next in importance to the waterway is the character of the stream; its average velocity and liability to sudden increase must be ascertained before determining the number and strength of the piers to be placed in the bed of the river. The piers will naturally tend to diminish the breadth of channel through which the waters pass, causing an accumulation of the water immediately above the bridge, and, in consequence of this, an increase of velocity below. The fewer the number of piers the better in all cases, particularly in bridging rivers which flow at the rate of three miles per hour and upwards, as is the case with rivers that run over shingly and rocky strata. The required amount of waterway and the character of the stream having been ascertained, the purpose for which the bridge is intended to serve, and the weight the piers and arches will have to bear, must be taken into account, as the form and method of construction to be adopted in building these parts of the bridge mainly depend on these points. It is an invariable rule that the piers should rise at least as high, or a little higher, than the level attained by the water of the river when swollen by a heavy flood rushing from the uplands; this will effectually prevent the water from rising at any time as high as the keystone of the arch, which would materially affect the stability of the bridge. They must also be constructed of a solidity in proportion to the force of the current, and the weight they must sustain in a vertical direction, as they are not intended to support the lateral thrust of the arches, which is generally directed, in the case of bridges of great length, through the entire series against the massive abutments at the sides. After securing proper foundations for the abutments and piers, which often have to be made of masses of solid masonry or concrete (*see* CONCRETE, COFFERDAM), within close-piled inclosures (*see* PILES) sunk far below the bed of the river, owing to the nature of the soil and the geological formation underneath, the next thing will be to calculate the weight of the passing load, the weight of the superincumbent mass between the crowns of the arches and the roadway, and the weight of the arches themselves. These weights will constantly exercise a destructive pressure on the abutments and piers; and it must be the care of the engineer to construct them of sufficient size and strength to bear the excessive strain upon them at every point, and thus insure the stability of the bridge. In calculating the weight of the passing load, an allowance of 240 lbs. per square foot is made for ordinary bridges, and 960 lbs. for railway bridges; the weights of the other parts are found by calculations based on the measurement of the same. With regard to the force exerted by the strength of the current against the piers, it can be calculated by ascertaining practically the mean velocity of the water and the superficial area of the end of the pier exposed to its action. The piers should be protected against the rush of the current by the addition of what are called cutwaters, which are pieces of masonry the horizontal section of which is an equilateral triangle, projecting from the ends of the piers in the form and exercising the functions of a wedge, which divide the water in its course, and thereby materially lessen the momentum with which it comes against them. In non-tidal rivers, cutwaters need only be placed on that side of the pier which is opposed to the direction of the stream, but in tidal rivers they should be added on both sides. With regard to the form of the arch to be employed, an elliptical or segmental arch is most elegant in appearance, particularly a segmental arch, which is one-sixth of the circumference of a circle, subtending an angle of 60°, in which the versed sine is exactly equal to one-fourth of the span. In segmental arches the lateral thrust on the abutments is greater than in any other form; but as the voussoirs forming an arch on this construction can all be cut from the same mould, as well as those of the semicircular arch, they can be erected at less expense than an elliptical arch. But when the semicircular form is used, unless the banks of the river be very steep, and the approaches to the bridge are such as to warrant its adoption, the roadway must necessarily be kept at a considerable height above the level of the water, particularly if the water in the river be subject to great increase after heavy rains, as the piers must be raised above the level of the flood-line. The following bridges in various parts of Great Britain and Ireland afford good examples of such constructions with elliptical, semicircular, and segmental arches. Elliptical:—London Bridge, Blackfriars Bridge, Waterloo Bridge, and Limerick Bridge. Semicircular:—Stockport Bridge, the Royal Border Bridge, Berwick, and the Dee, Lockwood, and Tyne viaducts. Segmental:—Chester, Coldstream, Glasgow, Tewkesbury, and Vauxhall bridges, with old Rochester Bridge, and the Vale Royal Viaduct: the arches of the two structures last named are segments subtending an angle of 60°. A greater extent of span can be obtained in suspension and tubular bridges, and those constructed with cast-iron girders, than in bridges of masonry or brickwork. The arch of the bridge at Chester, which is 200 feet in span, with a rise or versed sine of 42 feet, is perhaps the largest built of stone in this country. In building bridges of stone or brickwork, the engineer has to exercise great care in the construction of the centre, or wooden framing on which the arch is built. (*See* CENTRING.) The principal requirements for a centre are that it should be well braced together with cross timbers, to avoid any displacement of the trusses laterally; that it should be exactly similar in outline to the curve proposed for the intrados, or line formed by the lower ends of the voussoirs of which the arch is composed, allowance being made for the compression of the wooden frame under the heavy weight that is to be piled upon it; and that it should be supported in such a manner that it can be easily removed without injury to the arch as soon as the masonry is completed. The common plan is to support the centring on wedges, which are driven out when the stonework is finished; but the French have adopted a plan of resting it on sandbags, which can be easily removed without causing any vibration in the fresh masonry, which must be produced, and often with serious injury to the work, where the wedges are struck out by blows of a hammer. Wooden bridges are often used instead of stone in countries such as America, where timber is cheap; but they are liable

to decay, from exposure to the weather and other causes, and are far from durable structures. When bridges are built of timber, the foundations should be carefully made of masonry, and the timber framing and girders well trussed and tied together, and supported by struts, or inclined pieces of wood acting like a bracket on a large scale, which convey the thrust to the foundations of stonework on which the bridge is built. The trusses should be as simple as possible in construction: their object is to throw the pressure in a vertical direction on the foundations or supports of the bridge, and they should be made with due regard to a safe and proper balance of the pressure and tension to which they are exposed. (*See* CARPENTRY, TRUSS.) Iron bridges are of various kinds; but, as it has been already stated, suspension, lattice, and tubular bridges will be described under their respective headings. Bridges of metal are liable to expansion and contraction under the influence of heat and cold; but allowance can always be made for this in forming the different parts of which they are composed. When it is required to throw a straight bridge over a roadway, without having recourse to the support of an arch, as it is frequently done in the construction of railways, particularly in the metropolis and its surrounding suburbs, girders of cast iron may be used when the space to be bridged over does not exceed 30 feet; but when it is more than this, recourse should be had to wrought-iron girders. When an arched bridge of considerable span is made of iron, cast iron is used, as it is capable of resisting great compression. The arch itself is composed of several separate castings, or voussoirs, which are put together in the curvature of a segment of a circle. Southwark Bridge affords a good example of a bridge of cast iron, as well as Vauxhall and new Rochester bridges, and Laira Bridge, near Plymouth. The splendid bridge over the Thames with elliptical arches, known as New Westminster Bridge, affords a specimen of the combination of wrought and cast iron in bridge-building. The expense of maintaining bridges is defrayed (like that of roads) by the public, this having been part of the *trinoda necessitas*, to which every man's estate was by the ancient law subject; viz., *expeditio contra hostem, arcium construction, et pontium reparatio;* but it is incumbent, not on the parishes, but on the counties at large in which the bridges are situate. The liability of the county extended, at common law, not only to the bridge itself, but to so much of the road as passed over it, and even to so much as formed its end or approaches; and by stat. 22 Hen. VIII. c. 5, the county was bound to repair three hundred feet either way from the bridge. And such is still the state of the law as to all bridges built prior to the Highway Act, 5 & 6 Will. IV. c. 50; by this act the road itself passing over or adjoining to a bridge thereafter to be built must be repaired by the parish, or other parties bound to the general repair of the highway of which it forms a portion, the county being still subject, however, to its former obligation as regards "the walls, banks, or fences of the raised causeways and raised approaches to any bridge, or the land arches thereof." By stat. 24 & 25 Vict. c. 97, s. 33, it is enacted, that whoever shall unlawfully and maliciously pull or throw down, or in anywise destroy, any bridge (whether over any stream of water or not), or any viaduct or aqueduct over or under which bridge, viaduct, or aqueduct any highway, railway, or canal shall pass, or do any injury with intent, and so as thereby to render such bridge, &c., dangerous or impassable, shall be guilty of felony. Punishment,—penal servitude for life, or not less than three years; or imprisonment not exceeding two years, with or without hard labour, and with or without solitary confinement; and, if a male under the age of 16 years, with or without whipping.

BRIDGE-HEAD, in Mil., a fortification intended for the defence of a bridge, built either to secure the [illegible] from the sudden attack of an enemy, and then [illegible] an essential portion of the regular works constructed for the defence of any town, or thrown up hastily to secure the retreat of an army across a river, and to enable a small body of defenders to hold the enemy in check until the retreat has been safely effected, and means have been taken to destroy the bridge by which the passage has been made. The common form of a bridge-head is a breastwork open in the rear, offering a salient angle to the attacking force; sometimes it is formed by bastions regularly connected by curtains, or by a series of redoubts. The army in retreat should gain the bridge by openings in the breastwork, which should be placed in the re-entering angles, if the work be of sufficient extent, and protected by a cross-fire from opposite faces of the fortification, and a direct fire from traverses in the interior. The most favourable position for a bridge-head, or *tête-du-pont*, as it is generally called, is when the bridge which it is intended to defend is situate at a re-entering bend of the river, or where the river forms an arc, having the chord which subtends it on the same side as the bridge-head. Bridge-heads are to be found at many fortified towns on the Rhine.

BRIDGE, MILITARY.—Bridges of a temporary nature, constructed for the passage of troops and artillery across a river, are of various kinds. The best are those made by the aid of pontoons and casks (*see* PONTOON); but there are many other sorts, of which the following is a brief summary:—1. A bridge of boats, made with small decked boats, if they can be obtained, laid together side by side, on which trestles are placed to insure uniformity of height, that sustain a roadway made of planks. 2. The rope bridge, only used when the river is narrow and the banks steep. 3. The boat-and-rope bridge, to make which some boats are laid together, and [illegible]bles placed across the gunwales, which support a roadway formed of stout planks. 4. The trestle bridge, a bridge of timbers supported on strong rough trestles, planted at intervals across the stream, and secured by ropes running along the top, and heavy stones attached to the bottom. 5. The raft bridge, formed of planks lashed to a frame of timber or trees felled on the spot. 6. The pile-and-spar bridge, consisting of a double row of piles, to which spars are lashed that support timbers laid across them. There are also what are termed flying-bridges. The swing flying-bridge consists of one or more boats attached to a rope, which is fastened at the other end to a buoy in the middle of the river, or to a stake in one of its banks; the boat is carried across the stream by the action of the current, and hauled back to the shore from which it started by means of another rope. The trail flying-bridge is a boat or raft attached by rings to a guide-rope fixed across the stream to stakes on either bank, and drawn backwards and forwards at pleasure. The raft is sometimes made in a triangular form, and is attached to the guide-rope by a single ring, and carried across by the force of the current.—*Ref.* Sir Howard Douglas's *Military Bridges*.

BRIDGET, SISTERS OF ST., *brid'-jet*.—A religious order, founded by Dr. Delany, bishop of Kildare, in 1803, and afterwards approved by Gregory XVI. It was named after St. Bridget, who is regarded as one of the great saints of Ireland. The rule embraces three vows, of poverty, chastity, and obedience; and the sisters specially direct themselves to the education of girls.

BRIDGETINES, BRIGITTINS, or BIRGITINES, *brid'-e-tins*.—A religious order, founded by St. Bridget of Sweden, in 1344, and afterwards confirmed by Urban V. The first monastery of the order was erected at Wadstena, in East Gothland, and served as the model for others. It comprised sixty nuns and twenty-five monks, all under the direction of an abbess, the order being specially instituted in honour of the Virgin. They professed great mortification, poverty, and self-denial, as well as devotion. This order spread greatly, not only in Sweden, but also in Germany, the Netherlands, and other parts of Europe. It was suppressed in Sweden at the Reformation; but there are still establishments of it in Italy, Portugal, and other parts. In England, a monastery of Brigittins was established, near Isleworth, by Henry V., in 1415.

BRIDGEWATER TREATISES, *brid'-wau-ter*.—The last earl of Bridgewater, by his will, dated February 25th, 1825, directed certain trustees therein named to invest in the public funds the sum of £8,000; said sum to be at the disposal of the president for the time being of the Royal Society of London, to be paid to the person or persons nominated by him, who shall be appointed to write, print, and publish 1,000 copies of a work "On the Power, Wisdom, and Goodness of God as mani-

fested in the Creation." It was judged preferable, in

on subjects connected with the original theme. The several subjects, with the distinguished authors selected to write upon them, were as follows:—1. The Adaptation of External Nature to the Moral and Intellectual Constitution of Man, by T. Chalmers, D.D.; 2. Chemistry, Meteorology, and the Function of Digestion, considered with reference to Natural Theology, by William Prout, M.D.; 3. On the History, Habits, and Instincts of Animals, by the Rev. William Kirby; 4. On Geology and Mineralogy, by the Rev. William Buckland, D.D.; 5. The Hand, its Mechanism and Vital Endowments, as evincing Design, by Sir Charles Bell; 6. The Adaptation of External Nature to the Physical Condition of Man, by John Kidd, M.D.; 7. Astronomy and General Physics, considered with reference to Natural Theology, by the Rev. William Whewell; 8. Animal and Vegetable Physiology, considered with reference to Natural Theology, by P. M. Roget, M.D. All of these works have since been reprinted by Bohn in his Scientific Library.

Brief, *breef* (Lat. *brevis*, short), in Law, is a concise statement of the facts in a cause before a court, and of the evidence in support thereof, with observations of the attorney or solicitor engaged for the party on whose behalf it is prepared, and references to decided cases affecting any legal points in dispute. It forms the instructions to counsel who has the management of the cause on behalf of the client, and it should, as far as possible, develop all that can be collected in favour of the opponent, so as to give an opportunity to counsel to anticipate what may be advanced to the prejudice of his client. After delivery of the brief, it is usual to have a consultation with counsel, who advises with his junior (if one be retained) and the attorney or solicitor, and determines on the course to be taken before a jury or the court.

Brief, in the English Prayer-book, denotes the sovereign letters patent authorizing a collection for a charitable purpose. They are directed to be read among the notices after the Nicene Creed. — *Ref.* Hook's *Church Dictionary*.

Brief, Papal, a pontifical letter dispatched from the court of Rome to princes or other high personages. A papal brief differs from a papal bull in being less ample, and in being always written upon paper sealed with red wax, with the pope's private seal, the fisherman's ring; hence it concludes with *Datum Romæ, sub annulo piscatoris* (given at Rome, under the ring of the fisherman). The papal bull, on the other hand, is always written upon the rough side of a sheet of parchment, and in ancient Gothic characters. (*See* Bull, Papal.) The papal brief is issued to decide affairs of inferior importance to those adjudicated upon by the papal bull.

Brig, or Brigantine, *brig* (Fr.), in Mar., a name generally applied to a square-rigged merchantman with two masts, though mariners of different countries apply it to some peculiar vessel in their own marine. Amongst English seamen, a brig is distinguished by having her mainsails set nearly in the plane of her keel; whereas the mainsails of larger vessels are hung at right angles with the ship's length, and fastened to a yard which hangs parallel to the deck; but in a brig, the foremost edge of the mainsail is fastened in different places to hoops, which encircle the mainmast, and slide up and down it as the sail is hoisted or lowered: it is extended by a gaff above and a boom below. This term is also used to designate a small, light, flat, open vessel, which can be propelled either by sails or oars, used either for fighting or giving chase.



BRIG.

Brigade, *brig-aid'* (Fr.), in Mil., a term applied to a body consisting of two or more regiments or battalions; two brigades thus composed forming a division of an army sent into the field. When a number of regiments are stationed in any camp, such as the camp at Aldershot or the Curragh, they are generally grouped into brigades. A brigade varies considerably in numerical strength, as it may include from two to six battalions of infantry, or the same number of squadrons of cavalry. A brigade of artillery consists of two or three batteries, either of foot or horse artillery, and eight men form what is called a brigade of Sappers and Miners. The term Household Brigade is applied to the household troops, consisting of the Horse-guards, Life-guards, and Foot-guards.

Brigade-Major, an officer who is attached to a brigade to perform duties similar to those of the adjutant of a regiment, and acts as an aide-de-camp to the brigadier-general. He must be a captain or sub-altern officer, and is generally selected from among the captains of the regiments forming the brigade.

Brigadier-General, *brig-a-deer'*, the name given, in Mil., to the officer selected to take the command of a brigade. The post is generally given to one of the colonels commanding the regiments of which the brigade is composed. He holds temporary rank between a colonel and major-general.

Brigandine, *brig'-an-deen* (Fr. *brigantin*), a coat of mail composed of small scales or pieces of metal sewn upon a closely-fitting tunic of linen or leather, and sometimes covered externally with the same material. It seems to have resembled the tegulated armour of the time of Stephen.

Bright's Disease, or Granular Disease of the Kidneys, *brites*, is a particular disease of the kidneys, named after the late Dr. Bright, who first pointed out its nature and character. It consists in a degeneration of the tissues of the kidneys into fat, by which their secreting powers are impaired, and the urea is not sufficiently separated from the blood. The distinguishing characteristic of this disease is the existence of albumen in the urine, which, though not invariably, is almost always present, and is readily detected by its coagulating on the application of heat. Healthy urine contains no albumen, which is the great agent in nutrition. It is obtained here at the expense of the serum of the blood, and no disease so closely approaches hæmorrhage in its power of impoverishing the blood and exhausting its red particles. Hence arises that waxy and leucophlegmatic aspect which so strongly characterizes this complaint. Patients labouring under this disease are liable to inflammatory and congestive states of other important organs; and hence coma, convulsions, and apoplexy may occur during its progress. The heart, too, may become implicated, and dropsy almost always occurs, sooner or later. This disease may be occasioned by severe cold, repressed perspiration, or immoderate use of ardent spirits, and it not uncommonly follows scarlet fever. In the treatment, the secretions of the skin are to be encouraged by the use of warm baths and diaphoretics, and the dropsical tendency is to be counteracted, as far as possible, by purgatives and diuretics. Local bleeding is frequently beneficial, but general bleeding is to be avoided, from the exhausting tendency of the disease.

Brill, *bril* (*Pleuronectes rhombus*), a fish bling the turbot in shape, but inferior to it both as regards size and quality. The London market is chiefly supplied from the southern coast of England, where the brill is very plentiful.



THE BRILL.

Brilliant, *bril'-yant* (Fr. *brillant*), a name given

to the *diamond* when cut in the following manner. The principal face, which is called the table, is surrounded by a fringe composed of a number of facets, which is all that is visible above the bezel when set. The proportion for the depth should be half the breadth of the stone, terminated with a small face parallel to the table, and connected with the surface by elongated facets. As the octahedron is the most common natural form of the stone, and the brilliant cut is by far the most advantageous in point of effect, besides being the most economical form that can be adopted, it is generally preferred. (*See* DIAMOND.)

BRIMSTONE. (*See* SULPHUR.)

BRINE, *brine* (SAX. *bryne*), water saturated or highly impregnated with common salt. Brine is either natural, as when it flows from brine-springs, or artificial, when it is formed by dissolving salt in water. Brine-springs are fountains which flow with salt water instead of fresh. There are several of them in different parts of England.

BRISTLES, *bris'-selz* (SAX. *bristle*), are the long, stiff, coarse hairs taken from the hog, and are principally used in brush-making. They are mostly imported from Russia and Poland to the amount of 3,000,000 lbs. weight annually. They are separated into different qualities and colours by children, the whitest being technically termed *lilies*, the rest black, yellow, or *grey*, as the case may be.

BRISTOL DIAMONDS, *bris'-tol*, small brilliant hexagonal crystals of white quartz, found in the limestone at Clifton, near Bristol.

BRISURE, *bre-zoor'* (Fr. *briser*, to break), in Mil., an expression applied to any part of a parapet or rampart which is constructed in a direction different to that part of the fortification of which it forms a continuous portion. In field-works the term *brisure* is applied to the faces of a star fort, or those of any line of defensive works consisting of a series of re-entering and salient angles.

BRITANNIA METAL, *brit-tăn'-ya*, an alloy of ti lead, antimony, and brass, in very varying proportions, some makers using equal parts of these metal while others use an excess of tin amounting to 7½ per cent. of the whole. Britannia metal is much used for spoons, teapots, &c. &c., on account of the ease with which it may be worked and polished.

BRITANNIA TUBULAR BRIDGE, a bridge built by the directors of the Chester and Holyhead railway, over the Menai Strait, to connect the island of Anglesey by railway with the mainland, and admit of the transit of passengers and mails to Holyhead, *en route* to Ireland, without interruption. It was designed by Mr. Robert Stephenson and Mr. Fairbairn, the celebrated engineers (*see* vol. I. of this work), in 1845, and is remarkable for being the first tubular bridge ever erected. Four important requisites have been satisfied in the construction of this and other bridges on the same principle,—strength, lightness, a span of considerable extent without the support of arches, and non-interference with the navigation of the waters over which they are thrown. (*See* TUBULAR BRIDGE.) The building was commenced in 1846, and the structure completely finished in 1850, one line of tubes being thrown open for traffic in the month of March in that year, and the other in August. The entire length of the bridge is about 1,840 feet; but the tubes extend to a distance of about 1,512 feet from end to end. The bridge consists of a double line of tubes, each formed of four separate pieces of tubing, supported on three towers of massive masonry and two abutments, one on the Anglesey side, the other on the Caernarvon side of the strait. The principal or central support, called the Britannia Tower, is built on a rock which rises above the level of the water in the middle of the strait; it is altogether 191 feet in height, the height of the masonry on which the tube rests being 104 feet above high water-mark. The supports between the central tower and the abutments are built near the shore on either side, and are about 173 feet in height. The span between the Britannia Tower and the tower on the Caernarvon side is 459 feet 3 inches, and between this tower and the abutment 230 feet; while the span between the Britannia Tower and the tower on the Anglesey side is 459 feet 3 inches, and between this tower and the abutment 230 feet. The tubes stretching from tower to tower are twelve *feet* longer than the span at either end, and considerably more at the abutments; they rest on bed-plates, which move on rollers and balls of cast iron, to admit of the expansion and contraction of the metal of which the tubes are composed, under the influence of heat and cold. The tube is higher in the centre than at either end, the top being in the form of a parabolic curve; the height externally in the middle is 30 feet, and at either end 22 feet 9 inches; internally it is 26 feet high in the centre, and 18 feet 9 inches at the extremities, the thickness of the walls being 2 feet; the width of the interior of the tubes is 13 feet 8 inches, and is the same throughout. The iron of which the tubes are made, exclusive of more than two millions of rivets used to fasten the plates and girders together, weighs 10,550 tons, of which 9,360 are wrought iron; 1,015, cast-iron girders and plates; and 175, railway beds and rails. There are nearly 1,500,000 cubic feet of masonry in the towers and abutments. The long tubes, spanning the water from tower to tower, were built on shore, and floated off on pontoons; they were then gradually and successfully raised to their present position by enormous hydraulic pressure, an achievement which is regarded as one of the most remarkable engineering operations of modern times. The entire cost of the structure was about £600,000.

BRITISH ARM . (*See* ARMY.)

BRITISH AS ATION FOR THE ADVANCEMENT OF SCIENCE, is an association of men of science, which meets annually in one of the larger towns of the United Kingdom, and has for its object "to give a stronger impulse and a more systematic direction to scientific inquiry,—to promote the intercourse of those who cultivate science in different parts of the British empire with one another and with foreign philosophers,—to obtain a more general attention to the objects of science, and a removal of any disadvantages of a public kind which impede its progress." It is divided into several sections, each of which has a president, e-presidents, secretaries, and council. The sections as follows:—A. Mathematics and Physics; B. Chemistry and Mineralogy, including their applications Agriculture and the Arts; C. Geology; D. Zoology and Botany, including Physiology; sub-section D. Physiological Science; E. Geography and Ethnology; F. Economic Science and Statistics; G. Mechanical Science. Life members pay, on admission, £10; annual subscribers pay £2 for first year, and £1 every subsequent year; and associates pay £1 for admission o the meetings, &c. Life members and annual subscribers are entitled to a copy of the reports *gratis*. The association originated in a general feeling of the w state of science in England, and the first meeting, hich was held at York in 1831, was brought about mainly through the instrumentality of Sir David Brewster. Large sums are annually expended by the association in grants to individuals to enable them to prosecute scientific inquiries in particular directions.

BRITISH GUM.—British gum, or dextrine, as it is usually called, from the property possessed by it of rotating a ray of polarized light to the right, is simply torrefied starch. To prepare it, it is only necessary to heat starch to a temperature of 300°, until it assumes a buff colour. Starch consists of a soluble substance contained in an insoluble envelope. By exposing it to heat, the envelope is broken, and the soluble matter is set free. (*See* STARCH.) It is much used by calico-printers and dyers for thickening dyes and stiffening fabrics.

BRITISH MUSEUM.—This great national institution owes its foundation to the will of Sir Hans Sloane, who, during a long and successful career as a physician in London, had accumulated, in addition to a considerable library of books and MSS., the largest collection of objects of natural history and works of art of his time. These he directed, on his death, which took place in 1753, to be offered to the British government for £20,000, which he believed to be not one-fourth of their value. Fortunately, the offer was at once accepted. The act 26 Geo. II. c. 22, which authorized their purchase, directed the purchase also of the Harleian collection of MSS. for £10,000, and enacted that the Cottonian library, which had been given to the government for public use in the reign of William III., should, with these, form one general collection. This act di-

rected, that for these purposes the sum of £100,000 be raised by means of lottery, leaving sufficient funds available for the purchase and fitting up of premises for receiving them, and for originating a permanent income. In the spring of 1754, the mansion in Great Russell Street, then known as Montague House, was purchased as a repository for the whole, and between 1755 and 1759 the different collections were removed into it. Trustees were appointed, and the new institution received the name of the British Museum. It was first opened for public inspection on the 15th January, 1759. A nucleus having been formed, the museum rapidly increased, and it became evident that additional accommodation would be necessary. The arrival of the Egyptian antiquities from Alexandria in 1801, and the purchase of the Townley marbles in 1805, rendered additional accommodation indispensable, and a gallery, adequate for both, was completed in 1807. The donation by his majesty George IV. of the library of his father, George III., in 1823, led to active steps being taken for the erection of an entirely new museum, plans of which were ordered by the government to be prepared. Sir Robert Smirke was accordingly employed to prepare the plans, and in 1828 the eastern wing of the present building was finished and occupied by the Royal library. The other portions of the new building were gradually proceeded with, and in 1847 the northern, southern, and western wings were finished. The style of architecture adopted is the Grecian Ionic. The principal front of the building is towards the south, facing Great Russell Street. It consists of a great central portico, with an advancing wing on either side, giving to the entire front an extent of 370 feet, the whole of which is surrounded by a colonnade consisting of 44 massive columns. The columns are five feet in diameter at their base and 45 feet high; 12 stone steps, 120 feet in length, leading up to the portico. In the pediment are groups of allegorical figures by Sir Richard Westmacott, representing the progress of civilization. On either side of the Museum there is a semi-detached house, containing the residences of the chief officers of the establishment, giving an additional length of 200 feet to the front, and making its entire length 570 feet. The building, on its southern and eastern face, is inclosed by a renaissance iron railing, painted in imitation of bronze, and terminated by gilt spear-heads. An outer iron barrier runs the entire length of the front of the building. The building, as erected by Sir Robert Smirke, consisted of four ranges of apartments,—east, west, north, and south, and inclosed a large open quadrangle in the centre. The southern range contains the great entrance-hall and staircase. The entrance-hall is 62 feet by 51, and 31 feet high, and is ornamented by four marble statues,—Chantrey's Sir Joseph Banks, Roubilliac's Shakspere, Nollekin's bust of Townley, and Westmacott's Mrs. Damer. To the west of the hall is the principal staircase, leading to the galleries; the centre flight is 17 feet wide, flanked by two pedestals of grey Aberdeen granite intended to receive colossal sculptures. On the first landing are pedestals and carved vases of Huddlestone stone. To the east of the hall in the southern range, on the lower floor, is a room containing the Grenville library; and to the west a saloon, containing antiquities. The eastern range, besides some apartments appropriated to MSS., has a magnificent apartment, 300 feet long and 40 wide, containing the Royal library. The northern range of apartments is allotted to the general library, one of the rooms, the "main library," being 84 feet by 80, and having a striking appearance. The western range has one magnificent apartment, 300 feet in length, containing Egyptian and other sculpture. The whole of this extent of building on the lower or principal floor is of the height of 31 feet, and lighted by large windows, which are at the height of nearly 14 feet from the floor. Ascending the grand staircase we reach the upper floor, containing antiquities and natural history collections. The division of the southern range, to the west of the staircase, is occupied by antiquities, while botany occupies the division to the east. The western range is also occupied by antiquities; the northern partly by mineralogical specimens and partly by zoological objects, the latter also occupying the whole of the eastern range. The ranges of apartments on the upper floor, while of goodly dimensions, and well adapted for the purposes they serve, present, architecturally, no striking features. They are fitted up with glass cases against the walls, and table-cases in the centre, for the exhibition of the different objects. They are also lighted from above, an arrangement which, while it affords more wall-space for the exhibition of the objects, likewise admits of their being seen to greater advantage. Such was the great edifice planned by Sir Robert Smirke, which, at the time of its being finished, was regarded as the finest of the non-ecclesiastical buildings in the metropolis; but before it had reached completion it was found to be insufficient for the rapidly-increasing wants of the museum. A gallery, or saloon, for the Elgin marbles was constructed to the west of the western range, and further accommodation for the library was obtained by building what is called "the arch-room," an addition to the western side of the northern wing. Various other additions have since been made, the most important of which is the new Reading-room, of which it is scarcely possible to speak in too high terms of admiration. It occupies the quadrangular space in the centre of the building, and is connected with the entrance-hall by a long passage. At least thirty feet of the quadrangle are left all round, to give air and light to the surrounding buildings. The plan of the new reading-room was suggested by Mr. Panizzi, the present principal librarian, and was carried out by Mr. Sidney Smirke, brother of the architect of the main building. The first parliamentary grant for its construction was voted in 1854, and it was opened in 1857, the entire cost, including the fittings and furniture, amounting to about £150,000. It is circular in form, and is constructed principally of iron, being covered by a magnificent dome, the largest, with one exception, in the world. The diameter of the floor is 140 feet, and the height from the floor to the top of the dome is 106 feet. The dome exceeds in diameter either that of St. Paul's or of St. Peter's at Rome, and is only surpassed by that of the Pantheon at Rome, which has a diameter of 142 feet. It is, perhaps, to be regretted that the architect did not enlarge its dimensions by a few feet, so as to render it indisputably the largest dome in the world. The room is lighted from above by a range of 20 windows, 27 feet high and 12 feet wide, running round the dome, and by a lantern-light, 40 feet in diameter at the top. The walls are lined with books to the height of 25 feet, accessible either from the floor or from two rows of galleries, which run round the apartment. The books accessible from the floor are chiefly books of reference for the use of the readers, who may consult them without applying to any of the attendants. About 20,000 volumes are in this way at the service of the readers. Should a reader require any other book in the library, he has only to copy out its title and number from the catalogue, adding the date, his own name, and the number of his seat, on a ticket provided for the purpose, and in a short time the volume or volumes are placed noiselessly at his side. Each reader has a table four feet three inches long, carefully marked off, and fitted up with every convenience for reading and writing; and there is accommodation for about 300 readers. Even this large number of seats is becoming too small for those that seek to avail themselves of the use of the room, and of late numbers have had, on particular occasions, more especially on the Saturday afternoons, to go away disappointed, the seats being all occupied. Those who have occasion frequently to avail themselves of the reading-room and library are best able to estimate the value of the boon which they enjoy; and much praise is due to Mr. Panizzi, who not only conceived the original design, but constantly superintended the progress of the work, frequently suggesting improvements and alterations as it went on. Notwithstanding the great additions made to the Museum, a strong demand still exists for more space. Various schemes have been proposed for obviating this difficulty, either by the extension of the present building, or by removing some part of the collections to another locality. One of the proposals is the removal of the natural history collections to Kensington, to a building to be erected there for that purpose; and this scheme is very likely to be carried out. *Contents.*—At first the Museum

prised three departments only,—printed books, manuscripts, and natural history, the last including antiquities, works of art, &c. From time to time the number has been increased, so that now there are eight departments; viz., printed books, manuscripts, prints and drawings, antiquities, zoology, botany, geology, mineralogy. Over each of these departments is a chief officer, called a keeper; those of natural history having also a superior officer, called a superintendent. *The Printed Book Department.*—The original bequest of Sir Hans Sloane, amounting to about 50,000 volumes, soon received a valuable addition in the Royal library, which had been accumulated by the sovereigns of England from the time of Henry VII. downwards. This library was presented to the Museum by George II. in 1757. The collection itself was not large, numbering only some 10,500 volumes; but it was valuable, as comprising the libraries of some eminent individuals, as Archbishop Cranmer and Isaac Casaubon. At this time it also received the right to a copy of every work entered at Stationers' Hall. In 1763 it received from George III. a valuable collection of pamphlets relating to the civil wars of England between 1640 and 1660, made by George Thomason, a bookseller of the time in St. Paul's Churchyard. In 1823 the splendid library of George III., collected during his long reign, at an expense of about £150,000, was presented to the Museum by George IV. The most important of the recent additions was that bequeathed by the Right Hon. Thomas Grenville, in 1846, consisting of 20,240 volumes, collected at an expense of upwards of £54,000. Besides bequests and donations, the library has been largely increased by purchases, and is now one of the largest collections of books in the world, being estimated to contain (1862) upwards of 600,000 volumes. *Manuscript Department.*—The history of the manuscript department in general resembles that of the printed books, though its growth has been much less considerable. The Cottonian, Sloanean, and Harleian collections formed the nucleus of this department. The Cottonian collection, made by Sir Robert Cotton, who died in 1631, is particularly rich in Anglo-Saxon MSS. and documents referring to the early history of Britain. Many of the works formerly belonged to monastic libraries. The Sloanean collection consists of 4,100 volumes, relating chiefly to medical and natural-history subjects. The Harleian collection is of a very miscellaneous character, including early civil and ecclesiastical records, MSS. of the ancient classics, illuminated missals, and poems, essays, ballads, plays, "in almost every modern language." It consists of about 7,300 volumes, besides 14,000 original rolls, charters, deeds, and other legal documents. In 1757 another collection was added,—that of the MSS. of the Royal library of England, comprising about 1,950 volumes, many of which were obtained from the monasteries on their destruction. One of the most valuable documents of this collection is the *Codex Alexandrinus*. (*See* ALEXANDRIAN MANUSCRIPT.) The Lansdowne collection of 1,245 volumes was purchased in 1805, and the Hargrave collection, chiefly connected with law, in 1813. The Burney collection of 520 volumes is chiefly noted for its copies of the ancient classics. The Royal library of George III. brought with it about 440 volumes of MSS. Francis Henry Egerton, the last earl of Bridgewater, bequeathed to the Museum 67 MSS., together with £5,000 and £7,000; the interest of the former sum to be spent in adding to the Egerton collection, and that of the latter to pay the salary of an Egerton librarian. In 1835 the Arundel collection, comprising 600 volumes, was obtained from the Royal Society. It is particularly rich in works bearing upon the early history of the people and language of this country, and contains a large assemblage of books of civil and canon law. These are the principal collections in this department; but there are numerous others obtained either as donations or by purchase, and containing many works of interest and value. The *Department of Prints and Drawings* comprises those bequeathed by the Rev. C. M. Cracherode, in 1799; by Mr. Richard Payne-Knight, in 1824; the Sheepshanks collection of Dutch etchings, purchased in 1836; and numerous smaller collections, obtained by gift or by purchase. Latterly this department has been increasing as rapidly as any in the Museum. Of the Italian school, there are original drawings by Michael Angelo, Raphael, Paul Veronese, Tintoretto, Leonardo da Vinci, Correggio, and others. The German school contains drawings of Peter Vischer, Albert Durer, Hans Holbein, and others. The Dutch school is represented by one or two superb drawings by Rubens; also numerous specimens of Van Dyck, Rembrandt, Ostade, Teniers, Paul Potter, and A. Cuyp. The French school is represented by numerous drawings by Claude Lorraine and others; and the Spanish by some of Murillo, and others of less note. Among the engravings are a number of specimens of the Italian school, including works by Botticelli, Leonardo da Vinci, Raimondi, and others. Of the German school there are specimens of Lucas Cranach, Martin Schongauer, Albert Durer, and others. The Dutch school is represented by engravings by Lucas van Leyden, Van Dyck, Teniers, Rembrandt, Ostade, &c. This department contains, also, an extensive and valuable collection of works in niello, and of sulphur casts. *The Department of Antiquities.*—The collection of antiquities, which was at first so small as to be regarded merely as an appendage to natural history, now occupies more space than any other department except the library. It is divided into two classes; the one consisting of sculptures, including inscriptions and architectural remains, the other the smaller remains of whatever nation or period, as vases, terra-cottas, gems, coins, medals, domestic utensils, ornaments, &c. The first considerable addition to this department was made by the purchase of the collection of Greek and Roman antiquities made by Sir W. Hamilton. The Egyptian antiquities brought from Alexandria in 1801, and the Townley marbles purchased in 1805, added largely to the collection; and in 1807 the antiquities were made a distinct department. In 1815 an extensive series of sculptures, the frieze of the temple of Apollo *Epicurius* (or the deliverer), near Phigalia, in Arcadia, was purchased by the Prince Regent, and ordered to be deposited in the Museum. To these were added, in 1816, the Elgin collection, consisting chiefly of excellent sculptures from Athens, purchased by government from the earl of Elgin for £33,000. Since that time numerous additions have been made to this department, particularly in the Assyrian antiquities obtained by Mr. Layard and others, and the sculptures and other antiquities obtained from the mausoleum of Halicarnassus. The sculptures are on the ground floor, and consist of Egyptian, Assyrian, Greek, and Roman remains. The Egyptian sculptures are of basalt and granite, and some of them date from 2,000 years before Christ. They represent human and allegorical figures, usually of colossal size, and inscribed with hieroglyphics. The smaller Egyptian remains are in a gallery on the upper floor. The Assyrian antiquities were obtained by a series of excavations conducted by Mr. Layard during 1847-50, and more recently by Messrs. Rassam and Loftus, at Nimroud, Koyunjik, Korsabad, &c. The monuments consist chiefly of slabs sculptured in slight relief, exhibiting warlike encounters, triumphal marches, &c., and frequently covered with cuneiform characters (which *see*). These monuments are exhibited in a suite of three long narrow rooms, recently erected, together with a large apartment on the basement. The Grecian antiquities are contained in three apartments communicating with the Egyptian gallery, known as the Lycian, Elgin, and Phigalian galleries. The Lycian apartment contains sculptures brought from Lycia, 1842-46, by Sir C. Fellowes, and ranging in date from the subjugation of the country by the Persians, B.C. 545, to the period of the Byzantine empire. The Elgin and the Phigalian galleries are so called from containing the Elgin and Phigalian marbles, which constitute the most important part of their contents. The collection of Roman antiquities embraces an interesting series of busts of various dates, arranged in chronological order, running down one side of the gallery; while, on the other, are mosaics and other remains discovered in this country. In the Græco-Roman saloon are antiquities found in Italy, but which bear unmistakable evidence of Greek origin. Among the smaller collections is that of vases, comprising numerous specimens of Phœnician, Etruscan, Greek, and Roman

workmanship. The bronzes are numerous, comprising a great variety of articles of Greek, Etruscan, and Roman manufacture. The British and Mediæval collection illustrates the condition of the arts in our own country, from the time when arrow- and spear-heads were made of flint, through the Anglo-Saxon and Norman periods, down to the Middle Ages, when works of art were produced which excite wonder and admiration even in the present day. The Ethnographical collection embraces articles now, or formerly, in use among nations other than European. Connected with the Antiquity department is the collection of coins and medals, which is very rich and valuable. They are arranged into ancient, mediæval, modern, and oriental, and are kept in one room, called the "Medal-room," no space having yet been found for exhibiting any of them to the public. Of the *Zoological department* it is almost impossible to say anything without being led into details, which our limits strictly forbid. According to the statement submitted to her Majesty's commissioners of inquiry in 1849 by Dr. Gray, after visiting the continental collections, he "believes that the Museum collections of mammalia, birds, shells, and lepidopterous insects, are much more extensive than any other public collection, and superior to all the public collections together. This is certainly the case with the first and last-mentioned groups, and he believes also with the other two. The collections of reptiles, fish, and crustacea, are second only to those at Paris, if at all below them;" but "the Museum collection in each of these classes contains many species which the Paris collection wants. The Museum collection of insects, taken as a whole, is much larger and better arranged than that of Paris.... The collections of corals, sea-eggs, and starfishes, are very large, far larger than those of all the other European collections together." Since that time the various collections have been largely increased. The *Botanical collection* is very extensive. The nucleus of this department was formed by the herbarium collected by Sir Hans Sloane, bound in 262 volumes, and comprising about 8,000 specimens collected in Jamaica and elsewhere. In 1827 it received, as an addition, the magnificent collection of Sir Joseph Banks, at one time the most valuable assemblage of dried plants in Europe. Since that time the additions to this department have been numerous, so that it now contains upwards of 50,000 species of plants, and in point of value to the botanist is second to no other collection in the world. Since 1858 a portion of this collection has been exhibited to the public. The *Geological* or *Palæontological department* contains an extensive series of fossil remains of plants and animals from the various fossiliferous strata. It has been mostly formed within the last quarter of a century, the first great contribution to it being the celebrated collection of Dr. Mantell, in 1839. It has since received large additions. The fossils and minerals together occupy six rooms of the north gallery of the Museum, the fossils being mostly disposed in wall-cases around the rooms, and the minerals in table-cases in the centre. The mineralogical collection, which is large and is rapidly increasing, is arranged according to a chemical classification, which, however, is not fully up to the present state of the science, and a re-arrangement is in contemplation. The management of the Museum is vested in a body of trustees amounting to forty-nine in number. The three principal trustees are the archbishop of Canterbury, the lord chancellor, and the speaker of the House of Commons, in whom is vested the patronage to the various offices, except that of principal librarian. There are twenty-two other official trustees; nine are representatives of the families of distinguished donors; and fifteen are elected by the other trustees. At first, the admission to the Museum was by means of printed tickets after written application; and the visitors were hurried through the several departments by attendants, not more than forty-five visitors being admitted per day. From time to time more liberal measures have been adopted, and now all who present themselves are freely admitted. The Museum is open daily during Easter, Whitsun, and Christmas weeks, and on Mondays, Wednesdays, and Fridays, in every other week, except the first week of January, of May, and of September, when it is closed. In summer, it is open from 10 to 6, in winter from 10 to 4; and during the months of March, April, September, and October, from 10 to 5 o'clock. The total expenditure connected with the Museum for the financial year 1859-60 was £78,445; of which,—salaries, £36,532; house expenses, £3,306; purchases and acquisitions, £23,763; bookbinding, cabinets, &c. £11,580; printing catalogues, &c. £2,778; miscellaneous, £486. The estimated expenditure for the year 1860-61 was £100,850. The total expense of the British Museum to the nation since its foundation in 1753 to 1860 has been £1,382,733.

BRITISH NAVY. (*See* NAVY.)

BRITTLENESS, *brit'-tl-ness* (Ang.-Sax.), a property possessed by some bodies, which, although solid, have their component particles so arranged, that the cohesive force which holds them together is overcome by comparatively small mechanical force. They can easily be reduced to powder. Brittleness is the reverse of malleability: as an instance, lead is malleable and glass is brittle.

BRITTLEWORTS. (*See* DIATOMACEÆ.)

BRIZA, *bri'-zä* (Gr. *brizo*, I nod, on account of the quaking character of the spikelets), in Bot., a gen. of grasses, commonly known as Quaking-grass, or Maiden-hair. Two species are natives of Britain, the *B. major* and *minor*. Their dense clusters of flowers hang upon the ends of very delicate filamentous peduncles, forming elegant panicles, which shake with the slightest breath of air.

BRIZURE, *brize'-ure* (Fr. *briser*, to break), an expression in Her., used in reference to any charge that is in a broken condition, or bruised. The terms *brisé* and *brisé* are used synonymously.

BROACH, or BROCHE, *brooche* (Fr. *broche*, a spit), a name given in Arch. to a small steeple or spire that is built on the top of a tower, rising immediately on the summit of its walls, without being surrounded at the base by a parapet or battlements.

BROAD ARROW, *broad-ar'-ro*, in Her., a charge representing an old-fashioned arrow-head, consisting of a hollow central spike from which side-pieces diverge in the form of the letter V, the outer edges of which are perfectly straight, and the inner engrailed. In heraldic phraseology, the broad arrow is commonly called a Pheon.

BROAD ARROW, in Mar., a mark formed by three lines broader at one end than the other, meeting together in a point. It is stamped or cut on all timber or metal used in her Majesty's dockyards, and on all naval stores that will bear incision or impress, belonging to the crown, that they may be identified if stolen. Sails and ropes are marked by the intermixture of a coloured thread or yarn. Thread of a different colour is used in each of her Majesty's dockyards; so that any storekeeper can not only tell that the material is the property of government, but also say in what dockyard it was made. It is unlawful for any one to have stores bearing the broad arrow, or any other government mark, in his possession; and an act was passed in 1698 by which a fine of £200 and costs is inflicted on any one on whose premises property so marked may be found.

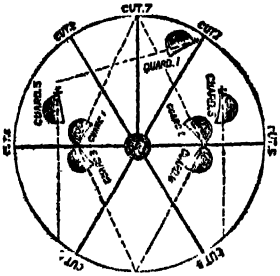


BROAD ARROW.

BROADSIDE, *broad-side* (Ang.-Sax.), in Mar., is precisely the same as would be called by soldiers a volley, *i.e.*, the discharging of the whole of the guns contained in one side of a ship at the same moment. The weight of shot and shell that can be delivered by the broadside of a line-of-battle ship is very great; the *Duke of Wellington*, of 131 guns, can fire off at one broadside a weight of metal amounting to 2,400 lbs. When a vessel is pressed down on one side in the water by the wind, she is said to be on her broadside.

BROAD-SWORD, *broad'-sord*, a sword with a broad blade, designed chiefly for cutting, but capable of being used, like the rapier, for thrusting. When made so as to be employed in the latter way, as well as for cutting, it is called a sabre, and forms one of the weapons of the English and continental cavalry soldier. The modern representatives of the old English broad-sword is the claymore, with which the Highland regiments in the English service are still armed. The English became more and more skilful in the use of the broad-sword, according as the wearing of suits of mail began to grow out. It was a common weapon in the

days of Queen Elizabeth, and the "swash-bucklers," or "bullies," of that period achieved an unenviable notoriety for their skill in it. The buckler, or shield, a very ancient article of armour, generally accompanied the broad-sword, forming as it did the principal means of defence against it. At the close of the 16th century, sword-and-buckler fighting began to grow out of use, having been superseded by the continental mode of fighting with the rapier, or thrusting-sword, and the dagger. The Highlanders, however, continued to use the weapon, as well as the target or buckler, until they were disarmed after the rising of 1745. With the Scotch Highland clans the broad-sword was termed the claymore, and it was their national weapon. Sir Walter Scott, in the "Lady of the Lake," gives several spirit-stirring descriptions of combats with the claymore and target. As has been stated, the sabre used in the cavalry regiments at the present time is a broad-sword with a point sharpened for thrusting. Every recruit is taught to use the weapon so as to make it a formidable instrument of destruction in warfare. In the accompanying illustration is shown a reduced model of the sabre-target. The lines within the circle denote the direction in which the "cuts" are to be made. Cut 1 is directed diagonally through the target, coming out at 4; cut 2 is the same, only from left to right; 3 is made upwards, diagonally, and 4 is the same, only in the opposite direction; cut 5 is horizontally through the target, from right to left, and 6 from left to right; cut 7 is perpendicularly downwards. All these cuts are fairly given with the edge of the broad-sword. The swords drawn upon the target represent the guards. There are seven cuts, seven guards, and three points.



BROADSWORD TARGET.

**Brocade**, *bro-kaid'* (Sp. *brocado*), a stout silken stuff, variegated with gold and silver, raised and enriched with foliage, flowers, and other ornaments, and used for the dresses of both sexes during the 17th and 18th centuries. In an inventory of the wardrobe of Charles II., in the Harleian library, is mentioned "white and gold brocade at two pounds three and sixpence per yard, and coliere-du-prince brocade at two pounds three shillings per yard." Brocade was not known in England till after the 13th century, and was a great rarity and luxury upon the continent in the 14th.

**Brocage**, *brok'-ij* (Ang.-Sax.), is the hire or commission due to a broker or agent, for managing a transaction frequently of a mean or unlawful nature.

**Brocage Contracts for Marriage**, are contracts by which a reward is stipulated for the promotion of a particular marriage by means of exerting an influence over one of the parties. These contracts are in law held to be *contra bonos mores*, and can afford no ground of action.

**Brocards, Brocardics, or Brocardica**, *bro'-kards*, denote, properly, maxims or principles in law, as the *Brocardica Juris* of Azo; but it has come to be applied to maxims or proverbs generally. It is said by Vossius to be derived from the Greek term *protarchia*, first elements; but others, with more probability, derive it from Burchard, or Brocard, bishop of Worms, who made a collection of canons, called from him Brocardica; and as they abounded in short sententious sayings and proverbs, the name came to be applied to works of that description.

**Broccoli**, *brok'-o-le* (Ital., sprouts), the name given to one of the many cultivated varieties of the *Brassica oleracea*. It is a common garden vegetable, and differs from the cauliflower only in having coloured instead of white heads. (*See* Brassica.)

**Brochure**, *bro-shure'* (Fr. *brocher*, to stitch), is a term taken from the French, and used in the same sense as pamphlet; properly a stitched book.

**Brochus, or Brochos**, *bro'-kus* (Gr., a snare), a medical term, denoting a noose, or a particular kind of bandage. It is also used to signify a person having inordinately thick lips, or whose teeth project forwards.

**Brogue, or Brog**, *brogue* (Irish), was a sort of rude, clumsy shoe, formerly worn by the native Irish and the Scotch Highlanders. From the manner in which the wearers of brogues pronounced the English language, the term came to be applied to their pronunciation.

**Broken-backed**, *bro'-kn-bak'-ed*, in Mar., a term applied to the state of a ship so loosened in her frame, either by age, weakness, or some great strain, as to droop at each end.

**Broken-wind**, a disease or unsoundness in horses, caused by a morbid secretion from the mucous membrane lining the larynx and the windpipe, with its many ramifications. The nature of the disease is not well understood, and the present mode of treating it is very unsatisfactory. Broken-wind is in reality incurable; and all that a veterinary surgeon can do is to mitigate the disease. Low-bred horses, which do not thrive, are most liable to broken-wind. While the horse is being exercised, the symptoms can be best observed. The eyes become suffused with blood, which is mostly in ... ire, the nostrils are distended, and the breathing ... mes very laboured. Horse-dealers sometimes try ... conceal the defects of a broken-winded horse by making him swallow grease. The effect, however, soon passes away, and it is therefore only the very ignorant and unwary who are thus deceived. A broken-winded horse has always a hollow cough, and, if watched while at work, the ribs are noticed to be actively moved, and after the air is expelled from the lungs they are depressed with a sudden jerk, produced by the abdominal muscles. When employed on hard work, broken-winded horses often drop down and die from exhaustion or from suffocation, internal hemorrhage, or congestion of the lungs. The disease of broken-wind was much more common in former times than at the present day: it is now found principally in those countries where horses are badly managed and coarsely fed.

**Broker**, *bro'-ker* (Ang.-Sax.), is a person employed as an agent to transact business between merchants or others, usually in the interest of either the buyer or seller, but sometimes acting for both parties. Generally, brokers confine themselves to the purchase and sale of some particular articles, or class of articles, by which means they obtain a more intimate knowledge of their qualities, market value, &c., and are thus able to negotiate on more favourable terms for their employers. A merchant trading in a variety of articles cannot have the same intimate knowledge for his guidance; and hence generally finds it for his advantage to effect his purchases and sales by means of brokers. Brokers are of different kinds, according to the branches of business to which they devote themselves; as bill-brokers, exchange-brokers, insurance-brokers, ship-brokers, pawnbrokers; all of whom will be found noticed under their special heads in other parts of this work. In London, every person desirous of acting as a broker must be licensed by the lord mayor and aldermen for that purpose, under such restrictions and limitations as they may think fit to enact. When admitted, he must give bond, under a penalty of £500, for the faithful discharge of his duties, without fraud or collusion, and to the utmost of his skill and knowledge. He is further bound not to deal in goods on his own account—a stipulation which is very commonly broken. Each broker pays on admission a fee of £5, and a like sum annually, so long as he continues to act. Any person acting as a broker without being duly licensed, is liable to a penalty of £100 for each transaction; but the law is frequently evaded. Every broker is bound to register regularly in a book all the contracts which he has entered into. The term broker is also usually applied to persons who buy and sell second-hand household furniture, though such an occupation bears little analogy to that which we have been describing, as these parties generally buy and sell, not as agents, but on their own account. Such persons frequently superadd to their business the appraising

and selling of goods distrained for rent; for the performance of which functions, however, they must provide themselves with an excise license, and conform to the regulations enacted by 57 Geo. III. c. 93.—*Ref.* Macculloch's *Commercial Dictionary*; *English Cyclopædia*—Arts and Sciences.

**Brokerage**, *bro'-ker-dj*, is the per-centage or commission charged by brokers for the sale or purchase of goods, bills of exchange, &c. (*See* Commission.)

**Broma**, *bro'-mă* (Gr. *broskō*, I eat), denotes food of any kind that is masticated; and hence *bromatology* is a discourse on food, *bromography* a treatise on food.

**Bromal**, *bro'-mal*, in Chem., a compound formed by the action of bromine upon alcohol. It is a colourless oil, of spec. grav. 3·35, and is analogous in its composition and properties to the corresponding compound of chlorine,—chloral (which *see*).

**Brome-grass.** (*See* Bromus.)

**Bromelia**, *bro-me'-li-ă* (named after Bromel, a Swedish botanist), in Bot., the typical genus of the nat. ord. *Bromeliaceæ*. The green fruit of *B. pinguin* is used as an anthelmintic and a diuretic in the West Indies; the prickly leaves yield strong fibres, which are twisted into ropes, and woven into coarse cloth.

**Bromeliaceæ**, *bro-me-li-ai'-se-e*, in Bot., the *Bromelia* or the Pine-apple fam., a nat. ord. of monocotyledonous plants, sub-class *Petaloideæ*. They are herbs or somewhat woody plants commonly epiphytical. Leaves persistent, crowded, channelled, rigid, sheathing at base, and frequently scurfy and with spiny margins; flowers showy; perianth superior, or nearly or quite inferior, arranged in two whorls, the outer of which has its parts commonly united into a tube, while the inner has its parts distinct, imbricated, and of a different colour; stamens 6; anthers introrse; ovary 3-celled, with a single style; fruit capsular or indehiscent, and 3-celled; embryo minute, in the base of mealy albumen, with the radicle next the hilum. There are 28 genera and about 175 species, which are distributed through the tropical regions of America, West Africa, and the East Indies. They are chiefly important for yielding edible fruits and useful fibres. Some have anthelmintic properties, and others contain colouring matters. (*See* Ananassa, Bromelia, Billbergia, Tillandsia.)

**Bromic Acid**, *bro'-mik*, symbol $BrO_5$, equivalent 120, the only known compound of bromine and oxygen. It corresponds in composition to chloric acid, but has never been obtained in an anhydrous condition. In combination with water it forms a colourless liquid, which first reddens and then bleaches litmus. With bases it forms bromates, which are similar in their properties to chlorates.

**Bromine**, *bro'-mine* (Gr. *bromos*, a stench), symbol Br, equivalent 80, spec. grav. 2·966. Bromine is an elementary substance, consisting of a heavy mobile fluid of a deep brownish-red colour. When exposed to the air, it volatilises rapidly, and boils at 145° Fahr. Its smell is disagreeably pungent, giving rise to a painful spasm of the glottis, if breathed. It acts energetically on the skin, producing a sore immediately on contact. At —7° Fahr. it solidifies into a yellowish-brown crystalline mass. It was discovered in 1826, by Balard, in minute quantities in sea-water, in which it exists as bromide of magnesium. It also occurs in a native bromide of silver found in Chili, and in union with various alkalies in certain mineral waters. It is prepared by passing chlorine through a solution of alkaline bromides, until the yellow colour produced remains uniform. Ether is added, which isolates the bromine. This is separated from the saline solution and shaken up with a solution of caustic potash. The solution is then evaporated to dryness, and the residue distilled with binoxide of manganese and sulphuric acid. Bromine is the only element that is liquid at ordinary temperatures, except mercury. The properties of bromine resemble those of chlorine; but they are somewhat less strongly developed. It bleaches vegetable colour, and is a non-supporter of combustion. It is slightly soluble in water, giving to it a yellow colour. It combines with water and forms a hydrate, which crystallizes in octahedra at 32° Fahr. The principal compounds of bromine are hydrobromic acid, a compound of one equivalent each of hydrogen and bromine. The action of hydrobromic acid on metallic oxides is precisely similar to that exerted on them by hydrochloric acid. Thus, hydrobromic acid and potash combine, forming bromide of potassium and water. Hydrobromic acid is soluble in water to a considerable extent. It is colourless, strongly acid, and suffers no change on exposure to the air. On the addition of nitric acid, decomposition takes place, and a bromic *aqua regia* is formed, which, like the chloric *aqua regia*, dissolves gold and platinum. With oxygen, bromine forms only one compound, *bromic acid* (which *see*). With chlorine, bromine forms a chloride, a reddish-yellow volatile liquid, soluble in water, and possessing bleaching properties. It also unites, in two proportions, with phosphorus and iodine. With sulphur, it forms a single bromide. None of these compounds merit notice. Bromine and its compounds are extensively employed in the daguerreotype and collodion processes. In the former, it reduces the time of exposure from minutes to seconds. Bromide of potassium is also used in medicine.

**Bromoform**, *bro'-mo-form*, a compound of bromine and formyl, corresponding to chloroform, which is a compound of the latter radical with chlorine.

**Bromus**, *bro'-mus* (Gr. *bromos*, wild oat), in Bot., Brome-grass, a gen. of plants belonging to the nat. ord. *Gramineæ*, characterised by the flowers being in lax panicles; the glumes many-flowered; the outer palea bifid at the extremity and awned beneath; and by the very short stigma growing from the face of the germen beneath its apex. Many of the species are very common British grasses. Some have erroneously been reputed to be purgative.

**Bronchi**, *bron'-ke* (Gr. *bronchos*, the windpipe), in Anat., is the name given to the subdivisions of the trachea, or windpipe, which proceed to the lungs. The trachea divides into the two bronchi opposite the third dorsal vertebra. The right bronchus is larger than the left, and is shorter, reaching the lung on a line with the fourth dorsal vertebra. The left bronchus passes under the arch of the aorta. The structure of the bronchi is similar to that of the trachea, being round and cartilaginous in front, and flat, with muscular and fibrous tissue, behind. On entering the substance of a lung, the bronchi divide and subdivide into numerous branches, till they terminate in very minute air-cells.

**Bronchitis**, *bron-ki'-tis*, or inflammation of the lining membrane of the bronchial tubes, is one of the most prevalent and fatal diseases in this country. The great exciting cause is cold, especially when combined with moisture; but whatever tends to diminish the general vigour of the system, and exposes of every kind, predispose to it. Any sudden change of temperature is apt to produce it. It is especially prevalent during the spring months. Its first symptoms are generally those of a common cold, accompanied with an occasional cough and a sense of weariness and headache. The cough increases, and there is a feeling of oppression in the chest, and the breathing produces a kind of wheezing noise. The pulse is rapid and weak, and there is extreme lassitude, with pain in the limbs, mental heaviness, &c. If the feverish symptoms increase, the breathing becomes difficult from the clogging of the tubes with mucus, which is, to some extent, expectorated during the cough. In severe cases, the symptoms become more and more alarming; the breathing becomes so embarrassed that the patient can no longer lie down, but requires to maintain an upright posture and use all his muscles in respiration. At last, he is so exhausted that he ceases to expectorate, and dies of suffocation from the accumulated mucus, usually in from five to seven days. Even in less severe cases, the delicate respiratory tubes are frequently permanently injured; so that the proper aëration of the blood is interfered with. The treatment of this disease will vary, according to its nature and the constitution of the patient; and the necessity of always having recourse to a medical man cannot be too strongly insisted upon. The great object of the treatment is to reduce and remove the inflammatory condition of the organs: hence a mustard-poultice should be applied to the chest, the feet bathed in hot water, and warm diluent drinks, as barley-water or linseed tea, given. It is frequently necessary to have recourse to blood-

letting and to administer emetics, in order to remove the accumulations of mucus. The bowels should be kept moderately open during the whole course of the disease. (*See* Catarrh, Cough.)

Bronchocele. (*See* Goitre.)

Bronchotomy. (*See* Tracheotomy.)

Bronze, *bronze* (Fr.), an alloy of copper and tin, to which are sometimes added small portions of zinc and lead. Gun, bell, and speculum metal partake much of the nature of bronze. The manufacture of bronze is very ancient, having been brought to a considerable state of refinement 700 years before the Christian era. The ancients used it for weapons and tools, on account of its great hardness; but it was at length superseded for these purposes by steel, and is now only employed for statuary and medals. For the former purpose, bronze is particularly well fitted, being tough, hard, little affected by atmospheric influence, besides possessing the valuable property of flowing freely when melted, and expanding when solidifying; by which means the most intricate detail in the mould is copied with sharpness. Bronze may be tempered in an exactly contrary manner to steel. If cooled suddenly, it becomes so soft that it may be hammered and turned in the lathe; but if allowed to cool slowly, it becomes brittle, hard, and elastic. In casting large statues or other works, the greatest skill and care are necessary, from the circumstance that alloys of copper and tin have a tendency, when melted, to separate, the tin rising to the top of the melted mass, and forming a more fusible mixture. From the following analyses, it will be seen that bronze differs greatly in composition: —Ancient bronze from Celtic antiquities,—tin, 12; copper, 88. Egyptian bronze,—tin, 22; copper, 78. Chinese bronze,—tin, 20; copper, 80. Roman bronze, —tin, 15; copper, 85. Modern bronze from the statue of Louis XV.,—copper, 82·45; zinc, 10·30; tin, 4·10; lead, 3·15. (*See* also Bell, Speculum, and Gun-Metal.)

Bronzite, *bron'-zite*, a variety of diallage occurring in serpentine and greenstone. It is found in dark-green foliated masses, with a pearly metallic lustre resembling bronze; whence its name. Chemically, it is a silicate of magnesia, containing small portions of lime, protoxide of iron, manganese, alumina, and water.

Brookite, *brook'-ite*, oxide of titanium, crystallising in thin hair-brown masses; found on Snowdon and in Dauphiny.

Broom. (*See* Cytisus.)

Broom-rape. (*See* Orobanchaceæ.)

Brosimum, *bro'-si-mum* (Gr. *brosimos*, eatable), in Bot., a gen. of plants belonging to the nat. ord. *Artocarpaceæ*, or Bread-fruit family. The species *B. utile*, sometimes called *Galactodendron utile*, is the celebrated palo de vaca, or cow-tree, of South America. It yields a milky juice, said to be almost as nutritious as milk from the cow. From the bark of *B. namaqua* strong fibres are obtained, which are much used in Panama for making sail-cloth and ropes.

Brother, *bruth'-er* (Lat. *frater*; Ger. *bruder*), is a term denoting the relationship between a male and a male or female born of the same father and mother. When the relationship is only by one of the parents, the term half-brother, or brother of the half-blood, is frequently used. A brother-german is a brother both by the father's and mother's side; a brother-uterine, only by the mother's side. A foster-brother is one suckled by the same nurse, but not born of the same parents. A brother-in-law is a relationship by marriage,—the brother of one's wife, or the husband of one's sister. In Scripture, the term brother is used in a wider sense, as in the case of Abraham and Lot, Jacob and Laban, &c. It is customary for kings to style each other brother; and persons in the same profession, as judges, bishops, priests, &c., not unfrequently do so. The primitive Christians called each other brothers; and monks of the same convent usually adopt the same phraseology. Certain classes of monks were particularly called brothers; as the monks of St. Dominic, Preaching Brothers; those of St. Francis, Minor Brothers. (*See* Beutheen.) Lay brothers were an inferior class of monks, not in holy orders, but bound by monastic rules, and usually employed as servants in the monasteries. They were sometimes called outer brothers. In the Middle-Age writers, brother sometimes denotes a *comes*, or governor of a province. In a more general sense, brother or brethren is used for mankind in general; all the human race being descended from the same parents.

Brotherhood. (*See* Fraternity.)

Broussonetia, *broo-so-ne'-ti-a* (in honour of M. Broussonet, a French naturalist and traveller), in Bot., a gen. of plants belonging to the nat. ord. *Moraceæ*. There is but one species, *B. papyrifera*, the paper mulberry, the bark of which is used in China and Japan as paper material, and in the South-Sea Islands for making a kind of cloth. The plant forms a small tree, with soft, brittle, woolly branches, and large, hairy, rough leaves, either heart-shaped and undivided, or cut into deep irregular lobes. It is not uncommon in British shrubberies.

Brown Coal, *brown-kole*, a named used for lignite, in contradistinction to fine coal, which is black. (*See* Lignite.)

Brownie, *brow'-ne*, the name of a kind of fairy formerly believed in in the Hebrides and North of Scotland. He was an obliging sort of elf, that used to come into houses by night, and perform lustily any piece of work that might remain to be done. At one time every family of importance believed that they had a special brownie, and they gave him offerings of the various products of the place. Thus some, when they churned their milk, or brewed, poured some of the milk or wort through the hole of a stone called the brownie's stone. The brownie of Scotland bore a very striking resemblance to the Robin Goodfellow of England.

Browning, *brown'-ing* (Ang.-Sax.), a process by which the barrels of muskets and rifles are partially oxidized and sulphurized, and so prevented from being easily rusted. The barrel being brightened and cleaned thoroughly from oil, a mixture of nitric acid, chloride of iron, sal ammoniac, and sulphate of copper, is laid on, and allowed to remain several hours. The process is repeated several times, and the barrel is cleaned ultimately with alkaline water, and polished.

Brownists, *brown'-ists*, a sect of Christians, which arose in England towards the end of the 16th century, and took their name from their founder, Robert Brown, a man of some learning, but of an impetuous and fiery temper. He began to inveigh against the ceremonies of the Church of England in 1580, and zealously diffused his sentiments by preaching from place to place, principally in the county of Norfolk. Being greatly opposed, he left England with a congregation which he had collected, and settled at Middleburgh, in Zealand; but, quarrelling with his flock, he, three years afterwards, left them, and returned to England. He again itinerated through the country, and preached with considerable success; but he afterwards conformed to the established church, and obtained the rectory of Oundle. His followers, however, continued to increase, so that Sir Walter Raleigh, in 1592, estimated their number at upwards of 20,000, exclusive of women and children. They were treated with great rigour, and several of them were executed in the reign of Elizabeth. Many fled to Holland, where several churches were established; as in Amsterdam, Rotterdam, and Leyden. This sect subsequently merged in the Independents, of whom Mr. Robinson, pastor of the Brownist church at Leyden, is regarded as the real founder. The Brownists differed from the Episcopalians mainly regarding ecclesiastical order and discipline, for their theological opinions were generally conformable to the Articles of the Church. Their doctrines and church government very much resemble those of the English Independents of the present day. (*See* Independents.)

Brucia, or Brucine, *bru'-se-a*, an alkaloid occurring in large quantities in conjunction with strychnia in the *strychnos nux vomica*. It is less marked in its properties than strychnia, which it closely resembles. It crystallizes in colourless transparent rhombic prisms, which are insoluble in ether. Its poisonous properties are less active than those of strychnia. By the action of nitric acid on brucia, compounds are obtained which render it probable that methyl enters into the composition of this alkaloid. (*See* Strychnia.)

Brucite, *bru'-site*, a fibrous hydrate of magnesia,

occurring in silky greyish or bluish-white masses. A name given to chondrodite or chrysolite.

**Brumaire**, *bru-maire'* (Fr. *brume*, fog), the name given to the second month of the year in the French revolutionary calendar. It commenced on the 23rd of October and ended on the 21st of November, thus comprising thirty days. It received its name from the fogs that usually prevail about this time. The 18th of Brumaire, VIII. year (9th of November, 1799), is celebrated for the overthrow of the Directory and the establishment of the sway of Napoleon.

**Bruniaceæ**, *bru-ne-ai'-se-e*, in Bot., the *Brunia* fam., a nat. ord. of dicotyledonous plants in the sub-class *Calycifloræ*. They are small heath-like shrubs, found at the Cape of Good Hope and in Madagascar. Their properties and uses are unknown.

**Brunonian System of Medicine**, *bru-no'-ni-an*, was founded by Dr. John Brown, a Scottish physician, who flourished towards the end of last century. His system is explained at large in his "Elementa Medicinæ," published in 1780. It found numerous supporters, and gave rise to much opposition. According to him, the characteristics of life are sensation and motion; the capability of being affected by external powers is termed excitability; the agents are *stimuli*, or exciting powers; the result is excitement. When the *stimuli* act upon the excitability with a sufficient degree of power, there is a pleasant sensation of health; when they raise the excitement above this pount, or depress it below it, disease takes place; and when the *stimuli* cease to act, or the system to feel their power, death ensues. The *stimuli* are of two classes—external and internal; the external being heat, light, air, food, medicines; the internal, the functions of the body, muscular exertion, powers of the mind. Excitement is life, and the body has an unceasing tendency to dissolution, which is only opposed by the incessant application of excitement. All *stimuli*, by acting upon the excitability, tend to exhaust it. Our whole life is an alternation of wasting and recruiting our excitability,—of wasting it by day in labour and enjoyment, of recruiting it by night by the abstraction of all stimulating powers. All diseases are of two kinds—*asthenic*, or diseases of weakness, or debility; and *sthenic*, or diseases of excess of strength. His mode of treating diseases, therefore, had for its object merely the increasing or diminishing of excitement, without regard to their particular symptoms. The doctrine, in its original form, may be considered as exploded; but more recently a sect has arisen, principally in Italy, who profess a modification of the Brunonian system, and who are known as Modern Brunonians. They advocate what is known as the *contra-stimulant* mode of treatment of disease.

**Brunswick Green**, *brunz'-wik*, a pigment consisting of oxychloride of copper, formed by exposing copper clippings to the action of hydrochloric acid, or a strong solution of sal-ammoniac, in the open air.

**Brushes, Brushmaking**, *brush'-es* (Fr. *brosses*; Ger. *bürsten*), instruments used for painting or for removing dirt by light rubbing, from floors, furniture, &c. They are generally made of hair, bristles, or whalebone, and are divided into two classes,—simple and compound. Simple brushes are composed of a single tuft, and compound brushes consist of several tufts inserted in a handle. Painters' brushes are examples of the former, and ordinary hair-brushes of the latter. The smaller kinds of simple brushes are known by the name of pencils, and are made of camel or sable-hair, inserted in quills of different sizes. When coarser and stronger material is used, they are generally mounted in tin tubes, and known by the name of *tools*, the larger kinds being bound round sticks with string or copper wire. After these come whitewash brushes, which consist of two or more large tufts fixed side by side on a flat handle, and secured firmly with string or wire. Compound brushes are so made that a number of tufts are inserted into holes perforated at regular distances in the back or stock of the handle. In making brushes of this description, the workman takes a tuft of a size corresponding to the hole; holding it compactly together, he dips it into a mixture of melted pitch and tallow, and then binds that end firmly with a piece of strong thread called a *thrum*. He then dips the bound end into the pitch and tallow again, and inserts it with a peculiar twist into one of the holes. The pitch-mixture sets rapidly, and the tuft is very firmly secured. Hearth-brushes, banister-brushes, and other house brooms, are all made in this manner; the lighter kind of dusting-brushes are also made similarly. The most important substances used in making brushes are hogs' bristles. In the brushes above mentioned the bristles are used the full length, but when brushes are wanted for hard rubbing or scrubbing, they are cut short. In these short-haired brushes the tufts are generally inserted by the *drawn* method. In this process the back of the brush is bored in a similar manner to that described, after which a smaller borer is used, and the perforation carried right through the stock. The brushmaker then takes a smaller number of bristles than will fill the hole, and attaches their ends to a fine wire, which is passed through the hole in the stock and drawn tight up to a knot. He then passes this wire, which is very flexible, through another hole, and forms another knot, and so on till a row is completed, when he cuts off the ends with a strong pair of shears furnished with a gauge, which regulates the length of the tuft. The back of the brush is then covered with a thin piece of wood as a veneer. Tooth-brushes and ivory brushes are often made with silver wire which is left visible; and sometimes the tufts are held in their places by a process called *trepanning*. The ends of the wires in trepanned work are secured laterally. For making soft brushes, such as hat-brushes, goat's-hair, and other kinds of hair, are much used. The process of drawing in the coarser description of brushmaking is performed by men, but women are largely employed in the manufacture of fancy brushes, and the selecting and cleaning of the bristles. The value of the brushes and brooms exported from this country in 1856 was £37,041.

**Brush-Turkey** (*Talegalla Lathami*).—This bird, called also the wattled talegalla, inhabits New South Wales, from Cape Horn to Moreton Bay. It is about the size of a common turkey three parts grown. The whole of the upper surface is of a blackish-brown, the feathers of the chest edged with silvery grey. The skin of the head and neck is of a deep red, and the neck is ornamented with a bright yellow wattle. The most curious circumstance connected with the brush-turkey is, that it does not, like other birds, hatch its eggs by sitting on them, but collects together an immense heap of decaying vegetable matter as a depository for its eggs, and trusts to the heat evolved during the process of decomposition for the development of its young. This heap is gradually collected by the bird for several weeks previous to the period of laying, and is sometimes so large as to contain two or three cartloads. Says Mr. Gould: "The mode in which the materials composing these mounds are accumulated is singular: the bird never uses its beak, but, grasping a quantity in its foot, throws it backwards to one common centre; thus clearing the surface of the ground completely for a considerable distance round. The heap being accumulated, and time allowed for a sufficient heat to be engendered, the eggs are deposited, not side by side, as is ordinarily the case, but planted at the distance of nine or twelve inches from each other, and buried, at nearly an arm's depth, perfectly upright, with the large end upwards. They are covered up as they are laid, and allowed to remain till hatched. I have been credibly informed, both by natives and settlers living near their haunts, that it is not unusual to obtain nearly a bushel of eggs at one time from a single heap; and as they are delicious eating, they are eagerly sought after."

**Brute**, *brute* (Lat. *brutus*), a term applied to those animals which act by instinct only, in order to distinguish them from men, who act by reason. It is synonymous with the word beast.

**Bryaceæ**, *bry'-ai'-se-e* (Gr. *bruo*, I sprout), in Bot., Urn-mosses, a sub-ord. of the Moss fam., distinguished by the sporangium dehiscing transversely, either from the separation of the operculum or in an irregular manner. (*See* Musci.)

**Bruxism**, *brig'-sm* (Gr. *bruchō*, I grind my teeth), in Med., is the grinding of the teeth, or that gnashing and chattering of the teeth which takes place in epilepsy and other convulsive disorders.

**Bryonia**, *bri-o'-ne-a* (Gr. *bruo*, I sprout), in Bot., a

gen. of plants belonging to the nat. ord. *Cucurbitaceæ*. The most interesting species is *B. dioïcus*, the red-berried bryony, or wild vine, an indigenous perennial, growing in hedges and thickets, and blossoming during the month of May. The flowers are yellowish-white, with green streaks, and are dioecious; that is, the male and female flowers are borne by distinct plants. The stems are put forth annually, and climb by means of tendrils. The root is large, white, and is sold by herbalists under the names of white bryony and mandrake-root. (For the true mandrake, *see* MANDRAGORA.) The root contains a peculiar bitter principle, termed *Bryonin*. It is a violent emetic and purgative, and is highly poisonous, giving rise to symptoms much resembling those of cholera. It is stated to be frequently used by quack doctors in the country, and is employed as a topical application to bruises. *B. alba*, *Americana*, and *Africana*, have similar properties.

BRYUM, *brī'-um*, in Bot., a gen. of Mosses in the sub-ord. *Bryaceæ*. The species are very numerous, and many of them are natives of Britain. Their stems are short, and their leaves form tiny rosettes, from the centre of which the fruit-stalks spring.

BUAZE, *bu'-aize*, a South-African plant, found growing in the Maravi country by Dr. Livingstone. It affords a remarkably strong fibre, which is used by the natives for stringing beads upon. The botanical characters and relations of the plant have not yet been ascertained.

BUBBLE, *bub'-bl* (Du. *bobbel*), a small vesicle or bladder of water, or any other fluid inflated with air or gas.

BUBBLE, is a cant name for a strong bubbling malt liquor.

BUBBLES, a name given to fraudulent or unsubstantial commercial projects, which hold out prospects of speedy gain, for the purpose of enriching the originators at the expense of ignorant and sanguine speculators. The term is generally applied to those schemes in which the funds are raised by the sale of shares, or by a subscription to a transferable stock. The name was first given to undertakings of this kind at the time of the South-Sea project. By this notorious scheme, capital to the amount of three hundred millions was involved. The Bubble Act (6 Geo. I. c. 18) entirely prohibited the formation of companies by gambling in transferable stocks, or by the sale of shares, stating that they had "manifestly tended to the common grievance, prejudice, and inconvenience of great numbers of his Majesty's subjects in their trade and commerce." The Bubble Act was repealed by the stat. 6 Geo. IV. c. 91; and the projectors of bubble companies are now only punishable, when they can be found guilty of fraud and conspiracy, at common law.

BUBO, *bew'-bo* (Gr. *boubon*, the groin), in Med., denotes a swelling of a lymphatic gland, particularly those of the groin or armpit. It may arise from mere irritation or some local disorder, in which case the bubo is termed sympathetic; or it may arise from the absorption of some irritating matter, or from constitutional causes.

BUBONOCELE, in Med., is a term applied to inguinal hernia. (*See* HERNIA.)

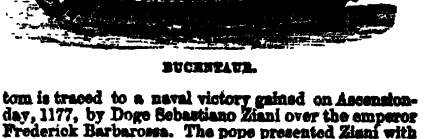
BUCCAL, *buk'-kal* (Lat. *bucca*, the cheek), in Med., denotes of or belonging to the cheek; as, the *buccal artery*, which is a branch of the internal maxillary; the *buccal glandules*, small mucous glands, or follicles, situated within the cheek, under its lining membrane.

BUCCANEERS, *buk'-a-neers*, a class of pirates who infested the coasts of the West Indies and South America in the 16th and 17th centuries. The term is derived from a Caribbee word, *boucan*, which was applied to the flesh of cattle cured in a particular manner. The natives taught the process to the colonists, and the French, who adopted the word, formed from it the verb *boucaner*, and the noun *boucanier*; whence our term buccaneer. The buccaneers owed their origin to the jealousy of the Spaniards, who refused to allow any other nation to settle or trade in that part of the world. Enterprising adventurers of other countries were naturally averse to submit to this, and the cruelties that were practised against those that dared to make their appearance there, were such that the adventurers formed themselves, about 1524, into an association, not merely for mutual defence, but for carrying out aggressive operations against the Spaniards. They were principally English and French. They lived in a state of constant warfare, carrying on hostilities independently of peace or war at home. They made frequent descents on the coasts, plundering and destroying the weaker towns and settlements. They had their principal settlement for some time on the island of St. Kitts, and afterwards on Tortuga, near St. Domingo; and, when not engaged in traffic with the Indians, or in excursions against the Spaniards, their principal occupation was the hunting of wild cattle, of which they made boucan. At a later period, many of them became logwood-cutters in the Bay of Campeachy. The Spaniards, however, continued to harass and murder them wherever they were to be found, and the enmity between them, instead of subsiding, only became more intense. By degrees, many men of good birth joined them, usually under an assumed name. The history of these men abounds in deeds of daring and high valour, but is also marked by deeds of revolting cruelty. Among the great leaders whose names figure in the history of buccaneering are the Frenchman Montbars, called the "Exterminator;" Peter of Dieppe, called "Peter the Great;" and Henry Morgan, a Welshman, afterwards knighted by Charles II., and made deputy-governor of Jamaica. A high state of honour seems to have existed among them, and it is said that oaths, locks, and all kinds of fastenings, were prohibited among them, as implying a suspicion of their honour. In 1670 a treaty of peace was concluded between England and Spain, which provided for the extinction of the buccaneer warfare, but with little success. The war between France and Britain, after the accession of William III. in 1688, effected what treaty could not accomplish, by causing a dissolution of the ancient alliance, and a war between the two parties. The treaty of Ryswick, in 1697, and the accession of a French Bourbon prince to the throne of Spain four years later, brought about the final suppression of the buccaneers. After their suppression, a race of pirates, of a much more dangerous and desperate character, arose, and for a number of years preyed upon the commerce of all nations, until at length they were hunted down and exterminated. The name given to the buccaneers by the French is generally *flibustiers*, apparently a corruption of the English word freebooters, and whence the Americans have their term Filibusters.—*Ref.* Burney's *History of the Buccaneers*; Dampier's *Voyages*; and the *Narratives* of Wafer, Ringrove, and Sharp.

BUCCINATOR, *buk-si-nat'-tor* (Lat. *buccina*, a trumpet), in Anat., is a muscle of the cheek, so called from being brought much into play by trumpeters.

BUCCINUM. (*See* WHELK.)

BUCENTAUR, *bu-sen'-tawr* (Gr. *bous*, an ox, and *kentauros*, a centaur), was the name of the state galley of the republic of Venice, in which the doges annually, on Ascension-day, "married the Adriatic." This custom is traced to a naval victory gained on Ascension-day, 1177, by Doge Sebastiano Ziani over the emperor Frederick Barbarossa. The pope presented Ziani with a gold ring as a sign that on that day the Adriatic had been subjugated to Venice, "as a spouse to her husband." Annually, on Ascension-day, the doge, with great pomp and ceremony, and with a numerous attendance, proceeded in the *Bucentaur*, and dropped a gold ring into the Adriatic, with these words, "We wed thee with this ring, in token of our true and perpetual sovereignty." When the French took Venice, what is said to have been the ancient *Bucentaur* was burnt.



BUCENTAUR.

BUCHANITES, *buk'-an-īts*, the name of a sect of reli-

gious fanatics which sprang up in the west of Scotland about the year 1783. The founder of the sect was a Mrs. Elizabeth Buchan, the wife of a potter in Glasgow, who, from slight aberrations, at length gave herself out to be the woman spoken of in Revelation xii. She gained over to her belief the Rev. Mr. White, minister of a Relief congregation in Irvine, and many of the inhabitants of Irvine were induced to become her followers. White was represented as the man child born of the woman. They went from house to house explaining the Scriptures, praying, and testifying that the end of the world was at hand, and that it was the duty of every Christian to abandon the concerns of time, and to prepare for the reception of Christ. Such proceedings led to popular tumults, and she and many of her followers were expelled from the town in May, 1784. They found a settlement at Closeburn, Dumfriesshire, where they remained for some time living in daily expectation of being translated to heaven; and on one occasion their leader conducted them to the top of a hill, from which they were going to be taken up to heaven; but, after waiting for a considerable time, they had to return disappointed. After this many of them left the society, and Mrs. Buchan herself died in 1792; but there still remained a few survivors, the last of whom died in 1846.

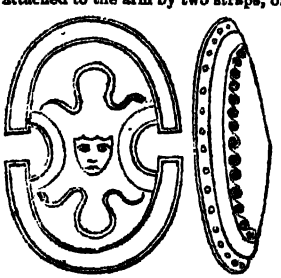
BUCHU LEAVES. (*See* BAROSMA.)

BUCK, *buk* (Sax. *bucca*), the male of the fallow deer. A buck is called a fawn in his first year; a pricket in his second; a sorel in his third; a sore in his fourth; a buck of the first head in his fifth; and a great buck in his sixth. The female of the buck is termed a doe. The term buck is also applied to the male of the goat, sheep, rabbit, and hare. The male of the red deer is termed a stag, or hart, and never called a buck. (*See* DEER, STAG.)

BUCKHOUND, *buk'-hound*, a kind of dog formerly very common in England, but comparatively rare now. It was used exclusively for buck-hunting, and closely resembles the staghound (which *see*). Many varieties of hounds, beside the buckhound, are now used for deer-hunting.

BUCKING, *buk'-ing* (Ang.-Sax.), in *Min.*, is a term applied to crushing ore by hand on a plate called a *bucking-plate*, by means of a flat-headed hammer.

BUCKLER, *buk'-ler* (Fr. *bouclier*), a shield or weapon of defence worn on the left arm. It was of different sizes, and made of different materials. It was attached to the arm by two straps, one of which passed over the fleshy part of the fore-arm below the elbow, and the other was grasped in the hand. The Roman spearmen wore bucklers about four feet long by two in breadth, slightly curved in form, behind which they crouched before or after hurling the javelin: it was made of wood, strengthened with leather and metal plates and bosses. In mediæval times the buckler was generally round or oval. The Scotch target was a buckler of bull's-hide, ornamented with a rim, boss, and studs of metal: it was used to catch and turn away the blow of a sword or lance, and always formed part of the equipment of a Highlander.



BUCKLER.

BUCKRAM, *buk'-rum* (Fr. *bougram*), a sort of strong, coarse linen cloth, gummed, calandered, and dyed several colours. It is employed in drapery, garments, &c., when they are required to be kept stiff in a particular form, and also for making wrappers to cover bales of merchandise.

BUCKSKIN, *buk'-skin*, a name given to a strong, twilled woollen cloth, generally used for making trousers. It is highly milled to the width of twenty-seven inches, and the pile or nap is so finished as to show the texture through it. It has doubtless obtained its name from its strength and toughness, and its resemblance in these respects to leather made from the skin of a buck.

BUCKTHORN. (*See* RHAMNUS.)

BUCKWHEAT. (*See* FAGOPYRUM.)

BUCOLICS, *bew-kol'-iks* (Gr. *boukolika*), properly means pastoral, pertaining to cattle, and is the name given to a species of poetry which was common among the ancient Greeks, but has been little cultivated by the moderns. It represented rural affairs, and the life and manners of shepherds. The poems of Theocritus, Bion, and Moschus, and the Eclogues of Virgil, are of this class. The metre employed is the hexameter, or heroic; but the lines flow more easily here than in epic poetry.

BUD, *bud* (Du. *bot.*), in Bot., the organized rudiment of a branch or a flower. Buds which produce leaves, and have the power of extending into branches, are called *leaf-buds*; while those which produce flowers only, and are ordinarily destitute of this power of extension, receive the distinctive appellation of *flower-buds*. Theoretically considered, however, a flower-bud is merely a modified leaf-bud; for all the different parts of a flower may be regarded as altered leaves. A leaf-bud usually originates in the axil of a previously-formed leaf, the terminal bud of a branch being no exception to this rule. Every leaf has one or more of these organs in its axil, either in a rudimentary or perfect state. Whether lateral or terminal, each bud consists at first of a minute conical cellular mass, which communicates with the cellular tissue of the stem or branch. Around this, spiral and other vessels and wood-cells are soon developed, and these are also connected with similar parts of the wood. Outside all, in a cellular substance, which ultimately becomes the bark, the rudimentary leaves are developed. By the growth of these parts, a little conical body is produced, which, under favourable circumstances, develops into a branch resembling in every respect the parent axis. In temperate and cold climates, the buds, which remain dormant during the winter, are generally covered with modified leaves, called *scales*. These protective organs are usually of a hardened texture; sometimes they are covered with a resinous secretion, as in the horse-chestnut and several species of poplar; and sometimes they have a dense coating of soft hairs, or down, as in some of the willows. Buds thus protected are said to be *scaly*. In the buds of tropical regions, and those of herbaceous plants which are never exposed to the cold of winter, such protective organs would be useless, and are accordingly absent. These buds are distinguished as *naked*. In a few instances, even buds of perennial plants growing in cold climates are naked, like those of tropical plants: such is the case with the alder, and with the buckthorn. Within the leaf-bud the future leaves are often very curiously folded, or rolled up, and the different positions which they assume are highly characteristic of different kinds of plants. The arrangement of the leaves in the bud must not, therefore be overlooked by the practical botanist. (*See* VERNATION.) A leaf-bud may be removed when young from one plant and grafted upon another, by the process of *budding*, so as to continue to form its different parts: indeed, in some instances, it may even be made to grow in the soil immediately after removal. In certain cases, moreover, leaf-buds are naturally detached during the life of the parent, so as to form independent plants, and thus propagate the species. On this account they have been called *fixed embryos* by some botanists. They are, in fact, embryo plants fixed to the axis, capable of sending stems and leaves in an upward direction, and woody fibres, which may be considered as roots, downwards. A tree may, accordingly, be said to consist of a series of leaf-buds attached to a common axis, or trunk. In ordinary trees, in which there is provision made for the formation of numerous lateral leaf-buds, any injury done to a few branches is easily repaired; but in palms, which only form central leaf-buds, and have no provision for a lateral formation of them, any injury inflicted on the bud in the axis is extremely likely to have a prejudicial effect on the future life of the plant. Leaf-buds are sometimes *extra-axillary*; that is to say, they are occasionally developed in other positions besides the axil of leaves. Such buds are termed *adventitious*

or *abnormal*. The woody nodules, called *embryo-buds*, seen in the bark of the beech, elm, and other trees, are looked upon as partially-developed abnormal buds, in which the woody matter has been hardened by the pressure of the surrounding tissue. The nodules sometimes form knots on the surface of the stem; at other times they appear as large excrescences; and in some cases twigs and leaves are produced by them. Adventitious buds are produced naturally on the edges of certain leaves, and on the surfaces of others. These are capable of forming independent plants. Similar buds may be made to appear on the leaves of *Gesnera*, *Gloxinia*, and *Achimenes*, by wounding various parts of them, and placing them in moist soil: this is the method often pursued by gardeners in their propagation. Flower-buds, like leaf-buds, are ordinarily axillary, being produced in the axil of floral leaves or bracts. They cannot be used for budding, for they always die when removed from the parent stem. (*See* Leaf, Flower, Bud.)

Buddhism, *bud'-dism*, a religious system which prevails over a great part of Asia, and is said to have a greater number of adherents than any other religious system among mankind, amounting, according to some geographers, to four hundred millions, or about a third part of the human race. The system is said to have originated in India, about 600 years before the Christian era; but in the land of its birth almost all traces of it have now disappeared. It is the prevailing religion, however, of the inhabitants of the high table-land north of the Himalayas to Siberia, of China, Japan, India beyond the Ganges, Ceylon, and several islands of the Indian archipelago. The founder of the system is said to have been a prince of the name of Siddhartha, son of Suddhodana, king of Kapalavastu, which was somewhere on the confines of Nepaul. He is called by numerous names, but the principal, that of Buddha, *i.e.* the wise or enlightened, does not seem to have been given to him till after he appeared as a teacher of religion. In China, Buddha has been corrupted into Fo-ts and Fo. He is said to have been equally distinguished for great beauty of person and high mental endowments. He early gave evidence of a serious and contemplative disposition, and in order to drive away this, his father surrounded him with all the pleasures of a gay and luxurious court. At the age of twenty he married a charming princess, by whom he had two children, a son and a daughter. Earnest thoughts of the depravity and misery of human life, however, continue to engage his attention, and he conceives the idea of retiring from society and living in solitude; guards are set over him to prevent his escape; but he at length succeeds, and takes up his abode on the banks of a river called Anassara, or Narassara. He was now about thirty years of age, and he remained there for six years, spending his time in devout meditations. He would, it is said, remain for weeks plunged in deep abstraction, attempting to solve the mysteries of life, death, sin, goodness, wisdom, and such-like. At length he is enlightened, and comes forth as a religious teacher of others. He first appears at Warnasahi (Benares), to propound his new doctrines; and for upwards of forty years he continued to preach his system, traversing a great part of northern India, combating the Brahmins, and making numerous converts. He died in the eightieth year of his age, after having lived to see his doctrine spread all over India. For several centuries Buddhism seems to have continued to flourish in that country, and to have been tolerated by the Brahmins. At length, it seems to have endured a long-continued persecution, which ultimately had the effect of entirely expelling it from the country where it had originated. What was the cause or the nature of these persecutions is unknown; but the last traces of the system disappear about the 11th or 12th century; but by this time it had taken firm root in other parts, where it still continues to flourish. Numerous remains of Buddhist temples are scattered over India; and, during the period of persecution, when they were driven from the cities, they retired among the hills of the west, and there constructed those cave-temples which, from their number, vastness, and elaborate structure, still excite the wonder of all who see them. Buddhism differs from Brahmanism in the extreme simplicity of its religious doctrine, and the almost complete absence of dogmas or ritual. It is, or rather was,—for it has been much corrupted by other creeds, an essentially moral system. Its object was to teach man how to attain to a pure and holy life. Hence it did not so much destroy other religions with which it came in contact, as engraft itself upon them. It did not abolish castes where they already existed, but it did not introduce them where they were unknown. Buddha admits and names a number of the Brahmanical gods, but he sets the Supreme Intelligence above them. The ritual or worship is extremely simple, consisting in offering flowers and perfume, the repeating of sacred formulas, and the singing of hymns. The temples contain only an image of Buddha and a *Dagoba*, or shrine containing his relics. There are no priests or clergy properly so called, but only an order of monks, who have given themselves to a life of sanctity, and who are generally very numerous. They are obliged to live in celibacy; but they may retire from their order if they desire it, and are then permitted to marry. The four sublime verities, or axioms, upon which the system of Buddhism is built, are—1. that there exists pain; 2. that the cause of pain is desire, or the attachment of the soul towards certain objects; 3. that pain can be ended by Nirvana; and 4. the way that leads to Nirvana. By the practice of six transcendant perfections,—alms, morals, science, energy, patience, charity, a man might hope to arrive at the state of Nirvana,—repose or annihilation. Existence is viewed as a curse rather than a blessing; and the endless transmigrations through other beings that had to be endured, were causes of suffering; and hence the highest object of desire was to be delivered from the necessity of being born again. There are five moral precepts of universal obligation; viz., not to kill, not to steal, not to commit adultery, not to lie, and not to be drunken. There are others for those entering upon a religious life.—Ref. *Manual of Buddhism*, by R. S. Hardy; *Introduction à l'Histoire du Buddhism Indien*, by Burnouf; *Le Bouddha et sa Religion*, by Saint-Hilaire; *Edinburgh Review*, April, 1862.

Budding, *bud'-ing* (from Du. *bot*, a bud), in Hort., a peculiar mode of grafting, in which a leaf-bud is used instead of a young twig or scion. The bud to be employed is cut out of the branch along with a small portion of the bark and young wood, and the woody part is then carefully separated. Two incisions are made in the bark of the stock intended to receive the bud, so as to form the letter T; the bark is raised on both sides of the longitudinal cut, and the bud, with its shield of bark, is inserted in such a way that the upper edge of the shield joins exactly to the transverse cut in the bark of the stock. The leaf in the axil of which the bud grew is cut off, and the newly-inserted bud is for a while held in its place by strands of bass matting. If the bud is sufficiently matured, and if the bark attached to it is properly fitted to that of the stock, the operation is almost sure to be successful. This is by far the most common method of budding. It is generally distinguished as *shield-budding*. Another method, called *scallop-budding*, consists in removing entirely a thin slip of bark from the stock, and fitting into the wound a similar slip bearing the bud. The proper time for budding is a little after midsummer, when the bud is perfectly formed. The process is particularly well adapted for trees which are apt to exude gum when wounded, as the plum, cherry, peach, and stone-fruits in general; also for roses and many other flowering shrubs. The budding-knife has a point like a lancet, and the handle generally terminates in a thin ivory blade, to be used for raising the bark of the stock. The effects of budding are precisely similar to those of ordinary grafting. (*See* Grafting.)

Buddle, *bud'-dl* (Ang.-Sax.), in Min., a trough or pit containing water in which the ore is washed.

Buddlea, *bud-le'-a* (after Adam Buddle, an English botanist of the 17th century), in Bot., a gen. of plants belonging to the nat. ord. *Scrophulariaceæ*. The species are shrubs, natives of the warmer regions of the world, and are remarkable for their gay and sweet-scented orange-coloured flowers. *B. neemda* is said to be one of the most beautiful plants of India. *B. globosa*, a native of Chili, is hardy enough to endure the climate of most parts of England, and has become a common ornament of our gardens.

BUDE LIGHT, *bude*, a very bright light, rivalling in brilliancy the electric and lime lights, made by urging a current of pure oxygen through the flame of an Argand gas-jet. It derives its name from the village of Bude, in Cornwall, where it was first used by its inventor.

BUDGET, *bud'-jet* (Fr. *bougette*), a bag or little sack, such as may be easily carried. It comprises also the contents of the bag or sack, and hence has come to denote a stock or store of anything; as a budget of inventions. In parliamentary language, the budget is the financial statement laid annually by the chancellor of the exchequer before parliament, of the estimated public income and expenditure for the following year, commencing on the 6th April, mentioning what taxes it is proposed to repeal, reduce, or augment, and what new ones are to be imposed. In his speech on the occasion, the chancellor reviews the financial condition of the country, comparing the income and expenditure of the previous year with those of preceding years, justifying the changes that are proposed to be made, and estimating their probable effects. The statement of the chancellor is always looked forward to with great interest, and frequently gives rise to much excitement, as involving important changes.

BUDNÆANS, *bud-ne'-ans*, in Eccl. Hist., a sect that arose in Poland towards the close of the 16th century, and took their name from their founder, Simon Budnæus. They denied the divinity of Christ, and refused to worship him, adopting, also, many wild vagaries. Their founder was afterwards admitted into the communion of the Socinians, and his followers seem to have dispersed.

BUFF, or BUFFY COAT, *buff*, in Med., is a light yellow viscid substance, which is formed on the surface of blood drawn in certain states of disease.

BUFFALO, *buf'-fā-lo* (Ital. and Span. *bufalo*; *Bos bubalus*).—This animal differs from the bison in having no hump on the back, and only a small dewlap on the breast. Besides this it carries no shock of hair about its neck and shoulders. They generally live in flocks of about a hundred, and affect marshy regions, both on account of the coarse but luxuriant vegetation there to be found, as well as the opportunity for a "mud" bath, of which the buffalo is remarkably fond. The way he indulges this ugly predilection is singular: throwing himself flat upon his side in the mire, he shuffles round and round, the soil yielding to his immense weight the exudation of any moisture it may contain, till he manufactures for himself a delicious basin of mortar covering him to his very eyes. When he emerges and has basked awhile in the sun, he looks like some hideous slack-baked clay image. This manœuvre, however, is not without purpose. Among the rank vegetation, and in the air, swarm millions of stinging flies, and until the buffalo's mud coat peels off through long wear, he is as impregnable to their attacks as the clay image he represents. The buffalo is one among the very few animals who manifest no fear at the approach of the tiger; indeed, sportsmen concur that unless a tiger be full-grown and in possession of all his strength, he will not venture to attack the bull buffalo. Should the tiger, made desperate by hunger, attack a herd of buffaloes, his fate is certain. The whole herd will band against the common foe, and, assailing him with hoofs and horns, rend his striped hide to gory ribands, and trample him maimed and crushed into the mire.

BUFFER, *buf'-fer*, in Engin., a rod with an enlarged end attached to a spiral spring of great strength, fixed to the striking parts of locomotives and railway carriages, in order to diminish the shocks arising from any sudden movement or stoppage.

BUFFET, *boof'-fai* (Fr.), anciently denoted a small apartment separated from the rest of a room, and used for containing china, glass-ware, &c. The name was afterwards applied to a cupboard or set of shelves, which was used for a like purpose, but which has now been superseded by the modern sideboard. Buffet, or buffet-stool, was also applied to a small wooden stool generally used as a footstool.

BUFF LEATHER, *buff'-leth'-er* (contracted from *buffalo*), a kind of leather made from the hides of buffaloes, or from the salted and dried hides of South-American oxen and cows. They are dressed with oil in the same manner as chamois leather. Buff leather is very pliable, and not liable to crack or rot. It is used for making bandolins, belts, pouches, gloves, and other articles.

BUFFO, BUFFA, *boof'-fo*, a term applied by the Italians to an actor and singer who takes the humorous and ludicrous parts in their operas. The epithet is also applied to the pieces themselves; as *opera buffa*, a comic opera.

BUFFONT, *buf'-font'*, a projecting covering of gauze or linen for a lady's breast, in fashion in and after the year 1760, a period when English ladies' costume was very ungraceful. The buffont entirely concealed the neck and bosom, and stuck out from beneath the chin like the breast of a pigeon. It was generally accompanied by some other ugly articles of costume which were invented at that time. The figure in the illustration wears the buffont, the cumbrous head-dress, and the little frilled jacket, of that period. The buffont was worn in Paris as late as 1788.



BUFFONT.

BUFFOON, *buf-foon'* (Fr. *bouffon*; Ital. *buffo*), a low jester, a man who amuses others by rough tricks, antic gestures, broad jokes, and such-like. The name is said to be derived from the barbarous Latin word *buffo* (cheeked), a name given to those who appeared on the stage with their cheeks puffed up to receive blows on them, and thus to excite the laughter of the spectators. In Italy the term is not always used in a contemptuous sense: there there are two sorts of buffoons,—the *buffo cantante*, who has frequently an important part to play, requiring considerable musical talent, and the *buffo comico*, whose part consists more in acting. In England the name was sometimes applied to those persons who were employed as fools at court or at the tables of great men.

BUG, *bug* (probably Welsh *bwg*).—This tiresome insect is too well known to need a devotion of space to its description. It is commonly asserted, though with what degree of truth it is hard to say, that before the year 1670 the insect in question was unknown in England, and that it was imported from America with the timber that country furnished for the rebuilding of London after its destruction by the great fire. Its blood-sucking propensities, and the disgusting smell it emits when excited, are in these days no wonder amongst us. The female bug deposits her eggs at the beginning of summer: they are small, white, and of an oval shape, each being fixed to a hair-like glutinous stalk, ready to adhere to anything it touches.

BUGLE, *bu'-gl* (Ang.-Nor.), formerly a brass instrument without any keys, used only by hunters and for military purposes; within the last few years, however, it has been so much improved by the addition of six keys, that it now is of the greatest service both in solo and concerted music, and is very commonly found in orchestral and military bands. The bugle, when played with taste, forms a delightful accompaniment for the pianoforte, and possesses the advantage over most other horns, of a methodical fingering, by which the true tones can be produced without so much recourse to the ear as would otherwise be necessary.

BUGLE, in Bot. (*See* AJUGA.)

BUGLOSS. (*See* ANCHUSA.)

BUHL-WORK, or, more properly, BOULE-WORK, *bool*, a method of inlaying metal upon grounds of ebony or tortoise-shell, or *vice versâ*, the invention of M. de Boule, a famous French cabinetmaker of the time of Louis XIV.

BUHR-, BUHRE-, or BUHR-STONE, *boor*, a name given

to certain quartzose rocks the worked surfaces of which possess the property of cutting or grinding. They are used principally as millstones. The best kinds are creamy white, with a granular and somewhat cellular texture, and are obtained in the tertiary formation of the Paris basin and the surrounding district. They are cut into wedge-shaped parallelopipeds called *panes*, which are bound together with iron hoops to form large millstones.

Building, *bil'-ding* (Sax. *byldan*, to build).—By this term is understood the art of putting together certain materials, such as stones, bricks, timber, slates, &c., wrought into various necessary forms, for the purpose of constructing dwelling-houses and other edifices required for public or private purposes. In building, the builder practically carries out the ideas of the architect, who contrives the plan of the required edifice, that it may be well fitted for the purpose for which it is intended in every respect, and be suitable for the locality in which it may happen to be placed. The architect also furnishes the builder with working drawings of the various elevations of the edifice and vertical sections of different parts, the form of the roof, ground-plans of the several floors, plans of the staircases, and drawings in detail of ornamental portions of the exterior and interior, drawn exactly to a certain scale. He also gives the builder specifications of the materials to be employed in the construction of the building, and the manner and form in which the materials are to be applied; and to do this, it is necessary that the architect should have a practical as well as theoretical knowledge of the strength and durability of the different materials used in building, particularly timber, and the forms and arrangement in which their capability to resist pressure and tension can be employed to the greatest advantage. The builder, having carefully examined the plans and specifications provided by the architect, enters into an agreement to perform the work required for a certain sum, undertaking it by "contract," as it is termed; or he binds himself to execute it at certain valuations for different parts of the work; that is to say, at so much per perch for walling in stone; so much per rod for brickwork; so much per square for roofing, flooring, and paving; so much per foot for woodwork of different kinds, &c.; charging for the work by what is called a "schedule of prices;" in which case it is measured after its completion by persons appointed by the architect to value what the builder has done, and it is paid for according to their valuation. During the progress of the building, the work is superintended by a "clerk of the works," a competent person acting under the architect's orders, to see that the builder faithfully follows the specifications; using good materials, and applying good workmanship, through the agency of mechanics in his employ who are well skilled in the different branches of constructive building. In building, particularly with reference to dwelling-houses, great attention should be paid to the following points:—The situation should be such as will insure freedom from damp, and protection from north-easterly and easterly winds; the principal apartments should have, if possible, a western or southern aspect; the ground on which the house is built should be of a nature to secure a good supply of water, and a sufficient fall for drainage; and the position of the doors and windows should be regulated in a manner calculated to secure freedom from draughts and smoky chimneys, which is to be obtained by ascertaining the direction of the winds to which the dwelling will be chiefly exposed. The method of construction adopted in the various component parts of buildings of a public and private nature, will be found on reference to their respective headings, as well as notices of the various styles of architecture and ornamental details, and plans resorted to in building with different kinds of material. (*See* the articles Arch, Architecture, Ashlar, Barge-board, Bond, Brickwork, Building en Pisé, Building-Stone, Carpentry, Cellar, Chimney, Coping, Design Architectural, Dome, Door, Fireproof Buildings, Flue, Foundation, Gallery, House-joining, Lintel, Mansarde, Masonry, Painting, Paper-hangings, Plastering, Roof, Rusticated Work, Scaffolding, Slate, Staircase, Stucco, Smoke, Sewer, Timber, Tiling, Wall-plate, Window, &c., &c.) The large contractors, as the late Mr. T. Cubitt, Messrs. Lucas & Kelk, the contractors for the great Exhibition building of 1862, and others of equal celebrity, employ machinery worked by steam power in the manufacture of various parts of buildings, which tends to insure great accuracy of fitting when the portions are put together; and, indeed, there are certain firms, particularly in the metropolitan districts, who employ themselves entirely in the manufacture of particular parts of a house, such as doors, windows, &c., by machinery, which greatly facilitates the operations of the builder, particularly if they be on a small scale, by enabling him to purchase ready-made articles, which cost him considerably less than they would if he had purchased the material and employed artisans to execute the required work. The more machinery can be brought into operation, the cheaper buildings can be raised; and hence the advantage and greatly increased rate of profit that accrue to contractors whose capital enables them to erect machinery to accomplish the construction of different parts of their work. It is said that progress in the art of building, in different localities, is always controlled by the material that can be most readily procured in the neighbourhood, and that greater architectural beauty, convenience, and elegance, are attained and shown in cities where stone, that can be easily worked, can be had in the immediate vicinity. The truth of this is certainly evinced in the numerous magnificent structures in stone that are to be seen at home, St. Petersburg, Paris, Vienna, Brussels, Edinburgh, Glasgow, New York, and other European and American cities; but, in the present day, it has been shown that much can be effected in brickwork in every way, as exemplified in the buildings lately erected in that material in and around London, Manchester, and Liverpool; and a still higher degree of perfection will be obtained when more attention is paid to the production of coloured or polychrome bricks, and the brickwork is so arranged as to obtain the juxtaposition of broader masses of colour, that will present a more pleasing effect of contrast or harmony than can be found in the intersection of walls of one colour by single stretching-courses of another, few and far between, or the formation of the straight or cambered arches above doors and windows by alternate wedges of colour, just the thickness of a brick. The most beautiful and pleasing buildings in the world may be produced in brickwork, if the dressings, coins, and ornamental details, be formed of clay, coloured and moulded to suit their position in the building, and the architect be animated by the taste and feeling of an artist in grouping his coloured materials together.

Building Act for London and its Neighbourhood. (*See* Metropolitan Building Act.)

Building en Pisé, a method of building walls with compressed earth, which has been practised in France for a long period of time, particularly in the southern part of the country, about Lyons. Walls built on this plan somewhat resemble the old "cob" walls of mud and straw, of which barns, cottages, and garden-walls were sometimes made in agricultural districts in various parts of England; but they are more durable, more finished in appearance, and better calculated to withstand the weather, from the method adopted in raising them. The foundations of the walls are made of stone or brick, and are raised a short distance above the level of the ground. Earth is then procured, which is neither too light from containing too much sand, nor too heavy from the presence of clay in great quantities, but which consists of rich soil, sufficiently moist, with a little fine gravel in it. This is rammed into a solid mass on the top of the foundation, being kept in the proper shape and position by a sort of mould formed of two boards, that are held apart by iron bolts and screws to the extent required for the thickness of the wall, and are removed as soon as the portion of wall between them is completed. The wall is made in courses a few inches in depth, and the earth is added in small quantities at a time, that every portion of the wall may be well beaten together. The face of the wall on the exterior, and the interior as well, if required, is thus formed:—the earth that is next the boards forming the mould, is taken out, and a space left, about an inch or two in depth, between the board and the main part of the wall, which is filled

with a facing composition formed of three parts of earth and one part of lime, mixed together with water like mortar, but allowed to dry, and reduced to powder before it is rammed in. It hardens and forms a solid coating, which keeps the core of the wall free from moisture. To avoid settlement from shrinking of material, all the bond timbers and pieces of wood placed in the walls are made as thin as possible, and the openings for doorways and windows are formed by inserting frames of thick planks in the required positions, and ramming the earth closely against them as against the sides of the moulds. The walls may be whitewashed or coloured, and smoothed by a wooden instrument used by plasterers, which gives them a very neat appearance. They are very durable if protected from damp as much as possible, as walls of this description have stood in France for more than a hundred years, and appear as sound as when they were first built; and the durability of the cob-wall, without any external facing, is well known. As the material costs nothing but the expense of bringing it to the spot where it is to be used, the cost of buildings constructed in this way is very low in comparison with that of houses of stone and brick. Mr. Robert Salmon, of Woburn, Bedfordshire, who has erected many buildings in this way, found that the cost of a square yard of wall built *en pisé* was only one-fourth of that of a square yard of brickwork in that locality, if finished with facing composition on one side only, and one-third, if finished on both sides.—Ref. *Transactions of the Society of Arts*, vol. xxvii.; *English Cyclopædia—Arts and Sciences.*

Building Leases. (*See* Leases.)

Building Societies are in the nature of a joint-stock company, established to raise a subscription-fund by advances, from which the members shall be enabled to build or purchase dwelling-houses, or to purchase land; such advances being secured to the society by mortgage of the premises so built or purchased. They are established upon the basis of rules provided, to be sanctioned under the provisions of the acts relating to *friendly* societies, and they are made subject in general to those acts. The members become shareholders by paying an entrance-fee and binding themselves to make a periodical subscription, for the most part, by monthly payments. The non-payment subjects the member to a fine limited by the rules. The members are either investers or borrowers. When the fund raised is large enough to let out, loans are made to the borrowers, and so from time to time, as subscriptions are paid in, fresh advances are made. The borrowers thus anticipate what they would otherwise receive on the termination of the society. In general, the money borrowed cannot be repaid in one sum, but only by the periodical subscriptions, the mortgage remaining a security for the payment thereof, and of the fines incurred through default of, or irregularity in, paying such subscriptions. The loan and use of the money advanced being upon the principle of compound interest, it follows that the term of the mortgage by repayment of the money, and, consequently, the duration of the company, must be limited to a given number of years. This term varies in different societies in proportion as the amount of subscriptions is greater or smaller, and generally ranges from ten to fourteen years. A society may, however, become *permanent* by the successive issuing of fresh shares; but the interest in, and liability under, each share must terminate when the time arrives for the investing member to be paid the sum fixed by the rules in respect of it, or when the borrowing member has fully paid up his subscriptions. If the security taken by the society be good and ample, the invester would obtain his money at the expiration of the calculated time; but it frequently happens that losses arise on the sale of the property under the mortgage, and the term for payment to the investers is postponed, and their contemplated benefit much reduced. If the society be terminable, it must follow, that as the time runs out, some of the investers must be paid off. The persons to be paid are determined by lot, or some other mode provided by the rules. The rules are settled and approved by a barrister, who is appointed to revise the rules of, and register, all benefit and friendly societies.

Building-Stone.—There are many kinds of stone used for building purposes, differing greatly in quality and durability. That which at present appears to be considered the best for buildings in which the stone is required to be wrought by the mallet and chisel into various ornamental forms, and retains its sharpness after exposure to the weather, is a magnesian limestone, a stone which consists of carbonate of lime and magnesia, which was used for the new Houses of Parliament. A stone much used for the dressings and coins of buildings, as well as many other ornamental purposes, is an oolitic limestone of a rich cream-colour, known as Bath-stone or freestone, which is quarried in the vicinity of Bath and the Isle of Portland. On Dartmoor, in Devonshire, and in Scotland, in the neighbourhood of Aberdeen and to the north of that town, granite is obtained, which is hard and difficult to work, but which is well calculated for paving streets and building bridges, and for the basements of public buildings, from its great durability. Sandstones of various kinds, such as the old and new red sandstone, green-stone, and basalt, are also used, and the limestone found at Purbeck, in Dorsetshire, on the coast of Devonshire, and in other parts of Great Britain, which furnishes handsome slabs of black, red, and grey marble, veined with white, which are cut and polished for mantelpieces, &c. The chemical composition of the various kinds of building-stone, the causes which lead to their decay, and the processes used to protect them from the action of the weather, will be found under their respective headings. (*See* Basalt, Granite, Limestone, Oolite, &c.; Stone, Preservation of.)

Bukkum-wood. (*See* Cæsalpinia.)

Bulb, *bulb* (Lat. *bulbus*), in Bot., a shortened stem or branch, usually subterranean, bearing on its surface a number of fleshy scales, which are modified leaves. It is only found in monocotyledonous plants, and is seen in the hyacinth, lily, and onion. The bulb may be looked upon as a subterranean leaf-bud, arising from a shortened axis. From its centre an herbaceous stem arises, and from the subterranean axis new bulbs, or *cloves*, as they are called, are produced. Every new bulb is formed in the axil of a scale, like a bud (which *see*); sometimes it remains attached to the parent bulb, and sends up an axis and leaves; at other times, it is detached in the course of growth, and forms an independent plant. The new bulbs feed on the parent one, and ultimately cause its complete absorption. The scales are generally thickened by the deposition of nutritive matters, intended for the future use of the plant. In the onion, squill, and leek, these scales are covered externally by thin membranous coats or tunics: hence the bulbs are said to be *tunicated*. When the membranous coats are absent, the bulb is said to be *naked* or scaly, as in the white lily. The solid rounded underground stem, called by botanists a *corm*, is commonly regarded as a bulb. (*See* Corm.)



Bulb of Lily.

Bulbils, or Bulblets, *bul'-bils*, in Bot., small conical or rounded bodies produced in the axil of the leaves of some monocotyledonous plants, and which are of the nature of bulbs. They can be readily distinguished from ordinary leaf-buds by their fleshy character. They are easily detached from the parent stem, and, when placed in favourable circumstances, they produce new individuals. They may be seen in *Lilium bulbiferum*, *Dentaria bulbifera* (coral-wort), and in *Ranunculus ficaria* (pilewort).

Bulgarian Language, *bul-gal'-ri-an*, is a branch of the Sclavonic, and is divided into two dialects,—the old and new Bulgarian. The old Bulgarian is the richest in inflections, and its literature is the oldest of any of the Sclavonic tongues. The new Bulgarian has arisen since the destruction of the kingdom in 1392, when the language came to be mixed with those of neighbouring nations, particularly of Wallachia and Albania. The new Bulgarian can scarcely be said to possess any literature; but it has a large collection of songs.

Bulimia, *bul-i'-mi-a* (Gr. *bous*, an ox, and *limos*, hunger), in Med., denotes an insatiable craving for

food. Persons labouring under this disease feel all the effects of hunger, even when the stomach is full, and the stories that are told of the quantities of food consumed in such cases are scarcely credible. The real nature of this disease is very imperfectly known. In some cases, the health appears to be otherwise good; but usually bulimia is a concomitant of other diseases. Its consequences are leanness, pulmonary fevers, consumption, dropsy. Sometimes there exists an extraordinary craving for food after the system has been much exhausted, or from a certain condition of the stomach, which causes it to digest the food with too great rapidity; but these do not indicate disease, but only excessive appetite.

Bulkhead, *bulk'-hed*, in Mar., a name given to certain partitions built up in several parts of a ship between two decks, either lengthways or across, to form and separate the various apartments. Some of those which are built across the ship are remarkably strong. Those which inclose the magazine are of oak plank, and rabbeted, as are those of the spirituous-liquor room. Others in the hold are generally oak plank, cyphered, to keep the gravel or dirt of the ballast from getting into the storerooms, or into the well to damage the pumps. Water-tight bulkheads are iron partitions running athwart the hold. By means of these, the body of the vessel is divided into several water-tight divisions. Hence, if the vessel is leaking in one part, the rest may remain dry till the injury is repaired. Nearly all large vessels are now made with these bulkheads. The *Great Eastern* has ten of them, reaching nearly to the level of the upper deck.

Bull, *bull*, a term applied on the Stock Exchange to those brokers who contract to buy any quantity of stock or shares, without having the intention or ability to pay for them, and who are, therefore, obliged to sell again, either at a profit or a loss, before the time at which they have contracted to take it. It is the opposite of *bear* (which *see*).

Bull (Du. *bulle*), in Zool., the male of the *Bos* or bovine gen. of quadrupeds, of which the cow is the female.

Bull, in Lit., denotes an equivocal expression, a blunder, a contradiction, errors to which the Irish are particularly liable. "I confess it is what the English call a *bull*, in the expression, though the sense be manifest enough."—*Pope*.

Bull, Golden, is the name given to an edict or imperial constitution granted by the emperor Charles IV., and regarded as the Magna Charta of the German empire. It received its name from the seal attached to it being in a gold box, and was granted by the emperor at an imperial diet held at Nürnberg in 1356. This bull regulated the form and ceremony in the election of emperors, determined the number of electors, with their functions, rights, privileges, &c., all of which were previously undetermined. It comprised thirty articles, and the original is still preserved at Frankfort-on-the-Maine.

Bull, Papal (Lat. *bulla*, a seal), is a written letter issued from the Roman chancery by order of the pope, and sealed with lead. The bull is, strictly speaking, only the seal or pendent lead, which alone gives the document its authority. It is impressed on the one side with the heads of St. Peter and St. Paul, and on the other with the name of the pope and the year of his pontificate. Bulls are written in old Gothic characters, upon stout and coarse parchment, and are granted for the consecration of bishops, the promotion to benefices, celebration of jubilees, &c. They are either bulls of grace or bulls of justice; in the former the seal is attached by a cord of silk, in the latter by a cord of hemp. Bulls are distinguished from *briefs* both in form and character. The latter are more abbreviated in their form, are written upon fine parchment in Roman characters, are issued by the apostolic secretary, and sealed with red wax. Briefs are of the same authority as bulls, though issuing from different departments of the government, both being equally regarded as acts of the pope. The *Bull in Cœna Domini* is a particular bull which was read every year on the day of the Lord's Supper, or Maundy-Thursday, in the presence of the pope, containing excommunications and anathemas against heretics and all who disturb, oppose, or disobey the Roman pontiff. After the bull was read, the pope threw down a burning torch in the public place, to denote the thunder of this anathema. The reading of this bull was discontinued by Clement XIV. In the Middle Ages bulls were also used by kings and emperors in great affairs of state. In affairs of the greatest importance, golden bulls were employed; silver, leaden, and waxen ones being made use of in matters of less moment.

Bulla (Lat. *bulla*, a round boss or stud), a small round ornament made of gold or silver, worn by the children of the ancient Roman nobility. The bulla was worn until they arrived at the age of fourteen, and was placed upon the neck or breast. It was a distinctive mark of free birth.

Bulla, a genus of molluscous animals with univalve shells, whose general characteristics are,—that the shell is sub-oval, that the aperture is oblong and smooth, and that one end is a little convoluted. The animal breathes by gills, but has no respiratory tube, and consequently the margin of the aperture of the shell is entire. Most of this genus, especially of the larger sizes, are furnished with an organ exactly resembling the gizzard of a fowl, and which they appear to use for the purpose of masticating their food.

Bullace, *bul'-lase*, the English name of a kind of plum, the *Prunus insitita* of botanists. (*See* Prunus.)

Bull-baiting, *bul'-bait'-ing* (Du. *bulle*, bull; Goth. *beitan*, to bait), the barbarous sport of baiting bulls with dogs. The animal was usually tied to a stake, with the points of his horns muffled, and then attacked by the dogs, who tore him to death for the amusement of the spectators. It is said to have been introduced as an amusement into England about the year 1209.

Bull-dog, *bull'-dog* (*Canis molossus*), a variety of the dog, remarkable for its broad, short muzzle. It is generally looked upon as an essentially English dog; but there is a doubt as to whether it has not existed as a definite race since the time of the Romans, or whether it is not a recently-formed variety of mastiff. It is smaller than the mastiff, and has a massive head; the forehead sinks between the eyes, and the nose-line rises again at a considerable angle; the lower jaw projects in a remarkable manner beyond the upper, continually showing the teeth; the lips are thick and pendulous, the neck strong and thick,



and the legs short. The projection of the under-jaw and the livid redness of its eyes give the bull-dog a fierce and forbidding aspect, often heightened by a designing leer, which seems natural to the animal. The strength and courage of bull-dogs are proverbial. They will attack any animal, utterly regardless of its strength and size. They were formerly much used for bull-baiting; since the abolition of which sport, the breed has decreased in numbers. One of these dogs will seize an ox by the nose, and, with apparent ease, hold him still, or throw him on his side, as he is ordered by his master. When trained for the purpose, they fight very savagely with one another; and in certain of the mining and manufacturing districts of

England this sport is still carried on. On growing old, the bull-dog becomes very vicious and dangerous, often inflicting severe bites on the slightest provocation. The bull-terrier is a cross between the bull-dog and the terrier. It is, if possible, more ferocious than the bull-dog itself.

BULLET, *bul'-let* (Fr. *boulet*), the name given to any kind of leaden missile which is discharged from a rifle, fowling-piece, or pistol. Prior to the introduction of the various kinds of modern rifles with barrels furnished with numerous spiral grooves, the bullet was spherical in form, and made by pouring lead in a molten state into a mould, the diameter of which corresponded with the calibre of the weapon for which it was intended. For the old rifle with two deep grooves in the interior of the barrel, the bullet was surrounded with a projecting rib, and was made by casting the lead in a grooved mould. Bullets of all shapes are now made by compression, a method infinitely superior to that of casting them, as there can be no irregular cavity or air-hole in any bullet formed by pressure, a thing which would seriously affect the flight of any projectile, and cause it to fall wide of the mark, on account of the eccentricity of motion that would be imparted to it, arising from the cavity causing it to be lighter on one side than on the other. The first attempt to form bullets by compression was made about 1840, by Mr. Napier, whose machine was adopted by the government and used at Woolwich. It was worked by steam power. Strips of lead, first subjected to heavy pressure under rollers to produce condensation of the metal, were passed under a machine by which they were pressed into lengths resembling strings of nearly round pieces of lead. These lengths were then passed between hemispherical dies, or plungers, which closed on each piece with great force; when the dies receded from each other, the bullets were ejected by springs, which acted on plugs in the dies, and came out in the form of a perfect sphere, connected, however, by a small piece of metal, which was removed by the action of a punch worked by a treadle, under which the bullets passed in succession. The old round bullets were from 14 to 20 to the pound; the calibre of the weapons for which they were intended varying from ·60 or $\frac{3}{5}$ of an inch to ·68 or $\frac{11}{16}$ of an inch. The spherical bullet is now entirely superseded by conical elongated projectiles of various forms, the principal of which is that used for the Enfield-Pritchett rifle. This bullet is spherical at one end and hollow at the other, which is next the powder when the musket is loaded. The cavity is in the form of a truncated cone, and extends into the bullet pretty nearly half its length. A little boxwood plug, about half the depth of the cavity in height, is fitted into the end of the bullet, leaving a small hollow space in its interior between the plug and the bottom of the cavity. When the powder explodes, this wooden plug is driven deeper into the cavity, and causes the lead, which presents the form of a tolerably thin ring at the flat end of the bullet, to expand and fit tightly into the grooves of the rifle, by which windage is prevented, and the accurate flight of the missile towards the mark insured. There are many kinds of bullets of the conical form, with numerous contrivances for obtaining expansion at the moment of discharge, but they are too numerous to mention here in detail. The principal are those made by Minié, Delvigne, Norton, Robins, Beaufoy, Manton, and Greener. The Minié bullet somewhat resembles the Enfield; but it is pointed at the upper end instead of being hemispherical, and the cavity at the lower end is deeper and without any plug. Robins, Beaufoy, and Greener's bullets are ovoid or egg-shaped; but Greener's is fitted with a metal plug at the lower end, which answers the same purpose as the wooden plug in the Enfield bullet, causing the expansion of the lead into the grooves of the rifle. Mr. Greener was the first who made a bullet on this principle, in 1833, and received a reward of £1,000 from government for his invention in 1857. The Enfield bullets are made by compression in machines which draw the lead into them in the form of rods and cut them into pieces of the proper length, which are stamped or pressed into the required form by four steel dies with which each machine is furnished. Each machine will turn out about 120 bullets per minute. The boxwood plugs, which are inserted into the cavities of these projectiles, are also cut by machinery.—*Ref.* Busk's *Rifle and how to use it*, and *Handbook to Hythe*; Coles's *Catechism of Musketry*.

BULLETIN, *bul'-let-in*, is a term derived from the French, where it originally signified a ballot used in elections; and hence a small piece of paper on which one gave his vote. Afterwards it came to signify an official report, giving an account of the actual condition of some important affair intended for the information of the public. When kings or other persons of high rank are dangerously ill, daily bulletins are issued by the physicians respecting the state of the patient. In time of war, bulletins are issued by the generals, announcing the state of an army or the result of a battle. This practice became common in the French army under the first Napoleon.

BULLET-TREE, or BULLY-TREE, a tree supposed to belong to the gen. *Mimusops*, in the nat. ord. *Sapotaceæ*. It is a native of Guiana, and much valued for its timber, which is hard and durable. It yields a delicious fruit about the size of a cherry.

BULL-FIGHTS, or combats between men and bulls, are a very ancient kind of amusement, and were common in Greece several centuries before the Christian era. In Rome, under the emperors, they were also common, and afterwards they became popular in many of the other countries of Europe. At present Spain is the only country in Europe where they are still held. In Madrid and all the larger towns of Spain bull-fights are frequent. In Madrid the season lasts from April to November, during which time bull-fights take place at least once a week. The combats are held in a large amphitheatre called the *Plaza de toros*, open at the top, and with seats rising one above another round the circle, and capable of accommodating from 10,000 to 12,000 spectators. The area is divided into an outer and an inner circle, separated from each other by a strong fence, the latter being the place where the combats take place, the former affording shelter to the men on foot when hard pressed by the bull, in order to which there are a series of openings in the fence just large enough to allow a man to pass through. The actors on the arena are the bull, usually of the fierce Andalusian or Castilian breed; the *picadores*, or combatants on horseback; the *banderilleros*, who are armed with sharp goads with coloured streamers; the *chulos*, who wear very bright-coloured cloaks; and the *matador*, who dispatches the bull. The contest begins with the *picadores*, who are each armed with a lance, and mounted usually on a very worthless horse. Their object is to wound the bull with the lance, and then to avoid his onset. The horse is frequently gored in the encounter, and when a picador is closely pressed, the banderilleros and chulos rush in and withdraw the bull's attention by pricking him with their darts and waving their cloaks. When the bull begins to flag, the picadores withdraw, and are succeeded by the banderilleros, who are armed with banderillas, or darts, about two feet long, ornamented with a coloured flag. These the banderillero sticks into the bull behind the horns when it is preparing to toss him. After a time the third act of the play commences, and the matador enters upon the stage, attended by some chulos as assistants. Over his left arm he has a red mantle, behind which is concealed a sword which he has in his right hand. He awaits the charge of the bull, and, if well skilled, dexterously plunges the sword between the shoulder and the blade, and the animal drops dead at his feet. Twenty minutes is the time usually taken to terminate the contest, and eight or ten bulls are often dispatched in a single day.—*Ref.* Ford's *Handbook of Spain*.

BULLFINCH, *bull'-finsh* (Ang.-Sax.), (*Loxia pyrrhula*), a song-bird common to all parts of England and Europe generally. It is about the size of the common hedge-sparrow, but of bulkier build, and rather more than a third of its length is monopolized by its tail. The bill is short, strong, and of a blue-black colour. On the upper part of the head, round the base of the beak, and forming a chin-shaped patch beneath, jet black predominates; the back is ash-grey; breast and belly dusky red; wings and tail black; upper tail-coverts white; legs dark brown. The female exactly resembles the male, except that her colours are less

distinctly marked, and her under-parts are rather russet than red. The bullfinch has acquired considerable celebrity from the facility with which it learns to whistle airs. Training bullfinches to "pipe" is a mode of making money frequently practised in Germany; considerable pains are requisite. There was one German bullfinch-teacher, named Lewis de Berg, whose



BULLFINCH.

birds were sold for their weight in gold. "I feed the smaller birds with rape-seed," wrote he; "I give them likewise, at times, a little bruised rice soaked canary wine, and afterwards dried carefully for u Though giving the bird a few grains while wet with this excellent liquor does mighty well, yet it does not do to be constantly practised."—*Ref.* Beeton's *Home Pets.*

BULL-FROG (*Rana pipiens*), the largest of the species *Rana*, or Frogs. It is generally six to eight inches long, exclusive of the feet, and four inches broad. It is an inhabitant of North America, particularly of the southern states. At a distance, its voice resembles the lowing of a bull; hence its name. The fore feet of the bull-frog are unwebbed, and have only four toes; but the hind feet, which are long, are webbed very widely. Its colour is a dull olive, marked irregularly with dark stains; the belly, however, is of a pale green colour, thickly spotted. The bull-frog frequents springs only where the constant running of water has made a deep pool. Scarcely a spring of this description is without a pair of these frogs. When surprised, with a spring or two they leap into their retreat. They prey on young ducks and geese, which they swallow whole; it is also believed that they keep the springs in which they reside wholesome.

BULLHEAD, or MILLER'S-THUMB, *bull'-hed* (*Cottus gobio*), a small fish, common to our brooks and rivers. It is about four inches long, with a large roundish head, and a capacious mouth, formidably filled with teeth. It is generally found under loose stones at the bed of the stream, and is seemingly so insensible to danger, that, should half a dozen of them be lying together, the juvenile angler may capture the whole by continuing to drop in his bait till they are all hooked. The term bullhead is considered to refer to the large size of the head, and the name of miller's-thumb is doubtless applied because of the resemblance of the same part to the thumb of a miller, which, like this fish's head, is smooth, and broad, and rounded, a form produced by a peculiar and constant action of the muscles in the exercise of his occupation. The miller's hand is constantly placed under the meal-spout, to ascertain the quality of the grinding. The thumb, by a particular movement, spreads the sample over the fingers, and serves as a gauge of the value of the produce.—*Ref.* Yarrell's *British Fishes.*

BULLION, *bull'-yon*, properly signifies uncoined gold and silver, or, more strictly, refined gold and silver in bars or other masses; but in political economy the term is frequently used to denote the precious metals both coined and uncoined. The word is said to be derived from the French *billon*, base coin, from the currency in France having been much debased by the kings. There are numerous interesting questions connected with the subject of bullion, which will be found treated of in different parts of this work (as BANKING, CURRENCY, MONEY, &c.). It is still an open question what effect a great increase in the supply of the precious metals would have upon the value of money. The great increase in late years of gold, brought from America and Australia, has at least had no perceptible effect in that respect. At the Bank of England, all bullion of the standard fineness offered for sale must be bought at the uniform price of £3. 17*s.* 9*d.* an ounce; at the Mint it is bought at the rate of £3. 17*s.* 10½*d.*; but the seller must wait for payment until the bullion can be converted into money; and hence the former mode of disposing of it is usually preferred.

BULL'S-EYE, the black or gold mark in the centre of a target. (*See* TARGET.)

BULL-TROUT, *bull'-trout* (*Salmo Eriox*, or *Salmo grisens*).—This fish, which is often called the Grey Trout in England, and the Sewen in Wales, is nearly allied to the salmon. It generally lives in the sea, but deposits its spawn in rivers. Its form is not so elegant as that of the salmon; its head and neck are thicker, and its tail more bulky in proportion. The colour of the male is reddish brown, and that of the female dark grey; their scales are smaller than those of a salmon of equal size. Anglers look upon the bull-trout as rank next to the salmon as regards sport. It is usually under 15 lbs. weight, but some attain a weight of 20 lbs. The flesh, which is lighter coloured than that of the salmon, is coarser, and has not so delicate a flavour.



BULL-TROUT.

BULRUSH, *bull'-rush*, the popular English name for any large rush-like plant growing in marshes. (*See* TYPHA, SCIRPUS.)

BULWARK, *bull'-wurk*, in a man-of-war, the boarding above the upper deck fastened to the outside of the timber-heads and stanchions. They protect the men in action from the fire of the enemy. In ordinary vessels they are simply a protection from the waves, and prevent articles from being washed overboard. If a sailing vessel has to be converted into a man-of-war, the bulwarks require to be greatly strengthened. The name of bulwark was formerly applied in military art to ramparts and bastions.

BUMASTUS, *bu-mas'-tus*, in Geol., a gen. of Silurian trilobites, remarkable for their oblong-oval or grape-like form. They occur in large numbers in the limestone of Barr, in Staffordshire, and on this account are commonly called the "Barr trilobites."

BUMBOAT, *bum'-bote*, a kind of wherry, used in and about harbours, for carrying provisions for sale to ships lying at a distance from the coast. Bumboats are frequently called shore-boats, to distinguish them from those belonging to the vessels.

BUNCH, *bunch*, in Min., a mass of ore too small and irregular to constitute a vein. When a mine is full of such masses, to the exclusion of regular veins, it is said to be *bunchy*.

BUNGALOW, *bun'-gal-lo*, an East-Indian term for a sort of house or villa, with a thatched roof. They are occupied by Europeans, and vary in size and accommodation, according to the fancy or requirements of their owner. They generally consist of a ground-floor,



surrounded by a verandah; but some are of two stories. In the principal cities of Bombay, Madras, and Calcutta, the bungalows of the wealthier class of Europeans are spacious and magnificent: the large

number of domestic servants required by European residents are accommodated in adjacent offices. Public bungalows are for the reception of travellers, and are maintained by government. They are fitted up with rooms, bedchambers, bath-rooms, tables, chairs, &c., for the use of which the traveller pays a rupee, that is two shillings, per day. The traveller himself is expected to come provided with food, drink, cooking utensils, bedding, and servants; but, in some of the better sort of bungalows, the khitmutgar supplies those necessary articles. The distance between the public bungalows is usually from twelve to fifteen miles, which is a good Indian day's journey. The introduction of railways will most probably effect a conversion in the public bungalow, and make it, in some measure, approximate to the English hotel. Military bungalows are for the accommodation of soldiers in cantonments, and are on the same extensive scale as barracks.

BUNION, *bun'-yun* (Gr. *bounos*, an eminence), in Surg., is a painful inflammatory swelling of the foot, most commonly about the root of the great toe. The pressure of tight shoes is usually the exciting cause; and, in order to remedy it, all such pressure upon the part should be avoided. Bleeding by leeches, warm fomentations, or poultices, should be resorted to, in order to remove the inflammation. The swelling may sometimes be considerably reduced by caustic.

BUNIUM, *bu'-ni-um*, in Bot., a gen. of plants belonging to the nat. ord. *Umbelliferæ*. The species are perennial herbs, with usually tuberose and globose roots, square stems, compound leaves, and white flowers. *B. flexuosum* and *bulbocastanum*, both growing wild in this country, have edible tubers, which are commonly known as earth-nuts or pig-nuts. *B. ferulaceum*, a native of Greece, has also edible tubers, which are termed topana.

BUNKUM, *bunk'-um*, is an Americanism, applied to a speech delivered merely for the purpose of conciliating popular favour, or gaining popular applause; a species of oratory more commonly to be met with in America than in most other countries.

BUNT, *bunt*, a disease of wheat and other grains, caused by a parasitic fungus. (*See* UREDO.)

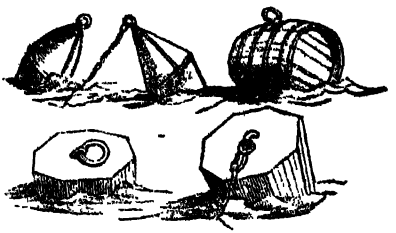
BUNTER, *bun'-ter* (Ger., variegated), in Geol., the term applied by the Germans to the new red sandstone of English geologists, in allusion to its variegated colours. (*See* TRIASSIC SYSTEM.)

BUNTING, or BUNTINE, *bun'-ting*, a thin woollen fabric, of which ships' flags are made.

BUNTING (*Emberiza*), an interesting group of passerine birds, whose chief characteristic is a bill very strong, short, conical, and compressed laterally, but without any tooth or notch; the upper mandible is narrow, turned in at the edges, and with a bony knot at the palatal end, forming, as a whole, an instrument admirably adapted for breaking the rinds or shells of seeds, and ejecting them without losing any of the kernel. The Common, the Yellow, the Cirl, the Ortolan, the Snow, the Reed, and the Lapland, are the various distinguishing names of the British members of this family. Besides these there are the Painted bunting of South America, and the Yellow-shouldered bunting of the Cape. When the female of this last-mentioned species loses, through age, the faculty of propagating her kind, she throws off her comparatively modest attire, and appears, for the rest of her life, as splendidly plumed as her mate; and so exactly like, that it is simply impossible to tell one from the other without the minutest examination.

BUNTLINES, *bunt'-lines*, in Mar., are ropes fastened to cringles (small holes formed in the bolt-ropes of sails) on the bottoms of the square sails, to draw them up to their yards. They are inserted through certain blocks above or on the upper portion of the yard; whence, passing downwards on the fore part of the sails, they are secured below to the lower edge, in several places to the bolt-rope.

BUOY, *boi* (Fr. *bouée*), in Mar., floating bodies constructed of any light buoyant substance, and used either to mark some danger (such as sands and shoals) or to denote the position of a ship's anchor, &c. They are made in a great variety of shapes. Several of the most ordinary forms are represented in the illustration. Buoys are sometimes placed so as to mark the best entrance to a harbour, or into a dock; in some cases, as at Spithead, being put in a double line, so as to show the only safe course that a vessel can take. The principal buoys of this kind are under the superintendence of the Trinity House. This corporation has lately adopted a buoy invented by Mr. Horbert, which has the advantage of keeping nearly perpendicular in all kinds of weather. The bell-buoy is ingeniously arranged, so that any tide or current passing where it is floating moves an under-shot wheel, which rings a bell. It is thus rendered useful in a fog or at night.



BUOYS.

BUOY DUES.—On account of the importance of buoys in navigation, they are placed under several strict regulations. The Trinity House, under whose jurisdiction most of the warning and directing buoys are distributed, claims certain dues from all ships entering ports where they are placed. These buoy dues are sometimes collected as a tonnage, varying from ½*d.* to 2*d.* per ton; sometimes as a payment on entering or leaving the port, and in some cases as a rate on the vessel. Many coasting vessels pay a yearly sum, whatever number of voyages they make. The buoys in the Thames alone bring in an annual revenue of £14,000 to the corporation of the Trinity House.

BUOY, LIFE. (*See* LIFE-BUOY.)

BUPHAGA AFRICANA, *bu-fa'-ga*, a curious bird, about the size of a full-grown blackbird, distributed throughout Southern Africa, and likewise found in Senegal. Its common habit is to search for its food in the infested hides of wild animals of the ox genus, as well as the rhinoceros, though its vulgar name, rhinoceros-bird, would imply that it was exclusively attached to that animal. Its claws are well adapted for holding on securely to its hairy and animated pasturage, and its bill is shaped like a pair of wire-drawer's pliers; so that the parasite, although, as is frequently the case, nearly buried in the skin, is easily extracted. "If it rendered the rhinoceros no further service than ridding it of these biting pests, it would deserve the animal's gratitude; but, in addition, it does him the favour of warning him of the approach of the hunter. With its ears busy as its beak, the little sentinel detects danger afar off, and at once shoots up in the air, uttering a sharp and peculiar note, which the rhinoceros is not



BUPHAGA AFRICANA.

slow to understand and take advantage of. Cumming asserts, that when the rhinoceros is asleep and the *buphaga* fails to wake him with its voice, it will peck the inside of his ear, and otherwise exert itself to rouse its thick-headed friend."—*Wild Sports of the World.*

Buprestidæ, *bu-pres'-ti-de* (Gr.), a gen. of hard-shelled beetles, generally very beautiful in appearance. Green would seem to be their most ordinary colour, but many are of the richest azure, spangled with gold-colour; some are vivid red, and others of a glowing copper hue. They are found on the trunks and branches of trees, and, when disturbed, will fall to the ground seemingly without life, and by this means frequently escape. There exist nearly five hundred of this genus, but not more than twenty are commonly met with in this country.

Bur, Burr, or Barr, *ber* (Ang.-Sax.), a very small ridge raised on the edges of lines that have been cut on a plate of metal by the action of the graving-tool or dry-point. It is generally removed by a tool called a scraper, as it gives a somewhat smeared appearance to impressions taken from the plate if it be allowed to remain. In plates engraved by Rembrandt the bur was not removed, and he managed to take advantage of it to give additional effect to his etchings.

Buratite, *bu'-ra-tite*, a hydrated carbonate of copper, containing also zinc and lime, occurring in the radiating needles at Chessy in France, and in the Altai Mountains.

Burbot, *ber'-bot* (*Gadus lota*), an eel-like fish found in many northern English lakes and rivers. It is said, however, to attain greatest perfection in the Lake of Geneva.

Burden, *ber'-den*, in Mus., is that portion of a song which is repeated at the close of every verse or stanza. It is derived from the French *bourdon*, a drone bass; because the one, like the other, is characterized by the same unchangeable tone, and bears upon the ear with the same monotony. The adoption of a burden in vocal music is very ancient, and it is still occasionally introduced with very pleasing effects.

Burden, in Mar., denotes the contents of a vessel, or the number of tons she will carry.

Burden (Ang.-Sax. *byrden*, something borne), in Scots Law, denotes generally any restriction, limitation, or incumbrance, affecting either person or property. Burdens are thus either personal or real,—personal when imposed on a person, real when imposed directly and specifically on heritable property. A proprietor may create a real burden by reservation in parting with lands; but it is essential that it be properly expressed and declared to be a burden on the lands themselves.

Burdensack, *bur'-den-sak*, was a provision in the old law of Scotland, by which a man could not be punished for theft if he took as much meat as he could carry on his back, provided it was to satisfy the cravings of hunger. It is not now recognized in law.

Bureau, *bu-ro'*, is a term derived from the French, and signifying a writing-table or desk; also an office for transacting public or private business. It also denotes a department of government, and the term *bureaucracy* is applied to a government conducted by a series of independent departments, each under the superintendence of a chief, to whom alone the officials are responsible.

Burette, *bu-ret'* (Fr.), a vessel used by chemists for pouring out small and exact quantities of solutions. Burettes are of various shapes, and are generally graduated. They consist essentially of a tube with a fine spout and an opening, which may be closed at pleasure with the thumb.—*Ref.* C. G. Williams's *Chemical Manipulation.*

Burgage Tenure, *ber'-gaj*, in Law, is an ancient tenure proper to boroughs, whereby the inhabitants, *by custom*, hold their lands or tenements of the queen, or other person, by a rent certain. It is, indeed, only a kind of town-socage, as a common socage, by which other lands are holden, is usually of a rural nature. By the operation of the Enfranchisement Acts, this species of tenure is gradually diminishing.

Burgess, *ber'-jes* (Lat. *burgarii*). — Burgesses are properly men of trade, or the inhabitants of a borough or walled town; but the term is usually applied to the magistrates of such a town; as the bailiff and *burgesses* of Leominster, &c. Before the statute 5 & 6 Wm. IV. c. 76 (commonly called the Municipal Corporation Act), the title of *burgess* (or the *freedom*, as it is called) was generally acquired by birth, marriage, or servitude, that is, by being born of a freeman, by marrying the daughter or widow of a freeman, or by apprenticeship for seven years within the borough to a freeman. It might also be obtained by gift or purchase. In the boroughs comprised in the act, the definition of a *burgess* (that is, a burgess entitled to such new rights as the act for the first time confers on these boroughs) is a male person of full age, not an alien, nor having received within the last twelve months parochial relief, or alms, or pension, or charitable allowance from the charitable trustees of the borough, who, on the last day of August in any year, shall have occupied any house, warehouse, counting-house, or shop, within the borough, during that year and the whole of the two preceding years; and, during such occupation, shall also have been an inhabitant householder within the borough, or within seven miles thereof; and shall, during such time, have been rated in respect of such premises to all rates for relief of the poor, and have paid all such rates, and all borough rates in respect of the same premises, except those payable for the last six calendar months; and shall be duly enrolled in that year as a burgess on the *burgess-roll*. Which definition, however, is to be understood as subject to the following rule,—that when the premises come to the party by descent, marriage, marriage-settlement, devise, or promotion to any benefice or office, he shall be entitled to reckon in the occupancy and rating of the former party from whom they were so derived. (*See* 6 & 7 Wm. IV. c. 104, s. 7; 7 Wm. IV. & 1 Vict. c. 78, ss. 4 to 9, and 24; and Borough *in loco*. And as to the burgess-roll, *see* R. v. Hardwich (mayor), 19 Ad. & E. 66; R. v. Eye (mayor), 9 Ad. & E. 670.)

Burgh (Goth. *bourge*, a city), is a general name given to certain towns and cities in Scotland, and corresponding to borough (which *see*) in England. There are *royal burghs*, *burghs of barony*, *parliamentary burghs*.

Burgh Acres, in Scotland, are acres or small patches of land lying in the neighbourhood of royal burghs, usually feued out to, and occupied by burgesses, or persons resident within the burgh. Statute 1695, c. 23, concerning runrigde lands, exempts burgh acres from division; but the exemption is confined to royal burghs.

Burghers, *ber'-gers*, in the ecclesiastical history of Scotland was the name of one of the two bodies into which the Secession church was divided in 1747. The cause of division was,—Whether it was lawful for seceders to take the burgess oath, professing the established religion and promising to maintain the same. The one party, the Burghers, held that their creed was identical in all material points with that of the established church, and that professing their belief in the one was the same as professing their belief in the other. The Antiburghers, on the other hand, maintained that the oath could only be received in the sense intended by those who administered it. The dispute was carried on with great acrimony for two years, and resulted in a separation. After the separation both sections rapidly increased, and though the animosity was maintained with great bitterness for some time, it began gradually to subside, and at length, in 1820, the two became again united under the name of the United Associate Synod of the Secession Church. More recently they have become united with several other bodies into the United Presbyterian Church (which *see*).

Burgh Laws (*Leges Burgorum*), an ancient collection of laws relating to burghs in Scotland, now more valuable to the archæologist than the lawyer.

Burgh of Barony, or Burgh of Regality, is a corporation analogous to a royal burgh, consisting of the inhabitants of a determinate tract of ground within the barony, erected by the king and subject to the government of magistrates. The right of electing magistrates is vested by the charter of erection, sometimes in the baron or lord of the regality, and sometimes in the inhabitants themselves.

Burgh Royal, a corporate body erected by charter

from the crown, conferring upon it certain powers and privileges. The corporation consists of the magistrates and burgesses of the territory erected into a burgh. The magistrates are generally a provost and bailies, dean of guild, treasurer, and common council. There are 66 royal burghs in Scotland; and under the Reform Act, 23 of the 53 M.P.'s for Scotland are returned by the royal burghs. The election of magistrates is now regulated by 2 & 3 Will. IV. c. 76, and in burghs not royal, but contributing to return members to parliament, by 3 & 4 Will. IV. c. 77, and 4 & 5 Will. IV. c. 86. The act 16 & 17 Vict. c. 26, provides for the supplying of vacancies in town councils of burghs consequent on null and irregular elections. The police of burghs and other populous places, and the paving, draining, cleaning, lighting, and improving the same, are regulated by 13 & 14 Vict. c. 33; and the 16 & 17 Vict. c. 93, enables burghs to maintain and improve their harbours. The exclusive privilege of trading in burghs is abolished by 9 & 10 Vict. c. 93. The transmission of property within burghs is regulated by 10 & 11 Vict. c. 49. A convention, composed of commissioners from each of the royal burghs, meets annually at Edinburgh, with power to make regulations for promoting the trade and commonweal of the burghs.

Burglary, *ber'-glă-re* (Lat. *burgi latrocinium*), in Law, nocturnal housebreaking, which, by our ancient law, was called *hamesecken*, as it is in Scotland to this day. The definition of a burglar, as given by Sir Edward Coke is, "he that by night breaketh and entereth into a mansion-house *with intent to commit a felony*." The breaking and entering a dwelling-house by *day*, to steal property therein, amounts, however, to a felony. As regards the offence of burglary, by the 7 Wm. IV. & 1 Vict. c. 86, s. 4, the night is considered as commencing at nine in the evening, and concluding at six in the morning. It is generally applied to breaking into a mansion or dwelling-house; for no distant barn, warehouse, or the like, is under the same privileges; nor is a house in which no one resides, unless the inhabitant has only left it for a short season, *animo revertendi*. If the building broken into communicates with the dwelling-house, either immediate or by means of a covered and inclosed passage leading from the one to the other, the breaking into it is burglary. The offence extends to breaking into a room or lodging in any private house, the mansion for the time being of the lodger, if the owner doth not himself dwell in the house, or if he and his lodger enter by different outward doors; but if the owner himself lies in the house, and has but one outward door at which he and his lodgers enter, such lodgers seem only to be inmates, and all their apartments to be parcel of the one dwelling-house of the owner. There must be both a breaking and entry to complete the offence, but they need not be done at once. The breaking extends to taking out the glass of, or otherwise opening a window, picking a lock or opening it with a key, lifting up the latch of a door, or unloosening any other fastening which the owner has provided; or the introduction of any part of the body, or the insertion of an instrument, or stepping over the threshold, or putting in a hook to draw out goods, or a pistol to demand one's money. If a person leave his door or window open, the entering is not a burglary; but if an inner or chamber door be unlocked after such entry, it is so. The following acts also constitute the offence; viz.—to come down a chimney, to knock at a door, and, on its being opened, to rush in with a felonious intent, or, under pretence of taking lodgings, or otherwise, to fall upon an inmate and rob him; a servant to open his master's chamber door with a felonious design, or any other person lodging in the same house, or in a public inn, to open and enter another's door with such evil intent; or a servant to conspire with a robber and let him into the house by night. There must be a felonious intent, otherwise the entry, actual or constructive, will amount only to a *trespass*. The intent is a question for the jury. Whosoever shall burglariously break and enter into any dwelling-house, and shall assault with intent to murder any person being therein, or shall stab, cut, wound, beat, or strike any such person, shall be guilty of felony, and shall suffer death. For common burglary, the punishment is transportation for life, or not less than ten years, or imprisonment for any term not more than three years; and in case of imprisonment, hard labour and solitary confinement may be superadded.

Burgomaster, or Burgyemeister, *bur'-go-mas-ter*, is the title of the chief magistrate in a municipal town in Holland and Germany, corresponding to the English mayor and the French maire.

Burgonet, *bur'-go-net*, a helmet which formed part of the armour worn at the close of the 17th century. It was invented by the Burgundians, and from them received its name. All the armour of that period was richly decorated and fluted. The burgonet took the form of the head more closely than the helmets in previous use, and frequently had overlapping plates of steel that protected the neck. There is a resemblance between the burgonet in the accompanying illustration and the singular helmet worn in the reign of Richard II. A serrated ridge usually ran from the summit, and a plume of feathers either stood up from the apex of the helmet, or one long flowing plume was inserted in the pipe at the back. This plume streamed behind the wearer, frequently descending lower than the waist.



BURGONET.

Burgos Lustre, *boor'-gos lus'-ter*, a certain method of gilding ceramic ware by the double sulphide of gold and potassium, prepared by heating gold in a fine state of division with sulphur and carbonate of potash.

Burgundians, Burgundi, or Burgundiones, *bur-gun'-di-ăns*, an ancient Germanic race, originally inhabiting the country between the Oder and Vistula, about the present New Mark and the southern part of West Prussia. They were distinguished from the other Germans by living together in villages—*burgens* (whence, perhaps, their name). Afterwards they were driven out of their territory by the Gepidæ, when they passed westward and settled in the region of the Upper Rhine. In the beginning of the 5th century they settled, with other German nations, in Gaul, and established themselves between the Aar and the Rhone. They are said to have been converted to Christianity in seven days. From 407 to 534, the kingdom of Burgundy was harassed by internal as well as external dissensions, being sometimes under one king, sometimes under several. In 451, one of their kings, Gundicar, engaged Attila, but was defeated and slain. In 534, King Godemar was slain in battle, and Burgundy became a Frankish province. In consequence of the weakness of the later Carlovingian kings, the country, in the latter part of the 9th century, became once more independent; and from being the residential city of Boso, the first king, it took the name of the kingdom of Arles. After various changes, Burgundy became finally united to France, on the death of Charles the Bold without male issue, in 1477.

Burgundy Pitch, *bur'-gun-dy*, a resinous substance used for making plasters. It is prepared from common frankincense, the resin of the spruce fir (*Abies excelsa*), by melting it in hot water immediately after it has been scraped from the tree, and then straining it through a cloth. The resin is thus freed from mechanical impurities, while it loses some of its volatile oil. The substance sold as Burgundy pitch is often a factitious compound, consisting of resin rendered opaque by the incorporation of water, and coloured by palm oil, or else a cheap preparation of concrete American turpentine.

Burial, *ber'-ri-al* (Ang.-Sax. *birgan*, to conceal), the act of interring the body of a deceased person. Of the various modes of disposing of the dead, that of inhumation appears to have been the most ancient, as it is also that which is most generally practised among civilised nations. The practice of burning dead bodies, and afterwards depositing the ashes in an urn, was commonly practised among the Greeks and Romans, and appears to have derived its origin from the

dread of inhumen treatment to them after death; but the practice appears to have gone out of use during the Empire. Almost every nation has manifested a certain degree of solicitude and care in the disposal of their dead; and both in sacred and profane history we find that burial was regarded as a matter of the highest importance. Among the Jews the deprivation of burial was looked upon as one of the most disgraceful things that could befall a man; and the ancient Greeks and Romans believed that their souls would not be admitted into the Elysian fields till their bodies were committed to the earth. Among the ancients burials seem to have generally taken place without the cities, and this practice was followed by the early Christians. At first they had no separate burying-places, but in the the time of Gregory the Great, who was bithop of *Rome* anno 590, inclosures around churches began to be employed for that purpose, at first exclusively for ecclesiastical dignitaries, but afterwards for any who died in communion with the Church. There is no instance on record of a formal consecration of a burial-ground before the 6th century; and burial within churches does not appear to have taken place previous to the 7th. Monuments with inscriptions in memory of the dead were early adopted. Except in times of persecution, the Christians conducted their funeral ceremonies during the day; but in imitation of the heathens, they adopted the custom of carrying torches at their funeral processions. The body was conducted to the grave amid the singing of hymns, and the practice of singing on such occasions was thus defended by Chrysostom: "What mean our hymns? Do we not glorify God and give him thanks, that he hath crowned him that is departed, that he hath delivered him from trouble, and hath set him free from all fear?" "If thou believest the things which thou sayest to be true, why dost thou weep and lament, and make a mere mock and pageantry of thy singing?" It was usual to carry in the procession palm and olive branches, as symbols of victory and joy, and to burn incense. Laurel and ivy leaves were sometimes put into the coffin; but cypress was rejected, as being emblematical of sorrow and mourning. It was also customary to strew flowers on the grave. It was not unusual to celebrate the Lord's Supper at the grave; and they also fell into the error of commending the soul of the deceased to God in prayer. During the procession, the *tuba*, or trumpet, was employed, or, in some cases, rattles of wood or iron. In the 8th century the tolling of bells was introduced. The distribution of alms at funerals was not uncommon. From an early period it was customary to deliver funeral orations in praise of the deceased. The primitive Church denied the more solemn rites of burial only to unbaptized persons, self-murderers, and the excommunicated, who continued obstinate and impenitent, in manifest contempt of the church censures. In the same way the burial service of the Church of England is to be read over all but such as die unbaptized, or have committed suicide, or have been excommunicated. Funeral services, as remarked by St. Augustine, are designed rather for the comfort and benefit of the living than for the dead; and hence, when denied to any, it is chiefly with the view of testifying the Church's abhorrence of certain offences and of inducing others to avoid falling into them. "This office is also denied to infants not yet admitted into the Church by baptism; not so much to punish the infants, who have done no crime, as the parents, by whose neglect this too often happens."—(Hook's *Church Dictionary*.) The burial service of the Church of England is singularly appropriate and impressive. The rubric directs that the priests and clerks, meeting the corpse at the entrance of the churchyard, and going before it, either into the church or towards the grave, shall say or sing as is there appointed. In Scotland there is no religious service at the grave, but usually a short service is held in the house of the deceased before the body is removed.

**Burial Acts.**—In consequence of the overcrowded state of graveyards in the metropolis, an act was passed, called the Metropolitan Interments Act, 1850. This was repealed by the 15 & 16 Vict. c. 85, 1852. The object of the legislature was to effect a discontinuance of intramural interments, and to empower ——— to establish burial-grounds for parishes, and enforce regulations of a sanitary character. Several other acts relating to the subject have been since passed, whereby the objects proposed to be carried out in the city of London were extended to the provinces. These acts are the 16 & 17 Vict. c. 134, the 17 & 18 Vict. c. 87, and the 18 & 19 Vict. cc. 79 & 128, and the whole are amended by the 20 & 21 Vict. c. 81, the 22 Vict. c. 1, and the 23 & 24 Vict. c. 64. These acts are carried into effect by burial boards, which are appointed in the manner prescribed by the leading statutes, and they are subject to the control of the secretary of state for the Home department and orders of council.

**Burial Societies.** (*See* Friendly Societies.)

**Burials, Registration of.** (*See* Registration.)

**Burin,** *bu'-rin* (Fr. *burin*, a graving-tool), the name given to the instruments or gravers with which the engraver cuts lines on a steel, copper, or zinc plate in making an engraving. The size and shape of gravers vary according to the breadth and depth of the lines they are intended to produce. They are made of well-tempered steel, and are generally shaped like a four-sided prism, with the lower end ground obliquely to a point; but for very fine lines a lozenge-shaped graver is used. The steel end is attached to a handle, and thus forms a tool about five or six inches in length. In cutting a line, the graver is pushed gently, but firmly, in the requir[ed] direction, being held in such a position that it for[ms] a small angle with the surface of the metal.

**Buriti Palm.** (*See* Mauritia.)

**Burking,** *burk'-ing*, murdering a person with the intention of selling the body for dissection. Before the year 1832 there were not sufficient legal means by which bodies could be procured for anatomical purposes. Previous to that time the prices for subjects became very high, and tempted men to commit some horrible crimes. Among these were two men named Burke and Hare, who, as associates, are believed to have murdered no less than sixteen persons solely for the purpose of handing their bodies over to the surgeons. Burke was tried in 1828, at Edinburgh, Hare being received as king's evidence against him. Their practice was to decoy poor people, usually strangers, into their houses, and there smother them after making them drunk. Burke was convicted and hanged, and his name has ever since been given to the inhuman crime of which he was guilty. In 1832 an act was passed (3 & 3 Will. IV. c. 75), by which the supply of bodies for dissecting purposes was put under legal superintendence, and inspectors were appointed to the various schools of anatomy. This act has proved sufficient to meet the evil for which it was intended. To *burke* a project or a speech comes from this word, and means bringing to a sudden end.

**Burlaws,** or **Byrlaws,** *ber'-laws*, in Scotland, were laws made and determined, by consent of neighbours, for their mutual guidance and protection. Hence, byrlaw-men, or birley-men, were a species of rustic judges, appointed by the common consent of the district, for settling disputes among neighbours. In some parts, birley-men are still recognised in cases of valuation of houses and crops, as well as other matters of local custom.

**Burlesque,** *bur-lesk'* (Ital. *burlare*, to jest, mock), denotes a style of composition in which the humour consists in a ludicrous mixture of things high and low, of high thoughts clothed in low expressions, or *vice versâ*, of ordinary or base topics invested in artificial dignity. The burlesque style may exist in conversation as well as written composition, and even in acting and drawing. It is, however, most common in poetry. Burlesque appears to have been unknown among the ancients; but specimens of it are found in most modern languages, particularly the Italian. Butler's "Hudibras" is a well-known example in English.

**Burletta,** *bur-let'-ta* (Ital. *burlare*, to jest), is a comic *operetta*, or short opera, or a musical farce.

**Burmanniaceæ,** *bur-man'-ni-ai'-se-e*, in Bot., the *Burmannia* fam., a nat. ord. of monocotyledonous plants in the sub-class *Petaloideæ*. This order is said to include 10 known genera and 38 species, natives of the tropical parts of Asia, Africa, and America. They are herbaceous plants, without true leaves, or with tufted radicle ones. Flowers hermaphrodite, regular;

perianth tubular, regular, superior, usually with six divisions; stamens inserted into the tube of the calyx, 3 or 6, distinct; ovary inferior, 1-celled with three parietal placentas, or 3-celled with axile placentas; seeds numerous, very minute; embryo solid. The species have no important properties.

Burnett Prizes, The, *bur'-net*, were founded by Mr. Burnett, a merchant in Aberdeen, who, dying in 1785, left a part of his fortune to found these prizes. The interest was to accumulate for forty years at a time, and was then to be divided and given, as two prizes (of not less than £1,200 and £400), to the authors of the best two essays on "The evidence that there is a Being, all-powerful, wise, and good, by whom everything exists; and particularly to obviate difficulties regarding the wisdom and goodness of the Deity; and this, in the first place, from considerations independent of written revelation; and, in the second place, from the revelation of the Lord Jesus; and from the whole to point out the inferences most necessary and useful to mankind." On the first competition, in 1815, the first prize, of £1,200, was awarded to Dr. W. Laurence Brown, principal of Marischal College, and the second, of £400, to the Rev. J. Bird Sumner, afterwards archbishop of Canterbury. On the second competition, in 1855, 208 essays were given in, the judges being the Rev. Baden Powell, Henry Rogers, and Isaac Taylor. The first prize, of £1,800, was adjudged to the Rev. Robert Anchor Thompson, master of the hospital of St. Mary the Virgin at Newcastle-upon-Tyne, and the second, of £600, to Dr. John Tulloch, principal of St. Mary's College, St. Andrew's.

Burning, *burn'-ing* (Sax. *byrnan*, to burn), the action of fire or heat upon any combustible matter, by means of which the constituent particles of the substance acted upon are rapidly oxidized and converted into vapour and ashes, or into calx.

Burning-Glass, a glass lens employed to refract the heat-rays of the sun into a focus. Dr. Young, in his lectures on Natural Philosophy, describes some remarkable experiments performed with Parker's burning-glass, which was presented to the emperor of China when Lord Macartney visited Pekin. This instrument was a double convex lens, three feet in diameter, three inches thick in the centre, and weighing 212 pounds. Its focal distance was 6 feet 8 inches; but this was generally shortened by a smaller lens. The most refractory substance fused was a cornelian, which required 75 seconds for its fusion; a crystal pebble was fused in 6 seconds, and a piece of white agate in 30 seconds. The solar rays may also be brought to a focus by reflection from a concave mirror, or from a combination of mirrors. With a machine composed of 108 small plane metallic mirrors, so arranged that they all reflected radiant heat to the same spot, Buffon found that he was able to [illegible] wood on fire at the distance of 209 feet, to melt lead at 100 feet and silver at 50 feet. A glass globe filled with water will collect the rays of the sun into a focus: hence there is some danger in leaving a fish-globe or a decanter of water near a window, exposed to direct sunlight, during hot weather. (*See* Lens, Mirror, Refraction, Reflection.)

Burning the Dead. (*See* Burial.)

Burnisher, *ber'-nish-er* (Fr. Sp. *brunir*, to burnish), a tool made of agate, steel, or some other very hard highly-polished material, and used by silversmiths, bookbinders, and others, to give smoothness and lustre to rough surfaces.

Burns and Scalds, *burns*, *skawlds*, in Surg., are injuries done to the body through excessive heat; burns being produced by fire or heated solids, scalds by heated fluids. Scalds seldom penetrate deeper than the cutis; burns, on the contrary, may penetrate to any depth. Burns are more fatal in the young and old than in those of middle life, and are more dangerous on the head or trunk than on the extremities. A burn affecting an extensive surface is more to be dreaded than one which penetrates deeper without extending over much surface. Where the skin is blistered, cold evaporating lotions should be applied; as, camphorated spirits of wine, sugar-of-lead lotion, or cold water, so as to prevent the blisters from bursting, and to lessen the inflammation. The blisters may be pricked with a fine needle, in order to allow the serum to escape; but care is to be taken not to admit the air, and on no account is the raised cuticle to be removed. When the cuticle is destroyed, and the inflamed cutis exposed, spirit of turpentine is the best application that can be used in the first instance. A mixture of lime-water and milk, or of lime-water and olive-oil, will also be found useful. In more serious cases of burning, arising from clothes taking fire, the explosion of gunpowder, &c., the patient frequently, immediately after the accident, falls into a state of collapse, occasioned by the shock. He suffers no pain, and the pulse is quick, weak, and scarcely to be felt. Stimulants, as brandy, are to be freely administered, to prevent the patient from dying from the shock; and warm lime-water and oil or milk, or spirits of turpentine, are to be applied to the parts: the collapse may last for several hours, and, if not fatal, is succeeded by a stage of reaction: the patient becomes sensible, the pulse rises, pain begins to be felt, and, perhaps, vomiting takes place. When the reaction has been established, the stimulants should be laid aside; and now inflammation has to be guarded against. This stage is characterized by the usual local and constitutional symptoms attendant on inflammation. In the antiphlogistic treatment now adopted, much care has to be observed, as it is necessary to keep up the patient's strength. Poultices may be applied to the deeply-burnt parts, in order to expedite suppuration and the separation of the sloughs. When the sloughs have separated, and suppuration is established, cicatrization commences. The poultices are now to be laid aside, and moderately stimulating ointments to be applied. Great care is to be taken at this stage to preserve the parts in a proper position, as in cicatrization there is a great tendency to contraction, and naturally distant parts may be brought together, and much inconvenience or deformity may be the result. Extensive burns may prove fatal in any stage, and the patient, especially if young, or advanced in years, can seldom be pronounced free from danger until cicatrization has been completed. In the event of one's clothes taking fire, it is obvious that the upright posture is not only favourable to the spread of the flames, but allows them to reach the more important parts of the body, as the head and neck; while running about only tends to increase the power of the flames. The best thing, therefore, to do, is to lie down and roll about on the floor, and, if possible, to seize the hearth-rug or table-cover, and envelop the body in it. The first thing for a person to do in being called to assist on such an occasion, is to snatch up a rug, blanket, or other woollen article, and envelop the body of the sufferer closely in it, which will have the effect of extinguishing the flames. In removing the clothes from the burnt parts great care is to be taken not to break any blisters that may be raised, as a great object is to exclude the air from raw or inflamed surfaces. A course frequently adopted in such cases is to cover the parts with flour, or to wrap them in wadding or cotton wool, so as to exclude the air; but the treatment indicated above is generally preferable.

Burnt-offering. (*See* Sacrifice.)

Burnt Sienna, *burnt si-en'-nā*, a transparent orange-red pigment, used by oil and water-colour painters. It is made from burnt terra di Sienna, an ochreous iron-earth. It mixes well with other pigments, and very fine greens are obtained by mixing it with Prussian blue. One of its chief advantages is that it dries quickly.

Burnt Umber, *um'-ber*, a semi-transparent russet-brown pigment. It is made from umber, an ochreous earth containing manganese, found near Umbria, in Italy. It mixes well with other pigments and dries quickly.

Bursæ Mucosæ, *bir'-se mu-co'-se* (Lat., mucous bags), in Anat., are small membranous sacs, situated about the joints of the bones, and containing a kind of mucous fat, which serves to lubricate the joints, in order to render their motion easy. They are of different sizes and firmness. *Bursalogy* is the name given to a description of the *bursæ mucosæ*.

Bursarii, *bur-sa'-ri-i* (Lat. *bursa*, a purse), the receivers or accountants of the bursaria, or exchequer, of collegiate or other conventual bodies.

Bursary, *ber'-sa-ry* (F. *bourse*; Lat. *bursa*, a purse,)

is a sum of money allowed to a student at a university to enable him to prosecute his studies. The money is usually the annual proceeds of a bequest left by some private individual for that purpose. It is said that the institution of bursaries originated with the Poles in the 14th century, who were accustomed to supply promising young men with the means of travelling to Germany, and there studying philosophy under the monks. This practice was soon adopted in other countries; and now there is, perhaps, no civilized country in which such endowments do not exist, under the name of bursaries, exhibitions, fellowships, scholarships, &c. They are of two kinds,—either for furnishing the student with the means of prosecuting his studies during the academical curriculum, or to devote himself to literary pursuits after that period. It is to the former of these that the term bursary is applied. In the Scottish and continental universities the former is the mode in use, though recently, in Scotland at least, the latter method has been introduced; at Oxford and Cambridge both methods prevail. (*See* EXHIBITIONS, SCHOLARSHIPS, FELLOWSHIPS.) As already stated, bursaries, at least in Scotland, have in almost every case been founded by the munificence of private individuals, and generally with a view to securing the benefits of a liberal education to those who would not otherwise have the means of obtaining it. Some were to be adjudged by public competition, others were to remain in the presentation of the heirs of the donor; some were restricted to persons of certain names, others to persons born in certain parts of the country. The bursaries connected with the Aberdeen university are more numerous than those of any other of the Scottish universities. The number of bursaries connected with the two colleges Marischal and King's was 253, of the annual value of £3,150; but, by ordinances of the University Commissioners in 1862, the number has been reduced to 189, and their annual value to £2,770. The number of prizes or scholarships, which were formerly of the annual value of £235, has been raised to 16, of the value of £925. The tendency of late years has been more and more to alienate the bursary funds from their original destination and to bestow them as prizes for superior scholarship, or as inducements to persons after completing their academical curriculum, to devote themselves to literary pursuits. This, we think, is to be regretted; for, while there may be some truth in the assertion that, where numerous, as in Aberdeen, they tend to induce persons to enter the learned professions who are not naturally fitted for them, yet when disposed of solely for scholarship on entering the university, as the great majority of them are,—and when the examination is mainly or solely confined to one branch, as Latin version-writing, then, we believe, that in many cases persons of talent and ability who have struggled through great hardships to attain a certain amount of education, are denied the means of proceeding farther, and that it was such cases that the founders intended to meet. Such persons, who may have had to thank a country parish school for all the instruction they have received, cannot compete on equal terms with those who have enjoyed the advantages of a long and thorough training under the best masters. The bursaries, too, being bestowed for scholarship, have come to be viewed in the light of prizes, and we believe, in the majority of cases, are held by persons whose parents are well able to pay for their education. While so much is done for scholarship, we confess we should like to see something done for young men of promise, desirous of obtaining a liberal education, without the means of doing so, and who, we cannot help thinking, have the first claim to be considered in the disposal of the bursary funds.

**BURSCH**, or **BURSCHE**, *boorsh* (Ger.), is the designation applied to a student at a university in Germany.

**BURSCHENSCHAFT**, *boor'-shen-shaft*, was the name of an association of the students in Germany, formed in 1815, and which had for its object the political regeneration of Germany.

**BURSERA**, *bir'-se-ra* (so named in honour of Burser, the naturalist), in Bot., a gen. of plants belonging to the nat. ord. *Amyridaceæ*. The species *B. gummifera* and *acuminata* yield fragrant resinous substances, that from the former being termed Chibou, or Cachibou resin, and that from the latter, resin of Curana. This genus, with some other genera of *Amyridaceæ*, is included by many botanists in a nat. ord. termed *Burseraceæ*.

**BURYING-BEETLE** (*Necrophorus*), a gen. of *Coleoptera*, found in Europe and North America. They have received their name from a remarkable habit they have of burying the bodies of dead birds, mice, moles, and other small animals, in which they deposit their eggs. One of the species is a native of Britain, the *Necrophorus Vespillo*. It is a black-beetle about an inch in length, and has two bright orange bands across the back. It has an intensely fœtid odour, and the hands smell for hours after touching it. In some parts of Russia, where poor people are buried only a few inches beneath the surface of the ground, the burying-beetles pierce the graves in every direction. In this country they feed upon putrefying dead bodies and the garbage that is thrown out near towns, as soon as it begins to smell. They hunt in couples, and as soon as they find a dead bird or mouse, they alight upon



BURYING-BEETLE.

it, and, after feeding, the male commences his work of interment. This is done by digging with his head alone a trench round the dead object; a second trench is then dug within the first, and then another, until the earth is entirely excavated. The dead bird or mouse then falls into the hole thus formed. Much time and labour are expended in this work. As soon as the corpse is fairly dragged to the bottom of its grave, the beetle quickly throws back the removed earth, and both insects bury themselves in the body. After the female has deposited her eggs, the pair work their way out. The eggs are quickly hatched. The larvæ are whitish, with six feet and a brownish head. When perfect insects, they make holes in the ground, and work their passage to the outer air.

**BUSKIN**, *bus'-kin* (Ang.-Sax.), the English translation of the Latin word *cothurnus*, which was a kind of boot, covering the foot, and rising above the calf of the leg, sometimes even reaching as high as the knee. It was principally worn by hunters, horsemen, and persons of rank and authority. The sole of the buskin was generally of an ordinary thickness, but sometimes it was made thicker than usual by the insertion of slices of cork. The object here was to add to the stature of the wearer; for which reason it was worn by the Greek and Roman tragedians, in order to give them a more heroic appearance, as the *soccus*, or low-heeled shoe, was worn by the comedians. Hence, in English, the *buskin* and *sock* have come to be synonymous with tragedy and comedy; as in Dryden,—



BUSKIN.

"Great Fletcher never treads in *buskins* here,
Nor greater Jonson dare in *socks* appear."

It was also worn by ladies for ornament. The Melpomene in the Villa Borghese is represented with the buskin, and it forms part of the recognized hunting costume of Diana.

**Bush**, *bush* (Dan. *busch*), in Bot., a low diminutive shrub, with numerous branches near the base.

**Bushel**, *bush'-el* (Fr. *boisseau*), an English measure of capacity for dry goods, as fruits, grain, &c., and containing four pecks, or eight gallons, or one-eighth of a quarter. Until the year 1826, from the reign of Henry VII., a Winchester bushel was the legal measure of England; but by the 5 Geo. IV. c. 74, it was superseded by the imperial bushel. The imperial bushel is the standard measure of capacity for coals, lime, fish, potatoes, or fruit, as well as all other goods commonly sold by heaped measure. It should contain 80 lbs. avoirdupois of distilled water, should be made round, with a plain and even bottom, and be 19½ inches from outside to outside. Du Cange derives the name from *busselus*, a corrupt Latin word for a measure of wine equal to eight gallons.

**Bussa Palm.** (*See* Manicaria.)

**Bust**, *bust* (Ital. *busto*), a term in Sculp., by which is meant a representation of the head, neck, shoulders, and breast, with, most frequently, the arms cut off midway above the elbow. The derivation of the word is uncertain, as the Lat. *bustum* first meant the place where dead bodies were burnt, then the grave, and lastly, in later ages, was taken to signify the dead body, or rather a body without the head. The representation of the upper part of the human form, as shown in the bust of sculpture, is supposed to have originated with a custom in vogue among the ancient Greeks of placing heads of Mercury on pillars, whence they were called *Hermæ*, from Hermes, the Greek name of that divinity. Busts were first used as portraits of men of renown, as warriors, statesmen, poets, philosophers, &c., about 330 B.C. The method of taking a cast in plaster of Paris from the human body is said to have been first practised by Andrea Verocchi, an Italian, about the middle of the 15th century. By the aid of the plaster cast the sculptor is enabled to produce a very accurate portrait of the original, and in this branch of art English sculptors have attained a high degree of excellence. Among sculptors that are famous for their portrait busts, Sir Francis Chantrey stands pre-eminent.



BUST.

**Bustard**, *bus'-tard* (Fr. *bistarde*).—This is the largest of European land birds. When full grown, the Great Bustard (*Otis tarda*) weighs from twenty-five to thirty pounds. It is about four feet long, and across its extended wings measures three yards. The head and neck are ash-coloured, and there is a tuft of feathers about five inches long on each side of the lower mandible. The bustards generally live in open countries dotted with low bushes, a locality which gives them the advantage of a broad look-out and secures them from surprises by enemies. They are said seldom to use their wings for aërial locomotion, but as adjuncts to their long legs in running. The speed they make this way is considerable, and may be sustained a very long time. The bird is still found in parts of France and Germany, and is common in Russia and on the extensive plains of Tartary. In this country, however, it has long been rare. Yet that they were sometimes common is certain, so common as to be a looked-for dish at feasts and banquets. A living and reliable naturalist speaks of the circumstance being in his remembrance, of seeing one, and sometimes two, bustards gracing the Christmas board of the Bush inn at Bristol. In 1799 a bustard was taken alive on Salisbury Plain, and, according to Stanley, the latest authentic instance of a capture of this bird is that of a gamekeeper in Norfolk, who took a hen bustard in a rabbit-trap, in May, 1829. One of the bustard's chief peculiarities is a singular pouch, shaped like a modern soda-water bottle, and hanging immediately beneath the base of the lower mandible. The real use of this pouch has not been ascertained. Douglass supposes that the bird fills it with water in the midst of the arid plains over which it is accustomed to wander; but as the pouch is peculiar to the males, this would seem, at least, improbable. Bewick has his opinion on the subject, and Stanley has his; but what can be said when Mr. Yarrell, one of our best and most painstaking naturalists, hints broadly that it is altogether a blunder—that he has dissected a male bustard, and discovered *no pouch at all*. With regard to the food of the bustard, as great diversity of opinion exists. Pennant declares their food to consist of corn and other vegetables that grow in their neighbourhood; Brookes asserts that their proper food is frogs, mice, small birds, and various kinds of insects; and Montagu, that vegetables (especially turnip-tops) and earth-worms form the staple of the bustard's aliment. The Little Bustard (*Otis Tetrax*), though common in France, Sardinia, and Italy, is very rarely seen here: it is also found in North Africa, Turkey, and Greece. It is about eighteen inches in length. It is a very shy bird, and when disturbed, escapes by alternately running and flying.



BUSTARD.

**Butcher**, *butt'-cher* (Fr. *boucher*), a slaughterer of cattle for the table; also a vender or retailer of the same. The methods of killing cattle vary in different countries, as do the means by which the meat is disposed of to the consumer. In London, the carcass-butchers kill the animals, and sell the meat in large quantities to the retail butchers, who afterwards sell it to their customers. Napoleon I., in 1809, judiciously removed the slaughter-houses, which were receptacles of filth and injurious to health, to the outskirts of Paris. In all countries the Jews have their own butchers, who are licensed by the rabbis, and who, instead of knocking down the animals, according to the usual practice, cut their throats. The method of killing cattle by penetrating the spinal marrow is practised in some countries; and it has even been suggested, by some humane persons, that the animals should be subjected to the influence of chloroform, that they might die without pain or struggle.

**Butcher-bird** (*Lanius excubitor*).—The sanguinary title of this member of the Shrike family, received from Gesner two hundred and fifty years ago, arises not only from its savage and cruel disposition, which seems to lead it to kill for the pleasure of killing, but also from its singular habit of impaling its victims on thorns and twigs, and in that position tearing and devouring their carcasses piecemeal. All small birds have the strongest antipathy to the butcher-bird, and will express their rage and fear by the loudest cries should one appear in their neighbourhood. It is about the size of the common thrush. Its bill is black, and furnished with bristles at the base; the upper parts of its plumage pale blue, and its under-parts white. It is common all the year in France, but in this country is only a rare winter visitant. When confined

in a cage, the same love of fixing its food before it tears it to pieces is discovered, and for this purpose the bird usually avails itself of the wires of its prison, to which it hangs its dead captive. A bird of this species remained in the possession of a friend of Mr. Yarrell for twelve months; it became very tame, and would readily take food from its master's hands. When a bird was given to it, it invariably broke the skull and ate the brains first. It sometimes held its prey in its claws and pull it to pieces in the manner of the hawks, but seemed to prefer forcing part of it through the wires of its cage and pulling at it. It always hung what it could not eat t the sides of its cage. It would often eat three small birds in a day. Another of these shrikes (*Lanius collaris*), a native of Southern Africa,



BUTCHER-BIRD.

exhibits this carcass-suspending propensity in as marked a manner as the above. The Hottentots assured Le Vaillant that this bird does not prefer fresh food, and that its motive for hanging its carcasses was much the same as prompts some of us to hang venison and game. A curious result sometimes follows this habit of the African shrike. Beneath the scorching sun of that region the process of decomposition does not always take place, from the rapid exhalation of the animal moisture; consequently, the trees and shrubs are sometimes found bearing amongst their fragrant buds and blossoms many ready-dried specimens of the small birds of the country.

BUTCHER'S BROOM. (*See* RUSCUS.)

BUTEA, *bu-te'-a* (named after John, earl of Bute, a great patron of botanists), in Bot., a gen. of plants belonging to the nat. ord. *Leguminosæ*, sub-ord. *Papilionaceæ*. The most important species is *B. frondosa*, a native of India. This tree yields an astringent gum called *butea gum*, which resembles kino in its properties, and is sometimes forwarded to this country under that name. It is used medicinally in India in diarrhœas and similar diseases; also for tanning. The dried flowers of this species and those of *B. superba* are known as Tisso and Kessaree flowers, and are extensively used by the Indians in the production of beautiful yellow and orange dyes. The fibres of the inner bark of *B. frondosa* are known under the name of *Pulas cordage*.

BUTOMACEÆ, *bu-to-ma'-se-e*, in Bot., the *Butomus* or Flowering Rush fam., a nat. ord. of monocotyledonous plants in the sub-class *Petaloideæ*,—aquatic plants with parallel-veined leaves, sometimes milky. Flowers perfect and showy, with inferior perianth of six pieces arranged in two whorls, the inner being coloured; ovaries superior, 3—6, or more; ovules numerous, arranged all over the inner surface of the ovaries; fruit many-seeded, separating more or less into as many parts as there are component carpels; seeds without albumen. The *Butomoceæ* chiefly inhabit the northern parts of the world, but a few occur in tropical countries. There are four genera and seven

BUTOMUS, *bu-to'-mus* (Gr. *bous*, an ox; *temno*, I cut), in Bot., the typical gen. of the nat. ord. *Butomaceæ*. *B. umbellatus*, the common flowering rush, is frequent in ditches and ponds in England and Ireland, but is very rare in Scotland. The leaves, which spring from the crown of the root, are from two to three feet long and of a triangular shape. The scape or flowering stem is longer than the leaves, and terminates in a large umbel of rose-coloured flowers. The plant possesses acrid and bitter properties, and was at one time used in medicine. The roasted rhizome is edible. The sharp leaves of the *Butomus* were believed to cut the mouths of the cattle that cropped it—whence the name.

BUTTER, *but'-ter* (Sax. *buter*, *butera*; Ger. *butter*; Lat. *butyrum*).—Butter is the fatty part of the milk of animals separated by the process of churning. Cows' milk is composed of three ingredients,—the cheesy portion or curd, the whey or watery part, and the butter. Milk when examined by the microscope is found to consist of a number of fatty globules floating in the whey. These globules, which are little sacs containing the butter, are broken during the process of churning, which allows the liberated fatty matter to aggregate in small masses and float on the top of the whey. These are generally united by pressure against the bottom of the churn, and the remaining buttermilk is given as a drink to pigs. The butter is afterwards spread out in a thin layer in a shallow pan, and washed with clear spring water to free it from any buttermilk that may remain in its pores. It is then formed into rolls if intended to be sold as fresh, but if it is to be kept for any length of time, it is mixed with salt, in the proportion of three or four pounds of salt to half a hundredweight of butter, and packed in casks for the market. The quality and quantity of butter contain in cows' milk depend materially on the nature of the pasture. Rich natural meadows afford the best food for cows intended to produce butter. Poor pastures are objectionable, not only from the quantity of butter contained in the milk being diminished, but from its receiving an unpleasant taste from certain plants or weeds growing on all unfertile or marshy soil. The amount of butter produced by a gallon of milk should be from three to four ounces. Butter is much adulterated with water, dripping, and mutton fat. The first may be detected by the wetness of the butter when squeezed, and the two last by small white particles being visible in the newly-cut surface of the butter. The consumption of butter in London is estimated at about 15,000 tons annually. About 400,000 cwt. of foreign butter are annually imported from Holland, Belgium, and France, and from 100,000 to 120,000 cwt. of Irish butter are annually sent to Portugal and Brazil.

BUTTER OF ANTIMONY, terchloride of antimony. (*See* ANTIMONY.)

BUTTER OF SULPHUR, an obsolete name for precipitated sulphur.

BUTTER OF TIN, bichloride of tin. (*See* TIN, BICHLORIDE OF.)

BUTTER OF ZINC, chloride of zinc. (*See* ZINC, CHLORIDE OF.)

BUTTER, VEGETABLE, a name commonly given to any concrete oil of vegetable origin which at all resembles the butter obtained from animal milk, or which is employed for similar purposes. The most important solid oils or fats procured from plants are,—Butter of cacao, from *Theobroma Cacao*; of cinnamon, from *Cinnamomum zeylanicum*; of nutmeg, from *Myristica moschata*; of cocoa-nut, from *Cocos nucifera*; of laurel, from *Laurus nobilis*; Shea or Galam butter, from species of *Bassia*; palm-oil, from *Elais guineensis*; and vegetable tallow, from *Stillingia sebifera* in China, from *Vateria indica* in India, and from *Pentadesma butyracea* in Sierra Leone. All these oils contain a large proportion of stearine, and many are used as substitutes for animal fat in candlemaking. The plants yielding them are frequently termed *butter-trees*.

BUTTERCUP. (*See* RANUNCULUS.)

BUTTERFLY, *but'-ter-fly* (so named from the colour of the yellow species; Sax. *buterflege*), the name of an extensive group of the ord. *Lepidoptera* which fly by day. They are distinguished from other insects by these generic characters:—The antennæ are terminated by a knob, or at least are somewhat suddenly thicker at the extremity; by the beauty as well of the under as of the upper side of their wings, which are usually erect when the animal is in a state of repose. They possess four wings, covered with minute scales, which to the naked eye appear like powder. "If you divide the wing of any butterfly, which you may easily do by scraping it on both sides with a penknife, you will be amused to trace the lines in which the scales were planted, con-

sisting of innumerable minute dots; the lines of the under side, in some cases, so cut those of the upper side as by their intersection to form lozenges. With regard to the position of the scales on the wing, they usually lie flat, but sometimes their extremity is incurved."—(*Kirby and Spence.*) The number of British *Papilionidæ* is not more than seventy, and at least two-thirds of this number are to be met within five-and-twenty miles of London; and it singularly happens, that some of these affect particular localities, sometimes of an area of but a few acres, and are never elsewhere seen. Even on such favourable spots their appearance is limited to a few days in a certain season of the year. Another peculiar circumstance in the history of these insects is, that several species appear in certain localities, at intervals of several years, when they will literally swarm; come the next season, and not a solitary one will reward the most diligent searcher. This might be attributed to the variable character of our climate, but it is well known that in tropical countries the same irregularities occur. The external form of the chrysalids varies according to the species of butterfly that inhabits them; in all, however, there are apertures opposite to the thorax, by which respiration is carried on during the whole period of their inactive state. When the entombed creature has acquired sufficient vigour, and the down already grown upon it has separated it on all sides from the shell, the latter is broken through by the insect's head, and it emerges a butterfly. At first, however, the wings are closely folded to its body; but they soon expand of themselves, and are sufficiently hardened by the air to endure the effort of flying. It, however, is not every chrysalis that becomes a butterfly, probably not a thousandth part of their number do. Both in a caterpillar and in a perfect state they are surrounded by ever-hungering enemies. Many species of the Ichneumonidæ perforate the body of the caterpillar and there deposit their eggs; and although the caterpillar continues to live, and is transformed into a chrysalid, no butterfly is produced from it, those internal parts which were essential to its perfection being consumed. Sparrows and other birds are mortal foes to butterflies, and a single pair will easily dispose of between three and four hundred in the course of a single week.

BUTTERMILK, *but'-ter-milk*, the milk which is left after the butter has been separated by means of churning, or other processes. It is ordinarily procured from milk after it has been kept some time, and has become more or less acid; but it may be procured from new milk when it is not acid, and only differs from milk by the absence of its oily parts. In this state it is still tolerably nourishing, and, being easy of digestion, is employed in phthisical cases with greater advantage than either the entire milk or the watery parts of it in a more acid state. The acid of buttermilk does not increase the acescency of the stomach, or occasion the flatulency usually generated by vegetable acids.

BUTTERWORT. (*See* PINGUICULA.)

BUTTONS *but'-tons* (Fr. *boutons*), articles of dress used either for fastening or for ornamental purposes. Buttons are made of an endless variety of materials, the processes employed in the manufacture varying according to the substance used. Metal, wire, wood, bone, glass, shell, mother-of-pearl, precious stones, velvet, silk, and other substances are used. Birmingham is the place where they are most extensively manufactured. They are made in a great variety of shapes; but, at the present time, these may be classed under four heads,—buttons with shanks; buttons without shanks; buttons on rings or wire moulds; and buttons covered with cloth or other material. Buttons with shanks are usually made of brass, which is supplied to the manufacturer in sheets of the required thickness. By means of fly-presses and punches, circular disks called *blanks*, are cut out of these sheets. This is mostly performed by females, who can furnish about thirty blanks per minute, or twelve gross in an hour. Hand-punching is the general mode of cutting out blanks; but more complicated machines, which cut out eight or ten blanks at a time, are in use. After being punched, the edges of the blank are very sharp, and require to be smoothed and rounded. Their surfaces are then planished on the face by placing them separately in a die under a small stamp, and allowing them to receive a sharp blow from a polished steel hammer. In this state they are ready to receive the shanks, or small metal loops by which they are attached to the dress. The shank manufacture is a distinct branch of trade in Birmingham. They are made by a machine in which a coil of wire is gradually advanced towards a pair of shears which cuts off short pieces. A metal finger then presses against the middle of each piece, first bending it and then pressing it into a vice, where it is compressed so as to form a loop; a hammer then strikes the two ends, spreading them into a flat surface, and the shank is pushed out of the machine ready for use. The shanks are attached to the blanks by women, with iron wire, solder, and resin. They are then put into an oven, and, when firmly united, form plain buttons. If a crest or inscription is wanted, the button is placed in a die and stamped. After being cleaned, they can be silvered or gilt. (*See* GILDING.) The manufacture of gilt buttons has fallen off greatly of late years, the Florentine and silk buttons having superseded them. Wire buttons are rings of wire covered with cloth. Horn buttons are made by pressure, the horn being previously softened by heat. In 1851, there were 6,938 persons employed in the button manufacture in England; of these, 4,980 were employed in Birmingham.

BUTTRESS, *but'-tress* (Fr. *butte*, from *aboutir*, to abut), a piece of masonry or brickwork projecting from the face of a wall, and giving it support and increased strength and solidity. In Grecian and Roman architecture the buttress was not used, but its place was occupied by a pilaster, or some slight projection in that form. The buttress was introduced with Gothic architecture in the Mediæval period, and, by degrees, it was formed into a very ornamental addition to the building to which it was attached. The Norman buttress was a flat projection, finished with a slanting coping, jutting slightly over the face only, and not over the sides; there was generally a band round the lower part, which formed a continuation of the capping of the basement, and if the basement projected beyond the face of the wall, the face and sides of the bottom of the buttress projected to a similar extent, forming a sort of pediment on which the upper portion rested; with this exception, its depth was the same throughout from top to bottom, but never very great; its face was generally broad. Sometimes the Norman buttress is found in a semicircular form. Good examples of this style, from its earliest adoption to the Transition period, may be found at Fountain Abbey, the ruins of the abbey at Glastonbury, and Norwich Castle. The chief characteristic of the Early English buttress is, that it projects from the face of the wall to a much greater extent than the Norman buttress, its depth being equal to, and sometimes more than, its breadth. It generally consists of two or three divisions or stages, each division being less in depth than the one immediately below it, and finished with a water-table, or stone bevelled to present a single inclined surface, or a series of surfaces, like shallow steps, one above another. The tops are generally finished in a triangular or pointed form, resembling the gable-end of a house, and the roof projecting over it. Examples will be found at Canterbury Cathedral and the majority of English parish churches. The buttresses of the Decorated English style are similar, in general form, to those of the Early English period, but are always divided into stages, ornamented with panels and niches, which are sometimes filled with figures and finished with crocketed canopies; the top is often finished with an elaborately-carved finial or



BUTTRESS.

pinnacle. The edges of buttresses of the Early English and Decorated English styles are often chamfered. When they are built at the corner of a building, they project diagonally sometimes, but generally two are built, at right angles to each other, on either side of the angle. Examples of Decorated English buttresses will be found at Exeter Cathedral, York Minster, and Waltham Cross. The Perpendicular English buttress differs from the buttresses already mentioned in being divided into a great number of stages, with panels in front and at the sides, filled with rich tracery. They are higher, and have small pieces, in the form of a bracket or capital of a column, rising from the wall-plate at the top of each stage, which serve as pedestals for small statues. King's College, Cambridge, and St. George's, Windsor, furnish good examples of this kind of buttress. Flying buttresses are buttresses built against the walls of the side-aisles of cathedrals and large churches, and connected with others immediately in their rear, projecting from the walls of the nave, with stonework in the form of a semi-arch, which is sometimes plain and sometimes elaborately carved and perforated with tracery of rich design, as may be seen in those at King Henry the Seventh's Chapel, Westminster Abbey, the cathedrals at Salisbury and Chichester, and those at Amiens and Rheims, in France, which present extraordinary examples of stonework carved with skill and taste. Flying buttresses were introduced at the close of the Early English period.

**Butts, Rifle,** *buts* (Fr. *but*, a mark), a term applied to a screen, generally made of earth-work and masonry, for protecting the markers during rifle-practice at a target. It is placed about fifteen yards in front of and to one side of the target, and in such a position that the markers can easily see the face of the target from it. When the nature of the ground will permit, a trench is dug, and the earth excavated is thrown up on the side of the firing. The interior is lined with stonework, and there are two wings, or epaulements, which protect the markers not only from the shots but from any stones that may be thrown up by them. About eighty yards in rear of the marker's butt, a smaller butt, capable of holding two men, is placed, wherever it is practicable. The markers in these butts note the *ricochet* shots. The bank, screen, or earth-work against which the target leans is also called a butt.

**Butyl,** *bu'-tile* ($C_4H_9$).—Butyl is an organic radicle, discovered by Kolbe amongst the products obtained by electrolysis from valerate of potash. It may also be prepared by the action of sodium on iodine of butyl, in a vessel so arranged that the volatilized products may return into it as fast as they are volatilized and condensed. When the reaction has terminated, the butyl may be distilled off at a temperature not exceeding 300° Fahr. When pure, it is a limpid oil, with an agreeable ethereal odour. It boils at 226° Fahr., and may be distilled without alteration. It is one of the lightest known fluids, its spec. grav. being only 0·694. It is the radicle of a great number of very interesting organic compounds. It has been called valyl by certain chemists, from being formed from valeric acid, and by others tetryl, from being *fourth* in the series of hydrocarbon radicles:—

| | |
|---|---|
| 1. Methyl, $C_2H_3$. | 3. Propyl, $C_6H_7$. |
| 2. Ethyl, $C_4H_5$. | 4. Tetryl, $C_8H_9$. |

**Butylic Ether,** or Oxide of Butyl, *bu-til'-ik* ($C_8H_9O$), was first described by Kolbe as a product of the voltaic decomposition of valerate of potash. It is at present but little known. *Butylic alcohol*, or hydrated oxide of butyl ($C_8H_9O,HO$), was discovered by Wurtz in beetroot molasses. It is a colourless highly refractive liquid, boiling at 228°, and has a slightly vinous odour, somewhat resembling that of amylic alcohol. Its spec. grav. is 0·803. It is quite similar in properties to the other alcohols of the same group.

**Butyline,** *bu'-ti-line* ($C_8H_8$), butyl less one equivalent of hydrogen. This compound was discovered by Faraday amongst the products of distillation of oil, and is frequently called oil-gas. It is a colourless gas, burning with a white luminous flame. It is one of the principal products of the distillation of india-rubber. It was afterwards obtained by Kolbe from valerate of potash, and by Wurtz by acting on butylic alcohol with chloride of zinc. It is similar in its properties to ethyline ($C_4H_4$), or olefiant gas, the corresponding product of ethyl.

**Butyrate of Lime,** *but'-e-rait*, the source of butyric acid, is made in the following manner:—Sugar, chalk, and cheese, are mixed with sufficient water to form a solution of spec. grav. 1·070, and exposed to a temperature of 80° or 90° for some weeks. Butyric fermentation ensues, the liquid becoming ropy, and giving rise to lactic acid, which unites with the lime and forms lactate of lime. The lactate of lime in turn becomes decomposed, giving rise to butyrate of lime in abundance. The compounds and derivatives of butyric acid must not be confused with those of butyl. Butyric acid bears the same relation to butyl that acetic acid does to ethyl, and is, in fact, the hydrated oxide of butyryl, as acetic acid is of acetyl. *Butyric ether*, a combination of ethyl and butyric acid, is a colourless inflammable liquid, with a peculiar odour and taste of pineapples. Dissolved in alcohol, it is used in confectionery under the name of pineapple oil. The peculiar odour of old rum is due to the presence of a small quantity of this ether. It must not be confounded with butylic ether. (*See* Butyl.)

**Butyric Acid,** *bu-tir'-ik* (from Lat. *butyrum*, butter), ($HOC_8H_7O_3$).—Butyric acid is a liquid with a sharp, acrid taste and a smell of rancid butter, having a spec. grav. of 0·83, and boiling at 314° Fahr. It is prepared by distilling three parts of butyrate of lime with twelve parts of water and one of hydrochloric acid. Butyric acid exists ready-formed in certain fruits, and is one of the products of oxidization of fibrin, or caseine. All substances which form lactic acid may be made to yield butyric. Its salts, when dry, are inodorous, but when wetted, a strong smell, resembling that of rancid butter, is perceptible.

**Butyrine,** *but'-e-rine*, an oleaginous substance, discovered by Chevreul in butter. It is prepared by exposing purified butter to a temperature of 66° for several days. Stearine separates in grains, and one oily compound is obtained, which is mixed with alcohol and frequently shaken during twenty-four hours. The alcohol is then distilled off, carbonate of magnesia added to the oily residue, which is washed and treated with alcohol, which, on being once more distilled, leaves the butyrine behind.

**Butyrone,** *but'-e-rone*, a substance obtained by Chevreul amongst the products of distillation of butyrate of lime. It is similar in properties to acetone and propione.

**Buxine,** *buk'-sine*, an alkaloid obtained from boxwood. It has a bitter taste, and is insoluble in water. It is soluble in a slight degree in alcohol and ether. It forms neutral salt with the acids, and acts as an alkali on reddened litmus. Boxwood bark contains nearly one per cent. of buxine.

**Buxom,** *buk'-sum* (Ang.-Sax. *bucsum*, easily bended to the will of another), originally signified obedient or obsequious; and in an old form of marriage, the bride promised to be obedient and buxom to her husband. At present it is used in the sense of gay, lively, brisk, associated with plumpness.

**Buxus,** *buk'-sus* (supposed to be from Gr. *puknos*, dense, in reference to the wood), in Bot., the Box, a gen. of plants belonging to the nat. ord. *Euphorbiaceæ*, and consisting of evergreen shrubs or small trees with opposite leaves, entire at the margins, and easily split into two plates. The flowers, which are very small, grow in little axillary clusters, the male and female flowers being distinct, but borne on the same plant. There are only two species known; namely, *B. sempervirens* and *B. balearica*. The former, which is the common box, is remarkable, botanically, for being the most northern arborescent species of *Euphorbiaceæ*. In Britain, it seldom attains a height of more than twelve or fourteen feet; but, in the south of Europe, it is often twice that height. It grows wild in this country only on the dry chalky hills of the south. Many varieties are known in gardens, the most remarkable of which is the dwarf-box, so much used for the edgings of walks. The wood of the arborescent *B. sempervirens* is heavier than that of any other European tree, and will sink when placed in water. It is of a beautiful pale-yellow colour, and of a fine regular and compact texture. It is preferred to every other

kind of wood for the manufacture of flutes, flageolets, and other wind instruments; of rules and mathematical instruments; and of the handles to most small tools. For the purposes of the turner, the wood-carver, and especially of the wood-engraver, boxwood is invaluable. Most of the engravings printed in the illustrated papers are executed on blocks of this wood. Spain and Portugal export large quantities of boxwood; so also do Circassia and Georgia, through the port of Odessa. In 1815, the box-trees cut down on Box-hill, near Dorking, in Surrey, produced upwards of £10,000; but the tree is of such slow growth, that it is seldom cultivated in Britain, except for ornamental purposes. The leaves of the common box are purgative, and have been employed medicinally. An empyreumatic oil obtained from boxwood has been used successfully for the relief of toothache. *B. balearica*, the Turkey, Minorca, or Balearic box, forms a larger tree than the other species, and has leaves three times as large. It is much more impatient of cold, but is occasionally seen in shrubberies in the south of England. The wood is of a bright yellow, and much inferior to the true boxwood, for which it is often substituted. It is brought to this country in large quantities from Constantinople, and sold for wood-engraving.

Buzzard, *buz'-zard* (Du. *buzaard*; *Buteo vulgaris*), a predacious and carrion-feeding bird, common to the whole of Europe. It is a sluggish bird, and its courage is not nearly commensurate with its size; for, while it measures nearly two feet in length, and its extended wings cover a breadth of nearly five feet, it will flee from the attack of a magpie or jackdaw. Like the kite, the raven, and all birds that feed much on carrion, the buzzard has a lofty flight when in search of food. In colour it is reddish-brown above, and white or cream-colour beneath; the tail is barred with black and ash-colour, and has a white tip. The bird's beak is comparatively small and feeble. It breeds in extensive woods, builds a ragged nest, and lays two or three eggs, which are either wholly white or white blurred with yellow. If during the period of incubation the hen should be killed, the male bird will take upon himself the business of hatching and rearing the brood. The young accompany the old birds for some time after quitting the nest; a circumstance unusual with most birds of prey, who drive off their young almost as soon as they can fly. "In the softness and fulness of its plumage, its feathered legs, and habits," writes Dr. Richardson, "this bird bears some resemblance to the owls. It flies slowly, sits for a long time on the bough of a tree, watching for mice, frogs, &c." Wilson likewise observes, that in Pennsylvania it is in the habit of coursing over the meadows long after the sun has set. The honey-buzzard, or pern (*Pernis apivorus*, Cuvier), is a little longer than the common buzzard, and not so bulky. The crown of the head is of a pure bluish ash-colour; the upper surface deep brown, inclining to greyish, and the under parts dingy white, barred with deep brown. It is said to derive its name from the partiality it shows for bees, wasps, and their larvæ as food. "One of these birds was shot in Pendring-Hall Park, Suffolk. The person who killed it, saw it on the ground near some wasps' nests. I found, on dissecting it, a quantity of wasps and nymphæ from the comb, both in its craw and stomach, with a few small beetles. It would be highly interesting could we be made aware of the manner in which this bird conducts the attacks on the wasps' nest. The buzzard, in order to get at the comb, must, in some way, enlarge the entrance; the legs and claws of the bird I have mentioned were very dirty, even to the knee, most likely from searching much on the ground for food, and using them in making an entrance into the wasps' nests."—(*Magazine of Natural History.*) The honey-buzzard inhabits Russia, Sweeden, and Norway, and is found generally in the south of Europe. It is rare in this country, though it has been known to breed here. Sir William Jardine quotes a case, as does W. R. Fisher. (*See* the *Zoologist.*) White, in his "Natural History of Selborne," tells of "a pair of honey-buzzards that built them a large shallow nest, composed of twigs and lined with dead beechen leaves, upon a small, slender beech, near to Selborne Hanger. In the middle of the month of June, a bold boy climbed this tree, though standing on so deep and dizzy a situation, and brought down an egg, the only one in the nest. The egg was smaller and not so round as the egg of the common buzzard, and was dotted at each end with small red spots, and surrounded in the middle with a broad zone blood-red gore."

By-law, *bi'-law*, is a private law made by those who are duly authorized to do so by charter, act of parliament, prescription, or custom, for the preservation of order and good government within some particular place or jurisdiction. If made under an act of parliament, they must be sanctioned and approved by the secretary of state, or some public board to whom the act gives authority for the purpose, and they are then as binding as enacted laws. They must not be against the public policy of the law, and must be reasonable. Joint-stock companies and other such bodies are empowered by their charters or deeds of settlement to make by-laws, which are binding on the shareholders.

Byrrhus, *bir'-rus*, a gen. of the ord. *Coleoptera*. This insect is about the size of the lady-bird, is of a deep brown colour, with its wing-shells marked by black lines. It is commonly found in gardens.

Byronima, *bir-so-ni'-ma*, in Bot., a gen. of plants belonging to the nat. ord. *Malpighiaceæ*, consisting of tropical trees, all remarkable for their astringency. Thus the bark of *B. crassifolia* is used internally as an antidote to the bite of the rattlesnake, and for other purposes where an astringent medicine is desirable. The barks of other species are much employed in Brazil for tanning. American alcornoque bark, which is now largely imported into this country for the use of the tanner, is said to be the produce of *B. lawrifolia*, *rhopalæfolia*, and *coccolobæfolia*. Several species have edible fruits. The fruit of *B. spicata* is used medicinally in the treatment of dysentery.

Byssolite, *bis'-so-lite* (Gr. *bussos*, fine flax, *klados*, a branch), a name applied to fibrous varieties of amianthus, tremolite, actinolite, and other minerals of a filamentous nature.

Byttneriaceæ, *bit'-ne-ri-a'-se-e* (in honour of A. S. Buttner, a professor at Gottingen), in Bot., the Chocolate fam., a nat. ord. of dicotyledonous plants in the sub-class *Thalamiflorœ*,—trees, shrubs, or undershrubs, sometimes climbing, having the following general characters:—Leaves simple, alternate, with usually deciduous stipules; calyx 4—5-lobed, valvate; corolla absent, or having as many petals as there are lobes to the calyx; stamens hypogynous, equal in number to the petals, and opposite to them, or twice as numerous, or indefinite (when more numerous than the petals, some are always sterile); filaments more or less united; anthers 2-celled, introrse (turned inwards); ovary sessile or stalked, composed of 4—10 carpels, united round a central column; style simple; stigmas equal in number to the carpels; ovules 2 in each cell, fruit usually capsular; embryo straight or somewhat curved, usually lying in a small quantity of fleshy albumen, the cotyledons being plaited or spiral. There are 45 genera and 400 species, mostly tropical plants. In their properties they closely resemble the *Malvaceæ* and *Sterculiaceæ*; thus, many are mucilaginous, as the *Waltheria douradinha*, the species of *Pterospermum*, and the bark of *Guazuma ulmifolia*, *Abroma angustum*, and *Dombeya spectabilis*. The fruit of *Guazuma ulmifolia* contains a sweetish pulp, which is eaten in Brazil. The most important plant of the order is *Theobroma Cacao*, the cacao or cocoa-tree, from the seeds of which cocoa and chocolate are prepared. (*See* Theobroma.) The typical gen. *Byttneria* does not include any plants remarkable for useful products.

Byzantine Architecture, *be-zan'-tine*.—After the division of the empire of Rome into the Eastern and Western empires, the latter of which retained Rome as its capital, while Constantinople, then known as Byzantium, became the seat of government of the former, new styles of architecture were gradually produced in each metropolis to suit the requirements and progress of the age, which sprung out of the forms that had been adopted for the temples of heathen Rome and the Christian churches of the later period of the empire. From the classic architecture, therefore, of old Rome was derived the Romanesque, which gradually spread through Western Europe, and is considered by some to have passed through various phases, known as Lombardic, Norman, Saxon, &c., until it

attained the full extent of its development in the Gothic architecture of different periods in the Mediæval ages; and the Byzantine, the parent stock of Arabian architecture, from which all public buildings of ancient date in northern Africa and Spain derive their principal characteristic features, the pointed arch excepted, which influenced the architecture of the East, and even spread westwards, as may be seen in many a noble structure in Venice, Italy, and southern France. In our own times, Byzantine architecture is the ecclesiastical style of architecture in Russia, the prevailing style of the Greek church, as Gothic architecture is peculiar to the cathedrals and churches of Roman Catholic and Protestant countries in Western and central Europe. Byzantine architecture may be considered to have been originated by Constantine the Great, who commenced rebuilding Byzantium in the year 324, and gave the city the name which it now bears, removing the seat of government thither from Rome about four years later. Constantine spared no expense to make his new city the most magnificent in the world: public works of all kinds were erected with marvellous rapidity, from the designs of architects who had followed the emperor from Rome, and adorned with sculpture gathered from the fallen cities of Greece and Asia Minor. At first, the palaces, temples churches, baths, and basilicas, which were erected, were based on the plans, and embraced all the characteristic features of similar buildings at Rome; but, to carry out his grand designs, Constantine caused schools to be established for the study of architecture, in which men were trained for the profession, who gradually mingled new and original features with those of the style that had been introduced from the West, and formed a style of architecture peculiar in itself, and eminently adapted to the requirements of the ritual of the Greek church, although bearing evident traces of the source from which it originally sprung. There are four periods of Byzantine architecture, including that of its decline, from the conquest of Constantinople by the Venetians in 1204, to the overthrow of the Eastern empire by the Turks in 1453. The first, or transition period, in which it gradually lost its similarity to the architecture of Rome, then known as Romanesque, ranges from 325 to 526. The churches were then built in the form of the Roman basilica (*see* BASILICA), with a central nave and long side-aisles, a portico at the western end, and an apse at the east end. The second period, when it had assumed an entirely distinctive character, extends from 526, shortly after which Justinian assumed the purple, to the close of the 8th century; and the third from this epoch to 1204, when Baldwin, count of Flanders, and his Venetian allies, attacked the Greeks, and gained temporary possession of Constantinople. The prevalent form of the churches of the second period, or period of pure Byzantine architecture, is that of the Greek cross; the central square, formed by the intersection of the arms of the cross, is covered by a dome or cupola, and the spaces which represent the arms are also covered by semi-cupolas, or, in many cases, entire ones. The whole length of the interior, from east to west, is divided into five parts. At the east end is the apse, in which stood the altar, divided from the next portion, called the bema, by a panelled screen richly adorned with paintings and gilded carved work, in which were three doors of communication between the bema and the apse, which was considered to be the holiest part of the church. The bema or sanctuary, which lay immediately before the apse, sometimes contained the bishop's throne. The choir came next, extending from the bema to the nave, and was allotted to the priests and those who took part in the choral services of the church. The nave formed the body of the church, separated from the choir by a balustrade, and from the narthex, or large western vestibule, by a screen. The narthex was provided with galleries in which the female catechumens sat, the males occupying the ground-floor of that portion of the building. The Roman, or semicircular arch, is the only form of arch employed, and the great distinctive feature of the style is the constant use of the cupola or dome, which was supported on arches of a wide span, springing from massive piers at the four corners of the central space. The base of the dome was sometimes pierced with lights, which gave a light and elegant appearance to that part of the structure. The heads of the windows were semicircular in form. The doors sometimes had semicircular headings, but they were generally surmounted by the flat lintel; the pillars used were generally square or octagonal in form, surmounted by square capitals tapering downwards, with the corners of the lower part of the capital taken off when it surmounted an octagonal shaft, to give it a corresponding form below, although the upper part remained square. The capitals were adorned with foliage, generally of a symmetrical pattern, in relief, on sunken panels formed in the faces. The interior was richly ornamented with sculpture, painting, and mosaic-work of most elaborate description. The cathedral of St. Sophia, now the principal mosque at Constantinople, built by Justinian in 532, is considered to be one of the finest existing specimens of Byzantine architecture: good examples of the style of the second period are also to be seen in the churches of St. Sergius and St. Irene, at Constantinople. The best examples of the third period are the churches of St. Mark at Venice, and St. Pantocrator at Constantinople: in this period greater attention was paid to external decoration, but the churches were much smaller in every respect. The church of St. Anthony at Padua, the cathedral at Aix-la-Chapelle, the churches of Ravenna and Pisa, and that of St. Front at Périgueux, in France, are also Byzantine in character. Noble and massive in form, and decorated with broad masses of rich and warm colour, vast and majestic in its proportions, with all the details boldly, yet carefully and laboriously worked out, Byzantine architecture, in its purest character, as exemplified in the church of St. Sophia, the great type of the style, is well worthy of adoption in modern English church architecture; for, while it will bear comparison with Gothic architecture in every respect, and is superior to it in many, it is infinitely better than that of the classic form gathered from the heathen fanes of Greece and Rome, as may be seen by contrasting the magnificent Byzantine church built at Wilton, in Wiltshire, by the late Lord Herbert of Lea, better known as Mr. Sidney Herbert, with the heavy unprepossessing piles, in imitation of the classic style, that were produced by the architects of the 17th and 18th centuries. The following account of the church of St. Sophia, rebuilt by Justinian after it had twice suffered destruction by fire, is derived from the historian Gibbon. The architects were Anthemius of Tralles, and Isidorus of Miletus, the former of whom superintended the works in person, often accompanied by the emperor himself. It was finished in nearly six years from its commencement, and dedicated to the service of God by a solemn festival. The eastern part of the dome was injured by an earthquake, and the dome was, therefore, rebuilt by the nephew of Anthemius, under the direction of Justinian. The dome is 115 feet in diameter, and lighted by 40 windows round the base; the first dome was very flat, being barely 20 feet in height, or 180 feet above the pavement; the second dome, which still exists, is 40 feet high. The circle on which the dome rises is supported by four bold arches, which spring from massive piers of freestone, clamped together with iron and cemented with lead and quicklime, placed at the four angles of the central space; the dome is built of pumice-stone and very light porous bricks from the isle of Rhodes. The form of the building is that of a Greek cross, measuring 269 feet from east to west, from the sanctuary to the nine western doors between the narthex and the nave, and 243 feet from north to south. The doors of the edifice are the only parts in it made of wood; the building itself is built of brick covered with slabs of marble. It is richly adorned with 100 columns of marble of different colours, jasper, and porphyry; eight of which came from the Temple of the Sun, and eight, of green marble, were given by the magistrates of Ephesus. The walls, the great central dome, the semi-domes, and pavement, are adorned with mosaics; and there were many images of our Saviour, the Virgin Mary, and the saints, which the Turks have mutilated and defaced. Every part of the building was adorned with gold and silver; the balustrade of the choir, the capitals of the pillars, the ornaments of the doors and galleries, were of bronze, richly gilt; the sanctuary is said to have contained more than 17 tons

of silver, many portions of it being overlaid with solid plates of that metal; and the holy vases and vestments of the altar were of pure gold, enriched with jewels of great value. It is computed that the lowest sum which can be named as the cost of the building is one million pounds sterling.—Ref. Neale's *History of the Holy Eastern Church*; Fergusson's *Hand-book of Architecture*; *English Cyclopædia*—Arts and Sciences.

BYZANTINE CHURCH comprehends collectively all those churches which acknowledge the supremacy of the œcumenical patriarch of Constantinople. The adherents of this church are comprised almost entirely within the limits of Turkey, Greece, and Palestine, and are altogether estimated to amount to about 3,000,000.

BYZANTINE, GREEK, or EASTERN EMPIRE, are designations given to the Eastern Roman empire, founded on the death of Theodosius the Great, A.D. 395. This monarch divided the Roman empire between his two sons, Arcadius and Honorius, giving to the former the eastern portion, comprising, in Asia, Syria, Asia Minor, and Pontus, to the shores of the Black Sea; in Africa, Egypt; in Europe, Thrace, Mœsia, Macedonia, Greece, and Crete. Through the weakness of Arcadius, this empire suffered many misfortunes. At first the government was in the hands of Rufinus, who was succeeded by the eunuch Eutropius, and the latter by Gainas, the murderer of Rufinus. This last fell in consequence of his ambitious designs in 401, and the proud and covetous empress Eudoxia now ruled till her death in 404. Her husband survived for four years more, and, on his death in 408, was succeeded by his son, Theodosius II.; but being a minor, and naturally of a weak and feeble mind, the government was conducted first by Anthemius and afterwards by his sister Pulcheria, who took the title of Augusta and governed with great ability. She enlarged the empire by wresting West Illyria from the Western empire, and Armenia from Persia. On the death of her brother, in 450, she succeeded to the empire, and married the senator Marcianus, whose valour averted the attacks of Attila on the frontiers. Leo I., a Thracian of low birth, was elevated to the throne on the death of Marcianus, in 457. He ruled well; but an expedition of his, undertaken against the Vandals in 467, failed. He was succeeded by his grandson, Leo II., in 474; but he only survived a few months, and was followed by his father, Zeno. The rule of this monarch was weak, and he was disliked by his subjects. During his reign the empire was harassed not only by foreign foes but was disturbed by internal rebellions. After his death, in 491, his widow Ariadne, by marrying the minister Anastasius, raised him to the throne. His reign was characterized by numerous wars. He carried on a six years' contest against the robber tribes of Mount Taurus; he was engaged in war with the Bulgarians on the Danube, to defend himself from whose incursions he built the *long wall*, as it is called, across the peninsula of Constantinople. The war with Persia also broke out afresh during his reign. On his death, in 518, the soldiery proclaimed Justin emperor. This monarch maintained his position mainly through the influence of the clergy, whom he conciliated by persecuting the heretics. He was succeeded in 527 by his nephew Justinian, famous for his code of laws. His reign was distinguished by the victories of his generals Belisarius and Narses; but its rapid decay after his death showed how little had, during his reign, been contributed to the material strength of the empire. He was succeeded (565) by Justin II., a weak and cruel prince, under the government of his wife Sophia. The Lombards wrested from him a part of Italy; he carried on an unsuccessful war against the Persians; and the Avari plundered the provinces on the Danube. Vexation at these misfortunes drove him insane. Tiberius, captain of the guard, was then made regent, and on the death of Justin, in 578, he was raised to the throne. He reigned with mildness and wisdom, purchased peace with the Avari, and conquered the Persians through his general Mauricius, whom he left as his successor in 582. The latter replaced Kosroes II. on the throne of Persia, and thus obtained peace with that country; but, on the other hand, his wars with the Avari did not prosper. He was slain in a military insurrection, 602. His successor, Phocas, proved a wicked and abandoned ruler, and was slain in a conspiracy, 610. He was succeeded by Heraclius, who was successful against the Avari and Persians, but found a more formidable foe in the Arabs, who during 636-41 overran the countries on the Euphrates, Syria, and Egypt. Heraclius was succeeded by his son, Constantine III.; but he died soon after, and was succeeded by his step-brother Heraclionas, who speedily lost his crown in an insurrection. Constans III. ascended the throne 643; he concluded a peace with the Arabs, but afterwards, in 668, lost his life in a conspiracy. He was succeeded by his son, Constantine IV., Pogonatus, who compelled a peace from the Arabs by the Greek fire, but was, on the other hand, obliged to give tribute to the Bulgarians. He was succeeded in 685 by his son, Justinian II., who was deposed in 695 by Leontius, and he in turn by Apsimar, or Tiberius III., and this last by the Bulgarian king Trebelius, on which Justinian, in 705, again ascended the throne. He was assassinated in 711, and with him terminated the dynasty of Heraclius. In 713, Philippicus, the successor of the last king, was deposed, and in 716 Anastasius, who succeeded him, retired to a monastery. His successor, Theodosius III., abdicated the following year, and Leo III. ascended the throne. In his contests with the Arabs he gave occasion for the breaking out of those controversies respecting the worship of images which rent the empire for more than a century. In 728 the exarchate of Ravenna was lost, and the eastern provinces became the prey of the Arabs. His son, Constantine V., who succeeded him in 741, was a brave and noble prince, but, on account of his zeal as an iconoclast, was hated by the monks, who gave him the surname of Copronymos. Leo IV. reigned from 775 to 780, and was succeeded by Constantine VI., who, having attempted to free himself from the influence of his mother, Irene, and her paramour Stauratius, that ambitious woman caused him to be blinded, and he died soon after (797). A powerful party having risen against her, she was obliged to take refuge in a convent, and Nicephorus was raised to the throne (802). He fell in a war against the Bulgarians (811), and his son Stauratius soon lost the throne to his brother-in-law, Michael I., who, in his turn, had to yield it up to his general, Leo V. (813). This last was a skilful and victorious ruler; but he fell in a conspiracy excited by his zeal against image-worship (820). Under Michael II., Crete and Sicily fell into the hands of the Arabs. His successor, Theophilus (829-42), is praised for his love of justice. Under Michael III. (842-67), in 842, by the council of Nicæa, the worship of images was again established. Basilius I., the Macedonian, who caused Michael III. to be put to death, governed (867-86) with wisdom and power, and was victorious over the Paulicians (whom *see*) and the Arabs. His dynasty continued in possession of the Byzantine throne, with few interruptions, till 1056. His son, Leo VI., surnamed the Philosopher, reigned from 886 to 912, and was succeeded by Constantine VII., Porphyrogenitus (912-59). The dissolute Romanus II. reigned from 959 to 963, and was succeeded by Nicephorus Phocas (963-69), and the latter by Tsimiskes, who ruled till 976. He was victorious against the Arabs and Bulgarians, as well as against the Russians, who, for the first time, during the reign of Michael III., appear in a hostile attitude towards the Byzantine empire. Basilius II. (976—1025), the son of Romanus, a brave prince, conquered the Bulgarians, and made their country a province of the empire. His successors, his brothers Constantine VIII. (1025-28) and Romanus III. (1028-34), who obtained the throne by marrying Zoe, the daughter of Constantine, were very unlike him. The latter was assassinated by his wife Zoe, an abandoned but crafty princess, who raised successively Michael IV. (1034), Michael V. (1041), and Constantine IX. (1042) to the throne. On the death of Constantine (1054), Theodora, sister of Zoe, was raised to the throne, and on her death, in 1056, was succeeded by Michael VI., who, the following year, was deposed by Isaac I., with whom begins the Comnenian dynasty. He retired to a monastery in 1059, and was succeeded by Constantine X., who reigned till 1067; and his widow Eudoxia, by marrying Romanus IV., raised him to the throne.

## Byzantine Historians

Romanus was deposed by Michael VII., whose successors were Nicephorus III. (1078) and Alexius Comnenus (1081). Under the latter of these began the Crusades. His successors were Johannes, or Kalo-Johannes (1118), and Manuel I. (1143), both able princes, who warred successfully against the Turks. Manuel's son, Alexius II. (1180), was murdered by his guardian Andronicus (1183), who soon afterwards fell in an insurrection, and with him terminated the Comnenian dynasty. His successor, Isaac II. (1185), was deposed by his brother, Alexius III. (1195); but the Crusaders afterwards restored Isaac to the throne, together with his son, Alexius IV. The citizens, however, raised to the supreme power Nicolas Kanalas, who took the title of Alexius V., and put to death Alexius IV. In 1204 the French and Venetians took Constantinople, as well as the European portion of the Byzantine empire, and founded, by raising Baldwin count of Flanders to the throne, the so-called Latin empire (1204-61). Baldwin died 1206, and his brother Henry reigned till 1216. He was succeeded by Peter, count of Auxerre and Courtenay, who reigned only a short time, and for the next four years the empire was without a ruler. In 1221 Robert, son of Peter, came to the throne, and was succeeded by John of Brienne (1228-37), and the latter by Baldwin II. (1237-61). During the reign of the last of these a great part of the Latin empire was taken possession of by Johannes Vatazes, the successor of Lascaris, who had founded a Greek empire at Nicæa, in Asia Minor; and in 1261 his successor, Michael VIII., Palæologus, with the aid of the Genoese, took Constantinople, and the Latin empire thus fell. Michael was succeeded by Andronicus II. (1282), who, from 1322, was obliged to divide his power with Andronicus III., who became sole emperor in 1328. He died 1341, and under his successor Johannes V. (1341-91), the Turks first obtained a firm footing in Europe. The sultan Murad, in 1361, took possession of Adrianople and made it the seat of government; and his successor, Bajazet, besieged Manuel II., the son of Johannes, in Constantinople itself. In 1422 the capital was again besieged by Murad II. Johannes VI. (1425-48), son of Manuel, was in 1444 compelled to pay tribute to the Turks The last Byzantine emperor was Constantine XI., brother of Johannes. He struggled bravely, but in vain, against the overwhelming forces of the Turks, and at last fell heroically fighting in defence of Constantinople, which was captured by Mohammed II., on the 29th May, 1453, and the Byzantine empire was brought to a close.—*Ref.* Brockhaus' *Conversations Lexikon.*

Byzantine Historians, is a name given to certain Greek writers who have written on the history of the Byzantine empire. They are divided into three classes:—1. Those whose works refer exclusively to Byzantine history; 2. those who write on general history, treating also at some length of Byzantine history; and 3. those who have written on Byzantine architecture, antiquities, customs, &c. The works of the Byzantine historians were collected and published by Labbe, Fabrotti, Dufresne, and others, in 42 vols., Paris (1651—1711). A new edition of the Byzantine historians, entitled "Corpus Scriptorum Historiæ Byzantinæ," was commenced at Rome, 1828, by Niebuhr, with the assistance of Bekker, Dindorf, Schopen, Meinecke, and others, and many volumes of it have since been published.

Byzantine Painting and Sculpture.—Byzantine art may be considered as the connecting link between ancient and modern art. When Constantine removed the seat of empire from Rome to Constantinople, many an artist that had gained repute in Rome sought to acquire an extension of renown in the new imperial city. There they founded a Byzantine school of art, to which the painters and sculptors of the West resorted when the savage hordes of the North poured over the sunny plains of Southern Europe, and gave the *coup de grâce* to the waning power of the Western empire. In Byzantium, this school preserved the characteristics of ancient art during the sombre dawn of the Mediæval period, when the culture of the fine arts languished and almost died out in other parts of Europe, or became debased and devoid of spirit and beauty. It also struck out a new and original path in idealising and representing with artistic force and excellence, both with the pencil and the chisel, the graces and virtues of the Christian faith, in opposition to the efforts of the artists of ancient Greece and Rome, who skilfully expressed the attributes of heathenism by portraying the perfection of the human form, animated indeed by human passions and desires, but uncontrolled and unsoftened by the elevating influence of that faith which they knew not, but the spirit and expression of which the Byzantine artists so thoroughly felt and comprehended. In both painting and sculpture, their works were executed in a careful and pains-taking manner; and mechanical perfection was attained in the manipulation of their subjects and the way in which the separate details were laboriously worked out. The influences of oriental climes and the recollections of ancient art met and mingled on common ground, and united in giving character and originality to the Byzantine school. Their figures are full of dignity; their form, attitude, and expression, betoken them as being conceived in a spirit truly Christian, while the accompanying details were marked by a symbolism pregnant with meaning; as when the garments of our Saviour, resisting the Spirit of Evil in the hour of his temptation, are painted black, as typical of error and evil, and the Virgin Mary is represented with a black complexion, to signify the bitter woe that wrung that loving mother's heart. Indeed, the principal fault in Byzantine art seems to lie in the manner in which its professors strove after perfection in detail, particularly that of a mechanical nature; but, on the other hand, this betokens a true love of art, and a desire to attain excellence, in the evident care which they took to neglect nothing which might tend to give force or expression to their work. In mosaic-work the Byzantines excelled; the domes of their churches, as well as the pavements and the walls in parts, being beautifully inlaid in elaborate and exquisite tracery, often grotesque in form, glowing with brilliant colours. They possessed goldsmiths and jewellers of no mean order, who were animated by tastes and feelings truly artistic, as may be seen in the magnificent chalices, candelabra, and crosses of the Byzantine period, incrusted in many cases with jewels of great value, that have remained to our own times; they were also exceedingly skilful in carving in ivory, and in the illumination of copies of the Holy Scriptures. Byzantine art retained its pre-eminence until the close of the 12th century, when it gradually declined, until the conquest of the Eastern empire by the Turks ended the existence of the school that had flourished so long and so successfully. But it had done its work; its professors had carefully preserved the traditions of bygone ages, and handed them, unimpaired by lapse of time, and accompanied by their own experience and teaching, to the various schools of Italy, in which its influence may be plainly traced, particularly in those of Sienna and Florence, as exemplified in the painting of St. Peter and St. John, by Pierrolino (1100), in the Academy of Fine Arts of Sienna, and that of the Virgin and Child, by Guido di Ghezzo (1221), in the church of San Domenico, in the same city, and in many of the works of Cimabue, Giotto, and Leonardo da Vinci, who flourished at Florence at a later period.

Byzantine Recension, is the name given to the text of the Greek New Testament as propagated within the limits of the patriarchate of Constantinople.

## C.

C, the third letter, and second consonant of our alphabet, has two sounds, being pronounced like *k* before the vowels *a*, *o*, and *u*, and like *s* before *e*, *i*, and *y*. This letter is first met with in the Latin alphabet, where it occupies the same place as the gamma or *g* in the Greek; and, indeed, originally it had the same sound; *legiones*, with the earlier Romans, being written *leciones*. Subsequently the *g* sound became hardened to that of *k*, and that was the only pronunciation that it afterwards had with the Romans, as we know from the circumstance, that whenever the Greeks had occasion to adopt Latin words with *c* into their language, they always represented it by *k*; as Cicero, *Kikero*; Cæsar, *Kaisar*. As regards sound, C is a

superfluous letter in English, as its place could always be supplied either by *k* or *s*. As a numeral, C stands for 100, CC for 200; and so on. In music it is the name of one of the notes of the gamut. Placed after the clef, it intimates that the music is in common time, which is either quick or slow as it is joined with allegro or adagio; but if alone, it is usually adagio. If the C be crossed or turned, the first requires the air to be played quick, the last very quick.

CAABA. (*See* KAABA.)

CAB, *kăb* (Fr.), an abbreviation of the word cabriolet. It is a small light carriage for one horse, which generally plies for hire, although some gentlemen have private cabs of their own.

CABA, *ka'-ba*, a Jewish measure, the sixth part of a seah, or satum, and the eighteenth part of an ephah. It was equal to 3¼ pints of our wine measure, or 2⅝ pints of our corn measure.

CABAL, *kă-bal'* (Fr. *cabale*), a number of persons united together for some secret design, usually to promote their own private views in church or state by intrigue. It differs from party as being usually composed of a few persons, and it generally implies secrecy and intrigues. In History, it is a name given to the ministry of Charles II., consisting of five men famous for their intrigues, and the initial letters of whose names form the word *Cabal*; viz., Clifford, Ashley, Buckingham, Arlington, and Lauderdale. "Never," says Hume, "was there a more dangerous ministry in England, nor any more noted for pernicious counsels."

CABALLARIA, *kăb-bă-lai'-ri-ă*, in Middle-Age writers denotes lands held by the tenure of furnishing a horseman with suitable equipment during war, or when the lord had occasion for him.

CABBAGE. (*See* BRASSICA.)

CABBAGE BARK. (*See* ANDIRA.)

CABBAGE-FLY, *kăb'-baj* (*Anthomyia Brassicæ*), an insect of the same gen. as the beet-fly and turnip-fly. Its larvæ feed upon the roots of cabbage, and often do great injury. It is about a quarter of an inch long, and the expanse of its wings is about half an inch. The colour of the male and female is dark grey. The face of the male is silvery grey, with a dark streak on the forehead; the abdomen is linear, and the eyes nearly meet together on the crown of the head. The face of the female is whiter than that of the male, and there is no dark streak on the forehead; the eyes are wide apart, and there is a broad black stripe between them; the abdomen of the female also terminates conically. The larvæ, which are yellowish-white in colour, closely resemble those of the common flesh-fly.

CABBAGE PALM, a name commonly given to a palm having a tender terminal bud, which is boiled and eaten as a vegetable. (*See* ARECA, CHAMÆROPS, EUTERPE.)

CABBALA, *kăb'-bă-lă* (Heb., traditions), is a term sometimes used in a large sense to denote all the traditions which the Jews profess to have received from their fathers; in a more restricted sense, it is applied to a species of theology and philosophy made up of mystical interpretations and metaphysical speculations concerning the Deity and other beings, said to have been handed down by a secret tradition from the earliest ages. Some of the rabbins pretend that the origin of the Cabbala is to be referred to the angels, and that the angel Raziel instructed Adam in it. According to the Maimonides, God, when he delivered the law to Moses, gave him also the explanation of it. This explanation he communicated to Aaron and the elders, and it was afterwards handed down traditionally from father to son. In truth, these explanations of the law are only the interpretations and decisions of the rabbins on the law of Moses, in the framing of which they studied principally the combinations of particular words, letters, and numbers, and by that means pretended to discover the true sense of the difficult passages of Scripture. The Cabbala is divided into the symbolical and the real. The former consists in seeking abstruse and mysterious significations in a word by attributing certain values or meanings to the letters which compose it. The real, which is opposed to the symbolical, and comprehends doctrines, is divided into the theoretical and practical. The aim of the theoretical is to explain Scripture according to the secret traditions, and to form therefrom a philosophical system of metaphysics, physics, and pneumatology. The practical, on the other hand, pretends to teach the art of performing miracles by an artificial application of the divine names and sentences of Scripture. Some of the Jews believe that Jesus Christ wrought his miracles by virtue of the mysteries of the Cabbala.

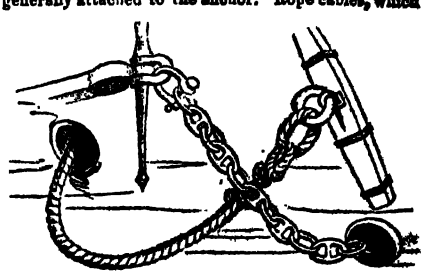
CABBALISTS, *kăb'-ba-lists*, are those Jewish doctors who profess the study of the Cabbala. The first cabbalistic author that is known is Simon son of Joachai, who is said to have lived a little before the destruction of Jerusalem by Titus, and is the author of a book entitled "Zohar."

CABIN, *kăb'-in* (Fr. *cabane*), a term in Mar., used to denote certain apartments in a ship, designed for the use of either the officers or passengers. In ships of war there are several cabins, the principal of which (for the use of the chief officer) is called the state cabin, and is furnished with a balcony or gallery, projecting over the stern. The apartments where the other officers sleep and mess are usually called *berths*. In Virginia, the habitations of the Indians are called cabins. They generally stand about nine or ten feet in height, and are made by fixing poles in the ground and fastening them together at the top; these poles are then covered with bark, a hole being left in the roof to carry off the smoke.

CABINET, *kăb'-i-net*, denotes a closet or retired apartment; also a private room in which consultations are held. In the abode of a prince, the cabinet was an apartment where he transacted the business of the state, advised with his privy counsellors, and issued his decrees. Hence the name came to be applied to the counsellors chosen by monarchs to advise with them on the course of public affairs, and to direct the higher branches of the administration. In this country, the privy council was formerly the adviser of the king in all weighty matters of state; but, by degrees, a selection of the members of this body came to be made by the king for more private advice, and at length, in the reign of William III., the distinction of the cabinet from the privy council, and the exclusion of the latter from all business of state, became fully established. The first lord of the treasury, the lord chancellor, chancellor of the exchequer, president of the privy council, and the secretaries of state, now five in number, have always seats in the cabinet, and with them are usually associated nearly an equal number of their colleagues in the ministry, presiding over other important departments of the government.

CABIRI, *kăb'-e-re*, the name given to mystical deities of antiquity venerated in Egypt, Phœnicia, Asia Minor, and Greece, but of whose nature and functions little is known. In Greece, their rites were performed with great ceremony in Samothrace, Lemnos, and Imbros; in Asia Minor at Pergamus; in Phœnicia at Berytus; and in Egypt at Memphis. Their names, number, character, and other particulars, are given so diversely by different authors, that little can be affirmed with certainty regarding them. The festivals celebrated in honour of the Cabiri were called *Cabiria*.

CABLE, *kăb'-l* (Fr. Sp.).—This term is employed on board ship to denote either a large rope or a strong chain generally attached to the anchor. Rope cables, which



ROPE AND CHAIN CABLES.

...ry in diameter from one inch to eight inches, are made of the best hemp, twisted very strongly and compactly. The general number of strands in a rope cable is three,

but some are made with four. The strength of a good cable six inches in diameter has been reckoned to be equal to sixty tons. Chain cables, although they are much heavier and possess less elasticity than rope cables, are now very generally adopted in all classes of vessels. They are composed of iron links, the length of which is usually about six diameters of the iron of which it is made, and the breadth about 3½ diameters. All chain-cables made for the government are required to be manufactured in lengths of 12½ fathoms. In the middle of every other length there must be a swivel, and in each length a joining-shackle. The links are made of bar iron, and the sizes of chain cables are denoted by the thickness of the bar iron used. Each link is bent into a nearly oval form, and is strengthened in the middle by a stay-pin of cast iron.

CABOMBACEÆ, *kai-bom-bai'-se-e*, in Bot., the Water-shield fam., a nat. ord. of plants in the class *Dicotyledones*, sub-class *Thalamiflorœ*,—aquatic plants with floating peltate leaves; sepals and petals 3 or 4, alternating with each other; stamens definite or numerous; thalamus flattened, small; carpels 2 or more, distinct; fruit indehiscent; seeds few; embryo minute, inclosed in a vitellus, and outside of abundant fleshy albumen. There are only two genera belonging to the order; namely, *Cabomba* and *Hydropeltis*. The species occur in America, Australia, and India; they have no important properties. *Hydropeltis purpurea* is said to be nutritious.

CABOTS, *ka-boots'*, a name for the drug Koussoo. (*See* BRAYERA.)

CACAO, or COCOA. (*See* THEOBROMA.)

CACHALONG, *kash'-a-long*, a fine variety of opal, found on the borders of the river Cach, in Bucharia. (*See* OPAL.) A specimen from the Faroe Islands consisted of silica 95·32, water 3·47, and traces of iron, potash, soda, lime, and magnesia.

CACHALOT. (*See* SPERM WHALE.)

CACHE, *kash* (Fr., a lurking-hole).—The settlers in the west of North America, when crossing over the Rocky Mountains, often find it advantageous to disburden themselves of some of the articles which they are carrying. In order that they may gain possession of them on their return, they are in the habit of digging holes, in which they place the provisions or other articles, and then cover the place up. These holes, or places of concealment, are called caches. The construction of a cache is a work of great ingenuity and labour. A hole six or eight feet deep, and several feet broad, is first dug; the articles to be concealed are then put in, and the hole is filled up, the surface being carefully replaced, so as to show no sign. Landmarks are, however, noted, and the locality of the cache is easily found when the travellers return.

CACHET, LETTRES DE, *kash'-ai*, were secret warrants proceeding from, and signed by, the kings of France, and countersigned by a secretary of state, by which any person could be imprisoned or banished to a certain place without any reason being assigned. The introduction of them is ascribed to the famous Capuchin Padre Joseph, under the ministry of Cardinal Richelieu. They were also called *lettres closes*, or sealed letters, to distinguish them from *lettres patentes*, or public documents. During the reign of Louis XIV. *lettres de cachet* might be obtained by any one who had influence with the king or his ministers, and were frequently resorted to as a means of gratifying private revenge. During the reign of Louis XV. they were often given away to favourites as *cartes blanches*, with only the king's signature, so that any names might be inserted.

CACHEXIA, *kăk-ex'-i-a* (Gr. *kakos*, bad, *hexis*, habit), is a term used in Med. to denote a bad condition or habit of body, arising from whatever cause, in which the functions are imperfectly performed, and the complexion unhealthy. It is employed by Cullen to denote a particular class of diseases in which the general habit is affected; and a change of complexion, with emaciation or morbid enlargement, are characteristic symptoms; as, jaundice, dropsy, &c.

CACIQUE, *kă-seek'*, the title given to the native chiefs in some parts of America at the time of the conquest by the Spaniards: it signifies "lord" or "master."

CACODEMON, *kăk-o-de'-mon* (Gr. *kakos*, bad, and *daimon*, demon), denotes an evil or mischievous demon or spirit. (*See* DEMON.)

CACODYL, *kăk'-o-dil* ($C_4H_6As$ or Kd), an organo-metallic base, containing arsenic. It is prepared from its chloride by the action of zinc. It is a thin, transparent, colourless liquid, resembling arsenietted hydrogen in smell. It is very inflammable, and, when poured into oxygen, chlorine, or the air, it inflames. It boils at 338° Fahr., and crystallises in large transparent square prisms when cooled down to 21° Fahr. It forms salts with the halogens and acids. It also forms an acid containing three equivalents of oxygen. This acid is peculiar as possessing no poisonous property, though containing nearly half its weight of arsenic.

CACOETHES, *kăk-o-e'-thes* (Gr. *kakos*, bad, *ethos*, disposition), a bad custom, disposition, or habit; as the *cacoethes scribendi*, the desire for scribbling. An incurable cancer is also called a cacoethes in medicine.

CACOPHONY, *kă-kof'-o-ne* (Gr. *kakos*, bad, *phone*, voice, sound), in Gram., is a fault of style, consisting in the bringing together of two letters or syllables which produce a harsh or disagreeable sound, or in the too frequent repetition of the same letters or syllables.

CACTACEÆ, *kăk-tai'-se-e*, in Bot., the Cactus or Indian Fig fam., a nat. ord. of plants belonging to the class *Dicotyledones* and the sub-class *Calyciflorœ*. The *Cactaceæ* are remarkable for their succulence, for the great development of their cellular tissue, and the anomalous form of their stems, which are globular, columnar, flattened, or angular. Most of the species are leafless, having tufts of hairs or spines instead of leaves. The flowers are sessile, sometimes very showy; the sepals and petals are usually numerous, and scarcely distinguishable from each other. The stamens originate in the orifice of the tube formed by the combination of the petals and sepals, are very numerous, and consist of delicate thread-like filaments terminated by small roundish anthers. The ovary, which, in consequence of its adhesion to the sepals, seems to occupy the place of the flower-stalk, consists of a single cell lined with parietal placentas, covered over with minute ovules; its style is slender, with stigmas equal in number to the placentas. The fruit is succulent, and contains a great number of seeds, which are without albumen. These plants are natives of the tropical regions of America. There are 18 genera and about 800 supposed species. Many yield edible fruit, useful in febrile complaints. Cattle feed on the succulent stems of some species during the dry season in certain districts of South America. One plant belonging to the order is largely cultivated in Mexico for the nourishment of the cochineal insect; and numerous species are grown in European conservatories on account of their splendid flowers, or their singular forms. The most interesting species are described under the names of the genera to which they belong. (*See* CEREUS, ECHINOCACTUS, MELOCACTUS, OPUNTIA, PERESKIA.)

CACTUS, *kăk'-tus*, the name under which Linnæus included the *Cactaceæ*, believing that they formed a single genus. The name still continues in popular use, being applied to any plant in the order. (*See* CACTACEÆ.) The term appears to have been adopted from Theophrastus, who used it to describe a spiny plant.

CADARI, or KADARI, *kăd-a'-re*, a sect of Mohammedans, who assert free-will in opposition to fate, deny the existence of any secret power in determining the will, and reject all absolute decrees and predestination. The author of this sect was Mabed ben Kaled al Gihoni, who suffered martyrdom for his belief.

CADDICE-WORM, *kăd'-dis*, the common name of the species of *Phryganea* which reside in the water in cases, which they form of various substances, such as bits of stick, grains of seed, small stones, &c., held together by a silken thread, secreted in their bodies in the same manner as in the silkworm. The perfect insect, the caddis-fly (*Phryganea grandis*), has a body of a leathery consistence, and thickly clothed with hair; head small, with semi-globular eyes; antennæ as long as the body; anterior wings elongated, lanceolate in the females, but rather more obtuse in the males. They are very active, moving with a gliding motion; but their flight is awkward. They frequent damp and marshy situations. When handled, they emit a very

unpleasant odour. Their colours are ordinarily brown or grey.

CADENCE, *kad'-dense* (Fr. *cadence*; Lat. *cadere*, from *cado*, I fall), in Mus., a term signifying a fall or pause, either at the end of a piece, or at the termination of each of its parts. In vocal or instrumental music, cadences are used for the same purpose as stops in writing; *i.e.*, to indicate the terminations, either of the parts into which a composition is divided, or the conclusions of entire pieces; as in writing, stops mark the divisions, or completion of a sentence. There are two kinds of cadences,—viz., middle and full; the former, like commas and semicolons in writing, divide the various parts of a composition; whereas the latter denotes the conclusion of a piece.

CADET, MILITARY, *kă'-det'* (Fr. *cadet*, younger in service), a youth who is trained up for the army by a course of military study and discipline. When the friends of any youth intended for the army wish to give him a sound military education, they enter his name at the Cadets' College. There they supply him with board, lodging, clothing, books, and instruments. The annual expense thus entailed varies from £100 to £20. The age of admission is between 16 and 19, and the subjects of study are English composition, modern languages, mathematics, natural and experimental sciences, history, geography, and drawing. Every student can go up for examination in any half-year, and the results of the examination are reported to the commander-in-chief. As soon as vacancies occur in the college, they are filled up by the candidates in the order of merit. After being entered, they study for two years a great variety of subjects connected with theoretical and practical military art. When this course of study is complete, the cadets are eligible for commissions in the army, a certain number of which are at the disposal of the college. Queen's cadets are the sons of officers who have fallen in action or have died from the effects of active service, and have left their families in reduced circumstances. They are twenty in number, and are admitted and educated gratuitously. When the East-India Company possessed both military and political power in India, upwards of 5,000 officers were in their pay. The company established a college or school at Addiscombe, where youths were examined as to their proficiency in an ordinary English education. If they passed satisfactorily, they were admitted into the college. The age of admission was between 14 and 18. After two years' study in the college, they became cadets in the company's service, receiving pay and being eligible for service in India. Thus the officers who commanded the company's regiments had been educated by the company. The introduction of competition in the matter of appointments to the college, and the transference of the powers of the company to the crown, have greatly modified this class of military cadets. The word cadet is also applied to any younger member of a noble family, in order to distinguish him from the eldest son, and in France to any junior officer, in contradistinction to one who is his superior.

CADET, NAVAL, an officer of the lowest rank in the British navy. On being appointed to a ship, every captain is permitted to nominate one cadet; and every flag-officer on receiving his flag can appoint two. The first lord of the Admiralty appoints all the rest, who are subjected to competitive examination. The candidates, who enter the service at the age of 12 to 14, are examined at the Royal Naval College at Portsmouth. If they pass their examination in a satisfactory manner, they are sent to a training ship at Plymouth or Portsmouth, in order to learn seamanship, &c. If they do not make sufficient progress at this stage, they are rejected; but if they give satisfaction, they are put on board sea-going vessels. Here they are expected to note carefully all that is going on; to salute the officers, and to learn the different ways of splicing ropes, tying knots, arranging the rigging, going aloft, keeping watch, &c. The cadet becomes a midshipman after serving satisfactorily three months in a training ship and fifteen months in a sea-going ship.

CADI, or KADI, *kă'-de*, is a Turkish word signifying one learned in the law, one who decides in judicial matters,—a judge. The cadi is an inferior judge, and is established in the towns and villages; while the mollah, or superior judge, is over a province. Both are chosen from the higher ranks of the priesthood, as all law is founded on the Koran.

CADRIDERLITES, *kăd-dis-rĭ'-de-lites*, a sect of Mohammedans, who resemble the ancient Stoics, assuming an uncommon gravity of manner and avoiding all feasting and amusements. They receive both the Bible and the Koran, assimilate in many things to the Christians, and believe that Mohammed was the Holy Ghost whom Christ said was to be sent.

CADMEAN LETTERS, *kăd'-me-an*, the name given to the sixteen letters that originally composed the Greek alphabet, and which, according to tradition, were brought by Cadmus from Phœnicia, whence they were called *grammata Kadmeia*, Cadmean letters. In reality, they are found to agree, in form and order, with the Samaritan or Phœnician letters.

CADMIUM, *kăd'-me-um* (symbol Cd, equivalent 56·74, spec. grav. 8·6).—Cadmium was first discovered in 1818, by Stromeyer, in small quantities in certain zinc ores, in consequence of the behaviour of their solutions with sulphuretted hydrogen. It is occasionally found in nature as a sulphide in zinc ores, and is obtained as an accidental product during the extraction of that metal. Being much more volatile than zinc, the first portions of the distilled metal contain a large proportion of cadmium. It is separated from the zinc by means of sulphuretted hydrogen. It is of a white colour, much resembling tin in its physical properties. It is soft, malleable, and ductile, and when bent emits a creaking sound, like tin. It is easily fused, and distils at a high temperature. When heated in air, it oxidizes more readily than zinc, burning with a luminous flame, and producing a reddish-brown oxide. It fuses at 442° Fahr., and by slow cooling may be obtained in beautiful octahedral crystals. When heated in dilute hydrochloric or sulphuric acid, it evolves hydrogen. It only forms one oxide, CdO, which is formed when cadmium is heated in air. It is yellow, brown, or black, according to the temperature to which it has been exposed. It is infusible, does not volatilize, and forms well-marked salts with the acids. The *chloride* is formed by dissolving the metal in hydrochloric acid. It crystallizes in four-sided prisms. The *sulphide*, which is obtained by heating a mixture of oxide of cadmium and sulphur, is much used as a pigment. It is of a bright yellow colour, but becomes temporarily red on being heated. The only other important salt is the iodide, which has of late received an important application in photography. Being a very stable salt, it is not decomposed when added to collodion. For this reason, collodion iodized with it preserves its sensitiveness undiminished during many months. For photographic purposes, it should be purchased at a respectable chemist's, as it is a salt that is very difficult to prepare for oneself.

CADRITES, *kăd-rĭ'-tees*, a kind of Mohammedan monks named after their founder, Abdul Cadri. They live together in monasteries, which, however, they may quit when they please and marry, on condition of wearing black buttons on their garments, to distinguish them from the rest of the people.

CADUCEUS, *kă-dū'-se-us*, in Antiq., was the winged staff or sceptre of Mercury, said to have been presented to him by Apollo in return for the seven-stringed harp which Mercury had given to him. Amongst the ancient Greeks and Romans, the caduceus was the staff of office borne by ambassadors and heralds. It was from this circ-



MERCURY BEARING CADUCEUS.

cumstance, doubtless, that it became a symbol of Mercury, the messenger of the gods. Originally, it was a simple olive-branch; then a white or gilded staff, round which was added in a later age the representation of two twisted snakes, with two outstretched wings above them. Many mythological legends are connected with the addition of the snakes. One tale relates that Mercury with his caduceus separated two snakes that were fighting. Hence the wand began to be the symbol of peacemaking, and the figures of the serpents were retained. The Romans sent to the Carthaginians a messenger bearing a caduceus and a javelin; thus offering them the choice of peace or war; and in old Roman coins Mars is often represented with the caduceus in one hand and a javelin in the other. Mercury was considered to be the patron of commerce, and the rod of the caduceus signified power, the serpents prudence, and the wings diligence. It is still used in modern times as the symbol or representative of commerce.

CADUCOUS, *kă-dū'-kus* (probably from *caduc*, fleeting, frail), in Bot., falling early or soon after development. Thus, a calyx is said to be *caducous* when it falls off before the flower expands, as in the poppy.

CÆCUM, *sē'-kum* (Lat. *cæcus*, blind), in Anat., the name given to a large blind-pouch, or *cul-de-sac*, extending downwards from the commencement of the large intestine. (*See* INTESTINES.)

CAEN STONE, *kan(g)*, in Geol., an oolitic limestone, so termed from its being extensively quarried in the neighbourhood of Caen, in Normandy. It is the French representative of our *Great*, or *Bath oolite*. It forms an admirable building-stone; for though it is soft in the quarry, it hardens on exposure, and is found to be exceedingly durable.

CÆSALPINIA, *se-zăl-pin'-i-a* (so named in honour of Cæsalpinius, a Romish physician of the 16th century), in Bot., a gen. of plants belonging to the nat. ord. *Leguminosæ*, being the type of the sub-ord. *Cæsalpineæ*. The species are trees or shrubs, natives of the warm parts of America and Asia, having pinnate or bipinnate leaves, showy yellow flowers, and stems which are usually more or less prickly. The useful products of the genus are very numerous. The valuable dye-wood known in commerce as Brazil-wood, is said to be obtained from the species *C. crista*. It is used for dyeing red, rose-colour, and yellow. Braziletto-wood, which produces fine red and orange tints, is said to come from *C. braziliensis*. Nicaragua, Lima, or peach-wood, which is extensively used for dyeing red or peach-colour, is probably the produce of *C. echinata*. The exact species yielding these three dye-woods have not, however, as yet, been determined with certainty. Another valuable dye-stuff, also giving a red colour, is obtained from the Asiatic species *C. sappan*, and is known as Sappan, Bookum, or Bukkum-wood. The roots of this tree, under the names of Sappan-root and yellow-wood, are sometimes imported from Singapore, and employed for dyeing yellow. The twisted legumes of *C. coriaria* are powerfully astringent, and are extensively used in tanning. In commerce they are known as Divi-divi, or Libi-dibi pods. The legumes of *C. Papai*, the Pi-pi of commerce, are employed for similar purposes, but they are very inferior to them. The roots of *C. moringa* and *nuga* are said to be diuretic, and the wood of *C. echinata* is stated to possess tonic properties. From *C. oleosperma* an oil is obtained.

CÆSALPINIEÆ, *se-zăl-pin'-e-e*, in Bot., a sub-ord. of the *Leguminosæ*, or Bean fam., characterized by irregular flowers, which are not papilionaceous, and by the petals being imbricated in the bud, with the upper or odd petal inside the lateral ones. The genera belong to the warm regions of the globe, and some of the species—the locust-trees for example—grow to a prodigious size. (*See* HYMENÆA.) Among the products of this sub-order useful to man, are many valuable dye-woods; such as Brazil-wood (*Cæsalpinia*), logwood (*Hæmatoxylon*), and barwood (*Baphia*); many excellent kinds of timber; some important medicines, as senna (*Cassia*), and balsam of Copaiba (*Copaifera*); edible fruits, as the tamarinds (*Tamarindus*, *Codarium*), and the carob (*Ceratonia*); tanning substances, fibres, and gums.

CÆSAR, *sē'-zar*, a title borne by all the emperors of the ancient Roman empire. After Julius, the first and greatest Cæsar, the title Augustus Cæsar was given to the reigning emperor, and that of Cæsar to the heir-apparent.

CÆSAREAN OPERATION, *se-zā'-re-an* (Lat. *cæsus*, from *cædo*, I cut), in Surg., is the extraction of a child from the womb by an incision through the parietes of the abdomen and the uterus. It is also called *hysterotomy*, from *hustera*, the womb, and *tome*, a section. This operation has been practised from very ancient times, and persons so extracted were termed *cæsones*. Julius Cæsar is said to have received his name from his having been brought into the world in this way. There are three cases in which this operation may be necessary:—1. When the fœtus is alive and the mother dead, either in labour or in the last two months of pregnancy; 2. when the fœtus is dead but cannot be delivered in the usual way, on account of the deformity of the mother, or the disproportionate size of the child; 3. when both mother and child are alive, but delivery cannot take place, from any of the above causes. The operation is one of great danger, but there are many instances of both mother and child having lived after its performance.

CÆSTUS, *sees'-tus* (Lat.), in Antiq., a rough gauntlet made of raw hide, and strengthened with lead or plates of iron. It was used by the wrestlers both to protect their hands and wrists, and to give force to their blows. The cæstus was also a kind of girdle made of wool, which the husband untied for his bride the first evening after marriage.

CÆSURA, *se-zū'-ra* (Lat. *cædo*, I cut), in Greek and Latin poetry denotes the cutting off of the last syllable of a word from those that precede it, and carrying it forward into another foot. It always renders the syllable on which it falls long, though it may properly be short. In modern poetry it denotes the pause which is introduced into a verse or line to render the versification more melodious, and to aid the recital.

CÆTERIS PARIBUS, *sē'-te-ris păr'-i-bus* (Lat., other things being alike or equal), is a term frequently employed by mathematicians and philosophers to denote the equality of all other points or circumstances except those at issue; as when it is said that the velocity and quantity of blood circulating in a given time through any section of an artery will, *cæteris paribus*, be according to its diameter and its nearness to, or distance from, the heart.

CAFFEINE, or THEINE, *kăf-feen'* ($C_{10}H_{10}N_4O_4$), a crystalline alkaloid found in tea, coffee, Paraguay tea, and in *guarana*, a species of chocolate prepared from the fruit of the *Paullinia sorbites*. Tea contains from 2 to 4 per cent. of caffeine, coffee but 1 per cent. It is easily obtained from tea by making a strong infusion of the leaves, mixing it with subacetate of lead, which precipitates the tannin, and transmitting a current of sulphuretted hydrogen through the liquid to precipitate the excess of lead. On evaporating the solution, and allowing it to cool, the caffeine crystallizes out in long silky needles. It has a weak, bitter taste, and fuses at 352°. Water and alcohol dissolve but a small quantity in cold, but it is very soluble in boiling water and ether. The fact that caffeine forms the essential principle of three substances used by widely different nations is a very curious one, and shows that the craving which it satisfies is as natural as it is universal. The use of tea or coffee as an article of diet seems to exercise a very important influence in retarding the waste in the tissues of the body. Its effect on the human system has, however, yet to be fully studied.

CAFFIRS. (*See* KAFFIRS.)

CAFFRE-BREAD. (*See* ENCEPHALARTOS.)

CAGE, *kaij* (Fr. *cage*), an inclosure made of boards, or with lattice-work of wood, wicker, or wire, for confining birds or beasts. Beasts were generally brought to Rome, in ancient times, shut up in cages made of oak, or beech, ingeniously formed, and covered with green boughs, in order that the animals might be deceived and fancy that they were still in their forests. The fiercer animals were conveyed in iron cages. Wild beasts were also kept in iron cages before they were let out into the amphitheatre for sport.

CAHIER, *ka-heer'* (Fr., a paper book, or a number of sheets of paper loosely tied together), in French history denotes the reports and proceedings of cer-

tain assemblies; as those of the clergy, the states-general, &c.

CAIMACAM, or KAIMACAN, *kaï'-mâ'-kân*, a dignity in the Ottoman empire answering to that of lieutenant, or lieutenant-governor, among us. There are usually two Caimacams, one residing at Constantinople, as the governor; the other attending the grand vizier in the quality of lieutenant. Sometimes there is a third attending the grand signior.

CAINOZOIC, *kain-o-zo'-ik* (Gr. *kainos*, recent, *zoe*, life), in Geol., a term applied to the upper stratified systems holding recent forms of life, as distinguished from *Mesozoic* (holding intermediate), and *Palæozoic* (holding ancient and extinct forms). The cainozoic period embraces the tertiary and post-tertiary systems of British geologists. (*See* GEOLOGY.)

CAINITES, *kain'-ites*, a perverse and stupid sect of heretics that arose in the 2nd century, and took their name from Cain, whom they reckoned worthy of special honour. All the wicked persons mentioned in Scripture they looked upon with favour; even Judas Iscariot, whom they regarded as worthy of praise from having caused the death of Christ, and thereby saved the world.

CA IRA, *sa ç'-ra* (Fr., it will go on), is the name given from the refrain to a well-known song, by which, during the first French revolution, the lower classes were inflamed and incited to deeds of cruelty. The famous *Marseillaise* was directed against the foreign, and the *ça ira* against the aristocrats, the domestic, enemies of the revolution.

"Ah, ça ira, ça ira, ça ira!
Les aristocrates à la lanterne!"

The melody is older than the words, having been a favourite air with queen Marie Antoinette.

CAIRN, *kairn*, is a word of Celtic origin, denoting a heap or pile of stones. The term is commonly applied to the artificial piles of stones, usually of a conical form, that are to be met with in various districts. They appear to have been raised for various purposes, as to distinguish marches or boundaries, to commemorate battles; but, most commonly, they were intended to mark the burial-places of distinguished individuals. The bones found in cairns are generally half-burned, and are inclosed in *cists*, or stone chests, or in urns of earthenware. In one case, as many as seventeen stone chests were found under the same cairn.—(*Pennant.*) Various articles in common use, as flint arrow-heads, stone hammers, &c., or ornaments, are frequently found along with the bones. The size of these cairns is believed to have been, in general, in proportion to the rank or popularity of the deceased; for, not only would the people of the district assemble to testify their respect to him, but, so long as the memory of him existed, not a passenger went by without adding a stone to the heap. "To this moment," says Pennant, "a suppliant will tell his patron *carri mi cloch er do charne* (I will add a stone to your cairn), meaning, when you are no more, I will do all possible honour to your memory." Some of the larger cairns are *chambered*, i. e., have internal galleries, or chambers. The most remarkable of this class is at New Grange, near Drogheda, in Ireland. Cairns belong chiefly to stony countries; where stones are scarce, earthen tumuli take their place. They are to be found throughout the British islands, in France (especially Brittany), and Norway; but in Germany, Denmark, Sweden, and other parts of Europe, tumuli are more common.

CAIRNGORM, or CAIRNGORUM, *kairn'-gorm*, a smoky-tinted variety of quartz, often of a fine brown or amber colour. It receives its name from the mountain Cairngorm, on the sides of which it is found in great perfection. It is sometimes so dark as to be nearly black. It is much used for seals, brooches, and the larger forms of jewellery; and one Edinburgh lapidary is said to have cut nearly £400 worth from a single crystal.

CAISSON, *kais'-son* (Fr. *caisson*, a chest), a term applied in Civ. Eng. to large frameworks of timber, used in forming a foundation for the piers of a bridge, or any structure, a portion of which is built in deep water. Caissons are now only used for this purpose in cases where the bottom is rocky, as it has been found that the underlying strata, if of a different nature, are apt to be undermined and worn away by the action of the water, to the detriment of the superstructure; as in the case of old Westminster bridge, the foundations of which were made in this manner in 1740, by Labelaye, a Swiss engineer, and which has been lately replaced by the present structure. The following was the method adopted:—When the bottom had been prepared and levelled, a hollow framing was brought over the spot, and, as soon as a sufficient quantity of masonry had been piled upon it, it was pierced and sunk. Caissons are now made open at both ends, and filled with concrete, to insure solidity. Docks are sometimes closed by caisson-gates, especially if it is not necessary to open them very often. In Mar., the caisson is a machine for raising vessels, resembling an enormous chest, with an air-tight chamber in the interior, which will not allow it to sink below a certain depth. In order to raise the vessel, it is sunk, by letting the water into it, and brought under the ship's bottom, and there secured. The holes, through which the water entered, are then closed, and the water pumped out. This causes it to rise and lift the vessel, bringing the bottom out of the water for inspection and repairs, which can be thus effected without bringing the vessel into dock, or hauling her on shore. In Mil., it is applied to the tumbril, or waggon, in which ammunition is carried; and to a large wooden chest filled with powder and shells, and buried under, or near, any fortifications, to be exploded, if necessary, like a mine.

CAITHNESS FLAGS, *kaith-ness'*, in Geol., a series of dark-coloured flaggy beds, belonging to the middle portion of the Old Red Sandstone, as developed in Scotland. These beds are rich in fossil fishes. The stone is of great toughness and durability, and is largely employed for paving.

CAIUS COLLGE, *kaï'-o-us*, Cambridge, or more properly, Gonville and Caius College, was founded in 1348, by Edmund Gonville, rector of Terrington, in Norfolk, and endowed for a master and three fellows. Various benefactors afterwards added to its endowments, and in 1558, John Caius, M.D., having rebuilt a large part of the college, and endowed three additional fellowships and twenty scholarships, obtained a royal charter, by which the former foundations were all confirmed, and his own foundation established, the name of the college to be, thenceforward, Gonville and Caius College. New statues have been given under act of parliament, 19 & 20 Vict. c. 88, by which the college is henceforth to consist of a master, thirty fellows, and thirty-six scholars. The fellowships are all open, and are not vacated by marriage, but terminate, in general, at the end of ten years from the full standing of M.A. They may, however, be retained under certain circumstances; as, if the fellow be holding, or have held, certain university or college offices, or shall have taken holy orders within five years after attaining the standing of M.A., or shall have been permitted, by special vote of the master and fellows, to retain it. Twelve of the fellows are seniors, the other eighteen are juniors. They are to be chosen from graduates of the college (or, if the master and seniors shall at any time see fit, of the university) who have distinguished themselves in the studies of the university, or in some department of science, literature, or art. The thirty-six scholarships are divided into four classes, of different value, from £60 to £20, and are perfectly open. They are tenable until the scholars are of standing to take the degree of B.A., and may, in special cases, be continued until the holder is of standing to take M.A. There are also connected with this college four studentships in medicine, founded by Christopher Tancred, Esq., each of the annual value of £113, which may be held for three years after taking B.M.; two scholarships, of the annual value of £52. 10*s.*, founded in 1830, by John Sayer, and in the presentation of the governors of Harrow school; and two exhibitions at Harrow school, founded by John Lyon, 1590, each £16 yearly, for four years.—*Ref. Cambridge University Calendar.*

CAJANUS, *kăj'-ă-nus* (from the Malay name *Catjang*), Bot., a gen. of plants belonging to the nat. ord. *Leguminosæ*, sub-ord. *Papilionaceæ*. The species yield a kind of pulse, known as pigeon-peas, much used for food by the poor of the West Indies. In Jamaica, pigeons are usually fed with these seeds; hence their English name.

CAJAPUT. (*See* MALALEUCA.)

CALABASH, *kăl-ă-băsh'* (Sp. *calabaza*), a name give to vessels made from the hard shell of the fruit of the calabash-tree. These are much used in the West Indies and tropical parts of America, and serve as bottles, cups, goblets, &c. for holding liquids. They are often elaborately carved, and ornamented with various colours. The calabash will sustain a considerable amount of heat, and it is sometimes used as a kettle for boiling water. Dried gourd-shells, used for holding fluids, are also called calabashes.



CALABASHES.

CALABASH. (*See* CRESCENTIA.)

CALABASH NUTMEG. (*See* MONODORA.)

CALADIUM, *kăl-ai'-di-um*, in Bot., a gen. of plants belonging to the nat. ord. *Araceæ*. The species are mostly natives of South America and the West Indies, and are frequently cultivated as stove-plants in this country for the sake of their elegant spotted stems and neat leaves. They have the same general appearance as the species of *Arum*, and resemble them in being all more or less acrid. The species *C. seguinum* highly poisonous, and when any part is chewed, th tongue swells so much that the power of speech is lost. On this account, it has received the popular name dumb-cane. *C. sagittifolium*, the Brazil cabbage, cultivated in many parts of the world for its leaves ar root-stock, which, when boiled, are edible. The leaves are preferred, and are said to form a most nutritious and delicate vegetable. The corms of many other species, when cooked, are edible.

CALAMANDER-WOOD. (*See* DIOSPYROS.)

CALAMINE, *kăl'-a-mine*, native carbonate of zinc. (*See* ZINC.)

CALAMINE, ELECTRIC, a silicate of zinc, found various parts of America in rhombic prisms and in massive incrusted aggregations. On being heated, it possesses electric properties; whence its name. It is an important ore of zinc. (*See* ZINC.)

CALAMINTHA, *kăl-ă-min'-tha* (Gr. *kalos*, beautiful, *mintha*, mint), in Bot., a gen. of plants belonging to the nat. ord. *Labiatæ*. Four species are natives of Britain, and are known respectively by the trivial names of mountain-balm, cat-mint, basil-balm, and wild basil. The first, which is also termed the common calamint (*C. officinalis*), has aromatic leaves, which are frequently employed by country people to make herb-tea, and as a pectoral medicine.

CALAMITES, *kăl'-ă-mites* (Lat. *calamus*, a reed), in Geol., fossil stems occurring abundantly in the coal-measures. They are hollow-jointed cylinders, with longitudinal furrows, and their flattened condition proves that they must have been so soft as to offer little resistance to pressure. The true affinities of the gigantic plants, of which these are the remains, have not yet been determined.

CALAMUS, *kăl'-ă-mus* (Lat., from Gr. *kalamos*, a stalk, stem, or reed), a pen made from a reed, probably the stem of *Arundo Donax*, used by the ancients. The reed-pen, called *Kalâm* by the Arabs, is still commonly employed in Oriental countries.

CALAMUS, in Bot., a gen. of palms consisting of numerous species, all having very slender stems, which are found climbing over the trees in the forests of the hotter parts of the East Indies. Some of the best descriptions of walking-canes are obtained from the plants of this genus. The Malacca cane is the produce of *C. Zalacca*; Rattan cane, of *C. scipionum* and *rudentum*; and Partridge cane, of an undetermined species. The fruit of *C. Draco* is the chief source of the astringent resinous substance known in commerce as dragon's-blood. This completely covers the fruit, and is melted or scraped off, and then formed into small cakes.

CALAMUS AROMATICUS, *ă-ro-măt'-i-kus*, a name given by the ancients to a plant generally supposed to be the sweet flag. (*See* ACORUS.) Dr. Royle is, however, of opinion that the name was applied to the sweet-scented grass which he has designated *Andropogon calamus aromaticus*. (*See* ANDROPOGON.)

CALAMUS SCRIPTORIUS, *scrip-to'-ri-us* (Lat., a writing-pen), in Anat., is a groove or canal with a pen-like termination at the bottom of the fourth ventricle of the brain.

CALANDRA, *kăl-ăn'-dra*, a gen. of coleopterous insects closely allied to the *Circulionidæ*. The corn-weevil (*C. granaria*) is included in this genus. In its perfect form this little beetle is of a reddish-brown colour, about an eighth of an inch long; has a slender snout slightly bent downwards, a closely-punctured and very long thorax, and furrowed wing-covers, that do not entirely cover the tip of the abdomen. It bores a hole into the grain with its proboscis, in which an egg is deposited. The egg turns into a tiny grub, which devours the whole inside of the grain, leaving the husk entire. Wheat and other grain may, therefore, be much damaged without presenting a bad appearance. If the true state of the case, however, should be suspected, there is a very simple test. A handful of the suspected grain is thrown into a pan of water, when the hollow husks at once float on the surface, and the sound grains sink to the bottom. It will afford some idea of the formidable character of these tiny beetles, to state as an ascertained fact, that one female is capable of p ducing six thousand of her kind in a single year.

CALAPPA, or BOX-CRAB, *kăl-lăp'-pa*, a gen. of *Crustacea* inhabiting the seas of the Indian Archipelago, the Pacific and Atlantic oceans, and the seas of South America. One of this family (*Calappa granulata*) is an inhabitant of the Mediterranean, and, according to Prisso, is found most frequently in the fissures of rocks, at a depth sometimes of a thousand feet. Their general colour is pale rose, with whitish feet and brown nails.

CALASH, *kal-ăsh'* (Fr. *calèche*), a small low-wheeled carriage or chariot, employed for taking exercise in parks, gardens, &c. It is generally provided with a hood, or covering, which can be raised or drawn down at the plensure of the occupant. The term calash is also given to a head-covering used by ladies.

CALATHUS, *kăl'-ă-thus*, a gen. of coleopterous insects belonging to the *Geodephaga* section. Upwards of twenty of this species of ground-beetle are found in Europe.

CALATRAVA, ORDER OF, *kăl-ă-trav'-vă*, an order of knighthood founded by the Abbé Raymond, after the rules of the Cistercians, in 1158, when Sancho III., king of Castile, transferred to him the city of Calatrava. In 1163, the knights, under Don Garcias de Redon, separated themselves from the monks, and were afterwards confirmed by the pope. In 1197, Calatrava was taken by the Moors, and the knights transferred their seat to the castle of Salvatierra, and called themselves after it. After the death of their twenty-ninth grand master, De Padilla, 1486, the choice fell several times upon the king, and in 1523 the pope made the office of grand master hereditary to the crown, and allowed the knights to marry. Though long one of the most honourable and distinguished of the orders in Spain, they never attained to great wealth, but they were possessed of great influence in the state. The order has lost most of its possessions, and, at present, is little more than an order of rank. The robe of the order is a white mantle with a red cross of lilies on the left breast.

CALCAIRE-GROSSIER, *kil-kaire gros'-se-ai* (Fr., coarse limestone), in Geol., an important member of the Eocene group of beds in the Paris basin, usually co-ordinated with the Barton, Bagshot, and Bracklesham beds of England.

CALCAIRE-SILICIEUX, *sil-e'-se-u(r)* (Fr., flinty limestone), in Geol., a compact silicious limestone, which sometimes takes the place of the *Calcaire-grossier* in the Paris basin.

CALCAREOUS SPAR. (*See* CALCITE.)

CALCAREOUS TUFA, *kăl-kai'-ri-us tu'-fa*.—Calcareous tufa is formed in volcanic districts by the deposition of calcareous matter in a more or less compact form.

CALCAREOUS WATERS.—Carbonate of lime dissolves in pure water to the extent of two or three grains to the gallon; but when carbonic acid is pre-

sent, it is much more freely taken up. If, however, the temperature be raised, the carbonic acid escapes, leaving behind a crystalline deposit of carbonate of lime. In nature, enormous crystalline concretions of this kind are formed by water charged with carbonic acid percolating calcareous strata. The stalactite caverns of Derbyshire are instances of this. *Stalactites* are formed by water charged with carbonic acid and carbonate of lime dripping from the roof, and leaving behind a portion of carbonate of lime before it drops. When it falls on the floor of the cavern, another deposition of calcareous matter takes place, forming a *stalagmite*, which gradually rises to meet the stalactite above it; in this way a natural pillar is formed. Most spring water contains carbonate of lime held in solution, which is deposited on the sides of the vessel when the carbonic acid is expelled by heat. In steam boilers this becomes a great inconvenience, and is obviated by adding sal-ammoniac to the water. Chloride of calcium is formed, which remains dissolved, while the carbonate of ammonia is volatilised with the steam. Water containing carbonate of lime in solution, or *hard water*, as it is popularly termed, is therefore softened by means of boiling. Hard water precipitates soap as *stearate* and *margarate of lime*, forming the well-known curdy precipitate. Until the whole of the lime is thrown down, no lather can be formed; hard water is, therefore, very uneconomical for washing purposes. Dr. T. Clark has devised a very ingenious method of softening hard water, by adding milk of lime. The carbonic acid unites with the lime, setting free the carbonate originally dissolved, and the whole falls to the bottom as a precipitate of carbonate of lime.

CALCEDONY, or CHALCEDONY, *kăl-sed'-o-ne* (from Calcedon, in Bithynia), a translucent massive variety of quartz, closely allied to opal and agate, and often found associated with them. It often occurs in cavities in amygdaloid and other rocks, in the form of "icicles," or stalactites. The colours vary from white to yellowish brown, pale grey, bluish grey, and light brown.

CALCEOLA, *kăl-se-o'-la* (Lat., a little shoe), in *Geol.*, a fossil brachiopod, so called from its under valve, which is shaped like the point of a shoe, and fitted with a lid-like upper valve. It is characteristic of the middle Devonian period.

CALCEOLARIA, *kăl-se-o-lai'-re-a* (Lat. *calceola*, little shoe), in *Bot.*, a gen. of herbaceous or shrubby plants belonging to the nat. ord. *Scrophulariaceæ*, and distinguished by the following characters:—Calyx 4-partite; corolla 2-lipped, the lower lip being inflated so as to form a bag, and the shape of the whole, in some species, resembling that of a slipper; fruit a capsule, semi-bivalvular, with bifid valves; only two fertile stamens. The species are natives of South America and the Falkland Islands. In Chili and Peru they occur in such abundance as to give a peculiar aspect to the landscape. Most of them have corymbs of showy flowers, generally yellow, but sometimes purple. Calceolarias have been extensively cultivated in Europe as greenhouse plants since about 1830, and by crossing the species some lovely hybrids have been produced. Some of the species are used in South America for dyeing.

CALCINE, *kăl-sine'* (Lat. *calx*, lime), a chemical term, signifying the separation of the more volatile portions of a solid body by means of heat. Thus lime is formed from chalk or limestone by calcination. The older chemists applied the term to the oxidation of metals by heat, thinking it was an analogous process to that just mentioned; they therefore called all oxides produced by heat, calx, or calces of the metal; thus, calx of tin is what is now called oxide of tin.

CALCINITES, *kăl'-sin-ites*, compact calcareous incrustations formed in the open air. A section shows layers and lines of varying colour and hardness, which mark the gradual progress of the deposit.

CALCITE, CALCAREOUS SPAR, or CARBONATE OF LIME, *kăl-site'*, native crystallized carbonate of lime, occurring under nearly 600 different crystalline forms, all derived from the fundamental rhombohedron. The purest crystals are transparent and colourless; other varieties are semi-transparent and opaque, often coloured with grey, red, yellow, rose, and violet. One transparent form occurring in rhombohedral crystals possesses the property of double refraction; *i. e.*, objects seen through it appear double. From having been found in Iceland, it is called Iceland Spar (which *see*).

CALCIUM, *kăl'-se-um* (symbol Ca, equivalent 20, spec. grav. 1·55), the metallic base of the alkaline earth lime. Calcium belongs to the second group of metals, and has for its analogues barium, strontium, and magnesium (which *see*). It is one of the most abundant substances in nature, forming a very large portion of the crust of the earth. It occurs in nature in combination with fluorine as fluor spar, with oxygen and carbonic acid as chalk, limestone, and marble, and with oxygen and sulphuric acid as gypsum, which is hydrated sulphate of lime. Calcium was first obtained by Sir Humphrey Davy by electrolysis, in 1808; but little was known of its properties until Dr. Matthiessen formed it by the electrolytic decomposition of a mixture of the chlorides of calcium and strontium. It is a light-yellow metal, of the colour of gold alloyed with silver; it is rather harder than lead. It melts at a red heat, and is very malleable. It tarnishes in a day or two even in dry air, and in moister air it becomes slowly oxidized. It burns with a brilliant white light when heated in air, chlorine, or the vapours of iodine, bromine, and sulphur, and rapidly decomposes even at ordinary temperatures. It has also been obtained by MM. Liès-Boudart and Jobin by acting on iodide of calcium with sodium. The best-known compound of calcium is its oxide, or lime, which may be obtained in a state of perfect purity by heating pure carbonate of lime to redness. In practice, lime is made by burning common limestone with alternate layers of coal in a kiln. Lime is a white, porous, opaque, inodorous, infusible substance, with strong alkaline and caustic properties. When water is thrown on it, an equivalent is absorbed, and heat evolved, hydrate of lime (CaOHO) being the result. Hydrate of lime is commonly called *slaked*, or *slacked lime*, to distinguish it from anhydrous oxide, which is known by the name of *quick lime*, from its powerful caustic properties. Cold water dissolves about $\frac{1}{760}$ of its weight of hydrate of lime, forming lime-water. Contrary to the usual rule of solutions, hot water only dissolves about half that quantity. In fact, when lime-water, prepared in the cold, is heated, it deposits crystals, which redissolve as the solution cools. Lime-water is alkaline to the taste, and turns vegetable yellows brown, and blues green. Exposed to the air, it gradually absorbs carbonic acid, and deposits carbonate of lime. *Milk of lime* is hydrate of lime mixed with water until a milky fluid is obtained. Lime is greatly used in the arts for mortar, cement, and manure, for dyeing, soap-making, and leather-dressing. Mortar is prepared by mixing one part of freshly-slaked lime and two or three parts of sand, with sufficient water to form them into a paste. The theory of the hardening of mortar is but imperfectly understood, the most prevailing idea being, that a combination of silicate of lime and a compound of the carbonate with the hydrate are formed, which, together, set in a solid mass. *Hydraulic mortars*, or cements, are such as set under water. They are made from natural or artificial mixtures of silica, or some earthy silicate, and lime. They are prepared by calcining a limestone containing these ingredients. A double silicate of lime and magnesia is formed, which has the property of absorbing water, and becoming insoluble. (For the theory of the action of lime as a manure, *see* MANURE.) Hydrate of lime is used in the purification of gas, in the preparation of ammonia and bleaching-powder, in candle-making, soap-boiling, cotton-printing, tanning, and sugar-refining. In the laboratory, hydrate of lime is extremely useful in preparing caustic alkalies, and in absorbing carbonic acid, for which it possesses a very strong affinity. In medicine, lime-water is used as an antacid, and to afford a supply of lime to the bones of rickety children who have not the power of assimilating sufficient lime from their ordinary food to give the necessary compactness to their bones. The principal oxysalts of calcium are the following:—*Carbonate of lime* ($CaOCO_2$).—This substance enters largely into the composition of rocks and minerals. In the amorphous state, it occurs abundantly under the well-known forms

of limestone, oolite, chalk, and marl. It also forms the larger portion of corals, the bones of animals, the egg-shells of birds, the scales of fishes, and the shells of molluscs. In minute granular crystals, combined with various metallic oxides or bituminous matter, it constitutes marble of different sorts. White Carrara marble is nearly chemical, pure carbonate of lime. In a regular crystalline state, it occurs under a greater variety of forms than any other mineral. Its primary form is a rhombohedron, as in Iceland spar; but in arragonite it forms hexagonal and square prisms. (For a more particular description of these forms *see* CALCITE and ICELAND SPAR.) The uses of carbonate of lime are very numerous, under the forms of limestone and oolite, which constitute building-stone, marble, chalk, lithographic stone, &c. &c. When burnt with access of air, limestone forms ordinary lime; if, however, the air be excluded, and the heat raised to a considerable height, it fuses without undergoing decomposition, and, on cooling, forms a crystalline mass resembling marble. *Chloride of lime* is the name given to bleaching-powder, which is prepared by passing a current of chlorine through milk of lime, by which means it is obtained in solution; or by passing chlorine over hydrate of lime, which produces it in the form of a moist powder. The product obtained is regarded by chemists as a mixture of *chloride of calcium* (CaCl) and hypochlorite of lime (CaO.ClO). By exposure to the air, hypochlorous acid is continually evolved by the action of the carbonic acid. If an *excess* of any acid is added, chlorine is produced. The former property is taken advantage of to destroy the gaseous poisons with which the air of sick-rooms and other localities is contaminated. By the action of the carbonic acid of the air, or by the addition of small portions of dilute sulphuric acid, hypochlorous acid is evolved, which *oxidizes* and destroys the *miasmata*. A mistaken notion has arisen that it is the *chlorine* that acts in this case; but, from the *rationale* given above, it will be seen that it is the oxygen of the hypochlorous acid which is the destroying agent. When *chlorine* is required for bleaching purposes, an excess of acid is used. (*See* BLEACHING.) Chloride of lime is often used in the laboratory in conjunction with a weak acid as an oxidizing agent. Some chemists look on chloride of lime as being an oxychloride of calcium, or CaOCl, and deny that the compound contains chloride of calcium in an uncombined state, as none is dissolved out when chloride of lime is mixed with alcohol. *Phosphates of lime.*—There are several phosphates of lime, the most important of which is that obtained from the incineration of bones, which may be regarded as a triphosphate of lime. *Superphosphate of lime*, much used as a manure, is prepared by gradually mixing bone-dust with oil of vitriol, and adding an equal quantity of water between each addition of acid. The mass is allowed to lie in a heap until it is dry, and is then used under the name of *superphosphate of lime*. Its real composition is found to be a mixture of phosphate and sulphate of lime with the animal matter of bones. *Sulphate of lime* occurs in nature as *gypsum*, *selenite*, and *anhydrate*. Gypsum, on being burnt, yields a white powder, commonly known as *plaster of Paris*, from the best gypsum-beds being found near that city. Plaster of Paris, which is anhydrous sulphate of lime, possesses the property of solidifying when mixed with water: it also expands slightly at the same time. These properties render it extremely valuable for casting and moulding objects of which copies are required. Plaster of Paris absorbs water from the air if allowed to remain in unclosed vessels. (*See* GYPSUM and STUCCO.) *Sulphate of lime* is prepared by passing sulphurous acid through water containing chalk or hydrate of lime in a fine state of division. It is used as a convenient source of sulphurous acid.

CALCIUM, CHLORIDE OF (CaCl).—Chloride of calcium may be obtained from the residue remaining in the retort after the preparation of ammonia, by adding to it a slight excess of hydrochloric acid and evaporating. On cooling, the solution deposits crystals containing six atoms of water of crystallization. These crystals, which are six-sided prisms, are highly deliquescent. By fusing at a heat not exceeding 392° Fahr., four equivalents of water are expelled, and the remaining white porous mass is extremely useful in the laboratory for drying gases. Further fusion expels the whole of the water. Anhydrous chloride of calcium, on being mixed with water, gives rise to a considerable elevation of temperature; while the crystallized or hydrated salt, mixed with snow or water, depresses the temperature to −82° Fahr. Chloride of calcium is found in nearly all mineral waters. Chloride of calcium absorbs ammoniacal gas to a considerable extent, producing a salt of the formula $CaCl.4NH_3$.

CALCIUM, FLUORIDE OF (CaF).—Fluoride of calcium occurs somewhat abundantly in the mineral kingdom as fluor spar, which is generally associated with the ores of tin, lead, copper, and zinc. It is found in crystals, the primitive form of which is the cube. They are generally yellow or purple, and sometimes pale green, or even colourless. On being heated, they decussitate violently, and emit a peculiar bluish-green phosphorescent light, which is probably due to electricity. Fluoride of calcium is sparingly soluble in water. It is soluble to some extent in nitric and hydrochloric acids, from which ammonia precipitates it unchanged. Sulphuric acid decomposes it, forming sulphate of lime with the evolution of hydrofluoric acid. It is principally used in the laboratory for this latter purpose. It is also employed as a flux in copper-smelting.

CALCIUM, PHOSPHIDE OF ($Ca_3P$).—Phosphorus and calcium unite to form this compound, which is interesting as the ... of the phosphides of hydrogen. It is prepared by distilling phosphorus over lime heated to low redness, a mixture of phosphide of lime and phosphate of calcium being the result. Phosphide of calcium is a dull red substance, hard enough to strike fire with steel. When powdered and exposed to the air, it slacks, emitting phosphuretted hydrogen. In its unslacked form, it is decomposed when thrown into water, phosphuretted hydrogen being evolved, which ignites spontaneously.

CALCIUM, SULPHIDES OF.—There are several compounds of calcium with sulphur, the principal of which are the protosulphide, which is known by the name of Canton's phosphorus, and the pentasulphide.

CALCIUM, TEROXIDE OF ($CaO_3$).—This compound was procured by Thénard in brilliant crystalline plates, by adding lime-water to peroxide of hydrogen.

CALCULATING-MACHINES, *kěl'-ku-lai-ting*, machines by which all the common arithmetical operations and others of a more complex nature may be readily effected, thereby saving a considerable amount of time to those who are engaged in calculating long series of figures, and insuring results which cannot fail to be correct. The system of logarithms (*see* LOGARITHMS), invented by the celebrated Napier of Merchistoun, in 1614, which is of the greatest assistance to mathematicians and others in the computation of figures, by shortening the ordinary operations, seems to have been instrumental in directing attention to the construction of an instrument by which arithmetical results could be produced by mechanical means, although the abacus (*see* ABACUS) had been long used in Europe and Asia for effecting calculations; and Napier himself had produced what may be termed an elementary calculating-machine, consisting of rods with four faces, known as Napier's Bones. (*See* NAPIER'S BONES.) The first instrument which can justly be called a calculating-machine was invented by Blaise Pascal, in 1642, when he was about nineteen years of age. It was more especially contrived for the calculation of sums of money, although it would also perform the ordinary operations of arithmetic with numbers on the common or decimal scale of notation. It consisted of a set of cylinders, with numbers marked on their external surface, moving on axles to which wheels were attached, with a certain number of notches cut in their circumference. As it is a matter of extreme difficulty to understand the construction and operation of a complex calculating-machine from description only, it has been thought better to render the manner in which Pascal's machine was made, and the method by which it was worked, as clear as possible to the reader, merely mentioning the machines of other inventors, with a brief account of their general principles and purpose. Pascal's machine consists, as has been said, of a number of cylinders of the same size, with figures on the circumference, arranged in certain

series, as in fig. 1. In these figures, for the sake of exhibiting the whole of the numbers, the circumferences of the cylinders are represented as bands, the extremities of which would join each other if brought into a circular form, at *x x*, *y y*, &c. It will be seen that the cylinder next the right hand of the reader is divided into twelve equal parts, equivalent to the number of pence in a shilling; the second into twenty parts, the number of shillings in a pound; while those towards the left hand, in succession, are divided into ten parts, corresponding to the nine figures and cipher used in our common system of notation. With the cylinders last named, if there be a sufficient number of them, the operations of addition and subtraction in abstract numbers can be readily performed,

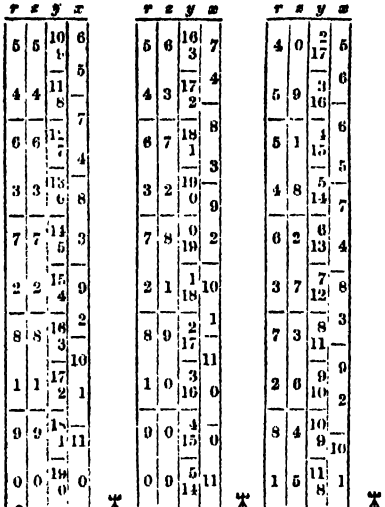


FIG. 1. FIG. 2. FIG. 3.

and, with the aid of the first two, sums in pounds, shillings, and pence, can be added and subtracted. It should be remarked, that a wheel is attached to the axle of the cylinder on the right, having twelve notches in its circumference, one with twenty notches on the axle of the next, and wheels with ten notches on the axles of the remaining cylinders. These wheels are turned by hand with a small rod of metal, one end of which can be easily inserted in the notches, to pull the wheels forwards, and each wheel acts on the one next to it, from right to left, by a mechanical arrangement; so that, while the first wheel moves round once, the second moves onwards a twelfth part of its circumference; while the second moves round once, the third moves onwards a twentieth part of its circumference; and while each of the others completes an entire revolution, the one next to it, to the left, moves onwards a tenth part of its circumference, for reasons that are sufficiently obvious, or which, at all events, will be clearly seen presently. It should also be mentioned, that in fig. 1 the wheels are placed, with the ciphers of each series in a line in front of the machine, ready to commence operations. The double lines merely represent the front of the machine, to which the requisite line of figures must be brought when it is desired to make any calculations, and against which the results should appear, to be conveniently read. For the sake of illustration, suppose it is desired to add £5. 13*s*. 2*d*. to £9. 1*s*. 11*d*. We must first turn the wheels by the metal rod, in the direction shown by the arrow, until the figures 9, 14, 11, appear in the front of the machine, as in columns *z z*, *y y*, *x x*, in fig. 2; the figures in column *r r* remaining unaltered. It will be noticed, that by the change of position from fig. 1 to fig. 2, the space now in front of the cylinder *x x* in fig. 2 has been moved onwards eleven divisions from its original position in fig. 1, in the direction indicated by the arrow. We must now move it forwards two spaces in the same direction, as we have to add 2 to 11; we then have 1 in the lower part of the space now in front, as in fig 3, which indicates 1*s*. 1*d*., as the cylinder has moved forwards thirteen spaces, or a complete revolution and one space (representing a shilling and a penny) from its original position in fig. 1. But while the cylinder *x x* moves through one revolution, the wheelwork connecting it with the cylinder *y y*, causes that cylinder to move onwards $\frac{1}{20}$th part of its circumference, and the figure 15 appears instead of 14 (or would appear if figures were given, showing the successive action of each cylinder on that next it to the left, which the reader can easily construct for himself), which shows that 1*s*. has been carried, as it were, to 14; and we have now to add 13 to 15 for the shillings, instead of 13 to 14. The cylinder *y y* must, therefore, be moved onwards in the same direction as before for thirteen spaces, which brings 8 in the lower part of the space in front of the machine, indicating £1. 8*s*. as the result of the addition, as the cylinder *y y* has moved forward twenty-eight spaces, or one revolution, and eight spaces, from its original position in fig. 1. The cylinder *z z*, from the action of the wheelwork connecting it with *y y*, has moved forward one space during the complete revolution of *y y*, bringing 0 in the lower part of the space now in front of the machine instead of 9, showing that £1 has been carried to the original £9, and indicating that the £5 to be added must be added to £10. The cylinder *z z* is, therefore, moved forward five spaces, which brings 5 in the lower part of the space now in front of the machine, and by the connecting wheelwork between the cylinders *z z*, *r r*, the latter is moved forwards one space from its original position in fig. 1, in consequence of *z z* having performed a complete revolution, giving the reading £15. 8*s*. 1*d*. as the result, as shown in fig. 3. It will be noticed that the lower figures in the spaces are the figures used in the operation of addition; the upper figures are used to perform subtraction. From the above process the general principles of calculating-machines will be understood, and it will be readily seen how machines of a simple nature can be constructed to perform operations in compound addition and subtraction for any system of weights and measures. Machines of a more complicated nature, that would require pages of description to make their construction and principles even faintly comprehended, have been invented by Thomas of Colmar, Staffel, Wertheimer, Baranowski, Schott, Maurel, Roget, Roth, Slovinski, Babbage, and G. and E. Scheutz, two brothers, Swedish engineers. Of the above, those invented by Mr. Babbage, called

by him the Difference Machine and the Analytical Machine, are the most extraordinary. The former is yet incomplete, and is deposited in the museum of King's College, London. It was invented in 1822, or, rather, Mr. Babbage had then conceived the primary idea of the machine. Government assisted Mr. Babbage to carry out his invention by grants amounting to £17,000; but government aid was ultimately withdrawn in consequence of some quarrel between Mr. Babbage and the authorities, and the machine was thrown on one side. It was intended to connect a printing or stamping apparatus with the machine, by which it would have registered the results obtained on copper plates. Had this invaluable machine been finished, it would have performed any operation in arithmetic and algebra, and complex processes of differentiation and integration. The withdrawal of the government grant did not deter Mr. Babbage from prosecuting his plans, and he was an exhibitor of his inventions in the Industrial Exhibition of 1862. The invention of the brothers Scheutz was based on the description of Mr. Babbage's Difference Machine, and is similar to it in general principles, though it differs from it in some points in the method adopted in its construction. It was purchased by Mr. Rathbone, a merchant of Albany, U.S., for £1,000, and presented by him to the Dudley Observatory in that town. Messrs. Scheutz have since completed a machine for the British government.—Ref. *Edinburgh Review*, July, 1851; *English Cyclopædia*—Arts and Sciences.

CALCULUS, *kăl'-cu-lus* (Lat., dim. from *calx*, a limestone), in Med., is a hard inorganic concretion formed in various parts of the animal body, and bearing a general resemblance in form or composition to stone. It receives various names, from the parts in which it exists; as, *salivary* in the salivary glands and ducts, *pulmonary* in the lungs, *intestinal* in the stomach or intestinal canal, *biliary* in the gall-bladder, *urinary* in the kidneys or bladder, *gouty* in the joints of gouty persons. The most familiar instance of the formation of calculus is the tartar which is deposited from the saliva and mucus of the mouth upon the teeth. The term calculus is, however, most frequently applied to those concretions which are formed in the gall-bladder or biliary ducts, and those formed in the kidneys or bladder. *Biliary calculi*, or *gall-stones*, are composed almost entirely of cholesterine, with some colouring matter. They vary greatly in size and number, amounting sometimes to hundreds, and even, it is said, to thousands; but so long as they remain in the bladder they do not usually cause much uneasiness. It is when they pass into the canal by which the bile is conveyed to the duodenum, that they occasion great pain and derangement of the system. The pain occurs in paroxysms, and is generally attended with shivering and vomiting. If the bile be wholly obstructed, jaundice comes on, and rapid emaciation succeeds. The disorder sometimes proves fatal, but generally the stones find their way, sooner or later, into the intestines, and the disturbance subsides. The best remedies are opium and hot applications over the seat of pain, or a warm bath. *Urinary calculi*, *gravel*, or *stone in the bladder*, are concretions formed and existing in the urinary passages. They generally originate in the kidneys, and afterwards pass down into the bladder, where they frequently attain a very large size: some have been found to attain a weight of 14 to 16 oz., and even more. While in the kidneys they are termed *renal calculi*, and they sometimes remain there permanently, and may even attain a considerable size without causing much inconvenience; but they may also produce inflammation and abscess, and ultimately cause death. Generally, however, while yet of small size, they pass down the ureters into the bladder. Sometimes the passing is attended with symptoms similar to those occasioned by the passing of a gall-stone, and similar remedies are to be had recourse to. The calculus having passed into the bladder, is then termed a *vesical calculus*. At first it is attended with comparatively little pain; but unless removed or evacuated, it is sure to enlarge, and to give rise to one of the most dreadful diseases that can afflict humanity. In the earlier stages much may be done to check the progress of this dangerous malady; but when the calculus is once formed, the only means by which it can be got rid of is an operation. The stone must either be withdrawn through the urethra by an instrument, or it must be broken into fragments small enough to be voided with the urine, or it must be extracted by an incision. (*See* LITHOTRITY, LITHOTOMY.) The different varieties of urinary calculus are thus classed by Dr. Wollaston, in the order of their frequency:—1. Uric acid; 2. oxalate of lime, called the mulberry calculus from its dark colour and rough surface; 3. ammoniaco-magnesian phosphate, called also the triple phosphate; 4. phosphate of lime, or bone-earth calculus; 5. fusible calculus, a combination of the last two species, and so called from its fusibility under the blowpipe; 6. the mixed calculus, composed of several of the other kinds confusedly mixed; 7. urate of ammonia; 8. carbonate of lime; 9. cystic oxide; 10. xanthic oxide. The three last are extremely rare. Many of the calculi, and, indeed, most of them, are not of one uniform composition, but consist of strata of two or three varieties, one forming a nucleus for the other deposits, and calculi thus formed receiving the name of alternating. Uric acid is more common as a nucleus than any other substance. Urinary calculus is more frequent in some districts than others, and locality likewise influences the species of the stone. It is particularly prevalent in Norwich, while there are other large t- s in which it is scarcely heard of. In some famili- . appears to be hereditary, and especially in thos- who are also subject to attacks of gout. It is much more common among males than females; and soldiers and sailors are particularly free from it. The predisposing causes of it, however, are still very imperfectly understood.

CALCULUS, in Math., is a term generally applied to signify any branch of mathematics which may lead to or involve calculation,—in fact, to all except pure geometry. There is the common *Arithmetical* calculus, and there is the *Algebraic* calculus. The invention of the *Differential* calculus and the *Integral* calculus is claimed for Leibnitz; they are identical with the *Fluxionary* calculus invented by Newton. The calculus of *Partial Differences* is a branch of the differential and integral calculus; and the calculus of *Variations* is another portion of the same theory. That part of Algebra which relates to exponents and logarithms is sometimes called the *Exponential* calculus.

CALDARIUM. (*See* BATH.)

CALDRON, *kawl'-dron* (Fr. *chauldron*), a large kitchen vessel, generally made of copper, having a movable iron handle, by which it can be suspended on a hook above the fire.

CALEDONIA, *kăl-e-do'-ni-a*, the name given by the Romans to that part of Scotland lying north of the firths of Clyde and Forth, which formed the northern boundary of the Roman province Britannia, as established by Agricola, who penetrated farthest in this direction. The derivation of the term is doubtful, but the root, *caled*, or *caledon*, is evidently British. With later writers, *Caledonia* corresponds pretty nearly with the present limits of Scotland. The inhabitants are described as having red hair and large limbs; as living in tents, naked and barefooted; as fighting from chariots, with shields and short spears, and having daggers also. They belonged not to the Germanic but the Celtic race.

CALEDONITE, *kăl-e'-do-nite* (from Caledonia, Scotland), a compound of sulphate of lead with the carbonates of copper and lead, found in long prismatic crystals, of a deep bluish-green colour, at the Leadhills mine, in Scotland.

CALEMBOUR, or CALEMBOURG, *kăl'-em-boor*, is a French expression for a pun, said to have been taken from a certain Westphalian, Count Calemberg, who visited Paris in the reign of Louis XV., and became notorious for his blunders in the language.

CALENDAR, or KALENDAR, *kăl'-en-dar* (Gr. *kalein*, to call), a written catalogue or table of all the days of the year, arranged in the order of days and weeks, to which are generally added certain astronomical indications, such as the hours of the rising and setting of the sun, the entrance of that star into each sign of the zodiac, the commencement of the seasons, the phases of the moon, as well as the particular epochs of religious and civil acts. The calendar being in reality but the chronological table of the year, has necessarily varied

with different peoples, according to the divers forms of their year. These different forms will be found explained in the article YEAR. The most remarkable calendars are,—1. The Hebrew calendar. The year of the Jews was a lunar one, being composed of 354 days, divided into twelve months, which had alternately twenty-nine and thirty days. In order to make this lunar year accord with the solar year, the Hebrews supplied, seven times in nineteen years, an intercalary month of twenty-nine days. Each month was divided into periods of seven days, or weeks, the Saturday being celebrated under the name of Sabbath.—2. The calendar of the Greeks, whose year was likewise lunar, and composed of twelve months, containing alternately twenty-nine and thirty days. To accommodate this year to the solar one, the Greeks added every two years a supplementary month. Each month was divided into three decades.—3. The Roman, or Julian calendar. The Roman year, under Romulus, contained only ten months, or 304 days. Under Numa, however, the year was extended to twelve months, or 355 days; but, although nominally thus defined, the calendar did not in reality fix anything more precise than the commencement of the months and seasons; and through the ignorance or negligence of the priests, the utmost derangement subsequently arose. To obviate this confusion, Julius Cæsar, in 46 B.C., effected a reform, by the introduction of the Julian calendar, in which the length of the solar year was fixed at 365 days, to which was added, every four years, a day called bissextile. This calendar was adopted not only by the Romans but also by all the modern nations, and remained in use until the introduction of the calendar of Gregory XIII. The Roman year had twelve months, each being divided into unequal parts by the Calends, Nones, and Ides (*see* these words).—4. The Gregorian calendar. This mode of distributing time was the result of the reform inaugurated by Gregory XIII., and first came into operation in October, 1582. This calendar principally differed from the preceding in deducting 10 days of that year, in which it first came into operation, it having been ascertained that the error of 11 minutes of the Julian year had amounted, in 1582 years, to 10 whole days. In order to prevent a recurrence of this error, it was ordered that every year ending a century should not be counted as a leap-year, excepting the 400th year, and the multiples of 400. Thus, 1200 and 1600 were leap-years, 1800 was not, nor will be 1900: 2000, as being a multiple of 400, will be a leap-year, as well as every 400th year afterwards, in addition to every fourth year when it does not end a century. The Christian peoples, while they preserved the names and the order of the months of the Romans, rejected their manner of dividing the months and counting the days; adopting, instead, the Hebrew system of dividing the month into weeks. The Greeks and Russians have refused to adopt the Gregorian calendar, retaining the Julian, or what is called in this country the "old style." Hence it is necessary to deduct 12 days from the new style, in order to make it agree with the old. The reason for there being at the present time a difference of 12 instead of 10 days between the old and new modes of reckoning, is due, as has already been explained, to the fact that, in the Gregorian calendar, the years 1700 and 1800 were not counted as leap-years, while, according to the old, or Julian mode, they were so estimated.—5. The French Republican calendar. This was adopted by a decree of the National Convention of Oct. 1793. The year was therein divided into 12 months, of 30 days each, 5 complementary, or "sans-culottides" days, being added at the end of each year. The commencement of the year was fixed at midnight of the 22nd of September (the autumnal equinox), and, retrospectively, the new year, or Year I. of the Republic, began on the 22nd of September, 1792. Fresh names were given to the months and the days; the titles of the months being,—for the autumn season, Vendémiaire, Brumaire, and Frimaire; for the winter season, Nivôse, Pluviôse, and Ventôse; for the spring season, Germinal, Floréal, and Prairial; and for the summer season, Messidor, Thermidor, and Fructidor. Each month was divided into a period of three decades (10 days each), each day bearing, instead of the name of a saint, that of an agricultural product, implement, or animal useful in cultivating the earth. This calendar remained in force during thirteen years, and was abolished by a decree of the emperor Napoleon I., on the 1st January, 1806.

CALENDARS, in Eccl. Hist., denoted certain books preserved in the churches, containing the memorials of the days on which the martyrs suffered. Afterwards confessors, and other distinguished Christians who had not arrived at the glory of martyrdom, were also admitted to this honour. The principal work of this kind is Assemann's "Calendar of the Universal Church," illustrated with notes.

CALENDARUM FESTUM, *kăl-en'-dă-rum fes'-tum* (Lat., Feast of the Calends), in Eccl. Hist., were heathenish festivals celebrated on the calends of January, and afterwards adopted by the early Christians. They were observed in the churches with masks, and were attended with singing, dancing, and gross indecencies. Fathers and councils long laboured in vain to put down these festivals; and Tertullian, Chrysostom, and Augustine have declaimed in the very strongest terms against them. —*Ref.* Du Cange, *Glossarium Latinitatis*—Kalends.

CALENDARUM FRATRES (Lat., Brethren of the Calends), a religious society, which originated about the 12th century, and took its name from the custom of assembling together in various places on the first day of each month to regulate the observance of the ensuing feasts, distribute alms, &c. It spread over France and Germany, but afterwards, having given rise to abuses, it was abolished.

CALENDERING, *kăl'-en-der-ing* (Fr. *calendrer*; Gr. *kulindros*, a cylinder, roller), the name given to the final process adopted to finish pieces of cotton, or linen, for the operations of the calico-printer, or for sale. It is done by passing the webs between cylinders subjected to enormous pressure, and the process directly derives its name from the cylinders that are used to smooth, or flatten, the cloth that is passed between them. When clothes have been washed, they are subjected to a simple form of calendering by passing them through a mangle, or by starching, and afterwards pressing them with the common smoothing-iron. The patent mangle is somewhat similar to the machines at present used by manufacturers in the general principles of its construction; and the old mangle, in which clothes were pressed on rollers that moved backwards and forwards on a level surface under a heavy box filled with stones (*see* MANGLE), was identical with the old calendering machines, with this difference only, that they were larger and heavier, and turned by horse-power. When the French and Dutch Protestants were obliged to quit their respective countries on account of the severities practised against them, they introduced the cylindrical calendering machine, in which the cloth is passed between cylinders, instead of between rollers and a flat surface, as in the mangle, by which improvement every part of the piece receives a uniform pressure, and is passed through in one direction, from end to end, instead of being rolled backwards and forwards on rollers under a heavy traversing-box. The cylinders were formerly made of wood, but they are now made of paper and cast iron, or copper, a cylinder of paper working against one of iron, which is found to be better than iron working against iron, as the paper cylinders combine some slight degree of elasticity with the extraordinary hardness they possess. These cylinders are made of discs, or plates, of thick pasteboard, with a hole in the centre to receive an iron axis, and others near the circumference, through which long iron bolts, with nuts and screws at either end, are passed. Iron plates are added at the ends of this cylinder of pasteboard disks, and the whole is tightly compressed by the action of the screws. The surface of the roller is rendered true by turning it in a lathe. The iron cylinders which are used in conjunction with those of paper are hollow, and heated by the introduction of steam, or red-hot heaters. The calendering machine consists of four or five rollers placed in a strong framework, generally of cast iron, one above another. The pressure with which these rollers work against each other is regulated by levers. If smoothing only is required, the rollers are so regulated that their surfaces may travel with uniform velocity, although they may be of different sizes (that is to say, if two rollers were in juxtaposition, one of which was six

inches in diameter and the other twelve, the smaller roller must revolve twice while the other is going round once, as the circumference of the larger one is equal in extent to twice that of the smaller); but if the material is required to be glazed, the rollers are so set that their surfaces may travel with different velocities, in order that the surface of one may rub against the surface of that next to it. When fabrics are calendered, they are first subjected to slight pressure between warm cylinders. They are then prepared with starch, which is sometimes adulterated with plaster of Paris, to give an appearance of substance to the material, and again passed through the machine. The round threads of which the web is composed are then found to be flattened, and the texture of the fabric rendered closer, which is the main object of calendering. When the fabric is to be glazed, as chintz, for curtains and the coverings of chairs and sofas, very hot copper rollers are used, which rub as well as press against the paper cylinders to produce the desired polish. Watered goods are made to present their peculiar appearance by passing them under a metal cylinder with a raised pattern on it, which produces a greater pressure on some parts of the cloth than on others. Lawns and muslins are only subjected to a light pressure, that is just sufficient to smooth the surface without flattening the thread. Glazing was formerly effected by stretching the fabric on a table, and rubbing it with a polished flint, and this method is now sometimes adopted for small articles, or made-up goods with seams in them.

CALENDERS, *kăl'-en-ders*, a Mohammedan sect, which take their name from Santon Calendri, their founder. They preach in the market-places, and live upon what their hearers are pleased to bestow; but they are distinguished more by free living than austerities, and are held in little esteem.

CALENDS, or KALENDS, *kăl'-ends* (Lat. *calendæ*), in Roman chronology denoted the first days of every month, being so named from *calo*, I call or proclaim, because then the priests proclaimed the number of fasts or sacred days to be observed in the month. The Romans divided their month into three periods,—the *Calends*, *Nones*, and *Ides*. The calends always fell on the 1st of the month, the nones on the 5th, and the ides on the 13th, except in the months of March, May, July, and October, when the nones fell on the 7th, and the ides on the 15th. The days of the month were then reckoned backwards; thus the 30th of April was the day before the calends of May, or the second day of the calends, the 29th the second day before the calends, and so on to the 13th, when the ides commenced, the 12th being the day before the ides, and the 4th the day before the nones. As the Greeks did not reckon their days in this way, the Romans had a proverbial expression, *ad Græcas calendas* (on the Greek calends), meaning never. The calends were usually the time for settling accounts, interests, &c.; hence they were sometimes called *tristes calendæ*. The book in which an account of the interest was kept was termed *calendarium*.

CALENDULA, *kăl-en'-du-la*, in Bot., the Marigold, a gen. of plants belonging to the nat. ord. *Compositæ*, sub-ord. *Tubiliflorœ*. The species *C. officinalis* is the common Marigold of English gardens, the Gold-blume of the Germans, the Souci du jardin of the French, and the Furrancio of the Italians. Formerly, many medicinal virtues were ascribed to this plant, and its flowers were usually added to soups to colour them, and also to act as "comforters of the heart and spirits." Saffron is frequently adulterated with the yellow florets of the marigold. The name is stated to be derived from *calendulæ*, the Latin for the first day of the month, there being flowers almost any month in the year.

CALENTURE, *kăl'-en-ture* (Lat. *caleo*, I make hot), is a term derived from the Spanish, and applied to a violent ardent fever common among sailors in very hot climates. It is so called either as being accompanied by a burning heat, or as resulting from the great heat of the climate.

CALEPIN, *kăl-e-pan(g)'*, a French term, denoting a collection of literary or scientific notes or information, a pocketbook in which one inscribes his observations or reflections, or a lexicon. The word is derived from Calepino, a learned lexicographer of the 15th century, who took his name from his native place, Calepio, in Italy, and was the author of a celebrated polyglot dictionary, which subsequently passed through many editions.

CALF, GOLDEN, *kalf*, in Sacred Hist., was an idol set up and worshipped by the Israelites at the foot of Mount Sinai, in their passage through the wilderness to the land of Canaan. The people fancying, from the long tarrying of Moses on the mount, that they were deprived of his future guidance, prevailed upon Aaron to fashion them a golden calf, that they might worship as they had seen done in Egypt, and for that purpose they contributed their ear-rings. This calf Moses is said to have burnt with fire, reduced to powder, and strewed it upon water, and made the children of Israel drink, the object of which probably was to testify his contempt for such gods, and to show how utterly powerless they were to save themselves from destruction.

CALIBER, *kăl'-e-ber* (Fr. *calibre*), in Mil., the technical expression for the diameter of the bore of any kind of cannon, rifle, or fowling-piece. The capacity of mortars and other guns used for throwing hollow shot and shells is usually expressed by naming their calibre, as 10-inch howitzer, 13-inch mortar, &c.; while pieces of ordnance, from which solid shot are fired, are, on the contrary, spoken of in accordance with the weigh of the shot they throw, as 12-pounder, 300-pounder, The compasses, with curved legs, used for taki g the diameter of shot and shells and cylindrical bodies, are called calibre compasses, or, improperly, callipers.

CALICO, *kăl'-e-ko*, plain cotton cloth, which constitutes one of the most important British textile manufactures. It derives its name from the town of Calicut, in India, whence it was first imported. (*See* COTTON MANUFACTURE.)

CALICO-PRINTING, the art of impressing cotton fabrics with various figures in one or more colours. In describing this art, the term will be taken in its widest sense, as signifying printing on any fabric, whether cotton, woollen, or silk. There are few dyes which of themselves will impart to cotton a brilliant colour, able to resist the actions of light and washing. The dye must be combined with a substance called a mordant, which has an affinity both for the dye and the cotton fibre. These substances, although generally colourless, have the property of changing the colour of the dye. Thus, if a piece of cotton cloth be impressed with acetate of alumina in lines, with acetate of iron in dots, and with a mixture of the two in circles, it will become permanently impressed with red lines, black dots, and chocolate circles. The process of printing in different colours by means of mordants is very ancient, being described by Pliny as having been practised in his day in Egypt. In his Natural History he says: "Robes and veils are painted in Egypt in a wonderful way, being first imbued, not with dyes, but with dye-absorbing drugs, by which they appear to be unaltered; but when plunged into a caldron of boiling dyestuff, it is curious to see many colours imparted to the robe, in consequence of the modifying agency of the excipient drug." In India, the modern method of printing by resist-pastes has been known from time immemorial, the process employed being that of painting the design upon the fabric by hand with melted wax. Many of the specimens of Indian calico-printing by this method are most intricate in their design, and must have taken a lifetime to execute. Calico-printing was first introduced into England at the latter end of the 17th century, and met with furious opposition from the silk-weavers of Spitalfields, in whose favour the English government passed several acts prohibiting the importation of Indian calicoes, and exacting heavy penalties from any one making or wearing printed calicoes. In 1730, fabrics of cotton weft and linen warp were allowed to be printed and worn, by paying a duty of 6*d.* per square yard; and it was not until 1774 that cotton cloth was allowed to be printed, on the payment of a heavy duty, which was only removed in 1831. The processes employed in calico-printing are,—*Singeing*, by which the cloth is denuded of its fibrous down, which would prevent the perfect application of the dyestuff. It is effected in two ways; either by rapidly passing the cotton cloth over a

red-hot iron, or by passing it over a series of gas flames, which are sucked through the fabric by suction-tubes placed over them. The fabric is next bleached by being boiled in an alkaline lye of soda or lime, rinsed, steeped in a weak solution of chloride of lime, rinsed again, steeped in dilute sulphuric acid, once more rinsed, dried, and smoothed. The cloth is now ready for printing, being brilliantly white, and capable of receiving dyes of the brightest and purest colours. Calicoes are printed in four ways,—by small wooden blocks worked by hand, by large wooden blocks worked by a machine, by copper plates, and by copper cylinders. The first and third methods are almost obsolete; the second is practised principally on the continent; and the fourth is, *par excellence*, the English method. In the large blocks mentioned in the second method the patterns are generally made of sycamore, laid upon deal, and either engraved in relief, or formed by copper slips, of different shapes, being driven into the surface. The machine used in this style is called a *Perrotine*, from the name of its inventor, M. Perrot, of Rouen. The cloth is wound round a prismatic iron roller, and the different coloured blocks are brought down on it successively. By this process, one man and three children can print thirty pieces of cloth in a day. In the English process, the pattern is impressed upon copper cylinders by hard steel rollers called dyes. These cylinders are mounted upon strong iron shafts, upon the end of which is a toothed wheel, by means of which motion is communicated to them. Several of these engraved cylinders, one for each colour, are united in one machine, forming two, three, five, and even ten-colour machines. The cotton cloth is made into a continuous web of forty or fifty pieces, and is drawn over the rollers, each one receiving its colour from a cylinder covered with woollen cloth, and revolving in an oblong trough of colouring-matter, mordant, or resist-paste, and transferring it to the cloth. Calico-printings have reached such a state of perfection, that they will print nearly *ten miles* of cloth per day, with a pattern containing four or five colours. Dyestuffs are of two kinds, those which impart their colour alone, and those which require the application of a mordant. The former are called substantive, the latter adjective. (*See* DYEING.) There are, principally, five styles of calico-printing.—1. The *Fast-colour*, or chintz style, in which the pattern is applied in the form of a mordant, the cloth being afterwards passed through a dye-bath. The colour, of course, clings only to the mordanted portion, the rest being washed out in an after-process. 2. The *Rongeant* style, in which the pattern is worked upon the cloth by the agency of some chemical substance which discharges portions of the uniform colour in which the cloth was first printed. 3. The *Resist-paste* style, when the pattern is printed in some substance which resists the general dye afterwards applied to it, such as indigo, or some other substantive colour. 4. *Steam colours*, in which a mixture of the mordant and dye is printed on the cloth, the union of the two being effected by subjecting it to the action of steam. 5. *Spirit colours*, in which a mixture of dye and *tin spirits*, or chloride of tin, is used Patterns printed in this style are very brilliant, but extremely fugitive. In the first style, the mordant used may be either acetate of alumina, or red liquor; acetate of iron, or iron liquor; or chloride of tin, or tin spirits. The mordant is mixed with starch or British gum, and different shades of the same colour may be obtained by diluting it more or less. The principal dyes used in this style are logwood, Brazil-wood, peach-wood, Persian berries, archel, madder, cochineal, fustic, catechu, quercitron, and galls. (The different colours obtained by the combinations of various mordants with dyestuffs will be found fully described under DYEING.) In the *rongeant*, or discharge style, the discharge generally consists of some strong acid, such as nitric, oxalic, or tartaric acid, made into a paste with pipe-clay and gum, and applied either to the dyed or mordanted cloth. In the latter method, a new mordant may be applied along with the discharge, in which case a coloured pattern will be the result. For instance, a violet ground, with red lines and white dots, may be produced by passing the cloth through weak iron-liquor, and printing the lines with red-liquor mordant. The dots are then printed with a discharge-paste of tartaric and oxalic acid, and the whole is passed through a madder dye-vat. In the *resist*, or reserve style, various substances capable of resisting the action of substantive dyes are used; such as oils, metallic oxides, and their salts; and reserves, containing mordants, are used, when a coloured impression is desired. The latter method of printing with mordant resists is called the *lapis lazuli* style,—wherefore it is hard to say. *Steam colours* are mostly produced by the aid of peroxide of tin, or stannic acid, or perchloride of tin is used as a mordant. A full-bodied red, for instance, is produced in the following manner:—A decoction of peach-wood is thickened with gum, and mixed with chloride of tin. The impression is printed on the cloth with this mixture, and, when dry, the goods are submitted to the action of dry steam, which causes the union of the substances contained in the dyestuff. *Spirit colours* are brilliant, but very fugitive. They are mostly vegetable dyes, mixed with perchloride of tin, or tin spirits, as it is termed. A sixth style—*Pigment printing*—is when a heavy, insoluble colour, such as ultramarine or magenta, is mixed with gutta-percha solution, albumen, or caseine, and printed on the cloth. Since the introduction of the aniline dyes, this method of printing has somewhat revived. By the combination of superexcellence in machinery and chemistry, England is now at the head of the calico-printing trade; the exports reaching, in 1857, 808 millions of yards; but it will be long before she will succeed in rivalling the exquisite printed muslins of the French manufacturer. Though taking the lead in machinery and chemistry, we are very far behind in the artistic portion of the trade; the staring combinations of twenty colours of Manchester contrasting very unfavourably with the artistically blended hues of the commonest productions of Mulhouse and Paris.

CALIF, CALIPH, or KALIF, *kal'-lif* (Arab., lieutenant or vice-gerent), the title assumed by the successors of Mohammed in the supreme power. It was first adopted by Abu Bekr, his immediate successor, and continued for a number of centuries to be the title of the principal line of sovereigns. The term *califate* was employed to designate the empire under the sway of the calif's. After the death of Mohammed, his successors extended their empire so vastly, that, 100 years after his flight from Mecca, the bounds of the califate extended from India to the Atlantic Ocean, including Persia, Syria, Egypt, and Spain. "The language and laws of the Koran were studied with equal devotion at Samarcand and Seville; the Moor and the Indian embraced as countrymen and brothers in the pilgrimage to Mecca; and the Arabian language was adopted as the popular idiom in all the provinces to the westward of the Tigris."—(*Gibbon.*) At this time, the califs were the most potent and absolute monarchs of the globe. They united in themselves both the regal and sacerdotal characters; their prerogative was not circumscribed, either in right or in fact; and if the Koran was the rule of their actions, they were the supreme judges and interpreters of that divine book. The empire reached its greatest power and splendour during the latter part of the 8th and the beginning of the 9th century of our era, under the califs Mansur, Harun-al-Rashid, and Mamun. Even then, however, the empire was beginning to show symptoms of decay, and, under Mamun's successor, Mostasem, Turkish soldiers were employed for the first time in the army. Under his successors, these came to be a formidable power in the empire, and at length assumed the right of deciding the succession to the throne. Independent dynasties sprung up in different parts of the empire, and even within the capital and provinces that continued faithful, the authority of the calif was little more than nominal. In 1258, "after a siege of two months, Bagdad, the capital, was stormed and sacked by the Moguls, and their savage commander pronounced the death of the caliph Mostasem, the last of the temporal successors of Mohammed, whose noble kinsmen of the race of Abbas had reigned in Asia above 500 years."—(*Gibbon.*) The nephew of the murdered Mostasem fled to Egypt, where he retained the title of calif, under the protection of the Mamelukes, and bequeathed the honour to his successors. When the Turks conquered Egypt, in 1517, the last of the nominal califs was carried to Constantinople, and since that

time the Turkish sultans have assumed the title of calif, and claimed to be regarded as the spiritual head of the Moslems.

CALIGÆ, *kăl'-e-je*, is a term derived from the Latin *caliga*, a kind of shoe, or rather half-boot, worn by the Roman soldier; and hence, in the early ages of the Church, it was applied to a similar article of dress, which formed part of the insignia of a bishop, and was emblematical of the spiritual warfare upon which he had entered.

CALIGO, *kăl'-e-go* (Lat., darkness), is a term employed in Med. to denote dimness or obscurity of vision; and hence it forms part of the name of various diseases of the eye attended with dimness or loss of sight; as *caligo corneæ, lentis, humorum*, &c. (*See* BLINDNESS, EYE.)

CALIGRAPHY, *kăl-ig'-rĭf-e* (Gr. *kalos*, beautiful, *graphe*, writing), is the art of beautiful writing. Previous to the invention of printing, this art was greatly fostered, and many admirable specimens of it still exist. Some of them are written in letters of gold, vermilion, &c., on leaves of various colours, and richly ornamented with beautiful devices. The scribes who were employed in thus copying MSS. were termed caligraphers.

CALIPPIC PERIOD, or CYCLE, *kăl-ip'-ik*, in Chron., receives its name from an Athenian astronomer, Calippus, by whom it was first observed, about B.C. 330. About a century before, it had been discovered by Meton, that in nineteen years there are 235 lunations when the new and full moons return to nearly the same day and hour. Calippus observed that this would be more nearly the case by taking four Metonic cycles or periods of nineteen years, and then subtracting one day. The Calippic period is thus 76 years, less one day.

CALISTHENICS, *kăl-is-then'-iks* (Gr. *kalos*, beautiful, *sthenos*, strength), the science or practice of exercising the limbs and body for the purpose of strengthening the muscles and acquiring a more graceful carriage. (*See* GYMNASTICS.)

CALITRICHACEÆ, *kăl-it-ri-kā'-se-e* (Gr. *kalos*, beautiful, *thrix*, hair), in Bot., the Starwort family, a nat. ord. of dicotyledonous plants, in the subclass *Monochlamydeæ*. The species are small aquatic herbs, having the following general characters:—Leaves opposite, entire, simple; flowers minute, axillary, solitary, unisexual, schlamydeous; the male flower of 1—2 stamens, with reniform anthers, the female flower having a 4-cornered, 4-celled ovary, with one suspended ovule in each cell; fruit indehiscent, 4-celled; seeds 4, peltate, with fleshy albumen; embryo inverted, with a very long superior radicle. *Calitriche* is the only genus, and includes six species, natives of fresh-water pools in Europe and North America. Their uses are unknown.

CALIVER, *kăl'-i-ver*, a hand-gun in common use about 1600, that could be discharged from the shoulder without a rest. It was fired by means of a matchlock. The barrel was shorter than that of the old musket, and much lighter, and the diameter of its bore was made according to a fixed standard; hence the name of the weapon, corrupted from calibre. (*See* CALIBRE.)

CALIXTINES, *kăl'-iks-tīnes* (Lat. *calix*, a cup), a Bohemian sect which sprung up among the Hussites, and received their name from holding that the communion-cup should be given to the laity as well as the clergy. Their confession of faith, drawn up in 1421, contained the following articles:—1. The Word of God should be freely, and without hindrance, regularly preached by the priests of the Lord, throughout Bohemia; 2. the sacrament of the holy communion, the wine as well as the bread, should be freely administered to all Christians burdened by no mortal sins, according to Christ's institution; 3. the clergy should be separated from secular affairs, and should conform themselves to the life and teaching of the apostles; 4. that all mortal sins, and especially such as are of a public nature, as simony, unchastity, and the like, and all others that are contrary to the law of God, should be judged of and punished by those having authority over such matters. They were the more moderate of the followers of John Huss, being opposed to the more extreme sect of the Taborites. They subsequently became the dominant party in Bohemia, and exercised considerable influence over public affairs. From the beginning of the 16th century, however, they gradually lost their importance, and came to share in the fate of the Protestants generally in Bohemia. (*See* BOHEMIAN BRETHREN.)

CALIXTINES, were also the followers of George Calixtus, a celebrated Protestant divine of the 17th century, who endeavoured to unite the Romish, Lutheran, and Calvinistic churches in the bonds of charity and mutual benevolence. He maintained that the fundamental doctrines of Christianity—by which he meant those elementary principles whence all truths flow—were preserved pure in all three communions, and were contained in the Apostles' Creed; and that the tenets and opinions that had been constantly received by the ancient doctors during the first five centuries, were to be held as of equal weight and authority with the express declarations and doctrines of Scripture.

CALI YUGA, *kal'-le yu'-ga*, a Hindu era, taken by the Brahmins as the commencement of the present age of the world, called by them the "iron age." It dates from 3102 B.C., the period of the Deluge. The year 1863 is the year 4964 of the Cali Yuga era; therefore, to bring any date of the Cali Yuga era to its corresponding date according to the Christian era, we must subtract 3102 from it. The year, according to this era, commences in April

CALKING, *kawk'-ing*, in Mar., a term signifying the act of forcing a quantity of oakum into the seams between the planks of a ship's decks or sides, by means of iron chisels, called *calking-irons*. When the oakum has been driven firmly into these seams, it is covered with a coating of pitch or rosin, to prevent its rotting.

CALL, *kawl*, is a term used in Theology in a variety of significations. In a general sense, it denotes God's invitation to man to accept of the offer of salvation. *Effectual calling* is said to be "the work of God's Spirit, whereby, convincing us of our sin and misery, enlightening our minds with the knowledge of Christ, and renewing our wills, he doth persuade, and enable us to embrace Jesus Christ, freely offered to us in the gospel." *Call to the ministry*, is said to be twofold; either outward, when one is judged qualified to hold office in the church, and is admitted thereto in due form; and inward, when one is inwardly moved thereto by the Holy Spirit. This inward call should precede, and is required as a qualification for the outward. The candidate for deacon's orders, in the Church of England, is asked, "Do you trust that you are inwardly moved by the Holy Ghost to take upon you this office and ministration to serve God, in promoting his glory, and the edifying of his people?" According to Dr. Hook, the meaning of this question is, "whether, after an impartial examination of their hearts, they find that they do not take this sacred employment upon them, barely for a maintenance in the world, or that thereby they may acquire those superior dignities and profits which, in these peaceable ages of Christianity, some of the clergy do partake of, but only that they think they may be serviceable in God's vineyard, and are willing to contribute the best of their labours therein for the promoting of God's glory, and the edifying of his people."—(*Church Dictionary.*) Calvin defines the inward call, in his *Institutes*, to be "the good testimony of our own heart that we have taken this office, neither for ambition, covetousness, nor any evil design, but out of a true fear of God, and a desire to edify the Church." *Call*, among Presbyterian churches, is applied to the invitation given by a church to one duly qualified to become their pastor. The question as to the right of a congregation to choose their own pastor has led to frequent dissensions in the Church of Scotland, and was the cause of the disruption of that body, which took place in 1843. (*See* PATRONAGE, FREE CHURCH, CHURCH OF SCOTLAND.)

CALL (Fin.), a term used in monetary transactions, signifying a demand for the payment of certain instalments due on shares issued by joint-stock companies. In the formation of such companies, shares of a fixed amount are offered to the public, purchasable upon expressed conditions. A stipulated sum is paid upon the delivery of the preliminary acknowledgment, technically known as scrip; and all shareholders are liable to be "called" upon from time to time to pay further sums, until this amount is paid up; hence the phrase.

This application is penally regulated by the board of directors, and is dependent upon the progress of the speculation or the necessity that may exist for the employment of additional capital. It has, however, a somewhat different meaning on the Stock Exchange, where a "call" is when a person gives so much for the option of *buying* stock (public securities) at a specified time, the price and date being settled at the time the option-money is given.—*Ref.* Fenn *on the Funds, &c.*

CALL, a kind of silver or brass whistle, used by the boatswain and his mates to summon the sailors to their posts, and to direct them about the various employments of the ship. A gold call was formerly the insignia of an admiral.

CALL OF THE HOUSE, in parliamentary proceedings, is an imperative summons, issued to every member of either house, to attend on some particular occasion, when important matters are to be brought before them. In the *House of Lords*, when any urgent business is deemed to require the attendance of the Lords, it has been usual to order the house to be called over; and this order has sometimes been enforced by fines and imprisonment upon absent lords. The most important occasion on which the house was called over in modern times was in 1820, when the bill for the degradation of Queen Caroline was pending. The house then resolved "that no lord do absent himself on pain of incurring a fine of £100 for each day's absence, pending the three first days of such proceedings, and of £50 for each subsequent day's absence from the same; and in default of payment, of being taken into custody." When the *House of Commons* is ordered to be called over, it is usual to name a day which will enable the members to attend from all parts of the country. If it be really intended to enforce the call, not less than a week, or ten days, should intervene between the order and the day named for the call; the interval, however, has varied from one day to six weeks. The order for the house to be called over is always accompanied by a resolution, "that such members as shall not then attend be sent for, in custody of the sergeant-at-arms." On the day appointed for the call, the order of the day is read and proceeded with, postponed, or discharged, at the pleasure of the house. If proceeded with, the names are called over from the Return Book, according to the counties, which are arranged alphabetically,—the members for the county being called first, and then the members for the cities or boroughs within that county. The counties of England and Wales are called first, then those of Scotland and Ireland in their order. The names of members who do not answer when called are taken down by the clerk of the house, and are afterwards called over again. If they appear in their places at this time, or in the course of the evening, it is usual to excuse them for their previous default; but if they *do* not appear, and no excuse is offered for them, they are ordered to attend on a future day. It is also customary to excuse them if they attend on that day, or if a reasonable excuse be then offered; but if a member should not attend, and no excuse is offered, he is liable to be committed to the custody of the sergeant-at-arms, and to the payment of the fees incident to that commitment.—*Ref.* MAY'S *Law of Parliament.*

CALL TO THE BAR. (*See* BARRISTER.)

CALLA, *kăl'-lă* (from Gr. *kallos*, beauty), in Bot., a gen. of plants belonging to the nat. ord. *Orontiaceæ*. The most interesting species is *C. palustris*, from the acrid rhizomes of which the Laplanders prepare a kind of bread, by a tedious process, which includes drying, washing, grinding, and baking. The acrid juice cannot be throughly removed without great labour in washing the rhizomes.

CALLIDIUM, *kăl-lid'-i-um* (Gr. *kallos*, beauty, *eidos*, form), small beetles, infesting houses, and very destructive to woodwork, especially of spruce and fir. One of this family (*Callidium bajulus*), a flattish, rusty-black insect, will, according to Messrs. Kirby and Spence, not only eat their way through the rafters of a house, but even bore through sheet-lead; fragments of lead having been found in their stomachs.

CALLIGONUM, *kăl-lig'-o-num* (Gr. *kallos*, beauty, *gonia*, angle), in Bot., a gen. of plants belonging to the nat. ord. *Polygonaceæ*, characterised by a quadrangular fruit, winged at the angles. The species *C. Pallasia*, which is found on the sandy steppes near the Caspian Sea, is valued by the wandering Kalmucks for the acid juice of its fruit and shoots, which often serves to allay their thirst; and also for the nutritious gum which may be obtained from its root.

CALLIPÆDIA, *kăl-li-pe'-di-a* (Gr. *kallos*, beauty, *paidia*, children), the name of a Latin poem in four books, by the French abbot Claude Quillet de Chinon, and published under the fictitious name of Clavidus Lætus. The full title of the work is "Callipædia; seu, de pulchræ Prolis habendæ Ratione;" and was translated into English verse by Nicholas Rowe.

CALLIPERS. (*See* CALIBER COMPASSES.)

CALLITRIS, *kăl'-e-tris*, in Bot., a gen. of coniferous plants. *C. quadrivalvis*, the arar-tree, yields the resin called sandarach, juniper resin, or gum-juniper, which is imported in large quantities from Magadore. It is much employed in the preparation of varnishes. When powdered, it is called pounce. The timber furnished by this tree is very durable, and is used by the Turks for the floors and ceilings of their mosques.

CALLOSITY, *kal-os'-i-te* (Lat. *callositas*), is an induration or hardness of the skin; as that of the hands through hard labour.

CALLUS, *kăl'-us*, in Surg., is the bony matter which is deposited between the fractured ends of broken bones. It is an osseous substance, formed by a process of nature for the reuniting of broken bones.

CALM, *kam*, in Mar., the name given to that state of complete rest in the air when there is no wind stirring. The regions in the immediate vicinity of the equator are the parts of the ocean where the mariner is overtaken by the most frequent and most durable calms. In the Atlantic Ocean the region of calms has a breadth of six degrees. The Pacific Ocean derives its name from being characterised by an equatorial belt of calm region averaging five degrees in breadth, and lying between the south-eastern and north-eastern trade-winds. (*See* TRADE-WINDS.) In these calm latitudes rain is constantly falling; and when Captain Wilkes, of the United States exploring expedition, traversed them in 1838, he found that in the ten days he was making the journey the constant aqueous precipitation was at the rate of upwards of eighteen feet per year. The calm latitudes of the Atlantic Ocean are situate between the tropic of Cancer and lat. 20° N.

CALMUCKS. (*See* vol. I. of this work.)

CALOMEL, *kăl-o-mel* (Gr. *kalos*, good, *melas*, black, from the qualities and colour of the Ethiop's mineral to which the name was originally applied), chloride of mercury. (*See* MERCURY, CHLORIDE OF.)

CALOPHYLLUM, *kăl-o-fil'-um* (Gr. *kalos*, beautiful, *phullon*, leaf), in Bot., a gen. of plants belonging to the nat. ord. *Guttiferæ*, including many valuable timber trees. *C. inophyllum*, the piney-tree of Penang and the islands to the eastward of the Bay of Bengal, furnishes fine straight spars. *C. calaba* and *C. inophyllum*, besides yielding timber, produce seeds from which good burning oil is obtained. The fragrant resinous substance known as East-Indian tacamahaca is a product of the species of this genus.

CALOR MORDICANS, *kal'-or mor'-de-kăns* (Lat., biting heat), in Med., is applied to a particular kind of heat, that sometimes attends typhus and other fevers, and is considered a dangerous symptom. It is biting and pungent, rather than burning, and leaves a smarting sensation on the fingers for several minutes after touching it.

CALORIC. (*See* HEAT.)

CALORIC-ENGINE, *kăl-or'-ik*, an engine in which the power is derived from the expansion of air by heat. The caloric-engine is a name given to a particular air-engine by Captain Ericsson, a Swedish engineer resident in America. In its working parts, the caloric-engine closely resembles the steam-engine; the heated air acts upon a piston which works in a cylinder, and the piston-rod and connecting-rod convey the power to the crank and main shaft. The caloric-engine seems to resemble closely the air-engines of Messrs. Stirling. In the earlier air-engines, such as those made by Sir George Cayley and others, the air was passed through a heated chamber, by which means it was raised to a temperature of nearly 600°, and after doing its work it

was allowed to escape. By this process, a great quantity of heat was wasted. In Stirling's air-engines and in Ericsson's caloric-engine, the chief improvement lies in the ingenious way in which the heat is economised. The chamber in the caloric-engine, through which the hot air passes, is filled with fine wire nettings, placed side by side, to the thickness of twelve to twenty inches. On leaving the cylinder, the air, after performing its work on the cylinder, is made to pass outwards through this chamber. In its passage, a quantity of its heat is abstracted by the metal network and given up again to the returning air, which passes inwards through the same chamber. The returning air, with a slight accession of heat from the furnace, produces another effective stroke of the piston; heat, which would otherwise have been wasted, is thus retained, and a corresponding quantity of fresh heat and fuel is saved. Very few of the many ingenious varieties of air-engines have succeeded. In 1853, Captain Ericsson tried a very bold experiment with his caloric-engine. He introduced it into the *Ericsson*, a first-class vessel of the ordinary steam-boat pattern. The register of the ship was 1,003 tons, and she was furnished with paddles. Instead of one funnel, however, she had four small tubes, gaily painted in white and gold. The caloric-engine consisted of two pairs of cylinders, connected in their action, but not placed side by side. Each pair was composed of two cylinders, of which the lower one was much the larger. The upper was called the "supply cylinder," the lower the "working cylinder." The diameter of the working cylinders was 168 inches, and that of the supply, 137 inches each. This enormous bore, however, 14 and 12 feet alternately, was found insufficient to perform the work required. Ericsson afterwards reduced the size of the cylinders, and used highly compressed air. All the results, however, were unfavourable. Caloric-engines, for performing lighter work, such as printing, &c., are much used in North America, and, with additional improvements, it is probable that they will be very extensively employed.

CALORIMETER. (*See* HEAT.)

CALOTROPIS, *kă-lot'-ro-pis* (Gr. *kalos*, beautiful, *tropis*, keel, in allusion to the keel of the flower), in Bot., a gen. of tropical plants belonging to the nat. ord. *Asclepiadaceæ*. The species *C. gigantea* or *procera* yields the medicinal bark known as Mudar bark, which has been much employed in India for the treatment of cutaneous affections, and occasionally as a substitute for ipecacuanha. It contains a peculiar principle, called *mudarine*. The fibres of the bark are known under the names of *Ak* and *Mudar fibres*. The bark of the root of *C. Hamiltonii* has similar properties, and is said to yield the fibres termed *Yercum*.

CALOTTISTS, or LE RÉGIMENT DE LA CALOTTE, *kă-lot'-ists*, the name of a society of wits and satirists in France during the reign of Louis XIV., at the head of which were Torsac and Aimon, officers of the royal guard. They took their name from *calotte*, a little cap, such as was worn by the monks to cover the tonsure. If any public character committed a ludicrous or stupid blunder, the society would send him a patent to wear the calotte as a protection for the weak part of his head. The arms of the society consisted of various insignia of folly, and it had for its motto, *C'est regner que de savoir rire*. As it numbered among its members many persons of high rank, it was possessed of considerable power, and, at length, became so audacious as to attack even royalty itself. It was dissolved by the minister Fleury. At the time of the Reformation, the term *régime de la calotte* was applied to priestly rule.

CALOTYPE, *kăl'-o-tipe* (Gr. *kalos*, beautiful, *tupos*, impression), a name given to a process in photography discovered by Mr. Fox-Talbot. It is often called the Talbotype, but the name at the head of this paragraph is the most usual. The method of taking calotypes is as follows:—A piece of paper is saturated with a solution of iodide of potassium, dried, and laid on a bath of nitrate of silver. Iodide of silver is formed, and the paper is washed in clean water, and dried. When examined in a good light, it is found to be of a delicate canary-yellow colour, due to the formation of iodide of silver on the surface. It is rendered sensitive to the light by being laid on a solution of nitrate of silver, to which have been added gallic acid and acetic acid. It is then dried, exposed to the image in the camera, and developed with a solution of gallic acid to which have been added a few drops of acetonitrate of silver. When all the details have appeared, it is well washed, and the unaltered iodide of silver is dissolved out by means of a triturated solution of hyposulphate of soda. The picture is once more washed, and then waxed to render it semi-transparent. The result is a negative picture, *i.e.*, a picture with the lights and shadows reversed. To procure a positive from this, it is superposed on a piece of sensitized paper and exposed to the light. The light shining through the shadows, which, being reversed, are transparent, blackens the paper, whereas the lights, being opaque, stop the light from acting on the sensitive surface, and leave it white. This operation is called printing. (*See* PHOTOGRAPHY.)

CALOYERS, *kăl-oi'-ers* (Gr. *kalogeroi*, good old men), is a general name given to the monks of the Greek church. They follow the rule of St. Basil, whom they regard as their father and founder. There are three degrees among them: the novices, who are called *Archari*; the ordinary professed, called *Microchemi*; and the more perfect, called *Megalochemi*. They are likewise divided into cœnobites, anchorets, and recluses. They have four [illegible]nts, the first and greatest of which, for the resurre[illegible] of our Lord, is called the grand quarantain, and [illegible]asts for eight weeks. During this Lent the religious drink no wine. All the monks are obliged to labour for the benefit of the monastery as long as they continue in it. The most considerable monastery of the Caloyers in Asia is that of Mount Sinai, which was founded by the emperor Justinian, and endowed with 60,000 crowns revenue. They have also numerous monasteries in Europe, the most celebrated of which are those of Mount Athos, in Macedonia. There are also female Caloyers, or Greek nuns, who likewise follow the rule of St. Basil, but their nunneries are always dependent on some monastery.

CALTHA, *kal'-tha* (Gr. *kalathos*, a goblet), in Bot., a gen. of plants belonging to the nat. ord. *Ranunculaceæ*, tribe *Helleboreæ*. The species *C. palustris*, commonly known as the Marsh Marigold, grows wild in marshy places, and has showy bright yellow flowers.

CALTROP, *kal'-trop* (Sax. *coltræppe*), a piece of iron consisting of four sharp spikes projecting from a common centre in such a manner that three of the points will rest on the ground and the fourth stand upright in whatever way it may be thrown from the hand. Caltrops are sometimes thrown down before infantry or artillery, to check a charge of cavalry, or in a breach to impede the advance of the storming party; they are, however, far more injurious to cavalry than infantry. Caltrops are sometimes called crow's-feet.



CALTROP.

CALUMBA, *kă-lum'-ba*, the name given to a root very extensively used in medicine as a stomachic and mild tonic. It takes its name from Colombo, in Ceylon, whence it was first brought. (*See* JATEORHIZA.)

CALUMET, or PIPE OF PEACE, *kăl'-u-met*, is the name given by the North-American Indians to a tobacco-pipe of a particular construction. The bowl is of polished marble, and the stem is of strong reed, 2½ feet long, and adorned with locks of women's hair and



CALUMET.

feathers. When used in treaties and embassies, the Indians fill the calumet with the best tobacco, and present it to those with whom they have concluded any important business, smoking out of it themselves

after them. To present it to strangers is a mark of hospitality.

CALUMNY. (*See* LIBEL.)

CALUMNY, OATH OF, in the old law of Scotland, was an oath that both parties to a lawsuit might be ordained to take, by themselves or their counsel, that they believed their case to be true and good. The object was to prevent rash and unprincipled lawsuits. An Act of Sederunt (1st February, 1715) requires, that before asking the oath, a sum shall be consigned, to be forfeited to the other party on his deponing in the affirmative. Though still recognized, it is now almost unknown in practice.

CALVARY, *kăl'-vă-re*, in Roman Catholic countries, is a name given, from the mount on which Christ was crucified, to certain places either adjoining a church or outside a town, where are represented various scenes of the passion of our Lord. One of the most celebrated is that of Mount Valerian, near Paris, which is composed of seven chapels, in each of which some mystery of the Passion is represented.

CALVINISM, *kăl'-vin-izm*, is the name given to certain theological doctrines, after John Calvin, the celebrated reformer. Generally, all who hold these doctrines, of whatever sect, are termed Calvinists; but it is applied more particularly to the reformed churches of Switzerland and Germany, as distinguished from the Lutheran. Luther, notwithstanding his dauntless courage in opposing the corruptions of the papacy, retained many things which gave offence to a number of the reformers. He was disposed to treat with toleration images, altars, wax tapers, private confession, and the mass. To all of these Calvin was opposed. He declared the Church to be a separate and independent body, endowed with the power of legislation for itself, and left to the civil magistrate little more than the privilege of protecting the Church and providing for its wants. He maintained that the Church ought to be governed like the primitive Church, only by synods and presbyteries, that is, by assemblies of elders, composed both of clergy and laity; and that among the clergy all are by the law of Christ equal in rank and authority. His religious discipline was severe, and excommunication was a civil sentence. In divinity, Calvin was an implicit follower of St. Augustine, and taught, with the great Latin father, the doctrine of the absolute decrees. The leading doctrines of Calvinism, as opposed to Arminianism, and as explained and confirmed by the synod of Dort, are the five following:—1. That God has chosen a certain number of the fallen race of man unto eternal glory before the foundation of the world, without the least foresight of faith, good works, or any conditions performed by the creature, and that the rest of mankind he was pleased to pass by and ordain to dishonour and wrath for their sins. Predestination, however, is held not to affect the agency or accountableness of creatures, or as being to them any rule of conduct. On the contrary, they are supposed to act as freely, and to be as much the proper subjects of calls, promises, and threatenings, as if no decree existed.—2. That though the death of Christ be a most perfect sacrifice and satisfaction for sins, abundantly sufficient to expiate all those of the whole world; and though on this ground the gospel is to be preached to all mankind indiscriminately, yet it was the will of God, that Christ, by the blood of the cross, should efficaciously redeem those, and those only, who were from eternity elected to salvation, and given to him by the Father.—3. That all mankind are totally depraved in consequence of the fall of Adam, who, being their federal head, his sin involved the corruption of all his posterity, which corruption renders them unable of themselves to do anything truly good, and exposes them to his righteous displeasure, both in this world and in that which is to come.—4. That all whom God has predestinated unto life he is pleased in his appointed time effectually to call by his word and spirit out of that state of sin and death in which they are by nature, to grace and salvation by Jesus Christ.—5. That those whom God hath effectually called and sanctified by his spirit, may fall partially, or for a time, but shall never fall finally, from a state of grace. These tenets, however, are not held to the same extent by all who bear the name of Calvinists. There are some who consider that they go too far, and these are known as Moderate Calvinists; and there are others, known as High Calvinists, who think that they do not go far enough. Calvinism originally existed in its greatest purity in the city of Geneva, whence it extended into Germany, France, the United Provinces, and Britain. In Germany the followers of Calvin constitute the Reformed Church. In France, Calvinism was abolished by the revocation of the edict of Nantes. In Holland it still continues to be the prevailing religion. In England it was adopted and made the public rule of faith in the reign of Edward VI.; but since the time of Elizabeth it has been on the decline, though latterly a revival has been taking place. In Scotland, Calvinism, as established by John Knox, the disciple of Calvin, has been most enduring, and exists there in its greatest purity. Generally, however, the extreme doctrines of Calvin may be said to be rapidly losing ground, though Calvinism, in its milder form, is the professed creed of Presbyterians, Independents, Baptists, Methodists, &c., in both the Old and the New world.

CALX. (*See* CALCIUM.)

CALYCANTHACEÆ, *kăl-e-kăn-thaĭ'-se-e*, in Bot., the *Calycanthus* fam., a nat. ord. of dicotyledonous plants in the sub-class *Calyciflorœ*. These are shrubby plants, greatly resembling the *Rosaceæ*, but they differ in having opposite leaves, which are always simple, entire, and exstipulate; sepals and petals numerous and similar in appearance; stamens with anthers adnate and turned outwards; and lastly in having convolute cotyledons. There are but two genera, *Calycanthus* and *Chimonanthus*, the species of which are natives of Japan and North America. The flowers have a peculiar aromatic fragrance. The bark of *C. floridus*, the Carolina allspice, is sometimes used in the United States as a substitute for cinnamon-bark.

CALYCERACEÆ, *kăl-e-se-raĭ'-se-e*, in Bot., the *Calycera* fam., a nat. ord. of dicotyledonous plants in the sub-class *Corollifloræ*. They are exclusively natives of South America, and hold an intermediate position between *Dipsaceæ* and *Compositæ*; being distinguished from the former by their alternate leaves, by the absence of involucels to the individual florets of the capitula, by the valvate æstivation of the corolla, and by their monadelphous filaments and partially-united anthers; from the *Compositæ*, by the anthers being only partially united, and by the pendulous albuminous seed, with superior radicle. The properties and uses of these herbs are unknown.

CALYCIFLORÆ, *kăl-e-se-flor'-e*, in Bot., a sub-class of *Dicotyledones*, comprising plants with flowers having the following general characters:—Calyx and corolla usually present, the petals of the latter being generally distinct, but sometimes connate (slightly connected); stamens perigynous (borne on the calyx, but free from the ovary), or else epigynous (apparently seated on the ovary). The *Calyciflorœ* are subdivided into *Perigynæ* and *Epigynæ*. In the first of these subdivisions, the calyx is free, or nearly so; the stamens are usually perigynous, and the ovary is superior. In the second, the calyx is more or less adherent, and the ovary inferior. Professor Bentley describes fifty-one calyciforal orders; namely,—

*Sub-div.* 1, *Perigynæ*.—Celastraceæ (the Spindle-tree ord.), Stackhousiaceæ, Staphyleaceæ (the Bladder-nut ord.), Vochysiaceæ, Rhamnaceæ (the Buckthorn ord.), Anacardiaceæ (the Cashew-nut ord.), Sabiaceæ, Connaraceæ, Amyridaceæ (the Myrrh and Frankincense ord.), Leguminosæ (the Bean ord.), Moringaceæ, Rosaceæ (the Rose ord.), Calycanthaceæ, Lythraceæ, Saxifragaceæ, Hydrangeaceæ, Hensloviaceæ, Cunoniaceæ, Crassulaceæ (the Houseleek or Stone-crop ord.), Francoaceæ, Paronychiaceæ, Portulaceæ, Mesembryaceæ (the Ice-plant ord.), Passifloraceæ (the Passion-flower ord.), Malasherbiaceæ, Turneraceæ, Papayaceæ, Pangiaceæ.

*Sub-div.* 2, *Epigynæ*.—Cucurbitaceæ (the Gourd or Cucumber ord.), Loasaceæ, Homaliaceæ, Cactaceæ (the Cactus ord.), Grossulariaceæ (the Gooseberry or Currant ord.), Escalloniaceæ, Philadelphaceæ (the Syringa ord.), Myrtaceæ (the Myrtle ord.), Lecythidaceæ (the Brazil-nut ord.), Chamælauciaceæ, Barringtoniaceæ, Belvisiaceæ, Melastomaceæ, Onagraceæ (the Evening-primrose ord.), Haloragaceæ (the Mare's-

tail ord.), Combretaceæ (the Myrobalan ord.), Rhizophoraceæ (the Mangrove ord.), Alangiaceæ, Cornaceæ, Hamamelidaceæ (the Witch-hazel ord.), Bruniaceæ, Umbelliferæ, Araliaceæ (the Ivy ord.).

CALYMENE, *kill-e-mē'-ne* (*Gr. kekalumene*, concealed), in Geol., a gen. of trilobites, so named from the obscurity which long hung over the real nature of these fossil crustaceans. The genus belongs to the Silurian system, and is particularly well represented in the Ludlow rocks. It is distinguished by its ovate, convex, and deeply-trilobed shell or crust, which is occasionally found coiled up like the *oniscus*, or woodlouse. The most abundant species is *C. Blumenbachii*, which has long been known as the Dudley locust. (*See* TRILOBITE.)

CALYX, *kal'-liks* (Gr.), in Bot., the external envelope of the flower. It is composed of modified leaves, called *sepals*, which are usually green. Within the whorl of sepals there is generally another whorl of leaves, called the corolla (which *see*), but sometimes the calyx is the only envelope of the parts of fructification. The calyx may either consist of a number of separate sepals, as in the poppy, buttercup, and wallflower, or these parts may be more or less united, as in the fuchsia, melon, and tobacco. In the former case, the calyx is termed *polysepalous* or *polyphyllous*; in the latter, *monosepalous* or *monophyllous*, or, more correctly, *gamosepalous* or *gamophyllous*. Sepals are generally of a more or less oval, elliptical, or oblong form, with the extremity either blunt or acute. In their direction they are *erect*, or pointed upwards; *connivent*, or turned inwards; *divergent* or *patulous*, spreading outwards; or if their apices are turned downwards, *reflexed*. When of the usual green colour, they are said to be *foliaceous* or *herbaceous*; but when coloured, as in the fuchsia and tropæolum, *petaloid*. Whatever be its colour, the external envelope must be considered as the calyx. In describing a polysepalous calyx, the number of parts is indicated by the prefix of a Greek numeral; thus a *trisepalous* calyx has three sepals, a *pentasepalous* calyx, five; and so on. When the sepals are of equal size and like form, and arranged in a symmetrical manner, the calyx is said to be *regular*; when they are of different sizes and forms, it *is irregular*. In a monosepalous or gamosepalous calyx, the parts adhere in various ways. Thus the union may only take place near the base, as in the pimpernel, when the calyx is said to be *partite*; or it may extend to about the middle, as in the centaury, when it is *cleft* or *fissured*; or the joining may leave but a small portion of each sepal free, as in the lychnis, so as to form a *toothed* calyx; or the union may be complete, as in the chrysanthemum, in which case the calyx is termed *entire*. The number of partitions, fissures, or teeth, is also indicated by Latin numerals, as in the terms *quinque-partite* (five-parted), *quinque-fid* (five-cleft), and *quinque-dentate* (five-toothed). In a monosepalous calyx the part formed by the union of the sepals is sometimes called the tube, the free portion the *limb*, and the orifice of the tube the *throat*. The tube of the calyx sometimes adheres, more or less, to the ovary, as in the iris, gooseberry, currant, and in all plants of the Composite order. When such adhesion takes place, the calyx is said to be *adherent* or *superior*, because it appears to arise from the summit of the ovary. When there is no such adhesion, the ovary being quite distinct, as in the wallflower and buttercup, the calyx is described as *free*, *non-adherent*, or *inferior*. Many other terms which are sometimes applied to the calyx are explained under the heads LEAF, COROLLA, and FLOWER.

CAM, *kăm*, in Machinery, a plate with curved sides, fixed on a revolving shaft for converting a rotatory motion into a rectilinear. For instance, in the ordinary tilt-hammer a cam is fixed on a shaft, and as it revolves, depresses the end of a lever, upon the other end of which is fixed the hammer-head. Cams are also called tappets and wipers.

CAMALDOLITES, *kă-măl'-do-lites*, the name of a religious order established by St. Romuald, a Benedictine monk, in the vale of Camaldoli, near Aresso, in the Apennines, in 1018, and afterwards confirmed by Alexander II. in 1072. They were originally hermits, living in separate cells; but as their wealth increased, they came to associate together in convents. They rapidly spread, and from Italy they extended into France, Germany, and Poland. They wear a white garment, and observe the austere rules of the Benedictines; but as an order they are now almost extinct.

CAMARA NUTMEG, *ka-mā'-ra*, a false or wild nutmeg, obtained from the *Acrodiclidium Camara*, a plant of the Laurel ord., growing in Guiana. It is also known as the Ackawa nutmeg by the natives, who employ it as a spice.

CAMARILLA, *kăm-ă-ril'-la* (Sp., a little chamber, dim. of *camara*, a chamber), is a word borrowed from Spain, and employed in modern political language to signify the influence of secret and unaccredited councillors in matters of state or government. In Spain, where the term was first used, this influence has had a most pernicious effect. Under Ferdinand VII. the name was applied to those flatterers by whom that monarch was mostly influenced, and who were generally men without talent, and opposed to every kind of reform. The word was also much used in France during the reign of Charles X.

CAMASSIA, *kil-măs'-se-a* (from *quamash*, its native name), in Bot., a gen. of plants belonging to the nat. ord. *Liliaceæ*. The species *C. esculenta*, a native of North America, has edible roots, which are used by the Red Indians under the name of *quamash*. They are also known as bu[illegible]-roots.

CAMAYEU, *[illegible]-ā-yu*.—A painting executed in different shades o[illegible]ne colour is said to be *en camayeu*. This term may be applied to drawings in sepia and Indian ink, and even to those in chalk and pencil. It is synonymous with the expression "monochrome;" but it was also originally applied to paintings in which more than one colour appeared, although one particular tint prevailed, and almost concealed the others.

CAMBER, *kăm'-ber*, a term used in Carpentry to denote the convexity in the middle of a beam to prevent its becoming bent by its own weight, or the weight it has to sustain. *Camber slip* is a piece of wood curved differently on each side, for drawing the upper and under lines of straight brick arches.

CAMBIO, *kum'-be-o* (Lat., I change), is a term sometimes used in the mercantile phraseology of various countries, particularly of Holland, in the sense of exchange.

CAMBIST, *kăm'-bist* (Ital. *cambista*, a banker, moneychanger), is a term applied to one who exchanges foreign money, or deals in foreign notes or bills of exchange. It is also applied to a book in which the weights, measures, and moneys of different countries are converted into those of one particular place; as, Kelly's "Universal Cambist."

CAMBIUM, *kăm'-be-um* (Lat. *cambio*, I change), in Bot., a layer of vitally active cells placed on the outside of each annual zone of wood in an exogenous stem. It is from this that the new layers of wood and liber are formed. The cells of which it is composed are of a very delicate nature, each consisting of a thin wall of cellulose, within which are situate a primordial utricle, a nucleus, and abundance of protoplasm. (*See* CELL.) The cambium-layer is dormant during the winter, at which time the bark is firmly attached to the wood beneath; but in spring it is in full activity, being charged with the elaborated sap of the plant; and then the bark may be separated from the wood beneath. At all seasons, however, the bark and the wood are organically connected, and can only be separated by rupturing the delicate cells of the cambium-layer.

CAMBOGE, improperly GAMBOGE, *kăm-hoej'*, a gum resin exuded by one or more species of *Garcinia*, trees found principally in Siam. It is soluble in alcohol, and forms an emulsion with water. It is much used as a pigment, and also occasionally in medicine. It acts, when swallowed, as a powerful drastic purgative. A specimen of Siam camboge, analyzed by Dr. Christison, contained 74 per cent. of resin and 23 per cent. of arabin, the rest being moisture. Its use as a medicine must be carefully regulated, as the slightest overdose causes violent purgation and vomiting. It is said to form a considerable portion of a certain quack medicine sold by a self-constituted "College."

CAMBRIAN ROCKS, *kăm'-bre-an*, in Geol., a term applied by Professor Sedgwick to the lowest fossiliferous rocks, on account of their extensive develop-

ment in North Wales, anciently called Cambria. According to the classification of the government geological surveyors, the term is at present limited to a series of sandstones, gritstones, and slates, which underlie the Silurian Lingular strata. (*See* SILURIAN SYSTEM.)

CAMBRIC, *kaim'-brik*, a fine linen fabric, first made at Cambray; hence its name. It bears the same relation to linen that muslin does to calico. Scotch cambric is made of hard-twisted cotton. The French material *batiste*, so much used for printing, is a cotton cambric.

CAMBRIDGE MANUSCRIPT. (*See* BEZE CODEX.)

CAMBRIDGE, UNIVERSITY OF, *kaim'-brij*, one of the two highest educational institutions of England, is situated in the town of Cambridge, from which it takes its name. Its early history is involved in much obscurity, but it seems to have originated in certain schools established here about the 7th century. Edward the Elder, son of Alfred, is said to have erected, at his own expense, halls for the students and chairs and seats for the doctors, at the same time appointing teachers and adopting other necessary measures for the success of the institution. Some, however, maintain that a regular system of education was not introduced till 1109, when Joffrid, abbot of Croyland, having sent some learned monks, well versed in philosophy and the other sciences, to his manor of Cottenham, near Cambridge, they went daily into that town, where, in a hired barn, they gave lectures in the sciences, which were attended by a large concourse of students. The earliest charter known to have been granted to the university is that of 15 Henry III. (1229). At this time, the students lodged in the houses of the citizens, and the extravagant demands for rent gave rise to numerous disputes between the scholars and townsmen; and hence the king ordained that *taxors* be appointed, namely, two masters and two respectable and lawful men of the town, to fix the rent to be paid by the students for lodgings at a reasonable rate. Afterwards, hostels or halls began to be established, where the students lived at their own charges, under the superintendence of principals, who were responsible to the chancellor for the conduct of their pupils. The first endowed college was that of St. Peter, founded in 1257; and, as the colleges began to increase, the hostels disappeared. Of the other colleges, five were incorporated during the 14th century, four in the 15th, six in the 16th, and one, Downing College, in 1800. All of these colleges are maintained by the endowments of their several founders and benefactors. The university obtained its first formal charter of privileges from Edward I. in 1291, and subsequent charters, with various privileges, were granted by Edward II., Edward III., Richard II., and Henry IV. Additional privileges were conferred upon it by Henry V., Edward IV., Henry VII., Henry [illegible] and Queen Elizabeth, in the third year of her reign. By act of parliament, 13 Eliz. c. 29 (1570), all preceding grants, from Henry III. downwards, were confirmed, and the university was declared to be incorporated by the name of "the chancellor, masters, and scholars of the University of Cambridge." In 1614, James I. conferred upon it the right of sending two members to the House of Commons. The present university statutes were confirmed by Queen Victoria, by order in council, 31st July, 1858. The university "is a union of seventeen colleges or societies, devoted to the study of learning and knowledge, and for the better service of the church and state." Each college is a body corporate, bound by its own statutes, but is likewise controlled by the paramount laws of the university. Each of the seventeen colleges or departments in this literary republic furnishes members both for the executive and legislative branch of its government. All persons who are masters of arts or law, or doctors in one or other of the three faculties, viz. divinity, law, and physic, having their names upon the university register, have votes in this assembly or senate. Their meetings are held in the senate-house. The council of the senate, established by 19 & 20 Vict. c. 88, consists of the chancellor, vice-chancellor, four heads of colleges, four professors of the university, and eight other members of the senate, chosen from the electoral roll published by the vice-chancellor. Two of the heads of colleges, two of the professors, and four other members of the senate, are elected by the persons whose names are on the electoral roll, and they all hold office for four years. All public business must be approved of by the council before it can be brought before the senate. A few days before the beginning of each term, the vice-chancellor publishes a list of the several days on which a congregation or assembly of the senate will be held for transacting university business. These fixed days occur about once a fortnight; but, in case of emergency, the vice-chancellor may summon a congregation for the dispatch of extraordinary business, three days' notice of such meeting being previously given. The principal officers intrusted with the executive are the chancellor, high steward, vice-chancellor, commissary, and assessor. The *chancellor* is the head of the whole university, and presides over all cases relating to that body. In him is vested the sole executive authority within the precincts, except in matters of mayhem and felony. The office is tenable for two years, or for such longer period as the tacit consent of the university may choose to allow. The *high steward* has special power to take the trial of scholars impeached of felony within the limits of the university, and to hold and keep a list according to the established charter and custom. The *vice-chancellor* is elected annually on the 4th November by the senate, and his office embraces, in the absence of the chancellor, the execution of his powers, and the government of the university, according to her statutes. The *commissary* is an officer under the chancellor, and appointed by him, who holds a court of record for all privileged persons and scholars under the degree of M.A. The *assessor* is an officer specially appointed to assist the vice-chancellor in his court. The *sex viri* hold office for two years, and their business is to hear and adjudicate, together with the vice-chancellor, all accusations against members not *in statu pupillari* for offences against the statutes or ordinances of the university. They may punish by deprivation or suspension of degrees, but there is liberty of appeal from their decision to the senate. The *public orator* is the voice of the senate upon all public occasions. The two *proctors*, who must be masters of art or law of at least three years' standing, or bachelors of divinity, are elected annually, and their especial duty is to attend to the discipline and behaviour of all persons *in statu pupillari*, and to search houses of ill fame. The *registrary* sees to the due form of the "graces," and registers [illegible] in the university records. The two *moderators* superintend the examinations of the candidates for honours in the mathematical tripos. Two *pro-proctors* are appointed to aid the proctors. The three *esquire bedells* attend the vice-chancellor, whom they precede with their silver maces upon all public occasions and solemnities, and summon to the chancellor's court all members of the senate. The two *members of parliament* are chosen by the collective body of the senate. The professors are paid some from the university chest, others by her Majesty's government, or from estates left for that purpose. The annual income of the university is derived from various sources, the principal of which are the following:—the rectory of Burwell and a farm at Barton, producing about £1,000 per annum; the fees at matriculation and for degrees, and the profits of the university press, in all probably amounting to between £5,000 and £6,000. The funds are managed by the vice-chancellor, or by specific trustees, and the accounts are examined annually by three auditors, appointed by the senate. The *terms* of the university are three,—Michaelmas, or October term, from the 1st October to the 16th December; Lent, or January term, from the 13th January to the Friday before Palm-Sunday; and the Easter, or Midsummer term, from the Friday after Easter-day to the Friday after Commencement-day, which is always the last Tuesday but one of June. There are four classes of students:—1. *Noblemen* and *fellow commoners*, who are generally the younger sons of the nobility, or young men of fortune; and are so called from having the privilege of dining at the fellows' table.—2. *Scholars*, who are generally foundation-members of their respective colleges, elected by direct examination, or otherwise, from the most promising and distinguished of the students, and who enjoy

various advantages; as having their rooms and commons free, or other allowances.—3. *Pensioners*, who form the great body of the students, paying for their rooms and commons, and in general enjoying no pecuniary advantages.—4. *Sizars*, who are generally students of limited means, and who usually have their commons free, and receive various emoluments, and are no longer required to perform the menial offices that they once were. A student is admitted on the boards of a college, either by a personal examination, or through a recommendatory certificate signed by a master of arts of the university. If the certificate be deemed satisfactory, the name is at once entered on the college boards, and the student usually comes into residence at the October term following, when the academical year begins. During the first year of his course the undergraduate is a *freshman*; during the second a *junior sophy* and during the third a *senior soph*. The first university examination, technically termed the "previous," or "little go," takes place in the Lent term of the second year of the student's course, and a certificate of having passed this examination is indispensable to taking a degree. The subjects of examination are one of the four Gospels in the original Greek, Paley's "Evidences of Christianity," one of the Greek and one of the Latin classics, the Elements of Euclid, books i. ii. iii., and arithmetic. After the examination, the students are arranged in two classes,—those who have passed with credit and those who have simply passed. Rejected candidates must attend the next year's examination. Additional subjects of examination in mathematics are prescribed for those students who intend to be candidates for honours in mathematics, classics, or the natural or moral sciences; and no student is admitted to examination as a candidate for such honours who has not satisfactorily passed this additional examination. Every student must have completed nine terms' residence during two-thirds of each term, before he can take his B.A. The examination for B.A. is termed the "great go," and the candidates are called *questionists*. The examination of questionists who are not candidates for honours embraces the following subjects:—the Acts of the Apostles in the original Greek, one of the Greek and one of the Latin classics, history of the English Reformation, the first four and part of the sixth book of Euclid, together with such parts of algebra, mechanics, and hydrostatics as are prescribed by the schedule. The examination of candidates for mathematical honours, technically termed the "mathematical tripos," is confined to pure and mixed mathematics. It commences every year on the Tuesday after the 30th of December, or at the end of the tenth term. At the close of the examination the names of those who have most distinguished themselves are classed in three divisions; viz., *wranglers*, *senior optimes*, and *junior optimes*, which constitute the tripos, or three orders of honour. The highest of all is the senior wrangler for the year, "the greatest of English academical honours." The examination of those students who contend for honours in the classical tripos commences on the fourth Monday after the last Saturday of January in each year. The examination consists of translations from English into Greek and Latin prose and verse; translations from the best Greek and Latin authors into English, and questions on ancient history. The names of those who pass this examination with credit are arranged in a tripos, and distinguished as first, second, and third class. Two new triposes have recently been established for the moral and the natural sciences. The subjects for examination in the former of these, are moral and mental philosophy and logic, or history and political philosophy, political economy and jurisprudence; the subjects for examination in the latter, are chemistry, botany, geology, mineralogy, and zoology, with comparative anatomy and physiology. No student is to be admitted to these examinations (excepting candidates for degrees *jure natalium*) who has not passed the examination in the additional mathematical subjects of the "previous examination;" and all who pass with credit the examination for either of these triposes are entitled to admission to the degree of B.A. A B.A. may be admitted *ad incipiendum in artibus* at any time after three years from the completion of his bachelor's degree; the inceptors of each year becoming complete M.A. by creation on the "commencement-day." By the university statutes, degrees may be conferred without residence or examinations on persons of certain rank or dignity, as bishops, privy councillors, noblemen, &c. An M.A. must be of at least seven years' standing before he can be admitted to the degree of B.D., for which degree the requisite exercises are one "act" and an English sermon. A D.D. must be a B.D. of five years' standing, the exercises being one "act" and an English sermon. The candidate for the degree of L.B. is required to have kept nine terms at least, and to have passed the previous examination. The subjects of examination are portions of the Roman civil law, the constitutional and general law of England, international law, and general jurisprudence. The names of those students who pass this examination with credit are arranged in three classes of honour. An L.B. may take the degree of M.L. by incepting, as in arts, at any time after the completion of three years from his inauguration. An L.M. of five years' standing may proceed to the degree of B.L.D. after keeping an act. A student, before he can become an M.B., must have resided nine terms, and have passed the previous examination. Five years of medical study are required of candidates for this degree, except in the case of students who have graduated as B.A., when four years is deemed sufficient. There are two examinations, the first of which may be passed by the student after three years of medical study; the second, on the completion of his course. The subjects of the first examination are chemistry, botany, comparative and human anatomy and physiology, materia medica, and pharmacy and pathology; of the second examination, pathology and the practice of physic, clinical medicine, medical jurisprudence, and the medical treatment of surgical and obstetrical diseases. All persons proceeding to the degree of M.D. are required to produce certificates of having been engaged in medical study during five years. The university also confers degrees of bachelor and doctor of music, the conditions for either of which are the same; namely, that the candidate be a member of some college, and that he satisfy the professor of music as to his proficiency in the art, more especially by composing a solemn piece of music, to be performed at the appointment of the vice-chancellor, before the university. Besides the honour of occupying a high place on the tripos list, the university holds out to the ambitious student stimulants to exertion, in the prizes which are annually submitted for competition. The principal of these are the Smith prizes, the chancellor's medals, and the university scholarships. The number of fellowships is 430, varying in value from £100 to £300; while some of the senior fellowships are of the value of £600 or more. For further information on matters connected with the university, we must refer to the *Cambridge University Calendar*. The following is a list of the colleges, with the date of their foundation, and number of members in 1861. A particular notice of each college will be found under its alphabetical head:—

| Colleges. | Founded. | Undergraduates. | Members of Senate. | Members on the Boards. |
|---|---|---|---|---|
| St Peter's | 1257 | 31 | 171 | 232 |
| Clare | 1326 | 36 | 151 | 224 |
| Pembroke | 1347 | 20 | 91 | 126 |
| Caius | 1348 | 113 | 283 | 501 |
| Trinity Hall | 1350 | 78 | 99 | 255 |
| Corpus Christi | 1351 | 65 | 183 | 290 |
| King's | 1441 | 15 | 104 | 144 |
| Queen's | 1448 | 50 | 165 | 252 |
| St. Catharine's | 1473 | 29 | 139 | 192 |
| Jesus | 1496 | 33 | 140 | 222 |
| Christ's | 1505 | 76 | 215 | 383 |
| St. John's | 1511 | 259 | 918 | 1444 |
| Magdalene | 1519 | 31 | 127 | 192 |
| Trinity | 1546 | 563 | 1721 | 2869 |
| Emmanuel | 1584 | 78 | 230 | 388 |
| Sidney | 1598 | 40 | 73 | 135 |
| Downing | 1800 | 8 | 43 | 60 |
| Total | | 1523 | 4607 | 7709 |

The average annual expense incurred by the student at one of the colleges is thus estimated, and the difference is not much at any of the other colleges:—

| | £. | s. | d. |
|---|---|---|---|
| Tuition | 12 | 0 | 0 |
| Rooms, rent | 10 | 0 | 0 |
| Attendance, assessed taxes, &c. | 6 | 5 | 0 |
| Coals | 3 | 10 | 0 |
| College payments | 5 | 7 | 4 |
| Cost of living | 20 | 12 | 6 |
| Laundress | 5 | 8 | 0 |
| Total | £60 | 2 | 10 |

CAMEL, *kăm'-el* (Lat. *camelus*).—Of this gen. of mammiferous ruminants there are two species,—1. the common camel (*Camelus bactrianus*); 2. the Arabian camel, or Dromedary (*Camelus Dromedarius*). The first is principally distinguished by its humps being two in number, whilst the dromedary has but a single hump. The latter species is distributed over an immense extent of country, being found in Arabia, Persia, Southern Tartary, Egypt, India, and the Canary Islands. The common camel is not nearly so abundant, and its geographical range much more limited. It is principally found north of the Taurus and the Himalaya Mountains. The structure of the camel is beautifully adapted to its various uses, and presents one of the most splendid pieces of nature's mechanism. Its personal appearance is anything but fascinating, and, certainly, it would be more attractive on the score of curiosity than admiration. Practically, however, the camel affords a good illustration of the truth of a certain old proverb, implying that good looks are not *always* a proof of utility. The camel is distinguished from all other ruminants, except the llama, by having incisor teeth. The upper jaw contains sixteen teeth,—two incisors, two canines, and twelve molars; the lower jaw, six incisors, two canines, and ten molars—eighteen in all. The upper lip is swollen and divided, the nos-



CAMEL.

trils slit obliquely, the neck elongated, the head long, the eyes very prominent, and the ears somewhat small. The legs of the camel are long, weak-looking members, terminating with two hoofs or toes, padded with soft cushions underneath, which enable the animal to walk securely on the soft sands of the desert. The stomach of the camel is a curious construction, and enables the "Ship of the desert" to carry a supply of water wherewith it may refresh itself on its terribly long and tiresome journeys over immense tracts of parched and sandy desert, where, for days and weeks sometimes, not a drop of water is attainable. The services of the camel to the wandering tribes of Arabs, and other inhabitants of the East, cannot be too highly appreciated, or, indeed, understood, by the people of civilised nations. The usual load of a caravan-camel is about five hundredweight; but, on extraordinary occasions, a strong camel will carry a thousand pounds! It will travel eight or nine miles an hour. The usual travelling speed of a caravan is eighteen miles a day. The only part of Europe in which this animal is found is at Pisa, in Tuscany. The date of the introduction of the camel into Europe is unknown. The usefulness of the camel as a beast of burden was not unknown to the ancients. In the Scriptures we frequently find allusions to the camel; the three thousand of these animals belonging to Job forming a considerable portion of his property. In the book of Genesis there are several pertinent notices of the camel, which, even according to Jewish chronology, would at least prove that this animal was a domesticated and useful servant of man four or five thousand years ago. At what remote period the camel roamed at large, wild and free, is uncertain. The earliest writers make scarce mention of "wild camels;" and when they do so, it is not at all unlikely that allusion is made to animals which, on some occasion, have escaped from bondage, or been set free. The names of the camel in different countries are all very similar. The Hebrew name is Gamal; it is the Djemal of the Arabs; Camelo of the Italians; in France, Chameau; in Germany Kamel.

CAMEL (Fr. *chameau*), in Mar., a machine, chiefly used in Holland and Russia, for raising and carrying ships over any bars or banks that may obstruct the passage of a river. It was invented by Bakker, a burgomaster of Amsterdam, in the year 1688 or 1690. A *camel* is composed of two parts, the outsides of which are perpendicular, and the insides concave, shaped so as to embrace the hull of a ship on both sides. Each part has a small cabin, with sixteen pumps, ten plugs, and twenty men. They have on deck also a large number of horizontal windlasses, from which ropes are fastened round the ship's hull. When they are used, the plugs are opened, and the water admitted until the camel sinks with the ship; all the ropes are then made loose, and the vessel is allowed to float between the two sides of the machine; on the ropes being tightened and the water pumped out, the camel rises, lifting the ship with it: both are then towed over the bar. This machine can raise a ship eleven feet, or, in other words, make her draw eleven feet less water. Beckmann, in his "History of Inventions," states that the Dutch first contrived to carry their numerous fleet through the Pampus by means of large empty chests fastened to the bottom of each ship; and that this contrivance gave rise to the invention of the camel.

CAMELINA, *ka-me-li'-na*, in Bot., the Gold-of-pleasure, a gen. of cruciferous plants. *C. fatida* is sometimes found growing in fields of corn and flax in Britain. *C. sativa*, which is a common field-plant in France, has seeds containing much fixed oil.

CAMELLIA, *ky-mel'-li-a* (in honour of George Joseph Camellus, a traveller in Asia), in Bot., a gen. of plants belonging to the nat. ord. *Ternstræmiaceæ*, natives of China, Japan, and the north of India, and extensively cultivated as greenhouse-shrubs throughout Europe and the States of America. The species *C. japonica*, which, as its name indicates, is a native of Japan, has received great attention from the florists of that country and of China from time immemorial. It has shining leaves, ovate-elliptical, almost acuminate, and serrate; flowers without stalks, generally solitary, large, and rose-like. In its wild state the flowers are red; and the red single camellia is much prized by gardeners as a stock on which to graft the fine double varieties which have been developed by cultivation. Some of these varieties are of Chinese or Japanese origin; others have been raised in Britain, continental Europe, and America. Their colours are various, and the varieties differ much in the form and position of the petals. Camellias flower in the autumn, winter, and spring. They are propagated by cuttings and by layers, or, when the finest varieties are dealt with, by grafting and inarching. The single camellia is often propagated by seed, and in this way the finest stocks for grafting are produced. Of the other species cultivated, the most hardy, and one of the most beautiful, is *C. reticulata*. From this and *C. japonica*, many splendid hybrids have been produced. The seeds of *C. oleifera*, which is extensively cultivated in China, yield by expression an excellent kind of salad-oil. *C.*

*sasanqua* has fragrant flowers, which are said to be used in some parts of China for flavouring teas.

CAMELLIACEÆ. (*See* TERNSTRŒMIACEÆ.)

CAMELOPARD, *kăm-ĕl'-o-pard* (Lat. *camelus*, camel, *pardalis*, panther).—This graceful giant was, till within the last century, not only little known in this country, but its very existence was doubted; and no marvel, when its extraordinary proportions are considered. "Who can wonder at the incredibility of the people? 'I have seen an animal,' said the traveller, 'with the skin of a leopard, the head of a deer, a neck pliant and graceful as the swan's, so tall that three tall men, mounted on each other's shoulders, could no more than touch its forehead, and yet so gentle and timid withal, that the merest cur barking at its heels would put it to its utmost speed, which exceeds that of the hare or greyhound.'" —(*Wild Sports of the World.*) These, moreover, are not all the wonders connected with the animal in question. What the elephant's proboscis is to it, as regards a grasper and a feeler, so is the camelopard's tongue to it. Its oblique and narrow nostrils are protected by securious fringe of bristles, which it can at pleasure draw together, to the exclusion of the fine sand that the suffocating storms of the desert raise in clouds. Its full and lustrous eyes are so wonderfully appointed, that, without moving its head, it can see behind, before, above; and thus defy the stealthy approach of its enemies. The legs of the camelopard have a curious, not to say awkward appearance. The first impression one receives on regarding them is that the hind ones are shorter than the fore. This however, illusory, and probably arises from the fact of the animal's neck stretching in a line with its back. In running, the hind legs are lifted alternately with the fore, and are carried outside and far beyond them, while the long tail, tufted at the end like that of the buffalo, is curled above the back, and swings pendulum-fashion exactly as the neck moves. From forehead to forehoof the full-grown buck measures eighteen feet, while the female, which is more slender than the male, measures about three feet less in height. Hunters describe the flesh of the camelopard as being slightly scented with the perfume of the mokaala and other flowering shrubs on which it feeds. Gordon Cumming, however, makes mention of a still more extraordinary circumstance,—that the living body of the animal emits a delicious perfume. "No pen, or words, convey to a sportsman what it is to ride into the midst of a troop of giraffes. They emit a powerful perfume, which, in the chase, comes hot on the face, reminding one of the smell of a hive of heather-honey in September."—(Cumming, *Five Years in Southern Africa.*) They congregate in herds of from twelve to twenty; though at times as many as thirty, and even forty, have been seen in company.

CAMEO, *kăm'-e-o* (Ital. *cammeo*).—When gems are cut in relief, they are called cameos; but the term is generally given to small sculptures executed on those precious stones which have two layers of different colours, The exterior of these layers forms the relief, and the interior the background. Imitation cameos are also made from shells, some of which are exquisite works of art. The shells generally employed are the bull's-mouth, which give a pinkish-white relief, with an underlayer of red, resembling the sardonyx. The black-helmet gives a dark onyx ground, and the queen's-conch a deep pink. As these shells have three layers of colour, the tints required for the different figures and representations can be toned and modified. Cameos are also made of artificial substances, and glass was employed for this purpose by the ancients. The origin, however, of cutting cameos in precious stones is very remote. The art is supposed to have had its rise in Asia: it was practised in Babylon, and was transferred thence into Egypt by the Phœnicians. It was then carried on by the Greeks and Romans, who brought it to great perfection. After the age of Praxiteles, the art of cameo-cutting became very popular in Greece. They were not only used for ornaments of dress, but were set in goblets, vases, lamps, &c. Antiquarians have not decided as to whether the gems commonly called Etruscan are Greek. Some drinking-cups at that time were made out of a single stone, the outer surface forming one cameo. The Gonzaga cameo, now in St. Petersburg, is said to be the finest specimen of the antique cameo in existence. It represents two heads, supposed to be those of Ptolemy and Eurydice. A cameo, representing Cupid and Psyche, in the Marlborough collection, is said to be the finest in England. The Portland vase in the British Museum is one of the most beautiful specimens of the ancient glass cameo. The manufacture of shell cameos is very recent. It originated in Rome in 1805, and, up to the year 1840, was almost entirely confined to Italy. A large number of cameos are now made in Paris: they are set as brooches, pins, &c., and much worn as ornaments.

CAMERALISTICS, *kăm'-e-răl-is'-tiks* (Ital. *camera*, a chamber), is a term sometimes employed to designate the science of public finance, or that branch of political economy which comprises the means of raising and disposing of the public revenue.

CAMERA LUCIDA, *kăm'-e-rā loo'-se-dā* (Lat., light chamber), an optical instrument intended to facilitate the perspective delineation of objects, invented by Dr. Wollaston in 1807. In its original form, the camera consists of a four-sided prism of glass, set in a brass frame, which is supported by an upright rod six or eight inches long, having at its lower end a screw-clamp for fixing it to the edge of a table. The upper face of the prism, which is placed horizontally, and that directed towards the object to be delineated, form a right angle, and the other two faces form an obtuse angle of 135°. The rays from the object, falling nearly perpendicularly on the first surface, enter the prism, and are totally reflected by the lower and back surfaces to the eye, so that the object appears in the direction of the drawing-board, or table, placed beneath the instrument. The eye is placed at the edge of the prism, so that the rays from the drawing-pencil and paper may enter the pupil together with the reflected rays from the object. In this way the draughtsman obtains a faint image of the object on the paper, and if he be skilled in the use of the instrument, he may trace the outline of the object with extraordinary fidelity. A plate of metal, with a small aperture as an eye-hole, is placed at the edge of the prism under the eye, so that the reflected rays and those from the sketching-point form only very small pencils. By thus cutting off the unnecessary rays, the difficulty of using the instrument is greatly diminished, for the eye is kept to one point. There are various improvements and modifications of the camera lucida, the best of which is that contrived by Signor Amici of Modena, in which a triangular prism is combined with a plate of glass having parallel surfaces. The camera lucida has been most successfully employed in delineating the forms of wonder and beauty revealed by the microscope. The instrument used for this purpose resembles that commonly applied to landscape-drawing, but is provided with a fitting, which adapts it to the eye-piece of the microscope. The *steel disc* of Sömmering is used by many microscopic draughtsmen instead of the camera. This contrivance is a little disc of polished steel, placed at an angle of 45° with the eye-piece, so as to receive the magnified image of the object and reflect it upwards upon the retina of the observer. The disc is smaller than the aperture of the pupil, and the drawing-pencil can at the same time be seen very well as it traces the image apparently thrown down on the paper beneath. When either the camera or steel disc is used, the body of the microscope must, if possible, be placed horizontally.

CAMERA OBSCURA, *kăm'-e-rā ob-skū'-rā* (Lat., dark chamber), an optical instrument for producing upon a screen the image of a field of view more or less extensive. It was invented by Baptista Porta in the 16th century. It has long been known as a familiar toy, in which form it consists of a rectangular box, furnished at one end with a convex lens, having a focal length equal to the length and depth of the box. Opposite the lens is placed a plane mirror inclined at an angle of 45°, which throws the image of any object to which the lens may be directed on a plate of ground glass at the top of the box. The image thus formed may be traced on the rough surface of the glass by a black-lead pencil. The glass is shaded from the external light by a hinged lid having two side wings. Since the discovery of photography, the camera has become an important scientific instrument, and has

received a number of improvements. The more important modifications of the photographic camera are described in another part of this work, with the operations connected with them. (*See* PHOTOGRAPHY.)

CAMERLINGO, *kam'-er-lin'-go* (Lat. *camerlingus*), signified, originally, according to Du Cange, the treasurer of a pope or emperor, or one who had the management of the public finance. Now the term is only applied to the cardinal who ranks next to the pope, and is at the head of financial matters and justice in the Papal dominions. When the Holy See is vacant, the Cardinal Camerlingo issues the public edicts, and exercises all the other prerogatives of sovereignty.

CAMERONIANS, *kăm-e-ro'-ne-ans*, a name popularly given to a religious sect in Scotland, after one Richard Cameron, who fell a martyr to the cause of religious liberty in 1680. The body themselves, however, reject the designation of Camcronians, as they maintain that their principles date long anterior to that time, and have adopted the title of the *Reformed Presbyterian Church*. When Charles II., after his restoration, attempted to establish episcopacy in Scotland, many of the inhabitants of that country held that he had broken faith with the nation, and had forfeited all claim to their obedience. Some of the more prominent of these were persecuted and imprisoned, and not a few of them suffered martyrdom. Richard Cameron and about twenty others publicly issued a declaration at Sanquhar, and affixed it to the market cross, as a protest against the king and his government. Some weeks afterwards, the party was surprised by a vastly superior force in Ardsmoss, on the confines of the counties of Ayr and Dumfries. After a brave fight, Cameron and his brother were slain, and sixteen others were taken prisoners, and soon after perished on the scaffold. Their principles, however, continued to gain ground, and in 1681 they organized themselves into various societies, maintaining close correspondence with each other. They still continued the objects of the most ruthless persecution. They were proscribed and hunted like wild beasts by the government, no respect being shown to either age or sex, while numbers of them perished on the scaffold or at the stake. Their leader, James Renwick, who was beheaded in 1688, was the last of the Scottish martyrs. The Revolution, which occurred soon after, put an end to their persecutions for conscience sake. They were among the first in Scotland to take up arms in the cause of the prince of Orange, in which they rendered important services, and were "the first men in Scotland that petitioned the Convention of Estates to place the crown of Scotland on the head of their deliverer, King William." After the Revolution, and principally on account of the control exercised by the state in church matters, they were unwilling to unite with the church as then established in Scotland, and they remained a distinct body. They were never very numerous, and after this time they sank into a comparatively obscure sect. They did not form themselves into a regular church till 1743, when, under the direction of the Rev. John McMillan, who had joined them from the established church, they "formed and established a presbytery in the name of Christ, the alone king and head of the Church, under the title of the Reformed Presbytery." After this time they increased in numbers, and in 1811 a synod was constituted, under which there are six presbyteries, with 36 ministers and 45 congregations. The entire number of members is estimated at about 6,000. They have a theological hall, with professorships of systematical theology, and biblical literature and church history. The standards of the church are the Westminster Confession of Faith, the larger and shorter catechisms, and a "Testimony," authorized and issued by the synod in 1339.

CAMERONIANS, or CAMERONITES, the name also of a sect of Calvinists in France, so called from their founder, John Cameron, a learned theologian, born at Glasgow in 1579, and afterwards professor at Bordeaux, Sedan, and Saumur. They asserted that the will of man is only determined by the practical judgment of the mind, and that divine grace moves the will through the light imparted to the judgment. The rigid adherents to the synod of Dort were very severe against them, and the controversy was carried on with great zeal and subtlety on both sides, though the whole question between them was only whether the will of man is determined by God immediately, or mediately by the intervention of knowledge which he imparts to the mind.

CAMISARDS, *kăm-e-sards'*, the name given to the Protestant insurgents in the Cevennes, who, after the revocation of the edict of Nantes, in 1685, being subjected to great persecutions, took up arms in their own defence, and for a time repriaed upon their persecutors with equal cruelties. The name is said to be derived from *camise*, or *chemise*, a shirt, because, when making their nocturnal attacks, they usually wore a kind of shirt over their clothes, in order to distinguish each other; hence camisade signifies a nocturnal attack. After seventeen years of suffering, they at length, in July, 1702, took up arms in their own defence, and, incensed by the speeches and prophecies of some among them who pretended to be inspired, their zeal rose to fanaticism. Severe measures were adopted against them; their villages were burned and their prisoners butchered; and they, in turn, pillaged and burned the Catholic villages, sacked the churches, and massacred the priests. Marshal Villars having, in 1704, succeeded the Marshal de Montrevel, who was first sent out against them, tried pacific instead of harsh measures, and by persuasion and promises induced many of them to lay down their arms; among whom was Jean Cavalier, the ablest and most popular of their leaders. This remarkable man, originally a journeyman baker, afterwards came to England, where he was favourably received, and rose to be a general in the army and governor of Jersey. The recusant Camisards continued in arms for some time; but, being much reduced in strength, their attacks were less frequent, and on a much smaller scale, and by degrees hostilities ceased. A subsequent rising took place in the Vivarais, a part of the Cevennes country, in 1709, which, after a vigorous resistance, was subdued. A work on the Camisards has recently been published by Ernest Alby (Paris, 1858).

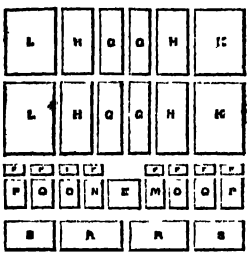
CAMLET, *kăm'-let* (from camel), was the name originally given to a fine cloth made from the hair of the Angora goat. The British camlets are, however, entirely made of sheep's wool, or a mixture of wool with linen or cotton, and spun very hard.

CAMOMILE, or CHAMOMILE. (*See* ANTHEMIS.)

CAMOUFLET, *kăm-oo'-flai*.—In Mil., when sappers and miners have driven a gallery close to any part of the works of a besieged town, a countermine is sometimes made by the besieged, charged with a composition so called, the explosion of which destroys the works of the attacking party, and kills or injures the men employed in the trenches with its intolerable and suffocating odour.

CAMP, *kămp* (Lat. *campus*, a level plain), the name applied to any collection of tents or huts in which soldiers are temporarily lodged in time of war, or to buildings of more lasting character; as the camps at Aldershot and the Curragh. The children of Israel are spoken of in Numbers ii. as pitching their camp, according to their tribes, round the tabernacle in the wilderness; and this is the first mention of a military encampment in history. The Romans paid great attention to the formation of their camps. Wherever the army remained, if only for a single night, a trench was dug, and a rampart thrown up round it for its protection. They were accustomed to make two different kinds of camps,—one for the summer season, when troops were on the march, and the other for soldiers in winter quarters. They were alike in principle of construction, but, while the summer camps were larger in size, being intended for the accommodation of an entire consular army, the winter camps were more strongly fortified. When a Roman army was on the march, some centurions, with a military tribune, were usually sent on before the main body to choose a site and mark out a camp for the encampment of the army for the ensuing night, or for a longer period, as it might happen. The ground chosen was generally as level as possible, and on elevated ground, from which the whole of the surrounding country could be seen. If it could be obtained, a slightly rising ground in the centre was taken for the position of the Prætorium, or headquarters of the general or consul commanding, and the camp was laid out round this spot. It was in the form of a square, and the length of each side

was about 2,080 English feet, when it was intended to accommodate an entire consular army, which consisted of two Roman legions, each of 4,200 foot-soldiers and 300 cavalry, and 10,500 infantry and 1,800 cavalry of allied or auxiliary troops, of which 2,100 infantry and 600 cavalry formed what were termed the extraordinary or picked troops of the allies, who acted as part of the general's body-guard; making the total force under arms about 25,000 men, including officers. There was a gate in each side of the square; namely, the Prætorian gate (A), in the front of the camp, the Decuman (D) in the rear, and the principal gates (C, D) at either extremity of the principal street, which ran



ROMAN CAMP.

through the camp in front of the Prætorium (E), and was 100 feet in width. The tents of the tribunes, who held the chief commands in the Roman legions, and the prefects, who were possessed of equal authority among the auxiliary troops, were placed along the principal street on either side of the general's quarters, but slightly in advance. A road 50 feet in breadth ran from the Prætorium to the Prætorian gate, crossed about midway, at right angles, by another called the Via Quintana. On either side of the passage to the Prætorian gate, the Roman cavalry were posted (G, G), and with them the Triarii, a division of the Roman infantry. (*See* ARMY.) Other passages of fifty feet intervened between the tents of these troops and those of the rest of the Roman infantry (H, H), and also between these and the cavalry and infantry of the allies, part of which were placed on the right wing of the army (K) and part on the left wing (L). On the right of the Prætorium were the quarters of the quæstor (M), who acted as the chief of the commissariat department; on the left, the forum (N), or market. On either side of the quæstor's quarters and the market were placed the tents of the auxiliary cavalry (O, O) and infantry (P, P), that formed the consul's body-guard, separated by the quarters of volunteer troops, consisting of men of rank and station, who had accompanied the army out of friendship towards the general. In the rear of these quarters and the Prætorium were placed the remainder of the chosen or extraordinary auxiliary troops (R, R), while the remaining space (S, S) was occupied by any friendly troops that might be attached to the army for a short time. Between the inner square thus occupied by the encampment and the rampart, an open space, 200 feet in width, intervened. The *vallum*, or rampart, was made of turf and earth taken out of the *fossa*, or ditch, surmounted and strengthened by a row of stakes or palisades. The ditch itself was generally from twelve to fifteen feet wide and nine or ten feet deep. In consequence of the arrangement above described, which they had always adhered to, with certain necessary variations, Babylon, and was then required, according to circumstances, the Phœnicians. It is composing a Roman army and Romans, who brought they were to occupy; and as the age of Praxiteles, marked out before the arrival of very popular in Greece art repaired to its quarters as ornaments of dress, lately proceeded to construct lamps, &c. Antiquarian art and ditch which fell to its the gems commonly and ward was kept during day drinking-cups at guards were relieved every three stone, the outer any remains of Roman camps in Gemæga cameo, no towns the names of which end in "chester," a corruption of the Latin *castra*, a camp, such as Manchester, Colchester, Winchester, &c., have been built on the sites of Roman encampments or military towns, from which they have derived their names. The remains of the Danish camps in this country, or those which are considered to be Danish, indicate that they were circular in form, and sometimes constructed with more than one line of defence. The temporary encampments of the Saxons and Danes were fortified with barricades composed of trees, with the branches cut, to present the form of projecting stakes, and sometimes with a rampart of earth and stones. The Britons protected their villages in a similar manner. The Gauls and ancient Germans surrounded themselves with their waggons and chariots, disposed in the form of a circle, and strengthened by barricades of trees and branches. With regard to the disposition of troops in these circular inclosures, it is known that the Saxons pitched the tent of their chief in the centre, and the cavalry were grouped immediately round it, while the infantry occupied the remaining space between the cavalry and the defensive barriers. Prior to the use of cannon, in the time of the Norman and early Plantagenet kings, it is supposed that English armies were encamped in the field on a plan similar in general principles to that adopted by the Romans, the ground being marked out and a position assigned to each division. When an army was besieging a town, the camp was protected by fortifications to guard against surprise, and when cannon were introduced, redoubts were added at various points of the line of defence. But the practice of grouping the tents or huts in the form of a square or circle has been abandoned for some two centuries or more, to avoid exposing the army to the fire of the enemy in one mass; and it is now considered better to place the tents along an extended front, each regiment occupying the position it would take if the army were drawn up in order of battle (*see* LINES OF INTRENCHMENT), and the tents not showing a greater extent in front than the regiment would occupy when drawn up two deep. A battalion 1,000 strong would therefore require a space in front of 875 feet for the extent of the line of tents, as it would occupy this space when drawn up in file. A regiment of cavalry drawn up two deep, consisting of eight troops of eighty men each, would occupy a front of 960 feet. The tents for the infantry are placed in two rows parallel to the front; the tents of the captains and subalterns occupy another line; and the tents of the field-officers, the adjutant's tent, and the field-officers' horses, are grouped behind these. The tents of the quarter-guard are placed about 250 feet to the front, in the centre of the battalion, and the tents of the rear-guard are pitched about fifty feet to the rear of the adjutant's tent. The regiment parades in front of the first line of tents, between these and the tents of the quarter-guard. A somewhat similar arrangement is adopted for cavalry; but the tents of the privates are pitched in lines perpendicular to the front, instead of being parallel to it as is for infantry, and the horses are picketed between them. When an army is encamped, the infantry is generally disposed in the centre in two lines, with the reserve occupying another line in the rear; the cavalry is placed on either side, and the artillery is placed on the flanks with the cavalry, or in the rear. When an encampment is formed, great attention is always paid to the position of the ground around it, and all approaches are fortified against attack by redoubts and intrenchments. Advanced guards are also thrown out all round, to guard against surprise or sudden attack. Any good plan of the disposition of the British and French forces before Sebastopol, showing the nature of the ground and the position of the redoubts that defended the approaches, will give the reader the best idea of the arrangement of a modern camp, which must always be governed by the nature of the surrounding country.

CAMPAIGN, *kăm-pain'* (Fr. *campagne*, Ital. *campagna*, an open plain), a term applied in the present day to a series of operations in warfare, by which any important end is achieved. It was formerly taken to mean that which was done by an army between the time that it left its winter-quarters for active operations in the field during the summer months, until it entered them again. During this time the soldiers were under can-

vas or without shelter in the open field; and hence the name.

Camp at Aldershot.—This camp, and the camp at the Curragh of Kildare, in Ireland, are permanent camps, intended for the instruction of officers and soldiers in military science and operations in the field, and to teach them how armies, divisions, and brigades are handled in warfare, forming, in fact, practical military schools on a large scale. For this purpose, the country round Aldershot is well adapted, being composed of moorland, heath, and common, unfit for cultivation, but admirably well suited for sham fights and the construction of siege-works and intrenchments. The heath, which was purchased by government in 1854 for about £130,000, has an area of rather more than 7,000 acres. The situation presents advantages of a peculiar nature in being near the London and South-Western and South-Eastern railways, which renders it convenient for the dispatch of troops to the southern shores of England at very short notice, should occasion ever require it. The camp was immediately laid out and drained, and roads formed; blocks of wooden huts were also constructed for the reception of the soldiers, which have since been replaced by brick barracks replete with every convenience, at a cost of more than £250,000, forming the finest barracks in the world. The buildings form two long lines, with a parade-ground between them, the infantry and artillery occupying what is called the North Camp, and the cavalry the South Camp. The barracks are disposed in the form of blocks, or quadrangles, with a courtyard in the centre, each block affording accommodation for an entire regiment, and containing sleeping-rooms, each for twenty-four men, washing-rooms, mess-rooms, school-rooms, kitchens, and the necessary offices, with separate apartments for the sergeants and married soldiers. The officers' barracks and mess-rooms are situated in the spaces that intervene between the blocks. The sleeping-rooms have balconies attached, from which the men gain a view of the surrounding country and parade-grounds. Drill-grounds, covered in with glass, have been made, and suitable play-grounds, in different parts of the camp. Stables, and sheds for guns and stores, are attached to the artillery and cavalry barracks. Lectures and amateur theatrical performances are given for the instruction and amusement of the men, and the only requisites to be added for the soldier's recreation are those of soldiers' club-houses and gardens, to counteract the ill effects of beer-houses and other places of demoralization that abound in the neighbourhood. Captain Jackson's report on the condition of the camp and neighbourhood, made by order of government, will doubtless soon cause the former to be provided; and the example set by the emperor of the French at the camp at Châlons will bring about the establishment of the latter.—*Ref.* Mrs. Young's *Aldershot and all about it.*

Camp Equipage, a term under which are included all necessary articles for the use of the soldier in the field, such as tents, tent-furniture, and cooking utensils. Both officers and men are restricted to a certain quantity of camp equipage, that the army may move from place to place with as little incumbrance as possible. (*See* Tent.) The camp equipage of an army on the march in India exceeds that of all others, on account of the peculiar requirements of the eastern climate and the numbers of non-combatants that move with it. (*See* Camp-Followers.)

Camp-Followers, the name given to the sutlers and men and women who deal in trifling commodities, and follow an army on the march. In India there are often as many as five camp-followers for every officer and soldier in the army. When in the field they are subject to the Articles of War. They prove of some utility in a battle for the purpose of conveying the wounded to the rear, or by assisting to do so; but the majority of them, the women especially, are persons of low character and habits, and follow the army for the sake of plundering the slain, often killing the wounded after nightfall, for the sake of the watches, money, and jewellery that they may have about them. They will often purchase valuable articles from the soldiers for small sums of money, and many have been known to acquire considerable wealth by these and other questionable means.

Camp-Meetings are religious festivals held among the Methodists in some parts of England and the United States of America. In the latter country, Presbyterians also, particularly in the back settlements, have their camp-meetings. In America, on these occasions, the people assemble from great distances, some in waggons, others on horseback, sometimes to the number of 15,000 or 20,000. They bring their provisions with them, and, erecting booths, they devote six or eight days to religious exercises. Besides prayer-meetings morning and evening, there are four sermons daily during the festival, and the Lord's Supper is celebrated on the Sunday. In Mrs. Stowe's "Dred" there is an account of an extraordinary camp-meeting. Among the Methodists of England the camp-meeting only lasts for one day.

Campanile, *kăm'-pa-nile* (Ital. *campana*, a bell), the Italian name for a belfry or bell-tower, and thence applied in Arch. to any part of a building that rises above the rest in the form of a square tower. The campanile differs from the English bell-tower in being detached from the building to which it belongs. There are some good examples in modern English church architecture, the best of which will be found at Wilton, in Wiltshire, appended to the Byzantine church built by Lord Herbert of Lea. In domestic architecture the campanile usually rises over the entrance, terminating in a room of small size at the top, which often answers the purpose of a belvidere. (*See* Belvidere.) The chimney-shafts of engine-houses are often built in this style. It is a distinctive feature of Italian architecture, and is found in Byzantine architecture of the third period (*see* Byzantine Architecture), as exemplified in that attached to the church of St. Mark at Venice. They are generally square in form, without buttresses, and of the same dimensions from top to bottom. The leaning tower of Pisa is, however, an example of the circular campanile. Among those which are to be seen in almost every Italian town, the campaniles at Cremona and Florence are most worthy of notice, the former for its great height (395 feet) and the latter for the great beauty of its design and execution. It was built by Giotto in 1334, and is 269 feet high, occupying an area of 45 feet square. The exterior is coated with slabs of coloured marble. It was the intention of the architect to have placed a spire on the top, but his design has never been carried out. There is a good campanile, 350 feet high, attached to the cathedral of Seville, built at the close of the 12th century, now called La Giralda, from an enormous weathercock, a ton and a half in weight, cast in bronze, which was put up in 1568. It represents a female figure.

Campanula, *kăm-păn'-u-lă* (Lat., a little bell), in Bot. the Bell-flower, a gen. of plants forming the type of the nat. ord. *Campanulaceæ*. It includes several British species, which are known to all lovers of wild flowers; thus, *C. rotundifolia* is the hare-bell; *C. glomerata*, the clustered bell-flower; and *C. rapunculus*, the rampions. The roots of the latter species are eaten in some parts.

Campanulaceæ, *kăm-păn-u-lai'-se-e*, in Bot., a nat. ord. of dicotyledonous plants in the sub-class *Corollifloræ*, consisting of herbs, or undershrubs, with the following characters:—Leaves nearly always alternate, exstipulate; calyx superior, persistent; corolla monopetalous, regular; stamens equal in number to the lobes of the corolla, with which they are alternate; anthers 2-celled, distinct, or partly united; fruit dry, capsular, opening by lateral fissures or valves at the top, many-seeded; seeds with fleshy albumen. There are 29 genera and 500 species, chiefly natives of the temperate parts of the northern hemisphere.

Campanularia, Campanularidæ, *kăm-păn-u-lai'-ri-a*, a gen. and fam. of zoophytes. This division is thus characterized by Dr. Johnston: "Polypedom plant-like, horny, rooted by a creeping tubular fibre, branched or simple; the polypæ cell-within and campanulate, terminal, elevated on a ringed footstalk disposed either alternately or irregular." The above authority also mentions having seen the antennæ of a crab so completely invested with this zoophyte as to resemble hairy brushes, the coraline in this instance having chosen a station by which it obtained all the benefits of locomotion.

CAMPBELLITES, or DISCIPLES OF CHRIST, *kăm'-bel-ites*, an American sect of Baptists founded by Alexander Campbell, a Scotchman, who left the Presbyterian church in 1812. He became united with a Baptist association, but, protesting against all human creeds as a bond of union, and declaring that the Bible alone ought to be accepted as the rule of faith and practice, he was excluded from the fellowship of the Baptists in 1827. His followers formed themselves into a separate body, and in 1833 were supposed to number 100,000 souls. In 1841 Mr. Campbell founded a college at Bethany, in Virginia, which is attended by about 150 students. The sect at present is supposed to number about 150,000 persons, principally in the states of Virginia, Tennessee, and Kentucky.

CAMPHENE, CAMPHILINE, or DADYL, *kăm'-pheen*, a product obtained from turpentine by acting on that body with hydrochloric acid. Hydrochlorate of camphene is formed, which is transformed into camphene by the abstraction of the hydrochloric acid by the aid of quicklime.

CAMPHINE, *kam-pheen'*, a name applied commercially to a pure variety of oil of turpentine which is said to be furnished by the *Pinus australis* of the southern states of America.

CAMPHOGENS, *kăm'-fo-jens*, a series of hydrocarbons, which, when treated with hydrochloric acid, form artificial *camphor* or *terebenes*. They include oil of turpentine, oil of lemons, oil of rue, and one or two others.

CAMPHOR, *kăm'-for* (Gr. *kamphogen*, Arab. *kaphoor*), a solid crystalline substance found in many plants, though only obtained in large quantities from two; namely, *Camphora officinarum* and *Dryobalanops aromatica*. The former, an evergreen tree growing in China, Formosa, and Japan, yields almost all the camphor of European commerce. The camphor, which may be regarded as a solid volatile oil, is diffused through the entire plant, and is separated from the root, trunk, and branches. These parts are cut into chips, and boiled in water till the camphor begins to adhere to the stirring-rod, when the liquid is strained and allowed to stand until the camphor concretes. It is then sublimed into inverted straw cones contained within the earthen capitals of the stills. Vast quantities of this *crude camphor* are procured from the province of Fokien, in China, and the opposite island of Formosa; but some of good quality is exported from Japan. It is generally in small greyish, slightly sparkling grains, which, by aggregation, form crumbling cakes. Refined camphor is prepared by mixing the crude product with lime, and subliming it into thin glass vessels of a peculiar shape, which are afterwards cracked so as to obtain the camphor in concavo-convex cakes, each about three inches thick, with a hole in the middle. Camphor is colourless and translucent, and has a strong, penetrating, aromatic odour, and a bitter, rather pungent taste, though leaving a sensation of coolness in the mouth. Its specific gravity is from ·98 to ·99; so that it floats upon water, and, evaporating while doing so, undergoes a curious rotatory movement. It volatilizes slowly at ordinary temperatures, melts at 288° Fahr., boils at 400°, and burns with a bright flame. It is soluble in alcohol, ether, oils, and dilute acids; also to a certain extent in water. The Sumatra or Borneo camphor is the produce of *Dryobalanops aromatica*. It greatly resembles the ordinary camphor, but is never seen in European commerce, because the Chinese give a price for it eighty or a hundred times greater than that at which they sell their own camphor. It does not appear, however, that the Sumatra camphor is in any way preferable to that of China. The same tree which affords this rare substance yields also a pale yellowish limpid fluid, called *liquid camphor*, or *camphor oil*. Artificial camphor, closely resembling the natural product, may be formed by acting upon oil of turpentine with hydrochloric acid. It differs from true camphor in burning with a sooty flame, and in giving off, when heated, the odour of turpentine. Camphor is used in medicine, both internally and externally, as a temporary stimulant. In moderate doses, it will allay nervous irritation and produce quietude and placidity of feeling. In very large doses it acts as a narcotic, and is said to be poisonous. Raspail, the founder of a peculiar system of medicine widely adopted in France, elevates camphor almost to the dignity of a universal medicine. The alcoholic solution of camphor and liniments, of which it is the principal ingredient, are much used for external application in sprains and bruises, chilblains, and chronic rheumatism. Insects are kept from attacking specimens of natural history by placing pieces of camphor in the cases in which such specimens are preserved. Chemically considered, camphor is a compound of carbon, hydrogen, and oxygen, in the proportions expressed by the formula $C_{10}H_{8}O$.

CAMPHORA, *kăm-fo'-ra*, in Bot., a gen. of plants belonging to the nat. ord. *Lauraceæ*. The most interesting species is *C. officinarum*, the camphor-tree, a native of China, Formosa, and Japan, where it grows to a considerable size. It is an evergreen, and all parts emit a champhoraceous odour when bruised. The wood is white, light, and durable, and is much used in China for carpenter's work. From the roots, trunk, and branches of this plant, the *common*, or *officinal camphor*, is obtained. (*See* CAMPHOR.)

CAMPHORIC ACID, *kăm-for'-ik*, is formed when camphor is acted on by concentrated nitric acid. It crystallizes in lamellar or acicular crystals, which have a bitterish sour taste. They melt at 158° Fahr. and dissolve slightly in water. Camphoric acid forms salts with various bases.

CAMPHORONE, *kăm'-fron*, a liquid formed by passing the vapour of camphor over red-hot lime.

CAMPION. (*See* LYCHNIS and SILENE.)

CAMPYLOSPERME, *kăm-pi-los-per'-me* (Gr. *kampulos*, a curve; *sperma*, seed), in Bot., a sub-ord. of the *Umbelliferæ*, characterized by the albumen of the seed being rolled inwards at the edges, so as to present a vertical furrow on its face.

CANAILLE, *kăn-ile'* (Lat. *canis*, a dog), is a French term sometimes used in this country, and signifying the lowest class of the people,—the rabble. Formerly, before the revolution in France, this word was applied by the nobility to all who were not of their own rank; and afterwards the people themselves adopted it in contempt of the aristocracy, when it came to lose its offensive signification. At present, the French apply the term only to such as have been guilty of some base act. Of one who has degraded himself, whatever his rank, they say, "C'est une canaille."

CANWOOD. (*See* BAPHIA.)

CANAL, *kăn-ăl'* (Lat. *canalis*, a water-course), an artificial water-course made for the purpose of facilitating communication and the carriage of coals, bricks, and heavy goods, from a seaport to any inland town, or from one inland town to another. Some are broad and deep enough to admit of the passage of vessels of considerable tonnage, in which case they are termed "ship canals;" others are but limited in length, and merely intended to allow barges and small vessels to pass from one part of a navigable river to another, and hereby to avoid any shallows or irregularity in its course that tend to obstruct navigation, or to cut off any bend of considerable extent;—these are called "lateral canals." Canals cut for the purpose of allowing the passage of boats from one river to another, each supplied by a different watershed, such as the Canal du Centre in France, are called "summit-level canals." All the great nations mentioned in the early history of the world were in the habit of constructing canals for promoting inland navigation. Remains of engineering works of this nature of considerable extent are to be found in India, Egypt, and the plains of Assyria, watered by the Tigris and Euphrates. The canals of the Chinese are of great length, the Great or Imperial canal, by which Pekin is supplied with rice, and the various productions of the provinces that lie to the south of it, is 700 miles long. It was not until the 15th century that locks were used. They are said to have been introduced by Leonardo da Vinci in the construction of a canal near Milan. Up to this time canals had merely been long lines of water of the same level throughout; but the contrivance known as the "lock" allowed them to be made in short lengths of different levels, so that the surface of the last inland reach of any canal might be many feet above the level of that next to the river or estuary with which it communicated, and admitted of their construction through rising ground of irregular surface as well as level plains. In Holland, canals take the place of roads

in a great measure; but the extreme flatness of the country renders the use of the lock less requisite than in other parts of Europe. The first canal of any importance made in France was the Canal de Briare, which unites the rivers Loire and Seine, which was completed in 1642; but the greatest engineering work of this kind ever attempted in that country is the Southern canal, or canal of Languedoc, which connects the Mediterranean with the Atlantic Ocean, and allows vessels of 100 tons burden to pass along its entire length. It is nearly 150 miles long, with upwards of 100 locks. It is carried over many valleys by means of aqueducts, and is 600 feet above the level of the sea in its highest part. This great undertaking was finished in 1681. In England, the construction of canals did not commence until the middle of the 18th century, although the New River canal had been cut and completed by the year 1614, and the Thames made navigable as far as Oxford a few years later. Among the principal English canals may be mentioned the Bridgewater canal, constructed by Mr. Brindley for the duke of Bridgewater, commenced in 1758, and the Grand Junction canal, completed 1790, which communicates with several others, and affords inland communication between the ports of London, Bristol, Liverpool, and Hull, by the various canals and rivers with which it is connected. In America, the Great Erie canal, 363 miles long, is one of the most famous; and the Welland canal, which connects Lake Erie with Lake Ontario, and enables vessels to pass from one lake to the other, which the Falls of Niagara would otherwise prevent. The Ganges canal, in India, cut for the purpose of watering the land between the Ganges and the Jumna, is the largest in the world; it is 900 miles in length, and, when completed, will have cost upwards of £1,500,000. In late years schemes have been introduced for uniting the Atlantic and Pacific oceans by a ship canal across the Isthmus of Panama, and for cutting a canal through the Isthmus of Suez, to allow vessels *en route* for India to pass from the Mediterranean Sea to the Red Sea. M. de Lesseps, the projector and engineer of the last-named canal, has commenced operations; but it is a matter of great doubt if the works will ever be completed. Ship canals are generally short in length, being intended for the passage of vessels from the coast to towns situated at a short distance from it, or from one sea to another. Among the most notable of this description are the North Holland canal, between the Helder and Amsterdam, and the Caledonian canal, between the North Sea and the Atlantic, connecting Beauly Firth, an arm of the Moray Firth, and lochs Ness, Oich, Lochy, and Eil, with Loch Linnhe on the western coast, by means of cuttings from one to another. The former is 51 miles in length, 125 feet wide at the surface, 31 feet across the bottom, and 20 feet deep. It is below the level of the sea, but it is protected by embankments from any influx of the ocean. The locks are 297 feet long and 51 feet broad, for large vessels; but there are some of less size to admit of the passage of smaller vessels. Ships of 1,400 tons burden can pass through the larger locks. The entire length of the Caledonian canal from Beauly Firth to Loch Linnhe is 60 miles, of which 23 are artificial cuttings, and the remainder the intervening lochs above named. The cuttings are 115 feet across the surface of the water, 50 across the bottom, and 20 feet deep: there are 28 locks in the course of the canal, about 175 feet long and 40 wide. The difference in level between each reach is about 8 feet. The entrance to a ship canal should be sheltered, and in such a position that it may be free from the deposit of mud and alluvial matter. The nature and construction of locks and lock-chambers for these and other canals will be found elsewhere. (*See* LOCK.) Towing-paths are made on both sides, and are about three feet above the level of the water. The top of the shelving bank on either side is cut in the form of a step, to leave a few feet of shallow water between the main body of water in the centre and the towing-paths on the sides, to break the action of waves against the banks. The slope of the sides differs in different canals, but can easily be calculated from the dimensions of the depth and breadth at different points, as may be seen by reference to the annexed figure, which shows a section of the Caledonian canal. Lateral canals are used as a means of affording a remedy for defective navigation in a river; they are similar in general principles to the ship canal and ordinary canal for barges; but as the natural course of the river itself is made available for the passage of vessels in some parts, works of a peculiar construction



SECTION OF THE CALEDONIAN CANAL.

are required to allow barges to pass from the river to the canal, and *vice versâ*, or from one side of a river to the other, which is often necessary to avoid interference with another stream joining the main river below the point of transit. Sometimes it is contrived to carry a canal over any large tributary by means of an aqueduct. The dimensions of the lateral canal of the Loire, one of the best of its class, are as follows: — Breadth across the surface of the water, 33 feet; depth, 5 feet 3 inches; length of locks, 100 feet, breadth, 17 feet. The breadth of ordinary barge canals in England varies from 16 to 50 feet across the water-line, and the depth ranges from 4 to 6 feet. The floor-line, or bottom, is rather more than twice the breadth of the largest boat likely to be used on the canal. The angle of inclination of the sides to the bottom varies from 138° to 150°; and, indeed, it is better to make the angle of inclination as large as possible, unless the sides are formed of masonry. Even small canals should have surf-beams, or indentations near the top of the slope, to receive shallow water; but this is generally neglected. The edge of the bank is sometimes strengthened by a low parapet, to prevent injury from the perpetual chafing of the tow-ropes; and by paving or camp-sheeting, to protect it from the wash of the waves used by the passage of vessels. The towing-paths vary in 4 to 16 feet in width, accordingly as the towing is ected by means of men or horses. When it is necessary to cut a tunnel for the passage of a canal, a narrow spac netimes allowed for a towing-path on one r both sides; but when there are no towing-paths, the bargemen force their boats through by lying on their backs on the top of the cargo and pushing against the top of the tunnel with their feet. Sometimes the barges are hauled through by pulling hand-over-hand along ropes fixed at either end of the tunnel; and, in other cases, by machinery especially adapted for the purpose. The bottom d sides of canals are made impervious to water by coating them with a thick surface of puddle,—a mixture of loam or clay, gravel, and water, which is worked with a spade until it will neither absorb water nor admit of its passage. Sometimes concrete is used instead of puddle, particularly by the French. In addition to this, and the construction of locks and works for communication with rivers, as in lateral canals, the engineer must be careful to secure an ample supply of water from natural and artificial sources, such as reservoirs, particularly in the construction of summit-level canals; and to construct basins, wharfs, sidings, and intermediate stations, to facilitate the passage of vessels and the loading and unloading of their cargoes. He has also to build aqueducts to carry the canal across valleys, and siphon-aqueducts and culverts (*see* SIPHON-AQUEDUCT, CULVERT) for the passage of streams and water under the bed of the canal; and to make fixed bridges, swing bridges, and lifting bridges, to secure means of transit from side to side. Stop-gates and means of drainage are also required, by which the water may be shut off from any part of the canal, and its contents emptied in order to effect necessary repairs; and the engineer must carefully consider the daily loss of water arising from evaporation, and the leakage through lock-gates, and provide for an ample supply to compensate for loss constantly arising from these causes and the passage of boats through the locks. In some cases, the loss from transit of boats from one reach to another is guarded against by overcoming the difference of level by raising and lowering boats perpendicularly by means

of machinery, or by taking them on carriages up and down a railway laid on an inclined plane, or by floating the barges into large water-tight cases, which move on an incline by means of rollers.—*Ref.* Smiles's *Lives of the Engineers*; *English Cyclopædia*—Arts and Sciences.

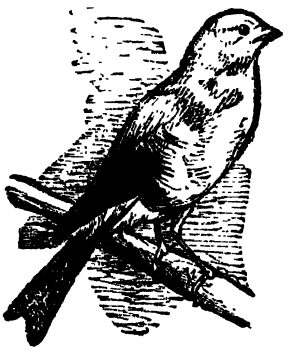
CANAL, or CANALIS (Lat. *canna*, a reed), is applied to many parts of the human body. *Canalis arteriosus* is a blood-vessel in the fœtus, which unites the pulmonary artery and the aorta, but which disappears after birth. *Canalis venosus*, a canal which in the fœtus conveys the blood from the vena portæ of the liver to the ascending vena cavæ. *Canalis nasalis*, a canal going from the internal canthus of the eye downwards into the nose.

CANARD, *kă-nard'*, a term recently adopted by us from the French, in which language it signifies a duck. With us it is used in a secondary sense, to denote a piece of information given out with the view of misleading, or in order to bring about some desirable result.

CANARIES, *kăn-ai'-rees*, in Mus., a lively dance-tune, in three-eight time, said to have been introduced into this country from the Canary Islands. It is, however, more probable that it was carried over from Normandy to these islands by John de Bethencourt, who invaded them about the close of the 14th century. The Canar is introduced by Purcell in his "Diocletian:" the tune is in two strains of eight bars each, in three-eight t

CANARIUM, *ka-nai'-ri-um*, in Bot., a gen. of plants belonging to the nat. ord. *Amyridaceæ*. The species are natives of the Spice Islands and parts of Asia. *C. commune* is cultivated for sake of the kernels of its fruit, and for the fragrant resinous substance which exudes from its bark. The latter probably constitutes the Manilla Elemi of commerce. *C* an oil very like copaiva, known in shipbuilding-yards as Damar. Other species produce edible fruits, useful oils, and resins.

CANARY-BIRD, *kă-nai'-re* (*Carduelis canaria*).—This popular and pretty singing-bird is a native of the Canary Islands. Its introduction into Europe was somewhat singular. According to some authorities, at the end of the 14th century, and to others, at the beginning of the 16th century, a vessel containing, among other merchandise, a number of canary-birds, and which was bound for Leghorn, was wrecked on the



LONDON CANARY.

coast of Italy. The birds, being set at liberty, took refuge in the adjacent island of Elba, and the climate being congenial to their habits, they increased considerably. The islanders, finding such an elegant songster suddenly settling in their country, were anxious to become possessors of them, and quickly the whole colony of canaries were taken prisoners. From Italy they were brought to other countries, and became highly valued as singing-birds. The wild bird of the Canary Islands and the domesticated bird so familiar in this country are quite at variance in personal appearance. The colour of the wild canary is a dusky grey; whereas, in the domesticated canary, we have a great variety of colours,—green, yellow, white, brown, grey, &c. This is, of course, owing to the numerous cross-breedings this species has been subjected to. It breeds freely with several other species; the goldfinch, the bullfinch, the siskin, the green-bird, and the linnet, among the number. Altogether, it is reckoned that there are no less than thirty varieties of the canary. The best authority on the subject says,—"Those canaries that have the upper part of the body of a dusky green or linnet-brown, and the under-part the yellowish green of the green-bird, with dark-brown eyes, are the strongest, and most nearly resemble the primitive race. The yellow and the white have often red eyes, and are the most tender. The chestnut are the most uncommon, and hold a middle rank for strength and length of life between the two extremes. The canary that is most admired amongst us now is one with the body white or yellow; the head (particularly if crested), wings, and tail, yellowish-dun. The second in degree is of a golden yellow, with the head, wings, and tail black, or, at least, dusky grey. Next follow the grey or blackish, with a yellow head and collar, and the yellow, with a blackish or green tuft, both [illegible] which are very much valued. As for those that are [illegible]egularly spotted, speckled, or variegated, they are [illegible]h less sought after, and are used to pair with those of one colour,—white, yellow, grey, brown-grey, and the like."—(Bechstein's *Cage-Birds*.) In Germany and the Tyrol the breeding of this bird is carried on on an extensive scale, and it is principally from these places that the rest of Europe is supplied. In its native home, the canary builds its nest in thick, bushy, high shrubs and trees, with roots, moss, feathers, [illegible] pairs in February, lays from four to six pale-blue eggs, and hatches five and often six times in the season. Bechstein gives the following directions for getting and keeping good canaries:—"The most essential is to choose from among the young that which promises a fine tone, and to seclude it from all other birds, that it may learn and remember nothing bad. The same precaution is necessary during the first and second moultings; for, being likely to relearn, if I may say so, its song, it would introduce into it, with equal ease, foreign parts. It must be observed whether the bird likes to sing alone or in company with others; for there are some which appear to have such whims, liking to hear only themselves, and which pout for whole years if they are not humoured on this point. Others sing faintly, and display their powers only when they can try their strength against a rival. It is very important to distribute regularly to singing-birds the ample allowance of fresh food which is intended for the day. By this means they will sing every day equally; because they will eat uniformly, and not pick the best one day, and be obliged to put up with the refuse the next. About two spoonfuls of dry food is sufficient for the daily nourishment of a canary."

CANARY-GRASS. (*See* PHALARIS.)

CANARY WINE.—This wine, which is also known by the name of Teneriffe, is a product of the Canary Islands. In taste it resembles Madeira: it is made from grapes which have been gathered before they are ripe, and, when new, has a sour and unpleasant taste. After being kept carefully for two or three years, its mildness increases greatly, and, like Madeira, it is greatly improved by a journey to the tropics. More of it is produced on the island of Teneriffe than on the other Canary islands. The name of Canary is only applied to the Bidogne wine, and never to the Malvoisie or Malmsey of the Canaries.

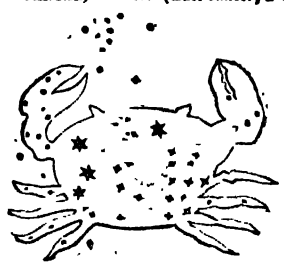
CANCELLARII, *kăn-sel-lai'-ri-i*, the name given to an inferior class of servants of the church in the earlier part of its history, but the precise nature of whose duties is doubtful.

CANCELLI, *kăn-sel'-li* (Lat., lattice-work), in Med., is applied to the spongy or reticular substance of the bones. (*See* BONE.)

CANCELLING OF A DEED, *kăn'-sel-ling*, is a delivery of it up to have lines drawn over it in the form of lattice-work or *cancelli*, though the phrase is used figuratively for any manner of obliterating or defacing it. This mode is principally used in the case of bonds or other deeds, by an order of a court. But, generally speaking, the effect of a deed can only be de-

stroyed by an actual release.—As to the effect of cancellation, the student is referred to Viner's *Abridgment*, Faits (x. 2, 3, 4); Shepherd's *Touchstone*, 70; and the case of Todd *v.* Emly, 11 *Mecson & Welsby's Reports*, 4.

CANCER, *kăn'-ser* (Lat. *cancer*, a crab), in Astron., a constellation from which the fourth sign of the zodiac derives its name, although it is many centuries since the constellation and the sign occupied the same position. The zodiacal division so called occupies the thirty degrees of the ecliptic between 90° and 120° from the first point of Libra, or the vernal equinox. The most conspicuous star in the constellation is *Acubens*, a star of the third magnitude.



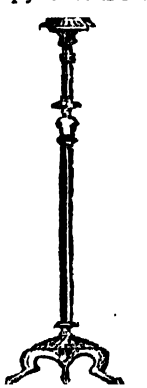
CANCER.

CANCER (so called from the large blue veins which appear, in cancer, to resemble crab's claws), is a disease of a very malignant character, making its appearance as a scirrhous tumour, which ultimately terminates in an ill-conditioned and deep ulcer. Any part of the body may be the seat of this disease, though the glands are most liable to its attack. The female breast, the tongue, or lips, are among the parts most subject to it. The tumour at first is small, hard, indolent, and nearly insensible, with little or no discoloration of the surrounding skin. It remains in t state for a longer or shorter period, sometimes for years, but at length it passes into a more active condition:—the tumour increases in size, the skin changes to a livid or red appearance, and pain begins to be felt in it. The pain, which is of a shooting or lancinating nature, is at first slight, and occurs at considerable intervals; but it increases by degrees, and the intervals diminish until it becomes almost constant. The cutaneous veins become turgid, and the surface of the tumour presents to the feel a knotty, uneven surface. Sometimes the skin never actually breaks, but usually, after a longer or shorter period, the tumour ulcerates and becomes an open sore. The discharge is of a thin, fœtid, acrid nature, which corrodes the surrounding parts. The sore presents thick jagged edges and a soft centre, eaten as it were into irregular cells. The shooting pains are now much increased, and are of a very violent nature. The disease pursues its onward course; sometimes it seems as if it had exhausted itself, and was allowing nature to work a cure by the formation of new flesh; but this is merely a delusion, for it soon recommences its destructive course, and at length, it may be after years, it seizes upon some vital organ, or the patient sinks exhausted by the pain and continued drain upon his system. Of the cause, nature, or treatment of this terrible disease little is, unfortunately, known. By some it is regarded as constitutional, by others as local; some maintain that it is hereditary, others that it may be transmitted by inoculation. So far as may be judged from the conflicting evidence on these points, there does seem, in general, to be a certain constitutional predisposition to this disease; though, according to Mr. Paget, only a sixth of the cases can be traced to any hereditary transmission. The evidence is against its being transmitted by inoculation. If cancer be at any period merely a local disease, it can only be in its earliest stage, for, in a short time, the whole system seems to be infected with it; and hence it is that, after a time, the extirpation of the original tumour so often fails in effecting a complete cure. Though all ages and both sexes are liable to this disease, the young are less frequently attacked by it than the old, and females are more subject to it than males. Though cancer is, unfortunately, by no means uncommon, it is not all, nor even the majority of tumours, that bear a general resemblance to it, that are cancerous; in fact, it is often with the greatest difficulty that the cancerous or non-cancerous nature of a tumour can be determined: the presumption always is, in the case of a tumour getting well, that it was not cancer: hence the great importance, in every suspicious case, of having recourse to a skilful surgeon. With medical quacks every tumour is pronounced to be a cancer, and every cancer curable, the cures effected in the former case being taken credit for as of cancer; and, in the latter case, much excruciating agony is entailed upon the sufferer without any benefit. The only hope of a cure in cancer is by extirpating the tumour in its earliest stages; and even this, after all, frequently affords but a temporary relief. According to Mr. Paget (*Lectures on Surgical Pathology*), the average duration of life after the appearance of the cancer is forty-nine months. In forty-nine cases in which the cancer was once removed by operation, the average duration of life was somewhat more than forty-nine months; and hence he concludes that the average duration of life is not materially affected by the removal of the local disease, but adds, that it is probable that the progress of the more rapid cases is retarded by the operation. Sometimes, in place of the knife, escharotics, as chloride of zinc, are had recourse to, but with no better success. Though a cure may not be expected, much good may be effected by means of palliatives; the patient is to be sustained by good nourishing diet, but all stimulants are to be avoided, and everything that would tend to increase the activity of the disease. The state of the general health is to be carefully attended to, and both mind and body kept as free from excitement as possible. In the local treatment of the disease, sedatives, as hemlock, henbane, and opium, are to be had recourse to in order to allay the pain. Among the lower animals this disease is not of unfrequent occurrence, the animals most liable to its attack being the dog and cat.

CANCER, a gen. of short-tailed *Crustacea*. The term is now generally restricted to the common crab. (*See* CRAB.)

CANCER-ROOT. (*See* EPIPHEGUS.)

CANDELABRUM, *kăn'-de-lah'-brum* (Lat. *candela*, a candle), an article of furniture much used by the ancients both in public and private buildings. Although properly signifying simply a candlestick, the term was generally applied to the support of a lamp. The candelabra used in public edifices were mostly of large size, with a cup or receptacle at the top, to contain a lamp or some substance capable of illuminating. Some of the candelabra discovered at Herculaneum and Pompeii have long thin bronze stands, with flat disks or vases at the top, on which the light was placed. The bases of these are usually triangular, with the head of a lion, griffin, or goat at each angle. In all buildings the candelabra were amongst the most richly-ornamented articles, and were made of bronze, iron, marble, terracotta, and wood. Some, however, were made or covered with gold and silver. Sometimes, instead of a shaft, a figure was introduced, holding, in one hand, the cup or receptacle for the oil. A small candelabrum was used as an altar. There are several specimens of the ancient candelabra in the Townley collection in the British Museum.



CANDELABRUM.

CANDIDATE, *kăn'-di-dait* (Lat. *candidus*, white), is a term used to denote an applicant for any office, privilege, or position. It is derived from the Romans, among whom those who sought offices or preferments wore white robes, and were called *candidati*. In this dress the candidate endeavoured to gain popular favour in every possible way,—by canvassing the people, addressing them in the market-place, and, it may be,

exhibiting the wounds he had received in the service of his country. Notwithstanding the severe laws against corruption, bribery was largely resorted to on such occasions. In the early Christian church, newly-baptized converts wore white robes for eight days after baptism, and were hence termed *candidi*.

CANDLE, CORPSE, or DEAD-LIGHTS, *korps kān'-dl*, are superstitious appearances which are still believed in in various parts of the country, particularly in Wales and the north of Scotland. The appearance is said to resemble the flame of a candle, and to proceed from the house of a person who is about to die, and to pursue its way to the churchyard precisely in the same way that the corpse is afterwards to be carried. If the light is small, and of a pale-bluish colour, the corpse will be that of an infant; if larger, that of a person of some age. If several of different sizes are seen, then will so many corpses of like ages pass together.—*Ref.* Brand's *Popular Antiquities*.

CANDLE, INCH OF, was formerly a mode of marking a certain period of time, generally for deliberation or making up one's mind. Thus, *excommunication by inch of candle* was when the offender was allowed time to repent so long as a candle continued burning, after which sentence of excommunication was pronounced against him. *Sale* or *auction by inch of candle* was a form of sale at which persons were allowed to bid while a small piece of candle continued burning; and the moment it expired the property was adjudged to the last bidder.

CANDLE-TREE. (*See* PARMENTIERA.)

CANDLES, *kān'-dls* (Lat., Sp., Ital. *candela*).—A candle may be defined as a contrivance for purposes of illumination, consisting of a wick of fibrous material, surrounded by solid fatty matter, being distinguished in this latter particular from lamps, in which the fatty matter is liquid. It is difficult to determine the exact date at which candles were first used. There are several instances of candles being mentioned in the Old and New Testaments; but the context proves in most cases that the Hebrew word should be translated *lamp*, and not *candle*. For example, the seven-branched candlestick is ordered to have seven lamps made for it, and Aaron is directed to use olive-oil as the fuel thereof. Torches are mentioned in various ancient writings, and from them, no doubt, candles were gradually developed. Pliny, however, describes a candle made of brittle rushes, which clearly corresponds to our modern rush-light. In the later days of the Romans, wax candles were much used by the upper classes. In the Middle Ages candles of the same material were made, weighing as much as 50 lbs.; and the Britons and Anglo-Saxons used ornamented tapers in their processions. The use made of candles by King Alfred for horological purposes is too well known to need further allusion. Good old Gilbert White of Selborne describes rushlights as being made and used by the cottagers in his time. The manufacture of candles progressed but little in this country until the year 1799, when W. Bolts took out a patent for various improvements in candle-making, consisting chiefly of a method of pressing the tallow during the act of cooling. The patent likewise describes a candle-hol[illegible] in which the candle is pressed upwards by means of a spiral spring, a contrivance which has been revived with great success in our own days. Most of the improvements up to the present time have been in the same direction,—the removal of the various objectionable properties of the common tallow candle. The disagreeable smell of tallow arises from its being improperly purified; for, if it contain the minutest portion of cellular matter, it readily putrefies. Tallow is generally purified, or *rendered*, as it is termed, by being melted in a copper pan exposed to the direct action of the fire. The impurities rise to the top, and are skimmed and pressed. The pressed cake forms the "greaves" of the shops, and is used for feeding dogs. On the continent the raw tallow is melted by steam heat with very dilute sulphuric acid, for the purpose of destroying the cellular tissue. Tallow prepared in this way is much superior to that purified by the ordinary method. Great efforts have been made, from time to time, to obviate the use of snuffers by causing the wick to curl over out of the flame, so as to become consumed by the oxygen of the air. This, as yet, has not succeeded perfectly with the tallow candle, although, in the case of stearic candles, success has been achieved. Chevreul's researches on animal and vegetable fats and oils led to the use of stearin for the manufacture of candles. Chevreul showed that fats consist of olein (an oily liquid) and two crystalline solids,—margarin and stearin. He found that by pressure the olein could be eliminated, leaving behind a hard mass resembling wax in its nature and properties. The fusing-point of the pressed tallow was found to be much higher, and thus a considerable advantage was gained. By following up these researches, it was further ascertained that p stearin and margarin contained fatty acids combined with the base of glycerin. These fatty acids melted at a still higher temperature when pure; the next improvement was, therefore, to devise a plan of separating them from the base with which they were combined. This was effected in two ways,—by *lime saponification*, the invention of De Vielley, and by *sulphuric saponification*, a process we owe to the ingenuity of a countryman—George Gwynne. These processes are briefly as follows:—*Lime saponification*.—Tallow, water, and lime, are boiled together until complete saponification takes place, or, in other words, until the lime has decompos[illegible], the fat uniting with the stearic, margaric, and ol[illegible]cids to form an insoluble soap, setting free the gly[illegible]n, which dissolves in the water. When cold, the lime-soap is reduced to powder and remelted. When it has reached the boiling-point, sulphuric acid is added, which combines with the lime, setting free the three acids already mentioned. The oleic acid being the lightest, separates, forming an oily layer on the top, and the heavier fatty acids are drawn off and cooled, and further purified by pressure. *Sulphuric saponification*.—In this process, the tallow or fat is boiled with sulphuric acid, which acts by uniting with the base of glycerin to form sulpho-glyceric acid, which is readily soluble in water and with the fatty acids, to form sulpho-stearic, sulpho-margaric, and sulpholeic acids, which are easily decomposed by water. When the decomposition is complete, the blackened mass is well washed and distilled, the three acids passing over in a tolerably pure condition. They are further purified by pressure, which eliminates the liquid oleic acid. The best stearic candles are a mixture of stearic and margaric acids. *Composite candles* contain these two acids, mixed with stearin, in varying proportions. The principal source of stearin and stearic acid is palm-oil, the manufacture being carried on chiefly by Price's Patent Candle Company. *Wax candles* are dipped and rolled between two marble slabs until the proper shape is obtained. *Spermaceti* is the solid portion of the oil of the sperm-whale, and is obtained by filtration and pressure. The most important improvement lately introduced into candlemaking is the manufacture of candles from *paraffine*, a solid substance obtained by the distillation of coal at a low temperature, and containing the elements of coal-gas. (For details on the various points connected with candle manufacture from different materials, *see* COCOA-NUT OIL, FATTY ACIDS, PARAFFINE, SPERMACETI, and WAX.)

CANDLEMAS, *kān'-dl-mās*, a religious festival observed in honour of the purification of the Virgin Mary, on the 2nd of February, the 40th day after the Nativity. The name Candlemas is evidently derived from the consecration of the candles to be used in the churches during the year, that takes place on this day among the Roman Catholics. There is also a procession with lighted candles on that day. In an old document of 30 Henry VIII., entitled "Conceruyng Rites and Ceremonies to be used in due fourme in the Churche of Englande," it is declared that the bearing of candles on Candlemas-day "is done in the memorie of Christe, the spiritualle lighte, when Simeon dyd prophecye, as it is redde in the churche that daye." The festival is said to have originated with the ancient Romans, who, on this night, went about Rome with torches and candles in honour of the goddess Februa, the mother of Mars. Pope Sergius, seeing the people attracted by this ceremony, ordained, 684, that all Christian people come to church on that day with candles in honour of the Virgin, the mother of our Saviour. From this probably arose the custom which formerly prevailed in England of women bearing lights when they were churched. The weather on Candlemas-day has in many parts

been regarded as indicating the character of the winter:—

"The hind had as lief see
His wife on a bier,
As that Candlemas-day
Should be pleasant and clear."

In Scotland it is said,—

"If Candlemas is fair and clear,
There 'll be twa winters in the year."

We have also heard the following:—

"If Candlemas-day be fair and clear,
The half of winter 's to gang, and mair;
If Candlemas-day be wet and foul,
The half of winter 's gane at Yule."

CANE, *kain* (Lat. *canna*), a term commonly applied to any small smooth stick, but more correctly limited to the stem of a small palm or large grass. (*See* CALAMUS, BAMBUSA.)

CANELLA, *kă-nel'-lă*, in Bot., the typical gen. of the nat. ord. *Canellaceæ*. The inner bark of *C. alba* forms the Canella of the apothecaries. The tree is common in many parts of South America and in the West-India islands, where it is often called Wild Cinnamon. The bark is removed with an iron instrument, and, after being deprived of the epidermis, it is dried in the shade. It is seen in flat or quilled pieces, of a light buff-colour, and from having been confounded with Winter's bark (*see* DRIMYS), it is sometimes called spurious Winter's bark. Being an excellent aromatic, stimulant, and tonic, it is frequently used in medicine. In the West Indies and some parts of Europe it is used as a spice. Distilled with water, it yields a reddish-yellow, fragrant, and very acrid essential oil, which is often mixed with, and sometimes sold for, oil of cloves.

CANELLACEÆ, *kă-nel-lai'-se-e*, in Bot., the Canella fam., a nat. ord. of dicotyledonous plants, in the subclass *Thalamiflorœ*. There are but two genera known, —*Canella* and *Cinnamodendron*, which consist of evergreen shrubs possessing aromatic properties.

CANG, CANQUE, or KEA, *kăng*, the name of an instrument of punishment used in China. It is composed of two heavy pieces of wood worn round the neck like a collar, and usually from 50 to 60 lbs. weight, but sometimes above 100.

CANGI, CHANGI, or CANGANI, *kăn'-gi*, an ancient people of Britain against whom Ostorius Scapula led his army after the reduction of the Iceni, A.D. 50. Antiquarians are much divided in opinion as to the character and locality of this people; but the generally received opinion is that their country lay about North Wales, or somewhere between the Iceni (East Anglia) and the Irish Sea.

CANICULAR DAYS, *kăn-ik'-u-lar* (Lat. *dies caniculares*, or dog-days), among the ancients, were twenty days before and after the helical rising of Canicula, which, occurring during the hottest part of the year, was supposed to be the occasion of the great heat, and of the diseases that prevail about that time.

CANICULAR YEAR, (Lat. *canis*, a dog), in Chron., the name of the year as observed by the Egyptians and Ethiopians, so called because reckoned from one heliacal rising of Canicula, or the Dog-star (Sirius), to the next. The reason of the choice of Canicula seems to have been not so much its superior brightness, as that its heliacal rising then coincided with the greatest swelling of the Nile; and hence the first rising of this star was annually observed with great attention. The Canicular year ordinarily consisted of 365 days, and every fourth year of 366.

CANINA, *kăn-ï'-na* (Lat. *canis*, a dog), a term in Zool., used to distinguish the Dog tribe, which includes dogs, wolves, jackals, and foxes. There are many varieties of dogs, most of which are clearly defined. Of all the inferior animals, the dog is the greatest friend and companion of man. In the south-east of Europe, and in parts of Asia, the dogs have no masters, and prowl about the towns and villages, living upon carcasses and offal. The Mahometans and Hindoos look upon them as impure, and will not touch them without an ablution. Putting aside these exceptions, it is certain that dogs have been domesticated and attached followers of man in all ages. In the monuments of Egypt and Etruria several species of domestic dogs are represented; and in one of the Nineveh sculptures brought to this country by Layard, is a magnificent specimen of a mastiff. There are several varieties of wild dogs in India, and in Australia there is a very savage wild dog, called the Dingo, which bears a strong resemblance to the wolf. Naturalists are not agreed as to the parent stock of the dog; some consider that it is derived from the wolf, while others trace it to the jackal: no trace of the breed, however, is to be found in a primitive state of nature. Where dogs have been met with wild, they have never shown a tendency to return to the form either of the wolf or the jackal. Dogs have been found in a feral state. The wolf was formerly a native of Great Britain: it is now extirpated, but still infests the western countries of Europe. In all its varieties the wolf is a cruel and cowardly animal. The jackals are gregarious animals, which hunt in packs, and prey upon smaller mammalia and poultry. Their long-protracted screaming cry at night is peculiarly disagreeable. They are natives of India, and are found also in great numbers in Syria. The fox is a native of Europe, America, and Northern Asia. Its cunning and sagacity are proverbial. It is preserved in Great Britain, and affords great diversion to the sportsman. The tribe *Canina* belongs to the class *Mammalia*, ord. *Fera*, and fam. *Felidæ*. (*See* DOG.)

CANIS MAJOR, *kăn'-nis ma'-jor* (Lat. *canis*, dog; *major*, greater), in Astron., a constellation of the southern hemisphere containing Sirius (*see* SIRIUS), which is the brightest star that appears in the heavens. It is situated below Orion, and a line drawn through the stars composing Orion's Belt will pass through Sirius if produced. Besides the brilliant star, it contains one of the second magnitude and many of the third and fourth.

CANIS MINOR, *mï'-nor* (Lat. *canis*, dog, *minor*, less), in Astron., a constellation between Gemini and Canis Major. It contains a first magnitude star of the first magnitude, called Procyon. It is a constellation of the southern hemisphere.

CANKER, *kănk'-er* (Sax. *cancer*; Lat. *cancer*), a disease in trees which attacks the young shoots and branches first of all, and at last appears in the trunk. If not cured or its progress prevented by cutting back the tree, that it may throw out new branches, it will gradually destroy it in the course of a few years. It is produced by accidental injury to the branches, or by superabundant moisture about the roots, that a stiff subsoil will not allow to drain away. The name is also given to a disease which appears in the feet of horses and in the ears of dogs. In the horse it is produced very often by damp and dirt, but in some cases it is constitutional. Ulceration takes place between the outer casing of horn and the tender part of the foot which the horn protects. It is attended with considerable inflammation, the horn becomes detached in parts, and proud flesh is formed. The portions of horn that are separating from the foot should be removed, and the sore dressed at first with a caustic preparation to stop the growth of proud flesh, and afterwards with Friar's balsam. Until a cure is effected, the foot should be protected with tow, which should be changed daily. Care should be taken to keep the foot clean and dry. In dogs, inflammation of the ear produces ulceration and the formation of proud flesh in the interior of that organ. Bathing with warm water will often check the disease; and if this will not do, Goulard's lotion should be applied, to which a little alum may be subsequently added to heal the ulcer. In some cases the disease appears at the edge of the flap of the ear, when means must be taken to prevent the dog from irritating the sore by scratching, and it must be dressed with an ointment in which a large proportion of alum has been mixed.

CANNA, *kăn'-nă*, in Bot., a gen. of plants belonging to the nat. ord. *Marantaceæ*, or Arrow-root family. One or more species growing in the West Indies yield *tous-les-mois*, a very pure and useful starch, now largely consumed in this country and elsewhere. The exact species from which this is obtained cannot be definitely ascertained; but it is probable that the three known respectively as *C. edulis*, *C. glauca*, and *C. Arabica*, furnish the supply. The rhizome called *African tur-*

*merle*, from its resemblance in appearance and properties to ordinary commercial turmeric, is said to be the produce of *C. speciosa*. The seeds of *C. indica* are commonly called *Indian shot*, on account of their black colour and peculiar hardness.

CANNABINACEÆ, *kăn-nă-bi-nai'-se-e*, in Bot., the Hemp fam., a nat. ord. of plants of the class *Dicotyledones*, sub-class *Monochlamydeæ*; consisting of rough herbs with a watery juice, having the following structural characters:—Leaves alternate, lobed, stipulate; flowers small, unisexual, dioecious, the males in racemes or panicles; calyx scaly, imbricated; stamens 5, opposite the sepals, with thread-like filaments, the females in spikes or strobiles, each flower with one sepal surrounding the ovary, which is superior and 1-celled, containing a solitary pendulous ovule; fruit indehiscent; seed without albumen. There are only two genera,—*Cannabis* and *Humulus*, the Hemp and the Hop, and each consists of but one species. They are natives of the temperate parts of Europe and Asia.

CANNABIS, *kăn'-nă-bis* (Lat.), in Bot., the Hemp, a gen. of plants representing the nat. ord. *Cannabinaceæ*. —*Cannabis sativa*, the only species, yields the valuable fibre called hemp, which has been known for more than 2,500 years as a material for cordage, sacking, and cloth. In Britain the plant grows to the height of about six feet, but in warmer climates it has occasionally been found eighteen feet high. The principal supplies of the fibre are derived from Russia. The fruits, commonly termed *hemp-seed*, are oleaginous and demulcent, and are used for feeding birds. When submitted to pressure, they yield about 25 per cent. of a fixed oil, which is used for making varnishes. In the sap of the hemp-plant there exists a resinous substance which has extraordinary narcotic properties. In northern climates the proportion of this resin in the several parts of the plant is so small as to have escaped general observation; but in the warmer regions of the East, the resinous substance is sufficiently abundant to exude naturally from the flowers, leaves, and young twigs. The Indian hemp, which is so highly prized for its narcotic virtues, is considered by some botanists to be a distinct variety, and is distinguished by them as *C. sativa*, var. *indica*. This herb, and the resin obtained, are largely employed in Asia, and in some parts of Africa and South America, for the purposes of indulgence. The whole plant dried is known by the name of *gunjah* in the markets of Calcutta. The larger leaves and seed-capsules separated from the stalks are called *bang*, *sukjee*, or *sidhee*. The tops and tender parts of the plants, collected just after the flowering time, are in some places sold under the name of *haschisch*. The dried flowers, called *kief* in Morocco, contain so much of the narcotic principle that a small pipe filled with them, if smoked, will suffice to intoxicate. The dried pistils of the flower enter into the composition of the Turkish madjoun. The resin which naturally exudes from the leaves and flowers, when carefully collected by hand, is known as *momeea*; the same, when beaten off with sticks, is sold under the name of *churrus*. An extract obtained by the use of butter, when mixed with spices, forms the *dawamese* of the Arabs, and is the foundation of the *huschisch* of many Eastern countries and districts. The dried plant is smoked, and sometimes chewed. Five or ten grains reduced to powder are smoked from a common pipe along with ordinary tobacco, or from a water-pipe with a peculiar variety of tobacco called *tombeki*. The resin and resinous extract are generally swallowed in the form of pills or boluses. The hemp-plant and its preparations appear to have been used from very remote times. The effects of the natural resin or *churrus* have been carefully studied in India by Dr. O'Shaughnessy. He states that when taken in moderation it produces increase of appetite and great mental cheerfulness; while in excess it causes a peculiar kind of delirium and catalepsy. The effect produced by hemp in its different forms varies, like that of opium, both in kind and in degree, with the race of men who use it, and with the individual to whom it is administered. Upon Orientals its general effect is of an agreeable and cheerful character, exciting them to laugh, dance, and sing, and to commit various extravagances. It, however, renders some excitable and quarrelsome, disposing them to acts of violence. It is from the extravagant behaviour of individuals of this latter temperament that the use and meaning of our word "assassin" have most probably arisen, the word having been derived from *haschischin*, a haschisch-eater. As a medicine, Indian hemp was tried by Dr. O'Shaughnessy in rheumatism, hydrophobia, cholera, and tetanus. In the last such wonderful cures were effected, that the hemp was pronounced an anticonvulsive remedy of the greatest value. Pereira calls it an exhilarant, inebriant, phantasmatic, hypnotic or soporific, and stupefacient or narcotic. The extract made in India, and then imported, has been found to be much stronger than that made over here. This fact seems to prove that the plant is materially injured by the voyage.—*Ref.* Johnston's *Chemistry of Common Life*.

CANNEL COAL, *kăn'-nel kole*, a brittle, compact variety of coal, having a waxy lustre and a conchoidal fracture. It burns with a bright flame, emitting large quantities of gas, which renders it particularly valuable for gun-making. Cannel coal is a corruption of candle coal, a name given to it from the candle-like brilliancy of its flame. The Scotch miners call it *parrot coal*, from the chattering noise it makes when thrown into the fire. Some of the harder varieties are used for working into ornaments like jet.

CANNIBALS, *kăn'-ni-bals*, is supposed to be a corruption of Caribs, the original inhabitants of the West-India Islands, who were reputed to be man-eaters; and hence the term has come to denote *anthropophagi*, or persons who devour human flesh. Sometimes persons have been driven by dire necessity, as in sieges and shipwrecks, to eat human flesh; and there have been instances known of persons in civilized communities deprived of [illegible] wing for that kind of food, and to commit murder in order obtain it. Many persons, however, have doubted whether there ever existed, in any state of society, a people who were voluntarily addicted to this species of barbarity; but the testimony of modern travellers, as well as of ancient writers, is so strong upon this point as to leave little room to doubt that it has been, and even still is, practised among various races. Homer represents the Cyclops and the Laestrygons as anthropophagi; and, according to Herodotus, the Massagetæ ate the flesh of their aged parents. Herodotus also asserts that the Padæi of India were in the habit of killing and eating their relatives when they fell ill; and that, among the Essedones, when a man's father died, his relations came and helped to eat the dead man, whose flesh was rendered more palatable by being mixed up with that of animals. Such accounts as these have been fully borne out by the descriptions of modern travellers. The statements of Marco Polo regarding the Battas, a people of Sumatra, have been confirmed by Mr. Marsden. When America was discovered, this practice was found to prevail to a very great extent. According to Prescott, "they (the Mexicans) did not eat human flesh merely to gratify brutish appetite, but in obedience to their religion. Their repasts were made of the victims whose blood had been poured out on the altar of sacrifice." The body of the sacrificed captive "was delivered to the warrior who had taken him in battle, and by him, after being dressed, was served up in an entertainment to his friends. This was not the coarse repast of famished cannibals, but a banquet teeming with delicious beverages and delicate viands, prepared with art and attended by both sexes, who conducted themselves with all the decorum of civilized life."—(*Conquest of Mexico.*) In New Zealand and many parts of Africa cannibalism was systematically practised, with some, human flesh being regarded as a great delicacy, and even preferred to every other kind of food. M. Du Chaillu states that the Fans, a people of equatorial Africa, not only devour the bodies of captives but even the bodies of those who have died of disease, purchasing for that purpose the corpses of neighbouring tribes, and disposing in the same way those of their own. He relates that "a party of Fans, who came down to the sea-shore, once actually stole a freshly-buried body from the cemetery, and cooked it and ate it among them; and, at another time, a party conveyed a body into the woods, cut it up, and smoked the flesh, which they carried away with them." Some of the cannibals are even said to display a considerable degree of taste

in the matter of human flesh. The Caribbees are reported to have preferred sucking infants to all other food. Among the North-American Indians, the greatest luxury which a successful warrior could enjoy was the heart of his vanquished enemy. Among the Fans the head is a royalty saved for the king; and this, too, is the part which Richard Cœur-de-Lion is said, in the old romance which bears his name, to have partaken of, and to have declared that "there is no flesh so nourissant unto an Englishman as the head of a Sarezyne." The Feejee islanders are reported to have, in some cases, "spared the crews of English and French ships wrecked on their coasts, as they had found, by experience, that the flesh of such persons was tainted to an unpalatable extent by the savour of salt and tobacco."—*Encyc. Brit.*

CANNON, *kăn'-non* (Lat. *canna*, a reed or tube; Ital. *cannone*, a large tube).—As an account of the origin and progress of artillery and engines of war, from early ages to the present time, and a description of the various improved weapons, and the different kinds of ordnance used in the English service, and some of the foreign armies and navies, will be found in other parts of this volume (*see* ARMSTRONG GUN, DAHLGREN GUN, LANCASTER GUN, ORDNANCE & ARTILLERY, &c.), the present article will be devoted to a description of the method used at Woolwich and elsewhere for casting, boring, and finishing brass and iron cannon of all descriptions. It seems possible that the old method of casting guns will be superseded by the manufacture of guns out of twisted bars of wrought iron, as adopted by Sir William Armstrong, for, despite the efforts of all who wish to detract from the merits of these admirable weapons, their superiority over cast-iron guns, in many respects, has been clearly proved by the severe proofs to which they have been subjected. It is difficult to say to what extent the improvement of these engines of war, and the defensive armour-plates of vessels and floating fortresses, will be carried; but, at all events, the gun produced by Sir W. Armstrong in the spring of 1862 claims the pre-eminence at present, although its performances will most probably be eclipsed by the monster Armstrong gun now making, which will weigh 22 tons, and which, when rifled, will throw a bolt weighing 600 lbs. through the *Warrior's* side at a distance of 3,000 yards. The 12-ton gun above mentioned throws a circular shot of 150 lbs. weight as a smooth-bored gun; and, when rifled, an elongated projectile weighing 300 lbs. may be discharged from it. A single discharge will sink any iron-clad vessel that now floats on the waters. In experimental firing from this arm at Shoeburyness, on Tuesday, April 8, 1862, a circular shot of 150 lbs. weight, propelled by the expansive force of 40 lbs. of gunpowder, knocked the outer plate and teak interior of the target to pieces, and bulged the inner skin of iron; while another, fired with a charge of 50 lbs. of powder, went through the entire thickness of the target, consisting of armour-plate, teak, and inner coating, and buried itself in the massive timbers that supported it, even loosening the blocks of granite with which the whole was backed up. With such signal proofs of the superiority of the wrought-iron gun, it may be fairly supposed that the time for cast-iron ordnance is rapidly passing away. In casting bronze guns, an alloy is made of nine parts of copper to one of tin; but the proportion of tin is generally increased for large guns and lessened for small ones. For iron guns, the metal obtained in Staffordshire and Monmouthshire is in no way inferior to the best Swedish iron. The principal part of the cannon used in the British service has been cast by the Carron and Low Moor companies, and other private firms; but the government have lately established a foundry at Woolwich, to avoid the necessity of being entirely dependent on private enterprise. The first thing to be done in making a cannon is to build up the mould in which the weapon is to be cast. A model of the gun, turned in hard well-seasoned wood, or made of iron, is set upright, and surrounded with a casing or box. This casing is made of pieces connected by nuts and screws passing through flanges projecting from the sides. As it is built up round the model piece by piece, the intervening space is filled with sand, mixed with a little clay and water, and rammed tightly together. The model and the mould of sand around it are made much longer than the actual length of the gun, that the whole of the gun may consist of good metal. The piece that projects from the muzzle when the casting is finished, in consequence of this, is called the "dead-head," and is cut off in a lathe: it contains the scum and impurities of the molten metal, which always rise to the surface when it is poured into the mould. The dead-head is also useful in supplying the shrinkage arising from cooling, when the metal contracts about $\frac{1}{8}$ of an inch in every foot. When the mould has been dried in a stove, the outer casing and model are removed, and the mould itself separated in pieces, which are carefully built together in a vertical position, and imbedded in a surrounding mass of sand to receive the molten iron. The metal, selected for its toughness and hardness, is then fused in a furnace with coal, and, when liquid, is allowed to run into the mould which has been prepared to receive it. When the casting is thoroughly cooled, the dead-head is cut off, and the axis of the piece exactly found by the aid of the centering-machine. As soon as this operation has been performed, the gun is removed to another lathe, and the rings at the muzzle and breech, and those on either side of the trunnions, are carefully turned. Great nicety is required in this part of the process, for the formation of the bore is regulated by these rings. The gun is then raised by means of points resembling cones, that enter the centerings, to admit of the trunnions being turned by the action of the trunnioning machine; after which the holes that receive the tangent-scale, and the bush of copper through which the vent is bored, are cut by means of a drill. The hole in which this copper plug is screwed enters the bore diagonally. The diameter of the vent itself is about $\frac{1}{4}$ of an inch. The process of boring is next performed; the gun is placed in a boring-machine in a vertical position, and the boring effected by means of a very hard and sharp steel tool, which works at the end of a long iron bar, somewhat after the manner of a centrebit. Sometimes the gun is made to revolve, and to rise gradually as the interior is cut away by the boring-tool; and in other methods the gun is fixed, and the cutting-tool revolves. The exterior of the gun is then finished off, and it is afterwards taken to the proving-chamber. A somewhat different method is used at Woolwich for forming the models and moulds of the brass or bronze guns that are cast there. Each model is formed in three separate parts; the central part, from the base-ring to the middle of the dead-head is made on a piece of wood less in diameter at one end than the other, that it may be readily pulled out when occasion requires it. Straw is now wound round this wooden centre, and an exterior coating of moistened sand, earth, and horse-dung put over the straw. The whole mass is made to revolve against a board cut in the form of half the longitudinal section of the gun, which moulds the composition to the required shape. The model of the breech is made on a cone of iron in a similar manner, and pieces of wood are affixed in the proper places to represent the trunnions, vent-piece, and tangent-scale. This model is then coated with a composition of sand and hair, which forms the mould for the required cannon. The model is then taken out by degrees, the wooden centre being first pulled out, and then the straw which surrounded this centre; the composition forming the exterior of the model is next removed by the action of fire, the horse-dung having the property of making the composition light and friable, and the hollow mould, when dried, is ready for use. The trunnion-models, and other pieces of wood that have been used in the process, are taken away at different stages of the manufacture of the mould, the composition being put on in three or four separate coats. When the mould is put in the casting-pit, the three separate pieces in which it has been made are carefully built together and imbedded in sand, as in making the moulds already described for iron ordnance. Prior to 1750 cannon were cast hollow; but about this date the method of casting them in a solid piece and boring them afterwards was discovered by a Swiss engineer. As the exterior cools before the interior, it is found to be of much closer grain than the part which is subsequently removed; and, on this account, cannon made on this system were soon discovered to be far superior to guns which were cast

hollow, the metal which was more porous, and, consequently, much weaker in some parts than in others; and as it could not offer a uniform resistance to the force of the powder in every part, the piece was liable to burst at any time. The following are some of the largest and most remarkable cannon ever constructed:—1. A cannon used by Mahomet II. at the siege of Adrianople in 1453, which fired balls of stone of 600 lbs. weight. 2. A cannon at Ehrenbreitstein, on the Rhine, made in 1529: it is rather more than 18 feet long, and 18 inches in the bore. It requires a ball weighing 140 lbs. 3. The monster cannon cast by Aurungzebe in India in 1683, named the "Lord of the Plain," which is 14 feet long, 28 inches in the bore, and will fire a ball weighing 1,800 lbs. This gun is to be seen at Bejapoor, with another iron gun of similar calibre. The mould in which it was cast is said to be in existence at Ahmednugger at the present day. 4. The huge wrought-iron gun made by Messrs. Horsfall, at Liverpool, in 1864, and presented by them to the British government. It is just 16 feet long, and weighs nearly 22 tons. The curious brass gun at Dover Castle, known as Queen Elizabeth's pocket pistol, cast in Holland, and presented to her by the Dutch states, is a beautiful specimen of the ordnance of that period. —Ref. *English Cyclopædia*—Arts and Sciences.

CANOE, *kă-noo'* (Fr. *canoë* - Span. *canoa*), a boat much used by rude nations. It is generally made by excavating the trunk or body of a tree, and then cutting or burning it into a suitable shape. Sometimes it is made of bark or skins. Some canoes have decks, and are moved by sails made of rushes or silk-grass; some are large enough to carry twenty to thirty hogs-



heads of sugar. They are, however, generally small in width, with barely room for two men to sit abreast: the length varies greatly. The canoe is generally an open boat rowed with paddles instead of oars. As the remains of canoes have been dug up in various parts of the United Kingdom, it is evident that they were much used by the ancient Britons.

CANON, *kăn'-on*, is a word derived from the Greek, and used in various senses by ecclesiastical writers. Its original meaning, and that in which it is used by the apostle Paul, is *rule*—"As many as walk according to this rule (Gr. *canon*), peace be on them and mercy." —(Gal. vi. 16.) Hence it came to be applied in the early Church to a law or rule, either of doctrine or discipline, enacted by persons of authority in the Church, as popes, bishops, councils. Thus we speak of the canons of the council of Nice, the canon of the council of Trent, meaning the decisions of these councils on points of doctrine or discipline submitted to them. The number of canons is very great, the collected body of them forming what is called the *Canon Law* (which *see*). The *Apostolical Canons* are generally believed to have been issued at a very early period, and are by some referred even to the time of the apostles themselves; whence their name. Canon was also applied to a catalogue of all the things belonging to the Church, or to a catalogue of saints acknowledged and canonized by the Church; also a book used in the service of the Church, as a collection of hymns which were to be sung on festivals. More recently it came to be applied to the divine and inspired writings; in which sense we speak of the canon of Scripture, the canonical books of the Old and New Testaments. (*See* BIBLE.) Canon is also applied to the book of laws and rules to which persons are subject who devote themselves to a religious life. These rules were frequently read over to such persons, and to them also the term canon came to be applied; thus, the Augustinian canons were those who adopted and lived under the rule of St. Augustine. The Paschal canon is a table of the movable feasts, showing the day of Easter and the other feasts depending on it, for a cycle of nineteen years. Canon is also applied to that part of the communion service or mass of the Roman Catholic church which follows immediately after the Sanctus and Hosanna, corresponding to that part of the service of the English church which begins at the prayer, "We do not presume," &c.

CANON, is one who possesses a prebend, or revenue allotted for the performance of divine service in a cathedral or collegiate church. The institution of this order is not ancient, being attributed to Chrodegangus, a bishop of Metz about the middle of the 8th century. At first they were merely inferior ecclesiastics, living in community by the cathedral, and assisting the bishop in his duties, entirely dependent on his will, and supported by the revenues of the bishopric: at first, they even inherited his movables. By degrees they shook off their dependence, and formed themselves into separate bodies, of which, however, the bishops were still the recognized heads. In the 10th century there were establishments of this kind formed even in cities where there were no bishops, and these took the name of [illegible]gations, or Colleges, the members being called [illegible]ates. The name chapter now given to these was not in use till long after. In time, the canonical or collegiate life became so common that every cathedral had its chapter distinct from the rest of the clergy. They gradually relaxed in their observance of their rules, and at length they ceased to live in community; yet they still formed bodies, making themselves as a necessary council of the bishop, assuming the rights of the rest of the clergy, and taking upon themselves the administration of a see during its vacancy, and the election of a bishop to supply it. There were even some chapters exempt from the jurisdiction of the bishop, and owning no head but their dean. After the example of cathedral chapters, collegiate ones also continued to exist as bodies after they had ceased to live in communities. Canons were of various kinds; as, *cardinal canons*, who were attached, *in cardinali*, to a church, as a priest is to a parish; *domiciliary canons*, such as, not being in orders, had no right in any particular chapters; *expectative canons*, such as, without having any revenue or prebend, had the title and dignity of canons, a voice in the chapter, and a place in the choir till a prebend should become vacant. *Foreign canons* were such as did not officiate in the canonries to which they belonged, and were opposed to *mansionary* or *residentiary* canons. *Lay* or *honorary canons* were persons among the laity who, out of honour and respect, had been admitted into some chapter of canons. *Tertiary canons*, or such as had only a third part of the revenues of the canonicate. *Regular canons* were such as lived in community, and, like religious communities, had, in process of time, added the solemn profession of vows to the practice of their rules: they were called regular to distinguish them from *secular canons*, who abandoned living in community, and mixed more or less with the world, but at the same time practised a religious life according to the rules of the order. The order of regular canons of St. Augustine was brought into England by Adelwald, confessor to Henry I., who erected a priory at Nostel, in Yorkshire, and obtained for them the church of Carlisle as an episcopal see, with the privilege of choosing their own bishop. They were singularly protected and encouraged by Henry I. and by Queen Maud; and it appears that under the reign of Edward I. they had fifty-three priories. This institution was spared at the time of the Reformation, and it continues to the present day. Canons are sometimes called prebendaries from their being in the enjoyment of a prebend; they have stalls in the cathedral churches, which are generally called prebendal stalls. They are still nominally what they once actually were,—the council of the bishop for the administration of the affairs of his diocese; and they constitute the chapter of the body known as the Dean and Chapter. (*See* DEAN AND CHAPTER.)

CANON, a vocal composition consisting of two, three, or four parts, in which the several voices begin at fixed intervals consecutively; sometimes each voice commences with the same, sometimes with different notes,

## Canon Law

Canons may be finite or infinite; the former end, like other compositions, with a cadence, while in infinite canons the theme is begun again before the parts which follow are concluded. They are so constructed as to form a perpetual *fugue*, but differ from ordinary *fugues*; for in the latter it is sufficient for the subject to be repeated occasionally according to the laws of counterpoint, while in the former it must be strictly repeated by all the succeeding parts. In ancient music canons were rules for determining the intervals of notes. Ptolemy, rejecting the Aristoxenian method of measuring the intervals in music by the magnitude of a tone, thought that they should be distinguished according to the ratios or proportions which the sounds terminating those intervals bear to one another when considered according to their degree of acuteness or gravity, which, before Aristoxenus, was the old Pythagorean way. From this canon Ptolemy and his followers have been called *Canonici*, as those of Aristoxenus were named *Musici*. Amongst the ancient Greeks this term signified what we now call a monochord.

Canon Law, is a body of Roman ecclesiastical law relative to such matters as that church either has, or pretends to have, the proper jurisdiction over, and, considered with respect to any intrinsic obligation, has no force or authority in this kingdom; it is no more binding in England than our English laws are binding at Rome. But, as far as this foreign law, on account of some peculiar property, has in some particular cases and in some particular courts been introduced and allowed by our laws, so far it obliges, and no further, its authority being wholly founded upon that permission and adoption. Wherever the system of canon law departs from the rules of our common and statute law, the latter take place of the former. The decrees and canons of the Church of Rome were adopted, as they then existed, by the clergy and people of England so early as the year 605. About the middle of the 12th century,—but said by Godolphin to have been in the year 1230, a system of laws under the influence of successive popes began to be compiled and promulgated at different periods. This system has been generally diffused through Europe, and prevails with more or less authority in different countries under the title of the *Canon law*. It consists of two principal parts,—the Decrees and the Decretals. About the year 1150, that which is called the Decrees, or *Decretum*, having been first collected by Ivo, bishop of Carnat, was perfected by Gratian the monk, the confessor of Pope Eugenius, who allowed them to be read in schools and alleged for law. This is the most ancient work, as beginning from Constantine the Great, the first Christian emperor.—(Ridley's *View of Civil and Ecclesiastical Law*, p. 74, *et seq.*) The Decretals are canonical epistles written by the popes, or popes and cardinals, for determining some matter of controversy. These were compiled by Raymundus Barcinius, chaplain to Gregory IX., and published at his command about the year 1231, to which Boniface VIII. added a sixth book in 1298. The Clementine Constitutions, which appear to be intended as a continuation of the Decretals, were compiled by Clement V., and published by his successor, John XXI., at Avignon, in 1317, who afterwards collected some further constitutions, which were published about the year 1340.—(Ridley, *ib.*) A seventh book of Decretals and a book of Institutes were added by Gregory XII., under whose sanction the *Corpus Juris Canonici*, containing all the several parts, was published in 1580. The Decrees appear to set out the origin of the canon law, and the rights, dignities, and degrees of ecclesiastical persons, with their manner of election, ordination, &c. The Decretals contain the law to be used in the ecclesiastical courts. To this body of canonical law of foreign origin must be added the constitutions passed in this country by the pope's legates, Otho and Othobon, and the prelates of England, assembled in national councils in 1237 and 1269, and also the constitutions framed in provincial synods under the authority of successive archbishops of Canterbury, from Stephen Langton, in 1222, to Archbishop Chichely in 1414. The government of the English church is partially founded on the canon law; but no part of this law is of force except from the royal assent; and if at any time the ecclesiastical courts did, by their sentence, endeavour to enforce obedience to such part of the canon law as was inconsistent with, or opposed to, the common law, the courts at common law, upon complaints made, would grant prohibition. The authority vested in the Church of England of making canons was ascertained by the statute of 25 Hen. VIII. c. 19, commonly called the Act of the Clergy's Submission, by which they acknowledged that the convocation had always been assembled by the king's writ; so that, although the power of making canons resided in the clergy met in convocation, their force was derived from the authority of the king's assenting to and confirming them. The old canons continued in full force till the reign of James I., when the clergy, being assembled in convocation, the king gave them leave to treat and consult upon canons, which they did, and presented them to the king, who gave them the royal assent. These were a collection out of the several preceding canons and injunctions. Some of these canons are now obsolete. In the reign of Charles I. several canons were passed by the clergy in convocation. A most elaborate history of the canon law will be found in the historical introduction to Ayliffe's Parergon."

## Canons of the Church of England

Canons, Book of, in Scottish Eccl. Hist., was a code of canons or laws prepared by the Scottish prelates, and confirmed under the great seal by letters-patent bearing date May 23, 1635. These canons were subversive of the whole constitution of the Church of Scotland, and enjoined adherence to the liturgy, which had not yet been published or even prepared. They decreed excommunication against all who should deny the king's supremacy in ecclesiastical matters, or that should dare to say that the liturgy (unpublished) contained anything contrary to the Scriptures. No general assembly should be called but by the king; no ecclesiastical business should be discussed, except in the prelatic courts; no private meetings should be held by ministers for expounding the Scriptures; and on no occasion, in public, should a minister engage in extempore prayer. Great indignation was felt all over Scotland when the character of these canons came to be known; and though it did not then break out into positive violence, it added greatly to that deep undercurrent of feeling which soon afterwards broke out with such violence.

Canons of the Church of England, *kăn'-ons*, are certain laws and constitutions made for the government of the Church, and which have received the assent and confirmation of the kings of England. Even when the papal power was most dominant in England, from the time of William I. to the Reformation, the Church had no power to enforce any canons or constitutions which had not received the royal assent. The canons in force at the time in England were all collected, explained, and systematized by Lyndwood, dean of the Arches in the reign of Henry VI. It was intended to reform these canons soon after the Reformation, and Cranmer and some other commissioners were appointed for that purpose by Henry VIII and Edward VI. The work was completed; but the king dying before it was confirmed, it still remains unconfirmed. The book is called "Reformatio Legum Ecclesiasticarum ex authoritate Regis Henrici VIII. inchoata, et per Eduardum VI. provecta." These canons are still binding, and are acted upon in the ecclesiastical courts, except where they are superseded by subsequent canons or by acts of parliament. Another book of articles or canons was made at a provincial synod in London, April 3, 1571, by Parker, archbishop of Canterbury, and the rest of the bishops; but it is not said to have been confirmed by royal authority. In the 27 Eliz., certain canons were agreed to by the archbishop and bishops at a provincial synod at London, Nov. 24, 1584, and afterwards confirmed by royal authority. Other canons and constitutions were treated of by a provincial synod of Canterbury, and being afterwards approved of and confirmed by the queen, they were, by royal authority, transmitted to the two provinces of Canterbury and York, and published for the due observance of them. In 1603 a synod assembled at London, under the archbishop of Canterbury, in terms of a writ issued by James I. for that purpose, to confer, consider, consult, and agree upon such canons, orders, ordinances, and constitutions as they should think necessary, fit, and

convenient for the honour and service of God, the good and quiet of the Church, and the better government thereof, to be from time to time observed, performed, fulfilled, and kept by the whole clergy. These canons are 141 in number, and are for the most part a digest of old canons, with some new ones added. They treat—1. Of the Church of England; 2. of divine service and administration of the sacraments; 3. of ministers, their ordination, function, and charge; 4. schoolmasters; 5. things appertaining to churches; 6. churchwardens and side-men; 7. parish clerks; 8. ecclesiastical courts; 9. judges ecclesiastical and their surrogates; 10. proctors; 11. registrars and apparitors; 12. authority of synods: forming the basis of the ecclesiastical law as bearing upon the clergy, but not binding upon the laity, except in so far as they are declaratory of the ancient canon law. In 1640 the convocation then assembled passed a body of canons, which were ratified by the king under the great seal the same year; but being of a very arbitrary nature, an attempt was made at the time to set them aside, on the plea that the convocation could not lawfully continue its session after the dissolution of parliament. The opinion of the judges at the time was unanimously in favour of the legality of the proceedings; but they were unanimously rejected by the Commons, and, by an act passed in the 13th year of Charles II., they were abrogated. —*Ref.* Hook's *Church Dictionary*.

CANONICÆ, or CANONESSES, *kăn-on'-i-se*, was a name given to ecclesiastical virgins, from their being enrolled in a canon or catalogue of ecclesiastics. They differed from monastic virgins in not being confined to a cloister, but in living ordinarily in the houses of their parents.

CANONICAL, *kăn-on'-e-kăl*, of or belonging to the canons of the church. *Canonical hours* are certain stated times of the day assigned to the offices of prayer and devotion, "that all Christians throughout the world might at the same time join together to glorify God." They are observed principally among Roman Catholics, and are prime, terce, sext, and nones—the first, third, sixth, and ninth hours of the day; *i.e.* at six, nine, twelve, and three o'clock; vespers in the evening, at six; complin, as completing the services of the day; and matins and lauds shortly after midnight. In England the canonical hours are from eight to twelve o'clock, before or after which marriage cannot be legally performed in any parish church. *Canonical letters*, in the ancient church, were testimonials of the orthodox faith sent by the bishops and clergy to each other in order to keep up the Catholic communion, and to distinguish Christians from heretics. *Canonical life*, the method or rule of living prescribed by the ancient clergy who lived in community. *Canonical obedience* is that submission which, by the ecclesiastical laws, the inferior clergy are bound to pay to their bishops, and religious persons to their superiors. In the Church of England every clergyman takes an oath of canonical obedience to his bishop when he is instituted to a benefice or licensed to a cure. *Canonical punishments* are those which the Church has in its power to inflict, as in Roman Catholic countries excommunication, penance, and the like. *Canonical sins*, in the ancient church, were such as were deemed capital or mortal; as idolatry, murder, heresy.

CANONICI, *kăn-on-i'-si*, a term applied in early times to the clergy, from their names being enrolled in a canon or catalogue of some church.

CANONICS, or CANONICA, *kăn-on'-iks*, the name applied by Epicurus to his system of logic, as consisting only of a few rules or canons. He rejected the dialectics of the Stoics, as full of vain subtilties and deceits, and fitted rather for parade and disputation than for directing the understanding in the pursuit and attainment of truth. Canonics treated of the means by which More recise, both physical and ethical, was obtained, inspired wri conditions or *criteria* of truth. These con- of Scripture, rding to him, were sensations, ideas or Testaments. , and affections. From these three sorte the book of ness we get all our knowledge, which is subject who al or moral; the former perceived by the These rules itter by the understanding. In reality his and to them rrespond very much to what is now termed thus, the A .

CUM, *kăn-on'-e-kum*, in a general sense, denotes a tax or tribute. It is more particularly used in the Greek church for a fee paid by the clergy to bishops, archbishops, and metropolitans, for degrees and promotions. It is also applied to the first-fruits paid by the Greek laity to their bishops or priests, and which is regulated according to the number of houses or *fires* in a place.

CANONIST, *kăn'-on-ist*, is a person skilled in, or who professes, the study and practice of the canon law. Canonists and civilians are usually combined in the same persons; and hence the title of *juris utriusque doctor*, or *legum doctor*, which is usually expressed by J.U.D. or LL.D.

CANONIZATION, *kăn-on-i-zaï'-shun*, in the Roman Catholic church, is a ceremony by which a deceased person is enrolled in the canon or catalogue of the saints. Canonization was not known in the Christian church till about the middle of the 10th century, and it seems to have been borrowed from the custom among the Greeks and Romans of deifying the more distinguished of their great men and heroes. It probably took its rise in the practice of the Church invoking the aid of early martyrs. The bishops at first decided who were entitled to this honour, and afterwards what was : irst a mere local decision came to be converted int imposing ceremony, and the power of conferr ; this honour was appropriated by the popes. Alex. nder III., in 1170, pronounced it an exclusive privilege of the papal chair. At first none but martyrs were admitted into the category of saints; but afterwards men of distinguished piety were admitted to this honour; and in later times the pope assumed the right of admitting also such kings and potentates as had greatly favoured his temporal interests. Now, no steps can be taken towards canonization until fifty years after the person's death; but formerly there were no restrictions in this respect, and the honour was frequently obtained through family interest or the intrigues of friends. A few pretended miracles at the tomb were sufficient to give one a claim to have his name inscribed among the saints. Since the time of Benedict XIV., an official, known as *l'avvocato del Diavolo* (the Devil's advocate) is employed, whose business it is to sift the evidence brought forward, and to endeavour to oppose the admission of the candidate. The first step towards canonization is beatification (which *see*). After beatification has been obtained, a new suit is necessary in order to obtain the canonization of the same individual. For that purpose, the pope holds four consistories. In the first he causes the petition of those who request the canonization to be examined by three auditors of the rota, and directs the cardinals to revise all the necessary instruments; in the second the cardinals report the matter to the pope; in the third, which is in public, the cardinals pay their adoration to the pope, and the Devil's advocate makes his appearance, raising doubts as to the genuineness of the miracles, and exposing any want of formality in the procedure. On the other hand, another advocate makes a pompous oration in praise of the candidate, and expatiates at great length on the miracles which he is said to have wrought. In the fourth consistory, the pope, having summoned together the cardinals and prelates, orders the report concerning the deceased to be read, and then takes their votes whether he is to be canonized or not. On the day of the canonization the church of St. Peter is hung with rich tapestry and most brilliantly illuminated, while the pope and all the cardinals officiate in white. The ceremony is very expensive, and therefore is not often performed; but recently (1862) the honour has been conferred upon certain Japanese martyrs.

CANONRY, or CANONICATE, *kăn'-on-re*, is the name of the office filled by a canon. A prebend may exist without a canonicate; but the canonicate is inseparable from the prebend. It is the canonicate that gives the right of suffrage and other privileges to the canon, and not the prebend.

CANOPUS, *kă-no'-pus*, a very bright star of the first magnitude in Argo, a constellation of the southern hemisphere. The origin of the name is uncertain; but it was probably derived from the ancient Egyptian city Canopus, or Canobus, which was situated on one of the mouths of the Nile called the Canopic mouth, about three miles distant from the modern Aboukir.

CANOPY, *kăn'-o-pe* (Gr. *konopeion*, from *konops*, a gnat), a word meaning in its original sense a covering similar to the mosquito curtains of India, to protect the sleeper from those insects. Subsequently the term canopy was applied to any ornamental covering above the head, for the purpose of distinction, honour, or adornment. In this sense the word is synonymous with the term baldachin. (*See* BALDACHIN.) In Arch., it is applied to the coverings that project from the surface of the wall above the heads of statues placed in niches and over altar-tombs, and to the dripstones over windows when elaborately carved. Magnificent specimens of canopies are to be found over the tombs of some of our kings, and over the bishop's throne in many of our cathedrals. The canopy is a peculiar feature of Gothic architecture, belonging principally to the Decorated English and Perpendicular English styles. The canopies that are found over altar-tombs are generally formed by a flat roof supported on pillars at the sides, with a series of beautifully-carved arches running from pillar to pillar in the front. Those formed in recesses are often groined and adorned with pendants. Some canopies, particularly those erected over bishops' thrones and the tombs of monarchs, rise in successive tiers most elaborately chiselled, and terminate in a spire adorned with crockets and a finial.—*Ref.* Parker's *Glossary of Architecture*.

CANT, *kant*, is a term to which various derivations have been assigned. By some it is derived from the Latin *cantus*, sung; by others from *quaint*; and by others from Andrew Cant, a rather prominent Scottish divine of the 17th century. It denotes a quaint affected manner of speaking or writing, or the speaking in a whining, affected tone of voice. It is more particularly applied to a peculiar manner of preaching, praying, or begging. It also denotes the frequent use of phrases not well understood; or the use of terms of a particular profession or class of individuals; as, gipsy cant. It signifies also the selling or bidding at an auction.

CANTABRI, *kăn-tai'-bre*, in Ancient Hist., the name of a rude people of Spain, inhabiting the mountainous districts between Palencia, la Montaña, and Asturias, to the shores of the Bay of Biscay, which, after them, was called the Cantabrian Sea. They are described as resembling the Scythians and Thracians; and by their bravery they maintained a six years' contest with the Romans, begun by Augustus and concluded by Agrippa (B.C. 25—19). A portion of the people still remained unsubdued in their native fastnesses, and from these the Basques of the present day are believed to have sprung.

CANTATA, *kăn-ta'-ta* (Ital., from *cantare*, to sing), in Mus., an elegant species of vocal composition, of which there are several kinds, supposed by some to have been invented by Barbara Strozza, a Venetian lady, about the middle of the 17th century, while others attribute its invention to Giacomo Carissimi, pontifical maestro di capella. It consists of an intermixture of air and recitative, and was at one time extended to such a length as to form a sort of small opera, but is now, however, ordinarily written for only one voice with a *thorough base*, though sometimes for several, accompanied by one or more instruments. In Italy, cantatas of great length, accompanied by a numerous band, are usually performed on great occasions of festivity, such as the reconciliation of princes after a long disunion, or the arrival of great personages in the capital of a state. But these differed essentially from what is usually understood by a cantata, or monologue, consisting of short recitatives and two or three airs at most, as they are occasionally poems in which several singers are employed. According to Du Cange, the word *cantata* was used in the Church as early as the year 1314 to express what is at present understood by *anthem*, with which word it is still synonymous in Germany, cantatas being chiefly confined, in the Lutheran church, to sacred music.

CANTEEN, *kăn-teen'* (Ital. *cantina*, a wine-cellar or vault), a place within the barracks where the soldier may purchase beer and spirits. It is under the control of the officer in command, who can regulate the price and see that the cantineer supplies liquor of a good quality, and practises no imposition on his customers. The sale of spirits at these places was forbidden in 1847. The canteens are rented from government: it is to be hoped that soldiers' club-houses will soon be substituted for them. The term canteen is also applied to a chest in which officers carry plate, spirit-cases, tea, sugar, and other requisites; and to a small wooden vessel, or cask, made of oak, slung by a strap over a soldier's shoulder, and used to carry water or any other liquor when on the march. They hold about three pints. They are painted blue, and marked with the number of the regiment and letter of the company to which the owner belongs.

CANTER, *kăn'-ter*, the movement of a horse going at a moderate gallop, when the fore feet are raised nearly together, with a leap or spring. The name is derived from the easy pace and gentle gallop with which the pilgrims were in the habit of traversing the roads to the shrine at Canterbury.

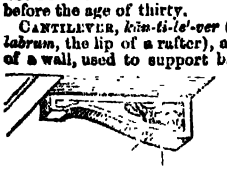
CANTHARADIN, *kăn-thar'-ră-din*, the crystalline blistering principle contained in the *Cantharis vesicatoria*, or Spanish blister-fly, first obtained by Robiquet. To procure it the flies are digested in alcohol. The alcoholic solution is afterwards evaporated to dryness, and washed with cold ether, which dissolves out the cantharadin. When pure, it is insoluble in water, but very soluble in boiling alcohol. Lard containing one five-hundredth of cantharadin will produce a very powerful blistering effect when applied to the human skin.

CANTHARIDÆ, *kăn-thar'-e-de* (Gr. *kantharos*, a beetle), the name given to a fam. of coleopterous insects, very numerous, much variegated in colours, of moderate size, and generally living on vegetable substances. They are distinguished by the head being dilated behind the eyes, and then suddenly narrowed into a short neck. When alarmed, they counterfeit death; and some varieties at the same time emit a thick yellowish fluid, with a disagreeable smell, from the articulatories of the legs, &c. Many species are employed externally in medicine to produce blisters, as they possess strong vesicating powers. They are also used internally as a powerful stimulant. Many species of the gen. *Cantharis* which possess this property are natives of Europe, India, and America. The *Cantharis vesicatoria* is the common blister-fly of the shops. (*See* BLISTER-FLY.) The striped cantharis is a native of North America, where it is called the Potato-fly. The gen. *Mylabris* contains several species, which have properties similar to those possessed by the Cantharis; and the gen. *Melos* has also various species which have all the properties of the blister-fly.

CANTICLES, *kăn'-te-kls* (Heb., Song of songs), a name frequently given to the Song of Solomon, the 22nd in order of the books of the Old Testament. There is no other inspired book concerning which so much diversity of opinion has been entertained. In modern times many attempts have been made to deny the canonicity of this book, not so much on historical or critical grounds, but from the subject of the book itself. The ancient Jews, without exception, regarded it as a sacred book, and it is cited as of divine authority from the earliest times of the Christian church. As to the authorship of the book, some have maintained that it is not the work of one, but of several authors, or a collection of early songs made by some later hand; others that it belongs to an age much later than that of Solomon. The book itself professes to be the work of Solomon, and the unanimous testimony of tradition is in support of this view. There are also in it frequent allusions to the time and circumstances of Solomon, a time when the kingdom was in peace and power, while the profusion of its imagery, gathered from foreign as well as domestic scenes, shows it to have been written at a time when the Jews had extensive intercourse with neighbouring nations, and singularly confirms the view of its being Solomon's, who had a remarkable liking for foreign grandeur. The continuity of the subject and sameness of the style, mark it as the work of one author. The interpretation of the book itself is a subject which has given rise to much discussion. The book is an amatory poem. The assumption of a love-song into the sacred canon has called forth many attempts at explanation. Among the Jews it was regarded as an allegory indicating the love of Jehovah to his chosen people. The Christians adopted the allegorical view, and maintained that it symbolized the love of Christ for his church. Luther assumed it as a political

allegory referring to the happy consequences of Solomon's reign; and more recently it has been held to be a prophetical description of the Christian church. The German rationalists of the last century maintained the literal interpretation of this book, and this has been the prevailing opinion in that country since that time; but some of the recent expositors, as Hengstenberg, have recurred to the allegorical interpretation. Those who interpret it literally regard it as celebrating the love of Solomon for an Egyptian princess, or for a daughter of Israel; and some consider it as setting forth the beauty of conjugal fidelity, and commending monogamy. Some critics divide the book into twelve distinct poems or idyls; others into plots of seven days, commensurate with the period of a marriage feast; while others regard it as a drama of four or six acts. According to Dr. Jahn, the book divides itself into distinct songs, as follows:—1. An innocent country maiden makes an undisguised profession of her attachment, and her lover replies to it with equal protestation of affection (i. 2—ii. 7). 2. A maiden sings of her lover, who is seeking her everywhere, and she also confesses her warm affection (ii. 8—iii. 5). 3. A maiden in a litter surrounded by Solomon's soldiers, is brought to the harem of the king. The lover prefers far before all the royal beauties his own beloved, in whose society he declares that he is happier than the king himself (iii. 6—v. 1). 4. A maiden beloved sings of her lover. He had come to her door at night, and had fled away before she opened it. She seeks him, is beaten by the watch, and stripped of her veil. She describes the beauty of her lover, who at length answers, celebrating her loveliness with a contemptuous glance at the multitude of the king's wives (v. 2—vi. 9). 5. Shalamith recounts in few words the allurements of the courtiers whom she had met with unexpectedly in the garden, and her rejection of them, and celebrates her affection for her lover (vi. 10—viii. 3). 6. Protestations and praises of constant affection (viii. 4—7). 7. A discourse between two brothers about guarding and giving away their sister in marriage, who replies with scorn that she would be her own guardian (viii. 8—12). 8. A fragment. A lover wishes to hear his beloved. She replies by persuading him to fly; perhaps, because her parents or relations were near, who, in the East, never allow such meetings (viii. 13, 14).—(*Introduction to the Old Testament.*) Some of these divisions are sufficiently fanciful, as indeed is the case with all the attempts that have been made of the same kind. The truth seems to be that the poem is destitute of any plan, and that it aims simply at placing the love of the king and his bride in a variety of aspects. With all the change of scenery there is no change of the relations subsisting between the parties who appear in each successive scene. The difference of manners between the East and West is to be kept in view in considering this song, which is also far more delicate in the Hebrew than in any European dress. Allegory is even to this day a favourite mode of expression in the East, and the veiling of spiritual fervour and enjoyment under the figure of love is common to all eastern nations. Many good persons, however, in their attempts to reconcile the literal with the spiritual sense of this book, have injudiciously carried their attempts too far, and have been led beyond the boundaries which a reverence for the sacred Scriptures should ever prescribe. The Jews did not allow their youth to read this book before the age of thirty.

CANTILEVER, *kăn-ti-lē'-ver* (probably fr. Lat. *canterii labrum*, the lip of a rafter), a projection from the face of a wall, used to support balconies and ornamental cornices, answering the same purpose as a bracket, but widely differing from it in form. It is often used synonymously with the term bracket; but, strictly speaking, the name should be confined to long pieces of wood, iron, or stone, projecting for some distance from the wall, but comparatively narrow in width and depth. The projections that support the eaves of a house are cantilevers. A good pictorial illustration of the term may be seen in the engraving appended to the article BALCONY. The word is also spelt cantalever, cantaliver, and cantliver.



CANTILEVER.

CANTO, *kăn'-to* (Ital. *canto*, a song), a part or division of a poem, answering to book in prose.

CANTON, *kăn-ton'* (Fr. *canton*; Ger. *kante*, a corner), in Her., one of the nine honourable charges or ordinaries, occupying a third part of the chief, or exactly one-ninth part of the field. It is square in form, and is borne on the dexter or sinister side of the shield.

CANTON (Fr. *canton*, a district), a term employed in Geog. to denote a portion of territory forming a separate state or government. Switzerland is divided into cantons. The arrondissements in France are subdivided into cantons, of which there are 2,971; and these are again subdivided into communes.

CANTON'S PHOSPHORUS.—The protosulphide of calcium, when newly made, is very phosphorescent. This property was discovered by Canton, who first prepared this substance by calcining oystershells and mixing the whitest pieces with one-third their weight of flowers of sulphur, and recalcining them in a crucible with a luted cover. When heated for an hour, the whitest pieces were selected and preserved in well-stoppered bot[illegible].

C[illegible]ONMENTS, *kăn-ton'-ments* (Fr. *cantonnement*).—In mil., troops are said to go into cantonments when, either on account of the inclement state of the weather, difficulty of obtaining supplies, an armistice, temporary suspension of operations in the field, or other causes, the general commanding determines to quarter his troops in the towns and villages of any particular district, instead of putting them under canvas. A careful examination of the capabilities and natural position of the district is first made by the quartermaster-general and officers of engineers, and the men are then billeted in the villages and farmhouses, but kept together as closely as possible, in order to resume active operations whenever it may be required. Headquarters and a main guard are established in some central and commanding position, pickets of cavalry and advanced guards are posted at outlying points to watch every approach to the neighbourhood in which the troops are placed, and everything is done that is necessary to secure the position in event of the enemy making a sudden and unexpected advance. The term cantonments is applied in India to barracks built near any large town or city for the reception of troops. They correspond very nearly to our own barracks and permanent camps, with this particular difference, that the quarters of the various troops are not contiguous, but are spread over an area of considerable extent. The cantonments are sometimes called "the lines." They generally situated at some little distance from any town to which they are attached, and comprise quarters for European and native troops of all arms of the service,—cavalry, infantry, and artillery, with separate bungalows for the officers. Parade-grounds, magazines, mess-rooms, offices, and bazaars, are attached. The cantonments near Delhi are pleasantly situated on a rising ground to the north of the city, about two miles from the Cashmere gate. The cantonments, or lines, at Meerut will ever be remembered in Anglo-Indian history as the spot in which the slaughter of European officers and their families, that so signally marked the first act of the sanguinary drama of the Indian revolt, was commenced by the infuriated mutineers.

CANTRED, or CANTRETH, *kăn'-tred* (Brit. *cant*, a hundred, and *tref*, a town or village), is used in Wales in the same sense as a hundred in England, denoting certain division of a county.

CANVAS, *kăn-văs* (Fr. *canevas*), a coarse material used for the sails of vessels and for the foundation of painted cloth for floors. The term is also applied to a light material woven with the warp and woof at intervals, so as to leave square interstices between them, and used by ladies for tapestry and Berlin-wool work. Painter's canvas, on the contrary, is a material of very close texture, called "ticking." It is generally purchased stretched on frames of various sizes, and primed with a light neutral grey or drab tint ready for use.

CANZONE, *kăn-zo'-ne* (Ital.), is the name given to one of the oldest forms of the Italian lyric. The word is, indeed, derived from the *canzón* or *chanson* of the

Provençals; but the Italians were the first to give it a definite form. It received its classic stamp principally from Dante and Petrarch. With them the canzone was any considerable lyric poem divided, like the Greek strophic ode, into stanzas exactly corresponding to one another in number of lines, metre, and position of rhymes; the last stanza being commonly shorter than the others, and usually consisting of a valedictory address by the poet himself to the poem. After Petrarch the Italians began to deviate from the strict form of the canzone, among whom were Tasso and Chiabrera.

CANZONETTA (Ital., dim. of *canzone*), is an abridged canzone written in short lines and verses.

CAOUTCHOUC, INDIA-RUBBER, or GUM-ELASTIC, *kiout'-chook* (its Indian name).—Caoutchouc is the solidified milky juice of certain tropical plants, the largest supply being obtained from the *Ficus elastica*, a tree belonging to the ord. *Moraceæ*, found in Assam; from other species of *Ficus* growing in Java and America; from the *Siphonia elastica*, a native of Guiana and Brazil; and from the *Urceola elastica*, a climbing plant found in the islands of the Indian archipelago. Many other plants yield caoutchouc in small quantities; such as the common fig (*Ficus carica*), the spurge, the dandelion, and the celandine. The milky juice of these plants consists of the caoutchouc mechanically suspended in the form of small globules in a thin aqueous fluid charged with soluble vegetable matter. In this respect it bears great analogy to cows' milk (*see* MILK), which is also a thin aqueous fluid holding insoluble globules in mechanical suspension. The analogy is further borne out by its behaviour when left to itself. Preserved in close vessels, it separates into two portions, the more solid part, the caoutchouc, rising to the top, and forming a thick cream upon the surface. Prepared in this way it contains many impurities. The likeness borne by this milky juice to animal milk has caused it to become an article of food in several countries, and the juice of the cow-tree, or hya-hya of tropical America, is consumed in large quantities by the natives of the district in which it grows. The caoutchouc of commerce occurs in the form of large shapeless masses collected at the foot of the tree which has been cut, or in rude cylinders formed in clay moulds. It is a imported in the shape of bottles, figures of animals, imitations of the human foot, &c. These are made by dipping a rude clay mould repeatedly into the juice and allowing the caoutchouc to solidify between each operation, the clay being broken and extracted when a sufficient thickness has been obtained. Such is the raw India-rubber of commerce, the properties of which are too well known to need description. When first introduced into this country, about a century ago, its only use was to efface marks made by lead pencils. Its elasticity and imperviousness to moisture were well known, but the impossibility of procuring it in large masses caused its use to be limited to the purpose just mentioned. In 1819 Mr. T. Hancock commenced his experiments on its solubility in different fluids. His first experiments were unsuccessful, and he directed his ingenuity to a process for cutting the bottle-shaped masses into thin pieces, and applied them to the making of elastic bands for gloves, waistbands, garters, stays, patterns, clogs, &c. In the process of manufacture he accumulated an immense quantity of waste pieces, which he turned to use by taking advantage of the property that caoutchouc possesses of uniting when exposed to a heat of 300° Fahr. The fragments were combined into a mass by means of a machine called a *masticator*, which consisted of a spiked roller working inside a hollow spiked cylinder. At first, only two ounces at a time could be masticated; but by enlarging his machinery he worked up large masses, which could be afterwards cut into sheets and blocks. He further discovered that these sheets could be dissolved in oil of turpentine. This was an important discovery, leading to the invention of waterproof cloth by Mr. Charles Macintosh. The method by which this was effected consisted in cementing together two surfaces of cotton-work cloth by means of the caoutchouc solution. This formed a material impervious to air and water, to which was given the name of Macintosh. Mr. Hancock continued making experiments on the liquid caoutchouc imported from Peru, but found he could use more successfully the solution above named. The uses to which the solution was applied are so numerous that it would be impossible to mention the whole of them. In 1821 a method of making elastic fabrics, having threads of caoutchouc in the warp or weft, was introduced. The manner in which the threads were formed is ingenious. A round flat disk of caoutchouc was made by cutting a bottle into halves and subjecting them to pressure; the disks were then cut into ribbons by a knife revolving spirally, the ribbons being afterwards sliced into square threads by another machine containing a series of cutters. The shreds thus prepared were stretched to their full extent while warm, and, being kept in a state of tension until they were cool, it was found that they did not spring back to their original length until once more heated. The stretched thread was covered with cotton, and used as the warp of the fabric into which they were made. When woven, the fabric was beaten, which caused the caoutchouc to relax, reassuming its elastic condition. Caoutchouc continued to receive numerous applications in manufactures, civil and mechanical engineering, domestic appliances, and surgical instruments, until 1842, when the most remarkable discovery in relation to this material was made by Mr. Goodyear, an American inventor. In this year an agent of this gentleman brought to England a few specimens of caoutchouc which had been treated so as to lose its three great defects of hardening by cold, becoming sticky and relaxing by heat, and dissolving in oil and grease. The new material also possessed greater toughness and almost perfect elasticity. The inventor wished to sell his invention; but as the process was not communicated, English manufacturers declined to treat. The indefatigable Mr. Hancock at once set to work to produce a similar material, and after expending much time and labour in investigating the matter, he discovered a means of combining caoutchouc with sulphur, producing the substance known as *vulcanized India-rubber*. Since that period various methods have been devised for its manufacture, by kneading certain proportions of caoutchouc and sulphur in a masticator; by dissolving caoutchouc in sulphurized oil of turpentine, which is afterwards allowed to evaporate; by dipping the rubber in a solution of chloride of sulphur in bisulphide of carbon; and several other methods more or less important. The perfect elasticity of the new material, the ease with which it could be moulded into various shapes, the properties of resisting heat, cold, and solvents, soon rendered its use universal. Its applications to engineering purposes were most important. It soon superseded the use of metal springs for the buffers of locomotives. It replaced leather for valves and washers, and waterproof overshoes began to be manufactured under Goodyear's patent by millions. Since 1842 the trade in India-rubber articles has steadily increased, the imports having quadrupled in ten years. By combining caoutchouc with sulphur at an elevated temperature, a hard, light, intensely black substance called ebonite, or vulcanite, has been formed; for a description of which consult articles EBONITE and VULCANITE. Chemically considered, pure caoutchouc is a carbide of hydrogen, or hydro-carbon, $C_5H_7$, possessing a spec. gravity of 0·92 to 0·97 (Faraday). It is prepared by dissolving the commercial material in chloroform, precipitating with alcohol, and drying at a temperature of 70° to 80° Fah. As it is found in commerce, it is a dark-brown material, soft and elastic at ordinary temperatures, hardening temporarily at about 40° Fah., and melting at 250° into a liquid having the consistency of tar, which does not soon resolidify. It is insoluble in water and alcohol; but dissolves more or less readily in chloroform, washed ether, bisulphide of carbon, coal-tar, naphtha, benzole, and oil of turpentine. Nitric acid, sulphuric acid, and the alkalies, attack it but slowly. According to Payen, caoutchouc consists of two portions, one of which is soluble in the liquids above mentioned, while the other only swells and softens under their influence. Caoutchouc dissolves in the fixed oils, but loses its elastic properties thereby. Distilled in close vessels, caoutchouc furnishes a mixture of several hydrocarbons, which possesses powerfully solvent properties. By careful distillation at different temperatures, this mixture is separated into liquids of different densities and boiling-points. One of these is remarkable for its low

specific gravity, ·630 at 25° Fah., and for boiling at 32° Fah. (freezing-point). Himly gave the name of *caoutchine* to one of these hydrocarbons having a specific gravity of ·842 and a boiling-point at 340°. It resembles oil of turpentine in most of its properties. Among the less volatile portions, Bouchardat found a yellow oily hydrocarbon, which he named *hevéene*. He also obtained *tetrylene* (which *see*); *caoutchene*, a liquid of specific gravity ·650, which boiled at 58°, and yielded crystalline plates at 11°; and a third compound, which he considered to be *eupion* (which *see*). Caoutchouc, in its unvulcanized state, is most useful in the laboratory, for connecting the tubes of apparatus. Its power of resisting re-agents, and its property of cohering to form a tight joint when newly cut, render it a desideratum in the modern laboratory. In its permanently-melted condition, it forms a valuable lute for pneumatic apparatus. Stoppers and stopcocks lubricated with it remain movable, yet perfectly air-tight. Vulcanized, it serves for gas bags and tubes, and for many other purposes. It must, however, be used with great care, as it is liable to introduce sulphur into solutions near which it passes.

Caoutchouc Mineral, an elastic bituminous mineral, resembling caoutchouc in its physical properties. A few specimens of this substance have been found in a lead-mine in Derbyshire, in a coal-mine at Montbrelais, and in bituminous limestone at Woodbury, in Connecticut.

Cap, *kap* (Lat. *caput*, the head), is the garment that covers the head. Caps were not worn by the Romans for many ages. When the rain or sun was troublesome, the lappet of the gown was thrown over the head. The same usage prevailed among the Greeks, where, at least during the heroic age, no caps were known. The general use of caps and hats in Europe is referred to the year 1149, when they were used at the entry of Charles VII. into Rouen. From that time they began to take the place of *chaperons* or hoods. When the cap was of velvet, it was called mortier; when of wool, simply bonnet. None but kings, princes, and knights were allowed to use the mortier. The cap was the head-dress of the clergy and graduates. Pasquier says that the giving of the cap to students in the universities denoted that they had acquired full liberty, and were no longer subject to the rod of their superiors,—in imitation of the ancient Romans, who gave a *pileus* or cap to their slaves in the ceremony of making them free; and hence on medals Liberty was represented as holding out a cap in her right hand. Churchmen, members of universities, students, and others, wear square caps. The French clergy wear a shallow kind of cap called a *calotte*, which covers only the top of the head. The cap was also sometimes used as a mark of infamy. In France those who had been bankrupt were obliged to wear ever after a green cap, to prevent people from placing confidence in them in any future transaction; and if they should at any time be found without this cap, their protection was to be null.

Cap-à-Pie. (*See* Armed at all Points.)

Cap of Maintenance or Dignity, an ornament of state worn by royal or noble individuals on certain important occasions. It forms part of the British regalia, and was carried before the kings of England at the coronation. A cap of maintenance is also carried before the mayors of some cities.

Capacity, *ka-păs'-e-te* (Lat. *capax*, capacious), in Phil., properly denotes the susceptibility of the mind of being affected by a particular class of emotions. It signifies literally "room for," and denotes the passive power of the mind as distinguished from faculty, which is active power. It is an aptitude to receive certain modifications of our consciousness, in receiving which we are passive. The terms power, faculty, capacity, are more appropriately applied to natural than acquired capabilities, and are thus inapplicable to mere habits.

Capacity, Legal.—The legal capacity of persons depends upon their age or condition. (As to the first, *see* Age.) In the second case, the law has wholly or partially placed infants, married women, idiots, persons of unsound mind, and some others, under its protection, absolved them from the consequences of certain acts committed, or limited their liability under contracts entered into by them. (The subject will be referred to under the several titles of Age, Companies, Corporation, Contract, Duress, Husband and Wife, Idiots, Infants, Insanity, Marriage, and Officer Public.)

Caparisoned, *kă-păr'-e-zond* (Fr.), a term employed in Her. to denote a war-horse fully furnished for the field. In the Middle Ages, horses were caparisoned in a very superb and costly manner; and in some countries the horse caparison consists of the richest and most gorgeous materials.

Cape. (*See* vol. I. of this work.)

Capella, *kă-pel'-la* (Lat. *capella*, a she-goat), in Astron., a brilliant star of the first magnitude in the constellation Auriga.

Capercailzie, or Capercailie, *kă-per-kail'-ze* (*Tetrao urogallus*), a bird of the Grouse species, whose appellation is of Gaelic origin, and means "horse of the wood;" it is also called the Cock of the wood. Formerly, this magnificent bird was an inhabitant of the British isles, being principally found in the Highlands of Scotland, but has been for some time extinct there. It prefers the pine forests of Norway and Scandinavia, in which regions it is found in abundance. Several attempts have been made to introduce this bird again into Scotland, but without any satisfactory results, although the soil and climate of the country are well adapted to the purpose. As it is, a larger number of capercailzie may be found in the regions of Headenhall than in any



CAPERCAILZIE.

other part of the United Kingdom. The food of the capercailzie consists of the leaves of the Scotch fir, also various berries found in the North. The young have a more luxurious diet, feeding on ants, worms, and other insects. The size of this species varies considerably; in some cases a full-grown male (which is one-third larger than its mate) will scarcely weigh ten pounds; whereas it will sometimes exceed sixteen pounds. This discrepancy is greatly owing to the latitude in which it is found. In length it usually measures about 3 feet ten inches. The capercailzie may lay claim to considerable beauty. Not until it is three years old is it fully developed, and then it exhibits an eagle-like grandeur and boldness, beside which every *Gallus domesticus* sinks into insignificance. Its plumage is beautifully glossy, mottled with grey and brownish-black, the neck and breast black, tinged with a rich green. The female's attire is humbler, and is variegated with yellowish-brown, white, and brownish-black. It would seem a pity that vigorous attempts were not made once more to introduce the capercailzie into the United Kingdom.

Capers. (*See* Capparis.)

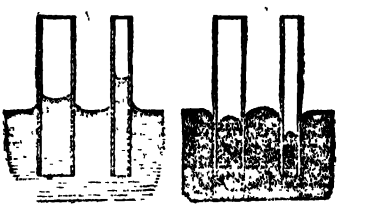
Capetian Dynasty. (*See* France, vol. I. of this work.)

Capias, *kai'-pe-as* (Lat. *capio*), to arrest a defendant. It is of various kinds. One is a writ called *capias ad respondendum*, before judgment. It cannot be issued unless the cause of action exceeds £20, and in no case without an affidavit made by the plaintiff that it does exceed that sum; nor can it be issued at all unless the defendant is about to abscond; in which case, on an affidavit of the cause of action, and stating circumstances to show the defendant is about to leave the country, an order can be obtained for his arrest by an application to a judge of one of the courts of common law at Westminster, or a warrant for such arrest by an application to a commissioner in bankruptcy, or a judge of a county court, except the courts for Mid-

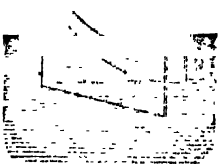
diesex and Surrey. In either case a writ of capias must be issued; but if a warrant be obtained, the defendant may be arrested thereon without the writ, which must, however, be issued forthwith, and if no action be pending, a writ of summons also. The writ of capias must, if the debtor be in custody, be served with the capias within seven days inclusive, from the date of the warrant. The defendant, on giving bail to the satisfaction of the sheriff in double the sum claimed, will be discharged; or, on giving bail before a judge, to satisfy the debt and costs, can obtain an order for his discharge; or he may apply to a judge of a superior court, commissioner in bankruptcy, or county court judge, to have the writ or warrant set aside and vacated, if the application be made before arrest, or for his discharge out of custody if the application be made after his arrest. Another writ of capias is called *capias ad satisfaciendum*, and is issued on a judgment obtained in an action against the defendant, to arrest the defendant to satisfy the judgment. It cannot be issued in an action of debt unless the debt recovered exceeds £20, and the defendant cannot give bail, but must remain in prison until he be discharged under the Bankruptcy Act. (*See* BANKRUPT.) Another of such writs is called *capias ad withernam*, issued in cases of distress for rent, or damage *feasant* by cattle, where the distress is carried out of the county or concealed, on which the sheriff might return that the goods or beasts were *elonged*, *elongata* (carried to a distance), to places to him unknown, and thereupon the party replevying could have a writ of *capias in withernam*, *in retuto* (or more properly *repetitio*) *namio*, a term which signifies a second or reciprocal distress, in lieu of the first which was eloigned. It was therefore a command to the sheriff to take other goods of the distreinor, in lieu of the distress formerly taken and eloigned or withheld from the owner; so that there was distress against distress, one being taken to answer the other by way of reprisal, and as a punishment for the illegal behaviour of the original distreinor; for which reason goods taken *in withernam* could not be replevied till the original distress was forthcoming. As replevins can now be proceeded with in the county courts without writ, the old practice in such cases has fallen into desuetude. (*See* REPLEVIN.) It should be stated that in the old northern languages the word *withernam* is used as equivalent to *reprisals*.—(Sternhook, *de Jure Sweon.* l. 1, c. 10.) A writ of *capias pro fine*, issued against a plaintiff for an amercement or fine to the crown for bringing a false action. This is abolished in some actions by 5 Will. & Mary, c. 12, and in all cases disused. The remaining writ of capias is a *capias utlagatum* issued against a person outlawed in any action, whereby the sheriff is commanded to apprehend him, and keep him in safe custody till the day of the return of the writ, and then have his body there to be ordered for his contempt. (*See* OUTLAWRY.)

CAPILLARIES, *kap-il'-la-rees* (Lat. *capillus*, a hair), in Anat., are the minute blood-vessels of the body, which form the connection between the extremities of the arteries and the veins. They vary in size from $\frac{1}{1000}$th to $\frac{1}{3000}$th of an inch in diameter, being smallest in the brain and largest in the bones. It is in the capillaries that nearly all the changes in the blood take place. It is in them that its carbonization is effected and animal heat produced, and from them that the bile, sweat, and urine are secreted.

CAPILLARY ATTRACTION, a term applied to that part of Physics which investigates the phenomena produced when solid bodies are brought into contact with liquids. These phenomena are best observed in small tubes, about the diameter of a hair: hence the name. In all cases, although the phenomena are very varied in their nature, the result may be attributed to the mutual attraction of the liquid molecules for each other, and to the attraction between these molecules and solid substances. The following instances are examples of capillary attraction. When a solid substance is immersed in a liquid which wets it, as, for instance, a glass rod in water, the liquid becomes curved upwards towards the side of the solid, making its surface slightly concave, instead of being horizontal. If, however, the liquid does not wet the solid, as, for instance, a glass rod dipped into mercury, the liquid is depressed against the sides of the solid and assumes a convex shape. The surface of the liquid against the sides of the vessel which contains it is also concave or convex, according to whether the liquid does or does not wet it. If a small tube, instead of a glass rod, is employed, these phenomena become much more apparent. The liquid ascends, or is depressed, according to whether the tubes are moistened by the liquids or not, as represented in the annexed illustrations. The amount of



ascent or depression is proportionately greater, according to the diameter of the tube. Gay-Lussac has demonstrated that liquids ascending or being depressed in capillary tubes are governed by these laws. First, that a liquid ascends in a tube when it moistens it, and is depressed when it does not; secondly, that this ascent and depression are in the inverse ratio of the diameters of the tubes, so long as these do not exceed two or three millimètres; and, thirdly, that the ascent and depression vary with the nature of the liquid and the temperature, but that they are altogether independent of the thickness of the tube and the nature of the substance, provided that it is moistened by the liquid. These laws hold good *in vacuo* as well as in air. Analogous capillary phenomena occur when two bodies of any given shape are immersed in water, provided they are sufficiently near. If two parallel plates of glass are immersed in water at a short distance from one another, the water will rise between them in the inverse ratio of the separating distance. If the plates are immersed in mercury instead of water, a corresponding depression is the result. If two glass plates, AB and AC, inclined to one another at a small angle, as represented in the accompanying engraving, be so immersed in a liquid which wets them that the line of contact between the two plates is vertical, the liquid will rise towards the summit of the angle of the two plates, and the curve from the highest part of the surface to the lowest will be the *hyperbola*. When two floating balls, both moistened by the liquid, are so near that the surface between them is not level, they are attracted towards one another. Balls that are not moistened by the liquid in which they float are also attracted in the same manner. Balls made of cork are instances of the former, and balls made of wax of the latter. If one floating ball is moistened by the liquid and the other is not, both balls are repelled. The theory of capillary attraction is one of the most difficult in physics, and can only be completely treated by mathematical analysis. It has been more especially studied by Laplace, Clairaut, and Poisson. The effects of capillary attraction are to be observed in many operations in nature. Insects can often move on the surface of water, because their feet are not wetted by the fluid, and a depression is caused, which buoys them up. A sewing-needle will float on the surface of water if covered with oily matter. Oil ascends in the wicks of lamps by capillary attraction, and water rises in wood, sponge, bibulous paper, and other porous substances, by the same force.



CAPITAL, *kap'-it-al* (Lat. *caput*, the head), a term in Arch., applied to that part of the column which sur-

mounts the shaft, including the bell,—a part swelling outwards between the shaft and abacus, and the abacus itself. When the lower part of the capital assumes the appearance of being a continuation of the shaft, separated from it by an astragal or moulding, it is called the neck of the capital. In the five classic orders of architecture (*see* ARCHITECTURE) the capitals form striking marks of distinction, and there is considerable difference in the treatment of the capital of the same order in Greek and Roman architecture, as will be seen presently. The capital of the Tuscan order is very plain, consisting of a neck, on which is an ovolo moulding, supporting a square abacus surmounted by a fillet. That of the Roman Doric is similar in form, but the neck is ornamented with rosettes and buds. The capital of the Greek Doric is far more elegant in appearance, consisting of a massive abacus supported by an echinus moulding that swells from the shaft, and is separated from it by three small annulets. The capitals of the Greek and Roman Ionic are similar in appearance and general details. They are formed by volutes of two parallel faces, connected by curved or horizontal lines. Between the spirals of the volute there is an echinus moulding, and, when a neck is added, it is enriched with tracery in relief. The abacus consists of an ogee moulding and fillet. The method of tracing the spiral of the volute will be found elsewhere. (*See* VOLUTE.) The bell of the Corinthian capital is richly ornamented with the leaves of the acanthus disposed in two rows, finished by four small spiral volutes in each face rising from the leaves below. Two of these curl outwards under the corners of the abacus, and two inwards, towards each other in the centre of each side. The abacus is formed of a cavetto, fillet, and echinus. The great point of difference in the Greek and Roman Corinthian capitals consists in the form given to the leaves. In the former they are pointed, and far more natural in form than in the latter, in which they are beautifully rounded at the edges. The Composite capital is similar to the Corinthian, but the volutes at the angles are bolder and more ornate, springing out of a deep ovolo moulding which runs along the sides of the faces between the spirals. A description of the various forms of capitals used in architecture of different epochs, styles, and countries, will be found in the several articles devoted to this subject. (*See* ARABIAN, BYZANTINE, EGYPTIAN, HINDOO, GOTHIC ARCHITECTURE, &c.)

CAPITAL, in Mil., a line drawn through any separate part of a system of fortification, such as a bastion, ravelin, lunette, &c., dividing it into two equal and similar parts. Thus the capital of a bastion is the straight line drawn from the salient angle through the centre of the entrance in the rear.

CAPITAL, in Pol. Econ., may be defined as the accumulated savings of industry, capable of being employed either for the support of human existence, or as an instrument of production. In Com. the term is generally understood to mean the accumulated stock of every description with which a merchant or manufacturer carries on his business. In this sense it includes not only the actual money employed, but the plant or machinery requisite for the production of commodities, as well as the buildings, raw materials, &c., indispensable for trade purposes. In short, it is wealth appropriated to reproductive labour. In the science of political economy, capital has, however, a more exact meaning. It is difficult accurately to define it, and much valuable time has been wasted in futile discussions upon the subject; but it will suffice to say, in ordinary language, that it comprehends every species of wealth which a nation or community possesses as the result of human exertion, and applicable to present and future uses. It represents the entire wealth of a country, as apart from individuals. Upon reference to the most important treatises which have appeared upon this branch of political philosophy, we find capital usually divided into two kinds, viz.—1st *Fixed capital*, consisting of the tools and instruments used by the labourer in creating the products of his industry, the machinery he makes and guides, and the premises necessary either to facilitate his efforts or to protect such produce. 2nd. *Circulating capital*, which Adam Smith explains as comprising "the provisions, materials, and finished work of all kinds which are in the hands of their respective dealers, and of the money which is necessary for circulating and distributing them to their final consumers." *Fixed* and *circulating capital* are dependent, and react upon each other according to circumstances; and Mr. M'Culloch lays it down as a cardinal doctrine, that "it is only by their conjoined and powerful operation that wealth can be largely produced and universally diffused." He further says, "The quantity of industry, therefore, not only increases in every country with the increase of the stock or capital which sets it in motion, but, in consequence of this increase, the division of labour becomes extended, new and more powerful implements and machinery are invented, and the same quantity of labour is thus made to produce an infinitely greater quantity of commodities. The ultimate object of the production or employment of capital is to provide for consumers, the wants or desires of whom vary with their condition of life." (*See* POLITICAL ECONOMY.)

CAPITAL ACCOUNT, in the financial affairs of railways and of public companies, signifies all that appertains to the capital stock. In railway concerns, for example, the money obtained for shares and upon debentures is lodged in a bank, where it constitutes the capital account of the railway company, and serves as the source hence the directors of the company may obtain the means of purchasing the land, locomotives, rails, carriages—in brief, everything necessary to bring the undertaking up to the point of working. Upon the opening of a line of railway for traffic, another account is commenced, called the revenue account, and which is frequently kept in another bank, and kept totally apart from the capital account. (*See* REVENUE ACCOUNT.)

CAPITAL LETTERS are those large letters of the alphabet that are employed in writing and printing, in place of small letters, at the beginning of proper names, sentences, lines in poetry, &c. Formerly it was the custom to begin every noun with a capital letter, and this is still the case in German; but in English the capitals are now more sparingly employed. The principal occasions in which they are used are at the commencement of proper names of persons, places, mountains, &c.; of adjectives derived from proper names; the opening of quotations; beginning of a sentence, and of each line in poetry; the pronoun I; and every principal word in the titles of books.

CAPITAL PUNISHMENT, in Crim. Juris., is the punishment of death,—the depriving the criminal of his life. It is so called from the head being that part of the body most commonly acted upon. The modes of inflicting capital punishment have been very various at different times and in different countries. Sometimes the object has been merely to accomplish the death of the criminal; at other times, it has been to prolong and add to his sufferings by cruel tortures, to satisfy craving for vengeance, or as a public example. It could be well-nigh impossible to enumerate all the ways which ingenuity has devised for the purpose of adding to or prolonging the sufferings of those who are being put to death; but among the more common may be mentioned, burning at the stake, crucifying, sawing in pieces, quartering alive, breaking upon the wheel, exposing to be torn by wild beasts, pinching to death with red-hot pincers. When the object is merely the infliction of death, hanging or beheading is usually had recourse to, and these are now almost the only modes employed in Europe. There are several important questions connected with capital punishments much agitated in the present day, which, however, our limits will only admit of our entering upon very briefly. There are many persons, whose opinion is entitled to the greatest weight, who hold that the state has no right to inflict death as a punishment for crime. The right which a state possesses to punish for offences arises from the right which every one naturally has to protect himself from injury at the hands of another. In a state of nature, every individual has a right to protect himself from injury, and to repel force by force, and may even take away the life of another, if necessary, to preserve his own. It was the consciousness of this great natural law that made Cain cry out against the severity of his punishment, saying, that "every one that findeth me shall slay me." When

men come into a state of society, the right of protecting themselves from injury is transferred, by common consent, from individuals to the community, which, in this case, receives exactly the same power over all its members as each individual man naturally had to protect himself from others. This, of necessity, includes the punishment of death; and there is also the Scripture injunction given by God himself to Noah and his children, that "Whoso sheddeth man's blood, by man shall his blood be shed." Hence it is that the state has the right to punish murder by death; and practically in this country it is, happily, only in cases of murder that capital punishments are now inflicted. In Blackstone's time there were no fewer than 160 crimes punishable by death. There is more room to doubt whether capital punishments ought to be inflicted for lesser crimes than that of murder. According to Sir Matthew Hale, "When offences grow enormous, frequent, and dangerous to a kingdom or state, destructive or highly pernicious to civil societies, and to the great insecurity and danger of the kingdom or its inhabitants, severe punishment, or even death itself, is necessary to be annexed to laws in many cases by the prudence of lawgivers." There are some who, while they do not deny the right of the state to inflict capital punishment, yet question its expediency, asserting that the desired end would be as well, or better attained in another way. The end of punishment is not to avenge past, but to prevent future offences. There are three ways in which this may be accomplished:—1. by reforming the criminal himself; 2. by preventing him from again offending; and 3. by deterring others through his example. It is this last that is the principal object in view in all criminal punishments. Is this object, then, best obtained through capital punishment, or might it be better attained in some other way? Would the continued example of a living culprit, condemned to a lifetime of labour as a slave to repair the injury done to society, have a greater effect in deterring others from crime than the sight of an execution? It is here, in our opinion, that the strength of the arguments against capital punishment lies. We believe that it is scarcely possible for those for whose benefit the example is specially intended, in any measure to realize the feelings of one under sentence of death; and we may easily suppose that they will not strive to do so. While, doubtless, the culprit himself would gladly welcome any kind of servitude, however hard, in exchange for certain death, we believe that generally the onlooker would regard that mode of death vastly preferable to a prolonged period of suffering, from which there was no hope of deliverance. Punishments of long duration are much more terrible to the spectator than those that are severe, but soon over. The intenseness of pain does not make such an impression upon the mind as its long continuance. Many think that they could meet death with firmness and intrepidity, who would shudder to think of perpetual slavery. The terrors of death make so slight an impression that it soon passes out of the mind, especially if moved by desire or passion. The tendency, too, of a public execution is (except in rare cases) rather to excite the pity and compassion of the spectators for the sufferer than detestation of his crime; and there have been cases, too, where persons have been of so depraved tastes, as that the sight of a public execution has even moved them to desire what they regarded as the *éclat* of such an exhibition. It has been advanced by Sir Samuel Romilly, against those who hold that the state has no power to inflict capital punishment, that if perpetual servitude be a severer punishment than death, how can it have the power of inflicting the greater and not of inflicting the less. The answer to this is, simply, that to the criminal himself no punishment is, or can be, greater than that of death; but to the spectator, perpetual slavery seems much the severer of the two. The spectator collects all the miserable moments of a slave's life into one point, while to the slave himself they are diffused over a long period: the sufferer, too, becomes, by habit, callous to his misfortunes, and even finds sources of consolation, of which the onlookers are ignorant. While, therefore, perpetual slavery would serve effectually to prevent the criminal from further offending against the laws, such a proceeding would doubtless be the more merciful to him, and would also, we believe, serve more effectually as a means of deterring others. It has been well said, that "a penal system ought to aim at economizing pain by diffusing the largest amount of salutary terror, and thereby deterring as much as possible from crime at the smallest expense of punishment actually inflicted." The criminal would also be, in this way, able to contribute something for the good of society, whose laws he had broken, and might also have time to prepare himself for that tribunal before which he had yet to appear. There would also be an important gain in the greater certainty of the punishment; for "crimes," says Beccaria, "are more effectually prevented by the *certainty* than by the *severity* of punishment." The very severity of capital punishment prevents it in many cases from being carried out, and thus allows some hope of escape, even to the most guilty. The arguments against capital punishments will be found ably stated by Beccaria, "Essay on Crimes and Punishments;" and those on the opposite side by Jeremy Bentham, "Rationale of Punishment." (*See* PUNISHMENT.)

CAPITATION, *kă-pit-at'-shun* (Lat. *caput*, the head), denotes a thing that is applicable to all persons—literally, to every head. A capitation or poll-tax is a tax levied on persons by the head, without reference to property or other circumstances: it may be on every one; on all males; on all above a certain age, &c. In France the ancient capitation-tax is now replaced by more approved modes of taxation.

CAPITOL. (*See* CAPITOLEUM, vol. I. of this work.)

CAPITOLINE GAMES, *kă-pit'-o-line*, annual games instituted by Camillus, and held by the ancient Romans in honour of Jupiter Capitolinus. They commemorated the preservation of the Capitol from the attacks of the Gauls. The name was also given to certain games instituted by Domitian, which were celebrated every five years.

CAPITULAR, *kă-pit'-u-lar* (Lat. *caput*, the head), is a term frequently employed on the continent to designate a major canon or prebendary, a capitular member of a cathedral or collegiate church.

CAPITULARIES, *kap-it'-u-la-ries* (Lat. *capitularia*), were certain laws or ordinances issued by the French kings of the first and second Frankish races, for the administration of civil and ecclesiastical affairs. These capitularies were made in the assemblies of bishops and lords of the kingdom. The best known are those of Charlemagne and Louis. Ansegisus, abbot of Fontenelles, made a collection of these in 827, and other collections were made subsequently. Bishops were also accustomed to give the name of capitularies to the rules which they drew up from the canons of councils for the regulation of their own dioceses.

CAPITULATION, *kăp-it-u-lai'-shun* (Lat. *capitula*, heads, from *caput*), in Mil., the act by which an officer in command of a fortress or body of troops surrenders to the enemy. The terms of the surrender are stated in a series of articles, to which the expression is more particularly applied. The governor of a fortress is justified in capitulating to an enemy when he has defended his post as long as the ammunition, provisions, and resources of the place will permit; for when the walls have been breached, and there is no hope of obtaining relief, continued resistance would be an act of madness and folly, which would sooner or later compel him to surrender at discretion, placing himself and his forces entirely at the mercy of the enemy. A white flag is the sign that the besieged desire to capitulate. The articles are generally drawn up by officers deputed for the purpose by the general commanding the investing army on the one hand, and the governor of the fortress on the other. The terms generally depend on the nature of the case, but, in most instances, the beleaguered troops are permitted to march out with drums beating and colours flying, and the officers are allowed to retain their private property. Protection is obtained for all, and considerate treatment for the sick and wounded, and the women and children, if there be any with the garrison. The besiegers generally take possession of the arms and stores remaining in the place. A convention is a sort of capitulation by which the general of an army occupying any district agrees to withdraw his troops and

evacuate it in favour of a superior force, which he cannot hope to oppose with success in the field.

CAPITULUM, *kă-pit'-u-lum*, in Bot., a kind of inflorescence, consisting of a close terminal collection of flowers surrounded by an involucre. It constitutes the *compound flower* of Linnæus, and is also known under the names *anthodium* and *head*. The receptacle bearing the flowers may be flattened, as in the cotton thistle; or slightly convex, as in the chamomile; or globular, as in the American button-bush; or of other form: hence the numerous modifications of the capitulum. In the nat. ord. *Compositæ* the flowers are always arranged in capitula.

CAPNOMANCY, *kăp'-no-măn-se* (Gr. *kapnos*, smoke; *manteia*, divination), a species of divination used by the ancients. If the smoke ascending from the sacrifice was thin and light, and went up in a straight line, it was considered to augur favourably; but if it went in any other direction, it was an evil omen. Some practised this kind of divination by throwing poppy or jasmine seeds on the fire, and watching the direction of the smoke in the same way.

CAPNOMOR, or KAPNOMOR, *kăp'-no-mor* (Gr. *kapnos*, smoke, and *moira*, a part), a colourless oil of peculiar odour, resembling that of ginger, discovered by Reichenbach, amongst other products, in heavy oil of tar. It is limpid and volatile, insoluble in water and solution of potash, but dissolving readily in alcohol, ether, and the essential and fixed oils. Its specific gravity is slightly below that of water. It boils at 317° Fahr., and distils unaltered. It burns with a sooty flame, and is perfectly neutral in its reactions. It is obtained by distilling a solution of crude creosote in potash and with water. With sulphuric acid it forms a purple-red solution. It has not yet been satisfactorily analyzed.

CAPONNIÈRE, *kăp-on-yare'* (Fr.), in Mil., a passage made across the ditch of a fortress to any of the outworks, such as the ravelin in front of the curtain connecting any two bastions. It is composed of a double line of parapets about eight or nine feet high, with a banquette from which the defenders may fire. Externally, the earth slopes from the top of the parapets to the bottom of the ditch, forming a glacis on either side of the work. When only one parapet is made, it is called a demi-caponnière. Sometimes the caponnière takes the form of a covered gallery of masonry, with the sides loopholed for musketry. In field-works they are formed of palisades, or consist of trenches with a bomb-proof covering.

CAPOTE, *kă-pote'* (Fr.), a long cloak made of muslin or black silk bordered with lace. It is worn by ladies *en négligé*. The name is also given to a large horizontal hat with a heavy fringe of lace; and over-coats worn by the French soldiers are called capotes.

CAPPARIS, *kăp'-pă ris*, in Bot., the Caper-bush, the typical gen. of the sub-ord. *Cappareæ*, of the nat. ord. *Capparidaceæ*. The pickled flower-buds of various species are used under the name of capers. Those eaten in Europe are the produce of *C. spinosa*, a trailing shrub which grows in rocky places in the south of Europe. It is the only species of the order found on the north of the Mediterranean. The capers used in Barbary are obtained from *C. Fontanesii*, and those used in Egypt from *C. ægyptiaca*. The latter species is believed to be the hyssop of Scripture.



CAPER PLANT.

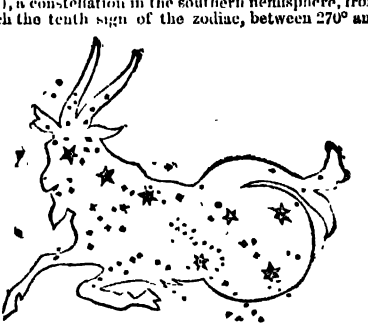
CAPPARIDACEÆ, *kăp-păr-i-d ă'-se-e* (from the Arab. *kepar*, capers), in Bot., the Caper family, a nat. ord. of dicotyledonous plants in the sub-class *Thalamifloræ*, including 28 genera and about 340 species—herbs, shrubs, and a few trees, mostly natives of tropical and subtropical regions. The leaves are alternate; the flowers solitary or clustered; sepals 4, sometimes cohering in a tube; petals usually 4, rarely 5, sometimes wanting; stamens generally a multiple of 4, or indefinitely numerous, placed on a hemispherical or an elongated disk; the ovary 1-celled, the style thread-like or wanting; the fruit is either pod-like and dehiscent, or baccate and indehiscent. The two kinds of fruit have led to a division of the order into two sub-orders; viz., *Cleomeæ*, characterized by a capsular fruit, and *Cappareæ*, by a baccate fruit or berry. In their properties the *Capparidaceæ* greatly resemble the *Cruciferæ*, being generally pungent, stimulant, and antiscorbutic. Some are aperient, diuretic, and anthelmintic.

CAPRA, the Goat. (*See* GOAT.)

CAPRIC ACID, *kap'-rik* (Lat. *capra*, a goat, terminal *icus*), a volatile fatty acid discovered by Chevreul amongst the products of the saponification of butter. It is also procured by acting on oleic acid or oil of rue with nitric acid. It is also found in small quantities in the fatty acids of cocoa-nut oil. Capric acid crystallizes in fine needles, which fuse at 86°, giving out an odour resembling that of a goat. It is sparingly soluble in boiling water, from which it separates in glistening plates. It has been named capric acid from its peculiar odour, but is now generally termed *rutic acid*, from being easily confounded with caproic and caprylic acids, and from being the acid of which oil of rue is the aldehyde. (*See* ALDEHYDE.)

CAPRICCIO, *kă-prit'-tcho* (Ital.), in Mus., an irregular species of composition, in which the composer, without any other restraint than the boundary of his imagination, continually digresses from his subject and runs wild amidst the fervour of his fancy. Perhaps the finest specimen of this form of musical composition is Mendelssohn's B minor C, for orchestra and pianoforte.

CAPRICORNUS, *kap-re-kor'-nus* (Lat. *capricornus*, a goat), a constellation in the southern hemisphere, from which the tenth sign of the zodiac, between 270° and



CAPRICORNUS.

300° of longitude from the first point of Aries, originally derived its name. The sun enters the winter solstice in this sign.

CAPRIFOLIACEÆ, *kăp-ri-fo-li-ai'-se e* (Lat. *caper*, goat; *folium*, leaf, in reference to the climbing habit of the plant), in Bot., the Honeysuckle fam., a nat. ord. of dicotyledonous plants in the sub-class *Corollifloræ*, consisting of shrubs with the following general characters:—Leaves opposite and exstipulate; calyx superior, 4—5-cleft, usually bracteated; corolla monopetalous, 4—5-cleft, tubular or rotate, regular or irregular, rarely polypetalous; stamens 4—5, inserted on the corolla, and alternate with its lobes; ovary inferior, 1—5-celled, usually 3-celled, often with 1 ovule in one cell and several in each of the others; fruit generally a berry, dry or succulent, indehiscent. There are 16 genera and about 220 species, chiefly natives of the northern parts of Europe, Asia, and America. They often have showy flowers, which are commonly sweet-scented. Many are cultivated in our gardens and shrubberies; as Honeysuckles, which are species of the genera *Caprifolium* and *Lonicera*; Guelder-roses, species of *Viburnum*; the Laurustinus (*Viburnum Tinus*); the Snowberry (*Symphoricarpus racemosus*); and the common Elder (*Sambucus nigra*). Some of the plants are emetics and mild purgatives; others are astringent; others sudorific and diuretic; and a few are acrid.

CAPROIC ACID, *kăp-ro'-ik* ($C_{12}H_{12}O_4$), an acid obtained during the saponification of butter or cocoa-nut oil, or by oxidizing oleic acid by nitric acid. It is

liquid at ordinary temperatures, has a sweet and pungent taste, and a characteristic odour of acid perspiration. It boils at 388° Fahr., and its specific gravity is ·930. It is best prepared by boiling cyanide of amyl with alcoholic solution of potash. Ammonia escapes, and a crystalline residue of caproate of potash is left behind. The salt is dissolved in water, and sulphuric acid is added, which unites with the potash, leaving the caproic acid floating on the surface. Caproic acid forms monobasic salts with the bases.

CAPROIC ALCOHOL.—Caproic alcohol is the hydrated oxide of c[illegible]yl or h[illegible] the [illegible] of the homologous radicles. It is often called hexylic alcohol. It is obtained from the fermented mark of the grape, along with propylic, butylic, and amylic alcohols, from which it is separated by fractional distillation. It is a colourless aromatic liquid of specific gravity ·832, and it boils at 302° Fahr. By heating it with hydrate of potash, caproate of potash is formed, in the same manner that acetate of potash is formed from vinic alcohol when it is heated with hydrate of potash, acetic acid bearing the same relation to vinic alcohol that caproic acid does to caproic alcohol.

CAPROIC ETHER.—Caproic ether is the caproate of ethyl, and must not be confounded with *caprylic ether*, which would be oxide of caproyl—a substance as yet unknown. It is prepared by distilling caproate of baryta, alcohol, and sulphuric acid together. It is a limpid, oily fluid, boiling at 324° Fahr., and possessing an agreeable fruity odour, resembling that of pine-apple.

CAPROYL, or HEXYL, *kap'-roil, hex'-ile* ($C_{12}H_{11}$).—The radicle of caproic alcohol is termed hexyl, from being the sixth of the homologous radicles forming the alcoholic series. It is obtained by the electrolysis of œnanthylate of potash as a fragrant oil, boiling at 337° Fahr. It is a permanent substance, and remains undecomposed when submitted to the action of sulphuric or moderately strong nitric acid; but by mixing the two it is changed into a fatty acid, supposed to be caproic acid.

CAPRYL, or OCTYL, *kap'-rile* ($C_{16}H_{17}$), the eighth radicle of the homologous alcoholic series, obtained by treating the chloride of caprylwith metallic sodium. Its properties have not yet been thoroughly investigated.

CAPRYLIC ACID, *Kap-ril' ik* ($C_{16}H_{16}O_4$), one of the volatile acids obtained by Chevreul during the saponification of butter. It is also obtained by the action of nitric or oleic acid. It is a colourless, oily liquid, insoluble in water, but soluble in alcohol and ether, with a disagreeable sudoriferous smell. It becomes solid at 50° Fahr., and boils at 457° Fahr. It is prepared by decomposing caprylate of baryta with sulphuric acid. It forms monobasic salts with the bases, which have not as yet been examined.

CAPRYLIC ALCOHOL.—Caprylic or octylic alcohol is the hydrated oxide of capryl or octyl, as vinic alcohol is the hydrated oxide of ethyl. It occurs in small quantities in the fermented mark of the grape; but its most available source is castor oil, which contains a compound of glycerin and ricinoleic acid. This compound, when heated with hydrate of potash, is resolved into hydrogen, sebate of potash, and octylic alcohol. The following is the process for its preparation as recommended in Miller's "Elements of Chemistry," vol. iii. p. 129.—"Castor-oil is saponified by means of potash or soda, and afterwards an excess of the hydrated alkali is added, amounting to one-half the oil used. The mass is heated in a retort, and an oily liquid covered with water distils over. This oily liquid, which is the octylic alcohol, is rectified several times with potash, until the residue is no longer coloured brown. Octylic alcohol is a colourless liquid of a powerful aromatic odour. It is insoluble in water, but dissolves readily in acetic acid, ether, and alcohol. Its spec. grav. is ·82⁵, and it boils at 350°."

CAPRYLIC ETHER.—*Caprylate of ethyl* is generally called by this name; but by doing so it is apt to be confounded with true caprylic ether, which would be oxide of caproyl. Caprylate of ethyl is a colourless liquid, with an agreeable odour of pine-apples. Caprylic acid forms ethers with methyl and amyl, which have been investigated by Wills and others.





CAPS, PERCUSSION, *kaps, per-kus'-shun* (Lat. *percutire*, to strike), small cylindrical cases of copper, containing a little detonating mixture at the bottom of the cavity. These cases fit closely over the nipple of the fowling-piece or rifle, and explode when struck sharply by the descending hammer, igniting the powder with which the piece is charged. The detonating composition used in the manufacture of percussion caps consists of a mixture of fulminating mercury, chlorate of potash, and ground, or rather pulverized, glass. (*See* DETONATING POWDER, FULMINATING MERCURY.) The following is the method used in making the caps for the use of the British army; the process is similar for all kinds of caps, but for fowling-pieces the copper case is thinner and smaller in size than those made for government, which also have a projecting rim round the edge of the cap, by means of which they are more easily taken from the cap-pocket, and adjusted on the nipple of the rifle. The common cap is destitute of this rim. The copper is prepared in sheets two feet long, and a little more than three inches in width, which are pressed and completely flattened between rollers. By means of steel punches in the form of a cross, measuring three-fourths of an inch between the extremities of opposite arms, the copper is cut into little pieces of this shape, which are heated for a considerable time in metal cylinders, and then thrown into cold water to harden. They are then plunged into a bath of sulphuric acid and water, which removes the oxide with which the pieces have become coated during the last-named stage of the process; and after this they are dried and oiled. The next step consists in moulding the copper crosses into caps by means of dies, after which the oil is removed by shaking them in sawdust, and the caps are arranged in a perforated plate containing 1,000 holes, in order to be charged with the detonating mixture. This preparation is pressed into the bottom of each cap by the action of another plate studded with projections that fit into each cap as it lies in the perforated plate already mentioned. Another similar plate, with the projections smeared with varnish, is then pressed into the caps. The varnish forms a coating over the fulminating composition to protect it from damp and the action of the weather. After the varnish has been introduced, it is hardened by submitting the caps to the action of a steam-bath, and glazed by the introduction into each cap of a polished nipple, which revolves by the action of a lathe. The caps when finished are packed in small cases, each containing twenty-five. In the army a case is allowed to every twenty rounds of blank or ball cartridge, to cover loss arising from caps missing fire, or other causes. For private use they are packed in boxes containing from 500 to 1,000 each, and numbered to correspond with the nipple for which each size is suited. The invention of percussion caps was brought about by an attempt made by the French in 1793 to substitute a fulminating powder for gunpowder, in consequence of the difficulty that existed in France at that time of procuring saltpetre. The Rev. Mr. Forsyth, a Scotch clergyman, conceived from this the idea of igniting the charge of powder by means of a detonating mixture exploding by percussion, and in 1807 he patented his process, having laid his plans before the Board of Ordnance, and received encouragement to proceed in the development of his invention. The great difficulty to be overcome was that of insuring the explosion of the detonating powder, which was eventually effected by placing the mixture in a cup or cell of metal. Before 1825 the use of copper caps and the percussion lock had become general, and the old musket with the flint lock, which had rendered such efficient service in the Peninsular and other wars, was superseded by a more efficient arm,—the percussion musket, or *Brown Bess*, which has, in turn, given way to the infinitely superior Enfield rifle. Whatever may be the form of the fire-arm, it is unlikely that the mode of exploding the charge by detonating powder, originated by Mr. Forsyth, either by percussion through the fall of the hammer on the cap, or by friction produced by a point entering a cartridge into which detonating powder has been introduced, will be changed for a better method. The principle of the percussion lock is now applied to heavy ordnance, and many kinds of shells have been prepared to explode by detonation on

striking any object, instead of by means of the fuse; among which, that which was invented by Captain Norton may be especially mentioned. (*See* SHELL.)

CAPSICINE, *kăp'-si-seen* (from *capsicum*, derived from Gr. *kapto*, I bite, in allusion to its pungency), an alkaloid found in the capsules of the various species of capsicum used in the manufacture of cayenne pepper. It has a burning taste; is insoluble in water and ether, but soluble in alcohol, and may, when quite pure, be crystallized. It forms salts with nitric, sulphuric, and acetic acids. Its composition is unknown.

CAPSICUM, *kăp'-se-kum* (Lat., a bridle), in Surg., is a single split cloth bandage, used to support the lower jaw; so called from its resemblance to a bridle.

CAPSICUM (from Gr. *kapto*, I bite), in Bot., a gen. of plants belonging to the nat. ord. *Solanaceæ*, consisting of numerous species, all remarkable for the presence of an acrid resin called *Capsicine* in their fruits, which are hot, pungent, and stimulating. Though now extensively cultivated in many parts of the Old World, the various species are supposed to be natives of South America. The officinal capsicum, the *C. annuum* of Linnæus, or the *C. fastigiatum* of Blume, has oblong-cylindrical fruits, not an inch long in the most valuable varieties, but two or three inches long in others. These fruits are commonly sold as *Chillies*, and are used to make a hot pickle, and the liquid known as *Chili vinegar*. Cayenne pepper consists of the powdered fruits of several species of *Capsicum*, found in the West Indies and South America. In medicine, the fruit of the capsicum is used as a counter-irritant: with salt as a stimulant in scarlatina; as a gargle in relaxed sore-throat; and in the form of Cayenne lozenges.



CAPSICUM PLANT.

CAPSTAN, *kăp'-stăn* (Fr. *cabestan*), a strong column of timber, shaped like a truncated cone, passing through the deck of a ship, and turned by levers or bars, which pass through holes pierced in its upper extremity, serving, by means of a cable which winds round the barrel, to weigh the anchor and draw up weights, &c. Men-of-war have commonly two capstans, the largest of which, called the *main capstan*, is placed behind the main-mast, standing upon the first deck, and reaching four or five feet above the second: this is also called the *double capstan*, because it has two drumheads, and serves two decks for drawing up anchors, and because its force may be greatly accelerated by applying hands on each deck. The other is the *jeer*, or *little capstan*: this stands on the second deck, between the main and mizen masts. There is also a *flying capstan*, so called from its being movable to any part of a ship.

CAPSULE, *kăp'-sule* (Lat. *capsa*, a chest), is a membranous production, inclosing any part like a bag; as the capsular ligaments inclosing the synovia of the joints, the capsule of the crystalline lens of the eye.

CAPSULE, in Bot., a superior, one or more-celled, many-seeded, dry, dehiscent fruit. It is *syncarpous*, that is, formed of several carpels united together. The dehiscence or opening of the capsule may either take place by valves, as in the foxglove, primrose, and rhododendron, or by pores near the summit, as in the poppy and snapdragon. The distinctive name of *Pyxis* or CAPER FA[illegible] has been given to a beautiful kind of [illegible]pens as if cut around near the summit, in Egypt from Cappearance of a cup with a lid. Exbelieved to be the l[illegible]er may be seen in the pimpernel and

CAPPARIDACEÆ, pe[illegible]ule is one-celled in the mignonette, *kapar*, capers), in Igentian; two or more celled in the dicotyledonous pla[illegible]neum, iris, and datura. It is a very cluding 28 genera[illegible] fruit, and is found almost universally and [illegible]ew trees, t orders; such as *Papaveraceæ*, *Caryotropical* regions. [illegible]*ceæ*, *Scrophulariaceæ*, *Liliaceæ*, *Iri*solitary or clustered; [illegible]*ceæ*.

a tube; petals usuall[illegible] (Lat. *caput*, the head; Fr. *capi*stamens generally a[illegible]en, in Mil., to an officer commanding a company of infantry, a troop of cavalry, or a battery of artillery.—In Mar., it is given to the naval officer that commands a ship of war. Commanders in the navy are called captains by courtesy; but the term properly belongs to officers occupying the intermediate rank between commanders and admirals, who were formerly called post-captains. The name is improperly given to the chief officer of a merchantman, whose proper appellation is that of *master*. Many sailors on board ship holding some petty place of authority among others, are called captains; as the captain of the gun, captain of the forecastle, &c. In the army, the captain has the complete control of the internal economy of his company in matters of discipline, clothing, arms, accoutrements, barracks, billeting, and accounts. In this he is assisted by his subalterns, —the lieutenant and ensign in infantry, lieutenant and cornet in cavalry, and first and second lieutenants in engineers, artillery, and marines. In the artillery there is an officer called the second captain, formerly termed the captain-lieutenant. The captain is responsible to the major for the good order of his company in every respect. The captains in both services share the advantages derived from a general brevet. The value and mode of purchase of a captain's commission, and rate of p[illegible] will be found elsewhere. (*See* COMMISSIONS, A[illegible]; COMMISSIONS, NAVY.) It is necessary that an o[illegible]er should have been an effective subaltern for two years before he can attain the rank of captain. The naval captain holds a post of greater importance than a captain in the army, as it involves a far greater amount of responsibility; the latter being responsible for his company only, while the former is answerable for the safety of his ship and the discipline of the crew, and has the management of everything on board. The captain in the army ranks with a lieutenant in the navy, and a captain in the navy ranks with a lieutenant-colonel in the army until he has held his commission three years, when he ranks with a full colonel. When several ships compose a fleet under the command of an *admiral*, the captain of the ship in which the admiral hoists his flag is called the *flag-captain*, and takes precedence of others in the fleet of the same rank. The captain of the fleet is an officer through whom the admiral issues his orders, holding a position similar to that of the principal aide-de-camp to a general officer or chief of the staff.

CAPTION, *kăp'-shun* (Lat. *captio*, a taking).—When any commission at law or in equity is executed, the commissioners subscribe their names to a certificate, testifying when and where the commission was executed; and this is called a *caption*; also where a man is arrested, the act of taking him is called a *caption*. There is also the *caption* of an indictment, which is the setting forth of the style of the court before which the jurors make their presentation. It is also the memorandum at the foot of an affidavit or statutory declaration, subscribed by the judge, commissioner, or other person before whom it is made, showing the time and place at which it is made.

CAPTION, in Scots law, is a writ issued under her majesty's signet, and in her majesty's name, at the instance of a creditor in a civil debt, for the apprehension and imprisonment of the person of a debtor until he pay the debt. By a legal fiction, no person in Scotland could be imprisoned for a debt purely civil, unless in royal boroughs or under small-debt decrees; and hence the imprisonment was nominally for the act of rebellion in delaying obedience to the command of the sovereign to pay the debt, and hence, too, it was only granted after a charge of horning. This form of proceeding is now rather matter of history than of custom, having fallen into desuetude since 1838, the power of imprisonment having been then extended to sheriffs by 1 & 2 Vict. c. 114. *Caption* is also the name of a summary warrant of imprisonment issued against an agent to return the papers of a process or law suit, which have been borrowed by him and are unduly detained.

CAPTIVE, *kăp'-tiv* (Lat. *captivus*; Fr. *captif*), a person taken by an enemy in war. Formerly, captives in war became the slaves of those who took them, or were sold as slaves. Often they were subjected to the greatest cruelties, or were put to death in many inhuman ways. Great numbers of them were sometimes offered as sacrifices to the gods of the victors. It seems to have

been a custom occasionally resorted to in the East, to make the captives lie down on the ground and then to put to death a certain portion of them, which was measured by a line or determined by lot. It was in accordance with this custom that David, as we are told, "smote Moab, and measured them with a line, casting them down to the ground; even with two lines measured he to put to death, and with one full line to keep alive" (2 Sam. viii. 2). Sometimes, as referred to by Virgil (*Æneid*, b. viii. 485 *et seq.*), the living and the dead were coupled together, face to face and hand to hand, till the living became as the dead. Sometimes, as with the Romans, their necks were exposed to the soldiers to be trampled upon; sometimes they were loaded with irons, and sometimes, as in the case of Samson, their eyes were put out. They were often stripped naked, and made to travel in that condition, exposed to the burning heat of the sun by day and to the chilling cold by night. There are frequent references in the Old Testament to the modes of treating captives, and a knowledge of these serves to throw light upon many passages of Scripture prophecy; as when Isaiah describes the character and work of the promised Messiah:—"He hath sent me to heal the broken-hearted, to preach deliverance to the captives, and recovering of sight to the blind, to set at liberty them that are bruised."

CAPTIVITY, *kap-tiv'-e-te* (Lat. *captivitas*; Fr. *captivité*), a term employed in Scripture to denote the punishment inflicted by God on the Jews for their idolatry and wickedness, by allowing them to be removed out of their own land. This was one of the means frequently adopted by eastern monarchs in order to establish their power over vanquished nations; viz., to transport an important part of the population of those nations into their own dominions; and sometimes, also, they established in the vacated territory a portion of their own subjects. To a people like the Hebrews, whose religion was connected with particular places, such a proceeding must have been particularly severe. When personally removed from Jerusalem, they could no longer obey their sacred law in many of its most vital points, and many others they were forced to modify by reason of their changed circumstances. Their first captivity was that of Egypt, from which they were rescued by Moses; but this is to be regarded rather as a providential dispensation than as a penal evil. We read of six captivities that took place during the government of the judges; but the two most signal captivities of this people were those of Israel and Judah after they had been formed into separate kingdoms, and are known as those of Assyria and Babylon. That which is called the first captivity was not brought about by a single removal of the population; on the contrary, the kingdom of Israel was invaded on several occasions by the kings of Assyria. About B.C. 740, Tiglath-Pileser carried off the more distant trans-Jordanic tribes to Assyria. His successor, Shalmaneezer, twice invaded the kingdom which remained to Hosea. He attacked and reduced Samaria after a siege of three years, B.C. 721, and carried off into Assyria and Media the king and the remainder of the ten tribes, and their place was supplied by colonies from Babylon and Susis. This was the end of Israel as a kingdom. More than a century elapsed before the second or Babylonish captivity, which overtook the kingdom of Judah. Two distinct deportations are mentioned in the second book of Kings, three in Jeremiah, and one in Daniel. The two principal deportations, however, were—1. That which took place B.C. 598, when Jehoiachin, with all the nobles, soldiers, and artificers, were carried away; and, 2. that which followed the destruction of the temple and the capture of Zedekiah, B.C. 588. The seventy years of captivity predicted by Jeremiah are dated by Prideaux from B.C. 606. The Jews in their captivity were not treated as slaves, but as colonists. They had elders and judges among themselves, who governed them and determined disputes according to their own laws. There was nothing to hinder a Jew from rising to the highest eminence in the state, or holding the most confidential offices. The Babylonish captivity was brought to a close by the decree of Cyrus, B.C. 536, and the return of a portion of the nation, under Sheshbazzar or Zerubbabel, B.C. 535. What became of the ten tribes is a subject which has given rise to much discussion. Many attempts have been made to discover them living as a distinct community in some distant part of the interior of Asia. The most probable opinion, however, seems to be that the great mass of them became absorbed in the nations among whom they were planted; but that many of them returned with the children of Judah, after the Babylonish captivity, to their own land, by which means they became one people, the event probably referred to by Ezekiel when he says, "Thus saith the Lord: Behold I will take the children of Israel from among the heathen whither they be gone, and will gather them on every side, and bring them into their own land; and I will make them one nation in the land upon the mountains of Israel." Even of the children of Judah, it is calculated that the great majority of them chose to continue in Assyria, and those of them who kept up their national distinctions were known as the "Dispersion," or the "Dispersed among the Gentiles." The character, language, and habits of those that returned, of the Jewish people, were very markedly changed by the captivity. Their love for agricultural pursuits had declined, and a taste for commercial enterprise had taken its place. A new and deeper feeling of reverence for the letter of the law of Moses had taken possession of them, and a profound hatred of their old sin of idolatry. The sufferings entailed upon the Jewish people under the Romans far exceeded that of any other captivity which they underwent; for they were then reduced to a real state of bondage. According to Josephus, 1,100,000 men fell in the siege of Jerusalem by Titus, and 97,000 were captured during the war. Of the latter, many were cast to wild beasts or butchered in the amphitheatres; others were doomed to work as public slaves in Egypt, and only those under 17 years of age were sold into private bondage. An equally dreadful destruction fell upon the remains of the nation, which had once more assembled in Judæa, under the reign of Hadrian (A.D. 133), as related by Dion Cassius. By these two savage wars the Jewish population must have been effectually extirpated from the Holy Land itself, a result which did not follow from the Babylonian captivity. Since that time, the Jews have been, with few and partial exceptions, a despised, oppressed, and a degraded people, scattered among the nations of the earth.—*Ref.* Calmet's, Smith's, and Kitto's *Dictionaries of the Bible*.

CAPTURE, *kăp'-tsher*, the act of taking or seizing; as the capture of a vessel, of booty, of an enemy by stratagem, surprise, or force. (*See* BOOTY, PRIZE.)

CAPUCHINS, *kăp-u-sheens'*, a branch of the religious order of the Franciscans, so called from the *capuce*, a sharp pointed cap or cowl wherewith they cover their heads, having in addition the ordinary Franciscan habit. They owe their origin to Matthew de Bassi, a Franciscan monk of Urbino, who, having resolved upon a more literal fulfilment of the rule of St. Francis than then prevailed, obtained in 1526 from Pope Clement VII. leave to wear this cap, and to preach anywhere. His example was soon followed by others, and convents of them were established in various parts. They soon spread over Italy, and in 1573 were established in France, and in 1606 in Spain. They followed the Spaniards and Portuguese across the ocean, and engaged in missionary work in America, Asia, and Africa. The abolition of the monastic system in Germany and France at the close of the last century almost wholly annihilated the Capuchins, and they suffered severely in Spain during the 3rd and 4th decades of this century. At present they are on the increase in all Catholic countries. The Capuchins are enjoined to dress in coarse and mean garments, to go barefooted, and to journey neither on horseback nor in vehicles; to practise the strictest abstinence (though the use of meat and wine is not forbidden); to beg neither meat, nor eggs, nor cheese, but to accept them when offered; to ask for no more than suffices for the day; to gather provisions only for three, or at the most for seven days; to touch no money; to admit as novices persons neither too young nor too weak; to refuse pay for mass; to pray in silence two hours each day; and to observe the ancient strictness in divine worship. The grossest mortification of the senses and the utter neglect both of soul and body which characterized the Capuchins

gave them great influence over the hearts of the people. —Ref. Herzog's *Theological Dictionary*.

CAPUDAN PASHA, *kăp'-u-dăn pa-sha'* (Turkish), is the officer who has command of the fleet and the management of all naval affairs in the Ottoman empire. He has also civil jurisdiction over a number of seaports and maritime districts, as well as the Turkish islands of the Archipelago. He is a pasha of three tails, and a member of the divan.

CAPUT, *kaĭ'-put* (Lat., the head), in Anat., is applied to that portion of the human body which comprises the skull and face. The skull is distinguished into the following parts:—the *vertex*, or crown; the *sinciput*, or fore part of the skull; the *occiput*, or hind part; the *tempora*, or temples. The parts of the *facies*, or face, are the forehead, eyes, nose, &c. (*See* FACE.) The term *caput* is also applied to,—1. the upper extremity of a long bone, as the humerus; 2. the origin of a muscle; 3. a protuberance resembling a head, as the *caput Gallinaginis*, a small eminence in the urethra; 4. the beginning of a part; as *caput coli*, the head of the colon.

CAPUT BARONIAL (Lat., the head of the barony), was formerly used to denote the chief seat or castle of a nobleman, where he had his usual residence and held his court.

CAPUT LUPINUM (Lat., wolf's-head), a term formerly applied to an outlawed felon, to denote that any one might slay him that should find him,—that he might be knocked on the head like a wolf.

CAPUT MORTUUM (Lat., dead head), a term employed by the old chemists to denote the fixed residue of chemical operations after all the volatile matters had been driven off.

CAPUT OBSTIPUM (Lat., stiff-head), in Med., denotes wry-neck, an involuntary and fixed inclination of the head towards one of the shoulders.

CAPUT PURGANS (Lat. *caput*, and *purgo*, I purge), a name given to a medicine which causes a defluxion from the nose, purging, as it were, the head.

CAPUTIATI, *kă-pu-ti-aĭ'-te*, in Eccl. Hist., a sect of religious fanatics which arose in the latter part of the 12th century, in the diocese of Auxerre, and thence spread into other parts of France. Their badge was a singular kind of cap (*capuche*), which they wore; whence their name. Their leader, Durand, pretended to be inspired by the Virgin Mary, and declared that their object was to restore peace and liberty upon earth, by levelling all distinctions, abolishing subordination, and abrogating the magistracy. Hugo, bishop of Auxerre, waged war against them, and succeeded in putting them down.

CAPYBARA (*Hydrochœrus capybara*), *kăp-ĭ'-bă-ra*.—This rodent animal is found in the south of America, and in general appearance greatly resembles a small pig. It feeds on vegetables and fish; for which latter purpose it frequents rivers, and swims about in pursuit of its prey with great facility. "They occasionally frequent the islands in the mouth of the Plata, where the water is quite salt, but are far more abundant on the borders of fresh-water lakes and rivers. In the daytime they either lie among the aquatic plants, or openly feed on the turf-plain. . . . . Both the front and side view of their head has quite a ludicrous aspect, from the great depth of their jaw. The animals I saw at Maldonado were very tame: by cautiously walking, I approached within three yards of four old ones. As I approached nearer and nearer, they frequently made their peculiar noise, which is a low, sharp grunt, not having much actual sound, but rather arising from the sudden expulsion of air. The only noise I know at all like it is the first hoarse bark of a large dog. Having watched the four from almost within arm's length (and they me) for several minutes, they rushed into the water at full gallop with the greatest impetuosity, and emitted at the same time their bark. After diving a short distance, they came again to the surface, but only just showed the upper part of their heads. When the female is swimming in the water, and has young ones, they are said to sit on her back."—(*Darwin.*) The flesh of the capybara is esteemed a dainty by the jaguar, which preys largely upon this animal. The way in which it captures the capybara is very singular. It is said that, leaping to the back of the doomed animal, the jaguar, by a rapid movement of the fore-paws, twists its head round, and breaks its neck.

CAR, or CHAR, *kăr*, occurs frequently in the names of places, and seems to be the same as the Celtic *caer*, which signifies a city.

CAR.[4] (*See* CARTS and WAGGONS.)

CARABIDÆ, *kă-răb'-ĭ-de* (Gr. *karabos*, a beetle), a fam. of coleopterous insects, comprising several species. The principal characteristics are given as follows:—Anterior tibiæ without emargination on the inner side; head narrower than the throat; eyes rather prominent; palpi with the terminal joints often compressed, large, and somewhat triangular in shape; mandible simple, moderately long, and rather thick. In general, the members of this family prey upon insects; and the construction of their bodies is eminently adapted for this purpose, being very firmly encased in a stout covering, enabling them to search among the stones, crawling over and under them for their prey without fear of hurt; at the same time they can suffer but little from the attacks of other insects. Some species of the Carabidæ are, it has been ascertained, herbivorous, finding their food principally in the cornfields. In the British Museum may be found a splendid collection of these insects.

CARABINEERS, *kăr-ă-bin-eers'* (Fr.), a name formerly applied to light cavalry employed in the French service, and among the Spaniards, Italians, and Arabs, for skirmishing and outpost duty. Many regiments of English cavalry were once known by this title, but it is now the distinctive appellation of the 6th dragoon guards.

CARACAL, *kă-ră-kal'* (*Felis Caracal*), sometimes called the Persian lynx, is found in both the continents of Asia and Africa. This animal is the lynx of the ancients. It is about three feet in length, of a pale reddish-brown above, and whitish beneath. It has a small head, although somewhat elongated, and small ears. In disposition it is fierce and savage, which, combined with great strength, renders it no mean animal. Such qualities, which would, in its wild state, make it rather an inconvenient and troublesome animal to the natives, are turned to good account by employing its services in the chase of other animals and birds, in which pursuits it is said to acquit itself in a highly creditable manner.

CARACARA. (*See* FALCON.)

CARACOLE, *kar'-a-kol* (Fr., a wheeling about), a term applied, in the art of Horsemanship, to the half-turn or semi-round taken by the rider either to the left or right. In the army, after each discharge, the cavalry make a caracole, in order to pass to the rear of the squadron.

CARAITES, *kăr-rai-ites*, one of the most ancient and most remarkable of the Jewish sects. They kept aloof from the other Jews, and dwell chiefly in S.-W. Russia, Galicia, Turkey, and Persia. The rabbins make them identical with the Sadducees of the New Testament, or a branch of that sect which separated themselves from the other Jews under the leadership of one Anan, about A.D. 640. The Caraites themselves, however, claim a much higher antiquity, and produce a catalogue of doctors up to the time of Ezra. They are not mentioned by either Josephus or Philo; and hence it seems probable that they were not in existence in the times of these authors. The most likely hypothesis is, that they separated themselves from the Rabbinists about the time of Anan, maintaining the authority of the Word of God, and rejecting the traditions of the elders: hence they received the name of *Caraim*, textualists, or persons holding by the text of Scripture. They do not, however, reject all tradition, for they have certain interpretations which they call hereditary, and in which they confide. But they give no credit to the explanations of the Cabbalists, nor to any institutions of the Talmud but such as are conformable to Scripture. Their theology differs from that of the other Jews, chiefly in being purer and more free from superstition. The written Word of God they regard as the only certain rule of faith and practice, and vindicate the right of private judgment in its interpretation. They have many excellent customs, and insist much upon practical piety. They direct their attention chiefly to the law of the Old Testament, to the almost entire neglect of the prophecies; and thus they never

attain to the true spirit of the revelation. They believe in the immortality of the soul; in the resurrection, judgment, heaven and hell, and the other doctrines which the ancient Sadducees denied. They are simple in their dress and manners; conscientious, peaceful, honest, and true to their word. They mingle but little with other people; but those among whom they live speak very favourably of them. Mr. Oliphant says that "the Caraite merchant enjoys everywhere so high a reputation that throughout the Crimea his word is considered equal to his bond." The number of this sect has been greatly diminished, partly by wars and other public calamities, which have befallen the countries in which they were settled. There are at present about 500 in Vilna, 150 in Galicia, 200 in Odessa, and 4,000 in the Crimea. They have also a congregation in Constantinople, one in Jerusalem, one in Alexandria, and several in Asia Minor and Persia.

CARAMBOLE. (*See* AVERRHOA.)

CARAMEL, *kăr'-ra-mel* (Fr.).—If sugar is melted, and the heat raised 400° or 420°, the sugar loses two equivalents of water, and becomes a brown, deliquescent, and nearly tasteless mass. Caramel is often used by cooks and confectioners as a brown colouring matter. The brown colour in brandy and rum is due to a small portion of caramel dissolved in them.

CARAPA, *kă-rai'-pă* (from *caraipe*, its African name), in Bot., a gen. of tropical plants belonging to the nat. ord. *Meliaceæ*. *C. guineensis*, an African species, yields a fatty oil called Kundah or Tallicoonali, which is purgative and anthelmintic. Besides being valuable in medicine, it is well adapted for burning in lamps. It is expressed from the seeds. The bark of the tree has febrifugal properties. *C. guianensis*, a native of Guiana and the adjacent countries, furnishes similar products indeed, it is somewhat doubtful whether the species are essentially distinct.

CARAT, or KARAT, *kăr'-ăt'*.—The carat was originally a French weight, and was equal to the twenty-fourth part of a marc or half-pound. It was used for weighing gold and jewels, and its weight varied greatly in different countries. In time it fell entirely into disuse, and at the present day the carat merely signifies the twenty-fourth part of the weight of any piece of gold, or alloy of gold. Thus, if the piece weighed is all gold, it is said to be twenty-four carat gold: if only half of it is gold, it is said to be twelve carat gold; and so on. In the weighing of diamonds the carat is used, and is then equal to 3½ grains. The original French carat varied from one ounce to one-third of an ounce.

CARAVAN, *kăr'-ă-van* (Persian *kārwān*, a trader), is a name given to a company of merchants, travellers, or pilgrims, who associate together for safety and convenience, and at stated times traverse the deserts or other dangerous parts of Asia or Africa. In this way commercial intercourse between different countries has been chiefly carried on in these parts from the remotest antiquity. Since the establishment of the Mohammedan religion, travelling has been rendered more common and necessary, a visit to Mecca being enjoined by the Prophet upon all his followers at least once in their lives. Large numbers of the faithful, therefore, assemble in every country where the Mohammedan faith is established, and proceed in caravans to Mecca. The greater number of those proceeding to that city, however, have trade as well as prayers in view. These caravans are regularly organized by government, and are under the direction of chefs or agas, who have usually under them such a number of troops as is deemed necessary for their protection. The different travellers have their proper place assigned to them in the long line of march, those from the same town or province being usually together. A caravan has sometimes several thousand camels, which follow each other in single file, so that it may be several miles in length. Camels are almost uniformly used in preference to the horse or any other animal, on account of their great patience of fatigue, and their wonderful adaptation for travelling in the desert. The usual arrangement is to contract with a person who has his camels, tents, servants, &c., and who undertakes to convey the traveller for a given sum. Sometimes 50,000 or 60,000 persons arrive at Mecca with the pilgrim caravans; but in former times the number was much greater. The principal caravans to the holy city are those of Damascus and Cairo. The former of these is the largest and best regulated, being under the especial protection of the Turkish sultan, and composed of travellers, merchants, and pilgrims from Europe and Asia. The Egyptian caravan, which starts from Cairo, is not so large as the other, and its route is much more dangerous, water being scarce, and fierce Arab tribes prowling over the country. The Persian caravan from Babylon, and the Moorish caravan from Morocco, have both become very irregular. The great Indian caravan, which started from Muscat, has long been given up. Besides these great annual caravans, there are numerous others on a smaller scale, and of a more casual nature, constantly going in various directions. Merchants and travellers proceeding in the same direction usually wait upon each other until they can form a caravan for mutual protection, when one of their number is generally appointed to direct their movements. Any trader may form a company in order to make a caravan, and he in whose name it is raised is usually considered the chief, unless he appoint another in his place.

CARAVANSARY, or CARAVANSERA, *kăr-ă-văn'-să-re* (Persian *kārwān*, a trader, and *serai*, a large house), in Eastern countries is a place appointed for receiving and loading caravans; or a kind of inn where caravans rest at night, except that it presents little but shelter, the traveller being obliged to carry all his provisions and necessaries along with him. They are usually erected by the munificence of princes or other great men, and are situated sometimes in the towns and villages, and sometimes at convenient distances along the road. They are usually large square buildings, with a spacious court in the middle; and under the arches or piazzas that surround them there runs a bank raised some feet above the ground, where the merchants and travellers take up their lodgings, the beasts of burden being fastened to the foot of the bank. Over the gates there are sometimes little chambers, which the keeper lets out at a very dear rate to such as wish to be private. They are always supplied with water, which is sometimes brought from a great distance. There are some caravanseras where most things can be had for money; and as the profits of these are considerable, they are usually well stored.

CARAVANSERASKIER, *kar'-ă-văn-se-răs-keer'* (Persian), the director, steward, or keeper of a caravansera.

CARAVEL, or CARVEL, *kăr'-ă-vel* (Fr.), a small vessel used in the herring fishery on the coast of France, and usually from twenty-five to thirty tons burden. It is also applied to a light round old-fashioned ship of from 120 to 140 tons, formerly used in Spain and Portugal.

CARAWAY. (*See* CARUM.)

CARBAMIC ACID, *kar-bam'-ik* ($C_2H_3NO_4$).—When dry carbonic acid and dry ammoniacal gas are mixed, a white substance results, which was formerly supposed to be anhydrous carbonate of ammonia. Later investigations proved that it was a compound, containing ammonia combined with carbonic acid. Carbamic acid forms salts with numerous other bases, which are interesting only in a theoretical point of view.

CARBAMIDE, *kar'-băm-ide* ($CH_2NO$), a peculiar compound, formed by the action of ammonia on chlorocarbonic acid. It is said by Natauson to be identical with urea, in which case the equivalent would require to be doubled, $C_2H_4N_2O_2$. (*See* UREA.) Carbamide may be regarded as carbonic acid with an equivalent of oxygen, replaced by an equivalent of amidogen.

CARBAZOTIC ACID, or PICRIC ACID, *kar'-bai-zot'-ik*, a complex acid, produced by the action of nitric acid on a number of organic substances, such as phenic acid, salicin, phloridzin, silk, indigo, and a number of the resins. It may be prepared in a variety of ways. A large quantity is furnished by heating one part of indigo with eight or ten parts of nitric acid reduced to coarse powder. As soon as the effervescence of nitric oxide has ceased, the liquor is boiled and nitric acid added from time to time, until no more gas is given off. On cooling, the carbazotic acid crystallizes out in long, pale yellow, brilliant, not angular plates, which are to be washed, redissolved, and recrystallized. Carbazotic acid is soluble in 80 or 90 parts of cold water, forming a liquid of a bright yellow colour. It has an intensely bitter taste, and has been used instead of hops for making bitter ale. It has been employed in dyeing silk and wool, to which, in conjunction

with cream of tartar or alum as a mordant, it gives a fine yellow colour. Carbazotic acid is sometimes employed as a test for potash, with which it forms a bright yellow crystalline precipitate, even in dilute solutions. Carbazotate of potash is anhydrous, and requires 160 parts of water for its solution; the salts of soda, ammonia, and the earths, are freely soluble.

CARBIDE, *kar'-bide*, a term now employed instead of *carburet* to denote the union of carbon with a base. The more important carbides will be found under the heads of their respective bases.

CARBINE, or CARABINE, *kar'-bine* (Fr ), a light kind of musket, about three feet or more in length, used by light cavalry, the artillery, the yeomanry cavalry, and the Irish constabulary. The carabins, or light cavalry, enrolled by Henry II. of France, about 1560, and the carabineers of Louis XIV., in the latter part of the 17th century, were armed with these weapons; and it is uncertain whether these troops derived their name from that of the gun with which they were armed, or whether the gun received its appellation from that of the troops. The new cavalry carbine made by Mr Prince is a rifled breech-loader, with a barrel 26 inches long and ·753 of an inch in the bore. It weighs 7¼ lbs. The carbines used by the British cavalry and artillery are all rifled.

CARBOLIC ACID, *kar-bol'-ik* (*Phenic Acid, Hydrate of Phenyl, Phenole, Hydrated Oxide of Phenyl, Phenyl Alcohol*), ($C_{12}H_5OHO$).—Carbolic acid is a very abundant product of the distillation of coal. Laurent obtained carbolic acid from oil of coal-tar by collecting separately those portions which boil between 300° and 400° Fahr. By mixing with this oil a hot saturated solution of hydrate of potash, a white crystalline substance separates, the supernatant liquid is decanted, and the crystals are dissolved in a small quantity of water. The solution separates into two portions, the denser of which contains carbolate of potash. The potash is abstracted by the addition of hydrochloric acid, and the liquid carbolic acid rises to the surface. The carbolic acid solution is digested with chloride of calcium to remove water, and afterwards exposed to low temperature. It then crystallizes in long colourless needles, which must be kept from contact with the atmosphere. Carbolic acid melts at 95°, and boils between 369° and 370°. The slightest trace of moisture is sufficient to cause the liquefaction of the crystals. Carbolic acid is but sparingly soluble in water; it is, however, readily dissolved by alcohol, ether, and acetic acid. It has a burning taste, and an odour of smoke resembling creosote. Its solution does not redden litmus, and leaves a permanent greasy mark on paper if let fall upon it. A splinter of deal dipped in carbolic acid and then into nitric acid becomes dyed blue. Carbolic acid has lately received an important application as a disinfectant and deodorizer, for a full account of which *see* DEODORIZATION.

CARBON, *kar'-bon* (Lat. *carbo*, a coal),—symbol C, equivalent 6, spec. grav. as diamond 3·55, as graphite 1·9 to 2·3,—an elementary non-metallic solid body, very widely diffused through nature. Its purest and rarest form is that of the diamond (*see* DIAMOND), but in the forms of graphite and mineral charcoal it occurs very abundantly in nearly every part of the world. It also occurs, in combination with oxygen, as carbonic acid, in small quantities in the air, and in the waters of most springs. In combination, as carbonic acid, with lime and magnesia, it occurs, in enormous quantities, as limestone, marble, chalk, dolomite, &c.; whilst, combined with hydrogen, it enters largely into coal, peat, and lignite. From its invariable presence in all organic matter, it has been called the organic element; and Hoffman poetically calls organic chemistry "the history of the wanderings of carbon." From entering thus directly into the vegetable and animal creation, carbon may be considered as the most important element; and the pouring out of carbonic acid by animals, to serve for the food of vegetables, is one of the many silent chemical operations constantly going on around us. The wonderful provision of Nature by which the carbonic acid cast out by animals as a poisonous product is converted into food for the support of plants, by the action of the sun's rays, has been the admiration of all philosophers and chemists from the days of Lavoisier to the present time. Carbon, as it exists in the form of the diamond, $C\alpha$, is fully described under that head; and the same may be said of graphite, $C\beta$, which is treated of under the head of BLACK LEAD. Charcoal, or amorphous carbon, $C\gamma$, exists as ordinary wood charcoal and lampblack, generally combined with incompletely-burned compounds of carbon and hydrogen. Coke and animal charcoal are other forms of carbon. Charcoal is made by inclosing wood billets in an iron retort, to which is adapted a tube for conveying the products of combustion to appropriate receivers, and exposing it to a red heat for four or five hours. Where wood is very abundant, large heaps, covered with powdered charcoal, leaves, turf, and earth, are fired and allowed to burn slowly for a month or more. Charcoal prepared in this way is superior to that burnt in retorts. *Animal charcoal*, or ivory-black, is prepared in cylinders, in a similar manner to that employed for wood charcoal. Carbon, in its amorphous condition, is a black, dense, perfectly opaque, insoluble, infusible, inodorous, tasteless body, conducting heat badly and electricity freely. At ordinary temperatures it shows no chemical affinities. This property has been taken advantage of by the ancients, who use it for ink. The same property has rendered it a common practice to char the inside of tubs and casks intended to hold liquids; and posts and piles partially charred are found to last longer under water than when immersed in their natural state. Finely-divided charcoal has powerful antiseptic properties, and it is coming into use as a deodorizer to be used for purifying the air of sewers. Dr. Letheby's late experiments in this direction appear to prove that, by a proper application of charcoal air-filters, the air in sewers may be rendered wholesome and pure. Charcoal also has the peculiar property of absorbing colouring matter from organic solutions: hence its use as a decolorizer. At high temperatures carbon combines energetically with oxygen, and will remove it from great numbers of its combinations: hence its use in reducing metallic oxides. Whatever be its source or form, carbon is chemically the same, and, when burnt in oxygen, forms carbonic acid. Boxwood charcoal was found by Saussure to be capable of absorbing gases in the following proportion:—

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| Hydrogen ..... | 1·75 | times its volume. | |
| Nitrogen ..... | 7·5 | ,, | ,, |
| Oxygen ..... | 9·42 | | |
| Carbonic acid ..... | | | |
| Sulphuretted hydrogen ... | 55· | ,, | ,, |
| Hydrochloric acid ..... | 85· | ,, | ,, |
| Ammoniacal gas ..... | 90· | ,, | ,, |

It will be seen from the above table that the more unwholesome the gas, the greater the quantity absorbed; a fact which appears to point to charcoal as the great disinfectant and deodorizer. Indeed, the great success attending the use of carbon for filters, both for air and water, is a proof of its efficiency in this direction. (*See* FILTERS.) Carbon unites with several of the elements to form very important compounds. Its inorganic compounds are treated of under CARBONIC ACID, CARBONIC OXIDE; CARBON, CHLORIDE OF; CARBON, BISULPHIDE OF; CARBURETTED HYDROGEN.

CARBON, BISULPHIDE OF ($CS_2$),—equivalent 38, spec. grav. 1·27, boiling-point 118·5° Fahr. Only one compound of sulphur and carbon is known. It is prepared by heating fragments of charcoal to redness in a retort; into which dip a tube reaching to the bottom of the charcoal. From time to time sulphur is dropped through the tube, which is closed again immediately. The sulphur and carbon gradually combine, and the bisulphide distils over into the receiver, which is kept cool with ice. It is at first yellow, from excess of sulphur; but by being re-distilled several times, it is obtained in a state of purity. It is a colourless liquid, with an acrid, pungent taste, and a fœtid odour. It is insoluble in water, but dissolves in ether and alcohol. It is very volatile, and has never been frozen. It burns with a blue flame, giving off sulphurous and carbonic acid gases. It dissolves sulphur and phosphorus readily, and these elements may be obtained in crystals by slow evaporation of their solutions. Berzelius looks on bisulphide of carbon as a sulphuric acid corresponding to carbonic acid, which is an oxygen acid.

This idea is borne out by the fact, that bisulphide of carbon will unite with several sulphides to form salts, which are called sulpho-carbonates,—$KO \cdot CO_2$, carbonate of potash; $KS \cdot CS_2$, sulpho-carbonate of potassium. The solution of phosphorus in bisulphide of carbon is used in electrotyping objects, which are coated with a film of phosphorus by its means, and rendered capable of [illegible] an immediate metallic covering when plunged into the solution of sulphate of copper. From certain experiments of Berzelius, it is supposed that a protosulphide of carbon exists. A mixture of bisulphide of carbon and solid carbonic acid produces the most intense cold known.

Carbon, Chloride of.—There are three chlorides of carbon:—

Protochloride of carbon, $C_4Cl_4$.
Sesquichloride of carbon, $C_4Cl_6$.
Bichloride of carbon, $C_2Cl_4$.

The first compound is formed by passing the vapour of sesquichloride of carbon through a red-hot glass tube filled with fragments of glass. Chlorine is liberated and a colourless liquid collected, which boils at 250° Fahr. It is re-acted on by deutoxide of chlorine gas, $C_4H_4$. The second is formed by acting on Dutch liquid under the influence of solar radiation. It is a volatile crystalline solid, with an aromatic odour resembling camphor. It fuses at 320° and boils at 360°. Its specific gravity is 2, and it is soluble in ether and alcohol. There is also a liquid sesquichloride with the formula $C_2Cl_3$, which was obtained by Regnault by passing the vapour of bichloride of carbon through a tube heated to redness. The third, which is often called perchloride of carbon, was obtained by Regnault from wood-spirit and from chloroform by the combined action of chlorine and the sun's rays. Kolbe forms it by passing bisulphide of carbon and chlorine through a red-hot tube. It is a colourless liquid, possessing a peculiar alliaceous odour, and boiling at 172° Fahr. At −9° Fahr. it becomes a solid of pearly crystalline appearance. Besides these compounds of chlorine and carbon, Faraday obtained a sub-chloride of carbon ($C_4Cl_2$), which formed fine silky crystals, subliming without change by passing the protochloride several times through a red-hot tube.

Carbon, Oxychloride of (*Chloro-carbonic Acid, Phorgene Gas*).—spec. grav. 3·68, symbol $COCl_2$.—When equal volumes of chlorine and carbonic acid are exposed to the sun's rays, they gradually combine, and condense into half their volume. Oxychloride of carbon is a suffocating gas, which is decomposed by water into carbonic acid and hydrochloric acid. It may also be formed by passing carbonic oxide through pentachloride of antimony.

Carbonari, *kar-bo-na'-re* (Ital., colliers, or charcoal-burners), the name assumed by a large political secret society of Italy, which first emerged from its concealment in 1820. We are still in a great measure ignorant of the nature of the society; for though it has published instructions, catechisms, statutes, and rituals, yet the real spirit of the society and the motives of the leaders are unknown. The stories regarding the great antiquity of this confederation may well be passed over as unworthy of credit. Botta, in his *Storia d'Italia*, is more likely to be correct in stating that it originated in the republicans who, under Murat's government, equally hating the French and King Ferdinand, fled to the wild recesses of the Abruzzi, where they formed themselves into a secret confederacy under the name of *Carbonari*. Their leader, Capobianco, is said to have been a man of great rhetorical powers. The ritual of the Carbonari was taken from the vocation of charcoal-burning, and their war-cry was "Revenge for the lamb torn by the wolf." Clearing the forest of wolves (opposition to tyranny) was the basis of their symbols. By this they probably at first meant only deliverance from foreign dominion; but in later times it denoted freedom from all despotic rule,—antimonarchical and democratic principles having taken possession of them. Among themselves the initiated were styled "good cousins." The place of meeting was called a hut (*baracca*), the outer district a forest; the interior of the hut was the *vendita*, the place for selling charcoal. The union of the huts of a province constituted a republic. Soon after the institution of the society it numbered from 24,000 to 30,000 members; and it is said that during the month of March, 1820, no fewer than 650,000 new members were initiated. The religious and Protestant nature of the confederacy is evident from its rules, one of which declares that "Every Carbonaro has the natural and unalienable right to worship God according to his own views and convictions." The Carbonary of th[illegible] from the Freemasons, though they did not spring from them. After the suppression of the Neapolitan and Piedmontese revolution of 1821, the Carbonari throughout Italy were declared guilty of high treason, and punished as such by the laws. After the restoration of the Bourbons, numerous secret societies formed themselves in France; and they became united with the Carbonari at Paris in 1820. Soon after this Paris became the head-quarters of Carbonarism, which from this time assumed more of a French character. The initiated were *bons cousins*; the uninitiated, *pagani*, or heathens. No written communications were allowed among them, and all intercourse had to be carried on by word of mouth. All treachery was punished by assassination. From the time of its establishment in France to the end of the French and Spanish war, Carbonarism in France was very active. At that time its activity received a check, and it ceased to manifest itself by any open attempts against the government. The society, however, continued to hold together till the revolution of 1830; after which many of the most influential of the members attached themselves to the new government, and the society was at length dissolved. In its place, however, the republicans formed themselves into a new society, borrowing the character and forms of the old, and taking the name of the *Charbonnerie démocratique*. It was founded for carrying out the principles laid down by Testo in his *Projet d'une Constitution républicaine*, which were those formerly advocated by Babeuf, and laid at its head Buonarotti, a fellow-conspirator of Babeuf. All the operations of this new society centred in Paris, a mode of proceeding which gave offence to the Italians who had joined them, who seceded, and formed themselves into a separate body under the name of "Young Italy." Carbonarism is not known to exist in France at present, the latest trace of it having been found in the south of France in 1841; but it is reported to be still in existence in Italy, or, at least, to have been so up to the recent series of changes.

Carbonic Acid, *kar bon'-ik* ($CO_2$).—equivalent 22, spec. grav. 1·529.—Carbonic acid is the product of the combustion of all substances containing carbon. It occurs in combination with metallic oxides in the mineral kingdom, also dissolved in mineral springs. It issues from the earth in volcanic districts, and forms the deadly choke-damp of the coal-mines. It is also a product of respiration, fermentation, and putrefaction, which is nothing more than slow combustion. It is easily prepared by acting on a carbonate, such as chalk or marble, with nitric, sulphuric, or hydrochloric acid, in a gas-generating apparatus. The carbonate of lime is converted into chloride of calcium, and the carbonic acid escapes as gas.

| Carbonate of Lime. | Hydrochloric Acid. | Chloride of Calcium. | Carbonic Acid. | Water. |
|---|---|---|---|---|
| $CaO.CO$ | + $HCl$ | = $CaCl$ | + $CO_2$ | + $HO$ |

Carbonic acid is known in the solid, liquid, and gaseous By a pressure of thirty atmospheres at 32° Fahr., it is liquefied, the pressure required decreasing as the temperature gets lower. Liquid carbonic acid is colourless, insoluble in water and fatty oils, but mixing in all proportions with ether, alcohol, bisulphide of carbon, naphtha, and turpentine. At −94° Fahr. it solidifies into a vitreous transparent mass. Solid carbonic acid is best prepared by Thilorier's method, by generating carbonic acid in a condenser until it is liquid, and then allowing it to escape through a stop-cock into the air. The liquid gas evaporates with such rapidity, that intense cold is produced, and the remainder is converted into snow. It is a bad conductor of heat, and may be handled with impunity, a film of gaseous carbonic acid always protecting the hand from injury. If pressed upon the skin, a blister is produced similar to that caused by a burn. It is used, in connection with ether and bisulphide of carbon, for producing intense cold. Gaseous carbonic acid is colour-

less, possessing a slightly acid smell and taste. At ordinary temperatures it dissolves in water in the proportion of bulk for bulk. By pressure, water may be made to take up great quantities of the gas, the same *volume* being always absorbed, no matter how great the pressure may be. Upon the removal of the pressure, the gas escapes in bubbles. A familiar instance of this occurs in the effervescence of bottled beer or aerated waters. When inhaled, carbonic acid produces death, even when much diluted. A lighted candle is generally used to test an atmosphere suspected to contain carbonic acid; but it is found that air that will support combustion will contain sufficient of this gas to cause insensibility and dangerous illness. Carbonic acid produced during respiration may be shown by breathing through a tube into lime-water, which is at once rendered cloudy by the formation of carbonate of lime. The ill effects of crowded rooms are owing to the systemic depression produced by small quantities of carbonic acid. Carbonic acid was formerly called *fixed air*, from the fact of its having been discovered as a solid or fixed constituent in limestone by Dr. Black, in 1757. Though a feeble acid, and easily separable from its combinations, carbonic acid unites with the metallic oxides, forming a very numerous and important class of salts, the carbonates, descriptions of which will be found under the headings of their bases. The carbonates of the alkalies are soluble in water, the carbonates of the other metallic bases being for the most part insoluble, except the water is highly charged with carbonic acid. Hard water contains carbonate of lime or magnesia, held in solution by the carbonic acid contained in the water: hence, when the gas is dissipated by boiling, the carbonate of lime is precipitated, incrusting the vessel in which it has been boiled. Carbonic acid contains one equivalent of carbon, united with two of oxygen. Its true composition was discovered by Lavoisier, who bestowed on it the name it bears.

Carbonic Oxide (CO),—equivalent 14, spec. grav. 0·967 [illegible] produced [illegible] when is passed over red-hot charcoal; from which it will be seen that this gas is formed during the combustion of almost every organic substance. The first result of combustion is, of course, carbonic acid, which, passing over the red-hot coals or wick, as the case may be, parts with an equivalent of its oxygen. The gas, however, is inflamed as fast as it is formed, and reconnected with carbonic acid. It is generally prepared by the decomposition of oxalic acid by sulphuric acid. Oxalic acid consists of $C_2H_2$ united to an equivalent of water, without which it does not appear to be able to exist. The sulphuric acid abstracts this equivalent of water, leaving the $C_2H_2$ at liberty to separate into CO, carbonic oxide, and $CO_2$, carbonic acid. The latter is absorbed by passing the mixed gases through milk of lime. Carbonic oxide gas thus prepared is colourless and inodorous, burning with a blue flame, and giving rise to carbonic acid. It supports neither combustion nor respiration, one per cent. mixed with air being sufficient to cause dangerous drowsiness. It is now satisfactorily proved that the coma generally resulting in death produced by the combustion of charcoal in close rooms, is due to the formation of carbonic oxide by the carbonic acid formed during combustion, being exposed to the action of so much incandescent material. It is a neutral body, has no action on litmus-paper, does not combine with acids or bases, and has never been liquefied: it is slightly soluble in water. In metallurgical processes carbonic acid plays an important part by supplying fuel as fast as it is formed.

Carboniferous System, *kar-bon-if'-e-rus*, in Geol., the name given to the great assemblage of fossiliferous strata resting upon the Old Red sandstone, and capped by the Permian series. To this system the great coal-fields of the world belong. It consists of alternations of sandstones, shales, clays, limestones, coals, and ironstones, in every degree of admixture and purity, and of every condition of formation,—terrestrial, fresh-water, estuary, and marine. In the strata there have been discovered fossils representing all the great forms of life, with the exception, perhaps, of true dicotyledonous plants in the vegetable kingdom, and of birds and mammals in the animal kingdom. The most striking peculiarity in the system is the profusion of fossil vegetation which marks almost every stratum, and which, in numerous instances, forms thick seams of solid coal. Although this *coaly* or *carbonaceous* aspect prevails throughout the whole, it has been found convenient to arrange the system into three groups,—the Lower Coal-measures or Carboniferous Slates, the Mountain or Carboniferous Limestone, and the Upper or True Coal-measures; or, more minutely, according to the views of most British geologists, into the following series:—1. Upper Coal-measures; 2. Millstone Grit; 3. Mountain Limestone; and 4. Lower Coal-measures. Other subdivisions have been attempted, according to the local peculiarities of different coal-fields; but it is enough for the purposes of the general reader to know, that all these minor arrangements can be readily co-ordinated with one or other of the above four series. In recapitulating his admirable account of the Carboniferous system, Mr. David Page remarks:—"Looking at the whole succession and alternations of the strata,—the sandstones, clays, shales, limestones, ironstones, and coal,—and noting their peculiar fossils,—the estuary character of the shells and fishes of the lower and upper groups, and the marine character of the corals, encrinites, shells, and fishes of the middle group, with an excess of terrestrial vegetation throughout, are reminded of conditions never before or since [illegible] inhabited on our globe. The frequent alternations of the strata, and the great extent of our coal-fields, indicate the existence of vast estuaries and inland seas, of gigantic rivers and periodical inundations; the numerous coal-seams and bituminous shales clearly bespeak conditions of soil, moisture, and warmth favourable to an exuberant vegetation, and point partly to vegetable drift, and partly to submerged forests, to peat-swamps and estuarine jungles; the mountain-limestone, with its marine remains, re[illegible]ds of lo[illegible]al islands [illegible]ed [illegible]oral reefs, and lagoons thronged with shell-fish and fishes; the existence of reptiles and insects tells us of air, and sunlight, and river-banks; the vast geographical extent of the system bears evidence of a more equable climate over a large portion of the earth's surface; while the interstratified trap-tuffs, the basaltic outbursts, and the numerous faults and fissures, testify to a period of intense igneous activity—to repeated upheavals of sea-bottom and submergences of dry land. . . . . The natural conditions under which the system was formed are not more wonderful, however, than the economical importance of its products,—building-stone, limestone, marble, fire-clay, alum, copperas, lead, zinc, silver, and above all, iron and coal, are its principal treasures—conferring new wealth and comfort on the country that possesses them, and giving a fresh and permanent impetus to its industry and civilization."—*Ref.* Page's *Advanced Text-book of Geology*.

Carbuncle, *kar-bun'-kl* (Lat. *carbunculus*, a little coal), in Surg., is a broad, flat, firm, burning tumour, usually of considerable size. It occurs most commonly in middle life, and in those who indulge freely in the pleasures of the table. It begins with a hard, painful swelling, of a livid colour, which rapidly enlarges. The pain is severe, and is much increased by pressure; the patient is much depressed, and a general derangement of the system takes place. Vesicles form on the part, which soon open, and discharge a thin viscid fluid, with occasionally sloughed portions of disintegrated tissue. Sometimes these apertures run into each other, and form large openings. The predisposing cause of this disease is a derangement of some of the secretions of the human body, which is to be remedied by purgatives and other medicines suited for each particular case; the system being at the same time supported by tonics and a nourishing diet. This, however, is not enough,—an early and free application of the knife is necessary to the part itself. An incision, usually in the crucial form, throughout the whole extent of the diseased mass evacuates the purulent formation, and affords an exit for the sloughs when loose. Potassa fusa is also to be freely applied, in order to produce a separation between the healthy and diseased parts, and to prevent injury to the system from absorption of diseased matter.

Carbuncle, a large garnet, cut *en cabochon; i.e.* convex on the under side, and concave on the upper. The light is generally reflected in a flame-like form:

hence the name. The clear deep-red garnets from Pegu are most highly valued. There are many substitutes for garnet, such as the cinnamon-stone, which, when cut *en cabochon*, deceive even mineralogists. For the chemical composition of the carbuncle, *see* GARNET.

CARBURETTED HYDROGEN. (*See* HYDROGEN.)

CARBURETS, *kar'-bu-rets.*—Carburets are now called carbides, the word being more analogous to chloride, iodide, &c.

CARBYLE, SULPHATE OF, *kar'-bils*, ethronic anhydrine, so called by its discoverer Magnus. It is a combination of four equivalents of sulphuric acid with one of olefiant gas. (*See* ETHIONIC ACID.)

CARCASS, *kar'-kuss* (Fr. *carcasse*), in Mil., a destructive missile discharged from a mortar, like a shell, and designed to set fire to buildings and stores belonging to the enemy. It is a hollow spherical case of iron, perforated with three holes, and filled with combustible matter, which blazes furiously from these apertures, and cannot easily be extinguished. The composition, which resembles in many points the famous Greek fire of the Byzantines, burns for nine or ten minutes, and is lighted by fuses placed in the holes, which ignite at the moment of discharge. The 13-inch carcass contains 18lbs. of composition, and weighs nearly 2 cwt. They are said to have been first used in Germany about 1670.

CARCASS, in Build., a term applied to the bare walls and roof of a house, and the joists of timber running from wall to wall to support the flooring. It is merely the shell of the building, devoid of external decoration, doors, windows, and any internal fittings. The joists that support the floors and ceiling are sometimes called the carcass-flooring, and the frame of the roof that supports the tiles or slates the carcass-roofing.

CARCERULE, *kar'-se-rule* (Lat. *carcer*, a prison), in Bot., a superior many-celled fruit, each cell being dry, indehiscent, and one or few-seeded, and all more or less cohering by their united styles to a central axis. The fruit of the common mallow is a good example.

CARDAMINE, *kar'-da-mine* (from Gr. *kardia*, heart or courage, on account of its strengthening properties), in Bot., a gen. of plants belonging to the nat. ord. *Cruciferæ*. *C. pratensis*, the Cuckoo-flower, or Lady's-smock, is an indigenous perennial met with in meadows and moist pastures, blossoming in the months of April and May, when its flowers, which are flesh-coloured, white, or light purple, present a very pleasing appearance. Formerly the flowers were used medicinally, as a remedy in epilepsy. The leaves are antiscorbutic, and are sometimes eaten as watercress.

CARDAMOMS. (*See* ELETTARIA and AMOMUM.)

CARD-BOARD, or CARD, *kard-bord* (Fr. *carte*, card; Sax. *bord*, board), a substance made by pasting together several layers of paper. The number of these layers and the description of paper employed regulate the thickness and quality of the card-board produced. Ordinary card-board is made of fine white paper outside, with several layers of cartridge-paper between. Bristol-board is made altogether of fine white paper. Mill-board is made of coarse brown paper, layers of which are glued together and pressed. It is mostly used by bookbinders. Cards are enamelled by brushing them over with a mixture of china-white and size. After being rubbed with some finely-powdered talc, they are polished vigorously with a brush.

CARDIA, *kar'-di-a* (Gr., the heart), in Anat., is the name given to the superior opening of the stomach, on account of its being situated near the heart.

CARDIAC MEDICINES, *kar'-di-ăk*, are cordials or stomachic and stimulating medicines, which are given to raise the spirits.

CARDIACEÆ, *kar-di-aï'-se-e* (Gr. *kardia*, the heart), a fam. of bivalve *Mollusca*. They have a thick, closed, equivalve shell, with the umbones usually bent round, so that the shell, when seen from either extremity, presents a more or less cordate appearance. The hinge-teeth are strong, from one to three in each valve, and there are usually one or two smaller teeth on each side of the hinge. The animal possesses two adductor muscles.—(Dallas's *Animal Kingdom*.) The species of this family are very numerous, and greatly vary in size, some of their shells being remarkable for the smallness and delicacy of their construction. The type of the family is the Cockle. (*See* COCKLE.)

CARDIALGIA, *kar-di-ăl'-ji-a* (Gr. *kardia*, and *algos*, pain), in Med., denotes pain or an uneasy sensation in the stomach, accompanied with anxiety, a heat more or less virulent, sometimes attended with oppression or fainting, and frequently with an inclination to vomit, or a plentiful discharge of clear lymph-like saliva. (*See* HEARTBURN, INDIGESTION.)

CARDINAL, *kar'-di-năl* (Lat. *cardinalis*, principal, from *cardo*, a hinge), is a term used in various connections to denote the chief, principal, or fundamental parts of a thing. Thus, we speak in grammar of the *cardinal numbers*, in moral philosophy of the *cardinal virtues*, in cosmography of the *cardinal points*, and in meteorology of the *cardinal winds*. It was also the name given, under the emperor Theodosius, to the highest officers of the state, as it is in the present day to dignities in the Roman Catholic church.

CARDINAL, the highest dignity in the Roman Catholic church next to the pope. The cardinals were at first only the principal priests or incumbents of the parishes of Rome, which was early divided into parishes. Afterwards it came to be applied to the chief priest of any parish, who was alone allowed to baptize and administer the Eucharist. The title continued to be thus general down to the 11th century, when the popes, having grown powerful, formed a college or secret council of ecclesiastics of high rank to assist them in their duties, to whom alone the title of cardinal was soon reserved. At first, the title was confined to ecclesiastics in Rome or its neighbourhood; but afterwards it came to be conferred upon others at a distance, Conradus, archbishop of Mayence, being, it is said, the first who received this honour from Pope Alexander III. In 1160 the cardinals obtained, after much opposition on the part of the other clergy, the exclusive right of choosing the pope, and Innocent IV. gave them a rank above the bishops, together with the red hat. Boniface VIII., in the beginning of the 14th century, assigned to them the princely mantle, and Urban VIII. gave them the title of "eminence" instead of "most illustrious." The number of cardinals has varied greatly at different times. In the 12th century they rarely exceeded thirty, and in the 13th there was at one time but seven. In 1516 there were only thirteen, and in 1559 the highest number, seventy-six, was reached. The council of Basel decided that there should be twenty-four; but Sextus V. fixed their number at seventy, to correspond with the seventy elders of Israel. This last has since been adhered to; but the number is seldom full (it was so, however, in 1853, when eight new cardinals were created), the pope generally leaving some vacancies for extraordinary cases. The pope may select cardinals from any country, but with a preference for Italians; and in 1850, of the sixty-seven cardinals, fifty-one were Italians. Their creation occurs first in a secret conclave of cardinals, and is then publicly repeated. The person appointed is solemnly received in a public session of the consistory, and decked with a cardinal's hat. The promotion is completed at the close of the next secret conclave, which the new cardinals attend. In the case of cardinals who cannot attend, the pope dispatches one of his chambermen of honour to carry to them their cap, but they must receive their hat at his own hands. Their dress consists of a surplice with a short purple mantle, and a small cap, over which they wear the hat, either red or violet, with silk strings and tassels at the end. They have also a ring of sapphire, set in gold, which is worn on the fourth finger. They are divided into three classes; viz., six cardinal bishops, fifty cardinal priests, and fourteen cardinal deacons. In the first class are the bishops of the six suffragan sees of the Roman province; viz., Ostia, Porto, Albano, Tusculum, Sabina, and Præneste: the others generally derived an honorary title from some of the churches of Rome. In their own college, cardinal bishops rank first, the others according to the date of their appointment. The oldest cardinal bishop residing in Rome is dean of the college of cardinals. This college is the pope's council in all important cases, especially in all ecclesiastical matters, in which he must consult them. Cardinals are alone eligible to the papal chair, and as soon as this becomes vacant, they form a conclave to elect a successor. (*See* CONCLAVE.) As the pope is both a temporal and an ecclesiastical sovereign, the

cardinals occupy civil as well as spiritual offices. The *cardinal chamberlain* has control of the treasury and jurisdiction in the court; the *cardinal secretary of state* is a cabinet minister and foreign secretary; the *cardinal vice-chancellor* is chief of the chancery; the *cardinal secretary of briefs* is chief of the bureau of briefs, recently combined with that of foreign affairs; the *cardinal secretary of the interior* was first instituted in 1833; the *cardinal penitentiary* and the *cardinal prodatarius* are chief of their respective departments. The congregations (which *see*) are also under the direction of cardinals. The council of cardinals, when assembled under the pope for the discussion of matters affecting the church or the state, is called a *consistorium*. (*See* CONSISTORY.)

CARDINAL BIRD. (*See* GROSBEAK.)

CARDINAL NUMBERS, in Gram., are the numbers one, two, three, &c., as distinguished from first, second, third, &c., which are called ordinal numbers, as denoting order.

CARDINAL POINTS, in Cosmography, are the four points of intersection of the horizon with the meridian and the prime vertical circle, or, north, south, east, and west. The *cardinal winds* are those which blow from the cardinal points. In Astrol., the *cardinal points* of the heavens, or of a nativity, are the rising and setting of the sun, the zenith, and nadir.

CARDINAL SIGNS, in Astron., are—Aries, Libra, Cancer, and Capricorn.

CARDINAL VIRTUES, a term applied in Morals to those virtues which are supposed to comprise all the rest, or to which all the others are subordinate. This distribution of the virtues originated in the ancient Greek philosophy. It is to be found in the teaching of Socrates, as recorded by Xenophon, and was further developed by Plato, who makes them out to be Justice, Temperance, Fortitude, and Prudence. According to Dr. Whewell, this division "fails altogether; since the parts are not distinct, and the whole is not complete." He gives us another, which to us seems liable to the same objection; viz., Benevolence, Justice, Truth, Purity, and Order. The Roman Catholic moralists have adopted the ancient division of the cardinal virtues, to which they add what are termed the theological virtues; viz., Faith, Hope, and Charity, making the entire number seven.

CARDINAL'S HAT (Lat. *cardinalis*, principal) —Innocent IV. decreed that the cardinals in the Romish church should wear a red hat, which was intended to show that they were ready to shed their blood in the Church's cause. If a newly-appointed cardinal is at Rome, he first visits the pope, who puts a red cap on his head. The red hat is afterwards given to him at a consistory, and the proceeding is accompanied by a number of symbolical ceremonies. Except in the case of members of a royal house, the cardinal's hat is always given by the pope's own hands. Some cardinals who have not visited Rome have died without receiving it. The red cap is always sent to a chosen cardinal if absent.



CARDINAL'S HAT.

CARDING MACHINE, *kar'-ding* (Du. *caard*), a machine in which the fibres of cotton are combed or carded so as to disentangle them from each other, and the name given to the process of bringing into a proper condition for spinning into strata resting on the cylinders. These machines consist of wooden frames to which strips of leather are fastened, and perforated with numerous wires regularly fields of the wood. The wires are short and stiff, and the of sandstones, and cylinder resembles a circular brush. stones, in every case cylinders are arranged in a strong every condition, so that the wires nearly meet, and estuary, and by machinery connected with a steam discovered fossil life, with the cylinder-wheel. The cotton is put into the donous plants end, and is rapidly whirled round from and mammals, under until it comes out at the other end striking peculiar a filmy fleece; this is received on another cylinder called the "doffer," from which it is removed by the dofling-knife, and gathered into a narrow mass by passing through a funnel-shaped aperture. It is then ready to be drawn out and spun into yarns and thread. The combs or cards of wire with which the cylinders are coated were formerly made by hand, but they are required in such quantities in Lancashire and the manufacturing districts that they are now made by machinery, invented by Mr. Dyer, of Manchester, in the early part of the present century, which has since been greatly improved. By one part of the machine the strip of leather is moved slowly onwards throughout its entire length, and on its passage it is perforated and studded with wires by another part, the wires being also cut in the same machine. These machines for making cards for the carding-engines are very complex and beautiful in construction; each will cut and fix about 500 wires per minute.

CARDIOSPERMUM, *kar-di-os-per'-mum* (Gr. *kardia*, heart, *sperma*, seed, in reference to the shape of the seeds), in Bot., a gen. of plants belonging to the nat. ord. *Sapindaceæ*. The root of the species *C. halicacabum* is described as diuretic, diaphoretic, and aperient. The leaves are boiled and eaten as a table vegetable in the Moluccas.

CARDITIS, *kar-di'-tis* (Gr. *kardia*, the heart, termination in Path., denotes inflammation of the heart. It is characterized by pain in the region of the heart, great anxiety, fever, difficulty of breathing, palpitation, cough, irregular pulse, and fainting. It is applied properly to inflammation of the muscular tissue of the heart itself; but this is a form of disease that rarely occurs alone, being usually accompanied by *pericarditis*, or inflammation of the pericardium, or by *endocarditis*, or inflammation of the lining membrane of the heart. The symptoms and treatment in each case are similar. (*See* HEART, DISEASES OF.)

CARDOON, *Kar-doon'* (Sp. *cardon*), a garden vegetable, introduced into this country about the middle of the 17th century from the south of Europe. It bears a great resemblance to the artichoke, and belongs to the same botanical genus. (*See* CYNARA.) The tender stalks of the inner leaves, rendered white and crisp by earthing up, are used for stewing, and for soups and salads during the winter. With the florets of the cardoon, called *cardo do coalho*, the Portuguese formerly coagulated milk for cheese-making.



CARDOON.

CARDS, PLAYING, *kards*.—Neither the country nor the date of the introduction of playing-cards is known. Possibly they came from the East; for the Chinese and Hindoos have playing-cards that are clearly not of European origin. The manufacture of these articles is a very important one in this country, playing-card makers having been a large and influential body for the last four centuries. The manufacture is carried on under peculiar restrictions. No person is allowed to manufacture them, except in the cities of London and Westminster and Dublin, the manufacture being entirely forbidden in Scotland. They pay a duty of one shilling per pack, which is levied by means of the ace of spades, which is a government stamp. The aces are printed at Somerset House, on paper furnished by the card-maker, who has to pay for the engraved plate from which they are printed. The ace plates, of which two are necessary, one for the home and the other for the export stamp, cost £30 each. When the aces are required, a requisition is sent in for a ream, containing 9,600, and an officer is sent round to every cardmaker, at certain intervals, to seal the packs containing the aces drawn from the stock. The duty is collected by the number of seals being counted, the aces not made into cards not being charged for. The stock of aces is counted from time to time, and any deficiency has to be paid for, the manufacturer being called on to account for such an irregularity. When playing-cards are exported, the manufacturer must enter into a heavy bond that the cards will be landed at the port

specified, to insure a drawback of three halfpence per pound. The income derived from the tax on playing-cards is about £12,000 a year. The cardboard used in England for playing-cards is made of four sheets of paper. Two strong sheets of cartridge-paper are first pasted together, dried, and pressed: these are afterwards covered on each side with a sheet of strong well-sized paper. They are generally painted by means of stencil-plates, with a mixture of water-colour and paste. When painted and dried, they are rubbed with Castile soap and glazed with a flint. The operation of glazing is tedious and delicate, and causes much waste. The outlines of the court cards and the ornaments on the backs are printed with the ordinary letter-printing press. When finished, they are cut up and sorted; the best quality being called "Moguls," the second best "Harrys," and the third "Highlanders," the names being given from the figures on the wrappers. They are then tied in packs, and sealed by the revenue officer, as before explained. Messrs. De la Rue, of Bunhill Row, are the first among our English playing-card makers. These gentlemen have, by every means in their power, tried to render playing-cards works of art, not only on their backs, but on their also. In the former they have succeeded ad- idly de be hand Mr. Owen Jones and other eminent artists. T tried to reform the public taste by substituting artistic figures of kings and queens for the impossible caricature bu upe the attempt, after having incurred a very heavy lo There has been little or no improvement of note the manufacture of late years, the only important change being the introduction, by Messrs. De la Rue, of a method of printing the cards from metal or wood blocks. A pack of cards exhibited by this firm in 1851, with the backs ornamented in chromo-lithograj cost nearly £1,000. The designs were by Mr. Owen Jones, and consisted of the monograms of the different members of the royal family, wreathed with emblematical flowers. They also exhibited a pack of cards for the use of near-sighted people, the four kinds of pips being printed in four different colours.

Carduelis, *kar-dooel'-is* (from Lat. *carduus*, a thistle, on account of their love for the seeds of the thistle), a gen. of birds of the finch tribe. (*See* Goldfinch, Canary, &c.)

Carduus, *kar'-du-us* (Lat., a thistle), in Bot., the Thistle, a gen of plants belonging to the nat. ord. *Compositæ*, consisting of numerous species, some of which are noble-looking flowers. *C. benedictus* and a few others have been used in medicine as tonics and febrifuges.

Carle or Carle Sunday, *kair, karle*, is the secon Sunday before Easter, or the fifth Sunday from Shrove-Tuesday. It was formerly a custom in many parts of England to have grey peas steeped and fried in butter, nd given away to be eaten on this day. These were alled c It fr id Romish custom of eating steeped beans on this day,—a custom which probably originated from some earlier heathen practice.—*Ref.* Brand's *Popular Antiquities*.

Careening, *kar-een'-ing* (from Fr. *carêner*, to careen), the process by which a ship is laid down on one side in the water, in such a manner as to expose the other for the purpose of cleaning. It is seldom or ever now used in the British navy, as the copper sheathing with which our vessels are lined prevents, in a gr easure, their fouling; and the docks and newly-invented hydraulic lifts by which ships can be raised out of the water render it unnecessary. The *Great Eastern*, for instance, in 1860 was lifted by the latter means and placed upon a kind of dock called a graving in Milford Haven, and was thus enabled to be repaired and cleaned without the dangerous and difficult process of careening.

Caret, *kair'-et* (Lat. *caret*, I want), in Gram., is a mark thus ʌ, used to denote that something has been omitted, and that it is interlined.

Carex, *kair'-reks* (from Lat. *careo*, I want, the upper spikes being without seeds), in Bot., a gen. of plants belonging to the nat. ord. *Cyperaceæ*, or Sedge family, consisting of upwards of 250 species, more than sixty of which are British. The creeping stems of *C. arenaria* and other species help to bind the sands of seashores, and the plants are sometimes carefully cultivated for this purpose on the dykes of Holland. These stems, improperly called roots, have been used medicinally as substitutes for sarsaparilla, under the name of German sarsaparilla.

Cargadors, *kar'-ga-dors*, is a term applied by the Dutch to a kind of brokers whose business it is to find freights for ships, or ships for freights, and to give notice to merchants of ships that are ready to sail.

Cargo, *kar'-go* (Span. *carca*, a load or burden), is a general name for all the goods and merchandise carried on board a trading vessel. It is sometimes applied, also, to the invoice of the goods wherewith the ship is laden. The person often sent with a ship in charge of the cargo, and authorized to dispose of it to the best advantage, is called the *supercargo*.

Carica, *kar'-re-kâ* (from being erroneously supposed to be a native of Caria), in Bot., a gen. of plants belonging to the nat. ord. *Papayaceæ*. The species are natives of South America and the tropical regions of the old world. The acrid milky juice of *C. digitata* is said to be a deadly poison. The juice of the unripe fruit, and the powdered seeds of *C. papaya*, are powerful anthelmintics; but the fruit, when cooked, is edible. This plant is said to have the property of rendering meat tender. It is stated that newly-killed meat hung among the leaves soon becomes soft and delicate, and that the flesh of old hogs and old poultry fed on its fruit or leaves is remarkably tender. The stitute for up. The juice is said to be a highly animalized product, resembling animal albumen in its characters and

Caricature, *kăr-e-kă-ture'* (Ital. *caricare*, to load or overcharge), is a representation in which certain parts or peculiarities of an object are exaggerated, but in such a way that the general likeness is preserved, or even made more striking. Though the effect of caricature is generally to produce laughter, yet this idea is not invariably associated with it; for caricature may produce pity, or even horror. Caricature in the pictorial arts occupies the same place that burlesque does in literature. The legitimate objects of the one and of the other are the vices and follies of individuals or of classes, and all disagreeable peculiarities of manner and appearance which arise from these. External deformities, which do not spring from the fault of the persons affected, can never be proper subjects of caricature. The ancients employed caricature, as we find from their busts. Among Italian painters, Leonardo da Vinci is a master of this art, representing the quarrelsome, braggart, peevish, gluttonous, clownish, with an exaggerated fidelity. Among the French, Callot, and among the English, Hogarth, stand prominently out in this walk. The Italians have too strong a sense of the beautiful to have a great relish for caricatures, and the Germans are too grave to excel in these sportive productions. The French caricatures are rather of life the satirical con- ceptions. The English exhibit a greater appreciation of, and skill in this sort of humour than any other people. Some of the best specimens of caricature of any time or nation are to be found in the pages of the hebdomadal *Punch*.

Caries, *kair'-reez* (Lat., rottenness), in Path. Anat., is a disease of the bones analogous to ulceration of the soft parts. It differs from necrosis, in that, in the latter, the bone is destitute of vitality, which is not the No rresponds to mortification of the oft parts. Caries most frequently attacks the bones of the spine; but it may affect any of the bones, especially such as are of a spongy texture, as the carpal or tarsal bones, or the heads of the long bones, where they form articulations. The young, or those of a scrofulous habit of body, are most subject to this disease. It sometimes appears spontaneously; at others, as the result of an injury, as a blow or fall. It begins with inflammation, usually attended with a dull, heavy pain and weakness in the part affected. In course of time an abscess forms, which, if not arrested, at length bursts and discharges a thin fluid containing particles of the bone. In caries of the vertebræ, curvature of the spine takes place, more or less, according to the number of vertebræ affected, and paralysis generally sets in. At the ar-

tiulation of the bones, the part enlarges, the cartilages become affected, and amputation or excision of the joint is often necessary, in order to save the patient's life. Much may be done in arresting the progress of this disease, at least in its earlier stages. For this purpose, the patient should be strengthened by good air and nourishing diet, at the same time that rest is enjoined: the state of the stomach and bowels should also be attended to. In the local treatment of the disease, blisters, leeches, and issues, are to be employed. The abscesses are best left to nature, unless they are productive of much uneasiness. When they have burst, the exfoliation of the diseased part should be expedited as much as possible, so that the healthy portions of the bone may granulate and heal.

CARILLONS, *kăr-il'-lons* (Fr.), a name given to small instruments furnished with bells (properly tuned), that are acted upon by finger-keys, like those of a pianoforte, and used for accompanying certain songs, where the ringing of church-bells is to be imitated, and where dampers are not used for preventing the continuance of the sound. The steeples of some of the churches in Holland and some parts of the Netherlands are furnished with a large series of bells, tuned accurately to the tones and half-tones of the scale. They are connected at one end by wires with hammers, that strike the bells, and at the other with keys, and pedals for the lower notes of the scale. The persons who play these instruments (called *carillonneurs*) find it rather hard work, as the carillons are played by striking the keys rather forcibly with the hands and feet. The keys of these instruments are projecting sticks placed far enough apart to enable the performer to strike them with violence and velocity by the two hands edgeways, connected with the bells as those of an organ are with the pipes. The performers on these instruments wear thick leather coverings on the little fingers of each hand, to protect them from the violence of the stroke given. The first and second trebles are played with the hands, and the bass with the feet on the pedal keys. *Carillon* is also the name given to small keyed instruments made to imitate a peal of hand-bells, the tones of which are produced by box hammers striking iron bars of different lengths. Handel used to accompany his air in Milton's "Allegro," "Or let the merry bells ring round," on this instrument.

CARISSA, *kăr-is'-sa*, in Bot., a gen. of plants belonging to the nat. ord. *Apocynaceæ*. The species *C. Carandas* bears an edible fruit, which is eaten in the East Indies, either alone or with meat, as a substitute for red-currant jelly. The fruits of *C. edulis* and *t* are also eaten in Abyssinia.

CARLINA, *kăr-lī'-na* (after the emperor Charlemagne, whose army was cured of the plague by it), in Bot., a gen. of plants belonging to the nat. ord. *Compositæ*, and closely allied to the Thistles. *C. acaulis*, the Carline thistle, grows on hills and mountains, especially in calcareous soils, in the middle latitudes of Europe. It was formerly in high repute for the medicinal virtues of its root, which, in large doses, acts as a drastic purgative;

second dyn of the Frankish kings. (*See* FRANCE, vol. I. of this work.)

CARLUDOVICA, *kar-lu-dov'-e-ka* (in honour of Charles IV. and Louisa of Spain), in Bot., a gen. of plants of the nat. ord. *Pandanaceæ*. The unexpanded leaves of *C. palmata* furnish the material employed in the manufacture of Panama hats.

CARMAGNOLE, *kar'-man-yole*, the name of a song and dance that originated and became very popular in the time of the first French revolution. It appeared first in the south of France, and is supposed to have received its name from the town of Carmagnola, in Piedmont. It was commonly sung and danced at popular festivals, executions, and outbreaks of popular fury. Afterwards the name was applied to a kind of white jacket worn by the revolutionists, and by all who wished to show their patriotism.

CARMEL, KNIGHTS OF MOUNT, or KNIGHTS OF THE ORDER OF OUR LADY OF MOUNT CARMEL, *kar'-mel*, a military order of knighthood instituted in 1607, by Henry IV. of France, and incorporated by bull of Pope Paul V. in 1608, with the order of St. Lazarus of Jerusalem. The order was to consist of 100 French noblemen, who were to act as a body-guard to the king in battle.

CARMELITES, or WHITE FRIARS, or THE ORDER OF OUR LADY OF MOUNT CARMEL, *kar'-mel-ites*, a religious order forming one of the four tribes of Mendicants or Begging Friars, and deriving both their name and their origin from Mount Carmel. They claim the prophet Elijah as the parent and founder of their community,—an assumption which gave rise to a warm contest between them and the Jesuits about the end of the 17th century. The order was founded in the 12th century, by one Berthold, a Calabrian, who came to the Holy Land, and formed a community of hermits on Mount Carmel, at the traditional abode of Elijah. The order afterwards obtained the sanction of the Church, and a rule from Albert, patriarch of Jerusalem, enjoining poverty, manual labour, living in separate cells, specified prayers, and fastings and silence at certain times. Pressed by the Saracens, they withdrew from Mount Carmel about 1238, and soon spread over Europe, especially Italy, France, Spain, and England. They held their first European general chapter at the monastery of Aylesford, in England, 1245. They had afterwards about forty houses in England and Wales. In 1247 they obtained certain modifications of their rule from Innocent IV., which contributed much to their popularity; and still more so did the adoption of the *scapulary*, consisting of two stripes of grey cloth, worn one upon the breast and the other upon the back, and fastened together on the shoulders. It was an invention of 1287, and a brotherhood of Scapulary arose, composed of laymen without any monastic vows. The scapulary was revealed by the Virgin, who was said to visit purgatory every Saturday, to save all who had at any time borne it, or had died in it. In the 16th century, St. Theresa, a Spanish lady of noble family, undertook the difficult task of reforming this order, which had lost much of its primitive sanctity. She met with much opposition from the members of the order; but being assisted by Johannes de Santa Cruce, she succeeded in dividing the order into two branches:—1. The *Carmelites of the Ancient Observance*, or the moderate party, who continued to adhere to their milder rule of and 2. those of the *Strict Observance*, or *the Bare-footed Carmelites*, who went bare-footed, and adopted a much more severe and self-denying course of discipline. There are now four independent bodies or congregations of Carmelites:—1. Carmelites of the milder rule; 2. Carmelites of Mantua; 3. Bare-footed Carmelites of Spain; and 4. Bare-footed Carmelites of Italy, or of St. Elias. There is also an order of Carmelite nuns, which was instituted in France in 1452, and at present are very numerous in Italy.

CARMEN, *kar'-men* (Gr. *chairo*, I rejoice), a term used among the Latins to signify in a general sense a verse. In a more peculiar sense, they employed it to denote a spell, charm, form of expiation, &c., couched in few words, and placed in a mystic order, on which its efficacy depended. These were generally in verse; but it was also applied to laws, precepts, prayers, and all solemn formulæ comprised in few words, and arranged in a certain order, though written in pros

CARMINATIVES, *kar-min'-a-tives* (Lat. *carmen*, a charm; Fr. *carminatif*), in Med., is a term applied to certain substances which have the power of dispelling flatulence, or relieving pain in the stomach and bowels. They belong chiefly to the vegetable kingdom; as, cardamoms, peppermint, ginger, and other aromatic stimulants.

CARMINE, *kar'-mine* (Fr. *carmin*), is the colouring matter of the *Coccus cacti*, or cochineal insect, and consists of carminic acid united with alumina or oxide of tin, according to the mode of manufacture. There are various receipts for the preparation of carmine, but the success of the process depends more on the care with which it is conducted. "Twenty ounces of cochineal and 113 grains of carbonate of soda are boiled in distilled water for twenty minutes; when removed from the fire, three-quarters of an ounce of alum and one-eighth of an ounce of bitartrate of potash are added. The whites of two eggs are now added; and on treating the liquid, the carmine rises to the surface. The carmine is collected in a strainer, washed, and dried at 82° Fahr."—*English Cyclopædia*.

CARMINIC ACID, *kar-min'-ik.*—Mr. Warren De la Rue finds that the colouring matter of cochineal is an acid body, capable of uniting with bases to form coloured salts and precipitates. He procures it by treating the powdered insect with ether, to remove the fat, and digesting the insoluble portion in water. Acetate of lead is then added, and a lead-like carminate of lead is precipitated. This must be well washed, decomposed by sulphuretted hydrogen, and the filtered solution evaporated *in vacuo* over sulphuric acid. The colouring matter thus obtained is *carminic acid*. It is a purple-brown friable mass, soluble in alcohol and water, and slightly emetic. It dissolves unchanged in sulphuric and hydrochloric acids, but nitric acid decomposes it. Chlorine, iodine, and bromine change its colour to yellow, and the freed alkalies colour the aqueous solution purple. With alum no precipitate occurs until ammonia is added, when it falls down as a brilliant crimson-lake. The alkaline earths give purple precipitates, and with salts of tin a bright crimson solution is obtained.

CARNATION. (*See* DIANTHUS.)

CARNELIAN, *kar-ne'-li-an* (Fr. *cornaline*), in Min., a term originally applied to a flesh-coloured calcedony, but now applied to blood-red, yellow, white, brown, and nearly black varieties of this mineral. They consist principally of silica coloured by oxide of iron. This word is frequently written and pronounced *coraelian*. The finest carnelians are found in Arabia, India, Surinam, and Siberia.

CARNIVAL, *kar'-ni-val* (Lat. *caro*, flesh, *vale*, farewell; *i.e.* farewell to flesh), the name of a festival observed in Roman Catholic countries, particularly in Italy, immediately before the commencement of Lent, beginning on the feast of the Epiphany, or Twelfth-day, and ending on Ash-Wednesday. It doubtless arose from the *Saturnalia* of the ancient Romans which were celebrated annually, in the month of December, with all kinds of mirth and freedom, in honour of the golden age, when Saturn governed the world, and when liberty, equality, and happiness prevailed. The Christianized Romans were in this, as in other cases, loath to lose their pagan festivals, and the Church granted her sanction to what she could not very well prevent. The early Christians, it is said, on these days, gave themselves up to voluntary madness, put on masks, exchanged sexes, clothed themselves like spectres, and considered all kinds of pleasures allowable. The rich commenced their festive period at the feast of the Epiphany, or on Three Kings' day; while the middle classes confined themselves to the week immediately preceding Ash-Wednesday, and the poorer classes to the three or four days before Lent. During the last days of the Carnival, all kinds of mummery are practised, and freedom of every sort abounds. Rome and Venice are now the cities where the carnival is celebrated with the greatest effect; but even in them it is rapidly declining. In Rome the public festivities are confined to the Corso (which is about a mile long, but very narrow) and the street adjoining, and extends over the eight days immediately preceding Ash-Wednesday. The balconies of the houses are crowded with numerous gaily-dressed spectators, and hung with brilliantly-coloured pieces of cotton or silk; while innumerable streamers of the same hues flutter in the breeze. The street below is thronged with carriages filled with gay parties; while crowds of pedestrians mingle with the vehicles, masked, clad in every variety of costume that fancy can suggest, and playing every imaginable kind of prank. One and all, in the street or on the balconies, engage heartily in pelting each other with flowers, bonbons, and *confetti* (*i.e.* small pellets of lime about the size of a pea). Among the most usual masks are punchinellos, with enormous noses and protuberant backs and stomachs; harlequins in particoloured vestments, with swords of lath; and pantaloons, indulging their usual propensity for thieving by snatching bouquets from the hands of those in the passing carriages. The festivities do not last the entire day, but only from about 2 to 5 o'clock, and are each day succeeded by a race by spirited horses without riders. In the evening the windows are illuminated, and the maskers go about with tapers in their hands, every one striving to preserve his own taper and extinguish those of others.

CARNIVORA, *kar-niv'-o-ra* (Lat. *caro*, flesh; *voro*, I devour), a term applied to all creatures which feed upon flesh. It is definitely applied to that order of the mammalia which preys upon other animals. The forms of this order are very varied. They are furnished with three sorts of teeth, and have nails or claws upon the feet like man and the quadrumana; but they differ from these two orders in not having the thumbs of the anterior extremity capable of being opposed to the other fingers. The modifications of the molar teeth generally indicate the kind of animal food eaten by carnivora. Some are made for cutting or lacerating, some are serrated, and others are totally or partially tuberculated: in the latter case vegetables form a greater or less proportion of the diet. In all cases the jaws of carnivora only open upwards and downwards, and never horizontally. The brain of these animals is considerable in bulk, well marked, but without a third lobe, and does not cover the cerebellum. Of all the senses smelling seems to be in the highest perfection; and as their food does not require much elaboration and digestion, their intestines are comparatively short. Cuvier divides the carnivora into four tribes:—1. The Plantigrades, which are distinguished by applying the whole sole of the foot, especially the hinder one, to the ground in walking. The bear and badger are instances. 2. The Digitigrades, which have long flexible bodies and short legs. The ferret and polecat, and the fox, are instances of the two subdivisions of this tribe. 3. The Felidæ, or cats, in which the destructive power is most highly developed. They are distinguished by the short round muzzle, the shortened powerful jaw, and the retractile claws, sheathed by means of elastic ligaments when the animal is in repose. All the Felidæ have two false molars above and two below; the upper flesh-cutter has three lobes and a blunt heel within; the lower one has no heel, but has two pointed and cutting lobes. They have also one small tuberculated molar above, without any corresponding molar below. The tiger is an example of this tribe. 4. The Amphibia; of which the seal is an example. Many remains of mammiferous carnivora have been discovered in bone caverns and osseous breccia.

CARO, *ka'-ro*, a Latin word signifying flesh. It is frequently used in medicine, as well as many of its compounds; as, *carnea columnæ*, the fleshy columns or muscular fasciculi within the cavities of the heart; *carneus*, fleshy, applied to some muscles of the heart; *carnicula* (dim.), a small fleshy substance; *carniformis*, having the appearance of flesh; *carnivorous*, flesh-devouring, applied to animals that live on flesh; *carnosus*, fleshy.

CAROB BEAN. (*See* CERATONIA.)

CAROL, *kar'-ol* (Ital. *carola*, a song of joy), denoted originally a song sung as an accompaniment to dancing, and afterwards applied to a religious song used in celebration of Christmas. Christmas carols were early in use in the Christian church. According to Tertullian, it was customary for them at their feasts to place in the middle such as were able to sing, and call upon them to praise God in a hymn either out of the Scriptures, or of their own invention. Religious songs or ballads in celebration of Christmas are still sung in many parts of England.

CAROLINA PINK. (*See* SPIGELIA.)

CAROLINE BOOKS, *kar'-o-line*, the name given to four books drawn up by the bishops of France by order of Charlemagne to refute decisions of the second council of Nice regarding the worship of images.

CAROLITIC COLUMNS, *kar-o-lit'-ik*, columns, the shafts of which are decorated with foliage, flowers, and branches, winding round them in a spiral form, or assuming the shape of wreaths and garlands. The Apprentice's Pillar in Rosslyn chapel is a good example of a carolitic column. The derivation or meaning of the term carolitic is uncertain, unless it be a corruption of such a word as "corollitic," or "corolitic," which might have been coined to express the peculiar nature of the decoration of the column; from *corolla*, or *corol*, a crown or garland, in its primary signification, and the affix *ic*, which means "of the nature of," or "formed like."

CAROTID ARTERY, *kar-ot'-id* (Lat. *arteria carotides*), in Anat., is the name given to a considerable artery on each side of the neck. It is so called from the Greek

verb *kuroo*, I cause to sleep, because, if tied or compressed, the person becomes comatose, and has the appearance of being asleep. The right carotid arises from the arteria innominata, the left from the aorta. The left is thus rather longer than the right, and is in general somewhat smaller. They ascend backwards and outwards into the neck, and, when opposite the os hyoides, each of them divides into the external and internal carotid arteries; the former proceeding to the face and parts without the cranium, the latter to those within. The external carotid afterwards divides into ten branches; viz., the superior thyroid, lingual, lateral, occipital, muscular, pharyngea ascendens, posterior auris, transverse facial, temporal, and internal maxillary. The internal carotid enters the cranium by a somewhat tortuous course, and afterwards separates into four branches,—the ophthalmic artery, and the anterior, posterior, and central arteries of the brain.

CARP, *karp* (Fr. *carpe*), (*Cyprinus Carpio*).—This fish is found in most of the lakes and rivers of Europe, and in many places it is cultivated in ponds with great care, although not to a great extent in this country, which is, doubtless, owing to the abundance of salt-water fish. It is said that this fish was introduced into England about the beginning of the 16th century, and it has always been greatly esteemed as a delicate article of food. The carp usually feeds on worms and various insects; this diet, however, in places where this fish is bred, is intermixed with grain, &c. The length of a carp's life is amazing. A century would seem to be about the average; but a healthy fish will occasionally live to the age of 150 years, or thereabouts. When it is considered that it is an extraordinarily prolific fish, and that its roe has been known to



CARP.

turn the scale against the remainder of the carp out of which it has been taken, it is, perhaps, fortunate that it is so generally popular a diet. The carp usually measures about fifteen inches in length; in warm climates, however, it sometimes nearly reaches three feet. The general colour of the carp is yellowish-olive; the head is large, and the mouth is provided with two beards, one shorter than the other; the scales are large and very distinct.

CARPEL, *kar'-pel* (Gr. *karpos*, fruit), in Bot., a modified leaf, forming the whole or part of the pistil. When several carpels are present, they may be either distinct from each other, as in the columbine, or combined so as to form one body, as in the poppy. The carpels, taken collectively, constitute the *Gynœcium*, or female system of flowering plants. (*See* PISTIL.)

CARPENTER BEE, *kar'-pen-ter* (*Xylocopa*).—This species belongs to the *Apidæ*, or true bees. Its name is derived from the singular manner in which its nest is built. This is generally found in soft decaying wood, and is lined with leaves of a semicircular form cut from plants. It is also known as the *Leaf-cutting Bee* and *Upholsterer Bee*. It is found in all parts of the world.

CARPENTER'S RULE, a flat wooden rod used by carpenters for the purpose of measuring work and taking dimensions. It is commonly two feet in length, made of two pieces of boxwood joined by a brass hinge, and divided by means of lines perpendicular to the length of the rule, to show the number of inches, half-inches, fourths, eighths, and sixteenths of an inch in the entire length. Some rules are graduated in such a way as to aid in calculating the solid content of timber.

CARPENTRY, *kar'-pen-tre* (Fr. *charpenterie*), the art of preparing and putting together pieces of timber for building and other purposes. The expression carpentry, strictly speaking, is more particularly applicable to the system of framing pieces of timber together to form the partitions, roofs, and floors of buildings, the trusses and frames of wooden bridges, and the centring or supports on which large arches and the arches of bridges are built; as well as the keel, ribs, timbers, and planks forming the hull of a vessel, which will be treated under the head SHIPBUILDING. (*See* SHIPBUILDING.) Although the term carpenter is applied indiscriminately to all who make articles of any kind from wood, yet it must be remembered that rough work requiring great strength and durability in method of construction and materials is put together by the carpenter properly so called, while the interior fittings of a house, such as the stairs, skirting-boards, flooring, doors, windows, &c., requiring greater finish and neatness in execution, are the work of the joiner (*see* JOINERY); and pieces of household furniture, particularly those made of the more valuable kinds of wood, come from the hands of the cabinetmaker. The carpenter should be well acquainted with the properties of different kinds of timber (*see* WOOD), and have a knowledge of the strength and durability of each sort, its capability of bearing great tension and compression, and the power it possesses of resisting the action of various causes that bring about the decay of woodwork. (*See* MATERIALS, STRENGTH OF.) When a tree is felled for building or other purposes, the trunk is stripped of its bark, and it is left to lie exposed to the air or the action of water until it is "seasoned," that is until it has become hard dry wood, free from sap. At least no wood should be used until it has attained this condition; for many of the discomforts of modern houses arise from the green state of the timber that has been worked up in their construction; and the draughts that come through ill-fitting window-frames, shrunken doors and skirting boards, and the gaping chinks between the boards of the flooring, are to be principally attributed to the same cause. Unless the timber is thoroughly seasoned, it is also liable to the action of the weather, swelling and fitting far too tightly under the influence of a damp atmosphere, and shrinking, splitting, and warping under the heat of the summer sun. Trunks of trees sent from foreign countries are roughly squared to economize space in the holds of the timber-vessels that bring them to our coast; and in this state they are called "balks." Sometimes they are sawn up and brought over in pieces varying in thickness from 2½ to 4 inches. When these pieces are only 7 inches in width, they are called "battens;" if wider, "deals." When the timber is brought in balks, it is sawn up as required into beams or planks by saws handled by two men in sawpits, or by the action of a circular or band-saw, worked by machinery. (*See* SAW, SAWMILL.) The tools used by a carpenter in the exercise of his art are various. For dividing pieces of wood he has the hand-saw, with a long, thin, elastic blade, every alternate tooth of which is turned slightly outwards in contrary directions, and the panel-saw, a smaller tool of similar description. For making incisions in wood to any required depth, the tenon-saw is used,—a small fine blade, with sharp teeth, set in a piece of metal running along the back, to stiffen it and prevent it from bending. For cutting out circular pieces, or holes of any kind, such as keyholes, the keyhole or turning-saw is used, consisting of a narrow stiff blade, decreasing in breadth and thickness, and the teeth becoming finer by degrees towards the end. Smoothness is given to wood by means of tools called planes. A large plane, called a "jack-plane," is used for rough work, and a smaller sort, called a "smoothing-plane," for giving a finish to the surface. Besides these there is a great variety of planes used for cutting grooves in wood and for fashioning different kinds of mouldings, which are now generally purchased by builders ready made by machinery. For cutting holes in timber, technically called "mortises," to receive "tenons" or projections from the ends of other pieces of wood that fit into them, strong narrow chisels are used, which are driven into the timber by a mallet. Other chisels of different widths are used for paring and cutting, and "gouges," which are tools resembling chisels brought into a semicircular form, are used for hollowing out cavities and cutting holes. These are the principal tools of the carpenter, with hammers, gimlets, and brad-awls for boring holes for the passage of nails and screws; centrebits for boring holes of various diameters, consisting of short iron boring-tools that are inserted in a socket at the lower end of a carved handle, with a

broad boss at the other end to receive the pressure of the workman's chest when using the instrument; punches for driving the heads of nails below the surface of the wood; rasps for smoothing and fashioning pieces of wood into shapes, such as the twisted shaft so common in Elizabethan furniture; a square for fitting pieces together, or cutting wood at right angle a mitre-board for forming the angles of frames; a level for cutting wood at any required angle; a line for marking timber by rubbing it with chalk or charcoal, which produces a rough imprint by stretching it tightly from end to end of the required line, and, pulling it from the surface, allowing it to return and strike it smartly; a straight-edge for ascertaining that the surface and edges of a board are perfectly straight and level; a gauge for drawing lines parallel to the edge of any piece of wood; a screw-driver, pincers, spoke-shave, compasses and callipers, and a glue-pot. Screws and nails of all sorts and sizes are used for fastening pieces of wood together; but the best sort of nail seems to be one invented and patented by Mr. Wiggell, late master of the Government School of Design at Exeter, which combines the properties of the nail and screw, and can be driven with the hammer, and withdrawn by means of the pincers, without injury to the nail or wood. The methods used in the construction of the woodwork used in buildings for partitions, roofs, staircases, &c., will be found under their respective headings. (*See* Partition, Roof, Staircase.) Some of the means used to connect and fit separate pieces of timber together will be found under the heading Joinery. —*Ref.* Tredgold's *Principles of Carpentry*; Nicholson's *Architectural Dictionary*.

Carpet Knights, *kar'-pet*, a term sometimes applied to civilians, or persons of peaceable professions, who, on account of birth, meritorious service, or the like, are raised to the dignity of knighthood. They were so called because they usually received their honours in the court, kneeling on a carpet, and were thus distinguished from knights created in the camp or on the field of battle.

Carpet Manufacture. (*See* Manufacture of Carpets.)

Carphologia, *kar-fo-lo'-je ä* (Gr *karphos*, the nap of clothes, and *lego*, I pluck), is the picking of the bedclothes sometimes observed in persons in the delirium of a fever, and regarded as a very dangerous symptom.

Carpinus, *kar-pi'-nus* (Celtic *car*, wood, , head, the wood being used for the yokes of cattle), in Bot., a gen. of plants belonging to the nat. ord *Corylaceæ*, which also includes the oaks, the hazels, the beeches, and the chestnuts. *C. betulus*, the hornbeam, and *C. americanus*, yield excellent timber, largely employed for agricultural implements and the cogs of mill-wheels.

Carpocratians, *kar-po-krat'-shans*, a sect of heretics, who sprang up in the 2nd century, and were named after their founder, Carpocrates, an Alexandrian. Their doctrines were those of the Gnostics, believing in one supreme original being, from whom all existence has emanated, and to whom it strives to return. The system seems to have been founded in great measure upon the Platonic philosophy, especially the "Phædrus;" and it also bears a close affinity to Buddhism. The finite spirits who rule over the several portions of the earth, they hold, seek to counteract this universal tendency to unity, and from their influence, laws, and arrangements, proceeds all that checks, disturbs, or limits this desire to return into the Supreme Being. The souls of men, imprisoned in corporeal bodies, can only escape by rising above the desires of nature through contemplation. Christ they regarded merely as a man who had risen to the highest flight of contemplation, and had thus set himself free from the laws of the spirits of this world. Plato, Aristotle, Socrates, and others, who have risen above the religion of their time, they regarded in the same light, and paid them, also, divine honours. This sect was much given to the art of magic, and are said to have been most immoral in their practice, holding a community of wives, and not only sanctioning, but inculcating sin, as one of the means of rising superior to the spirits of this world. This sect, though small, continued to exist down to the 6th century.

Carpus, *kar'-pus* (Gr. *karpos*), is a term in Med. applied to the wrist, or that part of the upper extremity between the forearm and the hand. The carpal bones, or bones of the wrist, are eight in number, and are arranged in two rows,—a superior and inferior, each containing four bones. In the superior row, counting from without inwards, are the scaphoid or navicular, the lunar, cuneiform or pyramidal, and pisiform bones; and in the interior, the trapezium and trapezoid bones, the os magnum, and the unciform bone.

Carrel or Quarrel Bolt, *kar-rel*, the arrow used in cross-bows; a cross bow.

Carrier Pigeon. (*See* Pigeon.)

Carriers, *kar'-re-urs* (Welsh *cariaw*; Fr. *charrier*, to carry).—Persons carrying goods for hire, as masters and owners of ships, hoymen, lightermen, carmen, coachmen, railway companies, and the like, come under the denomination of *common carriers*. The liabilities and privileges of carriers are treated of under Bailment and Lien. In addition to what will be found under those titles, it may be stated that a common carrier for hire by land or water is answerable, by the custom of the realm, for every loss or injury to the goods conveyed, unless occasioned by the act of God or the queen's enemies; and, on the other hand, is bound to receive and convey the goods of every applicant who is ready to pay the price of carriage, provided he has room for them, and his liability is capable of being varied by a special contract (if any should happen to be made) relative to the terms on which goods are to be carried on any particular occa- &c. ordingly, it was competent to him at common law, by a public notice of the terms on which he deals (as by a notice that he will not be liable for goods beyond a certain value, unless booked as such, and paid for at a higher rate), to limit the measure of his responsibility; for upon proof, direct or presumptive, that such notice came to the knowledge of the customer before the goods were sent, the law would suppose a special contract between the parties conformable to the terms of the notice, though it still held the carrier responsible for negligence or wilful misconduct; and such is still the state of the law with respect to carriers for hire by water. (See 8 & 9 Vict. c. 42, enabling *canal companies* to become common carriers.) But, as to those by land, it is now provided by 11 Geo. IV. & 1 Will. IV. . 68, that no public notice shall limit or in anywise affect their liability at common law for an in respect whereof they may not be entitled to the benefit of that act (*sec.* 4). On the other hand, however, the same statute (reciting that by reason of the practice of sending money, bills, notes, jewellery, & other articles of great value in a small compass, the responsibility of carriers by land for hire had been greatly increased) enacts for their benefit that no such carrier shall be liable for loss or injury to certain enumerated articles of the general description mentioned in the recital (when the aggregate value shall exceed £10), unless, at the time of delivery to the carrier, the value and nature shall have been declared, and such increased charge paid thereon as by a legible notice affixed in the office shall have been previously advertised to the public; but if no such notice shall have been affixed, or if the carrier shall refuse (when required) to give a receipt acknowledging the parcel to be insured, he is not to be entitled to the benefit of the act, and remains liable as at common law (secs. 1, 2, 3). It has been held, however, that where the carrier has complied with the act, and the customer has not, the former is not liable to the latter even for gross negligence. It is also provided that nothing in the act contained shall affect any express special contract between the carrier and customer, or protect the carrier in any case from loss arising from the felonious acts of any servant in his employ, or protect any such servant from liability for loss occasioned by his own personal neglect or misconduct (secs. 6, 8). In the particular case of a conveyance by sea, it is to be observed that the liability of the shipowner (though he is, in point of law, a common carrier, if the ship be ordinarily hired to carry goods) does not usually rest on the common-law rule, but on the special contract created between the parties by the bill of lading; and that a bill of lading, in its most ordinary form, con-

tains an exception of the act of God, the act of the queen's enemies, fire, and all perils of the seas. By various acts of parliament, also, shipowners are exempted from liability for losses arising from any act done without their fault or privity beyond the value of the ship and freight; and are, moreover, protected from those which occur by the breaking out of a fire on board the vessel. (*See* BAILMENT, BILL OF LADING, LIEN.)

CARRONADES, *kăr'-ron-aids*, short cast-iron guns, having a chamber to receive the powder similar to a mortar, and attached to the carriage by a bolt, which passes through a large iron eye or loop underneath the gun, instead of working on trunnions, as large pieces of ordnance generally do. They derive their name from the Carron foundry, near Falkirk, where this kind of cannon was first cast. As their range is limited in extent, the carronades were more particularly useful in sea-fights when the contending vessels came to close quarters, or in breaching ramparts when they were placed pretty near the face of the work; but at short distances they threw shot and shell as effectively as larger guns, and they had this advantage, that they were much lighter, and could be handled by fewer men than long pieces of the same calibre. In consequence of the improvements that have lately taken place in gunnery, carronades are now but little used.

CARROT. (*See* DAUCUS.)

CARROUSAL, *kăr-row'-zăl* (Ital. *carroscllo*, dim. of *carro*, a chariot), is, properly, a course or contest of chariots and horses, but generally applied to a magnificent entertainment given by princes or other great personages on occasions of public rejoicing, and consisting in a cavalcade of persons richly dressed and equipped, after the manner of ancient cavaliers, who met in some public place to practise jousts, tournaments, and the like. Carrousals took the place of the earlier tournaments, and were common in all the courts of Europe down to the 18th century.

CARRUCATE, *kăr'-ru-kăit* (Lat. *carrucata*), in the ancient laws of England, denoted a plough of land, or as much as one team could plough in a year. The contents of a carrucate are very variously stated, and, indeed, it seems to have varied at different times and in different parts. In the Domesday survey, the hide and carrucate appear to be the same. In the early part of the reign of Richard I., the carrucate is said to have been estimated at 60 acres, and to have been afterwards fixed at 100. In the time of Edward I., it appears to have been more than once estimated at 180 acres; and in the 23rd of Edward III., a carrucate of land in Worcester contained 112 acres, and in Middleton 150.

CARTE BLANCHE, *kart blaunsh* (Fr., white card), is a paper containing nothing but the signature and, it may be, the seal of the party who grants it, in order that the party receiving it may fill it up or insert such conditions in it as he pleases. Generally, the term is used to express unlimited authority delegated by one person to another to act as he may think best. Thus, a representative is said to have received carte blanche from his sovereign if he has unlimited power to deal with those to whom he is accredited.

CARTEL, *kar'-tel* (Fr. *cartel*; Sp. *cartello*), a term applied to an agreement between two states that are at war, for an exchange of prisoners. It is also a challenge to fight a duel. Ships that are used to convey exchanged prisoners, or to take messages from one hostile power to another, are called cartel ships, or by the French *bâtiments parlamentaires*. To such ships one gun only is allowed for the purpose of making signals.

CARTESIAN PHILOSOPHY, *kar-tē'-se-ăn*, is that system of philosophy which owes its origin to Descartes (1596—1650), who is entitled the father of modern philosophy. He endeavoured to constitute philosophy a demonstrable science, founded on the principles of pure rationalism, and was to philosophy on the continent what Bacon was to it in England. Unable to find any firm ground in any of the prevailing systems, distracted by doubts, mistrusting the evidences of his senses or the conclusions of his understanding, he determined to reconstruct his knowledge, to believe nothing but upon the clearest evidence of reason, and to examine the premises of every conclusion. He pushed his scepticism so far that he came to doubt everything but his own existence. It appeared to him that doubts might reasonably be entertained about everything but this own existence; to doubt the existence of *that* which thinks and doubts, appeared to him to be an absurdity. Setting out, therefore, from his well-known postulatum, *Cogito, ergo sum* (I think, therefore I am), he resolved to admit nothing which could not be deduced from it by a chain of logical reasoning. He did not attempt, as some philosophers have held, to prove his own existence in this way; he merely regarded it as the only thing about which there could not possibly be any doubt. His next step was to lay down certain rules for the detection of truth. These were:—1. Never to accept anything as true but what is so evidently, so that there can be no reason to doubt it. 2. To divide every question into as many separate questions as possible, that, each part being more easily conceived, the whole may be more intelligible. 3. To conduct the examination with order, beginning with the most simple, and rising by little and little to the most complex; and 4. to make such exact calculations, and such circumspections as to be certain that nothing essential has been omitted. Consciousness being the ground of all certainty, everything of which we are clearly and distinctly conscious, must be true, and everything which we clearly and distinctly conceive, exists, if the idea of it involves existence. The method of reasoning to be followed in the investigation of truth, was, in his view, the mathematical. "Those long chains of reasoning," he says, "all simple and easy, which geometers use to arrive at their most difficult demonstrations, suggested to me that all things which came within human knowledge, must follow each other in a similar chain; and that, provided we abstain from admitting anything as true which is not so, and that we always preserve in them the order necessary to deduce one from the other, there can be none so remote to which we cannot finally attain, nor so obscure but that we may discover them." To prove the existence of God was the first application of his method. This consciousness of mine is finite and imperfect; but infinity and perfection are involved in these ideas, and innate in the mind; therefore an infinite and perfect being must exist. The fundamental attribute of matter is extension, of mind is thought. The soul, whose nature consists in thought, is simple in its essence, or, in other words, purely immaterial, but intimately connected with the body. The *pineal gland* he supposed may be its seat. From the immateriality of the soul he deduced its immortality; but lest he should be obliged to extend the same properties to other animals, he pronounced them to be *living machines*. The soul is free because it thinks itself so, and in this very freedom consists its liability to error. He made a distinction between the passive impressions and active decisions of the soul. He constituted three classes of ideas: adventitious, or those which we naturally acquire; those which we create; and innate, or those which are born with us. He accounts for the communion existing between soul and body by his doctrine of *Assistance*,—the assistance or co-operation of deity. (For his famous theory of vortices *see* VORTICES.) Notwithstanding the many defects of the Cartesian philosophy, its confusion in some parts and contradictions in others, and a want of conclusiveness in many of its inferences, it awakened men to independent thought, and impelled them to investigate the fundamental principles of philosophy.—*Ref.* Enfield's, Lewes's, and Tenneman's *Histories of Philosophy*; D. Stewart's *Dissertation on the Progress of Philosophy*.

CARTHAMIN, *kar'-thă-min*, the red dyeing principle of the safflower, or *Carthamus tinctorius*. It is obtained by digesting safflower in weak acetic acid to remove the yellow dyestuff. The washed dye is digested in a solution of carbonate of soda, and a skein of cotton is placed in the liquid, and lemon-juice or citric acid is added. The colouring matter is removed by the cotton, from which it is washed, redissolved in carbonate of soda, and reprecipitated with citric acid. When dry, carthamin is a red pulverulent substance, metallic green when viewed in the mass, but purplish-red when seen in thin layers. Safflower was formerly much used as a dye, particularly in the form of pink saucers, for dyeing silk stockings; but its fugitiveness is a great objection to its use.

CARTHAMUS, *kar'-thă-mus* (from the Arab. *quartom*, to paint), in Bot., a gen. of plants belonging to the nat. ord. *Compositæ*. The most important species is *C. tinctorius*, the safflower, or bastard saffron. The florets of this yield a beautiful pink dye, and are sometimes used to adulterate hay saffron. The substance called cake saffron consists of safflower and mucilage. The fruits commonly called seeds yield, by expression, a useful oil, which is known in India as Koosum oil.

CARTHUSIANS, *kar-thu'-si-ăns*, a religious order founded by one Bruno, a very learned man and professor of philosophy in Paris, about 1080. They are so called from the desert of Chartreuse, near Grenoble, the place of their first institution, and are remarkable for the austerity of their rules. The members cannot leave their cells nor speak to any one without the permission of their superior. Their beds are of straw, with a covering of felt or coarse cloth. They wear hair-cloth shirts, white cassocks, and over these black cloaks. In their refectory they are to keep their eyes on the meat, their hands on the table, their attention on the reader, and their heart fixed on God. They are not allowed animal food, must fast every Friday, except a small allowance of bread and water, and observe an almost perpetual silence. When allowed to discourse, they are to do so modestly, not in a whisper, nor yet in a loud or contentious manner. They confess to the prior every Saturday. The convents of this order are generally very beautiful; that of Naples, though small, is most magnificent, and richly ornamented. The Carthusians first settled in England in 1180, and had monasteries in various parts of the country. There was one established in London where the Charterhouse (a corruption of the original term) now stands.

CARTILAGE, *kar'-ti-lej* (Lat. *cartilago*), in Anat., is a white, firm, elastic substance, intermediate between bone and ligament, and commonly known by the name of *gristle*. Cartilages are divided by anatomists into—1. articular or obducent, covering the surface of the bones, which form movable joints; 2. inter-articular, which are situated between the ends of bones, forming articulations; and 3. connecting cartilage, which unites one bone with another. In some cases, cartilage occurs unconnected with bone, as in the larynx and trachea. In early life, cartilage in various parts occupies the place of bone, and becomes afterwards ossified. The physical properties of cartilage—its firmness, elasticity, and powers of resistance—render it specially fitted for the purposes which it serves, facilitating the motions of bones or connecting them together.

CARTILAGINOUS FISHES, *kar-ti-laj'-i-nus*, are fishes the skeletons of which are destitute of bony fibre. In some cases they would almost appear to form the connecting link between the vertebrate and invertebrate animals. The skeleton of the lancelets, for example, is merely rudimentary; it simply consists of a slight transparent flexible dorsal column. The dorsal column of the lamprey also presents a similar appearance. The centre of the backbone of the sturgeon is a column of cartilage, and the vertebræ of sharks consist of hollow cones, which have their cups filled up with the remains of a gelatinous cord. Great elasticity is the result of this arrangement. In many of the more highly organized cartilaginous fishes, several vertebræ are joined together in one piece, and the skull is formed without sutures, although the shape corresponds with that of other fishes. Cuvier placed cartilaginous fishes with the batrachian reptiles in his class *Amphibia*. Naturalists are now, however, unanimous in placing them in the class of fishes. The heterocercal tail is one of the most remarkable characteristics of all classes of this kind of fish. The vertebral column is prolonged into the upper portion of the caudal fin, and the lower one is given off beneath. Similar tails are to be observed in the fossil fishes of the Old Red Sandstone period.

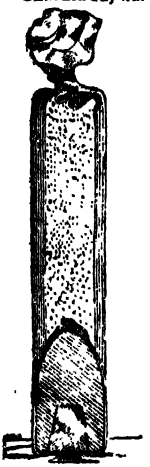
CARTOON, *kar-toon'* (Lat. *carta*, paper; Ital. *cartone*, pasteboard), in Paint., a drawing on a large scale, generally of the full size, executed as a preliminary design for tapestry or any painting of considerable size in oil-colours or fresco, from which the work itself is afterwards copied. It serves in the latter case as a study in which the artist can more readily correct the composition of the design and the details of the drawing, before entering on the execution of his painting. When it is desired to prepare a cartoon, several sheets of paper are fastened together at the edges, and the whole is stretched over a frame of the necessary size. The trouble, however, of fastening paper together to any extent may be avoided by the use of "colossal drawing-paper," which is now made for the purpose in a continuous sheet of great width and several yards in length. After the paper is stretched, it is sometimes primed, particularly if the cartoon is to be executed in distemper colours; but this process is dispensed with if it is to be merely a sketch in chalks, similar to the cartoons which were exhibited in 1843 as studies for the frescoes in different parts of the new palace at Westminster, some of which may now be seen at Hampton Court. The drawing is transferred to the canvas or plaster in fresco-painting (*see* FRESCO-PAINTING) either by rubbing the back of the cartoon with black chalk or charcoal, and tracing the outline with a hard point, or by puncturing the outline with holes, through which the surface of the material on which the work is to be executed may be marked with chalk. If, however, the painter desires to preserve the original cartoon, he stretches threads across his drawing, so as to divide the surface into a number of squares of the same size, and draws lines across the canvas at right angles to each other, to divide it into a similar number of corresponding squares. Cartoons are indispensable for paintings in fresco, as these can only be executed in small portions at a time, while the plaster on which the painting is made remains wet. Some cartoons by Annibale Carracci may be seen in the National Gallery; but the finest in the world are those by Raffaelle, which are carefully preserved at Hampton Court. It is to be regretted that seven only remain out of the original set of twenty-five which were executed for Leo X. about 1616, as designs for tapestry. Two sets were made at the tapestry-works at Arras, one of which is now at Rome and the other in the museum at Berlin. Raffaelle's exquisite designs were thrown aside as soon as the tapestry was executed, and the greater part were lost or destroyed. The seven that remain were purchased by Rubens for Charles I., to be copied at the tapestry-works at Mortlake. After the death of this monarch, they were bought for the nation, by order of Cromwell. Charles II. afterwards sent them to Mortlake, where an attempt was made to produce the designs in tapestry, and there the drawings were much injured and defaced. They were, however, restored and mounted on canvas by a painter of the name of Henry Cooke, by command of William III., who built a gallery for their reception at Hampton Court, after a design by Sir Christopher Wren. They were removed to Buckingham Palace and Windsor Castle in the reign of George III.; but they were subsequently restored to the gallery at Hampton Court, in 1814, where they still remain.

CARTOUCH, *kar-toosh'* (Fr. *cartouche*), in Mil., the name sometimes given to the box or case in which soldiers carry their cartridges. The word is not so much used in this country as in France, but the leathern case in which the cartridges are carried is called the pouch. In former times the external case was filled by a block of wood, the sides of which were bored full of holes to receive cartridges. When the cartridges in one side were exhausted, the soldier was obliged to turn the block to get at those in the next side, a proceeding which was attended with inconvenience in the heat of action. Cartridges are now carried in a tin case, which fits into the outer one of leather. The name was also formerly given to a wooden box containing a number of bullets and balls, which were used as grape and canister are now, for firing into a close body of men on the deck of a vessel, or advancing to carry a breach by assault.

CARTOUCHE (Ital. *cartoccio*), in Arch., a tablet intended to receive an inscription which resembles a scroll of paper rolled up at the ends. It is also applied to the modillion that supports the corona of a cornice used in interior decoration. In Egyptian architecture the expression denotes the oval or elliptical figures that are carved on columns and other parts of a temple to receive hieroglyphic inscriptions of different kinds.

These figures are cut in what is called *cavo-rilievo*, that is to say, the surface of the ground of the cartouche is hollowed out below the surface of the stone, while that of the hieroglyphic figures that appear in relief on the ground of the cartouche is level with it, being, in fact, the surface of the column round which the sunken part has been hollowed out.

CARTRIDGE, *kar'-tridj*, a case of pasteboard or flannel containing the exact charge of a fire-arm. Those for large guns are usually cased in flannel, but sometimes tin, paste-board, and wood are employed. For sporting purposes, cartridges are made up containing a quantity of small shot without powder. In these the outer paper covering contains a wire network, a charge of small shot intermixed with bone-dust, and at the end a wadding. These cartridges bear the name of wire-cartridges. The ball-cartridges made for the rifles of the present time contain powder and a conical bullet. The powder is protected by a number of folds of the paper; round the bullet there are only two folds. In the annexed woodcut there is shown a section of a ball-cartridge; at the base there is the hollow conical bullet with its plug; above is the powder. A blank cartridge contains powder only. The number of cartridges kept in the British military stores is very great, probably near a hundred millions.



CARTRIDGE.

CARUM, *kai'-rum* (from Caria, in Asia, it being originally found there), in Bot., a gen. of plants belonging to the nat. ord. *Umbelliferæ*. The species *C. Carui* is the common caraway, a native of most parts of Europe. It is largely cultivated in Essex for its fruits, commonly called seeds, which have a pleasant [illegible] and a warm aromatic taste, owing to the presence of about five per cent. of volatile oil. They are much used in confectionery and for flavouring cakes. The oil, obtained by distilling the fruits with water, is used as a corrective adjunct in medicine.

CARUNCLE, *kar'-un-kl* (Lat. *caruncula*, dim. of *caro*, flesh), in Anat., is used to denote a small piece of flesh, or a little fleshy excrescence; hence the *caruncula lachrymalis*, a small fleshy glandiform body, situated on the inner angle of each eye.

CARUS, *kā'-rus* (Gr. *karo*, the head), in Med., denotes profound sleep, or lethargy (which *see*).

CARVING, *kar'-ving* (Sax. *ceorfan*, to carve), a term more particularly applied to the production of figures, fruit, flowers, and ornamental work, from pieces of wood or ivory, by cutting the same into the desired shape by means of chisels, gouges, saws, and files of the necessary forms. The art of carving is called "sculpture" when stone is the material employed, and "chasing" when the work is executed in metal. The ancient sculptors of Greece, and those of Byzantium in later times, excelled in carving in ivory; and magnificent cups, crucifixes, and other works of art, were produced in this material in Italy and the Low Countries between 1200 and 1600. The Hindoos and Chinese are famous for their delicate and elaborate carving in ivory to this day. Magnificent specimens of wood-carving are to be found in the majority of cathedrals and churches in the Gothic style of architecture erected during the middle ages in England and on the continent; while Windsor Castle, Hampton Court, St. Paul's Cathedral, and many of the residences of the nobility, are enriched with work produced by the chisel of Grinling Gibbons, a carver of considerable repute, who excelled in the production of fruit and flowers, and flourished between 1670 and 1721. The art has been revived to a great extent in the present day; and some beautiful carving in wood may be seen at the New Palace at Westminster, mostly executed by machinery contrived for the purpose, as well as at St. Michael's Church, Cornhill, and the chapel of Jesus College, Cambridge. The Swiss are extremely ingenious in carving animals in soft wood, spirited figures being produced by comparatively few strokes of the tools employed. A very effective imitation of carving in oak and dark wood is made in gutta percha and leather, which is softened and pressed in moulds prepared for the purpose. The Kenilworth sideboard, and one known as Stevens's sideboard, made by Mr. John Stevens, of Taunton, the former of which was shown at the Exhibition of 1851, and the latter in that of 1862, may be cited as affording good specimens of modern artistic skill in carving in wood.

CARYA, *kai'-ri-ā* (Gr. *karuon*, a nut), in Bot., a gen. of plants belonging to the nat. ord. *Juglandaceæ*. The species are chiefly natives of North America. *C. alba*, the common hickory, is valuable for its timber, and also for its edible seeds, which are commonly known as hickory nuts. *C. olivæformis* yields an olive-shaped or elliptical nut, which resembles the walnut in flavour, and is known as the pecean nut. *C. porcina* yields an edible nut called the hog-nut.

CARYATIDES, *kăr-e-at'-e-dees* (Gr. plural of *karuatis*, a woman of Caryæ), in Arch., the term given to female figures clothed in long flowing robes, that are used instead of columns, to support an entablature like the male figures called Atlantes. (*See* ATLANTES.) The use of male and female figures to support porticos or entablatures was doubtless derived from the Egyptians, and dates from a very early period; but, according to Vitruvius, they received the name they still bear to commemorate the cowardice and want of patriotism shown by the people of Caryæ, a town of Arcadia, when Xerxes invaded Greece. For this act they were punished by their fellow-countrymen, who sacked their town, and, after killing all the males, reduced the women to a state of slavery; and as the figures called Caryatides appear supporting a heavy burden like slaves, this name was applied to them to keep the slavery of the women of Caryæ in remembrance.



CARYATIDES.

CARYOCAR, *kăr-ri-o'-kar* (from Gr. *karuon*, nut), in Bot., a gen. of plants belonging to the nat. ord. *Rhizobolaceæ*. The species are large trees, natives of the hottest parts of South America. *C. butyrosum* is much esteemed for its timber, which is used in shipbuilding and for other purposes. The separated portions of the fruit constitute the Souari or Suwarrow nuts of commerce, the kernels of which are delicious. An excellent oil may be extracted from them.

CARYOPHYLLACEÆ, *kai-ri-o-fil-lai'-se-e* (Gr. *karuon*, nut; *phullon*, leaf), in Bot., the Pink or Clovewort fam., a nat. ord. of dicotyledonous plants, in the subclass *Thalamifloræ*. They are mostly herbaceous plants, with stems swollen at the joinings, and opposite, entire, and exstipulate leaves. The flowers are usually hermaphrodite, and the sepals, petals, and stamens exhibit a quaternary or quinary arrangement. The stamens are hypogynous, the anthers innate. The ovary is commonly 1-celled, with from two to five styles. The fruit is a 1-celled capsule, or rarely 2—5-celled, generally with central placenta, to which the seeds are attached. The plants of this order are natives chiefly of temperate and cold regions. When found in the tropics, they are generally on the slopes and summits of mountains, often reaching the limits of eternal snow. Lindley gives 59 genera and 1,055 species. They possess no important properties. Some of the wild species are eaten as food by small animals, and some, particularly the *Vaccaria vulgaris*, are thought to increase the secretion of milk in cows fed upon them. *Saponaria officinalis*, which contains a peculiar principle called *saponine*, has been used as a remedy in syphilis. The same principle is particularly

abundant in *Gypsophila Struthium*, to which it communicates well-marked saponaceous properties: hence the plant is commonly termed Egyptian soap-root. Some of the plants have showy flowers, as the species of *Dianthus*, *Silene*, and *Lychnis*. From plants of the first of these genera are derived all the beautiful cultivated varieties of the sweet-william, pink, and carnation.

CARYOPHYLLUS, *kai-ri-o-fil'-us*, in Bot., a gen. of plants belonging to the nat. ord. *Myrtaceæ*. The most important species is *C. aromaticus*, the clove-tree, a native of the Moluccas, but now grown also in the Isle of France, India, and the West Indies. The *cloves* of commerce are the unexpanded flower-buds dried. They form a well-known spice, and are much used in medicine on account of their aromatic, stimulant, and carminative properties. The dried unripe fruits are called *Mother cloves*, and are used in China and other countries instead of the ordinary cloves, to which they are very inferior.

CARYOPSIS, *kai-ri-op'-sis*, in Bot., a superior one-celled, one-seeded indehiscent fruit, with a thin, dry, membranous pericarp, completely and inseparably united with the seed. The grains or fruits of the grasses, as wheat, barley, rye, and maize, are examples.

CARYOTA, *kā-re-o'-tā* (Gr.), in Bot., a gen. of palms, natives of the East Indies. From the species *C. urens*, sugar, or *jaggery*, is procured, and its juice, when fermented, forms a kind of toddy or palm-wine. From the trunks of the old trees a kind of sago is obtained, and this is much used as food in Assam.

CASA, *kaï'-za* (Lat., a hut or cottage), was used in the Middle Ages for a convent or church: thus Bede calls Whitchurch *Candida casa*.

CASCADE, *kas-kaid'* (Fr.), denotes properly a waterfall, in which the water does not, as in the cataract, fall uninterruptedly from a great height, but in which it is broken at several parts during its fall, or it is a waterfall less than a cataract. It is generally applied to those artificial waterfalls that are met with in pleasure-grounds and public parks.

CASE, *kase* (Lat. *casus*, from *cado*, I fall), in Gram., is that modification which is effected on a noun to denote its relation to the rest of the sentence. This is commonly denoted by changes in the termination of the noun. The number of cases in the declension of nouns varies much in different languages. In Sanscrit there are eight cases; in Latin six; in Greek five. In English there are only three cases,—the nominative, possessive, and objective,—the last occurring only in pronouns. All the other relations of nouns are expressed by prepositions.

CASE, ACTION ON THE, was a form of personal action called trespass on the case, for redress of wrongs and injuries done without force; as, for not performing a promise made by the defendant to the plaintiff, or for speaking words by which the plaintiff was defamed, or for other misdemeanour or deceit. Before the act was passed which rendered it unnecessary to describe the nature of the action in the writ, it was imperative that the declaration should be framed to comply with such description, and many nice distinctions were drawn in cases ranging between this form of action and that of trespass *vi et armis* (by force actual or constructive). Except to a legal antiquary, it would be practically useless to give an account of the history of this form of action, or to notice the distinctions above referred to; and this observation will apply to the other five forms of personal actions, except that of *replevin*, which is one of very limited application, and different in its general character, and will be treated of in its proper place.

CASE, PRINTER'S, a large flat oblong frame, generally about thirty-four inches long, fifteen inches broad, and an inch and a quarter deep. It is used by printers as a receptacle for types, and is divided into numerous compartments, each of which contains a number of types of the same kind. A pair of cases, as generally used in England, consists of an upper and a lower case, which are placed sloping. The upper case is divided into ninety-eight "boxes," which contain the large and small capitals, the figures and reference-marks, and some other letters not frequently used. The lower case has fifty-three "boxes," which contain the smaller letters, spaces, points, &c. The arrangement of the boxes in the lower case varies in different printing-offices. The boxes in the upper case are of uniform size, and the letters are placed in alphabetical order, as the comparatively rare use of capitals makes it immaterial to the compositor which type is nearest. But in the lower case the size and position of the boxes depend upon the letter contained. Those letters which occur most frequently in composition are placed in the largest boxes, and in the most convenient position to suit the compositor. As the letter *e* occurs more frequently in English composition than any other letter, the box containing it is placed in the middle of the case, and is larger than any of the others. The type, or "letter," contained in a case is sufficient to fill three pages of this work, equal to 27,000 or 28,000 types of this small-sized letter.

CASE-HARDENING, *kard'-en-ing* (Ang.-Sax.), the process by which a surface or outer coating of steel is given to iron goods, such as grates, fenders, firearms, gun-locks, keys, tools, &c. It renders any article which has been so treated far more durable than it otherwise would be, and sufficiently hard to resist the action of a common file. It also makes it capable of receiving a high degree of polish. When any piece of ironware is to be case-hardened, it is first made red-hot in a close case, surrounded with charcoal, or the burnt hoofs, skin, or bones of any animal, mixed with salt and sometimes vinegar. It is kept in this state for a greater or less time, according to the size of the article or the thickness of the steel coating required. It is then taken out and cooled in water or oil, and afterwards polished. Sometimes yellow prussiate of potash is used, which is applied to the iron when it is red-hot; after which it is heated again, and then cooled and polished.

CASE-SHOT, or CANISTER, *kase'-shot*, a number of musket-balls inclosed in a metal case or cylinder, which bursts immediately after leaving the muzzle of the gun, and the bullets radiate outwards, or scatter in all directions, like the pellets in a charge of shot fired from a fowling-piece. It is very destructive to a body of men at 250 or 300 yards' distance. Case-shot are made to suit guns of different calibre. Those chiefly used in the present day are called "Shrapnel shells," as they were invented by an officer of the name of Shrapnel. The case is spherical in form, like a shot or shell, and is filled with bullets and powder. It explodes by means of a fuse, which ignites when the shell is fired, and is so regulated that the case may burst just before reaching the body of men against which it is directed.

CASEINE, *kai-seen'* (Lat. *caseus*, cheese), is the nitrogenous principle of milk, which forms a large portion of the curd. Casein, in the soluble *form*, appears to be preserved in solution by a small quantity of alkali contained in the milk. In the coagulated form it is readily obtained by adding dilute sulphuric acid to the milk, which precipitates in the form of a curd. The curd is well washed and dissolved in carbonate of soda, and allowed to stand for twenty-four hours, to let the oil rise to the surface. This is skimmed off and the casein precipitated by an acid. The process is repeated a second time, and the coagulum digested with alcohol and ether, and dried. With all these precautions the casein still contains some saline matter, which cannot be removed. It is also obtained by coagulating the milk with hydrochloric acid. The curd is washed with dilute hydrochloric acid, and finally with pure water; a glutinous mass is obtained, which is slowly dissolved by digestion at 110°, with a large quantity of water. The solution is filtered, coagulated with carbonate of ammonia, the coagulum washed with water, ether, and alcohol, and finally dried. Coagulated casein is readily dissolved by the alkalies and alkaline carbonates. Casein also unites with earthy carbonates, and forms insoluble compounds. A very tenacious lute is made by mixing poor cheese with slaked lime. The most remarkable form of coagulation is that produced by the action of the secretion from the mucous membrane of the stomach. This substance is called rennet, and consists of the inner membrane of the fourth stomach of the calf, salted and dried. When a solution of rennet is mixed with milk, a dense coagulum is formed, leaving the whey behind, as a thin, clear, straw-coloured liquid. The

section of rennet in this instance remains unexplained. Caseine has not been found anywhere but in milk. The quantity varies according to the period of lactation at which the milk is examined. Its amount also varies with different animals, as will be seen from the following table:—

| | | |
|---|---|---|
| Human female | 31 to 35 | parts in 1,000. |
| Cow ,, | 30 to 41 | ,, |
| Dog ,, | 80 to 146 | ,, |
| Ass ,, | 19 to 23 | ,, |

CASEMATE, *kais'-mait* (Fr.), in Mil., the term applied to a vaulted shell-proof chamber constructed in any work of defence, with embrasures, from which a fire can be kept up on the enemy, the artillerymen employed being protected from the enemy's shot and shell. In some fortresses, casemated batteries are raised in tiers, one above another. Casemates were at first merely loopholed galleries, built in the face of any work, from which a fire of musketry could be directed, to prevent the enemy from effecting a lodgment in the ditch in front; but in the present day they consist of vaulted chambers made of solid masonry, and as lofty as possible, every care being taken to promote ventilation and carry off the smoke, which, with the deafening reverberation of the roar of the guns, causes no little inconvenience to the officers and men employed therein. Sometimes they are made open towards the rear, or with large massive doors, that can be opened or closed at pleasure. There is generally a hole above each embrasure and a chimney in the top of the vault, which aids in carrying off the smoke when firing is going on. Casemates are also used for the reception of troops and stores during a siege, or as hospitals. For these purposes they must be at least sixteen or eighteen feet wide, and the same in height. Care should also be taken to keep them dry by covering the masonry, forming the vaulted roof with cement, and making drains to carry off the ra that may fall on the earth and turf above the roof.

CASEMENT, *kais'-ment* (Ital. *casamento*), a window which opens on hinges fixed to the side of the window-frame. Casement windows are common in old houses, the frames which support the glazing, which is set in grooved bands of lead, being made of iron. They are much used in the domestic Gothic architecture, but are more liable to admit draughts than the sash windows, and however pretty their appearance may be from without, they are inconvenient within, as the heavy wooden frames and transoms of the entire window serve to keep out the light and hide the view. The name is also given to a broad and deep circular moulding in Gothic architecture, which is sometimes enriched with rosettes placed at intervals, or foliage.

CASEOUS OXIDE. (*See* LEUCINE.)

CASH, *kish*, in Com., signifies ready money, bills, drafts, bonds, and all readily negotiable paper.

CASH ACCOUNT, in Book-keeping, is an account to which nothing is carried but cash on the one hand, and from which all the cash payments of the concern are drawn on the other. The balance is called the *cash in hand*. When the balance is in favour of the credit side, the account is said to be *in cash*; when in favour of the debit side, *out of cash*.

CASHEW NUT. (*See* ANACARDIUM.)

CASHIER, *kash-eer'* (Fr. *caissier*), the cash-keeper; one who is charged with the duties of paying and receiving the debts of a house of business or a society. The cashier in many cases is called the treasurer. Cashiers of the Bank are those officers who sign notes, and examine them when returned for payment.

CASHIERING, *kish-eer'-ing* (Fr. *casser*, to break).—When an officer of the army or navy is dismissed her Majesty's service in consequence of scandalous and infamous conduct, he is said to be cashiered. It is dismissal attended with deep and indelible disgrace, and the offender is disqualified from ever re-entering the service from which he is thus ignominiously expelled.

CASINO, *ki-se'-no* (Ital., a little house, dim. of *casa*, a house), is a club-house or place for social meetings. It is derived from the Italian, and was first applied to those small pleasure retreats which noblemen in Italy usually have at some distance from their palaces, to which they occasionally retire and enjoy themselves. Afterwards, the middle classes united in societies, and formed similar casinos or club-houses, for social enjoyment. The term is also applied to a building annexed to or near a theatre, where musical or dancing soirées are held, and where there are also conversation and billiard-rooms, refreshment-rooms, and such-like. Casinos are now common in France, Germany, and other parts of the continent, and have also been introduced into England.

CASKET, *kás'-ket* (Fr. *casse*), a small box or chest for holding jewels or other small articles of value. The term is also applied by seamen to a small rope fastened to little rings upon the yards; it is used in order to fasten the sail to the yard when it is to be furled.

CASQUE, *kásk* (Fr. *casque*; Lat. *cassis*, a helmet), a term synonymous with helmet (*see* HELMET), applied to a defensive covering for the head, made of plates of steel or iron, and surmounted with a plume. It seems, from the derivation, to imply more particularly a helmet similar to those worn by the Greeks and Romans, which covered the head only, and left the face and neck exposed.

CASSATION, COURT OF (Fr. *cassation*, from *casser*, to annul, quash is the highest judicial tribunal of France, so called fr its having the power to annul the decisions of an the other tribunals. It is not, strictly speaking, a court of appeal, because it does not go into the merits of the cases on which judgment has been given, but only takes up the legal bearings of the case, as to whether the due forms of procedure have been observed, and the judgment be in strict accordance with law. When a judgment is quashed, the case is remitted back to the tribunal appealed from to give a new decision. It is a court of appeal in criminal as well as in civil cases. It consists of forty-eight members, who are appointed by the sovereign, but who hold office for life. It is divided into three sections, viz.—1. *Section des Requêtes*, which decides on the admissibility of the petitions or appeals; 2. *Section de Cassation civile*, which decides upon appeals in civil cases; and 3. *Section de Cassation criminelle*, which decides upon appeals in criminal matters. The court has a president, and there are presidents also of each of the three sections; but the minister of justice, as keeper of the seals, has the right of presiding in cases where it sits on appeals from the *cours impériales*. Cases of peculiar difficulty may be judged of by the three sections united; and the whole court, when presided over by the minister of justice, possesses powers not specially provided for by law; as in censuring or suspending judges, &c. This court owes its origin to the revolution of 1789, and it has been of great benefit to France, maintaining a unity in the legislation, and protecting the people from arbitrary proceedings or misjudgments in the other courts. In all the changes of government and administration, this court has always preserved a high character for strict impartiality.

CASSAVA. (*See* MANIHOT.)

CASSIA, *kish'-e-á* (from Arab. *katsa*, to tear off, the bark being stripped from the tree), in Bot., a gen. of plants belonging to the nat. ord. *Leguminosæ*, sub-ord. *Cæsalpinieæ*. The leaflets of several species furnish the important drug senna. Some uncertainty prevails as to the species yielding some of the commercial varieties. That kind commonly known as Alexandrian senna is generally supposed to be derived from *C. officinalis*, var. *lancelata*, and *C. oborata*. This is the kind most esteemed in Britain; but it is frequently adulterated with the leaves of other plants. The common East-Indian, Mecca, or Bombay senna, is supposed by Royle to be the produce of *C. officinalis*, var. *acutifolia*; Tinnevelly senna, a very fine kind, is furnished by *C. officinalis*, var. *elongata*. The above three varieties are those generally used in this country, and are officinal in our pharmacopœias. Other commercial varieties are, Tripoli senna, from *C. æthiopica*; Aleppo senna, from *C. oborata*; and American senna, from *C. marilandica*. Another drug, called cassia pulp, or purging cassia, is obtained from a species of this gen.; namely, *C. fistula*. The pulp is contained in the pods. It is of a reddish-black colour, with a sweetish taste, and possesses laxative and purgative properties. The pods of *C. brasiliana* are used in veterinary medicine under the name of horse-cassia.

The bark of *C. auriculata* is employed for tanning, and the flowers are said to be used for dyeing yellow. The seeds of *C. Absus*, under the names of Chichou and Cismatan, are used in Egypt as a remedy in ophthalmia.

CASSIA-BARK, and CASSIA-BUDS. (*See* CINNAMOMUM.)

CASSIOPEIA, *kăs-se-o-pe'-e-ă*, in Astron., a constellation in the northern hemisphere, midway between the constellations Auriga and Cygnus. It is not far from the north pole, and may be distinguished by five stars disposed somewhat in the form of the letter M. It contains only one star above the third magnitude, and that is not so brilliant as stars of the second. It is figured on the celestial globe as a female figure sitting in a chair with its feet towards the pole. The name is said to be derived from Cassiopeia, the mother of Andromeda, who was made a constellation and placed in this position for having boasted that she was prettier than the daughters of Nereus. Tycho Brahe observed a star of great brilliancy in this constellation in 1572, which disappeared in 1574. It is said to have appeared there in 945 and 1264, but this is doubtful; yet if this were the case, Sir John Herschel considers that it may reappear in 1872.

CASSOCK, *kăs'-sok* (Fr. *casaque*), a kind of surtout or long upper garment, now usually worn only by the clergy, but formerly by all classes. As worn by the English clergy it is black, with a single upright collar; but on certain state occasions bishops sometimes wear purple cassocks. In the Church of Rome they vary in colour with the dignity of the wearer; those of the priests being black, bishops purple, cardinals scarlet, and popes white.

CASSOWARY, *kăs'-so-wā-re* (*Casuarius*), a gen. of large and powerful birds closely allied to the Ostrich. It is an inhabitant of Java and the adjacent Indian archipelago, and is generally called the helmeted cassowary, on account of an osseous crest or horny helmet which surmounts its head. The skin of the head and the upper part of the neck are without feathers, and of an intense blue and deep red colour. There are also two pendent wattles, partly red and partly blue, on the front of the neck. On the breast is a bare place, on which the bird rests when lying on the ground. In height it is less than the ostrich, standing little more than five



CASSOWARY.

feet when erect. It is, however, robustly built, and very strong. From the appearance of its eyes and the form of its head, the cassowary might be supposed to be of a fierce and threatening nature. This is not the case, as it is rather timorous and shy than otherwise. When attacked, it defends itself by kicking backwards with its feet, and striking with its short and otherwise useless wings. All the feathers of the cassowary are of the same kind, and of the same colour: they are only designed for covering. Its whole plumage is very poorly supplied with feathers, and, at a short distance, it presents the appearance of a rough coat of coarse hair. It feeds upon eggs, fruit, and succulent herbage. The eggs of the cassowary are greenish in colour, and have a much thinner shell than those of the ostrich. This peculiar bird, which is the largest known except the ostrich, is becoming very rare in its native regions; but there are specimens to be seen in most of the menageries of Europe.

CASSYTHACEÆ, *kăs'-se-thā'-se-e*, in Bot., the Dodder-Laurel family, a small nat. ord. of plants separated from the *Lauraceæ* by Lindley. There is only one gen. —*Cassytha*, which includes nine species, natives of tropical regions, and distinguished from the species of *Lauraceæ* by their parasitical habit, by their scaly modified leaves, and by the fruit being inclosed in a succulent calyx. Their uses are unknown.

CAST, *kăst* (Dan. *kaster*).—The term cast is generally employed to denote a statue, bust, or the resemblance of anything that may be formed by pouring plaster of Paris in a liquid state into a suitable mould. It is also applied to articles of cast-iron and other metals. Impressions or casts are taken from the human face by inserting paper funnels into the nostrils, and then pouring liquid plaster of Paris over the face, which has been previously greased, to prevent the adherence of the material employed. It rapidly hardens and becomes fit for removal. The cast thus taken forms a mould from which casts of the face may be procured. The process is useful in multiplying copies of works of art executed in marble, architectural details, &c. In angling, the line with the collar and flies attached is called a cast; and we commonly use the expressions "cast in the eye," "cast of countenance," and "cast of hawks," in hawking, when a number are let loose at once.

CASTANEA, *kăs-tā'-ne-ă*, in Bot., a gen. of plants belonging to the nat. ord. *Corylaceæ*. The species are familiarly known as chestnut-trees. *C. vulgaris* or *resca* is the Spanish chestnut, which is much cultivated for timber, and for its edible nuts, which form a principal part of the food of the poor in the south of Europe. *C. americana*, a native of the Northern States of America, produces a much smaller, but very sweet nut. The chestnuts eaten in Britain are chiefly imported from Spain.

CASTANETS (Sp. *castañeta*, or *castañuela*, probably from *castaña*, a chestnut), a small musical instrument of percussion, much used by the Spaniards and Moors in their dances. It consists of two small round pieces of hard dried wood, or of ivory, hollowed out in the centre, and placed together, with the concavities inwards, and fastened to the thumbs. The fingers being rapidly struck upon them, a tremulous sound is produced, which marks the measure of the dance. The use of this instrument was probably brought by the Moors from the East into Spain. It is now frequently used in ballets and operas. The *crotalon* of the ancients was a similar instrument.

CASTE, *kast* (Port. *casta*, a breed), in general, is applied to the several classes or orders into which communities are sometimes divided, with hereditary burdens or privileges; more particularly it is applied to that division into classes which prevails in India. The Portuguese, who were the first of European nations to establish themselves in India, found there a very strict distinction maintained between the different classes of society, to which they applied the term *casta*. Hence the term has also come to be applied to such social distinctions among other nations as are made to depend upon birth or fortune. The distinction of castes has existed in society from the very earliest times. In Egypt, Assyria, ancient Persia, and over almost the whole of Asia, it rises beyond the period of history. In Egypt the division into castes existed as early as the time of the Pharaohs, the principal of these being the priests, soldiers, husbandmen, watermen, and herdsmen. In Persia, even before the time of Zoroaster, the people were divided into four castes; viz., priests or magi, soldiers, husbandmen, and tradesmen. It is highly probable that these divisions were originally founded upon differences of descent, and that the separate castes were at first separate races of people. Among the Hindoos society is divided into four castes:—1. The Brahmins, or priests; 2. the Cshatrya, or military class; 3. the Vaisya, or mercantile; and 4. the Sudra, or servile class. The Brahmins are reported to have proceeded originally directly from the mouth of Brahma, and to them is assigned the duties of reading and teaching the Vedas, of sacrificing, and assisting others to sacrifice. The most

exalted of men, even kings themselves, are infinitely inferior to the meanest of Brahmins. The least disrespect shown to one of the sacred order is the most atrocious of crimes. Neither the body nor property of a Brahmin can be touched, even though guilty of the worst of crimes. "What men desirous of life would injure those by the aid of whom worlds and gods perpetually subsist?" The Cshatryas, or military caste, sprang from the arm of Brahma, and, though looked down upon by the Brahmins, they are looked up to by the other castes with a veneration only inferior to that paid to the Brahmins. It is said that the sacerdotal order cannot do without the military, nor the military without the sacerdotal, the prosperity of the one depending upon the other. It is the duty of the Cshatrya to defend the people, to give alms, to sacrifice, to read the Veda, and to shun the allurements of sensual gratification. The Vaisya, the agricultural or mercantile class, sprang from the thigh of Brahma, and their duty is to keep cattle, to cultivate land, carry on trade, lend money at interest, sacrifice, bestow gifts, and read the Veda. The Sudra, or servile class, proceeded from the foot of Brahma; and a chief part of their duty is to serve the other castes. The most abject and grovelling submission is imposed upon them as a religious duty, and enforced by the most cruel punishments. No Sudra must amass wealth, and a Brahmin may seize, without hesitation, the property of his slave. Neither are they allowed to read any of the sacred books, nor to be instructed in the principles of religion. Besides these four castes, there exist in India a large class of persons called Pariahs or Chandalas, who are regarded as the outcasts of society, objects of contempt and disgust, with whom no one of caste can hold any intercourse. The loss of caste is one of the most serious calamities that can befall a Hindoo. This, however, results not from immoralities, for the most abandoned Brahmin retains his rank, notwithstanding his crimes; but he will entirely forfeit it, and lose all countenance in society, by touching impure food, or some such petty delinquency. Mixture of castes, though not absolutely forbidden, involves disadvantages upon the offspring. The different castes have become so much intermixed, that the pure races can scarcely be said to exist in the present day, except among the Brahmins; and, from the state of society, distinct employments can now no longer be maintained. A Brahmin who cannot find employment in his own line may descend to the exercise of military duties, or tillage, or traffic. A Cshatrya and a Vaisya may also have recourse to inferior employments without loss of caste. The Indian armies are now not confined to one, but are recruited from all castes of the community. From the intermixture of the races, innumerable mixed tribes have sprung up, who form castes among themselves.

CASTELLAN, *kăs-tel'-lăn* (Lat. *castellanus*), the governor of a castle or the constable of a fortified house. It was also the name of a dignity or office in Poland, the castellans constituting a kind of lieutenants of provinces, and commanding a part of a palatinate under the palatine. They also formed a lower class of senators of the kingdom, and sat on low seats behind the palatines or great senators.

CASTELLATION, *kăs-tel-lai'-shun* (Lat. *castellatio*), in the Middle Ages, denoted the building of a castle, or the fortifying of a house to render it a castle, which, by the ancient laws of England, required the king's authority.

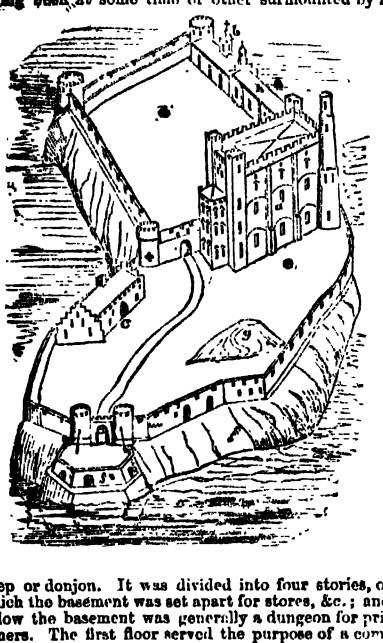
CASTIGATION, *kăs-te-gai'-shun* (Lat. *castigatio*), denotes punishment, correction, or discipline. Among the Romans, *castigatio* was applied to a military punishment inflicted on offenders by beating with a wand or switch.

CASTING, *kăst'-ing*, a term applied to the process of pouring a metal or some other substance, in a fluid or semi-fluid state, into a mould, which is made in various ways, and of substances best suited for the material which is to be poured into it. The fluidity of the substance may be produced by heat, or some other agent; but the cast always solidifies in the mould. The process is applied to the manufacture of articles in iron, bronze, bell-metal, lead, steel, copper, porcelain, plaster, and cement of various kinds. The method of casting cannons in iron and bronze will be found elsewhere. (*See* CANNON.) The process adopted in casting statues in plaster, and making ornamental pottery and busts in Parian ware, differs materially from that which is used in forming metal castings. Each process will be found described in the notice of that branch of art to which it respectively belongs. (*See* PORCELAIN, POTTERY, SCULPTURE.) The process of forming or founding iron castings of great size, and bells and statues in bell-metal and bronze, will be found described under the head of FOUNDING.

CASTING VOTE, is the vote which is given by the president or chairman of a meeting when the votes on each side are exactly equal; and thus the point at issue is decided by the casting vote. Sometimes the chairman has a casting vote in addition to his vote as an ordinary member; at other times, he has only a casting vote. The speaker of the House of Commons has only a casting vote, and when, as has sometimes happened, it is necessary to give it, it is generally on that side which will admit of the question being reconsidered.

CASTLE, *kas'-l* (Lat. *castellum*, a fort or small camp), the name formerly given to a strongly-fortified building inclosed by walls, and intended for a place of residence, calculated to afford protection against the attack of an enemy. The buildings to which this term is applied were chiefly the residences of the nobles during the Middle Ages, and were erected in the reigns of the Norman and Plantagenet kings while the feudal system existed in this country. Castles are said to have been built in many parts of England by the Saxons and Danes, but they were not of the strength and size of the Norman castles. The Romans erected many strongly-fortified camps in various parts of the country, called *castella*, which were garrisoned by small bodies of troops. These were afterwards used as works of defence by the Saxons, and turned into castles by the Normans by the addition of the massive keep and barbacan, with towers here and there at the angles of the outworks; but with the introduction of the feudal system by William the Conqueror, that monarch and his followers, among whom the country was parcelled out, commenced the building of the castles whose picturesque remains give additional interest to many a beautiful bit of English scenery, and are intimately associated with historical events and legendary lore. The erection of these baronial fortresses was effectively continued in the succeeding reigns, no less than 1,115 having been built in the troublous times that marked the reign of Stephen. The great strength of the castle, and its capability of resistance to the imperfect artillery of the day, consisting of the trebuchet, balista, mangonel, and other machines, from which stones, darts, and fireballs were hurled at and within the walls, rendered the barons insolent and oppressive, as they could not only defy the forces which a neighbouring baron might lead against them, but even those of the king himself. The unfortunate Saxons and people who were held in thraldom, passing with the land itself from one master to another, were obliged to labour at the will of the baron who owned the district, in the erection of these strongholds, which afterwards became the scene of many a deed of violence and wrong; and, indeed, the insolence and lawless conduct of the barons attained such a height, that, in the reign of Henry II., no one was permitted to erect a castle without the permission of the crown; and this was seldom granted without sufficient cause, for the castles had become the retreats of ruffians who menaced the life and property of all around them whenever an opportunity offered itself. The baronial castle, however, often formed a nucleus for a town, and many a prosperous and thriving English town and city can trace its rise from the few mean dwellings that a noble's retainers erected around and close to the castle of their feudal superior for the purpose of mutual security and defence. The principal parts of the Norman castle were the keep or donjon, the courtyard or bailey, as it was sometimes called (*see* BAILEY), the walls that surrounded the court, the barbacan or gatehouse (*see* BARBACAN), and the ditch or moat. Sometimes an inner court was made within the outer one, immediately round the keep, also surrounded with walls, which served as a second line of defence when the enemy had taken the barbacan and occupied the outer court. Out-

buildings were also added to serve as a chapel, stables, and lodgings for soldiers, with a mound between the barbacan and keep, from which it is supposed that the baron dispensed justice to his retainers. The keep was usually a square tower of enormous strength; the walls were from twelve to twenty feet in thickness at the base, and about eight or ten feet wide at the top: they were surmounted by battlements. A narrow winding staircase, generally in one of the angles or a projecting turret, gave access to the first floor, where the entrance to the interior of the castle was situated. The chambers were small, and insufficiently lighted by narrow windows set in deep embrasures. The walls also contained small chambers and galleries here and there, and staircases giving access to the battlements. These passages were loopholed, to admit the light, and for purposes of espial and defence. The keep was generally buttressed, and had circular towers or bastions at the angles, one of which rose above the rest, to afford a lookout-post for the warder or sentinel on guard. A good example of the old Norman keep will be found in Norwich Castle, and those of Rochester, Conisborough, and Newcastle. Sometimes the keep was built in an angle of the outer wall, sometimes entirely within it; and it was often erected on an artificial mound, like the Dane John at Canterbury, which probably derives its name from having been at some time or other surmounted by a



keep or donjon. It was divided into four stories, of which the basement was set apart for stores, &c.; and below the basement was generally a dungeon for prisoners. The first floor served the purpose of a common hall, with small withdrawing-rooms or private chambers attached. The second and third floors were divided into apartments for the owner of the castle and his family, and sleeping-chambers for his guests and domestics. The arrangement of castles that were built at a later period, such as Windsor Castle, Kenilworth, and others, was more complicated, and the buildings covered a greater area. Jousts and martial exercises were carried on in the court-yard, the walls of which were strengthened with towers and bastions, furnished with battlements, loopholes, and machicolations. The barbacan formed a fortified entrance to the court-yard, with a portcullis and necessary defences. From this the drawbridge, which afforded the means of passage over the surrounding moat, was raised and lowered. The Scottish fortalices and peel-houses, particularly those on the border, were not of the size and strength of the English castles. They consisted chiefly of a square tower with battlements and bartizans (*see* Bartizan): it was surrounded by a moat whenever it was possible to do so, and every advantage was taken of its natural position to secure it from attack or surprise. In the accompanying illustration depicting a Norman castle, and copied from Grose's "Military Antiquities," there are shown:—*b*, the chapel; *c*, the stable; *d*, the inner bailey; *e*, the outer bailey; *f*, the barbacan; *g*, the mount; *h*, the lodgings of the soldiers. —Ref. *English Cyclopædia*—Arts and Sciences; Britton's *Architectural Antiquities*; Bayley's *Ancient Castles of England and Wales*.

Castor, the Beaver. (*See* Beaver.)

Castor Oil. (*See* Ricinus.)

Casuarinaceæ, *kăz-u-ăr-in-ai'-se-e*, in Bot., the Beefwood fam., a nat. ord. of dicotyledonous plants in the sub-class *Monochlamydeæ*. There is but one genus,—*Casuarina*, which includes about thirty-two species, principally natives of Australia. They are very peculiar trees, with slender, wiry, drooping, jointed branches, which have no evident leaves. The name Beefwood was suggested by the colour of the timber resembling that of raw beef. The wood is also known under the names of Botany-bay Oak, Forest Oak, He Oak, and She Oak. It is imported in considerable quantities, and is used in this country for inlaying and marqueterie.

Casuistry, *kăz'-u-is-tre* (Ital. Span. *casuista*; Fr. *casuiste*; from Lat. *casus*, a case), is that branch of ethical science which professes to deal with cases of conscience. It lays down rules or canons directing us how to act in all matters of moral doubt; whether and how far an obligation is binding upon us, or may be relaxed or dissolved, on account of concomitant circumstances. Its rules are drawn from revelation, reason, the canon law, authority of the fathers, &c. This science has been chiefly cultivated by the Roman Catholics, and was much studied in the 15th and 16th centuries, especially by the Jesuits, being admirably calculated to advance the policy of that order. The confessor, who was able to lay down exact rules of conduct, and to decide which was the greater of two sins, obtained a great power over his penitent. Indeed, the science has been said to have had its origin "in the distinction between mortal and venial sin," and has not inaptly been termed "the art of quibbling with God." This science, however, has been cultivated in the Protestant as well as the Roman Catholic church, and there was, until recently, a professor of casuistry in the Cambridge university.—*Ref.* Mayor's *Bibliotheca of Casuists*, where they are arranged under the three heads of Lutheran, Calvinist, and Roman.

Casus Belli, *kai'-sus bel'-li* (Lat., the cause of war), is the reason assigned by one nation for going to war with another.

Cat, *kat* (*Felis*).—It is not a little singular that the origin of the most important member of this family, the domestic cat (*Felis domesticus*), should be involved in such obscurity. By the older naturalists it was supposed that it might be considered to be descended from the wild cat (*Felis catus-ferus*). Modern science has upset this theory by bringing a tremendous array of argument, and battering at its most vulnerable parts. In its place another theory has been substituted, and accepted generally by naturalists. It is well known that the ancient Egyptians possessed a domestic animal, which, judging from representations of it on the monuments of Thebes and elsewhere, bore a resemblance to our domestic cat. Moreover, in the British Museum there is a copy of an Egyptian painting, which is supposed to represent the cat of that country catching birds; and it is conjectured that it was trained for that purpose. This same animal has been referred to as being not unlikely the progenitor of the domestic cat; and the probability of this theory has been augmented by the discovery of a species (*Felis maniculata*) by Rüppel in Nubia. This animal is said to be about the size of the domestic cat, and one-third smaller than the wild cat. Rüppel gave his opinion that it must be a descendant of the domestic cat of the Egyptians, and that, at some remote period, it was transferred to the Europeans by the contemporary Egyptians. This opinion has been adopted by many eminent zoologists, amongst whom may be mentioned Temminck, and Sir William Jardine in our own country; the latter, in particular, has some very inge-

nious remarks thereupon, which may help considerably to elucidate the difficulty connected with the origin of *Felis domesticus*. There does, indeed, seem much in favour of Rüppel's theory; only, on the other hand, we have naturalists of equally heavy calibre dissenting from it. An authority whose opinion cannot be too highly estimated in all that relates to natural history thus alludes to *Felis maniculata*:—"This species, to which the high authority of Rüppel has assigned the origin of our house-cat, is still further removed from it in essential zoological character than even the British wild cat, to which it has been previously so generally referred; and that, as in the case of so many of our domesticated animals, we have yet to seek for the true original of this useful, gentle, and elegant animal."—(Bell, *History of British Quadrupeds.*) Dallas also makes a similar statement in his "Animal Kingdom." Mr. Bell not only denies the correctness of Rüppel's theory, but deals a death-blow to Sir William Jardine's and other naturalists' notion of the crossing of the wild and tame cat. "It is not without much reflection on the matter," says he, "that I have come to the conclusion that this opinion of their intermixture, repeated and transmitted from one to another till it has become an uncontested dogma, is erroneous, and has its foundation in mistaken facts." This emphatic declaration from so eminent a zoologist is a little startling; but, with all deference, we must still incline to the opinion that the intermixture of the two breeds is far from improbable. It would seem that the subject of the origin of domesticated animals is fraught with considerable difficulty. It has engaged the attention of numerous zoological societies for some years, and but little progress has been made. The wild cat is found in all the wooded districts of Europe,—in Germany, Russia, and Hungary; it is also found in the north of Asia and Nepaul. In Great Britain it was at one time abundant, and met with in all the woods and forests. From a charter granted to the abbot of Peterborough, in the reign of Richard II., we learn that the wild cat was one of the animals hunted in those days. Its hide was probably not very highly valued; Archbishop Corbyl's canons (1127) ordained that the nuns and abbesses should not wear a more expensive apparel than that made of wild cats' or lambs' skins. At the present time, the number of wild cats inhabiting England is not very large, and they are principally found in the northern counties. In Ireland, and more particularly in the north of Scotland, they are still found in large numbers. Pennant's description of the wild cat is very amusing, although perhaps more applicable to the animal of his time than our own. "The wild cat," says he, "may be called the British tiger; it is the fiercest and most destructive beast we have, making dreadful havoc among our poultry, lambs, and kids. It inhabits the most mountainous and woody parts of these islands, living mostly in trees, and feeding only by night." It multiplies as fast as our common cats; and often the females of the latter will quit their domestic mates to seek the forest home of the wild species." The domestic cat is so well known that any description of it would be unnecessary. In the town and the country, in the mansion of the rich and the cottage of the poor, in the workshop of the artisan and the offices of the merchant, this well-known animal may be commonly found. It is of many colours and sizes: there is the black cat, the tabby, the tortoiseshell, the white, the slate-coloured, the blue or Chartreuse, the dun-coloured cat, and a few others, the most beautiful of which, perhaps, is that known as the Angora cat, with its long silky hair. As a domestic animal it is greatly prized, and its services are extremely valuable; but as a companion of man it does not rank very highly. It displays very little of that affection, nay, absolute devotedness, so characteristic of the dog. It is more attached to locality than to its owner; and there are numerous instances on record of its deserting a family in whose service it has been living for years, on their removal from a residence in which it has been brought up, and to which it will return, even though it be under the rule of strangers. Perhaps one of the most admirable qualities of the cat is its extreme devotion to its young; for their sake it will brave the greatest danger, and its uneasiness at finding them removed, only for a few minutes, is familiar to all. The numerous anecdotes of its maternal care alone would fill a volume. The extraordinary artifices it will resort to to secure its young are astounding, and seem almost human in their character. The period of gestation is sixty-three days, the young remaining blind nine days after birth.

CAT, in Mar., is a term used in various ways, according to the words with which it is joined. Its principal significations are the following:—*Cat-fall*, a rope used to heave up the anchor from the water's edge to the bow. *Cat-harpings*, small ropes for bracing the *shrouds* to the lower masts behind their respective yards. *Cat-heads*, two strong short beams of timber projecting over a ship's bows on each side of her bowsprit. *Cat-block*, a two or three-fold block, used to draw the anchor up to the cat-head by means of an iron hook, called the *Cat-hook*, which is fastened round it. *Cat-o'-nine-tails*, an instrument composed of nine thongs of line or rope, about half a yard in length, having on each three knots tied at regular distances; to this a piece of very thick rope is joined as a handle.

CATABAPTISTS, *kăt-ă-băp'-tists* (Gr. *kata*, against, and *baptizo*, I baptize), is applied to persons opposed to baptism, regarding it either as a rite altogether obsolete, or as applicable only to converts from another religion to Christianity.

CATACHRESIS, *kăt-ă-krē'-sis* (Gr., abuse, from *kata*, *at*, and *chraomai*, I use), is applied to a figure in rhetoric in which an improper in place of a proper term is used. It occurs when, for want of a proper word to express a thought, one is added which comes near to it; as when it is said of the Greeks,—

"They *build* a horse by Pallas' art divine."

It is frequently used by poets for novelty, or to give additional force to the expression, when the proper word is not strong enough; as when Milton, in describing the descent of Raphael from heaven, says that he—

"*Sails* between worlds and worlds."

CATACOMBS, *kăt'-ă-komes* (Gr. *kata*, in the sense of "below," and *kumbos*, a hole or hollow), vaults below the surface of the earth, used as burial-places for the dead. There are many of these subterranean excavations, in the form of long galleries and chambers, in many parts of Europe. They are to be found at Syracuse and Palermo, in Sicily, and in Asia Minor, Syria, Egypt, Persia, and Greece: some have also been discovered in South America. The catacombs of Rome, Naples, and Paris are the most famous; they are cut out of a soft calcareous rock that is easily quarried. The catacombs of Rome are on the Via Appia, or Appian Way, not far from the city: they are said to extend for twenty miles underground; but they cannot now be explored for more than one-fourth of that distance, and many parts have fallen in, which causes a visit to them to be attended with some danger. It would also be hazardous in the extreme to visit the catacombs without a guide, or to become separated from the party with whom one may be traversing these gloomy vaults and galleries, which wind about in all directions; and cross each other like the turnings of a labyrinth. The passages are about eight feet in height and five in width; the graves are hollowed out of the sides, forming three tiers one above another. When the body had been deposited in the cavity assigned to it, it was walled up, and an inscription, generally confined to D. M. (*Deo Maximo*), with a few brief particulars with reference to the name, age, and calling of the occupant of the cell, was cut on the stones that formed the closure of the tomb. At intervals there are large vaulted chambers, which form a centre in which many of the passages meet, and which appear to have been used as places of worship. They are furnished with altars, and are ornamented with fresco-paintings, inscriptions, sculptured crosses, and crucifixes. Some of these chambers, or chapels, are said to have been formed by order of some of the popes of Rome. The early Christians used the catacombs as places of worship and cemeteries for their dead; but it is most probable that they were excavated and used for this purpose prior to the Christian era. The catacombs at Naples are similar in construction to those at Rome, and were used by the early Christians for the same purposes. They are adorned with fresco-paintings of

great freshness of appearance, among which the palm-tree is conspicuous as an emblem of Palestine. The galleries of the Neapolitan catacombs are wider than those of the catacombs at Rome. Those at Palermo and Syracuse are characterized by greater regularity of construction, and are filled with the tombs of heathens and Saracens as well as of Christians. The catacombs of Egypt are inferior to those of Italy in size; many of them were explored by Belzoni, who brought from thence the sarcophagus of Psammetichus the Powerful, who flourished about 650 B.C., made of alabaster, and most beautifully sculptured. Catacombs of considerable extent were discovered about a hundred years since in the hill of Tarchino, about three miles from Cornoto, in Italy, the site of Tarquinii, one of the twelve republics or representative cities of the ancient Etruria. They are remarkable for the beauty of the decorations, paintings, friezes, mosaics, vases, arms, and other archæological remains that have been discovered in them. The catacombs of Paris extend under the city for a considerable distance; they were formerly quarries, from which the stone that was used in building the old city was excavated. They have acquired the name from having been made the receptacles of skulls and bones removed from the churchyards and cemeteries within the confines of the city, which had become inconveniently crowded with human remains. The passages present a singular appearance, the bones having been arranged in the form of crosses and other patterns over the surface of the side-walls. The remains of many of those who were so ruthlessly slaughtered in the revolution of 1792 were thrown into the catacombs.—*Ref.* D'Agincourt's *History of Art by its Monuments*, vol. i.

CATAFALQUE, *kăt'-ă-fălk* (Ital. *catafalco*, a scaffold), an elevated tomb, usually a temporary structure of carpentry, decorated with painting or sculpture, and containing the coffin of a distinguished person, round which tapers, ornaments, inscriptions, armorial bearings, &c., are disposed. It is generally placed in the middle of a church or large hall. The sarcophagus is exposed for show upon an elevation covered with black cloth, and is laid beneath a canopy and surrounded by candelabra. Some mark or insignia of the rank of the deceased, as a baton, an epaulette, or sword, is placed upon the coffin. In the case of a sovereign or member of a royal family, princely or ducal trophies are made use of.

CATALECTIC, *kăt-ă-lek'-tik* (Gr. *katalektikos*, deficient), is a term used in Greek and Latin poetry to denote a verse wanting one syllable of its proper length. *Acatalectic* is applied to such as are complete, and *hypercatalectic* to such as have syllable too many.

CATALEPSY, *kăt'-ă-lep'-se* (Gr. *katalepsis*, from *kata*, down or into, and *lambano*, I seize), in Path., is a disease characterized by a sudden deprivation of sensation and voluntary motion. The attack usually comes on without any warning, and during the paroxysm the patient remains in precisely the same position as he was in at the moment of attack. The circulation and respiration are in most cases but little affected; but occasionally they are greatly depressed, and are sometimes even imperceptible. The attack may last only for a few minutes, or it may continue for hours, and even, it is said, for days; and consciousness generally returns with the same suddenness as it left, the patient having no recollection of anything that passed during the attack. This disease bears a great resemblance to the mesmeric state, and, indeed, is so often feigned, that many have doubted whether it really had any existence. There can be little doubt, however, that it is sometimes, though not often, a real disease. The hysterical and melancholic are most predisposed to it; and the paroxysm is frequently induced by some strong mental emotion, or by some disorder of the digestive or secretive organs. The treatment will necessarily vary in each particular case, according to the general condition of the patient and the probable exciting cause. Generally, however, the system should be strengthened by nourishing diet, gentle exercise, sea-bathing, and tonics. During the attack the body should be kept warm and excited by gentle friction; mustard poultices should be applied to the soles of the feet, the palms of the hands, and the pit of the stomach; and strong ammonia applied to the nostrils.

CATALOGUE, *kăt'-ă-log* (Gr. *katalogos*, from *katalogeo*, I register), denotes generally a list or register of things one by one,—an enumeration of particulars. More strictly and commonly, it is applied to a list or register of books in a library. A catalogue of some sort is absolutely necessary in every large library; but the plan on which it may best be constructed is a subject that has given rise to much discussion, and on which much difference of opinion exists. Each of the proposed plans has its advantages; and there are none without their disadvantages. They may all be divided into two great classes,—the *alphabetical* and the *classified*; in the former the books being arranged alphabetically, according to their authors or titles; in the latter, classified in some way or other, according to their subjects. The alphabetical arrangement possesses the advantage of being much more simple, and more easy of consultation; but then people frequently require to consult catalogues for books on particular subjects, of which they know neither the author nor title. To meet this difficulty various attempts at classification have been made, but all have more or less failed. They have generally been founded upon some attempted classification of human knowledge, in accordance with some theory, either of the powers or functions of the mind itself, or of the order and succession in which the phenomena of the material world may be conceived to present themselves to its contemplation; but, from the time of Bacon downwards, all attempts that have been made at discovering a natural system of classifying all knowledge have been marked by failure. For an account of the multitudinous schemes that have been devised for the cataloguing of books on any such plan, we can only refer for further information to such works as J. F. M. Albert's "Recherches surles Principes fondamentaux de la Classification bibliographique," Paris, 1847; T. H. Horne's "Outlines for the Classification of a Library," 1825; F. A. Ebert's "Bildung des Bibliothekars," 1820; Brunet's "Manuel du Libraire" (Introduction). Generally, the catalogue-makers now, in place of attempting to solve some of the knottiest problems that have ever puzzled the brains of metaphysicians, content themselves with adopting some convenient and easily-understood classification of the various branches of literature. It may interest our readers that we give here the heads of a scheme proposed by Mr. E. Edwards, a gentleman of great experience in this way, and one well entitled to speak with authority on the subject. He gives it as particularly suited for a town library (*Memoirs of Libraries*, vol. ii. p. 815, *et seq.*) Class I. *Theology.*—1. Holy Scriptures; 2. Sacred philology; 3. Collective works of theologians; 4. Dogmatic and polemic theology; 5. Catechetical theology; 6. Pastoral and hortatory theology; 7. Mystical theology; 8. Liturgies and treatises on ecclesiastical rites and ceremonies; 9. Works relating to Judaism; 10. Natural theology. II. *Philosophy.*—1. Collective works of philosophers, and general treatises on philosophy; 2. Treatises on ethics, or moral philosophy in particular; 3. Treatises on metaphysics, or intellectual philosophy in particular. III. *History.*—1. Works on the composition and study of history, and on its objects and uses; 2. Universal history and biography; 3. Ancient history and biography; 4. History of the Middle Ages; 5. General ecclesiastical history; 6. History of Modern Europe generally; 7. History of Great Britain and Ireland; 8. Modern history of the other countries of Europe; 9. History of America; 10. Modern history of Africa and of Asia. IV. *Politics and Commerce.*—1. General treatises on politics; 2. National constitutions and treatises relating thereto; 3. Treatises on monarchy; 4. on parliamentary representative assemblies; 5. on the administration of civil government; 6. General treatises on law; 7. Collections of laws, and expository treatises thereon; 8. Treatises on the criminal laws; 9. Political economy; 10. Treatises on church establishments, religious liberty, and matters connected therewith; 11. on public education; 12. on armies and navies—their organization, maintenance, and discipline; 13. on foreign policy, and on the rights, duties, and ---- ment of ambassadors and consuls; 14. Political sa — and miscellanies. V. *Sciences and Arts.*—1. Treatises

on the sciences and arts collectively, dictionaries of science and art, general transactions of philosophical societies; 2. Physical sciences; 3. Mathematical sciences; 4 Mechanical arts; 5. Military and naval arts; 6. Arts of design; 7. Art of writing; 8. Musical and histrionic arts; 9. Medical arts; 10. Domestic and recreative arts. VI. *Literature and Polygraphy.*—1. General treatises on literature and literary compositions, histories of literature in general; 2. Linguistics or philology; 3. Poetry and fiction; 4. Oratory, or collections of speeches on various and miscellaneous subjects, and treatises on oratory; 5. Essays, proverbs, and literary miscellanies; 6. Epistolography, or collections of letters on various and miscellaneous subjects, and treatises on letter-writing; 7. Bibliography and literary history of particular countries; 8. Polygraphy (*i.e.* works on subjects extending over two or more of the classes comprised in this scheme). The works in many of these divisions are subdivided into sections, and these frequently into several sub-sections, if the books that they comprise are numerous. (*See* BIBLIOGRAPHY.)

CATALOGUE, in Astron., a term applied to denote a list of stars, in which their positions at a certain time are registered, according to their latitude and longitude, or right ascension and declination; and means are also given whereby the effects of aberration, precession, and nutation may be computed, and the position of the star in the heavens may be determined at any time. Catalogues are also given of the positions of the nebulæ and fixed stars, and the elements by which the places of the planets and asteroids may be determined. The instruments used in observing the position of the stars, in order to form a catalogue, are the transit-instrument, circle, and sidereal clock. (*See* CIRCLE, SIDEREAL CLOCK, TRANSIT-INSTRUMENT.) A catalogue of standard stars, by which the right ascension of others may be regulated, will be found in the "Nautical Almanac." Mention is made elsewhere of the principal catalogues of the stars from that of Ptolemy to the present time. (*See* ASTRONOMY.)

CATALYSIS, *kăt-ăl'-e-sis* (Gr. *kataluo*, I dissolve).—Catalysis, or power of presence, is a term applied to the chemical action that certain bodies exert upon others, without themselves taking part in the chemical changes resulting therefrom. Thus, yeast converts sugar into carbonic acid and alcohol, without itself entering into the composition of either of these bodies. Examples of this occur in many of the ordinary operations of the laboratory. Chlorate of potash, for instance, melts at 650° Fah., and if the heat is raised to 700° Fah., it is decomposed and gives off oxygen; but, if mixed with one-fourth of its weight of black oxide of manganese or copper, oxygen is evolved below 450°. The term catalysis must be looked upon as merely applied to certain actions, the nature of which is imperfectly understood, and not as implying a special force. Most of these actions may be ascribed to other well-known causes. Mr. Merce, for instance, explains the action of certain metallic oxides on chlorate of potash by supposing that the particles of the oxide attract the oxygen contained in the salt with sufficient force to cause its liberation, although the force is not sufficient to effect their union. (For a full elucidation of the most modern views upon this subject, *see* a paper read by Brodie before the Royal Society, and published in part II., p. 759, of the Philosophical Transactions.)

CATAMARAN, *kăt-tăm-ă-răn'*, in Mar., a sort of float,



CATAMARAN.

consisting of three pieces of wood lashed together, one of which serves as a keel, the other two as sides. The rower stands or kneels in it, and paddles with a piece of bamboo. It is used on the coast of Coromandel, and particularly at Madras, for the conveyance of letters, messages, &c., to the shipping in the roads.

CATAPAN, or CATIPAN, *kăt'-ă-păn* (Gr. *katepanos*, captain), a name given by the Greeks in the 12th century to the governor of their dominions in Italy.

CATAPHRYGIANS, *kăt-ă-frij'yănz*, a sect of heretics that arose in the Christian church in the 2nd century, and received their name from the country of Phrygia, in which they first made their appearance. Their founder was one Montanus, a native of Mysia, who, after his conversion to Christianity, became subject to trances, in which he uttered what were supposed to be prophecies, as did also Priscilla and Maximilla, two ladies of rank who joined him. (*See* MONTANISTS.)

CATAPLASM, *kăt'-ă-plazm* (Gr. *kataplasso*, I besmear or cover with a plaster), in Surg., is a poultice or external application of a pulpy consistence, employed for removing inflammation, promoting suppuration, or relieving pain. They are of various kinds, and may be composed of a great variety of substances, according to the purpose they are intended to serve, being emollient, stimulating, astringent, discutient, antiseptic, anodyne, &c. The common linseed poultice is in all ordinary cases the best that can be used. It is formed by gradually stirring the meal into a sufficient quantity of boiling water until the mass has acquired a proper consistence. It is then inclosed in a piece of muslin or thin calico, and applied to the part as hot as it can be borne. The bread poultice is also very useful, though inferior to the former. It may be made either of milk or water, the bread being crumbled in, and the mass allowed gently to simmer over the fire till properly softened, and then beat and stirred about with a spoon till of the proper consistence. A cold bread-and-water poultice is sometimes used to allay inflammation. Among the other substances employed in the making of poultices are oatmeal, mustard, vinegar, yeast, charcoal, hemlock, digitalis, alum, sugar of lead, carrot, and sorrel. Considerable care is necessary in making the poultice of the proper consistence. It should be sufficiently thick to maintain a certain form when applied, and yet to accommodate itself easily to the part.

CATAPULTA, *kăt-ă-pul'-tă* (Gr. *katapeltes*), an engine of war of great power, used by the ancients for throwing large darts and arrows against the enemy, as the balista was used for throwing stones. It resembled a strong short bow placed in a frame of wood, securely planted in the ground. The cord was attached to a flat piece of wood, which worked on a slide projecting to the rear. The bow was bent by the action of a small windlass at the extremity of this projection. When the cord was suddenly released from the extreme tension to which it had been subjected, the recoil of the bow returning to its original position, hurled the arrow forward with great force. The catapulta is said to have been invented by Dionysius, the tyrant of Syracuse, in Sicily, about 400 B.C.

CATARACT. (*See* EYE, DISEASES OF THE.)

CATARACT, *kăt'-a-răkt* (Gr. *kata*, downwards; *rasso*, I dash), in Hydrog., a precipice in the channel of a river, caused by rocks or other obstacles stopping the course of the stream, from whence the water falls with a greater noise and impetuosity. The English language has many words that express the different degrees of rapid and sudden descent in streams of water. The term most generally used is *falls*. Many cataracts are remarkable for their picturesque sublimity. The falls of Niagara, in America, surpass, in size and grandeur, all others in the known world.

CATARRH, or COLD, *kă-tar'* (Gr. *katarrheo*, I flow down), is the most common of all the disorders to which the human body is subject, more particularly in variable climates, like our own. There are two kinds of this disease,—the one a common cold; the other influenza, or epidemic cold. (For an account of the latter, *see* INFLUENZA.) A common catarrh is an inflammatory state of the mucous membranes of the head or chest. In the former case it is called cold in the head, or *coryza*; in the latter, cold on the chest, or *bronchitis* (which *see*). The symptoms of a cold in the head are a sense of uneasiness, heat, and stuffing

in the nostrils, diminution or loss of smell, dull, heavy pain in the forehead, inflamed eyes, sneezing, and a slight impediment in breathing. Generally, it extends also to the throat and chest, occasioning hoarseness, cough, and difficulty of breathing. Frequently there is also a general derangement of the system, loss of appetite, lassitude, chilliness, succeeded by dry feverish heats and stiffness of the joints. The nostrils discharge a fluid at first thin and acrid, but which afterwards becomes thicker, and often purulent. The common cause of this disease is exposure to a cold or damp atmosphere, or to draughts, especially when the surface of the body is warm or perspiring. It is frequently occasioned by passing directly from a warm into a cold atmosphere, and we believe, even more frequently by passing immediately from a cold into a warm atmosphere. Indeed, any sudden atmospheric change is apt, in delicate persons, to produce cold; but in passing from a warm room to the cold air, people generally take some care, though they are not generally aware that the like danger attends passing directly from the cold air into a heated room, and, hence, do not provide against it. The treatment of a common cold is usually a simple matter. Confinement to the house for a day or two, a warm foot-bath, diluent drinks, abstinence from animal food and vinous or other fermented liquors, and a dose or two of some gentle laxative, are usually sufficient to remove the disease. There is also what is called the *dry* method of cure, which has the advantage of not requiring confinement to the house, though, otherwise, some might be inclined to regard the cure as worse than the disease. It consists simply in abstinence from every kind of drink, no liquor, or next to none, being allowed until the disease is gone. Dr. Williams, its inventor, states that the necessary privation is not hard to bear, and that a cure is effected, on an average, in forty-eight hours. He allows, without recommending, a table-spoonful of tea or milk for the morning and evening meals, and a wine-glassful of water at bedtime. The principle acted upon is that of cutting off the supply of watery materials to the blood, and thus leaving nothing to feed the secretion from the inflamed mucous membrane. The best preventive against cold is the daily use of the cold bath, and this is the best means that can be adopted by those who have an habitual tendency to this disease. It should, however, be begun in summer, and the water ought to be at first tepid; but, after being begun, the practice may be continued throughout the winter.

Catastrophe, *kat-ás'-tro-fe* (Gr. *katastrophe*, from *kata* and *strephein*, to turn), is a turning about, a revolution, and generally applied to the final turn or change of events, the change which produces the final event. In ancient dramatic poetry it was applied to the fourth and last part of the play, or that immediately succeeding the catatasis; the whole drama being divided into protasis, epitasis, catatasis, and catastrophe.

Cat-bird (*Turdus felivox*), a species of American thrush, of the same group as the mocking-bird, which it closely resembles in its vocal powers and its courage in defence of its young. It feeds on fruit and berries of all kinds, worms and insects, and builds its nest in the most conspicuous manner, generally in the neighbourhood of human habitations. It derives its name from its peculiar mewing cry when disturbed in its nest.

Catch-word, *kitsh'-wurd*, among printers is the word placed by itself at the bottom of each page, as being that with which the next page begins. This system is now not much in use; but it is still sometimes employed in writing, particularly in deeds and other formal documents.

Catechasis, *kat'-e-ke'-sis* (Gr. *katechesis*), is used in a general sense to denote instruction in the rudiments of any art or science, more particularly in the first principles of the Christian religion. It is derived from the Greek verb *katecheo*, which signifies to sound or ring, and also to ring a thing in one's ears, or to teach orally; and hence, etymologically and originally, *catechesis* denoted instruction communicated orally in the first principles of the Christian religion. In the primitive church it was the instruction communicated *viva voce* to children and heathen adults previous to their being baptized and admitted as members of the Church. The dispensers of this instruction were called *catechists*, and the recipients *catechumens*.

Catechise, *kät'-e-kiez'*, is to instruct by asking questions; to examine. In education this is one of the best ways of communicating instruction to the young, and of disciplining their mental powers. By this means their attention is excited and kept up, their knowledge is fixed in their minds, and they are taught to give expression to their thoughts. Unfortunately, however, the mode pursued by teachers is too often not that best suited for the purpose. Instead of having for their object the establishing and adding to the knowledge which the scholar already has, they appear rather bent upon despoiling him, and making him doubtful of every particle of knowledge which he possesses; the mode of proceeding being very much like that by which a counsel attempts to bamboozle a witness for the opposite side. It has been well said that "a boy may preach, but it requires a man to *catechise*."

Catechism, *kät'-e-kizm*, generally denotes an elementary book, containing the rudiments of any art or science in the way of question and answer; more particularly it is applied to such a work on the simpler doctrines of religion. Catechisms for children should be framed so as not to puzzle and confound, but to convey instruction by degrees, and to proceed from the simplest and most elementary principles to the more profound. The earliest catechisms of the Church consisted of no more than a repetition of the baptismal vow, the Creed, and the Lord's Prayer; and these, together with the ten commandments, constituted at first that of the Church of England. Afterwards James I. commanded the bishops to add to it a short and plain explanation of the sacraments, which was accordingly done by Bishop Overall, then dean of St. Paul's, and approved by the rest of the bishops. This is one of the best catechisms in existence, being alike remarkable for its brevity, simplicity, and freedom from sectarianism. The Shorter Catechism of the Westminster Assembly of divines, which is that adopted by Presbyterians, and taught in almost all the schools of Scotland, is admirable as a compendium of theology, but is much too profound, and goes too far into the regions of dogmatical theology for elementary instruction.

Catechu, *kat'-e-ku* (Jap. *kate*, a tree, *chu*, juice), called *kut* or *kutch* by the natives of India, is properly an extract prepared from the inner brown-coloured wood of the *Acacia Catechu*; but the term is now applied also to other extracts similar in appearance and properties. Some of the catechu of commerce is prepared from the kernels of *Areca Catechu*, and a kind called *Gambir*, or *Terra japonica*, from the leaves of *Uncaria Gambir*. The substance is largely employed in the arts of dyeing and tanning, and medicinally as an astringent. It is imported in roundish balls or square pieces, varying in colour from a pale whitish or light reddish-brown, to a very dark brown. The dark-coloured catechu from Pegu is said to be the most powerful of all vegetable astringents. Catechu contains a large proportion of *tannin*, very similar in properties to that of galls; also a peculiar principle called *catechine*. (*See* Acacia, Areca, Uncaria.)

Catechumens, *kat-e-ku'-mens*, were the lowest order of Christians in the primitive church, and were admitted into that order by the imposition of hands and the sign of the cross. The time of their continuance in this state varied at different times and in different places; and frequently it depended upon the proficiency of the catechumens themselves. Though regarded in some measure as Christians, yet they were not even permitted to see the celebration of the eucharist. There were four orders of catechumens,—1. The *Exothoumenoi*, or those receiving instruction privately without the church, and not yet allowed to enter it; 2. the *Audientes*, who were admitted to hear sermons and the Scriptures read in church, but not allowed to partake in the prayers; 3. *Genuflectentes*, so called because they received imposition of hands kneeling; 4. *Competentes* and *Electi*, the immediate candidates for baptism.

Categorical Proposition, *kät-e-gor'-e-kal*, in Log., is a proposition which affirms or denies absolutely, without any condition. They are of two kinds,—*pure*, such as assert simply one thing of another, as *the king reigns*; and *modal*, such as assert one thing of another under a certain mode or form, as *the king reigns justly*. (*See* Proposition.)

CATEGORIES, *kăt'-e-gor-eez* (Gr. *kategoria*, from *kategoreo*, I declare or predicate), in Log. and Met., is a term applied to an arrangement or distribution under certain heads, of all that may be said or predicated of any object of human thought. According to Aristotle, who enters fully into this subject in his "Organon," all the objects of our thought are comprised in the following ten categories:—1. *Substantia*, substance; 2. *Quantitas*, quantity; 3. *Qualitas*, quality; 4. *Relatio*, relation; 5. *Actio*, action; 6. *Passio*, passion; 7. *Ubi*, where; 8. *Quando*, when; 9. *Situs*, position; 10. *Habitus*, possession. Philosophers are much divided in opinion as to the utility of these categories, some regarding them as worthless, others of great value. According to Harris, "there are few theories so great, so comprehensive, so various, as the theory of these categories: in contemplating them we see whence the sciences and arts all arise,—history out of substance; mathematics out of quantity; optics and medicine out of quality and quantity; astronomy, music, and mechanics out of quantity and motion; painting out of quality and site; ethics out of relation; chronology out of when; geography out of where, &c." The Categories of Aristotle are, in truth, a metaphysical and not a logical reduction, and are methodically deduced and simplified by Sir W. Hamilton, in his edition of Reid's works, p. 697. Mr. J. S. Mill, who objects to Aristotle's classification, attempts another of his own, as follows:—1. Feelings, or states of consciousness; 2. the minds which experience those feelings; 3. the bodies or external objects which excite all that class of feelings which we call sensations; and 4. the successions and co-existences, the likenesses and unlikenesses, between feelings or states of consciousness. The categories of Kant are purely subjective, being merely a classification of the conceptions or judgments of the understanding. They are—1. Quantity; 2. Quality; 3. Relation; and 4. Modality. In the first he includes unity, multitude, totality; in the second, reality, negation, limitation; in the third, substance and accident, cause and effect, action and reaction; and in the fourth, possibility, existence, necessity.

CATENA, *kăt'-e-nă* (Gr., a chain), in Biblical Criticism, is an exposition of a portion of Scripture, formed from collections out of several authors; such as the "Catenæ" of the Greek fathers in the "Octateuch" by Procopius; the "Catena Aurea" of Thomas Aquinas.

CATERPILLAR, *kăt'-er-pil-lăr*, the common name given to the larvæ of the lepidopterous insects, butterflies and moths. There is as great a variety in the form of caterpillars as in the insects to which they change. Each family, genus, and species may be distinguished by its characteristics. The bodies of caterpillars are generally long, nearly cylindrical, and divided into thirteen segments, of which the anterior forms a horny head, furnished with jaws and antennæ, and usually with groups of simple eyes. On each side of the body are nine spiracles, or small openings for respiration. The mouth of the caterpillar is usually furnished with strong jaws, capable of tearing, cutting, and masticating the substances on which it feeds, which are very varied in their character, although they entirely differ from the substances eaten by the perfect insect. The first three segments of the body are each furnished with two feet, which represent the six feet of the insect into which they change. All the feet or legs are very short. When the caterpillar has arrived at the proper stage to undergo its metamorphosis, it seeks some secluded spot. Some species find a retreat in the hollows of the barks of trees, others in the walls or wooden palings of the garden, while a few species bury themselves in the earth. Fortunately for the agriculturist, a great quantity of the lepidoptera are destroyed by parasites, which lay their eggs in the larvæ. The caterpillar undergoes two changes, firstly to the pupa state, then to the perfect winged insect. (*See* BUTTERFLY, MOTH.)

CATGUT STRINGS, *kăt'-gut*, strings prepared from the intestines of sheep for musical instruments, bow-strings, batters' bow-strings, clockmakers' cords, and thongs for whips and laces for boots. The intestines are first cleaned and freed from fatty matter, and the external membrane removed. They are then soaked, and the inner membrane is taken away, after which they are soaked in a solution of potash. They are next drawn through a plate perforated with holes, fumigated with sulphur, and sorted according to size. The strings known as "Roman strings" are the best for violins. They are made at Milan, and are distinguished for their strength and transparency. They are generally formed of two separate pieces twisted together; and great nicety is necessary in conducting the process of fumigation to which they are subjected, lest they become too brittle if exposed for too long a time to the action of the sulphur, or liable to be frequently out of tune if not exposed long enough. Larger strings are made by twisting several lengths of catgut together until the required thickness is obtained. The intestines of other animals have been used for making a coarse but strong cord for turning lathes and machinery; but those of the sheep only have been found to furnish strings suitable for musical and philosophical purposes.

CATHA, *kă'-thă*, in Bot., a gen. of plants belonging to the nat. ord. *Celastraceæ*. The most important species are *C. edulis* and *spinosa*, two shrubs flourishing in Arabia. The young shoots, with the leaves attached, of these plants constitute the famous drug called *kât*, *khat*, or *kafta*, which is chewed by the Arabs, and is said to produce great hilarity of spirits and an agreeable state of wakefulness. A decoction is also made from it and used as a beverage, like our tea: its effects are described as being somewhat similar to those produced by strong green tea.

CATHARI, *ka-thai'-re* (Gr. *katharoi*, pure), in Eccl. Hist., was a name given to several sects of Christians who made professions of greater purity in life or doctrine than others. It was chiefly applied to the Novatians; but was given afterwards to various sects, known in France and other countries as Albigenses, Paterini, Paulicians, &c.

CATHARTICS, *kă-thar'-tiks* (Gr. *kathairo*, I purify), in Med., is a term applied to such substances as, taken internally, cause a special irritation of the intestinal canal, and increase the alvine evacuations; in other words, have a purgative effect. Cathartics act upon the system in various ways, and have been variously divided; as, into stimulating, as jalap, aloes, colocynth; refrigerating, as Glauber or Epsom salts; astringent, as rhubarb; emollient, as castor-oil; narcotic, as tobacco or henbane. One kind is preferable to another according to the circumstances of each individual case.

CATHEDRA, *kă-thē'-drä* (Gr., a seat), denotes, in a general sense, a chair; more particularly, a professor's chair, or a preacher's pulpit; and is also used for a bishop's see or throne in a church. Hence, to speak *ex cathedrâ*, is to speak with authority, as a bishop from his throne.

CATHEDRAL, *kă-thē'-drăl*, is a church in which the bishop's throne or seat (*cathedra*) is placed, and which is thus the chief or principal church in the diocese or district. It has usually, also, a dean and body of canons or prebendaries; but this is not essential to constitute a cathedral church, nor is every church that has a chapter of canons a cathedral. (*See* BISHOP, CANON.) The cathedral church is the parish church of the whole diocese, which, in early times, was commonly called *parochia*. In England no diocese has more than one cathedral, but there are numerous instances of a plurality of cathedrals even in the same city, on the continent, particularly in Italy; as at Rome, Milan, &c. The normal plan of an English cathedral is in the form of a Latin cross, that is, a cross whose transverse arms are less than the longitudinal limb. Generally, its several parts are sufficiently distinguished as nave, choir, and transept, with aisles, western towers, and central tower; but in more minute description, especially where ritual arrangements are concerned, these terms are not always sufficiently precise; and in order to arrive at a more exact nomenclature, it is necessary to trace the changes in a cathedral church from the Norman period to our own (for which *see* Hook's "Church Dictionary"). The cathedral service is the usual Church of England service, intoned, with an anthem and the Psalms chanted.

CATHERINE WHEEL, *kăth'-e-rine*, a circular window, or portion of a window, frequently found in cathedrals and churches built in accordance with the Gothic style of architecture. When the entire window is circular

in form, it is generally found at the east end or in the gables of the transepts. In some of the cathedrals in France, windows of this description are found of great diameter, divided into compartments by stone tracery elaborately chiselled into a variety of forms, and sometimes by shafts radiating from a circular centre. The name is taken from the instrument on which St. Catherine of Alexandria suffered torture and death, A.D. 307, for her persistent adherence to the Christian faith.

CATHETER, *kăth'-e-ter* (Gr. *kathiemi*, I put down or into), in Surg., is the name of an instrument employed for drawing off urine by introducing it into the bladder. It is a long tube, usually formed either of silver or gum-elastic, open at the handle, and having at the sides, near the point, holes or eyes into which the urine flows, and is thus carried off. Those for males are usually from ten to eleven inches in length, and considerably curved towards the point; those for females are much shorter and nearly straight. The introduction of the catheter is an operation requiring a considerable degree of tact and skill, and should be done with great caution.

CATHIONS, *kăt'-thi-ons* (Gr. *kata*, from; *eio*, I go).—All substances susceptible of direct decomposition by the electric current are called electrolytes, according to Faraday. Those elements which are evolved at the anode are termed *anions*, and those which are evolved at the cathode, *cathions*. Thus, when water is electrolyzed, two *ions* are evolved,—oxygen, which is the *anion*, and hydrogen, the *cathion*. (*See* ELECTROLYSIS.)

CATHODE, *kă'-thode* (Gr. *kata*, from; *odos*, a way), a term introduced by Faraday to designate the negative pole of any electrical arrangement for decomposing a chemical compound; the cathode, in other words, is the surface by which the electric current leaves the body undergoing decomposition. (*See* ANODE, ELECTROLYSIS.)

CATHOLIC, *kath'-o-lik* (Gr. *katholikos*, general, universal), a term first applied to the Christian church to distinguish it from the Jewish, which was confined to one nation or people. Afterwards, when sects and heresies arose, taking to themselves particular names, those who remained orthodox and adhered to the Church, called themselves Catholics, *i. e.* members of the Church general or universal. Hence, the Roman church now calls itself by the name of Catholic, regarding itself as the only true and orthodox church, and holding that all who have separated from her are sectarians and heretics. (*See* ROMAN CATHOLICS.) The seven *Catholic epistles* are those of James, Peter, Jude, and John, and are so called probably because they were not written to any particular person or church, but to Christians generally. The title of Most Catholic Majesty is borne by the kings of Spain.

CATHOLIC EMANCIPATION ACT. (*See* ROMAN CATHOLIC EMANCIPATION ACT.)

CATKIN. (*See* AMENTUM.)

CATOPTRICS, *kă-top'-triks* (Gr. *katoptron*, a mirror), that part of optics which treats of the reflection of light from the regularly-formed surfaces of such bodies as water, glass, and the metals. The name of speculum, or mirror, is generally given to those substances which have a highly-polished and regularly-formed surface; but, in general use, the term speculum is applied to a metal reflector and mirror, to a reflector made of glass, and coated with an amalgam of tin and mercury or a layer of pure silver. There are four kinds of reflectors used in optics,—the plane, the convex, the concave, and the cylindrical; and when a ray of light is incident upon any of these surfaces, its reflection is always governed by the same laws. These laws, which are the result of observation and experiment, form the groundwork of catoptrics. They are as follows:—First, that the incident ray, the normal to the surface at the point of incidence, and the reflected ray, are all in one plane; second, that the angle of reflection is always equal to the angle of incidence. (*See* OPTICS.)

CATOPTROMANCY, *kă-top'-tro-măn-se* (Gr. *katoptron*, a mirror, and *manteia*, divination), a species of divination among the ancients by means of a mirror. It is said that among the Achæans, a sick person was wont to let down a mirror by a thread into a fountain before the temple of Ceres, and if, on looking into the glass, his countenance appeared ghastly and distorted, it was regarded as an ill omen; but if fresh and healthy, as an indication that he would recover.

CAUCUS, *kaw'-kus*, a term used in America to denote a political meeting of a party for the purpose of agreeing upon candidates to be proposed for election to offices, or to concert measures for supporting certain candidates. The origin of the term is doubtful.

CAUDEX, or STIPE, *kaw'-dex* (Lat. *cædo*, I cut, because, by cutting off the branches, what remains, constitutes the trunk), in Bot., the acrogenous (summit-growing) stem of a tree-fern. The caudex often rises to the height of fifty or sixty feet, bearing on its summit a crown of foliage. It produces no lateral branches, but is covered with scars produced by the successive whorls of leaves or fronds which have fallen during the life of the plant. The stem is of uniform diameter from near the base to the top.

CAUDLE, *kaw'-dl* (Fr. *chaudeau*, from Lat. *calidus*, warm), is a kind of warm broth, composed of gruel, wine or beer, sugar, and spices, and given to the sick.

CAUL, *kawl* (Lat. *caula*, a fold), is a thin membrane, sometimes found encompassing the head of a child when born. This was formerly regarded with great superstition, it being held to denote that the child so born would be very fortunate and escape many dangers. A caul was also believed to confer the like benefits upon its possessor; and hence they were frequently sold at a high price. They were regarded by seamen as an infallible preservative against drowning. Even so late as 8th May, 1818, an advertisement appeared in the *Times*, offering, for six guineas, a child's caul, "for which fifteen pounds was originally paid, was afloat with its late owner thirty years in all the perils of a seaman's life, and the owner died at last at the place of his birth."

CAULESCENT, *kawl-es'-ent* (Lat. *caulis*, a stalk), in Bot., a term applied to plants having evident stems.

CAULIFLOWER. (*See* BRASSICA.)

CAULIS (Lat.), in Bot., the term applied to the stem of an herbaceous plant which dies down annually to the surface of the ground.

CAUSE, *kawze* (Fr. *cause*; Lat. *causa*), in ordinary language is understood to be that by which something known as the effect is produced, and without which it could not have existed. Aristotle divides causes into four different kinds,—the *material*, *formal*, *efficient*, and *final*. The first is that of which anything is made, as the brass or marble of a statue. The formal is the form, idea, or pattern of a thing, as the artistic idea or plan of the statue. The efficient cause is the power acting to produce the work, as the mechanical labour employed in producing the statue. The final cause is that which led to the production of the thing, as the end or motive in view in the making of the statue. As will be seen from the examples given, it is possible for one object to combine all the kinds of causes. *Causation, causality*, or the action of a cause in producing an effect, is one of the most disputed points within the region of metaphysics. There is believed to be some connection between cause and effect; but the utmost scrutiny has never been able to discover any power by which the cause operates. Experience only teaches us how one event consequently follows another, without instructing us in the secret connection which binds them together. We believe that a cause is something which not only precedes, but has power to produce the effect. The various opinions as to the nature and origin of the principle of causality in the human mind are ranged by Sir W. Hamilton into two great categories,—the one comprehending those theories which consider this principle as *empirical*, or *à posteriori*,—that is, as derived from experience; the other, those which view it as *pure*, or *à priori*,—that is, as a condition of intelligence itself. These two primary genera he subdivides into several subordinate classes.—(*See Lectures on Metaphysics*, vol. ii. p. 385, *et seq.*) He attempts to explain it by what he terms "the law of the conditioned," or the law of limitation; that we are unable, on the one hand, to conceive of nothing becoming something; and, on the other hand, of something becoming nothing; that we are utterly unable to realize in thought the possibility of the complement of existence in the universe being either increased or diminished. *Ex nihilo nihil, in nihilum nil*

*posse reverti*, expresses, according to him, "in its purest form, the whole intellectual phenomenon of causality." This explanation, however, is not generally received by philosophers.

CAUSES, FINAL, DOCTRINE OF, which, with Aristotle, was merely an inquiry into tendencies, has, by the theologians of modern times, been employed to establish the truth of a divine providence. The argument from final causes, according to Dr. Reid, when reduced to a syllogism, has these two premises:—1. That design and intelligence in the cause may, with certainty, be inferred from marks or signs of it in the effect; and 2. that there are the clearest marks of design and wisdom in the works of nature; the conclusion being, that the works of nature are the effects of a wise and intelligent cause. The remark of Lord Bacon, that final causes are sterile, has frequently been quoted. "They are sterile," says Dr. George Wilson, "for the same reason as the vestal virgins were; namely, that they belong to God." "Gentle, solemn, and beautiful, they attract men, and modestly permit them to look on their features; but awe mingles with admiration in the gazer's heart, and the ever-burning fires on the vestal altar forbid all close and impious approach. Nevertheless, we must seek after and love final causes even with a lover's passion, although in this life they never can be ours." They are "the most perfect of earthly witnesses to the being and perfections of God." —*Edinburgh University Essays.*

CAUSEWAY, *kawz'-way*, or *kawz'-e* (Fr. *chaussée*), a pathway that is raised above the level of the ground. This name is given to the raised sides of a street that intervene between the houses and the roadway, the outer edge of which is formed by strong blocks of stone called curbstones. (*See* CURB.) The causeway is generally paved with flat broad flagstones, and sometimes with pebbles set on edge, and rammed tightly together. Causeways are often formed by the sides of roads, for the convenience of foot-passengers, by throwing up a low level bank of some breadth, and along the marshy banks of rivers. In the latter case, faggots are laid down on the yielding soil, and a thick coating of earth and gravel is thrown upon them. A part of the north coast of Antrim, Ireland, between Bengore Head and the mouth of the river Bush, is called the Giant's Causeway, being formed of flat terraces of columnar basalt.

CAUSTIC, *kaw'-stik* (Gr. *kaustikos*, from *kaio*, I burn), in Med., is applied to such substances as burn or destroy the skin and flesh by acting chemically upon them. The caustics principally used in practice are the nitrate of silver, or lunar caustic, and potassa fusa, common caustic, or caustic potass.

CAUTERY, *kaw'-te-re*, in Surg., is a burning or searing of morbid flesh by a hot iron or by caustic medicines, the former mode being termed *actual cautery*, the latter *potential cautery*.

CAUTION, *kaw'-shun*, in Scots Law is an obligation by which a party binds himself as surety for the performance of any deed or obligation undertaken by another.

CAVALCADE, *kav-ăl-kaid'* (Fr.), a procession or march of persons on horseback; a formal, pompous march or procession of horsemen and equipages by way of ceremony, or as a means of gracing a triumph, or welcoming the public entry of a person of distinction, a victorious warrior, &c.

CAVALIER, *kav-ă-leer'* (Fr.), in English history was the name given to those who adhered to the cause of Charles I., as distinguished from the Roundheads, or friends of the Parliament.

CAVALLIER, in Mil., a work of defence raised on the level of a bastion or curtain, about ten feet above the rampart of the work, with a rampart of its own about six feet in height. The height of the cavalier must depend on that of the eminence it is intended to command. The sides should be parallel to the faces of the work on which it is constructed: formerly it was made in the form of a semicircle. The object of this defensive work is to gain height to command any rising ground from which the enemy might direct a fire into the fortifications, and to pour a plunging fire into their trenches. Works raised by the attacking party on the glacis of a fortification, consisting of a series of steps formed by a bank of earth revetted with gabions, from which a fire may be directed into the common way, are called trench cavaliers.

CAVALRY, *kăv'-ăl-re* (Fr. *cavalerie*, from *cheval*, a horse; Ital. *cavaliere*, a horseman or knight; Sp. *caballero*, a horseman; Lat. *caballus*, a horse), a name applied generally to soldiers mounted on horseback. The British cavalry consist of twenty-eight regiments, of which two are called Life-guards, one Horse-guards, seven Dragoon guards, of which the fifth are distinguished as Carabiniers, and eighteen ordinary dragoon regiments, which are classed as Dragoons, Light-dragoons, Lancers, and Hussars, as follows:—Dragoons, 1st, 2nd, 6th; Light-dragoons, 3rd, 4th, 13th, 14th; Lancers, 5th, 9th, 12th, 16th, 17th; Hussars, 7th, 8th, 10th, 11th, 15th, 18th. The English cavalry are superior in weight to, and better mounted than, any cavalry in the world. At Waterloo the French cuirassiers could not for a moment withstand the charge of the life-guards, for man and horse were overturned by the impetus with which the household cavalry was launched against them, and literally ridden over by them. A regiment of dragoons consists of eight, and sometimes ten troops, of about eighty men each, including non-commissioned officers; each troop has a captain, lieutenant, and cornet; and two troops form a squadron, and four squadrons a regiment. The term dragoon is derived from the weapon with which the French cavalry were armed, that were raised about 1600 by the Mareschal de Brissac, to surpass the famous German reiters, who were skilled in the use of the pistol on horseback. This was a short blunderbuss, with the muzzle formed like the yawning jaws of a dragon; whence those that were armed with it were called *dragoniers*, and then dragoons. The other names applied to English cavalry—namely, lancers and hussars—have also been derived from foreign troops, the former being in imitation of the Polish lancers of the French army, who were armed with a long lance, and the latter from the hussars, or *houssards*, a species of light cavalry that formed part of the national armament of Poland and Hungary. With the exception of the lancers, who carry a lance, sword, and pistols, the English cavalry, both light and heavy, is armed with sword and carbine. The cavalry carbine is now a short breech-loading rifle, sighted for 600 yards. The average annual cost of a cavalry regiment, including horses, is considered to amount to £25,000. The price of a horse is about £20 or £25, and it costs as much more to train him and render him fit for service. Cavalry, in latter times, have been all-important in confirming and securing a victory, by pursuing the flying foe, and turning what might otherwise have been a retreat into a rout. But, in early ages, battles were mainly fought with cavalry, who were enrolled from among the nobles and the more wealthy part of the population. The natural features of Greece rendered it impracticable for the Greeks to make their cavalry of similar importance to that of other nations, and they depended entirely on their infantry; but the Romans, although they paid great attention to the discipline and effectiveness of their infantry, had large bodies of cavalry with every consular army, who were all men of good family and position. The cavalry of the Parthians was skilled in attack and flight when needful; they would lure on the foe by a feigned retreat, and bring down soldier after soldier with unerring aim while galloping at full speed on horseback. The cavalry of the Anglo-Saxons, and of the Huns, Goths, Vandals, and northern tribes that destroyed the mighty Roman empire, were justly famous, and composed the bulk of the armies of the day. The armies of the Middle Ages were composed chiefly of cavalry, and, in the time of the Crusades, infantry were but little esteemed; but at Agincourt, Cressy, and Poictiers, the English bowmen did gallant service, and, with the introduction of gunpowder and cannon into warfare, infantry and artillery began to equal cavalry in importance, and were soon considered more essential to bear the brunt of the battle. In the early part of the 18th century, the cavalry of Poland, or *Pospolite*, as it was termed, consisted of the nobles and *élite* of the kingdom, who were magnificently armed and accoutred. Who does not admire the gallant volunteer cavalry of Charles I., that made such brilliant charges, under Rupert, the Murat of his day as a cavalry officer, against the stern iron-clad troopers of the Parliament. Many of the sons of these cavaliers, doubtless, served in the Scotch Greys, the first regular regiment of

cavalry that was raised in England, by Charles II., in 1661. Since that time, the cavalry has always formed a distinguished arm of the British military service. The following are the distinctive duties of heavy and light cavalry in the British service:—The latter make reconnaissances, and are used for outpost duty and gathering provisions, as well as in pursuit of a flying foe; while the former are used to cover the retreat of an army, and charge the enemy's cavalry and infantry, and capture his guns. It is considered that infantry formed in square to resist cavalry cannot be broken; but at the battle of Mohammerah, in Persia, March 26, 1857, British cavalry broke a square of Persian infantry, and rode through them; for Captain Wren, a man of gigantic size and power, who was foremost in the charge, having hitted his horse at the bristling line of bayonets, bore the men that held them to the ground under the weight of himself and his charger; thus enabling those who were at his heels to penetrate the square. When about to make an attack, the cavalry, like the infantry, are divided into the attacking force, the supports, and the reserve. Cavalry charge cavalry in line, infantry in column, and artillery in *echelon*. (*See* ECHELON.) Its chief use is in pursuit or in covering a retreat, and an encounter with cavalry is a hand-to-hand combat, which is seldom the case with infantry, and can never happen with artillery.

CAVEAT, *kal'-ve-at* (Lat. *caveat*, let him beware; from *caveo*', is a caption entered in the spiritual court, to stop institutions of clerks to benefices, probates of wills, administrations, and such like, from being granted without the knowledge of the party that enters it. The caveat being lodged or entered, the proceedings are thereby stayed, and the promoter, if he intend to proceed, must warn the other party to his caveat, who can then enter and dispute the right in a suit to be instituted for the purpose of trying it. If he fail to do so, the matter will proceed as if the caveat had not been entered.

CAVES, or CAVERNS, *kaivs, kăv'-erns* (Lat. *carus, caverna*, hollow), hollow places in the earth. They occur more or less along the rocky shores of all free-flowing seas, and are the results of abrasion by waves laden with fragments of stone, and acting upon pre-existing fissures or the softer portions of the exposed rocks. The most celebrated caverns, however, occur in limestone strata, and appear to be the results partly of fissuring by subterranean disturbance, and partly of waste by the percolation and passage of carbonated waters. Some are celebrated for their great extent, others for their gorgeous stalactites and stalagmites, and many for their treasures of sub-fossil bones. Among the most remarkable caverns may be mentioned, one in the limestone rock at Kirkdale, Yorkshire; those found in the carboniferous limestone of Glamorganshire, in which remains of British pottery have been found, in addition to bones of birds and beasts, which have been dug up more than eight feet below the present surface; and Fingal's Cave, in Staffa, an island on the west coast of Scotland, a fine example of a natural cavern in basalt or igneous rock. In the limestone strata of Derbyshire caverns are found lined with a calcareous deposit of brilliant whiteness, with pieces like icicles of great size hanging from the roof and rising from the floor. These pieces sometimes meet and form columns. Among the Derbyshire limestone caverns, Peake's Hole, near Castleton, Poole's Hole, and the Bagshaw Grottos, are the most remarkable.

CAVIARE, or CAVIAR, *kav-e-aire* (Sp. *cabial*; Arab. *gabiar*, from the Arab word *gebera*, signifying to press or strain, and season with fat), an article of food prepared in Russia from the roe of the sturgeon or some other large fish, and is made by washing it in strong vinegar, and afterwards salting. The taste for eating caviare is acquired; most people at first finding its "most ancient and fish-like smell" and oily taste very disagreeable. It is, therefore, only epicures who appreciate it: hence the proverb of "caviare to the multitude," which is applied to anything not likely to be appreciated by the common people.

CAVY. (*See* GUINEA-PIG.)

CAYENNE PEPPER (*See* CAPSICUM.)

CEANOTHUS, *se-an-o'-thus* (a name given by Theophrastus to a spiny plant), in Bot., a gen of plants belonging to the nat. ord. *Rhamnaceæ*. The young shoots of *C. americanus* are used as an astringent, and in New Jersey the leaves are employed as a substitute for tea: hence they are commonly known as New Jersey tea.

CEBIDÆ, *se-bi'-de* (Gr. *kebos*, a species of monkey), a term applicable to all the monkeys of the American continent.

CEBRIO, *seb'-re-o*, a fam. of coleopterous insects of peculiar structure. The body is of an oblong form, arched above and deflexed in front; the mandibles curved, and entire at the tip. The thorax is broadest behind, and the antennæ generally longer than the head and thorax. Some of these insects are remarkable for having the antennæ beautifully pectinated and of very great length.

CECIDOMYIA, *se-se-do-mi'-a* (Gr. *kekidos*, high-leaping; *muia*, a fly), small two-winged flies, that deposit their eggs on the buds of growing plants. The best known is the wheat-fly (*Cecidomyia tritici*), that may be seen in immense masses flying about wheat-fields about June. It deposits its eggs in the centre of the corolla, where the larva is hatched; and, by devouring the pollen, the plant is greatly damaged. When first hatched, they appear in the form of tiny footless maggots, taper towards the head, and blunt at the hinder extremity, with the rings of the body somewhat wrinkled and bulging at the sides. They are at first perfectly transparent and colourless, but soon take a deep yellow or orange colour. The maggots, when fully grown, are nearly an eighth of an inch in length. It is said that they quit the wheatears at the beginning of August, and descend into the earth about half an inch below the surface, where they probably remain throughout the winter, making their appearance again in the shape of winged flies when the spring corn begins once more to show its head.

CECROPIA, *se-kro'-pi-a* (after Cecrops, king of Athens, whose legs were fabled to be of snakes), in Bot., a gen. of plants belonging to the nat. ord. *Artocarpaceæ*. *C. peltata*, a tree growing in the West Indies and South America, is remarkable for its stems being hollow except at the nodes. Owing to this peculiarity, the smaller branches are often used for making wind instruments.

CEDAR. (*See* CEDRUS.)

CEDAR-BIRD, *sel'-dar* (*Ampelis cedrorum*), a native of America. The appellation of Cedar-bird is given to it on account of its partiality to the berries of the cedar. The passion of the cedar-bird for this diet sometimes leads it into excesses, and, perhaps, premature death. As many as fifteen berries have been found in the throat of a single bird. "The nest is large for the size of the bird, fixed in the forked or horizontal branch of an apple-tree, ten or twelve feet from the ground; outwardly, and at the bottom, is laid a mass of coarse dry stalks of grass, and the inside is lined wholly with very fine stalks of the same material. The eggs are three or four, of a dingy bluish white, thick at the great end, tapering suddenly, and becoming very narrow at the other; marked with small roundish spots of black, of various sizes and shades, and the great end is of a pale, dull, purple tinge, marked likewise with various shades of purple and black."—(Wilson's *American Ornithology*.) The tactics of the parent bird when disturbed in its nest are singular. On such occasions, the female at once flies off to a distance; it neither exhibits the least distress, nor utters a solitary cry of lamentation, and the intruder is left to examine the eggs or young at his leisure. The cedar-bird is largely consumed as an article of food, and at the end of autumn is, owing to its voracity, in prime condition. At this season a great quantity are sent to the markets. The colour of this bird is, on the upper parts, of a fawn-colour; the chin is black, and the abdomen and breast yellow. The wings are slaty-blue; the tail-feathers are rich yellow. Round the forehead there is a dark line, covering the eyes. It is about six inches and a half in length, and is rather a shy-built bird.

CEDAR-WOOD, OIL OF, an essential oil procured by distillation from cedar-wood at the rate of twenty-eight ounces to the hundredweight of shavings. It contains *cedrola*, a white crystalline sand, and *cedrene*, a liquid hydrocarbon.

CEDAR-WOOD, TINCTURE OF, is readily made by

steeping the shavings of the wood in proof spirit. Mixed with a fourth part each of tincture of myrrh and rhatany, and flavoured with a few drops of oil of peppermint, it forms a valuable mouth-wash, termed "Eau Botot."

CEDRAT, *se'-drăt*, a perfume procured from the rind of the citron (*Citrus medica*) by expression and distillation. It is much used in the manufacture of scents, from possessing a peculiarly refreshing lemony odour. Extract of cedrat is made by dissolving two ounces of the oil of citron in a pint of spirits of wine.

CEDRELA, *se'-dre-lă* (from *cedrus*, the cedar-tree, its wood having an aromatic resinous scent like it), in Bot., a gen. of tropical trees, the type of the nat. ord. *Cedreluceæ*. *C. febrifuga*, *C. Toona*, and other species, have febrifugal and astringent barks, which have been used as substitutes for cinchona. *C. Toona* furnishes timber resembling mahogany, which is much used in the East Indies, and is occasionally imported into this country under the names Toon, Tunga, Poma, and Jeea-wood.

CEDRELACEÆ, *se-dre-lai'-se-e*, in Bot., the Mahogany fam., a nat. ord. of dicotyledonous plants in the sub-class *Thalamiflorœ*, consisting of nine genera, including twenty-five species, chiefly natives of the tropical parts of America and India,—trees with alternate, pinnate, exstipulate leaves. The flowers are hypogynous and symmetrical; calyx and corolla with 4 or 5 divisions, both imbricated in æstivation; stamens double the number of petals, with united or distinct filaments, and inserted on a hypogynous disk; ovary usually 4 or 5-celled, with 4 or more ovules, and a simple style. The fruit is capsular, with axile placentas; seeds usually numerous, flat, and winged. The plants of this order have aromatic, tonic, astringent, and febrifugal properties, and many of them are valuable timber-trees. Mahogany and satin-wood are products of the *Cedrelaceæ*. (*See* SWIETENIA, CHLOROXYLON.)

CEDRONE SEEDS. (*See* SIMABA.)

CEDRUS, *se'-drus* (Gr. *kedros*), in Bot., the Cedar, a gen. of trees belonging to the nat. ord. *Pinaceæ*, sub-ord. *Abieteæ*. The cedar of Lebanon (*C. Libani*) has been celebrated from the earliest ages for its grave beauty, its longevity, and its magnitude; also for the excellence and durability of its timber. It is often alluded to in Scripture as an emblem of stability and prosperity. The grove of cedars on Mount Lebanon is about three-quarters of a mile in circumference; but of the four hundred trees now standing, there are but twelve of extraordinary age. One of these is sixty-three feet in circumference, and has possibly been in existence for some two thousand years. The cedar was introduced into England in the latter part of the 17th century, and one specimen at Sion House, London, is now eight feet in circumference at three feet above the ground. The Deodar, or Himalayan cedar (*C. deodara*), is also a magnificent tree, and is held in great veneration by the Hindoos. The turpentine obtained from this species is much used in India for medical purposes, and is known by the name of *Kelon-ke-tel*.

CEILING, *seel'-ing* (Lat. *cælum*, Fr. *ciel*, the heaven), an expression applied to the top or covering of a room, or any lofty building of great size, as a church. It is derived from words in the Latin and French languages that are used to denote the vault of heaven, which seems to cover that part of the world that lies within the circle of our horizon, in the form of an immense vault; and it is probable that the observation of this led to the adoption of the term. The ceiling is formed by nailing laths to the under surface of the joists that support the floor of the story above or the beams of a roof, and covering them with two or three coats of plaster. The ceilings of churches are often semicircular in form, and divided into large squares by beams adorned with bosses at the points of intersection, and that of the chancel is sometimes coloured blue and studded with stars. Flat ceilings are sometimes divided in this way, and adorned with painting and gilding, and those of houses of the Tudor period are frequently enriched with mouldings.

CEIMELIA, *si-me'-li-ă* (Gr.), was anciently applied to treasures or other things stored up as valuables, and in the early Church denoted the sacred vessels and utensils belonging to the church. Hence, *Ceimeliarcha*, or *Ceimeliophylax*, was the officer, in ancient churches and monasteries, who had the custody of these things; and as rolls and archives were also under his charge, he was also frequently called *Cartophylax*, or *Custos archivorum*.

CELANDINE. (*See* CHELIDONIUM.)

CELARENT, *sel'-ă-rent*, among logicians is a name given to a mode of syllogism, in which the major proposition and conclusion are universal negatives, and the minor a universal affirmative; as,—

CE. None whose understanding is limited can be omniscient.
LA. Every man's understanding is limited.
RENT. Therefore, no man is omniscient.

CELASTRACEÆ, *se-las-trai'-se-e*, in Bot., the Spindle-tree fam., a nat. ord. of dicotyledonous plants in the sub-class *Calyciflorœ*, consisting of 30 genera and about 200 species, chiefly natives of the warmer parts of Asia, North America, and Europe, though many are found at the Cape of Good Hope. They are shrubby plants, with simple leaves and small deciduous stipules. Flowers small, regular, and perfect, or rarely unisexual by abortion; sepals and petals 4—5, imbricated in æstivation; stamens equal in number to, and alternate with the petals, and inserted with them on a large, flat, expanded disk; ovary superior, placentas axile; fruit superior, 2—5-celled. The plants are chiefly remarkable for the presence of an acrid principle. The seeds of some contain oil; those of *Celastrus paniculatus* yield an oil used as a medicine in India. Two other species of the typical genus, *C. scandens* and *senegalensis*, have purgative and emetic barks. (*See* CATHA, EUONYMUS.)

CELERY. (*See* APIUM.)

CELESTINE, *sel'-es-tine*, a mineral found in rhomboidal prismatic crystals, consisting of *sulphate of strontia*. It is the commonest mineral of strontia.

CELESTINS, *sel'-es-tins*, a religious order, founded in the 13th century by Peter de Meuron, who was afterwards raised to the papal chair as Celestin V.; whence they took their name. This order speedily extended itself in Italy, France, Germany, and other parts of Europe. Their habit consists of a white gown, a capuche, and a black scapulary. When they go out, they wear a black cowl with the capuche. They are allowed no animal food except when ill, and have frequent fasts. They rise two hours after midnight to say matins. This order was numerous in the middle of last century, but it is now nearly extinct.

CELIBACY, *sel'-ib-ă-se* (Lat. *cælebs*, unmarried), is the state of unmarried persons. In the ancient world celibacy was generally viewed with disrespect, and legal enactments were sometimes issued against it. Among the Spartans those who lived in celibacy were subjected to various disadvantages, and in their old age were not treated with the same respect as other citizens. Among the Romans various means were adopted to discourage celibacy, and frequently fines were imposed upon old bachelors. Dionysius Halicarnasseus mentions an ancient constitution whereby all persons of full age were compelled to marry; but the first law of this kind of which we have any certainty was that enacted under Augustus, called *Lex Julia de Maritandis ordinibus*, and afterwards *Papia-Poppæa*, or *Julia Papia*, from certain amendments made on it under the consuls Papius and Poppæus. By this law divers prerogatives were given to those who had many children, and penalties imposed on all that led a single life—as, that they could not succeed to an inheritance except of their nearest relatives, unless they married within 100 days after the death of the testator. The Church of Rome imposes a universal celibacy on all its clergy, from the pope to the lowest deacon and subdeacon. The advocates for this usage pretend that a vow of perpetual celibacy was required in the ancient Church as a condition of ordination even from the earliest apostolic times. This, however, was evidently not the case, for we possess numerous examples to the contrary. It is generally believed that most of the apostles were married men; St. Peter certainly was, and Philip, one of the seven deacons, was also a married man. St. Paul asserted that he had the power "to lead about a sister, a wife, as well as other apostles" (1 Cor. ix. 5). In

the ages after the apostles, we have accounts of several married bishops, presbyters, and deacons. Polycarp mentions Valens, presbyter of Philippi, who was a married man; and there are still extant two letters of Tertullian, a presbyter of the 2nd century, addressed to his wife. Novatus was a married presbyter of Carthage, as we learn from Cyprian, who was, in the opinion of some, also himself married; and so was Cæcilius, who converted him, and Numidius, another presbyter of Carthage. Many of the ancient fathers, however, wrote in favour of celibacy; and as early as the beginning of the 4th century some persons in the Church advocated the passing of a law obliging the clergy to abstain from marriage. At the council of Nice, A.D. 325, a motion was made to that effect; but it was so strenuously opposed by Paphnutius, an Egyptian bishop, that it was laid aside. Siricius, who died about the end of the 4th century, was the first pope who forbade the marriage of the clergy; but celibacy does not seem to have been completely established in the Church till the papacy of Gregory VII., at the end of the 11th century, and even then it was loudly complained against by many writers. The old English and Welsh records show that the clergy were married there as late as the 11th century. Celibacy was established in the Greek church by the council of Trullo, 692, but only as regards bishops. Presbyters, deacons, and all the inferior orders, may live in the married state after ordination. Perhaps celibacy more than anything else is to be regarded as the weak point of the Roman Catholic church, and that which contributed most to the success of the Reformation. The violence thus done to human nature was the cause of the gross immoralities that prevailed in the Church, and rendered the priesthood the despised among the people. At the time of the Reformation the attention of the Church was directed to this subject, and it was discussed at the council of Trent (1563), whether celibacy ought still to be maintained; but the majority were in its favour. Recently, and even within the last few years, the question has been agitated in various parts of the continent, particularly in Germany.

CELLARIUS, or CELLERARIUS, *sel-lair'-re-us* (Lat., cellarer), an officer in monasteries to whom belonged the care and procurement of provisions for the convent.

CELLITES, *sel'-lites*, a religious order, founded at Antwerp in the beginning of the 14th century. Their patron was one Alexius, a Roman; and hence, in Italy, they were called Alexians, but in the Netherlands and Germany, where they had many monasteries, Cellites.

CELLS, *sells* (Lat. *cella*, a cell), in Phys., are closed vesicles, or minute bags, formed by a membrane in which no definite structure can be discerned, and having a cavity which may contain matters of variable consistence. These cells, remaining as separate corpuscles in the fluids, and grouped together in the solids, persisting, in some cases, with but little change, in others undergoing a partial or thorough transformation, produce the varieties of form and structure met with in the animal and vegetable textures. The embryo animal, as well as the embryo plant, is, in its early stages, entirely formed of cells of a simple and uniform character; and it is by a gradual transformation in the progress of development that some of these cells become converted into the diversified elements of a complex fabric. We find in the operations of the simple cell an epitome, as it were, of those of the highest and most complex plant, which again bear a close resemblance with those that are immediately concerned in the nutrition and reproduction of the animal body. Every cell owes its origin, in some way, to a pre-existing cell. In plants, the most common mode of multiplication is the subdivision of the original cell into two halves. Sometimes the new cells originate in little bud-like prominences on the surface of the parent cell, which, after a time, become detached and form cells. Cells have properly a spheroidal or rounded shape, but they assume various forms from coming in contact with other cells. Certain of the animal tissues, in their earlier conditions, appear in form of a congeries of cells, almost entirely resembling the vegetable cells, and in their subsequent transformation pass through a series of changes resembling those that occur in vegetable development. In animals, as in plants, there are two principal ways in which cells may be developed; namely, within the cavity of a previously existing cell, in which case the process is said to be *endogenous*; or in the midst of a plastic fluid, or *blastema*, probably containing cell-germs, which has been prepared or elaborated by cells of a previous generation, but which has been set free by their rupture. The nucleus seems to perform a much more important part in animal than in plant cells, in which, indeed, as a rule, it is absent; and even in animal cells it is often wanting. It is a small round or oval body in the interior of the cell, sometimes lying free, but at other times attached to the cell-wall, and averaging in diameter, in the animal cells, from $\frac{1}{4000}$ to $\frac{1}{2000}$ of an inch. In the conversion of cells into the several tissues, there is in different instances a great difference, not only in the nature and extent of the change which the cells undergo, but also in the condition which these bodies have attained when the process of change commences. In some cases they have already acquired a distinct cell-wall and cavity; in others they never attain the condition of cells strictly so called, and the process of transformation begins while they may be said to be but in a nascent state. The following are the principal modes in which cells or their elements are metamorphosed:—1. Increase in size and change of figure; 2. alteration of substance and of contents; 3. division into fibrils; 4. changes in the relation of cells to each other; 5. formation of membranes and fibres from the blastema, without the intervention of actual cells; 6. changes in the nuclei of cells; and 7. ulterior changes in the blastema. Two or more of the processes here mentioned may occur in the same cell.—*Ref.* Kölliker's *Manual of Human Histology*; Von Mohl's *Anatomy and Physiology of the Vegetable Cell*; Carpenter's *Principles of Physiology*; Quain's *Anatomy*.

CELLULAR TISSUE, *sel'-lu-lar*, in Anat., is the old name given to what is now commonly known as areolar, reticular, or connective tissue. It is composed of a large number of small transparent fibrils, each about $\frac{1}{4000}$ of an inch diameter, crossing each other in all directions, and leaving small open spaces, or *areolæ*; whence its name of areolar tissue. This is one of the most extensively diffused of all the tissues of the human body, forming the connecting medium of all the others. It is very sparingly supplied with blood-vessels, and no nerves have been found distributed to it.

CELLULAR TISSUE, in Bot. (*See* TISSUE.)

CELLULARIS, *sel'-u-li-re.*, in Bot., plants composed of cellular tissue only, forming one of the two great subkingdoms in De Candolle's system of classification.

CELOSIA, *se-lo'-si-a*, in Bot., a gen. of plants belonging to the nat. ord. *Amaranthaceæ*. Several species have bright-coloured persistent flowers, and are cultivated in our gardens. The best-known is *C. cristata*, the cock's comb.

CELT, *selt* (Lat. *celtis*, a chisel), in Archæol., is the name given to certain instruments of stone or bronze, used by people in the earliest state of civilization, and found chiefly in tumuli and other early earthworks in Western Europe. The term has been somewhat loosely applied to various kinds of cutting instruments; but it is now generally restricted to chisels or small instruments of a similar character. Some of the stone celts are extremely rude and inartificial, but others are beautifully shaped and highly polished. They vary considerably in size, but are commonly about six inches in length, and generally bear some approximation in shape to an incisor tooth. Bronze celts belong to a somewhat higher state of social progress, and present a greater diversity of form than the stone celt. There are numerous examples of both kinds in the British Museum.—Ref. *English Cyclopædia*—Arts and Sciences.

CELTIBERIANS, *selt'-i-be'-re-ănz*, or *kelt'-i-be'-ri-ănz*, a people of ancient Spain, who are supposed to have been descended from the Celts of Gaul, who, having immigrated into Spain, became mixed with the native Iberians; and thus their descendants became distinguished for the best qualities of both peoples. They inhabited a large inland district of Spain, corresponding to the S.W. portion of Aragon, nearly the whole of Cuenca and Soria, and a large part of Burgos. They were a brave and warlike people, equally distinguished as cavalry

and as foot-soldiers, and proved formidable antagonists both to the Carthaginians and Romans. They were subdued by Hannibal with difficulty; and, after having submitted to the Romans in the second Punic war, they subsequently revolted against them. It was not till after the wars of Sertorius that they were finally subdued, and began to adopt the Roman language and manners.

Celtic Architecture, *selt'-ik*, or *kelt'-ik*.—This term is sometimes applied to the rude attempts at building in stone which were made by the Celts of Gaul and Britain. They consist chiefly of Druidical remains in the form of temples and cromlechs. The temples were huge blocks of stone set up in a circle, in a vertical position, which support others placed horizontally upon them, as imposts or lintels. Some of these stones bear traces of the chisel, and the upright and transverse blocks were often fitted together with mortise-and-tenon joints. The cromlechs, which consist externally of a large block supported on three or four smaller ones, were supposed to have been altars on which the Druids sacrificed human and other victims; but they have been found to be monumental records covering cavities below the surface of the earth, in which bones of men and animals, and stone implements, have been discovered. The finest Druidical circles or temples that still remain tolerably perfect are those of Stonehenge and Avebury, in Wiltshire, and of Carnac, near Auray, in the department of the Morbihan, in the north-west of France. Cromlechs are to be found in many parts of the British isles, the Channel Islands, France, and other parts of Europe. The most remarkable in this country are at Plas Newydd, in Anglesey, and near Aylesford, Kent, the latter of which is known as Kit's Coty House.

Celtis, *selt'-is*, in Bot., a gen. of trees belonging to the *Ulmaceæ*, or Elm order. The fruit of *C. occidentalis*, which is commonly known as the Sugar-berry or Nettle-tree, has a sweetish, astringent taste, and has been used with some success in dysentery. *C. orientalis* has aromatic properties.

Celts, or Kelts, *selts, kelts* (Lat. *Celtæ*; Gr. *Keltai, Galatai*), an ancient race of people, which at one time appear to have inhabited the greater part of Central and Western Europe. The recent researches of philologists have shown that the Celtic language belongs to the Indo-Germanic group; but at what time they migrated westward is unknown. They appear to have been divided into two great families,—the Gauls, who inhabited Gaul, to whom the name of Celts is more properly applied, and the Cimbri, or Cimmerii, who appear to have migrated from Asia at a later period, and spread themselves over Germany to the Ocean. Herodotus, the father of history, mentions the Celts and Cynetæ as inhabiting the remotest parts of Europe towards the setting of the sun, near the sources of the Danube. A great immigration of the Gauls into Italy took place in the reign of the Roman king Tarquinius Priscus, under the leadership of Belloresus; and at the same time another horde of them, under Segovesus, crossed the Rhine, and, advancing as far as the Hercynian forest, settled along the Danube, and in the country now called Bohemia. At a very remote period the Celtæ had also passed into Spain, where their descendants became afterwards known as Celtiberians; and they likewise crossed over into Britain. Several subsequent irruptions of the Gauls took place into Italy; and in B.C. 390 the city of Rome was taken and burned by these barbarians. About 280 B.C. a vast multitude of Celts or Gauls invaded Macedonia and Greece, spreading terror and devastation everywhere before them, and, after making immense booty, returned homewards. An invasion of barbarians from the east of the Rhone and north of the Danube, about B.C. 113, first made the Romans acquainted with the Cimbri. Some years later the Teutones and Cimbri attacked the Belgæ; and Cæsar states that the Belgæ were the only people of Gallia who prevented the Cimbri and Teutones from invading their territory. The power of the Celts in Europe was, however, on the decline long before the time of Cæsar. The Gauls of Italy had been subjugated by the Romans; and in Gaul they were pressed on one side by the Belgæ and Germans, and on the other by the Iberians. The remains of the ancient Celts are now found in Brittany, Wales, the Highlands of Scotland, the Isle of Man, and Ireland. The Celtic tongues are the Scotch and Irish Gælic, the Manx, Welsh, Cornish, and Breton. The Basque, it is now generally agreed, is not a dialect of the Celtic. We know nothing of any original Celtic alphabet, nor of any works in that language; but in Gaul they seem to have become acquainted with the Greek language from the colony of Massilia (Marseilles). The Celts were men of large size, fair complexion, blue eyes, and light-coloured hair. They were of a fickle disposition, warlike, vain, boastful, and clamorous. Their government seems to have been a kind of aristocracy, their chiefs forming a senate or supreme council. The Druids formed a powerful body among them, being the guardians and interpreters of their laws, as well as the ministers of their religion. They were also the instructors of the people in all kinds of knowledge with which they were acquainted. Their bards or poets had also great influence among them, and used to accompany their songs with instrumental music on harps and the like. The Celts had no temples nor images, but worshipped their deity in groves and forests. Their religion seems to have been originally a sort of Theism; but they afterwards adopted some of the gods of the Germans and other nations. It is undoubted that they offered human victims in their sacrifices.—*Richard's Eastern Origin of the Celtic Nations*, edited by Dr. Latham, 1857; Smith's *Dictionary of Greek and Roman Geography*; *English Cyclopædia*—Arts and Sciences.

Cement, *se-ment'*, a term applied to those building materials of a calcareous and silicious nature which, when mixed with water, set quickly. By this property they are distinguished from mortars, which require time to harden. Natural cements are obtained by calcining argillaceous limestone containing silicate of alumina. The stone being burnt, the carbonic acid is driven off, and when water is added, a hydrated silicate of lime and alumina is formed. Cements thus made are known in England as Roman cements, and are prepared from the septaria found in the lias and London clays. Artificial cements of this character are made by calcining carbonate of lime and fine river mud together. *Portland cement* is made in this way. *Keene's cement* is obtained by recalcining gypsum which has been once burnt, and afterwards saturated with alum-water. *Parian cement* is made in the same way, borax being substituted for alum. Oil cements, consisting of lime, powdered tiles, litharge, and oil, were formerly much used; but they do not stand the London atmosphere, nor have they any powers of resisting force. *Temporary cements* are used by different workmen for holding their works while in progress. Thus, in lens-grinding, the glass plate is held to the tool by a mixture of resin, beeswax, and whiting. In joining gas-pipes, white or red lead, ground with oil, is used. *Electric cement* is composed of 1 of beeswax, 5 of resin, and 1 of red ochre. For engineering works, a mixture of two ounces of sal-ammoniac, one ounce of sulphur, and sixteen ounces of iron filings is made, and when required for use, it is mixed with twenty parts of iron borings or filings, and made into a paste with water, and applied immediately. A sulphide of iron gradually forms, making the joint as strong as the iron of which the parts are composed. A good cement for mending china is made by mixing fresh plaster of Paris with white of egg and applying it immediately. White lead, carefully applied, also answers the purpose very well.

Cementation, *se-men-tā'-shun*, the process of converting iron into steel by being heated, in the form of bars, for several hours with charcoal-powder in a chest of refractory clay. The result of the operation is called *blistered steel*, from the appearance of the surface. (*See* Iron and Steel, and Blistered Steel.)

Cemetery, *sem'-e-ter-e* (Gr. *koimeterion*, from *koimao*, I sleep), denotes literally a dormitory, or place for sleeping in, and was applied by the early Christians to a place of burial, as indicating their belief in a future resurrection. (*See* Burial.)

Cenotaph, *sen'-o-taf* (Gr. *kenos*, empty, and *taphos*, a tomb), is an empty tomb, a monument erected in memory of a deceased person, apart from the body.

Censer, *sen'-ser* (Fr. *encenser*, to perfume), a vase or sacred vessel used for burning incense. The Jewish

censer was a sort of chafing-dish with or without a handle, and probably of various forms. Josephus tells us that King Solomon made 20,000 gold censers for the temple of Jerusalem to offer perfumes in, and 50,000 others to carry fire in. Censers were also much used by the Greeks and Romans, being by the former termed *thumiaterion*, and by the latter *thuribulum*. They are still used in the service of the Roman Catholic church

CENSORS, *sen'-sors* (Lat. *censeo*, I take account of), two officers among the ancient Romans, first appointed by the fifth king of Rome, Servius Tullius. After the abolition of the monarchy, the office of censor was held by the consuls. Special magistrates were ultimately elected; these were all patricians until 351 B.C., when Caius Marcius, a plebeian, was elected. A decree was afterwards issued, which enacted that one of the two censors should always be a plebeian. The duties of the censorship were,—to take the census and register the property of the Roman people; to superintend and watch over the public morality, and administer the public finances. The office was looked upon as the highest in the state next to the dictatorship, and was originally held for the term of five years, but afterwards only for a year and a half. The decisions of the censors were received with much reverence. As the regulators of public morality, they exercised absolute powers, which were much dreaded. In time these powers were extended from public investigation to private, and the censors could inflict disgrace on any person whose conduct they disapproved of, either in regard to business or domestic matters. In the regulation of the public treasury they took upon themselves the collection of all taxes, rates, and tithes; they also prepared the budget or statement of the national finances.

CENSORSHIP OF THE PRESS denotes that kind of examination by government officials, to which printed publications are in some countries subjected, previous to their coming before the public. Soon after the invention of printing, the Church became aware of the dangerous character of the mighty power that had sprung up. The priests felt that the diffusion of knowledge would be destructive of their influence over the people; and hence they exerted all their power against it. They endeavoured first to prohibit the reading, and afterwards they placed restrictions on the printing of books. An ecclesiastical superintendence of the press was introduced in 1179 and 1196; but was more completely established by bull of Leo X. in 1515. In this the bishops and inquisitors were required to examine all books before they were printed, and thus to prevent the promulgation of heretical opinions. This principle of censorship the Church of Rome still adheres to, and enforces in all countries where she has the power to do so. For the benefit of those countries in which she had not the power to enforce her wishes, indices were prepared of such books as were not to be read under penalty of church censure. The *Index Librorum prohibitorum* was commenced by the council of Trent (1546). For works of an established character which cannot well be prohibited, there is an *Index Expurgatorius*, denoting that they are only to be read after being corrected or expurgated. In those countries where Protestantism established itself, a censorship of the press was also maintained, but in a more modified form. In England it was the practice to license books to be printed, the licensing power being chiefly monopolized by the bishops. Hence, we frequently see the word *Imprimatur* (let it be printed) on old books. It was abolished in this country in 1694, and now any work may be published; but the parties concerned will be amenable to law if it contain anything illegal or libellous. There are different modes of censorship; but the more common are when the MS. has to be submitted to the examination of a public officer or licenser, who deletes any objectionable passages, or when the work is examined after being printed, and found to contain anything objectionable, its sale is prohibited, and the author or publisher liable for prosecution. (*See* LIBERTY OF THE PRESS.)

CENSURE, *sen'-shure*, is a judgment condemning some book, action, or person. *Ecclesiastical censure* is a spiritual punishment inflicted by some ecclesiastical judge, whereby a Christian is deprived of communion with the Church, or a clergyman prohibited from exercising the accordotal office. These censures are excommunication, suspension, and interdict.

CENSUS, *sen'-sus* (Lat. *census*, from *censeo*, I tax, value, or esteem), denotes an enumeration of the people, such as is now made at stated periods in most of the countries of Europe. The practice of numbering the people appears to have prevailed in certain countries from a very early period. We are told that about 600,000 men of Israel went up out of Egypt, besides women and children, and there is reason to believe that they had borrowed the practice from the Egyptians, among whom they had been living. At a later period, David incurred the anger of Jehovah by numbering the people. Joab and the captains of the host were employed to do this work, and it occupied them nine months and twenty days, the number of valiant men in Israel being 800,000, in Judah 500,000. In these early times, the object of numbering the people was chiefly to ascertain the number of fighting men that could be brought into the field; and hence we find that no account is taken of women and children. At a later period, among the Greeks and Romans wealth comes to be regarded as an important principle in the state, and the census was taken more for ascertaining the wealth of the people, in order to adjust the rights and duties of citizenship among the different classes. Previous to the time of Solon, a citizen's rights at Athens depended upon his ancestry; but that lawgiver substituted property for birth, and made a citizen's rights and duties dependent upon his property. Accordingly, all the citizens were divided into four classes, according to their annual income. By the laws of Servius Tullius, the Roman citizens were divided into six classes, according to the amount of their property. The Roman census was taken with great care, and was very minute and full. It indicated not only the number and respective classes of all free persons, but their domestic position as husbands and wives, fathers and mothers, sons and daughters. The census, which at first was employed to ascertain the military strength of a people, and afterwards their wealth, may now be said to have in view the much more important object of ascertaining, in its widest sense, the social condition and progress of a people, with a view also to finding out those conditions, physical and moral, upon which social progress and well-being depend. It is not a little remarkable, that the first census of this country dates only from the beginning of the present century (1801). Previous to that time, the most vague ideas prevailed as to the amount of its population. Since then a census of the people has been taken decennially, and much valuable information has in this way been collected as to the age, rank, sex, condition, &c., of each person. The last census was taken on 7th April, 1861, and gave the total population of the United Kingdom as 29,334,787. A schedule was left at each house on Saturday, 6th April, and called for on Monday, the 8th, to be filled up, with particulars of every person who passed the night of Sunday in the house. No fewer than 44,451 enumerators were employed in distributing and collecting the schedules, besides 4,249 superintending officers, and the Custom-house officers and others employed to enumerate persons in vessels. In other countries, the period between the taking of each census varies generally from three to ten years; being three years in Prussia and Austria, five years in France, and ten in the United (?) States of America.

CENT, *sent* (Lat. *centum*, a hundred), is a term frequently used in commerce to denote a certain rate or ratio, being so much per hundred. Thus five per cent. profit or loss upon a transaction implies that the amount of profit or loss is in the proportion of £5 on every £100. This rate is termed the *per-centage*. Cent is also the name of certain small coins in various countries, being the hundredth part of other coins: thus in the United States the cent is the $\frac{1}{100}$ part of a dollar, or about one halfpenny English; in France the cent is $\frac{1}{100}$ part of a franc, about $\frac{1}{4}$ of a penny English; and in Holland the cent is $\frac{1}{100}$ part of the guilder, or $\frac{1}{12}$ of a penny English.

CENTAURS, *sen'-tors* (Gr., bull-slayers), a wild race of men who in ancient times inhabited Mount Pelion, in Thessaly, and who were fabled to have been half men and half horses,—the upper part of the figure being that of a man, the lower that of a horse. They are

believed to have been skilful horsemen, and the fable probably arose from the man and horse being mistaken for one animal. Their chief occupation was bull-hunting; whence they received their name. They are celebrated in Greek mythology on account of their war with the Lapithæ and their contest with Hercules.

CENTAURUS, *sen-tor'-us* (Lat., the Centaur), a constellation in the southern hemisphere, between those of Lupus and Ara; it contains about thirty-five stars, one of which is of the first magnitude.

CENTILOQUIUM, *sen-ti-lo'-kwi-um* (Lat.), is a term applied to collections of one hundred sentences or sayings; as the Centiloquium of Hermes, containing one hundred aphorisms or astrological sentences falsely ascribed to Hermes Trismegistus, and the Centiloquium of Ptolemy, a famous astrological work.

CENTIPEDE, *sent'-te-pede* (Lat. *centum*, a hundred; *pedes*, feet), (*Scolopendra*), a gen. of carnivorous *Annulosa*, distinguished by possessing antennæ of fourteen joints or upwards; a mouth composed of two mandibles, a quadrifid lip, two palpi or small feet, united at their base, and a second lip formed by a second pair of dilated feet joined at their origin, and terminated by a strong hook, having an opening beneath its point, through which a strong poison is ejected. In the West-India islands and the hotter parts of America the centipede is regarded very seriously as a pest. They attain a length of five or six inches, and very frequently find their way into beds. They will endeavour to escape when a light is brought into the room, but, if molested, will turn and bite, the bite immediately producing inflammation and fever. The common English centipede, however, is a harmless thing, not exceeding an inch in length, and for the most part hiding under the decayed bark of trees and among old lumber.

CENTO, *sen'-to* (Gr. *kentron*, a thing of patches), is a literary composition formed of verses or passages from one or more authors, disposed in a different order, and arranged so as to bring out a different meaning. Considerable dexterity was frequently displayed in the combining of passages of different authors so as to form a regular and connecting whole. Thus there were in early times *Homero-centones* and *Centones Virgiliani*. It was also a favourite amusement in the Middle Ages.

CENTRAL CRIMINAL COURT, *sen'-tral*, a court established in 1834 for the purpose of trying cases of treason, murder, felony, and misdemeanour committed within the city of London, the county of Middlesex, and parts of Essex, Kent, and Surrey. It is also authorized to try offences committed on the high seas and other places within the jurisdiction of the Admiralty of England. The court of Queen's Bench may also order a certain class of offenders to be tried here. The area over which the jurisdiction of the Central Criminal Court extends is nearly one hundred and thirtieth part of the area of England and Wales; but the proportion of population is only one-seventh, when compared with that of England and Wales. The district included in the jurisdiction, and mentioned above, is, for all purposes under the act by which it was established, considered as one county, and in all indictments and presentments the venue runs, "Central Criminal Court to wit." The judges may be selected from a very extensive list. They may consist of any two or more of the following persons:—the lord mayor of the city of London for the time being, the lord chancellor, the lord keeper of the great seal, and all the judges of her majesty's courts of Queen's Bench, Common Pleas, and Exchequer, for the time being; the chief judge and the two others in Bankruptcy, the judge of the Admiralty, the dean of the Arches, the aldermen of the city of London, the recorder, the common serjeant, the judges for the time being of the Sheriff's Court of the city of London, and any person or persons who hath, or shall have been, lord chancellor, lord keeper of the great seal, or a judge of any of her majesty's superior courts at Westminster; together with such others as her majesty, her heirs and successors, shall from time to time name and appoint by any general commission. On account of the extent of this list, it is found unnecessary to issue a commission every time the sessions are held; and the period of holding the sessions is not interrupted when the judges of the Westminster courts are on circuit. At the Old Bailey, and the New Court adjoining, the sessions are held twelve times a year, and the judges generally selected are two common-law judges and the recorder of the city of London. The sheriffs of the city of London and of the counties of Middlesex, Essex, Kent, and Surrey, summon the jurors according to the district in which they live. Jurors from Essex, Kent, and Surrey, who have served upon any jury at this court, are exempt, during the ensuing twelve months, from serving upon any jury in any court held in the county in which they reside, except the sessions of the peace.

CENTRAL FORCES are those forces which cause a body in motion to tend towards or recede from the centre of motion. The first law of motion is, that a body must continue for ever in a state of rest, or in a state of uniform and rectilineal motion, if it be not disturbed by the action of an external cause. Upon this law the doctrine of central forces is founded. It therefore considers the external forces which act upon a body in motion when there is an alteration either in its velocity or direction round a central point. It also considers the law of the force by which a body moves round another in a known curve, and solves various mathematical problems. Gravity, as exemplified in the force which acts on all bodies from the centre of the earth, is the simplest and most general example of a central force. Kepler and Newton gave much time and labour to the study of central forces.

CENTRALIZATION, *sen-tral'-i-zai-shun* (Gr. *kentron*, a point, the centre), denotes generally the bringing or reducing to a centre or within small compass, and is frequently applied in politics to the tendency to bring together all the departments of state administration to one centre,—to remove all local offices to the capital.

CENTRE OF GRAVITY, *sen'-ter*, a term employed to denote a certain point in the interior of a body, or system of bodies rigidly and invariably connected, so situated that any plane whatever which passes through it divides the body into two segments of equal weight.

CENTRE OF GYRATION is that point in a rotating body, or system of bodies, at which, if the whole mass were collected, a given force applied would produce the same angular velocity that it would have communicated to the system in its first condition.

CENTRE OF MAGNITUDE or FIGURE is that point in plane figures and curved surfaces where, supposing their areas had weight, they would balance themselves. Thus, the centre of magnitude of a circle would be its own centre. The same term is applied to any point which bisects all lines that pass through it, and are terminated by the circumference.

CENTRE OF OSCILLATION is that point in a body oscillating about a fixed axis, into which, if the whole mass were collected, the body would vibrate through a given angle in the same time as in its first condition.

CENTRE OF PERCUSSION is that point in a solid body, or system of bodies, into which, if the whole mass were collected, the greatest possible effect could be produced by striking it against another body. It may also be defined as a point in the axis of a moving body at which, when striking an immovable obstacle, the body rests in equilibrio, without inclining to either side or acting on the centre or axis of suspension.

CENTRE OF PRESSURE of a fluid pressing against a surface, is that point at which, if a force equal to the pressure were applied in an opposite direction, the surface would remain at rest.

CENTRIFUGAL FORCE, *sen-trif'-u-gal* (Gr. *kentron*, centre; Lat. *fugio*, I flee), is the force that urges a revolving body to fly off in a straight line instead of describing a curve. The moon is held in her orbit round the earth by centripetal force, and a stone flies from a sling by centrifugal force.

CENTRING, or CENTERING, *sen'-tring* (Gr. *kentron*, the centre, a point), a term used to denote the frame-work on which the bricks or stones that are used to form an arch or vaulted roof are supported during the process of construction. For small arches, such as those of doors and windows, it simply consists of two boards cut to the required shape, and kept apart by slips nailed to the edge of each, which correspond in length to the thickness of the wall in which the arch is placed; but for bridges with arches of great span and

breadth, a more elaborate system of framework is required, which must be put together in such a manner that it will offer a sufficient resistance to the weight placed upon it without bending perceptibly beneath it, and that it may be readily taken away when the arch is completed, care being taken to avoid giving heavy blows in removing it, which may shake and injure the fresh masonry. (*See* Bridge.) In building arches of brickwork or small stones, the frames are placed five or six feet apart, and tied together with braces, and on these thick narrow planks are placed, fitting closely together to support the bricks; but when large stones are used, close boarding is not required, and they are supported on what are technically called "laggings." When the span is of great size, the centering consists of a great number of vertical frames or trusses, disposed in such a manner as to offer effectual resistance to the strain that is brought to bear on them in the direction of their length; and these frames are strengthened with horizontal beams and cross braces, the whole forming a rigid network of timber. In making frames for centerings, it must be carefully contrived that the load shall not act in a direction transverse to the grain of the wood that is used; the pressure must, therefore, be carried throughout the length of the beams, some of which, in the usual method of construction, are directed against the abutments which are to support the arch, and sustained by them, and others which tend in an inward direction, towards the centre, are supported and prevented from yielding by the longitudinal pull of other beams that cross them obliquely. Shoes of cast-iron, that receive the ends of the beams, are used in modern centerings to obviate the necessity of making tie-joints, which weaken the beams. Care must be taken to prevent the centering from rising at the crown, which it is liable to do if it be not skilfully made, on account of the weight of the haunches of the arch tending to push the crown upwards. The centering used for Waterloo bridge, designed by Rennie, is one of the best examples in which the frames are supported by the abutments only. In building Chester and Gloucester bridges, Mr. Hurrison, the engineer of the former, supported his centering on temporary piers built in the bed of the river; while Telford, who built the latter, supported his on piles. Flexible centres, so called because the timbers of which they are composed can move freely on one another, are seldom used in the present day, because they invariably rise at the crown from the weight of the haunches, and the regularity of the curvature of the arches cannot be relied on. The arches of the beautiful elliptical bridge of Neuilly, built by Peyronnet, were constructed on centerings of this description.

Centripetal Force, *sen-trip'-e-tăl* (Gr. *kentron*, centre; Lat. *peto*, I seek), is the force by which a body in motion is kept revolving round a central point, instead of flying off at a tangent to its orbit.

Centaury. (*See* Erythræa, Sabbatia.)

Centuries of Magdeburg, *sen'-tu-rees*, the name of the first great Protestant history of the Church, and is so called from being divided into centuries, each volume taking up 100 years, and from Magdeburg, the city where it was prepared. It was projected by Matthias Flacius, about 1552, and the first volume was published at Balo in 1559. Thirteen volumes have appeared, bringing the history down to 1300. It is a work characterized by great judgment, learning, and fidelity. Each century is treated under sixteen distinct heads or chapters, viz.:—1. General View of the Period; 2. Extent and Propagation of the Church; 3. Persecution and Tranquillity of the Church; 4. Doctrine; 5. Heresies; 6. Rites and Ceremonies; 7. Government; 8. Schisms; 9. Councils; 10. Lives of Bishops and Doctors; 11. Heretics; 12. Martyrs; 13. Miracles; 14 Condition of the Jews; 15. other Religions; 16. Political Condition of the World. In the preparation of the work there were five general directors and ten paid agents, seven of whom, well-informed students, were employed in collecting materials; two of greater learning and experience arranged the matter thus collected, and submitted it to the directors, after which an amanuensis was employed to make a fair copy of the whole.

Cephalis, *sef-ă-l'-lis* (from Gr. *kephale*, head), in Bot., a gen. of plants belonging to the nat. ord. *Cinchonaceæ*. The annulated root of *C. ipecacuanha* is the official ipecacuanha of the British pharmacopœias. It is known as *true*, *annulated*, Brazilian, or Lisbon ipecacuanha, and is the only sort commonly met with in this country. It is collected in all seasons of the year, but chiefly from January to March, and is imported from Rio Janeiro, Bahia, and Pernambuco. When given in large doses, it acts as an emetic and as a purgative: in small doses it is expectorant and diaphoretic. Its peculiar properties are principally due to an alkaloid called *emetina*.

Cephalaspis, *sef-ă-las'-pis* (Gr. *kephale*, head, *aspis*, shield), in Geol., the Buckler-head, a fish of the lower Old Red Sandstone or Devonian period, so called from having the bones of the head united into a single shield-like case.

Cephalic, *se-făl'-ik* (Gr. *kephalikos*), is applied to something pertaining to the head. Thus, cephalic medicines are such as are administered for disorders of the head.

Cephalitis, *sef-ă-lī'-tis* (from Gr. *kephale*, the head), in Med., inflammation of the brain. (*See* Brain, Diseases of the.)

Cephalopoda, *sef-ă-lop'-o-dă* (Gr. *kephale*, head; *pous*, foot), a class of molluscous animals, more highly organized than any other, presenting undoubted rudiments of an internal skeleton, and containing secretive, digestive, respiratory, and generative organs. They are also distinguished by the possession of locomotive organs around the head in the shape of prolonged tentacula, which project forward and more or less conceal the mouth.

Cepheus, *se'-fe-us*, a constellation of the northern hemisphere, midway between the Polar star and Cygnus. The principal stars in this group are of the third magnitude only.

Cepi Corpus, *se'-pi kor-pus*, is a return made by a sheriff upon a *capias*, or other process to the like purpose, that he hath taken the body of the party named in the process, as he was thereby commanded.

Cepola, *sep-o'-lă*, a gen. of fish, the bodies of which are much compressed and elongated. (*See* Ribband Fish.)

Cerambycidæ, *se-răm-bī'-se-de*, a family of coleopterous insects, distinguished by the inordinate length of their antennæ. Generally they are of elegant form, and are found in forests and woods, on the trunks of trees, but rarely on flowers. Some of the exotic species are remarkable for emitting after death a scent something like attar of roses. The only scented Cerambycid known in England is the musk-beetle (*Cerambyx moschatus*). It is about an inch long, and of a fine green colour. It is found on willows in the neighbourhood of London. There is a very splendid collection of these insects in the British Museum.

Cerastes, *se-răs'-tees* (Gr. *kerastes*, horn), a snake distinguished by two horny protuberances on its head, and hence known as the horned snake. It is said to exist almost entirely without water. It is found in Libya, Arabia, &c.

Cerasus, *ser'-ă-sus*, in Bot., a gen. of trees belonging to the nat. ord. *Rosaceæ*, sub-ord. *Amygdaleæ*. Several species or varieties of this genus produce the well-known fruits called cherries. The varieties usually cultivated in our gardens are supposed to have been derived originally from two wild species, *C. avium* and *vulgaris*. Both have white flowers in clusters or nearly sessile umbels, and both are generally regarded as natives of Britain and of the middle and south of Europe. The timber of *C. avium* is valuable for the purposes of the cabinet-maker, turner, and musical instrument maker; the straight small branches are used for making pipe-stems, and the leaves have been used as a substitute for tea. The bark of the species *C. capollin* possesses astringent and febrifugal properties; that stripped from its root is used in Mexico as a remedy against dysentery. The leaves of *C. caproricida* contain so much hydrocyanic (prussic) acid as to prove poisonous to cattle that feed upon them. Most parts of the species *C. Lauro-cerasus*, the cherry-laurel, but especially the leaves and seeds, are poisonous. The poisonous effects are supposed to be owing to a volatile oil containing hydrocyanic acid. Even when bruised, the leaves evolve a vapour which is destructible to insect life: hence some gardeners make use of these

leaves for killing blight. Cherry-laurel water, obtained by distilling the leaves with water, is used medicinally for similar purposes as hydrocyanic acid. The plant is common in our gardens, and is popularly known as the "laurel," though it is not a member of the true laurel family. The kernels of the species *C. occidentalis*, a native of the West Indies, and others, are used for the purpose of flavouring liqueurs, such as cherry-brandy, Kirschenwasser, Maraschino, and Noyeau. The species *C. Padus*, or bird-cherry, has similar properties, though less powerful, to those of the cherry-laurel. *C. virginiana*, the choke-cherry, has astringent and febrifugal properties, and its fruits are commonly mixed with pemmican in North America. *C. serotina*, the wild or black cherry of the western states of America, is a beautiful and useful tree. The cherries are sometimes eaten, but are not very palatable. The wood is esteemed by cabinet-makers, having a close grain, and taking a very high polish. The inner bark forms the tonic and sedative drug which has been extensively prescribed of late in America, and which is just beginning to receive the attention of European practitioners. It is used as a tonic instead of cinchona, and as a sedative for the alleviation of general and local irritation. It is taken from any part of the tree, but preferably from the root. It has a lively cinnamon-colour, and, when fresh, a characteristic odour, like that of bitter almonds.

**Ceratin**, *se'-rā-tin* (from *cerasus*, the scientific name of the cherry-tree), the portion of the gum of the cherry-tree which is insoluble in cold water.

**Ceratonia**, *ser-ā-tō'-ni-ā*, in Bot., a gen. of leguminous plants of the sub-ord. *Cæsalpiniæ*. The most important species is *C. siliqua*, the ripe fruit of which is known under the names of carob, locust, St. John's bread, and Algaroba bean. Its pulp has a very sweet taste, and is supposed to have been the food of St. John in the wilderness. The fruit is now largely imported into this country for making cattle-food.

**Ceratophyllaceæ**, *se-rā-to-fil-lā'-se-e*, in Bot., the Hornwort fam., a nat. ord. of dicotyledonous plants in the sub-class *Monochlamydeæ*. There is but one gen., *Ceratophyllum*, the species of which are aquatic herbs, with verticillate leaves and minute monœcious flowers, natives of the northern hemisphere. Their properties and uses are unknown.

**Cerdon**, *ser'-don*, an ancient sect of heretics, so called from one Cerdon, who flourished at Rome about A.D. 140. They held that there were two principles, the one perfectly good, the other perfectly evil, and that between them was an intermediate kind of deity of a mixed nature, who created this lower world, and administers rewards and punishments. Their opinions generally resembled those of the Manichæans. (*See* Manichæans.)

**Cerebellum.** (*See* Brain.)

**Cerebric Acid**, *ser'-e-brik* (Lat. *cerebrum*, brain), an acid of a peculiar character found in the brain of animals, partly uncombined, and partly in the form of cerebrate of soda. It is a white solid, of a fatty nature, and may be obtained in crystalline grains, which are soluble in boiling alcohol and ether, but insoluble in cold ether. It is insoluble in water, but swells up when left in that liquid for several hours. Its composition has not yet been thoroughly investigated. This acid was formerly called Cerebrin.

**Cerebrum.** (*See* Brain.)

**Cerem**, *se'-rem* (Lat. *cera*, wax), a solid waxy body obtained from beeswax, which is supposed to be identical with paraffin.

**Cerements**, *sere'-ments* (Lat. *cera*, wax), were cloths dipped in melted wax, with which dead bodies were enfolded when they were embalmed.

**Ceremonies, Master of the**, an officer of the court, instituted by James I. to attend to the proper presentation of ambassadors, and other persons of quality, to the sovereign. The gentleman filling this office is necessarily a person of good address and master of several languages. He attends at court on all occasions of state ceremonial, and has under him an assistant master, or deputy.

**Ceremony**, *ser'-e-mo-ne* (Fr. *cérémonie*; Lat. *ceremonia*), is applied to certain forms or rites by which an act is rendered more grand or impressive. Ceremonies may be said to be of four kinds:—1. social; 2. sacred; 3. state; 4. international. Social ceremonies will be noticed under Etiquette, and state ceremonies under such heads as Coronation, Presentation, Opening of Parliament, &c. *Sacred ceremonies* are defined to be "the external rites and manner in which the ministers of religion perform their sacred functions." In respect of ceremonies there is a very marked difference between the old dispensation and the new. The former, or Mosaic dispensation, abounds with rites and ceremonies; the latter, or Gospel dispensation, is remarkable for the want of them. In what may be termed the childhood of the human race, numerous stringent laws and regulations are laid down for their guidance, and sensual representations are employed to make a deeper and more lasting impression upon the mind. Under the Christian economy, when men may be said to have been set free from a state of pupilage, his mode of worshipping the Creator was left very much to himself, and he was taught to seek within himself for those directions by which he might best attain a holy life and fulfil his high destiny. The great gospel law laid down on this subject was, "Let each *be persuaded in his own mind*, and so let him act." How far rites and ceremonies of human appointment may be employed in the worship of God is a very important question, and one which has given rise to much discussion. Of the two great sections of the Christian church, the Roman Catholic and the Protestant, the one is characterized by its attachment to, the other by its rejection of, human rites. One great peculiarity of the Christian religion is its striking adaptation to fallen human nature. Its laws are founded upon the necessities of our nature. The highest and purest worship of God is undoubtedly that of the heart; but in man's present infirm and imperfect condition, the heart may be greatly influenced by the senses; and hence the proper object of all religious rites and ceremonies is to impress and elevate the heart through the feelings. All religion must in some measure be dependent upon external forms; and so high an authority as St. Augustine declares that "no religion, either true or false, can subsist without some ceremonies." The great difficulty is to determine the length to which it is proper to go in accommodating religious ceremonies to weak human nature. When, from being a means of worship, they come to be regarded as worship itself, they are worse than useless,—they are pernicious. The Roman Catholics may have gone too far in this direction; but the majority of Protestants seem to have fallen into the other extreme, and to pay too little regard to the externals of religion. But we believe that no general rule can be laid down on this subject, outward rites and ceremonies being much more necessary to some than others. The great rule is for each to be persuaded in his own mind as to what is best for him, and to act accordingly. It has been frequently remarked that there is a striking similarity between many of the Jewish ceremonies and those of the ancient Egyptians; and many have been of opinion that Moses adopted many of them from the Egyptians. This may probably have been the case; and we are also told that many things were permitted to them, on account of the hardness of their hearts. There can be no doubt that many of the ceremonies of the Church of Rome were borrowed from the heathens. *International ceremony.*—Among independent states there exists a sort of international etiquette, according to which certain marks of respect are shown to the states, their rulers or representatives, by other states, and a certain rank or dignity accorded to them. In Europe, in the Middle Ages, frequent disputes took place among the rulers or representatives of the different states, on the subject of precedence. Claims for precedence were advanced on various grounds; as on the form of government, the number of crowns, the titles, achievements, extent of possessions, antiquity of their family, or the length of time that Christianity had been established in their dominions. At the congress of Vienna, the question of rank among the different powers was discussed, and a commission appointed with the view of settling it; but as no agreement could be come to, the matter was allowed to drop. Rulers of equal dignity, when they make visits, concede to each other the precedence at home; at other times they travel incognito, or do not appear on public occasions, or do so

with a reservation respecting their dignity. Emperors and kings style each other "brother," while they call princes of less degree "cousin." To international ceremonies belong—1. Titles of rulers; 2. acknowledgment of the title and rank of rulers; and 3. marks of respect conformable to their rank and title.

**Ceres**, *se'-res*, one of the asteroids that revolve between the orbits of Mars and Jupiter. It is the first of this group of minor planets in order of discovery, and the largest of them, with the exception of Vesta. It was first observed by Piazzi, an Italian astronomer, at the observatory at Palermo, in Sicily, January 1, 1801. The elements of its orbit were calculated by Gauss. It derives its name from Ceres, a heathen goddess that was the object of especial worship in Sicily.

**Cerinthians**, *se-rin'-thi-ăns*, the followers of Cerinthus, were among the earliest of the sects of heretics that sprang up in the Christian church. Cerinthus, according to some, was a contemporary of the apostle John; according to others, he lived in the 2nd century. He was a Jew, and studied philosophy at Alexandria; but the greater part of his life was spent in Asia Minor, where he promulgated his heretical doctrines. What the exact nature of these were it is difficult to say, for the accounts given of them are various and contradictory; but they seem to have much resembled, if they were not identical with those of the Gnostics. (*See* Gnostics.)

**Cerium**, *se'-ri-um*, symbol Ce, equivalent 47, a very rare metal, existing in *allanite*, *cerite*, and *orrine*. It is only known as a grey powder, which becomes lustrous on being burnished. It forms two oxides,—the *protoxide* and *peroxide*, which form a few salts of no importance or interest. They are said by Rumnelsberg to be isomorphous with those of cadmium.

**Cerolein**, *ser'-o-leen*, a greasy body found in beeswax, to which its colour, odour, and tenacity are due. It has an acid reaction, and fuses at 83°. It is soluble in ether, and is but imperfectly known. It is obtained by macerating the wax in cold alcohol, which retains it in solution.

**Cerotic Acid**, *ser-ot'-ik*, an acid contained in varying quantities in beeswax. It is obtained by dissolving the wax in hot alcohol and crystallizing. Genuine beeswax contains about 22 per cent. of *cerotic acid*. Heated with potash, it produces *cerolate of potash* and *ceroic alcohol*.

**Ceroxylon**, *ser-ox'-e-lon*, in Bot., a gen. of palms. The species *C. andicola* yields wax, which is applied to many useful purposes. It is a native of South America.

**Certainty, Certitude**, *ser'-tain-te* (Lat. *certum*, from *cerno*, I perceive), is applied primarily to the state of a person's mind when he feels sure or convinced of anything; but is also applied to the truths or events respecting which this conviction may be entertained. Certainty is *physical* when it is according to the laws of nature; *moral* when in accordance with the common order of things and the received opinions of mankind; and *metaphysical* when springing from intuitive beliefs, as the first principles of natural law. According to the mode in which it is attained, certainty is *immediate* when by sense or intuition, or *mediate* when by reason and demonstration. Some philosophers have made sense the measure and ground of certainty; others reason; and others, as Descartes, self-consciousness.

**Certificate**, *ser-tif'-e-kait* (Fr. *certificat*, from Low Lat. *certus*, certain; *facio*, I make), a testimony in writing as to the truth of a fact, or number of facts. Certificates, for a variety of purposes, are recognized by the law of England. Among these may be mentioned,—the annual certificates of attorneys (*see* Attorney); a bankrupt's certificate of conformity; the certificate of appointment to a bankrupt's estate and effects, granted to the creditors' assignees; the certificate of counsel, in order to enable a client to litigate *in formâ pauperis*; the certificates of the judges belonging to the higher common-law courts at Westminster, granted for various purposes; and the certificate of the registry of a ship granted by the collector, comptroller, or principal officer of the custom-house at the port of registry. This last certificate is held by the captain as a voucher of the character and privileges of his ship as a British vessel.

**Certiorari**, *ser'-ti-o-rai'-ri* (Low Latin, *certiore*), is a writ issued out of the court of Chancery, or a superior court of the common law, directed in the queen's name to the judges or officers of inferior courts of record, commanding them to return the record of a cause or matter depending before them, to the end that the party may have the more sure and speedy justice. It may be had either in criminal or civil cases, unless it be taken away by the express words of some act of parliament, which is very frequently the case where the statute gives jurisdiction to justices of the peace over criminal offences, and in other matters. In criminal cases the court of Queen's Bench has a superintendence over all inferior courts, and may remove the indictments or other proceedings therein depending, and transfer them to its own jurisdiction. The object of the writ is to obtain relief from some inconvenience supposed in the particular case to arise from a cause being allowed to proceed to trial before an inferior jurisdiction, less capable than the superior court of rendering complete and effectual justice, or to quash the orders or proceedings of such inferior jurisdiction. The most usual instances in which the writ is granted in criminal cases are,—1. To consider and determine the validity of indictments and the proceedings thereon, and the finding or verdict of a jury on coroners' inquisitions, and to quash or confirm them as there is cause. 2. Where it is surmised that a partial or insufficient trial will probably be had in the court below, the indictment is removed, in order to have the prisoner or defendant tried at the bar of the Queen's Bench or before the justices at Nisi Prius, or at the assizes; 3. in order to plead the royal pardon; 4. to issue process of outlawry against the offender in those counties or places where the process of the inferior courts will not reach him; 5. to remove orders of justices in quarter or petty sessions, for the purpose of having them quashed. It is also issued when peers are indicted for treason or felony, or for misprision of either, but not for any other offence. Under the writ the indictment is removed into the court of the Lord High Steward of Great Britain, in order that the defendant may be tried by his peers. A certiorari to remove an indictment may be granted at the instance of either the prosecutor or defendant; but before it be granted to any person (except the attorney-general), the application for it must be by motion made in the Queen's Bench, or before some judge of the court; and where the application is made by a defendant, he must, before the writ is issued, enter into a recognisance before a judge of the Queen's Bench, or a justice of the peace, in such sum and with such sureties as the court or a judge may direct, to defend the indictment, and appear to receive judgment if he be found guilty.

**Cerusse.** (*See* Lead, Carbonate of.)

**Cervidæ**, *ser'-vi-de* (Lat. *cervus*, a deer), the Stag or Deer class of animals, a gen. of quadrupeds belonging to the order *Pecora*. The generic character is solid horns, covered, while young, with a hairy skin growing from the top, naked, annual, and branched. There are several species of the *Cervidæ*. (*See* Deer.)

**Cessavit**, *ses-sai'-vit* (Lat., he hath ceased), was a writ which anciently lay by the statutes of *Gloucester* and *Westminster* 2. When a man holding lands of a lord by a rent or other services, neglected or *ceased* to perform his services for two years together, or where a religious house held lands given to it on condition of performing some certain spiritual service, as reading prayers or giving alms, and neglected it,—in either of which cases, if the *cessor* or neglect had continued for two years, the lord or donor, and his heirs, should have a writ of *cessavit* to recover the land itself; *eo quod tenens in faciendis servitiis per biennium jam cessavit*.

**Cessio Bonorum**, *ses'-si-o bon-o'-rum* (Lat., cession of goods), in Scots law is a process by which an insolvent surrenders his property for behoof of his creditors, and is, in consequence, set free from prison or obtains protection. The insolvent, however, is not, as in sequestration, discharged from his debts, for which his goods may be again attached at any future time; his person only is protected from any future proceedings for past debts.

**Cession**, *sesh'-un*, in Eccl. matters, is applied to the voidance of a benefice or dignity in the church, arising

from the accepting of another, which is by law incompatible with it. This voidance takes place, *ipso facto*, upon the acceptance of the second benefice, and the patron may at once, without any express resignation, present a new incumbent and require his admission.

CESTUI QUE TRUST, *set'-e-ke-trust'*, is the person for whose benefit a *passive*, or *active*, or special trust is assigned, and reposed in some other person to execute, and his interest is described as a *trust estate*, which distinguishes it from a *use* on the one hand, and from *legal estate* on the other. (*See* TRUST.)

CESTUI QUE USE is one who has the beneficial ownership or use of land, the legal seisin or feudal tenancy of which is in another, either by express declaration or deed, or by implication, from the nature of the conveyance itself. (*See* USES.)

CESTUI QUE VIE, *set-e-le-ve*, is one for whose life any lands or tenements are granted.

CESTUS, *ses'-tus* (Gr *kestos*, embroidered), a fine embroidered girdle worn by the Greek and Roman women close under the breasts. It was distinct from the zone, which was worn round the loins. Homer ascribes the power of charming and conciliating love to the cestus of Venus, which was covered with alluring representations. When Juno wished to gain the love of Jupiter, she borrowed this girdle from Venus. The cestus, or cestus, was also the name of a gauntlet worn by the Roman pugilists. (*See* CESTUS.)

CETACEA, *se-ta'-se-a* (Gr *ketos*, Lat *cetus*, a whale), an order of the mammalia, which differs from the rest of that class both in form and habits. In ordinary language it is generally classed with the fishes. All the cetacea have a fish-like form, but the tail fin is horizontal, and not vertical, as in fishes. It is moved by very powerful muscles, and is the great instrument of progression. There are no posterior limbs, and even the pelvis is only represented by two small rudimentary bones. The anterior limbs are in nearly all cases adapted for swimming. The bones, however, in the skeleton appear like those of a hand, but much abbreviated and solidified. The head is joined to the body without any apparent neck, and the upper parts of the vertebræ are ankylosed or consolidated. The skin is naked, and some of the species are conspicuously whiskered. The cetacea are viviparous, and suckle their young, towards which they show great affection. They are warm blooded, and breathe by lungs, and inhale air at the surface of the water. (*See* GREENLAND WHALE, SPERM WHALE, DOLPHIN, PORPOISE.)

CETRARIA, *set-ra'-re-a*, in Bot., a gen. of lichens, which includes the well-known Iceland moss. This lichen, which has been named *C. islandica*, is officinal in the British pharmacopœias, and is employed both as a nutritious food and as a mild mucilaginous tonic in catarrh and consumption. Combined with cocoa, it forms the article known as Iceland-moss cocoa, which was originally prepared by Mr Dunn of London. Two kinds of starch are found in this lichen,—one called *lichen starch*, and the other *inulin*; also a peculiar bitter principle, which has been named *cetrarin*. When used for food only, the plant should be deprived of its bitterness, either by heating it twice in water to near the boiling-point, or by digesting it in a weak alkaline solution, formed by adding half an ounce of carbonate of potash to about a gallon of cold water, and afterwards washing it with pure water. The species *C. nivalis* possesses somewhat similar properties.

CEVADILLA. (*See* SABADILLA.)

CEYLON MOSS. (*See* GRACILARIA.)

CHAFF- or CHAFF-WAX, *tchaf'-waks*, was an officer in chancery who fitted the wax for the sealing of the writs and such other instruments as were delivered out under the great seal, or seal of the court.

CHAFF-CUTTER, *tchaf'-kut-ter* (Sax. *ceaf*, chaff, Nor *cutter*, cut), an implement used by farmers for cutting hay and straw into small lengths. Much ingenuity has been applied to the construction of these machines, which are principally intended for the prevention of waste in feeding animals.

CHAFFINCH, *tchaf'-finch* (*Fringilla cælebs*), one of the most popular of European song-birds. Not only in England is the chaffinch a favourite,—with the French he is a household proverb; and as among us light-hearted folks are said to be as "merry as a lark," with them they are said to be "gay as a chaffinch."



Nowhere, however, is chaffinch enthusiasm carried to so high a pitch as in Germany. Bechstein informs us that in the knife-making village of Ruhl the inhabitants are such great chaffinch-fanciers that they will go sixteen miles to catch a bird, and that on one occasion, when a peculiarly good one was in the market, a gravy fancier, whose means were at low ebb, went and sold his only cow, and bought the coveted chaffinch with the money. The plumage of the chaffinch is as follows:—Fore part of the head black, back part, and extending even to the nape of the neck, blue, shading off to an olive-tinted chestnut, and again to a grey-green to the stump of the tail. The tail itself is black and grey, and on each of the two outer feathers there is a peculiar wedge shaped white spot. From the root of the lower half of the beak to the extremity of the under part of the body the colour is reddish-chestnut. The male may be distinguished from the circumstance of being smaller than its mate, whose length is six inches, and from the latter's under parts being dingier. The chaffinch lays four or five eggs, of pale purplish-buff colour, sparingly streaked and spotted with reddish-brown. Insects are its chief food, and in the summer season it effects incalculable good by destroying myriads of aphides and caterpillars. In Italy the chaffinch is killed for the table. It is very widely spread, being found in parts of Asia, in the north of Africa, and as



HEAD OF CHAFFINCH.

far west as the Azores. The chaffinch is a very pugnacious bird, and it is of this, its failing, that the English birdcatcher takes advantage in the profitable sport known as "pegging." First of all, the catcher must be provided with a chaffinch that will sing loud and fearlessly in the dark and when its cage is in motion. This is effected by allowing it to remain in its dark moulting box after the process of moulting is completed, and placing in the same apartment an able singer of its own species. After a while the little prisoner will sing as cheerily as its tutor. Then its cage is taken down, and suspended from the ceiling by an elastic cord. Although the consequent swinging motion seems to bother it vastly for a day or two, it grows used to it in a wonderfully short space of time, and will sing serenely with its house rocking like a ship at sea. Then its cage is tied in a handkerchief, and its trainer walks about the chamber with it swinging in one hand, and so the teaching progresses, until the poor bird will set up its little pipes at any hour and almost in any position, then it is called a "pegging-finch," and is worth from one guinea to five. Besides one of these decoys, the chaffinch-pegger must have a stuffed chaffinch mounted on a forked stick, and some pieces of whalebone furnished with a spike in one end, and thickly smeared with birdlime. Thus equipped, the birdcatcher sets out in the early spring morning, carrying his decoy in his cage in a handkerchief. When the country is reached, and the decoy, all in the dark, hears the voices of its free fellows among the boughs, it breaks out, and retrims them note for note as long as they please to keep the game up. By-and-by the birdcatcher marks a tree whence issue chaffinch notes the boldest and most defiant. It is said by these men (and it is their business to know) that never more than a single pair of chaffinches live in a tree. At the foot of the tree containing the bold free bird, the birdcatcher places his decoy, covering it over—cage, handkerchief, and all—with a handful of grass. Then he sticks the little branch on which the stuffed bird is mounted into the trunk of the tree, and just above it, and at a slight angle, one or two of the

limed whalebone twigs. Then the man retires. Meanwhile the free bird in the tree, with its hen near at hand, has heard the voice of the decoy, and, trembling with jealous rage, has replied to it, and been again replied to, the salvos on either side becoming heavier and fiercer each moment. At last the free bird, finding the mysterious stranger will not respond to the invitation to come out and fight, like a true finch, hops down in search of it. In an instant it spies the stuffed thing sitting out impudently, and, as it were, on the very steps of his castle; and, with a harsh cry, down he swoops to inflict deadly chastisement; but, alas! the treacherous twigs intervene, and, balking it of its vengeance at the very moment of its consummation, hold it an ignominious prisoner till the man runs up and consigns it to the store-cage. A clever birdcatcher will thus capture from twenty to forty singing chaffinches in a single morning.

CHAILLETIACEÆ, *shail-le-ji-ai'-se-e*, in Bot., the Chailletia fam., a nat. ord. of dicotyledonous plants in the sub-class *Monochlamydeæ*. The only remarkable member of this family is *Chailletia toxicaria*, a tree growing in Sierra Leone, producing fruit which is called ratsbane from its poisonous nature.

CHAIN, *tshaine* (Fr. *chaine*, Lat. *catena*), a series of links or rings connected or fitted into one another, usually made of some kind of metal; as a chain of gold or of iron; but the word is not restricted to any particular kind of material. It is often used for an ornament about the person.

CHAIN CABLE. (*See* CABLE.)

CHAIN MAIL, or ARMOUR, a flexible kind of armour made of hammered iron links connected together. It was much worn in the 12th and 13th centuries, and was lighter and more convenient than armour composed of steel or brass plates. It was not, however, so complete a defence against the thrust of a lance or spear.

CHAIN RULE. (*See* RULE OF EQUATIONS.)

CHAINS, in Mar., strong links or plates of iron, the lower ends of which are bolted through the ship's sides to the timbers. They are used in order to contain the blocks called "dead-eyes," by which the shrouds of the masts are extended; and are placed at short distances from each other on the outside of the ship. Top-chains are chains used in order to sling the lower yards in time of battle, to prevent them from falling when the ropes by which they are hung are shot away or injured.

CHAINS, HANGING IN, a species of ignominy frequently inflicted in former times upon the bodies of malefactors after execution. It consisted in hanging the body in chains upon a gibbet near the place where the crime was committed, and allowing it to rot there as a terror to other offenders. It was only in 1834 that a law was passed abolishing this practice in England.

CHAIR, *tshair* (Lat. *cathedra*, Fr. *chaire*, a pulpit), a movable seat or frame, made with a bottom of different materials, and used for persons to sit in. The term was originally applied to the pulpit from which the priest addressed the people. The place where professors and regents in universities deliver their lectures is still called the chair; as the professor's chair, the chair of natural philosophy, &c. The *curule chair* was an ivory seat placed upon a car, in which the prime magistrates of ancient Rome sat, and also those to whom the honour of a triumph had been decreed. The *sedan chair* is a vehicle in which persons are carried. It is supported by two poles, and carried by two men. Though not much used at the present day, it was greatly in vogue a hundred years ago. In William Hogarth's works it is frequently represented.

CHALCEDONY. (*See* CALCEDONY.)

CHALDEAN PHILOSOPHY, *kal-de'-an*.—The ancient Chaldees, favoured by wide plains, unclouded skies, and clear, still nights, early turned their attention to the study of the heavenly bodies. To them the sun, moon, and stars were the superior intelligences who created and sustain all things, and who guide the destinies of men. Hence they received divine worship and honours; and the study of their movements became a part of the priestly office. The blending of the Chaldees was greatly extolled in ancient times by Jews as well as Greeks; and they are generally allowed to have been the first people who made any considerable progress in astronomy. The determination of the lunar periods, of the equinoctial and solstitial points, a more precise definition of the solar year, the division of the ecliptic into twelve equal parts, of the day into twelve hours; the signs, names, and figures of the zodiac; the invention of the dial—are among the improvements in astronomy attributed to the Chaldees. It is said that Callisthenes, who accompanied Alexander the Great on his expedition, brought back with him from Babylon a series of astronomical observations extending over 1,903 years, or 2,234 years before the Christian era. Astrology was also much practised among the priests, who, from the movements among the heavenly bodies, professed to be able to foretell future events. According to Diodorus, they distinguished the five planets by the appellation of "interpreters," because they foreshadowed the destinies of men and nations, and presided over the birth of each individual. They conceived that besides the planets there were thirty stars, which were called the "consulting gods," twelve of which presided over the signs of the zodiac and the months of the year. Below these were twenty-four stars, of which half were to the north and visible, and half to the south and invisible, the visible being assigned to the living and the invisible to the dead; and they were denominated the "judges of the world." The interpretation of dreams, divination, incantations, and auguries, also occupied an important place in their system of knowledge.

CHALDÆANS, or CHALDEES, in its widest sense, and as used by the later Hebrew prophets and Greek and Roman writers, was synonymous with Babylonians, the ancient inhabitants of Babylonia; more strictly, it was applied to the people inhabiting the south-west part of that kingdom,—the country extending along the Persian gulf from the Euphrates to the Arabian desert. They are believed to have originally inhabited the Carduchian mountains, in the neighbourhood of Armenia, where Xenophon and others mention the existence of a people of that name. At what period they descended to the plains below, history affords us no information; but at length they became so numerous and powerful as to prevail over the other inhabitants of the country, and by the time of the Jewish captivity their name had come to be applied to the inhabitants of Babylonia generally. Gesenius and other recent philologists believe that the ancient name and race are preserved in the modern Kurds. The Chaldæans were also an order of persons in Babylonia who are in the book of Daniel classed with the magicians and astrologers, and were consulted by the king on matters of religion, evidently forming a sort of priest class. They also constituted the learned class of the people; and the term Chaldæans is applied by Greek and Roman writers to the whole order of the learned men of Babylon. At a later period the name came to be given in the western parts of the world to persons who professed to interpret dreams and impose upon the credulity of others, without reference to the place of their birth.

CHALDEE LANGUAGE, *kal-dee'*, is the name given by philologists to the eastern dialect of the Aramaic, of which the Syriac is the western, and which forms the northern branch of the Semitic tongues, the Hebrew, Arabic, and some other minor dialects forming the southern branch. As the language of Babylonia at the time of the Jewish captivity, it was much used by that people after their return to their own land, and, indeed, as a written language it is now known to us only through the Jews, every trace of its literature having disappeared, though it is still spoken by some of the tribes inhabiting the mountains of Kurdistan. In the Hebrew canon, several chapters in Daniel and Ezra are written in this language. As a dialect, it is distinguished from the Syriac by its softening diphthongs and the vowel *o*, for which it generally has *u*, by the use of *dagesh forte* and the general predominance of the last syllable. The modern Chaldee is also much less defective than in Syriac, and in general it is poorer than both the Hebrew and Syriac.

CHALDRON, *tshal'dron* (Fr. *chaudron*), is an English dry measure, containing 36 corn bushels; 31 chaldrons make a score. In a chaldron of coal there are 12 sacks; and 5 five chaldrons be loaded at one time, the vender must deliver 63 sacks, the three additional sacks being termed the *heaping*. At Preston and elsewhere, however, at the present time, coals are sold by the ton of

20 cwt. avoirdupois. In Newcastle, a chaldron of coals consists of 53 cwt., exactly double the London chaldron.

CHALICE, *tshill'-is* (Lat. *calix*, a cup).—This term was formerly applied to an ordinary drinking-cup; but it is now only used to distinguish the cup employed in administering the Holy Sacrament. Silver is the metal of which chalices are usually made; but they are often of gold or gilt, and studded with jewels. They are sometimes made of agate, crystal, or glass; but, on account of their fragile nature, these substances are seldom employed in their manufacture.

CHALK, *tshauk* (Lat. *calx*, lime), a variety of limestone, or carbonate of lime, of a soft, earthy nature, generally of a yellowish-white colour, and sometimes pure white. It often forms strata of great size. It has an earthy fracture, is easily broken, and is rough to the touch. Some varieties of chalk are so compact that they can be employed as building-stones when cut or sawn into shape. After being burnt into quicklime, chalk is converted into mortar, in which shape it is much used. Silica, alumina, and magnesia are often present in chalk, and when these are removed by pounding and diffusing in water, it becomes whiting. Chalk is also largely used in the manufacture of soda, for the purpose of decomposing the sulphate of soda in the "balling" process; and it is also used as a manure. (*See* LIME.) Perfectly purified chalk, when mixed with vegetable colouring matters, such as turmeric, litmus, and saffron, forms pastil colours. Vienna white is merely purified chalk. (*See* CRAYON.)

CHALLENGE. (*See* JURY.)

CHALLENGE TO FIGHT, *tshill'-lenj* (Norm. *challenger*, to claim), is an offence tending to provoke or incite another person to break the peace, and it is a misdemeanour to challenge to *fight*, either by word or letter, or to be the bearer of such challenge, and punishable by fine and imprisonment, according to the circumstances of the case; and a person who sends such challenge is liable to be apprehended and bound over in a recognisance to be of good behaviour.

CHALYBEATE SPRINGS, *kăl-ib'-e-ait*, natural waters containing iron in solution. For a full account and analysis of the most famous chalybeate springs, *see* MINERAL WATERS.

CHAMELAUCIACEÆ, *kăm-e-law-se-at'-se-e*, in Bot., the Fringe-myrtle fam., a nat. ord. of dicotyledonous plants in the sub-class *Calyciflorœ*. This is a small group of shrubby plants only found in Australia, having evergreen dotted leaves. They are nearly allied to *Myrtaceæ*, but may be distinguished from them by their heath-like aspect, their more or less pappose calyx, and by their truly simple 1-celled ovary.

CHAMEROPS, *kăm'-e-rops*, in Bot., a gen. of Palms. *C. humilis* is the only palm found wild in Europe. Fibres obtained from it have been used as a substitute for horse-hair, and in Sicily the different parts of this plant are employed for making walking-canes, hats, baskets, and other useful articles. The materials from which the Brazilian chip or grass hats are manufactured are obtained from the species *C. argentea*.

CHAMBER, *tshaim'-ber* (Lat. *camera*), a portion of a house or of an apartment. The term is ordinarily applied to a room intended for sleeping in. In policy and mercantile matters, a chamber is the place where certain assemblies or councils are held. The term is also applied to the assemblies themselves, whether established for state purposes, for local government, for the administration of justice, or for the direction of commercial affairs. A chamber of commerce is a body of merchants and traders, who associate together in order to promote the mercantile interest of the town or district to which the society belongs. Chambers of commerce were first introduced into Scotland from the continent at the close of the last century.

CHAMBER, in Mil., a term applied to a part of the bore at the breech end of a piece of artillery or small-arm. It contains the powder, but is contracted, so as not to admit the shot or shell. Chambers are of different forms, some being spherical, some cylindrical, and others conical or pear-shaped. The loading and firing of chambered guns are slower than those without chambers. They are generally used when the weight of the shot or shell is great in comparison with the charge of powder. The chamber of a mine is the place, mostly of a cubical form, where the powder is confined.

CHAMBERLAIN, *tshaim'-ber-lain* (Fr. *chamellan*; Lat. *cubicularius*, *præfectus cubiculi*), is variously used in our laws, statutes, and chronicles.

CHAMBERLAIN, THE LORD GREAT, is an hereditary officer of great antiquity, and was once of the highest dignity in the state. The office was conferred by Henry I. on the family of De Vere, earls of Oxford, and was enjoyed by them for nearly six hundred years. On the death of the eighteenth earl, without issue, the honour descended, by a female heir, to the family of Bertie, and is now held jointly by the families of Cholmondeley and Willoughby d'Eresby, each family enjoying it alternately in each succeeding reign. He attends on the king at his coronation, has the care of the palace at Westminster, the fitting up of Westminster Hall for coronations, feasts, and other great occasions; he attends upon peers at their creation, and upon bishops when performing their homage to the sovereign. Many perquisites and fees belong to this office; but the former are usually compounded for at the performance of any of those ceremonies where they are claimed. The delivery of the sword of state to a distinguished member of the existing administration is left wholly to the choice and discretion of this official. Upon all occasions of public ceremony, the keys of Westminster Hall and of the Court of Requests are delivered to him, and at these times the gentleman usher of the black rod, the yeoman usher, and the doorkeepers are at his command.

CHAMBERLAIN, LORD, OF THE HOUSEHOLD, who is not to be confounded with the preceding, is an officer of the royal household, having superintendence and control over all the servants employed about the royal chambers, except those of the bedchamber. The royal chaplains and other officers of the chapel royal, the physicians, surgeons, and apothecaries of the household, as well as the royal tradesmen, are by his appointment. He has the oversight of the queen's band, and of all comedians, trumpeters, and messengers. The performance of stage plays in the metropolis and at Windsor, and wherever there is a royal palace, is not legal unless in a house or a place licensed by the lord chamberlain, whose license is also necessary to render legal the performance of a new play in any part of Britain. Persons to be presented at levees or drawing-rooms are required previously to send their cards to him, and it is his duty to see that such persons are entitled to be presented to the sovereign. He is always a member of the privy council, and his tenure of office expires with his party. He has a salary of £2,000 a year, and is assisted in his duties by a vice-chamberlain, whose tenure is also dependent on the administration, and who has a salary of £924.

CHAMBERLAIN OF THE CITY OF LONDON is an officer of considerable trust and dignity. He acts as treasurer of the corporation, regulates the admission of freemen, and settles all disputes between masters and apprentices. He is chosen annually by the livery at large; but in practice the office is usually for life, the same person being re-elected each year.

CHAMBRE ARDENTE, *shambr-ar-dănt'* (Fr., burning chamber), in French Hist., was the name given to a tribunal, established by Francis I. about 1535, for the special object of trying and condemning heretics to be burnt. Afterwards the name was given to the extraordinary commissions established under Louis XIV. for the examination of prisoners, and, under the regency of the duke of Orleans, against certain officers of the public revenue.

CHAMBRE INTROUVABLE (Fr., the undiscoverable chamber), in French Hist., was a name bestowed, in ridicule, on the chamber of deputies which met after the second restoration of Louis XVIII. (1815), on account of its coldness and anti-nationality.

CHAMELEON, *kăm-e'-le-on*.—This reptile has probably been the subject of more delusion than any other member of the animal kingdom. The two most flagrant errors concerning the chameleon are, firstly, that the air is its common diet, and, secondly, that it is able to assume any colour, shifting from one to another in the twinkling of an eye. A brief examination of the animal at once contradicts both statements. Indolent and sluggish as it may appear, it

has an appetite for something more substantial than air, and enjoys an exercise of its limbs as much as any other reptile. The most curious part of the animal is its tongue; and it is owing to the singular nature of this organ that the erroneous idea arose of its subsisting on air. This tongue is composed of a hollow tube, which is terminated by a fleshy knob, and has a cup-like cavity in its anterior surface: this is covered with a glutinous secretion. By a wonderful provision the animal can dart its tongue with lightning-like swiftness and extraordinary sureness of aim at its prey. The quickness of this proceeding, together with the length of time the chameleon will exist without food, may, in a great measure, account for the popular delusion. With regard to its colour-changing propensity much might be said and quoted; only that it is not needful, as this phenomenon has been frequently and satisfactorily explained. The result of Mr. Milne Edwards's investigation is, in substance, as follows:—Beneath the transparent epidermis of this reptile there is a great quantity of minute soft granules, which bear the different colours; these are more or less extended, according to the quantity of blood that reaches them, and the change of colour is thus effected. The changes it really will undergo under certain powerful excitements are from its natural colour, pale grey, through pale green to yellow and dingy red, and sometimes, but rarely, nearly to black. The chameleon is a most sluggish animal, and will sit for hours on the branch of a tree, scarcely giving any token of its existence beyond an occasional roll of its singular eye, which possesses the property of independent motion; and thus, while one eye is quite motionless, the other will protrude from the animal's head, and glare in a hideous fashion. Then, perhaps, suddenly it will dart out its tongue oftentimes to twice the length of the whole animal, and whisk some unfortunate insect into its jaws. The period of time a chameleon will exist without food is astonishing. Hasselquist makes mention of one he kept for a month, which during the whole time, as far as he could ascertain, did not eat a single insect. Of this genus there are about eighteen species, all of which are natives of the Old World, principally to be found in Africa and Asia. Some species, however, have been naturalised in Europe.

CHAMELEON MINERAL.—Manganate of potash was so called from the changes of colour apparent in an alkaline solution of the salt. It is made by fusing binoxide of manganese with carbonate of potash in an open crucible.

CHAMOIS, *sham'-moi* (*Antilope rupicarpa*). — The chamois is rather larger than the roebuck, and, when full grown, weighs from sixty to eighty pounds. Its colour changes with the seasons. In summer it is of a dusky yellowish brown, and in winter jet black, excepting the hair of the forehead, the belly, and the tufts of hair that overhang the hoofs, which is tawny, and remains so always. The black stripe, too, extending from the eyes to the mouth is permanent. It has been a disputed point whether the chamois should be classed with the goat or the antelope genus. Examination, however, shows that there is really but little affinity either in the structure of the animals or their habits. The frontal bone of the chamois just before the horns is concave; that of the goat is convex. The horns of the latter recede; those of the former advance, and are perfectly plain and smooth, while the goat's horns are wrinkled. More than all, the chamois is well known to avoid spots favoured by goats; and no instance has ever been shown where a female of either species has brought forth a cross-bred kid. The head of the chamois exhibits in its construction a wonderful blending of lightness and strength. The frontal bones are so fragile that a rap of a man's knuckles would suffice to shatter them,—that is, if they were unsupported; but they are supported, and in a marvellous way. Over the first set of bones a second is thrown, and between the walls are arched cells and substantial girders of solid bone. The arched girders which occupy the space between the upper and lower surfaces rise, bridge-like, with a spiral twist, and here and there a flying buttress will give additional strength to the walls, or a lateral arch help to support the vault above. The horns of the chamois are very curiously constructed. Up to a certain point the horn is hollow, and thence to the





point it is dense and solid. The hollow part fits over a bony protuberance growing out of the skull itself. The horns of a full-grown buck measure about seven inches in length, the points being extremely sharp, and hooked backwards. At first sight it would seem that, as weapons of attack or defence, the chamois' horns, from their formation, would be next to useless. This, however, is far from the state of the case. When fighting, the chamois lowers his horns under the throat of his antagonist, or turns his head sideways, that the sharp point may come against the shoulder of the enemy, and then, drawing them back vigorously, inflicts a most formidable gash. The horns of the male chamois are thicker and altogether stronger-looking than those of the female; they do not diverge from each other



CHAMOIS.

in so straight a line as do hers, but describe a slight curve as they rise upwards and apart from each other. The horns of the doe are not so abruptly hooked as those of her mate. Except when running, the gait of the chamois is extremely awkward. The cause is evident. In the first place, its hoofs, shaped like those of the sheep, but longer and more pointed, are calculated for sliding rather than for stepping, and, in the second, its hinder legs have every appearance of being longer than the fore. A hunter afoot would probably overtake a chamois fleeing over a level plain; but among its native ice-hills the case is very different. Then the true purpose of the awkward-looking hind legs appears. Not only do they serve as springs, enabling him to perform miraculous flying leaps from crag to crag, but they break the concussion that would otherwise certainly occur in a leap from a great height, and enable the animal to alight with safety and freedom. A perpendicular wall of rock smooth as glass, and twelve or fifteen feet in height, is no impediment to the upward flight of a chamois. He will leap against the slippery wall, and, striking it with his hind feet, obtain a renewed spring, rebound again in an opposite direction to some higher bank, and there find firm footing on a patch so small that a man's two hands could cover it. The food of the chamois consists of such herbs and lichens as grow on the mountains; when, however, the winter sets in so fiercely that every green thing perishes, the animals shift their quarters from the steeps to the woods that grow at their bases, and there subsist on grass and leaves. An odorous dark-coloured ball is found in the stomach of the chamois, and probably owes its formation to the fibrous and resinous nature of the substances on which it feeds. At the pairing season, a sort of bladder beneath the skin of the buck's horns develops itself. This bladder contains a lymph of a strong musk-like smell, and, if shot at this season, the skin of the head will retain the scent for many years. At this scented period the chamois bucks, incited by jealousy, have most tremendous combats together, and it is at this season that the hunter can easily decoy them to within gunshot by imitating their love-call. The young are born in May, the chamois doe having sometimes two kids at a birth, but frequently but one. The pairing season is November; the period of gestation about twenty weeks. It is only about November that the full-grown patriarchal bucks roam at large,—the remaining portion of the year keeping close in the most secluded and inaccessible places. No animal

possesses so tough a skin as the chamois. It will sometimes happen that the hunter's bullet will send one toppling over a precipice nearly a thousand feet deep; but though every bone in its body be smashed by the fall, the hide will remain intact.

CHAMOMILE. (*See* ANTHEMIS.)

CHAMP DE MARS and CHAMP DE MAI, *shaun(g)-de-mar* (Fr.), in early French Hist., denoted certain public assemblies of the Franks, which were instituted as early as their conquest of Gaul in the 5th century. At first, these were held annually in the month of March, and were hence called the *March-fields* (*Champ de Mars*); but in the 8th century, king Pepin transferred the time of meeting to the month of May; whence they were termed *May-fields*. At these meetings, the king, courtiers, bishops, nobles, and people, assembled together for the discussion of public affairs, such as war, peace, the enactment of laws, all which questions were decided by the majority. The common people, however, long neglected their privilege of attending, and were at length deprived of it. Charlemagne in some measure restored it to them by ordering that every count should bring with him thirteen assessors, or the same number of the most respectable men within his jurisdiction, to represent the people in the general assembly. The first descendants of Capet departed from this usage; but Philip IV. (1285—1314) restored the third estate by calling together delegates from the cities.

CHAMPAGNE WINE, *shăm'-pain*, is produced from the grapes grown in Champagne, formerly a province of France. This favourite wine is divided into two classes,—white and red champagne. The former is made either sparkling or still. Sparkling champagne (*mousseux*) is produced by treating the wine in a particular manner during fermentation. The wine is racked off in December, and after being fined with isinglass, is bottled and securely corked. Carbonic acid is generated in the wine on account of the incomplete nature of the fermentation, and its effervescing qualities depend upon the quantity of that gas dissolved by the fluid. After the sediment which is deposited has been removed, a liquor, composed of a solution of sugar-candy in Cognac, is added, and each bottle is tightly recorked. Still Champagne is first racked off in the March after the vintage. The white Champagnes of Rheims and Sillery are considered the best. Those of Sillery are pale, amber-coloured, dry, spirituous, and possess a superior bouquet; those of Ay and Mareuil are more sparkling, and less spirituous. There are several varieties of first-class red Champagnes. On account of the profitable nature of the manufacture and the popularity of Champagne wine, it is much adulterated with the juice of pears, gooseberries, &c. Very little of the wine sold as Champagne in Paris is really genuine. It generally consists of some cheap light wine charged with carbonic acid gas.

CHAMPERTY, *shăm'-per-te* (Lat. *campi partitio*; Fr. *champart*), in Law, is a species of *maintenance*, and punished in the same manner, being a bargain made by a man with a plaintiff or defendant *campum partire*,—to divide the land or other matter sued for between them, if they prevail at law; whereupon the *champertor* is to carry on the party's suit at his own expense. Thus *champart*, in the French law, signifies a similar division of profits, being a part of the crop annually due to the landlord by bargain or custom. In our sense of the word, it signifies the purchasing of a suit, or the right of suing,—a practice so much abhorred by our law, that it is one main reason why a *chose en action*, or thing of which one has the right, but not the possession, is not assignable at common law, because no man should purchase any pretence to sue in another's right. By the Roman law, such offenders were punished by the forfeiture of a third part of their goods and by perpetual infamy. Hitherto must also be referred the provision of the statute 32 Hen. VIII. *c.* 9, that no one shall sell or purchase any pretended right or title to land, unless the vendor hath received the profits thereof for one whole year before such grant, or hath been in the actual possession of the land, or of the reversion or remainder, on pain that both purchaser and vendor shall each forfeit the value of such land to the king and the prosecutor. (*See* BARRATRY, MAINTENANCE.)

CHAMPIGNON. (*See* AGARICUS.)

CHAMPION, *shăm-pe-on* (Fr.), in the Middle Ages was a person who took up the cause and fought in the room of another, who, from age, infirmity, or other cause, might be so represented. Single combat was one of the ways frequently adopted in the Middle Ages to decide the right of a cause, and women, children, or aged persons, were allowed to appear by a representative. At one time, the champions formed a particular class, were compelled to wear a particular dress, and were looked upon as disreputable, being ready for hire to take up any quarrel. At a later period, however, during the ages of chivalry, the champion was a knight who entered the lists on behalf of an injured lady, a child, or one incapable of self-defence. The king's champion of England is a very ancient office, and is annexed to the Scrivelsby estate in Lincolnshire, having been held by the Dymoke family for many generations. The champion, armed *cap-à-pie*, and mounted on horseback, enters Westminster Hall during the coronation banquet, and proclaims by a herald, "that if any one shall deny the king's title to the crown, he is there ready to defend it in single combat; after which the king drinks to him, and then sends the cup to the champion, who drinks, and then carries off the cup as his fee."

CHANCE, *tshănce*, may be said to denote the cause or mode of happening of an event which is unexpected, or the cause of which is not manifest to human reason. Originally it was applied to events which were believed to happen independent of any law or cause; but this is a sense in which it is now seldom or never employed; for both reason and revelation assure us that there is no such thing as chance in this sense. Everything has its own law and its proper cause, and chance merely denotes that we do not know the proper cause nor the law according to which a phenomenon occurs. (*See* PROBABILITY.)

CHANCEL, *tshăn'-sel* (Lat. *cancellus*, a screen), the name given to that part of the choir of a church between the communion-table or altar and the balustrade or rail that incloses the space where the altar is situated. The term is generally confined to parish churches which have no aisles round the choir, or chapels connected with it. Sometimes the chancel and the choir are synonymous. Before the Reformation, the service was always performed in the chancel, and at that time the clergy were held to have a special right to it. At the present day, its repairs generally fall upon the impropriator or rector, and not on the parish. The impropriator or rector has a right to the principal pew in the chancel, but he cannot erect a tablet there without the leave of the ordinary. The chancel corresponds with the *bema* of the ancient basilics.

CHANCELLOR, *tshăn'-sel-lor* (Lat. *cancellarius*, from *cancelli*, lattice-work or railings), denoted originally a porter or doorkeeper,—one stationed at the lattice-work of a window or doorway to introduce visitors. Afterwards, under the later emperors, the name was given to a kind of secretary or scribe in the courts of law, from his position behind a screen or lattice-work separating him from the rest of the hall of justice. Gradually he appears to have risen in power and authority, and to have acquired certain judicial powers and a kind of superintendence over the other officers of the empire. From the empire the title and office passed to the Roman church, and hence every bishop still has his chancellor, the principal judge of his consistory; and when the modern kingdoms of Europe were established upon the ruins of the empire, almost every state preserved its chancellor, with different jurisdictions and dignities, according to their different constitutions. In all he seems to have had the supervision of all charters, letters, and such other public instruments of the crown as were authenticated in the most solemn manner; and therefore, when seals came to be used, he had the custody of the king's great seal.

CHANCELLOR, LORD, in England, was originally the sovereign's chief secretary, and, from the nature of this office, his adviser, and was hence called the keeper of the king's conscience. Petitions and claims were referred to him, and he formally prepared the royal grants and charters, affixing the king's seal to them. He thus became keeper of the great seal, and was invested with great discretionary power. He is created by the will of the sovereign, by the mere act of deliver-

ing the great seal into his custody, and he holds office during the pleasure of the crown; but practically he resigns office with his party. He is, by prescription, speaker of the House of Lords, and, by virtue of his office, a member of the privy council. He issues writs for summoning parliament, and transacts all business connected with the custody of the great seal. He is principal adviser of the crown in matters of law, chief judge in the Court of Chancery, and the head of the profession of the law. He appoints nearly all the judges of the superior courts, the commissioners in bankruptcy, and the judges of the county courts; appoints all justices of the peace, though usually upon the recommendation of the lords-lieutenant of the several counties, and is patron of all crown livings rated under £20 (in the reign of Henry VIII.). He is visitor, in right of the crown, of all hospitals and colleges of royal foundation; has the general guardianship of all infants, idiots, and lunatics; and exercises a special jurisdiction in questions relating to charities and trust estates. He ranks above all dukes not of the blood royal, and next to the archbishop of Canterbury. He has a salary of £10,000 a year, and an annuity of £5,000 on retiring from office. There is also a lord chancellor in Ireland, whose authority within his own jurisdiction is in most cases the same as that of the lord chancellor of Great Britain. He is appointed only during pleasure, and retires with the political party at whose instance he had been appointed. His salary is £8,000 per annum. In Scotland, prior to the union of the two kingdoms in 1707, there was also a lord chancellor, whose duties were analogous to those of the lord chancellor of Great Britain. At the Union this office was abolished, and in its place that of keeper of the great seal was created, for affixing the great seal to such writs as have to pass under it.

CHANCELLOR OF A BISHOP OR DIOCESE, is vicar-general to the bishop, directing and assisting him in all matters of ecclesiastical law, and holding his courts for him. It is not necessary that he be an ecclesiastic, but, if a layman or married, he must, by the canons, be at least a master of arts or a bachelor of law.

CHANCELLOR OF A CATHEDRAL, is an officer who superintends the arrangements for the regular performance of the religious services.

CHANCELLOR OF A UNIVERSITY, is usually the highest officer of the university, and exercises exclusive jurisdiction in all questions that concern the members of the university.

CHANCELLOR OF THE DUCHY OF LANCASTER, is an officer appointed chiefly to determine controversies between the king and his tenants of the duchy of Lancaster. The court is held at Westminster, but is not much resorted to, and is usually presided over by the chancellor's deputy.

CHANCELLOR OF THE EXCHEQUER. (*See* EXCHEQUER.)

CHANCELLOR OF THE ORDER OF THE GARTER, and other orders of knighthood, is an officer who seals the commissions and mandates of the chapter and assembly of the knights, keeps the register of their proceedings, and delivers acts thereof under the seal of their order. He also exercises various functions at the installation of the knights.

CHANCE-MEDLEY, or CHAUD-MEDLEY.—The former signifies a *casual* affray, the latter an affray in the *heat* of blood or passion, in which death ensues to the assailant. The law authorizes a man to protect himself from an assault or the like, in the case of a sudden brawl or quarrel, by killing him who assaults him, and considers it *justifiable homicide*. It does not apply to a case of attacking, and only when certain and immediate suffering would be the consequence of waiting for the assistance of the law. Wherefore, to excuse homicide by the plea of self-defence, it must appear that the slayer had no other possible, or at least probable, means of escaping from his assailant. If he had, then the offence would amount to *manslaughter*, or, possibly, *murder*, according to the circumstances of the case, and the distinction made by the law in determining whether the one or the other crime had been committed. Any accidental or unpremeditated killing of a person, without negligence or carelessness, as by a workman throwing down rubbish from a house after giving sufficient warning, or an officer whipping a criminal in a reasonable manner, and such like, is *chance-medley* and misadventure.

CHANCERY. (*See* COURTS OF JUSTICE.)

CHANDOS CLAUSE, *shăn-doz'*, is applied to a clause of the Reform Bill which gives the franchise to tenants under lease or at will in the counties paying not less than £50 of rent. A motion to this effect was made by the marquis of Chandos, and carried, after much opposition, by a majority of eighty-four. (*See* REFORM BILL.)

CHANGELING, *tshainje'-ling* (Ang.-Sax.).—It was at one time a common superstition that young children were liable to be stolen or changed by fairies before being baptised; and hence they were carefully watched till that ceremony was over. It was thought that the fairies were always anxious to change their own starveling elves for the more robust children of men. The children so left were called changelings, and were known by their greater backwardness in growth or learning: hence stunted or idiotical children were regarded as changelings.

CHANNEL, *tshăn'-nel* (Fr. *canal*), a passage or place of flowing. The term is generally applied to a water-course. The deeper part of a river, through which the principal current flows, is generally called the channel. The strait or narrow sea between two islands, or a continent and an island, is also called a channel; as the British Channel, the Irish Channel, &c.

CHANT, *tshant* (Fr. *chanter*, to sing), in its most extended sense, is applied to the musical performance of all those parts of the liturgy which by the rubric are permitted to be sung. More particularly, and as distinguished from singing, it is applied to that plain tune to which the prayers, litany, &c., are set in choirs and places where they sing. In the chant, when properly and fully performed, both the minister and the choir bear their respective parts, the minister reciting the prayers and all the parts of the service which he is enjoined to say alone (except the lessons) in one sustained note, occasionally varied at the close of a cadence, and the choir making the responses in harmony, sometimes in unison. In the Psalms and Canticles both the minister and choir join together in the chant without distinction, each verse being sung in full harmony. The chanting of prayers has always been observed in the principal of our cathedrals. In church history we meet with different kinds of chants or songs; as the Ambrosian, introduced by St. Ambrose; the Gregorian, by Pope Gregory the Great.—*Ref.* Hook's *Church Dictionary*.

CHANTRY, *tshăn'-dre* (Lat. *cantaria*), was a little chapel or particular altar in a cathedral church, built and endowed for the maintenance of a priest to say or sing masses for the soul of the founder, and such others as he might appoint. There were many of these in England before the Reformation; but in the thirty-seventh year of Henry VIII. the chantries were given to the king, who had power at any time to issue commissions to seize their endowments, and take them into his possession; and such as were not then seized were afterwards vested in his successor, Edward VI.

CHAOS, *kaï'-os* (Gr.), is applied to the confused mass, or the state of confusion, in which matter is supposed to have existed before it was reduced to order by the creating power of Deity. In the ancient Greek mythology, chaos was the vacant infinite space which existed before the creation of the world, and out of which sprang all things that exist. Chaos, according to Hesiod, produced by and out of itself Erebus and Night, who in turn were the parents of Æther and Day.

CHAP-BOOKS, *tshăp'-books*, is the name given to a kind of literature that was at one time very common in this country. The designation is probably derived from their forming part of the stock in trade of the chapman or travelling merchant. They were of inferior paper and typography, and the older of them, in the early part of the seventeenth century, are printed in black letter, in the form of small volumes. Their contents were of a very miscellaneous nature, comprising lives of heroes, martyrs, and other remarkable persons; stories of ghosts, giants, witches; dream-books, &c. The *Penny Chap-books* were a later and an inferior class of literature. They consisted usually of a single sheet of paper, folded so as to form twenty-four pages.

their contents were chiefly narratives either in prose or verse, and were characterized by a considerable degree of broad humour, and frequently not without a goodly sprinkling of obscenity. This class of literature was at one time very popular, and has scarcely yet passed out of use in the more remote parts of England and Scotland. It is said that nearly all these Penny Chap-books were the production of one man, Dougald Graham, who, previous to his death in 1789, was bellman or town-crier of Glasgow.—For further information on this subject, see *Chambers's Encyclopædia* and the authorities therein referred to.

CHAPEL, *tshăp'-el* (Lat. *capella*, Fr. *chapelle*), is an edifice for public worship, usually of a lower order, or not possessed of the same privileges, as a church. Where parishes are large or populous, parochial chapels, or chapels of ease, have frequently been erected for the accommodation of the people, with the consent of the bishop; and many of these have had districts assigned to them with the cure of souls, and the right of celebrating baptisms, marriages, &c., under special acts of parliament. Dissenting places of worship are also usually called chapels. The term is also applied to places for the celebration of religious worship in the houses of noblemen, hospitals, colleges, and similar establishments. In Catholic countries the term chapel is used to designate separate erections either within or attached to a church or cathedral, and devoted to special services. These are also called chantries. (*See* CHANTRY.)

CHAPEL, in a printing-office, is an association of the workmen for the purpose of enforcing order and regularity in the office, and settling any disputes that may arise. It takes cognizance of all offences, real or imaginary, committed within the office, and punishes by the infliction of fines. The president is elected by the other workmen, and is termed the "father of the chapel."

CHAPERON, *tshap'-e-ron* (Fr.), a hood or cap worn by the knights of the Garter. It was formerly worn by men and women of every degree, and afterwards appropriated by the doctors and licentiates in colleges, &c. The name afterwards passed to certain little shields and other funeral devices placed on the heads of horses at pompous funerals. A person who acts as a guide or protection to a lady at a public place is called a chaperon, probably because the cap or hood was formerly worn by persons acting in a like capacity.

CHAPITERS, *tshăp'-e-ters* (Fr. *chapitres*), signified, in our ancient common law, a summary of such matters as were to be inquired of or presented before justices in eyre, justices of assize or of the peace, in their sessions. These chapiters are now those articles which are delivered by the justice to the inquest or jury.

CHAPLAIN, *tshăp'-lain* (Lat. *capellanus*), is properly a person who performs divine worship in a chapel, as distinguished from one who officiates in a parish church. Hence it is also applied to those who are engaged to perform religious services in the army and navy, in families of distinction, hospitals, workhouses, &c. The nobility enjoy the right of appointing a certain number of private chaplains who are entitled to certain privileges respecting the holding of benefices, &c.; thus, an archbishop may have eight, a bishop or duke six, a marquis or earl five, a viscount four, &c.

CHAPLET, *tshăp'-let* (Ital. *ciapelletto*), is a string of beads made use of by Roman Catholics and others to count the number of their prayers. Its invention is by some attributed to Peter the Hermit, by others to St. Dominick, who is said to have received one out of heaven from the Virgin Mary. (*See* ROSARY.)

CHAPMAN, *tshăp'-măn* (Old Eng. *cheap*, a market), denotes generally a merchant; but it is commonly limited to one who deals only in small articles,—one who travels the country and attends markets.

CHAPTER, *tshăp'-ter* (Lat. *capitulus*, from *caput*, the head), is applied to the society of canons in a cathedral or collegiate church, of which the dean is the head, and which form the council of the bishop. (*See* CANON.) Attached to many cathedrals and collegiate churches are buildings for the meeting of the chapter, called *chapter-houses*, which are frequently of great beauty.

CHAPTERS, THE THREE, are frequently alluded to in the ecclesiastical history of the 6th century, and occasioned much discussion in the Church, as they were believed to support Nestorianism. They were—1. the writings of Theodore of Mopsuestia; 2. the books which Theodoret of Cyrus wrote against Cyril's anathemas of the Nestorians; and 3. the letter which Ibas of Edessa published against the council of Ephesus which condemned Nestorius. They were condemned by the emperor Justinian in 544; but the African and Western bishops, especially Vigilius of Rome, opposed the edict.

CHARACEÆ, *kă-rā'-se-e*, in Bot., the Chara fam., a nat. ord. of acotyledonous plants, in the sub-class *Acrogenæ*,—water-plants with distinct stems branching in a whorled manner, sometimes transparent and sometimes coated with carbonate of lime. They occur in stagnant, fresh, or salt water in all parts of the globe, but most abundantly in temperate climates. When in a state of decay, they give off a very fœtid odour, which is considered to be very injurious to animal life.

CHARACTER, *kar'-ăk-ter* (Lat. *character*, Fr. *caractère*), in Bot., the term usually applied to a list of the points by which any particular variety, species, genus, sub-order, order, sub-class, or class, is distinguished from another. There are two kinds of characters, called respectively *essential* and *natural*. By an essential character is understood an enumeration of those points only by which any division of plants may be distinguished from others of the same nature. A natural character, on the other hand, is a complete description of a given species, genus, order, or class, including an account of every organ, from the root upwards, through the stem, leaves, flowers, fruit, and seed.

CHARADE, *sha-rade'* (Fr.), is a kind of riddle, in which a word of several syllables is taken, and an enigmatical description of each of its syllables given separately, and then a similar description of the whole word. The descriptions should be so contrived as to be in some way connected together. The following is a good example, from the French:—"My first makes use of my second to eat my whole;" the first being *chien*, a dog; the second *dent*, a tooth; and the whole *chiendent*, dogs'-grass.

CHARBONROUX, *shar'-bon-roo'* (Fr.), charcoal prepared below a red heat, by which means it retains a considerable portion of oxygen and hydrogen. Ordinary charcoal contains 90 per cent. of carbon; while charbonroux contains only 70 per cent., the remainder being oxygen and hydrogen. Gunpowder made with this charcoal appears to inflame with greater energy than that made with ordinary charcoal. On theoretical grounds, however, it appears to be inferior to ordinary powder.

CHARCOAL, *tshar'-kole*.—This well-known substance exists under a great number of forms; such as gas-carbon, coke, wood-charcoal, lamp-black, and ivory-black. *Gas-carbon* is a very pure kind of charcoal gradually deposited in the insides of gas-retorts. *Coke* is dense charcoal, made by burning coal in a retort or coke-oven from which the air is excluded. It is much used as a fuel for locomotives, from giving out no smoke, and from being much lighter than coal. *Wood-charcoal*, although but little used in England as a fuel, is a very important element in the manufacture of gunpowder. The most perfect charcoal is, of course, that which is used in this manufacture. (*See* GUNPOWDER.) Thoroughly-burnt charcoal is bluish black, and varies in density according to the porosity of the wood from which it was made. Charcoal possesses the wonderful property of absorbing gases. (*See* CARBON.) *Lamp-black* is carbon deposited by any combustible burnt without sufficient air. (*See* LAMP-BLACK.) *Ivory-black*, *bone-black*, or *animal charcoal*, will be found described under the head of IVORY-BLACK. Gas-charcoal and coke are employed as elements in galvanic batteries, and to form the carbon-points for the electric lamp. For the latter purpose, a mixture of sugar and tar is sometimes burnt in moulds, by which means a very pure kind of charcoal is made to any desired shape. Charcoal is a conductor of electricity, and is thence used to surround the earth-terminals of lightning-conductors. Charcoal is one of the most indestructible substances in nature. Being perfectly non-volatile, and possessing no affinity for any other element at ordinary temperatures, it forms the most perfect ink possible; and papyri written with

carbon ink are as legible and perfect as the first day they were written.

CHARGE, *tcharj* (Low Lat. *cargare*, Fr. *charger*), is the address delivered by a bishop or other prelate at a visitation of the clergy under his jurisdiction. Among Presbyterians and dissenters generally, it is a sermon preached to a minister at his ordination, usually by some aged or able preacher, and bearing upon the nature, duties, trials, and encouragements of the pastoral office.

CHARGE (Fr. *charger*), in Her., the name given to figures of any kind represented on a shield, which is said to be charged with whatever figures may be depicted on it. The charges on a shield should be few and simple, and as appropriate as possible to the character or achievements of the original bearer of the coat. The simplicity of armorial bearings is a strong proof of their antiquity.

CHARGE, in Law, is an incumbrance upon property; as an annuity, mortgage, judgment, or any liability to which it is made subject by a deed, will, or other instrument, or by the operation of law or equity.

CHARGE, in Mil., an expression used to denote the quantity of powder which is necessary to fire a ball, shell, or bullet from any kind of cannon or firearm. The charge for different kinds of artillery, and for different purposes, varies from one-twelfth to one-half the weight of the projectile. Rifled cannon require a smaller charge than those with smooth bores; and in firing against a vessel or a body of troops at a short range, a smaller charge is needed for the same gun than would be required for breaching the walls of a fortress. The term is also applied to the onset made by one body of troops on another with fixed bayonets.

CHARGE D'AFFAIRES, *shar'-day-fair'* (Fr.), is the fourth, or lowest order of diplomatic agents, and is accredited not to the sovereign, but only to the individual who, for the time being, holds the office of principal secretary of state or minister for foreign affairs. Sometimes they are only empowered to act during the absence of the ambassador; at other times, they are independent of any ambassador.

CHARIOT, *tshar'-e-ut* (Fr.), was a kind of carriage employed in ancient times in war or for pleasure. We read of them as early as the time of Pharaoh, and they were frequently armed with scythes, as we read of them to have been with the ancient Britons. The ancient chariots had only two wheels, which revolved upon the axle, and were usually drawn by two horses. Among the Romans, however, there were also three- and four-horse chariots. The triumphal chariots of the Romans were often most splendidly adorned.

CHARISMA, *kā-riz'-mā* (Gr., a gift), a term frequently employed in the early Church to denote the extraordinary endowments conferred on the primitive Church; as the gift of tongues. It was also applied sometimes to baptism.

CHARITY, *tshar'-e-ti* (Lat. *caritas*, from *carus*, dear; Gr. *agape*, love), one of the three great theological virtues, consisting of love to God and our neighbours, or the habit and disposition of loving God with all our heart and our neighbour as ourselves. In a narrower sense, it signifies kindness, goodwill, and forbearance towards mankind in general, and, in a still lower sense, the giving of alms. This love to our neighbours, which is one of the greatest and noblest of Christian virtues, is not of a blind, indiscriminating character. True charity attempts not to shut our eyes to the distinction between good and bad men, nor to warm our hearts equally to those who befriend and those who injure us. It teaches us to slight and despise no man, inspiring us with forgiveness and humanity towards our enemies, with respect and esteem for good men, with candour and complacency towards our friends. "Charity is the comforter of the afflicted, the protector of the oppressed, the reconciler of differences, the intercessor for offenders. It is faithfulness in the friend, public spirit in the magistrate, equity and patience in the judge, moderation in the sovereign, and loyalty in the subject."—*Barrow*.

CHARITY COMMISSIONERS for England and Wales are a body of commissioners created by the Charitable Trusts Act of 1853, for inquiring into all charities, their nature, objects, and administration, and the condition of the property belonging to them, with power to call for the production of accounts and documents from trustees, and to appoint inspectors to visit and report upon their management. Their powers do not extend to Scotland, Ireland, the universities, or London. A report of their proceedings must annually be laid before parliament.

CHARITY, SISTERS OF. (*See* SISTERS OF CHARITY.)

CHARITY SCHOOLS. (*See* SCHOOLS.)

CHARIVARI, *shar'-e-va'-re*, is a French term, of uncertain etymology, but denoting properly a loud, discordant noise, produced by the beating of kettles, pans, and other domestic utensils, mingled with shouts, groans, and hisses. In this way, popular dislike was frequently manifested towards a person in France in the Middle Ages; and widows contracting second marriages, or persons of disproportionate ages marrying, were often annoyed in this way. Afterwards, the term came to be applied to political squibs and satires against public men; and in this sense it was adopted as the title of a French periodical published in Paris, corresponding to our English *Punch*. It may be mentioned, that the name of the German periodical of the same kind, published in Berlin, *Kladderadatsch*, also implies a loud, discordant noise, such as is occasioned by the beating of kettles and pans.

CHARLATAN, *shar'-a-tan* (Ital. *ciarlatano*), denotes a mountebank, quack doctor, or empiric, and is hence applied to any one who makes loud pretensions to knowledge or skill which he does not possess. Charlatanism is to be found among all classes of society, and manifests itself in various ways, according to the object and character of the person. In literature, in science, in politics, and even in religion, there are to be found many who pretend to greater knowledge, or power, or virtue, than they possess.

CHARLES'S WAIN, *tsharls's wain*, in Astron., the name given to seven stars in a constellation of the northern hemisphere, called *Ursa Major*, or the *Great Bear*. (*See* URSA MAJOR.) The origin of the name is not known.

CHARM, *tsharm* (Lat. *carmen*, a verse), is a magical power or spell, by which witches and sorcerers, with the assistance of the devil, were supposed to do wonderful things beyond the powers of nature. (*See* MAGIC.)

CHARNEL-HOUSE, *tshar'-nel-hows* (Lat. *caro*, flesh), was a place under a church, or in a churchyard, where the bones of the dead which were thrown up by the gravediggers were deposited.

CHARR, *tsharr* (*Salmo salvelinus*), a fish of the Salmon family, inhabiting the lakes of Scotland, Wales, and the north of England. The body is longer and more slender than that of the trout. The back is of an olive colour, speckled with white spots, and the belly red. Its flesh is held in high estimation.

CHART, *tshart* (Lat. *charta*), a hydrographical or sea chart for the use of navigators, exhibiting some part of the sea, or other water, with the coasts, islands, rocks, sands, bearings, &c. After the Admiralty has scanned any coast engravings, charts are engraved and sold at prices below their cost. Every available chart is supplied to men-of-war when proceeding to any particular district. At several places, such as Gibraltar, and the Cape of Good Hope, depôts for charts are established. All charts are brought back to England again, and are not re-issued without being revised.

CHARTA MAGNA. (*See* MAGNA CHARTA.)

CHARTE, *shart* (Lat. *charta*, paper), in French Hist., was originally applied to the letters or charters by which the French kings conferred rights or privileges on certain towns or communities; but it is now applied to the solemn acknowledgment made by Louis XVIII., on his restoration in 1814, of the rights of the French nation. It consisted of sixty-nine articles, and in principle was somewhat analogous to the Magna Charta and Bill of Rights of the British constitution. A misconstruction of one of the articles of this charte led to the revolution of 1830. It constituted the fundamental law of the French constitution down to the revolution of 1848, when a new state of things was introduced.

CHARTER, *tshar'-ter* (Fr. *charte*), is the written evidence of things done between man and man; and *charters* are divided into those of the *sovereign* and those of *private persons*. Charters of the sovereign are those whereby he passeth any grant to a person or body politic; as a charter of exemption, of privilege, pardon,

or the like. Charters of private persons are deeds and instruments for the conveyance of lands.

CHARTERHOUSE (a corruption of *Charteuse*, i.e. Carthusian), is an hospital, chapel, and schoolhouse in London, instituted in 1611 by Thomas *Sutton*, of Camps Castle, in the county of Cambridge. The site which it occupies was bought for a public burial-place during the great plague of 1349, by Sir Walter de Manny, who, in conjunction with the bishop of London, afterwards established here a Carthusian monastery. After the dissolution of the religious houses by Henry VIII., the property passed through various hands, until it was purchased for £13,000 by Thomas Sutton, who founded upon it, and richly endowed, an hospital, chapel, and school, called by Fuller a "masterpiece of English Protestant charity." It has a master, preacher, head schoolmaster, second master, with forty-four boys and eighty decayed gentlemen. In addition to the scholars, who are admissible between the ages of ten and fourteen, and receive free board and education, there are a number who attend the school only during the day, or board with the masters. The Charterhouse is regarded as one of the best schools in the metropolis, and many eminent persons have been educated here; among whom may be mentioned Dr. Isaac Barrow, Sir William Blackstone, Addison, Steele, John Wesley, Bishop Thirlwall, George Grote, W. M. Thackeray, and Sir C. Eastlake.

CHARTER-PARTY, is a mercantile instrument in writing (with or without seal), by which a party desiring to export goods from this country, or to import them from abroad, engages with some shipowner to take an entire vessel for the purpose, at a freight or reward thereby agreed for. Upon the execution of such an instrument the ship is said to be *chartered* or *freighted*, and the party by whom she is engaged is called the *charterer* or *freighter*. But where, instead of taking the entire vessel, the owner of goods merely bargains for their conveyance on board of her for freight (other goods being at the same time conveyed for other proprietors), she is described not as a chartered but a *general* ship; and in this case no charter-party is usually executed, but a bill of lading only. It may be here stated that the word *freight* is sometimes synonymously used with that of cargo. (*See* BILL OF LADING.)

CHARTISTS, *tshart'-ists*, the name of a political party that sprang up in England after the passing of the Reform Bill, and were so called from their principles being embodied in a document termed the "Charter." The Reform Bill, while it conferred political power upon the middle classes, did little towards improving the condition of the working classes of society. The middle classes, too, had been assisted by the latter in their effort to obtain the franchise, and, having attained their object, they became callous or opposed to any extension of the like privileges to those beneath them in the social scale. The introduction of the new poor-law, in 1835, was the first thing that caused any great outcry among the working classes against the party in power, and in 1836 the "Working Men's Association" was formed in London. For some time the association did not receive much countenance; but the great commercial distress, the scarcity of work, and the dearness of provisions, that followed soon after, were severely felt by the people, and led to open and alarming demonstrations of their feelings. In the autumn of 1838 monster meetings of the working classes were convened at Birmingham and other parts of the manufacturing counties, and highly inflammatory speeches were addressed to them. The Charter was drawn up by a committee of six members of parliament and six members of the Working Men's Association. The principal points of the Charter were—1. That every male inhabitant of the United Kingdom 21 years of age and of sane mind, provided he be a native of these realms, or have lived upwards of two years in the country and been naturalised, and be unconvicted of felony, shall be entitled to vote in the election of members of parliament; 2. that the United Kingdom be divided into 300 electoral districts, so as to give uniform constituencies of about 20,000 voters each; 3. that the voting be by ballot; 4. that a new parliament be elected annually; 5. that no property qualification be required for members of parliament; and 6. that every member be paid £400 a year out of the public treasury for his services. There is nothing contained in the charter that had not been advanced and advocated before. As early as 1780 the duke of Richmond introduced a bill into the House of Lords for annual parliaments and universal suffrage. Unfortunately the majority of the Chartists did not confine themselves to the points of the Charter. Many of them advocated an entire re-distribution of property. Ignorant of the principles of political economy, they demanded the establishment of a new relationship between capital and labour, and adopted the cry of "A fair day's wages for a fair day's work." Many of them, further, took up the view that they might, if necessary, employ physical force to obtain their ends. In May, 1839, a petition, signed by 1,280,000 persons, was presented to parliament in favour of the Charter, and during that year serious riots took place in various parts of the country, and various of the ringleaders were imprisoned. An outbreak at Newport, in the month of November, resulted in the death of ten persons and the wounding of many more; and three of the leaders, Frost, Williams, and Jones, were sentenced to death; but their punishment was afterwards commuted to banishment. The stringent measures adopted by the government at length served to repress these violent commotions; and though, in 1842, and again in 1848, outbreaks took place, these were of a less serious nature, and were speedily put down. Chartism may now be said to belong rather to the past than to the present, and those who are in favour of the principles of the Charter are content to advocate their views in a peaceable manner. In nothing is the social progress of the country more marked than in the great change that has taken place in the character of the working classes within the last quarter of a century. The distress that is at present (1862) so patiently borne in the cotton-manufacturing districts, in consequence of the civil war in America, would doubtless, twenty years ago, have been attended with very serious consequences,—an argument as strong as any for the extension of the franchise.

CHARTULARY, *tshar'-tu-li-re* (Lat. *chartularia*), originally denoted a collection of charters, and was afterwards applied to the books in monasteries, &c., in which such charters were entered. These books were common even as early as the 10th century, and they have been of great service in historical and genealogical researches. The officer who was intrusted with the care of the charters was also called *chartulary*.

CHASE, *tshaise* (Ang.-Nor.), is a franchise granted by the crown to a subject, empowering the latter to keep, for his diversion, within a certain precinct so called, the wild animals of chase (which, in a legal sense, are the same with those to which the right of forest extends); but not authorizing the establishment of forest law within such precinct. It has been described as "a smaller forest in the hands of a subject, but not governed by the forest laws." It differs from a park in that it is not inclosed, and likewise in that a man may have a chase in another man's ground as well as in his own; being, indeed, the liberty of keeping of beasts of chase or royal game therein, protected even from the owners of the land, with a power of hunting them thereon.

CHASIDIM, *tshis-e-dim'* (Heb., Pietists), is a name given collectively to a whole class of Jewish sects, but, more strictly, it is applied to a modern sect which sprang up in Poland towards the middle of last century. *Chasidim* and *Zadikim* were the names employed to designate the two great divisions of the Jewish people which arose after the Babylonish captivity; the former being in favour of certain innovations in the law of Moses, the latter being for a strict adherence to the law as it stood. From the former arose all those sects that receive traditions and explanations in addition to the law of Moses, as the Pharisees; to the latter belong the Sadducees, Essenes, &c. Of the modern sect of Chasidim, the founder was one Israel Baalsham, a Jewish rabbi. He gave himself out as having the true knowledge of the sacred name, through which he was endowed with miraculous powers, and could grant them forgiveness for their sins. He speedily obtained many followers, and at the time of his death, in 1760, he is said to have had 40,000 converts. This sect is very numerous in Poland, Hungary, the Danubian principalities, and Turkey.

**Chasing**, *chas'-sing* (from Fr. *enchasser*), a term employed to denote the art of working raised or half-raised figures in gold, silver, and other metals. It is distinguished from sculpture and carving, which refer to the same art when applied to marble, ivory, wood, &c. Silver is the metal which has always been most generally used for chasing.

**Chasseurs**, *shas'-surs* (Fr. *chasseur*, a huntsman), a name given by the French to bodies of light infantry which act as skirmishers and sharpshooters. They correspond pretty closely with our own 60th regiment, or rifle brigade. The name was originally given by the French to some troops raised in 1815, in imitation of the jägers of the Austrian army, who were chiefly chamois-hunters of the Tyrol, and unerring marksmen as well as active and athletic mountaineers. The French chasseurs were of two kinds,—cavalry and infantry; but now the term is more particularly applied to a body of men called *Chasseurs de Vincennes*, who were enrolled and armed with rifles about 1835, and quartered at Vincennes. The chasseurs of the Sardinian army are called *Bersaglieri*. In the Crimea, the bersaglieri of the Sardinian contingent attracted considerable attention on account of their activity and peculiar dress, which is soldierly in appearance although easy and comfortable. Garibaldi's chasseurs, that took a prominent part in the war between France and Sardinia on the one side, and Austria on the other, in 1859, and the campaign against Francis II. of Naples in 1860, are known as *Cacciatori dei Alpi*, or Alpine hunters.

**Chasuble**, *tshăz'-u-bl* (Lat. *casula*, or *prænula*), the outer dress formerly worn by the priest at the altar, and it seems to have succeeded the Roman toga. It was a circular piece of cloth, with a hole in the centre to admit the head, and it fell down so as to completely cover the body of the wearer. It is not now used in the English church, though prescribed in the rubric of Edward VI.'s First Book to be worn indifferently with the cope. It often appears on the older sculptures and brasses.

**Chateau**, *shăt'-o'* (Fr. *château*, Lat. *castellum*, a castle), a term formerly applied to the fortified residences of the French seigneurs. It is now generally applied to the imperial country residences and to the more sumptuous country residences of the aristocracy. The name enters into the composition of the names of many towns and districts in France.

**Chattels**, *tshăt'-tels* (Old Fr. *catals*, catels; *chatels*, movables of any kind), is a term used to express any kind of property which, having regard either to the subject-matter or the quantity of interest therein, is not *freehold*. The appellation was originally derived from the technical Latin word *catulla*, which, among the Normans, primarily signified only beasts of husbandry, or, as we still call them, *cattle*; but, in a secondary sense, was applicable to all movables in general; and not only to these, but to whatever was not a *fief* or *feud*; to which, among the Normans, there were two requisites,—a given duration as to time, and immobility with regard to place. And it is in this latter more extended and negative sense that our own law adopts the term, considering as a chattel whatever amounts not to freehold, which, like the Norman fief, requires immovability in respect of the subject-matter, and a given degree of duration, that is, a duration for a life at least, either absolute or determinable on a contingency, as regards the quantity of interest or estate. Any estate in lands and tenements which amounts not to freehold, is, consequently, a chattel; but inasmuch as it concerns, or, according to the technical expression, *savours of* the realty, it is denominated a chattel *real*, in order to distinguish it from things which have no concern with the realty, viz. mere movables, and the rights connected with them; and such things as these are, on the other hand, often described as chattels *personal*.

**Chavica**, *tshăv'-e-kă*, in Bot., a gen. of plants belonging to the nat. ord. *Piperaceæ*, the Pepper fam. The dried unripe spikes of *C. Roxburghii* constitute the long pepper of commerce, which is imported from our Indian possessions; those of *C. officinarum* form the long pepper used in America, obtained from the Dutch colonies. Long pepper contains an acrid resin, a volatile oil, and a peculiar crystalline alkaloid called *Piperine*. It resembles black pepper (*see* Pepper) in its effects, and is used for similar purposes. Dried slices of the root and stem are employed medicinally in India under the name of *Pippula Moola*. Other species of this genus, as *C. chaba*, *populifolia*, and *sylvestris*, have similar properties, and are used in India. The leaves of *C. Betle*, betel-pepper, and *C. Siriboa* are chewed by the Malays and other Eastern races with slices of the betel-nut and lime. (*See* Betel.)

**Checkmate**. (*See* Chess.)

**Cheese**, *tsheez* (Sax. *cese*, or *eyse*).—Cheese is the curd of milk salted, pressed, and dried. Milk is composed of three parts,—the oily or fatty portion, commonly known as cream, and which separates on standing, being lighter than the rest, and the curd, which remains dissolved in the whey until it is coagulated by some acid. In the manufacture of cheese, the curd is supplied by the rennet, which, being the dried stomach of the calf, contains a large amount of gastric juice, and appears to be the natural milk-curdle. It is prepared by salting and drying the inner membrane of the stomach of a sucking calf. When required for use, a piece is soaked for some hours in water or whey, and the whole added to the warm milk that is to be curdled. When the curd has coagulated, it is separated from the whey by straining, and pressed in a ring or hoop, from which it is continually removed and wiped to remove all superfluous whey. The colour of English cheese is due to arnotto, which is added to the milk before coagulation. Bath cream and Yorkshire cheeses are soft, and keep but a short time; Stilton is intermediate; and Cheshire, Gloucestershire, and Parmesan are hard, and intended for long keeping. The variety of colour and flavour in cheeses results from difference of pressure, length of time in keeping, varying proportion of salt, and many other circumstances.

**Chegoe**, or **Chigoe**, *tsheg'-o* (*Pulex penetrans*), a small black flea, peculiar to South America and the West-India islands. Tormenting and tiresome as is the English flea, it becomes a mild and inoffensive insect beside the terrible chegoe, which is not only troublesome, but dangerous. This insect burrows in and under the skin, and there deposits its eggs, the result being the most painful ulcers. Waterton tells us that on the plantations of Guinea an old woman, known as "Granny," is specially retained to mind the little children, and keep down the chegoe. Every evening she examines their feet (the part generally attacked), and after grubbing out any chegoe she may find, rubs into the hole lime-juice and cayenne pepper.

**Cheiromancy**. (*See* Palmistry.)

**Cheirostemon**, *ki-ros-te'-mon* (Gr. *cheir*, the hand; *stemon*, a stamen), in Bot., a gen. of trees of the nat. ord. *Sterculiaceæ*. The species *C. platanoides* is the Hand-plant of Mexico, which derives its common name from the remarkable appearance of its flowers; the anthers and style being so arranged as to resemble a hand furnished with long claws.

**Chelidonium**, *kel-i-do'-ni-um* (from Gr. *chelidon*, a swallow, the plant being said to flower at the coming, and dry up at the departure of the swallow), in Bot., the Celandine, a gen. of plants belonging to the nat. ord. *Papaveraceæ*. The species *C. majus* is found in waste places and on old walls in this country, and may be recognized by its small yellow flowers, and the orange-coloured juice which exudes from its stem when plucked. This juice is poisonous, and is a popular application for the cure of warts. It has been used with success in the treatment of opacities of the cornea, and has also been administered internally as a stimulant.

**Chemical Analysis**, *kem'-i-kăl*.—For theoretical information in this subject, *see* Analysis. The practical portions of it are treated under the heads of—*Dialysis*, which is the separation of crystalline and non-crystalline constituents of solutions by means of the intervention of an absorbing diaphragm;—*Inorganic Analysis*, the detection and separation of the constituents of products not being either of an animal or vegetable nature;—*Organic Analysis*, which is the resolution of animal and vegetable substances into their component parts;—*Spectrum Analysis*, which is the recognition of elementary substances by means of certain lines in the prismatic spectrum of a lamp, in the flame of which their compounds are burnt. See

also *Qualitative Analysis*, which is the accurate detection of the components of a substance without reference to their proportions;—*Quantitative Analysis*, the separation and weighing of the constituents of a compound;—*Volumetric Analysis*, the quantitative estimation of the component parts by means of measured test solutions of a uniform strength. (Consult also BLOWPIPE and RE-AGENT.) The best text-books on these subjects are enumerated at the end of each article.

CHEMICAL ATTRACTION. (*See* AFFINITY.)

CHEMICAL FORMULÆ.—The alchemists, for the sake of mystery, employed the signs of the different planets to represent the various metals. Modern chemists, for the sake of convenience and brevity, have given to every element one or two letters called symbols, which are used, in conjunction with figures and algebraic signs, to express every known compound. (For the symbols of the different elements, *see* SYMBOLS.) The principle upon which modern chemical notation is founded, is that each symbol indicates one or more atoms of the element it represents: thus, O, $O_2$, $C_{27}$, indicate respectively one, two, and twenty-seven atoms of carbon. Two symbols, placed side by side, signify that they are in close chemical union: thus, AgO signifies a compound containing an atom of silver united to an atom of oxygen. A comma, separating two or more groups of symbols, must be taken to mean that they are not in such intimate chemical union that the groups cannot be separated without decomposition: thus AgO, $NO_5$ represents nitrate of silver, which, by certain treatment, can be separated into AgO, oxide of silver, and $NO_5$, nitric acid. The sign *plus* + signifies that the union is still weaker; thus, $AgO,NO_5+HO$ means nitrate of silver united to an atom of water, HO. A number placed on the left of a group of symbols signifies that the whole group, as far as the next comma or *plus*, is to be multiplied by it: thus, $KO,2CrO_3$ signifies that one equivalent of potash is united with two of chromic acid. Sometimes the group to be multiplied is inclosed in a parenthesis: $3(HgCy)+2(KO,SO_3)$ means that three equivalents of cyanide of mercury are united to two of sulphate of potash. Formulæ may be *empirical* or *rational*,—the former giving merely the constituents of a compound, the latter indicating the manner in which they are grouped. It is evident, therefore, that a compound can only have one empirical formula, while its rational formulæ are as numerous as the theories of its composition. Alcohol, for instance, is represented empirically by the formula $C_4H_6O_2$. Rationally, it may be represented as the ethylate of water, $HO,C_4H_5O$; the hydrated oxide of ethyl, $C_4H_5O,HO$; as a compound of olefiant gas and two equivalents of water, $2HO,C_4H_4$, and so on, *ad infinitum*. Brackets are used to denote substitution compounds; that is, compounds in which one element, or group of elements, has been substituted for another without materially affecting the character of the compound.

$\left.\begin{matrix}NH\\H\\H\end{matrix}\right\}$ represents ammonia.

$\left.\begin{matrix}NH\\H\\Pt\end{matrix}\right\}$ represents platinamine, or ammonia in which an atom of platinum has replaced an atom of hydrogen. In like manner,

$\left.\begin{matrix}NH\\H\\C_4H_5\end{matrix}\right\}$ is the formula of ethylamine, or ammonia with an atom of hydrogen, replaced by an atom of ethyl. Two changes have been lately introduced into chemical formulæ that it will be well to notice;—one in which dashes are used to denote the atomic power of the element; the other, a line through a symbol, to signify that its atomic number has been doubled. $Bi'''$ means that bismuth has a tristomic power in the way of forming substitution compounds: thus,

$\left.\begin{matrix}N_4H_{10}\\H_2\\Bi'''\end{matrix}\right\}$ is an ammonia compound in which three equivalents of hydrogen are replaced by one of bismuth, that metal having a triple uniting power. This





notation originated with M. Gerhardt, an eminent French chemist, whose views on the subject are daily gaining ground, and are fully explained under the head of GERHARDT'S NOTATION.

CHEMICAL NOMENCLATURE.—The present system of chemical nomenclature is due to the immortal Lavoisier, and will ever remain a monument to his marvellous powers of systematic classification. It is based on the great principle that the name of a compound should, as far as possible, express its composition and properties. The names of many of the simple elements we have received from the alchemists, and were formed on no definite plan. Those elements which have been lately discovered have been named either from some characteristic property possessed by them, or from some word indicating their source. Metals, as a rule, terminate in *ium*, as *potassium*, *thallium*, &c.; metalloids in *on*, as *boron*, *silicon*, &c.; gases in *ine* or *gen*, such as *chlorine* and *oxygen*. In several instances theory grounded on insufficient facts has been allowed to influence the name of an element; for example, oxygen was named from *oxus*, acid, and *gennao*, to generate; the Lavoisierian theory being that no acid could exist without oxygen. Subsequently, however, it was found that oxygen occurred in all bases, and that many acids existed that contained hydrogen in its stead. The Lavoisierian nomenclature is founded on the fact that when a compound of two elements is submitted to the action of the voltaic current, these elements separate, one (the electro-positive body) being attracted by the negative pole, and the other (electro-negative body) going to the positive pole. As a rule, it was found that the metalloids were electro-negative and the metals electro-positive. The simplest combinations of two elements are termed binary compounds, and fall naturally into two divisions,—bases and acids. Bases always end in *ide*, and are compounds of different proportions of a metal with a metalloid. The proportion of the metalloid is indicated by the addition of a Greek or Latin numerical particle: thus we have the *protoxide*, *sesquioxide*, *binoxide*, and *teroxide* of various metals, indicating that these compounds contain one, one and a half, two, and three doses of oxygen to one of metal. When the metal is in excess, Greek prefixes are used: we have, for instance, the *dinoxide* or *trioxide* of a metal, showing that the metal is in a double or triple dose. Generally the prefixes *sub* and *per* are used to indicate the excess of metal over metalloid, and *vice versâ*. The termination *uret* was formerly used in several cases, such as *sulphuret*, *phosphuret*, &c.; but it is now abandoned in favour of the termination *ide*. The compounds of the metalloids with each other are named on the same principle. When the dose of oxygen is large, the compound is generally possessed of acid properties: thus we have $Cr_2O_3$, the sesquioxide of chromium, which is a base; but, by increasing the oxygen, we obtain $CrO_3$, which is an acid capable of forming salts with bases. The amount of oxygen contained in oxy-acids is indicated by the termination *ic* or *ous*, or the prefixes *hypo*, under, or *hyper*, above. A few examples of bases and acids will illustrate this:—

| | |
|---|---|
| $Pb_2O$ | Dinoxide or suboxide of lead. |
| $CuO$ | Protoxide or oxide of copper. |
| $Fe_2O_3$ | Sesquioxide of iron. |
| $MnO_2$ | Binoxide of manganese. |
| $AuO_3$ | Teroxide of gold. |
| $PCl_5$ | Pentachloride of phosphorus. |
| $PS_{12}$ | Dodecasulphide of phosphorus. |
| $ClO$ | Hypochlorous acid. |
| $NO_3$ | Nitrous acid. |
| $ClO_4$ | Hypochloric acid. |
| $NO_5$ | Nitric acid. |

Certain metalloids, such as sulphur and hydrogen, combine with other metalloids to form acids: for instance, we have—

| | |
|---|---|
| HCl | Hydrochloric acid. |
| HBr | Hydrobromic acid. |
| $AsS_3$ | Sulpharsenic acid. |
| $AsS_2$ | Sulpharsenous acid. |

The compounds of acids with bases are always indicated by the termination or prefix of the word giving the name of the acid. Acids ending in *ous* and *ic* form salts

ending in *ite* and *ate*, the prefix being, of course, preserved. A few examples of this will suffice:—

Sulphate of iron = sulphuric acid + oxide of iron.
Hypophosphate of lead = hypophosphoric acid + oxide of lead.
Sulphite of copper = sulphurous acid + oxide of copper.
Hyposulphate of cobalt = hyposulphurous acid + oxide of cobalt.

When the oxide with which the acid is united is a protoxide or peroxide, the prefixes *proto* and *per* are added; for instance, the pernitrate and protonitrate are the nitrates of the protoxide and peroxide of the metal. When the dose of acid is greater or less than the base, the prefixes *sub*, *sesqui*, *bi*, are used; as the *subcarbonate*, *bicarbonate*, and *sesquicarbonate of soda*. In double salts the name of the base only is repeated; as the *tartrate of potash and soda*. There are a few instances of acids and salts which have the same composition, but different properties. They are distinguished from the ordinary kind by the prefix *meta*; thus we have *phosphoric acid* and *metaphosphoric acid*. The prefix *pyro* signifies that the acid or salt has been obtained by heat; for instance, we have pyrogallic acid, produced in this way from gallic acid. In organic chemistry the nomenclature is in many cases somewhat confused. This is not owing to any want of proper principle in the formation of new words, but rather to the differences of opinion existing amongst chemists as to the composition of the substances indicated. Thus aniline is cylled *phenylamine*, *phenylia*, and *benzidam*, by different chemists, who each have a theory touching its composition. Organic chemistry may be defined as the chemistry of organic radicles or compounds containing carbon, which act in every way as elements. Organic radicles generally terminate in *yl*, and mostly contain carbon, hydrogen, and oxygen. Thus we have *ethyl*, the radicle of ether, which forms oxides and salts in the same manner as iron, lead, or any of the purely elementary bodies. (*See* Organic Radicles.) There are also compounds corresponding to the electro-negative bodies *oxygen*, *hydrogen*, *nitrogen*, &c. We have, for instance, *cyanogen* and *amidogen*, which form *cyanides* and *amides*, similar in their properties to *chlorides* and *oxides*. The termination *ol* or *ole* is generally applied to neutral compounds of carbon and hydrogen, possessed of neither basic nor acid properties, and are mostly liquids; such as *benzol*, *pyrol*, *quinol*. The termination *in* is applied to other neutral substances, generally solid; such as *paraffin*, *naphthalin*, and *albumin*. Those ending in *ine* or *ia* are generally bodies allied to the alkalies in their properties. We have, for instance, *quinine* or *quinia*, *strychnine* or *strychnia*, *aniline*, &c., which form salts with acids. Many of those which end in *amine* resemble ammonia, and are considered substitution compounds of that body, in which one or more equivalents of hydrogen are replaced by an organic radicle. Thus we have ethylamine—

(Ethyl) $C_4H_5$ } $H$ } $N$, in which one equivalent of hydrogen
$H$ }

is replaced by one of ethyl. If two or three equivalents are replaced, the prefix *di* or *tri* is added to the word; for instance, we have *dimethylamine* and *tripropylamine*, the composition of which is plainly indicated by their names. When the hydrogen is replaced by different bodies, their names are prefixed. We have, for instance, *ethyl-methyl-amylamine*, which consists of one equivalent of nitrogen united to one each of the organic radicles ethyl, methyl, and amyl. There are also substitution acids as well as bases; such as *bromobenzoic acid* and *chloracetic acid*, in which *bromine* and *chlorine* are substituted for an equivalent of hydrogen. Thus, although these names appear unintelligible and unwieldy to the superficial observer, they are as easily understood by the chemical student as any term including several nouns and adjectives would be to an ordinary individual. In this respect chemical nomenclature bears a very favourable contrast with that belonging to *mineralogy* and *botany*, those sciences being disfigured by the introduction of what may be termed *complimentary nomenclature*, according to the principles of which the substances





are called after their discoverers, or some great man whom the discoverer wishes to flatter, instead of being names indicative of their properties or origin.

Chemist and Druggist, *kem'-ist*, a term commonly applied to any person who has been apprenticed to, or regularly educated by, a vendor of drugs or dispenser of medicines, but who does not act as a visiting apothecary or surgeon. In this country the chemists and druggists constitute a very important and useful class. They sell medicaments, simple, or compounded according to the prescriptions of medical men; and they also act as medical advisers for the benefit of the poorer classes. The right of chemists and druggists to prescribe even in the manner usually followed in what is called "counter-practice," has been often questioned by the literary organs of the medical profession; but the highest legal authorities declare that they may so far prescribe for customers as to advise with them as to the nature, and quality, and mode of application of the medicines which they are about to sell; that they may listen to the statements of the customers, and may suggest to them and recommend the commodities which will be suitable and beneficial, or dissuade them from purchasing or taking things applied for in ignorance. The advice given by the chemist and druggist is merely incidental to the sale and dispensing of his wares and drugs, and cannot, of course, be made the subject of a charge. Counter-practice has always been a recognized branch of the business of the chemist and druggist, and we do not find it prohibited by any clause in the Apothecaries Act of 1815; on the contrary, we read that "all persons using or exercising the said trade or business, or who shall or may hereafter use or exercise the same, shall and may use, exercise, and carry on the same trade or business in such manner, and as fully and amply to all intents and purposes, as the same trade or business was used, exercised, or carried on by chemists and druggists before the passing of this act." Two societies have been established by the members of the trade; viz., the Pharmaceutical Society of Great Britain and the United Society of Chemists and Druggists. The objects of each will be noticed under its title.

Chemistry, History of, *kem'-is-tre* (Arab. *kimia*, the occult science; Fr. *chimie*, Ital. *chimica*).—There is, perhaps, no science the gradual progress of which is so easily traced from one step to another as the science of chemistry. The empirical mixing of two substances, possessing different properties, to form a third, differing from either, must have commenced with the first peopling of the earth. The fact was transmitted to others, who improved on it, and experimented on other similar bodies; and thus was a mass of practical information obtained, which gradually developed into chemical manufactures. The origin of chemistry is generally traced to Tubal Cain, the father of workers in metal, between whom and Hermes Trismegistus lies a period of obscurity of which we know nothing. Hermes is said to have been the inventor of alchemy, a notion not entitled to much credit. In any case, Egypt, which is said to have been colonized by his son Mizraim, was the foremost chemical nation of the East; their glass, pottery, colours, and method of embalming their dead, bearing strong testimony to the fact of their being acquainted with chemical processes brought to a great state of perfection. The practical part of the science existed previous to the theoretical; but by degrees, as men began to think, they began also to observe and theorise. Thinking men saw that a given earthy matter, such as iron ore, became transmuted, as it were, by fire into a hard metallic substance, like iron. What more rational, then, for them to suppose than that gold could be formed in a similar way? The change of earth into metal was to them less wonderful in theory than the change of lead into gold. Thus began alchemy,—that specious monster that inclosed legions of philosophers in its cruel grasp, ruthlessly devouring them, but whose bones our own great men have clothed with living flesh. The origin of alchemy is lost in obscurity. Philology, however, comes to our aid, and points out to us that common chemical words, such as *alcohol*, *alkali*, *alembic*, and others, have an Arabian origin, which plainly indicates that the Arabians, although, perhaps, not the inventors of the black art, were at any rate its most ardent votaries

Gradually, another notion stole in. The principles and practice of pharmacy became more general, and a specious logic was brought to bear on the fact that certain salts and liquors of a metallic nature assuaged pain and restored drooping vitality. It was then but one step further to go to find a compound that would prolong life indefinitely. Another object of pursuit was the universal solvent, or alkahest. The first practisers of alchemy were, no doubt, honest, serious men; but as time wore on, there arose a mass of impostors who found ready dupes in avaricious people, who were ever ready to buy the secret of unbounded riches. In this way there was formed a mass of almost unintelligible knowledge, carefully concealed from the vulgar by secret symbols and an absurd nomenclature. Through this accumulation of rubbish there ran some golden veins; and we must never forget, that although alchemy had its philosophers' stone and universal solvent, it also gave us a hundred salts and preparations daily used in our own laboratories. Towards the end of the 17th century arose a set of men whose brains were made in a better mould than those of their predecessors. Putting aside the idea of transmutation of metals, they turned their attention to the discovery of the principles that governed the formation and composition of bodies already in their hands, rather than to the pursuit of chemical chimeras that might for ever elude their grasp. Paracelsus, though imbued with the fanciful doctrines of astrology and demonology, must always be regarded with reverence for his virtues and pity for his faults. He must ever be considered as the connecting link between the alchemists and chemists. A few of his researches will be sufficient to show that, although full of the maddest hallucinations, he was one of those rare geniuses who have the power of lifting a science from the mire. He was the first to offer a true chemical explanation of the action of mercury, iron, and lead in the human system. He distinguished alum from copperas, showing that the former contained an earth, the latter a metal. He admitted the existence of other elastic fluids besides air. He was aware that animals could not live, and inflammable matters could not burn, without air. To him succeeded Van Helmont, who was the first to distinguish between aërial fluids, or gases, as he called them. After Van Helmont came Boyle, the founder of the Royal Society, one of the most acute experimentalists that ever lived. His numerous experiments are marvels of accuracy, bearing even the test of our present knowledge. He and his contemporary Hook made great improvements in the air-pump, the invention of Otto Guericke, and paved the way to further discoveries. At the beginning of the 18th century come the names and discoveries of Becher and Stahl, the founders of the phlogistic theory. They found that by heating charcoal with metallic oxides or calces, they were reduced to a metallic state. They further noticed, that when charcoal was burnt it was entirely dissipated. Upon these facts they founded the theory that charcoal, or phlogiston, was a principle which united with the calx to form the metal. This notion appeared to be further carried out by the fact that metals, when heated, are converted into calces; the explanation of which was, that the volatilised charcoal, or phlogiston, was consumed by the heat. This theory, which was the first general principle applied to the whole range of chemical phenomena, maintained its ground for some time, until the discoveries of Priestley tended to overthrow it, by proving that the calx, or oxide, of mercury, instead of gaining something by being heated, lost something, and that that something was oxygen. About this time Cavendish discovered hydrogen, and Rutherford nitrogen, experiment being heaped on experiment, and discovery on discovery, until the Stahlian theory gave way. It was succeeded by that of Lavoisier, the father of modern chemical science, who classified and arranged the known chemical facts into a system unparalleled for its precision, extent of view, and logical accuracy. His discoveries were few, but he reasoned on the discoveries of others with wonderful astuteness. From this moment chemistry marched onward with giant strides. It would be impossible to enumerate the whole of the discoveries that have taken place since the commencement of the present century; a few will suffice to show how wonderfully





science has progressed even in our own time. The application of the voltaic current to the decomposition of the alkalies, by Davy, resulted in the discovery of a dozen or more new metals. The atomic theory of Dalton threw great light upon the composition of salts and acids. The invention of the present symbolic notation by Berzelius, and the determination of the elementary equivalents soon followed. In 1811 Davy overthrew the notion of Lavoisier, that acids could not exist without oxygen, by proving that hydrochloric acid consisted only of chlorine and hydrogen. In 1812 Courtois discovered iodine; Balard followed some time after with bromine. Element succeeded element until they reached the number of sixty. All this time organic chemistry was making great progress. The vegetable alkaloids began to attract great attention; their analyses were made, and new theories founded on them. The early labourers, Liebig and Berzelius, threw great light on this branch of the science, which is even to this day the most attractive to many famous chemists. The development of the theory of organic radicles has gone on increasing, fostered by the labours of Faraday, Laurent, Gerhardt, Hofmann, and a host of others, until it has assumed a mathematical precision unknown to any other branch of physical science. The investigations of organic compounds by these philosophers have resulted in a complete change, both in the notation and nomenclature of mineral substances. This theory, which was founded by Gerhardt, will be fully explained under GERHARDT'S THEORY. The last great discoveries have been spectral analysis, which has resulted in the addition of three new elements to our already bulky list,—*cæsium* and *rubidium*, by Messrs. Bunsen and Kirchhoff, of Heidelberg, and *thallium*, by Mr. Crookes, a distinguished English analytical chemist. The researches of Graham upon the diffusion of salts in solution and in dialysis, or the separation of crystalizable and non-crystallizable substances in solution by means of an intervening diaphragm, are amongst the most brilliant discoveries of the age. The researches of Schönbein, Schroetter, Brodie, and others, on the allotropic states of bodies, seem to point to the compound character of the present elementary bodies. In fact, chemistry at the present day is making such enormous strides, that it can only be properly studied in the current scientific journals.

CHEMISTRY, PRINCIPLES OF.—Chemistry has been variously defined by different philosophers; that of Miller (Elements of Chemistry, vol. i.) being perhaps about the best:—"It is the province of chemistry to ascertain the nature of the different substances of which the universe is composed, to trace their mutual reactions on each other, to effect new combinations of these components with each other, and to define the conditions on which the combinations existing around us are producible." The world and its inhabitants are made up of some sixty-five elements or bodies, which have hitherto proved undecomposable. Their general description will be found under ELEMENTS; their particular description under their respective heads. The combinations of these bodies are described under BASES, SALTS, ACIDS, RADICLES; while the general laws which regulate their composition will be found under ATOMIC NUMBERS, AFFINITY, SERIES, TYPES, ALLOTROPISM, ISOMORPHISM, ISOMERISM, POLYMORPHISM, &c. Inorganic chemistry treats of the nature and properties of elements and compounds of mineral origin, and organic chemistry of those belonging to bodies of a vegetable or animal nature. The long-existing barrier between the two is, however, being gradually destroyed by the labours of Laurent, Gerhardt, Hofmann, Wurtz, Odling, and others, whose brilliant discoveries prove every day more and more that we must read the chemistry of the rocks by the light of the facts disclosed in the investigation of the properties of organic matter. (*See* ORGANIC and INORGANIC CHEMISTRY.) The best method of studying chemistry is to obtain a good elementary manual, such as Bernay's "First Steps in Chemistry;" to read it through attentively first; then to commence by making every substance contained in it. Many students are apt to begin by *analysis*; but this is a great mistake. Much more is to be gained by taking *synthesis* first. The apparatus and chemicals required for *synthesis* are

much less expensive than those necessary for analysis, which is, after all, the highest branch of chemical manipulation. Besides this, in performing synthetical operations, the student insensibly acquires manipulation, and in addition finds himself, at the end of a few months, in the possession of a vast number of interesting specimens, which will serve for material when he finds himself capable of performing elementary analysis; whereas the results of analysis are generally thrown away. The best books for the chemical student are perhaps the following, the order indicating the sequence in which they should be read:—Fownes' *Rudimentary Chemistry*; Bernay's *First Steps*; Fownes' *Manual of Chemistry*, or Abel and Bloxam's *Manual*; W. A. Miller's *Manual*; Odling's *Manual*. The latter is an exposition of the unitary system of Gerhardt.

CHEMISTRY, AS APPLIED TO AGRICULTURE. — The object of the practical farmer is to raise the largest quantity of valuable produce from a given extent of land at the smallest cost, in the shortest period of time, and with the least permanent injury to the soil. Until recently, agriculturists endeavoured to attain these results by experiment and experience; it has, however, been demonstrated, that chemistry, geology, and chemical physiology, point out clearly the proper steps by which the main object may be effected. Agricultural chemistry, as a science, collects, investigates, and endeavours to explain all known facts in practical husbandry. It also deduces principles from observation and experiments made in the field or the laboratory, which may be more or less applicable in all circumstances. With a knowledge of such principles the farmer can understand symptoms and appearances he has never before seen, and can adapt his practice to circumstances which have never before fallen under his observation. Agricultural chemistry also suggests improvements, and, probably, unthought-of modes of rendering the soil fertile, besides inducing the analysis of soils, manures, and vegetable products. Chemical physiology also explains how plants grow and are nourished, and how animals are supported and most cheaply fed.—Ref. *Elements of Agricultural Chemistry and Geology*, by J. F. W. Johnston.

CHENOPODIACEÆ, *ke-no-po-de-ai'-se-e* (Gr. *chen*, a goose; *pous*, a foot), in Bot., the Goosefoot or Spinach fam., a nat. ord. of dicotyledonous plants, in the subclass *Monochlamydeæ*. There are 72 genera, which include 510 known species, distributed over all parts of the globe, but most abundant in extra-tropical regions,—herbs or undershrubs, with leaves without stipules, alternate, or, rarely, opposite; flowers minute, greenish, without bracts, perfect, polygamous or dichnous; calyx persistent, usually divided nearly to the base, imbricated; stamens usually equal in number to the lobes of the calyx, and opposite to them; ovary superior or partly inferior, 1-celled, with a single ovule attached to its base, and a style usually in 2—4 divisions, rarely simple. Fruit an achænium or utricle, or sometimes baccate. Several plants of this order inhabit salt-marshes, and yield by combustion the soda-ash called *barilla* (which *see*). Many are esculent; as beet and mangold-wurzel (*see* BETA), spinach (*Spinacia oleracea*), garden orach (*Atriplex hortensis*), and English mercury. (*See* CHENOPODIUM.) The seeds of others are nutritious. Several contain volatile oil, which renders them anthelmintic, antispasmodic, aromatic, carminative, and stimulant.

CHENOPODIUM, *ke-no-po'-de-um*, in Bot., the typical gen. of the nat. ord. *Chenopodiaceæ*. The seeds of *C. Quinoa* contain starch granules, which are remarkable for being the smallest hitherto noticed. They are known under the name of *petty rice*, and form a common article of food in Peru. *C. bonus Henricus* is the English mercury, a plant formerly much used as a pot-herb. The seeds of *C. anthelminticum* (wormseed) are largely employed in North America for their anthelmintic and antispasmodic properties. *C. vulvaria* (stinking goosefoot), an indigenous plant, is a popular emmenagogue. *C. ambrosioides* is employed in Mexico and Columbia as tea; hence it is commonly known as Mexican tea.

CHEQUE, *tshek* (Fr.), a written order drawn on a banker or other person for the payment of money on demand. Cheques cannot be drawn for any sum under £1, and must be on a penny stamp. The party on





whom a cheque is drawn is obliged to honour it if he has funds belonging to the drawer in hand. Until dishonoured, it must be regarded as payment. An ordinary cheque is made payable to a certain person or bearer. For purposes of safety and convenience the use of cross-cheques has been introduced. Two transverse lines are drawn across the cheque, and the words "& Co." are written between them. Payment of a cross-cheque can only be procured by passing it through another bank.

CHERIMOYER, *ker-e-moi'-er*, the name commonly given to the fruit of the *Anona cherimolia*. It has been described as the finest of all fruits, and is generally eaten for dessert by the wealthy inhabitants of Peru and Brazil. It is sometimes called the cherimolia. (*See* ANONA.)

CHERRY and CHERRY LAUREL. (*See* CERASUS.)

CHERUB, *tsher'-ub* (Heb., plural *cherubim*, mighty ones), the name of a particular order of angelic beings frequently mentioned in Scripture. They were placed with flaming swords to guard the garden of Eden when Adam and Eve were driven out of it; and when Moses was commanded to make the ark of the covenant, he was to place a cherub on each end of it, so as to cover the mercy-seat with their wings. What the form was under which the cherub was here represented we have no certain account, and various conjectures have been thrown out on the subject. Many are of opinion that, as in Ezekiel's vision, it was composed of parts of a man, lion, ox, and eagle. In art, cherubs are commonly represented by a child's head with wings, or as a human figure with wings at the shoulders, and wings also in place of the lower extremities.

CHERVIL. (*See* ANTHRISCUS.)

CHESS, *tshes* (Fr. *échecs*), an ingenious and intellectual game, played by two persons, each having at command sixteen pieces, made of wood, bone, or ivory, upon a board divided into sixty-four squares, eight on each of the four sides. These squares are coloured red and white, or black and white, alternately, and the pieces of each player are of different colours. On either side there are eight superior pieces and eight inferior. The former consist of a king, a queen, two bishops, two knights, and two rooks or castles; the latter consist of eight pawns, or foot-soldiers. On commencing a game, the king and queen occupy the centre squares of the first or royal line, and are supported in regular succession by a bishop, a knight, and a rook, while before each piece stands a pawn. In placing the board, it is always the custom, in this country, to place a white square at the player's right-hand corner; and, in arranging the pieces, the queen is always placed on a square of her own colour. The pieces on the king's side are called the king's,—as king's bishop, king's knight; while those on the queen's side are similarly styled queen's bishop, &c. The pawns take their names from the pieces before which they stand; as, the king's pawn, king's rook's pawn, queen's pawn, &c. Every superior and inferior piece moves according to certain rules, and the success of the game depends entirely upon skill. A knowledge of the varied moves is acquired over the chess-board with comparative ease from any competent person. The queen is the most powerful piece on the board, while the king, from the nature of the game, which does not admit of his exchange or capture, is the most important piece: the game depends upon his *safety*. The approximate value of the pieces has been given by a competent authority as,—queen, 9·94; rook, 5·46; bishop, 3·50; knight, 3·05; pawn, 1·00. Towards the conclusion of a game, however, the pawn rises in value. When the king is directly attacked by any piece or pawn, he is said to be in *check*. If he is unable to place himself out of check, to interpose a piece to parry the check, or to capture the checking piece, he is said to be *checkmated*, and the game is lost. When neither player can give checkmate, the game is said to be *drawn*. When one player has his king so situated that, not being then in check, he cannot play him without placing him in check, and at the same time has no other piece or pawn to move instead, he is said to be *stale-mated*, and the game is considered drawn. The game of chess is very ancient, and there is considerable dispute as to its origin. It seems to have been known immemorially in Hindostan by the name

*Chaturanga*, or the four members of an army; namely, *elephants*, *horsemen*, *chariots*, and *foot-soldiers*. Since that time the game has undergone many alterations. It passed into Persia from Hindostan, and then into Arabia, where it was called *Shatrang*, or the king's distress. In the 8th century the Arabs introduced the game into Spain, and from thence it passed into the rest of Europe. Chess was unknown to the ancient Greeks and Romans, but it was played in England before the Norman conquest. The Eastern game differs in several peculiar points from the game played in Europe, but resembles the game played by the Saxons. The laws of chess are at present undecided and unsatisfactory.—The best books of reference are Staunton's *Chess-player's Handbook*, and Morphy's *Games at Chess*, edited by Lowenthal.

CHEST, in Anat. (*See* THORAX.)

CHEST, MILITARY and NAVAL, *tshest* (Sax. *cist* or *cyst*).—The term Military Chest is applied to the money and securities which are held by the chief of the commissariat department during a campaign, to provide pay and provisions for the soldiers. The Naval Chest, or Chest at Greenwich, as it is sometimes called, is a fund to provide for the necessities of sailors who are unable to pursue their calling in consequence of any injury. Gratuities and pensions for a certain number of years, or for life, are given out of this fund. It was originated in the reign of Queen Elizabeth, the sailors voluntarily giving up a small part of their monthly pay to form the fund. The money thus obtained was deposited in a chest kept for the purpose; whence the name.

CHESTNUT. (*See* CASTANEA.)

CHETAH, or HUNTING LEOPARD. (*See* LEOPARD.)

CHEVALIER. (*See* CHIVALRY.)

CHEVAUX DE FRISE, *shav'-o de freez'* (Fr., horses of Friesland), long beams of wood or iron, bristling with spikes, that are passed through the beam at regular intervals, in alternate directions, at right angles to each other. They are used to defend the ditch or borne of any fortification during an attack, and to impede the advance of a storming party when entering a breach. These implements of warfare are easily carried with an army, and, in our service, consist of hollow cylinders of iron, about six feet long, pierced to receive the spikes or pickets, which are carried in the interior of the cylinder when the army is on the march. The origin of the name is uncertain; but it was probably first used by the Dutch during their protracted but successful struggle against Philip II. of Spain in the 16th century.

CHEVRON, *shev'-ron* (Fr. *chevron*), in Her., one of the nine honourable ordinaries, occupying a third part of the field. It represents the rafters of a house, and shows that the person to whom the coat of arms in which it occurs was first granted, was the founder of his family, or had achieved some important and honourable undertaking. The diminutives of the chevron are the chevronel and the couple close.—In Arch., it is a zigzag moulding, a peculiar characteristic of Norman architecture.

CHEVRONS, in Mil., stripes worn on the arm to distinguish the various grades of non-commissioned officers. The sergeant-major wears four stripes, sergeants three, corporals two, and lance-corporals one. Light infantry, the light and grenadier companies of all regiments, and the guards and fusiliers, wear the stripes on both arms. They are composed of gold lace or white braid in the regular army; but in the volunteer service anything is allowed except gold lace. The stripes are worn with the point downwards, above the elbow, and are thus distinguishable from good-conduct stripes, which are worn with the point upwards below the elbow.

CHEVY CHASE, *tshev'-e-tshais*, the name of one of the most famous of the old English ballads, narrating a hostile encounter that took place on the Scottish border between the two warlike families of Percy and Douglas. Percy, earl of Northumberland, had vowed to hunt for three days in the Scottish border without condescending to ask leave from Earl Douglas. He had with him 1,500 men, and Douglas brought against them 2,000. In the middle of the contest the two earls meet hand to hand. After fighting for some time, Douglas is pierced to the heart by an English arrow, and Percy immediately after falls by a Scottish spear. Although the leaders were thus both slain, the battle still raged with great fury, till only 53 of the English and 55 of the Scottish remained. The event referred to in the ballad, though apparently different from the battle of Otterbourn, which took place in 1388, is probably the same, or at least the tragical circumstances attending the latter have been incorporated in it. The beauties of this ballad have been criticised by Addison in the "Spectator" (Nos. 70 and 74); and Sir Philip Sidney said of it, that he never heard the old song of Percy and Douglas but his heart was more moved than by a trumpet. There are two versions of this ballad, an ancient and a more modern, both of which are given in Percy's "Reliques of Ancient English Poetry."

CHIARO-OSCURO, or CHIAROSCURO, *ke-ar'-o os'-ku-ro*, *ke-ar'-o-sku'-ro* (Ital. *chiaro*, light; *oscuro*, dark), that branch of painting which has for its object the combination and arrangement of the light and dark parts of a picture to the best advantage. Relief and depth, and what is generally called the *effect* of a picture, are produced by chiaroscuro. Leonardo da Vinci was the first who reduced the art of chiaroscuro to a system. Correggio afterwards improved it practically; and it is said to have reached perfection under Titian.

CHICA, a red dye. (*See* BIGNONIA.)

CHICA, or MAIZE-BEER. (*See* ZEA.)

CHICKEN POX, *tshik'-en-pox*, in Med., is the name given to a [illegible] give disease, usually of a mild nature, and bearing some resemblance to small-pox. Some are of opinion that it is only a mild form of small-pox, but it is generally regarded as a distinct disease. It is mostly confined to children, and is of a contagious nature. The premonitory fever is very slight, and the vesicles are filled with a watery fluid, rarely with yellow matter or pus, and pass away in the course of four or five days, leaving only slight crusts or scales, which fall off without leaving any permanent mark. The disease is rarely attended with danger, and, generally, all that is necessary is to put the patient upon spare diet, and to administer a dose or two of some mild aperient.

CHICK-PEA. (*See* CICER.)

CHICK-WEED. (*See* STELLARIA.)

CHICORY. (*See* CICHORIUM.)

CHIEF, *tsheef* (Fr. *chef*, from Gr. *kephale*, the head), denotes the highest in office or rank, the head or principal part of anything.

CHIEF, in Her., one of the nine honourable ordinaries, occupying the upper part of the shield and a third part of the field. When any charge or charges are borne in the upper part of the field, they are said to be *in chief*.

CHIEF JUSTICES, *tsheef jus'-tis* (Fr. *chef*, chief; Low Lat. *justiciarius*, justice), are the principal judges of the courts of Queen's Bench and Common Pleas; the chief judge of the court of Exchequer being called the Lord Chief Baron. (*See* JUDGES.)

CHIEFTAIN, *tsheef'-tin* (Old Fr. *chefetain*, from *chef*, chief), is the leader, captain, or chief of a troop, army, or clan, but generally of the last. The chieftains of the Highland clans of Scotland were the patriarchal and feudal heads of their respective clans. (*See* CLANS.)

CHILBLAIN, *tshil'-blain* (Ang.-Sax. *chill*, cold; *blain*, a pustule or blister), is an inflammatory affection of the skin, occasioned by exposure to sudden alternations of heat and cold, and usually affecting the hands or feet. Young persons are more subject to it than adults, and females than males. The part is red and swollen, and is attended with heat and a great sense of itching. Chilblains are generally produced by persons holding their hands or feet to the fire immediately after they have been exposed to great cold. This is to be carefully guarded against, and a uniform temperature, as far as possible, maintained by the use of warm socks and gloves. The itching is best removed by frequently rubbing the part with some stimulating application, as camphorated spirits of wine. One of the best means of removing chilblains on the hands we have found to be washing them slightly before going to bed with warm water, which allays the heat and promotes the general circulation. If the parts should ulcerate, it is often very difficult to heal; but the best application to use is spermaceti ointment.

CHILDERMAS-DAY, or INNOCENTS' DAY, *tshil'-der-*

*mas* (Ang.-Sax.), an anniversary of the Church of England, held on the 28th of December, in commemoration of the children of Bethlehem, slain by order of Herod.

CHILIASTS, *kil'-li-ists* (Gr. *chilias*, a thousand), in Eccl. Hist., was applied to those who believed that Christ was to come again and reign a thousand years upon earth. (*See* MILLENARIANS.)

CHILLIES. (*See* CAPSICUM.)

CHILTERN HUNDREDS, *tchil'-tern hun'-dreds*, is a portion of Buckinghamshire known as the Chiltern Hills. The stewardship of the Children Hundreds is a nominal office under the crown, in the gift of the chancellor of the exchequer, and serves the purpose of enabling a member of the House of Commons to resign his seat (which he cannot do unless in some way disqualified), it being regarded as a place of honour and trust under the crown. The office is resigned immediately afterwards.

CHIMES, *tchimes* (Dan. *kimer*, to tinkle), a peal of musical bells placed in a church-tower, and either rung by hand or by machinery contrived for the purpose. In the ordinary art of bell-ringing, melody is never thought of; mechanical order and succession are the only results aimed at. In Belgium and Holland there are some very perfect chimes.

CHIMPANZEE, *tchim-păn-zee'* (*Troglodytes niger*), a species of ape, and one which in form and structure exhibits the greatest resemblance to man. It is a native of the warmest parts of Africa, and seldom attains a height exceeding four feet when in an erect position. Its skin is thickly covered with long black hair in front; and on the head, back, and limbs, the hair grows thicker than elsewhere. The ears are thin, prominent, and naked, and not unlike human ears in shape. The appearance of the nasal organ is that of a mere pucker in the skin. The thumb of the hand is small and weak; that of the foot remarkably large and powerful. One of the most important of the distinctive points of difference between the anatomy of man and the anthropomorphous apes is, that in the former the muscle which terminates in a single tendon and concentrates its action on the great toe, in the case of the apes the same muscle terminates in three tendons, none of which is connected with the great toe or hinder thumb, but which flex the three middle toes,—part of the adaptation of a foot for clasping as a hand. The great toe of the chimpanzee is shorter than the other toes, and opposed to them as a thumb. The most man-like of this genus, however, is undoubtedly the gorilla, about which, till within the last quarter of a century, scarcely anything beyond the most vague and preposterous stories were known. (*See* GORILLA, OURANG-OUTANG, APE.)

CHINA-WARE. (*See* PORCELAIN.)

CHINCHILLA, *tchin-tchil'-la*, a small rodent animal, chiefly valuable for its fur, which is beautifully soft, downy, and of considerable length, but so loosely attached to the skin, that it falls off unless handled with considerable care. It associates in numbers, and excavates burrows in which it resides, feeding chiefly on roots. In size and general form it resembles the rabbit, excepting the tail, which curls over, after the fashion of the squirrel's. It is a native of South America, and inhabits the valleys of the high mountain-districts. The length of the body is about nine inches, and that of the tail five. As soon as they die, their hair falls off; and for this reason it is unavailable for many purposes to which otherwise it would be applied.

CHINESE ARCHITECTURE, *tchi'-nese*. — The architecture of the Chinese is peculiar to China, differing entirely in form and ornamentation from that of any other Eastern nation. The materials that are used in building consist chiefly of marble, stone, wood, brick, bamboo, and tiles of porcelain, which are glazed and coloured. The erection of all buildings in China, whether for public or private purposes, is carried on under the supervision of a surveyor; and the rank of the person who is to inhabit it has much to do with the form and size of the private dwelling-house. These consist principally of a ground-floor and first floor; but houses of many floors have been sometimes built, reaching 200 feet in height. A great quantity of wood is used in building, which is richly coloured and relieved with gilding, so that the houses present a gay and picturesque appearance. The walls of the apartments on the ground-floor are of tolerable solidity, generally pierced with square or long and narrow windows, which are often filled with elaborate trellis-work. On these walls wooden columns are erected to support the roof, which is formed of bamboo, and for the most part turned up at the edges. The roof is sometimes made in two parts, resembling one roof rising out of another. The windows and doors are often circular in form. The walls are plastered and decorated with panels containing paintings and inscriptions in the Chinese symbolic characters. Balconies are generally formed in front of the apartments on the first floor, the front of which consists of trellis-work. The royal palaces are of great extent, consisting of a series of courts, with galleries and halls of audience, beautifully painted. The last court in the series is set apart as the residence of the emperor. The palace at Pekin is said to occupy an area about 1,080 yards in length by 840 yards in breadth. The *Yuen-ming-yuen*, or Summer Palace, near Pekin, which was plundered by the French and burnt by the British in 1860, was surrounded by pleasure-grounds filled with beautiful buildings devoted to various purposes. Their tombs and mausoleums are generally formed in the side of a hill, the entrance being in the centre of a wall of polished granite, built in the form of a horseshoe, and flanked with side-walls surmounted by a heavy coping: a platform of granite is generally placed before the entrance. Arches of wood or stone are often erected across streets or at the entrance to a town or dwelling-house, with an inscription to the memory of some person deceased. Their temples differ greatly in form and size, but in many points of architectural construction and decoration they resemble the dwelling-houses of a higher class. The ordinary temples, or joss-houses, consist of a chamber containing an idol. The Buddhist temples are larger and more elaborate, consisting of a vestibule, which leads to courts containing temples, sometimes two stories in height, in which are seated colossal images of Buddha. Buildings for various purposes are attached, such as the reception of animals offered by worshippers of Buddha, and the ashes of the priests who are burnt after death. The courts are surrounded by colonnades, behind which are rooms or cells, in which the officiating priests of the temple reside. The pagodas, which form a conspicuous feature in Chinese scenery, are either monumental records, or are intended for the reception of some relic of Buddha, like the Japanese temple Boro Buddor. (*See* BORO BUDDOR.) They are generally octagonal in form and nine stories in height, surmounted by a conical roof, from which an ornamented pole rises. Each story is less in size than the one below it, and is surrounded by a balcony, from which a sort of pent-house projects, ornamented with bells at the corners. These pagodas are built of brick, and the exterior of some of them is coated with porcelain tiles. The walls of their cities are high, and broad at the top, with square towers at intervals. Their castles are also square in form, being contracted in size towards the top, and surmounted, like the walls, with battlements. The Chinese build bridges with circular, pointed, and elliptic arches, and assert that the method of constructing the various forms of arches has been known to them from very early ages, which is doubtful.—*Ref.* Huc's *Travels in Tartary, Thibet, and China*.

CHINESE GRASS. (*See* BŒHMERIA.)

CHINESE LANGUAGE AND LITERATURE.—The Chinese language belongs to that class of tongues of Eastern Asia that are commonly termed monosyllabic, *i. e.* in which each word is pronounced by a single movement of the organs of speech, and each expresses a complete idea or object. The words all terminate either in a vowel or diphthong, or a nasal sound. Of such words or roots there are about 450 in the language. Many of these words, however, are differently pronounced or accentuated,—some of them in four or five different ways, and having as many different meanings. In this way the number of roots or words is increased to about 1,200. There are, besides, many words that, with the same pronunciation, express very different things. The words undergo no changes of form, and the want of conjugation or declension is made up by particles,

or by the position of the words in a sentence. The construction of the sentence is thus an important part of Chinese grammar, as upon it the meaning mainly depends. There are numerous dialects of the Chinese; but it is said to be spoken most purely and correctly at Nankin. The best grammars and dictionaries of the Chinese language are those of Morrison and Medhurst. In Chinese the alphabet is not composed of letters, but each word has a certain character peculiar to itself; and hence the number of characters corresponds with the number of words in the language. As the same words differently pronounced express different objects, the number of written characters must necessarily correspond; and hence it is said that the number of characters in the language exceeds 40,000. In its origin the Chinese language is hieroglyphic or pictorial, and to the original characters a number of symbolical and conventional signs have been added; by the union of which hieroglyphs and symbols, with an imperfect indication of the sound, the greater number of the Chinese characters are composed. Native grammarians divide their characters into six classes; the first comprising simple representations of sensible objects; as the sun, moon, mountain, tree, &c., and including 608 characters. The second class includes such as are formed by the union of two or more simple hieroglyphs, which give a more or less clear idea of the meaning intended to be conveyed; as the sun and moon combined give the idea of light; mouth and bird, that of song. Of this class there are 740 characters. The third class is composed of such as indicate a certain relation of place; as above, below, the numerals, &c.,—of which there are 107. The fourth class comprises such characters as, by being inverted, convey a contrary meaning; as right, left, standing, lying,—and contains 372. The characters of the fifth class are termed borrowed characters, as expressing abstract ideas or mental acts by means of representations of sensible objects; as a heart signifying the spirit, a room a woman: of these there are 598. The sixth class comprises those that are composed of a hieroglyph and a mark representing the sound. Almost all the names of animals, trees, plants, and many other objects which it would be too difficult to represent hieroglyphically, are indicated in this way: their number is given at 21,810. These, however, are merely repetitions of those of the other five classes; so that the entire number of Chinese characters may be reduced to 2,425; and if one has learned these, he may be said to know all. Of the great number of characters that are to be found in Chinese dictionaries, amounting to about 40,000, not more than a tenth part are in common use. In the arrangement of their dictionaries, the Chinese select a certain number of characters, usually about 214, which serve as a sort of key, and answer the same purpose as the letters of our alphabet. The *Chinese Literature* is undoubtedly the richest, and, in a geographical, historical, and ethnographical point of view, it is the most important of the whole of Asia. The printed catalogue of the library of the emperor Kein-long consists of 122 volumes; and a selection of the Chinese classics, with commentaries and scholia, begun by command of the same monarch, is said to comprise 180,000 volumes, of which, in 1813, 78,731 volumes had appeared. In the five canonical or classical books called the "King" are contained the oldest specimens of Chinese poetry, history, philosophy, and jurisprudence, some portions of which are probably among the oldest written monuments of the human race. They were collected from various sources by Confucius in the 6th century before Christ; and in this collection they have been handed down to us with apparent fidelity. The five "Kings" are — 1. The "Y-king," or Book of Changes (a Latin translation of which was published by Mohl,—Stuttgart, 1832); 2. the "Sohu-king," or Book of Annals, which is imperfect, comprising fragments of the early history of the people (Chinese and English, by Medhurst,—Shanghai, 1846); 3. "Schi-king," the Book of Songs (in German, by Rückert,—Altona, 1833); 4. "Tschün-thsieu," the History of certain Kingdoms, from 770 B.C. to the time of Confucius; 5. "Li-ki," or Book of Ceremonies, which contains a series of laws and directions extending down even to the minutest details of life. The "Tscheu-li," which has been translated into French by Biot (Paris, 1851), is a kind of official handbook of the old Chinese empire. Next to the "Kings" in value and importance are the "Sse-schu," or the four books which were written by Confucius and his disciples, and are to be regarded as the most certain sources for information regarding that important school of philosophy which has in so marked a manner affected the whole intellectual and political condition of the Chinese. These four books are generally known as the works of Confucius, and have been translated into various languages;—into English by Collie (Malacca, 1828). To these books numerous scholia, commentaries, and paraphrases have been written. Almost contemporary with Confucius was Lao-tse, also the founder of a wide-spread school of philosophy. In mythology they have "The Book of the Mountains and Seas" and the "History of the Gods and Spirits." In jurisprudence, worthy of special notice is the general collection of laws and the criminal code of the present ruling dynasty.—(*See* "Ta-Tsing-leu-lee, being the fundamental laws and supplementary statutes of the penal code of China," by Staunton; London, 1810.) The Chinese literature is also very rich in medical works, and works on natural history, astronomy, uranography, geometry, agriculture, war, music, and all branches of technology and mechanics.—(*See* "Résumé des principaux Traités Chinois sur la Culture des Mûriers et l'Education des Vers à Soie. . . Julien; Paris, 1837.) In philology, the first rank is due to their dictionaries, which have been prepared with great diligence, and examples collected out of the whole treasury of Chinese literature. The greatest work of this kind is the dictionary of the emperor Kang-hi, which is now regarded as the highest authority for the form, pronunciation, and signification of the characters. Equally rich and valuable is the encyclopædic literature of the Chinese; among which is the work of Ma-tuan-lin (A.D. 1300), entitled "Wen-hien-thong-khao,"—*i.e.* an accurate examination of the ancient documents, with rich supplements,—presenting an inexhaustible mine of the best materials for a thorough knowledge of the Chinese and the neighbouring races, from the oldest to the most recent times, in every department of life. But the most valuable department of Chinese literature is undoubtedly the historical and geographical, which are absolutely indispensable to a thorough knowledge of Upper Asia. Sse-ma-thsian (B.C. 100) compiled his "Sse-ki," or Historical Memorials, from every available source, and gives the history of China from B.C. 2637 to the commencement of the dynasty of Han, in the second century before the Christian era. This work has been continued by the different dynasties, and forms a complete collection of the annals of the empire down to the end of the last dynasty of Ming, A.D. 1643. The entire collection of the official annals from 2698 B.C. to A.D. 1645, a period of 4,343 years, and comprising 3,705 books, is to be found perfect in the library of Munich. Amongst their other labours, the Chinese have by no means neglected poetry, of which there are voluminous collections that have yet to be made known to Europe. As lyric poets, the names of Tu-su and Li-thai-pe, who flourished about the 8th century, are specially famous. Of their numerous poems little is as yet known.—(*See* Davis "On the Poetry of the Chinese," in the "Transactions of the Royal Asiatic Society," vol. ii.) The romances of the Chinese are not characterised by any great flights of the imagination, but are valuable as giving an insight into the domestic life, and the modes of thinking, feeling, and acting of the people. Their dramatic poetry follows peculiar rules, and approaches partly the romantic plays of the Germans, partly the *commedie delle arti* of the Italians. They have also a kind of dialogue novels, which form a subordinate species of drama. The best-known collection of dramas is "Yuen-dschin-pe-tschong,"—*i.e.* the Hundred Dramas from the Mongolian dynasty (1280—1341), out of which all the dramas that are yet known to us have been taken; as the "Lao-seng-urh," or an Heir in his Old Age, by Davis (London, 1817); "Hang-koung-tsew," or the Sorrows of Han, by Davis (London, 1829). The richest collections of Chinese books in Europe are at Paris, London, Berlin, Munich, and St. Petersburg. We possess as yet no history of Chinese literature. The Chinese themselves have numerous works of this class; but they are very meagre, and are almost en-

tirely confined to bibliographical and critical sketches. —*Ref.* Brockhaus' *Conversations Lexikon.*

CHINESE TALLOW. (*See* STILLINGIA.)

CHIRURGY, *ki-rur'-je* (Gr. *cheir*, a hand, and *ergon*, a work), is a term sometimes used in place of surgery, from surgical operations being performed by the hand. (*See* SURGERY.)

CHIVALRY, *shiv'-al-re* (Fr. *chevalerie*, from *chevalier*, a knight or horseman), is a term applied to the order of knighthood established during the Middle Ages in almost all the kingdoms of Europe, and whose laws, rules, and customs are still to be found largely pervading the manners and customs throughout Europe. Though chivalry first assumed importance in the 11th century, it was far from being, as many have supposed, an invention of that period, but sprang naturally and by degrees out of the feudal system that had long prevailed over a great part of Europe. Its origin is to be traced to the feudal mansions of the barons, where young men were trained to the occupation of the warrior, and instructed in the relations that subsisted between the vassal and his lord. By degrees the influence of the Church manifested itself, and religious ceremonies were mingled with those by which a young man was admitted to the rank of a warrior. To the influence of the clergy are to be attributed in great measure those high moral principles that characterized the spirit of chivalry, and were so far in advance of the then condition of lay society in general. The education of a knight was briefly as follows:—The young and noble stripling, generally about his 12th year, was sent to the court of some baron or knight, where he spent his time in acquiring the use of arms and attending upon the ladies. The respect for female character, which was one of the marked features of chivalry, was one of the characteristics of the ancient German tribes, and is mentioned by Tacitus. When advancing age and experience in the use of arms had qualified the page for war, he became an *escuyer*, or esquire, so called from *escu*, or *scudo*, a shield, because it was part of his duty to carry the shield of the knight whom he served. The third and highest rank of chivalry was that of knighthood, which was not conferred before the 21st year, except in the case of distinguished birth or great achievements. The individual prepared himself by confessing, fasting, &c.; religious rites were performed, and then, after promising to be faithful, to protect ladies and orphans, never to lie or utter slander, to live in harmony with his equals, he received the *accolade*, a slight blow on the neck with the flat of a sword, from the person who dubbed him a knight, and who, at the same time, pronounced a formula to this effect:—"I dub thee knight, in the name of God and St. Michael (or in the name of the Father, Son, and Holy Ghost). Be faithful, bold, and fortunate." A warlike spirit, an undefinable thirst for glory, and a lofty devotion to the fair sex, were the great characteristics of chivalry. The crusades gave a more religious turn to the spirit of chivalry, and made the knights of all Christian nations known to each other. Chivalry was at its height between the 11th and the 14th centuries. It decayed with the progress of mercenary armies and the decline of feudal institutions, in the 15th century, and in the 16th it had almost ceased to exist.

CHLORANTHACEÆ, *klo-ran-thas'-se-e* (Gr. *chloros*, green; *anthos*, a flower), in Bot., a small nat. ord. of dicotyledonous tropical plants, in the sub-class *Monochlamydeæ*, consisting of about fifteen species, which are arranged into three genera. They are herbs or under-shrubs, with jointed stems, sheathing leaves, and spiked schlamydeous flowers, with scaly bracts. The typical genus *Chloranthus* includes some useful species. The roots of *C. officinalis* and *brachystachys* have been employed in Java as stimulants in malignant fevers, and for their antispasmodic effects. The leaves of *C. inconspicuus* are used in China to perfume tea. Aromatic stimulant properties are common to all the plants of this order.

CHLORIC ACID, *klor'-ik* ($ClO_3$).—This acid has never been obtained in an isolated condition, it being, as yet, impossible to separate from it the last equivalent of water. It is formed by passing a current of chlorine through an alkaline solution, when the chloride of the metal and the chlorate of the alkali are formed. It is obtained as a monohydrated acid by mixing an equivalent proportion of sulphuric acid with a solution of chlorate of baryta, and submitting the decanted liquid to spontaneous evaporation *in vacuo*. It is colourless, strongly acid, has an oily consistence and a pungent smell. Paper dropped into it inflames. It is not decomposed by light, and its oxidising properties are very powerful. It forms salts with bases, called *chlorates*, which are decomposed by heat, the chloride of the metal being left behind, while oxygen is liberated. The most useful of them is the chlorate of potash, which is formed by passing chlorine through a solution of caustic potash: chloride of potash and chloride of potassium are formed, the former being separated by crystallization. (For an account of its valuable properties, *see* POTASH, CHLORATE OF.)

CHLORIDES, *klor'-ides*.—Chlorine enters into combination with the metals and the non-metallic elements, forming compounds of great importance. These will be treated of particularly under the heads of their respective bases. They all, however, possess some common properties which it will be well to consider in this place. With the exception of the chloride of silver and the sub-chlorides of mercury and copper, all the chlorides are soluble in water. In many of their properties they closely resemble the oxides; and it is generally found that a metal will enter into as many combinations with chlorine as it does with oxygen. Thus we have the proto- and bi-chloride of platinum, corresponding to the proto- and bin-oxide of that metal. They are all fusible at ordinary temperatures, and melt and dissolve with greater readiness than their corresponding oxides. Chlorides of metals are mostly formed by dissolving the oxide or carbonate of the metal in hydrochloric acid. This process fails in the case of magnesium and aluminium. Most of the metallic chlorides are decomposed when heated in a current of hydrogen, hydrochloric acid and the pure metal being the result. This is taken advantage of in the formation of pure iron and several other metals. The chlorides of the noble metals are generally decomposed by simple ignition, the metals remaining behind in an uncombined form. The other chlorides are not decomposed by heat. When heated with black oxide of manganese and sulphuric acid, they eliminate chlorine.

CHLORIMETRY, *klor-im'-e-tre* (*chlorine*, and Gr. *metron*, a measure), the name given to the method of determining the amount of available chlorine in the chloride of lime of commerce. There are several ways of effecting this. The oldest is ascertaining the weight of the amount necessary to decompose a certain amount of a standard solution of indigo or sulphuric acid. This process has been abandoned, being rendered fallacious from the solution of indigo becoming spontaneously discoloured by keeping. The method at present employed consists in determining the amount of bleach necessary to convert a known quantity of arsenious acid, $As_2O_3$, into arsenic acid, $As_2O_5$. Another method, which is perhaps more frequently used than the one just mentioned, is to ascertain the quantity of bleaching-powder which is required to peroxidize a known amount of protosulphate of iron. A certain amount of protosulphate of iron is dissolved in water,—say 50 grains of the latter to 1,000 grains of the former, forming the test-liquid. Fifty grains of bleaching-powder are dissolved in a little water and poured into a test-measure. The bleaching-powder solution is then dropped into the protosulphate until a drop of ferricyanide of potassium (red prussiate of potash) no longer gives a blue precipitate. The operation is concluded by a simple rule-of-three sum. Chlorimetry is an hourly operation with calico-bleachers, it being important to know the exact strength of the steeping-liquor at each immersion of fabric. Mr. Crum's process is the one generally employed. It is founded on the property possessed by acetic acid of turning a solution of a persalt of iron to a deep red. Known quantities of acetic acid, perchloride of iron, and bleach-liquors are mixed together, and the colour produced is compared with those of twelve vials ranged in a frame, containing similar ingredients, submitted to known but varying proportions of chlorine. In this instance the colour indicates the exact amount of chlorine contained in the measured

quantity of bleach-liquor; from which data the percentage is easily calculated.

CHLORINE, *klor'-ine* (Gr. *chloros*, green),—symbol Cl, equivalent 35·5, spec. grav. 2·44.—*Chlorine, dephlogisticated marine acid*, or *oxymuriatic acid*, was discovered by Scheele in 1774, while examining an ore of manganese. It was thought at first to be a compound gas; but Gay-Lussac and Thenard supposed, and Sir Humphry Davy proved, that it was an elementary body. It was the latter philosopher that bestowed upon it the name of chlorine, from *chloros*, green (Greek), on account of its colour. It occurs in nature in great abundance, in combination with many mineral substances, such as rock-salt; also in sea water and sea plants, as the chlorides of potassium and sodium. It may be prepared in two ways,—either by heating black oxide of manganese with hydrochloric acid, or by heating a mixture of black oxide of manganese, chloride of sodium, and dilute sulphuric acid. It is a transparent gas of a greenish-yellow colour and a powerfully suffocating odour, which, even largely diluted with air, produces great irritation of the air-passages. One hundred cubic inches weigh between 77 and 78 grains. It is, therefore, about two and a half times heavier than atmospheric air. Water absorbs about twice its volume; it can, therefore, be only collected by displacement or over warm water. Under a pressure of four atmospheres it condenses into a yellow limpid liquid, rather heavier than water, and remains fluid and unfrozen at a temperature of —230° Fahr. With water, *chlorine* forms a definite hydrate, which, when subjected to a cold of 32° Fahr., solidifies in the form of large yellow crystals. Chlorine is not combustible, but supports combustion to a certain degree. A wax taper burns in it with a reddish smoky flame, the hydrogen of the wax combining with the chlorine to form hydrochloric acid, and the carbon being set free. Chlorine, in common with several other elementary bodies, has the property of replacing hydrogen in its organic compounds. It is in this manner that chlorine bleaches textile fabrics. The brownness of the fabric is due to some brown organic substance, which, when submitted to the action of chlorine, parts with its hydrogen and assumes a colourless form, containing chlorine. This fact is proved on a large scale by the action of chlorine on indigo. Another property of chlorine is that of destroying noxious vapours and miasmata. For the same reason, it is used as a disinfectant, the action being the same as that mentioned above. For laboratory use, chlorine is best made as follows:—Oil of vitriol and water, of each seven parts. Allow the mixture to cool, and add four parts of chloride of sodium, mixed alternately with three parts of peroxide of manganese. The gas comes off slowly at first until the application of a gentle heat, when it immediately rushes forth in large quantities. The manufacture of chlorine for bleaching purposes is described under BLEACHING-POWDER. Chlorine is possessed of powerful affinities, and unites with all the metalloids and metals. With oxygen it forms five compounds,—hypochlorous acid, $ClO$; chlorous acid, $ClO_2$; peroxide of chlorine, or hypochloric acid, $ClO_4$; chloric acid, $ClO_5$; perchloric acid, $ClO_7$; all of which are described under their respective heads. With hydrogen it forms hydrochloric acid, and with nitrogen a fearfully explosive substance,—perchloride of nitrogen. With carbon it forms several chlorides. (*See* CARBON.) In many of its properties, it bears a very strong analogy to its congeners bromine and iodine. The relation subsisting between the atomic weights of these three bodies is very peculiar, the equivalent of bromine being halfway between iodine and chlorine:—

| | |
|---|---|
| Chlorine ..... | 35·5 |
| Iodine ..... | 127 |
| | 2)162·5 |
| | 81·25 |

80 being the equivalent of bromine. The same relation is carried out in the properties of these bodies, bromine standing halfway between the other two in specific gravity, colour, affinity, solubility, and consistency. Chloride of iodine, too, possesses many properties in common with bromine. Whether bromine will ever be discovered to be a chloride of iodine or not, is a question to be answered by the chemistry of the future.

CHLORINE-WATER:—Water at 60° absorbs two volumes of chlorine. When freshly made, this solution possesses all the properties of the gas. It gradually becomes decomposed, liberating oxygen and forming hydrochloric acid.

CHLOROFORM, *klor'-o-form* (prefix *chloro*, and *formyl*),—$C_2HCl_3$.—This interesting compound is produced by a variety of reactions. The most usual way of preparing it is by acting upon dilute alcohol with chloride of lime. Six parts of chloride of lime are mixed with twenty-four parts of water, and one part of alcohol is added to the mixture; the whole is transferred to a capacious still, and the heat is quickly raised until it reaches 160°. The products, which consist of chloroform and water, collect in two layers, the lower of which is chloroform. It is separated from the water by means of a pipette, agitated with sulphuric acid, and once more distilled. Chloroform is a colourless, volatile, mobile, highly refracting liquid, of specific gravity 1·497, and boiling at 142° Fahr. It has an ethereal odour, and a sweetish penetrating taste. It is readily soluble in ether and alcohol, but sparingly so in water. Concentrated sulphuric acid has but little action on it, and potassium does not decompose it. It yields, however, to the action of light, and should be tested for alcohol and other products of decomposition before it is used for an æsthetic purpose. Pure chloroform, when dropped into water, should fall to the bottom without becoming milky. Alcohol is detected in it by its turning green on the addition of bichromate of potash and sulphuric acid. It should remain colourless when oil of vitriol is agitated with it, and the liquid itself should be perfectly colourless, and free from any chlorous odour. The vapour of chloroform has the remarkable property of rendering a person breathing it temporarily insensible to pain. To Professor Simpson, of Edinburgh, is due the credit of introducing chloroform as an anæsthetic. (*See* ANÆSTHETICS.) Chloroform is an excellent solvent for sulphur, phosphorus, and iodine. It also readily dissolves fatty and resinous bodies. It is a perfect solvent of caoutchouc, which is left unaltered on evaporation. Chemists are at variance as to the real composition of chloroform, some regarding it as a derivative of methyl, others looking on it as a terchloride of formyl. There are other chlorides derived from the same source, having the formulæ $C_2HCl_5$ and $C_2HCl$; but they have not yet been properly studied. Iodine and bromine form similar substances,—iodoform and bromoform, having the formulæ $C_2HI_3$ and $C_2HBr_3$.

CHLOROSIS, *klo-ro'-sis* (Gr. *chloros*, green), in Med., is the name of a disease to which young females are subject, and which is characterized by a peculiar sallow or greenish-yellow hue of the countenance, and hence known as the green sickness. It is usually attended with great debility, palpitations of the heart, difficulty of breathing, pains in the back and loins, and other distressing symptoms. The principal means to be employed in the cure of this disease are gentle exercise in the open air, with nutritious and rather stimulating diet, tonics, sea-bathing, and agreeable society.

CHLOROSPERM. (*See* ALGÆ.)

CHLOROUS ACID, *klor'-ous* ($ClO_2$), one of the oxides of chlorine. It is a dark greenish-yellow gas, possessing a pungent odour and bleaching properties. If heated to 136° Fahr. it explodes, being resolved into chlorine and oxygen; it also explodes when placed in contact with combustible substances. By intense cold and pressure it may be reduced to the form of a red liquid. Water dissolves about six times its volume of the gas, the solution varying in colour from green to yellow, according to the degree of saturation. Chlorous acid has powerful bleaching properties, and combines with bases to form chlorites, many of which are crystallizable. It is expelled from its combinations by carbonic acid. It is prepared by heating nitric acid, chlorate of potash, and arsenious acid. The gas must be collected by displacement, as it acts both on mercury and water.

CHLOROXYLON, *klo-rok'-s-lon* (Gr. *chloros*, green; *xulon*, wood), in Bot., a gen. of tropical trees belonging

to the nat. ord. *Cedrelaceæ*, or Mahogany fam. All the species have dotted leaves, which yield by distillation an essential oil. *C. Swietenia* furnishes Indian satin-wood, which is sometimes imported into this country for the use of cabinetmakers. Royle states that this tree is one of the plants that yield the wood-oil of India. (*See* DIPTEROCARPUS.)

CHOCOLATE. (*See* THEOBROMA.)

CHOIR, *quire* (Gr. *choros*, Lat. *chorus*, Fr. *chœur*, Sax. and Ger. *chor*), is that part of a church or cathedral where the singers or choristers chant or sing divine service. It is also applied to those whose special duty it is to perform the service to music. Every choir is divided into two parts, stationed on each side of the choir, in order to sing alternately the verses of the psalms and hymns, one side answering to the other. The choral service in the English churches had been much neglected, but a great improvement in this respect has taken place within the last forty or fifty years.

CHOKE-DAMP, *tshoke'-dămp* (Ang.-Sax.), a name given by miners to carbonic acid, as distinguished from fire-damp, which is carburetted hydrogen.

CHOLERA, *kol'-e-rā* (Gr. *chole*, bile, and *rheo*, I flow), in Med., is the name given to two or three different forms of disease, each of which is characterized by vomiting and purging, with great pain and debility. The mildest form of this disease is known as bilious or British cholera, and usually prevails to a greater or less extent in this country every summer or autumn. It apparently proceeds from some disordered condition of the bile, which is either in excess or too acrid, and seems to be produced by cold, suppressed perspiration, unripe or acid fruits, &c. It generally commences with griping pains of the bowels, followed by vomiting and purging, together with heat, thirst, a hurried respiration, and a frequent but weak and fluttering pulse. In favourable cases these symptoms subside in a few days, leaving the patient in a very weak and exhausted condition; but in severe cases great depression of strength ensues, attended with great anxiety and lowness of spirits, violent spasms, cold clammy sweats, a hurried and short respiration, hiccup, a low and irregular pulse, and the patient sinks rapidly, being sometimes carried off in twenty-four hours. In the earlier and milder form of this disease, when the strength is not much exhausted, tepid demulcent liquids are to be frequently administered, so as to lessen the irritation and facilitate the discharge of the bile. Where the symptoms are severe and the patient rapidly sinking, opium is to be administered freely, but in small quantities, and effervescent saline draughts given to check the sickness, and enable the stomach to bear the frequent doses of opium. When the urgent symptoms are relieved, the strength is to be restored by gentle tonics and a light and nutritious diet. The severer form of this disease is sometimes called spasmodic cholera, from being usually attended with violent spasms. The Asiatic, malignant, or pestilential cholera, is a much more violent form of disease, and first became known in this country in the autumn of 1831. It commonly comes on without any warning, and the patient is frequently a corpse in a few hours. The attack usually begins with sickness and purging; the discharge in this case not being bilious, but a thin colourless fluid like rice-water, accompanied with great prostration of strength and cold clammy sweats. In a short time dreadful cramps assail the extremities, and afterwards the abdomen and other parts of the body; the body becomes bent, the limbs twisted, the countenance cadaverous, the pulse almost imperceptible, the eyes sunken and surrounded by a dark circle, the patient sinks into a state of apathy, and, unless a favourable change speedily takes place, he soon expires. When reaction takes place, the pulse gradually returns, the natural warmth of the body is restored, and the spasms and difficulty of breathing give way. Frequently, however, the reaction is accompanied by fever, closely resembling typhus, and which often terminates fatally, in from four to eight days. As regards the treatment of this disease, the only advice that can be given here is, to seek the aid of a medical man without delay.

CHONDRUS, *kon'-drus*, in Bot., a gen. of *Algæ*. The most important species is *C. crispus*, commonly called carrageen, or Irish moss, which is used medicinally for its nutritive, emollient, and demulcent properties, being administered in the form of a decoction or jelly. It is also used for making *bandoline* (which see), and as a substitute for size. *C. mamillosus*, which has similar properties, is always found in the carrageen moss of the shops.

CHORAL SERVICE, *kor'-ăl*, of the English church is when those parts of the service ordered in the rubrics are sung by a full complement of clergyman and choristers in a cathedral church.

CHORD, *kord* (Lat. *chorda*), in Geom., is a right line drawn from one part of an arc of a circle to another. The term is also applied to the string of a musical instrument.

CHORD, in Mus., the harmonious combination of three or more musical sounds. Before the introduction of simultaneous sounds, it was solely applicable to a distended sonorous string; but after the discovery of *counterpoint*, and the formation and establishment of various combinations, a general term became necessary to express those combinations, and that which before applied only to a single string was now borrowed, and its sense extended to a union of the sounds of several strings, pipes, or voices. In practical music there are several kinds of chords; *i. e.* the *fundamental chord*, consisting of the third, fifth, and eighth of the fundamental bass, or their inversions;—the *accidental chord*, which may result from either of two causes, viz., *anticipation* or *retardation*; by *anticipation* when their construction assumes some note or notes of a succeeding chord (a chord not yet struck); by *retardation* when one or more notes are, by *suspension*, carried in to the composition of the succeeding chord;—the *anomalous* or *equivocal chord*, in which some interval or intervals are *greater* or lesser than those of the fundamental chord;—and the *transient chord*, in which some intermediate notes are introduced to smoothen the transition from one chord to another; which do not form any component parts of the fundamental, and cannot be justly called either anticipations or suspensions.

CHOREA, *kor-e'-a* (Gr. *choreia*, a dancing or jumping), in Med., is the name of a disease otherwise known as St. Vitus's Dance, and characterized by convulsive motions of the limbs, as of a person dancing. The muscles of voluntary motion are no longer under the complete control of the will, and the power of walking or of using the arms or hands is impaired. It is common to both sexes; but rarely attacks before the age of eight or after that of sixteen years. Those of a weakly constitution, or whose health has been impaired by confinement or improper nourishment, are chiefly subject to it. The great cause of it is a disordered state of the digestive organs, producing a certain degree of mental weakness. The patient is at first restless, irritable, fretful, and gloomy. After a time there come on irregular and involuntary twitchings of the muscles; he cannot walk steadily, or drags one leg after him; the arms become affected, and the muscles of the face, head, and trunk may become, at different times and in different degrees, affected by it. This disease usually disappears under judicious treatment, or as the patient grows up; but occasionally it terminates in epilepsy, paralysis, or idiotcy. The proper mode of treatment is to restore the tone of the system by tonics, a nourishing diet, and frequent exercise in the open air, with occasional purgatives, if necessary.

CHORUS, *kor'-us* (Lat.), among the ancients, denoted a number of singers and dancers employed on festive occasions, and also in the performance of plays. During the most flourishing period of Attic tragedy, the chorus consisted of a group of male and female personages, who remained on the stage as bystanders or spectators, and, during the intervals of the acting, chanted songs relating to the subject of the play. They sometimes even took part in the performance, by advice, comfort, consolation, or discussion. In early times it consisted of a great number of persons, sometimes as many as fifty; but it was afterwards limited to fifteen. The leader of the chorus was called *coryphæus*, and sometimes the chorus was divided into two parts, which sang alternately. With the decline of ancient tragedy, the chorus also fell into disuse. In recent times some

attempts have been made to restore the ancient chorus; as in Schiller's "Bride of Messina."

CHORUS, in Mus., alludes, in its general sense, either to a composition of two, three, four, or more parts, each of which is intended to be sung by a plurality of voices; or to the performers who sing those parts, and form what is called a *chorus*, or choral part of a band.

CHOSE, *shoze* (Fr.), signifies a thing; and a *chose in action* is a thing of which a man has not the possession or actual enjoyment, but has a right to demand the same by action; for property in things personal is of two kinds,—either *in possession*, where a man has not only the right to enjoy, but also the actual enjoyment of the thing; or else it is *in action*, where a man has only a bare right, without any occupation or enjoyment, the possession whereof, however, may be recovered by a suit in equity or action at law; from whence the thing so recoverable is called a thing or *chose in action*; and although a debt or right of action may be assigned, the assignee can only recover in the name of the assignor, except in cases of bankruptcy, where the law has given the power to the assignee to deal with the debt or right in his own name as assignee, it being vested in him by operation of law.

CHOUANS, *shoo-án'*, was the name given to a party of royalist insurgents that appeared on the right bank of the Loire during the first French revolution. At first they were composed chiefly of smugglers and other lawless persons; but they were speedily joined by peasants, priests, noblemen, and others. They are said to have taken their name from one Jean Cottereau or Chouan, a leader of one of their bands, and who fell in an engagement on the 2nd of February, 1794. As early as 1792, the marquis de la Roarie attempted to bring them to open insurrection; but, in consequence of his arrest, the attempt fell to the ground. In the following year Jean Cottereau succeeded in this attempt, and, for a time, the *Chouannerie*, as it was called, threatened to imperil the security of France, and the guerilla warfare which followed gave employment to as many as 60,000 regular troops. At length, partly by force and partly by negotiation, the movement was put down; and though Chouannerie has, on more than one occasion since, attempted to make its appearance on the banks of the Loire (as in 1799 and in 1814-15), it has never again become formidable.

CHOUGH, *tshuff* (Sax. *ceogh*), (*Fregilus graculus*), a British bird, much resembling in size and habits the jackdaw; its colour, however, is in parts different. It is of a jet black over its upper parts, while the head and neck feathers are tinted with purple. The beak is bright vermilion, bent from the base, and very strong. The legs and feet are of the same colour as the beak, and powerfully formed. Its length, when full grown, is about fifteen inches. Like the jackdaw, the chough is easily tamed, and just as mischievous and entertaining when its domestication has been accomplished.

CHRESTOMATHY, *kres-tom'-á-thi* (Gr. *chrestos*, useful; *manthano*, I learn), is a name sometimes applied in literature to a collection of useful pieces out of the best authors. The analogous term anthology is usually limited to selections from the poets.

CHRIST, ORDER OF. (*See* TEMPLARS.)

CHRIST-CHURCH COLLEGE, OXFORD, *krist tshurtsh*, owes its first foundation to Cardinal Wolsey, who, in 1525, obtained from Clement VII. a bull for the suppression of twenty-two monasteries, the aggregate revenues of which were estimated at nearly £2,000, in order to found and endow a college at Oxford, on the site of the priory of St. Frideswide. It was to have consisted of a dean, sub-dean, 100 canons, 10 public readers, 13 chaplains, an organist, 12 clerks, and 13 choristers, and was to have been called the "College of Secular Priests;" but afterwards, the name was changed to "Cardinal's College." Before its completion, the cardinal had fallen into disgrace; and in 1532 the society was refounded by the king, under the title of "Henry VIII.'s College." In 1545 this was again suppressed; and in the year following it was re-established under the name of the "Cathedral Church of Christ in Oxford," for the maintenance of a dean, 8 canons, 8 chaplains, a schoolmaster, an organist, 8 clerks, and 8 choristers, together with 100 students. By ordinance of the commissioners, under 17 & 18 Vict. c. 81, the number of canons is reduced to 6, of students to 80; of which 26 are senior students (with permanent tenure) and 52 junior students, of whom 21 are to be elected from Westminster school, and hold their places for seven years; the remaining 31 studentships being open to all candidates who have not exceeded their eighth term from matriculation, and are tenable for five years. Every third junior studentship is to be given for proficiency in mathematics and for proficiency in physical sciences alternately.—*Ref. Oxford University Calendar*, 1862.

CHRIST-CROSS ROW, *kriste-kros-ro'*, was the name given to the letters of the alphabet arranged in the form of a cross, and used in the instruction of children. It is referred to in Shakspeare: "And from the cross-row plucks the letter *g*."

CHRISTIAN KNOWLEDGE, SOCIETY FOR THE PROMOTION OF, an incorporated society for the education and religious instruction of the poor, supported by the members of the Church of England, and the oldest society of the kind in the kingdom. It was founded by the Rev. Dr. Thomas Bray in 1698, and was incorporated in 1701, its objects being, "(1) to promote and encourage the erecting of charity schools in all parts of England and Wales; (2) to disperse, both at home and abroad, bibles and tracts of religion; and, in general to advance the honour of God and the good of mankind by promoting Christian knowledge, both at home and in other parts of the world, by the best methods that should offer." These objects the society ever has, and still continues to keep in view. Numerous charity-schools have been established by it in all parts of the country; large sums have been expended in behalf of missionary enterprises abroad; and bible and tract distribution are largely carried on. The society annually expends about £100,000 in furtherance of these objects.

CHRISTIAN NAME. (*See* NAME.)

CHRISTIANITY, *krist-e-an'-e-te* (from Christ, Gr. *Christos*, the Anointed One), is that religion which was instituted by Jesus Christ, and whose doctrines are contained in the books of the Old and New Testaments. *When the fulness of the time was come*,—when the three great historical nations had each in its own peculiar way co-operated in preparing the soil on which Christianity was to be planted,—the Jews on the side of the religious element; the Greeks on the side of science and art; the Romans, as masters of the world, on the side of the political element;—then it was that through Him, and by the power of the Spirit that proceeded from Him—by the might of Christianity—all the threads of human development which had hitherto been kept apart were to be brought together and interwoven in one web. Whilst, on the one hand, the seed of divine truth out of which Christianity sprang was communicated to reason by divine revelation; so, on the other hand, reason, unfolding itself from beneath, had to learn by experience, especially among the Greeks, how far, singly, and by its own power, it could advance in the knowledge of divine things. The preparations made by the previous development of the history of nations had been leading precisely to this point, and were destined to proceed just so far in order to admit of Christianity, the goal and centre-point of all. "We look upon Christianity," says Neander, "not as a power which has sprung up out of the hidden depths of man's nature, but as one which descended from above, when heaven opened itself anew to man's long alienated race; a power which, as both in its origin and its essence it is exalted above all that human nature can create of its own resources, was designed to impart to that nature a new life, and to change it in its inmost principles. The prime source of this power is He whose life exhibits to us the manifestation of it—Jesus of Nazareth, the Redeemer of mankind, when estranged from God by sin. In the devotion of faith in Him, and the appropriation of the truth which He revealed, consists the essence of Christianity." "But, although Christianity cannot be understood except as something which, being above nature and reason, is communicated to them from a higher source, it stands, nevertheless, in necessary connection with the essence of these powers and with their mode of development. Otherwise, indeed, it would not be fitted to raise them to higher perfection, and, in short,

would be unable to exercise any influence upon them." "This connection consists therein, that whatever has by their Creator been implanted in the essence of human nature and reason, whatever has its ground in their idea and their destination, can only attain to its full realisation by means of that higher principle, such as we see it actually realised in Him who is its source, and in whom is expressed the original type and model after which humanity has to strive. And accordingly we discover abundant evidence of this connection when we observe human nature and reason, and see how by virtue of this, their original capacity, they do, in their historical development, actually strive after this higher principle, which needs to be communicated to them in order to their own completion." It is simply because in all cases where, by historical preparations, the soil has been rendered suitable for its reception, Christianity enters readily into all that is human, and strives to assimilate it to its own nature, and to imbue it with its own spirit, that on a superficial view Christianity itself appears to be only a result produced by the joint action of the several spiritual elements it had drawn together. And for the same reason it may also be blended for a while with the impure elements which it attracts by its influence, and so in its temporary manifestation assume a shape which wholly resembles them; but at last by its own intrinsic power it begins a process of purification, from which it issues refined and ennobled even in its outward form. In the history of Christianity we have the growth of that mighty tree which, springing up from the little grain of mustard-seed, is destined to overshadow the earth, and under the branches of which all nations are to find a safe lodging. We "survey a process of development in which we ourselves are still involved,—a process which, moving steadily onwards, not always in a straight line, but through various windings, is yet in the end furthered by whatever attempts to arrest its progress,—a process which, having its issue in eternity, constantly follows the same laws; so that in the past, as it unfolds itself to our view, we may see the germ of the future which is yet to meet us." The history of Christianity naturally divides itself into two branches,—the *external* and *internal*, according as the events of which it is made up have happened to the Church from without, or have been transacted within its own body. To the internal branch belongs, first of all, the history of that religious faith which forms its bond of union both in its scientific development and life in the members; next, the character of the public religious exercises; and thirdly, the form of government. To the external relations of the Church belong, first, its diffusion, and, second, its relation to other associations, particularly to the state. In the treatment of the history of Christianity, the old system of division into centuries has been rightly abandoned, and a division into epochs adopted instead, though considerable difference of opinion exists as to determining the different epochs. Neander divides the period from the introduction of Christianity to the Reformation into six epochs, comprising, (1) the first three centuries, or down to A.D. 312; (2) from the end of the Diocletian persecution to the time of Gregory the Great, bishop of Rome (312—590); (3) from the time of Gregory the Great to the death of the emperor Charlemagne (590—814); (4) from the death of Charlemagne to Pope Gregory VII. (814—1073); (5) from Gregory VII. to Boniface VIII. (1073—1294); (6) from Boniface VIII. to the beginning of the Reformation. The history of each epoch is divided into four sections:—(1) the relation of the Christian Church to the world, its extension and limitation; (2) the Church constitution, Church discipline and schisms; (3) Christian life and Christian worship; (4) Christianity apprehended and developed as a system of doctrines. Dr. Gieseler divides ecclesiastical history into four periods:—(1) from the introduction of Christianity to the time of Constantine (*i. e.* till 324), when the acknowledgment of the Church in the Roman empire was secured,—the first development of the Church under external oppression; (2) from the time of Constantine to the beginning of the controversies concerning image-worship (324—726),—the development of Christianity as the prevailing religion of the state; (3) from the beginning of the image controversies to the Reformation (726—1517),





—the development of the Papacy prevailing over the state; and (4) since the time of the Reformation, the development of Protestantism. The evidences in favour of the truth of Christianity are divided into external and internal. The external evidences are those that tend to prove the authenticity and divine authority of the Holy Scriptures, and have been divided into direct and collateral. The direct evidences are such as arise from the nature, consistency, and probability of the facts, and from the simplicity, uniformity, competency, and fidelity of the testimonies by which they are supported. The collateral evidences are either the same occurrences, supported by heathen testimonies, or others which concur with and corroborate the history of Christianity. Its internal evidences arise either from its exact conformity with the character of God, from its aptitude to the frame and circumstances of man, or from those supernatural convictions and assistances which are impressed on the mind by the immediate operation of the divine Spirit. The numerous sects of professing Christians have been thus classified:—"(1) The Latin, or Roman Catholic Church, the accredited faith of which is embodied in the symbol of Pope Pius IV. and the Catechism of the Council of Trent; (2) the Eastern, or Orthodox Greek Church, the creed of which is defined in the symbol entitled 'The Orthodox Confession of the Catholic and Apostolic Greek Church' (1642); (3) the anti-Byzantine Eastern churches of Armenia, Syria, Egypt, and Chaldea; (4) the Protestant Lutheran churches holding the Confession of Augsburg (1530); (5) the Protestant churches holding the Gallic, Helvetic, and Belgic Confessions; (6) the Protestant Episcopal churches holding the Thirty-nine Articles of the Anglican church; and (7) the Protestant churches adhering to the Westminster and Savoy Confessions."—(*Conder.*) The total number of professing Christians is estimated at about 800,000,000, of which, probably, nearly one-half are Roman Catholics, about 65,000,000 belonging to the various sects of Protestants, and probably a like number to the Greek church. The principal points in the history and doctrines of Christianity will be found noticed under their proper heads in different parts of this work.

CHRISTIANS, *krist'-yans*, are those who profess Christianity, or the religion of Jesus Christ. (*See* CHRISTIANITY.) The disciples, we are told, were called Christians first at Antioch.

CHRISTIANS OF ST. THOMAS is a name applied to a people residing on the Malabar coast, in the south of India, and who profess the Christian religion. The Portuguese navigators, by whom they were first visited, represent them as professing to have received Christianity from the apostle Thomas, who is by some believed to have carried the Gospel into India. Others regard them as the descendants of a colony of Nestorians; but the most probable conjecture is that they are an offshoot of the ancient Christian churches in Persia. They have the episcopal form of government, and are said to acknowledge the patriarch of Antioch; their churches contain no symbols or pictures, except the cross; their priests are allowed to marry, and they celebrate the Agapæ.

CHRISTIANS, or THE CHRISTIAN CONNEXION, a sect of Christians which arose in America in the beginning of the present century. They profess to reject all creeds and all sectarian distinctions, and to receive the Scriptures as the only rule of faith and practice, each member being at liberty to determine for himself as to what is enjoined. They practise baptism by immersion and open communion, and the great majority of their members are professed Unitarians. Their members are estimated at about 300,000, and their ministers at 600.

CHRISTMAS, *krist'-mas* (*Christ*, and Ang.-Sax. *mæs*, a holiday or feast), a Christian festival observed in memory of the nativity of Christ, on the 25th of December. The exact day of the nativity of Christ has long formed matter of dispute; but it is generally agreed that it could not have been on the 25th of December, for one, among several reasons, that the shepherds could not have been watching their flocks in the fields by night in the middle of the rainy season. Sir Isaac Newton has ingeniously attempted to account for the choice of the 25th of De-

cember,—the winter solstice, by showing, that not only the feast of the Nativity, but most of the others, were originally fixed at cardinal points of the year, and that the first Christian calendars having been so arranged by mathematicians at pleasure, were afterwards adopted by the Christians as they found them in the calendar, the main object being to have a fixed time of commemoration appointed. Be this as it may, the 25th of December has been the day fixed upon for the commemoration of the nativity from the earliest ages of the Church. The festivities that used formerly to characterize this period have now, in a great measure, passed away. According to Polydore Virgil, the English were remarkable for the festivities with which they distinguished Christmas; and these are given at considerable length in Brand's "Popular Antiquities." On the night of Christmas-eve, it was usual to light up candles of uncommon size, called Christmas candles, and to lay a log of wood upon the fire, called a Yule clog or Christmas block, to illuminate the fire, and, as it were, to turn night into day. At court and in distinguished families, an officer, under various titles, was appointed to preside over the revels. Stowe says, "that in the feast of Christmas there was in the king's house, wherever he lodged, a Lord of Misrule or Master of merry Disports; and the like had ye in the house of every nobleman of honour or good worship, were he spiritual or temporal." The mayor of London and each of the sheriffs had their several Lords of Misrule. The Puritans in England were very much opposed to these ceremonies; and in Scotland, the Abbot of Unreason, as he was there called, was suppressed by act of parliament in 1555. Yule seems to have been originally a pagan festival, observed in ancient times among the Romans, Saxons, and Goths, in commemoration of the turning of the sun and lengthening of the day, and was afterwards kept up by the Christians. In a tract, entitled the "Vindication of the Solemnity of the Nativity of Christ," by Thomas Warmstry (1648), it is said, "If it doth appeare that the time of this festival doth comply with the time of the heathens' *saturnalia*, this leaves no charge of impiety upon it; for since things are best cured by their contraries, it was both wisdome and piety in the ancient Christians (whose work it was to convert the heathens from such as well as other superstitions and miscarriages) to vindicate such times from the service of the Devill by appoynting them to the more solemne and especiall service of God." The custom of decking churches and houses at Christmas with laurel, box, holly, or ivy, appears also to have been copied by the Christians from their pagan ancestors.

CHRISTMAS-BOX, is a small sum of money given to servants and others on the day after Christmas, which is hence called *Boxing-day*. The practice was, undoubtedly, founded on the pagan custom of new-year's gifts; and, until recently, it had spread to such an extent as to have become almost a national grievance. Tradesmen sent their journeymen and apprentices to levy contributions on their customers, and they, on the other hand, bestowed boxes on the servants of their customers. To the tradesman it was a pretence for lengthening out his bill; to the master and mistress for lowering the wages of their servants. In 1836 the secretary of state for foreign affairs issued a circular to the different embassies, requesting a discontinuance of the customary Christmas-boxes to the messengers of the foreign department and others; and since that time the practice has very much decreased.

CHRISTMAS CAROLS. (*See* CAROLS.)

CHRISTOLOGY, *kris-tol'-o-je* (Gr. *Christos*, Christ, and *logos*, discourse), is the doctrine of the person of Christ; a term applied to such treatises as those of Owen, Neander, Hengstenberg, and Dorner, which profess to expound what is taught in Scripture respecting the person of Christ.

CHRISTOPHORI, *kris-tof'-o-ri* (Gr., Christ-bearers), a name sometimes given to Christians in the early Church to denote the communion that exists between Christ and the Church.

CHRIST'S COLLEGE, CAMBRIDGE, was founded in 1505, by Lady Margaret, countess of Richmond and Derby, mother of Henry VII., for a master, twelve fellows, and forty-seven scholars. Edward VI. added one fellowship and three scholarships, and several others were added by subsequent benefactors. By recent arrangements, the scholarships have been consolidated and greatly improved in value; and at present the college consists of a master, fifteen fellows, and twenty-nine scholars. The fellowships and scholarships are now open to all the queen's subjects, without restriction or appropriation.

CHRIST'S HOSPITAL, LONDON, was established upon the site of the Grey Friars' monastery, in terms of a charter granted by Edward VI., 26th June, 1553, as an hospital for poor fatherless children and orphans. It is commonly called the Blue-coat School, from the dress worn by the boys, which consists of a blue coat or gown, a yellow petticoat and stockings, a round black bonnet or cap, a red leather girdle round the waist, and a clergyman's band round the neck. In 1672 the mathematical school was founded by Charles II. for forty boys, who are distinguished by a badge on the right shoulder, and called "King's boys." Subsequently another foundation was added by a Mr. Stone, the boys on which wear a badge on the left shoulder, and, from their number, are called "the Twelves;" and afterwards "the Twos" were added on another foundation. The governing body is composed of the mayor, aldermen, and twelve common councilmen of the city of London, and contributors of £400 each to the hospital funds, amounting in all to upwards of 500. [illegible] are admitted between the ages of seven and nine, [illegible] must leave at fifteen, unless they be "King's boys" or Grecians, *i. e.* in the highest class. Formerly six, but now eight Grecians, are sent, on various scholarships, to Oxford and Cambridge. The right of presentation is vested in the governors. The lord mayor has two presentations annually; each of the aldermen one; and the other governors one in every three years. The foundation-stone of the New Hall was laid in 1825, and it was publicly opened in 1829; the architect being the late Mr. James Shaw. A branch school was established at Hertford in 1683 for the education of younger children, boys as well as girls; the former being maintained and educated until they are capable of being received into the London hospital. The average number constantly maintained and educated in both establishments is about 1,200 (800 in London and 400 in Hertford), and the annual revenue and expenditure are each generally about £56,000. The New Hall of the hospital fronting Newgate Street is one of the chief ornaments of the City. Among the eminent men who have been educated here are Camden the historian, Bishop Stillingfleet, Richardson the novelist, S. T. Coleridge, Charles Lamb, and Leigh Hunt.

CHROMATES, *kro'-mats* (from *chromium*).—Chromic acid combines with bases to form three classes of salts,—basic, neutral, and acid. Most of the chromates are highly coloured. The most important are described under CHROMIC ACID, which *see*.

CHROMATICS, *kro-mat'-iks* (Gr. *chroma*, colour; terminal *ikos*), a term applied to that part of the science of Optics which explains the properties appertaining to the colours of light. White light consists of different-coloured rays, each endued with different degrees of refrangibility; and the different colours of bodies depend upon the power they have of absorbing or reflecting certain coloured rays. A surface that appears blue reflects that colour more than the others, which are absorbed; a white surface reflects all and absorbs none; while a black surface absorbs all and reflects none. By analysing a ray of solar light with a prism, Sir Isaac Newton first demonstrated the unequal refrangibility of the various coloured portions. He also concluded, from his experiments, that white light consists of seven colours,—red, orange, yellow, green, blue, indigo, and violet: these he called the primary colours. According to Sir David Brewster, there are only three primary colours,—blue, yellow, and red. A theory has recently been propounded, that colours are the results of the mixture of white light with shade. (*See* LIGHT, OPTICS, SPECTRUM.

CHROME IRON-ORE, or CHROMITE, *krome*, an important ore of chromium, from which are obtained the salts of chromium used in commerce. The mineral, which consists of protoxide of iron and sesquioxide of chromium, is reduced to powder, fused in a reverberatory furnace

## Chrome Ochre

with half its weight of nitre, and stirred continually. In this manner the chromium is converted into chromate of potash. The mass is dissolved out with hot water, and the silica and alumina are precipitated by some strong acid, which at the same time converts the neutral chromate into the acid bichromate.

CHROME OCHRE, a mineral consisting chiefly of oxide of chromium, found in fine yellowish-green masses, which are generally so mixed up with the rock in which it is found, that it is impossible to separate them except by chemical means.

CHROME ORANGE.—Dichromate of lead, which is of a splendid orange-colour, is obtained by adding to a solution of nitrate of lead a solution of chromate of potash, to which an equivalent of hydrate of potash has been added. It is obtained of a still more brilliant colour by fusing together five parts of nitre and one part of chromate of lead. Chromate of potash and dichromate of lead are formed, and the former salt is removed by washing.

CHROME YELLOW, a valuable pigment, made by precipitating a salt of lead with bichromate of potash. It is much used on account of its brilliant yellow colour.

CHROMIC ACID, *kro'-mik* ($CrO_3$).—This acid occurs in nature in combination with lead as chrome yellow, and with iron as chrome iron-ore. It is prepared by adding one measure of a warm saturated solution of bichromate of potash to one and a half of concentrated sulphuric acid. The acid is added in small portions at at a time, the solution being allowed to cool between each addition. Chromic acid crystallizes out, and bisulphate of potash remains in solution. The crystals of chromic acid must be removed with a platinum knife, and set to drain in a funnel stopped with asbestos. They must not be heated or brought into contact with organic substances. As soon as the best part of the sulphuric acid has drained away, the crystals are dissolved again and recrystallized under the air-pump. Chromic acid crystallizes in fine red needles, which are very deliquescent, and soluble in water. Although chromic acid is one of the most powerful oxidizing agents known, it is easily decomposed by light and organic substances. When absolute alcohol is poured on crystals of chromic acid, the former is oxidized with sufficient energy to cause combustion, the chromic acid being reduced to sesquioxide of chromium. Sugar and other organic substances have the same power of decomposing chromic acid. Chromic acid bears great analogy to sulphuric acid. Both these acids are isomorphous; they are both monobasic, and they form an acid and a neutral salt. The most useful of these compounds of chromic acid is the bichromate of potash, which forms fine red tubular crystals, which are anhydrous, and remain unchanged by exposure to the air. Bichromate of potash dissolves in ten parts of cold water, the solution having a fine red colour and an acid reaction. The chromate is easily formed from the bichromate by neutralising its solution with carbonate of potash, and crystallising. Both the chromate and the bichromate are extensively used in dyeing and calico-printing. Bichromate of potash is employed in conjunction with sulphuric acid in the laboratory as an oxidizing agent, and in commerce in the same manner in bleaching sperm oil. The bichromate of ammonia is used in photography. Except the chromate of lead, which is described under CHROME YELLOW, the other chromates and bichromates are unimportant.

CHROMIUM OR, *kro'-mi-um* (*Gr. chroma*, colour),—symbol Cr, equivalent 26·27, spec. grav. 5·9,—a pretty rare element, first shown to be a metal by Vauquelin, in 1797. Its most important ore is the chrome iron-stone, a compound of protoxide of iron and sesquioxide of chromium. It is also found as chromate of lead, from which mineral Vauquelin first obtained it in the metallic state. To effect its reduction, oxide of chromium is intimately mixed with powdered charcoal, and made into a paste with oil. It is then introduced into a crucible lined with charcoal, and carefully luted down. The whole is exposed to the action of a powerful wind-furnace for several hours, and an impure mixture of carbon and chromium is formed in the crucible. Mr. Fremy has lately succeeded in procuring chromium in the form of cubical metallic masses, by

## Chromium, Chlorides of

passing the vapour of sodium over the sesquioxide heated to redness. By heating sesquichloride of chromium with potassium, a grey metallic powder is formed, which consists of chromium in an allotropic condition. Chromium is a light-grey metal, very brittle, non-volatile, and non-magnetic. As might be inferred from the difficulty with which it is reduced, chromium, in the metallic state, has not yet received any useful application. Its oxide and many of the chromates have received useful applications in calico-printing and china-painting. The manufacture of bichromate of potash is very important, not less than 1,500 tons of chrome iron-stone being annually imported from the United States and Norway, to be converted into this useful salt.

CHROMIUM, OXIDES OF.—Chromium forms several compounds with oxygen, of which the most important are four:—Protoxide, CrO; sesquioxide, $Cr_2O_3$; chromic acid, $CrO_3$; perchromic acid, $Cr_2O_7$.—*Protoxide of chromium* can only be obtained in the state of hydrate on adding caustic potash to a solution of the protochloride. It absorbs oxygen with great avidity, decomposing water and setting free the hydrogen, becoming converted into a hydrated intermediate oxide. The protoxide of chromium forms a double sulphate with sulphate of potash, closely corresponding to the double sulphate of iron and potash in form and composition. The crystals are of a fine blue colour.—*Sesquioxide of chromium* is easily obtained as a greyish-green hydrate, by boiling with alcohol a solution of bichromate of potash acidulated with sulphuric acid. The alcohol seises half the oxygen of the chromic acid, leaving the sesquioxide free to form a sulphate with the sulphuric acid. On the addition of ammonia, a bulky gelatinous greyish-green precipitate of hydrated sesquioxide is produced, which, when dry, contains ten equivalents of water. In the hydrated condition it is readily soluble in acids, forming salts which do not crystallize. These salts, like the oxide, exist under several conditions, each condition giving rise to dissimilar properties. As this subject is rather complicated, the reader is referred to the article ISOMERISM, where the subject is fully treated. The anhydrous green oxide is not decomposed by heat; hence it is of great use in china- and enamel-painting. It is generally prepared for this purpose by exposing chromate of mercury to a red heat. The difficulty with which this oxide is decomposed by ordinary chemical re-agents has rendered it useful as a pigment for printing bankers' cheques and other important documents; but a great objection to its use is the fact of its being so hard that the pens used for writing upon drafts printed by it are speedily worn out. Oxide of chromium is the colouring matter of the emerald, pyrope, greenstone, and other minerals.—*Chromic acid* has already been considered, under that head.—*Perchromic acid* is formed by adding an aqueous solution of peroxide of hydrogen to chromic acid. The liquid assumes a deep-blue colour, but is rapidly decomposed with evolutions of oxygen. If, however, the solution is agitated with ether, the perchromic acid is isolated without decomposition, and may be made to form pretty stable salts with ammonia and certain organic bases. Strong acids decompose these salts, setting free the blue perchromic acid.

CHROMIUM, CHLORIDES OF.—There are two principal chlorides of chromium,—the *protochloride*, CrCl, and the *sesquichloride*, $Cr_2Cl_3$. The former is formed by passing a dry current of hydrogen over the sesquichloride heated to redness; hydrochloric acid is given off, and the protochloride remains in the form of a white powder, soluble in water, with which it forms a bluish-green solution that rapidly absorbs oxygen from the air.—*Sesquichloride of chromium* is formed in beautiful transparent plates of the colour of peach-blossoms by passing a current of dry chlorine over a mixture of sesquioxide of chromium mixed with charcoal contained in a porcelain tube heated to redness. Being volatile, the sesquichloride condenses at the cool end of the tube in the beautiful form just described. Thus prepared, it is quite insoluble in water and acids. Solution of sesquichloride of chromium is prepared from the hydrated sesquioxide by dissolving it in hydrochloric acid. The solution, on evaporation, yields green crystals, containing two equivalents of hydrochloric acid and ten equivalents of water. It is a

singular fact, that only two-thirds of the chlorine contained in the solution of this salt is precipitated by nitrate of silver. A violet chloride may be formed by precipitation from the violet sulphate by chloride of barium, from the solution of which the whole of the chlorine can be precipitated by nitrate of silver.

CHRONIC, *kron'-ik* (Gr. *chronos*, time), a term applied in medicine to such diseases as are of long duration, as contradistinguished from *acute*,—those that soon terminate either in recovery or death.

CHRONICLE, *kron'-i-kl* (Gr.), denotes a history in which the events are narrated in the order of time. It is nearly synonymous with annals, the only distinction between the two being, that chronicles are generally more full and connected. The term is now seldom used except in speaking of our old English histories; as *Hollinshed's Chronicle*, *Stow's Chronicle*. It is sometimes taken as the name of a newspaper; as the *Morning Chronicle*.

CHRONICLES, the name given to two books of the Old Testament standing thirteenth and fourteenth in our English version. In the Hebrew they are called *Books of Days*, *i.e.* diaries; and in the Septuagint *things omitted*, or supplements, from their being in some measure supplementary to the books of Kings which precede them. The first nine chapters of the first book contain a great variety of genealogical tables, beginning with Adam, which must have been very valuable to the Jews after their return from the captivity. The more ancient are so obscure as to be hardly intelligible unless collated with the Pentateuch. The more modern are the most perspicuous; but even they are not complete. Nothing is to be found of the tribes of Dan or Zebulon; that of Benjamin is twice introduced; Judah is pretty copious; and the register of David's descendants runs down to the end of the 4th century before Christ (by some believed to be a later addition). The genealogies of the priests and Levites are given most in detail, and terminate with the destruction of Jerusalem. Agreeably to the ancient usage in genealogies, historical facts worthy of observation are interspersed throughout the whole. From 1 Chron. x. to 2 Chron. ix. 31, we have accounts relating to David and Solomon, which, in part, are the same as those contained in the books of Samuel and the first chapters of the first book of Kings, although there are many additions, particularly on subjects relating to the worship of God. The latter portion of the second book affords a succinct history of the kingdom of Judah, and treats of many matters, especially with respect to the various reformations and to divine worship, which are not in the books of Kings. The kingdom of Israel is not mentioned except when it becomes connected with the history of that of Judah. Both from the style in which they are written, and the contents of the books themselves, it is evident that they were written soon after the time of the captivity. The choice of subjects treated of shows that the author's intention was to point out to the Hebrews, when returning to their country, their real ancestry, with the possessions and residences of their families, and to instruct them in the manner in which divine worship should be restored. As to the author of these books, the invariable Jewish tradition is in favour of Ezra; and this opinion is borne out by the peculiarities of the style and idiom, and by the obvious connection subsisting between the close of the narrative in the Chronicles and the opening of the book which bears his name. With respect to the discrepancies between the books of Chronicles and other books of the Old Testament, it is sufficient to observe that some of them are of little moment; some are caused by various readings; some have arisen from omissions in Chronicles of what is related in Samuel and Kings, or the introduction of what is passed over in those works; and others, perhaps, may have arisen from interpolations.

CHRONOGRAM, *kron'-o-gram* (Gr. *chronos*, and *gramma*, a letter), is applied to a verse or sentence, certain letters of which are in larger characters than the rest, to denote the date of the event to which it relates.

CHRONOLOGY, *kre-nol'-o-je*. (*See* CHRONOLOGICAL TABLE, vol. I. of this work.)

CHRONOMETER, *kre-nom'-e-ter* (Gr. *chronos*, time; *metron*, a measure), literally any instrument for measuring time; the term is, however, generally applied to those time-measurers which are used for determining the longitude at sea. The mechanism is essentially the same as that of an ordinary watch, but the size is greater. In the construction of such chronometers special precautions are taken to allow for change of temperature and other causes of derangement. (*See* HOROLOGY.)

CHRYSALIS. (*See* INSECT TRANSFORMATIONS.)

CHRYSANTHEMUM. (*See* COMPOSITÆ.)

CHRYSOBALANEÆ, *kri-so-bal-lai'-ne-e* (Gr. *chrusos*, gold; *balanos*, a nut), in Bot., a sub-ord. of the nat. ord. *Rosaceæ*. The plants belonging to this division are trees or shrubs, principally natives of the tropical parts of America and Africa. Many of them produce edible drupaceous fruits. The typical gen. *Chrysobalanus* includes two valuable fruit-trees. *C. Icaco* yields the cocoa-plum of the West Indies; and in Brasil the roots, bark, and leaves are prescribed against diarrhœa and other similar maladies. *C. luteus* yields a fruit which is eaten in Sierra Leone.

CHRYSOPHYLLUM, *kri-so-fil'-lum* (Gr. *chrusos*, gold; *phullon*, a leaf), in Bot., a gen. of tropical trees belonging to the nat. ord. *Sapotaceæ*. The species *C. Cainito* yields a delicious fruit known as the star-apple. *C. Buranheim* furnishes the astringent bark called Monesia bark, which has been much employed in France and Germany. The bark contains an acrid principle called *monesine*, which is analogous to *sapanine*.

CHRYSOTYPE, *kris'-so-tipe* (Gr. *chrusos*, gold; *tupos*, impression), a process in photography invented by Sir John Herschel, in which pictures are produced by means of ammonio-citrate of iron and chloride of gold. (*See* PHOTOGRAPHY.)

CHUB, *tshub* (Ang.-Sax.) (*Leuciscus cephalus*), of the same genus with the roach, dace, bleak, &c. It is plentiful in many of the rivers of England and of the south-west of Scotland. The chub rises freely at a variety of baits, — slugs, grasshoppers, cockchafers, and humble bees among the number. The best place to fly-fish for chub is close under overhanging trees, by the sides of streams, or against piles or other places that offer ready shelter. The chub spawns in May, and comes into condition again about the end of June or beginning of July. It bites best, and is in the best condition for bottom-fishing, between the middle of October and November. The colours of the chub are blue-black on the upper part, silvery white below; cheeks and gill-covers golden yellow. Weight seldom exceeding five pounds. Is not considered a great dainty.



CHUB.

CHURCH, *tshurtsh* (Ger. *kirche*, Dan. *kirke*, Scotch *kirk*), is generally supposed to be derived from the Greek *kuriakon*, belonging to the Lord; from *kurios*, Lord. In its widest signification, the term Church is applied to the whole collective body of those who profess to be followers of Jesus Christ, and hence denominated by ancient writers the Catholic or Universal Church. The assembly of the faithful upon earth is sometimes called the church *militant*, as distinguished from the church *triumphant*, the faithful already in glory. In a more limited sense the term is applied to a body of Christians differing in its constitution, doctrines, and usages from the rest; as the Roman Church, Greek Church, Reformed Church. In another sense it is applied to the whole Christian community of a country, or to the established religion of a country; as the Gallic Church, Church of England, Church of Scotland. In a still more limited sense it is applied to a particular congregation of Christians, who associate together and participate in the institutions of Christ with their proper pastors and ministers. It also signifies the building in which Christians assemble for the worship of God.

CHURCH, in Arch., the name given to a building especially set apart for the worship of God. The

models after which churches are principally built are those of the old Roman basilica (*see* BASILICA), and the cruciform plan adopted in Byzantine architecture. (*See* BYZANTINE ARCHITECTURE.) Churches are divided into five classes:—1. Metropolitan churches, or the principal churches in the sees of archbishops; 2. Cathedral churches (*see* CATHEDRAL); 3. Collegiate churches, or churches that have a chapter of canons, but no bishop; 4. Conventual churches, or churches attached to a monastery under the superintendence of an abbot; and 5. Parish churches. The first four classes are more ornate in character, and are considerably larger than the fifth, and have numerous chapels and aisles attached, which are not to be found in the parish church. The cathedral church, so called because it contains the throne of a bishop, which has been described in a preceding article, may be taken as the general type of these four classes. The parish church, particularly those built prior to the date of the Reformation, is generally built in the form of the Latin cross, with the nave much longer than the arms, forming the transepts and choir, or chancel. Those of the 18th century are, for the most part, built in imitation of the old Greek temple, a style utterly unsuited to a Christian church; but in the 19th century, a tendency is shown to imitate the purer Byzantine form of church architecture, and to build the churches more in accordance with the form of the Greek cross, in which the nave, transepts, and chancel, are of equal length. The principal part of our old parish churches belong to the Anglo-Norman, Early Perpendicular, and Decorated forms of English architecture. At the west end stands a massive tower with a belfry, buttressed and finished with battlements and pinnacles; but sometimes the belfry is in a tower built on arches at the intersection of the arms of the cross, which is often surmounted by a spire. The body of the church consists of a nave, separated from the side aisles by rows of pillars. The principal entrance is generally on the south side. The transepts are small, and in some churches there are none, or only one small transept on the south side, and one aisle to the nave. The chancel is separated from the nave by a screen carved in wood. The communion-table stands at the east end of the chancel, inclosed by rails. The vestry is usually found on the north side of the chancel, and the reading-desk and pulpit before the screen in the nave, sometimes on the north side and together, and at other times, one on either side of the central passage running through the church. The font stands at the west end, opposite the south porch. There is a gallery at the west end of the majority of churches for the choir and organ, if there be one. The nave and aisles are usually divided into a number of pews, resembling loose boxes; but these are gradually being removed, and long low pews, or open benches, are substituted for them wherever the interior of a church has been beautified and restored. The windows consist, for the most part, of lozenge-shaped panes in casement-lights, set in stone mullions and ornamental tracery.

CHURCH, GREEK. (*See* GREEK CHURCH.)

CHURCH OF ENGLAND. (*See* ANGLO-CATHOLIC CHURCH.)

CHURCH OF ROME. (*See* ROMAN CATHOLIC CHURCH.)

CHURCHING OF WOMEN, *tshurtsh'-ing*, is a public and solemn acknowledgment enjoined by the Church to be made by a mother, after childbirth, of the blessing that has been vouchsafed to her. It doubtless owes its origin to the Jewish rite of purification enjoined by Moses, and complied with by the Blessed Virgin; but it is not regarded by the Church as a purification, but as a thanksgiving to God for a merciful deliverance. The office is of great antiquity, and is found in the ritual both of the Western and Eastern churches.

CHURCH-RATES. (*See* RATES.)

CHURCHWARDENS, *tshurtsh-wour'-dens*, formerly called church-reves, or *ecclesiæ guardiani*, are the guardians or keepers of the church, and the legal representatives of the body of the parish. They are chosen annually by the parson and his parishioners, according to the custom of the place, and their duties are to look after the church, churchyard, church revenues, &c.; to observe the behaviour of the parishioners with regard to such faults as come under the jurisdiction of the ecclesiastical court; to take care that none preach without a license, &c. They constitute a kind of corporation, and are enabled to sue and to be sued at law.

CHURCHYARD, *tshurtsh'-yard*, is the ground adjoining to the church, in which the dead are buried. (*See* BURIAL.)

CHURCHYARD BEETLE. (*See* BLAPS.)

CHUTNEY, *tshut'-nee* (its Indian name), a condiment very largely consumed in India and Great Britain. There are many varieties of chutnee, but it generally consists of a compound of mangoes, capsicum or chillies, and lime-juice, flavoured with garlic and eschalots. Several native fruits, such as tamarinds, are often added to East-Indian chutnee.

CHYLE, *kile* (Gr. *chulos*, juice), is the milk-like fluid which is formed by the action of the bile and pancreatic juice upon the chyme in the duodenum, and absorbed by the lacteal vessels. The use of the chyle is to supply the matter from which the blood is formed and the waste of the living organs repaired. (*See* DIGESTION.)

CHYME, *kime* (Gr. *chumos*, juice), is the ingested mass formed by the action of the stomach upon the food, and which passes from the stomach into the duodenum. (*See* DIGESTION.)

CIBORIUM, *si-bor'-i-um*, was a name originally given to the husks of an Egyptian bean, and came afterwards to be applied to the canopy with which the altar was covered. The term is also applied to the pyx or box in which the host is preserved.

CIBOTIUM, *si-bo'-te-um*, in Bot., a gen. of ferns, nat. ord. *Filices*, including several species which produce silky hairs useful to man. The styptic called *penawar*, which is often used in Holland and Germany, consists of the fine hairs from the caudex of *C. Barometz*, the "Scythian lamb" of old writers. These hairs are imported from Sumatra, and are sometimes employed for stuffing cushions. Similar hairs are brought from the Sandwich Islands, and are known under the name of *pulu*. Three different species are said to yield pulu.

CICADA, *se-kai'-dă* (Lat., grasshopper), a gen. of insects of the ord. *Hemiptera*, common in tropical and warm temperate regions, and remarkable for the loudness of the sounds they emit. The organs that produce these shrill sounds consist of membranes and fibres connected with powerful muscles, and situated on the under-side of the abdomen. The largest insect of this genus does not exceed an inch in length; yet it is asserted that they may be heard in the still night at a distance of at least half a mile, and that the sound they emit is like grinding a knife on a whetstone.

CICATRIZATION, *sik'-a-tri-zai'-shun* (Lat. *cicatrico*, I heal up), is a term in Surg., applied to the healing or skinning over of an ulcer or broken surface of the skin.

CICER, *si'-ser* (from Gr. *kikus*, strength, in reference to its qualities), in Bot., a gen. of plants belonging to the nat. ord. *Leguminosæ*, sub-ord. *Papilionaceæ*. *C. arietinum*, a native of the countries around the Mediterranean, produces the edible seeds called chick-peas. These are extensively used as food, either boiled or roasted, and are the most common parched pulse of the East. The herbage affords a nutritious food for cattle.

CICERONE, *tsitsh-e-ro'-ne*, a name first given in Italy to those persons that act as guides to strangers in showing them the sights of Rome and other cities. The term is said to be derived from Cicero, and to have been given to them on account of their great garrulity. The word has now come into general use, and is applied to any one who points out the interesting objects of a town to strangers.

CICHORIUM, *si-kor'-e-um* (Lat.), in Bot., a gen. of plants belonging to the nat. ord. *Compositæ*. The species *C. Intybus* is the wild chicory or succory, a plant indigenous to this and many other countries of Europe, having numerous heads of bright-blue handsome flowers. It is extensively cultivated for the sake of its roots, which are sliced, roasted, and ground, to form the chicory of the shops, which is sold as a substitute for, or more frequently as an addition to, ground coffee. Nearly 100,000,000 lbs. are annually consumed in Europe. Much of the chicory used in Britain is of home growth; but still more is imported in the raw state from Holland and other parts of the continent. Though so extensively used instead of coffee, chicory

does not possess in any degree the peculiar exciting, soothing, and hunger-staying properties of that valuable product. The fresh root has been employed in medicine to produce similar effects to those produced by the dandelion root. (*See* TARAXACUM.) A blue dye may be prepared from the leaves. *C. Endivia* is the garden succory or endive, the leaves of which, when blanched, form a wholesome salad.

CICINDELIDÆ. (*See* TIGER-BEETLES.)

CICISBEO, *tshe-tshis'-be-o* (Ital., a gallant), is a term applied to a class of persons in Italy who constantly attend upon married ladies. In the higher ranks of society it was formerly the custom for *every* married lady to have her cicisbeo, who escorted her in her walks, and accompanied her to private parties and public amusements. The practice has now almost entirely disappeared.

CICUTA, *si-ku'-ta*, in Bot., a gen. of plants belonging to the nat. ord. *Umbelliferæ*. *C. virosa*, the water-hemlock, or cowbane, is a common indigenous plant of a highly poisonous nature. *C. maculata*, a native of America, has very poisonous roots, which, from having been mistaken for those of harmless *Umbelliferæ*, have not unfrequently led to fatal results.

CID, *sid* (Arab. *seid*, lord), is the name of an epic poem of the Spaniards, celebrating the exploits of their great national hero Roderigo Diaz, commonly called the Cid. The poem is supposed to have been written in the 12th or 13th century, but nothing is known of its author. (*See* CID CAMPEADOR, vol. I.)

CIDER, or CYDER, *si'-der* (Fr. *cidre*), the expressed and fermented juice of apples. The apples are thrown into a circular stone trough, and bruised by a heavy round stone, turned by horses, until the whole are reduced to a pulp called "must." The must is then spread upon a haircloth, several of which are piled together and placed under a screw press; the screw is turned slowly, and the juice exudes, flowing into a flat tub; from this it is poured into casks placed in a position where there is a free current of air. The liquor ferments, and the clear cider is drawn off from time to time: this is again racked until it is perfectly clear. The fermentation of cider is a very difficult process, requiring great experience to determine when it is going on too slowly or too quickly. In England, cider is made principally in the Herefordshire district, where the above method of pressing is adopted, and in Devonshire, where a screw press of rude form is employed. Cider requires great care in keeping, being apt to turn sour, and has lately fallen into disuse on account of great quantities of "doctored" sour cider having been retailed by dealers and publicans. Cider is also made in Normandy, Belgium, and Germany.

CIGAR MANUFACTURE. (*See* TOBACCO MANUFACTURE.)

CILIUM, *sil'-i-um* (Lat.), is a name given in Anat. to the eyelid or eyelash; and hence the term *ciliary* is applied to the arteries, glands, &c., belonging to the eyelids.

CIMBRI. (*See* vol. I. of this work.)

CIMMERIANS. (*See* vol. I. of this work.)

CINCHONA, *sin-ko'-na* (named after the Countess del Cinchon), in Bot., the typical gen. of the nat. ord. *Cinchonaceæ*. The plants of this genus are natives of the intertropical valleys of the Andes, and are found principally on the eastern face of the Cordilleras, growing commonly at heights varying from about 4,000 to nearly 13,000 feet above the level of the sea. The cinchona region extends from Santa Cruz de la Sierra, in Bolivia, about 18° S. lat., through Peru and Columbia, nearly to Caracas, in about 10° of N. lat. The plants are small shrubs or large forest-trees, with evergreen leaves and commonly showy flowers. They appear to require great moisture, and a mean temperature of about 62°. The cultivation of these plants has lately been commenced in India. The barks of several species and varieties are extensively used in medicine, and are undoubtedly the most valuable drugs known. They are imported into this country under the names of *Cinchona, Peruvian* and *Jesuits' bark*. Twenty-six different varieties have been described by Pereira; and Weddell has enumerated no less than thirty-nine. The most important are *Loxa*, or crown bark; grey, silver, or *Huanuco* bark; *Calisaya*, or yellow bark; and red bark. These four are officinal in our pharmacopœias, and are the principal sources of the precious alkaloids *quina* or *quinine*, *cinchonia*, and *quinidia*, which are all used in medicine, and possess in an eminent degree tonic, febrifugal, and antiperiodic properties. The barks themselves have similar properties, and are, moreover, slightly astringent. The name cinchona was given to the genus by Linnæus, in compliment to the countess of Cinchon, whose husband was the viceroy of Peru. She had derived great benefit from the bark during her residence in South America; and on her return to Europe, in 1639, she brought with her several specimens. The native names, curiously enough, are very similar to the scientific one, being *quinaquino* and *quina-quina*. The medicinal use of the bark was first made known in Europe by the Jesuits. (For a full account of the numerous varieties of cinchona bark found in commerce, *see* Royle's *Manual of Materia Medica*.)

CINCHONACEÆ, *sin-ko-na' se-e*, in Bot., a nat. ord. of dicotyledonous plants in the sub-class *Corollifloræ*, including about 2,550 species, which are grouped into 318 genera. They are trees, shrubs, or herbs, with opposite, simple, entire leaves, and stipules between the leaf-stalks on each side (interpetiolar). The calyx is superior, the corolla regular; the stamens are equal in number to the teeth of the calyx and segments of the corolla, being alternate with the latter; they are attached to the corolla (epipetalous). The ovary is inferior, and 2- or more celled; the fruit inferior, with one seed, or sometimes more than one. The *Cinchonaceæ* are almost exclusively natives of tropical and warm regions. They yield many valuable medicinal agents, the most important being quinine (*see* CINCHONA) and ipecacuanha (*see* CEPHAELIS). They also furnish man with many substances useful in the arts and domestic economy; such as dye-stuffs, tanning agents, edible fruits and seeds, and ornamental woods. The coffee-plant belongs to this extensive order. (*See* COFFEA.) Most of the plants have beautiful and fragrant flowers, and many have been introduced into our stoves.

CINCINNATI, THE, *sin-sin-nät'-e*, was a society or order of certain officers of the United States army, established in 1783, with Washington at their head. They took their name from Cincinnatus, the Roman general who left the plough to defend the state. As the order was made hereditary, it was regarded by many as contrary to the spirit of republicanism, and became so unpopular that it at length ceased to exist.

CINERARY URNS. (*See* URNS.)

CINNABAR, *sin'-nä-bar* (Gr. *kinnabari*), the principal ore of mercury, from which the greater proportion of all the mercury of commerce is obtained. It is a bisulphuret, and contains 86·2 parts of mercury and 13·8 parts of sulphur. Native cinnabar is found massive and crystallized in six-sided prisms, rhombs, and octohedra. It is of various colours, sometimes appearing steel-grey, and at others bright red. It is not found in Britain, but occurs in France, Hungary, and Spain, in Siberia and Japan, and in large quantities in South America. It has also been imported from China. Native mercury and native amalgam of silver are sometimes found accompanying cinnabar. Under the name of *vermilion*, cinnabar is used as a pigment, when refined. Hepatic cinnabar is a variety containing a little carbon, and so called on account of its liver-brown colour, from the Greek word *hepar*, the liver.

CINNAMOMUM, *sin-nä-mo'-mum* (Lat.), in Bot., a gen. of plants belonging to the nat. ord. *Lauraceæ*, including many species remarkable for their aromatic properties. *C. zeylanicum*, the cinnamon-tree, a native of Ceylon, is extensively cultivated in that island, also on the Malabar coast, in Java and Cayenne, for the sake of the aromatic bark of the young branches, which forms the *true cinnamon* of commerce. Cinnamon is much employed as a spice, and medicinally as a cordial, stimulant, carminative, astringent, antispasmodic agent, and as an adjunct to other medicines. It owes its properties to the presence of a volatile oil and tannin. The volatile oil is imported from Ceylon, where it is obtained from the rejected bark by distillation. It is known by the name of *oil of cinnamon*, and is used medicinally as a stimulant, and by cooks and confectioners for flavouring. From the leaves of the

tree another volatile oil, similar to oil of cloves in odour and taste, is prepared. From the ripe fruits a concrete fatty substance called *cinnamon suet* is obtained by expression.



CINNAMON.

The cinnamon-tree is the kinnamon or kinman of the Bible. *C. cassia*, a native of China, yields the *cassia bark* of commerce, which possesses analogous properties to those of cinnamon. From this bark the fragrant *oil of cassia* is obtained. The *cassia buds* of commerce, which are now much used as a condiment, are said to be the flower-buds of this plant. The cassia-tree is the kiddah or cassia of the Bible. Several other species of cinnamomum yield aromatic barks.

CINNAMON. (*See* CINNAMOMUM.)

CINNAMON, OIL OF. (*See* CINNAMOMUM.)

CINNAMON-STONE, *sin'-nă-mon*, a species of garnet, also called *essonite*, of a light cinnamon-yellow colour and high lustre. (*See* GARNET.)

CINQUE PORTS, or FIVE PORTS. (*See* vol. I. of this work.)

CIPHER, *si'-fer* (Arab. *sifr*, empty or destitute of), is a term applied to the figure 0. It is sometimes also applied to arithmetical characters generally; and hence the verb "to cipher" signifies to perform an arithmetical operation. A cipher is also a fanciful arrangement of the initials of a name, sometimes adopted by artists and others in order to distinguish their works.

CIRCLE, *ser'-kl* (Fr. *cercle*, Lat. *circulus*), in Geom., is, according to Locke's definition, "a line continued till it ends where it began, having all its parts equidistant from a common centre." The bounding line is called the circumference or periphery. Any straight line drawn through the centre and terminating in the circumference is called a diameter. The circle is one of the elements of plane geometry, the right line being the other; and those constructions only are regarded as geometrical which can be made by the aid of these two elements. The circle, however, derives its chief importance from its application in trigonometry to the measurement of angles. This application is dependent on the fact, that if circles of the same radii be described from the vertices of angles as centres, the arcs of the circles intercepted between the sides are always proportional to the angles. It is for this reason that the circle is almost always employed to compare angles with each other. For this purpose the circumference of the circle is divided into four equal parts, each of which is called a quadrant; each quadrant is divided into ninety equal parts, called degrees; each degree is divided into sixty equal parts, called minutes; each minute into sixty equal parts, called seconds.

CIRCLE, in Log., is applied to a kind of false reasoning, in which the principle is supposed which it is intended to prove, and afterwards the principle is proved by the thing which it seemed to have proved. The same fault takes place in definitions, when an idea is defined by others which suppose the knowledge of the first.

CIRCLE, MAGIC, the circle or space within which magicians work their enchantments, and which are believed to protect them from the evil spirits which they raise. A piece of ground is usually chosen, nine feet square, at the full extent of which parallel lines are drawn, one within the other, having sundry crosses and triangles described between them, close to which is formed the first or outer circle. About half a foot within the same a second circle is described, and within that another square space corresponding to the first, and in the centre is the seat or spot where the master and his associate place themselves.—*Ref.* Smedley's *Occult Sciences*.

CIRCUIT, *sir'-kit* (Fr. *circuit*, Lat. *circuitus*), are eight divisions of the kingdom, for the purpose of holding the assizes. They are the Home, the Midland, the Norfolk, the Oxford, the Northern, the Western, the South-Wales and Chester, and the North-Wales and Chester. (*See* ASSIZE.)

CIRCULAR NOTES, *sir'-ku-lar notes*, are a kind of bank-notes, issued by certain of the London banking-houses for the convenience of travellers. They are each of the value of £10 or upwards, and along with them the traveller receives a list of the agents in the different places where they may be cashed. The great advantage of these notes is, that the traveller may exchange one or more of them at different parts of his route, and receive their full value in the money of the country, without any charge for commission.

CIRCULAR SAILING. (*See* NAVIGATION.)

CIRCULATING LIBRARY. (*See* LIBRARY.)

CIRCULATING MEDIUM, *sir-ku-lat'-ting me'-di-um*, in Pol. Econ., is the medium by which exchanges or purchases and sales are effected, whether that be gold or silver coin, paper, or any other article employed as the measure of the value of other things. It is scarcely possible to imagine a people living without a circulating medium of some kind; and accordingly we find, even among the most savage tribes, some articles to which they refer as a measure of wealth, whether these be slaves, skins, or cowry-shells. (*See* CURRENCY.)

CIRCULATION OF THE BLOOD, *sir-ku-lat'-shun* (Lat. *circulus*, a circle), in Physiol., is applied to the course of the blood through the body, from the heart to the capillaries, and from the capillaries back again to the heart. The several organs of circulation are the heart, arteries, veins, and capillaries. By the heart the blood is propelled through the arteries to all parts of the body. The capillaries are very minute vessels, connecting the extremities of the arteries with those of the veins, and by the veins the blood is returned again to the heart. The heart is composed of two distinct cavities, separated from each other by a partition or septum, and termed the right and left sides of the heart; the right being also termed the venous or pulmonic heart, the left the arterial or systemic heart. Each of these sides is subdivided into two cavities, the superior being termed the auricle, the inferior the ventricle. The blood which has been distributed by the arteries through the different parts of the body, passes from them, by means of the capillaries, into the veins. The veins from the lower part of the body empty themselves into the inferior vena cava, and those from the upper part into the superior vena cava, and both pour their contents into the right auricle. This contracts, and forces the blood into the right ventricle, which, in turn, forces it through the pulmonary artery to the lungs, where, by the action of the air, the venous blood is purified and changed into arterial. It is then conveyed by the four pulmonary veins into the left auricle, whence it passes into the left ventricle, from which it is propelled into the aorta, and by this means distributed to all parts of the body. The pulse which is felt in the arteries is caused by the action of the heart propelling the blood in waves through the body. The discovery of the circulation of the blood is due to Dr. Harvey, afterwards physician to Charles I.; the opinion previous to his time being, that the blood circulated only in the veins, and that the arteries, from being always found empty after death, contained nothing but air; and hence their name.

CIRCUMCISION, *sir'-kum-sir'-zhun* (Lat., a cutting round), is the cutting off the prepuce or foreskin,—a rite common among eastern nations, both ancient and modern. Abraham was commanded by God to circumcise himself and all the males of his household, and to transmit the custom to his posterity. It took place on the eighth day after birth, and is still very scrupulously observed by the Jews. There is indubitable evidence to show that the rite was practised by the Egyptians long before the time of Abraham; and Herodotus and others mention its having been practised among various ancient nations. In modern times it has been found practised through a great part of Africa and Asia, and even in Mexico, the West Indies, and various parts of South America. Among the Mohammedans, as well as by the Jews, it is regarded as a religious rite. Circumcision was established among the Jews as a token of God's covenant with Abraham and his seed; and it was declared that "the uncircumcised man child whose skin of his foreskin is uncircum-

cised, that soul shall be cut off from his people; he hath broken my covenant."

CIRCUMCISION, FEAST OF, is a festival observed by the Church in commemoration of the circumcision of Jesus Christ, held on the eighth day after Christmas, or the 1st of January.

CIRCUMFLEX *sir'-kum-flex* (Lat. *circum*, round, and *flecto*, I bend), in Gram., is an accent marked thus ^, and is placed over a syllable to denote that its sound is intermediate between acute and grave. It is seldom used in the present day except to show the omission of a letter, which makes the syllable long and open; as *Bâle* for *Basle*.

CIRCUMLOCUTION, *sir-kum-lo-kw'-shun* (Lat. *circum*, and *loquor*, I speak), is a circuitous mode of expression, used either when the proper term for expressing an idea does not naturally and immediately occur, or when a person wishes to avoid expressing in direct terms something disagreeable or inconvenient.

CIRCUMSTANTIAL EVIDENCE. (*See* EVIDENCE.)

CIRCUS, *ser'-kus* (Lat.), a large inclosed space, of oblong form, adapted for horse and chariot racing, sports to which the ancient Romans were much addicted. The circus was also used for athletic games and the contests of wild beasts. There were many buildings of the kind in Rome, of which the Circus Maximus and Circus Agonalis were probably the largest. According to different authorities, the former was capable of holding between 200,000 and 400,000 spectators. The Circus of Nero was begun by Caligula; part of its site is now occupied by the Basilica of St. Peter. All the circi which existed in ancient Rome are completely destroyed; but near the tomb of Cæcilia Metellus, not far from the Appian Way, about two miles from Rome, there is a circus, commonly called the Circus of Caracalla, in a high state of preservation; it is small in size, but probably resembles closely the larger circi in general form. In length, the Circus of Caracalla is about 1,300 feet, and 300 feet wide. The long sides are not quite parallel; one end is semicircular, and the *carceres*, or covered stalls, furnished with gates, are there situated. In the *carceres* the chariots and horses remained till the starter gave the signal, when the gates were opened. Along the sides, and round the opposite end from the *carceres*, were ascending ranges of stone seats for the spectators. There is a bas-relief in the British Museum which gives a very tolerable notion of the appearance of an ancient circus. The modern circus does not resemble that of the ancients; it is small in size, and is generally a temporary erection, consisting of a ring surrounded by raised seats for the spectators. The principal amusements are feats of horsemanship and acrobatic displays.

CISSAMPELOS, *sis-sam'-pel-os* (Gr. *kissos*, ivy; *ampelos*, a vine), in Bot., a gen. of plants belonging to the nat. ord. *Menispermaceæ*. The root of *C. Pareira*, a climbing plant indigenous in Brazil, is an article of our Materia Medica, and is commonly known as *Pareira brava*. It possesses bitter, tonic, and diuretic properties, which are chiefly due to the presence of an uncrystallizable alkaloid named *cissampeline* or *pelosine*.

CISTACEÆ, *sis-tai'-se-e* (Gr. *kiste*, a box or capsule), in Bot., the Rock-rose fam., a nat. ord of dicotyledonous plants in the sub-class *Thalamiflorœ*, consisting of seven genera and 185 species, chiefly natives of the south of Europe and north of Africa; they are shrubs or herbs. The leaves are entire; the sepals and petals have a ternary or quinary arrangement, and are twisted in æstivation, the former being persistent and the latter caducous; the stamens are hypogynous and distinct; the ovary has parietal placentæ, and a single style with a simple stigma; the fruit is capsular; the seeds have mealy albumen and embryos inverted, curved, or spiral. The *Cistaceæ* have resinous and balsamic properties. From species of the typical genus *Cistus*, a fragrant resinous substance, called *Ladanum*, is obtained in the Levant. This is used medicinally as an expectorant and emmenagogue, and is much esteemed by the Turks as a perfume. A gum called *Kutcera*, which is sometimes substituted in India for tragacanth, is the produce of a plant of this order, named *Cochlospermum Gossypium*.

CISTERCIANS, *sis-ter'-si-ans*, a religious order originally established by St. Robert, abbot of Molesme (1098), and was so called from having its first establishment at Citeaux (Cistercium). Through the exertions of St. Bernard of Clairvaux and others, this order had increased in power so rapidly, that within a hundred years of its foundation it embraced 900 rich abbeys in different parts of Europe. It became so powerful, that it governed almost all Europe, both in temporal and spiritual concerns. The Cistercians dedicated themselves to a contemplative life, and their rule was severe. Cardinal De Vitry says they neither wore skins nor shirts, nor ate flesh, except in sickness, and abstained from fish, eggs, milk, and cheese. They lay only on straw beds, in their tunics and cowls; rose at midnight and sang praises to God till break of day; spent the day in labour, reading, and prayer, and in all their exercises observed a strict and continual silence. Towards the end of the 12th century, however, riches and indolence began to operate unfavourably on their discipline, and led the way to great corruptions. Many of the convents had ceased to exist before the Reformation, and many more speedily after that event. In the reign of Edward I. there were sixty-one Cistercian monasteries in England. The habit of the order is a white robe or cassock, with a black scapulary and a woollen girdle. Many eminent men have sprung from it.

CISTERN. (*See* WATER SUPPLY.)

CITATION, *...t'-shun* (Lat. *citatio*), a summons to appear, appl... particularly to process in the spiritual courts, where they proceed, according to the course of the civil and canon laws, by *citation*.

CITHARA, *sith'-á-ra*, an ancient musical instrument, supposed to have resembled the lyre; its precise construction, however, is now unknown. The cithara had at first only three strings; but the number was increased at different times to eight, nine, and, lastly, to twenty-four.

CITIES OF REFUGE, *sit'-eez*, were six cities (three on each side of Jordan) which God commanded Moses to set up for a refuge for the children of Israel, and for the stranger and for the sojourner among them, that every one that killeth any person unawares might flee thither, and find refuge from the avenger of blood. The manslayer was to remain there until the death of the high priest, after which he could return to his own land. They were Hebron, Shechem, and Kedesh-Naphthali on the west side of Jordan, and Bezer, Ramoth-Gilead, and Golan on the east. It is said that at every cross-road signs were set up, pointing the way to the cities of refuge.

CITIZEN, *sit'-i-zen* (Fr. *citoyen*, Lat. *civis*), is, by Aristotle, defined to be one who participates in the judicial and legislative power in a state; and in this sense it could only be applied in those states in which the people had some share in the sovereign power. In ancient Greece and Rome, citizens enjoyed numerous important privileges and immunities, which they watched over with the most jealous care. Among the rights enjoyed by Roman citizens was that of holding public offices in the state; of voting in the public assemblies of the people; of appealing to the people against any sentence of the magistrates, or act of oppression on the part of others; of making a will, and succeeding to an inheritance; and of having the power of life and death over their children. No magistrate could order a Roman citizen to be put to death, nor to be punished by stripes. Citizenship was only obtained by birth, or conferred by a public act. No term of residence, or the circumstance of being born in the city, conferred that right. Neither could any one claim citizenship by birth unless he was born of such a marriage as the state considered legal,—all marriages between citizens and freed slaves, or their descendants, were illegal. To be a citizen, it was necessary to be an inhabitant of Rome, to be enrolled in one of the tribes, and to be capable of dignities. There was also a lower class of citizenship, which conferred no right of voting or of holding public office. The practice of admitting aliens (*peregrini*) to the rights of citizenship became more and more common as their territories extended; and at length the emperor Caracalla granted the freedom of Roman citizens to all the inhabitants of the Roman world; but by this time their distinctive rights had been lost. The English law gives citizenship to every person born within the British dominions; as

well as to all persons who are born anywhere of a British citizen, or of one whose father, or father's father, was a citizen of Great Britain. Commonly the term citizen is employed to denote the inhabitant of a town. In France, a citizen is one who has been born in the country, or is naturalised in it.

Citric Acid, *sit'-trik*, a powerful tribasic acid, found principally in the lemon, lime, orange, and other members of the *Aurantiaceæ* fam. It also occurs in other acid fruits, such as the gooseberry, raspberry, strawberry, and tamarind. It is procured by neutralising lemon or lime juice with chalk, and decomposing the insoluble citrate thus formed with sulphuric acid. Citric acid is very soluble in water. It crystallizes in transparent colourless rhombic prisms, which have an agreeable acid taste. Citric acid is a tribasic acid, and forms three citrates of soda, for instance, containing one, two, and three equivalents of acid united to an equivalent of base. The alkaline citrates are all soluble in water; so also are many of the metallic citrates. The most important of these is the *citrate of lime*, by the decomposition of which citric acid is formed. When subjected to destructive distillation, citric acid undergoes a remarkable change. It first melts, and parts with its water of crystallization. At 350° Fahr. decomposition commences, gases are given off, and the residue consists of *aconitic acid*, an acid found in aconite. If the heat be continued, *itaconic acid* is formed. Citric acid may be looked upon as the hydrated teroxide of cetryl, a hypothetical radicle. Citric acid is very valuable as a mordant in calico-printing; it is also used in pharmacy, in the manufacture of lemonade and syrups, and occasionally in photography. Combinations of citric acid with iron and ammonia are much used in medicine. It is also used in the preparation of effervescing draughts. The antiscorbutic properties of lemon-juice are due to the presence of citric acid. (For a detailed account of the combinations and derivatives of citric acid, the reader is referred to Gerhardt's *Traité de Chimie*.)

Citrinulus, or Citrinus, *sit-ri'-nu-lus, si-tri'-nus*, old names for a kind of stone between a crystal and a beryl, formerly called saxifragus, and believed to be lithotriptic.

Citron, Oil of, *sit'-ron*, a fragrant oil procured by distilling the flowers of the *Citrus medica*, much used in perfumery.

Citronelle, Oil of. (*See* Andropogon.)

Citrus, *sit'-trus* (said to be from the town *Citron*, in Judea), in Bot., a gen. of plants belonging to the nat. ord. *Aurantiaceæ*. The different species and varieties of this genus yield the fruits known under the names of orange, lemon, lime, shaddock, pompelmoose, forbidden fruit, kumquat, and citron. The species *C. Aurantium*, and its varieties, produce all the various descriptions of sweet oranges, the most important of which are the St. Michael's, the blood-red, the Maltese, and the common oranges. They are imported in immense numbers from the Azores, Lisbon, Malta, and Sicily. *C. Bigaradia*, or *vulgaris*, yields the bitter, or Seville orange. The orange-tree is remarkable for its prolificness: thus, a single plant will sometimes produce as many as 20,000 good oranges. The small unripe fruits of *C. Aurantium*, as well as those of *C. Bigaradia*, are used for flavouring Curaçoa, being called *orange-berries*; when polished in a lathe, they constitute the ordinary *issue-peas* of the shops. The leaves of both species, when distilled with water, yield a volatile oil, which is called *oil of orange-leaf*, or *essence de petit grain*. Their flowers yield the fragrant oil known as *oil of Neroli*, which is the most important ingredient in eau de Cologne. The distilled water of the flowers is named *orange-flower water*. By distilling the rind of the ripe sweet orange with water, a fragrant oil, named *essential oil of sweet orange*, is obtained. The rind itself is used in medicine as an aromatic, stimulant, and tonic. The juice of the fruit forms a refreshing beverage, and in medicine a valuable refrigerant. The bitter orange is chiefly used for making marmalade. Its rind yields a volatile oil called *essential oil of bitter orange*, and is used medicinally, and for making *candied orange-peel*. *C. Limonum* and its varieties produce the fruits called lemons, the chief varieties of which are the wax-lemon, the imperial lemon, and the Gaeta lemon. They are chiefly imported from Sicily and Spain, those from the latter country being most esteemed. Both the rind and juice are employed in medicine, the former as an aromatic and stomachic, and the latter for its refrigerant and antiscorbutic effects. The juice contains a large quantity of citric acid, and is extensively used for flavouring and to form the refreshing beverage called lemonade. The rind contains a large quantity of essential oil, which is obtained from it by expression or by distillation, and is known as the *essential oil*, or *essence of lemon*. This oil is principally used as a flavouring agent in confectionery and in medicine, and occasionally in perfumery. *Candied lemon-peel* is a common ingredient in puddings and cakes. *C. Limetta* is the source of the lime. This fruit is generally imported into this country in a preserved state, and in that condition it forms a most agreeable dessert. Its juice is also imported, and largely employed, with that of the lemon, in the preparation of citric acid. *C. medica* yields the fruit called the citron, which is supposed to be the Hebrew *tappuach*. This word is translated in the English version of the Old Testament as "apple." The rind of the citron is imported in a preserved state, and is used in confectionery. The pulp is less acid and juicy than that of the lemon. Two essential oils used in perfumery are obtained from *C. medica*. They are named respectively *essence*, or *essential oil of citron*, and *essence of cedrat*, or *cedra*. The citron, lime, and lemon, are distinguished from the orange by their adherent rinds, their more lengthened form, and by the occurrence of a more or less prominent protuberance at the apex. *C. Bergamia*, which yields the Bergamot orange, so largely used in perfumery, is generally regarded as a mere variety of *C. Limetta*. (*See* Bergamot.) Besides the above fruits obtained from the genus *Citrus*, we have the shaddock, from the species *C. decumana*; the forbidden fruit, from *C. Paradisi*; the pompelmoose, from *C. Pampelmos*; and the kumquat of China, from *C. japonica*.



CITRON.

City, *sit'-e* (Fr. *cité*, Lat. *civitas*), is applied to certain large and important towns, both in England and other countries. It is commonly said that a city is a borough and a town-corporate, which is or has been the seat of a bishop; but this is not strictly correct, for there are many examples of towns in England which were once the seats of bishops, which are never called cities. The term seems rather to have been anciently applied as complimentary to certain towns of principal note and importance. A city differs in no respect, except that of superior dignity, from an ordinary borough.—*Ref. English Cyclopædia*—Arts and Sciences.

Civet (*Viverra*), *siv'-et*, a native of North Africa. Its size is about two feet six inches in length, and ten or twelve inches in height; head long; muzzle sharp, as in the weasel: a narrow bristly mane runs from the pole of the neck to the tail. Its colour is brownish grey, with black bands and spots. It is a carniverous animal, and preys on birds, small quadrupeds, and reptiles. The true civet's most remarkable feature consists of a sort of pouch between the anus and sexual organs, in which collects an odorous liquid of considerable value in the perfume-market. For the sake of this it is very commonly kept in confinement. The perfume is removed from the pouch about twice a week. The quantity yielded is about a dram at each removal. Great care has to be observed during the pouch-emptying process; for the civet has a decided objection to it, and will struggle its hardest to avenge itself on the operator. Whether the ferocity of the true civet is caused by their anxiety about the safe-keeping of their secretions, cannot, of course, be explained; but it is

certain that those who, on account of the valueless contents of their pouch, are not *operated* on, are com-



CIVET CAT.

paratively of amiable disposition, and will even become domesticated.

CIVET, a substance secreted by the *Viverra civetta*, or civet-cat. In any quantity the odour is overpoweringly disgusting; but, diluted infinitesimally, its perfume is most agreeable. It is extensively used by Parisian perfumers, but the English manufacturers prefer the use of musk.

CIVIC CROWN. (*See* CROWN.)

CIVIL, *siv'-il* (Lat. *civilis*, from *civis*, a citizen), that which relates to the community, or to the policy and government of the citizens and subjects of a state.

CIVIL DEATH, is where a man, by an act of parliament or judgment of law, is attainted of treason or felony, by which he loses his civil rights and capacities, and becomes, as it were, dead in law. Formerly it took place, also, where a man abjured the realm, or went into a monastery and became a monk, in which cases he became dead in law, and his estate fell to the next heir.

CIVIL LAW.—By this term, absolutely taken, is generally understood the civil or municipal law of the Roman empire, as comprised in the Institutes, the Code, and the Digest of the emperor Justinian, and the Novel constitutions of himself and some of his successors. Like the canon law, it has no force where it is repugnant to our common law, and the courts of the latter will prohibit any excess of jurisdiction, if attempted by any tribunal dealing with the civil law. (*See* CANON LAW.)

CIVIL LIST, was formerly applied to the list of all the expenses of the civil government of the country. Down to the time of the Restoration, the whole expenses of the government, civil and military, were included in one list; but a distinction was then made between the military and the civil expenses of the government. During the reign of William III. the amount of the civil list averaged about £680,000 annually. Under this head were included the expenses of the royal household, of the privy purse, maintenance of the royal palaces, salaries of the lord chancellor, judges, officers of state and ambassadors at foreign courts, incomes to the members of the royal family, secret-service money, pensions, &c. In succeeding reigns the amount of the civil list was much increased, until, by 1 Will. IV. c. 25, it was confined to expenses proper for the maintenance of the royal household, and the sum of £510,000 granted to his majesty exclusively for the privy purse, the salaries and expenses of the household, secret-service money, and pensions. The civil list is fixed in the first session of parliament after the accession of the sovereign, and is understood to be granted for the whole period of his reign. Her Majesty's civil list was settled, as in preceding reigns, on her accession to the throne, by 1 & 2 Vict. c. 2. In terms of that act she surrendered the hereditary revenues of the crown for life, in consideration of an annual sum of £385,000, for the support of her majesty's household and the honour and dignity of the crown. The application of this sum is intrusted to the lords of the treasury, and it is apportioned among the several branches as follows:—Privy purse, £60,000; retired allowances, salaries, and wages, £131,360; expenses of household, £172,600; royal bounty, alms, and special services, £13,200: leaving an unappropriated surplus of £8,040; but at the end of each year the lords of the





treasury are authorised to direct that the savings in any one of these classes may be applied in aid of the charges under any of the others. In addition to the above sum, £1,200 is granted to her Majesty for each and every succeeding year of her reign, cumulatively, for the payment of pensions to "persons who have just claims on the royal beneficence, or who, by their personal services to the crown, by the performance of duties to the public, or by their useful discoveries in science and attainments in literature and the arts, have merited the gracious consideration of their sovereign and the gratitude of their country." It is further provided, that if in any one year the civil-list charges should exceed the total sum of £400,000, then an account of the particulars of the excess shall be laid before parliament within thirty days. For the year ending 31st December, 1860, the civil-list charges amounted to £408,585.

CIVIL SERVICE, is applied to that department of the government service which is neither naval nor military. In it are included the post-office, customs, inland revenue, treasury, home, foreign, and colonial offices, War-office, Admiralty, Board of Trade, courts of law, diplomatic corps, &c. The following are the amounts voted for the several branches of the civil service for the year 1861-62.

| | | |
|---|---|---|
| I. | Public Works and Buildings | £733,974 |
| II. | Salaries and Expenses of Public Departments | 1,449,062 |
| III. | Law and Justice | 2,673,458 |
| IV. | Education, Science, and Art | 1,358,996 |
| V. | Colonial and Consular Services | 680,283 |
| VI. | Superannuations and Charities | 349,638 |
| VII. | Special and temporary objects | 295,966 |
| | Civil contingencies | 75,000 |
| | Total | £7,605,377 |

The number of persons employed in the civil service in any capacity (excluding law courts and law offices) in 1859 was as follows:—

| | | |
|---|---|---|
| I. | Heads of departments (political, 34; non-political, 156) | 190 |
| II. | Sub-heads of departments and heads of branches | 1,489 |
| | Clerks (established, 13,769; temporary, 389) | 14,157 |
| III. | Professional officers (superior, 1,922; inferior, 1,921) | 3,843 |
| IV. | Inferior officers (in-door, 2,259; out-door, 36,566) | 38,825 |
| V. | Artisans and labourers | 29,613 |
| VI. | Persons not wholly employed, women, &c. | 14,941 |
| | Total | 103,058 |

In the fixed civil service there are two kinds of offices: there are, first, what are called the *staff*, or special appointments, *i. e.*, certain situations to which men are appointed at once, irrespective of any previous connection with the service. These are usually the highest offices, which rank, in point of dignity and emolument, next to the ministerial offices, but differ from them in being held permanently. Distinct from staff appointments are what may be called graduated appointments, or those which are arranged in an ascending scale, so that one must enter at a particular stage, and pass through the lower in order to reach the higher. As a general rule, clerkships in all departments of the service are graduated appointments, one entering as a clerk of the lowest grade, with a salary of £90 or £80 a year, and gradually working his way upwards. There are, however, many other kinds of offices that are thus graduated, as in the post-office and custom-house. Of the salaries enjoyed by the different classes of officials the following is an approximation. Of those styled heads of departments the salaries may be said to range from £1,000 to £5,000, but the majority are under £2,500. The salaries of secretaries and chief clerks range generally from £1,000 to £2,000. Sub-heads of departments, and heads of branches, have usually from £300 to £1,500 a year, varying with the nature of their occupations. The great body of clerks in the public service may be distributed into four classes, those in the lowest having a

salary of £80 or £90 a year, and these in the highest from £500 up to £800 or £900. Of the office-keepers, messengers, porters, artizans, labourers, &c., the salaries or wages may be said to range from £150 a year down to under £1 a week. The chief doorkeepers and messengers of the houses of parliament, however, have salaries ranging from £150 to £400, or more, per annum. Formerly appointments to the civil service were obtained chiefly by favour, and frequent complaints were made as to the inefficiency of the servants. In 1854 a commission was appointed, which reported most unfavourably on the existing system of appointments; and hence, by an order of council, dated 21st May, 1855, it was ordained that commissioners be appointed to examine young men proposed for any of the junior situations in the civil establishments, and grant certificates to such as they shall find duly qualified, having previously ascertained that they are within the prescribed age, free from physical defect or disease, and of good moral character. After receiving his certificate, the candidate enters upon a six months' probation, during which his conduct and capacity for business are tested, and, if found satisfactory, he then receives his appointment. There are two kinds of examinations,—pass and competitive. In the pass examinations there are no marks assigned, the candidates being reported upon by epithets as to the nature of their work. In competitive examinations marks are employed. (*See* EXAMINATION.) The ages for admission are generally fixed at between 18 and 25. In 1860 there were 2,631 persons nominated for examination; and of these, 317 were rejected in the non-competitive examinations; 103 were ineligible on account of age or other causes. Of the competitive nominations, 603 only were examined; and of these, 407 were unsuccessful; 319 were not considered to have been qualified, if they had possessed absolute nominations. On retiring from the civil service, the servant receives a pension for the rest of his life, proportioned to the period of his service and the amount of his salary.

CIVIL WAR, a war between the inhabitants of the same state, or the citizens of the same city,—one of the greatest misfortunes that can befall a nation. The Wars of the Roses, the war between the Parliament and Charles I., in this country, and the present struggle between the Northern and Southern states of America, are the most notable civil wars since ancient times.

CIVILIAN, *siv-il'-yun* (Lat. *civis*, a citizen), a popular term signifying a person who is neither clerical, military, nor naval by profession. In Law, a civilian is a person who has studied the law and principles by which civic rights may be vindicated honourably, either in general society or in the special state to which he belongs. The civil law of ancient Rome was much studied in all the states of Europe in former times, and greatly influenced the formation of many municipal systems. Those who devoted much study to the nature of these laws were called *civilians*; and on account of the more severe character of the studies required, the term gradually was applied to the professor or doctor, as distinguished from the practitioner of laws. At present, in this country, the term is still applied to a student or teacher of Roman civil law.

CIVILISATION, *siv-il-i-zai'-shun* (Lat. *civis*, a citizen), is one of those terms in common use which it is difficult accurately to define in words. It is derived from the Latin word *civis*, a citizen, probably from those who live in cities being more civilised than those who inhabit country parts, or from the living in cities being one of the great characteristics of civilised life. "Whatever," says J. S. Mill, "be the characteristics of what we call savage life, the contrary of these, or the qualities which society puts on as it throws off these, constitute civilization." According to Guizot, the fundamental idea of civilisation is progress or development,—the perfecting of civil life or of society, properly so called; but comprising, also, the development of the individual internal life, the development of man himself, of his faculties, his sentiments, his ideas. Hence civilisation subsists on two conditions, and manifests itself by two symptoms,—the development of social activity and that of individual activity,—the progress of society and the progress of humanity. Civilisation denotes a state





of advancement from the savage state to that higher and more perfect condition which both science and revelation lead us to believe to be the ultimate destiny of the human race. The history of civilisation is the history of this progress, either in nations or in the race. It is a subject of the utmost importance, and, as yet, little has been done towards its elucidation. According to M. Guizot, the history of civilisation may be considered under two different aspects, and treated in two different ways. The historian may either place himself in the heart of the human mind for a given period, a series of ages, or among a determinate people, studying, describing, and relating all the events, transformations, and revolutions which had been accomplished in the internal man, and he would then have a history of civilisation amongst the people and in the period he had selected; or, instead of penetrating the internal man, he may take his stand in the midst of the world, and, instead of describing the vicissitudes of the ideas, the sentiments of the individual being, he may describe external facts, the events and changes of the social life. These two modes of treating civilisation are intimately connected together; they are the reflection and image of each other. As we view the history of the human race from the earliest times to the present, the progress of civilisation is very marked. It is not, indeed, in one undeviating straight line, nor is its course constant and uninterrupted. Sometimes it has the appearance of being at a stand-still, or even to be going backward; but this is only for a brief space, snatching, as it were, a breathing-time, in order with the greater vigour to again pursue its onward course. Very remarkable changes, too, have taken place among those nations that from time to time have occupied the foremost place in history. Nation after nation has, for a time, taken up the beacon-light, running with it onward for a time, and, when it begins to falter or fail, succeeded, as it were, by another of stronger and fresher energies. Many nations that once occupied the van in civilization have passed away, and live only in name. These are not confined to one district of country, nor even to one continent; at one time in Africa, at another in Asia, now in Europe, and anon it may be in America or Australia (when the New Zealander shall come over and contemplate the ruins of Saint Paul's). It seems as if, in each succeeding nation that arose, and under each clime, there were certain elements that favoured its growth for a time, and at a particular state of its progress; and that, when these were exhausted, the people that furnished them perished as useless. Or does it not rather seem, in most cases, that the very people that were ministering to the advance of civilisation in one direction were, in another, imbibing the very poison of which it was purifying itself, and thus accomplishing their own destruction? Is it not thus that the very refinements of civilised life have been the bane of so many? What, then, are the causes at work in producing these changes, —in effecting this progress? This is the most important in connection with civilisation, and this ought to be the great aim of its history. They are evidently of a twofold character,—internally in the race and externally in nature. The external or physical agents by which the human race are most powerfully influenced are, according to Mr. Buckle, climate, food, soil, and the general aspect of nature. But that these external agents are not all, or, perhaps, even the main agents at work, is evident from the fact that we find nations living under the like external circumstances, and yet in very different states of civilisation. The external circumstances in Greece and Rome were the same 2,000 years ago as now; but how different the people! This is one of the great errors into which Mr. Buckle has fallen. He overlooks the importance of the facts connected with the difference of race. Much as there is of error and loose reasoning in Mr. Buckle's book, it is undoubtedly a work of great ability, and is one of the first attempts made to systematise the history of civilisation. It is deeply to be regretted that the premature death of the author has left us only a fragment of the work. Mr. Buckle contends that it can be shown by positive evidence that human actions are governed by fixed laws, and that "when we perform an action, we perform it in consequence of some motive or motives; that these motives are the results of some

antecedents; and that, therefore, if we were acquainted with the whole of the antecedents, and with all the laws of their movements, we could with unerring certainty predict the whole of their immediate results." The measure of civilisation, in his view, is the "triumph of the mind over external agents;" and that in Europe the tendency has been in man to triumph over nature; out of Europe, in nature to triumph over man. The only possible way of arriving at a scientific knowledge upon these subjects lies, he thinks, in studying the "mental phenomena, not simply as they appear in the mind of the individual observer, but as they appear in the actions of mankind at large." While admitting that human actions are governed by fixed laws; yet it is doubtful how far the limited faculties of man will admit of his ever being able to arrive at any satisfactory knowledge of them. Whether a *science* of human action be possible is a question which Mr. Buckle has failed to solve. The circumstances "which influence the condition and progress of society are innumerable, and perpetually changing; and though they all change in obedience to causes, and therefore to laws, the multitude of causes is so great as to defy our limited powers of calculation." — (Mill's *Logic.*) The four leading propositions which Mr. Buckle regards as the bases of the history of civilisation, and holds to be the most essential for the right understanding of history, are—"1. That the progress of mankind depends on the success with which the laws of phenomena are investigated, and on the extent to which a knowledge of these laws is diffused; 2. that before such investigation can begin, a spirit of scepticism must arise, which, at first aiding the investigations, is afterwards aided by it; 3. that the discoveries thus made increase the influence of intellectual truths, and diminish relatively, not absolutely, the influence of moral truths,—moral truths being more stationary than intellectual truths, and receiving fewer additions; 4. that the great enemy of this movement, and therefore the great enemy of civilisation, is the protective spirit; by which I mean the notion that society cannot prosper unless the affairs of life are watched over and protected at every turn by the State and the Church; the State teaching men what they are to do, and the Church teaching them what they are to believe."

CLADONIA, *klă-dō'-ne-ă*, in Bot., a gen. of Lichens. *C. rangiferina* is the reindeer moss, so termed from constituting the principal food of the reindeer. *C. pyxidata* is commonly termed cup-moss; it has been employed as a remedy in hooping-cough.

CLAIM IN CHANCERY, *klaim*, is a proceeding, in certain cases, by which equitable relief may be obtained without special leave of the court, or filing a bill of complaint. It is lodged in the record and writ clerks' office, on which the court takes cognizance of the matter. The cases in which proceedings by claim may be instituted are,—1. Where the plaintiff is, or claims to be, a creditor seeking payment out of a deceased person's personal estate. 2. A legatee under a will seeking payment out of the personal assets. 3. A residuary legatee seeking an account of the residue, and payment or appropriation of his share. 4. A person entitled to the personal estate of an intestate seeking an account of such estate, and payment of his share thereof. 5. An executor or administrator of a deceased person seeking to have the personal estate administered under the directions of the court. 6. A legal or equitable mortgagee, or person having a lien as security for a debt, seeking foreclosure or sale, or otherwise to enforce his security. 7. A person entitled to redeem in the last-mentioned cases. 8. A person entitled to a specific performance of an agreement for sale or purchase of *any* property. 9. A person entitled to an account of partnership transactions dissolved or expired. 10. A person entitled to an equitable estate or interest, and seeking to use the name of his trustee in prosecuting an action for his sole benefit. 11. A person entitled to have a new trustee appointed in a case where there is no power in the instrument creating the trusts to appoint new trustees, or where the power cannot be exercised, and seeking to appoint a new trustee.

CLAIRVOYANCE. (*See* SOMNAMBULISM.)

CLAMP. (*See* JOINERY.)





CLAN, *klăn* (Gael. *clann*, children or descendants of a common ancestor), is a body of men united together by common ancestry, or some other tie. It is more particularly applied to those associations or tribes in the Scotch Highlands which are united together by one common name, and are supposed to be descended from a common ancestor, of whom the chief is the lineal representative. This system of clanship was essentially patriarchal, and similar to that which still exists among the nomadic tribes of the East. It was thus entirely different from the feudal system formerly prevailing in Europe; and hence it sometimes happened that the chiefship and the estates occupied by a clan were vested in different persons. "The Highland clans formerly enjoyed a bad fame among the lowland Scots for their predatory habits. "Being divided," says Camden, "into families, which they call clans, what with plundering and murdering, they commit such barbarous outrages, that their savage cruelty hath made the law necessary which enacts that if one of any clan hath committed a trespass, the rest shall repair the damage, or whoever of them is taken shall suffer death."

CLANDESTINE, *klăn-dest'-tin* (Lat. *clandestinus*), is applied to anything done secretly, without the knowledge of the parties interested, or without the proper solemnities. Hence a marriage is said to be clandestine when formed without the publication of banns and the knowledge of parents or guardians. (*See* MARRIAGE.)

CLAQUE, *klak* (Fr. *claquer*, to clap the hands), is the name given to the means by which public performances are secured a favourable reception. In Paris, one M. Santon established, in 1820, an office for the assurance of dramatic success, and was thus the originator of the so-called Parisian claque. Sometimes when the success of a piece is very doubtful, as many as from 300 to 500 *claqueurs* are sent to applaud it. They are even frequently instructed in the details of the piece, and shown beforehand what parts they are to applaud. They have also particular parts assigned to them: the laughers (*rieurs*) must laugh at every joke, the weepers (*pleureurs*) weep at all the moving passages, the *chatouilleurs* seek to keep their neighbours in good humour, while the *bisseurs* encore particular parts of the performance.

CLARE COLLEGE, CAMBRIDGE, *klair*, was founded by Lady Elizabeth, sister and co-heir of Gilbert, earl of Clare, in 1326. At present it consists of a master, eight senior and nine junior fellows, besides scholars, students, and foundation-servants. The seventeen fellowships are perfectly open to all persons who are bachelors of arts, or of a higher degree, without any limitation as to age or length of standing in the university. There are eight scholarships of £60, eight of £40, and eight of £20 per annum at this college. The number of undergraduates in 1862 was 38; of members on the boards, 226.

CLARE, NUNS OF THE ORDER OF ST., were instituted by St. Clare at Assisi, in Italy, about 1212, and subsequently confirmed by Popes Innocent III. and Honorius III. They observed the rule of St. Francis, and wore habits of the same colour with those of the Franciscan friars. Hence they were called *Minoresses*, and their house without Aldgate, London, where they first settled when brought over into England, about 1293, the *Minories*. They had only three houses in England besides this one.

CLARENDON, THE CONSTITUTIONS OF, *klăr'-en-don*, in English Hist., were certain ordinances made at a general council of the nobility and prelates, assembled by Henry II. at Clarendon, in Wiltshire, A.D. 1164. These enactments, sixteen in number, were designed to check the power of the pope and his clergy, and to limit the total exemption which they claimed from secular jurisdiction.

CLARET, *klăr'-et* (Fr. *clairet*, from *clair*, clear), a name used in England to denote the red wine of Medoc, and a term generally applied to the light red wines of France. *Clairet*, in France, signifies those wines which are red or rose-coloured; but the word, as used by us, and employed to describe every description of light-red wine, is unknown in France.

CLARICHORD, or CLAVICHORD, *klăr'-e-kord* (Lat. *clarus*, clear; *chorda*, a string), a keyed instrument.

resembling in form a spinet, now almost extinct. The strings are supported by five bridges, and covered with pieces of cloth, which soften and, at the same time, so deaden the tone, as to prevent its being heard at any considerable distance. On this account, it was formerly much used by nuns, as they could practise it without disturbing the silence of the dormitory.

CLARION, *klăr'-e-on* (Fr. *clairon*, from Lat. *clarus*, clear), a kind of trumpet whose tube is narrower, and tone more acute, than the common trumpet. It is said that the clarion now in use among the Moors served anciently for a treble to several trumpets, which sounded tenor and bass.

CLARIONET, *klăr-e-o-net'* (Fr. *clarinette*), a musical wind instrument, invented about the close of the 17th century by a German named Denner, and first introduced into Great Britain about 1770. It consists of four parts; viz. the mouth-piece (on which a flat reed is fastened), the upper joint, the middle piece, and the bell, or bottom piece; and has thirteen holes, five of which are stopped by keys. To these keys the instrument is indebted for its chief use, as, before their invention, it could not be employed in concert, as at present. Although chiefly used in concerted music, in which its charming effects are too well known to need encomium, its fulness and sweetness of tone as a solo instrument is extremely pleasing. This instrument bears a nearer resemblance to the female voice than any other extant. Some great improvements were made in wind instruments about eleven years since by M. Boehm, who brought the acoustical proportion of the tubes and finger-holes into correct numbers and measurement, by which means flutes, oboes, clarionets, &c., may be theoretically constructed. He also invented a mechanism for the keys, which gives much greater facility and precision to the execution.

CLASS, *klăs* (Lat. *classis*), in Bot., a group of orders possessing some important structural characters in common. In the system adopted throughout this work, we have the classes *Monocotyledones*, *Dicotyledones*, and *Acotyledones*, which present certain distinctive characters in their embryos, from which they derive their names; and they present, moreover, other important anatomical differences.

CLASSIC, *klăs'-sik*, is a term derived from the Latin word *classici*, the name given to the first, or highest class of Roman citizens. Hence it came to be applied figuratively to writers of the highest rank, and this is the sense in which it is commonly used in the present day. The highest and purest class of writers in any language are termed the classics; but, in a more limited sense, the name is given to the best writers of ancient Greece and Rome. In another sense, and as opposed to modern, it is applied to the productions of ancient Greece and Rome.

CLASSIFICATION, *klăs-sif-e-kā'-shun* (Lat. *classis*, a class), in a general sense denotes the arrangement of a variety of objects into groups or classes, according to their resemblances or differences. It is from the power of abstraction in the human mind,—the power of considering certain qualities or attributes of an object, apart from the re[st] that classification is possible. No assortment or arrangement can be formed among things not perfectly alike but by losing sight of their individual or lesser peculiarities, and limiting the attention to those which they have in common. The properties that may be adopted as the basis of classification are very various, as may be seen in the numerous botanical, geological, and other systems. When the properties on which the classification is based are arbitrarily selected, the system is said to be artificial; when they lie in the essential nature of the objects themselves, it is natural. "The ends of scientific (or natural) classification are best answered when the objects are formed into groups, respecting which a greater number of general propositions can be made, and those propositions more important than could be made respecting any other groups into which the same things could be distributed. The properties, therefore, according to which objects are classified, should, if possible, be those which are connected with many other properties, or, at any rate, which are pure marks of them. Causes are preferable, both as being the surest and most direct of marks, and as being themselves the properties on which it is of most use that our attention should be strongly fixed. But the property which is the cause of the chief peculiarities of a class, if unfortunately, seldom [illegible] to serve also as the definition of the class. Instead of this, we must commonly select some of its more prominent effects, which will serve as marks of the other effects and of the cause. "The end of classification as an instrument for the investigation of nature, is to make us think of those objects together which have the greatest number of important common properties, and which, therefore, we have oftenest occasion, in the course of our inductions, for taking into joint consideration. One idea of objects are thus brought into the order most conducive to the successful prosecution of inductive inquiries generally."—J. S. Mill's *Logic*.

CLAVICLE, or COLLAR-BONE, *klăv'-e-kl* (Lat. *clavicula*, from *clavis*, a key), in Anat., is the bone which extends horizontally from the sternum to the scapula, and serves to keep the shoulders apart, that the arm may enjoy a freer and wider range of motion. It takes its name from its resemblance to the ancient Roman key, and it is curved somewhat in the form of an italic *f*. Its sternal end is thick, strong, and expanded, while the acromial end is broad and flattened, and presents an oblong surface, in order to articulate with the acromion process of the scapula.

CLAY, *klā* (Sax. *clay*).—Clay is formed from the disintegration of felspathic rocks by the combined action of the air and water. It necessarily varies in its composition, but its fundamental constituent, according to the researches of Brogniart, Malagutí, and others, may be represented by the formula $Al_2O_3 2Si O_2 + 2aq$. This is as nearly as possible the composition of the fine fire-clay of the Staffordshire coal-measures. Ordinary clay contains, in addition, small portions of undecomposed rock, potash, oxide of iron, lime, and magnesia, the character of the clay being much modified by the preponderance of one or other of these ingredients. One of the great characteristics of clay in its hydrated condition is its plasticity, and its capability of being made hard by heat,—properties which render the different kinds of this substance available for various flotile purposes. The purest kind of clay is kaolin, or china-clay, which is formed by the disintegration of felspathic rocks. This species was originally found in China; but a similar description is obtained from deposits near St. Austle, in Cornwall, and at St. Trieix, near Limoges, in France. Kaolin is nearly pure silicate of alumina. (*See* PORCELAIN MANUFACTURE.)—*Pipe clay* is a white clay nearly free from iron, and found in large quantities in the island of Purbeck.—Common *potter's clay* contains a considerable amount of iron. The blue clay of Devonshire and Dorsetshire is much valued, being very plastic, and yielding a very white paste when burnt. The coarser varieties, which contain a large proportion of sand, are used for making brown stone-ware.—*Brick clay* contains varying proportions of iron; hence different counties build houses of different colours. The clay of the midland counties contains large quantities of iron, and the bricks made from it are of a bright red hue, while London bricks are yellow or brown, from deficiency of colouring material. When the proportion of iron is very much increased, we get the different coloured ochres.—*Marl* is clay containing a notable proportion of carbonate of lime. The colours known as *umber* and *sienna* are clays coloured by the peroxides of iron and manganese.—*Fuller's-earth* is a clay of a peculiar kind, which, when dried, possesses the property of absorbing grease from woollen fabrics, and is employed for that purpose. It contains a small percentage of magnesia.

CLAY IRONSTONE. (*See* IRON ORES.)

CLEARING-NUT. (*See* SEMECARPUS.)

CLEAVAGE, *klēav'-aj* (Sax. *cleofan*, to split), in Crystal., a term applied to the property possessed by crystals of separating into natural layers. (*See* CRYSTALLOGRAPHY.)

CLEMATIS. (*See* GARDEN.)

CLEF, *klef* (Fr. *clef*, Lat. *clavis*, a key), in Music, a certain character placed at the commencement of the several staves of a composition to determine the local names of the notes, and the sounds which they represent. There are three kinds of *cleft* now in use, viz., the F, or bass *clef*; the C, or tenor *clef*; and the G,

or treble clef. These, by the different situations in which they are placed, furnish us with a means of expressing all the notes within the usual compass of execution, either vocal or instrumental, without a continued addition of leger-lines either above or below the staff.

CLEMATIDEÆ, *klem-a-tif-de-e* (Gr. *klema*, a tendril), in Bot., a tribe of plants in the nat. ord. *Ranunculaceæ*, distinguished by the union of the following structural points:—Calyx valvate or indupliate; fruit consisting of a number of *achænia*; seed pendulous. The typical genus of the tribe is *Clematis*, which includes several beautiful climbers commonly cultivated in our gardens; also one indigenous species, *C. vitalba*, usually called traveller's joy.

CLEMENTINA, or CLEMENTINE HOMILIES, *klem-en-tī'-na*, in Eccl. Hist., are nineteen homilies of a Judaising tendency, falsely attributed to St. Clement. The generally received opinion is, that they were composed by an Ebionite, towards the end of the 2nd century.

CLEMENTINES, or THE CLEMENTINE CONSTITUTIONS, *klem-en-tens'*, is the name given to a collection of decretals of Pope Clement V., published by his successor, John XXII., in 1317, and forming part of the canon law.

CLERESTORY, *kleer'-stor-e*, in Arch., this name is applied to the windows that are pierced in the upper part or the side-walls of the nave of a cathedral or church, that rise above the arches which separate the nave from the side-aisles.

CLERGY, *kler'-je* (Lat. *clericus*, Gr. *klerikos*), is a term applied collectively to the whole body of ecclesiastics in contradistinction to the laity. The distinction of Christians into clergy and laity is as old as the time of the apostles, and was derived from the Jewish economy. As soon as the Christian church began to spread, and sufficient numbers were converted to form themselves into a regular society, then certain ecclesiastical officers were appointed among them as teachers and rulers. The clergy originally consisted only of bishops, priests, and deacons; but in the 3rd century many inferior orders were appointed as subservient to the office of deacon; such as subdeacons, acolytes, readers, &c. At first, probably, the clergy were not entirely relieved from the ordinary duties of life, so that they might devote themselves exclusively to their sacred office; yet it must have necessarily been nearly so, and it is certain that they were nominated to their offices by certain peculiar forms. The privileges and immunities enjoyed by the clergy of the early church were considerable. In some cases they were exempt from the cognisance of secular courts, from certain taxes and certain kinds of obligation to which others were liable, and were exempted from the burden of civil offices. Whenever they travelled, upon necessary occasions, they were to be entertained by their brethren of the clergy in all places, out of the public revenues of the church. If any controversies happened among them, they freely consented to have them determined by their bishops and councils, without having recourse to the secular magistrates. In all accusations against the clergy, especially against bishops, the character of the witnesses was inquired into before the testimony was admitted; nor would they receive the evidence of a heretic against a clergyman. The crimes involving punishment were simony, heresy, apostasy, murder, immorality, neglect of duty, &c.; and the punishments were various. Corporeal castigation and imprisonment were sometimes resorted to; degradation, suspension, deprivation, and excommunication were the other modes usually had recourse to, according to the heinousness of the offence. The laws regarding the duties of the various classes of clergy were definite and stringent. No clergyman was allowed to relinquish his station without permission; and he could not remove from one diocese to another without the consent and letters dismissory from his own bishop. In some cases they could resign, and a retiring allowance was sometimes granted to such. Residence in their respective cures was obligatory, and no one could hold office in two dioceses. Severe laws were enacted against wandering clergy (*vacantes*), or such as, having deserted their own church, would fix in no other, but went roving from place to place. There were also laws prohibiting them from following any secular employment which might divert them too much from their proper duties. They were likewise forbidden to frequent fairs or markets, to eat and drink in taverns, or to attend public theatres. No special clerical dress appears to have been in use before the 4th century. The clergy of the Church of Rome are distinguished into *regular* and *secular*. The regular clergy consist of those monks or religious persons who have taken upon them holy orders, and perform the offices of the priesthood in their respective monasteries. The secular clergy are those who are not of any religious order, and have the care and direction of parishes. The Protestant clergy are all secular. In England, the term clergy, in its ordinary acceptation, comprehends archbishops, bishops, deans and chapters, archdeacons, rural deans, persons (either rectors or vicars), and curates; to which may be added parish clerks, who formerly were, and yet sometimes are, in holy orders. Most of the privileges and immunities which the clergy enjoyed in England were taken from them at the time of the Reformation. Among those which they still possess are exemption from serving on a jury, or appearing at a court-leet or view of frankpledge. They cannot be compelled to serve the office of bailiff, reeve, constable, or the like; neither can they be pressed to serve during the wars. They are privileged from arrest in civil cases in going to, during, or returning from the celebration of divine service. Clergymen are disqualified from sitting in the House of Commons, nor can they engage in any kind of trade. Neither can a clergyman farm lands to the extent of more than eighty acres without a written permission from the bishop of the diocese, such permission specifying the number of years for which it is granted, and in no case exceeding *seven*. Clergymen are, by the ecclesiastical law, liable to be punished and corrected for loose, immoral, and profane conduct, for irreligious language, for irregularity in discharge of duty, or for preaching and maintaining doctrines contrary to the articles of the creed which they profess. For such they may be called to account by their ecclesiastical superior, by whom they may, if the charges are proved against them, be punished by admonition, suspension, degradation, or deprivation, as the case may require.

CLERGY, BENEFIT OF. (*See* BENEFIT OF CLERGY.)

CLERK, *klerk* (Lat. *clericus*), was a term originally applied only to clergymen, being, in fact, a contraction of the Latin word *clericus*. As learning was at one time almost entirely confined to the clergy, the word naturally came to be synonymous with a learned man, or one who could write. Hence we have the double meaning of the term,—a clergyman, and a scribe, or one whose principal business is writing. In the former sense it is now seldom used except in formal documents; but from it has come a secondary meaning, in which it is applied to certain laymen appointed to conduct or lead the responses of the congregation. These were originally real clerks, *i. e.* clergymen, generally in minor orders, who assisted the officiating priest. Parish clerks, after being duly chosen and appointed, are usually licensed by the ordinary. By a recent enactment, persons in holy orders may be appointed to this office. Until recently there were a large number of clerkships, connected principally with the courts of law, having ancient and quaint names, derived from some incident of their origin; as, clerk of the hanaper, clerk of the petty bag, clerk of the pells, clerk of the pipe. Most of these were abolished by acts of parliament in 1832 and 1837. The proceedings of the two houses of parliament, of the various courts of justice, and of the ministerial departments, are generally drawn up and recorded by clerks.—*The Clerk of the Parliaments* is the chief ministerial officer of the House of Lords; he and his assistants make minutes of the proceedings of the house, record its votes, resolutions, orders, and divisions, issue directions consequent upon its orders, prepare the journals, and superintend and verify the preparation and distribution of the printed documents issued by the house.—*The Clerk of the House of Commons* is the chief officer of that house, but nominally he is deputy of the clerk of the parliaments. He holds office for life under letters patent from the crown. He has the general charge of the official business of the house, assists and advises the

speaker in matters relating to the rules and practice of the house, and signs all orders and all bills which pass the Commons; he has the custody of all records and other documents of the house, and is required to take notes of all orders and proceedings, and to enrol the votes.—*The Clerk of the Crown in Chancery* is an officer of the crown in attendance upon the lord chancellor in parliament. He makes out and issues all writs of summons to peers, writs for the attendance of judges, commissions to commons and prorogue parliament, and to pass bills. He also makes out and issues all writs for the election of members of the House of Commons in England and Scotland, receives and has the custody of all returns to parliament for the United Kingdom, and has also the custody of all poll-books taken at elections. He also makes out all warrants, commissions, appointments, or other instruments that pass the great seal.

CLEVELAND IRONSTONE. (*See* IRON ORES.)

CLIENT, *kl'-ent*, is a party to a suit, action, or proceeding, who employs an attorney, solicitor, or proctor to conduct his case in a court. Among the Romans, a client was a citizen who put himself under the protection of some great man, who, in respect of that relation, was called *patron*. He assisted his client with his protection, interest, and goods, and the client gave his vote for his patron when he sought any office for himself or friends. The right of patronage was appointed by Romulus, to unite the rich and poor together in such a manner as that one might live without contempt, and the other without envy; but the condition of a client, in course of time, became little else than a modern slavery. (*See* ATTORNEY.)

CLIMACTERIC, *kli-mak'-ter-ik* (Lat. *climactericus annus*, from *climax*, a ladder or steps), denotes a critical year or period in a man's life, wherein, according to astrologers, there is some notable alteration to happen in the body, and the person will be exposed to great danger of death. The idea of climacterics is very ancient. According to some, every seventh year of a man's life is a climacteric year, certain important changes then taking place in the body. The ages of 63 and 84 are regarded as the *grand climacterics*, the changes being then greater, and the danger attending these periods much increased. Others allow the term climacteric only to the product of 7 multiplied by odd numbers; as 3, 5, 7, 9, &c. Some, again, consider every ninth year a climacteric.

CLIMATE, *kli'-mit*, is derived from the Greek word *klima*, signifying inclination, but which was also applied to certain zones on the earth's surface, from their supposed inclination to the pole. The space between the equator and the poles was, by the ancient geographers, divided into thirty such zones or inclinations (*klimata*). The first *twenty-four*, counting from the equator, were called *half-hour* climates, because they were determined by the length of the longest day, every half-hour, in its length from the equator, denoting a new climate. The last six were called month-climates, because, being within the polar circle, each was marked by an additional month of continuous sunshine. The climates of ancient geographers, therefore, served the same purpose as our parallels of latitude. In its present and most general acceptation, the word *climate* may be said to include all those atmospheric conditions and changes that sensibly affect our organs; such as heat, moisture, winds, electricity, &c. The principal elements, however, that go to constitute climate are heat and moisture, the latter being dependent upon the former. Heat is communicated to the atmosphere in three ways,—(1) By the direct rays of the sun; (2) by the reverberation of those rays from the ground; and (3) by contact with the ground. The sun being thus the great source of heat, it follows that, as a general rule, the temperature of a place would depend upon its latitude, or distance from the equator, and that all places in the same latitude would enjoy the same kind of climate. Were the surface of the earth composed of a homogeneous fluid mass, or of plains of rock perfectly alike in colour, density, and smoothness, then this would actually be the case; for all places in the same latitude would receive the solar rays at the same angle, and having the same capacity for absorbing and radiating heat, would possess exactly the same climate.





There are, however, various circumstances that tend to modify the climate of a country; as height above the level of the sea, inclination of the surface, proximity or distance from the sea, the position and direction of mountain-chains, nature of the soil, state of cultivation, prevalence of particular winds. Elevation above the sea-level is one of the most important modifying circumstances, the air becoming gradually colder as we ascend; so that even in the torrid zone the summits of very high mountains are covered with perpetual snow. The power of the sun's rays in imparting heat to the earth depending upon the angle at which they strike the surface, it follows that the inclination or slope of a country has an important influence upon its climate. Hence in the Alps of the Valais, for instance, on the one side may be seen the vine in luxuriant growth, whilst the other is thick-ribbed with ice. The ocean is a very important element in determining the nature of a climate. Islands and districts near the sea uniformly enjoy a milder and more uniform climate than inland regions in the same latitude. In summer the sea is not so much heated by the sun's rays as the land; and hence cooling sea-breezes temper the warmth of that season, while in winter the cold is mitigated in consequence of the water retaining its heat longer than the land. Thus Dublin, though 3° farther north than Heidelberg, has nearly the same mean annual temperature; whilst its winters are almost 6° warmer and its summers nearly 3° cooler. Mountains affect a climate in various ways, by influencing the direction of currents, and by attracting and condensing the vapours in the atmosphere. The nature of the soil and the state of cultivation operate materially upon climate. Different kinds of soil have different powers of radiating and absorbing heat; and a region shrouded in forests, or covered with swamps and marshes, will have a different temperature when cleared and drained. Marshes, by evaporation, deprive the surface of much of its heat; and forests, by intercepting the sun's rays, and by the increased exhalant surfaces exposed to the air, undoubtedly affect the temperature. Hence in hot climates forests tend to cool the air, and in frigid regions to prevent the loss of the earth's heat by chilling blasts. The prevalence of particular winds also influences the character of a climate; as does also the proximity of an oceanic current bringing water of a higher or a lower temperature than that of the surrounding sea. It will thus be seen that there are numerous circumstances that tend to modify the climate of any particular place, and that mere lines of latitude afford but an imperfect indication of the temperature. Hence geographers have had recourse to other lines called *isothermal* (Greek *isos*, equal, and *thermos*, heat), which are carried through all places having the same mean annual temperature. These lines diverge more and more from the parallels of latitude as they recede from the equator. In the American continent they descend much lower than in Europe; and in the southern hemisphere the mean annual temperature is much lower than in the northern, on account of its having much less land. But places having the same mean annual temperature may yet have very different climates; for places having a moderate summer and winter may yet have the same mean annual temperature as others where the summer and winter are extreme. Hence recourse is had to other lines indicating the mean summer and winter temperature, the former being called *isotherals* (Greek *isos*, equal, and *theros*, summer, the latter *isochimenals* (Greek *isos*, and *cheimon*, winter). The second great constituent of climate is moisture, which takes the forms of rain, vapour, fog, and dew. These will be noticed under their respective heads. In the torrid zone there are but two seasons, the wet and the dry. The former is regarded as the winter, the latter as the summer of these regions; but they are in direct opposition to the astronomical seasons, as the rains follow the sun. In India, however, the rainy and dry seasons are not regulated by the position of the sun, but by the change of the monsoons. In some districts there are two rainy and two dry seasons; and in others rain seldom or never falls, as in the great African desert of the Sahara. Only in the temperate zones can the year be properly said to be divided into four seasons, ex-

habiting the agreeable vicissitudes of heat and cold,—the temperate heats of summer and the healthful rigors of winter in kindly union with the varied charms of spring and autumn. In the frigid zones only two seasons are known,—a long and severe winter followed by a short but torrid summer. This harsh and abrupt transition is occasioned by the great length of the day in summer, when for a time the sun never sets, and by the total absence of that luminary in winter. It is to the varieties in the climate of different places that we are indebted for the great variety that exists in the vegetable and animal kingdoms. Every species of plant has certain climatic boundaries, some much more extended than others, within which alone it will flourish. Animals, too, have their climatic bounds. To man alone is it given to subsist in any climate. Even him, however, different climates affect very differently,—some being favourable to health, others tending to disease. The study, therefore, of the effects of different climates upon different constitutions and in different diseases, forms an important branch of medicine. Indeed, there are few diseases that may not be influenced by climate; and hence the necessity to the physician of making himself acquainted with the atmospheric conditions of different localities.

CLIMAX, *klí'-maks* (*Gr. klimax*), is applied to a figure in rhetoric in which the speaker ascends, as it were by a series of steps, from one idea to another, each being characterised by greater force, dignity, or importance than its predecessor; as in that celebrated saying of Julius Cæsar, "Veni, vidi, vici" (I came, I saw, I conquered). "Every one," says Lord Kames, "must have observed the delightful effect of a number of thoughts or sentiments artfully disposed like an ascending series, and making impressions deeper and deeper: such disposition of members in a period is termed a *climax*." The opposite of climax is anti-climax, or a descending from greater to less important ideas.

CLIMBING PERCH (*Anabas scandens*), *klí'-ming perch* (Ang.-Sax.).—This singular fish is an inhabitant of the ponds and rivers of most parts of the East Indies. Its general form resembles that of the common English perch; but it seldom attains a greater length than six inches. "The most remarkable character presented by these fishes consists in the structure of the superior pharyngeal bones, which are dilated into voluminous folded lamina, inclosed in a large cavity at the base of the skull, and forming numerous cells, in which a supply of water may be carried for the purpose of moistening the gills when the creature, as its habit is, quits the water for a time."—(*Dallas.*) It has been asserted, and that by travellers and explorers whose veracity is beyond question, that this singular fish has been seen *to climb trees*, fixing its anal fin in cavities of the bark, and urging its way upwards by distending and contracting its body. "Though these fish are sometimes compelled in their distress to travel by day, and have been met in the glare of noon toiling along a dusty road, their migrations are generally performed at night, or in early morning, whilst the grass is yet wet with dew. Climbing perches are plentiful in the Ganges, and the boatmen have been known to keep them for five or six days in an earthen pot without water, using daily what they wanted, and finding them as lively as when caught."—*Chambers's Encyclopædia.*

CLINIC, or CLINICAL, *klín'-ik, klín'-ik-al* (Gr. *klinikos*, from *klíne*, a bed), is applied, in Med., to the observation and treatment of diseases at the bedside of the sick; and hence clinical lectures are such as are given at the bedside of the patient, or from notes and observations made at the bedside. This is the most valuable mode of instructing in the art of medicine; the students are taken to the bedside of the patients in a public hospital and there practically instructed in the various phenomena of diseases, taught to observe the characteristics of each individual case, and to study the effects of the various modes of treatment. In modern times at least, clinical medicine was entirely neglected till about the middle of the 17th century; and it was not till the beginning of the 18th that it began, by Boerhaave, to be systematically carried out. Since that time it has come into general use, and now every good school has an establishment for clinical medicine in connection with it.

CLINICAL BAPTISM, in Eccl. Hist., is applied to baptism administered at the death-bed. Among the heretical opinions that at one time prevailed in the Church, was, that the sacrament of baptism washed away all sins previously committed; and hence it was often deferred to near the end of life, when there was little risk of sinning more; such persons were called *clinici*.

CLINKER, *klíng'-ker* (Ang.-Sax.), in Min., black oxide of iron, obtained in scales from red-hot iron while in process of forging. In common parlance the term is applied to the slaggy ferruginous masses that form in furnaces and stoves from the vitrification of the silica and iron contained in the coal.

CLIO, *klí'-o*, a gen. of shell-less mollusca, so extremely abundant in the Arctic seas, that they constitute a chief part of the food of whales. *Whales' food* is the name by which they are known to the fishermen. Sometimes the water is so full of them, that it would be impossible for a creature of so ponderous a maw as the whale to open his jaws without engulfing thousands.

CLIPPER, *klíp'-per* (Ang.-Sax., one who runs fast), a sailing-vessel built expressly for speed. Compared with ordinary ships, a clipper is longer and narrower; the bows, which are generally hollowed below the water-line, are extremely sharp, and the lines are fined gradually towards the stern. Clippers owe their origin to the necessity of a quick passage when goods of a perishable nature had to be conveyed to a great distance. This led to the application of science to the lines of a ship; so that there might be the least possible resistance to the water in sailing. The fruit-clippers have long been famous for their speed: while the clippers used in the slave-trade, and the opium-clippers, have for many years been notorious for their swift sailing. The magnificent clipper-ships which sail between Liverpool and Australia and America are among the finest vessels existing. Great improvements have been introduced by the Americans into the building of swift-sailing vessels and clipper-ships.

CLOCK. (*See* HOROLOGY.)

CLOD-CRUSHER, *klod krush'-er* (Ang.-Sax.), an agricultural implement used for crushing and pressing the soil. In its general form it consists of a cylindrical roller divided into many pieces, all strung upon one axle. These pieces actually constitute a number of independent wheels, which are notched on the outer edge, and so formed as to prevent the tearing up of the land, which, when the common roller was employed in rolling a growing crop, was a serious objection.

CLOG ALMANAC, or RUNIC STAFF, *klog*, was a kind of almanac or calendar formerly in use in England and Scandinavia, and was usually made of wood. Dr. Plot, in his History of Staffordshire (1686), describes one of these instruments, which, he says, is still in use among the meaner sort of people. "It is usually," he says, "a square piece of wood, containing three months on each of the four edges. The number of days in them are expressed by notches: the first day by a notch with a petulous stroke turned from it, and every seventh by a large-sized notch. Over against many of the notches are placed, on the left hand, several marks or symbols denoting the golden number or cycle of the moon. The festivals are marked by symbols of the several saints resting from the notches." These which he had seen in Staffordshire had only the prime and immovable feasts upon them; whereas others of a more perfect kind, preserved in the cabinets of the curious, had likewise the Dominical letters. Of the former there were two kinds,—a larger for family use, which usually hung at the end of the mantel-tree of the chimney, and a smaller for carrying in the pocket. Specimens are to be seen in the British Museum.

CLOISTER, *kloy'-ter* (Lat. *claustrum*, an inclosed space), in a general sense, a monastery, either inhabited by monks or nuns, who are inclosed or shut up from the world. In a more restricted sense, the term is applied to a covered passage running round the walls of certain portions of monasteries. It usually is found extending over three sides of a square or quadrangle, with the outer walls consisting of pillars and arches, and the roof frequently arched and ornamented with tracery. In the ancient monasteries the cloisters were used for several purposes. The monks held their lec-

turns in the cloisters, and at certain hours of the day met there and conversed together.

CLOSE-HAULED, *Kloze-hauld* (Ang.-Sax.), in Mar., denotes the arrangement or trim of a ship's sails when she is endeavouring to make progress, in the nearest direction possible, towards that point of the compass from which the wind blows.

CLOSE-QUARTERS, *kloze kwar'-terz* (Ang.-Sax.), in Mar., strong barriers of wood built in various portions of a merchant-ship, to be used as places of retreat in case she be boarded by an enemy. They are fitted with loopholes, through which a continued fire of musketry can be maintained upon the boarders. Figuratively speaking, when vessels approach each other very closely they are said to be at "close quarters."

CLOTH, *kloth* (Sax. *cloth*), a manufactured substance, consisting of wool, hair, cotton, flax, hemp, or other vegetable filaments. It is formed by weaving or interlacing threads, and is used for making garments or other coverings, besides being useful in a great variety of forms, such as woollen cloth, hair cloth, cotton cloth, linen cloth, &c. The term cloth, however, is generally employed to distinguish woollen cloth from fabrics made of any other material. (*See* WOOLLEN MANUFACTURE.)

CLOTHES-MOTH, *klothz'-moth* (Ang.-Sax.), a name common to a number of small moths of the gen. *Tinea*, whose larvæ are extremely destructive to woollen fabrics, &c. They begin not only to eat as soon as they are hatched, but to back to bits the substance in which they are hidden, and uniting the fragments with a glutinous silk of their own producing, make, of the whole, cases to live in. Cleanliness and exposure to light are the best safeguard against these tiresome insects.

CLOUD, *klowd* (Lat. *claudo*, I shut), a condensed mass of watery vapour that floats in the atmosphere or rests on the surface of the earth. In the latter case the vapour is called fog or mist; and it is only when it rises above us that it is termed a cloud. The height to which clouds rise above the surface of the earth varies with a number of circumstances; such as the temperature of the air, its humidity, the climate and seasons, and the neighbourhood of the sea or mountains. Heavy rain-clouds are frequently about 200 or 300 yards in height; while light fleecy masses of vapour rise to the height of four or five miles. The following is a brief outline of the theory of the formation of clouds. Vapour rising from the moist surface of the earth, or from water warmed by the heat of the sun's rays, is held in suspension in the atmosphere, and remains invisible until the air at some distance above the earth's surface is completely saturated with it; but if the evaporation from below still continues, the atmosphere becomes overcharged with moisture, and the vapour condenses and appears in a visible form. Clouds are primarily defined as *cirrus*, *cumulus*, and *stratus*. The term cirrus is applied to long streaky white clouds spreading in all directions,—they are commonly called mares' tails, and are the forerunners of windy weather; cumulus, to clouds consisting of thick white masses of vapour, ragged and broad at the base, ascending in the form of mountain-peaks: this form of cloud is commonly seen by day. The name stratus is given to a dense horizontal mass of cloud rising above the horizon, and commonly resting on the surface of the land. The mists that rise from valleys, marshes, and water, in the evening, belong to this class of clouds, which are considered as the precursors of fine weather. There are compound modifications of these classes of clouds, composed of the primary modifications variously blended together: they are termed *cirro-cumulus*, *cirro-stratus*, *cumulo-stratus*, and *cumulo-cirro-stratus*, or *nimbus*. The nimbus is the dark heavy rain-cloud.—*Ref.* Howard's *Climate of London*; Rees's *Cyclopædia*—article Cloud.

CLOVES. (*See* CARYOPHYLLUS.)

CLUB, *klub*, is a term of doubtful derivation; but, according to some, it comes from the Anglo-Saxon *cleofan*, or *clufan*, to *divide*, because the expenses are divided into shares or portions; and hence to club is to contribute a share or portion. A club, according to Dr. Johnson, is an assembly of good fellows meeting under certain conditions. This, though perhaps a true definition of the good old English clubs, is too limited for the term applied in the present day. A club





now may rather be said to be an association of persons meeting under certain conditions, or subjected to certain rules, it may be for purposes of conviviality, for uniting their separate efforts for one common object, for each contributing a share to one common fund, or for mutual benefit. The idea of a club is a number of persons united together for one common object. England is unquestionably the place for clubs. The first club of which we have any account was that famous one which met at the Mermaid tavern, of which Shakspeare, Ben Jonson, Beaumont, Fletcher, Raleigh, Selden, and others, were members. Ben Jonson afterwards founded another club, which met at the Devil tavern, in Fleet Street. It was, however, not till the early part of last century that clubs became a great institution. There then flourished the Brothers' Club, Scribleras Club, October Club, Hanoverian Club, the first Beefsteak Club, the Kit-Cat Club, &c., having Pope, Swift, Arbuthnot, Bolingbroke, Harley, and others among their members. The celebrated Literary Club, of which Johnson, Goldsmith, Reynolds, Burke, and others were members, was a later institution, being established in 1764, and meeting once a week at the Turk's Head, in Gerrard Street, Soho. The Essex-street Club, which was founded by Johnson a few years before his death, met at the Essex Head, in Essex Street, and was limited to twenty-four members. Among its regulations were, that each person should spend not less than sixpence, that each absentee should forfeit threepence, and that every one present should contribute a penny as a douceur to the waiter. The old clubs have passed away, and an entirely new kind of establishment has taken their place, or at least their name. The clubs of the present day are permanent establishments, their buildings frequently palatial, and they furnish their members with the conveniences of a home in the highest style of elegance and luxuriance at a very moderate rate. They include dining-room and news-room, drawing-room, library and writing-room, card-room, billiard- and smoking-rooms, committee-room, and other apartments, with frequently baths and dressing-rooms. Wines and provisions are supplied to the members at cost price, the expenses of the establishment being defrayed out of the fund arising from entrance-fees and the annual subscriptions. The members are admitted by ballot, and their numbers are usually restricted. The following is a list of the principal clubs in London, with the number of their members, entry money, and annual subscription:—

| *Name.* | *Members limited to.* | *Entrance Fee.* | *Annual Sub.* |
|---|---|---|---|
| | | £. s. | £. s. |
| Alfred | 600 | 3 3 | 3 3 |
| Army and Navy | 1,450 | 30 0 | 6 11 |
| Arthur's | 600 | 21 0 | 10 10 |
| Athenæum | 1,200 | 26 5 | 6 6 |
| Boodle's | — | — | — |
| Brooke's | 575 | 9 9 | 11 11 |
| Carlton | 900 | 15 15 | 10 10 |
| City of London | — | 26 5 | 6 6 |
| Conservative | 1,500 | 26 5 | 8 8 |
| Coventry House | 500 | 12 12 | 12 12 |
| Erechtheum | 600 | 21 0 | 7 7 |
| Garrick | 300 | 15 15 | 6 6 |
| Guards' | — | — | — |
| Junior United Service | 1,500 | 30 0 | 5 5 |
| Oriental | 800 | 21 0 | 5 5 |
| Oxford & Cambridge | 1,170 | 26 5 | 6 6 |
| Parthenon | 700 | 21 0 | 7 7 |
| Reform | 1,400 | 26 5 | 10 10 |
| Travellers' | 700 | 21 0 | 10 10 |
| Union | 1,000 | 26 11 | 6 6 |
| United Service | 1,500 | 30 0 | 6 0 |
| University Club | 1,000 | 26 5 | 6 0 |
| White's | 500 | — | — |
| Windham | 600 | 26 5 | 6 6 |

CLUB FOOT is a distortion of the foot, occasioned by the greater contraction of some muscles than others, by which means the foot is drawn out of its natural position. It may be inwards or outwards, with the elevation of the heel and depression of the toes, or the depression of the heel and elevation of the toes and fore part of the foot. Such deformities are usually congenital;

but sometimes they may arise from some disordered state of the system, or be occasioned by convulsions. This deformity may now, in almost every case, be cured by a careful subcutaneous division of the contracted tendons.

CLUB LAW is the law of force; from club, signifying a thick heavy stick.

CLUB-MOSS. (*See* LYCOPODIUM.)

CLUNY, or CLUGNY, MONKS OF THE ORDER OF, *kloo(r)'-e, kla(r)'-ye*, were the first branch of the order of Benedictines, and took their name from the town of Clugni, in France, where they were first established. The Benedictines having become very lax in their discipline, Odo, abbot of Clugni, in 927, not only insisted on a rigorous observance of their rules by the monks under him, but likewise introduced new ceremonies of a severer nature. These new rules soon came to be observed in the principal monasteries in France, Spain, Italy, Germany, and Britain; and by the 12th century the order numbered 2,000 cloisters in different parts of Europe. All the monasteries of this order in England were governed by foreigners, and were subject to foreign houses; and it is said that it was not till 1457 that they were entirely freed of all subjection to foreign abbeys.

CLUPEIDÆ, *klu-pe'-e-de* (Lat. *clupea*, a shad), a fam. of fishes, allied to the *Salmonidæ*, but differing from them because wanting an adipose fin. The herring may be regarded as the type of this order. They generally congregate in shoals, and periodically visit certain coasts. They are very widely diffused all over the world.

CLUSIA, *klu'-se-a* (in honour of Charles de l'Ecluse, a celebrated French botanist), in Bot., a gen. of trees belonging to the nat. ord. *Guttiferæ*. The balsam-tree of Jamaica is *C. flava*; and this, with the species *C. alba* and *rosea*, yield a glutinous resinous matter, used in some parts of the West Indies in place of pitch. In Nevis and St. Kitt's the three species are known indiscriminately by the names of fat pork, monkey-apple, and mountain or wild mango.

CLUSIACEÆ, *klu-si-ah'-se-e*, in Bot., the name sometimes given to the nat. ord. *Guttiferæ*, which *see*.

CLYSTER, *klis'-ter* (Gr. *kluzo*, I wash out), is a name given to certain medicines administered in a liquid form, by means of an injecting syringe, by the rectum, for the purpose of procuring evacuation of the bowels, or otherwise affecting the intestines or the system generally. In cases of lock-jaw, &c., when nutriment cannot be conveyed by the throat, it is sometimes administered in this way. The nature of clysters depends upon the object they are designed to effect; and they may be emollient, anodyne, purgative, or astringent. Clysters are sometimes used in order to relieve constipation; and for this purpose tepid water or gruel is commonly employed. The frequent use of this means, however (except by medical advice), is very injurious, as it impairs the tone of the alimentary canal, and unfits it for the performance of its functions. For the purposes of nutrition, beef tea or milk is commonly employed, administered in small quantities. Medicines introduced into the rectum in a solid form are called suppositories.

CLYTUS, *klī'-tus*, a gen. of coleopterous insects, abounding in species. A few are found in this country; but North America is their chief abiding-place. There one of the largest of the genus, *Clytus speciosus*, is a great destroyer of the sugar-maple. It is about an inch long, and its colour black, banded and spotted with yellow. Many sorts of clytus are found on flowers, to which they resort for the sake of the pollen.

COACH. (*See* VEHICLES.)

COADJUTOR, *ko-ad'-ju-tor* (Lat. *con* or *cum*, with, and *adjutor*, an assistant), is a fellow-helper, or one engaged in the assistance of another. In ecclesiastical matters, a coadjutor is one appointed to assist a bishop in his episcopal duties.

COAL, *kole* (Sax. *col* or *coll*).—Coal, chemically considered, is now one of the most important of mineral products. Whether we consider the enormous number of useful materials extracted from it by chemical means, or the vast amount of light shed upon obscure points of chemical science during the investigation of the properties of these products, it still remains the most valuable and interesting substance both to the practical manufacturer and to the chemical philosopher that has ever been bestowed on man. On examining the different kinds of coal, they are found to vary materially in their chemical composition, the principal difference being in the amount of carbon contained in them. *Lignite, or brown coal*, is least rich in carbon, containing not more than 65 or 70 per cent. After these comes the ordinary caking coal, as burnt in stoves, which contains from 70 to 85 per cent.; and lastly, the Welsh and Pennsylvanian anthracite, in which the proportion of carbon sometimes runs as high as 90 per cent. Intermediate between the last two is *steam-coal*, which burns freely, giving out a steady heat, but being of too hard a nature to be used as a gas-coal. The caking or bituminous coal, containing about 87 per cent. of carbon and 5 or 6 per cent. of hydrogen, is the most valuable of all coals, and is the most abundant product of the British coal-measures. It is characterized by being of a lustrous blue-black colour, having a cubical structure, and burning with a clear, brilliant flame. The principal primary products obtained from coal by destructive distillation are *coal gas, coal tar, gas-liquor*, and *coke*. A description of these substances, and the products obtained from them, will be found under their respective heads.

COAL-FISH. *Gadus carbonarius*), a somewhat common fish, extensively distributed through the principal seas of Europe, being abundant in the Baltic, the Mediterranean, and the Northern seas; also found in large quantities on the coast of Great Britain. According to Mr. Couch: "It is in the highest condition from October to December, at which season it prowls after prey in large companies; so that, when met with, they prove a valuable capture to the fisherman; for, though but coarse food, yet, being wholesome, substantial, and cheap, they are eagerly purchased by the poor, either fresh or salted. . . . I have known four men in two boats, two men in each boat, take over two tons' weight of this fish in a very few hours. The season for spawning is early in spring; immediately after which the coal-fish becomes so lank as to be worthless, in which state it continues through the summer." It owes its singular appellation to the curious nature of its skin, which, upon being handled, soils the fingers in the same way as would result from touching coal. It is likewise known, during its progress from birth to maturity, by the names of *cuddy, sythe*, and *sillock*. The fishermen of Yorkshire, however, have given it two more aliases: when young, they call it *parr*; and the old fish are named *lillets*.

COAL FORMATION. (*See* CARBONIFEROUS SYSTEM.)

COAL GAS. (*See* GAS.)

COAL TAR. (*See* TAR.)

COAL TRADE.—There is reason to believe that the existence and the use of coal in Britain were not unknown to the Romans. During the Saxon period, however, it seems to have been neglected. In 1239 Henry III. granted a license to the burgesses of Newcastle to dig for coal; and half a century later that town had become famous for its trade in this article. In 1306 the use of coal had become so general in London that the air was said to be infected with its noxious vapours, and its use was prohibited. In 1325 coals began to be exported to France, and in 1370 a duty of 6d. per ton was imposed upon ships coming from Newcastle with coals. In 1615 the coal trade at Newcastle appears to have employed four hundred sail; some of which went to France, others to the Netherlands. The coal trade of this country was long subjected to very heavy and oppressive duties. Formerly a duty of 6s. 5d. per ton upon large and 1s. 8d. per ton upon small coals was levied upon all coal exported to foreign countries. In 1831 these duties were considerably modified, and in 1835 they were repealed, with the exception of an *ad valorem* duty of 10s. per cent. on coal exported in British vessels, and 4s. per ton when exported in foreign ships. In 1840 these duties were altered to 10s. 6d. per cent., and 4s. 3d. per ton respectively. In 1842 duties of 2s. per ton on large and 1s. per ton on small coal and culm exported in British vessels, or in vessels of foreign countries with which reciprocity treaties existed, were imposed, and 4s. per ton on such as were exported in other foreign vessels. The two former duties were abolished in 1845, but the last continued in force till 1850. In the

reign of William III. a tax of 5s. per chaldron (53 cwt.) was laid upon all coal carried coastwise from one part of the kingdom to another, and during the French war it was raised to 9s. 4d. In 1824 this tax was reduced to 6s., and in 1831 it was repealed. Though these duties are now abolished, the coal trade is still in some places burdened with heavy local duties. By 1 & 2 Will. IV. c. 76, several oppressive acts affecting the coal trade of the city of London were repealed, and the duties previously payable to the corporation of the city upon coals were commuted for a duty of 1s. 1d. per ton, and by 8 & 9 Vict. c. 101, a like duty was imposed upon coal brought into London by railway, canal, or other inland carriage. Not less than 65,000,000 tons of coal are raised annually from the various mines of the United Kingdom, and even at that rate it is estimated that the supply will last for 1,000 years. *E*...land furnishes nearly 43,000,000, Wales about 8,500,000, Scotland nearly 9,000,000, and Ireland only about 120,000. Of these the greater part is either used in the vicinity of the mines or sent by inland navigation or land-carriage to different parts of the kingdom. The total quantity of coals, cinders, and culm sent coastwise to different parts of the United Kingdom was, in 1859, 9,525,811 tons; in 1860, 10,730,716. The quantity exported from the various ports of the United Kingdom to foreign countries and British possessions abroad was, in 1859, 6,529,483 tons; in 1860, 7,321,932. The country that received the largest quantity was France, amounting, in 1859, to 1,391,009 tons. In 1860 the total quantity of coals brought coastwise into the port of London was 3,573,377 tons; by inland navigation and land-carriage, 1,499,899. There is much reason to doubt the policy of permitting the export of coal to foreign countries free of duty. "Taking into account," says M'Culloch, "that coal is the mainspring or *causa causans* of our manufacturing pre-eminence, we have always regarded the repeal in 1845 of the duty of 4s. (?) a ton laid on it when exported, as being in all respects a most impolitic measure. The retention of the duty would not have perceptibly affected the exportation of coal, at the same time that it would have yielded a considerable amount of revenue derived wholly from the foreigner." "There does not seem to be any ground for doubting that supplies of English coal are, if not indispensable, of the greatest value and importance to France, and sundry other foreign states." "There cannot, in our view of the matter, be a doubt that it should be charged when exported with a duty of 5s., or rather 6s. or 7s. a ton. Such a duty would not be innocuous merely, but advantageous, and would probably produce above £2,000,000 a year."—Supplement to third edition of M'Culloch's *Commercial Dictionary*.

COALITION, *ko-ill-ish'-un* (Lat. *coalesco*, I grow together), denotes the conjunction of parts which had before been separated, into one whole. In the beginning of the French revolution, it came to be used by French authors by way of contempt for the confederation of the other powers against France, the word alliance probably appearing to them too dignified for the object. Since that time the word has come into common use; but there is generally some idea of reproach implied in it. Continental diplomatists make this distinction between alliance and coalition,—that the former is more general, while the latter is directed against a particular enemy for a particular object. In Britain, coalition is also frequently used in the sense of a union of several parties, or their leaders, against another party; but it still carries with it the idea of reproach.

COAST, *koast* (Lat. *costa*, Fr. *côte*), a sea-shore, or the country adjoining the edge of the sea. When they are bordered with small rocks nearly on a level with the surface of the water, coasts are very dangerous. The depth of water is usually in proportion to the height of the rocks on the coast; so that a high coast indicates deep water, and a low coast shallow water.

COASTING TRADE, *koast'-ing*, is commercial intercourse carried on by sea between different ports of the same country. Different laws regulate this department of trade in different countries, and, generally, the policy has been maintained of excluding foreigners from all participation in it. This policy was adopted in England in the reign of Elizabeth, or, perhaps, earlier, and was perfected by the navigation acts of 1651 and 1660. These were succeeded by a vast number of regulations at different times; and by the Customs Consolidation Act (16 & 17 Vict. c. 107), it was enacted that no goods or passengers should be carried coastwise from one part of the United Kingdom to another except in British vessels. In the following year, however, this restriction was repealed, and the trade is now free to the vessels of all countries. The number of vessels that were employed in the coasting-trade of the United Kingdom during the year 1859 were,—entered, 153,228 vessels, of 16,633,117 tons, of which 446 vessels and 71,554 tons were foreign; and cleared, 155,238 vessels, of 16,509,471 tons, of which 466 vessels and 65,083 tons were foreign.—*Vide* M'Culloch's *Commercial Dictionary*.

COAT OF ARMS. (*See* HERALDRY.)

COAT OF MAIL. (*See* MAIL, COAT OF.)

COBALT, *ko'-bawlt* (Germ. *kobold*, from *kobolden*, the name of certain mischievous demons who were supposed to haunt mines, and to manufacture those ores which looked rich to the eye, but were really of little value. Among these were supposed to be the ores of this metal, and hence its name), Symbol Co, equivalent 29·5, spec. grav. 8·6.—Cobalt is a metal very similar to nickel in its physical and chemical properties. It generally occurs in the same ore as nickel, and the separation of the two metals is a task requiring great patience and expertness. Cobalt is obtained as a metal either by reducing the oxide by hydrogen, or by calcining the oxalate. In the metallic state, it closely resembles steel. It fuses with great difficulty, and oxidizes at a high temperature. It remains unaltered in moist air, dissolves slowly in sulphuric and hydrochloric acid, but readily in nitric acid. It is reddish-grey in colour, and is said to be magnetic. It is obtained principally from two ores,—*Speiss cobalt* and *cobalt glance*. The compounds of cobalt are remarkable for their beauty of colour. The two colours *zaffre* and smalt are compounds of cobalt. Zaffre is an impure oxide of this metal, made by calcining the crushed ore in a reverberatory furnace. The sulphur and arsenic are thus roasted off, and the impure oxide remaining is ground to an impalpable powder with two or three parts of fine sand. Zaffre is used largely in the manufacture of stained glass and in the ornamentation of pottery. *Smalt* is a finely-powdered blue glass coloured with cobalt. Cobalt ore is partially roasted, and combined with an equal quantity of carbonate of potash and twice its weight of well-ground quarts. The whole is melted in suitable pots in a furnace, silicate of potash being formed, in which the oxide of cobalt melts, the other impurities falling to the bottom. The clear blue glass is ladled out, poured into water, and ground, when cool, into an impalpable powder. Smalt is used by paper-stainers. With oxygen, cobalt forms a protoxide and a sesquioxide. The *anhydrous protoxide* is obtained by calcining the hydrate or carbonate. It is a black powder, which, when heated in the air, changes into an intermediate oxide, $Co_3O_4$. Oxide of cobalt gives to glass a very intense blue, which resists the action of a very high temperature. Dissolved in ammonia, it gives a fine red liquid. Fused with potash, a brilliant blue compound is obtained. With magnesia, alumina, and oxide of zinc, it produces, when fused at a high temperature, pink, blue, and green compounds. The last two are used as pigments. The hydrated oxide is a pink precipitate thrown down by adding a solution of potash to the solution of a cobalt salt. Protoxide of cobalt forms salts with the acids, which are light blue when hydrated, but turn red when the water is driven off by heat. Protonitrate of cobalt is obtained by dissolving the oxide or the metal in nitric acid. It crystallizes in small deliquescent crystals containing six equivalents of water. A solution of this salt is often employed as a sympathetic ink, being light blue when cold, but bright red when the water of hydration is driven off by a gentle heat. The *sulphate of cobalt* is generally employed as the source of salts of this metal. The *sesquicioxide of cobalt* is a brownish powder obtained by passing chlorine through a dilute solution of potash, in which the protoxide is mechanically suspended. Its salts are at present unknown. *Chloride*

*of cobalt* is prepared by dissolving the oxide in hydrochloric acid; the pink solution resulting yields, on evaporation, rose-coloured octahedra of the hydrated chloride. The other salts of cobalt are uninteresting. A solution of the nitrate is used in blowpipe analysis. A small quantity of the substance to be examined is to be moistened with the solution, and heated in the blowpipe flame: a pink colour indicates magnesia, and a green and blue, zinc and alumina respectively. Fremy has formed some interesting compounds by combining the sesquioxide of cobalt with four, five, and six equivalents of ammonia, forming brown, red, and yellow salts. These double bases he names *fuscobaltia*, *roseocobaltia*, and *luteocobaltia*. *Thénard's blue* is a beautiful pale-blue pigment, consisting of a mixture of phosphate of cobalt and phosphate of alumina.

COBALT ORES.—The principal ores of cobalt are, *white cobalt ore*, which is the most common (it contains cobalt associated with arsenic, iron, and sulphur); *grey cobalt ore*, containing arsenic, iron, cobalt, and silica; and *glance cobalt*, which is a double bisulphide of arsenic and cobalt. All the ores of cobalt contain more or less nickel.

COBALTICYANOGEN. (*See* CYANOGEN.)

COBALTINE, *ko-bawlt'-een*, in Min., an arsenical ore of cobalt, also containing sulphur. It occurs in reddish silver-white trapezohedral crystals, at the mines of Wehna, in Sweden. It contains from 33 to 37 per cent. of metal.

COBRA DI CAPELLO. (*See* HOODED SNAKE.)

COCA. (*See* ERYTHROXYLON.)

COCCEIANS, *kok-se'-yans*, was a theological school which arose towards the middle of the 17th century, and took its name from its founder, John Coccejus, professor of divinity in the university of Leyden. He regarded the history of the Old Testament as a mirror which held forth an accurate view of the transactions and events that were to happen in the Church under the dispensation of the New Testament, and unto the end of the world. The greater part of the ancient prophecies, he maintained, were to be received in a literal manner, and by the very sense of the words used in these predictions. In fact, his whole system was an attempt to Judaize Christianity. He was a man of considerable learning, and he has most fully expounded his views in his "Summa Doctrinæ de Fœdere et Testamento," Leyden, 1648. His great opponents were Desmarets and Voetius. His views found for a time many supporters in Holland and other parts.

COCCOLOBA, *kok-ko-lo'-bi* (Gr. *kokkos*, a berry; *lobos*, a lobe), in Bot., a gen. of plants belonging to the nat. ord. *Polygonaceæ*. From the leaves, wood, and bark of *C. uvifera*, a very astringent extract, commonly known as Jamaica kino, is obtained. The fruit called the seaside grape is edible, and has an agreeable acid flavour.

COCCOSTEUS, *kok-kos'-te-us* (Gr. *kokkos*, berry; *osteon*, bone), in Geol., a fish of the Old Red Sandstone, so named from the small berry-like tubercles with which the plates of its cranial buckler and body are thickly studded. The remains found in the Caithness flagstones show that its length was from a few inches to about two feet.

COCCULUS INDICUS, *kok'-u-lus-in'-di-kus* (Lat., Indian berry), is the fruit of the *Anamirta paniculata* (which *see*). It has some resemblance to the bay-berry, and is imported into this country from the Eastern archipelago. In 1850 no fewer than 2,368 bags of one hundredweight each were received. Cocculus indicus is chiefly used for adulterating cheap beer; and it is really wonderful in how many ways it is fitted to disguise a liquor prepared from insufficient quantities of malt and hops; thus, it imparts to the sophisticated liquor an intensely bitter taste, a darkness of colour, and a fulness of body, while it adds to its inebriating qualities. It is scarcely necessary to state that the cocculus is never employed by respectable brewers. Its use has been forbidden by act of parliament under a penalty of £200 to the brewer, and one of £500 to the druggist who sells it to a brewer. In large doses it is poisonous to all animals, and it has long been used by poachers for stupifying fish and game. In medicine it has been employed as an external remedy for certain skin diseases. It owes its active properties to a very poisonous crystalline alkaloid called *picrotoxine*. The names *Levant nut* and *Bacca orientalis* are sometimes applied to this narcotic berry.

COCHINEAL, *kotsh'-in-eel* (Sp. *cochinilla*).—This beautiful dye is obtained from the *Coccus cacti*, a small insect infesting a tribe of cacti growing in Honduras and other parts of South America (*see* also CARMINE). The female insects, which are wingless, are alone collected, and the different degrees of value attached to them depend on the methods employed to kill and dry the insects. Analyses of cochineal have yielded chitine, fatty matter, phosphates of lime and potash, and the colouring matter carmine. Cochineal, in conjunction with chloride of tin, forms the "tin spirits" of the dyer. The cochineal insect is also cultivated in Mexico, Teneriffe, Java, and the West Indies. Efforts have been made, with more or less success, to introduce it into Van Diemen's Land, the Cape of Good Hope, Algeria, and Spain.

COCHLEARIA, *kok-le-air'-e-a* (Lat. *cochlear*, a spoon), in Bot., a gen. of plants, so named from the leaves being spoon-shaped, belonging to the nat. ord. *Cruciferæ*. The species *C. officinalis* is the common scurvy-grass, an indigenous annual found in muddy places near the seashore. It has white flowers, which blossom in April and May. When rubbed, it evolves a pungent odour, and its taste is acrid and penetrating. It has long been esteemed as an antiscorbutic properties, and was formerly admitted into the Dublin Pharmacopœia.

COCK, DOMESTIC, *kok* (Sax. *coc*, Fr. *coq*), (*Gallus domesticus*).—At what period of the world's history this valuable bird was brought under the control of man, it is almost impossible to determine. Without doubt, they were well known over many parts of Europe and Asia many hundred years before the Christian era. Pliny, in speaking of it, says,—"After the peacock, the birds which are most sensible to glory are those active sentinels which nature has produced to rouse us from our matin slumbers and send us to our daily occupations. They are acquainted with the stars, and every three hours they indicate by their crowing the different periods of the day. The gait of the cock is proud and commanding; he walks with head erect and elevated crest. Alone of all birds he habitually looks up to the sky, raising at the same time his curved and scythe-formed tail, and inspiring terror in the lion himself, the most intrepid of beasts." A mode of divination was practised by the ancient Greeks with these birds. The letters of the alphabet were written in a circle, and a grain of wheat and barley laid on each letter. Then a cock, consecrated for the occasion, was led within the circle. The required information was obtained by putting together those letters off which the cock picked the grains. This mode, however, was abandoned on the discovery that it was not an uncommon thing for the priests to have, as well as the genuine grains, imitations in wax; so that by proper management the bird could be made to uncover those letters that best accorded with their views. It has been asserted that our original breeds of domestic poultry were derived from Persia. This, however, takes root in the fact of Aristophanes alluding to the cock as the "Persian" bird. This is, in all probability, but a hinting at the fact that during the intercourse of the Greeks with the Persians, they obtained from them a breed of fowls partly or thoroughly domesticated. Although poultry has been known to exist in Persia from a very remote antiquity, the most patient research has failed to discover any birds of the genus *Gallus* in that country. According to Temminck, our domestic cock is derived from the Jago cocks (*Gallus giganteus*), a large and wild species inhabiting the island of Sumatra, and from the species *Bankiva*, another primitive bird found in the Javan forests. Nor is this argument without substantial basis; for the size of our common cock is intermediate between the Jago and the Bankiva, and in the nature of the feathers and the distribution of the barbs the resemblance is perfect; moreover, in the two wild species mentioned, the females are provided with a crest and small barbles,—characters which are not found in any other known primitive races. The domestic cock has his head surmounted by a notched crimson fleshy substance, called a comb; and under the throat hang two other pendulous fleshy bodies, called wattles. In both sexes there is below the ear

an oblong spot, the interior of which is reddish and the remainder white. The feathers arise in pairs from each sheath, touching by their points within the skin, but diverging in their course outwards. On the neck the feathers are long and narrow; on the rump they are of the same form, but droop laterally over the extremity of the wings, which are quite short, and terminate at the origin of the tail, the plumes of which are vertical. In the centre of the cock's tail are two long feathers, which fall back in a graceful arch. When the cock reaches the age of six months, he attains maturity, and his powers remain undiminished till he is three years old. Then, if younger male birds be about, he will find himself slighted by his numerous wives, and be compelled to yield to a rival the empire of the yard. Cock-fighting is one of the most widely-spread sports in the world. Captain Cook found it commonly practised among the South-Sea Islanders, and Mr. Ellis describes it as one of the most ancient games among the Tahitians. Long before a ship touched the shores of Polynesia, cock-fighting was known to the inhabitants. Amongst these, however, the rules that distinguish the "civilized" cockpit are not practised. It is, or, happily, *was*, our custom to clip the combatants of every superfluous feather; the Polynesians, on the contrary, delight to pit them with the full complement of plumage adorning them. In another respect, too, these savage cock-fighters showed themselves more humane than us: they never armed the heels of their birds with spurs; and as soon as one bird was observed to avoid his antagonist, he was said to be *vi* (beaten), and at once taken away. The common jungle-fowl of continental India (*Gallus Sonneratii*) is a very favourite fighting-bird with the Musulman natives of India. (*See* COCK-FIGHTING.) Considering their insignificant means of defence, the courage exhibited by the domestic cock is very singular. Bishop Stanley, in his "British Birds," says, "We knew an instance where a barn-door cock became the terror of his little domain. Accustomed to be fed by his owner, a clergyman, he shortly began to express his disappointment by very determined attacks, if his master happened to pass him without the accustomed offering. On one occasion he actually struck a piece out of a strong kersey-mere gaiter, and repeated the attack in spite of some severe kicks it was found necessary to inflict in self-defence. Nothing daunted, though occasionally kicked several yards like a football, he would still come on as fiercely as ever for three or four times. His reasoning, too, appeared to be on a par with his courage, for he soon discovered that women were protected by the lower part of their dress, and, accordingly, instead of flying at their legs and feet, he invariably flew at their heads, fixing himself on their shoulders."

COCKADE, *kok-aid'* (Fr. *cocarde*, a corruption of *coquarde*, a tuft of feathers), is applied to a mark of distinction worn on the hat, usually a riband or a knot of ribands, properly by officers of the army or navy, or their servants, but frequently assumed by others. It is also sometimes the badge of political party.

COCKATOOS, *kok-a-toos'*.—These birds are confined to the Eastern Archipelago and Australia; in the latter country they are very abundant. Like others of their congeners, they make their nests in decayed trees; indeed, if the tree should not be very much decayed, it makes little difference to the cockatoo, who can speedily dig for himself a hole in the trunk with his iron-like bill. They are easily tamed, and learn to imitate the human voice in some respects, although with little accuracy. A capital account of cockatoo-hunting by the natives is related by Captain Grey:—"Perhaps as fine a sight as can be seen in the whole circle of native sports is the killing of cockatoos with the kiley, or boomerang. A native perceives a large flight of cockatoos in a forest which encircles a lagoon; and in the leafy summits of the trees sit a countless number of cockatoos, screaming and flying from tree to tree as they make their arrangements for a night's sound sleep. The native throws aside his cloak, so that he may not have even this slight covering to impede his motions, draws his kiley from his belt, and, with a noiseless elastic step, approaches the lagoon, creeping from tree to tree, from bush to bush, and disturbing the birds as little as possible. Their sentinels, however, take the alarm; the cockatoos farthest from the water fly to the tree near its edge, and thus they keep concentrating their forces as the native advances. They are aware that danger is at hand, but are ignorant of its nature. At length, the pursuer almost reaches the edge of the water, and the scared cockatoos, with wild cries, spring into the air. At the same instant, the native raises his right hand high over his shoulder, and bounding forward with his utmost speed for a few paces, to give impetus to his blow, the kiley quits his hand as if it would strike the water: but when it has almost touched the unruffled surface of the lake, it rises upwards with unconceivable velocity and with the strangest contortions. In vain the terrified cockatoos try to avoid it: it sweeps wildly and uncertainly through the air; and so eccentric are its motions that it requires but a slight stretch of the imagination to fancy it endowed with life, and, with fell swoop, is in rapid pursuit of the devoted birds, some of which are



LEMON-CRESTED COCKATOO.

almost certain to be brought screaming to the earth. But the wily savage has not yet done with them. He avails himself of the extraordinary attachment which these birds have for one another, and fastening a wounded one to a tree, so that its cries may induce its companions to return, he watches his opportunity, by throwing his kiley or spear, to add another bird or two to the booty he has already obtained." Of this bird there are several species; as follows:—*Broad*, or *Rose-crested Cockatoo* (*Psittacus cristatus*).—This is the largest of the cockatoos, being about two feet in length. It is distinguished from the other species, which not only by its size, but also by its crest, is arched over the head, and of a bright orange-red colour beneath. The general colour of this bird is white, with a pink tinge. It is sometimes domesticated, and learns to mimic the voices of various animals with which it is domiciled or in the vicinity of which it is placed. It will mew like a cat, bark like a dog, or imitate, with marvellous correctness, the crowing of a cock.—*Great Sulphur-crested Cockatoo* (*Psittacus galeritus*).—This species is at the same time the handsomest and most common of the family. Its plumage is white, tinged with yellow on the tail and orange or lemon-colour on its crest, which is pointed, and about seven or eight inches in length. In Australia, these birds abound in large flocks of thousands in number. They commit frightful havoc in the cornfields, and the sight of this handsome bird is sufficient to create the utmost dismay in the mind of the agriculturist, who knows too well the affinity betwixt ripe corn and the lemon-crested cockatoo.—*Lesser Sulphur-crested Cockatoo* (*Psittacus sulphureus*).—Greatly resembling the preceding, only some few inches smaller. It is a native of the Moluccas; but of its habits little or nothing is known. It is very pretty, affectionate, and good-tempered, a rare combination of excellent qualities. There is another species of the Cockatoo genus, discovered within the last thirty years. A specimen was sent to Mr. Leadbeater, after whom it is named. It is about fifteen inches in length, of a white colour, tinged with pink. This species is exceedingly rare and greatly prized.

COCKBOAT, *kok'-bote* (Ang.-Sax.), a small boat used on rivers or near the shore, which is both too weak and too small for sea service.

COCKCHAFER, *kok'-chai-fer* (Ang.-Sax.), (*Melolontha vulgaris*), a well-known species of beetle, belonging to the *Lamellicornia*. It is very common throughout the greater part of Europe, and in this country is particularly abundant. In its larva state it lives for nearly four years, and feeds, very voraciously, on corn, &c. The perfect insect has an exceedingly short existence, sometimes living only a week, and occasionally so long as a month, after arriving at maturity. At this stage it feeds on the leaves of various trees. The sycamore, the lime, the beech, and willow are most in requisition: these trees are sometimes completely loaded with cockchafers. In its depredations it more nearly resembles the locust than any other insect; and, at certain times, commits frightful ravages in agricultural districts. A remarkable instance of this occurred in Ireland about the year 1688. On this occasion, it is said, they hung in clusters on the trees and hedges, like bees swarming: the noise of their countless jaws at work was heard by every traveller, and was compared to that of the sawing of timber.

COCK-CROWING.—The vulgar belief that spirits are permitted to roam about the world in the night, and obliged to disappear at cock-crow, is very ancient, and is mentioned by the Christian poet Prudentius, who flourished in the beginning of the 4th century, as being a common belief among the early Christians. The belief has not yet altogether died out; and Bourne tells us, that in the country villages, where the people require to go early to labour, they always go cheerfully at cock-crow; but if called abroad sooner, they are apt to imagine everything they see or hear to be a wandering ghost.

COCKER, ACCORDING TO, *kok'-ker*, a phrase sometimes applied to what is strictly correct, or according to rule. It is derived from a celebrated arithmetician of that name, who flourished in the 17th century, and was the author of a well-known work on arithmetic.

COCK-FIGHTING is said to have been a common pastime in Athens and other parts of Greece, and it seems to have been afterwards adopted from that country by the Romans. It is probable that cock-fighting was first introduced into this country by the Romans, though the bird itself was here before their arrival. In the reign of Henry II. it was a sport of the schoolboys on Shrove-Tuesday, and called *Carnilevaria*; but we have no earlier account of it. The same practice prevailed in many schools in Scotland to within the last century. It became a great national sport; and though more than once prohibited, it received encouragement and countenance from several of the crowned heads. The celebrated national cockpit at Westminster is said to have been erected by Henry VIII., and James I. and Charles II. were both encouragers of the sport. It was forbidden by one of the acts of Cromwell. At present, cock-fighting is prohibited by 12 & 13 Vict. c. 92, and a penalty of £5 may be levied on any person keeping fighting-cocks, letting a cockpit, &c., for every day that he shall so act; but it is still largely carried on, particularly in the colliery districts in the north of England. Cocks for fighting are selected with the greatest judgment, and trained with the utmost care. For the combat, they are carefully trimmed and armed with steel or silver spurs. The place appropriated to fighting is called the pit, and the battle is conducted by two setters, who place the cocks beak to beak. When once pitted, neither of the setters can touch his cock so long as they continue to fight, unless their weapons get entangled. In what is called the "Welsh main," a number of cocks are pitted against each other, and then the conquerors pitted against each other, until only one remains alive. (For those that wish further information on this subject, we may refer to Blaine's *Encyclopædia of Rural Sports*.)

COCKLE, *kok'-l* (*Cardium*), a gen. of Mollusca, belonging to the *Cardiacea*. There are numerous species of this animal, some two hundred of which are known. The common cockle is the most abundant, and large quantities of this shell-fish are found on the coasts of Great Britain, principally on muddy and sandy banks. By some it is considered a highly nutritious article of food; and, indeed, the enormous demand for it would seem to justify such an opinion. The structure of the cockle is somewhat curious; it has two adductor muscles, which serve the animal to draw the valves of the shell together. Its foot is very large, compared with the size of the animal, and bent in the middle. This member is not only used for the purpose of progression, but also for excavating holes in the mud and sand in which it lives. By suddenly straightening the foot, the cockle moves with a jump. As the foot is smaller than the shell, it may appear a little singular how it is enabled to bore a hole sufficiently large to admit the whole animal. This is accomplished by distending the foot with water, and then, by a rotary motion, the seemingly impossible feat is easily achieved.

COCKNEY, *kok'-ne*, is a nickname, or term of contempt, applied to a Londoner, and has been long in use, occurring in verse as early as the reign of Henry II. Its origin is doubtful. According to some, it is derived from *coquina*, a kitchen, and denoted the luxuriousness for which London was celebrated even in early times; or from *Cokeigne*, or *Cocagne* (probably from the same root), the name of a Utopian country of luxury and ease. According to some, it denotes one coaxed or cockered, made a fool or nestle-cock of; according to others, one utterly ignorant of rural affairs or husbandry. The latter probably originated in the well-known story of the Londoner, who, when on a visit to the country being told that the horse neighs, afterwards spoke of the cock neighing, hence *cock-neigh*, *cockney*. The modern mark of cockneyism is an abuse of the letters *h* and *r*; as, *hair* for *air*, *sofar* for *sofa*. The Cockney school of literature was a term applied in the earlier numbers of "Blackwood's Magazine" to Leigh Hunt, Hazlitt, Keats, and other young authors. The *King of the Cockneys* was an important personage in the sports and shows formerly held in the Middle Temple on Childermas-day, and had his marshal, butler, constable, and other officers, who were ordered to be entertained with due service in "honest manner and good order."

COCKPIT, *kok'-pit* (Aug.-Sax.), in a ship of war, is a cabin situated near the apartments of the surgeon and his assistants, where all the men wounded in action are conveyed to have their wounds dressed.

COCKROACH. (*See* BLACKBEETLE.)

COCOA, or CACAO. (*See* THEOBROMA.)

COCOA, or COCOA-NUT. (*See* COCOS.)

COCOA-NUT FIBRE, *ko'-ko*.—The seeds of the cocoa-nut palm (*Cocos nucifera*), well known under the name of cocoa-nuts, are contained in a large husk composed of solid woody fibres. These fibres were woven into fabrics of various sorts by the natives of Ceylon and India from time immemorial; but it is only within the last fifteen years that this material has been used in England. Cocoa-nut fibre is now applied most successfully to the manufacture of mats, matting, cordage, brushes, brooms, &c. &c. Latterly a method of introducing colour into the manufacture has been devised by dyeing the fibre; and some very fine combinations of colours have been formed, which contrast successfully with similar manufactures in the finest hemp. Cocoa-nut fibre has been used for bedding with great advantage. It does not become knotty or hard, does not harbour vermin, and is not affected by variation of climate. The refuse of the husk forms a perfect material for form-beds, being much less liable to give out an offensive odour than spent tan, which is often used for this purpose. Cocoa-nut fibre is also called *coir*, and has long been used for ropes and cordage under this name.

COCOON, *kok-oon'* (Fr. *cocon*), the silky tissue or envelope which the larvæ of many insects spin, as a covering for themselves immediately before passing into the pupa form. The name is also given to coverings made of other materials. Some caterpillars work into the silky envelope the hairs which cover their bodies; others imbed in the network a leaf, or several leaves fastened together. The larvæ of some insects produce the silken substance of which the cocoons are formed in much greater quantity than others. One of the most useful producers is the ordinary silkworm, whose cocoon is a close and compact oval ball, surrounded with a gauze-like glossy covering. It consists of one long continuous thread, sometimes a thousand feet long. Some parts of the thread are weaker than others; but the greater portion can be unwound as easily as a ball of cotton thread. Different insects

vary in the time occupied in spinning their cocoons: several days are spent by the silkworm in this task. In covering the pupa, many insects proceed with an almost mathematical nicety with regard to the direction and disposition of their threads.

Cocos, *ko'-kos* (Gr. *kokkos*, a kernel), in Bot., a gen. of Palms, *C. nucifera*, the cocoa or cocoa-nut palm, is perhaps the most useful member of that great family, which may be said to yield flour, sugar, oil, wax, wine, thread, utensils, timber for habitations, and leaves for thatching. The cocoa-nut palm itself furnishes our tropical brethren with most of their necessaries. Sugar, called *jaggery*, is largely obtained from the juice which flows out when its spathes and spadix are injured. Toddy and arrack are produced by the fermentation of this juice. The albumen of the seeds (cocoa-nuts) and the liquid within this (cocoa-nut milk) are important articles of food in many tropical regions. The cocoa-nut is also largely consumed in this country. From the albumen, or edible portion, the concrete oil known as *cocoa-nut oil*, or *cocoa-nut butter*, is obtained. (*See* Oils.) It is now extensively employed as a candle material and for making soap, being imported in enormous quantities by *Price's Candle Company*. (*See* Candle Manufacture.) In India it is much esteemed as a pomatum for strengthening the hair; but its unpleasant odour, and its liability to become rancid, prevent its use in this country for such a purpose. From the fibrous portion of the pericarp of the cocoa-nut, the strong fibres called *coir*, or *cocoa-nut fibres*, are obtained. They are remarkable for their strength and durability, and are much used for cordage, fishing-nets, matting, scrubbing-brushes, and similar manufactured products. The wood of the cocoa-nut palm is very hard, handsome, and durable, and is applied to many useful purposes. It is commonly called *porcupine-wood*.



COCOA-NUT PALM.

Cod, *kod* (Ang.-Sax.).—This fish is, perhaps, the most important to the human family of all the inhabitants of the deep. It affords labour and food to thousands of men, and is one of the most splendid national resources,—one which, owing to the wonderful provision of nature with regard to the fecundity of this fish, is not likely to diminish for a considerable period. For more than four centuries has the cod-fishery been carried on, without any interruption; yet the supply at the present day is something enormous. A single fisherman has been known to capture 500 of this fish in a day of ten hours. Now, as the cod frequently attains a weight of 60 lbs., this haul of the fisherman, even setting it down at a moderate rate, must have amounted to something like 20,000 lbs. of fish; and multiply this by several thousands, and we get the amount of cod which is daily obtained during the season. The great supply of cod is from the banks of Newfoundland; but the cod-fisheries near the coasts of Scotland, Sweden, and Iceland, are by no means insignificant. The principal places in which it is found on our coasts are thus alluded to by Mr. Yarrell:—"A change has taken place, from the cod having shifted their ground. Formerly the Gravesend and Barking fishermen obtained few cod nearer than the Orkneys or the Dogger Bank; but, for the last two or three years, the supply for the London market has been obtained by going no farther than the Lincolnshire and Norfolk coasts, and even between that and London, where previously very few fish could be obtained." There are about 6,000 vessels employed in the cod-fishery, in addition to a large quantity of small boats. All the cod are caught by hooks and lines; the bait used commonly consists of limpets, whelks, and pieces of various fishes. Our wonder at the extraordinary supply of this fish is considerably diminished when we examine the roe of the cod. By those who have taken the trouble to satisfy themselves, it has been calculated that when one devours a cod's roe, he also devours no less than about 180,000,000 lbs. of food, supposing it were allowed to arrive at maturity. One's brain reels at the bare idea of reckoning what *might* be the condition of cod-dom if these fishes were left alone for a few years. The cod is a very voracious fish, a good instance of which is related by Yarrell. "Mr. Crouch," says he, "has taken thirty-five crabs, none less than the size of a half-crown piece, from the stomach of a cod." It is not particular in its diet, but devours indiscriminately all the small fish it can catch. The *modus operandi* of the fishermen is thus described:—"For the deep-sea fishing very long lines are used;—these are fixed to the bottom by means of a small anchor, the other end being supported by a buoy, and the hooks are placed at the extremities of short lines, usually about six feet in length, attached at intervals to the main line. The long lines are usually left for about six hours, or for a whole tide, when they are taken up and examined. In the interval the fishermen are not idle; they carry on the work of destruction by means of hand-lines, of which each man manages a pair."—Dallas's *Animal Kingdom*.



COD.

Coda, *ko'-da* (Ital.), literally, a close or termination, an Italian word applied to a certain number of bars which form the final close of a composition.

Codarium, *ko-dā'-re-um* (Gr. *kodarion*, a leathern pouch), in Bot., a gen. of plants belonging to the nat. ord. *Leguminosæ*, sub-ord. *Cæsalpinieæ*. *C. acutifolium* and *obtusifolium*, both natives of Sierra Leone, yield fruits known as the brown and the velvet tamarinds. The pulp of each kind is eaten, and has an agreeable taste.

Code, *kod* (from Lat. *codex*, a manuscript), in Juris., is applied to a compilation of laws made by public authority. Several collections of the Roman law are designated by this name, the chief of which are, the Gregorian and Hermogenian codes, made by two celebrated jurisconsults, Gregorius and Hermogenes, and containing the constitutions of the emperors from Hadrian to Constantine; the Theodosian code, published in 438 by command of the emperor Theodosius II.; and the Justinian code, prepared by command of the emperor Justinian, and first published in 529, and a second time after revision, in 534. There are several of the modern systematic collections of laws designated by the title of code, the chief of which are the code of Frederick the Great of Prussia; that of Catherine of Russia (confined to criminal jurisprudence); that of Joseph II. of Austria; and the celebrated *Code Napoléon* in France. In France, before 1789, there was no uniform system of legislation; in some parts the Roman law prevailed, in others ancient custom, both being supplemented by royal ordinances. These having been abrogated at the revolution, several attempts were made to form a code of laws in accordance with their altered circumstances; but, on account of the unsettled state of society at that period, nothing of a satisfactory nature was effected. At length Napoleon, after he became first consul, appointed certain commissioners to draw up a project of a civil code, which was printed in the early part of 1801, and copies thereof transmitted to the different courts of France for their observations and suggestions. The whole was then laid before the legislative section of the council of state, and the various points successively discussed, Napoleon himself

taking an active part in the debates. After being submitted to the tribunate, it was at length promulgated as the civil law of France in 1804. When Napoleon was raised to the empire, the title *Code civil des Français* was changed to *Code Napoléon*. In 1816 the former title was restored, and in 1852 the title *Code Napoléon* was again given to it. This code, which regulates the civil rights of the people, as regards person and property, in its general arrangement and distribution resembles the *Institutions of Justinian*. It is divided into three books, the first of which treats of the civil relations of individuals; the second of property in its various kinds and modifications; and the third of the various modes in which property is legally acquired. Besides the *Code civil*, the French written law comprises five other codes. The *Code de Procédure civile* relates to the forms of process and the modes of procedure before the various civil courts.—The *Code de Commerce*, as its name indicates, bears upon commercial transactions. It consists of four books, the first of which treats of commerce in general, of the various classes of commercial men, of partnerships, &c.; the second of maritime commerce; the third of bankruptcies; and the fourth of commercial tribunals.—*Code d'Instruction criminelle* regulates the forms of procedure in criminal cases.—The *Code pénal* defines the various kinds of crimes, and their several punishments. This and the preceding were promulgated in 1810; but important changes have been made upon them by subsequent enactments, particularly in 1832.—The sixth and last of these is the *Code forestier*, which was published in 1827, and relates to the administration of the woods and forests.

CODEX, *ko'-dex* (Lat.), originally denoted the trunk of a tree, and was afterwards applied to the wooden tablets covered with wax which were used by the ancients for writing. It afterwards came to be applied to a book or manuscript generally; and under the emperors, and subsequently, it designated collections of civil and ecclesiastical laws. (*See* CODE.) In modern Latin it denotes a manuscript volume; as, Codex Alexandrinus, Codex Vaticanus, certain MS. copies of the sacred scriptures.—*Codex rescriptus* (a re-written codex), or *palimpsestus*, is an ancient parchment on which the original writing has been defaced, and a different composition copied.

CODICIL, *kod'-i-sil* (Lat. *codicillus*), is a supplement to a will, where anything is omitted which the testator would add, or which he would explain, alter, or retract; and it is the same with a testament, and taken as part thereof; and it must be executed in the same manner as a will, and be attested by two witnesses at least, who must be present when the testator signs or acknowledges it; and they must sign their names, as witnesses thereto, in his presence and in the presence of each other.

COEHORNS, *ko-horns'*, small mortars that were formerly used for throwing grenades, a kind of shell on a small scale. They were named after their inventor, Coehorn, a celebrated military engineer.

CŒLENTERATA, *se-len-ter-a'-ta* (Gr. *koilos*, hollow, *teras*, an anomaly), in Zool., one of the two sub-kingdoms into which the *Radiata* of Cuvier have recently been divided. It corresponds to the class *Polypi* of former writers, and includes most of those curious stationary creatures which are introduced into marine aquaria; as the sea-anemones and sertularia. (*See* ANIMAL KINGDOM.)

CŒLOCLINE, *se'-lo-kline*, in Bot., a gen. of plants belonging to the nat. ord. *Anamcem*. The species *C. polycarpa* is the berberine, or yellow-dye tree of Soudan. Its bark yields a beautiful yellow colour, which is much used for dyeing in certain parts of Africa. When reduced to a coarse powder, this bark is a valuable topical remedy in the treatment of ulcers. It contains the alkaloid *berberine*, to which its medicinal virtues are probably due.

COFFEA, *kof'-fe-a* (from Coffee, in Africa, where it grows in abundance), a gen. of plants belonging to the nat. ord. *Cinchonaceæ*. The species *C. arabica* is the coffee-plant, or *quhwa* of the Arabs, the seeds of which, when roasted and ground, are used to prepare the daily and most cherished drink of probably more than a hundred millions of human beings. The plant is said to be a native of Arabia Felix and Southern Abyssinia. From the former region it has been carried to various countries within the tropics, and, at the present time, it is cultivated wherever the climate is suitable. In some countries it seldom attains a greater height than eight or ten feet; but in others, its average height, when full grown, is from fifteen to twenty feet. It is covered with dark, smooth, shining, and evergreen foliage. It is raised from the seed in nurseries, and is transplanted when about six months old. In three years it comes into full bearing, and, under favourable circumstances, will continue to bear for twenty years. It blossoms throughout the year, so that mature fruit and opening flower-buds may be seen at the same time. The roasted seed or bean has been used to form a beverage in Abyssinia from time immemorial. In Persia it is known to have been in use as early as the year 875. From Abyssinia it was introduced into Arabia in the beginning of the 15th century, and about the middle of the following century it began to be used in Constantinople, where, in spite of the violent opposition of the priests, it soon became an article of general consumption. In 1652, the first London coffee-house was opened in George Yard, Lombard Street, by a Greek named Pasqua; and twenty years after, the first in France was established at Marseilles. Since that time, both the culture and consumption of coffee have continually extended. About forty millions of pounds are annually consumed in this country alone, and the consumption for the whole world has been estimated at about 600 millions of pounds. In the London market at the commencement of July, 1862, the cash prices for the coffees of different countries in bond were as quoted below:—*Native Ceylon*, fine, per cwt. 72*s.* to 73*s.*; ordinary, 69*s.* to 71*s.* *Plantation Ceylon*, fine, 91*s.* to 92*s.*; other kinds, 86*s.* to 88*s.* down to 70*s.* to 80*s.* *Jamaica*, finest, 120*s.*; other kinds, 75*s.* to 90*s.*, 71*s.* to 73*s.*, and 65*s.* to 70*s.* *Costa Rica*, 77*s.* to 85*s.* and 70*s.* to 77*s.* *Java*, 70*s.* to 78*s.* *Mocha*, fine, 128*s.* to 130*s.*; good, 110*s.* to 115*s.*; ordinary, 90*s.* to 98*s.* *Tellicherry*, 78*s.* to 85*s.* *St. Domingo*, 69*s.* to 72*s.* The duty, 3*d.* per lb. and 1 per cent., is, of course, not included in these quotations. The above list, taken with our statement respecting the annual consumption of coffee in Britain, will enable the reader to form some idea of the extent of our trade in the produce of *C. arabica*. The Arabian, or Mocha coffee, is small, and of a dark yellow colour; the Javan and East-Indian are larger and of a paler yellow; the Ceylon, West-Indian, and Brasilian have a bluish or greenish-grey tint. Coffee owes its valuable properties chiefly to the presence of an alkaloid called *caffeine*, and a volatile oil. It is remarkable that tea should contain precisely the same principle, *theine* and *caffeine* being identical. The sensible properties and effects of coffee, like those of tea, are too well known to require to be stated in detail. It exhilarates, arouses, and keeps awake; it counteracts the stupor occasioned by disease, by fatigue, or by opium; it allays hunger to a certain extent; gives to the weary increased strength and vigour, and imparts a feeling of comfort and repose. Its physiological effects upon the system, so far as they have been investigated, appear to be, that, while it makes the brain more active, it soothes the body generally, makes the change and waste of matter slower, and the demand for food in consequence less. In Sumatra and some of the neighbouring islands an infusion of the roasted leaf is used as a substitute for tea, and is called coffee-tea. The leaf contains the same principles as the seed, and therefore has analogous properties. Besides the real *C. arabica*, some other species are cultivated for their seeds; as, *C. bengalensis*, grown in Nepaul; *C. mozambicana*, on the coast of Mozambique; and *C. mauritiana*, in the Mauritius.



COFFEE-PLANT.

COFFER. (*See* CUFFER.)

COFFERDAM, *kof'-fer-dam* (Fr. *coffre*, a box; Ang.-Sax. *damen*, to stop up), a case or water-tight structure fixed in the bed of a river or other water, for the

purpose of keeping the bottom dry while building the foundations of bridges, piers, &c. Cofferdams are formed in various ways. They are sometimes made with a single, and sometimes with a double inclosure: in the latter case clay or chalk is rammed in between the two, to keep out the water. Generally a cofferdam is made by driving a number of timber piles close together, in two or more rows, according to the nature of the bottom and the depth of water. The distance between the rows varies from four to ten feet, and the space is filled up with puddled clay. In some cases cofferdams are made with only one row of piles, backed up with a bank of clay. When the bottom consists of rock, and piles cannot be driven, they are generally formed, when the depth of water allows, of two stone walls, the space between them being filled with clay or some other substance. The sides of all cofferdams must be very strongly constructed, in order to bear the pressure of the external water.

COFFIN, *kof'-fin* (Gr. *kophinos*, a wicker basket), is a chest or box for containing the remains of the dead. Coffins have been in use from very early times; and we are told that the body of Joseph was embalmed and placed in a coffin in Egypt. In that country coffins were usually made of pasteboard glued together, and covered with hieroglyphics; but sometimes these were also inclosed in coffins of wood, stone, or earthenware. Among the ancient Britons, stone coffins were sometimes employed for persons of distinction, and they are still occasionally met with in barrows, together with Roman urns; and the kistvaen, or coffin composed of rough stones set edgewise, and covered with one or more flat stones, was common. We are told that, from the 9th century to the reign of Henry III. and later, stone coffins were in general use for persons of the higher classes: the bodies of the common people, however, were only wrapped in cloth, and so put into the ground. Coffins of lead and wood were also occasionally in use among the Saxons. In some countries, as in Spain, the coffin merely serves the purpose of holding the body while it is carried to the grave or tomb, and is then used to perform the same office for others. In the East the body of a deceased person is carried to the grave on a simple bier, without any coffin, and this custom prevails equally among Jews, Mohammedans, and Christians. This was also the practice among the ancient Jews, as we know from the account of the widow of Nain's son.

COGNOMEN. (*See* AGNOMEN.)

COGNOVIT, *kog-no'-vit* (Lat., he acknowledges), is where a defendant acknowledges or confesses the plaintiff's cause against him to be just and true, and at any stage of the cause before judgment suffers judgment to be entered against him at once, or conditions for its postponement on terms arranged between him and the plaintiff. It must be signed in the presence of and attested by an attorney expressly appointed by the defendant, otherwise the instrument itself, and the judgment signed by virtue of it, will be set aside by the court. In the Queen's Bench the original cognovit, or a copy, and in the courts of Common Pleas and Exchequer, a copy of it, with an affidavit of its execution, must be filed within fourteen days of its being signed, or it will be considered fraudulent and void as against other creditors, and, in case of bankruptcy, the assignees may recover back from the plaintiff all moneys realised under it.

COGWHEEL, *kog'-weel* (Ang.-Sax.). — The large toothed wheels used in machinery are termed cogwheels where the teeth are made of wood. When the teeth are of iron, they are known as *toothed wheels*.

COHESION, *ko-he'-zhun* (Lat. *co*, together; *hæreo*, I stick), the force which holds together particles of a similar kind. Its action may be observed in a solid mass of matter where the component parts cohere with a force which resists any mechanical action which would tend to separate them. In liquid bodies cohesion is much weaker than in solids, the parts being disjoined with much more ease; and in aërial bodies cohesion is entirely overcome, the particles repelling one another instead of attracting. The force of cohesion is weakened or destroyed by two general causes,—either by heat, or by the attraction which may be exerted by the particles of one body on the particles of another. When these powers—heat and chemical attraction—are withdrawn, cohesion resumes its force, but with results that are different, according to the circumstances under which the withdrawal occurs. If a body which has been melted is suddenly cooled, it takes the form of an irregular solid. If, however, cohesion is exerted more slowly, the particles are united in regular forms. (*See* CRYSTALLISATION.) After the particles of a body have been separated, the force of cohesion will make them reunite if they are pressed closely together. Two clean smooth sheets of glass, if pressed together, will cohere so as to require considerable force to separate them. Cohesion is the attraction exerted by homogeneous or like particles, and differs from adhesion, which is the attraction exerted by heterogeneous or unlike particles.

COHORT. (*See* LEGION.)

COINAGE. (*See* MINT.)

COINS. (*See* NUMISMATICS.)

COIR. (*See* COCOA-NUT FIBRE.)

COKE, *koke* (Ang.-Sax.), is the dense charcoal remaining in the retort after coal has been submitted to destructive distillation. It consists almost entirely of carbon, with an admixture of mineral matter. As coke contains so large an amount of carbonaceous matter, it is particularly valuable where an intense heat without smoke is required. It is therefore much employed for smelting-furnaces; but its chief use is as locomotive fuel, and it is made for this purpose in enormous quantities by the different railway companies. The simplest way of coking coal is to burn the latter material in large heaps in the open air, covering them with ashes and earth to prevent combustion taking place too rapidly; but this method was found to take up a great deal of space, and experiments proved that the resulting coke was not so dense or valuable as when a coking-oven was employed. These ovens are generally ranged in rows of one hundred or more, a railway being laid along their roofs for the conveyance of the coal and withdrawal of the coke. The heat has to be regulated carefully during the process, which takes thirty or forty hours. When coking is properly conducted, a very small portion of unconsumed gas and soot escapes, and the coal, if good, yields 60 per cent. of compact coke. Gas-coke, formed in the process of gas-making, is objected to by many for domestic purposes, on account of the sulphur contained in it being given off during combustion. Salt thrown on the fire is often found to be a good remedy for this evil. Good coke should be compact, and in large pieces not liable to crumble away. It is best broken in pieces by a pointed instrument.

COLCHICACEÆ, *kol-tshe-kai'-se-e*, in Bot., a name sometimes given to the nat. ord. *Melanthaceæ* (which *see*).

COLCHICUM, *kol'-tshe-kum* (after *Colchis*, its native country), in Bot., a gen. of plants belonging to the nat. ord. *Melanthaceæ*. The most important species is *C. autumnale*, the common meadow-saffron. This is an indigenous perennial, growing in abundance in the pastures of Herefordshire, Worcestershire, Gloucestershire, and other counties. It blossoms during the months of August and September, its flowers being crocus-like, and of a purple colour. This plant offers a strange contrast to most others in the mode of producing flowers and fruit. The flowers appear during the autumnal months named, rising from the ground without any leaves; and, when they fade, nothing further is seen of the plant until the following spring, when tufts of leaves make their appearance inclosing the seed-vessel or capsule, which ripens about hay-harvest. Both the seeds and corms of this plant are employed medicinally in gout and rheumatism. In improper doses they act as narcotico-acrid poisons. The once celebrated French nostrum for gout, called *Eau médicinale d'Husson*, owed its properties to colchicum.

COLD. (*See* HEAT, CALORIC.)

COLEOPTERA, *kol-e-op'-ter-ă* (Gr. *koleos*, a sheath; *pteron*, a wing), the name applied to an order of insects possessed of four wings, the external pair not being formed for flight, but as sheaths for the interior pair. The Coleoptera comprehend all the Beetle tribe. The larvæ of coleopterous insects undergo a complete transformation; those which burrow in the ground generally prepare for the pupa state by remor-

ing the earth that surrounds them, so as to form an open oval space; others form a kind of cocoon or web round them; and some assume the *perfect* state without any sort of preparation. Although some of these insects may be injurious to vegetation, taken as a whole, there can be no doubt that their existence is conducive to man's comfort, and in some cases to a much greater extent than he suspects. Thus, the tiger-beetles (*Cicindelidæ*), the predacious ground-beetles (*Carabidæ*), the diving-beetles (*Dytiscidæ*), the lady-birds (*Coccinellidæ*), and many others, do mankind great service by preying upon caterpillars, plant-lice, &c., while the many dung-beetles (*Copridæ, Histeridæ, Gastrupidæ*, &c.), do good work as removers of carrion and as scavengers generally. Others there are which subsist on the various poisonous fungi; and others, again, which attack dead but still standing trees, and in a very short time cause them to cease to cumber the ground.

COLIC, *kol'-ik* (Gr. *kolon*, the colon), in Med., is a name given to several diseases which are characterized by severe pain of the bowels, with distension or flatulence, but without looseness or diarrhœa. Medical men distinguish no fewer than seven different kinds of this complaint; as, 1. *Spasmodic*, in which the principal symptoms are sharp and spasmodic pains about the navel; 2. *Stercoraceous*, when the pain is accompanied with constipation of the bowels; 3. *Accidental*, when occasioned by indigestible food, or by acrid matter in the intestines; 4. *Bilious*, when accompanied with vomiting of bile or with obstinate costiveness; 5. *Flatulent*, when it arises from flatulence in the bowels; 6, *Inflammatory*, when accompanied with heat and inflammation; 7. the *Lead, Painter's*, or *Devonshire colic*, the dry bellyache which is attributed to the poison of lead. Among the most frequent causes of this disease may be named poisonous or unwholesome substances, long-undigested food, redundancy of vitiated bile, intense cold, worms, &c. The treatment will, in each case, depend very much upon the cause; generally, the first object is to procure an evacuation of the bowels by mild and unirritating aperients. Opiates may be resorted to in order to allay the spasms, and the warm bath and fomentations are often of great service. It is usually necessary to persist in a course of mild aperients for some time, and all irritating substances in the food are to be avoided.

COLISEUM. (*See* vol. I. of this work.)

COLLAPSE, *kol-lapse'* (Lat. *collapsus*, from *collabor*, I shrink down), is a wasting or shrinking of the body, or of a part of it, or a sudden and extreme depression of its strength and energies.

COLLAR, *kol'-lar* (Lat. *collum*, the neck), the part of a garment which surrounds the neck, or something worn round the neck, as a chain or ring of metal. Among the ancients, collars were sometimes worn as badges of servitude. Several orders of knighthood are distinguished by the collars which they wear. These collars are made of gold, enamelled, and frequently set with ciphers or other designs: the badge of the order is attached to the collar, and lies on the breast when worn. The collar of the order of the Garter consists of twenty-six pieces, each in the form of a garter, enamelled azure, and connected by gold links. The George, or figure of St. George on horseback encountering the dragon, is attached to the collar. Round each of the pieces which form the collar of the Garter is the motto of the order,—"Honi soit qui mal y pense."

COLLATERAL, *kol-lat'-e-rāl* (Lat. *collateralis*), that which hangs by the side, not direct; as *collateral assurance* is that which is made over and above the principal deed itself. *Collateral security* is where a deed is made of other lands or property beside those granted by the principal mortgage or other security; and if a man covenants with another, and enters into a bond for performance of his covenant, the bond is a *collateral* assurance, because it is external, and without the nature and essence of the covenant.

COLLATERAL CONSANGUINITY OR KINDRED.—*Collateral relations* agree with lineals in this, that they descend from the same stock or ancestor; but differ in this, that they do not descend one from the other. *Collateral kinsmen* are such, then, as lineally spring from one and the same ancestor, who is the stirps or root,—the *stirpes*, trunk, or common stock whence these relations are branched out. (*See* LINEAL.)

COLLATION TO A BENEFICE, *kol-lat'-shun*, is the act of conferring or bestowing a benefice by the bishop, or other ordinary, where he has the right of patronage. It comprises both institution and presentation.

COLLECT, *kol'-lekt* (Lat. *con*, together, and *lego*, I read), is applied to certain short prayers in the Liturgy of the Church of England, as also in that of Rome. It is, as the name implies, a prayer read together with other parts of the service, either usually or on a particular occasion.

COLLECTANEA, *kol-lek-tā'-ne-a*, is applied in Lit. to a book containing a selection of passages from various authors, usually for the instruction of youth; as the *Collectanea Græca*.

COLLEGE, *kol'-lej* (Lat. *collegium*, a collection or assemblage), primarily denoted an association or body of men united together by the same laws or customs, or in the same office or employment. Hence, among the Romans, we find the word applied not only to corporations enjoying certain rights, as the priests, augurs, &c., but to men in the same office, as consuls, quæstors, tribunes,—to any body of merchants or mechanics, or even to an assemblage of the meanest citizens or slaves. In a more limited sense it was applied to a corporation or association of persons, of which there were many at Rome, and which required confirmation by special enactment. They possessed property as a corporate body, and had a common chest. In England a college is a society of persons existing as a corporate body, either by prescription or by grant of the king, and frequently possessing peculiar or exclusive privileges; as the colleges of physicians and surgeons. A college is also an academical institution, endowed with revenues, and subject to a private code of laws. Its particular form and constitution depend upon the terms of the foundation. The terms college and university are often confounded in modern times, and in Scotland and America the distinction has been very much lost sight of. A college is an institution for the advancement of learning; a university is for the conferring of degrees. At Oxford and Cambridge a college has a twofold character,—1. as an endowed society, composed of a head, fellows, and scholars; and 2. as a place of education. (*See* UNIVERSITY, CAMBRIDGE UNIVERSITY, OXFORD UNIVERSITY, LONDON UNIVERSITY, &c.) The colleges of France are very different from those of this country, being educational institutions established throughout the country, and bearing some resemblance to the German gymnasia. There are about 320 in all, and they are under the control of the University of France.

COLLEGE OF JUSTICE, in Scotland, consists of the supreme civil court, or Court of Session, with all its members and officers, including advocates, clerks of session, clerks of the bills, writers to the signet, solicitors before the supreme courts, &c.

COLLEGIATE CHURCH, *kol-le'-je-at*, is so called from having a college or chapter of canons attached to it, but no bishop; and thus differs from a cathedral, which is the see of a bishop. It is under the jurisdiction of the bishop of the diocese in which it is situated.

COLLEGIANTS, *kol-le'-je-ants*, a religious sect formed among the Arminians and Baptists in Holland about the beginning of the 17th century. They received the name of Collegiants because they called their assemblies colleges. They assemble twice a week, and any one is allowed to expound the Scriptures or offer up prayer. They hold sacred conventions twice a year at Rhenisburg, near Leyden, whence they are sometimes called Rhenisburgers.

COLLODION, *kol-lo'-de-on* (from Gr. *kolla*, glue), in Chem., is a solution of pyroxylon in a mixture of ether and alcohol. When this solution is exposed to the air, the ether and alcohol evaporate, leaving behind a thin tough pellicle. It is used exclusively in pharmacy, for forming an artificial skin on excoriated surfaces, and in photography. (*See* PHOTOGRAPHY.)

COLLUSION. (*See* CONSPIRACY.)

COLLYRIDIANS, *kol-le-rid'-i-ans* (Gr. *kolluris*, a little cake), were a party of female devotees, mentioned by Epiphanius. Towards the end of the 4th century they came from Thrace into Arabia, and paid divine honours

to the Virgin, celebrating annually a solemn feast in her honour, at which they offered cakes.

COLLYRIUM, *kol-lir'-i-um* (Gr. *kollurion*), in Med., was formerly applied to any medicament employed to restrain defluxions; but it is now confined to topical remedies for disorders of the eyes;—an eye-salve, or eye-wash.

COLOCASIA, *kol-o-kai'-se-a*, in Bot., a gen. of plants belonging to the nat. ord. *Araceæ*. The species *C. esculenta* and others have large fleshy corms, which are much used as food in Madeira and the West Indies, where they are known as *cocoes*, *eddoes*, or *yams*. (*See* DIOSCOREA for the true yams.) *C. himalensis* has also edible corms, which are used as food in the Himalayas. *C. antiquorum* in Egypt, and *C. macrorhiza* in the South-Sea Islands, yield corms which are eaten.

COLOCYNTH, *kol'-o-sinth* (Gr. *kolokunthis*), the bitter cucumber or bitter apple, a well-known drastic hydragogue cathartic. It is the fruit of the *Citrullus colocynthus*, a plant belonging to the nat. ord. *Cucurbitaceæ*, and supposed to be the "wild vine" of the Old Testament. Two kinds of colocynth are known in commerce; namely, *Turkey*, or *peeled colocynth*, which is imported from the Levant, the north of Africa, and Spain, and *Mogadore*, or *unpeeled colocynth*, which comes from Mogadore. The former is the best, and is generally employed in medicine; the latter being principally used by chemists for their show-bottles. The seeds possess the purgative property to a slight extent; but the pulp is by far the most active part of the fruit. In large doses, colocynth is an irritant poison. It owes its properties to a peculiar bitter principle, which has been named *colocynthin*.

COLOGNE EARTH, *ko-lone'*, an earthy mass of lignite, occurring in a large irregular bed forty or fifty feet thick, near Cologne. When levigated, it forms a pigment of a brown colour. It is composed of wood partially fossilized.

COLON, *kol'-lon* (Gr. *kolon*, a member or limb), in Anat., is the largest of the intestines, or, rather, the largest division of the intestinal canal. This canal is divided into the small and great intestines, the former consisting of the duodenum, jejunum, and ileum; the latter of the cæcum, colon, and rectum. The great intestine commences in the right iliac fossa, in a dilatation of considerable size, called the cæcum. It ascends through the right lumbar and hypochondriac regions to the under surface of the liver; passes transversely across the abdomen, on the confines of the epigastric and umbilical regions, to the left hypochondriac region; descends through the left lumbar region to the left iliac fossa, where it becomes convoluted, and forms the sigmoid flexure, from which the rectum extends to the anus. The colon is thus divided into four parts,—the ascending, transverse, descending, and the sigmoid flexure. The colon, in man, averages from 4 to 5 feet in length, and about 2 inches in diameter, being about a fourth part as long, and twice as wide, as the small intestine. The canal is not smooth and uniform, as in the small intestines, but bulges out between the bands of muscular fibre into various prominences, more or less regular in their form, in which the fæces lodge for a time, and become deprived of much of their moisture as they are rolled onwards by the peristaltic action to the rectum and anus. The colon is enveloped in the serous membrane called the peritoneum, which forms the external covering of all the abdominal viscera. (*See* INTESTINES.)

COLON, in Gram., is a point or character formed thus (:), and is used to mark a pause less than that of a period, and greater than that of a semicolon; or rather it may be said to be used where the sense of a passage is complete, but the sentence is not concluded. It distinguishes a member of a sentence which would make a complete sentence of itself, but is followed by an additional part, making it more full and complete. In practice, even among the best writers of the present day, the colon and semicolon are frequently confounded; and, indeed, the former is now going very much out of use.

COLONEL, *kur'-nel* (Fr.), the designation of a field officer who has the command of a regiment or battalion. The colonelcy of a regiment is generally given to some meritorious general officer for distinguished services; and the office is a sinecure, the actual command of the regiment devolving on the lieutenant-colonel, who is responsible for the drill and discipline of the corps. The term is not found in English military history prior to the reign of Queen Elizabeth, when colonels were appointed over regiments divided into ten companies, each commanded by a captain. It is supposed to be derived from the Latin *coronarius*, which implies the act of installing an officer in the command of a corps of men; and this seems probable, as *coronel* is the Spanish title for an officer of this rank.

COLONIZATION. (*See* COLONY.)

COLONIZATION SOCIETY, *kol-on-i-zai'-shun*, is a society in the United States of America, founded in 1816, with a view "to promote and execute a plan for colonizing (with their consent) the free people of colour residing in that country, either in Africa or some other place, as Congress shall deem expedient." Sherbro, on the western coast of Africa, was selected as a suitable spot for the colony, and in 1820 the first ship was dispatched with 88 colonists. In 1828 it contained more than 1,200 inhabitants; and subsequently it received the name of Liberia. In 1847 Liberia, with the full consent of the society, became an independent republic. From the foundation of the society down to 1850 its receipts have been 1,300,939 dollars, and it has sent out nearly 10,000 emigrants.

COLONNADE, *kol'-on-aid* (Lat. *columna*, a column), the name given in Arch. to a row of columns which are generally placed in front of a large building, and support a roof projecting from the building itself; thus forming a portico. When a colonnade is continued round the whole of the exterior of a building, or the interior if it be a quadrangle with a court in the centre, it is called a peristyle. Colonnades are to be seen in front of the British Museum, the Italian Opera-House, Covent Garden, and round Her Majesty's Theatre in the Haymarket.

COLONY, *kol'-o-ne* (Lat. *colonia*, a possession in land, a farm; from *colo*, I till or cultivate), originally signified a number of persons transferred from one country or place to another, where lands were allotted to them. Dr. Johnson defines it to be "a body of people drawn from the mother-country to inhabit some distant place." If to this we add that they still retain a certain political connection with the mother-country, the definition will be sufficiently correct. Four kinds of colonies are distinguishable:—1. Such as serve to ease the inhabitants of a country where the people have become too numerous to subsist conveniently together; 2. those established by victors among a vanquished people, to keep them in awe and obedience; 3. those formed by emigrants driven by oppression from their native country to seek peace and subsistence in distant parts; 4. such as are formed solely for purposes of trade. In the first of these senses, colonization must have taken place at a very early period of the world's history, when the human race began to disperse, first through the various regions of the East, and afterwards through the more remote parts of the globe. These, however, were not strictly colonists, in the sense in which the word is now used, for the parent country had no control over the settlers, and afforded them no protection. The Phœnicians were the earliest people that we have any account of sending out colonies. In their commercial enterprises they established colonies in Cyprus, Crete, Sicily, and other islands of the Mediterranean, and on the coast of Spain. The Greeks were early prompted to colonization by the narrow limits of their territory; and they established communities in Asia Minor and the islands and coasts of the Mediterranean. Still, though these communities were in close connection with the parent states, they were not strictly colonies in the modern sense of the term. The Romans were the first people to organize a system of colonization under which the colonists still remained subject to the central power. The earlier Roman colonies were formed by establishing bodies of Roman citizens in places taken in war, who exercised authority over the vanquished, and kept them in subjection to the Roman power. Colonies were the outposts of the empire, the means by which the Latin language and civilization were impressed on subject peoples. According to Servius, "a colony is a society of men led in one body to a fixed

place, furnished with dwellings given to them under certain conditions and regulations." They are sent out by a decree of the state, or with the general consent of the people. "Those who leave without such a consent, but in consequence of civil dissensions, are not colonies." The Romans had two kinds of colonies,—the Roman and the Latin. The inhabitants of the former had nearly all the rights of Roman citizens, except suffrage, and observed the laws, religion, and festivals of Rome. The Latin colonists, on the other hand, though subject to the supremacy of Rome, formed a separate state, and possessed a constitution of their own. They did not enjoy the rights of citizenship, and in war served not in the legions, but among the auxiliaries. There were also military colonies, which consisted of soldiers to whom land was given, instead of pay and provisions, after their campaigns. In modern times the states of Genoa and Venice were the first to turn their attention to colonization. The colonial establishments of the Genoese were commercial, similar to those of the ancient Phœnicians. They were governed by consuls sent from Genoa, and the order and justice of their administration have been much extolled. The Venetian colonization was of a more military character, like that of Rome. They sought conquest and dominion, and ruled over the earlier inhabitants of the countries. Portuguese colonization much resembled the Venetian, establishing military despotisms to centralise the native trade. As Portugal declined in colonial power, Spain rose into eminence,—mainly in consequence of the discovery of the New World. Their settlements were essentially military. Gold and silver were the main objects of their enterprise,—not as the legitimate proceeds of commerce, but as the spoils of force. At a later period, these settlements underwent modification toward a commercial character. The Dutch, after establishing their independence, soon turned their attention to extending their commercial relations in foreign parts. By the early part of the 17th century they had taken, one after another, all the Portuguese settlements in the East, with the exception of Goa; and by the middle of that century their power had reached its height: their possessions under the jurisdiction of the governor of Batavia had attained the extent of an empire; and these magnificent results were accomplished by a trading company, like the English East-India Company, and managed by a board of directors in Europe. The chief object of the Dutch in colonising was to increase and to monopolize their trade, and to this all their efforts were directed. The French colonized Canada, and, on the whole, in a humane manner; but their establishments were too much of a military character, and the civil population increased very slowly. Louisiana they bought from Spain, but made little progress in it, and sold it to the United States. Their recently-acquired colony of Algeria was obtained by conquest, and has had to be maintained at a great cost of blood. The English colonies have been acquired in almost every possible variety of way,—by settlement, by conquest, by treaty. They have generally local legislatures, elected by the people, and a governor and council named by the sovereign. "The Phœnician colonies were factories; the Roman colonies were garrisons; the Spanish colonies were gold-mines worked by slaves; France justly placed the products of her Algerian colony in our Exhibition under the heading 'Ministry of War.' The Greek cities, in the hour of their greatness, founded new cities the counterparts of themselves. England has had the honour—an honour which no disaster can now rend from her—of becoming the parent of new nations. To colonize in this, the highest sense, is the attribute of freedom."—(*The Foundation of the American Colonies*, by Goldwin Smith.) There are numerous important questions in politics connected with this subject which our limits do not admit of our entering upon. Colonization has been one of the most important means in the spread of civilisation. The nation that founds a colony in an unoccupied country, or in a country occupied only by savages, extends the empire of civilisation, it may be to an indefinite degree. The commercial intercourse that springs up between a mother-country and her colonies is necessarily of great advantage to the former; but after a colony has been fully established, and put on such a footing as to be able to maintain itself, it comes to be an important question how far it is right or proper to the mother-country to retain it in subjection. It is rarely the case that a colony yields a greater revenue than is required for its government and defence, and the deficiency must necessarily fall upon the mother-country. The total expense of her various colonies to Britain is upwards of £4,000,000 annually. "If our present relation with a colony such as Jamaica or Canada entails any expense on the mother-country, we may ask whether all the commercial advantages that result from this relation would not be equally secured if only the free commercial relation existed, and that of administration were to cease. In support of this view, it is shown that the commerce of Great Britain with the United States, now free and independent, has increased most wonderfully since the separation, and probably more rapidly than it would have increased under the colonial system. This being the case, a similar increase might be anticipated in the trade with all those foreign possessions whose trade is really of any importance."—(Article *Colony*, in *English Cyclopædia*.) No colonies were ever reckoned half so valuable as those which now form the United States; and it was generally supposed that their emancipation would be decisive of the fate of Britain. On the contrary, however, our trade, our wealth, our power, have been greatly increased.

COLOPHON, *kol'-o-fon* (Gr.), in Bibl., is applied to the conclusion on the last page of an early-printed book, where the printer's name, place, date, &c., were inserted, before the introduction of title-pages. It is taken from the Greek proverb "to put a Colophon to it;" meaning to complete a thing, in allusion to the famous cavalry of Colophon, an Ionian city of Asia, whose charge usually decided a battle.

COLOQUINTIDA. (*See* COLOCYNTH.)

COLOSSIANS, EPISTLE TO THE, *ko-losh'-yans*, is one of the smaller canonical epistles of the New Testament, addressed by St. Paul to the Christians of Colossæ, a city of Phrygia. The evidences in favour of the authenticity of this epistle are so strong, that few even of the extreme rationalists of the present day have ventured to deny it. It is generally believed to have been written by the apostle Paul from Rome about A.D. 62. There is a very close connection between this epistle and that addressed to the Ephesians. They were both written about the same time, and the condition of both churches was somewhat similar. The chief object of the apostle in this epistle was evidently to counteract certain philosophic or Judaistic doctrines that had crept into the Colossian church, and which he regarded as endangering the purity of the Christian religion. He exhorts them steadfastly to adhere to the doctrines which he taught, and to reject all such errors. From the allusions made to them in this epistle, we gather that in many respects they resembled the dreamy speculations of the Jewish Essenes, moulded and extended by contact with the false philosophy which, under the form and name of Gnosticism, prevailed over the East.

COLOSSUS, *ko-los'-sus* (Lat.), a word used by the ancient Greeks and Romans to designate a statue of gigantic size. The most remarkable work of this kind was the Colossus of Rhodes, a statue of Apollo, or the Sun, which was so high that, it is said, ships in full sail could pass between its legs. It was considered one of the seven wonders of the world, and was the work of Chares, a pupil of Lysippus, who spent twelve years in making it. It was 105 Grecian feet in height, and stood with extended legs on the two moles which formed the entrance into the harbour. According to Pliny, it cost 300 talents, and few persons could embrace its thumb. Within was a spiral staircase, which led to the summit, whence, by means of a great mirror attached to the neck, Syria and the ships proceeding to Egypt might be seen. This famous statue was thrown down and shattered by an earthquake in B.C. 224, about fifty-six years after its erection. For 623 years the fragments lay about the base, when they were sold by the Saracens to a Jew of Emesa, who loaded 900 camels with the metal. One of the most remarkable works of this kind in modern times is the colossal statue of Bavaria, at Munich. It represents a Titanic Virgin,

of calm majestic beauty, with a lion by her side, and is 54 feet in height, standing on a granite pedestal 30 feet high.

COLOUR, *kul'-ur* (Lat. *color*).—The source of all colour is light, as may readily be seen on calling to remembrance the colourless and almost indistinguishable appearance of objects in a room from which the light has been nearly entirely excluded. When the light is wholly shut out, all is dark, and we cannot distinguish anything in the room; but as it is gradually re-admitted, we begin to recognise the forms of objects, all of which appear to be of a dark neutral tint, and at last, when the sun's rays, or rays of artificial light, are permitted to illumine the apartment, everything appears in its proper and peculiar colour. The pure white light of the sun can be separated by a simple experiment (*see* DISPERSION, RAINBOW, PRISMATIC COLOURS) into tints which range in the following order:—red, orange, yellow, green, blue, violet, and indigo. These tints were supposed to be the primitive colours; but it is now known that light consists of rays of the three primitive colours, red, blue, and yellow, and that the others, which were originally ranked among the primitive colours, are in reality secondary or complementary colours, formed by the union of any two of the primitive tints. Now, when the sunlight falls on any object, it either reflects or absorbs the whole of the rays of which light is composed, or it reflects some and absorbs the remainder. When the whole of the incidental light is reflected, the object, if it be unpolished, appears to be white; if all the rays are absorbed, it seems to be black; but if part of the rays are absorbed and part reflected, it appears to be of the colour of those rays that are reflected; thus, simply, if all the rays except red are absorbed, and the red rays only are reflected, the object will appear to be red; if all except the blue rays are absorbed, it will seem to be blue. All variations of colour are produced by the reflection of certain rays in combination: thus, if the surface of any object or material absorbs all the red rays, reflecting those of blue and yellow, these will form green by combination, and the article reflect or scatter rays of a green tint, and appear to be of a green colour. When light, therefore, falls on any body, if it be polished, the rays are almost entirely reflected; but if its surface be without polish, and opaque, a part of the rays of which light is composed are absorbed, and part reflected, which causes the surface to assume the apparent colour which it presents to our sense of sight. The perception of form, however, is caused by the endless variation of light and shadow falling on the projecting and receding portions of any object; and when a painter represents any person or thing on canvas or paper, he produces the appearance of roundness, angularity, and solidity, that belong to the form of the object he is painting, by making the tint that he is using lighter for those portions on which the light falls, and darker for those that are in shadow. Thus, in representing a piece of armour formed of polished steel, the high lights which represent the prominent points and ridges, from which the light is reflected with the greatest brilliancy, are put in with opaque white colouring matter, while those parts which are removed from the light, or which, in other words, are in shadow, are represented by pigments of a dark colour, or very dark shades of the normal tint which the entire surface of the object naturally exhibits. A further notice of colour connected with the fine arts will be found in the article devoted to Painting. (*See* PAINTING.)

*COLOUR BLINDNESS* is a curious defect of vision, from which the eye is incapable of distinguishing colours. It is of three kinds:—(1) An inability to distinguish any colour, properly so called, the person being only able to distinguish white and black, light and shade. (2) An inability to distinguish between the primary colours, red, blue, and yellow, or between these and the secondary or tertiary hues, such as green, purple, orange, and brown. (3) Inability to distinguish minor shades and hues, as greys and neutral tints. The first form is rare; the second and third are common. Dr. George Wilson found, that of 1,154 persons examined by him in Edinburgh, 66, or 1 in 177, were colour blind: of these 21 confounded red with green, 10 brown with green, and 25 blue with green. The colours most liable to be mistaken with each other are,—(1) Red, full and bright, including crimson, scarlet, and the redder shades of orange, with full and bright green; (2) brown, including dull red, with dark or dull green; (3) purple, including pink, crimson, lilac, lavender, and other mixtures of red and blue, with blue; (4) green with blue; (5) red, including crimson and scarlet, with black; (6) light tints of all colours, such as straw-colour, &c., with white; (7) dark shades of all colours, such as claret, purple, olive, blue, with black. Colour blindness is hereditary, and generally shows itself in more than one member of a family. The cause of it is not known; but it is generally referred to some peculiarity of structure in the retina or brain. The subject is of great practical importance, from the extent to which coloured signals are employed on railways and at sea. —Ref. *Researches on Colour Blindness*, by Dr. George Wilson—Edinburgh, 1855.

*COLOUR PRINTING.* (*See* POLYCHROME PRINTING.)

*COLOURING MATTER, kul'-ur-ing.*—Most vegetable substances contain colouring matter that can be separated from them. Many of them are used as dye-stuffs. They are found in all the different organs of plants. In madder and turmeric they are found in the roots, in logwood and fustic in the wood, in quercitron in the bark, in safflower in the petals; in saffron they are furnished by the anthers, while in annatto and Persian berries they are obtained from the seeds. Many colouring matters are possessed of no tinctorial power as they exist in the plant, and it is not until they are brought into contact with some chemical agent, such as oxygen or ammonia, that they give evidence of any colorific property. Examples of these may be indicated in the cases of indigo and the lichens. Colouring matters generally are destroyed by oxygen, chlorine, and sulphur, especially when these bodies act in conjunction with solar light. There are, however, exceptions to this, as some colouring matters require to be oxidised before developing any colour. Colouring matters which are capable of fixing themselves to fabrics without the intervention of any other substance, are called *substantive colours;* those which require a mordant are called *adjective colours.* The colouring matter of animal substances appears to be due in a great measure to iron. In minerals colour results from a variety of different elements,—iron, chromine, and copper appearing to play the largest part in painting the earth.

COLTSFOOT. (*See* TUSSILAGO.)

*COLUMBIDÆ, kol-um'-bi-de* (Lat. *columba*, a dove), a fam. of birds comprising the pigeons, doves, and turtle-doves. The *Columbidæ* are chiefly remarkable for the way in which they feed their young. The bird's crop is furnished with numerous glands, which, in both sexes, become developed during incubation. These glands secrete a sort of milky substance, with which the food that passes into the crop is moistened. Saturated with this fluid, the food is regurgitated by the old birds for the nourishment of the young. (*See* PIGEON.)

*COLUMELLIACEÆ, kol-u-mel-le-a'-se-e*, in Bot., a small nat. ord. of dicotyledonous plants in the sub-class *Corollifloræ*. It consists of the single genus *Columellia*, which includes three species,—evergreen shrubs with opposite exstipulate leaves and unsymmetrical terminal yellow flowers. They are natives of Mexico and Peru. Their properties and uses are unknown.

*COLUMN, kol'-um* (Lat. *columna*, a column), in Arch., the name given to a pillar which is used to support a superincumbent weight in various ways. It consists of three parts,—the base (*see* BASE); the capital, which gives the distinctive character to the whole column in classic architecture (*see* CAPITAL); and the shaft, which forms the central part of the column between the capital and base. As the peculiar forms of the capitals of the five classic orders of architecture have been already noticed, it will merely be necessary here to treat of the shafts only. These were circular in form; but the external surface of columns of all orders except the Tuscan were fluted or ornamented with longitudinal grooves running from top to bottom. They are generally about twenty in number; and in Doric columns they are flat and shallow, and without fillets between the grooves, while columns of the remaining orders have fillets between the grooves,

and the grooves themselves are much deeper, having their horizontal section in the form of a semicircle or semi-ellipse. Sometimes the fluting is filled up to one-third the height from the base with astling, either plain or ornamented. The Greeks and Romans cut their columns in such a manner as to make them swell out slightly at about one-third of the entire height from the base. This was called the *entasis* of the column, and was effected by means of a sliding rule known as the rule of Nicomedes. The measurement and proportion of columns were regulated by the diameter of the lower end of the shaft, which was divided into two parts called modules, each module being subdivided into thirty minutes. Peculiarities in the columns used in the architecture of different countries and periods will be noticed in the articles devoted to each style of architecture respectively.—*Ref.* Sir W. Chambers's *Architecture*; Stuart's *Athens*.

Column.—In Mil., when a body of troops are disposed in such a manner as to present a narrow front, they are said to be in column. The term "in column" is diametrically opposed to that of "*in line*," when troops present an extended front. A division or brigade may be formed in column of battalions, and a regiment or battalion in column of companies, the regiments or companies, as the case may be, being generally moved to the rear of that on the right or left flank. In manœuvring a single company, it may be formed in column of subdivisions or sections; in forming close column of sections, the formation is made on the second section, or left section of the right subdivision; the first section moving to the front of it, and the third and fourth to the rear. When sections, subdivisions, companies, or regiments, forming a column, are at such a distance from each other that they can wheel into an unbroken line, they are said to be in open column; when within one-fourth of the length of either of the divisions named, they are in quarter-distance column; and when within a few paces of each other, in close column.

Coma, *ko'-ma* (*Gr. koma*, from *keo*, I lie down), in Path., is used to denote a diseased condition of the brain, manifesting itself in a state of insensibility resembling sleep, from which the patient cannot be aroused, or only in a very partial degree. Coma may result from congestion or hæmorrhage in the brain, or from any abnormal pressure on that organ; from the agency of narcotic poisons or alcohol; from exhaustion arising from the loss of blood, or from the action on the blood of various morbid products generated within the system. Slight coma differs but little from profound sleep; but in complete coma the patient is entirely shut off from the external world, and is quite dead to all external impressions. Medical writers distinguish several varieties of coma, the chief of which are the *coma vigil* and the *coma somnolentum*. The former is characterised by a constant disposition to sleep, without falling into a quiet, sound, or natural slumber, accompanied by delirium, muttering, and agitation; the latter is marked by profound sleep, without the power of awakening spontaneously, and, if roused, almost immediately sinking into the same state. Any of the forms of coma may come on suddenly, and terminate speedily in death; or it may come on gradually, and be of short duration; sense and voluntary motion as slowly returning. When its accession is slow, it often commences with drowsiness or headache. The causes and characteristics of this disease being so various, its treatment must also necessarily vary; generally, the object is by means of stimulants and counter-irritants to restore the patient to consciousness.

Combination, *kom-bin-a'-shun*, in Pol. Econ., is defined to be "an agreement or union among workpeople to effect an increase of wages, or some modification of the terms or conditions under which they are engaged." This is the sense in which it is commonly used, but it may also be applied to a union among masters or employers to keep up prices or keep down wages. Formerly the government considered it its duty to interfere largely in contracts entered into between masters and servants. In particular, severe laws were enacted against workmen combining together to raise their wages or to oppose their reduction. The injustice of these enactments became so apparent that in 1824 a committee of the House of Commons was appointed to inquire into and report upon them. In terms of this report, act 5 Geo. IV. c. 95 (1824), was passed, repealing all the statute and common law against combinations of masters or of workmen; and provided a summary mode of conviction and a punishment, not exceeding two months 'imprisonment, for violent interference with workman or master, and for combinations for that purpose. This statute having been found defective, another was passed the following year (6 Geo. IV. c. 129), which now regulates this subject. It legalizes all meetings or agreements, either verbal or written, for regulating the rate of wages or hours of work; but, at the same time, it imposes a penalty of not more than three months' imprisonment, with or without hard labour, for any one using violence or threats to make a workman leave his hiring or return work unfinished, or refuse to accept work, or belong to any club or contribute to a common fund, or pay any fine for not belonging to a club or contributing to a common fund, and for using violence to make any master alter his mode of carrying on his business. At present, therefore, combinations to raise wages or limit the hours of labour are perfectly legal, if unaccompanied by threats or violence; but any attempts at intimidating or preventing masters from employing other workmen, or other workmen from taking employment, at any wages they please, are illegal. Combination has its right side and its wrong: it is right when used as a means of protection, wrong when resorted to for oppression. Strength and skill are to the poor man what stock is to the capitalist, and to hinder him from employing this strength and skill in what manner he thinks proper, without injury to his neighbour, is a plain violation of the most sacred rights of man. "A hundred or a thousand capitalists may form themselves into a company or combination, take all their measures in common, and dispose of their property as they may, in their collective capacity, judge most advantageous for their interests. And why should not a hundred or a thousand labourers be allowed to do the same by their stock? Of all the varieties of property which a man can possess, the faculties of his mind and the powers of his body are most particularly his own. And to fetter him in the mode in which he is to exercise or dispose of these faculties and powers, is a manifest encroachment on the most inviolable of all rights, and can be justified only by an overwhelming necessity."—(*J. R. M'Culloch.*) These remarks, however, apply exclusively to voluntary combinations among workmen, and are not intended to countenance, in the slightest degree, the attempts that are sometimes made by combined workmen forcibly to prevent others from working, except on the terms and conditions they have fixed for their own conduct. The wages of any set of men who enter into combination for the purpose of raising them, must be either below the natural and proper rate, or equal to or above that rate. In the first case, then, it would be obviously unjust and oppressive to prevent them from adopting any measures, not injurious to the rights of others, to make their claim effectual. Few masters willingly consent to raise wages, and the claim of one or a few individuals is likely to be disregarded; and, therefore, it usually when a number of them combine and act simultaneously, that their demands are likely to be regarded. The subject of illegal combinations will be further treated under the heads of Conspiracy and Societies (*which see*).—*Encyclopædia Britannica.*

Combinations. (*See* Stinker.)

Combretaceæ, *kom-bre-ta'-se-e*, in Bot., the Myrobalan fam., a nat. ord. of dicotyledonous plants, in the sub-class *Calycifloræ*. There are 23 genera and about 200 species, which are exclusively natives of the tropical parts of America, Africa, and Asia. Trees or shrubs with entipulate entire leaves without dots, and flowers either perfect or unisexual. In the flower we may remark a superior calyx, with a 4—5-lobed deciduous limb; petals equal in number to, and alternate with, the lobes of the calyx; stamens inserted with the petals on the calyx, generally twice as numerous as the lobes of that part, though sometimes thrice as many, and sometimes equal to them in number. The order is remarkable for the presence of an astringent principle, which renders the barks of some species, and the fruits and flowers of others, useful for tanning and dyeing.

Some yield excellent timber. *Combretum butyrosum*, a native of South-Eastern Africa, produces a kind of vegetable wax, which is called *chiquite* by the Caffres, who make use of it to dress their victuals. (*See* TERMINALIA.)

COMBUSTION, *kom-bust'-shun* (Lat. *comburo*, I burn), a term applied to the phenomenon that takes place when chemical action is sufficiently intense to produce light and heat. Gases are sometimes divided into combustibles and supporters of combustion. The idea conveyed by such a classification is an erroneous one. Air is taken to be a supporter of combustion, and hydrogen gas burning in it as a combustible; but if the conditions are reversed, we are obliged to alter our classification; for a jet of atmospheric air may be burnt in an atmosphere of hydrogen.

COMBUSTION, SPONTANEOUS HUMAN, is a subject that has from time to time given rise to a considerable amount of discussion among its believers and disbelievers. Numerous apparently well-authenticated cases are given of this phenomenon; but the difficulties of accounting for the chemical changes involved in such a case have caused many eminent persons to reject the whole matter, and contend that none of the cases have been sufficiently well authenticated. On a point where doctors differ so much, we may well refrain from giving an opinion. The cause to which it is usually traced is gross intemperance. The victim is almost invariably a woman, fat, and rarely under 60 years of age. The flame is described as of a bluish colour, obscure in the light, and extinguished with difficulty by water. Sometimes the body is said to have been consumed so as to crumble to pieces when moved, without the clothes being burned; in other cases the combustion has extended to neighbouring objects. The ashes are always a fatty kind of soot; and a similar greasy matter, of fœtid odour, is deposited on objects around.

COMBUSTION-TUBE, a tube of hard German glass drawn out to a point at one end, and used for calcining organic matter in organic analyses.

COMEDY, *kom'-e-de* (Gr. *kome*, a village, and *ode*, a song), is applied to one of the two kinds of dramatic poetry, and is so named because anciently sung at village festivals, by rustic actors. The object of comedy is to expose to censure and ridicule the follies and vices of mankind. It naturally divides itself into two kinds,—comedy of character and comedy of intrigue. In the former the display of some peculiar character is chiefly aimed at; and the action is contrived with a view to this end, and is treated as subordinate to it. In the latter the plot or action of the play is made the principal object. The French comedies are chiefly comedies of character, the English mostly comedies of intrigue. In good comedy both characteristics should be properly mixed together. In comedy, the incidents and language approach nearly to those of ordinary life, and the termination of its intrigue is happy. The ancient comedy consisted in direct and avowed satire against particular known persons, who were brought upon the stage by name.

COMET, *kom'-et* (Gr. *kometes*, from *kome*, hair), in Astron., the name given to luminous celestial bodies which occasionally appear in the heavens, consisting of a round body, termed the head, to which a long stream of light is generally appended, called the tail, which stretches across the heavens for some considerable distance. The head consists, for the most part, of an ill-defined luminous haze, with a bright mass of light in the centre, called the nucleus, which resembles a star or small planet in apparent size and appearance. The tail is a long train of light, streaming out like hair behind the head, whence the name comet. In some comets, the head is without any nucleus whatever, and others have the luminous head without any tail appended to it. The tail is often of great length; that of the comet of 1858, called Donati's comet, being about 50,000,000 miles in length, while that of the comet of 1843, one of the most brilliant ever observed, was quite three times as long. These bodies travel round the sun in the path of an ellipse, having the sun as one of its foci, or in a parabolic curve. They are only seen when they are at their perihelion, and the tail is always turned away from the sun. Comets differ considerably from each other in form, some being without any tail, as it has been said; but they generally have a broad luminous tail, slightly curved in shape, which trails behind the head. They were supposed by the ancients to prognosticate some disastrous event, and they were considered to be within the region of the atmosphere that surrounds the earth. Tycho Brahe proved, however, that they were situated beyond the earth's orbit, and Newton showed that they travelled in elliptical orbits of great eccentricity, the curvature of which did not differ much from that of a parabola. Considering this to be the case, and assuming the path of the comet of 1682 to be parabolic in form, the astronomer Halley calculated its orbit from Newton's observations, and predicted its reappearance about the end of 1758 or the early part of 1759, making allowances for the disturbing action of the planet Jupiter. Halley's prediction was verified. When it reappeared, it was first observed on Christmas-day, 1758, by a German astronomer, and it passed its perihelion in March, 1759, thus adding to Halley's fame as an astronomer, and confirming the theory that Newton had advanced respecting the revolution of these bodies. This comet, now known as Halley's comet, which had been noticed in 1378, 1456, 1531, 1607, 1682, and 1759, appeared again in 1835, and, assuming seventy-six years to be the mean time that elapses between its successive appearances at its perihelion, it will be seen again in 1911. A description of the principal comets that are known to return to their perihelion at fixed periods, will be found elsewhere (*see* BIELA'S COMET, ENCKE'S COMET), as well as an account of the great comet of 1858. (*See* DONATI'S COMET.) The comets of Faye, Brorsen, and D'Arrest, discovered in 1843, 1846, and 1851, respectively, have also reappeared at the time calculated for their return to their perihelion. The large and brilliant comet of 1680, which is supposed to be the one that appeared in the year 44 B.C., just before the death of Julius Cæsar, and from which Newton derived the data which led him to assert that comets revolved round the sun in elliptic or parabolic orbits, was one of the most remarkable that has ever been observed. It presented an appearance of surpassing splendour; its tail appeared to extend over an arc of 90°, and it approached nearer to the sun than any that have yet been noticed, except the comet of 1843, which is also considered to have surpassed it in magnificence and lustre. It is beyond the bounds of possibility to state how many comets there are revolving round the sun, which is the centre of our solar system; but it may be said that more than two hundred have been observed up to the present time, the orbits of which have been calculated. Of these, about fifty revolve in elliptic orbits, and six at least have been observed at several successive appearances at their perihelion. With respect to their dimensions, it was ascertained by micrometric measurement that the great comet of 1811, which is supposed to arrive at its perihelion about once in 3,000 years, had a head 1,270,000 miles in diameter, with a nucleus in the centre, the diameter of which was about 2,640 miles, and a tail 100,000,000 miles in length. The nucleus of Donati's comet was 800 miles in diameter, while the diameter of the surrounding nebulous haze was about 100,000 miles, and the tail, 51,000,000 miles at its greatest length. It is not known of what substance comets consist; but it is evident that, whatever it may be, it must be extremely thin, and without any sensible weight, as stars have been observed shining through comets with undiminished lustre, which a slight fog would altogether hide from view. Newton considered the nucleus of a comet to be a solid body; but no astronomer has ever yet observed the passage of the nucleus of any comet over a star, which would decide the question whether they are solid or not. The great comet of 1843 was only 475,000 miles distant from the sun at its perihelion, and is considered to have been exposed to a heat more than 2,000 times greater than that of red-hot iron. It is not known what causes the tail of the comet; but it is supposed to be formed by a repulsive force acting on it from the sun, which drives particles thrown off from the nucleus to a great distance into space, in a direction proceeding away from the sun. It has been ascertained that the tails of comets increase in length and volume as they approach the sun, and decrease as they move away from it, their maximum length being attained when at their perihelion.

COMFREY. (*See* SYMPHYTUM.)

COMITIA, *kom-ish'-ya* (Lat. *co*, *cum*, or *con*, with, and *ire*, to go).—Comitium is the place of meeting, and comitia the people itself, or the assembled meeting. In the Roman constitution the comitia were the ordinary legal meetings or assemblies of the people, and distinct from the *concliones* and *concilia*. *Comitia* were those assemblies convened by a magistrate for the purpose of putting any subject to their vote. There were various kinds of *comitiæ*—the *comitia calata*, which met on the Capitol in front of the Curia Calabra, where the people assembled acted only a passive part, listened to what was announced, and witnessed what was performed.—The *comitia curiata*, where the people present had to decide by their votes whether the measures brought before them should be adopted or rejected. The main points to be decided were the election of the magistrates, including the king himself, the passing of laws, peace and war, and the capital punishment of Roman citizens.—The *comitia centuriata*, which endeavoured to unite the various elements of which the Roman people consisted into one great political body, in which power and influence were to be determined by property and age. For this purpose Servius Tullius divided the whole body of Roman citizens into six property classes and 193 centuriæ or votes; from which the assemblies in which the people gave their votes were called *comitia centuriata*.—The *comitia tributa*, which were also called into existence by the constitution of Servius Tullius, who divided the Roman territory into thirty local tribes. These divisions, which were originally a purely topographical arrangement, became in course of time a formidable political power.—*Ref.* Smith's *Dictionary of Greek and Roman Antiquities*.

COMITY OF NATIONS, *kom'-e-te* (Lat. *comitas gentium*, courtesy of nations), is a phrase expressing the true foundation of the recognition and effect sometimes given to the laws and institutions of one country within the territories of another. It is derived altogether from the voluntary consent of the latter, and is inadmissible when contrary to its known policy or prejudicial to its interests. In the silence of any positive rule, affirming, denying, or restraining the operation of foreign laws, courts of justice presume the tacit adoption of them by their own government, unless they are repugnant to its policy or prejudicial to its interests.—*Ref.* Story's *Conflict of Laws*.

COMMA, *kom'-ma*, in Punctuation, is a mark thus (,) used to separate those parts of a sentence which, though very closely connected in sense and construction, require a pause between them. It represents the shortest pause in a sentence. (*See* PUNCTUATION.)

COMMANDER, *kom-man'-der* (Fr.), the term employed to designate an officer in the royal navy who holds rank between a captain and lieutenant.

COMMANDER-IN-CHIEF, the designation of the general officer who has the control of the entire military force of Great Britain and Ireland. He generally holds the rank of field-marshal. His head-quarters, whence all orders emanate, are at the Horse Guards, Whitehall. The office is held at present (1862) by H.R.H. the duke of Cambridge.

COMMANDERY, *kom-man'-der-e*, in the Middle Ages, was a kind of benefice or fixed revenue attached to certain orders of chivalry, and conferred upon aged knights who had rendered worthy services to the order or the state. Commanderies were of different kinds among the different orders; and, after the system of benefices was abolished, the title was still retained, and conferred as an honorary dignity, as in the present day the second rank of the order of knights of the Bath are termed knights commanders. At the time of the suppression of the religious houses under Henry VIII., there were at least fifty commanderies, or preceptories, as they were often called, in England.

COMMANDITE, SOCIÉTÉ EN, OR PARTNERSHIP IN, *kom-man-deet'* (Fr.), is a kind of commercial society or partnership, in which one or more of the members contribute a certain amount of capital without taking any part in the management, becoming what we call sleeping partners. Such partners are called in France *commanditaires*, or partners in *commandite*, and are held liable for losses only to the extent of the funds or capital furnished by them.

COMMELYNACEÆ, *kom-mel-e-nat'-se-e* (after J. and G. Commelin, celebrated Dutch botanists), in Bot., the Spider-wort fam., a nat. ord. of monocotyledonous plants, in the sub-class *Petaloideæ*. There are sixteen genera, which include 260 species, chiefly natives of India, Africa, Australia, and the West Indies. They have flattened, narrow, and usually sheathing leaves. The perianth is inferior, more or less irregular, in six parts, arranged in two whorls; the outer parts being green, persistent, and opposite to the carpels; the inner petaloid. There are six or three stamens hypogynous, some being generally abortive: their properties are unimportant. The rhizomes of some species, as *Commelyna tuberosa*, *angustifolia*, and *striata*, contain much starch, and in a cooked state are edible. Some species have been reputed astringent and vulnerary, and others emmenagogue.

COMMENDAM, *kom-men'-dam* (Lat.), in Eccl. Law, was originally applied to a benefice which, during voidance, was committed to the care of a person who discharged the spiritual duties, but had nothing to do with the emoluments. Such a person was said to hold it *in commendam*. In time, however, the restriction as to interfering with the profits came to be evaded; and this came to be adopted as a mode of enjoying pluralities. By the law of England no benefice could be held *in commendam* without a license from the crown; and sometimes clergymen promoted to bishoprics with insufficient revenues were allowed in this way to retain their benefices; but by 6 & 7 Will. IV. c. 77, it is provided that no ecclesiastical dignity, office, or benefice shall be held *in commendam* by any bishop, unless he shall have held the same when the act passed.

COMMENTARY, *kom'-men-tär-e* (Lat. *comminiscor*, I call to mind), is a term used in literature in various significations. Originally it was applied to remarks or memoranda made on events and occurrences as they happened; as the Commentaries of Cæsar. At present it is usually applied to a series of critical notes and observations upon a book, either in the form of detached notes, or as a connected series of remarks, otherwise called a running commentary.

COMMERCE, *kom'-mers*, is derived from the Lat. *commutatio mercium*, and, in its most general sense, denotes the exchange of articles of any kind for money or other articles. The origin of commerce is coeval with the formation of society, and at first must necessarily have been carried on by barter. Individuals having more of any article than they required would endeavour to find out others in want of it, and, at the same time, possessing something which they would like to have. As the population of a place increased, commerce necessarily became more extended, and various facilities for carrying it on would be introduced. In the transaction between Abraham and Ephron, we read that the former paid to the latter "four hundred shekels of silver current money with the merchant" for the cave of Machpelah; and Joseph was sold to a company of Ishmaelitish merchantmen travelling to Egypt with spices and myrrh, for twenty pieces of silver. These are the earliest written notices that we possess of commercial intercourse, and they show that, even at that early period, it was in an advanced state. The Phœnicians were, however, the first nation of antiquity that seem to have devoted themselves in any great degree to commercial pursuits, and they were the first that made any great progress in navigation. They are mentioned as great traders in Genesis and in Homer; and in the 8th century B.C. their commerce embraced the entire known world, from India and Eastern Africa, on the one side, to Western Africa and Northern Europe on the other. The city of Tyre was then the commercial mart of the world. The Carthaginians were Phœnicians by origin, and their commerce was of the most wide-spread character, especially after the destruction of Tyre. The Greeks, too, at an early period, showed considerable skill in commerce, and some of their states found in it the source of much opulence. Athens was the chief commercial city of Greece, and was as distinguished for trade as it was for art and letters. In navigation the Romans at no time were remarkable; but after the fall of the Roman empire there sprang up in the north of Italy certain cities that for several centuries kept in their hands the commerce of the world. The chief of these were Venice,

Pisa, and Genoa, though several others rose to considerable importance. In the latter part of the 15th century, Venetian commerce was co-extensive with the then known world. About the middle of the 13th century there was formed in the north of Europe an association of commercial towns that occupies an important place in commercial history. This was what is termed the Hanseatic League, and it originated at Lubeck. At first it consisted of Lubeck, Hamburg, and Brunswick; but afterwards came to include upwards of sixty towns; among which were Dantzic, Stettin, Königsberg, Riga, Amsterdam, Cologne, &c. This body continued in a state of union for three centuries, after which it was gradually dissolved, the only remains of it that still exist being Hamburg, Lubeck, and Bremen. The maritime enterprises of Portugal began about the commencement of the 15th century; while the discovery of America, at a later period, placed Spain in the first rank among maritime nations. In the 16th and 17th centuries the lead in commerce was taken in a remarkable degree by the Dutch, and in the 18th by the English. The trade and navigation of England, unexampled as it now is for extent, did not by any means make an early figure in the commercial history of Europe. This is principally to be attributed to the political struggles in which she was from time to time engaged; and it was not till after the close of the 17th century, when the country had become settled, that she began to make those great strides in commercial progress that speedily brought her to the first place. Her home industry has fed her commerce, and each has contributed to raise her to her present state of greatness. Our limits do not admit of our considering in detail this remarkable progress; but we shall attempt to give some of the more prominent features. In the beginning of the 18th century the mercantile navy of England amounted to 270,000 tons; in the middle it exceeded 600,000; and in the end it approached 1,600,000 tons; while, in 1860, the total number of vessels belonging to Great Britain and her colonies was 38,501, and their tonnage amounted to 5,710,968 tons, of which 2,337 vessels and 500,144 tons were steam. A like surprising increase has taken place in our manufactures since the middle of the last century, occasioned in great measure by the discoveries of Arkwright, Watt, and others. The war with America, which terminated in the peace of 1783, exercised for the time an injurious effect upon our commerce; but after the peace it rapidly increased. In 1786 a commercial treaty with France was concluded, which, however, was put an end to by the war of 1793. For the first few years of the war, its injurious effects upon our trade were very manifest; but the extended circulation of bank paper in 1797 seemed for the time to bring a yearly addition to our national wealth, and this delusive state of matters continued during the greater part of the war. Its effects, however, began to be felt as soon as peace was concluded, and the sufferings of the succeeding twenty years were mainly owing to this circumstance. The year 1816 was among the most gloomy in our commercial history. In 1817 and 1818 a slight revival took place, but it was succeeded by a long depression. In 1822 various relaxations were made in our navigation laws, and, in 1823, trade again revived. Since that time our commercial prosperity has rapidly increased, notwithstanding several interruptions that have taken place, as in 1825, 1847, and 1858. In 1845 Sir Robert Peel abolished the customs duties on 420 different articles, a measure which was followed shortly after by the total repeal of the corn laws. These measures were followed by the repeal of the navigation laws in 1860. Since that time the policy pursued by the government has been more and more to withdraw the restrictions on commerce, particularly in the way of simplifying the tariff, and cutting off a number of articles that produced little revenue to the state. (*See* TARIFF.) The recent commercial treaty with France will doubtless have a very beneficial effect upon our commerce; but it has been too short a time in operation to enable one to judge, with any degree of accuracy, as to its results. There are three kinds of commerce:—1. Home trade, or that carried on between individuals of the same country; 2. foreign trade, or that carried on between the inhabitants of different countries; and 3. colonial trade, or that carried on between the inhabitants of any particular country and its colonists. It is impossible to form an estimate of the amount or value of the home trade of this country; but in 1860 the real value of the exports to foreign countries, of British, foreign, and colonial produce, was £120,234,414; to British possessions £43,998,927; and the imports, in the same year, into the United Kingdom from foreign countries was £167,638,188, and from British possessions £43,990,455. It would be difficult to overestimate the advantages of commerce to the individual or to society. Without commerce, man could in few positions supply himself with more than a few of the necessaries of life; by means of it, all parts of the world come to minister to his enjoyment; and he becomes in reality a "citizen of the world." In the words of Addison, by means of commerce, "our tables are stored with spices, and oils, and wines; our rooms are filled with pyramids of China, and adorned with the workmanship of Japan; our morning's draught comes to us from the remotest corners of the earth; we repair our bodies by the drugs of America, and repose ourselves under Indian canopies." "The vineyards of France are our gardens, the Spice Islands our hotbeds, the Persians our silk-weavers, and the Chinese our potters." Commerce distributes the gifts of nature, balancing the deficiencies of one country with what is superfluous in another; creates a demand for labour; finds employment for wealth; and multiplies and cheapens the productions of every country. In a commercial point of view, the whole world is, or ought to be, regarded as one people,—one nation, and their intercourse as free and unrestricted as possible. The loss of a trade with one nation is so much of the trade of the world rescinded and lost.



COMMINATION, *kom-min-ā'-shun* (Lat. *comminatio*), is a threat or denunciation of vengeance. In the Liturgy of the Church of England it is an office appointed to be read on the first day of Lent, or Ash-Wednesday, in room of the ceremony in the Church of Rome of sprinkling ashes on the head on that day. It is entitled "A commination or denouncing of God's anger and judgment against sinners;" and may be used "at other times, as the ordinary shall direct."

COMMISSARIAT, *kom-mis-sā'-re-at*, a term taken from an old French word, and applied to a body of men under the immediate command of a commissary-general or assistant commissary-general, who are attached to an army in the field, for the purpose of providing the necessary stores and provisions for the soldiers.

COMMISSARY, *kom'-mis-sār-e* (Fr. *commissaire*), one who is appointed or commissioned to execute some duty on behalf of another. The commissary of a bishop is an officer delegated by him to hold an inquiry or commissarial court in some distant part of the diocese; his powers are similar to those of the chancellor of the diocese, who sits in the consistorial court. In Mil. the term is applied to officers holding various positions, and exercising different offices. There is a commissary-general, who is the chief of the commissariat department, and commissaries, who inspect the muster-rolls returned by the commanding officers of regiments, and make periodical reports of the numerical strength of the army; there are also others who have to inspect the horses used by the cavalry and artillery, and who have charge of the stores under the control of the Board of Ordnance.

COMMISSARY COURT, in Scotland, was a court established in Edinburgh, at the time of the Reformation, for the trial of such cases as had formerly come within the jurisdiction of the bishops. Its powers were from time to time diminished, until it was entirely abolished in 1836, and its powers transferred to the Court of Session. At present there is what is called a commissary court in each county, of which the sheriff is commissary; but its jurisdiction is limited to decreeing and confirming executors to deceased persons and relative matters.

COMMISSION, *kom-mis'-shun* (Lat. *committere*, to intrust), in Mil., the name given to a small document printed on parchment, and addressed to the officer who is named therein, authorising him to perform certain "duties, matters, and things, that by law do appertain to the said commission," which he is called on to dis-

charge, in virtue of the rank he holds in the regiment or corps to which he is appointed. Commissions of officers in the army are signed by the queen; those of officers in the navy, by the first lord of the Admiralty; and those of volunteer officers, by the lord-lieutenant of the county in which the corps to which they belong have been raised. In the navy, engineers, artillery, and marines, officers obtain their commissions without purchase; but in the cavalry and infantry, gentlemen obtain commissions as ensigns and cornets by purchase, and rise to higher grades successively, by paying the difference between the price of the commission of the rank they are about to enter, and that of the rank they are about to leave. Commissions are sometimes given as rewards to meritorious officers, and occasionally to privates who have served for a considerable time, with honour and distinction. Cadets who have studied and passed at Sandhurst also obtain commissions without purchase, and the commander-in-chief can grant the same to sons of deceased officers, or in any case which appears to him to require it. Of the undermentioned commissioned officers in the army, the colonel, lieutenant-colonel, and major, are called field-officers; the captain, lieutenant, and ensign, or second-lieutenant, regimental officers; and the chaplain, adjutant, quartermaster, and surgeon, staff officers. The prices of commissions in various branches of the army are as follows:—

| Rank. | Foot-Gds. | Life (1) & H. Guards (2). | Drags. | Inf. |
|---|---|---|---|---|
| Lieut.-Colonel | £9,000 | £7,250 | £6,175 | £4,500 |
| Major ..... | 8,300 | 5,350 | 4,575 | 3,200 |
| Captain ..... | 4,800 | 3,500 | 3,225 | 1,800 |
| Lieutenant..... | 2,050 | {1,785 (1) / 1,600 (2)} | 1,190 | 1,100 |
| Cornet, or Ensign } ... | 1,200 | {1,260 (1) / 1,200 (2)} | 840 | 450 |

Every partoculer with regard to the full-pay and half-pay of officers of all grades in the army, navy, and marines, will be found in Hart's *Army List*, and Murray's *Navy List*.

COMMISSION, the warrant or letters patent which all men exercising jurisdiction, either ordinary or extraordinary, have to authorise them to inquire into, hear, or determine any cause, action, or matter; as the *commission* of the judges, justices of the peace, &c.—*Commission of Lunacy*, a commission issued out of Chancery to inquire whether a person represented to be a lunatic be so or not.—*Commission of the Peace*. Justices of the peace are appointed by the queen's special commission under the great seal, the form of which was settled by all the judges in 1590: this appoints them all jointly and separately to keep the *peace*, and any two or more of them to inquire of and determine felonies and other misdemeanours. Stipendiary magistrates, specially appointed for the metropolitan and other districts, have the power to act singly, and with the same jurisdiction and power as two or more justices of the peace.

COMMISSIONAIRE, *kom-mis-shun-air'* (Fr. *commissionaire*, one who is appointed to execute some office), the name given to the members of a corps who have been enrolled since the termination of the Crimean war, to furnish the public with trustworthy messengers who will execute any commission on receipt of a certain sum fixed as a remuneration for their services. Most of them have served in the army, and are incapacitated for other employment by the loss of an arm or a leg. They wear a military dress of dark green, with a black leather waist-belt, cross-belt, and pouch. The corps possesses an excellent band. Their barracks are in Exchange-court, Strand, but there are stations in many of the great thoroughfares, where they may be found waiting for employment.

COMMISSURE, *kom-mish'-ure* (Lat. *commissura*, a joining together), is a joint or seam, the place where two bodies or parts of a body meet and unite. (*See* BRAIN.)

COMMITTEE, *kom-mit'-te* (Fr. *comité*), a certain number of persons elected or appointed from a more numerous body to perform some special act or investigation. Although a committee does not usually consist of less than three members, it may be formed of one single member only. On the other hand, the whole of the members of a body may be resolved into a committee; as, for instance, when all the members of the House of Commons form themselves into a "committee of the whole house." When this latter proceeding takes place, the speaker vacates the chair, being superseded by a paid official, denominated the chairman of committee. In a similar way the chancellor of the House of Lords leaves the chair, which is then occupied by the chairman of committee of the upper house of the legislature. (*See* PARLIAMENT.)

COMMITTEE OF PUBLIC SAFETY (Fr. *Comité de Salut publique*) was the term applied to a number of members of the National Convention during the reign of terror, 1793-4, who acted as the dictators of France. The committee arose out of that section of the Convention called the "Mountain," which had gained the victory over the Gironde party; and at length its power came to be concentrated in three of its members,—Robespierre, the real chief, though half-concealed from view, Couthon, and St. Just. Among these men there was perfect equanimity down to the moment of their fall; and there is reason to believe that they had resolved to perpetuate their power by establishing a supreme council of three consuls, in which Robespierre would have had the perpetual presidency, with the departments of justice, exterior, and finance; Couthon that of the interior, and St. Just the war department. The career of this sanguinary tribunal was brought to a termination by some of their former associates impeaching its members before the Convention; and a reaction having taken place in the public mind, Robespierre, Couthon, and St. Just were executed on the 9th Thermidor (July 28, 1794).—*Ref.* Carlyle's *French Revolution*.

COMMITMENT, *kom-mit'-ment* (Lat. *committo*, I commit), is the ordering into custody an offender, or supposed offender, in order that he may be committed to prison to answer the offence. For criminal offences he may be arrested by,—1. warrant; 2. by an officer without warrant; 3. by a private person, also without warrant; 4. by hue and cry. In either case he must be taken before a magistrate to be dealt with, who, upon sufficient cause, issues his warrant of committal. A committal may also be made by a court of record for contempt for not obeying its order (in cases where a judgment cannot be entered) to pay costs, a fine, or other moneys, or otherwise in disobeying its mandate. Or it may be by the court ordering a person into the custody of its officer for an actual contempt of the court, in the body of the court or its precincts, abusing its process and otherwise, or for not putting in bail in cases where bail is requisite. And each of the houses of parliament may, by warrant, commit a person for contempt of its power or authority, or a breach of its privileges.

COMMODORE, *kom-mo-dore'* (Span. *commendador*, a commander), the designation of an officer in the navy who has the command of a small number of ships separated from the fleet for any special service. The office is held by a captain, who ranks with a brigadier-general in the army. There are two classes of commodores in our navy; those of the first class carry a red pendant, broad and swallow-tailed, at the mast-head; those of the second, a blue pendant. Commodores rank in the navy next to a rear-admiral.

COMMON, *kom'-mon* (Lat. *communis*, Fr. *commun*), or right of common, is an incorporeal hereditament, and a profit which a man has in the land of another; as, to feed his beasts, to catch fish, to dig turf, to cut wood, or the like. It derives its name from the community of interest which thence arises between the claimant and the owner of the soil, or between the claimant and other commoners entitled to the same right, all which persons are entitled to bring actions for injuries done to their respective interests; and both as against strangers and against each other. Common is chiefly of four sorts:—1. *Common of pasture*.—This is the right of feeding one's beasts in another's land, and it is either *appendant*, *appurtenant*, *because of vicinage*, or *in gross*. Common of pasture *appendant* is the privilege belonging to the owners or occupiers of arable land held of a manor, to put upon the wastes of the manor (thence called *commons*) their commonable beasts; that is, such beasts as are necessary either for the ploughing of land or for its manuring; *viz.* horses and oxen, cows and

sheep. It can be claimed only in respect of arable land, though it may be claimed by that name as appendant to a farm in fact containing pasture at the present day, for the land shall be presumed (where there is usage to sustain the claim) to have been all originally arable. Common *appurtenant* (which is said to be frequently confounded with common appendant) arises from no connection of tenure, nor from any absolute necessity, but may be annexed to lands in other lordships, or extend to other beasts besides such as are generally commonable; as hogs, goats, geese, or the like. It can only be claimed by grant, or by the long usage of particular persons to enjoy the same; which latter title is commonly called a title by prescription, and is supposed by the law to be founded on a special grant or agreement originally made for this purpose. Common *because of vicinage*, or neighbourhood, is where the inhabitants of two townships which lie contiguous to each other have usually intercommoned with one another, the beasts of the one straying naturally into the others' fields without any molestation from either. Common *in gross*, or at large, is such as is neither *appendant* nor *appurtenant* to land, but is annexed to a mansion, being granted to a man and his heirs by deed; or it may be claimed by prescriptive right, as by a person of a church, or the like corporation sole. This is a separate inheritance, entirely distinct from any other landed property vested in the person to whom the common right belongs. 2, 3. Common of *piscary* is a liberty of fishing in another man's water, as common of *turbary* is a liberty of digging turf upon another man's ground. There is also a common of digging for coals, minerals, stones, or the like. Common of *turbary* may be by grant or prescription, and may be either appurtenant or in gross. A common of turbary cannot be claimed as appurtenant to land, but only to a house, and does not authorize the taking of turf, except for the purpose of using it as fuel in the particular house to which the right is annexed. Common of *estovers* or *estouviers*, that is, necessaries (from *estoffer*, to furnish), is a liberty of taking necessary wood, for the use or furniture of a house or farm, from off another man's estate. (*See* BOTE.)

COMMONALTY, *kom'-mon-al-te*, is the lower of the two divisions of the civil state, the nobility being the other. Like the latter, it includes several degrees of rank and condition.

COMMON BENCH. (*See* COURT.)

COMMON COUNCIL, is the council of a city or corporate town, empowered to make bylaws for the government of the citizens. The common council of London consists of two houses,—the upper house, composed of the lord mayor and aldermen; and the lower house, of the common councilmen, elected by the several wards. The members of the common council are elected annually by the ratepayers of the different wards.

COMMONER, *kom'-mon-er*, is a student of the second rank at the universities of Oxford and Cambridge.

COMMON LAW.—The common law is grounded on the general customs of the realm, and includes in it the law of nature, the law of God, the principles and maxims of the law, and the decisions of the superior courts, which are founded thereon; and is said to be the perfection of reason, acquired by long study, observation, and experience, and refined by learned men in all ages. It overrides the canon and civil law, where they go beyond, or are inconsistent with it, as we have already noted in considering those subjects.

COMMON-PLACE BOOK, is a book in which are recorded and arranged under general heads such things as may occur in the course of reading or study, in such a way as that they may be easily found again. The advantage of such a book to the student or man of letters is very great. It not only trains him to read with accuracy and attention, but leads him insensibly to think for himself, and to watch over his own thoughts. To most reflective men there occur at times valuable thoughts, which, without some such way of preserving them, are generally lost. The method of arrangement adopted in a common-place book is of some importance, and various plans have been proposed, each having its advantages. The best is, perhaps, that which is given by Mr. Locke, and which, from twenty years' experience, he found of the greatest advantage. The method recommended by him is briefly as follows:—The first page, or, for more room, the first two pages that front each other, are to be made to serve as an index to the book, and to contain references to every place or matter therein. These are divided by parallel lines into twenty-five equal parts, whereof every fifth line is to be distinguished by its colour, or some other circumstance. These lines are to be cut perpendicularly by others drawn from top to bottom, and in the several spaces thereof the several letters of the alphabet, both capital and minuscule, are to be written. The manner in which this is done may be best seen from the following example of the first four letters:—

| | | | |
|---|---|---|---|
| A | *a* | C | *a* |
| | *e* | | *e* |
| | *i* | | *i* |
| | *o* | | *o* |
| | *u* | | *u* |
| B | *a* | D | *a* |
| | *e* | | *e* |
| | *i* | | *i* |
| | *o* | | *o* |
| | *u* | | *u* |

Having fixed upon the head to which the thing to be entered may be most naturally referred, we regard first the initial letter, and then the first vowel that follows it. For instance, in *Beauty*, *B* is the initial letter and *e* the first vowel; we look in the index for the partition *B* and the line *e*, which is the place for all words whose first letter is *B* and first vowel *e*; and finding no numbers already down to direct us to any page of the book, we turn forward to the first blank page, which, in the case of a new book, will be page 2, and there write what we have occasion for on the head of beauty; beginning the head in the margin and indenting all the other subsequent lines, that the head may stand out. This done, we enter the page in which it is written, viz. 2, in the index, in the space *B e*, from which time all subjects under the head *Be* come into the second and third pages. The *Index Rerum* of the Rev. Dr. Todd differs from the common-place book of Locke, in being intended rather as an index to subjects that occur in the course of one's reading than a common-place book. Instead of the passage being copied out in full, the substance of it is given, and the book and page referred to. The instructions that he lays down are—1. To have the index constantly at hand when you read; and when you meet with anything of interest, just note it down,—the subject, the book, and the page, and any word designating the qualities. 2. Make your index according to the subjects as much as possible, selecting that word which best conveys the idea of the subject. 3. A wide margin is to contain the word selected as a guide to the subject, and noted down on the corners of the page are the letters of the alphabet (capitals), and in the centre the first five vowels, *a*, *e*, *i*, *o*, *u*; each letter of the alphabet having two pages to each of the vowels, and consequently each letter having ten pages. 4. When you read anything which you may hereafter need, place the principal word in the margin under the first letter in that word, and the first vowel in it. For students and literary men, this system is preferable to that of Locke. The following are a few of the examples given:—

| | |
|---|---|
| America. | Supposed to be known in the time of Homer. Thomas Hist. Print. v. 1, p. 21. |
| Atheism. | of France, picture of. Schlegel's Lect. v. 2, p. 190. |
| Bradford. | Governor, notice of. Am. Quart. Rev. v. 2, p. 497. |
| Brougham. | Graphic and powerful description of. Port. Rhet. Reader, p. 497. |

COMMON PLEAS. (*See* COURT.)

COMMON PRAYER. (*See* LITURGY.)

COMMON-SENSE PHILOSOPHY is a term employed to designate a certain system of philosophy which professes to accept the testimony of our faculties as trustworthy within their respective spheres. The results of Bishop Berkeley's philosophical speculations led him to the conclusion that there was no such thing as a material world—nothing in nature but spirits and ideas; and that the belief in material substances and of abstract ideas is the chief cause of all our errors in philosophy, and of all infidelity and heresy in religion. Hume proceeded upon the same principles, but carried them to their full length, and as the bishop undid the whole material world, Hume, upon the same grounds, undid the world of spirits, and left nothing in nature but ideas and impressions, without any subject on which they might be impressed. Then appeared Dr. Thomas Reid with his philosophy of common sense. "I observe," he says, "that as the Peripatetic system has a tendency to materialise the mind and its operations, so the Cartesian has a tendency to spiritualize body and its qualities. One error, common to both systems, leads to the first of these extremes in the way of analogy, and to the last in the way of reflection. The error I mean is that we can know nothing about body or its qualities but as far as we have sensations which resemble those qualities. Both systems agreed in this; but, according to their different methods of reasoning, they drew very different conclusions from it; the Peripatetic drawing his notions of sensation from the qualities of body, the Cartesian, on the contrary, drawing his notions of the qualities of body from his sensations. The way to avoid both these extremes is to admit the existence of what we see and feel as a first principle, as well as the existence of things whereof we are conscious; and to take our notions of the qualities of body from the testimony of our senses with the Peripatetics, and our notions of our sensations from the testimony of consciousness with the Cartesians." The philosophy of common sense has been ably vindicated by the late Sir William Hamilton, in one of his notes appended to his edition of Reid's works. He maintains that the end of all philosophy is truth, and consciousness is the instrument and criterion of its acquisition; that philosophy is thus wholly dependent upon consciousness; that consciousness is to be presumed trustworthy until proved mendacious; that no attempt to show that the data of consciousness are (either in themselves or their necessary consequences) mutually contradictory has yet succeeded; and the presumption in favour of the truth of consciousness, and the possibility of philosophy, has therefore never been redargued. "Nature is not gratuitously to be assumed to work not only in vain, but in contradiction of herself; our faculty of knowledge is not without ground to be supposed an instrument of illusion; man, unless the melancholy fact be proved, is not to be held organised for the attainment, and actuated by the love of truth, only to become the dupe and victim of a perfidious creator." —*Sir W. Hamilton.*

COMMON TIME, in Mus. (*See* TIME.)

COMMONS, HOUSE OF. (*See* PARLIAMENT.)

COMMONWEALTH. (*See* REPUBLIC.)

COMMONWEALTH OF ENGLAND, *kom'-mon-welth*, was that form of government established in England on the death of Charles I. in 1649, and which existed during the protectorate of Oliver Cromwell and his son Richard, until the abdication of the latter and the restoration of monarchy again in the person of Charles II., in 1659.

COMMUNE, *kom'-mune*, in France, is a subordinate territorial subdivision of the country, less than a canton, and corresponding in some measure to an English parish. A commune includes sometimes a single town, and sometimes several villages, and each has a mayor and a communal municipality. There are upwards of 37,000 communes in France.

COMMUNICATING, *kom-mu'-ne-kat-ing*, in Theol., is the act of receiving the sacrament of the Eucharist. (*See* EUCHARIST.)

COMMUNION, *kom-mu'-ne-on* (Lat. *communio*, mutual participation), in a general sense, denotes fellowship or intercourse between two or more persons. In Theol. it is fellowship with any particular church; and hence a person is said to be in communion with a church who declares his acquiescence in its doctrines and participates in its worship. Different churches, too, are said to be in communion when they are united in doctrine and discipline. Communion is applied, in a more limited sense, to participation in the sacrament of the Eucharist or Lord's Supper. (*See* EUCHARIST.) *Free Catholic communion* denotes that all who have been baptised, either in infancy or adult age, may, on a credible profession of their faith, sit down at the Lord's table with others of different denominations. *Strict communion*, on the contrary, is confined to a particular denomination. *Communion service* is the office in the Liturgy of the Church of England for the administration of the Eucharist. *Communion elements* are the bread and wine employed in the Eucharist.

COMMUNISM. (*See* SOCIALISM.)

COMMUTATION OF TITHES. (*See* TITHES.)

COMPANION, *kom-pan'-yun* (Fr. *compagnon*), a kind of wooden porch placed over the entrance to the master's cabin in merchant-vessels.

COMPANION-LADDER, a ladder used in men-of-war, by means of which the officers ascend to or descend from the after-deck.

COMPANY, *kum'-pa-ne* (Fr. *compagnie*), an association of merchants, mechanics, or other traders, joined together for one common interest. In all municipal corporations the mechanics are united into companies, with privileges and large immunities bestowed on them by royal charter. Their original object was the protection and advancement of trade. Their powers have been considerably restricted in late years. The term company is more particularly appropriated to those large associations set on foot for the purpose of carrying on some industrious or commercial undertaking. Companies, in this sense, are generally divided into two great classes,—regulated companies and joint-stock companies. In open or regulated companies, the affairs are managed by directors appointed by the members; but there is no joint stock. Any person properly qualified can be admitted as a member if he pays a fine and agrees to submit to the regulations of the company, and each member trades upon his own stock and at his own risk. The regulated companies formerly existing in this country resembled the corporations of trades, and were a sort of enlarged monopolies. They now exist only in name, and do not maintain a monopoly in any branch of trade. Exclusive, or joint-stock companies, differ not only from regulated companies, but from private copartnerships. An institution of this sort is a company, having a certain amount of capital divided into a small or great number of transferable shares, managed, for the common advantage of the shareholders, by a body of directors chosen by and responsible to them. The South-Sea Company and the East-India Company are two of the largest institutions of this kind which have been organized in Great Britain. The former arose out of the inability of the government to pay the sailors of the royal navy during the long war with France in the reign of Queen Anne. The tickets with which the sailors were paid fell into the hands of usurers, and the nation found itself indebted £9,471,321, and no means provided for paying it by parliament. The chancellor of the Exchequer, Harley, afterwards earl of Oxford, proposed a scheme by which he allowed the proprietors of these debts 6 per cent. per annum, and incorporated them for the purpose of carrying on a trade to the South Sea. The fatal South-Sea bubble scheme was projected in 1720, and was executed upon the statute 6 George I., wherein it was declared that the company might redeem all or any of the redeemable national debts. Its pretence was that of raising a fund for carrying on a trade to the South Sea, and purchasing annuities, &c., paid to the other companies. Proposals showing the advantages of the design were printed and circulated. The sum necessary for carrying it on, together with the profits that were to arise from it, was divided into shares, to be purchased by persons disposed to adventure therein. The directors gave out that every £100 would yield £50 per annum, which occasioned such a rapid rise in stock that a £100 share sold for £800. In three months' time it fell to £150, and an immense number of persons were ruined. Fear-

ful scenes of wretchedness and distress resulted, and all the directors were severely fined, and many lost their entire property. This did not, however, interfere with the South-Sea Company, which, in the year 1722, had a capital of £33,800,000. In 1748 the whole of their trading stock was converted into an annuity stock, and the company ceased in every respect to be a trading community. The East-India Company was formed under a charter granted for fifteen years by Queen Elizabeth, in 1600, under the title of "The Governor and Company of Merchants of London trading to the East Indies." The charter was exclusive, prohibiting the rest of the community from trading within the limits of the company, which comprised the whole space, including both land and sea, between Cape Horn and the Cape of Good Hope. Ships were soon sent out by the company to Sumatra and Java, which returned with cargoes of calico, silk, indigo, &c.; and about 1612 they obtained leave from the native rulers to establish factories at Surat, Ahmedabad, Cambay, and Gogo. The town of Surat was considered the principal British station in the west of India, till the acquisition of Bombay. The charter of the company was frequently renewed, and their stations and factories increased in number. The station at Madras was established in 1640, that of Calcutta in 1645, and that of Bombay in 1665. By a statute of Charles II. they were empowered to make war and peace on the native princes, and for nearly two hundred years they took advantage of this privilege. A new East-India Company was formed in 1698, to whom the crown granted a charter, because they offered a loan of £2,000,000 to the state. The two companies could not agree, so they amalgamated, and formed one company, under an act of parliament passed in 1702. As long as the company existed, the constitution, as then formed, remained almost the same. Every shareholder who held £500 of the company's stock became a member of the Court of Proprietors. This court chose from their number twenty-four directors, each of whom held not less than £2,000 of the stock. The Board of Control, which was afterwards formed, had reference to the affairs of Indian government. The members of the East-India Company were, properly speaking, merchants exporting home produce and importing silk, calico, diamonds, spices, &c., from thence. Gradually, they began to interfere in the quarrels of native princes, and, in time, began to gain an influence which amounted to sovereign power over vast portions of territory. From this period they could not obtain a renewal of their charter without a loan to government, and in 1835 their trading privileges were taken away. Their dividends had to be paid by means of taxes levied on the people of India. The wars that have occurred since that time have been waged by this country as a nation, and not by the company. The last charter would have remained in force until 1878, had it not been for the Sepoy rebellion in 1857. Notwithstanding a vigorous resistance, the company were then compelled to give up their powers, and it was resolved that the management of India should be concentrated in the hands of the British government. In 1858, the whole of the company's powers were transferred to the crown. The East-India Company is still in existence, but solely for the purpose of receiving and paying dividends. The Hudson's Bay Company is another institution of the same kind, but smaller. They received their charter in 1670, for the exclusive right to trade in the vast territories which surround Hudson's Bay. They erected several forts on the western side of the bay, which were taken and destroyed by the French in 1782. For a considerable period, this company carried on a lucrative trade in the skins and furs of animals, which were found in great abundance in these districts, and were of much finer quality than those found in less northerly countries. On the formation of the North-West Company, they met with serious rivals; and when Lord Selkirk became a partner in the Hudson's Bay Company, many scenes of violent and sanguinary contest took place between the servants of the two parties. In 1821 these disputes were settled by a coalition of the two companies, and the extensive fur trade was carried on with their united capital. At the present time, the name of company is expressly given



to large institutions, such as the Bank of England, railway companies, &c., where the operations are conducted by means of agents acting under the orders of a board of directors.

COMPANY, in Mil., is the ordinary term given to a body of men in the guards, the line, or the marines, under the command of a captain. In the cavalry a captain's command is called a troop; in the artillery, a battery. The strength of a troop of cavalry and of a company in the line is eighty men of all ranks; of a battery of artillery, 120. In the volunteers, the *minimum* strength of a company is sixty men of all ranks, and the *maximum*, 100. A company is divided into subdivisions, and each subdivision into two sections. A sergeant and corporal are allowed to each section, and a fifth sergeant acts as captain's covering-sergeant. The first mention made in history of the division of an English regiment into companies under a captain, lieutenant, and ensign, is at the battle of St. Quentin, in 1557, when the French were defeated by the allied Spanish and English forces. The crew of a vessel is often called the ship's company.

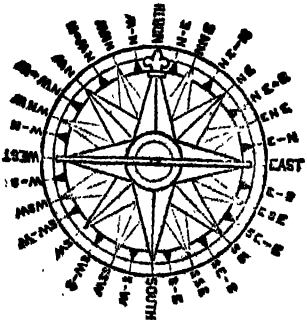
COMPARISON, *kom-par'-e-sun* (Fr. *comparaison*), in Phil., is the act of carrying the mind from one object to another, in order to discover some relationship subsisting between them. The result of comparison is a judgment.

COMPARISON, in Rhet., is a figure of speech frequently employed for the ornament of composition; and, when properly introduced, it adds much to the beauty of style. It consists in viewing two things with regard to a third, which is common to them both. Comparisons are of various kinds; but they may be all arranged into one or other of two classes, according as they are addressed to the understanding, with a view to instruct, or to the heart, with a view to please. The latter of these purposes is accomplished in various ways:—(1) By suggesting some unusual resemblance or contrast; (2) by setting an object in the strongest light; (3) by associating an object with others that are agreeable; (4) by elevating an object; and (5) by depressing it. The great pleasure in the art of comparison lies in discovering likenesses between things of different species, and where we would not, at first glance, expect a resemblance. Hence the objects compared should not bear too near and obvious a resemblance to each other. Neither ought comparisons to be founded on likenesses that are too faint or remote, nor to be carried beyond certain bounds.

COMPARISON, in Gram., is the means by which is denoted the degree in which the quality expressed by an adjective is possessed by the substantive with which it is coupled. There are three degrees of comparison,—the positive, comparative, and superlative. The positive expresses the quality simply, without any comparison; as good, wise, prudent; and, hence, some do not consider this as a degree of comparison. The comparative expresses that the quality is possessed in a higher degree by that object than another; as, John is taller than James. The superlative expresses the possession of the quality in the highest degree, or in a higher degree than it is possessed by a number of others; as, Solomon was the wisest man; James is the best scholar in his class. In English, there are two ways of expressing these degrees; either by an inflection or change on the word itself, as wise, wiser, wisest; or by the addition of a word, as prudent, more prudent, most prudent. In many cases, either form may be adopted; but where the former would produce a harsh word, or one difficult to be pronounced, the latter mode is adopted. Adverbs are compared in the same way as adjectives.

COMPASS, *kum'-pis* (Fr. *compas*).—This instrument, generally known as the mariner's compass, consists, in its simplest form, of a small box, in the bottom of which is placed a card with a diagram printed on it, similar to that in the accompanying illustration. Exactly in the centre of the card a fine steel pin is inserted, and upon this a light bar of steel, called the needle, is balanced. This needle, when magnetised and suspended on the point of the pin, has the property of turning its ends towards the north and south, varying slightly from a line drawn due north and south by a declination either towards the east or west, which differs in extent at different times, and to such a degree

that it is not uniform even for the space of twenty-four hours at any place on the earth's surface. (*See* DECLINATION.) In the diagram on the card, the circle represents the horizon, and the person using the compass must imagine himself to be standing within it. The entire circumference is divided into thirty-two equal portions by lines diverging from the centre, called points or rhumbs. The points marked N. S. E. W. are called the cardinal points. (*See* CARDINAL POINTS.) The north point is distinguished by a *fleur-de-lis*. It will be readily seen, on an inspection of the diagram, how the notation of the points between any two of the cardinal points is managed; thus the point midway between N. and W. is called N.W., or north-west,—a combination of the letters of the cardinal points between which it lies being used to denote it; that between N.W. and N. is called N.N.W., or north-north-west; and that between N. and N.N.W., N.-W.-




MARINER'S COMPASS.

or N. b. W. as it is usually written; meaning north by west. It may be remarked that whenever a hyphen or connecting mark is used between any two letters in the diagram, the word "by" must be expressed when reading the points of the compass; and it will be seen that the points which lie on either side of the cardinal points, and the points that are midway between these, must be read in this way. The angular distance between any two points is 11° 15′, as the horizon is divided into 360°, and each space between the rhumbs is consequently represented by 360° divided by 32. Different shapes have been adopted for the needle at various times; but it seems to be now acknowledged that it should be as light as possible, and in the shape of a very thin prism, placed in such a manner that its narrow sides are turned upwards and downwards, one towards the eye of the spectator and the other towards the card. It was formerly the custom to make a hole in the centre of the flat bar that was used as the needle for the reception of an agate cap, to work on the point of the pin on which the needle is balanced; but it is now considered better that the needle should have no perforation through its centre, but that a hole of little depth should be drilled into the lower side of the prism, that it may be suspended on the pin at a point a little below its centre of gravity, which causes it to possess greater sensibility, with as much freedom of action as before. When the compass is placed on board ship, it is suspended by gimbals (*see* GIMBALS), so that it may always be horizontal, whatever may be the position of the ship. It is inclosed in a box called the binnacle (*see* BINNACLE). The great requisites in a good compass are, that the motion of its needle should be steady, as well as active and sensible, without oscillation, and that it should be so contrived that it may be easily corrected when deviation is caused by any local attraction. Many attempts have been made to correct disturbances arising from local causes, chiefly from the iron used in the construction of vessels, by surrounding the compass with bars of soft iron or magnets, that will attract the needle in a contrary direction to that in which it is drawn by the metal on board, and so counteract and neutralise its effects. The methods suggested by Professor Airey, the Astronomer Royal, and Mr. Gray of Liverpool, are considered the best; but the correction of local attraction seems, under any circumstances, to be attended with considerable difficulty and uncertainty. In the royal navy, when compasses have been placed on board a vessel, they are corrected, for the influence of local attraction, by what is termed "swinging" the ship. The ship's head is brought round to every point of the compass successively, and the differences in the bearings, indicated by the compass on board and an azimuth compass on shore, under the charge of an intelligent officer, are carefully noted and registered. The results thus obtained form what is called a correcting card for the vessel in question. The Chinese assert that the mariner's compass was invented by the emperor Houang-ti, about 2634 B.C., and that it was then used to enable them to direct their course to any distant point on land. The sailors who navigated the Indian Ocean and Eastern seas were well acquainted with its use in the 3rd century after the Christian era, when it was quite unknown in Europe, where it is said to have been introduced by Marco Polo on his return from his travels in the East, about 1260. Flavio Gioja, a Neapolitan sailor, effected considerable improvements in it, and brought it into the form in which we now have it about 1300. Columbus is said to have discovered the variation of the compass in 1492; but this is considered to be doubtful. The inclination or dip of the needle (*see* NEEDLE DIPPING) was found out by Robert Norman, of Wapping, in 1576.

COMPASS, in Mus., a term used to express the extent of notes or sounds comprehended by any voice or instrument.

COMPASS, AZIMUTH.—This instrument is a compass used at sea to find the magnetic azimuth (*see* AZIMUTH) of the sun or any other heavenly body. It resembles the ordinary mariner's compass in form and general principles; but the circumference of the exterior circle of the diagram on the card is divided into degrees, and a ring is fitted to the top of the box, on which two sights are fixed in a vertical position, exactly opposite to each other, with a longitudinal slit in each, through which an observation of any object can be taken. The needle shows the bearing of the object towards which the sights are directed, with regard to the magnetic pole, and the angular distance thus obtained is its azimuth.

COMPASS OF VOICES IN CHORUSES.—Voices are of different kinds; viz. the *soprano*, or *treble*, the *contralto*, the *tenor*, and the *bass*. The first of these is in extent co-equal with the tenor, but is in pitch an octave higher. The soprano parts are often written in the C clef, on the bottom line of the staff. The extent of the contralto is about the same as the bass, but an octave higher; that of the tenor the same as the soprano, but an octave lower; and that of the bass the same as the contralto, also an octave lower. Voices, if compelled to sing above their medium note, soon become fatigued, and finish by screaming; again, if required to sing below the medium of the voice, they are deficient in power, and render the harmony feeble and indistinct.

COMPASSES, *kum'-pas-ses*, mathematical instruments principally used for drawing circles, arcs of circles, ellipses, &c., and for measuring and transferring distances. There are many kinds of these instruments, known as common compasses or dividers, hair compasses, triangular compasses, proportional compasses, beam compasses, and calliper compasses. (*See* CALIBRE.) The common compasses consist of two pointed legs, connected by a pivot-joint: the lower part of one leg is generally movable, to admit of the substitution of a drawing-pen or pencil. Triangular compasses have three legs working on two pivots; so that the distances between the three points of any triangle can be measured at once and transferred. Proportional compasses consist of two legs, pointed at either end, fastened together by a clamping screw, and presenting the form of the letter X when open. The length of the legs can be regulated by means of a scale engraved on the side, and set to measure and transfer distances in any desired proportion. The beam compass is a bar on which two sliding sockets travel that can be fixed at pleasure, and are provided with pen, pencil, and steel points. They are used for measuring long distances, and describing the arcs of large circles in the projections of maps.

COMPETITION, *kom-pe-tish'-un* (Lat. *competitio*, from *competo*, I strive after something in company or together), is the act of seeking or endeavouring to gain what another is seeking or endeavouring to gain at the same time. In Pol. Econ., it is that struggle after wealth that is constantly going on in the world, and that leads the purchaser to seek the best article he can at the lowest price, and the producer to furnish the best article at the lowest price. Socialists, and others ignorant of the principles of political economy, have declaimed vehemently against competition, and charged upon it all the economical evils that at present exist. There are, doubtless, evils connected with competition; but it is not the less certain that it prevents evils that are much greater. "Instead of looking," says J. S. Mill, "upon competition as the baneful and anti-social principle which it is held to be by the generality of socialists, I conceive that, even in the present state of society and industry, every restriction of it is an evil, and every extension of it, even if for the time injuriously affecting some class of labourers, is always an ultimate good. To be protected against competition, is to be protected in idleness, in mental dulness; to be saved the necessity of being as active and as intelligent as other people."—"It is the common error of socialists to overlook the natural indolence of mankind,—their tendency to be passive, to be the slaves of habit, to persist indefinitely in a course once chosen. Let them once attain any state of existence which they consider tolerable, and the danger to be apprehended is that they will thenceforth stagnate,—will not exert themselves to improve, and, by letting their faculties rest, will lose even the energy required to preserve them from deterioration."—(*Principles of Political Economy.*) Wherever competition is not, monopoly exists, and monopoly, in all its forms, is the taxation of the industrious for the support of indolence, if not of rapacity. With the exception of competition among labourers, all other competition is for the benefit of the labourers, by cheapening the articles they consume; and even in the labour-market, it is a source, not of low, but of high wages, wherever the competition *for* labour exceeds the competition *of* labour. It never could be a cause of low wages, save by the overstocking of the labour-market. On the establishment of the French provisional government of 1848, an attempt was made to do away with the natural system of competition among workmen, and to remunerate a number of workmen alike. A special experiment was tried at the Hôtel Clichy with a government order for the uniforms of the National Guard. Fifteen hundred tailors were assembled, and were allowed two francs a day as subsistence-money while they worked, and the balance between the sum paid and what the work would have cost had it been executed by an army-contractor, was to have been equally divided among them afterwards. It was found, however, when the day of reckoning came, that not only was there no balance to be paid, but that there was an actual loss, and that the two francs a day of subsistence-money, the lowest rate of wages paid to tailors under the competitive system, had overpaid them for the work actually done. Their energies, unexcited by the spirit of competition, relaxed when each man found that the proceeds of his increased exertions were not to be received by himself alone, but to be distributed over the whole body of his fellow-workmen; and even the thought of "liberty, equality, and fraternity," was insufficient to incite them. (*See* SOCIALISM.)

COMPLEXION, *com-plek'-shun* (Lat. *complecto*, I comprise), a term employed to signify the colour of the face and skin, although properly it means the temperament, and natural disposition of the body. Formerly, the human skin was supposed to consist of only two parts,—the cuticle, or epidermis, and the *cutis*, or real skin; but Malpighi showed that between these two was a soft gelatinous cellular texture, which he distinguished by the title *reti mucosum*. On this discovery that anatomist offered a suggestion as to the colour of negroes. The *reti mucosum* is of very different colour in different nations; and the difference of its colour corresponds so exactly with the difference of their complexions, that there can be little doubt that it is the principal seat of the colour of the human complexion. Of the different colours observed amongst mankind, Dr. Hunter gives the following view:—Black,—Africans under the line, and the inhabitants of New Guinea and New Holland. Swarthy,—the Moors in the northern parts of Africa, and the Hottentots in the southern parts. Copper-coloured,—the East-Indians. Red-coloured,—the American Indians. Brown-coloured,—the Tartars, Persians, Arabs, Africans on the Mediterranean coast, and Chinese. Brownish,—the inhabitants of Southern Europe, Sicilians, Spaniards, and also the Abyssinians in Africa. The Turks, Samoides, and Lapianders, are also brownish. White,—most of the European nations, including the Swedes, Danes, English, Germans, Poles, &c., together with the inhabitants of the islands in the Pacific Ocean.

COMPLUTENSIAN POLYGLOT, *kom-plu-tenz'-yan*, is the name given to an edition of the Holy Scriptures published in 1522 at Alcala de Henares (the ancient *Complutum*) at the expense of Cardinal Ximenes. The first four volumes comprise the Old Testament, in Hebrew, Latin, and Greek, in three distinct columns, the Chaldee paraphrase being at the bottom of the page, with a Latin interpretation; the fifth volume contains the New Testament in Greek, with the Latin Vulgate and interpretations of the Hebrew, Chaldee, and Greek names. The sixth volume is filled with various critical tracts. Only six hundred copies of this edition were thrown off, and the work is scarce and expensive.

COMPOS, or NON COMPOS, MENTIS. (*See* INSANITY.)

COMPOSER, *kom-po'-zer*, literally, a practical musical author, or, in other words, one who invents or composes new music according to the established rules of science, and who studies harmony and melody as connected with effect in composition, independently of the laws of acoustics, or the philosophy of sound. A composer must not be confounded with a *theoretical* musical author, whose business it is to speculate in acoustics, and write on the laws of harmony and melody, but not to interfere with their practical application in composition.



COMPOSITÆ, *kom-poz'-e-te* (Lat. *compono*, *compositum*, I put together), in Bot., a nat. ord. of dicotyledonous plants, in the sub-class *Corollifloræ*. It is one of the largest and most important orders in the vegetable kingdom, and its members are to be met with in all parts of the world. In northern regions the plants are generally herbaceous, but in warm climates they sometimes become shrubby, or even arborescent. The following botanical characters clearly define this great order:—The leaves are alternate, or opposite, and without stipules; usually simple, but often much divided. The flowers, which are termed *florets*, are hermaphrodite, or unisexual, are collected in dense heads or *capitula*, each collection of florets being on a common receptacle, and surrounded by an involucre. The separate florets are also frequently furnished with scale-like bractlets, termed *palese of the receptacle*. The calyx is superior, closely adhering to the ovary, its limb being entirely abortive, or membranous, or pappose. The corolle is monopetalous, tubular, superior, and usually deciduous; it is ligulate (strap-shaped), bilabiate (two-lipped), or funnel-shaped; in the latter case, four or five-toothed. The stamens are five in number, rarely four, and are inserted upon the corolla; the filaments are either distinct or monadelphous, and the anthers are united into a tube. The ovary is inferior and one-celled, with a single erect ovule. The style is simple, undivided below and bifid above; the stigmas are placed upon the inner surfaces of the two divisions. The fruit, termed a *cypsela*, is dry, indehiscent, one-celled, and crowned with the limb of the calyx, which is often pappose. The seed is solitary, erect, and albuminous. The order has been subdivided by De Candolle into the following sub-orders:—1. *Tubulifloræ*,—florets tubular or ligulate, either perfect, unisexual, or neuter; when perfect they are tubular, with five, or rarely four, equal teeth. 2. *Labiatifloræ*,—hermaphrodite florets, or at least the unisexual ones divided into two lips. 3. *Ligulifloræ*,—florets all ligulate and perfect. The first of these sub-orders includes the sections *Corymbiferæ* and *Cynarocephalæ*, proposed by Jussieu: the last corresponds to the *Chicoraceæ* of the same writer. Plants belonging to the sub-order *Tubulifloræ* abound.

principally in hot climates. They are remarkable for their bitter, tonic, and aromatic properties. (*See* ANTHEMIS, ARTEMISIA, ARNICA.) A few are used for dyeing. (*See* CARTHAMUS.) Some are cultivated as esculent vegetables, as the *artichoke* and *cardoon*. (*See* these words.) The *Labiatifloræ* are almost confined to the extra-tropical parts of South America. They do not furnish many useful products. The *Ligulifloræ* are most abundant in cold and temperate climates. Their chief characteristic is the presence of a milky, bitter, astringent, or narcotic juice, which possesses alterative, diuretic, aperient, or narcotic properties. The roots of some are esculent, and others, by cultivation with diminished light, become edible as salads. (*See* CICHORIUM, LACTUCA, TARAXACUM.)

COMPOSITE CANDLES, *kom'-poz-ite*, a name applied to candles made of different mixtures of ordinary tallow and stearine. They are less hard according to the amount of tallow they contain.

COMPOSITE NUMBER, in Arith., is one which can be divided by some other number greater than 1, in opposition to a prime number, which cannot be thus divided. Thus 12, 15, and 27 are composite numbers; whilst 11, 17, 89, are not composite.

COMPOSITE ORDER. (*See* ARCHITECTURE.)

COMPOSITION, *kom-po-zish'-zun* (Lat. *compositio*), in a general sense, is the act of forming a whole or integral of various dissimilar parts, and is also applied to the body or compound thus formed. In Lit. it is the art of forming and combining ideas, and clothing them with language suitable to the nature of the subject. In Log. it is a method of reasoning in which we proceed by gathering together a number of ideas, and combine them into one system, otherwise called synthesis. In Gram. it is the joining of two words together, or prefixing a particle to a word, to augment, diminish, or change its signification.

COMPOSITION denotes the art of producing new music according to the established rules of harmony and modulation, and of arranging musical sounds into airs and songs, &c., either for the voice or instruments. Composition includes melody, or the art of making a single part, and harmony, or that of disposing and concerting several single parts together, so that they may form one agreeable whole. As the musical scale consists only of twelve sounds, a careless observer might imagine that all the possible combinations of those twelve sounds would in time be exhausted, and thus bring composition to an end. It is not so, however, for these twelve sounds will admit, by mere combination, of 144 different successions, and each of these combinations may be again varied by length, rapidity, force, *legato*, and *staccato*, so as to admit of the construction of many million of tones; thus, no end can be found to composition, or any excuse made for wearisome monotony.

COMPOSITOR. (*See* PRINTING.)

COMPOST. (*See* MANURE.)

COMPOUND INTEREST. (*See* INTEREST.)

COMPOUND RADICLES, *kom'-pownd* (Lat. *compono*), in Chem., certain combinations of elements which behave towards acids and bases in the same manner as the elementary bodies. Cyanogen, for instance, which is a compound of carbon and nitrogen, forms compounds with the metals in the same manner as oxygen or chlorine; and ethyl, which is a compound of carbon and hydrogen, acts towards the acids in a similar manner to iron or lead, forming salts in a precisely parallel way. (*See* ORGANIC RADICLES.)

COMPREHENSION, *kom-pre-hen'-shun* (Lat. *comprehensio*), in Phil., is that act of the mind whereby it apprehends or knows any object presented to it on all the sides on which it is capable of being apprehended or known.

COMPREHENSION, in English Church Hist., is the name of a scheme proposed on several occasions for relaxing the terms of conformity, and admitting dissenters into community with the Church. It was proposed by Bridgman and Sir Matthew Hale, but without success; and subsequently Tillotson and Stillingfleet attempted it; but the bishops refused their assent. The scheme was revived again after the Revolution, but without success, and at length the Act of Toleration was passed. (*See* TOLERATION.)

COMPTROLLER. (*See* CONTROLLER.)



COM, *kon*, is a Latin inseparable preposition, which, at the beginning of words, signifies union; as *concurro*, a running together. In Mus., it signifies with; as, *con affetto*, with tenderness.

CONCATENATION, *kon-kat-e-nat'-shun* (Lat.), in Phil., denotes the connection that exists between a number of things linked together or dependent on each other.

CONCAVE, *kon'-kave* (Lat. *concavus*).—A curve or surface is said to be concave on the side on which straight lines drawn from point to point in it fall between the curve or surface and the spectator; that side is convex on which the curve or surface falls between the lines and the spectator. Thus the inner surface of a hollow sphere is concave, while the outer surface is convex. (*See* LENS.)

CONCAVO-CONCAVE, or DOUBLE CONCAVE.—Terms applied to lenses which are concave on both sides; when one side is plane and the other concave, the lens is said to be plano-concave.

CONCAVO-CONVEX, or MENISCUS, a lens having one side concave and the other convex. When one side is plane and the other convex, the lens is said to be plano-convex; and if both sides are convex, it is a double convex.

CONCEALMENT OF BIRTH. (*See* INFANTICIDE.)

CONCEPTION, *kon-sep'-shun* (Lat. *conceptio*), in Phil., is the simple apprehension or perception that we have of any object, without proceeding to affirm or deny anything regarding it.

CONCEPTION, IMMACULATE. (*See* IMMACULATE CONCEPTION.)

CONCEPTION OF OUR LADY, NUNS OF THE ORDER OF, a religious order of nuns, founded by Beatrix de Sylva, sister of James, first count of Portalegro, in Portugal. Pope Innocent VIII. confirmed the order in 1489, and granted them permission to follow the rule of the Cistercians. After the death of Beatrix, they were placed under the direction of the Franciscans, as the most zealous defenders of the immaculate conception, and, at the same time, they were required to follow the rule of St. Clara. Their dress consists of a white gown, blue mantle, and scapulary, on which is an image of the Virgin.

CONCERT, *kon'-sert* (Ital. *concertare*), a musical entertainment, in which a number of musicians, both vocal and instrumental, unite in the exercise of their various talents. Concerts sometimes consist of vocal music only. These are distinguished by the name of vocal concerts.

CONCERTINA, *kon-ser-te'-na*, a kind of musical wind instrument, patented by Professor Wheatstone in 1829, which is said to bear a greater resemblance to the human voice than any other yet invented. A bad opinion has been formed of this instrument by many people in consequence of their having mistaken for it the so-called German concertina, which is indeed only an improved accordion, shaped like a concertina. The real, or, as it is called, the English concertina, is both constructed and fingered in a totally different manner, and although the sounds are produced on the same principle as those of the accordion, there is no more similarity between them in performance than there is between a common whistle and a German flute. This instrument has a compass of three octaves and a half, and possesses not only a chromatic, but an enharmonic scale, it having two separate tones. From this fact, as well as from the flexibility of the bellows, the chords are better in tune than in most other instruments of a fixed sound. Its capabilities are such that the most complex harmonies, as well as the most difficult violin or flute music, can be played upon it. It also possesses the great advantage of being learnt in a very short time. The best instruction-books for this instrument are, perhaps, those by Giulio Regondi, Professor Wheatstone, and C. Coote.

CONCHIFERA, *kon-kif'-e-ra* (Lat. *concha*, a shell: *fero*, I bear), the scientific name given to certain bivalve shells, whose inhabitants are susceptible of no other impressions save those of immediate contact. The three orders into which this family is divided are the *Brachiopoda*, *Dimyaria*, and *Monomyaria*.

CONCHOID, *kon'-koid* (Gr. *konchoe*, a shell), the name of a curve invented by Nicomedes. It was much used by the ancients in the construction of solid problems. It had for its objects the trisection of an angle,

the construction of two geometrical means between two given lines, and the doubling of the cube. Mechanically the curve may be easily described, and is often used in architecture as a boundary-line of the vertical section of columns.

CONCHOIDAL, *kon-koy'-dăl* (Lat. *concha*, shell; *Gr. eidos*, form), in Min., a term applied to that peculiar fracture of stones and minerals which exhibits convex and concave surfaces. Flint, cannel coal, and glass, are examples of substances possessing a conchoidal fracture.

CONCHOLOGY. (*See* MOLLUSCA.)

CONCLAVE, *kon'-klaiv* (Lat., a private room), is the name given to the assembly of cardinals, met together for the purpose of electing a pope, and it is also applied to the place in which they meet for that purpose. The conclave is usually held in the Vatican, where on the day after the funeral of the deceased pontiff, they all assemble, and, after the regulations that relate to the conclave have been read, they are locked up in separate apartments, and kept under strict surveillance until the election has taken place. They meet once a day in the chapel of the palace, when a scrutiny is made of their votes, and this is repeated every day until at least two-thirds of the votes are in favour of one individual, who is then considered as duly elected to the pontifical chair. *Conclavist* is a spiritual or secular attendant on a cardinal during a conclave. Each cardinal has one such attendant, who has to take a vow of inviolable silence, and is not allowed to leave till the business is over, except on the ground of dangerous illness.

CONCLUSION, *kon-klu'-zhun* (Lat. *conclusio*), in Log., is that proposition which is inferred from certain preceding propositions, called the premises of an argument.

CONCORD, *kon'-kord* (Lat. *concordia*, Fr. *concorde*), in Mus., is the union of one or more musical sounds, which, by harmonizing and agreeing together, produce an agreeable effect upon the ear. When any two single sounds bear so much relation to one another that, on being sounded together, they make a compound sound, that relation is called *concord*. Concords are of two kinds, —perfect and imperfect. Perfect concords consist of the fifth and eighth, and imperfect concords of the third and sixth. These last have another distinction,—that of the greater and lesser third and sixth. Concords are again divided into consonant and dissonant. The consonant concords are the *perfect concords* and their derivatives; every other is dissonant. This term is also often applied to voices or instruments, with respect to their tuning; as, for instance, we say, "That instrument is not in concord," or not "in tune." "Those voices do not harmonize and agree."

CONCORDANCE, *kon-kor'-dans* (Lat.), "is a dictionary or index of all the important words in the Bible alphabetically arranged, for the purpose of finding passages, and of comparing the various significations of words." The importance of a work of this kind was early perceived; and the first work of the kind in any language was the concordance of Hugo de St. Caro, about the middle of the 13th century. By far the most complete and valuable concordance to the English Bible is that by Alexander Cruden, the first edition of which was published in 4to, 1737, and which has since passed through numerous editions. Perhaps the best concordance to the Hebrew text is that of J. Fürst, entitled "Concordantiæ Librorum Sacrorum Veteris Testamenti Hebraicæ et Chaldaicæ" (Leipsic, 1837-40). The most recent concordances to the Greek New Testament is that of C. H. Bruder, "Omnium Vocum Novi Testamenti Græci," 4to (Leipsic, 1843). The term has also come to be applied to works of a similar nature, of other books; as the "Concordance to Shakspeare," by Mrs. Cowden Clarke (London, 1847).—For further information on this subject see Watts's *Bibliotheca Britannica*; Orme's *Bibliotheca Biblica*; Darling's *Cyclopædia Bibliographica*; the *English Cyclopædia*, art. *Concordance*.

CONCORDAT, *kon-kor'-dăt* (Lat.), is the name given to a formal agreement entered into between the pope, as head of the Roman Catholic church, and the temporal ruler of a state, regarding ecclesiastical affairs within that state. These usually regard the right of appointing to vacant sees and benefices, the right to the revenues of vacant sees and livings, and the obtaining certain immunities for the clergy; as exemption from taxation, secular jurisdiction, &c. These have formed subjects of frequent dispute between the popes and the several states of Europe, and have given occasion to concordats settling the rights of each party in any particular state. Most of the concordats have been extorted from the popes, and have been, more or less, concessions of what the Church claims as her rights to the civil power. One of the most important of the earlier concordats was that of Worms, made in 1122, between Pope Calixtus II. and the emperor Henry V. of Germany, which has since been considered as a fundamental law as regards the relations between the Church and the State in Germany. Sometimes, however, the popes succeeded in concluding concordats to their advantage; but since the middle of the 18th century, the Church has been obliged to resign by concordats many important privileges. One of the most remarkable of the later of these was that extorted by Napoleon, in 1801, from Pope Pius VII. By it the French government obtained the right to appoint the clergy; the clergy became subject, in civil matters, to the temporal power, and all immunities were abolished. But the most remarkable concordat of modern times is that which was entered into between the pope and the emperor of Austria in 1855. By it the papal power was widely extended over all the Austrian dominions, and greater privileges conceded to it than had ever before been granted by any German sovereign. By it not only has the Church sole power in ecclesiastical matters, independent of the State, but all institutions for educational purposes are under its control; and it has the power of preventing the dissemination of works of a dangerous character.

CONCRETE, *kon'-krete* (Lat. *concrescere*, to grow together), an artificial conglomerate (*see* CONGLOMERATE), formed by mixing hydraulic lime, water, sand, and shingle, or screened ballast, together. Hydraulic lime is made from argillaceous limestone, which, when burnt, absorbs water very slowly, without swelling, and throws out much heat. (*See* LIME.) In making concrete, about one part of lime is used to nine parts of shingle, and, as hydraulic mortar hardens very quickly when the lime has absorbed as much water as is necessary for its crystallisation, these materials are mixed together before the water is added. When the whole has been thoroughly mingled, it is put, while it is still soft, in the position in which it is required for the artificial foundations of houses, the piers of bridges, &c., and allowed to harden. Concrete is quite impervious to damp, and is therefore well calculated for the foundations and floorings of the basements of buildings built on a damp subsoil, the moisture of which would soon penetrate through brickwork or flagstones.

CONCRETE, in Log., is a term employed in opposition to abstract, and is applied to a notion of an object as it exists in nature, invested with all its qualities and properties. Abstract, on the other hand, is applied to a notion of a particular property or quality, or an object thought of independently and apart from the object itself. Thus, a *just man* is a concrete notion, but *justice* is an abstract idea.

CONCRETIONS, *kon-kre'-shuns*, in Med., are hard substances that occasionally make their appearance in different parts of the human body. (*See* CALCULUS.)

CONCUBINAGE, *kon-ku'-bin-aj* (Lat.), is the cohabitation of a man with a woman to whom he is not legally united by marriage. In early times this was a common practice; and men of means had frequently, besides several wives, a number of concubines, as we read of in the Old Testament. The latter did not enjoy the same rights as a wife, and could be repudiated and dismissed at any time. Both among the Greeks and Romans concubinage was allowed; but it was not legally sanctioned amongst the latter until the time of Augustus. By the Lex Julia and the Lex Papia Poppæa concubinage was legally permitted to unmarried men; but not more than one concubine was allowed, and she must be a person of mean descent,—an actress or the like. The children were not considered as legitimate, but were called *natural*, and the right of inheritance was very much limited. With the introduction of Christianity concubinage ceased, and Constantine the Great made laws against it. In all Christian countries it is now considered unlawful; yet

there exists in Germany a peculiar kind of institution under the name of half-marriage, or left-hand marriage, in allusion to the manner of its being contracted, the man giving the woman his left hand instead of his right. It is a real marriage so far as the parties are bound to each other for life; but the woman cannot bear the husband's name or title, neither can her children succeed to his property. The common law of Germany permits this kind of marriage to princes and the nobility.

CONCUSSION, *kon-kus'-shun* (Lat. *concutio*, a shaking together), in Med., is applied to a violent commotion or shock communicated to the brain, or the whole nervous system, by collision of the body with some external object. In its slightest form, a stunning sensation is merely communicated, which passes away in a few minutes; in its severest form, death rapidly ensues. In the severer cases the patient becomes immediately pale and insensible; the breathing sometimes natural, but frequently slow and feeble; the pupil rather contracted; the pulse usually slow and weak, but sometimes natural; the extremities become cold, the secretions are suspended, and there is frequently nausea and vomiting. In the treatment of concussion great caution is necessary. The patient at first should be kept warm in bed till consciousness is restored, when wine or other stimulants may be cautiously administered. If he seem to be sinking, stimulants should be at once had recourse to; but so long as he remains stationary, no active means should be employed. Here, as in all other serious cases, our object is not to supersede the employment of a medical man, but merely to point out the best course to be followed till such a one can be called.

CONDENSATION, *kon-den-sa'-shun* (Lat. *con*, together; *densus*, close), the rendering of a body more compact, denser, or of more specific gravity, by causing its particles to come into closer contact. The term is usually applied to the process of converting a vapour into a fluid by distillation or some other method.

CONDENSER, *kon-den'-ser* (Lat. *condenso*, I make thick), a term used to denote any apparatus used for cooling heated vapours and reducing them to a liquid form. In ordinary distillation, the wormtub is the condenser most generally adopted. It consists of a spiral tube, which passes through a tub constantly filled with cold water. The vapour enters the tube at the top, and being condensed in its passage, runs out as liquid at the bottom. The condenser of a steam-engine is that part attached to the cylinder where the steam is condensed. The pneumatic condenser is a syringe worked on the same principle as the force-pump, by which a large quantity of air can be forced into a given space.

CONDENSING STEAM-ENGINE. (*See* STEAM-ENGINE.)

CONDITION, *kon-dish'-un*, is a restraint annexed to a thing, so that by the nonperformance the party to it shall receive prejudice and loss, and by the performance, commodity and advantage; or it is a restriction of an act, qualifying or suspending it, and making it uncertain whether it shall take effect or not; also it is defined to be what is referred to an uncertain chance which may happen or not happen. There are conditions of divers kinds; viz. *conditions in deed* and *in law*, *conditions precedent* and *subsequent*, *conditions inherent* and *collateral*, &c. A *condition in deed* is that which is joined by express words in a lease or other grant; as, if a man makes a lease of lands to another, reserving a rent to be paid at a certain day, with a proviso or condition that, in default of payment, the lessor may re-enter.—*Condition in law*, or *implied*, is when a person grants another an office; as that of keeper of a park, steward, &c., for term of life. Here, although there be no condition expressed in the grant, yet the law makes one, which is, if the grantee do not justly execute all things belonging to the office, it shall be lawful for the grantor to enter and discharge him of his office.—*Condition precedent* is when a lease or estate is granted to one for life, upon condition, that if the lessee *pay* to the lessor a certain sum at such a day, then he shall have the fee-simple. In this case, the condition precedes the estate in fee, and on performance thereof gains the fee-simple. The same rule applies to all cases where something is to be performed antecedently to an event taking place.—*Condition subsequent* is when a man grants to another his manor of dale in fee, upon condition that the grantee shall pay to him at such a day such a certain sum, or that his estate shall cease. Here the condition is subsequent and following the estate, and upon the performance thereof continues the estate by the performance of the condition.—*Inherent conditions* are such as descend to the heir, with the land granted, &c.—A *collateral condition* is that which is annexed to any collateral act. Conditions are likewise *affirmative*, which consist of doing; *negative*, and consist of not doing. Some are further said to be *restrictive*, for not doing a thing; and some *compulsory*; as that the lessee shall pay rent, &c. Also some are *single*, to do one thing only; some *copulative*, to do divers things; and others *disjunctive*, where one thing of several is required to be done.

CONDITIONAL FEE. (*See* FEE.)

CONDITIONED, PHILOSOPHY OF THE, *kon-dish'-und*, a phrase introduced by Sir William Hamilton to denote the limited region of knowledge open or accessible to the human mind. "The conditioned," he says, "is that which is alone conceivable or cogitable; the unconditioned, that which is inconceivable or incogitable. The conditioned, or thinkable, lies between two extremes, or poles; and these extremes, or poles, are each of them unconditioned, each of them inconceivable, each of them exclusive or contradictory of the other. Of these two repugnant opposites, the one is that of unconditional or absolute limitation; the other, that of unconditional or infinite illimitation." The infinite and the absolute, properly so called, he holds to be equally inconceivable to us. "We must believe in the infinity of God; but the infinite God cannot by us, in the present limitation of our faculties, be comprehended or conceived. A Deity understood would be no Deity at all; and it is blasphemy to say that God only is as we are able to think him to be. We know God according to the finitude of our faculties; but we believe much that we are incompetent to know."—*Ref.* Hamilton's *Lectures and Discussions*; Mansel's *Bampton Lectures*.

CONDOR, *kon'-dor* (*Sarcorampus gryphus*), a large bird of the Vulture species. It is almost strictly confined to the immense chain of the Andes, as is called the vast mountain-range that runs along the whole west coast of South America. Humboldt, who, with his companion Bonpland, passed a considerable period in these regions, and lost no opportunity of observing the condor and making the strictest inquiries concerning its habits, was enabled to clear away much of the mystery that had hitherto attached to the bird. Previously it was regarded as a bird of such monstrous proportions, that in its flight it cast a shadow on the earth like a big cloud, and as so ferocious as to snatch up and bear off infants, kids, and lambs in an instant. Humboldt, however, found the little children of the Indians sleeping in the open air, while their parents were away gathering snow to sell in the neighbouring towns; and at least half a dozen condors were in sight, hovering aloft and perched on the neighbouring heights. To all his inquiries on the subject, he was answered that a single case of child-stealing by these big birds was unknown. Yet that this arises from no lack of courage on the part of the condor is certain, for, as Humboldt was informed, two of them will even attack a heifer, pursuing it for miles, and wounding it with their beaks and talons. Gradually the poor animal will relax its speed, and from sheer exhaustion and thirst loll its tongue. Now is the condor's time. In an instant it darts at the tongue, and maintains so cruel a grip, that by-and-by the heifer sinks to the ground at the mercy of its enemies. The above-named renowned traveller also mentions an astonishing instance of vitality displayed by a condor which some Indians at Riobombe had taken alive. They first strangled it with a lasso and hanged it to a tree, pulling it forcibly by the feet for several minutes; yet scarcely was the lasso removed when the bird arose and walked about as though nothing was the matter. Three balls were then discharged from a pistol at less than four paces, all of which entered its body, and wounded it in the neck, chest, and abdomen. It still, however, kept its legs. Another ball then struck its thigh; but, though it fell to the ground, it did not die of its wounds for half an hour afterwards. The condor builds no nest, but lays

its eggs, which are three or four inches in length, and perfectly white, on the bare rocks. Broderip relates that he saw an egg laid by one of the pair confined in the Zoological Gardens. It was on the bare naked floor of the prison. There was no appearance of a nest of any kind. The hen condor does not appear to have exhibited any inclination to sit on her egg, so the next one that was laid was put under a Dorking fowl. The result was successful; but the issue, a male condor, only lived three weeks.

CONDOTTIERI, *kon-dot-te-air'-e*, an Italian word, signifying captains, chiefs, or leaders, but generally employed to designate soldiers of fortune, who raised troops of cavalry and infantry at their own expense, and engaged their services as mercenaries with governments or princes. They were numerous in the 14th and 15th centuries in the Italian wars. Sir John Hawkwood, an Englishman, was one of the earliest and most famous in Italy about the reign of Edward III. The troops under the command of the condottieri were well armed and equipped. In many cases the leaders had considerable military skill, but as their bands only fought for hire, the chief endeavour was not to slaughter but to take prisoners and obtain ransoms. The invasion of Italy by the French, under Charles VIII., put an end to these bloodless fights, by bringing more serious warfare on the field. Although many condottieri obtained great honour and wealth, only one attained high rank,—Francesco Sforza, originally a peasant. In 1451 he constituted himself duke of Milan, and transmitted the sovereignty to his descendants. (*See* SFORZA, vol. I. of this work.)

CONDUCTOR (from Sp. *conduir*, to lead), in Mus., one who superintends everything connected with a concert, and who also directs the performance of a band or orchestra. His duties are extremely onerous, as they do not consist only (as some people imagine) in the use of his *bâton*, or in his performance, either as a soloist or accompanist. Indeed, any person who wishes to become a good conductor must possess such a variety of qualities that are rarely found in one man. Some of these qualities we have enumerated below:—1. It is absolutely necessary that he who wishes to succeed as a conductor must be a composer in the full acceptation of the term. 2. He must possess a knowledge of the world as well as of music, and unite great firmness with a strong determination of purpose. 3. He must have a theoretical as well as a practical knowledge of every piece performed. 4. He must have a quick ear, rendered in the highest degree acute by culture, in order to enable him to detect the slightest error at rehearsal. 5. He must be endowed with a most delicate perception of the measure of time and the play of rhythms, so that he may indicate the *tempos* with accurate division and decision; he must not beat time like a machine, nor yet in so extravagant or violent a manner as to divert the attention of the audience from the music to the eccentric gyrations of his spasmodic *bâton*. 6. He must also be able to accompany, at the shortest notice, on the pianoforte, all kinds of pieces in all kinds of keys, in order to suit the different singers. All this, and much more, is required of a person who aspires to the important office of musical conductor.

CONDUCTORS AND NON-CONDUCTORS OF ELECTRICITY, *kon-dukt'-ors*, terms applied to substances according to whether they receive and communicate electricity readily or not. When a rod of metal is made to touch the prime conductor of an electric machine after it has been charged, all the electricity passes through the rod and through the body of the experimenter into the ground. The metal in this case is said to be a conductor. If, however, a rod composed of glass or shell-lac is used, the electricity will not be carried off. In this case the glass or shell-lac is said to be a non-conductor. All substances conduct electricity in the same manner from metals to ice and gases, but in different degrees; and the term non-conductor only signifies that the substance has a very low power of conducting. In frictional electricity, the best conductors are the metals; after which come graphite, sea-water, spring-water, and rain-water. Ice is a worse conductor than fluid water. Alcohol, ether, paper, dry wood, and straw are also inferior conductors. Among the substances reckoned as non-conductors are shell-lac, amber, resin, sulphur, glass, silk, wool, hair, feathers, &c. In galvanic electricity the substances that are found to conduct frictional electricity in a feeble manner are almost, if not altogether, non-conductors; and the metals which are nearly alike in conveying frictional electricity differ widely in their powers of conveying that obtained from the galvanic battery. When heated, the conducting power of metals is weakened; but in nearly all other substances the effect of heat is to increase the power of conduction. Shell-lac, wax, amber, and sulphur become conductors when fused; and glass conducts readily at a red heat. A conductor is said to be insulated when it rests upon non-conducting supports. In electrical apparatus glass is the non-conductor most employed. It requires to be kept very dry, as any moisture on its surface weakens its insulating power. The discovery of the identity of lightning and electricity has not been without its practical results; amongst which may be reckoned the application of *lightning conductors* to buildings and ships. For buildings, Franklin's original proposition is that generally adopted. It consists in erecting a continuous metallic rod by the side of any building. The rod is pointed at each end, and extended above the highest part of the place to be protected at one extremity, the other penetrating deep into the earth, or in contact with water. The highest point of the rod is generally made of copper, which does not rust. Iron points are very liable to acquire a coating of rust, which is a non-conductor, and diminishes their efficacy. The best conductors for ships are the fixed conductors recommended by Sir W. Snow Harris.

CONDUIT, *kon'-dit* (Fr. *conduit*; Lat. *conducere*, to lead along), the name more especially given to any small artificial channel or watercourse, by which water is led along from one place to another. When the conduit is large enough to allow the passage of barges throughout its length, it is called a canal. (*See* CANAL.) The name was also formerly given to plain or ornamental buildings, similar to the drinking-fountains of the present day, and provided with taps or open pipes, whence water could always be procured. Conduits may be open or closed; when open, they are often called "leats," and the mode of structure adopted is the form used for cutting canals. When closed, they are generally made of brickwork, and circular in shape, or flat at the bottom, with an arched covering above. In constructing a close conduit for the conveyance of water for drinking, care should be taken to make the brickwork impermeable to water, that no impurities may make their way through, and affect the water.

CONDYLURA, *kon-di-lu'-ra* (*Condylura cristata*), a small insectivorous animal of mole-like appearance, found in North America. It is about four inches and a half long from nose to rump, and has a bushy tail more than three inches long. Its head is remarkably large, body thick and short, and nose rather thick, and projecting beyond the mouth. At the end of the nose is a flat star-like process composed of seventeen cartilaginous points. These animals do not make such hills as the European moles, but only little subterraneous walks in the fields, forming banks about four inches broad by two inches thick, and which give way when trod on.

CONE, *kone* (Fr. *cone*, Gr. *konos*), in Bot., a collective more or less elongated fruit, composed of a number of indurated scales, each of which bears one or more naked seeds. The fruit is seen in the fir, larch, spruce, araucaria, and many other plants of the nat. ord. *Coniferæ*. A peculiar modification of the cone is seen in the cypress and in the juniper, and is termed the *Galbulus*. It differs from the true cone in being more or less rounded in form, and in having the heads of the scales greatly



CONE AND GALBULUS.

enlarged. In the galbulus of the juniper the scales are fleshy, and are united together into one mass, so that it resembles at first sight a berry. The figures represent the fruits of the Scotch fir (*Pinus sylvestris*) and the cypress (*Cupressus sempervirens*).

CONE, in Geom., denotes a solid body, which terminates in a point and has a circle for its base. The axis of a cone is a straight line drawn from the apex to the centre of the circle forming the base. When the axis is perpendicular to the plane of the base, the cone is said to be *right*; and when the axis is inclined to the plane of the base, the cone is said to be *oblique*. A *truncated* cone is the lower part of a cone cut by a plane parallel to the base. The area or surface of a right cone, exclusive of the base, is equal to a triangle, the base of which is the periphery, and its height the slant side of the cone, or equal to the sector of a circle whose radius is the slant side, and its arc equal to the circumference of the base of the cone. Every cone, whether right or oblique, is equal to one-third part of a cylinder of equal base and altitude: the solid contents are therefore found by multiplying the base by the altitude, and taking one-third of the product. The centre of gravity of a cone is in the axis, at a distance from the centre of the base equal to one fourth the distance from the vertex. (*See* CONIC SECTIONS.)

CONFEDERACY, *kon-fed'-er-a-se* (Lat. *con*, together; *fœdus*, a league), a term in politics signifying an alliance of independent states for a common object. It is sometimes employed, but less properly, to the alliance of individuals.

CONFEDERACY, in Law. (*See* CONSPIRACY.)

CONFEDERATION OF THE RHINE, *kon-fed-er-ai'-shun*.—During the war between France and Austria, in 1805, several German princes, feeling that they were too weak to remain neutral, were compelled to ally themselves with France. The next year the archchancellor announced at the diet that Cardinal Fesch, the uncle of Napoleon, had been appointed as his coadjutor. This proceeding was entirely at variance with the German constitution; but the same year sixteen German princes formally signed an act of confederation, in which they declared that their connection with the Germanic empire was dissolved, and that henceforth they were allied with France. They at the same time tried to justify the course they had taken by pointing out the evils and weaknesses of the Germanic government. Bacher, the French ambassador, at the same time declared that Napoleon no longer recognized the German empire. Several other princes joined the Confederation of the Rhine, as it was called, during the next two years; and at the close of 1806, a territory, with an area of 122,336 square miles, was under the protectorate of the French emperor. The terrible reverses sustained by the army of France seemed to lift a heavy burden from the German nation, and in the year 1813 they rose and threw from them the degrading yoke which they had been compelled to bear.

CONFEDERATION, THE GERMANIC, *kon-fed-er-ai'-shun*, the federal union of the sovereign princes and the free towns of Germany. It was formed at the congress of Vienna in 1815, and was framed to supply the want of the ancient imperial government dissolved in 1806. As originally settled, Germany was divided into forty sovereign states, or portions of states, but the number is now reduced to thirty-five. The diet is formed by plenipotentiaries, and is permanent; it forms the representative body of the league, and sits at Frankfort-on-the-Maine. When the confederation meets as a general assembly, six of the states—Austria, Prussia, Bavaria, Saxony, Hanover, and Wurtemburg—have four votes each; five other states, three each; four, two; and the rest one. In the formation of fundamental laws, admission of new members into the confederacy, and on religious questions, unanimity is required. The votes in the ordinary assembly are so apportioned as only to make seventeen in all, as it would be manifestly unfair if the votes of the smaller states were of equal force with those of the greater. The ordinary diet manages the general affairs of the confederation. Austria presides in both diets; but each state may offer its propositions, and the president is obliged to bring them forward for deliberation. The confederation has also at its disposal, in terms of the federal act, a large army, the peace establishment of which consists of 120,000 men. In case of war, the states are bound to furnish troops to the field in the proportion of one in the hundred of the population.

CONFERVOIDÆ, *kon-fer'-voy-de*, in Bot., a sub-ord. of the *Algæ* (which *see*).

CONFESSION, *kon-fes'-shun* (Lat. *confiteor*, I acknowledge), in Theol., is the verbal acknowledgment which a penitent makes of his sins to God or to a fellow-creature. Among the Jews, it was the custom on the annual feast of expiation for the high priest to make confession of sins to God, in the name of the whole people. Besides this general confession, the Jews were enjoined, if their sins were a breach of the first table of the law, to make confession of them to God; but violations of the second table were to be acknowledged to their brethren. Confession seems to have been early introduced into the Christian church; but at first it took place openly, and was chiefly in the case of such as had apostatized themselves or been guilty of any flagrant offence, and were desirous of being readmitted into the Church. The practice of private or auricular confession seems to have gradually crept in about the 5th century; and Innocent III., in the fourth Lateran council (1215), made it obligatory on every adult person to confess his sins to a priest at least once a year. The person confessing is allowed to conceal no sin,—at least no mortal sin,—that he remembers to have committed and not to have already confessed, and the father confessor is bound to perpetual secrecy. Confession obtains also in the Lutheran church, but with this difference, that while in the former case it is obligatory, it is here only recommended as a means by which a contrite sinner may obtain advice and consolation.

CONFESSION, in Law, is where a prisoner indicted of an offence, and brought to the bar to be arraigned, upon the indictment being read to him, and the court demanding what he can say thereto, he confesses the offence and the indictment to be true. Confession, in civil cases, is where the defendant confesses the plaintiff's right, or, in prosecutions under penal statutes, by which confession there may be a mitigation of a fine against the penalty of a statute, though not after a verdict.

CONFESSION OF FAITH, is a formulary detailing the articles of faith held by any particular church. The most ancient of these are what are known as the Apostles', Nicene, and Athanasian creeds. The Church of Rome, while receiving these, had no fixed and authoritative confession till the council of Trent. A summary of the doctrines contained in the canons of that council is given in the creed published by Pius IV. (1561) in the form of a bull. The numerous other confessions will be found noticed under their respective heads, or under the names of the different sects to which they belong, in other parts of this work.

CONFIRMATION, *kon-fir-mai'-shun* (Lat. *confirmatio*, strengthening), in an ecclesiastical sense, denotes the ceremony of laying on of hands in the admission of baptized persons to the enjoyment of church privileges. In the early Church, this ceremony appears to have been performed immediately after baptism; but afterwards a delay of about seven years came to be interposed after infant baptism. The present practice in the Church of England is to delay it until about the fifteenth or sixteenth year. The person confirmed releases his godfather and godmother of their obligations by taking upon himself the baptismal vows in their place.

CONFIRMATION ordinarily denotes an affirmative deed of conveyance at the common law, whereby an estate or right which is voidable is made sure and unavoidable, or a particular state is increased, or a possession made perfect; and it is a strengthening of an estate formerly made which is voidable, though not presently void; as, for example, a bishop grants his chancellorship by patent for a term of the patentee's life. This is no void grant, but voidable by the bishop's death, except it be strengthened by the confirmation of the dean and chapter.

CONFISCATION, *kon-fis-kai'-shun*, from Lat. *confiscare*, and that from *fiscus*, which signifies, metonymically, the emperor's treasure; and as the Romans say such goods are forfeited to the emperor's treasury for any

offence,—are *bona confiscata*, so we say of those which are forfeited to our crown, or the queen's exchequer, for any offence which causes or works a forfeiture.

CONGÉ D'ELIRE, *kon(g)'-zhay da(r) leer'* (Fr., leave to choose), is the king's license or permission sent to a dean and chapter to choose or elect a new bishop when a bishopric becomes vacant.

CONGELATION, *kon-jel-a'-shun* (Lat. *congelo*, I freeze), the process of passing from a fluid to a solid state, whether through the effect of pressure or the lowering of the temperature. Until lately, the latter cause was held to be the chief reason of congelation. It is now very apparent that temperature is only one element. Water may be cooled many degrees below 32° Fahr., and yet retain its liquid state. (*See* ICE.)

CONGER EEL, *kong'-gur* (Lat. *anguilla conger*).—This fish may easily be distinguished from the fresh-water species by the upper jaw being the longest, and the dorsal fin commencing much nearer the head. On account of this difference, Cuvier separated them from the rest as a sub-gen. It is darker on the upper parts than the common eel, and brighter beneath. It attains a very large size, weighing occasionally from seventy to a hundred pounds, and measuring six and eight feet in length. The principal conger-fishery is on the Cornish coast. The fishing takes place at night (the darker the more chance of success), and the ordinary bait is a pilchard. "It is dreadfully voracious," says Mr. Couch; "it spares not even its own species. From the stomach of a specimen weighing twenty-five pounds I took three common dabs, and a young conger of three feet in length. The power of jaw in this fish is very great; in the stomach of small specimens examined on the coast I have found the young testaceous coverings of our shell-fish comminuted into fragments. They are often tempted by the crustaces entrapped in the lobster-pots to enter these decoys in order to feed on them, and are thus frequently captured."

CONGESTION, *kon-jest'-shun* (Lat. *congestio*, from *congero*, I amass), is a term employed in Med. to denote an unnatural accumulation of blood in the capillary vessels of any part, accompanied with disordered function of the organ in which such accumulation takes place. The organs most liable to congestion are the brain, lungs, and liver; but other parts are also subject to it. It is usual to distinguish two kinds of congestion,—a passive and an active. In passive or simple congestion there is merely an accumulation of blood arising from distension and diminished vital energy in the capillaries; in active congestion, on the other hand, the blood-vessels are in a state of inordinate activity, and a preternatural quantity of blood is determined to them. Anything may be the cause of congestion which diminishes the vital energy of the capillaries, or which increases the quantity of blood which they contain. (*See* INFLAMMATION.)

CONGLOMERATE, *kon-glom'-e-rait* (Lat. *con*, together; *glomerare*, to gather in round heaps), in Geol, a rock composed of rounded and water-worn fragments of stone, bound or cemented together by silicious, ferruginous, or calcareous matter. The component fragments may vary from pebbles the size of a pea to boulders half a ton in weight. Some conglomerates are commonly known as *pudding-stones*, from the resemblance of the pebbles in the mass to the fruit in a plum-pudding.

CONGREGATION, *kon-gre-gai'-shun* (Lat. *con*, and *grex*, a flock), commonly signifies an assembly of persons met together for the purpose of religious worship. In the Roman Catholic church it is applied to certain boards of cardinals, prelates, and others intrusted with the management of particular branches of the affairs of the Church. There are twenty-one of these congregations, fifteen for spiritual and six for temporal purposes; the chief of them being the Congregation de Propaganda Fide, for consulting as to the advancement of the Catholic religion throughout the world; the Congregation of the Index, for examining books, and deciding upon their fitness for general perusal; the Congregation of Sacred Rites, for regulating all matters relating to ceremonies and rites in worship; the Congregation of Relics, for inquiring into the genuineness of sacred relics; the Congregation of the Holy Office, or Inquisition, for taking cognizance of heresies and all novel opinions; the Congregation of Religious Discipline; and the Consistorial Congregation. These congregations act as a check to the power of the pope; for, though their proceedings are usually sanctioned by him, he cannot put a veto upon them without weighty reasons. A company of monks or religious persons, forming a subdivision of an order, is also called in the Church of Rome a congregation. "The Congregation of the Lord" was a title assumed by the first Scotch Presbyterian reformers, in contradistinction to the Church of England, which they called the "Congregation of Satan." They appeared first in 1557 under the duke of Argyle, and at a later period were led by John Knox.

CONGREGATIONALISTS. (*See* INDEPENDENTS.)

CONGRESS, *kon'-gress* (Lat. *congressus*), a meeting of the rulers or representatives of different states, for the purpose of considering matters of international interest. Although the term is not used in this sense at the present time in America, it originally had this signification. The first congress held in America was a meeting of the delegates of the various British colonies, to consider their grievances, in 1765. Before a treaty of peace is signed, there is usually a meeting of plenipotentiaries, which is called a congress. The term is, however, more strictly applied to those great diplomatic conferences where extensive schemes of future policy are determined upon. The congress of Vienna, held in 1815, at the conclusion of the great war, is one of the most famous, and also the congress of Carlsbad, held in 1819, for regulating the affairs of Germany; the congress of Paris, held in the year 1856, at the conclusion of the Crimean war, had for its purpose the consideration of the relations between Russia and Turkey. It is the most important congress of the present day. The national legislature of the North American states is called the Congress in the constitution of the general government. It consists of a Senate and a House of Representatives, each constituting a distinct and separate branch. The term congress has also been applied in late years to any philanthropical meeting on a large scale, in which the representatives of different nations have appeared; such as the Peace Congress, the Social Science Congress.

CONGRUITY, *kong-gru'-e-te* (Lat. *congruo*, I come together, correspond, or agree), denotes a suitableness or relation of agreement between different things. Congruity, wherever it is perceived, is agreeable, and is so nearly allied to beauty as to be commonly regarded as a species of it. It is difficult to define what the nature of this relationship is, or to ascertain what are the particular objects which, taken in conjunction, manifest congruity; for there are many objects that suggest neither congruity nor incongruity. Incongruity, on the other hand, is an unsuitableness between different things, and is disagreeable.

CONIC SECTIONS, *kon'-ik sek'-shuns*, the curves formed by the intersection of a right or oblique cone and a plane. If the cone is cut by a plane parallel to the base, the section is a *circle*; if the section is made obliquely, that is, nearer to the base at one end than the other, a curve is obtained which is called an *ellipse*; if the section is made parallel with the axis, perpendicular from the vertex, or so as to make a greater angle with the base than is made by the side of the cone, the curve obtained is called a *hyperbola*; and if the section is made parallel with one side of the cone, the curve is called a *parabola*. The ancient Greeks investigated the properties of conic sections with great acuteness; and a work on them is still extant, written by Apollonius of Perge.

CONIFERÆ, *ko-nif'-e-re* (Gr. *konos*, a cone; Lat. *fero*, I bear), in Bot., the Pine fam., a nat. ord. of dicotyledonous plants, in the division *Gymnospermia*,—resinous trees, or evergreen shrubs, with branched continuous stems. The leaves are needle-shaped or lanceolate, parallel-veined, fascicled, or imbricate. The flowers are naked (without floral envelopes), and monœcious or dioecious, the male flowers being arranged in deciduous aments, and the female flowers in cones. The fruit is either a cone or a galbulus. The seeds are naked, hard externally, and albuminous, with two or many cotyledons. The plants of this order abound in temperate climates, and also occur in cold and tropical regions. There are about 30 genera, which include about 120 known species.

They possess very important properties; many supply valuable timber, and most of the species contain an oleo-resinous juice, or turpentine, which is composed of a volatile oil and resin. (*See* Abies, Pinus, Juniperus, Cedrus.)

Conium, *ko'-ne-um*, in Bot., the Hemlock, a gen. of plants belonging to the nat. ord. *Umbelliferæ*. The most important species is *C. maculatum*, an indigenous plant, which is extensively employed in medicine to relieve pain, relax spasm, and compose general nervous irritation. It owes its properties chiefly to the presence of a colourless oily liquid, with a penetrating mouse-like odour, to which the name of *Conia* has been given. In improper doses hemlock is a powerful poison, and many fatal accidents have arisen from its having been mistaken for harmless umbelliferous plants; it may, however, be readily distinguished by its botanical characters. The stem is large, round, and smooth, with spots upon it of a purplish-black colour; the leaves are dark green, and shining; the general involucre consists of from three to seven leaflets, the partial involucre of three leaflets; the fruit has undulated, crenated primary ridges, and contains no *vittæ*; and the whole herb, when bruised, evolves a disagreeable smell, which has been likened by some to that of mice, and by others to that of cat's urine. No chemical antidote is known for hemlock.

Conjugal Rights, *kon'-ju-gal* (Lat. *con*, and *jugo*, I yoke).—A suit for restitution of *conjugal rights* is a species of matrimonial causes, and is brought in the Court of Divorce whenever either the husband or wife is guilty of the injury of subtraction, or lives separate from the other without any sufficient reason.

Conjugation, *kon-ju-gai'-shun*, in Gram., is a regular distribution of the several inflections of verbs into their different voices, moods, tenses, numbers, and persons. (*See* Verb and Grammar.)

Conjunction, *kon-junk'-shun* (Lat. *conjungere*, to join together), in Astron., when two heavenly bodies have the same longitude or right ascension (*see* Ascension, Right), they are said to be in conjunction. If they also had the same declination, or latitude, north or south of the celestial equator, the nearer heavenly body would apparently cover the disk of that which is more remote. When any heavenly body is in a line between the earth and the sun, it is said to be in conjunction with the latter; but it is said to be in opposition to it when the earth comes between the body in question and the sun. Geocentric conjunction is the conjunction of two heavenly bodies as viewed from the earth; but when heliocentric conjunction is spoken of, the conjunction is understood to be considered as if viewed from the sun. True conjunction is the observation at the earth's surface reduced to what it would be if witnessed from the centre of the earth.

Conjunction, in Gram., is an indeclinable word or particle which serves to unite words, sentences, or clauses of a sentence, and to show their relationship or dependence upon one another. There are two kinds of conjunctions,—the conjunctive and the disjunctive; as, Peter *and* John, James *or* Robert.

Conjuration, *kon-ju-rai'-shun* (Lat. *con*, and *juro*, I swear), is the act of using certain words or ceremonies to obtain the aid of a superior being, more particularly applied to the magical words, characters, or ceremonies, by means of which evil spirits, tempests, &c., are said to be raised or driven away. The Romish priests formerly affirmed that they could expel devils by holy water prepared in a particular manner, and sprinkled over the possessed person, with a number of conjurations and exorcisms. According to some authors, the difference between conjuration and witchcraft is, that in the former case the effect is accomplished by prayers and invocation of God's name; whereas in the latter it is brought about by supplicating the aid of the devil.

Connoisseur, *kon-noy-sure'* (Fr. *connoisseur*, from Lat. *cognoscere*, to know), a person who is skilled in any subject, and particularly one who is well fitted to judge of the merits of paintings and sculpture, from possessing a critical knowledge of works of art. It may be considered as equivalent to the vulgar term "knowing one" used on the turf. In the Italian, such a person is termed *conoscente*.

Conquest, The, *kong'-kwest*, in Hist., is the name given to the invasion of England by William of Normandy, who, having overcome Harold II. at the battle of Hastings (15th Oct. 1066), obtained the crown of England, and became the founder of the Norman dynasty.

Consanguinity, or Kindred, *kon-san-gwin'-e-te* (Lat. *consanguinitas*), is the connection or relation of persons descended from the same stock or common ancestor. (*See* Collateral Consanguinity, and Lineal.)

Conscience, *kon'-shens* (Gr. *suneidesis*, Lat. *conscientia*, Fr. *conscience*, Ger. *gewissen*), is a term applied to the moral nature of man in general. According to its ancient usage among the Latins, the word *conscientia* was primarily applied to being privy to, together with another; and in its secondary meaning it bore a moral signification, or knowledge of one's own conduct, whether right or wrong. The modern use of the word is more extensive in its sense, denoting not only what the Latin moralists signified by it, not only the sense of the difference between right and wrong in our own and others' conduct, but containing likewise the important element of the feeling of human responsibility. Thus conscience, as it is at present accepted, is not only applied to the moral judgment which accompanies all moral actions, as to whether they are right or wrong, but it denotes, besides, that feeling of approbation or disapprobation, of rectitude or contrition, which invariably accompanies all moral actions. Thus a judgment and an emotion lie at the root of what is known as the conscience; for not only are men accustomed to say, "My conscience cannot approve of such and such conduct," but they likewise own to being disturbed by certain "qualms of conscience" on occasion of any violation of rectitude either in their own or in others' experience. Thus conscience and the moral faculty mean almost the same thing; although the former, as it is unquestionably the more ancient term, so it seems to be the one which is ordinarily employed in common conversation instead of its heavier and more learned rivals of the moral sense, the moral nature, and so forth. Nearly all writers are agreed as to the existence of some sort of a conscience in human nature, whether or not they are prepared to subscribe to the moral faculties, and moral senses, and moral natures of other writers. Thus Adam Smith, who is a strong advocate for sympathy, as the ultimate explanation of our moral nature, is loud in his proclamation of the existence of conscience. Sympathy, indeed, is with him the ultimate resolution which he gives to the popular conscience. And Dugald Stewart deplores the employment of such metaphorical language as "this man in the breast," of Adam Smith, instead of what he considers as the more appropriate terms of conscience and reason. (*See* Stewart's Collected Writings, *Active and Moral Powers*, vol. i. p. 333.) Smith, in his *Theory of Moral Sentiments* (part vii. s. 3, c. 3), says that the conscience "properly signifies our consciousness of having acted agreeably or contrary to the directions of some moral faculty." And Dugald Stewart (*l. c.*) adds, "The truth I take to be this,—that the word conscience coincides exactly with the moral faculty; with this difference only, that the former refers to our own conduct alone, whereas the latter is meant to express also the power by which we approve or disapprove of the conduct of others." But this seems a somewhat arbitrary limitation of the term conscience; and in this article it is made throughout to apply both to our own moral conduct and to that of others. The ethical philosopher, of course, is bound to inquire into the nature of the distinction between right and wrong in human conduct, and into the complexion and character of those feelings with which right and wrong are contemplated by man; but conscience, in so far as it is a portion either of ethics or of the practical conduct of man, merely requires to ascertain that there is such a principle as right and wrong in human nature, and that there are such feelings as those of responsibility and of remorse, which approve or disapprove of human actions. As to the precise theory of the moral sentiments which may be maintained, or as to the exact criterion of morality which may be held, the inquirer into the nature of conscience, as such, gives himself little trouble. Suffice it to say, that this principle in

human nature has been analysed into a judgment and an emotion; one gives himself little anxiety as to the ultimate origin of this judgment, or as to the final elements of which this affection may be composed. The unrepented pleasure, accordingly, of Socrates; the variously modified views of human happiness of Plato and Aristotle; the mere reverence for morality or bare acts of *duty* of the Stoics; the pleasure theory of Epicurus and his school; the human will and the divine will of the schoolmen; the greatest happiness principle of Bishop Cumberland, of Jeremy Bentham, and of the two Mills; the rational views of Cudworth and of Price; the eternal fitness of Clarke; the moral sense of Shaftesbury and Hutcheson; the refined view of the selfish system of Leibnitz; that love to being in general of Edwards; the principle of reflection or conscience of Butler; and a class of desires and affections, having dispositions and volitions for their object, of Mackintosh: these, we say, are all views more or less precise, more or less closely allied to the truth of the real theory of our moral nature, be it what it may. We may remark in general, that of all speculators, Bishop Butler was undoubtedly the first to point out the supreme authority of conscience in the moral constitution of man. Although the ancient moralists had beautifully described the result of such a state of matters as Butler pointed out as the abiding law of our nature, and while Lord Shaftesbury and Francis Hutcheson laid much too little stress on this all-important provision of *man's* state, Dr. Butler was unquestionably the first to point out an important distinction, which has, since his time, been adopted by all moralists. It accordingly appears that this moral faculty or conscience is the supremely regulative principle in our constitution. Give the laws which govern its activity free scope, the most beautiful harmony and propriety of conduct will ensue; violate those laws, and the direst confusion in character and in conduct is the result. (*See* Stewart's *Active Powers* and Mackintosh's *Ethical Philosophy*, and the other writers alluded to in this article.)

Consciousness, *kon'-shus-ness* (Gr. *suneidesis*, Lat. *conscientia*, Fr. *conscience*, Ger. *bewusstseyn*), is the recognition by the mind of its own acts. While it is thus a comprehensive term for the complement of all our mental energies, it nevertheless, from its high generality, cannot at all be defined. It is so elementary, that it is impossible to resolve it into any notion more simple than itself. But while consciousness cannot logically be defined, it may still be philosophically analyzed. The forms under which this condition of all thinking operates, are—*I know that I know, I know that I feel*, and *I know that I desire*; or, in other words, *I am conscious* that I know, feel, and desire. And while this is so, the act necessarily involves, (1) a knowing mind, (2) a known object, (3) a recognition by the mind of its object. It accordingly appears that consciousness and knowledge mutually involve each other: they are not opposed as really diverse. It is somewhat remarkable, that a term in all ways so important and convenient should have escaped the subtle Greeks and the rhetorical Latins, and that it should have been reserved for Descartes, a Frenchman, to introduce the term *conscientia*, or consciousness, in its modern signification. An instance or two of the modern use of the word may, no doubt, be found in Quintilian and the Latin fathers; but no consistent adoption of it is to be met with before the time just specified. Among the Romans, if two individuals or more had a common knowledge of some circumstance, such a knowledge was called *conscientia*, or (*con-scio*) *knowledge together with*; but, except this, the term was always employed in a moral sense, as equivalent to our word *conscience*. The general conditions that attach to consciousness, in its modern acceptation, are obvious and palpable:—1. That the knowledge which it implies is actual, and not merely potential. For example, if I say of my friend that he knows the shape of the reading-room in the British Museum, that it is round, and not square, I mean that he is not conscious of the fact at the present moment, but that he may be rendered conscious of it by having his attention drawn to the circumstance. We are, in truth, conscious only of the present. 2. The knowledge which it implies is immediate, and not distant. Thus, while I am conscious of the dome of St. Paul's while I look at it, I am unconscious of it when it is out of my mind, having to ransack the arcana of memory to bring it up into consciousness as often as I wish to recall it. Again, in the 3rd place, I am only conscious in so far as I am conscious of some definite object, as contrasted either with no object, or with another object different from the present one in its qualities and modifications. Thus, suppose I am conscious of the desk at which I write, I am only so as taking the present desk in contrast with some other supposable desk, such as the one at the British Museum, at which many men are accustomed to write at the same time. In the 4th place, there is always judgment in every act of consciousness, or the affirmation or negation of one thing being or not being, having or wanting the qualities of another. We cannot, in truth, discriminate without judging; so that this fourth condition might stand as a corollary to the third. Every act of mind, in truth, implies a judgment, as every act of consciousness implies an act of affirmation or negation. The 5th undeniable act of consciousness is memory; for I cannot be conscious of an object without discriminating it from another state of mind to which the present one was only a successive phenomenon. I must distinguish all the separate acts of consciousness, and I can only distinguish them by the aid of memory, as I can only discriminate them by the help of judgment. As the fourth condition of consciousness, this one holds the position of being a second corollary to the third. Hutcheson, Reid, and Stewart, expose themselves to criticism by affirming this faculty to be special in its operation, and not general. They affirm, in short, that it is possible to read a book, and to know that we have read it, without being conscious at the same time of some portion of its contents; nay, that it is possible to be conscious of the perception of a book without being aware that it is a book that we perceive. There can only be a system of philosophy in so far as the veracity of consciousness is implicitly or explicitly affirmed by it. Philosophy, accordingly, in asserting its own possibility, asserts, in the same breath, the truthfulness of consciousness. Leibnitz truly has remarked, in his *Nouveaux Essais* (lib. ii. c. 27, s. 13), that "if our immediate internal experience is not certain, there can be no truth of fact of which we can be assured." All speculators agree in this, both sceptical and dogmatical. But not only is consciousness the evidence and authority of all legitimate speculation, it is likewise the source and spring from which it flows. As the criterion of philosophy, it must be clear and unadulterated; and hence there emerge three great laws that regulate its legitimate development. These are,—1st, that it be charged with no fact but what is simple and ultimate; 2nd, that all the facts ascribed to consciousness be taken without reserve in coming to any conclusion; and 3rd, that nothing but the facts, or what these data imply, be accepted as legitimate in any process of inquiry. As one illustration of the fertility of accepting or of rejecting these leading laws, may be mentioned the circumstance, that on the duality or unity of the first fact of consciousness hangs altogether the entire system of speculation which any inquirer may adopt. If, in saying that *I perceive a stone*, I do not recognize that there are two independent objects in this act, my perceiving *mind*, and the *stone* which I perceive, as two separate independent existences, but maintain with Berkeley and Fichte and Ferrier, that what seems a stone is not really a stone, but only a *mode* of my mind or of some other mind, then I deny the duality of the substances and assert their unity. And if I do so, I deny the doctrines of realism and accept those of idealism, and, possibly, of pantheism. We have only spoken of the partial rejection of the veracity and integrity of the facts of consciousness; something might also be said on the total rejection of those facts, which leads to the speculative doctrines of nihilism at the first remove.—(For further illustration on this point, *see* Reid's *Works*, by Sir William Hamilton, p. 749.)

Conscription, *kon-skrip'-shun* (Lat. *conscribere*, to enrol), the name given to the compulsory system of enlistment of soldiers for the army, practised in France and other foreign countries. Every Frenchman, as soon as he attains the age of 20, is liable to be drawn

by lot to serve in the ranks for seven years, unless he be incapacitated by any bodily or mental infirmity, or exempt, from being the only son of a widow, or the eldest son of a family that are left without parents. Pupils at college, and those who are studying for the church, are also exempt, as well as those who have a brother already in the army; and no man is taken at present who is under 5 feet 2 inches in height, although, during the Peninsular war, the standard height in the French army was only 4 feet 11 inches. In France about 200,000 yearly attain the age of 20, and become liable for service. Those who are exempt from any cause are not reckoned in this calculation.

CONSECRATION, *kon-se-krai'-shun* (Lat.), the solemn act of dedicating any person or thing to a divine service or use. In modern times the consecration of men is usually called ordination, and that of temples, churches, altars, &c., is called dedication. Consecration was one of the most universal religious ceremonies of the ancients. It was practised in India, Egypt, Judæa, Chaldæa, Greece, Rome, among the Celtic Druids of Britain, and in Europe generally. At the commencement of the Mosaic dispensation, all the first-born of man and beast were consecrated to the Lord. Subsequently the whole tribe of Levi were consecrated, and Aaron and his sons were especially consecrated to the priest's office. In the Old Testament there is a description of the consecration of the tabernacle and altar, of the first or Solomon's temple, and also of the consecration of men, beasts, houses, fields, and the walls of Jerusalem. It was not until the commencement of the 4th century, when Christianity, under Constantine, became the religion of the Roman state, that churches were publicly consecrated. The ceremony was then attended with great pomp and splendour. The practice of consecrating buildings for religious purposes is still continued in the Church of England as well as in the Church of Rome. In the English church the burial-ground is also consecrated.

CONSECRATION OF A BISHOP, is the separating of a person for the holy office of a bishop, by imposition of hands and prayer. According to a canon of the Nicene council, there must be four, or at least three, bishops present at the consecration of a bishop. The ceremony used in the Church of England will be found in the Book of Common Prayer: it was prepared in the reign of Edward VI. It is stated in the preface, that "no one shall be accounted or taken to be a bishop, or suffered to execute the same function, unless he be called, tried, and admitted thereunto, according to that form, or *hath had formerly episcopal consecration*." The Church of Rome denies the validity of the English orders generally, as derived from heretical and improperly-consecrated bishops. An old story, refuted by Lingard, a Roman Catholic historian, is known by the name of "the Nag's Head Consecration." It is asserted that Archbishop Parker was consecrated at the Nag's Head tavern, Cheapside, by one of the Protestant bishops laying a Bible on his head, and saying, "Take thou authority," &c. According to Lingard, the whole story was false, as Parker was consecrated by the bishops of Bath, Chichester, and Exeter, at the chapel at Lambeth. The bishop of Bath had been consecrated according to the Roman Catholic pontifical, in the reign of Henry VIII. The story probably arose from the fact that the commissioners who ratified Parker's election dined at the Nag's Head, a tavern much occupied by country clergymen.

CONSECRATION OF CHURCHES.—All churches in this country must be consecrated, as the law recognises no place as a church till it has been consecrated by the bishop. The ceremony was formerly one of great solemnity and grandeur. During the sitting of the Long Parliament, Alderman Pennington presented a petition, in which the consecration of churches was included among "the manifold evils, pressures, and grievances caused, practised, and occasioned by the prelates and their dependents." At the Restoration, the practice of consecrating churches, which had been abolished, was resumed, and since that time each bishop has adopted any form he thought best; though, perhaps, the form of consecrating churches, chapels, and burying-places, which was sent down by the bishops to the lower house of convocation (1712), and ordered by a committee of the whole house, is the one



—not that it is enjoined by any competent authority—now most generally used.

CONSECRATION OF THE ELEMENTS. (*See* EUCHARIST.)

CONSEQUENCE, *kon'-se-qwens* (Lat. *con*, and *sequor*, I follow), is that which follows or results from any cause, act, or principle.—In Log., it is applied to the conclusion of a syllogism, or that which results from the premises.

CONSERVATIVE, *kon-serv'-a-tiv* (Lat. *con*, and *servo*, I keep or guard), in a political sense, is one whose aim it is to preserve from innovation or radical change the existing institutions of the country, both civil and ecclesiastical; and hence he is opposed to such measures and changes as he believes to tend in that direction. (*See* TORY.)

CONSERVATORY, *kon-serv'-vā-tor-e* (Lat. *conservare*, to preserve), a glass house for the reception of tender plants that require protection from the wind, frost, and rain. A conservatory requires a little artificial heat from a stove placed within it in winter only; and thus constitutes the chief point of difference between the conservatory and hothouse, which is heated by pipes, and an apparatus for the transmission of hot air, throughout the year as well as by a bark bed. Conservatories are often rendered an ornamental feature in a building when attached to it and connected with one of the principal apartments, or forming the entrance.—Ref. *Beeton's Book of Garden Management*.

CONSIDERATION, *kon-sid-e-rai'-shun* (Lat. *consideratio*), in Law, is the material cause of a contract, without which it cannot bind the party. The consideration is either *expressed* or *implied*. The latter is when the law itself enforces *a consideration*; as, if a man goes into a common inn, and, staying there some time, takes meat or lodging either for himself or his horse, the law presumes he intends to pay for both, notwithstanding there is no actual bargain or contract between him and his host. Also there is a *consideration of nature* and blood, and a *valuable consideration*; and therefore, if a man be indebted to divers others, and, in *consideration* of natural affection, gives his goods or estate to his son, this is a fraudulent gift as against the creditors (unless it be upon, or in consideration of, his marriage), because this act intends a *valuable consideration*.

CONSISTORY, *kon-sis'-tor-e* (Lat. *consistorium*), was originally applied, under the later Roman emperors, to the place in which their privy council met, and afterwards to the council itself. When the Roman church was established, this form of court was adopted by the ecclesiastical power, and, down to the present time, the highest council of state in the Roman government is called the consistory. The ordinary consistory, which is composed only of cardinals, and over which the pope himself presides, meets once a week in the papal palace, for the transaction of general business connected with the Church, the election of cardinals, bishops, and the like. Extraordinary consistories, or, as they are called, secret consistories, may be summoned at any time by the pope, as occasion may require. The Protestant churches on the continent have also their consistories, which manage the affairs of the Church. In England the consistory is a spiritual court formerly held in the nave of the cathedral church, or some chapel or aisle belonging to it, in which the bishop presided, and had some of his clergy for assessors and assistants. This court is now held by the bishop's chancellor or commissary, either in the cathedral church or other convenient place in the diocese for hearing and determining ecclesiastical causes.

CONSOLE, *kon'-sol* (Fr. *console*), in Arch., a richly-ornamented bracket in the form of a corbel (*see* CORBEL), fastened to a wall to form a support for busts, statuettes, candelabra, &c., or used to support a cornice as a modillion. The name console-table is applied to a semicircular table projecting from the wall, and supported on brackets terminating in a solid foot, or fixed to the wall. There are other forms of console-tables, but this is the most common.

CONSOLS, *kon-sols'*, a contraction of the term Consolidated Annuities. The British government, during the process of borrowing the money which now forms the national debt, laid themselves under certain special

conditions; these conditions generally consisted in an undertaking to pay an annuity of so much per cent. On account of the complication and confusion which arose from the number of stocks thus formed, in 1757 the Consolidated Annuities Act was passed. By this statute an average of the value of the different stocks was struck, and the whole consolidated into one fund, kept in one account at the Bank of England.

CONSONANT, *kon'-son-ănt* (Lat. *con*, and *sono*, I sound), in Gram., is a letter which cannot be sounded by itself without the aid of a vowel placed either before or after it.

CONSORT, *kon'-sort* (Lat. *consors*, from *con* and *sors*, lot), is literally one who throws in his lot with another; a companion or partner in an undertaking; a husband or wife. By the law of England, the *queen consort*, the wife of the reigning king, is, in all legal proceedings, looked upon as a single, not as a married woman. She may purchase and convey lands, grant leases, and do other acts of ownership without the intervention of the king. She may also sue and be sued in her separate person, and possesses courts and officers distinct from those of the king. She pays no toll, and is free from any fine which a court could impose upon women in general; but in other respects she is on a similar footing with the other subjects of the king. In her life and person, however, she enjoys the same protection as the king, it being high treason to design the death of either. The husband of a queen regnant is not endowed by the constitution with any distinctive rights or privileges. All his privileges and honours, therefore, must emanate from the crown under the form of warrant, grant, patent, &c., or else be conferred by act of parliament introduced after a royal message on the subject. Up to 1857, when the title of Prince Consort was bestowed upon him by letters patent, the late Prince Albert possessed no distinctive title and no place in court ceremonial but such as was accorded to him by courtesy.

CONSTABLE, *kun'-stă-bl* (Old Fr. *connestable*; Sax. *cuning* or *eyng*, and *staple*, the stay or hold of the king; Lat. *comes stabuli*, literally, head of the stables), an officer who supports the queen by the maintenance of her peace. The office of *lord high constable* has been disused in England, except only upon great and solemn occasions, such as the coronation and the like, ever since the attainder of Stafford, duke of Buckingham, under King Henry VIII.; as in France it was suppressed about a century after, by an edict of Louis XIII. The office of *high* or *chief constable* was established in England by Edward I. (stat. Winch. 13 Edw. I.). He appointed two in every hundred to view the armour of every person within the same, to present all such defaults before the justices; to present the defaults of bourns, of highways, and of such as lodged strangers in uplandish towns for whom they would not answer. Their powers were, by several acts of parliament, enlarged, and they are now conservators of the public peace in their hundreds, as the petty constables are in parishes; and they serve precepts or warrants on certain occasions, and return the list of jurors. They are appointed at the courts leet of the franchise or hundred over which they preside, or, in default of that, by the justices at their special sessions. *Petty constables*, or *parish constables*, seem to have been first appointed about the beginning of the reign of Edward III., to alleviate the burthen of the chief constable. They are now appointed by the justices under 5 & 6 Vict. c. 109; and by that act it is declared that the leet shall appoint no constable except for the performance of duties unconnected with the public peace. Their principal duty is the preservation of the peace and the service of the summonses and the execution of the warrants of the justices of the peace, to them directed, relative to the apprehension and commitment of offenders. *Special constables* are persons appointed on particular occasions by the magistrates, who have power to appoint and swear in as many householders or others as they may think fit, who have no legal exemption from the office of constable. *County* and *district constables* are appointed by the justices under the 2 & 3 Vict. c. 93, and 3 & 4 Vict. c. 88. (*See* POLICE, and refer to *Lambard on Constables.*)

CONSTANCE, COUNCIL OF, *kon'-stănz*, a celebrated ecclesiastical council held at the city of that name in the grand duchy of Baden, Germany, between 1414 and 1418. It was summoned at the request of the emperor Sigismund to put an end to the great schism in the Church arising from the contest between John XXIII., Gregory XII., and Benedict XIII. for the papal chair; and also to prevent the spread of the doctrines of John Huss. There were assembled, besides the emperor and Pope John XXIII., twenty-six princes, one hundred and forty counts, twenty cardinals, seven patriarchs, twenty archbishops, ninety-one bishops, six hundred prelates and doctors, and about 4,000 priests. This council deposed the three rival popes, and elected Martin V. as head of the Church, and tried and condemned to the stake both John Huss and Jerome of Prague.

CONSTANTINOPOLITAN HISTORY. (*See* BYZANTINE EMPIRE.)

CONSTELLATION, *kon-stel-lat'-shun* (Lat. *con*, together; *stella*, a star), in Astron., the name given to large clusters of stars which occupy a considerable space in the field of the heavens, and are distinguished by names and grouped within fanciful outlines of men, animals, and things, principally derived from persons and incidents mentioned in the mythology of the Greeks and Romans. Aratus and Ptolemy among the ancients, and Bayer, Helvetius, and Lacaille, in more modern times, are the principal astronomers who have grouped the stars into constellations. Tycho Brahé, Lemonnier, Hevelius, and Halley, have added five more, which are recognized. Many more have been named by these and other astronomers, which are not admitted into the list of acknowledged constellations. Bayer commenced the notation of the stars in the various constellations by the Greek alphabet, marking the brightest star by the first letter, and so on; and when there were more stars than Greek letters, he denoted the rest by small italics. The stars were numbered in each constellation by Flamsteed, in the order of their right ascension, and this is the plan usually adopted in the catalogues of Bradley, Lacaille, and others. There are forty-eight constellations given by Aratus and Ptolemy, which are depicted on the celestial globe and in star maps; but as many more have been added since the time of Ptolemy, some of which are rejected; so that the acknowledged number is about ninety. The principal constellations are noticed under their respective titles.

CONSTIPATION, *kon-stip-ăt'-shun* (Lat. *constipatio*, from *constipo*, I crowd together), in Med., is a torpitude or sluggishness of the bowels, occasioned by an excessive action of the absorbents of the bowels, or defective secretion of the juices of the intestines, by which the fæces become hardened, or by an impaired peristaltic action of the intestines. (*See* DIARRHŒA.) It arises most frequently from a deficiency or vitiated secretion of the bile, which is the natural stimulus of the bowels. Sedentary habits predispose to constipation, as does also the use of certain kinds of food. When severe and obstinate, it gives rise to inflammation of the bowels, and may soon prove fatal. The treatment consists in moving the bowels by means of purgatives, and then restoring the natural state of the system by means of active exercise in the open air, sea-bathing and the use of food of a laxative nature; as brown bread, green vegetables, &c.

CONSTITUENT ASSEMBLY, in French Hist. (*See* ASSEMBLY, NATIONAL.)

CONSTITUTION (Lat. *constitutio*, from *con*, and *statuo*, I set, fix, or appoint), in a general sense is an ordinance, regulation, or law, made by authority of a superior, either civil or ecclesiastical. The decrees and decisions of the Roman emperors were called constitutions, and in the Roman church this name is given to a decree of the pope in matters of doctrine.

CONSTITUTION in a political sense is the established form of government in any kingdom, state, or community, whether that be a body of written laws or be founded on prescriptive usage. In England, the constitution is made up of the whole body of public law, consuetudinary as well as statutory, which has been in progress for many centuries, and is still undergoing change or modification. Wherever the power of a sovereign over his people is limited in any particular by law or usage, such a state may be said to have a constitution. Constitutions have by political writers

been divided into three kinds:—(1) those established by the sovereign power; (2) those springing out of rights enjoyed by the people, or certain classes of them, and which form conditions in the contract between the sovereign and the people; and (3) those founded on compact between different sovereign powers. The first class may again be divided into those established by a free sovereign people for their own regulation, and those that are granted by monarchs to their subjects. In regard to political principles, constitutions are—(1) democratic, where the sovereign power is vested in the body of the people; (2) aristocratic, when the government is chiefly or entirely in the hands of certain privileged classes; (3) monarchical, when in the hands of one person; and (4) of a mixed character, as in Britain, where the sovereign power is distributed over the king, lords, and commons. Constitution always implies a sovereign power, whether that be vested in one or many, in one supreme ruler, or in all the male population above a certain age.

CONSTITUTION, *kon-stit-tu'-shun* in Med., is used to denote the general condition of the body, as evinced by the peculiarities in the performance of its functions; as the peculiar predisposition to certain diseases, the liability of particular organs to disease, varieties in digestion, in muscular power and motion, in sleep, in the appetites, &c. Some marked peculiarities of constitution are observed to be accompanied with certain external characters, such as a particular colour and texture of the skin and hair, and also with a peculiarity of form and disposition of mind. These have been observed from the earliest times, and have been divided into classes. (*See* TEMPERAMENT.)

CONSTITUTIONS AND CANONS. (*See* CANONS OF THE CHURCH OF ENGLAND.)

CONSTITUTIONS APOSTOLICAL. (*See* APOSTOLICAL CONSTITUTIONS.)

CONSTITUTIONS OF CLARENDON. (*See* CLARENDON, THE CONSTITUTIONS OF.)

CONSUBSTANTIAL, *kon-sub-stan'-shal* (Lat. *con*, and *substantia*, substance), a term used in Theol. to denote something co-essential, or of the same substance, with another. It is generally employed to designate the belief that the Son of God is of the same essence with the Father, and was first adopted by the council of Nice to express the orthodox doctrine, and to serve as a barrier against the errors and subtilties of the Arians, who denied this doctrine. The Greek term is *homoousias*.

CONSUBSTANTIATION, or IMPANATION, *kon sub stan-she-a'-shun, im-pan-a'-shun*, is employed to designate the doctrine of the Lutheran church regarding the presence of Christ in the Eucharist, as opposed to transubstantiation, the doctrine of the Roman church. While the Romanists hold that the bread and wine of the Sacrament are changed into the body and blood of our Lord, Luther and his followers attempted to solve the mystery by maintaining that, through the consecration of the elements, the real body and blood of our Lord became united therewith, and were thus partaken of by the recipients. This doctrine was first introduced into the Church about the end of the 13th century, by John, surnamed Purgens Asinus, a doctor of Paris, and is still held by Lutherans.

CONSUL, *kon'-sul*, in Pol., is a public officer appointed by a government to reside in some foreign country, in order to facilitate and protect the commercial relations between his own country and that to which he has been sent. This class of officers seems to have been created by the Italian states about the 12th century. Taking advantage of the crusades, they procured permission from certain Asiatic princes to send persons into their territories as protectors of their merchants going to these parts. Their example was gradually followed by other European nations, and by the 16th century the system was generally established over Europe. The right of sending consuls to foreign countries depends either upon custom or express treaty; and hence their powers differ widely in different states. In general, the duty of a consul is to watch over the commercial interests of the state whose servant he is; to see that the conditions of commercial treaties are properly observed; to give his best advice and assistance to her trading and other subjects; to prevent their infringement of the laws; to reconcile their differences, uphold their interests; and generally to render the condition of the subjects of the country employing him within the limits of his consulship as comfortable, and their transactions as profitable and secure, as possible. Consuls occasionally partake of a certain kind of diplomatic character; and in Turkey, according to an ancient treaty and certain by-laws of the Levant Company, British consuls enjoy extensive judicial powers. A British consul is expected to be master of the language of the country in which he resides, and to have a knowledge of its laws and regulations, particularly such as relate to trade; to procure and send home statistical returns connected with commerce, and the prices of produce and provisions; and to report any infectious disorders that may be within his district. Consuls are sometimes natives of the countries in which they reside, but more frequently of the countries which they represent. All British consuls holding a royal commission are subjects of Great Britain, but many of the vice-consuls are not so. The emoluments of British consuls were formerly derived chiefly from fees, which depended upon the tonnage, number, value of cargoes, &c., of the British vessels entering and leaving the limits of their consulships; but now their fees are very inconsiderable, arising from notarial acts, certificates, &c.; and, in addition, they have in many cases fixed salaries from the crown. In some cases they are allowed to engage in trade; in others they are interdicted from it. In most cases the salary is small, but in some it is as high as £1,600 or £1,800 a year. There are English consuls or vice-consuls at all the chief ports with which the nation has commercial relations. In some countries, where there is no superior diplomatic agent, a consul-general is appointed, who is, sometimes, accredited as a political agent, with the rank of *chargés d'affaires*, and is resident at the seat of government. The total number of British consuls-general, consuls, and vice-consuls is about five hundred, of whom about one-half receive salaries. The government estimate of salaries to these for 1860-61 was £129,229.

CONSUL, the highest ordinary magistrate in the ancient Roman republic. (*See* vol. I. of this work.)

CONSUMPTION, in Med. (*See* PHTHISIS.)

CONSUMPTION, *kon-sump'-shun* (Lat. *consumptio*), in Pol. Econ., is employed as opposed to production. It does not mean the consumption or annihilation of matter, that being as impossible as its creation, "but the consumption or annihilation of the qualities which render commodities useful and desirable. To consume the products of art or industry, is to deprive them of the utility, and, consequently, of the value communicated to them by labour." "We produce commodities only that they may be used or consumed. Consumption is the end and object of human industry; production is merely a means to attain that end."—(J. R. McCulloch.) In this sense, then, consumption is synonymous with use, and is the end or object of production. "It would be an improvement," says Professor Senior, "in the language of political economy, if the expression 'to use' could be substituted for that of 'to consume.'" "That almost all that is produced is destroyed, is true; but we cannot admit that it is produced for the purpose of being destroyed. It is produced for the purpose of being made use of. Its destruction is an incident of its use not only not intended, but, as far as possible, avoided." In every healthy condition of society there is always a natural relationship maintained between production and consumption. The greater the consumption, the greater the stimulus given to production. There will always be an excess of production over consumption wherever the course of industry is not impeded by bad laws. Political economists distinguish between *productive* and *unproductive* consumption. Commodities are consumed productively when the advantage or benefit, whether material or otherwise, accruing in consequence to their possessors, exceeds their value; and they are consumed unproductively when such advantage or benefit is less than their value.

CONTAGION, *kon-ta'-jun* (Lat. *contagio*, from *con*, and *tango*, I touch), in Med., ought, properly speaking, to be confined to the communication of disease to

a healthy body by actual contact with the sick, or with the palpable matter from their bodies, and infection to be applied where disease is communicated through the medium of the atmosphere, or by means of other intermediate substances, called *fomites*. This distinction, however, is frequently lost sight of, and the term contagion applied to all cases in which the disease is conveyed to the person of the recipient by particles of matter proceeding from the person of the sick, whether these particles are in a solid or a gaseous form, whether they are imparted by direct contact of the two bodies, or by being wafted through the air, or carried upon articles of clothing. There are two kinds of contagious diseases: (1) Those that can only be communicated by direct contact, as itch, syphilis; and (2) those which are capable of being produced either by direct contact, or without it, as small-pox, typhus fever, &c. Some contagious diseases seem to effect some radical change upon the system, so that it is not again liable to attack from the same disease, as small-pox; and some diseases, that do not generally manifest any contagious disposition, do occasionally, under unfavourable circumstances, assume a malignant and contagious form. The term contagion is also applied to the poisonous matter by means of which the disease is communicated. In this latter sense, it is a morbific matter *sui generis*, which, on entering the blood, produces a definite train of morbid phenomena, and communicates to the blood the property of generating a similar poison capable of producing precisely the same disease.

Continent, *kon'-tin-ent* (Lat. *con*, and *tenere*, holding), a large tract or division of land not separated by the sea from other lands, or a connected tract of land of great extent, whether an island or not. The surface of the earth is divided into five continents, which are generally recognized; namely, Europe, Asia, Africa, America, and Australia.

Continental System, *kon-te-nen'-tal*, was a plan devised by Napoleon to exclude Britain from all intercourse with the continent of Europe, in order to compel her to acknowledge the maritime law established at the peace of Utrecht. This system began with the famous decree of Berlin (Nov. 21, 1806), which declared the British islands to be in a state of blockade; all commerce, intercourse, and correspondence, at an end; every Briton found in France, or a country occupied by French troops, a prisoner of war; all property belonging to Britons fair prize, and all trade in British goods entirely prohibited. Britain immediately directed reprisals against this decree, and by an order in council of 7th January, 1807, she prohibited all neutral vessels from sailing to any port belonging to France or her allies, or to one of any nation so much under her control that British vessels could not have intercourse with it. Every neutral vessel which should violate this order was to be confiscated with her cargo. A second decree of 11th November, 1807, was still more severe against neutral commerce. By this, all harbours and places of France, and her allies in Europe and the colonies, as likewise every country with which Britain was at war, and from which the British flag was excluded, were subject to the same restrictions as if they were closely blockaded; all commerce in the manufactures and productions of such countries was prohibited, and vessels engaged in such commerce were to be confiscated; as also all those vessels whose certificates showed that they were built in the enemy's country. Another order in council declared the sale of vessels to neutrals by the enemy unlawful, and the intended transfer of property void. These orders were followed by reprisals on the French side. By a decree of Milan, of 17th December, 1807, strengthened by a decree of the Tuileries of 11th January, 1808, every vessel, of whatever flag, which had been searched by a British vessel, and consented to be sent to Britain, or had paid any duty whatever to Britain, was to be declared *denationalised*, and to have become British property, and as such a good prize. In order more effectually to annihilate British commerce, the tariff of Trianon respecting colonial goods was proclaimed 3rd August, 1810, which was extended by a decree of 12th September, and on the 18th October was followed by the decree of Fontainebleau, which directed the burning of all British goods. These decrees were to be carried out, with more or fewer modifications, in all countries connected with France. The consequence was, that the price of colonial and foreign goods rose enormously on the continent; a regular smuggling trade was carried on at different points; numerous substitutes for colonial goods, particularly coffee and sugar, were invented; and a variety of manufactures grew up on the continent which were the germs of very extensive and flourishing branches of industry. On the breaking-up of Napoleon's power, the so-called continental system fell to the ground.

Contingent, *kon-tin'-jent* (Lat. *con*, and *tango*, I touch), in Pol., is the name given to the quota of troops to be furnished by each member of a number of states composing a confederation.

Contingent Legacy. (*See* Legacy.)

Contingent Remainder. (*See* Remainder.)

Contingent Use. (*See* Use.)

Contour, *kon-toor'* (Fr. *contour*, from Lat. *contorquere*, to bend or twist), a name which is sometimes given to the outline by which any figure or form is defined or expressed. It is also applied to the constitution of a country and the undulations of its surface, referring chiefly in the latter case to the outline of hill and dale obtained by making a section of it in any direction. We often speak of the contour of a figure, and associate it with an outline consisting of beautifully rounded curves rather than with one which is full of abrupt turns and angular projections.

Contraband, *kon'-tra-band* (Ital. *contrabando*; Lat. *contra*, against, and *bannum*, proclamation), in Com., is applied to all goods or wares exported from or imported into, any country against the laws of said country.

Contraband of War, is a designation applied to certain commodities useful in war, which, by the law of nations, neutrals are prohibited from carrying to belligerent states. According to Vattel, "such are arms, ammunition, timber for shipbuilding, every kind of naval stores, horses, and even provisions in certain junctures, when we are in hopes of reducing the enemy by famine." There is great difference of opinion among authorities as to what are and what are not contraband of war, and the usage among nations has been equally fluctuating. Grotius divides commodities into three classes: (1) Those which are useful only for the purposes of war; (2) those which are not so; and (3) those which are susceptible of indiscriminate use both in war and peace. The first he, with all other authorities on the subject, regards as strictly contraband of war, and prohibited from being carried by neutrals to the enemy; the second he permits to be so carried; and the third, such as money, provisions, ships, and naval stores, he sometimes prohibits and at other times permits, according to the existing circumstances of the war. Of the same nature with contraband goods is the carrying of military persons or dispatches in the service of the enemy. The dispatches of an ambassador or other public minister of the enemy resident in a neutral country are excepted. In general, where the ship and cargo do not belong to the same person, the contraband articles only are confiscated, and the carrier-master is refused his freight to which he is entitled upon innocent articles which are condemned as enemy's property. Under the fraudulent circumstances of false papers and false destination, the ship as well as the cargo is liable to confiscation. Where the ship and the contraband articles belong to the same person, they are involved in the same penalty.

Contract, *kon'-trakt* (Lat. *con*, *trahe*, I draw),—The subject of contracts is partly treated under the head of Agreement. In addition to what is there stated, it may be remarked that contracts are *express or implied*, the terms of the former being openly uttered and avowed at the time of the making; the latter rest on a mere construction of law, and in general it will be implied that a man actually promises to fulfil that which he ought to fulfil. (*See* Bailment.) Where there is an *express promise*, the law does not raise an implied one in reference to the same matter,—*for expressum facit cessare tacitum*; and where there is a contract by deed, no express parole promise to the same effect and upon the same subject can coexist with

ft, for the contract by specialty merges or extinguishes that by parole. A parole contract may be either written or verbal. A contract may be either *executed*, as if A. agrees to change horses with B., and they do it immediately, in which case the possession and the right are transferred together; or it may be *executory*, as if they agree to exchange next week: here the right only vests, and their reciprocal property in each other's horse is not in possession, but in action; for a contract executed (which, when it relates to an exchange or sale of goods, differs in nothing from an *assignment*) conveys a chose in possession; a contract executory conveys only a chose in action. (*See* CHOSE IN ACTION.) A promise by parole only is not binding in law, unless made upon a *consideration*, or some compensation or *quid pro quo*, to be reciprocally afforded by the promisee. As a general rule, the *adequacy* of the consideration is a question that the law will not entertain, provided a consideration of *some* value shall appear to have existed. (As to a contract by deed, *see* DEED.) There are some rules applying indifferently to all kinds of contracts. They relate to the *capacity* of persons to contract, and to the *construction* and *performance* of contracts when made. Those which relate to capacity principally concern the condition of insanity, drunkenness, infamy, coverture, and duress. (*See* the references under the article CAPACITY, LEGAL.) In addition to the matter explained under the heads of subjects so referred to, it may be stated that a person drunk, to the extent of complete intoxication, so as to be no longer under the guidance of reason, is absolutely incapable, while that condition lasts, of entering into a valid contract. The rules which govern the *construction* or interpretation of a contract when made will be mentioned when we consider the article DEED, as the same laws of construction apply in general both to sealed and unsealed agreements. The *performance* of a contract cannot be enforced if the contract be founded upon an *immoral* or *illegal* consideration, or be obtained by fraud, or, if good at the time of making it, the performance becomes illegal by a subsequent alteration of the law, or if the promisee on his part has failed to perform the consideration. But, on the other hand, no excuse is in general afforded by the circumstance that what a man absolutely engaged to do has since become impossible, for it was his own fault to make an unconditional contract. Yet, if the performance be hindered by the opposite party, the case, of course, is different, and the party making the engagement excused.

CONTRACTION, *kon-trik'-shun*, in Gram., is the shortening of a word by the omission of a letter or syllable. The Greek language abounds with contractions, which have been adopted chiefly to avoid a harshness in the pronunciation arising from the concurrence of two vowels in two successive syllables or words. Hence two or more simple vowels coming together are usually contracted into a diphthong. This is said to be *proper* when the vowels are contracted without change into a diphthong; *improper*, when, in the contraction, a vowel or diphthong of a different sound is substituted. *Elision* takes place when two vowels at the end of one and at the beginning of another word come together, and the final vowel of the first word is rejected, its place being marked by an apostrophe placed over the consonant which is left. This takes place chiefly with the poets. *Crasis* is that kind of contraction in which two words coalesce into one, and are accented as one, without any elision. In *synizesis* two vowels are contracted into one sound—not in writing, but in pronunciation. In the Middle Ages, before the introduction of printing, numerous contractions were resorted to for the purpose of abbreviating the labour of transcription. In many of the arts and sciences contractions are still common. (*See* ABBREVIATIONS.)

CONTRADICTORY PROPOSITIONS, *kon-trā-dik'-tor-e* (Lat. *contradictio*), in Log., are the opposites of each other, the one being a mere and naked denial of the other. To be truly contradictory, they must have the same terms, and differ both in quantity and quality,—the one denying and the other affirming the same thing of the same subject considered in the same circumstances.

CONTRALTO, *kon-trāl'-to* (Ital.), in Mus., is a term employed to designate the deepest kind of female voice, or that part in the score whose range of tones lies between that of the tenor and that of the soprano or treble, also called the *alto* or *counter-tenor*.

CONTRARY PROPOSITIONS, *kon'-trā-re* (Lat. *contrarius*), in Log., are universal propositions, one of which affirms and the other denies the same predicate of the same subject. They differ in quality, but not in quantity, and, therefore, are distinguished from contradictory propositions, which differ both in quantity and quality.

CONTRITION, *kon-trish'-un* (Lat., from *contero*, I break or bruise), in Theol., is deep sorrow for sin, arising from the thought of having offended an infinitely holy and benevolent God. It is usually understood to mean genuine repentance, and to be accompanied with a detestation of sin and of oneself on account of it.

CONTROLLER, or COMPTROLLER, *kon-trōl'-er* (Norm.), is an officer appointed to control, over-see, or verify public accounts; as the comptroller of the royal household, whose duty it is to examine and check the expenses of the household. He is usually a member of the privy council, and a political adherent of the government in power. The comptroller-general of the exchequer has the control and record of the receipts and payments of the public revenue of the United Kingdom, and the preparation and issue of exchequer bills. He is incapacitated from holding any other office under the crown, is appointed by letters patent, and holds his office during good behaviour.

CONUNDRUM, *kon-un'-drum*, a sort of riddle, in which some quaint or odd resemblance is proposed for discovery between things perfectly unlike; as, for instance, Why is a whisper like a forged bank-note?—Because it is uttered but not allowed (aloud).

CONVENT, *kon'-vent* (Lat. *conventus*, from *con* and *venio*, I come), is applied both to a community of religious persons, whether monks or nuns, and to the abbey, monastery, or nunnery in which they reside. (*See* MONASTERY, NUNNERY.)

CONVENTICLE, *kon-vent'-e-kl*, is a diminutive of convent, denoting properly a cabal, or secret assembly, of a part of the monks of a convent to form a party in the election of an abbot. It is said by some to have been first applied in England to the schools of Wickliffe, and has since been used by way of reproach for those religious assemblies which dissent from the established church. In 1664, what is called the Conventicle Act was passed, decreeing that if any person or persons above sixteen years of age were present at any meeting for worship different from the Church of England, where there should be five persons more than the household, they should, for the first offence, suffer three months' imprisonment, or pay £5; for the second the punishment was to be doubled; and for the third they were to be banished to America, or pay £100; and if they returned, to suffer death. This act having expired, another was passed in 1669, according to which a fine of 5*s.* was to be inflicted for the first offence, and 10*s.* for the second: and any one preaching, or suffering a religious meeting to be held in his house, incurred a penalty of £20. By 1 Will. & Mary, c. 18, Protestant dissenters were freed from these penalties; but it was not till 1812 that the Conventicle Act was repealed by 52 Geo. III. c. 112.

CONVENTION, *kon-ven'-shun* (Lat.), denotes properly the act of coming together, a meeting or assembly of several individuals. It is more particularly applied to a formal meeting, or an assembly of delegates or representatives for the transaction of important business, civil or ecclesiastical. In English Hist. it is the name given to an extraordinary assembly of parliament, or of the states of the realm, held without the king's writ. Of this kind was the parliament which restored Charles II., and that which conferred the crown upon William, prince of Orange. In the latter case, William, on the abdication of James II., invited the lords spiritual and temporal, to the number of about ninety, all who had sat in parliament under Charles II., and the mayor, aldermen, and fifty common councilmen of the city of London, to meet and deliberate upon the state of the country. They recommended him to summon a convention of the states of the realm; and accordingly circular letters were dispatched to the several counties, cities, boroughs, and universities, for the election of members. The convention met on the 22nd June,

1689, and, after long debate, passed the Act of Settlement, which declared the throne vacant, and conferred the crown, with its prerogatives more exactly limited and defined than formerly, on William and his princess jointly. A similar convention met at Edinburgh in March, 1689, and, after declaring that James had forfeited all title to the throne, made a tender of their allegiance to the prince and princess of Orange.—In French Hist. the term is applied to that assembly which met after the Legislative Assembly had pronounced the suspension of the royal functions in September, 1792, and proclaimed the republic. This body dissolved itself on the establishment of the Directory, in October, 1795.—In the United States, meetings of the people of separate states by specially chosen representatives, to revise and amend the state constitutions, have been named conventions.

Convention of Royal Burghs. (*See* Burghs, Royal.)

Conversation, *kon-ver-sā'-shun* (Lat. *conversatio*; from *con*, and *verto*, I turn), denotes familiar discourse or easy talk between two or more persons, and is opposed to a formal conference. The pleasure and advantages to be derived from conversation are very manifest. There is much in it to lead the superficial observer to view it as a natural gift, and we find individuals, and even nations, that have peculiar talents for it; but still it is an art, and may be learned like every other art, and from its value and importance it is entitled to much more attention than is usually bestowed upon it, at least in this country. Let a man have read, thought, studied as much as he may, rarely will he reach his possible advantage as a *ready* man, unless he has exercised his powers much in conversation. De Quincey goes farther, and not only regards conversation as giving greater facilities to a person in expounding or diffusing the truth, but as giving a new insight into the truth itself. "A feeling dawned on me," he says, after narrating his early dislike of conversation, "of a secret magic lurking in the peculiar life, velocities, and contagious ardour of conversation quite separate from any which belonged to books; arming a man with new forces, and not merely with a new dexterity in wielding the old ones. I felt, and in this I could not be mistaken, as too certainly it was a fact of my own experience, that in the electric kindling of life between two minds, and far less from the kindling natural to conflict (though *that* also is something), than from the kindling through sympathy with the object discussed in its momentary coruscation of shifting phases, there sometimes arise glimpses and shy revelations of affinity, suggestion, relation, analogy, that could not have been approached through any avenues of methodical study." "But in relation to the majority of men, conversation is far less valuable as an organ of intellectual culture than of social enjoyment. For one man interested in conversation as a means of advancing his studies, there are fifty men whose interest in conversation points exclusively to convivial pleasure. This, as being a more extensive function of conversation, is so far the more dignified function; whilst, on the other hand, such a purpose as direct mental improvement seems, by its superior gravity, to challenge the higher rank."—(*Essay on Conversation.*) The ancient philosophers were masters of the art of conversation, and adopted this mode of communicating instruction to their disciples. In modern times the French are distinguished, among all other nations, for sparkling, fluent, animated, and delightful conversation. The *Encyclopédie Moderne* says, not without some truth:—"Les Allemands ne causent pas, ils argumentent; la conversation des Italiens est une pantomime mêlée d'exclamations; chez les Anglais, ce qu'on nomme conversation est un silence syncopé par des monosyllabes et interrompu de quart d'heure en quart d'heure par le bruit de l'eau qui s'échappe de l'urne à thé; chez les Français la conversation est un art qui a ses principes, ses règles, ses préceptes, et sa méthode." Rousseau justly remarks that the tone of good conversation is neither dull nor frivolous. It is fluent and natural; sensible, without being pedantic; cheerful, without being boisterous; elegant, without being affected; polite, without being insipid; and jocose, without being equivocal. It deals not in dissertations or epigrams; conforms to the demands of good taste, without being bound by rule; unites wit and reason, satire and compliment, without departing from the rules of a pure morality, and allows all to speak on subjects which they understand. Each expresses his opinion, and supports it in as few words as possible; and no one attacks that of another with warmth, or upholds his own with obstinacy. All impart information, and all are entertained. In this art, as in most others, it is more easy to indicate what things are to be avoided than to point out precisely what ought to be done. The object of conversation is to afford entertainment or agreeable information; and one of its first rules is to allow everybody to contribute his share, while every one at the same time ought to exert himself for the gratification of the company. Egotism, or any display of self-conceit, is the very bane of conversation, and carefully to be avoided, as is also tediousness in narration. Adapt yourself to your company, and your conversation to your talents and information. Good sense and good feeling should guide in the selection of topics for conversation, and prevent the introduction of subjects that may not be agreeable to the company. The great art of conversation is to keep it constantly flowing, and to seize upon points which can turn it into new channels. "La conversation n'est point une course vers un but, une attaque régulière sur un point, c'est une promenade au hasard dans un champ spacieux, où l'on s'approche, on s'évite, on se froisse quelquefois sans se heurter jamais."—(*Encyclopédie Moderne.*) It is much to be regretted that an art which occupies such an important place among the accomplishments of social life is yet so much neglected as it is among us. It is one of the most important means that can be employed in the intellectual training of children, and yet it is entirely neglected in the schools. This is one of the errors that exist in our present artificial system of education, when children are taught subjects for which they will have little or no use in after-life, to the entire neglect of such as will daily concern them.

Conversations Lexikon. (*See* Encyclopædias.)

Conversion, *kon-ver'-shun* (Lat. *conversio*), in Log., is the forming of one proposition from another, by interchanging the subject and predicate, thus: the converse proposition of "Every A is B," is, "Every B is A." There are three kinds of conversion,—simple, limited, and by contra-position. In simple conversion, both quantity and quality are retained, as in the example just given. Universal negative and particular affirmative propositions may be simply converted. It requires, however, that the extremes be of equal extent,—that is, either both distributed or neither distributed; as, "Every equilateral triangle is equiangular;" "Some poor persons are liberal." In limited conversion the quantity of universal affirmatives and universal negatives is changed; as, "All oaks are trees," "Some trees are oaks;" "Nothing that is morally right can be politically wrong," "Nothing politically wrong can be morally right." Conversion by juxtaposition is applicable to universal affirmatives and particular negatives, and consists in the combining with each of the transposed extremes the particle *not*; as, "Whosoever is of God doeth righteousness," "Whosoever doeth not righteousness is not of God."

Conversion, in Law, is where a man has found, or becomes possessed of another's goods, and refuses to deliver them on demand; in which case he is said to have converted them to his own use. And an action of *trover* will lie to recover the goods, or the value thereof.

Convert, *kon'-vert* (Lat.), is one who changes his religion, and is specially applied to such as abandon any other faith and adopt that of Christianity. It is opposed to *apostate*, applied to one who has forsaken the Christian religion for some other.

Convex. (*See* Concave.)

Conveyance, *kon-vā'-ans* (Lat. *con*, and *veho*, I carry), in Law, is a writing, sealed and delivered, whereby the property in lands and tenements is conveyed from one person to another. Where the property in goods or in a term of years, or other estate less than freehold, is passed by deed, the instrument of transfer is called an assignment. (*See* Assignment.)

Convict, *kon'-vikt* (Lat.) denotes generally one

convicted of a criminal charge, particularly of a serious nature. In a special sense, it is applied to such as have been sentenced to transportation or penal servitude. (*See* PENAL SERVITUDE, TRANSPORTATION.)

CONVICTION, *kon-nik'-shun* (Lat.), is a record of the summary proceedings upon any penal statute before one or more justices of the peace, or other persons duly authorized in a case where the offender has been convicted and sentenced.

CONVOCATION, *kon-co-kai'-shun* (Lat. *con*, and *voco*, I call), an assembly of the clergy of the Church of England, by their representatives, for the purpose of consulting on ecclesiastical matters. They were originally ecclesiastical councils of the archbishops, summoned for the consideration of spiritual matters; but they afterwards came to be endowed with certain parliamentary privileges. Convocations were first assembled in England, under the king's authority, by Edward I., who summoned them by writ, directed to the two archbishops, for the purpose of obtaining subsidies from the clerical body. Subsequently, convocations continued to be held without royal authority till the passing of 25 Henry VIII., which declares that neither archbishop can summon a convocation without the king's command, nor continue it after it is commanded to cease. When assembled, they cannot confer to constitute any canons without license from the king, nor can they execute any of their canons without royal assent. They cannot execute any after royal assent, but within the four following limitations:—(1) That they be not against the prerogative of the king; (2) nor against the common law; (3) nor against any statute law; (4) nor against any custom of the realm. In 1661, convocation granted a subsidy to Charles II., which was the last tax of the kind paid by the English clergy; for by an arrangement made between Archbishop Sheldon and Lord Chancellor Clarendon in 1664, the convocation of the clergy gave up the privilege of taxing themselves to the House of Commons, in consideration of their being allowed to vote at the election of members of that house. Since that time, convocation exists in little more than name and form. On the meeting of every new parliament, the archbishops of Canterbury and York, in obedience to a writ issued from the crown, convoke the bishops, and the bishops the clergy of their respective dioceses. After the transaction of a few formal matters, the meeting is generally prorogued. Convocation, like parliament, consists of two distinct houses,—the one called the upper house, where the archbishop and bishops sit, and the other the lower house, where the rest of the clergy are represented by their deputies. In the convocation of York, however, on the rare occasions on which it meets, the business is generally conducted in one assembly. Some attempts have recently been made to rescue convocation from its present lifeless state, but hitherto with very little effect.

CONVOLVULACEÆ, *kon-vol-vu-lai'-se-e* (from Lat. *convolvo*, I roll or bind together), in Bot., the Convolvulus or Bindweed fam., a nat. ord. of dicotyledonous plants in the sub-class *Corolliflorœ*. Herbs or shrubs generally twining or trailing, and milky. The leaves are alternate and exstipulate. The calyx has five deep divisions; is much imbricated, persistent. The corolla is 5-partite or 5-plaited, regular, deciduous, and has no scales in its tube; æstivation plaited. There are five stamens alternate with the lobes of the corolla. The ovary is 2-, 3-, or 4-celled, or its carpels are more or less distinct. The fruit is capsular. In this order there are 67 known genera, with about 665 species, which are chiefly found in the plains and valleys of hot and tropical regions. A few flourish in temperate climates, but none in the coldest latitudes. They are remarkable for the presence of an acrid milky purgative juice in their roots. *Jalap* and *scammony* are products of this order.

CONVOLVULUS, *kon-vol'-vu-lus*, in Bot., the Bindweed, a gen. of plants, the type of the nat. ord. *Convolvulaceæ*. It is characterized by a bell-shaped corolla, with five prominent plaits and five shallow lobes. Three species are natives of Britain; namely *C. arvensis*, *Sepium*, and *Soldanella*. *C. Scammonia*, a native of Asia Minor, is a valuable medicinal plant, being the source of the purgative gum-resin called scammony. This is obtained from the fresh root, by cutting the top obliquely off, and allowing the milky juice which exudes to be collected in shells or other vessels. The greater part of the scammony of English commerce is imported from Smyrna. It is usually much adulterated.

CONVOY, *kon'-roi* (Fr. *convoi*), in Mil., a train of waggons laden with provisions, accompanied by a detachment of troops to guard them from falling into the hands of the enemy.—In Mar., the name is given to some of her Majesty's ships that sail with a fleet of merchant-vessels in time of war, to protect them from the enemy's cruisers in their transit from one port to another. If any of the ships thus protected get captured, through neglect on the part of the master to obey signals, or from parting company with the convoy, the policy of insurance effected on the vessel and cargo before starting becomes void.

CONVULSIONARIES, *kon-vul'-shun-ä-res*, the name given to a fanatical sect of Jansenists, who made their appearance in Paris about 1730. They used to assemble at the grave of a celebrated Jansenist named Francis of Paris, in the churchyard of St. Medardus, and there work themselves up into the greatest agitations or convulsions, preaching, prophesying, and professing to receive wonderful revelations. They threw themselves in the most violent contortions of body, rolled about on the ground, imitated birds and beasts, and when they had completely exhausted themselves, went off in a swoon. In 1732 the king caused the churchyard to be walled in and a watch set over it, and, the following year, he issued orders for them to be imprisoned; but even these steps did not entirely put a stop to their fanaticism.

CONVULSIONS, *kon-vul'-shuns* (Lat. *convello*, I pull together), in Path., is a violent and involuntary contraction of the muscles of the human body, generally with corresponding relaxations, but sometimes with rigidity and tension. The fits vary much in extent and violence, sometimes attacking the whole body, at other times only particular parts; sometimes lasting only for a few minutes, at other times continuing for hours. When the affected muscles are rigid and tense, and their contraction persistent or not quickly alternating with relaxation, the convulsion or spasm is said to be *tonic*; when contractions and relaxations rapidly alternate, it is called *clonic*; when slight contractions rapidly alternate with relaxations, it is called *tremor*. Sometimes the attack is sudden and without any warning; but generally it is preceded by certain premonitory signs, such as giddiness, dimness of vision, coldness of the extremities, tremblings, and a cold air creeping up the back or up a limb. During the fit the teeth gnash and often bite the tongue, the mouth foams, the eyes roll wildly about, and the whole face is distorted. The muscular force exerted is sometimes so great as to overcome the strength of several attendants. Great languor commonly succeeds, attended frequently with headache and giddiness; but these generally pass quickly away. In partial convulsions the mind is rarely affected; but when general, it is in most cases lost during the fit. The causes of convulsions are many and varied, and their treatment must in each case depend very much upon the cause. In children the common cause is irritation of the bowels, arising from gross and indigestible foods, teething, or worms. These are to be treated by the administration of appropriate purgatives and the lancing of the gums. In puerperal convulsions bleeding and opiates are the usual remedies; and in cases where they arise from violent affections of the mind, the exciting cause must be studiously avoided. During the fit the patient should be immediately surrounded as much as possible by fresh cool air, his face, neck, and bosom freely exposed to it, and everything tight about the body loosened. For children a warm bath is strongly recommended. The after-treatment consists in the judicious use of tonics and nervous stimulants, with cold bathing, regular exercise in the open air, plain but nourishing diet, and attention to the state of the bowels.

COOLIES, or COULIES, *koo'-lees*, was originally the name of one of the most fierce and barbarous of the aboriginal tribes of Hindostan, which abounds chiefly in the province of Gujerat. From the circumstance of many of these being afterwards employed as labourers and porters in Bombay and other parts of India, the

name came to be applied by Europeans to that class of persons generally in India. It is now also applied to emigrant labourers from India and China to America, the West Indies, and other parts.

COOPERAGE, or COOPERING, *koop'-er-āj*, *koop'-er-ing* (Eng.-Sax.), the mechanical art by which casks, tubs, barrels, and all kinds of wooden vessels bound together with hoops, are made. It is a very ancient art, and its invention is ascribed by Pliny to the people who lived at the foot of the Alps. On account of the abundance of wood, the fabrication of casks was early introduced into France, and from that country it was imported into Britain. The occupation of the modern cooper is divided into several distinct branches. The *dry* cooper makes casks for containing all kinds of goods not in a liquid state; such as sugar, flour, &c. The *wet* or *tight* cooper makes vessels for holding liquids; and this branch is subdivided into *large* and *small* work, which are kept quite distinct. There are, also, *white* coopers, or those who make tubs, pails, churns, &c.; and there are coopers in *general*, who undertake every variety of work. The upright pieces which form the sides of a barrel or cask are called staves, and the shaping and planing of these is the most difficult and the most important part of a cooper's work. Each stave must form part of a double concoid; it must be broader in the middle, and gradually become narrower, but not in straight lines, towards the two extremities. The outside of the staves, across the wood, is wrought into segments of a circle, and is made thickest in the middle, growing gradually thinner towards the ends. When the staves are dressed and arranged in a circular form, the cooper can make their edges coincide perfectly together. In the shape of the staves, and in giving the proper curve, consists the principal part of the cooper's art. The best work is made of oak, of which five kinds are used; viz., Quebec, Virginia, Dantzic, Hambro', and English. Small dry casks or kegs are chiefly made of Quebec oak. All wood employed ought to be thoroughly dried before being put together.

CO-OPERATION, *ko-op'-er-ā'-shun* (Lat. *con*, and *opus*, a work), denotes literally a working together, and in Pol. Ec. is applied to certain societies formed among the industrial classes for some commercial purpose. The prevailing belief that the labourer does not work for himself, but for the capitalist,—that the latter obtains all the profit of his labour,—has led to the natural conclusion, that if he could work for himself, if he could supply capital as well as labour, then the whole of the profits would be his own. This has led to the formation of societies among the working classes, where, by each contributing a small sum to the general fund, they have obtained capital for the purpose of embarking in some commercial undertaking, the profits on which being afterwards divided among them, or going to increase their capital and enlarge the sphere of their operations. Thus, instead of putting their savings into a bank, or investing it in other securities which yield only a small interest, as the capital is employed by others, who must have their profits out of it, they employ it for themselves, and thus obtain the whole of the profits. Co-operation differs from communism, socialism, or any other fanciful scheme of civil society. It is simply a joint-stock company, carrying on some commercial enterprise. It usually takes the form of a society for supplying its members and others with articles of daily consumption. The goods are purchased with the money of the society, and sold at the ordinary market rate, the profits being periodically divided among the members, or going to increase the capital. At Rochdale, Leeds, and other places, co-operative societies of working men have been set on foot, and carry on large flour-mills, cotton-factories, and other industrial establishments. Each operative member receives weekly wages, and periodically a share of the profits. "The form of association," says J. S. Mill, "which, if mankind continue to improve, must be expected in the end to predominate, is not that which can exist between a capitalist as chief, and workpeople without a voice in the management, but the association of the labourers themselves on terms of equality, collectively owning the capital with which they carry on their operations, and working under managers elected and removable by themselves." "There is a capacity of exertion and self-denial in the masses of mankind which is never known but on the rare occasions on which it is appealed to in the name of some great idea or elevated sentiment." The system of co-operation is one of great benefit to the working classes, if properly carried out. It fosters provident habits, and encourages industry. Each individual is as much as ever dependent upon his own exertions, which are also more suitably rewarded. It leads, also, to strict inquiry into the moral character of such as are desirous of admission into their society. By several recent statutes, all the provisions relating to friendly societies have been extended to such associations of working men "as have been formed for the mutual relief, maintenance, education, and endowment of the members, their husbands, wives, children, or kindred; and for procuring them food, lodging, clothing, and other necessaries, by exercising or carrying on in common their respective trades or handicrafts." (*See* FRIENDLY SOCIETIES, SOCIETIES.)

COOT, *koot*.—The habits of this bird closely resemble those of the common *Gallinæ*. They are found in various parts of Europe, Asia, and America, but abound in larger numbers in Holland than elsewhere. It is about sixteen inches in length; its upper parts are slaty black, and its under lead-colour. From the bill almost to the crown of the head there is a fleshy excrescence, destitute of feathers, and smooth and round. On this account it is sometimes called the bald-headed coot. The nest of this bird, commonly built in a bush of rushes, and surrounded by water, is, although of ragged appearance, exceedingly strong. "So firm are some of them," writes a sporting naturalist, "that whilst up to my knees in water, they afforded me a seat sufficiently strong to support my weight." The common coot is found in many parts of England, particularly in the Southampton Water and in the Isle of Sheppy.

COPAIBA. (*See* COPAIFERA.)

COPAIFERA, *ko-pai'-fe-ra* (from *copaiba*, the Brazilian name, and Lat. *fero*, I bear), in Bot., a gen. of plants belonging to the nat. ord. *Leguminosæ*, sub-ord. *Cæsalpinieæ*. The species are natives of tropical America, and several yield the valuable oleo-resin which is used in medicine under the name of *balsam of copaiba*. This is obtained by making incisions into the stems of the trees. Most of the copaiba of commerce is brought from the Brazils, a very little being imported from Guiana and the West-Indian islands. The timber known as the purple heart, or purple wood of Guiana, is the produce of *C. publiflora*, and probably *C. bracteata* also. It is largely employed for making musket ramrods and for ornamental purposes.

COPAL. (*See* HYMENÆA.)

COPALCHI BARK. (*See* CROTON.)

COPARCENARY, *ko-par'-se-nā-re* (Norm.), is an estate where lands of inheritance descend from the ancestor to two or more persons. It arises either by *common law* or by *particular custom*. By *common law*, as where a person seised in fee simple or in fee tail dies, and his next heirs are two or more females, his daughters, sisters, aunts, cousins, or their representatives. In this case they shall all inherit, and these co-heirs are then called *coparceners*, or, for brevity, *parceners*. *Parceners by particular custom* are where lands descend, as in gavelkind, to all the males in equal degree, as sons, brothers, uncles, &c.

COPARTNERY. (*See* PARTNERSHIP.)

COPE, *koop* (Sax. *cappe*), is a kind of cloak or vestment worn by the clergy of the Anglican church during divine service. It reaches from the neck nearly to the feet, and is open in front, except at the top, where it is united by a band or clasp. The rubrics of Edward VI. prescribe a cope or vestment for the priest administering the holy communion, and for the bishops when executing any public ministration in the church, for which a vestment may be substituted either by priest or bishop.

COPE, among Miners, is a custom of tribute due to the crown, or lord of the soil, out of the lead-mines of Derbyshire.

COPEC, *ko-pek'*, a Russian copper coin, equal to the hundredth part of a rouble, which is about 3*s.* 2*d.* sterling.

COPERNICAN SYSTEM. (*See* ASTRONOMY.)

COPERNICIA, *ko-per-nish'-yă*, in Bot., a gen. of palms. The species *C. cerifera*, the Carnauba palm, is a native of the Brazils. On the lower surface of its leaves wax is secreted, and this is occasionally imported into this country under the name of *Carnauba* or Brazilian wax.

COPING, *ko'-ping* (Du. *kop*, the head; Sax. *coppe*, a cap), in Arch., the layer of stones or brick that is placed on the top of a wall to form a finish to it, and to protect it from the weather. There are three kinds of coping: flat or parallel coping, which is generally placed on gable-ends of houses and walls of all kinds; feather coping, the stones of which are thicker on one side than on the other; and saddle-back coping, which slopes from the centre on either side. The coping should project beyond the surface of the wall over which it is placed, to prevent the rain from trickling down its sides.

COPPER, *kop'-per*, in Chem., symbol Cu, equivalent 31·75, spec. grav. 8·921 to 8·952. The symbol of this important metallic element is an abbreviation of its Latin name *cuprum*, which word is itself derived from that of the island of Cyprus (Gr. *kupros*), where it was first worked on an extensive scale. It was called *Venus* by the alchemists, who gave to it the symbol of that planet, ♀. Copper is a hard, sonorous, ductile, and malleable metal, of a characteristic reddish-brown colour. Very thin films have been obtained, which were of a beautiful green colour by transmitted light, although of the natural colour by reflected light. It is one of the best conductors of heat and electricity, and expands one part in 582 between the freezing and boiling points of water. By slow voltaic reduction, it may be obtained in cubes and octahedral forms, which are also taken by several deposits of native copper. The melting-point of copper is 1996° Fahr.; and by exposing it to a very intense heat, it boils and volatilises, burning with a brilliant green flame. Heated to redness in the open air, copper combines rapidly with oxygen; but even moist air at ordinary temperatures has but little effect on it. In sea-water it becomes gradually corroded by the formation of an oxychloride of copper. Nitric acid oxidizes and dissolves it with great rapidity; sulphuric does not act on it at ordinary temperatures, but dissolves it rapidly if heated, sulphurous acid being evolved and oxide of copper formed, which unites with the excess of acid to form the sulphate. Hydrochloric acid dissolves it with access of air; if the air is excluded, no action takes place. It is but little affected by the fixed alkalies; but, with access of air, ammonia slowly oxidizes it. The uses of copper are very important, large quantities being used for sheathing ships, and in the manufacture of boilers and utensils for domestic purposes. With zinc it forms brass, and with different proportions of tin it forms bronze, bell-metal, gun-metal, and speculum-metal. Its oxides and salts are largely used as pigments and in pharmaceutical preparations. Copper unites with oxygen in four proportions:—1. The *sub-oxide* or *dinoxide*, $Cu_2O$; 2. the *protoxide* or *black oxide*, CuO; 3. the *binoxide*, $CuO_2$; and 4. *cupric acid*, the composition of which is not known. Sub-oxide of copper may be obtained in several ways:—1. By calcining the sub-chloride with carbonate of soda, and washing the residue; 2. by heating four parts of copper-filings and five parts of protoxide of copper in a close crucible; 3. by boiling a solution of sulphate of copper with grape vinegar, and adding potassa. By the first and third processes, the suboxide is obtained in a crystalline state. Sub-oxide of copper is a feeble base, and its salts are unimportant. Its principal use is in the manufacture of stained glass, to which it imparts a ruby-colour of great beauty. *Protoxide of copper*, CuO, is prepared by heating copper plates and turnings in a current of air, or by calcining nitrate of copper in an earthen crucible. It is a black powder, possessed of strong hygroscopic qualities. When strongly heated, it fuses, and parts with a portion of its oxygen, a compound of suboxide and protoxide being formed. Oxide of copper is easily reduced at a moderately high temperature by carbon, hydrogen, or organic matter,—a property which renders it peculiarly valuable in the ultimate analysis of organic bodies. It is also used to give a green colour to glass. It is quite insoluble in





water, but dissolves freely in acids, yielding very important salts. The *hydrated oxide*, $CuO_2HO$, is obtained by decomposing a solution of a copper salt with an excess of potassa. The pigment known as blue verditer consists of a hydrated oxide of copper. Boiled with water, it becomes black and anhydrous. It is soluble in ammonia, forming a deep blue solution. *Binoxide of copper*, $CuO_2$, has been obtained by the action of binoxide of hydrogen, or hydrated oxide of copper. It is a yellowish-brown powder, easily decomposed into oxygen and oxide of copper by heat or acids. *Cupric acid*, the formula for which has not been determined, is known only in combination with potassa, and is formed when finely-divided copper is heated to redness with caustic potash and nitrate of potash. Digested in water, the mass yields a blue solution, supposed to consist of *cuprate of potash*. The salts of copper are characterized by their green or blue colour. They are nearly all soluble, and have a strong, disagreeable, metallic taste, acting as poisons on the human system. The symptoms of poisoning by copper are violent and irrepressible purgings and vomitings, followed by exhaustion and death. The best antidote is albumen, or white of egg, with which the salt form an insoluble and almost inert compound. In medicine, sulphate of copper is used as a tonic, and antispasmodic in cases of dyspepsia and Asiatic cholera. It is also used as an outward application to wounds which present the granulated appearance known as "proud flesh." In five-grain doses, sulphate of copper acts as a powerful emetic. The other salts of copper are but seldom used. The most characteristic reactions of copper salts are as follows: *Ammonia* in excess gives a dark blue solution; *yellow prussiate of potash* gives a red-brown precipitate. A strip of bright *metallic iron* precipitates copper from acid solutions in a metallic form. Of late years, copper has been used somewhat extensively to give a bright green colour to pickles and preserves. Its presence may be readily detected by incinerating the suspected article, washing the ashes in water, and filtering. If, on the addition of liquid ammonia, the solution strikes a deep blue colour, copper is present. Oxide of copper forms four compounds with acetic acid: *neutral acetate* (known in commerce under the name of verditer, which *see*), *subsesquiacetate*, *diacetate* (or verdigris, which *see*), and the *triacetate*, which is the most stable of the acetates of copper. Copper forms two chlorides, two simple compounds with cyanogen; Wurtz obtained a compound termed *hydride of copper*; and there is another important salt termed *nitrate of copper*. The copper of commerce is very nearly pure, containing only traces of arsenic, iron, lead, tin, and silica. Copper is employed chiefly in the sheathing of ships, to protect them from the action of the sea-water. It is also used very largely in the construction of small boilers and culinary vessels. Copper-plates are used in engraving, the impression being very sharp and delicate. The most important alloys of copper and zinc are brass, Dutch gold, pinchbeck, and tombac. Brass varies in composition according to the purpose for which it is to be used. It generally consists of two-thirds copper and one of zinc, with traces of lead and tin. Formerly, it was the custom to fuse the zinc ore and the copper together; but nowadays it is considered better to prepare brass by combining its constituent metals in proper proportions. *Tombac* is about fifteen per cent. poorer in copper. The principal alloys of copper and tin are bronze, gun-metal, bell-metal, and speculum-metal. The alloy known as argentum, packfong, or German silver, consists of two parts of copper, one of nickel, and one of zinc. The copper and zinc are first fused together, and the zinc is afterwards added. German silver has a yellow colour, is malleable and ductile. It should not be employed for culinary vessels, as it is easily oxidized and dissolved by contact with the air and acids. For some purposes, copper is covered with a thin layer of tin, by spreading the fused metal over the heated surface of copper, to which it adheres.

COPPER ORES.—The ores of copper are somewhat numerous and widely spread over the earth's surface. Native copper is occasionally found crystallised in cubes, octahedra, or dendritic crystals, or in amorphous masses, in North America and Siberia. Near

Lake Superior is a vein of metallic copper associated with silver, two feet in thickness. The commonest ore of copper is copper pyrites, which is the ore found in Cornwall, from which more than two-thirds of the copper used in Great Britain is obtained. After being sorted and sifted, it is sent to Swansea to be smelted. North America and Saxony also supply this ore. The Australian ore, large quantities of which are annually imported, is a mixture of the green and blue carbonate, and contains from 25 to 30 per cent. of metal, the average of Cornish pyrites containing only 8½ per cent. Certain ores found in Chili are valuable from the amount of silver they contain. The red and black oxide also occur in Cornwall, Siberia, Brasil, and Germany.

Copper Pyrites, in Min., an important ore of copper, occurring as a double sulphide of iron and copper, $Cu_2S.F_2S_3$, in various parts of the world. Copper pyrites have a brassy lustre, and are found generally in amorphous masses with a conchoidal fracture; sometimes they occur crystallized in tetrahedra. The variety called *peacock copper ore* contains a very large per-centage of copper.

Copper-smelting. (*See* Smelting.)

Copperas, *kop'-per-as* (from Germ. *kupper-wasser*, copper-water).—This term is applied, with the prefixes blue and green, to the sulphates of copper and iron respectively.

Coppered, *kop'-perd*, in Mar., is a term employed to denote a ship whose bottom is cased with copper, in order to prevent the worms eating into the planks or to keep dirt from accumulating there. The practice of copper-sheathing was introduced about the year 1758.

Copper-fastened.—When the heads of all the bolts and other metal-work in the exterior of a ship's hull are formed of copper, she is said to be copper-fastened. This is done because, if made of iron, they would corrode when the vessel is copper-sheathed.

Copperplate Printing is performed at what is called a rolling press. In the process of printing, the plate of copper from which the impression has to be taken is raised to the temperature of about 180°, by placing it in an iron box in which steam circulates. Copper-plates were formerly heated by placing them over burning charcoal, thus causing the trade to be very injurious to the health of the workmen. After the plate is heated sufficiently, the printer dabs a small quantity of ink on the face of it with a rubber made of linen rags. He then removes the plate from the source of heat, takes off some of the superfluous ink with a piece of canvas, next carefully rubbing the face of the plate with both hands in succession. To accelerate the wiping, he dips his hand from time to time in whiting. The chief art of the printer is to remove every particle of the ink from the plain surface, and yet not disturb the ink in the engraved parts. When properly finished, the plate is laid on the plank of the press, and the damped paper which is to receive the impression is laid over it, with two or three folds of flannel or blanket above. The plate is then pulled through the rollers of the press, and the required impression obtained.

Coprid*æ*, *kop'-ri-de*, a fam. of four-winged insects allied to the *Scarabæus*. The name is from the Greek word for dung (*kopros*), in which these beetles are generally found.

Coprolites, *kop'-rol-ites* (Gr. *kopros*, dung; *lithos*, stone), are the excrements of animals found in a fossil state in the secondary and tertiary strata. They consist chiefly of the voidings of saurians and sauroid fishes. The true nature of coprolites was first discovered by their occurrence near the region of the intestinal tube in the bodies of several fossil ichthyosauri. Scales, bones, teeth, and other parts of undigested food, are often found in them, and occasionally they are found exhibiting the spiral twisting noticeable in the excrement of some living fishes. Coprolites contain a considerable proportion of phosphate of lime, for which reason they are largely employed in the manufacture of artificial manures.

Coptic Language, *kop'-tik*, is the language of the ancient Copts, or that which was in use in Egypt after the introduction of Christianity. What relationship it bore to the more ancient language of that country it is impossible to determine. The written character is Greek, with an addition of eight other letters to express sounds peculiar to the Coptic, and many Greek words have been introduced with Christianity. There are two principal dialects of the Coptic,—the Sahidic, or Upper Egyptian, and the Memphetic, or Lower Egyptian. The former contains a greater number of Greek expressions, but the latter appears to be the more polished. There is a third dialect,—the Bashmuric, which was spoken in the Delta, but of which only a few fragments now exist. It is interesting from its supposed resemblance in some points to the language of the hieroglyphics. The Coptic literature is by no means rich or valuable, consisting for the most part of translations of the sacred Scriptures, lives of saints, homilies, and some Gnostic works. The translations of the Bible were probably made about the end of the 3rd or beginning of the 4th century, and follow, as far as the Old Testament is concerned, the Septuagint version. The Coptic language has not been spoken in Lower Egypt since the 10th century, but it lingered for some centuries later in some parts of Upper Egypt. It is still, however, employed by the Copts in the religious worship; but the lessons, after being read in Coptic, are explained in Arabic.

Coptis, *kop'-tis* (from Gr. *kopto*, I cut), in Bot., a gen. of plants belonging to the nat. ord. *Ranunculaceæ*. The species *C. trifoliata*, commonly called gold thread, is a native of North America, and is much prized for its root, which is a pure and powerful bitter, and forms an excellent stomachic and tonic. The root of *C. Teeta* is found in the bazaars of India, under the names of *mishmee bitter* and *mahmira*. It is intensely bitter, and is a very valuable tonic.

Copts, *kopts*, the name given to the Christian descendants of the ancient Egyptians. The name is generally believed to be derived from the city of Coptos, in Upper Egypt, to which, during the persecutions that took place under the Roman emperors, many of the Christians had fled for refuge. In Egypt they are called *Kibt*, which some are inclined to believe to be the root of the name Egypt. The number of Copts in the country at present is not more than 150,000, or about a fourteenth part of the entire population, and about 10,000 of them live in Cairo. They are not of large stature, have black eyes, rather curly hair, and in several other respects resemble the ancient Egyptians, from whom they have inherited also the custom of circumcision. Their dress very much resembles that of the Moslems; but they are usually distinguished by a black turban. In character they are generally gloomy, deceitful, and avaricious. They have always been distinguished for their expertness in figures, in consequence of which many of them fill important posts throughout the country, and have acquired great influence. In religion they are generally monophysites of the Jacobite sect, only a small portion of them being united either with the Greek or Roman church. They ascribe their conversion from heathenism to St. Mark, whom they regard as the first patriarch of Alexandria. Their present patriarch is still said to be "of Alexandria," though he resides at Cairo. Besides him, they have a metropolitan of the Abyssinians, bishops, arch-priests, priests, deacons, and monks. The patriarch is always chosen from the monks of the convent of St. Anthony, either by his predecessor or by lot, and is not permitted to marry. He nominates the metropolitan of Abyssinia, who resides in that country. There are twelve bishops. The Copts are very strict in their religious observances, and hate other Christian sects more than they do the Moslems. They practise baptism by immersion, unction, and exorcism; have auricular confession; and celebrate the Lord's Supper with leavened bread which has been dipped in wine. They fast regularly on Friday, and observe it with great strictness. Their monks and nuns lead a very strict life. The Copts have many schools, but only for boys, who there learn the psalms, gospels, and the apostolic epistles in Arabic, and then the gospels and epistles also in Coptic. The Coptic, however, is not taught grammatically, nor is it any longer a spoken tongue.—Ref. *Conversations Lexikon*.

Copula, *kop'-u-la* (Lat., a band), is the name given in Log. to the word or words which connect the predicate and the subject of a proposition, which indicate

that the predicate *is* affirmed or denied of the subject. Sometimes the copula is contained in the predicate,—as, The fire burns; but in strict logic *is* and *is not*, or some other part of the *verb to be*, are the only copulæ permitted; as, The fire *is* burning; John *is not* at home.

COPYHOLD, *kop'-e-hold*, is a tenure for which the tenant has nothing to show but the *copy* of the *rolls*, made by the steward of the lord's court, on such tenant being admitted to any lands or tenements within a manor that time out of mind, by use and custom of the manor, have been granted or demised to such as are entitled to take the same in fee or fee-tail, for life, years, or at will, according to the custom of the manor by *copy of court roll* of the manor.

COPYING-MACHINE, *kop'-e-ing*, a contrivance by which duplicates of letters and manuscripts may be produced without having recourse to transcription. A copying-machine generally consists of a flat bed, upon which rest the letter to be copied and the paper for the duplicate. Above these is a flat plate, called a platten, which, by means of a screw or lever, is made to produce the necessary pressure. The ink with which the letter is written contains a certain amount of sugar or treacle, which is transferred to the paper laid upon it by the pressure exerted. The copy made is, of course, reversed, but the paper is purposely made thin, in order that the writing may be read through it. Various contrivances have been invented for procuring the necessary amount of pressure, but the simple screw and lever appears to be the best of them all. The manifold-writer may be described under this head. It simply consists of a number of sheets of paper blackened with some composition that will come off when pressed hard, but will not move at a slight degree of pressure or friction. Blank sheets of paper are inserted between these, and the writing is performed with a hard stylet made of steel or agate, the whole being placed on a smooth copper or pewter plate. (*See* also PANTOGRAPH.)

COPYRIGHT, *kop'-e-rite*, is that right which the law allows an author or his assigns of printing and reprinting his own *original* work. The Roman law contains no recognition of the right of property as regards the productions of literature; neither with us in England was the right of authors in this respect clearly ascertained until a comparatively late period of our legal history; but in the reign of Queen Anne it became at length the subject of positive regulation, and subsequent enactments were applied to it. It is now mainly regulated by the 5 & 6 Vict. c. 45, which provides that the copyright of every book (under which word is included, in the construction of the act, every volume, part, or division of a volume, pamphlet, sheet of letter-press, sheet of music, map, chart, or plan separately published) which shall be published in the lifetime of its author, shall endure for his natural life, and for seven years longer; or, if the seven years shall expire before the end of forty-two years from the first publication, shall endure for such period of forty-two years; and that, when the work is posthumous, the copyright shall endure for forty-two years from the first publication, and shall belong to the proprietor of the author's manuscript. If the work be unlawfully printed within the British dominions, an action for damages must be brought within twelve calendar months; and, if unlawfully reprinted in any place out of the British dominions and imported into the United Kingdom, it may be seized as forfeited by any officer of the customs or excise, and the offenders are liable to penalties. The title of the work must be registered at Stationers' Hall before an action can be brought for the infringement. The act empowers the judicial committee of the privy council to allow the proprietor of a deceased author's work to publish the work, subject to such conditions as they may think fit. Besides the remedy by action, the courts of equity will (after the registration) interfere by injunction to restrain an infringement of the right. An assignment of the copyright properly registered at Stationers' Hall is as effectual as if made by deed. Protection does not extend to the work if it be immoral, blasphemous, or seditious in its tendency, or if it be defamatory of private character, or if (with a view to defraud the public) it is published as the work of one who is not in truth the author. The sole liberty of printing and publishing (except in unlicensed places) *oral lectures* is secured to the lecturer; and the author of *dramatic pieces* and *musical performances* has, as his own property, the sole liberty of bringing them out upon the stage. The law also recognises a species of copyright in *engravings* and *prints, sculptures, models, copies*, and *casts*; and also in *designs for articles, whether of ornament or utility*. And by the law regulating *international copyright*, the copyright of works, as well in the language in which they are written, as of translations, is reserved to foreign authors, under certain regulations, one of them being the registration at Stationers' Hall; and this international protection extends not only to books and prints, but also to articles of sculpture and other works of art. (*See* 5 & 6 Vict. c. 45; 7 & 8 Vict. c. 12; 8 & 9 Vict. c. 93; 10 & 11 Vict. c. 95; 15 & 16 Vict. c. 12; 13 & 14 Vict. c. 104; and 21 & 22 Vict. c. 70.) (*See* further, as to protection of inventions, PATENT, LETTERS.) By the Copyright (works of art) Act, 1862, protection is extended to artists. It is thereby enacted that the author (being a British subject, or resid t within the dominions of the crown) of every origi painting, drawing, and photograph, which shall ' e, or shall have been made, either in the British dominions or elsewhere, and which shall not have been disposed of before the commencement of the act (29th July), and his assigns, shall have the exclusive right of copying, reproducing, and multiplying the same for the term of his natural life, and seven years after his death. If, on sale, he wishes to reserve the copyright, he must have an agreement in writing to that effect, or the right will belong to the purchaser. The act is not to prejudice the right of any person to copy or use any work in which there shall be no copyright, or to represent any scene or object, notwithstanding there may be copyright in some representation of such scene or object. The work must be entered at Stationers' Hall, the charge for which is to be one shilling; and certain enactments of the 6 Vict. are to apply to the entry. The penalty for each offence against the act is £10, and forfeiture of the copy. The International Copyright Act of the 7 & 8 Vict. forms part of the act.

COQUILLA NUTS. (*See* ATTALIA.)

CORACLE, *kor'-a-kl* (Celtic, *curach*), a light boat or canoe, constructed with a framework of wood covered with skins. Coracles were used by the ancient Britons from the most remote times. Julius Cæsar built some after the British model: the keel and gunwhales were of light wood, and the sides of wicker, covered with hides. The general size of a coracle was about four feet long and three wide, its shape being oval. It held only one person, who propelled it with a paddle, and on land it was carried with ease upon the shoulders from place to place. The coracle is still in use in some parts of Ireland, especially on the coasts of Donegal and Clare. It is also used on the Severn, in England.

CORAL REEF, *kor'-al* (Gr. *korallion*, Fr. *corail*, Ger. *riff*, a reef), a term applied by naturalists, as well as by mariners, to any connected mass of coral structures, whether trending away in long partially submerged ledges, encircling islands like breakwater-barriers, or rising as low ring-shaped islets above the waters of the ocean. In almost all tropical seas, incrusting patches or small banks of living coral are to be found along the shores, wherever they consist of hard rock and the water is quite clear. In the Indian and Pacific oceans, however, far away from any land, huge masses of coral rock rise up from vast and unknown depths just to the level of low water. These masses are often unbroken for many miles in length and breadth, and groups of such masses, separated by small intervals, occur over spaces sometimes of 400 or 500 miles long by 50 or 60 in width. One of the greatest formations of coral rock is along the north-east coast of Australia. (*See* BARRIER REEF.) The reef masses consist of living corals only at their upper and outer surface; all the interior is composed of dead corals and shells, either whole or in fragments, and the calcareous portions of other marine animals. The interstices of the mass are filled by calcareous sand and mud derived from the waste and *débris*, the wear and tear of the corals and shells, and by count-

less myriads of minute organisms, mostly calcareous also. The surface of a reef, when exposed at low water, is composed of solid-looking stone, which is often capable of being split up and lifted in slabs, bearing no small resemblance to some of our oldest limestones. The slabs, when broken open, are frequently found to have a semi-crystalline structure internally, by which the forms and the organic structure of the corals and shells are more or less disguised and obliterated. The raised coral-reefs in the islands of Timor and Java are often internally as white and friable as chalk. Darwin states that the principal reef-builders are the *madrepores, astræas, porites, meandrinæ*, and *nullipores*, at moderate depths, and the *millepores, seriatopores*, and other delicate forms, at depths from fifteen to twenty fathoms,—the great field of coral development thus lying between low water and twenty fathoms.—*Ref.* Darwin *On the Structure and Distribution of Coral Reefs; Voyage of H.M.S. Fly;* Dana's *Report on the Geology of the United States Exploring Expedition.*

CORBEL, *kor'-bel* (Ang.-Norm.), in Arch., the name given to blocks of stone projecting from the surface of a wall to support the machicolations of towers (*see* MACHICOLATION), or the ends of the beams of the floors in old castles. The beams which form what is called an open roof in churches and large halls are often supported on carved corbels. The stones which support the bartizans (*see* BARTIZAN) at the angles of towers, jutting out in layers one above another, are also called corbel-stones, and stones which project in this manner are spoken of as "corbelling out."

CORCHORUS, *kor'-kor-us* (from Gr. *koreo*, I purge, in allusion to the laxative qualities of *C. olitorius*), in Bot., a gen. of plants belonging to the nat. ord. *Tiliaceæ*. The most important species is *C. capsularis*, the jute-plant, a native of India. The fibre called *jute*, or *jute-hemp*, is obtained from the bark. It is now imported in enormous quantities into this country, and is employed for making coarse bags, and as a foundation for inferior carpets. It is also frequently mixed with silk in the manufacture of cheap satin fabrics. It does not appear to be well adapted for cordage, because it will not bear exposure to wet. In India it is used chiefly for the purpose of making coarse canvas called *gunny*, which is the common material for bags employed in packing raw produce. The species *C. olitorius*, commonly called Jews' mallow, is used in some parts of the world as a pot-herb. In Panama the leaves of *C. mompoxensis* are employed as a substitute for Chinese tea.

CORDELIERS, *kor-de-leers'*, was the name given to the strictest branch of the Franciscan friars, on account of their wearing a knotted cord for a girdle. They were originally called minor friars, and were established towards the end of the 14th century. There are said to have been at one time in France no fewer than 284 male and 123 female convents of Cordeliers. During the French revolution of 1789, a political society assumed this title from the circumstance of its meetings being held in an old Franciscan convent. It was opposed to the Jacobins, and was of great influence, numbering among its members Danton, Desmoulins, Marat, and others.

CORDIACEÆ, *kor-de-ai'-se-e* (in honour of Cordus, a German botanist), in Bot., the Cordia or Sebesten fam., a nat. ord. of tropical trees in the sub-class *Corollifloræ*. The fruits of many species are edible; as those of *Cordia myxa* and *latifolia*, known in India as Sebastens or Sebesten plums; those of *C. abyssinica*, commonly called the Wanzey, a native of Abyssinia; and those of *Varronia rotundifolia*, which are used to fatten cattle and poultry. The order consists of eleven genera, in which there are about 180 known species.

CORDIALS, or LIQUEURS, *kord'-yals* (Fr. Sp. *cordial*, from Lat. *cor*, the heart), are made by flavouring rectified spirit with different essential oils, such as aniseed, caraway, clove, peppermint, &c., and adding a portion of syrup sufficient to neutralise the burning taste of the spirit.

CORDYCEPS, *kor'-di-seps*, in Bot., a gen. of Fungi, including many species which are very destructive to living plants and animals. The disease called ergot, which occurs in the grains of rye and other grasses, is produced by *C. purpurea*. (For Ergot of Rye, *see* SECALE.) Caterpillars are frequently killed by other species growing in them. The remains of the caterpillar, with the developed fungus of the species *C. sinensis*, is a highly esteemed drug in China, where it is much used as a tonic.

CORIANDER. (*See* CORIANDRUM.)

CORIANDRUM, *kor-e-an'-drum* (from *Gr. koris*, a bug, in allusion to the smell of the leaves), in Bot., a gen. of plants belonging to the nat. ord. *Umbelliferæ*. The species *C. sativum*, the coriander, has long been cultivated for its fruits, improperly called *seeds*, which are used in the East for flavouring dishes and curries-powder, and in Europe for the purposes of the distiller, confectioner, and pharmaceutist. They have a peculiar odour and warm aromatic taste, due to the presence of a yellowish-coloured volatile oil.

CORIARIACEÆ, *ko-re-ar-e-ai'-se-e* (Lat. *coriun*, a hide), in Bot., the *Coriaria* fam., a nat. ord. of dicotyledonous plants, in the sub-class *Thalamifloræ*. There is but one genus, which includes eight known species, natives of the south of Europe, Chili, Peru, New Zealand, and Nepaul. The order appears to be most nearly related to *Ochnaceæ*, with which it agrees in having its carpels distinct, and placed on an enlarged disk or gynophore; but it is distinguished from that order by its opposite leaves, by sometimes having polygamous flowers, by the persistent fleshy petals, by the absence of any style, and by its long linear distinct stigmas. The plants are to be regarded with suspicion, as they have sometimes produced poisonous effects: the fruits of some, however, are edible. The leaves of *Coriaria myrtifolia* have been used on the continent to adulterate senna, though such leaves are known to be poisonous. They may be at once distinguished from senna-leaves by their two sides being equal and symmetrical at the base, while those of senna are unequal. *C. myrtifolia* and *ruscifolia* have been employed to produce a black dye: the fruits of both species are very poisonous.

CORINTHIAN ORDER. (*See* ARCHITECTURE.)

CORINTHIANS, EPISTLES TO THE, *kor-in'-thi-ans*, are two epistles of the apostle Paul addressed to the church at Corinth, and forming part of the canonical writings of the New Testament. In order clearly to comprehend the scope of these epistles, it is necessary to glance at the circumstances of the people to whom they were addressed. Christianity was first planted at Corinth by the apostle Paul himself during a residence there of about eighteen months, between A.D. 51 and 53. After Paul's departure from Corinth, Apollos, an eloquent man and mighty in the Scriptures, came and preached the gospel there with great success,—watering what the apostle had planted. Other teachers of Christianity also came among them, and the Church came to be divided into different sects,—some declaring for Paul, others for Apollos, some for Cephas, and some for Christ. The converts, too, were partly Jews and partly Gentiles; the former contending strenuously for the observance of Jewish ceremonies, the latter giving way to the idolatrous and lascivious practices of the heathens. When the apostle Paul received information of this state of matters, he wrote to them his First Epistle, the contents of which naturally divide themselves into two distinct parts,—the one being intended to remedy the disorders and abuses that had crept into the Church, the other being in reply to certain questions which the Church had submitted to him for his decision; as, concerning matrimony, concerning the lawfulness of eating things sacrificed to idols, and touching the resurrection of the dead. This epistle produced very different effects in the Church. Many were led to amend their conduct, and to greater vigilance and zeal against the errors into which they had fallen; while others were led to cast imputations upon the apostle, and to accuse him of levity, pride, arrogance, and of being personally contemptible. The great object of the Second Epistle was, therefore, to defend himself against these imputations. He enlarges on his spiritual office, enumerates his sufferings and disasters, recounts his labours, and details his successes. The great oratorical power of this epistle has always been much admired. The various emotions that agitated the mind of the apostle when writing it are expressed with great power. These, as well as his elegance of diction, possess of

persuasion, and force of argument, are all admirably discussed and illustrated by Professor Roysards in his "Disputatio inauguralis de altera Pauli ad Corinthios Epistola," 1816. The former of these epistles is generally believed to have been written about A.D. 57, the latter about 58. The authenticity of either has scarcely even been questioned; but much discussion has arisen as to whether the apostle had addressed to the church at Corinth an earlier epistle than either of these, referred to in 1 Cor. v. 9, in the words, "I have written to you in an epistle." Those who are of opinion that there was no other epistle, maintain that the reference is to the one he was then writing.—*Ref.* Horne's *Introduction to the Holy Scriptures.*

CORK, *kork* (Lat. *cortex*, rind, shell; Germ. *kork*).—In Manuf., cork is the outer bark of the evergreen oak, a tree growing in Portugal, Spain, Italy, and France. The largest quantity of cork is obtained from Spain and Portugal; the smallest but best portion coming from France. The principal use of cork is for the stoppers of bottles, its softness and elasticity rendering it peculiarly valuable for this purpose. Being exceedingly light, it is used for the floats of fishermen's nets. Cork-cuttings, till lately a waste product, have received important applications in the manufacture of mattresses and life-preservers. In a state of coarse powder, it is used, in conjunction with india-rubber and gutta-percha, in the manufacture of kamptulicon, or elastic floor-cloth. (*See* KAMPTULICON.) Cork, when treated with nitric acid, yields suberic acid (which *see*. *See* also QUERCUS).

CORM, *korm* (Gr. *kormos*, a stump), in Bot., a solid underground stem, which does not spread by sending out roots, but remains in a rounded form. It occurs in the tulip, crocus, and in many other monocotyledonous plants. It is distinguished from a root by producing annually small corms, or thickened branches. It differs from a bulb in being solid. (*See* BULB.)

CORMOPHYTES, *korm'-o-fites*, in Bot., plants having stems, as distinguished from *Thallophytes*, or those which simply form cellular expansions of various kinds, to which the term *thallus* is applied. Cormophytes are divided, according to the internal structure of their stems, into three great classes, called respectively Exogens or Dicotyledons, Endogens or Monocotyledons, and Acrogens or Acotyledons.

CORMORANT, *kor'-mor-ant* (Fr. *cormoran*).—This bird is very widely diffused, and inhabits the New as well as the Old continent. Its length is from twenty-seven to twenty-nine inches. Under the throat there is a whitish collar, reaching as far upward as the eyes. Top of the head, neck, breast, and lower parts greenish black; upper part ashy brown, bordered by a band of glossy greenish black; quill and tail-feathers black; bill blackish ash; feet black. This is the bird's



CORMORANT.

winter plumage. In the spring the occiput and a part of the nape of the neck are adorned by a crest of long green feathers, and the collar round the neck changes to the purest white. "The young, when first hatched," writes Mr. Selby, "are quite naked, and very ugly, the skin being of a purplish black. This, in six or seven days, becomes clothed with a thin black down; but the feathered plumage is not perfected in less than five or six weeks. I have repeatedly found that, when thrown into the sea, though only half-fledged, they immediately plunge beneath the surface, and endeavour to escape by diving. This they will do to a great distance, using their imperfect wings and pursuing their submarine flight in the same manner, and almost with as much effect, as their parents." The smell arising from the cormorant is said to be so offensive that the Greenlanders will not touch it. If buried in the ground for about twenty hours, however, the offensive odour abates, and they may be eaten by persons of strong appetites. It is found on the Tern Islands, where its nest is entirely composed of sea-weed, which is frequently heaped up to the height of two feet. In this rough nest are deposited from three to five eggs, of a pale bluish-white, with a rough surface. Cormorants were formerly trained in England to catch fish for the table. When so employed, their necks were encircled by a leather thong, to prevent them from swallowing the catch. The Chinese cormorant (*Phalacrocorax sinensis*), or Leutze, as the Chinese call it, is commonly bred and instructed in the art of fishing.

CORN, *kourn* (Ang.-Sax.), a term generally applied to all seeds used in making bread, especially the seeds of the cerealia. The principal seeds of this kind in temperate climates are wheat, rye, oats, and barley; while those of warm climates are maize, rice, and millet. In a more restricted sense the word corn is applied to that particular grain of a country which is most largely used in making bread. In England corn refers to wheat, in Scotland to oats, and in America to maize.

CORN LAWS and CORN TRADE.—From the great importance of corn as an article of food, it is scarcely to be wondered at that it was so long subject to government interference and restrictions in this country. From the period of the Conquest down to the year 1436, the efforts of the government were directed to prevent its exportation out of the country, while, at the same time, its importation was permitted. The object was to provide an abundant supply of this prime necessary of life at as low a rate as possible; but in that intractable science of political economy, the means adopted to produce a certain result have often been found to have a contrary effect. Agriculture was neglected, because the farmers could not obtain a remunerative price for their produce. In 1436, therefore, with a view to stimulate home production, an act was passed authorizing the exportation of wheat whenever the home price did not exceed 6*s.* 8*d.* (12*s.* 10½*d.* of present money) per quarter, and of barley when the home price did not exceed 3*s.* In 1463, another act was passed prohibiting the importation of corn from abroad until the home price exceeded that at which exportation ceased. On account of the fluctuating policy of the times, however, these laws were in a great measure inoperative. Nominally, they continued in force till 1562, when the prices at which exportation might take place were extended to 10*s.* per quarter for wheat, 8*s.* for rye, and 6*s.* 8*d.* for barley. Nine years later (1571) an act was passed which declared that the lord presidents and councils and the justices of assize should, within their respective jurisdictions, consult with the inhabitants as to the cheapness and dearth of any kinds of grain, and fix annually the average prices by which exportation should be governed within their several limits. Corn might thus be exported at all times to friendly countries when proclamation was not made to the contrary, subject to a poundage or customs duty of 1*s.* per quarter on all wheat exported; and if exported under special license, and not under the act, the duty was 2*s.* per quarter. In 1593, another act was passed permitting exportation on paying a duty of 2*s.* per quarter on wheat and 1*s.* 4*d.* on barley and malt, whenever the price did not exceed 20*s.* and 12*s.* respectively. In 1604 the price was again raised to 26*s.* 8*d.* per quarter of wheat; and in 1623, to 32*s.* for wheat and 16*s.* for barley and malt. Besides the various acts passed for regulating the foreign trade in corn of this country, there were various enactments interfering with it within the kingdom. Under the impression that the injurious effects of dearths, which were then of frequent occurrence, were much aggravated by dealers in corn buying it up and withdrawing it from the market, and that, if corn were purchased by the consumers directly from the growers, it would be obtained cheaper, as the profits of the dealers would

thus be saved, various acts were passed against the buying of corn in one market with the view of selling it again in another, called *engrossing* (which see), declaring such an offence to be punishable by fine and imprisonment. During the troublous times of the civil war, the minds of the people were too much agitated to pay much regard to the corn trade; but, on the restoration of Charles II. a new scale was introduced. Wheat was permitted to be exported when the price did not exceed 40*s.* per quarter, barley and malt 20*s.*, oats 16*s.*; the export duties being on wheat 20*s.* per quarter, barley and malt 10*s.*, and oats 6*s.* 8*d.* By the same act the import rates or duties were fixed as follows: on wheat, when the price did not exceed 44*s.* per quarter at the place of importation, 40*s.* a quarter; when it exceeded that rate, 6*s.* 8*d.* a quarter; barley and malt, when the price did not exceed 30*s.* at the place of importation, 26*s.* 8*d.*; and when it exceeded that rate, 5*s.* per quarter. Of course, these high duties acted as a virtual prohibition of the trade. Three years later, the corn trade again became a subject of legislation. By 15 Car. II. c. 7, it was declared that when the price of wheat does not exceed 48*s.* per quarter at the havens or places of shipment, barley and malt 28*s.*, and oats 13*s.* 4*d.*, then it shall be lawful for any person or persons to transport said corns or grains from such places to any parts beyond the seas, subject, however, to the same rate of duties as had been fixed by the previous act. It was further declared that when the prices of said corns and grains do not exceed the above-mentioned rates at the port or haven where any of them may be imported, they shall be subject to the following duties; viz., wheat 5*s.* 4*d.* per quarter, barley and malt 2*s.* 8*d.*, and oats 1*s.* 4*d.* This act further declared, that when the price of corn or grain did not exceed the above rates, then it should be lawful for any person or persons to buy in open market, and to lay up and keep the same, and afterwards to sell it without incurring any penalty. In 1670 a duty of 16*s.* was imposed upon all wheat imported into this country when the price was at or under 53*s.* 4*d.* per quarter in this country, and 8*s.* when above that price and under 80*s.*, at which last importation was free. In order to determine accurately the price of grain at the various ports wherein foreign corn might be imported, it was enacted in 1685 that justices of the peace in the several counties may, at quarter sessions, by the oaths of two persons duly qualified (*i. e.* possessed of estates of a certain value and not being corn-dealers), determine the prices of the several kinds of grain to be certified to the principal officer of the customs in the several counties for his rule and regulation. The average price of wheat per quarter for the ten years from 1650 to 1660 was 40*s.* 6*d.*; from 1660 to 1670, 48*s.* 10*d.*; from 1670 to 1680, 50*s.* 8*d.*; and from 1680 to 1685, 44*s.* 3*d.* The increasing power of the agricultural party in the state is evident from the various legislative enactments that were made to protect their interests. This was still further evident by the act passed shortly after the accession of the prince of Orange to the throne in 1688, by which a *bounty* of 5*s.* was granted for every quarter of wheat exported when the price was at or below 48*s.*, and other grain in proportion. Subsequently, by 11 & 12 Will. III. c. 20, all previous duties on the exportation of corn were abolished, while the duties and prohibitions upon the importation of corn continued in force. From 1697 to 1773, the total amount of bounties on exports out of the public revenue was [illegible]. In the four years ending 1691, the price of wheat averaged 27*s.* 7*d.* the quarter, being lower than any period during the century; but in the four years ending 1699 it reached 56*s.* 6*d.* "In the fifty-three years from 1692 to 1715," says Mr. Tooke, "History of Prices," "there were eleven bad harvests, during which the average price of wheat was 50*s.* 1*d.* the quarter; in the fifty years ending 1765 there were only five deficient harvests, and the average price for the whole half-century ranged at 31*s.* 11*d.*; and taking the ten years ending 1751, during which the crops were constantly above the average, the price of wheat was only 28*s.* 2½*d.* the quarter." In considering the effects of the bounty, it is not to be forgotten that prices were gradually falling before it was granted, and it was with the avowed intention of checking this fall that it was [illegible]. There can be little doubt,





however, that, by stimulating cultivation to too great an extent, it had counteracted the intention for which it was framed; and it was not till sixty or seventy years after its introduction that, by the increase of the population, the consumption came to be in some measure proportioned to the enlarged produce of the agriculturists. After the year 1750, when the exports of all kinds of grain amounted to 1,667,778 quarters, the quantity exported rapidly decreased, and in 1760 it was only about 600,000 quarters. After the peace of Paris, in 1763, the march of improvement was much accelerated, and the price of wheat rose to an unusual height. In 1773 an act was passed declaring the bounty and exportation to cease until wheat should be 44*s.*, and barley 22*s.* a quarter; and allowing foreign wheat to be imported on paying a nominal duty of 6*d.* whenever the home price reached 48*s.* a quarter. The object of these regulations was to maintain, as far as possible, a level rate of 48*s.*, which was assumed to be a fair price both for grower and consumer. The landowners raised a loud clamour against this law; and at length, in 1791, they succeeded in obtaining an act raising the price at which importation was allowed at 6*d.* a quarter to 54*s.*, a duty of 2*s.* 6*d.* being imposed when the price was between 50*s.* and 54*s.*, and a prohibitory duty of 24*s.* 3*d.* when below 50*s.* In 1804 a prohibitory duty of 24*s.* 3*d.* per quarter was imposed on all wheat imported when the home price was at or below 63*s.*; between 63*s.* and 66*s.* a middle duty of 2*s.* 6*d.*; and above 66*s.* a nominal duty of 6*d.* The price at which bounty was paid on exportation was changed to 40*s.*; but grain might be exported without bounty so long as the price did not exceed 54*s.* In 1813 and 1814 committees of both houses of parliament were appointed to examine and report on the state of the corn trade; and in 1815, after much opposition, an act was passed allowing the free importation of corn from foreign countries, in order to be warehoused or re-exported, but forbidding the importation for consumption unless the prices were, for wheat 80*s.*, for barley 40*s.*, and for oats 26*s.* From the British colonies, however, grain might be imported for consumption when the prices were, for wheat 67*s.*, barley 33*s.*, and oats 22*s.* In this year also the bounty was abolished, though since 1792 the price at home had been so high that none could have been claimed. In 1816 and 1817 the harvests were deficient, and the prices were raised above these limits, so that a large quantity of corn was imported free of duty. The year 1822 yielded an abundant harvest, and the prices fell lower than they had been at any time since 1792. In 1823 the act of 1815 was so far modified as to allow of grain being imported for home consumption when the prices were, for wheat 70*s.*, barley 35*s.*, oats 25*s.* per quarter, and from British colonies when at 59*s.*, 30*s.*, and 20*s.* respectively. In order to prevent any violent reaction from a large supply of grain being suddenly thrown upon the market, a duty of 17*s.* a quarter was to be laid upon all wheat imported during the first three months after the opening of the ports, and 12*s.* thereafter, and other kinds of grain in proportion. In 1825 the importation of wheat from the British colonies of North America was permitted, without reference to the price at home, on payment of a duty of 5*s.* a quarter. The following year a long-continued drought caused great apprehensions as to the harvest, and to prevent the disastrous consequences that might ensue had importation been prevented until the season was too far advanced to admit of supplies being brought from the north of Europe, his majesty was authorized to admit 500,000 quarters of foreign wheat for home consumption. The crops of oats, peas, &c. being ascertained to be deficient, an order in council was issued on the 1st of September, admitting certain descriptions of grain for home consumption at an almost nominal duty until forty days after the first meeting of parliament, on the ground that "if the importation for home consumption of oats and oatmeal, and of rye, peas, and beans, be not immediately permitted, there is great cause to fear that much distress may ensue to all classes of his majesty's subjects." Nothing could show more clearly the errors of the then existing system than the necessity that the government was under of thus interfering from time to time, in order to prevent the disastrous results that it otherwise would have produced. In

1827 Mr Canning introduced certain resolutions into the House of Commons on this subject, the leading principles of which were, that foreign corn might be imported free of duty at all times for warehousing; and also be always admissible for home consumption on payment of certain duties, according to a graduated scale. The bill founded on these resolutions not being carried, the following year Mr. Charles Grant (afterwards Lord Glenelg) introduced a series of resolutions founded on the same principles as those of Mr. Canning; and, after a good deal of discussion, they were carried, and embodied in act 9 Geo. IV. c. 60. In terms of this act, grain could be imported for home consumption at all times on payment of duties, decreasing as the price of grain advanced, and increasing as it fell. When the price of wheat was 66*s.* and under 67*s.*, the duty was to be 20*s.* 8*d.*, an additional 1*s* of duty being imposed for every 1*s.* of decrease in the price under 66*s.*; between 67*s.* and 68*s.* the duty was 19*s.* 8*d.*, increasing up to 73*s.*, at and above which there was a uniform duty of 1*s.* per quarter. For barley, oats, rye, &c., there were similarly graduated scales. The prices which regulated the duties of this act were ascertained from the sales made in 150 of the principal towns of England and Wales. The dealers were bound, under a penalty for each omission, to make weekly returns of all their sales, to the corn inspectors of the different towns, who reported them to the comptroller of corn returns in London. From these reports the average weekly price of each kind of grain was computed, and the aggregate average price for the previous six weeks; and a certified copy transmitted to the collectors of customs at the different ports, and also published weekly in the *Gazette*. The duty on importation was regulated by the aggregate average for six weeks. In 1829 and 1830, the crops being deficient, there was a large importation of corn, the average price of wheat being about 65*s.* a quarter. The crops from 1831 to 1835 being more than usually abundant, importation had almost wholly ceased, and in the last of these years the price of wheat was as low as 39*s* 4*d* a quarter. In 1837 and the five following years, the crops were deficient; and in January, 1839, wheat was as high as 81*s.* a quarter. The inability of the sliding scale to maintain anything like a uniformity in the price of corn being abundantly proved, Lord John Russell, in name of the government, proposed, in 1841, the substitution of a fixed duty of 8*s* a quarter on wheat, 4*s* 6*d* on barley, and 3*s.* 4*d.* on oats; but the ministry going out of office soon after, the proposal fell to the ground. In 1842, Sir Robert Peel introduced and carried his measure, in which the sliding scale was still retained, but largely modified. Under 51*s.*, the duty on wheat imported from foreign countries for home consumption was 20*s.*, decreasing gradually as the price rose to from 66*s.* to 69*s.*, when the duty was 6*s.*, and again decreasing gradually to 1*s.* when the price was 73*s.* or upwards. The duty on colonial wheat when the price was under 58*s.* was 5*s.*, and when 58*s.* and upwards, 1*s.* One hundred and thirty-eight new towns were also added to the 150 which, under the former act, made returns of prices. All efforts, however, to maintain the price of corn at an equable rate were in vain, and in 1845 the unsatisfactory state of the corn harvest and the failure of the potato crop in Ireland created serious apprehensions of a famine over the country. The Anti-Corn-Law League was also actively carrying on its operations, and monster meetings were being held in different parts of the country, and addresses presented to the queen, praying for an abolition of the corn duties. On the 19th January, 1846, parliament was opened by the queen in person, and immediately thereafter Sir Robert Peel, who had for so many years been an active supporter of the corn duties, announced that he had been led to change his views on the subject and to adopt the principles of free trade. On the 27th of January he detailed to the house his great scheme of commercial and financial policy. It was finally arranged that that subject should be taken up by the house on the 9th of February. The debate was continued, by repeated adjournments, into the third week, when it finally terminated on the 27th of February, by a division on the twelfth night, when 337 members voted in favour of the measure and 240 against it; majority, 97.





The second reading of the Corn Law bill was carried by a majority of 88, and the third reading, on the 15th of May, by a majority of 98,—327 being for, and 229 against the measure. The debates were carried on with much acrimony on both sides, and, in particular, the personal character and motives of Sir Robert Peel were frequently and violently attacked. On the 16th of May, the bill was brought into the House of Lords by the duke of Wellington, and after a series of animated debates and strong opposition, the bill was at length carried, and received the royal sanction on the 26th of June. By this act, 9 & 10 Vict. c. 22, the total repeal of the corn laws was provided for at the end of three years, or on the 1st of February, 1849; the duties being, in the mean time, considerably modified. On and after 1st February, 1849, wheat and other corn was subjected to a fixed duty of 1*s.* a quarter, and flour and meal of all sorts to a fixed duty of 4½*d.* a cwt. Under the act of 9 Geo. IV. c. 60 (from 1828 to 1842), the entire quantity of foreign wheat imported was 13,562,856 quarters and 4,305,150 cwt. of foreign wheat flour, besides 597,700 quarters of colonial wheat and 1,744,591 cwt. of colonial wheat flour. In 1847 there were imported 2,650,056 quarters of wheat and 6,329,646 of wheat meal and flour; in 1851, 2,833,636 quarters of wheat and 5,363,478 cwt. of wheat meal and flour; in 1855, 2,607,702 quarters of wheat and 1,904,224 cwt. of meal and flour; in 1858, 4,275,435 quarters of wheat, and 3,980,352 cwt. of meal and flour; and in 1860, 5,880,959 quarters of wheat, 5,056 220 cwt of wheat meal and flour, and 7,123,667 quarters of other kinds of corn. The gross amount of customs duty received from corn imported into the United Kingdom in 1861 was almost £1,200,000. The principal countries from which our foreign corn is obtained are Russia, Denmark and the Duchies, Prussia, France, United States, Turkey, and Egypt.—*Ref. Encyclopædia Britannica; English Cyclopædia; McCulloch's Commercial Dictionary.*

Corn Rent is a rent paid for land, varying in amount according to the price of corn. The principle is that a certain portion of the produce of the land is to be paid to the landlord for rent, not in kind, but at its money value. The quantity is fixed, but the value fluctuates with the average price of grain, which is sometimes taken for one year and sometimes for several. In many parts of Scotland rents are still paid in this way, being determined by the fiars-prices which are fixed annually in each county by the sheriff and a jury. (*See* Fiars.)

Cornaceæ, *kor-nai'-se-e*, in Bot., the Cornel or Dogwood fam., a nat. ord. of dicotyledonous plants of the sub-class *Calycifloræ*. They are trees, shrubs, or rarely herbs, with simple, exstipulate, and (with but one exception) opposite leaves. The flowers are generally perfect, but occasionally unisexual, with a superior four-lobed calyx; a corolla of four petals, with valvate æstivation; four stamens, alternate with the petals; an inferior ovary, usually two-celled, having a single pendulous anatropous ovule in each cell, and furnished with a simple style and stigma. The fruit is drupaceous. The embryo is in the axis of fleshy albumen. There are nine genera and forty species natives of the temperate parts of Europe, Asia, and America. They are chiefly remarkable for tonic, febrifugal, and astringent properties. (*See* Cornus.)

Cornarists, *kor-nar'-ists*, in Eccl. Hist., were the followers of one Theodore Cornhert, who flourished in the latter half of the 16th century, and was secretary of the States of Holland. He was a man of great ability, but a religious enthusiast, and wrote against all sects. He maintained that no one had any warrant to be a religious reformer who could not work miracles, and that it was not necessary for salvation to be a member of any church.

Corn-crake, or Landrail, *korn'-krake* (*Gallinula crex*).—The corn-crake appears to be extensively spread over the whole continent of Europe, and in Holland it is specially abundant. It is migratory, arriving here about the beginning of May. It is about the size of a partridge. All the feathers of its upper part are blackish-brown in the middle, edged with ash-colour; breast olive-ash; throat, belly, and abdomen white. Its habits are extremely shy. It selects for its abode grassy meadows, osier-beds, and such places, where it

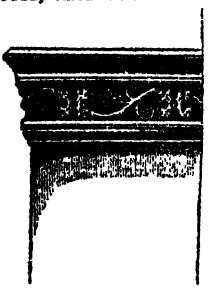
may remain completely hidden. Its food is worms, snails, and insects. The nest is composed of tender water-flags and grasses, and from eight to twelve eggs, of a yellowish white, dotted with rusty spots.

CORNEA, *kor'-ne-ă* (Lat. *cornu*, a horn), in Anat., is the name given to one of the coats of the eye, from its being of a horny consistence.

CORNET, *kor'-net* (Ital. *cornetta*, a small flag), the designation of commissioned cavalry officers of the lowest grade. Cornets in the cavalry rank with ensigns of infantry regiments and second lieutenants of engineers, artillery, and marines. The cornet is so called from carrying the guidon, or small square regimental flag.

CORNET-A-PISTON, *kor'-net-ă-pis'-ton* (Fr.), a new kind of wind instrument, extremely popular amongst modern composers. It is in reality a post-horn with the addition of three pistons. According to Kœnig, the earliest idea of a piston suggested itself to a German named Herr Stolzel, who, in the year 1606, introduced one successfully into the French horn, whereby the number of its stopped tones was diminished. Shortly after, the use of a second piston was adopted, and then *Cornets à deux pistons* were introduced, while at the present day we have metal instruments with three and four pistons, ranging from the highest to the lowest brass instruments, each susceptible of a chromatic scale, not one sound of which is of a closed nature. The best instruction-book for the cornet-a-piston is that by Kœnig.

CORNICE, *kor'-nis* (Fr. *corniche*), in Arch., the name of the upper part of the entablature (*see* ARCHITECTURE) which comes immediately above the frieze. It is divided into two principal parts, the upper of which projects considerably beyond the lower, being supported by modillions or mutules. The fillet, which composes the lower part, with an echinus moulding and smaller fillet above it, from which the modillions project, and an ogee, or bed-mould below it, which separates it from the frieze, is generally enriched with dentils, especially in the Corinthian and Composite orders. The upper part is subdivided into two portions,—the corona, which rests on the modillions, and the cymatium, which surmounts the corona. The term cornice is also applied to the ornamental moulding projecting from the upper part of the walls of a room immediately under the ceiling.



CORNICE.

CORNISH CRUCIBLES. (*See* CRUCIBLES.)

CORNS, *korns* (Ang.-Sax.), are certain small, hard, troublesome excrescences on the feet, arising from a thickening of the cuticle or epidermis, and owing generally to irritation, caused by excessive pressure or friction on the part. Corns are of two kinds,—hard and soft, the latter being situated between the toes. Frequently a bursa, or bag, is formed beneath the corn, which is apt to inflame and cause great pain and irritation. In the treatment of corns, the great object is to remove all undue pressure or friction; and for that purpose, the boots or shoes should be easy and pliant. This will be still further effected by protecting the corn with a small piece of thick soft leather, spread with diachylon or other emollient plaster, and having a hole in the centre corresponding with the size of the corn. The feet should also be frequently bathed with warm water, and as much as possible of the corn carefully pared away, care being taken not to wound the more sensitive part. If the corn is very sensitive, it ought to be occasionally touched with lunar caustic; and if much inflamed, a warm bread poultice should be applied to it.—*Ref.* Sir B. Brodie's *Lecture on Corns and Bunions*, in *Medical Gazette* of 12th February, 1836.

CORNUS, *kor'-nus* (Lat. *cornu*, horn, the wood being held to be durable and hard as horn), in Bot., the typical gen. of the nat. ord. *Cornaceæ*, including several useful plants. The bark of *C. florida* is much esteemed in North America as a substitute for Peruvian bark in the treatment of intermittent and remittent fevers. The fruit of *C. mascula*, the cornelian cherry, is astringent, and has an acid juice, which is used by the Turks for flavouring their sherbets. The seeds of *C. sanguinea*, the common dogwood of our hedges, yield a fixed oil, adapted for burning in lamps.

CORODY, *kor'-o-de* (Ital. *corrodo*, provision), is a species of incorporeal hereditaments being a right of sustenance, or to receive certain allotments of victual and provision for one's maintenance.

COROLLA, *ko-rol'-lă* (Lat., a little crown), in Bot., the inner envelope of the flower, consisting of leafy organs called *petals*, and situated, in a complete flower, between the calyx and the stamens. It is generally the most conspicuous whorl of organs, being more or less coloured. It is, in fact, that part of the plant which usually delights us most by its gay appearance and fragrance. Petals are rarely green, though occasionally this colour is met with, as in some *Cobæas*, in *Hoya viridiflora*, *Gesnelobus viridiflorus*, and *Pentatropis spiralis*. When there is but one whorl of enveloping organs in the flower, it is regarded as the calyx (which *see*), and the flower is said to be *apetaloid*. A petal is often narrowed below into a stalk-like portion analogous to the petiole of a leaf, as in the wallflower; the narrowed portion is then termed the *unguis* or *claw*, and the expanded portion the *limb*. Such a petal is said to be *unguiculate* or *clawed*. The shapes of petals are indicated in botanical descriptions by terms easily understood; such as *oblong*, *lanceolate*, *elliptic*, *orbicular*, *ovate*, and *cordate*, applied to the outlines, and *concave*, *tubular*, and *boat-shaped*, applied to the forms of petals which are not flat. In describing their direction, the terms *erect*, *connivent*, *divergent*, and *reflexed*, are used in the same sense as when applied to the parts of the calyx. The petals, like the sepals, may be either distinct, or more or less united into one body. In the former case the corolla is said to be *polypetalous* or *dialypetalous*; in the latter, *monopetalous* or *gamopetalous*. The number of petals in a polypetalous corolla is indicated by a prefix, as in the case of a polysepalous calyx: thus a corolla of two petals is said to be *dipetalous*; of three, *tripetalous*; of four, *tetrapetalous*, and so on. When the petals are all of the same size and form, the corolla is termed *regular*; when they vary in these particulars, it is said to be *irregular*. We give below the more important forms of the regular polypetalous corolla:—*Cruciform*. — This corolla gives the nat. ord. *Cruciferæ* its name. It consists of four petals, usually with claws, as in the wallflower (*see* figure, in which two of the petals are turned back to show the claws), but sometimes without claws, as in the oe-landine, and the whole arranged in the form of a cross. *Caryophyllaceous*, —consisting of five petals with long claws inclosed in the tube of the calyx, and with their limbs commonly placed at right angles to the claws, as in the lychnis, single pink, carnation, and catchfly. *Rosaceous*,—composed of five petals, without, or with very short claws, and spreading in a regular manner, as in the strawberry and single rose. There are many anomalous forms of the irregular polypetalous corolla to which no particular names are applied. There is one form, however, of great importance, namely, the *Papilionaceous*. This derives its name from the fancied resemblance which it bears to a butterfly (*papilio*). It is composed of five petals, one of which is superior and larger than the others, and is termed the *standard* or *vexillum*; two are inferior, and usually more or less united, so as to form a somewhat boat-shaped cavity,



CRUCIFORM COROLLA.

called the *keel* or *carina*; and two are lateral, and termed the *wings* or *alæ*. This curious form is common to the various species of pea, and a vast number of plants which form the sub-ord. *Papilionaceæ* of the *Leguminosæ*. When the petals unite, so as to form a monopetalous corolla, various terms are used; as in the case of the monosepalous calyx, to indicate the degree of adhesion; such as *parite*, *cleft*, *toothed*, and *entire*. (*See* CALYX.) The part where the union has taken place is called the *tube*; the free portion, the *limb*; and the orifice of the tube, the *throat* or *faux*. The monopetalous is *regular* when the parts are of the same size and form, and united so as to form a symmetrical body; it is *irregular* when these conditions are not complied with. The most noteworthy forms of the regular monopetalous corolla are distinguished as follows:—*Tubular*,—nearly cylindrical throughout, as in the central florets of many composite plants, like the Ragwort, Chrysanthemum, and Milfoil. *Campanulate*, or *bell-shaped*.—Rounded at the base, and gradually enlarging to the summit; as in the Harebell. (*See* figure—*a*, stigma; *b*, corolla; *c*, calyx.) *Infundibuliform*, or *funnel-shaped*; as in Convolvulus and Tobacco. *Hypocrateriform*, or *salver-shaped*.—The tube long and narrow, and the limb at right angles to it; as in Phlox, Auricula, and Primrose. *Rotate*, or *wheel-shaped*.—Tube short, otherwise similar to the preceding form; as in Forget-me-not. *Urceolate*, or *pitcher-shaped*.—Swollen in the middle, and contracted at both the base and apex; as in the Purple Heath. Of irregular monopetalous corollas, the following are the most important.—*Labiate*, or *lipped*.—Limb divided into two portions, one overhanging the other, the tube being left open, so that the whole resembles in a degree the lips and mouth of an animal; as in the Rosemary. (*See* figure.) This form is common to most of the plants included in the nat. ord. *Labiatæ*. *Personate*, or *masked*.—Resembling the labiate in being divided into two lips; but distinguished by the lower lip being approximated to the upper, so as to close the orifice of the tube or throat. It is seen in the Snapdragon and Toadflax. The *Calceolate*, or slipper form, which occurs in Calceolaria, is but a slight modification of this form. *Ligulate*, or *strap-shaped*.—A tubular corolla, partly split open on one side; as in the whole of the florets of the Dandelion, and in the florets of the ray of the Chrysanthemum and Daisy. *Digitaliform*, or *glove-shaped*.—Somewhat bell-shaped, but slightly irregular; as in the Foxglove. The corolla, whether polypetalous or monopetalous, is subject to various irregularities, arising from the expansion or growing outwards of one or more of the petals into processes of different kinds. Thus, in the Snapdragon and Valerian, the lower part of the tube becomes dilated on one side, so as to form a little bag, and the corolla is then termed *saccate* or *gibbous*. Sometimes a petal, or the tube of a monopetalous corolla, becomes prolonged downwards, so as to form a spur. Examples of *spurred* or *calcarate* petals or corollas may be seen in the Heartsease, Columbine, Toadflax, and Red Valerian. On the inner surface of the petals of many flowers there are curious appendages in the form of scales or hair-like processes. Sometimes these scales are more or less adherent, and form a cup-shaped process; as in Narcissus: to this the term *corona* is commonly applied, and the corolla which exhibits it is said to be crowned. If the corolla falls as the flower opens, as in the Grape-vine, it is *caducous*; if it falls off, as is generally the case, soon after the opening of the flower, it is *deciduous*. In rare instances it is *persistent*, and then it usually becomes dry and shrivelled, as in Heaths and Campanulas, and is said to be *marcescent*. (The above remarks are abridged from Bentley's *Manual of Botany*, to which reference should be made by those requiring fuller information respecting the various forms of the corolla.)



CAMPANULATE COROLLA.



LABIATE COROLLA.

COROLLARY, *kor'-ol-lă-re* (Lat. *corollarium*, properly signifying a gratuity or donation to an individual over and above his due), is usually employed to designate a necessary consequence of a proposition.—In Geom., it is a consequence drawn from some proposition already demonstrated, without the aid of any other proposition.

COROLLIFLORÆ, *ko-rol-le-flor'-e*, in Bot., a sub-class of *Dicotyledones*, comprising those plants which have flowers furnished with both calyx and corolla, the latter being composed of united petals; the stamens are inserted on the corolla or ovary, or free and arising from the thalamus. The *Corollifloræ* are subdivided into—*Epigynæ*, in which the calyx is adherent, and the ovary consequently inferior; *Hypostaminæ*, in which the stamens are inserted into the thalamus, and do not adhere to the corolla, while the ovary is superior; and *Epipetalæ*, or *Epicorollæ*, in which the corolla arises from the thalamus, and has the stamens attached to it, the ovary being superior. Fifty-eight natural orders are included by Professor Bentley in the sub-class; namely:—Subdivision 1. *Epigynæ*.—Caprifoliaceæ (the Honeysuckle ord.), Cinchonaceæ, Galiaceæ (the Madder ord.), Cucurbitaceæ, Valerianaceæ, Dipsaceaceæ (the Teasel ord.), Calyceraceæ, Compositæ, Campanulaceæ, Lobeliaceæ, Goodeniaceæ, Stylidiaceæ, Vaccinieæ (the Cranberry ord.). Subdivision 2. *Hypostaminea*.—Brunoniaceæ, Ericaceæ (the Heath ord.), Monotropaceæ, Pyrolaceæ, Epacridaceæ. Subdivision 3. *Epipetalæ*.—Ebenaceæ (the Ebony ord.), Aquifoliaceæ (the Holly ord.), Sapotaceæ, Styracaceæ, Apocynaceæ, Loganiaceæ, Diapensiaceæ, Stilbaceæ, Gentianaceæ (the Gentian ord.), Asclepiadaceæ, Cordiaceæ, Convolvulaceæ, Cuscutaceæ, Polemoniaceæ (the Phlox ord.), Solanaceæ (the Potato ord.), Atropaceæ (the Deadly Nightshade ord.), Oleaceæ (the Olive ord.), Jasminaceæ, Salvadoraceæ, Myrsinaceæ, Ægiceraceæ, Primulaceæ (the Primrose ord.), Plumbaginaceæ, Plantaginaceæ, Hydrophyllaceæ, Boraginaceæ, Ehretiaceæ, Nolaneæ, Labiatæ, Verbenaceæ, Myoporaceæ, Selaginaceæ, Pedaliaceæ, Gesneraceæ, Crescentiaceæ (the Calabash-tree ord.), Bignoniaceæ, Acanthaceæ, Scrophulariaceæ (the Fig-wort ord.), Orobanchaceæ (the Broom-rape ord.), Lentibulariaceæ. The natural orders placed in the first subdivision were included by De Candolle in the *Calycifloræ*; the *Corollifloræ* of his system being made up of those monopetalous orders in which the corolla is hypogynous, and the ovary consequently superior. The arrangement followed in this work is preferable, as it makes the monopetalous corolla the essential mark of the *Corollifloræ*.

CORONATION, *kor-o-nā'-shun* (from Lat. *corona*, a crown), is the act of crowning or consecrating a king. The practice is very ancient, as we read in Scripture of the coronations of Solomon and of Joash, the son of Ahaziah. Generally it has been accompanied by anointing with oil, which probably originated with the Jews. In the history of England, after the kingdoms of the heptarchy became united, the ceremony of coronation is frequently alluded to; but the first English coronation of which we have any detailed account is that of Richard I. Minute accounts of many of the coronations since that time have been preserved. The formulary generally followed in coronations since Edward III. is contained in the "LiberRegalis," preserved with great care in the archives of the dean and chapter of Westminster. On a coronation the great officers of state, the archbishops, bishops, peers, peeresses, and others, assemble at Westminster Abbey. The sovereign, with the princes and princesses of the blood royal, attended by the officers of the royal household, proceed in state from the palace to the abbey, accompanied by the representatives of foreign powers, both resident and extraordinary. On arriving at the west entrance of the abbey, the sovereign is received by the great officers of state, and the noblemen bearing the regalia, and then proceeds to the robing-chamber. Having been robed, he marches in procession up the nave into the choir, the choristers meanwhile singing

the royal anthem, and the spectators welcoming him with shouts of congratulation. He proceeds to a chair of state called the *Recognition Chair*, and, after the anthem is concluded, the archbishop of Canterbury declares him to be the undoubted sovereign of this realm. The king next passes to the altar, and there makes the first offering; and, after returning to the chair of state, the Litany is read by two bishops, and the communion service by the archbishop, assisted by a bishop. The sermon is next preached by the archbishop of York or the bishop of London, after which the oath is administered by the archbishop of Canterbury. A hymn is then sung, and the archbishop reads a prayer, which is followed by the anthem "Zadok the priest and Nathan the prophet." The archbishop then anoints the king on the head and hands in the form of a cross with the consecrated oil, pronouncing the words, "Be thou anointed with holy," &c. The investiture then takes place, and the archbishop, having consecrated the crown with prayer, with the assistance of the other bishops, places it on the sovereign's head. The peers and peeresses present all put on their coronets, the bishops their caps, and the kings of arms their crowns, amid the acclamations of the assembly, the sounding of trumpets, and the firing of guns. The benediction is then pronounced, after which the Te Deum is sung. The enthronization is then performed; and, by the assistance of the archbishop and bishops, the sovereign is placed in the royal throne, and the exhortation "Stand firm and fast," &c., pronounced. The homage is next performed; the archbishop first, for himself and the other lords spiritual, repeating the words of the homage, followed by the royal dukes, and then the senior of each rank in the peerage for his own degree. The holy sacrament is next administered, after which the final prayers are read, and the blessing pronounced. The sovereign then, after having exchanged the robe of state for the royal robe of purple velvet, returns to the palace in the same state as he proceeded to the abbey.

CORONATION OATH is the oath administered to a sovereign on his coronation. By it he solemnly promises and swears to govern according to the statutes established by parliament and the laws and customs of the realm; to administer law and justice in mercy; to maintain the laws of God, the true profession of the gospel, and the Protestant reformed religion established by law; and to preserve unto the bishops and clergy of the realm, and to the churches committed to their charge, all such rights and privileges as by law do or shall appertain to them or any of them. The oath is administered in the form of question and answer by the archbishop of Canterbury; after which the sovereign, kneeling before the altar, repeats the words, "The things which I have here before promised I will perform and keep, so help me God," and then kisses the Book. The coronation oath, and the alterations which it has undergone, are amply discussed by Mr. Taylor in his *Glory of Regality*.

CORONER, *kor'-o-ner*.—The office of coroner is a very ancient one at the common law. He is called coroner, *coronator*, because he has principally to do with pleas of the crown, or such wherein the sovereign is more immediately concerned; and in this light, the lord chief justice of the Queen's Bench is the principal coroner of the kingdom, and may, if he pleases, exercise the jurisdiction of a coroner in any part of the realm. But there are also particular coroners for every county in England, usually four, but sometimes six, and sometimes fewer; and in every borough having separate quarter sessions, a coroner is appointed, with exclusive jurisdiction within the borough. This officer is of equal antiquity with the sheriff, and was ordained with him to keep the peace when the earls gave up the wardship of the county. He is chosen by all the freeholders in the ancient county court; but the crown and certain lords of franchises, having a charter from the crown for that purpose, may appoint coroners for certain precincts or liberties by their own mere grant, and without election. He is chosen for life, but may be removed by being made sheriff, which is an office incompatible with the other, or by the writ *de coronatore exonerando*, on account of engagements in other business, incapacity by years or sickness, or for that he has not a sufficient estate (lands to the amount of





twenty pounds per annum) in the county, or lives in an inconvenient part of it, or is guilty of extortion, neglect, or misbehaviour. He may appoint a deputy by writing under his hand and seal. His duties are *judicial* or *ministerial*; but his principal duty is to inquire, when any person is slain, or dies suddenly or in prison, or under suspicious circumstances, concerning the manner of his death. He is also to inquire concerning shipwrecks, and certify whether wreck or not, and who is in possession of the goods. Concerning *treasure-trove*, he is also to inquire who were the finders, and where it is, and whether any one be suspected of having found and concealed a treasure. He is a conservator of the queen's peace, and becomes a magistrate by virtue of his appointment, having power to cause felons to be apprehended, whether an inquisition have been found against them or not. His *ministerial* office (as the sheriff's substitute) is to execute process in cases where the sheriff may be suspected of partiality, as that he is interested in the suit, or of kindred to either the plaintiff or defendant.—*Ref.* Jervis *On the Office and Duties of Coroners*.

CORONET, *kor'-o-net* (Lat. *corona*, a crown), an inferior kind of crown worn by princes and noblemen as distinctive tokens of their several degrees. They will be found illustrated and described under CROWN.

CORPORAL, *kor'-por-al* (Fr. *caporal*, Ital. *capo*, head), in Mil., the designation of a non-commissioned officer who ranks next to a sergeant, and immediately above a lance corporal. It is the duty of the corporal to relieve and place sentries. When the regiment is on parade, he falls into the ranks with the privates. The corporal receives a somewhat higher pay than a private, and is distinguished by wearing two chevrons on his arm. (*See* CHEVRONS.)

CORPORAL (Lat. *corpus*, a body) is the name given to the linen cloth which is spread over the consecrated bread (*corpus*, or body) after the communion. In the Romish and Greek churches it is an object of great reverence, and the folding and unfolding of it by the priest at the altar is accompanied with much ceremony. It is said to represent the wrapping of the body of our Lord in fine linen by Joseph of Arimathea. The *corporal oath* is derived from the ancient usage of touching the corporal to add solemnity to an oath.

CORPORAL PUNISHMENT. (*See* FLOGGING.)

CORPORATION, *kor-por-ai'-shun* (Lat.), is a body politic or incorporate, so called as the persons are made into a body, and of capacity to take and grant, &c.; or it is an assembly and joining together of many into one fellowship and brotherhood, whereof one is head and chief and the rest are the body, and this head and body knit together make the corporation; also it is constituted of several members, like unto the natural body, and framed by fiction of law to endure in perpetual succession. Of corporations, some are *sole*, some *aggregate*: *sole*, when in one single person, as the queen, a bishop, dean, parson, vicar, or the like; *aggregate*, which is most usual, consisting of many persons, as mayor and commonalty, dean and chapter, &c. Likewise corporations are *spiritual* or *temporal*; *spiritual*, as bishops, deans, archdeacons, parsons, vicars, and other ecclesiastical persons; *temporal*, as mayors, commonalty, bailiffs, and burgesses, &c., of towns and boroughs; and some corporations are of a *mixed* nature, composed of spiritual and temporal persons, such as heads and fellows of colleges and hospitals, &c. *Lay* corporations are of two sorts,—*civil* and *eleemosynary*. The *civil* are such as are erected for a variety of temporal purposes, as the king or queen, to prevent the possibility of an *interregnum* or vacancy to the throne, and to preserve the possessions of the crown entire; a mayor or commonalty, bailiff, and burgesses, or the like, for the good government of a town; others for the advancement and regulation of commerce, as the trading companies of London and other towns, and public companies instituted by act of parliament or royal charter, and others for the better carrying on of divers special purposes, as the colleges of Physicians and Surgeons, the Royal Society, the Society of Antiquaries, &c. Among these the general corporate bodies of Cambridge and Oxford must be ranked, which are not strictly spiritual or ecclesiastical, being composed of more laymen than clergy; neither are they eleemosynary foundations, though stipends

are annexed to particular magistrates and professors, and these stipends are preceded by service and duty. *Eleemosynary* are such as are constituted for the perpetual distribution of the free alms or bounty of the founder to such persons as he has directed or as the mode of government has been defined. Of this kind are all hospitals for the maintenance of the poor, sick, and impotent, and all colleges, both in our universities and out of them. Corporations, both sole and aggregate, may purchase, take, and hold land to them and their *successors*, as natural persons may hold them and their *heirs*; but they are subject to the provisions of the law as to devises to charitable uses and the statutes of mortmain, and must have a license from the crown to enable them to hold or alien their lands in mortmain; but aggregate corporations, when of the eleemosynary, or ecclesiastical, or municipal kind, and corporations sole, are in general restrained by statute from alienation of their lands, beyond the life of the person who constitutes the corporation sole or is the head of the corporation aggregate. Power is nevertheless given to them, in some cases, to grant long building-leases. Corporations aggregate may sue and be sued, and do all other acts, by their corporate name. Their corporate property only, and not the members individually, is amenable to judgments given against them. Their acts are under their common seal. There are some personal acts, however, as to which convenience has introduced an exception to this rule. Thus a corporation may, through its head, give command to a bailiff to make a distress. It may make by-laws or private statutes for the better government of the corporation, not contrary to the laws of the land, or contrary to or inconsistent with its charter, or manifestly unreasonable. It must appear by attorney, for it cannot in person. It cannot maintain or be made defendant to an action of battery or the like; but it may maintain an action for breach of contract, and, in some cases, may be sued in such action as defendant. It is also liable to an action for damages in respect of any tortious acts committed by its agents, and is even liable in certain cases to an indictment, as where it allows a bridge, the repair of which belongs to it by law, to fall into decay; but in general it can be guilty of no crime in its corporate capacity. It may also, under certain circumstances, be the subject of bankruptcy; as in the cases of joint-stock, banking, and other companies, founded by statute or charter for trade or profit. Aggregate corporations that have by their constitution a head, can do no acts during the vacancy of the headship, except only appointing another. There may be a *corporation aggregate* constituted *without a head*, as the collegiate church of Southwell, in Nottinghamshire, which consists only of prebendaries, and the governors of the Charterhouse, London, who have no president or superior, but are all of equal authority. The act of the major part is esteemed the act of the whole. No chattel interest can go to a corporation sole. There are several subjects relating to corporations which cannot, for want of space, be entered upon here; such as the mode of creating them; some other powers and capacities not before noticed; the mode by which they are visited for the inquiry into and correction of abuses; and the method of dissolving them. For the consideration of these, the student is referred to elementary treatises on the subject. (*See* MUNICIPAL CORPORATIONS.)

CORPORATION, ACTS OF. (*See* TEST AND CORPORATION ACTS.)

CORPS, *kor* (Fr. *corps*, Lat. *corpus*, a body), the name given in Mil. to any body of troops, without reference to the number of men of which it is composed. It can be applied with equal propriety to a regiment or battalion, consisting of many companies, or to a single company, as in the case of volunteer corps, when the company is isolated, and known by a distinctive number and title.

CORPS D'ARMÉE, *kor-dar-may'* (Fr.), a term applied to the large sections into which the military forces of Europe are divided in a time of peace. The British army is not large enough to be divided into corps, but in many continental states the military strength is divided into a number of corps, each complete in itself as an army, furnished with everything necessary for service. Every corps d'armée is subdivided into four





corps, belonging respectively to the cavalry, infantry, artillery, and engineers. Among the French, 100,000 men, being considered too many to form one army, are divided into two or more corps d'armée. In the Russian system, the military strength is divided into about twelve corps, which are stationed in different districts throughout the empire. The Austrian forces are also divided in a similar manner.

CORPULENCE, *kor'-pu-lens* (Lat. *corpulentia*, from *corpus*, the body), is an undue bulkiness or size of the body, arising from an excessive accumulation of fat in certain parts. It is impossible to define exactly the limit beyond which the body can be said to be corpulent, depending, as it does, very much upon the general habit and the state of health of the individual. It most commonly takes place after the age of forty, but is not confined to any particular period of life, being to be found also in childhood and youth. The causes of corpulence are both natural and acquired. There are some persons who have a natural tendency to corpulence; in others it may be induced by modes of life, indolent and sedentary habits, and the use of certain kinds of food. The undue accumulation of fat produces a variety of effects, interfering with the vital energies of the body, and incapacitating for exertion. The chances of life are not so great among persons of a corpulent habit as among those of a normal condition. All sudden or violent measures to get rid of corpulence are attended with harm; and not the least dangerous is the popular remedy of vinegar, which has the effect of destroying the digestive powers. Attention to diet, and the avoidance of such articles as tend to generate fat, together with active exercise and the counteracting of indolent habits, are among the best means that can be employed. Dr. Chalmers, in his small treatise "On Corpulence," gives a variety of cases in which *liquor potassæ* was used with great effect; but this remedy should not be resorted to without the sanction of a medical adviser. There are numerous very remarkable cases of corpulence on record. Of modern instances known in this country, was Bright of Maldon, in Essex, a respectable tallow-chandler and grocer, who died the 12th of November, 1750, in the twenty-ninth year of his age. He weighed 616 lbs; and it is said that seven persons of ordinary size could be inclosed in his waistcoat. Daniel Lambert, who is supposed to have been the heaviest man that ever lived, died at Stamford, in Lincolnshire, at the age of forty, on the 21st June, 1809. He is said to have weighed 52 stone 12 lbs., or 740 lbs.

CORPUS, *kor'-pus* (Lat., body), is a term applied in Anat. to certain parts of the animal structure; as the *corpus callosum*, the *corpora quadrigemina*. It is also applied to a collection or body of laws or canons; as *Corpus juris civilis*, *Corpus juris canonici*.

CORPUS CHRISTI (Lat., body of Christ), is the name of a festival of the Church of Rome, instituted by Pope Urban IV. in 1264, in honour of the consecrated host, and with a view to its adoration. It is observed on the Thursday of the week after Pentecost, and is kept as one of the greatest festivals of the Roman Catholic church.

CORPUS CHRISTI COLLEGE, CAMBRIDGE, was founded in 1352 by two societies, or guilds, in Cambridge, called the guild of Corpus Christi and the guild of the Virgin Mary; and at first the college bore both names. Afterwards it acquired the name of Bene't College (by which it is still often distinguished), from the adjoining church of St. Benedict. It has twelve fellowships,—eight open to all the queen's subjects, wherever born; two are appropriated to natives of Norfolk, and two to the Norwich scholars on Archbishop Parker's foundation. All the fellows are required to take holy orders within three years after their election, and the degree of B.D. within eight years after that of M.A. There are also a large number of scholarships and exhibitions connected with this college, some of them being of considerable value.

CORPUS CHRISTI COLLEGE, OXFORD, was founded in 1516 by Richard Fox, bishop of Winchester, for a president, twenty fellows, and twenty scholars, the fellows to be elected from the scholars, and the scholars from natives of certain specified dioceses and counties. By the present statutes, which have been recently amended, it is provided that both fellows and scholars shall be

elected without any restriction as to place of birth. The scholarships are tenable for five years from matriculation, and are of the annual value of £80, together with rooms rent free. There are also four exhibitions of the same value, and tenable for the same period as the scholarship.—*Ref. Oxford University Calendar*, 1862.

CORRECTION, HOUSE OF. (*See* PRISONS.)

CORRELATION OF THE PHYSICAL FORCES, *kor-rel-lat'-shun* (Lat. *con*, with; *relatio*, a throwing back), the reciprocal relation between gravitation, the molecular forces, heat and light, electricity, and animal force. (*See* FORCES.)

CORRIDOR, *kor'-re-dor* (Ital. *corridore*), a long passage or gallery in a mansion, or any large building, which affords access to a long range of chambers that are independent, and have no other means of communication with each other. A corridor may be closed, or open to the air on one side.

CORROSION, *kor-ro'-shun* (Lat. *con*, and *rodo*, I gnaw), the gradual eating or wearing away of any substance, such as a metal, under the action of acids, by means of which its nature is completely changed by slow degrees.

CORROSIVE SUBLIMATE, in Chem., bichloride of mercury. (*See* MERCURY, BICHLORIDE OF.)

CORSAIR, *kor-sare'* (Ital. *corso*, a race), a term applied generally to sea-robbers or pirates, but originally used to designate those pirates in the south of Europe who sailed from Algiers, Tunis, Tripoli, and the ports of Morocco. They were directed by their princes to attack the merchant-vessels of nations with whom they were at war.

CORSET, *kor'-set* (Fr.), a tight-fitting under-dress or stay for the body, worn by females. It generally consists of cloth, and is stiffened by whalebone or other means, and tightened by a lace.

CORSICAN MOSS. (*See* GRACILARIA.)

CORSLET, *kors'-let* (Fr.), a light body-armour, worn by the pikemen about the middle of the 17th century. Sometimes the term is employed to designate the entire suit under the title of a corslet, complete or furnished, which included the headpiece or gorget, as well as the tasses which covered the thighs.

CORSNED, or MORSEL OF EXECRATION, *kors'-ned* (Sax. *corsnæde*, a compound of *cors*, curse, and *sned*, a piece or mouthful), was a form of trial or purgation made use of anciently in England. A morsel of bread was consecrated by exorcism, and was administered to a suspected person as a test of his innocence. If the person was guilty, it was held that the bread would remain in the stomach and produce pallor and convulsions; if the person was innocent, the bread would act as a wholesome and nutritious morsel. Some state that the holy sacrament was given to the suspected person with the corsned, while others believe that the latter was nothing else than the sacramental bread itself. It is related in the old English chronicles, that Goodwin, earl *of* Kent, during the reign of Edward the Confessor, after declaring himself innocent of the death of the king's brother, took the corsned, which, sticking in his throat, killed him.

CORTES, *kor'-tes* (Sp.), is the name given in Spain and Portugal to the assembly of representatives of the nation. These assemblies have been variously constituted, and possessed of various powers, at different times in these countries. They have existed from an early period, but their origin is involved in obscurity. In Spain, on the decline of the Moorish power, as district after district was recovered by the Christian princes, we find certain political corporations rising up and limiting the power of the princes. In the two principal states (formed by the union of a number of smaller ones), Castile and Aragon, the three *estamentos*, or states of the clergy, nobility, and inhabitants of enfranchised towns, were represented in the Cortes. In Aragon the Cortes appointed a judge, who decided all questions and disputes between the king and his subjects, and confined the royal power within constitutional limits. In Castile the rights of the states were less marked, and in particular the privileges of the burgher class, were less extensive than in Aragon. In both countries, however, the king was dependent on the Cortes. After the union of the two kingdoms, Ferdinand and Isabella succeeded in making themselves independent of the Cortes; and afterwards, when the Castilians attempted to oppose an extraordinary tax, at a meeting convoked at Toledo by Charles I. in 1539, the king abolished this assembly of the states. After this neither the clergy nor nobility were assembled, but deputies from eighteen of the cities were sometimes convened, only, however, when subsidies were to be granted. The special privileges of the Aragon Cortes were much abridged by Philip II. in 1592; and after the Spanish war of succession, Philip V. deprived those provinces which had adhered to the Austrian party of the privileges that still remained to them. From that time the Cortes were only convened to pay homage to the king or the prince of Asturias, or when a question respecting the succession to the throne was to be determined. After 1713 they did not meet till 1789, on the accession of Charles IV. In 1809 the Cortes were assembled by the Junta, and in 1812 gave out a new constitution. This extraordinary Cortes was succeeded by the ordinary Cortes, elected according to the new constitution, in 1813; but it was dissolved by Ferdinand, on his return in 1814, and the new constitution abrogated. Numerous changes in the constitution and Cortes have since taken place, which our limits prevent us from entering upon. Since 1833 they have been accustomed to meet and debate; but being possessed of little power, they have generally been employed to give weight to one or other of the contending factions. The history of the Cortes of Portugal is nearly the same as those of Spain.

CORUNDUM, *kor-un'-dum*, in Min., a mineral containing puré alumina, and occurring in hexagonal prisms of great hardness. When coloured and transparent, corundum constitutes *sapphire*, and the granular variety is known as *emery*.

CORVETTE, *kor-vet'* (Fr.), in Mar., a sloop of war, an advice-boat, having fewer than twenty guns.

CORVUS. (*See* CROW.)

CORYLACEÆ, or CUPULIFERÆ, *kor-il-ai'-se-e* (Gr. *korus*, a helmet, the calyx enwrapping the fruit), in Bot., the Oak fam., a nat. ord. of dicotyledonous plants, in the sub-class *Monochlamydeæ*. Trees or shrubs, with alternate leaves, usually feather-veined and simple, with deciduous stipules. The flowers are monœcious, the male being clustered or in aments, with from five to twenty stamens into the base of a membranous valvate calyx, or of scales; the female solitary or clustered, surrounded by an involucre of bracts, which ultimately form a capule round the ovary, which has three or more cells. The fruit is a glans or nut. The plants of this order abound in the forests of temperate regions, and a few occur in the high lands of tropical climates. They are of great importance as timber-trees: many yield edible seeds, and some have astringent barks and cupules. There are about 280 known species, which have been arranged into 10 genera, the most noteworthy being *Quercus* (the Oak), *Corylus* (the Hazel), *Fagus* (the Beech), *Castanea* (the Chestnut), and *Carpinus* (the Hornbeam).

CORYLUS, *kor'-i-lus* (Gr. *korus*, a helmet), in Bot., the typical gen. of the nat. ord. *Corylaceæ*, which includes the common hazel (*C. avellana*), a shrub well known as the original source of many kinds of edible nuts. The wild hazel of our woods yields the nuts which are gathered with so much pleasure by schoolboys; and varieties of the same species produce the different kinds known as the White, Red, and Jerusalem filberts, the Great and Clustered cobs, the Red Smyrna, the Black Spanish, and the Barcelona nuts. The importation of nuts into this country is on an average 150,000 bushels a year. The oil obtained from them by expression is occasionally employed by artists and watchmakers. From the branches of the hazel good charcoal is prepared.

CORYMB, *kor'-imb* (Lat. *corymbus*), in Bot., the name given to a particular form of inflorescence. It is a kind of raceme (which *see*), in which the peduncles (flower-stalks) become gradually shorter as they approach the top, so that all the flowers are about on a level. It occurs in some species of *Geranium*, in the hawthorn, and many familiar plants. When the stalks or secondary axes of a corymb, instead of bearing flowers immediately, divide and form tertiary axes, a *compound corymb* is produced, as in some species of *Pyrus*.

CORYMBIFERÆ, *kor-im-bif'-er-e* (Lat. *corymbus*, and *fero*, I bear), in Bot., the name given by Jussieu to a sub-ord. of the *Compositæ*, which consisted of plants having florets all tubular and perfect, or having tubular and perfect florets in the disk, and tubular and pistiliferous, or ligulate, florets in the ray. The genus *Chrysanthemum* may be taken as an example. Two species of this genus grow wild in Britain; namely *C. leucanthemum* (the ox-eye) and *C. segetum* (the corn marigold). In our gardens a number of beautiful varieties of the species *C. indicum*, *sinense*, and others, are cultivated. They are hardy plants, and are remarkable for the number and the varied colours of their flowers, which appear late in the autumn. There is a fine show of blooming chrysanthemums in the gardens of the Inner Temple, London, every season.

CORYPHA, *kor-i'-fă* (Gr. *koruphe*, the summit, the leaves growing only on the top), in Bot., a gen. of palms. It includes one remarkable species, namely *C. umbraculifera*, the talipot palm of Ceylon, from which large quantities of sago are obtained.

COSMETIC, *kos-met'-ik* (Gr. *kosmeo*, I adorn), is a preparation used to whiten or soften the skin, or otherwise to beautify and improve it. With the ancient Romans, the term *cosmetæ* was applied to those slaves who were employed to dress and adorn their mistresses.

COSMOGONY, *kos-mog'-o-ne* (Gr. *kosmos*, the universe; *gone*, generation), the science which relates to the formation of the universe, as distinguished from cosmography, which treats of the universe as we see it, and from cosmology, which treats of the actual and permanent state of the earth as it is. Cosmography has been embodied as a science by Baron Humboldt, in his celebrated work entitled "Cosmos." All cosmogonists may be divided into two great classes,—those who believe that the world sprang into existence at the order of the Almighty, and those who hold that the universe is in itself the body and being of Deity, and, as such, has been in existence through all eternity. The former are termed Theistical cosmogonists, and the latter Pantheistical.

COSMOPOLITAN, *kos-mo-pol'-i-tăn* (Gr. *kosmos*, world; *politès*, citizen), a citizen of the world; a person who makes himself at home wherever he goes, and is never a stranger at any place.

COSMORAMA, *kos-mo-rä'-mă* (Gr. *kosmos*, the world, and *horaein*, to see), an exhibition in which various scenes illustrative of remarkable events and different parts of the world are shown. The effect of the pictures is heightened by throwing artificial light upon them; and they are viewed through lenses of great magnifying power, which makes them appear to be wonderfully natural and life-like.

COSMOS. (*See* COSMOGONY.)

COSSACKS. (*See* vol. I. of this work.)

COSSUS, *kos'-sus*, a gen. of night-flying moths, having the following characteristics:—Antennæ long, rather slender, furnished on the inner edge with a series of transverse elevated ridges, which resemble the teeth of a saw; two distinct palpi, thickly clothed with scales, and each three-jointed; head small, upper wings longer and larger than the lower; body large. (*See* GOAT-MOTH.)

COSTS, *kosts* (Germ. Dan. *kost*), are the charges to which a person is subject in a legal proceeding, and are a necessary appendage to judgments, but are payable in various interlocutory and other proceedings. The first statute which gave costs *eo nomine* to the plaintiff, was the statute of Gloucester, 6 Edw. I. c. 1, as did the statute of Marlbridge, 52 Hen. III. c. 6, to the defendant in one particular case relative to wardship in chivalry, though, in reality, costs were always considered and included in the quantum of *damages* in such actions where damages are given; and even now costs for the plaintiff are always entered on the roll as increase of damages by the court. With the exception which has been mentioned, no costs were allowed to the *defendant* in any case till the statute 23 Hen. VIII. c. 15, since which divers statutes have been passed, both as regards plaintiff and defendant, and rules and orders of the courts have been made respecting them. Paupers, that is, such as will swear themselves not worth five pounds in the world, except their wearing apparel and the matter in question in the cause, are exempt, when plaintiffs, from the payment of court fees, and entitled to have counsel and attorney assigned to them by the court without fee, and are excused from paying costs when unsuccessful, but shall suffer other punishment, at the discretion of the judges. In modern practice, no instance, however, of the award of *any* punishment in such cases has occurred; but a person thus suing *in formâ pauperis* may recover costs though he pays none for the counsel, and clerks are bound to give their labour to *him*, but not to his antagonists. And if a plaintiff shall bring an action of covenant, debt, detinue, or assumpsit (not being for breach of promise of marriage), and he shall not recover more than twenty pounds; or, in an action of trover or case, and he shall not recover more than five pounds, provided any such action is cognizable in a county court, unless the judgment be by default, or unless it be certified by the judge who tries the cause, or it appears to the court itself that there was sufficient reason for bringing the action there. To this general rule, however, there are certain exceptions; as where the plaintiff dwells more than twenty miles from the defendant, or where the cause of action did not arise wholly, or in some material point, within the jurisdiction of the county court within which the defendant dwells or carries on his business at the time of the action being commenced, or (in general) where an officer of the county court is a party. In case between party and party, the costs are taxed by an officer of the court, who reduces or increases any of the charges, according to a certain scale governed or fixed by rules of the court, or at his discretion where the item is not included in such scale; and, as between an attorney or solicitor and his client, either party may have the costs taxed. (*See* ATTORNEY.)

COSTUME, *kos-tume'* (Fr.), the term ordinarily applied to the garments, robes, &c., of a people; thus the kilt, plaid, and hose of the mountaineers of Scotland are termed the Highland costume. The several peculiarities in the dresses of doctors, masters of arts, bachelors, and undergraduates, constitute what is generally called the costume of the university, or academical costume. — A rule or precept in Painting, by which the artist is enjoined to make every person and thing depicted sustain its proper character, and not only observe the story, but that the circumstances, the scene of action, the country or place, the habits, arms, manners, &c., exactly correspond.

COTERIE, *ko-ter-e'* (Fr.), a friendly or select party, a club or association limited to a small number of individuals. The word is of French origin, and is supposed to have been derived from the Latin *quot*, how many. In the 13th or 14th century, when merchants joined together in an enterprise, they formed a coterie, and each subscribed his quota. It soon lost this signification, and now only refers to exclusive societies.

COTILLON, *ko-til'-yun* (Fr., an under petticoat), a brisk French dance executed by eight persons. It was very popular in France at the conclusion of the last century, but was superseded by the quadrille, which is itself a modified form of the cotillon.

COTTAGE, *kot'-tăj* (Ang.-Sax.), a small habitation, detached from other buildings, and generally one story high. The name was originally applied only to dwellings of a very humble kind, but it is now used to designate a great variety of buildings, from the ornamental cottages of the French to the Swiss chalets. The rural cottages of England are famed as being the most beautiful; they are generally clean and neat in the interior, and picturesque and ornamental outside. A great deal of attention has been given of late years to the accommodation of agricultural cottages.

COTTON. (*See* GOSSYPIUM.)

COTTON, GUN. (*See* PYROXYLINE.)

COTTON MANUFACTURE, *kot'-tn* (Fr. *coton*, Ital. *cotona*, probably from the Arab. *kotun*, fine).—This branch of industry, which was known in India and China many centuries before it was introduced into Europe, is now one of the most important manufactures of Great Britain. Herodotus is the first of the Greek writers who mentions cotton: he calls it tree-wool. Both the Greeks and Romans imported their cotton from India. At the present day the inhabitants of China are principally clothed in dresses made of native cotton woven at home. About the 10th century the cotton-plant was extensively cultivated, and its

produce woven into cloth by the Moors in Spain, where the manufacture flourished for some time, especially at Barcelona. The cloths made were of coarse texture, and a large quantity was used for sail-cloth. On account of the prejudice against the Moorish population, the traffic in manufactured cotton was only carried on with Africa and the East. In Italy cotton fabrics began to be made about the same period. From that country the manufacture passed into the Netherlands, and was brought into England by Protestant refugees after the capture of Antwerp by the duke of Parma in 1585. As early as 1641 Manchester began to be noted as a town where cotton was manufactured. Before the invention of Arkwright, the cotton manufacture in England was of very slight importance. Arkwright's patent for spinning by rollers was taken out in 1769. Previous to that year the weavers, dispersed in cottages scattered throughout the district, purchased the cotton with which they worked. Having spun it and woven it into cloths, they took their goods to market, and sold them on their own account. The rapid growth and prodigious magnitude of the cotton-manufacture of Great Britain form one of the most extraordinary phenomena in the history of industry. In 1760 the Manchester merchants began the system of distributing the supplies of cotton wool among the weavers by means of agents. A few years afterwards, Hargreave, an ingenious but illiterate weaver, invented the *spinning-jenny*,—a machine by which eight threads could be spun at a time, against one by the distaff or spinning-wheel. This invention was much opposed by the working weavers in the district. They destroyed his machine, and compelled him to leave his native place. A few years afterwards, Richard (afterwards Sir Richard) Arkwright, a hairdresser, brought out his machine for *spinning by rollers*. The principle of the patents taken out by Hargreave and Arkwright were combined by Mr. Crompton, who shortly afterwards invented a piece of mechanism called the *mule-jenny*. It produced a much finer yarn than either of the other machines. Crompton received a grant of £5,000 from the government for his service. At first the mule-jennies consisted of not more than thirty spindles each; now they frequently contain 1,000 to 2,000 spindles, with which threads have been produced 1,000 miles long, and only one pound in weight. The first steam-engine for a cotton-mill was constructed by Mr. Watt in 1785. At this time the application of the improved machinery was confined to the production of yarn; and as the difficulty had formerly been to find thread enough to supply the looms, so now it seems to have been feared that it would be impossible to find a sufficient number of weavers to work the thread that was spun. Dr. Cartwright, however, supplied this great desideratum by his invention of the *power-loom*. This invention was followed by the *cylinder printing-machine*, *mechanical engraving*, and the processes of calico-printing and bleaching. (*See* Calico-printing, Bleaching.) More recently the process of spinning has been further facilitated by the *self-acting mule* of Messrs. Sharp, Roberts, & Co., of Manchester. These machines do not require the manual aid of a spinner, but can be attended to by a boy or girl, whose duty it is to join the threads which break during the spinning. A great variety of apparatus and a large number of machines have been invented of late years; but, for the most part, they consist of extensions or improvements of the inventions of Hargreave, Arkwright, Crompton, Cartwright, and Roberts. The ordinary process of cotton manufacture is as follows:—The raw material, when it arrives at the cotton-mill, is first taken to the mixing-room. The contents of each bag are spread out in a horizontal layer of uniform thickness, the contents of the several bags forming separate layers. The heap is then trampled or pressed together. The cotton of which this *bing*, as it is called, is composed is then torn down by a rake from top to bottom, and a portion of each layer thus obtained. If the layers consist of different qualities of cotton, a uniform mixture is thus obtained. The quantity raked down is then conveyed to the *scutching* or *willowing machine*, where it is dragged through two rollers, transferred to two beaters, which thrash out all sand, seeds, and other impurities; after which it is passed through two more rollers and a second set of beaters. The cleansed cotton is then passed through the *spreading-machine*, and afterwards wound in a fleecy state upon a large wooden roller. In this state it is conveyed to the carding-machine, where it is drawn out into parallel layers. (*See* Carding-Machine.) Each of these layers is made to undergo compression in its way to a roller, from which it is given off in the form of a thick, soft thread, into a tin can. This thread is called a *sliver*. The next stage is termed *drawing*, and the machine employed is called a *drawing-frame*. The sliver is passed through the drawing-frame, which completes the process begun by the carding-machine, the fibres of the cotton being arranged longitudinally in a uniform and parallel direction. This drawing operation is repeated several times, in order to correct all inequalities. The next process is *roving*,—a continuation of the drawing. The cord, which is now called a *rove*, being much thinner, has a slight twist given to it by passing through a can, which is made to revolve with great velocity while receiving it. It is then wound upon bobbins, and is ready for the spinning-frame. As the spinning and weaving of cotton differ very slightly from that of silk, linen, woollen, &c., they will be found described under the articles Spinning and Weaving. Sea-Island and long-stapled Egyptian cotton are the varieties from which the finer kinds of yarn are spun; and from them muslins, laces, &c., are made. Cambrics, shirtings, calicoes, &c., are made from Brazilian and the better classes of American cotton. Coarse yarns, used for making fustians and other heavy fabrics, are made from the inferior qualities of America and Surat. From wefts of wool or worsted and warps of cotton several varieties of Coburg and Orleans cloths, mousselines de laine, damasks, &c., are made. The Yorkshire broadcloths are sometimes one-half cotton. Fabrics are also made of linen and cotton, silk and cotton, &c. The continent of Europe was formerly the largest consumer of yarn made in England, but now the principal demand comes from India and China. In 1818, 14,743,675 lbs. of twist were exported, of which only 1,861 lbs. went to India and China. In 1859, 192,341,516 lbs. were exported, of which 44,006,352 lbs. went to India alone. The value of the yarn exported in 1859 was £9,485,704, and the value of manufactured cotton goods exported £38,712,740.

Cotyledon, *ko-til-e'-don* (Gr. *kotula*, a cavity, in allusion to the cup-like leaves), in Bot., a rudimentary leaf, forming part of the embryo of a flowering plant. (*See* Embryo.)

Cotyledon, in Bot., the *Navelwort*, a gen. of plants belonging to the nat. ord. *Crassulaceæ*. The species *C. umbilicus* is a common plant on walls and rocks in the West of England. It has long been in use as a popular remedy in hysteria, and as an external application to destroy corns and warts. Of late years it has been frequently employed as a remedy for epilepsy.

Cotyledones, *ko-til-e-do'-neas*, in Bot., a name sometimes applied to the sub-kingdom *Phanerogamia*, or flowering plants. (*See* systematic arrangement of plants in the article Botany.)

Coucal (Egyptian), *koo'-kil* (*Centropus aegyptius*), a bird about fifteen inches long. The feathers of the head and neck are of a metallic greenish hue, which colour, passing to a duller tint, marks the bird's upper parts generally, while the under portions are white. They are solitary in their habits, breeding in holes in trees, and feeding on insects and small reptiles. Its note somewhat resembles that of our cuckoo; indeed, the Arabs call the bird *koo-koo*, from its repetition of these syllables.

Cough, *kof* (qu. Du. *kuch*), is a spasmodic action of the respiratory organs, occasioning a violent and sonorous expulsion of air from the lungs. Coughing most frequently occurs as a symptom of some other complaint, as catarrh, pleurisy, phthisis, &c.; and hence some nosologists have been led to regard it as always so. At times, however, it is as truly idiopathic as any other disease. It is of the utmost importance that the air-passages to the lungs should be perfectly free from any obstruction; and hence the larynx, trachea, and bronchi are endowed with a very high degree of irritability, so that the slightest contact of a foreign body causes the most violent excitement.

Coughing, then, is occasioned by an irritant in these parts, and is an attempt to get rid of the irritation. The air from the lungs is suddenly driven up with great force through the air-passages, so as to carry with it any causes of irritation that may be present in them: Cough may also be excited by irritant vapours or gases, or may arise from an abnormal sensibility of the lining membrane. In most cases cough is attended with expectoration, but sometimes it is quite dry. When the mucous membrane of the air-passages is unduly stimulated, the vessels become overloaded with mucus, and coughing is produced to effect its discharge, as is frequently observed in catarrh. This kind of cough is often a chronic disease in old age, and is frequently very troublesome. The dry cough, which is mostly unattended by any expectoration, is obviously of a nervous character, and is observed in highly irritable, nervous, and hysterical constitutions. The treatment of cough, when symptomatic of any other disease, will be found noticed in other parts of this work; as CATARRH, BRONCHITIS, PHTHISIS. When it is occasioned by the irritation of the mucous, it is to be treated with demulcents; as mucilaginous drinks and liquorice. Stimulants and full diet are to be avoided, and inflammatory symptoms carefully guarded against. Sedatives, expectorants, and aperients are often very useful in effecting a cure. Great relief is frequently afforded by the use of the warm foot-bath and warm gruel, with a ten-grain Dover's powder after the patient is in bed, and then plenty of covering to encourage perspiration. In dry coughs opium and its preparations should be used. Coughs should never be neglected; for they are frequently symptomatic of organic disease, or may induce it. If they do not yield to simple remedies, medical advice ought to be sought.

COUMARIN, *koo'-ma-rin*, in Chem., $C_{18}H_8O_4$, an odoriferous crystalline principle, found largely in the Tonka or Tonquin bean (*see* DIPTERYX), the common melilot, and in the sweet-scented vernal grass. It is to this odoriferous principle that the pleasant scent of new-mown hay is due; and by combining the essential oil of Tonka-beans with other scents, perfumers are accustomed to imitate with great accuracy the odour of a field of new-mown hay. It is easily extracted from the Tonka-bean by digesting the powdered seeds in alcohol. On evaporating the alcoholic solution, crystals of coumarin are obtained, which may be decolorized by digestion with animal charcoal and subsequent recrystallization. It melts at 122°, boils at 518°, at which temperature it may be distilled unaltered. Its vapour has an agreeable aromatic odour. It has a burning taste, and is but slightly soluble in cold water; warm dissolves it readily, depositing it in silky crystals as the solution cools. It forms several substitution compounds with chlorine, iodine, bromine, and nitrous acid. A most irregular and somewhat anomalous compound is formed by its union with teroxide of antimony. On treating it with perchloride of antimony dissolved in hydrochloric acid, a compound is formed having a composition indicating the union of an atom of coumarin with an atom of teroxide of antimony. Boiled with a solution of potash, coumarin assimilates the elements of water, and becomes transformed into *coumaric acid*, which unites with the potash. Coumaric acid is obtained in brilliant transparent plates by decomposing a solution of coumarate of potash with hydrochloric acid.

COUNCIL, *kown'-sil* (Lat. *concilium*, Fr. *concile*), in a general sense is a number of persons summoned or convened together for consultation or advice. In modern politics, it is generally used to designate an assembly intended to assist the sovereign, and composed of members whose chief business it is to discuss, advise, legislate, or decide; it being the duty of the ministers to execute. In England, Alfred, to whom we are indebted for so many wise institutions, had three councils, through which all the business of the nation passed. The first was a select council, to which only those high in the king's confidence were admitted, corresponding to the present cabinet. The second council was composed of nobles and bishops appointed by the king, and resembled the present privy council. The third was the witteneagemot, or general council of the nation, which was independent of the king. In the present day, the queen has a variety of councils to assist her in the discharge of her duties, the maintenance of her dignity, and the exercise of her prerogative. The first of these is the high court of parliament (which *see*); 2. the peers of the realm, who are by their birth hereditary counsellors of the crown, and may be called together by the sovereign to impart their advice in all matters of importance to the realm, either in time of parliament, or, as has been their principal use, when no parliament is in being. A third council belonging to the queen is, according to Sir Edward Coke, her judges of the courts of law for law matters. But the principal council belonging to the queen is the privy council (which *see*), which is generally, by way of eminence, called *the council*. The cabinet council (which *see*) is composed of the more distinguished members of the privy council, to the number usually of about fifteen.

COUNCIL, in Eccl. Hist., is an assembly of prelates and other spiritual persons convened for the purpose of deliberating and making laws for the benefit of the Church. There are several kinds of councils:—1. General or œcumenic councils, which are composed of representatives from all parts, summoned for the settling of points of universal interest; 2. national councils, composed of the bishops or clergy of one kingdom or state, but whose decisions are not regarded as binding over the Church; and 3. provincial councils, convoked by the metropolitans in their respective districts. The earliest councils were provincial; but sometimes clergy from distant parts attended, in consequence of express invitation. The metropolitan, as president, came to acquire great influence in the provincial council, which at length became little more than an organ in his hands. Presbyters as well as bishops were admitted to deliberate and vote, and deacons were also present; but it is matter of doubt whether they were allowed to vote. Some are of opinion that the laity even had seats and votes in the early councils. The number of councils which have been held at various times is very great, amounting, according to some authorities, to 1,500 or 1,600. Of general or œcumenical councils, the number is by no means so great; but the different churches are by no means agreed as to what are to be regarded as such. The Greek church only acknowledges seven, and the Roman Catholics reckon eighteen; but even the different sections of the latter church are not agreed as to the individual councils that are to be included in the list. The French reject those of Lyons, Florence, and the Fifth Lateran, and receive in their stead those of Pisa, Constance, and Bâle, which the Italians reject. The following is a list of the general councils according to the Roman church: the first eight were called by the emperors, and the rest by the popes. The principal of them will be found more particularly noticed under their own names in other parts of this work. 1. The Council of Nice, which was convened at the city of that name in 325, and which condemned the Arian heresy and drew up the creed known as the Nicene; 2. the first Council of Constantinople, which was convoked by the emperor Theodosius the Great in 381, and which confirmed more definitely certain points of the Nicene creed against the Arians, and condemned the Macedonian heresy of denying the divinity of the Holy Ghost; 3. the Council of Ephesus (431), which condemned the Nestorian heresy; 4. the Council of Chalcedon (451), which condemned the errors of Eutyches and Dioscorus, who affirmed that Jesus Christ had but one nature; 5. the Second of Constantinople (553), which condemned the doctrines of the "Three Chapters" (*see* CHAPTERS, THREE) and the heresies of Origen, Arius, Macedonius, and others; 6. the Third of Constantinople (680) confirmed the canons of the five previous councils, and condemned the heresy of the Monothelites, which asserted that there was only one will in Christ; 7. the Second of Nice (787) condemned the Iconoclasts, and sanctioned the worship of images in the churches; 8. the Fourth of Constantinople (869) confirmed the worship of images, deposed Photius from the see of Constantinople, and restored Ignatius; 9. the first Council of Lateran (1123) decreed that investiture was the solemn right of the Church; 10. the second Council of Lateran (1139) confirmed the election of Pope Innocent II.,

and condemned the heresies of Peter de Bruis and Arnold of Brescia; 11. the Third Lateran (1179) condemned the "errors and impieties" of the Waldenses and Albigenses; 12. the Fourth Lateran (1215) took up many points of morality, and condemned various heresies; 13. the first Council of Lyons (1245) ordered a new crusade for the recovery of the Holy Land, and excommunicated Frederick II. of Germany; 14. the Second of Lyons (1274), for reforming discipline and the morals of the clergy, and effecting a union with the Greek church; 15. the Council of Vienne (1311) condemned the order of the Templars, and confiscated their property; 16. the Council of Pisa (1409) deposed Gregory XII. and Benedict XIII., and elected Alexander in their stead; 17. the Council of Constance (1414) deposed the three contending popes and elected Martin V. in their place, and condemned the doctrines of Huss, Wickliffe, and Jerome of Prague; 18. that of Basle (1431), called to effect a reform in the Church, and to bring about a union with the Eastern church; 19. the Council of Florence (1439) effected a reconciliation between the Eastern and Western churches; but the act was afterwards disavowed by the great body of the Eastern church; 20. the fifth Lateran council (1512), for the suppression of the pragmatic sanction (which *see*), and the strengthening of the power of the Roman see; 21. the Council of Trent (1545), for the reformation of ecclesiastical abuses and the condemnation of the reformed principles. (*See* SYNOD.)

COUNCIL OF WAR is an assemblage of the principal officers of a fleet or an army, summoned by the admiral or general, for deliberation or consultation, or to assist him by their advice.

COUNCIL, TOWN. (*See* TOWN COUNCIL.)

COUNSEL, or COUNSELLOR, *kown'-sel*, is a person retained by a client to plead his cause in a court of judicature, or to advise him privately, as it is called, in chambers, although the etiquette is not to receive instructions from or to advise a client, except through the intervention of an attorney, solicitor, or proctor. Among the civilians, counsel are called advocates; but in the courts of common law and equity, there are two species or degrees,—barristers and serjeants. The former we have dealt with under the word BARRISTER, and we shall treat of the latter in the proper place. From both these degrees some are usually selected to be her Majesty's counsel learned in the law, the two principal of whom are her Majesty's attorney and solicitor-general. Queen's counsel must not be employed in any cause against the crown, without special license. A custom has of late years prevailed of granting letters-patent of precedence to such barristers as the crown thinks proper to honour with that mark of distinction, whereby they are entitled to such rank and pre-audience as are assigned in their respective patents; sometimes after the queen's attorney-general, but usually next after her Majesty's counsel then being. These, as well as the queen-consort's attorney and solicitor-general (when the sovereign is a king), rank promiscuously with the king's counsel, and, together with them, sit within the bar of the respective courts, but are not sworn, and therefore are at liberty to be retained in causes against the crown. A counsel cannot maintain an action for his fees, which are given not as *locatio vel conductio*, but as *quiddam honorarium*; not as a salary or hire, but as a mere gratuity. He is not answerable for any matter spoken relative to the cause in hand, and suggested in his client's instructions, although it should reflect upon the reputation of another, and even prove absolutely groundless; but if he mentions an untruth of his own invention, or even upon instructions, if it be impertinent to the cause in hand, he is then liable to an action from the party injured; and counsel guilty of deceit or collusion are punishable with imprisonment for a year and a day, and perpetual silence in the courts. Practising barristers are exempt from serving on juries, as parish constables, and are privileged from arrest in civil cases, whilst going to, staying at, and returning from, the superior courts, quarter sessions, and, if previously retained, petty sessions. (*See* ADVOCATE, BARRISTER, SERJEANT-AT-LAW.)

COUNT, *kount* (Fr. *comte*, Lat. *comes*), is a title of dignity intermediate between duke and baron, and is, properly, a nobleman who owns a domain erected into a county; but sometimes ambassadors and plenipotentiaries are styled counts without possessing the necessary territory. In England the title has never been used, although *comes* is regarded as the Latin equivalent for earl, and from a very early period the title countess has been given to the *wife* of an earl. In the times of the Roman republic the inferior officers, such as the tribunes, prefects, &c., were known as the *comites* of their principal. As a title of dignity it was first used during the reign of Constantine, who, upon the foundation of the new capital, bestowed the dignity of *comes* upon ten out of thirty-five provincial generals. The Germans, Franks, and other nations retained the title, applying it principally to the governors of cities, just as *duces*, or dukes, designated those noblemen that were in command of provinces. During peace they administered justice, in war they commanded in the army. Under the last of the second race of French monarchs, the dignity became hereditary. In Germany, a count is called *graf*. (*See* GRAF.)

COUNT (Fr. *compte*), in LAW, signifies the declaration of the complainant in a real action. As *declaration* is applied to personal, so *count* is applied to real causes; but *count* and *declaration* are oftentimes confounded, and made to signify the same thing; so the divisions of, or separate statements or allegations in, a declaration, indictment, or criminal information, are called *counts*.

COUNTENANCE, *kown'-ten-dns* (Fr. *contenance*), the whole form of the human face, or system of the features.

COUNTER-IRRITANTS, *kown'-ter-ir'-rit-ants* (Lat. *contra*, against), in Med., are certain substances applied to the skin in order to produce irritation at some distance from a diseased part, with a view to withdraw the inflammation or unnatural action from it. The slightest class of counter-irritants are *rubefacients*, or such as merely redden the skin; *vesicants*, or such as produce vesicles or blisters, are a more powerful class, and not only cause counter-irritation but prove evacuant; *pyogenic counter-irritants*, or *suppurants*, are still more evacuant. Setons, issues, and the actual cautery, also belong to the class of counter-irritants. There is no more valuable remedial agent than counter-irritation, and none more frequently employed with the best results; but it must be rightly timed and placed, not too soon, nor yet too near the seat of the disease. It should not be had recourse to until all acute action has fully subsided, otherwise it may not only fail in affording relief, but may aggravate the local and general disease. It should also be applied at some distance from the site of the original disorder, and yet not too far removed from it.

COUNTERMINE, *kown'-ter-mine* (Lat. *contra*, Fr. *contre*, against; *mine*, mine), in Mil. when an attacking force are engaged in driving the gallery of a mine under any part of the fortifications of the besieged, the latter often drive another gallery towards the enemy's mine to destroy it, and prevent the injury which would be caused to their works if the mine exploded.

COUNTERPOINT, *kown'-ter-point*, literally, point against point; so called from the points formerly employed in music instead of notes,—an important branch of musical science, which consists in the art of composing music in several parts either for a variety of voices or instruments; now synonymous with harmony, and nearly so with composition; the only difference being, that composition implies more of invention and of imagination than counterpoint. The invention of the latter is involved in great obscurity: by some it is attributed to Guido (a native of Tuscany, who was born about 900); but, although he was the first to write on this subject, which had made little progress before his time, it is obvious that it was known to several of the earlier musicians. Its real origin appears to have been as follows:—When the organ was introduced into France, about 757, and used as an accompaniment to the voice, it gave a facility for producing several sounds simultaneously. This soon led to the discovery that there were some sounds among them, which, when struck together, caused agreeable effects: the minor third appears to have been one of the first of these. Other harmonies were also used, whilst (without mentioning those em-

ployed by several authors before Guido) show the origin of the art, and at the same time prove it to have been totally unknown to the ancients. Primitive counterpoint is now called plain or simple counterpoint, to distinguish it from the modern figured or florid counterpoint, in which the melody is beautified and the general effect enriched by the frequent introduction of many successive notes in one part against a single note in another. When the laws of counterpoint began to be understood, vocal music came to be divided into four parts, the lowest of which was denominated *tenor*, the next *counter tenor*, the third *metotus*, and the highest *triplum* and *treble*. About the middle of the 15th century these parts were increased to six, and were called *base*, *baritone*, *tenor*, *contralto*, *mezzo-soprano*, and *soprano*.

COUNTERSCARP, *kown'-ter-skarp* (Fr. *contre*, against, or opposite; *escarpe*, scarp), in Mil., that side of the ditch which is opposite the rampart and the scarp below it. To form the outline of the counterscarp of the main ditch of a fortress opposite any of its sides, formed by two semi-bastions and the curtain between them, arcs of circles should be described in front of the salient angles of the bastions from the angles themselves as centres, and a tangent drawn to the arc in front of each bastion from the shoulder of the other. These lines meet in a point in front of the curtain, which is called the angle of the counterscarp. The ditch is thus contrived that it may be swept by cross-fires from the flanks. The counterscarp of a ditch round an outwork is parallel to the rampart. Sometimes it is revetted with masonry, and very steep; but if it be constructed to admit of a hasty sortie being made on the enemy by the garrison, it should slope in a gentle incline from the bottom of the ditch.

COUNTERSIGN, *kown'-ter-sine* (Lat. *contra*, against; *signum*, sign), the name given to a watchword selected by the officer in command, and privately communicated to the guards and sentries posted about a camp, or at the entrance to a fortress, who have strict orders not to allow any one to pass into the citadel, or within the lines, unless he can give this word, and thereby show that he has the authority of the commanding officer to enter.

COUNTER-TENOR CLEF, *kown'-ter-ten'-or klef*, in Mus., the name given to the C clef when placed on the third line, in order to accommodate the counter-tenor voice.

COUNTER-TENOR VOICE, *rois*, a term applied to the highest natural male voice. It extends from E or F above G gamut to B or C above the treble clef note.

COUNTING-HOUSE, *kown'-ting hows* (Ang.-Sax.), the house or room specially appropriated by merchants, traders, and manufacturers, to the purpose of keeping their books, accounts, letters, and papers.

COUNTRY DANCE, *kun'-tre* (Fr. *contre danse*), a lively pointed air, calculated for dancing. It is of French origin, and was at one time so popular as to be transplanted into almost every country in Europe. There are no established rules for the composition of airs to this dance, neither is it confined to any particular measure, so that any common lively song-tune may be adapted to it.

COUNTY, *kown'-te*, in British Geog., meant at first the territory under the jurisdiction of a count or earl; but at the present time it is a term, so far as England and Scotland are concerned, synonymous with shire, the latter word coming from the Saxon, and the former from the French. In Ireland the term shire is not used as an equivalent of county; neither would it appear to be so used in the English colonies, or in the states of North America. Some of the English counties are almost identical with the old Saxon kingdoms. As a territorial division, the county is a comparatively late introduction into Scotland; whilst in Ireland its recognition is still more recent. In all the counties of England, with the exception of Durham, Westmoreland, and Cumberland, *sheriffs* are appointed every Michaelmas term for the execution of the laws. The command of the militia of a county is vested in the lord-lieutenant. Other county officers are:—Justices of the peace, *custodes rotulorum*, high constable, bailiffs, and coroner. In England there are fifty-two counties, three of which, Lancaster, Chester, and Durham, are called counties palatine (from *palatium*, palace), because the chief officer had originally regal powers, or power to administer justice equal with that exercised by the monarch in his palace. Scotland contains thirty-three counties; Ireland thirty-two.

COUNTY CORPORATE, in England, is a term applied to several cities or boroughs which, in consequence of extraordinary privileges, are enabled to form counties by themselves.

COUNTY COURTS. (*See* COURTS.)

COUP, *koo* (Fr., a blow), is a term used in various ways to convey the idea of promptness and force. *Coup d'état* is a violent and arbitrary political measure; *coup de théâtre*, a sudden and striking change in the action of the scene; *coup d'œil*, in military affairs, a rapid conception of the weakness and advantages of certain positions or arrangements of troops; *coup de main* signifies a vigorous, prompt, and decisive military attack.

COUPLET, *kup'-let* (Fr.), a pair of rhymes, two verses; a division of a hymn or ode, in which an equal number or equal measure of verses is found in each part, called a *strophe*.

COUPONS, *koo'-pon(g)s* (Fr. *couper*, to cut), in Finance, is a term applied to any cheque, or other piece of paper, cut off from its counterpart. In a special sense, coupons are dividend or interest warrants, which are presented for payment by holders of debentures. All coupons in Great Britain must now bear a stamp.

COURANT, *koo-rănt'* (Fr. *courant*, running, from Lat. *currere*, to run).—In Her., when any animal, such as a deer or a dog, is drawn running at full speed, it is described as courant.

COURIER, *koor'-e-er* (Fr.).—There are two classes of couriers,—public and private. Public couriers are employed by the government to carry dispatches expeditiously and safely to and from the ambassadors at foreign courts. They are accustomed to travel, able to speak several languages, and always ready, at a moment's notice, to set out either on horseback, by hired carriage, or by rail, night or day. They are acquainted with all the regulations of passports, &c. Private couriers are servants employed by the opulent, when travelling in foreign countries, to facilitate their route, by going before to make preparations, and by looking after their lodgings and general accommodation.

COURSING, *koarse'-ing* (Lat. *curro*, I run), the sport of hunting hares with greyhounds, which follow the game by sight and not by scent. The breed of greyhounds has greatly improved in this country, and coursing has become very popular. Coursing meetings are held in open parts of the country where hares are abundant, and the owners of greyhounds enter their respective dogs for various stakes. A judge is appointed, whose duty it is to decide with respect to the merits of the dogs engaged. The sport then begins by two dogs being selected for a course. They are restrained by the "slipper," a man who holds them by a long strong cord, with a spring attached to their collars. The field is then beaten for a hare. When it is found, it is allowed 80 to 100 yards start, or "law," as it is called; the judge then gives the word "go," and the slipper frees the dogs by means of the spring. The judge follows the greyhounds through the whole course, and awards the victory to the dog which shows the finest qualities of speed, endurance, and sagacity, and not necessarily to the dog which kills the hare. Coursing is of great antiquity, and is treated of by Arrian, who flourished A.D. 150. It was first practised by the Gauls, and was a popular sport with the ancient Greeks.

COURT, *koart* (Sax. *curt*, Lat. *curia*, a senate-house), originally meant the place inclosed by the buildings of a feudal castle; afterwards it came to denote the retinue or council of a sovereign. (*See* ROYAL HOUSEHOLD.)

COURT.—In Law, a court is defined to be a place wherein justice is judicially administered; and as by our excellent constitution the sole executive power of the laws is vested in the person of the sovereign, it will follow that all courts of justice (which are the medium by which she administers the laws) are derived from the power of the crown; for, whether created by act of parliament or letters patent, or subsisting by prescription (the only methods by which any court of judicature can exist), the queen's consent in the former

is expressly, and in the latter impliedly, given. In all these courts the sovereign is supposed, in contemplation of law, to be always present; but as that is, in fact, impossible, she is there represented by her judges, whose power is only an emanation of the royal prerogative. For the more speedy, universal, and impartial administration of justice between subject and subject, the law has appointed a prodigious variety of courts,—some with a more limited, others with a more extensive jurisdiction; some constituted to inquire only, others to hear and determine; some to determine in the first instance, others upon appeal, and by way of review. All these in their turns will be taken notice of in their respective places; but we may here mention one distinction that runs throughout them all; viz., that some of them are *courts of record*, others *not of record*. A court of record is that where the acts and judicial proceedings are enrolled on parchment for a perpetual memorial and testimony, which rolls are called the records of the court, and are of such high and superéminent authority, that their truth is not to be called in question; for it is a settled rule and maxim, that nothing shall be averred against a record, nor shall any plea, or even proof, be admitted to the contrary. And if the existence of a record be denied, it shall be tried by nothing but itself; that is, upon bare inspection whether there be any such record or no, otherwise there would be no end of disputes; but if there appear any mistake of the clerk in making up such record, the court will direct him to amend it. All courts of record are the queen's courts, in right of her crown and royal dignity; and therefore every court of record has authority to fine and imprison for contempt of its authority; while, on the other hand, the very erection of a new jurisdiction, with power of fine or imprisonment, makes it instantly a court of record. But the courts *not of record*, or those of them, at least, in which the common law is administered, are of inferior dignity; and, in a less proper sense, the queen's courts and these *are* not intrusted by the law with any power to fine or imprison the subjects of the realm, unless by the express provision of some act of parliament. In these also the proceedings are not enrolled or recorded; but as well their existence as the truth of the matters therein contained, shall, if disputed, be tried and determined by a jury. In every court there must be, at least, three constituent parts,—the *actor, reus*, and *judex*; the *actor*, or plaintiff, who complains of an injury done; the *reus*, or defendant, who is called upon to make satisfaction for it; and the *judex*, or judicial power, which is to examine the truth of the fact, to determine the law arising on that fact, and, if any injury appears to have been done, to ascertain, and, by its officers, to apply the remedy. (As to appeals against the decision of different courts, *see* APPEALS.)

COURT, ADMIRALTY. (*See* ADMIRALTY.)

COURT, ARCHDEACON'S, is an ecclesiastical court, but the most inferior in the whole ecclesiastical polity. It is held before a judge appointed by himself, and called his official. Its jurisdiction, until the establishment of the Court of Probate, comprised the granting of probates and administrations. It has jurisdiction over ecclesiastical causes in general arising within the archdeaconry, and in ordinary cases the party may commence his suit either in this court or the bishop's, though in some archdeaconries the suit must be commenced in the former, to the exclusion of the latter. From the Archdeacon's Court an appeal lies, by 24 Hen. VIII. c. 12, to that of the bishop.

COURT OF ARCHES. (*See* ARCHES.)

COURT OF ASSIZE. (*See* ASSIZE.)

COURT OF BANKRUPTCY.—Jurisdiction in cases of bankruptcy is committed to certain commissioners and to the judges of county courts (except those of the metropolitan county courts), with a final appeal to the lords justices. There is also a subordinate jurisdiction given to the registrars of the several courts. The courts of the commissioners are held in the principal, or London district, in Basinghall Street, and the district courts are held in several provincial towns. The subordinate powers of the registrars are defined by the Bankruptcy Act of 1861, secs. 52 and 58; but they have no power to commit or to hear a disputed adjudication, or any question of the allowance or suspension of an order of discharge. The London court has the power to transfer the proceedings from one district court to another, or to a county court, and the majority in number and value of the creditors may resolve that the proceedings shall be transferred to the county court of any district other than the metropolitan district; and the court is to order the same accordingly. As we have before to some extent treated of the law of bankruptcy, and incidentally of the powers of the court, the reader is referred to the title BANKRUPT.



COURT BARON is a court incident to every manor in the kingdom, to be holden by the steward within the manor. This court baron is of two natures: the one a *customary court*, appertaining entirely to copyholders, in which their estates are transferred by surrender and admittance, and other matters relative to their tenure only; the other is a court of common law, but not one of record, and is before the freeholders who owe suit and service to the manor, the steward being rather the registrar than the judge. It may hold pleas of any personal actions, of debt, trespass, on the case, or the like, where the debt or damages do not amount to forty shillings. But the proceedings may be removed into the superior courts, and, after judgments given, a writ of *false judgment* lies to the courts at Westminster, to rehear and review the cause; which circumstances being productive of great vexation and delay, this court has now fallen into disuse. (*See* COURT OF THE HUNDRED, and the statute there quoted.)

COURT, CENTRAL CRIMINAL. (*See* CENTRAL CRIMINAL COURT.)

COURT OF CHIVALRY is a court military held before the earl-marshal. It has cognizance of contracts and other matters touching deeds of arms and war, as well out of the realm as in it; and from its sentence an appeal lies immediately to the queen in person. This court was in great reputation in the times of pure chivalry, and afterwards during our connection with the continent by the territories which our princes held in France, but has long since fallen entirely out of use, on account of the feebleness of its jurisdiction and want of power to enforce its judgments, as it can neither fine nor imprison, not being a court of record.

COURT OF THE CINQUE PORTS.—These have an exclusive jurisdiction (before the mayor and jurats of the ports), in which exclusive jurisdiction the queen's ordinary writ does not run. A writ of error lies from the mayor and jurats of each port to the lord warden of the Cinque Ports in his Court of Shepway, and from that to the Queen's Bench. (*See* CINQUE PORTS, and COURTS, SHEPWAY.)

COURT OF THE CLERK OF THE MARKET.—This court is the most inferior court of criminal jurisprudence in the kingdom; but is incident to every fair and market therein, to punish misdemeanours committed in such fair or market, as a court of *pied poudre* (which *see*) is to determine all disputes relating to private or civil property. The object of the jurisdiction is principally the cognizance of weights and measures, to try whether they be of the true standard thereof or not, which standard was anciently committed to the custody of the bishop, who appointed some clerk under him to inspect the abuse of them more narrowly; and hence this officer, though in most cases a layman, is called the *clerk* of the market.

COURT OF COMMON PLEAS, or, as it is sometimes technically called, the Court of *Common Bench*, is one of the three superior courts of common law, and is a court of record, and in that capacity takes cognizance of all actions between subject and subject, without exception, including formerly the extensive class of real actions, of which it still retains the few surviving species. (*See* ACTION.) And over remedies of this kind (which formerly excelled all others in importance) it has always exercised an exclusive jurisdiction, as it did also over fines and recoveries, while these modes of assurance existed, and still does over the forms of conveyance now substituted for them. For these reasons, and also because its authority in these matters was original, and not usurped (as in the case of the Exchequer and Queen's Bench), it has always been considered as the principal seat of the learning relative to ordinary actions between man and man, and is styled by Lord Coke the lock and key of the common

law. It has the exclusive jurisdiction of deciding questions of law relating to the rights of voters for members of parliament, in cases stated by revising barristers. It has no authority, however, like the Exchequer, in matters relating to the revenue. The judges are at present five in number, one chief and four puisne justices, and from their decision proceedings in error may be taken into the Exchequer chamber. It is one of the three courts called the *superior courts*, or the *courts at Westminster*, the other two being the courts of Queen's Bench and Exchequer.

COURT, CONSISTORY.—Every diocesan bishop has a court held in his cathedral for the trial of all ecclesiastical causes arising within his diocese, and in which probates and administrations were granted previous to the establishment of the Court of Probate. The bishop's chancellor, or his commissary, is the judge, and from his sentence an appeal lies to the archbishop of the province.

COURT, CONTEMPT OF.—Contempts of court are either *direct*, which openly insult or resist the powers of the courts or the persons of the judges who preside there, or else are *consequential*, which (without such gross insolence or direct opposition) plainly tend to create a universal disregard of their authority. All courts of record are the queen's courts, in right of her crown and royal dignity; and, therefore, every court of record has authority to fine and imprison for contempt of its authority. The principal instances of either sort are the following kinds:—1. Those committed by inferior judges and magistrates, by acting unjustly, oppressively, or irregularly, in administering those portions of justice which are intrusted to their distribution, or by disobeying the royal writs issued out of the superior courts; by proceeding in a cause after it is put a stop to, or removed by writ of prohibition, certiorari, error, supersedeas, or the like. 2. Those committed by sheriffs, bailiffs, gaolers, or other officers of the court, by abusing the process of the law, or deceiving the parties by any act of oppression, extortion, collusive behaviour, or culpable neglect of duty. 3. Those committed by attorneys and solicitors. (*See* ATTORNEY.) 4. Those committed by jurymen in collateral matters relating to the discharge of their office such as making defaults when summoned, refusing to be sworn or to give any verdict, eating or drinking without leave of the court, and especially at the cost of either party, and other misbehaviour and irregularities of a similar kind; but not in the mere exercise of their judicial capacities, as by giving a false or erroneous verdict. 5. Those committed by witnesses, by making default when summoned, refusing to be sworn or examined, or prevaricating in their evidence when sworn. 6. Those committed by parties to any suit or proceeding before the court by disobedience to any rule or order made in the progress of a cause, or other proceeding; as by non-payment of costs awarded by the court upon a motion, or by non-observance of awards duly made by arbitrators or umpires after having entered into a rule for submitting to such determination. However, the contempts in such cases as last mentioned is, in general, consequential or constructive only; as it implies no actual disregard of authority, but may proceed from the poverty of the party. 7. Those committed by any persons in the way of disobedience to the queen's writs, or other disrespect to the court's authority, or writing to a judge privately on a matter before the court. Some of these contempts may arise in the face of the court; as by rude and contumelious behaviour; by obstinacy, perverseness, or prevarication; by breach of the peace, or any wilful disturbance whatever: others in the absence of the party, as by disobeying or treating with disrespect the sovereign's writ, or the rules or process of the court, by perverting such writ or process to the purpose of private malice, extortion, or injustice; by speaking or writing contemptuously of the court or judges acting in their judicial capacity; by printing false accounts (or even true ones against the prohibition of the court) of causes then depending in judgment; by gross or wilful misbehaviour to an officer of the court in the performance of his duty, or treating the process of the court with actual disrespect or contempt; and by anything, in short, that demonstrates a gross want of that regard and respect which, when



once courts of justice are deprived of, their authority (so necessary for the good of the kingdom) is entirely lost among the people. (*See* ATTACHMENT, COMMITMENT.)

COURT OF THE CORONER is a court of record, to inquire into the matters referred to under the article CORONER, *in loco*. As there stated, his principal duty is to inquire into the deaths of parties, and in general he ought to hold his court *super visum corporis*, upon view of the body.

COURT, COUNTY.—The County Court, as it exists at common law, and independently of the branch now added to it by statute, is a court incident to the jurisdiction of the sheriff. It is not a court of record, but might entertain all personal actions to any amount by virtue of a special writ, called a *justicies*, issued out of the common-law side of the court of Chancery. This power was taken away on the establishment of the new county courts. The freeholders of the county are the real judges in this court, and the sheriff is the ministerial officer. All outlawries of absconding offenders are there proclaimed, and all popular elections, as of coroners, verderers, and knights of the shire, must be made *in pleno comitatu*, or in full county court. Proceedings are removable from hence into the superior courts by writs of *pone* or *recordari*, in the same manner as from hundred courts and courts baron; and the same writ of false judgment may be had in the nature of a writ of error. (*See* reference in COURTS, BOROUGH.)

COURT, CUSTOMARY, is distinct from the Court Baron (although usually held at the same time). The Court Baron is that of the freeholders of a manor, whilst the Customary Court is that of the copyholders or customary tenants. It is held before the lord or lady of the manor, the steward, and a jury, called the *homage*, or *homage jury*, who are tenants of the manor. The chief business at these courts is to admit tenants to their property on the death or alienation of the preceding tenant. The jury make presentments of defaults and deaths of tenants, and assess fines for admittance of the tenants.

COURT OF DELEGATES was formerly the great court of appeal in all ecclesiastical courts, but its functions have been superseded by the Judicial Committee of the Privy Council.

COURT OF EXCHEQUER was at first intended principally to order the revenues of the crown, and to recover the king's debts and duties, though it has since acquired, and originally by usurpation, the additional character of an ordinary court of justice between subject and subject. It is called the Exchequer (*scaccarium*) from the chequered cloth, resembling a chessboard, which covered the table there, and on which, when certain of the king's accounts were made up, the sums were marked and scored with counters. It consists of two divisions,—the *receipt* of the Exchequer, and the *court* or *judicial* part of it. It formerly had jurisdiction as a court of equity; but this was transferred to the court of Chancery, except in matters of revenue. It is therefore now a court of revenue and a court of common law. In the former capacity it ascertains and enforces, by proceedings appropriate to the case, the proprietary rights of the crown against the subjects of the realm; in the latter it administers redress between subject and subject in all actions whatsoever, except in the few species of real actions which still survive the general demolition of that class. These are exclusively under the jurisdiction of the court of Common Pleas. It is a court of record, and its judges are five in number, consisting of one chief *baron* and four puisne *barons*, as in this court the judges are termed. It is one of the three courts called the *superior courts*, or the *courts at Westminster*, the other two being the court of Common Pleas and the court of Queen's Bench.

COURT OF EXCHEQUER CHAMBER.—This is a court of appeal to correct the errors of other jurisdictions. It exists—1. as a court of mere debate, such causes from the other courts being sometimes adjourned into it as the judges, upon argument, find to be of great weight and difficulty, before any judgment is given by them in the court below. It then consists of all the judges of the three superior courts of common law, and now and then the lord chancellor also. 2. As a court of error. It then consists of the judges of the two superior courts other than that whose judgment

is appealed against, sitting collectively as a court of error in the Exchequer chamber to revise such judgment. A writ of error lies from this court to the House of Peers.

Court Fool, a jester much employed in ancient times by nobles and wealthy persons, to enliven the time by jests and witty remarks. During the Middle Ages, the court fool became an indispensable officer. He usually had his head shaved, and wore a fool's cap of gay colours, with ass's ears and a cock's comb. He often had bells attached to his cap, and carried a sceptre variously formed. The dress, however, generally depended on the caprice of his master. Triboulet, the court fool to Francis I., king of France, obtained an historical reputation, as did also his successor Brusquet. English court jesters disappeared with the Stuart dynasty; one of the last examples being Armstrong, who died in 1646. Afterwards half-witted persons were employed as court fools by noblemen; but towards the end of the 17th and the beginning of the 18th century the custom was entirely abolished.

Court of High Commission.—This was a court in causes ecclesiastical. It was erected and united to the legal power by virtue of the statute 1 Eliz. c. 1, and was intended to vindicate the dignity of the Church by reforming, ordering, and correcting the ecclesiastical state and persons, and all manner of errors, heresies, schisms, abuses, offences, contempts, and enormities. It was abolished by statute 16 Chas. I. c. 11.

Court of the Hundred is only a larger court baron, being held for all the inhabitants of a particular hundred, instead of a manor. The *free* suitors are here also the judges, and the steward the registrar, as in the case of a court baron. Causes are equally liable to removal hence, and may be reviewed, as in the court baron, and in practice no resort to this court is ever made. By the 9 & 10 Vict. c. 95, s. 14, provision is made enabling the lord of any hundred, or of any honor, manor, or liberty, having any court in right thereof in which debts or demands may be recovered, to surrender to her Majesty the right of holding such court, after which it shall be discontinued.

Court of Hustings. (*See* Courts of London.)

Court of Inquiry.—On some occasions, the crown directs a *court of inquiry* to be held in cases of breach of the Articles of War, the object of which is to ascertain the propriety of resorting to ulterior proceedings against the party charged.

Court-Leet, or View of Frankpledge, is a court of record, and held once in the year, but not oftener, within a particular hundred, lordship, or manor, before the steward of the leet. Its original intent was to view the frankpledges, that is, the freemen within the liberty. Besides this, the preservation of the peace and the chastisement of divers minute offences are its objects. The jurisdiction of the court is the same as that of the Sheriff's Tourn, or ancient County Court, and extends from common nuisances, and other material offences against the peace and public trade, down to eavesdropping, waifs, and irregularities in public commons. The court has grown into a state of desuetude, by reason of its holding its session so seldom, and of the business, for the most part, having devolved upon the quarter sessions.

Court, Lords Justices'.—This is a court of appeal in Chancery, and consists of the lord chancellor and two judges, called the Lords Justices, and possesses all the jurisdiction exercised by the lord chancellor himself, so far as his judicial business in Chancery is concerned, without prejudice, however, to his right to sit, as formerly, alone. To this court (the powers of which may be exercised not only by its full body but by either of its judges), together with the lord chancellor, or by both the judges apart from the lord chancellor, an appeal from the master of the rolls and each of the vice-chancellors may be referred, or may be entertained by the lord chancellor alone, sitting in his proper jurisdiction; and from these appellate jurisdictions an appeal in turn lies to the House of Lords. This is also the court of appeal in matters in bankruptcy.

Court of Oyer and Terminer, and General Gaol Delivery. The jurisdiction of this court will be found under Assizes.

Court of Parliament.—The high court of *parliament* is the supreme court of the kingdom, not only for the making, but also for the execution of the laws, by the trial of great and enormous offenders, whether lords or commoners, in the method of parliamentary impeachment. (*See* Impeachment.) The *court of our lady the Queen in Parliament* is held during the session of parliament for the trial of an indicted peer. (*See* Lords, House of.)

Court of Peculiars is a branch annexed to the Court of Arches. It has a jurisdiction over all those parishes dispersed through the province of Canterbury, in the midst of other dioceses, which are exempt from the ordinary's jurisdiction, and subject to the metropolitan only. All ecclesiastical causes arising within these *peculiar* or exempt jurisdictions are originally cognizable by this court, from which an appeal lies to the Court of Arches.

Court of Pied Poudre, or Pie Powder (*curia pedis pulverizati*), so called from the dusty feet of the suitors; or, according to Lord Coke, because justice is there done as speedily as dust can fall from the foot. But the etymology given us by a learned modern writer (Barrington's Observations on the Stat. 837) is much more ingenious and satisfactory; it being derived, according to him, from *pied puldreaux* (a pedlar, in Old French), and therefore signifying the court of such petty chapmen as resort to fairs or markets. It is a court of record incident to every fair and market, though fallen into disuse, and now in a manner forgotten, of which the steward of him who owns or has the toll of the fair or market is the judge; and its jurisdiction extends to administer justice for all commercial injuries done in that very fair or market, and not in any preceding one; so that the injury must be done, complained of, heard, and determined within the time during which the fair or market is held. The court has cognizance of all matters of contract that can possibly arise within the precinct of that fair or market; and the plaintiff must make oath that the cause of action arose there. From this court a writ of error lies in the nature of appeal to the courts at Westminster. The reason of its original institution seems to have been to do justice expeditiously among the variety of persons that resort from distant places to a fair or market, since it is probable that no inferior court might be able to serve its process, or execute its judgments, on both, or perhaps either of the parties; and therefore, unless this court had been erected, the complainant must necessarily have resorted, even in the first instance, to some superior judicature. Courts similar to the pie-powder courts were usual both with Greeks and Romans, who introduced fairs into Germany and the North.—*Ref.* Fosbroke's *Dictionary of Antiquities.*

Court, Presentation at. (*See* Presentation at Court.)

Court of the Privy Council is the great court of appeal in all ecclesiastical causes, and those from the colonies, and was substituted for the former appeal court, viz. the Court of Delegates, which was composed of commissioners appointed under the great seal. Practically, all the judicial authority of the privy council is now exercised by a *committee* of privy councillors, called the *Judicial Committee of the Privy Council*, who hear the allegations and proofs and make their report to her Majesty in council, by whom the judgment is finally given.

Court of Quarter Session, or *General Quarter Sessions* of the peace, is a court that must be held in every county once in every quarter of a year, in the first week after each of the following days,—the 11th October, the 28th December, the 31st March, and the 24th June, before two or more justices of the peace, one of whom must be of the *quorum*. The jurisdiction of the court extends to the trying and determining of all felonies, misdemeanours, and trespasses, except treason, murder, or capital felony, which, when committed by a person not previously convicted of felony, is punishable with transportation for life, and except certain other offences enumerated in the acts of 5 & 6 Vict. c. 56, of 5 & 6 Vict. c. 38, and 9 & 10 Vict. c. 25. Its jurisdiction comprises offences relating to the game laws, highways, alehouses, bastard children, the settlement and provision for the poor, servants' wages, and apprentices. Some of these are proceeded upon by indictment, and others in a summary way, by motion, and

order thereupon, which proceedings may for the most part (unless guarded against by particular statutes) be removed into the court of Queen's Bench by writ of *certiorari facias* (*see* CERTIORARI), and be there either quashed or confirmed. The court also manages the financial affairs of the county, and makes county-rates, and superintends the prisons and pauper lunatic asylums in the county. As regards the county of Middlesex, two sessions, or adjourned sessions of the peace, are, by 7 & 8 Vict. c. 71, to be held in every calendar month, and the first sessions in January, April, July, and October respectively, are to be the general quarter sessions of the county; and the second sessions in those months are adjournments of the general quarter sessions; and a serjeant or barrister-at-law, of not less than ten years' standing, and in the commission of the peace for the county, and qualified by law to act as such justice of the peace, is appointed by her Majesty to be the assistant-judge of the court. In many municipal corporations or boroughs, there is also a court of quarter sessions of the peace, having, in general, the same authority in cases arising within the limits of the borough as the county quarter sessions within the county. But of such court the recorder of the borough is the sole judge, and he is to hold the court once in every quarter of a year, or at such other and more frequent times as, in his discretion, he may think fit, or her Majesty may direct. (*See* CUSTOS ROTULORUM.)

COURT OF QUEEN'S (or KING'S) BENCH, so called because the sovereign used formerly to sit there in person, the style of this court being *coram ipso rege* or *regind*. In the reign of a king it is called the *King's Bench*, and during the protectorate of Cromwell was styled the *Upper Bench*. It is a court of record and the supreme court of common law in the kingdom, consisting of a chief justice and four puisne justices, who are, by their office, the sovereign conservators of the peace and supreme coroners of the land. Yet though the sovereign himself used to sit in this court, and still is supposed so to do, he did not, neither by law is he empowered to, determine any cause or motion but by the mouth of his judges, to whom he hath committed his whole judicial authority. The jurisdiction of this court is very high and transcendant. It keeps all inferior jurisdictions within the bounds of their authority, and may either remove their proceedings, to be determined here, or prohibit their progress below. It superintends all civil corporations in the kingdom. It commands magistrates and others to do what their duty requires in every case where there is no other specific remedy. It protects the liberty of the subject by speedy and summary interposition. It takes cognizance both of criminal and civil causes, the former on what is called the crown side, or in the crown office, the latter on the plea side of the court. On the crown side, or in the crown office, it takes cognizance of all criminal cases, from treason down to the most trivial misdemeanour or breach of the peace. Into this court indictments from all inferior courts may be removed by writ of certiorari, and the manner of trial in this court is either at bar (which rarely happens) or at *nisi prius*. On the plea side, or civil branch, it enjoys a general jurisdiction and cognizance over all actions between subject and subject, those of the real class only excepted, which are entertained by the court of Common Pleas. It does not meddle, however, with matters of revenue, which belong to the court of Exchequer. It is one of the three courts called the *superior courts*, or *courts at Westminster*, the other two being the courts of Common Pleas and Exchequer. A writ of error lies from this court to the Exchequer Chamber. (*See* CERTIORARI.)

COURT, ROLLS, is one of the branches of the court of Chancery, presided over by a judge who is called the *Master of the Rolls*, and who was originally appointed only for the superintendence of the writs and records appertaining to its common-law department, but accustomed also to sit on the equity side as a separate though subordinate judge. He has jurisdiction in all proceedings in equity, except such as, by the course of the court, are appropriated to the great seal alone. The act of 1 & 2 Vict. c. 94, vested in him the custody of the public records.

COURT OF SESSION. (*See* SESSION, COURT OF.)

COURT OF SEWERS is a temporary tribunal erected by virtue of a commission under the great seal, which formerly used to be granted *pro re natâ* at the pleasure of the crown, but now at the discretion and nomination of the lord chancellor, lord treasurer, and chief justices, pursuant to the Statute of Sewers, 23 Hen. VIII. c. 5. Their jurisdiction is to overlook the repairs of the banks and walls of the sea-coast and navigable rivers, or, with the consent of a certain proportion of the owners and occupiers, to make new ones, and to cleanse such rivers and the streams connected therewith, and is confined to such county or particular district as the commission shall expressly name. The commissioners are a court of record, and may fine and imprison for contempt, and, in the execution of their duty, may proceed by jury, or upon their own view, and may take order for the removal of any annoyance, or the safeguard and conservation of the sewers within their commission, either according to the laws and customs of Romsey Marsh, or otherwise, at their own discretion. They may also assess such rates or scots upon the owners of lands within their district as they shall judge necessary; and if any person refuses to pay them, the commissioners may levy the same by sale of his goods and chattels, or sell his freehold or copyhold lands, in order to pay such scots or assessments. By 4 & 5 Vict. c. 45, the[illegible]re also empowered, for the purpose of defraying [illegible]n expenses incident to the commission as in the act particularized, to tax in the gross in each parish such lands as are within the jurisdiction, but so that such lands shall contribute thereto in proportion to the benefit received as compared with the lands of the other parishes, which tax shall be denominated the general sewers tax, and be recoverable by distress and sale. Their conduct is under the control of the court of Queen's Bench, which will prevent or punish any illegal or tyrannical proceedings. Before dismissing the subject, it may be noted that Romsey Marsh, above mentioned, is in the county of Kent, forming a tract containing 23,000 acres, and is governed by certain ancient and equitable laws of sewers composed by Henry de Bathe, a venerable judge in the reign of King Henry III., from which laws all commissioners of sewers in England may receive light and direction.

COURT OF SHEPWAY is a court held before the lord-warden of the Cinque Ports. A writ of error lies from the mayor and jurats of each port to the lord-warden in his *court of Shepway*, and from thence to the Queen's Bench.

COURT, SHERIFFS', or SHERIFFS' TOURN, or rotation, is a court of record held twice in every year, within a month after Easter or Michaelmas, before the sheriff, in different parts of the county; being, indeed, only the turn of the sheriff to keep a court leet in each respective hundred: this, therefore, is the great court leet of the county, as the County Court is the court baron; for out of this, for the ease of the sheriff, was taken the *court leet*, or *view of frankpledge*, which *see*.

COURTS, BOROUGH, were originally founded from the favour of the crown to particular districts, for the convenience of the inhabitants, that they might prosecute their suits, and receive justice at home. The courts at Westminster have, for the most part, a concurrent jurisdiction with them, or else a superintendency over them. Their proceedings ought to be according to the course of the common law, unless otherwise ordered by parliament. By the Municipal Act, 5 & 6 Will. IV. c. 76, the recorder is to be the judge in any court of record for civil actions in the boroughs to which the act extends, if such court be not regulated by the provisions of any local act; but he may appoint a deputy. From these courts, where they are courts of record, a writ of error lies in general to the court of Queen's Bench. A detailed statement as to all the borough courts, county courts, courts of requests, and other local courts throughout the kingdom (as they existed previously to the 9 & 10 Vict. c. 95), showing the extent of their jurisdiction, the authority under which they were held, and their form of process, &c., will be found in the fourth Report of the Common Law Commissioners, Appendix, Part II. No. 5.

COURTS OF CHANCELLORS OF THE UNIVERSITIES. (*See* UNIVERSITIES.)

COURTS, COUNTY.—The necessity being felt of establishing throughout the whole kingdom some satisfactory

and uniform plan of proceeding for recovery of all debts and demands below a certain amount, it was conceived that new inferior courts, with improved machinery and an ample jurisdiction, might advantageously be created under the name of *County Courts*, which should form, as it were, a branch of that ancient and well-known institution. This design was carried out by the statute 9 & 10 Vict. c. 95. By the effect of this act, and of orders of council subsequently made thereon, pursuant to its provisions, the courts of request, which this court was intended to supersede, have in general been abolished. The act provides, that for all purposes, except those within the jurisdiction of the new courts to be holden thereunder, the county courts shall be holden as before. By the act referred to and subsequent statutes, the jurisdiction of the county courts extends over England, except the city of London, and has been from time to time materially enlarged. It includes all pleas of personal actions where the debt or damage claimed is not more than £50, whether on balance of account or otherwise, or when reduced by set-off under that sum, with the exception, however, of actions of ejectment, or in which the title to any incorporeal hereditament, or to any toll, fair, market, or franchise, shall be in question, or in which the validity of any devise, bequest, or limitation under will or settlement may be disputed, except as hereinafter mentioned; or for any malicious prosecution, libel, slander, seduction, or breach of promise of marriage. It also extends to the recovery of any demand not exceeding £50, which is the whole or part of the unliquidated balance of a partnership account, or claimed by way of distributive share under an intestacy, or as legacy under a will. It has concurrent power with the superior courts to give summary judgment in actions upon bills of exchange where the claim does not exceed £50. It has power to proceed in cases of replevin; and the proviso which deprived it of entertaining cases of ejectment was modified in certain cases; but now, by 19 & 20 Vict. c. 108, sec. 50, landlords are enabled, after the expiration of the tenancy, to recover possession of houses, lands, or other corporeal hereditaments, whose neither the rent nor the value of the premises shall have exceeded £50 a year, and no fine or premium shall have been paid; and by sec. 51 a claim for rent or mesne profits, or both, may be added; and by sec. 52 a similar jurisdiction is given in cases where half a year's rent is in arrear, and no sufficient distress can be had. The crown may sue in the court for *customs* duties or penalties not exceeding £100; and an action may be brought therein against custom-house officers for illegal seizure, where the damages claimed do not exceed £5. Parties may, by consent, confer a jurisdiction on the court in any action and for any amount, except in cases of criminal conversation; the right of action for which has, however, in all cases been abolished. It may in certain cases detain foreign ships for damage done in any part of the world to any property of her Majesty or any of her subjects, until satisfaction is made, or security is given to abide the event of a legal proceeding in respect of it. In the court may be recovered the costs of proceeding under the Nuisances' Removal Act, 1855. It has an appellate jurisdiction in cases of awards of surveyors in the metropolitan district, under the Metropolitan Building Act, 1855, where the matter does not involve the payment of more than £50. It may give relief and make orders in relation to *charitable trusts*, where the income of a charity does not exceed £30; and entertain (under certain conditions) an appeal against the commissioners in assessing the *succession duties*, if the sum in dispute does not exceed £50, or the appellant contends that it should be reduced by a sum not exceeding £50. The judges sitting at places more than twenty miles from the General Post-office are appointed commissioners to act under the powers of the Joint-Stock Companies Winding-up Amendment Act, 1849, which is, however, except as to cases of banking and insurance companies, repealed; and to take evidence in winding-up cases, under the Joint-Stock Companies Act, 1856. The court has a jurisdiction in certain cases in bankruptcy (*see* BANKRUPT); and the contentious jurisdiction of the Court of Probate (subject to certain conditions) is extended to it, with power to revoke a probate or grant of administration in cases





where the personal estate is under the value of £300, and the real estate is under the value of £300. Under the *Copyright of Designs Act*, 1858, the proprietor may take proceedings in the court of the district within which any piracy has been committed, for the recovery of damages sustained by reason of the piracy. The judge of a county court may issue his warrant for the apprehension of *absconding debtors*, sworn to be indebted £20 or upwards (*see* ARREST); and may perform all such duties relating to causes or matters depending *in chancery*, or any judge thereof, or before the chancellor in the exercise of any authority belonging to him necessary or proper to be done in his district, as the chancellor from time to time by a general order may direct. It will be thus seen that the constitution of these courts has been a great boon to the country, by enabling suitors at a comparatively small expense to obtain justice, in a great number of instances, without running the risk of incurring the loss, delay, and vexation of having to resort to the superior courts, which frequently operated as a denial of justice altogether; and there is little doubt but that in process of time, by the gradual enlargement of their jurisdiction, these tribunals will become local justice-seats for the transaction of all legal business, except that of the superior class, for the determination of which the highest legal acumen may be required.

COURTS OF THE DUCHY OF LANCASTER. (*See* PALATINE COURTS.)

COURTS OF DURHAM. (*See* PALATINE COURTS.)

COURTS, FOREST.—These have fallen into absolute desuetude, although certain branches are courts of record. They consist of the courts of *attachment*, of *regard*, of *swenmote*, and of *justice-seat*. As the constitution of these courts is a subject more for the antiquary than the general reader, we consider it unnecessary here to enter upon it.

COURTS OF LONDON.—There are several courts having jurisdiction within the city; but most of them entertain matters peculiar to the government and constitution of the city, as regulated by custom. The principal are the—*Hustings*, which is the ancient county court of London, and held before the lord-mayor, recorder, and sheriffs, and is the principal court of the city; but no actions can be brought in it that are merely personal. To this court a writ of error lies from the sheriff's court, and from thence to justices appointed by a commission from the crown (who used to sit in the church of St. Martin's-le-Grand), and from them to the House of Lords.—*Lord Mayor's* is a court of record held before the mayor and aldermen for all actions arising within the liberties of London, in which the recorder is judge, but the mayor and aldermen may join with him when they please. So in this court, all matters of equity within London may be determined upon bill and answer, upon which the recorder is also judge. It takes cognizance of appeals from the inferior courts of the city and foreign attachments; as to which, *see* ATTACHMENT. Since writing that article, the court of Queen's Bench has decided that the court has no jurisdiction unless the garnishee has a residence or carries on business in the city.—*Orphans*. The mayor and aldermen, in their Court of Orphans, are entitled, according to the custom of London, to the custody of the person, lands, and chattels of every infant whose parent is free of and dies within the city, which custom lasts, in the case of males, till twenty-one; of females, till eighteen or marriage. It is said, however, to be fallen into disuse.—*Sheriffs'*. This is held before their steward or judge, and has cognizance of all pleas of personal actions to any amount, and in which, where the debt or damages claimed shall not exceed £50, a summary mode of proceeding has been recently established, similar in general to that provided for the new county courts.—See *The London* (City) *Small Debt Extension Act*, 1852.

COURTS OF LORD HIGH STEWARD. (*See* STEWARD.)

COURTS-MARTIAL.—These courts are established by virtue of an annual act of parliament called the Mutiny Act. (*See* ARTICLES OF WAR; INQUIRY, COURT OF.)

COURTS, NISI PRIUS.—These are composed of two or more commissioners, called judges of *assize* and *nisi prius*, empowered to try all questions of fact issuing out of the courts at *Westminster* that are then ripe for trial by jury; the original of which name is this: all

causes commenced in the courts of *Westminster Hall* are, by the course of the courts, appointed to be tried on a day fixed in some *Easter* or *Michaelmas term*, by a jury returned from the county wherein the cause of action arises, or in which the *venue* is laid; but with this proviso, "nisi prius" *justiciarii ad assisas capiendas venerint*; that is, unless, before the day prefixed, the judges of assize come into the county in question (which they always do in the vacation preceding each *Easter* and *Michaelmas term*), and there try the cause; and then, upon return of the verdict given by the jury to the court above, the judges there give judgment for the party for whom the verdict is found; there being, however, as to London and Middlesex, this exception,—that instead of their being comprised within any circuit, courts of *Nisi Prius* are held there for the same purpose in and after every term before the chief or other judge of the superior courts at what are called the London and Westminster *sittings*.

Courts, Palatine.—These are of a limited local jurisdiction, and have at the same time an exclusive cognizance of pleas in matters both of law and equity, and appertain to the counties palatine of Lancaster and Durham, and are the palatine courts of Common Pleas and of Chancery, and they are courts of record.

Courts of Request or Conscience were established in various parts of the kingdom for the recovery of small debts and demands; but they were superseded by the establishment of the new county courts.

Courts, Stannary, in Devonshire and Cornwall, are for administration of justice among the tinners therein. They are courts of record, and held before the lord-warden and his substitutes. All tinners and labourers in and about the stannaries, during the time of their working therein *bonâ fide*, are privileged from suits of other courts, and to be only impleaded in the Stannary courts in all matters arising *within* the stannaries, excepting pleas of land, life, and member. But if a cause of action between *tinner* and *tinner* arise out of the stannaries, it may be brought elsewhere, if the plaintiff will (2 Inst. 231, Com. Dig. Courts, l. 1); and even if it arise within the stannaries, the plaintiff has the option of bringing it either in the Stannary Court or in the County Court.—(*See* Newton *v.* Nancarrow, 15 Q.B. 144.) No writ of error lies from hence to any court in Westminster Hall, but an appeal lies from the vice-warden to the lord-warden, and thence to the privy council of the prince of Wales as duke of Cornwall, when he has had livery of investiture of the same; and from thence the appeal lies to the king or queen in the last resort.—(*See* 6 & 7 Will. IV. c. 106, as to workers in *lead, copper*, &c.)

Courts, University (the Chancellor's Courts).—The two universities of England (Oxford and Cambridge) enjoy the sole jurisdiction, in exclusion of the queen's courts, over all civil actions and suits whatsoever, when a scholar or privileged person is one of the parties, except in such cases where the right of freehold is concerned, provided the defendant is resident there, and provided, in the case of Cambridge, the cause of action arose within the town of Cambridge or its suburbs. And these, by the university charter, they are at liberty to try and determine either according to the common law of the land, or according to their own local customs, at their discretion; which has generally led them to carry on their process in a course much conformed to the civil law. This privilege, so far as it relates to civil causes, is exercised in the Chancellor's Court, the judge of which is the vice-chancellor, his deputy or assessor. From his sentence an appeal lies to delegates appointed by the congregation; from thence to other delegates of the House of Convocation, and if they all three concur in the same sentence, it is final, at least by the statutes of the university, according to the rule of the civil law. But if there be any discordance or variation in any of the three sentences, an appeal lies in the last resort to judges' delegates, appointed by the crown under the great seal in chancery. In criminal offences, the lord high steward has cognizance of all indictments of treasons, insurrections, felonies, and mayhem, which shall be found against a scholar or privileged person. He is nominated by the chancellor of the university for the time being; but, when his office is called forth into action, he must be approved by the lord high chancellor of England, and a special commission is given to him and others to try the indictment then depending, according to the law of the land and the privileges of the university. The party charged has no right to have the indictment removed, and the vice-chancellor only can claim cognizance of it, and, when allowed by the judges of assize, it comes to be tried in the High Steward's court. The indictment must first be found by a grand jury, and then the cognizance claimed. When the cognizance is so allowed, if the offence be a misdemeanour only, it is tried in the Chancellor's Court by the ordinary judge.

Courts, Vice-Chancellors'.—These are branches of the court of Chancery, and the judges sit (like the master of the rolls) separately from the lord chancellor, and are virtually his assistants. Except in a very few instances, but without an appellate jurisdiction, they possess and exercise the same judicial powers as the lord chancellor. An appeal lies from the decision of the judge to the lord chancellor or to the lords justices, and from them to the House of Lords.

Courtesy Titles. (*See* Titles.)

Covenant, *kuv'-e-nânt*, in Theol., is used in a double signification, the one of which is commonly called the Scriptural, the other the systematic or popular use of the term. In the former sense we find the word repeatedly used in Scripture to denote an arrangement, disposition, or institution, according to which the divine favour is dispensed to those with whom it is made. It is not properly a contract or bargain, which requires that contracting parties be on an equal footing, and that each has the power of accepting or rejecting the proposals of the other; but it is an appointment or institution by a party infinitely exalted above the other, promising to confer or grant certain blessings in a particular way. God's covenant with man signifies his solemn promise or engagement to do or not to do a certain thing. Thus, in his covenant with Noah, he engaged that the waters of the deluge should not again cover the earth. The two great covenants mentioned in Scripture are what are called the Old and New, or the first and the second; the former of which was that made by God with the children of Israel, when he took them to be a peculiar people unto himself, and is also called the Mosaic or Sinai covenant, because it was given to Moses on Mount Sinai. The second, or New Covenant, is that which was instituted by Jesus Christ, and ratified by the shedding of his blood, being the gracious charter or instrument by which God has revealed it to be his pleasure to dispense the sovereign blessings of his mercy to all who will accept of them. As used in a systematic sense, divines speak of two covenants,—that of works and that of grace. The former is that which was made with Adam on his creation, in virtue of which he was constituted the federal head of the human race, and his acts became binding on his posterity. The covenant of grace is a compact or agreement between God and believers, in which God promises to give them all the blessings of salvation through and for the sake of Jesus Christ; and they on their part voluntarily engage to give themselves to God with a sincere faith. Some divines speak of a third covenant, which they call the covenant of redemption, or the engagement entered into between the Father and the Son, by which the Father constituted the Son the representative and Redeemer of the human race, and the Son undertook their redemption.

Covenant, in the Eccl. Hist. of Scotland, is applied to certain contracts or conventions entered into by the leading Protestants of that country, binding themselves to maintain their religious principles against innovation and opposition. The *First Covenant* was signed at Edinburgh on the 3rd of December, 1557, by the earls of Argyle, Glencairn, and Morton, the lord of Lorn, John Erskine of Dun, and a great number of other distinguished persons. They engaged, with God's grace, to apply their whole power, substance, and very lives, to maintain, set forward, and establish the most blessed word of God and his congregation. On the 31st of May, 1559, another covenant was signed by them at Perth, in which they bound themselves still more distinctly to mutually support

and defend each other against all attacks upon them for the sake of religion. This is known as the *Second Covenant*. The *First National Covenant of Scotland* was occasioned by a fear that the young king was too much under the influence of Catholic advisers, and was signed by James VI., on January 28, 1581, and in it he solemnly abjured the errors of popery. It was afterwards subscribed by the greater part of the nobility and gentry throughout the kingdom. Attempts on the part of Lennox, Arran, and others of the nobility, to re-establish bishops roused the country to a renewal of the covenant in 1590; and as the king continued to give indications of a leaning towards prelacy, it was again renewed in 1596. The attempts made by James, after his accession to the English throne, to introduce the episcopal service and forms of worship roused the indignation of the people of Scotland, and the National Covenant was again renewed in 1638. The covenant, as then drawn up, consisted of three parts:—1. The old covenant of 1581, exactly as at first prepared; 2. the acts of parliament condemning popery and confirming and ratifying the acts of the General Assembly; and, 3. the special application of the whole to present circumstances. The subscribers engaged by oath to maintain religion in the same state in which it existed in 1580, and to reject all innovations introduced since that time. The subscribing began in the Greyfriars church and churchyard, in Edinburgh, on the 28th of February, and afterwards copies of it were circulated throughout the kingdom, and signed by nearly all of competent age and character. It is worthy of remark that the signing was everywhere regarded as a most sacred act, and some persons of note who offered their subscriptions were refused, because it was supposed that they were influenced more by the fear of men than love to the cause. Those who subscribed were known by the name of *Covenanters*. Soon after this time Charles I. came to a rupture with the English parliament, and the latter, in order to obtain the assistance of the Scotch, made overtures for a union, which led to the *Solemn League and Covenant*. This document was drawn up and ratified by the Convention of Estates in Scotland in 1643, and afterwards accepted and subscribed by the English parliament and Westminster assembly of divines. It bound the united kingdoms to endeavour the preservation of the reformed religion in the Church of Scotland, in doctrine, worship, discipline, and government, and the extirpation of popery and prelacy and the reformation of religion in the three kingdoms. When Charles II. came over to Scotland, in 1650, he signed both this and the National Covenant before landing, and again on his coronation at Scone, in 1651. On his restoration to the English throne, however, he soon manifested his repugnance to these documents, and they were rescinded by act of parliament in 1661, and burned by the common hangman. After this time, the *Covenanters*, or those who maintained their adherence to the principles of the National Covenant, in Scotland, were subjected to great persecutions, which served only to confirm them in their principles. Those who refused to abjure the Covenant were regarded as rebels, and were obliged to betake themselves to the desert moors and mountains of their native country, where they were hunted like wild beasts till the establishment of freedom of conscience by the revolution of 1688. The sufferings, the courage, and the piety of the Covenanters have to this time endeared them to the Scottish mind. Long after the return of more peaceful times, their memory was cherished by the religious with the deepest reverence. The sect of the Cameronians still regard themselves as representatives of the old Covenanters. (*See* CAMERONIANS.)

COVENANT, in Law, is a promise made by deed, and is in effect a contract entered into by the covenantor with the covenantee. The subject of *contracts* in general will be found in its proper place, and under the word DEED will be treated the nature and requisites of the instrument by which the covenant is created.

COVERED WAY, *kuv'-erd*, a passage round any fortification constructed on the outer edge of the ditch opposite the rampart, and protected from the enemy's fire by the glacis. (*See* GLACIS.) The broad open spaces opposite the angles formed by the flanks and faces of the bastion and its salient angle are termed the re-entering and salient places of arms. The covered way is an important part of the works of any fortress that are constructed beyond the main ditch; an attack on it is attended with difficulty and loss, as the attacking party are easily shot down by the men stationed therein as they ascend the glacis; and it affords the besieged the means of forming without exposure to the fire of the enemy, and deploying from thence in line when making a sortie on the besiegers from the fortress.

COW, *kow*, the female of the bovine species.

COW BUNTING (*Molothrus pecoris*), a passerine bird of North America. Its most remarkable trait is that, like the cuckoo, it deposits its eggs in strange nests. It is about the size of the thrush, and is chiefly black, with a violet tinge. The tail is slightly forked; legs and claws glossy black, and very muscular.

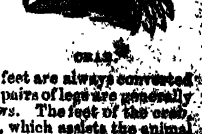
COWL, or COUL, *kowl* (Lat. *cucullus*), is a sort of hood worn by the Bernardines and Benedictines. They are of two kinds,—the one white and very large, worn on ceremonial occasions and when assisting at the office; the other black, and worn on ordinary occasions, in the streets, &c.

COW-POX. (*See* VACCINATION.)

COWRIES, *kow'-reez*, a gen. of univalve shells, remarkable for the brilliancy of their colours, and the high polish of which they are susceptible. They abound both in the old and new world, but their greatest development, both in point of size and number of species, takes place in warm climates. In the East Indies and many parts of Africa, cowries are used as current coin by the natives.

COYPU, *koi'-pu* (*Myopotarinus Coypus*), a rodent animal, smaller than the beaver, but of many similar characteristics. Its habits are aquatic; it burrows near the margin of rivers, and swims with the greatest ease. Its hind feet are webbed; its head large and depressed; ears small and rounded; muzzle long and pointed, and ornamented with bristle-like whiskers. Its tail is round, instead of being flattened like the beaver's. It is peculiar to South America, and its skin forms the staple of a considerable trade.

CRAB, *krab* (Sax. *crabba*).—This name is popularly applied to the whole of the crustaceans belonging to the ord. *Decapoda*. This order is divided into three sub-orders,—the *Macrura*, or *long-tailed crustacea*, to which the lobster and crayfish belong; the *Anomura*, which appears to hold an intermediate position between the former and the third sub-order,—the *Brachyura*. To the latter the common crab belongs. This animal is thus characterized:—The abdomen is always converted into a short jointed tail, quite destitute of terminal appendages, and bent round so as to fold closely under the breast. The cephalo-thorax is usually of a more or less rounded form, generally broader than long, and often produced in front into a point. The upper surface is entirely covered by a single plate (the carapace, or back). The eyes and the inner antennæ, the latter of which are very short, can be entirely concealed within small cavities of the forehead. The outer antennæ are never of any great length, and the anterior feet are always converted into nippers. The four other pairs of legs are generally terminated only by single claws. The feet of the crab, although sometimes flattened, which assists the animal greatly in making progress through the water, are, as a rule, essentially made for pedestrianism. Its walk or run is of a very curious nature; and its gait, when alarmed, more nearly approaches that of a tipsy person than anything else; for, instead of making its way forward, it shuffles along sideways, but nevertheless with great rapidity. In some species of the *Brachyura* the young crabs undergo several metamorphoses before arriving at maturity; but in many others immediately they are hatched they resemble their parents in all but size. The common crab (*Cancer Pagurus*) inhabits deep water, and is caught either on the rocks at low tides, or by means of a trap—a basket



CRAB.

—baited with meat or some animal garbage, into which the animal is easily enabled to crawl, but out of which the intellects of the crab are too dull to devise a means of escape. The small edible crab (*Cancer manas*) is also very common on all parts of our coast, but not so much valued as the former. A very curious species is the hermit-crab, belonging to the sub-ord. *Anomura*. This creature possessing a very soft abdomen, it would be very likely to be seized by some predacious fish, if it were exposed. To prevent this, the hermit-crab seeks for some empty tenement, wherein it may take up its abode. The habitation usually chosen is the shell of some univalve mollusk. "Into this spiral home the hermit-crab is coiled, and retains himself in this position by means of a sucker at the extremity of his tail, assisted by two or three rudimentary feet, which are developed upon the abdominal sac; and so firmly does he adhere to his castle, that he will allow himself to be torn to pieces rather than let go his hold. By protruding his body with its three pairs of legs from the orifice of the shell, the little hermit is enabled to walk with ease upon the sandy beach in search of his prey; but the moment danger threatens him, he disappears again into his cell, the orifice of which is then occupied by one of his claws, which is always larger than the other. As the crab does not possess the same power of adding to the size of the domicile that was enjoyed by the original tenant, he is compelled from time to time to change his residence for one a little larger, and often appears almost as difficult to please as a human householder in the same predicament. Often they may be seen crawling about amongst the empty shells just thrown upon the beach, trying one after another, until they meet with one uniting all the conditions requisite for crustacean comfort; but, until this great object of their search is obtained, always returning to their old house after each unsuccessful trial." Dallas, from whom the above happy description is quoted, says, moreover, that "when two of them happen simultaneously to cast a longing eye upon some particular suitable residence, they often engage in a fierce battle for the possession of the coveted object, which the victor always carries off in triumph."



SEA-KALE.

CRAMBE, *krămb* (Gr.), in Bot., a gen. of plants belonging to the nat. ord. *Cruciferæ*. The species *C. maritima*, or sea-kale, grows wild on the sandy sea-shores of Britain. About the middle of the last century it was first introduced into gardens, and grown like asparagus, under a covering which shielded it from the action of light. In the wild state the plant is very acrid; but, when blanched by the art of the gardener, the stem and leaf-stalks form a delicious vegetable, which is preferred by many to asparagus.

CRAMP, *krămp* (Sax. *kramma*, Du. *kramp*), in Med., is an involuntary and painful contraction of one or several of the voluntary muscles connected with a certain part or organ, as of the leg, foot, or arm. It is often the result of cold, is sometimes occasioned by a greatly disordered state of the bowels, and frequently comes on without any obvious cause. In general, cramp is readily removed by a forcible exertion of the antagonist muscles, so as to overcome the spasmodic contraction, or by friction and warmth. Cramp of the stomach is to be combated by the external and internal use of stimulants, and by opium, ether, and other antispasmodics. (*See* SPASMS.)

CRANBERRY. (*See* OXYCOCCUS.)

CRANE, *krāne* (Sax. *cran*), a machine used on wharfs and in warehouses for the purpose of lifting heavy weights, packages, &c. There are several kinds of *cranes*; but those now most common consist of an upright revolving shaft with an arm or jib projecting outwards in an oblique direction, having a fixed pulley attached to its outer extremity, over which a rope or chain is passed, having one of its ends secured to a cylinder with a wheel and pinion, by means of which the weight is raised to the required height, and, by means of the revolving shaft, deposited anywhere within the reach of the jib.

CRANE, COMMON (*Grus cinerea*). — This bird is found in considerable flocks in the northern parts of Europe. It measures about five feet in length; general plumage ash-coloured, but forehead black; sides of the head and hind part of the neck white. On the upper part of the neck there is a bare ash-coloured space of about two inches, and above this the skin is naked and red, with a few coloured hairs. The pinion of each wing is furnished with an elegant tuft of curled feathers. The bill is long, straight, and compressed, obtuse towards the end, and with the lateral base deeply chan-



CRANE.

nelled. Its nest is usually constructed in some swampy tract or insulated ruin. It lays two eggs, of a pale dull-greenish colour, blotched with brown. Its food is frogs, snails, grain, vegetables, &c. When a flock congregated on a marsh compose themselves for slumber, some few are invariably wide awake, and stand perched on one leg, looking out for danger. Kolben, with an audacity that should direct particular scrutiny to anything else he may aver, says that these sentinel cranes hold in the tucked-away foot a large stone, so that, should it fall asleep, the falling of the stone would rouse the sleepers. The crane is a bird delighting in the wastes that lie on the edges of marshes, or that are subject to periodical overflowings by rivers. Such pasturage at one time abounded in England, and then the crane was well known amongst us, and its breeding encouraged, and a penalty enforced for disturbing its eggs. So long ago, however, as Pennant's time, the bird was regarded as having ceased to exist among us. In proof of the great favour the crane attained in the eyes of gourmands, Pegge relates, in his "Form of Curry," that "William the Conqueror was so exact, so nice and curious in his repast, that when his prime favourite, William Fitz-Osborne, who was dapifer or steward of his household, had the charge of the curey, served him with the flesh of a crane scarcely half roasted, the king was so highly exasperated that he lifted up his fist, and would have struck him, had not Eudo, who was appointed steward immediately after, warded off the blow." The Demoiselle or Numidean crane (*Arithropeides virgo*) is a native of Africa. It is, although smaller than the common crane, of much more graceful build and handsome plumage. The chief peculiarities are a tuft of snowy feathers, which pass off backwards from behind each eye, and the long pointed feathers which hang loosely from the upper part of the breast. Its chief colours are silver-grey and black.

The crowned crane (*Ardea pavoniara*) is somewhat smaller than the last-mentioned, and is chiefly known by the possession of a close tuft of velvety black feathers covering the fore part of the head, while behind them rises a remarkable crest of fine feathers twisted spirally, and fringed along its edges with a series of black pointed hairs. Its cheeks and temples are entirely naked, and covered with a bright rosy red.

CRANIOLOGY. (*See* PHRENOLOGY.)

CRANIUM. (*See* BRAIN.)

CRANK, *krănk* (Dut. *kronkel*, a bend or turning), in Machin., is a shaft or axis bent like an elbow, and used either for converting rectilineal into circular motion, or *vice versâ*. Thus the rectilineal motion of the piston of an ordinary steam-engine by means of a connecting-rod gives a circular motion to the crank. There are two points in the motion of a crank where the connecting-rod has no power; viz., when the arm of the crank is parallel with the connecting-rod above or below the axis. In order to carry the crank over these points, the fly-wheel is used. By its impetus the circular motion is kept steady and regular.

CRANNOGS, *krăn-noags'*, a term applied to the lake-dwellings and fortified islands of the ancient Celts in Ireland, Scotland, and other countries. Although dwellings of this kind on Lake Prasias, in Macedonia, were described by Herodotus (book v. chap. 16), the subject did not attract much attention until vestiges of similar erections were found in other parts of Europe. In 1839, the first crannoge was discovered by Mr. W. R. Wilde, one of the secretaries of the Royal Irish Academy. After draining the small lake of Lagore, in the county of Meath, a circular mound, which had been an island, was discovered. It was thickly strewn with bones, and as these were being removed for manure, the island was found to be of artificial construction. Its diameter was about 140 feet, and it was formed by upright oak piles seven feet long, mortised into oak planks laid upon the sand and marl at the bottom of the water. The piles were united at the top by cross beams, and the space inclosed was divided into compartments filled with bones and black peaty earth. A second tier of piles was also observed rising from the lower tier. The bones were found to be those of horses, asses, oxen, sheep, dogs, &c.; and amongst them were a large number of swords, knives, spears, cooking-utensils, and ornaments. Mr. Wilde's discovery was followed by the discovery of several other crannoges in Ireland, some of them perfectly artificial, and others partly natural and partly artificial. In nearly all cases, the piles are made of oak, mostly fine young trees, from four to nine inches broad. In some crannoges, a causeway leads from the island to the mainland; but they were generally reached by canoes, remnants of which have been found in nearly all. Crannoges are mentioned in the annals of Ireland as early as the 9th century, and continued to make a figure in history till the 17th century. In the winter of 1853, on account of the continued drought, the Lake of Zurich was unusually low, and the inhabitants of the village of Meilen endeavoured to regain a piece of land from the lake. During the process, the remains of rows of deeply-driven piles were discovered. About them were found a large quantity of weapons, tools, and utensils of very primitive form and make. On close examination, it was found that the piles had supported a platform, and that the whole building resembled the crannoges of Ireland. Since that time, thirty to forty crannoges have been found in the upper and lower lakes of Constance, thirty in the Lake of Geneva, and twenty in the Lake of Neufchâtel. The lake-dwellings of Switzerland resemble those described by Herodotus more closely than the Celtic crannoges. There is no mention of them in history, but their remains prove that they are ancient. Since 1857, the traces of crannoges have been found in nearly every part of Scotland; and remains of lake-dwellings have been discovered in Savoy, Upper Italy, Hanover, Prussia, and Denmark. Traces of a not very certain kind of crannoge were observed in draining a mere at Wretham Hall, near Thetford, in Norfolk.

CRANTARA, or FIERY CROSS, *krăn'-tar-a* (Gaelic, *creun tarigh*, the cross of shame), was a military signal employed in the Scottish highlands for collecting the distant and scattered clansmen to the standard of their chief. It was a firebrand, or wooden cross, which, after being dipped in the blood of a goat, was sent by a swift-footed messenger to the nearest hamlet, where he delivered it without uttering a word but the name of the place of rendezvous. The fleetest runner of the hamlet was immediately dispatched with it to the next, and so on, till all had received notice. It was understood to denounce destruction by fire and sword against all who refused to obey the summons, and was called the Cross of Shame, because disobedience implied infamy. It was in use among the ancient Scandinavians, from whom the Highlanders appear to have borrowed it. The last time this signal was made use of in the Highlands was in 1745.—*Ref.* Sir Walter Scott's *Lady of the Lake*, canto iii.

CRAPE, *krajp* (Fr. *crêpe*), a light transparent silken fabric, from which the whole of the gloss has been taken in the mode of dressing the silk. It is soaked in a solution of gum after it has been woven, and dried, which gives it a peculiar shrivelled appearance.

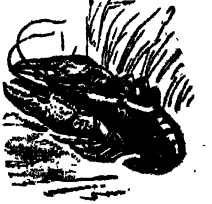
CRASSULACEÆ, *krăs-su-lăi'-se-e* (Lat. *crassus*, thick, from the thickness of its leaves), in Bot., the Houseleek or Stonecrop fam., a nat. ord. of dicotyledonous plants in the sub-class *Calyciflorœ*,—succulent herbs or shrubs with exstipulate leaves. The flowers are perfectly symmetrical, the sepals, petals, and carpels being equal in number (from three to twenty), and the stamens being also equal to them, or twice as many. The petals and stamens are almost, or quite, hypogynous. The corolla is monopetalous or polypetalous. The fruit is either apocarpous and follicular, or a many-celled capsule, with loculicidal dehiscence. The seeds are small; the embryo is in the axis of fleshy albumen. The *Crassulaceæ* are found in very dry situations in all parts of the world; a large number occur at the Cape of Good Hope. Astringent, refrigerant, and acrid properties characterize them, and have given a few some importance as medicinal plants. (*See* COTYLEDON (the Navelwort), and SEDUM.)

CRATÆGUS, *krut-ē'-gus*, in Bot., a gen. of plants belonging to the nat. ord. *Rosaceæ*. The species *C. oxyacantha* is the hawthorn, whitethorn, or May, so well known for the beauty and fragrance of its flowers, and for being the best hedge-plant in Europe. Some varieties of this species are highly ornamental, producing double pink or scarlet blossoms.

CRATE, *krait* (Lat. *crates*, wicker-work), a kind of large basket or hamper made of wood or wicker-work, and used for packing china, glass, and earthenware.

CRATER, *krai'-ter* (Gr. *krater*, a cup or bowl), the mouth or orifice of a volcano, so named from its cup or bowl shape. (*See* VOLCANO.)

CRAYFISH, or CRAWFISH, *krai'-fish* (*Astacus fluviatilis*), a crustaceous animal, differing little in general appearance from the lobster. Species of this genus are found in almost all parts of the world. The flesh is reckoned cooling and nutritious. It lives best in rivers, where it takes up its habitation beneath stones and in holes in the banks, there lying in wait for the larvæ of insects, decomposing animal substances, and small fish.



CRAYFISH.

CRAYON, *krai'-on* (Fr. *crayon*, a pencil; *craie*, chalk), the name of a pencil of any kind in France, but applied more particularly in this country to pieces of charcoal, and black, white, and red chalk, of a convenient size and shape, which are used for drawing on various kinds of tinted paper, and for sketching cartoons, or the outlines of paintings of considerable size on canvas. The best black crayons are made of a soft black earth found in Italy, and the best white ones of a fine kind of French chalk. Crayons of various colours and tints are also made by mixing vegetable and mineral colouring matter with pipe-clay or chalk, and giving consistency and adhesiveness to the mass by the addition of a little milk, gum-water, wax, soap, or some similar substance. Drawings in crayon look soft and rich in colouring, but the outline is generally hazy and ill-

defined. A metal tube slit at both ends, which can be compressed at pleasure by a sliding ring, and is called a *porte crayon*, is used to hold the chalk; but sometimes the material is inclosed in a casing of wood, and resembles a lead pencil. Softness in shading is produced by rubbing the chalk-marks gently with a piece of leather or paper, which is rolled tightly together and cut to a blunt point at each end.

Cream, *kreem* (Fr. *crême*), the oily or butyraceous substance which collects on the surface of milk. When milk is allowed to stand for some time, it undergoes certain changes; the cream, being lighter, rises to the surface, forming a thin layer, while the milk below, less rich by the abstraction of the cream, assumes a pale bluish colour, and consists of curd, the substance from which cheese is made. When cream is kept for some days it becomes thicker, and, if suspended in a linen bag in a cool room, will acquire the consistency of cheese. Cream cheese is sometimes made in this way. Clotted cream is milk and cream in a congulated and sour state.

Cream of Tartar, in Chem., bitartrate of potash. (*See* Potash, Bitartrate of.)

Creasote, *kre'-ă-sout* (Gr. *kreas*, flesh; *sozo*, I preserve), in Chem., a fluid containing oxygen, hydrogen, and carbon, first found by Reichenbach, in the heavy oil obtained by the distillation of wood-tar. Its preparation is too tedious and troublesome to describe here. When pure, it is a colourless oily liquid of high refractive power, boiling at 398°. It is not easily kindled, but, when burnt, it gives forth a sooty smoky flame. It has a burning taste, and its odour is peculiar. It is sparingly soluble in water, to which it gives its odour and taste. It is freely soluble in acetic acid, alcohol, ether, benzol, and terasulphide of carbon. It coagulates albumen immediately, and is the most powerful antiseptic known. Meat that has been plunged into a solution containing only 1 per cent. of this substance becomes dry and hard on exposure to the air, and does not become putrid. It is thought by many, from its composition and properties, to be a homologue of phenic acid.

Creatine, or Kreatine, *kre-ă-treen'* (from Gr. *kreas*, flesh), in Chem., a substance having basic properties found in flesh and urine. Flesh contains but a very small portion of this body. It is prepared by chopping up raw cod, mixing it with an equal weight of water, and expressing the liquid. The liquid is then heated, to coagulate the albumen and baryta; water is added as long as it occasions a precipitate. The filtered liquid is evaporated to a very small bulk, and yields crystals of nearly pure creatine. It crystallizes in colourless oblique prisms. It is sparingly soluble in cold water and cold alcohol, and insoluble in ether. Although neutral to test-papers, it forms definite compounds with some of the acids. By boiling creatine with hydrochloric acid, a new base,—creatinine, is formed.

Creatinine, or Kreatinine, *kre-ă-tin'-een*, in Chem., is formed spontaneously in putrid urine, or by acting on creatine with hydrochloric acid, when hydrochlorate of creatinine is formed, from which the acid may be separated by boiling it with hydrated oxide of lead. It requires twelve parts of cold water for solution, but dissolves more readily in hot water and alcohol. Its solution restores the colour of reddened litmus, and it appears to be somewhat strong in its basic properties, forming crystalline sulphates, hydrochlorates, and numerous double salts.

Creation, *kre-ai'-shun* (Lat. *creatio*), in its strict and primary sense, signifies the bringing into being of something which did not before exist. It is therefore generally applied to the original production of the materials out of which the visible world was composed. There is but one underived and self-existing cause by whose power and agency all things were at first created. In a secondary or subordinate sense, it is used to denote those subsequent operations of the Deity upon matter by which the whole system of nature and all the primitive order of things received their forms, qualities, and laws. In this secondary sense, God is said to have created man out of the dust of the earth. The researches of modern science have raised many questions as to the accuracy of the account given by Moses, in the beginning of Genesis, of the creation of the world, or, at least, of the commonly-received interpretation of it. To enter upon the several points of controversy, and to give the various solutions of them, would be to write a book; and this is the less necessary as, to our mind, no satisfactory solution of the difficulties has yet been arrived at. There is indubitable evidence that the world existed many ages, and underwent various changes, before it received its present races of inhabitants, others of other forms and other properties having lived their ages and become extinct. The difficulty is to reconcile these facts with what we find recorded in the book of Genesis. The most probable solution, and even that is not without its difficulties, is, that in Genesis we have an account of two distinct creations, separated from each other by a very long and undetermined period, the first being *in the beginning*, when God created the heavens and the earth; the other, when the work of the days was carried on, the days being understood to mean long periods of time. It is to be borne in mind that the great truth which Moses intended to convey to the children of Israel was, that God was the creator of all things; and that it was necessary for him to do this so as to be understood by them, and to conform his instructions to their preconceived or prereceived opinions. Scripture was intended to teach theology, not science,—to reveal that could never have been found out by reason, not to leave to reason its own particular province. If, therefore, by the powers of reason man has come to see greater beauties and a sublimer depth in the works of God than have been revealed in his divine word, it seems very unreasonable to make use of this as an argument against the truth of revelation. To expect from the Bible a scientific account of the works of creation seems as unreasonable as if we were to expect an accurate knowledge of the anatomy of the human body from a child before he attempted to walk. God has given man instincts before reason; and though reason may teach us that instincts sometimes err, these errors cannot be advanced as an argument against the existence of the instincts, but are to be attributed to the imperfections of our nature. God is the author of nature, as well as of the Bible, and, instead of attempting to set up the one in opposition to the other, we ought to wait with patience till some satisfactory solution of the difficulty may be arrived at. It was an excellent advice of an eminent divine, to learn to "*trust* God where we cannot trace Him." It is to be regretted that Christians have frequently been led into the error of attempting to establish the truth of Christianity upon a solution of such difficulties as those that occur in the Mosaic account of the creation. If in the prophetic writings lengthened periods of time are expressed by the term *days*, the like interpretation may, without any stretch of the imagination, be given to the *days* of creation, the works of which, though long after the fact, were as much subject of revelation as the other. Science has already furnished us with several very remarkable proofs of the truthfulness of the Mosaic account. The order of creation, as given by Moses, is exactly that which science tells us had been followed. We are told also, that on the first day, God said, "Let there be light, and there was light;" and afterwards we find that the sun and moon were not created or made to shine till the fourth day. This apparently manifest contradiction has been reconciled by modern science, which proves that light exists independently of the sun, and must itself have been an original and independent creation.

Credence, *kre'-dens*, is a small table near the altar or communion-table, on which the bread and wine to be used in the celebration of the Lord's Supper are placed previous to consecration. They were common in the early churches. The name is said to be derived from the practice in ancient courts of having a sideboard or credence-table, at which the cupbearers and carvers (*credentiarii*) were required to taste the wines and meats before being presented to the monarch, in case of poison.

Credentials, *kre-den'-shls*, are the instruments or letters which an ambassador or other diplomatic minister receives from his own government, to present to that to which he is sent, and which define his powers and show to what rank of minister he is intended to belong. A sovereign has the right to determine the particular character with which he chooses to invest

his minister; and if he is received at the foreign court, it must be in the quality attributed to him in his credentials. Hence the ambassador usually communicates their contents before being admitted to his first audience.

**Credit**, *kred'-it*, in Pol. Ec., is one of those terms which are well understood, but which it is difficult accurately to define in words. It may be said to be the lending of wealth or capital by one individual to another, the lender being said to give, and the borrower to get or receive credit. A party who purchases goods on credit merely acquires the command of so much of the capital of the seller as these goods represent. Credit, then, is nothing but a new distribution of the capital or wealth already in existence, and is advantageous in so far as the borrowers can generally employ it to better purpose than the lenders. Credits are injurious when they allow the idle, reckless, or improvident, to squander the means of the frugal and industrious; but, generally speaking, these bear but a small proportion to the other class, where wealth is lent to persons who can employ it to better purpose than the lenders. The rate of interest or premium paid by the borrower for the use of the capital depends on a variety of circumstances; as the time and manner of its repayment, its security, the state of the money-market, &c. (*See* Interest.)

**Crédit Foncier**, *krai'-de fon(g)'-se-a* (Fr., credit on lands), is an institution in France, established by an edict of 28th February, 1852, the object of which is to supply landed proprietors with the means of carrying out improvements by granting them loans of money on the security of their lands, to be repaid by equal instalments, so as to extinguish the debt within a certain period. On this principle certain societies have been formed in France, with the authority of the government, subject to certain conditions, and endowed with certain privileges. Their regulations are precisely defined by law, and they are not allowed to advance to more than half the value of the property pledged or hypothecated.

**Crédit Industriel**, *a(h)n-doos'-tre-el'* (Fr., industrial credit), is the name given to a commercial society recently established at Paris (1853), under the sanction of the government, for the purpose of making advances for a limited period, to persons engaged in industrial pursuits, on goods, shares, bills, bonds, &c., to the extent of two-thirds of their marketable value. The liability of the shareholders is limited to the amount of their shares. The capital is 60,000,000 francs, divided into 120,000 shares of 500 francs each.

**Credit, Letters of.** (*See* Letters of Credit.)

**Crédit Mobilier, Société Général de**, is the name of a society established in France in 1852, upon the principle of limited liability, under the sanction of the government. The capital was fixed at 60,000,000 francs, divided into shares of 500 francs each. The operations of the society are directed principally into three fields:—(1) To aid the progress of public works, and promote the development of national industry,—making railways, managing gas-companies, and, in fact, becoming a kind of universal trading association; (2) for the buying up of the shares and bonds of existing trading societies and companies, for the purpose of consolidating them into one common stock; and (3) for the transaction of general banking and brokerage operations. The funds for the carrying out of these diverse operations are,—(1) the capital of the company; and (2) the deposits received from the society by the public.

**Creed**, *kreed* (Lat. *credo*, I believe), is a brief summary of the articles of faith. There are various creeds, the chief of which are the Apostles', Athanasian, and Nicene. (*See* these articles.)

**Creeper**, *kreep'-er* (*Certhia*).—With the exception of the yellow-crested wren, the common creeper (*Certhia familiaris*) is probably the smallest-bodied British bird: when fully grown its weight is only five drams. The bill is hooked, the legs slender, and the toes and claws very long. The nest of the common creeper is built in a hole in the bark of a tree, and is formed externally of hay and lined with feathers. It is a constant resident in Britain, but, owing to its bustling habit and swift movements, is seldom seen even in localities where it abounds. The wall-creeper (*Certhia muraria*, Linn.) is a more rare bird in every other part of Europe save the south; in Spain and Italy it is common, as well as in Provence, and it may be seen creeping on the outer walls of St. Peter's, at Rome. Its colour is of a deep bluish-grey; the wing-coverts and middle quill-feathers black, those nearest the body edged with white. This bird clings to the vertical faces of walls and rocks, just as the common creeper attaches itself to the perpendicular surface of trees.

**Cremation**, *kre-mai'-shun* (Lat. *cremo*, I burn), denotes the act of burning, and is particularly applied to the ancient custom of burning the dead.

**Cremocarp**, *kre'-mo-karp* (Gr. *kremao*, I suspend; *karpos*, fruit), in Bot., an inferior two-celled, two-seeded fruit, with a dry indehiscent pericarp. The two cells or halves of which it is composed are joined face to face to a common axis called a *carpophore*, from which they separate, when ripe, to such an extent, that each remains suspended by a very slender cord. Each half is termed a *hemicarp* or *mericarp*, and the inner face the *commissure*. Examples of the cremocarp, as above defined, are only found in the *Umbelliferæ*. By Lindley the definition of cremocarp is extended so as to include fruits of a similar nature, but which have more than two cells.

**Crenel**, or **Crenelle**, *kre-nel'* (Lat. *crena*, a notch).—The embrasures in battlements are so called because they resemble notches taken out of the parapet. In Mil., a wall surmounted by a battlement is said to be crenellated. (*See* Battlement.) In Her., crenellé is a term implying that the outline of an ordinary is like that of the battlements of a wall.

**Creole**, *kre'-ole*, is a corruption of the Spanish *criollo*, a term which was originally applied to all the descendants of Spaniards born in America and the West Indies. It was afterwards applied to the descendants of other Europeans, who were hence distinguished as French Creoles, Danish Creoles, &c. As now used, it is applied to such as have been born within or near the tropics; and it includes persons of all colours, which has led to the common idea that it implies an admixture more or less of African blood. In this country it is commonly applied to one born in South America or the West Indies, of European parents.

**Crescendo**, or **Cres**, *kres-shen'-do*, in Mus., a term employed to signify that the notes in the passage over which it is placed are to be gradually swelled. This contrivance must be very ancient, as we learn, from a passage in Cicero, that the Romans practised it continually. The swell is, although in one sense applicable to all music, generally numbered among the most refined and delicate of its beauties, and in this sense is never used unless the sentence or passage be very emphatic.

**Cresset**, *kres'-set* (Fr. *croisette*, a small cross), a great light set upon a beacon, lighthouse, or watch-tower. It also signifies a torch or lamp, varieties of which are represented in the annexed illustration.



CRESSETS.

Cressets were originally surmounted by a small cross, from which custom they derive their name; and it was by carrying about a fiery cross that armies were raised in Scotland during the olden time. Shakspeare makes use of the word in Henry IV.:—

"At my nativity
The front of heaven was full of fiery sparks,
Of burning *cressets*."

**Crescentiaceæ**, *kres-sen-te-ai'-se-e*, in Bot., the *Crescentia* or Calabash-tree fam., a nat. ord. of dicotyledonous plants in the sub-class *Corollifloræ*, consisting of small trees with the following characters:—

Leaves simple, alternate or clustered, without stipules; flowers irregular, growing out of old branches or stems; calyx free, entire at first, afterwards splitting irregularly; corolla somewhat bilabiate; stamens didynamous (two long and two short), with a fifth of a rudimentary character; ovary one-celled, and surrounded by an annular disk; fruit indehiscent, woody; seeds large and numerous, without albumen, enveloped in a pulp. The order includes about 34 species, which have been arranged in 11 genera. They are natives exclusively of tropical regions. The sub-acid pulp, the fruit of *Crescentia Cujete*, the calabash-tree, is eaten by the negroes in Jamaica, and the hard shell is used for holding liquor or snuff, and for many other purposes. The fruit of *Parmentiara edulis*, another plant of this order, is eaten by the Mexicans, and that of *P. cerifera* is greedily devoured by cattle in Panama. The latter fruit resembles a candle in shape, and the plant is commonly called the candle-tree.

Crest, *krest* (Lat. *crista*, a tuft or plume for the helmet), in Her., a portion of the armorial bearings of a nobleman or gentleman entitled to bear coat-armour that is commonly used without the shield, being painted on the doors of carriages, and engraved on plate and signet-rings. In the days of chivalry the crest or cognizance of the wearer was borne on the helmet. It was made of leather or light wood, gilded and painted, and a wreath of twisted silk was fastened round the lower part, where it was attached to the helmet. In modern times the crest is always drawn on a wreath composed of the principal metal and colour occurring in the bearer's coat of arms, the coils being of metal and colour alternately. Sometimes the crest rests on a cap of maintenance. Crests are supposed to have been introduced into England in the 12th century; they were then used as a means of recognising the bearer in a tournament. They were generally assumed at the pleasure of the wearer; but there are cases in which crests have been specially granted to families which bear them; among which may be mentioned those of Drake and Hawkins, of Devonshire, the famous admirals of Queen Elizabeth; the former of whom bore a globe surmounted by a ship, to which a rope was attached, held by a hand, in commemoration of his having circumnavigated the globe; and the latter a negro fettered with golden chains and manacles, for his achievements in the Spanish main.

Crest Tile, in Arch., the name given to tiles running along the ridge of the roof of a building, and surmounted with trefoils, or any other ornament, as a finish. They are chiefly used in Gothic architecture.

Cretaceous System, *kre-tai'-she-us* (Lat. *creta*, chalk), in Geol., the name given to the last or uppermost of the secondary formations. As developed in the south of England, it is composed of calcareous, argillaceous, and arenaceous rocks, the former predominating in the upper, and the two latter in the lower portion of the system. The strata occurring in England have been arranged into the following groups:—*Upper chalk.*—Generally soft white chalk, containing nodules of flint and chert, in more or less regular layers. *Lower chalk.*—Harder and less white than the upper, and generally with fewer flints. *Chalk marl.*—A greyish earthy or yellowish marly chalk, sometimes indurated. *Upper greensand.*—Beds of silicious sand, occasionally indurated to chalky or cherty sandstone, of a green or greyish white, with nodules of chert. *Gault.*—A bluish tenacious clay, sometimes marly, with indurated argillaceous concretions and layers of greensand. *Lower greensand.*—Beds of green or ferruginous sands, with layers of chert and indurated sandstones, local beds of gault, rocks of cherty or chalky limestone (Kentish rag), and fuller's earth. A more comprehensive classification, derived from the study of continental as well as English strata, is given below, with the estimated thickness of each subdivision:—

*Upper Cretaceous Series.*

| | |
|---|---|
| Maestricht and Faxoe beds | 100 feet |
| White chalk with flints | 500 |
| White chalk without flints | 600 |
| Chalk marl | 100 |
| Upper greensand | 100 |
| Gault | 150 |

*Lower Cretaceous or Neocomian Series.*

| | |
|---|---|
| Lower greensand | 850 feet |
| Speeton clay | 60 |
| Wealden beds | 1,300 |

There is no place where all the above strata are present at once, and some are very local and inconstant. The Wealden beds, so called from their forming a district known as the Weald of Kent and Sussex, have only recently been included in the cretaceous system. They consist of sandstones and shales, with a few beds of limestone and ironstone, and, as developed in the south-east of England, they seem to occupy the site of an ancient estuary which received the clay and mud of some gigantic river, whose waters occasionally bore down the spoils of land plants and land animals, to be entombed along with those of aquatic origin. The life of the whole cretaceous period was abundant, as the known fossils within the British area represent land plants, fresh-water and marine shells and fish, large terrestrial and marine reptiles, and species of every class of animal having hard parts capable of preservation, except birds and mammals; and even as regards these, most geologists believe their absence to be accidental, as both existed during the preceding period, though their fossil remains are very rare. The more important useful products of this system are chalk, flint, fuller's earth, phosphatic nodules, and the so-called "firestone rock." The two latter are extensively employed as manures.

Cretinism, *kre'-tin-izm*, is idiocy arising from imperfect formation or development of the brain, and generally accompanied with great bodily deformity. The name is of uncertain origin. Some derive it from *Chrétien* (Fr., a Christian), because they were generally regarded as beings incapable of sinning, and thus were viewed with some kind of respect. According to others, it is from the Romance or Grison *cretina*, a corruption of the Latin *creatura*, a creature. These unfortunate beings are chiefly to be met with in the valleys of the Alps, particularly in the Swiss cantons of Valais, Vaud, Grisons, Glarus, Uri, and Aargau; but they are by no means confined to these parts, being much more extensively spread than was at one time supposed. Cretinism is often accompanied with goitre (which *see*). There are various degrees of Cretins: some seem to be sunk in intelligence below the level of many of the brutes; while others are able to go about and attend to some easy labour. The Cretin seldom attains more than 4½ feet in height. The cranium is deformed, and has a conical shape, the forehead being thrown backwards, narrowed, and flattened, and the occiput being nearly on a line with the neck. Their eyes are small, the nose broad and flat, the mouth large and open, with the tongue often protruded, and the whole countenance is idiotic, or expressive only of lasciviousness. The flesh is soft and flaccid; the skin wrinkled, yellowish, or pale and cadaverous; the belly large and pendulous; the limbs crooked, short, distorted; and the gait imperfect and waddling. The cause of this infirmity is still matter of dispute among physicians. Some attribute it to the nature of the water, by which an undue amount of calcareous matter is conveyed into the system; others to the stagnation of the atmosphere in the deep narrow valleys. There are other causes that may possibly exert an influence upon it; as the poor diet and filthy, lazy, and intemperate habits of the people among whom it exists, together with the intermarriages among near relatives. There can be no doubt that it is in some measure hereditary, though all the children of a family are not affected by it. Many attempts have recently been made to improve the condition of the Cretin. The first thing to be done as soon as the disease manifests itself (for in many cases it does not appear till some time after birth,—sometimes not before the sixth or seventh year) is to remove the sufferer to a pure bracing atmosphere. The treatment required is first to get the body into a healthy condition, by simple and nourishing food, warm clothing, frequent bathing and friction of skin, and gentle exercise. The development of the mind will follow that of the body, but must be done very gradually. Dr. Guggenbühl was the first that made any systematic attempt to educate the Cretin. He opened his institution on the Abendberg, in the

canton of Bern, Switzerland, in 1840; and since that time several other institutions for the same purpose have been established on the continent.

CREW, *krew* (a contraction of Sax. *cread*, or *cruth*, a crowd), in Mar., the company of sailors belonging to a ship, boat, or other vessel. In an English vessel of war the entire crew are thus arranged in groups:—1. Warrant and subordinate officers; 2. chief petty officers; 3. working petty officers of the first class; 4. working petty officers of the second class; 5. comprehends all those lower in rank than the fourth class. A ship's company or crew is also subdivided into several minor groups,—the boatswain's crew, the gunner's crew, the sail-maker's crew, &c.

CRIBBAGE, *krib'-bij* (Ang.-Sax.), a game played by two persons with a complete pack of fifty-two playing-cards. It is divided into two classes, the five-card and the six-card games. The five-card is the original game, and affords the greatest scope for the exercise of skill. The points are scored upon a board, and sixty-one points constitute the game. All the kings, queens, knaves, and tens, count as ten each, and the rest of the cards according to their ordinary value; that is, six for six, five for five, and so on. The points which reckon for the game are fifteens, sequences, flushes, pairs, &c. After dealing, the players gather up their cards, and having taken out two each, place them, with their faces down, on the table. These four cards form the "crib," which becomes the property of the dealer, under certain conditions. Points are scored in two different ways in cribbage,—first in play, and second in reckoning up the cards held. After the crib is put out, the pack is cut by the non-dealer, and a card turned up by the dealer. When this card is a knave, it is called "two for his heels," and counts two to the dealer; and a knave held in hand, of the same suit as the turn-up card, entitles the player to score one; it is called "one for his nob." Six-card cribbage is played in a very similar manner, but is inferior in science to five-card cribbage. When three parties play at the game, each plays on his own account; and when four play, sides are generally chosen. (*For rules, &c., see* Bohn's *Handbook of Games.*)

CRICKET, *krik'-et* (Du. *krekel*).—This well-known little insect has been, and is still, a subject of much delusion. Notwithstanding that modern naturalists have cleared up all mystery connected with the cricket, if ever any existed but in the rude and untaught mind, still, at the present day, there is many a household in England any member of which would associate the chirping of the cricket with some fatality, and consider it an alarming omen. Thanks, however, to the variety of superstition, by many persons it is considered as a sign of good luck, although with about as much reason as in the former notion. At any rate, it possesses the merit of being a less harmful superstition, and may, without much injury, remain, until a purer and truer knowledge shall dawn in the dark corners that are still untouched with the blaze of Progress. The cause of the chirping noise made by the cricket, and which is so familiar to the fireside listener during the cold winter evenings, is simply the friction of the wing-covers against each other. The house-cricket is about an inch in length, and the *antennæ* often half again as long as the whole body. It is found in various parts of Europe, more particularly in the south. In Great Britain it is very abundant. Only in the winter months does the cricket take up its abode with man, usually selecting rooms on the lower floor, and greatly affecting the kitchen, where there is generally no lack of food lying about. Sometimes it selects chinks and crevices in which to hide, and often burrows in the mortar, where, through the long evenings, it chirps continuously. Its monotonous chant is considered very amusing by some; by others, whose temperaments are of a nervous nature, it is thought to be disagreeable and irritating. In the summer, the cricket takes its departure, and finds an abode in the crevices of garden-walls and such-like places. At this season it does not forget its melody; but it is said, in the fine summer evenings, to chirp more pertinaciously. The field-cricket is also found in this country, but is not nearly so common as the preceding species. It is exceedingly reserved in its habits, avoids the society of man, and prefers hot, sandy localities; it burrows in the ground, and there lies all the year round. The field-cricket is carnivorous, and preys upon other insects. It is larger than the common species, and its chirp is much louder. Another interesting species is the mole-cricket, whose habits are very singular, and greatly resemble those of the animal from which it is named. In its structure, too, there is a remarkable similarity. This insect is continually engaged in excavating galleries under the earth, some of which are of considerable dimensions. To enable it to do this with perfection, its anterior limbs are connected into



CRICKET.

a pair of flat fossorial organs, which are in appearance much like the hand of the mole. In its burrowing processes, it does great injury to the roots of plants. With regard to its diet, little is positively known; and whether it lives on vegetable or animal food, is still a matter of uncertainty. By some authorities, however, it is said to feed on both roots and insects. The female of this species prepares a large chamber wherein to lay her eggs, which are said to be from two to four hundred in number. Until after the first moult, the young remain together, but then take their departure, and commence burrowing on their own account. The mole-cricket is usually about two inches in length, and is of a brown colour. The most extraordinary cricket is that found in Sicily (*Gryllus megacephalus*), which chirps sufficiently loud, it is said, to be heard distinctly at a mile distant (!).

CRICKET (Sax. *cryce*, a stick), a well-known national English game, played upon a level piece of turf, generally about one or two acres in extent. In a full game of cricket, there are eleven players on each side; and two bats, a ball, and two sets of wickets, with bails, are required. There must also be two umpires and two scorers. Although an ordinary game is usually played with eleven on each side, there is no restriction as to numbers; the parties may stipulate for eleven against twenty-two, twelve against twenty, &c. When a game is about to be played, the wickets or stumps are placed opposite to each other, three on either side, at a distance of twenty-two yards. Each wicket is twenty-seven inches in height above ground, and the three are connected at the top by two loose bails, four inches long each. Two lines are then drawn upon the grass at either end. The first is in a line with the stumps, and is called the "bowling-crease;" the other is parallel, four feet in front of the wicket, and is called the "popping-crease." Having chosen sides and tossed for innings, the players on the side which is out take their places. The bowler places himself behind the wicket from which he intends to bowl, and the wicket-keeper directly behind the wicket opposite to him. The rest of the men on the outside are called fielders, and consist of the long-stop, point, cover-point, short-slip, long-slip, middle-wicket, long-field off, long-field on, and leg. All being arranged in their places, the players on the inside send out two batsmen, who take up their posts before each wicket respectively. One of the umpires then calls "play!" and the bowler delivers the ball towards the opposite batsman, his object being either to hit the wickets or to bowl it in such a way that the batsman may play a catch. In either of these cases the striker is out. But if the batsman can hit away the ball to such a distance that

he is able to exchange places with the opposite batsman, he scores one run to his side. Every time an exchange of places safely occurs, a run is scored to the side who has the innings. The delivery of every four balls constitutes an "over," when the bowling is transferred to the opposite wicket, and all the fielders change their positions accordingly. When a batsman is put out, another of the players on his side takes his place, and so on, till all the players but one are put out, when those who have had their innings field out and those who have been fielding out take their innings. Each side has two innings, and the party that makes the largest score wins the game. There are several stringent laws with regard to the bowling. If the bowler sends a ball on the outside of the "popping-crease" at the opposite wicket, it is called a "wide ball," and scores one to the inside. The bowler must also deliver the ball with one foot behind the "bowling-crease;" the ball must be bowled, and not thrown or jerked, and the bowler must not raise his hand or arm above his shoulder in delivering the ball. An infraction of these rules constitutes a "no ball," which scores one to the inside. There are many other laws of cricket, which have lately been revised. (See *The Cricket-bat, and How to Use it*,—Baily Brothers, Cornhill: 1861; Felix *On the Bat*; and Lillywhite's *Guide to Cricketers*.) Though comparatively modern in its origin, cricket seems to have taken the precedence of all other national games. Nearly every town, village, and school, possesses its cricket-ground; and cricketers are to be found in all classes of the community, from peers to peasants. Military authorities hold the game in such high estimation, that soldiers are encouraged to play at it in their leisure. No game tends more to the development of muscular strength and activity than cricket. Many professional men in England make their living by playing matches. The Marylebone and the Surrey clubs are the most influential, and the "Eleven of all England" and the "United Eleven" are the two finest cricket-clubs in existence. In 1859, a number of cricketers went from England to America and played a number of matches, on account of a challenge which came from the latter country; and in 1860-61, another body went to Australia, where they played many games. In both cases success attended the cricketers who came from the Old country.

**Crime**, *krime* (Lat. *crimen*, Fr. *crime*), is the violation of a right when considered in reference to the evil tendency of such violation as regards the community at large, although it may be a civil injury if considered in relation to the damage which the party who is made the subject of it individually sustains. The distinction of public wrongs from private,—of *crimes* from *civil injuries*, seems, upon examination, to consist in this,—that private wrongs, or civil injuries, are an infringement or privation of the civil rights which belong to individuals, considered merely as individuals. Public wrongs, or crimes, and misdemeanours, are a violation of the same rights, considered in reference to their effect on the community in its aggregate capacity; and, thus understood, they are classed either as *felonies* or *misdemeanours* (which *see*).

**Criminal Law.** (*See* Law.)

**Crinoidea**, *kri-noid'-e-ă* (Gr. *krinon*, lily; *eidos*, likeness), an extensive order of animals, chiefly fossil, belonging to the class *Echinodermata*, and so named from their lily-like appearance. In existing seas, the crinoids are represented by the *Comatulæ*, or feather-stars of our own shores, and by the rare and all but extinct *Pentacrinites* of the West Indies. The comatula, though free-floating in its adult state, is attached by a stalk to the sea-bottom when young; the *Marsupites*, a fossil form, appears also to have been free in its mature state; but every other crinoid was provided with a long, slender, many-jointed stem, by which it was fixed, during life, to the rock. The characteristics of the order, which is of vast zoological interest, are well exemplified in the *Pentacrinus*. This animal may be described as a stalked comatula. The stalk, which is composed of calcareous joints or ossicles articulated to each other by radiated surfaces, supports a vasiform receptacle or cup formed of five calcareous plates, and in this receptacle the digestive and other viscera are situated. The upper part of the receptacle is covered by a plated integument, in which there is an aperture for the mouth. From the brim of the cup proceed ten many-rayed arms, furnished with articulated feelers or pinnæ capable of expansion and contraction, for the capture of prey. The principal fossil families are described under the head of Encrinite.

**Crinoline**, *krin'-o-leen* (Lat. *crinis*, hair), a stiff fabric formerly made of horse-hair, and used in order to distend female apparel. The term originated among the Parisian milliners, and at first was only applied to this particular kind of hair-cloth; but it is now applied to every kind of hoop by which women's dresses are expanded. The hoop or crinoline, as now generally worn, is made of various materials; such as cane, whalebone, steel wire, &c. Some are made of very extensive size, reaching a circumference of even five yards. The hoop came into fashion about 1856, and has remained in vogue ever since. The habit of wearing hoops is not new, as they formed an article of attire in the reign of Elizabeth: they were then called *fardingales*. They went out of fashion in James I.'s reign; but came in again in 1711, and remained in fashion till the reign of George IV. They were then only worn by the courtiers; their use had been given up in private . . . The king abolished their use in court at last by royal command.

**Crisis**, *kri'-sis* (Gr. *krino*, I decide), in Med., denotes the decisive period or event of a disease,—a sudden and considerable change of any kind, occurring in the course of its progress, and producing an influence upon its character. Among ancient physicians, it was applied to that tendency which fevers were supposed to possess, of undergoing a sudden change at particular periods of their progress. Hence there were what were called *critical* days,—certain days in the progress of an acute disease on which a sudden change, either favourable or unfavourable, would take place. The seventh, fourteenth, and twentieth or twenty-first days, were regarded as eminently critical. Little importance is now attached by medical men to critical days.

**Crithmum**, *krith'-mum*, in Bot., a gen. of umbelliferous plants. The species *C. maritimum* is the samphire, which is commonly used as an ingredient in mixed pickles. It is found growing on the seashore, and occasionally on old walls.

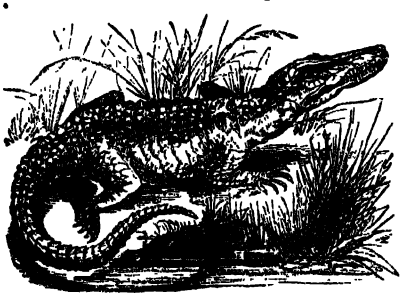
**Criticism**, *krit'-e-sizm*, has been defined to be "the art of judging with propriety concerning any object or combination of objects." In a less extended sense, it is the application of the principles of taste to matters connected with literature and the fine arts. The object which it proposes is to distinguish what is beautiful and what is faulty in every performance; from particular instances to ascend to general principles, and so to form rules or conclusions concerning the several kinds of beauty in works of genius. It lays down those forms or ideas which answer to our conception of the beautiful, and points out, by reference to these, the excellencies or defects of individual works. The rules of criticism are not formed by any induction *à priori*,—that is, they are not formed by a train of abstract reasoning independent of facts and observations. Criticism is an art founded wholly on experience, founded on the observation of such beauties as have been found to please mankind most generally. Such observations, taking their rise at first from feeling and experience, were found upon examination to be so consonant to reason and the principles of human nature, as to pass into established rules, and to be applied for judging of the excellency of any performance. In a still more limited sense, criticism is applied to a particular branch of literature. To this branch belong essays or articles in magazines, reviews, &c., upon particular books, pointing out their various merits and defects.

**Critique**, or **Critic**, *krit-eek'*, *krit'-ik*, in Phil., is a term adopted from the Germans, and is applied to the science of the pure faculty of reason, or the investigation of that which reason is able to know or effect independently of experience. It is applied to the philosophical system of Kant, from his famous work entitled the "Kritik der reinen Vernunft" (Criticism of Pure Reason). (*See* Kantian Philosophy.)

**Crocket**, *krok'-et* (Fr. *crochet*), in Goth. Arch., an ornamental projection on the edges of the sides of pinnacles, canopies, spires, &c., consisting chiefly of

leaves and knots of foliage, and occasionally of animals. They were small and insignificant when they were first introduced; but they became larger and bolder in the Decorated and Perpendicular English styles.

Crocodile Family, *krok'-o-dile* (Gr. *krokodeilos*), the largest order of the Saurian order of reptiles. The tail is flattened at the sides; there are five anterior and four posterior toes, of which the three inner ones only on each foot are armed with claws; all the toes are more or less joined by membranes. There is a single row of pointed teeth in each jaw; and the tongue is fleshy, flat, and attached very nearly up to the edges, which led to the ancient belief that the crocodile was without a tongue. The back and tail are covered with large and strong square scales, elevated into a ridge on their middle. There is a deeply denticulated crest on the tail, at the base of which the crest becomes double. The scales of the belly are squared, delicate, and smooth. The nostrils are opened at the end of the muzzle by two small crescent-shaped slits, closed by small valves, and lead, by a long and straight canal pierced in the palatine and sphenoidal bones, to the bottom of the back part of the mouth.



CROCODILE.

As the lower jaw is prolonged behind the skull, the upper jaw has the appearance of mobility, but it only moves in concert with the whole of the head. The external ear is shut at will by two fleshy lips. The eye has three lids. Under the throat are two small glandular orifices, whence issue a musky secretion. Like the rest of the *Lacertæ*, crocodiles are oviparous. Their eggs are deposited in the sand or mud on the banks of the rivers they frequent; and the young, when hatched, immediately proceed to the water. The egg of the crocodile is not much larger than that of the goose; but it is very much harder, and its form more oblong. As is the case with many newly-born creatures, the head of the young crocodile seems monstrously large as compared with the rest of its body. "The laying of the eggs," says M. Ricord, "takes place in April, and the number amounts to from twenty to twenty-five, more or less, laid at many times. The female deposits them in the sand with little care, and scarcely covers them. I have met with them in the lime which the masons have left on the banks of the river. If I have reckoned right, the young ones come forth on the fortieth day, when the weather is not too cold. At their birth they are five or six inches in length. They are hatched alone; and, as they can do without nourishment while coming out of the egg, the female is in no hurry to bring it to them. She leads them towards the water and into the mud, and disgorges for them half-digested food. The male takes no account of them." In crocodiles the number of teeth does not vary with age, as in other animals, the teeth being hollowed at the base in such a manner as to serve for the case or sheath of the germ of the tooth destined to replace it. The teeth are numerous, large, and of unequal length. Cuvier says that the crocodile cannot swallow while in the water, but that it first drowns its prey and places it in some nook under water, where it is allowed to putrefy before it is eaten. This is denied by certain modern travellers and naturalists, but many reliable authorities quote instances in





favour of Cuvier's opinion. The prey of the crocodile is chiefly fish, but it derives a considerable part of its sustenance by lying in wait in the evening at the water's edge, and hauling into the water any small quadruped that may come to drink. They have been killed in Upper Egypt exceeding thirty feet in length. Its colour, when full grown, is blackish-brown above and yellowish-white beneath; the upper parts of the legs and the sides are varied with deep yellow, and parts of the body bear a green tinge. No living specimen of this family is found in Europe, nor has any at present been discovered in Australia. Africa is the native country of the crocodile, and it is also found in Madagascar. The crocodiles are generally considered as forming a natural passage from the saurians to the chelonians, to the last genera of which, in certain points of their conformation and habits, they nearly approximate. The *Crocodilidæ* are divided into two great families,—the crocodiles proper, which are distributed in the Old and New world, and the alligators, which are peculiar to America.

Crocus, *kro'-kus* (Gr. *krokos*), in Bot., a gen. of plants belonging to the nat. ord. *Iridaceæ*. From the species *C. vernus* and *versicolor* numerous varieties have been produced by cultivation, which are of great value in the flower-garden, on account of the early appearance and remarkable brilliancy of their flowers. *C. sativa* is the saffron crocus, the karcorn of the Bible. The dried stigmas of this plant, with the top of the style, constitute *hay-saffron*, or, when pressed together, *cake-saffron*. The latter is seldom met with in the shops, the product sold for it being simply the pressed florets of the safflower. (*See* Carthamus.) Saffron is much used as a flavouring agent on the continent and in the East. In Britain, it is principally employed as a colouring agent in pharmacy, and medicinally in certain nervous affections, and as an emmenagogue.

Cromlech. (*See* Celtic Architecture.)

Crop, *krop* (Ang.-Sax.), a term applied to the quantity of corn, roots, grass, &c., grown on a piece of land at one time. The order in which different crops are made to succeed each other was not made a subject of scientific research till the middle of last century.

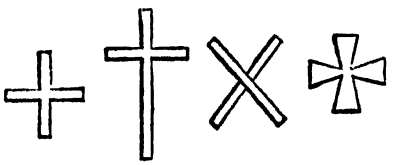
Crosier, *kro'-zhur* (from the root of cross), the crook or pastoral staff of a bishop, the emblem of pastoral authority and care. Strictly speaking, the crosier is a staff surmounted by a cross, although it is generally confounded with the pastoral staff, which is made in the form of a crook. The use of crosiers is very ancient. The Byzantine crosier has at the top either a cross or a knob, with curved serpents on both sides. When the bishops pronounce solemn benediction, they take this emblem into their hands. These staves were sometimes barely curled, and sometimes were highly ornamented and enriched with costly jewels. One of the most costly crosiers remaining in England is that of William of Wykeham, of silver gilt, richly enamelled. It is exhibited to visitors in the chapel of New College, in Oxford, to the society of which the bishop presented it in 1404. Another fine crosier is that of Bishop Fox, preserved at Corpus Christi College, Oxford.



CROSIER.

Cross, *kros* (Lat. *crux*), a common instrument of capital punishment among the ancients. It was made of two pieces of wood, crossed either at right angles or otherwise, on which the bodies of the malefactors were fastened, and left exposed till death put an end to their sufferings. After the crucifixion of Christ, the cross became the emblem of the Christian religion. Constantine, believing that he had gained his victory over Maxentius through the sign of the cross, caused them to be set up in public places and upon public buildings. The cross, as an emblem, however, was in use long before the Christian era, and had many mystical and religious properties attached to it. When the Spaniards arrived in South America, they were astonished to find that the natives used the cross as a

religious symbol in their temples. Early in the Christian dispensation, however, the cross became an emblem of the religion. The large cross over the entrance to the chancel of a church was called the Rood, or Holy Rood, and became an object of veneration. The rood was often elaborately ornamented. Crosses are of various forms: in the Latin cross, the horizontal



CROSSES.

bar crosses the perpendicular near the top, while, in the Greek cross, which is similar to the cross of St. George, the horizontal crosses the perpendicular in the centre. In the cross of St. Andrew, the two bars cross each other diagonally. After the union of Scotland with England, the cross of St. George and that of St. Andrew were blended, forming the union jack. The Maltese cross is merely the Greek cross, with an ornamental expansion of the ends. Monumental crosses were often raised either to mark a boundary or the entrance to a sanctuary. Many striking remains of these crosses are to be found in Great Britain and Ireland. Monumental crosses were erected by Edward I. on the places where the body of Queen Eleanor rested while being borne to burial at Westminster. The crosses of Charing, Cheapside, and Waltham, belonged to these. The two former have disappeared, but the latter still remains. Market or town crosses were originally stands from which the ecclesiastics preached. St. Paul's cross was one of the most famous of these. It was situated near the present site of St. Paul's Cathedral, and was essentially a place of preaching for the town. It was, in its latter days, in the form of a plain pulpit, made of wood, and was surmounted by a Maltese cross. Round it were arranged seats for the audience. It was displeasing to the Puritans, and was demolished by order of the parliament. Nearly every old town in England has either a town cross or the remains of one.

CROSS, VICTORIA, a reward which may be granted to a soldier of any rank to mark any act of valour. It was first instituted in 1856, at the conclusion of the Crimean war. It is in the form of a Maltese cross, and is composed of metal taken from the Russian guns captured at Sebastopol. In the centre of the cross is the royal crown surmounted by a lion, and on a scroll below is the legend, "For Valour." On the clasp two branches of laurel are represented, and the cross hangs from it supported by the letter V. The ribbon worn by soldiers is red, and that worn by sailors blue. Each recipient of the Victoria cross receives a pension of £10 per annum.

CROSSBILL, *kros'-bil* (*Loxia curvirostra*).—The range of the crossbill extends from the north of Europe as far as Greenland. The most singular characteristic of this bird is its beak, the upper and lower mandibles being equally curved, hooked, and the elongated points crossing each other. Buffon speaks of this peculiarity as an error and defect of nature, which clearly enough shows that he was totally unacquainted with the bird's nature. Its favourite food is the fruit of the pine, and of the efficacy of the crossed mandibles in splitting and extracting the kernels from nuts there can be no doubt. "The beak of the crossbill is altogether unique in form; the mandibles do not lie upon each other with their lateral edges in opposition, as in other birds, but curve to the right and to the left, and always in opposite directions to each other. In some specimens the upper mandible is turned to the right, the lower mandible curved to the left; in others the position of the mandibles is reversed in their direction. In the specimen I examined, the upper mandible curved downwards, and to the left; the under portion turned upwards, and to the right. When holding the head of this bird in my fingers, I found I could bring the point of the under mandible in a line underneath and touching the point of the upper, but not beyond it towards the left side, while on its own side the point passed with ease to a distance of three-eighths of an inch. The upper mandible has a limited degree of motion on the cranium, the superior maxillary and nasal bones being united to the frontal by a flexible bony lamina."—(*Yarrell.*) The chief colour of the crossbill's plumage is ashy-grey, with a greenish tinge on the upper parts, while the lower parts are yellowish green. Its bill is horn-colour; its length about six inches. This is the plumage of the adult bird; after the first moult, however, and until the bird is a year old, all its upper and lower parts are of a tarnished red, more or less tinged with green and yellow; while the lower coverts of the tail are white, with a brown spot in the centre.

CROSS BUNS, a small spiced cake, marked with a cross, and specially prepared for Good Friday. The hot-cross-bun is the most popular symbol of the Roman Catholic religion in England that the Reformation has left; they are supposed to represent the eulogiæ, or consecrated loaves, given away as alms to those who, from any impediment, could not receive the host. They were marked with a cross similar to that on the Good Friday bun.

CROTALARIA, *kro-tă-la'-re-ă* (Gr. *krotulon*, castanet, on account of the rattling of the seeds in their inflated pods, when shaken), a gen. of plants belonging to the nat. ord. *Leguminosæ*, sub-ord. *Papilionaceæ*. *C. juncea*, an Indian plant, furnishes a coarse fibre, called *sun*, *sunn*, *shunum*, *taag*, or *Bengal hemp*, which is often confounded with *sunnee*, the fibre of the *Hibiscus cannabinus*. *C. tenuifolia*, another Indian species, is the source of the Jubbulpore hemp.

CROTALUS. (*See* RATTLE-SNAKE.)

CROTCHET, *krot-sh'-et* (Fr. *crochet*), the third principal note in music. It is equal in duration to half a minim, or the fourth of a semibreve.

CROTON, *kro'-ton* (Gr. *kroton*, the dog-tick, in reference to the resemblance of the seeds to that vermin), in Bot., a gen. of plants belonging to the nat. ord. *Euphorbiaceæ*. The seeds of the species *C. Tiglium*, and probably also those of *C. Pavana*, constitute the *croton*, or *tiglium seeds*, of the materia medica. They yield, by expression, an oil called *croton oil*, which, in doses of from one to three minims, is a powerful drastic cathartic, and, when applied externally, acts as a rubefacient and counter-irritant. The seeds are used without preparation, in India, as purgative pills. *C. Eleuteria* and *Cascarilla*, natives of the Bahama islands and Jamaica, yield the aromatic tonic bark commonly known as *cascarilla* or *eleutheria bark*. *C. pseudo-China* yields the *quilled copalche bark* of Pereira, and *C. suberosum* the *corky copalche bark* of the same author. In their medicinal properties the copalche barks resemble cascarilla. The aromatic bark known as *Malambo bark* is the produce of *C. Malambo*. It is extensively used in Columbia as a remedy in diarrhœa and as a vermifuge; also externally, in the form of an alcoholic tincture, in rheumatism.

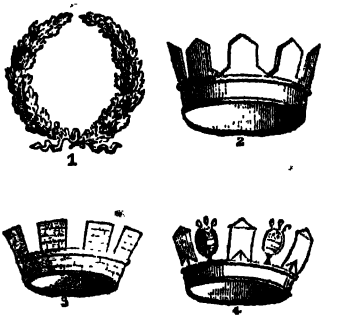
CROUP, *kroop* (Ang.-Nor.), in Med., is an acute inflammation of the mucous membrane of the larynx, but frequently extending also to the trachea and bronchial tubes. This disease is not mentioned by medical writers before the middle of last century, and it is the opinion of many that it did not exist prior to that time. It is a disease that is very prevalent and fatal among infants. It is usually preceded by the symptoms of a common cold, with hoarseness and a harsh cough, pain in the head, fever, and swelling and redness in the back of the throat; but it may make its appearance suddenly during the night, in the midst of apparent health. In a short time the respiration becomes noisy and difficult, accompanied by a crowing sound during inspiration; the face is red and swollen, the eyes suffused, the head thrown back, and everything indicates the great sufferings of the patient. In extreme cases, as the disease advances, the breathing becomes more difficult, the cough more suffocating, the voice stifled, and the countenance livid; and gradual insensibility or convulsions at length close the scene. The fatal issue often takes place in thirty hours, and even less; but most frequently it happens about the end of the second day, though it has sometimes been known to run on to the fourth, fifth, or sixth day. The disease is most common between the first and tenth year, and rarely

occurs after the age of puberty, though occasionally it is to be met with among adults. It is most common in cold damp seasons and in low marshy localities. In so rapid and fatal a disease, medical advice ought to be immediately obtained. Bleeding, except by leeches, is not now generally approved of by medical men: some recommend emetics and purgatives; others opium and calomel. Warm bathing, or sponging with warm water, should be had recourse to, as well as the inhalation of a watery vapour.

CROW, COMMON, or CARRION, *kro* (Sax. *crawe*) (*Corvus Corone*).—This common British bird is, perhaps, as well known, and at the same time as little liked, as any feathered creature. The farmer hates him for his appetite; the rural inhabitants hate him because so does the farmer; and, on account of his sombre attire, unmusical voice, and carrion propensities, those unconnected with the agricultural interest are seldom squeamish about the fate of a crow, nor apt to regard as aught but a justly-punished criminal the wide-spread and gibbeted carcass of poor *corvus* set out, as in a pea-field, as a warning to its relicts. Only it happens that the crow is gifted with an extraordinary amount of intelligence, he would, ere this, have been banished from the face of the land. The carrion crow is spread over the Old and New continents, and feeds, like the ravens, on any sort of animal offal, or, when this is not attainable, on worms, moles, mice, caterpillars, grubs, beetles, &c. In the winter it associates with the rooks, and may be seen with them busily turning over the earth in search of food. The nest, like that of the rook, is constructed at the summit of a tree of slender branches, matted with clay and horsedung. The hen lays four or five eggs of a palish green, sometimes blurred and spotted with a darker colour. They lay but once in the year, unless the young or the eggs be destroyed by accident. It is said that the crow may be domesticated, and taught to speak as distinctly as the raven. "The carrion crow will feed voraciously on ripe cherries; and in the autumn he will be seen in the walnut-trees, carrying off from time to time a few of the nuts. With the exception of these two petty acts of depredation, he does very little injury to man during nine or ten months of the year; and if in this period he is to be called over the coals for occasionally throttling an unprotected leveret or a stray partridge, he may fairly meet the accusation by a set-off in his account of millions of noxious insects destroyed by him. However, in the spring of the year, when he has a nest full of young ones to provide for, and when these young begin to give him broad hints that their stomachs would like something of a more solid and substantial nature than mere worms and caterpillars, his attention to game is enough to alarm the stoutest-hearted squire or henwife. These personages have long sworn an eternal enmity to him, and he now, in his turn, visits, to their sorrow, the rising hopes of the manor with ominous aspect; and he assaults the broods of the duck-pond in revenge, as it were, for the many attempts both squire and henwife have made to rob and strangle him."—(*Waterton.*) The hooded crow (*Corvus Cornix*) is rather smaller than the preceding, with black head, throat, wings, and tail. Its name is derived from the contrasted black head and grey body. It is more ferocious than the carrion crow, and has been known to pick out the eyes of lambs, and even of horses helplessly hampered in bogs. In certain parts of the Faroe Islands it is no uncommon thing for these birds to assemble in great force, say a thousand in number, and, while the rest appear to sit wrapped in the profoundest attention, *one* or another will flutter his wings and "caw" at a tremendous rate. When he has done, another begins; and so the meeting continues for an hour or so. Then they break up, and it is not uncommon to find one or two birds left behind dead. The natives have a belief that these meetings refer to the criminal behaviour of some of the flock, and that they, if found guilty, are executed on the spot. The Alpine crow, or chocard (*Pyrrhocorax alpinus*), has the compressed arched and sloped beak of the blackbird; but its nostrils are covered with feathers like those of the crow, to which it has been annexed. It builds in the clefts of rocks of the higher mountains, descending in immense flocks to the valleys. The nutcracker crow is, although not a true crow, allied to the family in several particulars. It is not uncommon in many parts of Europe, but rarely visits England. Pennant remarks, that the specimen from which his description was taken was the only one that he had ever heard of that was shot in the three kingdoms.

CROWBERRY. (*See* EMPETRACEÆ.)

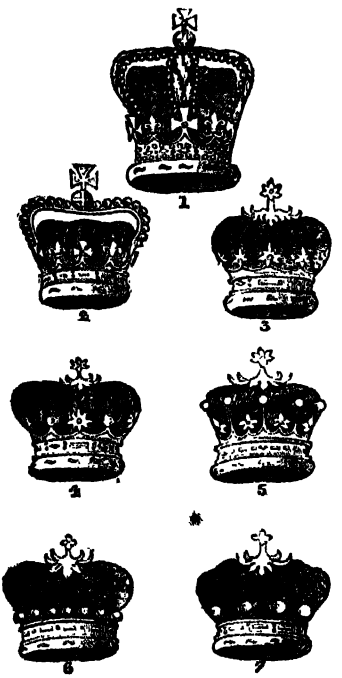
CROWN, *krown* (Lat. *corona*), an ornament placed upon the head, denoting regal or imperial dignity. Crowns were originally garlands formed of leaves, and in that form have been used by almost every nation. The regal crown first originated in the diadem, which was a fillet fastened round the head and tied behind. It is represented in the statues of Jupiter, the Ptolemies, and the kings of Syria. Kings were, however, generally distinguished by a fillet of a different colour from that usually worn. It was mostly in the form of a golden band, which, in time, began to form the basis of raised ornamental work, studded with costly jewels. The crown was used by the ancient Greeks as an emblem of office, as an ornament for victors at public games, and as a mark of distinction for citizens who had specially served their country. Amongst the Romans the crown was still more generally used. The *corona obsidionalis* was the crown most highly prized. It was bestowed by an army or beleaguered garrison on the general who rescued them. It was made of leaves or wild flowers gathered on the spot. The civic crown, composed of oak-leaves and acorns, was the crown next



1. CIVIC. 2. VALLARIS. 3. MURALIS. 4. NAVALIS.

in esteem. It was bestowed upon any soldier who saved the life of a Roman citizen in battle. The man who gained it was entitled to many privileges. The mural crown, made of gold and surmounted with turrets or battlements, was bestowed upon the soldier who first scaled the ramparts of a besieged city. The *corona vallaris* was bestowed on the person who first mounted the rampart or entered the camp of an enemy; and the *corona navalis* was bestowed on him who first boarded an enemy's ship. Both the mural and civic crowns are used at the present time in heraldry. The triumphal crown was of three kinds, and was bestowed upon generals who had obtained a triumph. Several other crowns of different forms were worn by the Romans. Among these may be mentioned the sacerdotal crown, sometimes made of gold, sometimes of ears of corn, and sometimes of olive-leaves. It was worn by the priest and bystanders during a sacrifice. The funeral or sepulchral crown was placed upon the head of the dead. In Greece these crowns were usually made of parsley. The convivial crown was a wreath of flowers worn on festive occasions. The nuptial crown was a wreath of verbena plucked by the bride and worn by her. The natal crown was a chaplet hung over the door of a chamber where a child was born.—(*Ref.* Smith's *Dictionary.*) The crown is a term often used in Great Britain in order to designate the state; as, crown ministers, crown lands, &c. In an ecclesiastical sense, the term crown is used to denote the clerical tonsure of the Roman Catholics. (*See* TONSURE.) The crown of Great Britain (1) is a circlet of gold, surmounted alternately with four crosses and four fleurs-de-lis. Four arch-diadems, enriched with pearls, arise from these, and close under a mound en-

signed with a cross pattée. The gold circle is also adorned with diamonds, sapphires, rubies, pearls, &c. The crowns worn by princes and noblemen are called *coronets*; that of the prince of Wales (2) is composed of a circle or fillet of gold; four crosses pattées are placed round the edge between the same number of fleurs-de-lis. From the two centre crosses a bent arch extends, surmounted by a mound and cross. The coronet of a duke (3) is a circle of gold, richly chased, having on the



CROWN AND CORONETS.

edge eight strawberry-leaves; that of a marquis, (4) a circle set round with four strawberry-leaves, and as many pearls interposed on pyramidal points. In an earl's coronet (5) there are eight pearls, set on pyramidal points, and eight strawberry-leaves, which are lower than the pearls; that of a viscount (6) is surrounded with pearls only, the number being unlimited; a baron's coronet (7) has only six pearls, all at equal distances. All the coronets of the British nobility, as at present worn, surround caps of crimson velvet, turned up with ermine. Viscounts and barons had no coronets allowed them until after Queen Elizabeth's reign. The coronet of the kings-at-arms is a plain fillet of gold with sixteen leaves, half of which alternately are higher than the others. *Miserere mei Deus* is the motto on the band.

**Crown Lands**, the lands, estates, or other real property belonging to the crown or sovereign. The crown lands of England are now contracted within narrow bounds, having been granted away at various times to subjects. William III. so impoverished the crown property in this way, that an act was passed by which it was decreed that all grants of crown lands for more than thirty-one years are void.

**Crown-post**, *krown-poast*, in Build., the name given to the vertical truss or post that rises from the horizontal tie-beam of two rafters to the point in which the rafters meet. It is also called a king-post. This formation is also found in what is called a king-post partition, in which the vertical timbers between the joists at the top and bottom of the partition are strengthened by struts slanting like rafters which bear on the lower corners of the frame-work, and are fitted into a central vertical king-post near the top of the partition. In this case the crown-post ties the horizontal joists of the partition, and affords a means of support to the centre of the floor above.

**Crown-work**, *krown'-wurk*, in Mil., the name given to outworks of a peculiar form, somewhat resembling the general outline of a crown, situated beyond the principal works of any fortified place. They were formerly called horn-works, consisting of two converging flanks, connected at the ends nearest the country by a rampart with a re-entering angle in the centre, the whole work being like the letter M in form. The most common form now adopted by military engineers for a crown-work is that of a front consisting of two of the faces of a regular polygonal fortification, such as surrounds a citadel, or, in other words, a projecting bastion in the centre of the work, with a demi-bastion on either side, connected with it by curtains inclined to each other at a certain angle. This front is connected with the main works by long flanks from the salient angles of the demi-bastions, converging as they approach the works: the whole is surrounded by a ditch which joins the main ditch. Sometimes a ravelin is constructed to defend the curtain of the weakest face of a ' tification, and strengthened by a surrounding crow . ork. The best example of this kind of work is th double crown-work at Metz, executed by Cormontaingue.

**Crozophora**, *kro-zo-fó'-ra*, in Bot., a gen. of plants belonging to the nat. ord. *Euphorbiaceæ*, and containing one remarkable species, namely, *C. tinctoria*, a native of the south of France. This yields, by expression, a green juice, which is converted, by the combined action of ammonia and the air, into the purplish dye called *turnsole*.

**Crucible**, *kru'-se-bl* (Ital. *crociuolo*).—In Chem., crucibles are vessels made of some material capable of resisting a high temperature, used by chemists and metallurgists for fusing metals or chemical compounds. According to the material to be melted and the heat required for fusion, they are made of platinum, iron, plumbago, porcelain, clay, or lime. Those made of hard refractory clay, such as the Cornish or Hessian crucibles, are most usually employed. They will stand a very high heat without melting. Plumbago crucibles serve a double purpose, acting not only as vessels, but as reducing agents. Platinum crucibles are used in operations where a clay crucible would be acted on by the fluxes employed. Where a very high temperature is required, as, for instance, in melting platinum, a lime crucible is used. Lately, Messrs. Johnson and Matthey have introduced crucibles made of an alloy of platinum and iridium, which have many advantages over those made of platinum only. (For an account of the manufacture of plumbago crucibles, *see* Plumbago.)

**Cruciferæ**, or **Brassicaceæ**, *kru-sif'-e-re* (Lat. *crux*, cross; *fero*, I bear), in Bot., the Cruciferous or Cabbage fam., a nat. ord. of dicotyledonous plants in the sub-class *Thalamiflorœ*, having the following well-marked characters:—The leaves are alternate, and without stipules. The flowers are usually arranged in racemes, are generally without bracts, and mostly yellow or white, seldom purple, sometimes a mixture of these colours. The sepals are four in number,—deciduous, imbricate, or valvate. The petals are also four,—hypogynous, cruciate, alternate with the sepals, and deciduous. The stamens are tetradynamous (six in number, four of which are long and two short). The thalamus is furnished with green glands placed between the stamens and the ovary. The ovary is superior, one-celled, or usually two-celled, in consequence of two parietal placentæ meeting in the middle and forming a spurious dissepiment or partition. Stigmas two, situated opposite the placentæ. The fruit, which is termed a *siliqua* or *silicula*, is one-celled, or spuriously two-celled, and one- or many-seeded. The seeds are stalked, and have no albumen. The order is one of the most natural known, and is eminently European. There are 195 genera, consisting of about 1,600 species, which are principally herbaceous plants. If ordinary care be observed, they are not likely to be confounded with plants of any

other order except *Capparidaceæ*. The cruciferous flowers may, however, be always distinguished from those of the latter order by their stamens, which, though always tetradynamous, are never raised above the corolla upon a lengthened thalamus or stalk. The general properties of the *Cruciferæ* are almost as definite as the botanical characters. The possession of antiscorbutic and stimulant properties, combined with an acrid flavour, may be said to constitute a universal character. The pungency of cruciferous plants depends on a volatile oil composed of carbon, hydrogen, nitrogen, oxygen, and sulphur. An oil expressed from the seeds is one of the most important products. None of the plants of the order, with one or two doubtful exceptions, are poisonous; many of them are esculent vegetables. The disagreeable odour emitted by them when decaying is attributed to the sulphur and nitrogen which they contain. (*See* BRASSICA, CRAMBE, NASTURTIUM, SINAPIS.)

CRUCIFIXION, *kru-se-fix'-shun* (Lat. *crux*, a cross, and *facio*, I make), was one of the most ancient modes of inflicting the punishment of death. At first, probably, it was inflicted by merely fastening the victim to a tree and leaving him thus to perish of want, or to be devoured by wild beasts. Afterwards crosses, or cross pieces of wood, in various forms, came to be used. The usual forms of cross were that resembling the letter X, commonly called the St. Andrew's cross; that in the form of the letter T, consisting of an upright piece of timber with a transverse piece on the top; and the let-in cross, in which the transverse piece of timber was let into the upright, but at some distance from the top, somewhat in this form †. The cross was used as an instrument of punishment by almost all the nations of antiquity,—the Greeks, Romans, Carthaginians, Jews, Syrians, Persians, &c. Its use was abolished throughout the Roman world by Constantine, out of respect to the feelings of the Christians, and since that time it has gone out of use. Among the Carthaginians, crucifixion was inflicted on all ranks of individuals, but among the Romans it was confined to slaves and the vilest malefactors. Among the latter the culprit was scourged prior to crucifixion, and was also forced to carry his cross to the place of execution. The sufferer was usually attached to the cross by means of nails driven through his hands and feet, but sometimes he was fastened with ropes. In order to hasten death, the legs were frequently broken, or the body pierced with a spear or other sharp instrument, otherwise the sufferer often lived for days upon the cross.

CRUELTY TO ANIMALS. (*See* ANIMALS, CRUELTY TO.)



CRUSADES, *kru-saids'* (Lat. *crux*, a cross), in the history of Europe, is the name given to certain religious wars carried on for the space of two centuries, between the Christian nations of the West and the Mohammedans, for the possession of Palestine. They received their name from the Christians engaged in them having adopted the sign of the cross. As long as the caliphs of Bagdad and their successors, the Fatimites of Egypt, were in possession of the Holy Land, the Christians had full liberty to visit the sacred places; but after the conquest of Palestine by the Turks, the pilgrims were subjected to cruel treatment, and Europe was filled with their complaints. At length, Peter of Amiens, known as Peter the Hermit, who had visited the Holy Land and witnessed the cruelties perpetrated by the Turks, set out on a pilgrimage through Europe, everywhere inflaming the minds of the people with accounts of what he had seen, and producing the most extraordinary excitement. The pope, Urban II., was not slow in taking advantage of this state of things, and, in 1095, summoned two councils, at which the war was agreed upon, and the 15th of August, 1096, was fixed for the departure of the army. The first army consisted of about 40,000 men, chiefly Frenchmen, Normans, Dutch, Germans, and Italians, but totally undisciplined. They marched through Hungary and Servia, where many of them perished, and the rest were totally defeated and almost annihilated by the Turks, at Nicrea, in Bithynia. It was succeeded, however, by a well-disciplined army of about 600,000 strong, comprising many of the nobility and the best soldiers in Europe, under the command of Godfrey of Bouillon, duke of Lorraine. They marched into Asia and took Nicæa, and afterwards Antioch and Edessa. At length, on the 15th of July, 1099, after a siege of about six weeks, they obtained possession of Jerusalem, and Godfrey of Bouillon was chosen king. For nearly half a century the conquerors not only maintained their position, but greatly extended their territories, till 1144, when the city of Edessa was taken by the emir of Mosul. A second crusade was preached by St. Bernard, abbot of Clairvaux, and two immense armies, estimated together at upwards of a million of men, were raised, under the command of Conrad III., emperor of Germany, and Louis VII., king of France. Through the treachery, however, of the Greek emperor, Manuel Comnenus, this vast army was all but destroyed by the Turks, and, after an unsuccessful attempt to reduce Damascus, the residue had to make their way back to Europe. The news of the capture of Jerusalem by Saladin (1187), and the fall of the Christian kingdom of Palestine, brought about the Third Crusade. The leaders of this new expedition were Frederick Barbarossa, emperor of Germany, Philip Augustus, king of France, and Richard Cœur-de-Lion, king of England. Barbarossa first took the field in 1189, and defeated the sultan at Iconium; but, in approaching Syria, he was seized with a fever, and died in 1190. Richard and Philip arrived in Syria some months later with a great army, and were joined by the army of Barbarossa. After a lengthened siege they obtained possession of the city of Acre; but Philip soon afterwards returned to France, and Richard concluded a peace with Saladin, in terms of which the Christians of the West were to be allowed to make pilgrimages to Jerusalem without molestation. The Fourth Crusade was intended, like the others, for the conquest of the Holy Land; but, instead of that, it directed its efforts against the Greek empire. Assembling at Venice in 1203, the doge of that city induced them to take the town of Zara, in Dalmatia, and afterwards they took up the cause of Alexius, whose father, Isaac Angelos, had been driven from the Greek throne by his own brother. They took Constantinople, and, after elevating to the throne several princes successively, they at length elevated to it their own chief, Baldwin, count of Flanders, giving him a fourth part of the empire, and dividing the rest among themselves. He and his successors held the empire of the East for upwards of half a century. The Fifth Crusade commenced by the march of a body of troops, under the command of Andrew II. of Hungary, against the Turks, in 1217. After a series of successes in Palestine and Egypt, they suffered a severe reverse before Cairo, and were obliged to sue for leave to return home in 1221. Five years later, Frederick II. of Germany put himself at the head of a considerable army, and set out for the conquest of the Holy Land. The expedition was successful, and Frederick, after receiving from the sultan possession of Jerusalem, and being crowned king, returned home in 1229. Jerusalem and Palestine having again fallen into the hands of the Turks in 1234, the Sixth Crusade was undertaken by Louis IX. of France in 1249. He marched into Egypt, took Damietta; but was afterwards defeated, the greater part of his army cut off, and himself taken prisoner. He obtained his liberty and that of his followers on agreeing to pay a heavy ransom, and then returned home. Louis, however, did not give up the idea of reconquering the Holy Land, and a few years later he originated the Seventh and last Crusade against the Holy Land. He died at Tunis, on his way to Palestine, and the command of the expedition devolved upon Edward, prince of England, afterwards Edward I. He marched into Palestine, took the town of Nazareth, but effected nothing further of consequence, and soon after returned home. Acre and a few other towns still remained to the Christians, and were defended for some time by the Templars and other military knights; but at length Acre capitulated in 1291, and the other towns soon after followed its example. How far the crusades have been of advantage or otherwise to the subsequent progress of Europe, is a question which has given rise to much discussion. They were undoubtedly carried on at an enormous expense of human life, and, in the end, produced no material result, while, during their continuance, they necessarily retarded all progress in

the peaceful pursuits of the arts or manufactures; but, on the other hand, we believe that they have exercised a most beneficial influence upon the civilization of Europe. The various nations of Europe were united together in one common cause, and taught to know and sympathize with each other; they were brought into contact with two new civilizations,—the Greek and the Saracenic, each more advanced and refined than their own; and commercial enterprise received from the crusades its first and its greatest stimulus.

Crusca, Accademia della, *kroos'-ka . ăk-ka-dai'-me-a del'-la* (Ital., the academy of the bran or chaff), was the name of one of the earliest, and one of the most celebrated of the societies of modern Europe. It was founded at Florence in 1582, chiefly through the exertions of the poet Antonio Francesco Grazzini, and was so called from its chief object being to sift or purify the national language. The great work of the academy was the "Vocabolario degli Accademici della Crusca" (or Dictionary of the Italian Language), which was first published at Venice in 1612, and has since gone through numerous editions, being still regarded as the standard authority on the Italian language. This society has recently been incorporated with two other societies, under the name of the Royal Florentine Academy.

Crust of the Earth. (*See* Geology.)

Crustacea, *krus-tai'-she-ă* (Lat. *crusta*, a hard shell), a class of articulated animals whose external covering is less solid than that of the majority of testaceous mollusca, but much firmer and harder than the skin of the naked mollusca. This tegumentary skeleton may be regarded as a kind of epidermis, for beneath it is found a membrane like the true skin of higher animals. At certain times this solid envelope detaches itself and falls off, as the epidermis of reptiles separates itself from their bodies. With the crawfish this shell-shedding, or *ecdysis*, as it is called, is preceded by a few days' sickness and fasting, and at that time the carapace, or upper shell, becomes loosened from the corium to which it is attached. The corium begins forthwith to secrete a new shell, which, at first soft and membranous, becomes gradually harder and harder, and is at last calcareous. When all connection is broken off, the animal sets about freeing itself of the incumbrance. It rubs its legs one against the other, and finally throws itself upon its back, and in that situation begins to swell out and shake itself, till it tears the membrane that attaches the carapace to the abdomen. The greatest difficulty occurs in freeing the extremities, nor could they be extricated at all, did not the old shell split longitudinally. The entire process is completed in half an hour; but it takes from twenty hours to three days for the conversion of the soft and membranous integuments into a firm case similar to that lately abandoned. While this transformation is taking place, the muscles of the animal are flaccid, and the flesh altogether unfit to be eaten. An exception to this rule, however, would seem to occur in the case of the land crab; for, according to all that has been written on the subject, the latter animal is never so delicious as during the moulting period.

Crypt, *kript* (Gr. *kruptein*, to conceal), a low chamber under a church or cathedral, with a vaulted roof, the groined arches of which spring from short but massive columns. Sometimes the crypt extends under the entire church, as at Canterbury cathedral; but they are generally of much smaller dimensions. Divine service was formerly performed in them, and they were also used as places of burial.

Cryptography. (*See* Secret Writing.)

Crystalline Lens, *kris'-tăl-line* (Lat. *crystallus*, a crystal; *lens*), in Anat., is the lens of the eye, a lenti-form pellucid substance, inclosed in a membranous capsule, and situated in a depression in the anterior part of the vitreous humour. (*See* Eye.)

Crystallization, *kris-tăl-li-zai'-shun*, in Chem., crystallisation may be defined as the spontaneous assumption of well-defined geometrical forms by bodies in passing from the fluid or aëriform state to the solid condition. Bodies not capable of assuming the crystalline form are termed *amorphous* or *colloid;* those which form crystals, *crystalloid*. When a substance crystallizes in two distinct forms, which cannot be derived from the same original, it is said to be *dimorphous*. Sulphur, for instance, will crystallize in octahedra or prismatic crystals. Some substances are even *trimorphous*. Sulphate of nickel crystallizes in right rhombic prisms, square-based octahedra, and oblique rhombic prisms, according to the temperature at the time of evaporation. Bodies crystallizing in similar forms are called *isomorphous*. The alums and fluor spar; carbon, gold, copper, and their compounds; the potassium compounds of chlorine, iodine, bromine, and fluorine, form *isomorphous* groups. Crystallization may be effected in several ways,—by evaporation, by sublimation, by fusion, or by slow electrical action. It sometimes happens that precipitates are thrown down in a crystalline form; thus, when tartaric acid is added to a solution of potash, the tartrate of potash falls down in minute crystals. Crystallization by evaporation is effected either by allowing a hot saturated solution of the salt to cool gradually or by spontaneous evaporation. In the former case the masses of crystals are small and confused. Where single perfect crystals are required, the method of crystal-feeding invented by Leblanc must be resorted to. A small but perfect crystal is first obtained by one of the methods mentioned, and placed in a cold concentrated but not saturated solution of the substance in question, after which the crystal is turned regularly twice every day, taking care to expose a fresh surface each time until the crystal has reached the desired size. As the solution becomes weaker, it should be replaced by a fresh quantity of the original strength. Great care must be taken not to use a saturated solution, otherwise fresh crystals will form in the vessel and on the original crystal. A glass plate may be used to lay the crystal on in the solution, and a pair of horn or box-wood tweezers are better than the fingers for turning it. By these means crystals of enormous size may be made. The solution should, as much as possible, be kept at the same temperature, and the crystal should be turned very regularly. Crystallization by fusion is resorted to in the case of metals and other insoluble substances. The metal or other body is melted in a ladle or crucible, and allowed to cool until the top crust is solid; it is then pierced with an iron rod, and the melted substance not yet solidified is allowed to run out. Fine masses of crystals of bismuth and sulphur may be obtained in this way. Many salts do not appear to be capable of crystallizing without holding a certain portion of water in combination, termed water of crystallization. Thus ordinary carbonate of soda has ten equivalents of water united with it. Some crystals part with this water very easily, losing their crystalline form and falling to powder merely by exposure to the atmosphere. Such salts are called *efflorescent*, in contradistinction to those which absorb water from the atmosphere, which are termed *deliquescent*. Many salts have the property of crystallizing without water of crystallization; others, again, crystallize in different forms, according to the number of equivalents of water they contain. Biborate of soda, or borax, for instance, crystallizes in prisms or octahedra, according as it contains ten or five atoms of water of crystallization. The forms which crystals assume are also influenced by the purity of the solution from which they are crystallized; for instance, iodide of potassium assumes a prismatic form when crystallized from a neutral solution, but if from one containing carbonate of potash, the resulting crystals are cubical. As to the force causing crystallization we as yet know but little; all we know at present is, that electricity and light both accelerate crystallization. If a weak voltaic current be passed through a solution of silica, it will gradually crystallize round the wires; and if camphor be exposed to the light, crystals will form thicker on the most illuminated side.

Crystallography, *kris-tăl-log'-grà-fe* (Lat. *crystallus*, a crystal; Gr. *graphe*, writing).—Although the forms of crystals appear to be infinite, yet, upon carefully considering their axes, angles, faces, and edges, they are found to fall into six well-defined groups, which are distinguished from each other by the relative positions and lengths of their axes. These six groups are again subdivided into divisions according to the arrangement of their planes with respect to their axes. The subject of crystallography is a very difficult one, and only to be learnt by means of an extensive series

of figures or models. It will therefore be necessary to treat the matter somewhat cursorily, referring the student to several standard works upon the subject. The six crystalline systems mentioned are:—1. *Regular system*, in which the axes are equal and rectangular. The cube, octahedron, and rhombic dodecahedron are the principal members of this system. 2. *Square prismatic*, in which two of the axes only are equal, all three being rectangular. 3. *Right prismatic*, in which all the axes are unequal, and all rectangular. It may perhaps assist the memory if it is borne in mind that in each of the above systems the whole of the axes are rectangular, while in the following three the axes are all inclined to each other. 4. *Rhombohedral*, in which the three axes are equal but not rectangular. 5. *Oblique prismatic*, one axis rectangular to two, but all unequal. 6. *Double oblique*, in which all the axes are unequal, and none rectangular. The forms belonging to different systems shade off gradually into each other. Thus, the cube, by being slightly increased on one of its faces, becomes a square prism; and the square prism, by having one of its sides slightly enlarged, becomes a right prism. Many forms are derived from each other by having slices removed from their angles or edges. Thus the octahedron may be modified into a cube by having its angles gradually sliced away, and into the rhombic dodecahedron by having its edges treated in the same manner. A few turnips or potatoes and a sharp knife will afford the student much information in this way. Thus alum, which crystallizes as an octahedron, is often found crystallized with its edges or angles sliced away, and approaching the form of one or other of the forms mentioned. (*See* also ISOMORPHISM and POLYMORPHISM.) The best books to consult on this subject are Dana's *Mineralogy* and Nicol's *Mineralogy*. There is also a short but excellent account of the subject in Odling's *Chemistry*, part I.

CUBE, *kube* (Gr. *kubos*, a die), in Geom., is a solid body terminated by six square equal faces, and occupying among bodies a place analogous to that of the square among surfaces. It is also called the hexahedron, by reason of its possessing six sides. One of the most celebrated problems in the history of geometrical science is the duplication of the cube, *i.e.* the construction of a cube which shall have twice the volume of a given cube. In the time of Plato, it was a constant subject of controversy with geometers, who, however, failed to solve the problem, because the straight line and circle, which were the only lines admitted into their calculations, are not sufficient for the cubation of solids.

CUBE ROOT is a number or quantity which, if multiplied into itself, and then again by the product, produces the cube; or, when twice multiplied into itself, produces the number or quantity of which it is the root. Thus 5 is the cube root of 125, because $5\times5=25\times5=125$.

CUBEBA, *ku-be'-bă* (Arab. *cubabah*), in Bot., a genus of plants belonging to the nat. ord. *Piperaceæ*. The species *C. officinalis*, a native of Java and Prince of [illegible] Island, yields the berries called cubebs, which [illegible]tensively employed in medicine for their peculiar [illegible]er of arresting excessive discharges from the urethra. Cubebs resemble black pepper, but may be distinguished by the network of raised veins on their surface, also by the short stalks which they possess.

CUBEBS. (*See* CUBEBA.)

CUBIT, *ku'-bit* (Lat. *cubitus*), a measure of length employed by the ancients, and more especially by the Hebrews. It was originally the distance from the elbow to the tip of the middle finger. According to some authorities, there were two cubits in use by the Jews,—the sacred and the common cubit. The former was twenty-one inches long and the latter eighteen inches. Calmet, however, states his belief that the second, or shorter cubit, was not introduced until after the Babylonian captivity. Hence Ezekiel's precaution (Esek. xl. 5) in speaking of the cubit as a cubit and a hand-breadth. The exact length of the cubit is not known; it has been stated to be 1 foot 9·888 inches, and a hand-breadth 3·684 inches, in the tables of measure affixed to several versions of the authorized Bible.

CUCKING-STOOL. (*See* DUCKING-STOOL.)

CUCKOO, *kook'-oo* (Lat. *cuculus*, Fr. *coucou*), (*Cuculus canorus*).—This bird, which derives its name from the peculiar sound of its note, is very widely diffused. It is found in India and in Africa, and migrates northward in summer, even to Lapland and Kamtchatka. It makes its appearance amongst us in April, and disappears again by about the middle of August. It would seem that love is a passion that occupies very little of the cuckoo's consideration. There is no pairing or continued attachment between the male and female, and the latter generally, if not always, lays her eggs in the nest of some other smaller bird, leaving their hatching and future maintenance to fate. The gratitude of the foster child is of a piece with its parent's heartlessness. Mr. Selby asserts that, when hatched, the young cuckoo has between its shoulders a depression in which it lodges any burden it wishes to carry to the edge of the nest for ejectment; that, at the expiration of twelve days, the hollow is filled up, and that, should the proper occupants of the nest chance to remain till then, the young cuckoo no more molests them. The hedge-sparrow, the pied wagtail, and the yellow-hammer, are the birds commonly selected by the cuckoo for imposition. In the early part of the summer of 1823, a cuckoo, having previously turned out the eggs from a water wagtail's nest, which was built in a small hole in a garden-wall at Arbury (the seat of Francis Newdegate, Esq.), deposited her own egg in their place. When the egg was hatched, the young intruder was fed by the water wagtails till he became too bulky for his confined and narrow quarters, and in a fidgety fit fell to the ground. In this predicament he was found by the gardener, who picked him up and put him into a wire cage, which was placed on the top of a wall not far from the place of his birth. Instead, however, of its foster parent the wagtail coming to feed it, there appeared at its prison-bars a friendly hedge-sparrow, who, day after day and at very frequent intervals, continued to bring it food, until it was well fledged and big enough to be set at liberty. Bishop Stanley relates an instance of an unfledged cuckoo being placed in the same cage with a young thrush. The cuckoo was either too idle or unable to feed itself; so the good-natured thrush kindly performed the operation for him. One day a tempting worm was offered at the wires, and at once the thrush went to it. Whether its original intention was to give it to its patient ward can never be known; if so, however, the sleek plump thing hanging in the thrush's very beak was too great a temptation: it swallowed it. It seemed that the cuckoo had made sure that the worm was coming up to him, and when he discovered his error he hopped fiercely down, and, with one blow of its cruel beak, took one of the thrush's eyes out. Even in this maimed condition the patient nurse continued to wait on its tyrant patient, and never ceased to do so till the cuckoo was big enough to shift for itself. The gilded cuckoo (*Cuculus auratus*) is an inhabitant of the Cape of Good Hope, and extremely common in Caffraria. It is a very beautiful bird, the chief of the plumage being brilliant green with golden reflections. It is about seven inches long. Like the common cuckoo, it deposits its egg in the nests of other birds, and, unless Vaillant was mistaken, in a way that puts aside the notion that the hen-cuckoo *lays* them where they are to be hatched by another bird. While out shooting with his man Kloac, he brought down a golden cuckoo with one of the eggs of its species, and evidently freshly lain, *in its throat*; and it then occurred to him that his attendant had frequently brought him a bird of this kind, with the exclamation, "This one dropped an egg as she fell from the tree." Later in the day another cuckoo was shot by Vaillant, with an egg in its gullet. "I was convinced from this circumstance," writes the sporting naturalist, "that the female cuckoo deposits



CUCKOO.

her egg in the nest of another bird by conveying it thither in her beak." Besides those noticed, there is the spotted cuckoo (*Oxylophus glandarius*), an inhabitant of the north of Europe; the oriental cuckoo (*Eudynamys orientalis*), found in the East Indies; and the yellow-billed American cuckoo (*Coccyzus americanus*), likewise called the cow-bird and the rain-crow.

CUCKOO-FLOWER. (*See* CARDAMINE.)

CUCKOO-PINT. (*See* ARUM.)

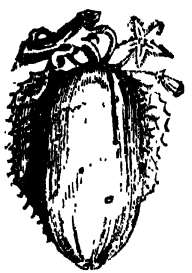
CUCUMBER. (*See* CUCUMIS.)

CUCUMIS, *ku-ku'-mis*, in Bot., a gen. of plants belonging to the nat. ord *Cucurbitaceæ*. The fruit of *C. sativus* is the common cucumber, and that of *C. Melo* the melon. The fruits of the species *C. Hardwickii* and *Pseudo-colocynthus* are said to be powerfully cathartic.



CUCUMBER.

CUCURBITA, *ku-kur'-bit-a* (Lat. *cucurbita*), in Bot., the typical gen. of the nat. ord. *Cucurbitaceæ*. The fruits of several species are employed as articles of food; thus, that of *C. Citrullus* is the water-melon, so highly esteemed for its cooling and refreshing juice; that of *C. ovifera* is the vegetable marrow, one of our most delicate table vegetables; that of *C. maxima* is the red gourd or pumpkin, which, when boiled, tastes like a young carrot; and *C. Pepo* is the white gourd, a favourite culinary vegetable on the continent. An oil, called *ecusi* by the inhabitants of Yorruba, in Africa, and largely used by them for dietetic and medicinal purposes, is supposed to be the produce of one or more species of this genus.



VEGETABLE MARROW.

CUCURBITACEÆ, *ku-kur-bit-ai'-se-e*, in Bot., the Gourd or Cucumber fam., a nat. ord. of dicotyledonous plants in the sub-class *Calycifloræ*. Upwards of 60 genera have been described, and these include more than 300 species. The plants are natives of hot climates in almost every part of the world; they abound in the East Indies, many occur in Peru and Brazil, a few are found in Europe and North America, and one species only, *Bryonia dioica*, in the British isles. They are all herbs with tuberous or fibrous roots, which are annual or perennial, and with stems which are generally succulent, and either prostrate or climbing by means of tendrils. The leaves are rough, alternate, and radiate-veined. The flowers are unsexual, monœcious, or diœcious. The calyx is monosepalous, and, in the female flowers, superior. The corolla is monopetalous, four or five-parted, sometimes fringed, with strongly-marked reticulated veins, perigynous, and occasionally scarcely distinguishable from the calyx. The male or sterile flower has generally five stamens, which are epipetalous, and either distinct, or monadelphous, or triadelphous, the anthers being two-celled, usually long and sinuous, rarely straight. Now and then male flowers are found with only two or three stamens. In the fertile or female flower the ovary is inferior, the style is short, and the stigmas are more or less dilated. The fruit is usually a pepo, as in the cucumber; or rarely a succulent berry, as in the bryony. The seeds are more or less flattened and exalbuminous. An acrid, bitter, purgative principle characterises the plants of this order, and is especially evident in the pulp surrounding the seeds. In some cultivated species the acridity is scarcely perceptible, and the fruits are edible. (*See* CUCUMIS, CUCURBITA.)

CUDBEAR. (*See* LECANORA.)

CUE, *ku*, the last words of a speech spoken on the stage, which the actor who is to answer catches and regards as an intimation to begin. It is also applied to any hint given to an actor on the stage, as to what he has to do or say.

CUIRASS. (*See* BREASTPLATE.)

CUIRASSIERS, *kwe-ras-seers'* (Fr. *cuirasse*, breastplate; Lat. *corium*, a hide), the name given in continental armies to heavy cavalry wearing cuirasses, or metal back- and breastplates. We have no cavalry so called in the British army, although the Life Guards and Horse Guards wear cuirasses. The cuirass was originally formed of thick leather, which was ball-proof,—whence its name; but when this material was no longer used, the name was retained, and applied to the metal plates which superseded the leathern armour.

CULDEES, *kul'-deez*, the name given to an ancient religious order of ecclesiastics that existed in Ireland, Scotland, and the northern parts of England. The derivation of the name is uncertain, some tracing it to the Gaelic, others to the Latin. According to Buchanan, it is a corruption of *cultores Dei*, worshippers of God. The time of their first appearance, and the character of their institutions, have been no less matter of dispute than their name. Some date their origin from the middle of the 6th century, and attribute their institution to Columba, who came over from Ireland to the island of Iona, on the west coast of Scotland, where he established a monastery, and from which he sent forth his disciples to diffuse the knowledge of Christianity. Having no correspondence with the see of Rome, they are said to have been free from the corruptions that, at a later period, crept into that church, as saint and relic worship, auricular confession, penance, &c.; and their time for the celebration of Easter differed from that of the Church of Rome. They prosecuted their missionary labours throughout Ireland, Scotland, and the northern parts of England, and established flourishing settlements in various parts, after the model of Iona. Many of these were in the form of colleges, where instruction was given to youth. In Scotland their chief settlements were, besides Iona, on the island of St. Serf in Loch-leven, at St. Andrews, Dunkeld, Abernethy in Perthshire, Monifoth near Dundee, and Monymusk in Aberdeenshire. The Culdees gradually lost their power before the growing influence of the Church of Rome; the erection of bishopries under the patronage of the kings of Scotland being a death-blow to their independent existence; and their suppression is generally dated from the end of the 13th century, when the Culdees of St. Andrews made their last attempt at resisting the usurpations of the bishop of that see, though it is generally believed that numbers continued to hold their principles down nearly to the time of the Reformation. There are others who hold that there is no trustworthy evidence of the existence of the Culdees prior to the middle of the 9th century; that there is no reason to suppose that they differed in any material point of faith, discipline, or ritual from the Church of Rome; and that, in reality, they were a more collection of monastic institutions in connection with the Catholic hierarchy.

CULEX, *ku'-leks* (Lat., a gnat), in Ent., a gen. of the *Diptera* or two-winged insects, constituting the Gnat fam. They are characterized by their length of proboscis and their finely-tufted antennæ. (*See* GNAT, MOSQUITO.)

CULM, *kulm*, in Min., a slaty kind of anthracite, occurring in Wales and North Devon. The strata in which it is found are often called the *culm measures*.

CULMINATION, *kul-min-ai'-shun* (Lat. *culmen*, the top of anything).—When any heavenly body is on the meridian, it has then attained the highest point of its daily course, and is therefore said to culminate. The sun culminates at mid-day, the moon at midnight, when it is full moon.

CULTIVATION OF THE SOIL, *kul-tiv-ai'-shun*, the art of preparing the soil for those particular crops which it is required to bear. The ordinary agricultural implements used for this purpose are the plough, the spade, and the hoe. In some modified form these instruments have been in use among all nations, at all times. The soil, by their means, is stirred and exposed to the action of the atmosphere, and loosened, so that the roots of plants may make their way more easily

through it. Other objects are also effected by complete inversion and careful cultivation of the soil. The surface-plants are buried and allowed to decay; water in excess passes through it in wet weather; and in dry seasons more moisture is retained. In dry climates the soil requires to be well ploughed and rolled, but in wet climates these operations must be restricted.

CULVERIN, *kul'-ver-in* (Fr. *coulevrine*), the name of a piece of ordnance, used in the 16th and 17th centuries, of great length, and formed to throw a ball to a considerable distance. It was 5½ inches in the bore, and threw a ball about 18 lbs. in weight. The bore of the demi-culverin was 4 inches, and the weight of the ball about 9 lbs. Queen Elizabeth's pocket pistol at Dover Castle is a culverin.

CULVERT, *kul'-vert*, a barrel-drain of small diameter, or an arched water-course for the conveyance of water under roads, railways, embankments, and canals.

CUMINUM, *ku-mi'-num* (Gr. *kuminon*), in Bot., a gen. of composite plants. *C. Cyminum*, the cumin, is a dwarf fennel-looking plant, cultivated in the south of Europe and Asia Minor for its fruits, which are hot and aromatic, like those of the caraway and anise.

CUNEIFORM, *ku-ne'-e-form* (Lat. *cuneus*, a wedge, and *forma*, form), is the name given to an ancient species of written language found on the monuments of the ancient Assyrian, Babylonian, and Persian empires. It is so called from the letters being composed of parts resembling a wedge, a nail, or an arrow-head. It is found carved in rocks and sculptures, or stamped on bricks and tiles; and is met with on the ancient monuments of Persepolis, and other cities of the Persian empire, among the ruins of Babylon and Nineveh, and even in Egypt. It appears to have been first employed in Assyria and Media, and to have subsequently spread over the whole extent of the Persian empire. There are three distinct alphabets or kinds of cuneiform writing, and which are mostly found together in parallel columns, being translations of each other. The most ancient of these is the Assyrian, which consists of about 400 different characters, and is the one which has given most trouble to philologists, and in which least progress has been made. The second of these is called the Median, which is a modification of the first, and consists of about 100 characters. The most recent is the Persian, which consists of only 39 to 41 letters. It is much more refined than the others, and the forms are much less complicated. The letters here are all very distinctly formed, none being at all doubtful, and the words are separated from each other by an oblique stroke. This language is believed to be the original of the modern Persian, and to be nearly allied to the Sanscrit. There is every reason to believe that the employment of the cuneiform character originated in Assyria, while the system of writing to which it was adapted was borrowed from Egypt. "The whole structure of the Assyrian graphic system," says Rawlinson, "evidently betrays an Egyptian origin. The alphabet is partly ideographic and partly phonetic, and the phonetic signs are in some cases syllabic, and in others literal. Where a sign represents a syllable, I conjecture that the syllable in question may have been the specific name of the object which the sign was supposed to depict; whilst in cases where a single alphabetical power appertains to the sign, it would seem as if that power had been the dominant sound in the name of the object." Much progress has already been made in deciphering these ancient records, from which we may expect much light to be thrown on the early history of the world. The first accounts of the cuneiform characters were brought to Europe about the beginning of the 17th century, and some time afterwards imperfect copies of them were published. The first publication of a connected inscription was made by Le Bruyn at Amsterdam, in 1714; and, subsequently, Niebuhr published copies of some which he had found at Persepolis and elsewhere, and which were more accurate than any that had appeared before. Still, for long after this, nothing was done towards the deciphering of the language. Many, indeed, were of opinion that they belonged to no language,—that they were mere ornaments carved at the caprice of the architect, or charms, or talismanic signs; while at least one author saw in them only the destructive work of worms. Grotefend, of Hanover, was the first that made any progress in the deciphering of these characters, and brought the result of his labours before the Academy of Göttingen in 1802. The labours of Grotefend were not followed up by others for the next twenty years; but since that time there have been many able and active labourers in the field; among whom we may mention Rask, Burnouf, Lassen, Westergaard, Rawlinson, Renau, Norris, Hincks, Oppert.

CUNONIACEÆ, *ku-non-e-ai'-se-e*, in Bot., a nat. ord. of dicotyledonous plants in the sub-class *Calycifloræ*. They are nearly allied to the *Saxifragaceæ*, but differ from them in being trees or shrubs, with opposite leaves and large interpetiolar stipules. They are natives of South America, the Cape, the East Indies, and Australia. Most of them have astringent properties, and some have been used for tanning.

CUPANIA, *ku-pai'-ni-a* (in honour of Cupani, an Italian monk and botanist), in Bot., a gen. of plants belonging to the nat. ord. *Sapindaceæ*. The species *C. sapida* flourishes in the West Indies, and is in some respects a valuable and interesting tree. The distilled water of the flowers is used by the negro women as a cosmetic, and the succulent, slightly acid arillus of the seed is eaten for dessert. The fruit containing the seeds is commonly known as the akee-fruit.

CUPEL, *ku'-pel* (Lat. *cupella*), in Chem., a small cup made of bone ashes, used for extracting base metals from gold and silver. The compound, on being heated in the cupel, loses the base metals by their becoming oxidized, and sinking into the cupel. (*See* ASSAYING.)

CUPELLATION, in Chem. (*See* ASSAYING.)

CUPULIFERÆ, *ku-pil-i-fer'-e*, in Bot., a name given by some botanists to the Oak or Mastwort order. (*See* CORYLACEÆ.)

CUPOLA. (*See* DOME.)

CUPPING, *kup'-ping* (from the cup-like form of the glasses employed), in Surg., is the application of cupping-glasses, from which the air has been previously extracted, to the skin, with the view of attracting blood to the part, and, if necessary, abstracting it. Cupping was practised by the ancients, and is frequently had recourse to in the present day. In performing the operation, the part is first washed with warm water, in order to promote the flow of blood to it, and then a small bell-shaped glass, from which the air has been partially expelled by holding it for an instant over the flame of a spirit-lamp, is immediately applied to the spot, and the usual amount of pressure on the part being thus diminished, the blood flows towards it, producing a distension of the blood-vessels and an elevation of the surface. This is called *dry cupping*, and is frequently of great service in the removal of certain kinds of pain. Several glasses may be used, and usually the operation is repeated five or six times. The glass is readily removed by inserting the nail of a finger between the edge of it and the skin, so as to admit the air. When it is intended to abstract blood, the cupping-glass is removed as soon as the part is sufficiently swollen, and the scarificator applied to it. This instrument contains a number of lancets (usually about ten or twelve), which, by touching a spring, are made to inflict a corresponding number of wounds, the depth of which may be regulated by the operator. Immediately on the wounds being made, the cupping-glass is applied, exhausted as before, and the blood allowed to flow into it until a sufficient quantity has been abstracted. If the blood coagulates, or the glass be full, it should be carefully removed, and the part sponged with warm water, and the glass again applied to it. Cupping is preferable to any other method of blood-letting in many kinds of inflammatory disease.

CUPRESSUS, *ku-pres'-sus* (Gr. *kuo*, I produce; *parisos*, equal; because it bears equal branches), in Bot., the Cypress, a gen. of plants belonging to the nat. ord. *Coniferæ*. *C. sempervirens* is a common timber-tree in some parts of the Levant. Its dark foliage is particularly impressive when seen near architectural works; and on this account the tree was always planted by the Moors round their splendid palaces, and by the Romans near their villas. In the burial-grounds of Turkey and Arabia, the tombs of the faithful are generally shaded by the cypress. The timber of this and other species is very durable, and is said to resist the worm. The doors of St. Peter's church at Rome are of cypress-wood, and have lasted

upwards of 1,100 years. It is supposed that the gopher-wood of the Bible was chiefly obtained from species of this genus.

Cupric Acid, *ku'-prik*, in Chem.—This acid never occurs in a separate state. When finely-divided copper is fused with nitre and hydrate of potash, a cuprate of potash is formed, which is an exceedingly unstable salt, easily decomposed with potash, oxygen, and copper.

Cuprite, *ku'-prite*, in Min., the red oxide of copper, which is also known as octahedral copper-ore, from the form of its crystals.

Curaçoa, *ku-rà-so'*, a sweet and agreeable liqueur, obtained by digesting orange-peel in sweetened spirits, and flavouring with cinnamon and cloves or mace. It is made in great perfection by the Dutch in the islands of Curaçao, from which it derives its name. The spirits employed in its manufacture are usually reduced to nearly 50 under proof, and each gallon contains about 3¼ lbs. of sugar. Curaçoa varies in colour, the darker kinds being produced by digesting in it powdered Brazil-wood, and mellowing the colour by caramel or burnt sugar.

Curate, *ku'-rait* (Lat. *cura*, care), literally signifies a person who has the care of souls, and in this sense it is used in the English Book of Common Prayer. Commonly, however, it is used to denote the lowest degree in the Church of England,—the person who is employed under the spiritual rector or vicar, either as assistant to him in the same church, or else in a chapel-of-ease within the same parish belonging to the mother church. A curate has to be licensed and admitted by the bishop of the diocese, or by an ordinary having episcopal jurisdiction, who also usually appoints the salary; in which case, if he be not paid, the curate has a proper remedy in the ecclesiastical court; but if he be not licensed by the bishop, he only has his remedy at common law. A curate not licensed may be removed at pleasure; but if licensed, he can only be removed by consent of the bishop, or where the rector or vicar does duty himself. A curate having no fixed estate in his curacy, not being instituted and inducted, may be removed at pleasure by the bishop or incumbent, and in such case he is usually termed "stipendiary." Where, however, the profits of a benefice are impropriate, so that both the rector and the vicar are or may be lay, the curate is "perpetual," and not removable, being the clerk employed to officiate by such impropriators. A curate, before being licensed, must subscribe to the Thirty-nine Articles and the three articles of the 36th canon; must declare his conformity to the united Church of England and Ireland; and must take the oaths of allegiance, supremacy, and canonical obedience. In general, the stipends paid to curates are still miserably small, though they have been much improved by a recent enactment. By 1 & 2 Vict. c. 106, certain rules are laid down for fixing the amount of stipend to be paid to curates by non-resident incumbents. The lowest stipend is fixed at £80, or the whole value of the living if less than that sum. Where the population amounts to 300, the stipend is to be £100; where 500, £120; where 750, £135; and where 1,000, £150; or the whole value of the living, if less than these sums.

Curator, *ku-rai'-tor* (Lat. *curare*, to take care), an officer among the ancient Romans, whose duties were very varied. In civil law, a curator was one appointed to administer the estate of any person not legally competent to manage his own property. Every person under age who was not under paternal or domestic rule, was put under the superintendence of a guardian. Up to the age of fourteen in a male minor, and twelve in a female, this guardianship was styled tutelage; from that time to the age of twenty-five it was called curatorship. The tutor, or the first guardian, was the legal *alter ego* of the minor; but the curator was merely the representative of his ward and the ordinary administrator of his rights. Persons who recklessly squandered away their money were placed under the superintendence of a curator. Deaf and dumb persons were also considered to be legally unable to administer their affairs, and were put under similar guardianship. The *curator bonorum* was a trustee for the administration of the affairs of absent or deceased persons, and also of insolvent debtors. After the time of Augustus several public officers were appointed who held the title of curator. There were curators of the roads, who had the superintendence of the planning and repairing of the roads; the curators of public works, who had the superintendence of the public buildings, theatres, aqueducts, &c.; the curators of the river, who were the conservators of the Tiber. There were also other curators, who had the superintendence of the public games; others who administered the landed property of municipia; and others who distributed corn among the people. In the universities and in learned societies, the officers who have charge of libraries, museums, collections of natural history, &c., are called curators.

Curb-stone, *kerb*, the line of stonework which borders the footpath of a road. It is generally made of a hard durable stone, such as granite.

Curcuma, *kur-kw'-mà* (Arab. *curkum*), in Bot., a gen. of plants belonging to the nat. ord. *Zingiberaceæ*. The dried tubers or rhizomes of *C. longa* constitute the *turmeric* of the shops. Turmeric is extensively cultivated in almost every part of India, being employed as a condiment by the natives. It forms the principal ingredients of curry-powder, giving to that compound its peculiar colour and bright yellow colour. In this country it is used for dyeing yellow, and for making turmeric-paper, which is used as a test for free alkalies, being turned by these from a yellow to a reddish-brown colour. As a medicinal agent, turmeric is a mild aromatic. The rhizomes of another species, *C. angustifolia*, contain much starch, which, when extracted, forms East Indian arrowroot, or curcuma starch.

Curfew, *kur'-few* (Fr. *couvre feu*, cover fire), the ringing of a bell as a signal to the inhabitants to extinguish their fires. This practice originated in England through William the Conqueror, who ordained, under severe penalties, that, upon the ringing of a bell at eight o'clock in the evening, all lights and fires should be put out, and every one should go to bed. The custom of ringing the curfew-bell about eight o'clock is still kept up in many places, though its original significance is lost. The law by which it was ordered to be rung was repealed by Henry I., in 1100. The practice of putting out fires so early was highly necessary to prevent accidents, at a time when hearths were placed in the middle of the floor, under an opening in the roof to allow the smoke to escape. This hole was covered up when the family retired to bed. A prayer-bell is often rung about eight o'clock in some Protestant countries. This custom arose out of the curfew-bell. Pope John XXXIII., fearing the approach of misfortunes, ordered that every one, on hearing the curfew, should repeat three Ave Marias. The practice of ringing the curfew-bell existed on the continent long before the Norman conquest.

Curia, *ku'-re-à* (Lat.), signifies both a division of the Roman people and the place of assembly for such a division. Each of the three ancient Romulian tribes, the Ramnes, Tities, and Luceres, was subdivided into ten curiæ. The plebeians had no connection with the curiæ, and the clients of the patricians were members of the curiæ only in a passive sense: thus the curiæ alone contained those that were real citizens, and their assembly alone was the legitimate representative of the whole people. Each *curia* had its own place of worship, which was superintended by a priest, *curio*, who was assisted by another, called *curialis flamen*. The word *curia* is also used to designate the place in which the senate held its meetings; as, curia Hostilia, curia Julia curia Pompeii, &c.

Curia, in Arch., the building in which the higher council of the state met, in a Greek or Latin city. It is described by Vitruvius as being adjacent to the forum. Its form was quadrangular, either square or oblong. Halfway up each wall there was a projecting shelf, or cornice, to prevent the voice being lost in the height of the building. A sort of religious character was conceived to belong to the senate-house, and there were often statues of the gods placed in it.

Curlew (*Numenius arquatus*), *kur'-lew* (Fr. *courlis* or *corlieu*).—The gen. to which this bird belongs is characterized by a long, slender, incurved bill, slightly compressed and furrowed for three-fourths of its entire length; it has a blunt tip; wings ample; tarsi naked

above the joints. In length the curlew measures about two feet, and, in the case of the male, the whole plumage is bright ash-colour, with longitudinal brown spots on the head and breast; upper mandible blackish brown; lower mandible flesh-colour; iris brown; feet deep ash. The curlew is very common in most parts of Europe, and occurs in parts of Asia. It inhabits the vicinity of waters and marshy wastes, and feeds on earth-worms, slugs, small testaceans, and insects. Its nest, a careless construction of dried grass and leaves, is usually placed among the rushes. Its eggs are large, over two and a half inches in length, of an olive-green colour blotched with deep brown.

CURLING, *ker'-ling* (Teut. *krullen*), a common sport among all classes, played upon the ice in Scotland. The sport is regulated by certain rules issued by the Caledonian Curling Club, and artificial shallow pieces of water are maintained for the purpose of playing it. The game is played with flat round stones about 9 inches in diameter, and about 30 to 45 lbs. in weight. Each stone, of which every player has a pair, has a handle. A piece of ice is chosen, about 35 yards long and 8 or 9 feet broad, which is called the *rink*. The players choose sides, and points with circles round them, called *tees*, are marked off at either end. The number of points required to make game is usually 31, and the sides play alternately. The principal object of the curler is to drive his stone towards the tee. Much depends upon throwing it with strength, as well as discretion; for it is often necessary to drive away the stone of an adversary which has obtained a favourable place. The game is generally played with great keenness. It has of late years been introduced into England and Canada.

CURRANTS, *kur'-rănts* (from *Corinth*, where they were originally grown), the dried fruits of a variety of the grape-vine, now extensively cultivated in Zante and several other of the Greek islands. About 20,000 tons of these minute raisins are annually imported into this country. (*See* VITIS.) The currants of English gardens, red, white, and black, are the produce of species of *Ribes* (which *see*).

CURRENCY, *kur'-ren-se* (from Lat. *curro*, I flow or run), in Pol. Ec., denotes the circulating medium of a country, that by which sales and purchases are effected without having recourse to barter. Among savage nations various kinds of articles have been used as a circulating medium; but as nations became more civilized, the precious metals, particularly gold and silver, came generally to be employed. As trade advanced, however, and commercial transactions became large and frequent, metal money was found to be inconvenient, and recourse was had to a paper currency. In this country, then, the currency includes not only the coinage of the realm, but Bank of England notes, and even country bank-notes, although not a legal tender,—in fact, whatever passes current from hand to hand, without individual signature, as appears on drafts or cheques. Currency differs from money in so far as it is applied only to what passes as money at a particular time and place. A depreciated currency is a currency which is not equal to its nominal value in bullion. In some parts of Germany, the British West Indies, and North America, the term currency is applied to the moneys of account only. For information as to the paper currency of this country, *see* BANKING.

CURRENTS, *kur'-rents* (Lat. *currere*, to run), the name given to water running in any direction, and, in navigation, to the courses in which the water in certain parts of the ocean is always moving, with a constant and generally uniform motion and in the same direction. These currents greatly tend to accelerate or retard the motion of any vessel that comes within their influence. Two different kinds are to be distinguished in the ocean,—the drift current and the stream current. The former is produced by winds which are always blowing in the same direction, such as the trade winds, or by winds which prevail in certain quarters for considerable periods; and the latter by causes about which there seems to be no certain and settled opinion at the present time, but which are probably somewhat analogous to those by which wind currents are produced in the atmosphere. Ocean currents are of great breadth, and in some cases sweep across from one continent to another. In the Atlantic Ocean the great equatorial current crosses from the Gulf of Guinea to the east coast of South America, with a breadth varying from 175 to 535 miles and a mean velocity of 1½ mile per hour. The Gulf Stream runs from the Gulf of Mexico in a north-easterly direction, and is supposed to reach the shores of the British isles, being about 3,000 miles long, and having an average breadth of 250 miles. Its waters are of a dark blue colour, and can readily be distinguished from the green waters of the Atlantic. Its mean velocity is about three miles per hour. Its velocity and temperature lessen as it approaches the European coast; the latter being 86° off the American coast, and about 72° where it approaches the continent of Europe.—*Ref.* Maury's *Physical Geography of the Sea; Investigations of the Winds and Currents of the Sea;* and *Charts of the Winds and Currents of the Atlantic.*

CURRYCOMB, *kur'-re-koamb* (Ang.-Sax.), a scraper used by grooms in dressing horses. A number of notched iron plates are fixed in parallel lines upon a back-piece about four inches square, to which a handle is attached. The notches form a set of rough teeth, with which the horse is scrubbed or curried.

CURRY POWDER, or PASTE, *kur'-ree*, a compound much used in India and this country for seasoning a great variety of dishes. It is made by mixing together turmeric with various spices; such as coriander-seed powder, black and cayenne pepper, ginger, &c.—*Ref.* Mrs. Beeton's *Book of Household Management.*

CURSE OF SCOTLAND, *kers*, a popular term applied to the nine of diamonds in a pack of playing-cards. The probable origin of the phrase arose out of the hatred entertained by the Scotch against John Dalrymple, earl of Stair, on account of his connection with the massacre of Glencoe, in which every man under seventy years of age was killed, and a large number of women and children died by cold and hunger. By some reports, the order for the massacre was signed on the back of a nine of diamonds card; but the more probable origin of the phrase consists in the fact that the coat-of-arms borne by Dalrymple was "or, on a ground saltire azure, nine lozenges of the field." The resemblance which these nine lozenges bore to the nine of diamonds probably gave the origin to this strange term. On account of the massacre of Glencoe, Dalrymple had to resign office two years later, in 1695.

CURTAIN, *kurt'-n* (Lat. *curtina*), in Mil., the name given to that part of the rampart which is built between the bastions, and, consequently, connects their flanks. The curtain is generally defended by a ravelin or redoubt, and other outworks constructed immediately in front of it, to save it from being too much exposed to the direct fire of the enemy, with whom it is an object to effect a breach in it as soon as possible.

CURTESY, TENANT BY THE, *kert'-te-se*.—An estate *by the curtesy of England* is that to which a man is by law entitled on the death of his wife, in the lands and tenements of which she was seised during the marriage in fee simple or fee tail, provided he had issue by her born alive during the marriage, and capable of inheriting her estate; in this case he shall, on the death of his wife, hold the lands for his life as tenant by the curtesy of England. If the lands, however, be in gavelkind, the rule is so far different that he shall hold no more than a moiety, and that only while he lives unmarried; and, on the other hand, his title attaches whether he had issue born or not.

CURVE, *kerv* (Lat. *cuspis*, a point), in Geom., a line which, running on continually and gradually in all directions, may be cut by a right line in more points than one. The theory of curves forms a very important branch of the higher portion of mathematical science; but only those curves that follow some law in their change of direction can form the subject of geometrical speculation. The law of the circle is that all portions of the curve are equidistant from one point, called the centre. The invention of defining curves by algebraic equation is due to Descartes, and the law of a plane curve is generally expressed by an equation between the co-ordinates of any point in it referred to a fixed point. Descartes divided all curves into two classes,—geometrical and mechanical. It is now the custom to indicate the same distinctions by the terms algebraic and transcendental. The curve is called algebraic when its equation only contains the

powers of $x$ and $y$; and it is called transcendental when the equation contains other functions, such as logarithms of $x$ and $y$. Algebraic curves are divided into different orders, according to the degree of the equation which expresses the relation between their co-ordinates. Straight lines are said to be of the first order, because the equation of a straight line contains no powers or products of the variables $x$ and $y$. Curves of the second order are those of which the equation rises to two dimensions, and the curves which it includes are the circle, the ellipse, the hyperbola, and the parabola. Out of the infinite number of curves that can be drawn, very few comparatively have received definite names. Besides the four mentioned above, which form the conic sections, there are the semi-cubical parabola, the cissoid of Diocles, the conchoid of Nicomedes, the cycloid, the trochoid, the curve of sines, cosines, tangents, &c., the logarithmic curve, and others.

CURVET, or CORVET, *kerv'-et* (Ital. *corvetta*), in Horsemanship, an air in which the horse's legs are more raised than in the demivolts; a leap both up and forwards, wherein the horse raises both his fore-feet at once, and as his fore-legs are falling he raises his hind-legs as he did his fore; so that his fore-legs are in the air at the same time.

CUSCUTACEÆ, *kus ku-tā'-se-e*, in Bot., the Dodder fam., a small nat. ord. of dicotyledonous plants, which is generally regarded as a subdivision of *Convolvulaceæ*. The plants composing it are distinguished from those of that order by their parasitic habit, by the absence of leaves, by the tube of the corolla being furnished with scales alternating with the segments, and by having a thread-like coiled embryo with almost obsolete cotyledons. They are chiefly natives of temperate climates, and are often very destructive to flax, clover, and other crops.

CUSP, *kusp* (Lat. *cuspis*, a point) —When two curves touch, or appear to touch each other, and terminate in a point at which they have a common tangent, this point is called the cusp of the curve. Cusps are of two kinds: in one, the tangent lies on one side of both curves, and their convexities are both turned in the same direction towards the tangent; in the other, the tangent lies between the curves, and their convexities are turned towards the tangent in opposite directions. In Arch., the term is applied to the points formed by the meeting of curves in the interior of trefoils, quatrefoils, &c., and in the ornamental stone tracery of church windows these points are often adorned with foliage. The cusp was introduced towards the close of the first period of Gothic architecture, and became a marked feature in the Decorated English and Perpendicular English styles.

CUSPARIA BARK. (*See* ANGUSTURA BARK.)

CUSTARD-APPLE. (*See* ANONA.)

CUSTODY. (*See* IMPRISONMENT.)

CUSTOM, *kus'-tom* (Fr. *coutume*), in the human economy, differs from habit, with which it is usually coupled, in being a frequent repetition of the same act, whereas habit is the effect which such custom produces upon the mind or body. Custom is well said to be "a second nature." It is able to give a man inclinations and capacities altogether different from those he was born with. Acts that are at first most disagreeable to us, or are only accomplished with the utmost difficulty, become, by each repeated act, more easy and pleasant; until at length it may be difficult, or even impossible, for us to refrain from doing them. Physiologists tell us that every act of the body,—nay, even every thought of the mind,—destroys a certain portion of the matter of our body; but, by that very act of destruction, an increased energy or vitality is communicated to the part, by means of which, in a healthy and normal condition, a larger quantity of fresh matter is attracted to the part, and by this means an increased store of materials is laid up for future use. By this means the arm of the blacksmith acquires strength; the foot of the dancer and the hand of the musician their dexterity. The effect of custom makes but little figure during the vivacity of youth; in middle age it gains ground, and in old age it governs without control. To introduce an active habit, the mere repetition of acts is not sufficient, without length of time. The acts require to be separated from each other by short intervals of time, in order to acquire their full force; and the more regular and uniform any operation is, the sooner it becomes habitual. Some pleasures are strengthened by custom, which in other cases begets familiarity and indifference, or even disgust. Custom blunts the edge of distress and pain; yet the want of anything to which we have been long accustomed is a kind of torture. The power of custom is a happy contrivance for our good. The mind grows fond of those actions which it is accustomed to; and what was at first difficult and disagreeable, becomes at length easy and pleasant; so that even our employments come to be changed into our diversions. It thus also distributes a corresponding amount of pleasure among all ranks of life; for while it renders pleasant the labours of the poor man, the pleasures of the rich man lose their effects from satiety. Satiety is necessary to check exquisite pleasures, which would otherwise engross the mind and withdraw it from more important pursuits. From a consideration of the effects of custom we can see the importance of that precept which the heathen philosopher Pythagoras is said to have given to his disciples,—*Optimum vitæ genus elicito, nam consuetudo faciet jucundissimum*—"Select that course of life which is the best, and custom will render it the most pleasant."

CUSTOM is a rule of civil conduct prescribed to the inhabitants of this kingdom. The *lex non scripta*, or unwritten law, includes not only *general customs*, or the common law, properly so called, but also the *particular customs* of certain parts of the kingdom, and likewise those *particular laws* that are by custom observed only in certain courts, jurisdictions, or among particular bodies of men. *General customs* are the universal rule of the whole kingdom; *particular customs* are probably the remains of a multitude of local customs, prevailing, some in one part and some in another, over the whole of England while it was broken into distinct dominions, and out of which, after it became a single kingdom, one common law was collected and made applicable to the realm at large; but for reasons now long forgotten, particular counties, cities, towns, manors, and lordships, were indulged with the privilege of abiding by their own customs, in contradistinction to the rest of the nation at large, which privilege is in many instances confirmed to them by charter or by several acts of parliament. Such is the custom of gavelkind, borough-English, of manors, of the city of London and other places; and to this head has been referred that branch of the law which comprises certain rules relative to bills of exchange, partnership, and other mercantile matters, and which is generally denominated the *custom of merchants*. The *validity* of a custom is determined by the following rules:—1. It must have been *used so long that the memory of man runneth not to the contrary*. The time of *legal* memory refers to so remote a date as the commencement of the reign of King Richard I.; but the observance of a custom for a long time will amount to *presumptive proof* of its having prevailed during the whole period of legal memory. The principle is materially qualified by the Statute of Limitations of 2 & 3 Will. IV. c. 71. 2. It must have been *continued*. Any interruption would cause a temporary ceasing; the revival gives it a new beginning, and thereupon it becomes void. 3. It must have been *peaceable*, and acquiesced in. 4. It must be *reasonable*, or rather, taken negatively, it must *not be unreasonable*. 5. It must be *certain*. 6. It must be *compulsory*. 7. Customs must be *consistent* with each other. 8. And customs in derogation of the common law must be construed *strictly*. 9. No custom can prevail against an act of parliament.

CUSTOMS DUTIES are duties charged upon commodities on their being imported into, or exported from a country. They appear to have been called customs from being customary payments, or payments which had been in use from time immemorial. They seem to have existed in every commercial country. The trouble and expense necessarily incurred by a government in making provision for the commerce of a country, naturally led to its seeking some means of remuneration, and none seemed so fair and reasonable as that it should fall on the goods or vessels on whose behalf they were incurred. Customs duties were levied in England previously to the Conquest. It is said that Ethelred

## Customs Duties

established duties on ships and merchandise, to be paid at Billingsgate, in the port of London, about 979. In 1206 the entire customs revenue of England, including that derived from tolls and fairs, amounted to only £4,958. 7s. 3½d. At first, the duties were principally raised on wool, skins, and leather, when exported, and were considered part of the inheritance of the crown. By an act of 3 Edward I. a duty of 6s. 8d. was levied on every sack of wool containing 26 stone; 6s. 8d. on every 300 woolfels (sheep-skins); and 13s. 4d. on every last (12 dozen) of hides. Foreign merchants paid one half more than English merchants; and a subsequent act of the same reign established certain new customs, to be paid by foreign merchants only. The duties of tonnage and poundage were customs duties; the former being paid upon all wine imported, at so much a tun; and the latter, a duty on all goods not specified, at so much in the pound of their value. In the 47th year of Edward III., a duty of 6d. in the pound was imposed upon all goods exported and imported, except wool, woolfels, leather, and wine, which were subject to particular duties. In the 14th of Richard II., this duty was raised to 1s.; but three years afterwards it was again reduced to 6d. In the 2nd of Henry IV. it was raised to 8d., and in the 4th of the same prince, to 1s. From this time to the 9th of William III., this duty of poundage continued at 1s. The duties or subsidy of tonnage and poundage were granted for the defence of the realm and the keeping and safeguard of the seas, and for the intercourse of merchandise, and were at first granted only for a fixed period at the beginning of each reign, but afterwards for life. At the time of the Revolution, in 1688, the customs duties amounted to:—

| | £. | s. | d. |
|---|---|---|---|
| 1. Tonnage and poundage ... | 577,507 | 12 | 10½ |
| 2. Duties on wines and vinegar imported ... ... ... | 172,930 | 11 | 0½ |
| 3. Duties on tobacco and sugar imported ... ... ... | 148,861 | 8 | 0 |
| 4. Duties on French linens, silks, brandies, &c. ... ... ... | 93,710 | 8 | 1 |
| | £992,980 | 0 | 0 |

The last three classes of duties were imposed in 1685. A new subsidy of poundage, an additional 1s. in the pound, or 5 per cent., was imposed by the 9 & 10 William III., on most imported commodities. Numerous additions and alterations were subsequently made on the customs duties, and various modes of rating adopted, so that the simplicity of the ancient plan was destroyed, and endless confusion produced. In order to remedy these inconveniences, Mr. Pitt, in 1787, proposed the abolition of all duties then subsisting, and the substitution, in their stead, of one single duty on each article, amounting, as near as possible, to the aggregate of the various duties then payable. These principles were embodied in the act 27 Geo. III. c. 13, commonly called the Consolidation Act. In 1803 another consolidation of the duties was effected by 43 Geo. III. c. 68; but numerous fresh enactments having impaired the utility of these arrangements, the government was induced, in 1823, to cause the preparation of a new set of laws for the consolidation of the customs. Mr. Deacon Hume, then comptroller of the customs in the port of London, and afterwards secretary to the Board of Trade, was appointed by the Treasury to undertake the preparation of a general law, or set of laws, for the consolidation of the customs of the United Kingdom. The bills prepared by him form the subject of eleven acts of 6 Geo. IV. (c. 105 to c. 116 inclusive), and received the royal assent in July, 1825. They came into operation on the 1st of January, 1826, and, by their great simplicity, proved of immense advantage to commerce. In 1833 eight of Mr. Hume's acts were repealed or altered by 3 & 4 Will. IV. c. 50 to c. 57 inclusive. In 1842 Sir Robert Peel proposed considerable improvements, which were carried into effect by 5 & 6 Vict. c. 47, by which the duty was reduced on 75 different articles, and the number of articles in the tariff reduced to 813. In 1845 Sir Robert Peel effected still further improvements by abolishing the duty on 430 other articles. Since that time, almost every year has seen alterations and improvements in our tariff, and in 1853 the duties on 134 articles were entirely removed. (*See* TARIFF.) In 1763, the net produce of the customs duties was about £2,000,000; in 1793, £4,407,000; in 1815, £11,369,000; in 1830, £21,084,825; in 1840, £23,466,117; and in 1860, £22,852,393. The amount of duties repealed or reduced in 1860 was £2,840,931, and imposed, £577,904. The collection of the customs duties and the enforcement of the laws which relate to navigation and trade are, subject to the control of the lords of the Treasury, in the hands of a board consisting of a chairman, deputy-chairman, and four commissioners; with a secretary, assistant-secretary, and a staff of subordinate officers. As nearly one-third of the entire revenue of the country is derived from the customs duties, they are of the utmost importance to our prosperity, and there are many important questions connected with them. The duties should in no case be so high as to encourage smuggling, nor, indeed, in most cases, so as to interfere with their consumption; neither should they in general be too low, for then they must be extended over a great number of articles, by which means the expense of collection is largely increased, and the freedom of the trader much interfered with. They should be levied, as much as possible, on articles that do not constitute necessaries of life, or necessaries of manufacturing industry. Moderate customs duties are among the least objectionable of all taxes, as they interfere little with the operations of the manufacturer or trader, in many cases serving rather as a protection to the former, and are collected at the least possible expense. With one or two exceptions, where the duty is high on certain necessaries of life, there is little to object to in our present system of customs duties. Down to the time of the Revolution, customs duties were charged indiscriminately on commodities whether exported or imported; but, since that time, they have been almost exclusively laid on imported articles, and now are so entirely.

CUSTOS ROTULORUM, *kus'-tos rot-u-lor'-um* (Lat.), in Law, is a special officer, who is always a justice of the *quorum*, to whom are committed the records or rolls of the general and quarter sessions of the peace of the county for which he is appointed. His nomination is by the royal sign manual, and to him the nomination of the *clerk of the peace* belongs, an officer who acts as clerk to the court of quarter sessions, and records all their proceedings, and who also takes the custody of such documents as are directed to be deposited with him by statute, or under the standing orders of either house of parliament.

CUTANEOUS DISEASES. (*See* SKIN, DISEASES OF THE.)

CUTICLE. (*See* SKIN.)

CUTLASS, *kut'-las* (Fr. *coutelas*), in Mil., a broad heavy sword with a basket-hilt of iron, used by sailors in boarding an enemy's vessel. (*See* BROADSWORD.)

CUTLERY, *kut'-ler-e* (Fr. *coutellerie*), in a general sense, includes all cutting instruments, such as knives, forks, scissors, &c. There are three kinds of steel employed in the manufacture of different articles of cutlery,—common steel, shear steel, and cast steel. All edge tools which require to be tenacious without being very hard, are made of shear steel. The best scissors, razors, penknives, &c., are made from cast steel, which is able to take a very fine polish. Common steel is only used in making very common articles of cutlery. In making good table-knives shear steel and cast steel are generally preferred. In the ordinary method of making knives, the blades are cut out of a sheet of steel, and the backs, shoulders, and tangs of wrought iron, are attached to the steel blades by welding at the forge. The knife is then ground to the proper shape, and the blade polished and hardened. The fork manufacture is a distinct branch of industry, and the manufacturers of table-knives generally buy their forks from the fork-makers ready to be put into their handles. In making table-knives two men are generally employed; one is called the foreman, or maker, and the other the striker. Penknives are usually forged by a single hand, with hammer and anvil simply; they are hardened by heating the blades red-hot, and dipping them into water up to the shoulder. Razors are also hardened in the same manner. The grinding and polishing of cutlery are generally performed by machinery. The business of the grinder is divided into

three processes,—grinding, glazing, and polishing. Grinding is performed upon stones of various dimensions, those articles which require temper requiring to be ground on wet stones. Glazing is a process by which lustre is given to cutlery; it is performed with a glazer, consisting of a circular piece of wood, sometimes covered with leather, or an alloy of lead and tin: it is fixed on an axis, like a grindstone. The polishing process is the last, and is performed on a similar piece of wood covered with buff leather. Only articles of cast steel which have been hardened and tempered are subjected to this operation. The manufacture of cutlery has been brought to great perfection in Great Britain. The principal manufactories are in London and Sheffield.

Cutter, *kut'-ter*, a small kind of vessel, rigged somewhat like a sloop, fitted with one mast and a very long bowsprit, the latter of which can be reefed, or taken in, when it is necessary to use a smaller jib. They are employed by government for the revenue service, as the swiftest and most convenient vessels for chasing smugglers, and for preventing the landing of contraband goods. This term is also applied to small clincher-built boats, used by the officers of ships, similar in shape to gigs, but with sharper bows, having generally six or eight oars. Eight-oared cutters are now much used in regatta-racing.

Cuttle-fish (*Octopus*), *kut'-tl fish* (Ang.-Sax.), a molluscous animal of the gen. *Sepia*, ord. *Cephalopoda*. The body is somewhat oval, but broader at the head than at the extremity, which is obtusely pointed. The head is furnished with eight arms and two feet, the latter being nearly similar in structure to the arms or tentacula, but considerably longer in their dimensions. A neck divides the head from the body, which is furnished on each side, throughout its entire length, with a narrow fin. The back of the cuttle-fish is strengthened by a calcareous plate, well known as the *cuttle-fish-bone*. This bone was in former times in great repute among apothecaries as an absorbent; but now it is chiefly used in the form of a powder, to polish the softer metals. The term bone, however, is properly inapplicable to the calcareous shield of the cuttle-fish; as in its composition it is exactly similar to shell, and consists of various membranes hardened by carbonate of lime, without the smallest mixture of phosphate. This animal is sometimes termed the ink-fish, a name that arises from the circumstance that beneath its throat is a bladder, in which is secreted a fluid black as the blackest ink, and which, when annoyed or pursued, it ejects, so staining the water around it, that it is an easy matter for it to escape unperceived. It likewise possesses the chameleon-like power of changing its colour, a circumstance that did not escape the observation of Mr. Darwin while at the Cape de Verd Islands. "I was much amused by the various arts to escape detection practised by one individual, which seemed fully aware that I was watching it. Remaining for a time motionless, it would then stealthily advance an inch or two, like a cat after a mouse, sometimes changing its colour. It thus proceeded till, having gained a deeper part, it darted away, having a dusky train of ink to hide the hole into which it had crawled." There is a serious belief among fishermen generally that the larger cephalopoda are highly dangerous, from twisting their arms round swimmers, and thus impeding their motions. "Some of these, particularly those of Sicily, are sometimes caught of an enormous size, with their arms fully as long as an ordinary man's leg; but notwithstanding the marvellous stories related and believed by their captors, we did not hear of any well-authenticated instance of these animals having actually occasioned loss of life."—Swainson's *Instincts of Animals*.

Cutty Stool, *kut'-te*, in the Scotch church, was the stool or seat of repentance on which offenders against chastity had to sit during divine service, professing repentance and receiving the minister's rebukes.

Cyanic Acid, *si-ăn'-ik*, in Chem., $C_2HNO_2$ or $CyO,HO$.—When cyanogen is passed through a solution of an alkali, a change takes place similar to that which occurs when chlorine is used in the same manner. Cyanide and cyanate of the base are produced, the cyanic acid, however, containing only one equivalent of oxygen, instead of five, as in the case of chloric acid. There are several more convenient methods of producing cyanic acid than the one named. One is by heating an intimate mixture of two parts of ferrocyanide of potassium with one of peroxide of manganese, the mass being constantly stirred until it reaches a low red heat. When cool, cyanate of potash may be dissolved out. Cyanic acid is so unstable that it cannot be separated from its compounds by an acid. It is best procured by distilling *cyanuric acid* (which *see*), a crystalline compound having precisely the same composition, in a sealed tube. It is extremely pungent, very volatile, and acts as a powerful caustic if dropped on the flesh. It cannot be preserved, as it gradually changes into a white glassy mass, destitute of acid properties, insoluble in water, and permanent in air. This body has been named *cyamelid*, and has exactly the same components as hydrated cyanuric and cyanic acids.

Cyanite, *si'-ăn-ite* (Gr. *kuanos*, blue), a mineral belonging to the garnet family, occurring in broad prisms in mica and talc schists. Transparent cyanite is often used for sapphire; but it may be known by its inferior hardness.

Cyanogen, *si-ăn'-o-jen* (Gr. *kuanos*, blue, and *gennao*, I produce), in Chem., sym. Cy or $NC_2$, equivalent 26, spec. grav. 1·8064, combining volume 2.—Cyanogen, or bicarbide of nitrogen, is one of the most interesting of the carbon compounds, its discovery by Gay-Lussac in 1815 having thrown considerable light upon two important facts in chemical science,—the existence of compounds acting as elements, and of substances having the same ultimate composition, but different properties. In fact, it was the means of originating new theories with respect to organic bodies generally. The name *cyanogen*, signifying blue-producer, was bestowed on this substance in consequence of its forming an essential ingredient in Prussian blue. Cyanogen cannot be formed by the direct union of its elements, but may be obtained by passing nitrogen over a mixture of charcoal and carbonate of potash heated to redness in a porcelain tube. The potash becomes reduced to potassium, carbonic oxide escapes, and cyanogen is formed, which unites with the potassium, yielding cyanide of potassium. The reaction that takes place is interesting—

$$KO,CO_2+C_4+N=K,NC_2+3CO.$$

The compounds of cyanogen are, however, generally obtained from the ferrocyanide of potassium, a salt formed by heating in a covered pot five parts of refuse animal matter, such as hide, hoof, and horn waste, with two parts of potash and iron filings. The mass, when cold, is digested in water, which dissolves out the ferrocyanide of potassium. Ten parts of this salt, distilled with seven parts of oil of vitriol and five or six parts of water, yield hydrocyanic or prussic acid, which, if saturated with oxide of mercury, furnishes cyanide of mercury. This, on being dried and heated in a retort, furnishes cyanogen. Cyanogen is a colourless gas, with a peculiar penetrating odour. It is poisonous in its effects if breathed, and it burns with a beautiful purple flame. It dissolves in one-fourth of its bulk of water, in one-twenty-fifth of alcohol, and may be submitted to a high temperature without decomposition. It is easily liquefied by a pressure of four atmospheres. In the liquid state it is colourless, limpid, and lighter than water. At −3° Fahr. it freezes, forming a transparent crystalline solid. Cyanogen, which is in itself a compound radicle, has the property of uniting with various elements to form still more complicated radicles. Thus, with iron it forms two compounds,—*ferrocyanogen*, $FeCy_3$, or $Fcy$, and *ferridcyanogen*, $F_2Cy_3$, or $FdCy$; with cobalt, cobalti-cyanogen; with manganese, mangani-cyanogen; with platinum, platino-cyanogen; with palladium, palladio-cyanogen; with iridium, iridio-cyanogen; and with copper, cupro-cyanogen; which all behave as elements, uniting with the metals and forming hydracids with hydrogen. The principal compound of cyanogen is cyanic acid, composed of an equivalent of cyanogen and an equivalent of oxygen, which has been described under the head of Cyanic Acid. It also forms five other compounds with oxygen, all of which possess precisely the same compo-

sition, but differ remarkably in their properties. They are cyanuric, cyanilic, fulminuric, fulminic acids, and a body called *cyamelid*. Descriptions of their properties will be found under their respective headings; with nitrogen, cyanogen forms *cyanamide*, which has been already described. Cyanogen forms with chlorine three compounds, which all have the same ultimate composition, but differ materially in their properties. One of them is gaseous, another liquid, and the third solid. With iodine and bromine it forms solid combinations; with sulphur it forms a compound radicle, sulpho-cyanogen (Scy), which, with hydrogen, forms hydrosulpho-cyanic acid; with selenium a similar compound is formed. The cyanides of the alkalies and earths are soluble; those of the heavy metals mostly insoluble in water. The most important of these is the *cyanide of potassium*, which is obtained by heating to redness in an iron crucible eight parts of ferrocyanide of potassium and three of carbonate of soda, until the mixture has ceased to be of a yellow colour, and has given off the last bubble of gas. This salt is made in large quantities for the use of electrotypists and photographers. The former use it as a solvent for gold and silver in electro-plating; the latter to remove the unused iodide of silver from the collodion-plate. Cyanogen is prone to form double salts with the metals. Cyanide of potassium, when added to solutions of the heavy metals, throws down a precipitate, which is soluble in an excess of the precipitant, forming a double cyanide of potassium and the metal. These double cyanides are of two classes,—those which form salts easily decomposed by hydrochloric acid, such as cyanide of potassium and silver; and those which are not so easily decomposed, such as the cyanides of potassium and iron, of potassium and cobalt, and several others. The salts of the second class are looked upon by chemists as containing the metal united with the cyanogen, forming an organic radicle. This will, perhaps, be better understood by considering the following formulæ:—

1st class.—Double cyanide of nickel and potassium, $NiCy,KCy$.

2nd class.—Double cyanide of iron and potassium, or ferrocyanide of potassium.

$$\underbrace{2\,(KCy)}_{\text{Cyanide of potassium.}} + \underbrace{FeCy}_{\text{Cyanide of iron.}} = \underbrace{K_2}_{\text{Potassium}} + \underbrace{FeCy_3}_{\text{Ferrocyanogen.}}$$

In the latter salts the heavy metal is generally masked; thus the iron in ferrocyanide of potassium is not distinguishable by the usual tests for that metal. The whole theory of cyanogen and its compounds is most intricate and cannot be entered into here. Those who wish to pursue the subject further are referred to the discussion of the properties of cyanogen and its compounds, in the third volume of Miller's *Elements of Chemistry*. When binoxide of nitrogen is passed through a solution of hydro-ferridcyanic acid, a decomposition takes place, an equivalent of hydrocyanic acid being replaced by an equivalent of binoxide of nitrogen. The compounds formed by this radicle will be described under the head of NITRO-PRUSSIDES.

CYANOSIS, or BLUE DISEASE, *si-ăn-o'-sis* (Gr. *kuanos*, blue), is a diseased condition of the system, arising from a malformation of the heart, which, allowing the intermixing of the venous with the arterial blood, in consequence of which the former is not properly oxygenized, and a blueness is imparted to the skin: whence the disease takes its name. Little can be done towards effecting a cure of this disease; and though it interferes with the functions of the body and produces general weakness, it does not necessarily destroy life.

CYANURIC ACID, *si-ăn'-u-rik*, in Chem.—This acid is obtained in a variety of ways, which need not be described here. It is deposited from its aqueous solution in colourless rhombic prisms. It is sparingly soluble in cold water, more freely in boiling alcohol, and still more so in boiling water. It is polymeric with cyanic acid and several other products of cyanogen.

CYCADACEÆ, *si-ki-dā'-se-e*, in Bot., the *Cycas* fam., a nat. ord. of dicotyledonous plants, in the sub-class *Gymnospermia*, consisting of small palm-like unbranched trees or shrubs, with stems marked by the scars of fallen leaves. In a few species the stem divides in a forked or dichotomous manner. The leaves are clustered at the summit, are pinnate, parallel-veined, hard, and usually circinate in vernation. The flowers are quite naked, unisexual, and dicœcious; the male flowers in cones, consisting of scales, from the under surface of which one-celled anthers arise; the female, consisting of naked ovules placed on the margins of altered leaves, or of ovules arising from the base of flat scales, or from the under surface of peltate ones. The seeds are hard or succulent, with embryos, single or many, in fleshy or mealy albumen. The plants are principally natives of the temperate and tropical parts of America and Asia, and are also found occasionally at the Cape of Good Hope, in Madagascar, and Australia. Their stems and seeds yield mucilage and starch. The product known as Japan sago is said to be obtained from a species of the typical gen. *Cycas*. This sago is not an article of European commerce.

CYCADITES, *si'-ka-dites*, in Geol., fossil plants of the oolite and chalk, apparently allied to the existing *Cycadaceæ*. The leaves only are known.

CYCLE, *si'-kl* (Gr. *kuklos*, a circle), in Chron., the name given to any period of time, or a certain number of years, in which certain events and phenomena recur at intervals, in the same regular order of succession, coming exactly to the same point again at the same time, or very nearly so, at the commencement of each cycle. These divisions are artificial or arbitrary, and have been invented to compensate for the impossibility of measuring natural cycles, such as the revolution of the earth round the sun, or that of the moon round the earth, by our divisions and subdivisions of time. An explanation of the most remarkable of these cycles, and those in common use, will be found under their respective names. (*See* CALIPPIC CYCLE, GOLDEN NUMBER, INDICTION, JULIAN PERIOD, METONIC CYCLE, SOLAR CYCLE.)

CYCLOPÆDIA. (*See* ENCYCLOPÆDIA.)

CYCLOPEAN ARCHITECTURE, *si-klo'-pe-ăn* (Gr. *kuklops*, round-eyed, from *kuklos*, a circle, and *ops*, an eye), an expression applied to any wall that is formed of large, irregular, unhewn stones, piled together without mortar or cement of any kind. Walls of this description are to be seen at Tiryus, Mycenæ, and Epirus, in Greece, that were most probably built by the ancient Pelasgi; and similar specimens of building, though not on the same gigantic scale, exist in Italy, Asia Minor, and Peru, as well as in some parts of the British isles; among which may be mentioned the Laws, near Dundee, in Scotland, and the Giant's Sconce, near Coleraine, in Ireland. The name was given to walls of this kind because they were supposed to have been built by the Cyclopes, one-eyed giants, who were the workmen of Vulcan.

CYDONIA, *si-do'-ne-ă* (so named because a native of Kydon, in the island of Crete), in Bot., the Quince, a gen. of plants belonging to the nat. ord. *Rosaceæ* and sub-ord. *Pomeæ*. *C. vulgaris* is a deformed low tree, sometimes cultivated for its fruit, which is a pome with a persistent calyx, like the medlar. This fruit is mixed with apples in making pies and tarts, and is much esteemed for the preparation of a kind of marmalade. In the rind of the quince Wohler has found œnanthic ether, to which its peculiar fragrance is due. The seeds contain much mucilage and are occasionally used for preparing bandoline (which *see*).



QUINCE.

CYGNET. (*See* SWAN.)

CYGNUS, *sig'-nus* (Lat. *cygnus*, a swan), a constellation in the northern hemisphere, situated between those of Cassiopeia and Lyra. Its brightest star is one of the second magnitude.

CYLINDER, *sil'-in-der* (Gr. *kulindo*, I roll), a solid body which has three surfaces, one of which is convex and continuous, and the other two parallel. A right cylinder is one in which the line joining the centres of

the limiting circles is perpendicular to their plane. All other cylinders are oblique. A right cylinder, taken in this view, may be conceived as described by a rectangular parallelogram, revolving about one of its sides.

CYLINDER OF A STEAM-ENGINE is that part of the engine in which the piston works, and from which, by alternately admitting and condensing the steam, all the power of the machine is derived. The boring of cylinders for steam-engines requires very powerful and accurate machinery. The cylinder is cast hollow, and the object of the boring-machine is to produce a true cylinder, with an even surface, so that the piston may fit exactly and work freely. Some machines for this purpose act horizontally and others vertically, while the cutters revolve and advance by the action of some powerful prime mover. This operation is generally repeated three times, in the last of which the greatest care is required.

CYMA RECTA, *si'-mă rek'-tă* (Lat. *cyma*, a little shoot, a branch; *recta*, right), in Arch., the name given to a moulding which somewhat resembles the letter S, hollow in the upper part and projecting below. When this order is changed, and the projection is above instead of below, the moulding is called *cyma reversa*. The entire curve which a section of the moulding presents will be found to consist of the conjunction of two parts, each of which is exactly one-fourth of the circumference of a circle.

CYMATIUM, *sim-ai'-shē-um*, the upper part of the cornice of an entablature (*see* CORNICE, ENTABLATURE); so called because it is generally in the form of the moulding described in the preceding article.

CYMBALS, *sim'-bals* (Lat. *cymbalum*), musical instruments, the origin of which is very ancient,—indeed, probably more so than that of the tambourine. They were made of sonorous brass or copper, and were very various in form; the difference consisting in the size, the presence or absence of a rim, the depth or shallowness of the bowl, as well as the shape of the handle by which they were held. Modern cymbals are, *par excellence*, military instruments; and, when played with taste, form a very pretty addition to a band. They are instruments of percussion; and, when struck together, produce a loud harsh tone of no fixed pitch. The best cymbals are obtained from China and Turkey; and all the attempts of Europeans to discover the metal of which they are made have hitherto proved abortive. Although best adapted for military bands, modern composers often introduce them in the orchestra with very pleasing effects.

CYME, *sime* (Gr. *kuma*, a sprout), in Bot., a common term for the different kinds of definite inflorescence; that is to say, for every inflorescence formed of a terminal flower, beneath which are lateral branches, each having a terminal flower, and lateral branches again similarly dividing, and so on. The varieties of the cyme will be described under the head of INFLORESCENCE.

CYNARA, *sin-ai'-rā* (from Gr. *kuon*, a dog, in allusion to the spines of the involucrum), in Bot., a gen. of plants belonging to the nat. ord. *Compositæ*. It includes the *artichoke* and *cardoon* (which *see*).

CYNICS, *sin'-iks*, the name of a sect of ancient philosophers, whose founder was Antisthenes, a disciple of Socrates. According to some, the name is derived from the Greek word *kuon*, a dog, on account of the snarling character of the sect; according to others, it is formed from Cynosarges, the name of the gymnasium in which the founder expounded his system. His doctrines were chiefly confined to morals, and, like most other moral systems, in attempting to reform certain evil tendencies he fell into their opposite extremes,—in avoiding Scylla he fell into Charybdis. The evils resulting from the refinement and luxury of his age having attracted his notice, he attempted to lead men back to their original simplicity of life and manners. He taught that the true dignity of man consists in wisdom, and wisdom in independence of mind; and being by birth poor, and, consequently, excluded from all political rights, he maintained that this independence, or, rather, freedom from all restraint, was to be attained by man rendering his wants as few and simple as possible. He obstinately placed himself in opposition to the character of the times in which he lived, was mean and negligent in his dress, assuming





the garb and the staff and wallet of a mendicant. He is represented as teaching that pain or labour, and even infamy, is a good, and pleasure, on the contrary, an evil. His doctrine of the supreme good is a life according to virtue, which consists in action, and requires neither many words nor extensive knowledge. He condemned all civil institutions, despised the ties of kin or country, and saw in wedlock no higher or better end than the propagation of the species. These peculiar views were carried to still greater lengths by his followers. With them philosophy was considered to consist entirely in practice, in the art of living, or in the attainment of a pleasant life, which consisted solely in dispensing with all, even the most simple and necessary wants. The sage, they maintained, ought to be free from all outward influences, and superior to all the accidents of chance or change. Most of the arts and sciences, as they do not tend to make men virtuous, but sometimes, on the contrary, interfere with the attainment of it, are unprofitable and pernicious. The most famous of the Cynics besides their founder were Diogenes of Sinope, Crates of Thebes with his wife Hipparchia, and Menippus. At length the sect became so disgusting from their impudence, dirty habits, and profligacy, that they ceased to be regarded with any respect and passed into obscurity. The great merit of this system is that it paved the way for the establishment of Stoicism, by which it was succeeded and superseded.—*Ref.* Ritter's *Geschichte der Philosophie*; Hegel's *Geschichte der Philosophie*; Lewes's *History of Philosophy*.

CYPERACEÆ, *si-per-ai'-se-ē*, in Bot., the Sedge fam., a nat. ord. of monocotyledonous plants in the sub-class *Glumaceæ*, consisting of grass-like or rush-like herbs, natives of all parts of the world, and found especially in marshes, ditches, and the neighbourhood of running streams. The stems are solid, often angular, and are without joints or diaphragms. The leaves form entire or closed tubular sheaths round the stem. The flowers are spiked, imbricated, and either perfect or unisexual, each arising from the axil, of from one to three bracts or glumes. The lowermost glumes are frequently empty, or without flowers in their axils. There is seldom a visible perianth; but it exists sometimes in the female flowers as a tube, or as a whorl of hypogynous scales or bristles. Stamens hypogynous, 1—12, commonly 3; anthers 2-celled, innate; ovary 1-celled, superior, with one erect ovule; fruit indehiscent, with a single seed having fleshy or mealy albumen, inclosing a lenticular embryo. Although closely allied to the *Gramineæ* (grasses), the plants of this order are of little use to man, their seeds being deficient in those nutritive qualities which render the seeds of the cereals so valuable. The rhizomes, tubers, or corms, of some species of the typical genus *Cyperus* were formerly employed in medicine as aromatic tonics and astringents. When boiled or roasted, some of these corms are edible.

CY-PRÈS, *se-prai'* (Nor.).—It is a rule with respect to all charities, that the intention of the donor, so far as it is practicable and legal, shall be strictly observed, the law not permitting it to be varied without necessity, even by consent of his heir. But where it is incapable of being literally acted upon, or its literal performance would be unreasonable, a decree will be made by the court of Chancery for its execution *cy-près*, that is, in some method conformable to the general object, and adhering as closely as possible to the specific design of the donor.

CYPSELA, *sip'-se-lă*, in Bot., the name given to a kind of fruit which occurs in all plants of the order *Compositæ*. It differs in nothing essential from the *achænium* (which *see*), except in being inferior and of a compound nature.

CYRENAICS, *si-ren-ai'-iks*, the name of a sect of ancient philosophers, whose founder, like that of the Cynics, had been a disciple of Socrates, being Aristippus, a native of Cyrene, in Africa, after which city his followers were called Cyrenaics. Unlike Antisthenes, however, he was born of illustrious and wealthy parentage, and had accustomed himself to every kind of pleasure. He seems, indeed, to have been endowed with a great readiness and facility for extracting pleasure and gratification from the most difficult situations of life; and his great maxim was, that a man

ought to control circumstances, and not to be controlled by them. According to him, the sum of life was made up of pleasure and pain; the one to be sought after as good, the other to be avoided as evil. The chief good, according to him, was the greatest number of agreeable perceptions; and the true philosopher was one who actively and successfully pursued pleasure. He taught that man ought to devote himself entirely to the enjoyment of the present moment, neither regretting the past nor caring for the future. Every act was regarded to be in itself morally indifferent, and only to be viewed as it produced pleasure or pain to the individual. The chief successors of Aristippus were Theodorus, Hegesias, and Anniceris, each of whom became the founder of a sect known respectively as the Theodoran, Hegesian, and Annicerian schools. As Cynicism was the forerunner of Stoicism, so Cyrenaicism paved the way for Epicureanism, which constitutes its chief merit.—*Ref.* Ritter's *Geschichte der Philosophie;* Hegel's *Geschichte der Philosophie;* Lewes's *History of Philosophy.*

Cyrillaceæ, *si-ril-lai'-se-e* (in honour of *Cyrillo*, a Neapolitan botanist), in Bot., the *Cyrilla* fam., a small nat. ord. of dicotyledonous plants in the sub-class *Thalamiflorœ*, consisting of evergreen shrubs with alternate exstipulate leaves, nearly related to *Olacaceæ*, but distinguished by their imbricate petals, which are altogether free from hariness on the inside, and by the stamens being all fertile, and, if equal in number to the petals, alternate with them. They are natives of North America; but nothing is known of their properties and uses.

Cyst, *sist* (Gr. *kustis*, a bladder), in Anat., is applied to the urinary bladder, gall-bladder, and similar vessels in the human body; but it is also applied to morbid growths within the body, having the form of a bag or bladder, and inclosing morbid matter.

Cytinaceæ, *si-tin-ai'-se-e*, in Bot., the Cistus-rape fam., a small nat. ord. of dicotyledonous plants in the sub-class *Monochlamydeæ*, consisting of root-parasites of a fungoid texture. The flowers are perfect or unisexual, and either solitary and sessile or clustered at the top of a scaly stem. Calyx 3—6-parted; anthers sessile, opening longitudinally; ovary 1-celled, interior; ovules very numerous; placentas parietal; fruit 1-celled, with numerous seeds imbedded in pulp. The plants of this order occur in the south of Europe and Africa, growing as parasites upon the roots of *Cistus*, upon fleshy *Euphorbiaceæ*, and upon other succulent plants. Some have astringent properties; as *Cytinus Hypocistus*, from which an extract is made in the south of Europe, and there used in diarrhœa and for arresting hæmorrhage. *Hydnora africana* has a putrid animal odour; but when roasted, it is eaten by the natives of Africa.

Cytisus, *si'-tis-us*, in Bot., a gen. of leguminous trees and shrubs, of which the laburnums are well-known and universally admired examples. The timber of the tree-laburnum (*C. alpinus*) is much prized by cabinet-makers and turners for its hardness, beauty of grain, and durability.

Cyttaria, *sit-tai'-re-a*, in Bot., a gen. of fungi. *C. Darwinii* and *Berteroi* are employed for food; the former in Terra del Fuego and the latter in Chili.

Czar, *zar*, a title of the emperor of Russia. Up to the 16th century, the principal rulers of the Russian provinces were called grand-dukes. Several adopted the title czar; but Ivan II., Wassiljewitch the Cruel, was the first who was solemnly crowned czar. After him, all the monarchs of Russia called themselves czars of Moscow; and after the conquest of Little Russia and Smolensk, they took the title of czars of all the Russias. The rank of imperial dignity was not granted to the czar by the European powers until the reign of Peter I. He called himself Imperator, and the empress Imperatriza. The ordinary title of the empress is czarina. The emperor Paul I., in 1799, gave the title Cæsarewitch to his second son. All the sons of the czar are called grand-dukes.

## D.

D is the fourth letter of our, as well as of the Latin, Greek, and Hebrew alphabets. The Greek name is *delta*, the Hebrew *daleth;* and our form of the letter, which is the same as the Latin, is evidently derived from the Greek (Δ), by rounding off the right-hand angle into a curve. The Hebrew *daleth* signifies a door, and in its earlier form it bore a manifest resemblance to the door or opening of a tent. D is the medial letter of the order of dentals or palato-dentals, and readily interchanges with those of the same order; as German *tief*, deep; *traum*, dream; *du*, thou; *dein*, thine. It also readily interchanges with the letter *l;* as, Greek *dapsilas*, Latin *lapsilis;* Latin *cauda*, Spanish *cola*. (*See* L.) The Latin D is frequently changed into *z*, *s*, or *ss* in German; as *duo*, *zwei*, two; *decem*, *zehn*, ten. D also seems to manifest a kind of affinity for the letter *n*, and is drawn by it into a number of words to which it does not radically belong; as Latin *tener*, English *tender*. *Di* followed by a vowel is sometimes changed into *j;* as, *diurnal*, *journal*. D, or as it was formerly written, IↃ, stands for 500. In Music, D is the second note of the diatonic scale, answering to the *re* of the Italians.

Dab, *dab* (*Pleuronectes limanda*), a common flat fish well known in the London market. Its average size is eight or nine inches in length, and six or seven in breadth. Its upper side is pale brown, and its under parts white. It is usually caught with plaice and flounders. The three spring months constitute its "season."

Dabchick, *dăb'-tshik*, or little grebe (*Podiceps minor*), a small bird nine or ten inches in length, commonly found about lakes and fishponds. It is an exceedingly active swimmer, and dives with great ease. It progresses under water with considerable rapidity, with the aid of both wings and feet. The larger grebes do not appear to use their wings in this way. (*See* Grebe.)

Da Capo, or D.C., *da-ka'-po* (Ital.), in Mus., an expression placed at the end of a piece, to indicate that the performer is to return to, and end with the first part.

Dace, *dais* (Du. *duas*) (*Cyprinus leuciscus*), a small fish found in clear and quiet streams. Its head is small, muzzle pointed; back slightly elevated, and tail slightly



DACE.

forked. The scales of the dace are rather small. It is gregarious. The food is worms and other soft animal substances. April and May are the prime times to fish for dace.

Dacrydium, *dă-krid'-i-um* (Gr. *dakru*, a tear), in Bot., a gen. of plants belonging to the nat. ord. *Taxaceæ*, or Yew family. It includes several valuable timber trees; as, the Huon pine of Australia (*D. Franklinii*), the Kakaterro of New Zealand (*D. taxifolium*), and the Dimon pine (*D. cupressinum*).

Dactyl, *dăk'-til* (Gr. *daktulos*, a finger), in Greek and Latin poetry, is the name of a foot or measure consisting of a long and two short syllables,—as in cărmĭnă, ōmnibŭs. It is so called from its resemblance to a finger, which has a long and two short joints. Dactylic verses are hexameters which end in a dactyl instead of a spondee.

Dactylis, *dak'-til-is* (Gr. *daktulos*, a finger), in Bot., a gen. of Grasses. The species *D. cæspitosa*, is the tussac-grass of the Falkland Islands, which forms an excellent kind of fodder for cattle. It is now grown to some extent in Shetland and other parts of Britain.

Dactylology, *dăk-til-ol'-o-je* (Gr. *daktulos*, a finger, and *logos*, discourse), denotes a mode of discoursing with the fingers, the art of communicating ideas by means of the fingers. (*See* Deaf and Dumb.)

Dado, *dai'-do* (Ital. *dado*, a die or cube), in Arch., the name of the square plinth or pedestal on which a column or statue is sometimes placed. It is in the form of a cube,—whence its name. In the internal decora-

tion of buildings, the term is often applied to the boarding or panelling which covers the lower part of the walls of a room, finished by the skirting-board below, and an impost, or small projecting cornice, called a chair-rail, above. The dado of a room, including its three parts, is about three feet in height. It is commonly found in houses of the 17th and 18th centuries; but it is not much used in the present day.

DADYL, in Chem., a hydrocarbon obtained by heating oil of turpentine with quicklime. It is a liquid oil, boiling at 273° Fahr. It is also called *camphilene* and *camphene*.

DÆMON. (*See* DEMON.)

DAG, *dăg* (Fr. *dague*), the name of a hand-gun or pistol, invented in the early part of the 16th century, resembling the demi-haque and pistol in form, but having the butt straight and flat, and terminating in a square surface instead of being curved and finished by a rounded knob like that of the pistol. The butt, indeed, was very much like the handle of a Turkish yatagban, or old-fashioned dagger, square and broad where the little finger grasps the hilt, and from this resemblance the weapon probably derives its name. The Italian for wood-knife or dagger, is *pistolese*, which seems to corroborate the supposition that these weapons derived their names from their resemblance to daggers, or from bearing the same relation to a musket that a dagger bears to a sword.

DAGGER, *dăg'-ger* (Fr. *dague*), a weapon consisting of a short blade, sometimes broad, two-edged, and tapering to a point, and sometimes triangular in form, like a bayonet, set in a hilt, with a loop of wire projecting from it on either side, to receive the pressure of the hand in making a thrust. It was sometimes used as a weapon of defence, particularly in duelling and single combat, being used in the left hand to parry the thrusts of a rapier. In the days of chivalry, the knight generally carried a long sharp dagger in his girdle, called a *misericorde*, with which he dispatched his adversary when he had unhorsed him, if he refused to yield, by stabbing him in the throat.

DAGON, *dā'-gon* (Heb. *dag*, a fish), the name of a celebrated god of the Philistines, worshipped at Ashdod, Gaza, and elsewhere. Difference of opinion exists as to the form of this idol; but the most general opinion is, that it had the head and hands of a man, while in the lower part it resembled a fish. The form of the figure alludes to the maritime position and piscatorial pursuits of the Philistines. Some derive the name from the Hebrew *dagan*, corn, and believe him to have been the god of agriculture. In 1 Samuel v., we have an account of the fall and destruction of this idol before the ark of the Lord.

DAGUERREOTYPE PROCESS, *dă-gair'-o-tipe*, a process of photography invented by M. Daguerre, an eminent French chemist, by which images are impressed on a silver plate. A perfectly polished silver plate is exposed in the dark to the vapours of iodine and bromine, by which means a mixture of iodide and bromide of silver, exquisitely sensitive to light, is obtained. The plate is then exposed to the action of the image formed by light in the camera obscura, for a period varying from a few seconds to several minutes, according to the intensity of the light. A latent impression is formed on the film of bromo-iodide of silver, giving this substance the property of combining with the vapour of mercury in those parts where the light has struck. This latent impression is brought out or developed by being exposed for a few seconds to the vapour of mercury in a heated box. On withdrawing the plate, the mercury will be found to have fixed itself to the silver in exact proportion to the effect of the light on the different portions of the image, the deposit being white and brilliant on the lightest portions, more or less grey on those parts constituting the half-tones, and being absent altogether in the deep shadows. It is then washed with a weak solution of hyposulphite of soda, which dissolves out the bromo-iodide of silver, which has remained unaltered by the light. The last process consists in laying on a fine film of metallic gold, by pouring over the plate a solution of the double hyposulphite of soda and gold, or *sel d'or*, as it is commonly termed. There are few questions which have given rise to greater controversies amongst chemists than the nature of the daguerreotype image, many supposing it to be mercury only, others thinking that it is an amalgam of mercury and silver. It is unfortunate that the quantity of material formed is so very minute that it becomes impossible to subject it to analysis. Daguerreotypes have been almost entirely superseded by photographs on paper and glass. The absence of any unpleasant metallic gloss, and the easier multiplication of the latter, to say nothing of the process being much simpler, have almost entirely excluded daguerreotypes from public favour. It often happens that daguerreotypes become covered with a crust of sulphide of silver, from the action of the sulphur compounds contained in the coal and gas burnt in our houses. In such cases the daguerreotype should be washed, by a competent photographer, with a weak solution of cyanide of potassium, until the objectionable film is removed, when the image will be found to be restored to its pristine brilliancy. The facts just mentioned dictate the necessity of preserving daguerreotypes in air-tight cases, as much as possible away from the mantel-piece, where they are most usually hung.

DAHLGREN GUN, *dal'-gren*, a gun of heavy calibre, invented by and named after an officer belonging to the United States navy. In form it is somewhat similar to the Armstrong g although it does not possess the symmetry, power, lightness of that weapon. The breech is extremely strong, being very much thicker than the breech of an ordinary cannon; while the part between the trunnions and the muzzle is lighter, and contains less metal than a common gun of the same calibre. It is much used in the United States navy, and highly prized by the Americans; but it is inferior to Sir W. Armstrong's beautiful weapon in every respect. It fires shells as well as solid shots.

DAIRI, *da-e-re'*, is the name of the ecclesiastical sovereign of Japan, who has his capital at Miako.

DAIRY, *dair'-e* (Ang.-Sax.), a term usually applied to all that is connected with milk and its management on a farm. It is also applied to the place where the milk is kept and converted into butter or cheese. In the successful management of the dairy very much depends upon the quality of the cows and the food with which they are supplied. The construction of the house where the milk is stored, &c., is of the highest importance. It should be situated on a dry spot, somewhat elevated, having, if possible, a northern exposure. A high roof and free ventilation are necessary; and the proximity to pig-sties, sewers, or offensive smells, must be avoided. Coolness is essential during the summer, and an equable temperature in the winter. As the milk suffers from being agitated or too much cooled before it is set for the cream to rise, the cowhouse should be as near as possible to the dairy. The milk should be brought direct from the cows, without being exposed to the outer air, if possible. No substances except milk, butter, and newly-made cheese, should ever be allowed to come into a dairy. The floor and shelves, which are generally of stone or slate, should be carefully washed every day, and any spilled milk should be removed immediately. Scrupulous cleanliness, indeed, is the first rule in all dairies. After being brought into the dairy, the milk is run into shallow dishes, made of earthenware or oak, lined with lead. The layer of milk run into each vessel should be shallow, in order to promote the formation of cream. The cream removed at the first skimming is the richest and best. For the methods employed in the dairy for converting milk into cheese and butter, see the articles under these heads. In London and other large towns the cows are kept by the dairymen tied in their stalls. They are seldom kept longer than twelve months, being disposed of as soon as their supply of milk does not equal the cost of their feeding.

DAIS, *dais* (Fr. *dais*).—In the common acceptation of the word, when we speak of the dais, we mean the raised flooring at the upper end of a hall, on which the high table stands, and where the most distinguished guests are seated, or the platform on which a throne, or chair of honour, is placed. This also seems to be the meaning of the term when it occurs in the works of old English poets and prose writers. In France it means the canopy erected over a raised platform occupied by the sovereign at any reception or public ceremonial, as well as the platform itself; and the canopy

carried over the host or sacred wafer, when the priests are bearing it to the bedside of a dying man, is so called. Originally it most probably meant the canopy only, under which a throne, altar, font, or statue was placed; being next applied to the elevated platform on which such things were placed, and afterwards to any piece of flooring that was higher than the rest.

DAISY. (*See* BELLIS.)

DALBERGIA, *dăl-ber'-je-ă* (after Dalberg, a Swedish botanist), in Bot., a gen. of leguminous plants of the sub-ord. *Papilionaceæ*. Several species are good timber trees, the most valuable being *D. Sissoo*, which furnishes the Indian wood called sissoo or sheeshum. From *D. latifolia*, East-Indian ebony or black-wood is obtained.

DALMATIC, *dăl-măt'-ik*, is the name of a long white gown with sleeves, formerly worn by the Dalmatians, and, since the time of Pope Sylvester I., by the deacons of the Roman Catholic church, over the *alba* and *stola*. It was formerly also worn by the German emperor at the time of his coronation.

DAM, *dăm* (Germ. *damm*), a construction of stone, wood, or earth, erected for the purpose of keeping back a current of water, with the object of giving power by increased head, or for holding back supplies of water for flooding lands, or for rendering the stream above the dam navigable by increased depth. The first builders of dams were the beavers, whose constructions of sticks, clay, and earth, attest their wonderful sagacity. Perhaps the most magnificent work of this kind is that described by Minard. It is in the province of Alicante, in Spain, between two steep mountains, which are in close proximity to each other. The height of this dam is 156½ feet; its length 272½ feet; its thickness at top 69½ feet. It was erected in 1594, and is used for collecting water to be used for irrigating the vineyards in the neighbourhood.—*Ref.* Minard's *Cours de Construction des Ouvrages qui établissent la Navigation des Rivières et des Canaux*, Liège, 1851.

DAM, in Law, a boundary or confinement; as to *dam up*, or *dam out*, *infra damnum suum*, within the bounds or limits of a man's own property or jurisdiction.—*Bract.*, lib. 2, c. 37.

DAMAGE, *dăm'-ăj* (Ang.-Nor.), in Law, signifies, generally, any hurt or hindrance which a man receives in his estate; but in a particular sense, it is applied to what the jurors are to inquire of and bring in when any action passeth for the plaintiff. (*Co. Litt.*, 257.) *Damages* are a species of property acquired and lost by suit and judgment of law, and are given to a man by a jury, as a compensation and satisfaction for some injury sustained; as for battery, false imprisonment, slander, trespass, and otherwise. (2 *Bl. Com.*, 438.) (As to the quantum of damages which will carry costs, *see* COSTS.)

DAMAGE-FEASANT, or FAISANT, *dăm'-ăj faiz'-ănt* (Ang.-Nor.), in Law, is where a stranger's beasts are found in another person's ground without his leave or license (and without the fault of the possessor of the close, which may happen from his not repairing his fences in cases where he is bound by law to fence), and there doing damage, by feeding, or otherwise, to the grass, corn, woods, or the like. (2 *Danv. Abr.* 364; 3 *Bl. Com.* 7.)

DAMASK, *dăm'-ăsk* (from Damascus, where it was originally made), a woven fabric, in which, by particular arrangements of the loom, figures of flowers, fruits, and others not of a geometrical form, are produced. The art of damask-weaving remained for a long time a mystery confined to a few places; but since the invention of the Jacquard loom it is extensively employed where stuffs used for dress or house-furnishing require ornament. The flowered ribbons of Coventry and the costly silks and satins of Lyons and Spitalfields are specimens of damask manufacture. The chief seat of the trade is Dunfermline, in Scotland; it is also largely made in England, Ireland, Belgium, Saxony, Silesia, and Austria.

DAMASKEENING, or DAMASCENE-WORK (*dăm-ăs-keen'-ing* (Fr. *damasquiner*), the art of producing a watered or wavy appearance on steel sword-blades, armour, &c., or of inlaying and encrusting steel with gold and silver. This art was originally practised at Damascus, and was introduced into Europe in the 12th century by the Crusaders, who frequently brought Damascus blades, which were celebrated for their elasticity, temper, and keenness, with them on their return from the Holy Land. Various methods of damaskeening were practised; but the most common seem to have been those of welding two different kinds of steel, or steel and iron, together, or of cutting lines on the surface of the steel and filling them with gold or silver, which was either forced into the incised lines and brought on a level with the surface of the steel, or remained in relief above it. When the former method was used, a light pattern, generally in wavy lines, was produced on a dark ground, or *vice versâ*, and the junction of the metals caused the pattern to run through the entire thickness of the blade, so that it could not be obliterated even by grinding. The damaskeened steel armour and works of art in this style of the 15th and 16th centuries came chiefly from Milan and Venice. The most beautiful piece of work of this kind that now exists is the shield made by Benvenuto Cellini, which is in the possession of her Majesty. It was formerly the property of Francis I. of France, and was given by him to Henry VIII.

DAME, *daim* (Lat. *domina*, a mistress), formerly a title of honour given to high-born ladies, in order to distinguish them from the wives of citizens and the ordinary commonalty. The prefix *ma* was given to the word *dame* on account of the great courtesy shown to ladies of high rank. *Madame*, "my lady," was applied to a lady of title; and in France, *Notre Dame*, our Lady, was applied to the Virgin Mary as a term of veneration and homage. The word dame, in England, is not much used, but in general signifies a married woman. The French word *madame* is shortened into madam, and is used in a similar sense.

DAMMARA, *dăm'-mă-ră*, in Bot., a gen. of coniferous trees, including two remarkable species. *D. australis*, the kawrie or cowdie pine of New Zealand, furnishes excellent timber for masts and spars, and also yields a gum-resin, which is now largely imported into this country under the names of Australian copal, kawrie gum, and Australian dammar. It is chiefly used in the preparation of varnishes. *D. orientalis* yields a somewhat similar gum-resin, which is known as Indian dammar.

DAMPER, *dăm'-per*, a term applied to several mechanical contrivances. The damper of a furnace or fireplace is a door or valve, which, by rising, falling, sliding, or otherwise, lessens the passage for air, and thus damps or checks the intensity of the combustion. The damper of a pianoforte also acts as a check: it is in the form of a small lever, which presses against a string soon after it has begun to sound, and thus stops the vibration. An apparatus which communicates dampness is also called a damper: thus, damping-machines have been invented for the purpose of moistening postage and other stamps.

DANÆEÆ, a sub-ord. of Ferns. (*See* FILICES.)

DANCE OF DEATH, *dănse*, a term applied to a certain class of allegorical representations generally dating about the 14th century, and illustrative of the power of death over the human race. In the dark ages of monkish bigotry and superstition, the people were led into a belief that the fear of death was acceptable to the Creator. Hence they seem to have derived one of their principal gratifications in contemplating this necessary termination of humanity, surrounded by ideas of the most horrible and disgusting nature. The representations of skulls and bones on the tombstones of the present day are the remnants of the customs of that time. Gradually, the feeling of the people towards death changed, until it was represented under simpler and more majestic forms. During this transition-state, one of the most favourite emblems of mortality was the Dance of Death. It was a drama performed in or near churches, and consisted of short dialogues between Death and twenty-four or more followers. It originated in Germany, but was afterwards greatly in vogue in France, where it was called *la Danse Macabre*, from St. Macarius, an Egyptian anchorite. Shortly after its introduction into France, pictorial representations of the dance began to be made, and remains of these are to be found not only in many places on the continent, but also in Great Britain. The drama was altogether laid aside in the middle of the 15th century.

and the pictures held the chief place of importance. Hitherto they had been placed only in the quiet cloisters of the convents, but now they were exhibited in public, and soon lost their original character. The grotesque idea of Death dancing with his victims was departed from by Holbein, who, availing himself of the subject, produced fifty-three distinct subjects for engraving, which he called "Imagines Mortis." The originals are at St. Petersburg.—*Ref.* Holbein's *Dance of Death*, in Bohn's *Illustrated Library*.

DANCETTE, *dăn-set'*, one of the eight peculiar forms of partition-lines recognized by English heralds. It is a zigzag line, the indentations of which are of a great size, and limited to three in number.

DANCING, *dăn'-sing* (Ger. *tanzen*), is the art of moving in measured steps, or adapting the movements of the body to the sounds of music. There is no account of the origin of the practice of dancing among mankind. It is found to exist among all nations, even the most rude and barbarous. Among the Jews, dancing seems to have formed part of the religious worship on some occasions, as is evident from some passages in the Psalms. The ancient Greeks made the art of dancing into a system, by which the different passions could be powerfully expressed. Homer mentions dancing at entertainments, and Aristotle ranks dancing with poetry. The Spartans compelled their children to practise dancing from the age of five: they were led by men, and sang hymns and songs as they danced. The Pyrrhic dance was danced by the Spartan youths; it was expressive of a sham fight. There were three kinds of dances among the ancients: military dances, intended to make the body robust, active, and well disposed for all the exercises of war; domestic dances, which had for their object an agreeable and innocent relaxation and amusement; and mediatorial dances, which were in use in expiations and sacrifices. The early Christians danced at their religious assemblies, although there is no mention of the practice in the New Testament. At the present day, dancing is a favourite amusement as a social custom and healthful exercise.

DANCING MANIA, an epidemic disorder among susceptible subjects, in which imitation is brought about under high excitement. It is closely allied to hysteria, and principally occurs among persons who are desirous of notoriety or sympathy. During the Middle Ages, epidemics of this class were common in Germany; and in Italy they were ascribed to the bite of the tarantula spider. Towards the close of the 14th century, a number of men and women appeared at Aix-la-Chapelle, on the festival of St. John, dancing and screaming in a frantic manner in the streets. Many foamed at the mouth, and danced till they fell down insensible; others dashed their brains out against the walls. While dancing, they were unsusceptible of outward impressions, but were haunted by visions. The epidemic spread over the Low Countries, and bands of wretched ignorant people traversed the country, and, excited by wild music, danced themselves into convulsions, singing all the time in derision of the priests. At the beginning of the 17th century, St. Vitus's dance, as it was then called, was on the decline, and it is now only heard of in isolated cases.

DANDELION. (*See* TARAXACUM.)

DANEGELT, *dain'-gelt* (Sax. *Dane*, and *gelt*, money), was an ancient annual tax of the Anglo-Saxons, levied for the purpose of defending their coasts against the Danes.

DANE-LAGH, or DANE-LAW, *dain'-law*.—After King Alfred had overthrown the Danes under Guthrun, at Ethandune, a treaty was entered into by which the Danes were bound to evacuate the whole kingdom of Wessex, from Somerset to Kent. They were, however, allowed to occupy the greater portion of the east coast of England, including the whole of Northumbria. The portion of territory which they occupied was called Dane-lagh, or Dane-law; because they were not governed by English, but by Danish law. The treaty was concluded in 878 A.D., and was held in force till the Norman conquest.

DANIEL, BOOK OF, *dăn'-yel*, is the twenty-seventh in order of the books of the Old Testament, and is the work of the author whose name it bears, at that time a captive in Babylon, to which country he was taken when very young. Being of noble, if not of royal extraction, and a youth of great promise, he was brought into the king's court, and instructed in the language and sciences of the Chaldeans, and subsequently rose to very great eminence. The book which bears his name is partly historical and partly prophetical. The first six chapters are historical, and speak of Daniel in the third person; the last six contain visions, which Daniel relates in the first person. In the first six chapters we have recorded a variety of events which occurred in the reigns of Nebuchadnezzar, Belshazzar, and Darius; and, in particular, the second chapter contains Nebuchadnezzar's prophetic dream concerning the four great successive monarchies, and the everlasting kingdom of the Messiah, which dream God enabled Daniel to interpret. In the last six chapters we have a series of prophecies, revealed at different times, and extending from the days of Daniel to the general resurrection. The Assyrian, the Persian, the Grecian, and the Roman empires, are all particularly described under appropriate characters; and it is expressly declared that the last of them was to be divided into ten lesser kingdoms; the time at which Christ was to appear is precisely fixed; the rise and fall of Anti-christ, and the duration of his power, are exactly determined; and the future restoration of the Jews, the victory of Christ over his enemies, and the universal prevalence of true religion, are distinctly foretold as being to precede the consummation of all things. The book abounds with the most exalted sentiments of piety and devout gratitude; its style is simple, clear, and concise; and many of its prophecies are delivered in terms so plain and circumstantial, that many have been led to deny their authenticity, and to maintain they were written after the events had taken place. Porphyry, in the 3rd century, affirmed that the book was composed as recently as the time of Antiochus Epiphanes, and that therefore it narrated only past events; and he has had many followers in more recent times, and even in the present day. The arguments, however, advanced against the authenticity or genuineness of the book are of the most weak and frivolous character. "If the book had been written after the events, as these assert, it must have been written in Palestine; in which case the writer would not have been acquainted with the names of the Chaldean offices, which are in the Zendic, Phelvic, and Parsic languages; and he would not have been acquainted with the views peculiar to the Magians, much less would he have ventured to make use of them; he would not have applied to the last king of the Chaldeans the name Belshazzar, which is unknown to historians; he would not have covered the walls of the royal supper-hall with plaster, but rather with costly wainscot; he would not have known that Xerxes had excited even the West (the Carthaginians); neither would he have been acquainted with the history of Alexander, of Egypt, and of Syria (Dan. xi. 2, vii. 6, viii. 5, xi. 3); he would not have mentioned the third expedition of Antiochus Epiphanes a second time (xi. 40) out of its natural order; neither would he have written occasionally so enigmatically, nor have used two dialects, but he would carefully have avoided whatever would have thrown difficulties in the way of his reader; he would not have specified the year and day of his visions, which could afford him no advantage in the transformation of history into prophecy; he would have inserted in his visions less of Alexander and more respecting the Maccabees; and he would not have said, in viii. 15, 27, xii. 4, 8, that these predictions were unintelligible until they should be accomplished, and that the prophecy, x. 1, was understood by Daniel, such observations being inconsistent with the supposed transformation."—(Jahn's *Introduction to the Old Testament.*) In short, the book is exactly such as one living at the time, and in the circumstances of Daniel, would have written, and is as different as possible from anything that we could conceive written during the Maccabean period. The very accuracy of these prophecies, which is objected to their authenticity, is what might be expected from a man of his character, as a man accustomed to the study of political affairs, and who would therefore take a more particular view of what was revealed to him. Finally, we have the testimony of Christ himself as to the real and prophetic character

of the book when he says, "When ye, therefore, shall see the abomination of desolation *spoken of by Daniel the prophet*, stand in the holy place," &c. (Matt. xxiv. 15).—*Ref.* Hengstenberg, *Die Authentic. des Daniel*; Horne's *Introduction to the Old Testament*; Jahn's *ditto*.

DANISH LANGUAGE AND LITERATURE, *dā'-nish*.—The Danish language was originally a dialect of the so-called Old Norse, which, on account of the political superiority of the Danes over the other Scandinavians, was also called the "Dönsk Tunga,"—*i.e.*, the Danish language. The Danish is the most changed of the languages derived from the Old Norse; the Swedish and Norwegian being less so, and the Icelandic least of all. The political union of the Danes with the Anglo-Saxons under Canute the Great, and the intercourse between the two nations that resulted therefrom, had a considerable influence upon the Danish language, to which the other branches of the Old Norse tongue were not subjected. Much more important and considerable was the influence exerted upon it at a later period from contact with the Germans. The Reformation introduces another era in the history of the Danish language; and the translation of the Bible into it gave it a fixed character, and raised it to the rank of a written tongue. As in Germany, so also in Denmark, a rage for everything French prevailed for a time, and many Gallic terms were then introduced. A reaction, however, took place in the latter half of the 18th century; and, since the beginning of the 19th, much has been done to restore and maintain the purity of the Danish tongue, by the establishing of a taste for Old Norse studies, and by the writings of such men as Baggesen, Oehlenschlager, Grundtvig, and others. Since the union of Norway with Denmark, towards the end of the 14th century, the Danish has been the literary language of Norway; and it is also the language of the educated classes, as well as that generally spoken in the towns. The modern Danish is one of the softest languages now spoken in Europe. When a foreigner hears it spoken for the first time, he hardly perceives any sounds in it except the vocalic, the consonants being so much softened in pronunciation that they scarcely appear. The vocalic system is hence very perfect; and Dr. Rask has distinguished ten vowels, the sounds of which are all quite distinct. The inflections are few and simple, and the language is one that may be easily mastered. Although Denmark can scarcely be said to have possessed any national literature, properly so called, prior to the 18th century, yet its origin may be carried back to the time of the Reformation. The oldest remains of the Danish language do not ascend higher than the 12th century, and consist of laws of the early kings; as the "Skaanske Lov," the "Sjellandske Lov," &c. To the 12th century belong the works of the historians Saxo Grammaticus and Svend Aagesen, which, however, are in Latin. In the 13th century we meet with what seems to be the oldest of the Danish heroic songs, or Kjampeviser, and which are still more numerous in the 14th (collected by Nyerup, Abrahamson, and Rahbek, 5 vols., Copenhagen, 1810-14; Supplement by Rasmussen and Nyerup, 2 vols., 1821). Like the German, the Danish owes its character as a written language to the Reformation. The greatest writer of this period in Denmark, and in a certain sense the founder of modern Danish literature, was Christiern Pedersen (1480—1554), who, besides a number of other works, had a principal hand in the translation of the Bible. The literature which thus received a stimulus from the Reformation at first specially took a direction towards history, as well as to investigations connected with northern antiquities. There appeared in the 16th and 17th centuries not only a number of works of the first importance on the history of the country, both in Danish and Latin, but there were begun, even in the 16th century, investigations into the northern antiquities which have been so successfully followed up in recent times by Halderson, Olavsen, Magnussen, Rask, Rafor, Müller, Thomsen, Petersen, and others. The period of modern Danish poetry may be said to have commenced immediately after the Reformation. At first the subjects were generally of a sacred nature, as we see in the works of Rasch, E. Pontoppidan and others. Arreboe, who was the first of their epic poets, describes, in his great work, the "Hexameron," the events of the first six days of creation. Danish poetry reached its first culmination during the time of the lyric poet Thomas Kings (1634—1723) and his contemporary Jorgen Sorterup. A new epoch commenced with the genial and versatile Ludwig von Holberg, the creator of the Danish stage. He, in the first half of the 18th century, and Ewald in the second, are considered to mark the golden age of Danish literature. The first truly national tragedy was Ewald's "Rolf Krage;" and beside him, as dramatists, stand Samsöe, Sander, and Thaarup. Among the other poets belonging to this period, are Jens Baggesen, Tullin, Falster, Friman, Bruun, Zetlitz, the brothers Trojel, Pram, and others. A new impulse was given to poetic literature by Oehlenschläger (1779—1851), who had as contemporaries in the same field, Stoffeldt, Ingemann, Grundtvig, Heiberg, Overskou, and others. Among the most recent poets are Hers, Blicher, Hölst, Rosenhof, Winther, Von Hauch, P. L. Moller, and Mollbech. As a poet and writer of short tales, Hans C. Andersen has acquired a European reputation. In the region of history are the names of P. E. Muller, N. M. Petersen, H. Engelstoft, J. Möller, Molbech, Werlauff, Knudsen, Estrup, and Worsaae; while important historical works have also been produced by C. L. Bader, F. L. Jahn, L. C. Müller, R. Allen, Nathanson, and Wegner. As publicists, are distinguished Direkinck-Holmfeldt and Ostwald; as statisticians, A. Baggesen, Bergsoe, Nathanson, Ruf, and Anschen. The services rendered by Schouw to physical geography, and by Oersted to physics and chemistry, are known and acknowledged far beyond the limits of their native country. Among theologians are Martensen, Mynster, Clausen, Nielsen, and Scharling; and among jurists, A. S. Oersted and Algreen-Ussing occupy a first place. As a philologist and critic, Madvig has made himself a European reputation; while Westergaard, from his knowledge of the languages of India and Persia, and Bröndsted and Petersen, from their knowledge of classical antiquity, have rendered good service to learning. The works of Thorwaldsen, presented by the artist to his countrymen, have created a taste for sculpture and the fine arts generally among them, and given a new direction to their mental culture.

DAPHNE, *daf'-ne* (the Greek name of the laurel), in Bot., a gen. of plants belonging to the nat. ord. *Thymeleaceæ*. The species are mostly shrubby evergreens of great beauty, with leaves of a peculiar velvet texture, and very fragrant flowers. The root-bark of *D. Mezereum*, the mezereon, or spurge olive, is official in the British pharmacopœias. It may be used as a vesicatory, and as a masticatory in toothache; but it is principally employed as a stimulant, diaphoretic, alterative, and diuretic. It owes its properties to an acrid resin and an acrid volatile oil. The stem-bark has similar virtues, but is generally considered to be less active. The fruit is acrid and poisonous. The bark of *D. Laureola*, the spurge laurel, is sometimes substituted for the official bark. The inner barks of *D. cannabina* and other species are used in some parts of the world for making paper.

DARIEN SCHEME, *dair'-e-en*, an ill-fated undertaking, projected in 1695 by William Paterson, a clergyman in Scotland. This person having a strong desire to see foreign lands, made his profession the means of gratifying it. He went to the new Western world ostensibly to convert the Indians; but while there, he observed that on the Isthmus of Darien there was a tract of country which did not belong to the Spaniards, and was inhabited by a race always at war with them. He also noted that the natural features of the country were admirably adapted to the construction of harbours and the formation of a colony. Paterson's original idea was to have submitted his project to England; but having few friends there, he was discouraged. He then applied to the Dutch, but they heard him with indifference; after which, having made the acquaintance of the marquis of Tweeddale, he resolved that the scheme should be carried out in Scotland. The Darien Company was consequently established by act of the Scottish parliament, and sanctioned by royal authority. Its principal aim was to form a great commercial station between the Eastern and Western hemispheres. When the subscription-list

was opened, all classes eagerly subscribed, and in a very short time £400,000 were signed for in Scotland, although there was not cash to the value of £800,000 in the kingdom at that time. Afterwards England subscribed £300,000, and the Dutch and Hamburgers £200,000. At this period, however, the jealousy of trade caused the English parliament to protest against the formation of the Darien scheme as detrimental to the interests of the East-India Company. The king interfered, and the result was the almost total withdrawal of the English and Dutch subscriptions. The Scotch, however, were not depressed by this opposition, but rather elated; and on the 26th of July, 1698, twelve hundred men set sail for Darien from Leith in five ships. Nearly all the inhabitants of Edinburgh came down to see them depart. On reaching their destination they purchased lands from the natives, and sent messages of amity to the neighbouring Spanish governors. The colony was called New Caledonia; the site of the principal city, New Edinburgh, was fixed upon, and a fort commenced at Acta, called Fort St. Andrew. Everything succeeded for the first few months; but when the hot summer weather arrived, many of the colonists sickened and died. Their provisions began to fail them also; and on applying to the British colonies in America, they heard with indignation and dismay that the authorities, having learned that King William had not given his sanction to the scheme, refused to hold intercourse with the Darien colony. After lingering eight months, waiting in vain for assistance from Scotland, they almost all died or quitted the settlement. About thirty of the colonists got back to Scotland. Paterson was one of these, and during part of the time in the passage home he was insane. While these misfortunes surrounded Paterson and his companions, the Scotch, ignorant of what had occurred, sent out another colony of 1,300 men to support the extinct settlement. A Spanish force of 1,500 men immediately attacked the new-comers, and after a gallant resistance they were finally obliged to quit the territory. Paterson never wholly gave up hopes that the scheme would be tried again; he survived many years, neglected, but pitied and respected. The Scottish India House in Edinburgh is the chief memorial of the Darien scheme, a project which materially injured the commerce of Scotland, and excited a deep hostile feeling against the English government and nation.—*See* PATERSON, vol. i. of this work.

DARTER, *dar'-ter* (*Plotus Anhinga*, Linn.).—In general form this bird resembles the cormorant, but the head is smaller, and supported on a very long and slender neck. The beak is perfectly straight and pointed, with the edges of the mandibles denticulated. Buffon, in allusion to the darter, says, "It offers us a reptile grafted on the body of a bird." It is sometimes called the snake-bird. Its habits while in the water have contributed not a little to its name. It generally swims with its body immerged, especially when apprehensive of danger, its long neck extending above the surface, and vibrating in a peculiar manner. "Whether the darter be swimming or flying, it is certain that the most striking and remarkable part of its body is its long slender neck, which is continually in tremulous oscillation. In flight alone it is unmoved and stretched out, and forms, with the tail, a straight horizontal line. Its long tail, composed of strong and elastic feathers, serves as a rudder when swimming submerged in pursuit of fishes, upon which it principally feeds. When the darter seizes a small fish, it swallows it entire, but if it be too large, it carries it to a rock or the trunk of a tree, and, fixing it beneath one of its feet, cuts it in two by a stroke of its bill. It establishes its nest on trees or rocks in the vicinity of waters."—(*Temminck.*) The darter is found in the warmer parts of the world, in America, and Africa. Although of aquatic habits, it is said to build in trees.

DASYURES, *da'-se-u'-res* (Gr. *dasus*, hairy; *ouros*, tail).—This family includes the largest of the rapacious marsupials. The largest of the species (*Dasyurus ursinus*) measures about eighteen inches long in the body, and is covered with long thick hair, of a black colour. It is a native of Van Diemen's Land, where it is commonly known as "the devil." It is chiefly destructive among sheep, and, despite its small size, is capable of doing immense mischief among the penned flocks. When Van Diemen's Land was first colonized, "devils" were very abundant; but they are now for the most part banished to the woods in the unfrequented parts of the country, where they subsist on small quadrupeds and birds. The feet of the dasyurus are formed for terrestrial progression; the anterior have five toes, and the hind ones four, all perfectly separate, and armed with curved claws. The deficient toe of the hind feet is sometimes represented by a sort of tubercle, which, however, does not reach the ground. The teeth are usually forty-six in number; the form of the molars in the upper jaw is usually irregularly triangular, with three points. The dasyures are evidently analogous to the ordinary carnivorous quadrupeds, not only in their ferocity and carnivorous propensities, but also more or less in form.

DATA, *dai'-tă* (Lat., things given), in Geom., are certain things or quantities which are given or determined by the conditions of a particular problem. A thing is said in general to be given which is either actually exhibited or can be found out; that is, which is either known by hypothesis or can be demonstrated to be known. Hence, in the analysis or investigation of a problem from the things that are laid down to be known or given, by the help of known propositions, other things are demonstrated to be given; and from these, other things are again shown to be given; and so on, until that which was proposed to be found out in the problem is demonstrated to be given. In the book of Data ascribed to Euclid, which is the most valuable of the works left us on geometrical analysis by the Greeks, the word is used for such spaces, lines, and angles as are given in magnitude.—In Philosophy, Medicine, &c., the facts from which an inference is drawn are called data.

DATE, *dait* (Lat. *datum*, given), the time when an event happened, or when anything is to be done. The date of an event, or of a document, is often of great importance; but it is frequently a matter of great difficulty to ascertain it correctly. One of the chief obstacles is the difference between the two styles by which dates are reckoned, and through which a discrepancy of between ten and twelve days may be made in the calculation, according to the century to which the date belongs. There was only one style of reckoning time in Europe until 1582, when Pope Gregory XIII. introduced the "new style," which declared the 5th of October, 1582, to be the 15th, thereby correcting a number of errors which had accumulated. The ten days were then struck out, and nearly all Roman Catholic countries adopted the new style; the Protestant countries, however, retained the old or Julian calendar, for a longer or shorter period of time. (*See* CALENDAR.) Thus, in all dates after 1582, it is necessary to ascertain whether the old or new style was used at the time and place specified. Many old documents are dated from some particular service of the church on the day of writing; and in some nations, for a great length of time, it was customary to date from the year of the monarch's reign.

DATE OF A DEED, is the description of the time, viz., the day, month, year of our Lord, year of the reign in which the date was made.—1 *Inst.* 6. (*See* DEED.)

DATE-PALM and DATES. (*See* PHŒNIX.)

DATHOLITE, *dăth'-o-lite*, in Min., a boro-silicate of lime, found in various parts of the world in oblique rhombic prisms. It also occurs in botryoidal forms, when it receives the name of *botryolite*. It is found rather abundantly near Lake Superior, where it is profitably employed in the manufacture of boracic acid. It is also used as a flux for copper ores.

DATISCACEÆ, *dai-tis-kai'-se-e* (deriv. unknown), in Bot., the *Datisca* fam., a nat. ord. of dicotyledonous plants in the sub-class *Monochlamydeæ*, consisting of herbs and trees having the following botanical characters:—leaves alternate, exstipulate; flowers diclinous; male flower with a 3—4-cleft calyx; 3—7stamens; anthers 2-celled, linear, bursting longitudinally; female flower with a superior 3—4-toothed calyx and a 1-celled ovary, with 3—4 polyspermous parietal placentæ. Fruit dry, opening at the apex. Seeds without albumen, minute, numerous. The whole order includes but four species, which are widely distributed over the world. The only noteworthy plant is *Datisca cannabina*, the root of which is employed in Cashmere for dyeing yellow.

DATIVE, *dat'-tiv* (Lat. *dativus*, from *do*, I give), in the grammar of most languages is the name of the third case in the declension of nouns, and serves to denote participation by the noun in the action of the verb which accompanies it.

DATURA, *dăt-ū'-rā* (from *taturah*, its Arab. name), in Bot., a gen. of plants belonging to the nat. ord. *Atropaceæ*. The species *D. Stramonium* is the thorn-apple, a plant possessing extraordinary narcotic properties. It is much employed in medicine as an anodyne and antispasmodic, its effects resembling those of belladonna. In spasmodic asthma, smoking the herb, or inhalation from its infusion in hot water, frequently gives great relief; but in some instances, when thus used, the herb has produced fatal results. A strong decoction of the leaves in water is used in Cochin-China as a remedy in hydrophobia, in which terrible disease it is reputed to be very efficacious. Stramonium owes its principal activity to the presence of a narcotic alkaloid called *daturia*, which much resembles *hyoscyamia* and *atropin*, the alkaloids of *Hyoscyamus niger* and *Atropia Belladonna*. The *daturia* is especially abundant in the seeds, it is a powerful poison, and strongly dilates the pupil. *D. Tatula*, *metel*, *ferox*, *fastuosa*, and *sanguinea*, have similar properties to *D. Stramonium*. The fruit of *D. sanguinea*, the red thorn-apple, is used by the Indians of the Andes and of Central America for preparing a narcotic drink which produces a peculiar kind of intoxication, and is supposed to put those who partake of it in communication with the spirits of their ancestors.—*Ref.* Johnston's *Chemistry of Common Life*.

DATURIA, *dă-tū'-rē-ă* in Chem., the active principle contained in the seeds of the *Datura Stramonium*, which appears to be identical with that of the belladonna *atropia*.



CARROTS.

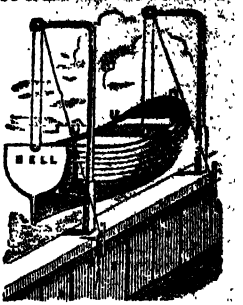
DAUCUS, *daw'-kus*, in Bot., a gen. of plants belonging to the nat. ord. *Umbelliferæ*. *D. Carota*, var. *sativa*, is the cultivated or garden carrot so much esteemed for its esculent roots. Those roots are occasionally used in medicine as a poultice, for their moderately stimulant properties. The term is derived from the Greek *daio*, I make hot, in allusion to its medicinal effects.

DAUPHIN, *dŏ'-fin(n)* (Lat. *delphinus*), the title borne by the heir-apparent to the crown of France before the Revolution. It was originally held by the counts or lords of Vienne, in the province of Dauphiné. Humbert II., the last of these lords, died without issue, in 1349, and bequeathed his possessions to Charles, the grandson of Philip of Valois, on condition that the heir-apparent to the throne of France should bear the title of Dauphin of Vienne. The rights conferred by Louis IX. upon the dauphin were almost regal; but after his reign they were gradually lessened, and the title became a mere honorary distinction.

DAVID'S DAY, ST., *dăi'-vidz*, is held on the 1st of March, and was originally dedicated to St. David, archbishop of Menevia, now called St. David's, in Pembrokeshire. St. David is the patron saint of Wales, and is said, during the days of King Arthur, to have won a victory over the Saxons. During the fight, the archbishop's soldiers wore leeks in their caps, as distinctive marks. In memory of this conflict, the Welsh still wear the leek on St. David's day.

DAVY-LAMP, *dăi'-ve lămp*, in Min., a lamp invented by Sir Humphry Davy to obviate the fearful explosions liable to take place in coal-mines from taking naked lights into places containing *firedamp*, a light carburetted hydrogen. This great philosopher found, that when a lamp is surrounded by wire gauze, the meshes of which are under the fortieth of an inch, any explosions taking place from the passage of fire-damp into the lamp are not communicated to the gaseous mixture outside; in fact, that the heat of the flame passing through the wire-net was so much diminished as to be harmless. This may be readily demonstrated by bringing a piece of fine wire-net down on the flame of a candle, when it will be found that the flame will not pass through it. There are many modifications of the Davy-lamp, but they are all similar in their fundamental principles.






DAVITS.

DAVIT, *dăv'-it*, in Mar., a piece of timber projecting over a ship's bow, used as a crane to hoist the anchor out of the water in such a manner as to prevent its rubbing against her side and injuring the planks. This name is also given to pieces of iron placed in pairs in certain parts of a vessel's sides and stern, employed for hoisting and lowering boats. (*See* BOAT-LOWERING APPARATUS.)

DAWK, or DAK, *dauk*, a mode of travelling adopted in India. The traveller is borne in a palanquin from station to station in his route, and his luggage or clothes are carried in boxes or baskets, called *pettarahs*, by separate bearers who accompany the palanquin. The usual number of bearers who accompany the traveller is about eleven, and a fresh relay of them is supplied by the postmasters at each station. The stations are from nine to eleven miles apart. The arrangements with regard to the cost are made with the postmaster of each presidency before starting; but the traveller is also expected to give the bearers a gratuity at the end of each stage. A sum equivalent to an English shilling is generally sufficient to divide among them. A travelling-carriage, with seats for four, is used upon the great trunk road from Calcutta to the Upper Provinces: it is called a horse-dawk; but it is not generally in use in other parts of the country.

DAWN, *dawn* (Sax. *dagian*), the break of day, the twilight, or half-light that occurs between the first appearance of light and the rising of the sun.

DAY, *dă* (Sax. *dæg*, probably from Lat. *dies*), that period of the earth's revolution on its axis in which its surface is presented to the sun. The term is, however, applied to any astronomical space of time which depends directly on the earth's rotation. But the only days distinguished by that name in astronomy are the sidereal day, the real solar day, and the mean solar day. The sidereal day is the period between the two transits of the same fixed star, that is, a complete revolution of the earth. It is divided into twenty-four hours, and begins when the equinox is on the meridian of the place. The real solar day is the interval between two transits of the sun over the meridian. The length of the real solar day varies at different periods of the year, on account of the unequal motion of the sun and the obliquity of the ecliptic. The mean solar day is the average of all the real solar days. The mean solar time is thus arrived at by imagining a sun moving uniformly in the celestial equator and completing its circuit in the same time as the real sun. The real and mean solar days only coincide in four days of the year. In the intervals the sun is either too fast or too slow. The difference is called the Equation of Time (which *see*). The mean solar day is 24 hours 3 minutes 56·55 seconds of sidereal time; and the sidereal day is 23 hours 56 minutes 4·09 seconds of a mean solar day. The ancients generally began their day at sunrise, with the exception of the Egyptians, who began at midnight, and the Arabians, who began at noon. The latter nation still retains the same custom; and most of the modern Eastern nations reckon the commencement of the day from sunrise. *A day in Law* includes the whole twenty-four hours, without reference to light or darkness. Unless there is some agreement stating otherwise, an obligation to pay on a certain day is discharged if the money is paid before twelve o'clock at night. *A lawful day* is a day on which a writ can be executed without legal impediment. All days, except Sundays and fast-days appointed by government, are lawful days. Criminal

warrants, however, can be granted and executed both on Sundays and fast-days. All contracts entered into by persons in their ordinary calling are void if made on a Sunday. Christmas-day, Good Friday, and Easter-day, in England, stand on the same footing as fast-days appointed by government. *Days of grace.*—When a bill becomes due, in general three days are allowed for its payment beyond the time marked on the face of it. These additional days are allowed by mercantile custom, and protected by the laws of the United Kingdom; they are called days of grace. When the third day of grace falls on a Sunday or fast-day, the bill is considered due the day before.

DAY-FLY. (*See* EPHEMERA.)

DEACON, *de'-kon* (Gr. *diakonos*, a servant or minister), is used in the New Testament for any one that ministers in the service of God, and it is also sometimes used in this sense by ecclesiastical writers, when it includes bishops or presbyters as well as deacons: but it is now generally employed to designate the third or lowest of the three orders in the Christian priesthood. The primitive deacons took care of the secular affairs of the Church, received and disbursed moneys, kept the church's accounts, and provided everything necessary for its temporal good. We have an account of their first institution in the sixth chapter of the Acts of the Apostles; and in the third chapter of the First Epistle to Timothy we have the qualifications specified that were necessary to the office of a deacon. There were also deaconesses in the primitive church, one of whom was Phœbe (Rom. xvi. 1); and this order, though generally disused in the Western church in the 5th century, continued in the Eastern until the 12th. In the primitive church, the deacons were styled "ministers of the mysteries of Christ." It formed part of their duties to take care of the holy table, and the ornaments and utensils appertaining thereto, and to receive the oblations of the people and present them to the priest. In some churches they read the gospel in the communion-service, and ministered the bread and wine to the people in the Eucharist; they also baptized, and, with the bishop's license, sometimes preached. They were also wont to direct the people in public worship, using certain known forms of words to give notice when each part of the service began; and they sometimes represented the bishop in general councils. The Church of England enjoins that "none shall be admitted a deacon, except he be twenty-three years of age, unless he have a faculty;" and the duties of the office are laid down as follows:—"It appertaineth to the office of a deacon, in the church where he shall be appointed to serve, to assist the priest in divine service, and specially when he ministereth the holy communion, and to help him in the distribution thereof, and to read Holy Scripture and homilies in the church; and to instruct the youth in the catechism; in the absence of the priest to baptize infants, and to preach, if he be admitted thereto by the bishop. And, furthermore, it is his office, where provision is so made, to search for the sick, poor, and impotent people of the parish, to intimate their estates, names, and places where they dwell, unto the curates, that, by his exhortation, they may be relieved with the alms of the parishioners or others." In the present day, the more peculiar duties of this officer have devolved chiefly upon churchwardens and overseers of the poor, and his spiritual functions have been more extended. He may now celebrate matrimony and the burial of the dead, and, in fact, perform all the ordinary offices of the Christian priesthood, except consecrating the elements in the Eucharist and pronouncing the absolution. He cannot, however, take any benefice or hold any ecclesiastical promotion: for this, it is requisite that he take priest's orders. In Presbyterian churches generally, the office of deacon is merged in that of elder; but in the Free Church of Scotland and some others there are, in addition to elders, deacons who are ordained to take charge of the funds of the church. In the Congregational churches, on the other hand, they perform the duties both of elders and deacons, and, besides attending to the poor, distribute the elements in the sacrament, and assist the minister with their counsel and advice.

DEAD-EYES, *ded*, in Mar., are flat circular blocks, perforated with three holes, and encircled with ropes or iron bands, which, with the help of other tackle, form a purchase for extending the shrouds and stays, otherwise called the standing rigging.

DEAD LANGUAGES is a term employed to denote such languages as are now no longer spoken by any people or nation, in contradistinction to such as are so spoken, and are known as living languages.

DEAD RECKONING, the name given in Mar. to the method of determining the position of a ship at sea by a calculation based on the following data: the latitude and longitude from which the vessel sailed, which is generally called its point of departure; the time which has elapsed since it left this point, or any other of which the latitude and longitude have been properly determined; the direction in which the vessel is sailing, as indicated by the compass; and, lastly, the rate of sailing, ascertained from measurement by the log. (*See* LOG.) In this method of calculation, no recourse is had to observations of the sun, moon, and stars; but, owing to changes of the wind, the influence of currents, and a variety of causes which affect the course of the vessel, the results of the computation cannot be depended on, and they must be corrected by calculations made from observations of the heavenly bodies.

DEADLY NIGHTSH[illegible]E, or DWALE. (*See* ATROPA.)

DEAF AND DUM[illegible] (Sax. *deaf dumb*).—A person is said to b[illegible] deaf when he is either entirely or in a great measure destitute of the sense of hearing, and dumb when he is without the power of speech or of articulating sounds. Such individuals are also sometimes called deaf-mutes. Deafness is either congenital or acquired. When congenital, it arises from an original malformation of the ear, and is always accompanied with dumbness; when acquired, it is the result of some disease affecting some of the delicate parts connected with the organ of hearing. (*See* DEAFNESS, EAR, HEARING.) The ear is necessary to articulation, which is acquired by imitating the sounds we hear uttered by others; and, therefore, if a person is unable to distinguish between articulate sounds, he is incapable of acquiring speech, at least in the ordinary way, and is dumb in consequence of his deafness. It is rare indeed to find dumbness in deaf persons resulting from any imperfection in the organs of speech or from feebleness of mind; and hence the fallacy that till recently prevailed, that the want of the power of speech was owing to a mental or physical incapacity of the individual, who was thus incapable of receiving education. Persons who have lost their hearing after having acquired the use of speech, and who are thus still able to communicate their ideas orally to others, do not come under the class of deaf and dumb. This affliction is much more common than, for a long time, and up to a very recent period, it was believed to be. The census of 1851 was the first that revealed to us the number and proportion of deaf and dumb in this country. According to that return, we find the number of deaf mutes in the United Kingdom to have been at that time 17,300, or one to every 1,590 of the entire population. The relative proportions, however, differ much in different parts; being, in Herefordshire, as high as one in 1,054; in Worcestershire, one in 1,160; and in the northern counties of Scotland, one in 1,156. In the ex-metropolitan portion of Kent again there is only one in every 2,313; in Durham, one in 2,480; and in Huntingdonshire, one in 3,016. What the causes are which produce deafness are as yet but very imperfectly known or understood. There can be no doubt, however, that there exists some connection between the physical conditions of a country and deafness. In mountainous districts it is generally found to be more prevalent than in plain and flat districts, and in rural parts than in cities or towns. A marshy district, or an impure atmosphere, undoubtedly tends to render it more common. The greater number of these unfortunate persons are to be found among the poorer classes; and hence there is reason to believe that the defect is frequently caused by the want of necessary supplies and attention during infancy and childhood. Among the other causes that doubtless tend to produce deafness, are intermarriages among near relations, hereditary predisposition, and certain conditions of life. In some of the cantons of Switzerland the proportion is as high as one to every 200 of the population; and it is

also very high in Norway and Sardinia. It is worthy of remark, as stated by the commissioners in their report upon the status of disease in Ireland, that in comparing the congenital with the acquired cases of deafness, they found that the congenital form of disease exists most among the rural populations; and that acquired after birth prevailed most in crowded cities and towns, where children and young persons are particularly exposed to accidents, scrofulous affections, and deleterious influences, arising from density of population, unwholesome food, impure air, and insufficient sewerage. It is remarkable that the defect is seldom transmitted direct from deaf and dumb parents to children. "We can show," says the principal of the New York Institution, "that it is much the most common for the children of deaf mute parents to possess the faculties of which their parents were deprived." This fact is clearly established, and there is thus no sufficient reason why the deaf and dumb should not marry. The education of the deaf and dumb has only recently been beginning to receive a due amount of attention. We are told by Bede that a deaf man was taught to repeat words and sentences by John, bishop of Hagulstad (Hexham), who flourished in the latter half of the 7th century; but eight centuries elapse before we read again of any attempt to instruct this unfortunate class of persons, when Rodolphus Agricola, a native of Groningen, mentions a deaf mute that he had known having been taught to note down his thoughts. Half a century later, the learned and versatile professor of Pavia university, Jerome Cardan, gave to the world the theoretical principles upon which the instruction of the deaf and dumb is founded. He says, "Writing is associated with speech, and speech with thought: but written characters and ideas may be connected together without the intervention of sounds, as in hieroglyphic characters," and asserts that on this principle the instruction of the deaf and dumb is possible though difficult. Soon after this time, Father Ponce (1520-81), a Benedictine monk, acquired a great reputation for teaching the deaf and dumb to speak and write. In 1620 Juan Paulo Bonet, a Spaniard like Ponce, and a monk of the same order, wrote a book on the instruction of deaf mutes, and invented a one-handed alphabet. From that time the subject came to receive more attention, a number of works were published, and various systems proposed. Among the persons who more particularly distinguished themselves by their labours in this field, were Dr. John Bulwer, Dr. John Wallis, Dr. William Holder, George Dalgarno, in England; John Conrad Amman in Holland; Heenicke in Germany; and Rodrigue Pereire in France. The first schools established for the education of deaf mutes were those of the Abbé de l'Epée in Paris, and Mr. Braidwood in Edinburgh, both in 1760. The system of De l'Epée was much improved by Sicard, his pupil and successor in the Paris institution, and who is entitled to rank with him as one of the greatest benefactors of the deaf and dumb. In 1783 Mr. Braidwood removed to Hackney, near London, where he taught for many years with great success. The late Dr. Watson, so long superintendent of the London Asylum, was instructed by him, and stood in the same relation to him that Sicard did to his master De l'Epée. In 1792 the London Asylum was founded, and it has been the means of doing much good among this unfortunate class, having at present upwards of 300 pupils. Since the beginning of the present century, a number of similar institutions have been founded, the principal of which are those of Manchester, Doncaster, Dublin, Liverpool, Birmingham, Belfast, Edinburgh, Glasgow, Brighton, and Newcastle. It is very difficult for one who has not given some attention to the subject to form anything like a true conception of the helpless condition of one that is born deaf and dumb. He is not only destitute of all ideas connected with sound, but he is deprived of the means by which instruction and information are usually conveyed to the mind. The voice of speech is to him a nonentity, and he is entirely ignorant of the power of words. He can hold no communication with his fellow-men, except by means of a few imperfect natural signs. His ideas are very much limited to the objects and events he witnesses and the exterior relations of things, and he is shut out from all the knowledge derived from history and tradition. Conceptions of past ages, distant





countries, a future world, or a deity, are all beyond his reach. In regard to the combination and application of the ideas which he acquires, he is still in the state of nations in the very infancy of society, and cannot be aided or directed by others in his efforts or reason. The objects to be accomplished in the education of a deaf mute are to teach him an entire language, and to give him all that mass of moral, religious, and ordinary knowledge that is necessary for him as a social and immortal being. This has to be done by signs, and the meaning contained in the signs has also to be conveyed to him. The first and most important operation in instructing the child is that written words have a meaning, and suggest to all persons of education the same idea. It is necessary to begin by instructing him in the names of external objects, beginning with those which are best known to him and most frequently presented to his view. Thus, the name of any object, such as a knife, may be written in large letters upon a board, and the attention of the child directed alternately to the name and to the object which is presented to him at the same time, until he be gradually brought to understand that a certain relation exists between them. After he has been taught the relation between the names of objects and the objects themselves, he has next to be taught the analysis of words into the letters of the alphabet and the particular gesture which he is to attach to each word as its distinctive sign, together with the meaning of collective words, as distinguished from those denoting individual objects or parts of objects. General terms, as applicable in common to a number of individuals, and to generic names comprehending a number of species, are next to be explained; and lastly the most general and abstract terms, such as *being*, *object*, &c. The qualities expressive of the accidents, variations, and modifications of objects, and which are expressed by adjectives, are next taught. The master must endeavour to make his pupil conceive these qualities, in the first place, as inherent in the objects themselves, and next as capable of being detached by a mental operation from such objects, though in fact they have no existence but as united with them. The means employed in the instruction of the deaf and dumb are,—1. The visible language of pictures, signs, and gestures; 2. the finger alphabet or dactylology, and writing; and 3. articulation and reading on the lips. The first is the earliest and most simple mode of communicating instruction. Dactylology, or the manual alphabet, is a mode of denoting the different letters of the alphabet by means of the fingers. There are two kinds in use; in the one only one hand being employed, in the other both: the latter is the more common. Writing is another important means in the education of deaf mutes, and is useful not only as enabling them to fix their lessons in their mind, but as being also the chief medium by which they can hold intercourse with strangers. Articulation is only in this country regularly and systematically taught in the London Asylum and in Donaldson's Hospital, Edinburgh. It is the teaching of the pupil to express his ideas in speech. In order to this, the sense of touch, as well as the eye, is employed. The pupil is made to notice the movements of the external organs of speech of the teacher, to feel with his own hand the vibrations which sound creates in the trachea, and also to feel those emissions of breath which are caused by the production of certain sounds. He is made to imitate such utterances, and, by means of patience and ingenuity on the part of the teacher, he will at length succeed in imitating what he observes and in expressing himself by speech. Reading on the lips, as it is called, is intended to enable the deaf-mute to understand what is said to him by others, from observing the motion of their lips. The difficulties that attend this mode of instruction are very great, and so far as it is intended to make him comprehend all that is said to him, are insuperable. The system, however, is pursued in Germany, and has been attended with very considerable success. We have, perhaps, said enough on this subject for the general reader; and for those who desire more particular information, we must refer to the works of Dr. Watson and others, specially devoted to this subject. Long and able articles thereon are to be found in the *English Cyclopædia*, sect. Arts and Sciences.

DEAFNESS, *daf'-ness*, is a considerable or entire loss of the sense of hearing. Hearing is produced by the vibrations of the air striking on the tympanum, or drum of the ear, and is communicated to the auditory nerve by means of a series of small bones, connected in a very remarkable manner. (*See* EAR.) Deafness may be congenital,—arising from some original malformation of the organ, or it may result from disease or accident, impairing or destroying some portion of the delicate organism of the ear. It frequently results from some obstruction in the external passage of the ear which interferes with the transmission of sound to the tympanum. This is often occasioned by an unusual accumulation of cerumen, or wax of the ear, which is secreted by the glands of the passage. The most speedy and effectual way of removing this is by syringing the ear with warm water three or four times a day, until it is brought away. Insects and other foreign bodies sometimes lodge in the ear, and occasion deafness; or ulcers or morbid growths may form in the passage, and thus interrupt the transmission of sound. The tympanum may be inflamed, thickened, or injured, to such a degree as to be wholly incapable of performing its office of transmitting sound. Obstruction of the Eustachian tube, which conveys air from the back part of the mouth into the internal cavity of the ear, will often occasion a considerable degree of deafness. Hence, inflammation and other diseases of the throat have frequently this effect. Deafness also sometimes results from derangements in the minute and complicated parts of the organs which are beyond the reach of direct observation, and consequently are but imperfectly understood. The nerve by which impressions are communicated from the internal ear to the brain is also subject to disease, and may occasion deafness, which may also result from diseases of the brain itself. Long exposure to loud deafening noises, a cold, various fevers and inflammations, rheumatism, headache, and repelled cutaneous eruptions, frequently produce deafness. The particular plan of treatment to be pursued will depend upon the nature of the cause, and will necessarily vary considerably in different cases; while the exercise of the greatest attention is often necessary, in order to ascertain the real nature of the case. The diseases that affect the ear are the same as those that affect the other organs, and are to be treated upon the same principles. When they result from inflammation, the inflammation is to be removed in the usual way; when from polypi or morbid growths, these are to be removed by lunar caustic or a surgical operation; when from nervous debility, the general tone of the system is to be strengthened. When an obstruction of the Eustachian tube is the cause of deafness, it is often removed by perforating the tympanum. When it results from a partial or entire loss of the tympanum, an artificial one may be employed, the best being that invented by Mr. Joseph Toynbee, of vulcanized india-rubber, attached to the end of a fine silver wire, by means of which it may be inserted or withdrawn at pleasure.—Ref. *The Diseases of the Ear*, by Joseph Toynbee, F.R.S. London, 1860.

DEAL, *deel* (Sax. *delan*, to divide), in Carpentry, boards made of fir wood more than six feet in length, and more than seven inches wide. They are generally three inches thick, and when sawn thinner are usually called planks. Most of the deals imported into this country come from Sweden, Norway, the Baltic, and North America. (*See* ABIES, PINUS.)

DEAN, *deen* (Fr. *doyen*, Lat. *decanus*), is an ecclesiastical dignitary in cathedral and collegiate churches, being the head of the chapter of canons or prebendaries, and forming, together with them, a council to advise the bishop in the affairs of his see. The term is believed to come from the Greek *deka*, ten. In the ancient monasteries every ten monks were subject to one called the *decanus*, or dean, from his presiding over ten; and every hundred had another officer, who was in the same way called *centenarius*, from the Latin *centum*, a hundred. The business of the dean was to exact every man's daily task, and to bring it to the *œconomus*, or steward of the house, who himself gave a monthly account to the father, or head of the monastery. In England there are, properly speaking, three classes of ecclesiastical presidencies to which the title dean belongs; namely, rural deans, deans of cathedrals, and deans in peculiars. A rural dean was originally a clergyman, and who exercised a superintendence over the clergy of a rural deanery, or district of ten parishes. By degrees this office fell into disuse, and its duties came to be exercised by the archdeacon. Of late, however, the office has been revived with much advantage. Deans in cathedral or collegiate churches preside over the chapter of canons or prebendaries, forming the council of the bishop. Anciently the deans were elected by the chapter; but now the crown, as in the election of bishops, issues a *congé d'élire* to the chapter, naming the person that they are to appoint. In the new bishoprics founded by Henry VIII., the dean is named by letters patent only. The dean and chapter nominally elect the bishop.—Deans in peculiars are the chief officers of certain peculiar churches or chapels, who, by ancient usage, are entitled to the title dean; as, the dean of the Arches, the dean of St. George's, Windsor, the dean of the King's Chapel, the dean of Bocking, &c. In the universities of Oxford and Cambridge, the dean is the officer appointed to superintend the chapel services, and to exercise some control over the students. The deans of the chapel royal in Scotland are three clergymen of the established church, who are appointed by the crown, and whose duties are limited to preaching a occasional sermon before her Majesty when in Scotland, and attending at the election of the representative peers. The emoluments of the office are from £600 to £800 annually to each of the deans; but recently the appointments have been bestowed upon professors in the university, whose chairs were only slightly endowed. In the University and King's Colleges, London, and in some of the Scotch universities, the dean is head or chief of a faculty, and is chosen for a limited period. In Scotland the president of the incorporation of Advocates or Barristers in Edinburgh, is styled Dean of Faculty. He is elected annually, but is usually re-elected until he is promoted to the bench.

DEAN OF GUILD, in Scotland, is the name of an officer who is at the head of the guildry or mercantile body of a municipal burgh. In former times his powers were very considerable, and he acted as judge in commercial causes within the burgh. He was also usually a member of the town council. His principal duty is now to see "that buildings within the burgh be agreeable to law, neither encroaching upon private property nor on the public streets or passages, and that houses in danger of falling be thrown down." In Edinburgh, Glasgow, Dundee, Perth, and Aberdeen, the dean of guild is still *ex officio* a member of the town council.

DEATH, *deth*, in common language, is opposed to life, and is considered as the cessation of it. It supervenes as the necessary termination of all that long succession of phenomena of which life consists. How organized bodies perish, and how the organic force is transferred from the producing parts of organic beings to the new living products, while the old producing parts perish, is one of the most difficult problems of general physiology, and has never yet met with a satisfactory solution. In every part of a living organism there is a continual destruction of old particles and the formation of new ones going on; and, generally, the more active the vital activity of the part the more rapidly do these changes take place. Even the most solid portions of the animal frame are not free from this change, though in them it goes on less rapidly than in the softer tissues. Every movement of the body, nay, even every thought of the mind, is attended with the death and disintegration of a certain amount of muscular or nervous matter as its necessary condition; hence, in the performance of each of those functions whose aggregate makes up the life of man, the particular organ which ministers to that function undergoes a certain loss by the decline and death of its component particles; and this the more rapidly in proportion to the activity of the changes which are effected by their instrumentality. If the regenerative processes be performed with due vigour, no deterioration of the organ takes place; but with the advance of years this regenerative power gradually diminishes, and the entire organism progressively deteriorates, until at last death supervenes. We have thus two kinds of death,—molecular, or that which is constantly taking place among the molecular particles of the

body, and which is, in fact, essential to its life and well-being; and systemic or somatic, which is the death of the body as a whole. Somatic death may result either from the general failure of the vital powers, as in old age, or from some disease or injury in some of the vital organs, which extends itself to the organism in general. It may be due to failure in the propulsive power of the heart, which constitutes *syncope;* and this may occur either in consequence of the heart losing its irritability, and so ceasing to contract, or by being affected by tonic spasm, and so remaining rigidly contracted. In both cases death is instantaneous; the subject turns suddenly pale, and falls back, or drops down, expiring with one gasp. Or death may take place by the gradual cessation of the action of the heart; in which case it is termed *asthenia*. Somatic death may also be occasioned by an obstruction to the flow of blood through the capillaries of the lungs, or to the entrance of air to these organs, thus constituting *asphyxia*, or *apnœa*. Death by *coma*, or beginning at the brain, is caused by various influences, which primarily destroy the functions of the superior masses of the nervous system. The chief of these are obstruction to the circulation of the blood through the brain by pressure, and the effects of certain narcotic poisons, as opium, &c. As the ordinary act of breathing depends upon the nervous action of the medulla oblongata and spinalis, it is quite evident why death may result from an impaired state of these organs; and this mode of death is of the nature of apnœa. Death may also be occasioned by a disordered condition of the blood itself, which at the same time weakens the power of the heart, impairs the activity of the nervous system, and prevents the performance of those changes in the capillaries which afford a powerful auxiliary to the circulation; this is termed death by *necræmia*, and occurs in typhoid fevers, and other diseases of a malignant or pestilential kind. Death may also result from the direct agency of cold stagnating all the vital operations of the system. It is to be borne in mind, that death is frequently produced by a conjunction, or by the rapidly-following results, of two or more of these modes; indeed, the perfect distinction of these different modes of death is almost exclusively confined to cases where the dissolution is speedy or sudden. The signs of approaching death are necessarily various, and depend, in a great measure, upon the nature of the disease. We shall notice some of those that are common to most diseases and to natural decay. In some cases there is a dulness of the senses, inactivity of the muscles, vacancy of the intellect, and extinction of the sentiments, as in death resulting from old age. There is, also, frequently some degree of delirium, which is often of a most interesting and pleasing character, resembling dreaming more than any other form of derangement; sometimes, again, the dying fancies of the individual are of the most dreadfully distressing character; but it is presumptuous, as many do, to hazard much upon the various modes of terminating the career of life. In the delirium the reproduction of visual sensations often bears a considerable part; and frequently the victim of typhus is seen catching at something in the air, or picking at it on the bedclothes. The sense of hearing is frequently also affected, and imaginary voices, and sounds of tolling bells, &c., are heard. *Dementia*, or mental debility, sometimes comes on shortly before death, and for the most part manifests itself in an incapacity of concentrating the ideas upon any one object, and by an all but total failure of the memory: this mental weakness often painfully manifests itself in the apparent pleasure which the sufferer takes in some of the most childish amusements. The voice generally becomes low and weak as death approaches; but sometimes it has a shriller pitch than natural; sometimes it is husky and thick; and not unfrequently it dwindles to a mere whisper. The muscular system generally becomes feeble and relaxed; the pulsations of the heart gradually feebler, but more frequent; the respiration sometimes hurried and panting, sometimes ceasing gradually; and sometimes slow, laborious, and stertorous. There is frequently, also, an accumulation of fluids,—mucous, serous, or purulent, in the bronchial tubes. What is known as the "death-rattle" is produced by the passage of the air from the lungs through the fluid collected in the



trachea and upper respiratory passages. The moribund are often impatient of any kind of clothing, throwing off the bed-clothes, and lying with chest bare, the arms extended, and the neck as much exposed as possible. Among the other signs of approaching dissolution, are the sunken eye, the hollow temple, the sharpened nose, the forehead dry, tense, and harsh, the complexion shallow, livid, or black, the lips cold, flaccid, and pale, or of a leaden hue. We believe that the opinion that generally prevails of the great amount of suffering that immediately precedes death, and which is expressed by such words as the death-struggle or agony of death, is very erroneous. There is every reason to believe that as death approaches, the sensibilities are gradually deadened, and that in most cases consciousness has ceased before the struggle commences. The muscular spasms,—the slow, gasping, or gurgling breathing,—the collapsed or distorted features, though in some cases accompanied by feeling, are altogether independent of it. Convulsion is not, as superficial observers often imagine, a sign of pain; it is an affection of the motific, not of the sensific part of the nervous system. Those who have made the nearest approaches to actual death, as in drowning, have described their feelings as being of an extremely pleasurable kind; and a late eminent physician told his attendant friends on his deathbed, that "he wished he could be at the trouble to tell them how pleasant a thing it was to die." We believe that dying is not less truly than beautifully described in Scripture as being a "falling asleep;" an idea which was also entertained by the ancient Greeks, who regarded death as the twin brother of sleep. The consequences of death first become apparent in the organs of sense and motion; the eye loses its brightness, and the flesh its elasticity; the muscles become stiff, and coldness and paleness spread over the whole body. Yet it is often a very difficult matter to distinguish between real and apparent death. The most reliable test is afforded by the condition of the muscular substance; for after real death this gradually loses its irritability, so that it can be no longer excited to contraction by any kind of stimulation; and this loss of irritability is succeeded by the appearance of cadaveric rigidity. The most satisfactory proof, however, is given by the occurrence of putrefaction, which usually first manifests itself in the blue-green coloration of the cutaneous surface, especially of the abdomen, but which speedily extends to other parts. —*Ref.* Todd's *Cyclopædia of Anatomy and Physiology;* Carpenter's *Human Physiology;* Muller's *Physiology*.

Death, in Myth.—It is not to be wondered at that an event so impressive and so deeply interesting to all, should have excited the attention of every people, and led them to form very different ideas regarding it. It is indeed remarkable that the Greeks, whose conceptions of an after-life were so gloomy, should have represented death as a pleasing, gentle being; while the Christians, whom religion teaches to look upon death as a release from bondage,—a change from misery to happiness, give him a most frightful and disgusting shape. According to the theogony of Hesiod, the god of death was the offspring of Night and the twin brother of Sleep. During the most flourishing period of the arts in Greece, Death was represented on tombs as a friendly genius with an inverted torch, and holding a wreath in his hand; or as a sleeping child, winged, with an inverted torch resting on his wreath. Sleep was represented in the same manner, except that the torch and wreath were omitted. According to an idea originating in the East, death in the bloom of youth was attributed to the attachment of some particular deity, who snatched his favourite to a better world. It was ascribed, for instance, to Jupiter, if occasioned by lightning; to the Nymphs, if by drowning; to Aurora, if happening in the morning, &c. The representations of death by the Romans were less pleasing than those by the Greeks; and among their later poets we find death represented under some horrible forms, gnashing his teeth and marking his victims with bloody nails, a monster overshadowing whole fields of battle. The Hebrews had also a fearful angel of death, called Samaël and Prince of the World, and coinciding with the devil; but he removes with a kiss those that die in early youth. The disgusting representation of death (a skeleton with a scythe)

common among Christians, originated in the 14th century. In recent times, however, the ancient idea of death as a beautiful youth has been revived.

DEATH, CIVIL. (*See* CIVIL DEATH.)

DEATH, in Theol., is used in a much wider sense than it is in ordinary language, as is also the word life, to which it is opposed. In theological language, there are three kinds of death,—temporal, spiritual, and eternal, as there are three kinds of life, to which each of these is respectively opposed. The first of these is temporal death, or the death of the body; the second is spiritual death, or the natural condition of the soul under the power of sin; and the third, or eternal death, denotes the everlasting perdition of the wicked. As Adam introduced death into this world, so Christ, by his sufferings and death, has brought life. He has taken away the sting and power of temporal death, has introduced spiritual life, and has promised to all that believe and follow him life everlasting.

DEATH'S-HEAD HAWK-MOTH (*Acherontia atropos*), a lepidopterous insect of the family *Sphingidæ*. It is a species of hawk-moth found in several places in England and in nearly every quarter of the globe. Its length across the wings is nearly five inches; its body is of a yellowish colour, with black stripes; the markings upon the back of the thorax are faint, but bear a close resemblance to a skull or death's-head, from which it derives its name. The wings are dark-coloured, being mottled with yellow, brown, and black. The caterpillar of the death's-head moth is greenish-yellow; the back is covered with black specks, with



DEATH'S-HEAD HAWK-MOTH.

transverse lines of blue and white. It is often found feeding upon the leaves of potatoes. The moth itself is mostly seen flying during the morning and evening in autumn. As it flies it utters a low plaintive sound, and this, together with the death's-head mark upon the thorax, have caused it to be generally regarded with disfavour. How it contrives to make the noise is not known. Another strange property possessed by the death's-head hawk-moth, is that it is able to enter and plunder beehives with perfect impunity.

DEATH-WATCH (*Anobium tessellatum*).—There are certain superstitions that, once rooted in the light soil of a small mind, can never be eradicated or grubbed out by the keenest weapons common sense can bring to bear against them. The insect under consideration is a case in point; and there can be little doubt that this tiny beetle has caused more quaking and consternation than ever did *Tigris regalis*, or the king of beasts itself. Authors were formerly but ill-agreed as to the insect emitting the dolorous ticking. Some attributed it to a spider, others to a wood-louse. It is, however, now generally received as authentic that the "death-watch" is produced by certain beetles belonging to the timber-boring genus *Anobium*. The insect in question is of a greyish-brown colour, about a quarter of an inch in length, and moderately thick in proportion: the wing-shells are marked with irregular variegations lighter than the ground-colour. The ticking noise is thus produced:—raising itself upon its hind legs, with the body somewhat inclined, it beats its head with great force and agility against the woodwork on which it is standing. The general number of distinct strokes in succession is from seven to eleven. They follow each other quickly, and are repeated at uncertain intervals. It is said that this insect, if caught and confined on a table, may be taught to knock in reply to a tap of the finger-nail. This training, however, must be a work of some little time, for it is well known that the death-watch, as soon as touched, will contract its legs and counterfeit death, maintaining the imposition even when subjected to a heat fierce enough almost to roast them. The ticking is merely the call of either sex to its mate, and may be considered analogous to the call of birds. Says Sir Thomas Brown in his learned "Pseudodoxia Epidemica," "He that could eradicate this error from the minds of the people would save from many a cold sweat the meticulous heads of nurses and grandmothers."

DEBATE, *de-bait'* (Fr. *débat*), is a formal exchange of opinions between two or more persons, with the view of arriving at some definite conclusion. The subject is usually treated in a definite manner, and the speakers succeed each other according to certain rules. There is frequently a chairman or president, whose business it is to see that order is maintained, and that the debate is properly conducted. Debate is, even in a greater degree than conversation (which *see*), calculated, if properly conducted, to improve the mental powers. It does so in so far as the heat and vehemence of debate are calculated to excite the faculties to greater activity than is usually the case in conversation. The effort to be sustained is also greater; the ideas have to be arranged systematically, the words well chose and the various forms of exposition, persuasion, a appeal have to be resorted to in order to gain o r object. Many young persons imagine, that in order to train themselves to the art of public speaking, it is useful to adopt that side of the question under debate which to themselves appears the weakest, and thus to display their ingenuity in trying to make the best of it. There cannot be a greater mistake. All high eloquence is the offspring of passion or warm emotion; and a man, to be eloquent, must be in earnest, and feel that he is uttering his own sentiments. They will improve themselves to more advantage, and acquit themselves with more honour by choosing always that side of the debate to which, in their own judgment, they are most inclined, and supporting it by what appears to themselves most solid and persuasive. They will acquire the habit of reasoning more closely, and expressing themselves with greater warmth and force, when they are adhering to their own sentiments than when they are speaking in contradiction to them. Neither should one venture to speak upon a subject which he has not studied beforehand; for, in order to speak well, a man must feel that he has his mind made up upon it. A too early adoption of the practice of debate is, however, apt to lead to very reprehensible and often incurable faults, inducing young men of immature judgment and superficial knowledge to advance and adhere to opinions which can only be supported by sophistry, and to contend for victory rather than for truth. In this way a habit may be formed, which will not easily be unlearned afterwards, of disregarding right reason and truth, and fair argument. The practice of debate should be preceded not only by general cultivation of the mind, but also by much practice in writing. At first, at least, the substance of what is to be spoken on each occasion should, after reflection, be written down, not in the words designed to be uttered, but in brief heads, so that as little as possible may be left for the speaker to frame at the moment, except the expressions.

DEBENTURE, *de-ben'-tshur* (Lat. *debeo*, I owe), is a custom-house certificate, authorizing the exporter of certain classes of goods to receive the amount of drawback to which he is entitled upon the goods. It is also applied to a deed by which a railway company mortgages its property for the payment of a certain sum of borrowed money, at the time and under the conditions specified. A debenture is also an instrument by which the government is charged to pay to a creditor or his assigns the money found due on auditing his accounts.

DEBILITY, *de-bil'-e-te* (Lat. *debilitas*, weakness or decay of strength), in Med., is defined to be "that departure from the healthy condition of the frame which consists of a diminution of its vital energies,—of an enfeebling of its powers, manifested in numerous conditions and grades throughout the whole frame, or more or less remarkably in particular systems or organs." It is intimately connected with the nature of most diseases, and often constitutes disease

of itself. Numerous attempts have been made to distinguish or classify the different kinds of debility. The most recent writers regard it—(1) As *direct* or *primary*, arising from the abstraction of stimuli, or the operation of contra-stimuli, or such substances as directly enfeeble the organization; (2) *indirect, consecutive*, or *secondary*, arising either from exhaustion occasioned by previous excitement, or from increased excitation of an organ occasioning proportionate diminution of the energy of others; and (3) *complicated debility*, consisting not only of depressed, but of otherwise morbid or vitiated vital action. Besides the conditions that characterize general debility, there are also specific or partial states of debility, manifesting themselves more particularly in certain of the tissues, organs, or systems; as the circulating or nervous system, the organs of digestion or secretion, the cellular tissue, &c. The treatment of debility will always, in a great measure, depend upon its particular form and cause; and these are necessarily so many and varied, that no special directions can be laid down regarding it. There is, however, a particular class of remedies called *tonics*, which are in general more beneficial than any other, although other articles, as diffusive stimulants and antispasmodics, may often be used with great advantage. Tonics have derived their name from their influence in augmenting the tone of contractile parts, elevating, in a gradual manner, depressed vital power almost up to and seldom or never above the healthy standard. They are also characterized by the permanency of their action. Change of air, moderate exercise, agreeable occupation, and pleasant society, are also among the most beneficial means of restoring the depressed or exhausted powers of the frame. Sea-bathing, and in some cases medicated baths, are likewise often of great benefit.—*Ref.* Copland's *Dictionary of Medicine*.

Debit, *deb'-it* (Lat. *debeo*, I owe), money due for goods sold on credit or for services rendered. It is generally written *debt;* but in mercantile language the word is mostly applied to the *debit* side of an account, which is generally entered on the left-hand page of the ledger. The term is also applied to the entering of an account on the debtor side of a book; as, to debit the sum or amount of goods sold.

Debouching, *de-boosh'-ing* (Fr. *déboucher*, from *de*, from, and *bouche*, the mouth).—In Mil., troops are said to debouch when they emerge from any wood or narrow pass into a plain or open country. The application of the term is obvious from the derivation.

Débris, *dai-bree'* (Fr.), a French term which has been generally adopted by geologists, and applied to masses of broken rocks, &c. In ordinary conversation, the fragments of any fallen building, such as a house or bridge, are called the débris.

Debt, *det* (Lat. *debeo*, I owe), is that which one person owes to another, whether it be money, goods, or services. In Law, debts are usually divided into debts of record, debts by special contract, and debts by simple contract. A debt of record is a sum of money which appears to be due by the evidence of a court of record, or adjudged to be due on an action at law. A debt by specialty, or special contract, is where a sum of money becomes due, or is acknowledged to be due, by deed or instrument under seal; such as by deed of covenant or sale, by bond or obligation, &c. A debt by simple contract is an obligation depending upon mere oral evidence, or upon notes unsealed; within which class fall bills of exchange and promissory notes. Debt is also a personal action of contract which lies for the recovery of a debt in its technical sense, *i. e.* a certain amount of money due by one person to another.

Debt, National. (*See* National Debt.)

Debtor and Creditor, *det'-or, kred'-it-or.*—The former is one who owes a debt to another, the latter is the person to whom a debt is due. In the early history of every country it will be found that the laws against debtors are much more severe than at a later period of its civilization. In rude states of society the creditor was not only entitled to seize the goods of the debtor in satisfaction of the debt, but frequently also he had the power of enslaving the person of the debtor and all who were dependent upon him. We find evidence of this in the early laws of Greece and Rome. The right of a creditor to sell his debtor was abolished at Athens by Solon. At Rome the debtor was subject to be taken by the creditor to his own house, and there treated in the most cruel manner for sixty days; and if at the end of that time no one stepped forward to release him, he might be sold for a slave. This power of the creditor over his debtor seems to have become practically obsolete, and a milder mode of treatment to have crept in under the emperors. According to the Institutes of Justinian, a debtor was subject only to loss of property for payment of his debts. Among the Jews, while the law of Moses admitted of the person of a debtor being sold into bondage, it also provided for his merciful treatment, and enacted a certain time for his being set free. The poor Hebrew was not to be compelled to serve as a bond servant but as a hired servant and as a sojourner, and was to be set free on the year of jubilee, he and his children; and he was to return unto the possession of his fathers. During the feudal period the person of the debtor could not generally be seized for debt, such a proceeding being inconsistent with the duties of military service, to which every man was bound. This was also the case in England at an early period; suits were commenced by a summons, and if the defendant failed to appear, process was issued for the attachment of his property; but in actions upon contract no further remedy was given, either at the commencement of the suit or after judgment. In actions for injuries accompanied with force, it was, however, permitted to issue process for the arrest of the person. By various subsequent statutes the same remedy was extended to other actions in which there was no force; as actions of account, debt, detenue, and actions on the case. In the court of King's Bench, however, the defendant was, without the aid of these statutes, liable to arrest upon process issued for an alleged trespass, and when arrested he was made to answer for any other cause of action. In the court of Exchequer jurisdiction was obtained by a similar fiction: upon recovery of judgment in any action in which an arrest was allowed upon mesne process, a writ could be issued, called *capias ad satisfaciendum*, whereby the defendant could be arrested and committed to close custody. Important modifications have recently been made in the laws of debtor and creditor.—*See* Bankruptcy, Insolvent, Imprisonment, &c.

Début, *dai-bu'*, a French term which has been adopted as an English word. It properly means an opening or beginning, but it is more especially applied to the first appearance in public of an actor or actress. It is also applied to the first appearance at any particular theatre of an actor or actress. In either case the actor is called a *débutant*, and the actress a *débutante*.

Decadence, *de-kai'-dens* (Lat. *de*, from; *cadere*, to fall), a term applied in the Fine Arts to the decline of any school of painting, or the literature or architecture of any country, from the point at which it may be considered to have reached its summit of perfection. In the Bolognese school of painting (*see* Bolognese School of Painting), for example, the works of the artists belonging to it reached the highest degree of excellence in the productions of the Caracci, although the Caracci themselves are said to belong to the decadence of the more comprehensive Renaissance school, which culminated in the paintings of Raffaelle. In England, architecture, especially church architecture, has been in decadence since the Tudor period, and perhaps, more strictly speaking, from the 14th century, when Gothic architecture attained the highest degree of excellence in this country. But the period of its decadence is now past, and it is beginning to revive again, as well as other branches of art, by the substitution of Byzantine and Gothic forms for the hideous imitations of classic architecture that disfigure the ecclesiastical structures of the 17th and 18th centuries. In Rome, literature attained its highest point in the prose writings of Cicero and the poetry of Horace, Virgil, and Ovid, and the works of other Latin authors of the Augustan era; but when these men had passed away, the decadence commenced, and later works in this language are not marked by the elegance and purity of diction which characterized the writings of those who have been mentioned.

DECAGON, *dek'-ă-gon* (Gr. *deka*, ten; *gonia*, angle), a geometrical figure which has ten sides and ten angles. When the sides and angles are all equal, the figure is called a regular decagon, and is inscribable in a circle. An irregular decagon can be formed from a pentagon by describing any irregular triangles upon its sides, so that no two of them shall have their sides in the same straight line.

DECALOGUE, *dek'-ă-log* (Gr. *deka*, ten, and *logos*, word), is literally the ten words, a sense which the Hebrew as well as the Greek term bears, and is applied to the law of the ten commandments as given by God to Moses on Mount Sinai. These were written on two tables of stone by the finger of God himself, and were thus different from the other precepts of the law, which were given through Moses; while their being written on "durable tables of stone" serves to denote their ever-binding nature. The Decalogue, like many other portions of Scripture, has afforded subject for minute criticism for those that are ever on the search for hidden meanings. Thus, they tell us that the number ten is the symbol of completeness, indicating that they form by themselves an entire whole, made up of the necessary, and no more than the necessary, component parts; that they were written on both sides so as to cover the entire surface, and not leave room for future additions. Much dispute has arisen as to how the commandments were divided on the two tables. It is generally admitted that the first comprehended our duty to God, and the second our duty to man. According to Josephus, however, there were five commandments upon each table, and two and a half upon each side; and Philo-Judæus adopts the same view. The more general view among Christians is, that the first table contained only the first four commandments, and the second the remaining six. But the Roman Catholics, who throw the two first commandments into one, and split the last into two, have only three on the first table, and seven on the second. The difficulty lies with the fifth commandment ("Honour thy father and mother," &c.), whether it is to be regarded as coming under the head of love to God, or to our neighbour: Christians have generally regarded it as belonging to the latter. Scripture, however, always looks upon parents in a very peculiar light, and very different from what is implied in the general term neighbour. It rather regards them as representatives of God, to whom he has delegated a portion of his authority, and for whom he consequently exacts a portion of the honour due unto himself. There is nothing unscriptural in the view which places honour to parents among the observances that God specially claims as due unto himself; and filial obedience as a part of Christian worship. The more closely the commandments of the Decalogue are examined, the more clearly do we perceive their spiritual and comprehensive character, and their suitability for all time. They recognize love as the root of all obedience, and hatred as the root of all transgression; and the love that is required is no shallow and superficial thing, finding its development in a few easy external acts, but, on the contrary, it embraces the entire field of man's spiritual agency, and has respect alike to his thoughts, words, and deeds. They comprise a brief but comprehensive summary of all religious and moral duty. In the first table of the law the first and second commandments point to the sole Godhead, and absolute spirituality of God, requiring for himself personally, and for his worship, that place in the heart to which they are entitled; the third demands the due honouring of him in word; and the fourth and fifth the honouring of him in deed. In the second table we are commanded not to injure our neighbour,—1. in deed; that is (1), in his person (6th commandment); (2), in his family (7th com.); or (3) in his property (8th com.). 2. In word (9th com.); or in thought (through covetousness, 10th com.).—Ref. *Typographs of Scripture*, by Dr Fairbairn, 1857.

DECAMERON, *dek-am'-e-ron* (Gr. *deka*, ten; *emera*, day), the name given by the Italian poet Boccaccio to his well-known collection of tales. They are supposed to be narrated by a party of guests during a ten days' visit to a villa in the country, while the plague raged in Florence in 1348. There are few works which have had an equal influence on literature with the Decameron. In England its effects were powerful. Chaucer adopted the notion of the frame in which he inclosed his tales



from it; and, according to Burton, in his "Anatomy of Melancholy," one of the principal amusements of our ancestors was the reading of Boccaccio aloud. The first English translation of the Decameron appeared in 1620.

DECANTATION, *de-kăn-tai'-shun* (Fr. *decanter*, to pour off), in Chem., a process of separating the solid and liquid constituents of solutions, by allowing the former to subside, and drawing off the latter by means of a siphon. It is resorted to in cases when the acid or alkaline nature of the solution would destroy a paper or linen filter.

DECAPITATION. (*See* CAPITAL PUNISHMENT.)

DECEMVIRI, *de-sem'-vi-ri* (Lat. *decem*, ten; *viri*, men), the title of certain magistrates or functionaries in ancient Rome, who were appointed as a sort of commission to draw up a code of laws. Three commissioners were first sent over to Greece, and the principal work of the Decemviri was to collect and digest the information gained by them. After a year's absence, the commissioners returned from Greece, and a violent dispute arose between the patricians and plebeians as to which party the decemviri should be chosen from. The patricians gained the day, and the entire government of the state was intrusted to them during the year for which they were to hold office. This form of government proved very successful, and the state was governed with justice and moderation. On the conclusion of their term of office, a fresh body of decemviri were chosen, and the only one of the previous commission who was re-elected was the notorious Appius Claudius. The new decemviri acted in the most unjust and tyrannical manner. Each of the ten was accompanied in public by twelve lictors, who not only carried the rods, but the axe, the emblem of sovereign power. The plebeians were treated with every variety of contumely and outrage, until the unjust decision of Appius Claudius in the case of Virginia seemed to bring their tyranny to a climax. The decemviri were driven from their office by a popular insurrection, and the tribunes and ordinary magistrates of the republic were again appointed. Besides these extraordinary commissions, there were decemviri chosen for judicial purposes, to preside over and summon the centumviri, and to judge certain causes by themselves. Decemviri were likewise appointed at times to divide lands among the military.

DECIMAL FRACTIONS, *des'-i-mil frăk'-shuns* (Lat. *decem*, ten), are fractions which have 10, or some power of 10, for their denominator; as one tenth, one hundredth, one thousandth, &c. In ordinary practice, it is often convenient to use decimal fractions, which, for the sake of brevity, are not written out fully. The numerator alone is expressed, with a point on the left-hand side: thus, ·3 represents $\frac{3}{10}$, ·03 represents $\frac{3}{100}$, ·003 represents $\frac{3}{1000}$, &c. Decimal fractions seem to have been introduced about the middle of the 15th century, by Regiomontanus. The first treatise on the subject was written by Stevinus, in his "Practique d'Arithmetique," published in 1582. They are now generally adopted amongst all civilized nations in arithmetical calculations. In many countries the weights, measures, money, &c., are regulated and calculated by decimal division. Many arguments have been used, and many attempts have been made, to introduce a decimal coinage into this country, but without success.

DECIMATION, *des-im-ai'-shun* (Lat. *decem*, ten).—In former times, when an army, or any division of an army, had mutinied against its commanding officer, and all had equally incurred the penalty of death, punishment was inflicted on the revolted troops by killing every tenth man, selected by lot, or taken out in the order in which they stood in the ranks. This mode of punishment was sometimes resorted to when a body of men had shown cowardice before the enemy.

DECKS, *deks* (Ang.-Sax.), a term used in Mar. to denote the floors of a ship. Besides serving as platforms for the people on board, they keep the sea and rain from the cargo beneath, and also strengthen the ship by holding her sides together. In large vessels there are several decks; namely, the *orlop deck*, which is the lowest; the *lower*, or *first deck*; the *middle*, or *second deck*; the *upper*, or *main deck*; and the *quarter deck*.

DECLAMATION, *dek'-lăm-ai'-shun* (Lat. *declamare*, to

speak aloud, to declaim), is a discourse or speech made in public in the tone and manner of an oration. Among the Greeks, declamation was the art of speaking indifferently on all subjects, and on all sides of a question,—of making a thing appear just that was unjust, and of triumphing over the best and soundest reasons. Among the Romans, as among us, it was generally restricted to certain exercises which scholars perform at school, to teach them to speak in public. "Declamations," says Quintilian, "such as are usually pronounced in schools, are, if but adapted to real cases, and made similar to actual pleadings, of the greatest service, not only while our education has still to reach maturity (for the exercise is alike both in conception and in arrangement), but even when our studies are said to be completed, and have obtained us reputation in the forum; since eloquence is thus nurtured and made florid, as it were, on a richer sort of diet, and is refreshed after being fatigued by the constant roughnesses of forensic contests." In the colleges of the Jesuits declamations are little dramatical performances of few scenes rehearsed by students, in order to train them for public speaking. Declamation forms, or rather we fear we must say would form, a most useful branch of education, teaching not only correctness of speech and action, but cultivating the feelings, and giving them proper expression.

Declaration, *dek-lăr-ai'-shun* (Lat. *declaratio*), a legal specification on record of the cause of action by a plaintiff against a defendant. The declaration should correspond with the process in the names and descriptions of the parties; for if there be a material variance, the court will set aside the proceedings. The plaintiff may declare as soon as the defendant has appeared in answer to the writ of summons, or, where the summons is not specially indorsed, on failure of the defendant to make appearance. The declaration must state clearly the plaintiff's case in one or more counts, each count generally setting forth a separate cause of action. All irrelevant matter is struck out at the cost of the plaintiff; and if no appearance is made by the plaintiff after the declaration has been delivered to him or his attorney, the plaintiff may proceed to claim judgment by default. (*See* Pleading.)—*Ref.* Tomlins' *Law Dictionary*.

Declaration, an asseveration made in place of an oath. From time to time statutes have been enacted to enable Quakers, Moravians, and Separatists to make a solemn affirmation that what they say is true, in giving evidence either in civil or criminal cases. False declarations are liable to the penalty of perjury.

Declaration, Dying, a declaration made by a person under the conviction of approaching death. Such declarations are admitted as evidence at a trial, and are often very useful, although, as a general rule, hearsay or secondary evidence is not allowed in English law. In cases of murder, the dying declaration of the victim is always admitted as evidence, if it can be proved that the deceased gave the evidence deliberately, and was in possession of his faculties. (*See* Evidence.)

Declension, *de-klen'-shun* (Lat. *declinatio*, from *declino*, I decline, bend, or deflect), in Gram., denotes the various modifications of number and case to which nouns, pronouns, and adjectives are subjected, in order to express the relation which one thing bears to other things. To decline a noun, therefore, is to go through its several cases, singular and plural. (*See* Case, Number, Noun.)

Declination, *dek-lin-ai'-shun* (Lat. *declinare*, to incline).—The position of a star in the heavens is determined by its right ascension (*see* Ascension, Right) and declination, as the position of any place on the earth's surface is determined by its latitude and longitude. If we suppose a great circle to pass through any star in the heavens and the north and south poles, being consequently perpendicular to the equator, that portion of the circle which lies between the star and the equator, whether it be north or south of that line, is the declination of the star. Declination circles are small circles drawn on the celestial globe parallel to the equator, similar to lines of latitude on the terrestrial globe.

Declination of the Needle.—The declination of the magnetic needle is said to have been discovered by Columbus in 1492, if we may believe the statement made to this effect in the life of that adventurous and skilful sailor written by his son. But whether this be true or not, it is certain that the discovery was made about the close of the 15th century, as incontestable evidence exists that it was known to the principal maritime nations of Europe that were engaged in commerce at the commencement of the century following. When the magnetic needle of the mariner's compass is disturbed, it oscillates until it gradually settles, and points steadily to two points on the horizon, or graduated circle of the instrument representing the horizon, which are diametrically opposite to each other. A great circle passing through these points in a plane perpendicular to that of the true horizon, represents the magnetic meridian of the place, while the geographical or astronomical meridian is represented by a great circle also vertical to the horizon, the plane of which passes through its true north and south points. These planes intersect, and are inclined to each other at a small angle, and this angle indicates the extent of the variation or declination of the magnetic needle from the line joining the true north and south points of the horizon. The declination may be either east or west, as the magnetic poles happen to be either east or west of the true north. The declination of the needle is constantly varying. In 1581 it was found to be 11° 15′ E. of the true north, from observations made near London; in 1633 it was only 4° 5′ E.; while in 1657 it is said to have pointed due north and south; but the authority on which this assertion rests is doubtful. In 1818 it was found to be 24° 30′ W., and in 1822, 24° 12′ W. It seems, then, to be a fair hypothesis that the declination varies alternately to the east and west to about 25° on either side, gradually returning from the maximum of variation on one side to the true meridian, and thence progressing to the maximum on the other side; and from other data given above it would appear that the rate of increase or decrease in the variation averages about 8′ or 9′ yearly, and that the needle takes about 170 years to arrive at either extreme of variation after pointing due north. But as very little is known, comparatively speaking, of terrestrial magnetism and its causes and effects, no hypothesis respecting the erratic movements of the needle can be received with safety or considered satisfactory. The declination of the needle at any place is so inconstant that it varies even in the course of the day, being sometimes east and sometimes west of the mean variation at that place. The variation is ascertained and measured by an instrument constructed for the purpose, called a declinometer, and by the dipping-needle. (*See* Dipping-Needle.)

Decoction, *de-kok'-shun* (Lat. *decoquo*, I boil), in Chem., the extraction of the soluble portions of plants by boiling or heating in water.

Decomposition, *de-kom-po-zish'-un* (Fr. *décomposer*, to decompose, from Lat. *compono*, *compositus*).—This term is applied, in common parlance, to the separation of the constituents of a substance during putrefaction. In chemistry it is applied to any process during which a compound body undergoes the separation or re-arrangement of its elements.

Decomposition of Light. (*See* Light.)

Decomposition of Forces. (*See* Forces.)

Decorated English, *dek'-o-rai-ted* (Lat. *decoro*, I adorn).—This style of Gothic architecture, also known as the Second, or Middle Pointed, or Edwardian, prevailed in England during the 14th century, and was generally adopted in all ecclesiastical and public buildings erected in the reigns of Richard I., Edward I., Edward II., and Edward III.; whence the term Edwardian has been assigned to it by Messrs. Garbett and Fergusson. It corresponds with the style known as *Ogival Secondaire* in France, which expression is used in that country to denote the Gothic architecture of the 14th century. By some architects the year 1270 is fixed as the date of transition from the First Pointed, or Early English style (*see* Early English), to the Decorated English, but by others the year 1307 is assigned as the period of change. As, however, any transition from one style to another must be gradual and imperceptible rather than abrupt and perfectly defined, it will be sufficient for general purposes to consider that the Decorated English is the characteristic style of architecture of the 14th century, and that it reached its highest degree of excellence

DECAGON, *dek'-ă-gon* (Gr. *deka*, ten; *gonia*, angle), a geometrical figure which has ten sides and ten angles. When the sides and angles are all equal, the figure is called a regular decagon, and is inscribable in a circle. An irregular decagon can be formed from a pentagon by describing any irregular triangles upon its sides, so that no two of them shall have their sides in the same straight line.

DECALOGUE, *dek'-ă-log* (Gr. *deka*, ten, and *logos*, word), is literally the ten words, a sense which the Hebrew as well as the Greek term bears, and is applied to the law of the ten commandments as given by God to Moses on Mount Sinai. These were written on two tables of stone by the finger of God himself, and were thus different from the other precepts of the law, which were given through Moses; while their being written on "durable tables of stone" serves to denote their ever-binding nature. The Decalogue, like many other portions of Scripture, has afforded subject for minute criticism for those that are ever on the search for hidden meanings. Thus, they tell us that the number ten is the symbol of completeness, indicating that they form by themselves an entire whole, made up of the necessary, and no more than the necessary, component parts; that they were written on both sides so as to cover the entire surface, and not leave room for future additions. Much dispute has arisen as to how the commandments were divided on the two tables. It is generally admitted that the first comprehended our duty to God, and the second our duty to man. According to Josephus, however, there were five commandments upon each table, and two and a half upon each side; and Philo-Judæus adopts the same view. The more general view among Christians is, that the first table contained only the first four commandments, and the second the remaining six. But the Roman Catholics, who throw the two first commandments into one, and split the last into two, have only three on the first table, and seven on the second. The difficulty lies with the fifth commandment ("Honour thy father and mother," &c.), whether it is to be regarded as coming under the head of love to God, or to our neighbour: Christians have generally regarded it as belonging to the latter. Scripture, however, always looks upon parents in a very peculiar light, and very different from what is implied in the general term neighbour. It rather regards them as representatives of God, to whom he has delegated a portion of his authority, and for whom he consequently exacts a portion of the honour due unto himself. There is nothing unscriptural in the view which places honour to parents among the observances that God specially claims as due unto himself; and filial obedience as a part of Christian worship. The more closely the commandments of the Decalogue are examined, the more clearly do we perceive their spiritual and comprehensive character, and their suitability for all time. They recognize love as the root of all obedience, and hatred as the root of all transgression; and the love that is required is no shallow and superficial thing, finding its development in a few easy external acts, but, on the contrary, it embraces the entire field of man's spiritual agency, and has respect alike to his thoughts, words, and deeds. They comprise a brief but comprehensive summary of all religious and moral duty. In the first table of the law the first and second commandments point to the sole Godhead, and absolute spirituality of God, requiring for himself personally, and for his worship, that place in the heart to which they are entitled; the third demands the due honouring of him in word; and the fourth and fifth the honouring of him in deed. In the second table we are commanded not to injure our neighbour,—1. in deed; that is (1), in his person (6th commandment); (2), in his family (7th com.); or (3) in his property (8th com.). 2. In word (9th com.); or in thought (through covetousness, 10th com.).—Ref. *Typographia of Scripture*, by Dr. Fairbairn, 1857.

DECAMERON, *dek-am'-e-ron* (Gr. *deka*, ten; *emera*, day), the name given by the Italian poet Boccaccio to his well-known collection of tales. They are supposed to be narrated by a party of guests during a ten days' visit to a villa in the country, while the plague raged in Florence in 1348. There are few works which have had an equal influence on literature with the Decameron. In England its effects were powerful. Chaucer adopted the notion of the frame in which he inclosed his tales from it; and, according to Burton, in his "Anatomy of Melancholy," one of the principal amusements of our ancestors was the reading of Boccaccio aloud. The first English translation of the Decameron appeared in 1620.

DECANTATION, *de-kăn-tai'-shun* (Fr. *decanter*, to pour off), in Chem., a process of separating the solid and liquid constituents of solutions, by allowing the former to subside, and drawing off the latter by means of a siphon. It is resorted to in cases when the acid or alkaline nature of the solution would destroy a paper or linen filter.

DECAPITATION. (*See* CAPITAL PUNISHMENT.)

DECEMVIRI, *de-sem'-vi-ri* (Lat. *decem*, ten; *viri*, men), the title of certain magistrates or functionaries in ancient Rome, who were appointed as a sort of commission to draw up a code of laws. Three commissioners were first sent over to Greece, and the principal work of the Decemviri was to collect and digest the information gained by them. After a year's absence, the commissioners returned from Greece, and a violent dispute arose between the patricians and plebeians as to which party the decemviri should be chosen from. The patricians gained the day, and the entire government of the state was intrusted to them during the year for which they were to hold office. This form of government proved very successful, and the state was governed with justice and moderation. On the conclusion of their term of office, a fresh body of decemviri were chosen, and the only one of the previous commission who was re-elected was the notorious Appius Claudius. The new decemviri acted in the most unjust and tyrannical manner. Each of the ten was accompanied in public by twelve lictors, who not only carried the rods, but the axe, the emblem of sovereign power. The plebeians were treated with every variety of contumely and outrage, until the unjust decision of Appius Claudius in the case of Virginia seemed to bring their tyranny to a climax. The decemviri were driven from their office by a popular insurrection, and the tribunes and ordinary magistrates of the republic were again appointed. Besides these extraordinary commissions, there were decemviri chosen for judicial purposes, to preside over and summon the centumviri, and to judge certain causes by themselves. Decemviri were likewise appointed at times to divide lands among the military.

DECIMAL FRACTIONS, *des'-i-măl frăk'-shuns* (Lat. *decem*, ten), are fractions which have 10, or some power of 10, for their denominator; as one tenth, one hundredth, one thousandth, &c. In ordinary practice, it is often convenient to use decimal fractions, which, for the sake of brevity, are not written out fully. The numerator alone is expressed, with a point on the left-hand side: thus, ·3 represents $\frac{3}{10}$, ·03 represents $\frac{3}{100}$, ·003 represents $\frac{3}{1000}$, &c. Decimal fractions seem to have been introduced about the middle of the 15th century, by Regiomontanus. The first treatise on the subject was written by Stevinus, in his "Practique d'Arithmetique," published in 1582. They are now generally adopted amongst all civilized nations in arithmetical calculations. In many countries the weights, measures, money, &c., are regulated and calculated by decimal division. Many arguments have been used, and many attempts have been made, to introduce a decimal coinage into this country, but without success.

DECIMATION, *des-im-ai'-shun* (Lat. *decem*, ten).—In former times, when an army, or any division of an army, had mutinied against its commanding officer, and all had equally incurred the penalty of death, punishment was inflicted on the revolted troops by killing every tenth man, selected by lot, or taken out in the order in which they stood in the ranks. This mode of punishment was sometimes resorted to when a body of men had shown cowardice before the enemy.

DECKS, *deks* (Ang.-Sax.), a term used in Mar. to denote the floors of a ship. Besides serving as platforms for the people on board, they keep the sea and rain from the cargo beneath, and also strengthen the ship by holding her sides together. In large vessels there are several decks; namely, the *orlop deck*, which is the lowest; the *lower*, or *first deck*; the *middle*, or *second deck*; the *upper*, or *main deck*; and the *quarter deck*.

DECLAMATION, *dek'-lăm-ai'-shun* (Lat. *declamare*, to

speak aloud, to declaim), is a discourse or speech made in public in the tone and manner of an oration. Among the Greeks, declamation was the art of speaking indifferently on all subjects, and on all sides of a question,—of making a thing appear just that was unjust, and of triumphing over the best and soundest reasons. Among the Romans, as among us, it was generally restricted to certain exercises which scholars perform at school, to teach them to speak in public. "Declamations," says Quintilian, "such as are usually pronounced in schools, are, if but adapted to real cases, and made similar to actual pleadings, of the greatest service, not only while our education has still to reach maturity (for the exercise is alike both in conception and in arrangement), but even when our studies are said to be completed, and have obtained us reputation in the forum; since eloquence is thus nurtured and made florid, as it were, on a richer sort of diet, and is refreshed after being fatigued by the constant roughnesses of forensic contests." In the colleges of the Jesuits declamations are little dramatical performances of few scenes rehearsed by students, in order to train them for public speaking. Declamation forms, or rather we fear we must say would form, a most useful branch of education, teaching not only correctness of speech and action, but cultivating the feelings, and giving them proper expression.

Declaration, *dek-lăr-ai'-shun* (Lat. *declaratio*), a legal specification on record of the cause of action by a plaintiff against a defendant. The declaration should correspond with the process in the names and descriptions of the parties; for if there be a material variance, the court will set aside the proceedings. The plaintiff may declare as soon as the defendant has appeared in answer to the writ of summons, or, where the summons is not specially indorsed, on failure of the defendant to make appearance. The declaration must state clearly the plaintiff's case in one or more counts, each count generally setting forth a separate cause of action. All irrelevant matter is struck out at the cost of the plaintiff; and if no appearance is made by the plaintiff after the declaration has been delivered to him or his attorney, the plaintiff may proceed to claim judgment by default. (*See* Pleading.)—*Ref.* Tomlins' *Law Dictionary*.

Declaration, an asseveration made in place of an oath. From time to time statutes have been enacted to enable Quakers, Moravians, and Separatists to make a solemn affirmation that what they say is true, in giving evidence either in civil or criminal cases. False declarations are liable to the penalty of perjury.

Declaration, Dying, a declaration made by a person under the conviction of approaching death. Such declarations are admitted as evidence at a trial, and are often very useful, although, as a general rule, hearsay or secondary evidence is not allowed in English law. In cases of murder, the dying declaration of the victim is always admitted as evidence, if it can be proved that the deceased gave the evidence deliberately, and was in possession of his faculties. (*See* Evidence.)

Declension, *de-klen'-shun* (Lat. *declinatio*, from *declino*, I decline, bend, or deflect), in Gram., denotes the various modifications of number and case to which nouns, pronouns, and adjectives are subjected, in order to express the relation which one thing bears to other things. To decline a noun, therefore, is to go through its several cases, singular and plural. (*See* Case, Number, Noun.)

Declination, *dek-lin-ai'-shun* (Lat. *declinare*, to incline).—The position of a star in the heavens is determined by its right ascension (*see* Ascension, Right) and declination, as the position of any place on the earth's surface is determined by its latitude and longitude. If we suppose a great circle to pass through any star in the heavens and the north and south poles, being consequently perpendicular to the equator, that portion of the circle which lies between the star and the equator, whether it be north or south of that line, is the declination of the star. Declination circles are small circles drawn on the celestial globe parallel to the equator, similar to lines of latitude on the terrestrial globe.

Declination of the Needle.—The declination of the magnetic needle is said to have been discovered by Columbus in 1492, if we may believe the statement made





to this effect in the life of that adventurous and skilful sailor written by his son. But whether this be true or not, it is certain that the discovery was made about the close of the 15th century, as incontestable evidence exists that it was known to the principal maritime nations of Europe that were engaged in commerce at the commencement of the century following. When the magnetic needle of the mariner's compass is disturbed, it oscillates until it gradually settles, and points steadily to two points on the horizon, or graduated circle of the instrument representing the horizon, which are diametrically opposite to each other. A great circle passing through these points in a plane perpendicular to that of the true horizon, represents the magnetic meridian of the place, while the geographical or astronomical meridian is represented by a great circle also vertical to the horizon, the plane of which passes through its true north and south points. These planes intersect, and are inclined to each other at a small angle, and this angle indicates the extent of the variation or declination of the magnetic needle from the line joining the true north and south points of the horizon. The declination may be either east or west, as the magnetic poles happen to be either east or west of the true north. The declination of the needle is constantly varying. In 1581 it was found to be 11° 15′ E. of the true north, from observations made near London; in 1633 it was only 4° 5′ E.; while in 1657 it is said to have pointed due north and south; but the authority on which this assertion rests is doubtful. In 1818 it was found to be 24° 30′ W., and in 1822, 24° 12′ W. It seems, then, to be a fair hypothesis that the declination varies alternately to the east and west to about 25° on either side, gradually returning from the maximum of variation on one side to the true meridian, and thence progressing to the maximum on the other side; and from other data given above it would appear that the rate of increase or decrease in the variation averages about 8′ or 9′ yearly, and that the needle takes about 170 years to arrive at either extreme of variation after pointing due north. But as very little is known, comparatively speaking, of terrestrial magnetism and its causes and effects, no hypothesis respecting the erratic movements of the needle can be received with safety or considered satisfactory. The declination of the needle at any place is so inconstant that it varies even in the course of the day, being sometimes east and sometimes west of the mean variation at that place. The variation is ascertained and measured by an instrument constructed for the purpose, called a declinometer, and by the dipping-needle. (*See* Dipping-Needle.)

Decoction, *de-kok'-shun* (Lat. *decoquo*, I boil), in Chem., the extraction of the soluble portions of plants by boiling or heating in water.

Decomposition, *d. ăkom-po-zish'-un* (Fr. *décomposer*, to decompose, from Lat. *compono*, *compositus*).—This term is applied, in common parlance, to the separation of the constituents of a substance during putrefaction. In chemistry it is applied to any process during which a compound body undergoes the separation or re-arrangement of its elements.

Decomposition of Light. (*See* Light.)

Decomposition of Forces. (*See* Forces.)

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about the middle of this period. It is considered to be the most perfect of all the different styles of Gothic architecture. It possessed all the peculiar forms and ornamentation of that which immediately preceded it, but there was a greater degree of elegance in the outlines of the former, and more richness in the latter, which was bold and natural in design and execution, without being too florid and elaborate, as in the succeeding period. Its chief characteristic features are the windows, the doorways, the capitals of the pillars, and the vaulting of the roofs. In the windows the lancet form assumes wider proportions, and instead of consisting of one long narrow pointed light, or two or three of these at the utmost, grouped together and separated by piers, they are broader, and divided into five or more compartments by shafts or mullions. The head of the window is still pointed, the arcs forming it being described either from centres taken without the sides, or from centres taken in the sides themselves, with a radius equal to the span of the window. The tracery of the head consists of cusped circles combined with geometrical curves, which are also foiled or ornamented with cusps. The piers and arches of the doorways are richly ornamented, the former with light shafts surmounted with sculptured capitals, and the latter with deeply-cut mouldings. Both doors and windows have dripstones above them resting on corbels, which are frequently carved to resemble heads. Sometimes the moulding of the arch of a doorway is continued through the piers towards the ground, without any break at the impost from which the arch springs. Mouldings of every description are enriched with ball-flowers and foliage, and crockets are used to ornament the angular edges of pinnacles and canopies. The buttresses are bold and highly-finished, and flying buttresses are frequently used. The pillars are formed of groups of light and elegant shafts clustered together, and surmounted by capitals consisting of a bell swelling out in a convex form from the neck-moulding, and decorated with foliage and flowers closely copied from the natural forms. The vaulting of the roof is subdivided into patterns, by ribs in different directions interlacing each other, so as to form a kind of rectilineal tracery, and beautifully-carved bosses are fixed at the points of intersection.

DECOY, *de-koi'* (Aug.-Nor.), a plan by which ducks and other aquatic birds are enticed up a narrow channel from a river or lake. This channel usually terminates in a cover of network several yards in length. On either side of the channel the turf is kept smooth and in good order; this tempts the birds to leave the water, and they alight and begin to dress their plumage. While thus employed at some distance up the channel, the decoy-man and his dogs, who have been on the look-out, but carefully concealed, suddenly appear. The birds take to the water again, and are driven by the dogs into the network inclosure, where they are easily captured.

DECREE, *de-kree'* (Lat. *decretum*, from *decerno*, I judge), is the decision or order of some competent authority upon some doubtful or disputed point. During the Roman emperors it was usual to submit disputed points to them for their decision, which was called *decretum*, and became part of the Roman laws. In the Middle Ages, when the pope came to be regarded as the highest authority in ecclesiastical matters, his decisions, in like manner, were received as law, and took the name of decretals. (*See* CANON LAW.) In the law of England the final judgment of a court of equity is usually called a decree; in Scotland it is applied to the final judgment of any of the courts: in the latter country it is also frequently termed a decreet.

DECREES OF (GOD, in Theol., are the settled purposes of the Almighty, whereby he hath from all eternity foreordained whatsoever comes to pass. (*See* PREDESTINATION.)

DECREPITATION, *de-krep-it-ai'-shun* (Lat. *decrepo*, I crackle), a term applied to the crackling noise, attended with the flying asunder of their parts, made by many minerals and salts when heated. Chloride of sodium, sulphate of baryta, and several other bodies which contain no water, decrepitate most violently when heated. They separate at the natural joints of the crystals.

DECRETAL. (*See* DECREE. CANON LAW.)

DEDICATION, *ded-e-kai'-shun* (Lat. *dedico*, I inscribe, dedicate), in Lit., is a complimentary address to a particular person, prefixed by an author to his work. The practice arose from the slight remuneration that in early times was to be derived from literary labour. Hence authors came to be in many cases dependent upon wealthy patrons, to whom they dedicated their works; and hence, too, many authors sought the patronage of a powerful or wealthy individual, by dedicating their works to him. It thus came to be a common practice to acknowledge a dedication with a sum of money. Fortunately this state of things has ceased to exist, and literary talent may be said in every case to find itself suitably rewarded by a discriminating public. Dedications have therefore in a great measure passed away, and where we still find them, they are generally either a token of private friendship or a mark of public esteem.

DEDICATION is a religious ceremony, whereby a person or thing is solemnly consecrated or set apart to the service of God and the purposes of religion. The use of dedications is very ancient both among the worshippers of the true God and among the heathen. In Scripture we meet with dedications of the tabernacle, temple, altar, vessels, persons, and even of the garments of the priests. Under Christianity, dedication is only applied to church, and is usually called the consecration thereof. (*See* CONSECRATION.)

DEDICATION, FEAST OF, was a festival observed in the early church on the anniversary of the dedication of any particular church. The practice is said to have been established in England by Gregory the Great, who, in an epistle to Mellitus the abbot, gave injunctions to be delivered to Augustine that the people be allowed liberty on these anniversaries to build booths and feast round their churches, in lieu of the ancient heathen sacrifices. This festival, or wake, as it was called, was long observed with much ceremony; but it ceased to be held about the churches, but in private houses. A council held at Oxford in 1222 ordained that, among other festivals, the day of dedication of every church should be observed within its proper parish. In many places the observance was afterwards transferred to the Sunday following the day of dedication; and in 1536 Henry VIII. enjoined that it be kept in all places throughout the realm on the first Sunday in October. Afterwards the Puritans began to exclaim against it as a remnant of popery; and popular prejudice was excited against it, so that in many parts it was discontinued. It is still observed in some parts of England, particularly the north and midland counties.—*Ref.* Hook's *Church Dictionary*.

DEDUCTION, *de-duk'-shun* (Lat. *deduco*, I draw from or bring out of), in Log., is a reasoning from generals to particulars, the drawing of a particular truth from a general principle already known. It is opposed to induction, which consists in rising from particular truths to the determination of a general principle. The principle of deduction is that things which agree with the same thing agree with one another; of induction, that in the same substances, in the same circumstances, from the same causes, the same effects will follow. Before we can deduce a particular truth, we must be in possession of the general truth, which may be acquired either intuitively, in which case it is commonly called an axiom, or by induction, when it is called a secondary axiom, principle, law, or form. Deduction, when it uses the former kind of truth, is demonstration or science; while truths drawn from the latter kind are contingent and relative, admitting of correction by increased knowledge. The mathematical and metaphysical sciences are founded on deduction; the physical sciences rest on induction.—*Ref.* Fleming's *Vocabulary of Philosophy*.

DEED, *dede* (Sax. *dæd*), a formal document, on paper or parchment, duly signed, sealed, and delivered. When made by one party only, a deed is called a deed poll; when several parties are concerned, an indenture. A deed poll is cut even, or polled, at the edges. The form commences in the mode of a declaration,—"Know all men by these presents, that," &c. The form appropriated to an indenture, or a deed among several parties, is,—"This indenture, made, &c., between, &c., Witnesseth," &c. A properly-arranged deed of conveyance usually consists of the following parts:—First,

the date and names of the parties; secondly, the recitals in which the intentions of the parties and former transactions with regard to the same are recounted as far as necessary. Then the operative part, consisting of the habendum, which defines the estate or interest to be granted; the tenendum, usually joined with the habendum, but it is unnecessary, since the tenure is never expressed, except upon a sub-grant or lease reserving rent; the reddendum, or the reservation of some new thing, such as rent to the grantor; next come the conditions, if any, annexed to the grant, the covenants, and the conclusion, which mentions the execution, &c. A deed must be signed and sealed by the grantor, and by the grantee also, if any agreement or covenant is entered into by him. The delivery of a deed completes its efficacy, and thence it takes effect. A deed is good although it mentions no date, or has a false or impossible date, provided the real date of its delivery can be proved. After execution, a deed may become void by erasure, interlineation, or other alteration in any material part; but, generally, such alterations are presumed to have been made before execution. —*Ref.* Wharton's *Law Lexicon*.

DEEMSTER. (*See* DOOMSTER.)

DEER, *deer* (SAX. *deor*) (*Cervus*), a Linnæan gen. of ruminant quadrupeds, constituting the family *Cervidæ*. The chief characteristics of the deer tribe are, gracefulness of form, fleetness, and neatness and strength of limb; they have a long neck, small head, which is carried high, large full eyes, and large ears; they have no cutting teeth in the upper, but eight in the lower jaw; the males have usually two short canines in the upper, but neither sex has any in the lower jaw. They are distinguished from all other ruminants by their branching antlers, or horns, which, in most of the species, exist in the male only. Unlike the horns of the ox, the antlers of the deer are deciduous, falling off every year after the breeding season, and renewed before that exciting period again returns. Each year, until the animal attains old age, the horns increase in size both in breadth of palmation and number of branches; when, however, the animal grows so old as to cease to be affected at one season more than another, the horns, although renewed, diminish in size at each renewal. It has been clearly ascertained that the size



FALLOW DEER.

and development of the antlers are closely connected with the sexual system. The deer's horns are produced by an action analogous to that by which injuries to the bones are repaired. The process forming the base of the horn is covered by a skin, beneath which a sort of inflammation is set up; this produces cartilaginous matter, which increases rapidly in amount, gradually becomes ossified, and finally forms the horn, which, when mature, is still covered with the vascular skin beneath which it has been formed. This, however, dries up and peels off soon after the complete development of the organs, and the latter then consist of bare bone. The growth of the horn is attended by considerable heat, and the blood-vessels which supply the head enlarge in size. It is rather curious that cast horns are seldom or





never found in localities even where it is certain that hundreds of antlers must have been shed. This, however, is not the only instance of the mysterious disappearance of osseous matter. In the forests of Ceylon, where hundreds of elephants must die in the course of a single year, the skeleton of that gigantic animal is, as is related on eminent authority, *never* found. (*See* ELEPHANT.) The species of Cervidæ are very numerous, and dispersed generally through the world, excepting Australia and the south of Africa. Deer are pretty uniformly clothed with hair longer and thicker on those which inhabit cold, than those which inhabit hot climates. The ancient customs and laws of "venerie," that noble science which our ancestors looked upon as one of the first accomplishments of the high-bred noble, and a knowledge of which was essential to his education, were formal and technical to a most absurd degree. A few of the terms betokening the different ages of the stag and hind are still retained, though somewhat altered. The young of either sex is called a *calf*. After a few months the male becomes distinguished by the growth of the bosses, or frontal protuberances on which the horns are afterwards developed, which, during the first year, are merely rounded knobs; from whence he takes the name of "Knobber." In the second year they are longer and pointed, and are called *dags*, and the animal has now the name of "Brocket." In the third year, the first, or *brow antler*, has made its appearance, and the deer becomes a "Spayad." In the fourth the *bez antler* is added, and he is then termed a "Staggard." He is a stag in the fifth year, when the third antler, or "Royal," appears; and in the sixth, the commencement of the *sur royal*, or crown, is formed, when he takes the name of hart, and retains it through his life. At this time he is called a hart or stag of ten, probably because the branches, including the *sur royal*, frequently amount to that number. After the seventh year he is said to be *crocked*, or *palmed*, or *crowned*, according to the number of branches composing the *sur royal*. The female is a *calf* in the first year, a *brocket's sister* in the second, and in the third, and afterwards, a hind.—*Ref.* Bell's *British Quadrupeds*.

DEERMOUSE, *deer'-mous* (*Meriones*), a gen. of American rodent quadrupeds. The deermouse is common in Canada. It is about the size of a mouse, with a very long tail, and very long and slender hind legs. It is capable of making leaps of four or five yards. It burrows, and passes the winter in a lethargic state.

DEER-STALKING, *stawk'-ing* (SAX. *stælcan*, to step slowly), a method of hunting the deer in such wild and precipitous countries as render the pursuit of them with dogs and horses impossible. It is a very favourite sport in Scotland, and it requires in the sportsman patience, perseverance, and exertion, being at the same time attended with no slight amount of danger, through the nature of the localities where the game is found. The localities of deer-stalking are principally confined to the Highlands of Scotland, and consequently embrace some magnificent scenery. The stratagems of deer-stalkers to get within reach of their cautious prey are very varied. The extreme wariness of the red deer is such that it requires the utmost circumspection to advance towards them. When they are approached, it must always be done on the leeward side, as the quick scenting powers of the deer would soon apprise him of the presence of a sportsman who came on the windward side. A circuit of some miles is often necessary, in order that the stalkers may approach the deer undetected. After having arrived at the given point, it is often found necessary to gain another more completely concealed from the wary sentinel of the herd, one being always especially on the look-out to guard the whole against surprise. It is necessary, therefore, that the stalking party in these cases should lie down until the herd have turned into another situation. The best rifles are used in the sport, and the dogs employed are well bred and thoroughly trained to the work. Two or three couples are required, and they are mostly of the true, strong Grampian deer-dog breed, differing very slightly from the Scotch or Irish greyhound.—*Ref.* *The Art of Deer-Stalking*, by William Scrope, Esq., F.L.S.

DE FACTO, *de fak'-to* (Lat.), in Law, signifies a thing actually done, that is, done *in deed*. A king *de facto* is one that is in actual possession of a crown, but who

has no legal right to the same; in which sense it is opposed to a king *de jure* (of right), who has a right to a crown, but is out of possession.

DEFAMATION, *def-ă-mā'-shun* (Fr. *diffamer*, to defame, from Lat. *diffamo*), in LAW, is when a person speaks scandalous things of another, as of a magistrate, whereby the person spoken against suffers in reputation. The party so offending is liable to be punished according to the nature and quality of his offence; sometimes by action on the case at common law, sometimes by statute, and sometimes by the ecclesiastical laws. In some special cases, defamation is punishable in the spiritual courts. (*See* LIBEL, SLANDER.)

DEFAULT, *de-fault'* (Fr. *défaut*), in Law, generally signifies the non-performance of that which ought to have been done. In a special sense, however, it denotes the non-appearance in court at a day assigned. A plaintiff is nonsuited who makes default in appearance in a trial at law; and judgment may be had against a defendant who makes default.

DEFENCE, *de-fens'* (Fr. *défendre*, to oppose or deny), in Law, signifies popularly a justification or protection. This was, however, not its original signification, as its French derivation shows; it merely meant an opposing or denying by the defendant of the truth or validity of the plaintiff's complaint. A defence is in reality a general assertion that the plaintiff has no ground of action, which assertion is afterwards extended and maintained in the defendant's plea.

DEFENDANT, *de-fend'-ant* (Ang.-Nor.), the party sued in a *personal* action. It is distinguished from *tenant*, the party sued in a *real* action. The term defendant is also used to designate the person indicted or otherwise proceeded against for any crime not amounting to felony.

DEFENDER OF THE FAITH, *de-fend'-der*, a title conferred by Pope Leo X. on Henry VIII. for writing against Martin Luther in 1521. Though subsequently recalled by the pope, it was confirmed by act of parliament, and has ever since been retained by the sovereigns of this country.

DEFILADING, *de-fi-lā'-ding* (from Fr.), in Mil., a term applied to the art of constructing works of defence, in such a manner both as regards the direction and height of the lines of rampart, that no portion may be enfiladed, or swept along its entire length by a fire from any eminence commanding the fortification, and that the parapet of the rampart may be high enough to prevent the interior from being exposed to the direct fire of the enemy. The former is called horizontal and the latter vertical defilading.

DEFILE, *de-file'* (Fr. *défiler*, to march in file), the name given in Mil. to any narrow passage, whether it be a deep valley between two hills, a road between hedges, or even a street, along which troops can only march in column with a narrow front.

DEFINITION, *def-e-nish'-un* (Lat.), literally signifies the laying down a boundary, and is applied to the giving or explaining the meaning of a word by means of other words. A definition serves to show what notions are to be included, and, by inference, what to be rejected, in each word; and thus to afford, as far as possible, a precise understanding of its meaning. Definitions are usually distinguished into nominal and real; the former merely explaining the meaning of terms, and thus belonging to grammars and dictionaries; the latter explaining the nature of the thing itself, and coming within the province of logic. Real definitions are divided into essential and accidental; the former stating the primary and essentially constituent parts of that which is to be defined; the latter laying down what are regarded as circumstances or properties belonging to it. Essential definitions are again divided into physical and logical, the former enumerating such parts as are actually separable, the latter the separate ideas in the mind that go to complete the abstract notion represented by the word; namely, the genus and the difference. The conditions of a good definition are:—1. That it be adequate, neither too narrow, and thus only applicable to a part instead of a whole, nor too extensive, to include a whole instead of a part; 2. that it be clearer, *i. e.*, consisting of ideas less complex than the thing defined; and 3. that it be expressed in a suitable number of words, in opposition to prolixity, or excessive brevity. Words expressive of ideas purely simple cannot be properly defined, and words expressing less-complicated ideas are from their nature more perspicuous than those which express the more complex ideas.

DEFLAGRATION, *def-lă-grā'-shun* (Lat. *de*, concerning; *flagro*, I burn), in ordinary language, a rapid combustion attended with flame and vapour. The term, however, is generally applied to the sudden combustion of substances by throwing them into a red-hot crucible.

DEFLEXION OF RAYS OF LIGHT. (*See* LIGHT.)

DEFORMITY, *de-form'-e-te* (Lat. *deformitas*, from *de*, and *forma*, a form), is the want of that regularity of form necessary to constitute the beauty or symmetry of an object. In the human subject deformities may be either congenital or acquired; *i. e.*, occurring before or after birth. The subject of congenital deformities has recently received from medical men a great degree of attention, and is usually treated of under the head of TERATOLOGY (Gr. *teras*, a monster, and *logos*, discourse), a term introduced by Geoffroy St. Hilaire. Formerly various absurd notions were entertained on this subject, and a monstrosity was considered as the presage of some misfortune, the warrant of divine vengeance, the effect of witchcraft, &c. To these notions they owe their name of monsters, from the Lat. *monstrare*, to show. Modern research has shown that these deformities are all to be traced to natural causes, which are generally reduced to two main divisions,—1. to the original malformation of the germ; or, 2. to the subsequent deformation of the embryo by causes operating upon its development. To the former class are attributed such malformations as are repeatedly produced by the same parents, and hence are in some degree hereditary. Subsequent deformation of the embryo may be produced by various causes affecting its development. A very prevailing opinion is that deformities may be occasioned by strong mental impressions on the mind of the female during pregnancy. Of this, however, there is no satisfactory proof, and it is generally discredited by medical men. Deformities, however, are frequently produced by physical injuries suffered by the mother during pregnancy; and hence a strong mental impression may so affect the mother physically as to transmit its effects to the fœtus. A third cause is attributed to diseases of the ovum and fœtus. A fourth, and assuredly a very general and frequent cause of malformation, consists in impeded development of the fœtus by some remote and unknown cause. Those who wish to investigate this subject further will find a long and able article upon it in Todd's "Cyclopædia of Anatomy and Physiology," under the head Teratology. The various kinds of artificial deformities will be found treated of under their proper heads in other parts of this work.

DEFTER-DAR, *def'-ter-dar* (Persian), signifies, literally, a book-keeper, and in Persia and Turkey is the title of the minister of finance. In Turkey he sits in the divan, disposes of all the public money, and publishes firmans in his own name, without referring to the grand vizier.

DEGLUTITION, *deg-loo-tish'-un* (Lat. *deglutitio*, from *deglutio*, I swallow), is the act of swallowing, or the passage of a substance, either solid, liquid, or gaseous, from the mouth to the stomach. Though simple in appearance, deglutition is yet the most complicated of all the muscular actions that serve for digestion. It is effected by the contraction of a great number of muscles, and requires the concurrence of many important organs for its accomplishment. It is divided into three stages. In the first, the food passes from the mouth to the pharynx; in the second, it passes the opening of the glottis, that of the nasal organs, and arrives at the œsophagus; and in the third it passes through this tube and enters the stomach. The first of these is purely voluntary; the second is not so, but is an action of the reflex function; the third is altogether involuntary, being due to the irritability of the œsophagus, which, by a series of muscular contractions and expansions, forces the substance downwards.

DEGRADATION, *deg'-ră-dā'-shŭn* (Lat. *de*, down, and *gradus*, a step), is the act of depriving or stripping a person for ever of a dignity or degree of honour. The degradations of a peer, priest, knight, officer, &c., are

all performed with divers ceremonies. In the Church of England a clergyman may be deprived of the holy orders which he formerly had, either summarily by word only, or solemnly, by divesting the party degraded of those robes or ornaments which were the ensigns of his degree. By canon 122, sentence of deposition from the ministry can only be pronounced by the bishop, with the assistance of his chancellor and the dean, if they can conveniently be had, or certain others. In the Romish church the person to be degraded appears before the priest who is to perform the ceremony in his clerical vestments; those parts of the hands which had been anointed are first slightly scratched with a knife or piece of glass; he is then successively stripped of his sacred ornaments and robes of office, is clothed in a lay habit, and then publicly handed over to the secular judge, who is present to take him under his jurisdiction.

DEGREE, *de-gree'* (Lat. *de*, of or concerning; *gradus*, a step; Fr. *dégré*), in universities, is a distinction conferred on the students or members of a university as a testimony of their proficiency in the arts or sciences, and entitling them to certain privileges. The origin of degrees, like many other points connected with the early history of universities, is involved in obscurity. That they existed at a very early period is unquestionable, but there is no reason to believe that they were co-eval with the earliest universities. The oldest degrees were those in arts; and the term bachelor, which designates the lowest degree in each faculty, would seem to justify us in tracing the whole system of degrees to the university of Paris. The terms master and doctor were originally synonymous, and were commonly given to persons engaged in teaching, and not as titles conferred by authority after a prescribed course of study or a formal examination. Afterwards the term master was restricted to teachers of the liberal arts, and the title of doctor was assumed by the teachers of theology, law, and medicine. The masters and doctors afterwards adopted certain regulations, which were confirmed by public authority, to prevent unqualified persons from assuming their office; and hence these titles came to indicate a certain rank, and convey certain powers in the body scholastic. When this took place, and more especially when an initiatory stage was marked by the name of bachelor, the several designations were called steps, or degrees (Lat. *gradus*). Every graduate had an equal right of teaching publicly in the university the subjects competent to his faculty up to the rank of his degree, and he even incurred an obligation to teach as a condition on which his degree was granted. Degrees are of two kinds:—1. Ordinary, or those which are conferred upon the members of a university after examination, and are thus certificates of attainment; and 2. Honorary, or those that are sometimes conferred upon persons of distinction without any examination. Degrees bear the same names, and, with some variation, the same relative academical rank, in most countries of Europe; but the mode of granting them, and their value at different universities as tokens of proficiency, vary greatly. In the English universities there are for arts the degrees of bachelor and master, and for the higher faculties bachelor and doctor. The degree of doctor in philosophy, granted by some of the foreign universities, is of modern introduction.—(*See* UNIVERSITIES, and the several articles on special universities; as those of Cambridge, London, Oxford, &c.)—Ref. *Encyclopædia Britannica*, art. Universities.

DEGREE.—In Math., the circle is divided into 60 equal parts, called degrees; each degree into 60 equal parts, called minutes; each minute into 60 seconds, each second into 60 thirds; and so on. (*See* CIRCLE, TRIGONOMETRY.) In Astron. and Geog., the imaginary great circles that are supposed to be described on the surface of the earth, and on the apparent surface of the heavens, are similarly divided, to aid us in effecting astronomical and geographical calculations, and in determining the position of stars and other celestial bodies on the latter, and the situation of places on the former. These divisions are known as degrees of latitude and longitude, according to the direction in which they are measured. Degrees of latitude are measured from the equator towards the north and south poles, along the meridian, or any great circle in a plane perpendicular to that of the equator. They are numbered, in either direction from the equator, from 0° to 90°. As the earth is not a complete sphere, the length of a degree of latitude is not exactly the same at all parts of the earth's surface, being rather less at the equator than at the poles; for all practical purposes, however, they are assumed to be equal everywhere, having a mean length of 60 geographical miles, or 69·1 English miles, which would be the case if the earth were spherical instead of being an oblate spheroid. The small circles which are supposed to be described on the earth's surface through every degree of latitude, in planes parallel to that of the equator, are called parallels of latitude. Degrees of longitude are measured east and west along the equator, from the meridian of Greenwich on the terrestrial globe, and from the first point of Aries on the celestial globe, and are numbered in either direction from the points that have been indicated from 0° to 180°. Each degree of longitude is 60 geographical miles, or 69·1 English miles at the equator. It may be defined as the arc intercepted between two meridians or great circles that intersect each other at the poles at an angle of 1°. It will readily be seen, that as the meridians are at 60 geographical miles' distance from each other at the equator, and meet in a point at the poles, the degrees of longitude become less and less in length as they are measured along every successive parallel of latitude between the equator and the poles. The following table shows the length of a degree of longitude in English miles measured along every fifth parallel of latitude,—the distance at which parallels of latitude are usually inserted in maps of ordinary size. The table is calculated on the supposition that the earth is spherical.

| Deg. of Lat. | English Miles. | Deg. of Lat. | English Miles. | Deg. of Lat. | English Miles. |
|---|---|---|---|---|---|
| 0 ..... | 69·10 | 35 ..... | 56·61 | 70 ..... | 23·60 |
| 5 ..... | 68·81 | 40 ..... | 52·85 | 75 ..... | 17·88 |
| 10 ..... | 67·95 | 45 ..... | 48·78 | 80 ..... | 11·98 |
| 15 ..... | 66·65 | 50 ..... | 44·35 | 85 ..... | 6·00 |
| 20 ..... | 64·84 | 55 ..... | 39·58 | 90 ..... | 0·00 |
| 25 ..... | 62·53 | 60 ..... | 34·50 | | |
| 30 ..... | 59·75 | 65 ..... | 29·15 | | |

It should be remembered, that in describing the position of a place on the earth's surface we must mention the latitude as north or south of the equator, and the longitude as east or west of the first meridian. In most countries geographers assume the the meridian of the capital as the first meridian.

DEGREE, in Mus., a name given to each line and space contained in the staff. There are nine degrees; viz., five lines and four spaces; when a greater number are required, short parallel lines, called ledger-lines, are added, either above or below the staff. A melody is said to proceed by degrees when it ascends or descends to the next line or space.

DEGREE, THEORETICAL, in Mus., the difference of position or elevation between any two notes. Theoretical degrees are of two kinds, viz., *conjunct* and *disjunct*; they are called *conjunct* when two notes are so situated as to form the interval of a *second*, and *disjunct* when they make a *third* or any greater interval.

DEGREES OF NOBILITY. (*See* NOBILITY.)

DEIFICATION. (*See* APOTHEOSIS.)

DEI GRATIA, *de'-i grai'-shea-ä* (Lat., by the grace of God), is a formula which sovereigns add to their title, and which is taken from an expression of the apostle Paul in the New Testament. It was first used by the clergy in the time of Constantine the Great, as an expression of dependence upon the grace of God, and afterwards the higher clergy came to use along with it the addition, *et apostolicæ sedis* (by the grace of God and the apostolic see). In the time of the Carlovingian race the secular princes also assumed it; and in course of time it came to be regarded as asserting something like the divine right of kings and their independence of any earthly power.

DEINACRIDA, *di-nä-kri'-dä*, a gen. of the Cricket tribe, abundant in New Zealand, where it inhabits decaying trees and chinks and crannies in old woodwork. It is carnivorous, and its bite is very severe.

DEIPNOSOPHISTS, *dips-nos'-o-fists* (Gr. *deipnon*, a feast, and *sophistes*, a sophist), was a name given to

an ancient sect of philosophers famous for their learned conversation at meals. Athenæus has left a collection of *Anu*, which bears the title of *Deipnosophistæ*.

DEISCAL, *de-is'-kăl*, the name of a ceremony originally used in the Druidical worship of Britain, and consisting of the Druids, accompanied by all the worshippers, proceeding from east to west, according to the course of the sun, three times round the altar. It invariably formed part of the public offices of their religion, and was preserved as a ceremony on various occasions long after Druidism had disappeared. In some parts, even down to a late period, it was customary for the people to testify their respect for their chieftain by performing this ceremony round his person.

DEISM, or THEISM, *de'-izm* (Lat. *deus*, Gr. *theos*, God), properly means belief in a God, as opposed to Atheism. Strictly speaking, the two words are synonymous, but custom has made a distinction between them, the former being generally used in a bad, the latter in a good sense. In this view a deist is one who believes only in a supreme being, rejecting Christianity and denying revelation. A theist, on the other hand, is applied to all that believe in one God. The name of Deist seems to have been first assumed as the denomination of a party by some gentlemen in France and Italy about the middle of the 16th century; and Viret, an eminent reformer, in his epistle dedicatory prefixed to the second volume of his "Instruction Chrétienne," published in 1563, mentions certain persons who called themselves by a new name,—that of Deists. These persons were desirous of disguising in this way their opposition to Christianity under a more honourable title than that of atheist. The first deistical writer of any note that appeared in this country was Herbert of Cherbury, who flourished in the 17th century. He was the first to form deism into a system, asserting the sufficiency of natural religion, and hence discarding revelation as useless and unnecessary. The five fundamental articles of his system were:—1. That there is one supreme God; 2. that he is chiefly to be worshipped; 3. that piety and virtue are the principal part of his worship; 4. that we must repent of our sins, and if we do so, God will pardon them; and 5. that there are rewards for good men and punishments for bad men, both here and hereafter. Among the more noted of those who have followed in his steps may be mentioned Hobbes, Blount, Toland, Collins, Woolston, Tindal, Morgan, Chubb, Bolingbroke, Hume, Gibbon, Paine, and, we may add, Lord Shaftesbury. In France, Voltaire, Rousseau, Condorcet, and many others, have rendered themselves conspicuous by their deistical writings. Dr. Clarke distinguishes four kinds of deists:—1. Those who believe in the existence of an infinite and eternal being, who created the world without concerning himself with the government of it. 2. Those who believe in the being and natural providence of God, but deny the difference of actions as morally good or evil, which is merely established by human laws, God taking no concern with them. 3. Those who, having right apprehensions concerning the nature, attributes, and all-governing providence of God, yet consider them as of such a nature that we can form no true judgment nor argue with any certainty regarding them, denying the immortality of the soul, and alleging that the present life is the whole of human existence. And 4. those who believe in the existence, perfections, and providence of God, the obligations of natural religion, and a state of future retribution, on the evidence of the light of nature, without a divine revelation. Deism has assumed various forms, usually taking its character from the age in which it was. At one time it denied the historic evidences for the truth of Christianity; at another, the credibility of miracles; again it denied the necessity or possibility of a revelation, and anon the character of the revelation itself. Formerly deism was a rude, repulsive creation, destroying the distinction between right and wrong, depriving man of all hope of a hereafter, and giving him no aim for life but sensual pleasure. Now it has assumed a more pleasing and seductive form. The Bible is indeed a revelation, but it is such a revelation as is to be met with in other works; the writers were inspired, but it is such an inspiration as characterizes men of genius in every age. Minos and Moses were equally inspired to make laws, David and Pindar to write poetry, Newton





and Isaiah, Leibnitz and Paul, had each only various forms of the one spirit from God most high. (*See* INSPIRATION, REVELATION, RATIONALISM.)

DEL CREDERE COMMISSION, *del kred'-e-re*, is a phrase borrowed from the Italian, and employed in mercantile law to denote an additional premium charged by a factor or agent, in consideration of which he guarantees the solvency of the purchaser, and thus becomes personally liable for the price of the goods sold.

DELEGATE. (*See* DELEGATION.)

DELEGATES, COURT OF, *del'-e-gaits*, was formerly the highest court of appeal in ecclesiastical and maritime causes in England. This court was created by Henry VIII., for the purpose of hearing appeals from ecclesiastical courts, a right which had previously been held by the pope. It was so called because the judges had delegated to them their powers by commission under the great seal. In ordinary cases, it was composed of three common-law judges and three civilians, but in special cases a fuller commission was sometimes issued. This court was abolished by 2 & 3 Will. IV. c. 92, and its powers transferred to the king in council. By 3 & 4 Will. IV. c. 41, its powers are now exercised by the judicial committee of the privy council.

DELEGATION, *del-e-gā'-shun* (Lat. *delegatio*, from *delego*, I refer, or commit), is properly the investing one with authority to act for another, and has hence come to be applied to a body of persons deputed thus to act. Before the present constitution of the United States of America was adopted, the persons constituting the congress at Philadelphia were called delegates; and the body of representatives of a state in congress are still called the delegation of a state. In Maryland and Virginia, what in most of the other states is called the House of Representatives is there called the House of Delegates. The name of delegate is also given to the representatives sent to the congress of the United States from territories not yet formed into states. In the States of the Church, in Venice, and Lombardy, the term *delegazione* is applied to the governing court of a province as well as to the province itself. Prior to the recent political changes in Italy, there were nine *delegazioni* in Lombardy and eight in Venice, each of which was presided over by a delegate, a vice-delegate, and an adjunct. By a decree of 1816 the Papal States were divided into seventeen delegations; but this number has been several times altered. The delegate, according to the old system, must always be a prelate, and is appointed directly by the pope. If a cardinal, he has the title of legate, and his province is called a legation.

DELF, or DELFT, *delf*, a kind of coarse porcelain, originally manufactured at the town of Delft, in Holland. It has been superseded, even in Holland itself, by the superior manufactures of England, and the improved taste in the making of pottery introduced by Wedgwood. The town of Delft has now entirely lost its reputation for pottery: at present, not more than two hundred persons are engaged in the earthenware factories.

DELIQUESCENCE, *del-e-kwes'-ens* (Lat.), the property possessed by certain substances of absorbing water from the atmosphere and becoming liquid in it. Advantage is taken of this property in the case of chloride of calcium, which is much used by chemists for drying gases, and for promoting the crystallization of other less deliquescent salts. The damping of common salt in wet weather is an instance of the deliquescent property of the chloride of magnesium always contained in it as an impurity.

DELIRIUM, *de-lir'-e-um* (Lat. from *deliro*, I rave or am furious), is a confusion of ideas, which occurs in the progress of certain diseases, from disturbed function of the brain. Sometimes the term is employed to include every form of mental alienation; but generally a distinction is made between insanity and delirium, the latter occurring principally in fever and inflammatory diseases, while the former is unattended by these disorders. (*See* INSANITY.) The insane usually display all the external appearances of health, and have the digestive and nutritive functions in a sound state. In the delirious, on the other hand, all the cerebral functions are severely affected; there are no correct sensations, connected ideas, or passions; no regular voluntary motions; little or no intelligence or

recollection. The patient is almost a stranger to everything that surrounds him, as well as to himself. Delirium may be either violent and frantic (*delirium ferox*), as in acute inflammation of the membranes of the brain, or low and muttering (*typhomania*), as in low fever. It supervenes on fever during any part of its course. It occurs in the hot state of some intermittents, but rarely makes its appearance in typhoid or continued fever until the disease has reached its height. It sometimes occurs suddenly, without any previous indication; but more frequently it is preceded by headache, throbbing of the temples, a flushed and oppressed countenance, &c. The patient is at first delirious during the short and imperfect periods of sleep, or immediately after he is roused, becoming, when fully awakened, more clear and comparatively collected. By degrees this lucid interval becomes less perceptible; the individual becomes more and more incapable of reflection and mental exertion, and gradually loses the power of recognizing the persons and objects which surround him. When delirium is about to terminate fatally, sensibility becomes more and more impaired, until all conscious feeling seems to be lost. Inarticulate moaning succeeds to delirious incoherence, the patient loses in a great measure sight and hearing; the mouth and tongue are dry, yet the patient no longer complains of thirst; the pupils become scarcely contractile; black spots, like flies, appear before the patient's eye, and the evacuations escape without consciousness. As delirium is rather a symptom of disease than a disease itself, its treatment necessarily forms part of that of the disease on which it supervenes, and will therefore fall to be noticed under these heads.

Delirium Tremens, Delirium Ebriositatis, or Mania a Potu, is a disease of the brain usually caused by an abuse of spirituous liquors, but sometimes also by great mental anxiety and loss of sleep; or it may result from bodily injuries or accidents, loss of blood, &c. Delirium sometimes makes its appearance in consequence of a single debauch; but more frequently it is the result of protracted or long-continued intemperance. It usually supervenes on a fit of intoxication; but it not unfrequently occurs, also, when the habitual drunkard omits his accustomed draught. The approach of an attack is almost invariably preceded by the patient being remarkably irritable, with fretfulness of mind and mobility of body. He becomes very nervous and uneasy; is startled by any sudden noise, the opening of a door or the entrance of a visitor; is restless; the hands and tongue are tremulous; he complains of inability to sleep, and if he dozes for a moment, he is awakened by frightful dreams. Soon delirium manifests itself: if questioned, the patient often answers rightly enough; but if left to himself, he begins to talk or mutter; he is surrounded by frightful or loathsome animals; is pursued by some one who has a design upon his life; he has terrible and ghastly visions. Though most commonly of a frightful or terrifying character, the delirium is not always so: occasionally the appearances are droll and ludicrous, and the patient seems amused by them; at other times it turns on some matter of business, as settling of accounts or telling of money, and the patient is in a perpetual bustle, and his hands are constantly full of business. The predominant emotion with the delirious patient is fear, and in his efforts to escape from an imaginary enemy, he may be guilty of a murderous assault, or, as is more frequently the case, may take his own life; and hence he requires to be very carefully watched. "The strong features of this complaint," says Dr. Watson, "are sleeplessness, a busy but not angry or violent delirium, constant chattering, a trembling of the hands, and an eager and fidgety employment of them. . . . The tongue is moist and creamy; the pulse, though frequent, is soft; the skin is perspiring, and most commonly the patient is drenched in sweat." The delirium continues until the patient sinks into a sleep, from which he awakes comparatively rational, or dies from exhaustion. In such cases death is often sudden, the patient rising for some trivial purpose, and falling in a faint, from which he never recovers; or at length, after passing many nights without sleep, he sinks into a state of coma, which terminates in death. This disease, however, is rarely fatal, unless where the strength of the patient has been seriously impaired by long-continued excesses. The great remedy is sleep, and the best means of inducing this is by opium, which is to be given in large doses, and frequently repeated, until the desired effect follows. Sometimes it is necessary, in order to procure sleep, if the patient is in a very exhausted state, or if the disease has been brought on by the cessation of an accustomed stimulus, to allow the patient a certain quantity of his ordinary beverage; but this should not be continued longer than he can do without it. Chloroform has also been recommended as a means of procuring sleep when opium fails. This disease is to be carefully distinguished from inflammation of the brain, with which it has many symptoms in common; for bleeding, which is resorted to in the latter disease would be of the utmost danger in this.

Delivery, *de-liv'-er-e* (Fr. *délivrer*, to deliver), is the fifth and last of the several parts that go to make up the business and art of the orator, the others being invention, disposition, embellishment, and memory: invention, in order to find out what to say; disposition, in order to arrange in a proper manner; embellishment, to deck it in proper language; memory, to retain it; and delivery, to give it forth with dignity and grace. The ancient masters of oratory looked upon delivery as occupying a most important place in the art. It is said of Demosthenes that when asked what was the first point in oratory, he answered, delivery; and the second, delivery; and the third, still delivery. "Delivery," says Cicero, "has the sole and supreme power in oratory. Without it a speaker of the highest mental capacity can be held in no esteem; while one of moderate abilities, with this qualification, may surpass even those of the highest talent." Though, from the character of the people and of the times in which we live, delivery may not now be entitled to the same attention that it formerly received, yet it only requires a little consideration to see that it is one of great importance to the public speaker, and is entitled to a much greater degree of attention than it at present receives. If the end of all public speaking is to persuade,—to convey our own ideas and emotions to those whom we address, then our voice, looks, and gestures interpret our ideas and emotions not less than words do,—nay, the impression they make upon others is frequently much greater than any words can make. An expressive look, a passionate cry, often speak much more eloquently than any words. Words are only arbitrary conventional symbols of our ideas; but tone and gesture are the language of nature. "Every emotion of the mind," says Cicero, "has from nature its own peculiar look, tone, and gesture; and the whole frame of a man, and his whole countenance, and the variations of his voice, sound like strings in a musical instrument, just as they are moved by the affections of the mind." Anger, for instance, assumes a particular tone of voice,—acute, vehement, and with frequent breaks; violence has another tone,—strained, vehement, impetuous, with a kind of forcible excitement; fear is desponding, hesitating, abject; lamentation and bewailing, flexible, full, interrupted, in a voice of sorrow; pleasure, unconstrained, mild, tender, cheerful, languid; trouble, a sort of gravity without lamentation, oppressed, as it were, with one heavy uniform sound. "On all these emotions a proper gesture ought to attend; not the gesture of the stage, expressive of mere words, but one showing the whole force and meaning of a passage; not by gesticulation, but by emphatic delivery, by a strong and manly exercise of the lungs; not imitated from the theatre and actors, but rather from the camp and the palæstra." The first great *object* with every public speaker should be to speak so as to be fully and easily understood by all who hear him; and in order to this, the four chief requisites are a due degree of loudness of voice, distinctness, slowness, and propriety of pronunciation. Power of voice is doubtless, in good measure, a natural gift; but yet it may be much improved by art. The great object is to speak so as to be heard by all, and yet so easily and naturally as neither to fatigue himself nor to seem to speak with pain. The next important thing in a speaker is distinctness of articulation. He ought to make every syllable, and even every letter of the word which he

pronounces, be distinctly heard; and attention to this will do more to compensate for loudness than is commonly imagined. In the third place, slowness of speech is to be studied; for the opposite confounds all articulation and all meaning. It gives weight and dignity to the discourse, and is of great assistance to the voice, by the pauses and rests which it affords. It also assists the speaker in preserving a due command of himself; whereas a rapid and hurried manner is apt to excite that flutter of spirits which is the greatest enemy to correct delivery. The speaker must, in the fourth place, attend to propriety in pronunciation, or the giving to every word which he utters that sound which the most polite usage of the language appropriates to it. There are other points that require to be attended to by all who would speak with grace and force, so as to please and move the audience; the chief of which are emphasis, pauses, tones, and gestures. On the right management of the emphasis depend the whole life and spirit of a discourse; and by an abuse of emphasis the meaning is often rendered ambiguous or perverted. In order to acquire the proper management of emphasis, the great rule is for the speaker to study to attain a just conception of the force and spirit of what he is going to say. The most frequent and principal use of pauses is to mark the divisions of the sense, and, at the same time, to allow the speaker to draw breath; and the proper adjustment of them is one of the nicest and most difficult accomplishments in delivery. Tone consists in the modulation of the voice, the notes or variations of sound which we employ in public speaking. Of the importance of this we have already spoken. A speaker cannot successfully convey his own sentiments and emotions to his hearers, unless he utter them in such a way as to show that he feels them. The great rule here is to follow nature, and to consider how she teaches us to utter any sentiment or feeling of the heart. Gesture, or action, as it is frequently termed, is of great importance to the orator "Action," says Cicero, "which, by its own powers, displays the movements of the soul, affects all mankind;" and "the countenance is next in power to the voice, and is influenced by the motion of the eyes." The great rule here, as in the previous case, is to attend to the looks and gestures in which earnestness, indignation, compassion, or any other emotion, discovers itself to most advantage in the common intercourse of men, and to take these for our models. For further information on this subject, we may refer to the Institutions of Quintilian, who, in the last chapter of the eleventh book, has given many particular rules concerning gesticulation, which modern writers have done little else than translate.

Delphin Classics, *del'-fin*, in Lit., is the name given to an edition of the Greek and Roman classics, prepared and commented upon by thirty-nine of the best scholars of the day, under the editorship of Bossuet and Huet, at the instigation of Louis XIV., for the benefit of his son the dauphin (*in usum Delphini*); whence their name. Many of the particular works have been reprinted in this country, and are well known.

Delphinium, *del-fin'-e-um*, in Bot., a gen. of plants belonging to the nat. ord. *Ranunculaceæ*. The seeds of *D. staphysagria*, commonly called staves-acre seeds, have been used for destroying vermin. They contain an alkaloid called *delphinia*, which is occasionally employed medicinally as an external remedy in rheumatism and neuralgia.

Delphinus, *del-fi'-nus* (Lat. *delphinus*, the dolphin), one of the original constellations made by Aratus, an old Greek astronomer. It is close to the constellation Aquila. Its brightest star is one between the third and fourth magnitude, and it has four of the fourth magnitude.

Delta, *del'-ta*, the Greek letter Δ.—The lower portion of Egypt, between the eastern and western branches of the Nile and the sea, was, from its resemblance to the letter above, called the Delta. In modern times, whenever a river, before entering the sea, diverges so as to form a triangle, with the sea-line for the base, the alluvial deposit included by the three lines is called a *delta*. The existence of a delta at the mouth of a river depends not so much on the amount of sediment held in suspension as on the presence or absence of currents met with at the point of discharge. Deltas are not to be found where there are strong ebb tides; in such case deposit is washed away. But in sheltered bays and gulfs, in the Mediterranean Sea, where there are scarcely any tides, and in inland lakes, deltas almost invariably occur.

Deltoid, *del'-toid* (Gr. Δ *delta*), in Anat., is a muscle of the shoulder, which moves the arm either forward, backward, or upward. It is so called from its resemblance to the Greek letter *delta*. In Bot., the term deltoid is applied to a leaf of triangular form.

Deluge, *del'-yuje* (Lat. *diluvium*), is either a partial or general overflow of water, flooding the land. It is generally applied to that great overflow of water narrated in Scripture, and commonly known as the Flood. This great event is ordinarily calculated to have occurred in the 1656th year after the Creation, and 2293 years before Christ. We are told in Genesis (vii.) that all the fountains of the great deep were broken up, and the windows of heaven were opened, and God caused it to rain forty days and forty nights upon the earth; that during that time the waters increased and prevailed exceedingly upon the earth, and all the high hills and mountains were covered fifteen cubits and upwards; that all flesh died that moved upon the earth, and every man save Noah and those that were with him in the ark; that the waters prevailed upon the earth an hundred and fifty days, and at the end of that time they were abated, God having made a wind to pass over the earth and assuage the waters; the fountains also of the deep and the windows of heaven being stopped, and the rain from heaven restrained. Noah entered the ark on the 17th day of the second month; on the 17th day of the seventh month the ark rested upon the mountains of Ararat; and on the 1st day of the first month of the year following, the waters were dried up from the earth, and about two months later the earth itself was dried. Such is the concise account of this great catastrophe given in sacred writ, a subject which has given rise to much discussion, and furnished materials for the cavillers at religion. Without going into all the points connected with this subject, we may briefly allude to a few of them. We find in the legends and traditions of most of the earlier races upon the earth (the Chinese, Hindoos, Persians, Greeks, &c.) accounts of a similar catastrophe, and though sometimes they are in an allegorical form, yet they so closely resemble the account given by Moses, that they have generally been regarded as referring to the same event. Even the Mexicans, Peruvians, and other ruder nations of the new world, are represented as having their traditions of the great deluge. Numerous ingenious and fanciful theories were formerly given forth in order to explain the phenomena of the Deluge; and early geologists believed that they found in the fossil remains imbedded in the earth unquestioned evidence of this universal destruction. So far was this the case, that infidel writers found themselves reduced to the absurd shift of representing them as *lusus naturæ*. So far as the testimony of geology goes, we have no evidence that bears directly upon this subject. Some of the ablest geologists are of opinion that the Deluge as described by Moses had been so gradual and of so short duration that it could have produced comparatively little change upon the surface of the earth. "The simple narrative of Moses," says the late Dr. Fleming, of Ediuburgh, "permits me to believe that the waters rose upon the earth by degrees; that means were employed by the author of the calamity to preserve pairs of the land animals; that the flood exhibited no violent impetuosity, displacing neither the soil nor the vegetable tribes which it supported, nor rendering the ground unfit for the cultivation of the vine. With this conviction in my mind, I am not prepared to witness in nature any remaining marks of the catastrophe; and I find my respect for the authority of revelation heightened when I see on the present surface no memorials of the event." The majority of the ablest scientific men and theologians are now, however, of opinion that the Flood was only partial, and not universal. It was sent as a judgment of God against impious men, and there is no reason to believe that the human race had then spread themselves over the entire surface of the globe. The word *all*, in accordance with Eastern phraseology, is not always in

Scripture to be taken in a strictly literal sense; and hence, in the Mosaic account, there is nothing that can be regarded as contrary to the view of the Deluge being only partial. The object to be effected was the destruction of ungodly men, and if there be no reason to conclude that they were at that early period extensively scattered abroad, we think there is abundant evidence to show that God is always very economical of his means, and never has recourse to great measures in order to effect what may be brought about by small. The opinion of a partial deluge has been taken up and developed by Hugh Miller in his last great work, the "Testimony of the Rocks." "There is," he says, "a remarkable portion of the globe, chiefly in the Asiatic continent, though it extends into Europe, and which is nearly equal to all Europe in area, whose rivers (some of them, such as the Volga, the Ural, the Sihon, the Koor, and the Amoo, are of great size) do not fall into the ocean, or into any of the many seas which surround it," but lose themselves in the eastern part of the tract in the lakes of a rainless district, and in the western fall into seas such as the Caspian and the Aral. In this region there are extensive districts still under the level of the ocean. "Let us suppose," he continues, "the human family still amounting to several millions, though greatly reduced by exterminating wars and exhausting vices, were congregated in that tract of country which, extending eastward from the modern Ararat to far beyond the Sea of Aral, includes the original Caucasian centre of the race. Let us suppose that the hour of judgment having at length arrived, the land began gradually to sink, as the tract in the Run of Cutch sank in the year 1819, or as the tract in the southern part of North America, known as the Sunk Country, sank in the year 1821. Further let us suppose that the depression took place slowly and equally for forty days together, at the rate of about four hundred feet per day, a rate not twice greater than that at which the tide rises in the Straits of Magellan, and which would have rendered itself apparent as a persistent inward flowing of the sea. Let us further suppose that from mayhap some volcanic outburst coincident with the depression, and an effect of the same deep-seated cause, the atmosphere was so affected that heavy drenching rains continued to descend during the whole time, and that though they could contribute but little to the actual volume of the flood, at most only some five or six inches per day, they at least seemed to constitute one of its main causes, and added greatly to its terrors, by swelling the rivers and rushing downward in torrents from the hills. The depression which by extending to the Euxine Sea and the Persian Gulf on the one hand, and to the Gulf of Finland on the other, would open up, by three separate channels, the fountains of the great deep, and which included, let us suppose, an area of about 2,000 square miles each way, would at the end of the fortieth day be sunk in its centre to the depth of 16,000 feet, a depth sufficiently profound to bury the loftiest mountains of the district; and yet having a gradient of declination of but sixteen feet per mile, the contour of its hills and plains would remain apparently what they had been before. The doomed inhabitants would see but the water rising along the mountain-sides, and one refuge after another swept away, till the last witness of the scene would have disappeared; and when, after 150 days had come and gone, the depressed hollow would have begun slowly to rise, and when, after the fifth month had passed, the ark would have grounded on the summit of Mount Ararat, all that could have been seen from the upper window of the vessel would be simply a boundless sea, roughened by tides now flowing outward with a reversed course toward the distant ocean by the three great outlets, which, during the period of depression, had given access to the waters. Noah would of course see that the fountains of the deep were stopped, and that the waters returned from off the earth continually; but whether the deluge had been partial or universal he could neither see nor know."

DEMAGOGUE, *dem'-ă-gog* (Gr. *demos*, people, and *agogos*, leader), was applied, in ancient Greece, to such persons as by their abilities had great power in gaining over the mass of the people to their views, and thus obtained great influence in the state. This was its original and proper signification; but it came afterwards to be applied in a bad sense to such as attempted to mislead the people, and gain them over to their own selfish views, and who did not hesitate to resort to deceit and falsehood for that purpose. In its original acceptation it was regarded as a most honourable designation, having been applied to Solon, Demosthenes, and others of the most illustrious men of antiquity; but it is now almost invariably used in a bad sense.

DEMAND AND SUPPLY, *de-mand' sup-ply'* (Fr. *demander*, to demand, from Lat. *de*, and *mando*, I command; Fr. *supplier*, to supply, from Lat. *supplio*, I fill up, supply), in Polit. Econ., denote the relationship that subsists between the demand and supply of commodities,—that is, between consumption and production. A demand, in this sense, is not simply a want, but it is a want leading one to exchange the product of his own labour for that of other men,—an "effective want," as Adam Smith terms it. This demand not only leads to a supply of the articles in demand, but it also leads to an increased production on the part of the buyers, in order to enable them to purchase what they are anxious to obtain. Hence a universal increase of production leads to a corresponding increase of consumption. The relations between the demand for an article and its supply determine its price, which will rarely vary, for any length of time, much above or below its cost of production. Though the first effect of a demand exceeding the supply of a commodity is to raise its price, yet the increased price attracts the competition of others, and fresh labour and capital are employed in its production, until the supply is accommodated to the demand or exceeds it. In some cases, however, where the supply is necessarily limited, the price rises in proportion to the deficiency, and the number of consumers is diminished. Where, as in articles of food, the demand is universal, the effect of a deficiency is to raise the price higher and higher until a fresh supply can be obtained. The general effect of lowering the price of an article is to increase the amount of consumption, and of raising the price to diminish it. When the supply of any article exceeds the demand, the reverse of all this takes place, and the prices generally fall in proportion to the excess of the quantity. An excessive production of any commodity is always attended with evil to the producers, who must either cease to produce or must produce in less quantities: and not only does it act injuriously upon them, but extends also to other classes, inasmuch as the consumption of these produces is diminished. "In proportion to the extent of the market, and the variety and abundance of commodities to be exchanged, will be the facility of disposing of the products of capital and labour; and this consideration points out as the most probable antidote to gluts, a universal freedom of commerce. When the free interchange of commodities is restricted, not only is a glut caused more easily, but its causes are more uncertain, and dependent upon unforeseen events. With the whole world for a market, the operation of the laws of demand and supply would be more equable, and the universality of the objects of exchange would make gluts of rare occurrence."—*English Cyclopædia, sect.* Arts and Sciences.

DEMARCATION, LINE OF, *de-mar-kai'-shun* (Fr.), in the language of politics, is applied to the line of boundary agreed on by two contending parties, or fixed by a third, regarding some disputed territory. The term originated in the 15th century, when Pope Alexander VI., in order to settle the disputes of Spain and Portugal on the subject of their Indian possessions, drew an imaginary line through the ocean, defining the possessions of both parties, and to this line the term demarcation was first applied. It has now come to be used in this sense in most of the languages of Europe.

DEMESNE, *de-meen'* (Nor. *demeine*, demayne, probably from Lat. *dominicum*), such lands as were next to the lord's mansion, which he retained in his own hands for the use of his household and for hospitality. At the present day, demesne signifies the right which the owner in possession of lands in fee-simple has in his estate.

DEMI, *dem'-e*, is a term derived from the French, signifying literally "half," and frequently used in

the composition of English words; as *demigod*, or half-god.

**Demigods**, *dem'-e-gods*, in Greek and Roman Myth., were a kind of half-gods, an inferior kind of deities, who were regarded as having something earthly in their composition. They were generally the spirits of such men as had been deified, more particularly such of them as were regarded as the offspring of divinities and mortals.

**Demi-haque**, *dem'-e-hăk* (Fr.), the name of a small firearm in general use about the end of the 15th century. It was like a large pistol in form; but the butt was long and greatly curved. It was, as the name implies, a diminutive of the haquebut, or hook-butt, a musket the stock of which was curved, instead of being straight like that of the arquebus or hand-gun, the shape of which prevented these weapons from being held in a position which would allow the eye to be directed along the barrel towards the object aimed at.

**Demi-lune**, *dem'-e-lune* (Fr. *demi*, half; *lune*, the moon), in Mil., the name sometimes given to the ravelin, a work erected beyond the main ditch, in front of the curtain, to defend this part of the fortification and the flanks and shoulders of the collateral bastions. It is composed of two faces, forming a salient angle towards the open country, and is surrounded by a ditch communicating with the main ditch. It is open towards the rear, and gained by a *caponnière* thrown up across the ditch in a line perpendicular to the curtain.

**Demise**, *de-mize'* (Fr. *démise*), a term applied to the conveyance of an estate, either in fee, or for life, or years. The king's death is, in law, called the *demise of the king* to his royal successor. In England, according to public law, "the king never dies;" for immediately the death of the reigning monarch occurs, the sovereignty passes to his successor; no ceremony or installation is required, the successor becoming monarch by the act of the law itself. Blackstone thus writes of this custom:—"So tender is the law of supposing even a possibility of his death, that his natural dissolution is generally called his demise, an expression which signifies merely a transfer of property."

**Demiurge**, *dem'-e-urj* (Gr. *demiourgos*, from *demos*, people, and *ergon*, work), is literally a workman or handicraftsman, and was employed by the Gnostics to denote a being whom they regarded as the creator of the visible world. He was, in their view, the archon or chief of the lowest order of the spirits in existence prior to the creation of this world; and it was he, they said, that, by contact with chaos, gave to this earth its form and living characters. From him man received his *psyche*, or sensuous soul; while from God, the supreme divinity, he received his higher spirit, or *pneuma*. In this way they attempted to account for the existence of a good and evil principle in man, and for the origin of evil in the world. (*See* Gnostics.)

**Democracy**, *de-mok'-rā-se* (Gr. *demos*, and *krateo*, I rule or govern), is usually defined to be a government in which the whole of the people, or a great proportion of them, exercise the sovereign power, either directly or by means of representatives. Among the Greeks, from whom we have received the term, it denoted a government in which the sovereignty was exercised by the great body of the citizens. It was also necessary to a democracy that the majority of the citizens be of the poorer class; for, according to Aristotle, if a considerable majority of the citizens are rich, and exclude the remaining body, who are poor, from political rights, this is not a democracy. A pure democracy is when every adult male citizen of sound mind has an equal share in the sovereign power. Such a condition could only exist in very small communities, as were the states of ancient Greece; and in modern times we have examples of it in some of the Swiss cantons, where all public business is discussed in a full assembly of the people. It thus became necessary to have recourse to delegates or representatives, elected by the people for the purpose of carrying on the government, and invested with powers for that purpose. So long as these are held responsible to the sovereign body by whom these powers are delegated, this is still a democracy, though it is evidently less pure than the other, as the will of the people is only indirectly exercised, and is hence liable to be misrepresented or opposed. Even if the sovereign power should only be in the hands of those who were possessed of a certain amount of property, if these should constitute the great majority of the people, this would still be called a democracy. The best form of government for any particular state is that which is best suited to its condition. In some cases a monarchy, in others an oligarchy, and in others a democracy, may be the best; but the ideally perfect form of government,—that which is best adapted for a people in its highest state of development, is the democratical, acting in its most practicable form, *i.e.* by representatives. We believe that not only does it produce the best form of government, and establishes it upon a firm basis, but that it also acts most beneficially in developing the intellectual and moral qualities of the people. Hence the importance of a gradual and steady extension of the rights of government till they reach all classes of the people. The principle of democracy is that of equality, and of every member of a community being entitled to a voice in the affairs of that government of which he is a subject. In order to this, however, it is necessary that he give satisfactory evidence that he is possessed of a sufficient degree of intelligence and integrity to exercise this power aright, and not use it merely for the furtherance of private or party ends. In a well-formed democracy, each one ought to see clearly what the true interests of the state are, and seek to advance them. So long as one class or party fancies that it is for the interest of the state that another class or party be kept in check, and if one of these parties must have the rule, history has always shown that it is best in the hands of the aristocracy. It may be, however, that the party feeling is so strong, and their power so equally balanced, that neither of them can obtain the rule, or neither of them may possess the ability, though they had the power; then an intelligent monarchy, even though it may be an absolute one, is undoubtedly the best for that people.

**Demon**, *de'-mon* (Gr. *daimon*), was the name given by the ancients to certain spirits or genii, which they regarded as intermediate between gods and men. According to Plato, the name is derived from *daemon*, knowing, in allusion to their superior intelligence. Homer and some of the earlier of the Greek writers applied the term generally to every order of being superior to man; hence the gods were sometimes called demons, and the adjective *daimoniakos* was used to signify divine. In Hesiod we have an express account of the demons, as spirits intermediate between gods and men, being the souls of men who had lived in the golden and silver ages, and of whom there were different orders. According to Plato, the demon is a middle intelligence between the gods and men, watching over, directing, and recording the actions of the latter. In the opinion of some, the celestial deities did not at all interfere in the management of human affairs, but committed it entirely to the care of the demons; and that every mortal at birth received a particular demon, who accompanied him through life and acted as his guiding spirit. According to their influence, demons were distinguished as good and bad,—*agathodemons* and *cacodemons* (Gr. *agathos*, good, and *kakos*, bad); but in either case they were regarded as carrying out the intentions of the gods, and not as being in any degree hostile or opposed to them. Hence, in its original sense, a demon was not necessarily an evil spirit, an idea which has come to us from the Jews, who were wont to regard the deities of other nations as only embodiments or emissaries of the Evil One. The genii of the Romans were analogous to the demons of the Greeks, though they differed from them in many important particulars. Every individual was believed at birth to receive a particular genius, which accompanied him through life, and conducted him through its various vicissitudes. The genius was represented as enjoying the good things of this life; and hence for one to pinch his appetites was to defraud his genius. It was generally believed that each person had two genii,—a good and a bad; and as the one or the other prevailed, so was his conduct good or the reverse. Places and cities, as well as men, were believed to have their particular genii. The origin of the doctrine of demons is to be sought in the East. The Hindoos associated with their supreme deity, Brahma, an innumerable host of messengers or demons,

called *deitjas;* and the Persians still further developed and systematized this doctrine of subordinate spirits. In accordance with the dualistic principle of their religion, they had two kinds of demons,—those who were servants of the good principle, or Ormuzd, and were called Izeds, or genii of the Light, and those who served the evil principle, Ahriman, and were called the Devs, or genii of Darkness. The Jews, at the time of the Babylonish captivity, doubtless became acquainted with the system of the Persians; and to this may perhaps be attributed many of the popular notions that were afterwards held by them on this subject. Among Christian writers demons are simply fallen angels, or devils, as used in the New Testament; and *demonology* is thus a discourse on the supposed nature and properties of such evil spirits, and of the superstitions regarding them. (*See* Magic, Witchcraft.)

Demoniacal Possession, *de-mon-i'-ă-kăl*, is one of those questions that has occasioned a great deal of discussion, and which, to Christians, has presented no few difficulties. We do not indeed sympathize much with those who would bring everything to the touchstone of their own imperfect reason, and who cannot be made to believe in anything that is not perceptible to the senses; yet there are difficulties connected with this question that necessarily keep one from speaking with any degree of certainty regarding it. The question is, whether, when Christ was upon the earth, wicked and impure spirits were permitted to take up their abode in the bodies of human beings, directing, controlling, and tormenting them. Those who hold that this was not the case, maintain that the appearances which characterized those said to be possessed, do not differ in any particular from what we observe in certain diseases in the present day; that such beliefs were common to the age and people among whom Christ was; and that he, when speaking of demons, merely conformed his language to their understandings, and spoke so as to be understood by them. On the other hand, it is argued that the appearances were such as showed that the demoniacs were not mere lunatics, or epileptics; that they knew Christ, and acknowledged him to be the Holy One of God; that Christ himself addressed them as unclean spirits; and that the account of the demons entering the herd of swine cannot be accounted for in any other way. The question is beset with difficulties; but we do not think it a conclusive argument against demoniacal possession, that because we have no evidence of it in the present day, therefore it could not have existed at any previous time, or under any other circumstances. We are sufficiently ignorant of the spirit world that we may well speak with caution as to its nature and powers. There are numerous still unsolved questions relative to the connection that subsists between mind and matter; we see, even in recent times, old forms of disease disappearing, and new and previously unknown diseases taking their place; and lastly, the doctrine of demoniacal possession is consistent with the whole tenor of the sacred Scriptures. People would do well to bear in mind the inscription on La Motte's sundial, when attempting to speak authoritatively on such subjects,—"*Quand je ne vois pas clair, je me tais,*" When I do not see clearly, I am silent. In the early ages of the Church there was a peculiar service appointed for the cure of demoniacs.—*Ref.* Farmer's *Essay on Demoniacs;* Moses Stuart's *Sketches of Angelology*, in *Bibliotheca Sacra*, 1843.

Demonstration, *dem-on-strā'-shun* (Lat. *demonstro*, I show or point out), was used by the old English writers to denote any manner of showing either the connection of a conclusion with its premises, or of a phenomenon and its asserted cause; but in philosophical language it now only means that process by which a result is shown to be a necessary consequence of the premises from which it is asserted to follow, these premises being admitted either as matter of fact, of intuitive evidence, or of previous demonstration. In ordinary language the term is often used as synonymous with proof. Demonstration is either direct or indirect: it is direct when the truth of the proposition is proved at once and directly, and indirect when it is proved by showing that the contradiction is impossible and absurd, which is usually termed *reductio ad absurdum.*—Ref. *English Cyclopædia.*

Demonstration, in Mil., the name given to a display of troops in any particular direction, the object of which is to lead the enemy to imagine that some attack or movement of importance is meditated in that quarter, and induce the officer commanding to detach a force to watch the troops so employed,—a measure which will tend to weaken his means of defence at that point against which any attack or manœuvre is really directed.

Demotic, or Enchorial Characters, *de-mot'-ik* (Gr. *demotikos*, of the people), are terms applied by antiquaries to a certain kind of writing practised by the ancient Egyptians, and formed out of the ancient hieroglyphic, being a kind of current hand employed by the people generally, and differing from the hieratic, or that used by the priests. It is sometimes found on public monuments along with the ordinary hieroglyphic writing, as on the famous Rosetta stone.—(*See* Hieroglyphics.)

Demulcents, *de-mul'-sents* (Lat. *demulceo*, I soften), is a name given to such medicines as are especially useful in obviating the action of acrid and stimulating matters, and that not so much by correcting or changing their nature as by involving them in a mild and viscid fluid, which prevents their acting, or by covering the surface exposed to their influence. They are generally divided into two classes,—mucilages and expressed oils. In the former are almonds, coltsfoot, Arabic and several other gums, linseeds, mallows, liquorice-root, barley, oats, wheat, sago, and starch; in the latter, most European and many foreign oils, fat, and other animal substances, including hartshorn-shavings, gelatine and isinglass, spermaceti, and wax. They are principally used in catarrh, diarrhœa, dysentery, gravel, and a few other complaints.

Demurrage, *de-mur'-rij* (from Fr. *demeurer*, to detain), in mercantile affairs, denotes the detention of a ship by a merchant, in loading or unloading, beyond the time specified in the charter-party, or other agreement with the owners. It is usually stipulated in charter-parties that the freighter may detain the vessel for a specified time, or as long as he pleases after the time specified for loading or unloading, on paying so much per day for overtime. During the receiving or discharging of the cargo, the merchant is liable for all detention from ordinary causes, even though these be inevitable or beyond his control; while the shipowners have the risk of all interruptions from the moment the loading or unloading is completed.

Denarius, *de-nai'-re-us* (Lat. *deni*, ten each), was the name of the principal silver coin among the Romans, and was at first equal to ten asses, but afterwards, when the as was reduced, the denarius represented sixteen of them. Its value is estimated at 8½*d.* during the Commonwealth, and 7½*d.* under the Empire. The Romans had also a gold denarius (*aureus denarius*), equal to ten silver denarii; and also a copper denarius (*denarius æris* or *æreus*), of which there were six in a silver denarius. The denarius has usually a helmeted figure of Rome on the one side, and chariots drawn by two or four horses on the other.

Dendrolagus, *den-drol'-a-gus* (Gr. *dendron*, tree; *lago*, I choose), a gen. of Marsupialian animals belonging to the Kangaroo fam. They, however, differ considerably from the rest by their adaptation to an arboreal life. The size of the animals belonging to this family differs considerably, some of them measuring more than four feet in length, independent of the sweeping tail; while others (*see* Kangaroo Rat) are no larger than a small rabbit. The tree kangaroos are found rather plentifully in New Guinea.

Dendrolites, *den'-dro-lites* (Gr. *dendron*, tree; *lithos*, stone), the petrified stems of trees and plants found in the secondary formations, and especially in the coal strata. These remains are found in very different sizes, some being gigantic. Sometimes they are found with fossil branches, fruit, and even leaves; but in general they are only found in fragments. The wood from which dendrolites originally were formed, mostly belongs to the Filices, the Cycadeæ, and the Coniferæ; and it is generally converted into agate or pitch-stone. There is considerable doubt as to their origin, and some of them are so hard that they are cut and used for

artistic purposes. When cut into very thin plates, and examined under the microscope, they show the structure of the wood perfectly, and it is possible for the botanist not only to name the order or family, but to specify the genus and species of plants to which it belongs. Brongniart was one of the first who devoted himself to the study of this branch of science.

DENDROSAURA, or TREE-LIZARDS, *den-dro-saw'-rē* (Gr. *dendron*, tree; *sauros*, lizard), the term applied to a genus of reptiles of which the chameleon may be regarded as the type.

DENGUE, or BREAK-BONE FEVER, *deng(r)*, is the name of a disease that has, on several occasions, recently made its appearance in the southern states of North America and the East and West Indies, and is characterized as a severe inflammatory fever, accompanied with rheumatic pains in the joints and muscles. Though very severe, it is not often fatal, and usually terminates in a few days with a copious discharge of perspiration.

DENIZATION, *den-e-zai'-shun*, the act of enfranchising or making free an alien born. (*See* next art.)

DENIZEN, *den'-i-zen* (Welch *dinasdyn*, man of the city), is applied to one who is by birth an alien, but who has been made an English subject by letters patent or by certificate of the home secretary of state. Though he enjoys more privileges than an alien, he is not on an equal footing with a natural-born subject. He cannot hold any office of trust or receive a grant of lands from the crown. He may hold lands by purchase, which an alien cannot, but he cannot take by inheritance, neither can his issue before denization inherit to him.

DENOMINATIONS, THE THREE, *de-nom-e-nai'-shuns* (from Lat. *denomino*, I name), a term applied to an association of dissenting ministers residing in and about London, organized in 1727, and which possesses the privilege of presenting addresses at court. The three denominations are the Presbyterian, the Independent, and Baptist; and there are about a hundred and fifty members, of whom about one half are Independents. The origin and objects of this body are involved in some obscurity. They are very attentive to court etiquette, and present dutiful and loyal addresses to the sovereign on the occasion of births, marriages, deaths, &c. of members of the royal family. On presenting their address on the accession of a new sovereign, the whole body are introduced, and have the honour of kissing hands; on other occasions they present their addresses by deputation of about twenty, who are received in the royal closet.

DENOMINATOR, *de-nom-e-nai'-tor* (from Lat. *denomino*, I name), the number of parts into which a unit is divided in any fraction. It is distinguished from the numerator, which specifies the number of parts of a certain kind which are to be taken; thus, in the fraction $\frac{3}{4}$, 3 is the numerator, and 4 is the denominator.

DENOUEMENT, *dā-noo'-mawn(g)*, (Fr. *dénouer*, to untie or solve), is usually employed to denote the termination or catastrophe of a play or story, but more strictly it denotes the train of circumstances that bring about the catastrophe.

DENS, *dens*, is the Latin term for a tooth, in the plural *dentes*; whence come such English words as dentist, dentition, dentifrice, &c.

DENSITY, *den'-si-te* (Lat. *densitas*), a term which has exactly the same practical meaning as specific gravity. If two substances are of equal bulk, but one contains more matter than the other, it is said to have more density. The quantity of matter is measured by the weight; and thus specific gravity and density become proportional. Rarity is opposed to density, and the rarest body known is hydrogen, and the densest body iridium, which is upwards of forty times the weight of water.

DENTIFRICE, *den'-te-frees* (Fr.), a substance, usually in the form of a powder, used as an aid in cleaning the teeth. Camphorated chalk is one of the most generally used dentifrices. Cuttle-fish shell and charcoal, reduced to fine powder, are extremely useful as detergents. Pumice-stone is also employed when the teeth have become dark-coloured. Catechu, cinchona, and rhatany, are used in order to give astringency; myrrh to give odour, and bole Armenian to impart colour to various tooth-powders.

DENTIROSTRES, *den-te-ros'-trees* (Lat. *dens*, tooth; *rostrum*, beak), birds of predatory habits, and distinguished by the upper mandible being notched on either side. The butcher-bird belongs to this order. (*See* BUTCHER-BIRD.)

DENTIST, *den'-tist*, is one whose business it is to treat diseases of the teeth. (*See* TEETH and TOOTHACHE.)

DENTITION, *den-tish'-un* (Lat. *dentitio*), is the breeding or cutting of the teeth, which takes place soon after birth, and is frequently attended with various disorders. At birth the teeth consist only of pulpy rudimentary substances, buried in the gum; and it is not till the third or fourth month after birth that they begin to assume shape and hardness. At this period children become uneasy and fretful; the gum is red and swollen, accompanied with a feeling of itching, which is manifested by the eagerness with which they press any hard substance against the gums. The salivary glands sympathize with the gums, and there is a copious discharge of saliva. Frequently these symptoms of local irritation are accompanied by others of a more constitutional nature. The skin becomes dry and hot, the face flushed, the bowels relaxed, and the child very restless and fretful. A red rash usually also appears on the ski called the *red gum*; and it the irritation extends to muscles of the chest, there is a dry and troublesor cough. When the infant is in a tolerably healthy state, these symptoms usually subside in the course of two or three weeks; but if it be in a weakly condition, they frequently lead to serious and sometimes fatal results. The mucous membrane which lines the stomach and intestines may be affected from that of the mouth, and griping pains, nausea, vomiting, diarrhœa, and other disorders, may be the result. The external skin sympathizing with the internal covering, may be affected with various kinds of eruptions; the air-passages and lungs may also become inflamed, or the brain and nervous system may become diseased, producing convulsions, epilepsy, tetanus, &c. The cutting of the teeth usually takes place between the seventh and ninth month, though sometimes it is much later. The gum again becomes extremely sensitive; but, instead of now being eased by the pressure of a hard substance, it cannot endure the slightest touch. It is red and swollen, but paler at the upper part, which, just before the tooth appears, seems covered with a flat whitish blister. The other symptoms are a repetition of those already described, with frequently eruptions about the head or lips, inflammation about the ears, and occasionally spasmodic movements of the mouth and jaws. These diseases are not always confined to the period of infancy; for in irritable and nervous constitutions they sometimes manifest themselves (though usually in a less aggravated form) at the irruption of the second or permanent teeth, and even occasionally when the *dentes sapientiæ* are about to make their appearance. As the great exciting cause of these disorders is the local irritation in the gums, the great object to be kept in view in the treatment of them is to abate or remove this irritation. Where that is considerable, the gums ought to be freely lanced. As the flow of saliva and diarrhœa are efforts of nature to carry off the inflammation, these are not to be interfered with, unless the latter be excessive, in which case it is to be cautiously corrected by small doses of magnesia or carbonate of lime. Where the bowels are confined, small doses of cooling laxatives are to be administered. If there be drowsiness and oppressed respiration, irregular movements of the jaws, or convulsions, a leech or two to the temples, and a small blister to the back of the neck, or behind the ear, ought to be resorted to. Very mild opiates may sometimes be of benefit; but they ought only to be administered with the utmost caution, and never intrusted to the nurse. Extreme caution should also be exercised in meddling with any eruptions on the skin. Indeed, the period of dentition in children cannot be too scrupulously watched over; for there are few diseases that require more prompt treatment than some that then make their appearance; and, if not of themselves fatal, they often lead to serious or fatal disorders.

DEOBSTRUENTS, *de-ob'-stru-ents* (Lat. *de*, and *obstruo*, I obstruct), is a term applied to such medicines

as have the property of removing obstructions in any part of the body, especially in the lymphatic system. They were formerly much used, and depended upon in medical practice; but latterly they have fallen into disuse. Almost the only deobstruents now employed are mercury, iodine, and bromine.

DEODAND, *de'-o-dănd* (Lat. *Deo dandum*, given to God), was a term applied to a personal chattel which had occasioned the death of a man without the default of another, and which was, by the law of England, forfeited to the crown, in order to be applied to pious uses, or distributed as alms by the king's almoner. According to Blackstone, the custom was designed, in the blind days of popery, as an expiation for the souls of such as were snatched away by sudden death; but it seems more probable that it is to be imputed to that natural horror which one feels at whatever has occasioned the death of a human being; or it may have been intended to teach caution to owners of cattle or implements which were attended with danger. The custom was also a part of the law of Moses; and similar regulations are to be found in the laws of most nations. Deodands were abolished in this country by 9 & 10 Vict. c. 62.

DEONTOLOGY, *de-on-tol'-o-je* (Gr. *deon*, due, and *logos*, a discourse), properly signifies the science of duty, and expresses well what is commonly known as ethics, or moral science. It has, however, been adopted by Bentham and his followers to designate their own particular doctrine of ethics. "Deontology," says Bentham, "or that which is proper, has been chosen as a fitter term than any other which could be found to represent, in the field of morals, the principle of *utilitarianism*, or that which is useful."—*Deontology; or, the Science of Morals.*

DEPARTMENT, *de-part'-ment* (Fr. *département*), is a territorial division of France, which was introduced in 1790, at the instigation of Miraboau. Previous to that time France was divided into provinces; but these were looked upon as too aristocratic by the revolutionists, and a new division was effected. The great object was to render them nearly equal to a certain average of size and population, so that the more populous departments are generally the smallest; but the rule was not uniformly adhered to. The names were chiefly taken from the rivers, mountains, or other prominent geographical features. The number of old provinces was thirty-four, and the number of departments formed was eighty-three. Afterwards, under Napoleon, the number was increased to one hundred and thirty; but till lately, the number has been eighty-six, when three new ones were formed out of the newly annexed territory of Savoy and Nice, making the number at present eighty-nine. Over each department is an officer called a prefect, appointed by the government, and a *conseil de préfecture*. The departments are subdivided into arrondissements, each of which is under a sub-prefect. Arrondissements are again subdivided into cantons, and these into communes, corresponding in some measure to our parishes.

DEPHLOGISTICATED, *de-flo-jis'-te-kai-ted*, in Chem., a term used by the followers of the Stahlean theory to denote bodies which had been burnt or deprived of their phlogiston. (*See* PHLOGISTON.)

DEPILATORY, *de-pil'-ă-to-re* (Lat. *de*, from, and *pilus*, a hair), is a term applied to certain chemical substances employed for removing hair from the skin. Formerly it was usual to apply pitch to the part to be denuded, and then to pull it forcibly away; but this rude practice is now discontinued. Most of the depilatories to be purchased, contain orpiment; and as this is an arsenical preparation, its employment is dangerous. One part of quicklime and two parts of carbonate of soda, mixed and formed with water into a paste, and then applied to the part, will be found to be a good depilatory.

DEPLOY, *de-ploy'* (Fr. *déployer*, to extend; Lat. *deplicare*, to unfold), in Mil., when troops have been marching in column, and change the formation from column to line, they are said to deploy into line. In column, the front presented is narrow; but when the troops are in line, it is greatly extended; whence the meaning of the term.

DEPONENT, *de-po'-nent* (Lat. *depono*, I lay down), is a term applied in Lat. Gram. to certain verbs which have a passive form, but an active or neuter signification. They are so called because they have laid down, as it were, the signification proper to their form.

DEPORTATION, *de-por-tai'-shun* (Lat. *deportatio*), a kind of banishment in use among the Romans, in virtue of which a condemned person was sent to a foreign country, his estate confiscated, and himself deprived of the rights of a Roman citizen. During the French revolution, deportation was resorted to in lieu of the guillotine, and many political offenders were in this way got rid of. The punishment has lately been revived, and a number of troublesome persons have been removed to South America or Algeria. It ranks third in the order of punishments; capital punishment, and condemnation to the galleys or public works, for life, being the two highest.

DEPOSIT, *de-poz'-it* (Lat. *depositum*, from *depono*, I lay down), usually signifies a sum of money which one man puts into the hands of another as security for the fulfilment of an agreement, or as a part payment in advance. Among the Romans, a *depositum* was anything which one person put into the hands of another to be kept without any remuneration, and to be restored whenever demanded. The depositary was not bound to take more than ordinary care of the article, but he had to make good any loss occasioned by fraudulent design or gross neglect. To refuse to return a deposit involved infamy. The principles of the Roman law on this subject have been adopted by most modern nations.

DEPOSITION, *dep-o-zish'-un* (Lat. *depositio*), the testimony of a witness put down in writing by way of answer to interrogatories exhibited for that purpose in chancery, &c. Informations upon oath, and the evidence of witnesses before magistrates and coroners, are reduced into writing in the words used by the witnesses, or as nearly thereto as possible. Evidence in the court of Chancery is taken in written answers to interrogatories, which are also in writing.

DEPOSITION, in the Church of Scotland, is the depriving a clergyman of his ecclesiastical dignity and of the temporalities of his benefice, in consequence of immoral or scandalous conduct, or of holding doctrines contrary to the standards of the Church. Usually, proceedings are commenced in the presbytery within whose bounds the clergyman officiates; but an appeal lies against its judgment to the General Assembly. He may afterwards be restored by the General Assembly to his position as a minister, but he cannot be restored to his benefice.

DEPOSITS, *de-poz'-its*, in Geol., those rocks which have been formed by the settling down of matter held in suspension in water. Deposits originate in denudation, the forming of alluvium, and the gradual collection of sand, gravel, &c., at the mouths of rivers. (*See* DELTA.) Deposits are called marine, lacustrine, fluviatile, &c., according to the circumstances which attended their formation.

DEPÔT, *de-po'* (Fr. *dépôt*), in Mil., the name given to any place in which naval and military stores are deposited; but it is more particularly applied to the town or barracks which form the head-quarters or home station of any regiment the main portion of which is serving abroad. Here the records and books of the regiment are kept, and one or two reserve companies are stationed, which are called depôt companies. All recruits and young officers appointed to the regiment are sent to the depôt to be drilled, and to learn their duty before being sent out as reinforcements to the regiment wherever it may be stationed abroad. The depôt system was introduced into the British service in 1825.

DEPRIVATION, *dep'-ri-vai'-shun* (from Lat. *de*, and *privo*, I take from), in Eccl. Law, is the removing a person from some degree, dignity, or order in the Church, and the depriving him of his ecclesiastical preferments. The modes of deprivation are usually reduced to three heads:—1. Where the thing done is in itself actually null, void, and inoperative in law,—as the presentation of a layman to a benefice, and then there is no need of any sentence of deprivation. 2. Where the statute declares that upon the doing, or omission to do, a certain act, the party shall be *ipso facto* deprived, there is no need of any sentence. 3. Where the doing, or the omission to do, certain acts

are causes only for deprivation by the ecclesiastical court, then there must be sentence of deprivation. In all causes of deprivation, where a person is in actual possession of a benefice, these things must occur:—1. The party must be cited and admonished to appear; 2. a charge must be given against him by way of libel or articles; 3. a competent time must be assigned for his proofs and interrogatories; 4. the person accused shall have the liberty of counsel to defend his cause, to except against witnesses, and to bring legal proof against them; and 5. there must be a solemn sentence read by the bishop, after hearing the merits of the cause and the pleadings on both sides. Incontinence, drunkenness after admonition, and gross scandal, are deemed sufficient grounds for deprivation, when proved to the satisfaction of the court; also disobedience to the orders and constitutions of the Church; conviction of treason, murder, or other felony, by a temporal court; or of perjury, either in a temporal or ecclesiastical court.

DEPUTATION, *dep-u-tai'-shun* (Lat. *deputatio*), is a number of persons selected in order to represent the views of a larger body or company on any particular question, to lay their case before some person of influence or in office, or to act for them in any particular affair.

DEPUTIES, CHAMBER OF, *dep'-u-tees*, was, under the French monarchy, the lower of the two legislative chambers in that country. It consisted of 430 members, representing the 86 departments, and holding office for three years. Each member was required to be at least 30 years of age, and to pay annually, of direct taxation, 500 francs. The right of election was vested in persons 25 years of age, and paying 200 francs of direct taxation; lists of such persons being made out annually by the mayors of the several communes, and revised by the prefect. The Chamber of Deputies was composed of three great divisions.—the *côté droit*, *côté gauche*, and the *centres*. The *côté droit*, or right side, was to the right of the president's chair, and consisted of such members as were inclined to support the royal prerogative. The *côté gauche*, or left side, was occupied by those that usually supported popular measures; while those persons who generally supported the ministers occupied the *centres* (*centre droit* and *centre gauche*). The constitutional monarchy and representative government of France being overthrown by the revolution of 1848, a national assembly was instituted, the members of which were elected by ballot and a suffrage all but universal. The National Assembly was abolished in 1851, and the year following a new form of government was established. Corresponding to the Chamber of Deputies under the old régime, is now the *Corps Législatif*, or legislative body, composed of 261 members, in the proportion of one deputy to about every 35,000 electors in each of the departments. They are chosen for six years by universal suffrage, and each member receives an indemnity of 2,500 francs a month during the session. The emperor selects the president and vice-presidents from among the members, and has also the right of convoking, adjourning, or dissolving the body. The chamber has no power of originating any law, but merely of discussing and voting on such measures as are brought before it. If amendments are adopted, they must be sent to the council of state, and no measure can be discussed that has not received the sanction of that body. The session lasts for three months, and, in case of a dissolution, a new one must be convoked within six months.

DEPUTY, *dep'-u-te*, is one who is appointed in the place of another, and who exercises the power that properly belongs to him. The appointment of a deputy does not free the principal from responsibility.

DERBY DAY, THE, *dar'-be*, the second day of the Epsom summer meeting, when the great race of the Derby stakes is run for. It is generally in the last week of May or the first week in June, and is always held on a Wednesday. The first Derby race was instituted by Lord Derby in 1780, and the stakes consist of fifty sovereigns each, with twenty-five forfeit. At the first Derby there were only 36 subscribers; but the race has ever since grown rapidly in fame and popularity; in this year (1862) the number of subscribers was 233, the number of horses starting 34, and the net value of the stakes £6,525. The Derby day is the great





holiday for nearly all the inhabitants of London; the roads between the metropolis and Epsom are thronged from an early hour with every variety of vehicle, and the railway trains are constantly leaving the stations with fresh cargoes of passengers for the Downs. It is almost impossible to get a horse on the Derby day in or about London. The horses that run in the Derby must be three years old, and the course is a mile and a half in length. An immense amount of money, besides the stakes, is won and lost annually on the result. The Derby of 1862 was won by Caractacus, and was run in 2 minutes 45½ seconds.

DERBYSHIRE SPAR, *der'-be-sheer*.—In Min., fluor spar is popularly known by this name, from the most celebrated fluor spar being found at the Blue John mine, in Derbyshire.

DERELICT, *der'-e-likt* (Lat. *de*, and *relinquo*, I leave or forsake), in Law, is a term applied to such goods as are thrown away or relinquished by the owner. "Property both in land and movables being originally acquired by the first taker,—which amounts to a declaration that he intends to appropriate the thing to his own use,—it remains in him, by the principles of universal law, till such time as he does some other act which shows an intention to abandon it; for then it becomes, naturally speaking, *publici juris* once more, and is liable to be seized and appropriated by the next occupant." In the case of lands gained from the sea, the law holds, that if this gain be by small and imperceptible degrees, it shall go to the owner of the land immediately behind; but if it be sudden and considerable, it belongs, by common law, to the crown; for the soil, when the sea flowed over it, was *prima facie* crown property, and therefore ought to remain so, though no longer covered by the sea. In the same way, in the case of an island rising in the sea, it is held to be the property of the crown, though the civil law gives it to the first occupant.—*Ref.* Stephen's *Commentaries on the Laws of England*.

DERIVATION, *der-iv-ai'-shun* (Lat. *derivatio*, from *derivo*, I drain off), in Med., is applied to the removing or drawing away of a disease from its original seat to another part by artificial means; as by the application of a blister in pleuritis. The doctrines held by the earlier physicians on this subject, as that the matter of the disease was thus drained away through some channel, are now quite exploded.

DERMATOLOGY, *der-ma-tol'-o-je* (Gr. *derma*, the skin, and *logos*, a discourse), is the science of the treatment of the skin and its diseases.

DERMESTIDÆ, *der-mes'-ti-de* (Gr. *derma*, skin; *esthio*, I eat), small beetles of a very destructive character. Nothing seems too tough for their digestion. Although obnoxious in many respects, the insects of this family are of infinite service in the economy of nature, by causing the rapid decomposition of animal matter into a substance fitted for the improvement of the soil, and by their labours, united with those of the *Silphæ*, *Necrophori*, &c., destroying such portions of these remains as are left untouched by the flesh-flies, which only consume the soft portions of the carcases."—(*Westwood.*) The best known of the dermestes is *D. cardarius*, or bacon-beetle, a name applied through the insect's real or supposed fondness for bacon. It is about a third of an inch in length, and of a dusky brown colour, with the upper half of the wing-shells ash-coloured, and marked with black spots.

DERMIS. (*See* SKIN.)

DERRICK, *der'-rik*, a temporary crane, consisting of a spar supported by stays and guys, carrying a purchase for loading or unloading goods on shipboard. The derrick is an invention of Mr. Bishop, an American. Derricks have been used for a considerable time in America as lifting powers; they have been proved very expeditive and economical. One of the largest ever made was constructed by the Thames Iron Shipbuilding Company. It is a floating derrick, and consists of a flat-bottomed vessel 270 feet long and 90 feet across the beam. It is propelled by bucket-paddle floats, and can be moved at the rate of four miles an hour. From the deck rises an iron tripod 80 feet high, on the top of which a boom 120 feet long revolves. Above the boom is the king-post, a continuation of the tripod, 50 feet high. Ten fourfold blocks are attached to one arm of the boom, and the chains attached to

these are passed across the king-post over the other end of the boom, and down in the vessel, where they are connected with two powerful steam-engines. A body weighing 1,000 tons can not only be lifted by this powerful crane, but can be transported from place to place.

Dervish, *der'-vish* (Persian, a poor person), is employed like the corresponding Arabic word *fakir*, to denote a particular class of persons in Moslem countries, resembling in many respects the monks of Christendom. There are many different brotherhoods and orders of dervishes, who are generally named after their founders; and, according to tradition, their origin dates from the earliest times of Islam, but they probably arose at a much later period. They mostly live in richly-endowed convents called Tekkije or Changah, and are under a chief, who has the title of sheik or pir, *i. e.* elder. They are generally allowed to marry, but are obliged to sleep one or two nights a week in the convent of their order. Among some of the orders a part of their religious exercises consists in dancing and turning round with great velocity, while others subject their bodies to the most cruel tortures. Though they seem generally to lead very worthless lives and to practise the grossest immoralities, yet they are regarded with great awe and veneration by the people.

Descant, *des-kant'* (Sp. *discante*), a term formerly used to express the art of composing in parts. By Hubald, Odo, Guido, and others, it was employed to signify concord and harmony of sounds. Descant is of three kinds; viz., *Plain descant*, which is synonymous with simple counterpoint; *Figurative descant*, which is less restrained, and includes the relief of discords; and *Double descant*, which denotes that arrangement of the parts which will allow the treble or any high part to be converted into the bass, and *vice versâ*. This term is also employed to imply a melodious display of notes extemporaneously played or sung to any given bass, as well as to denote the highest part in the score, viz., the soprano, or highest female voice.

Descent, *de-sent'* (Lat. *descensus*; Fr. *dissent*, in which way the term is usually spelt in all old law-books), the title whereby a man, on the death of his ancestor, obtains the inheritance as heir-at-law. The term inheritance is sometimes used in the same sense, although it properly signifies that which is, or may be, inherited by descent. Descent is defined in the interpretation clause of the 3 & 4 Will. IV. c. 106, as "the title to inherit lands by reason of consanguinity, as well when the heir shall be an ancestor or collateral relation, as where he shall be a child or other issue." Inheritances, hereditaments, things which may be taken by descent, are various. The crown is the principal of these, the descent of which differs in one essential point from that of a private inheritance. When a king has no sons, the eldest daughter takes the whole of the inheritance, in exclusion of the younger sisters. Dignities and honours, such as baronies and other peerages, are descendible according to the limitations contained in the patents by which they were created. (*See* Heir, Inheritance.)—Ref. *English Cyclopædia*, sect. Arts and Sciences, art. Descent.

Description, *des-krip'-shun* (Lat. *descriptio*, from *de*, and *scribo*, I write), in Literary Composition, is the placing of objects in a clear and proper light before the reader; a matter of so great difficulty, and requiring such high and varied powers, that many critics regard it as a test of genius. When we consider the great qualifications that are necessary to excellence here, it is not to be wondered at that we find so few writers distinguished for great descriptive powers. "The best describers," says Blair, "are simple and concise. They set before us such features of an object as on the first view strike and warm the fancy; they give us ideas which a statuary or a painter could lay hold of and work after them, which is one of the strongest and most decisive tests of real merit of description." Objects ought to be painted so accurately as to form in the mind distinct and lively images. Useless circumstances ought to be suppressed, because they load the narration; but if a circumstance be necessary, however slight, it cannot be described too minutely. Inferior writers are continually striving to enliven their subject by exaggeration and a profuse use of superlatives, which unfortunately has the contrary effect to what is intended, and the reader is led by contrast to think more meanly of the subject than probably it deserves. A prudent man, in writing as in walking, husbands his strength, and reserves his strongest expressions for the most important points of his narrative. Reasons that are known to every one ought to be taken for granted; the expression of them is childish, and interrupts the progress,—a superfluity of words is always a great nuisance in narration. Abstract or general terms are always to be avoided. Sometimes a single circumstance, happily introduced, has more power than the most laboured description. The words selected should correspond with the ideas they are intended to convey,—an elevated subject requiring an elevated style, a familiar subject a plain style, and a serious subject a serious style. A writer of genius is not apt to clothe a high subject in low words; but it is more common to find the expression raised above the tone of the subject. Description addressed to the imagination is susceptible of the highest ornaments that sounding words and figurative expression can bestow upon it. Writers of genius, sensible that the eye is the best avenue to the heart, represent everything as passing in our sight, and from readers or hearers, transform us into spectators. "The force of language," says Lord Kames, "consists in raising complete images, which transport the reader, as by magic, into the place of the important action, and convert him into a spectator, beholding every thing that passes. The narrative in an epic poem ought to rival a picture in the liveliness and accuracy of its representations: no circumstance must be omitted that tends to make a complete picture, because an imperfect image, as well as any other imperfect conception, is cold and uninteresting." There is no species of composition into which description does not enter in some shape; but there are few compositions of any length that can be called purely descriptive. In descriptive poetry the highest exertions of genius may be displayed. "Description," says Blair, "is the great test of a poet's imagination;" and in the "selection of circumstances lies the great art of picturesque description." They ought not to be vulgar and common, such as are apt to be passed by without remark, but such as may catch the fancy and draw the attention. All the circumstances employed ought to be uniform and of a piece, and ought to be such as particularize the object described and mark it strongly. "This happy talent," says Blair, "is chiefly owing to a strong imagination, which first receives a lively impression of the object, and then, by employing a proper selection of circumstances in describing it, transmits that impression in its full force to the imagination of others."

Desert, *dez'-ert* (Lat. *desertus*, deserted, solitary), a waste or large tract of barren country. The term is applied very vaguely, but is more particularly appropriated to sandy and stony plains. According to Dr. Ami Boué, in a memoir communicated to the Association of German Naturalists at Gratz, in 1843, deserts, properly so called, always point out the site of a large gulf or inland sea. These large sheets of water have now entirely disappeared, but they are of a comparatively recent geological epoch. Deserts are distinguished by different names in various parts of the earth. The term desert is more particularly applied to the waste tracts of Africa and Arabia. Those in Asia, especially in Thibet and Tartary, are called steppes. In South America, the large plains, rank with vegetation but unfit for human settlements, are called llanos, pampas, and silvas, or desert-forests. The wide-stretching plains of North America are called prairies and savannahs. The desert of Sahara is the most famous of the properly so-called deserts. It stretches almost without a break from Cape Nun, on the north-west coast of Africa, eastward to the banks of the Nile. In some parts of this desert, as at Tegazza, rock-salt as white as snow extends in vast beds beneath a stratum of rock. Rain only falls between July and October, and the vast plains are tenanted by lions, panthers, and serpents, often of a monstrous size. The ostrich is also found in numerous flocks, and a few monkeys and antelopes pick up a scanty allowance of food. Here and there, often at great distances, are a few small fertile spots, called *oases*, which serve as resting-places for the mer-

chants, who travel on camels, hence called "the ships of the desert."

DESERTER, *de-zer'-ter* (Lat. *deserere*, to abandon), in Mar. and Mil., the name applied to any soldier or sailor who absconds from his ship or regiment for the purpose of avoiding the duties which he has consented to discharge for a certain period. Desertion is punished by imprisonment and flogging; but the number of lashes allowed to be awarded by court-martial is not to exceed fifty. It involves the loss of additional pay and pension, good-conduct money and stripes, and rank as non-commissioned officer. If a soldier or sailor is merely absent without leave for a short period, the breach of discipline committed does not amount to desertion, and is punished by loss of pay for the time he is absent, and confinement to barracks or extra drill. Any one who induces a soldier or sailor to desert is liable to penal servitude for life. The crime of desertion was formerly punished by death; and it is only since 1860 that the custom has been abandoned of branding the deserter on the breast or shoulder with the letter D.

DESERTION, *de-zer'-shun*, in Marriage.—Till recently, the law of England made no provision for a wife's obtaining redress for wilful desertion by her husband; but by 20 & 21 Vict. c. 85, and 21 & 22 Vict. c. 108, desertion by either spouse is made a ground of judicial separation, and provision is made for the protection of property acquired by a wife who has been deserted. In Scotland, one of the spouses wilfully deserting the other may first be sued for adherence, after one year; and, after four years from the time of desertion, may be divorced by the Court of Session.

DESICCATION, *des-ik-kai'-shun* (Lat. *de*, and *sicco*, I dry), in Chem.—Bodies are generally dried in two ways, — by submitting them to heat, more or less gentle, or by inclosing them in a receiver, with concentrated oil of vitriol or chloride of calcium. The latter process is resorted to when heat would cause the decomposition of the body acted upon.

DESIDERATUM, *de-sid-e-rai'-tum* (Lat., wished for), denotes something that is wanted to the completness of a thing, or to promote the advancement of any object.

DESIGN, *de-zine'* (Lat. *designo*, I mark out), denotes, in a general sense, an intention, scheme, or plan of action, and in the Arts is applied to the idea or plan in the mind of the artist which he attempts to embody or represent in some visible form to the minds of others. Every work of design may be considered either in relation to the art that produced it or to the end that it is intended to serve. What is done with a view to some effect that is to follow, is said to be the result of design; and from the adaptation of means to ends that we observe in nature, we are led to conclude that they are the work of an intelligent designer. For the arguments that are employed to prove the being of a God from the evidences of design that are to be seen in nature, *see* Paley's *Natural Theology*; the *Bridgewater Treatises*; and the *Burnett Prize Essays*.

DESIGN, in Arch., the name given to a set of geometrical drawings drawn to a certain scale, representing the different sides, interior, and extent, of any building, in such a manner that it can be erected by a builder in exact conformity with the original idea or conception of the architect. When the building is small, these are taken as working drawings, but if it be of great size and extent, working drawings are made from them for the use of the builder on a larger scale. They are intended to show the proportions and outline of the required building, and in them the principles of perspective, and light and shade, are disregarded entirely as regards the former, and almost entirely with respect to the latter. The various parts of an architectural design for any building are respectively termed "plan," "elevation," "section," and "details." The plan shows the shape of the building and the area which it is to cover; it may be termed with propriety a horizontal section of the building; it shows the position of the walls of the rooms, and their respective thickness; the situation of rooms and passages with regard to each other, and indicates the apertures required for doors, windows, fire-places, staircases, &c. The parts representing solid masonry are coloured, while the open spaces are left plain, and indicated by dotted lines. A plan is given for every floor of a building, from the basement upwards, and the exterior of the roof is also represented in this manner. The elevations show the outline of the front, back, and sides of the building, and the windows, doors, projections of chimneys, and all the ornamentation that may be introduced; such as string-courses, dressings of the doors and windows, cornices, entablatures, balconies, &c. The sections are representations of the interior on a vertical plane, supposed to pass through the building from top to bottom, on any line indicated on the ground plan. They show the thickness of the floors, the height of rooms, the height and form of doors and fireplaces, the profiles of cornices, domes, and skylights, as well as that of the roof; the direction of staircases, &c. Details, or parts at large, are representations of the horizontal and vertical sections of different rooms and parts of the building on a larger scale than that which is used for the general plan: they are also drawings of any embellishment that may be introduced, and are necessary to make their intended form intelligible to the workmen.

DESIGN, is an expression employed in the Fine Arts to signify the representation of any form or combination of objects, either in simple outline or in colour. It is applied indiscriminately to anything of this kind, from the sketch of any simple object or elementary form, that may be represented by a few strokes of the pencil, to the elaborate combinations required for the intricate pattern of a shawl or any other similar production of the loom, as well as to the composition of a picture, or group of figures, or the form of any work of art, whether useful or ornamental. The most exquisite designs, with reference to attitude, elegance of form, and force of expression, are considered to exist in the works of the old Greek sculptors and the best Italian masters of the mediæval period, such as the marbles of the Parthenon, the cartoons of Raffaelle, and the statues of Michael Angelo; but there are modern painters who are in no way inferior to the old masters in design and power of conception; in proof of which may be mentioned Mr. Frith's wonderful painting known as "The Railway Station."

DESIGN, SCHOOLS OF.—The government schools of design that are established in various parts of the country, in connection with the Central Training School at South Kensington, which was originally opened at Somerset House in 1837, are intended to impart a knowledge of drawing and a taste for the fine arts to the great bulk of the people, and more particularly to those who are employed as artisans and designers in manufacturing establishments of all kinds. It was the intention of the originators of the scheme to confine their operations entirely to the latter class; but it was soon discovered that the public generally would not appreciate beauty and symmetry of form and proportion, and harmony of colour, in objects of every-day use, before means had been taken to teach the people the general and rudimentary principles of art, and inspire them with a desire for that which is pleasing to the eye, whether in household furniture, paper-hangings, earthenware, or materials for the attire of the person, in preference to the ugly, unshapely, and staring art-productions of the 18th and early part of the 19th century. It was also found, that however Englishmen might excel in the manufacture of everything in which strength and utility are required, they were far behind the French and other continental nations in ornamental and decorative art, and did not apparently understand that stability and usefulness could be combined with elegance of form and pleasing colouring; and it was a knowledge of this, and an earnest desire to remedy this palpable deficiency in English art, that led the late Prince Consort to conceive and mature the idea of the Great Exhibition of 1851, to which the establishment of the schools of design may be considered, in some degree, to have been a stepping-stone. At all events, the productions of British workmen in the International Exhibition of 1862 have shown that the lessons learnt in these schools and the Exhibition of 1851 have not been lost; and the interiors of our dwellings show that our artisans are giving forms and ornament to the articles they produce, suitable to the purposes for

which they are intended; and that people are beginning to see that it is more consonant with reason to use a carpet figured with a geometrical pattern rather than gaudy bunches of flowers; and that the eye is better satisfied to rest on a jug of simple design and colour, whose outline is formed of graceful curves, than on one of that squat bulging form in blue and white, or two shades of brown, ornamented with uncouth figures in bas-relief, or the unmeaning willow pattern, which was the stereotyped fashion, both as regards shape and decoration, for jugs of all kinds some thirty or forty years since. The schools of design are under the control of the Science and Art Department of the Committee of Council on Education, and the offices of the department, and the Central Training School for the United Kingdom, are in Cromwell Road, South Kensington. To this school both male and female students, that are duly qualified, are admitted, and partly maintained at the expense of the government while passing through the prescribed course of study. When they are fully competent, they receive certificates, and are sent as teachers to local schools in connection with the central establishment. Teachers in these local schools receive grants from government, in addition to their income, in proportion to the success of their pupils at the annual inspection and examination, when medals and prizes are awarded to the most deserving and efficient. A school of art may be founded in any locality in connection with the central school, provided that suitable premises can be obtained, at the public expense, the government, in some cases, bearing as much as one-fourth of the total cost when new buildings are erected for the purpose. It is also requisite that there be five public schools for the poor, in which the master recommended by the department can give instruction, or 500 poor children in the district, who must be taught, if it be desired, free of expense. Pupil teachers in National and British schools are also entitled to receive instruction at a low charge; and an evening class must be held three times a week, at which any person can receive instruction in drawing for a sum not to exceed sixpence weekly. Successful students at the local schools send their drawings for competition to the central school, when queen's prizes and medals are awarded to those who excel in any particular branch of art. Each school obtains drawings, works of art, or apparatus, to the amount of £10, for every queen's prize or medal obtained by the pupils who have studied there. Every school of art may borrow books, drawings, and works of art from the museum and library at South Kensington; and any mechanics' or working man's institute can obtain assistance in the purchase of drawing models and casts for the purposes of instruction.

**Desire**, *de-zire'*, is an affection of the mind excited by the view or the contemplation of any desirable good which is not in our possession, but which we are solicitous to obtain. There is room for difference of opinion as to the number of our desires that are original; but that certain of them are primarily inherent in our nature, scarcely admits of doubt. (*See* Ethics.)

**Desmodium**, *des-mō'-de-um* (Gr. *desmos*, a bond, in allusion to the stamens being joined), in Bot., a gen. of plants belonging to the nat. ord. *Leguminosæ*. Some of the tropical species are remarkable for the periodical movements of their leaflets. In *D. gyrans*, a native of India, the leaf is trifoliate, the terminal leaflet being much larger than the two lateral ones. When exposed to the influence of a bright light, the large leaflet becomes more or less horizontal; but, on the approach of evening, it falls downwards. The lateral leaflets are in constant motion during the heat of the day, advancing by their edges towards the large terminal leaflet, and then retreating towards the base of the common petiole. This movement takes place first on one side and then on the other, so that the point of each leaflet describes a circle. As these movements resemble those of the arms of the old semaphore telegraphs, the plant has been named the telegraph-plant. No satisfactory explanation of the cause of the extraordinary movements of the leaflets has yet been given.

**Despotism**, *des'-pot-izm* (Gr. *despotes*, master), in Pol., is a form of government in which the supreme power is vested in the hands of one who is irresponsible or uncontrolled by others. The term is received from the Greeks, among whom it denoted that kind of relationship that subsists between a master and his slaves. As a master had unlimited and uncontrolled power over his slaves, governing more by harshness than conciliatory measures, and viewing them only as intended to serve his own ends; so a despotic form of government was regarded as one where the sovereign had unlimited power over the lives and fortunes of his subjects. But this idea of a despotism is one which could never have any existence in fact. No sovereign has ever been so absolute or despotic as that he could carry out his wishes with a total disregard to every one else. His power actually depends upon his having the support of a large body of his subjects; and he is compelled to act so as to carry along with him their approval, or, at any rate, not to go in opposition to their wishes. The most absolute monarch that ever lived could not openly seize the property of a subject, or put him to death, without assigning some colourable grounds for so doing; for such an act would undoubtedly endanger his crown. The existence of an absolute government, when carrying out oppressive measures, depends upon its being able to conceal or pervert the real facts of the case. Despotic rulers feel their dependence upon public opinion much more than those whose power is in some measure limited; and it is this that leads them to lay restrictions upon freedom of speech and of the press. According to some, a despotism may include any number of individuals governing for their own individual interests, to the exclusion of those of the whole community.

**Destiny**, *des'-tin-e* (Lat. *destino*, I fix or appoint), is an appointed or predetermined state or condition; the necessary and unalterable course of events predetermined by a superior Being. A belief in destiny or fate has been held by almost every people in every time, and has been usually incorporated in their religious beliefs. Among the ancients it was regarded as a power superior both to gods and men, governing all things irresistibly; for, according to Seneca, the Ruler of all things, in writing the book of destiny, prescribed the limits of his own power. According to the Stoics, destiny is a certain arrangement of events which follow each other of absolute necessity, there being no power able to interrupt their connection; and hence every man ought with patience to submit to his fate, which no effort on his part could possibly avert. (*See* Fate.) The doctrine is also held by many persons in the Christian church. (*See* Predestination, Free Will.)

**Destructionists**, *des-truk'-shun-ists* (from Lat. *destruo*, I destroy), in Theol., is a name given to such as hold a kind of middle scheme between universal restoration and endless perdition, or who maintain that the wicked shall neither be for ever miserable nor finally saved; but that, after undergoing an awful suffering proportioned to their crimes, they shall be utterly annihilated. This doctrine, they maintain, is implied in the scriptural word death, which they hold denotes a termination of suffering; and that eternal death is simply annihilation. Though there is apparently so little reason for this view, yet it has been entertained by some able theologians.

**Desvauxiaceæ**, *dai-vaze-e-ai'-se-e*, in Bot., the Bristlewort fam., a nat. ord. of monocotyledonous plants, in the sub-class *Petaloideæ*. They are small, sedge-like herbs, with setaceous sheathing leaves. They are natives of Australia and the South-Sea Islands.

**Detachment**, *de-tatch-ment* (Fr. *détacher*, to unfasten), in Mil., the term applied to any body of troops, whether large or small, sent from an army, division, brigade, regiment, or company, for the performance of some special service. Large detachments, consisting of cavalry, infantry, and artillery, almost forming a separate army, may be sent from the main body to create a diversion, and attract attention to some particular point; to carry on the siege of any fortress; to protect lines and bases of operation, or to act on those of the enemy; to prevent the junction of two separate detachments of the enemy; to capture or protect a convoy; or to act on the flanks or rear of an enemy on the field of battle.

**Detergents**, *de-ter'-jents* (Lat. *detergo*, I wipe away), is a name given to such medicines as cleanse

and remove viscid humours adhering to and obstructing the vessels; also such applications as cleanse foul ulcers.

DETERMINATION, *de-ter-min-ai'-shun* (Lat.), in Med., is applied to the excessive flowing of the blood to any part; as a determination of blood to the head, &c.

DETINUE, *det'-in-ue* (Lat. *detinendo*), in Law, is the name of a writ which lies against one who, having goods delivered to keep, refuses to restore them.

DETONATING POWDER, *det'-o-nai-ting pow'-der* (Lat. *detono*, I thunder; Fr. *poudre*, powder), a term applied to certain combinations of substances which detonate or fulminate by slight friction, by heat, or by electricity. Amongst these may be mentioned the ammoniurets of gold and silver and the fulminates of silver and mercury. In most cases of detonating powders, decomposition is the result of detonation; thus, ammoniuret of gold is separated into metallic gold and other products. Iodide of nitrogen, a detonating powder, resolves itself into iodine, which appears as a violet vapour, and nitrogen, which assumes a gaseous form. A mixture of 3 parts of nitre, 2 of dry carbonate of potash, and 1 of sulphur, forms a detonating powder. If a small quantity of this compound be heated on a metallic plate to about 330°, it blackens, fuses, and explodes with much violence, in consequence of the rapid action of the sulphur upon the nitre, and the sudden evolution of nitrogen and carbonic acid. Detonating powders are much used in the manufacture of percussion-caps.

DEUS EX MACHINA, *de'-us eks mai'-kin-a* (Lat., a god from the machine), is an expression borrowed from the ancient stage, it being usual among the ancient Greeks, when there was any difficulty in bringing the plot to a satisfactory conclusion, to have recourse to the assistance of a deity, who was let down in a machine for that purpose. In the modern drama, when a person or incident is arbitrarily introduced in order to bring about the dénouement, this is called a *deus ex machina*. —The rich old uncle who comes home unexpectedly from the West Indies, and rescues his scapegrace nephew from his pecuniary embarrassments, is a deity of this stamp. The expression is also by analogy sometimes applied to the mode in which some philosophers attempt to account for facts which they cannot explain by any known law; viz., by the intervention of supernatural agency.

DEUTERO-CANONICAL, *du'-te-ro* (*i.e.*, belonging to the second canon), a term applied by Roman Catholic writers to what is commonly termed by Protestants the Apocrypha, or the Apocryphal books of the Old Testament. They receive their name from their being regarded as inspired, but not of the same authority as the canonical books proper.

DEUTERONOMY, *du-ter-on'-o-me* (Gr. *deuteros*, second, and *nomos*, law), is the fifth book of the Old Testament and the last of what is termed the Pentateuch. This book was written by Moses shortly before his death, and embraces a period of five or six weeks of the fortieth year of the journeyings of the children of Israel in the wilderness. He speaks with the affection and solicitude of an old man soon to die, and with a freedom, boldness, and vehemence which none could have used but one who had done so much for the people whom he addressed, and one who was anxiously desirous for its future welfare. The tone of the law falls here considerably in the background, and the individuality of the lawgiver and his peculiar relation to the people stand out more prominently. He is taken up with their inward concerns and future fate, laying before them the good effects that will follow the observance of the law, and the evil consequences that will infallibly result from its neglect. Most of those to whom it was more immediately addressed had not seen many of the wonders of God, or had been too young to understand them; and hence the sacred historian begins by recapitulating the various mercies which God had bestowed upon them and their forefathers from their departure out of Egypt,—the victories which, by divine assistance, they had obtained over their enemies,—their rebellion, ingratitude, and chastisements. The moral, ceremonial, and judicial laws are repeated, with additions and explanations; and the people are urged to obedience in the most affectionate manner, from the consideration of the endearing promises made to them by God, which he would assuredly perform if they did not frustrate his designs of mercy by their own wilful obstinacy. That no person might thereafter plead ignorance of the divine law, he commanded that it should be read to all the people at the end of every seventh year; and concluded his ministerial labours among them by a most beautiful ode, and by giving his benediction to the several tribes. In the last chapter, which is commonly ascribed to Joshua, we have an account of the last days of Moses; how, from the top of Mount Nebo, he surveyed the promised land; and then, having died in Moab, was buried by God himself, so that no one knew his tomb. This book contains only one prophecy relative to the Messiah, but a number of very remarkable predictions relative to the future of the Jews.—*Ref.* Horne's *Introduction to the Holy Scriptures.*

DEUTEROPATHIC, *du'-te-ro-path'-ik* (Gr. *deuteros*, second, and *pathos*, suffering), is applied in Med. to an affection induced in a part through sympathy with the part originally affected; as, where the stomach is disturbed through a wound in the head.

DEUTOXIDE, *du'-toks-ide* (Gr. *deuteros*, second, and *oxide*), in Chem., the oxide of a metal containing a double dose of oxygen The word *binoxide* is, however, more generally u l. This remark applies to all compounds commenc with the word *deuto*.

DEUTZIA, *de-ut'-ze-a*, in Bot., a gen. of plants belonging to the nat. ord. *Philadelphaceæ*. The leaves of some species, especially those of *D. scabra*, are covered with beautiful scales; hence, from their roughness, they are used in Japan for polishing purposes.

DEVELOPMENT. (*See* PHYSIOLOGY.)

DEVELOPMENT THEORY, *de-vel'-op-ment the'-o-re* (Fr. *développer*, to develop; *théorie*, theory), a theory originally propounded by the author of a work entitled "Vestiges of the Natural History of Creation," published in the year 1844. In this work the author first states that animal and vegetable life have progressed gradually on the globe. With regard to animal life, and arguing from fossil remains, he places the order or progression as follows:—First, an era of invertebrate animals; second, a period during which fishes were the only vertebrate form of being; then a period when reptiles were seen in addition, but without birds or mammalia; next a time when the last were added, but without man; and finally, the present era, in which that master species has existed in supremacy over all. Taking creation, then, as a broad course of progressive organization, the theory of development is thus set forth:—All animal and vegetable organisms commence with a simple cell, of which it is impossible in any case to tell to what form it is destined to advance. A series of changes takes place, by the careful examination of which it is possible to determine to which class the future animal or vegetable will belong. According to the theory as enunciated by Von Bär, "a heterogeneous, or special structure, arises out of one more homogeneous or general, and this by a gradual change." At the same time it is contended that the embryo of each grade of being passes through the general conditions of the embryos of the grades beneath it. In an embryo of the vertebrate sub-kingdom can be traced the change which will determine whether it will belong to the fish, reptile, bird, or mammal class. In an embryo of the mammal class, the characters of the particular order are next determined; and afterwards those of the family, genus, species, sex, and individual in succession. As an illustration,—"There is no essential difference between the vertebral column of the early embryo of man and that of an embryo fish; the evolution of the nervous centres begins, in both, on the same plan; so also does that of the circulating apparatus." Comparing the changes through which the embryo passes, with the history of the general life of the globe, a strong similarity in the plan is to be observed in the individual life of every one of the forms of organized beings which now people it. There has been a succession from invertebrate to vertebrate; from the fish to the reptile, from the reptile to the bird and mammal; in the mammal finally to man. Having brought forward examples and proofs from this part of the argument, the following hypothesis is put forth. That a chemico-electric operation, by which germinal vesicles were produced, was the first phenomenon in

organic creation, and that the second was an advance of these through a succession of higher grades, and a variety of modifications, in accordance with laws of the same absolute nature as those by which the Almighty rules the physical department of nature. The theory of development was strongly and ably opposed by Mr. Hugh Miller, Professor Sedgwick, Dr. Hitchcock, and others, who argued that it was immoral and anti-Christian to doubt the generally received theory of creation by law; namely, that every event in nature takes place by fixed and not by progressive law. Notwithstanding the strong opposition the theory has received, it has gained many supporters. Since the year 1859, when Mr. Darwin published his "Origin of Species by Natural Selection," the subject has excited much attention. In this work Mr. Darwin brings forward an hypothesis of the *becoming* of new species, founded on the modifiability of which animals are seen to be capable under breeding. The principal suggestion in the work is, that in the struggle for existence among the multitudes of animals, any variety which was better adapted for the circumstances than its companions, would live and increase while the others declined. He thus traces all animals back to four or five primitive types, rejecting the theory of development, and referring all the phenomena to an advance or improvement in progress.—Besides the works referred to, see *Explanations, a Sequel to Vestiges, &c.*; and *Edinburgh Review*, April, 1860, art. Darwin on the Origin of Species.

DEVICE, *de-vise'* (Mediæv. Lat. *divisa*, a design), the name given to any emblem selected by a person, family, or body of men, to serve as a mark of distinction. The device is often accompanied by a motto, and is similar in purpose to the crest, or any charge in a coat of arms. It differed, however, from the family crest of the bearer, in having some characteristic in allusion to his name, character, or some enterprise in which he was implicated or about to engage. The cross, in a variety of forms, was the common device of the Crusaders; the sprig of broom (*planta genista*) was the device of the Plantagenets; the red and white rose, respectively, were the devices of the rival houses of York and Lancaster; while the rose and portcullis, and rose and crown, were the emblems of the house of Tudor.

DEVIL, *dev'-l* (Gr. *diabolos*, false accuser; Heb. *Satan*, adversary), is the name commonly given in the New Testament to the arch-fiend, who is represented as being in constant opposition to God, and the ruler of a host of evil spirits like himself. Originally created good, he and his followers fell into sin, and so became wicked and malicious. Retaining many of his original qualities, he became a powerful instrument for evil. He was the means of deceiving our first parents, and leading them into sin, and thus brought sin and suffering into this world. There are various other names applied to the devil in Scripture. There are some persons in the present day who deny the personality of Satan, and regard him only as an evil principle. Such an opinion can only be held by doing the utmost violence to the language of Scripture. He is everywhere there spoken of as having a real personal existence, as being in a state of constant activity, possessed of power and dominion, and as having messengers and followers. He is held accountable, is charged with guilt, and is to be judged and receive final punishment. How, on any such idea, Christ's temptation in the wilderness can be accounted for, we cannot see. If we believe in the existence of good spirits (and there is certainly no reason to think that man is the highest creature in the scale of being), there is no reason to doubt the existence of evil spirits. Scripture speaks as plainly and decidedly regarding the existence of the one as of the other.

DEVISE, *de-vize'* (Fr. *deviser*, to imagine or invent), in Law, is the act whereby a testator conveys his lands by will, the conveyance of personal property being commonly termed a bequest. (*See* WILL.)

DEVONIAN SYSTEM. (*See* OLD RED SANDSTONE.)

DEW, *dew* (Sax. *deaw*), the moisture or aqueous vapour which is deposited from the air on those bodies which are exposed to it. It is generally observed in the form of minute globules on the surfaces of leaves. When the cold is extreme, it takes a solid form, and appears as hoar-frost. When the atmosphere is at any given temperature and pressure, it holds a proportionate quantity of aqueous vapour in suspension. If that temperature is lowered to a certain point, called the dew-point, a quantity of aqueous vapour is set free in the form of water or dew, which can sometimes be seen falling as a fine rain or mist. Those substances which radiate heat rapidly are cooled soonest; and therefore the dew is deposited upon them first. All vegetable fibres are ready radiators of heat; consequently, the smooth leaves of trees, shrubs, and grasses cause the dew to be deposited upon them even upon moderately warm evenings. Radiation takes place most rapidly when there is a clear sky: when there are many clouds in the air, heat is radiated back by them to the earth, which nearly supplies the amount of heat lost. Thus dew is more readily deposited upon clear fine nights than when the sky is overcast. The history of the knowledge of dew is interesting. Aristotle supposed that there was a rain formed by the condensation of the water which had been evaporated during the day, by the cold of night. (*Meteor.* i. 10.) In 1784, however, the recognized opinion was, that the cold was caused by the dew. It was not until the discoveries of Leslie concerning radiant heat, in 1794-5, that the true theory of dew was established

DEW-POINT. (*See* DEW.)

DEXTRIN, *deks'-trin*, in Chem., a transparent brittle solid, with a vitreous fracture, formed by submitting starch to a heat of 400° Fah. Dextrin is a modification of starch, possessing the same composition, but different properties. It is, for instance, soluble in cold water, a property which renders it particularly valuable for manufacturing purposes, under the name of *British gum* (which *see*). It has received the name of *dextrin* from causing the rotation of a polarized ray from left to right. It may be always distinguished from starch by not giving a blue colour with iodine; and from gum, by giving a blue solution with potash and sulphate of copper.

DEY, *dai*, is a Turkish title of dignity, now applied only to the ruler of Tripoli, but formerly borne also by the ruler of Tunis, and, prior to its conquest by the French, by that of Algiers. The word is of doubtful origin; but, according to some, it is from the Turkish *dai*, a maternal uncle, to denote the high esteem in which the rulers of these countries were held by the Porte.

DIABETES, *di-ă-be'-tes* (Gr. *dia*, through, and *baino-mai*, I pass), in Med., is a disease characterized by an inordinate flow of urine. Medical men recognize two distinct kinds of diabetes,—the *diabetes insipidus*, in which there is merely a greatly-increased flow of urine; and *diabetes mellitus*, in which the urine is found to contain a large quantity of saccharine matter. Persons of a debilitated constitution, and in the decline of life, are most subject to this disease. It commonly comes on slowly and imperceptibly, without any apparent disorder of the system, and may exist for a considerable time before it attracts any notice. One of the most constant symptoms of this disease is an inordinate degree of thirst; and yet the quantity of urine passed daily is usually much greater than that of the liquids drunk. A voracious appetite is also a usual characteristic of this disease. At length the constitution manifestly suffers, the body becomes emaciated, the strength and vigour fail, the pulse is frequent and small, a slight degree of fever prevails, and the skin is dry and rough. There are also usually aching pains in the back and loins, and uneasy sensations along the urinary passages. The symptoms gradually become more and more intense, until at length the patient sinks from exhaustion, or is cut off by dropsy, consumption, or some other incurable disease. Of the causes or treatment of this disease, unfortunately, little is known. It may be produced by intemperate habits, or whatever tends to impair the system and produce debility. In general, the kidneys are found in a diseased state after death, though in some cases no traces of disease could be found in these or any of the other urinary organs. In fact, as yet little is known of the true character of this disease. The measures resorted to in its treatment are rather of a palliative than a remedial nature; for the general opinion among physicians is, that it is incurable. It is possible, how-

erer, by judicious treatment, to greatly mitigate the symptoms, and to ward off the issue for a number of years. The treatment should be principally directed to restoring and strengthening the tone of the system, by abundant exercise in the open air, and the use of tonics and such medicines as tend to soothe the nervous system. The state of the skin is particularly to be attended to; and daily ablution of the whole body in warm or cold water is recommended. The Turkish bath, it is believed, might possibly prove useful in this disorder. Flannel should also be worn next the skin. Those kinds of food that contain sugar, or matter easily convertible into sugar, are to be as much as possible avoided.

DIADEM, *dī'-ă-dem* (Gr. *diadema*, a fillet), originally a band of silk or woollen, according to some authorities invented by Bacchus, to relieve the headache produced by intoxication. It was probably imported into Greek costume from the East, and afterwards became the distinguishing ornament of royalty. The diadem of the Egyptian deities and kings bore the symbol of the sacred serpent. Among the Persians it was twined about the tiaras of the kings, and was purple and white. In the earliest times the diadem was very narrow; but broad diadems were introduced by the Persians, and adopted by Alexander the Great. The early Roman emperors abstained from the use of this ornament, to avoid giving offence to the people by calling up the remembrance of the kings. Constantine the Great was the first who used it; and after his time it was ornamented with a single or double row of pearls.

DIÆRESIS, *di-er'-e-sis* (Gr. *diaireo*, I divide), in Gram., is the dividing of a diphthong or of a contracted syllable into two syllables, and is usually denoted by two dots, thus (¨), over the last vowel; as avenged, beloved. Sometimes the mark of diæresis is used to show that two vowels coming together do not form a diphthong; as reiterated.

DIAGNOSIS, *di-ag-no'-sis* (Gr. *diagignosko*, I discern or distinguish), is the art of discovering the nature of a disease, and of distinguishing it from other diseases of a similar nature. Much depends upon a correct diagnosis of disease; and the minute characteristics that frequently distinguish one disease from another render it often a matter of great skill and delicacy. If the true nature of a disease be not ascertained, a course of treatment may be pursued that may be followed by very serious results.

DIAGONAL, *dī-ăg'-o-năl* (Gr. *dia*, through; *gonia*, an angle), a straight line drawn from any angle to an opposite one in a rectilineal figure. A straight line drawn between two adjacent angles would obviously coincide with the boundary-line; consequently no triangle can have a diagonal. A quadrilateral figure has two diagonals, a pentagon five, a hexagon nine, &c. In order to calculate the number of possible diagonals in a given figure, the plan is, to take three from the number of sides, multiply the remainder by the number of sides, and take half the product. Thus,—

$$\text{In the case of a pentagon, } \frac{2\times 5}{2}=5, \text{ and}$$

$$\text{In the case of a hexagon, } \frac{3\times 6}{2}=9.$$

DIAGRAM, *dī'-ăg-răm* (Gr. *diagramma*), a drawing delineated for the purpose of demonstrating the properties of any geometrical figure; such as a triangle, a circle, a square, &c.

DIAL. (*See* SUNDIAL and HOROLOGY.)

DIALECT, *dī'-ă-lekt* (Gr. *dialegesthai*, to converse), a term applied to a language which resembles another in its general features, but differs from it in details. The two most widely-spread families of languages in the world are the Indian-Gothic and the Semitic. In the former are included the Sanscrit, Zend, Armenian, Greek, Latin, Lithuanian, Sclavonian, Teutonic, and Celtic dialects. In all these, the resemblance, although often far distant, is able to be traced. The Semitic embraces the Hebrew, Syriac, Arabic, and other dialects not so well known. The differences of speaking the same language in the same country do not properly come under the head of dialects. In France any such peculiarity is called *patois*, and in England *provincialism*.

DIALECTICS, *dī-ă-lek'-tiks* (Gr. *dialektikos*, from *dialegomai*, I discourse), is the old name for logic, or the art of reasoning and disputing justly. According to Socrates, dialectics were so called from being an inquiry pursued by persons who take counsel together, separating the subjects considered according to their kinds. There were several systems of dialectics among the ancients. The dialectics of Plato are a kind of analysis to direct the human mind by dividing, defining, and bringing things to the first truth; which having reached, it applies itself to explain sensible things, but with a view to return to the first truth, where alone it can rest. The dialectics of Aristotle comprise the doctrine of simple words, delivered in his book of Predicaments; the doctrine of propositions, contained in his book "De Interpretatione;" and that of the several kinds of syllogism, in his books of Analytics, Topics, and Elenchuses. The dialectics of the Stoics appear to have been little more than a system of grammatical rules. (*See* LOGIC.)

DIALIUM, *dī-aĭ'-le-um*, in Bot., a gen. of leguminous plants. The only remarkable species is *D. indicum*, which yields a fruit called the tamarind plum, the pulp of which has an agreeable slightly acidulous taste, somewhat resembling that of the common tamarind.

DIALLAGE, *dī'-al-lăj* (Gr. *diallage*, difference), in Min., a foliated silicio-magnesian mineral, so called from its changeable colour.

DIALLOGITE, *dī-ăl'-lo-jite*, in Min., a carbonate of manganese, occurring in crystalline masses of a rose-red colour. It is found chiefly in gneiss and porphyry veins, with silver, lead, zinc, and other ores. It is found in Saxony and Transylvania.

DIALOGUE, *dī'-ăl-og* (Gr.), is a conversation between two or more persons, usually upon a particular subject, and conducted with more formality than an ordinary conversation. The ancient philosophers were fond of conveying their instructions in this form, and some of their principal works that have come down to us are in dialogues. Plato is particularly distinguished for the beauty of his dialogues, which, for richness and power of imagination, are unrivalled, and have often been compared to the conversations of the gods. The dialogues of Cicero, as "De Oratore," are agreeable and well supported; but the style is sometimes prolix and heavy, and the orator too often peeps out in them. Lucian is also distinguished as a writer of dialogues full of pleasantry and satire. In modern times we have the learned and elaborate dialogues of Erasmus, in Latin; besides whom, there are, among the Germans, Lessing, Mendelssohn, Herder, Jacobi, Schelling, &c.; Petrarch and Machiavelli, among the Italians; and Fénélon, Fontenelle, Malebranche, and Sarrassin, among the French. In England we have the "Divine Dialogues" of Henry More; the "Visions of Heaven and Hell," said to be Bunyan's; the "Philosophical Dialogues" of Berkeley; the dialogues on natural religion of Hume; the moral and political dialogues of Bishop Hurd; Lyttleton's "Dialogues of the Dead;" and many others. Still more recently have appeared Southey's "Colloquies on Society;" Walter Savage Landor's "Imaginary Conversations;" Help's "Friends in Council;" and Professor Wilson's "Noctes Ambrosianæ." To write in dialogue is by no means so easy a task as is commonly imagined. It requires more than merely the introduction of different persons speaking in succession. It ought to be a natural and spirited representation of real conversation, exhibiting the character and manners of the several speakers, and suiting to the character of each that peculiarity of thought and expression that distinguishes him from others. From a dialogue thus conducted, the reader receives a fair and full view of both sides of the argument, and is at the same time entertained with polite conversation, and with a display of consistent and well-supported characters. Such a production stands high among the works of taste. The so-called Socratic dialogue is a conversation in the form of question and answer, in which the questions are so contrived, that the person questioned is led to come to the very conclusion that the questioner wishes to bring him. "There are some questions," says Hume, "to which dialogue writing is peculiarly adapted, and where it is preferable

to the direct and simple method of composition. . . . Any question of philosophy which is so obscure and uncertain that human reason can reach no fixed determination with regard to it, if it should be treated at all, seems to lead us naturally into the style of dialogue and conversation. Reasonable men may be allowed to differ where no one can reasonably be positive; opposite sentiments, even without any decision, afford an agreeable amusement; and if the subject be curious and interesting, the book carries us in a manner into company, and unites the two greatest and purest pleasures of human life,—study and society." He also considers it useful in handling points that are so obvious as not to admit of dispute, and yet so important that they cannot be too often inculcated; the vivacity of conversation serving to enforce the precept, and give it novelty and beauty, from the various lights in which it is presented by the different personages.

Dialysis, *di-al'-e-sis* (*dia*, through, and *luo*, I set free), in Chem., a method invented by Mr. T. Graham of separating the crystalloid and colloid constituents of solutions, by taking advantage of the property possessed by the former of passing through a septum of colloid matter. (*See* Diffusion of Liquids.) It is generally effected by means of an instrument called a *dialyser*, which consists of a hoop of gutta-percha covered with a sheet of parchmentized paper strained tightly, and kept in its place by an india-rubber band. The solution to be dialyzed is poured into the dialyser to the depth of half an inch, and the whole is floated in a basin of pure water. The crystalloids contained in the liquid diffuse themselves through the parchment-paper into the water below, but the colloids are retained behind the *colloidal parchment-paper*, being impervious to them. A mixture of common salt and gum placed in the dialyser for thirty or forty hours parts with the whole of its salt, the gum being left behind in pure condition. Other substances besides parchment-paper may be used; such as a layer of albumen brushed on writing-paper and congulated by heat, or a film of animal mucus laid between two pieces of linen. Dialysis promises to be of the greatest use in separating crystalline principles, such as the alkaloids, from vegetable infusions. It may also be applied to the detection of crystalline poisons, such as arsenic or strychnine, in animal mixtures, no matter how heterogeneous the compound may be. It also throws great light on many obscure points in animal physiology. The ready absorption of crystalline matters by the stomach, which is a membrane covered with colloid mucus, and the reparation thus effected of the crystalloid and colloid portions of the food, are instances of dialysis going on in the human frame. Another example is the tongue, the mucous membrane of which readily transmits crystalloid salt and sugar to the nerves of taste; while gum, starch, and other colloids, are either rejected altogether or only feebly absorbed. For a full account of Mr. Graham's experiments on dialysis the student is referred to a paper on the subject, in the "Philosophical Transactions" for 1862, part I., which is one of the most masterly scientific memoirs ever written.

Diamagnetism. (*See* Magnetism.)

Diameter, *di-am'-e-ter* (Gr. *dia*, through; *metron*, a measure), a term generally applied to the line drawn through the centre of a circle, and bounded at either end by the circumference. Whenever any point is called a centre, any straight line drawn through that point is generally called the diameter.

Diamide, *di'-a-mide*, in Chem.—A diamide is a substitution compound of ammonia, in which two equivalents of hydrogen in a double equivalent of ammonia are replaced by one eqvivalent of an element or radicle.

Diamine, *di'-a-mine*, in Chem., a diamide with basic properties capable of forming salts with acids.

Diamond, *di'-a-mond*, in Min.—The word diamond is derived from the Greek *adamas*, unconquered, in allusion to its extreme hardness. Chemically speaking, diamond is pure crystallized carbon. As found in nature, diamonds occur crystallised in forms belonging to the regular system. The crystals are mostly derived from the octahedron; but the faces are frequently convex, and the edges rounded. In their rough state they present the appearance of semi-transparent rounded pebbles, covered with a thin brownish opaque crust. Freed from this coating, they are generally colourless; but they are also found tinged with red, orange, yellow, brown, and black. The pure white transparent variety are most highly prized, and are called diamonds of the first water. The finest diamonds occur in quartzose alluvial deposits at Golconda and Bundelcund, in India, where the finest specimens have been found; also in Borneo, in several districts in Brazil, in the Ural mountains, in Russia, and in one or two other unimportant localities. The origin of the diamond in nature is at present unknown. It is, however, evidently of vegetable origin. Diamond is the hardest body known, and can only be cut or polished by means of its own powder. The powder is mixed with oil, and spread on a revolving steel disk, and the diamond, which is attached with solder to a suitable support, is held against it until a facet is formed. It is then unsoldered, fixed in a different position, and a second facet ground. The most remarkable diamonds with which we are acquainted, are the diamond mentioned by Tavernier, as belonging to the Great Mogul, which is said to have weighed 900 carats in the rough state; the diamond amongst the Russian crown jewels, weighing 195 carats; the famous Pitt diamond, which weighs 136 carats. This diamond is, from its lustre and colour, considered the finest known. The Kohinoor belonging to the queen, weighed 213 carats, but was badly cut. It was re-cut in 1852 by Messrs. Ganard, and now weighs 147 carats; but is greatly improved in brilliancy, although lessened in size. Diamonds are valued at so much per carat of four grains, and increase in price in a given proportion. The general rule for finding the value of cut diamonds, is to double the weight in carats, and multiply its square by £2. This rule does not apply to diamonds weighing more than 20 carats. Flaws in diamonds are often cut out by cleavage through the natural planes of the crystal. A distinguished English philosopher made a large sum of money by buying flawed diamonds at a low price, and cleaving them into smaller gems. The principal use to which diamonds are applied, besides as articles of ornament, is for cutting glass. For this purpose, the natural curved edge is used. Writing diamonds are either sparks with natural or accidental points, or diamonds ground to a conical point. Diamond-dust is employed for grinding the faces of other gems. Diamonds are inflammable when heated red-hot, and plunged into an atmosphere of oxygen, burning with a steady light, and giving rise to pure carbonic acid. They are not, however, perfectly pure, a small residue being left behind, containing silica and iron. The specific gravity of diamond is about 3·34.

Diamond Beetle, a name usually given to *Entimus imperialis*, a species of the tribe *Curculionida* (weevils), and order *Coleoptera*, found abundantly in Brazil. It is polished black in colour, the head, thorax, and limbs being slightly granulated and covered with metallic



DIAMOND BEETLE.

green scales, and the wing-cases (*elytra*) studded with regular lines of concavities, each depression thickly lined with bright green scales, so that the rays of light are reflected and heightened by the contrast of the shining black interstices. The genus *Entimus* is entirely exotic; but there are small species of the genera *Polydrosus* and *Phyllobius* common in England, orna-

mented with similar scales, but not presenting the gem-like spots. The elytra of the diamond-beetle are sometimes made into head-dresses, &c., for ladies; but the most general use of the insect is as an object for the microscope.

Diamond Necklace, The, a famous piece of jewellery, made by a man named Boehmer, in Paris, about the years 1744-45. According to Madame Campan, it was originally intended for Madame Du Barry, the favourite of Louis XV. On the death of the king, in 1744, Du Barry was compelled to leave the court, and Boehmer was left with the necklace on his hands. It was a wonderful and costly piece of work, consisting of 500 diamonds. Its value was said to be 1,800,000 livres, or £80,000 sterling, and it was too expensive for any one to buy it. A woman named De Lamotte, who waited about the court, having heard of these circumstances, contrived to persuade the Cardinal Prince Louis de Rohan, a vain profligate man of great wealth, that Queen Marie Antoinette did not look upon him with disfavour. The vain cardinal, readily believing this, was ready to do anything to retain the regard of the queen. He was persuaded by De Lamotte that Marie Antoinette was extremely anxious to possess the diamond necklace; but not having enough money then, she was willing to sign an agreement to purchase it, if the cardinal would become security. Rohan did consent, and signed the agreement, which was also apparently signed by the queen. On the 1st of February, 1786, the necklace was handed over to him, and he took it to Versailles, the place where the queen had undertaken to send for it. All this time the cardinal had never seen the queen, although, by a stratagem of De Lamotte's, he imagined that he had met her for a few moments at midnight in the park of Versailles, and all the messages, written and verbal, had come through the woman De Lamotte. On the day after he arrived at Versailles, a man dressed in the uniform of the court valets came to his apartments, and took away the necklace, saying, as he did so, that it was "in the name of the queen." Almost immediately afterwards, De Lamotte, her husband, and the sham valet, left Paris. The whole transaction had been a deception and a swindle. The verbal messages from the queen were all false, and the written ones forgeries by the sham valet, who was an adept at imitating handwriting; and the woman whom the cardinal had met in the park of Versailles was not the queen, but an unfortunate of Paris, named Gay d'Oliva, who had been hired by De Lamotte for the purpose. The plot was discovered by Boehmer, who, when he found that he was not paid when the period for the first instalment arrived, inquired at the court if the queen had received the necklace. This aroused suspicion, and inquiries being instituted, the cardinal and the persons associated in the plot were arrested and sent to the Bastille. The trial lasted nine months, and sentence was given on the 31st of May, 1786, when all were acquitted except Lamotte, who was branded on the shoulder with the letter V, for *voleuse*, thief. When the cardinal got out of the Bastille, at ten o'clock at night, large mobs hurrahed round him, out of spite to the court. It was the beginning of the Revolution. Seven years afterwards Marie Antoinette was led to execution, and the yelling and cursing mob taunted her with the scandal of the diamond necklace a few moments before she died.

Dianthus, *di-ăn'-thus* (Gr. *anthos*, flower; *dins*, of Jupiter,—the divine flower), in Bot., a gen. of plants belonging to the nat. ord. *Caryophylluceæ*. Many of the species are highly valued for the beauty and the fragrance of their flowers. *D. barbatus*, the sweet-william, is an old inhabitant of the flower-garden, and was much esteemed in Gerarde's time "for its beauty to deck up the bosoms of the beautiful, and garlands and crowns of pleasure." The flowers grow in fascicles, and are usually of a fine crimson colour. There are numerous varieties in cultivation. The species *D. caryophyllus*, which grows wild on old walls in the south of England, is supposed to be the source of the garden carnations, and, by some botanists, of the pinks also. The carnation has been cultivated from time immemorial in Europe, and its beauty and rich spicy odour make it a general favourite. It is the principal florist's flower of Germany and Italy, from which countries we derive the choicest varieties. The varieties of the carnation are arranged in three classes,—*flakes*, *bizarres*, and *picotees*. Flakes have two colours only, the stripes being large; bizarres (Fr., odd or irregular) are variegated in irregular spots and stripes, with no less than three colours; picotees (Fr. *piquettée*, pricked or spotted) have a white ground spotted or pounced with red, purple, or other colours. The garden *cloves* have petals of a deep scarlet colour, and are derived, like the varieties of the carnation, from *D. caryophyllus*. The pink, as a florist's flower, received but little attention until the close of the last century, but many fine varieties have been developed since then. Being one of the hardiest and least expensive of fine flowers, it is much cultivated by operative mechanics and manufacturers round large towns. The varieties most esteemed are those called *pheasant's eyes*, which seem to have sprung from *D. plumarius*. New varieties of the carnation and pink are procured from seeds, and thousands of seedlings are annually blown by florists and amateurs, though it frequently happens that there are not more than two or three worth keeping. Established or approved varieties are continued by layering and by cuttings, or, as they are commonly called, *pin*[illegible]*s*. The soil in which they thrive best is a rich lo[illegible] rather sandy than otherwise.

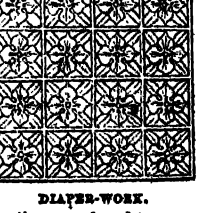
Diapason, *di-ă-pa'*[illegible]*n* (Gr. *dia*, through; *pas*, all), in Mus., an ancient Greek term for the interval of the octave. It is also the name of a kind of rule by which certain instrument-makers determine the measures of the various parts of their instruments. Some of the stops in the organ are called by this appellation, because they extend through the entire instrument. Dryden makes use of the term in one of his finest metaphors,—

> "From harmony, from heavenly harmony,
> This universal frame began;
> From harmony to harmony
> Through all the compass of the notes it ran,
> The diapason closing full in man."

Diapensiaceæ, *di-ap-en-se-ai'-se-e* (Gr. *dia*, through; *pente*, five; in allusion to their being five-cleft), in Bot., a small nat. ord. of dicotyledonous shrubby plants in the sub-class *Corolliflorœ*. There are but two genera and two species, the properties and uses of which are unknown. They are natives of North America and northern Europe.

Diaper, *di'-ăp-er* (Fr.), a kind of textile fabric, either of linen or cotton, or a mixture of the two, with a figured pattern on the exterior surface, produced by a peculiar method of twilling. Diapers are much used for table-linen and fine towels. With the exception of damask, diapers are the most ornamental kind of twilled cloths. There is some controversy as to the origin of the term diaper. According to Mr. Planché, it is derived from d'Ipres, that is, "of Ypres," a town in Flanders famous for its manufacture of rich stuffs and fine linen before the year 1200. Ducange derives the word from the Italian *diaspro*, the jasper, on account of its shifting lights; but the former is the most probable derivation.

Diaper-work, or Diapering, in Arch., is a mode of decorating a surface by covering it with the constant repetition of a small flower, leaf, or other ornament, either carved or painted. If carved, the flowers are entirely sunk into the work below the general surface. They are generally square, and placed close to one another; but in some cases other arrangements are used, as in Canterbury cathedral. Diaper decoration was first introduced in the Early English style, in which it was sometimes employed to cover large spaces, as in Westminster Abbey and Chichester cathedral. It was also extensively used in the Decorated style. Diaper-work was only used as a painted ornament in the Perpendicular style, and very few specimens of it remain. Some portions of a pattern of



Diaper-work.

beautiful flowing foliage are to be seen in the Lady chapel in Gloucester cathedral.—*Ref.* Parker's *Glossary of Architecture.*

DIAPHANOUS BODIES. (*See* LIGHT.)

DIAPHORETICS, *di-ă-fo-ret'-iks* (Gr. *diaphoreo*, I carry through), a name given to medicines that increase the natural exhalation of the skin. When they are so powerful as to produce actual perspiration, they are called *sudorifics*, the difference between the two classes being only one of degree, not of kind. They are in general used to restore the cutaneous discharge when it has been suppressed through cold, and are hence useful in catarrh, rheumatism, or diarrhœa proceeding from cold. Among the more common diaphoretics are antimony, ipecacuanha, ammonia, opium, guiacum, camphor, and contrayerva. A dose of Dover's powder, with warm drinks and plenty of blankets in bed, usually produces copious perspiration, and is very beneficial in colds.

DIAPHRAGM, *dī'-ă-frăm* (Gr. *diaphragma*, a partition), in Anat., is the name given to that transverse muscle which separates the thorax or chest from the abdomen or belly. It is usually described as consisting of two muscles. The superior and larger of these arises from the ensiform cartilage of the sternum, and the ends of the lower ribs on each side; from which points the fibres converge, and terminate in a tendon, or aponeurosis, termed the *centrum tendinosum*, or central tendon. The second and inferior muscle springs from the vertebræ of the loins by two productions, or crura; that on the right side from the four upper lumbar vertebræ, that on the left from the three upper ones. From these points the fibres ascend, some of them crossing over and decussating to surround the œsophageal opening; but all of them ultimately uniting with the central tendon, and thus making but one muscular partition. The diaphragm is convex superiorly and concave inferiorly, and is covered on its upper side by the pleura, and on the lower by the peritonæum. In form it is nearly circular, and is fleshy at the edges, but becomes tendinous towards the centre. It presents three large openings and several smaller ones. The opening of the vena cava is quadrangular in form, and is situated in the tendinous centre. The œsophageal opening is posterior to that of the vena cava, and is of an elliptic form. The aortic opening is the most posterior, triangular, and between the crura. This muscle is the principal agent in respiration; for by contracting it enlarges the cavity of the chest, and allows the lungs to receive the air in inspiration, while by being relaxed, the cavity of the chest is again diminished, and the air suddenly expelled. The contracting and relaxing of this muscle must likewise, it is evident, have a similar effect in increasing and diminishing the size of the abdominal cavity; and hence, by its action upon the stomach and intestines, it aids in the expulsion of the fæces and urine. The diaphragm is largely engaged in laughing, sneezing, sighing, sobbing, and other affections of the respiratory organs. Whatever occasions stoppage of the action of this muscle speedily proves fatal. It is subject to inflammation, called *diaphragmatitis*; but as this is rarely confined to the organ itself, but communicated either to the pleura or peritonæum, its symptoms and mode of treatment correspond with inflammation of these parts. (*See* PLEURITIS and PERITONITIS.)

DIARRHŒA, *di-ar-re'-ă* (Gr. *dia*, and *rheo*, I flow), is a disease characterized by an increased discharge from the bowels, usually in a very liquid state, and sometimes containing a large quantity of bile. This disease may be occasioned by anything that stimulates or irritates the mucous surface of any portion of the alimentary canal. Besides the various purgative medicines, undressed or indigestible foods or vegetables, acid fruits, oily or putrid substances, frequently cause diarrhœa. Suppressed perspiration, occasioned by a sudden chill or cold applied to the body, or a draught of any cold liquid when overheated, may produce it. It is more apt to occur during the summer and autumn months than at any other period of the year. The effluvia arising from the decomposition of organic substances is a frequent cause of it. It sometimes results from the irritation caused by worms, or by some organic disease, and is a common symptom of the advanced state of consumption. Besides looseness of the bowels, this disease is usually accompanied with griping and flatulency, together with an uneasy sensation in the lower part of the abdomen. There are frequently, also, nausea and vomiting, a bitter taste in the mouth, a furred and yellow tongue, dry and harsh skin, a pale or sallow countenance, and, if not speedily checked, great emaciation. Physicians distinguish various kinds of diarrhœa; as *crapulosa*, when the fæces pass of ordinary quality, but immoderately loose and copious; *biliosa*, when the bile is more abundant than natural; *mucosa*, when the excrements contain a quantity of mucus; *serosa*, in which they are almost entirely liquid and watery; and *lienteria*, when the food passes through the body in an almost unaltered state. This is one of those diseases by means of which nature strives to get rid of impurities, and restore the system to its normal condition. Hence, when it is not very violent, and when the patient is strong, it is best to allow it to run its course, at all events for a time, and even to aid it by small doses of laxatives. In any case, great care is to be taken not to stop it too suddenly. Sometimes an emetic is of great benefit in removing the cause of irritation. When it arises from obstructed perspiration, a warm bath, or a dose of Dover's powder, and warm clothing in bed, will usually effect a cure. When it is occasioned by a too acid state of the secretions, the great remedy is chalk mixture. Opium is also frequently employed; but it should not be taken in large quantities without medical advice. The treatment thus in all cases depends upon the cause from which it springs.

DIARY, *dī'-ă-re* (Lat. *diarium*, from *dies*, a day), is strictly a daily register or record of occurrences in which the writer has had a personal share, or which have at least in some way come under his own observation. The use of diaries has now become so common in this country that the manufacture of them forms an important branch of trade. They are usually prepared with a blank space for every day of the year, and vary in form and size according to the object they are more particularly intended to serve. Usually one book is intended to contain the events of a year. The use of diaries cannot be too strongly recommended. To the merchant and man of business they form a register of transactions and engagements; to the student and man of letters a record of daily readings, thought, and observation. The publication of such diaries as those of Pepys and Evelyn has thrown much light upon the state of society at the time when the writers lived.

DIASTASE, *dī'-ăs-taze* (Gr. *diastasis*, a separating of parts), in Chem., a peculiar ferment found in all germinating seeds. It is this principle which causes the starch in malt to be converted first into dextrin and then into sugar. When barley is malted, diastase is developed in the grain, which converts the starch into sugar, on the application of heat and water in the operation of mashing.

DIASTOLE, *dī'-ăs-tole* (Gr. *dia*, and *stello*, I stretch), in Phys., is applied to the dilatation of the heart and arteries, and is opposed to systole, which denotes the contraction of these parts.

DIATHESIS, *di-ath'-e-sis* (Gr. *diatitheml*, I dispose), in Med., is applied to a certain state of body predisposing it to certain diseases. Thus the scrofulous, gouty, cancerous diathesis, denotes a certain constitution of body leading, under certain favourable conditions or exciting causes, to these diseases.

DIATOMACEÆ, *dī-ăt-om-ăs'-se-e* (Gr. *dia*, across; *tome*, cut), in Bot., the Brittleworts, a fam. of confervoid algæ, of very peculiar character, consisting of microscopic brittle organisms, found in almost all fresh, brackish, or salt water, sometimes forming a uniform yellowish-brown layer at the bottom of the water, at others adhering to various water-plants, decaying stems, and stones, or scattered between the filaments of *Confervæ*. They also occur among mosses and *Oscillatoriæ*, and on damp ground. The individual cells of the *Diatomaceæ* are called *frustules* or *testules*, and are furnished with an external coat of silica. This flinty coat, of two usually symmetrical portions or valves, is comparable with those of a bivalve shell, but is in contact, at its margins, with an intermediate piece called the hoop, which varies in breadth according to age. The separate valves are of various forms; as circular, oblong, ellip-

tical, linear, saddle-shaped, boat-shaped, and undulate; and their broad surfaces exhibit various more or less delicate sculpturings and markings, in the form of bands, lines, either parallel, radiate, or crossing each other, and dots, or a cellular appearance. The *Desmidiaceæ* are regarded by Professor Bentley, whose classification we have adopted in this work, as a section of the sub-order *Diatomaceæ;* but those writers who have devoted special attention to microscopic plants make each group a distinct family. The *Desmidiaceæ* are found only in fresh water, are generally of a green colour, and are not silicious externally,—in place of the flinty sheath of the diatom, there is a very transparent coat of cellulose. The study of the humble forms of vegetable life included in these two interesting families is pursued with great zeal by our leading microscopists, and new facts are continually being ascertained respecting their reproduction and movements.—*Ref. Micrographic Dictionary*, by Griffith and Henfrey; Pritchard's *Infusoria* (new edit.); Carpenter's *Revelations of the Microscope*.

DIATONIC (Gr. *dia*, through, and *tonos*, a sound).—Of the three scales employed by the ancient Greeks, that which consisted, like the modern system, of intervals, of major tones and semitones. The diatonic has long been considered the most natural of these three scales. According to Aristoxenus, it was the first; and the other two, viz., the chromatic and enharmonic, were formed from the division of its intervals.

DIATONIC SCALE.—The natural scale, consisting of eight sounds and seven intervals; five of these intervals are called *tones*, and the remaining two *semitones*, which occur between the third and fourth and seventh and eighth. The diatonic scale is a gradual succession of sounds by tones and semitones, which may proceed either from acute to grave or *vice versâ*, five whole tones and two semitones making a complete natural octave.

DIATRIBE, *di'-ä-tribe* (Gr., a disputation), is generally a continued discourse or disputation, more particularly a bitter and violent attack, either written or spoken, on any subject.

DIBBLE, *dib'-bl* (Ang.-Sax.), a well-known gardening implement, made of wood, usually about an inch and a half in diameter, used for making holes for planting seed, &c. It is pointed, and provided with a handle, by means of which it can be more easily pressed into the ground. In some parts of England wheat is planted with the dibble; several dibbles are joined together, and the handle is made of such a length as to enable the man, as he walks backwards, to make the holes: children follow him, and drop two or three grains into every hole. A considerable saving of seed is effected by sowing with the dibble. Dibbles can only be used in light soils; stiff and clayey soils cannot be treated in this way; the soil grows hard round the hole, hindering the shoots from the seed; at the same time it holds water, which is also detrimental.

DICAST, *dí'-kast* (Gr. *dikastes*), a functionary amongst the ancient Greeks, who, with his colleagues, was empowered constitutionally to try and pass judgment upon all causes and questions that the laws and customs of his country pronounced capable of judicial investigation. The dicasts of the Attic democratic period, when they were selected from the people, and when they took an oath that they would well and truly discharge their duties, closely resembled the English jury. The conditions of the eligibility of a dicast at Athens were, that he should be a free citizen, in the enjoyment of his full franchise, and over thirty years of age. Six thousand persons were elected for the service every year. The mode of election is not very clearly stated; but it is evident that they were chosen by lot. Before proceeding to his duties, the dicast was obliged to swear the official oath. After the oath was taken, the courts were assigned to the several sections of dicasts. As soon as the allotment took place, each dicast received a staff, on which was painted the letter and colour of the court to which he was appointed. Every dicast received a fee for his attendance.

DICE, *dise* (Fr. *dé*), the plural of die. They are small cubes of ivory or bone, marked with black dots on their sides, marked from one to six upwards. Dice are placed in a small tubular box, shaken with the hand, and then thrown out. When the dice are perfect in their form as cubes, there is no possibility of knowing what number may be thrown; but amongst swindling gamblers loaded dice are often used, which are so constructed as to turn up a certain number when required. The principal game played with dice is hazard. They are also employed in other games of chance; two dice are used in the game of backgammon. Lotteries, raffles, and disputes, are also often settled by throwing a pair of dice. By the act 9 Geo. IV. c. 18, a duty of twenty shillings was imposed upon every pair of properly-made dice. This act was passed for the purpose of suppressing gambling, and since that time all dice have been stamped; and any person issuing dice without the government stamp is liable to a penalty.

DICHORD, *dí'-chord* (Gr. *dis*, double, and *chord*), the name given to the two-stringed lyre, the invention of which is ascribed to Mercury by Apollodorus, who gives us the following account:—"Mercury," says he, "walking on the banks of the Nile, happened to strike his foot against the shell of a tortoise, the flesh of which had been dried away by the sun, and nothing left of its contents but nerves. He was so pleased with the sound it produced, that he thence conceived the idea of a lyre, which he afterwards constructed in the form of a tortoise, and ung it with the dried sinews of animals."

DICK BEQUEST, *dik*, is a fund left by Mr. James Dick, of London, a native of Forres, in Morayshire, who amassed a considerable fortune in the West Indies, and at his death, in 1828, bequeathed the bulk of it, amounting to upwards of £100,000, as a fund to be applied for the benefit of the parochial schoolmasters of the counties of Moray, Banff, and Aberdeen. This money has been of immense service, not only in increasing the comforts of an underpaid class of men, but in raising the standard of education. The teachers, before participating in the fund, are subjected to a very searching examination; and there is also a visitor appointed to inspect and report periodically upon the condition of their schools. The sum which each teacher receives is thus made to depend upon his qualifications and efficiency in teaching, and at present varies from about £20 to £40, the average being about £30. The sum annually distributed is about £4,000; but a number of teachers do not participate in it, from not having passed the necessary examination.

DICKER, *dik'-er* (Gr. *deka*, ten), is a word used by old authors, signifying ten; as a dicker of skins or hides, —*i.e.*, ten hides; a dicker of gloves, or ten pairs of gloves.

DICOTYLEDONES, *di-ko-til-e'-dones* (Gr. *dis*, two; *kotuledon*, a cavity), in Bot., one of the two great classes into which the phanerogamous or flowering plants are divided. It agrees with the *Exogens* of some botanists, and with the *Exogens* and *Gymnogens* of Lindley. (*See* BOTANY.) The name *Dicotyledones* is derived from the condition of the embryo prevailing throughout the vast majority of plants included in the class; but, as in all other natural groups, instances occur wherein the particular character which has suggested the name is absent. In these exceptional cases, however, the plants agree with the rest in other prominent characters, as the structure of the stem and the plan of the flower. The presence of a pair of cotyledons in the embryo must not, therefore, be regarded as an essential character of the *Dicotyledones*, though it is presented by most of the plants in this great natural group.

DICTAMNUS, *dik-tăm'-nus* (from *Dicte*, a mountain of Crete, where it grew), in Bot., a gen. of plants belonging to the nat. ord. *Rutaceæ*, including two species, which are commonly cultivated in gardens for the sake of their handsome flowers. Of these, the more remarkable is *D. fraxinella*, so named in allusion to the similarity which exists between its leaves and those of *Fraxinus*, the ash. This plant is said to contain such a quantity of volatile oil, that the air surrounding it becomes inflammable in hot weather. Its root was formerly much used in medicine, being thought to possess aromatic, tonic, diuretic, antispasmodic, and emmenagogue properties; but it is now rarely, if ever, employed. The plant is commonly called the false dittany.

DICTATOR, *dik-tat'-tor* (Lat.), the highest magistrate

in the ancient Roman republic. The first dictator was appointed about the year 253 A.U.C., or 501 B.C. As the consuls possessed equal authority, and often differed in their opinions, jealousy frequently brought disunion into the government. In order to avoid these evils, the dictatorship was established. The dictator united in himself the power of the two consuls, and the authority of all the other magistrates, except that of the tribunes, ceased as soon as he was appointed. He was attended, both within and without the city, by twenty-four lictors, bearing fasces and axes. At first, the dictator was only taken from the patrician order, but in 356 B.C., Marcius Rutilus, a plebeian, was elected. The dictatorship could not lawfully be held longer than six months; but Sylla and Julius Cæsar were nominated perpetual dictators, the former in 81 B.C., and the latter after his victory at Pharsalus. The title of dictator was declined by Augustus, and was never assumed by the emperors of Rome. In Niebuhr's Roman History the office of dictator is traced back to the Latins, from whom, according to the historian, it was introduced into Rome.

DICTIONARY, *dik'-shun-ä-re* (modern Lat. *dictionarium*, from *dictio*, a saying), is a work which professes to give information on an entire subject, or an entire branch of a subject, under words or heads arranged in the order of the alphabet. Thus we have dictionaries of Art, Science, and Literature; of Law; of Medicine; of Anatomy and Physiology, &c. In a more limited sense a dictionary is a collection of the words in one or more languages, arranged in alphabetical order, with their significations; as, an English dictionary, an English and French dictionary. It is necessary for a dictionary that the subjects be arranged in alphabetical order, that some explanation or interpretation be attached to each term, and that it professes to go over the whole subject or field of knowledge which it takes up. Dictionaries may be divided into three classes, according as they take up words, facts, or things. Dictionaries of words are generally such as explain in alphabetical order the words composing any language, in the same language, or interpret them by the words of some other. Special dictionaries contain only the words used by single authors or classes of authors. A dictionary usually, also, gives an explanation of phrases; for when it is confined to single words, it is properly only a vocabulary. The Greek term Lexicon is sometimes used as equivalent to dictionary. The term Thesaurus (treasury) is also sometimes used. A glossary (Lat. *glossarium*) is a dictionary of unusual terms. The ancient Greeks and Romans made use of glossaries of unusual words and phrases, but had no dictionaries of language in our sense of the term. In learning a foreign language they seem to have adopted the natural method of conversation. It was not till after the invention of printing, when a taste for the classic languages of antiquity began to prevail, that dictionaries of these languages came into use. The Latin Thesaurus of Robert Stephens made its appearance in 1531; and in 1572 the Greek Thesaurus of Henry Stephens was published. Among the most carefully-compiled dictionaries of modern languages are the "Vocabolario degli Academici della Crusca," of the Italian; and the "Dictionnaire de l'Académie Française," of the French. The Spaniards also possess a dictionary of considerable merit, entitled "Diccionario de la Lengua Castellana," by the Royal Spanish Academy. In English, Johnson's dictionary, which made its first appearance in 1755, notwithstanding its defects, still ranks as a standard work of its class. Dr. Richardson's dictionary, which first formed part of the "Encyclopædia Metropolitana," but was afterwards published separately, is rather critical and philosophical than practical, and adopts the principle of giving together all the words derived from the same root. It is particularly valuable for the numerous examples which it gives of the uses of the words. A more practical and generally useful dictionary is that by Dr. N. Webster, of America, which has several times been reprinted in this country. Based upon it is the "Imperial Dictionary," by Dr. John Ogilvie, which is a very useful and tolerably complete and accurate work. Walker's "Critical Pronouncing Dictionary" is chiefly useful as giving the correct pronunciation of the words. A really good English





dictionary is a want which has not yet been supplied. The first German dictionary of any note was that of Adelung, in 4 vols., Leipsic, 1774-80. A much more valuable work was that of Campe, "Deutsche Wörterbuch," 5 vols., Brunswick, 1807-11. Immeasurably surpassing it is the "Deutsche Wörterbuch" of the brothers Grimm, of which the first volume appeared in 1854, and which is still in course of publication. For those who wish a list as complete as possible of the dictionaries of all languages, we must refer to Vater's *Litteratur der Grammatiken, Lexica und Wörtersammlungen aller Sprachen der Erde*, 2nd ed., by B. Jülg, Berlin, 1847. The second class of dictionaries—those of facts—comprehends dictionaries of History, Biography, Geography, &c. They deal chiefly or exclusively with facts that exist, or have existed, or with events that have happened, or are supposed to have happened. They are frequently incorporated or combined with the third class, or dictionaries of things, which will more properly come to be noticed under the head of ENCYCLOPÆDIAS.—Ref. *English Cyclopædia*.

DICTUM, *dik'-tum* (Lat., something said), is properly applied to the arbitrament or award of a judge, but is frequently also used to denote a positive assertion.

DIDACTIC, *di-dăk'-tik* (Gr. *didasko*, I teach), signifies speaking or writing in a manner adapted to teach or explain the nature of things. Hence didactic poetry has for its object the communicating of instruction in the form of poetry. In one sense, almost every kind of poetry may be said to be more or less didactic; more particularly, however, it is applied to those cases in which the chief object of the poem is to communicate instruction on a particular subject; as the "Georgics" of Virgil, the "De Rerum Natura" of Lucretius, and the "Ars Poetica" of Horace. Though didactic poetry may sometimes attain an elevated and animated character, yet it cannot be denied that the more it becomes didactic, the less, of necessity, is it poetical; for the invention, freedom, and elevation of poetry must be in a great measure dropped. Didactic poetry must have been among the earliest forms of poetic composition, and there is scarcely a nation in which it has not taken root; while at the same time there is hardly a subject, however prosaic, that has not found some one to give it a poetic dress. In didactic poems, generally, the information or instruction is accompanied with reflections, illustrations, &c.

DIDASCALIA, *di-dis-kal'-le-a* (Gr., instruction, information), a term in use among the Greeks, and also till recently among most of the nations of modern Europe. It was sometimes applied to the representation of dramatic pieces, but more particularly to a written addition, in which information is given of the authors and contents of the plays, of the time, place, and success of the representation, &c. Many old authors have written didascalia, containing not merely theatrical information, but also critical notices of the plays, giving an analysis of the plan and development, the beauties and defects of each.

DIDYMIUM, *did'-e-me-um* (Gr. *didumos*, twin), in Chem., a very rare metal, closely allied to cerium, and occurring with it in its ores. It forms one oxide, which has the properties of an earth.

DIE-SINKING, *di-sink'-ing* (Fr. *dé*, die; Sax. *sincan*, *sencan*, to sink), the art of preparing a die or stamp by which an impression is produced on medals or pieces of money, or any pattern or device on buttons and thin plates of metal, by means of great pressure. When a die is required for a coin or medal, the engraver takes a piece of soft steel of suitable dimensions, generally three or four inches in length, and about an inch greater in diameter than the coin required. On this he hollows out the exact form of the desired impression by cutting away the steel by degrees, with small, well-tempered, case-hardened tools. As soon as this is done, the steel is hardened by being heated red-hot in a crucible with charcoal and oil, or bone-dust (*see* CASE-HARDENING), and then plunged into cold water. When a great number of coins of one sort are required, the original die is termed the matrix, and copies are made from it by taking an impression from it in soft steel, which is in relief, and is called the puncheon, and from which, when it has been hardened, other dies are produced by pressure exactly similar to the matrix, and in *intaglio*,

which are case-hardened in their turn before they are fit to transmit an impression to any metal used for money. The metal used for our coinage, whether gold, silver, copper, or bronze, is stamped in a cold and solid state; but medals and casts can also be produced by a method called casting *en cliché*, in which the metal is used in a soft state, and an impression may be obtained even from dies of wood or plaster. For this process an alloy is used, consisting of ½ lead, ½ tin, and ½ bismuth, which fuses readily at the boiling-point, 212° Fahrenheit. When the metal is still soft, resembling paste in consistency, the die is placed upon it, and the impression produced by a smart blow from a mallet. The surface of the metal sets instantly, from coming into contact with that of the cold die, and thus readily retains the form that has been given to it. Copies of medals may be readily made in this way; but each face will be obtained in a separate piece, and these must be joined to give a representation of the coin in a complete form. A quantity of ornamental-work is produced in thin metal for gas-fittings, cornices, parts of cruet-stands, trays, &c., by means of a pair of dies, on one of which the pattern is formed in relief, and on the other in *intaglio*, the metal being placed between them, and brought into the desired shape by pressure. Dies are also made in metal for forming articles in gutta-percha and leather, and producing embossed figures on the cloth covers of books, as well as on cardboard, paper, &c.

Dies Iræ, *dī'-ēs ī'-rē* (Lat., day of wrath), is the name commonly given, from the opening words, to a celebrated Latin hymn, describing the final judgment of the world. It is characterized by remarkable force and beauty, combined with great smoothness of rhyme, and commences:—

Dies iræ, dies illa,
Solvet sæclum in favilla,
Teste David cum Sibylla.

Quantus tremor est futurus,
Quando Judex est venturus,
Cuncta stricte discussurus!

Tuba mirum spargens sonum
Per sepulchra regionum,
Coget omnes ante thronum.

The authorship of this beautiful hymn has been ascribed to various persons; but it most probably proceeded from the pen of Thomas of Celano, a Franciscan monk, who died about the year 1255. In the 14th century it was admitted into the service of the Church, and made a part of the Requiem, or mass for the souls of the dead. Several alterations were then made in the text; but that is believed to be the original reading which is found engraved on a marble tablet in the church of St. Francis at Mantua. This hymn has been frequently translated into German, and has been done into English by Lord Macaulay, Lord Lindsay, and others.

Diet, *dī'-et* (Ger. *reichstag*, Du. *ryksdag*, Dan. *rigsdag*), is derived from the Latin *dies*, 'a day,' and is properly the day of the empire. It is applied to the principal national assembly of various countries of Europe. Under the old German empire, the emperor summoned annually two regular diets, which met usually at Ratisbon, besides extraordinary ones on special occasions. The emperor and the diet exercised all the prerogatives of sovereignty, levying taxes, enacting laws, declaring war, and making peace. The diet was composed of three chambers:—1. The chamber of Electors; 2. that of the Princes, which was divided into two sections,—the spiritual and temporal,—the former being subdivided into the Swabian and Rhenish benches, each of which had one vote, and the latter into the Wetteravian, Swabian, Franconian, and Westphalian benches, each of which had also one vote; 3. the chamber of the Imperial Cities, divided into the Rhenish and Swabian benches. Each of the chambers deliberated separately; but then the two first met together, and decided definitively on any proposition, which, when ratified by the emperor, became a decree of the empire. The emperor could refuse his ratification, but could not modify the decisions of the diet. The diet of the modern Germanic confederation is a meeting of plenipotentiaries, which is permanent, and assembles in the free city of Frankfort-on-the-





Maine. The diet is constituted in two forms;—1. as a general assembly, called *Plenum*; and 2. as a minor council. The Plenum meets only when some organic change is to be introduced, or any affair relating to the whole confederation to be decided. Every member of the confederation has at least one vote, and several of the larger powers, as Austria and Prussia, have four; making in all seventy votes. In making or altering fundamental laws, unanimity is required; but in other cases matters are decided by two-thirds of the number of votes. In the ordinary or federative diet, there are only seventeen votes, of which the eleven principal states have one each, and the remaining twenty-seven only six among them. It brings forward and discusses propositions which are to be presented to the Plenum, where they are not debated, but simply decided by votes. It also executes the enactments of the Plenum, and dispatches the current business of the confederation. It decides by a simple majority, and seven votes form a quorum. Austria presides in both diets, and has the casting vote in the smaller assembly. The deputies have the character of plenipotentiaries, are responsible only to their respective governments, and must therefore act according to the instructions of their own courts, and not after their own convictions: The diet of Hungary composed of the king (the emperor of Austria) and the estates, the latter being divided into two chambers,—an upper and a lower. They consist of the higher clergy, the magnates, the two courts of appeal, and two representatives from each chapter, county, city, and privileged district. The diet of Switzerland is composed of the representatives of the cantons, and is held every two years, alternately at Zurich, Berne, and Lucerne. It manages such affairs of the constitution as are not within the jurisdiction of any of the separate states. Each canton has a vote in the diet.

Dietary, Military and Naval, *dī'-et-ā-re* (from Gr. *diaita*, manner of living), that which pertains to the prescribed rules for feeding among soldiers and sailors. In the British army the dietary is under the control of the commissariat department. During the Crimean war the necessity of reform in the distribution of food and daily necessaries became too painfully apparent. Since that time the whole arrangements have been put on a new footing. The commissariat is now a War-office department, under a commissary general-in-chief. The cooking of provisions has also since that time become a very important feature in the English military system. It was too palpably shown that cookery was but little understood by the British soldiers. Government sent out M. Soyer principally to give advice in regard to hospital cookery, and also to superintend the general military dietary. A committee was appointed a few years ago to consider the subject of barrack economy, and they recommended that every large barrack should have a bakery with two ovens, where the men could learn to bake and make their own bread. They also advised that arrangements should be made by which the men might be enabled to bake their own meat, instead of eating it always boiled. Gradually these recommendations are being acted upon, and nearly all large barracks are provided with new and carefully-arranged stoves. The cooking arrangements at the new barracks at Aldershot are superior to any yet used in the English army. (*See* Commissariat, Rations.) In naval dietary two circumstances are taken into account in supplying provisions to ships in the royal navy;—first, the ration or established allowance of certain articles; and second, the average experience of the past with regard to others. Under the first head all rations are equal, from the first officer to the ordinary seaman; under the second head there are wide differences: thus, fresh meat, preserved meat, lemon-juice, wine, &c., are considered as non-guaranteed by the crew, and can be given or withheld, as circumstances may occur. Naval dietary has changed from time to time in relation to the kind and quality of food supplied. The daily ration in 1844 was as follows:—biscuit 1 lb., salt meat ½ lb., vegetables ½ lb., sugar 1½ oz., rum ½ pint. A small quantity of oatmeal and vinegar were also allowed every week. The cost of the naval dietary in 1844 was about £18 per man per annum. In 1847 tea and sugar were first introduced into the sailor's diet, in lieu of rum; government has,

however, never tried to force the temperance system on the navy. In 1850 the dietary was made more liberal by the Admiralty, in order to increase the attractiveness of the navy; no country is now so liberal in its naval dietary as England. The dietary in emigrant ships is regulated by law, every ship being bound to possess certain kinds and quantities of provisions, according to the number of the passengers and the length of the voyage.

DIETETICS, *di-et-et'-iks* (Gr. *diaitetike*), is that department of medical science which relates to the diet or ordinary food. (*See* FOOD.)

DIEU ET MON DROIT, *dyu(r) ai mawn(g) drwaw* (Fr., God and my right), the motto of the royal arms of England, first assumed by Richard I., to intimate that he held his sovereignty from God alone, and not in vassalage to any man. It seems to have subsequently been dropped, but was afterwards assumed by Edward III., and was continued (except during the reign of Elizabeth), without interruption, to the time of William III., who used the motto *Je maintiendray*, though the former was still retained upon the great seal. After him, Queen Anne used the motto *Semper eadem*, which had been used before by Elizabeth; but, since the time of Queen Anne, *Dieu et mon droit* has continued to be the royal motto.

DIFFERENCE, *dif'-fer-ens* (Lat. *differre*, to carry from each other), in *Log.*, is one of the predicables, and denotes that particular quality which distinguishes the subject under contemplation from all others, when looked at from the point of view in which we are regarding it. Logically, it is said to express the formal or distinguishing part of the essence of a species,—that which distinguishes it from every other species contained under the same genus. The having only three sides is the difference or distinguishing feature which separates triangles from squares, polygons, and every other species of figure contained under the common genus rectilineal.

DIFFERENCES.—In Her., there are marks of differences of two classes; the former of which is used to distinguish different branches of the same family from each other and from the chief of the family, when the original bearer of the coat is dead; and the latter to distinguish the coat-armour of sons from the paternal coat, while the father is still alive. Marks of difference, properly so called, belonging to the first class, consist of the addition of a chief or border to the original coat; the eldest son bearing the paternal coat without any addition; the second son, the paternal coat within a plain border; the third bearing it within a border engrailed; the fourth, with a border invected; the fifth, within a border wavy, &c. Sometimes differences have been shown by assuming borders of different tinctures or metals, or by altering the colours and metals of the field and charges of the coat. Differences of the second class, properly called marks of cadency, consist of the addition of a certain figure to the paternal coat for each of the sons; these figures consisting of a label of three points for the eldest son, a crescent for the second, a mullet for the third, a martlet for the fourth, an annulet for the fifth, a fleur-de-lis for the sixth, a rose for the seventh, a cross moline for the eighth, and a double quatrefoil for the ninth. When the father is dead, the marks of cadency should be erased and the border substituted, as mentioned above. The princes of the blood royal bear the label only on the royal arms, and are distinguished by bearing various emblems on the points of the label. The prince of Wales, however, bears a label argent simply, without any distinctive mark on the points.

DIFFERENTIAL CALCULUS, *dif-fer-en'-shal* (Lat. *differo*, I move apart), a term applied to one of the most important branches of the higher mathematics. The object of the differential calculus is to find the ratios of the differences of variable magnitudes, on the supposition that these differences become infinitely small. In this study it is necessary to pay particular attention to the meaning of the terms infinitely and infinitely small. All magnitudes in mathematical reasoning are considered to be capable of augmentation and diminution without limit. A quantity, therefore, can be conceived to be so great as to exceed any finite quantity of its own nature, or so small as to be less. In the first case it is said to be infinite, and in the latter infinitely small. These magnitudes are of course imaginary, as in both cases quantities may be conceived either greater or smaller; so that an infinitely large quantity may be considered as nothing, or zero, and an infinitely small quantity as the same, when compared with one another. In the differential calculus, the infinitely small quantities which come under consideration are called *differentials*. The differential of a magnitude, or variable function, as it is called, is expressed by placing the letter *d* before the magnitude or function. Thus *dx* signifies the differential of the variable magnitude *x*. Formerly it was the custom to put a dot over the *fluxion* of a quantity, as it was then called. Thus $\dot{x}$ represented the fluxion of $x$. The use of the letter *d* was introduced by Leibnitz, who, contemporary with Sir Isaac Newton, gave much attention to the subject. These two philosophers, independently of one another, studied the science of the differential calculus at the same time; but of late years the method of Leibnitz has almost exclusively prevailed, to the exclusion of the name, notation, and method of Newton's fluxions, in such points as they differ.

DIFFRACTION OF THE RAYS OF LIGHT, *dif-frik'-shun* (Lat. *diffractum*), in Optics, the modification which light undergoes in passing very near the edges of any opaque body. It was first observed by Grimaldi, who noticed that when a ray of light was allowed to enter a dark room, the shadows cast from any opaque body were larger than if the light passed by it in straight lines, and that those shadows have three bands of coloured light parallel with them. At first this phenomenon was attributed to the refracting power of the atmosphere; but this theory was disproved by Newton, who treats of the subject in the last book of his Optics. He endeavoured to explain its occurrence through the general properties of light. It is now looked upon as identical with many phenomena connected with the undulatory theory of light, and is assigned to the interference of undulations.

DIFFUSION OF GASES, *dif-fu'-zhun* (from Lat. *diffundo*, I pour out hither and thither), in Chem.—If two vessels be filled with two different gases, and connected by a tube, it will be found that, after a certain lapse of time, an intimate and equal intermixture of them will take place. If, however, means be taken to measure the velocity with which they mix, it will be found that the lighter of the two diffuses itself much more rapidly into the heavier than *vice versâ*. This velocity of diffusion may be measured in the following manner:—If a glass tube, closed at one end with a porous plug of plaster of Paris, is filled with hydrogen, and plunged mouth downwards, the hydrogen will gradually pass through the porous diaphragm into the air, and the air will gradually supply its place. But it will be found that the hydrogen diffuses itself into the air much more rapidly than the air into it, causing the water to rise in the tube, contrary to the action of gravity. Mr. Graham and others, by a similar apparatus, have determined the exact rates of diffusion of all gases, which appear to be in accordance with a law that the relative diffusiveness of gases is unity divided by the square root of their density, taking air as the standard. The following are the velocities of diffusion of some of the more familiar gases:—

| | |
|---|---|
| Hydrogen | 3·83 |
| Carburetted hydrogen | 1·34 |
| Olefiant gas | 1·02 |
| Air | 1· |
| Carbonic acid | 0·81 |
| Sulphurous acid | 0·69 |

Diffusion of gases is a process that is continually going on around us. Were it not for this property, gases deleterious to animal and vegetable life would be constantly accumulating in poisonous masses, instead of being silently and harmlessly distributed through the atmosphere.—*Ref.* Graham's *Philosophical Magazine*, 1833.

DIFFUSION OF LIQUIDS, in Chem.—*Liquids of different densities*, like gases, gradually diffuse into each other when brought into contact. Thus, if a salt-jar be filled with water, and red wine be gradually and carefully conveyed to the bottom of the vessel, it will be found that, after the lapse of a few days, the wine will gradually diffuse itself into the water and the water

into the wine, until the whole is uniformly mixed. By means of an apparatus of this kind Mr. Graham was enabled to calculate the different velocities of a large number of substances. These velocities vary in the most remarkable manner, sulphuric acid, for instance, diffusing into water with twenty-four times the velocity of albumen. Pursuing these experiments, Mr. Graham was at last able to classify all soluble substances according to their velocities, and in doing so he made the marvellous discovery that a diaphragm covered with a layer of a solution of low velocity totally interrupted the passage of a solution of still lower power of diffusion through its mass. Carrying these ideas further, he has classified all soluble substances under two heads,—*colloids*, or amorphous substances, similar to gelatine, which he takes as the type of the class, and *crystalloids*, or substances taking a crystalline form, and having a high diffusive velocity. These two classes seem to be divided naturally by other characteristics than velocity of diffusion. All crystalloids are more or less rapid, while colloids, such as starch, dextrin, albumen, &c., are insipid, and soluble with difficulty. Colloids offer but little resistance to the diffusion of crystalloids through their mass, while they are in a manner impervious to substances of their own class. On this property Mr. Graham has founded his system of dialysis, or the separation of the crystalloid and colloid constituents of a liquid by the intervention of a colloid septum. (*See* Dialysis.) Another curious property of colloids is their power of remaining in solution until some disturbing influence suddenly reduces them to what Mr. Graham calls their *pectous* state. For instance, solution of ulmic acid may be preserved perfectly liquid for weeks in a sealed tube, but it is sure to become gelatinous, and insoluble at last. The late discoveries of Mr. Graham in the crystalloid and colloid conditions of matter may be reckoned as amongst the most valuable of the day, and will increase the lustre of an already brilliant reputation. The following table will give an idea of the relative diffusibility of crystalloids and colloids :—

| | | |
|---|---|---|
| Hydrochloric acid ... | 1· | Crystalloids. |
| Chloride of sodium | 2·33 | |
| Cane sugar ..... | 7· | |
| Albumen .....49· | | Colloids. |
| Caramel .....98· | | |

(For a full account of Graham's experiments on diffusion of liquids, see a paper by him in *Philosophical Transactions* for 1862, part 1.)

Digamma, *di-gam'-mă* (Gr. *dis*, twice, and *gamma*, the letter gamma), was the name given to an old letter of the Greek alphabet, from its having the form of two gammas set one over the other, and resembling our F. It appears to have occupied the sixth place in that alphabet, and to have had the sound of *v*. Much discussion, however, has been carried on regarding the nature and pronunciation of this letter, upon which we cannot enter, but must refer the curious to Kidd's edition of Dawes' *Miscellaneæ Critica*, and Ahren's *De Græcæ Linguæ Dialectis*. The use of the digamma was most common in the Æolic dialect; but even from this it disappeared at a very early period.

Digest, *di'-jest'* (Lat. *digestus*, put in order), is a name often applied to the Pandects of the civil or Roman law. It was compiled from the works of previous Roman jurists by Tribonian and others, at the command of the emperor Justinian, and was published in A.D. 963.

Digester, *di-jes'-ter* (from Lat. *digero*, I distribute, dissolve), a strong iron or copper vessel, with a steam-tight lid, furnished with a safety-valve, in which water and other fluids can be heated beyond their boiling-points. This form of apparatus was first invented by Papin, and is in consequence frequently called Papin's digester.

Digestion, *di-jest'-tshun* (Lat. *digestio*, from *digero*, I carry to different parts, or dissolve), in Physiol., is that process by which the food of animals is converted into chyme in the stomach, and prepared for being ultimately taken into the blood. The function or process of digestion is one of the principal of those that are directly concerned in the maintenance of life; and hence its proper performance is of the utmost importance to the individual; while depending, as it does, upon the healthy condition of a great number of organs, it is not to be wondered at that it is liable to disorders, and is productive of an endless variety of diseases under the general term indigestion. The principal processes connected with digestion are usually represented as,—(1) Mastication; (2) insalivation; (3) deglutition; (4) chymification, or the action of the stomach; (5) chylification, or the action of the intestines; (6) defæcation; and (7) the absorption of the chyle. The operation of mastication is a very important auxiliary to digestion; since the more the food is broken down and mixed with the saliva the more readily and completely will it be acted upon by the stomach. Imperfect mastication is a frequent cause of indigestion. During this process the salivary glands yield up their contents, by means of which the dry food is moistened and rendered more fit for deglutition. The third process is the act by which the food is transferred from the mouth to the stomach. (*See* Deglutition.) The alimentary matter being propelled by the contractions of the œsophagus into the cardiac extremity of the stomach, is there acted upon and dissolved by the gastric juice, which is secreted by glands lying in its inner or mucous coat. This process is assisted by the muscular contractions of the stomach, by means of which the mass is kept in motion until it is formed into chyme. When it has been sufficiently operated upon, it passes through the pyloric opening into the duodenum. The pylorus possesses a peculiar sensibility, that prevents any matter from passing through it but such as has been properly converted into chyme. Recent investigations have shown that the changes which the food undergoes in the stomach are essentially chemical. (*See* Gastric Juice.) The process of gastric digestion is very slow. It is more than an hour before the food suffers any apparent change; and the ordinary time required for the digestion of animal food is from three to four hours. The chyme having passed through the pylorus into the duodenum, becomes mixed with the biliary, pancreatic, and intestinal secretions. These juices, by their action upon the chyme, separate it into two portions,—one a milky fluid called chyle, the other the excrementitious portion. The bile seems to be of use principally in promoting the digestion of fatty matters, while the pancreatic juice serves mainly to convert starchy matters into sugar. Of the use of the intestinal juice little is known. The chyle attaches itself to those irregular circular folds of the mucous membrane of the small intestines, called the valvulæ conniventes, where it is absorbed by the lacteals. The large intestines also possess lacteals; so that, if any portion of the chyle should not have been absorbed in the small intestines, it is taken up in the large ones. The fæces pass gradually from the small to the great intestines, until they reach the rectum, where they are retained for some time and then discharged. The absorption of the chyle forms the last act in the process of digestion. It is, as we have already seen, taken up by the lacteals, and is by them conveyed to the mesenteric glands, where it is supposed to undergo some change. From thence it makes its way to the right side of the aorta, in the lumbar region, where it is finally discharged into an elongated pouch, called the receptaculum chyli. From this pouch the thoracic duct conveys the chyle upwards to the left side of the neck, where it is poured into the left subclavian vein at its junction with the internal jugular, and, being thus mixed with venous blood, it is carried to the lungs and there converted into new and perfect arterial blood.

Digestion, in Chem., is heating a substance in a liquid, in order to extract some principle contained in it. It is distinguished from maceration by being performed at a high temperature.

Digestive, *di-jest'-iv*, in Surg., is a term applied to such applications, ointments, poultices, and the like, as promote, or are believed to promote, healing or suppuration, when applied to a wound or ulcer. Though common formerly, the term is now little used.

Digging, *dig'-ging* (Ang.-Sax.), the operation of moving, or stirring, or breaking up earth with a spade, pickaxe, or other sharp instrument. It is mostly performed in gardening, but in some situations, where the size of the inclosures is small, or where the power is insufficient for the easy working of the

common or the subsoil plough, cultivators prefer manual labour with the spade. Experience, too, has proved that the expense of deep-digging, or spade-husbandry, is not materially different from that of the subsoil plough. In gardening, the chief use in digging is to mix the soil by burying the surface and bringing what is below to the top. In private gardens digging is often much neglected; but commercial growers, who have to make the most of their ground, pay particular attention to the subject, and the result is seen in their superior productions. In ordinary digging, the spades used in the market gardens round London are 13½ inches long and 10 inches broad. Those used in private gardens are smaller.—*Ref.* Johnson's *Farmers' Encyclopædia.*

DIGIT, *dij'-jit* (Lat. *digitus*, finger), a finger; a term employed in Arith. to denote one of the ten symbols or figures, 0, 1, 2, 3, &c. According to the original acceptation of the term, the first ten figures of any row were digits, but now, by common acceptation, the term is employed to denote the first ten figures used in reckoning number; thus, 20 is a number of two digits. By astronomers the term digit is used to signify the twelfth part of the diameter of the sun or moon; thus, in speaking of eclipses, they say that it was of seven or eight digits.

DIGITAL EXERCISES, *dij'-it-ăl eks'-er-si-zes* (Lat. *digitus*, a finger; Fr. *exercice*), in Practical Mus., are exercises employed for the purpose of rendering the fingers independent of each other. As the third finger is the weakest, it is very necessary for all who practise the pianoforte, &c., to cultivate its *volition*, and strengthen it by exercises adapted for that purpose.

DIGITALIS, *dij-it-ai'-lis* (Lat. *digitus*, a finger), in Bot., a gen. of plants belonging to the nat. ord. *Scrophulariaceæ*. The most important species is *D. purpurea*, the purple foxglove, one of the handsomest of our indigenous plants. It is a biennial, blossoming during the months of June and July, and is found on hedge-banks and the sides of hills, in dry, gravelly, or sandy soil. The flowers are somewhat bell-shaped, and their remote resemblance to the fingers of a glove suggested the generic name. They are beautifully marked on the inside with purple blotches. The foxglove sometimes grows to a great height; one specimen gathered near Tintern Abbey, measured 7 ft. 9 in., the spike of flowers was 4 ft. 10 in. in length, and the number of flowers thereon 311. A variety commonly met with in gardens has white flowers spotted with different shades of cream-colour and pearl. The wild foxglove is a most important medicinal plant. The leaves only are officinal in our pharmacopœias; but the seeds and roots possess similar properties. Digitalis is a diuretic, and greatly resembles tobacco in many of its properties. It is employed to reduce the action of the heart in diseases of that organ, in fever, and in inflammations. It is prescribed as a diuretic in dropsies of all kinds, but is most useful in those associated with a debilitated and generally diseased state of the constitution. It is a violent poison, and great care is requisite in prescribing it, as its use, even in small doses, has led to fatal results; for it accumulates in the system. The active principle of foxglove is termed *digitaline*.

DIGITIGRADA, *dij'-jit-e-grai'-dă* (Lat. *digitus*, a finger; *gradior*, I walk), in Cuvier's zoological system, a tribe of carnivorous animals distinguished by walking upon the toes, the heel being always raised from the ground. Those animals which place the heel or the sole of the foot on the ground belong to the tribe *Plantigrada*. Some of the most carnivorous mammalia belong to the digitigrada. The feline and canine families, hyænas, civets, &c., are all included in it. The Weasel fam. (*Mustelidæ*) appears to form a connecting link between the digitigrada and the plantigrada.

DIGNITARY, *dig'-ne-tă-re* (Lat. *dignus*, worthy), in ecclesiastical matters is one who holds cathedral or other preferment, to which jurisdiction is annexed, giving him some pre-eminence over mere priests or canons. The dignitaries in English cathedrals are, for the most part, the dean, precentor, chancellor, treasurer, and archdeacon; but in cathedrals of the new foundation, the only dignitary is the dean.

DIGNITY, *dig'-ne-te* (Lat. *dignus*), denotes nobleness, or elevation of mind, consisting in a high sense of justice, truth, and propriety, with an abhorrence of all mean and sinful acts. It is also applied to the titles of honour and authority among men; and these, in this country, are usually divided into superior and inferior, the former comprehending dukes, marquises, and the like; the latter, baronets, knights, &c. They were originally annexed to the possession of certain estates in land, and created by a grant of these estates; and although they have now become little more than personal distinctions, they are still classed under the head of real property. Having thus, in theory at least, relation to land, they may be entailed by the crown within the statute *De Donis*. No temporal dignity of any foreign nation can give a man a higher title than that of esquire. Dignity, in Oratory, is one of the three parts of elocution; consisting in the right use of tropes and figures.

DIGRAPH, *di'-gràf* (Gr. *dis*, twice, and *graphe*, I write), in Gram., is a union of two vowels of which only one is sounded; as in *head*, *breath*. It differs from a diphthong, which also consists of two vowels, in the sound produced in the latter case being different from that of either of the vowels taken separately.

DIGRESSION, *di-gres'-shun* (Lat. *digressio*), denotes literally a stepping out of the way or road; and hence, in literature, a departure or wandering from the main subject under consideration. Digressions may sometimes be introduced with great effect; but they ought not to be had recourse to without sufficient reason, and should never be too frequent nor too long. Frequent digressions are a sure mark of an unskilful speaker or writer. Where a subject is heavy and dry, an occasional digression may serve to relieve the attention, and throw additional light upon it.

DIKE. (*See* DYKE.)

DILAPIDATION, *dil-up'-e-dai'-shun* (Lat. *di*, and *lapis*, a stone), in ecclesiastical matters, is the suffering the edifices of a benefice to go to decay, and neglecting to repair them, and is also applied to the committing, or suffering to be committed, any wilful waste upon the glebe, woods, or other inheritance of the church. Dilapidations are therefore either permissive (arising from neglect) or voluntary (occasioned by some wilful act). By the Injunctions of Edward VI., it is required that the proprietors, parsons, vicars, and clerks, having churches, chapels, or mansions, shall yearly bestow upon the same mansions or chancels of their churches, being in decay, the *fifth* part of their benefices till they be fully repaired; and the same being thus repaired, they shall always keep and maintain in good estate; for the revenue of the clergy is given not only as a provision for the clergyman, but also for his suitable residence. Dilapidations may be sued for in the spiritual courts; but it is most usual to do so by action at common law. The action may be brought by the successor against the predecessor, if living; or, if dead, against his executors; and against an alienee, if made over to him to defeat the remedy for dilapidations.

DILATATION, *dil-ă-tai'-shun* (Lat. *dilatatio*), is the expansion or enlarging of bodies after a state of contraction or compression. It differs from extension, as the latter is properly applied only to lines and surfaces, the former to bodies that spread open or enlarge in all directions.

DILATORY, *dil'-ă-tor-e* (Lat. *dilatio*), denotes literally a delaying or putting off, and is applied, in Law, to certain pleas which are put in merely to delay the suit by questioning the propriety of the proceeding rather than by denying the injury. They are either pleas to the *jurisdiction*, showing that by reason of some matter therein stated, the case is not within the jurisdiction of the court; or pleas in *suspension*, showing some matter of temporary incapacity to proceed with the suit; or pleas in *abatement*, showing some matter for abatement, or quashing the declaration. These pleas must be verified by affidavit, or evidence produced in the court to induce a belief in their truth; and in general they are not allowable after a plea in bar. The effect of a dilatory plea is that, if successful, it defeats the particular action, leaving the plaintiff at liberty to commence another in a better form, if the case should be such as to admit of an amendment of that description. In criminal cases, a plea in abatement, or dilatory plea, is founded on some matter of fact extraneous to the indictment, tending to show that it is defective in point of form.

DILEMMA, *dil-em'-mă* (Gr. *dis*, twice, and *lemma*, an assumption,—a twofold assumption), in Log., is a species of argument in the form of a complex conditional syllogism. It is defined to be a redundant hypothetic syllogism, in which the hypothetical premiss consists of an antecedent or condition dependent on the several members of a distributive or disjunctive consequent. This argument was called by the Romans the *Syllogismus cornutus*; whence our phrase of "placing one on or between the horns of a dilemma." It is used to prove the absurdity or falsehood of some assertion. A dilemma must be so framed that one of the alternatives must be admitted; and each alternative must exactly apply. It ought also to be incapable of being retorted. When an affirmative is proved, the argument is said to be constructive; when a negative, it is called destructive. Of the constructive dilemma there are two sorts,—the simple, which concludes categorically, and the complex, which has a disjunctive conclusion. There is only one kind of destructive dilemma. The Greek dialecticians prided themselves on exhibiting dilemmas which they alleged to be insoluble. Some of these examples were constructed with great dexterity, and the discovery of the fallacy is by no means easy. One of the most famous of them, known as the "sophism of Euathlus," is as follows:—Euathlus had received lessons from Protagoras the rhetorician, on condition that the fee should be paid when the pupil gained his first cause. Euathlus delaying to undertake any cause, Protagoras sues him, and argues in this way: "If I am successful, you must pay me in virtue of the sentence; if unsuccessful, you must pay me in terms of our agreement, as then you will have gained your first cause." The pupil retorts: "If I am successful, I am free by the sentence; if unsuccessful, I am free by the agreement."

DILETTANTE, *dil-e-tăn'-te* (Ital., pl. *dilettanti*), is an admirer or lover of the fine arts, and is sometimes applied, by way of reproach, to one whose knowledge is mere affectation or pretence.

DILETTANTI SOCIETY, is a society of noblemen and gentlemen, formed in London in the earlier half of last century, and which has done much to foster the study of antique art in England. In 1764 it fitted out an expedition to Greece, for the purpose of collecting details and drawings of ancient monuments, the result of which was published under the title of "Ionian Antiquities," in 1769. They have since fitted out several other expeditions, and given their results to the world in the same way. They have also issued "Specimens of Ancient Sculpture,—Egyptian, Etruscan, Greek, and Roman," selected from different collections in Great Britain, in 2 vols., London, 1809-35. The last work published by them is entitled, "Portfolio of Greek Architecture, or Drawing-book of Dilettanti," London, 1858.

DILIGENCE, *dil'-e-jens* (Lat. *diligentia*, from *diligo*, I love earnestly), denotes generally a steady application of the mind or body to business of any kind; also care, attention, heedfulness. The law recognizes only three kinds of diligence,—(1) Common or ordinary diligence, which men in general exert with regard to their own concerns; (2) extraordinary diligence, or that care which very prudent persons take of their own affairs; and (3) low or slight diligence, such as persons of little or no prudence take of their own matters. In the law of Scotland diligence is also applied to the warrants issued by the courts for enforcing the attendance of witnesses, or compelling the production of writings. It also denotes that process of law by which a creditor attaches the person, lands, or effects of his debtor, either on execution or in security for his debt. Diligences are either real or personal,—real when applicable to real or heritable rights, and personal when for the purpose of securing the person of the debtor or his personal estate.

DILIGENCE (Fr.), a heavy French travelling-coach, drawn by four horses. Before the introduction of railways, the diligence was much used in all parts of France. It is divided into three compartments,—the *coupé*, or front, holding three travellers; the *intérieur*, holding six; and the *rotonde*, entered from behind, holding eight. The driver's high seat in front is called the *banquette*; and the rest of the passengers are huddled indiscriminately among the luggage or under the tarpaulin which covers it. In general, a diligence weighs about five tons, and goes at the rate of six miles an hour.

DILL. (*See* ANETHUM.)

DILLENIACEÆ, *dil-len-e-ai'-se-e* (after the botanist Dillenius), in Bot., the *Dillenia* fam., a nat. ord. of dicotyledonous plants, in the sub-class *Thalamifloræ*, consisting of trees, shrubs, and a few herbs, having the following marks of distinction:—Leaves usually alternate, and, except in rare cases, without stipules: sepals and petals, five of each, hypogynous, the former persistent in two rows, the latter with an imbricated æstivation; carpels more or less distinct; seeds arillate; albumen fleshy, homogeneous. The order includes between 20 and 30 genera, and about 200 known species, occurring chiefly in Australia, India, and equinoctial America. They have astringent properties, and many are used for tanning and as vulneraries. The young calyces of some species of the typical genus *Dillenia* have an acid taste, and are employed to flavour curries in some parts of India. Many species of this genus grow to a large size, and form hard durable timber. Those of India are generally remarkable for fine evergreen foliage and very beautiful flowers. They are sometimes cultivated as stove or greenhouse plants in this country.

DILLESK. (*See* DULSE.)

DILUENTS, *dil'-u-ents* (Lat. *diluo*, I wash away), in Med., are liquids administered to increase the fluidity of the blood, and render certain of the secretions and excretions less viscid. They likewise promote the operation of more active medicines, especially aperients and diuretics. Water is the simplest and frequently the best diluent; or it may be made more agreeable by the addition of acid or other substances, or in the form of toast-and-water. Gruel, infusion of tea, mutton and chicken broth, beef-tea, and such-like, come under this designation. Diluents are of great use in allaying the thirst of patients affected with fever or other inflammatory complaints, and are often very useful in subduing the more violent symptoms of the disease, and relieving the system by means of perspiration. The excessive use of fluids at meals, however, is hurtful to digestion.

DILUVIUM, *di-lu'-ve-um* (Lat. *dis*, asunder; *luere*, to wash), in Geol., a term applied to accumulations of gravel, sand, or stones, which are referred to the *extraordinary* action of water, the term alluvium implying the *ordinary* operations of water. At one time geologists merely used the word diluvium to distinguish accumulations supposed to have been formed during the Noachian deluge; but we now employ it as a common name for all masses which have apparently been produced by powerful aqueous agency.

DIMENSION, *dim'-en-shun* (Lat. *dimensio*), in Geom., signifies the extent of anything. A line, whether straight or curved, has only one dimension,—length; a surface has two dimensions,—length and breadth; while a solid has three,—length, breadth, and thickness. All forms of extension can be determined by these three dimensions. In Alg., the term dimension is applied to the number of true factors to a term, and is used very much in the same sense as *degree*; thus, $x^2$, $xy$, are of two dimensions; $x^3$, $x^2y$, $xyz$, &c., are of three dimensions. An equation is generally said to be of as many dimensions as there are units in the index of the highest power of the unknown quantity.

DIMINISHED, *dim-in'-ishd* (from Lat. *di*, and *minuo*, I make less).—In Mus., when an interval, by the application of a sharp or natural to the lower tone, or of a flat or natural to the upper, becomes contracted within its natural space or compass, it is said to be *diminished*: thus, by raising a minor seventh a minor semitone higher, a diminished seventh is produced.

DIMINUTION, *dim-in-u'-shun* (Lat. *diminutio*).—This term in Mus. implies the imitation of, or reply to, any given subject in notes of half the length or value of those of the subject itself. For instance, a theme expressed in minims and crotchets, and taken up in crotchets and quavers, would be said to be answered in *diminution*.

DIMINUTIVE, *dim-in'-u-tiv* (Lat. *diminutivus*, from *diminuo*, I lessen), in Gram., is applied to a word whose signification is lessened or diminished by some change effected upon its form. Though diminutives are chiefly

confined to substantives, yet we occasionally find them among adjectives, pronouns, and even verbs. The diminutive does not always express littleness or smallness, but sometimes, also, tenderness, affection, contempt, &c. They are usually formed by the addition of a syllable at the end of a word. There is, perhaps, no language without diminutives; certainly, they are very common in most. Generally, they will be found to be most common in the language of a people of lively and affectionate manners, and prevail most in the friendly and familiar intercourse of the common people. The Italian language, particularly the Tuscan dialect, is especially rich in diminutives. The Spanish, Portuguese, French, and German languages likewise abound with them. The old Scotch dialect is very rich in diminutives, and there we sometimes find, as in the Italian, double diminutives; as, *horsie*, a little horse; *horsikie*, a very little horse.

DIMISSORY LETTERS, *dim'-is-sur-re*, in the early Christian Church were, at first, letters granted to Christians on their removal from one place to another; but, afterwards, the name came to be more strictly applied to letters granted to the clergy when they were to remove from their own diocese and settle in another, testifying that they had the bishop's leave to depart. "No clergyman, of whatever degree," says the council of Trullo, "shall be entertained in another church without the dimissory letters of his own bishop." In the Church of England, dimissory letters are such as are given by a bishop to a candidate for holy orders, having a title in his diocese, directed to some other bishop, and giving leave for the bearer to be ordained by him. Persons inferior to bishops cannot, in ordinary cases, grant these letters.

DIMITY, *dim'-e-te* (Du. *diemit*), a stout cotton cloth of a thick texture, generally striped, or otherwise ornamented in the loom. It is mostly white; but variegated dimities are frequently made, the pattern and the ground being of different colours. The figure or stripe is raised on one side and lowered on the other, so that the two sides present reversed patterns. Dimity is chiefly used for articles of female dress, and for bed-furniture or window-curtains.

DIMORPHISM, *di-mor'-fizm* (Gr. *dis*, twice; *morphe*, form), in Chem., the property possessed by certain bodies of assuming crystalline forms which cannot be derived from each other. Instances of this occur in the case of sulphur, which crystallizes as oblique prisms and as octahedra, according as it is crystallized by heat or from the solution in bisulphide of carbon.

DINGO, *ding'-go* (*Canis Dingo*), the native dog of Australia, regarded by some naturalists as a distinct species, but more generally as the descendant of a race once domesticated, and returned to its wild state. It is found in Australia both in a wild and tamed state; the tame dingo being about the size of our familiar sheep-dog, and the wild one somewhat larger. The latter has a large head, with a fuller muzzle than the sheep-dog; ears short and erect; tail bushy; colour tawny. It does not bark, and is very destructive to the sheep of the colonists; not so much on account of the amount of meat required for the satisfaction of its hunger, as from its savage habit of continuing to strangle as many sheep as its strength will allow before it squats down to pick a bit of one.

DINORNIS, *di-nor'-nis* (Gr. *deinos*, wonderful or terrible; *ornis*, a bird), a gen. of large birds of the tribe *Brevipennes*. No species of the dinornis now exists, but many bones belonging to birds of this class have been found in New Zealand, not only in the most recent deposits, but in the sand by the sea-shore, in caves, in swamps, in the soil of forests and in river-beds. Among the natives there are many traditional reports about these birds, which were called *moa*. Other large birds, such as the palapteryx and the aptornis, are also spoken of by them. It would appear that the dinornis became extinct at the end of the 17th or the beginning of the 18th century. According to the traditions of the natives, these birds must have had brilliantly-coloured plumage, and their flesh was a delicate food. For these two reasons they were objects of pursuit. They are described also as being fat and stupid, unable to fly, and living in the mountains or in the depths of forests, feeding entirely on vegetable food. The bones of the dinornis have been closely



examined by comparative anatomists, and the description of the natives coincides with the inferences drawn. The dinornis must have been considerably larger than any bird now existing; some of the bones found are twice as large as those of the ostrich. The body must have been very bulky, and somewhat similar to that of the extinct dodo. The *Dinornis giganteus* must have been nearly eleven feet high. The bones of the legs are massive, and remarkably solid in structure. The number of bones of the dinornis that have been found is very great. Several species have been recognised, and some skeletons have been nearly completely restored. The first bone examined by a naturalist was a leg-bone, and the naturalist was Professor Owen. From that bone alone he placed the dinornis in its correct place in the system of nature.

DINOSAURIA, *di-no-saw'-re-ă* (Gr. *deinos*, wonderful or terrible; *sauros*, a lizard), a term applied to distinguish an order of extinct lizards found as fossils in the lias, oolite, and wealden formations. There, are, however, no traces of them in the lower cretaceous strata. The dinosauria were enormous reptiles of the lizard class, which approached nearer to the mammal type than any other of their order. Four powerful limbs supported their bodies, and the sacrum was composed of five vertebræ amalgamated. The Megalosaurus, the Iguanodon, and the Hylæosaurus are the principal gen. of the order.

DINOTHERIUM, *di-no-the'-re-um* (Gr. *deinos*, wonderful or terrible; *therion*, a wild beast), an extinct



DINOTHERIUM (RESTORED).

animal, whose cranial bones are found in the miocene formations of Germany, France, &c. Like the elephant, this remarkable animal was provided with a pair of formidable tusks, which projected downwards from the lower jaw. It was also provided on each side of its jaws with five double-ridged grinders. From the largeness of the nasal cavity, it is supposed that the animal had a trunk like the elephant. As none of the body or limb bones of the dinotherium have been found, its true position in the system of nature is not accurately determined. Cuvier and Kamp have referred it to the same class with the tapir.



SKULL OF DINOTHERIUM.

DIOCESE, *dī'-o-seez* (Gr. *dioikesis*, administration), was originally applied, under Constantine the Great,

to those larger civil divisions of the empire, each of which was under a prefect, and comprised several provinces, which were under rectors. The government of the Church was adapted to this division, and each diocese was under the spiritual superintendence of an archbishop, the term parish being applied to the charge of a bishop. Now the term diocese is equivalent to bishopric, and denotes the district over which the authority of a bishop extends. (*See* BISHOPRIC.)

DIODON, *dī'-o-don* (Gr. *dis*, twice; *odous*, tooth), a Linnæan gen. of fishes, now giving its name to a fam.—*Diodontidæ*. These fishes are about two feet in length, of a nearly spherical form, and possess the power of inflating or contracting themselves at pleasure. When their stomachs are thus distended with air, there are displayed over the entire surface numerous spines, as though to protect its now somewhat unwieldy body from attack. It is, doubtless, this latter circumstance that has procured for the fish the titles of sea-porcupine and globe-fish. When inflated, the globe-fish is incapable of swimming, but floats with the stream. They are found in warm seas. The sun-fish is of this family.

DIONÆA, *di-o-nē'-a* (from Dioni, one of the names of Venus), in Bot., a gen. of plants belonging to the nat. ord. *Droseraceæ*. The only species known is *D. muscipula*, a native of North America. This plant affords a remarkable instance of vegetable irritability. The leaf is two-lobed, and each lobe is furnished on its upper surface with three stiff hairs, which, on being touched by an insect or any other object, cause the two halves to collapse and inclose the object. This plant, which is commonly known as Venus's fly-trap, is sometimes cultivated in our stoves.

DIOPSIS, *di-op'-sis*, a gen. of dipterous insects, remarkable for the length of the pedicles on which the eyes are situated. On this account it is likewise termed the telescope-fly. All the species are found in warm parts of the old world.

DIOPTRICS, *di-op'-triks* (Gr. *dioptrikos*).—That portion of geometrical optics which treats of the passage of rays of light from one medium to another of a different kind. (*See* REFRACTION, OPTICS.)

DIORAMA, *di-o-rām'-ā* (Gr. *dia*, through; *orao*, I see), a method of painting and scenic exhibition invented by two French artists, Daguerre and Bouton. It does not possess all the advantages of a panorama, but produces a far greater degree of optical delusion. The peculiar effects of the diorama arise more particularly from the contrivances employed in exhibiting the sinting. In the first place the picture is viewed through a proscenium; the room in which the spectators are is almost in darkness; and the light, which is admitted through coloured glass, falls upon the picture alone. It is principally used to illustrate architectural and interior views. By means of slides and shutters the light can be increased or diminished at will, and hence very pleasant effects can be represented; such as the ordinary change from daylight to sunshine, and from sunshine to cloudy weather or twilight. The diorama was first exhibited in Paris in 1822, and in London in 1823. It was at first very popular, a large building being erected for its exhibition in Regent's Park. At first successful, it soon became unpopular, and the building is now used as a Baptist chapel.

DIOSCOREA, *di-os-kor'-e-ā*, in Bot., the typical gen. of the nat. ord. *Dioscoreaceæ*. Various species, as *D. alata*, *sativa*, and *aculeata*, produce the tubers called yams, which, when boiled, are eaten in tropical countries as the potato is eaten in Europe. The Chinese yam is now cultivated in this country, and is much esteemed by many as an esculent.

DIOSCOREACEÆ, *di-os-kor-e-ā'-se-e*, in Bot., the Yam family, a nat. ord. of monocotyledonous plants in the sub-class *Dictyogenæ*, consisting of shrubby plants with twining stems rising from tuberous root-stocks, or tubers placed above or under the ground, and having net-veined leaves, and small-spiked bracteated flowers. They are natives chiefly of tropical countries, a few only being found in temperate regions. They are generally characterized by great acridity, though farinaceous matter adapted for food exists in the tubers of many species. (*See* DIOSCOREA, TAMUS, TESTUDINARIA.)

DIOSMEÆ, *di-oz'-me-e* (Gr. *dios*, divine; *osme*, smell), in Bot., a sub-ord. of the *Rutaceæ* (which *see*).

DIOSPYROS, *di-os'-pi-ros*, in Bot., a gen. of dicotyledonous trees, belonging to the nat. ord. *Ebenaceæ*. Many of the species have hard and dark-coloured heart-woods, which constitute the different kinds of ebony; thus, *D. Ebenum* furnishes Mauritius ebony; *D. melanoxylon*, a native of the Coromandel coast, the sort commonly known as black ebony; and *D. Ebenaster*, the bastard ebony of Ceylon. The beautifully variegated furniture-wood called Coromandel or Calamander wood, is obtained from *D. hirsuta*, and is brought to Europe from Ceylon. Other species also yield valuable timber. The fruit of *D. Kaki* is eaten in China and Japan, and is known in the latter country as the keg-fig. The fruit of *D. virginiana*, a native of the United States, is sweet and edible when quite ripe, but very austere before then; hence it is frequently employed medicinally in its unripe state as an astringent.

DIP, *dip* (Ang.-Sax), in Min., a miner's and geologist's term for the direction of any mineral vein or stratum in relation to the horizon.

DIP, in Geol., the technical term for the angle at which strata slope downwards into the earth. This angle is measured from the plane of the horizon, and may be readily ascertained by the common spirit-level and plummet, or, as is usual among geologists, by a small pocket instrument called the *clinometer* (which *see*). To describe the opposite of *dip*, the term *rise* is used; and, as every bed that dips in one direction must necessarily rise in another, either term may be used according to the position of the observer. For instance, a bed of coal which is spoken of by those on the surface as dipping to the south, would be described by the miners in the pit as rising to the north. The place where each bed rises to the surface of the ground is called its *outcrop* or *basset*. Miners say that such and such beds "crop out" to the surface, and speak of their "basset edges." The line at right angles to the dip, that is, the line of outcrop of a bed along a level surface, is called its *strike*, a term introduced from the German by Professor Sedgwick. On geological maps the direction of the dip is generally indicated by an arrow, and the line of outcrop, or strike of a stratum, by a bold line.

DIPHTHERIA, or DIPHTHERITIS, *dif-the'-re-ā* (Fr. *diphtherite*, from Gr. *diphthera*, a skin or membrane), is a very malignant and fatal disease of the throat, which has recently made its appearance, and differs from all other forms of sore throat previously known. It was first observed and described by M. Bretonneau, of Tours, in France, where it prevailed as an epidemic in 1818. It subsequently broke out in other French towns, and in 1857 it made its appearance in England, where it has since been, unfortunately, by no means rare, and has already caused a large amount of mortality. It is characterized by a peculiar inflammation of the mucous membrane of the throat, or pharynx, accompanied by the production of a false membrane. At first this membrane appears in the form of a white spot on the pharynx or tonsils, from which it gradually extends forwards to the soft palate and into the nostrils, and backwards into the œsophagus, sometimes into the larynx, but seldom into the trachea, producing at length suffocation. It is usually accompanied by a fœtid discharge from the nose and mouth, and hæmorrhage frequently occurs. There is usually, also, a low and dangerous form of fever, with great depression of spirits and rapid decrease of the patient's strength, which is still further accelerated by his inability to take food. Various modes of treatment have been recommended. The patient's strength is to be supported by means of tonics and stimulants. Quinine is generally recommended; and in most cases wine may be given with advantage. In the local treatment of the throat, nitrate of silver and chlorine are used. There can be little doubt that this disease is owing, in some measure, to the neglect of sanitary measures, and it is generally believed to be contagious, though some medical men deny both of these statements.

DIPHTHONG, *dif'-thong* (Gr. *diphthoggos*, a double sound), in Gram., is a double vowel, or two vowels pronounced together or in rapid succession, so as to make only one syllable. Diphthongs, with relation to sight, are distinguished from those with reference to sound: as an instance of the former, we have *mouse*; of the latter, *mind*. Many double vowels, however,

are not real diphthongs, because the sound of only one of the vowals is heard; as in *bread, field*.

DIPLOMA, *dip-lō'-ma* (Gr. from *diplos*, double), originally denoted any charter, letter, or other composition, written on parchment and folded. Afterwards it came to be applied to a letter or writing of a sovereign, conferring some title or dignity, or granting some privilege or immunity. The term is now commonly applied to a letter or instrument duly signed and given by a university or other learned society, in proof of the holder having a certain degree, or licensing him to practise a certain art.

DIPLOMACY, *dip-lō'-mā-se* (Gr. *diploma*), is the art of conducting the official intercourse of separate states, and particularly of negotiating treaties. The term is of recent origin, having only come into general use since the beginning of the present century, and is not to be found in Johnson's Dictionary. The art itself is very ancient, and must have originated when people began to form themselves into distinct nations. In the earliest periods of history we read of heralds or messengers employed in carrying messages from one king or state to another, though regular and permanent embassies at foreign courts do not seem to have been maintained by any nation previous to the 16th century. The subject has usually been treated under the head of Law of Nations; but in reality the two are quite distinct. The diplomatist requires undoubtedly to be acquainted with international law, and to observe its general conditions; but otherwise his sphere of operations is distinct and independent of it. Besides attending to the larger operations connected with treaties or alliances, the diplomatist has to keep a vigilant eye on the minor details of international law, to see that these are equitably administered; in which sense he is like a "law-agent, whose duty it is to see that his client receives justice at the hands of other nations under this code." It is, perhaps, worthy of notice that the term is frequently used in ordinary conversation to denote a certain degree of underhand cunning; and conduct which is wily and subtle, without being directly false or fraudulent, is styled diplomatic. It is generally in weak states that the science of diplomacy has flourished most. It owes its first marked development as a science to the Italian republics, who, exposed as they were to the attacks of great military monarchies, cultivated diplomacy with peculiar care. Their politicians, conspicuous among whom was Machiavelli, became celebrated for their unrivalled skill in the science; and it was long the practice of the greater states of Europe to employ Italians in negotiation, on account of their supposed peculiar aptitude for the subtleties of the profession. Italian diplomacy was in general profound, cautious, and unscrupulous. It occupied itself much in forming combinations and alliances, and sometimes did not disdain to bribe, steal, forge, or even to murder, in order to accomplish its objects. The origin of modern diplomacy is usually traced to the reign of Henry IV. of France (1589—1610), a monarch who was all his life surrounded by singularly delicate and difficult complications, and who was privileged to have about him remarkably able statesmen and negotiators, pre-eminent among whom was the famous Sully. Cardinal Richelieu (1624-42) continued the foreign policy of France on the method of Henry IV., and is generally regarded as the founder of the present system of maintaining permanent legations at foreign courts. It was during his administration that French began to supersede Latin as the language of diplomacy in Europe. Diplomacy greatly enlarged its field of action in the 17th century, and the ambitious and warlike policy of Louis XIV. exercised a marked influence upon the character of the diplomacy of his times. Artifices unknown to primitive diplomacy were freely resorted to, such as secret and separate articles in treaties; and it has been suspected that even sham treaties were promulgated, to mislead or blind the general public. During the period from the treaty of Utrecht (1713) to the beginning of the French revolution (1789), the diplomacy of Europe assumed an aspect very different from that of the preceding century. The nations were exhausted by continued wars, and sought rather to cultivate the arts of peace, and industry and commerce were





greatly extended. This extension of commerce, particularly to distant parts, as America, Africa, and the West Indies, led to improvements and a remodelling of one branch of the diplomatic service,—the consular. The French revolution and the long series of wars that succeeded it wrought a great change in the character of diplomacy, by raising up gigantic combinations against Napoleon and against the revolutionary spirit of the times. In 1815 the monarchs of the great continental states sought to strengthen themselves against revolution by forming what was termed the Holy Alliance, which, in reality, was merely a combination among the several members to aid each other in suppressing any attempts that might be made in favour of constitutional principles within the dominions of any member of the league. The last event that called forth much diplomatic skill was the late war with Russia, which was both ushered in and succeeded by a large amount of diplomacy. According to the Baron de Martens, whose work is still the chief authority on this subject, diplomacy is at the same time one of the most important and one of the most difficult branches of human knowledge. The fate of a nation depends very much, in the present state of the world, upon its relations with others; and these, again, are materially influenced and determined by its diplomacy. The diverse and ever-changing relations subsisting between different states, dependent upon their character and constitution, their power, real or presumed, their alliances, discords, the vicissitudes of events, &c., all come under consideration in diplomacy. From history, from treaties, and from diplomatic correspondence, much, indeed, may be learned; but these are not all. The same events may, indeed, reproduce themselves at different epochs, and the same subjects may come up for discussion; but a diversity of incidents, sudden and unforeseen events, the difference of manners, of interests and views, and the character of the actors, may so completely and suddenly change the aspect of affairs, that the same subjects may present, when least expected, a striking dissemblance, and the example which had been chosen may cease to furnish a line of conduct. The determining motives can only be seen from a full and entire knowledge of all the circumstances of the case; and the diplomatist must also have a forethought to the events more or less probable by which these may be modified or changed. The branches of knowledge which the diplomatist ought to be specially versed in, as given by De Martens, are as follows:—1. The natural law of nations, and public law in general, which supply the fundamental maxims of all positive legislation in political matters. 2. The positive law of European nations, which is founded on treaties and usages which modify fundamental maxims, and regulate the relations of the different nations, both in war and peace. 3. The public law of the principal states of Europe, which is founded on the laws of each particular state. 4. History and its subsidiary branches, particularly the history of wars, of negotiations, and treaties, which serve to make known the progress and tendency of cabinets. 5. The various political means that may be brought into operation; as concession, retention, confederation, and the like. 6. Political economy, which shows how social wealth, independence, and organisation form, distribute, and perfect themselves. 7. The geography and statistics of the separate states. 8. The conduct of negotiations, or the course to be followed in treating of the interests of different states; and 9. The art of composing diplomatic dispatches. Diplomatic agents in Europe rank, according to the congress of Vienna, as follows:—1. ambassadors; 2. envoys extraordinary and ministers plenipotentiary; 3. ministers resident; 4. chargés d'affaires; 5. secretaries of legations and attachés: the last, however, have no precise diplomatic character, and are only by courtesy considered as attached to the legations. The duties, rights, and privileges of these several agents will be noticed under their own heads in other parts of this work. The secretary of state for foreign affairs is in this country the official organ and adviser of the crown in all communications with foreign powers. He negotiates all treaties, leagues, and alliances with foreign states, either directly with the foreign ministers residents in this country, or through the British am-

bassadors abroad.—*Ref.* Baron C. de Martens, *Le Guide Diplomatique*, 1857.

DIPLOMATICS, *dip-lo-mät'-iks*, which is not to be confounded with the above, is the science of *diplomas*,—of deciphering ancient writings, and judging of their character, value, date, &c. The most ancient diplomas that we possess do not extend beyond the 5th century of our era, when parchment seems first to have come into general use, the material commonly used prior to that time being the leaves of the Egyptian papyrus. It is only since the middle of the 17th century that diplomatics has been raised to the dignity of a science, and its importance recognized as one of the chief sources of historical knowledge. The first who attempted to reduce it to a system was the Jesuit Papebroek, of Antwerp, who, about 1675, published a work on this subject, entitled "Propylæum." He was succeeded by John Mabillon, whose able and learned work, "De Re Diplomatica," first appeared at Paris in 1681. After him came Maffei, the Italian, whose work, "Istoria Diplomatica," was published at Mantua in 1727. The most learned and elaborate work on this subject, however, and which has been of immense service to subsequent labourers in this field, is the "Nouveau Traité de Diplomatique," by MM. Toussaint and Tassin, two Benedictine monks of St. Maur, 6 vols. 4to, Paris, 1750-65, with 100 plates. Diplomatics was reduced to a systematic form by Gatterer, in his "Elementa Artis Diplomaticæ" (1765), and afterwards in his "Abriss der Diplomatik" (1798). A more able work, however, was Schoenemann's "Versuch eines vollständigen Systems der Diplomatik," 2 vols. (Hamb. 1800-1). Among the more recent works on this subject are Kopp's "Palæographia Critica," 4 vols. (Manh. 1817-20); and Pertz's "Schrifttafeln" (Hanover, 1846). In order to distinguish the authentic from the counterfeit, and to be able to say to what period a diploma belongs, it is necessary to observe all its external marks and characters, the form in which it is made up, the parchment on which it is written, and the ink that has been used. It is not difficult for those who apply themselves to this study to distinguish the parchment as well as the ink of the ancients, from that of the moderns; but that which best distinguishes the original from the counterfeit is the writing or character itself, which is so different at different times, that one skilled in the science can generally tell with certainty, within forty or fifty years, when any diploma was written. All diplomas are written in Latin, and consequently the letters and characters have a general resemblance to each other; but there are certain strokes of the pen that distinguish not only the ages but the different nations among which they have been produced. The successive corruptions of the Latin tongue, the style and orthography of each age, as well as their different titles and forms; the abbreviations, accentuations, and punctuation, and the different methods of writing the diphthongs, all these form so many marks and characters by which the authenticity of a diploma is to be judged. Attention to these minute points is the more necessary, as some of the monks and priests were very expert at making counterfeits, and frequently enjoyed the confidence of princes and statesmen, being sometimes even intrusted with their rings and seals. The signature of the diploma consists either of the sign of the cross, or of a monogram or cipher, composed of the letters of the names of those who subscribed it. The initial letters of the name, and sometimes also the titles, were placed about this cross. By degrees, the custom changed, and they invented other marks. They sometimes added also the date and epoch of the signature, the feasts of the church, days of the calendar, &c. The seal annexed to a diploma was anciently of white wax, and artfully imprinted on the parchment itself. It was afterwards pendent from the paper, and inclosed in a box or case, which they called *Bulla*. There are some also that are stamped on metal, and even on pure gold.

DIPLOTAXIA, *dip-lo-tak'-se-a* (Gr. *diplos*, double), in Bot., a kind of fruit resembling the ordinary capsule in every respect, except that it is inferior. It is the only inferior fruit which presents a dry dehiscent epicarp. Examples are seen in the campanulas.

DIPPEL'S OIL, *dip'-pels*, in Chem.—The dry distillation of bones yields a substance known to chemists as





*Dippel's animal oil*, which contains an immense number of bases of great interest. It is often called *bone-oil*.

DIPPER (*Cinclus*), a gen. of birds of the Thrush fam., the British representative of which is the common dipper, or water-ousel. This bird is rather smaller than the thrush, of a dark-brown colour, with throat and upper parts pure white. The facility with which the dipper dives and pursues its prey beneath the water is very remarkable. It has been remarked that when it wades deeper than the knee, it displays its wings, and hangs them down. It was related by an eye-witness to Buffon, that this bird, when at the bottom of the water, appeared enveloped with air, which gave it a brilliant surface, like some kinds of beetles, which, when immersed in water, are always inclosed in a bubble of air. Its object in drooping its wings on entering the water may be to confine the air. The dipper builds a very curious nest, composed of moss, domed, and with an entrance at the side: the site chosen is generally the bank of a stream, or sometimes under a cascade.

DIPPING-NEEDLE, *dip'-ping*.—This instrument consists of a frame in which a graduated circle is fixed in a vertical position. The frame itself moves on a graduated circle in a horizontal position, fixed on a small tripod that can be adjusted by means of levelling-screws. The needle is suspended on two knife-edges of agate, fixed in the frame exactly in the centre of the vertical circle, and moves freely in any direction in a vertical plane. When the vertical plane in which the needle moves coincides with that of the magnetic meridian of any place, the needle inclines from a horizontal position, and forms an angle with the horizontal line. This angle of inclination is called the dip of the needle. The dip varies like the angle of declination at different parts of the earth's surface, and at the same place at different periods. It also varies at different heights above the earth's surface. In 1576, when this property of the needle was first discovered by Robert Norman, the depression of the north end was about 71° 50′; in 1723 it had increased to 74° 42′; but at present it is about 68° 30′. When the plane of the needle is at right angles to the vertical plane of the magnetic meridian, the needle assumes a vertical position; but when it is in the plane of that meridian, the dip is the least. When the needle is in a vertical position, it gives us the means of determining the magnetic meridian by moving the vernier attached to the horizontal circle of the instrument over the space of 90°, which brings the vertical circle and needle into the plane of the magnetic meridian, and causes the latter to serve the purpose of a declination-needle.

DIPSACACEÆ, *dip-sä-kai'-se-e* (probably from Gr. *dipsao*, I thirst), in Bot., the Teazel fam., a nat. ord. of dicotyledonous plants in the sub-class *Corollifloræ*, consisting of herbs and undershrubs with opposite or verticillate leaves, and capitate or verticillate flowers surrounded by a many-leaved involucre. They are chiefly natives of the south of Europe, the Levant, and the Cape of Good Hope. Some are reputed to possess astringent and febrifugal properties, but as remedial agents they are altogether unimportant. One very useful plant belongs to the order, namely *Dipsacus Fullonum*, the fuller's teazel, the dried heads of which have long been employed for dressing cloth. Their hooked bracts are just stiff enough to raise the nap, but too yielding to tear the stuff.

DIPSOMANIA, or OINOMANIA, *dip-so-mai'-ne-ä* (Gr. *dipsa*, thirst; *oinos*, wine; *mania*, madness), a term recently applied to an inordinate or insane craving for alcoholic stimulants. Lately medical men have come to the opinion that the inveterate drunkard is to be regarded as habitually under the influence of an insane impulse which it is impossible for him to resist, and which, therefore, renders him a fit subject for confinement or restraint. In 1844 the English lunacy commissioners urged the justice as well as the expediency of the confinement of habitual drunkards in our lunatic asylums, and this view has found many advocates.

DIPTERA, *dip'-ter-ä* (Gr. *dipteros*, two-winged), an ord. of insects, having for their most conspicuous character only two wings, corresponding to the anterior pair of four-winged insects. They are also distinguished by having two clubbed appendages, called *halteres* or

balancers, which seem to be the rudiments of two posterior wings. In ordinary language the diptera are called flies, usually with some characteristic prefix; such as the housefly, blow-fly, &c. The term fly, however, is often applied to insects which do not belong to the diptera; as butterfly, dragon-fly, May-fly, &c. Mosquitoes, gnats, and midges belong to the diptera. It is one of the most extensive of the orders of insects, and some of the species are remarkable for the extraordinary numbers in which they appear. The larvæ of the order have frequently a membranous head, and always have the stigmata, or breathing-pores, confined to the second and terminal segments of the body. Dipterous insects are also distinguished by having the mouth in the form of a sucker, composed of from two to six lancet-shaped elongated scales, inclosing a canal upon the upper surface of the tongue or proboscis.

DIPTERACEÆ, *dip-ter-ai'-se-e*, in Bot., the Sumatra camphor fam., a nat. ord. of dicotyledons, in the subclass *Thalamifloræ*, consisting of large trees, with simple alternate involute leaves and large deciduous convolute stipules. The flowers are perfect and symmetrical, being composed as follows:—Calyx and corolla each with five divisions; the former unequal, permanent, imbricated in æstivation, and ultimately enlarged so as to form wing-like expansions crowning the fruit; the latter with equal petals, and twisted in æstivation. Stamens hypogynous, numerous, with beaked anthers. The fruit is 1-celled and 1-seeded; seed without albumen; radicle superior. The plants of this order are all natives of the forests of the tropical East Indies, with the exception of the genus *Lophira*, which belongs to tropical Africa. This genus has been placed in an order by itself, called *Lophiraceæ*, by some botanists. The useful products of the order are oleo-resinous substances. (*See* DIPTEROCARPUS, DRYOBALANOPS, VATERIA.)

DIPTEROCARPUS, *dip-ter-o-kar'-pus* (Gr., double-winged carpel), in Bot., a gen. of plants belonging to the nat. ord. *Dipteraceæ*. Several species, as *D. turbinatus*, *costatus*, *alatus*, and *incanus*, yield an oleo-resinous substance, called wood-oil or Gurjun balsam, which resembles in its properties the so-called balsam of copaiba, and which is used for similar purposes. In India wood-oil has been employed for painting houses.

DIPTERYX, *dip'-ter-ix*, in Bot., a gen. of plants belonging to the nat. ord. *Leguminosæ*, sub-ord. *Papilionaceæ*. The seeds of *D. odorata*, a native of Guiana, have a very powerful and agreeable odour, which is due to the presence of a volatile oil containing coumarin. They are used for scenting snuff and in perfumery, and are commonly called Tonquin or Tonka beans.

DITOTE, *dip'-tote* (Gr. *dis*, twice; *ptpto*, I fall), in Gram., is applied to a noun that has only two cases.

DIPTYCH, *dip'-tik* (Gr. *diptuchon*, folded together), properly signifies something folded, and was originally used in the same sense as diploma. Diptychs, however, were usually tablets of metal, ivory, or wood, of equal size, fastened together by a hinge or ring, and were frequently beautifully carved on the outside. They were early in use among the Greeks and Romans, and were also common in the early Christian Church, where they were used as registers. The ecclesiastical diptychs were of three kinds;—the *diptycha mortuorum*, in which the names of all such as had died in the odour of sanctity were enrolled; *diptycha vivorum*, containing the names of such as were still alive and deserved well of the church; and the *diptycha episcoporum*, containing the names of distinguished bishops. Portions of these were read during the celebration of the mass; and it was also the custom in some churches for the deacon to rehearse from these books the names of eminent bishops, saints, or martyrs, before they made oblation for the dead. The names of those excommunicated were erased from the diptychs, and again restored on their readmission into the church.

DIRÆ. (*See* vol. I. of this work.)

DIRECT and RETROGRADE, *di'-rekt ret'-ro-graid* (Lat. *directus*, *retro*, backwards, and *gradus*, a step), in Astron., when the motion of any heavenly body is from west to east, or in the direction and order of the signs of the zodiac, it is said to be direct; when the motion is in the contrary direction, or from east to west, it is said to be retrograde. The motion of all the heavenly bodies, except some of the comets, is direct. The apparent motion of the heavens is retrograde, because the earth's motion is direct. By the astronomers of the 15th and 16th centuries, bodies in direct motion were said to move in *antecedentia*, and those in retrograde motion, *in consequentia*.

DIRECT, in Mus., a certain character placed at the end of a staff to indicate to the performer the situation of the first note on the succeeding staff, and is for this purpose always situated on that line or space in its own staff which corresponds with the line or space occupied by the note which it is intended to announce in the other.

DIRECTOR, *di-rek'-tor* (Lat. *dirigo*, I make straight), in general, is one who has the chief management of a scheme, design, or undertaking. More particularly, he is one of a number of persons chosen by a plurality of votes from among the body of proprietors to conduct the affairs of some joint-stock undertaking, as a bank, railway, assurance company, or the like. In most cases, the directors are required to be possessed of a certain amount of stock, and frequently also they are allowed a small *honorarium* for their services. The whole of the directors, collectively, form the board of directors; and they are generally invested with certain powers by the acts of the legislature to which they owe their existence. In the case of banks there are usually two kinds of directors,—ordinary and extraordinary; the former for seeing to the ordinary business of the concern; the latter attending only on particular occasions. The office of a director is one of no small risk and responsibility, and several stringent enactments have recently been passed regarding it. Act 20 & 21 Vict. c. 54, declares any person being a director, public officer, or manager of a company, who shall make, circulate, or publish, or concur in making, circulating, or publishing, any written statement or account which he shall know to be false in any material particular, with intent to deceive any member, shareholder, or creditor, of such body or company; or with intent to induce any person to become a shareholder or partner therein, or to intrust or advance any money or property to such body or company, or to enter into any security for the benefit thereof, shall be guilty of a misdemeanor, and liable to penal servitude for three years. Directors generally have the superintendence and management of all the affairs of the company, except in such matters as require the approval of the general body of the proprietors. A portion of the directors usually retire annually by rotation, and their successors are nominated at a general meeting of the proprietors. Directors elect their own chairman, and may also delegate their powers to committees. The presence of a certain number of the directors, called a *quorum*, is necessary before any business can be transacted. They are required to keep minutes of all their meetings, and of all the business transacted at these meetings, such minutes being signed by the chairman, and received as evidence of what took place. By Act 19 & 20 Vict. c. 47, regarding joint-stock companies, it is declared that if the directors shall declare a dividend when the company is known by them to be insolvent, or a dividend, the payment of which would render it insolvent, they shall be jointly and severally liable for the debts of the company that may be then existing, or that shall be thereafter contracted, so long as they may remain in office, provided the amount for which they shall be so liable shall not exceed the amount of the dividend declared.

DIRECTORY, *di-rek'-tor-e*, in the first French revolution, is the name given to the highest governing body to whom the executive authority was committed by the constitution of the year III. (1795). It was composed of five members, the first of whom were Barras, Rewbel, Lepeaux, Letourneur, and Carnot. They ruled in connection with the two legislative chambers, called the Council of Ancients and Council of Five Hundred. By the revolution of the 18th Brumaire (1799), this body and the constitution of the year III. were abolished, and the consulate established.

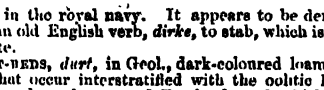
DIRECTORY, a kind of regulation for the performance of public worship, drawn up by the Assembly of Divines in England, at the instance of the parliament, in 1644. It was designed to supply the place of the Liturgy, or Book of Common Prayer, the use of which the parlia-

ment had abolished. It consisted of some general heads, which were to be managed and filled up at discretion, for it prescribed no form of prayer or circumstances of external worship, nor obliged the people to any responses excepting Amen. It forbids all salutation and civil ceremony in the churches. The reading of Scripture in the congregation is declared to be part of the pastoral office. All the canonical books of the Old and New Testaments (but none of the Apocrypha) are to be publicly read in the vulgar tongue. It prescribes heads for the prayer before sermon; and it delivers rules for the management of the sermon. The introduction to the text must be short and clear, drawn from the words or context, or some parallel place of Scripture. In dividing the text, the minister is to regard the order of the matter more than that of the words; he is not to burden the memory of his audience with too many divisions, nor perplex their understandings with logical phrases and terms of art; he is not to start unnecessary objections, and he is to be very sparing in citations from ecclesiastical or other human writers, ancient or modern. It recommends the use of the Lord's Prayer as the most perfect model of devotion. It forbids private or lay persons to administer baptism, and enjoins it to be performed in the face of the congregation. It orders the communion-table at the Lord's Supper to be so placed that the communicants may sit about it, and the dead are to be buried without any prayers or religious ceremony. It also orders that the sabbath be kept strictly, both publicly and privately; that days of fasting or thanksgiving are to be observed, as may be deemed necessary; but that all festivals are to be abolished, and no day kept but the Lord's-day. It also asserts that the singing of psalms together in the congregation is the duty of Christians, and that no place is capable of any holiness in consequence of consecration. The use of the Directory was enforced by an ordinance of the Lords and Commons at Westminster, which was repeated in 1645, and a fine imposed upon such ministers as should read any other form than that imposed by the Directory. The king, in return, by a proclamation dated from Oxford in the same year, forbade the use of the Directory, and enjoined the continuance of the Liturgy. The Scottish parliament and the General Assembly of the Church of Scotland adopted the Directory. Many of its regulations are still complied with in that church, and it is usually appended to the *Confession of Faith*. It may be seen at length either there or at the end of Neale's "History of the Puritans."

DIRECT TAXATION. (*See* TAXATION.)

DIRGE, *durj*, an abbreviation of *dirige*, the first word of the *antiphona* "Dirige Domine Deus," chanted in the funeral service of the Roman Catholic church. It is now used to express a solemn and mournful composition performed at funerals.

DIRK, *durk* (Scot. *durk*), the name of a short dagger or pomard, now applied to the little weapon worn by



DIRK.

cadets in the royal navy. It appears to be derived from an old English verb, *dirke*, to stab, which is now obsolete.

DIRT-BEDS, *durt*, in Geol., dark-coloured loam-like beds that occur interstratified with the oolitic limestones and sandstones of Portland, and which are evidently the soils in which the cycads and zamias of the period grew. Stumps of trees in an erect position, with their roots extending beneath them, have been found in these strata.

DIS, *dis* (Lat.), a prefix or inseparable preposition, derived from the Latin, whence the French *des*. It signifies a separation or parting from, and has thus the force of a privative or negative in meaning; as in the words *dis-able*, *dis-oblige*, &c. In some cases it still signifies separation; as in *dis-connect*.

DISABILITY, *dis-ă-bil'-e-te* (Lat. *dis*, and *habilis*, able), is the incapacity of a person to do any legal act. It is said to be absolute when it wholly disables a person,—as outlawry, excommunication, attainder, alienage; or partial,—as infancy coverture, idiotcy, lunacy, drunkenness, and the like. Disability is ordinarily said to arise in four ways:—(1) By the act of the ancestor; (2) by the act of the party himself; (3) by the act of law; and (4) by the act of God.

DISAFFOREST, or DEAFFOREST, *dis'-ăf-for-est*, in Law, is to discharge from being a forest; to reduce from the privileges of a forest to the state of common ground.

DISBAR, *dis-bar'*, in Law, is to expel from the bar; to degrade a barrister from his rank or position. In England this power is vested in the benchers of the four inns of court; but it is rarely exercised except in very flagrant cases.

DISC, *disk* (Lat. *discus*), in Bot., a term now applied to whatever intervenes between the stamens and the ovary upon the thalamus. It presents great variety of forms: thus in the Orange it forms a fleshy ring, surrounding the base of the pistil; in the Tree Pæony, a dark-red cup-shaped expansion, covering nearly the whole of the pistil except the stigmas; in the Rose, a sort of waxy lining to the tube of the calyx; in umbelliferous plants, a swelling on the top of the ovaries, adhering to the styles. In other cases, the disc is reduced to little separate glandular bodies, as in cruciferous plants; or to scales, as in the Vine; or to various petaloid expansions, as in the Aquilegia.

DISC, the surface of a circular plate of metal or other substance. A thin circular plate of any substance.

DISCHARGE, *dis-tsharj'* (Fr. *décharger*), in Mil., the term applied to the release of a non-commissioned officer or private from the duties which he has voluntarily undertaken for a certain number of years at the time of his enlistment. When the end of the time for which he has agreed to serve has arrived, he can legally claim his discharge; but, should he desire to leave the regiment before his period of service has ended, he must obtain the permission of his commanding officer to do so, and pay a certain sum in compensation for the loss of his services. This sum is generally about £20; but, if he be a skilled artisan in the engineers or artillery, he may have to pay as much as £35 or £40. When a soldier is discharged for misconduct, he is degraded in the presence of the whole regiment, by having his stripes, buttons, and facings torn from his uniform, and he is then "drummed out" of the service. At the time of his discharge, every soldier receives a certificate, signed by the commanding officer of the regiment, stating his character and the time for which he has served.

DISCHARGING-ROD, *dis-tsharj'-ing*, an instrument much used in electricity for discharging Leyden jars without partaking of the shock. The jointed discharging-rod is that most generally employed. It consists of two brass wires, terminated by two brass balls. The wires are jointed at the middle, and are attached to a glass handle. With this instrument it is easy to discharge a jar or battery, by bringing one ball in contact with the exterior, and the other with some part of the interior. The glass handle, as an insulator, forms a protection from all the effects which take place in the restoration of electrical equilibrium.



DISCHARGING-ROD.

DISCIPLE, *dis-i'-pl* (Lat. *discipulus*, from *disco*, I learn), strictly means one who learns anything from another; and hence the followers of any teacher, philosopher, or head of a sect, came to be called his disciples. In this sense it is sometimes used in Scripture; as when we read of the disciples of Moses, of John, of Christ. Generally, however, it is used with reference to the last of these,—the followers of Jesus. Sometimes all who received the doctrines of Christ are called disciples; but, in a more limited sense, it is applied to the seventy or seventy-two persons that were his more immediate followers and attendants. Sometimes it is used as synonymous with apostles, and applied to the twelve.

DISCIPLINA ARCANI, *dis-e-pli-nă ar-kai-ni* (Lat., discipline of the secret), in Eccl. Hist., is the name given to a system that prevailed in the early primitive church, of concealing from unbelievers, and even from catechumens, certain parts of their worship, and especi-

ally the sacraments. Even ministers, when lpd in their public discourses to speak of the sacraments or the higher doctrines of faith, contented themselves with remote allusions, adding, "the initiated know what is meant." It is difficult to account for the introduction of a system so contrary to the spirit of Christianity. Neander supposes that it took its rise in the church of Alexandria, whence it extended first to the Eastern and afterwards to the Western churches. It appears to have been gradually established after the 2nd century, and is supposed to have reached its perfection during the 4th.

DISCIPLINE, *dis'-ip-lin* (Lat. *disciplina*), signifies literally instruction, cultivation, improvement; but it is applied figuratively to a rule or order of government; a particular mode of life, in accordance with the rules of some profession or society; also chastisement or correction, bodily punishment or mortification. In military matters it denotes obedience to and exercise of the laws and regulations of the service. In ecclesiastical affairs it is the putting in force of the laws instituted by any particular church to preserve its unity, purity, and usefulness. At an early period of the Church, it consisted in depriving the offender of all the privileges and benefits of baptism, by turning him out of the society and communion of the church. The offender was first solemnly admonished once or twice, before he was cut off from the communion, or expelled from the church. The person was then held to be excommunicate; the faithful shunned and avoided him, partly to establish the church's censures, partly to make him ashamed, and partly also to secure themselves from the danger of being corrupted. They were readmitted to the church by what is called public penance; by renouncing their former errors and vices, and submitting to the imposition of certain penalties, or to a certain course of discipline called *pœnitentia*, the purpose of which was not so much to punish as to serve as an evidence of repentance.

DISCIPLINE, BOOKS OF, in the Eccl. Hist. of Scotland, are certain documents drawn up and published for the direction and guidance of the reformed church in that country. The first Book of Discipline was drawn up, at the request of the General Assembly of 1560, by John Knox and other eminent Scottish reformers of the time, approved by the General Assembly, and subscribed by the majority of the nobles and inferior barons and gentry composing the privy council of the kingdom. It was characterized by a vigorous exercise of ecclesiastical discipline against all offenders; for, say they, "the kirk of God can neither be brought to purity, nor yet be retained in the same, without the order of ecclesiastical discipline, which stands in reproving and correcting the faults which the civil sword doth not or may not punish." In this matter they followed the example of the early Christian church; for they justly regarded the relaxation of discipline under the papacy as one great cause of its universal corruption. It is also worthy of remark, as showing the advanced views of the authors of this document, that it takes special notice of the subject of education, viewing it as necessarily connected with religion. It lays it down as imperatively necessary that there should be a school in every parish, for the instruction of youth in the principles of religion, grammar, and the Latin tongue; and it further proposed that a college should be erected in every "notable town," in which logic and rhetoric should be taught, along with the learned languages; for "the rich and potent may not be permitted to suffer their children to spend their youth in vain idleness, as heretofore they have done; but they must be exhorted, and, by the censure of the church, compelled to dedicate their sons, by [training them up in] good exercise, to the profit of the kirk and commonwealth; and that they must do of their own expenses, because they are able. The children of the poor must be supported and sustained on the charge of the kirk." The Second Book of Discipline was adopted by the General Assembly in 1578, and, though never formally ratified by act of parliament, it is still regarded as the standard work on matters of order and administration by Scotch Presbyterians. It was prepared at a time when much controversy was carried on between the Church and the State; and it begins by laying down the essential line of distinction between the two powers. The civil power appertains to the civil government of the commonwealth; the ecclesiastical power flows immediately from God and the Mediator Jesus Christ, and is spiritual, not having a temporal head upon earth. Civil authority has for its object the promoting of external peace and quietness among the subjects; ecclesiastical authority, the direction of men in matters of religion and which pertain to conscience. The former enforces obedience by external means, the latter by spiritual means; and as they be both of God, and tend to one end, they ought to co-operate within their respective spheres, and fortify one another. There are three kinds of church officers,—ministers, who preach and rule; elders, who are merely rulers; and deacons, who act as distributors of alms and managers of the funds of the church. The office-bearers are to be admitted by election and ordination, and none are to be intruded contrary to the will of the congregation to which they are to be appointed. The document, says Dr. McCrie, "is a form of ecclesiastical polity, whose practical utility has been proportioned to the purity in which its principles have been maintained. Accordingly, it has secured the cordial and lasting attachment of the people of Scotland. . . . And the principal secessions which have been made from the national church in this part of the kingdom have been stated not in the way of dissent from its constitution, as in England, but in opposition to departures, real or alleged, from its original and genuine principles." (*Life of Melville.*)—*Ref.* Hetherington's *History of the Church of Scotland.*

DISCIPLINE, MILITARY AND NAVAL, a general term applied to the rules for regulating the behaviour of soldiers and sailors. Discipline is maintained and directed by the War-office and the Admiralty; and the Articles of War and the Mutiny Act are the principal grounds upon which they act. In practice, the adjutant maintains regimental discipline; and the adjutant-general is in relation to the whole army what the adjutant is to his regiment. The regimental adjutant superintends the drill and field movements, inspects the guards, escorts, &c., receives garrison orders, keeps regimental books, &c. The military discipline of volunteer regiments is maintained by adjutants appointed by the War-office.

DISCLAIMER, *dis-klaim'-er* (Lat. negative *dis*; *clamo*, I call for), in Law, is a plea in which a party in a suit disclaims or denies all interest in the matter in question. It is more particularly applied to the denial by an alleged tenant of his tenancy, which operates as a forfeiture of the lands to the lord, if he succeed in proving his tenancy.

DISCONTENT, *dis'-kon-tent* (Lat. *dis*, and *contentus*, content), is dissatisfaction with our present condition, and is not only a source of wretchedness to the individual himself, but of annoyance to all with whom he may be brought into contact. It is generally owing, not so much to the actual circumstances of the individual as to a bad condition of mind, leading him to contrast his condition with that of those whom he regards as placed in more favoured circumstances than himself, without considering the many points in which he is more favoured than others. Discontent frequently springs not so much from actual ills, as from a dread of those which are expected. But, as pleasures are rarely so great in actual enjoyment as in anticipation, it is the same with evils. All experience testifies to the truth of the Christian maxim, that "sufficient for the day is the evil thereof," while every one's past history must furnish him with instances of what at the time he regarded as evils, but which eventually turned out for good.

DISCONTINUANCE, *dis'-kon-tin'-u-ans* (Lat. *dis*, and *continuus*, continual), in Law, is an interruption or cessation of the course of a thing; as a discontinuance of possession, of a plea, of a process, &c. Discontinuance as to real property consists in keeping out the true owner of an estate by a tenant whose entry was at first lawful, but who wrongfully detains the possession afterwards. A rule to discontinue at common law is obtained by a plaintiff when he finds that he has misconceived his action, or that from some defect in the pleadings, or other reason, he will not be able to

maintain it. It is not necessary for that purpose to obtain the defendant's consent, but the plaintiff must undertake to pay the costs.

Discords, *dis'-kords* (Fr. *discorde*), in Mus., a dissonant or inharmonious combination of sounds, so called in contradistinction to *concord*, the effects of which it is intended to sweeten and relieve. Some require to be introduced by certain preparatives, and to be succeeded or resolved by concords to which they have some relation. *Discords* are sometimes intentionally introduced into music, not for themselves alone, but to set off the concords by contrast and opposition. Their necessity in the composition of part music cannot be denied, as they not only improve the concords by opposition, but by causing a momentary distress to the ear, which remains unsatisfied and even uneasy until it hears something better, they give a stimulus to the attention, which would otherwise languish.

Discordant, *dis-kord'-ánt*.—All dissonant or inharmonious sounds, whether successive or simultaneous, are thus called.

Discount, *dis'-kownt* (Sp. *descontar*), is an allowance made on a bill, or any other debt not yet become due, in consideration of present payment. It is usual in commercial dealings to allow for discount a sum equal to the interest on the debt from the time of payment to the time when it actually becomes due, which sum is deducted from the whole amount. This mode of calculation, though generally adopted, is not strictly correct; for it is evident that in this way the discounter receives more than he is actually entitled to. Thus, if a bill for £100 due twelve months hence be discounted at the rate of 5 per cent., the holder only receives a present payment of £95, which, by being lent out at 5 per cent., will in twelve months only produce £4. 15*s.* 2½*d.*, which is the true discount on the bill. The person who, at the end of twelve months, receives £100 for an advance of £95, actually receives of interest £5. 5*s.* 3*d.* per cent. The rate of discount varies according to the demand for money and the character or credit of the parties subscribing to the bill. The rate of discount upon good bills is usually from 3 to 4 per cent. When merchandise is purchased at a fixed term of credit, the discount allowed for payment before the expiry of that term is usually considerably above the current rate of interest, as the creditor is thus insured against the insolvency of the debtor. The depreciation in value of any fixed investment is also called discount. Thus, if the market value of a railway share on which £100 had been paid is only £90, it is said to be at a discount of 10 per cent.

Discourse, *dis-korse'* (Lat. *discursus*, from *dis*, and *curro*, I run), in Log., is an operation of the mind, whereby it passes or proceeds from one thing to another,—from a thing known to one unknown, and is thus synonymous with reasoning (which *see*). In Rhet. it is used in the same sense as an oration,—a series of sentences and arguments arranged in a regular manner, with a view to carry conviction to the minds of those to whom it is addressed. It is also sometimes applied to the familiar talk or conversation of an individual.

Discovery, *dis-kuv'-e-re* (Fr. *découvrir*, to discover), in Law, is the act of disclosing or revealing any matter. Till recently, the courts of common law had no power to compel a litigant before them to disclose any fact resting merely within his knowledge, or to discover any document in his power or possession. This defect has been remedied by recent enactments; and it is now competent for litigants, and they may be compelled to give evidence on the trial of such action, the credibility of which evidence to be decided by a jury. The judges may also, on application by either of the litigants, compel the opposite party to allow the applicant to inspect all documents in his custody or under his control relative to such action or proceeding.

Discretion, *dis-kresh'-un* (Lat. *discretio*, a separating), is that kind of prudence or discernment which enables a person to judge critically of what is correct and proper in certain circumstances, particularly as regards his own conduct. In Law, discretion is the power or faculty of discerning between right and wrong. "There are," says Addison, "many more shining qualities in the mind of man, but there are none so useful as discretion. It is this, indeed, which gives a value to all the rest; which sets them at work in their proper times and places, and turns them to the advantage of the person who is possessed of them." "Discretion is the perfection of reason, and a guide to us in all the duties of life." It "points out the noblest ends to us, and pursues the most proper and laudable methods of attaining them."

Discus, *dis'-kus* (Gr. *diskos*), a quoit used by the ancients. It was generally a heavy circular piece of iron, sometimes perforated in the middle. The discus was not thrown at a mark, but the players endeavoured who could throw it the farthest. The practice of throwing the discus is mentioned by Homer as being one of the sports at the funeral of Patroclus. In the Cabinet of Antiquities at Paris, a discus is preserved which contains holes for the insertion of the thumb and fingers. In the well-known statue of Discobolus throwing the discus, in the British Museum, one of the methods of using it may be seen.

Discussion, *dis-kus'-shun* (Lat. *discutio*), in Scots Law, denoted the doing diligence by a debtor against the principal creditor before coming against his cautioners or sureties, which was necessary to be done, unless the latter bound themselves as principals, or renounced the benefit of discussion. By the Mercantile Law Amendment Act (19 & 20 Vict. c. 60), the right of discussion was abolished, and can now only be enjoyed by express stipulations, or in the case of cautioners bound prior to the passing of that act.

Discussion, *dis-kus'-shun* (Lat. *discussio*, a shaking off), in Lit., denotes the clear treating or handling of any particular point or problem, so as to shake off the difficulties with which it is embarrassed. Thus we say such a point was well discussed when it was properly treated and cleared up. (*See* Conversation, Debate.)

Discutient, *dis-ku'-te-ent* (Lat. *discutio*, I destroy), in Med., are remedies that discuss or disperse morbid matter.

Disease, *diz-zeze'* (Ang.-Sax.), is a departure from the state of health in which the due balance between the several parts or properties of the animal frame is maintained. It is "a changed condition or proportion, in function or structure, in one or more parts of the body." Diseases of function are deviations from a standard furnished by physiology, and diseases of structure a departure from a standard supplied by anatomy. These, however, are usually combined; for there is seldom structural disease without some disorder of function; and in many instances functional diseases are, or ultimately will be, accompanied by change of structure. The causes of disease may be either intrinsic, existing within the body, or independent of any obvious external influence; or they may be extrinsic, having their origin without the body. The latter embrace all the external agencies that can operate either on body or mind; as temperature, air, food, poison, sensual impressions, and the like. Causes of disease, however, are often present without disease ensuing, some frames being less susceptible to particular causes of disease than others. Hence physicians distinguish two kinds of causes,—predisposing and exciting; the former being circumstances which so influence the functions or structures of the body as to render it unusually susceptible to the influence of particular exciting causes,—that is, of such circumstances and agents as seem to more immediately operate in producing disease, especially when in a state of predisposition. The predisposing causes of disease are said to be,—(1) Debilitating influences; (2) excitement; (3) previous disease; (4) present disease; (5) hereditary constitution; (6) temperament; (7) age; (8) sex; (9) occupation. The exciting causes are so termed because the diseases seldom make their appearance unless they have been present; and hence they have come to be regarded in the light of excitements to it. They are divided into cognizable and non-cognizable agents; the former comprehending those physical and mental influences of whose existence we can take cognizance independently of their operation in producing disease; the latter such as elude our senses, and whose existence we only infer from their morbific effects. The cognizable agents are,—(1) Mechanical influences; (2) chemical influences; (3) ingesta; (4) bodily exertion; (5) mental emotion; (6) excessive evacuation; (7) suppressed or

defective evacuation; (8) defective cleanliness, ventilation, or drainage; (9) excesses and changes of temperature. The noncognizable agents are endemic, epidemic, and infectious poisons, and are sometimes termed zymotic (Gr. *zuma*, a ferment). The classification and arrangement of diseases according to their external characters is termed Nosology; and that branch of science which more particularly regards the nature and progress of disease with a view to its cure, is called Pathology. (*See* Nosology, Pathology.)—*Ref.* Williams's *Principles of Medicine*.

Disfranchise. (*See* Franchise.)

Dishonour of a Bill, *dis-hon'-or* (Lat. *dis*, and *honor*), is when the person on whom a bill is drawn declines to accept it or to pay it when it becomes due. In such a case it is necessary for the holder, or person in whose favour the bill is drawn, to give notice to the drawer and indorsers of the dishonour of the bill within a reasonable time, so as to preserve his recourse against them.

Disinfectants, *dis-in-fek'-tănts* (Lat. *dis*; Fr. *infecter*, to infect).—Disinfectants are substances which, by combining with deleterious gases or emanations, decompose them and render them harmless. The most powerful disinfectant known is chlorine, which is generally employed for this purpose in the form of chloride of lime. Another powerful disinfectant is permanganate of potash, which acts by yielding up an equivalent of nascent oxygen. It is known in commerce as "Condy's disinfecting fluid." Carbolic acid in solution is also a powerful means of getting rid of noxious vapours. To the constant use of these and other disinfectants by the different boards of health throughout the country may be attributed the great decrease of fever and other contagious disorders amongst the poor.

Disintegration, *dis-in-te-grai'-shun* (Lat. *dis*, *integer*), the act of separating the integrant parts of a substance, as distinguished from decomposition, or the separation of constituent parts. Disintegration refers more particularly to the mechanical diffusion of a substance; decomposition, to the chemical division.

Disjunctive Conjunction. (*See* Conjunction.)

Disjunctive Proposition, *dis-junk'-tiv* (from Lat. *dis*, and *jungo*, I join), in Log., is a proposition compounded of two or more categorical propositions, so stated as to imply that one of them must be true. In such a case we proceed either by asserting the truth of one member of the division, and thence inferring the falsity of all the rest, which is called the *modus ponens*; or else by asserting the falsity of all the members but one, and hence inferring the truth of that one, which is called the *modus tollens*.

Dislocation, *dis-lo-kai'-shun* (Lat. *disloco*, I put out of place), is the displacement out of their natural position of bones articulated together or forming a joint. It is usually occasioned by external violence; but may also, in some cases, result from diseases of the joint. Dislocation is either complete or incomplete; being incomplete when the articular surfaces remain partially in contact, and complete when there is an entire separation. It is simple when there is no wound and the skin remains unbroken; compound, when there is a wound, by means of which the external air may communicate with the joint. When, besides the dislocation, there are fractures of the bones or laceration of important organs, then it is termed a complicated dislocation. Dislocations are named either from the joint or from the bone that is chiefly displaced; and various terms are likewise employed to indicate the direction; as upward, downward, forward, backward, &c. Nearly all the bones of the human body are liable to displacement; but some are much more so than others; as those of the shoulder, hip, elbow, ankle, &c. Generally, those joints are the most liable to dislocation that admit of the greatest extent of motion. Dislocation is in most cases easily observable; but in some parts it is extremely difficult of detection. It is attended with loss of power and motion in the part, with more or less of swelling and pain, which is increased on moving the part; the patient feels sick and faint, and there is a sensation of numbness in the part. Dislocations should be reduced as soon as possible after their occurrence; for the longer it is delayed, the more difficult will be the operation. In a short time the patient recovers from the shock of the accident; the muscles, which were at first relaxed, resume their former rigidity, and render the reduction much more difficult. Dislocations are reduced by pulling gently, yet firmly and steadily, for some minutes, until the muscles are fatigued, and the head of the bone brought down below the level of the joint, when, by being gently lifted over the edge of the socket, it falls into its place, upon the extending force being slightly relaxed. The force required is often very considerable, and sometimes it is necessary to have recourse to a block and pulleys, in which case the body is securely fixed by proper bandages to a staple in the wall, or other sufficient support. In order to overcome the violent contraction of the muscles, it was sometimes necessary formerly to weaken the patient by bloodletting, emetics, &c.; but latterly chloroform has been most commonly resorted to for this purpose. After reduction it is necessary that the joint be kept in a state of perfect rest for some time, in order to allow the ruptured ligaments to unite; otherwise the accident will ever afterwards be liable to recur. When a dislocation has been left unreduced, the parts come to adapt themselves to their new situation; a new socket is formed for the head of the bone displaced, the old socket becoming absorbed or filled up. Compound dislocations are generally attended with danger, and, when occurring in the large joints, are usually fatal, or require amputation. The displaced bones should be replaced without delay, and with as little violence or disturbance as possible, and the external wound closed. Sometimes, however, it is necessary to dilate the wound, in order to effect the reduction or to remove the detached pieces, if the end of the bone should have been shattered. If there is surrounding inflammation, leeches should be applied to the part.

Dislocation, in Geol. (*See* Fault.)

Dismes, *dis'-mes* (Lat. *decima*, or tenths), the name given to the tenth part of the yearly value of all spiritual benefices anciently paid to the pope, who claimed this tithe of the tithes on the principle that the Jewish high priest took tithes of the Levites. This was frequently a cause of dissatisfaction to the English kings, and led to frequent disputes with the papal power. At the time of the Reformation these were annexed to the crown; and in the reign of Queen Anne the tenths and first-fruits were granted for the augmentation of poor livings, under the name of Queen Anne's Bounty. (*See* Bounty, Queen Anne's.)

Dispatches, *dis-patsh'-es* (from Fr. *dépêcher*, to send away), a term applied to a letter, or packet of letters, sent with expedition by a messenger express. It is mostly used when referring to a letter or letters on some affair of state or public concern. Papers containing information sent by some public officer to the government on public business are always called dispatches.

Dispensary, *dis-pen'-să-re* (Lat. *dispensarium*, from *dispendo*, I distribute), denotes properly the shop or place in which medicines are made up and distributed, but is now more commonly applied to a charitable institution for supplying medical advice and medicines gratuitously to the poor. These valuable institutions are only of recent origin, but they are now to be met with in every town of any importance either in this country or on the continent. Attached to each are generally one or more physicians and surgeons, who, besides attending at the institution, visit at their own houses those that are too ill to attend personally. There is also a resident medical officer for dispensing the medicines. In most cases dispensaries are supported by voluntary contributions and a subscriber of a certain sum annually, or at once, becomes a governor, and is entitled to have one patient always on the books. "It would," says the English Cyclopædia, "be a great improvement in the principle of these institutions, if some contribution towards their support were required on the part of the poor themselves, which would enable the independent labourer, without asking charity, to procure the best advice for his sick family at a much cheaper rate than he can possibly do at present."

Dispensation, *dis-pen-sai'-shun* (Lat. *dispensatio*), properly signifies distribution, or the act of dealing out to different places or things. In Theol., it is

applied to the dealings of God with his creatures, particularly in some unusual or extraordinary way. In some cases it has reference to those providential ordinations by which the world was prepared for the gospels. Sometimes it has reference to the system of principles or rites enjoined by divine authority; as, the Mosaic dispensation, the Christian dispensation.

DISPENSATION, in ecclesiastical matters, is a relaxation of the law, or a dispensing with obedience to it in certain cases, granted by one who has the power to do so. The pope, as being above the law, claimed to have the power of dispensing with obedience to it in such cases as he thought fit,—a power which was at one time frequently exercised, and led to great irregularities. By 25 Hen. VIII. c. 21, the power of granting dispensations as previously exercised by the pope was transferred to the archbishop of Canterbury, but with the following important restrictions:—(1) That nothing be repugnant to the law of God, for king or subject; (2) that nothing be against the statute 21 Hen. VIII. against pluralities of benefices; (3) nor against the king's prerogative, or laws or statutes of the realm; and (4) that he is limited to such as shall appear convenient and necessary, upon examination of the causes and qualities of the income. Hence it is that the archbishop has authority to grant special licenses for the celebration of marriage, and for clergymen to hold pluralities.

DISPENSATORY, *dis-pen'-sā-to-re*, is a book containing the method of preparing the various kinds of medicine used in pharmacy. Almost every country in Europe, and many of the large cities, have their own dispensatories, which the apothecaries are bound to follow.

DISPERSION, *dis-per'-shun* (Lat. *dispergere*, from *dis*, a particle denoting separation, and *spargere*, to scatter), the term applied to the separation of a ray of white light into its several component coloured parts by refraction, through the instrumentality of a prism. (*See* PRISM.) When a ray of white light, or light from the sun, is allowed to enter a darkened room through a very small hole made for the purpose in the shutter by which the light is excluded from the apartment, and allowed to fall on a screen of white paper, conveniently fixed to receive it, it will cause a bright spot to appear on the screen, larger or smaller, in proportion to the distance of the screen from the window, and round or oval in shape, according as the ray falls on it at right angles to it, or at any angle which is not a right angle. If this ray be intercepted by placing one of the wedge-shaped edges, or angles formed by the meeting of any two of the planes that compose the sides of the prism, in the bright track of light passing from the hole to the screen, it will be refracted or bent, and the white light will be dispersed, or, in other words, decomposed and separated into its various component parts of coloured light. We are made aware of this by the change in the position and appearance of the spectrum, as the bright spot of light that falls on the screen is called. Its new position is considerably above or below the original one, according to the way in which the ray of light enters the apartment, which shows that the ray, instead of proceeding to the screen in a straight line as before, has become bent out of that direction in its passage, and the spectrum, if previously round, has now become oval, or, if oval, considerably elongated in form, and, instead of looking like a spot of uniform bright appearance, the luminous space is covered with horizontal bands of colours arranged in the following order,—red, orange, yellow, green, blue, indigo, violet. These colours appear in the order of their refrangibility or capability of refraction, some being subject to a greater degree of refraction than others; that of blue being greater than that of yellow, and yellow greater than red. The breadths of the spaces occupied by the different colours are not in the same ratio to each other for every kind of prism; that is to say, the ratio of the spaces occupied by the colours differs according to the kind of glass of which the prism is made, and the length of the spectrum also differs. This is called the irrationality of dispersion. The best method of trying the experiment of dispersion of light is to allow the sun's rays to enter the apartment through a long and very narrow slit, instead of through a circular hole, which will give a spectrum of greater breadth. In Optics the term is often applied to the reflection or scattering of rays of light from any polished and reflecting surface, such as a steel mirror or looking-glass.

DISPERSION OF MANKIND, is that event which took place at the building of the tower of Babel, in consequence of the confusion of tongues.

DISPONDEE, *dis-spon'-de* (Lat. *di* and *spondee*), in Greek and Latin poetry is a double spondee, or a foot consisting of four long syllables; as, *juramentum*.

DISPOSITION, *dis-po-zish'-un* (Lat. *dispositio*), in Log., is that operation of the mind whereby we put the ideas, propositions, or arguments which we have formed concerning a subject, in the order fittest to gain a clear knowledge of it, to retain it in the memory, or to explain it to others. In Rhet., it is the due placing or ranging the several parts of a speech or discourse. The logician is tied down to a certain prescribed form in his mode of reasoning, the rhetorician adopts that mode that seems most convenient for him. "A discourse," says Quintilian, "that wants disposition must necessarily be confused and without connection, liable to frequent tautologies and omissions, and, like one wandering in the dark, be conducted by chance rather than design." (*See* ORATORY.) Disposition likewise denotes a particular state of mind, distinguishing one individual from another, and inherent in the constitution.

DISPOSITION, in Sc. Law, is a deed of conveyance by which property, either heritable or movable, is conveyed or transferred from one party to another.

DISPUTATION, *dis-pu-tai'-shun* (Lat. *dis*, and *puto*, I think), is a discussion or contest, either by word or writing, on some unsettled question. (*See* DEBATE.)

DISQUISITION, *dis-kwe-zish'-un* (Lat. *dis*, and *quæro*, I seek), is a formal or systematic inquiry into the nature, kinds, or circumstances of any problem, question, or topic, by arguments, or by discussion of the facts and circumstances, in order to elucidate the truth, or to obtain clear notions regarding it.

DISRUPTION, *dis-rup'-tshun* (Lat. *dis*, and *rumpo*, I break), in the Eccl. Hist. of Scotland is applied to that act by which upwards of four hundred ministers of the established church left their churches and manses, in 1843, in vindication of their principles, and formed themselves into what has since been known as the Free Church. (*See* FREE CHURCH.)

DISSECTION, *dis-sek'-shun* (Lat. *dis*, and *seco*, I cut), is applied to the cutting or dividing of the different parts of the body in anatomy. (*See* ANATOMY.)

DISSEISIN, *dis-se'-zin*, in Law, is the unlawful dispossessing a man of his land or estate, or interrupting his seisin. (*See* SEISIN.)

DISSENTERS, *dis-sent'-ers* (Lat. *dis*, and *sentio*, I think), in Eccl. Hist., is the general name applied to all the religious sects in this country that differ from the established church, in doctrine, discipline, or mode of worship. The Roman Catholics and Jews, however, are not usually classed with dissenters. The origin of Protestant dissent from the Church of England is usually traced to the reign of Edward VI., when, by the Act of Uniformity, passed in that reign, dissent from the worship and ceremonies of the established church was rendered a penal offence. Dissenters became much more numerous in the reign of Elizabeth, and from their professing extraordinary purity in worship and conduct, they received the name of Puritans. During that and several of the succeeding reigns, a variety of laws were passed for the repression of dissent, of the most rigorous and oppressive character. During the rebellion the laws against Protestant dissenters were repealed; but they were revived at the Restoration, and the parliament of Charles II. proceeded to enforce, systematically, by new measures of rigour, the principle of universal conformity to the established church. By the Act of Uniformity (13 & 14 Car. II. c. 4), it was enacted that the Book of Common Prayer, as then recently revised, should be used in every parish church, and other place of public worship; and that every schoolmaster and person instructing youth should subscribe an acknowledgment, declaring that he would conform to the liturgy. By this statute, 2,000 of the clergy, who refused to comply with its requirements, were deprived of their preferments. The Corporation Act of 1661 excluded all dissenters from municipal appointments;

and the two Conventicle Acts, in 1664 and 1670, made it penal for five persons, in addition to the occupiers of a house, to assemble for religious worship. In 1665, the Five-mile Act imposed a penalty of £40 on every Nonconformist minister who came within five miles of any corporate town. In 1673, the Test Act excluded dissenters from all civil offices and military commands. The revolution of 1688 ushered in an era of more liberal measures for the dissenters. The Act of Toleration (1 Will. & Mary, c. 18) bestowed on Protestant dissenters full liberty of worship upon paying tithes and other dues, taking the oaths of allegiance and supremacy, and certifying their places of worship to the bishops or justices of the peace; dissenting ministers being also required to sign thirty-five and a half of the Articles of the established church. From that time, various statutes have been passed, extending a greater degree of freedom to dissenters; and in 1828 the Test and Corporation acts were abolished. The oldest of the dissenting bodies are the Presbyterians, Independents, Baptists, and Quakers. About the middle of last century sprang up the Methodists, followers of Wesley and Whitfield, who soon became very numerous, but are now divided into a number of different sects. According to the census of 1851, which, however, is confessedly imperfect, there were, in all, 34,167 places of worship, having, in all, 10,212,563 sittings, in England and Wales; of which 20,390, with 4,894,019 sittings, belonged to the several bodies of dissenters, including Roman Catholics and Jews. Of these, 161 places of worship, with 83,812 sittings, belonged to the Presbyterians; 3,244, with 1,067,760 sittings, to the Independents; 2,789, with 752,313 sittings, to the Baptists; 371, with 81,599 sittings, to the Quakers; 1,194, with 2,444,976 sittings, to the various sections of Methodists; 570, with 186,111 sittings, to the Roman Catholics; 229, with 68,554 sittings, to the Unitarians; 222, with 30,783 sittings, to the Latter-Day Saints; 32, with 7,437 sittings, to the Catholic and Apostolic Church; and 53, with 8,438 sittings, to the Jews. The most numerous body of dissenters in Scotland, is the Free Church, which seceded from the established church in 1843, and is nearly, if not quite, as numerous as the establishment. They, however, disclaim the name of dissenters, as they maintain that they do not dissent from the principles of the Church of Scotland, but came out in consequence of their adherence to them. Next to the Free, is what is termed the United Presbyterian Church, which originated in the secession of a considerable body of ministers and laymen from the established church in 1732. In 1847 this body became united with the Relief Church, a somewhat later secession, under the designation of the United Presbyterian Church. According to the census of 1851, the total number of places of worship in Scotland was 3,395, with 1,834,805 sittings; of which 1,183 places of worship and 767,080 sittings belonged to the established church. Of the rest, 889, with 495,335 sittings, belonged to the Free Church; 465, with 288,100 sittings, to the United Presbyterians; 192, with 76,342 sittings, to the Independents; 134, with 40,022 sittings, to the Episcopalians; 117, with 52,760 sittings, to the Roman Catholics; and 119, with 26,036 sittings, to the Baptists. The proportion of unoccupied sittings is largest in the established, and smallest in the Free Church. Dissent, at least as based upon any material point, is much less prevalent in Scotland than in England; the differences between the two principal sects of dissenters and the established church being mainly regarding the connection between church and state. In Ireland, exclusive of the Roman Catholics, the principal dissenters are the Presbyterians, who are mostly confined to the province of Ulster. A particular account of the different sects referred to in this article will be given under their own heads in other parts of this work.

DISSIDENTS, *dis'-so-dents* (Lat. *dissideo*, I disagree), is a term synonymous with our dissenters, and the term usually applied to certain sects in Poland who dissented from the Roman Catholic church, but who were yet allowed the free exercise of their own worship. Even during the lifetime of Luther, Protestant principles had made such progress in Poland that half the senate, and more than half of the nobility, had adopted the new faith. The compact of Sandomir in





1570 united the Lutherans, Calvinists, and Bohemian Brethren into one body (a union which had also a political tendency); and by the religious peace sworn to by the king in 1573, they obtained the same rights with the Roman Catholics. From dissensions among themselves, however, and the increasing power of the Catholic church, the dissidents by degrees lost most of their privileges, and in 1717 and 1718 they were deprived of their right of voting in the diet. In 1736, a the diet of Pacification, an old statute was revived which required that every king be of the Catholi church. After the accession of the last king, Stanislaus Poniatowski, the dissidents brought their grievances before the diet in 1766, and were supported b Russia, Prussia, and England; Russia in particular improved the opportunity to extend her influence in Poland, and succeeded by her mediation in bringing about a new convention in 1767, by which they were again placed on an equal footing with the Roman Catholics; the war, however, against the confederates breaking out, and the kingdom being dismembered, little was effected until 1775, when the dissidents regained all their privileges, except the right of being elected senators or ministers of state. Later events in that country have confirmed to the dissidents equal rights with the Roman Catholics. They include Lutherans, Calvinists, Greeks, and Arminians, but exclude Anabaptists, Socinians, and Quakers.

DISSOLUTION, *dis-so-lu'-shun* (Lat. *dissolutio*, from *dis*, and *solvo*, I set free), a term variously applied, but in its commonest and most general sense implying the separation of the parts of a body which in the natural condition are united. The state of being liquefied by heat or moisture is termed dissolution: thus, ice is changed from a solid into a fluid state by heat; metals, again, can undergo dissolution by the action of an acid menstruum. The separation of the soul from the body is termed dissolution, or, more generally, death. (*See* DEATH.) Dissolution of the blood, in Med., denotes that condition of the vital fluid in which it does not readily coagulate on its cooling, out of the body, as in the case of malignant fever. Shakspere gives a fair illustration of the application of the term:—"I am as subject to heat as butter; a man of continual *dissolution* and thaw."

DISSOLUTION OF MARRIAGE. (*See* DIVORCE.)

DISSOLUTION OF PARLIAMENT may be effected in three ways;—1. by the will of the sovereign, expressed either in person or by representation; 2. by the demise of the sovereign,—in which case, however, it is to continue in existence for six months after the demise, unless sooner prorogued or dissolved by the successor; and 3. by length of time, *i. e.* seven years. (*See* PARLIAMENT.)

DISSOLVING VIEW, *diz-zol'-ving* (Lat. *dissolvo*), pictures painted upon glass, and exhibited by means of the magic lantern (which *see*). After one picture has been exhibited, by removing the focus, or lessening the light, the effect is rendered less distinct; then by means of another magic lantern, or a lens, a fresh slide is gradually introduced, so that one picture blends with another almost unconsciously to the spectator. The exhibition of dissolving views is usually accompanied with music, and the tunes played become louder as the light increases, which is always when the new picture gains its full distinctness.

DISSONANCE, *dis'-so-nins* (Fr.), in Mus., a term used to denote the effect produced from the unison of two sounds not in concordance with each other. Thirds and sixths were anciently considered as dissonances; in fact, every chord except the perfect concord is dissonant. Formerly there was an unlimited number of dissonances, but they are at present reduced to a comparatively small number.

DISSYLLABLE, *dis'-sil-lă-bl* (Gr. *disullabos*), in Gram., is a word of two syllables; as, *goodness*, *beauty*.

DISTAFF, *dis'-tăff* (Sax. *distaf*), the staff of a spinning-wheel, to which a bunch of flax or tow is attached, and from which the thread is drawn. Before the introduction of machinery for the purpose of spinning threads, the distaff was much used, but it is now, except in very rare cases, superseded.

DISTAFF-DAY.—Formerly the day after Twelfth-day was termed St. Distaff's day, and was generally regarded as the termination of the Christmas sports.

Herrick, in his "Hesperides," thus quaintly describes the boisterous mirth that marked this season:—

"Partly worke, and partly playe,
You must on St. Distaff Day.
From the plough soone free your teame,
Then come home and fother them.
If the maides a spinning goe,
Burne the flax and fire the tow;
Scorch their plackets, but beware
That ye singe no maiden's haire.
Bring in pales of water, then
Let the maides bewash the men.
Give St. Distaff all the right,
Then bid Christmas-sport good night,
And next morrow, every one
To his own vocation."

**Distance**, *dis'-tăns* (Lat. *distare*), in Paint., an expression used to denote the utmost extent to which the power of vision can reach, or the limit of view. Extreme distance is the visible horizon of the observer, in which the land and sky appear to meet; and middle distance is that part which lies midway between the distance of the picture and the foreground.

**Distance**, in Horse-racing, is a length of 240 yards from the winning-post. At this point is a post with a gallery running round it, capable of holding three or four persons. It is called the distance-post. When a race is run, a man is stationed at the distance-post, and is provided with a small red flag, with which he can communicate with another man at the winning-post. When the winner passes, the man at the winning-post lowers his flag, and the man at the distance-post lowers his flag at the same time. If any horse has not then arrived at the distance-post, he is said to be "distanced," and incurs penalties accordingly.

**Distemper**, *dis-tem'-per* (Fr. *détrempe*), in Paint., the name given to the colouring matter used in scene-painting, and for printing and staining paper-hangings. A mixture is made of whitening and coarse size, in the proportion of ten parts of the former to one of the latter, to which the required colour is added when it has been diluted with a little water, and brought to a consistency resembling cream. Distemper colours dry very rapidly, and should be slightly warmed before they are used. This method is sometimes used in colouring the walls of houses externally, and the interior of rooms.

**Distemper**, a disease to which young dogs are liable. It is supposed to have been derived from France, and is considered to be a typhoid inflammation affecting the upper air-passages. It closely resembles the strangles of young horses, and the scarlatina and such-like diseases to which young children are liable. The disease is contagious, occurs generally only once in a lifetime, runs a definite course, and is accompanied by low fever and debility. Careful attention to nursing and diet constitutes the most successful treatment of this disorder. A dog with the distemper is easily recognized. The eyes become red, weak, and watery; the nose hot and dry; any movement in the air excites a cough or sneeze; and there is a general dulness, fever, and loss of appetite. The running from the nose, as the disease proceeds, becomes, after some days or weeks, mucous or purulent, loading the eyes and obstructing the nostrils. It then lodges in the bronchial tubes, preventing the free access of air and the purification of the blood. All dogs are subject to distemper; but highly-bred, delicate, and fancy dogs are most liable to the disease, and the mortality amongst them is the greatest. In the cure of distemper all irritating and reducing remedies must be avoided. If the stomach is overloaded, it should be relieved by a mild emetic; and if no effect is produced by the dose, it should be repeated in twenty minutes. To ward off distemper, young dogs should be very liberally and nutritiously fed. In such cases, in spite of all care, if they are attacked with distemper, they are almost certain to pass over it very favourably. Nothing proves the prophylactic effect of pure air and voluntary exercise more than that young hounds at their walks are seldom attacked by distemper. Dogs are liable to distemper more than once; but the repetition is of unusual occurrence. Inflammation of the lungs is often the consequence of distemper; and the bowels are always more or less affected by diarrhœa and dysenteric discharges, often indicating ulceration of the intestinal canal. Protracted cases of distemper are sometimes attended by a pustular eruption on the chest and abdomen, accompanied by an hepatic affection usually called "the yellow disease," from its giving the whole surface of the skin a yellowish colour. The symptoms in such cases are generally fatal. Distemper is communicated by contact of the diseased catarrhal secretion. Inoculation has been proposed as a mitigation of the disease; but it has been proved by Mr. Blaine that vaccination is inefficacious. (*See* Blaine's *Canine Pathology*, and *Rural Sports*, part iv. chap. iv.—Diseases of Dogs.)

**Distich**, *dis'-tik* (Gr. *distichon*, consisting of two rows), a couple of verses or poetic lines making complete sense. The term is principally applied to the hexameters and pentameters used among the Romans, especially by Ovid and Catullus. Among the Greeks and Romans the distich was used as a vehicle for the expression of definite sentiments, and especially for epigram. Goethe and Schiller, together with other great poets of Germany, have, in later years, shown a great predilection for the distich, and great skill in using it.

**Distillation**, *di-til-lā'-shun* (Lat. *distillo*, from *dis*, and *stillo*, I drop), the process of evaporating a fluid by means of heat, and afterwards condensing it into a liquid. Its object is to separate one substance from others with which it may be mixed; and the possibility as to whether a substance can be distilled depends upon the temperature at which it evaporates. In chemistry, distillation is performed by means of a retort or flask, and a receiver. It is, however, carried on in the most extensive scale for the production of ardent spirits. It is not known when distilled spirits were first made; but the discovery is usually attributed to the alchemists, who called it *aqua vitæ*. Originally spirits were distilled from wine; hence the common name of alcohol—spirits of wine. In the production of ardent spirits, there are two distinct operations: first, the conversion of some vegetable substance into alcohol; and second, the separation of the alcohol from the substances with which it is mixed. The latter operation is, properly speaking, distillation; although, in ordinary language, both are classed under that head. Sugar, and starch, which is easily converted into sugar, are the chief sources of alcohol. By the action of fermentation, sugar is converted into alcohol and carbonic acid; so that all substances containing sugar or starch will yield spirits after distillation. After the *wash*, or alcoholic mixture, has been formed, the process is continued in a still or alembic. When heated to 176°, the alcohol, mixed with steam, evaporates, and, passing through the worm of the still, is cooled and condensed, and trickles out in a liquid form into a receiver. Anhydrous alcohol cannot be obtained by distillation alone. Spirits of wine, or rectified spirit, contains as much as 25 per cent. of water. Taking water as 1000, the specific gravity of alcohol is 793. *Proof* spirit is the legal standard of strength established by the excise of Great Britain: its specific gravity is 918·6; it contains about equal parts of water and alcohol. The principal spirits obtained by distillation are,—brandy from wine, rum from molasses, and whiskey, gin, &c., from corn or malt. Among the Dutch the corn spirit is flavoured with juniper-leaves; hence the names gin, geneva, from the French *genièvre*, juniper. The Germans distil spirit from potatoes.

**Distillation, Destructive**, the process of heating vegetable and animal substances in closed vessels to such a temperature as to decompose them. The results of the decomposition are collected and obtained in various ways. When coal is subjected to destructive distillation, the results are gas, coke, tar, naphtha, &c.; when wood is thus distilled, the results are wood-spirit, wood-vinegar, charcoal, &c. The results of destructive distillation are mostly obtained by condensation.

**Distilled Water**, *dis-tild'*.—When water is subjected to the process of distillation, the result is a fluid without odour or colour, with an insipid taste. In this form it is called distilled water, and, if evaporated to dryness, ought to leave no residue. Distilled water, in its purest possible form, is absolutely necessary to the chemist in his laboratory. (*See* Water.)

DISTILLED WATER.—When aromatic plants are distilled along with water, the combined results are usually called distilled waters. Rose-water and lavender-water are examples of common occurrence.

DISTILLERY, *dis-till'-e-re*, the building or works where distillation is carried on. (*See* DISTILLATION, STILL.)

DISTORTION, *dis-tor'-shun* (Lat. *distortio*, from *distorqueo*, I twist), in Surg., is a permanent deviation from the natural shape or position of the body, producing visible deformity. Distortions may arise from various causes. They generally occur after birth, and thus differ from deformities, which are for the most part congenital. Distortions are frequently occasioned by affections of the muscles or nerves. It is well known that every movable part of the body is furnished with two sets of muscles acting in contrary directions, by means of which it is not only moved, but also retained in its natural position. Hence it is evident that if, by means of any injury to one of the sets of muscles, or of the nerves communicating with them, their contractility is destroyed or impaired, the part can no longer be maintained in its natural position, but will be drawn towards the antagonistic muscles. In this way various kinds of lameness, wry neck, squinting, &c., are produced. The most common cause of distortion, however, is disease of the bones. These are sometimes deficient in the earthy matter which gives them hardness and rigidity, and thus are incapable of supporting the weight of the parts which they are designed to bear, or of sustaining the muscular action, without becoming bent and distorted. From this arises the disease known as rickets (which *see*). The distortion known as the lateral curvature of the spine arises from weakness in the vertebral muscles, inducing a habit of resting the weight of the body more on one side than the other. Unlike rickets, which commence early, this does not usually make its appearance before the tenth year, and is most commonly found among slender and delicate females in the higher and middle ranks of life. It is generally occasioned by too much confinement and restraint, and is best got rid of by plenty of free exercise of the limbs in the open air. Angular curvature of the spine differs entirely from the above, and is occasioned, for the most part, by ulceration of the body of one or more of the vertebræ. The support in front being thus lost, the spine is bent sharply forwards, and one or more of the spinous processes project behind. Perfect rest in the horizontal position, issues and setons in the neighbourhood of the diseased bone, and attention to the general health, is the treatment to be adopted in this case. Diseases of a similar kind frequently occur in the bones and joints of other parts of the body, and require similar treatment. Distortions may also arise from a variety of other causes; as rheumatism, gout, burns, and various chronic and local affections; but these come more properly for consideration under their own heads.

DISTORTION, in Phot., a term applied to the unnatural increase in size of certain parts of the picture. Distortion arises from several causes; such as using too small a lens; not using a sufficiently large diaphragm or stop; by approaching the object too closely; or by the lens itself being improperly connected.

DISTRESS, *dis-tress'* (Lat. *districtio*), in Law, is the taking of a personal chattel out of the possession of a wrong-doer into the custody of the party injured, to procure satisfaction for the wrong committed. Distresses are either for some duty omitted, some default, or nonfeasance; or they are in respect of some wrongful act done by the distrainee. The most usual injury for which a distress is taken, is that of non-payment of rent. A lord may also distrain of common right for neglect to do suit to the lord's court, or other certain personal service. Distresses may also be taken where a man finds beasts of a stranger wandering in his grounds doing him hurt or damage; in which case the owner of the soil may distrain them while they are upon his grounds, till satisfaction be made to him for the injury he has sustained. As a general rule, all chattels personal are liable to be distrained, unless specially protected or exempted, as are all animals *feræ naturæ*; whatever is in the personal use or occupation of any man at the time; and things delivered to a person exercising a public trade, to be carried, wrought, or managed in the way of his trade. But,





generally speaking, whatever goods or chattels the landlord finds upon the premises, whether they, in fact, belong to the tenant or a stranger, are distrainable by him for rent, the stranger having his remedy by action on the case against the tenant. Fixtures, however, and things in the custody of the law, money (except in certain cases), and goods of a perishable nature, as fruits, milk, &c., are exempt from distraint; as are also beasts of the plough, and the instruments of a man's trade or profession, if there be sufficient property on the premises otherwise. A distress cannot be made in the night except in the case of cattle *damage feasant*, as otherwise they might escape. A landlord may distrain within six calendar months after the determination of the lease, provided his own title or interest, as well as the tenant's possession, continue at the time of the distress. In general the distress must be made on the premises; but goods fraudulently or clandestinely carried off may be distrained within thirty days thereafter, unless they have been *bonâ fide* sold for a valuable consideration. The landlord may not break open a house of which the rent is in arrear to make a distress; but when he is in the house, he may break open an inner door. Distresses must be proportioned to the thing distrained for, and an inventory of as many goods as are judged sufficient to cover the rent and expenses, must be made and served personally on the tenant, together with a notice of the fact of the distress having been made, and the time when the rent and charges must be paid, or the goods replevied. The landlord cannot sell the goods distrained before the expiry of five days; and prior to the sale, an appraisement must be made by two sworn appraisers of the value of the goods. After the sale, if there be any overplus after payment of the rent and expenses, it is to be handed over to the tenant. Cattle cannot be lawfully distrained if found trespassing through default of the occupier of the land by neglecting to repair his fences or to shut his gates, unless the owner of the cattle suffer them to remain after receiving notice of their trespass; neither can they be distrained if once off the land upon which they have been trespassing.

DISTRIBUTION, *dis-trib-u'-shun* (Lat. *distribuo*, I distribute), is the placing particular things in the places or compartments which have been already prepared to receive them. In Log., a term is said to be distributed when it is employed in its full extent, so as to comprehend everything to which it is applicable; to be spread, as it were, over the whole class, and applied to each object individually, not to all collectively. When a common term denotes fewer than all the objects of a class, it is said to be taken particularly, or to be undistributed.

DISTRIBUTION OF ANIMALS.—Certain tribes, genera, and species of animals are peculiar to certain portions of the globe. In some respects the distribution of animals resembles that of plants, and both these are dependent on meteorology. Thus, where vegetation is most abundant, animal life is most prolific. Plants are stimulated in their growth by heat and moisture; and as in tropical climates the heat and moisture are greatest, there also the animal formations are most abundant. As they decrease in a direction from the equator to the poles in perhaps a similar proportion, so do animals decrease, not only in the size of individuals, but in the number of species. This law affects vertebrate and invertebrate animals which inhabit the land, but is reversed in the case of those animals of higher organization which inhabit the sea. The latter are found to increase in a direction from the equator to the poles. The distribution of animals is also limited in many cases by the intervention of seas or lofty ranges of mountains; but animals, like plants, are adapted to particular climatic conditions, and, like them, are subject to fixed laws. Man can endure the scorching heat of the tropic zone and the intense cold of the Arctic circle. The dog, however, is the only vertebrate animal that can accompany him. Many animals cannot exist except in a determined climate. The lion and tiger would soon die in an arctic climate, and a polar bear could not exist at the tropics. In continents, animal and vegetable life decrease in proportion as the observer recedes from the coast. Certain species of animals remain shut up in a chain of mountains, and are unable to move to other similar

localities; for, as the temperature decreases with the elevation, before they could pass to another mountain-ridge they would have to traverse a region whose temperature would be much higher than that to which they are accustomed. The Himalayan Mountains thus present to the ascending traveller a succession of species similar to that met with in travelling from Brazil to Labrador, or from India to Kamtschatka.—*Ref.* Johnson's *Physical Atlas.*

DISTRIBUTION OF WEALTH. (*See* WEALTH, DISTRIBUTION OF.)

DISTRIBUTIONS, STATUTE OF, is the name given to statute 22 & 23 Car. II. c. 10, explained by 29 Car. II. c. 3, which regulates in England the division of the estate of a person dying intestate. It enacts, that after the expiration of one full year from the death of the intestate, one-third of the surplus of his personal estate shall go to the widow, and the remainder be divided in equal proportions among the children. If there be no children, then the widow is to have one half, and the other half to be divided among the nearest of kin; if no widow, then the whole to go to the children; and if neither widow nor children, then the whole to be distributed among the next of kin.

DISTRICT, *dis'-trikt* (Lat. *districtus*), in general language, a limited extent of country, or a circuit within which right or authority may be exercised. Military districts are portions of Great Britain which are set apart in order to assist military command and organization. Each district has its head-quarters at some particular town. The northern district of England has its head-quarters at Rotherham, the western at Plymouth, and the south-western at Portsmouth. London is the head-quarters of the rest of England, which is considered to be a military district. Edinburgh is the head-quarters of the Scottish district; and Ireland is divided into five districts, the head-quarters of which are Dublin, Cork, Limerick, Athlone, and Armagh.

DITCH, *ditsh* (Sax. *dic*), in Agr., a long trench cut by the sides of roads and fields, to carry off the surplus water that may fall on the surface. When land is drained by means of pipes, these discharge themselves into a ditch dug along the lowest side of the field. In flat low countries the fields are often separated by broad ditches, without any other kind of fence whatever. The banks of these are sometimes planted, and the field is entered through a gate placed on a bridge thrown across the ditch, and wide enough to admit of the passage of a cart. Where it is practicable to do so, the earth taken from the ditch is formed into a bank and planted with thorns, which in a few years form an impenetrable fence.

DITCH, in Mil., a broad and deep trench surrounding the rampart of any fortification. The rampart is generally formed of earth taken out of the ditch. The main ditch of a fortress is about 120 feet wide and 12 feet below the level of the ground. The sides are generally secured with revetments of masonry. The side immediately below the parapet is called the scarp of the ditch, and the side opposite to the scarp is called the counterscarp.

DITHIONIC ACID, *dith-e-on'-ik*, in Chem., $S_2O_5$; also called hyposulphuric acid,—the second of the *thionic* series of sulphuric and oxygen compounds, all of which contain five equivalents of the latter. It unites with transforming salts, generally known as *hyposulphates*, none of which are of any importance.

DITHYRAMBUS, *dith-e-ram'-bus* (Gr.), a surname of Bacchus. In ancient verse, the term was used to designate a species of lyric poetry, more particularly cultivated at Athens. It was distinguished by its wildness and enthusiasm, but in later years it degenerated into mere bombast. Originally the dithyrambus was a hymn sung in honour of the deity after which it was named. It was generally sung by a chorus of fifty, who danced in a circle as they sang round the blazing altar of the god. The song was at first rudely accompanied by flute-music, but afterwards Arion invented a regular choral form for it.

DITTO, *dit'-to* (Lat. *dictus*, said), a term in common use, signifying aforesaid, or the same thing. The derivation of the term is more directly from the Italian *detto*; it is used to save repetition, and is often contracted to the form *do.*





DITTY, *dit'-te*, a term derived from the Latin *dictum*. It was originally spelt dittie, and implied in its primitive sense a saying or sentence. In modern times, however, it has been used to signify a short poem or song.

DIURETICS, *di-u-ret'-iks* (Gr. *diouretikos*), in Med., those agents which have the power of augmenting the secretion of urine. Their action is beneficial whenever the system is troubled with an excess of fluids or of salts and nitrogenous substances derived from effete tissues. There are some diuretics, such as nitrate of potash, which act primarily upon the urinary organs; others, as the mercurials, which act primarily on the absorbents and secondarily on the kidneys; and others again which act directly on the stomach or system generally, and indirectly on the urinary organs. Stimulant and tonic medicines have generally a diuretic action in cases of debility. As in the case of the function of perspiration (*see* DIAPHORETICS), so in that of the secretion of urine, many external circumstances influence its due performance. These two great functions seem to supply the place of, and alternate with, each other, and the circumstances which favour the one will generally interfere with the other. To secure the proper action of a diaphoretic, the skin of the patient must be kept warm; but, in employing a diuretic, it is necessary to keep the skin cool.

DIVAN, *div-an'*, an Arabic or Persian word, originally signifying a register of names and accounts, but more generally employed to designate a court of justice or supreme judicial tribunal. The word, however, is very variously applied. Among the Persians, a collection of poems or songs by one and the same author is called a divan. The state or reception rooms in palaces and the private houses of the rich citizens of Constantinople are also called divans. Among Europeans the term is more generally applied to a kind of sofa, probably from such being used in the divans of the orientals. *Cigar divans* are establishments fitted up with couches, &c., where, by paying a fee, visitors can smoke, read the periodicals of the day, and be provided with coffee and other refreshments.

DIVEL-ON-THE-NECK, *div'-el*, an instrument of torture, employed against the Lollards. FOX, in his "Acts and Monuments," thus describes it:—"Certain strait irons, called the divel-on-his-neck, being after an horrible sort devised, straitening and winching in the neck of a man with his legs together, in such sort as the more he stirreth in it the straiter it presseth him, so that within three or four hours it breaketh and crusheth a man's back and body in pieces."

DIVERGING LINES, *di-verj'-ing* (Lat. *divergo*, I tend from), a term employed in Math. and Opt. to denote those lines which separate or recede from one another after proceeding originally from the same point. Diverging lines are opposed to converging lines. Thus a convex lens renders the rays of light convergent, while a concave lens renders them divergent. In Math., a diverging series is one of which the terms increase more and more the further it is continued.

DIVERS, *di'-verz* (*Mergus*).—The divers closely resemble the grebes; indeed, the chief point of difference consists in the former having palmated feet. They have a strong, straight, rather compressed, pointed bill, about as long as the head; a short rounded tail; short wings; their legs placed far back, and toes completely webbed. They fly well, and, as divers, are remarkably expert. They measure usually from two and a half feet to three feet in length, and are essentially inhabitants of high northern latitudes, visiting our shores in the autumn, remaining through the winter, and quitting us in the spring to seek their northern breeding-stations. The great northern diver (*Colymbus glacialis*) is the largest of the tribe. It measures full three feet in length, and four feet six inches in breadth. The bill, which is black and very strong, measures four inches from the top to the corners of the mouth. The head and neck are black, shaded with purple and green. At the back of the neck there is a white crescent-shaped band, marked with black oblong strokes pointing downwards. The breast and underside of the body are white; the back, wing-coverts, and scapulars, are black, thickly dotted with white. Speaking of this bird, Dr. Richardson says, "It can swim with great swiftness, and to a very considerable distance, under water; and when it

comes to the surface, it seldom exposes more than the neck. It takes wing with difficulty, flies heavily, though swiftly, and frequently in a circle round those who intrude on its haunts. Its loud and very melancholy cry, like the howling of the wolf, and at times like the distant screams of a man in distress, is said to portend rain. Its flesh is dark, tough, and unpalatable." The red-throated diver (*Colymbus septentrionalis*) is smaller than the great northern, and lighter coloured. In habitat, however, they exactly agree.

DIVERTIMENTO, *di-ver-te-men'-to* (Ital.), a short, light, pleasing composition, vocal or instrumental, written in a style calculated to engage the popular ear.

DIVIDEND, *div'-e-dend* (from Lat. *divido*, I separate), in Com., is applied either to the money which is divided amongst the creditors of a bankrupt out of his estate, or to the annual interest payable upon the national debt and other public funds.

DIVINATION, *div'-in-ay'-shun* (Lat. *divinatio*), a term applied generally to the various arts used in all ages for the discovery of things, secret or future, in a supernatural way. In all ages, and among all nations, there has been exhibited a strange feeling of curiosity which has prompted mankind to look forward into futurity with the intention of penetrating its mysteries. Originally, these speculations were made by deep thought, by comparing the past with the present, and by drawing careful inferences as to the probable course of events. The human mind did not, however, stop at this point, for the strong desire to look into futurity led mankind to see presages of events in things between which and the object of anxiety no connection existed whatever. Every department of nature began to be consulted, as furnishing good or bad omens of human destiny. The feeling among ancient nations was, that if gods really existed, they cared for men; and if they cared for men, it was only natural that they should send them signs of their will. From this sentiment divination began to form a regular science, intimately allied to religion, and furnished with particular laws and regulations, differing in character according to the degree of civilization attained by the country in which it was established. Among the ancient Greeks and Romans, divination was practised with great enthusiasm. In the most trivial matters of every-day life they saw something that had reference to the future, or destiny, while their auguries and oracles formed the higher class of divination. The different systems of divination employed by the ancients are very numerous. Aëromancy, or divining by the air; Arithmomancy, or divining by means of numbers; Capnomancy, by the smoke of sacrifices; Chiromancy, by the lines in the palms of the hands; Hydromancy, by water; Pyromancy, by fire, &c., constitute only a few of the many methods in vogue. A number of superstitious customs in use at the present day evidently owe their origin to ancient forms of divination. Lucky and unlucky days were once considered very important matters of consideration; and even now, in commencing any undertaking, Friday is avoided by many persons in all ranks of society. It is also generally conceived that a wedding in May is unlucky. A large number of omens are associated with what first happens to any one about to undertake anything. To stumble is always considered unlucky; various lucky and unlucky signs are deduced from the number of certain birds—generally magpies—seen. A hare crossing the path is deemed unlucky; so is an old woman. Priests were formerly considered unlucky, and the hunters of old, when they met a priest, coupled up their hounds and retired; there was no sport for them on that day. Many superstitions of this kind are associated with the subject of love and marriage. The variable and unaccountable changes and chances connected with the subtle passion no doubt fostered these, and people drew conclusions from the most improbable sources. The methods by which people even yet endeavour to foretell a future husband or wife—happiness or misery—are innumerable. These customs vary in different localities, and are often restricted to certain days; such as the eve of St. Agnes or Hallowe'en, the last night of October.

DIVINE RIGHT, *div-ine'* (Lat. *divinus*), in Pol., a term employed to denote the source of kingly power, and formerly used as an argument to maintain the





claim of monarchs to absolute and unqualified obedience from their subjects. The monarch was held to be the direct representative of Deity, to whom alone he was responsible for his actions. This subject gave rise to much controversy in England during the struggle between the Royalists and the Parliament, the former of whom stood up for the divine right. Some traced this divine right to the primitive patriarchal sway, which was the true Scriptural idea; others to some supposed social contract, in which men gave up their natural rights in exchange for protection. The present king of Prussia, at his coronation recently, excited some surprise by asserting the doctrine of the divine right of kings.

DIVINE SERVICE, in Law, is applied to an obsolete mode of tenure, in which the tenants were obliged to perform some special divine service; as to sing so many masses, distribute a certain sum in alms, &c.

DIVING-BELL, *di'-ving* (Sax. *dyfan*, to dive), a vessel, generally made of cast iron, by means of which persons can descend to a great depth under water, with slight inconvenience. It was probably invented about the 16th century. In the time of Aristotle, divers used a kind of kettle; but the manner in which it was used is not clearly described. In 1538, a diving-bell was used by two Greeks at Toledo, in Spain. In shape this vessel appears to have been very like that of the modern diving-bell. The experimentalists let themselves down under water, with a burning light inside the bell, and rose up again without being wet, and with the light still burning. The art was then now; for, according to John Taisnier, the experiment was witnessed by Charles V. and a multitude of spectators, in order to test its possibility. After the destruction of the Spanish armada, many of the ships were sunk off the island of Mull, on the western coast of Scotland. The Spanish prisoners had declared that these vessels contained great riches; and this report excited much avarice, and tempted speculators to endeavour to gain the lost treasure. In one of these attempts, made in 1665, a rough kind of diving-bell was used, but not successfully. In 1687, a person named Phipps, under the patronage of the duke of Albemarle, formed a project for searching and unloading a Spanish vessel sunk on the coast of Hispaniola. He descended by means of a diving-bell, and returned to England with £200,000, which he had gathered from the wreck. Dr. Halley's bell was the first really practical and useful diving-bell. It was made of wood coated with lead, and contained about 60 cubic feet of air. It was made in the form of a truncated cone, three feet in diameter at the top and five feet in diameter at the base. In the top a clear glass was inserted, to let in the light. For the purpose of introducing fresh air, two barrels lined with lead were sunk alongside the bell. They were provided with hose and taps communicating with the interior of the bell. The pressure of the water forced the air, when required, into the vessel, and the impure air was allowed to escape through a valve in the top. In 1721 Dr. Halley's diving-bell was improved by an additional apparatus designed by himself, and by means of which the diver was able to leave the bell at some distance, and remain a considerable time in the sea. The man was supplied with air by means of a large metal helmet with glass eyeholes. It was supplied with air from the bell by means of flexible tubes. Several ingenious improvements have been made upon Halley's diving-bell at various times, the most important of which, perhaps, are those of Smeaton, who first applied the bell to operations of engineering. To Smeaton also belongs the invention of the modern cast-iron diving-bell. The first bell of this sort was used in the formation of Ramsgate harbour, in 1788: it weighed 50 cwt. The men inside the bell being powerless as to its motions, are obliged to communicate by means of signals with those above. On account of the facility with which water transmits sound, a stroke on the side of the bell can be easily heard by those on the surface. Taking advantage of this circumstance, it is generally arranged that one stroke means "more air," or "pump strong;" two strokes, "stand fast;" three, "hoist;" four, "lower;" five, "more south;" six, "north;" seven, "front;" eight, "back;" nine, "lower down the bucket;" ten, "hoist up the bucket loaded," &c.

DIVINING-ROD, *div-i'-ning* (Lat. *divino*, I divine), a hazel twig cut in the form of a Y, by the aid of which certain persons, called *dowsers*, pretend to be able to discover water or mineral veins. The rod is held in a peculiar manner, and the dowser walks backward and forwards over the ground to be tried. As soon as he crosses or approaches a metallic vein or aqueous spring, the twig turns towards it with a slow rotatory motion. The superstition has not yet died out, and dowsers are common in Devon and Cornwall.

DIVINITY. (*See* THEOLOGY.)

DIVISIBILITY, *div-iz-e-bil'-e-te*, the property possessed by all bodies of being separable into parts. The question as to whether matter is or is not infinitely divisible, was formerly much agitated among philosophers. According to the nature of the atomic theory, the question is not of importance to science; but, from investigation made, there seems to be no limit to the divisibility of the most solid bodies. The diffusion of odours through the atmosphere shows the minute division of material particles; and the tinging of large quantities of fluid with minute portions of colouring matter is an instance of the same. In the gilding of buttons, five grains of gold, which is applied as an amalgam with mercury, are allowed to each gross. In this way a coating is left which must amount to the 110,000th of an inch. An ounce weight of silver gilt over with eight grains of gold has been drawn into a wire of 13,000 feet, covered throughout its entire length with gold. In the theory of numbers, the term divisibility indicates the capability of any number being divided by another without remainder.

DIVISION, *din-iz'-zhun* (Lat. *dividere*, to divide).—In Mil., an army which is under a general officer, known as the commander-in-chief, is always divided into two or more divisions, each under the command of a general officer. Each division is again subdivided into brigades, and each brigade is composed of about four regiments or battalions. A division consists of all arms of the service,—cavalry, infantry, and artillery.

DIVISION, in Practical Mus., implies a course of notes running into each other in such a manner as to form one connected chain of sounds; in Vocal Mus. it is applied to a single syllable. The singing or playing a passage of this kind is called *running a division*. With theoretical musicians it signifies the divisions of the intervals of the octave.

DIVISION, one of the principal rules of arithmetic. By this operation can be determined how often one quantity is contained in another. There are three numbers employed in division: the first is called the divisor, the second the dividend, and the third the quotient. The dividend is the number to be divided; the divisor, that by which the dividend is to be divided; and the quotient, the result. Both divisor and quotient are factors of the dividend. Division may, therefore, be defined as the operation of finding the second factor of a given quantity when the first is given. It is divided into two classes,—arithmetical division and algebraical division. In arithmetical division, when the numbers are expressed in the scale of tens, the following is the mode of working:—On the left-hand side of the dividend is written the divisor, separating them by a line. Beginning with the highest order of units of the dividend, the lower orders are passed over until the fewest number of figures is found that will contain the divisor; it is next determined how many times the divisor is contained in these figures, and the number is written on the other side of the dividend, beginning from the left, for the first figure of the quotient. The divisor is then multiplied by this figure of the quotient, and the product placed under the figures of the dividend used, and subtracted from them, and the next figure of the dividend is brought down to the remainder. The number of times the divisor is contained in the result forms the second figure of the quotient. The operation is continued till all the figures of the dividend are used; the final result is the quotient sought. If the final remainder is 0, the division is said to be exact, or the dividend contains the divisor an exact number of times. Arithmetical division is also performed in varying scales, either in terms, ordinary fractional units, or in the varying scales of commerce. If the numbers to be divided are fractions, they will be either vulgar or decimal. In vulgar fractions, dividend and divisor are





first reduced to simple fractions, if one or both are mixed fractions; the terms of the divisor are then inverted, and the dividend multiplied by the resulting fraction. The product is the fractional quotient, which is reduced to its lowest terms, or sometimes to a whole number, by the rules for the transformation of fractions. As an example:—Divide

$$5\tfrac{1}{2} \text{ by } 2\tfrac{1}{7};\ 5\tfrac{1}{2} = \tfrac{11}{2} \text{ and } 2\tfrac{1}{7} = \tfrac{15}{7};$$

hence the quotient is equal to

$$\frac{43 \times 7}{8 \times 15} = \frac{301}{120}$$

which cannot be reduced to lower terms. In the division of decimal fractions, the dividend and divisor are written down as whole numbers, as many 0's being added to the dividend as may be necessary. The division is performed as in whole numbers, continuing the process to any desired extent, or till a remainder is found equal to 0. A number of decimal places, equal to the number of decimal places in which the dividend exceeds the divisor, is then marked off the right hand of the quotient. If there are not enough in the quotient, 0's are prefixed till the requisite number is obtained: the result is the quotient. When the numbers are expressed in any of the varying commercial scales, as *pounds*, *shillings*, and *pence*, two cases may arise; first, when the dividend is expressed in the varying scale, and the divisor in the scale of tens; and second when the dividend and divisor are expressed in varying scales. When the divisor is expressed in the scale of tens, the quotient is in the same scale as the dividend. The following is the rule adopted:—Divide the number of units of the highest order in the dividend by the divisor; the quotient will be the number of units of the same order in the quotient sought. Multiply the remainder by the number of units of the next lower order which make one of this order, and to the product add the number of units of the next lower order in the given number; divide this sum by the divisor, and the quotient will be the number of units of this order in the quotient sought. This operation is continued till the lowest order of the scale is reached, and the result is the quotient sought. Thus, let it be required to divide £25. 8*s*. 6*d*. by 3, the operation is as follows:—

| £ | *s*. | *d*. | £ | *s*. | *d*. |
|---|---|---|---|---|---|
| 3) 25 | 8 | 6 ( | 8 | 9 | 6 |
| 24 | | | | | |
| 1 | | | | | |
| 20 | | | | | |
| 28 | | | | | |
| 27 | | | | | |
| 1 | | | | | |
| 12 | | | | | |
| 18 | | | | | |
| 18 | | | | | |
| 0 | | | | | |

The operation may, however, be much simplified in practice. When both dividend and divisor are expressed in varying scales, it is necessary that both should be reduced to the same unit, and the quotient is consequently expressed in the scale of tens. As an instance, divide £25. 10*s*. 9*d*. by 18*s*. 11*d*. If both are reduced to pence, they stand £25. 10*s*. 9*d*. = 6,129*d*.; and 18*s*. 11*d*. = 227*d*.; whence,

$$\frac{6129}{227} = 27, \text{ the quotient required.}$$

In Alg., division is arranged under three heads:—First, the division of monomials, where, in order to get the co-efficient of the quotient, the co-efficient of the dividend is divided by the co-efficient of the divisor. After this, all the letters which enter the dividend and divisor are written, an exponent being given to each equal to the excess of its exponent in the dividend over that in the divisor. The result is the quotient sought. If the signs of the dividend and divisor are alike, the sign is *plus* (+); if they are unlike, it will be *minus* (−). The second division of algebraical division includes

the division of a polynomial by a monomial. In this case each term of the polynomial is divided separately by the divisor. The algebraic sum of the separate results is the quotient. The third division is the division of polynomials. Both dividend and divisor are arranged with reference to the same leading letter. The first term on the left of the dividend is then divided by the first term on the left of the divisor, and the quotient forms the first term of the quotient. The divisor is then multiplied by the term of the quotient found, and the product subtracted from the dividend for the first remainder. The first remainder is then divided by the first term of the divisor for the second term of the quotient. The divisor is multiplied by this term of the quotient, and the product subtracted from the first remainder to make the second remainder. The operation is continued till a remainder is found whose first term is not exactly divisible by the first term of the divisor. The operation of the division of polynomials may sometimes be shortened by various methods. Among these may be mentioned *synthetic* division, which is applicable when the dividend and divisor are homogeneous, and contain only two letters. In the division of radicals, the process depends upon reducing the radicals to equivalent ones of the same degree. A number may also be divided by another by subtracting the logarithm of the divisor from the logarithm of the dividend: the number corresponding to the remainder in the logarithmic table is the quotient required.

Division, in Log., is the separating a thing into several parts or ideas. Logicians distinguish three kinds of division:—1. When the genus or kind is divided by its species or differences; 2. when a thing is divided into several classes by opposite accidents; and 3. when the accidents themselves are divided according to the subjects in which they inhere. The laws of division are,—1. That it be full and adequate,—that is, that the members of it entirely exhaust the whole thing divided; 2. that the members of the division be opposite; 3. that one member of the division be not contained in the other, so that the other may be affirmed of it; 4. the division should not be into too many or too general parts; and 5. the members, unless the subject require it, should not be too unequal.

Division of Labour, in Pol. Ec., is applied to that necessary division of occupations which is a consequence of man's living in society. In that rude state of society in which there is no division of labour, every man endeavours to supply by his own industry his wants as they occur. "When he is hungry, he goes to the forest to hunt; when his coat is worn out, he clothes himself with the skin of the first large animal he kills; and when his hut begins to go to ruin, he repairs it as well as he can with the trees and the turf that are nearest to it." But as men came to live in society, they found that one person could produce more by confining his attention to only a few objects than by carrying on a great many. Their wants, too, gradually increased; and as the means of supplying these could only be obtained through labour, they were naturally led to seek the greatest amount of production from the least expenditure of labour. Hence the principle of division of labour is the very foundation of any social system, and must have existed from very early times; but it remained for political economy to discover its nature, uses, and results. Adam Smith was the first to point out definitely the great importance of this principle. "The greatest improvement," he says, "in the productive powers of labour, and the greater part of the skill, dexterity, and judgment with which it is anywhere directed or applied, seem to have been the effects of the division of labour." He instances the trade of a pin-maker, in which, he says, "one man draws out the wire, another straights it, a third cuts it, a fourth points it, a fifth grinds it at the top for receiving the head. To make the head requires two or three distinct operations; to put it on is a peculiar business; to whiten the pins is another; it is even a trade by itself to put them into the paper; and the important business of making a pin is in this manner divided into about eighteen distinct operations." In a small manufactory, he says, where only ten persons were engaged, they could make upwards of 48,000 pins a day, or 4,800 each. Such has been the progress of improvement since his day, that each person can now produce more than double that number. The great increase of the quantity of work produced in consequence of the division of labour is owing, he says, "to three different circumstances; first, to the increase of dexterity in every particular workman; secondly to the saving of the time which is commonly lost in passing from one species of work to another; and lastly, to the invention of a great number of machines, which facilitate and abridge labour, and enable one man to do the work of many." As it is the power of exchanging that leads to the division of labour, so the amount of labour, and consequently the extent of division, must always be limited by the extent of the market. If there were no means of exchanging, men would be obliged to provide everything that they require for themselves. Hence it is, that in populous cities trades are subdivided to a much greater extent than in villages or country parts; and hence, too, the advantages to be derived from the division of labour can only be reaped in their full extent where there is a great power of exchanging or an extensive market. Another important consequence of the division of labour, and one which Adam Smith, though he has alluded to it, has not prominently stated, is the power possessed by every country of availing itself to a certain extent of its natural or acquired advantages, which is called the territorial division of labour. Nature seems to have intended to unite, by mutual dependence, all the countries of the world into one commercial family. For this purpose, different districts or countries have different products and capacities; so that some are more particularly adapted for carrying on some branches of labour, and others for others; and the full advantages of which can only be reaped by free intercourse between the different nations. The commerce of one country with another is merely an extension of that division of labour by which so many benefits are conferred on the human race. By means of mutual intercourse, mankind are enabled to distribute their labour as best fits the genius of each particular country and people; and the industry of the whole is thus rendered incomparably more productive. There is another feature of this question which it is necessary to glance at, and that is, the effect of this minute subdivision of labour upon the workmen themselves. Some hold that it reduces men to the character of mere organized machines, and affords them no scope for mental development. This, however, we do not believe to be the case. Man's mental condition is principally dependent upon the circumstances by which he is surrounded and the persons with whom he associates. Rarely does his occupation, especially if it be of a manual kind, exert great influence upon it. In rural districts, where employments are less divided than in large cities, we do not find that the people in the former case display more intelligence than the latter, but the reverse; the frequent intercourse among their fellows, and the great variety of objects that are constantly exciting the attention of the city man, giving him a greatly superior mental training to the other. But we believe a division of labour to be good for man, because it is inseparably connected with civilization; for, if the one is beneficial, so of necessity must be the other.

Division of Time.—The length of sounds in Mus. is regulated by dividing the time occupied in the performance of any given melody or harmony into regular portions called measures. In order to illustrate this more clearly, we will take a straight line and divide it into equal portions,—the straight line to represent the time of the melody, and each division to constitute a measure or bar. The time must be kept equal by motions of the hand or foot. Presuming the true time of a crotchet to be known, we will suppose the bar to be subdivided into four crotchets (as in common time), when the half of the measure will of course be two crotchets; therefore, the hand or foot being raised, we put it down for the first note, raise it with the third, and lower it again to commence the next bar. Time is to music what rhythm is to poetry, and cannot be too rigidly observed.

Divisor, *dic-i'-sor*, one of the factors of the dividend,—the factor by which the dividend is divided. Divisors of a number are those numbers by which it is exactly divisible. Thus, 1, 2, 3, 4, 6, and 12 are

divisors of 12, because 12 may be divided by each of them without a remainder.

DIVI-DIVI. (*See* CÆSALPINIA.)

DIVORCE, *di-vors'* (Lat. *divortium*, from *diverto*, I turn away or separate), denotes a separation by law of husband and wife; and is either a divorce *a vinculo matrimonii* (from the bond of marriage), or *a mensa et thoro* (from bed and board), the marriage in the former case being dissolved, but not so in the latter, the parties being only debarred from living together. According to the law of Moses, "when a man hath taken a wife and married her, and it come to pass that she find no favour in his eyes because he hath found some uncleanness in her; then let him write her a bill of divorcement, and give it in her hand, and send her out of his house."—(Deut. xxiv. 1.) After ninety days the wife might marry again; but after she had contracted a second marriage, though she should be again divorced, her former husband might not take her again to be his wife. The like lax notions on the subject of marriage appear to have prevailed generally in the East at that early period; and even at the present day, as among the Arabs, a husband can divorce his wife on the slightest occasion; Burckhardt mentioning that he had seen Arabs, not more than forty-five years of age, who were known to have had more than fifty wives. The Mahomedan law allows of a separation by mutual consent, giving the wife the right of retaining her marriage portion unless she agrees to relinquish a part of it as the price of the separation. They are permitted to separate and reunite twice; but, after the third divorce, he cannot again receive her until she has been married and divorced by another. Among the Hindoos and Chinese, the notions are still more lax on this subject, and a husband may divorce his wife upon the slightest grounds, or even without assigning any reason. Among the causes that are considered to justify separation are loquaciousness or quarrelsomeness on the part of the wife. The laws of the several Grecian states regarding divorce differed greatly from each other. In some it was permitted on slight grounds; in others the laws were stringent regarding it. At Athens divorce was permitted on slight causes, but not without giving a bill containing the reasons for it, to be approved, if objected to, by the chief archon. At Sparta, divorces seem to have been very rare. By the early laws of Rome, the husband was not allowed to divorce his wife without just cause; as for adultery, drunkenness, counterfeiting his keys, or poisoning his children. Other causes were afterwards added, and at length divorces took place on very frivolous pretexts, and the women enjoyed the same liberty as the men. Hence Augustus introduced a law enacting additional ceremonies in obtaining a divorce, and requiring the presence of seven witnesses, before whom the marriage contract should be torn. By the Theodosian code, among the causes for which a husband could divorce his wife, were, adultery; the being a witch or a murderess; committing sacrilege; violating sepulchres, or buying or selling one free-born to slavery; favouring thieves and robbers; frequenting sights or theatres, or feeding with strangers against the wishes of her husband; the being privy with those that plot against the state, or dealing falsely or offering blows. If the wife could prove the husband guilty of any of these crimes, she also was at liberty to leave him; but could not marry again until after the expiry of one year, whereas the husband might marry again immediately. Voluntary divorces were abolished by one of the *novels* of Justinian, but were afterwards revived by another *novel* under the emperor Justin, and the practice is understood to have continued in the Eastern empire down to the 9th or 10th century, when it was finally subdued by the influence of Christianity. The Scripture doctrine on this subject is enunciated by our Saviour, when he says, "Have ye not read that he who made them at the beginning made them male and female; and said, for this cause shall a man leave father and mother, and shall cleave to his wife, and they twain shall be one flesh." "What, therefore, God hath joined together, let not man put asunder." "Moses, because of the hardness of your hearts, suffered you to put away your wives; but from the beginning it was not so; and I say unto you, Whosoever shall put away his wife except it be for fornication, and shall marry another, committeth adultery; and whoso marrieth her who is put away doth commit adultery." —(Matt. xix. 4—9.) Our Saviour's declaration naturally became the foundation of the law of divorce in all Christian countries; and after marriage was raised to the dignity of a sacrament by Pope Innocent III., in 1215, the ecclesiastical courts claimed the sole jurisdiction over it. The papal canon law regarded the bond of marriage as indissoluble, but allowed a divorce *a mensa et thoro* for five causes; viz., adultery, impotency, cruelty, infidelity, and *ingressus religionis*. The Church, however, assumed to itself a power to grant dispensations for absolute divorces. The principle of the canon law, not admitting of an absolute dissolution of the marriage contract for any cause whatever, governed the ecclesiastical law of this country. A divorce was only a judicial separation *a mensa et thoro*, not allowing either of the parties to marry again during the lifetime of the other. An individual, however, if able to incur the expense, might, after a sentence of divorce *a mensa et thoro*, pronounced by the ecclesiastical court, by obtaining an act of parliament, procure a suspension of the law, and, by legislative interference, obtain a dissolution of his marriage. There were certain causes, however, which were regarded as nullifying marriage and justifying a divorce *a vinculo matrimonii*; as, a previous marriage subsisting, or affinity within the prescribed degree. The sentence in such a case being declaratory only that the marriage was originally null and void. The law of England granted judicial separation only on the grounds of adultery or cruelty; and the effect of it was to place the woman in the same position as a *femme sole*, enabling her to hold and deal with property free from the control of her husband; and in the case of the man, relieving him from all obligation to support his wife. By act 20 & 21 Vict. c. 85, an entire change was effected in the law of divorce in England, and a court instituted with exclusive jurisdiction in matters matrimonial, and with authority, in certain cases, to decree the dissolution of a marriage. The entire jurisdiction, therefore, previously exercised by the ecclesiastical courts in matters of divorce, was transferred to this court under the name of the Court for Divorce and Matrimonial Causes (*see* next article); and sentence of judicial separation (having the same effect as a divorce *a mensa et thoro*) may be obtained either by the husband or wife on the ground of adultery, or cruelty, or desertion without cause for two years and upwards. This court has also the power of dissolving a marriage on a petition presented by the husband, setting forth that his wife had been guilty of adultery, or on a petition by a wife on the ground that her husband had been guilty of incestuous adultery, or of adultery with cruelty, or adultery with desertion for two years or upwards. It is the duty of the court not only to satisfy itself as to the facts alleged, but also whether or not the petitioner has been in any manner accessory to or conniving at the adultery, or has condoned the same; and shall also inquire into any counter charge which may be made against the petitioner. In any of these cases, or if there is reason to believe that the petition is presented or prosecuted in collusion with either of the respondents, then the court shall dismiss the said petition. The court may also, if it sees fit, order the husband to secure to the wife such gross or annual sum of money for any term not exceeding her own life, as it may deem reasonable in the circumstances. It can also allow damages, if asked for, against the adulterer, and may also order him to pay the costs of the proceedings. It has also the power to declare in what manner such damages are to be paid or applied, and to direct that the whole, or any part thereof, shall be settled for the benefit of the children, if any, of the marriage, or as a provision for the maintenance of the wife. It may also make such provisions as it may deem proper with respect to the custody, maintenance, and education of the children of the marriage; and may, if it shall think fit, direct proper proceedings to be taken for placing such children under the protection of the court of Chancery. If the wife who has been guilty of adultery is entitled to any property, either in possession or reversion, the court may, if it think proper, order such settlement as it may deem reasonable to be made of such property, or any part thereof, for the benefit of the innocent party, and of

the children of the marriage, or either of them. Either party may appeal from a decision of the judge ordinary to the full court, and either party dissatisfied with the decision of the full court on any petition for the dissolution of a marriage may, within three months after the pronouncing thereof, appeal therefrom to the House of Lords, if then sitting, or within fourteen days after its next meeting. Every decree for a divorce is thus a decree *nisi*, and not absolute till after the expiration of not less than three months, within which time it shall be lawful for any person to show cause why such decree should not be made final. After the decree has become final, it shall be lawful for the respective parties thereto to marry again, as if the prior marriage had been dissolved by death; but it is provided that "no clergyman in holy orders of the united church of England and Ireland shall be compelled to solemnize the marriage of any person whose former marriage may have been dissolved on the ground of his or her adultery, or shall be liable to any suit, penalty, or censure, for solemnizing, or refusing to solemnize, the marriage of any such person." The law of Scotland on this subject differs materially from that of England. According to the former, if the husband should either abandon his family, or turn his wife out of doors, or by barbarous treatment endanger her life, or render her condition quite uncomfortable, the judge will, on proper proof, authorize a separation *a mensa et thoro*, and award a separate alimony to her, suitable to her husband's fortune, to take place from the time of the separation, and to continue till there shall be either a reconciliation between the parties or a sentence of divorce. Actions of divorce were formerly brought before the Supreme Commissary court of Edinburgh; but by act of parliament in 1830, they were removed to the jurisdiction of the court of Session; and questions of fact connected with such cases may, at the discretion of the court, be tried by jury. The grounds of divorce are two: adultery, and wilful desertion, the latter of which must have continued for four years. The pursuer must also swear that the action is not carried on by collusion. The offending parties cannot intermarry. The effect of a decree of divorce is, that the offending party forfeits all benefit which might accrue to him or her from the marriage. In France, before the revolution of 1792, marriage was, in accordance with the principles of the canon law, held to be indissoluble; but after that event very lax notions prevailed on this subject, and divorces were permitted on very slight grounds. The Code Napoléon greatly restricted this liberty, but allowed a divorce to either party on the ground of adultery, outrageous ill-usage, and some other causes. In Holland, divorce *a vinculo matrimonii* is obtainable on the ground of adultery or desertion. In the different states of America the laws are by no means uniform on this subject. In several of them no divorce is granted but by special act of the legislature; but generally, divorce *a vinculo* may be granted by courts of justice for adultery. In most of the states, in addition to adultery, intolerable ill-usage or wilful desertion (in some for seven, in others for three years), will form grounds for a divorce *a vinculo matrimonii*.

Divorce and Matrimonial Court is a court instituted by act 20 & 21 Vict. c. 85, for trying matrimonial causes, and granting decrees of divorce, which had been formerly under the jurisdiction of the ecclesiastical courts. The judges of this court are, the lord chancellor, the lord chief justice of the court of Queen's Bench, the lord chief justice of the court of Common Pleas, the lord chief baron of the court of Exchequer, the senior puisne judge for the time of the three last-mentioned courts, and the judge of her Majesty's court of Probate, the last of whom to be the judge ordinary. By 23 & 24 Vict. c. 144, the powers of the judge ordinary were much extended, so that he may now alone pronounce a decree of divorce, a power which was at first reposed in the whole court. (*See* Divorce.)

Do, *do*, the name of the first note of the natural major diatonic scale. It has been long since substituted for that of *ut*, which was employed by Guido, the latter monosyllable being rejected as too hard and rough.

Docetæ, *do-se'-te* (Gr. *dokein*, to seem), an heretical sect that sprung up very shortly after the foundation of the Christian religion. As their name implies, they





disbelieved in the incarnation of Christ; asserting that he acted and suffered in appearance only. It is believed by some divines that several portions of St. John's Gospel were especially directed against the doctrines held by the Docetæ.

Dock, *dok* (Tent. *docke*, probably from *dekken*, to inclose), an inclosed space or artificial basin in the bank of a river or side of a harbour, contrived for the reception of ships. There are two kinds of docks,—wet and dry docks. A wet dock may either have gates to retain the water in it, so that ships may remain in it afloat, or be left open for the tide to flow in and out. A wet dock without gates is generally called a *basin*; the term is, however, sometimes applied to a wet dock with or without gates. A dry dock either becomes dry by the ebbing of the tide when the gates are left open, or by shutting the gates at low water and pumping out whatever water may be left at that time. Docks of this kind are employed for repairing and examining ships. Wet docks are used for the loading and unloading of vessels, and contrived generally for the purpose of keeping them always afloat. The first wet dock made for commercial purposes in this kingdom was formed in 1708, at Liverpool. At nearly all the most important ports and harbours in Britain now there are several extensive and commodious wet docks. Wet docks are usually surrounded by quay or wharf walls of solid masonry or brick-work, and are entered by means of a lock, having two gates, usually in two folding leaves each: this arrangement, in many places, enables vessels to enter or go out a considerable time before or after high water. Dock gates, till late years, were opened and shut by means of chains worked by hand, either by capstans or winders; hydraulic machinery is, however, now much used. The principal docks in the world are those of London, Liverpool, and Birkenhead. In London, the Commercial dock, situated at Rotherhithe, has an area of nearly 50 acres, four-fifths of which are water: it is principally used in the corn and timber trade. The West-India docks extend across the Isle of Dogs, and consist of two portions,—the import dock and the export dock; they are both 880 yards in length, and between 130 and 170 yards in width. The East-India docks are situated at Blackwall, below the entrance to the West-India docks; the area of extent is 30 acres, and they are divided into the loading and unloading docks. The London docks, at Wapping, were finished in 1805; they cover a space of 28 acres, and have extensive warehouses for wine and tobacco. St. Katherine's docks, situated between the London docks and the Tower, were finished in 1828; their area is 24 acres, and they are divided into two portions, capable of receiving vessels of 800 tons burden: only 11 acres of the space are water, the rest being taken up with large warehouses and extensive quays. The Victoria docks are situated on the Plaistow marshes, on the north side of the Thames, immediately below the East and West India docks; they comprise a half-tide basin of 16 acres, an inner dock of 7½ acres, and a portion (12 acres) of the canal intended to intersect the eastern lands of the company. Some very large warehouses are attached to these docks, used chiefly for the storing of tobacco. In the following table will be found a nearly correct statement of the number and areas of the docks in Great Britain, including those locks or entrance-basins provided with gates, at a number of the principal ports:—

| | No. | Area in Acres. |
|---|---|---|
| London | 28 | 350 |
| Liverpool | 38 | 266 |
| Birkenhead, belonging to the Liverpool corporation | 4 | 142 |
| Bristol | 4 | 79 |
| Hull, exclusive of timber-ponds | 7 | 46½ |
| Great Grimsby | 2 | 51 |
| Hartlepool | 1 | 20 |
| West Hartlepool, inclusive of timber-ponds | 3 | 32 |
| River Wear | 2 | 41 |
| River Tyne | 4 | 107 |
| Leith | 3 | 15½ |
| Dundee, partly unformed | 4 | 34 |
| Aberdeen | 1 | 35 |

For further information concerning the docks of Great Britain *see* McCulloch's "Commercial Dictionary." Docks are generally the property of large companies, and as their management is costly, they require to be supported by those vessels using them: this is done by levying rates, powers being granted by the acts of parliament authorizing the construction of the various docks. Sometimes dock dues are levied on vessels in bulk according to tonnage, and sometimes according to the nature or value of the goods.—*Ref.* Chambers' *Encyclopædia.*

Dock, the common name for some species of Rumex (which *see*).

Dock, the inclosed space, usually surrounded with an iron railing or *chevaux de frise*, in which a prisoner is placed during his trial.

Dock Warrants, orders for the removal of goods stored or warehoused in the several docks. The orders are granted by the proper persons appointed at docks, in favour of any one for whom the importer applies. The rules laid down by the various dock companies closely resemble each other, and are very strictly attended to. Unless the rules are complied with, goods will not be delivered up. Warrants can be obtained for a whole or part of a cargo; and a warrant can also be divided into smaller warrants, and these may be assigned; a warrant may also be assigned by a holder. If a warrant is lost, a fresh warrant is not granted till the first warrant is advertised; and before it is granted the holder is obliged to enter into an agreement with the company to indemnify them in case of any future loss.

Docket, Docquet, or Doquet, *dok'-et* (Welsh *tocyn*), is a brief summary, or abridged entry of any document or instrument on a small piece of paper or parchment. It is chiefly used in law; decrees in chancery, and other legal instruments, being thus docketed for purposes of reference. Attestations or declarations annexed to written instruments are also called dockets, especially such as are done by a notary. A docket is also a ticket or direction tied to goods.

Dockyards, yards or magazines situated near large harbours, for the purpose of containing all kinds of naval stores, timber, &c., together with all the materials requisite for the building and repairing of ships. Before the reign of Henry VIII. there were neither arsenals nor dockyards belonging to the crown; but to that monarch belongs the credit of having first founded a regular navy, by the establishment of dockyards, and the formation of a board consisting of certain commissioners. The first dockyard erected in his reign was that of Woolwich. Those of Portsmouth, Deptford, Chatham, and Sheerness followed. Plymouth, and afterwards Pembroke, are more recently-formed dockyards. All of these establishments have slips in which new ships are built, sheds and dry docks for repairing vessels, and all the requisites for rigging and fitting them out for sea. Boat-building and mast-making are also carried on; and in some cases blocks, ropes, and sails are made and anchors forged. A brief description of several of the royal dockyards may give a general idea of their usefulness. Portsmouth dockyard is considered the great naval arsenal of England, and the head-quarters of the British navy. It is by far the largest of the royal dockyards; and its central station with regard to the opposite coast of France, its safe and extensive harbour, and splendid anchorage at Spithead, all combine to give it prominence. The wharf-wall of the dockyard on the western side of the harbour is 3,900 feet in length; the mean depth may be 2,000 feet, and it incloses an area of more than 100 acres. Within the yard are several large basins with dry docks, double docks for frigates, building-slips, &c., attached to them. On the north-east side is a row of storehouses, 900 feet in length; and the south-west side the rigging-house and sail-loft, 300 feet long. There are two hemp-houses and two sea-storehouses, extending 800 feet; while the rope-house, tarring-house, and other buildings connected with the ropery, are on the same large scale. Besides these, there are saw-mills, a gigantic smithery, an iron-mill, a copper-mill, a copper-refinery, in which all the old copper taken from ships' bottoms is melted and rolled; and all the bolts, gudgeons, and other articles of copper used in the navy, are cast there. Connected with the dockyard is a naval college, established in 1729, and a naval architectural school, the professor of which has the charge and keeps the rate of all the chronometers belonging to the navy which may not be in use. Woolwich dockyard presents a frontage of 3,680 feet to the river, to which may be added 160 feet more timber-grove. The breadth is very irregular, but is estimated at between 250 and 900 feet. It has two docks with entrance from the river, and one dock with an entrance from a large basin. There are also three large and two smaller building-slips, besides a boat-pond. Woolwich dockyard is more looked upon as a building-yard than as a store; but it is very complete in all the usual appendages of artificers' workshops, storehouses, offices, &c. One of the four divisions of marines are stationed at Woolwich, where their barracks are situated. Deptford dockyard has a front wall facing the Thames, about 1,700 feet in length, and has an area of about 30 acres. It has three large slips, two smaller ones, and three dry docks. Its principal use is in repairing vessels. Through its proximity to London, however, it has become the general magazine of stores and necessaries for the fleet. The principal stores consist of small cordage, canvas, and ships' sails, beds, hair for beds, hammocks, slops, and marine clothing; anchors under the weight of about seventy-five hundred,—all above that size being made in the queen's dockyards. Plymouth possesses one of the finest harbours in the world, able to contain in perfect safety at their moorings more than a hundred sail of the line. The dockyard, however, has only one basin; but it is not only a good building and repairing yard, but a good refitting yard. All the dockyards are under the control of the Admiralty; and each is governed by a set of officers, who are responsible to that department. In several dockyards there are arrangements connected with the storing of guns and ammunition. In the estimates for 1860-61, the cost of materials for ship-building and steam machinery was put down at £3,000,000; the wages to workmen and labourers at £1,400,000; and the salaries to officers, clerks, &c., at £130,000.

Dockyard Battalions.—In the year 1847 the workmen of the various dockyards were enrolled into a corps for the defence of the yards, and a certain number of them were trained to the use of the large guns; so that each of the battalions has artillery attached to it. Each corps is formed of clerks, artisans, and labourers. The colonel is a naval officer, and commissions are given to the others. This valuable body of men is regularly drilled, the men receiving remuneration for time lost in drilling. Sergeants and corporals of marines usually superintend the drilling. The uniform consists of blue frock-coats and trowsers, and a helmet. At first the enlistment in the dockyard battalions was voluntary, but now it is compulsory. The service, however, is very popular, and the list is well filled. When first enrolled, in 1847, the battalions numbered 9,000 men; and an item appeared in the estimates of £20,000 for their training and exercise.

Doctor, *dok'-tor* (Lat. *doctor*, from *doceo*, I teach), properly signifies a teacher or instructor, one so skilled in his particular art or science as to be able to communicate it to others. It is generally believed to have been first adopted as a distinctive title in the 12th century, and to have originated with the university of Bologna. The university of Paris followed immediately after, and, in 1145, conferred the degree of doctor in divinity on Peter Lombard. In England the degree of doctor was not introduced into the universities till the reign of John or Henry III. In modern times the title of doctor forms generally the highest degree in the faculties of theology, law, and medicine. In Germany, the title of doctor in philosophy has been substituted for the older title of master, which is still retained in this country. The universities of Oxford and Cambridge also confer the degree of doctor in music. As to the conditions and qualifications necessary to obtain this degree, see the accounts of the different universities in other parts of this work.

Doctor in Music, a musician upon whom the degree of doctor has been conferred by some university. The name of the first professor to whom this title was granted not being clearly known, the date of its origin in England cannot be clearly demonstrated. According

to Anthony Wood, it was first instituted in the reign of Henry II.; while Spelman fixes its foundation in that of John. By the qualifications formerly required of a candidate for either a doctor's or a bachelor's degree, it is clearly shown that music was considered a purely speculative science. No importance was attributed to skill in composition; the ability of reading and expounding Boethius was received as a much higher criterion of scientific acquisition than the finest specimen of inventive harmony and melody. By the more modern statutes, however, higher qualifications are rendered necessary; the candidate being required by them to submit for the inspection of the musical professor a composition in eight vocal parts, with instrumental accompaniments.

DOCTORS' COMMONS, or COLLEGE OF CIVILIANS, is a college, or "common-house," founded by Dr. Harvey, dean of the Arches, about the beginning of the reign of Queen Elizabeth, for the professors of civil law in London, and is situated near St. Paul's Churchyard. The original building was burned down in the great fire of 1666; but it was afterwards rebuilt in 1672. Besides being the residence of the doctors of the civil law, who all used to live here, as to diet and lodging, in a collegiate manner, "commoning together," it was also the official residence of the judges of the court of Arches of Canterbury, of the Admiralty, and of the Prerogative court, who held their courts here. The only courts that still continue to exercise their functions here are the court of Arches, the court of Admiralty, the Archdeacon's court, and the court of Faculty. In 1768 the members of this society obtained a royal charter, and were incorporated under the name of "the College of Doctors of Law exercent in the Ecclesiastical and Admiralty courts." The college consists of a president (the dean of the Arches for the time being), and of those doctors of law who, having regularly taken that degree in either of the universities of Oxford or Cambridge, and having been admitted advocates, in pursuance of the rescript of the archbishop of Canterbury, shall have been elected fellows of the college in the manner prescribed by the charter. Hence no one can be admitted a member, or allowed to practise as an advocate in the courts at Doctors' Commons, who has not first taken the degree of doctor of laws in one of the English universities. Proctors in these courts discharge duties similar to those of solicitors and attorneys in other courts. In order to be admitted a proctor to practise in the court of Arches, it is necessary to have served a clerkship of seven years under articles with one of the senior proctors, who must be of five years' standing, and who is prohibited from taking a second clerk until the first shall have served five years. The proctors appear in court in black stuff gowns, the advocates wearing wigs, bands, and black silk gowns, exchanged on certain days for scarlet cloth gowns, which, in the case of graduates of Oxford, are bound round with taffeta,—of Cambridge, trimmed with white minever.

DOCTRINAIRE, *dok-trin-aire'* (Fr.), denotes properly a man who is the supporter of a particular doctrine, or who is a man of doctrines. In general, it is used in a bad sense, as applied to those who hold pedantic or unpractical views. In this sense it was applied in France, during the Restoration, by the reactionary court party, to a faction of the parliamentary opposition, who wished to carry out rational and scientific doctrines in politics against all arbitrary measures. This party went out from the salons of the duc de Broglie, and had, as its leader in the chamber, Royer Collard, being supported in the press and before the public by Guizot. Their watchword was a constitution on the basis of the charter of Louis XVIII. After the revolution of 1830, Guizot, Broglie, and others of this party, became ministers and supporters of the government, and their principles came to be very much the same as those of the then king.

DOCTRINE, *dok'-trin* (Lat. *doctrina*, from *doceo*, I teach), denotes in general anything that is taught either as a matter of faith or practice; and hence the term has come to be applied to a variety of opinions that have been adopted and inculcated in religion, philosophy, &c. The doctrines of the Bible are the first principles and the foundation of religion, and ought to be carefully examined and well understood, so as to





influence the heart and life. "Thus, the idea of God's sovereignty excites submission; his power and justice promote fear; his holiness, humility and purity; his goodness, a ground of hope; his love excites joy; the obscurity of his providence requires patience; his faithfulness, confidence, &c."

DOCUMENT, *dok'-u-ment* (Lat. *documentum*, from *doceo*, I teach, as teaching or showing something), in Law, is applied to any written muniment produced in proof of any fact asserted.

DODECAGON, *do-dek'-a-gon* (Gr. *dodeka*, twelve; *gonia*, an angle), in Geom., a polygon which has twelve angles and twelve sides. When the angles and the sides are each of them equal, the dodecagon is a regular one, and may then be inscribed in or circumscribed by the circle, the sum of its interior angles equalling twenty right angles. If the side of a dodecagon be 1, its area will=$3 \times (2+\sqrt{3})$, or 11·196 nearly.—In Fort., the term is applied to a place surrounded by twelve bastions. (*See* REGULAR FIGURE.)

DODECAHEDRON, *do-de-kai-he'-dron* (Gr. *dodeka*, twelve; *edra*, a base), in Geom., one of the five regular solids of Plato, being contained under a surface composed of twelve equal and regular polygons or bases. (*See* REGULAR BODY.)

DODO, *do'-do*, a gen. of birds said to be now extinct, but of whose existence within the last three centuries there is abundant evidence. When, in 1599, the island of Mauritius was discovered, the bird in question was so plentiful that the sailors ate the flesh to satiety, as it was easily killed, and its flesh, especially the breast, much relished. It is described as being considerably larger than a swan, weighing sometimes fifty pounds, with a very bulky and heavy form. The bill was long and strong, depressed at the base, with a separate and much-arched apical portion, which was so sharp and strongly hooked at the tip that the dodo has been considered by some naturalists as



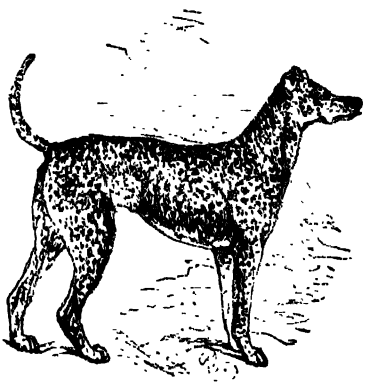
DODO.

approaching the predacious birds. The nostrils were placed on the sides of the depressed portion of the bill, which was covered by a naked skin; the face was similarly clothed. The feet, which were very short and stout, bore a considerable resemblance to those of the pigeon. The wings were also very short, and quite incapable of raising the bird in the air, even had they been furnished with the ordinary stiff quill-feathers; but, in place of these, they bore a few soft decomposed plumes like those of the ostrich and the teal, and were adorned with a tuft of similar but smaller feathers. This rudimentary condition of the wings led to the dodo's being placed among the cursorial birds by many writers. The general colour of the dodo was a blackish grey, but the plumes of the wings were of a light ash-colour. In Tradescant's catalogue ("Museum Tradescantianum; or a Collection of Rarities preserved at South Lambeth," by John Tradescant; London, 1656), we find, among the "whole birds, dodao, from the island Mauritius; is not able to flie, being so big." That this was a dodo there can be no doubt; for we have the testimony of an eye-witness, whose ornithological competency cannot be doubted, in the affirmative. Willughby, at the end of his section on the

dodo, and immediately beneath his translation of Bontius, has the following words:—"We have seen this bird dried, or its skin stuffed, in Tradescant's cabinet." Le Strange, in his observations on Sir Thomas Browne's "Vulgar Errors," speaks of a dodo exhibited (probably in a caravan) in the streets of London:—"About 1638, as I walked London streets, I saw the picture of a strange fowl hong out upon a cloth, and went in to see it. It was kept in a chamber, and was a great fowle, somewhat bigger than the largest turkey-cock, and so legged and footed, but stouter and thicker, and of a more erect shape; coloured before like the breast of a young cock tesan (pheasant), and on the backe of dunn or deare colour. The keeper called it a dodo, and in the ende of a chimney in the chamber there lay an heap of large pebble-stones, whereof he gave it many in our sight, some as bigg as nutmegs; and the keeper told us shee eats them, conducing to digestion; and though I remember not how farre the keeper was questioned therein, yet I am confident that afterwards she cast them all agayne." Tradescant's stuffed specimen passed to the Ashmolean Museum at Oxford; but, being allowed to fall to decay, it was, by order of the curators, destroyed in 1755. Luckily, however, the head and one of the feet escaped destruction, and these, together with one other foot, safely stored in the British Museum, comprise the sole known remains of a creature commonly eaten within the last three hundred years.

Doe, John, *jon do*, in Law, was, previous to the passing of the Common Law Procedure Act (1852), a fictitious personage, who was usually employed as plaintiff in actions of ejectment against an equally fictitious defendant, Richard Roe. The claimant John Doe served the tenant in possession of the land with a declaration in ejectment against Richard Roe. Subjoined to this declaration was a notice to appear, addressed to the tenant in possession by name, in the form of a letter from Roe, informing him that he, Roe, was sued as a *casual ejector* only, and had no title to the premises and would make no defence, and therefore advising him to appear in court and defend his own title, otherwise he, Roe, would suffer judgment to be had against him, and he would thus be turned out of possession. If the tenant in possession did not, in due time, take the proper steps to be admitted defendant in the place of Roe, then, upon judgment being given against Roe, the real tenant would be turned out of possession by the sheriff.—*Ref.* Stephen's *Commentaries on the Law of England*.

Dog, *dog* (*Canis familiaris*).—To use the oft-quoted words of a great naturalist, "The dog exhibits the most singular, the most complete, and the most useful conquest that man has made. The whole species is become our property; each individual is entirely devoted to his master, adopts his manners, distinguishes and defends his property, and remains attached to him even unto death; and all this springs not from necessity -not from restraint, but simply from gratitude and a true friendship."—(*Cuvier.*) In all ages the *origin* of the domestic dog has been a question, and one most difficult of solution, with the most learned naturalists. Some are of opinion that the breed is derived from the wolf; others maintain that it is a familiarized jackal; all agree that no trace of it is to be found in a primitive state of nature. Wild dogs still exist: India furnishes them. There thousands exist in a completely independent state, and without exhibiting any wish to share the dwellings of man. Close observation of these animals, however, throws little light on the subject; and after all it would appear that they are naught else than abandoned canine vagabonds; and in their prowlings about the skirts of the villages they exhibit a fearlessness of human beings that, since it does not spring from ferocity or defiance, would seem to betoken a confidence in man never to be found in the roaming wolf or jackal. In certain Eastern cities, again, the canine prowlers are very numerous, and sometimes dangerous to approach, on account of their ferocity. Thus, however, is small proof of their wolfish origin. As Colonel Hamilton Smith truly observes, "If domestic dogs were merely wolves modified by the influence of man's wants, surely the cur of Mahomedan states, refused domestic care, and only tolerated in the capacity of scavengers, would long since have resumed some of the characters of the wolf." Mr. Bell, whose opinion on the subject is of high value, says, "In order to come to any rational conclusion on this head, it will be necessary to ascertain to what type the animal approaches most nearly after having for many successive generations existed in a wild state, removed from the influence of domestication and of association with mankind. Now we find that there are several distinct instances of the existence of dogs in such a state of wildness as to have lost even that common character of domestication,—variety of colour and marking. Of these, two very remarkable ones are the dhole of India and the dingo of Australia; there is, besides, a half-reclaimed race among the Indians of North America, and another, also partially tamed, in South America, which deserve attention; and it is found that these races, in different degrees, and in a greater degree as they are more wild, exhibit the lank and gaunt form, the length of limb, the long and slender muzzle, and the great comparative strength which characterize the wolf; and that the tail of the Australian dog, which may be considered as the most remote from a state of domestication, assumes the slight bushy form of that animal. We have here, then, a considerable approximation to a well-known wild animal of the same genus in races which, though doubtless descended from domestic ancestors, have



DALMATIAN DOG.

gradually assumed the wild condition; and it is worthy of especial remark that the anatomy of the wolf, and its osteology in particular, does not differ from that of the dog in general more than the different kind of dogs do from each other. The cranium is absolutely similar, and so are all, or nearly all, the other essential parts; and to strengthen still further the probability of their identity, the dog and the wolf will readily breed together, and their progeny is fertile. The obliquity of the position of the eyes in the wolf is one of the characters in which it differs from the dog; and although it is very desirable not to rest too much on the effects of habits or structure, it is not, perhaps, straining the point to attribute the forward direction of the eyes in the dogs to the constant habit for many successive generations of looking forward to their master, and obeying his voice." The latter part of this argument is, however, of too theoretic and speculative a character to carry weight, or, as some insist, to be worth weighing. With regard to the alleged untamably savage disposition of the wolf, Mr. Bell disposes of the objection by relating two anecdotes, one of which is of a she-wolf confined in the gardens of the Zoological Society in the Regent's Park. This creature, who had pups, was constantly in the habit of bringing them to the bars of her den that they might be caressed by the visitors, till at length, through constant friction against the hard iron, she rubbed the life out of the whole of her precious litter. Another strong argument used by Mr. Bell in favour of the identity of the dog and the wolf, is the fact that in both the period of gestation is the same,—

sixty-three days. The young of both wolf and dog are born blind, and see at the same, or about the same time, namely, at the expiration of the tenth or twelfth day. A satisfactory classification of the different kinds of dog has not yet been arrived at. What some naturalists regard as types, others regard as mere mongrel races. It is hard to found a principle of arrangement; form does not afford it, neither does the character of the fur; kinds that are totally dissimilar associate as easily as those that are closely allied. One of the best arrangements is that made by Colonel Hamilton Smith, wherein the domestic dogs are grouped in six sections:—1. the Wolf-dogs, including the Siberian, Iceland, Esquimaux, Newfoundland, Nootka, sheep, great wolf, Great St. Bernard, Pomeranian dog, &c.; 2. Watch and Cattle dogs, including the German boar-hound, Danish dog, mâtin, dog of the North American Indians, &c.; 3. the Greyhounds, including the Brinjaree dog, different kinds of greyhound, Irish hound, lurcher, Egyptian street dog, &c.; 4. the Hounds, including the bloodhound, old Southern hound, staghound, foxhound, harrier, beagle, pointer, setter, spaniel, springer, cocker, Blenheim dog, water-dog, or poodle, &c.; 5. the Cur dogs, including the terrier and its allies; 6. the Mastiffs, including the different kinds of mastiffs, bull-dog, pug-dog, &c.

DOG-DAYS. (*See* CANICULAR DAYS.)

DOG-FISH (*Scyllium catulus*), the common name of some of the smaller species of shark. The best known is the picked dog-fish, which is found in the European seas, and attains a length of about three feet. It belongs to the family *Spinacidæ*, of which one characteristic is the presence of a spine before the two dorsal fins. The body is long and tapering; the head flat: the snout conical; the teeth in both jaws sharp-edged, and formed for cutting. The tail fin is longer than it is broad. The upper parts are slate-grey, the under parts yellowish white. To use its spines offensively, the dog-fish bends itself into the form of a bow, and by a sudden motion causes them to spring asunder in an opposite direction. It sometimes appears in prodigious numbers: twenty thousand have been taken in a net at one time off the coast of Cornwall. They are said to afford the best food of any of the sharks, and are commonly brought to the markets of sea-side towns. The flesh is often dried. The liver yields oil, and the refuse parts are used as manure. It causes great annoyance to fishermen by cutting the hooks from their fishing-lines.

DOG-SHORE. (*See* LAUNCHING.)

DOG-STAR. (*See* SIRIUS.)

DOG-WATCH, in Mar., are the two reliefs which take place between four and eight o'clock P.M., each of which being only two hours on deck. The intention of these watches is to change the turn of the night-watch every twenty-four hours, so that the party watching from eight till twelve in one night shall watch from midnight till four A.M. on the succeeding one.

DOG-WOOD BARK. (*See* CORNUS.)

DOGE, *doje* (Ital., from the Lat. *dux*, a leader), the title of the chief magistrate in the republics of Genoa and Venice. The dogate, or office and dignity of doge, was elective; the doge of Genoa being elected for two years, and at Venice for life. The office was originated in the latter city in the year 697. When the seven tribunes by whom state affairs had been previously administered were found unequal to their posts, the Venetians resolved to replace them by a single chief magistrate, who should hold office for life. The doge was chief of the council, first minister, and personal representative of the republic; but, though invested with almost regal authority, he was not a sovereign. He could convoke assemblies, declare war, or conclude treaties, command the armies of the state, appoint the military tribunes and the judges, collect citizens, hear appeals, decide disputes between the clergy, award ecclesiastical punishments, invest bishops, and instal them in their churches. Notwithstanding these vast powers, a perusal of the history of Venice will prove, that though the Venetians allowed four centuries to elapse before they fixed the bounds, or controlled the exercise of the power of their chief magistrate, that, after that time, the doge was merely the representative of an authority which was actually reserved to the republic. In fact, he was a state pageant, who lent the weight of his name to the acts of the senate. He could give audience to ambassadors, but not make any answer to them as from himself on matters of importance. All credentials with which the senate furnished ministers to foreign courts, though written in his name, were not signed by him, but by a secretary of state, who sealed them with the arms of the republic. Dispatches were directed to him by ambassadors, but he could not open them, except in presence of the councillors; and, although money was struck in his name, it did not bear his stamp or arms. He could not go beyond Venice without permission of the council. His children and brothers were excluded from all the chief offices of state; and so jealously did the republic regard the chief they had themselves elected, that the doge of Venice was, politically speaking, a nonentity. He could not divest himself of his dignity at will; and at his death, three inquisitors and five correctors examined into his conduct with the most searching rigour. The personal history of the doges is inseparably incorporated with that of the republic of Venice; and the office, after an existence of eleven hundred years, yielded, with but a slight resistance, to the power of the republic of France.—Ref. *Quarterly Review*, vol. 31; *Edinburgh Review*, vol. 16; Daru's *Histoire de la République de Venise*, 8 vols. 8vo, Paris.

DOGGER, *dog'-ger* (Du.), a small ship or fishing-vessel, navigated in the German Ocean, and built after the Dutch fashion, with a narrow stern, a main-mast and mizen-mast. It is principally used for fishing on the Dogger Bank, an extensive sand-bank in the German Ocean, between England and Germany.

DOGGERELL, *dog'-ger-el* (Ang.-Sax.), a term applied to mean, paltry, loose, and irregular rhymes, where the jingle at the end of each line is the only thing preserved in common with verse or poetry. Shakspere, in "As you like it," gives an example of it, where Touchstone says, "I'll rhyme you so eight years together, dinners and suppers, and sleeping-hours excepted. It is the right butter-woman's rank to market,—

> "If a hart do lack a hind,
> Let him seek out Rosalind.
> If the cat will after kind,
> So, be sure, will Rosalind.
> Winter garments must be lined,
> So must slender Rosalind," &c.

DOGGET'S COAT AND BADGE, *dog'-gets*, a prize contended for at a rowing-match upon the Thames on the 1st of August every year. Thomas Dogget, an actor at the theatre in Drury Lane, desirous of commemorating the accession to the throne of George I. (Aug. 1, 1715), left a bequest of a waterman's coat and badge to be rowed for annually. At the present time several prizes are rowed for on the same day. In 1861, after Dogget's coat and badge, the second and third prizes were respectively five-eighths and three-eighths of the interest of £260. 17*s.* 3*d.*, formerly £200 South-Sea stock, left in the will of Sir William Joliffe, the amounts being respectively £1. 17*s.* 9*d.* and £2. 15*s.* 0*d.* The prize for the fourth man was £1. 11*s.* 6*d.* and for the fifth and sixth men, each £1. 1*s.*: the last three prizes were given by the Fishmongers' company. The competitors are six young watermen whose apprenticeships have expired within the year. The locality chosen for the race is from London Bridge to the Old Swan at Chelsea. The umpire is usually the barge-master of the Fishmongers' company, and the rowers are each placed singly in a boat provided with sculls. The match excites great local and general interest, and the skill exercised, and the speed attained by the rowers, are extraordinary.

DOGMA, *dog'-ma* (Gr., an opinion or notion), originally meant an opinion given out as a positive assertion, not requiring to be supported by any arguments; and hence a settled opinion, a principle, maxim, or tenet, particularly in theology or philosophy. In English, the term is frequently applied in a depreciatory manner to assertions advanced without proof. In a theological sense, it is applied to the doctrines of Christianity advanced not for discussion but for belief; hence dogmatic theology is that branch of divinity that systematically arranges and expounds the various doctrines of Christianity, as distinguished from scho-

istic theology, which deals with the arguments by which the truth of these doctrines may be supported. The first attempt to furnish a complete and coherent system of Christian dogmas was made by Origen in the 3rd century, in his work "De Principiis." He was followed, in the 4th century, by Augustine, with his work, "De Doctrina Christiana." The first, however, to treat this subject systematically was John Damascenus, who flourished in the 8th century. In the middle ages ingenious examinations of the Christian doctrines were made by the schoolmen; but agitating, as they did, subtle questions of little practical importance, they loaded the science with useless refinements. Among the Protestant reformers, Melancthon was the first who wrote a compendium of the Christian doctrine, which is still justly esteemed. The spread of the critical philosophy of Kant gave a fresh stimulus to this branch of theology in Germany, and since that time it has been extensively cultivated in that country. The most recent important work on this subject is that of J. Peter Lange, "Philosophische Dogmatik" (Heidel, 1849-51). Several Roman Catholic theologians in Germany have recently distinguished themselves in this field, some inclining to liberal notions, and others supporting the rules of the Church. It is worthy of remark that Nitsch and Beck have, in recent times, treated Christian dogmatics and morality in combination, the custom having been for the last two centuries to discuss them separately.—Ref. *Conversations Lexikon*.

Dogmas, History of, or, the History of Opinions, is a branch of ecclesiastical history which is more cultivated in Germany than here. "The history of dogmas," says Neander, "traces the generic development of Christian doctrine; it shows in what forms the same Christian truth has been developed as doctrine, and the relation of these forms to one another and to Christianity itself. . . . The history of dogmas is distinguished from the history of Christian truth, as it stands in the original records, which is to be regarded as the peculiar province of New Testament theology, and especially of New Testament dogmatics. . . . It is also bounded at another point by the representation of the condition of the Church at the present time, which is the business of statistics. . . . The history of dogmas relates, therefore, to the development of Christian doctrine in the intermediate period between pure apostolic Christianity and the church of the present day." Its object is to exhibit in an historical way the origin and the changes of the various Christian systems of belief, showing what opinions were received by the various sects in different ages of Christianity; the sources of the different creeds; by what arguments they were attacked and supported; what degrees of importance were attached to them in different ages; the circumstances by which they were affected; and the modes in which they were combined into systems. It is easy to see how important and interesting a study this is, teaching, as it does, modesty and forbearance in the support of particular opinions, by showing the vast variety of those which have afforded subjects of bitter controversy at particular periods, and have then passed away into oblivion. It shows farther, the process of culture which the human mind has experienced under the influence of Christianity, the conflict of truth with error, and the triumph of the former over the latter. The history of dogmas stands in very close connection with the history of the Church, and was formerly regarded merely as a department of it; but on account of its wide extent and importance, it is now generally treated as a distinct science. In church history, dogmas are not noticed till their influence has been greatly extended, while in the history of dogmas conflicting opinions are traced to their germ; the latter gropes its way to their hidden origin, the former only concerns itself with them as outward embroilments of controversy. The history of dogmas further forms the transition from ecclesiastical history to dogmatic theology, properly so called. In the history of dogmas two methods of arrangement may be followed,—either the order of time, or according to the nature of the events. Each of these methods has its advantages and disadvantages, and generally the two are combined; certain epochs or periods being adopted, and the dogmas of these periods then treated separately. Historians, however, differ greatly as to the number and limits of the different periods. The following are those adopted by Hagenbach:—1. From the close of the Apostolic age to the death of Origen (80—254),—the age of Apologetics; 2. from the death of Origen to John of Damascenus (240—730),—the age of Polemics; 3. from John Damascenus to the Reformation (730—1517),—the age of Systems (scholasticism in its widest sense); 4. from the Reformation to the abolition of the *Formula Consensus* in reformed Switzerland, and the rise of the Wolfian philosophy in Germany (1517—1720),—the age of Polemico-ecclesiastical Symbolism; 5. from the year 1720 to the present day,—the age of Criticism, of Speculation, and of Antithesis between faith and knowledge, philosophy and Christianity, reason and revelation.—*Ref.* Hagenbach's *History of Doctrines*; Neander's *Lectures on Dogmas*.

Dogmatists, *dog'-ma-tists*, were a sect of ancient physicians, called also *Logici*, or logicians, from their employing the rules of logic and reason in their profession, as distinguished from the empirics. They treated medicine as a speculative science,—defining, dividing, laying down principles, and drawing conclusions. They reduced diseases to certain genera, and these genera to species, and furnished remedies for them all.

Doit, *doyt* (Du. *d* ·), a small piece of Dutch copper money, in value the eighth part of a stiver, or half a farthing. In Scotland, during the reign of the Stuarts, the doit was the penny piece, twelve of which were equal to a penny sterling. Shakspere, in "Coriolanus," makes allusion to it as a thing of the least value.

Dolce, or Dol, *dol'-chai* (Ital.), a term in Mus., used to denote that the passage over which it is written is to be played in a soft, smooth, and delicate manner. In instrumental music, this term is generally applied to those portions of melody which are so peculiarly adapted to the voice that the performer cannot express them better than by taking the vocal tones as his guide.

Dole, *dole* (Lat. *dolus*, guile), a term used in Scotland, denoting the amount of conscious guilt or evil intention necessary to make a legal crime. It corresponds with the English term felonious intent. *Doli incapax* is one who is incapable of dole, or incapable of consent.

Dolerite, *dol'-er-ite*, in Min., a mineral composed of felspar and anjike. It is a variety of greenstone.

Doles at Funerals, *doles*, an ancient custom of making gifts to the poor at funerals, which was in use till comparatively modern times. It was continued until long after praying for the dead had been abandoned at the Reformation. The custom probably arose from the opinion that such gifts did give repose to the soul of the deceased. In Nichols's "History of Leicestershire" he thus speaks of the custom in connection with the village of Strathern:—"In 1790 there were 432 inhabitants, the number taken by the last person who carried about bread which was given for *dole* at a funeral,—a custom formerly common through this part of England, though now fallen much into disuse. The practice was sometimes to bequeath it by will; but whether so specified or not, the ceremony was seldom omitted. On such occasions a small loaf was sent to every person, without distinction of age or circumstances; and not to receive it was a mark of particular disrespect." The practice of giving doles at funerals was not only common in England, but also in Wales, Scotland, and Ireland. By some the custom is traced back to the sin-offering amongst the ancient Hebrews.

Doll, *doll* (Welsh *delor*), a toy, shaped like the figure of an infant, used by children of both sexes, but mostly by female children, whose love of dolls not only cultivates their affections, but teaches them to exercise their ingenuity in making clothes for and dressing them. The management of a doll is therefore a part of the education of girls, whose natural instincts and love of nursing are exhibited from their tenderest age. The use of these little effigies dates from the most remote period, and is common to all countries. They were portions of the playthings of the children of the ancient Romans and Persians; and in the female children of patrician Europeans, or the savage offspring of the Australian aborigines, the love of the imitation of the cares of maternity is equally implanted. The

majority of the dolls imported into Great Britain come from the Netherlands. The old Dutch or Flemish doll had a well-made face, a gaudy dress, and thin wooden legs. Great improvements have recently taken place in the manufacture of dolls, and large quantities are made in France, on the Rhine, and in Switzerland, as well as in England; and many hundred women are employed in their construction; some of whom carve the faces, others the figures, others the limbs; another class of operatives paints them, and another prepares and puts on the dresses. In 1861 there were twenty-three master doll-makers in London, one of whom manufactured them entirely of gutta-percha. Wires and machinery have been introduced into the bodies of the dolls, that make them open and shut their eyes, and imitate the sound of the words "papa," and "mamma." Since the accession of the queen, blue eyes have been generally inserted in the heads of dolls in England; but on the continent, and especially in Spain, black eyes are the favourites. In America, black dolls are made of gutta-percha, expressly for the use of negro children.

DOLLAR, *dol'-lar* (Ger. *thaler*, Du. *daulder*), the name of a coin of the states of America, whose value in the scale of coins adopted is equal to 100 cents, 10 dimes, or $\frac{1}{10}$ of an eagle. The American dollar, which was taken from the old Spanish dollar, or piastre, was formerly only of silver; but since 1849, a considerable issue of gold dollars has taken place. The American dollar is estimated in exchange at 4*s*. 2*d*. sterling. The Prussian dollar, or thaler, is worth 3*s*. sterling; in other parts of Germany the value of the dollar varies.

DOLLY-SHOP, *dol'-le*, the name applied in London to a shop where rags, old articles, and refuse, are bought, and over the door of which is usually suspended a large black doll. Dolly-shops are often kept as cloaks for an illegal trade. A small sum is advanced upon articles, which the seller has the option of repurchasing a few days after at a higher price; and thus a large profit is derived from a system of unlicensed pawnbroking.

DOLMEN, *dol'-men*, the name given by French archæologists to the monumental records erected over Celtic burial-places in Great Britain and France, which are called cromlechs in this country. (*See* CELTIC ARCHITECTURE.) The word is supposed to be the Celtic term for a stone table. The neighbourhood of Saumur, on the Loire, in the department of the Maine and Loire, is rich in Druidical remains, and one of the most remarkable dolmens that are known is to be seen there. It is called the *Pierre couverte*, and consists of a rude structure of four broad thick stones, covering an area of about sixty-five feet in length by fifteen in breadth, and supported on ten unhewn blocks about six feet high.

DOLOMITE, *dol'-o-mite* (from Dolomieu, a French geologist), in Min., a crystalline variety of magnesian limestone, differing from the ordinary varieties, which are compact and amorphous. The crystalline structure is generally supposed to result from igneous influence.

DOLPHIN, *dol'-fin* (*delphinus*).—This fish bears a great resemblance to the porpoise, but has a much longer and sharper snout. The teeth in both jaws are nearly conical, though some of the species lose those of the upper jaw at an early age. They are very vo-



DOLPHIN.

racious, and are said to prey not only on fishes, medusæ, &c., but also on the wounded and feeble of their own species. They live, however, in herds, which often delight the voyager in the ocean solitude by the gambols which they perform around his ship. "They may be discovered," says a celebrated naturalist, "at a great distance, as they are continually leaping from the surface of the sea, an action which, as it seems to have no obvious object, is probably the mere exuberance of animal mirth. When a shoal is seen thus frolicking at the distance of a mile or two, in a few moments, having caught sight of the ship, down they come trooping with the velocity of the wind. When arrived, they display their agility in a thousand graceful motions,—now leaping with curved bodies many feet in the air, then darting through a wave with incredible velocity, leaving a slender [illegible] of whitening foam under the water; now the [illegible] fin only is exposed, cutting the surface like a knife; then the broad and muscular tail is elevated as the animal plunges perpendicularly down into the depth, or dives beneath the keel to explore the opposite side." It is said that in these gambols the dolphin has been known to leap out of the water to such a height as to fall on the deck of a ship.

DOM. (*See* DON.)

DOM-BOC. (*See* DOOMBOOK.)

DOME, *dome* (Gr. *doma*, Lat. *domus*, Ital. *duomo*, a house; but, in the last-named language, applied to cathedrals and churches, as the house of God), in Arch., a word which expresses any covering placed over a building and taking the form of a hemisphere or spherical vault, whether round or polygonal, at the base. A distinction should properly be made between the terms dome and cupola,—the former applying to the exterior, or convexity of the covering, and the latter to its interior surface, or concavity; but they are generally used as synonymous expressions. In building a dome of masonry, its thickness should be the greatest at the base, which is the weakest part, and gradually diminish towards its crown or centre. The lower courses of masonry should also be strengthened by hooping or framing, particularly if the diameter of the base be considerable. The principles on which the equilibrium of a dome is maintained are similar to those on which the equilibrium of arches depends. (*See* EQUILIBRIUM OF ARCHES.) They are put together on centerings of elaborate construction; but these serve rather as a scaffold for the workman than as a support for the materials of which the dome is made, until the crown is inserted. The use of the dome was not resorted to by the Egyptians, Assyrians, and Greeks; but the Romans, who were the first to use the arch to any great extent, also erected circular vaulted roofs or domes over many of the temples of their heathen gods; among which may be named those of Bacchus, Apollo, Minerva, and Diana, and the magnificent Pantheon at Rome. They also covered the chambers of some of their splendid baths with roofs built in this form; as in the baths of Caracalla and Diocletian. In Byzantine architecture, the dome was a peculiar feature in all cathedrals and churches built after that style, and amongst these the dome of St. Sophia, at Constantinople, may be especially noticed. (*See* BYZANTINE ARCHITECTURE.) The majority of the Italian churches built during the middle ages are also surmounted by domes. The great dome of St. Peter's at Rome was designed and partly built under the superintendence of Michael-Angelo. Among the most remarkable domes of more modern construction may be mentioned those of the Invalides and the Pantheon at Paris, and those of St. Paul's, by Sir Christopher Wren, the reading-room of the British Museum, and the Exhibition building of 1862, in London. The following are the dimensions of some that have been already mentioned, with one or two additions, giving the height in feet from the base to the centre, and the diameter of the base, including the thickness of the walling or materials between the outer and inner surface:—

| NAME. | Height. | Diameter. |
|---|---|---|
| Pantheon, Rome | 143 | 143 |
| Baths of Caracalla, Rome | 116 | 112 |
| Baths of Diocletian, Rome | 68 | 74 |
| St. Sophia, Constantinople | 201 | 115 |
| S. Maria del Fiore, Florence | 310 | 139 |
| St. Peter's, Rome | 330 | 139 |
| Invalides, Paris | 173 | 80 |
| Pantheon, Paris | 190 | 67 |
| St. Paul's, London | 215 | 112 |
| British Museum, London | 106 | 140 |
| Exhibition Building, 1862, London | 100 | 160 |

—*Ref.* Fergusson's *Handbook of Architecture*; Robison's *Mechanical Philosophy*; *English Cyclopædia*—Arts and Sciences.

DOMESDAY, or DOOMSDAY BOOK, *domes'-dai*, one of

the most ancient and valuable records of England, framed by order of William the Conqueror, to serve as the register from which judgment was to be given upon the value, tenure, and services of lands therein described. According to some historians, the survey was begun in 1080 or 1083; according to others, at the close of 1085. The book itself records its completion in 1086. The work appears to have been known by the other names of Rotulus Wintoniæ (Roll of Winchester), Liber de Wincestra (Book of Winchester, in consequence of its being at one period preserved in that city), the Liber Censualis Angliæ (Rate-book of England), Scriptum Tricarii Regis (Record of the King's Treasury). The origin and object of the record are well described by the author of the "Saxon Chronicle," a contemporary work. He states, that in the nineteenth year of the Conqueror's reign an invasion was apprehended from Denmark, and the military constitution of the Saxons being then laid aside, and no other introduced in its stead, the kingdom was wholly defenceless, which occasioned the king to bring over a large army of Normans and Britons, who were quartered upon every landholder, and greatly oppressed the people. But the danger having passed away, the king held a council, to inquire into the state of the nation; the immediate consequence of which was the compilation of the "Domesday Book," or Great Survey, which was finished in the succeeding year, at which period the king, attended by all his nobility, held a court at Sarum, where all the principal landholders submitted their lands to the yoke of military tenure, became the king's vassals, and did homage and fealty to his person. The formation of the record took place three years: persons called the king's justiciaries visited the greater part of the kingdom and obtained the required particulars, on oath, from the sheriffs, lords of manor, parish priests, reeves of hundreds, bailiffs, and villeins of each vill. The record contained a list of the bishops, churches, religious houses, great men, king's officers, king's tenants *in capite*, and under-tenants: the particulars of the name of each place, its holder, its extent, the extent of wood, meadow, and pasture, the ponds and mills, the quantity of live stock, the value of the whole, the homages of each manor, the number of villeins, cotarii, servi, and freemen, and how much each freeman or soeman had. Three estimates of the estates were made: viz., as they were in the time of Edward the Confessor; as they were bestowed by William, and as they were at the time of the survey. Moreover, the jurors were required to state whether any advance could be made in the value. The returns of the justiciaries were sent to Winchester, and being there digested, were entered in two volumes, which were carried about with the king and great seal, or deposited in a chapel or vault of the cathedral, called *domus Dei*. From this last circumstance the name Domesday is thought to be derived; while others ascribe it to a parallel between the decisions of the book and those of the day of doom. The first volume, called the "Great Domesday," consists of 382 folio pages, closely written on vellum, and contains the survey of thirty-one counties. The second, or "Little Domesday," is a quarto volume of 450 pages, and comprises the returns from Essex, Suffolk, and Norfolk. It contains also a list of "invasions," or lands possessed without royal authority. Neither Northumberland, Cumberland, Westmoreland, nor Durham, appears in the record; for which various reasons are assigned. Other counties are described, either wholly or in part, under adjacent divisions. No account is given of either London or Winchester. As a census of the population, the Domesday Book is of no value; but with regard to the ancient tenure of lands its authority is supreme. It mentions only 1,400 tenants *in capite*, and 8,000 under-tenants, and names a total population of 282,242. The book is now preserved in the chapter-house at Westminster. A fac-simile of it was published in 1783 by order of the government. It was ten years in passing through the press. In 1816 the commissioners of public records published two supplementary volumes, with a valuable introduction by Sir Henry Ellis. The first volume was taken up with the general introduction; the second volume contained four similar records as the Domesday; viz., the Exon Domesday, the Inquisitio Eliensis, the Winton Domesday, and





the Boldon Book. These last records were valuable, as tending to supply what was deficient in the older and more famous Domesday-book. It is under contemplation to publish a fac-simile edition of the record. —Ref. *A General Introduction to Domesday-book*, by Sir Henry Ellis; *England under the Norman Occupation*, by Mr. J. F. Morgan.

Domestic Architecture, *do-mes'-tik* (Lat. *domesticus*).—The domestic architecture of every nation is greatly influenced by the degree of civilization to which it has attained, the climate and situation of the country, the national and social manners and customs of the people, and the materials for building which can be most readily procured. In any case, the external appearance and architectural design of any dwelling-house, whether it be a palace or a cottage, should be adapted to its local position, being mainly governed by the surrounding scenery, the materials that may be at hand, and sometimes by the style of the houses that may be in juxtaposition with it; while the internal arrangements must be controlled in a great measure by the circumstances, habits, and position in life of the family for whose occupation it is intended. But in dwelling-houses of an ordinary class, however desirable an architectural display and ornamentation may be when judiciously used, it is necessary that the comfort and convenience of the interior should be regarded before the external appearance, particularly when the builder is limited in his outlay; and the money which is too often wasted on the decoration of the outside should be spent in making the sleeping apartments a foot or two higher, and the attics less confined in space. The chief points to which attention should be paid in choosing a site for a house and erecting the building have been mentioned elsewhere. (*See* Building.) To enter more deeply on a subject that occupies so great a range, and involves so many points that are worthy of consideration, would be manifestly impossible, and it would be equally futile to attempt to point out any particular style of building, as regards the exterior or frontage, or any method of arranging the interior, when so many matters have to be thought of that directly refer to the locality in which the building is to be erected, and the purposes which that building may be intended to serve. It will be sufficient, therefore, to direct the reader to those works which will give him an insight into the form of English houses since 1100 to the present time, at different periods of our history; and the most suitable hints for the erection and design of houses, whether for private residences or for business purposes, either in town or country.—*Ref.* Parker's *Glossary of Architecture*; Gwilt's *Every Lowedia of Architecture*; Loudon's *Encyclopædia of Cottage Architecture*; *Architecture of the Victorian Age*, Darton & Co.

Domicile, *dom'-e-sile* (Lat. *domicilium*, from *domus*, a house), in Law, is the place where a person has his home. What constitutes a man's domicile in a legal sense is a question that has given rise to many difficulties, and is marked by many subtile distinctions. In general, a man's domicile is "where he has placed his hearth and centred his fortunes." The domicile of the parents is that of the child; and if a child be illegitimate, it follows the domicile of its mother. A married woman follows the domicile of her husband, and a widow retains the domicile of her late husband till she acquires another. A married man's domicile is generally taken to be where the residence of his family is; and in general the place where a man lives is to be taken as his domicile, unless there be evidence to the contrary. Every person of full age who removes from one place to another with the intention of making the latter his permanent residence, constitutes it his domicile; but it is held that the former domicile is not lost till the new one is acquired *animo et facto*. It is an established principle of the English law that domicile of origin must prevail until the party has not only acquired another, but has manifested and carried into execution an intention of abandoning his former domicile and adopting another as his sole domicile. The distribution of personal property is regulated according to the laws of the country in which the deceased was domiciled at the time of his death. Succession to heritable property is regulated by the law of the country where it is situated, wherever the death of the

proprietor may have taken place. A will, to be valid, must be executed in conformity to the law of the country where the testator was domiciled; and the validity of a marriage depends upon its being in conformity with the law of the country in which it took place, provided the parties were *bonâ fide* domiciled there.

DOMINICAN FRIARS, *dom-in'-e-kan*, an order of friars first instituted by Dominic de Guzman, at Toulouse, in 1215. About the year before he had, together with Diego de Asebes, endeavoured to convert the Albigenses in the south of France by preaching. Feeling that the immorality of the clergy and the ignorance of the population were great aids to heresy, he instituted the order of the Dominicans for the purpose of preaching and converting. The order was confirmed by Innocent III. and Honorius III., in 1216. Before that time, however, Dominic had found that preaching had little effect upon the Albigenses; and, at his instigation, the pope proclaimed a crusade against the "heretics." The barons of France were summoned to join, and horrible slaughter was committed on these unfortunate people. Dominic himself is not said to have been a harsh or cruel man, but merely led blindly away by bigotry and religious passion. The members of his new order wore a white garment similar to that worn by the Carthusians, with a black cloak and a pointed black cap. Five years after their institution they took the vow of poverty, and in the following year Dominic died. He was canonized by Gregory IX. in 1233. Another Dominican order was established in 1224, called the Knights of Christ. Its object was to suppress heresy by force of arms. The title of the order was afterwards changed to that of the Penitents of St. Dominic. They did not lose their civil or domestic rights and privileges. The original order increased rapidly in numbers and influence. Within six years after their institution they had spread into England, led by Gilbert du Fresney, and founded a monastery at Oxord. They also made their way into Scotland, where they were well received by Alexander II. In England they were always called the *Black friars*, and many traces of them are to be observed in nearly every town. In France they were called Jacobins, from the fact that they first located themselves in the Rue St. Jacques,—in the Latin, Jacobus. They produced several famous scholars; Albertus Magnus, Thomas Aquinas, and Raymund de Pennaforte, being amongst the number. Their great rivals were the Franciscans. At the present day, the order of Dominicans only flourishes in Italy, France, Hungary, Switzerland, and America. Dominican nuns have also existed contemporaneously with the friars. There are several of their convents on the continent.

DOMINO, *dom'-e-no*, a long robe of black silk furnished with a hood removable at pleasure, and used as a disguise by persons of both sexes, chiefly at masquerades. The name domino was doubtless derived from the habit worn by the priests upon their heads and shoulders during winter; from whence sprung the association with a word frequently occurring in the liturgy of the Roman Catholic church.

DOMINOS, a game generally played with twenty-eight flat oblong pieces of ivory or bone, each divided by a line into two parts, bearing numbers marked by points. The game is won by the player who plays out all his tablets or dominoes first, or, if that is impossible, the player who has the least number of points on the dominoes left in hand. The game of dominoes is supposed to be very ancient; it has been traced back to Greek, Hebrew, and Chinese origin. At the beginning of the 18th century it was introduced into France from Italy, and, after becoming very popular there, it spread into Germany and generally over the continent.

DON, *don* (from the Lat. *dominus*, lord), a title of honour in Spain and Portugal. In the latter country no person can assume the title of don without permission from the king. This mark of distinction and nobility was first conferred upon Pelayo, in the beginning of the 8th century. It is frequently found in the works of Chaucer, under the old English form of the word, *dan*.

DONATI'S COMET, *do-na'-te*, a brilliant comet discovered at Florence by an Italian astronomer, named Donati, early in June, 1858, when it was supposed to





be nearly 330,000,000 of miles distant from the earth. It became visible to the naked eye in the beginning of the September following, reaching its perihelion about the 30th of that month. It reached the point in its orbit nearest to the earth on Oct. 10, when the diameter of its head appeared to be about 100,000 miles, and that of the nucleus 800 miles. When it first became visible without the aid of a telescope, its tail appeared to be 14,000,000 of miles in length. This gradually increased to 51,000,000 on Oct. 10, when the tail seemed to cover an arc of 40°; but as it went away from the earth, the length of this part of the comet diminished with greater apparent rapidity than it had previously increased.

DONATION, *do-nat'-shun* (Lat. *donatio*, from *dono*, I give), is the act of giving or bestowing; also, a gift. A donation, to be valid in law, supposes a capacity both in the donor to give and in the donee to receive. It distinguishes between a *donatio inter vivos* and *donatio mortis causâ*; in the former case a gift, to be valid and binding, must either be accompanied by the solemnity of a deed, or by that of delivery of possession; and when so perfected it is not in the donor's power to retract it, though a mere gift, unless it be prejudicial to creditors, or the donor were under some legal incapacity, as infancy, coverture, or the like. A *donatio mortis causâ* is when a person in his last sickness, apprehending his dissolution near, delivers, or causes to be delivered, to another the possession of any personal goods to keep in case of his decease. The gift being made only in contemplation of death, implies that if the donor lives, it shall revert to himself, and consequently it partakes of the nature of a legacy. If the donor dies, it needs not the assent of the executors, but it is of no avail against creditors in case of a deficiency of assets. To be effectual, it must be accompanied by a delivery of the chattels; or if it be in action, and not in possession, the delivery of the instrument by which it is secured. As it takes effect from the delivery, it is not a testamentary act, and does not come within the jurisdiction of the ecclesiastical courts, nor require probate or administration.

DONATISTS, *do'-nā-tists*, in Eccl. Hist. was the name of a powerful and influential Christian sect that arose in North Africa in the early part of the 4th century. They were the followers of Donatus, a bishop of Numidia, who opposed the election of Cecilianus to the bishopric of Carthage in 311, on the ground of his being a *traditor*, or having delivered up the sacred books to the pagans, and that thereby his election was void, and all who adhered to him heretics. He quitted the Roman church, and founded a distinct sect, regarded all others as heretics, and not to be received into their body without a second baptism; consequently they denied the infallibility of the Roman church. They were condemned in a council held at Rome two years after their separation, and the year following by another at Arles. Constantine the Great, in 316, deprived them of their churches, and sent their seditious bishops into banishment; but, notwithstanding these severities, their doctrines spread very rapidly, and in 330 they are said to have numbered 172 bishops in the Christian provinces of Northern Africa. Driven fanatical by the oppression of the civil power, they not only denied the right of the state to interfere in matters ecclesiastical, but bands of Donatist zealots attacked the imperial troops, and for thirteen years continued to devastate Mauritania and Numidia. Martyrdom was eagerly sought by them, and they willingly gave themselves up to be executed. Neither the eloquence of Augustine nor the severities of the emperor Honorius had any marked effect upon this body, and they continued to flourish during the 5th and greater part of the 6th century. Towards the end of the 6th century, however, many of them were induced to return to the Catholic church, and in the following century they became extinct. The Donatists, like the Novatians, went upon the principle that the essence of a true church, according to Ephesians v. 27, consisted in the purity and holiness of each of its members individually, and not merely in its Apostolico-Catholic foundation and teaching: hence they held, that every church which tolerated unworthy members was itself polluted by communion with them, and consequently ceased to be a true Christian church. They

therefore excommunicated all known and gross offenders, only receiving them again upon being re-baptized: and they also held that the efficacy of the sacraments depended upon the personal worthiness of the administrator.

DONATIVE, *don'-ă-tiv* (Lat. *donativum*), is generally a donation, gift, or gratuity. In the canon law it is applied to a benefice given by the patron to a priest without presentation to the ordinary, and without institution and induction. No license from the bishop is necessary to perfect the donee's title to the possession of the donative; it receives its full effect from the single act and sole authority of the donor. Donatives are further exempt from episcopal jurisdiction, and are visited by commissioners appointed by the patron. Donatives are created whenever the king, or any subject by his license, doth found a church or chapel, and ordain that it shall be merely in the gift or disposal of the patron, subject to his visitation only, and not to that of the ordinary, and vested absolutely in the clerk by the patron's deed of donation, without presentation, institution, or induction. According to some, this was anciently the only way of conferring ecclesiastical benefices in England, the institution by a bishop not being earlier than the time of Becket; according to others, the claim of the bishops to institution is as old as the first planting of Christianity in the island. The law now is, that if the true patron once waives his privilege of donation, and presents to the bishop, and the clerk is admitted and instituted, the advowson ceases ever after to be donative.

DONIS CONDITIONALIBUS. (*See* ENTAIL.)

DONJON, or DONGLON, *don'-jon* (Fr. *donjon*), in Mediæval Arch., the name given to the keep or principal part of a castle. (*See* CASTLE.) Prisoners were generally confined in the basement story of the donjon, and from this circumstance, the word, which is now written dungeon, has been taken to express any dark and dreary prison cell, but more particularly one which is partially or entirely below the surface of the ground.

DON JUAN, *don ja'-un*, a legendary or mythical character, prevalent in southern Europe, and intended as a representative embodiment of sensuality and want of faith. It stands in contrast to Gothe's Faust, which represents rather a crafty and subtle rationalism tending towards the same ends. The legend of Don Juan represents the hero as a profligate man, who gives himself up entirely to his own selfish pleasures, especially to that of love. The legends are numerous, but bear a close resemblance to one another. The principal events are as follows. The scene is laid at Seville, and Don Juan is represented as belonging to a high and celebrated family. His chief object is the seduction of the daughter of a governor at Seville. Finding that the father opposes his designs, he stabs him in a duel. Afterwards, forcing his way into the family tomb of the murdered man, he orders a feast to be laid out, and sneeringly invites the marble statue which had been raised to his victim to join him at the banquet. The statue does appear, and, seizing Don Juan, both of them sink together into hell. This legend, which has been much used, was first employed in an operatic form by Vincenzo Righini, in "Il Convitato di Pietra." Mozart's "Don Juan" was written eleven years afterwards, and since that time (1787) the legend has been a general favourite.

DOOM BOOK, DOM BOC, or DOME BOOK, *doom'-buk*, is the name given to the code of laws compiled by Alfred the Great. The general opinion has long been that Alfred was the framer of these laws; but, according to Dr. Pauli, in his life of that monarch, "he created no new laws; his aim was simply to restore, to renovate, to improve." In every part of his dominions he met with existing laws which required revision, alteration, or arrangement, and to this duty Alfred addressed himself, assisted by the advice and co-operation of the wisest and best men of the time. He had before him the Kentish collection of Ethelbert, the compilation of the West Saxon laws by his own ancestor Ina, and the law-book of the great Offa, which was used in Mercia. "Ina's collection was the only one received entire into the Codex, which was chiefly applicable to the condition of the West Saxons. A few articles were admitted here and there from the Kentish and Mercian laws; but research into this matter is not possible, as Offa's book is lost."—(*Pauli.*) Everywhere throughout this code is the character of Alfred's own mind shown much more than that of the age in which he lived. It cannot be denied that there is a tendency towards despotism manifested in these laws, and also that they incline too much to the old Levitical law; but nevertheless it is evident that he strove to administer law and justice with equity, and to temper the old Jewish economy by the addition of the grand Christian doctrine, that "a man should love his neighbour as himself." He begins with extracts from the Bible:—"And the Lord spake all these words; saying, I am the Lord thy God," &c.; then follow the Ten Commandments, part of the Mosaic law, followed by passages from the New Testament, including the golden rule of Christian morality. He strove not only to repress crime, but to check every species of immorality among all classes of his subjects; and his efforts to educate the morals of his powerful but still uncultivated people, in accordance with the doctrines of the Bible, are indeed beautiful and excellent.—*Ref.* Dr. R. Pauli's *Life of Alfred the Great.*

DOOMSDAY-BOOK. (*See* DOMESDAY-BOOK.)

DOOMSTER, or DEEMSTER, *doomster*, the name of an officer formerly attached to the High Court of Justiciary in Scotland. He pronounced the sentence or doom of condemned persons. The office has been abolished for many years. When a trial had concluded, the doomster was brought forward face to face with the wretched criminal. In the "Heart of Midlothian" and "Old Mortality" this dread official is described with all Sir Walter Scott's graphic power. Deemsters, in the islands of Jersey and Man, are judges of a particular kind.

DOOR, *dore* (Sax. *dure*, Teuton. *deur*), the movable panel by which the doorway or entrance to any building, apartment, closet, or court, is closed. The most common kind of door consists of boards joined together and nailed to transverse slips of wood. Such doors as these are called "ledge-doors." They are hung on staples, and fastened by a latch: they are principally used for workshops, out-houses, offices, and walled gardens. The ordinary house-door is fastened to one side of the doorway by hinges (*see* HINGE), on which it swings. It is secured by a box-lock, fixed to the inner side, or by a mortise-lock, which is buried in the lock-rail, and worked by handles projecting on either side. These doors are made of panels fixed in a solid framework, and finished by mouldings of different kinds, which surround the panel. The horizontal pieces of the frame are called "rails," and the vertical pieces "styles." Doors are technically described by the number of panels they contain and the kind of moulding with which they are finished. When they move on hinges, like the ordinary doors of apartments, they are termed "swing-doors." Large double doors used to separate any long room are called "folding-doors." A jib-door is a door in a wall, which cannot well be detected when closed. A rolling or sliding door is one which travels on rollers, or in a groove, parallel and close to the wall in which is the aperture that it is intended to close. A smaller door which closes an opening cut in the entrance-door of a court-yard or large building, is called a "wicket-door." A trap-door is a door cut in the floor to give access to cellars, or open parts under the roof of a house. Doors of large public buildings are sometimes made of brass, and even of stone or marble.

DOORWAY, *dore'-way*, an aperture in the wall of any building, or the partitions, to allow of ingress and egress to and from the building itself and the various apartments that are within it. In ordinary buildings a strong framework of wood, to which the door is hung, is fastened to bond-timbers inserted in the sides of the opening. The vertical pieces or sides of the framework are called the "jambs," and the transverse piece at the top "the lintel." A piece of wood called the "sill" is sometimes put transversely between the feet, or lower ends of the jambs, to give strength and stiffness to the framework. For entrance-doors the sill is generally of stone. The framework is finished round the edge that is nearest the wall of the room or passage by a moulding. Doorways vary according to the size and importance of the building or apartment to which they give access, but the dimensions of an ordinary door-

way are about 7 feet by 3 feet. The treatment of the doorway forms a striking characteristic feature in the various styles of architecture. In Egyptian and Assyrian architecture the doorways are surmounted with square lintels. The openings, particularly in the former, were wider at the bottom than at the top, and surrounded by a flat moulding enriched with sculpture. The lintel was generally very deep, and surmounted with a projecting cornice, and colossal figures were usually placed on either side of the opening. The doorways in Grecian architecture were rectangular in form; they were surrounded by mouldings, and sometimes surmounted with a cornice supported on brackets. In early Roman architecture the form of the doorway was the same; but at a later period the semicircular arched heading was introduced, which subsequently became the characteristic feature of the Byzantine and Romanesque styles. In Arabian and Gothic architecture the head of the doorway assumed a pointed form, and in the latter the opening was surrounded by a great variety of bold and deep mouldings, and richly ornamented. The decoration employed became more and more elaborate in the transition from the Norman style to the Perpendicular English, through the Early English and Decorated English periods, being, perhaps, most graceful and natural in the style last named. In the Perpendicular English style of architecture, the doorway, although it was still pointed, was surmounted by a square moulding or label, which is peculiar to buildings in this style and of the Tudor period, when the flat four-centred arched heading was introduced.

**Dorado**, *do-ra'-do* (Fr. *dorade*, Sp. *dorado*, gilt, from *dorar*, to gild), in Astron., a constellation in the southern hemisphere, otherwise known as the Sword-fish, and so named by the German astronomer Bayer. It lies in a direct line between the constellations Argo and Eridanus. Its largest star is of the third magnitude.

**Dorcas Society**, *dor'-kăs*, a term applied to an association of ladies who unite together to obtain subscriptions in order to bestow clothing and other aids to females in distress and want. The name is also given to societies got up for the purpose of giving work to distressed needlewomen. The name owes its origin to a verse in the Acts of the Apostles. "And all the widows stood by him weeping, and showing the coats and garments which Dorcas made, while she was with them."—Acts ix. 39.

**Doric Dialect**, *dor'-ik*, was one of the four dialects of the ancient Greek language, being that spoken by the inhabitants of Doris. It was characterized by a certain roughness and harshness, and was much less polished than either the Ionic or Attic. Pindar, Theocritus, and Bion wrote in this dialect.

**Doris**, *dor'-is*, a genus of naked marine molluscs, sometimes known as sea-lemons. The body is oval, the abdomen flat; the back flat in some, and elevated in others; the mouth a small proboscis, with two small tentacula; the vent situated in the back, and surrounded by a circle of branched or plumed gills. As is obvious from the structure of the digestive organs, the species must exist on the softest food. They are plentiful on the coasts of Britain, where they may be found crawling on rocks, sea-weed, &c.

**Dormant**, *dor'-mănt* (Fr., sleeping), in Her., an animal is said to be dormant when it has its head resting upon its fore-paws, in contradistinction to couchant, where the head of the animal is held erect.

**Dormant Vitality.** (*See* Vitality.)

**Dormer**, *dor'-mer*, the name given to a window put in a small projection like a gable rising vertically from the roof of a house, and used to light attics or sleeping apartments in the roof, instead of a skylight, which is in the plane of the roof. There are sometimes three, and even four rows of dormer windows in the steep roofs of large public edifices built in France, Belgium, Holland, and Germany, between the commencement of the 15th and the close of the 17th century.

**Dormitory**, *dor'-me-for-e* (Lat. *dormire*, Fr. *dormir*, to sleep), a sleeping-chamber, but especially applied to large apartments in a monastery or school calculated to hold a great number of beds. To insure privacy and solitude, either side of the dormitory in religious houses was often divided into a number of small cells.

**Dormouse**, *dor'-mows* (from Lat. *dormio*, I sleep, and *mouse*), a gen. of rodent quadrupeds, which is generally regarded as forming a connecting link between the *Muridæ* (rats, mice, &c.) and the *Sciuridæ* (squirrels, &c.). The chief characters by which the dormice are distinguished from the squirrels are derived from the structure of the skull, teeth, and intestine. The form of the skull resembles that of the mice, in being suddenly narrowed in the frontal region. There are four molar teeth on each side in each jaw; the upper jaw not possessing the anterior rudimentary fifth molar characteristic of the squirrels. The intestine is destitute of a cæcum,—an organ which is of very large size in all the other rodentia. The dormice have no cheek-pouches. The ears resemble those of mice. The body is about the size of that of the common mouse, but much plumper; the eyes large, black, and prominent; the tail between two and three inches in length, and more hairy at the top than elsewhere. With the exception of the throat, which is white, the dormouse is of a tawny-red colour. They are found only in the temperate parts of the Old World, especially in Europe and Africa. In Asia they appear to be confined to the neighbourhood of the Caucasus. Only a single species, the common dormouse (*Myoxus avellanarius*), is found in Britain. It is extremely gentle and easily tamed, and feeds on beech-mast, acorns, hazel-nuts, &c. "It takes its food holding it in its hands, and sitting on its haunches like a squirrel (so do the rats), and often suspending itself by its hind feet, in which position it feeds as easily and comfortably as in the most ordinary position. Towards the winter it becomes exceedingly fat, and, having laid up a store of food, retires to its little nest, and coiling itself up into a ball, with the tail over the head and back, becomes completely torpid. A mild day calls it into transient life; it then takes a fresh supply of food, and relaxes into its former slumber; and, finally awakening in the spring, by which time it has lost much of its fat, it enters upon its usual habits, and the enjoyment of the conjugal and paternal affections. The young are generally born blind; but in a few days the eyes are opened, and in a short time they are enabled to seek their food independently of their parents' care. I have reason to believe, in some cases at least, the dormouse has a second brood early in the autumn, as I have received from one locality in the month of September an adult one about half grown, evidently of the spring brood, and three very young ones, not more than a fortnight or three weeks old."—(*Bell's British Quadrupeds.*) There are two other beside the common dormouse; viz., the fat dormouse (*Myoxus Glis*) and the garden dormouse (*Myoxus Nitela*). The former is a large species, as big as a rat, and with a tail like a squirrel. It is A native of France and the south of Europe. The garden dormouse is smaller than the fat dormouse, and, breeding in gardens, is very destructive to wall and other fruit. It is a native of the temperate parts of Europe and Asia.

**Dorsal**, *dor'-sal* (Lat. *dorsalis*, from *dorsum*, the back), denotes something appertaining to the back, and in Anat. it forms part of the name of ligaments, arteries, &c., belonging to that region.

**Dorstenia**, *dor-ste'-ne-ă* (in honour of Theodore Dorsten, a German botanist), in Bot., a gen. of plants belonging to the nat. ord. *Moraceæ*. The rhizomes and roots of several species have been supposed to be antidotes to the bites of venomous reptiles: those of *D. contrayerva* and *brasiliensis* have been employed in medicine for their stimulant, tonic, and diaphoretic properties.

**Dort, Synod of**, *dort*, a famous assembly convened in 1618 at Dort, or Dordrecht, on the Rhine, convoked by the authority of the States-general. Eminent divines from England, Scotland, Bremen, Hessia, Switzerland, the Palatinate, and the United Provinces, attended it, to decide the controversy between the Arminians and the Calvinists. The Arminian party desired to begin the debate by a condemnation of the Calvinistic tenet of reprobation; but it was decreed that as they themselves were accused of departure from the faith, before they could condemn others they must justify themselves. To this order of procedure they would not yield submission. They were banished, and the synod condemned, in order, the Arminian tenets. The Ar-

minians, *or*, as they were sometimes called, the Remonstrant party, suffered civil proscription and cruel persecutions. Grotius was sentenced to perpetual imprisonment, and Oldenbarnevelt was executed. Friesland, Groningen, Zealand, Guelderland, and Utrecht, would not accept all the decisions of the synod; and its authority was not fully recognized in Holland or England. (*See* ARMINIANS and CALVINISM.)

DORY, or JOHN DORY, *dor'-e*, a native of the Mediterranean, Northern, and Atlantic seas. Torbay, on the western British coast, is a celebrated locality for this fish. Its name John Dory is probably derived from its French appellation, *jaune* (yellow) *dorée* (gilt). It is usually about eighteen inches in length, though Pennant mentions one that weighed twelve pounds. The general surface of the body is smooth and destitute of scales, but spiny scales or bony shields guard the dorsal and ventral edges. The anterior portions of the dorsal and oval fins are spiny, and very distinctly separated from the spineless portions. It is an extremely voracious fish, preying on small fishes and their spawn, as well as on the various kinds of crustacea and marine insects. It has an oval black spot on each side, and on this account shares with the haddock the honourable repute of being the fish from whose mouth the tribute-money was taken by St. Peter, the impression of whose thumb and forefinger remained to record the event. Other species of the dory very similar to the European are found in the seas of other parts of the world. It is the type of the fam. *Zeidæ*. The scientific name of the British species is *Zeus Faber*.

DOSE, *dose* (Gr. *dosis*, from *didomi*, I give), is employed to denote a proper quantity of anything to be given or administered at one time, and is generally applied to medicines. As the quantity of any medicine proper to be administered to an individual must necessarily depend upon his age and strength, these have to be taken into account in determining in any case the proper dose. A certain quantity, known as a full dose, is usually fixed upon as being suitable for a male from 25 to 40 years of age, diminishing proportionally for persons above or below that age. Thus, when the age is between 1 and 2 months, $\frac{1}{12}$ to $\frac{1}{6}$ of a full dose is sufficient; at 6 months, $\frac{1}{4}$; 12 months, $\frac{1}{3}$; 2 years, $\frac{1}{2}$; 5 years, $\frac{2}{3}$; 8 years, $\frac{3}{4}$; 12 years, $\frac{4}{5}$; 16 years, $\frac{5}{6}$; 20 years, $\frac{7}{8}$; 50 years, $\frac{7}{8}$; 65 years, $\frac{3}{4}$; 80 years and upwards, $\frac{2}{3}$. Besides age, there are frequently other circumstances to be taken into account; as the constitution, habits, &c., of the individual; and usually about one-fourth less should be given to an adult female than an adult male. Neither will the above rule apply to all medicines; for some naturally act more powerfully on children than adults, or *vice versâ*.

DOT, *dot* (derivation doubtful), in Mus., a point placed after a note to increase its duration one half. Formerly the dot was called the *point of perfection*; because a note, when dotted, attained its greatest length, or, in other words, was perfected. Dotted notes are also termed *notes of prolation*.

DOTTED NOTES, *dot'-ted*, notes which are increased in length by the addition of dots placed after them. A dot placed after a note renders it half as long again. Thus, inasmuch as a semibreve is as long as two minims, so is a dotted semibreve equal to three minims. A double dot placed after a note increases it to three-fourths its original value: thus, a double-dotted semibreve would be equal to three minims and a half. Rests may also be increased by the addition of dots: thus, a dotted semibreve rest is as long as a semibreve and a minim rest. A double-dotted rest is lengthened in the same manner as the sound of a double-dotted note. Double dots are rarely affixed to semibreves or minims. When dots are placed at the sides of double bars, they indicate that the portions on the dotted sides are to be repeated. They are sometimes attached to single bars for precisely the same purpose.

DOTTEREL, *dot'-tur-el* (*Charadrius morinellus*), a species of plover inhabiting the northern parts of Europe and Asia. They delight in the high elevations. On the Helvellyn, in Cumberland, 3,055 feet above the level of the sea, they abound in vast numbers, as they do, likewise, on some of the highest mountains of Scotland. They are migratory, and appear in Britain on their northern migration, in spring, and on their southern migration, in the autumn. The length of the dotterel is about ten inches. Its plumage in summer is brown on the upper part; the cheeks, throat, and a band above the eyes, white; breast rusty red, with a white gorget on the upper part of it; a conspicuous black patch on the middle of the belly, and a few of the tail-feathers tipped with white. It is tolerably well known in the London market, and its flesh is much esteemed.

DOUAY BIBLE. (*See* BIBLE.)

DOUBLE BAR, *dub'-l* (Fr. *double* and *barre*), in Mus., a term applied to two straight parallel lines drawn close together perpendicularly through the staff, for the purpose of dividing the various strains of a movement.

DOUBLE BASS, CONTRA BASS, or VIOLINO.—The deepest and most powerful-toned instrument employed in concerted music. It so enriches and sustains the masses of harmony, as to be indispensable in the orchestra. It has three thick catgut strings, which are tuned by fourths, and generally plays from the same book or part as the violoncello, though it is sometimes found necessary to write a distinct part for it. Notwithstanding that all music for the double bass, in common with that for the violoncello, is written in the bass clef, the real pitch of the former instrument is an octave lower than that of the latter.

DOUBLE COUNTERPOINT.—When, in two-part composition, the parts are so composed that the upper one may be inverted an octave lower, so as to become the under part, whilst the other retains its place unaltered, it is called a double counterpoint in the octave.

DOUBLE DECOMPOSITION, in Chem., the interchange of acids and bases which takes place when certain salts are mixed together. Thus, sulphate of potash, on being mixed with nitrate of baryta, is not only decomposed itself, but causes decomposition in the baryta salt, giving rise to *sulphate* of baryta and *nitrate* of potash. Double decomposition is resorted to in innumerable instances for the formation of salts, both in the laboratory and the manufactory.

DOUBLE ENDING.—When, at the end of a strain, two or more dots, a double bar, and several notes are placed, with a figure 1 over the first and a figure 2 over the second part, it is thus called. It signifies that certain measures are to be repeated, and the part under figure 1 to be sung or played the first time, and that under figure 2 the second. Should the parts 1 and 2 be connected by a tie, both are to be repeated the second time.

DOUBLE FLAT, in Mus., a character compounded of two flats, signifying that the note before which it is placed is to be sung or played two semitones lower than its natural pitch.

DOUBLE SHARP, a character in Mus., designated by a cross, thus X, used to raise any note an interval of two tones. Neither double flats nor double sharps are ever placed at the head of a staff indicating the signature, but are only occasionally introduced in the course of a composition; for which reason no general staff signature is given to keys requiring more than seven sharps.

DOUBLE-SHOTTING.—When ships engage at close quarters, the guns are sometimes loaded with two and even three balls, when they are said to be double and treble-shotted. By increasing the weight of metal to be discharged from the gun, its destructive power is considerably augmented at any short range.

DOUBLE STARS. (*See* STAR.)

DOUBLE-TONGUING, a peculiar mode of tonguing employed by flautists, which produces a more brilliant and spirited effect, combined with a greater facility of *articulation*, than the ordinary method. Double-tonguing is effected by the action of the tongue against the roof of the mouth; this action being caused by articulating the word *tootle* very distinctly, and at the same time accommodating such articulation with the corresponding notes.

DOUBLING THE CUBE. (*See* DUPLICATION OF THE CUBE.)

DOUBLOON, *dub-loon'* (Fr. *doublon*), a Spanish and Portuguese coin, the double of a pistole.

DOUBT, *dowt* (Lat. *dubito*, I doubt), is that state of mind in which we hesitate as to two contradictory conclusions, having no preponderance of evidence in

favour of either. Philosophers distinguish two kinds of doubt,—provisional and definitive. Provisional doubt is a voluntary suspension of our judgment for a time, in order to come to a more clear and sure conclusion. Definitive doubt is scepticism. We doubt through blindness, or passion, or malice; through fancy, or from a wish to doubt; but we doubt also from prudence and from mistrust, from wisdom and through penetration of mind. A preliminary doubt is the fundamental condition of philosophy. We begin, in order that we may not end with doubt. This was first established as a rule in philosophic inquiry by Descartes, who tells us that he began by doubting everything, discharging his mind of all preconceived ideas, and admitting none as clear and true until he had subjected them to a rigorous examination.



DOUBLET.

DOUBLET, *dub'-let* (Ang.-Nor.), a tightly-fitting coat or jacket, closely resembling the jerkin. It reached a little below the waist-belt, and the sleeves, although generally fastened on to the body of the garment, were sometimes detached, and tied on at the shoulder. The name "doublet" is derived from the fact, that it was usually wadded, or doubled, for purposes of defence. The allusions to this article of dress are frequent in the old dramatists; thus Shirley, in his "Bird in a Cage" (A.D. 1633), says,—"Every morning does this fellow put himself upon the racke with putting on his apparel, and manfully endures his taylor when he screws and wrests his body into the fashion of his doublet."—*Ref.* Fairholt's *Costume in England*.

DOUCHE. (*See* HYDROPATHY.)

DOVE, *duv* (Sax. *dana*, Du. *duif*), a name sometimes extended, as the name pigeon also is, to the whole family of *Columbidæ*. "No distinction between the terms dove and pigeon is sanctioned either by constant scientific or general popular use. Audubon attempts to make a distinction, giving the name pigeon to



RINGDOVE.

those species of which many nests are built close together on the same trees, and dove to those which are solitary in their nidification; but this distinction is quite unsuitable to the European species and contrary to British usage. (*See* PIGEON.)

DOVE, SYMBOL OF THE.—The Holy Ghost having descended upon Christ at his baptism in the form of a dove, that bird is generally employed as a symbol of the Spirit in religious art. It is also used as an emblem of peace, when it bears an olive-branch in its mouth, doubtless referring to the return of the dove to the ark. When used as an emblem of purity by the ancient painters, it was usually represented white, with red claws and beak, and sometimes with a golden nimbus round the head. Dying saints and martyrs are frequently represented with a dove flying from their mouths; in these cases it is a symbol of the soul purified by suffering. In some stained windows, the seven gifts of the Holy Spirit are symbolized by a dove, from which proceed seven rays, terminating in seven stars. When used as a symbol of the Church of Christ, the dove is represented with six wings,—two at the head, two at the shoulders, and two at the feet. The figure of a dove is often to be seen in English churches at the present day over the covers of fonts.

DOVETAIL, in Carpentry and Joining, the name given to a peculiar method of connecting two pieces of timber together. The end of one piece is cut into one or more projections, resembling the fan-like form of a bird's tail, which are fitted into a hollow or hollows of exactly the same shape cut out of the end of another piece to receive them. It is used for joining flat boards, and in scarfing beams together, as well as for joining timbers end to end or at right angles to each other, and the ends of the sides of boxes and drawers.

DOWAGER, *dow'-ă-jur* (Fr. *douairière*), denotes, properly, a widow with a dower, but commonly the title is only applied to the widows of persons of high rank, and is used to distinguish them from the wives of their husbands' heirs, who have the same name and title.

DOWER, *dow'-ar* (Welsh, *dawd*), that portion of a husband's lands, tenements, &c., to which a wife is entitled for her life upon the death of her husband.

DOWRY, *dow'-re* (Lat. *dos*, a gift), though often confounded with dower, has quite a different meaning, being the marriage portion brought by a wife to her husband.

DOXOLOGY, *doks-ol'-o-je* (Gr. *doxa*, glory, and *logos*, a discourse), denotes a form of praise, or giving glory to God; as in the concluding paragraph of the Lord's Prayer,—"Thine is the kingdom, and the power, and the glory, for ever;" or the Hymn of the Angels (Luke ii. 14),—"Glory to God in the highest, and on earth peace, good will to all men." Two hymns used in the early Christian church were known as the greater and lesser doxology. The greater doxology was simply an expansion to the angelic hymn, and is now generally known by that name; it is sung in the Roman Catholic church at the celebration of the Lord's Supper and at matins. The lesser doxology is the ordinary doxology, "Glory be to the Father, and to the Son," &c., repeated at the end of each psalm in the service of the Church of England.

DRACÆNA, *drai-se'-nă* (from Gr. *drakaina*, a female dragon, the inspissated juice becoming a powder like dragon's blood), in Bot., a gen. of plants belonging to the nat. ord. *Liliaceæ*. The most remarkable species is *D. Draco*, the dragon-tree of Teneriffe, which attains a great size, and, unlike the majority of monocotyledonous trees, has forked branches. This plant yields a red resin, resembling dragon's blood, but it is not known in commerce. *D. terminalis*, the ti-plant, a native of the Sandwich Islands, has starchy roots, which are baked and eaten by the islanders; its juice is used for making a fermented beverage, and its leaves are employed as fodder for cattle.

DRACHM, DRACHMA, or DRAM, *dram* (Gr. *drachme*), a silver coin of ancient Greece, used as the unit of the money system. Since the year 1833 the unit of the money system of modern Greece has also been called *drachma*, and is equal to about 8½*d*. Amongst the ancients the value of the drachma varied at different times and places. The Attic drachma was nearly equal to a French franc, or 9½*d*. in English money. It differed according to the value of specie, but was always calculated as the 100th part of the *mina*, which was generally worth about £4 sterling. There were also coins valued at two, three, and four drachmas. As a weight the drachma was considered also equal to the 100th part of a *mina*, or about ¼ oz. There are two drachmas, or drams, used as weights in England; viz., the avoirdupois, which is equivalent to 27¾ grains troy, and the apothecaries', which is equivalent to 60 grains troy.

DRACO, *drai'-ko* (Gr. *drakon*, Lat. *draco*, a dragon), a constellation in the northern hemisphere, between Ursa Minor, Cepheus, Cygnus, and Hercules. The largest star in this constellation is of the second magnitude. This star, known as γ *Draconis*, and numbered 33 in Flamsteed's catalogue, and 6091 in the catalogue of the British Association, is the one which was used

by Bradley when he discovered the aberration of light, to determine the coefficient of aberration of the fixed stars.

DRAFT, or DRAUGHT, *draft* (from Sax. *druffan*, to draw), is an order from one person to another, directing the payment of money either to the drawer or to a third party. The term is also applied to the first or rough copy of a legal or formal document. When this draft is corrected and finally adjusted, it serves as the material for a fair copy. Proof-sheets and MSS. may be called the drafts of printed works. In Mil., the selecting and detaching of soldiers from a company, regiment, &c., to form other companies, or to proceed upon certain duties, is termed drafting.

DRAG, *drăg* (Ang.-Sax.), a mechanical arrangement, by which the speed of a vehicle can be decreased by stopping or slackening the rotation of one or more of the wheels. The original drag was a very primitive arrangement, and was generally called the *shoe* or *skid*; it consisted of a hollow piece of iron, not unlike a shoe in shape, which fitted the tire of one of the hind wheels. It was attached to the bottom of the carriage by a chain, and when applied was put under one of the hind wheels; by this means, acting as a sort of wedge, it prevented the wheel from going round, and thus retarded the velocity of the vehicle. The invention of the patent drag was a great improvement upon this clumsy mechanism. By means of the patent drag a sort of skid is pressed against one of the sides of a wheel, effecting all the stoppage required, with the advantage that the whole can be regulated by the driver, without stopping or getting down, by means of a handle connected with a series of rods and levers. In the case of the shoe-drag, the stoppage of the carriage every time it was put on or taken off was absolutely necessary. The use of the drag is to keep the vehicle from pressing too hard upon the horses when going down hill at their ordinary pace. Powerful drags, which act in a similar manner to that described, are used for stopping or decreasing the speed of railway trains: they are called *brakes*.

DRAGOMAN, *drag'-o-man* (Turk. *trul'cvan*), the term applied, in Turkey, to all interpreters or foreign guides. The diplomatic dragomen, however, are very important personages, and serve as a means of communication between the officers of the Ottoman government and the ambassadors of other European nations. They are allowed several important privileges, not the least of which is, that they and their families are not considered to be under Turkish law, but under the jurisdiction of the country by whose embassy they are employed. As the laws of Turkey are very severe and summarily carried out, this privilege is much valued. The diplomatic dragomen are seldom pure natives, but mostly Italians, descended from Genoese or Venetian merchants. The occupation of the ordinary Turkish dragoman is exactly similar to that of the French *commissionnaire* and the Italian *cicerone*. Dragomen of this description are provided at many of the hotels in Constantinople, and other cities throughout Turkey.

DRAGON, *drăg'-on* (Gr. *drakon*, Fr. *dragon*), a term



FLYING DRAGON.

applied in modern Nat. Hist. to certain kinds of saurian reptiles. Some of these (the genus *Draco* of Linnæus) are furnished with a broad membranous lobe on each side. This is supported by the six first false ribs, which are extended straight outwards from the vertebral column. By the movement of these bones, the reptile is enabled to stretch its broad lateral membrane, which thus forms a sort of parachute, to support it in its long leaps from branch to branch. They, however, are quite destitute of any power to strike the air; so that their flight is nothing but a floating through the air. As a rule, the species is harmless; there is, however, one, inhabiting the marshy plains of Guiana, and called the flying dragon, that bites severely if it should be handled. This creature has a long compressed tail, the back and tail crested, and the tongue forked, like that of a serpent: it sometimes attains a length of six feet. Both its flesh and eggs are eaten.

DRAGON, in Myth. Hist.—In nearly every country, and at all times, there have been legends concerning the existence of a huge monster, which went about devouring and devastating all before it. This monster, or dragon as it is generally called, is supposed to be the symbolical representative of arrogant power and cruelty, whose sole object is to oppose order and progress. Although it is probable, as Brand says, that "the dragon is one of those shapes which fear has created to itself," nevertheless, from the generality of the legends concerning this winged saurian, it is possible that the existence of some species of the pterodactyl, in very remote times, may have originated the superstition. However this may have been, it is certain that this mythical animal, in all ages, has been looked upon as a minister of evil, the destruction of which was considered one of the grandest objects of human energy. The task was usually allotted to gods and heroes. Apollo killed the Python, and Perseus slew the dragon, and saved Andromeda. Hercules, as the ideal of physical power, is also represented as a dragon-slayer. From poetry the legend of the dragon passed into art, and the Greeks and the Romans bore it as an emblem on their shields and helmets. In the *Nibelungen Lied*, in later times, Siegfried is represented as killing a dragon; and in the epic of Beowolf, the two contests of the hero, first with the monster Grendel, and afterwards with the dragon, form the principal incidents of the poem. Among the Scandinavians, Thor was described as a dragon-slayer. Among the Teutonic tribes the practice of bearing the dragon as an emblem on their shields and banners was common, and they introduced the practice very early into England. Among the Celts the dragon was considered the emblem of sovereignty, and as such was borne on the helmet of the monarch. In the Middle Ages, in religious paintings, the dragon was looked upon as the representative of sin. Saints and martyrs are frequently depicted trampling a dragon under foot. It is also used with this signification in the figure of St. George and the Dragon. Sometimes it has been used as a symbol of heresy. A body of men in Hungary, who enrolled themselves in order to crush John Huss and his followers, called themselves Knights of the Order of the Dragon. The figure of the dragon is much used in heraldry; and when an animal, such as a lion or tiger, is represented with its own head but with a dragon's wings and tail, it is said to be *dragonné*. Fiery dragons were meteors of which there are many old records. The fear of the spectators bestowed the forms of dragons on the phenomena which they beheld.

DRAGONET (*Callionymus*), a fish of the *Gobioidæ* fam., inhabiting the Mediterranean and Northern seas. They are remarkable for having the gill-opening reduced to a small hole on each side of the nape, and the ventral fins placed under the throat, separate and larger than the pectorals. The eyes are placed on the top of the head, looking upwards; the skin smooth and scaleless. The colours of the fish are yellow, blue, and white, making a beautiful appearance. There are three or four species; but that known with us as the gemmeous dragonet (*Callionymus*), and, by the Scotch, *gowdie*, is by far the most beautiful. All the species are about twelve inches long.

DRAGON-FLY (*Libellula*), a Linnæan gen. of neuropterous insects, common in England, and to be seen in fine summer weather hawking about over the surface of ponds and rivers in search of insect prey. Their

vulgar English name is "horse-stinger," which is no less inappropriate than ugly, as the insect possesses no means of annoying either horses or any other of the larger animals. They rival the butterflies in their hues, and, like them, love to bask in the sunshine. They are, however, not nearly so harmless in their mode of living, and, instead of the nectar of flowers, prey on insects. They have strong horny mandibles and maxillæ, covered by the labrum and labium; their tarsi are three-pointed; their wings are equal; the posterior extremity of the abdomen is furnished with hooks or peculiar appendages. Their ferocity is so ungovernable, that when taken and imprisoned, they have been known to devour their own bodies. The great dragon-fly (*Æshna grandis*) is about four inches long, and the largest of the British species. It has been seen to dart upon a large cabbage butterfly, and to bite off the wings and devour the entire body in less than a minute. In the larva state, the *Libellulidæ* live entirely in the water, engaged in unceasing strife with other insects, for whose capture and destruction it possesses ample means, through a singular contrivance of its lower lip. This consists of two principal pieces, one of which is articulated to the head, whilst the second is attached to its extremity. At the apex of this second piece, two jaw-like organs are articulated. In repose this lip is folded beneath the head, but can be immediately extended to a considerable distance in front of the head, so as to seize any minute insects or small fishes that may pass before it. The respiration of the larvæ of some of these insects is singularly contrived. They are provided with the means of drawing water into their bodies to supply air for respiration, and expel it again by the same orifice at the extremity of the abdomen, with such force, that they thus propel themselves through the water, whilst their legs are at rest. The hooks at the extremity of the abdomen of the dragon-fly render the creature essential service at the period of transformation. Crawling out of the water, it attaches itself by these hooks to a stick or rush, and struggles out of the pupa-case. At first its body is quite soft and moist, and the wings folded up into a small compass. In a few hours, however, the wings are capable of expansion, and the body assumes a proper consistency. Dragon-flies abound most in warm climates, but are met with in very northern regions.

DRAGON-TREE. (*See* DRACÆNA.)

DRAGON'S BLOOD. (*See* CALAMUS, PTEROCARUS.)

DRAGOON, *drăg-oon'* (Fr. *dragon*, from Lat. *draco*, a serpent with wings and claws, supposed to be able to emit flames from the mouth), a mounted soldier, so called from the weapon with which the horsemen raised about 1600, by the Maréschal de Brissac, were armed; because the muzzle was shaped like the extended jaws of a dragon. It is the common term for a cavalry soldier in the British service. (*See* CAVALRY.)

DRAIN, *drain* (Sax. *drehnigean*), the name applied to any channel constructed underground for the purpose of carrying off surplus water and refuse matter from houses, fields, &c. When drains are open and are merely channels cut along the surface of the ground, or by the sides of streets and roads, they are called ditches and gutters; when they are of great size, for the purpose of carrying off the refuse of a town, they are called sewers. Drains that lie underground may be formed of pipes of clay or earthenware, or of low walls of brick or stone, raised on a bottom formed of broad flat stones, and covered in with the same. These are, however, more liable to become choked by the roots of trees and shrubs growing into them than those which are formed of pipes. Circular drains of brickwork are called barrel drains.

DRAINING, or DRAINAGE, the art by which surplus water may be carried off from swampy districts and stiff clay soil, as well as other land in which the excess of water is prejudicial to vegetation. It may be applied to low districts containing thousands of acres, or to single fields of comparatively small extent. In the latter case it is chiefly applied to render stiff and tenacious clay soils friable, fertile, and productive; and, indeed, it is now found that no land of this description can possibly be brought into proper cultivation without having recourse to this system for its amelioration. It is considered better that all drains should





be cut in the direction of the slope of the field, which is the direction in which it is ploughed from top to bottom. The trenches for drains are cut with spades of different widths, the upper part of the trench being taken out with the widest, and a very narrow one, called a bottoming-tool, being used to form the bottom of the trench, so that the vertical section of a trench cut for the formation of a drain exactly resembles that of a flower-pot. The bottom of each trench was at first filled with rough stones only, about 2 or 3 inches in diameter, and a thick layer of soil was thrown over them; but subsequently, drain-tiles and pipes were used without the addition of any stones above them, as the drains were found to be less liable to obstruction when the whole of the trench above the pipes was filled in with earth. The tile-and-shoe drain was introduced when the practice of filling the trench with stones was first abandoned: this consisted of a flat tile, or shoe, which was laid at the bottom of the trench, and on which another tile, arched in form, was placed, which was of the same length as the shoe on which it stood. But these have been superseded by the cylindrical drain-pipes, which are made in all sizes, from 12 to 24 inches in length and from 1 to 6 inches in diameter. Pipes about 2 inches in diameter are commonly used for small drains, and the larger sizes, from 4 to 6 inches in diameter, for sub-main drains. In loose or peaty soils the pipes should be connected by collars, but this is not required in ordinary soils. The depth and width of the trench at the bottom of which the drain is to be placed must also be regulated, in a great measure, by the nature of the soil; but it should in no case be less than 2 feet or more than 6 feet below the surface. When the drains are about 3 feet deep, and less than this, they should be placed about 25 or 30 feet apart; but when they are deeper than 3 feet, they should be placed apart, at distances varying from 50 to 70 feet. It has been calculated that the cost of drainage per acre varies from £2. 10*s.* to £5. The cost of pipes per thousand is as follows:—1 inch in diameter, 4*s.* 6*d.*; 1½, 6*s.*; 1¾, 8*s.*; 2½, 10*s.*; 2¾, 12*s.* The principal advantages to be derived from draining are these:—A deeper richer mould is obtained, which readily absorbs moisture in time of drought; heavier crops are obtained, which ripen earlier, as the seed can be sown sooner on drained than on undrained soil; mosses, rushes, and coarse sour grass are entirely removed in course of time, and the air is no longer tainted with the exhalations that rise from marshy land; the soil also can be worked sooner after a heavy fall of rain than it could have been when it was in an undrained state. The drainage of extensive districts comes within the province of the civil engineer. Among the principal tracts of country that have been reclaimed and made available for pasturage and tillage by draining, may be mentioned, the Bog of Allen, in Ireland; Chat Moss, in Lancashire; and the Pontine marshes, near Rome. Immense works of this nature have been carried out in Holland, and in the fen districts of Cambridgeshire and Lincolnshire, near the Wash, which are drained by what is called the "Bedford Level," under the control of the Bedford Level corporation. In the cases that have just been mentioned, the surface of the land reclaimed lies below the level of the sea, and the water that is continually collecting from rain and other causes is discharged through self-acting floodgates, or has to be lifted, by wheels or Archimedean screws, over the embankments that have been constructed to prevent the encroachments of the water. These wheels and pumps are worked by steam power, and, in Holland, sometimes by means of windmills. Constant care and watchfulness is required to see that the embankments, sluices, floodgates, &c., are always in perfect order and repair. On May 4th, 1862, the Middle Level sluice, through which the waters of the Middle Level drain are discharged, that runs through the fens for eleven miles, suddenly blew up, as it is called, having been undermined by the waters of the German Ocean. The sluice had evinced unmistakable signs of decay for a considerable period. When it first burst, about 10,000 acres of fertile ground, rich and smiling with the accumulated industry of years, were submerged in a few hours, and the sluice, that had been erected at a cost of £40,000, was rendered entirely useless. Day by day the waters crept

on, destroying crops and cattle, and damaging homesteads and farm-buildings, until thousands of acres, in addition to what had been covered by the first rush of the sea through the broken sluice, were hidden under water. The efforts of the most skilful engineers were powerless for many weeks to put a stop to the work of destruction that was going on in the Marshland fens; and it was not until the end of the following month that the ingress of the waters was checked. This disaster was followed by the destruction of the Marshland Smeeth sluice, a drain entering the Ouse about 300 yards to the north of the Middle Level sluice, on the evening of Oct. 4th. This happened in consequence of the extra pressure on the embankment and works, owing to the discharge of a quantity of water from the land that had been submerged in May, through this and an adjoining drain, called the Marshland sewer. The rush of water had undermined and scoured away the earth behind the flank walls of the sluice, although every precaution had been taken to strengthen the embankment on either side. In consequence of the destruction of the sluice, which gave signs of breaking up only ten minutes before the catastrophe happened, a great part of the country which had been reclaimed and brought into cultivation since the bursting of the Middle Level banks in May, was again flooded, and the struggle to force back the encroaching waters of the North Sea had to be commenced anew.

DRAIN-TRAP.—When a drain has been constructed, it is desirable to prevent the escape of any mephitic gas from the drain itself, generated by the decomposition of its contents, as well as the entrance of sand and any solid matter into the water-course, which would form an accumulation and choke the drain. To obviate this a small square pit is made at the head of the drain, the bottom of which is below the level of the mouth of the pipe. The pit is covered by a grating or perforated pinte, to the centre of which an iron cup is attached, which fits over the top of the pipe, and has its lip below the surface of the water in the pit. The water between the mouth of the pipe and the surrounding wall of the cup acts as a barrier to prevent the escape of any foul air from the pipe. This is the common bell-trap, which is liable to get out of order in consequence of the ease with which the loose grating and cup may be removed. The most efficient drain-trap that can be used, which has received the approbation of architects, builders, and medical men, is the new patent sink-trap, invented by Messrs. Tye & Andrew, Brixton Road, London. It effectually prevents the escape of all noxious vapour, and when the trap is once fixed, the grating cannot be removed, which prevents the entrance of any solid substance into the drain. Besides the fixed grating, other points of importance which render the trap infinitely superior to all others, are the column of water which it opposes to the escape of any vapour that may be generated in the drain; and the screw boss, which allows a forcing-pump to be attached to the trap, which will remove any obstruction that may enter the drain from any other communicating with it from a stable or elsewhere, and thus obviate the unpleasant alternative of opening the drain, to the detriment of the pavement, turf, beds, or garden walks under which it passes, whenever a stoppage may occur.

DRAMA, *dra'-ma* (from the Gr. *drama*, action), a poem or piece composed for the stage; a composition in dialogue, in which the action is recited and represented, and not related. The love of imitation is inherent in human nature; and the first evidence of intellect given by a child is his assumption of the manner and bearing of some other person. As with individuals, so with nations; and almost every ancient and modern civilized people have cultivated dramatic representation in some form. The Hindoos and the Chinese have a rich store of theatrical works; and in China the love of dramatic exhibition is a perfect rage. According to Aristotle, the Attic drama arose from the recitations of the leaders of the *Dithyrambus*. The origin of the Grecian drama is said to have been the orgies of shepherds and peasants in their solemnization of the rites of Bacchus, when the sacrifice of a goat was followed by dances and a sort of masquerade, in which they personated fauns and satyrs. In place of masks, they stained their faces with the lees of wine; and to the music which formed the principal part of this wild festivity, was added the recitation of an individual performer, who entertained the audience by his own single and unaided exertions. Thespis was the first to shape a regular entertainment out of these rude materials, in which effort he is said to have been assisted by one Susarion. The actors were separated from the audience, and placed upon a cart, or elevated platform made of boards laid upon trestles. The date of this first improvement was about 440 or 450 years before the Christian era. Æschylus was the first who converted monologue and soliloquy into action and dialogue. He introduced upon the boards more than one actor at the same time, and relieved the declamation of the Thespian orator by the musical performance of a chorus: he also introduced scenery. A theatre, first of wood, afterwards of stone, accommodated a number of regular and attentive spectators; and the principal actors dressed in personal disguises suitable to the characters personated. They also wore masks painted to represent the personage whom they performed. The mouths of these masks were shaped like the end of a trumpet, which, though it aided the actor's voice in filling the enormous area of the theatre, must have had a ludicrous appearance. The *cothurnus*, or buskin, added to the actor's height; the enormous distance between the eyes of the auditors and the actors considerably lessening the apparent absurdities of the mask and buskin. Great trouble and expense were bestowed upon costume. When a Grecian actor personated a hero or a god, he concealed his face, increased his height, and wore a dress and mask exactly resembling the popular idea of the personage to be portrayed. The theatres were of enormous size, and built in the shape of a horse-shoe. The audience were placed on seats elevated one above another in gradation. The stage, which was on a level with the lowest row of seats, was placed at the flat end of the building. The space in the centre of the theatre, called in the present day the pit, was called the orchestra, and was occasionally occupied by the chorus. Æschylus having regulated, Sophocles, Euripides, and other dramatists, improved an amusement to which the art-loving Greeks became passionately attached. During the performance of a play written by Hegemon, news was brought of the total defeat of the Grecian army before Syracuse. Among the auditors were relations of those who had fallen, and hardly one spectator had not, in addition to a patriotic grief, to mourn the loss of a friend or relative. They did not quit the theatre, but, spreading their mantles before their faces, ordered the representation to proceed, and, thus veiled, remained till its conclusion. The admission to these ancient theatres was at first one *drachma*; but Pericles caused the price to be lowered to two *oboli*. In their personations, the Grecian actors aimed at gravity of movement and declamatory grace, rather than the rapidity and vivacity of passion. They held a high rank in the republic, and popularity carried with it a rich recompense. The old Grecian comedy will be best described as the exact opposite and antithesis to their tragedy; for as in tragedy, deities, Titans, and departed heroes declaimed in sublime sentences, so, in comedy, the whole plan of a piece often turned upon these same sublime personages, who were brought upon the stage for the mere purpose of ridicule. In fact, the Grecian comedy was a burlesque in the most modern sense of the word, in which Bacchus was represented as a coward, and Hercules as a glutton. Aristophanes, the author of this kind of entertainment best known to us, was not the originator of the Grecian comedy: he had many predecessors,—Magnes, Cratinus, Crates, Eupolis, and others. After ridiculing the Olympian deities, a species of mythological irreverence which the Athenians heartily enjoyed, he made the stage a vehicle for attack on public men, and, among others, Socrates and Cleon, a demagogue of great influence. Decrees were passed to protect the citizens against scurrilous dramatic libels, and finally comedy was proscribed. An actor named Anaxander was punished capitally for parodying a line of Euripides so as to convert it into an attack upon the government. He was starved to death,—a fate that has since, not uncommonly, fallen to

the lot of both actors and dramatists. Aristophanes, who found that personality and invective were no longer tolerated, barbed the arrow of his wit at the accidents and absurdities of domestic life, in which walk of satire he was successfully followed by Menander and others. This new mine of satire was called by the ancients the New Comedy; and it was about this time that dramatic representations began to be divided by intervals of cessation, or acts, the use of the chorus being discontinued with the old comedy. If the dramas of Plautus and Terence do not present any great variety of character, it must be remembered that in works professing to be a picture of actual manners, comic writers could not, in a country where women led a life of seclusion, write for representation any female characters but those of mothers, maid-servants, and courtesans: thus the plot of a piece often turned upon the passion of a lover for a young woman, who was not brought upon the stage once during the play. Despite these disadvantages, the new comedy of the Greeks often conveyed a knowledge of deep truths and subtle feeling. In closing these brief remarks upon the Greek stage, it must be mentioned that the apostle Paul has quoted from the Grecian drama.

The *Romans* had a sort of rude histrionic representation of their own. Their oldest spoken plays were borrowed from the Osci, the indigenous inhabitants of Italy, and were called *Fabulæ Atellanæ*. The performance consisted of satirical couplets, which were declaimed during the intervals of the games, and characters of fabulous antiquity were usually personated. According to Livy, 361 years before the birth of Christ, during the rage of a great pestilence, in order to propitiate the deities, the Romans introduced a regular dramatic entertainment. Their plays, however, notwithstanding the assumption of the mask and buskin as a regular profession, were rude in structure, until Livius Andronicus, who was by birth a Grecian, led the way to improvement by transplanting his native stage to Rome. The works of the Roman tragic authors, with the exception of those of Seneca, have not reached our time, though, singularly enough, we are compelled to judge of the new school of Greek comedy through the medium of Latin translations; indeed the Romans had two species of comedy,—the *Palliata*, in which the scene and dress were Grecian, and the *Togata*, in which they were Roman. It is presumed that as Roscius Gallus is mentioned by Cicero as wearing a mask upon the stage, in order to conceal an obliquity of vision, that other actors of his day played with their faces uncovered. The Romans, to quote the words of St. Augustine, "accounted the art of stage-playing infamous, and ordained that stage-players should not only want the honour of other citizens, but also be disfranchised and thrust out of their tribe." This feeling was doubtless engendered by the fact of the Romans confounding the dramatic art with the games of the circus and amphitheatre, in which gladiators and slaves performed. Notwithstanding a denunciatory edict of the prætor, many actors rose to great wealth and high esteem in Rome. Roscius was the friend of Piso, Sylla, and Cicero; and Paris, who was afterwards put to death by Domitian out of jealousy, exercised an arbitrary authority over dramatic authors. Critics formed a code of laws for the guidance and regulation of the poet, of which Aristotle and Horace expressed their approval. The ancient dramatic art expired with pagan Rome, and in its first age Christianity was inimical to the theatre. Any person connected with the dramatic art was not allowed baptism. The connection of the ancient theatre with heathen superstition, and the profligacy of some of the entertainments exhibited, offended the primitive church. With the extinction of literature and art, every trace of dramatic composition or performance was for many centuries lost. The modern drama, like the ancient, had its foundation in religion, with this difference, that in place of the worship of Bacchus, miracle-plays and mysteries were produced. The first speaking sacred drama is said to have been "Della Passione di nostro Signor Giesu Christi," by Giuliano Dati, bishop of San Leo, in 1445; and it was in Italy, the country in which the tragic art expired, that it revived in a different and purer form; but considerable uncertainty exists on this point; for the French claim the performance of a pastoral entitled "Un Jeu" as early as the 13th century. The Chester Mysteries, the earliest plays acted publicly in England, were performed from 1268 to 1276. The meaning attached to the word "mystery" may be gleaned from the quotation of two of the verses of the proclamation or prologue to the famous Chester Mysteries or Whitsun Plays. The "moonke" mentioned is one Done Rondall, of Chester abbey, the deviser of the Mysteries:—

> This moonke, moonke-like in Scriptures well seene,
> In storyes travelled with the best sorte;
> In pagentes set fourth, apparently to all eyne,
> The Olde and Nowe Testament with livelye comforte;
> Intermynglinge therewith, onely to make sporte,
> Some things not warranted by any writt,
> Which, to glad the hearers, he woulde men to take yt.
>
> Now, you worshippfull Tanners, that of custome olde
> The fall of Lucifer did set out,
> Some writers awarrante your matter; therefore be boulde,
> Lustily to playe the same to all the rowtte;
> And yt any thereof stande in any doubte,
> Your author his author hath, your shewe let bee,
> Good speech, fyne players, with apparill comelye.

Rude parodies of sacred history being inconsistent with the purity of the Christian religion, the Mysteries were succeeded by the Moralities, a sort of performance that bore considerable resemblance to the Old Comedy of the ancients, as they were founded upon allegorical subjects, almost always bore allusion to the events of the day, and abounded with strong and biting satire. Upon the revival of letters, Latin plays were composed by the learned in avowed imitation of the productions of ancient Greece and Rome; but the general public, to whom the classic drama was as a sealed book, showed a strong partiality to a new sort of representation, a union, or, rather, compound, of tragedy and comedy, which was called History or Historical drama. These generally told the exploits of a king from his manhood to his death, with such points of history as were the most marked and striking of his reign. These dramatic chronicles were so popular in England that hardly a single subject upon which Shakspere wrote had not been appropriated by his predecessors; the majority of his historical plays were therefore altered by him from the plan of old dramatic chronicles.

The *Romantic* drama, which followed the historical, was founded upon legends, poems, and popular fictitious narratives. In Spain, the land of chivalry and romance, Lopez de Vega and Calderon, disregarding or despising the restrictions of the classic drama, inaugurated a new school. Their heroes, the exact reverse of the passionate sensual demigods of the ancient drama, were virtuous, self-sacrificing, brave, true, and loyal. Action and bustle took the place of tedious elaboration of sentiment and thought; the passion of love was sublimated into a high, generous, and romantic feeling; and the introduction of a clown, who made extemporaneous jests both to actors and to audience, gave great pleasure to spectators, who were unwilling that the actors should entirely ignore their presence, and liked a chorus, though comprehended in one person, to explain and criticise the action of a play during its progress. In England the romantic drama was welcomed with ardour. In Italy the taste for the ancient and classical school of drama was so rooted that romantic dramas, histories, and tragi-comedies, could not long hold a place, but were succeeded by tragedies written upon the classic models.

The *Italian* comedy produced characters that never varied, some of whom are supposed to have descended directly from the Mimi of the *Fabulæ Atellanæ*. This ancient origin is claimed for Harlequin and Punchinello, an English Punch, both of whom are buffoons, cowards, wags, and jesters, like the *Sannio* of the Romans. *Pantalone* was a Venetian merchant; *Dottore*, a Bolognese physician; *Spaviento*, a Neapolitan braggadocio; *Pulliciuella*, a wag of Apulia; *Giangurgolo* and *Coviello*, two clowns of Calabria; *Gelsomino*, a Roman beau; *Beltrame*, a Milanese simpleton;

*Brighella*, a Ferrarese pimp; and *Arlecchino*, a blundering servant of Borgamo. Thus each personage, clad in a peculiar dress, and furnished with a peculiar mask, was intended as a characteristic representative of some particular Italian district or town. To further this local personation, each actor spoke the dialect of the place he represented. Besides these, and a few other such personages, of which, at least, four were introduced into each play, there were the *amorosos* or *innamoratas*,—that is, men and women who played serious parts; and also *Smeraldina, Colombina, Spilletta*, and other females, who acted the *servettas* and waiting-maids. These last wore no masks, and all spoke Tuscan or Roman. The pieces played by them were called *Commedia dell' Arte*. Goldoni adopted Harlequin and the rest of his mimic troop; but, instead of trusting to the extempore wit of the actors, wrote for them plots and dialogues.

*France* has boasted that when the classic drama was banished from every other stage in Europe, it found a home in Paris; and yet her drama, like those of other nations, was, during the 16th and a great part of the 17th century, borrowed from Spain. As the English owe the excellence of their stage to Shakespere, so France is equally indebted to Corneille. Cardinal Richelieu placed himself at the head of five dramatic authors, all of whom are forgotten, with the exception of Corneille. It was at this period that the classical fetters of the three unities were imposed upon French dramatic poets. "The unities of action, time, and place must be observed." Corneille adds, "*Personne n'en doute.*" The French are not only proud of their pretensions to classicality and their regard for the unities, but are enabled to boast with justice that they have discarded tragi-comedy,—that is, such pieces as comprehend two distinct plots,—one of a serious, the other of a humorous sort, each totally unconnected with the other. Corneille and Racine were, according to Sir Walter Scott, the Homer and the Virgil of the French drama. Even Voltaire himself was content to imitate these two great models, although he endeavoured to make a Turk talk like a Turk, and a savage like a savage, instead of in the brilliant metaphor and stilted sentiment of the buskined heroes of his predecessors. Molière, the founder of French comedy, followed the path marked out by Menander, and has closely copied some pieces from the Latin stage. Few satirists have attacked vice and folly so successfully; and it should be remembered, when considering his marvellous power, that, while the English stage was fostered by a people, the French stage was merely the appanage of a court. Thus the sphere of the satirist was limited to the palace and its immediate surroundings. Schlegel observes,—"The object of French comedy is not life, but society,—that perpetual negotiation between conflicting vanities, which never ends in a sincere treaty of peace; the embroidered dress, the hat under the arm, and the sword by the side, essentially belong to them; and the whole of the characterization is limited to the folly of the men and the coquetry of the women." This comedy of manners rather than of nature was overturned by the "Figaro" of Beaumarchais,—a production in which incident, intrigue, characters in high and low life, lively dialogue, and political satire, were so craftily intermingled, the whole being flavoured with a strong tone of licentiousness, that it was received by the Parisian public with an almost frantic enthusiasm.

The *English* drama was founded upon the Spanish model. "Ferrex and Porrex," the first regular English tragedy, was acted before Queen Elizabeth upon the 18th of January, 1561, by the gentlemen of the Inner Temple. A version of the same piece was acted in one of the minor London theatres in 1854, but without success. "Gammer Gurton's Needle," which was said to be the work of John Still, master of arts, and afterwards bishop of Bath and Wells, was first performed in Christ's College, Cambridge, in 1575. The jest of the piece turns on the loss and recovery of the needle with which Gammer Gurton repaired the breeches of her man Hodge. The popular characters are, the Sturdy Beggar, the Country Vicar, the Clown, and the Shrew. Thus we see that, at the very commencement, English comedy was founded on characters of middle and humble life,





and, unlike the French, was not dependent upon the frivolities and fashions of lords, ladies, and courtiers. It is to be remarked, that as our first tragedy had no intermixture of comedy, so our first comedy had no intermixture of tragedy. The influence of the plays of Shakspere upon poetry, the drama, and the world at large, is too universally recognized to need comment in a work of this description, even if the space prescribed to us were unlimited. It is enough to say that his transcendant genius and matchless power created a model, which never has, and perhaps never will be equalled. His historical plays throw a light upon his country's history; his tragedies are acknowledged masterpieces by the highest critics of every civilized nation; and his romantic dramas and comedies, though not faultless, abound with the errors of a genius incapable of self-control, and too powerful to submit to the trammels imposed upon the dramatist by the pedantry of inferior minds. The tragedies of Jonson are distinguished for a sublime expression of moral sentiment. In comedy he occasionally followed the older Grecian school, as in the "Tale of a Tub," where, in order to ridicule his enemy, Inigo Jones, he trod in the path of Aristophanes. In the "Staple of News" and "Cynthia's Revels" he introduced allegorical characters, and personified abstract passions. In tracing the history of the English drama, we perceive the immense influence over his successors, of the plays of Shakspere. Massinger, a man of considerable genius, endeavoured to unite the romance of Shakspere to the realistic humour of Jonson; and though he has to an extent succeeded, his love passages are infinitely less interesting and his villanies more revolting than are those of his two models. Beaumont and Fletcher, both men of remarkable talents, grafted upon Shakspere's method of composition the boundless license of the Spanish school. Sometimes almost discarding probability, violating character, and therefore weakening, if not destroying, the interest of the plot, they compensate for these faults and irregularities by admirable descriptive passages, elegant wit, passionate and tender dialogue, and rich humour. The plays of Shirley, of Ford, of Webster, and Decker, although now forgotten by the mere playgoer, and holding no place upon the boards of the theatre of the present day, abound with admirable passages and detached scenes of singular merit; and it is, doubtless, to the fact of the rude apology for scenery, and the eye of the spectator being entirely ungratified in the English playhouses of the 16th and 17th centuries, that we are indebted for that brilliant band of distinguished poets known as the Elder Dramatists. Audiences crowded to the theatre, not to gaze on splendid scenery, but to listen to the literary production of the author and to the declamatory graces of the player. The great and original school, founded by Shakspere and Jonson, and followed by Massinger, Beaumont and Fletcher, and others, closed with the outbreak of the civil war in 1642. A proclamation shut up the theatres and dispersed the players, almost all of whom took up arms for King Charles, in whose service many of them perished. One Robinson, an actor at the Blackfriars theatre, was killed by Harrison, the regicide, in cold blood, Harrison declaiming the text from Scripture, "Cursed be he who doeth the Lord's work negligently." The most ancient English playhouses were, according to Malone, the Curtain, in Shoreditch, and the Theatre. In the time of Shakspere there were no less than nine theatres open,—three private houses, one in Blackfriars, the Cockpit or Phœnix, in Drury Lane, and one in Salisbury Court. The six public theatres were the Globe, the Swan, the Rose, and the Hope, on the Bank side; the Red Bull, and the Fortune. In the winter of 1648, the players at the Cockpit, while acting the "Bloody Brothers," were surprised by a party of soldiers in the middle of the play, and carried to prison in their playhouse dresses. On Feb. 11, 1647, an act of parliament was passed that all stage-galleries, seats, and boxes should be pulled down, by warrant of two justices of the peace; that all actors of plays for the time to come, being convicted, should be publicly whipped; and all spectators of plays should, for each offence, pay five shillings. The Restoration may be said to have inducted the second period of the English drama. Charles II., who in his exile imbibed French

tastes, brought with him to England a relish for the beauties of the French stage. Dryden, Howard, and the authors of the day, fostered this taste, and heroic plays were applauded by both the court and city. The heroic play was a forced and unnatural mixture of French sentiment, English noise and bustle, stilted dialogues, drums, and processions. The heroes and heroines were all of one exactly virtuous pattern; valour was entirely refined, and love of the most impossible purity. At the same time, comedy deserted delineation of character and construction of plot, and endeavoured to shine only in dialogue. The atmosphere of a licentious court infected the stage; and authors strove by a succession of smart jests and loose epigrams to amuse the wits of the town rather than to point a moral or wing a satirical truth. The duke of Buckingham's famous satirical burlesque of "The Rehearsal" exhibited the absurdities of the two French schools of art, and tragedy and comedy retraced their steps. About this time actresses first appeared upon the stage. Before the Restoration the characters of women had been played by boys and young men. It is to this introduction that we owe the brilliant display of passionate tenderness evinced in the female characters of Otway, and, despite some rant and fustian, of Lee. The 18th century ushered in genteel comedy, an entertainment that exhibited the foibles of the higher classes; comedy of intrigue, in which plots and surprises succeed each other; and English opera. (*See* Opera.) To Garrick the stage is indebted for a revival of the plays of Shakspere; and to Sheridan for a description of comedy, that, to the polish and wit of the authors of the Congreve and Farquhar school, added humorous and characteristic dialogue. George Colman the elder and George Colman the younger both contributed admirable comedies to the rich repertory of the drama; and Maturin, Lord Byron, Coleridge, and Joanna Baillie, were the authors of the tragedies produced in the early part of the present century. The two Kembles and Mrs. Siddons, Edmund Kean, Charles Young, and Miss O'Neil, were of the same era, one of the most brilliant of which the English stage can boast. The last attempt to maintain a high school of tragic art was made by Mr. Macready, at Drury Lane, in 1842. The events of the last fifty years are not matters of history, therefore we shall not dwell upon them. At present, English literature would seem to have abandoned the drama, for our stage is almost entirely occupied by translations from the French. The public have contracted a taste for the morbid, the spectral, and the horrible, united to illusions of the eye and mechanical contrivance. The causes for this decline are many; but it cannot be supposed that at a time when theatres are more successful speculations in a commercial point of view than ever, a taste so low can be long sustained. The actors deplore the exercise of the various arts that now prove so attractive; and there can be no doubt that, although many managers of theatres may realize large fortunes, the degradation of the art of acting will be the natural result of the unhealthy excitements that now pander to a depraved popular taste.—*Ref.* Art. *Drama*, by Sir Walter Scott, in *Encyclopædia Britannica*.

Dramatis Personæ, *dräm'-ä-tis per-so'-ne* (Lat.), the various personages introduced in the course of a drama, or the actors representing the characters in a play.

Drapery, *drā'-pe-re* (Fr. *drap*, cloth), in Sculp.—The proper treatment of drapery thrown about any figure executed in piaster or marble is attended with difficulty, and requires considerable skill on the part of the artist and modeller. It must be allowed, that the costume of the present day is peculiarly unsuited for representation in the above materials; but, in many cases, additional effect is given to the figure, and the story is conveyed to us in a more striking manner, by the addition of a little drapery thrown around the nude form, the folds of which are carefully arranged and skilfully disposed to suit the circumstances under which the figure is represented. Thus, a short garment girt round the waist of a running figure, showing the contour of the fore part of the thigh and knee, and streaming out behind, gives additional force to the action by exhibiting the influence of the wind on the figure, which is supposed to be in rapid motion. Whenever drapery is used, it should be so contrived that it may give expression to the form of the figure, and aid in explaining the story that the sculptor wishes to convey to us in connection with his work. Many will remember the wonderful and exquisite manner in which the light drapery was treated that was thrown over the head of the "Veiled Figure," by Monti, that was exhibited in the Austrian court in the Great Exhibition of 1851.

Drastics, *drăs'-tiks* (Gr. *drastikos*, active, brisk, from *drao*, I effect), is a term generally applied to such medicines as are very violent in their action, particularly as purgatives; such as croton oil, jalap, &c.

Draught, *draft* (Ang.-Sax.), a technical term used in Mar. to express the depth of water in which a ship can float; thus, if a vessel requires twelve feet of water to enable her to float, she is said to draw twelve feet. In order that her draught may be easily known, it is marked on the stem and stern-post.

Draught (Lat. *haustus*) is a liquid form of medicine intended to be taken at once, or at a draught; whence its name.

Draughts, a game played by two persons on a board similar to that used in playing chess. Each player has a set of twelve pieces, which consist of small round flat disks, made of wood or ivory: one set is black and the other white. The pieces must all be placed on the same colour, in alternate fours in the first three rows, before each player. The pieces must only move one square at a time, diagonally and forwards. If an opponent's piece stands in the way, there is no retreat,—the player must either advance or take his adversary's piece. A piece can only be taken, however, when there is a vacant square directly behind it; the attacking piece is lifted over and placed on this vacant square, while the piece leaped over is removed from the board. The object of the game is either to take all the adversary's pieces, or to hem them in so that he cannot play. The game increases in interest towards the close, as those pieces that reach a vacant square on the adversary's first line become *kings*, that is, their power is doubled, and they can move backward or forward to all parts of the board. The game of draughts does not require so much science as chess, but is a favourite recreation with a great number of people. In France the game is called *les Dames*, probably on account of its having been always very popular with ladies.

Draughtsman, *drafts'-măn* (Ang.-Sax.), one who is skilled in the use of the pencil. A mechanical draughtsman is one who is skilful in making drawings of machinery, diagrams, maps, and plans, in which the use of mathematical instruments is involved.

Drawback, *draw'-bak* (Ang.-Sax.), in *Com.*, is a term used to signify the sum paid back by government upon certain classes of goods exported, on which duty has already been paid. The object of this is, obviously, to enable the exporter to compete in the foreign market on an equal footing with those of other nations. If the amount of drawback exceeds the sum paid as duty, then it partakes of the nature of a bounty (which *see*). The general principle of drawbacks is not objectionable, though they may be so in particular cases. "To allow," says Adam Smith, "the merchant to draw back, upon exportation, either the whole or a part of whatever excise or inland duty is imposed upon domestic industry, can never occasion the exportation of a greater quantity of goods than what would have been exported had no duty been imposed." Such encouragements "tend not to overturn that balance which naturally establishes itself among all the various employments of the society, but to hinder it being overturned by the duty." Goods on which drawback is to be claimed require to be examined and certified by a revenue officer, on whose certificate a debenture is granted, entitling the owner to receive the drawback. No drawback is given on damaged or decayed goods.

Drawbridge, *draw'-brij* (Ang.-Sax.), a movable bridge, that was attached to the old baronial castles, to enable persons to cross the moat and gain access to the castle yard. It is also used to afford means of entrance to fortresses and citadels over the main ditch, being fastened by hinges to the scarp of the ditch in front of the main gateway, and raised and lowered by chains attached to the end that rests on the counterscarp, which pass over pulleys, and are wound and unwound

by means of a windlass. Besides this kind of bridge, which is sometimes termed a lifting bridge, there are two other sorts, called turning or swivel bridges, and rolling bridges. The turning bridge moves in an horizontal plane on a pivot, which secures one end of it to the pier on which it rests; the other end takes the form of an arc of a circle, and works on small rollers, that run on an iron rail to lessen the friction. The rolling bridge travels on rollers for the same purpose, and is moved backwards and forwards by a wheel which works in a rack; these are often used to span a space in the centre of a bridge of some length over a tidal river, to admit of the passage of masted vessels.

Drawing, *draw'-ing* (Ang.-Sax.), the art of delineating objects in outline on a flat surface, without reference to light and shadow, in the primary acceptation of the word, which, in a more extended sense, is also taken to signify any finished work of art, with all the necessary effects of light and shade, executed in pencil, crayon, Indian ink, sepia, water-colours, and in pen-and-ink, after the manner of an etching. But to return to the primary meaning of the word. It is by his skill in outline that the productions of an artist are chiefly marked. A work that is faulty in drawing, however excellent the manipulation may be, is of little worth, and is unsatisfactory to the eye. Good drawing is characterized by power, freedom, grace, and accuracy, and these qualities can only be acquired by study and constant practice. Sketching, or landscape-drawing, is perhaps less difficult than any other branch of the art, because its imperfections can be less readily detected; but it is a far more difficult task to delineate the human figure, and, by a few bold strokes, to produce outlines which present such expression, combined with freedom of treatment, as those from the pencil of Flaxman, Retzsch, and Julius Schnorr. The student who would excel in the representation of the human form must carefully study the anatomy of the figure, the construction of the skeleton, the functions and positions of the muscles, and the varied workings of those of the face which serve to indicate the various passions and emotions of the mind. To attain correctness in landscape-drawing, a knowledge of perspective is indispensable, the first principles of which are explained elsewhere. (*See* Perspective.) Without a knowledge of this most important branch of the art, no representation of landscape scenery or objects which present geometrical forms can be correctly expressed; and it is equally necessary to attain a correct method of rendering the lights and shadows of a picture, which are entirely regulated and defined by certain rules of perspective. The apparatus required by a beginner consists of a drawing-board made of a piece of deal or mahogany, clamped at the edges by pieces of which the grain runs in a contrary direction, to prevent it from warping; some pencils, india-rubber, a T square, and a box of simple mathematical instruments. The paper may be damped and pasted to the edges of the drawing-board, and then allowed to dry, when it will be found to present a beautifully smooth and even surface, or it may be fastened to it with small pins that have broad flat heads and are known as drawing-pins. After practising at the formation of elementary figures, such as straight lines, curves, rectangles, triangles, circles, and ellipses or ovals, there are no better examples for study than the leaves of various plants. When these can be sketched with readiness and freedom, drawings may be made from vases, cups, articles of furniture, and simple plaster casts. From this the learner should proceed to the study of perspective, and give roundness to his forms in outline by the proper introduction of light and shade, varying his work by copying from the flat, as it is technically termed, heads and figures in crayon from examples by Julien, and animals and landscapes from the productions of Cooper, Harding, and Prout, which may be purchased or hired for a trifling amount.

Drawing and Quartering, an old and barbarous punishment, still in force, which is inflicted upon those who are found guilty of treason. The sentence is, that the prisoner be drawn to the place of execution on a hurdle; that he be hanged by the neck till he be dead; that his head be severed from his body; and that his body be divided into four parts, or quartered. When females are found guilty of treason, the quartering is not carried into force. By a warrant under the sign-manual of the sovereign, countersigned by a principal secretary of state, the sentence of "drawing and quartering" can now be altered into beheading.

Drawing-board, a board on which drawing-paper is stretched, for the purpose of painting in water-colours. The paper is first thoroughly wetted, and then attached to the board at the edges. As it dries, the paper contracts, and, when quite dry, is found to be strained and stretched regularly, and ready for use. Originally the paper was stretched by means of a frame, and by pressure from behind: the present plan, however, is found simpler and more perfect. The edges of the wet paper are glued or pasted to the board, and the whole allowed to dry regularly. It is necessary that the board should be so constructed as not to be liable to warping. This is effected by holding together the piece or pieces of wood by an edging of other pieces the grain of which runs in a contrary direction.

Draw-plate, a steel plate used in the manufacture of metals, for the purpose of converting them into wires or bars. It is furnished with a series of graduated holes, through which the metals are drawn. The term draw-plate is also applied to a metal plate put in front of a fire or over the front opening of a fireplace, in order to cause the [illegible] to pass through the fire, instead of over it, in its way to the chimney.

Dray. (*See* Vehicles.)

Dreams, *dreems* (Du. *droom*, Ger. *traum*), are defined to be "trains of ideas presenting themselves to the mind during sleep." It frequently, if not always, happens during sleep, that while some of the mental faculties are suspended, others are still active, and are busy with numerous ideas which succeed each other with more or less regularity. This is dreaming. It is characterized by an absence of consciousness with regard to external things, and an entire suspension of voluntary control over the current of thought, so that the principle of suggestion—one thought calling up another according to the laws of association—has unlimited operation. The subject of dreams is one of the most intricate and perplexing in the entire field of mental philosophy, and it has not yet met with that amount of attention that its importance demands. Sir William Hamilton believes that, "whether we recollect our dreams or not, we always dream." To have no recollection of our dreams does not prove that we have not dreamed; for it can often be shown that we have dreamed, though the dream has left no trace upon our memory. Many other philosophers have held the same opinion; among whom Kant, who distinctly maintains that we always dream when asleep; that to cease to dream would be to cease to live; and that those who fancy that they have not dreamt have only forgotten their dreams. The phenomena of dreams also go far to prove what is now generally believed to be true, that different mental faculties have different portions of the brain appropriated to them, and through which they act. One of the most remarkable features of dreaming is the rapidity with which the mind passes through a long series of events. Whole years may seem to the dreamer to have elapsed, and a multitude of images may have been successively piled up before him, though the time occupied therewith is known to have occupied only a few minutes, or even a few seconds. Thus a dream involving a long succession of supposed events has often originated in some circumstance that aroused the sleeper, and taken place within the short space that preceded the state of full consciousness. The character of a dream is often to be traced to some sensuous feeling or impression. Thus Dr. James Gregory having on one occasion gone to bed with a vessel of hot water at his feet, dreamed of walking up Mount Etna, and feeling the ground warm under him; and on another occasion, having thrown off the bedclothes in his sleep, he dreamt of spending a winter at Hudson's Bay. Dr. Reid, having a badly-dressed blister on his head, dreamt of falling into the hands of Indians, and being scalped by them. We believe that many more of our dreams may be traced to this source than is commonly imagined, and that many of those unpleasant dreams that are sometimes found to precede illness may be occasioned by feelings or sensations of which in the ordinary waking state we are unconscious. It is in this way that indigestion is so fruitful a cause of un-

pleasant dreams. Of the five senses, touch is the most excitable during sleep, and most frequently modifies the character of our dreams. The sense of hearing is the next; and the least excitable of all our senses is that of sight. Our belief in the reality of the scenes brought before us, and in the presence of external objects not before us, are among the most curious and important of the phenomena of dreams. Everything seems real and vivid before us. Dr. J. Cunningham attempts to explain this, by maintaining that the affinity that exists between sensations and ideas is greater than is commonly imagined, and that "all thought is objective and pictorial." "We cannot think," he says, "without thinking of something, and that something must be thought of as outside the mind. It is not our thoughts, but the things we think of, that are present to our consciousness; and thus our thinking consists of a series of visions."—(*Macmillan's Magazine*, 1862.) Be this as it may, we believe that this phenomenon cannot be adequately explained by referring it to "a complicated case of association," as is sometimes attempted to be done. It is said that dreams turn most frequently upon what has occupied our thoughts during the day, and that the most recent associations occur more readily than those which are more remote. This, however, we do not think to be so much the case as is supposed. The death of a friend may occupy the chief part of our thoughts for weeks or months, and yet during all that time he may never once appear to us in our dreams; and it is only when he ceases to occupy so great a part in our thoughts during the day, that he begins to appear to us in sleep. "It is not always," says Sir W. Hamilton, "the subjects that occupy us most when awake that form the matter of our dreams; and it is curious that the persons the dearest to us are precisely those about whom we dream most rarely. The mind of the man of business, when he is away from home most frequently returns in sleep to the scene of his labours, and it is only, perhaps, some time after he has again returned home that the beautiful scenery and pleasant associations that occupied his mind when away again recur to his thoughts in sleep. We are rather inclined to the opinion, that, as a general rule, those faculties are most in action during sleep that have been least exhausted during the day. We say as a general rule, for it is well known that frequently the mind may be so exercised during the day that sleep can only be obtained with the greatest difficulty at night; and in the same way particular faculties may be so excited during the day as to continue in action also in sleep; but generally a due amount of action demands a due amount of rest. But the phenomena of dreams are yet too little studied to enable us to assert much with certainty regarding them; and in all probability they differ very much in their nature and character in different individuals. It is commonly said that nothing surprises us in our dreams. This, however, is by no means uniformly the case. We do, indeed, often see persons that are dead, or in a distant country, or witness events that have happened long ago, in our dreams, and feel no surprise; but sometimes, also, the idea that the person is dead or in a distant country, or that the event is matter of history, also occurs to us; then we are surprised, and we begin to think that we are dreaming. Or we find ourselves on some desert island, or the inhabitant of some gorgeous palace: we are surprised, and begin to cogitate how we came there. It is said, too, that there is a great disturbance in the ordinary play of the emotions; that we may walk on the brink of a precipice, or see ourselves doomed to immediate destruction, and yet feel not the slightest emotion of fear; that we may perform the most ruthless crime without compunction, and see what would in our waking hours cause us unmitigated grief, without the smallest feeling of sorrow. This is by no means uniformly the case, or even, so far as our own personal experience goes, is it so generally; but here, too, we believe that the nature of the dream differs in different individuals. Frequently the scenes that appear to us in our dreams are of the wildest and most unreal description. All probabilities, and even possibilities, of time, place, and circumstance, are violated, and yet they rarely strike us as untrue or improbable. There is also in general a remarkable want





of coherence in our dreams, and a complete incongruousness in the thoughts and images that pass through our minds. Sometimes, however, the very reverse of this takes place, and the reasoning or imaginative powers may possess a strength unknown to them in their ordinary condition. Thus Condorcet saw in his dreams the final steps of a difficult calculation that had puzzled him during the day; and Condillac states that when engaged with his "Cours d'Etude," he frequently developed and finished a subject in his dreams which he had broken off before retiring to rest. The circumstances under which Mr. Coleridge composed his fragment called "Kubla Khan" have been described by himself, as follows:—He had fallen asleep in his chair while reading in "Purchas's Pilgrimage" of a palace built by Khan Kubla, and remained asleep for about three hours, during which time, as he himself tells us, "he could not have composed less than two or three hundred lines,—if that, indeed, can be called composition in which all the images rose up before him as things, with a parallel production of the corresponding expressions, without any sensation or consciousness of effort." On waking, he instantly sat down to commit it to paper; but, after having written so much of it, he was called away by a person on business, and when he returned to the task, the poem had vanished from his memory. The popular belief that there is something supernatural in the nature of dreams, and that frequently in this way events are revealed that are about to happen, has been held from the earliest times, and is shared in by many well-informed persons in the present day. Many of the instances of remarkable dreams may, doubtless, be explained from natural causes, but there are others so well authenticated that we cannot altogether discredit them, that are manifestly unexplainable by any natural means. If we admit the testimony on which these dreams are given, we are driven to confess that they arise from causes, and are subject to laws, of which we are ignorant. "At present, we see only the particular interpositions, particular events, belonging to another system, which we call supernatural, which is governed, however, doubtless, like our own, or the natural system, by general laws, and which moves, perhaps co-ordinately with this to a common end, although we know not the laws of that system, nor to a connection between it and our own."—(*English Cyclopædia.*) It is, indeed, an interesting question,—what purpose do dreams serve in the animal economy? There can be little doubt, we think, that they exert a certain influence upon the character. "A particular tendency," says Sir William Hamilton, "may be strengthened in a man solely by the repeated action of dreams." "Dreams," says Sir J. Brodie, in his "Psychological Inquiries," "are, at any rate, an exercise of the imagination. We may well conceive that one effect of them may be to increase the activity of that faculty during our waking hours; and it would be presumptuous to deny that they may not answer some purpose beyond this, in the economy of percipient and thinking beings." "If," says Pascal, "we dreamt every night the same thing, it would perhaps affect us as powerfully as the objects which we perceive every day. And if an artisan were certain of dreaming every night for twelve hours that he was a king, I am convinced that he would be almost as happy as a king who dreamt every twelve hours that he was an artisan." Hence it is of some importance to study the art of procuring pleasant dreams, on which subject Dr. Franklin has an essay. A more accurate knowledge of the nature of dreams would tend to illustrate many of the more obscure mental phenomena. The analogy between dreaming and insanity is very striking. There is the same wild disorder of the mental faculties, the same rapid and tumultuous thoughts, the same violent passions, common to both. One of the most recent writers on this subject is M. L. F. Alfred Maury, whose work, "Le Sommeil et les Rêves, Etudes Psychologiques sur ces Phénomènes et les divers Etats que s'y rattachent," Paris, 1861, is well worth the attention of any who are desirous of studying this subject. He made numerous experiments upon himself, and had a second person by him to record what he might say or what gestures he might make during sleep, and to wake him suddenly at any moment that might seem to promise a favourable

result. Many of his observations, however, we are inclined to regard as peculiar, and not to be generally characteristic of dreams; and hence we are inclined to question some of the general principles which he deduces from them; but it is only by the multiplication of such observations that we can expect to arrive at such a knowledge as to be able to distinguish the general from the particular, the rule from the exception.

DREDGING, *dred'jing* (Ang.-Sax.), the operation of dragging or scraping with a net the bottom of seas, lakes, or rivers, for the purpose of bringing up shells, &c. The common oyster is obtained by dredging. The dredge employed is a bag-net, composed of iron rings linked together so as to form meshes. The mouth is made of sheet-iron, and acts as a scoop when the dredge is lowered, and drags along as the boat sails over the oyster-beds. Dredging has lately been much practised by naturalists for the purpose of investigating animal life in the ocean. The late Professor Forbes, by a series of interesting experiments, was thus enabled to show that there are zones of animal life corresponding with different depths of the sea. The naturalist's dredge is of much lighter construction than that of the oyster-dredge, and resembles more a shrimp or sole-dredge; but it varies according to the bottom to be explored.

DREDGING-MACHINE, a machine employed for the purpose of clearing out or deepening the channels of rivers, harbours, &c. The most effectual machine is the bucket dredging-machine; it is in the form of a large barge with an open hold. A long stage, in the form of an inclined plane, overhangs the side of the barge, having a strong wheel at each end working an endless chain. To this chain a series of perforated iron buckets is attached, each with a shovel-shaped steel mouth projecting on one side. The buckets, which ascend on one side of the inclined plane and descend on the other, are so contrived as to descend empty. On reaching the lower wheel, the shovel-shaped mouth digs into the bottom, and as it turns round is partially filled with rubbish, and passes upwards to the upper wheel. As it is inverted while passing over the upper wheel, it discharges its contents into the open hold of the barge. Every succeeding bucket on the endless chain continues the action, and the depth of working can be increased or decreased by changing the inclination of the framework. The more powerful dredgers, instead of emptying the buckets into their own holds, discharge them into other barges drawn up alongside. Dredging-machines are worked sometimes by steam-engines, sometimes by the action of an undershot wheel, and sometimes by horse-power,—the horse moving round a circular path in the barge. Some very large and powerful dredging-machines are in use on the rivers Tyne and Clyde.

DRESS, *dres* (from Fr. *dresser*, to make straight), a term applied to the body-coverings used by all but the most uncivilized human beings for the purposes of warmth and ornament. In tropical climates, the origin of dress was most probably ornament; but in proceeding from the equator to the poles man would find it necessary to provide himself with clothing which would protect him from the inclemency of the weather. Skins and furs, and those vegetable products which could be manufactured readily, would, in all likelihood, form the first garments; while with the progress of civilisation, more complicated textures, such as those of wool, hair, flax, silk, &c., came into use. The dress adopted in different nations differs in form and in the substances employed, but in general is suited to the climate in which it is worn, and the occupations of the people. In most of the countries of Europe, among the upper and middle classes, one style of dress is adopted, varying at times according to the dictates of fashion. But all the slight changes of late years, with very few exceptions, seem to be tending towards a more simple and appropriate style of dress.

DRIFT, *drift* (Dan. *drift*), in Geol., a term signifying "that which is driven;" as *drift-wood*, wood carried down by rivers, and driven by tides and currents to distant shores; *sand-drift*, sand driven and accumulated by the wind. The word is often used as an abbreviated term for the Glacial Drift of the Pleistocene period. (*See* GLACIAL DEPOSITS.)

DRILL, *drill* (Du. *drillen*, Sax. *thirlian*), a tool used for boring holes in wood, metal, stone, bone, &c. It is formed in different ways, according to the kind of hole it is required to make, and the material which it has to penetrate. Drills for boring iron have pointed heads, with sharp edges projecting from them, that cut in different directions. Those for boring wood are like an auger or large gimlet, or they are broad and flat, with a projecting spike in the centre and cutting edges on either side: drills of this form are called *centrebits*. These tools are worked by a rotatory motion imparted to them by a cranked handle, having a socket and spring at one end to receive and hold the drill, and a boss at the other, against which the workman presses his chest; or by a bow of steel, with a strong piece of catgut attached to it loosely enough to admit of its being passed once or twice round a pulley, through the centre of which the tool passes. The workman presses the drill against the material that he is boring by his chest, which is protected by a plate of metal.

DRILL, in Mil., the general name given to the exercises by which a soldier is qualified for his duty. Squad, or setting-up drill, teaches him how to march in slow, quick, and double time, to go through his facings, and to perform certain simple evolutions from the halt or when marching; these are combined with posture exercises, called extension motions, which tend to give the soldier a good carriage and an erect military figure. When the recruit is dismissed from squad drill, which is taught to small batches or squads of men by a sergeant appointed for the purpose, he learns company drill, the manual and platoon exercise, and position drill; he is then competent to go through a course of battalion drill in concert with the other companies of the regiment to which he belongs, and to proceed to aiming drill, judging-distance drill, and target practice. In every regiment every soldier goes through a course of setting-up drill in the spring. The course of drill for each arm of the service is similar, as far as the elementary part is concerned; but the artilleryman has to acquire a knowledge of gun drill, and the trooper must learn his drill on horseback, and the sword exercise. There are manuals of drill for cavalry, infantry, and artillery, published at a low price by Messrs. Clowes & Son. Punishment drill is an extra quantity of drill assigned to a soldier for some minor fault, which he has to go through in heavy marching order.

DRIMYS, *dri'mys* (Gr. *drimus*, acrid), in Bot., a gen. of plants belonging to the nat. ord. *Magnoliaceæ*. The bark, which is commonly known under the name of Winter's bark, is obtained from a species of this genus, namely, *D. Winteri* or *aromatica*. It was first brought to Europe by Captain Winter, after a voyage to the Straits of Magellan, in 1579, and was formerly much used as a substitute for cinnamon, having similar aromatic and stimulant properties: at present it is rarely employed. It is sometimes confounded with canella bark, which has been termed spurious Winter's bark.

DRINKING USAGES (Sax. *drincan*, to drink; Fr. *usage*, usage).—From the earliest times of remote antiquity, there have always been special usages connected with the custom of drinking. Amongst the ancient Hebrews, the drink-offering constituted one of the most solemn parts of their religious ceremonies. The patriarch Jacob poured out a drink-offering on the pillar of stones which he had erected to mark the place where he had talked with God. (Gen. xxiv. 14.) In the 15th chapter of Numbers there are special directions for the pouring out of drink-offerings of wine with the burnt offerings, to be "a sweet savour unto the Lord." Amongst the ancient Greeks and Romans, the pouring out of libations to the gods was an ordinary religious ceremony. They were not only offered before solemn prayers, but also before meals. In the latter case, the host, before the guests began to eat, poured a small quantity of wine upon the floor, as a sort of propitiation to the gods. This practice was somewhat equivalent to our grace before meat. It was also the custom at times to drink to the health of the guests. From usages such as these, in after-time, arose the custom of proposing healths or giving utterance to sentiments before drinking at a feast. Among the Scandinavians, Teutons, and ancient Britons, such usages were customary at their boisterous carousals. The Anglo-Saxons were in the habit of crying, "*Wæs hæl*" (be in health) before drinking. Wassail is evidently derived from this

origin; but it is attributed by some to an occurrence said to have taken place between Rowena, the daughter of Hengist, and the British king Vortigern. The king was at an entertainment at the castle of Hengist, and, during a feast, lost his heart to the fair Rowena, who, kneeling gracefully before him, presented a cup of wine, saying, "*Liever kyning, waes hæl*" (dear king, your health). The *waes hæl* of the Saxons was, however, in use before that time, and was equivalent to the "Your health" of the present day. The practice of pledging a guest before drinking arose from a necessity of showing that there was no poison in the wine, or that there was no danger to the guest while he drank. It originated in the 10th century. The introduction of Christianity did not at all contribute to abolish the practice of using the wassail cup. It began, on the contrary, to assume a religious aspect; and in the larger monasteries, amongst the monks of old, the wassail bowl was placed at the right hand of the abbot in the refectory. It was handed round to each, and was called *Poculum Charitatis*. In the universities a similar cup is still passed round, called the grace cup. In the dinners given by the public companies of the city of London, after the cloth has been removed, the master and wardens rise, and "drink to their visitors in a loving cup, and bid them all heartily welcome!" A silver cup filled with warm spiced wine is then handed round to all present. Some of the drinking-cups belonging to the priesthood in the Middle Ages were of the most costly workmanship. That of Thomas a Becket is still preserved; it is made of ivory, mounted with silver, and studded on the summit and base with pearls. Round the cup is an inscription, "Vinum tuum bibe cum gaudio" (drink thy wine with joy); but round the lid, deeply engraved, is the restraining injunction "Sobrii estote" (be moderate). The word toast, with regard to drinking usages, is comparatively modern; it originated in the practice of putting a piece of toast in a jug of ale. According to "The Tatler," the word toast was first applied to the drinking of healths at Bath, in the reign of Charles II. A celebrated beauty of the time was in the large public bath, and a number of her admirers were standing around. One of them took a glass of water from the bath and drank to her health; while another who was standing by, half tipsy, offered to jump in, saying, that although he objected to the liquor, he would like to have the toast. From that time the word was applied to drinking the health of any beauty at private parties, and, in time, all sorts of subjects were toasted at public and private feasts. Toasts also began to be accompanied by cheers; and at the present day, at large public banquets, toast-masters are generally appointed, who not only give out the subject of the toast, but lead the cheers which follow. Many drinking usages are connected with domestic events, and seem to have been handed down from ancient times. The custom of drinking at births, christenings, and marriages, can easily be accounted for; but the strangest usage of all is the practice of drinking at funerals. The wakes held in Ireland and some parts of Scotland have been long maintained, and are still kept up by habit. They probably owed their origin to the want of excitement amongst the phlegmatic northern nations, and the long dark nights in a cheerless climate.

**Drinks**, *drinks* (Ang. Sax.).—In order to dilute our food and repair the constant waste of fluids that is taking place in our system, a certain quantity of liquid must be taken into the system; and so necessary is this, that one can bear hunger better and longer than he can do thirst. Water is, undoubtedly, the natural drink of man, and, in a perfectly healthy condition, is preferable to any other; but there are many others which, in certain conditions of the body, or through habit, may be taken, not only without injury, but with advantage to the health, if only taken in moderation; such as alcoholic drinks. Much depends upon the purity of the water one uses in the preservation of health, and the presence of even very minute quantities of earthy or putrescent matter may produce the most pernicious results. Thus a very minute impregnation with lead is quite sufficient to develop all the symptoms of chronic lead-poisoning if persevered in for a sufficient length of time. Again, an excess of the saline ingredients which appear to be innocuous in small quantities, may produce a marked disorder of the digestive organs, and through them of the system generally. The injurious effects of the use of impure water are also manifest in the extraordinary augmentation of the liability to attacks of such zymotic diseases as may at the time be prevalent. For the purification and preservation of water, numerous ingenious methods have been adopted; and one of the most approved is by means of patent filters, in which the water is passed through alternate layers of sand and charcoal. (*See* Filter.) Where there is reason, however, to suspect much injurious contamination, the process of boiling should never be omitted; after which it may be strained and filtered, and lastly agitated in contact with the atmosphere, in order to restore to it its natural proportion of air. Much has been written for and against the use of alcoholic or fermented liquors; and it is one of those points on which medical men are very much divided. Without going into the arguments advanced on either side, we may give it as our opinion, that while in a healthy and natural state of the human frame, their use may be, and probably is, in some measure injurious; yet that, from the tear and wear that most people have to endure in the present state of society, more or less of alcoholic liquor is necessary to maintain the body in even the ordinary state of health. The quantity of drink required varies according to the climate, the nature of the solid food taken, and individual peculiarities. Most persons generally consume too much of liquids; and this is to be particularly guarded against during meals. By diluting the gastric juice, it prevents the food from being properly acted upon. Perhaps the best time for taking drinks of any kind is an hour or two after meals, as is shown by the degree of thirst which is then felt. Drinking large quantities of water is sometimes employed with beneficial effects in the cure of certain diseases. By exciting the vascular system and its connected secreting organs, it tends to remove from the blood various effete or noxious matters. On the other hand, a total abstinence from drink for two or three days is recommended as an effectual mode of stopping fluxes and of relieving catarrhs, inflammations, and congestions. (*See* Cold.)

**Driver Ant**, *drif'-ur*, the local name of a species of hymenopterous insects belonging to the fam. of Ants.

**Driving, Furious**, *drif'-ving fu'-re-us* (Sax. *drifan*, to drive; Lat. *furiosus*, furious), which was a misdemeanor by common law, was declared to be a statutory offence by 1 Geo. IV. c. 4, which declares that if any person shall be maimed or otherwise injured by reason of the wanton and furious driving or racing, or by the wilful misconduct of any coachman, or other person having the charge of any stage-coach or other public carriage, the offender shall be guilty of a misdemeanor, and punishable as such by fine and imprisonment. By 2 & 3 Will. IV. c. 120, the provisions relating to stage-couches were consolidated, and penalties imposed for furious driving, or other offences against the act. This act was amended by 3 & 4 Will. IV. c. 48; 2 & 3 Vict. c. 66; and 5 & 6 Vict. c. 79. The provisions relating to hackney and stage coaches in London will be found in 1 & 2 Will. IV. c. 22; 6 & 7 Vict. c. 86; 13 & 14 Vict. c. 17; and 16 & 17 Vict. c. 33.

**Droits of Admiralty.** (*See* Admiralty, Droits of.)

**Dromedary.** (*See* Camel.)

**Dromia**, *dro'-me-á*, a gen. of crustacea, of which the sponge-crab (*Dromia vulgaris*) may be taken as the type. The sponge-crab is furnished with two sharp curved claws, which enable it to hold fast to pieces of sponge, medusæ, &c.

**Drone.** (*See* Bee.)

**Dropsy**, *drop'-se* (Gr. *hudrops*, from *hudor*, water, and *ops*, aspect or appearance), in Path., is a disease characterized by the accumulation of watery fluid in one or more of the shut cavities of the body, or in the areolar tissue, or in both, independent of inflammation. In a state of health, the capillaries, which ramify every part of the body, constantly pour out upon every surface, into the most minute cells as well as the great cavities, a watery fluid to moisten the parts, and thereby facilitate motion and prevent injury from friction. This watery fluid is speedily taken up

by another class of vessels, called the *absorbents*, which carry it back to the general circulation. When the healthy condition of these organs is impaired, either from the exhalents acting too powerfully, or from the absorbents being deficient in action, an accumulation of fluid takes place, either in the general cellular membrane or in the natural cavities of the body. Dropsy is either active or passive. Active or acute dropsy is owing to excessive action of the exhalents, in consequence of increased action of the heart; it comes on suddenly and tumultuously, and sometimes can scarcely be discriminated from inflammation with serous effusion. It is induced by various causes; as exposure to a cold moist atmosphere, particularly when the body is in a state of perspiration from active exercise or long exposure to heat. A labourer "has been digging (perhaps) in a wet ditch in winter time, and he pauses to take his meal; or he has been unloading a waggon, and rides home some miles in a heavy rain that wets him to the skin; or he has been mowing in the heat of summer, and lies down to sleep upon the damp grass." The perspiration is suddenly checked, and in the course of a few hours he becomes universally anasarcous. Chronic or passive dropsies are occasioned by defective absorption, arising, in some measure perhaps, from an enfeebled state of the absorbents, strictly and anatomically so called, but more frequently, chiefly, and in some cases entirely, from undue fulness of the veins; this venous repletion being produced almost always by some impediment to the free return of the blood to the heart; as tumours pressing on the great blood-vessels, ossification of the valves of the heart, &c. When the veins are distended to a certain degree with watery fluid, the entrance of more of the same fluid through their sides is impeded or prevented; and when the distension is still greater, the aqueous part of the blood may even pass in the other direction out of the vessel. The difference between active and passive dropsy is chiefly in the rate at which the collection augments; in the one case the liquid is rapidly effused in quantity much beyond the natural amount of exhalation, in the other the exhalation goes on as usual, but the fluid exhaled is not taken back again into the circulating vessels with sufficient facility. Wherever there is a shut sac, or wherever there is loose and permeable areolar tissue, there we may have dropsy. There are certain parts, however, where it is more generally met with than in others, and is hence distinguished by particular names: thus, when in the head, *hydrocephalus*; in the chest, *hydrothorax*; in the belly, *ascites*; in the areolar tissue generally throughout the body, *anasarca*. When the areolar tissue of a part becomes dropsical, it is said to be œdematous. *Cæteris paribus*, those parts of the body become the most loaded with serous fluid, of which the areolar tissue is plentiful and loose. In the treatment of this disease, the first object is to get rid of the preternatural accumulation of watery fluid; the second, to prevent its collecting again; for dropsy is generally a symptom or sequence of other disorders, and rarely a disease of itself. In active or febrile anasarca general blood-letting is often of great advantage, as it not only helps to relieve the congestion upon which the effusion depends, but it tends to abate the undue action of the heart; in other cases, however, blood-letting would be very injurious, from its enfeebling the patient; and as it frequently occurs from weakness, or living on poor or unwholesome food, the treatment must consist of a generous diet, with tonics. In general, the object is to augment the discharge of watery fluid from one or more of the secreting surfaces of the body; and it is often a matter of great nicety to determine by what surface or channel this ought to be attempted. In some cases it is best to seek to promote this discharge by way of the kidneys; in others, by the mucous lining of the alimentary canal; in others, by the external skin. Sometimes great present relief is afforded to the patient by tapping; but it is generally only temporary, and can only sometimes be resorted to.

**Droseraceæ**, *dros-e-ra'-se-e* (Gr. *droseros*, dewy), the Sun-dew fam., a nat. ord. of dicotyledonous plants in the sub-class *Thalamifloræ*. They are bog or marsh plants, frequently furnished with glands, and having alternate exstipulate leaves with a circinate vernation. Peduncles, when young, circinate; flowers regular





and symmetrical, hypogynous, with a quinary arrangement of their parts, which are persistent and imbricate; anthers extrorse; styles several; placentæ parietal; fruit capsular, 1-celled, with loculicidal dehiscence; seeds numerous; embryo small at the base of copious fleshy albumen. The *Droseraceæ* are found in almost all parts of the world with the exception of the Arctic regions. They possess slightly acid and acrid properties. The typical gen. is *Drosera*, the sun-dew, the species of which are interesting, from the peculiar irritability of the hairs on their leaves. The plant commonly known as Venus's fly-trap is a species of *Dionæa*, another genus of this order, and exhibits in a most striking manner this irritability. (*See* Dionæa.) Some of the sun-dews communicate a beautiful purple stain to the paper upon which they are dried, and also yield a yellow colour when treated with ammonia. They may, therefore, be expected to furnish valuable dyes, and should be examined with this view by the practical chemist.

Drowning, *drown'-ing* (Dan. *drugner*, to drown), is suffocation produced by the immersion of the body under water, or, according to some, by the exclusion of atmospheric air from the lungs by any liquid. The necessity of air to life is well known, and any exclusion of it, for even a few minutes, produces death. When a human being unable to swim falls into the water, if it is not of great depth, he first goes to the bottom; but on account of the air in the lungs rendering the specific gravity of the body lighter than the water, he immediately rises again to the surface. The efforts made by him to maintain himself at the surface diminish the quantity of air in the lungs, and he again sinks to the bottom, but soon rises again; and this alternate rising and sinking may occur several times in succession. The air which is expelled from the lungs is seen to rise to the surface in the form of bubbles, and with every expiration the specific gravity of the body is increased; the powers of sensation and voluntary motion rapidly diminish, and the body settles at the bottom. A feeble motion may still be perceived in the chest for a short time, but that, too, ceases, and death ensues. In drowning, death is effected by the impure condition of the blood. The impure or venous blood of the system is constantly being carried to the lungs, where, being brought into contact with the air, its impurities are carried off, and it is converted into pure or arterial blood. When, by any means as in drowning, the lungs are shut out from communication with the external air, this operation cannot be carried on, impure instead of pure blood is carried through the system, the brain is immediately affected, sensation and volition rapidly diminish, and at length cease. The period during which life may continue in submersion varies in different persons. In some instances bodies submerged but one minute have been found to be lifeless; and in many cases recovery has taken place after a submersion of eight or ten minutes. Occasionally, animation has been restored after a submersion of fifteen or twenty minutes, or even of half an hour. In general, if the body has not been in the water longer than from five to eight minutes, the prompt use of the proper means will restore animation. When the body is recovered after drowning, the skin is cold and pale, presenting sometimes patches of livid discoloration. The expression is usually placid, the eyes half-closed, the pupils dilated, the tongue swollen and pressed forward, and the lips and nostrils covered with a mucous froth. The fingers are sometimes found torn and abraded, and the hand grasping gravel or other substances, which have been seized in a convulsive struggle at the bottom of the water. Internally, the epiglottis is found to be raised; bloody foam appears in the windpipe and bronchial passages; the lungs are soft and distended; a large quantity of black fluid blood is collected in the right, and less in the left cavity of the heart; and the vessels of the brain are swelled and filled with impure blood. The following plan of treating a drowned person was proposed by the late Dr. Marshall Hall in 1856:—1. Treat the patient instantly, on the spot, in the open air, except in severe weather, freely exposing the face, neck, and chest to the breeze; 2. send with all speed for medical aid and for articles of clothing, blankets, &c.; 3. place the patient gently

on the face, with one arm under the forehead, so that any fluids may flow from the throat and mouth, and without loss of time,—I. *To excite respiration;* 4. turn the patient on his side and, *a*, apply snuff or other irritant to the nostrils; *b*, dash cold water on the face, previously rubbed briskly until it is warm. If there be no success, again lose no time, but, II. *To imitate respiration;* 5. replace the patient on his face (when the tongue will then fall forward, and leave the entrance into the windpipe free); then, 6. turn the body gently, but completely, on the side and a little beyond (when inspiration will occur), and then on the face, making gentle pressure along the back, when expiration will take place, alternately. These measures must be repeated deliberately, efficiently, and perseveringly, fifteen times in the minute only. Meanwhile, III. *To induce circulation and warmth*, continuing these measures, 7. rub the limbs *upwards* with firm pressure and with energy, using handkerchiefs, &c., for towels; 8. replace the patient's wet clothing by such other covering as can be instantly procured, each bystander supplying a coat, waistcoat, &c. "These rules," says Dr. Hall, "are founded on physiology; and whilst they comprise all that can be done immediately for the patient, exclude all apparatus, galvanism, the warm bath, &c., as useless, not to say injurious, especially the last of these, and all loss of time in removal, &c., as fatal."

Drug, *drug* (Fr. *drogue*), a term applied to those substances used in medicine sold by the druggist and compounded by apothecaries according to the prescriptions of physicians and surgeons. The professions of the chemist and of the druggist are mixed together in a very confused manner. This uncertainty has been caused principally by the rules established by the medical corporations, such as the College of Physicians, the College of Surgeons, and the Apothecaries Company. Acids, alkalies, oxides, and salts, which are used in large quantities, are manufactured on an extended scale in several parts of Great Britain. The term of chemist and druggist is, however, usually applied to those persons who retail and understand the chemicals which they purchase from other parties who make them on a large scale. A book has been lately published by Dr. Normandy, under the title of "The Commercial Handbook of Chemical Analysis:" this work is intended to afford aid in the detection of fraud in the manufacture of food, drugs, and chemicals. The subject upon which it treats is of especial importance to provincial druggists. The different substances are alphabetically arranged. The following remarks show the usefulness of such a work:—"Country druggists form a class of persons to whom this work would be very serviceable; for although there are, of course, highly creditable exceptions, particularly in great provincial towns, the bulk of whom are not distinguished for chemical, or even pharmaceutical knowledge. Few are capable of conducting an analysis or organic research, and they are frequently imposed upon by wholesale dealers, who send them damaged or spurious drugs, which, if administered in dangerous maladies, might induce aggravation of disease, and very probably cause death." In 1858 a new medical act was passed, by which the new general council formed to carry out the provisions of the act is empowered "to cause to be published, under their direction, a book containing a list of medicines and compounds, and the manner of preparing them, with the true weights and measures by which they are to be prepared and mixed, and containing such other matters and things relating thereto as the general council shall think fit, to be called *British Pharmacopœia;* and the general council shall cause to be altered, amended, and republished such Pharmacopœia as often as they shall feel necessary." In mercantile language, any commodity that lies on hand, or is not saleable, is called a *drug*.

Drugget, *drug'-get* (Fr.), a sort of cloth, of a coarse, flimsy woollen texture, generally used for covering carpets, but in some parts of Great Britain used as an article of clothing by females among the poorer classes. Usually, it consists of a mixture of woollen and cotton, and in Scotland the material called drugget has generally the warp of a coarse flax, and is commonly striped blue and white.

Druggist. (*See* Chemist and Druggist, Pharmaceutical Society of Great Britain, and United Society of Chemists and Druggists.)

Druids, *dru'-idz*, a name given to the order of priests which existed in ancient times among certain branches of the Celtic race, if not among all. Numerous derivations have been given of the name; but the most probable seems to be from the old Celtic word *derowyd*, from *de*, 'god,' and *rowyd*, 'speaking,' a participle of the verb *rowyddim*, 'to speak.' Various writers have endeavoured to establish a connection between the Druids and some of the other early heathen sects. Some argue that the Druidical and Persian religions were identical; others regard them as connected with the Hindoos, others with the Egyptians, and so on. They only become known in history about the 1st century before Christ, and they were then chiefly found in Gaul and Britain. Julius Cæsar is the ancient author who has given the clearest and most minute account of them. According to him, they formed one of the two orders of rank and dignity in Gaul. They were engaged in things sacred, conducting the public and the private sacrifices, and interpreting all matters of religion. They were held in great honour among the people, and a number of young men resorted to them for the purpose of instruction. They determined almost all controversies, public and private; decreed rewards and punishments; and if any one did not submit to their decision, they interdicted him from the sacrifices, which, among them, was the most heavy punishment, such persons being shunned by all, and deprived of all civil rights and privileges. Among the Druids there was one who possessed supreme authority over them, who was either elected by the suffrages of the others, or, if pre-eminent in dignity among the rest, was at once elected. They assemble at a fixed period of the year, in a consecrated place in the territories of the Carnutes, which is reckoned the central region of the whole of Gaul; and hither all who have disputes assemble from every part, and submit to their decrees and determinations. They do not go to war or pay tribute like the rest, being exempted from military service, and having a dispensation in all matters. They are said to learn by heart a great number of verses; for they regard it unlawful to commit these to writing; and hence some remain in training for twenty years. In almost all other matters in their public and private transactions, they use Greek characters. One of their leading tenets is, "that souls do not become extinct, but pass after death from one body to another; and they think that men, by this tenet, are in a great degree excited to valour, the fear of death being disregarded. They likewise discuss and impart to the youth many things respecting the stars and their motion; respecting the extent of the world and of our earth; respecting the nature of things; respecting the power and the majesty of the immortal gods. This institution is supposed to have come from Britain; and even now those who desire to gain a more accurate knowledge of that system, generally proceed thither for the purpose of studying it." As to the amount of knowledge possessed by the Druids, we have little means of determining. They unquestionably, however, possessed some knowledge of the heavenly bodies beyond what simply pertained to the regulation of their religious festivals, inasmuch as they computed the year by lunations, which supposes an acquaintance also with the solar year; and various relics have been found in Ireland, among Druidical remains, which are thought to be astronomical instruments designed to show the phases of the moon. At the same time, there was not a little of astrology, divination, and magic mixed up with their purer science. In their doctrine of medicine particularly, there was far more of superstition than of knowledge. To a great many plants they attributed a sacred mystic character. The oak was especially regarded as sacred among them, and in the oak-groves they frequently performed their rites, deriving, according to some, their name from the oak. Most sacred of all, however, was the mistletoe, which they esteemed as an antidote to all poisons, a cure for all diseases. It was gathered at certain seasons, with the most formal and pompous ceremonies. According to Pliny, as soon as it was discovered upon the oak, the Druids collected in crowds about the tree; a priest in white vestments ascended, and, with a knife of gold,

cut the mistletoe, which was received by another standing on the ground; sacrifices were offered up, and the day spent in rejoicings. There were certain other plants which were regarded as potent remedies for various diseases, and were carried about as charms, as well as amber beads, which the Druids manufactured for warriors in battle, and which are still found in their tombs. A still more powerful talisman was, according to Pliny, the serpent's egg. It was formed, he says, by the poisonous spittle of a great many serpents twined together. It was gathered at moonlight, and afterwards worn in the bosom. Their profounder ceremonies, those which they celebrated in the depths of the oak forests or of secluded caves, are known to us only through the vaguest traditions, and in the stupendous but dilapidated stone monuments which still exist in some parts of France and Britain. It is said that human sacrifices were frequently offered up upon their altars. They consisted of three distinct classes,—the bards, the vates or prophets, and the priests proper. The bards were poets, not only of a religious, but also of a martial and satirical class. The vates were the divinors or revealers of the future, who were charged with the conduct of sacrifices and other external ceremonies, and who stood as mediators or interpreters between the people and the higher order of priests. These dwelt in the depths of the oak forests, cultivating the more secret and mystic doctrines of their faith. They exercised judicial functions, and were resorted to in great numbers by the youth for instruction. When Gaul was subdued by the Romans, the Druidical religion gradually retired before the classic heathenism, and, step by step, withdrew at first into Armorica, and then into Great Britain, where, in the time of Nero, it was attacked and mostly suppressed. It lingered as a public worship longest in the island of Anglesea, whence it was finally driven out by the Roman troops, amid a great deal of slaughter. Nevertheless it continued, as a superstitious belief, to hold sway for many years thereafter over the minds of the Celtic tribes and their descendants.

Drum, *drum* (Du. *trom, trommel*, Ger. *trommel*, Dan. *tromme*), a musical instrument of percussion, supposed to be of Oriental invention, and said to have been introduced into Western Europe by either the Moors or the Arabians. Of drums we have three kinds; they are as follows:—1. The *base* or *Turkish drum*, which is the largest, and consists of a hollow cylinder of oak covered at each end with vellum fastened to the rim in such a manner that it may be tightened or loosened *ad libitum* by means of small cords or braces acted upon by sliding knots of leather. 2. The *double* or *kettle drum*. — An instrument made of copper, nearly hemispherical, covered with a strong head of calf-skin, and standing upon three iron legs. They are always in pairs, and are tuned by screws,—one to the keynote of the piece accompanied, and the other a fourth below. 3. The *side-drum*.—This is constructed like the first, but generally has a brass cylinder, and is much smaller. Within the last six years great improvements have been made in the manufacture of side-drums by Messrs. Key, Rudall, and Co., Charing-cross, London; and, since 1858, our infantry have been supplied with these drums by the above-mentioned makers. They weigh three pounds less than the old ones, are much smaller, of a superior tone, and tuned by screws instead of the old straps and ropes. There has also been a drum of this kind invented without a cylinder, resembling two tambourines joined at a short distance apart by small bars of iron, with their concavities facing each other.

Drum-head Court-martial, the name given to a council of officers convoked in haste when on active service, to punish or pass sentence of death on any soldier who has committed an offence which requires to be dealt with in a summary manner. The big drum was used as a table, round which the officers composing the council assembled; whence the name, which is now applied to any court-martial held in haste.

Drum-Major, the principal drummer in a regiment, who beats the big drum, and teaches and has the general management of the other drummers. He also receives orders from the officer in command respecting the drummers, and the beats to be given at any appointed time.

Drummer, *drum'-mer*, any man or boy in a regiment who beats the drum, and in this manner gives various signals to the troops. (*See* Beat of Drum.) Signals are given to light infantry by buglers instead of drummers. The drummer has to perform the unpleasant duty of flogging any soldier who may be ordered to receive a certain number of lashes as a punishment. The drummers stand immediately before the privates on the muster-roll.

Drummer, a species of cockroach found in the West Indies, and so named from its habit of keeping up a continual knocking noise during the night. They are said to attack people when asleep; and this is probably correct, since they have been seen to prey on the extremities of the dead. (*See* Blattidæ.)

Drummond Light, *drum'-mund lite*, a light of extreme brilliancy, the invention of Lieutenant Drummond, R.E., and used by him in the trigonometrical survey of Great Britain, consisting of a jet of oxygen and hydrogen, mixed in the proportions to form water, directed upon a cylinder of lime. The lime, which is infusible, becomes white hot, and emits a pure white brilliant light of such intensity that it has been distinctly seen at a distance of one hundred and twelve miles. The lime cylinder is generally placed on a rotating pin, as part of the earth volatilizes from the intense heat. The Drummond light, or lime light, as it is more frequently called, is much used in exhibiting the magic lantern and the reflecting microscope. It has been applied also to lighthouses, but has been abandoned, the catoptric and dioptric principles upon which the illuminators are constructed requiring a broad flat light; whereas the lime-light is extremely minute in proportion to its wonderful brilliancy.

Drupaceæ. (*See* Amygdalæ.)

Drupe, *droop* (Lat. *drupa*), in Bot., a superior one-celled, one or two seeded, indehiscent fruit, having a fleshy or pulpy sarcocarp (middle layer), and a hard or bony endocarp (inner layer). The pericarp, or complete envelope of the seed, is separable into its component parts,—namely, epicarp (external layer), sarcocarp, and endocarp. The drupe is commonly called a stone-fruit. Examples occur in the peach, apricot, plum, and cherry. The fruit of the almond presents all the characters of a drupe, except that the sarcocarp is of a toughish nature, instead of being succulent. A number of drupes aggregated together on a common receptacle, as in the raspberry, form collectively a kind of *etærio* (which *see*).

Drying Oils, *dri'-ing oils* (Sax. *dri*, dry).—Oils are divided into drying and non-drying oils, according as they become solid or remain liquid by the absorption of the oxygen of the air. The principal drying oils are linseed, walnut, poppy, hemp, cod-liver, and sperm. Those belonging to the latter class are olive, almond, rape, colza, and many animal oils. The uses of the former for paint, and of the latter for illuminating purposes, are instances of their opposite properties being taken advantage of.

Dry-point, in Eng., a sharp, fine-pointed etching-needle, used to cut fine lines in a copper or steel plate without biting them in with acid. Work produced in this manner is very delicate as well as durable.

Dry-rot, the name given to the decay of timber, proceeding from the fermentation of sap that is left in the wood, and which is brought about by the influence of warmth, combined with a certain degree of moisture and the want of proper ventilation. It appears in timber that has not been properly seasoned, or which has been cut in the spring of the year, when the sap is rising, as in the case of oak-trees, which are cut at this time for the sake of the bark. When the sap has fermented, the vegetation of fungi follows, which spreads through the wood, destroying the fibres to such an extent that they crumble into dust under any slight pressure. To prevent dry-rot in timber, it is necessary that it should be well seasoned, and that the air should at all times have free access to it. Various methods have been adopted for filling the pores of the wood with some solution, to render it proof against destruction by dry-rot, among which may be mentioned Sir William Burnett's process, by which the wood is soaked in a solution of chloride of zinc, and that of Kyan, by which the pores of the timber are filled with a solution of bichloride of mercury, forced into them by the air-pump,

## Dryobalanops

DRYOBALANOPS, *dri-o-bāl'-a-nops* (Gr. *drus*, oak; *balanos*, acorn; *ops*, aspect), in Bot., a gen. of plants belonging to the nat. ord. *Dipteraceæ*. The species *D. aromatica* or *camphora* is a large tree found in Sumatra and Borneo. From its stem a liquid called liquid camphor, and a crystalline solid substance named Sumatra camphor, are obtained. (*See* CAMPHOR.)

DUALISM, *dū'-āl-izm* (Lat. *duo*, two), in Phil., is a term applied to those systems which refer all existence to two ultimate principles. This doctrine was held by many of the ancient Greek philosophers, who regarded the universe as constituted by two principles,—the one active, the other passive; the one spiritual, the other material. A mythological dualism was held by Zoroaster and the Magi, who accounted for the present state of things by maintaining the existence of a good and an evil principle. The Gnostics and the Manichæans subsequently adopted this belief. Those systems of philosophy which regard matter and spirit as distinct principles, are also a species of dualism, in opposition to materialism. The term dualism is also applied to a theory of perception. (*See* PERCEPTION.) The opposite of dualism is monism.

DUBLIN UNIVERSITY, *dub'-lin*, was founded by Queen Elizabeth in 1591, and incorporated by charter, or letters patent, as a "college, the mother of a university," under the title of "The College of the Holy and undivided Trinity, near Dublin." Since that period several royal charters have been granted by succeeding sovereigns, extending the privileges of the university, and making such alterations in the statutes and constitution as were from time to time deemed necessary. James I., by letters patent, issued in the eleventh year of his reign, after reciting, "that whereas said college was, and was esteemed, an university, and had enjoyed and possessed all and singular the rights, liberties, and immunities pertaining to an university," granted to the provost, fellows, and scholars, the privilege of electing two burgesses from among themselves to represent the university in the Irish parliament. One of these was taken away at the Union in 1800, but restored by the Reform Bill of 1832. In 1851 a royal commission was appointed to inquire into the state, discipline, studies, and revenues, of the university; and in consequence of their report, various alterations were effected in the statutes. In the charter of foundation the queen nominated one provost, three fellows, and three scholars, in the name of more, to constitute, with their successors, for ever, a body corporate and politic. The number of the corporation has been increased from time to time, and at present consists of a provost, seven senior and twenty-seven junior fellows, and seventy scholars. The provost and senior fellows form the board of management, and power is given to them to alter, amend, or repeal all laws, rules, or by-laws, to make new laws and rules from time to time; such new laws or alterations, however, not to have force or be binding upon the university until approved of by the senate or congregation. The senate consists of the chancellor, or, in his absence, of the vice-chancellor or pro-vice-chancellor for the time being, and such doctors or masters as shall have and keep their names on the books of the college. The caput of the senate is a council, consisting of the chancellor or vice-chancellor, the provost (or, in his absence, the vice-provost), and the senior master non-regent, who is elected by the senate. Every grace must pass the caput before it can be proposed to the rest of the senate, and each member of the caput has a negative voice. The provost, or head of the college, is appointed by the Crown, and must be in holy orders, and a doctor, or, at least, a bachelor in divinity, and not less than thirty years of age. The fellows are all chosen in the first instance by strict examination, but the seniors are promoted from the juniors in the order of seniority. The examination comprises mathematics, mental and moral sciences, physics, classics, Hebrew, and Chaldee. The system of instruction is superintended by the fellows, both senior and junior, most of them being employed as professors, lecturers, or tutors. In fact, it was not till the latter end of last century that the principle was recognised of having professors in the university who were not fellows. They hold their fellowships for life, unless they choose to accept of the incumbency of one of the thirty-two



## Dublin University

benefices at the disposal of the college. The law binding them to celibacy was abolished in 1840. They must be members of the English church, and are all bound to enter into priests' orders except five,—a *medicus*, two *juristæ juris civilis*, and two *juristæ juris anglici*. The average annual income of a senior fellow from various sources is usually from £1,200 to £1,500; of a junior fellow, principally from tuition, about £600. The income of the provost is about £3,600 per annum. The scholars are chosen from among the undergraduates after examination; one class of scholarships being for classical, another for scientific merit. Scholarships are open to all students being or becoming members of the established church, and are tenable until the holder is entitled to the degree of master of arts. Scholars have their commons free of expense, and their rooms for half the charge paid by other students: they pay half-fees, but are exempted from college charges or *decrements*, and receive from the college an annual salary. Besides these foundation scholarships, the number of which is seventy, there are also non-foundation scholarships, founded in 1854, open to students of all religious denominations. Their emoluments and tenure of office are the same as those of the other scholars; but, as their name imports, they are not members of the corporation, and do not enjoy the university franchise. There are four grades of students:—1. Noblemen, sons of noblemen, and baronets, who enjoy certain privileges, the two first being entitled to the degree of B.A. *per specialem gratiam*; 2. fellow-commoners, who have the privilege of dining at the fellows' table, and who are entitled to the degree of B.A. with one term examination less than pensioners; 3. pensioners, who form the great body of the students; 4. sizars, who are students of limited means, and have their commons free of expense, and are exempted from annual fees. Sizars are admitted annually by examination, and the number is limited to thirty. Each rank has a dress peculiar to itself. The mode of admission into the university is by an examination held once in every month (except February, August, and September); those in July, October, and November being public, the rest private. The subjects of examination embrace Latin and English composition, arithmetic, algebra (the first four rules and fractions), English history, modern geography, and two Greek and Latin books. Besides the honour of "first place" at entrance, prizes of the value of £5 and £2 are awarded for excellence in special branches of the entrance course, and also for Hebrew. Each student at entrance must select one of the junior fellows who act as tutors to be his instructor and guardian of his interests during his academic career. Undergraduates of the first and second year are junior and senior freshmen; of the third and fourth, junior and senior sophisters. The course for all students is,—*first* year, mathematics, Greek, Latin; *second*, mathematics, logic, and metaphysics, Greek, Latin; *third*, logic and metaphysics, physics, Greek, Latin; *fourth*, astronomy, ethics, physics (mathematical and experimental), classics. An extended course is prescribed for those who aspire to academic honours. Each term commences with an examination of the studies previously gone over, more especially those of the preceding year. Terms may be kept in two ways,—by attendance upon the lectures or by merely passing the term examinations. Hence any student, unless he be a scholar, may prepare himself for the examinations without residing in the college or in the city; and on his being represented by his tutor as resident in the country, no other academic duties are required of him. Students of divinity, law, engineering, and medicine, however, are required to attend lectures, and therefore must reside in the college or city. There are three academic terms in the year,—Michaelmas, Hilary, and Trinity; the two former followed by a short recess, the latter by a vacation of three months. The under-graduate course extends over four years, when the student is promoted to the degree of B.A. An M.A. must be a B.A. of three years' standing; a B.D. must be an M.A. of seven years' standing; a D.D. a B.D. of five years' standing, &c. The fees for the entrance or first half-year are,—for noblemen £60, fellow-commoners £30, pensioners £15, sizars £5. 1s. 3d.; for other half-years, noblemen £33. 12s., fellow-commoners £16. 16s., pensioners

£8. 8s., the sizars being exempt. These do not include rooms and commons. To encourage meritorious students, and to make some provision for those who, after graduation, desire to devote themselves to learning, fourteen studentships were founded by royal statute in 1859. These are open to candidates of all religious denominations, and are tenable for a period not exceeding seven years. The salary, as fixed by the provost and senior fellows, is not to exceed £100 per annum. A school of engineering was established in the university in 1842, with the view of combining the theoretical and practical instruction necessary for the profession of civil engineering. Dublin University possesses a very complete staff of professors, who represent nearly all branches of human knowledge; and the professorial system here is more largely combined with the tutorial than in any other British university. The total number of entrances for the year 1860-61 was 310; being, fellow-commoners 9, pensioners 295, sizars 6.—Ref. *Dublin University Calendar*.

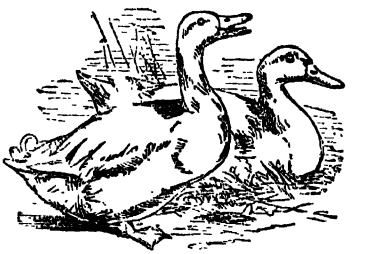
DUCAT, *duk'-at* (Lat. *ducatus*, duchy), a gold coin very much used throughout the currency of Europe. It derives its name from the legend found on the first pieces of the kind, which were coined in Sicily during the 12th century. The legend runs: *Sit tibi, Christe, datus, quem tu regis, Ducatus*, 'Let that *duchy* be thine, O Christ, which thou rulest.' After the 12th century the issue of ducats increased largely in Italy: Venetian ducats were called *Leckini*, from Lecca, where they were coined. In 1559, Germany adopted the ducat into the currency, and shortly afterwards its use spread over the whole of the north of Europe. The ducat varies in quality and weight. The ordinary ducat, which is current in Russia, Austria, Hamburg, &c., weighs 54 grains troy, and has a value of 9*s.* 4*d.* sterling. Many German states no longer issue ducats. The Italian ducat is of less value than that mentioned, the Venetian ducat being valued at 6*s.* sterling. The Spanish ducat is called *ducado*, but is generally called a dollar: its value in English money is 4*s.* 2*d.*, and it is made of silver.

DUCES TECUM, *du'-sees te'-kum* (Lat., you will bring with you), in Law, is a writ commanding one to appear at a certain day in the court of Chancery and to bring with him some evidences or other things which the court would view. A party in any cause or matter depending in the court of Chancery may by subpœna *duces tecum* require the attendance of any witness before the examiner, and is entitled to the production of any deed, paper, or writing in his possession, custody, or power. If the court, however, does not think it probable that the documents will be evidence between the parties, the court will not compel the documents of a third party to be produced.

DUCHAI HEMP. (*See* ÆSCHYNOMENE.)

DUCHY, *dutsh'-e* (Fr. *duché*), a term applied to the territory or dominions of a duke; as the duchy of Lancaster. The court of the duchy of Lancaster in England is also called the Duchy court. (*See* DUKE.)

DUCK, *duk* (Ang.-Sax.; Lat. *anas*).—The group to which the name of duck is generally extended is characterized by greater breadth of bill than either the swans or geese. Their food is chiefly animal, whilst that of both swans and geese is in great part vegetable. A well-known example of this family is the wild duck, or common mallard (*Anas Boschas*), the original of all the ordinary domestic varieties. It is found in all the countries of Europe, but abounds especially in the northern parts. It is nearly two feet in length, three feet in extent of wings, and weighs about three pounds. The bill is of a greenish-yellow colour; the head and upper part of the neck of a glossy green, terminated in the middle of the neck by a white collar. The scapulars are white, barred with fine brown lines; the back is brown, and the rump black, shaded with green. The lower part of the neck and breast is of a chestnut-colour; the belly pale grey, barred with dusky bars. The legs are orange-yellow. Like the rest of the duck tribe, the mallards quit the north at the end of autumn, and migrating southward, arrive at the beginning of winter in large flocks, and spread themselves over the marshy wastes of Britain. In bygone times, when the tracts of marsh land in England were much more extensive than now, the mallard was among the commonest of our wild-fowl; and even now our fen counties are patronized by them in such vast numbers as to keep the London market fully supplied in the season. The extreme wariness of these birds renders necessary much patience and ingenuity in obtaining large quantities of them. They fly at a considerable height in the air, in the shape of a wedge or triangle; before they alight on any spot, they take several wheels in the air, as though to reconnoitre, and then descend with extreme precaution. When at rest on the water, they take care to keep at a considerable distance from the shore, and when they compose themselves for sleep, some of the company are always awake to keep guard and to apprise the remainder of the approach of danger. They are much more active by night than by day. The wild duck usually makes her nest amongst the tall grass or rushes skirting the water; but instances have occurred of the birds building in trees. "In Sussex, the nest of a mallard was found in an oak-tree five-and-twenty



AYLESBURY DUCKS.

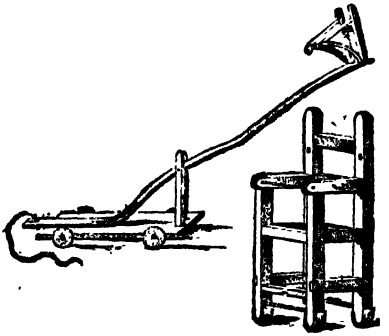
feet from the ground; the old bird was sitting upon nine eggs supported on some small twigs laid crosswise. In Derbyshire a gentleman's gamekeeper observed a wild duck fly out of a large oak in which the year previous had been a hawk's nest. On examination she was found to have completely repaired the old nest and to have laid therein two eggs. Another instance occurred at Madely, in Staffordshire. In this case the wild duck took possession of a rook's nest near the top of an oak. The drake was also seen to perch on a bough near her, and occasionally in her absence to sit in the nest."—(Stanley's *History of Birds*.) The food of the duck consists of worms, mollusca, and aquatic insects, which they separate from the mud by the agency of lamellæ at the margins of the bill. In speaking of the mallard as the type of the true duck, Mr. Yarrell observes, concerning their leading characteristics:—"Externally they exhibit considerable length of neck; the wings are also long, reaching to the end of the tail; the tarsi somewhat round; the hind toe free, or having no pendent lobe. In habits they may be stated generally as frequenting fresh water, but passing much of their time on land, feeding in ditches and about the shallow edges of pools, on aquatic plants, insects, worms, and occasionally fish, taking their food at or near the surface; possessing great powers of flight, but seldom diving, unless pursued. Of their internal soft parts, the stomach is in the greatest degree muscular, forming a true gizzard; the intestines long; the cœcal appendages from six to nine inches in length in the larger birds, and decreasing only in proportion to the size of the species. Of the bones it may be observed that the ribs are short, extending but little beyond the line of the posterior edge of the sternum. The keel of the breastbone is deep, affording great extent of surface for the insertion of large and powerful pectoral muscles. The enlargement at the bottom of the trachea in all of them is of bone only." In his first division of true ducks, Mr. Yarrell includes the sheldrake, Muscovy duck, wild duck, gadwell, shoveller, pintail, widgeon, bimaculated duck, garganey, and teal; accounts of all of which will be found in the proper places. The domestic duck is duller of plumage and less graceful in form than the wild. The most obvious distinction between them, however, lies in the colour of their feet; those of the wild ducks being yellow, and the tame ducks black. The tame duck does not, like the wild, pair, and remain

with one mate, but takes the control of an entire troop of hens. Whatever its species may be, the tame duck is a desirable bird to have in a poultry-yard. Nor is water indispensable to its existence; "so far from it, indeed, that, instead of being absolutely necessary, it is often injurious to the young; in fact, they should never be allowed to swim till more than a month old. Instead of allowing young ducks to go out in the morning to eat slugs and worms, they should be kept up, since this food, notwithstanding their partiality for it, is injurious."—(*Stanley.*) They lay a great number of eggs, require very little attention, and, with respect to ducklings, they may be easily fattened in the course of a month with any kind of pulse, or grain and water. (*See* DECOY.)

DUCK (from Swedish *duk*, a cloth), a sort of plain heavy linen, highly glazed, and of coarse texture. It is much used for making the smock frocks worn by the agricultural labourers in England, and also for the rough shirts worn by workmen in copper and iron smelting-works and forges.

DUCKBILL, ORNITHORHYNCHUS, or PLATYPUS, *duk'-bil*, a gen. of mammalia, ord. *Monotremata*. Only one species is fully ascertained (*O. paradoxus*, or *panatinus*), generally known as the water-mole in the Australian colonies. The entire length of the animal, including bill and tail, is about two feet; body long and compressed, and thickly covered with very glossy hair, at the roots of which is a layer of waterproof felt-like material. The head is round and small, eyes small and bright, no external ear, and instead of the muzzle, mouth, and teeth of an ordinary quadruped, the creature is furnished with a bill like that of a duck (but broader in proportion), and possessing small transverse lamine like the duck's bill. The legs are short; the fore feet have each five toes, with strong burrowing claws and a connecting membrane for swimming. The hind feet are likewise webbed, but the web does not extend beyond the base of the claws. The tail is strong, broad, and flattened, about half as long as the body, covered with longer and coarser hairs, and nearly naked on its under surface. It lives chiefly in the water, and, like the duck, seeks its food among the mud. Its burrowing powers are said to exceed those of any other animal, fifty feet being no very uncommon length for it to run. It is wary and active, and by no means easily shot. Its voice resembles that of a young puppy.

DUCKING-STOOL, *duk'-ing stool* (Ang.-Sax.), an apparatus of varied form, used formerly in Britain for punishing scolding wives. One of the most ordinary forms of the ducking-stool was the following:—A strong wooden chair was fastened to the end of a long beam, which worked like a see-saw on a pivot, on a post bedded into the edge of a dam or the deep part



DUCKING-STOOLS.

of a river. The woman was placed in the chair with her arms drawn backwards; a bar was placed across her back and inside her elbows, while another bar held her upright: in this uncomfortable position she was securely tied with cords. The persons appointed to carry out the punishment, by raising their end of the beam, caused the unfortunate culprit to go over head in the water. By pulling down their end





with a chair, she was once more brought to the surface; and the ducking was repeated, according to the enormity of her offence. Sometimes the ducking-stool was combined with a tumbrel. A ducking-stool of this description was in use at Leominster up to the year 1809; the beam was 23½ feet in length. The practice of using the ducking-stool commenced in the 15th century, but had almost died out by the close of the 18th. The ducking-stool, often confounded with the ducking-stool, was a different punishment; it was used unreservedly for men and women, who were fixed in a stool at their own doors, to be pelted and hooted at by the mob.

DUCT, *dukt* (Lat. *duco*, I lead or conduct), denotes generally any tube or canal by which a fluid is conducted or conveyed. It is more particularly used in Anat. to denote the vessels which convey the fluids in animal bodies.

DUCT, in Bot. (*See* VESSELS.)

DUCT, ALIMENTARY. (*See* ALIMENTARY CANAL.)

DUCTILITY, *duk-til'-e-te* (Lat. *ductilis*, from *duco*, I lead, draw), the power possessed by certain bodies, and especially the metals, in virtue of which they are capable of being drawn out in length, while their diameter is diminished, without fracture or separation. Among the metals it may be called the property of being able to be drawn out into wires. The order of the metals which are ductile is almost similar to the order of those which are malleable; it is as follows:—Gold, silver, platinum, iron, copper, zinc, tin, lead, nickel, palladium, cadmium. Platinum wire has been produced only $\frac{1}{1000}$th of an inch in diameter. Glass is exceedingly ductile at a high temperature. The property is also possessed by other substances; such as gums, glues, resins, &c., when softened by moisture or heat.

DUELLING, *du'-el-ling* (Lat. *duellum*, Fr. *duel*), a combat between two persons, at a time and place specified in a challenge sent by one of the parties to the other. Duels usually arise out of private quarrels, and the general practice is for the party insulted to send a friend to demand an apology. If he refuses, he is requested to name his friend; and the two friends, or seconds as they are called, arrange the preliminaries for the combat. They also choose the ground, regulate the mode of fighting, place the weapons in the combatants' hands, and enforce compliance with the rules which they have decided upon. Although the duel is now of very rare occurrence, it is comparatively a modern institution. Among the ancient Greeks and Romans no such practice existed, and the word *duellum* meant a war between two nations. Afterwards, under the belief that God would interfere miraculously in behalf of the innocent against the guilty, judicial disputes were decided through at Europe by trial by battle. (*See* BATTLE, or BATTEL.) Probably the duel originated in a belief in the same principle. It seems to have had its origin among the Germanic nations. Louis le Débonnaire was the first French king who permitted disputants to resort to arms. Henry II. prohibited duelling, on account of a combat between his friend Francis de la Chastaignerie and Guy Chabot de Jarnac, in which the latter was slain. The practice of duelling, however, still continued. Francis I. openly encouraged it, and set an example by challenging Charles V. Several ineffectual attempts were made to put down the practice; but to such an extent was it carried on during the sovereignty of Henry IV., that in the first eighteen years of his reign 4,000 gentlemen lost their lives in duels. Henry was compelled by popular feeling to endeavour to abolish the custom by adding death, in extreme cases, to the penalties then in force. He, however, did not look with an unfavourable eye upon duelling; consequently, although very unlawful, it became very fashionable. During the reign of Louis XIII. duelling became so prevalent that it was said in Paris that no Frenchman was worth looking at unless he had killed his man. Although duelling was so common, the law against it was carried out with great rigour, and several noblemen and gentlemen of high renown were beheaded for persisting in fighting. During Louis XIV.'s reign, duels of three, four, and five a side were common; but the king at last enforced the laws with such firmness that, for the time, duelling

was almost abolished. Duelling appears to have been introduced into England about the time of the Norman conquest; but it was principally in its public or judicial form. Private duelling was very prevalent in the reign of Queen Elizabeth. It declined during the Commonwealth, but broke out again in the reign of Charles II. During the reign of William III. attempts were made to abolish duelling; and in 1712 a bill was introduced into parliament, but was thrown out, notwithstanding that its objects had been strongly advocated in Queen Anne's speech. After the wearing of swords was abandoned, duelling diminished for a time; but the pistol soon began to take the place of that weapon. After a time, chance took the place of skill, and ghastly, albeit absurd, duels were fought at two or three paces, one pistol being loaded and the other not. This sort of duelling seemed to reach its climax when the disputants made choice by lot between two pills, one made of bread and the other containing poison. From this point duelling declined, and has quite fallen into disrepute; in this country, indeed, it may be said to be abolished. By the laws of England, any man killing another in a duel, however fair it may have been, is considered guilty of murder. Whilst it was not looked upon unfavourably by the public, no jury could be found who would convict any one charged; but the case would probably be different at the present day. The duels among the German students were merely fencing-matches with sharp weapons; and although some ugly cuts in the face were given and received, they were never absolutely dangerous, as armed seconds were always on the alert to prevent any serious wounds. Several stringent additions on the subject of duelling were added to the Articles of War in this country in 1844 by the commander of the forces. Partly through these, but more particularly through the increasing improvement of English society, duelling has ceased to be an institution of this country.

Duenna *du-en'-na* (Span. *dueña*), the title applied to the chief lady in waiting upon the queen of Spain. In a more restricted sense, the termed is used to designate a person holding a middle position between a governess and companion, and appointed to take charge of those young ladies who are members of Spanish or Portuguese families.

Duet, *du-et'* (Ital. *duetto*), in Mus., a two-part composition, either vocal or instrumental, with or without a bass and accompaniments. To form a good duet, the execution should be pretty equally distributed between the two parts; the melodies so connected, intermingled, and dependent on each other, as to be entirely inseparable, but at the same time perfectly related and concinnous when heard together. Although combined by the situation of the harmony, the parts are not necessarily similar in their motion; on the contrary, it is by varying and giving them contrary directions, that the best effects are produced.

Dugong, *du'-gong* (*Halicore Dugong*), a marine animal belonging to the herbivorous cetacea. In general form it much resembles the manatee. Its length varies from twelve to twenty feet. It feeds on the algæ which grow on submarine rocks in shallow seas. Its affection for its young is remarkable; and if the latter can be surprised and captured, the mother may be easily taken. Its flesh is eaten, and said to resemble coarse beef in texture and flavour. It is found among the islands of the Indian archipelago. Ruppell asserts that it was with the skin of the dugong that the Israelites were ordered to veil the tabernacle.

Duguetia, *du-gu-e'-she-ă*, in Bot., a gen. of plants belonging to the nat. ord. *Anonaceæ*. The only interesting species is *D. quitarensis*, a native of Guiana, which furnishes the strong elastic wood called lancewood. This is chiefly use by couch-makers.

Duke, *duke* (Lat. *dux*, a leader, a general; Fr. *duc*, Ital. *duca*), an honorary title given in England to noblemen of the highest rank. The term is first used in history in Gen. xxxvi. 15, with reference to the grandsons of Esau, and probably signifies their position as the heads or founders of families or tribes, as it could have no political meaning further than this at that early period. It was applied as an especial title of rank to the military governors of provinces of the Roman empire about the year 325, in the reign of Constantine the Great, when they ceased to exercise the civil functions which had hitherto formed a part of the duties of the Roman governors or procurators. There were from thirty to forty of these *duces* or dukes, ten of whom were particularly distinguished by the appellation of *comes*, or companion, in allusion to the closer relationship into which they were brought to the emperor, by virtue of the high dignity with which they had been invested. The title *comes* in late ages became "count," and then implied a rank subordinate to that of duke, although it had previously been superior to it. (*See* Count.) The early Roman counts and dukes were distinguished by wearing a golden baldrick or band, and they received considerable emoluments from the state, to enable them to support their dignity in a becoming manner. Their power was entirely restricted to their military command, other officers being appointed to collect the revenues and administer justice. The title of duke was preserved in succeeding ages, and for the most part applied to military commanders of high rank, by the northern tribes, who asserted their supremacy over the south of Europe in the latter days of the Roman empire. At the time of the conquest it was given to persons exercising almost absolute and kingly power over large tracts of territory called dukedoms, acknowledging the supremority of the monarch, of whom they were supposed to hold their lands by feudal tenure, by some slight and occasional act of homage. (*See* Feudal System.) It was, however, no uncommon thing for the duke to enter the lists with his feudal lord on very slight grounds of offence, and successfully hold his own against him. Such were the dukes of Normandy, Gascony, Aquitaine, and Burgundy. Their dominions and titles were hereditary in all cases. The title is applied even in the present day to the sovereigns of many petty German states, sometimes with the prefix of "grand" or "arch;" as the grand-duke of Baden, the duke of Brunswick, &c. In our own country the Norman and Plantagenet kings assumed the title by virtue of their continental possessions, acquired by inheritance or marriage; but it was first conferred as an honorary distinction by Edward III. on his son, Edward the Black Prince, whom he created duke of Cornwall in 1335; since which time the title has always belonged to the prince of Wales for the time being, by prescriptive right. For some time after this the title was strictly confined to princes of the blood royal, or to those who were very nearly allied to the royal family; but about 1450 the dignity was extended to the Staffords, Beauchamps, and other families, besides those who could claim close kindred with the sovereign. The majority of English dukedoms were conferred in the reigns of William III. and Mary, Anne, and George I.; but since the death of that monarch comparatively few instances have occurred of the creation of a dukedom, that of Wellington, created in 1814, being most worthy of notice, and most honourably earned. There are at present twenty-eight dukes of the United Kingdom, the duke of Cambridge, a duke of the blood royal, being excepted, of whom twenty are English, seven Scotch, and one, the duke of Leinster, Irish. The duke of Norfolk is the premier or senior duke of England, by priority of creation; and the duke of Hamilton, the premier duke of Scotland.

Duke of Exeter's Daughter, an instrument of torture resembling the rack in construction. It is said to have been invented during the reign of Henry VI., by the dukes of Exeter and Sussex. According to Blackstone, it was never put into use. It was at one time exhibited along with other instruments of torture in the Tower of London.

Duke of York's School, the name commonly given to the Royal Military Asylum at Chelsea, established by the duke of York (who, by this and other acts, earned the appellation of the "soldier's friend") at the commencement of the present century, for the orphan children of soldiers. The expenses of the institution are met by a public grant made for the purpose, which always forms a part of the annual army estimates. The boys are admitted as vacancies happen to occur, and are chosen by the board of management from the numerous applicants who are candidates for the benefits of the charity. On quitting

the asylum the boys generally enter the army; but if they do not wish to do so, they are apprenticed to some trade. There was also a school for the orphan daughters of soldiers at Chelsea; but this has long since been given up, owing to the misconduct of some of those who had been educated there. It appears, however, to be unjust that this should exclude the daughters of soldiers who have died in the service of their country from participating in the advantages provided by the state for their sons.

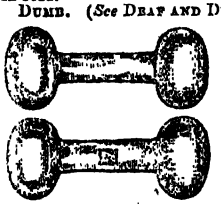
DULCAMARA. (*See* SOLANUM.)

DULCIMER, *dul'-se-mer* (Ital. *dolcimello*, from *dolce*, sweet), a musical instrument, most probably of the wind-species, used amongst the ancient Hebrews. Its exact form is unknown.

DULSE. (*See* RHODOMENIA.)

DULWICH COLLEGE, *dul'-ij*, was founded at Dulwich, a suburb of London, about 4½ miles S.S.E. of St. Paul's, by Edward Alleyn, an actor, in 1619. The original revenues only amounted to £800, but they now exceed £12,000, and maintain a master, four fellows, six poor brethren, six poor sisters, twelve poor scholars, and thirty out-members. The building was recently repaired and much improved, under the superintendence of the late Sir C. Barry. It has a picture-gallery containing some fine paintings, chiefly by the old masters, and bequeathed to the college by Sir F. Burgeois, in 1811.

DUMB. (*See* DEAF AND DUMB.)



DUMB-BELLS.

DUMB-BELLS, *dum'-bells*, two weights, generally made in the form represented in the engraving, used for purposes of exercise. They are made of various weights, varying from about 8 lb. to 2s lb. The centre bar, which is often covered with leather, is grasped in the hand.

DUNCIAD, THE, *dun'-she-ăd*, a satire originally written in three books, by Alexander Pope, in 1728; he, however added another book in 1742. For a considerable period Pope had suffered from the attacks of a number of critics and detractors, who not only denied his genius, but attributed to him the basest and meanest of motives. Unable to bear these attacks any longer patiently, and stung to the quick, he determined to strike out in every direction at his antagonists, and the Dunciad was the method by which he achieved his end. Critics, authors, publishers, *et hoc genus omne*, winced and howled as the stinging lash of his satire fell right and left among them, and wherever it fell it drew blood. He recriminated, and chastised in terse epigram and not over-delicate satire, every one by whom he thought he had been aggrieved, and immortalized his antagonists as he demolished them. Even now, although all the *dramatis personæ* are passed away from the scene, the Dunciad can still be read with interest as a model of polished verse and keen pungent satire.

DUNES, or DOWNS, *dunes* (Celt. *dun*, a hill, whence Fr. *dunes*, Ger. *dünen*, Du. *duynen*), the name given to low and almost barren hills of sand of great breadth, that extend along the coast of Holland, Belgium, and the northern departments of France, and serve to protect the fertile land within them from the inroads of the ocean. They have been formed by the wind blowing great quantities of sand inland whenever it gets dead on shore. A few kinds of grass, such as the *Carex arenaria* or sea-carex, the *Festuca rubra* or creeping fescue-grass, and the *Arundo arenaria* or sea-reed, grow on these sand-banks, and are of material benefit in binding the loose surface together. These sand-hillocks are to be found on the coasts of Brittany and Gascony and parts of Spain; they also exist on the north coast of Norfolk, where they are called *denes*. These denes have accumulated to a great extent during the last 250 years, having buried houses and the entire village of Eccles since 1600, and choked the mouths of several small estuaries. In this country the kindred term *downs* is applied to any elevated and slightly undulating table-land of some extent; such as the Downs of St. Austell, in Cornwall; Epsom Downs, in Surrey; and the North and South Downs, in Kent and Sussex.

DUNG-BEETLE, *dung-bē'-tl* (Ang.-Sax.), the name of certain of the *Scarabæides*, living, for the most part, on or in the dung of other animals. They are scientifically known as *Coprophagi* (Gr., dung-eaters). For the most part they are black, or black and brown, and some few are adorned with brilliant metallic colours. To this section belongs the sacred beetle of the Egyptians, the *Scarabæus sacer* of Linnæus: it is about an inch long, and of a black colour. This species is not only found in Egypt, but is met with in the south of Spain, France, and Italy, and, as well as other species of the group to which it belongs, incloses its eggs in a ball of excrement, which it forms by rolling the substance by means of its hind-legs. The size of the ball, when completed, is much larger than the insect, being sometimes as much as an inch and a half in diameter. The dor, or shard-born beetle (*Geotrupes stercorarius*), belongs to this tribe, and is one of the commonest of British beetles. It is of a stout form; less than an inch long; black, with metallic and blue reflexions on the under-surface. This species may often be heard droning through the air of a summer evening. It is almost impossible to over-estimate the great good performed by these insects. Not only do they hasten the removal from the ground of what becomes more offensive the longer it stays, but they carry the offensive matter to where plants grow, and, by distributing it in the soil, materially assist their proper growth.

DUNGEON. (*See* DONJON.)

DUNKERS, TUNKERS, GERMAN BAPTISTS, or BRETHREN, a religious sect of Baptists that originated in Germany in the early part of the 18th century, about twenty families of which left their native country, and settled in Pennsylvania, U.S., about 1719. They were speedily followed by others, and at length formed themselves into a distinct sect, and, in 1733, established a kind of monastic society at a place called Ephrata. The members adopted the dress of the White Friars, and received monastic names, though they did not take any monastic vows. They hold the fundamental doctrines of Christianity, and acknowledge the Scriptures as the only infallible rule for faith and practice. They are chiefly remarkable for their rigid adherence to the precepts and ordinances of the New Testament, and do not admit of any innovations whatever on the established forms and ceremonies of Christ, even to the washing of the feet before receiving the sacrament. Their chief peculiarities are with regard to baptism and the sabbath. They hold to adult baptism, and administer the ordinance by triple immersion; and they observe the seventh day as the sabbath. They are exceedingly simple and peaceful in their manners, disclaiming violence even in cases of self-defence, and suffering themselves to be defrauded and wronged rather than go to law. They consider future happiness only to be obtained by penance and outward mortification in this life, and deny the eternity of future punishment. This sect still exists in scattered bodies, chiefly in Pennsylvania.

DUNMOW FLITCH, *dun-mo'*, a singular custom instituted at Dunmow, in the county of Essex, in 1244, by Robert de Fitzwalter. Its object was the bestowal of a prize on a man and wife who had lived without quarrelling, on the following conditions:—"That whatever married couple will go to the priory, and, kneeling on two hard pointed stones, will swear that they have not quarrelled nor repented of their marriage within a year and a day after its celebration, shall receive a flitch of bacon." The first prize was not claimed till two hundred years after the institution of the prize, and since that time there have only been eight claimants for the flitch. The last two awards were made in 1855 and 1860. Mr. Harrison Ainsworth, the novelist, and others, have endeavoured of late years to perpetuate the custom.

DUODECIMAL SCALE, *dū-o-dec'-e-măl* (Lat. *duodecim*, twelve), an operation or rule in arithmetic by which the contents of any surface or solid are estimated by multiplying together its linear dimensions, expressed in feet, inches, and lines. It is principally used by contractors and artificers in finding the contents of their work. Cross-multiplication is another term applied to the same system of calculation. As an

example, suppose it were required to ascertain the superficial contents of a piece of timber 12 feet 9½ inches long and 3 feet 7 inches in width. In order to calculate this by the duodecimal scale, one dimension must be put under the other, the feet being placed under the feet and the inches under the inches. The half-inch is expressed in lines, 6 lines going to the half-inch, 12 lines to a full inch:—

| | | |
|---|---|---|
| 12 | 9 | 6 |
| 3 | 7 | |
| 38 | 4 | 6 |
| 7 | 5 | 6½ |
| 45 | 10 | 0½ |
| | 12 | |
| | | 120½ |

In this calculation, feet are considered as units of measure, and inches are so many twelfths of unity. The units thus form the first place in the column, the twelfths the second, and the one hundred and forty-fourths the third. When the first line is multiplied by 3 feet or 3 units, the result is 38 feet, $\frac{4}{12}$ of a foot, and $\frac{6}{144}$ of a foot. When the upper line is multiplied by $\frac{7}{12}$, the six lines are made equal to $\frac{42}{144}$. The $\frac{6}{12}$ multiplied by the $\frac{7}{12}$ are equal to $\frac{42}{144}$, which added to the other make $\frac{48}{144}$, or $\frac{4}{12}$ and $\frac{6}{144}$. 6½ is therefore placed in the third column, and the $\frac{4}{12}$ is carried forward. The ultimate result is as above, 45 square feet and 120½ square inches. To practical men the operation described is much simpler than the explanation, and beginners have great difficulty in mastering it. The duodecimal scale is not generally inserted in ordinary books of practical arithmetic.

Duodecimo, *du-o-des'-e-mo* (Lat. *duodecim*, twelve), a term applied to a book when every sheet is folded six times, so as to make twelve leaves, or twenty-four pages. Is is usually abbreviated into 12mo.

Duodenum, *du-o-de'-num* (Lat. *duodenus*, consisting of twelve), in Anat., is the name given to the first portion of the small intestine, and was so called by the ancients because it was supposed not to exceed the breadth of twelve fingers; but as they dissected only animals, this does not hold true in the human subject. It is from eight to nine inches in length, and commences at the pyloric end of the stomach. It first inclines upwards, backwards, and to the right, and, having arrived near the neck of the gall-bladder, it bends vertically downwards, and again changes to a transverse direction; thus forming two curves or angles. It is in this intestine that chylification of the food takes place. (*See* Digestion.)

Duplication of the Cube, *du-ple-kai'-shun* (Lat. *duplico*, I double), a celebrated problem of ancient geometry, by which it was required to construct a cube whose solid contents should be double the contents of a given cube. The origin of this problem is as follows: During the occurrence of a plague at Athens, a deputation was sent to the oracle of Apollo at Delos, to learn what would stop or mitigate the catastrophe. The answer received was, that the plague would not cease until they had doubled the size of the altar of the God. The shape of the altar was cubical, and the problem was, consequently, to find the side of another cube of twice the solid contents of the altar. This problem could not be solved by plane geometry, as it required the solution of a cubic equation. Hippocrates of Chios, however, by the insertion of two mean proportionals between two straight lines, resolved it into another and simpler problem. Several of the ancient geometers, including Archimedes, Eutocius, Pappus, and Nicomedes, discovered various methods of solving this problem by means of the higher curves. Newton and Huygens, among other celebrated modern mathematicians, also gave much attention to the subject of the Duplication of the Cube.

Dura Mater. (*See* Brain.)

Duramen, *du-ra'-men* (from Lat. *durus*, hard), in Bot., the heart-wood or central portion of an exogenous stem. It is made up of wood-cells with thickened sides, and which are impermeable to fluids, hard in texture, coloured, and of a dry nature. (*See* Alburnum.)





Durante, *du-rān'-te* (Lat.), is a term employed in certain law phrases in the sense of *during*; as, *durante bene-placito*, during pleasure; *durante vitâ*, during life. *Durante minore ætate* (during minority) is an administration granted during the minority of an infant executor, or an infant next of kin: *durante absentiâ*, an administration granted when the executor is out of the realm, to continue in force until his return.

Duress, *du-ress'* (Nor.), literally means hardship; and hence, constraint, imprisonment, or restraint of liberty. In Law, duress is of two kinds:—1. Duress of imprisonment, which is imprisonment or restraint of personal liberty; and 2. duress *per minas* (by menaces or threats), coercion imposed by fear of loss of life or limb. It is a general principle in law, that a contract made under compulsion is not binding, and many acts will be excused on this ground which would otherwise be blameable; but the evil to be dreaded must be in some proportion to that which is committed. A man would not be excused for homicide to avoid even a considerable injury to himself. But in regard to civil transactions, a smaller degree of restraint will be a sufficient ground for avoiding an obligation. Duress of imprisonment includes confinement of the person in any wise. The keeping of a man against his will in a private house, putting him in the stocks, arresting or forcibly detaining him in the street, is an imprisonment. If a man is under duress of imprisonment, and he seals a bond or the like, he may allege this duress and avoid the extorted bond. But if a man be lawfully imprisoned, and to procure his liberty, or on any other fair account, seals a bond or a deed, this is not duress of imprisonment, and he is not at liberty to avoid it. It is doubtful whether, in this country, mere duress of goods, as where the signature to an agreement was procured by a threat of detention of a person's goods or of injury to them, would suffice to avoid a contract; but in America this is held to be the case.

Durham University, *dur'-ăm*, dates its origin only from 1832, when a bill was introduced into parliament to enable the dean and chapter of that see to appropriate an estate at South Shields for the establishment and maintenance of a university for the advancement of learning in connection with the said cathedral church, the late Bishop Van Mildert engaging to provide eventually for the warden, the professor of divinity, and the professor of Greek, by attaching prebendal stalls to the several offices. Under the authority of this act, the university was opened in 1833, and in 1835 a statute was passed by the dean and chapter, and approved by the bishop, intrusting the ordinary management of the university, under the bishop as visitor, and the dean and chapter as governors, to the warden, a senate, and a convocation. After a constitution and the studies had been satisfactorily arranged, a royal charter was granted under the great seal on the 1st of June, 1837, incorporating the persons therein described by the name of "the warden, masters, and scholars of the university of Durham," and granting them "all the rights and privileges which are assumed to the university by the act of parliament, or incident to a university established by royal charter." It consequently possesses the right of granting degrees. By an order of her Majesty in council in 1841, it was provided that the office of warden should in future be permanently annexed to the deanery of Durham; a canonry in the cathedral church was annexed to each of the professorships of divinity and Greek; the professor of mathematics was appointed professor of mathematics and astronomy, with an increased salary. It was also provided that a professorship of Hebrew and the other Oriental languages should be founded; and, in addition to the six fellowships which had been established by the dean and chapter, eighteen others were to be founded. Certain additional estates were assigned to the university for this purpose. A college was formed within the university, and buildings fitted up for the reception of students, and censors and tutors appointed to watch over their conduct and direct their studies. These accommodations were subsequently much enlarged, especially by the addition of Durham Castle and its precincts. A new hall, called "Bishop Hatfield's Hall," was opened in 1846, and enlarged by an additional building in 1849. Another hall, called "Bishop Cosin's Hall," was opened in 1851.

## Durham University

In 1837 the benefits of the university were extended by the establishment of a course for students in civil engineering and mining; and in 1852 additional facilities were given for students in medicine. Various alterations have since been made in the university, the last of which are by the ordinances of the university commissioners, of date 30th June, 1862, for the government and administration of the university. In terms of these ordinances the bishop of Durham is to be the visitor of the university, and the dean of Durham the warden,—the latter exercising a general superintendence over the university, and convening the senate and convocation. The senate is to consist of the warden, professors, and tutors, and to manage the property, maintain the discipline, direct the studies and examinations, and transact the business of the university. The convocation is to consist of the wardens, professors, and tutors, and such persons as shall have proceeded to the second degree in the university; and will have power to confirm or reject what is submitted to it by the senate, but will have no power to originate or amend. The visitor has the appointment of the professors, to whose professorships canonries are annexed, and the senate will appoint all the other professors and all the tutors. There will be one professor of mathematics and astronomy; and in the school of physical science there will be at least three professors; namely, of chemistry and metallurgy, of geology and mineralogy, and of mining and machinery. To those professorships not connected with canonries a fixed salary of £300 per annum will be annexed, and the tutors are each to have a salary of £250. Students will be of two kinds,—matriculated, whose names are placed on the register of the university, and non-matriculated, —such as have the permission of a professor to attend his lectures without his name being on the register. The matriculated student must reside within the precincts of the college, or of some licensed hall or house, unless dispensation be granted to reside elsewhere; and previous to matriculation he must state to what school he proposes to belong, and pass an elementary examination adapted to the studies of such school. The degrees are granted in three separate schools; viz.—1. Arts, classics, and mathematics; 2. theology; 3. physical science. No matriculated student is required to keep more than four terms in order to proceed to the degree of bachelor in any of the three schools; and a graduate in any one of the three schools may, after an interval of three years, if he keep his name on the register of the university, proceed to the second degree in the same school. The matriculation fee will be £2, and the fee for tuition (each term) £5. Students resident in the college, or in any hall or house belonging to the university, must further make in advance the following payments:—£5 each term for rent, including furniture, and £1. 5s. each week for battels, including service, lighting, fuel, and all other domestic charges, except washing. A fee of 10s. is likewise payable each term to the university for keeping his name on the register. The fee for the first degree in any one of the three schools is £2; for the second, £4. Forty open scholarships of £30 a year, each tenable for two years, are to be established, open to all persons, whether members of the university or not; but no member of the university shall be entitled to compete who shall have been a member longer than one month. There are also to be forty scholarships of £50 a year each, open to all students commencing their second year, and tenable for one year; but, on the student graduating in one school and becoming a student in some other, may be held for a second year. The scholarships are to be distributed between the three schools in proportion to the number of students at each respectively, excepting that not more than one-third in number and value of them shall be held at any one time by the scholars in the school of physical science. There are also certain private scholarships, varying from £20 to £10. 10s. each, also tenable for two years, to be given to such persons as have most distinguished themselves in the examination for the university scholarships of £30 a year, and who are students in the school of arts. There are other private scholarships of from £25 to £10 a year each, given to such students of theology as have most distinguished themselves in the examination for the £30 scholarships.—Ref. *Durham Univ. Cal.*

## Dutch Liquid

Durian. (*See* Durio.)

Durio, *du'-re-o* (from Malay *dury*, thorny), in Bot., a gen. of plants belonging to the nat. ord. *Sterculiaceæ*. The species *D. zibethinus* yields the fruit called the durian, which is highly esteemed in the south-eastern parts of Asia, being accounted next in value to the delicious mangasteen. (*See* Garcinia.) It has, however, a strong smell, which renders it disagreeable at first to those unaccustomed to it; but the dislike to this smell is generally soon overcome.

Durra. (*See* Holcus.)

Dust, Atmospheric, *dust*.—When a ray of sunlight enters a partially-darkened apartment through any small aperture or chink in the shutters, or when a flood of intensely-brilliant light from the same source pours into a room through Venetian blinds or other means taken to exclude it to a certain extent, we can distinctly see small particles of various substances, familiarly called motes, floating about in the track of the sunbeam, and moving with greater or less rapidity according to the extent to which the air is agitated in which they are suspended. Under ordinary circumstances, these motes, or atmospheric dust, are invisible to human sight, being so minute that they can only be seen under the conditions that have been mentioned, through the reflection of strong sunlight from their surface, or by the aid of a powerful microscope. But whether they are visible to us or not, they are always present in the atmosphere that we breathe; and it is considered that the lower strata of the air immediately in contact with and above the surface of the earth are constantly impregnated with these small particles, of unappreciable weight and size, that are fragments of various organic and inorganic substances that have been worn away from the bodies of which they originally formed a part, by friction and other causes. Scientific meteorologists ascribe the suspension of these small particles to the internal friction of the air, the resisting power of which increases very rapidly in proportion to the diminution of the particles themselves; that is to say, that, supposing we have two very small particles, one being the 1,000th part of an inch in diameter and the other the 10,000th part of an inch, the power of the air to sustain the latter would be a hundred times greater than it would be to keep up the former, although the diameter of the smaller particle has only been diminished to the tenth part of the greater one; so that it follows that when particles of dust are of extremely minute size, they would be held suspended almost in a state of perfect rest, provided that the air itself were free from agitation from any exciting cause. In many parts of the world, vast collections of this atmospheric dust are frequently formed, from causes that have not hitherto been explained; and to such an extent that they assume the appearance of thick haze and banks of clouds, from which the terms "dust haze" and "dust storm" are frequently applied to them. When in Teneriffe, one of the Canary Isles, for the purpose of making astronomical observations, Professor Smyth found these clouds of dust to be constantly present in the atmosphere, often affecting the transmission of light to a great extent, so as to obscure the rising and setting of the sun, and to render the observation of the stars by day quite impossible, besides gathering round the summit of the Peak of Teneriffe in horizontal strata, and almost concealing portions of it from view. This atmospheric haze, occasioned by particles of dust, has been noticed in South Africa and on the Himalaya Mountains. Professor Smyth considers the occurrence of the phenomenon to be general throughout the world, although not so palpable to observation as in the districts already named; but he confesses his inability to determine where the dust came from, or whither it went, as well as why it should collect together in such quantities in mountainous regions. It has been discovered by Professor Ehrenberg, of Berlin, that the particles carried about by the wind, when submitted to chemical tests, consist of minute fragments of all kinds of mineral substances, mixed with mould and various organic bodies.—Ref. *English Cyclopædia*—Arts and Sciences.

Dutch Liquid, *dutsh lik'-kwid*, in Chem., $C_4H_4Cl$, or $C_4H_3Cl.HO$. When olefiant gas is mixed over water with chlorine in equal proportions, oily drops of a heavy, sweetish, aromatic liquid condense and

rink in the water. This product is called Dutch liquid from the circumstance of its having been discovered in Holland, and its oily appearance gives the name to olefiant gas. It is a very interesting substance to chemists, having been extensively employed by Faraday and Regnault in the elucidation of the theory of substitution.

DUTCH METAL, *well'-dl*, in Metal., an alloy of copper and zinc beaten into thin leaves resembling gold-leaf, from which it is readily distinguished by dissolving in oil of vitriol.

DUTCH RUSHES. (*See* EQUISETUM.)

DUTY, *du'-te* (Ang.-Nor. from *due*), is literally something due or owing by one person to another; hence, that which a person is bound by any natural, moral, or legal obligation to pay, do, or perform. In Pol. Ec., it is a tax or impost levied by the government for the public revenue. It is but reasonable that each individual who is member of a state should contribute in some way to the support of that state; and that, to some extent, in proportion to the benefits he derives from it. The apportioning the expenses of a government among the different classes of a community, in such a way as not to affect the material prosperity of the state or of individuals, is one of the most difficult branches of the art of government. High duties give rise to smuggling, and diminish the consumption of the article on which they are laid; while low duties increase the number of articles necessary to be taxed, and thus materially augment the expense of collection. The following general rules are laid down by Adam Smith on this subject:—1. That the subjects of every state ought to contribute towards the support of the government as nearly as possible in proportion to their respective abilities; 2. that the tax which each individual is bound to pay ought to be certain, and not arbitrary; 3. that every tax ought to be levied at the time, or in the manner, in which it is most likely to be convenient for the contributor to pay it; and 4. that every tax ought to be so contrived as both to take out, and to keep out, of the pockets of the people as little as possible over and above what it brings into the public treasury of the state. (*See* TAXATION.)

DWARF, *dwauf* (Sax. *dwerg*, *dwerg*), in general language, a term applied to those human beings who are less in height than the average of their species. In a more restricted sense the word dwarf is applied to those cases in which there is a uniform arrest of growth. Among the ancients there was a general belief not only in the existence of dwarfs of great minuteness, but also in the existence of nations composed exclusively of them. In the works of Aristotle there is an account, which he declares he had from trustworthy sources, of a race of diminutive men and diminutive animals, living in the caves on the banks of the Nile. Their habits and customs, together with their geographical positions, are also described by Pliny. The accounts of these pigmy people read very like Gulliver's accounts of the Lilliputians. Philetas, a poet, who was contemporary with Hippocrates, if all accounts are to be believed, was one of the smallest men that ever lived. He was obliged to load himself with ballast in order that he might not be blown away by the wind. Nicephorus Calistus mentions an Egyptian dwarf who "did not exceed a partridge in size" at the age of twenty-five. The most remarkable case of all, however, is that mentioned by Athenæus, of Aristatus, a poet, who was so small that he was invisible to the naked eye. Among the legends of the Scandinavians, the dwarfs occupy a conspicuous place. They are crafty, cunning elves, skilled in magic and in the working of metals. In Ethnology they are supposed to have been originally a race of oriental Lapps, who settled in Sweden and Norway after the Finns. In the mythology of the time they were looked upon as the connecting links between organic and inorganic nature. Giants were looked upon as the embodiment of the grander and more conspicuous forces of nature (*see* GIANTS), while dwarfs represented the subordinate, but still incomprehensible, natural powers. From the belief that dwarfs were more inclined to assist ordinary mortals than to further the ends of the giants, they began to be looked upon as beings well disposed towards man: they were supposed to appear at strange moments, instructing him how to change ores into metals; and it was also believed that they took charge of the development of seeds and fruits. From these ideas probably arose the widely-spread and still existing belief in fairies and other diminutive beings, supposed to be favourably disposed towards certain members of the human race. These old traditions, which belonged to western Europe, were broken through by the teaching and literature of the monks. All the strange legends and stories which had formerly been associated with dwarfs were transferred to the devil and his attendant spirits, and in some cases to the saints. Nevertheless, among the rural population of all the nations in the west of Europe there is a strong belief in the existence of the diminutive beings whom Shakspere has so deliciously portrayed in "Midsummer Night's Dream." In Great Britain there are still a large number of persons who have a belief in the "fairies" of England, the "brownies" of Scotland, and the "good people" of Ireland. Among the most remarkable dwarfs, properly so called, of modern times may be mentioned Sir Geoffrey Hudson, immortalized in Sir Walter Scott's "Peveril of the Peak." He was only eighteen inches in height at the age of thirty. After that age he rapidly grew to the height of three feet nine inches, and died at the age of sixty-three. His head and hands were enormous, but otherwise he was well proportioned. Another extraordinary dwarf was Count Joseph Borowlaski. At the age of twenty he was only two feet four inches in height, and at the age of thirty, three feet three inches. He was well proportioned, and married a woman of average size. He had several children of the ordinary size, and died at the extraordinary age, for a dwarf, of ninety-eight, in the county of Durham, in the year 1837. Nicholas Ferry, commonly known as Bébé, was another singular dwarf. His parents and relations were well-proportioned people; he himself was a seven months' child, and at his birth weighed less than a pound, and was not eight inches in length. He died at the age of twenty-three, not being more than three feet high. There is a wax model of him in the Museum of the Faculté de Médecine at Paris. At his death his bones were found to be completely ossified; and from the disappearance of the cranial sutures, his skull fully resembled that of an aged man. In the present day, one of the most remarkable dwarfs is Charles Stratton, usually known as General Tom Thumb. He was exhibited in this country about twelve years ago. At that time his height was twenty-five inches, and his weight twenty-five pounds. It is a singular fact in relation to dwarfs, that although the growth and physical development is arrested, in most cases the nervous system is fully developed.

DYEING, *di'-ing* (Sax. *deagan*, to dye), in Manuf.—Dyeing may be defined as the act of tinging or colouring absorbent materials by impregnating them with solutions of colouring matters. Colouring matters which effect this without the intervention of a third substance, or mordant, are called *substantive* colours, while those which require such aid are called *adjective*. The exact way in which dye-stuffs act upon fibrous materials has not yet been investigated as fully as it deserves; the generally received opinion is that the fibre has an affinity for the colouring matter in the case of substantive dyes, and for the mordant, which in its turn has an affinity for the colouring matter of adjective dyes. Another opinion is, that the fibres contain pores which absorb the dye, forming an insoluble lake in the case of mordanted dyes. However this may be, it is certain that different materials take dyes in different proportions. Thus silk and wool take the coal-tar dyes in the most perfect manner, but cotton requires the intervention of a powerful mineral or animal mordant. The operations that take place in dyeing are, mordanting, ageing, dunging, dyeing, and clearing. The principal mordants used are alumina, extensively employed for woollens and silks in the form of alum and cream of tartar, peroxide of iron, which is much used in the form of protacetate for logwood and madder. Peroxide of tin and several other metallic oxides are used for the same purpose; also albumen, caseine, and other animal substances in different forms. After the fabric has been mordanted, it is generally hung up in a room through which a current of steam and air is passing, by

mass of which the union between the fibre and the mordant is quickened very considerably. The cloth is then dunged, in order to remove the superfluous mordant not absorbed by the fibre. This was formerly effected by passing the fabric through a mixture of cow-dung and water; but this filthy operation has been superseded in a great measure by the introduction of what are termed *dung substitutes*. The principal dung substitutes in use at present are the arsenite, arseniate, and silicate of soda, phosphate of lime, and caustic soda. The action of these is chemical; whereas that of the cow-dung was supposed to be merely mechanical, by supplying the unabsorbed mordant with a fibrous material in a firm state of division. Dunging is one of the most important processes in dyeing, great care being taken to keep the dunging-liquor at a proper strength and temperature. The next process is the dyeing proper, which is effected by running the fabric through the solution of the dyestuff, the colour being modified, more or less, by the nature of the mordant used. It would be impossible in a short space to give an account of the different methods adopted of dyeing different colours; but a description of the means used to produce the more common colours will be interesting to the reader. Blacks are generally produced by logwood or galls, with an iron mordant. Common black silks are dyed with logwood and fustic, iron being used as a mordant. The best silks are dyed black on a blue ground. Woollen goods are first dyed blue with indigo, and afterwards with sumac, logwood, and green copperas or sulphate of copper. Cotton and linen goods are dyed black in a very similar manner. Chromate of potash is also sometimes used with logwood; but practical dyers say that it possesses no great advantages over blue or green copperas. Blues are produced from indigo, either in the form of sulphate or in aqueous solution. Prussian blue, with a persalt of iron or tin as a mordant, gives a very splendid dark blue; and, of late, several blues of novel shades have been produced from coal-tar. Reds are obtained by using cochineal, safflower, lac-dye, madder, or logwood, with a tin mordant. Fine crimson purples are obtained from coal-tar, and are known under the popular name of magenta. The most important yellow dyes are quercitron, fustic, turmeric, arnotto, and French or Persian berries. By combining these different colours, and by adapting the mordants, colours of every conceivable shade and hue are easily obtained. When the fabric has received the colour intended, it is washed in a solution of soap to which a little alkali has been added, after which it is boiled in water with or without the addition of solution of tin or other brightening substance. It is then said to be fast, which means that it will not be washed out. The chemistry of dyeing has of late years attracted the attention of our greatest chemists, and has reached such perfection that a loose colour is almost unknown. The matter has received the most minute investigation at the hands of such men as Hofmann, Stenhouse, Schunck, Rochleder, Persoz, and a host of others, who have not only benefited the art of dyeing by their researches, but have also discovered new facts leading to new theories of chemical philosophy. The last great discovery made in this direction is that of the coal-tar dyes, a discovery that will eventually make us the dye-producing nation of Europe.

DYE-STUFFS. (*See* COLOURING MATTERS.)

DYING DECLARATION. (*See* DECLARATION, DYING, and EVIDENCE.)

**DYKE**, *dike* (Du. *dyk*), an embankment of earth, sometimes revetted with masonry, or secured with a sloping front of stonework to prevent the water of the ocean or any river from overflowing the low lands that have been drained and brought into cultivation. The most remarkable works of this kind are in Holland, some of which have been thrown up along the banks of the Rhine, as well as other parts of the country, for the protection of the pasture-lands. These dykes are very broad at the base, and slope gradually towards the top, along which roads, and sometimes canals, are constructed, that serve to carry off the water from the meadows, which is lifted to the level of the canal by pumping. The dyke along the Helder is six miles in length. The French call these structures *levées*, and the low lands on either side of the Mississippi, near New Orleans, are protected from inundation by these embankments. The construction of dykes is an important part of the scheme for effecting the drainage of any tract of marsh land.

**DYKE**, in Geol., a term applied to any wall-like mass of igneous rock filling up a fissure in other rocks. A dyke may come up through any kind of previously-existing rock, whether igneous or aqueous. When the matter of the dyke is harder than the intersected strata, and these have been subjected to waste and denudation, the igneous wall-like mass may be traced for miles across a country; and on the other hand, where the rock-matter of the dyke has been softer, its course may also be traced by narrow wall-sided fissures and linear ditch-like depressions. A wonderful example of a trap-dyke is the one so well known in the north of England as the Cockfield Fell dyke, a nearly vertical wall of trap 18 or 20 yards thick, which runs in nearly a straight line from north-west to south-west for a distance of about seventy miles, cutting through all the rocks from the coal-measures into the lower oolites. Its igneous origin is proved by the baked appearance of the rocks in its neighbourhood. The coal in approaching the dyke begins to be affected at a distance of fifty yards; it first loses the calcareous spar which lines its joints and faces, and begins to look dull, grows tender and short, and also loses its quality for burning. As it comes nearer it assumes the appearance of a half-burnt cinder, and approaching still nearer it becomes converted into a real cinder. Immediately in contact with the dyke it forms a black substance, resembling compressed soot. The seam of coal is originally from six to eight feet thick; but in approaching the dyke it gets thinner and thinner, being ultimately reduced to nine inches.—*Ref.* Jukes's *Manual of Geology*.

**DYNAMICS**, *di-năm'-iks* (Gr. *dunamis*, power), that division of mathematics which treats of force, considered as producing motion in bodies. Force may be defined as any cause which changes, or tends to change, a body's state of rest or motion. The case of force tending to move bodies from rest will be found under the subject of STATICS. The case of force actually producing motion, or changing motion, belongs to Dynamics. Some of the most distinguished philosophers have given much time and labour to the investigation of this branch of mathematics. Among these may be mentioned Newton, Huygens, Euler, D'Alembert, Poinsot, and others. The doctrine of dynamics is divided into several distinct heads. First, the names and definitions of the various terms employed; such as force, velocity, accumulating velocity, moving velocity, motion, accumulating motion, &c. The second branch of dynamics treats of the movement of points, and is divided into two classes of problems,—direct and inverse. In the first case the path of a point is determined when the forces acting upon it are given; and in the second case the force or forces acting upon a point are determined when the path of the point is given. In the third branch of dynamics the motion of a rigid system of points or a solid body is treated of. D'Alembert first laid down the general method for treating problems in rigid dynamics. Motions of rotation are treated of in the fourth branch of dynamics. The three laws of motion upon which most of the problems in dynamics depend are as follows:—First, a body under the action of no external force will remain at rest, or move uniformly in a straight line. Second, when any number of forces act upon a body in motion, each produces its whole effect in altering the magnitude and direction of the body's velocity, as if it acted singly on the body at rest. Third, when pressure produces motion in a body, the momentum generated in a unit of time, supposing the pressure constant, or which would be generated supposing the pressure variable, is proportional to the pressure. (*See* CENTRAL FORCES, FORCE, PERCUSSION, PROJECTILES.)

**DYNAMOMETER**, *di-nam-om'-e-ter* (Gr. *dunamis*, power, and *metrein*, to measure), the name given to all instruments that are constructed for the purpose of measuring the power that can be exerted by the human frame, animals, or machinery, whether by a single effort of strength or by a continuous series of efforts exercised during any given time. In estimating the amount of work performed by any motive power by

means of a machine contrived for the purpose, we have to consider the force that has been applied and the space through which this force has been exerted. If a horse pull a hundredweight along a mile of level ground in half an hour, or half a hundredweight over two miles in the same time, he will have performed the same amount of work in both cases; but if he continue to perform the same task for an hour in either case, it is manifest that he will have done double the quantity. We see, then, that the amount of work done must be estimated by the force applied to accomplish it and the space of time for which the application of the force is kept up; in other words, it will be measured by the force exerted multiplied by the space of time through which it continues to act. To ascertain this with accuracy, dynamometers are required. The simplest kinds of these instruments are those used to determine the force which any man or animal can exert by a single effort. They vary considerably in form, as the force happens to be applied to the machine by tension or pressure, or by striking it with the clenched fist to determine the weight of the blow that a person can deliver. The amount of power exerted is indicated by a needle moving along an horizontal or circular scale. The best, perhaps, for ascertaining the strength of the human body, or that of an animal, is the dynamometer invented by Regnier, which consists of an elliptic spring of steel fitted with a hook at one end and handles and a graduated index at the other, with appliances to move the index needle to the proper extent when any force is applied to the machine. To test the strength of the body, the machine is fastened to the ground by the hook at the lower end, which is inserted in a socket imbedded in a strong beam. The person testing his power then plants his feet firmly against the beam, and, grasping the handles at the other end, pulls them with the utmost strength he can exert. This causes the sides of the spring to be brought more closely together than before, and the result of the force exerted to accomplish this is registered on the index. The strength of the arms is tested by squeezing the sides of the springs together by pressing on them with both hands. To measure the power of animals, the machine is fastened to a stout post or tree, and the animal is attached by a bar and traces to the handles or a ring passed through them. It is, however, manifest that the value of a continuous force cannot be measured by such machines as these, unless it were uniform. This, however, is far from being the case, as the force exerted by animals, and machines as well, is continually varying; but the work done during a long space of time can be accurately measured by machines contrived for the purpose; among which Morin's dynamometer seems to deserve especial notice. This contrivance measures the work done by machines by the bending of a spring, which is acted on by the motive power, and managed so as to register the influence that this exerts upon it by the action of pencils that describe lines on a strip of paper, from which the amount of work effected can easily be calculated. The construction, however, of this machine, and all of a similar nature, is too complicated to be thoroughly comprehended without a long and minute description, accompanied by elaborate diagrams. Ample information on the subject will be found in the *English Cyclopædia*—Arts and Sciences; Nichol's *Cyclopædia of the Physical Sciences*; Tomlinson's *Cyclopædia of Useful Arts*; and Ganot's *Physics*.

Dysentery, *dis'-en-ter-e* (Gr. *dusenteria*, from *dus*, with difficulty, and *enteron*, intestine), is a disease characterized by frequent mucous or bloody stools, attended with griping pains in the abdomen, straining, and tenesmus. It differs from diarrhœa in that while in the latter the stools are fæcal, in this there is a retention of the natural fæces, or they are expelled from time to time in small hard separate lumps, termed *scybalæ*. Dysentery consists essentially in inflammation of the mucous membrane of the large intestines, and, in the acute form or stage of the disease, is attended with fever. Dysentery is one of the pests of hot climates, and in all tropical countries, at certain seasons of the year, it is very prevalent and destructive. It is, however, among fleets and armies that this malady most displays its deadly power; so that it has been termed the "scourge of armies and the most fatal of all their diseases." At one time it was very prevalent





in this country; but now it is not a very common nor a very serious disorder here. The forms of this disease and the circumstances under which it prevails are infinitely various, and many speculations have been formed regarding it. It is now a primary, now a consecutive, and now a symptomatic disease. It has been ascribed to exposure to wet and cold, to the use of unwholesome food, to the agency of malaria, to contagion. Generally the most violent forms of this disease occur in warm climates and in situations where the body is exposed to extreme alternations of heat and cold; and hence there is every reason to believe that these influences are largely concerned in its production. It is doubtful, however, whether the use of unwholesome food or malarious poison would induce it as a primary disease; and the general opinion among medical men is that it is not contagious. Generally one of the earliest symptoms of dysentery is an uneasiness of the abdomen, soon amounting to pain of a griping character, particularly in the umbilical region, attended with an inclination to go to stool, and temporarily relieved by evacuation. As the disease becomes developed, the relief is but transient; the desire to go to stool is more frequent and importunate; the discharge is scanty, and what is voided is either altogether a jelly-like mucus, or, more commonly, it is mucous and bloody (the bloody flux of old authors), mixed with films and membranous shreds and fragments resembling flesh. The scanty evacuations now produce distress rather than ease, and the patient is tormented by a sensation that there is still something to come away, the expulsion of which would cure him, and is irresistibly impelled to strain violently to get rid of the irritation. In an advanced state the stools become greenish or black, and very fetid; the bladder frequently sympathizes with the rectum, and nausea and vomiting sometimes ensue. The patient passes sleepless or dreamy and disturbed nights, and is low-spirited and desponding. In fatal cases the pulse becomes very small and rapid, the features sharpen, the surface grows cold, and death at length sets in. The duration of this disease is very various. In some cases it may prove fatal in a few days, or even hours; in others it may last for weeks or months. Two stages are recognized of this disease,—the inflammatory and that of ulceration. In the inflammatory form, when the fever is high and the pain intense, blood-letting from the arm is generally recommended, and also the local abstraction of the blood by leeches or cupping. Dover's powder is also given as a sudorific, and profuse sweating encouraged. Purgatives are to be employed with great caution. If the colon be distended with feculent matter which it cannot discharge, then the mildest purgatives, such as castor oil, should be administered, and cautiously repeated until the whole of the irritating matter is removed. If, on the contrary, there is no accumulation of feculent matter, the use of purgatives is to be avoided. After the inflammatory state has been reduced by blood-letting, and the accumulated fæces ejected by purgatives, the great object is to soothe the irritated membrane by opiates, and to strengthen the system by gentle tonics and a light nourishing diet. If the disease is not cut short by this method, but has reached the second stage and become chronic, the most effectual remedies appear to be laxatives and opiates given alternately, and combined with such medicines as promote perspiration. The abdomen should be swathed in flannel, and much benefit may be obtained from the employment of clysters, if there be not too much tenesmus to admit of the introduction of the pipe. The food should be farinaceous and simple, and great care must be taken during convalescence to prevent a return to improper diet, and any fresh exposure to cold.—*Ref.* Watson's *Lectures on the Principles and Practice of Physic*.

Dyspepsia, *dis-pep'-se-ä* (Gr. *duspepsia*, from *dus*, bad, and *pepto*, I concoct or digest), in Pathol., is a bad or difficult digestion. It is by means of digestion that the food which is taken into the stomach is converted into nutritive matter for supplying the waste that is constantly going on in the system; hence anything that interferes with the due supply of nutritive matter materially affects the system, and may introduce a long series of ills. The complicated series of

operations by which digestion is carried on renders indigestion one of the most prevalent of the ills to which human flesh is subject,—it is the prevailing malady of civilized life. "We are," says Dr. Watson, "more often consulted about the disorders that belong to eating and drinking than, perhaps, about any others; and I know of no medical topic concerning which there is afloat, both within and beyond the profession, so much ignorant dogmatism and quackery." Referring to that article for an account of the various operation that are carried on in digestion, and a derangement of any of which would produce indigestion, we shall here chiefly confine our attention to that which is the most frequent cause of this disorder,—a faulty performance of the functions of the stomach. It is here, as is well known, that the principal change is effected in the food. Whenever food is taken into the stomach, there is in the natural state a secretion of gastric juice, which acts chemically upon it, and by which it is dissolved or converted into chyme. While this process is going on, it is facilitated by a sort of churning or revolving movement of the stomach, and at length it passes by degrees through the pylorie extremity of the stomach into the intestines. Dyspepsia, therefore, may be occasioned by a deficient supply of gastric juice, so that the food is not properly dissolved, or from a too torpid or too irritable condition of the muscular fibres of the stomach, in consequence of which the chyme is detained too long, or ejected too soon. A weak dyspeptic stomach acts very slowly, or not at all, on many kinds of food. They undergo spontaneous changes, promoted by the mere warmth and moisture of the stomach; gases are extricated, acids are formed, and, perhaps, the half-digested mass is at length expelled by vomiting, or it passes undissolved into the duodenum, and becomes a source of irritation and disturbance during the whole of its passage through the intestines. One of the most frequent signs of indigestion is a loss of appetite, no desire for food, or, perhaps, even an absolute repugnance and disgust at the very thought of eating. Sometimes the appetite is capricious and uncertain, or may even be morbidly craving and ravenous. Sometimes nausea comes on immediately after the food is swallowed; and sometimes without any nausea, but after the lapse of some time, the food is ejected by vomiting. There is, also, usually an obscure feeling of uneasiness, fulness, distension, and weight in the region of the stomach, occasionally amounting to pain, or even severe pain, with flatulence and eructation. Some persons suffer pain when the stomach is empty, others immediately after taking food, or the pain may not begin for two or three hours after a meal, and then continue for some hours. Sometimes the pain comes on at uncertain intervals in the most violent paroxysms, accompanied by a sensation of distension, much anxiety, and extreme restlessness. Costiveness is a very frequent concomitant of dyspepsia, but sometimes it is attended with diarrhœa. Among the innumerable disorders in more distant parts that are produced by dyspepsia are palpitations of the heart, irregularities of the pulse, asthma, pain in the head, with the loss of mental energy, and some confusion of thought. One of the worst of the occasional concomitants of dyspepsia is that state of mind which is known as hypochondriasis. There is languor, listlessness, or want of resolution, with an apprehension of some great evil in the future. Such persons are particularly attentive to the state of their own health, and, from any unusual feeling, perhaps of the slightest kind, they apprehend great danger, or even death itself. Of the causes that induce dyspepsia, are indigestion, noxious or irritating substances taken into the stomach as food or drink,—such as tainted meat, decayed vegetables, unripe fruit, very acid matters, alcoholic liquors, &c.; and even wholesome food taken too frequently, or in too large a quantity, especially when its nature is very nutritious or in a very concentrated form, or rendered too stimulating by being highly seasoned. The abuse of fermented and spirituous liquors is one of the most frequent causes of dyspepsia; and the consumption of large quantities of fluids, particularly during meals, is very injurious. Among the more remote causes of dyspepsia, or those which affect the stomach through other organs, are want of exercise or of pure air, intense study, or too close application to business, strong mental emotion, or exposure to a cold or moist atmosphere. In the treatment of dyspepsia it is to be borne in mind that it is not so much medicines that will remove the present discomfort that are required, as a discontinuance of those habits which have generated the discomfort. Hence one great and indispensable principle in the treatment of dyspepsia is that of restricting the quantity of food taken at any one time. The amount of food introduced into the stomach should be kept within the limits of its capacities and powers. Another very important principle is, that the stomach should have time to perform one task before another is imposed upon it. Mr. Abernethy always advised his patients to interpose at least six hours between one meal and another. From three to five hours ought to be allowed for the digestion of a meal, and one hour more for the stomach to rest in. As different articles of food are soluble in the stomach with various degrees of readiness, it is of importance to select those articles that are soluble with least difficulty, as well as to avoid mixing together in the stomach various substances which are of different degrees of solubility; hence it is salutary to dine off one dish. Animal food is much easier of digestion in the human stomach than vegetable, and a much less quantity of it is needed for nutriment, while it is not so likely to generate acidity. This, with a moderate portion of thoroughly-cooked vegetables, is, perhaps, the diet best suited for a feeble stomach. As regards the use of spirituous or fermented liquors, in the opinion of Dr. Watson—though some allowance must, no doubt, be made for custom—most dyspeptic persons would be better without any of these drinks. Finally, change of air, change of scene, change of society, usually exert a very beneficial effect in this disorder. "Get the patient to travel in search of health, and the chances are in favour of his finding it."— Ref. *Lectures on the Principles and Practice of Physic*, by Dr. Thomas Watson.

DYSPNŒA, *disp-ne'-a* (Gr. *dus*, with difficulty, and *pneo*, I breathe), in Path., is an embarrassed or laborious breathing. It is owing to a disturbance of the natural and healthy relation that ought to subsist between the quantities of blood and air in the lungs. When the quantity of atmospheric air that reaches the lungs is by any means diminished, or when there is more venous blood sent to the lungs than can be arterialized under the ordinary modes of inspiration, then instinctive efforts are made to increase the quantity of air by increasing the number of acts of inspiration. Hence dyspnœa may arise from a number of causes; as croup or laryngitis, diminishing the only inlet for the air; pressure upon the lung, or any other means by which its size is diminished, or it is rendered less spongy; or by increased action of the heart. The physician has thus to decide, in such a case, whether the heart or the lungs be at fault, or both, or neither, and to prescribe accordingly.

## E.

E is the fifth letter and second vowel of the English language, and it has a greater variety of sounds in English than in any other tongue. It is formed by a narrower opening of the glottis than the letter *a*, but the other parts of the mouth are used in nearly the same manner. It has a long and a short sound in most languages, and among the Greeks there were different letters for expressing the long and short *e* (the *epsilon*,—*ĕ*, and the *eta*,—*ē*). E has a long sound in *here*, *me*, and is short in *met*, *men*. It has also the sound of *a* open or long, as in *there*, *prey*. It is very obscure in *heaven*, *oxen*, *bounden*. As a final letter it is generally silent, but serves to lengthen the sound of the preceding vowel, or, at least, to indicate that the preceding vowel is long. After *c* and *g* the final *e* serves to indicate that the *c* is to be pronounced like *s* and the *g* like *j*. In French, *e* is pronounced in three different ways,—the *è ouvert*, *é fermé*, and *e muet*. In German it is long, like the English *a* in *fate*, in *reden*, *predigen*; short like *e* in *met*, in *recht*, *rennen*; and very short, or almost silent, in *hoffen*, *haben*. Among the ancients, E, as a numeral, represented 5 and also 250. In the calendar E is the fifth of the dominical letters; and in sea

charts it distinguishes all the easterly points. (*See* ABBREVIATIONS.) In Mus., E is the third note or degree of the diatonic scale, answering to the *mi* of the Italians and French.

EAGLE, *ē'-gl* (Fr. *aigle*, Lat. *aquila*), a gen. of birds of prey, constituting the largest of the *Falconidæ*. In these birds the bill is of moderate length, with the ridge of the upper mandible straight from the base, at least as far as the end of the cere, beyond which it is decurved; the lip is strongly hooked and acute, but is destitute of the strong tooth characteristic of the true falcons; and the lateral margins are more or less festooned. The wings are long and usually pointed, with the third, fourth, and fifth quills longest; and the tail is long, broad, and rounded. The tarsi are rather long, but vary greatly in their clothing, being sometimes covered with scales of various forms, and sometimes completely clothed with feathers. The toes are long and powerful, the inner one being usually stronger than the outer: they are all armed with long, strong, and greatly acute claws. The finest of the British species, and perhaps the finest of the group, is the well-known golden eagle (*Aquila chrysaëtos*). It is a solitary bird, building its nest on ledges of rock in the wildest part of the country, and far from the habitations of man. It is very common in Sweden, in Scotland, in the Tyrol, Franconia, and Sunbia; more rare in Italy and Switzerland; rather common in France, in the mountains of Auvergne, and in the Pyrenees; rare in Holland; and less common in the Oriental countries. The general colour of the plumage is deep brown, mixed with tawny on the head and neck, the feathers on the back being finely shaded with a darker hue. The wings, when closed, reach to the end of the tail; the quill-feathers are chocolate-coloured, with white shafts; the tail brown; feet yellow. It measures in length about three feet, with an expansion of wing of at least seven feet, and weighs about fourteen pounds. Its strength is prodigious. It has been seen to carry up to its lofty nest lambs of several weeks old, and even young fawns. It, however, now and then comes to harm through creatures very much smaller than those mentioned. Bishop Stanley relates that a gamekeeper out on the moors observed an eagle rise from the ground with something it had seized as its prey. For a time it sailed away steadily, but suddenly it became agitated, and, after fluttering irregularly for a short time, spired upwards in a straight line to a vast height, and then, ceasing to flap its wings, fell headlong to the ground. Struck with so unaccountable an occurrence, the keeper made what haste he could to the spot, and there found the eagle quite dead, with a wounded stoat by its side. It appeared that the eagle had seized the stoat in its search for prey, and the latter had contrived, while in the air, to open a vein or artery in the eagle's body, and to keep firm hold of the wound it had inflicted. Another case is recorded where the eagle fell suddenly and unaccountably from a great height, and, on being approached, a weasel peered out from under the great bird's wing, and scuttled off. The ring-tailed eagle is the one and two-year-old young of the golden eagle. Besides the golden eagle, there is another British species of this family, which feeds on fish, and, for this reason, is always met in the neighbourhood of water. This is the white-tailed sea-eagle (*Haliaëtus albicilla*). It is rather larger than the golden eagle, but exhibits a smaller extent of wing. Despite this bird's large size and strength, it rarely ventures to attack any animal larger than a hare; indeed, it seems to prefer its prey ready killed, and subsists for the greater part on stranded fish and the carrion carcases of such animals as it may find. This bird builds upon ledges of rocks that overhang the sea: the nest is composed of sticks, seaweed, and similar coarse material. The American or white-headed sea-eagle (*Haliaëtus leucocephalus*) is found in every part of the United States of America, preferring the low lands near the sea-shore to mountainous districts. It is this bird that America takes as its symbol. It is about the size of the golden eagle, but of a lighter colour, and the legs are only feathered a little way below the knees. The bill is large, acutely hooked, and of a bluish colour. A row of strong bristly feathers hangs from its lower mandible, and from this it takes its occasional name of Bearded eagle. Its chief prey is fish, and he commonly secures it as it swims near the surface of the water. It would seem, however, to derive not a little of its ailment by a stratagem much more ingenious than honest. The osprey, or hawk-fish, generally abides in the white-headed eagle's neighbourhood, and occasionally the latter, instead of fishing for himself, lurks near the osprey. This bird, sailing gently over the water, watches till a fish appears in sight, and then, to use Wilson's words, "like a perpendicular torrent, it plunges into the sea with a loud, rushing sound and with the certainty of a rifle. At this moment, the eager looks of the eagle are all ardour, and, levelling his neck for flight, he sees the fish-hawk once more emerging, struggling with its prey, and mounting in the air with screams of exultation. These are a signal for our hero, who, launching into the air, instantly gives chase; soon gains on the fish-hawk; each exerts his utmost to mount above the other. The unencumbered eagle rapidly advances, and is just on the point of reaching his opponent, when, with a sudden scream, the latter drops his fish; the eagle, poising himself for a moment, as if to take more certain aim, descends like a whirlwind, snatches it in his grasp before it reaches the water, and bears it silently away to the wood." Besides those enumerated, there are the crowned eagle (*Aquila coronata*) found in Africa; the supern eagle (*Falco superbus*) of Guinea; the cheela eagle (*Falco Cheela*) of India; the royal eagle (*Aquila imperialis*) of South America; the royal eagle (*Aquila regalis*) of Africa; the vulturine eagle (*Aquila vulturina*) of Caffraria.

EAGLE, in Her., the emblem of dominion, as well as of courage and magnanimity. It is generally borne with extended wings and legs, or "displayed," as it is technically termed. The eagle is assumed by Russia, Prussia, Austria, Poland, and America, as their national emblem, as the lion is the emblem of Great Britain. The eagle of Austria is represented with two heads. It was used by the Romans, Persians, and Egyptians as a symbol or badge of empire.

EAGLE, in Mil.—The standards of the legions of the Romans were generally surmounted by the figure of an eagle perched on a small cross-bar at the top of the staff of the banner, with its wings raised. It was about the size of a pigeon or sparrow-hawk, and sometimes carried thunderbolts in its claws. This custom has been adopted in the French army, and all the French military flags are surmounted with a small eagle made of the new metal aluminium, and gilt.

EAGLE, a gold coin of the value of ten dollars, current in the States of North America. (*See* DOLLAR.)

EAGLE, ORDER OF THE BLACK, an order of knights in Prussia, founded by the elector of Brandenburg on the day of his coronation as king of Prussia, Jan. 17, 1701. In addition to the princes of the royal family, the number of the knights was originally thirty, but it is now unlimited. A chapter is held twice in the year, and the candidates for nomination must be thirty years of age, and able to prove their noble descent through four generations by both parents. The Black Eagle is the highest order of knighthood in Prussia, and, with the exception of foreign princes and knights of the order of St. John, no member of it is allowed to wear any other order along with it. It is generally worn by those who are in attendance upon the king; consequently, no one who holds it is permitted to travel more than twenty German miles from the court without giving due notice. Knights of the Black Eagle are also knights of the Red Eagle. The insignia belonging to the order of the Black Eagle consist of an octagonal cross of blue enamel, with a black eagle between each of the arms of the cross. The cross is suspended across the left shoulder by a broad orange-coloured ribbon. On the left breast an embroidered silver star is worn. In the centre of the star is displayed a black flying eagle, bearing a thunderbolt in one claw and a laurel wreath in the other. The legend round the eagle is "Suum quique." Every new member of the order pays fifty ducats towards the support of the orphan asylum at Königsberg, after which he receives the robes and insignia of the order.

EAGLE, ORDER OF THE RED, an order of knights in Prussia, founded by the margraf George Frederick Charles, in 1731, as a reorganization of the *ordre de*

*la Sincérité* instituted by the hereditary prince of Anspach and Baireuth early in the century. Frederick William II. raised the order of the Red Eagle in 1791 to the rank of the second order in the monarchy. The decoration consisted of a white Maltese cross, surmounted by a royal crown, with the Brandenburg eagle in the corner. In 1810 it was reorganized, two additional classes being included in it. The second of these classes was, in 1830, subdivided into two, only one of which wore the cross.

EAGLE-HAWK (*Morphnus*, or *Spizaëtus*), a gen. of *Falconidæ* of the Eagle group, but consisting of species of comparatively small size, and characterized by short wings, long slender legs (tarsi), and comparatively feeble toes and claws. They are natives of warm climates, chiefly of South America, but also of Africa and the East Indies.

EAGLE-OWL (*Bubo*), a gen. of the Owl fam., found in almost all parts of America. (*See* OWL.)

EAGLE-STONE, in Min., a variety of argillaceous iron ore, having a concentric structure and occasionally so decomposed as to contain a loose kernel that rattles when shaken. The ancients imagined that this stone was the egg of the eagle, the internal nodule being the embryo eaglet. (*See* also GEODE.)

EAR, *ear* (Ang.-Sax.), in Anat. and Physiol., is the organ of hearing, and consists of three parts,—the external ear, the middle ear or tympanum, and the internal ear, or labyrinth. The external ear consists of an expanded trumpet-shaped cartilaginous structure, called the pinna or auricle, which collects the sounds, and a tube which conveys these sounds to the internal ear. The pinna or auricle consists of an uneven piece of yellow cartilage, covered with integument, and fixed to the margin of the meatus auditorius externus. It is of an oval form, with the margin folded and the larger end placed upwards. The round rim-like margin is called the helix, the depression immediately within which being the groove or fossa of the helix. Within the latter is a large elevation, called the antihelix, which presents at the upper part a well-marked depression,—the fossa of the antihelix. In the centre of the pinna is a deep hollow, named the concha, which conducts to the opening of the meatus auditorius. In front of that hollow is a projection of a triangular shape, called the tragus; and on the opposite side of the hollow, rather below the level of the tragus, is another projection,—the antitragus. Inferiorly the pinna is terminated by a soft pendulous part, called the lobule. The auditory canal, meatus auditorius externus, or the tube by which sound is conveyed from the pinna to the internal ear or tympanum, is about an inch and a quarter in length, and is formed partly by bone and partly by cartilage and membrane. Its direction is obliquely forwards and inwards, and is somewhat bent downwards towards the middle, so that it is rather higher there than at either extremity. In shape it is rather flattened from before, backwards, and it is narrowest at the bent part. The cartilaginous portion is about half an inch in length, and is formed by the cartilage of the concha and tragus being projected inwards to the circumference of the auditory passage, to which it is firmly attached. At the upper and back part of the tube the cartilage is deficient, and its place is supplied by fibrous membrane. The osseous portion is about three-quarters of an inch in length, and is narrower than the cartilaginous part. Its outer extremity is dilated and rough in the greater part of its circumference, for the attachment of the cartilage of the pinna. The inner end is less dilated than the outer, and is sloped, so that the anterior wall juts out beyond the posterior by about two lines: it is marked, excepting at its upper part, by a narrow groove, for the insertion of the membrana tympani. The skin lining the auditory canal is very thin, and closely adherent to the cartilaginous and osseous portions of the tube. It is continued over the membrane of the tympanum in the form of a thin pellicle, forming its outer covering. Around the entrance of the meatus are some fine hairs; and there are also ceruminous glands, which secrete the ear-wax, and open on the surface by separate orifices. The middle ear or tympanum is an irregular cavity situated within the petrous bone, and interposed between the meatus auditorius and the labyrinth or inner ear. It is filled with air, and communicates with the





pharynx by the Eustachian tube. It is traversed by a chain of small movable bones, which connect the membrana tympani with the labyrinth, and serve to convey the vibrations communicated to the membrana tympani across the cavity of the tympanum to the internal ear. The cavity of the tympanum measures about five lines from before backwards, three lines in a vertical direction, and between two and three in the transverse, being a little broader behind and above than below and in front. The outer boundary of the cavity is formed by the membrana tympani, and by a small portion of the surrounding bone. This membrane is a thin semi-transparent substance, nearly oval in form, separating the cavity of the tympanum from the bottom of the auditory canal. It is directed very obliquely towards the auditory canal, its external surface being concave, its internal convex. It is composed of three layers,—an external, middle, and internal. The outer one, as already stated, is part of the integument lining the meatus. The middle layer is fibrous, being formed of fibrous and elastic tissues, and fixed in the groove of the meatus. Some of the fibres radiate from near the centre to the circumference; others are arranged in the form of a dense circular ring towards the margin of the membrane. The internal layer is mucous, being part of the mucous lining of the tympanum. The Eustachian tube is the channel through which air is conveyed from the pharynx to the tympanum. It is about an inch and a half in length, and is directed downwards and inwards to the pharynx. Like the meatus auditorius, it is partly osseous and partly cartilaginous in texture. The small bones or ossicles of the tympanum are three in number,—the malleus, incus, and stapes. The malleus—so named from its fancied resemblance to a hammer—consists of a head, neck, handle, and two processes, a long and a short. The incus—so called from its resemblance to an anvil, but which may rather be said to resemble a bicuspid tooth, with one of the roots longer than the other, and bent to one side—consists of a body and two processes. The stapes is so called from its close resemblance to a stirrup, and consists of a head, neck, two branches, and a base. These small bones are connected together and with the tympanum by ligaments and moved by small muscles. The handle of the malleus is attached externally to the membrana tympani. The head of the malleus articulates with the body of the incus. The shorter process of the incus is received into an aperture of what are termed the mastoid cells; the long process curving downwards and ending in a rounded convex point, where it articulates with the head of the stapes. This last has an horizontal position, with the crura or branches directed forwards and backwards, and its base is fixed over the fenestra ovalis of the internal wall of the tympanum. This is a reniform opening leading from the tympanum into the vestibule, the opening in the recent state being closed by the lining membrane, which is common to both cavities. The inner and fundamental portion of the organ of hearing is called, from its complexity, the labyrinth, and consists of three parts,—the vestibule, the semicircular canals, and the cochlea. It consists of a series of cavities channelled out of the substance of the petrous bone, communicating externally with the cavity of the tympanum and internally with the meatus auditorius internus, which contains the auditory nerve. Within the osseous labyrinth is contained the membranous labyrinth, upon which the ramifications of the auditory nerve are distributed. The vestibule is the common central cavity of the osseous labyrinth, and is placed behind the cochlea but in front of the semicircular canals. It is somewhat oval in form from before backwards, and measures about one-fifth of an inch in different directions, but is narrowest from without inwards. In its anterior wall is a large oval opening leading to the cochlea, and in its posterior and superior walls are five openings, by which it communicates with the semicircular canals. These are three bony canals situated above and behind the vestibule. They are of unequal length, and measure about one-twentieth of an inch in diameter; but the ends of each are dilated just before opening into the vestibule, the one end in each being more dilated than the other, and called the ampulla. They describe the greater part of a circle, and all open at both ends into the vestibule,

the ends of two of them, however, coalescing. From a difference in the direction taken by these canals they have been named the superior and posterior vertical and the horizontal. The cochlea, so called from its resemblance to a snail's shell, is conical in form and placed almost horizontally in front of the vestibule. Its length is about a quarter of an inch, and its width at the base about the same. It consists of an axis or centre; of a canal winding spirally round it for two turns and a half from the base to the apex; and of a delicate lamina contained within the canal, which follows its windings and subdivides it into two passages. When measured along the outer side, the canal is about an inch and a half long, and its diameter at the beginning about one-tenth of an inch, but gradually diminishing to half that size towards the other end. The whole inner surface of the labyrinth, including the semicircular canals and the passages of the cochlea, is lined with a thin fibrous membrane, the outer surface of which adheres closely to the bone, while the inner is covered with a single layer of epithelium, like that on serous membranes, and secretes a thin serous fluid, called the liquor cotunnii or perilymph. This fluid fills the passages of the cochlea, and surrounds the membranous labyrinth. This last is a membranous structure inclosed within the osseous labyrinth, and separated from its lining membrane by the perilymph. It is confined to the vestibule and semicircular canals, having the general form of the surrounding bony parts, and is composed of a closed sac with rather a complex form, containing a fluid called the endolymph. That part of the membranous labyrinth contained in the vestibule consists of two rounded portions, which, though closely connected together, appear to be distinct sacs, the larger of the two, the utricle or common sinus, being situated at the posterior and upper part of the vestibule: the other, the saccule, is smaller and rounder, and is situated in the lower and fore part of the vestibule. Small calcareous masses or otoliths, consisting of minute rounded and elongated grains of carbonate of lime, are situate in the inner part of the wall of the utricle and saccule. The auditory nerve, which is distributed over the different parts of the labyrinth, enters by the meatus auditorius internus, and divides into two branches; viz., an anterior for the cochlea and a posterior for the membranous labyrinth. The cochlear branch divides at the base of the modiolus or axis into numerous twigs that enter the apertures in that body, whence they are directed outwards. The vestibular branch divides into three branches, which proceed to the membranous labyrinth, and ramify themselves on the walls of the sacs, some of the fine filaments passing through the otolith, others outside of it. The sense of hearing is, strictly speaking, only a refinement of the sense of touch. The impressions with which it is conversant arise wholly from peculiar undulations of the particles of ordinary matter, propagated in obedience to its ordinary laws through the medium in which the animal lives, and impinging more or less immediately upon a sensitive part. The trumpet-like pinna or auricle of the external ear serves to collect the sound, which is then conveyed, by means of the meatus auditorius externus, to the membrana tympani. This is thrown into vibration, which is communicated to the malleus, and is carried by the incus and stapes to the membrane of the fenestra ovalis. From this last the motion is communicated to the various parts of the membranous labyrinth, taken up by the fine filaments of the auditory nerve, and conveyed to the brain. The use of the small calcareous masses in the sacs is to strengthen the sonorous undulations, and to communicate to the nerves stronger impulses than the lymph alone could impart. The range of hearing, like that of sight, differs very much in different individuals. (*See* Deafness.)

**Ear-ring**, *eer'-ring*, an ornament worn in the ears, which require to be bored, in order that it may be attached. From passages in Jeremiah, it appears that they were much worn by the Hebrew women in his time; and decorating the person with ear-rings has always been a favourite custom among all Eastern nations. Among many nations they were worn both by men and women; but it has been an especial female ornament in nearly all ages and in all countries. Homer speaks of Juno as being adorned with ear-rings; and the statue of the Venus de Medici has the ears pierced for rings. Amongst the Greeks and Romans ear-rings were much worn; and during the decline of the Roman empire the most costly and brilliant jewellery was worn in the ears of the Roman ladies. Pearls were the principal jewels employed; but diamonds, rubies, and sapphires of great value, were also worn. Amongst the Egyptians ear-rings were much worn, many beautiful specimens of which are to be seen in the British Museum. In England, during the reigns of Queen Elizabeth and James I., ear-rings were worn by men as well as women. At the present day, in England, women alone wear ear-rings; many sailors, however, wear small round rings in their ears. When the ears are bored, a slight inflammation generally occurs, which acts as a counter-irritant in the case of sore eyes. This is often adduced as a reason for putting rings in the ears. Young girls usually have their ears bored for ear-rings when about seven years of age.

Ear-shell (*Haliotis*), a gen. of univalve mollusca, the shell of which somewhat resembles in shape the human ear. The head of the animal is large, having two long round tentacles, with eyes at the base on footstalks. Foot very large, having the margin fringed all round. It is always found near the surface of the water. Found in the East Indies.

Ear-trumpet, an instrument applied to the ear in cases of partial deafness arising from injury to the membrane of the drum of the ear, want of proper susceptibility in the auditory nerve, and other causes. It is made of metal,—silver or gong-metal being considered the best, and it is curved in form, one end being small enough to enter the ear, and the other bell-shaped, and expanding outwards like the mouth of a trumpet; whence it derives its name. It is curved, in order to collect the rays of sound, and oblige them to converge by reflexion on the membrane of the drum of the ear, like rays of light collected in a focus by means of a lens. The collection of the rays of sound causes them to act on the drum of the ear with greater power. There are many different kinds of ear-trumpets, differing from each other in construction, but being all made on the same principle,—to collect and concentrate the rays of sound. Some are very small, such as the auricle and ear-cornet, and can be worn in the ear or attached to the head by elastic springs; others are made of india-rubber, in the form of long tubes, with a bell-shaped opening at one end like the metal instruments. There are also artificial *membranæ tympani*, or membranes of the drum of the ear, made of vulcanized india-rubber, which are introduced into the orifice at the end of a piece of silver wire, and are found extremely useful in cases where deafness arises from perforation of the natural membrane.

Earwig, *eer-wig* (Sax. *ear* and *wicga*, a worm or grub).—These insects constitute the order *Dermaptera* of Leach, and which Westwood, who also regards them as forming a distinct order, has denominated *Euplexoptera*. The latter name refers to one of the most striking characters of the earwig; viz., the structure of the hinder wings, which are exceedingly beautiful. "In these the radiating nervures, instead of finding their common centre at the base of the wing, as is the case in most *Orthoptera*, spring from the extremity of a broad leathery piece, which occupies about a third of the anterior margin. Other radiating nervures occupy the space between the principal nervures, but only run from the posterior margin to the middle of the wing; and the whole are united by a transverse nerve, which runs parallel to the posterior margin. By the assistance of these nervures, the wing, which is of very delicate texture, folds up exactly the shape of a closed fan; but as the wing-cases of the earwig are very short, the wings can only be got under them by a very complicated transverse folding in two places; namely, at the apex of the leathery basal piece and at a second point about the middle of the wing, where the nervures appear to be thickened. Even the apex of the firmer part of the wing projects beyond the elytra."—(*Dallas.*) Earwigs are distinguished from the orthopterous insects (excepting the *Blattæ* and *Mantis* tribes, which with the *Forficula*, constitute Latreille's fam. of *Cursoria*) by

having the posterior legs formed for running. The female has no corneous ovipositor; and a remarkable fact connected with the insect is, that she sits upon her eggs in the manner of the hen, and the young, as soon as hatched, creep under the belly of the mother for protection at the approach of danger. In both sexes the abdomen is furnished with a pair of forceps, apparently of use as an instrument of defence. The antennæ are slender, filiform, and inserted before the eyes, and vary considerably as to the number of their joints. The thorax is generally of a rounded form, and but slightly convex. Ridiculous as is the fancy, there is no doubt that the insect's name, earwig, is furnished by the delusion that it will creep into the ears of sleeping persons. In all European countries the insect's appellation is significant of the belief. Newman, however, in his Introduction to the "History of Insects," says, "The shape of these wings (the hind ones), when fully opened, is nearly that of the human ear; and from this circumstance it seems highly probable that the original name of this insect was *ear-wing*." Earwigs appear to prefer damp situations, and are found under stones and under the bark of trees in great abundance. They subsist chiefly on the leaves and flowers of plants, and on fruits. There is in this country another species of earwig almost equally common with the above, but of a much smaller size. This latter is found about hotbeds and dunghills, and belongs to the genus *Labia*.

Earl, *erl* (Sax. *earl*, Dan. *jarl*), an honorary title of distinction given to noblemen, who take rank between marquises and viscounts. The term originated with the nations of the north of Europe, who applied the title of "jarl" (pronounced *yarl*) to chieftains of the highest rank, who were appointed by the sovereign to govern large tracts of land, having the powers of a viceroy in the administration of justice, but being also under the obligation of furnishing, equipping, and maintaining a certain number of men as a contingent to the national force, and of acting as their leader when the necessities of war compelled the king to call them out for actual service. The dignity was, in fact, equivalent among the Teutonic nations to that of the Roman *comes*, or count; and the appellation was the highest title of honour that the monarch could confer. It was introduced into England by the founders of the Saxon heptarchy, and then applied to the nobles generally, in contradistinction to the *ceorls*, who were free men, forming the large middle class of the Anglo-Saxon nation. The earls, who presided over the courts of justice and public meetings of the district or shire intrusted to their management, were further distinguished by the title of *ealdorman;* but this appellation ultimately fell into disuse, and at the time of the Conquest the Saxon governors of shires, whose rank was equivalent to that of the present lord-lieutenants of counties, were all styled earls. Among the most noted and most powerful of the Anglo-Saxon earls was Earl Godwin, whose son Harold succeeded Edward the Confessor on the English throne. Under William the Conqueror earldoms were held by tenure, and the earl was possessed of local jurisdiction and power, and was entitled to claim a certain portion of the local revenues: some of them, such as the earls of Chester, even held parliaments, created barons, and had their officers of state like the king himself. It remained the highest title of rank in England until the latter part of the 14th century, when the dignities of duke and marquis were introduced, the holders of which took precedence over earls. The title, which is now granted by letters patent, was formerly conferred by the king in person, who invested the earl, at his creation, with his mantle, putting on his coronet and girding on his sword with his own hands.

Earl-Marshal of England, the title of one of the great officers of state, who is at the head of the Heralds' College, and has the power of granting armorial bearings, with jurisdiction in matters relating to pedigrees and claims to coats of arms, through the kings-at-arms, Garter, Clarenceiux, and Norroy, who act as his deputies. The office is now hereditary, and attached to the dukedom of Norfolk by a grant made by Charles II. in 1672 to Henry Lord Howard. This officer was styled mareschal, or lord-marshal, only, until the reign of Richard II., who created Thomas Mowbray, earl of Nottingham, earl-marshal of England by letters patent. The earl-marshals acted as presidents of the Court of Chivalry, which fell into abeyance about 1630 or 1640.

Early English, *er'-le* (Ang.-Sax).—This style of Gothic architecture, known also as the First Pointed style, or Plantagenet, according to the arrangement of Garbett and Fergusson, corresponds with the *Ogival Primitif* of French Gothic architecture, and may be considered to have prevailed in England from 1189 to 1307, or during the reigns of Richard I., John, Henry III., and Edward I., and to have reached its fullest development about the middle of the 13th century. Some writers have proposed to distinguish the architecture of the first part of this period as Lancet, and that of the latter part as Geometrical; but it will be sufficient for general purposes to consider it as the characteristic style of the 13th century. In this style the strength and solidity of Anglo-Norman architecture was retained, but it was softened and subdued by the introduction of more graceful forms and a greater degree of enrichment. The heavy massive Anglo-Norman columns were replaced by lighter and more elegant shafts, having the appearance of a series of small columns clustered together round a central mass, and the semicircular arched head to the doors and windows was replaced by one of a pointed or lancet-shaped form. Sometimes two or three of these pointed lights were grouped together, separated only by narrow piers. When three were thus brought together, the centre light was considerably higher than those on either side, and in any case a continuous moulding surmounted the whole of the arches. In the latter part of this period two or more lancet-pointed windows were often surmounted by an arch of the same form, pierced with a cusped circle, or with trefoils and quatrefoils, and thus led to the elaborate tracery that marks the windows of the Decorated period. The doors were deeply recessed, and the sides of the splays were adorned with deeply-cut mouldings; they were also surmounted with a dripstone or moulding projecting from the wall, and springing from carved heads or corbels. The buttresses were narrow, but projected to a great distance from the walls; they were also divided into two or three stages, each projecting less than the one immediately below it. Flying buttresses were also introduced, and string-courses were commonly used, and sometimes appear in continuation of the moulding that surrounds the arch or arched points of the window, taking a parallel direction from the point from which the arch springs. The walls were ornamented with diaper-work, the surface being carved or painted, with a small regular pattern, generally of trefoils or quatrefoils. The capital of columns were bell-shaped, swelling outwards from the shaft, with an horizontal section similar to that of the shaft itself, and sometimes they were carved with foliage boldly rendered. The roofs were steep, and for the most part open; some, however, were vaulted and groined. Salisbury cathedral is considered the best example of this style of architecture, as it belongs wholly to the Early English period, and no other style is consequently found in combination with it. Parts of Westminster Abbey, Lincoln, Wells, and Hereford cathedrals, and York Minster, are also built in this style.

Earnest, *er'-nest* (Sax. *earnest* or *geornest*, Lat. *arrhæ;* whence, in Scotland, it is called *arles*), is something given in order to bind a bargain,—usually a small sum of money. It is also applied to any simple ceremony for the same purpose. Anciently, among all the northern nations, shaking of hands was held necessary to bind a bargain, a custom, says Blackstone, which we still retain in many verbal contracts. A sale thus made was called *hand-sale;* and in process of time the same word was used to signify the price or earnest which was given immediately after the shaking of hands, or instead thereof. By the civil law, he who recedes from his bargain loses his earnest; and if the person who received the earnest resiles, he must return the earnest double. By the law of England, however, if any part of the price be paid down and accepted, or any portion of the goods delivered and received by way of earnest, each person is obliged, in strictness, to abide by his bargain; and in case he decline it, he is not discharged upon forfeiting his earnest, but may be sued for the whole amount.

EARTH, *erth* (Sax. *eorth*, Ger. *erde*), the name given to the globe on which we live, which constitutes one of the larger, or primary, planets of our solar system, revolving round the sun as a centre. The Earth is the fourth planet from the Sun in order of distance (*see* PLANETS), including the planet Vulcan, discovered in 1859 between the Sun and Mercury. Its mean distance from the Sun is 95,000,000 miles, and it performs an annual revolution round that body in 365 days, 6 hours, 9 minutes, 6·9 seconds. The form of the earth, speaking in general terms, is globular, or spherical; and the simplest proof that can be adduced in support of this fact is that the extent of land or water over which we can look is much greater when we are on the top of a mountain or lofty tower, or at the mast-head of a vessel, than when we are on deck, or on the ordinary level of the ground; and that the tops of the masts of a vessel at sea always come into sight before the hull, which would not be the case if the hull of the distant vessel were not hidden from us by the convexity of the surface of the water. The same effect is also visible when we approach a city on land: the tops of the towers and the spires of the churches are seen before buildings of less altitude rise into sight. But, strictly speaking, the true form of the Earth is that of an oblate spheroid, that is, the shape of a sphere flattened at the poles. (*See* DEGREE.) The proportion between the diameter of the Earth at the equator and the distance from pole to pole, has been stated to be as 300 to 299. Taking, then, the circumference at the equator to be 21,600 geographical miles, or 24,876 English miles, reckoning 69·1 English miles to be equal to a degree, or 60 geographical miles, we find the equatorial diameter to be very nearly 6,875·5 geographical miles, or 7,918·3 English miles, and the polar diameter to be 6,852·5 geographical miles, or 7,891·9 English miles. The surface of the Earth may be estimated at about 150,000,000 geographical square miles, or nearly 200,000,000 English square miles. That the distance from the Earth's centre to the poles is less than it is from the same point to any part of the equator has been proved by actual measurement of arcs of the meridian at various places, which shows that the length of the degree of latitude increases as we approach the poles, which would not be the case if the Earth were exactly spherical, instead of becoming flattened towards those regions. The motion of a pendulum, also, is accelerated the nearer it is brought to the poles, which shows that the force of gravity increases as we approach the poles, and that the distance from the Earth's centre must consequently be less. The density, or specific gravity, of the Earth is as 5·66 when compared with the density of an equal bulk of water; that is to say, if we could compare the weight of the Earth and that of a sphere of water exactly the same size, the weight of the Earth would be 5·66 times as much as that of the water. This was supposed to be the case by Newton, and his supposition has been confirmed by an experiment known as Cavendish's experiment, by which the attractive force of lead on balls suspended by means of a torsion pendulum is ascertained. When this is known, it is easily determined what the attractive force of a mass of lead as large as the globe would be, and as the attractive force of the Earth is known, its mean density can then be compared with that of lead. The earth moves in its orbit from east to west; it performs its annual revolution in rather more than 365¼ days, as has been already said; and its diurnal revolution about its own axis, in a line passing through the poles, is effected in 23 hours, 56 minutes, 4 seconds. Its orbit round the Sun is elliptic, but nearly approaches the form of a circle. When at its perihelion, it is 94,000,000 miles from the Sun, and at its aphelion, about 96,000,000 miles. The Earth moves through space at the rate of 19 miles in a second, and travels over a distance of 1,641,600 miles per day, or nearly 600,000,000 of miles in the course of the year. The velocity of the Earth's rotation about its axis varies from 0 at the poles to about 1,520 feet per second at the equator. The Earth's axis has an inclination of 23½ degrees to the plane of its orbit: from this arise the phenomena of the seasons, and the variation in the length of day and night at various periods of the year. (*See* CLIMATE, DAY, NIGHT, SEASONS, &c.) The temperature





of the Earth varies at the Earth's surface at different times from different causes. (*See* DEW, METEOROLOGY, TEMPERATURE.) As we descend below the surface, as in the shaft of a coal-mine for example, the heat is found to increase to the extent of 1° Fahrenheit for every 15 or 20 yards; but it is not at all certain that this would be found to be a fixed law, and that the heat would increase in this ratio as we approached the centre of the Earth, if it were possible to do so.

EARTHENWARE, *erth'-en-wair* (Ang.-Sax.), the general name given to all utensils made of clay, which may be divided into three classes;—first, pottery, consisting of jugs and pans of a coarse description, red and brown in colour, that are made of a common kind of clay; secondly, porcelain, or vessels made of a very fine clay, with which a preparation of flint is mingled that fuses when the article is subjected to great heat and amalgamates with the clay, which will not melt, rendering the vessel semi-transparent (*see* PORCELAIN); and thirdly, the ordinary household ware, made of various kinds of clay that burn white, which differs from porcelain in being completely opaque, and to which the term earthenware is more properly applied and limited. The clay that is principally used in the Staffordshire potteries comes from Dorsetshire and Devonshire. The finer clay used in the manufacture of porcelain, and known as China stone, China clay, and kaolin, is found in Cornwall, principally in the neighbourhood of St. Austell. It consists chiefly of disintegrated granite; but the chief excellence of this, as well as of the Devon and Dorset clays, consists in its freedom from any impregnation of iron. To obtain the soft clay, large square pits are sunk in the earth, under which it has been ascertained by boring that a stratum of clay lies. The sides of the pit are kept from falling in by a sheeting of boards and faggots, sustained by transverse beams running from side to side, tier after tier, so that the interior looks like a network of wood. The clay is cut in rough cubes measuring about eight or nine inches every way; these blocks are then taken to the drying-yard, where they are stacked in large sheds, and allowed to dry before being removed to be shipped for the Potteries. The China stone of Cornwall is hard enough to be regularly quarried. The process of making earthenware at the Potteries is as follows:—The clay is mixed with water, generally by means of machinery, until it assumes the consistency and appearance of cream; it is then filtered through fine sieves until the mixture is perfectly free from the presence of any gritty matter. In the mean time flints have been heated to redness and calcined by being thrown into cold water, after which they are broken and ground to a fine pulp by the addition of some water. The clay and flint thus prepared are mixed together in the proportion of three or four parts of the former to one of the latter, and worked into a kind of paste, from which the greater part of the water is carefully evaporated in a kiln, the mixture being frequently turned over, that it may be of the same consistency and attain the same degree of dryness in all parts. After this it is beaten and mixed until the whole mass is thoroughly incorporated. The mixture, which is now called "slip," is next allowed to ripen by lying together untouched for some time before it is used. When the potter requires it for the construction of any vessel, a piece of the stiff paste is taken and kneaded, and then brought into the desired shape by an operation called "throwing," by which the lump, after being placed on the potter's lathe, is modelled by the manipulation of the fingers and the aid of some simple wooden tools. It is then allowed to dry, which brings the clay into a harder and firmer state; and it is subsequently fashioned and smoothed in a turning-lathe, after which spouts or handles are added, if necessary. Ornamental handles and spouts are made by casting or pressing the clay in a mould; but ordinary handles are made by forcing the material through metal pipes, from which it issues in the form of a thick ribbon or flattened cylinder, which are cut into pieces of the required length, and bent into the necessary shape. The portions thus made are joined to the main part of the vessel by a little slip in a moist state, which soon hardens. Plates, dishes, and all flat shallow vessels, are made in moulds, which are placed on an upright

spindle in the lathe. The rest of the process is similar to that of throwing. The pieces are then placed in boxes made of fire-clay, called "seggars," and baked in a kiln for about forty-eight hours, a gentle heat being applied at first, which is gradually increased in intensity until it becomes very great. After baking, the ware is called biscuit, and it is then ready for the final processes of colouring or printing, and glazing. Painting in various colours is confined entirely to porcelain and the better and more expensive kinds of earthenware. The common yellow ware is ornamented with rings, spots, and wavy stripes of blue and white, by allowing colouring matter to fall on them from perforated funnel-shaped vessels while the article is revolving on the lathe. The coarse blue pattern resembling sea-weed is produced by striking a brush charged with colour smartly against the vessel. When the ware is printed, the pattern is first engraved on copper-plates, from which impressions are taken on very thin paper in the desired colour, mixed with linseed-oil. The paper is laid on the ware while the impression is still wet, and the colour is transferred to its surface by rubbing the back of the paper lightly with a piece of cloth rolled tightly together. The paper is removed by soaking the article in water for a short time, after which the paper readily comes away, leaving the pattern printed in colour on the ware. The last process is that of glazing, the glazing matter for common ware being made of a mixture of litharge and calcined flint, and the better sorts, of a compound of lead, flint, glass, and salt reduced to a state resembling thin cream. After the ware has been dipped in this mixture, and wetted thoroughly all over, the articles are again placed in the seggars, and subjected to heat just strong enough to fuse the glaze, which produces the smooth, transparent, polished coating with which our various household utensils in earthenware are covered, and without which they would be rough to the touch, and liable to absorb oil and greasy matter, so that it would be consequently impossible, or at least a matter of difficulty, to keep them in a state of cleanliness. An historical sketch of the rise and progress of the potter's art, and the best and most remarkable kinds of earthenware that have been produced at various periods, will be found elsewhere. (*See* Potter's Art; Majolica, Palissy, and Wedgewood Ware.) It is only necessary to observe here, that although we may be surpassed by China and other nations in the production of the more beautiful sorts of porcelain, yet the solidity, strength, resistance to the action of fire, and the cheapness of English earthenware, have rendered it an article of commerce that is exported to every part of the world, and is purchased in preference to that produced in any other country.

Earth Houses, recesses in the earth, so called in Scotland, which seem to have been small natural caverns, or artificial chambers hollowed out to serve as a hiding-place in time of war for men and property, or as storehouses for corn and provisions for the winter. They are generally long and narrow in form, the largest being about 10 feet wide, 50 feet long, and 6 or 7 feet high. The sides are formed by a wall of rough stones, and the earth above is sustained by a ceiling of undressed slates or flag-stones, the ends of which are supported on the side walls. The entrance is small and near the top, and constructed in such a manner that it could be easily masked if necessary. When the floor was wide, the walls were brought closer together at the top, by allowing each tier of stones to project beyond the one below it, until the interior assumed somewhat of the form of a vaulted passage. They are not far below the surface of the earth, and are generally found in dry situations in the side of a hill or rising ground. Remains of various kinds have been found within them, which shows that they were used as temporary retreats, if not as permanent places of abode. Occasionally two or more chambers are found communicating by a small passage. These curious underground chambers are sometimes called Picts' houses.

Earthquake, *erth'-kwaik* (Sax. *cwacian*, to tremble), a term applied to any shaking or tremor of the outer surface or solid crust of the globe. No part of the earth is free from them. They are, however, most prevalent in the neighbourhood of volcanoes, and their frequency and violence seem to be connected with the intensity and activity of the volcanoes near them. Nearly all volcanic phenomena are accompanied by trembling and shaking of the earth in the adjacent districts. On many occasions they precede volcanic eruptions, and cease as soon as the eruption takes place. It is singular, however, that the most severe earthquakes take place in regions far remote from volcanoes; and districts in which there are the remains of extinct volcanoes are not more liable to earthquakes than other places. Egypt has been more exempt than, perhaps, any other country; but an earthquake occurred there in 1730 A.D. They sometimes happen in the middle of the ocean, and cases have occurred where volcanic islands have been thrown up, and afterwards have disappeared. It has been calculated that not less than twelve or thirteen earthquakes, destroying both life and property, happen every year. When they occur severely, there is, first, a trembling; then a severe shock, or a succession of shocks; then a trembling again, which gradually dies away. The most violent shocks are instantaneous, and there are seldom more than three or four. When there is more than one violent shock, there are smaller shocks or tremblings between. Sometimes whole cities have been destroyed by an earthquake, and sometimes fertile districts, with all their fruits and produce, have been laid waste. At the great earthquake of Lisbon, 60,000 human beings perished; and in Calabria, at the end of last century, 40,000 persons lost their lives in a similar manner. It has been calculated that at least thirteen millions of the human race have thus been destroyed. When an earthquake occurs, observers state that the shock has at first a distinct vertical direction, coming from below upwards, but afterwards the direction of the motion becomes gradually more horizontal, till it ceases. This motion is evidently caused by an earth-wave, or undulation of the solid crust of the earth. In the case of the earthquake at Lisbon, before mentioned, the course of this wave was roughly calculated. It must have moved very rapidly, not lasting at any point more than a second of time. The extent of area over which its influence was felt was very great. To the north, it was felt on the southern shores of Finland, and towards the west, beyond the St. Lawrence in Canada, and also in the West-India islands. The whole area affected could not have been less than 7,500,000 miles! The raising of the earth over such a vast surface of course affected the sea; and the wave thus formed attained a height of sixty feet at Cadiz, passing far beyond the ordinary limits of the tide. There are a great number of theories propounded in order to account for earthquakes; but they all agree in tracing them back to volcanic agency. The starting-point of all is the acknowledgment of the existence of a molten fluid mass in the interior of the earth. The generation of immense volumes of elastic gases under the influence of the heat of this mass, would necessarily result in an explosion, which would account for many of the earthquakes which occur. At a meeting of the British Association, Mr. Mallet proposed an ingenious theory. Assuming that the lines or centres of volcanic action are not far removed from the sea, he argued, that when an eruption takes place under the surface of the water, an opening or fissure results. Through this the water would descend to the central fire. Arriving there, it would take the spheroidal form until the surface with which it was in contact was cooled, when an explosion would take place amply sufficient to cause an earthquake. The latest theory of earthquakes is that of the brothers Rogers, who state that the producing cause is an actual pulsation of the molten fluid mass in the interior of the earth. This pulsation is carried forward in the shape of great waves, from large ruptures caused by the tension of elastic matter, bearing along, or floating, as it were, the rocky crust of the earth above. The structure of certain mountains confirms this theory in a very remarkable manner. The history and occurrence of earthquakes in bygone ages is of great interest to the geologist. They seem to have occurred at all times, and to have altered the surface of the globe in all parts, forming new lakes and river-courses, and sweeping away old ones; changing hills into valleys, and raising ridges of mountains out of level plains. The mysterious nature of earthquakes

is an incentive to their study; but every attempt at explaining their origin must be, at the best, theoretical.

Earth's Crust. (*See* Geology.)

Earths (in Chem.).—The earths proper are ten in number,—alumina, glucina, geonia, thorina, yttria, erbia, terbia, ceria, lantana, didymia. They are distinguished by being soluble in water, but dissolve in caustic alkalies and their carbonates. They are all oxides of metals which do not decompose water. Many of them have been but imperfectly examined, owing to their extreme rarity. Alumina, a constituent of all clays, and glucina, found in the emerald, are the most important. Alumina, by its isomorphism with sesquioxide of iron and other peculiarities, connects the earths with the oxides of the heavy metals.

Earths, Alkaline. (*See* Alkaline Earths.)

Earth-works, in Mil., intrenchments hastily thrown up, consisting chiefly of a rampart and ditch, and serving as temporary lines of defence. At the siege of Sebastopol, the southern side of the city was mainly defended by earth-works of great extent, size, and strength; and from this circumstance it is now considered that works of this kind are as serviceable as those of stone for permanent defences, and have the double merit of being less dangerous to the defenders, since no splinters of stone can fly about, as is generally the case when a block of granite is struck by a cannon-ball, and more easily repaired. It is not, however, likely that earth-works will supersede ramparts of stone against the heavy artillery that is now coming into use, but that our stone walls, like the sides of our vessels, must be rendered better able to resist the "heavy brunt of cannon-ball" by being coated with armour-plates of iron.

Earth-worm (Ang.-Sax.) (*Lumbricus*, Linn.), a well-known annelide. Its outward appearance is a body composed of numerous narrow rings closely approximated to each other; the colour of the body is reddish, or purplish; of a cylindrical form, somewhat pointed at the anterior extremity, and usually a little flattened at the tail. It is without the organs of sight. The organs of motion consist of a double row of bristles running down the lower surface of the body, and which are capable of being withdrawn within small hollows when not in use. The mouth is unarmed, and the intestine runs straight through the body. The vascular system consists of two longitudinal vessels running along the ventral and dorsal regions of the body, and united by numerous branches. The blood is red. Like the leeches, this worm is furnished with ciliated canals, which have been supposed to serve as organs of respiration; but their real destination appears to be still uncertain. As far as relates to its appearance above the ground, the earth-worm may be regarded as a nocturnal animal. In the night and at early morning, hundreds may be seen in localities where, during the daytime, not one is to be seen. They are of immense utility in improving the soil. The organs of the earth-worm's locomotion prevent its moving backwards, whilst the expansion of the rings, as it contracts the anterior segments and draws forward the hinder parts, widens a passage for it through the earth, whose particles were close together before. They are thus, in their multitudes, of incalculable utility in constantly loosening and stirring the soil, and accumulating on the surface those little hillocks of earth known as "worm-casts." On this subject Mr. Charles Darwin, who seems to have given it long and careful attention, remarks: "The burrowing of earth-worms is a process exceedingly useful to the gardener and agriculturist; and these animals are far more beneficial to man in this way than they are injurious by devouring the vegetables set in the soil. They give a kind of under-tillage to the land, performing the same below ground that the spade does above the garden, and the plough for arable land; and loosening the earth so as to render it permeable to air and water. It has been shown, too, that they will even add to the depth of soil; covering barren tracts with a layer of productive mould. Thus, in fields which have been overspread with lime, burnt marl, or cinders, these substances are in time covered with finely divided soil well adapted to the support of vegetation. That this result, which is commonly attributed by the farmers to the 'working down' of the materials in question, is really due to the action of the earth-worms, appears from the fact that in the soil thus formed large numbers of worm-casts may be distinguished. These are produced by the digestive process of the worms, which take into their intestinal canal a large quantity of the soil, through which they burrow, extract from it the greater part of the vegetable matter it may contain, and eject the rest in a finely divided condition. In this manner a field manured with marl has been covered in the course of eighty years with a bed of earth averaging thirteen inches in thickness." Besides their usefulness in the manner above described, the earth-worms are of importance as food for birds, fish, &c. Their value as bait for fishes is well known to every angler. The power of reproducing parts after mutilation is very great in this animal, as in the whole of the order. It is generally supposed that the earth-worm may be propagated by division; but this scarcely appears to be the case. It is said, however, that if it be divided across the middle, the part bearing the head will develop a new tail, although the tail will soon die; and that if the head be cut off, the body will form a new head; but it appears that both portions never survive the mutilation.

Easel, *e'-zl* (Ger. *esel*, an ass), a frame on which a painter supports the canvas on which he is working, in a slightly slanting position. It consists of three long legs connected by hinges at the top, which extend and form a tripod. Holes are bored in the faces of the two legs against which the painting rests, in which pegs are inserted, which support the picture, and afford the means of raising or lowering it to the height and position that may be desired. Easel pictures, among painters, are the smaller pieces which are painted on the easel, as distinguished from those which are drawn upon walls, ceilings, &c.

East, *est* (Sax. *east*, Ger. *ost*), the quarter of the heavens or point of the horizon where the sun rises at the equinoxes in March and September. When we are looking towards the north, the east is on our right hand and the west is on our left; and *vice versâ* when when we look towards the south. The east may be pretty nearly determined, and from that the other points of the compass, by calling to remembrance the point of the horizon in which the sun rises, making due allowance for the time of year; and if we are near a church it is still easier, as it is a fixed rule to build a church in such a manner that the chancel and communion-table is at the east end of the building, or points directly towards the east.

Easter, *est'-er* (Sax. *eastre*), a feast held by the Christian church in commemoration of the resurrection of our Saviour. It is a movable feast, occurring at any date between March 21 and April 25; and by it the other movable feasts throughout the ecclesiastical year are regulated. It is held about the same time as the Jewish Passover, or Paschal feast, although it very seldom happens that the Christian and Jewish festivals are observed on the same day. In the Greek and Latin churches Easter is still called Pascha, from the Jewish name for the feast of the Passover. The term Easter has been derived from various sources; some taking it from the Saxon *oster*, 'to rise,' and others from the name of a heathen goddess, Eostre or Ostara, whose rites the Saxons were accustomed to celebrate at this time of the year, and on account of which the month of April was styled Eostermonath in their calendar. It was a period of rejoicing with them, on account of the return of spring and the renewal of vegetation; and the name and the accompanying simple ceremonies that attended the festival, such as lighting fires, &c., were easily adopted by the Christian church in Britain, which taught that it was to be observed as a season of rejoicing, as it was held in commemoration of the resurrection of our Saviour. In the early church this festival lasted for some days, and catechumens were then usually admitted to the rite of baptism. At present its celebration is confined in the Church of England to Easter-eve, Easter Sunday, and the Monday and Tuesday in Easter week. In the Roman Catholic church it is a time of enjoyment, because the restrictions imposed during the preceding period of Lent are no longer to be observed. Coloured eggs are

commonly interchanged in families and among friends in Russia and all countries in which the Greek faith is established. There were many popular observances of Easter in various parts of England; such as eating tansy cakes and puddings; but these have fallen into disuse, although many still make a practice of wearing some new article of dress for the first time on Easter Sunday, alleging that it is unlucky not to do so. In determining the day on which Easter is to be held, the council of Nice, in 325, decided that it was to be celebrated on the Sunday following the 14th day of the first month of the Jewish year, on which the Latin or Western church had been accustomed to hold it; and on the introduction of the Gregorian calendar, a table was constructed, based on the Metonic cycle, by which Easter was to be found, and which the Church of England still uses. In the Book of Common Prayer, we are told that "*Easter Day* is always the First *Sunday* after the Full Moon, which happens upon or next after the Twenty-first Day of *March*; and if the Full Moon happens on a *Sunday*, *Easter Day* is the *Sunday* after." Now the moon above alluded to is not the moon of the heavens or the mean moon of the astronomers, but an imaginary moon, the movements of which follow the movements of the real moon by an interval of a day or two. Therefore, when "full moon" is spoken of in the directions regarding Easter given above, we are not to take it as the time when the moon is at the full in the heavens about this period, but the 14th day of the imaginary moon of the calendar, which falls upon or next after March 21 in any year. To find this 14th day, or "full moon," of the calendar, and consequently Easter-day, we must have recourse to the table below, taken from the Prayer Book. Having found the golden number for the year (*see* GOLDEN NUMBER), look for it in the first column of the table; and the date which is in a line with it in the second column, is the day of the full moon of the calendar. Next find the Sunday or Dominical letter for the year (*see* DOMINICAL LETTER), and the date which is opposite the *first* occurrence of the Sunday letter in the third column, reckoning in all cases from that letter in the column which is in a line with the date of the full moon already found, will give the day of the month on which Easter Sunday falls. If the Sunday letter is the same as that which is in a line with the date of the full moon, as it happened in 1862, Easter Sunday will be seven days after, as the coincidence of the Sunday letter and the date of the full moon in the same line shows that the full moon of the calendar falls on a Sunday.

| Gold. Num. | Days of the Month. | Sun. Let. | Gold. Num. | Days of the Month. | Sun. Let. |
|---|---|---|---|---|---|
| 14 | March 21 | C | ... | April 8 | G |
| 3 | " 22 | D | 15 | " 9 | A |
| ... | " 23 | E | 4 | " 10 | B |
| 11 | " 24 | F | ... | " 11 | C |
| ... | " 25 | G | 12 | " 12 | D |
| 19 | " 26 | A | 1 | " 13 | E |
| 8 | " 27 | B | ... | " 14 | F |
| ... | " 28 | C | 9 | " 15 | G |
| 16 | " 29 | D | ... | " 16 | A |
| 5 | " 30 | E | 17 | " 17 | B |
| ... | " 31 | F | 6 | " 18 | C |
| 13 | April 1 | G | ... | " 19 | D |
| 2 | " 2 | A | ... | " 20 | E |
| ... | " 3 | B | ... | " 21 | F |
| 10 | " 4 | C | ... | " 22 | G |
| ... | " 5 | D | ... | " 23 | A |
| 18 | " 6 | E | ... | " 24 | B |
| 7 | " 7 | F | ... | " 25 | C |

To explain the manner in which the above table is used, let it be required to find Easter Sunday for 1863. For this year the golden number is 2. The date in the second column, opposite the number 2, is April 2; this, then, is the day on which the moon of the calendar is supposed to be full. The Sunday letter for the year is D. Reckoning, then, from A, the letter in a line with the date of full moon, we proceed down the column until we come to D for the first time, in a line with





which we find April 5 in the second column, the day on which Easter falls for the year in question. The above table is available in finding Easter for any year from 1700 to 1899 inclusive. To make it available for any year between 1900 and 2199 inclusive, every number in the column of golden numbers must be shifted into the line immediately below it, except 17 and 6, which remain where they now are.—Ref. *Companion to British Almanac*, 1845; *Eng. Cyc.*—Arts and Sciences.

EASTER OFFERINGS, or EASTER DUES, are small sums commonly paid by each person when he receives the Lord's supper at Easter to the clergyman. They are generally twopence from every communicant, and are due of common right, and not by custom only.

EAST-INDIAN ARMY.—As the possessions of the East-India Company increased in India, it was found necessary to raise and maintain a body of troops to enable the Company to preserve its own by force of arms. At first a few Europeans, mostly men of desperate fortunes, under the command of some adventurer as reckless as themselves, garrisoned the forts that were erected for the protection of the merchants' factories; but ere one hundred and fifty years had elapsed from the date of the grant of the first charter, these little bands of men had grown into regiments and armies, and the Company was actively engaged in carrying on wars with the French and many of the native princes. Liberal pay, ample furloughs, and pensions after serving for a certain period, formed attractions which brought the natives to the Company's standard. A system of organization was introduced, a few regiments of Europeans were enrolled and dispersed among the native forces; and in 1857, at the commencement of the Indian mutiny, the armies of the three presidencies,—Bengal, Madras, and Bombay, amounted to about 280,000 troops of all arms of the service, including 18,000 European troops in the Company's pay and about 21,000 of the queen's troops, who were also paid by the Company while in India. Besides these, there were large contingents furnished and maintained by the native princes under British protection. Since the close of the mutiny, the power of the Company has passed into the hands of the Crown, and the European portion of the Company's troops has been amalgamated with the British army. (*See* ARMY.) The native portion has been entirely reorganized, and is quite as numerous as it was before the commencement of the outbreak, but perhaps more efficient and more under the control of its officers.

EAU DE COLOGNE, *o-de(r)-ko-lone'* (Fr., Cologne-water), a perfumed spirit, originally manufactured at the town of Cologne, in France, and generally used as a perfume, although several imaginary medical virtues in popular belief are attached to it.

EAVES, *eevz* (Sax. *yfes*), in *Arch.*, that portion of the roof which projects over and beyond the face of a wall, to carry off the rain and prevent it from trickling down its surface and rendering it damp.

EAVESDROP, *eevz'-drop* (Lat. *stillicidium*), is the water which drops from the eaves or roof of a building, or the space left outside the walls of a house for the rainwater to escape. Among the Romans, unless a man had a servitude of *stillicidium* over his neighbour's property, he was obliged to keep at a certain distance within his own in building; for no one was obliged to receive on his own property the water which fell from his neighbour's house. Laws to the same effect exist in most modern countries. The space is commonly regulated by usage, and may be usually from a foot to a foot and a half on the several properties; but a proprietor may build as near his own boundary as he pleases, provided the rain descending from the roof fall within his own property, because in this way he is only making a natural use of what belongs to himself, without encroaching on his neighbour's property.

EAVES-DROPPERS (Ang.-Sax.), in Law, are such as listen under walls or windows, or the eaves of houses, to hearken after discourse, and thereupon to frame slanderous or mischievous tales. Such persons are regarded as a common nuisance, and may be indicted at the quarter sessions, and punished by fine, and obliged to find sureties for their good behaviour.

EBB, *eb* (Sax. *ebbe*), the reflux or return of the tide towards the sea after high water; opposed to flood, or flowing.

**Ebenaceæ**, *eb-en-ai'-se-e* (from Arab. *abnous*, Lat. *ebenus*, Sp. *ebano*, ebony), in Bot., the Ebony fam., a nat. ord. of dicotyledonous plants, in the sub-class *Corollifloræ*, consisting of about 160 species, mostly natives of tropical India. *Character.*—Trees or shrubs with alternate, entire coriaceous leaves, without stipules. Flowers, polygamous; calyx 3—7-parted, inferior, persistent; corolla 3—7-parted; stamens equal in number to the divisions of the corolla, or twice, or four times as many, and attached to the corolla, or hypogynous; anthers 2-celled, introrse, opening longitudinally; ovary 3—12-celled, each cell with one or two ovules suspended from the apex; style usually having as many divisions as there are cells to the ovary. Fruit fleshy; seeds large, albuminous. Many of the *Ebenaceæ* are remarkable for the hardness of their timber, which is known under the names of ebony and ironwood. Many species have edible fruits, and some have astringent barks. (*See* Diospyros.)

**Ebionites**, *eb'-e-o-nites* (Heb. *ebion*, poor, low; used by the Jews as a term of contempt), a sect of Jews who professed Christianity (to a certain extent, and seem to have consisted of two different classes, the first of which was to be found in the Holy Land in the 1st and 2nd centuries of the Christian era; while the second existed in Syria, especially in the neighbourhood of Berœa, at the latter end of the 4th century and the beginning of the 5th. The early Ebionites denied the divinity of our Saviour, believing him to be a mere man, the son of Joseph and Mary, but considering him to be the Messiah, allowing the truth of his resurrection from the dead, and looking for his second coming to restore the Jewish kingdom upon earth to a greater state of splendour and power than it had ever before enjoyed. They seem to have been a moral sect, adhering to the Mosaic law. They acknowledged the Gospel of St. Matthew only, but struck out all parts which related to the divinity of our Saviour. The later Ebionites were distinguished from these by allowing the supernatural birth of our Saviour, although they did not believe in his pre-existence as the second person of the Trinity. They also used the Gospel of St. Matthew, but rejected the Acts of the Apostles and the Epistles of St. Paul.

**Ebonite**, *eb'-o-nite* (Lat. *ebenus*, ebony), a substance produced when caoutchouc is mixed with from two to ten per cent. of sulphur, and raised to a temperature of 270° to 300°. The caoutchouc undergoes a change, it acquires new characters, its elasticity is increased, and it becomes more pliable. The ordinary solvents do not affect, nor does cold or heat alter, its general conditions. (*See* Vulcanite.)

**Ebony.** (*See* Diospyros, Furniture.)

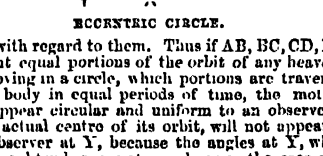
**Ebullition**, *eb-ul-lish'-un* (Lat. *ebullitio*, a bubbling up), the bubbling agitation of liquids after they have been heated to their *boiling-points* (which *see*). On gradually heating water in a glass flask by means of a spirit-lamp, we first observe the formation of minute air-bubbles, which dart through the liquid with great rapidity. As the temperature increases, these give place to larger bubbles, consisting of steam, which are formed at the bottom of the vessel, and which rise a little way in the liquid and then contract and disappear, producing a hissing or simmering sound. But as the heating goes on, these steam-bubbles rise higher and higher in the liquid, until at last they reach the surface and escape, when the liquid is said to be in a state of ebullition. The temperature at which the ebullition of a liquid takes place varies with the pressure of the atmosphere. When the barometer stands at 30 inches, water begins to bubble at the temperature of 212° Fahr., because at this temperature the elastic force of steam will support thirty inches of mercury, and [illegible] than it, the bubbles acquire the power of [illegible] devouring the [illegible] a kind of under-[illegible] surface of the heated liquid.

[illegible] same below grou[illegible]nn (Gr. *ekballo*, I cast out, exgarden, and the ph[illegible] plants belonging to the nat. ord. the earth so as species *E. officinarum* is commonly water. It has [illegible]cucumber, from the fruit sepaand to the dept[illegible]m its stalk, and expelling its seeds a layer of produ[illegible] violence. It is a native of the have been oversprea[illegible] is cultivated in England. The these substances [illegible]om the juice of the fruit, when vided soil well ad[illegible] drug called elaterium, or extract That this result, w[illegible] powerful in drogogue cathartic. It is given when pure in doses of from $\frac{1}{12}$th to $\frac{1}{4}$th of a grain. In improper doses it is an irritant poison. Elaterium owes its properties to a bitter principle, named *elaterin*.

**Ecce Homo**, *ek'-se ho'-mo* (Lat., behold the man), a term in Art applied to those pictures which represent Christ wearing the crown of thorns, and bound ready for execution. Some of the greatest painters have employed their highest efforts upon this subject. The finest Ecce Homo in existence, without doubt, is that painted by Correggio, and now in the National Gallery in London. In this magnificent picture the noble features of the countenance of Christ express the utmost pain without being disfigured by it. The Virgin Mary is also represented, fainting in the arms of Mary Magdalene. The effect of the pale countenance of the Virgin is enhanced by the contrast of the dark blue cloak, which is drawn over her head like a veil. The picture has, however, suffered a little from cleaning and repairs. It is generally supposed to have been painted by Correggio at the age of twenty-six.

**Eccentric**, *ek-sen'-trik* (Lat. *eccentricus*, from *ex*, from, and *centrum*, centre), in Mach., a sort of wheel, or revolving disc, in which the axis, or centre of motion, does not coincide with the geometrical centre. There are a great variety of eccentrics, and they are very useful in converting one kind of motion into another. By this means, continuous circular motion can be converted into alternating or intermitting rectilinear motion, or into curvilinear, but not rotary motion. Eccentrics may be driven by straps or bands; the bands, however, require to be extremely elastic, or it is necessary to apply a stretching pulley or roller, which can be pressed against the strap by the action of a weight. By this means a uniform degree of tension is attained.

**Eccentric Circle.**—According to the Ptolemaic system of astronomy, every heavenly body was supposed to move round the earth, as the centre of the universe, in a circular orbit, and at a uniform rate of speed. When it was found, however, that the apparent orbits of the heavenly bodies were not circular, and that they moved through unequal spaces in equal times, they accounted for it by supposing that the earth was situated in a position which did not coincide with the centre of the orbits of the bodies that were revolving round it, and in this manner they attempted to reconcile the discrepancy between the apparent motion of the sun and planets and the theory they had in-




ECCENTRIC CIRCLE.

vented with regard to them. Thus if AB, BC, CD, DE, represent equal portions of the orbit of any heavenly body moving in a circle, which portions are traversed by that body in equal periods of time, the motions which appear circular and uniform to an observer at X, the actual centre of its orbit, will not appear so to an observer at Y, because the angles at Y, which the arcs subtend, are not equal, as is the case with the angles at X, which are subtended by the same arcs, and the heavenly body will consequently appear to the observer at Y to describe equal spaces in unequal times, and *vice versâ*. The orbit of a revolution of a heavenly body is therefore called an eccentric circle in the Ptolemaic system, because the earth, round which it revolves, must be considered to occupy a position that is out of, or removed from, its centre.

**Ecchymosis**, *ek-ke-mo'-sis* (Gr. *ek*, out of; *chumos*, juice), in Surg., is a discoloration of the skin, occasioned by the rupture of blood-vessels and extravasation of blood, usually produced by falls, blows, sprains, and the like. One of the most common examples of ecchymosis is a black eye. In general, the discoloration does not take place till some time after the injury

of the injury; and it may usually be much diminished by the speedy and continued application of cold wet cloths to the part.

**Ecclesiastes, or The Preacher,** *ek-kle-ze-as'-teez*, is the name of one of the canonical books of the Old Testament, placed after Proverbs and before the Song of Solomon. These names are a translation of the Hebrew title *Koheleth*, the former of the two being adopted from the Greek Septuagint. There is no room to doubt the canonicity of this book. It has occupied a place in the Jewish canon from the earliest times, and has been universally received by the Christian church. From some passages in the Talmud, however, some seem to have questioned the expediency of placing it among the Scriptures that were read publicly, on account of its containing "words tending to heresy" and "words contradictory to each other." According to tradition, this was among the Scriptures which were not allowed to be read by any one under the age of thirty. Numerous questions have been started regarding the authorship, date, design, and plan of this book. Many critics contend that it could not have been written by Solomon, which is the generally received opinion, on account of numerous foreign and modern words that occur in it. In favour, however, of the common opinion, there is the unqualified testimony of the book itself, the author speaking of himself as the son of David, king of Israel, and the greatest possessor of wealth and wisdom in Jerusalem. The long intercourse of Solomon, too, with the representatives of foreign nations, and his foreign wives, would necessarily lead to the introduction of numerous foreign words and phrases in his writings. The book is generally believed to have been written in his old age, after he had experienced all the pleasures and follies of life, and was able to testify to their being all vanity and vexation of spirit. The plan and scope of the book are very obscure, and have given much trouble to commentators. Some have regarded it as a series of dialogues and disjointed narratives, rival poems, literary discussions, ethical aphorisms, and unfinished practical essays. The most plausible ground for regarding it as the work of a variety of authors arises from the frequency and abruptness of its transitions and the apparent want of any fixed plan. The great theme of the book is the vanity of all earthly things and labours: with this it begins, and with this it closes. It is as far removed as possible from the character of a formal treatise,—being the confessions of a man of wide experience, of his searches after truth and happiness, of his many disappointments, and of his ultimate success. According to Dr. Davidson, the contents are comprehended in four discourses. The first discourse is filled with melancholy, doubt, and dissatisfaction. The course of earthly things is unalterably fixed, and consequently all our efforts to obtain happiness by the acquisition of wisdom and the pursuit of pleasure are unsatisfactory, leading to the conclusion that the object of life ought to be the enjoyment of the good things that are within our reach (chap. i., ii.). The second discourse begins with a description of the absolute dependence of man on a higher immutable Providence; that the cheerful, undisturbed enjoyment of life comes from the hand of God: and that it is vanity to suppose that man, though possessing wisdom, can procure it by his own efforts. Yet God, who has connected everything with time and circumstance, disposes of events rightly and well,—this very limitation to man's effort being intended, for the purpose of teaching him to fear God (iii. 1—v. 19). But it is the lot of many men not to enjoy the good things of life which they have acquired; and this idea, which is started in the close of the second discourse, becomes the leading subject of the third. Though the enjoyment of the possessions acquired through the favour of God is often thwarted, man should endeavour to attain to the true and contented experience of life by cheerfully using the earthly things given him, exercising true wisdom, and avoiding the folly which is so common (vi.—viii. 15). In the fourth discourse, the mystery that it sometimes happens to the righteous as to the wicked, and the reverse, is taken up, and the conclusion arrived at, that, since there is an overruling Providence whose ways we cannot fathom, nothing remains but to direct the view to a righteous state of retribution hereafter, applying



wisdom and the fear of God to the satisfying of the spirit. "Thus the true enjoyment of the good things of this life is recommended in connection with and in subservience to the fear of God, whose judgment will hereafter clear up all seeming irregularities, and reward the works of men as they deserve."

**Ecclesiastic, or Ecclesiastical,** *ek-kle-ze-as'-tik* (Gr. *ekklesia*, the church), denotes something belonging to, or set apart for the church, in opposition to civil or secular, what pertains to the world. There are ecclesiastical things and persons; ecclesiastical law, jurisdiction, history, ceremonies, discipline, &c. Ecclesiastical persons are those whose functions consist in performing the service and maintaining the discipline of the church.

**Ecclesiastical Commissioners.**—In 1835 certain royal commissions were issued, directing certain persons therein named to consider the state of the several dioceses of England and Wales, with reference to the amount of their revenues and the more equal distribution of the episcopal duties; and also the state of the cathedral and collegiate churches, with a view to the suggestion of such improvements as might render them most conducive to the efficiency of the established church; and further, to devise the best mode of providing for the cure of souls, with special reference to the residence of the clergy in their benefices. These commissioners, comprising, among others, the English archbishops and bishops and the chief members of the government, recommended various improvements in our ecclesiastical system; in consequence of which act 6 & 7 Will. IV. c. 77, was passed, forming certain prelates and laymen of distinction into a body corporate, under the name of "The Ecclesiastical Commissioners for England," and empowering them to mature and submit to the queen in council such plans as might be best adapted to give effect to the recommendations of the commissioners. And it was enacted that such plans, when ratified by order in council, should have the force of law. The Ecclesiastical Commissioners have made numerous alterations in our ecclesiastical system, which have been embodied in orders in council. Among these are the erection of the new sees of Ripon and Manchester, and the union of the sees of Gloucester and Bristol; the augmentation of the revenues of the smaller bishoprics from those of the larger, without prejudice to the rights of existing prelates; the suppression of numerous sinecures; the making better provision for the cure of populous parishes; and such like. The corporation, as originally constituted, consisted of thirteen members; of whom five were episcopal, viz., the two archbishops and the bishop of London *ex officio*, and two other bishops nominated by the crown; five *ex officio* members of the government; and three laymen, to be also appointed by the crown. In 1840 the constitution of the board was materially altered, and, besides the two archbishops and the five members of the government, the corporation was made to include all the bishops of England and Wales, three deans, and six common law, equity, and ecclesiastical judges; together with eight permanent lay commissioners, six of whom are in the appointment of the crown and two in that of the archbishop of Canterbury. In 1850, by 13 & 14 Vict. c 94, authority was given to appoint another board; viz., that of "The Church Estates Commissioners," consisting of three members to form the acting committee of the board, and to whom all matters relative to the sale, purchase, management of lands, &c., are intrusted, and who are the responsible officers of the commission. The first and second of these commissioners are lay members of the church, appointed by her majesty by letters patent, during pleasure, the other being appointed by the archbishop of Canterbury. Five commissioners, two of whom must be Church Estates Commissioners, form a quorum of the general board; and in cases where the seal has to be affixed, two of the five must be members of the episcopal bench. The Church Estates Commissioners constitute, either *per se* or in combination with two other members of Ecclesiastical Commissioners appointed under seal annually by the board, a committee called "The Estates Committee." There are thus three boards, before one or other of which, according to the nature of the case, all matters must be brought for decision; viz., the

general board, the Estates Committee, and the Church Estates Commissioners. By 19 & 20 Vict. c. 55, all the duties, powers, and authorities of the Church-building Commissioners are transferred to the Ecclesiastical Commissioners. By 13 & 14 Vict. c. 94, the commissioners are required to lay an annual report before the secretary of state, to be by him submitted to parliament, of all their proceedings for the current year.

Ecclesiastical Corporations are corporations the members of which are spiritual persons. They are either aggregate or sole; in the former case being composed of a number of persons, as the dean and chapter of a cathedral; in the latter, consisting only of one; as a bishop, rector, or vicar. By the law of England every holder of an ecclesiastical benefice is regarded as a corporation, the temporalities of which fall to his successors and do not descend to his heirs.

Ecclesiastical Courts are courts in which the archbishops and bishops adjudicate upon matters pertaining to religion and the clergy. Although we have evidence that the higher orders of the clergy assisted in the national councils in the administration of justice under the Saxon and Danish kings, yet it is clear that no separate ecclesiastical courts existed antorior to the Norman conquest. William I. gave forth a charter, whereby it was enacted that no lay tribunal should take cognizance of matters affecting the clergy or the church, and that no bishop should take cognizance of secular matters. According to Coke, these tribunals judged and determined causes ecclesiastical and spiritual; namely, blasphemy, apostacy from Christianity, heresies, schisms, rights of matrimony, divorces, reparation of churches, probate of testaments, &c. By an act of parliament which came into operation in January, 1858, the jurisdiction relating to the granting or revoking of wills and letters of administration was transferred to the Court of Probate; and by the act 20 & 21 Vict. c. 85, which created a total change in the law of divorce of England, the exclusive jurisdiction relative to matters matrimonial was transferred from the ecclesiastical courts to the Court for Divorce and Matrimonial Causes. (*See* Divorce Court.) The total number of ecclesiastical courts in England and Wales is 372. (See *Court of Peculiars, Consistory Court, Archdeacon's Court,* and *Court of Delegates,* under art. Courts, and Arches, Court of. *See* also Convocation.)

Ecclesiastical Law. (*See* Canon Law.)

Ecclesiastical Year. (*See* Year.)

Ecclesiasticus, or the Wisdom of Jesus the Son of Sirach, *ek-kle-ze-as'-tik-us,* is the name of an apocryphal book of the Old Testament, said to have been originally written in Syro-Chaldaic, by Jesus the son of Sirach, a learned Jew; but the exact time in which he lived is uncertain. The book was translated into Greek, with an introduction by his grandson, probably about B.C. 130. It is destitute of any systematic arrangement, and consists chiefly of meditations and proverbs relating to religion and the general conduct of life. Its general tone, however, is ethical rather than religious, in some measure resembling the book of Proverbs; and hence some have been led to attribute it to Solomon. The sentiments are sometimes so profound and the style so highly poetical, that, according to Addison, "it would be regarded by our modern wits as one of the most shining tracts of morality that are extant, if it appeared under the name of Confucius or of any celebrated Grecian philosopher."

Ecclesiology, *ek-kle-ze-ol'-o-je* (Gr. *ekklesia,* the church, and *logos,* a word or discourse), a term that is applied to the study of ecclesiastical architecture and ornament, as well as of the vestments and ceremonies belonging to the Anglo-Catholic church. It is a branch of archæology. A journal is published monthly for the promotion of the science, named the *Ecclesiologist,* and there is an Ecclesiological Society, based on that which was formerly known as the Cambridge Camden Society. The leading manufacturers of church furniture and ecclesiastical decorations are Messrs. Cox & Son, of Southampton Street, Strand, who exhibited some beautiful specimens of fonts, lecturns, chandeliers, carved oak communion-tables, and stained glass windows, in the Industrial Exhibition of 1862.—Ref. *Handbook of English Ecclesiology.*

Echelon, *esh'-lon(g)* (Fr. *échelle,* a ladder).—Bodies of troops are said to be formed in echelon when the front of each body is in a line parallel to the fronts of the remainder, but the body itself occupies a position either to the rear of that which is immediately on its right, and in advance of that on its left, or *vice versâ,* according as the movement which follows the formation is to be to the right or left. Each body has its front clear of that which is in advance of it, so that the whole can be brought into the same alignment by marching forward. It is used in attack and retreat, and especially by cavalry in charging the enemy's troops. It is also an easy and expeditious method of changing the front of a regiment drawn up in line and bringing it into a new position that is in an oblique direction to that which it has just quitted. The most simple illustration of this formation is the zigzag outline presented by a flight of stairs or steps; whence it derives its name.

Echidna, or Porcupine Ant-eater, *e-kid'-nă* (Gr.) (*Echidna hystrix,* Cuvier).—Of this family there are two species,—*Echidna hystrix,* peculiar to New South Wales, and *Echidna setosa,* chiefly found in Van Diemen's Land. They are of the same size, and, in general appearance, resemble the common hedgehog. They affect hilly countries, living in burrows, and feeding on insects, principally ants and termites, which they capture by the projection of their long viscous tongues; which latter organ, as in the case of the true ant-eaters, by an arrangement of longitudinal and annular muscles, is capable of being extended and contracted to a considerable extent. The head of the echidna is small; muzzle much elongated, and terminating in a little mouth, which is destitute of teeth, but furnished with several rows of small spines on the palate, directed backwards. The legs are short and strong, and the feet all furnished with five toes, armed with powerful claws. With the aid of these latter, it can burrow with great rapidity, and when pursued, and not allowed sufficient time to bore a complete hiding in the earth, it enters itself so far as to expose only its prickly back to the threatened assault.

Echinocactus, *e-ki-no-kăk'-tus* (Gr. *echinos,* hedgehog; *cactus,* a spiny plant), in Bot., a gen. of plants belonging to the nat. ord. *Cactaceæ.* The stem is nearly globular, and is furrowed with longitudinal grooves, varying in number and depth. The flowers appear on the salient angles of the stem, in the centre of little tufts of bristles and spines. Many species of this genus are in cultivation as stove or greenhouse plants.

Echinodermata, *e-ki-no-der'-mă-tă* (Gr. *echinos,* spine, and *derma,* skin), a class of radiate animals, the highest in organization of that great division. They are characterized by possessing a well-organized skin, under which, or attached to it, are frequently found plates of solid matter constituting a kind of skeleton. They have a digestive and a vascular system, and a circular nervous system has been detected in many of the species. A muscular system is constantly present. The nutritive apparatus of the *Echinodermata* is very simple, presenting in most of the family a single orifice, destitute of teeth, in the centre of the lower surface of the body, performing the functions both of the mouth and anus; but in some presenting a digestive cavity, with an orifice for the evacuation of its contents, distinct from that by which the food is taken in. The muscular motion is generally present in these animals, but the organs of motion in them are various, the principal ones being the membranous tubes, which can be protruded at will through the ambulacral apertures, and which have been termed the feet. Whether or no the highest among the *Echinodermata* possess sight is not a settled matter. Among those who believe that they do, may be named Professors Ehrenberg and Forbes, and among those of a contrary opinion, Professor Rymer Jones. They are all marine animals, and are fairly represented by the star-fish, sea-urchin, and sea-cucumber.

Echinus, *ek-i'-nus,* in Arch., a moulding, sometimes called the ovolo or egg-shaped moulding. It consists of a series of oval bosses in a vertical position, projecting from the face of the moulding, and sometimes separated by a line, terminating in a triangular head, like a broad-arrow.

Echo, *ek'-o* (Gr. *echo,* sound), a popular term applied to reflected sound. When sound from any origin

is propagated through the elastic medium of the atmosphere, undulations, or waves, are produced in the air. When these waves come in contact with a cliff, or wall, or other opposing surface, they are reflected like light or heat. When the sound is so reflected as to come back to the observer's ear, it is called an echo. In order that the echo may be heard at the place where the sound originated, it is necessary that the reflecting surface should be at right angles to a line drawn to the point where the observer stands. An oblique wall throws off the echo so that it can be heard by others but not by the originator of the sound. The most perfect echoes come from surfaces that are either even or so curved as to be in the form of a concave mirror. This, however, is not necessary; for a very distinct echo is often returned from the edge of a wood. Sound travels at the rate of 1,125 feet in a second; consequently it is necessary, in order to obtain an echo, to be at least sixty-two feet from the reflecting surface, and $\frac{1}{10}$th of a second must be allowed to elapse in order to distinguish the sound from the echo. When nearer than this distance, the echo blends with the original sound, thus making both indistinct. In many churches and public halls, where the principles of acoustics have not been considered, the multitudinous echoes drown the speaker's voice. The distribution of sound in public buildings, so that the echoes may assist in strengthening the original sound, is a subject of great importance. An ingenious clergyman at Cambridge invented a parabolic reflector, which had the effect of stunning him while he preached, however impartially the subject of his discourse was imparted to his congregation. When several objects reflect sound, the number of echoes is multiplied, the sounds growing weaker and weaker till they die away. In order to produce many sounds, the reflecting plane must be at a considerable distance. At Woodstock there is an echo which repeats about twenty syllables, and the Swiss mountaineers sing their songs, and especially the *Ranz des Vaches*, in such a manner that the echo forms an accompaniment to the air. The number of syllables that an echo will repeat depends of course on the distance of the reflecting surface from the origin of the sound. At the tomb of Metella, in the Campagna, near Rome, there is an echo, which, according to Gassendi, is able to repeat an hexameter line requiring 2½ seconds to utter it. The Echoes of Killarney are celebrated, and also those of some of the Welsh lakes. Near Milan, there is an echo which repeats the report of a pistol sixty times.

Eclectics, *ek-lek'-tiks* (Gr. *eklego*, I choose or select), is a name given to such philosophers as, without attaching themselves to any particular system, or forming one of their own, professed to select from the various existing systems what they believe to be true, and thus to construct a new and complete whole. The name originated with the Alexandrian philosophers, or Neo-Platonists, who professed to gather and unite into one body whatever was true in all the systems of philosophy. The chief representatives of this school are Plotinus, Porphyry, Iamblichus, Proclus, and Clemens Alexandrinus. Modern eclecticism is considered to have taken its rise in the 17th century with Bacon and Des Cartes, but it has recently received a fresh impetus through the labours of the German philosopher Hegel. In the present day the most eminent supporter of this system is Victor Cousin.

Eclipse, *e-klips'* (Gr. *ekleipsis*), in Astron., the entire or partial obscuration of a heavenly body; which may be caused in two ways,—either by another body passing between it and the sun from which it derives its light, as in the case of an eclipse of the moon, when the earth passes between the sun and moon; or by the passage of a body between that which is eclipsed and the earth, as in an eclipse of the sun, when the moon passes between the sun and the earth. The eclipses which happen most commonly from the first-named cause are those of the moon (*see* Lunar Eclipse), the partial eclipse of Jupiter by the passage of one of its satellites between it and the sun, and the eclipses of the satellites of that planet (*see* Jupiter); while those which are occasioned by the second cause are eclipses of the sun by the moon passing between it and the earth (*see* Solar Eclipse), or by Venus or Mercury crossing the sun's disc, or the occultation of a fixed star by the moon. (*See* Mercury, Moon, Venus.) Eclipses of Jupiter and his satellites can also happen through the second cause as well as through the first. Eclipses of the sun and moon, like the appearance of comets, were generally regarded by the ancients as omens of some terrible public calamity that was about to happen; and although the theory of eclipses is said to have been known to the Chinese about 150 B.C., yet to this day the lower orders in China imagine that these phenomena are caused by the attempts of a dragon to devour the sun or moon, and they assemble with drums and other instruments, believing that the noise they make has the effect of alarming the dragon, and preventing him from making his anticipated meal. The first eclipse that is placed on record is one of the moon, observed at Babylon 721 B.C. Thales showed the true cause of lunar eclipses before 600 B.C.; but Calippus was the first who calculated their revolutions, about 275 years later. Among the most remarkable eclipses of the sun that are recorded in history, may be mentioned that which happened at the crucifixion of our Saviour, and those in 1191 and 1715, when the darkness was so great that the birds went to roost, and flowers closed their petals as at nightfall, and the stars shone brightly at midday. The theory of eclipses and the various phenomena that attend them are given in the articles to which reference has been made above, and all technical terms used in the description of an eclipse will be found under their proper headings. (*See* Emersion, Immersion, Penumbra.)

Ecliptic, *e-klip'-tik*, in Astron., the great circle in which the sun appears to move; so called because the moon is always found to be in or near this circle at the time of an eclipse. The plane of the ecliptic has a mean inclination of 23° 30′ to that of the equator. The angle of inclination varies to the extent of 5″ or 6″ in ten years. It is computed that the obliquity of the ecliptic varies between two extreme limits; namely, from 23° 57′ to 22° 54′, and that it takes about 8,500 years to effect the transition from one limit to another. The change in the angle of inclination arises from the attraction that Jupiter, Mars, and the other planets exercise on the earth. The inclination of the ecliptic to the equator is said to have been first measured by Eratosthenes about 250 B.C. The ecliptic is divided into four quadrants or arcs of 90° each by the equinoctial points and solstices. (*See* Equinoxes, Solstices.) These quadrants are subdivided into three arcs of 30° each, which are called the signs of the zodiac (*see* Signs of the Zodiac), and named from the constellations which happened to be found in each when the division of the ecliptic was first made. These do not now coincide, although the names are still preserved. Astronomical calculations are made from that point of intersection of the equator and the ecliptic, which is the position of the sun in the heavens on March 21st, and which is known as the first point of Aries. (*See* Aries.)

Eclogue, *ek-log'* (Gr. *ekloge*, a selection), denotes literally a selection of pieces out of various works, or a collection of the choice pieces of an author; but, from being a name given to the pastoral poems of Virgil, it has since come to be generally applied to that species of poetry. Some imagine the name eclogue to have been originally applied to such poems as were written in imitation of others, and that the eclogues of Virgil were so called as being imitations of the Idyls of Theocritus. The eclogues of Virgil are of various descriptions, only some of them having the true character of pastorals; others contain occasional poems on public and private events of the day, but slightly enveloped in the pastoral costume. The terms eclogue and idyl, in their primary signification, denote the same thing; but custom has made a difference between them, and appropriated the name of eclogue to pieces wherein shepherds are introduced speaking, and idyl to those written in a simple natural style, like the eclogue, but without any shepherds in them.

Ecole Polytechnique, *ai'-kole pol-e-tek'-neek* (Fr. *école*, school; Gr. *polus*, many, *techne*, an art), a military school established in Paris in 1794, under the name of *Ecole Centrale de Travaux Publics*, or central school of public works, for the purpose of educating young men for the profession of arms and civil engi-

neering. The project was originally set on foot by M. Lamblardie, director of the *Ponts et Chaussées*, which are under the control and superintendence of the government in France, and carried out by him with the aid of many eminent Frenchmen of that day. In the course of the following year a more extended course of military study was adopted. The pupils were distinguished by a uniform, and the name of the establishment was changed to the more comprehensive title of *Ecole Polytechnique*, which it still bears, with the addition of the word *Impériale*, added in 1852. It has been frequently closed on account of the active part that the pupils have taken in the revolutions and emeutes that have happened in Paris since the commencement of the present century; but it has always been reopened as soon as order has been restored. Civilians are admitted between the ages of 16 and 20; but soldiers who have served two years in the army are eligible until 25. Pupils have to pass an examination in order to obtain admission. The course of study extends over two years, when those who can pass the final examination are admitted into the engineers, artillery, civil engineers, or any employment of a similar nature under government.

ECONOMY, POLITICAL. (*See* POLITICAL ECONOMY.)

ECORCHÉ, *ai-kor'-shai* (Fr. *écorcher*, to skin or flay, from Lat. *corium*, a hide, or *cortex*, bark), the name given to a figure used by artists in the study of anatomy, in which the muscles are exposed to view by the removal of the outer skin. In parts of the figure the upper muscles are also removed, to exhibit those that lie nearer the bone. These figures are made for the use of artists in plaster or papier mâché. There are also series of drawings which serve the same purpose, and in which the muscles of the human frame are represented from every point of view.

ECSTASY, *eks'-tă-se* (Gr. *ekstasis*, a standing out, change, or transposition), is a condition of mind in which the soul seems as if it were transported out of the body. The varieties of ecstasy are infinite, but they are all marked by an altered or diminished consciousness. The individual may be either completely passive or violently moved, and may or may not have any knowledge of what is going on around him. Sometimes he assumes the air of inspiration. This mental condition may be induced by fixing the mind too exclusively on one idea or object, so as to overlook all other sensations, as in mesmerism and certain forms of disease. It is also known in connection with certain highly religious states of mind. Among many Eastern nations this condition is cultivated as a part of their religion; and even among Christians there have been writers—as Bonaventura, Gerson, and others—who have recommended those contemplations which may lead to ecstasy. People, however, are too apt to mistake the visions of a heated imagination for a higher and nearer view of spiritual things.

ECSTATICS, *eks-tăt'-e-si* (Gr. *ekstatikoi*, from *existemi*, I am entranced), in Ant., were dreamers who were cast into trances or ecstasies, in which they lay as if dead, but who, on recovering their senses, gave strange revelations as to what they had seen and heard.

ECTOZOA, *ek-to-zo'-ă* (Gr. *ektos*, without; *zoon*, living), a term applied to those parasitic animals, such as lice, ticks, &c., which live upon the external parts of other animals. The word is used in contradistinction to *entozoa*. Those entomostracous crustaceans which are parasitic upon fishes belong to the ectozoa. It is a matter of dispute whether these parasites are the cause of disease, or whether they are the result of previous disease.

EDDA, *ed'-dă*, a term applied to several Scandinavian songs, supposed to have been collected and arranged by Sæmund Sigfusson, surnamed Frodi, an Icelandic priest, who was born between 1054 and 1057, and died in 1133. These songs were first discovered and brought to light in 1643, by Brynjolf Swendson, bishop of Skalholt, who gave them the name of *Edda*, or 'grandmother.' There are, however, two works which bear the title,—the "Edda Sæmundar hins Fróda," or the Edda of Sæmund the Wise, and "Snorri Sturleson's Edda." Of these two eddas, the former is the most ancient, the date of its production being usually attributed to a period between the 6th and 8th centuries. The edda of Sæmund the Wise was published entire at Stockholm, in 1818, in 8vo. A complete edition of this edda was also published by Professor Munch, at Christiania, in 1847, and another in 1859, by Möbius. In 1851 a German edition of both eddas was produced by Simrock. Under the title of "Dreizehn Lieder in der Ursprache, mit einer doppelten Uebersetzung, &c.," the brothers Grimm have translated a part of Sæmund's edda. Snorri Sturleson's edda is a prose composition, and treats especially of Scandinavian mythology, and also of the language and literature of the ancient Scalds. In the first, or poetical edda, the detached poems attempt to shadow forth a religious system. Many of the poems have evidently been written before the introduction of Christianity; but the collection was probably made after the Christian era. The belief in the destruction of the world is apparently derived from Christian sources; and in the very beginning of the edda the germs of one all-destroying catastrophe are presented, which involves not only the destruction of the universe, but also holds out the promise of a resurrection and a happier existence in an abode of bliss. The elder edda consists of thirty-seven poems of various degrees of poetical merit, all relating to Scandinavian mythology. The later edda is divided into two books,—"Gylfaginning," the Fascination of Gylfa, a story similar to that of "Thrudnismal," in the elder edda. The second part of the later edda is called "Bragarsedhur," or the Discourse of Bragi, borrowed from the "Oegirsdrecka," or the Drinking-feast of Oegir. In this part, Bragi, the Scald of the Gods, discourses upon the origin of poetry. (*See* SCANDINAVIAN MYTHOLOGY.)

EDDY, *ed'-de* (Ang.-Sax.), a circular motion of the water, either in rivers or in the sea, but most frequently in the former. Eddies exist between the proper and the counter currents: they are caused by the edges of the one brushing against the other, or by a current running violently against a rock or an elevated shore, and in its recoil meeting some other object of impediment to its course; thus producing a circular motion of the water: the latter kind are often called whirlpools (*which see*).

EDDYSTONE LIGHTHOUSE, *ed'-de-stn*, a lighthouse in the English Channel, raised on a dangerous group of rocks that lie to the S.S.W. of Plymouth, and about 14 miles from the Breakwater, in *lat.* 50° 10' 54" N., and *lon.* 4° 15' 53" W. The lighthouse stands on the west side of the group. The Eddystone rocks were found so dangerous to homeward-bound vessels making for Plymouth harbour, that, in 1696, the Trinity Board resolved to erect a beacon on them. Mr. Winstanley, a gentleman of Essex and an ingenious mechanic, undertook the task, and in 1700 he had completed his building, a wooden structure on a stone base, and polygonal in form, which was swept from the rock in a terrific storm, Nov. 27, 1703, while the architect himself was there superintending some repairs. The next was commenced by Mr. Rudyard, a silk mercer, in 1706, and finished in 1709. It was circular in form, and, like Mr. Winstanley's, made of wood on a stone base, but 6 feet lower than his in height, being 92 feet in all. It stood uninjured by the weather until 1755, when it was destroyed by fire. In 1757 Mr. Smeaton commenced the present lighthouse, the base of which is formed of solid blocks of granite, dovetailed and clamped by irons to the rocks below and to each other; a solid bed of masonry is thus raised 13 feet above the highest point of the rock; here a passage is formed communicating with a circular stone staircase, which affords access to the lowest of the four chambers that are formed in the upper part of the building: the whole is surmounted by a lantern 24 feet in height, surrounded by a gallery. The tower is circular, being about 27 feet in diameter at highwater mark, and diminishing to 15 feet at the summit. It is 85 feet in height, including the lantern. Mr. Smeaton is said to have derived the idea of its form from that of the trunk of an oak-tree. The upper part was originally made of wood, but it was burnt in 1770, and reconstructed of stone in 1774. The light is fixed, and may be seen shining over the waters at the distance of thirteen or fourteen miles.

EDENTATA, *e-den-tai'-tă* (Lat., toothless), an order of mammalia characterized by the absence of incisive teeth in their jaws, and the length of their claws. With regard to the incisors, however, there is an ex-

ception to the rule in the case of the armadillo (*Dasypus setosus*), in which a single tooth is found in each intermaxillary bone, but placed so completely at the sides of these bones, that the front of the mouth is quite destitute of teeth. Cuvier observes, that, "although brought together by a purely negative character, the edentata have, nevertheless, some positive mutual relations, particularly in the great claws which encompass the ends of their toes, and which more or less approximate to the nature of hoofs; also in a certain slowness, or want of agility, obviously arising from the peculiar organization of their limbs." The number of existing edentata is not nearly so great nor so gigantic in size as at a remote period of the world's history, as the remains of these gigantic herbivora, the *mylodon*, *megatherium*, and the *megalonyx* testify.

EDICT, *e'-dikt* (Lat. *edico*, I proclaim or publish), is something that is given forth, or proclaimed, by competent authority, as a rule of action, more particularly an order, or ordinance, issued by a prince to his subjects, to serve as a law. Strictly speaking, or in this latter sense, edicts cannot exist in Britain, as the enacting of law is not lodged in the king, but in the parliament. In ancient Rome, the ordinances of the magistrates, but particularly of the two prætors, were called edicts. From the uncertainty of the law at that early period, it was the custom of the prætors, on their accession to office, to publish edicts, or rules, for regulating the practice of their courts, and the governors of the provinces had the same authority in their districts as the prætors in the city. The edicts of a preceding prætor were not binding upon his successor, unless he confirmed them; in which case they were styled *edicta vetera*, or *tralatitii*, in contradistinction to those issued by himself, which were called *edicta nova*. By the Cornelian law (B.C. 50), the prætor of the year was compelled to adhere to the spirit and letter of his first proclamation. In the reign of Hadrian, the prætor Salvius Julianus, an eminent lawyer, made a digest of the best of the prætorial edicts from the earliest times, which was ratified by the emperor and senate, and ordained to be always considered as law. By this *edictum perpetuum*, or perpetual edict, the standard of civil jurisprudence was at length fixed. From that time the power of making edicts was taken from the magistrates, and vested in the emperors. The celebrated edict of Milan was issued by the emperor Constantine after the conquest of Italy (A.D. 313), and granted to the Christians and others full liberty in the exercise of their religious duties. The edict of Nantes was issued by Henry IV. of France in 1598, granting religious freedom to his Protestant subjects, but was revoked by Louis XIV. in 1685. In France, the term edict (*édit*) has a very wide signification, being applied to every proclamation of the government, of whatever kind.

EDICTAL CITATION, *e-dik'-tal*, by the law of Scotland, is the mode of citing before a civil court, one who has no fixed domicile in the country, and cannot be cited personally,—a foreigner, or one who is abroad. Formerly, in such a case, the citation was published at the market-cross of Edinburgh, and pier and shore of Leith; but by 6 Geo. IV. c. 120, and 15 & 16 Vict. c. 36, this is now done by the delivery of copies at the office of Edictal Citations in the Register-house, Edinburgh, where they are preserved for three years, and abstracts of them published every fortnight.

EDINBURGH REVIEW. (*See* REVIEWS.)

EDINBURGH UNIVERSITY was founded in 1582 by royal charter, granted by James VI.; and hence it is styled "Academia Jacobi Regis," "King James's College," and "King's College." The lord provost, magistrates, and town council of Edinburgh, were constituted patrons and governors of the university. In 1621 an act was passed by the Scottish parliament which ratified to this university, in ample form, all the rights, immunities, and privileges enjoyed by the other universities in the kingdom; and this ratification was renewed in the treaty of union between England and Scotland, and in the Act of Security. In the beginning of the 17th century, the business of the university was conducted by a principal, who was also the professor of theology, and four regents, who conducted the youth through the course of study necessary to obtaining a degree in arts. Each regent conducted his students





through the entire course, teaching them in succession logic, ethics, and physics, with the kindred literary and mathematical studies. In 1642 the chair of Hebrew was instituted, in 1674 that of mathematics, in 1690 that of Greek, and in 1696 that of church history. In 1708 the present professorial arrangement in the faculty of arts was substituted for the previous regent-tutors system. The first professor of medicine was appointed in 1685; and in 1707 the foundation of the faculty of law was laid by the institution of a chair of public law, followed in a few years by chairs of civil and Scotch law. Since that time a number of new chairs have been added to all the faculties. From its foundation, in 1582, until 1858, the government of the university was in the hands of the magistrates and town council of Edinburgh; but it was taken from them by an act of parliament in 1858, and placed in the Senatus Academicus and the University Court, in connection with a general university council. The patronage of those chairs, which had been previously in the gift of the town council, was by the same act transferred to seven curators,—three nominated by the University Court and four by the town council, and hold office for three years. The offices of chancellor, vice-chancellor, and rector were also instituted. The chancellor is the official head of the university, is elected by the general council, and holds office for life. The vice-chancellor is nominated by the chancellor, and performs his duties in his absence. The rector is elected by a general poll of the matriculated students of the university. He is president of the University Court, and holds office for three years. The University Court is composed of the rector, principal, the lord-provost of Edinburgh for the time being, and five assessors, elected respectively by the chancellor, the rector, the town council of Edinburgh, the general council, and the senatus. The rector and his assessor continue in office for three years, the other assessors for four. It constitutes the court of appeal from the Senatus Academicus, and has the power to effect improvements in the internal arrangements of the university, after due consideration with the senatus and council, and with the sanction of the chancellor. The principal is resident head of the college and president of the senatus. He is appointed by the curators, and holds office for life. The principal and professors constitute the Senatus Academicus, which is intrusted with the superintendence and regulation of the teaching and discipline of the university, and with the administration of its revenues and property. The general council of the university consists of the chancellor, rector, and other members of the University Court, the principal and professors, masters of arts of the university, doctors of medicine of the university who have, as matriculated students, attended classes in any of the faculties for four complete sessions, and all who have established, within three years of the passing of the Universities Act (2nd August, 1858), that they had attended the university as matriculated students for four sessions, or three sessions and a fourth in some other Scottish university. The number of members of the general council at present (1862) is 2,279. They meet twice a year, in April and October, to take into consideration all questions affecting the well-being and prosperity of the university, their decisions being represented to the University Court, who are to return a judgment thereon. The chairs of the university are comprehended in the four faculties, the affairs of each faculty being superintended by a dean, who is elected by the professors of the faculty. The faculty of arts comprehends the chairs of humanity, Greek, mathematics, logic and metaphysics, moral philosophy, natural philosophy and rhetoric, and English literature; also universal history, practical astronomy, agriculture, music, and Sanskrit; attendance on the first seven of which is required for the degree of master of arts. The faculty of theology has chairs of divinity, Hebrew, ecclesiastical history, and biblical criticism and antiquities. The faculty of law has chairs of public law, civil or Roman law, and conveyancing. The medical faculty comprehends chairs of botany, institutes of medicine, practice of physic, anatomy, chemistry, midwifery, natural history, materia medica, clinical surgery, medical jurisprudence, surgery, and general pathology. There are two sessions in the year,—the winter session, which opens in the beginning of November and ends with April, and

the summer session, which opens in the beginning of May and ends with July, the latter being almost entirely confined to the medical classes. The ordinary course of study necessary for the degree of M.A. extends over four winter sessions; and candidates for that degree must be examined on all the seven subjects of instruction embraced in the above course of study; and the examinations may be conducted partly in writing and partly *viva voce*. Students who have passed satisfactorily the examinations for M.A. may, before taking the degree, offer themselves for a further examination, with a view to graduation with honours. There are four departments for honours; viz., classical literature, mental philosophy, mathematics, and natural science, in any one or more of which students may present themselves for examination. Each student has to pay annually a matriculation fee of £1. 1*s.*; and the fees for each class per session vary from £2. 2*s.* to £4. 4*s.* A fee of £3. 3*s.* is payable for the examinations for M.A. There are three medical degrees conferred by the university; viz., bachelor of medicine (M.B.), master in surgery (C.M.), and doctor of medicine (M.D.). No one is admitted to the degree of M.B. or C.M. who has not been engaged in medical and surgical studies for four years, one of which must be at the university of Edinburgh. He must produce certificates of having attended certain classes, and the medical and surgical practice of a general hospital; and he is also subjected to examination, both in writing and *viva voce*, on the various branches of study. The degree of M.D. may be conferred on any candidate who has obtained the degree of M.B., and is of the age of 24, provided he has been engaged for at least two years in attendance on an hospital, or in practice. The degrees of D.D. and LL.D. are honorary distinctions. The professors of humanity, Greek, mathematics, natural philosophy, chemistry, and music, have each an assistant, the first four having salaries of £100 each, the last two of £200 each. Conjoined with the professors as examiners for degrees, are three examiners in arts and three in medicine. The total number of scholarships and bursaries connected with the university is 112, and the annual value is about £1,800. They are mostly for the faculties of arts and theology, are generally of small amount, and in the patronage of the senatus, town council, or of private individuals. The total numbers of students in the winter session of 1861-62 was 1,427; being in arts 618, medicine 516, law 202, theology 91. The university library contains about 130,000 printed volumes, and above 700 MSS., many of which are of great interest and value. It originated in a bequest of about 300 volumes in 1580, and was subsequently largely augmented by donations from various persons; among others by the celebrated Drummond of Hawthornden, who bequeathed his library to it. It was formerly entitled to a copy of every book entered in Stationers' Hall, in lieu of which privilege it now receives a sum of £575 per annum. The museum of natural history was established in 1812, —a great part of it having been collected by the exertions of the late Professor Jameson. It receives a government grant of £200 per annum. The anatomical museum was founded in 1800 by Dr. Monro *Secundus*, who presented his own anatomical collection and that of his father to the university, for the purpose of "demonstrating to the students the structure, physiology, and diseases of the human body." The Royal Botanic Garden in connection with the university was founded in 1670, and extends to seventeen acres, having an extensive range of greenhouses and hothouses, with a large palm-house. There are also several private museums or collections in connection with some of the classes.—Ref. *Edinburgh University Calendar*, 1862.

EDITION, *e-dish'-un* (Lat. *edo*, I give out or publish), is the number of copies of a work that are printed at one time before the types are again taken down by the compositor. The number of copies of a work that may constitute an edition are hence very various, depending in a great measure upon the sale which it is expected to have, and varying from a few hundreds to many thousands. It is, however, of less consequence now than formerly to determine the exact number of copies that ought to be thrown off in one edition, as it is usual now, in any work that is expected to have a large or continued sale, to get it





stereotyped, and to print copies as may be required from the stereotype plates. In a bibliographical point of view, some editions of books are much more valuable than others. Generally speaking, the last edition of an author's work is the best, as containing his latest improvements; but in some cases circumstances give a greater value to earlier editions, or sometimes the first. Sometimes a book acquires its chief value from the editor, or even from the publisher; as Bentley's Horace, or the Aldine Classics. (*See* BIBLIOGRAPHY, BOOK-TRADE.)

EDITOR, *e'-it-or* (Lat. *edo*, I publish), is one who edits or prepares for publication the writings of another. We may distinguish two classes of editors;—1. those whose object is merely to reproduce the works of another in their purity, and content themselves with adding notes or commentaries to the text; and 2. those who have the general superintendence of some large literary work, encyclopædia, magazine, newspaper, or the like, receiving contributions from various persons, which they may have to correct, cut down, supplement, or reject, according to their character and the general plan of the work. In the former case the editor requires to be a man of great learning, taste, judgment, and exactness, and to have a full appreciation of his author, having to collate critically of the various readings, to explain the obscure passages, supply omissions and references, and generally to present his author in the most pure and favourable light to the public. In the latter case the qualifications require to be of a much more general and varied kind. Here a full and comprehensive view of the whole work is required, as well as an acquaintance with all its minor details, and the bearings of each upon the whole. Generally, a minute and accurate knowledge is necessary on a vast variety of subjects, and a readiness and full command over them, so as at once to be able to bring them to bear upon any particular point.

EDUCATION, *ed-u-kai'-shun* (in Lat. *educatio* is derived from the verb *educo*, I lead, or bring out or forth). The Latins used the word not only in relation to man, but also to the lower animals, and even to plants. To educate was to cultivate or bring out their various properties. With us, the term is properly confined to the human species, as being alone capable of education in any high or proper sense of the word. Man, says Kant (*Ueber Erziehung*), is the only creature capable of education. The lower animals require, at most, only nourishment and protection to enable them to reach their proper condition, and to perform all the functions of their nature; but man is possessed of powers and faculties indefinitely perfectible, and which require to be trained and directed by others; otherwise they may be useless, if not absolutely injurious. In this way has Providence wisely provided for the progress of the human race. While the lower animals of to-day are not a whit more advanced than when they were originally created, man has been gradually progressing towards a higher and more perfect state of development, and that exactly in proportion as the true principles of his nature were understood and acted upon. Each generation profits by the learning and experience of those that preceded it, and in like manner transmits its knowledge to its successors. Education, in its most extended sense, then, has to do with the progress of the human race towards a more perfect state of development. It marks its gradual advancement from the earliest dawn of history to the present time, observing the various circumstances that may have tended to promote or retard its progress, and seeks to gather from the whole instruction for the present or lessons for the future. In a more limited sense, education regards man as an individual destined for a future and higher state of existence, for which his entire life in this world is merely a preparatory training. In this sense a man is educated, either for good or evil, by everything which he experiences, from the cradle to the grave. In a still narrower sense, the term is applied to the training which one receives in childhood and early youth, in order to fit him for a proper discharge of his duties in after-life. This is, in many respects, the most important period of life. The mind of the individual is then most susceptible of impressions, which are at the same time the most lasting; and, generally speaking,

the training which he then receives marks his character through life. While we shall be obliged, in the present article, to confine our attention to the last of these, as embracing the most important period of life as regards education; yet it is only by keeping in view that our entire life here is but a preparation for another and a higher state of existence, and that all our training must be directed to that object, that we can arrive at clear and correct notions respecting it. Education, then, we would define to be the full and harmonious development of all the powers and capacities of man,—*full*, that is, each to the highest point of which it is capable; and *harmonious*, each in complete unison with all the rest. In other words, it is the bringing of his entire nature into the highest state of perfection of which it is susceptible; for, in the words of Milton, the end of education is "to repair the ruins of our first parents,"—to restore harmony and beauty and power to that system which was ruined by the Fall. It is a common error to confound education with instruction, and much misunderstanding is the consequence. There can be indeed no education without some instruction, but there may be a great amount of instruction with very little education. The best educated man is not he that *knows* most, but he that *can do* most. Bacon has well said that men are apt to set too high a value upon their acquirements and to underrate their faculties. It is impossible, from the nature of the present work, that we can traverse the vast field that the subject of education opens up to us, or notice the numerous important questions that are connected with it; and perhaps we shall best employ our space by noticing some of the more important points which are as yet but little understood or acted upon. In order to educate a human being, it is first of all necessary to know something of the nature of that being; for education can be right or true only in proportion as it is based upon a knowledge of that nature, and of the laws to which it is subject. Until a knowledge of human nature is more generally diffused and acted upon, we have little hope for any great progress in education. Man is not only subject to certain laws regulating his growth and determining his condition, but he is also possessed of a variety of faculties, differing greatly in their nature and character, having different periods of development, and requiring different modes of treatment. It is only by extending our knowledge of these, that we can expect to arrive at a true system of education, which has for its object their full and harmonious development. The true educator carefully observes the workings of Nature, and pursues the course that she indicates, aiding her in her operations, and, it may be, occasionally gently bending her to his ends, but never directly opposing or thwarting her, for he knows that she ever worketh wisely and well. Man, then, is possessed of a twofold nature,—a spiritual and a material; the one partaking of the nature of spirit, the other subject to the laws of matter. "The soul is that side of our nature which is in relation with the Infinite." "By this immortal soul," says Dr. Carpenter, in his *Human Physiology*, "man is connected with that higher order of being in which Intelligence exists, unrestrained in its exercise by the imperfections of that corporeal mechanism through which it here operates." It is unnecessary for our present purpose to attempt to speculate as to the nature of either spirit or matter apart and by itself. In man we have to do with the two inseparable connection; and it is only with man that education concerns itself. But not only are the two inseparably connected, but there is every reason to believe them to be inseparably present in every act. Physiologists, indeed, tell us, that as every movement of any part of the body causes destruction to a portion of the tissues of that part, so, in like manner, every thought that passes through the mind causes destruction to a portion of the nerve-matter of the brain. Thus every thought of the mind partakes of the material as well as the spiritual; and every movement of the body of the spiritual as well as the material. This is of importance to bear in mind; for we constantly hear people speaking of mental acts and physical acts, as if the two were distinct and separate, and not intimately connected the one with the other. In fact, the whole





tendency of science in the present day is to break up man into pieces, viewing him as distinct and separate parts, instead of one beautiful and united whole. We believe that not only are spirit and matter inseparably connected in man, but that the former is everywhere limited by the latter; that the body is, in fact, the prison-house of the soul. Not only is there every reason to believe this to be the case from what is generally regarded as the nature of spirit, but we cannot otherwise account for the *pari passu* growth of the mind with the body,—its feebleness in childhood, its strength in manhood, and its decay in old age. Our rational soul, says Hippocrates, is always the same throughout the whole course of our life,—in youth and in age, when we are children and grown men; but the body, on the contrary, never continues in one state, but is constantly changing. It is only by bearing in mind the intimate connection that subsists between body and spirit, and the dependence of the latter upon the former for its manifestations, that we are able to explain many of the mental phenomena; and hence, too, we in many cases obtain a clue how to proceed in education. We thus come to know that the body and spirit in man are not two distinct and opposing elements, the one being improved and strengthened as the other is weakened and depressed. The two are indissolubly united,—the spirit giving life to the body, the body giving direction and form to the mind. And not only so, but our physical nature plays a much more important part in the animal economy than is generally believed or acted upon in education. The brain, which is the organ of the mind, is a part of our physical constitution, subject to physical laws, to disease and decay, requiring exercise to develop it, and a due supply of arterial blood to maintain it in a state of health. To the educator, too, it is important to know that he is not, in the performance of his duties, dealing with incomprehensible spirit moving in another sphere, and the laws of whose operations it is impossible for him to divine; but that the spirit is strictly limited, and subject to the laws of matter; that it is in obedience to these laws that its operations are carried on, and that, however mysterious some of its workings may seem to be, they are all the result of causes which he ought to strive to find out. We see further here a valuable provision for the gradual improvement of the human race. It is well known that mental as well as physical qualities are transmitted from parents to children, however inexplicable the laws by which it is regulated may be at present, or how many apparent exceptions may occur. In our view, the general fact is explained by the physical character of the mind's organ; that, as the outward physical form is transmitted from parents to children, so is the physical character of the brain; and the man who has fought the good fight against his evil affections and lusts, and has kept the faith with his better nature, not only enjoys the fruits thereof himself, but may have the satisfaction of knowing that he may thereby be transmitting to his posterity the most valuable of all inheritances. "In order," says Sir B. Brodie, "to make the most of the intellectual powers, the animal system should be maintained in a state as nearly as possible approaching perfect health." "The state of mind, whether as regards the moral or the intellectual, is, to a very great extent, subjected to the influence of physical causes." But not only does this show the primary importance of physical health in education, but it leads us to look for the like laws governing the mind as we know to govern the body. The great law in education, mental or physical, is *exercise*. If we want to develop a muscle, we exercise it; if we want to improve a faculty, we must, in like manner, exercise it. In the one case, as in the other, the exercise must be proportioned to the strength of the individual, and every period of exercise should be succeeded by a time of rest. It is now the generally received opinion among philosophers and men of science, that different faculties of the mind have different portions of the brain for their organs; and hence it is that the mind, when tired of one subject, can turn with fresh vigour to another, in the same way as one tired with walking may sit down to some manual occupation. We would, however, caution against the error of passing at once

from one kind of violent or protracted exercise to another; more particularly from severe mental to great physical exertion, or *vice versâ*. The exercise of any part of the body causes an increased flow of nutritious blood to that part; and this continues for some time after the exercise has ceased, to supply the waste that has taken place; and hence to withdraw the blood at once in another direction by exercising other organs of the body, interferes with the regular course of nature, and deprives the wasted part of its due nourishment. But while the two elements of man's nature are concerned in every act, some partake more of the one and others of the other; and hence we have the common division of them into physical and mental acts, the former comprising the outward acts of the body, the latter mental thought and feeling; according to which we have a twofold division of education, into physical and mental. Of physical education, which deals with the proper development of the physical powers, it will not be necessary to say much. It is, indeed, a subject of the utmost importance, and entitled to much more attention than it has yet received, as it is not only upon it that the health of the body mainly depends, but it is by it that the body is made the ready, willing, and obedient servant of the mind. Its object ought to be to impart strength, dignity, and grace to every movement of the body. The value of correct habits formed in early life, whether they may be useful accomplishments, a graceful deportment, correctness of pronunciation, or any kind of manual dexterity, continues to be felt throughout the course of one's life. As a means of physical education, Ling's, or the Swedish, system of gymnastics is much superior to any other. It is not only founded on strictly physiological principles, but the attention of the pupil is excited and kept alive by his constantly receiving direction from the teacher as to the different movements that he is to perform; and thus it is in some measure a mental as well as a physical exercise. It is also free from that violent exertion that characterizes the other systems of gymnastics. Mental education has to do with the mind of man, and ought to be based upon a knowledge of that portion of his nature. The mind is that which feels, thinks, and acts, or is characterized by feeling, thought, and action. The first of these comprises not only those feelings and impressions that are communicated through the senses, but also the emotions and moral feelings, and generally all such as arise from states of the mind itself. In thought, the mind turns itself in upon those feelings, reasons of them, judges of them, arranges and compares them. In the last of these we have the active principles of the mind, or those that propel it into action; as the desires and the will. There are two kinds of actions; either passing outwards through the body, or inwards, directing the thoughts, calling up ideas, and forming conceptions. Here again we would caution against the error of regarding the mind as consisting of distinct and independent faculties, and not as one entire and united whole. "All our intellectual processes so completely interpenetrate each other, that it is impossible to separate them into distinct faculties and assign provinces to each."—(Morell's *Psychology*.) Feeling, thought, and action, therefore, are only different manifestations of the same active principle, and ought properly to go together. One of the great errors of the present systems is, that they are kept too much apart. Feelings are not so cultivated as to improve thought; and thought too frequently terminates in itself, without going out into action. The proper object of all thought and feeling is action, which is the great end of life. "A rigorous separation of the speculative from the practical," says Professor Fraser, the successor of Sir W. Hamilton in the chair of philosophy in Edinburgh, "is apt, by causing a disruption of the complex nature of man . . . to occasion weakness and vacillation in the conduct of life." Men fail not so much from not knowing what is right, as from not acting up to their knowledge.—(*See* especially on this subject Foster's admirable essay on *Decision of Character*.) One great means of imparting decision of character to children is to teach them unquestioningly and unhesitatingly to obey. Further, we believe that if people were true to their feelings, they would generally be found to act much more wisely on the spur of



the moment than after mature consideration; not from acting blindly, but from following a truer guide than reason. But to explain this will lead to another important question connected with the phenomena of mind,—that is, to what extent are we conscious of the operations of the mind? This is a question that has not hitherto received much attention in this country. The doctrine of unconscious perception, or latent thought, originated with Leibnitz, and from him has passed into the principal philosophical systems of modern Germany. It has received various names; as, latent or ultra-conscious thought, unconscious cerebration, reflex action of the brain, &c. This doctrine may be illustrated in many ways. A man, after puzzling over a difficult problem for a long time, and, unable to solve it, turns his attention to something else, and after a time, on returning to it again, he finds it all arranged and plain before him, although he is quite unconscious of having once thought of it in the interval. Certain conditions of the atmosphere produce lightness or depression of spirits, by means of impressions of which we are insensible; and the unpleasant dreams which result from indigestion are to be attributed to the same cause. We know, too, that beyond consciousness, there exist in the mind tems of knowledge of which we are wholly uncon- is in ordinary states, and which are only reveal- on extraordinary occasions; as delirium, madness, somnambulism, &c. Within this unexplored region exist the instincts and intuitions of our nature,—those innate principles of morality and beauty which seem to us so incomprehensible, guided and directed, it may be, by feelings of pleasure and pain. "There is a latent intelligence within us which works teleologically, apart from will, feeling, sensation, or any kind of consciousness whatever."—(*Morell*.) "I do not hesitate to maintain," says Sir William Hamilton, "that what we are conscious of is constructed out of what we are not conscious of; that our whole knowledge is in fact made up of the unknown and incognizable." It seems as if the mind might be compared to a dark cavern, into which consciousness, like a light at the mouth, permits us only to look a little way. In the dark and unknown region beyond are stored up all our knowledge and all our experience; and here are carried on those wonderful mental processes which are only known to us by their results. The highest and most perfect of the mental operations are instinctive or unconscious. Genius in its higher forms is of this kind, being moved and guided by inner impulses little accountable to reason. Genius had spontaneously produced great works before rules of criticism could be laid down; and her greatest works still are but little indebted to such helps. "What," says Gothe, in speaking of his works, "is in such cases termed invention, was with me spontaneous" ("Ich habe nie über das Denken gedacht"). "We observe with confidence," says Carlyle, "that the truly strong mind, view it as intellect, as morality, or under any other aspect, is nowise the mind acquainted with its strength; that here, as before, the sign of health is unconsciousness." "Here (underneath the region of consciousness), in its quiet mysterious depths, dwells what vital force is in us;—here, if aught is to be created, and not merely manufactured and communicated, must the work go on. Manufacture is intelligible, but trivial; creation is great, and cannot be understood." And this is true of the moral as well as the intellectual powers, the highest morality being also instinctive; for, as he says, "had we never sinned, we should have had no conscience." Policemen are necessary where rogues exist; but, were society perfect, there would be no rogues, and no need for policemen. Further, not only are the highest acts of the mind instinctive, but the tendency of all mental acts is to become so by practice. Acts of which the mind was at first painfully conscious, become gradually less so, until at length they may be performed quite unconsciously. Were educators to perceive and act upon the principle that there is in human nature something above and beyond reason, their labours would be crowned with more success,—more especially as it is during the earliest period of life that our instincts are most active and most susceptible of improvement. Everything ought then to be done to strengthen and fructify the

primary instincts of the child. If we observe nature, we shall find that early childhood is pre-eminently the time for imbibing knowledge. Who can estimate the amount of knowledge that a child acquires during the first few years of its life,—without effort, without instruction, without anything but by the spontaneous workings of its own mind? This knowledge, however, is entirely objective, being acquired from nature and life around it. This, then, is the period for perceptive teaching,—for storing the mind with objective knowledge. But during this time the child is not content with being merely the recipient of knowledge: true to its instincts, it soon begins to reproduce what it has acquired,—to imitate what it sees and hears, and to express what it feels. The power of seizing vivid ideas of things,—of combining, associating, and connecting them with the appropriate words or signs, is now in the highest state of intensity. Nature, therefore, shows that in education "our principal aim at this time of life should be to furnish nutriment for the growth and expansion of the powers of inward representation; that is, for strengthening the memory, training and regulating the imagination, giving full play to the laws of association, and producing the capacity of expressing ideas in clear, luminous, correct, and copious language. All these habits of mind can generally be acquired with great facility at this time of life; but, if neglected *now*, so difficult does the process of their education afterwards become, that it is a thousand chances to one whether they will ever be acquired to any degree of perfection at all."—(*Morell.*) As the reasoning faculties become more advanced and mature, these powers gradually degenerate. It is, therefore, of the greatest importance, not only that they be improved to the utmost during this period of life, but that nothing should be done to abridge it by prematurely developing the reasoning faculties. Unfortunately, however, this is the tendency of much of the teaching of the present day. The teacher, not content with receiving a correct answer to a question, must also have the reason why it is so. The less the child has to do with giving or receiving reasons at this time the better. Direct teaching is the best, and rules, or the application of them, should be as little resorted to as possible. Still more reprehensible is the practice of presenting to the child's mind both the right and the wrong at the same time; or, after receiving a correct answer, asking if he is sure it is not something else. It not only tends to loosen its hold in the child's mind, but to make him doubtful of his knowledge. "Spoil not," says Dr. Andrew Fuller, "thy memory by suspecting it. How canst thou find that true which thou wilt not trust." As in morals, the greatest injury you can do an innocent child is to suspect him; so in teaching, you cannot do a greater injury to a scholar than to make him suspect his knowledge. In questioning a boy, so as to bring out his knowledge, care ought to be taken to follow only the natural order. If questioned on the subject of his reading, the questions should follow the order in which it was read, and not taken at random throughout the lesson, or, as is sometimes done, by proceeding from the end to the beginning. This is of more importance than it may at first seem; for there are certain laws of the mind, commonly known as the laws of association, according to which things are stored up in the memory and reproduced. One of these is, that things are reproduced in the order and with the associations that they were received, and an habitual departure from this order is destructive of one of the finest and most important laws of mind. It is in this way that one comes to acquire the style and modes of thought of another, the thoughts flowing naturally in the same way, the ideas suggesting each other in the like order. In every process of thought or course of reasoning there is a certain natural order in which the ideas suggest and follow each other; and any interference with this order tends to introduce confusion,—thoughts springing up that are not directly wanted, and the mind becoming crowded with irrelevant matters. As in any mechanical operation, the work goes on best when the materials are brought to hand as and in the order that they are required; so in mental operations, the mind acts best when the thoughts and words are brought before it exactly in the order that they are needed,—





when it is given them at the proper time what they shall say; and if people would give more heed to the instinctive portion of their nature, they would find that its workings were much more true and reliable than any resulting from reason. Reason is but to be regarded as supplementary to that higher portion of our nature,—intuition. In the words of an old philosophical divine, whose works are by no means so well known as they deserve, "Intuition is by far the most perfect and excellent way of knowledge." "Our intuition here, however, is so short-sighted, that if we knew no more than we can thus attain to, we should not have sight enough to direct us in our journey through the world; so that our feeble eye is assisted with the glass of reason,—naturally, indeed, a very good prospective, but which logic, and especially algebra, has improved into a telescope. Still it is but an artificial way of seeing, and all art supposes and argues a defect in nature;" but "hereafter we shall be so far from needing any logic to direct us in our reasoning, that we shall have but little need or use even of reason itself."—(Norris's *Reason and Faith.*) But reason is given to us, and is necessary for us here, and therefore requires cultivation. Though not the highest faculty of our nature, it is the most practical, and that which has the closest bearing upon the occupations and duties of life. It is defined by J. D. Morell to be "the *co-ordinating power* in relation to all our other intellectual processes,—as that which gives unity and solidarity to them, aiding us at once in the pursuit of truth, and in adapting our lives to the state of things in which we exist."—(*Psychology.*) This faculty deals with the general and the abstract; separates our knowledge into definite parts; arranges, classifies, and embodies it in accurate terms; expands it into formal propositions, and draws conclusions from one proposition to another. As the mental powers become somewhat mature, then the main portion of our intellectual education should be directed to the regulation and development of this faculty by means of the higher branches of study,—logic, mathematics, science, and philosophy. We have said little of the means of education, of what is to be taught, and the order in which it ought to be communicated; but this is the less necessary, as those who shall have intelligently followed us in the above remarks will be able in some measure to judge for themselves on these points. The great thing in each case is to follow Nature, pursuing the course that she points out; and, as a general rule, the order of the progress of the race is the order that ought to be followed in the education of the individual members of it. We may mention that Dr. Neil Arnot has, in his *Survey of Human Progress*, given a sketch of the various branches of knowledge in relation to education. In fine, then, the object of education is the full and harmonious development of all our faculties; the bringing our entire nature, physical, moral, and intellectual, into the highest state of perfection of which it is capable. Who can tell how high that is? So far as our present knowledge or experience goes, it is indefinitely perfectible. However much we may see the physical, moral, and intellectual parts of man apart now, they are each and all necessary, in their respective spheres, to constitute a perfect man, whom we believe to be a thing of beauty, physically, morally, and intellectually. God has not in vain instilled principles of beauty into the mind of man; and according to a fine expression of Kant's, which, however, is but an adaptation of one of the sublimest doctrines of the Platonic philosophy,—that of *ideas*, there is in every man's mind the ideal of a perfect man. Beauty and goodness always go together; the one produces the other. A man's character is generally impressed upon his countenance; and hence there was truth, as well as wit, in Sidney Smith's remark of a man having all the ten commandments written on his forehead. The culture of the moral feelings gives a benignant and loveable expression to the countenance; intellectuality stamps itself principally upon the forehead; while the general admiration which a fine figure and manly bearing naturally excite, show that physical education must also play an important part in the forming of our perfect man. (*See* NATIONAL EDUCATION, PEDAGOGY, SCHOOLS, UNIVERSITIES.)

EDUCATION, MILITARY.—This term may be equally applied to the education given to candidates for com-

missions in the army, as well as to officers who have already served, or to the system adopted by government to afford instruction to soldiers and their children. Instruction in all the subjects most necessary for an officer to become acquainted with, combined with strict military discipline, is given to cadets or youths from 16 to 19 years of age at entrance, at the Cadets' College, Sandhurst; the Royal India Military College, Addiscombe; and the Royal Military Academy, Woolwich. (*See* CADET, MILITARY; MILITARY SCHOOLS.) A college was also established at Richmond, known as Cavalry College, in 1857, under private control, to afford a fitting education to youths about to enter that branch of the service. Officers are able to render themselves eligible for staff appointments at Sandhurst under recent regulations. (*See* STAFF COLLEGE.) The sons of deceased soldiers are brought up and educated at the Royal Military Asylum, Chelsea, better known as the Duke of York's School, as many being admitted annually, by selection, as the vacancies that occur and the resources of the establishment will allow. On leaving, they either enter the army, or are apprenticed to learn some trade. For the improvement of the soldier, schoolmasters are attached to each regiment, and stationed at the various camps and depôts; and instruction is regularly given in the elementary branches of knowledge to such as desire it, combined with lectures on various scientific subjects. (*See* REGIMENTAL SCHOOLS.)

EDULCORATION, *e-dul-ko-ra'-shun* (Fr. *édulcorer*, to sweeten, purify).—In Chem., edulcoration is the working of precipitates after filtration, to free them from any excess of precipitant or supernatant fluid. It is generally performed by means of a bottle containing two tubes, one drawn to a fine point and reaching to the bottom of the bottle, the other only entering the cork a few inches. By blowing down the latter tube, the water is forced out of the former in a fine stream.

EEL, *eel* (Sax. *el*) a fam. of fishes (*Anguilla*), belonging to the apodal section of the *Malacopterous*. Their long and cylindrical bodies are covered by a thick and soft skin, in which the scales are so deeply imbedded as to be scarcely apparent. The gill orifices are very small, and are situated far back; so that there is a long passage from the gill-chamber outwards; and hence, the gills not soon becoming dry, these fishes can remain a long time out of the water, some of them, indeed, leaving it of their own accord. Most of the eels are included in the Linnæan genus *Muræna*, and are divided by some naturalists into the families *Synbranchidæ*, *Muræenidæ*, *Anguillidæ*, *Congeridæ*, and *Ophisuridæ*. The *Synbranchidæ* have the gill-passages so united under a common integument as to present externally only a single orifice: they are almost destitute of fins. The species are few, and they are chiefly found in tropical seas. The *Muræenidæ* are also generally destitute of fins, or nearly so: they are all destitute of scales, and never found in fresh water. The *Anguillidæ* are fresh-water fishes, though some of them occasionally visit the sea. They have pretty large pectoral fins, anal and dorsal fins extending to and encompassing the tip of the tail, and numerous longish scales embedded in groups in the skin, so as to resemble latticework. *Ophisuridæ*, or snake-eels, are distinguished by the tail ending in a conical pointless fin. At least three species of eels are found in this country,—the Sharp-nosed, the Broad-nosed, and the Snig. The first-mentioned, which is common in streams and lakes, is distinguished, as its name implies, by its comparatively long and narrow muzzle. Its colours are dark olive-green on the upper surface of the head and body; under surface silvery white. The clearer the stream in which it lives, the more vivid are its colours. The broad-nosed eel is not uncommon, and is often found in the same waters with the sharp-nosed, from which, however, it is to be readily distinguished by the comparatively greater breadth of its head and the situation of its eyes, which are placed in advance of the angle of the mouth; the body, moreover, is thicker in proportion to its length, and the teeth more numerous and stronger; and the dorsal and anal fins, which are much deeper and thicker, commence farther back. In some parts of England this sort is known as the grig-eel. The snig is in many respects intermediate between the broad-nosed and sharp-nosed species; its colour is closely like that of the sharp-nosed eel. "In the comparative breadth of the nose," says Mr. Yarrell, "the snig is intermediate in reference to the broad and sharp-nosed eels, but rather more resembles that with the sharp nose. It has a slight but elongated depression extending from the anterior edge of the upper jaw to the upper and back part of the head; the tubular openings of the nostrils are longer, and the mucous pores about the lips larger and more conspicuous; both jaws rounded at their extremities, the lower one the longest; teeth longer and stronger than in the common sharp-nosed species; gape large; the angle and the posterior edge of the eye on the same vertical line; the pectoral fins, the commencement of the dorsal fin, and the vent, are each placed nearer the head than in either of our fresh-water eels." The snig is considered superior to other kinds for the table; but the sharp-nosed eel attains the greatest size,—sometimes five-and-twenty, and even thirty pounds weight. The eel migrates at the approach of winter to warm estuaries, generally brackish, and at times perfectly salt. Those, however, which live in ponds, and cannot emigrate, bore down into the mud, and there remain during the colder months of the year. They are sometimes dug out of the mud-banks of rivers and lakes in considerable quantities. Mr. Y[illegible]ell mentions that the London market is supplied w[illegible] eels by Dutch fishermen, from Holland. There are two companies in Holland, having five vessels each. Each ship is built with a capacious well, in which large quantities of eels are stored till they are wanted. Each vessel carries a cargo of this fish, weighing from fifteen to twenty thousand pounds, the duty on which cargo is £15.

EEL, CONGER. (*See* CONGER EEL.)

EEL, ELECTRICAL. (*See* ELECTRICAL EEL.)

EEL-POUT, the name given in some parts of England to the turbot.

EFFECT, *ef-fekt'* (Lat. *effícere*, to produce), in Paint. and Sculp., a term used to express the impression that correct drawing and judicious and harmonious colouring in a picture, or the outline and position of the figure or figures in a well-executed piece of sculpture, is apt to produce on the mind of the spectator. When we are looking at a work of art, and nothing incongruous or distorted in outline or design, or offensive to the eye in colouring, meets the view, we are prone to express our satisfaction with that at which we are looking by saying that the effect is very good or pleasing.

EFFECT, the impression produced on the ear and the mind by the performance of good music. It is the joint result of composition and performance; and is the chief object of both the composer and the executant, on whose ability and skill it entirely depends.

EFFENDI, *ef-fen'-de*, among the Turks a title of honour given to civil dignitaries and others, in contradistinction to the title *aga*, which is only bestowed upon courtiers and military officials. The word is equivalent to the English sir, or the French monsieur. Thus the minister of foreign affairs is called Reis-effendi; the first physician of the sultan is termed Hakim-effendi; the priest of the seraglio, Imam-effendi, &c.

EFFERVESCENCE, *ef-fer-ves'-ens* (Lat. *effervesco*, I boil over), in Chem., the escape of gas in minute bubbles from a liquid. Thus, when any strong ammonia is uncorked, effervescence takes place, from the relief of pressure. It also happens when a gas is replaced in a solution by some liquid or solid, as where sulphuric acid is added to a solution of carbonate of soda to unite with the alkali, setting free the carbonic acid.

EFFIGY, *ef'-fe-je* (Lat. *effigies*, a likeness, from *fingere*, to make or form), the resemblance or likeness of any person executed in metal, stone, wood, plaster, &c., or depicted in a drawing or painting. Although it is generally taken to mean a likeness in any form or material, it is a word but seldom, if ever, used in the fine arts. It may be better applied to the rude representation of any one, such as those of Guy Fawkes, which were formerly carried about the streets on November 5, than to any portrait, bust, or statue.

EFFLORESCENCE, *ef-flo'-res'-ens* (Lat. *effloresco*, I blossom).—In Chem., efflorescence is the formation of an opaque powder upon the surface of a crystal, from its losing its water of crystallization spontaneously, the action generally continuing until the whole has fallen to

powder. Familiar instances take place in common carbonate of soda and sulphate of soda, or Glauber's salt. It is the reverse of deliquescence.

EFFUSION, *ef-fu'-zhun* (Lat. *effusio*, from *effundo*, I pour out or forth), denotes generally the pouring out of any liquid, and is applied, in Med., to the escape of any fluid out of a vessel or viscus naturally containing it, and its lodgment in another cavity in the cellular substance, or in the substance of parts. It also sometimes signifies an oozing or morbid secretion of a fluid from vessels that have not been ruptured; thus surgeons often speak of coagulable lymph being effused on different surfaces.

E FLAT, the note E depressed half a tone,—the minor seventh of F, and the second flat introduced in modulating by fourths from the natural diatonic scale mode.

EGG, *eg* (Sax. *æg*, Lat. *ovum*), a body produced in the females of birds and certain other animals, containing an embryo or fœtus of the same species, or the substance from which a similar animal is ultimately produced. Those animals in which reproduction takes place by means of eggs are called oviparous. The marsupial quadrupeds and the mono-tremata form the connecting link between the warm-blooded animals which are oviparous and the truly viviparous animals, which only belong to the mammalia. The number of eggs produced varies greatly in different animals; some birds only produce one egg in a year, while others produce as many as twenty. The roe of some fishes contains myriads of eggs. The eggs deposited by some animals are enveloped in a gelatinous substance; others are connected in various ways, sometimes being in the form of a string. The eggs of a large number of birds are used as articles of food, those most generally used belonging to the class of birds called poultry. The common domestic fowl, the turkey, and the pea-hen, are birds whose eggs are most generally used all over the world. In some of the islands of Scotland, the eggs of several species of sea-birds, such as the gull and guillemot, form an important article of food among the inhabitants. Although the eggs of birds are principally eaten, the eggs of the turtle are also considered a luxury; and the eggs of fresh-water tortoises are valuable for the oil which they yield. An ordinary hen's egg has an average weight of 875 grains, of which the shell and its inner membranous coating weigh 93·7 grains; the albumen, or white, 529·8 grains; and the yolk 251·8 grains. The shell contains about two per cent. of animal matter, and one per cent. of the phosphates of lime and magnesia, the rest consisting of carbonate of lime, with a trace of carbonate of magnesia. (*See* ALBUMEN.)

EGG-APPLES. (*See* SOLANUM.)

EGG-BIRD (*Hydrochelidon fuliginosum*, or *Sterna fuliginosa*), a bird of the Gull fam., sometimes called the sooty tern. It is somewhat larger than the other members of the tern family, and has a long and sharp bill, nearly straight, compressed, and slender; wings narrow, long, and pointed; tail deeply forked; colour glossy black on the upper parts, edges of wings, forehead, and under parts white. It abounds in the West-Indian seas, and is chiefly valuable for its eggs, which are about two inches long, cream-colour, sparingly streaked with purple. So highly are these eggs esteemed, that their gathering is quite a considerable trade. The nest of the egg-bird is made in the sand, and the eggs number from one to three.

EGG-TRADE.—The trade in eggs forms no inconsiderable branch of our commercial intercourse with France, as the English poultry are not able to supply the home demand. Vast quantities of eggs are, however, brought from the country to London and other large towns. The importation of eggs from France gives employment to a large number of small vessels. In 1854 the duty on eggs was fixed at 8*d*. per cubic foot (nearly 200) on those brought from a foreign country, and at 4*d*. per cubic foot on those brought from a British possession. In 1858 no less than 134,084,800 eggs were imported into England, chiefly from France, but also from Belgium and Spain. In 1859, out of 740,000 cubic feet of eggs imported, 650,000 were from France, the rest coming principally from Belgium. The value of these eggs has been computed at £336,000. The imported eggs are seldom equal in quality to those





produced at home. The duty formerly paid on imported eggs is now removed.

EGRET. (*See* HERON.)

EGYPTIAN ARCHITECTURE, *e-jip'-shun*.—The architecture of Egypt is the oldest in the world, and is superior to that of any other country, Assyria alone excepted, in its colossal proportions, massive structure, general magnificence, and grandeur of conception. It has the merit of being entirely original, and possesses peculiar characteristics that distinguish it in a striking manner from that of any other country. The earliest specimens of Egyptian architecture that yet remain to us, and which will probably endure as long as the world lasts, are the pyramids, and the monumental records known as obelisks; but to ascertain the efficiency they had attained in this art, we must go to the temples of Karnac, Edfou, Denderah, and that of Abou-Sambul, hewn out of the solid rock, as well as the architectural remains that still exist at Thebes and other ancient cities of Egypt. The pyramids are buildings of great solidity, but of simple form. They are built on a square base, with four triangular sides, that meet in a common apex. They are supposed to be royal mausoleums, and were built between 1500 and 1000 B.C. (*See* PYRAMIDS.) The obelisks are four-sided shafts of great size, terminating in a pyramidal top. They are hewn out of a solid block of stone; they are also elaborately carved with hieroglyphics. The temples cover a great space of ground, and stand in a walled inclosure. Before the temple itself there is a large square court, surrounded on three sides by a colonnade. Access is obtained to this court through a doorway of great height, flanked on either side by quadrilateral towers, diminishing in size as they approach the top. The doorway and side towers are adorned with colossal sculptured figures, and in some cases an avenue of figures, generally sphinxes, was made, leading directly to the doorway we have mentioned. The temple itself was generally raised, the court between it and the grand entrance being composed of a series of broad steps rising in a gradual slope. These steps lead to a magnificent hall or portico, occupying nearly the entire width of the court, in which there are generally six rows of pillars which support the flat and massive roof. From the portico we enter a smaller hall, also divided into narrow spaces by pillars that support the roof, and after crossing two or more chambers, each narrower than the one before it, we gain the innermost chamber, or shrine, exactly fronting the entrance, in which the statue of the divinity was placed, to whose worship the temple was dedicated. The area occupied at the temple at Edfou is 414 feet long by 151 broad, the towers on either side of the gateway being 104 feet long by 47 broad at the base, and 84 feet in length by about 30 in width at the summit; but these proportions, large as they may appear, are eclipsed by those of the temple of Karnac, the great hall or portico of this magnificent building being 338 feet long by 170 broad, and covering an area nearly equal to that of the entire temple of Edfou. The entire length of the temple of Karnac is about 1,200 feet, and its breadth about 380. The columns, entablatures, and mouldings, are the great distinctive features of Egyptian architecture, in addition to the marked peculiarity that their doors and windows, and even the buildings themselves, present; namely, the convergence of the sides; so that the breadth at the base is greatly diminished in extent at the summit. The size of the columns is in proportion to the extent of the building in which they are placed. At Karnac they are 9 and 11 feet in diameter. First they were square in form, then polygonal, and at last circular shafts were made. All are elaborately sculptured. The shaft stands generally on a circular base, and sometimes on a base that contracts in size as it approaches the floor of the building, instead of expanding from its junction with the shaft, as is usually the case. The capitals are sometimes bell-shaped and adorned with lotus-leaves, while others are square in form, with a human face sculptured on each side. In some cases, as at Denderah, this capital is surmounted by another, also quadrilateral in shape and enriched with carving. The entablature was very massive and heavy, consisting of an architrave surmounted by a bold and deeply-moulded cornice, the

upper part of which projected considerably beyond the face of the walls of the building. The roof was perfectly flat. The doorways are surrounded by a flat moulding, and surmounted by a cornice and lintel of great depth. Figures attached to the walls were generally executed in *alto-rilievo*, like those that flank the doorways of the Assyrian palaces; but the hieroglyphics and representations of historical events were carved in low relief, in a style peculiar to Egyptian sculpture known as *cavo-rilievo*. (*See* CARTOUCHE.) The walls were adorned with paintings in red, blue, green, black, and yellow, on a white ground: gilding was also introduced as an embellishment, and the sculptured columns and the ceilings were also painted. The domestic dwellings of the Egyptians seem to have been built of brick, consisting of rooms ranged round a central court planted with trees, and having a fountain in the centre. They were sometimes two and three stories high. The flat lintel is common to Egyptian, Grecian, and Assyrian architecture; the method of forming arched doorways and vaulted passages was known to the Egyptians, but it was seldom resorted to by them, and then principally in the construction of tombs.

EGYPTIAN BEAN. (*See* NELUMBIUM.)

EHRETIACEÆ, *ee-e-ti-ai'-se-e* (in honour of D. G. Ehret, a German botanical draughtsman), in Bot., the Ehretia fam., a nat. ord. of dicotyledonous plants in the sub-class *Corollifloræ*, resembling the *Boraginaceæ* in most of their characters, but differing from them in having the carpels completely united, so as to form a two or more celled ovary; in their terminal style, and drupaceous fruit. There are 14 genera and 207 species, chiefly tropical trees or shrubs. The properties and uses of these plants are not very remarkable. Some species of *Ehretia* bear edible fruits. Some have a delicious odour, as *Heliotropium peruvianum*, the Peruvian heliotrope.

EIDER DOWN, *i'-der down* (Swed. *dun*), the down from the breast of the eider duck. The best is that which the birds have stripped from their breasts to provide a lining for their nests; that which is taken from the dead bird being considered inferior in quality, and called *dead down*, in contradistinction to that which is taken from the nests, and termed *live down*. The down is chiefly used for making coverlets that take the place of blankets on the continent; the down being placed between two pieces of linen or other material, and the whole quilted together to keep the feathers in place.

EIDER DUCK (*Somateria mollissima*), a species of wild duck inhabiting the frozen regions of the north. It is very abundant in Iceland, Lapland, Greenland, and Spitzbergen, on the shores of Baffin's Bay, &c. Generally, it is of a size intermediate between the domestic duck and goose. The head is large; the middle of the neck small, with the lower part of it spread out very broad, so as to form a hollow between the shoulders. The bill is horn-colour, the upper mandible being forked in a singular manner towards each eye, and covered with white feathers on the sides as far forwards as the nostrils. The top of the head is soft velvety black, cleft behind by a narrow streak of white; the feathers from the nape of the neck to the throat are puffed out, and look as though the ends had been clipped. The cheeks, chin, upper part of the neck, the back, and lesser wing-coverts, are white; bastard wings and primary quills brown; the front part of the neck to the breast is dun-colour, and thence to the under part of the tail deep black; tail brown; legs short and yellow. In Iceland and Norway the breeding-grounds of eiders are carefully protected, so that as little as possible may interfere with the growth of the eider-down crop. This curious and beautiful down grows on the breast of the bird, and the mode adopted to procure it is somewhat singular. The nest is composed of seaweed, and any hole or ledge is evidently considered an eligible building site. The number of eggs laid is usually five, six, or seven: they are three inches long, two broad, and of a uniform pale green. When first deposited in the nest, they are allowed to go uncovered; but in few days the mother begins to pluck the down from her breast, and to cover them over; and this process would seem to be indispensable to the growth and hatching of the young birds; for, if the nest be plundered, till the female has left no more down on her breast, the male bird will begin to furnish the comfortable covering from his own body. The common practice is to remove the whole of the eggs with the down, twice, and to leave the third lot of eggs, that the birds may not be thinned in number. The gross weight of the down yielded by one bird in a single season is half a pound; but this, when cleaned, is reduced by one-half. The elasticity of eider-down is so extreme that three-quarters of an ounce will fill a man's hat. It is capable of great compression, so that the down makes its appearance in balls no larger than a breakfast-cup, but weighing about three pounds. The flesh of the eider duck, though not so toothsome as that of the species familiar to us, is fit to be eaten, and is said to become of excellent flavour when the bird is wholly or even partially domesticated. They are evidently capable of easy domestication, at least with persons who reside near the sea. The Hon. A. Dillon, who spent a winter in Iceland and Lapland, relates that five of these birds chose as their location the ground under a narrow bench that ran along the windows of his house, and that when approached they evinced no timidity, and would even allow their backs to be stroked.

EIDOGRAPH, *i'-do-graf* (Gr. *eidos*, form, and *graphein*, to write), a machine which answers the purpose of a pantagraph, and is used for copying plans and drawings on the same scale, or for enlarging or reducing them in any proportion that may be desired. It was invented by the late Professor Wallace, of Edinburgh. It consists of a beam which moves in an horizontal plane, sliding in a socket that works on a vertical pin, which enters a tube in a mass of metal beneath it. The ends of the beam are fitted with pulleys that also work freely in an horizontal plane. Pieces of watch-spring pass round the pulleys, being fastened to them at one point by a simple pin to prevent them from slipping on the circumference, and connected by wires, so as to form a kind of endless band, which may be tightened or loosened at pleasure by swivel screws. Rods of metal slide in sockets under the pulleys. One of these has a tracing-point and the other a pencil, but at opposite ends of the arms, so that they may be in a line passing diagonally through the central pin, on which the beam, and consequently the whole machine, works. The beam and arms are graduated, and may be set to any required scale. When it is desired to use the machine, the operator, after setting the beam and rods as may be desired, passes the tracing-point over the drawing to be copied; a corresponding motion is communicated to the pencil at the opposite end of the other rod, which delineates a fac-simile of the drawing to be copied.

EISTEDDFOD, *i-steth'-vod* (Welsh *eisteddd*, to sit), a name applied generally in Welsh to any meeting or concourse of people, but more particularly to the assemblies of the Welsh bards and minstrels, who anciently formed an hereditary order. These meetings were forbidden by Edward I. at the conquest of Wales, but they were renewed by Henry VII., who was of Welsh origin. They have been again revived during the present century, and eisteddfods are held periodically at various Welsh towns in succession, at which prizes are awarded for proficiency in the Welsh tongue, and for poems in that language, and playing on the harp.

EJECTMENT, *e-jekt'-ment* (from Lat. *e*, out, and *jactus*, cast), is the name of an action at law, by which a party entitled to the immediate possession of lands or other corporeal hereditaments may recover that possession from the party wrongfully withholding it. Until abolished by the Common Law Procedure Act, of 1852, this action exhibited the most remarkable string of fictions then recognised by the courts of common law. This was by an action commonly known as John Doe v. Richard Roe. (*See* DOE, JOHN.) By the Common Law Procedure Act, of 1852, a writ is now issued out of any of the superior courts of common law, in a prescribed form, directed to the person or persons in possession by name, and generally to all persons entitled to defend the possession of the premises therein described, setting forth that some person or persons, by name, claim to be entitled to the possession, and to eject all other persons; and commanding those to whom it is directed, or

such of them as deny the alleged title, to appear in the court from which the writ is issued, within sixteen days after the service thereof, to defend the possession of the property. This writ (which remains in force for three months) is served by delivering it to the tenant in possession personally, or to some member of his family or household personally, on the premises; and any other person, on filing an affidavit that he or his tenant is in possession, may be allowed to appear in court and defend the action. If no appearance be entered, the claimant obtains an ordinary judgment by default, on which the sheriff gives him possession; but if an appearance be entered, an issue is at once made up without any pleadings, and the question is submitted to a jury.—*Ref.* Stephen's *Commentaries on the Laws of England.*

ELÆAGNACEÆ, *el-e-ăg-nā'-se-e* (Gr. *elaia*, an olive, and *agnos*, chaste), in Bot., the Oleaster fam., a nat. ord. or dicotyledonous plants in the sub-class *Monochlamydeæ*. They are trees or shrubs, with entire exstipulate leaves, usually scurfy. The flowers are mostly dioecious, rarely perfect. Male flowers amentaceous, bracteated; sepals 2—4, or united; stamens definite, perigynous. Female flowers with an inferior tubular calyx and a fleshy disc; æstivation imbricate; ovary superior, 1-celled, with a solitary ascending ovule. Fruit inclosed in the succulent calyx; indehiscent. Seed solitary, ascending, with thin albumen; embryo straight, with an inferior radicle. There are four genera and thirty species, mostly natives of the northern hemisphere. The fruits of several species of the typical gen. *Elæagnus* are eaten in Persia and some parts of India. Those of an English member of the family, namely *Hippophaë rhamnoides*, the sea-buckthorn, are also edible, and have been employed in the preparation of sauce for fish; but their use requires caution, as they contain a narcotic principle.

ELÆOCARPUS, *el-e-o-kar'-pus* (Gr. *elaia*, an olive, and *karpos*, a fruit), in Bot., a gen. of plants belonging to the nat. ord. *Tiliaceæ*. The Moluccа berries, which are frequently made into necklaces in India, are obtained from the species *E. serratus*. The outer portion of the fruit is pulpy, but the endocarp is hard, bony, and beautifully furrowed. The pulp is carefully removed from the berries when they are used as beads.

ELAIS, *el-a'-is* (Gr. *elaion*, oil), in Bot., a gen. of palms. The two species *E. guineensis* and *melanococca* are the Guinea oil-palms, from the fruits of which the vegetable butter called palm oil is extracted. The fruits are drupaceous, and the oil is found in the sarcocarp. It is of a rich orange-yellow colour, and is extensively used in this country in the manufacture of candles and soap, being the chief raw material worked up at the great factories belonging to Price's Patent Candle Company. In Africa it is used as food by the natives. Being emollient, it is sometimes used in medicine as an embrocation to spasms and bruises. The hard stony putamen of the same fruits yields a limpid oil. Palm wine may be prepared from the juice which flows from the wounded spathes of the two palms.

ELAND, *e'-land* (its name at the Cape).—This animal, considerably the largest of all the antelopes, is known by several different names,—the impoofoo, eland, Cape elk, canna, or bastard eland, are among the many terms applied to it. The ordinary eland is a large heavy animal, weighing, at full growth, from 7 cwt. to 9 cwt.; and, contrary to the rule amongst antelopes in general, is prone to be fat. Its usual size is that of a full-grown horse, measuring generally a little more than eight feet in length, and standing full five feet at the shoulder. The horns of the male are thick and heavy, and about a foot and a half in length. They are straight till they arrive at about three inches from the tips, where they bend outwards. They are also surrounded by a thick spiral wreath, which becomes indistinct at the points. The horns of the female eland are longer and smaller, and the spiral wreath is often absent. In both sexes the head is long and pointed, the ears large, the neck thick, and in front of the chest is a loose hanging skin or dewlap, with a border of long hair on its margin. A short erect mane of dark brown hair runs from the centre of the forehead to the root of the tail. This mane is directed backwards along the spine, but is reversed on the neck. The tail is more than two feet long, and terminates in a tuft of long black hair. The flesh of the eland is more prized as food than that of any other wild animal of Southern Africa. When dried and cured, the large muscles of the thighs are looked upon with high estimation, and are usually called thigh-tongues. Elands were formerly very common in the neighbourhood of Cape Town; but they have been so universally hunted, that they are only to be met with in the most retired parts of the colony. The disposition of the eland is very mild and gentle, and it seems predisposed to domesticity. It is gregarious, and lives in large herds upon the low hills and level plains. Elands, when hunted, are soon tired, as they are usually fat and short of wind. Very often they drop down during a chase from plethora. Of late years there have been many attempts made to introduce the eland among the animals used for food in England. The attempts have all been successful, and not only in the Zoological Gardens in Regent's Park, but also in the grounds of noblemen and private gentlemen, the eland has been reared and bred. Concerning its flesh as food, Dr. Livingstone, the celebrated African traveller, writes as follows:—"Our party was well supplied with eland-flesh during our passage through the desert; and it being superior to beef, and the animal as large as an ox, it seems strange that it has not yet been introduced into England." The *Acclimatization Society* has given much attention to the qualities of the eland; and it is more than probable that in a few years it will be largely bred in Great Britain. The scientific name of this animal is *Antilope oreas.*

ELASTICITY, *e-las-tis'-e-te* (from Fr. *élastique*, elastic, primarily from Gr. *elaudo*, an impeller forward), that property which certain bodies possess of recovering their former figure or state after internal pressure, tension, or distortion. Elasticity is perfect when the body exactly recovers its primitive form after the force by which its form has been changed is removed. Perfect elasticity is, however, not to be found in nature. Aeriform fluids or gases approach nearer to perfect elasticity than any other substances. In solid bodies, as a general rule, elasticity is destroyed by use: thus a bow loses its elasticity by being kept bent. Iron and steel can have their elasticity increased by being tempered, that is, by contracting their volume suddenly after being expanded by heat.

ELATERIUM. (*See* ECBALIUM.)

ELATINACEÆ, *e lăt'-e-nat'-se-e* (Gr. *elate*, a fir; the leaves resembling those of the fir-tree), in Bot., the Water-pepper fam., a nat. ord. of dicotyledonous plants in the sub-class *Thalamifloræ*, consisting of six genera and about 22 species,- little annual marsh-plants with hollow stems and opposite leaves, with interpetiolar stipules. The flowers are small and axillary; sepals and petals 3—5; the latter, as well as the stamens, being hypogynous. The fruit is capsular, 3—5-celled; the placentation axile. The styles 3—5; stigmas capitate. The seeds are numerous and exalbuminous. The plants of this small order are scattered all over the world. They are generally considered acrid.

ELBOW, *ell'-bo* (Sax. *elneboga*), in Anat., is the joint of the arm formed by the lower end of the humerus and the upper end of the radius and ulna. The lower end of the humerus is received into the hollow of the ulna, so as to produce a hinge-like arrangement, and the upper end of the radius forms also a small part of the joint. The surface of the humerus in contact with the ulna is limited, internally and externally, by a prominent ridge, and is hollowed out in the centre; that in contact with the radius is a small rounded eminence which moves in the cavity of the latter. On front of the humerus, above the articular surface, are two depressions that receive the coronoid process and the head of the radius during flexure, and behind is a large fossa for the reception of the olecranon, or large process of the ulna, in the extension of the forearm. Where the bones touch, their surfaces are covered with cartilage, and their articular ends are kept in place by a number of ligaments.

ELBOW-PIECES, the plates of metal used to cover the elbow-joint at the junction of the brassart, or rerebrace, and the vaut-brace, the former of which served as a protection to the arm between the shoulder and the elbow, and the latter to the lower part, between

the shoulder and the wrist. They were sometimes called *coudieres*. The elbow-piece is shown in the illustration appended to the article on BRASSARTS.

ELDER, *el'-der* (Gr. *presbuteros*), is the comparative degree of the Ang.-Sax. *eld*, and denotes one who is older than others; and hence an overseer or ruler. In the ancient Jewish polity, the elders were persons of considerable age and experience, and who consequently obtained certain power and influence over others. When Moses was sent into Egypt to deliver the children of Israel, he assembled the elders of the people, and told them that God had appeared unto him. Afterwards Moses associated with himself in the government seventy of the elders of Israel, which, according to the generality of interpreters, was the beginning of the Sanhedrim (which *see*). Every city, also, had its elders, who seem to have possessed a certain local jurisdiction. In the New Testament, the term elder is employed to designate a certain class of officers in the church, regarding the office and duties of whom there are various conflicting opinions. Whether the elders were lay officers of the church, has long been matter of dispute. It appears certain, however, that the elders mentioned by St. Paul (1 Tim. v.) did not hold the same office as those in the Presbyterian churches, but "laboured in word and doctrine." It is said that Calvin admitted lay elders into church courts on what he conceived to be the sanction of the primitive church, and "as an effectual method of preventing the return of inordinate power in a superior order of clergy." Elders, in the Presbyterian church, are certain laymen who are elected and ordained for ecclesiastical office, and who, in conjunction with the minister and deacons, compose in Scotland the kirk session. The number of elders is proportioned to the extent and population of the parish, and they are usually persons of tried character and Christian excellence. They have no right to teach or to dispense the sacraments; but in every question of jurisdiction within the parish, they form a spiritual court, of which the minister is officially moderator; and in the presbyteries, synods, and General Assembly, they sit as representatives of the several sessions or consistories. Formerly the power of the kirk-sessions in Scotland was much greater than at present. They used to take cognizance not only of all grosser immoralities, as swearing, drunkenness, lewdness, absence from public worship, &c., but also card-playing, racing, dancing, and the like. Their duties, in many respects, now correspond to those of churchwardens in the Church of England.

ELDER, in Bot. (*See* SAMBUCUS.)

EL DORADO, *el do-ra'-do* (Span., the golden region), the term applied by the Spaniards, in the 16th century, to an imaginary land abounding in gold and all kinds of precious stones, and supposed to be situate in the interior of South America, between the rivers Amazon and Orinoco. The origin of this fable was due to the heated imaginations of the avaricious Castilian adventurers, who loved to dream of regions more golden than those of Mexico and Peru. Many expeditions were fitted out for the purpose of discovering it, and, although each proved abortive, the belief in the existence of the "golden land" survived until the commencement of the 18th century. In England, even, the fable took root, and Sir Walter Raleigh twice visited Guiana in search of "El Dorado." The term has now become the property of the poet, who uses it to express a land of boundless wealth and felicity, like the Paradise of Mahomet or the Elysian fields of the ancients.—Ref. *Edinburgh Review*, vol. lxxii., art. *Sir Walter Raleigh*.

ELEATICS, *e-le-at'-iks*, the name of an ancient sect of philosophers, so called from Elea, a Greek colony of lower Italy, which was in all probability the residence, in his later years, of Xenophanes (about 530 B.C.), the founder of this sect, and the principal seat of its cultivation; for its great propagators, Parmenides and Zeno, were natives of this town. The Eleatic school is pre-eminently distinguished from the Pythagorean and Ionian by the recklessness with which it strove to attain to an exclusive knowledge of the supra-sensible. They attempted to construct a system of the universe upon metaphysical principles, and maintained that the source of all truth was something independent of and superior to sense. Their system was a monotheism, or rather a pantheism. They opposed the polytheism of the times by maintaining the infinity and self-existence of One; but they could not separate that One from the world. The apparent changes of the universe they regarded as mere illusions of sense, the Infinite being without change or corruption. "Whatever estimate," says Ritter, "may be formed of the Eleatic doctrine and its results, it cannot be denied that, as the first attempt to correct the conceptions and representations of sense by the pure notions of reason, or, at least, to reduce them to their true value, it is in the highest degree deserving the attention of the philosopher. By it the pure speculative element of thought was first abstracted from all that is incidental to its concrete appearance, and consciousness awakened thereby to a truer notion of philosophy. At the same time it is far from unprofitable to observe the course of the attempt to abstract from the sensible appearance, the perfect knowledge of true being, however unsuccessful the essay."

ELECAMPANE. (*See* INULA.)

ELECTION, *e-lek'-shun* (Lat. *electio*, a choice, selection), in a general sense, is the act of selecting one or more from a greater number, for any use or purpose. In Law it is also when man is left to his own free will to take or do one thing or another, which he pleases. It is the obligation imposed upon a party to choose between two or more inconsistent or alternative rights or claims, where he cannot enjoy the benefits of both. In courts of equity the principle of election is frequently applied where a party has inconsistent rights, and is compelled to elect which he will enforce. It has been said that the doctrine constitutes a rule of law as well as in equity, but that, in consequence of the forms of proceeding at law, a party cannot be put to elect. Every act of election presupposes a plurality of gifts or rights, with a right to the party to elect any one of them. Though, as a general rule, a person is not allowed to sue in equity and at law for the same thing, but is obliged to elect in which court he will proceed, yet there is an exception in the case of a mortgagee, who may proceed both in equity and at law at the same time.—*Ref.* Wharton's *Law Lexicon*.

ELECTION, in Theol., "is a purpose of God referring to certain and definite persons of the fallen and sinful race of mankind, determining to unite them to Christ, and by means of that new connection with him to bring them to perfect holiness and happiness."—(*Pye Smith.*) That God hath out of his mere good pleasure from all eternity predestined some of the human race to everlasting life, and left others to inevitable and eternal damnation, is a doctrine clearly taught in Scripture, and is a necessary consequence of the omniscience and foreknowledge of God. (*See* PREDESTINATION.)

ELECTION OF MEMBERS OF PARLIAMENT.—When a new parliament is to be summoned, the lord chancellor receives a written command from the sovereign in council to that effect, and directs the clerk of the crown in chancery to issue writs to the returning officer of each electoral district. The returning officer of each county must, within two days of the receipt of the writ, cause proclamation to be made of the time and place of said election, which must be not later than the twelfth nor sooner than the sixth day after said proclamation. In boroughs, the officer must proceed with the election within six days after the receipt of the writ, having first given three clear days' notice thereof. On the day fixed for the election, the writ is read in public by the returning officer, and candidates are proposed and seconded by qualified electors. A show of hands is then taken of those present, and the officer declares the apparent result, without, of course, knowing whether those who have held up their hands be electors or not. If the parties are satisfied with this declaration, the election is at an end; but if the partisans of any candidate are dissatisfied, they crave a poll, and the return is not made till this is over. In a contested election, polling-booths are erected in various parts, each of which is presided over by a deputy, and the polls are taken by poll-clerks appointed for that purpose. The polling is commenced and carried on simultaneously at all the places, commencing at eight o'clock in the morning and terminating at four o'clock in the afternoon in boroughs, and five in county elections. In boroughs the polling must take place on the

day following that fixed for the election, unless a Sunday, Good Friday, or Christmas Day; and in counties on the day next but two after the day fixed for election. On the day next after the close of the poll (in counties on the day next but one), the returning officer is to open the poll-books and declare the state of the poll, and make proclamation of the member or members chosen, not later than two o'clock in the afternoon of that day. The election being closed, the officer returns the writ, with the names of the persons elected by the majority, to the clerk of the crown in chancery, to whom also the poll-books are to be delivered for their future safe-custody. The candidate is considered to be a member of parliament from the moment of the declaration of the poll, although he does not act as a legislator until he has taken the oaths. No person is competent to vote at the election of a member of parliament unless his name appears on the register of electors; but in the case of one so registered no exception can be taken at the time of polling. In order to prevent bribery, treating, and intimidation at elections, the returning officers are now required annually to appoint certain officers, called *election auditors*, whose duty it is to take and publish an account of all expenses incurred at elections; and any payment in respect of any election made otherwise than by or through the election auditor is declared to be illegal. Bribery, if proved, involves the disqualification of the elector, and the unseating of the member chosen, if brought home to him.

ELECTION COMMITTEES.—At the beginning of every session of parliament the Speaker appoints by warrant six members of the House as "the General Committee of Elections." The members must be willing to serve, their seats must be unquestioned by petition, and they must not themselves be petitioners against any election. The Speaker's warrant is laid upon the table of the House, and if not disapproved of in the course of the three next sitting days, it takes effect. To this committee all election petitions are referred, and it is their duty to choose a committee for the trial of each petition, called therefrom an "Election Committee." Each election committee consists of a chairman and four other members of the House; the former of whom is chosen by and from out of a select body called the chairmen's panel (appointed to serve for that session by the general committee), and the latter by the general committee itself. This select committee, who are sworn truly and faithfully to try the matter before them, and are required to examine all witnesses on oath, then proceed to try the merits of the return or election (admitting no evidence, however, against any voter, or in support of any objection, not set forth in the list of voters, and objections which had before been delivered to the general committee), and determine whether the sitting members, or either of them, or any or what other person, were duly returned or elected, or whether the election be void. Such decision, being final between the parties to all intents and purposes, is reported to the House at large, and entered in their journals.—*Ref.* Stephen's *Commentaries on the Laws of England*; May's *Law of Parliament*.

ELECTOR, *e-lek'-tor* (Lat., from *electum*, supine of *eligere*, to choose), a dignity which is now merely nominal, the privileges that were formerly attached to it being lost, and the title retained by the ruler of Hesse-Cassel alone. It was originally applied to the high potentates of the empire, who claimed the right of participating in the election of the emperor. By the Golden Bull of Charles IV. of Germany, which was accepted and confirmed by the diet of Nuremberg in 1356, the exercise of this privilege was restricted to a few of the leading princes and ecclesiastics, and it ultimately became hereditary in certain families, and confined to the king of Bohemia, the electors of Brandenburg and Saxony, the elector palatine of the Rhine, and the archbishops of Cologne, Treves, and Mayence. Bavaria became an electorate under Maximilian the Great in 1623, and Hanover in 1692, under Ernest Augustus, bishop of Osnaburg. In 1778, Bavaria was united to the palatinate of the Rhine, and the number of electorates was reduced to eight. Some minor electorates were created at the commencement of the present century, after the peace of Luneville; but the privileges of the dignity





were lost at the dissolution of the Holy Roman empire by Napoleon in 1806, the last emperor, Francis II., having abandoned the title of emperor of Germany for that of emperor of Austria in 1804. The title had fallen into disuse, to a certain extent, long before this event, from the elector of Brandenburg having become king of Prussia in 1701, the electors of Saxony kings of Poland in 1697 and 1733, and the elector of Hanover king of Great Britain and Ireland in 1714. Bavaria, Saxony, and Hanover were erected into kingdoms in 1805, 1806, and 1814 respectively, when the rulers of each finally abandoned the title of elector for that of king.

ELECTRIC, *e-lek'-trik* (Gr. *elektron*, amber), in Phys., the term generally applied to a substance which may, under ordinary circumstances, be readily made to evince electrical properties by friction. Amber is a powerful electric, and its property of attracting light particles of matter when rubbed was known to the ancients. From the Greek word for amber, the terms *electric*, *electricity*, *electroscope*, and many others, are derived. Electrics do not transmit, or conduct, electricity; hence they are frequently termed *non-conductors*, or *insulators*; whilst, on the other hand, *anelectrics* (which *see*) are transmitters, or conductors, of electrical action. The most perfect electrics are shell-lac, sulphur, amber, jet, resinous bodies, gums, gun-cotton, glass, silk, diamond, agate, tourmaline, dry fur, hair, wood, feathers, paper, turpentine and various oils, dry atmospheric air and other gases, steam of high elasticity, and ice at 0° Fah. (*See* ELECTRICITY.)

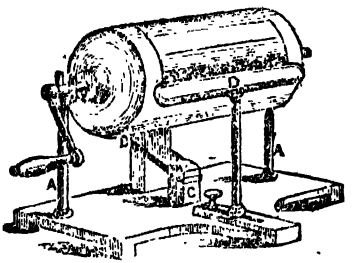
ELECTRIC CLOCK. (*See* HOROLOGY.)

ELECTRIC LIGHT. (*See* ILLUMINATION.)

ELECTRICAL EEL (*Gymnotus electricus*).—This extraordinary fish is an inhabitant of the fresh-water lakes and rivers of the warmer regions of America, Africa, and Asia. A specimen more than three feet in length was preserved alive in London between the years 1838 and 1842, and was examined by a great many electricians. Like the *torpedo* (which *see*), it has the power of giving electrical shocks; which power it exerts for killing or stunning the fishes upon which it feeds. Its body is smooth and without scales. A long ventral fin extends from behind the head to the extremity of the tail; the mouth is armed with sharp teeth, and projecting into it are numerous fringes, that, from their nature, appear to serve a purpose in respiration. The gullet is short, terminating in a capacious stomach. The electrical organs are situated on each side, and consist of flat partitions or septa, and cross divisions between them. The outer edges of these septa appear, when the skin of the body is turned over, in parallel lines, nearly in the direction of the longitudinal axis of the body. They are thin membranes nearly parallel to one another, their breadth being nearly the semi-diameter of the body. A powerful shock is felt when one hand is placed near the head and the other near the tail. By the electricity generated by the specimen exhibited in England, Faraday magnetized steel needles, and decomposed iodide of potassium with the greatest ease. A single medium discharge from the animal is calculated to be equal to the electricity of a Leyden battery of fifteen jars, containing 3,500 square inches of coated glass, charged to the highest degree.

ELECTRICAL MACHINE, an instrument for the excitation and collection of electricity. The earlier electricians, in the prosecution of their researches, used simple glass tubes or rods of sulphur, which were held in the hand and excited by friction with silk or flannel. The first idea of a machine originated with the celebrated Otto Guericke of Magdeburg, who mounted a globe of brimstone on an axis, and caused it to revolve rapidly against the palm of the hand. For the globe of brimstone Dr. Haukebee afterwards substituted a globe of glass; and Professor Winkler, of Leipsic, rendered the apparatus much more useful and convenient by affixing a cushion of soft leather stuffed with horsehair, so that, by the pressure of a spring, it might rub against the revolving globe. In the electrical machines now in use, the electric to be excited is either a hollow cylinder or a circular plate of glass. For most purposes the cylindrical machine is to be preferred, being the more simple in construction and the less liable to fracture. The cylinder is supported on two uprigh

pillars, A, A, usually of glass, which are fixed to a firm wooden base. Pressing against the cylinder is a flat cushion or rubber of coarse oiled silk, stuffed with wool or hair. This may be also fixed on an insulating pillar of glass. In the annexed figure, however, it is supported by a hinged wooden pillar B, which




ELECTRICAL MACHINE.

is drawn towards the cylinder by an elastic band placed over a block of wood, C. A long flap of thin silk, oiled on the upper side only, is sewed to the cushion, and rests upon the upper half of the cylinder. Opposite the loose edge of this flap is a row of metallic points connected with a metallic cylinder called the conductor, D, which is also supported by an insulating glass pillar. When the glass cylinder is put in motion by means of the winch attached to one of its pivots, the two kinds of electrical power which, when combined, neutralize each other, are developed, the conductor becoming charged with *vitreous* or *positive* electricity, and the cushion with *resinous* or *negative* electricity. When it is required to obtain vitreous electricity for charging jars or other purposes, the cushion must be connected with the earth by a chain or wire, in order that the electricity drawn from the glass by the points of the conductor may become continually replaced by that supplied from the earth. If it be required to collect resinous electricity, this arrangement must be reversed. The conductor must be connected with the earth, and the body to be charged must be presented to the insulated cushion. The plate-glass machine was devised by Van Marum about the year 1776. As constructed by Cuthbertson some few years after, the machine consisted of a circular disc of plate glass, from two to seven feet in diameter, mounted on an horizontal axis of metal, and sustained by a vertical frame of wood, to which were attached two pairs of cushions, one above and the other below. The plate was turned round between the rubbers by a winch fixed to the extremity of the axis. The electricity was confined by flaps of oiled silk, extending from each pair of cushions round nearly one-fourth of the circumference of the plate, and was then collected by two rows of points opposite its horizontal diameter, and communicating with an insulated metallic conductor. The plate-machine, as originally constructed, was not adapted for the collection of resinous or negative electricity; but it has lately been so modified that this defect has been completely overcome. Sir W. Snow Harris, in his "Rudimentary Electricity," describes a most effective arrangement, calculated to meet every difficulty in the use of the glass plate for both kinds of electricity. There are several instruments for exciting and collecting electricity besides the cylindrical and plate machines. (For notices of these, *see* BATTERY, ELECTRICAL and VOLTAIC; ELECTROPHORUS; HYDRO-ELECTRIC MACHINE; INDUCTION COIL; JAR, ELECTRICAL.)

ELECTRICITY, *el-lek-tris'-se-te* (Gr. *e'lektron*, amber, the substance in which electrical properties were first recognized), the name given primarily to one of the great forces of nature, and secondarily to that branch of physical science which has sprung from the investigation of phenomena depending on this particular force. The ancients were well acquainted with the fact that certain bodies, when rubbed, acquire the power of attracting light particles of matter. Thales of Miletus, the founder of the Ionic philosophy, who flourished some 600 years before the Christian era, developed this attractive property in amber by friction, and concluded that the substance was animated by an unknown spirit or element. Theophrastus, some centuries later, observed the same attractive property in a crystal termed the lyncurium, now supposed to be the tourmaline. Pliny and other naturalists refer to the attractive power of amber as something well known, but say nothing to lead us to suppose that their knowledge of electrical phenomena went beyond the discoveries of the old philosophers. The first attempt towards a generalization of electrical phenomena was made near the close of the 16th century, by Dr. William Gilbert, in a treatise on the Magnet. In the following century, Dr. Wall, Boyle, Newton, and others, accumulated many new facts; but these were not of a nature to lead to the discovery of general principles. The electric spark was first noticed by Dr. Wall. In the early part of the last century, Dr. Hauksbee made many electrical experiments, from which he ascertained that glass was a substance which could be readily electrified by friction: and that some other bodies, especially metals, treated in the same manner, manifested no electrical power whatever. In 1728, Mr. Stephen Grey, a pensioner at the Charterhouse, performed a number of experiments which led to the discovery of electrical conduction, and to the classification of bodies into conductors and non-conductors. The conclusions arrived at by Grey were firmly established by the brilliant researches of Du Fay, a French philosopher, to whom we are indebted for the discovery that there are two opposite states of electrical excitation, in which forces are developed attractive of each other. In 1745 and 1746, numerous attempts were made to confine electricity in glass vessels containing water or mercury; and, almost simultaneously, Von Kleist in Germany, and Cuneus in Holland, became acquainted with the disagreeable effects of the electric shock. Muschenbrock, of Leyden, repeated the experiments of Cuneus, and published a wonderful report of the effects of the shock received from the apparatus, which is still known as the Leyden jar or phial. The discoveries of Franklin followed soon after, and greatly advanced the science of electricity. By a series of beautiful experiments with a common kite, this celebrated philosopher ascertained what had been before conjectured, that lightning was an electrical phenomenon. Cavendish afterwards entered with great spirit into the field of electrical research, and thoroughly investigated the conditions of bodies charged with electricity. About the year 1780, Galvani, of Bologna, discovered that the mere contact of metals with the muscles and nerves of a frog recently killed produced convulsive motions; and, by repeating Galvani's experiments, the celebrated Volta, a professor of natural philosophy at Pavia, was led to the discovery of the apparatus now known as the Voltaic pile, a discovery which gave rise to a new branch of electrical science, which is termed galvanism, or, more correctly, Voltaic electricity. Davy's researches proved that the voltaic current was a most potent agent in chemical analysis. Oersted discovered, in 1820, that the current exerted a peculiar influence on the magnetic needle, and founded the science of electro-magnetism, which was soon afterwards fully developed by Ampère. Faraday, in his "Experimental Researches in Electricity," published between 1830 and 1849, described the phenomena of volta-electric and magneto-electric induction, and thus established the beautiful science of magneto-electricity. Seebeck, of Berlin, found that an electric current may be generated by the unequal effects of heat on different metals in contact, and gave the name of thermo-electricity to the new branch of science which sprung from this observation. Among the modern electricians to whom the world is greatly indebted are Grove, Wheatstone, Becquerel, Pouillet, Jacobi, Spenser, De la Rive, Harris, and Henry. The peculiar power which we call electricity is only known to us by its effects, and such terms as *electric fluid* and *electrical current* are to be understood as figurative expressions. Many theories respecting the nature of electricity have been advanced for the purpose of explaining electrical phenomena. That of Du Fay and Symmer supposes electricity to be an infinitely attenuated fluid pervading all bodies, and composed of two primary elements possessing distinct and opposite

properties. These elements, called *vitreous* and *resinous* electricities, are supposed to neutralize each other when combined, electrical repose being the result. When, however, a disunion of these elements takes place, each becomes active. In accordance with this theory, electrical excitation consists in a separation and abstraction of one of the elements, leaving the other in excess or uncompensated. The theory started by Franklin supposes the existence of a single homogeneous imponderable fluid of extreme tenuity and elasticity, in a state of equable distribution throughout the material world. This fluid is assumed to be repulsive of its own particles, but attractive of all other matter. When distributed in bodies, in quantities proportionate to their capacities or attraction for it, such bodies are said to be in their natural state. When we increase or diminish the natural quantity of electricity in any substance, excitation is the result, and the substance, if overcharged, is said to be electrified *positively*, or, if undercharged, *negatively*. The theories of Eules and Cavendish are less defective than those of Du Fay and Franklin, upon which they are respectively based; but even these are now found to be inadequate for the elucidation of electrical phenomena. Adopting the views of Faraday, scientific men of all nations now recognize two kinds of electrical force, distinguished by the terms *positive* and *negative*, but do not assume the existence of any peculiar kind of matter to which the term *electric fluid* may be applied. For a lucid exposition of Faraday's theoretical views of electrical action, the reader is referred to Sir W. Snow Harris's "Rudimentary Treatise on Electricity." As the various branches of electricity are generally considered as distinct sciences, they are treated separately in this work. The following are the principal heads under which electrical phenomena are described:—ELECTRICITY, FRICTIONAL; ELECTRICITY, VOLTAIC; ELECTRO-CHEMICAL THEORY; ELECTROLYSIS; ELECTRO-MAGNETISM; MAGNETO-ELECTRICITY; LIGHTNING and THUNDER. The more important electrical machines and instruments are noticed under BATTERY, ELECTRICAL and VOLTAIC; ELECTRICAL MACHINE; ELECTROPHORUS; ELECTROSCOPES and ELECTROMETERS; HYDRO-ELECTRIC MACHINE; INDUCTION COIL; JAR, ELECTRICAL. For information respecting the chief practical applications of electricity, *see* ELECTRO-MOTIVE POWER; ELECTRO-PLATING AND GILDING; ELECTROTYPE; LIGHTNING-CONDUCTOR; TELEGRAPHY; ILLUMINATION.

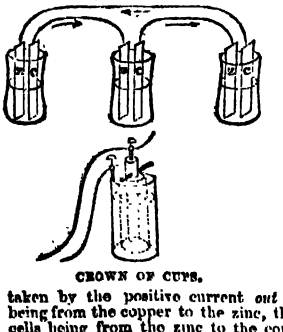
ELECTRICITY, ATMOSPHERIC, the term applied to electricity as a natural agent existing and acting in the atmosphere. Electricity is called into action upon a grand scale in the thunderstorm. How the electric accumulation takes place is a subject that has never been clearly ascertained, but it probably results from a variety of causes, and is also connected with some peculiar power in masses of aerial vapour, which enables them to receive and retain electrical charges. The analogy between lightning and electricity seems to have been first noticed by the Abbé Nollet, in 1748. It was afterwards verified by Benjamin Franklin, at Philadelphia, in 1752. (*See* LIGHTNING.) There is still very little known about the cause of atmospheric electricity. The many changes which are continually occurring on the surface of the earth and in the surrounding atmosphere are, doubtless, of such a nature as to disturb the electric equilibrium. Evaporation, change of state or form in the varieties of matter, changes of temperature, chemical action, all these combined, seem to produce those enormous electrical accumulations called thunderstorms. (*See* THUNDER, THUNDERSTORM.) The beautiful phenomena of the aurora borealis is most probably connected with, or dependent upon, atmospheric electricity. (*See* AURORA BOREALIS.) All meteors were at one time considered as derived from electricity; but the showers of stones by which many of them are accompanied show that they must be ascribed to other sources. (*See* METEOR, METEORIC STONES.) Those bodies called falling stars are considered by many to have an electric origin. They are most common when the atmosphere is favourable to electric accumulation.

ELECTRICITY, FRICTIONAL.—By this term, that department of physics which relates to the phenomena of ordinary electricity may be conveniently distinguished from those comparatively new sciences which have reference to the phenomena attendant on electrical excitation by chemical action, magnetism, and heat. If a stick of sealing-wax be rubbed with a dry piece of flannel or cloth, it becomes *electrified*, in other words, it acquires the power of attracting light bodies, as feathers, wafers, or bits of paper. Many other substances besides sealing-wax can be readily electrified by friction, and such substances are termed *electric* (which *see*). If a light, downy feather be suspended by a fine thread of white silk, and a dry glass tube, excited by rubbing, be presented to it, the feather will be strongly attracted to the tube, will adhere to its surface for a few seconds, and will then fall off. If the tube be now excited anew, and presented to the feather, the latter will be strongly repelled. The same experiment may be repeated with the stick of sealing-wax; the feather, in its ordinary state, will be drawn towards the excited body, and after touching again driven from it with a certain degree of force. Now, let the feather be brought into contact with the excited glass so as to be repelled by that substance, and let the excited sealing-wax be presented to it, a degree of attraction will be observed far exceeding that exhibited when the feather is in its ordinary state. Or, again, let the feather be made repulsive for sealing-wax, and then let the excited glass be presented; strong attraction will ensue. These experiments prove that there are two opposite kinds of electrical excitement, and that a body, to which one kind has been communicated, is attracted by another body in the opposite state, and repelled by one in the same state. It is customary to call the electricity manifested by glass *positive* or *vitreous*, and that developed in the case of sealing-wax and bodies of the same class, *negative* or *resinous*. The kind of electricity resulting from friction appears, however, to depend on some peculiar condition of contact between the rubbed surfaces; thus smooth glass rubbed with silk or wool becomes positive, but when roughened by sand or emery it acquires, under the same circumstances, a negative charge. Again, when silk is rubbed with glass, it becomes negative, but when rubbed with sealing-wax, positive. Both kinds of electricity are produced in every case of electrical excitation, the rubber and the rubbed body always assuming opposite states. There are many substances which cannot be excited in the ordinary way, though they may be electrified by placing them in communication with an excited electric. These are termed *anelectrics* (which *see*), or more correctly *conductors*, from their property of conducting the electrical force. If an electrified pith-ball, suspended by a silk thread, be touched by any electric,—a stick of dry sealing-wax for instance, its attractive power will not be in any sensible degree impaired; but if it be touched with any conductor in communication with the ground, it will instantly lose its electrical charge. It is therefore evident that electrics are *non-conductors*, or *insulators*, and that anelectrics are transmitters, or conductors, of electrical action. Modern researches have, however, proved that the difference between the two classes is only one of degree, not of kind; the very best conductors offer a certain resistance to the electrical discharge, and the most perfect insulators permit it to a small extent. The metals are by far the best conductors; shell-lac, sulphur, glass, silk, and dry gas, the worst. Electrical discharges take place silently and without disturbance in good conductors of sufficient size; but if the charge is very intense and the conductor very small, or imperfect from its nature, it is often destroyed with violence. When a break is made in a conductor employed in effecting the discharge of a highly-excited body, disruption or spark-discharge takes place across the intervening air, provided the ends of the conductor be not too distant. The *electrical spark* itself presents many points of interest in the modifications to which it is liable. The time of transit of the electrical force through a chain of good conducting bodies of great length is so minute as to be altogether inappreciable to ordinary means of observation. An electrified body exerts a peculiar influence upon neutral conducting bodies at sensible and even considerable distances. This influence, which has been termed *electrical conduction*, may be thus examined:—Let two small cylin-

ders of metal be insulated upon supports of glass varnished with a solution of shell-lac in spirits of wine, and let these insulated conductors be placed end to end at a short distance apart. Now, if one conductor be charged with positive electricity, it will induce a negative state in the nearer portions of the other, and a positive state in the more remote parts. The precise condition of the second conductor cannot be properly investigated without the aid of the most delicate electroscopes; but with a suspended pith-ball the attractive power of its distant extremity may be readily detected. On removing the electrified conductor, the second conductor at once loses its attractive power. For experiments on electrical attraction and repulsion, a large glass tube will be found very useful. To excite it, the rough side of oiled silk (oiled only on one side) rubbed over with *aurum musivum* (which *see*), may be used; or, if such a rubber cannot readily be procured, a dry soft silk handkerchief may be employed. To exhibit the mechanical, luminous, and heating effects of the electrical discharge, we require an *electrical machine* (which *see*), and for the accumulation of electricity of great intensity we demand, in addition to this, those powerful instruments the *jar* and *battery*. (*See* these words.)

ELECTRICITY, MEDICAL. (*See* ELECTRICITY, VOLTAIC; INDUCTION-COIL.)

ELECTRICITY, VOLTAIC, or GALVANISM, the science which relates to the phenomena connected with a peculiar form of electrical force obtained by certain arrangements of metals and liquids. Galvani, a professor of anatomy at Bologna, in 1789, made the discovery that the transmission of electricity through the nerves of a frog, recently killed, would excite muscular contractions; and he afterwards found that similar convulsions could be produced by merely touching the nerves and muscles with two different metals and then bringing the metals into contact. Upon these and similar phenomena, observed in an extended series of experiments with different animals, Galvani based his theory of "animal electricity," which was received with enthusiasm by the Italian physiologists of his day. According to this theory, every animal is endowed with an inherent constitutional electricity, generated in the brain and distributed through the nervous system, the principal reservoirs being the muscles. Volta, a professor of natural philosophy at Pavia, repeated Galvani's experiments, and proved that the contractions in the muscular fibre depended, not on any peculiar electrical condition of the animal frame, but on a feeble action derived from the metals with which the nerves and muscles were brought into contact. To determine the exact conditions under which electrical disturbance is produced, he commenced a course of experimental researches on the energies of different metals, which eventually led him to the discovery of the *pile*, an apparatus which must be regarded as the source of all the great discoveries relating to electricity made in modern times. The original voltaic pile, and the more important modifications of it which are now in use, are fully described under the head of BATTERY, VOLTAIC. The opposite figs. represent three cells of Volta's *couronne des tasses*, or *crown of cups*, the most simple modification of the pile, and a single cell of Professor Daniell's *constant battery*. The arrows show the direction taken by the positive current *out* of the battery, being from the copper to the zinc, the current *in* the cells being from the zinc to the copper. Two theories have been offered in explanation of the action of the voltaic pile or battery. The *contact theory* of Volta assumes that different metals have different electrical capacities, and that electrical disturbance



CROWN OF CUPS.

results from simple contact. In applying this theory to the pile, or crown of cups, it is assumed that each zinc plate takes electricity from the copper plate in contact, or connected with it, and at the same time discharges electricity through the moist or fluid conductor into the next copper plate. This theory is embarrassed by anomalies and improbabilities, and has been rejected by most scientific men. The *chemical theory*, now generally adopted, assumes that the chemical action set up between the solids and liquids of the pile is the source of its power. The facts which support this theory are very numerous, and most of them are inexplicable when viewed by the light of the contact theory. Faraday and others have proved that chemical action does give rise to electrical force; that when the chemical action of a battery diminishes or ceases, the voltaic current also diminishes or ceases; and that powerful currents may be generated without bringing dissimilar metals into contact. There is, indeed, every ground for supposing that chemical affinity and electricity are merely modifications of one force. (*See* ELECTROLYSIS.) The current force of the voltaic battery has been practically applied to many useful purposes. It is employed in telegraphy (which *see*) to deflect magnetic needles at a distance of hundreds of miles in such manner that alphabetical signals may be determ[illegible] by the direction and number of the deflections. Its power of converting iron bars into temporary magnets of unlimited power has been taken advantage of in the construction of electromotive engines and clocks. (*See* ELECTRO-MOTIVE POWER; HOROLOGY.) Its power of causing chemical decomposition has been turned to account by the metal-worker, the engraver, and the calico-printer. (*See* ELECTROTYPE; ELECTRO-PLATING AND GILDING; ELECTRO CALICO-PRINTING.) The current is also much used as a remedial agent in the treatment of many forms of disease of the human body; decided relief has been obtained in paralysis, lock-jaw, St. Vitus's dance, tic-doloreux, and deafness. Though the term *galvanism* is still commonly applied to the science relating to the current force, it is certainly less appropriate than either *voltaic electricity* or *voltaism*, for the observations of Galvani were unimportant compared with those of his great follower, Volta.—*Ref.* Sir William Snow Harris's *Rudimentary Treatise on Galvanism*.

ELECTRO CALICO-PRINTING, the art of producing patterns on cloth by the chemical action of the voltaic current. Many processes of electro calico-printing have been introduced, but as yet they are only used to a limited extent, and it is not likely that they will ever supersede the ordinary effective processes of calico-printing, which depend on chemical action alone. (*See* CALICO-PRINTING.) The following example will give the reader a general idea of the electro-chemical methods:—A white pattern is to be printed on a blue ground. The cloth having been wetted with very dilute hydrochloric acid, is placed on a sheet of tinfoil or other conducting surface connected with the negative electrode of a voltaic battery. A plate of iron, upon which the required pattern has been painted in varnish, is now connected with the positive electrode of the apparatus, and applied to the cloth. Electro-chemical action is at once set up, and the exposed portions of the metallic surface are dissolved by the acid, and the chloride of iron thus formed becomes fixed in the cloth. To develop the pattern, the cloth is now passed through a bath of prussiate of potash, which produces a beautiful blue colour wherever the iron has touched, but which does not affect the parts which the varnish has shielded.

ELECTRO-CHEMICAL THEORY.—In Chem., a theory founded by Davy and Berzelius to account for the chemical changes that take place in substances during their formation or decomposition. It assumes that the constituents of every binary compound are always in opposite electrical states; one being electro-negative and the other electro-positive. When an electric current is passed through such a compound with sufficient force to decompose it, its electro-negative constituent is disengaged at the wire connected with the positive pole of the battery, and its electro-positive element at the wire connected with the negative pole. (*See* ELECTROLYSIS.) The elements and many compounds have

been classified according to this theory. Thus hydrogen metals and their oxides belong to the class of electro-positive substances, while the non-metallic elements and the acids belong to the other class. It must be borne in mind, however, that the distinction is only relative, as a substance may be electro-positive to one body, but electro-negative to a third. Sulphur, for instance, is electro-negative to silver, but electro-positive to chlorine.

ELECTRODE, *e-lek'-trode* (Gr. *elektron*, amber; *odos*, a way), a term substituted by Faraday for the term *pole*, as applied to one of the terminations of a voltaic battery. It signifies the way or door by which a current enters or leaves a substance. (*See* ELECTROLYSIS.)

ELECTRO-DYNAMICS. (*See* ELECTRO-MAGNETISM.)

ELECTRO-ETCHING, a mode of etching based upon the destructive action of certain *anions* upon metals during *electrolysis* (which *see*). If two plates of copper be connected with the opposite ends of a voltaic battery and placed in a vessel containing water mixed with a little sulphuric acid, the plate connected with the positive end will be attacked by the anion oxygen, which is released during the decomposition of the water. This destructive action can be localized at pleasure, by covering certain parts of the plate with a protecting stratum of varnish. Now, as ordinary etching-ground effectually shields a plate from the effects of electrolytic action, it is evident that a drawing traced through the ground in the ordinary manner may be etched without difficulty by exposing the plate to the action of the nascent oxygen. A stout wire must be soldered to the plate; and this, as well as the back of the plate, must be varnished with a solution of shell-lac in spirits of wine. Thus prepared, the plate is placed in a decomposition-cell opposite a plate of somewhat similar size, and the two are connected respectively with the copper and the zinc of a Daniell's or a Smee's cell. (*See* BATTERY, VOLTAIC.) After a lapse of about ten minutes, the prepared plate is removed, for the purpose of "stopping out" the fine parts of the design with Brunswick black. This operation having been completed, the plate is returned for another space of ten minutes. The half-tints are thus stopped out, and the plate is once more exposed to the action for ten minutes, in order that the stronger lines of the drawing may be deepened. The etching is now completed, and the ground is removed by means of heat. The exact duration of the several exposures, as well as their number, must, of course, be regulated by circumstances. To etch upon iron or steel, a solution of common salt may be used as an electrolyte, and to etch upon silver, a solution of sulphate of silver. The mode of etching above described is, in many respects, superior to the common mode by the use of acids. The whole operation can be conducted with considerable regularity, and can be rendered slow or rapid at pleasure. Again, the plate can be taken out of the decomposition-cell from time to time to be examined, and can be re-submitted to the electrolytic action in a moment.

ELECTROLYSIS, *e-lek-trol'-e-sis* (Gr. *elektron*, amber; *luo*, I loose), a term applied by Faraday to the process of electro-chemical decomposition. The voltaic current has the power of loosening and separating the elements of certain compounds when these are interposed in the circuit. The substances which are thus susceptible of decomposition are termed *electrolytes*. They are all binary compounds, containing single equivalents of their components, which are held together by very powerful affinities. The amount of electrical power required to effect decomposition varies greatly with different electrolytes: solution of iodide of potassium, melted chloride of lead, hydrochloric acid, water mixed with a little sulphuric acid, and pure water, demand very different degrees of decomposing force, the resistance increasing from the first-mentioned substances to the last. One of the indispensable conditions of electrolysis is fluidity; for bodies which, when reduced to the liquid state by fusion or solution, freely conduct electricity and readily suffer decomposition, are frequently absolute insulators when solid. When a liquid is electrolyzed, its components are disengaged solely at the limiting surfaces, where, according to the usual figurative mode of speech, the current enters and leaves the liquid, all the intermediate portions appearing perfectly quiescent. Faraday has proposed the terms *anode* and *cathode* respectively for the surfaces which are supposed to receive and let out the current of positive electricity. The anode is therefore directly against or opposite the positive pole of the battery, or, according to Faraday's nomenclature, the positive *electrode*; and the cathode against or opposite the negative pole or electrode. The bodies which are set free by electrolysis are termed *ions*. Those ions which go to the anode, and appear at the positive electrode or pole, are distinguished by the term *anions*, and those which go to the cathode, and appear at the negative electrode, by the term *cathions*. In the old phraseology of the *electro-chemical theory* (which *see*), anions would be called electro-positive bodies, and cathions electro-negative bodies, from the assumption that they are under the influence of direct attractive forces residing in the opposite poles of the battery. Faraday has shown by conclusive experiments that the decomposing force is not at the poles, but within the substance which is acted on by the current; and the new terms introduced by him express the phenomena actually observed in all cases of electro-chemical decomposition. The following illustrations of electrolysis are particularly striking:—When a pair of platinum plates are plunged into a glass of water to which a few drops of sulphuric acid have been added, and the plates connected by wires with the extremities of an active voltaic battery, the water is decomposed into its two constituents, oxygen and hydrogen gases; the former being disengaged at the positive electrode, and the latter at the negative electrode. The sulphuric acid is added to the water merely to increase its conducting power. A solution of hydrochloric acid coloured with a little Saxon blue, and treated in the same manner, yields hydrogen at the negative electrode and chlorine at the positive, where its presence is made evident by the indigo becoming bleached. Iodide of potassium is decomposed in a similar manner, with still greater ease; and the free iodine at the positive electrode can be recognized by its brown colour or by the addition of a little gelatinous starch, with which it forms a lovely blue compound. The decomposition of water by the voltaic current was first observed by Messrs. Nicholson and Carlisle, and their discovery caused a great sensation in the scientific world. The researches of Davy on the chemical effects of the current led soon after to the great discovery that the alkalies, soda and potassa, and the earths, which had hitherto been regarded as elementary bodies, contained metals. This discovery, which was announced in 1807, proved that the voltaic pile was an instrument of immense importance in chemical investigations. To Davy's great pupil and successor, Faraday, the world is indebted for the elucidation of beautiful phenomena attendant on electrolysis. From a very extended series of experiments he was enabled to draw the general inference that the effects of chemical decomposition were always proportionate to the quantity of circulating electricity, and might be taken as an accurate and trustworthy measure of the latter. Guided by this important principle, he constructed his *voltameter*, an instrument which has rendered the greatest service to electrical science. This is merely an arrangement by which a little acidulated water is decomposed by the current, the gas evolved being collected and measured. By placing such an instrument in any part of the circuit, the quantity of electrical force necessary to produce any given effect can be at once estimated; or, on the other hand, any required amount of the latter can be, as it were, measured out and adapted to the object in view. Experiments performed with the aid of this instrument led to the important discovery that the relative decomposing effects produced by the same current in different electrolytes is exactly expressed by the atomic weights or chemical equivalents of the electrolytes. Thus if a current be made to traverse acidulated water, iodide of potassium, and chloride of lead, these three electrolytes will suffer decomposition at the same time, but by no means to the same extent; for the current which decomposes but 9 parts of water will separate into their elements 166 parts of iodide of potassium and 139 parts of chloride of lead. Electrolysis can be effected by the electricity of the common electrical machine, though only on a very minute

scale. This arises from the small *quantity* of electricity set in motion by the machine, as compared with that generated by the voltaic battery. A pair of small wires of zinc and platinum dipping into a single drop of dilute acid develop far more electricity, to judge from the chemical effects of such an arrangement, than very many turns of a large plate electrical machine. The wonderful powers of the electricity generated by the machine depend on its *tension*, or that property which enables it to overcome difficulties and pass through imperfect conductors. The electrolysis of metallic salts is now carried out on a large scale in the beautiful arts of *electrotype* and *electroplating* (which *see*). The more recent arts of *electro-etching, galvanography*, and *electro calico-printing* (*see* these words), are also based upon the chemical action of the voltaic current.—*Ref.* Fownes's *Manual of Chemistry*; Harris's *Rudimentary Treatise on Galvanism*.

ELECTRO-MAGNETISM, *e-lek'-tro-mág'-ne-tizm*, an important branch of electrical science, which may be said to have sprung from a discovery made by Professor Oersted, of Copenhagen, in the year 1820. The discovery of the Danish philosopher was thus simply stated:—When a properly-balanced magnetic needle is placed in its natural position in the magnetic meridian, immediately under and parallel to a wire along which a current of voltaic electricity is passing, that end of the needle which is situated next to the negative side of the battery immediately moves to the *west*; if the needle is placed parallel to and over the wire, the same pole moves to the *east*. When the uniting wire is situated in the same horizontal plane as that in which the needle moves, no declination takes place; but the needle is inclined, so that the pole next to the negative end of the wire is depressed when the wire is situated on the west side, and elevated when situated on the east side. By this discovery the relation of magnetism to electricity, which had long been suspected, was satisfactorily established, and a new and boundless field of research was opened. One of the earliest and most active labourers in this field was Faraday, who, reasoning on the fact that the action of a conducting-wire on a magnet is not a directly attractive or repulsive one, was led to the conclusion, that if the action of the voltaic current could be confined to one pole of the magnet, that pole ought, under proper conditions, to rotate round the wire; and conversely, if the magnet were fixed and the conducting-wire movable, the wire ought to rotate round the magnetic pole. Both of these phenomena he realized; and early in 1822 described the apparatus for exhibiting them. The apparatus employed to exhibit the rotation of the movable magnet consisted of a deep cup, nearly full of mercury, in which a cylindrical magnet was placed. The north pole of this magnet was allowed to project above the surface of the mercury, while its south pole was held down by a piece of thread attached to the end of a copper wire, which entered the cup through the centre of the base. The end of a second wire was made to dip into the mercury exactly over that at the bottom of the cup. By connecting the two wires with the two ends of a voltaic battery in action, the current was made to pass through the mercury; and the magnet, buoyed up by the mercury, rotated about it. If the positive current descended, the rotation was in the direction from east through south to west: but if the current was made to ascend, then the direction of the motion was reversed. Ampère subsequently caused a magnet to rotate round its own axis; and Barlow devised an ingenious apparatus for exhibiting the rotation of a conducting body round its axis. The first useful application of Oersted's discovery of the reciprocal force exerted between magnetic bars and conducting-wires, was made by Schweigger, a German physicist, in the construction of an instrument for indicating the direction and measuring the intensity of voltaic currents. (*See* GALVANOMETER.) The laws of electro-magnetic action were fully developed by Ampère, who must be regarded as one of the greatest philosophers of this century. In the course of his investigations he discovered a number of extremely interesting phenomena resulting from the action of electrical currents on each other, which become evident when arrangements are made for giving mobility to the conducting-wires. He found that when two currents flowing in the same direction were made to approach each other, strong attraction took place between them, and when in opposite directions, an equally strong repulsion. These effects have absolutely no relation that can be traced to ordinary electrical attractions and repulsions, from which they must be carefully distinguished. They are purely *dynamic*, having to do with electricity in motion; and hence they are generally treated of under the head of *electro-dynamics*. Upon those attractions and repulsions of conducting-wires Ampère founded a most beautiful and ingenious hypothesis of magnetic actions in general, which explains very clearly the influence of the current on the needle. He found that a striking analogy existed between wires conducting electricity and magnets, when the former were turned, corkscrew fashion, into helices. A helix has indeed all the properties of a magnet, but the nature of the pole at either end will depend on the direction of the turns of the helix; if these be from left to right, then the extremity at which the current enters will have the magnetic properties of a north pole; but if the helix be a left-handed one, then the extremity at which the current enters will have the magnetic properties of a south pole. The analogy extends to fracture. If a magnetic bar be broken in two, each piece is a perfect magnet, and the fractured parts have opposite poles; so it is with the helix, which, if divided in the middle, exhibits attraction between the fractured ends. Now, according to Ampère's theory of magnetism, the phenomena exhibited by a magnet depend on voltaic currents circulating round its molecules. In their unexcited state, these molecular currents move in all directions, and thus neutralize one another; but when the bar becomes a magnet, the currents move parallel to each other, and in the same direction, and the effect produced is that of a uniform current moving corkscrew-fashion round the bar, which thus becomes in effect a helix, and the attractions and repulsions are consequences of the actions of the currents on each other. In applying this theory to the explanation of the phenomena of terrestrial magnetism, it is necessary to suppose the incessant circulation of electrical currents round the globe from east to west perpendicular to the magnetic meridian. (*See* MAGNETISM.) A consideration of the influence exerted by electrical currents on magnets naturally led to the conclusion that the neutral condition of bodies susceptible of magnetism would be disturbed by an electrical current, and this conclusion was quickly verified by experiments. When an electrical current is passed at right angles to a piece of iron or steel, the latter acquires magnetic polarity, either temporary or permanent, as the case may be, the direction of the current determining the position of the poles. This effect is prodigiously increased by causing the current to circulate a number of times round the bar, which then acquires extraordinary magnetic power. A steel bar may be permanently magnetized in this way, but a bar of pure and soft iron retains the magnetic force only so long as the electrical current is circulating round it. Bars of iron thus temporarily magnetized are called *electro-magnets*. They are usually horse-shoe shaped, and the conducting-wire, which is wound several times round them, is ordinary copper bell-wire, covered with silk or cotton for the purpose of insulation. The power of the electro-magnet depends on the dimensions of the bar, the purity of the iron, the intensity of the current, and on the length and thickness of the covered wire. One has already been constructed which, when connected with a powerful voltaic battery, attracts the iron keeper with a force equal to the weight of more than two tons. When it was discovered that magnets of great power could so readily be made and unmade, attention was naturally given to the application of electro-magnetism as a motive power, and many ingenious models of engines driven by electricity soon made their appearance. At the present time, there are many highly efficient electro-magnetic engines in existence, but the expense of working them prevents their application to ordinary purposes. (*See* ELECTRO-MOTIVE POWER.) The application of electro-magnetism to telegraphy has led to marvellous results. Space and time have, in effect, been annihilated, and

the inhabitants of almost all the large towns of the civilised portions of the globe have been brought, as it were, within speaking distance of each other. A general description of the electric telegraph, with a sketch of the history of telegraphic communication, will be found under the head of TELEGRAPHY. Electro-magnetism has been most successfully applied as a motive power to the mechanism of clocks. (*See* HOROLOGY.) About ten years after Oersted's discovery, Faraday found that electrical currents could be developed in metallic bodies by the action of magnetism. Out of this discovery arose an entirely new branch of electricity, which has been termed Magneto-Electricity (which *see*).—*Ref.* Noad's *Manual of Electricity*; Sir W. Snow Harris's *Rudimentary Treatises on Magnetism and Electricity*.

ELECTRO-METALLURGY, a comprehensive term for the application of electricity to metal-working. The more important branches of electro-metallurgy are fully described under the heads ELECTROTYPE, ELECTRO-PLATING AND GILDING, and ELECTRO-ETCHING.

ELECTROMETERS. (*See* ELECTROSCOPES AND ELECTROMETERS.)

ELECTRO-MOTIVE POWER.—The attractive force of the electro-magnet is applied with complete success as a motive power; and machines or engines driven by this force are rather extensively used in the fabrication of mathematical and optical instruments. Compared with steam, electro-magnetism is a very costly agent, and, on this account, it cannot be employed for moving ordinary machinery. For small and delicate machines, however, electro-motive power is so excellently adapted, that its cost is not taken into consideration. Its peculiar advantages are its noiseless action, portability, safety, controllability, and freedom from dirt. The celebrated Russian philosopher Jacobi first constructed electro-motive engines large enough to be practically tested. With one of these, he, in 1839, succeeded in working the paddles of a boat with such force, that the boat, with ten persons on board, attained the speed of four miles an hour. In 1842, Mr. Davidson made some experiments with an electro-motive engine of his invention, and succeeded in propelling a carriage weighing five tons along a line of rails at the rate of four miles an hour. In America, Mr. Davenport and Professor Page successfully applied electro-magnetism to various machines; and in Denmark, Mr. Bjorth, in 1840, took out a patent for an electro-motive engine of 10-horse power, which far surpassed all previous contrivances. To M. Froment, the celebrated mathematical-instrument-maker of Paris, the world is indebted for the proof that electro-magnetism could be advantageously used as a permanent and regular moving power in a large establishment. The electro-motive machines of M. Froment are very various in form, magnitude, and power; but they all derive their motion from magnetism temporarily induced in iron bars by the action of the electric current. (*See* ELECTRO-MAGNETISM.) By an expedient to which an infinite variety of forms may be given, the current round each iron bar, or electro-magnet, can be alternately transmitted and suspended with any desired degree of rapidity; and, by varying the power of the battery, the length of the coiled wire, and the magnitude of the bar, a magnetic force of any desired intensity can be produced. A piece of iron, called an armature, is presented to one or both of the poles of the electro-magnet, towards which it is attracted while the current is transmitted, with a force proportionate to the intensity of the magnetism; and when the current is suspended, the armature either falls from the magnet by its own weight, or is withdrawn from it by the action of a spring or other mechanical arrangement provided for the purpose. The armature may be placed between two magnets, so as to be alternately acted upon by the electric current, which is transmitted round each in the intervals of its suspension round the other. The armature will then be moved alternately to and fro between the two magnets. In this manner, by alternately suspending and transmitting the current on the wire which is coiled round the electro-magnet, the magnet and its armature receive an alternate motion to and from each other, similar to that of the piston of a steam-engine or the foot of a person who works the treadle of a lathe. This alternate motion is made to produce one of continued





rotation by the same mechanical expedients as are used in the application of any other moving power. The force with which the electro-magnet and its armature attract each other determines the power of the electro-motive machine, just as the pressure of steam on the piston determines the power of a steam-engine.—*Ref.* Lardner on *Electro-Motive Power*, in *Museum of Science and Art*. The construction of several of M. Froment's ingenious contrivances is there plainly described.

ELECTROPHORUS, *e-lek-trof'-o-rus* (Gr. *elektron*, and *phoreo*, I bear), a valuable instrument for exciting electricity, devised by Volta. In the chemical laboratory it is generally used instead of an ordinary electrical machine for charging small Leyden jars, when mixtures of gases have to be exploded by the electric spark. To construct it, a plate of tin is made into a circle of about twelve inches diameter; a raised border is then turned up for about half an inch, and the extreme edge is turned outwards over a wire, so as to avoid a sharp border. A mixture of equal weights of shell-lac, Venice turpentine, and resin, is made by gently heating them together until well fused, stirring during the time with a stick, so as to thoroughly incorporate the ingredients. The composition should, when perfectly homogeneous, be poured into the plate with the raised edges until it is quite full, and the composition is to be kept melted, but not too hot, until the bubbles have entirely disappeared. The second portion of the instrument, or that which serves the place of a conductor, consists of a flat circle of wood, rounded at the edge, and neatly covered with tin-foil; it is rather smaller than the resinous plate. An insulating handle, formed of a piece of stout glass rod, is cemented into the centre of the wooden disc. Before using the instrument, it must be carefully dried and slightly warmed. The resinous surface is to be excited by beating with a piece of warm flannel. To do this effectually, the latter is to be folded into a slip about fourteen inches long, and, being grasped by one end, is to be struck upon the resinous surface smartly, and in an oblique direction, much in the manner of beating dust off a flat surface. When this has been done for about a minute, the warm dry cover or upper plate of the instrument is to be placed upon the resinous cake, and touched with the finger. If the cover is then raised a few inches, and the knuckle approached, a powerful spark of positive electricity will pass; and if the cover be again replaced, touched, and raised, a second spark will pass. This may be repeated many times without again exciting the resinous plate, for the electricity of the cover is not derived in the way of charge from the resin, but is the result of the process of induction. By substituting the knob of a Leyden jar for the knuckle, in order that it may receive a spark after each raising of the cover, the jar may be quickly charged sufficiently to give a powerful shock, or to cause the explosion of a gaseous mixture. The electrophorus is sometimes termed the perpetual electrical machine.

ELECTRO-PLATING AND GILDING, the arts by which silver and gold are deposited in thin films upon the baser metals through the agency of electricity. The idea of working in the noble metals by electricity was naturally suggested to several experimentalists simultaneously by the beautiful results obtained with copper. (*See* ELECTROTYPE.) The early attempts at electro-plating were, however, somewhat discouraging; for although De la Rive, C. V. Walker, and others, succeeded in obtaining deposits, they could only get deposits of the proper character when they chanced to have in action a power nicely balanced with the work to be performed. The first practical process of electro-plating was introduced by the Messrs. Elkington, of Birmingham, who have obtained patent rights for this and many other processes of electro-metallurgy. They employ solutions of the argento-cyanide and the auro-cyanide of potassium as electrotypes, from which silver and gold are respectively separated. These compounds are what chemists term double salts; for instance, cyanide of potassium is simply a compound of potassium and cyanogen; but argento-cyanide of potassium is silver and cyanogen combined with potassium and cyanogen, or, what amounts to the same thing, cyanide of silver united with cyanide of potassium. When a solution of this double cyanide is electrolyzed (*see* ELECTROLYSIS), silver appears at one electrode and

cyanogen at the other, while a proportionate amount of the simple cyanide of potassium is formed in the solution. But if the positive electrode is silver, the cyanogen combines with it and forms cyanide of silver, which unites with the liberated cyanide of potassium, and so keeps up the strength of the solution. In the great electro-plating establishments of Birmingham, large oblong vats are used as decomposition-cells: some of these contain from 200 to 250 gallons of the silvering solution. Silver plates, connected with the positive end of the voltaic apparatus, are placed at intervals in the vats: they correspond in extent of surface with the articles to be coated, and face them on both sides. Two brass rods, connected with the negative end of the apparatus, are laid over each vat lengthways, and from these the articles to be coated are suspended by copper wires. Almost all the articles which are commonly electro-plated, such as teapots, cruet-frames, candlesticks, spoons and forks, are formed of nickel silver or German silver, an alloy of copper, zinc, and nickel: this is chosen chiefly on account of its silvery whiteness, a quality of great importance when portions of the coating of noble metal have been worn away by use. The articles to be plated are first boiled in a solution of potash, to free them from grease; they are then quickly dipped in red nitrous acid, to remove any oxide that may have formed on the surface, and, after this, twice washed in different tanks of water, to remove every trace of the acid. After having been carefully weighed, they are suspended from copper wires and dipped into a solution of mercury in cyanide of potassium, then again twice washed in different tanks of water, and then they are ready for immersion in the silvering solution. Here they are left until the operator has reason to believe that nearly a sufficient amount of silver has been deposited on them, when he removes a test article and weighs it, to ascertain the exact condition of the others, and how much longer they require to remain in the solution. Any thickness of silver may, of course, be given to an article by continuing the operation sufficiently long, but from three to six hours generally suffice to give a proper coating: 14 ounce of silver to the square foot of surface is considered to form an excellent plate. In some establishments the silvering solution is kept constantly stirred by simple mechanical arrangements. The silver-plated articles, on being removed from the vats, are well brushed with brushes of very fine brass wire attached to a lathe, and cleaned with fine Calais sand; they are afterwards polished on revolving brushes with rottenstone, then by hand with soft leather and rouge, and lastly with the naked hand. The finishing operation is always performed by women, who, from the greater softness and delicacy of skin, excel men in the art of polishing. Articles with fluted, chased, and ornamented surfaces, are often burnished after being polished. The burnisher is a piece of highly-polished hardened steel, sometimes of bloodstone, flint, or agate, fitted to a handle; and when judiciously applied to smooth metallic surfaces, it imparts to them, by friction, an exceedingly brilliant and lasting polish. The process of electro-gilding is nearly the same as that of silvering, but, of course, plates of gold are suspended in the solution instead of silver plates.

ELECTROSCOPES AND ELECTROMETERS, *e-lek'-tro-scopes, e-lek-trom'-e-ters* (Gr. *elektron*, and *skopeo*, I see, or *metreo*, I measure), instruments constantly employed in electrical investigations. The distinction between the electroscope and the electrometer is often disregarded by scientific writers. Strictly speaking, the former is an instrument for simply rendering electrical excitation apparent by its effects, and the latter an instrument for measuring electrical forces. Any light body delicately suspended may be used as an electroscope. A pith ball hanging by a fine silk thread from a convenient stand is very frequently employed. Another form of this instrument consists of two pith balls hung by threads, or very fine metal wires: when excited, the balls diverge in virtue of their mutual repulsion. Bennett's gold-leaf electroscope—a much more delicate instrument, and one of great value in all electrical investigations—consists of two slips of gold-leaf suspended parallel to each other within a glass receiver, and communicating with a metal cap or disc above. When the cap is touched with an electrified body, the leaves separate, but instantly collapse when a second body charged with the opposite kind of electricity is brought near the cap. The oldest form of the electrometer consists of a vertical conducting-rod with a movable reed arm terminating in a light pith ball, and working over a graduated quadrant or semicircle. The instrument is generally attached to the prime conductor of the electrical-machine, and, when charged, the vertical rod repels the reed arm, which rises in the air, and marks on the graduated semicircle the angle of divergence. This instrument is known as Henley's quadrant electrometer. Cavendish constructed an excellent electrometer, with two slender reeds terminating with two cork balls, the divergence of which was indicated by a scale. In Coulomb's torsion-balance the force of electrical repulsion is estimated by the reactive force of a fine wire suspended vertically, and twisted more or less from its quiescent position. Harris's hiffilar balance—an exceedingly delicate and useful electrometer—may be regarded as a modification of Coulomb's. There are many electrometers for estimating the quantity of accumulated electricity in Leyden jars. Of these the most useful are the discharging electrometers of Lane and Cuthbertson, and the unit-measure and quantity-jar of Sir W. S. Harris. For descriptions and figures of all the more important electroscopes and electrometers, refer to Harris's *Rudimentary Electricity*.

ELECTROTYPE, *e-lek'-tro-tipe* (Gr. *tupos*, an impression), the term commonly applied to the art of depositing copper and other metals in or upon suitable moulds, through the agency of voltaic electricity, so as to produce faithful copies of coins, medals, statues, engraved blocks, and other works. For this art we are indebted to Professor Jacobi, of St. Petersburg, and Mr. Spencer of Liverpool, who almost simultaneously invented similar processes for moulding the copper released during the electrolysis of the sulphate, into beautiful or useful forms. The following examples of electrolysis (*see* this word) will elucidate this important branch of electro-metallurgy. If two platinum plates be connected with the opposite ends of a voltaic battery in action, and be placed in a vessel containing water and sulphuric acid, the water will be electrolyzed, or decomposed by electricity: the hydrogen gas will be released at the plate connected with the negative end of the battery, and the oxygen at that connected with the positive. If into the acid liquid some crystals of sulphate of copper (blue vitriol) be now thrown, electrolysis will still take place, but only one of the elements of the water, namely oxygen, will be evolved; for the hydrogen, on being released from the water, will take the place of the copper in the solution, and the copper thus liberated will be deposited on the negative plate. This experiment may be continued until all the copper is abstracted from the solution. If a copper plate be now substituted for the platinum one, forming the positive electrode, the water will be decomposed, but neither of the gases will escape. The hydrogen, as before, will take the place of the copper in the solution; the oxygen, instead of appearing at the positive plate, will combine with the copper of which that plate is composed, forming oxide of copper, which will unite with the sulphuric acid to form sulphate of copper. The chemical forces called into action by the current are so beautifully balanced that, in the last experiment, the quantity of copper supplied by the positive plate equals exactly the quantity withdrawn from the solution and deposited on the negative plate. The practice of electrotyping consists in preparing models or moulds of objects to be copied, and in so arranging the battery, or apparatus which generates the voltaic current, as to deposit the metal in a compact and solid form upon these models. There are many materials fitted for forming electrotype-moulds; of these, fusible metal, wax, stearine, plaster of Paris, and gutta-percha, are mostly used. Non-metallic moulds are rubbed over with plumbago or black-lead, which is an excellent conductor of electricity. The application of this substance to non-conducting surfaces was recommended by Mr. Mason. Plaster of Paris moulds must be saturated with wax or tallow, or covered with fine varnish, before they are placed in the copper solution. The simplest kind of voltaic apparatus for electrotyping is a single cell of a Daniell's battery, slightly

modified. (*See* BATTERY, VOLTAIC.) In a vessel of stoneware or glass is placed a tube or cell of porous earthenware, and in this a plate or rod of amalgamated zinc. A perforated shelf for holding crystals of sulphate of copper is fixed in the upper part of the outer vessel. The prepared mould which represents the copper or negative element of an ordinary voltaic pair is connected by a wire with the zinc, and suspended in the outer vessel. To charge the apparatus, the porous cell is filled with a mixture of water and sulphuric acid; the outer vessel with a saturated solution of sulphate of copper, with a little sulphuric acid in it; and the shelf is well furnished with crystals of sulphate of copper to keep the solution saturated. Certain precautions must be observed in using this apparatus. Thus the mould must not be too small in proportion to the size of the zinc; for when this is the case the copper is deposited as a dark powder. Again, it must not be too large, because then the copper is deposited very slowly, and is of a brittle texture. The single-cell apparatus is now only used for copying medals, seals, and other small works. For electrotyping large objects, or for operating upon a number of small moulds, a separate decomposition-cell is used, with a single cell of a Daniell's or a Smee's battery for producing the current. The decomposition-cell is filled with a dilute acid solution of sulphate of copper. Two brass rods, connected respectively with the zinc and copper (or platinized silver) of the generating-cell, are laid across the top; to one of these the moulds are attached, and to the other a plate or plates of copper. By a series of chemical changes, to which reference has already been made, the copper from the solution is transferred to the moulds; and the copper plates are dissolved with such regularity, that the strength of the solution is kept up. The useful purposes to which the electrotype process is applied are innumerable. It is used for copying busts and statues; for manufacturing pipes without seams, boilers, stewpans, and other vessels of copper; for reproducing the plates used to print Bank of England notes; for making casts from metal type and woodcuts; to form rollers of copper for printing or embossing calicoes; to give strong coatings of metal to fragile glass vessels, such as chemical retorts and flasks; to prepare metallic lace and cloth; and to cover delicate flowers and minute insects with durable films of copper.—*Ref.* C. V. Walker's *Electrotype Manipulation.*

ELECTRUM, *e-lek'-trum* (Gr. *elektron*, amber), a term used by the Greeks to denote amber, and applied by the Romans to this substance and to an alloy of gold and silver containing three or four parts of the former to one of the latter. The metal thus formed was characterized by great lustre and brilliancy. At the present day the term is often used to denote German silver.

ELECTUARY, *e-lek'-tu-ŭ-re* (Lat. *eligo*, I make choice), in Med., is a form of preparing certain remedies, such as dry powders, by forming them into a soft mass by means of syrup or honey, so as to be easily taken off a teaspoon or the point of a knife, or without their naturally unpleasant taste being perceived.

ELEEMOSYNARY, *el-ee-moz'-e-na-re* (Gr. *eleemosune*, alms), of or belonging to alms or charity. In the early church, the *eleemosynarius*, or almoner, was a peculiar officer, who received the eleemosynary rents and gifts, and distributed them to pious and charitable uses. In Law, eleemosynary corporations are corporate bodies constituted for the perpetual distribution of the free alms or bounty of the founder of them, to such persons as he has directed. Of this kind are all hospitals for the maintenance of the poor, sick, and impotent, and all colleges, both in our universities and out of them.

ELEGIT, *e-le'-jit* (Lat. *eligo*, I choose,—because it is the choice or election of the plaintiff), in Law, is the name of a writ of execution founded on the Statute of Westminster the Second, by which, after a plaintiff or defendant has obtained judgment in an action, the sheriff gives him possession of the lands and tenements of the opposite party, to be occupied and enjoyed until the money due on such judgment is fully paid, and during that period he is tenant by elegit. By the common law, a man could only have satisfaction of the goods, chattels, and present profits of lands, but not possession of the lands themselves. To remedy this, the above statute was passed, by which not only are the defendant's goods and chattels (except oxen and beasts of the plough) delivered over to the plaintiff, but if there are not sufficient to satisfy the debt, then the sheriff shall make delivery of a moiety of the defendant's land to be held until the whole debt and damages are paid and satisfied. This statute was altered by 1 & 2 Vict. c. 110, which enables the plaintiff by this writ to seize the whole, instead of only half of the defendant's lands and tenements. Upon this writ the sheriff impanels a jury, who appraise the debtor's goods and lands, and if the former are insufficient to pay the debt, then the latter are also delivered over to the creditor.

ELEGY, *el'-e-je* (Gr. *elegos*, from *e*, and *legein*, to cry alas!), a term applied, in modern English language, to a short poem composed on a mournful occasion, generally on some one's death. Amongst the ancient Greeks, the *elegos* was a strain of lament, and usually consisted of a poem made up of alternate hexameter and pentameter verses. The elegiac was also the favourite metre for epigrams. It was used, however, by different poets in different ways. The elegies of Callinus and Tyrtæus are political and warlike; those of Mimnermus are contemplative and melancholy; those of Theognis and Solon are moral and political, &c. The first Latin elegiac writer of note was Catullus, and he was followed by Tibullus, Tibutius, and Ovid. The elegiac verses of Catullus are either mournful or satirical, while those of the other poets of the Augustan era are devoted to subjects connected with successful or unsuccessful love. In more modern times, the poets of nearly every nation have practised this species of composition. Amongst the most successful in this country may be mentioned the Elegies of Hammond, the Lycidas of Milton, and Gray's Elegy.

ELEMENTS, *el'-e-ments* (Lat. *elementum*), in Chem.—An element may be defined as a substance which cannot be resolved into others. The ancient philosophers imagined earth, air, fire, and water to be elements, by the combination of which all other substances were formed. Modern chemistry has, however, proved that air, earth, and water are compound bodies, and that fire is an effect, and not a substance. The number of substances which cannot be further resolved by chemists are provisionally termed by them elements, it being by no means improbable that many of them are compound bodies. In the present state of knowledge, they are about sixty-five in number, and are divided broadly into the non-metallic and metallic elements; these two divisions somewhat running into each other, it being still a matter of dispute amongst chemists as to whether silicon is a metal or not. The following is a list of the elements divided in this manner:—

*Non-metallic Elements.*

| Name. | Symbol. | Equivalent. |
|---|---|---|
| Boron | B | 10·9 |
| Bromine | Br | 80 |
| Carbon | C | 6 |
| Chlorine | Cl | 35·5 |
| Fluorine | F | 18·9 |
| Hydrogen | H | 1 |
| Iodine | I | 127·1 |
| Nitrogen | N | 14 |
| Oxygen | O | 8 |
| Phosphorus | P | 32 |
| Sulphur | S | 16 |
| Selenium | Se | 21·3 |

Of these, selenium is but of slight importance.

*Metals.*

| Name. | Symbol. | Equivalent. |
|---|---|---|
| Aluminium | Al | 13·7 |
| Antimony | Sb | 129 |
| Arsenic | As | 75 |
| Barium | Ba | 68·5 |
| Bismuth | Bi | 213 |
| Cadmium | Cd | 56 |
| Calcium | Ca | 20 |
| Chromium | Cr | 26·7 |
| Cobalt | Co | 29·5 |
| Copper | Cu | 31·7 |
| Gold | Au | 197 |
| Iron | Fe | 28 |

| Name. | Symbol. | Equivalent |
|---|---|---|
| Lead | Pb | 103·7 |
| Lithium | Li | 6·5 |
| Magnesium | Mg | 12·2 |
| Manganese | Mn | 27·6 |
| Mercury | Hg | 100 |
| Nickel | Ni | 29·6 |
| Platinum | Pt | 98·7 |
| Potassium | K | 39·2 |
| Silver | Ag | 108·1 |
| Sodium | Na | 23 |
| Strontium | Sr | 43·8 |
| Tin | Sn | 59 |
| Tungsten | W | 95 |
| Uranium | U | 60 |
| Zinc | Zn | 32·6 |

The following are only of scientific importance, no use having as yet been found for them. Some of them, such as palladium, rhodium, iridium, and one or two more, would be exceedingly valuable but for their rarity.

| Name. | Symbol. | Equivalent. |
|---|---|---|
| Cæsium | Cs | |
| Cerium | Ce | 47 |
| Didymium | D | |
| Erbium | E | |
| Glucinum | Gl | |
| Ilmenium (?) | Il | |
| Iridium | Ir | 99 |
| Lanthanium | La | |
| Molybdenum | Mo | 46 |
| Niobium (?) | Nb | |
| Osmium | Os | 99·6 |
| Palladium | Pd | 53·3 |
| Pelopium (?) | Pe | |
| Rhodium | R | 52·2 |
| Rubidium | Rb | |
| Ruthenium | Ru | 52·2 |
| Tantalum | Ta | 184 |
| Tellurium | Te | 64·2 |
| Terbium | Tb | |
| Thallium | Tl | |
| Thorium | Th | 59·6 |
| Titanium | Ti | 25 |
| Vanadium | V | 68·6 |
| Yttrium | Y | |
| Zirconium | Zr | 22·4 |

To these may be added Donarium and Norium, two very rare metals, whose existence can hardly be said to be yet proved. Of these sixty-five elements, oxygen, hydrogen, nitrogen, chlorine, and perhaps fluorine (which has never been satisfactorily isolated), are gaseous; bromine and mercury are liquid; and the rest are solid at ordinary temperatures. (*See* also ATOMIC VOLUME, METALS, NON-METALLIC ELEMENTS.)

ELEMENTS, those numerical quantities, obtained by observation and calculation, which are used in compiling tables that exhibit the ephemeris of a planet's motions. The principal are its greatest, mean, and least distance from the sun; its mean daily motion; its mean annual motion; the eccentricity of its orbit and its inclination to the ecliptic; the longitude of its ascending node and perihelion; and its mass and density.

ELEPHANT, *el'-e-fint* (*Elephas*).—This is the largest of existing *Pachydermata*. In ancient times the most curious notions were entertained concerning it, not the least quaint being that it had no joints. Aristotle and Pliny were firm adherents to this doctrine. There can be little doubt that this delusion sprung from the fact that the elephant seldom lies down either in a wild or captive state. They have been surprised by hunters standing and yet fast asleep. Captain Denman so encountered and shot an elephant. With regard to its disinclination to lie down when domesticated, it is recorded that one belonging to Louis XIV. never assumed any but a standing position during five years. In this case, however, there was evidence that other than natural causes impelled the elephant to remain on his legs; for he was at great pains to scoop in the stone walls of his house two deep holes, in which he inserted his tusks before sleeping. Were the elephant's legs formed like those of other quadrupeds, the labour of raising his immense carcass from the ground might





account for his dislike to a recumbent position; but his structure is such that lying down and rising are matters of but little difficulty. Instead of bringing his hind legs *under* him when he lies down, he extends them behind him, in the position of a kneeling human being; when he wishes to rise, he simply draws his hind feet gradually under him, and his enormous weight is levered up with perfect ease. This mobility of limb is of vast service to the elephant in the performance of his duty as a beast of burden; and with a *howdah* on his back containing eight or ten persons, and the driver on his neck, he can descend steep hills with perfect safety. He manages in this way: kneeling down at the commencement of the declivity, he puts out one fore-leg and feels cautiously for a safe footing; if he does not find it, he hammers at the soft soil with his heavy foot until he has made an indentation sufficient to secure firm footing. One foot thus accommodated, the other is drawn out with equal care, and provided for in the same manner as the first. Then one of the hind legs is cautiously drawn forward and one of the fore feet being released from the foothole, it is inserted in its place: and all this is performed so rapidly that it might be repeated at least three times in as litt time as it takes to write this explanation. It is u st needless to observe that the elephant is distingu ed by the possession of a long



ELEPHANT.

trunk or proboscis, which serves him in place of a hand, and enables him to perform many extraordinary feats. Without this curious appendage he would find existence difficult, if not impossible. Elephants sometimes go blind while in a state of freedom, but, guided by this exquisite organ of touch, they are still enabled to make their way through dense forests, to gather food, and to avoid ditches and hollows. The elephant's trunk is not composed of a mere series of muscular rings, as its appearance would lead one to suspect. It has three perfect and distinct uses. As an organ of smell, it is an elongated and curiously elastic nose. Within it two canals are continued from the nostrils, which are reflected round the nasal bones and then proceed straight to its end. These canals are separated by, and embedded in, a fatty elastic membrane containing thousands of minute muscles. Of these there are three sets,—an outer longitudinal, composed of four layers; an oblique set, which are variously directed; and a third set, which radiate from the tubes to the circumference. They are very small, and supposed to number as many as forty or fifty thousand. Besides as an organ of smell, the elephant's trunk serves as a sucker, by which the great animal may quench his thirst at the shallowest pools. There is no passage from the trunk to the mouth; but the former may be filled, and then, the mouth of it being turned under and into the proper mouth of the elephant, the operation of drinking is accomplished. The elephant is very tenacious lest harm should come to this valuable organ. Some time ago one was confined in a menagerie at Dublin, and by some misfor-

tune the building and the animal were destroyed by fire. As no trunk could be found, it was concluded that it had been consumed; but on closer examination it was found almost to a depth of *two feet* into the hard floor of the den. The dentition of the elephant is of a very remarkable nature. From the upper jaw extend two enormous teeth fixed in sockets in the front of the mouth, but which, in fact, are neither incisors nor tusks, although by the latter term they are generally known. They spring, however, from the intermaxillary bones, and must be regarded as the representatives of the incisors. They grow from a permanent pulp, and continue to increase in size during the life of the animal. The incisors are wanting in the lower jaw, as are also the canines in both jaws; and the only other teeth possessed by this immense quadruped consist of two molars of a most remarkable structure on each side of each jaw. These teeth are of a very large size, and a quadrangular form. They consist of a series of plates of the ordinary substance of teeth (*dentine*), each coated with a layer of enamel, and united together into a mass by a material called the *cement*. The form of these transverse plates of dentine and enamel varies greatly in the different species. The formation of the molar teeth, like that of the tusks, is going on as long as the elephant lives; but with this difference, that whilst after shedding the first or milk tusks, the pulp of each tusk continues adding matter to its base without any change, in the case of the molars it is a succession of separate teeth that is produced, the hindermost pressing gradually forward to take the place of those which have been abraded by use, and cast off as unserviceable. The period of gestation of the elephant is a few days over twenty months. The breasts of the female are placed under the chest, and the young one sucks not with the trunk but with the mouth. The strongest proof of the elephant's antipathy to a recumbent position may be drawn from the fact that although the new-born calf is much too short to reach the teat, the mother, rather than lie down, will extend her legs so as to bring her breast nearer the earth. In a state of domesticity, the elephant-keeper will, under such circumstances, build a little platform of earth for the elephant-calf to stand on while it sucks. At its birth, the calf is about thirty-six inches in height. Weaning a young elephant is, by all accounts, a formidable undertaking. A celebrated English traveller thus describes the business:—"About two-and-thirty females with their young ones were driven into the inclosure, and shortly afterwards there also went in four *great* male elephants, the riders of which had in their hand a long rope with a noose in the end. After many unsuccessful attempts, they succeeded in snaring one of the calves by the hind leg. This was a difficult matter to accomplish, for, besides its own opposition, it was protected by the adroitness of several of the grown females, who crowded round it. So outrageously did the calf struggle, that the big males had frequently to beat him, and I observed that once or twice they lifted him with their trunks literally off his legs." There are two living species of the genus Elephas,—the Indian (*Indicus*) and the African (*Africanus*). The latter is confined to the southern parts of Africa, and is distinguished from the former by the convexity of its forehead, the enormous size of its ears, and the lozenge-shaped arrangement of the dentine and ivory in its molar teeth. The Indian or Asiatic elephant has the forehead concave, the ears of moderate size, and the dentine and enamel of the teeth arranged in transverse bands. It differs likewise from the African species by the paler brown of the skin, and in having four nails on the hind feet, instead of three; and its tusks are smaller, although in size and weight the Indian elephant exceeds the other. The largest tusk on record is spoken of by Kloknes as having been sold at Amsterdam: its weight was 350 lbs. According to a celebrated elephant-dealer, an animal's "points" should appear as follows:—"Ears large and rounded, not ragged and indented at the margin; eyes dark hazel, and free from specks; roof of the mouth and tongue without dark or black spots of any considerable size; trunk large; tail long, with a tuft of hair reaching nearly to the ground; five nails on each fore-foot, and four on each of the hind ones; head well set on, and carried rather high; arch or curve of the back rising





gradually from the shoulder to the middle, and thence descending to the insertion of the tail; all his joints firm and strong." It is conjectured that elephants attain their full growth at about their twentieth year. Their size has been greatly exaggerated. In former times it was thought a common thing for the elephant to reach a height of twenty feet; but it is now pretty certain that ten feet is tall, and twelve feet an extraordinary height for one of these animals. Among the Singhalese the beliefis still prevalent that the elephant attains the age of two or even three hundred years; it, however, is a tolerably well-ascertained fact that the duration of life in these animals is from seventy to eighty years. There are records of the elephant living to a greater age than this. Amongst the papers of Colonel Robertson (son of the historian of Charles V.), who held a command in Ceylon in 1799, shortly after the capture of the island by the British, showing that a decoy was then attached to the elephant establishments at Matura, which the records proved to have served under the Dutch during the entire period of the occupation (extending to upwards of 140 years), and was said to have been found in the stables by the Dutch, on the expulsion of the Portuguese in 1656. The number of elephant tusks brought to England is very large. In Sheffield alone it is stated that upwards of 46,000 tusks are annually consumed. The workers in ivory in that town are above 500 in number, and the value of the ivory about £30,000 per annum.—Ref. *Wild Sports of the World*, by James Greenwood.

Elephantiasis, or Barbadoes Leg, *el-e-fan-ti'-a-sis* (Gr., from *elephas*, an elephant), is the name of a disease common in the East and West Indies, and so called from the skin of the affected limb becoming rough, scaly, and enormously thickened, so as to resemble the leg of an elephant. It generally comes on with great heat of the skin, alternating with profuse perspiration and ardent thirst. The part becomes red, hot, swelled, and painful, increases to great size, and becomes a burden to the patient. Though it is the leg that is generally affected by this disorder, other parts of the body are liable to its attack; but it is not usual for more than one part to be morbidly enlarged in the same individual. In the treatment of this disease in its earlier stages the use of laxatives and diaphoretics is recommended, together with the application of iodine ointment to the part, and firm bandaging. In the later stages little can be done for its alleviation, and amputation of the part is generally discountenanced.

Eleusinian Mysteries, *el-eu-sin'-e-an mis'-ter-eez*, a term applied by the ancient Greeks to the festival and sacred rites originally celebrated only at Athens and Eleusis, in honour of the goddess Ceres. It was considered the holiest and most venerable of all the festivals of Greece. There are several traditions current as to its origin; and many of the mysteries are unknown, as they were so superstitiously observed, that any person who revealed any of the religious ceremonies was put to death. The first Eleusinian festivals are generally attributed to a tradition that Ceres, or Demeter, as she was called by the Greeks, while seeking for her lost daughter Persephone, overwhelmed with grief and fatigue, rested upon a stone called "the sorrowful stone," near a well at Eleusis. Round this well the Eleusinian women first sang their choruses, and instituted the first mysterious rites. In after-time the festival was divided into two classes,—the greater and lesser mysteries. The latter was considered a preparation for the former, and was held at Agræ, on the Ilissus. The celebration at Eleusis commenced in the third month of the Attic year, and lasted about nine days. The initiated were called *epoptai* or *epharoi*. On the first day those who had been initiated in the lesser mysteries met together at Athens; hence it was called *agyris*, 'an assembly.' A large number of strangers also crowded to Athens at the same time. On the second day the initiated purified themselves by ablutions; hence it was called *alade mystæ*,—'to the sea, ye initiated!' Very little is known with certainty about the proceedings on the third day. It seems to have been held as a day of fasting, a frugal meal of cakes made of sesame and honey being taken in the evening. Sacrifices were also offered up, principally consisting of sea-fish and barley cakes. The fourth day was devoted to a pro-

cession, with a basket containing pomegranates and poppy-seeds. It was carried on a waggon drawn by oxen, which women followed, bearing in their hands mystic cases, while the spectators shouted, "Hail Ceres!" as the procession passed. The fifth day was called the Day of the Torches. The initiated went by torchlight on the evening of this day to the temple of Ceres at Eleusis, where they seem to have remained. This custom is supposed to have been symbolical of Ceres wandering in search of her daughter. The sixth, Iakchos, in honour of Iacchus, the son of Ceres. The statue of Iacchus, adorned with a garland of myrtle, and bearing a torch in his hand, was carried along the Sacred Road, amid shouts of joy and songs, from the Ceramicus to Eleusis. Great numbers of persons accompanied this procession. On the night between the sixth and seventh days, the initiated remained at Eleusis, and those who were neither *mustai* (initiated in the lesser mysteries) nor *epoptai* were sent away by a herald, and the last mysteries were begun. The mustai repeated the oath of secrecy which they had sworn at the lesser mysteries, underwent a new purification, and were led by the mystagogues, in the darkness of night, into the lighted interior of the sanctuary, and were allowed to see what none but the epoptai ever beheld. The later writers speak of the rites connected with the oath as being of an awful and horrible character. This probably arose from ignorance, as the earlier writers mention nothing of the kind. On the seventh day the initiated returned to Athens with great mirth, and amid great raillery and jests from the spectators, especially at the bridge over the Cephisus. The eighth day was called *Epidauria*, and was a kind of additional, for those who, by some accident, had come too late or had been prevented from being initiated on the sixth day. On the ninth day, the principal ceremony consisted in the filling of two earthen vessels with water or wine: the contents of one were then thrown to the east, and those of the other to the west, while the priests who performed the libation uttered mystical words. Every free-born Athenian was compelled to be initiated into the Eleusinian mysteries. Slaves, prostitutes, and those who had forfeited their citizenship, were excluded. During the time of the celebration of the mysteries, no one taking part in the ceremonies could be arrested, either for debt or for any offence. The chief priest was called the Hierophant, and the second dignitary the Daduchus, or torchbearer. The Eleusinian mysteries survived the independence of Greece for a long time. Attempts were made under the emperor Valentinian to suppress them, but unsuccessfully: they appear to have continued to the time of the elder Theodosius.

ELEVATION, *el-e-va'-shun* (Lat. *e*, and *lero*, I raise), in the ceremony of the Mass, is the raising, first, of the host, and then of the cup, to receive the homage of the people as the body and blood of Jesus Christ,—the priest himself previously performing the act of adoration by a deep genuflection. At the elevation a bell is rung for the people to look upon the host. This ceremony was introduced into the Latin churchein the beginning of the 12th century.

ELEVATION, in Arch., the view or perspective of a building. The term is also applied in architectural drawing to the front view of a building or object drawn to a scale without regard to perspective.

ELEVATOR *el-e-va'-tor* (Lat.), in Anat., is a term applied to various muscles of the body, whose action is to lift up or elevate the parts to which they are attached; as the elevator muscles of the eye, mouth, &c. It is also the name given to an instrument in surgery, employed for raising depressed portions of the bones of the skull.

ELF. (*See* FAIRIES.)

ELF-ARROWS, *elf'-ar-roze*, a name popularly given in this country to the flint arrow-heads that are occasionally found, and which were at one time used here as weapons of attack, as they still are among various savage tribes. The popular belief was, that they were shot by elves or fairies; and, as they were most commonly met with after showers of rain, they received in Germany the name of thunderbolts. They were regarded as a preservative against witchcraft and poison, and were hence frequently worn about the person. They are now commonly to be seen in museums of antiquity.

ELGIN MARBLES, *el'-jin*, a collection of pieces of sculpture, made by Thomas, earl of Elgin, between the years 1802 and 1812, when he filled the office of ambassador to the Ottoman Porte. The vessel which was conveying the marbles to this country was wrecked near Cerigo; they were, however, recovered from the sea, and ultimately purchased by the British government for the sum of £35,000. They are now to be seen in the British Museum, in what are termed the Elgin rooms. The collection consists chiefly of slabs and fragments from the ruins of the Parthenon, a temple sacred to Minerva, built on the Acropolis of Athens during the time of Pericles, in the 5th century before Christ, and adorned with magnificent friezes and groups of sculpture, executed under the direction of Phidias. The sculptures are of three different kinds:—metopes, or rectangular slabs that covered the spaces between the triglyphs of the Doric frieze of the peristyle on the southern side of the building; parts of the frieze that surrounded the exterior of the entire temple, at a height of 40 feet from the ground, forming a continuous series of sculpture about 520 feet in length and 40 inches in height; and portions of statues that adorned the pediments, which are unfortunately considerably mutilated, being for the most part without heads, arms, or feet. The metopes are executed in high relief, and represent the battles of the Centaurs and Lapithæ: the slabs are sixteen in number, one, however, being a cast in plaster from the original piece, which is now in the Louvre at Paris. The frieze is in low relief, and represents the procession that took place at Athens once in five years, called the Panathenæa. There are about 325 feet of this frieze at the British Museum, 250 feet being portions of the original marbles, and the remainder consisting of plaster casts. Of the statues, the best are the group known as the Fates, the statue of Theseus, the torso of Ilissus, and the spirited head of one of the horses of Night. There are other remains of great beauty in the collection; among which may be mentioned the statue from the monument of Thrasyllus, the Caryatid from the Pandrosion, and the column from the Erechtheum, with some urns and sepulchral inscriptions.—Ref. *English Cyclopædia*—Arts and Sciences.

ELISION, *e-lizh'-un* (Lat. *elisio*, from *elido*, I strike off), in Gram., is the cutting off or suppressing a vowel or syllable, particularly at the end of a word, for the sake of euphony, or in poetry to suit the verse. Elision occurs chiefly in the ancient languages of Greece and Rome.

ELIXIR, *e-lik'-er* (Lat. *elixo*, I extract by boiling), is a name given to various medical preparations, consisting of wine, or spirits of wine, and various aromatic and bitter vegetable substances. The word has now almost gone out of use, and its place is supplied by tincture. Strictly speaking, however, elixirs differ from tinctures in being thicker and more opaque, and containing less spirit.

ELIZABETHAN ARCHITECTURE, *e-liz-a-be'-thăn*, the style that prevailed in England during the latter part of the 16th century and the early part of the 17th, and so called because it is the characteristic style of buildings erected during the reign of Elizabeth. It was used only for palaces, mansions, and dwelling-houses, being unsuited for ecclesiastical architecture; but, for the purposes to which it was applied, it was stately and picturesque as far as the exterior is concerned, and afforded the means of obtaining a commodious and comfortable interior. It is somewhat similar to the Renaissance style of architecture in France, and is sometimes said to consist of a combination of this with the Tudor style that prevailed in the reigns of Henry VII. and Henry VIII. The finest old country mansions and palatial residences in England are in this style, and among the best may be mentioned those of Longleat; Holland House, Kensington; Burleigh; Wollaton House, Notts; and Aston House, near Birmingham, which has lately been purchased and converted into a museum. The most common form of the ground-plan of houses in this style is that of the letter E, and it is supposed that it was adopted as a compliment to Queen Elizabeth, as it was the initial letter of her name; it is most probable, how-

over, that the plan was chosen on account of the convenience it offers for the peculiar structure of the exterior and the interior arrangements, and that the compliment was an after-thought. The main part of the mansion is represented by the back of the letter, while the wings at the sides and the porch in the centre are denoted by the three parallel lines projecting from it at right angles. The material most commonly used was brick of a bright red colour; the coins and dressings of the windows were occasionally of free-stone; the face of the exterior was also frequently orn amented by dark bricks disposed so as to form a diamond-pattern, in diagonal lines cutting each other at right angles. When stone was used, it was generally covered with stucco, and the exterior was painted. The larger buildings were reared on a solid basement, and the entrance was gained by flights of steps leading to a terrace with a balustrade in front. The windows were square-headed, generally broader than they are high, and divided into compartments by mullions and transoms. The different floors were divided on the exterior by broad string-courses running along the entire front of the building, and elaborately ornamented with arabesque scroll-work, consisting of curved and angular bands, and bosses combined in patterns of endless variety. The spaces between the windows were adorned with pilasters on pedestals, which were panelled and ornamented with scroll-work. The pilasters were always surmounted by a continuous entablature, nd the space between the entablature of one set and the base of the one above it is occupied by the ornamented band or string-course already mentioned. The gables were various in form, the ogee gable being the most common: the greater part of them are adorned with arabesque scrolls and mouldings. The chimney-shafts were tall, and generally circular, octagonal, or twisted in shape; sometimes they were banded with interlaced fretwork. Pinnacles, parapets, and balls were introduced wherever it was possible to do so. The broad and stately staircase of polished oak is one of the most striking features of the interior, the balustrades and massive uprights at the angles being richly carved. The ceilings were divided into compartments by rectangular and curved mouldings. The walls were panelled with wainscot, which had the effect of rendering the rooms dark, and to a certain extent gloomy. The chimney-pieces were elaborately adorned, and were lofty and massive. They seldom, if ever, had any shelf projecting over the hearth. To gain a suitable and comprehensive idea of the picturesque beauty of mansions in this style, both externally and internally, we have only to turn to some of the charming drawings of Louis Haghe and the coloured illustrations included in Knight's *Old England*.

ELK, or MOOSE DEER, *elk* (SAX. *elch*), (*Alces Malchis*), the largest of all the deer tribe, and common to the northern parts of both hemispheres. The antlers of this animal are comparatively short, but broadly dilated, and terminated by a numerous series of long points. When fully grown, these organs weigh from fifty to sixty pounds. The moose does not reach its full development till its fourteenth year, and then may be met measuring six or even seven feet at the shoulders. Its legs are very long; its neck thick and short; its head elongated, and terminated by a broad muzzle. The coat of the moose is composed of long bristly hair, of a light ash-colour, and of a dark russet-brown on the surface. In the winter the coat of the bull moose changes to a glossy black. From behind the ears down the neck and part of the back extends a mane, harsh and thick, and nearly a foot in length. The hair on the belly and inside the legs is sandy colour. Pendent from the spot where the junction of the head and neck occurs is a baggy pouch covered with long black hair, and known as the "bell." The food of the moose consists during the summer months of such leaves and tender branches as abound in his native forests. In the winter season it subsists on the tops of young shoots, pulling them into its mouth by its prehensile upper lip (or mouffle), and biting them off. When pressed by hunger, however, it will eat any green thing it meets, except the foliage of the spruce-tree; that, according to recent observations, it never touches. It readily eats grass, which, unless unless very tall, or growing on a bank, it cannot, from its stiff and short neck, crop without straddling awkwardly. Its flesh is highly esteemed as an article of food, especially when smoked or dried bacon-fashion. The "mouffle" is the most choice bit, and is said to be, when boiled, rich and gelatinous, and to resemble the renowned green fat of the turtle. "As the flesh of the elk is palatable, and the horns and skin extremely useful, the animal is much persecuted by hunters. It is a swift and enduring animal, although its gait is clumsy and awkward in the extreme. The only pace of the elk is a long swinging trot; but its legs are so long and its paces so considerable, that its speed is much greater than it appears to be. Obstacles that are almost impassable to a horse are passed over easily by the elk, which has been known to trot uninterruptedly over a number of fallen tree-trunks, some of them five feet in circumference. When the ground is hard, and will bear the weight of so large an animal, the hunters are led a very long and severe chase before they come up with their prey; but when the snow lies soft and thick on the ground, the creature soon succumbs to its lighter antagonists, who invest themselves in snow-shoes, and send over the soft snow with a speed that specially overcomes that of the poor elk, which sinks floundering into the deep snow-drifts at every step, and is soon worn out by its useless efforts."—(Wood's *Natural History*.) The most successful way of hunting the moose is by "calling;" that is, imitating the trumpeting noise made by the female at the pairing season, to attract the bull. Something like "quoh quorh" is the sound, and, by means of a tube of birch bark, the skilful hunter is enabled to simulate it exactly. Shy as the gazelle at other times, the bull moose swiftly obeys the invitation, and is thus brought within range of the rifle of the hunter, who is concealed in the thicket. —(*Wild Sports of the World*.) The moose, or elk, if taken young, is capable of domestication, and may be used as a beast of draught or burden.

ELL, *el* (Ang.-Sax.), a measure of length in various countries, used principally for cloth, linen, silks, and similar fabrics. Formerly it was much used in England; but it is now almost entirely superseded by the imperial yard. An English ell is 45 inches, or 5 quarters; a Flemish ell is 27 inches, or 3 quarters; the French ell is 6 quarters, and the Scotch ell $37\frac{3}{5}$ English inches.

ELLAGIC ACID, *el-laj'-jik*, an insoluble acid found as a grey crystalline powder during the preparation of gallic acid from gall-nuts. It also occurs, curiously enough, in the intestinal concretions called bezoar-stones, found in the stomachs of the wild goats, antelopes, and deer of Central Asia. M. Braconnot, who made a particular study of the substance in 1818, gave it the name of *ellagic* acid, which he formed by reversing the word *gallic* (Fr., *gal*).

ELLIPSE, *el-lips'* (Gr. *elleipsis*), an oval curve, one of the conic sections. (*See* CONIC SECTIONS.) The section of a cone formed by a plane passing through it at right angles to its axis is a circle. If the plane cuts the cone in a direction parallel to its surface, the conic section so formed is a parabola; but any section formed by the passage of a plane through the cone at any angle to its axis between a right angle and the angle at which the surface of the cone is inclined to the base, is an ellipse. To make this clear, let the figure A B C represent a cone (*see* CONE); any section of the cone at right angles to the axis A Z, or parallel to the base, as the section D F E G, will be seen at once to be a circle. Let the plane passing through the cone in the section D F E G be now supposed to revolve about F G, a diameter of the circle D F E G, as about an axis, any section of the cone, as H F K G, made in its revolution from its original position when it was at right angles to the axis, until it assumes a position L F N G M, parallel to the surface of the cone, is an ellipse. The section of the cone formed by the last-named position of the plane is a parabola. When the cutting plane is in a direction parallel to the axis, as O Q P or R T S, the curve thus formed is an hyperbola. In fig. 2, C F D G represents a perfect ellipse. The points A and B are called its foci, C D its greater axis, and F G its lesser axis. C is its centre, and the fraction represented by E B as the numerator, and E D as the denominator, its excentricity. The lines drawn from any point in the circumference to the foci are

termed the focal distances of that point, and the sum of these is the same for every point in the circumference, since the curve is generated by the revolution of a point controlled by a cord, equal in length to the

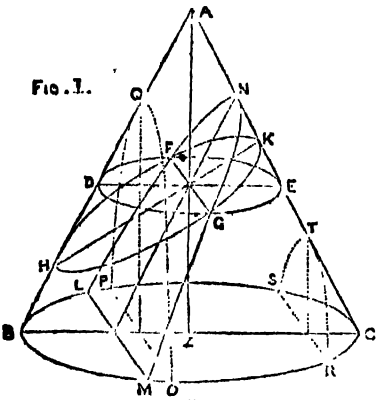



FIG. 1.

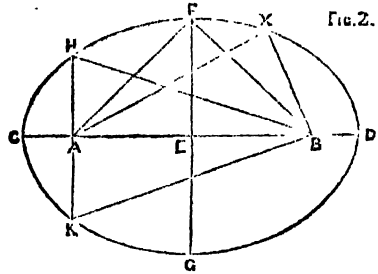


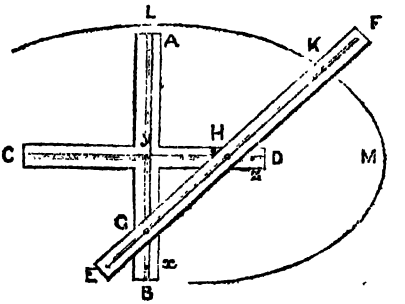

FIG. 2.

THE ELLIPSE.

greater axis C D, and fastened at the ends to the foci A B; thus, AC + CB = AH + HB = AF + FB = AX + XB, &c. The line drawn through either of the foci parallel to the lesser axis, as H K, is called the *latus rectum* of the ellipse.

ELLIPSIS, *el-lip'-sis* (Gr. *ellеipsis*, an omission), in Gram. and Rhet., is the omission of one or more words which may be easily supplied by the imagination. It is used either to express passion or for the sake of brevity and conciseness.

ELLIPTIC COMPASS, *el-lip'-tik*, the name applied to any contrivance used for describing an ellipse. The most common and simple method is to take a string, equal in length to the major axis of the ellipse (*see* ELLIPSE), and attach the ends to two pins, which are stuck into the material on which the ellipse is to be described, at those points in the major axis which represent the foci of the ellipse. The string must be then extended on the point of a pencil, and the curve traced by the point, the string being kept at full stretch, will be an ellipse. Another plan is to take two pieces of wood or metal, which may be fixed at right angles to each other: a deep groove is cut in the upper surface of each, in which two pins travel, which are attached to a beam, with a hole or socket at one end of it for the reception of a pencil. The pins may be fixed at any distance from each other on the beam, by means of clamping screws, so that ellipses of various sizes may be described, as large as the length of the beam will allow. The operation may be understood by the accompanying figure. A B C D are the four pins at right angles to each other, E F the beam, K the pencil point. Now, if the pins, K the pencil point. Now, if the curve L M, a quarter of the ellipse, and the pencil is at L the beam is exactly on the top of the pins, and when it is moved along its surface and in the same direction with it; the pins are at $x$ and $y$. As the pencil traces out the curved line, the pin at $x$ moves along the groove into the position $y$, while that which was at $y$ moves to $x$; so that, when a fourth of the ellipse has




ELLIPTIC COMPASS.

been described, the beam is exactly on top of C D, and in that direction. The pins travel up and down the grooves from either end to the centre, and from the centre to either end, until the entire curve has been traced out.

ELM. (*See* ULMUS.)

ELMO'S FIRE, SAINT, *el'-moze*, a luminous appearance or fiery meteor frequently seen playing about the masts and rigging of vessels at sea, during dark stormy nights. The phenomenon is due to atmospheric electricity.

ELOCUTION, *el-o-ku'-shun* (Lat. *e*, and *loquor*, I speak), is delivery, or the art of effective speaking. (*See* DELIVERY, ORATORY.)

ELOGE, *a-lozhe'* (Fr.; Lat. *elogium*, Gr. *eulogia*), denotes, literally, praise, and is more particularly applied to orations delivered in honour of a deceased person. When a member of the French Academy dies, it is the custom for his successor to deliver a panegyrical oration, setting forth his labours and merits. These eloges are generally printed and published, and some of them form eloquent and valuable contributions to literature.

ELONGATION, *e-lon-gat'-shun* (from low Lat *elongo*, I lengthen).—In Astron., this name is sometimes applied to the angular distance between the sun and any other heavenly body, viewed from the earth's surface. It is not used to express the distance between any two stars.

ELOPEMENT, *e-lope'-ment* (Du., from *loopen*, to run), in Law, is where a married woman of her own accord leaves her husband and goes to live with an adulterer. By the Statute of Westminster the Second, if a woman voluntarily leaves her husband and lives with an adulterer, she shall lose her dower, unless her husband be voluntarily reconciled to her.

ELOQUENCE. (*See* ORATORY.)

ELUTRIATION, *e-lu-tre-ai'-shun* (Lat. *elutrio*, I cleanse), in Chem., a process employed for separating substances reduced to powder, when of different specific gravities, by means of water. It is much employed in separating metals from their ores. Gold-washing is a rough elutriation.

ELVES. (*See* FAIRIES.)

ELYSIUM, or ELYSIAN FIELDS, *e-lish'-e-um* (Gr. *elusion*), in Myth., a place or island in the infernal regions where the souls of the virtuous were supposed to dwell after death. There happiness was perfect, and the pleasures innocent and refined. The air was wholesome, serene, and temperate. The employment of the spirits of heroes differs according to different poets. Homer, in the "Odyssey," describes such a region as that mentioned above, while in the "Iliad" Achilles in Elysium is depicted as in a sombre place, envying the meanest person on earth. Nearly all the later classical poets describe Elysium as a place of light and happiness, some adding continual feasting and revelry, others in warlike sports, and others in taming horses and hunting. The position of the Elysian fields differs also according to various poets. By some it is said to be in mid-air, others in the sun, others in the moon,

and others in the centre of the earth, near Tartarus: the general belief was that they lay in one of the isles of the ocean, called the Fortunate Islands, now called the Canary Islands.

ELZEVIR EDITIONS, *el'-ze-ver.*—The Elzevirs were a family of celebrated printers and publishers at Amsterdam, Leyden, the Hague, and Utrecht, who flourished mostly in the early half of the 17th century, and who gave to the world many beautiful editions of the best authors of antiquity. The Elzevir editions have been long and deservedly esteemed for the clearness, delicacy, and perfect equality of the characters, for their close position together on a solid and very white paper, and the excellence of the press-work. Their Virgil, Terence, and Greek New Testament, are regarded as their masterpieces. The Elzevirs published several catalogues of their editions, and a list of them is given by Mr. Horne in his "Introduction to the Study of Bibliography;" but the best account of them is to be found in the fifth volume of Brunet's "Manuel du Libraire," pp. 799- 827.

EMANATION, *em-a-nai'-shun* (Lat. *emanare*, to emanate, issue, or flow out), in the ancient systems of philosophy, is applied to that doctrine which regards all created things as emanations from the Supreme Being. In this view there was no spontaneous creation; but all things issued necessarily out of the Divine fulness. This doctrine came from the East, and exerted a powerful influence on the systems of ancient Greece, particularly the Pythagorean. Traces of it are also to be found in the Hindoo mythology of the present day. In theology, the doctrine of emanation has been employed to explain the relationship among the persons of the Trinity, the Son and Holy Ghost being regarded as effluxes or emanations from the Father.

EMANCIPATION. (*See* SLAVERY.)

EMANCIPATION, ROMAN CATHOLIC. (*See* ROMAN CATHOLIC EMANCIPATION.)

EMBALMING, *em-bam'-ing* (from Fr. *embaumer*), is the art of preserving the body after death, from decay, by means of aromatics, antiseptics, or desiccation. The embalming of the dead was practised by the ancient Egyptians from the earliest times, and was associated with their religious belief, for they held that the soul, after completing its cycle of separate existence of several thousand years, again returned to the body, and if found decayed or wasted, it transmigrated. The invention of the art was ascribed to Anubis, the son of Osiris, who first performed this office to his father; and hence all deceased persons were supposed to be embalmed after the model of Osiris. Herodotus and Diodorus have left us accounts of the process of embalming in their time; but these differ in several respects from the appearance of the mummies of the present day. The body was first delivered to the undertakers, called by the Greeks *paraschistæ* or "flank-incisors," a low and polluted class of persons, who resided in the cemeteries or suburbs. A scribe first marked with a reed pen on the left side below the ribs a line, along which the paraschistes made a deep incision with a rude knife of stone or flint, on which he was immediately pursued with stones and imprecations by the bystanders, as if he had committed some heinous offence. The *taricheutes*, or preparer, then proceeded to remove the entrails and lungs, with the exception of the heart and kidneys. The brains were drawn out through the nostrils by a crooked iron instrument. The entrails were washed with wine of palms and perfumed, and the cavities were then filled up with myrrh, cassia, and other aromatic drugs. The flank incision was then sewed up, and the body steeped in natron for thirty days, after which it was wrapped in linen bandages, anointed with gums. The body being thus prepared, was put in a wooden coffin, and placed in an upright position either in a sepulchre or in one of their own apartments, for many of them kept their dead at home, esteeming it a great comfort to have the bodies of their relatives beside them; and sometimes they were produced at festive entertainments. This was the most expensive mode of embalming, and was adopted only by the wealthiest classes, costing a talent of silver (or about £244). Another and cheaper mode, costing only 20 minæ (about £82), was effected without any incision, by injecting the viscera with oil of cedar, and then steeping the body in natron for seventy days; after which the viscera came away, and nothing remained but the skin and bones. The third method, used only for the lower classes, was performed by washing the body with myrrh and laying it in salt for seventy days. All classes among the Egyptians were embalmed, even the malefactors; and we read in Scripture that the body of the patriarch Jacob was treated in this way. The success of this art, as practised by the ancient Egyptians, is attested by the numerous mummies that are to be seen in the present day in all the great museums of Europe. (*See* MUMMY.) Various other nations of antiquity adopted certain means for the preservation of the human body. The Persians employed wax, the Assyrians honey; the Jews embalmed some of their kings with spices, with which the body of our Lord was also anointed; and Alexander the Great was embalmed with wax and honey. The only people, however, who adopted an elaborate process like the ancient Egyptians are the Guanches, or ancient inhabitants of the Canary Isles. The Egyptians also embalmed the ibis and other sacred animals.

EMBANKMENT, *em-bänk'-ment*, a term used in engineering, both civil and military: in the former it is applied to a mound of earth broad at the base and narrow at the top, thrown up to form a roadway or canal at a level above that of the ground, or to protect ground that lies low from being inundated by the sea or any river. In Mil., it is generally applied to the mass of earth thrown up against the revetments of a rampart or any scarped work, or which is raised in the form of a bank to furnish any earthwork for defensive purposes. It should be the especial care of the engineer to see that his embankments are constructed on ground which affords a firm and unyielding basis, or, if the ground below be loose and compressible, a proper foundation must be secured by driving piles, or by making pits in the soft ground, which must be filled with stones and other materials that do not readily yield to pressure. A good foundation secures the work from displacement by vertical compression, and care must be taken to avoid lateral displacement by cutting deep trenches at the foot of the slopes to carry off any excess of moisture. The slope of the embankment must also be regulated by the nature of the soil used in its construction, to prevent masses of earth from slipping away from the sides, which will happen, particularly after a heavy fall of rain which has continued for some time, if the sides be too steep. For chalk, gravel, rubble, and loamy soil, the base of the slope should be to the height as 1½ to 1; for sand and ordinary clay soils it should be as 2 to 1, and for marl and greasy soils as much as 3 to 1. The nature of embankments best suited to resist water, and the method of constructing them, will be found elsewhere, as well as the formation of those constructed for the sides of canals. (*See* CANAL, SEA DEFENCES, RIVER DEFENCES.) Embankments for roads and railroads are formed by depositing the material obtained from excavations and cuttings in successive layers: allowance should always be made for compression and settlement, particularly in works that are rapidly constructed, by raising the top of the bank above the level at which it will be when the materials of which it is composed have settled together into a solid mass. In forming a bridge or drain, over which an embankment is to be constructed, the masonry should be strong, and the outer surface of the walls and top of the arch covered with concrete to prevent the water from filtering through and destroying the mortar. Hydraulic lime should be used in building them. The principal embankments in England are those in the Fen countries in Cambridgeshire and Lincolnshire, and those constructed to carry parts of many lines of rail, some of which are of great magnitude.

EMBARGO, *em-bar'-go* (Sp.), is an order or prohibition imposed by the public authorities of a country on vessels to prevent their leaving its ports. Embargoes are usually resorted to only in time of war, and are of various kinds. On the breaking out of a war, it is usual for a government to lay an embargo on all vessels of the enemy within reach, in order that they may be declared prizes; when it is necessary to conceal any important movement from the enemy, an embargo

may be laid upon all vessels, native and foreign, that may be the means of conveying information; and an embargo may also be laid by government upon ships belonging to its subjects in order to employ them in the service of the country.

EMBASSY, *em'-bas-se* (Fr. *ambassade*), a term applied in general language to a diplomatic mission. In a more restricted sense, however, an embassy is a mission presided over by an ambassador, and is distinguished from an ordinary legation or mission which is intrusted to an envoy or other subordinate authority. The true difference between an ambassador and an envoy is that the former represents the person of his sovereign, and in that capacity is able to demand a private audience of the monarch to whom he is accredited. An envoy, on the contrary, is obliged to make his proposal to the minister of foreign affairs. Every ambassador is provided with a residence, and envoys and subordinate ministers receive an allowance for house-rent. There are now five embassies, properly so called; namely, those at Paris, St. Petersburg, Constantinople, Vienna, and Berlin. (*See* AMBASSADOR, ENVOY.)

EMBATTLED, *em-bat'-ld*, in Her., one of the eight crooked or curved lines used, in addition to the straight line, in dividing one part of the field from another, or for the outline of any principal ordinary. When this outline, or line of division, is in the form of the battlements of a tower, it is said to be embattled. French heralds use the term *crenelle*. (*See* CRENEL.)

EMBER-DAYS, *em'-ber*, are certain days of the year set apart by the Church for prayer and fasting, the weeks in which they occur being termed Ember-weeks. The derivation of the term is doubtful. According to some, it is derived from the Greek *hemeras*, days; according to others, from the Saxon *ymbren*, a circle or revolution. The Ember-days are the Wednesday, Friday, and Saturday after the first Sunday in Lent, after the feast of Pentecost, after the 14th of September, and after the 14th of December. They were first appointed to be observed by Pope Calixtus in the 3rd century, for imploring the blessing of God on the fruits of the earth, and also for the grace of the Holy Ghost upon the ministers ordained at these times. The Sundays immediately following these seasons are still appointed by the canons of the Church of England for the ordination of priests and deacons.

EMBEZZLEMENT, *em-bez'-zl-ment* (Nor. *embesaler*, to filch), the fraudulent appropriation by clerks, servants, or others, of money or goods intrusted to their care, or received by them on account of their employers. This is not an offence at common law, and hence offenders were suffered to escape, until it was made a felony by 39 Geo. III. c. 85. By 7 & 8 Geo. IV. c. 29, embezzlement is declared to be larceny, and punishable with transportation or imprisonment. By the Criminal Justice Act (14 & 15 Vict. c. 100) it is further made competent to convict for embezzlement persons indicted for larceny, and *vice versâ*. Persons employed in the public service embezzling money or valuable securities are deemed guilty of felony, and liable to penal servitude or imprisonment. For embezzling, stealing, or destroying her majesty's military stores to the value of twenty shillings, the offender is liable to penal servitude or imprisonment; under twenty shillings, to fine, corporal punishment, or imprisonment. By the Fraudulent Trustees Act (20 & 21 Vict. c. 54), provision is made for the punishment of fraudulent misappropriations by bankers, brokers, factors and other agents, of moneys or property intrusted to them.

EMBLEM, *em'-blem* (Gr. *emblema*, from *en*, into, and *ballein*, to cast), in the primary sense of the word, it means a piece of mosaic, or any work in which bits of one kind of material are inserted or let into another; but, in our acceptation of the term, it is applied to anything which, by association of ideas, appears to be a visible and suitable representation of some abstract quality, or it has a similar meaning to that of the word device. (*See* DEVICE.) Thus the lamb is the emblem of meekness, humanity, and docility; the lion, of courage and magnanimity; the dog, of fidelity; and the fox, of craft and cunning. The eagle is the emblem of imperial power, as it is reputed to be the king of birds, and often styled the royal bird. Other things have been taken as emblems of persons, as they are associated with them by historical recollections: thus the gridiron is the emblem of St. Lawrence, as the instrument of his martyrdom; the wheel, that of St. Catherine, for a similar reason. An angel bearing a pen is the emblem of St. Matthew; a lion, that of St. Mark; a bull, of St. Luke; and an eagle, of St. John. Flowers are supposed to be emblematic of various qualities, and are, in consequence, sometimes used in the East as a means of communication.

EMBOSSING, *em-bos'-sing* (Fr. *embosser*, from *bosse*, a stud), the art of obtaining patterns of any kind, or inscriptions, in relief, on cloth, leather, felt, metal, pasteboard, or paper. It is effected by subjecting the material on which it is desired to raise any pattern to very great pressure, which may be applied vertically by the sharp blow of a die, or by a cylinder. For embossing crests, addresses, &c., on paper and envelopes, a small stamping-machine is used, and the device desired is cut in intaglio on the die. The paper is placed on a piece of soft metal stamped by the die, and therefore having the device in relief, and the impression is obtained by pressing the die forcibly on it by means of a lever. For embossing woollen goods, the cylinders which are used must have the pattern cut on them in intaglio, but for velvets, and embossing paper of any size, the patterns must be in relief. The following is the process adopted when cylinders are used. The engraved cylinder, or embossing-roller, and another of the same diameter, called the bed-roller, are set closely together, and the material is passed between them. The bed-roller is made of paper (*see* CALENDERING), and covered with felt, to prevent it from receiving and retaining any impression from the embossing-roller. The cylinder on which the pattern is cut is made hollow, to receive heated irons, or to be heated by steam. Leather may be embossed by pressure, or by rendering it supple by moisture, and then fashioning it into the desired shape on a mould cut for the purpose. Ornaments for picture-frames and the interior decoration of apartments, which closely resemble carved oak, may be made in this manner. The cloth which is used for binding books is embossed by passing the material between two steel rollers engraved with the required pattern, which are heated by gas jets from pipes passing through the centre of the rollers, which are hollow. When there is any peculiar device on the cover of a book bound in cloth, and there is much gilding about it, the cloth is first glued to the millboard covers, and subjected to great pressure from the die engraved for the purpose, after it has been laid on an iron plate, which is heated from beneath by gas.

EMBRASURE, *em-brai'-zhur* (Fr.), in Arch. this term is applied to the rectangular indentations of a battlement, or the splayed opening for a door or window.

EMBRASURE, in Mil., the opening made in the parapet of a rampart to allow a cannon to be fired through it. The neck or opening of an embrasure should be as small as possible in front, or at the exterior face of the parapet, to protect the artillerymen who are working the guns from the sharpshooters of the enemy. The breadth of the opening varies from about 2 feet for 18-pounders to 3 feet 3 inches for 68-pounders and Lancaster guns. That part of the parapet which fills up the embrasure below the opening, and protects the gun-carriage, the muzzle of the gun appearing above it, is called the genouillère. The top of the genouillère forms the sill of the embrasure, and generally slopes outwards. The distance between the sill and the crest of the parapet should be about 4 feet, while the height of the genouillère varies from 2½ feet for guns on solid standing carriages to 3¼ feet for guns on travelling carriages. The cheeks splay outwards from the neck towards the rear or inner face of the parapet, and are inclined to the central line of fire or capital of the embrasure at an angle of eight or ten degrees. In field-works, embrasures are revetted with timber and fascines or gabions, and are protected from the flame from the muzzle of the gun by a covering of raw hides. Mantlets or shutters are often used to mask embrasures, and protect the men at the guns from riflemen. They are withdrawn suddenly when the gun is to be discharged, and closed after the fire is given.

EMBROCATION, *em-bro-kai'-shun* (Gr. *embrocha*, a moistening), a term originally applied to those exter-

nal applications used for softening or dissipating swellings. The word has, however, extended beyond its primary meaning, and is applied to oleaginous and spirituous compounds which excite the surface of the skin to increased action, and produce all the effects of counter irritants, or which, by their influence on the extremities of the nerves, assist in resolving spasm; thus acting as antispasmodics.

Embroidery, *em-broid'-er-e* (Fr. *broderie*), a term applied to the art of working ornamental figures upon fabrics of any kind with a needle and thread. The art of embroidery is one of the oldest, and has always been one of the most important domestic occupations among oriental nations. It was practised among the Hebrews during the time of Moses; and the women of Sidon were famous for their embroidery before the siege of Troy. In after-years, the women of Greece were celebrated for their proficiency in the same art; and some of their productions are said to have equalled, if not surpassed, many of the finest paintings then existing. The inhabitants of Peru, when discovered by the Spaniards, were found to have in their possession elaborate embroideries of gold and silver on feathers, which they manufactured with great skill. The ecclesiastical tapestry, curtains, priests' vestments, &c., in the middle ages, were all embroidered with the needle; and screens, corridor hangings, &c., were the daily handwork of some of the noblest ladies, assisted by their hand-maidens. In the present day, all embroidery may be divided into two classes,—embroidery on stuffs and on muslin. The first class includes all ornamental needle-work upon articles of furniture, standards, church vestments, &c.; the second is employed usually upon articles of female apparel, such as caps, collars, &c. Stuff embroidery is performed by means of a loom, and is executed with gold, silver, silk, cotton, and woollen threads. Muslin embroidery is generally accomplished by hand, the fabric worked upon being stretched on a frame. This kind of work has been very fashionable of late years; but although at first only looked upon as an elegant accomplishment practised by ladies, it now forms an article of considerable traffic, and gives employment to a large number of persons. *Berlin-wool-work* is a sort of embroidery which has been in vogue for many years among ladies. The fabric worked upon is generally stretched upon a frame, and the design to be embroidered is drawn upon it, or some other contrivance is employed by the worker. An engraving, in which lines are drawn corresponding with the threads of the fabric, is generally used. The name is derived from the fact that a printseller named Wittich, in Berlin, up to 1810, sold the best patterns for this kind of work. Machine embroidery has given a great impetus to the art, and about eight years ago a machine was invented by M. Heilmann, of Mulhausen, by which one person could guide 80 to 140 needles, all working at the same time. This machine was exhibited in the French Industrial Exhibition of 1854, and was afterwards patented in England. All the English rights were afterwards purchased by Mr. H. Houldsworth, the eminent silk manufacturer of Manchester, who greatly improved the machine.

Embryo, *em'-bre-o* (Gr. *embruon*, from *embruo*, I bud forth), is the rudimentary state of any organized body. In Physiol. it is applied to the fetus *in utero* before the fifth month of pregnancy, from its growth resembling the budding of a plant. Hence we have *embryology*, a description of the embryo; *embryotomy*, or the extraction of the embryo piecemeal in delivery.

Embryo, in Bot., the rudimentary plant existing in the seed. The presence of a true embryo is the essential characteristic of the seed of flowering plants; for a *spore*, as the reproductive body of a flowerless plant is called, has no true embryo, the rudimentary plant being only developed from it after its separation from the parent. Three parts, corresponding to the root, stem, and leaves of the perfect plant, are distinguished in the embryo, and are termed, respectively, the *radicle*, the *plumule*, and the *cotyledons*. These parts may be readily recognized in many seeds, especially when the process of germination is a little advanced. Plants which have seeds with two cotyledons are said to be *dicotyledonous*, and those which have seeds that commonly possess but one cotyledon are said to be *monocotyledonous*. The spores of flowerless plants having no true embryos, can have no cotyledons; hence such plants are said to be *acotyledonous*. When *albumen* is present in a seed, the size of the embryo is in inverse proportion to it: thus in grasses there is a large deposit of albumen, but a very small embryo; while in the nettle the embryo is large and the albumen small. When the embryo is external to the albumen and in contact with the integuments, as in grasses, it is described as *external*; when it is surrounded by the albumen on all sides, except at its radicular extremity, as in the pansy, it is said to be *internal*.



Emerald, *em'-er-ald* (Fr. *émeraude*), in Min., one of the precious stones, of a rich deep green colour, occurring in hexagonal prisms in granite, gneiss, and mica rock. The finest emeralds, however, are found in dolomite in Granada. The duke of Devonshire possesses an emerald from this locality measuring two inches in length by one in diameter. Fine specimens also occur in Peru, and inferior ones in Bavaria, India, and Siberia. Some specimens from the latter country measure 4½ inches in breadth and 12 in length; but they are worthless as gems, being full of striæ, and not transparent. Chemically, the emerald consists of 65 silica, 14 alumina, 13 glucina, 2·56 lime, and 3·50 oxide of chromium. It is distinguished from beryl by its more brilliant colour, being coloured with oxide of iron instead of oxide of chromium.

Emerald, Oriental, in Min., a green variety of sapphire (*See* Sapphire.)

Emersion, *e-mer'-shun* (Lat. *e*, from, and *mergere*, to plunge), in Astron., the term applied to the reappearance of a heavenly body from behind another, after the former has been hidden from view by the passage of the latter across its disc, as in an eclipse.

Emery, *em'-e-re* (from Cape Emeri, in the island of Naxos), in Min., a variety of corundum, consisting mainly of alumina, combined with a small quantity of silica, peroxide of iron, and a little water. *Dr. Lawrence Smith* states that those varieties containing least water are, *cæteris paribus*, the hardest. Emery occurs in Spain, Asia Minor, in the Greek islands, and in the island whence it takes its name. Ground to powder of different degrees of fineness, it is much used in the arts as a polishing powder. It is mostly employed attached to cloth or paper.

Emetics, *e-met'-iks* (Gr. *emetikos*), a term applied to those medicines which influence the stomach in a peculiar manner, so as to invert its action and produce vomiting. This effect is caused not by the quantity of the matter introduced, but by the nature of the emetic itself. Emetics are administered in many cases of illness. They are useful when it is found necessary to relieve the stomach of some hurtful or indigestible substance. Lives that have been endangered either by poisons or excess of food have frequently been saved by means of emetics. In cases of fever, emetics are used: it is supposed that the copious secretion which they produce from the glands of the stomach and intestines has a direct curative action. In all cases of fever, emetics should be administered at as early a stage of the disease as possible. They invariably render the disease milder, and may be advantageously repeated even at a more advanced stage, as they induce sleep and a moist state of the skin. They are specially efficacious in epidemic, typhus, common fever, and exanthematous fevers, especially measles, scarlet fever, and small-pox. According to the opinion of Dr. James Clark and Dr. Carswell, emetics are able to dislodge tubercular matter from the lungs in the earlier stages of consumption. Emetics, however, should always be given with great caution, since, in cases of depression of the system, their action is to produce nausea, by which the vital power is always diminished. The emetics generally used consist of preparations of antimony, zinc, and copper. Squills, lobelia, ipecacuanha, and other substances, are also employed. Mustard and water diluted is one of the mildest and most generally used emetics. Emetics should never be administered to a patient who is disposed to apoplexy, or a tendency of blood to the head, or where the patient is liable to hemorrhage from any organ, or is subject to hernia. During pregnancy, also, emetics must be avoided.

EMIGRATION, *em-e-grā'-shun* (Lat. *e*, and *migrare*, to remove to another place to dwell in), is the movement of one or a number of persons out of one place or country with a view to their settling in another, into which they are said to *immigrate* (Lat. *in*, and *migrare*). As commonly used in the present day, however, the term has a more limited sense, being applied to the leaving of an old and thickly-peopled country to settle in one but sparsely inhabited. The great emigration fields at present are the British possessions and the United States of North America, Australia, New Zealand, and South Africa. In 1860 the total number of emigrants from this country was 127,969; of whom 103,001 were from England, 3,872 from Scotland, and 21,596 from Ireland; 9,788 were for the North American colonies, 87,000 for the United States, 24,302 for Australia and New Zealand, and 6,881 for other places. The total number of emigrants from the United Kingdom, from 1815 to 1860 inclusive, was 5,046,067. The subject of emigration has given rise to various important questions among political economists. It was long a prevalent notion that emigration, as tending to weaken a nation, ought to be discouraged; but sounder views on this subject now prevail, and the government has adopted various measures for the encouraging of this movement. In 1831 a government commission on emigration was formed, by which officers were appointed both at home and in the North-American colonies to watch over the interests of emigrants, and to furnish them with necessary information. In 1840 commissioners were appointed under the royal sign-manual to act as a land and emigration board. This board forms a subordinate department of the Colonial office. It regulates the sale of the waste lands of the crown throughout the colonies, and applies the proceeds of such sales towards the removal thither of emigrants from this country. It is the duty of the commissioners to see that the provisions of the Passengers Acts (15 & 16 Vict. c. 44, and 18 & 19 Vict. c. 119) are observed, which they do by means of agents, established at the several outports, who examine into the seaworthiness and fitment of emigrant vessels, the amount of provisions and water on board, the number of passengers, their healthy condition, and the various other matters required by the act. These agents further procure and give gratuitously information as to the sailing of ships and the means of accommodation for emigrants, and whenever applied to for that purpose they see that all agreements between shipowners, agents, or masters, and intending emigrants, are duly performed. Emigration is one of the modes of relief provided by the Poor Law Amendment Act, 4 & 5 Will. IV. c. 76, which empowers owners and ratepayers to raise money on security of the rates for the purposes of emigration. Free emigration can rarely or never be detrimental to a country, and there are many cases in which it is highly expedient to aid and encourage it. "The late extraordinary emigration from Ireland (1846-51)," says McCulloch, "has done more perhaps to improve its condition than anything else that could have happened. In consequence of the diminution that has been effected in the population, employment is more easily obtained, and the rate of wages has increased; a considerable progress has been made in many parts of the country in the consolidation of small patches of land into something like farms of a reasonable size and susceptible of a better system of cultivation; the towns and workhouses have been in part, at least, relieved of their pauper population; and agitation, crime, and outrage are less prevalent. Nor is there any reason to fear that either in Ireland or anywhere else emigration will be, or indeed can be, carried to excess."

EMIGRÉS, *em'-e-grāz* (Fr.), a term applied to those individuals who left France during the revolution. After the taking of the Bastille, the princes of the royal family, *Monsieur* (Louis XVIII.), the count d'Artois (Charles X.), and the prince de Condé, departed from France. They were speedily followed, in 1791, by all those who considered that their rights, privileges, and property had been interfered with improperly. Noblemen left their estates and domains, officers, with large numbers of private soldiers, priests, monks, and private individuals, passed over into Germany, Belgium, Holland, Switzerland, and Piedmont. Very few of the *émigrés* had been able to save any property, and the greater proportion were consequently soon in a dreadful state of destitution. The princes themselves formed a court at Coblenz, with a government, ministers, and a court of justice. Communications were kept up with the foreign courts, and thus the feelings of the revolutionary party in France were more and more embittered against them. At last a body of *émigrés*, under the command of the prince de Condé, followed the Prussian army into Champagne. The republican government immediately put the strongest laws in force against the *émigrés*. Any person found assisting or favouring them in any way was condemned to death, and the lands of all *émigrés* were confiscated. Although many of them had refused to fight against their country, 30,000 persons were put upon the list, and condemned to perpetual exile from the soil of France. The last attempt made by the *émigrés* to penetrate into France by force of arms was in 1795, at Quiberon. The attempt was a failure, and the force belonging to the prince de Condé was broken up after the peace of Luneville, and sought a refuge in Russia. Under the Directory, many of the *émigrés* tried to return to France, and in 1801 Napoleon I. granted them a general amnesty. By the largest proportion this was hailed with delight, and they returned to their native land. Many, however, did not return until after the restoration of Louis XVIII. Those who had remained loyal received many honours from the king, but were unable to regain their estates or their privileges, on account of the charter of 1814. In 1825, those *émigres* who had lost their landed estates received a compensation of 30,000,000 francs yearly, on the capital of 1,000,000,000 francs. This grant was, however, repealed during the July revolution.—Ref. *Histoire des Emigrés Français*, by Antoine de Saint Gervais.

EMIR, *em'-eer* (Arab.), a title bestowed in the East upon all the real or supposed descendants of Mahomet, and his daughter Fatima. The term is also applied to all independent chieftains, not only in the East, but in the north of Africa. In Turkey, the prerogatives of the emirs are unimportant, the principal being their exclusive right to wear turbans of a green colour, which was a favourite of the Prophet. Those who are emirs from the mother's side are held in higher estimation than those from the father's. All the Turkish emirs are placed under the superintendence of the Emir-Beshir. The leaders, in case of war, during early Mahommedan history, were called emirs, and the word has been used in connection with several offices. The califs style themselves "Emir-al-Mumenin," prince of the Faithful; at the present time, in Turkey, the title is applied to the rulers of provinces. The master of the horse to the sultan is called Emir-Achor; the standard-bearer, Emir-Alem; and the surveyor of markets, Emir-Bazaar.

EMOLLIENTS, *e-mol'-yents* (Lat. *mollis*, soft), a term employed to denote those substances which are used externally, in medicine, for the purpose of softening the part of the body to which they are applied. They are mostly used in the form of poultices, fomentations, &c.

EMOTION, *e-mō'-shun* (Lat. *e*, and *moveo*, I move), in Mental Phil., is a term frequently used as synonymous with feeling, but which is strictly a state of feeling awakened through the medium of the intellect, and manifesting its existence and character by some sensible effect upon the body. An emotion differs from a sensation in not springing directly from an affection of the body, and from a cognition, by its being pleasurable or painful. According to Lord Kames, an emotion differs from a passion in this, that it passes away without exciting any desire, whereas a passion is accompanied by desire. Emotions, regarded in themselves, can scarcely be called springs of action. They tend rather to quiescence and contemplation, fixing the attention on the objects or occurrences which have excited them. But they combine with springs of action, and give them a character and a colouring. The physical changes that uniformly accompany the mental passions and emotions show clearly the intimate connection that exists between the inward states of consciousness and the physical or

corporeal organism. This is in some measure accounted for from the natural tendency of pleasure to cause an increased flow of the blood and vital energies to particular parts, and of pain to cause a depression or weakening of the vital functions. Why some special muscles should be affected differently from others,—why, for instance, anger should draw down the eyebrows and compress the lips, is a question that has not yet been satisfactorily solved.

Emperor, *em'-pe-ror* (Lat. *imperator*), the supreme monarch of a nation; a title, the dignity of which is considered to be superior to that of a king. Originating with the Romans, and signifying merely the individual who had the *imperium* or ruling power, it gradually began to mean the possessor of the sovereignty of the Roman world. From the Romans, the title passed to Charlemagne, and when the Carlovingian family died out in the German branch, the title became elective. At present, there are three emperors in Europe,—the emperor of the French, an elected monarch; the emperor of Russia; and the emperor of Austria.

Emperor Moth (*Saturnia Pavonia minor*), one of the most beautiful of the British species of moths. The expanse of its wings is about three inches. The colour is a greyish brown, tinged with purple; the back part of the wings has a band of pale brown and purple, the last band being much waved. In the centre of each wing is a large spot consisting of a black pupil with a yellow or grey iris, partly surrounded by a light blue crescent. The larva is of a green colour, with a black band on each segment, ornamented with pink tubercles, bearing a whorl of six hairs, diverging like a star. The cocoon of the emperor moth is very curiously constructed, the extremity not being closed, but terminated by a converging circle of stiff hairs, which enables the insect to make its escape, but entirely prevents the entrance of all intruders. This moth is of the same family as the silkworm moth (*Bombycidæ*), and the largest European species is the peacock moth (*Saturnia pavonia major*), which attains a width of five inches between the wings.

Empetrace'æ, *em-pe-tra'-se-e* (Gr. *en*, upon; *petros*, a rock), in Bot., the Crowberry fam., a small nat. ord. of dicotyledonous plants in the sub-class *Monochlamydeæ*. They are small heath-like evergreen shrubs, mostly natives of northern Europe and North America. Their leaves and fruit are generally slightly acid. The berries of *Empetrum nigrum*, the crowberry, are eaten in the very cold parts of Europe, and are also employed in Greenland to prepare a fermented liquor. In Portugal the berries of *Corema* are also used in the preparation of a beverage which is said to have a medicinal value in febrile complaints.

Emphasis, *em'-fa-sis* (Gr. *en*, and *phemi*, I speak), in pronunciation, is a mode of denoting one or more words in a sentence by a stronger and fuller sound of voice, in order to draw attention to them, or to show how they affect the rest of the sentence. Sometimes the emphatic words must be distinguished by a particular tone of voice, as well as by a stronger accent. On the right management of emphasis depends the life of pronunciation. With no emphasis, speech will be heavy and lifeless, and the meaning often ambiguous; and if the emphasis be misplaced, the meaning may be entirely perverted. There are two kinds of emphasis,—the simple and the complex; the former serving merely to point out the plain meaning of a sentence, the latter to mark some affection or emotion of the mind, or to give a meaning to words which they do not usually bear. In writing, an emphatic word is commonly underlined, and in print it is usual to put it in italics.

Empire, *em'-pire* (Lat. *imperium*), a term originally applied to that territory or extent of land governed by an emperor. The first empire was that of the ancient Romans, and it was divided into two great portions,—the empire of the East, or the Lower Empire, and the empire of the West. The empire of the East was greatly subdivided, according to the reigning dynasty. The empire of the West became the German, or Holy Roman empire, in the ninth century. At the present time the word empire is used to express any large extent of dominion. Thus, in ordinary language, it is customary to speak of the empire of Hindostan and the empire of Persia. The dominions of the queen of England are universally called the British empire. Those countries in Europe which are empires governed by emperors are France, Austria, and Russia.

Empiric, *em-pir'-ik* (Gr. *empeirikos*, from *empeiria*, experience), is properly one whose knowledge is founded on experience or observation. A certain sect of Greek physicians took this name to denote their mode of treatment, as distinguished from that of the Methodists and Dogmatists. They died out, and are preserved only in the works of their adversaries; and hence the term has long been synonymous with a charlatan or quack doctor, or more generally an ignorant pretender in science. In philosophical language, the term empirical means simply which belongs to, or is the product of, experience or observation, as distinguished from what is the result of reasoning or inference.

Emporium, *em-por'-e-um* (Gr. *emporion*, trading-place), the term applied to receptacles in which wholesale merchants stow their goods in seaport and other towns. The word is originally derived from the Greek word *emporos*, which signified in the time of Homer one who sailed in a ship belonging to another. It afterwards was applied to a wholesale merchant, and in later years gained its present signification.

Empyrean, *em-pi-re'-an* (Gr. *empyros*, from *en*, and *pur*, fire), a term applied by poets and others to the highest heaven, where the pure element of fire is supposed to exist. Milton frequently makes use of the word in "Paradise Lost;" as in the following lines:—

"Almighty Father from above,
From the pure *empyrean*, where he sits,
High throned, above all height, bent down his eye."

Emu, *e'-mu* (*Dromaius Novæ Hollandiæ*, or *Dromaius ater*).—This bird is widely diffused over the southern part of Australia, and is closely allied to the cassowary. When fully grown, it measures seven feet in length. The plumage is, for the most part, a mixture of grey and brown, paler below than above; head covered with feathers, which, together with those about the neck, are of a hairy texture. The long feathers observable in the wings of the cassowary are wanting in the emu; but instead of them it has real wings, though of so small a size as to be useless for flight. The legs are short and stout; there are three toes to each foot, and these are furnished with nearly equal claws. It is very swift, and when attacked kicks, as does the ostrich, but not forwards, as does the latter bird, but more as a cow kicks, sideways or backwards. The nest of the emu is made by scooping a shallow hole in the ground in some scrubby spot; concerning the formation of the nest, however, there are various opinions. Its eggs are dark green, and the number laid varies from seven to thirteen. Dr. Bennett remarks there is always an odd number, some nests having been discovered with nine, others with eleven, and others, again, with thirteen. In size the emu's eggs nearly equal those of the ostrich. They are monogamous, and the males, as in the case of the she's, perform the duties of incubation. The eggs are eagerly sought after by the natives as an article of food, as is also the bird itself for the sake of its flesh, which, particularly that about the hind quarters, is said to be of good flavour. The emu would seem to have been unknown in Europe until the 10th century, when the Dutch, on their return from one of their earliest voyages to India, brought one from the island of Tara. For a considerable time this bird was exhibited for money at Amsterdam, and finally it came into the hands of the emperor of Germany. In the year 1671 an emu was sent by the governor of Madagascar to the king of France, which was kept alive for four years in a menagerie at Versailles. A peculiarity in the anatomy of the emu should be noticed. "It is the largest bird after the ostrich, from which it differs sufficiently in its anatomy, for it has short intestines and small cæca, wants the intermediate stomach between the crop and the gizzard, and its cloaca does not in proportion exceed that of other birds."—*Cuvier*.

Enamel, *en-am'-el* (Fr. *émail*), in Manuf., a term given to an opaque glass, which owes its opacity to the presence of binoxide of tin. Mixed with various

metallic oxides and fused, it may be obtained of different colours. The enamel for watch-faces is made from arsenic instead of tin. A coarse enamel made of white glass free from lead, borax, and soda, is extensively used for coating the insides of culinary vessels. The process at first was unsuccessful, owing to the liability of the glaze to split off under the influence of sudden heat; but great improvements have lately been made, and enamelled culinary utensils are now cheap and common.

Enamel of Teeth. (*See* Teeth.)

Encampment. (*See* Camp.)

Encaustic Painting, *en-kaws'-tik* (Gr. *egkaustike*, from *en*, in or into, and *kaio* I burn), a method of painting that was practised to a great extent among the ancients, from the time of Alexander the Great until the 7th or 8th century, from which time the art gradually declined until the 14th century, when it seems to have been abandoned, and a practical knowledge of effecting it entirely lost. According to the historian Pliny, there were three methods of performing the process; the first and second seem, however, to be almost, if not entirely, identical; the first being the method of producing large pictures, and the second, of producing designs in miniature. In the first kind, the colour that was intended for the ground of the picture, after having been mixed with wax as a vehicle, was smeared over the surface of the wall or panel on which the painting was to be made, and carefully flattened. The design, whether it was a figure or an arabesque border or scroll-work, was traced on this ground with a sharp-pointed instrument, and the ground carefully removed, leaving the figure in a sort of shallow intaglio. The wall beneath was allowed to show through, or the hollow was filled with wax colouring matter of another tint; after which the whole was blended together with a hot iron, a process which removed all traces of the junction of the different colours, and imparted a brilliant gloss to the tints that were used. The second method, in which the work was executed on ivory, must have been similarly done, and the wax colour which had been spread over the ivory removed by the graving-tool, to allow the surface of the ivory to furnish the design, or the design was cut out on the ivory in intaglio, and the hollows thus obtained were filled with coloured wax. In the third kind, in which the colours were laid on with a brush, the colouring matter was mixed with wax dissolved in turpentine or some essential oil. The colours were laid on in a liquid state, and from the use of the brush an effect of light and shadow was obtained which it was impossible to produce in the other methods above described. When the picture was completed, the tints were blended together with a heated iron as before. About 1750, the lost art was recovered, and the practice of it revived, by M. Bachelier and Count Caylus in France. Both produced pictures in this style, and an account of the method used was published. It was warmly taken up throughout the south of Europe for some years, when it again fell into disuse. It was revived again at Munich in the reign of King Louis of Bavaria, and the interiors of many apartments in his palace, and various public buildings erected under his auspices, were executed in it. Since this time, many fine works in this brilliant style of painting have been produced; but it is far better suited for decorative work than for portraits, figures, or landscapes.—*Ref.* Eastlake's *Materials for a History of Painting in Oil*; Montabert's *Traité Complet de la Peinture*, vol. viii.

Encaustic Tiles, small earthenware tiles used for paving the passages in the nave and aisles of churches, and also the chancel. They are also used for paving entrance-halls and the vestibules of houses. They are for the most part in two colours, red and yellow being most commonly used, and they are so called because they have a light arabesque pattern figured on them on a dark ground, or *vice versâ*, in imitation of the early encaustic painting of the ancients.

Enceinte, *on(q)-saym(g)t'* (Fr.), in Mil., the name given to the inner and continuous line of defence works round any place; thus the line of bastions and intervening curtains inclosing the polygonal space which forms the interior of any citadel is termed the enceinte.

Encephalartos, *en-sef-ăl-ar'-tos* (Gr. *enkephalos*, that which is in the head; *artos*, bread), in Bot., a gen. of the nat. ord. *Cycadaceæ*, composed of elegant palm-like trees and shrubs, mostly natives of South Africa and Australia. From the stems of various species a kind of sago, called Caffre bread, is obtained.

Enchantment. (*See* Magic.)

Encke's Comet, *engk'-kes*, a comet of periodic recurrence, to which the attention of astronomers was first especially directed when it was discovered by M. Pons at Marseilles, November 26, 1818. The similarity of its elements to those of comets which had been observed in 1786, 1795, and 1805, led M. Encké to calculate its orbit, and he found the period of its revolution at that time to be just about 1,211 days. The comet reappeared in 1822, and on comparing its elements, and the time of revolution, with those of the comets of the years above mentioned, it was found that they were only successive apparitions of the same comet, and that it regularly appeared at its perihelion at intervals of rather more than 1,211 days. It was also found that its period of revolution was gradually growing shorter, at the rate of nearly three hours per revolution, which caused M. Encké to imagine that it was occasioned by some very slight resisting medium spreading throughout the whole of our solar system. It was named after M. Encké, instead of M. Pons, its discoverer in 1818, on account of the success of the former in determining its orbit and period of revolution, and predicting its reappearance in 1825, which happened at the time he had named for it.

Encore, *on(q)-kore'* (Fr.), literally, 'again,' 'once more,' an expression commonly used in places of public amusement by the audiences to express their wish for a repetition of a particular part of the performance; as a song, &c.

Encrinite, *en'-krin-ite* (Gr. *en*, and *krinon*, a lily), in Geol., any fossil crinoid, or lily-like echinoderm. (*See* Crinoidea and Echinodermata.) The encrinites, which form a most important class of fossils, are characterized by their long many-jointed stalks, surmounted by flower-shaped bodies, which were furnished with numerous finger-like rays, capable of closing and expanding. Their internal calcareous skeletons or scattered joints and fragments are so abundant in some carboniferous limestones as to compose the greater portion of the mass; hence the term *encrinal* or *encrinital limestone*. The minuter joints of the fingers and rays are usually termed *entrochi*, or wheel-stones, and the limestones in which they abound, *entrochal limestone*. The stalk of the encrinite was perforated by a canal, which kept the whole in vital action, and the separated joints have consequently some resemblance to beads,—a resemblance which has obtained for them the common names of "St. Cuthbert's beads," "wheel-stones," and "pulley-stones. It is usual to apply the term *Encrinites* to the genera having rounded and smooth stems; those having pentagonal and ornamented stems being termed *Pentacrinites*; those having pear-shaped receptacles, *Apiocrinites*; and those with receptacles forming more or less perfect cups, *Cyathocrinites*. Geologically, the encrinites range from the Silurian up to the present epoch. They occur most abundantly in palæozoic and mesozoic strata, rarely in cainozoic, and are now only represented by the comatula or feather-star, and the all but extinct pentacrinus of the West Indies. Like the corals, their function seems to have been, to a great extent, the secretion of lime from the ocean,—whole strata of limestone, silurian and carboniferous, being almost entirely made up of their remains.

Encyclopædia, or Cyclopædia, *en-si-klo-pe'-de-ă* (Gr. *paideia en kuklo*, instruction in a circle), is properly a work professing to give instruction in the whole circle of human knowledge. The two terms are used synonymously; but the former is regarded as the more correct, as denoting "*in* a circle;" whereas the latter may mean, "*of* a circle." The use of the word, however, in its present signification, is entirely modern. With the ancients, encyclopædia was applied to the whole circle of learning, a knowledge of which was necessary to constitute a liberal education. It comprised grammar, music, geometry, astronomy, and gymnastics. Various works of the ancients attempted to embrace the entire circle of

knowledge; but they exhibit no plan, and are only confused accumulations of the then known arts and sciences. It does not, however, appear that the ancients ever applied the term encyclopædia to any work of that kind. So far as is known, the name appears to have been first used in this sense by Alfarabius, a learned Arab who flourished in the 10th century, and whose work, remarkable for its learning and completeness, is preserved in MS. in the library of the Escurial at Madrid. The indefatigable Dominican Vincent of Beauvais, who flourished about the middle of the 13th century, gathered together with wonderful diligence the whole knowledge of his time in three works: "Speculum Historiale," "Speculum Naturale," and "Speculum Doctrinale," to which was soon afterwards added, by an unknown hand, "Speculum Morale." But these, and similar subsequent works of the middle-age period, which appeared under the title of "Summa," or "Speculum," manifest throughout a total want of a philosophic spirit. Several works bearing the name of Cyclopædia, or Encyclopædia, appeared in the 16th century; as Ringelberg's "Cyclopædia" (Basel, 1541), and Paul Scalich's "Encyclopædia, seu Orbis Disciplinarum tum Sacrarum tum Profanarum" (Basel, 1559). In the beginning of the 17th century, appeared a work of no small merit,—Matthew Martini's "Idea methodicæ et brevis Encyclopædiæ, sive Adumbratio Universitatis" (Herborn, 1606); but the most noted and valuable of the early encyclopædias was that of John Henry Alstedius, a professor at Weissembourg, in Transylvania, which appeared in 2 vols. folio, 1630, a smaller work having appeared ten years before. It consists of thirty-five books, the first four being an explanation of the rest; then follow six books on philology; ten on speculative, and four on practical philosophy; three on theology, jurisprudence, and medicine; three on the mechanical arts; and five on history, chronology, and miscellaneous topics. At Basel, in 1677, in 2 vols. folio, appeared the "Lexicon Universale" of Hoffmann, followed by a supplement of the same extent in 1684, the two being incorporated in four vols. folio, 1698. The dictionary form which was introduced by Hoffmann's work is that which has since been generally adopted in encyclopædias. It doubtless suggested the first English work of this kind,—the "Lexicon Technicum, or Universal Dictionary of the Arts and Sciences," by Dr. J. Harris, 2 vols. folio (London, 1706-10). A supplementary volume was afterwards added. It enjoyed great popularity till the appearance of Ephraim Chambers's Cyclopædia, in 2 vols. folio, in 1728. This presented a marked improvement upon its predecessors, and by an elaborate system of cross references, it was attempted to connect the various articles together, so as to form parts of various wholes. "No one," says the author, "seems to have perceived that a dictionary is in some measure capable of the advantages of a continued discourse: and therefore we see nothing like a whole in what has in this sort been done." It was long popular, and a seventh edition, in 4 vols. folio, appeared in 1778-85. Various other works of this kind were published before the end of this century, but the only one demanding particular notice is the "Encyclopædia Britannica," the first edition of which was published in 3 vols. 4to, Edinburgh, 1771. The fourth edition of this work appeared in 1810, in 20 vols, and the fifth and sixth, which were mere reprints, were followed by a supplement in 6 vols., in 1824. The seventh edition, in 21 vols., was published in 1830-42; and the eighth and last in 1852-60. Dr. Abraham Rees, who edited the last edition of Chambers's Cyclopædia on the basis of that work, produced his "Cyclopædia, or New Universal Dictionary of Arts and Sciences," extending to 45 vols. 4to (1802-19). Of the other encyclopædias, may be mentioned the "British Encyclopædia," 6 vols. 8vo, 1807-9; the "Encyclopædia Londinensis," 24 vols. 4to, 1810-29, by John Wilkes; "Pantologia, or New Dictionary of Arts and Sciences," 12 vols. 8vo, 1813-16; Burrowes' "Modern Encyclopædia," 10 vols. 4to, 1816; Miller's "Encyclopædia Edinensis," 6 vols. 4to, 1816; "Encyclopædia Perthensis," 2nd edition, 23 vols. 8vo, Edinburgh, 1816; "Oxford Encyclopædia," in 6 vols. 4to, 1828; "London Encyclopædia," 24 vols. 8vo, 1826-29; "Partington's British





Cyclopædia," 10 vols. 8vo, 1833-36, in four divisions, of Arts and Sciences; Biography; Literature, History, Geography, Law, and Politics; and Natural History. In 1818 was begun the "Encyclopædia Metropolitana, or Universal Dictionary of Knowledge," on an original plan, comprising the twofold advantages of a philosophical and an alphabetical arrangement. The plan is by Samuel Taylor Coleridge, and is explained in his article "Method" prefixed to the work. The matter is arranged in four divisions:—1. the Pure Sciences; 2 the Mixed and Applied Sciences; 3. the Biographical and Historical articles; and 4. the Miscellaneous and Lexicographical articles. The work was completed in 1845, and extended to 25 vols. 4to; and since that time most of the larger articles have been reprinted in a small cabinet form. The plan of this work has been found to be too philosophical for practical purposes. The "Edinburgh Encyclopædia," edited by Dr. (now Sir David) Brewster, was commenced in 1810 and finished in 1830, in 18 vols. The "Penny Cyclopædia" of the Society for the Diffusion of Useful Knowledge was begun in 1833 and completed in 1843, in 28 vols. Three volumes of supplements were subsequently added. This work when it appeared was remarkable for the talent displayed in its production, and for its cheapness. The articles were all compiled from original sources, and the total expense for literary labour alone is said to have amounted to £15,000. The "National Cyclopædia," in 12 vols 8vo, 1847-51, was an abridgement of the "Penny Cyclopædia." Perhaps the most objectionable feature in the "Penny Cyclopædia" was the too much space allotted to natural history subjects for a work of general reference. This has been remedied in the "English Cyclopædia" of Mr. Charles Knight, a work based upon the "Penny Cyclopædia," but divided into four distinct parts, any one of which may be purchased separately:—1. Arts and Sciences, in 8 vols.; 2. Natural History, in 4 vols.; 3. Biography, in 6 vols., and Geography in 4 vols. This publication was begun in 1853 and completed in 1861, and it may well be said to be "a really great and trustworthy work of reference." The Messrs. Chambers, of Edinburgh, are at present bringing out an encyclopædia based upon the last edition of the German "Conversations-Lexikon," to extend to about seven volumes 8vo, of which about one half is already published. Based upon an earlier edition of the same work is the "Encyclopædia Americana," a popular dictionary of the arts, sciences, literature, history, politics, and biography, &c., edited by F. Lieber, in 13 vols. 8vo, Philadelphia, 1829-33, with a supplementary volume in 1845. The "Popular Encyclopædia," 7 vols. 8vo, Glasgow, 1841, is little more than a reprint of this work. The "New American Cyclopædia," edited by George Ripley and Charles A. Dana, in 8vo, is in course of publication. Dr. Larduer's cyclopædia does not properly belong to this class of works, being a collection of independent works connected together by nothing but the title. Lastly, among English works of this class, we would allude to the present,—"Beeton's Dictionary of Universal Information," a work which, while not attempting, like some of the others, to give learned and elaborate treatises on the different subjects, aims especially at being accurate and practically useful, a book for every day and everybody, and withal at such a price as to render it accessible to all classes of persons. It is divided into two parts of one volume each, the one for history and geography, already published, the other for art, science, and literature, in course of publication. In Germany the largest and most comprehensive of the immediate successors of Hoffmann's work was Zedler's "Universal Lexicon," published at Halle and Leipsic in 64 large folio volumes, 1732-50. The largest work of this class, however, is (or, rather, will be when it is completed) the "Allgemeine Encyclopädie der Wissenschaften und Künste," by Ersch and Gruber, commenced at Leipsic in 1818, and still in course of publication. It is divided into three sections, which are carried on simultaneously, the first commencing with A, the second with H, and the third with O. Of the first section 66 vols. have been published (from A to Gid); of the second, 34 vols. (from H to Jun); and of the third, 25 (from O to Phy), making in all 122

4to vols. The most popular of all encyclopædias, and remarkable as being the first that attempted to popularize this class of literature, was the "Conversations-Lexikon," projected by Mr. Brockhaus, the publisher, in Leipsic, and first published there in 1812. It has since gone through a number of editions, the last of which, the tenth, in 15 vols, having appeared between 1851 and 1855. It has been translated into nearly all the languages of Europe, and, even when not translated, it has been largely adopted, or its plan carried out, by works of a similar kind. An abridgement of this work is published under the title of "Kleinores Brockhaus'sches Conversations-Lexikon für den Handgebrauch," 4 vols., 1854-56. The more notable of the other German encyclopædias are Meyer's "Grosse Conversations-Lexikon für die gebildeten Stände," in 38 vols. 8vo, Hildburghausen, 1840-52, with a supplement in 6 vols, 1853-55, and 8 volumes of plates; Pierer's "Universal Lexikon der Gegenwart und Vergangenheit, oder neuestes encyclopädisches Wörterbuch der Wissenschaften, Künste und Gewerbe," third edition, 34 vols 8vo, Altenburg, 1839-46; "Oesterreichische National Encyclopädie," 6 vols. 8vo, Vienna, 1835-37; "Conversations-Lexikon der neuesten Literatur, Völker, und Staatengeschichte," 2 vols 8vo, Leipsic, 1841-45; "Allgemeine Real Encyclopadie, oder Conversations-Lexikon für das Katholische Deutschland," by Dr. W. Binder, 12 vols 8vo, Regenburg, 1846-50; and Herzog's "Encyclopädie für Protestantische Theologie und Kirche," 10 vols 8vo, 1853-59. In France, the first volume of the celebrated "Encyclopédie, ou Dictionnaire Raisonné des Sciences, des Arts, et des Métiers," of Diderot and D'Alembert, appeared in 1751, and the seventeenth and last of the original series was published in 1765, 11 vols. of plates being added to the text, of which the first was published in 1762, and the last in 1772. A supplement was afterwards added, consisting of 4 vols. of text and one of plates, 1776-7. It is said to have been founded upon an unpublished French translation of Chambers's Encyclopædia, undertaken by an Englishman of the name of Mills. It numbered among its contributors writers of high name, as Voltaire, *Rousseau*, and others; but they were nearly all persons holding very sceptical views on all religious matters. It soon became very popular, and various editions of it were afterwards published in France and other parts of the continent, and its principal writers came generally to be known as the Encyclopédists. It was followed by another work of still greater extent, the "Encyclopédie Méthodique," begun in 1781 and not finished till 1832, comprising 201 vols. 4to, including 47 vols. of plates. Each science or art is treated separately in a distinct volume or volumes; so that, in fact, it forms a series of dictionaries on special subjects (48 in all), rather than an encyclopædia proper. The first edition of the Encyclopédie Moderne, ou Dictionnaire abrégé, des Sciences, des Lettres et des Arts, &c., par une Société de Gens de Lettres," was published in 20 vols. 8vo, with 2 vols. of plates; Paris, 1823-32. A third edition of this work was published in 27 vols., with 4 vols. of plates, in 1853-57, to which a supplement is in course of being added,—the 10th vol., published 1861, coming down to the end of O. A useful work of this class is the "Encyclopédie des Gens du Monde," in 22 vols.; Paris, 1833-44. The French have also a "Dictionnaire de la Conversation et de la Lecture," in 68 vols. (Paris, 1839-51), of which a new edition began in 1851 is still in progress, and a "Conversations Lexicon," founded upon the last edition of the German work of that name. Based upon the German "Conversations-Lexikon" are the "Enciclopedia Española," begun at Madrid in 1842; the "Biblioteca universal de Instruccion," Barcelona, 1842; the "Almennyttigt Dansk Konversations-Lexikon," by P. Larsen, Copenhagen, 1849; the "Svenskt Konversations Lexikon," Stockholm, 1845; besides others in Holland, Russia, Hungary, &c. At Turin, a "Nuova Enciclopedia popolare Italiana," in 4to, was begun in 1856. Those encyclopædias that we have noticed have been more or less universal in their character and aim; but there exists another and also an important branch of this class of works,—those, namely, that are devoted to separate branches of literature, science, or art. The number of these works is rapidly increasing, and their character improving,—indeed, now there is scarcely a





department of human knowledge that has not its dictionary or encyclopædia. As knowledge increases, so must the demand for encyclopædias also increase. As the sphere of knowledge extends, the less able is man, with his limited powers and capacities, to embrace the whole circle; he must, therefore, have recourse to helps,—to books where he can get what information he wants in a comprehensive and easily accessible form; and to furnish this is the object of an encyclopædia. The importance of this class of works is not yet sufficiently recognized in this country. In Germany almost every family, even among the lower classes, has its encyclopædia. In the words of the editor of "Macmillan's Magazine,"—"An encyclopædia in any man's house is a possession in itself for him and his family; an encyclopædia chained at Charing-cross for public reference would be a boon to London worth fifty drinking-fountains."

ENDEMIC, *en-dem'-ik* (Gr. *endemikos*, from *en*, among, and *demos*, the people), in Med., is a term employed to designate diseases peculiar to a certain class of persons, or to a particular district. Thus ague is an endemic disease in low marshy countries; the goitre in the Alps. They differ from epidemic diseases, which, without reference to locality or class, attack many persons at the same time in the same place, and are contagious; as influenza, scarlet fever, &c.

ENDIVE. (*See* CICHORIUM.)

ENDOCARP, *en'-do-karp* (Gr. *endon*, within; *karpos*, a fruit), in Bot., the inner layer of the pericarp of a fruit. In certain fruits it is remarkably hard, and is termed the *stone* or *putamen*. In the almond the endocarp forms a thin woody shell; in the apple it is the core containing the seeds, and in the orange it constitutes the thin membranous partitions which divide the pulp into separate portions. (*See* FRUIT.)

ENDOGENOUS PLANTS, or ENDOGENS, *en-doj'-e-nus* (Gr *endon*, within; *ginomai*, I am formed), plants having stems which increase by the addition of new matter within. De Candolle's class *Endogenæ* corresponds with *Monocotyledones* of most botanists, and its essential characters are given in this work under the latter head.

ENDOSMOSE, *en-dos'-mose* (Gr. *endon*, within; *osmose*, impulsion), a term originally applied by Dutrochet to the transfusion of gaseous bodies or liquids through membranous substances either of an animal or vegetable origin. He found that if two fluids of unequal density are separated by a membrane, the denser fluid will attract or draw to it the less dense. When the attraction was from without inwards, he called it endosmose; when from within outwards, he called it exosmose. In animals and vegetables this remarkable action of fluids performs a very important part. Upon it depend many phenomena connected with the circulation of the blood in animals and the circulation of the sap in vegetables. The substance contained within the membranous covers of the cells of plants is denser than the fluids without; hence a process of endosmose takes place by which the plant is supplied with nourishment from the soil. The bursting of some seeds and fruits depends upon endosmose; and some of the entozoa appear to exist by its action.

ENDOWMENT, *en-dow'-ment* (from Fr. *endouairer*, to endow), in Law, is the bestowing or assuring of dower upon a woman. It is sometimes used metaphorically for the setting a provision upon a parson, or building a church or chapel; and the severing a sufficient portion of the tithes, &c., for a vicar, towards his perpetual maintenance when the benefice is appropriated.

ENDYMION, *en-dim'-e-on*, in Bot., the Blue-bell, a gen. of plants of the nat. ord. *Liliaceæ*. *E. nutans* is the species which adorns the woods and thickets of this country. Its flowers are usually blue, rarely white.

ENEMA. (*See* CLYSTER.)

ENEMIES, ADHERING TO THE QUEEN'S. (*See* TREASON.)

ENFIELD RIFLE. (*See* RIFLE.)

ENFILADE, *en-fe-laid'* (Fr.).—When the line of fire from artillery or musketry is directed along the front of a body of troops drawn up in line, instead of against it, or so as to sweep the interior of any part of the defensive works about a place, or a trench in siege-works, from one end to the other in the direction of its length, it is called an enfilading

fire. It is obvious that an enfilading fire directed against a body of men in line must be far more destructive and harassing than a direct fire against their front; and, in a siege, if the attacking party can bring their guns into position so as to enfilade any part of the works of a besieged fortress, the guns in that part will be more readily dismounted and disabled, as the enemy's fire will strike them on the side, which presents a far better mark than the muzzle projecting through the embrasure.

ENFLEURAGE, *an(g)-flur'-azhe* (Fr.), a process for extracting the scents from flowers by absorption. Wooden frames containing glass smeared with pure fat are filled with flowers, and allowed to remain for a time, varying from one to six days. The grease gradually absorbs the scent, the flowers being renewed from time to time throughout their period of blooming. The scent is afterwards separated from the grease by soaking it in strong spirits of wine. Sometimes wire frames covered with cotton cloths imbued with fine olive-oil are used instead of glass. In this manner the most delicate odours are extracted from flowers, which would otherwise be lost in the process of distillation.

ENFRANCHISEMENT, *en-fran'-tshiz-ment* (Fr. *franchise*, freedom or right), is the act of admitting a person to certain privileges or liberties; as where one receives the freedom of a town corporate. In Law, the enfranchisement of a copyhold is its conversion into a freehold by agreement with the lord of the manor. By 15 & 16 Vict. c. 51, after the next admission subsequent to 1st July, 1853, either the lord or the tenant may require and compel the enfranchisement of the land, in consideration of a gross sum or of an annual rent, fixed either by mutual agreement or by valuators and an umpire under the direction of the copyhold commissioners. (*See* COPYHOLD.)

ENGINE, *en'-jin* (Lat. *ingenium*, a contrivance), a term applied in Mech. to any compound machine or instrument composed of various parts, and intended to produce some effect by mechanical force; such as a pump, a windlass, &c. Some engines are distinguished by connecting the word engine with the purposes for which they are used; as, steam-engine, fire-engine, &c. Battering-rams, and machines of the same class, are called military engines; and arrows, swords, guns, &c., are often called engines of death.

ENGINE, AIR. (*See* AIR-ENGINE.)

ENGINEERING, *en-jin-eer'-ing* (Fr. *ingénieur*, an engineer).—Strictly speaking, the term engineering should only be applied to the art of making machines, and using them for the performance of any work; but its signification has been extended to comprehend the art of raising constructive works for civil or military purposes. Engineering, in its extended signification, may be considered as being divided into two distinct departments,—civil engineering and military engineering. A notice of the various duties and employments of the civil engineer will be found in the following article. The military engineer is more particularly employed in designing, planning, and constructing works of defence and fortifications, as well as the siege-works, trenches, approaches, and mines of an attacking force investing a fortified town. He must also understand and be practically acquainted with the construction of the various kinds of bridges in use for the transportation of troops across rivers (*see* BRIDGE, MILITARY), and the method of taking a survey of any tract of country by measurement or triangulation in an accurate manner, or approximately by mere inspection, and judging the heights of hills and the distances of conspicuous objects from point to point. In the English service these works are executed by a body of officers and men especially educated and enrolled for the purpose, and called the "Royal Engineers" or "Sappers and Miners." In warfare, the engineers are intrusted with any work of demolition necessary to cover the retreat of an army, such as blowing up bridges, &c.; and in forcing open the gate of a fortress, the hazardous enterprise of fixing the powder-bags and attaching the saucisson, or laying the train required to cause their explosion, falls to the lot of the engineer. This perilous duty was performed at Delhi by Lieutenants Home and Salkeld, assisted by three or four non-commissioned officers and privates, who volunteered for the hazardous service, at the cost of their lives. A description of the different parts of fortifications and siege-works, and the structures that come within the province of the military engineer, will be found under their respective headings. (*See* FORTIFICATION, BASTION, &c.)

ENGINEERING, CIVIL (Lat. *civilis*, of or belonging to a state).—There are many duties and branches belonging to this important profession, which, in many respects, is allied to that of the architect, although this great distinction lies between the constructive works of each; namely, that the buildings raised by the engineer are works of great solidity, and of a useful nature, especially designed for the promotion of commerce, while those of the architect are structures of ornamental character and artistic design, of which the former, except in rare instances, are necessarily devoid. Among the chief duties of the civil engineer, is the construction of roads and great highways, aqueducts and canals, with all the necessary accompaniments, such as locks, locksgates, culverts, and bridges. All such structures as breakwaters and light-houses, which are buildings requiring great strength and solidity in the construction of their masonry and foundations, and the formation of huge masses of earth, thrown up as embankments, to protect countries that are below the level of the sea from inundation, or low meadow lands from being flooded by rivers that are subject to sudden and rapid increase from heavy rains, come within the province of the civil engineer. He also constructs docks for the reception of shipping, quays, reservoirs, and water-courses for supplying towns with water brought from a distance, and he accomplishes the drainage of marsh land and fenny districts, and irrigates dry soil requiring moisture to render it productive, by various artificial means. Railroads, with their deep cuttings, immense embankments, lofty viaducts, dark tunnels; and roadways sometimes carried for miles on arches of brick-work,—their iron girder, and other bridges, of enormous strength, and bridges of all kinds that span our rivers, whether of wood, stone, or iron, are all the work of the civil engineer. The formation of artificial harbours by throwing out piers and jetties; and the clearage of natural harbours from all obstructions, such as sunken rocks and sandbanks; and the construction of the great sewers and drains that run in every direction under our large towns and cities, all come under his care; and, in addition to this, he has to superintend the construction of the shafts and machinery of mines and coal-pits, to insure safety to the miners in their ascent and descent, and to secure proper and thorough ventilation in all parts of the mine. Another great branch of civil engineering is the manufacture of massive machinery, such as pumps, hydraulic and lever presses, looms, and steam-engines of all descriptions, whether they be locomotives, or for vessels, or for setting machinery in motion. In short, the civil engineer seeks to adapt the mechanical powers, and their appliances, and bring them into such forms and combinations that they may furnish the means of saving the expenditure and waste of animal strength and manual labour, and thereby cause the work to be done at a cheaper rate, and in a more efficient manner. It is only within the last three centuries that the professions of architect, painter, sculptor, and engineer, whether civil or military, have become separate and distinct callings. Those of the civil and military engineer have chiefly been elicited and established by the invention of gunpowder and cannon, which necessitated the employment of peculiar skill and close study in planning and constructing the works of defence that surround any place of importance; and the requirements of commerce, which has long since demanded, and still demands, canals, roads, railroads, and motive power beyond the constant control of the winds and waves, for the conveyance of merchandise by land or sea. Although we may consider Archimedes as the first engineer of whom mention is made in history, in memorable connection with appliances of the lever and other mechanical powers, yet the early nations of the world, especially the Egyptians, who raised and fixed in their present position the gigantic blocks that form the pyramids, and reared the mighty monoliths known as Pompey's Pillar and Cleopatra's Needles, must have been pos-

sessed of engineers of no ordinary mental capacity. The blocks that form the Cyclopean walls of Tiryns and Mycenæ, the marble columns and the temples of the Greeks, the sewerage and aqueducts of Rome, the underground structures for the drainage of the Assyrian city Nimroud, the canal of Xerxes that separated Mount Athos from the mainland, and the remains of those found in various parts of Egypt, Assyria, and the East, choked with sand and rubbish, all tell us of the magnificent schemes that the engineers of antiquity designed and carried out, whose names are lost to us, and whose works have been almost entirely destroyed, or at least rendered useless by neglect and the lapse of time. Among the engineers who flourished before the Christian era, Archimedes, who so skilfully conducted the defence of Syracuse, is the earliest on record, unless we consider Hiram, the clever Syrian artificer, who aided Solomon in the building of the Temple, as an engineer, as he doubtless was, and more than this, the best of that period that was to be found throughout Palestine. The writings of Vitruvius prove him to have been employed in the structure of military machines and works of defence, as well as in architecture, and the building of mills and manufacture of pumping-engines, and other works of utility for agricultural and commercial purposes. In the middle ages, and even in later periods, we still find the professions we have mentioned above combined in one person; for the eminent architect Brunelleschi, and Michael Angelo, the sculptor and artist, are mentioned as constructing fortifications, and the illustrious painter Leonardo da Vinci rendering an important service in the capacity of engineer by the construction of the first canal lock that was ever used to afford means of communication between waters on different levels. In our own country, the ecclesiastics, in whom the greater part of the learning of the times seems to have centered, and who were the most famous architects of their times, as exemplified in the cases of William of Wykeham and Peter of Colechurch, were also the best practical engineers of the day, prior to 1500; and it is towards the close of the 17th century that we find the celebrated architect Sir C. Wren also acting as a civil engineer. Among engineers of the 16th century, Albert Durer, the painter and engraver, may be named, who wrote to some extent on the science of fortification; but at this time considerable skill in civil engineering had been attained, both in northern Italy and Holland, where every effort was obliged to be made to secure the inhabitants of these fertile lowland districts from the encroachments of the sea and the rivers, and to render the surplus waters of the country the means of obtaining an easy transit for merchandise and the productions of the soil from one point to another. At the end of the 16th century, the profession of the military engineer began to be brought into greater prominence, and to be considered as requiring special qualifications in him who might undertake the office, and Errard de Bar le Duc, De Ville, Pagan, Vauban, Cormontaigne, Cochorn, and Belidor, may be considered as the originators of the modern system of military engineering. In England, although civil engineers had long been attached to English armies at home and abroad, yet the first military corps of engineers, now known as the Royal Engineers, was not formed until 1787. But prior to this date, the rapid extension of commerce, and the demand for improved means of inland communication, had called the peculiar talents of Brindley into active operation in the formation of the Bridgewater canal. At this period, civil engineering began to be considered a distinct profession in itself, of considerable importance in this country, and the Eddystone lighthouse, and the numerous canals, docks, and railway works in every part of the country, and our magnificent iron steam marine, and improved weapons of all calibres, constructed by Smeaton, the Rennies, Telford, James Watt, the Stephensons, Locke, Sir Isambard Brunel and his son, Scott Russell, Armstrong, and Whitworth, and many others, show what marked and rapid progress has been made in this branch of science. In 1793, a society of civil engineers was formed by Smeaton and others, under the name of the Smeatonian Society of Civil Engineers, and in 1818 the Institution of Civil Engineers was established, and incorporated by royal charter about ten years after. A person who desires to become a civil engineer, and possesses sufficient attainments to master the necessary subjects, should obtain an intimate knowledge of arithmetic and mathematics, trigonometry, statics, dynamics, hydrostatics, and hydrodynamics, mapping, surveying, and mechanical drawing, in order to enable him to construct plans and sections of lines of country for canals, railroads, &c., and to calculate the cost of materials and labour. He must also be acquainted with the strength and resistance of different materials in different positions and combinations, that he may be enabled to determine the principles of equilibrium in arches and roofs, the slope and form of his cuttings and embankments for railroads, and to resist the pressure of water; and he must also have a knowledge of the mechanical powers and machinery, and the means of applying them. With the theories acquired in the attainment of a knowledge of these subjects, practice must afterwards be combined; but in addition to practice and theory, good natural capacities and inherent talent of no ordinary nature are indispensable to cause a man to reach any degree of eminence in such a profession as civil engineering.

Engineers, Royal Corps of, one of the component parts of the English army. It has for its duties the making and defending all military works, and also the attack of similar works held by the enemy. The engineers form one regiment, and, unlike other branches of the army, are in continuous service both in peace and war. They are spread all over the world, and they are intrusted with the construction of all land and sea fortifications. In this work they are often assisted by civilians; but the engineer department of the country is responsible for the efficiency of the result. The corps of engineers was first formed in 1763, and in 1783 it was made a royal corps. In 1812 several corps of artificers, called sappers and miners, were placed under the engineers. Officers intended for the engineers enter the Royal Military Academy as cadets, and compete for their commissions at various periods. The head quarters of the engineers are at Chatham.

Engineers in the Royal Navy are those men who attend to the machinery on board the war steamers. When vessels of this kind were first employed, men were obtained from ordinary merchant steamers. Many changes were afterwards made, and there are now various grades of engineers in the navy. There are inspectors of machinery, chief engineers, and assistant engineers, the latter class being subdivided into three parts. These are all commissioned officers, and are strictly examined before being admitted. At the commencement of this year (1862), the number of naval engineers was reckoned at 1,089, with eight inspectors of machinery.

English Language, *ing'-glish*, is the vehicle of spoken and written communication between upwards of fifty millions of people, and is as heterogeneous in its elements as it is widely extended in its sphere. "Latin, Greek, Hebrew, Celtic, Saxon, Danish, French, Spanish, Italian, German," says M. Muller, in his recent "Lectures on the Science of Language,"—"nay, even Hindustani, Malay, and Chinese words, lie mixed together in the English dictionary." It was long a popular, and probably somewhat partial, whim in this country, that Anglo Saxon formed at least two-thirds of the spoken and written speech of it. But M. Thommerel has recently carefully gone over the dictionaries of Robertson and Webster, and has established the fact, that Anglo-Saxon stands in no greater a proportion to the words of merely Latin origin than the relation that 13,330 holds to 29,354. Yet the English language is essentially and truly a Teutonic or Saxon tongue; for it is not the extent of the vocabulary of a language that gives colour to the title of that language,—it is to the grammar to which the tongue conforms that we must trace its scientific relationship. Now, whatever there remains of grammar in English—and, indeed, it is very little—obviously bears marks of being forged in a Teutonic workshop; and hence the necessity that there is for classifying it as such in the general philology of the world. In tracing the growth of the English language, it is usual to divide its history into the four periods of *Anglo-Saxon* (449 A.D.—1066

A.D.), *Semi-Saxon* (1066 A.D.—1250 A.D.), *Early English* (1250 A.D.—1550 A.D.), and *Modern English* (1500 A.D. to the present day). These in their order:—

The *Anglo-Saxon* period of the language dates from a time when, in the 5th century, the Teutonic sea-rovers first occupied the southern portion of the island, and drove back its original Celtic inhabitants to the north and west. No sooner had they done this, than they settled in the island, and from that day to this the prevailing tongue of the country has been Anglo-Saxon, or English. This Anglo-Saxon was a Low-German dialect, bearing a close similarity to the old Frisic, which is usually recognized as the parent of the modern Dutch. After long years of social feuds and of national warfare, the absorption by Wessex, or West Saxons, of the various portions of the Heptarchy, in the 9th century, went far to make the ruling speech of the land the tongue of Berks and of Hants, the recognized centre of this clan. This fact not only gave colour to the more refined speech of the Anglo-Saxons, but, in addition to this, the fact of King Alfred, a native of Berks, rising up to be himself such an illustrious ornament to the letters of England, was a special literary confirmation of what before had been simply asserted by the sword. When we compare the writings of Cædmon, a North Anglian, and the writings of Alfred, two dialectical peculiarities at least seem at that early period to have prevailed in the island. There was the Northern or Anglian, which prevailed from the Humber to the Firth of Forth, and the Southern or Saxon one, which was spoken from the Humber to the English Channel. Now, which of those Anglo-Saxon dialects entered specifically into the formation of the English tongue? Two answers have been given to this question by competent scholars. The one, that the classical Saxon of Wessex gradually gave way to another dialect,—that of the Midland counties; the other, that we must look for the real groundwork of our tongue in the gradual coalescence of all the leading dialects of England.—(*See* Sir Francis Madden's edition of Layamon's *Brut*, 1847.) The latter view, we confess, appears the more likely. The main peculiarity of the tongue of the island at this early period was, that the infinitives were still in *an*, the substantives, adjectives, pronouns, and articles, were declined like the Latin; and the plural was unlike the singular: in other respects it differed much less from our modern vocabulary than one might at first sight suppose.

The *Semi-Saxon* period was a transition era, and, like every era of the kind, one of confusion and one of promise. The monks were, of course, the learned class of the time; and what with their ancient formularies and the mediæval Latin in which they performed their Ave-Marias and their Paternosters, when they attempted to write their mother-tongue they fell into the grossest mistakes. The "Saxon Chronicle," 1173, and Layamon's "Brut" (about 1200), afford abundant specimens of this slip-shod style of Anglo-Saxon, and it is abundantly evident, from an examination of the inflections and genders of the language, that it was undergoing at this time a thorough breaking up. *En* is constantly substituted for *on* in the plurals of verbs; the final *e* is often discarded; weak preterites occasionally take the form of strong ones, and there is a marked uncertainty in the government of prepositions. There is another curious feature observable in the Anglo-Saxon of this time,—that although its date makes it reach a century or two beyond the Conquest of 1066, it nevertheless exhibits but few traces of Norman French. In that curious old poem which has just been referred to, the "Brut," there are not more than fifty French or Latin words in a composition of 32,000 lines! Norman French might be the language of the court; it certainly was not the language of the people.

The *Early English* period, again, of the language exhibits important features of consolidation and of final hardening. The English tongue now asserts itself throughout; yet it is still struggling to become. In the first place, it contrived gradually to get rid of all Anglo-Saxon inflections, particularly in the substantives and adjectives; the vowels *a*, *e*, *u* in final syllables are all represented by *e*, and the final *n* of the infinitive has already begun to disappear. It constantly prefers to express the relations of an idea by some





new word attached to the original one, whereas the old Saxon tongue, like a genuine element of the Teutonic, always expressed such ideas by a modification of this word. In the admirable poem of the "Owl and the Nightingale," written probably towards the end of the 13th century, the French language appears as a decided element in its vocabulary. It has likewise become, by the time we reach Chaucer, Gower, and Lydgate, a component part of English speech. And it is obvious that this modification was effected much more through the literary regard which was engendered in the breasts of those old poets for the French Fabliaux, and such-like writings, than from any superior respect which they reluctantly paid to the speech of their Norman masters. Yet certain poets still clung affectionately to the old tongue, and in "Piers Plowman," and in a few others, we see examples of writers who still found the Anglo-Saxon sufficient for all their wants. The beautiful old ballad of the "Nut-brown Maid" (about 1500) is so modern in its style that it is difficult to believe it to be so ancient by a century at least. In the southern part of Scotland again, and particularly the Anglian counties lying south of the Forth, the language of the people was to all intents and purposes identical with the language of the extreme south. And it is to be noted, in illustration of this remark, that Barbour, a Scottish contemporary of Chaucer, wrote purer English than Chaucer did, that is to say, his poems were much freer from the foreign element of Norman-French. The north-eastern dialects of Scotland have always presented a stumbling-block to the ethnologists; for it is unquestionable that the inhabitants of those counties speak a language which, in its grammar at least, is very nearly akin to that of Norfolk and Yorkshire. Yet in the vocabulary of the people, there are a considerable number of words of Norse or Scandinavian origin. The existence, during the 11th century, for a period of thirty years, of a Norwegian kingdom under the sea-rover Thorfinn, in the extreme north-east of the island, might partially account for this Norse element in the speech of the country. But how are we to account for the existence of an Anglo-Saxon *grammar* north and east of the Forth, or even of the Tay? for it is well enough known that the Norse languages are all widely diverse in their grammar from the Saxon. No satisfactory answer has yet been given to this question; nothing but vague theories indeed have been formed regarding it. The close likeness of the two tongues to the north and south of the island did not last long after the war of independence. So early as Dunbar, the best Scottish poet before Burns, pedantic Latinisms had usurped the place of pure Anglo-Saxon, and in his best poem, the "Dance," the striking personification is abound with what were then considered as barbarisms.

In the *Modern English* period of the language, it was to a great extent perfected as to its grammar, if still deficient as to its vocabulary. Of course the rules and forms of the grammar had still to be rendered workable and delicate by the use which great practice can alone communicate. It is to be observed, however, that it was much more in the ease and dexterity which the old forms of speech received, that this modern period is distinguished, rather than in any new modifications effected upon the grammar itself. Of course the additions which have been made to the English dictionary since the beginning of the 16th century have been immense,—a process which still goes on; but the effects of change on the glossary of a tongue are merely secondary. The changes, accordingly, which it has since undergone, are merely changes in style, or in the variety of modes in which different individuals express themselves. The English language is worthy, by its remarkable combination of force, precision, and fulness, of being, as it is already, the speech of nearly all the free nations of the world. If it cannot boast of native purity, it can at least boast of what is better than purity in a language,—the strength and copiousness, the delicacy and grace, the refinement and tenderness, in which its glossary abounds. If it is Teutonic in its stem, as the single *s* in the third person singular of the present indicative assures us, it should be remembered the extent to which it draws on the old classical languages of

Europe.—Ref. *The Origin and History of the English Language*, by George P. Marsh, 1862; and other very accessible works are those of Craik, Spalding, and Latham.

ENGLISH LITERATURE is modified in a highly important manner by the history of the English people. Eras of great literary progress have always been found to succeed those periods of the nation's history characterized by important social changes, and sometimes by national revolutions. The literary annals of England may be conveniently arranged into three periods:—1. That antecedent to the Norman Conquest; 2. that extending from the Norman Conquest to the English Reformation; and 3. from the English Reformation to the present day. These in their order.

1. The time preceding the Conquest has a literature composed in three distinct languages, and possessing merits of a highly important character. First, there is the Celtic, spoken by the Northern Scots, the Irish, and the Welsh. The "Annals of the Four Masters," compiled by Tigernach, records the authentic doings of the Irish people so early as the fifth century. No other nation of modern Europe can make a similar boast. Then there are the Scottish Ossianic poems, which, if they were genuine, would lead back the reader to the third century. Among the Welsh people, again, their triads are said to extend as far back as the sixth century, although nothing very authentic can be learned of the exploits of the famous Welsh prince Arthur of the Round Table, or of the enchantments of the renowned magician Merlin. The cultivation of Latin literature in this country succeeded the introduction of Christianity into it. St. Ninian establishing himself at Whithorn, tried to convert Scotland late in the fourth century; St. Patrick made a similar attempt in Ireland in the fifth century; and St. Augustine laid the foundation of the Anglo-Catholic church late in the sixth century. Literary effort soon followed, and we meet as first in this honourable list the names of Alcuin, of Erigena, and of Bede. The "Gleeman's Song," the "Battle of Finnesburgh," and the "Tale of Beowulph," are the only stories of a Homeric cast which the Anglo-Saxon people possess. The latter, in particular, resembles closely, in some of its vividly picturesque touches, the old Iliad of Troy. Doubtless such remarkable religious poems as those of the monk Cædmon deserve to be mentioned in any summary of the literary history of England. Yet the Anglo-Saxon people were comparatively poor in poetry; but they were eminently simple and direct prose writers. Portions of the sacred Scriptures, Anglo-Saxon chronicles, sermons, glossaries, grammars, geographies, medical works, and dialogues, in their tongue, were all composed by their leading writers, Aldhelm, Bede, and Alfred. It was chiefly through the influence of the latter, who discarded Latin in all his communications with his subjects, that the Saxon tongue made so decided a start as it did during the ninth century. This illustrious monarch, who both by his enlightenment and his many virtues has rendered his time one of the most brilliant in English history, used all his personal leisure and all his personal influence to render into his native tongue the works written in the language of Rome. He was not a dab at Latin, and he knew it, which may possibly account for the loose style of some of his versions, containing, as they do, stray stories, fine bits of description, and even a devout prayer of an occasion, all commingled, in the most distracting manner to a modern classic, with the text of his author.

2. The Conquest brought with it a change of language and a change of manners in the court; but it could hardly modify the speech of the stubborn Englishmen of those days. In no long time the lordly Norman nobles found it to be their interest to study the despised tongue of the people they had conquered; and it is owing much more to the influence of Chaucer and Gower, and to the literary class generally, that French came materially to modify the existing language of England. These men knew French, because it was the tongue in which many interesting books were written; and they gave it to the people of England in the firm belief that an acquaintance with it would advance their taste and improve their manners. Classical and theological learning were now much prosecuted. The founding of the universities, and the extension of the monastic system, gave leisure for scholarship and induced thought. The close political intercourse that there was then with France improved both England and France in learning and in social manners. Such names as Lanfranc and Anselm, as Hales and Duns Scotus, as Michael Scot and Roger Bacon, show how entirely men were devoted, as they usually are in the infancy of a literature, where external peace and leisure will permit of it, to philosophy in both its branches of physical and metaphysical. The historical writers of the time, among whom we must mention William of Malmesbury, Geoffrey of Monmouth, Giraldus Cambrensis, and Matthew Paris, afford an agreeable offset to those subtle speculators. Of course the learned language of the time was altogether Latin; and it is worth noting that the wit and fancy of the ecclesiastics could find as hearty expression in the fine old drinking song of Walter Mapes, beginning "Mihi est propositum in taberna mori," or as Leigh Hunt elegantly renders it—"I devise to end my days in a tavern drinking"—in the twelfth century, as they came to do in the sixteenth century, when Bishop Still improved the immortal bacchanalian song of "Jolly good ale and old." Personal satire and invective were much rifer in Mapes's day, than they became; and the weak king John and the charter of Runnymede afforded those disposed to employ those local squibs only too good targets to aim at. The "Gesta Romanorum," a singular medley of tales, apologues, and so forth, told often with much humour and pathos, have an interest of their own; and they possess, likewise, a borrowed grace. They have been instrumental in suggesting some of the noblest themes in our recent literature, and thus have double claims on our affection. The "Merchant of Venice" and "Marmion," to go no farther from home, owe much to those old "Gesta." These compositions resembled closely in their structure the French "Fabliaux," and have had a much greater influence on our literature. The fine old romances of "Havelok the Dane," the "Gest of King Horn," "Bevis of Hamptoun," "Guy of Warwick," and last and best of all, those glorious old legends written mostly in French, but composed by Englishmen, to celebrate the greatness and the downfall of the mythical king Arthur and his Knights of the Round Table, no English student of this literature will pass by. It was only the other day that we had an admirable poem from Alfred Tennyson on the fragmentary materials of this very period. Meanwhile, the vernacular tongue of England, driven from the monasteries and the universities, was almost solely dependent for its patronage and subsistence on the common people of the land. It had no literature worth mentioning at this period; and it was rapidly merging into the Semi-Saxon, as it is called, of which the earliest and best representative is the "Brut" of Layamon. The fourteenth and fifteenth centuries brought in, in truth, a new era into English history and English literature. Cressy and Poictiers were fought, and John Wycliffe and Geoffrey Chaucer were born. The former deserves our ceaseless regard for his translation of the sacred Scriptures, the first ever effected by one hand (1380), and except Sir John Maundeville's travels (1356), it is the first specimen of early English prose writing in our language. The latter deserves our undying esteem for his immortal "Canterbury Tales" (1390—1400), which, for their fine sportiveness and healthy pathos, their humorous simplicity and genuine tenderness, will be admired while the language endures. It is to be remarked that the "Bruce" of Barbour, a Scotchman, an epic narrative, written about 1376, is in purer English than those poems of Chaucer of which we have just spoken. It resembles closely in its diction the English poem of "Piers Plowman." We can hardly do more than name a great many authors who crowd the canvas of the fifteenth and sixteenth centuries. Such are John Lydgate, whose "London Lackpenny" (about 1430) is still read with interest; Alexander Barclay, author of the "Ship of Fools" (1509); John Skelton, author of the satire called "Colin Clout" (died 1529); and Sir Thomas Wyatt, who died in 1541. The prose writers of this period are Sir John Fortescue, chief justice of the King's Bench under Henry VI.; William Caxton, who holds the honourable place of being the first who in-

troduced printing into Britain (1474), his first book composed with types being the "Game of Chess;" Fabian (1512); Hall, an English lawyer and chronicler (1547); and Tyndale, who was burnt for heresy in 1536. The Scotch poetry of the period almost matches in interest and importance that of the south part of the island. James I., king of Scotland, led the way with his "Queen's Quhair;" Wyntoun, the chronicler (1420); Blind Harry, the author of the once highly popular performance known as "Sir Wm. Wallace;" Robert Henryson (died 1508), and wrote a beautiful poem called "The Testament of Cresseid;" Gavin Douglas, whose best work, among a considerable number, is, without doubt, his translation of Virgil's "Æneid" into Scottish verse; and last and greatest of the poets of his country until the time of Burns, stands William Dunbar (died about 1520), whose "Daunce of the Seven Deadly Sins" showed him to have possessed imagination and humour, pathos and tenderness, boldness and vigour, in a very remarkable degree.

3. The period extending from the English Reformation to the present time eclipses in brilliancy and grandeur all the other eras of English literature. As the same sequence of events reigns in letters as in social life, the character of one era always determines the nature and complexion of the succeeding one. This is very observable in the Elizabethan age, on which we are now entering. The discovery of printing, and the discovery that all was not gospel that came from Rome, were two as potent instruments as could possibly be put into the hands of literary men. What Skelton and Dunbar had begun, Spenser and Shakspere carried to a splendid consummation. Doubtless an age so rife in new thoughts, and new images, and new forms of expression, could not have been heralded without its meed of bloodshed. The names of Latimer, of Cranmer, of Ridley, and of Sir Thomas More, lie like dark shadows along the landscape of the literature of the time, men whose blood was shed by the rude laws that temporarily assumed the form of justice. The "Utopia" of the latter is a work so proverbially imaginative that it has given the language a new word; yet so truly philosophical, and so full of elegant writing, as to be the wonder of the time at which it was produced. Roger Ascham, the learned tutor of Lady Jane Grey, and the writer of an excellent work, the "Schoolmaster," is another admirable miscellaneous writer of the time. As the English drama has already been taken up (*see* DRAMA), we need only mention here Sackville, who wrote the "Mirrour for Magistrates," and Brooke, author of the "Tragical History of Romeus and Juliet;" and the Scotsmen, Sir David Lyndsay, Boece, Major, Melville, and George Buchanan. "Lyndsay of the Mount," as he is sometimes called, and George Buchanan, call for a word of special mention, even in a summary like the present. The former was the companion of King James V. during his youth, and his unheeded counsellor in old age. He wrote a huge kind of drama of the moral-play or interlude type, called the "Satire of the Three Estates" (1535), the irony of which is ordinarily aimed at the abuses of the church, but of which the humour is frequently so gross as to render it unfit, at least, for general use. George Buchanan is universally admitted to have been one of the finest classical scholars who has appeared since the age of Augustus. He mingled much in the politics of his time, yet found leisure to nurse his genius in the retired ways of academic seclusion. The founding of the Scottish universities, and the institution of grammar and parish schools, which owed their origin entirely to the indefatigable labours of the reformer Knox, bade fair to give to Scotland an important place in the history of Great Britain. We now come close to the greatest era in the history of English literature. In all the essentials of true genius this age can give way neither to the best days of ancient Greece or Rome, of modern Italy or France. The greatest men the nation has ever produced come trooping up at the mention of Queen Elizabeth's name. There is Shakspere and Spenser and Sidney; there is Raleigh and Hooker and Jeremy Taylor; there is Milton and Hobbes and Cudworth, and many others besides, "men, all of them," to adopt the language of Francis Jeffrey, "not merely of great talents and accomplishments, but of vast compass and reach of understanding, and of minds truly creative; not men who perfected art by the delicacy of their taste, or digested knowledge by the justness of their reasonings, but men who made vast and substantial additions to the materials upon which taste and reason must hereafter be employed, and who enlarged, to an incredible and unparalleled extent, both the stores and the resources of the human faculties." Not only was Shakspere taller by a head than any of his contemporaries, the men who proudly closed around him bulk larger, even to the critical eye, than any other collection of names in the entire roll of our literature. Even the minor dramatists of the time, such as Marlowe and Chapman, Beaumont and Fletcher, Jonson and Drummond, are almost the equals of any poets who have succeeded them. About the close of this period a number of sweet poets arose, who mostly wrote in a lyrical measure, though some of them were didactic; such as Fletcher and Browne, Drayton and Wither, Quarles and "holy George Herbert." During the period of the Restoration and the Revolution, the literature of the stage was exceedingly profligate. The court and the king had imported from France a love of genteel profligacy, which found its most fitting expression in the comedy of intrigue; and Wycherly and Congreve, Vanbrugh and Farquhar, are the dramatic scapegoats of the time. Yet the age was not wholly corrupt, for it could boast of such distinguished theologians as Baxter, Owen, Calamy, Collier, Leighton, South, Tillotson, and Barrow. This was also the time when Milton, who stands in the front rank of poets, lived and sung of Paradise lost and of Paradise regained, writing "something," as he early hoped himself, "which posterity would not willingly let die." Marvel ridiculed the High Church, and Butler, of "Hudibras" fame, burlesqued Dissent; Walton angled, Locke speculated, Newton discovered, and John Dryden "found the English language of brick, and left it of marble." The literary history of the 18th century, and particularly of the reign of Queen Anne, has been censured severely by some, and praised to excess by others. It was natural that the critics of the period should be inclined to over-estimate the influence of the literature among which they lived; but many writers of the present day have decried it, possibly with a considerable touch of truth, for its polite scepticism and for its hollow insincerity. It has been glorified by its advocates as the Augustan age of English literature, and decried by its enemies as an age of utilitarianism and satire. The truth is, that both in poetry and in prose the form had come to be observed much more than the matter. Pope, of course, is the poetical chief of this age; and while he, no doubt, indulged much more than was meet in the most polished and most personal satire, he nevertheless, as in his "Essay on Man," displays a fine power of lofty contemplation, and a faculty of expression so brilliant, so happy, and so copious, that we look in vain for the match of it in the entire range of English poetry. Addison is unmatched for grace and ease; Swift has no equal in rude, pointed vigour; and the sense of Johnson's ponderous sentences is frequently obscured by their size. If Young, Akenside, Thomson, Gray, Collins, Beattie, and Cowper were animated by a truer sense of their duty in writing poetry than Pope was, the result shows that they accomplished much less than he did. The greatest poet of the century was Robert Burns. Its novelists were Richardson, Fielding, Smollett, Sterne, and Goldsmith; its historians were Hume, Robertson, and Gibbon; and its philosophers were Butler, Berkeley, Clarke, Shaftesbury, Hume, Paley, and Adam Smith. The first half of the 19th century opens with a galaxy of poets more brilliant, probably, than any that have appeared during an equal number of years in the whole history of English literature. Coleridge, Wordsworth, Scott, Byron, Shelley, Keats, Campbell, and Southey, are the poets of this time. There might be periods of greater originality, but there has been none so various, so diverse, and so fresh of its kind, as the period we are describing. Books have been multiplied to an unprecedented degree, and readers have increased almost as abundantly as the books have. This is the age of reviews and periodicals, and, indeed, of novels and romances. The great reviewers of the time are Jeffrey, Sydney

Smith, Hazlitt, John Foster, De Quincey, and Carlyle; the great preachers are Hall, Chalmers, and Irving; the philosophers are Stewart, Mackintosh, Bentham, Brown, Hamilton, and Stuart Mill; the men of science are Owen, Whewell, Faraday, Sedgwick, and Huxley; the novelists are Dickens, Thackeray, Bulwer Lytton, Charlotte Brontë, and "George Eliot;" the historians are Hallam, Macaulay, Thirlwall, Grote, Milman, and Carlyle. Ruskin stands alone as a writer on art. In poetry we have Tennyson, the Brownings, Matthew Arnold, Smith, and Massey, besides a host of others. America has been active in sustaining her credit as a scion of Saxon stock, and can number among her writers W. Irving, Poe, Longfellow, Cooper, Prescott, Emerson, Bancroft, Hawthorne, and Lowell, who have given us excellent prose and very good verse.

ENGRAILED, *en-graild'* (Fr. *engréler*, to indent in curved lines, to variegate), the name given to a particular form of partition line used in Her. It consists of a series of semicircular or scalloped indentations, the points of the indentations being turned outwards, or projecting into the field when the line is used, as it is principally, for defining the outline of any simple ordinary or sub-ordinary.

ENGRAVING, *en-grav'-ing* (from Fr. *graver*, to engrave), the name given to the art by which plates of metal or blocks of wood are prepared by incision or excision in order to imprint designs of any kind on paper, calico, or similar materials. The term engraving is more strictly confined to work of this nature executed on wood or metal; but there are also many different branches of the art, to which specific names are applied: thus, the process of engraving dies in steel for coins and medals is called "die-sinking" (*see* DIE-SINKING), while engraving on precious stones and shells, which consist of layers of different colours, so that, by cutting away a portion of the upper coat, a dark figure may be produced on a light ground, or *vice versâ*, is termed "cameo-cutting." (*See* CAMEO.) This branch of the art is somewhat similar to chasing, by which figures and patterns are produced in bas-relief on vessels of gold or silver. There is a great difference in the method used in preparing blocks of wood and plates of metal to effect impressions on paper. In the former, all the parts that are to appear white in the impression are cut away, and the lines which produce the imprint are left on the face of the block (*see* WOOD-ENGRAVING); but, on the contrary, in engraving on steel, copper, or zinc, the lines which are intended to produce the impression are hollowed out with a graving-tool. The Egyptians practised the art of engraving in bas-relief and intaglio on stone and metal at a very early age, and the Jews and Greeks probably derived their knowledge of the art from them. Indeed all the nations of the East have practised engraving of various kinds from a very early period of their history, although none of them ever discovered the practicability of taking impressions from incised plates, or wooden figures in relief. It was about 500 B.C. that a Greek named Aristagoras is said to have produced a map of all the portions of the world that were known to the ancients at that period, graven on a plate of brass. The incised lines were probably filled in with a coloured composition, so that the whole presented an appearance somewhat similar to the *niello*-work of the middle ages, or the second kind of the early encaustic paintings. (*See* ENCAUSTIC PAINTING, NIELLO.) The method of producing incised engravings on plates of metal for the purpose of ornamentation, was followed without the slightest variation in the manner of execution from the earliest times until the discovery of the art of printing, and the mode of taking impressions from engraved plates. The art of obtaining an imprint from wooden blocks and types is ascribed to Laurence Koster, of Haarlem, who printed a book of rude wood engravings on Scripture subjects, with texts of Scripture at the foot of each print, entitled *Speculum Humanæ Salvationis*, about the year 1430; but the merit of the earliest discovery of printing from metal plates is assigned to Masso Finneguerra, of Florence, who took an impression on paper from a large silver plate known as the "Pax," which he was engraving in *niello*, about twelve years after the discovery of Koster, who was then printing from movable types cut in metal. After this, the progress made by the Germans and Italians in engraving on wood and metal was rapid, and before the close of the 15th century, books were produced copiously illustrated with maps and engravings imprinted from metal plates. Prior to the time of Albert Durer, engraving had been effected by means of the graving-tool alone; but this great artist introduced the method of engraving known as etching, by which the design is bitten in, as it is technically called, by the corrosive action of a strong acid on the surface of the plate, after the design has been traced with a needle on the etching-ground, with which the plate has been previously covered. It should, however, be stated that the discovery of the art of etching by means of acid is ascribed by some to Parmegiano, who lived at the same time as Albert Durer. The style of engraving called "mezzotinto" was introduced by De Siegen about 1640: considerable improvements were subsequently effected in this branch of the art by Prince Rupert. Copper was the material used for all engravings, whether of maps or landscapes, in line, aquatinta, stipple, or on soft ground, until about the year 1815, when soft steel plates were first used by Messrs. Perkins and Heath, of Philadelphia, instead of copper, which were afterwards hardened when the process of engraving had been effected. The tools used in engraving are gravers or burins of all kinds and forms, made of case-hardened steel, etching-needles, scrapers for removing the burr thrown up by the graver or dry point, and burnishers to remove scratches from the plate, and to give a tone and finish to the engraving. The plate is prepared for the reception of the design by covering it with a coating of etching-ground, composed of a mixture of wax, resin, and gum-mastic. This is smeared over the plate after it has been heated, care being taken to render the surface of the ground uniform. It is then blackened by holding it over the smoke of a candle; and as soon as this is done the plate is allowed to cool. The outline of the drawing or map to be engraved, which has been carefully traced in pencil on paper, is next transferred to the ground by pressure, or by rubbing it with a burnisher, and the design thus obtained is traced through the ground with a needle. A rim is then raised round the edge of the plate with what is called "banking wax," and a solution of nitric acid and water is poured into the hollow thus formed. When this has remained on the plate a sufficient time to bite in the outline, or the lighter parts of the engraving if it be a landscape or figures, the acid is poured off, and the parts which are dark enough are covered with a kind of varnish called "stopping-ground," which resists the corrosion of the acid, and prevents it from acting on the plate in the parts thus covered. The plate is then again subjected to the action of the acid, and the process of applying the stopping-ground to those parts which are sufficiently dark and the acid to those which are not dark enough, is continued until all the requisite gradations of light and shadow have been obtained. The plate is afterwards finished with the graver. In line engravings, the greater part of the work is done by the burin, a skilful engraver being able to produce a vivid representation of the surface of any object or material by a judicious combination of lines and dots. Among the best engravings of recent date may be mentioned that of Sir Edwin Landseer's beautiful picture of Titania, by Samuel Cousins.

ENGROSSING, *en-gros'-ing* (Ang.-Nor.), among lawyers, means the making of a fair copy of a deed upon stamped paper or parchment, in clear legible characters.

ENGROSSING, in LAW. (*See* FORESTALLING.)

ENHARMONIC, *en-har-mon'-ik*, a term employed by the ancient Greeks to designate that of their three *genera* or scales which consisted of quarter-tones and major thirds. Besides this they had originally another kind of enharmonic much simpler and easier in execution, and upon which the theorists of the old school considered the quarter-tones or *diesis* as innovations too refined and artificial. There is also a species of enharmonic called equi-vocal or enharmonic change, in which the notation is altered, but the same keys of the instrument are used.

ENIGMA, *e-nig'-mă* (Gr. *ainigma*), a description or

definition of a thing given in obscure or ambiguous terms, with the object either of hiding what the thing is, or of occasioning its discovery to come as a surprise. In ancient times enigmas were considered of such worth that envoys were sent between the Eastern monarchs solely for the purpose of solving them. They were often used as the vehicles for conveying truths of the greatest importance. As familiar instances of the enigma among the ancients, may be mentioned that which Samson propounded to the Philistines, and also that of the Sphinx, which was solved by Œdipus. As a matter of literary display, the enigma has been a favourite at many times and among many nations. In France, during the 17th century, it was much in vogue; in fact, several ponderous treatises were written concerning its nature and history. Some of the greatest poets in Germany did not disdain to write enigmas, and several of Schiller's are incorporated in his published works. One of the most beautiful compositions of this kind is the enigma, generally attributed to Lord Byron, on the letter H, beginning, "'Twas whispered in heaven, and muttered in hell." In the present day the enigma is looked upon only as a species of pleasant amusement by which the time may be beguiled.

ENLISTMENT, *en-list'-ment* (Ang.-Nor.), in Mil., the name given to the act by which any one agrees to perform certain duties that are required of him as a soldier, during a certain period of time, for a fixed amount of remuneration in the form of daily pay and bounty money, which he receives when he joins the service. Enlistment is a voluntary act, and differs entirely from the compulsory system of drafting men for military service adopted generally in France and throughout Europe, and termed conscription. The only case in which military service is made compulsory in this country is that of balloting for the militia when any regiment is deficient in numbers; but this is never resorted to except in times of extreme urgency, and even then exemption can always be purchased by providing a substitute. The period of enlistment in the British and Indian army is now fixed at ten years for the infantry and twelve for the cavalry, engineers, artillery, and marines, to commence from the day on which the recruit takes the oath of allegiance, if he have already attained the age of eighteen, or from his eighteenth birthday, if this happen after the time when he was sworn in. In the navy a man may enter for continuous service for five or ten years; but he is liable to be detained in her Majesty's service for six months more if it be found necessary to do so, or even for an additional period of five years by royal proclamation, in event of his services being required through any serious emergency. When the recruit has enlisted and received the customary shilling, he has twenty-four hours given him to consider the step he has taken, Sundays, Christmas-day, and Good Friday, being *dies non* in all cases. After this time has expired, the sergeant is bound to serve him with a notice of his enlistment, and after the lapse of another entire day he must appear before a magistrate, who reads and explains to him the parts of the Articles of War that relate to mutiny and desertion, and administers the oath of allegiance. If, however, he does not still desire to become a soldier when he appears before the magistrate, he is at liberty to draw back on returning any money he has received from the sergeant as enlistment money or pay, with twenty shillings in addition as a fine for his withdrawal from his engagement, which is termed "smart money." Apprentices may not enlist without the consent of their masters, who may claim them from the military authorities within a month from the period of enlistment. Apprentices enlisting and concealing the claim that their masters have on their services, are considered as having obtained money under false pretences, and may be prosecuted and punished accordingly. They are also liable to serve as soon as they are out of their apprenticeship, and may be apprehended as deserters if they do not surrender themselves to a recruiting officer.

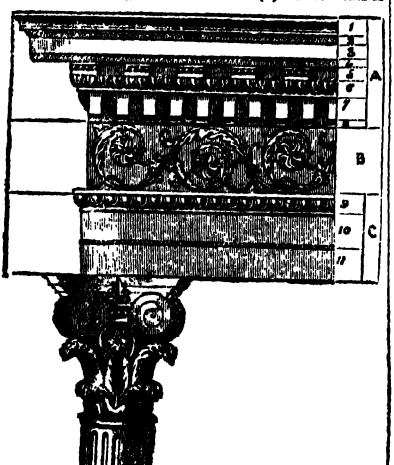
ENOCH, BOOK OF, *e'-nok*, is one of the apocryphal books of the Old Testament, and believed by some to be cited by St. Jude when he says, "Enoch, the seventh from Adam, prophesied, saying," &c. It is generally supposed, however, to have been written after the establishment of Christianity, from the frequent allusions that are made in it to passages of the New Testament; and it is probable that the author took occasion, from the words of St. Jude, to perpetrate the forgery. As for St. Jude himself, it is probable that he cites, not from any book of Enoch then subsisting, but from general tradition. The book was common in the early church, but was not generally received as canonical, and appears to have been lost about the 8th century. Bruce, however, when in Abyssinia, was fortunate enough to obtain three complete MSS. copies of this work. An English translation was published in 1828, by Archbishop Lawrence, and the Ethiopic version in 1838. Several German editions have appeared. The book is chiefly taken up with a relation of the prophetic visions of Enoch regarding the fall, heaven, hell, nature, astronomy, the future of the Jewish people, &c.; the whole being characterized by such absurdities as to render it unworthy of any credit.



ENSIGN, *en'-sine* (Fr. *enseigne*; Lat. *signum*, a standard), in Mil., the name given to commissioned officers of the lowest rank in the line. The ensign ranks immediately after the lieutenant. It is the duty of the senior and junior ensign in every regiment of infantry to carry the colours,—the former carrying the queen's colour, or union-jack, and the latter the regimental colour, which is generally of the same tint as the facings of the regiment, and has a small union-jack in the corner and the number of the regiment in the centre, with the names of the battles in which it has been engaged emblazoned round it on embroidered scrolls. In the foot-guards ensigns rank as lieutenants, and in the engineers, artillery, and marines, the duties are performed by a lieutenant, who receives less pay than the senior lieutenant of the company, and was formerly styled second lieutenant: The ensign originally derived his title from the duty that devolved on him of carrying the standard, which was formerly a mark or rallying-point for the soldiery in battle. In the present day it is a point of honour for a regiment to preserve its colours, and the ensigns who carry them are closely attended by a guard of sergeants, who wear a flag embroidered on the arm above their stripes, and are called colour-sergeants.

ENTABLATURE, *en-tab'-la-ture* (Fr. *entablement*, Sp. *entablamento*), in Arch., the whole of the superstructure that is supported by two or more columns which sustain the roofing of a portico or entrance, to any building of importance built in the classic style of architecture. The entablature sometimes supports a pediment with sides sloping downwards from the centre to either end. It is divided into three parts,—the architrave, the frieze, and the cornice. (*See* ARCHITRAVE, FRIEZE, CORNICE.) The depth of the entablature and its component parts is determined by the diameter of the lower end of the shaft of the column. (*See* ARCHITECTURE.) The entablature in each of the five orders of architecture is distinguished by certain methods of treatment and decoration. The Tuscan entablature consists of a plain architrave and frieze separated by a narrow projecting fillet, and surmounted by a cornice formed of simple mouldings, a fillet, and cymatium. In the Doric entablature, *guttæ*, or rain-drops, are attached to the under-side of the fillet or *tænia* that separates the architrave from the frieze, immediately under the triglyphs that ornament the latter; mutules are also placed on the cornice above the triglyphs. In the remaining orders the architrave is broken into two or more fillets, or facies, projecting one above another, with an ornamental moulding running along the upper part of each, and immediately under the fillet above it. The frieze is generally plain in the Ionic order, as in the Doric, although it is sometimes enriched, as were also the *metopes*, or rectangular spaces between the triglyphs on the frieze of the last-named order; but in the Corinthian and Composite orders it was richly adorned with sculpture in bas-relief. The cornice in the Ionic, Corinthian, and Composite orders is supported on a moulding enriched with dentils, and finished above with an ogee moulding; but in the Corinthian order the corona of the cornice is supported on modillions projecting from a band immediately below it, and surmounting the ogee moulding that has just been men-

tioned; while in the Composite order mutules are substituted for the carved modillions. In the accompanying engraving of an entablature of this order, the three principal component parts—the cornice (A), the frieze (B), and the architrave (C)—are clearly and distinctly separated by marginal lines, extending to the right and left, which indicate the exact space occupied by each. The cornice admits of a great number of subdivisions. At the very top is the cymatium (1), formed by the moulding known as the cyma recta, and resting on an enriched ogee or bed-mould (2). Below this is




ENTABLATURE.

a fillet termed the corona (3), resting on a similar bed-mould (4), which is supported in its turn by a mutule band (5), consisting of a fillet adorned with mutules at regular intervals. Between the mutule band and the fillet enriched with dentils (7), or the dentil-band, as it is frequently termed, is an echinus moulding (6), and below the dental-band another narrow moulding (8), which serves as a bed-mould for the entire cornice. The middle portion of the entablature,—the frieze, consists of a broad fillet only, enriched with a scroll-work of leaves and flowers. The architrave is divided into three parts,—an echinus moulding, distinguished as the architrave moulding (9), and two fillets separated by a narrow bead-moulding, and termed the fascia (10) and lower facia (11) respectively.

ENTAIL, *en-tail'*, in Law, is a term commonly applied to the form of an estate, technically in England and Ireland called a fee tail, and in Scotland a tailzie. It is said to be derived from the French *tailler*, 'to cut,' either because the heirs general are by this means cut off, or because this estate is a part cut out of the whole. An estate in fee tail is a limited fee, as opposed to a fee simple; it is that which a man hath to hold to him and the heirs of his body, or to him and particular heirs of his body, according to the will of the donor. Previous to the passing of the statute *de Donis*, 1285, lands, if given to a man and the heirs of his body, were regarded as conditional estates in fee simple; but the nobility, being anxious to perpetuate their possessions in their own families, procured the passing of that statute. It enacts, that from thenceforth the will of the donor is to be observed, according to the form in the deed of gift, and that the tenements so given (to a man and the heirs of his body, or the heirs male of his body, or the like) should, notwithstanding any alienation by the donee, go to his issue, if there were any, or if issue failed, should revert to the donor or his heirs. Estates tail are either general or special,—the former, where they are given to one, and the heirs of his body begotten; the latter, where the gift is to the heirs of the donee's body by a particular person; as by his now wife. In the former case, his issue in general, by all and every marriage, is, in successive order, capable of inheriting the estate tail; in the latter, no issue can inherit but that of the two designed. Each of these may be again either in tail male or tail female. "The establishment of this law," says Blackstone, "occasioned infinite difficulties and disputes. Children grew disobedient when they knew they could not be set aside; farmers were ousted of their leases made by tenants in tail; for if such leases had been valid, then, under colour of long leases, the issue might have been virtually disinherited; creditors were defrauded of their debts; for if tenant in tail could have charged his estate with their payment, he might also have defeated his issue by mortgaging it for as much as it was worth. Innumerable latent entails were produced to deprive purchasers of the lands they had fairly bought, —of suits in consequence of which our ancient books are full; and treasons were encouraged, as estates tail were not liable to forfeiture longer than for the tenant's life." But the nobility were always fond of this enactment, because it preserved their family estates from forfeiture. At length, however, in the twelfth year of the reign of Edward IV., it was decided, in the celebrated Taltarum's case, that by means of certain fictitious proceedings, known by the name of a common recovery, suffered by a tenant in tail, he should convert his estate into a fee simple absolute, and bar all persons whatever claiming the estate tail, or any estate ulterior thereto; and by long use and acquiescence these recoveries became the legal mode of conveyance by which a tenant in tail might dispose of his lands and tenements. Afterwards, in the reign of Henry VIII., estates tail were declared to be forfeited on any conviction for high treason; and soon after, in the same reign, certain leases made by tenants in tail, which do not tend to the prejudice of the issue, were allowed to be good in law, and to bind the issue in tail. The peculiar privileges of tail estates were still further curtailed by subsequent statutes, but most of all by 3 & 4 Will. IV. c. 74, enabling a tenant in tail, by an ordinary deed of conveyance, duly enrolled, without any indirect or fictitious proceeding, to alienе in fee simple absolute, or for any less estate, the lands entailed. Subsequently, by 1 & 2 Vict. c. 110, entailed estates were rendered liable for ordinary debts; and further, by 19 & 20 Vict. c. 120, a tenant in tail may demise the same from time to time for any term not exceeding twenty-one years. Estates tail have thus been gradually unfettered, and are now subject to even less restraint than is attached to conditional fees at common law, after the condition was performed by the birth of issue. In Scotland, the history of the entail system differs from that of England, in so far as it was there built and strengthened by the ingenuity of the lawyers, who, as fast as assailable points were discovered in the form of the deed, fortified it with new clauses. Thus, what are known as the "prohibitory," "irritant," "resolutive" clauses, were introduced; and by a statute of the Scottish parliament in 1685, entails in that country were reduced to a systematic form. The injurious effects of this enactment were widely felt in Scotland during the 18th and nearly the half of the 19th centuries; but it came to be the practice in law to insist upon the very strictest interpretation of the deed; and any error in the form, or even a clerical error, as the omission of a word, would vitiate the entail. At length, Andrew Rutherfurd, the then lord advocate, introduced a measure into parliament to lessen the injurious effects of this system, and which was embodied in 11 & 12 Vict. c. 36. By means of this act, which came into force on the 1st of August, 1848, persons then in existence, and holding under entails of prior date, may disentail them, after certain intimations, and with the consent of certain heirs next in succession. In old entails, where the heir in possession has been born since that date, and in all new entails made after that time, the heir of entail in possession may, by means of a simple deed of disentail, free his estate from the restrictions of the entail.

ENTERITIS, *en-te-ri'-tis* (Gr. *enteron*, the intestines), in Med. is a term employed to denote an acute inflammation of the peritoneal or external coat of the intestines. It is characterized by pain in the bowels (increased on pressure), vomiting, constipation, fever, and great prostration of strength. Though the fever

in the outset may be rapid and the pulse strong and hard, it soon becomes small and weak or wiry. The nausea and vomiting are often most distressing, fits of retching often continuing after the stomach has been deprived of its contents. In bad cases, as the disease proceeds, the abdomen begins to swell and becomes tense and tympanitic; hiccup sometimes comes on; the pulse intermits, or beats irregularly; the extremities grow cold; the features are sharpened and ghastly; cold sweats break out; the pain, perhaps, ceases, and death at length sets in. The brain is generally unaffected, and the intellect remains clear; but sometimes delirium occurs late in the disease. Enteritis may arise from various causes, particularly from cold and wet, more especially applied to the feet or legs, or cold drinks when the body has been previously overheated. Hardened fæcal matters, arising from indigestible substances taken into the stomach, may also produce this disease. Strangulated hernia, or the involution of one fold of the intestine within another, may induce this disease, by causing a complete obstruction to the passage of the contents of the bowels. Various diseases bear a considerable resemblance to enteritis; but that which most closely resembles it is colic, which, indeed, often passes into enteritis. Colic, however, is distinguished from enteritis by the absence of fever, the difference in the state of the pulse, the pain occurring more in paroxysms, and by being usually mitigated by pressure; whereas, in enteritis, it is increased. The ordinary remedies employed in inflammation must be resorted to in this disease. Blood is to be freely taken from the arm, leeches are to be applied to the abdomen, and afterwards fomentation-cloths. Great care is necessary in the administration of purgative medicines, as they frequently tend to aggravate the symptoms, and ought not to be resorted to till after the bleeding. The disease is to be cured by removing the inflammation, not by opening the bowels. The judicious administration of opium and calomel is often of the greatest benefit in this disease; and the best laxative to give, in order to clear out the bowels, is castor oil. Though there may not be much danger in mistaking colic for enteritis, the greatest danger may arise from mistaking enteritis for colic. Stimulants, cordials, or carminatives, which are often of the greatest service in colic, would greatly aggravate the symptoms in enteritis.

Enthusiasm, *en-thu'-ze-ăzm* (Gr. *enthousiasmos*, inspiration), is an exalted condition of mind, in which the imagination is inflamed and exalted, thereby conceiving and expressing extraordinary and surprising things. The excesses of the imagination are of two kinds; viz. 1 When, within its proper sphere, it gains so great a power that all the other affections and motives of human nature are overborne and excluded; and 2. when the imagination trespasses upon ground where it should have little or no influence, and where it can only prevent or disturb the operation of reason and right feeling. In the latter case the sobrieties of good sense and experience, the motives of interest, and even the dictates of rectitude, may be set at naught, and the commonest objects may be invested either with preposterous charms or with unreal deformities. There are, however, perhaps few minds that are not to some degree subject to constitutional fictions, which to a greater or less extent intercept the view of things as they really are. Naturally the pleasurable emotions which accompany the exercise of any of the active powers, and which serve to stimulate to exertion, are always subordinate and subservient, never predominant or importunate. In minds of an unhealthy temperament the emotion of pleasure, and the consequent excitement, may be disproportionate to the strength of the faculties; there may be more of commotion than of action, more of movement than of progress, more of enterprise than of achievement; the efficient power of the understanding is thus overborne and left in the rear. "Where there is no error of imagination, no misjudging of realities, no calculations which reason condemns, there is no enthusiasm, even though the soul may be on fire with the velocity of its movements in pursuit of its chosen object." "To apply an epithet which carries with it an idea of folly, of weakness, and of extravagance, to a vigorous mind efficiently, as well as ardently, engaged in the pursuit of any substantial and important object, is not merely to misuse a word, but to introduce confusion among our notions, and to put contempt upon what is deserving of respect."—Hof. *Natural History of Enthusiasm*, by Isaac Taylor.

Enthymeme, *en'-thy-meem* (Gr. *enthumema*, from *en*, and *thumos*, the mind), is a term employed in Rhet., introduced by Aristotle, and which since his time till recently has been almost universally misunderstood. It has generally been defined to be an imperfect syllogism, having one or other of its premises not expressed, but understood. Though several writers before his time had pointed out the error of this definition, Sir W. Hamilton was the first to call general attention to it, in an article in the *Edinburgh Review* for April, 1833. This error, he says, "has been believed; believed without any cogent evidence; believed from the most ancient times; and even when the opinion was at last competently refuted, the refutation was itself so completely forgotten, that we do not believe there is at present a logical author, not to say in England, but in Europe, who is even aware of the existence of the controversy." De Quincey states, in his essay on Rhetoric, that many years ago, when studying the Aristotelian rhetoric at Oxford, he was convinced that, by whatever name Aristotle might describe the main purpose of rhetoric, practically, at least, he threw the whole stress upon finding such arguments for any given thesis as, without positively proving or disapproving it, gave it a colourable support; but how to reconcile this with Aristotle's formal account of the office of rhetoric, that it consisted in finding enthymemes, he could not perceive, till his friend Sir W. Hamilton communicated to him an essay of Facciolati's (1724), entitled "De Enthymemate." An enthymeme, then, differs from a syllogism, not in the accident of suppressing one of its propositions,—either may do this, or neither; the difference is essential, and in the nature of the matter; that of the syllogism being certain and apodeictic, that of the enthymeme probable, and drawn from the province of opinion.

Entomology, *en-to-mol'-o-je* (Gr. *entomon*, an insect; *logos*, a discourse), that branch of science which treats of the habits, properties, and organization of insects. The name insect implies an animal insected or divided into segments. This term is applicable to the principal part of the articulate subkingdom, and was formerly applied to it; at present, the word insect is only used in reference to those articulated animals which are distinguished by antennæ and breathing organs composed of ramified trachea, with or without air-sacs. The science of entomology presents to the student of nature the most numerous and diversified objects worthy of attention. The observation of the structure and instincts of insects is full of interest, and has at all times engaged the attention of men of science. Along with other branches of natural history, the study of entomology was cultivated by Aristotle and other philosophers among the ancient Greeks. Pliny does not add much in his works to the information given by Aristotle, and it was not studied as an absolute science till the 17th century, when progress began to be made. The chief naturalists of that period were Goedart, Swammerdam, Malpighi, Leeuwenhoeck, and Ray. The science, however, was very backward, as Ray estimated the whole number of insect species in the world at 10,000. At the present day, it has been ascertained that a larger number than this exists in this country alone. During the 18th century, the great Swedish naturalist Linnæus gave his attention to the study of entomology, and his classification, as far as the orders are concerned, has served as the basis of all that have been since promulgated. It is founded on the presence or absence of the wings, their number, consistence, surface, position in repose, and also on the presence or absence of a sting. By this classification, insects were at first divided into seven classes; but additions and alterations have been made since that time. The following classification, adopted in the "Encyclopædia Britannica," is taken from an admirable article by James Wilson, of Woodville. Eleven different orders of insects are enumerated: 1. Coleoptera (Gr. *koleos*, a sheath; *pteron*, a wing), including all those kinds commonly called beetles. Their membranous wings, which are the true organs of flight, are protected by a superior and

anterior pair of harder consistence, called elytra. They are all masticators, and are provided with mandibles and maxillæ.—2. Orthoptera (Gr. *orthos*, straight; *pteron*, a wing), including crickets, grasshoppers, locusts, &c. The upper wings are of the consistence of parchment, reticulated, and more or less incumbent. The mouth is provided with mandibles and maxillæ.—3. Hemiptera (Gr. *emisu*, the half; *pteron*, a wing), including the cimices or bugs, the water scorpions, cicadæ or frog-hoppers, aphides, &c. A portion of their upper wings is usually membranaceous, or of the same consistence as the inferior pair. The mandibles and maxillæ are replaced by a sheath and sucker.—4. Neuroptera (Gr. *neuron*, nerve; *pteron*, a wing), including libellulæ or dragon-flies, ephemeræ, &c. Both pairs of wings are membranous, naked, and finely reticulated; mouth adapted for mastication, and furnished with mandibles and maxillæ.—5. Hymenoptera (Gr. *umen*, a membrane; *pteron*, a wing), containing wasps, bees, ichneumon-flies, &c., and characterized likewise by membranous naked wings, which, however, present fewer nervures, and are not reticulated, as in the preceding order. The mouth is furnished with mandibles and maxillæ, and the abdomen of the female is terminated either by an ovipositor or a sting.—6. Lepidoptera (Gr. *lepis*, a scale; *pteron*, a wing), containing all butterflies and moths, and generally characterized by the farinaceous or scaly aspect of the organs of flight, and the tubular or thread-like extension of the parts of the mouth.—7. Strepsiptera (Gr. *strepsis*, a turning or twisting; *pteron*, a wing), including a few peculiar and parasitical species belonging to the genera *Stylops* and *Xenos*.—8. Diptera (Gr. *dis*, twice; *pteron*, a wing), including the house-fly, and other two-winged kinds. The mouth is furnished with a proboscis, and there are two organs, called poisers or balancers (*halteres*), placed behind the true wings, one on each side.—9. Suctoria (so designated from their sucking propensities), is constituted by the genus *Pulex* of Linnæus, and differs from the ensuing apterous orders in undergoing a regular metamorphosis, and possessing what some regard as the rudiments of elytra.—10. Thysanoura (Gr. *thiazo*, I dance; *oura*, a tail), likewise an apterous order, including the *Podura* and other tribes. It evidently derives its name from the springing propensities of its order, which leap by means of a setiform process bent beneath the abdomen.—11. Parasita (so named from their parasitical or adhesive propensities, because they dwell on the bodies of other animals) contains the genus *Pediculus* of Linnæus, and the *Nirmi*, or bird-lice. (*See* the articles on the above orders for their particular characteristics.)

ENTOZOA, *en-to-zo'-ä* (Gr. *entos*, within; *zoon*, an animal), a term applied to those animals which live within others. They are of low organization, and generally vermiform in structure. In most cases the blood is colourless, and circulates, in the higher organized species, in a closed system of vessels. They have no respiratory organs, no articulated members for locomotion, and no organs of sense. In the higher organized entozoa, a filamentary nervous system has been recognized. Several species of entozoa infest the human body. (*See* INTESTINAL WORMS.)

ENTREPOT, *awn(g)'-tre-po*, is a term derived from the French, among whom it properly signifies a bonded warehouse, or place where goods from abroad may be deposited, and from whence they may again be withdrawn for export without payment of duty. In common language, however, it is employed to designate a seaport, or commercial town, through which the imports and exports of a large district pass.

ENTRESOL, *awn(g)'-tre-sol* (Fr.), in Arch., is a term borrowed from the French, and used to denote a low intermediate story introduced between two loftier ones. In Paris it is commonly placed above the first floor. It corresponds to the Italian *mezzanine* in its use and purpose. In buildings in London the entresol, or mezzanine, is occasionally placed immediately above the ground floor, but its use is not generally resorted to.

ENTRY, *en'-tre* (Fr. *entrée*, from Lat. *intro*, I enter), in Law, is the taking possession of lands and tenements by one who has title of entry. Entry was formerly a mode of keeping up the claim of the rightful owner of lands or tenements when another person had taken wrongful possession of them. He entered upon some part of the property claimed, declaring that he thereby takes possession of the whole; but if it lay in different counties, it was necessary to make a separate entry in each. This claim, if it was repeated once in the space of every year and a day (which was called continual claim), had the same effect with, and in all respects amounted to, a legal entry. If the claimant were deterred from entering by menaces or bodily fear, he might make claim as near to the estate as he could, with the like forms and solemnities. Such an entry gave a man seisin, or put into immediate possession him that had right of entry on the estate, and thereby made him complete owner, and capable of conveying it from himself by either descent or purchase. This remedy by entry took place in three only of the five species of ouster; viz., abatement, intrusion, and disseisin; for as in these the original entry of the wrong-doer was unlawful, they might, therefore, be remedied by the mere entry of him who had right. This right of entry might have been *tolled*, that is, taken away, by descent; as when any one seised by any means whatsoever of the inheritance died, whereby the same descended to his heir In this case, however feeble the right of the ancest might be, the entry of any other person who claim a title to the freehold was taken away, and he could not recover possession against the heir by this summary method, but was driven to his action to gain a legal seisin of the estate. A writ of entry was also a method of gaining possession of disputed property by trying the title of the occupant, where he had not only a bare possession, which might be destroyed by entry, but also an apparent right of possession. This writ was directed to the sheriff, requiring him to command the tenant of the land that he render to the demandant the land in question. The tenant was thereupon compelled to deliver up the possession of the land, or to show cause for not doing so, and thereupon the possession of the land was awarded to him that could show the clearest right to it. These forms, however, were in effect abolished by 3 & 4 Will. IV. c. 27, which declares that no person shall be deemed to have been in possession of any land within the meaning of that act merely by reason of having made an entry thereon, and no continual or other claim upon or near any land shall preserve any right of making an entry. The right of entry is now lost by not asserting it for twenty years.

ENVELOPE-MAKING, *en'-ve-lope, on'-vel-ope* (from Fr. *envelopper*, to enwrap).—Before the introduction of the penny postage, a double charge was levied on all letters which consisted of two pieces of paper. After the cheap postage was established, the restriction which caused the letters themselves to be sealed or wafered, was removed. Nearly all letters are now inclosed in an envelope or covering; and as upwards of 500,000,000 of letters pass through the post-offices in this country alone, the manufacture of envelopes is one of no slight importance. The French made envelopes before they were used in England; and when first manufactured in this country, they were made by hand, an expert maker being able to fold three thousand in a day. The general use of envelopes dates from 1840, and several ingenious attempts to make them by machinery were made at that time. The first machine of importance was that invented by Messrs. De la Rue, exhibited in the Great Exhibition of 1851. By the labour of two or three persons it was able to throw off three thousand envelopes per hour. Several other envelope-making machines have been invented since that time.

ENVOY, *en'-voi* (Fr. *envoye*), a diplomatic agent of the second rank, being inferior to an ambassador. In common with ambassadors, they are accredited direct from one sovereign to another; but they differ from the latter in not representing the personal dignity of their sovereign, but only his affairs. They are either ordinary or extraordinary. (*See* EMBASSY, AMBASSADOR, DIPLOMACY.)

ENVY, *en'-ve* (Fr. *envier*), in Ethics, is defined by Locke to be an uneasiness of mind, occasioned by the consideration of a good we discover in the possession of another person, whom we deem less worthy of it than ourselves. It is characterized by a degree of

sorrow that the good contemplated should escape ourselves, and of anger that it should fall to the share of another. It differs from emulation, which is merely a desire to become possessed of something which is enjoyed by another; whereas, in envy, there is a malevolent feeling which desires that others be brought down below our own level. Though the difference between emulation and envy is thus marked, through the natural weakness of our nature it is extremely difficult to preserve the former wholly unmixed with the latter. "Pure envy," says Dr. Reid, "is the most malignant passion that can lodge in the breast, which devours, as its natural food, the fame and the happiness of those who are most deserving of our esteem."

**Eocene**, *e'-o-sene* (Gr. *eos*, the dawn; *kainos*, recent), in Geol., a term introduced by Lyell to designate the lower tertiary strata, from the idea that the very small per-centage of still existing species among the fossils of these strata indicates what may be regarded as the *dawn* or commencement of the present condition of creation. (*See* Tertiary System.)

**Eolian Harp.** (*See* Æolian Harp.)

**Epacridaceæ**, *ep-ă-krid-ai'-se-e* (Gr. *epi*, upon; *akros*, the top), in Bot., the Epacris fam., a nat. ord. of dicotyledonous plants in the sub-class *Corolliflorœ*. The species are shrubs or small trees, natives of Australia, the Indian archipelago, and the South-Sea islands, where they are very numerous. There are 31 genera, and about 320 species. They are of little importance, except for the beauty of their flowers, on which account they are much cultivated. The fruits of many are edible; as those of *Astroloma humifusum*, the Tasmanian cranberry, and *Leucopogon Richei*, the native currant of Australia.

**Epact**, *e'-păkt* (Gr. *epaktos*, additional), the name given to the moon's age at the close of the year. The epact of the fictitious or ecclesiastical moon, by which Easter is regulated, is given in the table of movable feasts appended to the calendar in the Book of Common Prayer.

**Epaulement**, *e-pawl'-ment* (from Fr. *épaule*, shoulder), the name given to a species of low parapet without a banquette at its foot in the interior, which is thrown up as a means of protection, and used in the construction of field-works. The expression is often applied to a parapet of the usual height, regularly formed, with a banquette, and may be almost considered synonymous with the term parapet. It is, however, more properly employed to designate a mound of earth, about seven or eight feet high, thrown up on either side of a battery, towards the rear, in a direction at right angles to the face, to protect the guns and men from an enfilading fire.

**Epaulette**, *ep'-o-let* (Fr.), an ornamental badge worn upon the shoulder by military and naval officers and men in the English and continental services. These distinguishing marks vary in shape and richness according to the rank of the wearer. A few years ago the epaulette was abolished in the English army, the sash being substituted for it.

**Ephemera**, *e-fem'-e-rā* (Gr. *epi*, on; *emera*, a day), a gen. of neuropterous insects, belonging to the fam. of *Subulicornes* of Latreille. They have long, soft, tapering bodies, terminating in two or three long setæ. Their wings are placed nearly, or quite, perpendicularly; their antennæ are three-pointed, and very small. In the larva state they live in wet places, or under water, and enjoy an existence of two or three years; but when they attain their final stage of metamorphosis and perfect form, they are among the most fleeting of living creatures, existing often only a few hours, and propagating their species before they die. In this state they sometimes appear suddenly in myriads during fine summer evenings by the water-side, when they may be seen flitting about, and balancing themselves in the air, in the manner of gadflies.

**Ephesians, Epistle of Paul to the**, *ef-e'-zhănz*, is the fifth in numerical order of the fourteen epistles of St. Paul contained in the canon of the New Testament. The principal fathers of the early Church are unanimous in favour of the genuineness and canonicity of this book. Much controversy, however, has subsequently been carried on as to whether it was addressed to the Ephesians, from the omission of the words "to the Ephesians," in a few of the ancient MSS., and the assertion of Marcion, a heretic of the second century, but whose testimony is of no weight, that it was addressed to the Laodiceans. Others, again, regard it as a cyclical epistle addressed to no particular church, but to all, though Ephesus may have been the chief. Though the testimony against the received opinion were much stronger than it really is, it is not a matter of great importance; for what was addressed to one was intended for all. It is generally believed to have been written about the year 61 A.D., during the early part of the apostle's first imprisonment at Rome. "He was apprehensive lest advantage should be taken of his confinement to unsettle the minds of Ephesian converts, who were almost wholly gentiles. Hearing, however, that they stood firm in the faith of Christ, he wrote this epistle in order to establish them in that faith, and to give them more exalted views of the love of God and of the excellency and dignity of Christ; and at the same time to fortify their minds against the scandal of the cross. With this view, he shows them that they were saved by grace; and that, however wretched they once were, now they had equal privileges with the Jews. He then proceeds to encourage them to persevere in their Christian calling, by declaring with what steadfastness he suffered for the truth, and with what earnestness he prayed for their establishment and continuance in it; and urges them to walk in a manner becoming their profession, in the faithful discharge both of the general and common duties of religion and of the special duties of particular relations." The style of this epistle is exceedingly animated, and corresponds with the state of the apostle's mind at the time of writing. Overjoyed with the account brought him of their faith and holiness, and transported with exalted views of God's love and goodness, more especially in conferring the benefits of Christ's death upon the gentiles, his thoughts soar high, and find utterance in sublime and copious expressions.—*Ref.* Horne's *Introduction to the Sacred Scriptures*; Eadie's *Commentary on the Greek Text of the Epistle to the Ephesians*.

**Ephod**, *ef'-od* (Heb., a covering), among the ancient Jews, was one of the essential articles of the priest's official dress. It was an upper garment consisting of two pieces, one covering the back and the other the breast, and being united upon the two shoulders. It was made of plain linen, except that of the high priest, which was embroidered with various colours. Properly, according to the law of Moses, the ephod was to be worn only by the high priest; but it subsequently came to be in common use among the priesthood, and even David, when bringing the ark back to Jerusalem, appeared in one. The ephod was regarded by the Jews as a sacred object, and sometimes received divine homage. A description of the ephod of the high priest is given in Exodus xxviii. 6, *et seq.*

**Ephori**, *ef'-o-ri* (Gr. *ephoroi*, overseers), magistrates who were common to many Dorian constitutions in ancient times. Herodotus ascribes the first institution of ephori to Lycurgus, while Aristotle ascribes it to Theopompus, who lived about 770 B.C. Both these accounts, however, seem to be incorrect, the real origin of the ephori being lost, through historical inaccuracy and varieties of opinion. The duties of the ephori consisted in the management of the internal administrations of the state, especially matters of justice; and a particular building, called the *Ephorion*, was allotted to them. The number of the ephori was five; they were elected from and by the people, and held their offices for one year. Those who had votes in the election were not restricted by age or property, and the election was not put under any scrutiny; so that, as Aristotle observes, in the institution of the ephori, the people participated in the highest magistracy of the state. In later times, the powers of the ephori were greatly increased. They had the privilege of instituting scrutinies into the conduct of all the magistrates; and even the kings could be brought before their tribunal. Their powers from this time increased rapidly, until the kings were completely under their authority, and it could not be said when they could and when they could not interfere. At last, in 225 B.C., the ephori for the time being were murdered by Agis and Cleomenes, and the office abolished.

The ophori were, however, again restored to power under the Romans.

EPICALYX, *ep'-e-kal-iks*, in Bot., the term applied by many botanists to a circle of bracts appearing immediately below the calyx or outer covering of the flower. It is seen in the mallow tribe, and in many plants of the pink and rose tribes. Though a distinct name has been given to this whorl of leafy organs, it properly comes under the denomination of *involucre* (which *see*).

EPICARP, *ep'-e-karp* (Gr. *epi*, upon; *karpos*, fruit), in Bot., the external layer or region of the pericarp or shell of a fruit. This layer generally appears as a thin skin, being far less liable to alteration than either mesocarp or endocarp. (*See* FRUIT.)

EPIC POETRY, *ep'-ik* (Gr. *epos*, a discourse or narrative), is a kind of poetry which has outward objects for its subjects, and is thus distinguished from lyric poetry, which deals with the inner feelings and emotions of the mind. The distinction is general; for there are few productions to which it can strictly apply; but they belong to the one class or the other, according to the predominating character. As in the individual man, so with the human race, the mind is objective before it is subjective; it observes external objects before it turns its thoughts in upon itself; and hence we may conclude that the epic was the earliest species of poetry. The earliest specimens of this form of art probably consisted of simple tales rhythmically arranged, and recited to a very simple musical accompaniment. The longer and more artistic epic poems, however, embrace an extensive series of events and the actions of numerous personages. The epic poetry of the early Greeks naturally divides itself into two classes,—the heroic or romantic epos of Homer, and the hieratic epos of Hesiod, the one dealing with the political, the other with the religious, life of the Greeks. The "Iliad" and "Odyssey" of Homer present us with the finest specimens of this class of poetry that have ever appeared. The sacred poetry of Hesiod partakes very much of a lyrical character. The "Æneid" of Virgil is not equal to the "Iliad" of Homer as an epic; its superiority depending more on beauty of language and arrangement than on anything in the story. The greatest epic of modern times is the "Paradise Lost" of Milton. Dante's "Divine Comedy," however sublime in style, is destitute of that unity of event or action necessary to constitute a great work of this class. The "Jerusalem Delivered" of Tasso is regularly and strictly an epic, and adorned with all the beauties that belong to this species of composition. The epic poem is of all poetical works the most dignified, and at the same time the most difficult in execution; and hence it is that so very few have succeeded in the attempt to produce a really great epic. "To contrive a story which shall please and interest all readers, by being at once entertaining, important, and instructive; to fill it with suitable incidents; to enliven it with a variety of characters, and of descriptions; and throughout a long work to maintain that propriety of sentiment and that elevation of style, which the epic character requires, is unquestionably the highest effort of poetical genius."—(Blair's *Rhetoric*.) It requires, more than any other species of poetry, a grave, equal, and supported dignity. The action, or subject, must have three properties: it must be one; it must be great; and it must be interesting. Scattered and independent facts can never affect a reader so deeply, nor engage his attention so strongly, as a tale that is one and connected, where the several incidents hang upon one another, and are all made to conspire for the accomplishment of one end. Such episodes or subordinate actions as are introduced should be brought in naturally, and have sufficient connection with the principal subject; they ought to be elegant and well-finished, and present us with objects of a different kind from those that go before or follow after. Epic poetry has often been compared to the drama; and the essential difference between the two is, that the province of the former is description; of the latter, action. The emotions which epic poetry excites are not so frequent and violent as those produced by dramatic composition, but they are more prolonged and more developed by actual occurrences; for an epic poem embraces a wider compass of time and action than is admissible in the drama. "Epic poetry" is the region within which we look for everything that is sublime in description, tender in sentiment, and bold and lively in expression;" and "all the objects which it presents ought to be either great, or tender, or pleasing."—(*Blair*.)

EPICUREANISM, *ep-e-ku-re'-an-izm*, a term applied to the system of philosophy adopted and promulgated by Epicurus, who lived from B.C. 337 to B.C. 270. In its physical system epicureanism considered the universe, consisting of matter and space, to be infinite and eternal, while the various bodies of which it is composed are subject to decay and change. "Nothing can spring from nothing, nor can anything return to nothing," was one of the favourite maxims of the school. The science of physics was, however, in the opinion of Epicurus, subordinate to that of ethics. According to his authority, the great end of man is his own happiness, which is to be obtained by the subjugation of his passions and the moderation of his desires. His followers entering farther into the spirit and natural tendency of his system, resolved all happiness into the gratification of the senses. The system was consequently adopted readily by the idle, the luxurious, and the vicious. At the present day epicureanism in its physical system is synonymous with the doctrine of chance, and in its moral system with sellishness.

EPIDEMIC, *ep-e-dem'-ik* (Gr., from *epi*, upon, and *demos*, the people), in Med., is a general term applied to diseases which prevail among a large portion of the people of a country or place for a certain time, and then gradually disappear. The causes assigned for the prevalence of epidemic diseases are very various, and are by no means determined. The most generally assigned causes are a peculiar state of the atmosphere or climate, the seasons, &c. Defective ventilation or drainage, and unwholesome food or drink, are also among the causes that induce epidemics. Most epidemic diseases are likewise contagious, and thus, when once induced, spread with great rapidity. During the prevalence of an epidemic, it is proper to take particular care of the health, as the best means of resisting its influence.

EPIDERMAL APPENDAGES, *ep-e-der'-mal ap-pen'-daj-ez* (Gr. *epidermis*, the cuticle; Lat. *appendo*, I hang or attach to), in Bot., the general term for certain structures, consisting of cells, variously combined, found upon the surface of the epidermis, or in the subepidermal tissue. They may be divided into *hairs* and *glands*. The former are thread-like elongations, externally, of the epidermal cells, covered by cuticle. When a hair is formed of a single cell, it is said to be *simple*; and when composed of several cells, *compound*. Hairs appear under a variety of forms: thus they may be undivided, branched, or forked; star-shaped, or *stellate*; necklace-shaped, or *moniliform*; club-shaped, or *clavate*; shield-like, or *peltate*. They sometimes are found terminating in a hook on one side pointing downwards, when they are said to be *uncinate*; and sometimes they present two or more hooks at their apex, when they are said to be *glochidiate*, or barbed. When the divisions of a stellate hair are closely connected, a *scale* or *scurf* is formed. When hairs are composed of cells which are short, and have their sides thickened by secondary deposits, so that they form stiffened processes, they are then called *setæ*, or *bristles*. These, slightly modified, form *prickles*, which are defined as large hardened processes, terminating in a sharp point, and springing from the epidermis or the bark of plants. They are especially abundant on the stems of the rose and bramble. Hairs occur upon various parts of plants, and, according to their abundance and nature, give varying appearances to them, which are distinguished in practical botany by special names. The more common position of hairs is upon the leaves and stems; but they also occur on the parts of the flower, the fruit, and the seed. The substance called cowage, or cow-itch, is the hair covering the legumes of *Mucuna pruriens*, while cotton is simply the hair covering the seeds of various species of *Gossypium*. Glands, properly so called, are cells which secrete a peculiar matter; but with them botanists generally associate other superficial appendages. The *sting* of the nettle, the little receptacles in the rind of the

orange, and the *nectaries* at the base of the coloured leaves of the buttercup and crown imperial, are familiar examples of glands. When glands are situated below the epidermis, and surrounded by a compact layer of cells, they are said to be *internal*. These are common in such plants as rue, mint, marjoram, and thyme; and it is to the presence of the secretions they contain that the plants owe their value as articles of domestic economy or medicinal agents.

Epidermal Tissue, in Bot., the termed applied to the external layer of cells in flowering and the higher flowerless plants This layer may commonly be readily separated as a distinct membrane or skin, as its component cells differ in shape and in the nature of their contents from those cells placed beneath them. This tissue consists of two parts; namely, of an inner portion, usually called the *epidermis*, and of an outer thin pellicle, to which the name *cuticle* is given. Carpenter, and some other authors, make use of these terms in precisely the reverse sense, calling the external pellicle the epidermis. We, following Professor Bentley, will employ the terms as generally understood. The epidermis, then, consists of one or more layers of cells, firmly united together by their sides so as to form a membrane. These cells are generally of a flattened tabular character; but they vary much in their outline Ordinarily, in European plants, the epidermis is formed of but one row of cells; but in tropical plants, two, three, or more rows are common. The upper walls of the cells are generally much thickened by secondary deposits, and this thickening is especially evident in leaves of a leathery or hardened texture, as those of the oleander, box, and holly. The epidermis covers all parts of the plants upon which it is found that are exposed directly to the air, except the stigma; and it is in all cases absent from those which live under water. In the fungi, algæ, and lichens, it is altogether wanting. The cuticle covers the entire surface of the epidermal cells, with the exception of the openings called *stomata*, and even sheathes the hairs and other appendages. It has no cellular structure, but is a perfectly homogeneous membrane. A membranous layer, resembling, if not actually identical with cuticle, is found upon the surface of plants living under water, and also covering the algæ, lichens, and fungi. The *stomata*, or *stomates*, to which allusion has been made, are orifices situated between some of the epidermal cells leading into the intercellular cavities beneath, so as to allow a free communication between the internal tissues and the external air. They are commonly called *breathing-pores*. They vary in form and position in different plants and different parts of the same plant; but they are always the same in any particular part of a plant. The most common form is oval, but they are sometimes seen round or square. They are either placed singly upon the epidermis at regular or irregular distances, or in clusters, with spaces quite free from them intervening. The number of stomata also varies considerably in different plants and different parts of the same plant. We give the numbers counted in a square inch upon the upper and under surfaces of the leaves of a few plants, to show the extent of this variation:—Mistletoe, upper surface 270, under surface 200; pæony, upper surface *none*, lower surface 13,790; house-leek, upper surface 10,710, lower surface 6,000; lilac, upper surface *none*, lower surface 160,000. Stomata exist more or less upon all flowering plants, but are absent from the lower orders of flowerless plants. On floating leaves they are only found on the upper surface.

Epidermis. (*See* Skin.)

Epidermis, in Bot. (*See* Epidermal Tissue.)

Epiglottis, *ep-e-glot'tis* (Gr. *epi*, upon, and *glotta*, the tongue), in Anat., is the cartilage at the root of the tongue that falls upon the glottis, or superior opening of the larynx. In figure, it is somewhat oval, rather convex above and concave below, and covered by mucous membrane. It adheres inferiorly to the interior part of the thyroid cartilage by a strong elastic membrane. Its apex is loose, and always elevated upwards by its own elasticity. When the back of the tongue is drawn backwards in swallowing, the epiglottis is put over the aperture of the larynx, and thus shuts up the passage from the mouth into the larynx.





Epigram, *ep'-e-gram* (Gr. *epigramma*, an inscription), a term originally applied, as shown by its derivation, to the inscriptions on the tombs and monuments of the ancient Greeks. They were generally written in verse, and showed great simplicity of style. Usually they were either dedicatory, descriptive, amatory, or elegiac. They were seldom humorous; and their chief merit consisted in the justness of a single thought conveyed in harmonious language. The ancient Romans, in their acceptation of the term epigram, seem to approach nearer to the idea of modern epigram. Catullus and Martial were amongst their most famous epigrammatists. In modern times an epigram is considered to be a short poem usually consisting of two to eight lines, in which some striking or ingenious thought is expressed; whether it be serious or humorous is a matter of indifference. The French have always excelled in this kind of writing. The Germans have usually combined moral proverbs with their epigrams; but those of Schiller and Goethe are generally satirical. Pope, Byron, Burns, and Moore, in this country, have writtten epigrammatic satire with the greatest success. The following lines, written by Voltaire, under a statue of Cupid in his garden, may serve as a specimen of the modern epigram:—

"Qui que tu sois, voilà ton maître,—
Il l'est, le fut, ou le doit être."

Whoe'er thou art, thy master see,—
He is, or was, or is to be.

Epigynous, *e-pij'-e-nus* (Gr. *epi*, upon; *gune*, female), in Bot., a term applied to the stamens and corolla when they appear to arise from the summit of the ovary, in consequence of the adherence of the calyx to that organ. Examples may be seen in the campanula, carrot, and ivy. The name *Epigynæ* has been given to a subdivision of the *Calyciflorœ*, and also to a subdivision of the *Corolliflorœ*, from the calyx being more or less adherent, and the ovary consequently inferior. (*See* classification in article Botany.)

Epilepsy, *ep'-e-lep-se* (Gr. *epilepsis*, from *epi*, and *lambano*, I seize), in Med., is a form of disease which receives its name from the suddenness of its attack. It is also called the falling sickness, from the patient, if standing, suddenly falling to the ground. By the ancients it was called the sacred disease, from being supposed to be due to the influence of the gods or evil spirits. The attack is usually sudden, without any warning. The patient may be in his ordinary health, engaged, perhaps, in his usual occupation, when all at once he utters a piercing scream, and falls to the ground. Immediately thereafter the face becomes violently distorted, the head is usually drawn to one side, the eyes are set and staring, or roll wildly about, the colour of the skin becomes dark and livid, and the veins swollen and turgid; there is frothing at the mouth; the muscles of the lower jaw act violently, producing gnashing of teeth, and frequently the tongue is thereby grievously injured; the arms are sometimes thrown violently about, and the lower limbs may be agitated in a similar manner, while the fingers with great power clutch at whatever comes in their way. The breathing is at first heavy and difficult, but afterwards it becomes short, quick, and stertorious, and is often accompanied with sighing and moaning. One side of the body is commonly more agitated than another. After a longer or shorter period, the convulsive movements gradually diminish, and the patient seems to recover a faint glimmering of consciousness; but the look which he casts around is stupid and heavy, and he goes off into a lethargic sleep, from which he does not awake for some hours. Commonly there is no consciousness of anything that occurred during the paroxysm. On coming out of the fit, there is generally headache, and always languor, and it may be days before he fully recovers from the effects of the attack. The duration of the paroxysm is usually from five to ten minutes; but sometimes several attacks follow each other, and it may be protracted for several hours. This is a severe form of epilepsy; but frequently it is less severe, consisting merely of loss of consciousness, slight rigidity, and the convulsion of a few muscles, and lasting only for a minute or two. Occasionally death takes place during the paroxysm; but generally it is attended with little danger, unless the patient may injure himself

by falling in some dangerous position. During the attack, the principal thing is to see that the patient do not injure himself,—especially, a piece of cork or other gag ought to be placed between his teeth, to prevent injury to the tongue: the dress should be loosened about the neck and chest; the head, if possible, a little raised, and a free circulation of air maintained. The return of the fit is exceedingly various in different individuals; several years, in some cases, intervening between the attacks, while in others they may occur every month, week, or day. When neglected, they usually become more and more severe, or recur at shorter intervals. Repeated attacks of this disease, in general, soon produce a marked change in the mental and physical character of the individual. There is a gradual diminution of the active powers, purpose becomes irresolute, the spirits are depressed, and the memory fails; the features become coarse, heavy, and inexpressive, and the look vacant. The most frequent, perhaps, of the consequences of confirmed epilepsy is insanity, either in the form of acute mania or monomania following the attacks, or of gradual imbecility, without any acute seizure. Though the fit, as we have said, usually comes on suddenly, yet there is sometimes distinct warning of its approach. These vary in different individuals, and may be lowness of spirits, irritability, dizziness, noises in the ear, floating specks before the eyes. There is, however, a particular sensation which is said to be felt by some immediately before the attack, and which is known as the *aura epileptica*. It is variously described as resembling a current of air, a stream of water, or a slight convulsive tremor, commencing in one of the limbs, and proceeding upwards to the head, when the patient is deprived of all consciousness. Epilepsy is commonly divided into idiopathic, when it is a primary disease, depending on some affection of the brain, and sympathetic, when produced by an affection in some other part of the body, — as the stomach, bowels, liver, circulating system, &c. Among the causes which give rise to epilepsy are external injuries done to the brain by blows, wounds, fractures, and the like, or internal injuries by water in the brain, tumours, concretions, and polypi. Violent affections of the nervous system, sudden frights, strong mental emotions, acute pains in any part, worms in the stomach or intestines, teething, suppression of accustomed evacuations, &c., are causes which also produce epilepsy. Sometimes it is hereditary, at other times it arises from a predisposition, occasioned either by plethora or a state of debility. When it arises from hereditary predisposition, or comes on after the age of puberty, or when the attacks are frequent and of long duration, it is usually difficult to effect a cure; but occurring in early life, and occasioned by worms or any other accidental cause, it may, in general, be remedied with ease. Where the disease can be traced to any special exciting cause,—as injuries of the head, worms, teething, &c., the treatment should be first directed to its removal. Where, as is often the case, a plethoric state appears to occasion the disease, the patient is to be restricted to a low diet, frequent purgatives are to be exhibited, and everything avoided that may determine the blood to the head; and to counteract such a tendency, occasional cupping, blisters, issues, &c., may be useful. If, on the contrary, there are marks of inanition and debility, a generous diet, with tonic medicines and other means of strengthening the system, will be proper. In this disease great care is necessary in the matter of diet, and moderation in quantity and simplicity in character are material points. When the appropriate remedies are judiciously employed, and the proper regimen strictly adhered to, epilepsy is often permanently cured, and the suffering is greatly mitigated even in those forms which do not admit of cure.—*Ref.* Copland's *Dictionary of Practical Medicine*; Cheyne's *Cyclopædia of Practical Medicine*.

Epilogue, *ep'-e-log* (Gr. *epi*, on or after; *logos*, a speech), amongst the ancient Greeks, the end or summing up of a discourse. In English, the term is applied to the short poem, or prose address, delivered in a theatre at the conclusion of a play. It is, and has been at all times, familiar in tone, and, except on extraordinary occasions, is mostly written in a merry vein. The intention of the epilogue is to create a kind and friendly feeling between the actor and the audience; and it frequently alludes to the events, fashions, and follies of the day. One of the most charming epilogues is that spoken by Rosalind, at the conclusion of "As You Like It":—"If it be true that good wine needs no bush, 'tis true that a good play needs no epilogue: yet to good wine they use good bushes, and good plays prove the better by the help of good epilogues."

Epipetalous, *ep-e-pet'-ä-lus* (Gr. *epi*, upon; *petulon*, a petal), in Bot., a term applied to the stamens when they are attached to the corolla, as in the primrose. This character marks the subdivision *Epipetalæ* or *Epicorollæ*, of the sub-class *Corolliflorœ*. (*See* classification in article Botany.)

Epiphany, *e-pif'-a-ne* (Gr. *epiphaneia*, a manifestation), a church festival held on the 6th day of January, in order to celebrate the manifestation of Christ. In early times this festival probably commemorated the nativity of the Saviour, his manifestation in the flesh, and his manifestation to the Gentiles. The service in the Church of England has reference to these three events. As a household festival, the Epiphany is better known by the name of Twelfth-night (being the twelfth night from the Nativity). The practice of choosing a king and queen in family merriments upon that night has been traced back to a similar custom among the Romans during the Saturnalia.

Epiphegus, *ep-e-fe'-gus* (Gr. *epi*, upon; *phago*, I devour), in Bot., a gen. of plants belonging to the nat. ord. *Orobanchaceæ*. The root of *E. virginiana* is called cancer-root, from having been formerly used as an application to cancers. It was the principal ingredient in a once celebrated North-American nostrum, called Martin's cancer powder.

Epiphytes. (*See* Air-Plants.)

Episcopacy, *e-pis'-ko-pä-se* (Gr. *episkopos*, a bishop, or overseer), is that form of church government in which one order of the clergy is superior to another; as bishops to priests and deacons. Much discussion has taken place on the subject of episcopacy. Nothing conclusive can be gathered concerning it in the New Testament; but there can be no doubt that it existed universally in the Church from the earliest historic ages down to the time of the Reformation, and it is inferred, as no change can be shown to have taken place, that the same constitution existed from the time of the apostles. Presbyterians and Independents argue, on the other hand, that as there is nothing definite concerning it in Scripture, Christians are left a discretionary power of modelling the government of their church in such a manner as may seem to them most meet; and that every Christian society has a right to make laws for itself, provided these laws are consistent with charity and peace, and with the fundamental doctrines and principles of Christianity. "It cannot be proved," says Dr. Paley, "that any form of church government was laid down in the Christian, as it has been in the Jewish scriptures, with a view of fixing a constitution for succeeding ages, and which constitution, consequently, the disciples of Christianity would everywhere and at all times, by the very law of their religion, be obliged to adopt. Certainly no command of this kind was delivered by Christ himself; and if it be shown that the apostles ordained bishops and presbyters among their first converts, it must be remembered that deacons also, and deaconesses, were appointed by them with functions very dissimilar to any which obtain in the Church at present. The truth seems to have been that such offices were at first erected in the Christian Church as the good order, the instruction, and the exigencies of the society at that time required, without any intention, at least without any declared design, of regulating the appointment, authority, or the distinction of Christian ministers under future circumstances." The power vested in the bishops or higher clergy differs very much among the different episcopal bodies. The Roman Catholic and the Greek churches, as well as the Church of England, are episcopalian. (*See* Anglo-Catholic Church, Roman Catholic Church, Greek Church.)

Episode, *ep'-e-sode* (Gr. *epeisodos*).—In the Greek drama the term *eisodos* was applied to the entrance of the chorus upon the stage, and the *epeisodion* to that part of a play which lay between two choral songs.

As these recitations in the early history of the Greek stage had nothing to do with the choral part, the term *episodion*, with its Latin derivative *episodium*, began to be applied to any incidental narrative or digression in a poem which the poet has connected with the main plot, but which is not essential to it. In this light, the catalogue of ships is considered an episode in the "Iliad," and the description of the war in heaven is considered an episode in "Paradise Lost.' Episodes should grow naturally out of the subject, and should either point out important consequences or develop hidden causes. The episode describing the destruction of Troy, in Virgil's "Æneid," is an episode of this kind. In the best poets, episodes are generally finished in the most careful and elaborate manner. The "Faery Queen" of Spenser, and the "Orlando Furioso" of Ariosto, contain so many long episodes, that the poems present all the appearance of an inartistic compilation of unconnected legends.

EPISTLE, *e-pis'-l* (Gr. *epistole*, a message or letter), is a letter written from one person to another. The Scriptural epistles are letters which were addressed by the inspired apostles to churches or individuals. Of these the apostle Paul wrote fourteen, St. James one, St. Peter two, St. John three, and St. Jude one. Those of SS. James, Peter, John, and Jude, are commonly called general or Catholic epistles, as not being addressed to any particular church, but to the churches in general. It is not without its use that we have the doctrines of the Christian religion laid down, not by one apostle only but by several, so that the same divine truths are presented to us in different forms or through different media, and thus their manifold beauties and character are better displayed. In reading an epistle, we ought to consider the occasion of it, the circumstances of those to whom it was addressed, the time when it was written, its general scope and design, as well as the intention of particular arguments and passages. By epistle in the liturgy is meant the first lesson in the communion-service, and so styled because it is generally taken from the sacred Epistles, though sometimes it is taken from the Acts, and occasionally from the Prophets. Almost all the lessons now read as epistles in the English liturgy have been in their present place and used by the Church for many ages. They are found in all the liturgies used before the revision in the reign of Edward VI.; and they also appear in all the monuments of the English liturgy before the invasion of William the Conqueror.

EPITAPH, *ep'-e-taf* (Gr. *epi*, upon; *taphos*, a tomb), the inscription upon a tombstone. Among the classical nations of antiquity, epitaphs were at first only inscribed upon the tombs of heroes and those who had made themselves distinguished in their country. Among the Greeks, the term was also applied to those verses which were sung in memory of a deceased person on the day of his funeral, or on its anniversary. Amongst the Romans, every family who consecrated a tomb to their relations had the privilege of inscribing an epitaph upon it. Both Greek and Roman epitaphs were distinguished by three qualities,—brevity, simplicity, and familiarity. The Roman tombs were generally situated by the side of the public road, and the epitaphs usually commenced with the words "Sta, viator,"—Stop, traveller. Sepulchral inscriptions seem to have first taken their origin in England in the 11th century. At that time they were always written in Latin. In the 13th century, most of the epitaphs were written in French; but the clergy and religious bodies still continued to write in Latin. English epitaphs were not written till the middle of the 14th century. The modern English, French, and German epitaphs are more numerous and varied than those of any other time or nation. They exhibit every variety of style and sentiment, from heraldic prolixity and epigrammatic conceit to majestic gravity. All epitaphs should be characterized by brevity and truth. The long tedious inscriptions upon some tombs are as untrue as they are ungrammatical, and would almost seem to substantiate the German proverb:—"He lies like a tombstone, and is as impudent as a newspaper." Among the many famous epitaphs existing in England, may be mentioned the well-known inscription on Sir Christopher Wren's monument in St. Paul's cathedral, London:—



"Si monumentum quæris,—circumspice."
If you ask for his monument,—look around.

The following epitaph, which is exquisitely touching and simple, was written by Ben Jonson, and inscribed on the tomb of the countess of Pembroke:—

"Underneath this sable hearse
Lies the subject of all verse;
Sidney's sister, Pembroke's mother.
Death, ere thou canst find another
Good, and fair, and wise as she,
Time shall throw a dart at thee."

Notwithstanding the solemn circumstances with which epitaphs are associated, they are often made the vehicles of pleasantry and satire. Goldsmith wrote the following upon Mr. Edward Purdon:—

"Here lies poor Ned Purdon, from misery freed,
Who long was a bookseller's hack;
He led such a damnable life in this world,
I don't think he'll ever come back."

Burns wrote some very satirical epitaphs, and in France the same kind of grim humour has frequently been indulged in. The epitaph upon Robespierre is as follows:—

"Passant, ne pleure point mon sort;
Si je vivais, tu serais mort."

Dry your tears, passer by;
If I lived, you should die.

EPITHALAMIUM, *ep-e-thăl-ai'-me-um* (Gr. *epi*, on; *thalamos*, a bridal chamber), a species of poem sung by the ancient Greeks and Romans near the bridal chamber of a newly-married couple. Poems of this character were written by Anacreon, Stesichorus, and Pindar. The epithalamium written by Catullus on the occasion of the marriage of Peleus and Thetis has always been much admired; and that written by the English poet Spencer has been described as one of the most gorgeous in all literature.

EPITHET, *ep'-e-thet* (Gr. *epitheton*, from *epi*, upon, and *tithemi*, I lay or place), is applied to an adjective expressing some real quality of the thing to which it is applied, or an attributive expressing some quality ascribed to it. Epithets are often used in poetry and rhetoric, not to make up any essential part of the description, but only by way of ornament. Even Homer has been found fault with on this head, for equipping every hero with an epithet, not according to the exigencies of the case, but to suit the measure of his verse. Nothing, says Aristotle, tires the reader more than too great a redundancy of epithets, or epithets improperly applied; and yet nothing is so essential in poetry as a proper use of them. Epithets are also sometimes applied as surnames, or as persons' second appellation, and were anciently bestowed very freely on account of excellencies or defects, either of body or mind,—even kings not being exempt from them; as, Edward Longshanks, Richard Cœur de Lion.

EPIZOA, *ep-e-zo'-ă* (Gr. *epi*, on; *zoon*, an animal), a term applied to those parasitic animals which live upon the bodies of other animals. They may be divided into two classes,—those which live on the surface of the skin, and those which live in the skin. In the first class may be mentioned fleas, lice, bugs, ticks, &c.; and in the second, the itch-insect or *sarcoptes*, the pimple-mite or *Demodex folliculorum*; together with other species of the Acaridæ.

EPOCH, *ē'-pok* (Lat. *epocha*, point of time).—In Astron., the longitude or right ascension of a planet, at any particular moment of time, is simply called the epoch of that planet, for the sake of brevity. In order to determine the future position of a planet in the heavens at any particular period, it is necessary to reckon from its epoch, or known longitude at a certain point of past time. In Chron., the term epoch is used synonymously with era, and signifies a certain time from which we begin to count a series of years. (*See* ERA.)

EPROUVETTE, *ai-proo-vet'* (Fr.), in Mil., the name given to a contrivance by which the strength of gunpowder is ascertained. There are two methods of doing this; the first being effected by what is called the gun eprouvette, and the second by the mortar eprouvette. The latter is by no means an accurate test for comparing the strength of different kinds

of powder, unless the grain of all the sorts to be tried be of the same size. A small charge is put into a mortar, and a suitable spherical iron shot is placed upon it. The charge is then exploded, and the distance to which the projectile is thrown is carefully measured. The range obtained is, of course, greater or less according to the strength of the powder. In the gun eprouvette, a gun is attached to an iron rod at its centre of gravity, or point at which the gun would exactly balance if placed across a horizontal bar. The upper part of the rod is fastened to a horizontal bar, the ends of which rest in sockets, and which forms an axis, about which the whole apparatus may swing backwards and forwards when set in motion. From the lower part of the gun, and in a continuous vertical line with the bar by which it is suspended, a rod of iron projects, the point of which works in a groove cut in a piece of wood fixed below it, in the form of the arc of a circle, whose centre is in the axis, about which the whole machine oscillates. This groove is filled with a soft substance. The gun is loaded with a carefully-measured charge of powder, and when fired, the recoil of the gun causes the point of the rod projecting from the under part to describe a line on the soft substance in the groove, the measurement of which determines the strength of the powder. Sometimes a brass quadrant is fixed to the upper part of the rod by which the gun is suspended, on which the extent of the recoil is marked by an index.

Epsom Salts, *ep'-sum*, in Chem., sulphate of magnesia is known in commerce as Epsom salts, a name derived from the circumstance of its being largely contained in the springs in the neighbourhood of Epsom.

Equation, *e-kwai'-shun* (Lat. *æquare*, to make even or equal).—In Astron., the rate of motion of the heavenly bodies revolving in elliptic orbits is variable, and they are, from different causes, sometimes in advance of, and sometimes behind, the position in which they would be if they travelled at a uniform rate of motion. In calculating the position of a heavenly body from any epoch, a small amount, by way of correction, must consequently be added to or taken from its longitude at the time required, as it would be if it moved at a uniform rate; and this correction, in Astron., is termed an equation. There are various equations required in astronomical calculations of the longitude of heavenly bodies at given periods, arising from the attraction exercised on the planets by the sun, and that which they exercise on one another and their satellites. The moon's annual equation, the equation of time, and the equation or precession of the equinoxes, will be noticed elsewhere. (*See* Sun, Moon, Precession.)

Equation, Annual.—The action of the sun upon the moon, by its mean influence, during many successive revolutions of both bodies, tends to increase permanently the moon's distance and periodic time. This general average is not established without a series of subordinate fluctuations. In the lunar theory some of these are very sensible to observation. The most conspicuous is that termed the moon's annual equation. It is so called because it consists in an alternate increase and decrease in her longitude, corresponding with the earth's situation in its annual orbit,—namely, to its angular distance from the perihelion; and therefore having a year instead of a month, or aliquot part of a month, for its period.

Equations, a term applied in Algebra to those propositions which assert the *equality* of two quantities. The sign = placed between the two quantities signifies that they are equal. Thus $5x + 10 = 25$, is an equation expressing the equality of the quantities $5x + 10$ and 25. A simple equation is that which contains only the first *power* of the unknown quantity or quantities. Pure equations of the higher degrees are those which contain the square or any higher power of the unknown quantity, and are divided into two classes,—*pure* and *affected*. A pure equation is that in which only one power of the unknown quantity is involved, and an affected equation is that in which different powers of the unknown quantity are involved. Thus, $ax^3 = b$ is a pure equation, and $ax^2 + bx = c$ is an affected equation. An affected quadratic equation is that which contains the square of the unknown quantity and also the unknown quantity itself.

Equator, *e-kwai'-tor* (Lat. *æquus*, equal), in Astron. and Geog., the name given to the imaginary great circles that surround the heavens and the earth midway between the poles, so that every point in them is equidistant from each polar point. The plane of the terrestrial and celestial equator is at right angles to the axis of either sphere. The equator is so called because day and night are equal when the sun crosses it at the vernal and autumnal equinoxes in his passage along the ecliptic.

Equatorial Instrument, *e-kwai-to'-re-al*, an astronomical instrument of exceedingly complicated construction, fitted with a declination-circle, an hour-circle, and a telescope for taking observations, suspended in such a manner that it may be directed at pleasure to any point in the heavens that it may be desired to inspect. The whole instrument can be moved on two axes,—one of which is called the polar axis, as it is in the direction of the poles of the heavens; and the other, the transit or declination axis, which carries the declination-circle, and is placed at right angles to the polar axis. The best equatorial instrument for general purposes is one called the Portable Universal Equatorial, made by Troughton. It is fixed on a stand, which can be brought to a proper level by means of screws and spirit-levels attached to its base. At the top of the stand, a horizontal axis is placed, moving in sockets in the ends of the uprights that rise perpendicularly from its base. The polar axis is fixed to the cross axis, and at right angles to it. This may be set in its proper position by a latitude-circle attached to the cross axis, and moving in a plane parallel to that in which the polar axis moves. A tube, or inner axis, revolves within the tube which forms the polar axis, having an hour-circle attached to its lower extremity, which is regulated by a tangent-screw placed at the opposite end. The rest of the instrument is attached to a plate fixed to the top of this inner tube, and revolving with it. Upright pieces rise from either end of the plate, with sockets to carry the transit-axis, at one extremity of which a declination-circle is fixed, and at the other a telescope. From the construction of the instrument, it will be seen that the plate fixed to the upper part of the inner tube of the polar axis, and the hour-circle at its other extremity, move in planes parallel to that of the equator when the polar axis has been properly adjusted. The method of using this instrument, and the principles on which it is made, will be better understood by an inspection of the instrument itself, or a drawing of it on a large scale.—*Ref.* Rees's *Cyclopædia*; *English Cyclopædia*,—Arts and Sciences.

Equerry, *ek'-we-re* (Lat. *equus*, a horse; Fr. *écuyer*, a squire), an officer of state who holds office in her Majesty's household or in the household of princes of the royal family. An equerry is always in attendance on the Queen on state occasions, and when she rides or drives. The equerries are officers under the master of the horse, and the senior among them is designated chief equerry and clerk-marshal. His salary is £1,000 per annum. There are, besides, four equerries in ordinary, whose duties are to accompany the Queen when on horseback. Their duties fall in rotation.

Equestrian Games, *e-kwes'-tre-an* (Lat. *equus*, a horse), among the ancient Romans, were sports in which horse-racing was the principal amusement. They were divided into six classes,—the *prodromus* or plain horse-race, the chariot-race, the decursory race about funeral piles, the *ludi sevirales*, and the *ludi neptunales*.

Equestrianism. (*See* Horsemanship.)

Equestrian Statues. (*See* Statues.)

Equidæ, *e-kwi'-de*, an order established for the reception of the horse and its allies. Their most striking character consists in the structure of the feet, which are composed of but a single finger or toe terminating each extremity, and encased in a horny sheath or shoe. Besides this well-developed toe, however, the Equidæ possess on each side of the metacarpus and metatarsus two small rudimentary processes, which represent two lateral toes. The structure of the leg bones is much the same as in the generality of mammalia, except that the humerus and femur are comparatively short, and the bones of the fore-arm and shank, which are much longer, are partially ankylosed together, so that no

rotatory motion of these bones can take place. The bones of the carpus and tarsus are large and solid, and resemble the bones of the other mammalia in their general arrangement. Beyond these we find a single elongated metatarsal bone, the representative of the middle toe. This is completed by three phalanges, of which the last bears the single horny hoof. Dr. Gray thus defines the family of the Equidæ:—"This family (which is distinguished from all other animals by its undivided hoof, formed of the two anterior toes soldered together, its simple stomach and its female having the teats placed on the pubes) may be divided into two very distinct types of form,—the one the asses and the zebras, which are always more or less banded with blackish brown, and have always a distinct dorsal line, the tail only bristly at the end, and have warts only on the arms, and none on the hind legs; and the true horses, which are not banded, have no dorsal line, are furnished with warts on their arms and legs, and have long hair on the tail from its insertion to its extremity." The skull of the Equidæ is of an elongated form, the jaws being well developed, the lower one especially being of great strength and power. Both jaws are provided with six incisor teeth; small canines are also present in both jaws in the males, but in the females these teeth are usually rudimentary or quite deficient. The molars are six on each side in each jaw; their worn surface is flat, and exhibits a complicated pattern of enamel, generally of a lunate form. Between the molars and incisors there is a considerable space, and in this space is fitted the bit by which the animal is guided. The hair with which the skin is clothed is short on the general surface, but attaining a considerable length on the ridge of the neck and on the tail. The eye is rather large and full, and the external ears elongated, upright, and pointed. The most important species belonging to this family is, without doubt, the horse (*Equus caballus*). (*See* Horse.)

Equilateral, *e-kwe-lăt'-e-rŭl* (Lat. *æquus*, equal; *lateralis*, side), having all the sides equal; as an equilateral triangle. All the regular polygons are equilateral.

Equilibrium, *e-kwe-lib'-re-um* (Lat. *æquus*, equal; *libra*, balance), in Statics, is a state of rest produced by the mutual counteraction of several forces. Two equal forces, acting in contrary direction, for example, destroy one another, and produce equilibrium; as when the two ends of a lever or balance, charged with equal weights, maintain a level position. (*See* Mechanics, Statics.)

Equilibrium of Arches.—This is a subject which is treated in that part of mathematical science called Statics. In this the conditions are considered in which any body, or number of bodies, will remain in a state of rest under the influence of forces that act in opposite directions, and mutually counteract each other. It is evident that the conditions of equilibrium can be considered in theory only, as the slightest possible addition to either of the counteracting forces would immediately give it a preponderating influence, and destroy the state of balance. In investigating the equilibrium of arches, we must imagine the surfaces of the voussoirs to be perfectly smooth, and friction must be altogether disregarded, so that each stone may be considered to be sustained by the pressure of those on either side of it, acting, under these conditions, in directions perpendicular to their surfaces. The theory on which the equilibrium of arches depends is briefly this, that the weights of the voussoirs of which it is composed must be in the same proportion to each other as the sections of the chord of the arch, which are made by producing the lines which represent the junctures of the sides of the voussoirs to the centre from which the line of intrados is described, supposing the arch to be a segmental arch. It is also necessary that the perpendicular passing through the centre of gravity of any part of the arch should pass through a parallelogram formed by lines drawn perpendicular to the sides of the part in question from their extremities. In such an arch the voussoirs at the crown would be the least in depth, and each successive vousoir, from the crown towards the piers, would increase in thickness, so that the line of the extrados would not be described from the same centre as that from which the line of intrados has been described. The slightest alteration of the weight of any of the voussoirs of such an arch as this, in which the stones that compose it are supposed to be supported without friction, would cause it to be overturned; but when friction is taken into account, it is plain that an arch, which would remain in equilibrium under the conditions above stated, if they could exist in practice, would then be capable of sustaining a great amount of superincumbent pressure; and, indeed, pressure on the arch tends to make it stronger, by increasing the friction by which the pressure on it is resisted. The theory of the equilibrium of domes is somewhat similar to that of the equilibrium of arches, if we consider the dome to consist of a series of exactly equal and opposite slices, that are formed by planes passing perpendicularly through the axis at a small angle to each other, and which support each other at the crown, being, in fact, a number of balanced arches, each of which would preserve its equilibrium, if it were left standing alone. But in the dome equilibrium will be maintained, and the structure will be stronger, if the weight of the upper part of each of such a series of contiguous balanced arches be greater than that which would be required to preserve equilibrium in a balanced arch of similar form standing alone; because every stone in each circular and horizontal course, or each of the whole series of the opposite parts of the balanced arches, exerts a lateral pressure on those on either side of it, and their tendency to fall inwards locks the whole structure tightly together. To insure the equilibrium of an arch, friction being disregarded, it is therefore necessary to bring the weight of the voussoirs composing the crown up to a certain limit, which must not be increased or diminished in any way; but in the dome, equilibrium will be maintained, for the reasons above stated, when the weight of the upper portion of each of the series of arches of which it may be supposed to be composed exceeds this limit.—*Ref.* Robison's *Mechanical Philosophy*; *English Cyclopædia*,—Arts and Sciences.

Equinoctial, *e-kwe-nok'-shăl* (Lat. *æquus*, equal; *nox*, night).—The celestial equator is sometimes called by this name, because day and night are of equal length all over the world when the sun crosses the equator.

Equinoxes, *ek'-we-noks-ez*, the points in which the great circles known as the ecliptic and equator cut each other. They are distinguished as the vernal and autumnal equinox. The sun is at the former on the 21st of March, when he enters the first point of Aries; and at the latter on the 22nd of September, when he enters the first point of Libra. In the southern hemisphere, the names of the equinoxes are transposed; the vernal equinox to those who are north of the equator becoming the autumnal equinox to those in countries lying to the south of it; and the autumnal, the vernal equinox.

Equipage, *ek'-we-paij* (Fr. *équiper*), a term applied in general language to the carriage, horses, and liveries of a gentleman when abroad. The word is also applied to the furniture of an army or body of troops. In this sense it includes arms, artillery, utensils, provisions, &c. Camp equipage includes tents and things necessary for accommodation in camp; while field equipage consists of arms, artillery, waggons, tumbrils, &c. In marine affairs, the word equipage is applied to the crew of a ship, together with all her furnitures, masts, sails, ammunition, and general stores.

Equisetaceæ, *ek-we-se-tai'-se-e* (Lat. *equus*, a horse; *seta*, a hair, or bristle), in Bot., the Horsetail fam., a nat. ord. of *Acotyledones*, sub-class *Aerogenæ*; consisting of herbaceous plants, with striated, hollow, jointed, simple or verticillately-branched, aerial, siliceous stems, arising from slender creeping rhizomes, or underground stems. The joints are surrounded by membranous toothed sheaths, which are regarded as modified leaves; but, in general, the plants of the order are considered leafless. When branched, the branches arise in a whorled manner from beneath the axile of the teeth of the sheaths, and correspond in number with them. These plants are found in marshy or watery places in most parts of the world. There is but one genus, *Equisetum*, which includes about ten species, the greater number of which are indigenous. The rhizomes contain much starchy matter in the winter

months, which might be used as food in case of need. The silex, or flint, contained in the tissue of the rough horsetail, *Equisetum hyemale*, renders it a useful plant. Its stems are largely imported from Holland under the name of Dutch rushes, and employed by cabinet-makers, whitesmiths, and ivory-turners for smoothing the surface of their work.

EQUISETITES, *ek-we-se-ti'-tes* (Lat. *equisetum*, the plant horsetail), in Geol., the name given to fossil plants which resemble the equisetum of our pools and marshes. They are found in all formations, from the Devonian upwards, and have jointed stems, surrounded by closely-fitting cylindrical sheaths, which are regularly toothed, and which leave their impress on the stems. They may be distinguished from the *Calamites*, for which they are apt to be mistaken, by their stems not being channelled throughout.

EQUISETUM. (*See* EQUISETACEÆ.)

EQUITES, *ek'-we-teez* (Lat. plur. of *eques*, a knight, a horseman).—The equites, or knights, were a large and important body in ancient Rome, originally founded by Romulus, who divided his people into three tribes, and selected a hundred from each to serve on horseback as his body-guard. Their numbers were increased by succeeding kings, and at last they became an order in the state, known as the equestrian order, in which any one could be enrolled who was possessed of the requisite amount of property. They ranked next to the senators, and occupied seats in public places of amusement that were especially set apart for them. They were distinguished by wearing a gold ring, and a border on their vestments a little narrower than that worn by the senators. They always formed the chief part of the Roman cavalry, if not the entire body, and were commanded by an officer of high rank, who was styled *magister equitum*, or master of the horse. Some idea may be formed of the number of the equites from the story told by Roman historians, that Hannibal sent to Carthage three bushels or measures (*tres modios*) of gold rings taken from the fingers of the knights that lay dead on the field after the battle of Cannæ, fought Aug. 2, 216 B.C., in which 40,000 Romans perished.

EQUITY, *ek'-we-te* (Lat. *æquitas*), in a moral and general sense, is that which, in human transactions, is founded in natural justice, in honesty and right,—*ex æquo et bono*. "Equity, in its true and general meaning," says Blackstone, "is the soul and spirit of all law; positive law is constructed, and rational law is made by it. In this, equity is synonymous with justice; in that, to the true and sound interpretation of the rule." It is applied to cases to which the law, on account of its generality, does not exactly apply, but which must be determined by the sound judgment of the proper interpreter. In this sense, equity must have a place in every rational system of jurisprudence, if not in name, at least in substance; for it is impossible that any code, however minute and particular, should embrace, or provide for, the infinite variety of human affairs, or should furnish rules applicable to all of them. Cases will occur to which the antecedent rules will not apply without injustice, or to which they cannot be applied at all; and it is the office of a judge to consider whether the antecedent rule does, or ought, to apply to a given case. Hence arise a variety of rules in the interpretation of laws, according to their nature and operation, whether they are remedial or penal, or restrictive of general right, or in advancement of public justice. In the law of England, however, equity has a different and more restricted meaning. Remedies for the redress of wrongs, or for the enforcement of rights, are distinguished into two classes,—those which are administered in *courts of law*, and those which are administered in *courts of equity*. The rights secured by the former are called *legal*; those by the latter, *equitable*. The former are rights and remedies at common law; the latter, rights and remedies in equity. Much misunderstanding has prevailed regarding the distinctive features of these two branches of jurisprudence. Some have represented them as two opposing and hostile powers, continually at warfare with each other, and striving to encroach on each other's province, as if, in the language of Blackstone, "the one judged without equity, and the other was not bound by any law." It has also been stated that a court of equity is not bound by rules or precedents, but acts from the opinion of the judge; and that the province of equity, as distinguished from law, is to determine according to the spirit of the rule, and not according to the strictness of the letter. In the early history of equity jurisprudence, there might have been much to give colour to these views; but in the present day, courts of equity act upon principles as fixed and certain as those on which courts of law proceed. New cases may, and indeed do, arise; but they are decided upon these ascertained rules and principles, whatever may be the opinion of the judge as to what may be just or reasonable in the particular case before him. Equity, then, is a branch of jurisprudence which aims at supplementing the defects of common law, by extending relief to those rights of property which the strict law does not recognize, and by giving more ample and distributive redress than the ordinary tribunals afford. It by no means either controls, mitigates, or supersedes the common law, and does not assume any power to subvert its doctrines. Courts of common law proceed by certain prescribed forms, and give a general judgment for or against the defendant; but there are many cases in which a simple judgment for either party, without qualifications and conditions and particular arrangements, would not do entire justice to either. Some modification of the rights of parties may be required, some restraints on the one side or the other, or some peculiar adjustments, either present or future, temporary or perpetual. To meet these objects, the courts of law in this country have no provisions; they can only adjudicate by a simple judgment between the parties. Courts of equity, however, are not confined or limited in their modes of relief by such narrow regulations, but grant redress to all parties where they have rights, *ex æquo et bono*, and modify and fashion that redress according to circumstances. Courts of equity, too, bring before them all the parties interested in the subject-matter of the suit, and adjust the rights of all, however numerous; whereas courts of law must limit their inquiries to the contending parties. The most general description of a court of equity, as given by Mr. Justice Story, in the "Encyclopædia Americana," is "that it has jurisdiction in cases where a plain, adequate, and complete remedy cannot be had at law; that is, in the common-law courts. The remedy must be *plain*; for if it be doubtful and obscure at law, equity will assert a jurisdiction. So it must be *adequate* at law; for if it fall short of what the party is entitled to, that founds a jurisdiction in equity. And it must be *complete*; that is, it must attain its full end at law; it must reach the whole mischief, and secure the whole right of the party, now and for the future; otherwise equity will interpose and give relief." The jurisdiction of a court of equity is sometimes concurrent with that of common law, and sometimes it is exclusive. It exercises concurrent jurisdiction in cases where the rights are purely of a *legal* nature, but where other and more efficient aid is required than a court of law can afford, to meet the difficulties of the case and insure full redress. In some of these cases, courts of law formerly refused all redress, but will now grant it. The jurisdiction, however, having been once justly acquired by the courts of equity, at a time when there was no such redress at law, it is not now relinquished. The most common exercise of concurrent jurisdiction is in cases of accident, account, dower, fraud, mistake, partnership, and partition. The remedy here is often more complete and effectual than it can be at law; and in many cases falling under these heads, and especially in some cases of fraud, mistake, and accident, courts of law cannot, and do not, afford any redress; in others they do, but not always in so full and perfect a manner. A court of equity is also assistant to the jurisdiction of courts of law in many cases where the latter have no like authority. It will remove legal impediments to the fair decision of a question depending at law. It will prevent a party from improperly setting up at a trial some title or claim which would be inequitable. It will compel him to discover, on his own oath, facts which he knows are material to the right of the other party, but which a court of law cannot compel him to discover. It will perpetuate the testimony of witnesses to rights and titles which are

in danger of being lost before the matter can be tried. It will provide for the safety of property in dispute, pending litigation. It will counteract and control, or set aside, fraudulent judgments, by restraining the parties from insisting upon them. A court of equity exercises exclusive jurisdiction in all cases of merely equitable rights; that is, such rights as are not recognised in courts of law. Most cases of trust and confidence fall under this head. Its exclusive jurisdiction is also extensively exercised in granting special relief beyond the reach of the common law. It will grant injunctions to prevent waste or irreparable injury, to secure a settled right, to prevent vexatious litigations, or to compel the restitution of title-deeds. It will appoint receivers of property where it is in danger of misapplication; will compel the surrender of securities improperly obtained; prohibit a party from leaving the country in order to avoid a suit; will restrain any undue exercise of a legal right against conscience and equity, and decree a specific performance of contracts respecting real estates. It will in many cases supply the imperfect execution of instruments, and reform or alter them according to the real intention of the parties; will grant relief in cases of lost deeds or securities; and, in all cases in which its interference is asked, its general rule is, that he who asks equity must do equity. Whether it would be best to administer the whole of remedial justice in one court or class of courts, without any separation or distinction of suits, or of the forms or modes of proceeding, is a question upon which much difference of opinion exists. Lord Bacon has given it as his decided opinion, that the separation of common law and equity was wise and convenient. "All nations," he says, "have equity; but some have law and equity mixed in the same court, which is worse; and some have it distinguished in several courts, which is better." Lord Hardwicke was of the same opinion; and, indeed, it is the general opinion in those countries, as England and the United States of America, where the two exist separately. "There is nothing," says Mr. Justice Story, "incongruous, much less absurd, in separating different portions of municipal jurisprudence from each other in the administration of justice, or in denying to one court the power to dispose of all the merits of a case when its forms of proceeding are ill adapted to afford complete relief, and giving jurisdiction of the same cause to another court better adapted to do entire justice by its larger and more expansive authority." It is most probable that its suitability depends upon the habits, circumstances, and institutions of each particular nation, and that while it might be well adapted for one country or one age, it might be unsuitable for another. A suit is usually commenced in the courts of equity or chancery by presenting a petition to the lord chancellor, containing a statement of the plaintiff's case, and praying for redress. Frequently allegations are made in a bill, of which the plaintiff is uncertain, or which are merely conjectural, in order to elicit from the defendant a full discovery of the truth. Formerly, a writ of subpœna was issued, commanding the defendant to appear and answer the allegations of the bill within a certain time; but now, in place of the subpœna, a printed bill is served, which has the same effect as the service of a writ of subpœna. If upon the face of the bill any cause be apparent why the redress should not be granted, the defendant may demur, or put in a *demurrer*; and if such cause exist, and yet not apparent upon the bill, he may put in a plea stating such matter, and demanding judgment of the court, as in a demurrer. In either case, the subject is at once taken up and argued before the court, and, if allowed, the suit, or so much of it as is affected by the plea or demurrer, falls to the ground; but usually, on cause shown, the court will allow the plaintiff to amend his bill. If the defendant can neither demur nor put in a plea, and cannot disclaim, then he must answer, upon oath, the interrogatories in the bill, according to the best of his knowledge and belief. If the answer is sufficient, and the bill does not require amendment, issue is joined in the cause, witnesses are examined, the evidence is closed, and the cause set down for hearing, and heard in its turn. In some cases, the decree made on the hearing decides all the questions in the cause; in other cases, preliminary accounts, inquiries, and directions, are adjourned to chambers; and when these are answered, the cause comes on for hearing on further consideration, and the points in issue are disposed of. The court decides upon the proofs, arguments, and merits brought before it without the assistance of a jury; yet, if a serious doubt be entertained as to a question in fact, the court may direct an issue upon it to be tried by a judge and jury at common law, and may now itself impanel a jury to award damages to an injured party, either in addition to, or in substitution for, an injunction or specific performance, pursuant to 21 & 23 Vict. c. 27. The judges of the equity courts are the lord chancellor, the master of the Rolls, the two lords justices of the Court of Appeal in Chancery, and the three vice-chancellors. The ordinary business is transacted by the master of the Rolls and the three vice-chancellors.

EQUIVALENTS. (*See* ATOMIC NUMBERS.)

EQUULEUS, *e-kyu-ul'-e-us* (Lat., the little horse), one of the old Greek constellations made by Ptolemy, and situated between Aquila and Capricornus. Its brightest stars are of the fourth magnitude only. There is another constellation, named by Lacaille *Equuleus pictoris*, the easel, or painter's horse, which is situated near the constellation Argo.

ERA, *e'-rà* (Lat. *æra*), the name given to a point of time that is marked by some remarkable occurrence, and from which it has been consequently determined to count the series of succeeding years. Various eras have been chosen by different nations, but fixed, indeed, in an arbitrary manner, from which they have reckoned the principal events occurring in their history in chronological order. The most important of these is the Christian era, which was invented by a monk, Dionysius Exiguus, in the year 532 A.D. The first year of this era was supposed to be the year in which our Saviour was born; but this supposition has been found to be incorrect, as the birth of Christ is now allowed to have taken place four years previously. From this era the majority of the Christian nations of the world reckon events both backwards and forwards; any event which happened before this date being spoken of as taking place in the year —— before Christ, or B.C., and any which has happened since, as occurring in the year —— of our Lord, or A.D. In the system of chronology generally adopted, the date of the creation of the world is fixed at 4004 B.C.; but this is uncertain, and many different dates have been assigned to this event: thus, according to the Septuagint, it took place in the year 5872 B.C.; according to the Julian period, 4710 B.C.; and according to the mode of reckoning used by the Jews, 3761 B.C. The other principal eras from which events have been reckoned by the Greeks, Romans, Hindoos, and Mahometans, are as follows:—The Greeks reckoned by Olympiads, or periods of four years each, the first year of the first Olympiad coinciding with the year 776 B.C. The Romans reckoned from the building of the city Rome, which took place 753 B.C., in the fourth year of the sixth Olympiad. The principal Hindoo eras are those of the Cali Yuga and Vicramaditya, which correspond with the years 3102 and 56 B.C. The Mohammeddan era, called the Hegira, dates from the flight of Mahomet from Mecca, which took place 622 A.D. The rules by which the year of the Christian era may be found that corresponds with a given year of any other particular era, and *vice versâ*, will be found in the notice given of each important era under its own heading. (*See* CALI YUGA, HEGIRA, OLYMPIAD, VARRONIAN ERA, &c.)

ERASTIANISM, *e-rás'-te-an-izm*, a religious theory, first propounded by Erastus, a German divine of the 16th century. His proper name was Liebler, or Lieber, which, according to the fashion of the day, he changed to the Greek equivalent Erastus, 'beloved.' According to his theory, the pastoral office was only persuasive, like that of a professor of sciences over his pupils, without any power annexed. The Lord's Supper, like other ordinances of the Gospel, was, he declared, to be free and open to all; the minister might dissuade any one from joining, but might not refuse. Erastianism referred the punishment of all offences to the civil magistrate. The theory was for a time prominent in England, and Selden, Lightfoot, Coleman, and Whitelocke, belonged to the Erastian party.

**Erbium**, *er'-be-um*, in Chem., an exceedingly rare metal, found with yttrium and terbium in gadolinite. The oxide erbia is similar in its characteristics to alumina. It has a dark yellow colour, but forms colourless salts.

**Erechtheum, or Erechtheion**, *e-rek-the'-um*, one of the most important temples of ancient Athens, which stood on the north side of the summit of the Acropolis. The temple that originally occupied the site was built by Erechtheus, who reigned over Attica in the latter part of the 14th century B.C. It was designed for the reception of the image of Minerva, carved out of the trunk of an olive-tree, which was always a special object of veneration to the Athenians. Erechtheus was buried in the temple; from which circumstance the name of Erechtheum was afterwards given to that which was built on the same site about 490—395 B.C., the ruins of which may still be seen. The entire building forms a group of three temples,—the Erechtheum properly so called, the temple of Minerva Polias, and the Pandrosium. The Erechtheum occupied the largest space, and is supposed to have been built first of all. It is in the form of a parallelogram, about 73 feet long and 37 feet wide. The portico before the *prothyrum* looks towards the east, and was very shallow, if a wall existed between this and the *prothyrum*, as supposed by Stuart. The entablature and pediment of the portico was supported on six massive but elegant Ionic columns, enriched with carving, and about 27½ feet in height. The temple of Minerva Polias was attached to the north side of the Erechtheum, at the western end, and stood on a lower level. It was nothing more than an open portico, 33 feet wide and 21 feet in depth, the roof being supported by six columns, four in front and one on either side, 25 feet in height. It looked towards the north, and was probably nothing more than a side portico added to the Erechtheum at some time subsequent to its erection. The Pandrosium was attached to the western end of the south wall, and was built at a much later date than the other parts of the building. The roof of the portico, which has a southern aspect, was supported by six caryatides. (*See* Caryatides, Elgin Marbles.) The interior of the Pandrosium, or *cella* of the temple, was formed out of the lower or western end of the Erechtheum, a portion about twelve feet in width being separated from it for that purpose by a party wall. The portico of the Pandrosium is about 18 feet wide and 12 feet deep. —*Ref.* Fergusson's *Handbook of Architecture;* Stuart's *Athens;* Inwood's *Erechtheion.*

**Eremacausis**, *e-re-mo-kaw'-sis* (Gr. *erema*, slow; *kausis*, burning), in Chem., a term applied by Liebig to the slow decay of moist organic bodies by the absorption of oxygen without the production of heat. The slow decay of wood, under the combined influence of air and moisture, is an instance of this action.

**Ergot of Rye.** (*See* Secale.)

**Ericaceæ**, *e-ri-kai'-se-e* (Lat. *erica*, heath), in Bot., the Heath fam., a nat. ord. of dicotyledonous plants in the sub-class *Corollifloræ*, consisting of 42 genera and about 850 species. They are very abundant at the Cape of Good Hope, and are more or less generally diffused throughout Europe, North and South America, and Asia. The following details give the general character of the order:—Shrubby plants. Leaves entire, opposite, or whorled, exstipulate. Calyx 4—5-cleft, inferior, persistent. Corolla hypogynous, monopetalous, 4—5-cleft; æstivation imbricated. Stamens hypogynous, as many, or twice as many, as the divisions of the corolla; anthers 2-celled, opening by a pore, appendiculate. Ovary many-celled, with numerous ovules, surrounded by a disc or scales; style 1. Fruit capsular, rarely baccate; placenta axile. Seeds numerous, small, anatropous; embryo in the axis of fleshy albumen. By Lindley, the order has been divided into two sub-orders,—*Ericeæ*, in which the fruit is loculicidal, or rarely septicidal, or berried, and the buds naked; *Rhododendreæ*, in which the fruit is capsular, septicidal, and the buds scaly, resembling cones. Many of the *Ericaceæ*, particularly species of the genera *Erica*, *Rhododendron*, *Kalmia*, and *Azalea*, are largely cultivated in this country on account of the beauty of their flowers. The three latter genera are commonly called American plants by florists; but they are not confined to America, as the name would imply. Medicinally, the plants of this order are chiefly remarkable for astringent properties. Some, however, are narcotic, and a few even poisonous. The fruits of many are edible.

**Eridanus**, *e-rid'-a-nus*, a constellation formed and named by Aratus after the river Eridanus. It stretches along the heavens from Phœnix to Orion, in the shape of a winding river; it has one star of the first magnitude, and many of the third and fourth.

**Eriocaulaceæ**, *er-e-o-kaw-lai'-se-e* (Gr. *erion*, wool; *kaulon*, a stem), in Bot., the Eriocaulon or Pipe-wort fam., a nat. ord. of *monocotyledonous*, consisting of aquatic or marsh plants, with clustered linear leaves, usually grass-like, and minute unisexual flowers growing in dense heads. They are mostly natives of tropical America and the north of Australia. One species is found in Britain; namely, *Eriocaulon septangulare*, the pipe-wort. They have not been applied to any useful purpose.

**Eriodendron**, *er-e-o-den'-dron* (Gr. *erion*, wool; *dendron*, a tree), in Bot., a gen. of the nat. ord. *Sterculiaceæ*. The most remarkable species is *E. Samauma*, a native of South America. Its trunk frequently overtops all the surrounding trees before it gives off a single branch. The hairy covering of the seeds of various species of this genus forms a kind of vegetable silk much used for stuffing cushions and similar purposes.

**Eriophorum**, *er-e-of'-o-rum* (Gr. *erion*, wool; *phoreo*, I bear), in Bot., a gen. of the nat. ord. *Cyperaceæ*, or Sedge fam., consisting of numerous species, commonly known as cotton-grasses, from their fruits being surrounded by cottony or downy hairs. These hairs are sometimes used for stuffing cushions. The leaves are reputed to possess astringent properties.

**Ermine**, *er'-min* (Fr. *hermine*), *Mustela ermina*, Linn.—This little digitigrade animal is found generally in temperate Europe, but is common only in the north. It is not generally known that the ermine and the stoat are the same animal: the confusion arises from the change that takes place in the colour of the animal's fur at the different seasons. In the winter it is yellowish-white, the yellow hardly showing about the head, but gradually appearing more and more on the body, and increasing in intensity, so that some are of a pale yellow colour on their hind parts: then it is known as the ermine. About the end of March, however, the upper parts change to reddish-brown, of rather a dull tint, the lower parts continuing white; the tail remains black at the tip through all the changes. It is in the extreme northern regions that this change in the animal's colour takes place with greatest distinctness. With regard to the manner in which this change is brought about, naturalists are not unanimous. One of the highest authorities, however, Mr. Bell, expresses his belief that the winter change is effected not by the loss of the summer coat and the substitution of a new one, but by the actual change of colour in the existing fur; and he cites, in proof of this view of the subject, the case of the Hudson's Bay lemming, which, in Ross's first polar expedition, was exposed in its summer coat on the dock to a temperature of 30° below zero, and the next morning the fur on the cheeks and a patch on each shoulder had become perfectly white; at the end of a week, the winter change was complete, with the exception of a dark band across the shoulders, and prolonged down to the middle of the back. Like many other species of this genus, the ermine has the faculty of ejecting a fluid of a strong musky odour. Its fur is in great request; at one time it was one of the insignia of royalty, and it is still worn by the judges. Comparatively few ermine skins are at the present time exported from Hudson's Bay; but even so lately as 1850, 187,000 skins were received in England from that and other places.

**Ermine**, in Her., the name of one of the furs used for the lining of mantles, crowns, coronets, and caps of maintenance, as well as for the field and charges of armorial bearings. It represents the white skin of the little animal known as the ermine, with the tail, which is tipped with black, attached to it, as in ladies' muffs, &c., made of that material. It is figured by black spots and stripes, or tails, on a white field, each stripe having two lines, or hairs, diverging from it, one on

either side, and being surmounted by three spots, one placed at the extremity, and the others just below it, on each side of the point. There are four varieties of this fur in Her.,—*Ermines*, having white spots and stripes on a black field; *Erminois*, black spots and stripes on a gold ground; *Pean*, gold spots and stripes on a black ground; and *Erminites*, like ermine, but having a red hair diverging from either side of the stripe, instead of a black one.

Erosion, *e-ro'-zhun* (Lat. *erosus*, gnawed or worn away), the act of gradually wearing away; the state of being gradually worn away. In Geol., this term is employed to distinguish those features which are the results of the slow destructive action of running water, glaciers, the waves, and other agents; thus, *valleys of erosion* are those valleys which have been gradually cut out of the solid strata. Most of the ravines and glens and river-channels in the British isles are the results of erosion; for whatever inequalities of surface may have originally directed the waters into their channels, all the subsequent deepening, scooping out, and widening of the valleys, have been owing to the erosive force of running water, laden with sand, gravel, and other triturating *débris*. The destructive action of breakers is very remarkable. Along the eastern coasts of Scotland and England, as is proved by old records, land existed far outside the present shore; the sites even of important towns of the 12th or 13th century being now under the sea. Even still, in many places, whole acres are annually consumed, and the total known destruction of the last few centuries is to be measured sometimes by miles. All sea-cliffs, crags, and pinnacles of rock may, as a general rule, be regarded as evidences of the erosion and destruction of the formerly more widely extended land by the moving surface of the sea. Just as actual sea-cliffs are proofs of the erosive action now in operation, so in almost all cases, inland cliffs, crags, scars, and precipices, as well as valleys, ravines, gorges, and mountain-passes, are proofs of the erosive action of the sea in times when the land stood at a lower level with respect to it. A still more wonderful example of erosion is frequently afforded in a low and gently undulating district, from which the very mountains themselves, that geologists can prove once covered it, have been removed. (*See* River, Glacier, Iceberg.)

Erotic Poetry, *e-rot'-ik* (from Gr. *eros*, love), a term applied, in Greek and Roman literature, to amatory poetry. It is particularly used to signify the works of a certain class of romance writers and the Milesian tales. Erotic poetry belongs more especially to the later periods of classic literature, and it abounds in sophistical subtleties and ornaments. The most distinguished writers of this kind of poetry were Achilles Tatius, Heliodorus, Anacreon, Sappho, Ovid, Tibullus, Propertius.—For a collection of these writers, see *Scriptores erotici Græci*, *curd* Mitscherlichii.

Erratic-Block Group, *er-rat'-ik* (Lat. *erraticus*, wandering), in Geol., a synonym of the boulder clay, from the large transported blocks of stone which occur in it. The blocks, or boulders, are sometimes briefly designated erratics. (*See* Boulders, Pleistocene.)

Erratum, *er-ra'-tum* (Lat.), a term applied to those errors which have been overlooked in the composition or impression of a work. A list of the errata is generally placed at the beginning or end of a book.

Errhines, *er'-rines* (Gr. *errinon*, from *en*, in; *rin*, the nose), in Med., those medicines which are applied to the mucous membrane of the nostrils. The term *sternutatories* is restricted to those which cause sneezing. Errhines may be applied in a dry, soft, liquid, or gaseous state; they may be emollient, astringent, or stimulant,—the first sheathing irritated surfaces; the second restraining inordinate secretion, the consequence of relaxation; and the third favouring the natural mucous discharge, on the return of the secreting surface to a healthy state. The aromatic errhines most commonly applied are powdered herbs,—as mint, lavender, and rosemary; also tobacco as snuff. Ammonia and its carbonates are much employed. Acrid vegetables and poisons, and preparations of mercury, are applied in rare cases.

Error, *er'-ror* (Fr. *erreur*, from Lat. *erro*, I err, or go astray), in Law, signifies something wrong in the pleadings, or process, &c., upon which a writ, called a writ of error (in Latin, *de errore corrigendo*) used formerly to be brought for the remedy thereof. Now, however, by 15 & 16 Vict. c. 76, this writ is, in almost every case, dispensed with; and proceedings in error consist of a simple memorandum of error lodged with the officer of the court, accompanied, if the error be in fact, with an affidavit to that effect. Error may be either upon matter of *fact* or upon matter of *law*; but it is generally upon the latter. Formerly, writs in error were resorted to on very trivial grounds (as mis-spellings and other clerical errors), and interfered greatly with the due administration of justice; but it is now provided, that no judgment shall be reversed on account of any imperfection, omission, or defect of form; and even in case of material mistake, it is declared lawful for the superior courts, or any judge thereof sitting at *nisi prius*, at all times to make such amendments as may be necessary for the purpose of determining in the existing suit the real question in controversy. A writ of error must be commenced and prosecuted with effect within six years after the judgment is signed, or after the right of the party aggrieved to bring error accrued. Error lies only for some mistake in the proceedings in a court of record; for to amend errors in a base court a writ of false judgment is the remedy.—*Ref.* Stephen's *Commentaries*.

Erse, *ers* (a corruption of Irish), is a name given by the lowland Scotch to the Gaelic, or language of the inhabitants of the Highlands, from their being supposed to have come over from Ireland. (*See* Gaelic.)

Ervum, *er'-vum* (Lat. *ervo*, I pull up by the roots), in Bot., the Tare, a gen. of the nat. ord. *Leguminosæ*, sub-ord. *Papilionaceæ*, consisting of herbs with weak and slender stems, small papilionaceous flowers, and pods containing from two to four seeds. The species are common fodder plants in many parts of the world. The seeds of the *E. Lens* are called *lentils*, and have been used as human food from the earliest ages. They are seldom eaten in England; but throughout the continent of Europe, and in many parts of Asia, they are largely consumed. The lentil is considerably smaller than an ordinary pea, and is of the shape of a double convex lens; in fact, the word *lens* is simply the Latin name for this description of pulse. Several varieties of the lentil are cultivated; that which is most esteemed in France is termed *lentille à la reine*; it is very small, and has a reddish colour. Lentils are very nourishing, but somewhat indigestible. The seeds of *E. Ervilia*, the bitter vetch, are said to be poisonous.

Erysipelas, *er-e-sip'-e-las* (Gr., from *eruo*, I draw, and *pelas*, near or adjoining), in Med., is the name given to a peculiar kind of inflammation of the skin, so called from its tendency to spread to adjoining parts. It is known also as St. Anthony's fire or *ignis sacer*, and in common language as the *Rose*. It most commonly attacks the head and face; but it also sometimes occurs on other parts of the body. The local inflammation is preceded and accompanied with fever, and there are also usually certain premonitory symptoms that precede the outbreak of the disease; the patient feels ill,—shivery, feeble, languid, and often drowsy. After these symptoms have continued for some time, a red spot appears on some part of the body, accompanied with a burning heat and tingling. When attacking the face, it usually makes its appearance on the bridge of the nose, and rapidly extends itself to the eyelids, cheeks, and forehead. The redness is not intense, but rather of a pale rose-colour, and goes away temporarily on pressure, but returns immediately on its removal, and no pit remains after the pressure. By the second night, or morning of the third day, after the commencement of the fever, the face begins to swell, the eyes are completely closed, and the form of the features scarcely recognizable. On the fourth or fifth day, vesications appear on the inflamed surface, and break or subside on the fifth or sixth, when the redness changes to a yellowish hue, and the swelling and fever begin to diminish; and on the eighth day both disappear. The progress of the disease, however, is more rapid and its course of shorter duration in the young and sanguine than in those more advanced in life; the tumefaction in the former being sometimes fully formed on the second day, and the whole terminating on the sixth or seventh; while in the latter it may be protracted to the tenth or twelfth. Suppu-

ration rarely occurs, except occasionally in the eyelids or scalp. Sometimes the inflammation and swelling extend to the neck and throat, and may produce suffocation. In very bad cases, delirium and coma come on, and death ensues from effusion on the brain. No remission of the fever takes place on the appearance of the inflammation; but, on the contrary, it generally increases with the progress of the inflammation, and only ceases when it goes away. When the complaint is mild, the inflammation and fever generally cease gradually without any evident crisis. Among frequent causes of this disease, are exposure to a cold and moist atmosphere, sudden changes of temperature, intemperance, and unwholesome articles of food. It is sometimes also induced by wounds or sores, or even a slight puncture or scratch of the skin in persons predisposed to it. It is likewise contagious, and has to be strictly guarded against by means of ventilation and cleanliness in hospitals. Though the proper seat of the inflammation is the skin, it frequently extends to the parts underneath. Authors usually distinguish four kinds of this disease,—the phlegmonous, œdematous, gangrenous, and erratic. The first of these is characterized by the greatest degree of inflammation. In the œdematous, the inflammatory symptoms are less intense, but the tumefaction is greater. It most commonly affects persons of debilitated constitution, dropsical persons, and those who have been long subject to other chronic maladies. It is attended with considerable danger when it affects the face, and often terminates fatally on the seventh or eighth day. The gangrenous form most commonly occurs in the face, neck, or shoulders, and is accompanied with symptoms of low fever and delirium, which is succeeded by coma. The colour of the affected part is of a dark red, and scattered vesicles appear upon the surface, which frequently terminate in gangrenous ulcerations. It is always a tedious, and often a fatal form of the disease. In erratic erysipelas, the morbid patches appear one after the other in different parts of the body; sometimes thus travelling progressively from the head to the extremities. It is rarely attended with danger, and usually terminates in a week or ten days. In the treatment of erysipelas, very much depends upon the nature of the disease and the condition of the patient. If the patient be young and sanguine, and the inflammation high, bleeding may be had recourse to. When, on the other hand, the system is enfeebled, tonics, a nourishing diet, and even stimulants, may be necessary in order to strengthen the patient. In general, moderate purgatives, diaphoretics, and strict confinement to bed, are to be adopted. In order to allay the local irritation, it is recommended to wash the part from time to time with warm milk-and-water. A solution of nitrate of silver has been employed in some cases with very beneficial results.

**Erythema**, *er-e-thē'-mă* (Gr. *eruthros*, red), in Med., is a lesser kind of erysipelas, being characterized in like manner by some degree of redness of the skin and disorder of the constitution, but with little swelling, and little tendency to suppuration or vesication. It is not infectious. Medical writers distinguish six varieties of this disorder. It usually arises from some local irritation, or from a disordered state of the digestive organs. If the former case, it is to be remedied by the removal of the cause of irritation and the ablution of the part with warm water or some gentle stimulating lotion. In the latter case, the proper remedies for restoring the healthy condition of the digestive organs are to be employed.

**Erythræa**, *er-e-thrē'-ă* (Gr. *eruthros*, red), in Bot., a gen. of *Gentianaceæ*, consisting of herbaceous plants with erect branching stems, having opposite entire leaves, and pink, whitish, or yellow flowers. The most important species is *E. Centaurium*, the common centaury, an indigenous plant, having bitter tonic properties, similar to those of gentian.

**Erythrina**, *er-ith-rī'-nă* (Gr. *eruthros*, red), in Bot., the Coral-tree, a gen. of the nat. ord. *Leguminosæ*, sub-ord. *Papilionaceæ*; consisting of small trees, shrubs, and under-shrubs, natives of India, America, and the West Indies. Nearly all the species are remarkable for the brilliant scarlet colour of their flowers, owing to which they are much cultivated as stove plants.



**Erythrophlœum**, *er-ith-rof'-le-um* (Gr. *eruthros*, red; *phloion*, bark), in Bot., a gen. of the nat. ord. *Leguminosæ*, sub-ord. *Mimoseæ*. *E. guineense* is the sassy-tree of Western Africa, the bark of which, under the name of "ordeal bark," or "doom bark," is used by certain tribes as an ordeal to which persons suspected of witchcraft or secret poisoning are subjected, from the superstition that their innocence or guilt will be indicated by the effects produced by the bark on the system.

**Erythroxylaceæ**, *er-e-throks-e-lai'-se-e* (from *erythroxylon*, from Gr. *eruthros*, red, and *xulon*, wood), in Bot., the Erythroxylon fam., a nat. ord. of dicotyledonous plants, in the sub-class *Thalamifloræ*; consisting of but one genus, *Erythroxylon*, which includes seventy-five species, natives of the warmer regions of the globe, and especially abundant in Brazil. This order is closely allied to *Malpighiaceæ*, and in fact scarcely presents characters sufficient to warrant its separation from that order. Some of the plants are tonic, others purgative, and others stimulant and sedative. The wood of *E. hypericifolium*, and the bark of *E. suberosum*, are red, and are used for the preparation of dyes of that colour. Red is, in fact, the common colour of the wood throughout the genus; hence its name, which signifies red wood. The most important species is *E. Coca*, the leaves of which are much used by the Peruvians and other peoples of South America to form a masticatory, which is prepared by adding to them a very small quantity of an alkaline paste made from the ashes of different plants, or even a little common quick lime. The Indians of Peru have always ascribed to the coca marvellous virtues, believing that it will lessen the desire and necessity for ordinary food. Spruce says that an Indian with a chew of this masticatory in his cheek will go two or three days without food, and feel no desire to sleep. Dr. Weddell, however, speaks far less highly of the virtues of the coca; he states that it does not satisfy the appetite, but merely enables those who chew it to support abstinence for a length of time with a feeling of hunger or weakness. The use of coca is said to prevent the difficulty of respiration which is generally experienced in ascending long and steep mountains. Its excessive use is stated to be most injurious, producing analogous effects to those occasioned by the immoderate consumption of opium and fermented liquors. Johnston has computed the annual consumption of coca at 30,000,000 lbs., and has stated that its chewing is indulged in by about 10,000,000 of the human race. The nature of the constituents which give rise to the peculiar stimulating, hunger-allaying, and narcotic effects of coca, has not yet been satisfactorily determined.—*Ref.* Johnston's *Chemistry of Common Life*.

**Erythroxylon.** (*See* Erythroxylaceæ.)

**Escalade**, *es-kăl-laid'* (Fr., from Lat. *scala*, a ladder), a term applied, in military language, to a furious attack made by troops on a fortified place by means of ladders. In modern warfare escalades do not occur so frequently as in the olden time: they were then generally made at night, stealthily and in silence. Among the most celebrated modern escalades may be mentioned that made by the French troops at the siege of Prague, in 1741, and that of Antwerp, in 1832.

**Escalloniaceæ**, *es-kăl-lo-ne-ai'-se-e* (in honour of Escallon, a Spanish traveller), in Bot., the *Escallonia* fam., a small nat. ord. of *dicotyledones*, sub-class *Calycifloræ*, consisting of evergreen shrubs, with alternate exstipulate leaves and axillary showy flowers. They are chiefly natives of the mountains of South America.

**Escalop**, or **Escallop**, *es-kăl'-lup* (Du. *schalp*, a shell), a fam. of bivalve mollusks the shells of which are deeply indented. In the centre of the top of the shell is a trigonal sinus, with a hinge consisting of elastic cartilage. In Her., the escallop-shell is a frequent bearing in the escutcheon, it having been the pilgrims' ensign in their expeditions to the Holy Land.

**Escape**, *es-kaip'* (Fr. *échapper*, to fly from), in Law, is a violent or privy evasion out of some lawful restraint; as where a man is arrested or imprisoned, and gets away before he is delivered by due course of law. Officers who, after arrest, negligently permit a felon to escape, are punishable by fine; but it is regarded as a much more serious

offence if the escape is affected by the consent and connivance of the officer, and is generally looked upon in law as punishable in the same degree as the offence of which the prisoner is guilty, and for which he is in custody, whether treason, felony, or trespass. Breach of prison by the prisoner himself, when committed for any cause, was felony at the common law; but this severity was afterwards mitigated, and now no person shall have judgment of life or member for breaking prison, unless committed for some capital offence. But to break prison and escape when lawfully committed for any treason or felony still remains felony, as at the common law, and is punishable with penal servitude for not more than seven or less than three years, or imprisonment not exceeding two years. To escape from confinement under sentence or order of penal servitude is punishable by penal servitude for life. To break prison when lawfully confined on some inferior charge is a high misdemeanor, and punishable by fine and imprisonment.

ESCAPEMENT. (*See* HOROLOGY.)

ESCARP, or SCARP, *es-karp'* (Fr. *escarper*, to cut, strip), in Mil., that side of the ditch which forms the lower part of the rampart of a fortress, and which is below the natural level of the ground, or the summit of the glacis on the other side, is called the escarp or scarp. The slope of the escarp depends on the nature of the earth in which the ditch is cut, and the manner in which it is finished, varying from an angle of 45° with the level of the bottom of the ditch, if it consist of the soil only and loose rubble, to one of 80°, if the escarp be revetted with masonry. When the escarp is not revetted, it should be defended by lines of palisades projecting from its surface at right angles. At the present time many engineers make the revetments of the escarp and counterscarp perpendicular.

ESCARPMENT, *es-karp'-ment*, a term applied to the steep and precipitous side of any cliff or hill, formed, in some cases, by the action of water, and in others by the abrupt termination of geological strata. The cliffs above the Giant's Causeway, and the promontory known as the Fair Head, Antrim, afford good examples of natural escarpments. The expression is also applied to rocks and hills that have been cut away by artificial means for military purposes, as in many parts of the rock of Gibraltar, which have been scarped to render them inaccessible to an enemy.

ESCHALLOT, *es-shăl-lot'* or *shăl-lot'* (Fr. *échalote*), *Allium ascalonicum*, a species of small onion or garlic. It is said to have come originally from Palestine.

ESCHAROTICS, *es-kă-rot'-iks* (Gr. *eschara*), the crust of a scar produced by burning substances of a caustic nature which have the power of searing or destroying the flesh. The term is generally applied in Surg. to mild caustics. (*See* CAUTERY, CAUSTIC.)

ESCHEAT, *es-tshcat'* (Nor.-Fr. *eschet* or *echet*, chance or accident), in Law, is defined to be "an obstruction of the course of descent, and a consequent determination of the tenure, by some unforeseen contingency, in which case the land naturally results back, by a kind of reversion, to the original grantor or lord of the fee." Where the tenant of lands in fee dies without having aliened them in his lifetime, or disposed of them by will, and leaves no heir behind him to take them by descent, they escheat to the grantor or lord of the fee. In order to complete this title by escheat, it is necessary that the lord perform an act of his own by entering on the lands and tenements so escheated; on failure of which, or by doing any act that amounts to an implied waiver of his right, as by accepting rent of a stranger who usurps the possession, his title by escheat is barred. The law of escheats is founded upon the principle that none can inherit a person's estate but such as are of his own blood and consanguinity, and that when such blood becomes extinct, the inheritance itself must fail; hence, too, by the feudal system, the tenant, on attainder of treason or felony, not only forfeited his land, but his blood was held to be corrupted or stained, whereby every inheritable quality was entirely blotted out and abolished, so that no land could thereafter be transmitted from him or through him in a course of descent. If a bastard dies intestate and without issue, his lands escheat to the lord of whom they are held; for bastards being regarded as *nullius filii*,—the sons of nobody, are looked upon as having no blood in them, or, at least, no inheritable blood. Escheats are commonly divided into two classes,—*propter defectum sanguinis*,—from deficiency of blood; and *propter delictum tenentis*,—through delinquency of the holder, where, by attainder, the blood of the person attainted is so corrupted as to be rendered no longer inheritable. The attempts of recent legislation have been to modify this law, and now no attainder for felony, except treason or murder, extends to the disinheriting of any heir, or to the prejudice of the right or title of any person other than the right or title of the offender during his natural life.

ESCUTCHEON, *es-kutsh'-un* (Lat. *scutum*, Fr. *écusson*, a shield), in Her., the name given to the shield on which armorial bearings are depicted. The shield may be of any form, but the shape generally adopted is that of a square, a brace with the central point turned outwards, or two lines projecting outwards, and inclined to each other at a very large obtuse angle, being used at the bottom instead of a horizontal line to connect the sides. The armorial bearings of a lady entitled to bear arms, being unmarried, or a widow, are emblazoned on a shield in the form of a lozenge.

ESCUTCHEON OF PRETENCE.—When a man marries an heiress or co-heiress, he places the armorial bearings of his wife's family on a small shield, exactly in the centre of his own coat. This shield is called an escutcheon of pretence, and signifies that the children by such a marriage inherit the coat armour of their mother's family, as well as real property, and are the representatives of that family, as well as that of their father. On the death of the father, the children bear the armorial bearings of their mother's family quarterly with the paternal coat.

ESDRAS, *ez'-drăs*, is the name given to two apocryphal books of the Old Testament. In the list of apocryphal books in the sixth article of the Church of England they are called the third and fourth books of Esdras, Ezra and Nehemiah being sometimes called the first and second books of Esdras or Ezra. The books of Esdras (*i. e.* the third and fourth) never formed any part of the Jewish canon; they were rejected from the canon by the Council of Trent, and are not read in the service of the Church of England. They are commonly supposed to have been originally written in Greek by some Hellenistic Jews, though some imagine that they were first written in Chaldee, and afterwards translated into Greek. It is uncertain when they were composed, though it is generally agreed that the author wrote before the time of Josephus. The First Book of Esdras is chiefly historical, giving an account of the return of the Jews from the Babylonish captivity, the building of the temple, and the establishment of divine worship. It is little more than a recapitulation of the history contained in Ezra. The Second Book of Esdras is written in a prophetic strain, pretending to visions and revelations; some of which bear some resemblance to the Apocalypse; but altogether they are too ridiculous and absurd to cause any doubt as to their unauthenticity. It, however, contains some spirited descriptions, and occasionally rises to great sublimity of thought, being by some compared in style to the Book of Enoch. (*See* EZRA.)

ESPLANADE, *es-plăn-aid'* (Fr.), in Mil., the term applied to the open space that should surround a citadel, and intervene between the main ditch and any *fortifications* that may be thrown up round the town near which the citadel is situated. The esplanade should be about five or six hundred yards in breadth, measuring from the crest of the glacis. This open space of ground is necessary to deprive an enemy of the protection that buildings close to any citadel would afford to his troops while erecting batteries for the purpose of breaching the walls.

ESQUIMAUX DOG, *es'-kwe-mo*.—This animal is rather larger than the English pointer, but appears less, on account of the shortness of its legs. It has oblique eyes, an elongated muzzle, and a bushy tail, which combine to give it a wild and wolfish appearance. Its colour is generally a deep dun, obscurely barred or patched with darker colour. In the northern parts of America and the neighbouring islands, this is the only beast of burden. With a team harnessed to his sledge, the Esquimaux

the snow at a rate of sixty miles a day, and this for several days in succession. The driver has no reins; but he has a long whip, and that answers every purpose, as the old and knowing dogs are always put to the fore, and know their way across the vast blank snow-fields with unerring correctness; and should the "shafters" prove refractory, a few cruel lashes with the reindeer thong quickly bring them to a sense of duty. It is a rule, however, among sledge-drivers to use the whip as seldom as possible; not, it must be confessed, from motives of humanity; but the chastisement of one of the team generally leads to considerable confusion; the dog struck at once fails to biting and mauling his next neighbour, and so the traces become entangled, and a general fight ensues, usually ending in the upsetting of the vehicle and the loss of an hour in getting things in order again.

ESQUIRE, *es-kwire'* (Fr. *écuyer*, a shield-bearer; Lat. *scutifer*).—In the middle ages and the days of chivalry, the esquire was a young gentleman of good family in immediate attendance on a knight, who carried his shield and performed many duties in his capacity, which were not, however, of a menial nature. The esquire first served as a page in the knight's household. When he was old enough, and possessed of sufficient strength and skill to bear arms, the page was promoted to the rank of esquire, and attended the knight at tournaments and in the battle-field. He eventually became a knight himself, after exhibiting such prowess in the field or elsewhere as might entitle him to claim the spurs and other insignia of a knight. In the present day, the title of esquire should give the bearer precedence over gentlemen properly so called, who are entitled to bear coat-armour; but is of no value, owing to its universal assumption by those who have no claim whatever to attach it to their names. The following are those who are properly entitled to this appellation:—The sons of younger sons of dukes and marquises; the younger sons of earls, viscounts, and barons; the eldest sons of these younger sons just mentioned, with those of baronets and knights; officers of the royal household; captains in the army and navy, and all officers above the rank of captain; doctors of law and medicine, barristers, sheriffs of counties, magistrates while in the commission of the peace, and Royal Academicians.—Ref. *English Cyclopædia*,—Arts and Sciences.

ESSAY, *es'-sai* (Fr. *essai*, a trial, an attempt), in Lit., is a name given to a species of composition which is characterised by greater latitude of construction than is allowed in any other species of composition, and it differs from narrative in generally treating of mental or moral qualities. It is defined to be "in general, a short disquisition on some subject of taste, philosophy, or common life." It is thus applied to periodical papers published at different times on subjects of general interest; as morals, criticism, matters of taste, &c. This species of writing may be said to have originated in this country in the beginning of the last century, by the publication by Addison and Steele of the *Tatler*. The *Tatler* was succeeded by the *Spectator*, to which Addison was the chief contributor; and the *Spectator* was followed by the *Rambler* of Dr. Johnson. Numerous works of this class appeared in the latter half of the 18th century; but they have since gone out of fashion.

ESSENES, *es'-seenz* (Gr. *essenoi*), a sect which existed among the Jews during the lifetime of Christ. They are not mentioned in the New Testament, but they are described by Josephus and Philo. The authenticity of the account ascribed to the latter is, however, doubtful, as a work in his name, "De Vitâ Contemplativâ," is proved to have been written by a Christian monk. According to Josephus, the Jews were divided into three sects,—the Pharisees, the Sadducees, and the Essenes. The Sadducees were essentially a political party, and the Essenes were those who carried out the views of the Pharisees to an extent which made them ridiculous in the eyes of the party from which they sprung. Levitical purity hemmed them in with so many restrictions that it soon became necessary for them to live in retired and lonely places. The sect had not a large number of followers, but John the Baptist, and even Christ himself, are considered to have sprung from this division of the Jewish population. They took no part in public affairs, and spent their lives in contemplation. They adopted celibacy, and had no individual property. As matters of belief they held the Scriptures in the highest reverence, interpreting it, however, by an allegorical system of their own: they believed also in the immortality of the soul. Out of Essenism, in the stage of Sabaism, resulted Islamism, in the full development of whose tenets and practices several of the principal rites of the Essenes are preserved.

ESSENTIAL OILS, *es-sen'-shăl* (Lat. *essentialis*), in Chem., a term applied to the odorous principles of plants. They are also called volatile oils, to distinguish them from the fixed oils. Chemically speaking, they are either hydrocarbons or oxidized hydrocarbons, and oils containing sulphur. They are extracted from different parts of plants, some plants yielding two different essential oils. Thus the orange yields two distinct essential oils, one from the flower, the other from the peel of the fruit. They are prepared in different ways, either by enfleurage, by pressure, or by being distilled with water. The principal use of essential oils is in perfumery; but certain of them are used for flavouring, and in medicine. It would be impossible to give even a summary of the almost infinite number of essential oils: if the reader is curious on the subject, he may find a great deal of valuable information respecting them in Piesse's "Art of Perfumery," 3rd edition.

ESSOIGN, *es-soin'* (old Fr. *essonier*, to excuse), in Law, denotes an excuse for him that is summoned to appear and answer to an action, or to perform suit to a court baron, &c., by reason of sickness, infirmity, or other just cause of absence. A party might essoign himself three times by sending a substitute to explain the reason of his non-appearance. Formerly the first return in every term was, properly speaking, the first day in that term, and was usually called the essoign day of the term, as on that day the court sat to take essoigns or excuses for such as did not appear according to the summons of the writ. Essoigns are now rarely resorted to, and are almost unknown in practice.

ESTABLISHED CHURCH, *es-tăb'-lisht* (Fr. *établir*, to fix firmly), is a church established and maintained by a state for teaching religion in a particular form. History shows that in almost all nations an intimate connection has been maintained between religion and the civil government. In Greece, in Rome, among the ancient Druids, or the modern Chinese or Japanese, the same thing is evident; the Church gives its support to the State, and the State gives its protection to the Church. The government established among the ancient Jews was a theocracy, and among the Mohammedans, the Koran may be said to comprise both the civil code and the religious creed of the people. Hence, perhaps, the idea of an established religion is to be sought for in the inner nature of man. The subject, however, is one which has been very much discussed, and on which much diversity of opinion exists. In the New Testament there is nothing laid down on this subject; yet, from the stress that is laid upon respect for civil governments, some have drawn an argument in favour of establishments. In the early ages of Christianity, the Church was a stranger to any alliance with the civil powers; but, subsequently, the connection between the two became very intimate; and to this cause may be attributed most of the errors into which the Church fell. These, at length, became so great and manifest as to lead to the Reformation. When the Protestant states separated from the Church of Rome, each set itself to establish a Protestant church of its own, in conformity with certain prescribed tenets, which were frequently, also, enforced upon others. In England, as well as in other countries, the measures enacted against non-conformity and dissent were very oppressive; but these have, from time to time, been abolished, and now dissenters, in this country, may be said to enjoy nearly all the privileges that are compatible with an established church. (*See* DISSENTERS.) The great objection to an establishment arises from its tendency to suppress freedom of opinion, and to prescribe in what man's conscience ought to be the sole guide. In some of the continental countries this is attempted to be remedied by the State granting en-

documents to all of the more important of the Christian sects. In favour of church establishments is alleged the necessity that there is for a state to preserve and communicate religious knowledge. It is argued that the knowledge and profession of Christianity cannot be upheld without a clergy; that a clergy cannot be supported without a legal provision; and that a legal provision for the clergy cannot be constituted without the preference of one sect of Christians to the rest. The endowments of the established church in this country are not strictly derived from the State, which, indeed, has rather robbed than enriched it, but were chiefly bestowed by individual liberality to the Church in early times, and were transferred to the Anglo-Catholic Church at the time of the Reformation, though the right of appropriating them to one particular sect, when there are so many others, may be questioned.

**Estate**, *es-tait'* (Fr. *état*, Lat. *status*), in Law, is that title or interest which a man has in lands, tenements, or hereditaments, and is the condition or circumstance in which an owner stands with regard to his property. The leading distinction to which estates are subject is that of legal and equitable, the first being properly cognizable in the courts of common law, though noticed also in those of equity, and the second being properly cognizable only in the latter courts. A legal estate is usually considered in a threefold point of view: (1) With regard to the quantity of interest which the tenant has in the tenement; (2) with regard to the time at which that quantity of interest is to be enjoyed; and (3) with regard to the number and connection of the tenants. As to quantity of interest, estates are either freehold or less than freehold. Freehold estates, again, are divided into freeholds of inheritance and freeholds not of inheritance. Of estates less than freehold there are three kinds: (1) Estates for years; (2) estates at will; and (3) estates by sufferance. Besides these several divisions of estates in point of interest, there are what are called estates upon condition,—those whose existence depends upon the happening or not happening of some uncertain event. They are of two kinds,—estates upon conditions implied, and estates upon conditions expressed. As regards the time of their enjoyment, estates are either in possession or in expectancy. Of expectancies, there are at common law two sorts,—one called a reversion, the other a remainder. With reference to the number of persons entitled to the enjoyment, estates may be in severalty, joint tenancy, coparcenary, common, entireties.

**Estates of the Realm.**—The three estates of the realm are the three branches of the legislature,—the lords spiritual, the lords temporal, and the commons.

**Esther, Book of**, *es'-ther*, is one of the historical books of the Old Testament, placed after that of Nehemiah. It contains the history of a Jewish maiden, by name Esther, who became the wife of the Persian king Ahasuerus. As to the authorship of the book, nothing is with certainty known, nor are there any data on which to form a reasonable conjecture. By some it has been ascribed to Mordecai, by others to Ezra, or the high priest Joachim; but, in any case, it appears to have been written soon after the events which it narrates had taken place; and it has this peculiarity, that the name of God does not once occur in the whole book. The difficulties regarding the authenticity of this book have been much exaggerated. It has always been received as canonical by the Jews, and regarded as one of the most precious portions of their sacred scriptures. Some difference of opinion exists as to what Persian monarch is referred to under the name of Ahasuerus; but the probability seems to be in favour of Xerxes. The entire narrative corresponds with what we know of the manners and customs of the Persian court, and of oriental cruelty; while the origin of the feast of Purim shows very clearly that the occasion thereunto must have occurred in Jewish history. In the Septuagint there are a number of additions and details in this book, which Jerome, in the Vulgate, placed at the end of the book, and Luther in the Apocrypha. That these additions are spurious there can be little doubt.

**Estoppel**, *es-top'-pel* (Fr. *estoupir*)? in Law, is an impediment or bar of action arising from a man's own act. Estoppels are of three kinds:—(1) By matter





of record, as where a judgment has been given in a court of record, the parties to the suit are estopped from afterwards alleging matters which would be contradictory to the record; (2) by deed or matter of writing, no person being allowed to dispute his own solemn deed, which is therefore conclusive against him and those claiming under him, even as to the facts recited in it; and (3) by matter *in pais* (in the country), that is, by transactions between the parties not evidenced by record or writing; as livery, entry, &c. The principle of estoppel is, that what a man has once solemnly alleged, he should not be afterwards suffered to contradict.

**Estovers**, *es-to'-verz* (Fr. *estoffer*, to furnish), in Law, is the liberty which the owner of an estate for life or a tenant for years has of taking a necessary supply of wood from the estate for the use or furniture of his house or farm. The Saxon word *bote* is used in the same sense; and therefore house-bote is a sufficient allowance of wood to repair or to burn in the house; plough and cart bote are for making and repairing instruments of husbandry; and hay or hedge bote is for repairing hays or hedges. These botes must be reasonable, and if a tenant takes more than is needful for these purposes, he may be punished for waste.

**Estrays**, *es-trais'* (Nor. *estrayer*), in Law, are such valuable tame animals as are found wandering in any manor or lordship, the owner of them being unknown. The law gives them to the king, as general owner of the soil; but they are most commonly given by special grant from the crown to the lord of the manor. In order to become absolute property, they must be proclaimed in the parish church and two market-towns next adjoining to the place where they were found; and if not claimed within a year and a day, they belong to the king or his substitute.

**Estreat**, *es-treet'* (Lat. *extractum*), is a true copy or note of some original writing or record, and especially of fines or amercements, entered on the rolls of a court to be levied by a bailiff or other officer. When recognizances are taken, as for appearance to prosecute or give evidence in cases of felony or misdemeanor, and if the condition of such recognizances be broken, the recognizance becomes forfeited; and being estreated, or extracted, and sent up to the Exchequer, the party and his sureties, having now become the king's absolute debtors, are sued for the several sums in which they are respectively bound. The barons of the Exchequer have power to discharge, mitigate, or compound estreated recognizances and forfeitures, except such as are incurred before justices of the peace.

**Estuary**, *es'-tu-ə-re* (Lat. *æstuarium*), is a term in Geog. which was originally applied to any bay, creek, frith, or arm of the sea, in which the tide ebbed and flowed (Pliny, Epist. lib. 9, ep. 33); it is now used, however, to denominate those parts of river channels which are contiguous to the sea or ocean in which the water is salt or brackish. For the term *estuary* to be rightly applied, the ebb and flow of the tide must be distinctly perceptible, and there must be little or no current. In the British isles the estuary of the Humber is the largest.

**Etærio**, *e-tæ'-re-o* (Gr. *etaireia*, *society*), in Bot., a kind of fruit, examples of which are afforded by the strawberry, ranunculus, and Adonis. When the schæna (*see* Achænium) borne by a single flower are so numerous that they form more than a single whorl or series, they constitute collectively an etærio. In the ranunculus and Adonis, the schænia are placed on a convex thalamus of a dry nature; in the strawberry they are placed upon a fleshy thalamus. The so-called seeds of the strawberry are in reality so many separate schænia; while the part to which the strawberry owes its value as a fruit is merely the succulent thalamus. In the fruit of the rose, the schænia, instead of being placed on an elevated thalamus, are situated upon a concave one, to which the calyx is attached. This modification of the ordinary etærio is regarded by some as a distinct fruit by some botanists, who have distinguished it by the name of *Cynarrhodium*. In the raspberry and blackberry, a kind of etærio is formed of a number of little drupes or drupels, crowded together upon a dry thalamus.

**Et cætera**, *et-set'-a-rə*, a Latin phrase, which the

become thoroughly Anglicised. It is usually written *&c.*, and means *and so on, and so forth*. As an abbreviation it is of great use in writing.

ETCHING. (*See* ENGRAVING and ELECTRO-ETCHING.)

ETCHING UPON GLASS. (*See* GLASS.)

ETERNITY, *e-ter'-ne-te* (Lat. *æternitas*), an attribute of the Deity, the existence of whom, according to the true principles of religion, is without beginning or end. It is a negative idea clothed with a positive name. To whatever it is applied, it supposes a present existence, and it is the negation or denial of any beginning or end to that self-same state of existence. As applied to the Deity, it has not been controverted by those who acknowledge a deity at all. On the common basis of argumentative philosophy, there never could have been a time when nothing ever existed, as assuredly that state of nothing impalpable must necessarily have continued up to the present time. In strictness, however, we have nothing to do with duration prior to that of the visible world; it is sufficient for us to know that the contriver existed before his handiwork. Eternity being infinite, is inconceivable by our finite understandings; at the same time, we cannot imagine an infinite being to exist without it. There is a distinction made between an *anterior* and a *posterior* eternity; the latter belongs to beings whom God proposes to preserve for ever, the former to himself alone. —*Ref.* Paley's *Natural Theology*.

ETHAL, *e'-thil* (formed from the first syllables of ether and alcohol), in Chem.—When spermaceti is saponified, it yields ethal instead of glycerine, as is the case with the ordinary fats. It is a white solid, fusible at 118° Fahr., and soluble in alcohol, crystallizing in plates as it cools. It possesses the constitution and properties of a true alcohol, and stands in the same relation to palmitic acid that ordinary vinous alcohol does to acetic acid.

ETHER, *e-ther* (Lat. *æther*), in Chem.—Ether is used as a generic term to denote a series of organic bodies having the general formula $H_{n+1}(C_nH_{n+1})O$. They are looked upon as being derived from corresponding alcohols by the abstraction of one equivalent of water; or, in other words, they are regarded as the oxide of a radicle represented by the formula within the brackets, of which their alcohols are the hydrated oxides. This theory has undergone a modification of late years, the followers of Gerhardt laying it down as a principle that the equivalent of an ether when existing alone is double, and that its compounds are formed by substitution. There are strong reasons in support of this theory, as will be seen when we consider the double and compound ethers. Ethers are subdivided into,—1. *Simple ethers*, of which ordinary *vinous ether* may be taken as a type ($C_2H_5O$); 2. *the double ethers*, which consist of two equivalents of different ethers united, as the *methyl-ethylic ether* ($C_2H_5O, C_4H_3O$); and the compound ethers, which contain an equivalent of an ether united to an equivalent of an acid or halogen, and correspond to salts; thus nitric ether is $C_2H_5O,NO_2$; hydrochloric ether, $C_2H_5Cl$. From the formulæ given of the double and compound ethers, it will be seen that they may be considered as double atoms of the original ether, in which one atom is replaced by another ether in one case, and by an anhydrous acid or a halogen in the other. In common parlance, ether is generally taken to mean the ordinary sulphuric ether, as it is improperly termed, from being obtained from alcohol by the action of sulphuric acid. Pure ether is an extremely limpid, colourless, transparent fluid, very volatile, and refracting light with great power. Its odour is peculiarly powerful and penetrating if inhaled; at first producing exhilaration, and afterwards stimulating effects, followed by insensibility to pain. Its use as an anæsthetic has been superseded by chloroform. It has a specific gravity of 0·724 at 55° Fahr., and boils at 94·3° Fahr. It is used for producing cold artificially by rapid evaporation. Its vapour is extremely dense, sinking heavily in air; great care should therefore be taken not to pour it out with a flame below it; otherwise an explosion of a dangerous character might ensue. Mixed with certain proportions of air, it forms a highly-explosive compound. It dissolves readily in alcohol, but very sparingly in water. It is much used in medicine; but its principal commercial application is as a solvent for pyroxylin in the manufacture of collodion. In analysis it is used as a solvent for fats. Ether was formerly prepared by mixing two parts of alcohol and one of sulphuric acid, and heating the mixture in a retort until it began to blacken; a quantity of alcohol, equal to half that used, was added to the mixture, and the distillation continued as long as the ether distilled over. The process of Boullay, or the continuous process, as it is termed, is now generally used. Equal measures of alcohol and sulphuric acid are heated in a capacious retort, which is connected with a reservoir of alcohol in such a manner that, as fast as the ether distils off, a corresponding amount of alcohol makes up the deficiency. The process is continued until thirty times the original amount of alcohol is used, the sulphuric acid acting over and over again as the agent by which an equivalent of water is abstracted from an equivalent of alcohol. (*See* ETHERIFICATION.)

ETHERIFICATION, *e-ther-if-e-kai'-shun*, in Chem.—The process by which the same amount of sulphuric acid serves continuously for the abstraction of an equivalent of water from an almost indefinite number of equivalents of alcohol, has been much discussed amongst chemists. Numerous researches have been made on the subject by Liebig, Mitscherlich, Graham, and others, and the general explanation arrived at is that the sulphuric acid unites with the alcohol to form sulphethylic acid and water. The sulphethylic acid then splits up into ether, which distils over, and sulphuric acid, which again unites with the alcohol to form a second portion of sulphethylic acid, which is in its turn decomposed. The great difficulty in admitting this view arises from the circumstance that sulphethylic acid should be first formed and then immediately decomposed, under precisely similar circumstances of temperature. Mitscherlich and Graham consider that the sulphuric acid acts in a catalytic manner, simply inducing composition in other bodies by its pressure, somewhat in the manner of a ferment.—For a fuller discussion of this very interesting subject, the reader is referred to Miller's "Elements of Chemistry," vol. iii. 3rd edition.

ETHICS, *eth'-iks* (Gr. *ethica*, from *ethos*; Lat. *mos*, *mores*, manners, or moral conduct), signifies, strictly, both in ancient and in modern speech, the doctrine of morals. This branch of knowledge has been divided by modern writers into two parts, the one comprehending the *theory* of moral science, and the other its *practical* doctrines. On the former side the first part investigates that principle of our constitution by which we are led to form the notion of moral distinctions; and on the latter side it inquires into the proper object of moral approbation. In other words, this science endeavours to give an answer to the question,—Is it by the same faculty that perceives the existence of truth and falsehood in other departments of knowledge, or by a peculiar power of moral perception, which is pleased with one set of qualities and displeased with another, on which the peculiar obligation of moral conduct is founded? What is the common quality or qualities, in short, belonging to all the different forms of virtue? Is it benevolence,—is it sympathy,—is it a rational self-love? Thus the scope of the one question is to ascertain the origin of our moral ideas; that of the other to refer the various moral phenomena to their most simple and general laws. Again, the practical doctrines of morality comprehend the rules formed to direct human conduct, and the best means of compassing this general end. These two questions, when properly treated, seem to exhaust the entire theory of morals. Ethics, then, is a word which shall be employed in the succeeding article as altogether synonymous with moral philosophy. One of its best and latest German expounders observes, "The best name for this science is Ethic, or doctrine of morals, as is clear from the relation of this word to the three fundamental conceptions of morals,—law or duty, virtue, and chief good." Ethics, or morals, has properly to do with action rather than with thought; and hence the name of the *active powers* that Reid and Stewart have employed in their works to designate this tract of inquiry. Not that action belongs exclusively to morals and not also to the intellectual faculties; but that it belongs more

obtrusively and overtly to this department than it does to the other. Action in general is twofold: it is either instinctive and constitutional, as hunger, thirst, and the love of sex; or it is voluntary and designed, as when men pursue a course of ambition, or spend a long life in the endeavour to master some department of knowledge. Of those two lines of action, one is necessary, compulsory, and absolute while it lasts; while the other is contingent, voluntary, and relative. I may resist the strong urgings of ambition or of glory; but I cannot resist the demands of hunger. It is at the choice of Napoleon whether he leave Elba or no, although it is quite necessary that he should have his breakfast on that inauspicious morning. It thus appears, that while the one class of actions is necessary to our existence, the other is by no means necessary; and many persons would be all the happier to resist those urgent longings which besiege their wills and often carry them captive. Another consequence follows from this consideration, which it is all-important to note on the present occasion,—that it depends altogether on whether the will of man be consciously free, as to whether his acts can carry with them any moral responsibility. If a stone accidentally falls on my head and materially injures me, I do not blame the stone, I simply lay the charge on my own evil fortune. If I am bitten severely by my neighbour's dog, I may pronounce the dog dangerous to the lieges, I cannot hold him guilty of assault. But if I am knocked down and robbed by a ruffian in the next lane, I shall use all my endeavour to have him up before the magistrate and punished; for unless he be an imbecile or a madman, he cannot set up a plea of moral incompetence, which everybody would urge in favour of the previous cases. Nor am I responsible for an act performed by me while I was under moral or physical compulsion; for by being so constrained, my will, my voluntary guiding power, is deprived of its accustomed freedom, and I am no longer at liberty to act as I please. It hence appears that for all practical moral purposes, the will must be consciously free, otherwise there can be no responsibility. (*See* FREEDOM and NECESSITY.) And not only so; the other faculties, which always go to aid the moral judgment in pronouncing its awards, must be in a normally healthy condition, otherwise no moral blame is attachable to a vicious act more than to a virtuous one. Were our law courts capable of publicly recognizing the more delicate shades of character and of guilt that frequently come before them for judgment, and were human nature better able to appreciate the finer traits and more delicate lineaments of men's dispositions, there can be little doubt that our civil and criminal codes would experience an entire modification of their peculiar rigour against peculiar offences and crimes often committed with but little moral cogitation and with but little moral guilt. For how often are men's passions strong where their moral perception is not of the highest! And when malevolent emotions become heated, do they not blind men's minds to every other consideration but what this wicked passion points them to? Then the history of the growth and formation of human character is nearly a *terra incognita*, and such should always be taken into account in anything approaching a perfect code of moral, or even of criminal law. Whatever is calculated to shake or to confirm the will in its moral endeavours, is calculated to shake or to confirm the comparative perfection of the moral character. With the view, accordingly, of ascertaining and of classifying the various sources of our activity, various ethical inquirers have analyzed our various propensities into nearly the following principles:—1. There are our *appetites* of hunger, thirst, and sex, which take their rise from the body, and which ally us with the brutes. To those natural appetites belong the acquired ones; such as the liking for tobacco and other narcotics, and for intoxicating drinks. All stimulants are of this class.—2. There are the *desires*, which may be conveniently distributed into the desire for knowledge (curiosity), the desire of society, the desire of esteem, the desire of power (ambition), the desire of superiority (emulation). Then there are the acquired desires, or, as Dr. Hutcheson termed them, "secondary desires;" such as the





desire for wealth, for dress, for equipage, for retinue, and for furniture, which are all readily explainable on the principle of association.—3. Then there are the *affections*, or those active principles whose direct and ultimate object is the communication of pleasure or of pain to any of our fellow-creatures. These are distinguished, according to their tendency, into benevolent and malevolent affections. To the former class belong the parental and the filial emotions,—those of kindness, love, friendship, patriotism, universal benevolence, pity, gratitude, &c. It is to be remarked, regarding those affections, that this classification is simply offered from its convenience, not from its being exhaustive. There is one peculiarity observable with respect to these emotions, that, accompanied as they all are with exquisite pleasure, they have, nevertheless, nothing selfish in their origin. This has been fully demonstrated by many writers. It is a remark of Bishop Butler, that the final cause of so much agreeable emotion connected with the exercise of benevolence is in all likelihood, meant to induce us to cultivate with peculiar care a class of our active principles so immediately subservient to the happiness of human society. Our malevolent passions, or affections, are usually distributed into hatred, jealousy, envy, revenge, and some kinds of resentment. As the former class of affections are always accompanied with pleasant emotions, so the malevolent ones are invariably attended by disagreeable ones. It is obvious from this, that the latter are only to be used with a great degree of caution, and on no occasion in greater intensity than the urgent necessities of the case demand. They are like those poisonous cures that are sometimes administered to us to restore our frames to their accustomed health. If the prescribed dose be overstepped, the chances are that we must atone for our rashness with our lives. Such would be the constitution of man, were no inheritance of reason or of conscience to fall to his share. Reason, however, renders the nature of man altogether different from what it would otherwise be. It is by this faculty, in its multifarious forms, that man is capable of availing himself fully of his past experience in avoiding those temporary pleasures that he knows will be succeeded by a corresponding suffering, and in submitting to those lesser ills of life which he knows will ultimately minister to a greater accession of good. In a word, he can form that more enlarged and liberal idea of happiness with which every cultivated man is acquainted, and he can deliberate about the best means of attaining to this wished-for goal. It is impossible to pronounce the word happiness in the hearing of any man without at the same time enkindling in his mind various ideas, more or less attainable, of an exceedingly desirable object.—4. *Self-love*, accordingly, or that species of desire which longs for personal happiness as an end in itself, is a rational principle of our nature, altogether legitimate and praiseworthy when kept in its own place. The pursuit of one's interest in an enlightened way is perfectly lawful as an ethical end; it only becomes unlawful when, by its excess, it shuts out that essentially higher principle which men have variously termed the moral faculty, the moral sense, the conscience. Self-interest, or self-love, differs from selfishness, which always indicates a peculiarly low and vulgar state of character, which is only content with the perpetual gratification of a morbid sensuality. This enlightened regard to our own interest was, by many of the ancient philosophers, regarded as the whole of virtue, and they thought they had accomplished the duties of sages when they had laid down rules, of more or less particularity, for the attainment of this "supreme good," this *summum bonum*. Nor is it to be wondered at, that they placed the whole of virtue in this prudential self-regard; for the two principles—that of self-interest and of the moral faculty—lead to nearly the same course of action in practical life. That the principles are not identical,—on the contrary are radically and abidingly distinct, may be established from a variety of considerations. It is from experience that we learn the connection of virtue and happiness; and hence virtue, the cause, must certainly precede the existence of holiness, as the effect. The emotions which accompany the two principles differ both in degree and in kind. This may be readily established by any one at all acquainted

with what takes place in our public theatres. The audience here, from the enthusiasm of their combined judgment, impress one more forcibly than any amount of individual talking. And accordingly, the slightest thread of pure morality which the dramatist contrives to weave into his piece, at certain stages of the action, raises the passions of the crowd into transports, and forces tears from grave, sensible men. In all languages, the words employed to denote the ideas of duty and of interest are distinct. The *to kalon* and the *kathekon* of the Greeks, and the *honestum* and *utile* of the Latins, express exactly what we mean when we speak of duty and of interest. A similar conclusion likewise finds countenance in the early period at which our moral judgments make their appearance, it being always a considerable while before it is possible that we should be capable of forming the general notion of our own happiness. To escape the force of some of the foregoing arguments, it has been alleged that this notion of right and wrong, as a separate existence in human nature, was first of all discovered by philosophers and politicians, and the influence of education has effected the rest on the growing mind of the race. Now education is no doubt a powerful instrument; but there is no example on record that can be pointed to to illustrate the case of a new creation being implanted in men's minds by means of this potent organon of culture. No doubt sufficient allowance must be made for the different circumstances of mankind in different periods of society, and for the diversity of their speculative opinions, as well as for the different moral significance of the same action, performed under different systems of external behaviour. But while education may, and does, in this way modify in important respects the moral sentiments of mankind, as well as their opinions regarding the beautiful and the sublime, we would be far from maintaining that it can effect such wonders as to create our notions of right and wrong, or our æsthetical ideas. Now, last there should still linger in some men's minds a hesitation to accept of this ethical principle as contrasted with self-regard, we beg to refer to a very weighty sentence of Bishop Butler's on the subject, as calculated, so far as any historical authority can be so, to carry persuasion to the most wavering mind. This singularly able moralist says, in his second dissertation on "the Nature of Virtue," "For as much as it has been disputed wherein virtue consists, or whatever ground for doubt there may be about particulars, yet in general there is in reality a universally acknowledged standard of it. It is that which all ages and all countries have made profession of in public,—it is that which every man you meet puts on the show of,—it is that which the primary and fundamental laws of all civil constitutions over the face of the earth make it their business and endeavour to enforce the practice of upon mankind; namely, justice, veracity, and regard to common good." Having now vindicated the fact of moral perception as an essential part of the human constitution, the next question that demands our attention is the foundation and the formation of this distinction. One class of moral theorists leans to the emotional or subjective view of the origin of our ethical judgments, another class patronizes the intellectual or objective view, while a third class is of opinion that moral laws owe their origin entirely to theocratic legislation. As this distinction cannot be entered on here, some account will be found in the article Conscience of the different opinions maintained respecting the origin of the moral faculty by the chief writers who have treated of this question throughout the history of the world. In analyzing the state of our own minds when we are spectators of the good or bad actions performed by others, or even when we reflect on our own minds when we do some commendable action or are guilty of some reprehensible one, are we not conscious of the following things?—1. The appreciation of a certain rightness in actions. 2. A feeling of satisfaction, or the opposite, varying in degree according to the delicacy of our moral sensibility. 3. The appreciation of the merit or demerit of the agent. 4. The idea of moral obligation, as binding on all men. A word or two on this fourfold analysis in detail. 1. Granting that this rightness is appreciated by man-kind on viewing a moral action, is it as a sensation, as





a feeling, or as a judgment, that this fact of ethical appreciation is experienced, or is it something different from all these? While many wise and great men have argued on all of these sides, it becomes a moralist of the present day to proceed with caution. The truth is, that the act is somewhat Protean in its complexion. Now that one looks at it through hard, metallic intellectual glasses, the phenomenon turns up as determined an outline as a sum in arithmetic could; again that we view it through the somewhat hazy medium of emotion, it looms as large and palpable as the renowned "bogle" of the Brocken. And if a half sceptical and rather clumsy analyst takes the fact between his fingers, the chances are that, like the sand on the sea-shore, it will crumble through insensibly, and leave nothing behind. Still, the fact of the rightness and wrongness of actions remains to be accounted for; and unless we make the faculty an indistinguishable compound of reason and feeling, it is hard to say what other equally unobjectionable analysis of it can be offered.—2. Of the emotions excited by the contemplation of moral beauty and deformity, some are necessarily pleasurable, others are necessarily painful. Those qualities in good actions which excite agreeable emotions in the observer, form what some moralists are inclined to call the beauty of virtue, and the opposite things, as the deformity of vice. The emotions thus arising from the observation of moral beauty and of moral deformity are so much more exquisite in their agreeableness, as well as more harrowing in the pain they bring with them, than any that arise from the perception of material forms, that the Socratic school used to aver that the literal signification of the words beauty and sublimity arose primarily from the perception of the qualities of mind. (*See* Beauty.)—3. When a virtuous action has been performed in our presence, we cannot check our benevolent affections from going forth in its behalf; and if we attempt to do it, it is most likely to be at the expense of our own peace of mind. When, again, we witness an act of cruelty, of selfishness, of oppression, of deception, of cunning, we are inspired by a feeling of extreme hostility toward the delinquent, and can hardly restrain our indignation from breaking forth against him. In our own particular case, if we can occasionally approve of our conduct to the extent of looking forward with confidence to the approbation of a higher tribunal, the sense of ill-desert, on the other hand, is usually so absorbing as often almost to destroy this just anticipation of future reward in us. While our sense of the merit and demerit of actions must impress us anew with a sense of the intimate connection between virtue and happiness, yet we are not to suppose that always, when we have done well, prosperity will attend us as a matter of course. It takes a man of sense, nay of wisdom, to acquiesce calmly in the lot that Providence, in its inscrutable ways, has assigned to him. It is a vulgar error to expect that good or evil fortune always accompanies, in special instances, good and evil actions. Suffice it to say, that the just man, the benevolent man, the courageous man, the temperate man, deserves to succeed; and he shall do so, if he can afford to wait on the slow fulfilment of nature's laws. Virtue is, after all, the shortest road to happiness.—4. According to some, the idea of moral obligation or of duty is founded entirely on the conviction that the practice of virtue is enjoined by an express command of the Deity. But if this supposition were true, all men would reason in a circle; duty would be resolved into our idea of religion, and our idea of religion into our idea of duty. On the other hand, we would require, according to this system, to make our idea of virtue a mere matter of prudence, which would lead us to curious enough conclusions; it would induce us to hold that the denial of a future state absolves from all moral obligation, and that a being independently and completely happy can have no moral attributes, and, of course, no moral perception. The notions of reward and punishment necessarily imply the ideas of right and wrong. In truth, the strongest argument for a future state is deduced from our natural notions of right and wrong, as compared with the general idea of the course of human affairs. It seems strange, accordingly, to inquire why men are bound to practise virtue; the very notion of merit and demerit, of virtue abstractly considered,

implies, in the last resource, the idea of human duty. As Butler says, it is the violation of a known obligation that renders man obnoxious to punishment, it is not his foreknowledge of the certainty of that punishment. We accordingly conclude that the moral faculty is essentially different from all other powers of the mind; and while the slightest violation of its authority fills us with remorse, the greater our sacrifices in its behalf fill us with unspeakable satisfaction and triumph. Human duties are ordinarily divided into those relating to the Deity, to ourselves, and to others. Respecting the first, *see* NATURAL THEOLOGY. — *Ref.* Butler's *Sermons;* Sir James Mackintosh's *Ethical Dissertation;* Reid's *Active Powers;* Stewart's *Active and Moral Powers;* Dr. Thos. Brown's *Lectures on the Philosophy of the Human Mind;* Kant's *Metaphysic of Ethic;* Fichte's *Destination of Man;* Dorner's article "Ethic," in Herzog's *Encyclopædia;* Cousin's *Lectures on the Scottish School;* Jouffroy's *Ethics,* &c.

ETHIONIC ACID, *e-thi-on'-ik,* in Chem.—When olefiant gas is combined with anhydrous sulphuric acid, white milky crystals of ethionic anhydride are formed, which speedily deliquesce in the air, giving rise to ethionic acid.

ETHIOP'S MINERAL, *e'-thi-ops,* in Chem. ($H_2S$), subsulphide of mercury. It is obtained as a black powder by transmitting a current of sulphuretted hydrogen through a solution of a mercurial subsalt, or by triturating 18 parts of moist sulphur with 200 of mercury.

ETHMOID BONE, *eth'-moid* (Gr. *ethmoides,* from *ethmos,* a sieve, and *eidos,* form, because it is perforated like a sieve), in Anat., is one of the bones of the head, which is exceedingly light and spongy, consisting of many convoluted plates, which form a network like a honeycomb. It is somewhat cubical in form, and is situated between the two orbitary processes of the frontal bone, at the root of the nose. The olfactory nerves shoot down through the numerous small perforations of this bone to the organ of smell.

ETHNOGRAPHY, *eth-nog'-rä-fe* (Gr. *ethnos,* a nation, and *graphe,* description), is that science which treats of the manners, customs, religion, forms of government, and other peculiarities of different nations, and which is commonly regarded and treated as a branch of general geography.

ETHNOLOGY, *ith-nol'-o-je* (Gr. *ethnos,* nation, and *logos,* discourse), is that science which treats of the varieties of the human race, their history and distribution, their languages, physical and mental characteristics; arranging and classifying them, noting their points of similarity or dissemblance, and having in view the difficult problem of the unity or non-unity of the human race. "The chief ethnological problems," says Dr. Latham, "generally expressed, are those of (1) the unity or non-unity, (2) the geographical origin or origins, (3) the antiquity, and (4) the futurity of mankind,—questions all closely connected with each other, and all mutually illustrative of each other; questions to which the phenomena of classification and the several ethnological methods are subordinate." Ethnology differs from anthropology in that the latter deals with the relations of man to the other members of the animal kingdom, whereas the former regards the differences that exist among the different varieties of the human race. The latter requires only a single pair for its study, the former presupposes variety of races; and the greater the variety the further its boundaries extend. It partakes of history, but, unlike ordinary history, which deals with actions, it treats of the effects of physical agencies upon man,—soil, climate, nutrition, and the like; going back to a period long anterior to the existence of written records, and, unlike history, arguing from effects to causes, from the known to the unknown. In this way ethnology is, as Prichard says, the general archæology of the human race. Language, too, forms an important element in the study of ethnology, as well as physical geography, which teaches the relations that subsist between the inhabitants of a given area, and its physical configuration, climate, &c. The ethnologist should thus not only be a naturalist, but should also have a knowledge of archæology, or the study of human monuments and remains; philology, or the science of languages; and physical geography, so far as it relates to the effects of physical influences upon different races. The science of ethnology is of very recent origin, and is still in a very imperfect state. On the great question of the unity or diversity of the race, ethnologists are divided into two great schools. Of the one the representatives may be said to be Prichard and Latham, in England; of the other, Morton and Agassiz, in America. Peter Camper, a distinguished Dutch anatomist of the last century, was the first who attempted to lay down on scientific principles a method of distinguishing between the different races of mankind, from the form and size of the skull, by what is known as the facial angle. The head being viewed in profile, a line is drawn through the *meatus auditorius* of the ear to the base of the nose, meeting another touching the most prominent part of the centre of the forehead, and falling down to the most advanced portion of the upper jaw. The nearer the angle thus formed approaches a right angle the greater, as a general rule, is the intellectual development of the individual; and this is found to be generally the case, not only as regards man, but also among the lower animals,—the smaller the facial angle the lower are they in the scale of intelligence. One great objection to this method was its taking into account only one feature of the skull; to remedy this, Blumenbach fixed upon a number of characteristic peculiarities; and to him we owe the division of mankind into the five following classes:—(1) the Caucasian, (2) Mongolian, (3) Ethiopian, (4) American, (5) Malay. Cuvier reduced the five classes of Blumenbach to three,—the Caucasian, Mongolian, and Ethiopian, treating the Malay and American as subdivisions of the Mongolian. He referred the original seats of the human race to the mountain-chains,—the Caucasian to Mount Caucasus, the Mongolian to the Altai mountains, and the Negro to the chain of the Atlas. Dr. Prichard, who was the first that brought to the study of this subject a large knowledge of languages as well as of physiology, regards the banks of the great rivers, and not the mountains, as the primary seats of the different races. "The cradles, or nurseries, of the first nations," he says, "seem to have been extensive plains or valleys, traversed by navigable channels and irrigated by perennial and fertilizing streams. Three such regions were the scenes of the earliest civilization of the human race." "In one of these the Semitic or Syro-Arabian nations exchanged the simple habits of wandering shepherds for the splendour and luxury of Nineveh and Babylon. In a second the Indo-European or Japetic people brought to perfection the most elaborate of human dialects, destined to become in after-times, and under different modifications, the mother tongue of the nations of Europe. In a third, the land of Ham, watered by the Nile, were invented hieroglyphical literature and the arts, in which Egypt far surpassed all the rest of the world in the earlier ages of history." These three divisions do not correspond to the three indicated by the form of the skull, which he makes the savage or hunting tribes, the nomadic or wandering pastoral races, and the civilized and intellectually cultivated portions of the human family. In the first of these the prevailing form of the head is what he calls *prignathous,* denoting a prolongation or extension forward of the jaws; the second have broad and lozenge-formed faces, and what he terms pyramidal skulls. Among the civilized races the characteristic form of the skull is oval or elliptical. Though these two modes of division do not correspond, and we find in all the three classes of the former the heads in general of an oval or elliptico-spherical form, which characterize those whose faculties have been developed by civilization; "yet there are not wanting marks of some relationship between the Egyptians and the nations of central Africa, and between the Indo-Europeans and the northern Asiatics." "The Egyptian language, also, in the great leading principles of its grammatical construction, bears much greater analogy to the idioms of Africa than to those prevalent among the people of other regions. On the other hand, the languages of the northern Asiatics bear many tokens of relationship, though they may be admitted to be remote ones, to the idioms of the Indo-European race." The arrangement which he adopts is,—(1) The Syro-Arabian or Semitic race (including the Syrians, Jews, and Arabs), which celebrated

French anatomist regarded as the model of perfection, and at the same time the prototype of the human family. This race is intellectual, energetic, and restless. The second group are the Egyptians or Hamitic race, which he regards as indolent and superstitious, reposing over in luxurious ease and wealth on their own rich soil. The third group is the Indo-European, Japetic, or Arian race, comprising the Hindoos, Persians, Afghans, Koords, Armenians, and the nations of Europe, with their American colonies. "The physical differences between all these nations, though considerable, are not greater than most persons will think sufficiently explained by reference to climate and to diversity of food and of manners." The great central region of High Asia is inhabited by five nomadic races, belonging to the Mongolian division of authors, and characterized by pyramidal heads and broad faces. These are—(1) the Ugrian, in the N.W., from whom the Magyars are believed to have descended, and of which the Finns, Laps, Ostaks of the Obi, and other Siberian tribes, are varieties; (2) the Turkish, with their nomadic tribes, and the Ottoman branch; (3) the Mongolian, including the Calmucks; (4) the Tungusian, in the mountainous region between Lake Baikal and the river Okhotsk; (5) and the Bhotiya race (often termed Tartars), inhabiting a great part of Thibet and the Himalayan chain. Beyond the central region occupied by the five nomadic races are various tribes of people, spread over the lower countries of northern Asia, and over the cold plains which are traversed by the Siberian rivers and border of the Icy Sea. They belong to the same great division of mankind as the Tartars, whom they resemble in some of their leading characteristics, particularly in the form of the skull. He terms them Ichthyophagi or fishing tribes. To the same type of the human species as the nations of High Asia belong the Chinese, Koreans, Japanese, the races of the Indo-Chinese peninsula, and the aborigines of India, distinct from the Hindoos (who belong to the Indo-European stock). He believed that in the regions afterwards occupied by the Indo-European and Syro-Arabian races there existed a more ancient stock of inhabitants, also of eastern origin, but who had migrated westward at an earlier date, and to whom he gives the name of Allophylians. These, when displaced by the invaders, took refuge in the mountainous parts; and to them belong the Caucasians, the Iberians of the Pyrenees, the Berbers of the Atlas chain, and the Guanches of the Canary islands. Of the black races of the interior of Africa, the principal are the Senegambian, including the Mandingoes and the Foolahs. The true negro characters are most strongly marked on that portion of the coast which encircles the projecting region of Western Africa to the inmost angle of the Bight of Benin, the centre of the slave trade. The Hottentots and Bushmen of South Africa in many respects resemble the nomadic Mongolians of Asia; the warlike Caffres are said to combine the prominent forehead and nose of the European, the thick lips of the Negro, and the high cheekbones of the Hottentot. Among the African races, the Abyssinian, a fine dark, but not negro race, is interesting as having preserved, "in the midst of Moslem and pagan nations, its peculiar literature and its ancient Christian church," and having remains of a wide-spread Judaism and a language approaching the Hebrew. The Oceanic races Prichard divides into Malayo-Polynesian, Pelagian Negroes, and the Alfoorians of the New Guinea group of islands (which include the Australians). The American races are distinguished from those of the old world by their moral and social traits and by the structure of their languages. The Mexican tribes, which, according to him, arrived on the central plain of Anahuac, from the north, in the 7th century, found this region inhabited by the nations which have left the splendid ruins of Palenque; among whom were the Othomi, remarkable for their monosyllabic idiom. The Esquimaux and the Athabascas, with a Mongolian cast of countenance, extend across the northern portion of the continent from ocean to ocean; south of these, east of the Mississippi, were the Algonquins and the Iroquois, with their numerous tribes, almost always at war with each other, and the Alleghenian nations toward the south; west of the Mississippi were the Sioux and the Pawnees; on the Pacific coast the dark Californians and the tribes of the north-west coast; and in South America the Andean nations, the Brasilio-Guarani, and the mediterranean or central groups. Dr. Latham adopted another classification in his "Natural History of the Varieties of Man," London, 1850; but as this differs in some respects from that given in his article on Ethnology in the "Encyclopædia Britannica," we shall follow the latter, as being the more recent. He proceeds upon the doctrine—(1) that, as a matter of fact, the languages of the earth's surface are referable to a common origin; and (2) "that, as a matter of logic, this common origin of language is, *primâ facie*, evidence of a common origin for those who speak it." He maintains that this *primâ facie* evidence will not be overridden by the conflicting phenomena of physical and moral differences. "That the physical characters of our kind are permanent is argued from such a fact as the mummies of ancient Egypt giving us the same organization that is given by the modern Copts;" and, "again, that comparatively light complexions are found in some of the hottest parts of the world, whereas dark ones are found in comparatively cool ones, passes for an argument against the effects of heat on the skin." He divides the human race in three great divisions,—(1) the Asiatics and Northern Europeans, Polynesians, and Americans; (2) Central and Southern Europeans; (3) Africans and South-western Asiatics. In the first division are (A) those populations whose physical conformation is either typically or subtypically *Mongol*, having been generally recognized as such; comprising (*a*) languages monosyllabic, as the Chinese, Siamese, Burmese, (*b*) Turanians—languages other than monosyllabic, groups, (1) the Mongolian, (2) the Turk, (3) the Ugrian, (4) the Tungus, (5) the Peninsular;—(B) Iramans, groups, (1) the Persians, (2) Paropamisans, (3) Armenians, (4) Dioscurians (*i.e.*, the Caucasians of Caucasus, or Caucasians in the limited, proper, and convenient sense of the term);—(C) Indians;—(D) the Oceanic stock, (*a*) Amphinesia, (1) Protonesians, (2) Micronesians, (3) Polynesians, (4) Malagasi; (*b*) Kelænonesians, (1) Papuans of New Guinea, (2) Tasmanians, (3) Australians;—(E) Americans, comprising, in groups yet undetermined, the Esquimaux, Algonkins, Iroquois, Sioux, Woccons, Paducas, &c.; the great South-American families, of which the limits are the most defined are, (1) the Quichuas, (2) the Caribs, (3) the Guarini, the Chaco, the Pampas, and the Chileno groups, being of somewhat less though still of considerable magnitude. The languages of the second division—central and southern Europeans—fall into four divisions: (1) the Basks, who inhabit the western Pyrenees, the north of Spain, and the south of France; (2) the Skipetar, or Albanians, who inhabit Albania, and whose language isolates them; those many hold that it can be connected with those of the fourth class; (3) the Celts (*i. e.* Welsh, Bretons, Gaels, and Manxmen; and (4) Sarmatians, Germans, Latins, and Greeks, who are Indo-European in the strictest sense of the term. In the third division, the African and south-western Asiatic, there are: (1) the Semitic, (2) the Nilotic, (3) Kafre, (4) Negro, (5) Hottentot. Dr. S. G. Morton, whose principal works are the *Crania Americana* (1839) and the *Crania Ægyptiaca* (1844), divides man into the following groups in his catalogue of skulls, more, however, for convenience of study and examination than as an attempt at scientific classification:—(1) Caucasian group, with the Scandinavian, Finnish or Tchudic, Suevic, Anglo-Saxon, Anglo-American, Celtic, Sclavonic, Pelasgic, Semitic, Berber, Nilotic, Indostanic, and Indo-Chinese races; (2) Mongolian group, with the Chinese and Hyperborean races; (3) Malay group, with the Malayan and Polynesian races; (4) American group, with the barbarous and Toltecan races; (5) Negro group, with the native Africans, Hovas, and Afoorian races; (6) the mixed races, Copts, Nubians, &c. Professor Agassiz, in the "Types of Mankind," by Messrs. Nott and Gliddon (1854), holds "that what are called human races, down to their specialisation as nations, are distinct primordial forms of the type of man; believing that the boundaries within which the different natural combinations of animals are known to be circumscribed upon the surface of our earth coincide with the natural range of

distinct types of man." He gives a sketch of the natural provinces of the animal kingdom and their relation to the different types of men. He classifies them according to the following realms: (1) Arctic, inhabited by Hyperboreans; (2) Asiatic, by Mongols; (3) European, by white men; (4) American, by American Indians; (5) African, by Nubians, Abyssinians, Foolahs, Negroes, Hottentots, and Bosjesmen; (6) East-Indian or Malayan, by Telingans, Malays, and Negrillos; (7) Australian, by Papuans and Australians; and (8) Polynesian, by South-Sea Islanders. In the "Indigenous Races of the Earth" (1857), Messrs. Nott and Gliddon give an ethnographic tableau, in which the races are divided zoologically, according to the eight realms of Agassiz; they are also grouped physiologically (after Desmoulins, Achille Compte, and O. D'Halloy) into sixty-five families,—seven belonging to realm 1 of Agassiz, twelve to realm 2, sixteen to realm 3, fourteen to realm 4, eight to realm 5, three to realm 6, two to realm 7, and three to realm 8. The same realms have also their corresponding classes, arranged linguistically, after Alfred Maury, Crawfurd, Logan, &c. A detailed account of the different Asiatic, European, and African races is given by Dr. Latham, in his "Descriptive Ethnology," 2 vols., 1859. These remarks will show in how imperfect a state the science of ethnology still is; and those who wish to pursue the subject further, we would refer to the works cited.

ETHYL, *eth'-il* (Gr. *aither*, air; *ule*, the material of which a thing is made), in Chem. ($C_4H_5$, $C_2H_3$), the second and most important member of the series of alcohol radicles. When a mixture of granulated zinc and iodide of ethyl is heated to 300° in a tube from which the air is exhausted, a number of compounds are formed, ethyl, the radicle in question, amongst them. By breaking the tube under water, the liquid compounds are ejected in a gaseous form; and by carefully collecting the portions which come off last, the ethyl is obtained nearly in a state of purity. Ethyl is a colourless gas with slightly ethereal smell, and burns with a luminous flame. It may be liquefied at 38° Fahr. by a pressure of 2½ atmospheres. Frankland estimates its boiling-point at —0°. It is the radicle of ether and alcohol, and as such deserves especial notice. It dissolves readily in alcohol, but not in water.

ETHYLENE, or OLEFIANT GAS, *eth'-e-lene*, in Chem. ($C_4H_4$), the second hydrocarbon in the oleflant gas series. These hydrocarbons are described under the head of OLEFIANT GAS.

ETIQUETTE, *et-e-ket'* (Fr., a ticket), denotes the forms of manners and behaviour that prevail in polite society, established by usage and good breeding. The name is probably derived from the custom that prevailed, on state occasions, of delivering a ticket to each person, instructing him as to the part which he was to take in the ceremony. At no time, probably, was the spirit of etiquette so predominant and so tyrannical as at the court of Louis XIV. of France. At the present day, the etiquette of courts is becoming less and less strict; and in private society many of the old and absurd forms are given up. "Etiquette," says a writer on this subject, "is the barrier which society draws around itself as a protection against offences the *law* cannot touch: it is a shield against the intrusion of the impertinent, the improper, and the vulgar; a guard against those obtuse persons who, having neither talent nor delicacy, would be continually thrusting themselves into the society of men to whom their presence might (from the difference of feeling and habit) be offensive and even insupportable." The rules that are laid down on this subject are various, and are only to be learned properly by experience. Generally, however, a person going into society should maintain a certain degree of self-respect, and regard for the feelings of others, and should endeavour to make himself agreeable.

ETON COLLEGE, *e'-ton*, situated at Eton, in the county of Buckingham, was founded by Henry VI. in 1440, and was dedicated to "the Blessed Marie of Eton, beside Wyndesore." Henry had been moved to the foundation of this college by the successes of William of Wykeham's noble foundations at Winchester and Oxford, established about fifty years before. Eton college and King's College, Cambridge, were modelled upon Wykeham's plan. The original foundation seems to have provided for twenty-five scholars and twenty-five poor men, whose duty it was to pray for the king. In 1443 the number of almsmen was reduced from twenty-five to thirteen, that of the scholars being raised to seventy, at which it now stands. King's College, Cambridge, was also founded by Henry VI., and was designed to receive the best of the Eton foundations as vacancies occurred. Within the last two years this close connection has been severed, twenty-four out of forty-eight scholarships at King's being appropriated to Eton collegers, the remainder, together with all the fellowships, being virtually thrown open. The first provost of Eton was William of Wayneflete, the head master of Winchester, and founder of Magdalen College, Oxford. At the present day the foundation consists of a provost, vice-provost, six fellows (formerly assistant masters), a head master, a lower master, seventy scholars, three "stipendiuots" (chaplains), with choristers and almswomen. The college, which obtained several manors and advowsons from its founder, received several more from Edward IV. Since that period it has been successful and prosperous. At present there are about 820 boys, a large proportion of whom are members of the aristocracy. Those boys who do not belong to the seventy scholars on the foundation are called "oppidans," and board in the houses of the assistant masters and dames. The collegers wear black gowns but not college caps, as at Westminster, and their expenses are less than those of the "oppidans," who constitute the wealthy and aristocratic element of the school. In the appearance of the college itself there was nothing striking, except the size and elegant character of the houses, until the recent erection of new schools and the splendid restorations of the hall and the chapel, which is on the model of that of King's College, Cambridge. Among the old customs kept up at Eton college may be mentioned the "Montem," held on Whit-Tuesday every third year. The boys all appeared in fancy costume, headed by the captain. The last montem was held in 1844, when the contributions levied upon the spectators, or captain's "salt," as it was called, amounted to £1,338. 1*s.* 8*d.* Many eminent and illustrious men have been educated at Eton. The earl of Chatham, Sir Robert and Horace Walpole, Lord North and the duke of Wellington, were Etonians; and among living statesmen Eton has produced Lord Derby, Lord Elgin, Mr. Gladstone, Lord Stratford de Redcliffe, Sir G. C. Lewis, the earl of Carlisle, and several others.

ETRUSCAN ARCHITECTURE, *e-trus'-kin*.—There are but very few existing remains of the constructive works of the ancient Etruscans from which we are enabled to judge of the proficiency which this people had attained in the art of building. It is, however, certain that all works of a public nature were eminently characterised by solidity of construction, and were probably plain and devoid of elaborate sculptured decorations. The Tuscan order of architecture, the plainest and most massive in style of the five classic orders, is named after this people; and although no example remains at the present time to show that it was positively originated and adopted by them, yet we may justly believe that the Romans derived it from a country which was the cradle of early Italian art, and that it forms a fair standard by which we may judge of their skill and progress in the art of building. Their temples are said by Vitruvius to have been small, and rectangular or circular in form. They were ornamented with figures in bronze and stone, and the walls of the interior were probably panelled, and covered with paintings like those of the chambers that have been discovered in the sepulchral mounds that are so common in Tuscany. Their private houses were low, covering a large extent of ground, and surmounted with massive entablatures. Although there was but little architectural display in their buildings, the Etruscans had reached a high degree in the arts of painting and sculpture. The vases found in the Etruscan tombs are elegant in form, and the weapons and ornaments that have been discovered in the same localities are often of beautiful and elaborate construction. The principal archæological remains of ancient Etruria are the tombs sculptured and hewn out of the rocks

at Viterbo and Norchia; the amphitheatre at Sutri, also hewn out of the solid rock, and the numerous sepulchral tumuli. The roofs of many of the chambers found in these tumuli are arched; and as Rome derived her architects and knowledge of building from Etruria, we may consider the Etruscans as the originators of the arch and vaulted roofs in Europe.—*Ref.* Fergusson's *Handbook of Architecture;* Dennis's *Cities and Cemeteries of Etruria.*

ETRUSCAN VASES. (*See* VASES.)

ETYMOLOGY, *et-o-mol'-o-je* (Gr. *etumos*, true, and *logos*, description), is that part of grammar which treats of words by themselves, of their classification, their formation, and the alteration of their forms by derivation and inflection. It teaches the deduction of one word from another, and the various modifications by which the sense of the same word is diversified. The recent philological researches have given to this department of grammar a much more extensive and important field of inquiry, by bringing together whole groups of languages, and showing the connection existing between them in word and form. (*See* GRAMMAR, PHILOLOGY.)

EUCALYPTUS, *u-kă-lip'-tus* (Gr. *eu*, well; *kalupto*, I cover), in Bot., a gen. of the nat. ord. *Myrtaceæ*, consisting of trees having hard wood, alternate, entire, coriaceous leaves, and yellow flowers, growing in corymbs. They are natives of Australia and Tasmania. The most important species is *E. resinifera*, the iron bark, which yields on incision an astringent substance called *Botany Bay kino*. This contains a peculiar substance, to which the name *Eucalyptin* has been given. It has been employed as a remedy in diarrhœa. The leaves of *E. mannifera* and other species spontaneously exude a saccharine substance resembling manna, and hence termed *Australian manna*. It is said to drop from the trees in pieces sometimes as large as an almond. The secretions of the *Eucalypti* are commonly of a gummy nature, and on this account the trees are sometimes called gum-trees. The bark of some of them separates in fibrous layers; and this peculiarity has also obtained for them the name of stringy-bark trees. They frequently attain a prodigious height,—200 feet or more, the trunks being destitute of branches to a height of from 100 to 200 feet.

EUCHARIST, *u'-kă-rist* (Gr. *eucharistia*, the giving of thanks), is used, in a theological sense, to denote the sacrament of the Lord's Supper. The term is not found in the New Testament: but in the history of the institution of this ordinance, the word *eucharisteasas* occurs; and this probably led Justin Martyr and others to adopt the word, gratitude for divine mercy and grace being a chief requisite in those who would worthily partake. During the first three centuries, the Eucharist was celebrated every Sunday; but afterwards it came to be administered only three times in the year,—at Easter, Whitsuntide, and Christmas. In early times, the Eucharist was celebrated in the churches with closed doors, to the exclusion of all but the initiated, and it ordinarily took place at night. The use of tapers on the occasion is traced to these nocturnal celebrations. The mixing of water with the wine was generally regarded by the early church as essential to the due performance of the rite; and hence the three elements of bread, wine, and water are mentioned. At first, the communion bread was that in common use; but about the 7th century a peculiar kind of bread began to be prepared exclusively for it, of a circular form, and impressed with the sign of the cross. The communion in both kinds, i. *e.* both the bread and the cup to both laity and clergy, appears to have prevailed in the Church until about the 12th century, when the cup began to be gradually withdrawn from the laity, which was authorised by the council of Constance in 1415, and confirmed by that of Trent in 1562. Romanists profess to believe that Christ's whole and entire body, soul, and divinity, is contained in either species, and in the smallest particle of each. Hence they infer, that whether the communicant receives only the bread or the wine, he enjoys the full benefit of the sacrament. In the early church, communicants appear to have received the sacrament standing.—*See* on this subject a learned and interesting article in Knight's *English Cyclopædia*, section Arts and Sciences, article "Communion."

EUDIOMETRY, *u-de-om'-e-tre* (Gr. *eu*, well; *dios*, air; *metron*, measure), is the art of analyzing and investigating gaseous bodies by means of the instrument called the eudiometer. If, for instance, it be desired to estimate the amount of oxygen in the air, to three measures of atmospheric air contained in the eudiometer, add two measures of pure hydrogen,—*detonate*, and upon the cooling of the vessel, observe the absorption; divide its amount by three, and the quotient will represent the amount of oxygen. This method was invented by Volta. The best form of eudiometer is that invented by Dr. Ure. It consists of a siphon formed of glass, with legs of nearly equal length, open at one extremity, which is funnel-shaped, and hermetically sealed at the other, which is supplied with platinum detonating wires. The siphon leg, which is sealed up, is graduated into 100 equal parts or subdivisions of the cubic inch. In order to make use of this simple instrument, it must be filled with mercury and inverted in the pneumatic trough; a convenient supply of the gas to be measured is inserted, and having applied a finger to the orifice at the end of the open leg, the tube is removed from the trough and inverted, so as to transfer the gas to the sealed leg, where its quantity can be accurately measured. A portion of mercury must then be poured from the open end of the siphon, so as to leave a space of about two inches; and, closing the aperture again, detonate by the electric spark. The included portion of air serves as a spring, and, on withdrawing the thumb, which closed the open aperture, and adding mercury to restore the level, the change of bulk produced in the gas by detonation can easily be read off. Any liquid or solid that is required for the analysis of the residuary gas may then be passed up into the closed end, and different results may be thus arrived at.—*Ref.* Brande's *Manual of Chemistry.*

EUGENIA, *u-je'-ne-ă* (in honour of Prince Eugene, of Savoy), in Bot., a gen. of the nat. ord. *Myrtaceæ*, composed of trees and shrubs with opposite, entire leaves, axillary white flowers, and black or red berries. *E. Pimenta* is the most important species. Its dried unripe fruit constitutes pimento or Jamaica pepper, or, in more familiar language, allspice. The latter name is given to it because it is thought to have combined the flavours of cinnamon, clove, and nutmeg. It is used as a spice, and in medicine as an aromatic stimulant. Its properties are dependent on the presence of a volatile oil. The rose-apples of the East, which are much esteemed as dessert fruits, are the produce of *E. malaccensis*, *E. aquea*, *E. jambos*, and other species of this genus. In Brazil, the fruit of *E. caulifiora*, the *Jaboticaba*, is also much esteemed. The leaves of *E. Ugni* are used in Chili as a substitute for Paraguay tea.

EULOGY, *u'-lo-je* (Gr. *eu*, well, and *logos*, a discourse), denotes, in a general sense, an encomium or panegyric pronounced on any one on account of his merits or virtue. By the early ecclesiastical writers, the term eulogy or *eulogia* was applied to the Eucharist; but it afterwards came to be restricted to the bread which was distributed among those who had not communicated or who were absent.

EULOPHIA, *u-lo'-fe-ă* (Gr. *eulophos*, a handsome crest), in Bot., a gen. of Orchids. The tubercular roots of *E. vera* and *E. campestris* are much used in India for the preparation of the nutritious substance known by the names of salop, salop, and saloop.

EUNUCH, *u'-nuk* (Gr. *eune*, a bed, and *echein*, to have the care of), is, literarily, one who has the care of a bed, a name given to this class of persons in the East, from their being intrusted with the care of the women's apartments, or harems. The practice is of great antiquity, and even in the time of Herodotus it was carried on to a great extent among the Persians, who not merely intrusted the care of their wives and daughters to eunuchs, but considered them as more trustworthy than other men. The practice of making eunuchs does not seem to have prevailed to any great extent in Greece or Rome; but during the Eastern empire it was very common, and the chief of the eunuchs was one of the most important functionaries at court. Zeal for religion, as in the case of Origen, has

caused many persons thus to mutilate themselves; and in the 3rd century there arose a sect of heretics, who not only treated thus those of their own persuasion, but all others on whom they could lay hands. Several of the Christian emperors of Rome forbade the practice of making eunuchs; and Justinian imposed a law of retaliation on such as were guilty of such inhumanity. The council of Nice, at a later period, excluded from the pale of the Church all who, from whatever cause, made eunuchs of themselves. The practice is said to have prevailed in Italy, with the view of preserving the voice of singers for the operas of Europe; and in the East, in the present day, the seraglios are chiefly guarded by eunuchs.

EUONYMUS, *u-on'-e-mus* (Gr. *eu*, well; *onoma*, a name), in Bot., a gen. of the nat. ord. *Celastraceæ*. The species *E. europæus* is the common spindle-tree of our hedges. In France, charcoal prepared from the wood is largely used in the manufacture of gunpowder; while the young shoots, in a charred condition, are employed as rough crayons for sketching. The seeds are stated to be purgative and emetic, and also to be poisonous to sheep. The bark of *E. tingens* can be used as a yellow dye-stuff.

EUPATORIUM, *u-pā-to'-re-um* (derived by Linnæus from Mithridates Eupator, who first used it as a counter-poison), in Bot., a gen. of the nat. ord. *Compositæ*, sub-ord. *Tubilifloræ*. The leaves of *E. glutinosum* constitute a sort of matico, which is employed as a styptic. The matico used in this country is, however, derived from *Artanthe elongata*. *E. ayapana* and *perfoliatum* are employed as antidotes to the bites of venomous reptiles.

EUPHEMISM, *u'-fe-mism* (Gr. *eu*, well, and *phemi*, I speak), is a figure in Rhet., by which one expression is substituted for another, so as to convey the meaning in less offensive or milder terms; as when we use the word departed for dead. Euphemisms were much employed by the ancients to avoid the use of words or phrases which were regarded as omiuous.

EUPHONY, *u'-fo-ne* (Gr. *eu*, well, and *phone*, sound), denotes an agreeable sound, or combination of sounds,—that pleasing quality in language which results from the happy combination of the enunciative elements.

EUPHORBIA, *u-for'-be-ā* (named after Euphorbus, physician to Juba, king of Mauritania), in Bot., the typical gen. of the nat. ord. *Euphorbiaceæ*, consisting of about 300 species, many of which have valuable properties. The acrid resin commonly known as gum Euphorbium is the produce of certain undetermined species, the principal of which are probably *E. antiquorum*, *canariensis*, and *officinarum*. It is a dangerous emetic, cathartic, and rubefacient, and produces severe inflammation of the nostrils if those who powder it do not guard themselves from the dust. It is produced from the wounded stems, and collected in leather bags. In India it is said to be mixed with the oil expressed from the seeds of *Sesamum orientale*, and employed externally in rheumatic affections, and internally in cases of obstinate constipation. The Arabs are stated to make up violent diuretic pills by rubbing over the juice of the species *E. antiquorum* with flour: their camels, however, are said to eat the branches of the plant when cooked. The juice of the species *E. cerriformis*, *heptagona*, and *virosa*, African plants, furnish the Ethiopians with a mortal poison for their arrows; whilst that of *E. cotinifolia* serves a like purpose for the Brazilian Indians. The species *E. hibernica* is extensively used by the peasantry of Kerry for the purpose of stupefying fish; and so powerful are its properties said to be, that a small kreel or basket filled with the bruised herb suffices to stupefy the fish for several miles down a river. *E. hypericifolia*, a plant of tropical America, is astringent and somewhat narcotic, and is employed in the diarrhœa of children and as a vermituge; and *E. thymifolia* is employed for a like purpose in India. The root of *E. Ipecacuanha* is said to be equal to the true ipecacuanha, and is commonly used in the states of North America. Another species, *E. corollata*, the milk-weed, is also used as an emetic in the States. The fruits of *E. lathyris*, or caper-spurge, are sometimes pickled and eaten, instead of ordinary capers; but although the process of pickling appears to destroy in a great measure the acrid purgative properties which the fruits possess in a fresh



state, their use is by no means free from danger. A very active cathartic oil may be expressed from the seeds of the caper-spurge. The leaves of *E. serrulata* are prescribed by the native practitioners of India both internally as a purge, and externally, mixed with Margosa oil, in certain cases of contracted limb. The roots of *E. palustris* and *pilosa* are used as purgatives, and are said to have proved useful in hydrophobia. Many other species are purgative. *E. Tirucalli*, a native of India, is common in the Madras presidency, and makes an excellent hedge, as no cattle will touch its leaves. The sap of *E. phosphorea* is said to shine with a phosphorescent light in the forests of Brazil on warm nights.

EUPHORBIACEÆ, *u-for-be-ā'-se-e*, in Bot., the Spurge-wort fam., a nat. ord. of *Dicotyledones*, in the sub-class *Monochlamydeæ*, consisting of trees, shrubs, and herbaceous plants, generally with an acrid milky juice. The flowers are unisexual, monœcious or dioecious, axillary or terminal, sometimes inclosed in a calyx-like involucre, achlamydeous, or with a lobed inferior calyx, having on its inside glandular or scaly appendages, or even evident petals, which are either distinct or united. The anthers are two-celled. The female flowers have a superior ovary, which is either elevated upon a stalk or sessile upon the thalamus, one-, two-, three-, or many-celled. The styles are either absent, or corresponding in number to the cells of the ovary, entire or divided. The stigmas are equal in number to the cells of the ovary, or, when the styles are divided, corresponding in number to their divisions; the ovules, one or two in each cell, suspended from the inner angles of the cell. The fruit is either dry, when its parts separate from each other and from the axis, usually opening with elasticity, or succulent and indehiscent. Seeds one or two in each cell, suspended, often with an aril or carunculate. Embryo inclosed in fleshy albumen, cotyledons flat, radicle superior. The plants of the order are more or less distributed over the globe, but are especially abundant in warm regions, particularly in equinoctial America. Many are extremely poisonous, the poisonous principle being contained in the milky juice, and pervading all parts of the plant, more or less. Many have been employed medicinally, as rubefacients, suppurants, emetics, diuretics, and cathartics. Some, as cascarilla, are tonic, aromatic, and stimulant, and are perfectly devoid of any acrid or poisonous principle. Others, as manihot, yield starch, which is largely employed for food. Caoutchouc and resin are obtained from the milky juice of others. The seeds of many yield oils, either of a bland or of an irritating nature. A few of the fruits, and some of the roots, are said to be eatable. Timber is yielded by some, as the box; and dye-stuffs by others. The hairs of some are stinging.

EUPHUISM, *u'-fu-izm* (Gr. *euphues*, eloquent, of vigorous growth), a word employed in English literature to designate a bombastic inflated mode of expression. This style of language enjoyed a short-lived popularity during the reign of Elizabeth. The term originated from the title of a book by John Lyly, "Euphues," whose affected language formed the model of the style.

EUSTACHIAN TUBE, in Anat. (*See* EAR.)

EUSTACHIAN VALVE, *u-stā'-ke-an* (after Eustachius, the celebrated anatomist), in Anat., is a membranous semilunar valve separating the right auricle of the heart from the inferior vena cava.

EUTERPE, *u-ter'-pe*, in Bot., a gen. of palms. The species *E. montana* is one of the cabbage-palms, so called because the young leaf-buds are boiled and eaten, like cabbage. From the fruits of other species, particularly *E. Assai* and *edulis*, pleasant beverages are prepared.

EUTYCHIANS, *u-tik'-e-anz*, in Eccl. Hist., were a religious sect which arose about the middle of the 5th century, and were named after their founder, Eutyches, abbot of a monastery in Constantinople. In opposing the doctrines of Nestorius, who had been charged with dividing the nature of Christ into two distinct persons, they fell into the opposite extreme, and held that the human nature of Christ was absorbed in the divine, and that his body had no real existence. Their views were condemned in a synod held at Constantinople in 448, by Flavian, patriarch of that city, and Eutyches

himself deposed; but the following year this judgment was reversed by a general council held at Ephesus, and the doctrine of Eutyches declared to be orthodox. Eutychianism, however, was finally condemned in 451, at the general council of Chalcedon, which declared "that in Christ two distinct natures were united in one person, and that without any change, mixture, or confusion." The heresy, however, spread very extensively through the East, and the monophysite doctrine continues to exist in the Armenian and Coptic churches to the present day.

EVANGELICAL, *e-văn-jĕl'-e-kal* (from Gr. *euaggelion*, good news), denotes, in general, agreeable to, or in conformity with, the doctrines of the Gospel. It is frequently applied to those who make the atonement of Christ alone, and not the performance of moral duties, the ground of salvation; and hence it is frequently used as synonymous with orthodox. A body in the Anglican church assume to themselves the name of evangelical, their views coinciding very much with those of dissenters. In Prussia the term is employed to designate the national Protestant church, which is formed by a union of both Calvinists and Lutherans, being an attempt to unite the two parties.

EVANGELICAL ALLIANCE is an association of Christians of various denominations, formally organized in London in 1846. Its object is to promote unity and co-operation among the different sects of Protestants, and to unite their efforts against the advances of Romanism and infidelity. Their object is also to encourage and strengthen labourers in the cause of Christianity in all parts of the world, particularly such as are struggling with difficulties and hardships. They also exert themselves in behalf of religious toleration in all parts of the world. They have numerous branches, not only in the United Kingdom but France, Germany, Sweden, and other parts of the continent; America, Australia, East and West Indies, Africa, &c. The members of the alliance are such as hold evangelical views on the following points:—the divine inspiration of the Holy Scriptures, and the right of private judgment; the Trinity; depravity of human nature; the incarnation; justification by faith alone; the work of the Holy Spirit in conversion; the immortality of the soul; resurrection and judgment; the divine institution of the Christian ministry; and the obligation of the ordinances of baptism and the Lord's Supper. They hold conferences for devotion and mutual consultation in London, Paris, Berlin, and other cities; the last being held at Geneva, in 1861.

EVANGELICAL ASSOCIATION, a religious body which took its rise in the state of Pennsylvania in 1800, and has since spread over most of the free states and a great part of Canada. Its founder was Jacob Albrecht, a German Lutheran, who, impressed with the want of religious life and the corruptions that prevailed among the German churches, commenced a course of itinerant preaching, and made many followers. In 1850 they had over 300 itinerant, and a still greater number of local preachers, while their adult members were nearly 40,000. They devote themselves much to missionary labour, especially among the German population. In theology, they are Arminian; but on other points they agree in the essentials of Christianity with the various evangelical churches, with whom they seek to cultivate friendly feelings.

EVANGELICAL UNION, the name assumed by a religious body which was formed in Scotland in 1843, but which are better known under the name of Morrisonians. Their founder, the Rev. James Morrison, of Kilmarnock, was ejected from the United Secession Church for holding views contrary to the standards of that body. He held that the death of Christ bore no special relation to the elect, but was for the sins of the whole world; that all men were able of themselves to believe the Gospel; that original sin cannot render men liable to condemnation; that no person ought to be directed to pray for grace to help him to believe. Mr. Morrison was soon after joined by several other ministers of the United Secession Church, and also by several of the Independents; and they formed themselves into a body. They comprise now upwards of forty churches, and have a theological hall in Glasgow for the training of their students. Their opinions are generally those of Mr. Morrison, but their government is independent, and considerable differences of opinion exist among them.

EVANGELIST, *e-văn'-je-list* (Gr. *eu*, well, and *aggello*, I announce), is properly one who brings good tidings. Hence the writers of the four gospels are called evangelists, because they proclaim the glad tidings of salvation through Christ. Evangelist was also the name given to a particular class of Christian teachers chosen by the apostles to preach the Gospel, and ranking after the apostles and prophets, but before the pastors and teachers. They had no particular flocks assigned to them, but travelled from place to place under the direction of the apostles. This order is supposed to have been merely temporary, like that of apostles and prophets; and the term is now only applied to those writers in the New Testament who have given us the history of our Lord.

EVAPORATION, *e-văp-o-rā'-shun* (Lat. *evaporatio*, an evaporation), the conversion of liquid or solid bodies into elastic vapours or gases, by means of heat. Evaporation goes on slowly or rapidly according to circumstances. Water evaporates gradually at ordinary temperatures all over the surface of the globe. It rises in the air as vapour, and when condensed by change of temperature, forms rain or dew, and descends again to the earth. When, however, evaporation takes place rapidly, as in the case of ebullition, it is generally called *vaporization*. The quantity of vapour which rises from the surface of a liquid in the open air not only depends upon the quantity of surface exposed but also on the state of the atmosphere at the time. In warm and dry weather, both in winter and summer, evaporation is greatest. It was found by Dr. Dalton that water raised to 212° evaporated at the rate of 4·244 grains per minute. Mercury does not evaporate till it is raised to 60° or 80°. Below that temperature the gravity of the constituent atoms is greater than their elastic force. In all liquids whose boiling-points are high, the elastic force of the vapour is very small. The elastic forces of the vapours of most solid bodies are so low that they cannot be evaporated by the highest natural temperatures. The evaporation of a liquid is a cooling process to the liquid itself. This fact is made useful in India in order to produce ice. Water is exposed in shallow, unglazed, earthen vessels, resting upon imperfectly conducting substances, such as sugarcanes, &c. During the dry clear nights evaporation goes on, and a thin film of ice is formed. The cold produced by the formation of vapour may easily be observed by placing a cloth dipped in ether or alcohol on the bulb of a thermometer. The mercury will continue to descend as long as the evaporation lasts. If mercury is placed in the receiver of an air-pump, together with sulphuret of carbon, when the air is withdrawn, the cold produced by the evaporation of the sulphuret of carbon is sufficient to freeze the mercury. (*See* METEOROLOGY, HYGROMETER, RAIN.)

EVE, *eev* (Ang.-Sax.), is a term frequently applied to the night before certain holidays or festivals; as Christmas eve, the evening before Christmas day. In the primitive church, it was customary for Christians to pass a great portion of the night which preceded a holiday in religious exercises; and these, from their being performed in the night-time, were called *vigils* or watchings. These night meetings came to be so much abused that they were at length abolished.

EVENING SCHOOLS. (*See* SCHOOLS.)

EVEN-KEEL, *ē'-vn-keel*, implies an even position of a ship on the water; thus, a ship is said to swim upon an *even-keel* when she draws the same draught of water forward as abaft.

EVICTION, *e-rik'-shun* (from Lat. *evinco*, I overcome), signifies a recovery of lands by means of a form of law. It is, however, one of the most severe processes, and it is only resorted to in extreme cases. To render an illustration, it may be stated that it has been, at various times, called into action in Ireland, where tenants were *evicted*, *i. e.* driven off the lands they rented, in consequence either of inability or unwillingness to pay their rent, or, as in late instances, on account of the prevalence of Ribbandism or landlord-murder. With regard to its legal properties, it is recorded, that if land is evicted before the time of

payment, the said land being on lease, no rent is incurred or is liable by the lessee. Where lands are taken "on extent," and are evicted or recovered by better title, the plaintiff shall have a new execution. If a widow is evicted of her dower or thirds, she shall be endowed with the other lands of the heir. Lastly, if in exchange of lands, either party is evicted of the lands given in exchange, he may enter again into possession of his own lands which he thus exchanged. (For further information, *see* Law Reports.)

EVIDENCE, *ev'-e-dens* (Aug.-Nor., from Lat. *evidentia*), in Law, denotes, in its widest sense, whatever, exclusive of mere argument, legally tends to prove or disprove any matter of fact, the truth of which is submitted to judicial investigation. It is so called because it makes evident or clear, or ascertains the truth of the fact or point at issue, either on the one side or on the other. When such evidence is sufficient to produce a conviction of the truth of the fact to be established, it amounts to *proof*. By *competent evidence* is meant that which the law requires as the fit and appropriate proof in the particular case; such as the production of a writing where its contents are the subject of inquiry. By *satisfactory* evidence, or, as it is sometimes called, *sufficient* evidence, is denoted that amount of proof which ordinarily satisfies an unprejudiced mind beyond reasonable doubt. *Circumstantial* evidence is distinguished from positive proof, and is founded on the doctrine of presumptions; for when the fact itself cannot be demonstratively evinced, that which comes nearest to the proof of the fact is the proof of such circumstances as necessarily or usually attend such facts. Very strong presumption is, in many cases, equal to full proof. As a general rule, the best evidence of a fact must be given that its nature admits of. This rule does not demand the greatest amount of evidence which can possibly be given of any fact, but is to prevent fraud; the presumption being, when the best evidence is withheld, that the party has some sinister motive for not producing it. *Primary evidence* is that kind of proof which in the eye of the law affords the greatest certainty of the fact in question. All evidence falling short of this in its degree is termed *secondary*. This distinction refers only to the quality, not to the strength of the proof; for evidence which carries on its face an indication that better remains behind, is not primary but secondary. As a rule, secondary evidence is inadmissible until it be shown that the production of primary evidence is out of the party's power; as where an instrument is destroyed or lost, its contents may be proved by secondary evidence. The first degree of evidence, and, though liable to error and misconception, the most satisfactory to the mind, is that afforded by the senses; as where a judge or jury can have the matter in dispute brought before their eyes, so that they may judge for themselves. This mode of evidence, however, is seldom attainable in judicial trials, and the law is satisfied with requiring the next best evidence,—namely, the testimony of those who can speak from their own personal knowledge, which is termed *hearsay evidence*. But it is requisite that, whatever facts the witness may speak to, he should be confined to those lying within his own knowledge, whether they be things said or done, and should not testify from information given by others, however worthy of credit they may be. The *dying declaration* of a person who expects to die, respecting the circumstances under which he received a mortal injury, is admitted as evidence in criminal prosecutions in regard to the death, though the accused was not present when they were made, and had no opportunity for cross-examination; it being considered that a person in constant expectation of immediate death is removed from all temptation to falsehoods; but it is necessary to show that he was aware of his condition at the time of making his declaration. A person is said to be admitted as *queen's* evidence when, being one of the accused, he confesses his crime, and is admitted as evidence against his accomplices. It is at the discretion of the court whether they admit one as queen's evidence; but if he is admitted, and his partners are convicted, he is entitled to his pardon.—*Ref.* Taylor's *Treatise on the Law of Evidence*; Starkie's *Law of Evidence*.

EVIL, *e'-vil* (Sax. *efel, yfel*), may be said to be the antithesis or negation of *good*. "In the abstract, evil is want of conformity to the standard of good, whatever that may be; in the concrete, evil is anything that comes short of what is perfectly good." A very superficial view of things as they exist in this world is sufficient to convince one of the existence of evil; i. e. that all things come short of our ideal of goodness and perfection. Evil is usually divided into *physical* and *moral*,—the former including whatever is opposed to good in the sense of happiness; the latter, whatever is opposed to good in the sense of virtue. The question concerning the *origin of evil* has exercised the ingenuity of speculative men from the earliest times, and various theories have been proposed. The oldest and most widely spread of these is the *dualistic*, which supposes two opposite agencies or co-eternal and independent principles, the one the author of all the good, the other of all the evil in the universe. This doctrine prevails in the heathen systems of the East, and was also held by the Manichæans and others. A favourite hypothesis among the ancient philosophers was that of pre-existence; according to which, the evils which we suffer at present are punishments and expiations of moral delinquencies committed in a former stage of our being. The doctrine of *optimism* supposes that all events are ordered for the best, and that the evils which we suffer are parts of a great system conducted by almighty power under the direction of infinite wisdom and goodness. This comprises two very different classes of philosophers,—those who admit and those who deny the freedom of human actions and the accountableness of man as a moral agent. None of these modes of solving the difficulty appears satisfactory, and the Bible throws little light upon the subject. "The Bible, however, fully authorizes the only conclusions to which reason can safely come on this dark subject; viz.—1. That God is not the author of evil in any sense; 2. that, though able to prevent it, he has permitted it to exist; 3. that the evil permitted in the universe is not only less than the good directly willed by God, but is characterized as something intrusive and transitory, while the good is fundamental and permanent; 4. that God, in permitting evil, has not left it uncontrolled, but even holds it in his power and makes it subservient to his purposes; 5. that he will ultimately overrule the evil which he has permitted, so as to evolve a larger amount of good for his universe than if evil had not been permitted; and, in fine, that all that is perplexing to us in the existence of evil arises out of the limitation of our understanding;" that "the phenomenon of evil, which to us is so full of difficulty, may by higher intelligences—must by the highest—be seen to be in perfect accordance with the noblest order and the purest rectitude."—(*Alexander.*)—Ref. *Encyclopædia Britannica*, art. "Evil," by Dr. W. L. Alexander; Stewart's *Philosophy of the Active and Moral Powers*; King, *On the Origin of Evil*; Müller, *On the Christian Doctrine of Sin*.

EVIL EYE, a malignant influence superstitiously ascribed to certain persons, in virtue of which they are supposed to injure those on whom they cast an envious or hostile look.

EVIL, KING'S, a name formerly applied in England to scrofula, from the belief that it was curable by the touch of the king. This belief was long and very generally held, and we are told that Dr. Johnson was touched for this disease.

EWE, the female of the sheep. (*See* SHEEP.)

EXAMINATION, *egs-ăm-in-ay'-shun* (Lat. *examinatio*), is the usual mode of ascertaining the nature and extent of one's attainments. Examinations are of three kinds,—educational, competitive, testing. The first of these is employed in teaching, the second is resorted to for ascertaining the relative merits of several individuals; and the last determines who come up to a fixed standard. In teaching, examination, when properly conducted, is one of the most valued means of training the faculties of the scholar; tending not only to fix his knowledge in his mind, but to give him a proper command of it, and a facility in using it, that he would not otherwise attain. It is necessary that these objects be kept distinctly in view by the teacher, otherwise he may be the means of unsettling rather than establishing the scholar's knowledge, and may give confusion rather than clearness to his ideas. Competitive examinations

are such as are made of a number of individuals for the purpose of determining their relative attainments, and are more especially with the view of bestowing prizes. Competitive examinations are very liable to abuse, and ought to be used with caution, as their tendency is to stimulate emulation, rather than foster a love of learning for its own sake; to exercise the memory, rather than to train the other faculties; and to make all the reading and thought of the candidates turn upon the examinations. It also gives rise to a system of "cramming," by which many things are committed to the memory that should never have been thrust upon it, and which are not intended to be retained. All this is very injurious to the natural powers of the mind. In test or pass examinations, the object is not to ascertain the relative qualifications of a number of candidates, or their highest attainments, but who of them come up to a certain standard. They are used to determine the ability of a candidate to enter a university or to join a particular class, to be admitted to practise a certain profession, or to fill a particular office. Test examinations, if properly conducted, if the subjects of examination are judiciously selected, and if the standard is properly adjusted, are of great value and importance. Examinations may be conducted either orally or by writing, and each has its particular advantages; so that the best is a judicious combination of the two. In an oral examination, the examiner can most easily and clearly discover the depth of the scholar's attainments, and ascertain his readiness, and the command that he has over what he knows. Too much stress, however, ought not to be laid upon this kind of examination; for there are some persons whom it renders nervous and incapacitates from using their knowledge. There is also a class of persons known as the "slow but sure," who are not calculated to shine in this way. By written examination, the defects of the oral may be compensated. Subjects that require deliberation, and which are intended to test the reasoning powers and judgment, are best treated in this way. The subject of examinations has recently come to acquire greater importance, from their being now used in determining the qualifications of candidates for the civil service (which *see*). Much has been said both for and against this measure; and there can be no doubt it has its good and its bad features. It is, however, a decided improvement upon the previous system; and many of its objectionable features are such as will necessarily disappear in time, and as the subject comes to be better understood. One danger is the laying too much stress upon the examinations; for, however useful they may be in ascertaining special acquirements, they, in general, afford little means of judging of the more important qualities of industry, punctuality, steadiness, attention. Every-day experience shows that men have risen to the highest rank in their several walks of life who were never remarkable for their acquirements at school. In general, the standard of examination is placed too high, and embraces too great a variety of subjects,—subjects, too, which have little or no bearing upon the office which the candidate is intended to fill. Government, in this respect, might well look to the proceedings of private individuals. A merchant scarcely requires of his clerk to be well read in the ancient classics, or "up" in the higher mathematics; or of his messenger to be well versed in history and geography. The present system, however, is immeasurably in advance of the old; and we may reasonably hope that many of its present defects will be remedied in the course of time.

EXCELLENCY, *ek'-sel-len-se* (Lat. *excellentia*, excellence), a title first borne by the Lombard kings, and afterwards assumed by several emperors of the West. It was afterwards transferred to the inferior princes, especially in Italy, until they also gave it up, after Pope Urban VIII., in 1630, had bestowed the title of "eminence" on the cardinals. Since that period the title of excellency has become a title of office or service, neither hereditary nor transferable from one member of a family to another, but always belonging to the office. In Europe it is only borne by ministers in actual service, by the highest court and military dignities and, by ambassadors and plenipotentiaries. Governors of English colonies also receive the title of excellency.





EXCHANGE, *eks'-tshainj* (Fr. *échange*), is, properly, the giving of one thing or commodity for another, and in commercial language is employed to denote the means by which the debts of persons residing at a distance from their creditors are discharged without the transmission of money or goods. This is effected by means of what are known as bills of exchange. A bill of exchange is simply an order addressed to some person at a distance, directing him to pay a certain specified sum to the person in whose favour the bill is drawn, or his order. A merchant in London, who may be due a sum of money for goods to a merchant in Hamburg (instead of remitting money or goods to the amount of the debt), goes into the market and buys from another merchant who has a debtor in Hamburg a bill of exchange for the amount, which he transmits to his creditor in Hamburg, who in this way gets payment of his debt from a person in his own town, the debtor of the second merchant. In this way, the debtor in the one place is substituted for the debtor in the other, to the great convenience of all parties. Bills of exchange are of two kinds,—*inland* and *foreign*; inland, when both parties are in England; and foreign, when one of them is abroad, or in Scotland or Ireland. (*See* BILL OF EXCHANGE.) Exchanges between different parts of the United Kingdom are now almost entirely in the hands of bankers. In cities or countries having a considerable amount of intercourse together, the debts mutually due by the one to the other approach for the most part near to an equality. Between countries making use of different currencies there is what is known as a *par of exchange*, which is the equivalency of a certain amount of the currency of one country in the currency of the other, the currencies of both being supposed to be of the precise weight and purity fixed by their respective mints. Among the causes that affect the par of exchange, in addition to a rise or fall in the price of the precious metals, are, (1) changes made by authority in the quantity of pure metal contained in the coin by way of increase or diminution; (2) depreciation from the use of paper-money; (3) clipping; (4) tear and wear. When two countries trade together, and each buys of the other exactly to the amount that it sells, their claims will balance each other, and the exchange will be at par. This, however, is rarely the case; for there is almost always a balance owing on the one side or the other, and this balance affects the rate of exchange. Thus, if London sends more goods to Hamburg than she receives from it, there will be a greater demand for bills upon London in Hamburg than of bills upon Hamburg in London, and their value will proportionally advance above par, while in London, in like manner, they will fall below it. It is evident, however, that these fluctuations in the real exchange are subject to certain limits, beyond which they cannot advance. Thus the price of bills of exchange on any place can never exceed the expense of sending bullion to that place, otherwise the merchant will find it to his advantage to transmit bullion in place of bills. The tendency of any advance in the rate of exchange is to stimulate exportation and to put a check upon importation.—Ref. *Encyclopædia Britannica*, art. "Exchange," by J. R. McCulloch; McCulloch's *Commercial Dictionary*.

EXCHEQUER, *eks-tshek'-ker* (Fr. *échiquier*, Lat. *scaccarium*), is the name of an ancient court of record, wherein all causes touching the revenue and rights of the crown are heard and determined, and where the revenues of the crown are received. According to Camden, the court took its name from the chequed cloth, resembling a chess-board, which covered the table there, and on which, when certain of the king's accounts were made up, the sums were marked and scored with counters. This court was established by William the Conqueror as part of the Aula Regis, and reduced to its present order by Edward I. It was principally intended at first to order the revenues of the crown and to recover the king's debts and duties; but it subsequently acquired the additional character of an ordinary court of justice between subject and subject. It consists of two divisions,—the *receipt* of the exchequer, which manages the royal revenue, and the court, or judicial part of it. (*See* COURT OF EXCHEQUER.) As a court of revenue it ascertains and enforces, by proceedings appropriate to the case, the

proprietary rights of the crown against the subjects of the realm. To proceed against a person in this department of the court is called to *exchequer* him. The practice and procedure on this side of the court was amended by 22 & 23 Vict. c. 21. The judges of the court of Exchequer are the chancellor of the exchequer and one chief and four other barons. The first of these, however, now exercises no judicial functions, and only takes his seat formally on certain occasions. The duties of the chancellor of the exchequer are confined to matters relating to the finance of the country and the receipt and payment of revenue. He is, in fact, the principal finance minister of the crown, and exercises the chief and most responsible control over the expenditure of the different branches of the public service, the details of which are annually submitted for his revision. He prepares the annual statement of the estimated expenses of the country, and the ways and means by which they are to be defrayed, including the imposition or remission of taxes. (*See* Budget.) This office has sometimes been held conjointly with that of first lord of the Treasury.

Exchequer Bills are bills of credit issued under authority of parliament, and forming the principal part of the unfunded debt of this country. They are for sums varying from £100 to £1,000, and bear interest generally from 1½*d.* to 2½*d.* per day per cent., according to the usual rate of interest at the time. They were first issued in the reign of William III., 1696, and have been continued annually ever since. The amount of exchequer bills outstanding and unprovided for in 1861 was £20,435,197. The bills pass from hand to hand as money without any formal transfer, and the option is given periodically to holders of being paid their amount at par. Act 24 Vict. c. 5 (1861), declares that fourteen days prior to the expiry of each twelve months from the date of issue, and during their legal currency, notice is to be given in the *London Gazette*, that payment will be made, and if not then claimed, such bills are to have legal currency for another twelve months, and go on from year to year; but the holder cannot claim payment at any interval between the times fixed by such yearly notices; except that such bills during any part of the last six months of each year may be used in payment of any duties or taxes due to the crown. It is enacted that the bills are to be prepared in a form fixed by the Treasury, and to be signed by the comptroller-general or assistant comptroller, the rate of interest being fixed by the commissioners of the Treasury, and to be payable half-yearly by the Bank of England, but not to exceed £5. 10*s.* per cent. per annum. The Treasury are empowered to issue new bills to replace old ones to any amount not exceeding £13,230,000.

Exchequer, Court of. (*See* Court of Exchequer.)

Excise, *eks-size'* (Du. *accys*, Ger. *accise*), is derived from the Latin *excisa* (sc. *pars*), and properly signifies that part of the profits of the manufacturer or producer which is *cut off* for the support of the government, before the commodity is sold. It is generally applied to those taxes or duties which are levied upon certain articles produced and consumed at home,—exciseable articles when exported to other countries being usually entitled to a certain drawback. There are, however, certain duties included in the excise branch of the revenue to which the above definition does not strictly apply; as licences for carrying on certain trades. This mode of taxation had been established in Holland at an early period, but was first introduced into this country by the Parliament in 1643, in order to carry on the war against the Crown. The royalists soon after also had recourse to this mode of raising money, both sides declaring that the excise should be continued no longer than to the end of the war. It was first imposed upon the makers and vendors of beer, ale, cider, and perry; but the Parliament soon after laid it on flesh, wine, tobacco, sugar, and a number of other commodities, in pursuance of a plan proposed by Pym, who is considered to have been the father of the excise; and who, in a letter to Sir John Hotham, says that they had proceeded in the excise to many particulars, and intended to go on further; but that it would be necessary to use the people to it by little and little. Afterwards, when the nation had been accustomed to it for some years, the Parliament openly declared, in 1649, that "the impost of excise was the most easy and indifferent levy that could be laid upon the people;" and, accordingly, it was continued during the Commonwealth. Upon the Restoration, the excise duties were by 12 Car. II. c. 24, granted as part of the revenues of the crown, in lieu of the military tenures and the right of pre-emption and purveyance. By 30 Geo. II. c. 19, this branch of the royal revenue was taken from the crown and an annual sum of upwards of £7,000 granted in its stead. During the reigns of William III. and succeeding monarchs, excise duties were laid upon a number of commodities in order to meet the enormous expenditure occasioned by our wars on the continent. "Thus," says Blackstone in 1765, "brandies and other spirits are now excised at the distillery; printed silks and linens at the printer's; starch and hair powders at the maker's; gold and silver wire at the wire-drawer's; plate in the hands of the vendor, who pays yearly for a license to sell it; lands and goods sold by auction, for which a pound-rate is payable by the auctioneer, who also is charged with an annual duty for his license; and coaches and other wheel-carriages, for which the occupier is excised, though not with the same circumstances of arbitrary strictness as in most of the other instances. To these we may add coffee and tea, chocolate and cocoa-paste, for which the duty is paid by the retailer; all artificial wines, commonly called sweets; paper and pasteboard, first when made, and again if stained or printed; malt, as before mentioned; vinegars; and the manufacture of glass, for all of which the duty is paid by the manufacturer; hops, for which the person that gathers them is answerable; candles and soap, which are paid for at the maker's; malt liquors brewed for sale, which are excised at the brewery; cider and perry at the vendor's, and leather and skins at the tanner's." It is unnecessary to enter at length upon the numerous alterations that have from time to time been made in this branch of the revenue. The malt duty was first imposed in 1695. In 1787 the number of exciseable articles was twenty-seven; in 1833 they were reduced to fifteen; and in 1837 to nine, either by the duty being totally repealed or by being transferred to the management of some other department, by which it might be collected with greater economy and convenience. In 1823 the separate and independent boards of excise for England, Scotland, and Ireland, were conjoined; and in 1849 the excise was united with the stamps and taxes under one board, consisting of a chairman, deputy-chairman, and four other commissioners, entitled the Commissioners of Inland Revenue. These have full power to make all necessary rules and regulations, to enforce payments, and to appoint collectors and other subordinate officers, subject always to the control and instructions of the lords of the Treasury. To facilitate the collection of this branch of the revenue the United Kingdom is divided into *collections*; of which there are fifty-five in England and Wales, thirteen in Scotland, and fifteen in Ireland. Each collection is divided into several *districts*, and each district is subdivided into *rides* and *footwalks*. A ride comprises a considerable tract of country, in which the traders are thinly scattered, and the surveying officer is required to keep a horse. In towns, where the traders subject to survey are within a small circuit, the district under one officer is termed a *footwalk* or *division*. These survey officers are obliged to keep a minute account of each survey and of every particular connected with it, the exact time it commenced, how long it continued, &c. Each district is under the charge of a supervisor, who has thus the superintendence of a certain number of ride and footwalk officers, whose proceedings he constantly checks by surveying after them at uncertain times, examining their accounts, and keeping a diary, in which he inserts the particulars of his own surveys, and the errors which he may have discovered in those of the officers. The chief officer of each collection is termed a collector. He examines the diaries kept by the supervisors, and collects the duties payable in his district. The collector thus surveys the proceedings of the supervisors, while the latter act as a check upon the surveying officers. Such is the nature

of the system which Mr. Pitt in 1797 pointed at as a model for other public departments, on account of its efficiency and good management. There are also certain classes of officers below the ordinary surveying officers,—assistants, supernumeraries, and expectants. The traders subject to survey may be divided into four classes:—(1) those visited for the purpose of charging *growing* duties, as maltsters; (2) those whose license is high or low, according to the extent of their consumption, as brewers and tobacco manufacturers; (3) those subject to a license for dealing in articles upon which excise duty has, or ought to have been paid, as innkeepers; and (4) those subject to a license for dealing in articles on which customs duty has, or ought to have been, paid; as dealers in tea or tobacco. The excise was introduced into this country at a time when the attention of the state was directed to the readiest means of raising money, without much regard to its effects upon industry, or the general welfare of the people; and hence a strong prejudice long existed against it, which has not yet quite died out. Dr. Johnson defined it to be "a hateful tax levied upon commodities, and adjudged not by the common judges of property, but by wretches hired by those to whom the tax is paid;" and Blackstone says that "from its first introduction to the present time its very name has been odious to the people of England." Among the objections to the present excise system, is its interference in many cases with the freedom of the manufacturer in his operations. The officers inspect and control his premises and machinery, take cognizance of every part of the process, and often prescribe the mode of conducting and the time of commencing and completing each operation. It is said that upon the same premises, with the same capital, and the same amount of labour, double the quantity of cloths have been printed that could have been done previous to the repeal of the duty and the consequent removal of excise restrictions; and the duty on glass was avowedly repealed in order to facilitate improvements in its manufacture. A London distiller stated to the Commissioners of Excise Inquiry, some years ago, that, assuming that the duties on spirits distilled by him should be fully secured to the revenue, "it would be well worth his while to pay £3,000 a year for the privilege of exemption from excise interference." Dr. Ure, in the article "Brewing," in his Dictionary, says,—"As usual, the excise regulations interfere much with the progress of this, as of every other manufacture under fiscal superintendence. Careful to prevent fraud, they cripple industry, and seek, as it were, to secure the honesty of the labourer by cutting off his hand; ignorant or careless, meanwhile, of the permanent mischief which they inflict." Another objection to the present system is the inducement that the high duties, in certain cases, hold out to fraud. The higher the duties, the greater will always be the temptation to defraud the revenue; and all attempts to keep down smuggling, and at the same time maintain high duties, have signally failed. High duties, says Adam Smith, "tempt persons to violate the laws of their country, who are frequently incapable of violating those of natural justice, and who would have been in every respect excellent citizens, had not the laws of their country made that a crime which nature never meant to be so." These objections can only be removed by lowering the high duties, and, if necessary, including a greater number of articles. Duties within reasonable limits are uniformly found to be more productive than higher duties, which diminish the demand for the commodity and give encouragement to smuggling. Were light duties imposed upon a number of articles, instead of, as at present, heavy duties on a few, many of the present restrictions might be removed; and we believe that a greater sum might thus be raised, with little or no additional expense in collecting. The inducements to fraud would thus, in a great measure, be removed, and more might, with advantage, be trusted to the honour of the manufacturer. Experience also shows that the repeal or reduction of moderate duties, provided they have not interfered with the operations of the manufacturer, does not in a proportional degree render those articles cheaper to the consumers. Again, the excise laws, though in this respect they have been recently much improved, are still characterized by great obscurity and complexity, so as to be frequently unintelligible, and even contradictory. It is one of the principles regarding taxation laid down by Adam Smith, that "the time of payment, the manner of payment, the quantity to be paid, ought all to be clear and plain to the contributor, and to every other person." But so far from this being the case, there were, in 1836, no fewer than 620 acts of parliament relating to the excise; and at no distant period there were some forty or fifty acts in existence referring to the glass duties alone. We believe that were the duties reduced to a reasonable amount, and assessed so as to interfere as little as possible with the operations of the manufacturer, the laws made concise and intelligible, and the legal proceedings placed on a proper footing, whatever prejudices may exist against the excise would speedily disappear; for it enjoys certain advantages over every other mode of taxation. (*See* TAXATION.) The net amount of revenue yielded by the excise duties in 1850 was £14,316,084; in 1855, £16,389,486; and in 1860, £18,188,605. The following table gives the net amount of revenue received from each branch of the excise in each of the three kingdoms for the year ending 31st March, 1861:—

| | England. | Scotland. | Ireland. | Total. |
|---|---|---|---|---|
| Game Licenses... | £106,3[illegible] | £12,553 | £11,020 | £129,906 |
| Hops ..... | 582,728 | ... | ... | 582,728 |
| Licenses..... | 1,232,189 | 131,642 | 128,856 | 1,492,687 |
| Malt ..... | 5,679,631 | 205,511 | 323,671 | 6,208,813 |
| Paper..... | 965,229 | 281,226 | 59,798 | 1,300,253 |
| Race-horses | 6,245 | .. | ... | 6,245 |
| Spirits, home-made ... | 4,283,624 | 2,077,018 | 2,264,896 | 9,225,538 |
| Railways ..... | 337,079 | 29,222 | ... | 366,281 |
| Stage Carriages .. | 118,447 | 9,136 | ... | 127,883 |
| Hackney ditto ... | 87,751 | ... | ... | 87,751 |
| Chicory ..... | 357 | ... | ... | 357 |
| Total Exc. | £13,399,604 | 3,346,588 | 2,788,250 | 19,534,442 |

EXCLAMATION, *eks-kla-mai'-shun* (Lat. *exclamo*, I cry out), a term in Gram. susceptible of different significations, but which is usually accepted as an interjection, signifying sudden emotion, expressive of wonder, alarm, or joy. It is usually uttered by a vehement and sudden extension or elevation of the voice.

EXCOMMUNICATION, *eks-kom-mu-ne-kai'-shun* (Lat.), is an ecclesiastical censure or penalty, by which persons who have been guilty of any notorious crime or offence are cut off from the communion of the Church, and deprived of all ecclesiastical privileges. Excommunication is founded upon the natural right of all societies to exclude from their body such as contravene the established laws. The Jews expelled from their synagogue such has had committed any grievous crime; and the same was the practice in the religious system of heathendom. Among the early Christians excommunication was instituted for the purpose of preserving the purity of the Church and enforcing its discipline, though it came afterwards, in the hands of ambitious ecclesiastics, to be used as a means of advancing their own power, and was inflicted on the most frivolous occasions. The power of excommunication was lodged in the hands of the clergy, who distinguished it into the greater and the less. The latter consisted in excluding persons from participation in the Eucharist and the prayers of the faithful; the former deprived them of all the rights of the Church, and even cut them off from the society and conversation of the faithful, no one being allowed to receive an excommunicated person into his house, or to sit at the same table with him. He who was guilty of any intercourse with an excommunicated person, himself incurred the same sentence. Excommunication was early introduced into England as a means of ecclesiastical punishment; but many men were obstinate and profane enough to despise the *vinculum fulmen* of mere church censures; and so the common law stepped in to aid the Church, and declared that an excommunicated

person is disabled from doing any act that is required to be done by a *probus et legalis homo*. He thus could not serve upon juries, could not be a witness in any court, and could not bring an action, real or personal, to recover lands or money due to him. And further, if within forty days after the sentence the offender did not submit and abide by the decision of the spiritual court, the bishop might certify such contempt to the king in chancery; upon which there issued out a writ to the sheriff of the county, called, from the bishop's certificate, a *significavit*, or, from its effects, a writ *de excommunicato capiendo*; and the sheriff might thereupon take the offender and imprison him in the county gaol till he was reconciled to the Church, and such reconciliation certified by the bishop; upon which another writ, *de excommunicato deliberando* issued out of chancery to deliver and release him. But by 53 Geo. III. c. 127, it is declared that "no person who shall be pronounced or declared excommunicate shall incur any civil penalty or incapacity in consequence of such excommunication, save such imprisonment, not exceeding six months, as the court pronouncing or declaring such person excommunicate shall direct." By that statute, excommunication can only be pronounced as spiritual censure for offences of ecclesiastical cognizance,—adultery, heresy, simony, and the like; but the practice has long become obsolete.

EXECUTION, *eks-e-kū'-shun* (Lat. *ex*, out; *secutus*, followed), in a general sense, is the performance of any act or duty. In Law, it is the last stage of a suit giving possession of anything recovered at law or in equity after the decision of the court,—the putting in force of the sentence of the court. This is performed by different writs of execution, according to the nature of the action, and of judgment. In ordinary actions, the judgment is, in general, for the recovery of money only, either by way of debt or damages. In such case, the practice of the court allows the judgment-creditor to resort to one of the four following writs of execution:—(1) Writ of *capias ad satisfaciendum*, to imprison the body of the debtor till satisfaction be made for the debt, or damages and costs; (2) writ of *fieri facias*, by which the goods and chattels of the party against whom the judgment is recovered may be seized upon and sold; (3) writ of *levari facias*, which commands the sheriff to levy the debt on the lands and goods of the party against whom it is issued; (4) writ of *elegit*. (*See* ELEGIT.) Where the judgment is for the recovery of goods themselves which are detained, there is a special writ of execution, called a *distringas*, to compel the defendant to deliver the goods by repeated distresses of his chattels, or else a *scire facias* against any third person in whose hands they may happen to be, to show cause why they should not be delivered; and if the defendant still continues obstinate, then the sheriff shall summon an inquest, to ascertain the value of the goods and the plaintiff's damages, which shall be levied on the person or goods of the defendant. The 7 & 8 Vict. c. 96, abolished arrest for debts under £20, unless contracted by fraud.

EXECUTION OF DEEDS is the signing, sealing, and delivery of them by the parties, as their own acts and deeds, in the presence of witnesses. Execution is also the last stage in criminal proceedings,—the depriving the criminal of his life. (*See* CAPITAL PUNISHMENT.)

EXECUTIVE, *eks-ek'-u-tiv*, in Pol., is a term applied to a power in a state, distinct from the legislative or judicial. The power that deliberates and enacts laws is the legislative, that which judges or applies the laws to particular cases is the judicial, while the executive is that which carries the laws into effect, or superintends the enforcement of them. In England, the executive is, by the constitution, supposed to be vested in the king and such inferior officers as he may appoint.

EXECUTOR, *eks-ek'-u-tor* (Fr. *exécuteur*), is a person intrusted by a testator to carry out the directions and requests in his will, and to dispose of his property, as directed therein, after his decease. When no executor is named by will, or when those named refuse to act, then the Probate Court nominates certain persons to act as administrators to the deceased. Before probate of the will, an executor may effectually do most of the acts that he could enforce afterwards; but an expected administrator can properly do no act whatever before obtaining letters of administration. An administrator, after receiving letters of administration, is in most respects in the same position as an executor, and the cases relating to the one apply, in general, to those of the other. In Scots law, administrators are termed executors *dative*, *i. e.* appointed by the court; the other class being executors *nominate*, *i. e.* appointed by will. The right to nomination as administrators or executors dative is, generally speaking, in the order of relationship to the deceased. In England, the widow or next of kin have the first right to be appointed, and, failing them, creditors; in Scotland, persons entitled to the estate by a general settlement have a right to be appointed before others, and then the next of kin. An administrator is required to enter into bond with sureties for the faithful execution of his trust. An executor may refuse to act; but, having once acted, he cannot divest himself of the office or its responsibilities. If a person take upon himself to act as executor without any just authority, as by intermeddling with the goods of the deceased, he is called an executor *de son tort*, *i. e.* to his own hurt, and is liable to all the trouble of his office, without any of the profits or advantages; but merely doing acts of necessity or humanity, as looking up the goods, or burying the deceased, will not be so construed. An executor is not entitled to any remuneration for his own personal trouble or loss of time, unless it be expressed in the will. The duties of an executor are to bury the deceased in a suitable manner, to prove the will, and make up an inventory of the personal estate; to collect the goods and chattels of the deceased, and to pay his creditors in the order of legal priority. The legacies are then to be paid as far as the assets extend, observing the distinction between a specific and a general legacy, the residue, if any, going to the next of kin. The office of an executor is one of great trust and responsibility, as he not only represents the deceased, but is also a trustee for behoof of the creditors, legatees, and next of kin, of the deceased. He is liable for any loss occurring to the estate through negligence; for paying sums not due, unless upon decrees; for paying simple-contract creditors before special creditors, or legatees before all the debts are discharged, if there should be any deficiency in the estate. If he intromit with the funds or moveables, so as to lead to a suspicion of fraud, or so as to leave no means of ascertaining its extent, he is liable for all the debts of the deceased; otherwise, an executor is liable for the debts of the deceased only to the amount of the inventory.

EXEDRA, *eks-ed'-rā* (Gr. *exedra*), the name given in ancient architecture to recesses generally furnished with seats, which were placed in the halls and porticos of public and private buildings, and in the Roman baths and Greek palæstræ. They appear to have been similar to the modern alcove, though on a larger scale.

EXEGESIS, *eks-e-jē'-sis* (Gr., from *ex*, out of; *egeomai*, I lead), properly signifies the exposition or interpretation of any writing, but is almost exclusively confined to the interpretation of the sacred Scriptures. Exegesis is frequently confounded with hermeneutics. This distinction between them is thus given by Dr. Davidson:—"The meaning of all language, written or spoken, is developed by the application of general laws, usually termed *hermeneutics*. These principles, in their relation to Scripture, are styled *sacred hermeneutics*; and their application to particular instances has received the name of *exegesis*." Hermeneutics, then, is the science which lays down the principles of the art of interpretation, and exegesis is the application of these principles to particular instances. As the sacred books were written in foreign languages, by authors of a different age, and living in a country different from ours, it is evident, that in order to understand them thoroughly, requires not only an intimate acquaintance of these languages, but also a large mass of historical, geographical, and antiquarian knowledge. In the early ages of the Church, several of the fathers distinguished themselves as exegetical authors, as Origen, Chrysostom, Diodorus of Tarsus, and Jerome; but during the middle ages, from the ignorance of the sacred languages that then prevailed, the subject was

almost entirely neglected. The Reformation revived this study in the labours of Luther, Melancthon, Calvin, Zwinglius, Beza, and others. Since that time, this subject has been receiving more and more attention at the hands of scholars, and never more than in the present day, more especially in Germany.

EXERCISE. (*See* GYMNASTICS.)

EXETER COLLEGE, Oxford, *eks'-e-ter*, was originally founded in 1314, by Walter de Stapledon, bishop of Exeter, and some time lord high treasurer of England, and was then called Stapledon Hall. The bishop removed hither his scholars from Hart Hall, and made a foundation for a rector and twelve fellows. Thirteen fellowships were subsequently added by different donors; but in 1855, under powers granted by 17 & 18 Vict. c. 81, these fellowships were reduced from twenty-five to fifteen, and the restrictions with which they were burdened removed, so that they are now open without any preference with respect to birth. Candidates must be members of the Church of England, or of some church in communion with it, and must have passed all the examinations required by the university for the degree of B.A., or have been admitted *ad eundem gradum* of the university, or have become in any way a member of convocation. From the revenues of eight suppressed fellowships, twenty-two scholarships are founded; ten of which are open, ten (called Stapledon scholarships) are limited to persons born or educated in the diocese of Exeter, and two to persons born in any of the Channel islands, or educated at Victoria College, Jersey, or Elizabeth College, Guernsey. The revenues of the two remaining fellowships were divided among the rectorship and the fifteen fellowships. There are also twenty exhibitions attached to this college, but eleven of them are not in its immediate gift. The number of members on the books in 1863 was 607.

EXHALATION. (*See* EVAPORATION, VAPOUR.)

EXHIBITIONS, ART, *eks-e-bish'-uns* (Lat. *exhibitio*), displays open to the public, free or otherwise, of the works of living or deceased artists, mostly with the view of gaining purchasers for the paintings and instructing the national character. For more than a century and a half these great incentives to art have been carried out, and art exhibitions have become indeed popular institutions amongst nearly all the nations of Europe. In most European towns these exhibitions take place annually, and in France and England they are, in fact, of more frequent recurrence. In the middle ages, and up to the middle of the 17th century, when art was patronized only by the government, the priesthood, or the nobility of the different nations where art sprung up, the works of artists were deposited in public buildings or churches open to the public, so as to spread the artist's fame, and thus add to his prosperity and reputation; but when private patronage became the artist's mainstay, and when his works, if purchased, would be sure to be buried, as it were, in private houses, where none but a small circle could see them, it became necessary for the artist to have some public exhibition, whereby the public generally might see his works and judge of his talents before they were hidden away in the dwellings of their purchasers. Probably the earliest art exhibition was that which was started by the members of the Academy of Fine Arts at Rome: anything before this could not have been of any open or general character, being confined to the works of some particular master and his pupils. That of the French Academy, in the year 1673, was the first art exhibition, in the true sense of the word in which we take it; but this was not placed on a very firm basis. In the year 1745 it was once more regularly instituted, and an exhibition of fine arts took place biennially from that date down to the days of the Revolution. While the days of the barricades lasted, it was thrown open to all foreign artists, and in the year 1796 it was restored to the form of an annual exhibition. In England, however, art was more tardy, for it was not until the year 1769 that the regular exhibitions of the Royal Academy commenced. From that date down to the present time art exhibitions have steadily increased, and in London, instead of one, we can number some ten or twelve art exhibitions which are opened every year. To show the increased zest which these exhibitions have given to the prosecution of art, it may be stated, that in the first exhibition of the Academy in the last century, the number of works exhibited was only 130, and the number of exhibitors 69; while in 1862 the number of artists who exhibited was upwards of 1,000. One of the most memorable of fine-art exhibitions was that of Manchester in the year 1857, which met with a success somewhat similar to that of the Industrial Exhibition of 1851. The value of the works exhibited is stated to have been more than £6,000,000; and these were lent gratuitously by their possessors, in order that the public might obtain a sight of masterpieces which existed, it is true, but whose existence was unknown and unthought of by the world at large. In the Exhibition of 1862, great space was left for the exhibition of fine arts. (For further information see article on INTERNATIONAL AND INDUSTRIAL EXHIBITIONS.)

EXHIBITIONS, INTERNATIONAL AND INDUSTRIAL. (*See* INTERNATIONAL AND INDUSTRIAL EXHIBITIONS.)

EXIDIA, *ek-sid'-e-ä*, in Bot., a gen. of Fungi. The species *E. Auricula Judæ*, Jew's ear, is reputed to possess astringent and discutient properties, when applied externally as a decoction or poultice. *E. hispidula* is used in China as a styptic, and as food mixed in soups and hashes. It is known there under the name of *Moghi*, which signifies *ears of trees*.

EXILE. (*See* BANISHMENT, TRANSPORTATION.)

EXISTENCE, *eg-zis'-tens*, means the state of being, duration, or continuation. In mental philosophy, it partakes of the theories of *materialism* and *perception*. According to all theories, existence must have been, even of *chaos*, before the Adamite world, and it will continue to eternity.

EXIT, *eg'-zit* (from the Latin *exire*, to go out), signifies the departure of an actor or player from the stage, when he has performed his part in any particular scene or act. It is also applied to the termination of one's career or state of existence. It is usually placed in the margin of plays, as a guide to the actor or reader.

EXODUS, *eks'-o-dus* (Gr. *exodos*, a going out, a departure), is the name given to the second book of the Old Testament, as containing a narrative of the departure of the children of Israel out of Egypt under the guidance of Moses. In Hebrew it is termed *ve-aleh Shemoth*,—'these are the names,'—from the words with which the book begins. Exodus may be divided into two principal parts: (1) Historical (i. 1—xviii. 27), comprising (*a*) the preparation for the deliverance of Israel from their bondage in Egypt, and (*b*) the accomplishment of that deliverance; and (2) Legislative (xix. 1—xl. 38). In the first section we have an account of the great increase of Jacob's posterity in the land of Egypt, and their oppression under a new dynasty, which occupied the throne after the death of Joseph; an account of the birth, education, and flight of Moses; his solemn call to be the deliverer of Israel, and his return to Egypt; his ineffectual attempts to prevail upon Pharaoh to let the people go, the infliction of the ten plagues, and the institution of the passover. Then follows a narrative of their departure out of Egypt, their passage through the Red Sea, with the destruction of Pharaoh and his host in the midst of it; the principal events on the journey from the Red Sea to Mount Sinai; the bitter waters at Marah, the quails, the manna, the water from the rock at Rephidim, the battle with the Amalekites, and the arrival of Jethro with Moses's wife and children in the Israelitish camp. In the second part of the book we have the promulgation of the law on Mount Sinai, the preparation of the people by Moses for the renewing of the covenant with God, the promulgation of the moral law, the judicial law, and, lastly, the ceremonial law, including the construction and erection of the tabernacle. In chap. xxxii.—xxxiv. we have an account of the idolatry of the Israelites, the breaking of the two tables of the law, the divine chastisement of the people, and the renewal of the tables of the covenant. This book "comprises a history of the events that took place during the period of 145 years, from the year of the world 2369 to 2514 inclusive, from the death of Joseph to the erection of the tabernacle. Twenty-five passages, according to Rivet, are quoted from Exodus by our Saviour and his apostles in express words, and nineteen allusions to the sense are made in the New Testament."—

(*Horne.*) Mr. Horne also adopts the generally received opinion that Moses was the author of this book; but there have been many learned critics, both Jews and Christians, of a contrary opinion. There are many difficulties connected with this book, which have been attempted to be explained in different ways; some holding that it is the work of a much later author than Moses; others that it is the work of two distinct authors, living at different times; a third party that it abounds with interpolations, and so on. This subject has received a fresh interest from the publication, by Dr. Colenso, bishop of Natal, of a work on the Pentateuch, in which he gives forth views which are not regarded as orthodox. "I have arrived at the conviction," he says, "as painful to myself at first as it may be to my reader, though painful now no longer under the clear shining of the light of truth, that the Pentateuch, as a whole, cannot possibly have been written by Moses, or by any one acquainted personally with the facts which it professes to describe; and further, that the (so called) Mossic narrative, by whomsoever written, and though imparting to us, as I fully believe it does, revelations of the divine will and character, cannot be regarded as historically true." It remains to be seen what arguments are to be brought forward against the bishop's statements, most of which, however, are not new, and some of them are sufficiently weak. We cannot, however, enter upon the subject, but would refer those who wish to get the arguments in favour of the commonly-received opinions on this subject, to the works of Hengstenberg and Hävernick on the Pentateuch.

Ex officio, *eks-of-fish'-e-o* (Lat., by reason of office or duty), a term applied to an act done in execution of a power which a person has by virtue of his office. In legal phraseology, *ex-officio informations* are informations at the suit of the Queen, filed by the attorney-general, by virtue of his office, without applying to the court wherein filed, for leave, or giving the defendant an opportunity of showing cause why it should not be filed. *Ex-officio* criminal informations are used in official prosecutions in cases of libel, sedition, &c.

Exogens, *eks'-o-jens* (Gr. *exo*, without; *ginomai*, I am formed), in Bot., plants with stems that increase by external concentric layers,—as the beech, ash, and oak. The class *Exogenæ* of some botanists corresponds with the class *Dicotyledones* (which *see*).

Exogonium, *ex-o-go'-ne-um* (Gr. *exo*, without; *gonia*, angle), in Bot., a gen. of *Convolvulaceæ*. The species *E. purga* is a native of Mexico, near Chincanquico. Its tuberoular roots constitute the true jalap of the Materia Medica, so well known as a purgative.

Exorcism, *eks'-or-sizm* (Gr. *exorkizo*, I conjure), is the conjuration of evil spirits, in the name of God or Christ, to depart out of a person possessed. In the early ages of the Church, when persons were about to be baptized, they were called upon to make a solemn renunciation of the devil and all superstitious practices and worship; but afterwards, about the 4th century, when all idolaters came to be looked upon as possessed of devils, it became customary to exorcise them previous to their being baptized. Soon afterwards it came to be a form generally employed in baptism even of children of Christian parents, who were also regarded as possessed by the devil before baptism. The words employed were, "I adjure thee, unclean spirit, that thou come out of this servant of Jesus Christ; in the name of the Father, and the Son, and the Holy Ghost." Exorcism was retained by Luther, but was laid aside by the Reformed church. The Roman Catholics employ exorcism in three different cases;—in the administration of baptism, in actual or supposed demoniacal possession, and in the blessing of the chrism and holy water.

Exordium, *eks-or'-de-um* (Lat. *exordior*), is the introduction or opening part of an oration, and, according to Cicero and Quintilian, it ought to have one or other of three ends in view;—(1) to render the hearers benevolent, or to conciliate their good-will; (2) to excite their attention; or (3) to render them docile, or open to persuasion. An exordium should be easy and natural, and drawn either from the subject itself or from the situation of the speaker. The ancients distinguished two kinds of introductions,—the *principium* and *insinuatio*. The former is where the orator plainly and directly professes his aim in speaking. In the latter the orator must take a larger compass, and, presuming the disposition of the audience to be against him, he must gradually reconcile them to hearing him before he plainly discovers the point which he has in view.

Exosmose, *eks-os'-mose* (Gr. *ex*, out of; *osmos*, impulsion), the passage from within outwards of fluids or gases through a membranous separation. (*See* Endosmose.)

Exostosis, *eks-os-to'-sis* (Gr., from *ex*, out of, and *osteon*, a bone), in Surg., is a term applied to a morbid enlargement or hard tumour of a bone. This term is applied properly only to osseous tumours on the bones, though it is also sometimes applied to other morbid growths. Exostoses are easily distinguished from other swellings by their being fixed and immoveable, and at first unattended with any pain or inconvenience. There are three varieties,—the solid, the hollow, and the foliated. There is no bone that may not become the seat of this disease, though some are much more subject to it than others. No external treatment is of any benefit in this disease; and when it is necessary that they be removed, and can be done with safety, it is effected by sawing or cutting.

Exotic, *eks-ot'-ik* (Gr. *exotikos*, foreign), a term applied to the produce of foreign countries. In gardening, exotic plants are those which belong to a soil and climate entirely different to the place where they are raised, and are therefore mostly preserved in green-houses. Exotic plants from hot climates are very numerous, and require much attention; without great care, even if they do blossom, it is seldom that they produce fruit, or that their seeds ripen.

Expansion, *eks-pan'-shun* (Lat. *expansio*), a term applied to the enlargement or increase of bulk in bodies, generally produced by heat. This effect is one of the most common and obvious results of the raising of temperature in all bodies, solid and liquid. Among the solids, the metals are the most expansible by heat. Experience has taught our engineers that it is dangerous to confine such a force as this, and that it is necessary to make provision for it in metallic constructions. The arches of Southwark bridge rise and fall about an inch in the usual range of atmospheric temperature, and if provision had not been made for the expansion and contraction of the iron, destructive consequences must have ensued. In most cases, all bodies contract when the temperature is lowered; but there is a remarkable exception to this rule in the case of water, which begins to expand when lowered to 40° Fahr. (*See* Water.) The power evolved in the expansion of water is very great. A brass globe having a cavity an inch in diameter can be burst by filling it with water and freezing it, when the absolute force necessary to produce a like result is equal to 27,720 lbs. weight. Aeriform bodies are the most expansible forms of matter, and they all expand and contract alike.

Ex parte, *eks-par'-te* (Lat., of one part), in Law, is a phrase used in chancery proceedings, when a commission is taken out and executed by one side or party, the other party refusing or neglecting to join therein. When both parties join, it is called a joint commission. Hence the term *ex parte* has come to be applied, in common language, to any statement or evidence coming from one of the interested parties.

Expectorants, *eks-pek'-to-rants* (Lat. *ex*, out of, and *pectus*, the chest), is a term applied in Med. to such substances as promote the expulsion of mucus, or other matters, from the air-passages of the throat and chest. The agents that are used with this view are very different, and act in different ways. Vapours are the only agents that can act directly upon the organs affected; those that are taken into the stomach being only capable of acting in an indirect manner. The inhaling of the vapour of warm water simply, or mixed with certain medicinal substances, as vinegar, is very useful in this way. Most medicines which, taken in large doses, act as emetics, are used as expectorants; as squills, ipecacuanha, gum ammoniacum, &c. The expectorant most commonly used in ordinary cases is the syrup of squills. All substances, also, which excite irritation at the upper part of the windpipe, and produce coughing, act as expectorants.

When there is decided inflammation, the best expectorants are such as lessen the inflammatory state; and hence mustard, or a fly-blister, applied to the chest, or venesection, will be found to be of the utmost service. Great care is necessary to be observed in the selection of the particular agent to be employed in each case, and very great injury may be done by having recourse to such as are unsuitable.

Experience, *eks-pe'-re-ens* (Lat. *experientia*), can, strictly speaking, be applied only to what has occurred within a person's own knowledge, and in this sense, of course, can only relate to the past. Thus, a man knows by experience what sufferings he has undergone in a certain disease. Frequently, however, the word is used to denote a judgment derived from experience in its primary sense; and thus only can experience be applied to the future, or any general fact; as when it is said that we know by experience that water at a certain temperature will freeze.

Experiment, *eks-per'-e-ment* (Lat. *experimentum*, an attempt), an operation for the purpose of discovering some unknown truth, principle, or effect, or to establish it when discovered. Experiments are of great importance in physical science, and in chemistry they disclose the qualities of natural bodies.

Experimental Philosophy is that which deduces the laws of nature, the properties of bodies, and their mutual actions upon one another, from experiments and observations. The distinction between deductive and experimental philosophy is clearly pointed out in the following quotation from Sir John Herschel:—"A clever man shut up alone and allowed unlimited time, might reason out for himself all the truths of *mathematics*, by proceeding from those simple notions of space and number of which he cannot divest himself without ceasing to think; but he could never tell by any effort of reasoning what would become of a lump of sugar if immersed in water, or what impression would be produced on the eye by mixing the colours yellow and blue." Experimental philosophy is consequently founded on ocular demonstration, or that which cannot be denied without violating common sense or clear perception. (*See* Inductive Philosophy.)

Experimentum Crucis, *eks-per-e-men'-tum kru'-sis* (Lat., experiment of the cross), a leading or decisive experiment, either so called on account of its being like a cross or direction-post, placed by the roadside in order to guide travellers in the right path, or on account of its being a kind of torture to elicit the truth, as the cross was used like the rack for that purpose in ancient times.

Explosion, *eks-plo'-zhun* (Lat. *explosio*), the sudden expansion or bursting of any substance, accompanied by a loud report; as the explosion of gunpowder, an explosion of a steam-boiler, an explosion of gas.

Exportation, *ex-por-tai'-shun* (Lat. *ex*, out, and *porto*, I carry), the act of sending commodities out of one country into another. (*See* Commerce.)

Ex-post-facto, *eks-poast-fak'-to* (Lat.), a law phrase which is applied to something which has already been done or proved. For instance, a law is said to be made *ex-post-facto* when it renders an offence in a manner in which it was not punishable at the time it was committed; that is, a law made for the offence itself.

Expression, *eks-presh'-un.*—In the Fine Arts, this term is applied to the representation of the various passions of the mind, as shown in facial development. Sir Joshua Reynolds, who may be said to be the father of the English school of painting, directs that all attention must be paid to expression. He says,—"Care must be taken not to run into peculiarities. Those expressions alone should be given to the figures which their respective situations generally produce. Nor is this enough; each person should also have that expression which men of his rank generally exhibit. The joy or the grief of a character of dignity is not to be expressed in the same manner as a similar passion in a vulgar face."

Expurgatorius Index. (*See* Index Expurgatorius.)

Extempore Speaking, *eks-tem'-pore* (Lat. *ex*, and *temporarius*, lasting but for a time, temporary) may be defined to be the power of clearly and forcibly expressing oneself upon any subject without previous preparation, at least as regards the words; for, strictly speaking, every extemporized speech presupposes a preliminary operation of thought. Before extemporizing a speech, it is necessary to have the foundation of the discourse fixed in the mind, and the succession of thoughts to be expressed. There should reign between all its parts an order of filiation, or generation, the one idea naturally producing the other; and they should be so disposed, that each may be found in the very place marked out for it, the moment it is required. The great requisite in extempore speaking is to have clear and distinct ideas regarding the subject on which one is about to speak. In order to speak forcibly and clearly, one must begin by feeling vividly, and then clear ideas on the subject will naturally follow. It should not, however, obtain such possession of the mind as to prevent it from acting; for the mind of the speaker may become so completely absorbed by the contemplation of his subject, as to be unable to enter upon its development. This forms a stumbling-block to many in attempting to become good speakers; and it frequently occurs with men of genius. He, therefore, who would speak well must feel what he has to say, with sufficie strength to express it with warmth and vivacity; his feeling must not attain that vehemence whi prevents the mind from acting, and paralyzes the expression, from its very fulness. In speaking, the feelings have to be resolved into ideas, thoughts, images; and these into words, phrases, language. The main idea of the subject has to be firmly grasped; and in its exposition it has to be divided into its principal parts or members, and these into subordinate parts; and so on, until the subject is exhausted. The imagination is one of the most necessary faculties to the extempore speaker: it ought to be endowed with great quickness in the formation and variation of its pictures, and also with great clearness, in order to produce, at first effort, a well-marked image, the lines and outlines defined with great exactness, and the colours bright, so that language has only to reproduce it unhesitatingly and unconfusedly. In many men, even of talent, the imagination is not sufficiently ready and clear; it works too slowly, owing either to a natural deficiency, or, more frequently, a want of practice. To many, again, the excitement of appearing in public is so great as to produce a certain incapacity of speaking, not unlike inability to walk from giddiness. The great means of getting over this is to feel perfectly sure of what you are going to say, and to have a clear conception of it. The public speaker requires to be able to think methodically; and for that purpose he ought to study logic, and the works of the best authors; he ought, also, to acquire such a mastery over his own thought, as to be able to decompose it into its parts, to analyze it into its elements, and then, at need, to re-compose, re-gather, and concentrate it again by a synthetical process. Now, this can only be well done by writing; and hence, one ought to begin by learning to write before he ventures to speak. In learning to write, one must write in imitation of the great masters of oratory. Writing gives wonderful clearness and intensity to thought, and enables us to look at a subject in every light. In the consideration of a subject, the best way is first to seize hold of the main idea, and regard it intently for some time, the different faculties of the mind concentrating themselves upon this single point; the subject is thus turned over in every direction, and viewed in all its aspects; its principal parts then gradually come out and separate themselves from each other, becoming more and more developed, until they reach their perfect form. The public speaker should have his mind well stored with information on a great variety of subjects, more particularly such as are regarded as forming part of a liberal education; for we can only extemporize what is already in the mind. It is of importance, too, that all we know be strongly conceived, firmly linked together, and carefully wrought out in such a way that, throughout all the diversity of knowledge, the mind, so far as may be, shall admit nothing save what it thoroughly comprehends, or, at least, has made its own, to a certain extent, by meditation. Further, in public speaking, thought has to be clothed in language; and

some attention to this is likewise necessary, in order that the subject may appear in as favourable a dress as possible. For this purpose, one ought to cultivate assiduously that natural desire of communicating to others what he knows, and of making them see things in the same light that he sees them. The mind seizes upon a thing more quickly, and conceives it more clearly, when there is also present to the mind the idea of communicating it to another; and thus, also, a natural desire is fostered for public speaking. In the details of diction, at the moment of public speaking, great decision is necessary, in order to clothe the ideas in proper words as they fly past, and, amidst many unsuitable, to allow none but such as are proper to escape from the lips. The speaker, however, at first ought not to be too nice in this respect; especially, when once he has begun a sentence or an idea, he ought to go on daringly to the end, even though he may have to take refuge in some incorrectness of language, or some unauthorized turn of expression. Decision, and even rashness, are necessary for him who would make a good public speaker. Finally, "the understanding which sees rightly and conceives clearly, and the heart which feels keenly, soon come to find naturally, and without effort, the words and the arrangements most analogous to what is to be expressed."—Ref. *The Art of Extempore Speaking*, by M. Bautain, 1858.

Extension, *eks-ten'-shun* (Lat. *extensio*, a stretching), in Logic, is a term used in contrast to comprehension, and, as applied to a general notion, it denotes the number of objects included under it. By detaching properties from a notion, we extend the list of objects to which it applies; by narrowing the sphere of a notion, the qualities which it comprehends proportionally increase. Thus, the greater the extension of common term, the less the comprehension, and *vice versâ*.

Extent, or Extendi Facias, *eks-tent'*, in Law, is a writ of execution issuing out of the court of Exchequer, and directed to the sheriff, against the body, lands, and goods, or the lands only, of a debtor. The sheriff is to cause the lands, &c. to be appraised to their full extended value before he delivers them to the plaintiff, in order that it may be certainly known how soon the debt will be satisfied. The king, by ancient prerogative, is entitled to this writ in order to recover debts originally due to him, or assigned to the crown. Extents are either *in chief*, or *in aid*. In extents in chief, the crown is the real plaintiff against a crown debtor; and under it his body, lands, and goods, may be taken at once. Extents in aid are sued out at the instance and for the benefit of the crown, against the debtor of a crown debtor.

Extortion, *eks-tor'-shun* (Fr. *extorquer*, to draw from by force, from Lat. *extorqueo*, I wrest from), in Law, is an abuse of public justice, which consists in any officer unlawfully taking, by colour of his office, from any man, any money or thing of value that is not due to him, or more than is due, or before it is due. This is an offence at common law, punishable by fine and imprisonment.

Extra, *eks'-trâ*, a Latin preposition, signifying *over and above*, in excess; as, *extra work*, *extra pay*, &c.

Extracts, *eks'-trâkts* (Lat. *extractus*), medicinal preparations obtained in a variety of ways from vegetable sources. Sometimes they consist of the simple evaporated juices of the fresh plant, and at others they consist of certain principles extracted from the fresh or dried plant by means of a menstruum capable of dissolving them. They are termed watery, alcoholic, acetous, or ethereal, according to the menstruum employed. The object is to preserve the principles from putrefaction, which was likely to occur while they remained associated with or dissolved in other portions of the plant. They are also thus more readily used in making pills, &c. The preparation of extracts requires great care. A great improvement was introduced by Mr. Barry in the mode of preparing extracts by evaporating *in vacuo*. Compound extracts are those which are prepared from several plants, and simple extracts from one only.

Extradition, *eks-trâ-dish'-un* (Lat., from *ex*, and *trado*, I deliver), denotes the delivery from one nation to another, and is more particularly applied to the delivery by one nation or state to another of fugitives from justice, in accordance with treaty.

Extravasation, *eks-trâv-â-zâ'-shun* (Lat., from *extra*, without, and *vas*, a vessel), in Surg., is a term applied to fluids which are out of their proper vessels or receptacles. Thus, an extravasation of blood takes place when an artery or vein is injured, and the blood escapes into the cellular membrane; and an extravasation of urine, when, in consequence of a wound or ulceration, that fluid makes its way into the cellular substance, or among the abdominal viscera. Extravasation is distinguished from exudation, in that, in the latter case, the walls of the vessels remain entire, and the fluids escape by secretion. It is nearly synonymous with effusion, but is not so comprehensive. The discoloration that follows contusions is occasioned by the extravasation of blood into the cellular tissue under the skin, from the rupture of small blood-vessels. When the ruptured vessel is large, or situated in a delicate part of the body, as in the brain, extravasation is usually fatal.

Extreme Unction, *eks-trem' unk'-shun* (Lat. *extremus*, last; *ungo*, I anoint), is one of the seven sacraments of the Roman Catholic church, founded upon that passage in the Epistle of St. James which says:—"Is any sick among you? let him call for the elders of the church, and let them pray over him, anointing him with oil, in the name of the Lord: and the prayer of faith shall save the sick, and the Lord shall raise him up," &c. (v. 14, 15). This passage, it is said by Protestants, has reference only to the miraculous powers which were exercised in the time of the apostles. The rite of unction is frequently alluded to by the fathers; but it, at that time, was common to several of the sacraments, and it was also employed as a means of restoring to health, as it is in the Greek church at the present day. It is called "extreme," because it is only for persons at the point of death,—the closing ceremony of life. It is believed to purify the soul of the dying person from any sins that he may have committed, and to give him strength and grace to encounter the last struggle. It is administered by the priest, who, dipping his thumb in the holy oil, anoints the sick person in the form of the cross, upon the eyes, ears, nose, mouth, hands, and feet, each time saying,—"Through this holy unction, and his most tender mercy, may the Lord pardon thee whatever sins thou hast committed, by thy sight (hearing, &c.) Amen." The holy oil is blessed by the bishop every year with much solemnity, on Maundy Thursday. The council of Trent passed several canons on this subject, declaring it to be truly and properly a sacrament instituted by Jesus Christ.

Exuviæ, *egs-u'-ve-e* (Lat.), a word applied to the cast-off skin of any animal, reptile, or shell-fish, which is "shed." The films of *mucus* thrown off by most molluscs and zoophytes must also be regarded as *exuviæ*. In insects, the whole integument is shed annually, several times in succession, the last *cadyrie* taking place in the final transition state, from the pupa to the imago. In shell-fish, or *crustacea*, the external shell is usually cast yearly. The common snake, when confined, draws its skin off annually by means of pressure of the folds, and the rattlesnake is said to invert and draw off its own skin. In the more warm-blooded classes, the moulted feathers of birds and the hairs of various species of *mammalia* may be looked upon as *exuviæ*, or exuvial deposits; as also the small scales of what is termed scarf-skin, which are continually cast off from our own bodies.

Eye, *i* (Ang.-Sax.), the organ of vision, is one of the most wonderful and delicate portions of the human body. It is placed within a bony cavity, termed the orbit, pyramidal in form, with the base anteriorly, and directed a little outwards, and the apex backwards and inwards. The orbit contains the globe of the eye, with numerous muscles, nerves, vessels, fat, &c. The external appendages of the eye are the eyebrows, eyelids, and lachrymal apparatus. The eyebrows, or *supercilia*, are arches of hair covering the supra-orbital ridge of the frontal bone on each side, and extending from near the root of the nose to a little beyond the outer canthus of the eye. They serve to prevent the sweat from falling into the eyes, and to protect them against a strong light. The eyelids, or *palpebræ*, are two thin

curtains which cover the eye, the one being inferior, the other superior. Where they join outwardly is called the *external*, and inwardly towards the nose, the *internal canthus*. The margin of the eyelids, which is cartilaginous, is called *tarsus*. Along the margin of each eyelid is a row of stiff hairs, termed *cilia*, or eyelashes, and which serve to keep external bodies out of the eyes, and moderate the influx of light. Within the lids, near their edges, are numerous glandular bodies, named after their discovever, the *Meibomian* glands, and secrete an oily or mucilaginous fluid, which lubricates the eyes and lids, and facilitates their movements. The lacrymal gland is situated in a small depression of the frontal bone near the external canthus, and from it seven or eight canals issue, called the lacrymal ducts, and open on the internal surface of the upper eyelid; it secretes the tears, which then pass along the surface of the eye to the *puncta lacrymalia*, which are two callous orifices or openings, one in each lid, at the internal angle of the tarsus. From the lacrymal points the tears are conveyed by the lacrymal canals into the lacrymal sac, which is a membranous receptacle situated in the internal canthus of the eye. The nasal duct is a membranous canal, extending from the inferior part of the lacrymal sac downwards, backwards, and outwards, into the cavity of the nose. The lacrymal caruncle (*caruncula lacrymalis*) is a small fleshy body, of a red colour, composed chiefly of mucous follicles, and situated in the internal canthus of the eye. The globe or ball of the eye is composed of membranes or coats, humours, vessels, and nerves. The *membrana conjunctiva*, or conjunctive membrane, is a delicate mucous membrane, lining the internal parts of the eyelids, and covers the whole of the anterior part of the globe of the eye. The outermost coat of the eye is the sclerotic (Gr. *skleros*, hard), so called from its hardness. It is a strong, dense, white, fibrous structure, covering about four-fifths of the ball, and leaving a circular deficiency in front, which is occupied by the cornea. The latter, so named from its horny appearance, is the transparent covering in front of the eye, its edges being slightly overlapped by the sclerotic coat. Externally it is covered by the membrana conjunctiva, and internally it is in contact with the membrane of the aqueous humour. It is convex anteriorly and concave posteriorly, and is composed of several laminæ, or layers. The choroid membrane is of a black colour, and covers the internal surface of the sclerotic coat, with which it is loosely connected by connective tissue. Near its anterior margin it is thrown into numerous folds or processes, alternately long and short, and which lie upon the edge of the lens and anterior portion of the vitreous humour: they are called ciliary *striæ* or processes, and conjointly the *corpus ciliare*. On the outer surface of the choroid are seen the ciliary nerves and long arteries; next come the veins called, from the peculiar manner of their arrangement, *venæ vorticosæ*; next is the *tunica Ruyschiana*, composed chiefly of ramifications of minute arteries, forming a beautiful network; and next to this is the *tunica pigmenti*, composed of pigment-cells, usually of a hexagonal form, and secreting on its inner surface the *pigmentum nigrum*. The retina, or inner coat of the eye, consists of three layers of membranes, the outermost of which, in apposition with the choroid, is an extremely delicate membrane, termed the *tunica Jacobi*. The middle one, *tunica nervosa*, is in reality the expansion of the optic nerve, and terminates at the edge of the ciliary processes. The inner coat is the *tunica vasculosa retinæ*, which is vascular in texture, and contains several minute branches of the central artery of the retina. On the inner surface of the retina, at the back of the eye, and in a line with the axis of the globe, is a circular yellow spot, called the *limbus luteus*, in the centre of which is an apparent orifice, named, after its discoverer, the *foramen* of Sömmering. The *iris* (Lat., a rainbow), so called from its variety of colour in different individuals, may be regarded as a process of the choroid, with which it is continuous, although the two membranes differ in structure. It is a thin, flat, circular, membranous curtain, hanging vertically in the aqueous humour in front of the lens, and having a central orifice, termed the pupil, for the transmission of light. Its anterior surface is coloured variously in different individuals, and its inner surface is lined with a substance resembling the pigmentum nigrum, called the *uvea*. It divides the space between the cornea and the lens into two chambers, communicating freely with each other through the pupil. The anterior chamber is about a fifth larger than the posterior, and is lined with a membrane, which secretes the aqueous humour. The external edge of the iris, by uniting with the choroid and sclerotic coats, forms a greyish circle, termed the ciliary circle or ligament. The iris is muscular in structure, and has great power of contracting or expanding the pupil, so as to admit more or less light into the interior of the eyeball. In the anterior and posterior chambers is the aqueous humour of the eye, which serves to distend the cornea to allow the free motion of the iris, and to direct the rays of light as they pass through it. The crystalline lens is a transparent body situated behind and opposite to the pupil, while its posterior surface is received into a corresponding depression on the fore-part of the vitreous humour. In form it is double convex, the posterior surface being more convex than the anterior; and it is invested by a transparent membrane called the *capsule*, which contains also a small quantity of fluid, called the *liquor Morgagni*. The lens consists of concentric laminæ, formed upon a hard, firm nucleus, and becoming softer as they tend to the outer surface. The vitreous humour, or *corpus vitreum*, lies in the concavity of the retina, occupying about four-fifths of the eye posteriorly, and being perfectly transparent. It is inclosed in the hyaloid membrane, which also sends numerous processes inwards, so as to divide it into a number of cells, and to equalize the pressure exerted on the different parts. It is penetrated by branches of the central artery of the retina. The eyeball is moved about in its orbit by six muscles, four of which are straight (*recti*) and two oblique,—the superior and inferior. The four recti muscles have their origin at the apex of the orbit, and are inserted into the sclerotic coat near the cornea, above, below, and on either side. When acting together, they tend to fix and retract the eye; when separately, to raise, depress, or turn it to one side or the other. The superior oblique rises with the straight muscles, proceeds forwards to the upper edge of the orbit, where it passes through a small pulley of bone or cartilage, by which its direction is changed; and its course is then backwards, outwards, and downwards, to be inserted into the sclerotic coat. It serves to draw the eye downwards and outwards. The inferior oblique arises from a minute depression in the orbital plate of the superior maxillary bone, just within the margin of the orbit, at its lower part, whence it passes backwards, outwards, and upwards, to be inserted into the sclerotic, at its posterior part. Its action is to direct the eye upwards and inwards. The optic nerves, or second pair, after uniting to form the optic commissure, in which some of the fibres of each nerve cross to the opposite side, separate, and enter the optic foramen at the apex of the orbit. They pass through the sclerotic coat on the inner side of and below the axis of the eye, then through the choroid, and spread themselves out, and are lost or terminate in the retina. Branches of the third, fourth, fifth, and sixth pairs of nerves also proceed to the eye, for regulating the movements, &c. of the different parts. In sight, then, the rays of light in passing through the cornea are converged, so as to pass through the relatively small pupil, and impinge upon the lens, which, by the convexity of its surface and its greater density towards the centre, serves to converge the rays, and to correct the aberration. They then traverse the vitreous humour, and strike upon the retina. (*See* Optics.)

Eye, Diseases of the.—This organ, from its delicacy and the numerous parts of which it is composed, is subject to a great variety of diseases, most of which will be noticed under their own names in different parts of this work. (*See* Amaurosis, Ophthalmia, &c.) We shall here, therefore, only give an account of *cataract*, which has been referred to this place. It is derived from the Greek verb *katarasso*, I disturb or confound, and is usually defined to be a weakness or interruption of sight, produced by opacity of the crystalline lens or its capsule. Sometimes it is applied to every perceptible obstacle to vision situated in the

posterior chamber between the vitreous humour and the uvea. When the disease is situated in the lens or its capsule, it is called a true cataract; but when it consists of opaque matter deposited in front of the lens, it is termed spurious. The latter arises from inflammation, and is to be treated by the usual means employed for allaying inflammation; but no operation can be of use in such a case. Of true cataract three kinds are distinguished:—*lenticular*, affecting the lens alone; *capsular*, affecting the capsule; and *capsulo-lenticular*, affecting both lens and capsule. Lenticular cataracts are of two kinds,—*hard* and *soft*; the former being the more common, especially among elderly persons, and is usually of an amber-colour or brownish tint, and generally deep in proportion to its firmness. Soft cataract prevails in childhood and middle life, and occurs more frequently single than the other. A cataract may be occasioned by active inflammation or external violence, or it may arise from internal or unknown causes. Frequently it proceeds from an hereditary disposition which has existed for several successive generations, and sometimes it attacks several members of the same family, without any evidence of its being hereditary. The habitual examination of minute objects in a depending position of the head, by which an undue proportion of blood is thrown upon the organ, is said frequently to bring on cataract. It may make its appearance at any age, but is most frequent in elderly persons, though children are by no means exempt from it, and may be even born with it. It comes on without pain, and the symptom first perceived is a dim haziness of sight, as if a mist or thin film were interposed between the object and the eye. The obscurity is greatest in direct vision, the opacity being almost always first noticed in the centre of the pupil. Hence the sight is better in a weak than in a strong light, because in the former case the pupil is enlarged, and admits the passage of the rays through the less opaque edge of the lens. Hence, too, the remarkable effect produced by the application of belladonna to the eye, which has the power of dilating the pupil and producing a temporary improvement in the sight,—a means sometimes had recourse to by quacks, who profess to be able to cure this disease. There is no medicinal remedy that is known to have any effect upon this disease, nor is it at all likely, from the structure of the parts, that any such remedy exists. All palliative measures, therefore, are confined to attention to the general health of the patient and the removal of any inflammatory symptoms that may exist along with it. The only mode of cure is actual removal by an operation; but so long as one eye remains unaffected, the operation may be delayed. There are three modes of operation employed for the removal of cataract, each of which has its advocates, and any one of which may be best, according to circumstances. The first is by *extraction*, or the removal of the lens, and is effected by making an incision through the cornea as near the iris as possible, and then, by means of a needle, opening the front of the capsule, and gently removing the lens. The second method is the displacement of the lens from the axis of vision by what is called *couching* (*Fr. coucher*, to lie down) or *depression*. A needle is inserted through the fore part of the white of the eye, and is brought to bear upon the lens, pressing it back and down into the vitreous humour; and the opaque body being thus removed, sight is restored. The third method,—by *absorption*, is effected by puncturing the front of the capsule, and thus admitting the aqueous humour to act upon the cataract; by which means it is absorbed. All these operations require great care and skill in the operator, and the setting in of inflammation has to be specially guarded against.

**Ezekiel**, *e-zē'-ke-el* (Heb., God strengthens), is the name of one of the canonical books of the Old Testament, placed after the book of Lamentations, and before that of Daniel. It is named after its author, Ezekiel, who was carried away by Nebuchadnezzar into Mesopotamia in the first Babylonish captivity, and is stated to have commenced his prophesying in the fifth year of his captivity (about B.C. 59). The book consists of forty-eight chapters, and naturally divides itself into two equal halves; the first containing oracles before the fall of Jerusalem; the last, oracles after that event,—the catastrophe in question forming the centre and culminating point of the book. In the first part we have (1) an account of Ezekiel's call to the prophetic office, his commission, instructions, and encouragements for performing the duties (i.—iii. 21); (2) a circumstantial announcement of the destruction coming upon Judah and Jerusalem, on account of the wickedness of the people (iii. 22—vii.); (3) a cycle of visions and prophetic discourses, relating to the rejection of the covenant people, with a copious description of the guilt of the people, their rulers, priests, and false prophets (viii.—xix.); (4) several discourses reproving the idolatry of the people, and proclaiming the fearful judgment coming upon Jerusalem (xx.—xxiii.); (5) the destruction of Jerusalem and its inhabitants is figuratively delineated (xxiv.). The second part opens with prophecies against the Ammonites, Moabites, Edomites, and Philistines; (2) we have a prophecy against Tyre and Sidon (xxvi.—xxviii.); (3) a prophecy against Egypt (xxix.—xxxii.); (4) predictions respecting the restoration of the theocracy; (*a*) of the future salvation of Israel, in its conditions and basis (xxxiii.—xxxvi.); (*b*) in its development, from the reanimation of the people to their victory over all enemies of the Divine kingdom (xxxvii.—xxxix.); (*c*) the renewal and glorification of the theocracy in the Messianic period (xl.—xlviii.).—(Horne's *Introduction*.) There are so few grounds for doubting the genuineness of this book, that its authenticity has been very little called in question. Ezekiel seems to have been admirably fitted by natural disposition, as well as by spiritual endowments, to contend with the "rebellious house," the "people of stubborn front and hard heart," to whom he was sent. With force, fire, and vehemence, he performs the functions of the prophetic office, throwing his whole soul into the work. He is deep, vehement, tragical; and the only sensation which he affects to excite is the terrible. "His sentiments are elevated, fervid, full of fire, indignation; his imagery is crowded, magnificent, terrific; his language is pompous, solemn, austere, rough, and at times unpolished, sometimes almost to disgust; he employs frequent repetitions, not for the sake of grace or elegance, but from the vehemence of passion and indignation. Whatever subject he treats of, that he sedulously pursues; from that he rarely departs, but cleaves, as it were, to it; whence the connection is, in general, evident and well preserved."—(*Lowth.*) The vigour and definiteness of his conceptions, down even to the minutest parts, is very marked.

**Ezra, Book of**, *ez'-rā*, stands next after the second book of Chronicles, and before the book of Nehemiah, among the canonical writings of the Old Testament. It has generally, both by Jews and Christians, been attributed to the priest whose name it bears; chiefly because, in ch. viii. and ix., the actions of Ezra are related in the first person. It is a continuation of Jewish history, from the close of the book of Chronicles; giving an account of the post-exile history of that people, from their return out of captivity under Zerubbabel and Joshua till the arrival of Ezra in Jerusalem, and the reformatory measures set on foot by him in the new colony. The events narrated in the book occupy a period of about seventy-nine years (B.C. 536—457). It contains (1) the edict of Cyrus, permitting the Jews to return into Judæa and rebuild the temple, with an account of the people who first returned under the leadership of Zerubbabel; and of their offerings towards rebuilding the temple (i. ii.); (2) the building commenced (iii.); (3) hindrances from the Samaritans (iv.); (*b*) the temple finished in the sixth year of Darius Hystaspes, by the aid of a decree issued in the second year of his reign, and dedicated (v. vi.); (5) the departure of Ezra from Babylon, with a commission from Artaxerxes Longimanus (vii.); (6) account of his companions, and arrival at Jerusalem (viii.); (7) narrative of the reformation effected by him (ix. x.). The book of Nehemiah is sometimes called the second book of Ezra, the two having been at one time connected together; besides which there are two apocryphal books of that name. (*See* Esdras.)

# F.

F is the sixth letter and fourth consonant of the English alphabet, as it is also of the Latin. Its form is taken from the digamma of the ancient Greek alphabet, and it corresponds with the *vau* of the Hebrew. It is pronounced by bringing the upper teeth against the lower lip, and then breathing with a hissing sound. It is thus what is termed a labio-dental aspirate, and bears the same relation to the other labio-dental aspirate *v* that the unaspirated labials *p* and *b* bear to each other. F and *v* are frequently interchanged, and in German *v* has the sound of *f*,—as *von*, sounded *fon*; hence, in English words taken from the German, *f* takes the place of *v*, —as *vater*, father; *vier*, four. In Latin, *f* seems to have had a sound somewhat corresponding to a strongly-aspirated *h*; for we find the latter frequently substituted for the former in the Sabine dialect of that language; and in Spanish, the Latin *f* is frequently changed into *h*,—as Latin *formosus*, beautiful; Spanish, *hermoso*. The *phi* in Greek was often in Latin represented by *f* instead of *ph*,—as *pheme*, *fama*; and this is frequently done in Italian and Spanish, — as *filosofia*, philosophy. F in Latin also corresponded to *th* in Greek,—as *fir*, *ther*, Lat. *fera*, a wild beast. F in Latin and Greek often becomes *b* in English,—as *frater*, brother; and *p* in Latin and Greek, *f* in English,—as *pater*, father. F, in Mus., is the fourth note of the natural diatonic scale. It is also used as an abbreviation for *forte*, strong or loud, the superlative *fortissimo* being denoted by *ff*.

FABA, *fa'-bă* (from Gr. *phago*, I eat), in Bot., the Bean, a gen. of the nat. ord. *Leguminosæ*, sub-ord. *Papilionaceæ*. From the species *F. vulgaris*, formerly regarded as *Vicia faba*, all the cultivated varieties of the broad bean have been produced. The earliest garden variety is named the Mazagan, and the largest the Windsor. Of the field bean there are two sorts, the smaller being called *ticks*. Beans are largely used in feeding cattle, and are very nutritious. The garden beans form an important article of human food.

FABACEÆ, *fa-bā'-se-e*, a synonym for the nat. ord. *Leguminosæ* (which *see*).

FABIAN, *fa'-be-ăn*, an adjective expressive of delay—delaying or dilatory. Its real acceptation is *awaiting battle*, in imitation of Q. Fabius Maximus, a Roman general, who, while conducting operations against Hannibal in one of the Punic wars, only kept on harassing Hannibal by ambuscades and forays, without giving the Carthaginian general an opportunity of open battle. It thus is used to express delay or dilatory conduct.

FABLE, *fā'-bl* (Lat. *fabula*), denotes, in its most general sense, any fictitious narrative; but more particularly it is a short fictitious story, intended to convey practical rules of worldly prudence or wisdom, by imaginary representations drawn from the physical or external world. It differs from a parable, with which it has many features in common, in being carried beyond the bounds of the probable, and even of the possible. In the Æsopean fable, the imagined actors, or the chief of them, instead of being men, are the lower animals, and sometimes even plants, or other things really inanimate. The fable consists, properly, of two parts,—the symbolical representation and the application, or the instruction intended to be deduced from it, which latter is called the *moral* of the tale; but it ought also to be apparent in the fable itself, in order to render it complete. On account of its aim, it lies upon the borders of poetry and prose. By its very impossibility, the fable awakens and arrests the attention, and thus the meaning that is intended to be conveyed is made the more apparent. The oldest fables are believed to belong to the East; and of these the most celebrated are the Indian fables of Pilpay, or Bilpai; and the more meagre Arabic collection attributed to Lokman, who is said to have lived in the time of king David. Among the Greeks, the fables of Æsop are well known; but not a few of those that were current in Greece under his name are identical with those of the East. In Latin, Phædrus has left about ninety fables of considerable merit in imitation of Æsop; but the well-known fable of "the town mouse and country mouse," related by Horace, is the best in that language. During the middle ages, the fable does not seem to have been entirely neglected; and an edition of those current in Germany in the time of the Minnesingers has been published by Bodmer. The oldest known writer of fables in Germany is Stricker, who flourished about the middle of the 13th century; and among the most distinguished of the later writers of that country are Gellert, Gleim, and Lessing. In England, the most distinguished name in this walk is John Gay; and in France, pre-eminent among all the moderns for his delicate sarcasm and lively wit, is La Fontaine.

FAÇADE, *fas-sade'* (Fr.), in Arch., a term used to express the face or front of any building of importance. It may be applied to any side of a large quadrangular building embellished with sufficiently striking architectural features, but it is usually confined to the principal front, in which the chief entrance is most frequently, if not always, situated.

FACE, *fais* (Fr. *face*, Lat. *facies*, Ital. *faccia*), in Cryst., the terminal planes of a regular solid: thus the cube has six faces, or flat surfaces.

FACE. (*See* PHYSIOGNOMY.)

FACET, *fā'-set*, in Min., a term applied to the small faces of a gem or crystal. When precious stones are cut with numerous facets, they are said to be facetted, in contradistinction to those polished into rounded forms or cut *en cabochon*.

FACIA, *fā'-she-a* (Lat. *facies*, a face), in Arch., a name often given to flat bands or fillets introduced into architectural embellishments, but more frequently applied to the bands of an architrave, which are so placed that the one above projects beyond the surface of that which is immediately below it. In the architrave of the Composite order of architecture two facias are generally used, while in the Corinthian, and sometimes in the Ionic order, three are introduced. A pictorial representation of the facia will be found in the engraving illustrating the article ENTABLATURE. (*See* ENTABLATURE.)

FACIAL ANGLE. (*See* ETHNOLOGY.)

FAC-SIMILE, *fak'-sim'-e-le* (Lat., from *facio*, I make, and *similis*, like), denotes an exact imitation of an original in all its traits and peculiarities, a copy as accurate as possible. It is chiefly used in relation to copies of old manuscripts, or of the handwriting of famous men, or of interesting documents, which are made by engraving or lithography.

FACTION, *fak'-shun* (Lat. *factio*), is a term applied in a bad sense to any party in a state that offers uncompromising opposition to the measures of the government, or that endeavours to excite public discontent upon unreasonable grounds.

FACTOR. (*See* AGENT.)

FACTOR, *fak'-tor* (Lat. *facere*, to form), in Alg. and Arith., a term applied to each of the quantities which are multiplied into one another; in other words, to the multiplicand and the multiplier, in order to form a product. The term factor is also used in the same sense as divisor; so that any quantity that will divide another is a factor of it. The entire factors of 12 are 1, 2, 3, 4, and 6. Taken in pairs, the factors are $1 \times 12$, $2 \times 6$, $3 \times 4$, &c. The prime factors of a quantity are those factors which cannot be exactly divided by any other quantity except 1. Every number has 1 for a prime factor.

FACTORY, *fak'-to-re*, in a general sense, any building where cotton, wool, silk, flax, hair, hemp, jute, or tow, are manufactured by machinery worked by steam, water, or some other power. The factory system, as it is called, dates from the introduction of Arkwright's spinning machinery. After that time large numbers of workmen met together at the new cotton-mills. It is in this branch of manufacture that the factory system has been most developed. The advantages gained, are the subdivision of labour according to skill and strength, and that of applying to each process exactly the force that is necessary. Up to the year 1833, the employment of children in factories was much abused; they were employed by workmen whose wages depended greatly upon juvenile labour, and who consequently overtasked their strength and permanently injured their constitutions. A parliamentary committee investigated this subject in 1832; and a com-

mission was appointed to examine the mills themselves. An act for regulating factories was passed the next year." (*See* FACTORY ACTS.) In North America, spinning and weaving factories are much more frequently owned by joint-stock companies than in England. Some of them are very large, and the workmen and work-women hold a higher social position than in England. Many of the factories have boarding-houses attached to them, in which many of the operatives, especially young women and girls away from home, are boarded and lodged under a well-conducted system. The word factory was first applied to large aggregations of workpeople in one building during Arkwright's time. At that period it signified an establishment of merchants and factors in foreign countries. These factories were governed by several rules adopted for their own support, and in order to protect them from the interference of the governments of the countries in which they resided. In modern times these factories have nearly ceased to exist. The mode in which they were instituted seems to have been, that they first had a liberty to trade, then a district was assigned to them, in which they were exempt from the jurisdiction of the native courts. The English, at an early period, formed factories in China, which still exist. Factories have also been established by the Venetians, Genoese, Portuguese, Dutch, and French.

FACTORY ACTS are certain acts of parliament, which have been passed from time to time, regulating the employment of labour in these establishments. In 1832, in consequence of the numerous complaints that were made regarding the injurious effects of factory labour on the health of the labourers, particularly the young employed in them, a parliamentary committee was appointed to investigate the subject; and subsequently a commission was named to inquire on the spot into the actual condition of the operatives. Attempts had previously been made in 1802, 1816, and 1831, to legislate on the subject; but only on a small scale. In consequence of the report of the commission, 3 & 4 W. IV. c. 103 (1833), was passed, declaring, that after January 1, 1834, no person under 18 years of age shall be allowed to work in the night (*i. e.* between 8.30 p.m. and 5.30 a.m.) in any cotton or other factory, excepting in lace factories; that no person under 18 shall be employed more than 12 hours in one day, or 69 hours in one week; that 1½ hour daily be allowed for meals to each person restricted to 12 hours work; that no child shall be employed, except in silk-mills, under nine years of age; that after March 1, 1834, no child under 11 years old shall be employed in any factory, except in silk-mills, more than 48 hours in any one week, nor more than nine hours in any day,—nor after March 1, 1835, who shall not be 12 years old,—nor after March 1, 1836, who shall not be 13 years old; that children and young persons, whose hours of work are regulated, shall be entitled to two holidays and eight half-holidays in every year; that children, whose hours of work are restricted to nine hours a day, are not to be employed without a certificate from a physician or surgeon, certifying that they are of the ordinary strength and appearance of children of these ages; the crown to appoint four inspectors, with extensive powers, to see that the various provisions of the act are carried out, to make rules necessary for its execution, and to enforce attendance at school, for at least two hours daily out of six days in the week, of children employed in the factories. The following year, a short explanatory act was passed; but nothing further was done till 1844, when 7 & 8 Vict. c. 15, became law. By this act, the powers and duties of inspectors are more accurately set forth; and an office of factory-inspectors is established in London; regulations are laid down for the protection of children in wet-flax spinning, and from accidents by the machinery while in motion: a child is defined to mean a person under 13, and a young person, one between the ages of 13 and 18; children may be employed at eight years of age; all females are regarded as young persons; the maximum amount of daily work for each child is seven hours; work for children and young persons is to cease on Saturday at half-past four; and certain provisions are made regarding the meal-times. By 10 Vict. c. 29, the hours of labour for young persons, and women





above 18, are reduced to 11 hours a day, after July 1, 1847, and 10 hours after May 1, 1848; and by 10 & 11 Vict. c. 102, children are not to be employed before six in the morning, or after six in the evening, or after two on Saturday. In 1856, an act was passed as to mill-gearing, limiting the fencing to such parts of the machinery as children and young persons are liable to be injured by.

FACULTIES, COURT OF, *fak'-ul-tiz*, a court established by 25 Henry VIII. c. 21, under the archbishop of Canterbury, and having power to grant faculties, privileges, indulgences, dispensations, licenses, and the like, connected with ecclesiastical matters. Now the business of the court is chiefly confined to granting licenses to marry.

FACULTY, *fak'-ul-te* (Lat. *facultas*), in Phil., is commonly applied to those active powers of the mind which are original and natural, and which make part of the constitution of the mind. Capacity, on the other hand, is applied to those manifestations of mind in which it is generally regarded as passive, as affected or acted upon by something external to itself. "Powers natural and active," says Sir W. Hamilton, "are called faculties. Powers natural and passive, capacities or receptivities. Powers acquired are habits, and habit is used both in an active and passive sense. The power again of acquiring a habit is called a disposition." When philosophers thus classify the different operations of the mind, and assign them to different powers, it is not to be supposed that they regard the mind as made up of so many distinct parts. The mind manifests itself in different ways, and it is only these manifestations that they arrange and classify. When, therefore, they speak of a power or faculty of the mind, they only mean that certain operations of the mind have been observed and classified, according to the conditions and circumstances under which they manifest themselves. "This way of speaking of faculties," says Locke, "has misled many into a confused notion of so many distinct agents in us, which had their several provinces and authorities, and did command, obey, and perform several actions, as so many distinct beings: which has been no small occasion of wrangling, obscurity, and uncertainty, in questions relating to them."

FACULTY, in a university, is one of the particular departments of teaching. In most universities there are four faculties; viz. arts, law, medicine, and theology. (*See* UNIVERSITIES.)

FAGGING, *fâg'-ging* (Ang.-Sax.), is a term applied to a system of servitude which was at one time general in the higher schools of this country, and which has not yet entirely disappeared. It consists in the junior boys, or those of the lower school, as it is called, being compelled to act as servants or "fags" to the elder or more advanced pupils. The fag is under entire subjection to his master, having to attend to his fire, prepare his meals, brush his clothes, and perform other menial duties; and even to smuggle into the house forbidden delicacies for his master's use, and bearing the punishment if detected. Several attempts have of late years been made to abolish this barbarous custom, and it is hoped that it will soon entirely disappear.

FAGGOT, or FAGOT, *fâg'-got* (Fr. *fagot*, Armoric and Welsh *fagod*), is generally a bundle of sticks or small branches of trees bound together. In times of religious persecution the faggot was a badge worn on the sleeve of the upper garment of such persons as had abjured heresy, being put on after the person had publicly carried a faggot to some appointed place by way of penance. To leave off the wearing of this badge was sometimes regarded as a sign of apostasy. Among military men faggots were persons hired by officers whose companies were not full, to muster and hide the deficiencies of the company, and thus cheat the government of so much money. Faggot votes, in politics, were votes created by the partitioning of an estate into numerous small tenements, which were let to persons at an almost nominal rent, upon condition of voting at elections, according to the dictates of the lessor.

FAGOPYRUM, *fâ-go-pî'-rum*, in Bot., the Buckwheat, a gen. of *Polygonaceæ*. The fruits of *F. esculentum* and *tataricum* are used as a substitute for corn in the north of Asia and eastern Europe. The former species is cultivated in Britain as food for pheasants.

FAGUS, *fa'-gus* (from Gr. *phago*, I eat), in Bot., the Beech, a gen. of the nat. ord. *Corylaceæ*. *F. sylvatica*, the common beech, is one of our noblest forest trees. This and *F. americana* are much valued for their timber. The fruits (beech-mast) form a food for pigs. The fruit of *F. ferruginea* is eaten in North America for dessert.

FAINTING, or SYNCOPE, *faint'-ing, sin'-kope* (Irish *fuine*, a weakening; Gr., from *sun*, with, and *kopto*, I fall down), in Pathol., is a sudden and total or partial unconsciousness, resulting from impaired circulation of the blood through the brain, occasioned commonly by diminished action of the heart. The functions of the nervous system, respiration, and the action of the heart, are either suspended or very much diminished in force. The causes of fainting are various; as any strong mental emotion, loss of blood, severe pain, or anything which tends to diminish the vital energy of the system. Usually the patient is first conscious of a singing in the ears, then the sight becomes confused and all the senses deadened; the countenance becomes deadly pale, and the limbs are unable to support the weight of the body, which sinks to the earth. Fainting, if occasioned by a diseased state of the brain or heart, or if prolonged, may result in death; but if arising from any trivial cause, the patient in general speedily recovers. The patient should be laid on his back, with his head low, and his dress loosened about the neck; abundance of fresh air should be admitted to him, and cold water may be sprinkled on his face and neck, or ammonia applied to the nostrils.

FAIR, *fair* (Fr. *foire*, Welsh *fair*, Lat. *forum*, a market-place), is a larger species of market, which is held at more distant intervals, and sometimes devoted to one species of merchandise, sometimes to several. In the earlier stages of society, and in inland countries, where the facilities for commerce are comparatively circumscribed, the bringing together of commodities and dealers at certain times and in convenient places is of the utmost importance; and for this purpose various privileges have been annexed to fairs, and numerous facilities afforded for the disposal of property in them. In this country no fair can be held without a grant from the crown, or a prescription which supposes such grant; and before a patent is granted, it is usual to have a writ of *ad quod damnum* executed and returned, that it may not be issued to the prejudice of a similar establishment already existing. If her Majesty grant power to hold a fair or market in a particular place, the lieges can resort to no other, even though it should be inconvenient; but if no place be appointed, then the grantees may hold it where they find it to be most convenient. Formerly courts were established in connection with fairs, commonly called *pié poudre*, in allusion to the dusty feet of the suitors, where summary judgment was administered on all matters of dispute arising from transactions at the fair. In this country the fairs have lost much of their ancient splendour, and many of them have all but disappeared. The growth of towns, and the facilities afforded for the disposal and purchase of all kinds of produce, have rendered them much less necessary now than formerly. Those that are chiefly of use in the present day, and which have least declined, are the cattle and horse fairs. The August fair of Horncastle, in Lincolnshire, is the largest horse fair in the kingdom, many thousand horses being exhibited for sale at it. St. Faith's, near Norwich (Oct. 17), is the principal English fair for Scotch cattle; and Weyhill fair, in Hampshire (Oct. 10), has probably the greatest display of sheep of any fair in the kingdom. Falkirk fair or tryst is one of the most important in Scotland for the sale of cattle and sheep; and hardly inferior to it are those of Melrose and Lockerly. In Germany, the principal fairs are those of Leipsic, Frankfort-on-the-Maine, and Frankfort-on-the-Oder. In France, that of Beaucaire was formerly the largest in Europe, and is still frequented by a vast concourse of people. The great fair of Nishnij-Novgorod, in Russia, is at present the most important in Europe, being frequented by buyers and sellers from different parts of Europe and Northern and Central Asia. Another celebrated Russian fair is that of Kinchta, on the Chinese frontier, where the greater part of the commerce between the Chinese and Russian empires is transacted. A large fair is held at Mecca during the resort of pilgrims to that place.—*Ref.* McCulloch's *Commercial Dictionary*.

FAIRIES, or ELVES, *fair'-eez, elez* (Ger. *alfe*, Sw. *elf*, Dan. *ellefolk*, Old Norse *alf*), are supernatural beings, of human shape, of both sexes, and generally of very diminutive size. The name fairy is derived from the Latin *fatum*, fate; and hence the Italian name of this class of beings is *fata*. Elf is derived from the Old Norse *alp*, or *alf*, which signifies both a mountain and a demon of the mountains. The Anglo-Saxons had their *dun-aelfenne*, or fairies of the mountains; *wudd-aelfenne*, or fairies of the woods; *waeter-aelfenne*, or fairies of the fountains. They are thus classed by Shakspeare:—

"Ye elves of hills, brooks, standing lakes, and groves,
And ye that on the sands with printless foot
Do chase the ebbing Neptune, and do flee him
When he comes back."—*Tempest*, act v. sc. 1.

The general belief is that the native land of fairy mythology is Arabia, and that our knowledge of these beings was brought from that country by the Crusaders; but there can be no doubt that their origin is much more ancient. They are generally believed to be a kind of intermediate beings, partaking both of the nature of men and spirits, having material bodies, and yet possessed of the power of making themselves invisible, and of passing through any sort of inclosure. They are remarkably small in stature, with fair complexions, and generally clothed in green. Their haunts were believed to be groves, verdant meadows, and the slopes of hills, and their great diversion dancing hand-in-hand in a circle, as alluded to in *Midsummer Night's Dream*. The traces of their tiny feet are supposed to remain visible in the grass long afterwards, and are called Fairy Rings or Circles (which *see*). They were regarded as of a doubtful character, being sometimes benevolent and sometimes mischievous. The diseases of cattle were frequently attributed to their mischievous operation; and cattle that died suddenly, without any apparent cause, were commonly said to be elf-shot. They were said to be very fond of human children, and were in the habit of carrying away such as they could lay hold of, and leave vixens of their own in their room. In Poole's "Parnassus" are given the names of the fairy court:—"*Oberon*, the emperor; *Mab*, the empress; *Perriwiggin, Perriwinkle, Puck, Hobgoblin, Tomalin, Tom Thumb*, courtiers; *Hop, Mop Trip, Pip, Drip, Skip, Tub, Tib, Pick, Pink, Pin, Quick, Gill, Im, Tit, Wap, Win, Nit*, the maids of honour; *Nymphidia*, the mother of the maids." T. Crofton Croker, in his "Fairy Legends and Traditions of the South of Ireland," describes them as beings "a few inches high, airy, and almost transparent in body; so delicate in their form, that a dewdrop, when they chance to dance on it, trembles, indeed, but never breaks. Both sexes are of extraordinary beauty, and mortal beings cannot be compared with them." They live in large societies, and are governed by a queen; and the peasantry never speak of them but with caution and respect, as the good people and friends, believing them to be present, and to hear what is said. They have their dwellings in clefts of rocks, caves, and ancient tumuli, and every part of them is decorated in the most splendid and gorgeous manner. The popular belief in fairies may now be said to have died out in this country; but to it we are indebted for a class of literature which, at least to the young, has its ceaseless charms. The true fairy tales first became popular in the latter part of the 17th century, and the Italians appear to have been the first to take the lead. After a time, they became very popular in France; and, at present, they are more extensive and popular in Germany than in any other country.

FAIRY RING or CIRCLE, is a ring occasionally observed in pastures, and which was usually attributed by the peasantry to the dancing of the fairies. They are seldom of a perfect form, but are usually more or less irregular, sometimes forming a series of arcs of circles. They were ascribed by scientific men to various causes; but they are now known to be occasioned by the growth of certain kinds of fungi, which, proceeding outwards from a centre, render the soil for a time unfitted for the nourishment of grass.

FAITH, *faith* (Lat. *fides*), is that assent or credence

which we give to the declaration or promise of another, on the authority of the person who makes it. The greater part of our knowledge is derived from the information of others, and depends upon the credence which we give to their testimony; hence, to believe and to know are sometimes used indiscriminately. Faith is the means by which we obtain a knowledge of things which do not come under our own observation,—*things not seen;* and in this way faith is distinguished from sight. Faith is also distinct from reason, in so far as it deals with matters which we cannot comprehend by our reason; but, at the same time, while we exercise faith, we must also exercise reason; for it is impossible to exercise an acceptable faith without reason for so exercising it. Henry Rogers represents "reason and faith as twin-born; the one, in form and features, the image of manly beauty, the other of feminine grace and gentleness, but to each of whom, alas! is allotted a sad privation. While the bright eyes of Reason are full of piercing and restless intelligence, his ear is closed to sound; and while Faith has an ear of exquisite delicacy, on her sightless orbs, as she lifts them towards heaven, the sunbeam plays in vain. Hand-in-hand the brother and sister, in all mutual love, pursue their way through a world on which, like ours, day breaks and night falls alternate; by day the eyes of Reason are the guide of Faith, and by night the ear of Faith is the guide of Reason." "Reason is apt to be eager, impetuous, impatient of that instruction which his infirmity will not permit him readily to apprehend; while Faith, gentle and docile, is ever willing to listen to the voice by which alone truth and wisdom can effectually reach her."—(Essay on *Reason and Faith.*) Faith, in Theol., denotes the assent of the mind to the truth of what has been revealed to us in the Holy Scriptures, more particularly that living reception of truth by the heart by which we see our sinfulness in the sight of God, and are led to flee to Christ for salvation. Some theologians distinguish four kinds of faith:—(1) A mere assent to the truth of the doctrines of the Gospel, which leaves the heart unmoved and unaffected; (2) a belief in the doctrines of Christianity, coupled with a sense of our lost and sinful condition; (3) the assent of the mind, also, to the means of man's justification in the sight of God; and (4) such a belief as, by the aid of the Holy Spirit, leads us to come to Christ, and place all our hopes in him for salvation, which alone is the "saving faith." There was also in the early church that miraculous faith by which the apostles and others were able to work miracles.

FAKIR, *fa-keer'* (Arab., poor), a term applied to ascetics in several parts of the Eastern world, particularly in India, and is synonymous with the Persian and Turkish dervish (which *see*). Some of them live in communities, like the monks of the Western world, while others live singly, as hermits, or wander about, making strange displays of self-torture and mortifications. Their appearance is filthy and disgusting in the extreme. They go about naked, frequently with their bodies besmeared with the dung of the holy cow. They sometimes unite in bands, carrying banners, and making a great noise with drums and horns. Some of them hold their arms up in one position for years, till they have lost the power of taking them down again; others bend the body forward, till they are unable to restore it to its natural position again; while others clench their fists till the nails grow through the hand. They usually take up their abode in shady places, either in the open air or in old and ruinous buildings, without anything to repose on or to cover themselves. One writer affirms that a member of this order should have ten of the qualities proper to the dog; among which are, to be always hungry; to have no fixed residence; to watch during the night; to leave no heritage after his death; not to abandon his master, although ill-treated by him; to content himself with the lowest place, and to yield his seat to any one who wants it. It is estimated that there are not less than three millions of fakirs in India. Many of them are undoubtedly insane; but the greater part of them are impostors and hypocrites.

FALCON. (*See* FALCONIDÆ.)

FALCONIDÆ, *fal-kon'-i-de.*—Birds of this genus are distinguished from all other members of the family by the existence of a slight festoon on the lateral margin of the upper mandible, and also of an acute tooth on each side towards the apex. The wings are very long and pointed, the second and third quills being the longest; the tail is long and rounded; the tarsi of moderate length, stout and reticulated; the toes usually elongated, and terminated by long curved and acute claws. The tongue is fleshy, sloped, and canaliculated. The falcons proper are distinguished from the gerfalcon by a tooth more strongly defined on each side of the upper mandible, which, among the others, is a mere festoon; the lower mandible is also much more sloped at its point than in the true falcon. The falcons are found in all parts of the world, and the number of species is very large. Their flight is very swift, and their courage certainly greater than that of other rapacious birds. Their flight is performed by regular continuous beats, with little or none of that sailing motion which characterizes the kites. In capturing their prey, whether in the air or on the ground, they descend perpendicularly upon it. Their food consists, for the most part, of small quadrupeds and birds; but many of them also feed partly on reptiles and insects. The nests of these birds are rough and bulky, composed of sticks and twigs placed in the hollows of rocks or in trees. The eggs are usually laid at the close of winter or very early in spring: they vary in number from three to six, and are generally speckled with red or brown. (*See* GER-FALCON, GOSHAWKS, &c.)

FALCONRY. (*See* HAWKING.)

FALL OF BODIES, *fawl* (Ang.-Sax.).—When a body is allowed to drop through the air from a great height, or is thrown upwards, or through the air in any direction, the course which it takes, and the rapidity of its motion from or towards the earth, is regulated in all cases by certain laws. The motion of a body projected through the air in a horizontal or oblique direction, and the path which it describes, are considered elsewhere (*see* PROJECTILES, THEORY OF); and it will be sufficient here to examine the rate of motion of a body moving towards or from the earth in a vertical line. If a person were to stand on the top of a very high tower, and drop a ball from his hand, it would fall to the earth, moving much more rapidly as it approached the ground than it did when it was first dropped from the hand at the top of the tower. Its motion downwards is found to be what is termed a uniformly accelerated motion; that is to say, a motion continually increasing at a certain rate; or, in other words, if a body be moving at a certain velocity at the expiration of one second from the point of time at which it was allowed to fall, it will be moving twice as fast at the expiration of two seconds, three times as fast at the end of three, and so on. Experiments have shown that the rate per second at which bodies acquire velocity if moving downwards through the air, or lose velocity if moving upwards, is 32⅛ feet. (*See* GRAVITATION, PENDULUM.) This velocity acquired by a falling body in a second of time is called the measure of the accelerating force, which force is produced by the attraction of the earth. Therefore, when a ball has been allowed to fall from the top of a tower, it is moving at the rate of 32⅛ feet per second at the end of the first second after it has been dropped from the hand; at the end of the next second, it is moving with a velocity of 64¼ feet per second; at the end of the third, at the rate of 96⅜ feet per second; and so on. It will be seen, therefore, that the velocity of a body at any period of its fall may be ascertained by multiplying the rate of motion at the end of the first second, or, as it is generally called, the measure of the accelerating force, by the number of seconds during which it has been falling. The velocity of a body at any period of its fall being known, the space or length through which it has fallen may be ascertained by multiplying the velocity at that period by the number of seconds during which it has been falling, and dividing the result by 2. Thus, if a body has been falling from a state of rest for 5 seconds, its velocity at the end of the fifth second will be $32\frac{1}{6} \times 5 = 160\frac{5}{6}$ feet per second; and the space through which it has fallen will be $160\frac{5}{6} \times 5 \div 2 = 402\frac{1}{12}$ feet. If a body be thrown from the hand with considerable force, instead of being dropped in the direction of the ground, its velocity at any period of its course will be found by adding the rate of motion that it would have attained

at the end of any number of seconds, if allowed to fall from a state of rest to the initial velocity imparted to the body at the moment when it was launched from the hand. Thus, in the example above given, if the body had been thrown downwards with an initial velocity of 50 feet per second, its rate of motion at the end of the fifth second would be $50+160\frac{1}{2}=210\frac{1}{2}$ feet; but the space through which it has fallen would be $50\times5+402\frac{1}{2}$ $=652\frac{1}{2}$ feet, as the initial velocity of 50 feet per second tends to carry it through 250 feet in the five seconds, in addition to the space through which it is conveyed by the accelerating force of the earth's attraction. In the same way, if a ball be thrown upwards into the air at a certain velocity, by a person standing on the earth's surface, its motion will become slower and slower, at the rate of $32\frac{1}{2}$ feet per second, until the force with which it has been propelled upwards is entirely counteracted and destroyed by the attraction of the earth, which now acts as a retarding force; and when its initial velocity has been thus exhausted, the ball will seem to be stationary for a very small fraction of time, and then descend, acquiring rapidity of motion at the same rate as a ball allowed to fall from the same height from a state of rest.

FALLACY, *făl'-la-se* (Lat. *fallacia*), in Log., is defined by Whately to be "any argument, or apparent argument, which professes to be decisive of the matter at issue, while, in reality, it is not." Fallacies are commonly divided into two classes, according as the error lies in the words of the reasoning (*in dictione*) or in the matter (*extra dictionem*). The former are otherwise describable as *formal*, or logical fallacies; the latter as *material*, or non-logical fallacies, as errors arising beyond the reasoning process. They may be otherwise distributed into three classes,—fallacies of assumption, fallacies of exposition, and fallacies of inference, the first two being fallacies *extra dictionem*, the last *in dictione*. The fallacy of assumption consists in our reasoning from premises which are either untrue in themselves, or not admitted by those whom we wish to convince; as in begging the question when we take a thing for granted which requires to be proved, and in reasoning in a circle. A fallacy of exposition consists essentially in a mis-statement or wrong exposition of the question argued. This fallacy is committed when the conclusion which we infer, although it may legitimately be deduced from premises true or admitted, is not the conclusion which we are bound to prove,—it is not to the point, or away from the question. It is called in Latin *ignoratio elenchi*, because it is not the "elenchus" (*i. e.* proof of the *contradictory* of your opponent's assertion), which it should be. The varieties of this form of error are very numerous. Fallacies of inference are all *in dictione*,—formal or logical fallacies. In this class, the conclusion which the argument is supposed or alleged to prove does not follow from the premises. Fallacies of inference arise from illicit process either of the major or minor term, non-distribution of the middle term, or the occurrence of more terms than three. Fallacies of inference are otherwise divided into purely logical fallacies, or such as appear on the face of the argument, and semi-logical fallacies, those which are not apparent until we have ascertained the meaning of the term in which it occurs. All semi-logical fallacies of inference are referable to one cause, —ambiguity of terms. (*See* LOGIC.)—Ref. *Encyclopædia Britannica*.

FALLING SICKNESS. (*See* EPILEPSY.)

FALLING STARS, *fawl'-ing*, meteoric bodies, supposed to be of a similar nature to aërolites. (*See* AËROLITE.) They appear to the observer to resemble stars suddenly falling from their position in the heavens, and vanishing after a flight of short duration, during which they seem to draw a brilliant train of light behind them. The diameter of these bodies is supposed to vary from 80 to 120 feet, and their rate of motion to be between 20 and 40 miles per second; their distance from the earth, when visible to the beholder as falling stars, is considered to range between 20 and 150 miles, beyond which limit they become invisible. They generally appear singly, but sometimes in great numbers, almost resembling a shower of fire, a flight of many thousands having been noticed by Professor Olmsted in North America on the night of the 12th of November, 1833. It has been ascertained, by a long series of observations, that this phenomenon occurs with regularity at certain seasons of the year, particularly in the latter part of the months of April and November. It is also supposed that they occur with greater brilliancy at intervals of about thirty-four years, Humboldt having observed a remarkable fall of shooting stars at Cumana, in South America, in November, 1799, thirty-four years prior to the occurrence of the brilliant flight noticed by Olmsted in 1833. If this be the case, the next extraordinary display of falling stars will take place in November, 1867.

FALLOPIAN TUBES, *făl-lō'-pe-ăn*, in Anat., so called after the anatomist by whom they were first described, are slender tortuous canals, about four inches in length, proceeding from the upper angle of the uterus. Their inner, or attached extremity, is narrow and cordlike; but they soon begin to enlarge as they proceed outwards, and at length they bend backwards and downwards towards the ovary, about an inch beyond which they terminate in an expanded extremity, the margin of which presents a number of irregular processes, named *fimbriæ*, one of which, somewhat larger than the rest, is attached to the outer end of the corresponding ovary. They serve as ducts of the ovaries.

FALLOW, *făl'-lo* (Ang.-Sax.), in Agr., a term applied to a portion of ground in which no seed is sown for the space of a year. This is done in order that the soil may be exposed to the action of the atmosphere, the weeds destroyed by repeated ploughings and harrowings, and fertility restored, which previous crops had exhausted. A *green fallow* is a term applied to land which has been rendered mellow and clean from weeds, by means of some green crop, such as turnips, potatoes, &c.

FALLOW DEER (*Cervus Dama*). —This animal may be distinguished from the stag by the spotted coat, the spread and palmated horns, and the smaller size. It seldom measures more than three feet high at the shoulder. Its colour is reddish brown, spotted with white; but there is a variety which is of a nearly uniform dark brown. This latter is a native of Norway, and was brought to England at the time of James I. The manners of the fallow deer resemble those of the stag; but it is less delicate in the choice of its food, and browses closer. It attains full growth at the age of three years, and is said to live twenty years. The fallow deer's native country is the south of Europe and the south-western part of Asia. The skin of this animal furnishes a valuable leather, and the horns, like those of the stag, are manufactured into knife-handles, &c. The shaving of the horns has been used in the manufacture of *ammonia*, popularly known as *hartshorn*. (*See* DEER.)

FALSE IMPRISONMENT, *fawlse* (Lat. *falsus*).—Every confinement of the person is an imprisonment, whether it be in a common prison, in a private house, or even by forcibly detaining one in the public streets. Unlawful or false imprisonment, then, is when such confinement takes place without sufficient authority. A person who falsely imprisons another is liable to a criminal prosecution, and also a civil action for damages.

FALSE NEWS.—The spreading of false news, to make discord between the king and nobility, or concerning any great man of the realm, is a misdemeanor, and punishable by common law with fine and imprisonment.

FALSE PRETENCES, THE OBTAINING MONEY UNDER, in Law, is provided for by 7 & 8 Geo. IV. c. 29, which enacts, that if any person shall, by any false pretence, obtain from any other person, any chattel, money, or valuable security, with intent to cheat or defraud any person of the same, he shall be guilty of a misdemeanor, and liable to transportation for seven years (now penal servitude), or to fine and imprisonment. Act 14 & 15 Vict. c. 100, provides that it shall be no bar to conviction, that such crime may amount in law to larceny; and that it shall be sufficient to prove that the defendant did the act with intent to defraud, without specifying any particular person.

FALSE SWEARING. (*See* PERJURY.)

FALSE WEIGHTS AND MEASURES. (*See* WEIGHTS AND MEASURES.)

FALSETTO, *fawl-set'-to*, an Italian word used in Mus. to signify a feigned or artificial voice, produced by diminishing the aperture of the throat. The Italians

call the falsetto, *voce di testa*, or voice from the head, in contradistinction to *voce di petto*, the natural or chest voice.

FAMA CLAMOSA, *fā'-mā klăm-o'-sā* (Lat.), in the Eccl. Law of Scotland, is a wide-spread report affecting the moral character of a clergyman or elder of the church, and which may be taken up and investigated by the church courts, independently of any regular complaint by a particular accuser.

FAMILIAR SPIRITS, *făm-il'-yăr* (from Lat. *familia*), a name given to certain demons or evil spirits, which were supposed to attend and be at the service of a magician, or other favoured person. The belief in familiar spirits is very ancient, and by the law of Moses, such as had familiar spirits were to be put to death. Where Socrates speaks of his attendant demon, he is generally understood to refer to the inner feelings and promptings of his nature, and not to any familiar spirit. In eastern countries, the belief in familiar spirits is very general; and it was widely diffused over Europe in the middle ages. A favourite form assumed by a familiar spirit was that of a black dog. Jovius says that Cornelius Agrippa was always accompanied by a devil in the form of a black dog; and Goethe makes Mephistopheles first appear to Faust in this shape. Paracelsus was believed to carry about with him a familiar spirit in the hilt of his sword.

FAMILIARS, *făm-il'-yărs* (from Lat. *familia*, a family, as belonging to the family of the inquisitor), the name given to certain officers of the Inquisition, who assisted in apprehending such as were accused, and carrying them to prison. This office was esteemed so honourable that even noblemen and princes were ambitious of being admitted to it,—even the king of Spain himself assuming that title, and becoming protector of the order. Familiars were granted large indulgences and privileges, and might commit the most heinous crimes with impunity.

FAMILY, *făm'-e-le* (Lat. *familia*, Gr. *oikos*), is applied in a general sense to a number of individuals living together, or standing in a certain degree of relationship to each other; a household, including parents, children, and servants; or all descended from one common progenitor. Among the Romans, *familia* was applied to all persons in the power of a *paterfamilias*, —as his sons, daughters, grandchildren, and slaves; but it was also used in a wider sense, including all objects of property, even inanimate, and is explained by Gaius by the equivalent *patrimonium*. The family is the corner-stone of the social edifice, and is well said to be "God's best instrument on earth for the furtherance of the great moral and religious interests of man." Hence, it has been taken as a model for forming other associations,—political, civil, or religious. Among the early Hebrews, and in eastern countries, the patriarchal form of government is only an extension of the family relationship. The Greeks regarded the family as a type of the state; and among the Romans the natural power of a father was taken as the basis of the whole social and political organization of the people. The family life is based upon the wants and necessities of our nature, and is essentially fitted to develop and foster those habits and affections on which the happiness and welfare of mankind depend. It can only, however, exist in a state of purity where monogamy prevails. In the family relationship we find clear evidence that the pretended *state of nature*, which has been represented as the primitive condition of man, is totally opposed to the benevolent designs of the Author of nature.

FAMILY, in Bot., a synonym for Order (which *see*).

FAN, *făn* (Sax. *fann*), an instrument which is used by ladies to agitate the air, in order to create a sensation of coolness around them. It is manufactured of feathers, of paper, thin skin, or ivory, joined together, and is generally carved and painted, in order to insure its embellishment. The fan is mentioned in the Grecian classics (Euripides); indeed, it was known in an era far prior, as there are paintings in the relics of Thebes to prove that the Egyptians were familiar with its use. The fan was first brought into European notoriety by Catherine de Medicis, who introduced it into France, where it was so constructed that it could be used and folded in a manner similar to the fan in use at the present day. Great sums were spent on the ornamentation of the fans first in vogue, and many were painted on by the cunning fingers of Watteau. The Chinese have greatly excelled in the art of fan-making, and in the species of lacquered fans their superiority is fully admitted. The Chinese themselves use a cheaper sort, made of bamboo and paper, painted, which cost about tenpence each. In Europe, France manufactures the greatest number of fans used by the world of fashion. Of late years, the value of those manufactured exceeded £110,000 per annum. In the late Exhibition (1862), many pleasing specimens were shown to exhibit the high art to which fan-manufacture had arrived. A species of large fan is used in India for cooling the air of rooms and keeping down the temperature; for further information upon which, *see* article PUNKAH.

FANATICS, *fă-năt'-iks* (Lat. *fanatici*), is derived from the Latin *fana*, temples, and was applied to such as passed their time in temples, and, pretending to be inspired by the Divinity, would burst into wild and antic gestures, utter pretended prophecies, cut themselves with knives, &c. Hence, the term has, in modern times, come to be applied to such as manifest a religious enthusiasm, uncontrolled by reason or experience, and proceeding from a belief that they are under divine direction, and doing what will be well-pleasing in the sight of God. Fanaticism is sometimes applied in a wider sense to any excessive prepossession of the mind by ideas of any kind. Fanaticism has prevailed under different forms in all ages of the world; and one of its most remarkable and dangerous features is the tendency that it has to spread over large masses of a people. It is not usually confined to one individual; for there are generally to be found others who are ready to take up and act upon the delusion. The very earnestness of the fanatic—and fanatics generally are in earnest—serves to carry conviction to the minds of others. Among persons of this class were Emanuel Swedenborg, Madame Guyon, Johanna Southcote, and numerous others. When confined to an adherence to certain theological dogmas, it is in a comparatively mild and harmless form; but sometimes it manifests itself in atrocities of the most cruel and heartrending description,—murders, assassinations, and the like. If ignorance be the mother of devotion, much more is it the mother of fanaticism; and the only fit cure for delusions of this sort is the spread of education, enabling people to judge rightly as to the relative importance of things, and to distinguish between the true and the false.

FANCY, *făn'-se* (Gr. *phantasia*), a corruption of phantasy, was used by the ancient philosophers as co-extensive with conception,—that power or faculty of the mind by which man reproduces the images of objects, apart from any impression on the organs of sense. It is now properly applied to a particular province of the imagination, though sometimes it is loosely used as synonymous with it. The office of the fancy, according to Mr. D. Stewart, "is to collect materials for the imagination." "A man whose habits of association present to him, for illustrating or embellishing a subject, a number of resembling or analogous ideas, we call a man of *fancy*; but for an effort of imagination various other powers are necessary, particularly the powers of taste and judgment." "It is the power of fancy which supplies the poet with metaphorical language, and with all the analogies which are the foundation of his allusions; but it is the power of imagination that creates the complex scenes he describes, and the fictitious characters he delineates. To fancy we apply the epithets of rich or luxuriant; to imagination, those of beautiful or sublime." Others, however, regard fancy as a higher energy of the mental activity than imagination, and that it is "the imagination that furnishes the materials out of which it creates its phantasies, either by modifying or exaggerating them, or by forming new combinations."—*English Cyclopædia*.

FANDANGO, *făn-dăng'-go* (Sp.), is the name of an old popular Spanish dance, which proceeds gradually from a slow and uniform to the most lively, but never violent motion. It is danced by two persons only, and represents the various gradations of the passion of love to an extent bordering on the licentious. Various attempts have been made by the clergy to sup-

press this dance, but without success, though it is now chiefly confined to the theatres and parties of the lower classes.

FANTASIA, *fän-tä'-zhe-ä* (Ital.), in Mus., a term used to denote an extempore performance, in which the musician gives full scope to his imagination; and which, although subjected to the fundamental laws of melody, modulation, and harmony, is not elaborated by any strict rules or forms of construction. This term also signifies a written composition, in which the composer indulges his fancy unrestrained by any conventional forms or rules.

FANTOCCINI. (*See* PUPPETS.)

FARCE, *farse* (Fr. *farce*, Ital. *farsa*, Lat. *farsum*, stuffed,—denoting a mixture of different things), is a dramatic piece of a low comic character, usually played as an after-piece. Its sole end being to excite mirth, it excludes nothing, however wild or extravagant, which may contribute to that object. It differs from comedy in this, that while the latter is based upon nature and truth, the former does not scruple to have recourse to any extravagance or absurdity that may serve its purpose. Farces are said to have been first introduced by the Society of Clercs de Bazoche, in Paris, about 1400. Among the most celebrated of the early farces is that of "Maitre Pierre Pathelin," believed to be by Peter Blanchet, who flourished about 1460. Subsequently Molière greatly improved and elevated this class of dramatic literature. Farces usually partake of the character of the people to whom they belong; and hence the French, German, Italian, and Spanish farces have different characteristics.

FARINA. (*See* FLOUR.)

FARM, *farm* (Sax. *farma*, *fearm*), a portion of land cultivated for the purpose of profit. There are various kinds of farms. Arable farms are those in which the principal part of the land is under the plough; grazing farms are those in which the object desired is the fattening of cattle or other live-stock; dairy farms are those on which the chief intention is the production of milk, butter, cheese, &c.; lastly, those farms in which the arable and grass systems can be combined are called convertible farms. In some districts there are other subdivisions; such as hay or grass farms, and breeding or cattle farms. In all farms, the principal object attended to is the nature of the soil and its cultivation (*See* ARABLE LAND, MANURE.) The farmery is usually situated near the homestead, or farmer's house; and the area or court in which the cattle are foddered, dung prepared, and other farming operations performed, is called the farmyard.

FARM ANIMALS.—These animals may be divided into two classes,—first, those which are used for draught or for cultivating the soil; and, secondly, those which are bred and reared upon a farm, either for dairy purposes or for the object of being sold at a profit. For draught and ploughing purposes, the horse is more employed in England than in any other country;—oxen are much used among other nations. The best English plough horses come from Suffolk. The quicker action of the horse makes its work more productive than that of other animals. Amongst the farm animals which are bred for the purpose of sale, the most numerous are the sheep. The sheep is the easiest to feed of all animals, and derives the greatest benefit from what it consumes; while it gives the most active and rich manure to the land. For this reason, the English farmer makes it his object to keep a large number of sheep. England has always possessed a great many sheep; the British isles were celebrated for this even in the time of the Romans. There are, at the present day, three principal breeds in England,—the Leicester, the Southdown, and the Cheviot. (*See* SHEEP.) With regard to cattle, the principal objects of the English farmer in their rearing are the milk and meat. The milch-cow race, *par excellence*, of the British empire, came originally from the Channel Islands. The breed usually goes under the name of Alderney. The Ayrshire cow, which first came into notice about sixty years ago, is the Alderney cow's rival. Ireland possesses two races of milch cows. The first breed of cattle improved in the midland districts was the long-horned. It is now pretty generally abandoned. Among the improved breeds of long standing, the short-horns of Durham stand first: they first gained a reputation about 1778. Since that time, the race of improved short-horns has improved through the United Kingdom, and was some time ago introduced into France. The Hereford and Devon breeds are reckoned next to the Durham in excellence. The other farm animals of importance are pigs and poultry. (*See* PIGS, POULTRY.)

FARMERS-GENERAL, *farm'-erz-jen'-e-räl* (Fr. *fermiers généraux*), was a name given in France to the members of a privileged association, who, before the revolution of 1789, farmed certain branches of the public revenue, that is, paid the government a certain fixed annual sum for the right of collecting certain of the taxes. Under Francis I., in 1546, the duties on salt were first raised by farming the monopoly of its sale in each town. In 1599, Sully introduced the system of disposing of the right of farming the taxes to the highest bidder, and in this way greatly increased the public revenue. In 1728, under the regency, several of the individual leases were united into a *ferme générale*, which was let to a company, the members of which were termed *fermiers généraux*. In 1789, the number of farmers-general was forty-four, who paid annually into the treasury 180 millions of livres. They were possessed of extensive powers and privileges conferred upon them by special decrees; and, from the manner in which they exercised their powers, they were viewed with great detestation by the people. Hence, during the Revolution, to which this in no small degree contributed, many of these odious tax-gatherers perished on the scaffold, and an end was put to the system.

FARMING, *farm'-ing*, the business or management of a farm, comprehending the whole circumstances and conduct of it. Farming was for a long period looked upon as a profession easily understood and successfully pursued only by an empiric. It is now, however, regarded in a different light, and of late years science has done great service to farming. The farmer, in order to follow his profession properly, not only requires perseverance and observation, but he should also have a sound knowledge of natural science. In England, the farmers may be arranged in the following classes:—1. Large proprietors and country gentlemen; 2. yeomen and farmers properly so called; 3. possessors of small farms; 4. cottagers, including different descriptions of persons who cultivate small farms and a few acres adjoining to towns and villages.

FARO, *fa'-ro*, a game of cards, which used formerly to be much in vogue in England: at present, it is seldom if ever played. In the principles of the game, it is somewhat similar to *rouge et noir*. A *croupier* or banker, and a *tailleur* or dealer, sit opposite each other at an oval table, made expressly for the purpose, and covered with green cloth. Any number of persons may play, and, as a rule, the odds on the game are in favour of the *croupier*, who generally wins. The players have to bet on their cards winning against those dealt for the bank, and can double their stakes every time they win. They are not allowed to increase their stakes, however, to more than sixteen times what they were originally.

FARRIERY, *far'-er-e* (Fr. *ferrier*, a horse-shoer, from Lat. *ferrum*, iron), in its most common acceptation, is the art of shoeing horses; but the term is also applied to the art of preventing, curing, or alleviating the disorders to which horses and cattle are subject. Before the commencement of the present century, the practice of farriery was entirely confined to a class of men who were mere horse-shoers, and who were not only utterly ignorant of the physiology and anatomy of the horse, but were also totally unacquainted with the principles of the art of healing. Since that time a veterinary college has been established, and a better class of persons have taken up the profession.

FARTHINGALE, or FARDINGALE, *far'-thing-gale*, a petticoat expanded by hoops of whalebone, &c. They were first introduced into England during the reign of Elizabeth; and after coming into and going out of fashion several times, they reappeared about 1856, in a more capacious form than ever, under the name of crinolines (which *see*).

FASCES, *fas'-seez*, was a term applied in Roman antiquity to a symbol of authority, introduced by the kings. The *fasces* consisted of a bundle of rods (usually birch) bound together, with an axe in the

centre, the head of which projected so as to be visible to all. A class of officers somewhat similar to our old *bedfenders* bore the fasces before the kings, and they were called *lictors*. The king was usually preceded by twelve lictors whenever he went abroad, and after the days of the kings, the consuls were allowed a similar number. The dictator was preceded by twenty-four lictors, to signify his unrestricted supremacy. Afterwards the lictors, with their fasces, were allowed, in diminished proportion, to each of the chief magistrates in the city, and even in the provinces.

FASCIA. (*See* FACIA.)

FASCINES, *fas-seens'* (Lat. *fasces*, bundles of rods with an axe bound up in the middle of them, carried by the lictors before the Roman consul or dictator), the name given in Mil. to long faggots, or bundles of brushwood, used for various purposes; such as forming the revetments of parapets in field-works, and making the roof of a blindage or magazine, which may be rendered bomb-proof by covering the fascines with a sufficient depth of earth. They are also used for making roads over wet, boggy ground. The fascene is made of twigs and sticks laid together longitudinally, and tightly bound with twisted willow or hazel rods at intervals of fifteen or eighteen inches. They are usually made eighteen or twenty feet in length, and about nine inches in diameter. When they are used for the revetment of a parapet wall, they are secured by driving long stakes through them into the bank of earth against which they are placed. Fascines are also used in civil engineering for making dams, protecting the sides of dykes, and in forming foundations for any superstructure, as well as hearting for banks and a bottom for newly-made roads. They are shorter and much thicker than the military fascine, seldom exceeding ten feet in length, but often being as much as four feet in diameter. They are placed side by side over the spot it is desired to cover, and then they are pinned to the soil beneath with long stakes, the tops of which are connected by means of rods interlaced between them. When this has been done, earth and stones are thrown on the top of the facines. Sometimes areas of considerable extent are covered in this manner; and when the surface on which they are to rest is under water, the fascines are connected and floated over the spot, and then sunk into the desired position by stones and gravel placed on them; after which the necessary works may be constructed.

FAST, *fest* (Ang.-Sax. *fastan*), denotes a partial or total abstinence from food, a due supply of which is necessary to maintain the body in a healthy and vigorous condition. The length of time during which a person may subsist without food is very various, even though we give no credence to those remarkable instances, some of which seem to be well-authenticated, that are given of life being maintained in the circumstances for a number of weeks. (*See* HUNGER.) The term fast, however, is more particularly applied to a religious observance,—the abstinence from food for a time, in order to "afflict the soul" and to increase a devotional feeling in the mind. Religious fasting may be said to have been practised in all ages and countries where any devotional feeling prevailed,—among the ancient Egyptians and Assyrians, as well as among the Hindoos and Mohammedans of the present day. In the law of Moses, we do not find much reference to fasting; and some are disposed to think that it was "among those things which Moses allowed rather than originated, bore with rather than approved," as being an old and well-established practice. Of this, however, there does not seem to be sufficient evidence; and even though there were, we should not regard it as an argument against fasting, as seems to be done by the writer in Kitto's "Biblical Cyclopædia," but that it arose from a fear that what ought to elevate and refine the inward feelings might degenerate into an empty outward ceremony. There is but one fast enjoined by the great Hebrew lawgiver. On the tenth day of the seventh month, the great day of annual atonement, they were to "afflict their souls,"—a phrase which, doubtless, points to abstinence from food, as, indeed, is shown by the later practices among the Jews. Other general fasts were in course of time introduced, as commemorative of great national calamities. The prophet Zechariah enumerates four of these as being observed in his day; "the fast of the fourth month, and the fast of the fifth, and the fast of the seventh, and the fast of the tenth."—(Zech. viii. 19.) On particular and signal occasions, also, particular fasts were appointed, and private fasts were also common, especially among the later Jews. The abstinence usually lasted for twenty-seven or twenty-eight hours, beginning before sunset and not ending till some time after sunset the following day. On these occasions they put on sackcloth and sprinkled ashes upon their heads, in token of their grief and repentance. Partial fasts were also occasionally observed on particular occasions by certain of them; as when Daniel tells us that he mourned for full three weeks, and "ate no pleasant bread, neither came flesh nor wine in my mouth, neither did I anoint myself at all till three whole weeks were fulfilled."—(Dan. x. 3.) Though fasting is not positively enjoined by Christ or his apostles, we have evidence in the New Testament that it was practised by the latter; and St. Paul, in enumerating what he had done and endured in the cause of Christ, says, "in watchings often, in hunger and thirst, in fastings often."—(2 Cor. xi. 27.) In the earliest times we do not find mention of any public and solemn fasts being observed except upon the anniversary of Christ's crucifixion. However, in process of time, days of fasting were gradually introduced, first by custom and afterwards by positive appointment. Towards the close of the 3rd century fasting came to be held in much greater esteem, from a notion that it served as a security against the machinations of evil spirits, who were believed to direct their efforts principally against the luxurious. Fasting came also to be regarded as the most effectual means of appeasing the anger of an offended Deity; and hence it came to be looked upon as an indispensable duty, and express laws were enacted regarding it by the rulers of the Church. As it became more general, the severity of it was relaxed, and a mere abstinence from flesh and wine was judged sufficient. (*See* LENT.) The strict canonical fast only allows one meal in twenty-four hours. By the regulations of the Anglican church, fasting, though not defined as to its degree, is inculcated at seasons of peculiar penitence and humiliation as a valuable auxiliary to the cultivation of habits of devotion and of self-denial. The writer in Kitto's Cyclopædia already referred to draws from the words "Can the children of the bridechamber fast when the bridegroom is with them?" (Matt. ix. 14) the conclusion that it "involves an entire disapproval of fasting in the Christian church;" but we believe that most persons will be rather inclined to adopt the opinion of Dr. Hook, that the time when he, the bridegroom, was with them would be an improper season for tokens of sorrow; and that he at the same time intimates that it would be their duty thereafter; a view which is confirmed by its being practised by the apostles after his ascension. On the general subject of fasting he says, "All must acknowledge that this restraint, even upon the innocent appetites of the body, is eminently beneficial in assisting the operations of the mind. It brings the animal part of our nature into greater subservience to the spiritual. It tends to prevent that heaviness and indolence of the faculties, as well as that perturbation of the passions, which often proceed from indulgence and repletion of the body. It is thus highly useful in promoting that calmness of mind and clearness of thought which are so very favourable to meditation and devotion. The great end of the observance is to afflict the soul, and to increase a genuine contrition of heart and godly sorrow for sin." "In the practice of fasting, then, the intelligent Christian will not rest in the outward act, but regard it only as a means to a good end."—(*Hook's Church Dictionary.*) The distinction between the Protestant and the Romish view of fasting is this, that the Roman regards the use of fasting as a means of grace, the Protestant only as a useful preparation for the means of grace.

FASTI, *fas'-te*, used in Roman antiquity for the purpose of signifying kalendars, in which were comprised a notation of all the various days of the year, with their feasts, fast-days, and days set apart for the celebration of games and other ceremonies. There were two different kinds of *fasti*,—the *fasti kalendares* and

the *fasti magistrales*,—the less and the greater. The former were merely a kind of diary, in which all the days were recorded as feasts, fast-days, &c.; the latter was more of a record of things appertaining to the gods, the emperors, and the magistrates. The *fasti* were also registers of different periods when the different years were denominated, of the names of the various consuls, and the principal events and circumstances which occurred during their consulate were thus recorded. This register was termed *fasti consulares*, or the consular register. The *dies fasti* were always marked in the kalendar by the letter F. The classic poet Ovid celebrates the *fasti* in his *Libri Fastorum*.

FATALISM is a belief in fate, an unchangeable destiny, to which everything is subject, uninfluenced by reason, and pre-established either by chance or by the Creator. A fatalist is one who believes in fatalism.

FATA MORGANA, *fa'-ta mor-ga'-na* (Ital.), a singular phenomenon of unusual refraction, seen in the Straits of Messina. It is sometimes called "the castles of the fairy Morgana." When the rising sun shines so that the incident rays of light form an angle of 15° on the Sea of Reggio, and the bright surface of the water is not disturbed, and the tide is at its height, certain phenomena have been observed by several travellers, to which the name of Fata Morgana has been given. Minasi states that when an observer is placed with his back to the sun, and his face to the sea, the mountains of Messina, rising like a wall behind it, and forming the background to the picture, suddenly there appear in the water various objects,—countless series of columns, arches, castles, well-delineated pillars, lofty towers, magnificent palaces, with balconies and windows, herds and flocks, armies of men on foot and on horseback, and many other things in their natural colours and proper actions during the whole of the short period of time while the above-mentioned causes remain. As the day advances, the magic scene vanishes away. There is no doubt that this account of Minasi's is exaggerated, and had received considerable additions from his imagination; but, from many other accounts, it appears certain that the mirage at this place produces some very remarkable effects. Capt. Smyth, in his work upon Sicily, observes:—"I never met with a Sicilian who had *actually seen* anything more than the loom, or 'mirage,' consequent on a peculiar state of the atmosphere; but which, I must say, I have here observed many times to be unusually strong." Similar appearances occur, also, in the great sandy plains of Persia, of Asiatic Tartary, of Lower Egypt, on the plains of Mexico, in North America, &c. (*See* MIRAGE.)

FATE, *fait* (Lat. *fatum*), denotes, in a general sense, an inevitable necessity dependent on some superior cause. It is derived from *fandum*, 'speaking,' and primarily implied a word or decree spoken by a deity, the order of things divinely prescribed, according to which there is allotted to every person what shall befall him. It was also sometimes employed to denote the connection of causes in nature, or in the divine appointment, forming, as it were the links of a chain, in which all things are indissolubly united together. It is also used to express a certain unavoidable designation of things, by which all agents, both necessary and voluntary, are swayed and directed to their ends. Fate is sometimes divided into physical and divine; the former being the order and series of natural causes appropriated to their effects, the latter what is more usually called providence. According to Leibnitz, there are three kinds of fate,—"a *fatum Mahometanum*, a *fatum Stoicum*, and a *fatum Christianum*. The Turkish fate will have an event to happen, even though the means should be avoided, as if there was an absolute necessity. The Stoical fate will have a man to be quiet, because he must have patience whether he will or not, since 'tis impossible to resist the course of things. But 'tis agreed that there is a *fatum Christianum*, a certain destiny of everything, regulated by the foreknowledge and providence of God."

FATHERS, THE, *fa'-thers* (Sax. *fæder*), a name applied to the early writers of the Christian church,—those writers who have given us accounts of the traditions, practices, &c., that prevailed in the early church. The term is mostly confined to those who lived during the first six centuries of the Christian era, and no writer is dignified with the title of father who wrote later than the 12th century. They are frequently divided into the Greek and Latin fathers; and those who flourished before the council of Nice, in 325, are called the ante-Nicene fathers. The chief fathers of the first six centuries were as follows:—In the 1st century flourished Clement, bishop of Rome, and Ignatius, bishop of Antioch; in the 2nd century we have Polycarp, bishop of Smyrna, Justin Martyr, Hermias, Dionysius of Corinth, Hegesippus, Tatian, Athenagoras, Theophilus, bishop of Antioch, Irenæus, bishop of Lyons, Clement of Alexandria, and Tertullian; in the 3rd century, Minucius Felix, Hippolytus, Origen, Cyprian, Dionysius, bishop of Alexandria, Gregory (Thaumaturgus); in the 4th century, Arnobius, Lactantius, Eusebius, Julius Firmicus Maternus, Hilary, bishop of Poitiers, Athanasius, Basil, Ephraim the Syrian, Cyril of Jerusalem, Gregory of Nazianzen, Gregory of Nyssa, Ambrose, archbishop of Milan, Epiphanius, bishop of Salamis, Chrysostom, bishop of Constantinople, Ruffin, presbyter of Aquileia; in the 5th century, Jerome, Theodorus, bishop of Mopsuestia, Augustine, Cyril of Alexandria, Vincent of Lerins, Isidore of Pelusium, Theodoret, bishop of Cyrus in Syria, Leo I., surnamed the Great, Vigilius, bishop of Thapsus; the 6th century, Procopius of Gaza, Aretas, Gregory, bishop of Tours, Gregory I., surnamed the Great, bishop of Rome. The last of the fathers is Bernard of Clairvaux, who died about the middle of the 12th century. Learned men and theologians differ very much in opinion as to the value that is to be attached to the writings of the fathers. By some they are looked upon as nearly of equal authority with the Sacred Scriptures themselves, and as the most excellent guides in the paths of piety and virtue. Others regard them as unworthy of the least attention, considering them the very worst of all instructors, and treating their precepts and decisions as perfectly insipid, and in many respects pernicious. The right we believe lies between these two extremes; and while the Roman Catholics exalt too highly the opinions of the fathers, yet by Protestants generally they are too much disregarded. Their writings contain many sublime sentiments, judicious thoughts, and things naturally adapted to form a religious temper and to excite pious and virtuous affections; at the same time, it must be confessed that, on the other hand, they abound still more with precepts of an excessive and unreasonable austerity, with Stoical and Academical dictates, with vague and indeterminate notions, and, what is still worse, with decisions absolutely false and in manifest opposition to the character and commands of Christ. Of the character and doctrines of the primitive church they are competent witnesses, and, living within a comparatively short period of the apostles, there are many things which they relate regarding apostolic times which had come down to them by tradition, and which are therefore not to be altogether rejected. In many cases, therefore, they are to be deemed as competent witnesses of facts; but we must not confide in their decisions as judges. They had to contend with numerous adversaries, and in the heat of controversy they not only fell into various mistakes, but made use of very unsatisfactory methods of reasoning, betraying imbecility of judgment or inattention to the principles and rules of logic. Their works, instead of being distinguished by correctness and strength of argument, furnish innumerable examples of feeble reasoning, of interpretations of Scripture irreconcilable with good sense, and of a careless admission of spurious writings as genuine authority.

FATHOM, *fath'-om* (Sax. *fathem*), a measure of length containing six feet. It is principally employed in ascertaining the depth of water and mines, and for regulating the length of cordage and cables.

FATS, *fats* (Sax. *fæt*, fat).—In Chem., these important compounds are so nearly connected with the fixed oils, that it will be necessary to consider the properties of both under one head. The fats and fixed oils form a well-defined natural group of organic compounds, occurring abundantly both in the animal and vegetable kingdoms. Although, in common language, we speak of coal oils and essential oils, neither of these must be confounded, chemically, with the true fixed oils. The vegetable fats and oils are found

in various parts of the plant, but they are most abundant in the seeds. The seeds of the *Cruciferæ* especially yield a large quantity of oil; rapeseed, for instance, containing from 30 to 40 per cent. In animals, *fat* is found distributed through most parts of the body in warm-blooded animals, while in fish, and cold-blooded animals generally, its place is taken by oils. Fats and oils are extracted from animal and vegetable matter by simple pressure, or else by boiling. They are all lighter than water, their specific gravity varying from 0·91 to 0·94. They are all soluble in ether, benzole, and turpentine, and may be mixed with each other in any proportion. They are insoluble in water, and only to a certain extent in alcohol. They may be heated to 500° without undergoing any change; but on distilling them, they break up into various compounds, giving off acrid and offensive smells. Hence the term of *fixed oils*. They consist of a mixture of at least three proximate principles in different proportions, two of which, *stearin* and *palmitin*, are solid at ordinary temperatures, and the third, *olein*, which is liquid. The proportions in which *olein* is present constitute the real difference between a fat and an oil. When hydrated alkalies are added to fats or oils, a process takes place, which is termed *saponification*, or the formation of soap. The theory of this process will be found under SOAP. (*See* also FATTY ACIDS.) The principal oils used in daily life are *olive oil*, the uses of which are well known; *almond oil*, extracted from the kernel of the common almond; *colza oil*, largely used for illuminating purposes, and which is obtained from the *Brassica oleifera*; *linseed oil*, *sperm*, *whale*, *cod-liver oil* The solid fats are *cocoanut oil*, which is nearly solid at ordinary temperatures in this climate; *palm oil*, *butter*, *lard*, *tallow*, and *suet*.

FATTY ACIDS, *fat'-te.*—In Chem., when a fat or oil is saponified by an alkali, a peculiar change takes place, the *stearin*, *palmitin*, and *olein*, of which it is composed, and which are the *stearate*, *palmitate*, and *oleate* of glyceryl, respectively leave the glyceryl and unite with the alkali to form *stearate*, *palmitate*, and *oleate* of potash or soda, as the case may be. On decomposing either of these compounds with a strong mineral acid, the alkali unites with it, setting the fatty acid free. This may be easily tried by dissolving some tallow or oil in a solution of potash or soda, and precipitating the fatty acids by means of oil of vitriol. The fatty acids fall into two groups,—the *stearic* series and the *oleic* series. The principal members of the former are the *melissic* and *cerotic*, found in beeswax; the *stearic*, found in most animal fats; the *palmitic*, found in palm oil; the *lauric*, found in cocoanut oil; and the *butyric*, found in butter. The principal members of the *oleic* series are the *erucic*, found in mustard-seed and rapeseed; the *oleic*, found in all non-drying oils; the *physetoleic*, found in sperm oil; and one or two others of common import. Oils are commercially divided into drying and non-drying oils, the former absorbing oxygen from the air and forming a solid, the latter remaining liquid.

FATUITY, *fat-u'-e-te* (Lat. *fatuitas*, from *fatuus*, foolish), denotes foolishness or weakness of mind. The fatuous are distinguished from the imbecile, or idiots, in that the mental powers which they once possessed have been impaired or extinguished, whereas, in the case of the latter, the mental powers have been deficient from birth. There are various degrees and kinds of fatuity. It may amount only to some incoherence of ideas and words, or the patient may be deprived of all consciousness; it may merely enfeeble the intelligence or memory, or it may pervert the moral nature. (*See* INSANITY.)

FAUCES, *faw'-seez* (Lat. plur. of *faux*), in Anat., is the gorge, or back part of the mouth, terminated by the gullet.

FAULTS, *fawlts* (Fr. *faute*, defect), in Min., a miner's term for any fissure accompanied by a displacement of the strata. Slip, slide, heave, pitch and throw, are also common miner's terms for the same thing.

FAUN, *fawn*, a name given, in Roman Myth., to a class of deities supposed to inhabit the groves and forests. The fauns are nearly identical with the *panes* of the Greek mythology. These rural deities are supposed to be the descendants of Faunus, one of the kings of Latium, who was worshipped as presiding over fields and herds; and he is thus identified with the Greek Pan and the Egyptian deity Mendes. The ceremony of the Faunalia was one of those celebrated by the country people of Rome, and it took place on the 5th of December. Sacrifices were also burnt to Faunus during the ides of February.

FAUNA, *faw'-nă*, a term employed by naturalists to express the whole of the members of the animal kingdom living in a particular district, or at a particular time. Thus all the animals living in Great Britain constitute the British fauna. Those inhabiting the land form the terrestrial fauna, and those inhabiting the seas, the marine fauna. It is often applied, collectively, to all the animals of the world, the extinct species constituting the fossil fauna, and the living species, the recent fauna. The word is derived from the Fauni, who were supposed to be the patrons of wild animals.

FAUSSE-BRAYE, *fose'-brai* (Fr. *fausse-braye*, Ital. *fossa-brea*), in Mil., the name given to a low rampart and parapet, which was sometimes raised in the ditch surrounding the *enceinte* of defensive works of the 15th, 16th, and 17th centuries, round the base of the main rampart of the fortress, and extending about 30 feet beyond it. The terre-plein, or surface of the ground within the work, was generally on a level with that of the surrounding country, and therefore below the crest of the glacis. A parapet wall was thrown up round the outer edge of the mound, which was sometimes pierced with embrasures for cannon. The fausse-braye seems to have been an addition to the main rampart that was more beneficial to the attacking party than to the defenders, as no effectual fire could be directed from thence until the enemy appeared on the crest of the glacis, and it would afford considerable assistance to an attacking force in scaling the walls of a fortress, after effecting a lodgement in the ditch. It appears to have had its origin in a bank of earth that was frequently thrown up against the walls of ancient cities, to protect them in some measure from the assault of the battering-rams, and to have been superseded by the introduction of the covered way.

FAWN, an appellation given to a buck or doe of the first year. (*See* DEER.)

FEALTY, *feal'-te* (Fr. *fealté*, Lat. *fidelitas*), in Law, denoted, under the feudal system, an obligation on the part of the vassal to be faithful to his lord, and to defend him against all his enemies; and by the feudal law, an oath of fealty was required to be taken by all tenants to their landlords, which was couched in almost the same terms as our ancient oath of allegiance, which a subject owed to his sovereign. Foreign jurists generally regard fealty and homage as convertible terms, but some in some countries they are blended, so as to form one engagement. In this country, however, they are distinct; homage being the acknowledgment of tenure,—the oath taken by a tenant when he comes to his land; and fealty, the oath of fidelity by a vassal to his lord. The oath of homage is taken by the tenant kneeling, that of fealty standing, and includes the following obligations:—(1) *incolume*, that he do no bodily harm to his lord; (2) *tutum*, that he do no secret injury to him in his house; (3) *honestum*, that he damage not his reputation; (4) *utile*, that he do no damage to him in his possessions; (5) *facile*, and (6) *possibile*, that he make it easy and possible for the lord to do any good which was before in his power to do.

FEAR, *feer* (Sax. *færan*), in Ethics, is a painful emotion, or uneasiness of mind, excited by the apprehension of impending evil, and accompanied with a desire of avoiding it. It shows itself by paleness of the cheek, sinking of the spirits, trembling of the limbs, hurry and confusion of mind, sometimes producing fainting, and even death. Sometimes it rouses nature to exert itself to the utmost to avoid the approaching evil, and often things almost incredible have been performed under its influence. The *fear of God* is such an awe and reverence for the Supreme Being as renders a man religiously careful not to offend him, but to endeavour to please him in all his actions, and to cultivate such a temper and disposition of soul as are agreeable to the Divine nature. It evidences itself by a dread of his displeasure, a

desire of his favour; regard for his excellences; submission to his will; gratitude for his benefits; sincerity in his worship; and conscientious obedience to his commands. Fear was deified by the ancient Greeks and Romans.

Feast, or Festival, *feest* (Lat. *festum*), in a religious sense, is a ceremony appointed to commemorate a certain event. Some derive the word from the Latin *feriari*, to keep holiday; others from the Greek *hestiao*, I feast or entertain, from *hestia*, a hearth or fire. Almost every religion, true or false, has had its solemn feast-days. The ancient Greeks and Romans had them, as well as the Jews and modern Christians. God appointed several festivals among the ancient Jews, the first and most ancient of which was the Sabbath, or seventh day of the week, commemorative of the creation. The Passover was instituted in memory of their deliverance out of Egypt, and of the favour of God in sparing their first-born, when those of the Egyptians were slain. The feast of Pentecost was celebrated on the 50th day after the Passover, in memory of the law being given to Moses on Mount Sinai. The feast of Tents, or Tabernacles, was instituted in memory of their fathers having dwelt in tents for forty years in the wilderness, and all Israel were obliged to attend the temple and dwell eight days under tents. These were their principal feasts, but they had numerous others; as the feast of Trumpets, the feast of Expiation or Atonement, the feast of the Dedication of the Temples, the New Moons, &c. In the Christian church, no festival appears clearly to have been instituted by Jesus Christ or his apostles, yet Christians have always celebrated the memory of his resurrection, and numerous others were introduced at an early period. At first, they were only appointed to commemorate the more prominent events in the life and death of our Redeemer, and the labours and virtues of the apostles and evangelists; but martyrs came soon after to be introduced, and by the 4th century their number had increased to a very extravagant extent. And not only so, but instead of being spent in devotional exercises, they were employed in the indulgence of sinful passions, and in criminal pursuits; indeed, many of the festivals were instituted on a pagan model, and perverted to similar purposes. Feasts are either movable or immovable. Immovable feasts are such as are celebrated constantly on the same day of the year, the principal of which being Christmas-day, Circumcision, Epiphany, Candlemas or Purification, Lady-day or the Annunciation, All Saints', All Souls'; besides the days of the several apostles, as St. Thomas, St. Paul. Movable feasts are such as are not confined to the same day of the year. Of these, the principal is Easter, which gives law to all the rest, all of them following and keeping their proper distances from it; as Palm Sunday, Good Friday, Ash Wednesday, Sexagesima, Ascension-day, Pentecost, and Trinity Sunday. Besides these, which are general, there are others which are local or occasional, enjoined by the magistrate, or voluntarily set on foot by the people. "There is something truly admirable in the order and succession of these holy days. The Church begins her ecclesiastical year with the Sundays in Advent to remind us of the coming of Christ in the flesh. After these, we are brought to contemplate the mystery of the incarnation; and so, step by step, we follow the Church through all the events of our Saviour's pilgrimage to his ascension into heaven. In all this, the grand object is to keep Christ perpetually before us, to make him and his doctrine the chief object in all our varied services. Every Sunday has its peculiar character, and has reference to some act or scene in the life of our Lord, or the redemption achieved by him, or the mystery of mercy carried on by the blessed Trinity. Thus every year brings the whole gospel history to view."—Hook's *Church Dictionary*.

Feathers, *feth'-ers* (Ang.-Sax.), the general name for the exterior covering of birds. They consist of the *quill*, the shaft, and the vanes. The quill is a hollow semi-transparent horny cylinder, by which the feather is attached to the skin. It combines strength with lightness in a very extraordinary manner. The quill of the quill contains a series of conical capsules united together by a central pedicle, forming the membranous remains of the original formation-pulp. The *shaft* is quadrilateral, with a smooth convex surface; it contains a white, dry, and very light pith. The *vanes* are subdivided into two parts,—the barbs and the barbules. The sides of the shaft are covered with the barbs, and each barb forms of itself a small shaft which is covered in a similar manner with little barbs on each edge. Those barbules are so firmly bound to each other, that although, in reality separate, they seem to adhere. The feathers of birds are changed at periodical intervals. This is called "moulting." Feathers vary in their size, form, and function, and in most cases are accompanied by an accessory plume, which is usually in the form of a small downy tuft. In high northern latitudes, the inhabitants wear the skins of some birds with the feathers on, as clothing. In Greenland, clothes made with the skins of eider-ducks are worn with the feathers inside. The ancient Mexicans made pictures with the coloured plumes of humming-birds, after the manner of mosaic. Feathers make a considerable article of commerce. The feathers of the ostrich have been held in high estimation from the times of antiquity, and have been used as ornaments for the fans and head-dresses of ladies, the helmets of warriors, and for gay processions. Many parts of England and Scotland supply feathers for beds, and an inferior sort is imported from Ireland. The finest feathers used for this purpose are those of the eider-duck, which is obtained in Greenland, Iceland, and Norway. Very fine feathers, especially for quills, are obtained from Hudson's Bay. Down, or the first covering of young birds, is also an article of commerce. The down of the swan is brought from Dantzic, together with a large quantity of superior feathers. In 1845, a duty, which had, up to that time, been levied on feathers, was repealed. (*See* Birds.)

February, *feb'-ru-ă-re* ((Lat. *Februarius*, from *februo*, I purify), is the name of the second month of our year, and contains ordinarily twenty-eight days, except in leap-year, when it has twenty-nine, an intercalary day being added. It is so called because in that month funeral lustrations were performed at Rome. It was introduced into the calendar by Numa, who gave it the twelfth place; but the decemviri subsequently transferred it to where it now stands.

Feciales, *fe-she-a'-leez*, priests among the Romans, Etruscans, and other ancient nations of Italy, who acted as heralds of peace and war. Their persons were sacred from injury when engaged on any mission to a hostile state, as the persons of ambassadors, and messengers under a flag of truce, are inviolate in the present time. Their duties in some few particulars resembled those of the heralds of the middle ages. If the people of any city or nation had committed an act of aggression against the Romans, one of the feciales was sent to state the wrong that had been perpetrated and to ask for reparation. After a few days had elapsed, the herald made a second visit to receive the answer which might be prepared to the demand made by the Roman authorities. If it was unfavourable, the herald again returned to Rome and stated the results of his mission, and if war was determined on by the consuls and the senate, he proceeded a third time as far as the boundaries of the offending state, and hurled a bloody spear within them, which was considered to be equivalent to a proclamation of war, and an intimation that open hostilities had commenced. It was also the duty of these sacred heralds to complete treaties of peace with nations with which the Romans had been engaged in war, and treaties of alliance with those who were on terms of friendship with the powerful Roman people. The Roman feciales were twenty in number, and formed a kind of college of heralds, instituted by Numa Pompilius, the second king of Rome, about 710 B.C.

Federal Government, *fed'-a-rŭl* (from Lat. *foedus*, a league), is a government formed by the union of several sovereign states, each state giving up a portion of its power to the central authority, and yet retaining its powers of self-government. It differs from a confederacy in this, that each of the states that compose the latter is properly independent or supreme, the central authority having no power to enforce any of its measures upon the individual state, that being in the hands of their own governments. The Germanic

confederation belongs to this class, the diet being merely an assembly of ambassadors from several confederated but independent governments, and the resolutions of the diet being merely articles of agreement which each of the confederated governments spontaneously adopts, but which owe their legal effect in each state to laws and commands fashioned upon them by its own immediate chief. The common form of a federal government is where the central authority is vested in the hands of representatives appointed by the sovereign power of each state. Their powers are determined by the contract, and vary in different cases. In some, as in the Swiss cantons, it is little more than a confederation; in others, as in the United States of America, it approaches to a union. "The federal congress of the American union," says Mr. Mill, "is a substantive part of the government of every individual state. Within the limits of its attributions it makes laws which are obeyed by every citizen individually, executes them through its own officers, and enforces them by its own tribunals. This is the only principle which has been found, or which is even likely to produce, an effective federal government."—(*Representative Government.*) Federations of a kind existed in ancient times, as that of the Ionian states of Greece, the Achæan league, the Ætolian league, &c.

FEDERALISTS, *fed'-e-rál-ists*, was the name of a political party in the United States formed in 1788, and who claimed to be the peculiar friends of the constitution and the federal government. Their most distinguished leaders were Washington, Adams, Hamilton, and Jay, and the leading federalist states were Massachusetts and Connecticut, supported generally, though not uniformly, by the rest of New England; while Jefferson, Madison, Munroe, Barr, and Gallatin, led the opposition. Their opponents, the republicans, they called anti-federalists, and charged them to a certain extent with hostility to, or distrust of, the United States constitution and the general government. In the contests of the French revolution the federalists leaned to the side of England, the republicans to that of France. The opposition of the federalists to the war of 1812, and above all the calling of the Hartford convention, effected their destruction as a national party, and in 1820 they were completely disbanded. In the present unhappy struggle that is going on in that country, the Federals are the northern party, who are in favour of maintaining the union; the Confederates the southern states, who want to form themselves into an independent confederation.

FEE, *fee* (Sax. *feh* or *feck*, Lat. *feudum* or *fiodum*), in Law, is the same with feud or fief, and in its original sense is used in opposition to *allodium*, the latter denoting land held by a person in his own right, without owing any rent or service to any superior; whereas fee or *feodum* is applied to that which is held of some superior, on condition of rendering him service. As no subjects can be possessed of allodial property in England, all lands being held either mediately or immediately of the crown, a fee in general is the highest and most extensive interest that a man can have in a feud. Estates of inheritance are either estates in fee simple or fee tail. An estate in fee simple is the most extensive estate of inheritance that a man can possess in land, and is descendible to his heirs. Estates in fee simple are commonly divided into three kinds:—1. Fee simple absolute; that is, free from any qualification or condition.—2. Fee simple qualified, or base, one which has a qualification annexed to it, and which determines whenever the qualification subjoined to it is at an end; as in the case of a grant to A and his heirs, tenants of the manor of Dale, the grant ceases whenever the heirs of A cease to be tenants of the manor of Dale.—3. Fee simple conditional is a fee restrained in its form to some particular heirs, to the exclusion of others. (For an account of estates in fee tail, *see* ENTAIL.)—*Ref.* Stephen's *Commentaries*.

FEE, in the law of Scotland, denotes a full right of proprietorship in any property, and is distinguished from life-rent, which is merely the right to enjoy it during life. Frequently the two terms occur together, and an estate is said to be granted to a parent in life-rent and his children in fee.





FEELERS, in Ent. (*See* ANTENNÆ.)

FEELING, *feel'-ing* (Sax. *felan*, to feel), is primarily employed to denote the perceptions which we have of external objects by the sense of touch; but it has also come to be applied to our inward sensations. Thus a man may have a feeling of pleasure from hearing or from contemplating a beautiful landscape. In this way we have intellectual feelings, moral feelings, sensual feelings, feelings of taste, &c. Sir W. Hamilton divides feelings into two great classes,—the mental and the corporeal, or, in other words, into sentiments and sensations. Though, strictly speaking, all consciousness and all feeling be only mental, yet there are certain feelings that are clearly marked out to be in proximate relation to the body, and these he terms sensual feelings or sensations, while the internal or mental feelings he terms sentiments. The sensations are divided into two classes,—those which accompany our perceptions through the five determinate senses of touch, taste, smell, hearing, and sight; and those which are comprised under the common or vital sense (*communis sensus*); as feelings of heat and cold, feeling to health, muscular feeling, &c. The sentiments may also be divided into two classes,—contemplative and practical; the former being the concomitants of our cognitive powers, or powers of knowledge; the latter of our powers of conation, or of will and desire. (For a very elaborate analysis of the different feelings, see Sir William Hamilton's *Metaphysical Lectures*, vol. ii.) The feelings "are not primitive and independent states, but merely states which accompany the exertion of our faculties or the excitation of our capacities," and "take their differences from the differences of the powers which they attend."

FEES are certain sums of money paid to official persons as perquisites, or as recompense for their labour and trouble, and are fixed by ancient usage or by acts of parliament. The fees paid to officers connected with the administration of justice have been in most cases fixed and regulated by recent acts of parliament. Officers demanding improper fees are guilty of extortion (which *see*). The fees of barristers and physicians are regarded as *honoraria*, and cannot be recovered by legal proceedings.

FEIGNED DISEASES, *fained* (Fr. *feindre*, to feign), are diseases which certain persons pretend to be afflicted with, in order to avoid some duty, or in the hope of gain. The soldier, to escape the performance of duty; the mendicant, to impose on public or private beneficence; the criminal, to avoid the infliction of punishment, most frequently have recourse to these pretences. They are sometimes, however, had recourse to when no adequate motive can be assigned, and are difficult of detection in proportion to the skill with which they are simulated; and Fodère has observed that during the conscription in France the subject had been "brought to such perfection as to render it as difficult to detect a feigned disease as to cure a real one." The diseases most commonly feigned are epilepsy, catalepsy, convulsions, blindness, deafness, palsy, insanity, indigestion, neuralgia, rheumatism, palpitation of the heart, ulcers, &c. Vomiting, spitting of blood, diarrhœa, and ophthalmia, are also often simulated. It frequently demands very considerable ingenuity on the part of the physician to detect the knavery of such persons. The physician, after ascertaining that the apparent disease is capable of being simulated, and how far it is so, should endeavour to learn what motives the patient may have for playing such a part. His intelligence should be gauged, and the accordance of the disease with his age, sex, condition, &c., carefully examined. He should also ascertain from the relatives or friends of the suspected person what are his physical and moral habits. "But the chief dependence," says M. Rostan, "must be placed upon well-directed questions, for the impostor is rarely so familiar with the symptoms of his assumed malady as not to betray himself when asked if he does not feel certain symptoms foreign to his case, or to contradict himself when questioned at different times regarding the course of his disease. His embarrassment is likely to be much increased when he is catechised respecting the causes of his disorder and the remedies he has employed. However, he must be closely but secretly watched. Perhaps the strongest

light is thrown upon these cases by an examination of the involuntary functions. In diseases in which the pulse ought to be affected (and there are few which do not affect it), its condition will often lead at once to a detection of the imposture." There is generally, also, an aversion in persons feigning disease to take the proper remedies.

FEINT. (*See* FENCING.)

FELIDÆ, or FELINA, *fe'-le-de* (Lat. *felis*, a cat), a fam. of the Cat kind, of the order *Carnivora*, in which the destructive organs reach the highest perfection. The fam. is by some naturalists said to include the dogs, hyænas, wolves, and smaller carnivora; but the system generally adopted is to include among the *Felina* only the cats, lions, tigers, leopards, and lynxes. In these animals the head is short and almost rounded in its form. The principal instruments of the destructive energy of these animals are the teeth and claws. Their dental formula is as follows:—

Incisors $\frac{6}{6}$; canines $\frac{1-1}{1-1}$; præ-molars $\frac{4-4}{2-2}$; molars $\frac{2-2}{1-1}$

The canines are long, sharp, compressed, and cutting; the premolars are furnished with two roots, compressed, pointed, and serrated; the flesh-teeth, or true molars, are very large, sharp-edged, and terminated by two or three points; and behind the flesh-tooth in the upper jaw there is a small tubercular tooth, which is wanting in the lower. In addition to this formidable apparatus of cutting-teeth, the tongue in these animals is covered with small recurved prickles, by which they can detach from the bones of their prey every particle of flesh. The palate is soft, and that part of the tongue which corresponds with it is smooth; as it advances forward, it is covered with large soft papillæ directed backwards; then there are four large fenestate papillæ, anterior to which the simple conical papillæ continue increasing in size to near the tip of the tongue. These papillæ are armed with the strong cuticular spines before mentioned. The five toes of the anterior and four toes of the posterior extremities of the cats are armed with very strong, hooked, sub-compressed, sharp claws, which are preserved from being blunted by a peculiar arrangement of the phalanges. For this purpose the claw-joint of each toe is drawn back by ligaments attached to the penultimate joint, until it assumes a perpendicular position, when the claw which it supports is completely retracted within a sort of sheath, and is entirely concealed by the fur. When, however, the animal springs upon its prey, the tendons of the flexor muscles of the toes implanted into the opposite surface of the phalanx overcoming the elasticity of the retractile ligaments, push forward the claws, and they are ready to be buried in the flesh of a victim. The lower surface of the foot is furnished with thick ball-like pads of the epidermis, upon which the animal walks; and these are the cause of the peculiarly noiseless tread which is characteristic of all the members of this family. It will be seen, on reference to any members of the cat tribe, that the mode of walking adopted by these creatures is different from that of man, monkeys, or bats. The weight of the body rests only on the toes, and not on the entire foot. The manner of walking is termed "digitigrade," from the Latin words *digitus*, a finger, and *gradus*, a step. Cats hunt in the gloom, and consequently, while escaping observation, require every ray of light that can be made available. The pupil is a long vertical fissure; but this only obtains among the smaller genera; for in all the *Felina* that surpass the ocelot in size, the pupil again assumes a round form. "On the top of the skull there runs a tolerably high bony crest, which reaches its greatest elevation at the very back of the head. This bone-ridge is intended for the attachment of the powerful muscles which raise the head and enable the animal to perform its prodigious feats of strength. Pausing awhile, and directing our attention to the anterior of the skull, a curious internal ridge of bone is seen, which rises to some little height and separates the two great divisions of the brain from each other. In the cat tribe, this ridge arises entirely from that part of the skull which is known by the name of the 'parietal bone;' but in other carnivorous animals the 'occipital bone' is the principal source of this structure. The use of the bony ridge is not quite certain; but it seems likely that it may play an important part in guarding the brain from the severe shocks which must be occasioned by the movements of the animals when they leap upon their prey. Reverting to the exterior form, and passing from the head to the neck, we find that the first two vertebræ partake of a similar enlargement to that which has already been observed on the back of the skull. The vertebra which is nearest to the head, and is called the 'atlas,' is broad and strong, and spreads laterally; while the second, or 'axis,' is long, and is developed upwards into a very powerful crest. The ribs are beautifully formed, and placed rather widely apart, giving plenty of room for the heart and lungs to perform their duties effectually. The vertebræ that fill the space between the ribs and the hip-bones are very large, and so exquisitely jointed together that they unite a graceful flexibility of movement with great muscular power."—(*Rev. J. G. Woods.*) With regard to the digestive organs of the *Felidæ*, the salivary glands are small, as might be expected where it can hardly be said that mastication is exercised. In the case of the lion, the stomach is divided, by a slight contraction in its middle, into two portions. As in most of the family, its muscular coats are very strong. Blumenbach observes, that in most carnivorous quadrupeds, particularly those of a rapacious nature, the stomach bears a considerable resemblance, on the whole, to that of the human subject. "In the carnivora, the stomach, which is of a cylindrical form, has no cul de sac; the œsophagus opens at its anterior extremity, and the intestine commences from the posterior; so that everything favours a quick passage of the food, which receives no mastication, and is retained a very short time in the stomach. The intestine has no valves, is small in diameter, but muscular, and the whole canal, when compared with the body, is extremely short, being as 3 or 5 to 1. It is worth noticing, that in the domestic cat they are as 5 to 1; but in the wild cat they are only as 3 to 1."—(*English Cyclopædia*) The *Felidæ* are distributed in all parts of the world, with the exception of Australia, but principally in the warmer regions, where alone the larger species are met with.

FELLAHS, *fel'-lahs* (Arab., poor), is the name of a people in modern Egypt who live in villages and cultivate the soil. They are the most ancient race in that country, and are generally believed to be descendants of the old Egyptians, their physiognomy resembling that which is found on the ancient sculptures. They are a patient and laborious population, but are heavily taxed, and subjected to great hardships. They form the great bulk of the population of that country.

FELLOWSHIP, *fel'-lo-ship* (Sax. *felaw*, follow), in a college, is an endowment entitling the holder to a share in its revenues, and constituting him a part of the corporation. Fellowships are either original, having been constituted by the founder of the college, or endowed by subsequent benefactors. Formerly, most of the fellowships were restricted to the inhabitants of certain dioceses, or districts, or persons; but most of these restrictions have been removed by the commissioners, under the University Act of 1854. Some fellowships may be held by laymen, but, in general, they can only be held by persons in holy orders, or who are ordained within a specified time. They differ greatly in value, many of them being under £100 per annum, while some of them reach £700 or £800. Being paid out of the college revenues, which are for the most part received in corn-rents, they vary from year to year with the price of that commodity. The senior fellowships are the most lucrative, but all confer upon their holders the privilege of occupying apartments in the college, and certain privileges as to commons or meals. Fellowships are, in general, tenable for life, unless the holder marries, or inherits estates which afford a larger revenue, or accepts one of the livings belonging to the college.

FELO DE SE, *fe'-lo-de-se* (Lat., a felon of himself), is one that deliberately puts an end to his own existence, or who commits any unlawful malicious act, the consequence of which is his own death. He must, however, be of the age of discretion, and of sound mind, otherwise it is no crime. The law of England wisely and religiously considers that no man has a right to take away his own life, and that the suicide is

guilty of a double offence,—one spiritual, in evading the prerogative of the Almighty; the other temporal, against the king, who has an interest in the preservation of all his subjects. The law has, therefore, ranked this among the highest crimes, making it a peculiar species of felony, a felony against oneself. If one persuades another to kill himself, and he does so, the adviser is guilty of murder; and if two agree to commit suicide together, and one only is killed, the survivor will be guilty of murder, according to law. Formerly, the body of the felon was ignominiously buried in the highway, with a stake driven through the body; but now, by 4 Geo. IV. c. 52, it is privately interred at night in a churchyard, and without the rites of Christian burial. All the chattels, real and personal, of a *felo de se* are forfeited to the crown, though they are usually restored upon payment of moderate fees. The enactments against this crime, which punish only the innocent relatives, have led juries in general to find that the act was committed in a fit of temporary insanity.

FELONY, *fel'-on-e* (Ang.-Nor.), in Law, in its general acceptation, comprises every species of crime which occasioned, at common law, the forfeiture of lands or goods. This most frequently happens in those crimes for which a capital punishment either is, or was, liable to be inflicted. Hence all offences now capital are in some degree or other felony, as well as many other offences which are not punished with death; as suicide, homicide, larceny, &c., all of which are, strictly speaking felonies, as they subject the committers of them to forfeitures. Various derivations of the word have been suggested; but the most probable is that given by Sir Henry Spelman, from the Teutonic or German *fee*, fief or feud, and *lion*, price or value; felony being thus the *pretium feudi*, the consideration for which a man gives up his fief. (*See* FORFEITURE.)

FELSPAR, *fel'-spar*, in Min., an important mineral, and common constituent of rocks. It is the representative of a family, and consists essentially of a double silicate of alumina and some alkali, or alkaline earth. It forms a principal constituent of granite. Potash felspar is the orthose of the mineralogist, and gives rise to kaolin, or china-clay, by disintegration. Soda felspar is albite, lithia felspar petalite, and lime felspar labradorite. The term is derived from the German, and means *field-spar*.

FELT, *felt* (Sax. *felt*), the name given to the material formed by uniting and compressing fibres of wool, fur, and other substances fit for the purpose, into a compact body, by what is termed the felting process. This consists in mixing the fibres of the materials employed until they become interlaced or matted together in the form of a soft loose cloth or sheet, which is done by the instrumentality of carding and doffing engines. When this stage in the process has been reached, the cloth is wound on a roller, and carried to the felting-machine, in which the fibres are combined and interlaced still more closely by the action of heat and pressure, until the loose substance is converted into a close, thick material, possessed of great strength and durability. Felt of a fine kind is used for making hats (*see* HAT MANUFACTURE); and a coarser description is used for table-cloths and carpets. A stiff rough felt is also manufactured for making roofing for sheds, and coverings for hayricks and cornstacks, as well as for supplying a lining to the copper sheathing applied to the bottom of vessels; and another sort for covering steam-boilers, for which it is well adapted, on account of its properties as a non-conductor of heat. The last-named material is made of the waste woollen cloths used in paper-mills, reduced to a pulp, and beaten together after being put on the boiler in a wet state. It is then allowed to dry, when it becomes stiff, solid, and utterly impervious to heat. All the other different kinds of felt are made by amalgamating the materials by the agency of heat, moisture, and pressure. Table-cloths of this material are either embossed, having a raised pattern in one colour on a ground of another hue, or printed in a variety of tints and designs. The carpets made of the royal Victoria felt are also printed in colours. In addition to being inexpensive, they have the merit of being warm and comfortable, the closeness of their texture preventing draughts from entering an apart-





ment through crevices in the flooring; they are also tolerably durable, but, on account of the [illegible] printed on the surface of the fabric, the [illegible] apt to fade and become obliterated by [illegible]. The roofing felt is rendered waterproof [illegible] soaked with a preparation of tar or bitumen, [illegible] sold at a penny per square foot, and forms [illegible] substitute for thatch, slates, or tiles for the [illegible] out-buildings, being impenetrable to rain. It will, however, burn freely, if it happened to catch fire when in a dry state. Felt of a similar kind is also used for lining wooden buildings and the walls of rooms that are affected by damp. The Armenians prepare a thin kind of felted cloth for lining coats and dresses, and felt cloth is used in this country for lining coaches, and for pianofortes, and a variety of other purposes. The process is said to have been invented by the Saracens for making coverings for their tents, and introduced into Europe at the time of the crusades.

FELUCCA, *fe-luk'-ka* (Ital.), the largest and fastest description of boat used on the Mediterranean, having a low but graceful and buoyant hull, with a high stem and raking stern, fitted with three masts, lateen sails, a jib set on a small bowsprit, and long powerful oars to assist their progress in those lengthened calms so frequent on the above sea.

FEMALE FLOWER, *fe'-mail flow'-er* (Lat. *femella*, Fr *femelle*, female; *fleur*, flower), a term used in Botany to distinguish those flowers which are furnished with pistils, or female organs, but which have no stamens, or male organs of production.

FEME COVERTE, *fam ko'-vert* (Fr.), in Law, denotes that relationship in which, in consequence of marriage, a wife stands to her husband, being under his protection and influence, and her legal existence being suspended, or at least incorporated and consolidated in that of her husband. Her condition during marriage is thus called her coverture. A married woman cannot sue in the civil courts without her husband's concurrence, and in his name as well as her own; neither can she be sued without her husband being made a defendant. The property of a wife is, by marriage, transferred to her husband; and all deeds and acts done by her during her coverture are void. The landed property of a married woman is, during the marriage, under the administration of her husband, and her personal property is absolutely vested in him. When a wife is deserted by her husband, she may now obtain an order to protect any property that she may acquire by her own industry. The husband is bound to pay his wife's debts contracted previous to marriage, and also to provide her with necessaries during marriage; but he is not chargeable for anything besides necessaries. In some felonies, and other inferior crimes, committed by her through constraint of her husband, the law excuses her, except in the case of treason or murder.

FEMGERICHTE, FEHMGERICHTE, or VEHMGERICHTE, *faim-ger-ik'-te* (from the old German *fem*, punishment, and *gericht*, court of justice), was the name of certain secret tribunals which existed in Westphalia, and possessed immense power and influence in the 14th and 15th centuries. These are said by some to have been originated by Charlemagne, but it is more probable that they were relics of the ancient German courts of justice, which continued to exist in Westphalia after they had ceased in other parts of Germany. The Femgerichte first came into notice after the deposition and outlawry of the emperor Henry the Lion, when all law and justice seemed to be set at defiance, and anarchy everywhere prevailed. In such circumstances the secret tribunals took upon themselves the protection of the innocent and defenceless, and inspired with salutary terror those whom nothing else would keep in check. These tribunals soon acquired great power, and spread themselves over the whole of Germany, though their principal seat still continued to be Westphalia, the *red land*, as it was called, probably on account of its clayey soil. The secrecy with which they carried on their operations, and the power they manifested in carrying out their sentences, rendered them the terror of all Germany, and princes and nobles eagerly sought admission into their society. Their number is said at one time to have

amounted to 100,000. Though originally established for the support of right and justice, there can be little doubt that they afterwards were frequently made use of to carry out party feelings. Any one who had a complaint against his neighbour, which could not be sustained before the ordinary judges, betook himself to the Femgerichte. From the secrecy in which they were involved, little is known regarding their internal organization. The members were called the *Wissende*, or the knowing ones; and, before being admitted, they must be of blameless life, of the Christian religion, and take a terrible oath "to support the holy Fem, and to conceal it from wife and child, from father and mother, from sister and brother, from fire and wind, from all that the sun shines upon or the rain wets, from all that is between heaven and earth." From among the Wissendes the *Freischöffen* (free justices) were elected, who were the assessors of the court and executors of its sentences. The president of the court was called the *Freigraf* (free count). The general superintendence of the whole of the tribunals was in the hands of the lord of the land, who, in Westphalia, was the archbishop of Cologne. The chief superintendence, however, was in the hands of the emperor, who was usually, on his coronation at Aix-la-Chapelle, admitted a member of the society. The court of a Freigraf was called a *Freiding*, and the place where it was held a *Freistuhl*. The members had certain signs and watchwords, by which they were able to recognize each other, and which were concealed from the unmitiated. Their courts were either open or secret; the former were held by day in the open air, the latter by night in a forest, or in concealed and subterranean places. The process of trial, and the circumstances of judgment, were different in the two cases; the former decided in all civil causes, the latter took cognizance of such as had been unable to defend themselves sufficiently before the open courts, as well as such as were accused of heresy, sorcery, rape, theft, robbery, or murder. The accusation was made by one of the Freischoffen, who, without further proof, declared upon oath that the accused had been guilty of the crime. The accused was then thrice summoned to appear before the secret tribunal, and the citation was secretly affixed to the door of his dwelling, or some neighbouring place, the name of the accuser being concealed. The citation mentioned that the accused was to meet the Wissende at a certain hour and place, and to be conducted by them before the tribunal. Here by an oath the accused might clear himself; but the accuser might also oppose it with his oath and the oaths of witnesses. If the accused could now bring forward six witnesses in his favour, the accuser might strengthen his oath with fourteen witnesses; and sentence of acquittal did not necessarily follow until the accused had supported his case with the oaths of twenty-one witnesses. The judges were all armed, and dressed in black gowns, with a cowl that covered their faces like a mask. The condemned, as well as those who did not obey the summons, were then given over to the Freischoffen. The first Freischöffe who met him was bound to hang him on a tree; and, if he made any resistance, it was lawful to put him to death in any other way; and a knife was left by the corpse, to indicate that it was a punishment inflicted by one of the Freischöffen. The punishment, however, was rarely inflicted on those who readily appeared, the judges being satisfied with cautioning the defendor to redress the wrong he had been guilty of. At length a great outcry was raised against these courts, and in 1461 various princes and cities of Germany, as well as the Swiss Confederates, united in a league to enable all persons to obtain justice by their means, and to prevent them from seeking it from the secret tribunals. Their influence, however, was not entirely destroyed until the public peace was established in Germany, and an amended form of trial and penal judicature introduced. Goethe, in his "Goetz von Berlichingen," has given an account of the workings of these secret tribunals: but the best historical account of them is by Paul Wigand, "Das Fehmgericht Westfalens," Hamm., 1825.

**Feminine**, *fem'-e-nin* (Lat. *femina*, a woman), is the opposite of masculine, and means pertaining to a woman or women. Words are said to be feminine in grammar when they denote females, or have the terminations proper to express females in any given language.

**Femoral**, *fem'-o-ral* (Lat. *femur*, the thigh), in Anat., is applied to parts of or connected with the thigh; as, the femoral bone, or *os femoris*; the femoral artery, &c. (*See* Thigh.)

**Fen**, *fen* (Sax. *fen* or *fenn*), is used to signify low land which is wholly or partially covered with water to some depth. The subsoil is always saturated, and the land itself is apt to be overflowed with the discharges of rivers and lakes. The soil of these lands is generally of a deep black colour, and is unusually rich and light to the depth of some three or four feet. As the water often filters down to the subsoil, fen lands produce crops of grass and corn in far greater abundance than lands better situated. Until of late, windmills were used to drain the English fens, as is the case in Holland; but now steam is nearly the sole agent employed for this purpose. The fens in Lincolnshire, Kent, and Cambridgeshire, are the principal instances of this species of land in England.

**Fence**, *fens* (from Nor. *defender*, to prohibit, defend), a term used in Gardening and Husbandry to signify a hedge, wall, ditch, bank, or other inclosure, made around gardens, fields, woods, and other agrarian property, for the purpose of protection or separation. Fences are usually made of paling or split planks, although there are other and various methods in which they are constructed. In the wild and mountainous regions of Ireland and Scotland, where wood is very scarce, it is usual to make fences of rough stone walls, put together without any mortar, in order to separate the property of different individuals. In parts of Galway, in Ireland, some of these fences, or stone walls, are built in a very efficient and workmanlike manner, and are very durable, as the stone in many instances is of a soft nature, which is liable to split with a flat surface; in such cases there are many dry walls which present the usual appearance of those constructed with mortar. A high bank of earth, faced with turf sods, is often substituted for a stone wall when stones cannot be had, and a hedge is then planted on the top of this embankment; thus completing a formidable leap to lovers of the chase in hunting counties. Of all fences, the best which can be constructed is, undoubtedly, a live hedge, when it is properly planted and carefully cut and trimmed when arrived at full growth; for further information on which subject, *see* separate article Hedge. A *sunk fence* is one which is planted in a broad, deep ditch, and is not above the level of the ground; so that it is concealed from the view. A light fence of split rails or iron, which is erected to keep off cattle from a lawn, and which does not conceal the view, is termed a "ha ha." When fences are constructed of branches of thorns and bushes, without stakes, they are called *foot hedges*; when the branches are interwoven, and rods are wattled in at the top, they are termed *stake-and-edder hedges*.

**Fencing**, *fen'-sing* (from the same root as *defence* and *fence*), the art of using skilfully, in attack or self-defence, a sword, rapier, or bayonet; but usually taken to mean address in the use of the second of these weapons. In actual personal combat the rapier is, or more correctly was, used, for its employment has gone out with the practice of duelling. In the school of fence the foil is wielded. The foil is a circular or quadrangular rod or blade of pliable highly-tempered steel, blunted and covered with leather at the point, so as to prevent accidents in its practice. In length it varies between thirty-one and thirty-eight inches, and, for the purposes of the art, it is divided into two parts,—the *forte*, which occupies the half of the blade ending with the hilt, and the *foible*, which occupies the other half terminating with the button. During the pastime, the fencers wear a strong wire mask upon their faces as a defence against accidental thrusts, &c. Fencing was cultivated by the ancients; the Roman gladiators instructed the soldiery of that epoch; but as their weapons differed so materially from those of the present day, and as they defended themselves by shields and armour, their methods were infinitely less complicated and efficient than those of the present day. During the period comprised within the middle ages, fencing became greatly neglected, and this was owing most likely to the fact that there was a great improve-

ment in the armour worn by knights in battle; from which circumstance battle-axes and other ponderous weapons of offence were substituted for the sword. When metal casing became somewhat, if not altogether disused, fencing came once more into vogue; and, as all gentlemen wore swords, and quarrels were matters easily got up, it was absolutely necessary that all should have some knowledge of the "fence." The peculiar state of society in Italy made this even more needed than in any other country, and it followed that the Italians became the best fencers in Europe. Spain next found the art necessary, and soon France, in which latter country it created such a favourable impression that a school was established for its prosecution, and new improvements were found out every day in the science. The early Italian and Spanish schools taught the management of the sword, aided, generally, by the dagger or the mantlet; the shifting of the position of the fencer was also necessary to avoid attack. But since the habit of wearing the dagger and mantlet has been abandoned, and the velocity of attack and defence become so great, instruction in fencing has been strictly limited to the foil, and shifting position would be fatal to one engaged. The Italian foil is some thirty-eight or forty inches long, while the French is shorter, being only thirty-four inches, generally, in length. In fencing there are three openings or entrances,—*the inside*, comprising the whole breast from shoulder to shoulder; *the outside*, which can be attacked by all the thrusts made above the wrist on the outside of the sword; and, finally, *the low parts*, which embraces the armpits to the hips. In a work of this description it would be impossible to give all the different attacks and defences; the following, however, are the principal:—First, the *carte* is a guard which is shown by turning the wrist with the nails upwards, and the hand in a line with the lower part of your breast, the arm somewhat bent, the elbow inclining a little to the outside, and the point of your foil directed towards the upper part of your adversary's breast at an angle of about 15°. The *thrust*, *lunge*, or *longe*, is an attack. When at the guard in carte (as just shown), straighten the arm, raising your wrist above your head, keeping the point of your foil still pointing to your adversary's breast, and then thrust out first the wrist and then the whole body by a "lunge" of the right foot some two feet from the guard; your left foot remaining firm all the time. The *parade* is formed by moving your sword over from your guard, when received, obliquely downward to the right about six inches, and opposing the inside of your foil to your adversary's blade. The *seconde* is shown by holding your nails and wrist downwards, hand opposed outwards; and the blade should form an angle of 45° with the ground, pointed low. *Feints* consist in threatening an attack on one side of your foil and executing it on the other. There are many varieties of these, and the best defence is the *half-circle parade*, which is done by straightening your arm with your wrist on a line with your shoulder, and by a quick motion of your wrist, sweeping the point of your foil from right to left; thus covering your body from head to knee, and obliging your adversary once more to come to position. The calvary sword-exercise is but another instance of fencing applied on horseback, and the bayonet exercise, in point of fact, may be regarded in the same light.

FENNEC, *fen'-nek* (*Vulpes zaarensis*; *Canis Zerda* of Zimmermann), belonging to the carnivora, and chiefly found in Nubia and Egypt. This animal, which has given rise to much controversy, is generally placed by the French zoologists among the foxes; but the observations of Mr. Yarrell led him to pronounce decidedly that the fennec appears to him to belong to the genus *Canis*, the osteological part of its structure closely resembling that of the dog, and the pupil of the eye being circular. The fennec is of slight build, and seldom measures more than a foot in length, exclusive of the tail, which is fox-like and bushy, and measures eight inches in length. Its colour is very pale fawn, with a slight touch of jetty black at the base and extremity of the tail. Although without doubt a carnivorous animal, the fennec is especially fond of the fruit of the date-palm, and is said to be able, and frequently to exercise his ability, to





climb the lofty trees, and gather the dates. Bruce, who claims the honour of introducing the fennec to zoological science, asserts that it builds its nest in trees. In latter times, however, it has been certainly ascertained that it burrows like the foxes. It is of nocturnal habit.

FENNEL. (*See* FENICULUM.)

FEOFFMENT, *fef'-ment* (Lat. *feoffamentum*, from the verb *feoffare* or *infeudare*, to enfeoff, or give one a feud), in Law, is applied to the most ancient and solemn method of conveyance. It is defined to be "the conveyance of any corporeal hereditaments from one person to another by delivery of the possession of the hereditaments conveyed, and evidenced by an instrument in writing;" for since the Statute of Frauds, 29 Car. II. c. 3, no valid feoffment can be made without a written instrument. The person that so gives or enfeoffs is called the *feoffor*, and the person so enfeoffed is termed the *feoffee*. This mode of conveyance included a very material ceremony, called livery of seisin, without which the feoffee had but an estate at will. This was the actual delivery of a portion of the land or real hereditaments conveyed, as a twig or a turf, to testify to the reality of the act; or, the parties being within view of the land, the feoffor, referring to it, gave it to the feoffee. The latter mode of delivery was ineffectual unless the feoffee entered into possession during the life of the feoffor. This mode of conveyance may be traced up to the earliest antiquity, and has been common among most rude nations. Livery of seisin was anciently performed before the freeholders of the neighbourhood, who might afterwards bear witness, in the event of any dispute. Afterwards, however, the livery was made in presence of any witnesses, who attested such delivery in the body or on the back of the deed. Feoffments are now little used, and actual or symbolical livery of seisin is rendered unnecessary by 8 & 9 Vict. c. 106, by which corporeal hereditaments are made to be in grant as well as in livery, and which declares that a feoffment shall not have a tortuous or wrongful effect.

FERA, *fe'-re* (Lat. *ferus*, wild), a term employed by Linnæus to distinguish the order of mammalia which subsist more or less exclusively upon the flesh of other animals. They have three rows of teeth,—incisores, canines, and molars; unguiculate extremities, without an opposable thumb on the fore foot, but with the power of rotation in the fore-arm. The order of *Fera* corresponds with the insectivora, and the plantigrada, digitigrade, and pinnigrade carnivora of Cuvier's Classification. (*See* CARNIVORA.)

FERÆ NATURÆ, *fe'-re nä-tu'-re* (Lat., of a wild nature), a term applied in Law to wild animals, or such as retain their natural disposition of freedom, as distinguished from such as are tame or domestic. The law holds that a man can have no absolute property in animals *feræ naturæ*. There may be, however, a qualified property in these animals, either *per industriam*, *propter impotentiam*, or *propter privilegium*. *Per industriam*, by a man's reclaiming and making them tame by art, industry, and education, or by so confining them within his own immediate power that they cannot escape and use their natural liberty. These are a man's property only so long as they remain in his keeping; and if they should regain their natural liberty, his property ceases, unless they have *animum revertendi*, or are in the habit of returning. *Propter impotentiam* arises from the inability of the animals; as where such animals burrow or nestle on my land and have young there, I have a qualified property in these young ones till they can run or fly away. *Propter privilegium*; as where a man has the privilege of hunting, taking, and killing them, to the exclusion of others, as in the case of game. (*See* GAME LAWS.)

FERMENTATION, *fer'-men-tai'-shun* (Lat. *fermentatio*), in Chem.—Fermentation may be defined as a decomposition undergone by organic matter, through the influence of a small portion of organized matter which is in itself in an active state of alteration. This organized body, which is called a *ferment*, acts simply by its presence in, and takes nothing away from, nor adds anything to, the substance undergoing fermentation. In all cases of fermentation certain extraneous conditions are necessary; for instance, the presence of water and a moderately warm temperature. There are three

principal kinds of fermentation,—*alcoholic* or *vinous*, *lactic* or *butyric*, and *viscous alcoholic fermentation*. When the juices of plants or fruits containing sugar are kept at a temperature of 70° for several hours, the liquor becomes turbid, and small bubbles of gas make their appearance; in common language, it has begun to work or ferment. Under the combined influence of warmth, moisture, and oxygen, the albuminous matter has become decomposed, and a change is commenced, which, after it has once begun, continues until the whole of the gas has been eliminated. If the gas is collected, it will be found to consist of carbonic acid only, and on distilling the fermented liquor, a spirit lighter than water passes over, which is readily recognized as dilute alcohol. If the liquor be further examined with a microscope, it will be found to contain a number of oval organized bodies in the form of cells, a full description of which will be found under the head of YEAST. This yeast is the ferment in this instance, and if dried at a low temperature, it will preserve its power of exciting fermentation for a great length of time. Its power is stopped by several chemical agents; such as the strong mineral acids, the alkalies, excess of sugar, certain corrosive metallic salts, kreosote, carbolic acid, and the essential oils. The change taking place in the sugar may be rendered plain by the following:—

| Fruit-sugar. | Carb. Acid. | Alcohol. |
|---|---|---|
| $C_{12}H_{12}O_{12}$ | = $4CO_2$ + | $2(C_4H_6O_2)$ |

It was considered at one time that the change that bread undergoes during panification was a distinct kind of fermentation. It has now been ascertained that it is only a modification of the alcoholic fermentation produced by the action of the yeast upon the starch and sugar contained in the flour. *Lactic fermentation.*—Milk may, by being kept at a warm temperature, be converted into a spirituous liquor, by the change of the sugar of milk first into fruit-sugar and then into alcohol by the action of the azotised constituents contained in it. The change which more commonly takes place, when milk is allowed to ferment, is the transformation of sugar of milk into lactic acid. Other animal bodies are capable of effecting the same change in a shorter time; the use of rennet being a familiar example. Caseine, in like manner, is used for a similar purpose; butyric acid being easily made by fermenting sugar, cheese, and chalk together in certain proportions. *Viscous fermentation.*—Liquors containing sugar often pass into a ropy or thick condition, from the transformation of that body in a mucilaginous substance. No escape of gas takes place, but the liquid loses its sweet taste. The mucilaginous substance has not yet been thoroughly examined, but its formation is evidently connected with the electrical conditions of the air; examples of which are familiar in the instances of wines and beers turning thick and sour during a thunderstorm. The change of alcohol into vinegar is not a true fermentation, but a simple absorption of oxygen.

FERN. (*See* FILICES.)

FERN-ROOT. (*See* LASTREA.)

FERONIA, *fe-ro'-ni-a*, in Bot., a gen. of the nat. ord. *Aurantiaceæ*. The species *F. elephantum* is a large tree, growing in India. A kind of gum, closely resembling gum-Arabic, exudes from its stem, and it is very probable that this constitutes part of the East-India gum imported into this country. The young leaves have an anise-like odour, and are used by the native doctors of India for their stomachic and carminative effects. The fruit is known as the elephant or wood-apple.

FERRET, *fer'-ret* (Du. *vret*, Fr. *furet*), (*Mustela Furo*, Linn.).—This well-known animal is a native of Africa, but domesticated in Europe. Its habits are similar to those of the weasel, but more bloodthirsty. Its length is about fourteen inches, exclusive of the tail, which measures about five and a half inches; snout sharp; eyes red and fiery; colour commonly pale yellow, but sometimes partaking of all the colours usual in the weasel kind. In slightness of body and shortness of leg it likewise resembles the weasels. Ferrets are chiefly used to hunt rabbits. Courageous, however, as is the ferret, there is not more than one in ten who is a really good "ratter," or, indeed, that can be induced to enter a rat-burrow. The same timid animal, however, will, without invitation, scamper into a rabbit burrow; and for this very good reason, that whereas, especially if there be many litters of young rats in the colony, the old animals will show desperate fight with the intruder, the rabbits will never, on any chance, turn on it, but rush headlong away. In the pursuit of this latter sport, it was the custom in olden time to *sew* the lips of the ferret together before it was turned into the rabbit burrow, and so prevent it doing anything but scare them out of the hole and into the hands of the watcher at the mouth of it. In old books of "sport," there are elaborate instructions as to how the ferret should be held while his lips are being sewn, together with the sort of needle to be used. The modern system, however, is to muzzle or "cope" the ferret. This is accomplished by the use of two pieces of soft string, one of which is passed round the neck, and the other under the jaws, the four ends meeting at the back of the neck, and being there tied. Cold is fatal to the domesticated ferret. It breeds twice a year, the production ranging from six to nine young ones at a litter. Sometimes the female will eat up her young, and in that case she is likely to litter three times in the year. The period of gestation is six weeks. The young are born and continue blind during an entire month, and at three months old are considered fit for "work."

FERRIC ACID, *fer'-ric* (Lat. *ferrum*, iron), $FeO_3$, in Chem.—If one part of sesquioxide of iron and four of nitre be fused together for some time, a brown mass is obtained, giving a violet-coloured solution, containing ferrate of potash. Ferric acid has never been obtained in a free state, but solutions of the ferrates of the earths may be formed readily by mixing ferrate of potash with these salts.

FERRIDCYANOGEN, *fer'-rid-si-ăn'-o-jen* (Lat. *ferrum*, iron, and cyanogen), $C_{12}N_6Fe_2$, or $FdCy$, in Chem., a hypothetical radicle derived from cyanogen, giving rise to salts known as ferridcyanides, a good example of which is met with in the ferridcyanide of potassium, or red prussiate of potash of commerce, which is formed by passing chlorine through a solution of yellow prussiate of potash. Ferridcyanide of potassium is prepared in large quantities for the use of the calico-printer. When added to solutions of the persalts of iron, it gives no precipitate; but a very splendid dye, known as Turnbull's blue, is formed by mixing it with a solution of protosulphate of iron. The other ferridcyanides are unimportant.

FERROCYANOGEN, *fer'-ro-si-ăn'-o-jen* (Lat. *ferrum*, iron, and cyanogen), $C_6N_3Fe$, or $Fe_7$, in Chem., a hypothetical radicle derived from cyanogen, giving rise to salts known as ferrocyanides, of which the ferrocyanide of potassium, or yellow prussiate of potash, may be taken as an example. The salt of commerce is nearly in a state of purity, and is manufactured on an enormous scale for the use of colour-makers and calico-printers, by heating dried blood, bones, parings of hides, and other nitrogenous animal matter, with an equal weight of carbonate of potash and one-third of iron filings. The carbon, nitrogen, and iron unite with the potassium to form a yellow salt, crystallizing in large tabular crystals, containing three equivalents of water. It is very soluble in water, but insoluble in alcohol. Although it contains the elements of prussic acid when in solution, yet it is not poisonous. Distilled with sulphuric acid, it furnishes prussic acid in large quantities. It is much used in calico-printing and colour-making for the production of a fine blue colour, known as Prussian blue, with the persalts of iron. When protosalts of iron are used, a dirty greenish-white precipitate falls down, which constitutes one of the distinguishing tests between the per- and proto-salts of iron. It is also largely employed in the manufacture of cyanide of potassium, in fact, it is the only commercial source of that salt. With copper, it forms a characteristic purple-brown precipitate, and is used as a confirming test for salts of that metal. With the salts of cobalt it gives a yellowish-green precipitate.

FERRY, *fer'-re* (Lat. *ferre*, to carry), in Law, is a right, arising from royal grant or prescription, to carry men and horses across a river or arm of the sea for a reasonable toll. The owner of a ferry is bound to keep a boat always in repair and readiness for the

use of her Majesty's subjects, for neglect of which he is liable to be indicted. On the other hand, if a ferry be erected so near to an ancient ferry as to draw away its custom, it is a nuisance to the owner of the old one, for which the law will give him remedy. No public ferry can be established without a license from the crown. Bridges have taken the place of ferries to a great extent, and they are only found in the present day over streams running through flat districts, or in places where the traffic is not sufficient to warrant the outlay which would be incurred in erecting a bridge. They are also found at the mouths of tidal rivers, where a bridge would interfere with the passage of vessels, or its construction would be attended with considerable engineering difficulties. A ferry formerly existed where London Bridge now stands, the profits of which formed part of the endowment of a nunnery, which stood on the Southwark side of the water, on, or near, the site of St. Saviour's Church.

**Ferry-bridge**, a boat or barge of great size and peculiar construction, adapted for the transportation of horses and carriages, as well as foot-passengers, across a stream from one bank to another. The ferry-bridge or floating bridge, as it may be indifferently termed, consists of a level platform laid like a deck on a strongly-built flat-bottomed vessel, square at both ends. This deck or platform is furnished with railings on either side, or bulwarks boarded over, and it has a lap of timber attached to each end by hinges which can be raised or lowered by chains. These laps are allowed to rest on the land when the ferry-bridge touches the shore, to afford a safe and easy means of entrance and exit for carriages and horses. Bridges of this description are worked from side to side by means of a chain fastened at either end to posts placed for the purpose in the landing-places. If the distance across be short, the chain is passed round a wheel which is turned by the ferryman; but in floating bridges placed at the entrance of tidal rivers, where the distance from bank to bank is often considerable, the chain is passed round a barrel or capstan, which is worked by horses or steam power. Ferry-bridges of this description are used to convey vehicles across the river Tamar, at Saltash, in Cornwall and across the Dart, at Dartmouth, Devon.

**Ferula**, *fer'-u-lă* (Lat.), is the classical appellation of a wand or rod. In the time of the Eastern empire, the *ferula* was the name given to the emperor's sceptre. It consisted of a long stem with a flat head, and it is often to be seen depicted on old medals.

**Ferule**, *fer'-ule* (lat. *ferio*, I strike), is used to signify a little flat wooden slice or pallet for punishing children at school, by striking them with it on the palms of their hands. It is often applied, too, to a species of cane which is used for the same purpose of castigation.

**Fescennine Verses**, *fes'-sen-nine*, were a kind of rude, licentious poetry, common in ancient Italy, and said to have derived their name from the Etrurian city of Fescennium. They were in the form of dialogues between two persons, who satirized and ridiculed each other's follies and vices. They were sung on festive occasions, particularly at weddings, but were distinct from the epithalamin, which were more refined and regular compositions. The emperor Augustus prohibited them, as tending to corrupt the public morals.

**Festivals.** (*See* Feasts)

**Festoon**, *fes-toon'* (Fr. *feston*).—Strictly speaking, this word means a garland or wreath; but in architecture, sculpture, &c., it is applied to designate an ornament composed of flowers, fruits, and leaves interwoven or twisted together, suspended at each end, and falling down in the form of a curve or arch.

**Fetichism**, *fet'-ish-izm*, is the worshipping of a fetich. The word fetich is said to be derived from the Portuguese word *fetisso*, bewitched or possessed by fairies, and was applied by them to the objects worshipped by the negroes of Africa. Hence the term has come to be generally received, and is applied to the ascription of life and intelligence to inanimate objects, as stones, carved images, &c. Fetichism, then, is the worship of material substances, a form of idolatry that prevails very extensively among barbarous nations, and especially those of the negro race. Nor does the rude worshipper hesitate to chastise, or even to throw away or destroy, his fetich, if it does not seem to gratify his desires; and, according to Dr. Reid, children naturally believe the inanimate objects around them to be endowed with life. "To transfer," says Mr. Grote, "to inanimate objects the sensitive as well as the willing and designing attributes of human beings, is among the early and wide-spread instincts of mankind, and one of the primitive forms of religion; and although the enlargement of reason and experience gradually displaces this elementary fetichism, and banishes it from the region of reality into those of conventional fiction, yet the force of momentary passion will often suffice to supersede the acquired habit; and even an intelligent man may be impelled, in a moment of agonizing pain, to kick or beat the lifeless object from which he has suffered."—*History of Greece*, vol. v.

**Fetlock**, *fet'-lok* (Ang.-Sax., from *footlock*), a tuft of hair which grows behind the pastern-joints of most horses,—horses of diminutive size, however, have hardly any tuft.

**Feud**, in Law. (*See* Fee and Feudal System.)

**Feud**, *fude* (Ang.-Sax.), denotes a deadly quarrel or enmity subsisting between one tribe or family and another. They formerly prevailed extensively among the northern nations of Europe, and were a combination of kindred to revenge the death of any of their blood against the slayer and all his race, and were frequently kept up for many generations.

**Feudal System**, *fu'-dăl sis'-tem*, is that constitutional system which was introduced into Europe by the northern nations after the fall of the Roman power, and which has left important traces of its existence in most European countries. The constitution of feuds had its origin in the military policy of the Goths, Huns, Vandals, and other northern nations, who overran Europe at the declension of the Roman empire. The term feud is of very doubtful derivation, but most probably it is formed from the Teutonic *fee* or *feh*, wages or pay for service, and *odh* or *od*, property or possession; a feud then being the property or possession given as wages for service. In order to secure their newly-acquired possessions, and at the same time to reward their deserving followers, the conquering generals were wont to allot large districts, or parcels of land, to the superior officers of the army, and these were by them dealt out again in smaller allotments, or parcels, to the inferior officers and soldiers. The condition annexed to these holdings was that the possessor should do service faithfully, both at home and in the wars, to him by whom they were given; for which purpose he took the oath of fealty (*juramentum fidelitatis*), and in case of the breach of this condition and oath, by not performing the stipulated service, or by deserting the lord in battle, the lands were again to revert to him who granted them. The ownership of the land, therefore, properly remained in the hands of the superior, and probably at first was resumable by him at pleasure, or at least on the death of the holder; but, in most countries, lands soon came to assume an hereditary character, the rights of the superior, on the death of a vassal, being confined to the exaction of certain dues from his son and successor, as a consideration for confirming to him the feud which his father had held. Where the land descended to a female, the superior was entitled to control her marriage for the purpose of procuring a trustworthy vassal, a privilege which, like the other, was afterwards converted into a pecuniary payment. According to this system, every receiver of land, or feudatory, was bound, when called upon, to serve his immediate lord or superior, and to do all in his power to defend him. Such lord or superior was likewise subordinate to, and under the command of, a higher superior or lord; and so on upwards to the prince or general himself. The several lords were also reciprocally bound in their respective gradations to protect the possessions they had given. Thus the connection between lord and vassal was made to wear all the appearance of a mutual interchange of benefits,—of bounty and protection on the one hand, and of gratitude and service on the other. In this way the feudal connection was established, and an army was always at command, ready to fight in defence of the whole, or of any part, of the newly-acquired country. The wisdom of these measures

became evident to the other princes of Europe, and many of them who were independent adopted this system as a means of strengthening their power, parcelling out their royal territories, or persuading their subjects to surrender up and retake their own landed property under the like feudal obligations of military fealty. Thus the feudal constitution, or doctrine of tenure, extended itself over all the Western world; and the feudal laws drove out the Roman, which had hitherto universally prevailed. This system was adopted in most countries of Europe from the 9th to the end of the 13th century; but it differed in various particulars in the different countries. Though there can be no doubt that feudal principles prevailed to a considerable extent in the polity of the Saxons in England, yet it was only when that country was conquered by the Normans that it was regularly established. In some respects, however, the system of feudalism established in England differed from that of France, from which it was taken. One of these was that the king was the universal lord and original proprietor of all the lands in his kingdom, and that no man could possess, or hold, any part of it, but what was mediately or immediately derived from him, to be held mediately or immediately of him upon feudal service. Hence the Conqueror introduced the practice of compelling those holding mediately as well as immediately of himself to swear fealty to him; and thus the inferior vassals were under two oaths,—the one of fealty to the king, the other of fealty to their immediate superior. It has been remarked, however, that when the two interests came into collision, the vassal rarely failed to obey his lord rather than his king. The wardship, or guardianship of the tenant during minority, which implied both the custody of his person and the appropriation of the profits of his estate, was another feature of English feudalism which did not exist in the French. In England, the whole country was divided into about 60,000 knights' fees, the tenant of each of which appears to have been obliged to keep the field at his own expense for forty days, whenever his lord chose to call upon him. For smaller portions of land, smaller periods of services were due. Every great tenant exercised a jurisdiction, civil and criminal, over his immediate tenants, and held courts, and administered the laws within his lordship, like a sovereign prince. The existence of manor-courts and other small jurisdictions within the kingdom is one of the features of the feudal system. The land escheated to the lord when the tenant left no heir, and it was forfeited to him when he was found guilty either of a breach of his oath of fealty or of felony. There were also fines payable to the lord on certain occasions, as well as aids, reliefs, &c. The vassal had also to attend the lord's courts, sometimes to witness, and sometimes to take part in, the administration of justice; in battle, he was bound to lend his horse to his lord if dismounted, to keep to his side while fighting, and go into captivity as a hostage for him when taken. It was a breach of faith to divulge his (the lord's) counsel, to conceal from him the machinations of others, to injure his person or fortune, or to violate the sanctity of his roof.

Feu de Joie, *fu'-de(r)-zhwaw*, a term derived from the French, and applied to bonfires lighted in public places and in villages, to celebrate any important event or festive season. These *feux de joie* were known amongst the Romans, as Romulus instituted a species of them, particularly in honour of the building of the city of Rome. The term *feu de joie* is also often applied to a salute fired on any particular occasion, in celebration of festivals, &c.

Feuillans, *fu-e'-yans*, in Eccl. Hist., is the name of a reformed branch of the Cistercian order of monks. It was founded by Jean de la Barrière, abbot of the Cistercian monastery of Feuillans near Toulouse, in 1577, who, being opposed to the great laxity of discipline that then prevailed, introduced a much more austere mode of life. He soon found many followers, and they were declared independent by Sixtus V. in 1586. They were afterwards divided, in 1630, into two congregations by Pope Urban VIII., who separated the French from the Italians, and gave them two generals. They practised great austerities, going barefoot, and living only on herbs. The cloister of



this order at Paris gave name to the celebrated political club which, during the French revolution of 1789, held its meetings there. It was founded in 1790, by Lafayette, Sièyes, Larochefoucauld, and others, and was intended to support the constitution against the ultra party. When Count Clermont Tonnerre was elected president of this club, a popular insurrection broke out against it; and on the 20th of March, 1791, the Assembly in the cloister was dispersed by the mob.

Feuilleton, *fu(r)'-ye ton(g)* (Fr.), is properly a small leaf, but is generally applied to that part of a political newspaper which is devoted to news of a non-political character, as criticisms on literature and art, &c., and which is commonly, in continental newspapers, to be found at the bottom of the page. The feuilleton is an invention of the *Journal des Débats*, which, in 1800, introduced the system of giving literary criticisms in this form. Afterwards the belles-lettres element began to prevail in the feuilleton, and Jules Janin became the acknowledged king in this class of literature. In the years immediately preceding the revolution of February, whole romances were spun out in the feuilleton; and in particular, the *Constitutionnel* made large sums from the social romances of Eugene Sue, which it first published in this way. The French system has been imitated in England and Germany, though not to the same extent, and with less marked success. In fact, the feuilleton proper seems only to be in its natural element in France. The language and the character of the people are peculiarly fitted for imparting that grace, point, neatness, and vivacity that give a peculiar charm to the higher productions of this class of literature, and which draw additional power from their many-sidedness and frequent changes.

Fever, *fe'-ver* (Lat. *febris*, from *ferveo*, I am hot), in Med., is the name given to a very numerous and important class of maladies, which, however diversified in their several characteristics, still present something in common in their general features. It is impossible to give a general definition that will apply to all the different varieties and forms of this class of diseases; but, among the features that are almost always present are spontaneous and painful lassitude, weakness of the corporeal and mental faculties, alterations of the secretions, altered animal heat, quickened circulation, and increased thirst. One of the earliest and most constant symptoms of fever is lassitude, and is usually attended by a painful or irksome sensation in the back and limbs. It is manifestly referable to a depressed state of the nervous energy, more particularly as regards the organic nervous system. To this depressed state of the nervous energy that weakness of the corporeal and mental powers which often precedes the evolution of the disease, and always in some degree attends it, is to be attributed. It is usually manifested more in the corporeal than in the mental faculties, particularly at first. Some of the mental powers are more affected than others; as attention and the reasoning faculties, than the imagination. Alterations of the secreting and excreting functions are among the earliest and most constant, and most important phenomena of fever. The exhalations from the lungs and skin are the earliest and most affected; but, besides these, the salivary, gastric, hepatic, intestinal, and urinary secretions, are more or less altered as respects either quantity or quality; the alterations being somewhat different in different types and states of fever. The temperature of the body is also variously affected in the different stages. At first it is usually below, but it soon after rises above the normal condition, and is generally accompanied with a certain morbid sensation which it is difficult to describe. Quickened circulation has generally been regarded as one of the most essential symptoms of fever; but this feature is not constantly present, at least in some stages of the disease, and it is often of less importance than other states of the vascular system and the condition of the blood itself. When, indeed, the term fever is used in a general sense to denote a general disorder consequent upon or symptomatic of some local disease, and not a primary or idiopathic disease, then increased heat and accelerated circulation are the chief characteristics, without which the patient is said to be without fever; but when fever occurs as a particular disease of itself, these two symptoms are seldom the most prominent,

and are always associated with others which are usually more important. Thirst is seldom wanting in fever, except occasionally in its advanced state; and the appetite for food is also diminished or entirely abolished. Medical men distinguish various stages or periods in the course of fever which are characterized by features more or less marked; as, (1) the formative or precursory stage, the earliest stage of the disease, being characterized by those early changes which are productive of those which constitute the developed disease; (2) the stage of invasion, when the earlier symptoms of the disease itself manifest themselves; (3) the period of excitement or reaction, when fever in its more literal sense begins, and manifests its specific form; (4) the period of crisis, when a sudden change takes place in the course of the disease, known as the crisis; (5) the period of decline which succeeds the crisis, and which passes into the (6) last stage,—that of convalescence. Fever presents itself in a great variety of forms, the simplest of which is what is termed ephemera, or one day's fever, because it seldom lasts above twenty-four hours. It begins with chilliness or rigor, paleness, wearness, and a frequent small pulse, with indifference to food. These symptoms are followed, in half an hour or a little more, by heat of skin, a flushed face, frequent hard pulse, occasionally headache, and a peculiar sense of fatigue, restlessness, and slight soreness of the muscles. After this state has continued for twelve or eighteen hours, or at most twenty-four, gentle perspiration breaks out, under which, in the course of little more than an hour, every essential symptom vanishes, leaving only a feeling of exhaustion and muscular debility. This is the simplest and slightest form of fever; and though, on account of its shortness, it seldom attracts much notice, yet it is by no means uncommon in this country, particularly during the spring months. If such an affection be supposed to recur several times every other day, with an interval of comparative health in the intervening days, a clear notion will be formed of *intermittent* fever in its most frequent and characteristic form,—the tertian; and from the tertian may be derived all the other forms of intermittent fever. If, in the next place, the febrile state be conceived to be reinforced twice a day, or oftener, by a fresh attack of rigor or chilliness, with subsequent reaction before the pre-existing pyrexia had materially subsided, a distinct conception may be formed of remittent fever. From the remittent fever most nosologists deduce the only remaining primary type,—continued fever, by supposing the remissions to become gradually less and less distinct; but others, with perhaps more reason, regard them as ephemera, merely prolonged to such a duration as that its several stages occupy between four and nine or eleven days. In accordance with these remarks, what are known as primary fevers may be divided into three classes,—continued, intermittent, and remittent fevers. The first class comprises synocha, or inflammatory fever; synochus, mixed, or nervous fever; and typhus, or adynamic fever. Intermittent fevers are divided into tertian, quotidian, and quartan; while remittent fevers comprise the marsh remittents, and probably also the yellow fever. Besides primary fevers, there are the irruptive class of fevers, comprising the small-pox, measles, and scarlet fever; and the irritative fevers, comprising gastric fever and gastro-intestinal, remittent, and hectic fever.—*Ref.* Copland's *Dictionary of Medicine*.

FIARS, *fē'-ars*, in Scotland, are the annual average prices of grain, determined in each county so as to regulate crown duties, ministers' stipends, and the rents of agricultural subjects, where these are made to depend upon the price of grain. The derivation of the word is uncertain, and, according to Dr. Jamieson, it is of Gothic origin. They were originally instituted in Scotland for the purpose of ascertaining the value of the victual or grain-rents payable to the crown, and were at first determined annually by the exchequer, upon returns made of the prices of grain by the sheriffs of the different counties. Afterwards it was left to the sheriffs themselves to determine the fiars prices in their several counties, who summoned a jury for that purpose. Fiars appear to have been struck in Scotland as early as the middle of the 16th century; and the form of procedure is regulated by an act of sederunt, dated 21st December, 1723, and renewed 20th February, 1728. This act requires "the sheriffs of Scotland and their deputies yearly, betwixt the 4th and 20th of February (O. S.), to summon before them a competent number of persons living within the sheriffdom who have knowledge and experience of the prices and trade of victual in these bounds, and from them to choose fifteen men, whereof not fewer than eight shall be heritors, to pass upon the inquest, and return their verdict on the evidence underwritten, to their own proper knowledge, concerning the fiars of the preceding crops of every kind of victual of the product of that sheriffdom; and the said sheriffs and their deputies shall to the same time and place unto which the jury is called, also summon the properest witnesses, and adduce them and all other good evidence, before the said jury, concerning the price at which the several sorts of victual have been bought and sold, especially since the 1st of November immediately preceding until that day;" "and any persons then present may in open court and no otherwise, and observing due order and respect, offer information to the jury concerning the premises and concerning the evidence adduced or that might be adduced before them." In Scotland a great many contracts are regulated by the fiars prices. In letting farms on lease, it is often arranged that the whole, or a certain portion of the rent, be paid in grain, or according to the value of so many bolls of wheat or barley, as fixed by the fiars; so that in the event of a great fall of prices during the currency of the lease, the tenant should not suffer; and, on the other hand, that the landlord should reap a fair share of the advantage of a rise of prices. In like manner many feu duties, the stipends of the established church clergy, the salaries of parochial schoolmasters, &c., are made to depend more or less upon the fiars prices. It is the interest, therefore, of those who have to pay, that the fiars be struck as low as possible, and of those that are to receive, that they be as high as possible; and hence they are determined with a considerable degree of accuracy, generally, it is believed, rather under than over the mark. It is thought, however, that the period fixed for taking the averages is too early, there not being much of the grain of the previous crop brought into the market by that time.

FIAT, *fī'-at* (Lat., let it be done), in Law, denotes a decree, a short order or warrant of some judge for making out and allowing certain processes.

FIAT, in Bankruptcy, denoted the authority of the lord chancellor to a commissioner of bankrupts to proceed in the bankruptcy of the trader therein mentioned. It was abolished by 12 & 13 Vict. c. 106, and a petition for adjudication substituted.

FIBRE, *fī'-br* (Lat. *fibra*), a term applied to animal, vegetable, or mineral substances which have a stringy or thread-like structure. In a general sense, it includes the hair and wool of quadrupeds, the threads enwrapping the cocoons of silkworms, &c., the fibres of the leaves of plants and of their inner bark, the elongated cells or hairs connected with the seeds of plants, and the ordinary materials used in making cordage and textile fabrics. Mineral substances are called fibrous in structure, even when it is impossible to detach the apparent fibres. The only fibrous mineral which has been used for textile fabrics is *Amianthus*, a variety of asbestus; but that only to a very limited extent. The animal substances used are divided into two classes; the first including hair and wool, and the second the silk of cocoons. Nearly all textile fabrics are made from the first, and the wool of the sheep is the most important division of the class. The hair of the goat, alpaca, camel, bison, and other animals, is also used. The hair of most animals is, however, in general, too short to allow of its being used for textile manufacture. The vegetable kingdom yields the largest number of useful fibres, which are obtained from natural orders very different from each other. The acrogenous or cryptogamous plants do not, however, afford any. From exogenous plants, fibres are obtained from the inner bark, as in the case of flax, hemp, &c., and from the hairs of the fruit, as is cotton. In endogenous plants, the fibre is sometimes obtained from the fruit, as in cocoa-nut fibre. The spathe of horse palms is also used. Some of the slender palms called

rattans, and the bulrush, &c., are much used, on account of their fibrous nature, for wicker-work, chair-bottoms, and similar purposes. The most valuable fibres obtained from endogenous plants come from the leaf or leaf-stalk. The fibres of the bark of exogens are readily separated, usually by steeping or continually moistening with water. As this process injures the colour of endogenous substances, the fibres are generally separated by beating or passing between rollers. Fibres obtained from fruits, as cotton fibre, like the wool and hair of animals, exist naturally in a separate state, and only require to be collected and cleaned. Amongst the useful vegetable fibres, those of flax, hemp, and cotton have long held the first place. The principal additions, of late years, have been New Zealand flax, jute, Sunn or Sunn hemp, coir, Pita flax, Abaca or Manilla hemp, China grass, and some others. One of the most important uses of vegetable fibre is in the manufacture of paper. Among exogenous plants whose fibres are used for economical purposes, are a species of gossypium which produces cotton; the *Bombax villosum*, which produces silk-cotton, or vegetable silk; and the *Asclepias syriaca*, producing the silk-like down of Virginian silk. These three substances are obtained from the fibres of the fruit. Those obtained from the inner bark include the following:—several species of Hibiscus, producing Deckanee hemp; the *Corchorus olitorius*, from which jute is obtained; the *Linum usitatissimum*, producing flax; several species of the Crotolaria; together with other leguminous plants, producing Sunn, Jubbulpore hemp, &c.; several species of Boehmeria, one of which produces China-grass fibre, the *Cannabis sativa*, producing hemp; and the inner bark and roots of some species of pine and fir. Among the endogenous plants from which fibres are obtained, are the *Phormium tenax*, yielding New Zealand flax; *Agave americana*, yielding Pita flax; some species of Musa, from the leaves of which are obtained Abaca or Manilla hemp, and plantain fibre; several species of Bromelia, from which are obtained pine-apple fibre, &c.; the husk of the cocoa-nut and the fibre of the stem yield coir; and mats, chair-bottoms, and other important articles in general use, are obtained from the fibre yielded by the leaves of the cotton-grass and other species of the nat. ord. Cyperaceæ (which *see*).

Fibrin, *fi'-brin* (from Lat *fibra*, a thread), one of the constituents of the blood, and of muscular tissue. It contains, according to Mulder,—carbon 52·7, hydrogen 6·9, nitrogen 15·4, oxygen 23·5, sulphur 1·2, phosphorus 0·3. It occurs in two states,—liquid in the animal organism, and solid by spontaneous coagulation, as soon as it is removed from the living body. It is contained in blood in a liquid state, in the proportion of 2·5 parts to 1,000, and coagulates in a very short time after the exposure of blood to the air. It constitutes a large portion of muscle, arranged in bundles of fibres; whence its name. According to Liebig, it is found in the juices of plants and in the gluten of wheat. Mulder looks upon fibrin as a compound containing *protein*. (*See* also Protein Compounds.)

Fibula. (*See* Leg.)

Ficoidæ, *fi-koi'-de-e* (Lat. *ficus*, a fig), in Bot., a synonyme for *Mesembryaceæ* (which *see*).

Fiction, *fik'-shun* (Lat. *fictio*, from *fingo*, I feign), in Lit. (*See* Novel, Romances.)

Fiction of Law (Lat. *fictio juris*), is a supposition of law that a thing is true, without inquiring whether it be so or not, that it may have the effect of truth so far as is consistent with equity. They are common in the Roman law, and are not unknown in that of England. The fictions of the Roman law apparently had their origin in the edictal power, and they were devised for the purpose of providing for cases where there were no legal provisions. Fictions are resorted to in order to avoid a special hardship, or to remove some unexpected difficulty not provided for by the law. Their existence supposes a defect, which it is the business of legislation to remedy; and of late years many of them have been removed from our laws; as in the proceedings in ejectment (which *see*). Fictions must be framed according to the rules of law, and not what is merely imaginable; and there ought to be equity and possibility in every legal fiction. "These fictions of law," says Blackstone, "though at first they may startle the student, he will find, upon further consideration, to be highly beneficial and useful; especially as this maxim is ever invariably observed, that no fiction shall extend to work an injury; its proper operation being to prevent a mischief, or remedy an inconvenience that might result from the general rule of law."

Ficus, *fi'-kus* (Lat., a fig), in Bot., a gen. of the nat. ord. *Moraceæ*, consisting of trees and shrubs abounding in a milky juice. The most important species is *F. Carica*, the fig-tree, supposed to be a native of Asia Minor, but now found in all the southern countries in Europe. The fruit is termed a *syconus* (which *see*), and is eaten green, and dried as a luxury in some countries, and as a common article of food in others. The finest dried figs are imported from Turkey, and are sold in bulk at prices varying from 20*s.* to 50*s.* per cwt. In consequence of their nutritive, emollient, demulcent, and laxative properties, they are frequently employed in medicine. The fig-tree is cultivated in Britain, but not extensively. It is only in very warm situations that it will ripen its fruit in the open air, even though trained against a wall. When grown in houses built on purpose for it, the fig-tree is remarkably prolific. This fruit-tree is the *jeeh* of the Bible. *F. indica*, the banyan or banian tree, is another interesting species. T[illegible] is regarded as a sacred tree



BANYAN-TREE.

by the Hindoos. Its branches produce long shoots, or aerial roots, which descend to the ground and penetrate the soil; so that, in course of time, a single tree becomes a vast umbrageous tent, supported by numerous columns. No fewer than 350 stems, each equalling in bulk the trunk of a large oak, and more than 3,000 smaller ones, have been counted in one example. The poet has thus described this marvel of the vegetable kingdom:—

> "Branching so broad along, that in the ground
> The bending twigs take root; and daughters grow
> About the mother-tree; a pillar'd shade
> High over-arch'd, with echoing walks between.
> There oft the Indian herdsman, shunning heat,
> Shelters in cool, and tends his pasturing herds
> At loopholes cut through thickest shade."

The fruit of the banyan is of a rich scarlet colour, and about the size of a cherry; it is eaten by the monkeys, which live with birds and enormous bats in the thick forest of branches. The bark is a powerful tonic, and is much used by the Hindoo physicians. The white glutinous juice of the tree is used to relieve toothache, as an application to the soles of the feet when inflamed, and for making birdlime. *F. elastica*, also a native of India, yields an inferior kind of caoutchouc. *F. Sycamorus*, the sycamore fig, is said to have yielded the wood from which mummy-cases were made.

Fiddle. (*See* Violin.)

Fidei Commissum, *fi-de'-i kom-mis'-sum* (Lat., committed to the trust), in the Roman law, denotes something given (usually by will) to one, in confidence that he will convey it or dispose of it for the good of another. The obligation was not created by words legally binding, but by words of request; as *rogo* (I wish), *peto*

(I ask); and hence, originally, there was no legal means of enforcing its fulfilment till the time of Augustus, when a prætor was appointed whose sole business it was to see to the *fidei commissa*. The person intrusted with the property was called *fiduciarius*, and the person to whom it was intended to be conveyed, *fidei commissarius*. *Fidei commissa* were either particular or universal, the former being the bequest of a particular subject, the latter of the whole estate. They seem to have been introduced in order to evade some legal restriction, and to give the inheritance or a legacy to a person who was either incapacitated from taking it directly or who could not take as much as the donor wished to give. In some parts of the continent, as Germany and Holland, the *fidei commissa* form an important feature in the conveyance of heritable property, resembling our laws of entail (which *see*);—a person receiving the use of certain lands during his life, upon condition of transmitting them unimpaired, in a certain line, after his death.

FIEF. (*See* FEUDAL SYSTEM.)

FIELD, *feeld* (Ger. *feld*), in Agr., a portion of land inclosed by a fence, or rendered distinct by some line of separation, and set apart either for tillage or pasture. The term "field" was, in ancient times, applied in Britain to the lands under culture by the plough; its signification was consequently very comprehensive, as, until within the last two centuries, all land cultivated with the plough was uninclosed. Afterwards, when farmers portioned off and subdivided a part of the lands near the farmyard, the inclosed portions were called fields; the more distant portion, which remained open, was called open field or common field; while grass lands uninclosed were called commons. At the present day, in the improved state of agriculture, every farm is divided into fields, either by simple lines of demarcation, which are sufficient when no animals are to be grazed on the farm, or by lines of separation which will act as fences; such as walls, hedges, ditches, &c. In all farms, every field has a distinguishing name. Without a regular fixed division of arable lands into fields, it would be next to impossible to conduct a rotation or succession of crops. When space is an object, and the grass lands of a farm are used for the grazing of sheep, it is generally the custom to separate the fields by light netting, or hurdles, scarcely visible at a short distance. If this plan were more generally adopted with regard to the dividing-lines of fields, from a tenth to a fifth would be added to the contents of the greater number of corn farms. The same arrangement also saves considerably the first cost and the annual expense incurred, in order to plant hedges or build walls, and in keeping them afterwards in repair.

FIELD ALLOWANCE, a daily amount of additional pay given to officers in the British army in consideration of the extra expenses entailed on them by reason of their service in the field. There are two different sorts of field allowances,—ordinary and extraordinary. The ordinary allowance ranges from £1. 10*s.* for a field officer to 1*s.* per diem for a subaltern: this is given for service when in camp at home and when on service in the colonies. Extraordinary allowance is only allowed when troops are really in the field of action in actual warfare. No officer receives this unless present with the army in the field.

FIELDFARE, *feeld-fair* (*field* and *fare*, from Sax. *faran*, to go), (*Turdus pilaris*, Linn.), a migratory bird, appearing among us about the beginning of November and departing at the end of April. They seldom breed in this country. It is about ten inches in length, and of the following colours:—head, hind neck, and wings, grey; fore part of the back, chestnut; space before the eyes, brownish black; fore-neck and breast, reddish yellow; over each eye a whitish line; feathers tipped with a brownish triangular spot; those of the sides with large dusky spots, and margined with white; lower wing-coverts and axillary feathers, pure white. In Poland, Russia, and Austria, it is found throughout the year. It builds its nest in lofty trees, and feeds on worms and various berries.

FIELD-GLASS, a species of telescope, used for the purpose of observing the movements of armies and operations during a military campaign. Further information respecting this instrument will be seen under the separate head of TELESCOPE.

FIELD-MARSHAL, *feeld-mar'shal* (Ger. *feld-marschall*), the highest military rank that can be bestowed in the British army, and which is occasionally conferred on general officers for distinguished services in the field, and on princes of the blood royal in virtue of their position and connection with the sovereign. It is rather a title of honour in the British service than one which implies any particular duty to be discharged by the holder, like those of commander-in-chief, general of division, general of brigade, &c. The title, in its present form, is copied from that of *feld-marschall* in the Prussian and Austrian services, which was derived from the French term *maréschal de camp*, given to officers who performed, in former times, duties that were similar to some of those now discharged by the heads of the commissariat department and military train. The rank itself is of old standing. The supreme command of the English army was originally intrusted to a nobleman styled the lord marshal or earl marshal of England; but when this office was made an hereditary appendage to the dukedom of Norfolk, it had ceased to convey military rank, and marshals of the army were appointed when occasion required. There are at present (1862) seven officers of this rank in the British army: his majesty the King of the Belgians, Viscount Combermere, and Lord Seaton, who are field-marshals of some standing; and H.R.H. the duke of Cambridge, commander-in-chief; General Blakeney, Lord Gough, and Lord Clyde, who were made field-marshals on Nov. 9th, 1862, when the Prince of Wales attained his majority.

FIELD OFFICERS, in Mil., are such as are competent to command battalions,—as majors, colonels, and lieutenant-colonels; and the term is applied in contrast to those who can only take company duties, such as captains and lieutenants.

FIELD OF VIEW, in a telescope or microscope, means the space within which objects are visible when the focus of the instrument has been properly adjusted to suit the sight of the person using it.

FIELD SPANIEL. This class of dog has very long hair in some parts; it is generally white, with large brown, liver-coloured, or black spots of irregular size and shape. The nose is sometimes cleft, and the ears



FIELD SPANIEL.

are very long and pendulous, and covered with long hair like its body. The race of spaniel dogs was imported originally from Spain; whence their name. The field spaniel is used for shooting in field sports, like its congener, the *setter*.

FIELD SPORTS are diversions in the field in pursuit of game, &c.; as hunting, shooting, fishing, and coursing.

FIELD TRAIN, a department of the Royal Artillery somewhat resembling the commissariat of an army. On it devolves the duty of the safe-custody of stores and ammunition, and the forwarding of the same to the base of operations in the field. A regular staff of men and commissariat is kept up in the field train for the purpose of these duties being satisfactorily performed.

FIELD-WORKS, military works thrown up by an army when besieging a fortress or town; also those works erected by the besieged for the purposes of defence. Trenches, rifle-pits, &c., like those constructed by our army in the Crimea, are instances of one class of field-works.

FIERDING COURTS, *feer'-ding*, were certain petty courts established among early Gothic nations for the purpose of rendering speedy justice in small matters. They were so called because there were four of them established in each superior district or hundred.

FIERI FACIAS, *fi-e'-ri fai-she'-as* (Lat., that you cause to be made; usually contracted *fi fa*), in Law, is a judicial writ of execution that lies where judgment is had for debt or damages recovered in the queen's courts. It is a command to the sheriff to levy the debt and damages on the goods and chattels of the defendants, and takes its name from the words of the writ, *quod fieri facias de bonis et catallis*. This writ is to be sued out within a year and a day after judgment, or the judgment must be revived by a *scire facias*. This writ lies as well against privileged persons, peers, &c., as other common persons; and against executors and administrators with regard to the goods of a deceased person. The sheriff may not break open any outer doors to execute this writ, but must enter peaceably, and may then break open any inner doors to take the goods. And he may sell the goods and chattels of the party against whom the writ is issued, including even his estate for years or his growing crops, until he has raised enough to satisfy the judgment. The sheriff, however, cannot lawfully sell off goods lying upon any premises demised to a tenant, unless the landlord be first paid his rent due before the execution, to the extent of one year's arrears, neither can be carry off, or sell for the purpose of being carried off, any straw, hay, manure, or the like, from any lands let to farm, in any case where, by the covenants or agreements in the lease, the carrying off of the same is prohibited between landlord and tenant. By 14 & 15 Vict. growing crops seized and sold in execution by the sheriff are, nevertheless, liable for rent becoming due after such seizure and sale, so long as they remain on the lands. By 1 & 2 Vict. c. 110, money, bank-notes, bills of exchange, and other securities, may be taken under a writ of *fi fa*. Under 8 & 9 Vict. c. 127, all personal goods and chattels can be taken, excepting wearing apparel to the value of £5. If the sheriff seize the goods of a stranger, he will be liable in damages. A *fi fa* may be issued in chancery suits for the purpose of obtaining satisfaction of any pecuniary demand, under a decree or order of the court. A *fieri facias de bonis ecclesiasticis* is a writ issued when the defendant is a beneficed clerk having a lay fee, and addressed to the bishop of the diocese, requiring him to attach the ecclesiastical goods and chattels of the defendant in satisfaction of the claim.

FIERY CROSS. (*See* CRANTARA.)

FI FA. (*See* FIERI FACIAS.)

FIFE, *fife* (Fr. *fifre*), a wind instrument of music resembling a small flute in its form and method of performance, seldom having any keys, and never more than one. Fifes are of three kinds, called respectively A, B, and C. They are made from ten to sixteen inches in length, with or without a joint. The B fifes are the longer and lowest in tone, while those tuned to the key of C are the shortest and highest, and are much oftener used: they have a compass of two octaves. When employed for military purposes, or open-air performance, the fife is a very pretty as well as useful instrument; but its tone is too harsh and acute to be pleasant in chamber music.

FIFTEENTH, *fif-teenth'* (SAX. *fiftyntha*), was the name of a tribute, or imposition of money, anciently laid upon cities, boroughs, &c., throughout the realm. It was so called because it amounted to a fifteenth part of that which each city or town was valued at, or a fifteenth part of every man's personal estate, according to a reasonable valuation. This sum was first reduced to a certainty in the reign of Edward III., and long after, when the value of money had much changed, the amount to be paid by each town or parish for its fifteenth remained as then fixed.

FIFTH, *fifth* (SAX. *fifta*), in Mus., a distance com-





prising four diatonic intervals, that is, three tones and a half. It is the second of the consonances in the order of their generation. As consecutive fifths do not produce a good effect, they are not allowable in harmony. There are three kinds of fifths; viz., the perfect fifth (C—G), consisting of three whole tones and a semitone; the flat, diminished, or imperfect fifth (B—F), consisting of two whole tones and two semitones; and the extreme sharp, or superfluous fifth (C—G sharp), composed of four whole tones.

FIFTH-MONARCHY MEN, *fifth*, the name of a sect of religious fanatics who appeared in England during the Protectorate of Oliver Cromwell, and whose distinguishing tenet was a belief in the speedy advent of a fifth monarchy (succeeding the four mentioned by Daniel,—the Assyrian, Persian, Grecian, and Roman), of which Christ was to be the head. In 1660, a few months after the Restoration, they broke out into a serious insurrection in London, under the leadership of one of the name of Venner, on which occasion many of them lost their lives, and others were afterwards executed. The sect soon afterwards became extinct.

FIG. (*See* FICUS.)

FIGARO, *fig'-a-ro*, is a dramatic character, brought by Beaumarchais on the stage at Paris about 1785, in his two dramas, the *Barbière de Seville* and *Mariage de Figaro*. Since that time Mozart, Paesiello, and Rossini have made the name celebrated in classic operas; and now the term is frequently used to denote an adroit and cunning accomplice.

FIGURE, *fig'-gur* (Fr. *figure*, Lat. *figura*), expressive of the form, shape, or distinguishing characteristics of anything as expressed by the outline or terminating extremities. In *Arith.*, the term is applied to certain characters, by which any number which can be expressed by a combination of the nine digits and the cipher is denoted: as, 1, 2, 3, 4, 5, 6, 7, 8, 9, 0. These figures are called Arabic, on account, as it is surmised, of their being introduced into Europe by the Arabians. In *Theol.*, the term *figure* is used to denote a type or symbol. In *Geom.*, it is used in two different senses. In the first instance, it denotes, generally, a space bounded on all sides, whether by lines or by planes; in the second sense, it signifies the representation (by drawing on paper or otherwise) of the object, or subject of a theorem or problem, in order to render the demonstration or solution to be more easily understood and followed: in this last sense, the word *figure* is analogous to *diagram*. All bodies are necessarily inclosed by one or more boundaries, and therefore possess figure; hence, *figurability*, or the quality of possessing figure, is termed one of the first essentials of matter. In painting, and art generally, figure is applied to the representation of living objects, as a statue or the form of man.

FIGURE, in Rhet., is defined to be, in general, "that language which is prompted either by the imagination or by the passions." Rhetoricians commonly divide them into two great classes,—figures of words and figures of thought; the words in the former case being employed in a sense different from their original and primitive meaning; in the latter the words are used in their proper and literal meaning, the figure consisting in the turn of thought; but the distinction is of no great use. One is apt to imagine, that as figures of speech always denote some departure from simplicity of expression, they are therefore artificial, are of late growth. This, however, is by no means the case; for the earliest and least cultivated languages are generally those that abound most in figures. From the very paucity of his language, and the want of proper expressions to convey his meaning, man, in his untutored state, is led to exercise his fancy, and express his ideas in image and metaphor. Hence, then, what is a necessity in the language of the savages is that which also gives beauty and grace to the polished languages of civilized life. Figures serve to enrich a language and render it more copious; and they also bestow a dignity upon style, by enabling us to avoid the frequent use of common expressions to which the ear has been accustomed. More particularly, figures give us the pleasure of enjoying two objects presented together to our view without confusion,—the one signified by the figurative sense, which may be termed the principal object, and the one signified by the pro-

per sense, which may be termed accessory; the principal making a part of the thought, the accessory being merely ornamental. Lastly, figures possess a signal power of aggrandising an object, giving frequently a much clearer and more striking view of the principal object than could have been the case if it had been expressed in simple terms and divested of its accessory idea.

FIGURE-HEAD, an ornamental figure or bust, emblematical of war, navigation, or commerce, &c., fixed on the top of the projecting portion of a ship's stem or sternwater.

FIGURE OF THE EARTH. (*See* EARTH, GEODESY.)

FILARIA, *fe-lai'-re-ă* (Lat. *filum*, a thread), a gen. of parasitic entozoa, common to large and small animals, and infesting even certain of the molluscs. Of this family the most inimical to the comfort of man is the Guinea-worm (*Filaria medinensis*), which, in hot climates, insinuates itself under the skin of the lower members, causing excruciating pain. It has a slender and thread-like body, and sometimes attains a length of six feet. It is met only in certain portions of the torrid and temperate zones in Africa and Asia, and is especially frequent on the African coast.

FILBERT. (*See* COBYLUS.)

FILE, *file* (SAX. *feol*), an implement used in many trades to produce a smooth surface on hard substances, as metals, ivory, or wood, &c. They are made of bars of steel rendered doubly hard by a process called *double conversion*, drawn the required size at the tilt-hammer, and then shaped, the square and flat ones by the hammer and common anvil only, but those of round, half-round, and three-angled forms, by means of bosses or dies made in the above shapes, which fit into a groove left for them in the anvil. The steel blanks having been thus formed, are next *annealed*, or softened, to render them capable of being cut, by placing a number of them together in a brick oven rendered air-tight by filling up all the interstices with sand (to prevent oxidation of the steel, to which it is very liable if the air be admitted), and then making a fire play as equally as possible all round until they are red hot, when the heat is discontinued and the steel allowed to cool gradually before it is uncovered. The surface to contain the teeth is now rendered as smooth as possible by grinding or filing; the teeth are then cut with a carefully ground chisel, each incision being made separately. The next and last process,—that of hardening, is performed in various ways by different makers; the ordinary method, however, is to cover the files with a kind of composition or protecting varnish, to prevent oxidation and scaling of the steel when heated; they are then heated uniformly throughout, and lastly are plunged in cold fresh water to cool them as quickly as possible. A great number of extremely ingenious machines have been invented at various times to facilitate the process of file-making, but they have all proved more or less defective; however, notwithstanding this, it is very probable that many of the commoner kinds are cut by machinery.

FILE (Lat. *filum*, a thread), in Mil., the term applied to two soldiers standing one before the other, or conjointly to any soldier in the front rank and the man who stands immediately behind him in the rear rank, when the company or regiment is drawn up in line. A body of soldiers is often spoken of as consisting of so many rank-and-file, which includes the corporals, lance-corporals, and privates, who stand in the ranks, the officers and sergeants having different posts assigned to them in front, on the flanks, or in the rear of the company, as occasion requires; thus, a company of 80 men, exclusive of officers and sergeants, would be spoken of as consisting of 80 rank-and-file, or 40 files.

FILE-MARCHING, in Mil., when a company is drawn up in line, and the order is given to face to the right or left and march in that direction. This method of marching is called file-marching. Each front rank man and his rear rank man on his right or left, according to the direction in which the company has faced, still composes a file. (*See* FILE.) File-marching is a difficult movement for recruits, unless the leading file marches steadily, and takes the proper length of pace, and each file behind takes care to "look up," or keep closely in the rear of the file immediately before it. Men may be taught the necessity of doing this when



marching in file, by frequently giving the order "About turn," and immediately halting the company, when the loss of distance between some of the files will become apparent. Men marching singly in a line, one after another, are said to be marching in single or Indian file.

FILIBUSTERS, *fil-le-bus'-terz*, is the name given to certain adventurers in America, and is derived from the French *flibustiers*, a corruption of the English freebooters or buccaneers. (*See* BUCCANEERS.) The filibusters have come into notice since the termination of the late war between the United States and Mexico, and exerted themselves with setting on foot, within the United States, military expeditions designed to operate in the Spanish-American countries to the south. The pretended object of these expeditions was the emancipation of those countries from tyranny, foreign or domestic, and the introduction of democratic institutions after the model of the United States; but their real object undoubtedly was their own aggrandizement, by re-enacting the part of the original Spanish conquerors. Though the setting on foot of such expeditions is contrary to the laws of the United States, yet, as they enjoyed a considerable degree of popular favour, no strenuous legal measures were adopted against them. The most noted expedition of this sort was that led by William Walker against Nicaragua in 1855, who succeeded in maintaining himself in that country for nearly two years; but was at length expelled by the union against him of the other Central American states. Walker was subsequently taken and shot at Truxillo, in Central America, in 1860, when engaged on another piratical expedition. Filibustering is also a cant term much used of late years in the legislative assemblies of the United States to designate the employment of parliamentary tactics to defeat a measure, by raising frivolous questions of order, calls to the house, motions to adjourn, &c., in order to weary out the opposite party and to gain time.

FILICES, *fil'-se-seez*, in Bot., the Fern fam., a nat. ord. of *Acotyledones*, sub-class *Acrogenæ*, consisting of herbs with rhizomatous stems, and of arborescent plants. The leaves, or *fronds*, as they are generally called, arise irregularly from the rhizome, or are placed in tufts upon the apex of the stem; they are almost always circinate in vernation, and are simple or compound. The fructification consists of little somewhat rounded cases inclosing *sporcs*. These cases are called *sporangia*, and are collected in heaps, usually on the under surface or at the margin of the fronds, or rarely on the upper surface, or occasionally in a spiked manner upon a simple or branched rachis. The order is commonly divided into three sub-orders; namely, *Polypodieæ*, *Ilanceæ*, and *Ophioglosseæ*. Ferns are found in greater or less abundance in every part of the globe. In the northern hemisphere, they are herbaceous plants, but in the southern hemisphere, and in the tropics, they are sometimes arborescent, having stems occasionally fifty feet or more in height, and with the general habit of palms. There are about 210 genera and upwards of 2,000 species. Ferns are much cultivated in greenhouses and closed glass cases (*see* WARDIAN CASE), and their graceful and tender green fronds now adorn thousands of English homes. The annexed illustration represents species of the two genera most commonly cultivated; *a* being the *Scolopendrium vulgare*, or hart's-tongue, and *b* a species of *Polypodium*, or polypody. Several ferns have farinaceous rhizomes or stems, which, in certain parts of the world, are roasted or boiled, and eaten in times of scarcity. The fronds of several species possess slightly bitter, astringent, and aromatic properties, and those of others are mucilaginous. The rhizomes of some are astringent and tonic, and occasionally



FERNS.

possess well-marked anthelmintic properties. The silky hairs found on the rhizomes and stalks of some species have been used for stuffing cushions and as mechanical styptics.

FILIGREE, or FILLAGREE, *fil'-e-gre, fil'-li-gre* (Lat. *filum*, a thread, and *granum*, a grain), a delicate species of ornamental work in gold or silver, wrought in little threads of the metal intertwisted in excentric forms and patterns. It is of eastern origin, and was first introduced into Europe by the Italians. In the East, India, Sumatra, and Java have been celebrated for the high excellence to which they have arrived in the prosecution of this art. When the gold or silver has arrived at a molten state, it is drawn into wire on an anvil, and then twisted. After twisting, it is hammered down again into a flat state, and formed into the shape of flowers and leaves. When the *filigree* is finished, it is cleansed by boiling in water with common salt and alum, or occasionally lime-juice. The Chinese often manufacture filigree jewelry, but which is not so elegant as that produced by the Malays. Filigree-work has an extensive sale on board the Peninsular and Oriental Steam-packet Company's vessels at Ceylon, where it is eagerly sought after by the European passengers.

FILLIBEG. (*See* KILT.)

FILLET, *fil'-let* (Lat. *filum*, a thread), in Arch., the name given to a narrow band, or flat ribbon-moulding, frequently used to divide mouldings of a curved form. It is a common feature in architectural designs, especially in entablatures. It is distinguished from the band by being of narrow width and always flat. (*See* BAND.)

FILLY, *fil'-le* (Ang.-Nor.), a name applied to a young mare before it has reached its third year. For further information *see* article HORSE.

FILTER, *fil'-ter* (Fr. *filtre*), an apparatus by which fluids are separated from any solid matter held in suspension. They may be divided into four classes: those used in straining chemical liquids; those used for purifying water for household uses; those employed on a large scale by water-companies; and those used on shipboard for changing salt water into fresh. Chemical filters are either used for rendering fluids transparent, or for the purpose of separating and washing precipitates. They are usually made of unsized or blotting paper. (*See* FILTRATION.) Household filters for purifying water, either for drinking or culinary purposes, are made in various forms. In Paris, a large quantity of the river water is purified by passing it through boxes, at the bottom of which is a layer of charcoal between two layers of sand. Filtered river water, although not so agreeable to drink as spring water, is still well suited for other purposes. When water is filtered on a large scale by water-companies, the process is usually accomplished by means of filtering-beds. (*See* WATERWORKS.) The conversion of salt water into fresh is very important, and depends mainly upon distillation. There are many forms of apparatus for this purpose, and they are of great service on board ship, where the absence of fresh water often causes great misery. Dr. Normandy's method of converting salt water into fresh is largely adopted by the Admiralty and the large steamboat companies.

FILTRATION, *fil-tra'-shun*, in Chem., the separation of a liquid from any solid matter contained in it. It is generally effected by means of a filter formed of the corner of a round or square piece of filtering-paper, folded into four and placed on a funnel. When the liquid to be filtered is corrosive, sand, powdered glass, or wisps of asbestos, are generally used. A piece of cotton wool, loosely plugged into the neck of a funnel, forms a very good extempore filter for ordinary purposes, and may be applied to culinary as well as to chemical operations.

FIN, *fin* (Sax. *finn*), in Ichth., a flat expanded organ, projecting from the bodies of fishes, and used as an instrument of locomotion in the water. The fins of fishes are supported by elongated filamentary bones or rays, by the number and nature of which the naturalist is able to distinguish the various groups. Many species of the whale tribe possess an immovable fin upon the back, composed merely of a reflexion of integument over a mass of dense and ligamentous cellular membrane. The tail fin has the same structure, but is moved by the action of muscles upon the caudal vertebræ, which are continued through the middle part. In works in ichthyology, a system of notation, founded upon the number of fin-rays, is employed. Thus the number of fin-rays in the perch is expressed in the following manner:—D. 15, 1+13; P. 14; V. 1+5; A. 2+8; C. 17. This denotes that D., the dorsal fin, has in the first fin 15 rays, all spinous or bony; in the second fin, 1 spinous and 13 soft; P., the pectoral fin, has 14, all soft; V., the ventral fin, has 1 spinous and 5 soft; A., the anal fin, has 2 spinous and 8 soft; and C., the caudal fin, 17 rays.

FINALE, *fin-a'-le* (Lat. *finalis*), the last portion of any act of an opera, or part of a concert. Finales are of different kinds. In instrumental music, they are commonly of a lively character and performance, combined with a quick movement; while in operas, they generally consist of a series of compositions for many voices, and are various in character, time, and movement.

FINANCE, *fe-nāns'* (Fr.), in Polit. Econ., is employed to denote the revenues of a king or state. (*See* TAXATION, REVENUE, CUSTOMS, EXCISE, &c.)

FINCHES, *fin'-tshes* (Sax. *finc*), a fam. of birds belonging to the ord. *Passeres*, and the div. *Conirostres*, and known by the general name of *finches*. According to Mr. Vigors, this fam[illegible]ubraces, in addition the *Alaudinæ*, or larks, to wh[illegible] the buntings, or *Emberizinæ*, seem nearly allied, [illegible] greater part of the Linnean *Fringillidæ*, with the Linnean *Tanagrinæ* (tanagers), which approach these in their external characters and in their habits. As far as has hitherto been ascertained, none of the finches are of large size, and in their habits and general appearance there is a strong likeness. For the most part they are hardy birds. Their food chiefly consists of grain, worms, and insects. The characteristics of this family of birds are,—beak straight, longer than deep, conic and pointed; mandibles nearly equal, cutting edges entire, forming a straight commissure; nostrils basal, lateral, oval, partly hidden by the frontal plumes; wings with the first quill-feather longer than the fifth, but a little shorter than the second or third, which are equal, and the longest in the wing; legs with the tarsi of moderate length; toes divided, and adapted for hopping and perching; claws curved and sharp.

FINDER OF GOODS, *find'-er* (Sax. *findan*, to find).—The law on this subject is, that the finder of goods is to use all due means to discover the rightful owner; and if he keep and appropriate the articles to his own use, knowing the rightful owner, or without having made due exertion to find him out, he is held guilty of larceny. Failing the rightful owner, the goods become the property of him who finds them.

FINE, *fine*, in Law, is a pecuniary mulct or punishment imposed by a competent jurisdiction, and was so called because it was said *finem facere de transgressione*,—to make an end of the transgression. The statute law has seldom determined the amount of fines to be inflicted for particular offences, and the common law never. They vary according to the aggravation or otherwise of the offence, the quality and condition of the parties, and numerous other circumstances. This power, however, which is in the hands of the court, is far from being wholly arbitrary; for the Bill of Rights has particularly declared that excessive fines ought not to be imposed, nor cruel and unusual punishments inflicted; and the Magna Charta determines that no man shall have a larger amercement imposed upon him than his circumstances or personal estate will bear: saving to the landholder his contentment, or land; to the trader his merchandise; and to the countryman his wainage, or team and implements of husbandry. Hence it is never usual to inflict a larger fine than a man is able to pay without touching the implements of his livelihood; but instead thereof to inflict corporal punishment or a limited imprisonment.

FINE ARTS.—This term may be viewed as embracing all works which are executed by the mind and ingenuity of man. The phrase has of late, however, been restricted to a narrower and more technical signification, and it is chiefly applied to painting, sculpture, engineering, and architecture, all of which appeal to the eye, as the medium and interpreter of the pleasure derived. The great works of art now extant may

really be looked upon as models in their various lights of perfection, and they are chiefly composed of the relics of the ancient masters and classic art, consisting chiefly, as they do, of sculpture, the pictures of the old Italian school, the German, Dutch, and Flemish masters, and, it may be added, the works of Hogarth and Reynolds; all of which may be looked upon as different types of high art excellence. The schools of art which, in the present day, elevate the taste of the public, cannot be said to number more than three,—the English, the French, and the German; and the latter, perhaps, for pre-eminence in correct and classic drawing, ought to bear away the palm. The school of Germany is not older than the present century, and yet, in purity and elevation of style, it holds a rank far superior to that of France. This, perhaps, is owing to the fact of its being strictly guided by the old Italian rules of art in light and shade. This pre-eminence of Germany is not generally admitted, of course, by either the English or French schools, but there is no doubt as to the fact, and some of the best pictures of the French artist Ary Scheffer may be said to owe their excellence to the German schooling which that artist underwent. With regard to *fine arts* generally, England bears away the palm, as her excellence in painting (apart from classic rules), engraving, and architecture, can hardly be rivalled by other nations, although in the latter branch she may be, perhaps, a little weak. To sum up these remarks. The purity of design of the German school, and the variety and dexterity displayed in that of France, are qualities which the artists of this country would never like to deny; while, on the other hand, the Germans and French give praise to, and condescend to copy, the brilliant colouring and truth to nature which is always displayed by the English artists. To conclude in the elegant language of Brande's *Dictionary*, "the fine arts are the offspring of genius,—their model nature, and their master taste. Characterized by simplicity, they should never wander into luxury, nor degenerate into extravagance." (*See* Exhibitions, Art.)

Fine of Lands, in Law, is a name given to certain judicial proceedings which were formerly in common use in the conveyance of lands and hereditaments, but which have been abolished by 3 & 4 Will. IV. c. 74. Questions, however, regarding them will still occur, and the subject is thus one of present interest. It is defined to be "an amicable composition or agreement of a suit, either actual or fictitious, by leave of the king or his justices, whereby the lands in question became or were acknowledged to be the right of one of the parties." The party to whom the land was to be conveyed or assured commenced an action or suit at law against the other, by suing out a writ of *præcipe*, called a writ of covenant, founded upon the breach of a supposed agreement or covenant that the one should convey the lands to the other. On this writ there was due to the king, by ancient prerogative, a primer fine, amounting to about one-tenth of the annual value of the land. The suit being thus commenced, there followed the *licentia concordandi*, or leave to compromise the suit, for which there was another fine due to the king, called the king's silver, or sometimes the post fine, equal to about three-twentieths of the annual value of the land. Then came the concord, or agreement itself, after leave obtained from the court, which was usually an acknowledgment from the deforciants (or those who kept the other out of possession) that the lands in question were the right of the complainant. From this acknowledgment, or recognition of right, the party levying the fine was called the *cognizor*, and he to whom it was levied the *cognizee*. The acknowledgment had to be made either openly in the court of Common Pleas, or before the lord chief justice of that court, or two or more commissioners in the country, empowered by a special authority, all of whom were bound, by stat. 18 Edward I. st. 4, to take care that the cognizors were of full age, sound memory, and out of prison. If there was a married woman among the cognizors, she was privately examined whether she acted freely and willingly, or by compulsion of her husband. By these acts all the essential parts of a fine were concluded. The note of the fine was an abstract of the writ of covenant and the concord, naming the parties, the parcels of land, and the agreement, and which had to be enrolled in the proper office. The foot of the fine, or conclusion of it, included the whole matter, reciting the parties, day, year, and place, and before whom it was acknowledged or levied. In order that the fine might have full effect, it required to be openly read and proclaimed in court. This mode of conveyance was so effective that it bound not only those who were parties to the fine, but all other persons whatsoever, unless they brought their action or made lawful entry within five years after proclamation made, except in the case of married women, infants, prisoners, persons beyond the seas, and such as were not of whole mind, to whom, or their heirs, five years were allowed after they recovered their legal powers.

Finger-board, *fin'-ger-bord* (Ang.-Sax.).—The whole of the keys, both black and white, of a pianoforte or organ, are so called. That thin black board which extends over the necks of instruments of the violin kind, on which, during performance, the strings are pressed by the fingers of the left hand, is also denominated by this term.

Fingering, *fin'-ger-ing* (Ang.-Sax.), the art of so disposing the fingers on any musical instrument, more especially on the pianoforte and organ, as to produce the required notes in an easy and graceful manner. A good method of fingering is of the utmost importance to the student, as without it the easiest passages will often appear difficult, and the difficult ones almost impracticable.

Finial, *fin'-e-ăl* (Lat. *finis*, end, termination), in Goth. Arch., the term by which the carved ornament which surmounts the top of pinnacles, canopies, mouldings, &c., is designated. It is generally in the form of foliage clustering round a knob or boss. The ornament called a poppy-head, frequently used to finish the upright sides of open pews in churches, is a finial.

Finings, *fi'-nings* (Fr. *raffiner*, to purify), a term applied to those substances which are used for clarifying or clearing, in brewing and other manufacturing operations. Some of these are made by the persons using them, and others are purchased by them from the manufacturers. Isinglass is made into finings by mixing it with beer or cider, which is then stirred till the isinglass dissolves, when the mixture is strained through a sieve; it is then mixed with some of the same beverage as that which is to be fined, until it is brought to a liquid state. Finings of this kind are much used by brewers. A mixture of alum with carbonate of soda, or salts of tartar, dissolved in hot water, forms a fining much used by distillers and rectifiers.

Finite, *fi'-nite* (Lat. *finis*, end), signifies having a limit, bounded. It is the opposite of *infinite*.

Finnish Language and Literature, *fin'-nish*.—The language of Finland forms one of the chief branches of the Uralo-Altaic family, being, with the Esthonic and Lappish collaterals, kindred to the languages of the Ugrians, or Eastern Turks, Osmanli Turks, Samoyeds, and other Tartars, Magyars, Mongols, and Tunguses, whose chief branch are the Mantchoos. All these constitute the so-called Scythic, or Turanian, or Allophylic family. The Finnish comprises a number of dialects, of which the principal are the lower, which is used along the coasts, its Abo variety being that which is used in books; and the upper, which is spoken in the inland regions, divided into the sub-dialects of Ulea and Viborg. It is written by Latin or German characters, but the letters *b*, *c*, *d*, *f*, *g*, occur only in a few foreign words, and *q* is now obsolete. It is, however, rich in vowel-sounds, having no fewer than eight, *ä* and *ö* standing at the end of the alphabet. It has also many diphthongs, and, according to Rask, is one of the most harmonious of tongues. The nouns have fourteen cases, which are expressed by suffixes or postpositions to the nominative, and plurality is denoted for the nominative by suffixing *t*, and for the other cases by inserting *i* before their endings. There are only two declensions, the one for nouns ending in a vowel, the other for those ending in a consonant. The declension of adjectives is essentially the same as that of substantives, while the comparative ends in *mbi* and the superlative in *in*. There are no distinct genders, the sexes being indicated either by distinct words or by epithets. The verbs have only two simple

tenses,—the present and the past, the others being periphrastic. Their conjugation is complicated, their voices, moods, and other nice shades of meaning, being expressed by certain syllables inserted between the root and the personal suffixes. There are no separate particles, and all their prepositions are placed at the end of the words to which they are related. From the number of syllables thus brought together, some of the words are of great length (from eight to ten, and sometimes even as many as eighteen syllables); but in this way the most complicated ideas may often be expressed in one word, which would require several in most other languages. The construction is extremely free, without endangering the clearness of the sense. There can be little doubt, from the character and construction of the language, that this is not only one of the most ancient but one of the purest of the whole Asiatic-European family, being less mixed with foreign elements than the Hungarian, Turkish, or Mongolian. The literature of Finland is particularly rich in popular songs or *runes*, which are sung by the runolainen, or song-men, to the sound of the favourite national instrument, the *kantele*, a species of harp with five wire strings. They may be divided into mythical and lyrical songs. These songs were handed down by oral tradition from generation to generation for many centuries, until at length, about the close of the 18th century, Professor Porthan, the Bishop Percy of Finland, made a collection of them, which was published at Abo. With the death of Porthan the subject went to sleep, until Dr. Topelius entered upon the same field, and published five volumes of ancient and modern popular songs, the last of which appeared in 1831, at Helsingfors. Topelius prepared the way for Dr. Elias Lönnrot, the most enthusiastic and successful of all the collectors of old Finnish poetry. He was fortunate enough, in 1832 and the following year, to discover among the peasants of Karelen, and still farther on in Russia, a series of valuable poems, preserved by tradition, and comprising a mythical epic on the subject of the Finlandic Orpheus, the God of Song, Wæmæmöinen, his journeyings and adventures. He endeavoured, as far as possible, to present this cycle of songs in a connected epic form, and published them under the name of "Kalevala" (from Källeva, the great ancestor of all Finnish heroes), at Helsingfors, in 1835. Alexander von Humboldt, in his *Cosmos*, in speaking of this work, says: "Among the Finnish tribes who have settled far to the west in the lowlands of Europe, Elias Lönnrot has collected from the lips of the Karelians, and the country people of Olonetz, a large number of Finnish songs, in which 'there breathes,' according to an expression of Jacob Grimm, 'an animated love of nature, rarely to be met with in any poetry but that of India.' An ancient epos, containing nearly three thousand verses, treats of a fight between the Fins and Laps, and the fate of a demigod named Vaino. It gives an interesting account of Finnish country life, especially in that portion of the work where Ilmarine, the wife of the smith, sends her flocks into the woods, and offers up prayers for their safety. Few races exhibit greater or more remarkable differences in mental cultivation, and in the direction of their feelings, according as they have been determined by the degeneration of servitude, warlike ferocity, or a continual striving for political freedom, than the Fins, who have been so variously subdivided, although retaining kindred languages." In 1834, the Findlandic Society of Literature was established at Helsingfors, and has done much to spread a knowledge of, and develop a taste for, this language. In 1841, it sent out Dr. Lönnrot to travel throughout the country, in order to collect ancient songs, and he was again very successful. The result of his labours he published the same year, under the name of *Kantelotar*, or Songs for the Harp, in three volumes, containing no fewer than 652 ancient popular songs. In 1842, he published a collection of about 7,000 proverbs, and, subsequently, a collection of about 2,000 charades. In 1854, Rudbäk published a collection of Finnish legends and tales. These publications have given a great stimulus to the study of the Finnish language; and while the upper classes still cling to those of the Swedish, the peasantry welcome with avidity every addition to the limited stock of their printed literature. Newspapers and periodicals in their native tongue now circulate among them, and are eagerly read. The number of newspapers and periodicals published in Finland in 1858 was eighteen, of which eight were in Finnish and ten in Swedish. An interesting and valuable work is published annually, under the title of "Our Country's Album;" and, though written in Swedish, contains translations of popular songs, legends, sagas, &c., together with literary, philologic, and æsthetic papers, all bearing upon the language, poetry, and history of Finland. The prose literature of the people is devoted almost exclusively to religious and moral subjects. A Finnish translation of the New Testament appeared in 1548, and a portion of the Old Testament in 1552; but the whole Bible was not translated into Finnish till 1642. The greatest living poet of Finland, and, indeed, the greatest among all that that country, in modern times, has produced, is Runeberg, who, though he writes in the Swedish language, is truly national and patriotic in spirit, and the genius of his country is the only muse that he acknowledges. The best grammar of the language is that of Jacob Juden, in Swedish (Viborg, 1818), and the best dictionary that of Lönnrot, Helsingfors, 1853.



FJORD, or FJORD (*fe d*), the Norwegian and Danish name applied to a bay, creek, or arm of the sea which extends inland. It is somewhat analogous to the Celtic *lough* or *loch*.

FIRE, *fire* (Sax. *fyr*), heat and light emanating visibly, perceptibly, and simultaneously, from any body. The terrific energy of fire, the most important agent of civilization, the similarity of its effects with that of the sun, its intimate connection with light, its terrible and yet genial power, and the beauty of its changeful flame, easily account for the reverence in which it was held in ancient times. At a period when cause and effect, form and essence, were not distinctly separated, fire became an object of religious veneration, a distinguished element in mythology, an expressive symbol in poetry, and an important agent in the systems of cosmogony. It gained a place among the elements, and for a long time was believed to be a constituent part in the composition of all bodies, and to require only the concurrence of favourable circumstances to develop its activity. At a later period, fire, under the name of *phlogiston*, was considered to be the source of all chemical action. At the present day, the phenomena which were formerly ascribed to fire are attributed to the effects of heat. (*See* COMBUSTION, HEAT.)

FIRE AND SWORD, LETTERS OF, in the early law of Scotland, were letters granted by the Scotch privy council against any one who refused to obey the decrees of a court, and were principally employed to dislodge refractory tenants who refused to give up possession as required by order of the judge. These letters authorised the sheriff to call for the assistance of the county, and dispossess him by all methods of force. The practice now is, where one opposes by violence the execution of a decree or any lawful diligence, which the civil magistrate is not able by himself or his officers to make good, to make application to the military for assistance, who enforce the execution *manu militari*.

FIRE-ANNIHILATOR. (*See* ANNIHILATOR, FIRE.)

FIRE-ARMS. (*See* ARMS, ARTILLERY, &c.)

FIRE-BALLS. (*See* METEORS.)

FIRE-BRIGADE, an institution of men and fire-engines, fire-escapes, and so forth, under the command of a superintendent, and supported principally by the fire insurance offices in London and elsewhere, for the purpose of being in a constant state of readiness to preserve property and life from destruction by fire. Until the year 1825, all the fire insurance companies of London had distinct and separate establishments of fire-engines, &c.; but in that year the Union, the Sun, the Royal Exchange, the Atlas, and the Phœnix companies joined their establishments of fire-engines together, and formed one association or *fire-brigade*. This association lasted until the year 1833, when it was found that it was not sufficient to conquer the devastating element which was constantly making raids on London. It was therefore determined, in 1833, to incorporate all the detached forces of engines belonging to the remaining fire-offices which had not joined the association; and this complete band of engines and

men was placed under the command of a superintendent, each company paying so much towards the support of the whole. Mr. Braidwood, at that time the director of the fire-engines of Edinburgh, was invited to take the command of this new force, and he accepted the appointment. At the present time, therefore, the strength of the protectives from fire consists of about 300 parish or parochial engines, kept up by the various parishes under acts which passed in the years 1768-74. Secondly, there are a large number of private engines kept by merchants, firms, and large manufactories; and, thirdly, we have the comparatively small, but well-organized force of the London Fire-brigade. The force of this latter consists of between 30 and 40 large engines capable of throwing 88 gallons a minute to a height of from 50 to 70 feet, and a number of smaller engines (nine or ten) which are drawn by hand, and are comparatively useless in any large fire. To work these engines, the Fire-brigade musters in its ranks 12 engineers, 7 sub-engineers, 32 senior firemen, 39 junior firemen, and 14 drivers; altogether numbering over 104 men. This force is distributed in the following manner:—On the north side of the river; 1st, from the eastward to Paul's Chain, St. Paul's Churchyard, Aldersgate Street, and Goswell-Street Road; 2ndly, from St. Paul's, &c. to Tottenham-Court Road, Crown Street, and St. Martin's Lane; 3rdly, from Tottenham-Court Road, &c., westward; 4thly, the entire south side of the river. At the head of each district is a foreman, who never leaves it, unless acting under the orders of Captain Shaw, the superintendent, whose headquarters are in Watling Street. The following are the different stations in the various districts above mentioned, with the number of engines attached to each:—

| | |
|---|---|
| Watling Street (the principal station) | 4 |
| Wellclose Square | 3 |
| Farringdon Street | 4 |
| Chandos Street, Covent Garden | 3 |
| Schoolhouse, Ratcliff | 1 |
| Horseferry Road, Westminster | 1 |
| Waterloo Road | 1 |
| Paradise Road, Rotherhithe | 1 |
| Jeffrey Square, St. Mary Axe | 2 |
| Whitecross Street | 1 |
| High Holborn, No. 254 | 2 |
| Crown Street, Soho | 2 |
| Wells Street, Oxford Street | 1 |
| Baker Street, Portman Square | 1 |
| King Street, Golden Square | 3 |
| South ark-Bridge Road | 3 |
| Morgan's Lane, Tooley Street | 1 |
| Floating Engine off King's Stairs, Rotherhithe | 1 |
| Floating Engine off Southwark Bridge | 1 |
| Total number of engines... | 36 |

Besides these fire-engines, all the offices are supplied with fire-escapes, ladders, and all sorts of spare gear. On the alarm of fire, by a judicious code of rules, which the late Mr. Braidwood framed, each man knows the part he has to perform, and in about five minutes the generality of engines can be got ready and are tearing off to the scene of action. The complement of men to each engine is one engineer, four firemen, and a driver; but these are generally increased in number. The whole weight of the engine, with men and material, is from 27 to 30 cwt. (*See* FIRE-ENGINE.) That good effects have followed the establishment of the London Fire-brigade can well be believed. An article in the *Quarterly Review* on this subject states that, taking twenty-one years from the first institution of the Brigade in 1833, we find that the decrease in the twenty-first year (1865) of houses totally destroyed was at least 567, which affords a tolerably satisfactory result as to the efficacy of Mr. Braidwood's institution. The duty of the Fire-brigade is to save *property* and not *life*, although, of course, they exert themselves in the latter particular as well as in the former. The duty of saving life from fire is intrusted to the Royal Society for the Protection of Life from Fire, which was established, like the London Fire-brigade, also in the year 1833. This society sees to the proper appointment of fire-escapes, ladders, &c., being placed in the various districts and parishes, and it keeps up a sufficient body of men for their attendance. In consequences of the great fire in Tooley Street, in the year 1861, the insufficiency of fire-engines in the metropolis attracted the attention of the House of Commons. A committee was formed on the subject, and various resolutions passed, which, no doubt, will tend to the better organization of the Fire-brigade.



FIRE-CLAY, in Min., a variety of clay capable of bearing a great heat without melting or vitrifying. This arises from the absence of any alkaline earth to act as a flux. Stourbridge clay is one of the most famous, and is used largely in the manufacture of glass pots. It consists sixty-four per cent. of silica, twenty-four of alumina, the rest being oxide of iron, water, and traces of carbonaceous matter.

FIRE-DAMP, a miner's term for the light carburetted hydrogen of the coal-mines, from its inflammability, in contradistinction to *choke-damp*, which chokes or extinguishes flame.

FIRE-ENGINE, a machine contrived for the purpose of extinguishing fires by throwing water upon them from a jet. Previous to the invention of the modern fire-engine, there were various modes of extinguishing fires. Juvenal and Pliny both mention methods, and Pliny the younger speaks of pipes (*siphones*) being used to put out fires. Augustus appointed seven bands of firemen at Rome, each of which had the care of two divisions of the city; each band had a captain, and at the head of the whole body was the prefect of the watch. The earliest account, however, of any machine resembling the modern fire-engine is given by a Jesuit, named Caspar Schott, in 1657. It was a sort of force-pump, and was worked by 28 men; it threw a stream of water, an inch in diameter, to the height of 80 feet. After that time, the use of fire-engines became more general; but two important parts of the machine were not introduced till a later period; viz., the flexible hose and the air-chamber. The use of flexible tubes is obvious, and the air-chamber, which depends for its value on the increased elasticity of the air when compressed into less than its usual bulk, gives a steady and uninterrupted stream of water. The use of leathern pipes was first devised by two natives of Holland, both of whom were named Jan Vanderheide, in 1672. Many improvements were made in England after that time upon the fire-engines then in use. Amongst the names of those who have introduced the greatest improvements may be named Dickenson, Simpkin, Phillips, Furst, Newsham, Rowntree, Merryweather, Baddeley, Shand, Mason, and others. After the invention of the air-chamber, however, all new improvements were merely in details. The machine generally consists of a double forcing-pump, communicating with the same air-vessel; and instead of a force-pipe, a flexible leathern hose is used, through which the water is driven by the pressure of the condensed air in the air-vessel. Merryweather's small, or portable engines, are intended expressly for the protection of public establishments and large mansions. The Americans have invented a mode of weaving cotton tubes for engine-hose, and a machine has been made which will do this at the rate of 1,000 feet per day. These tubes are only one tenth of the cost of leathern hose. Mr. Braidwood, who unfortunately lost his life at the great fire in Tooley Street, in 1861, read a paper before the Society of Arts in 1856, in which he said:—"The description of fire-engines found to answer best in the metropolis are those with 7-inch barrels and 8-inch stroke, throwing, at the ordinary rate of working, about 90 gallons of water per minute. If a larger engine is thought desirable, two of these can be easily joined together in one stream, giving 180 gallons per minute. This size is preferred, because the weight, with hose, implements, firemen, and driver, is about 30 cwt., which is as much as two fast horses can manage, for a distance under six miles. It is not often that the engines are required to travel farther than this; when they are, four horses are used. For some years past a hand-pump has been carried with each engine; they having been found of the greatest service in keeping doors, windows, &c., cool. They throw from six to eight gallons per minute, to a height of 30 or 40 feet, and can be used in any position. The idea of these hand-pumps was taken from the old-fashioned squirt or hand-engine." On the continent, and in America, fire-engines are not managed, as in England, by fire insurance companies, but the whole matter is taken up by the government.

there are seven times as many firemen in Paris as there are in London, notwithstanding the smaller area and population of the former town. In North America, fire companies of volunteers are formed in many of the towns; the members are not paid, but are exempt from the militia service and certain taxes. The most powerful fire-engines now in use are worked by steam, and are very efficacious when a fire occurs.

FIRE-ESCAPE, a machine or apparatus for assisting persons to escape from the higher parts of a building when on fire. The contrivances for this purpose are very numerous and varied in their structure. The fire-escape, however, which has come most into use in London is a wheel carriage supporting a lofty canvas shoot or trunk, attached to a ladder or frame. When placed against the side of a house, a person can get from a window into the trunk, and, by means of some ingenious mechanism applied to the frame, slide in safety down to the bottom. Many machines of this kind are kept in public places in London during the night, attended by men, whose business it is to move the fire-escapes to any conflagration where lives are in danger. Among all the modern suggestions with regard to fire-escapes none are regarded as of equal value with the long ladder and canvas bag used by the Society for the Protection of Life from Fire. The following description of the fire-escape employed by the society has been published by them:—"The main ladder reaches from 30 to 35 feet, and can instantly be applied to most second-floor windows by means of the carriage lever. The upper ladder folds over the main ladder, and is raised easily into position by a rope attached to its lever-irons on either side of the main ladder; or, as recently adopted in one or two of the escapes, by an arrangement of pulleys in lieu of the lever-irons. The short ladder for first floors fits in under the carriage, and is of the greatest service. Under the whole length of the main ladder is a canvas trough or bagging, made of stout sailcloth, protected by an outer trough of copper wire net, leaving sufficient room between for the yielding of the canvas in a person's descent. The addition of the copper wire is a great improvement, as, although not affording an entire protection against the canvas failing, it in most cases avails, and prevents the possibility of any one falling through. The soaking of the canvas in alum and other solutions is also attended to; but this, while preventing its flaming, cannot remove the risk of accident from the fire charring the canvas. The available height of these escapes is about 55 feet, but some of them carry a short supplementary ladder, which can be readily fixed at the top, and which increases the length to 50 feet."

FIREFLY, a name vulgarly applied to those insects which have the power of emitting a luminous appearance from their bodies. (*See* GLOWWORM, &c.)

FIRE, GREEK. (*See* GREEK FIRE.)

FIRE, ORDEAL BY. (*See* ORDEAL.)

FIREPLACE, in Build., the name given to the square opening that is left in the wall of a house for the reception of a stove or grate. It is formed in a shallow pier or abutment of masonry, which generally projects from the face of the wall into the apartment, having recesses on either side of it. The upright sides of the opening are called the jambs, and the head, which is usually in the form of a cambered arch, is termed the mantel. A broad flat stone is fixed immediately under the jambs, which, with another stone of a similar kind, that is set directly in front of it, and on which the fender rests, is called the hearth; sometimes, however, the stone under the jambs is called the slab, while the term hearth is applied to that which lies immediately in front of them. The wide square cavity inside the wall, and just above the fireplace, is gradually contracted in size until it becomes a small passage, which is termed the chimney, or flue. (*See* FLUE.) This contraction is generally called the gathering. The width of the fireplace depends on the size of the grate that it is intended to receive, varying, in ordinary apartments, from 18 inches to 3 feet 6 inches. Its height is never less than three feet. It is surrounded by the chimney-piece, consisting of pieces of [illegible] or marble, fitted together in the form of a frame. The vertical pieces on either side are termed the jambs, and the horizontal piece, which the jambs support, is called the lintel. The lintel is surmounted by a broad shelf in the same material, called the mantel-piece. The chimney-piece, whether in wood or marble, is frequently carved, and may be made a very handsome and effective architectural feature in an apartment. When chimneys were first introduced, the fire was kindled on the hearth, the fuel being supported on andirons, or fire-dogs, made of metal, and often elaborately ornamented. (*See* ANDIRON.) The opening above the hearth was long without any chimney-piece or ornamental dressing round it; while a projection, somewhat resembling a penthouse, or porch over a door, was brought forward from the wall of the apartment, directly over the fireplace, to act as a funnel, and to prevent the escape of the smoke into the apartment, to the discomfort of the inmates. But when greater attention was paid to domestic architecture, the chimney-piece was introduced as an embellishment; and in mansions built in the Elizabethan style, it consisted of a mass of carving and panels, which was generally carried up as far as the ceiling. The mantel-piece was introduced at a subsequent period, when the practice of adorning the wall above the fireplace with carving was discontinued. It was at first fixed at the height of five or six feet above the floor of the apartment, and was extremely narrow; in the present day it assumes the form of a broad thick slab, and projects considerably beyond the chimney-piece, being about 3 feet 9 inches, or four feet, above the surface of the hearth.—*Ref.* Nicholson's *Architectural Dictionary*.

FIRE POLICY. (*See* INSURANCE.)

FIRE-PROOF. (*See* FIRE-PROOFING.)



FIRE-PROOF BUILDINGS.—To make a building entirely proof against the destructive action of fire is manifestly impracticable; but the danger arising from fire may be obviated to a considerable extent by selecting materials for building that are either incombustible or suffer less than others from the action of heat, and by paying proper attention to the construction of the building and the arrangement of the materials of which it is composed; that no wood-work, if timber be used in it, may be placed near enough to gas-pipes, or pipes communicating with heating apparatus, to be liable to ignition from explosion, or any other cause. All materials may be broadly classified as combustible and incombustible; including, under the former term, all kinds of wood, which fire will entirely consume; and under the latter, building-stone, brick, cement, and metal, which cannot be completely destroyed by fire, although the action of heat may exert considerable influence upon them. Of the different kinds of wood in common use, oak, teak, and mahogany, or any sort of hard wood, will not burn as rapidly and freely as deal. Of stones, some are more liable to injury from heat than others; limestone, and even granite, will crack and fly to pieces if cold water be suddenly poured on them when in a heated state; but sandstone seems capable of offering more effectual resistance to the action of fire than limestone, and therefore better suited for fire-proof buildings. When iron is used for joists or girders, it must be remembered that it is liable to contraction and expansion under the influence of heat and cold, and that cast-iron beams will break if suddenly cooled by a jet of cold water when red-hot, and that wrought-iron girders, in the same condition, are apt to give way under any excessive superincumbent weight. In constructing a fire-proof building, that is to say, a building in which an outbreak of fire will be attended with less destructive consequences to the building itself and the goods contained in it, than in one erected in the ordinary way, it is manifest that the use of combustible materials must be abandoned as much as possible, except for interior fittings, and to form linings or wainscoting for chambers used as apartments, to prevent the inconvenience likely to arise if the walls should be exposed to any great heat, because stones and metals are good conductors of heat, and wood is a non-conductor. No building can remain uninjured from the action of a great mass of fire in the interior, however well adapted it may be to resist fire externally. It is always found that large warehouses, in which great quantities of goods are stored, often suffer considerably, or are almost entirely destroyed, by the effect of fire in the interior. This might be

counteracted, to a certain extent, by storing inflammable goods and materials liable to spontaneous combustion in small separate buildings, or in isolated compartments; care being taken, in their construction, to prevent the communication of fire, breaking out in one part, to any other part of the building; for a large mass of fire in a building of great extent will do far more damage, in proportion to the building itself, than the heat arising from the burning of a small quantity of goods stored in a building of moderate size, for reasons that are evident. To render an ordinary building, for commercial purposes, tolerably fire-proof, a stone staircase should be constructed, instead of one of wood, as the wooden staircase is too often the means of communicating the fire from floor to floor: the walls, also, should be of brick or stone of good quality; the joists, rafters, and roof of iron; and the floors composed of stone, slate, tiles, or bricks. In building rows of houses, at least nine inches of brick or stone should intervene between the ends of the joists let into the party wall on either side, and openings for fireplaces should always be arched with brick, as wooden bressummers in this position, and the ends of beams projecting into chimneys, have frequently proved the means of causing the destruction of many an old-fashioned country mansion by fire.

FIRE-PROOFING, the means of protecting plate, money, papers, and documents of value, from the action of fire, by the use of safes or fire-proof chambers, and also of rendering woodwork and textile fabrics capable of resisting its ravages. Iron boxes for the reception and safe-keeping of coin and papers have long been used; but when these were exposed to great heat, there was nothing to prevent the contents from becoming injured or consumed, if they consisted of books or parchment deeds. In 1834, a patent was taken out by a manufacturer of the name of Marr, for making safes capable of preserving anything placed within them from being damaged when the safe was surrounded by a fierce fire; and of late years the construction of these iron repositories has been brought to great perfection by Chubb, Milner, Hobbs, and other makers. The general principle of making a fire-proof safe appears to consist in placing an inner case of iron inside an exterior framing of the same material, the intermediate space being filled with a composition that tends to prevent the heat from acting on the interior. The fire-resisting composition that is used consists of a variety of materials; such as powdered charcoal, sand, bone-dust, gypsum, &c., used singly or in various combinations; and glass vessels containing some peculiar fluid are sometimes added to the composition. The heat of a fire causes these glass vessels to crack; and the liquid contained in them is liberated and dispersed throughout the absorbent matter inserted between the inner and outer cases, and increases its capability of resisting fire. The iron of the exterior should be case-hardened, to guard against any attempt that may be made to force the safe open by drilling holes in it; and the lock should be so constructed as to be incapable of being blown open by the introduction of gunpowder. Every part should be made to fit closely and tightly together, especially the door, that no instrument may be inserted between its edge and the frame in which it fits, in order to force it open. The interior of the inner case should also be lined with some non-conducting material, such as the felt used for coating the exterior of steam boilers. Since the introduction of fire-proof safes, they have been extensively used for the preservation of mercantile books and other documents; and testimonials have repeatedly appeared in the newspapers with reference to the effectiveness of their fire-resisting qualities, and the failure of every attempt made by burglars to force them open. An excellent method of rendering timber impervious to fire, is to cover its surface with a solution of silicate of soda. When wood treated in this way is exposed to a fierce flame, the heat draws the salt contained in the solution to the exterior of the timber, on which it forms a glazed coating after having been melted by the action of the fire. Muslins and all linen and cotton fabrics may be rendered fire-proof by dipping them in a solution of tungstate of soda. The great merit of this preparation is that the material which has been dipped in it may be washed and ironed repeatedly without deteriorating the indestructible properties conferred on it [illegible] state of soda; and it does not render [illegible] woof brittle and rough to the touch, as textile [illegible] are which have been dipped in a solution of [illegible] common salt, both of which substances [illegible] ties that will preserve linen and cotton [illegible] destruction by fire to a certain extent, but not [illegible] tually as the tungstate of soda. It is cheap [illegible] applied, and its universal use would prevent [illegible] the fatal accidents that so frequently happen [illegible] ignition of light and inflammable fabrics. The [illegible] of silicate of soda, mentioned above, should [illegible] generally adopted as a wash for woodwork in [illegible] it effectually retards the action of the flames [illegible] the resinous nature of the deal commonly used in [illegible] ing is too liable to promote. The use of this preparation would certainly prevent much of the [illegible] of life and property that arises from the rapidity [illegible] which fires invariably gain ground before [illegible] means can be brought into operation to check [illegible]

FIRE-RAISING. (*See* ARSON.)

FIRE-SHIPS, vessels filled with combustibles [illegible] to be sent against the shipping of an enemy [illegible] anchor in rivers or roadsteads, after having [illegible] on fire in several places. They were frequently [illegible] during the wars of the last two centuries and the commencement of the present one, and often proved formidable engines of destruction. They are not so dangerous now, as one or two well-directed shots from one of the heavy guns now carried by ships of war would soon shatter to atoms any of the small craft that are generally used for the purpose. An attack with fire-ships was always made on a dark foggy night, which would allow of their being brought into close proximity to the vessels it was desired to destroy. The wind and current being favourable, the helm of each was set in such a manner as to cause them to drift right against the enemy's ships when at anchor. When they had been brought as closely as possible to the doomed shipping, the crew lighted the fuses attached to the combustible matter on board, and took to their boats to get clear of the approaching explosion and conflagration. Formerly, ships were especially kept for this purpose in the British navy, but now it is a part of every gunner's duty to know how to fit out a fire-ship, if such a method of attack be contemplated. The fire-ships of the English did considerable damage to the Spanish Armada in 1588; and among other notable exploits with these destructive vessels may be mentioned the daring attack of the earl of Dundonald, then Lord Cochrane, on the French fleet lying at anchor in the Basque Roads, in 1809, which met with complete success, and that made by Sir Sidney Smith on the flotilla collected by Bonaparte for the invasion of England, off Boulogne, in 1804, which unfortunately proved a failure.

FIRE, ST. ANTHONY'S. (*See* ERYSIPELAS.)

FIRE-WORKS. (*See* PYROTECHNY.)

FIRE-WORSHIPPERS. (*See* GUEBERS.)

FIRKIN, *fir'-kin*, a measure of capacity, which is equal to 9 ale-gallons, 7½ imperial gallons, or to [illegible] cubic inches.

FIRMAMENT, *fir'-mĕ-ment* (Lat. *firmamentum*), was a term used in Ancient Astron. to signify the eighth heaven, or sphere in which the fixed stars were placed. It was called the *eighth* heaven because of the seven spheres of the planets which it surrounds. The *firmament* was supposed to have had two motions; that from east to west, round about the poles of the ecliptic, and another and opposite motion from west to east. The revolutions it is said to complete in 25,412 years; according to Copernicus, in 258,000 years; at the end of which time the fixed stars return to the exact points that they occupied prior to their revolution. In the classics, the period was denominated the Platonic or great year. The word *firmament* usually designates the expansive arch over our heads, in which all the various phenomena of the stars and planets appear to take place.

FIRMAN, FERMAN, or FERMAUN, *fir-mân'* (Persian, order), is a word employed in Turkey to designate any decree issued by the Porte and authenticated by the sultan's own cipher or signet. Each of the ministers and members of the divan has the right of signing firmans relative to the business of his own department

but only the grand vizier is authorized to place at their head the cipher containing the interlaced letters of the sultan's name, which alone gives them force. A decree signed by the sultan's own hand is called *hatti sherif*. The name firman is also applied to a passport issued either by the Porte or a pasha, enjoining the subordinate authorities to grant protection and assistance to the traveller in whose favour it is granted. In India, a written permission to trade is called a firman.

**First-born**, *first*. (*See* Primogeniture.)

**First-fruits** (Lat. *primitiæ*) were the profits of every spiritual living for one year, claimed by the pope from all clerks appointed to benefices. In England this claim was first asserted in the reign of King John, and then only with regard to such clerks as the pope himself appointed to benefices; but subsequently they were demanded and taken by him from all clerks, by whomsoever appointed. By 26 Henry VIII. c. 3, the payment of first-fruits was transferred from the pope to the king, and their value fixed, as it is called, "in the king's books." Finally, Queen Anne gave up this branch of the royal revenue to the Church to form a perpetual fund for the augmentation of small livings. This is usually called Queen Anne's Bounty.

**Fisc, or Fiscus**, *fisk, fis'-kus* (Lat.), was the name given among the Romans to the private treasury of the sovereign, in opposition to the *ærarium*, or public treasury; but afterwards, when the sovereign power became absolute, the two terms came to be synonymous, and fiscus was applied generally to the property of the state. In Modern Law, on the continent of Europe, fiscus is applied to the public treasury, which is entitled to all fines, forfeited goods, goods without an owner, &c.; whence our term *confiscation*. The fiscus was entitled to many extensive privileges in civil as well as in criminal matters, and the term has come by degrees to be applied generally to the rights of the crown. In most of the German states there is an officer termed *fiscal*, who represents the government before the courts of justice, corresponding to the solicitor and attorney-general in England.

**Fiscal**, *fis'-kal*, pertaining to the public treasury or revenue. (*See* Fiscus.)

**Fish**, *fish* (Sax. *fisc*), (*Pisces*), a name applied to animals exclusively aquatic, and occupying the fourth and lowest station of the section *Vertebrata*. The head is large, and set upon the neck without the intervention of any distinct neck; the body is usually of a spindle shape, tapering gradually towards the extremity; and the surface is usually smooth, without any irregularities which might impede the motion of the creature in its native element. In its general form, the body is usually rounded, or slightly compressed at the sides; sometimes this flattening proceeds to a much greater extent, so that the animal presents the appearance of a broad band, or oval disc, of which the edges correspond with the dorsal and ventral surfaces; in other cases, the flattening takes place from above downwards, producing a disc-like body, of which the upper and lower surfaces are dorsal and ventral. A fish may be shortly defined as an animal breathing through the medium of water, by means of gills; and in giving it our consideration, this latter apparatus is the most important feature presented. It is situated on each side of the neck, and consists of numerous laminæ fixed on arches. These laminæ are covered with innumerable blood-vessels, and are so constructed as to present a considerable surface to the water, so that the blood may receive a sufficient portion of the oxygen contained in that element. As the water in contact with the gills becomes deteriorated, it is necessary that a constant current be caused to flow over them. In most fishes this is effected by their taking water in at the mouth and expelling it at the gill-covers. The blood, which is constantly sent from the gills to the heart, is distributed by means of the arteries to every part of the body, whence it returns to the heart by means of the veins. Animals of this order are for the most part furnished with an air-bladder in the interior of the body, which, as it is often connected with the œsophagus by a tube, must be regarded to a certain extent analogous to the lungs of the air-breathing vertebrata. This sac or air-bladder, however, has nothing to do with respiration; it receives blood from the arteries, and returns it into the veins, and the air which it incloses is probably derived from this fluid. By the dilation or compression of this sac, the specific gravity of the fish is governed, and, acted on by a curious muscular apparatus, renders its possessor lighter or heavier than the surrounding element. The limbs of the fish are formed into fins; the fore-legs constituting what are termed the pectoral fins, and the posterior extremities, the ventral. Besides these, ordinary fishes are furnished with one or two dorsal fins, an anal fin, and a caudal fin, or tail. In some fishes, the dorsal or median fins are continuous round the whole posterior portion of the body; and this is the condition in which these organs first make their appearance, during the development of the embryo in all fishes, the subsequent changes which take place in the arrangement of the parts being due to the unequal development of the bony rays, which support and stretch the membrane of which the fins are composed. The pectoral fin in all fishes consists of the same parts as the anterior limbs of any other vertebrated animal. Concealed within the skin, immediately behind the branchial openings, is found a bony circle, composed of several pieces, representing the shoulder-blade, with the coracoid bone and clavicle. This supports the bones of the arm, which are usually very short, and bear a series of carpal bones at their extremity; that latter supporting a number of short cylindrical joints, whence the rays of the fin take their rise. The internal supports of the ventral fins never present such a close resemblance to the pelvis of the higher vertebrata as do those of the pectorals to the scapular arch. When situated in their normal position in the abdomen, they always consist of cartilaginous or bony pieces, lying freely in the muscles, and quite unconnected with the vertebral column; but when the fins are advanced from this position to the neighbourhood of the pectorals, their internal supports are attached to the scapular arch of the latter members. The principal organ of motion is the caudal fin, or tail: by this it is propelled. The dorsal and ventral fins serve to balance it, and the pectorals to arrest its progress when required. The bones of fishes are of a less dense and compact nature than in the higher orders of animals, and always remain in an isolated state, similar to that of the embryo of the mammalia. The skeleton may be divided into four chief parts,—the vertebral column, the head, the respiratory apparatus, and the limbs. The vertebral column consists of vertebræ which are concave at each end and pierced in the middle; and, when joined together, the hollow space between each two is occupied by a gelatinous substance, which passes from one space to the next, through the hole in each bone. This hole is usually very small; but in some of the chondropterygians it is so large that the bodies of the vertebræ are mere rings. To the vertebræ are attached the ribs: in fact the ribs are the main support of all the other bones. The head varies more in form than in any other class of vertebrate animals. The same bones as those found in other oviparous animals are almost always traceable. The upper jaw consists of maxillary and intermaxillary bones. In the greater number of fishes, the intermaxillary bones constitute the chief portion of the upper jaw, the maxillary bones being placed behind and parallel to them. The lower jaw is composed, generally, of two bones on each side, the dental portion in front and the articular portion behind. The form of the body is for the most part such as mechanical principles teach to be best adapted for moving with least resistance through a liquid medium. The surface of the body is either smooth and lubricous, or is covered by closely-imbricated scales, rarely defended by bony plates or roughened by hard tubercles, still more rarely armed with spines. The central axis of the nervous system presents but one partial enlargement, and that of comparatively small size, at its interior extremity, forming the brain, which consists of a succession of ganglionic masses, most of them exclusively appropriated to the function of a nerve of special sense. The power of touch can be but feebly developed in fishes. The organ of taste is a very inconspicuous one; the chief function of the framework supporting it, or the hyoidan apparatus, relating to the mechanism of swallowing and breathing. Of the organ of hearing there is no outward sign; but the essential part, the acoustic

labyrinth, is present, and the semicircular canal, largely developed within the labyrinth, is without cochlea, and is rarely provided with a special chamber, but is lodged, in common with the brain, in the cranial cavity. The eyes are usually large, but are seldom defended by eyelids, and never served by a lacrymal organ. The alimentary canal is commonly short and simple, with its divisions not always clearly marked, the short and wide gullet being hardly distinguishable from the stomach. The pancreas, for the most part, retains its primitive condition of separate cæcal appendages to the duodenum. The heart consists essentially of one auricle and one ventricle, receiving the venous blood and propelling it to the gills; whence the circulation is continued over the entire body, in vessels only, which are aided by the contraction of the surrounding muscular fibres. The blood of fishes is red but cold, and is rarely elevated above the temperature of the surrounding element. The sexes of fishes, excepting the sharks and rays, offer no very decided external characters by which they may be distinguished. The respiratory organs, however, occupy more space in the males than in the females; and, on the other hand, the abdomen is larger in the females than in the males. The fecundity of fish is very wonderful, as the following table will show:—

| Fish. | Weight. | Weight of Spawn. | No. of Eggs. |
|---|---|---|---|
| | oz. dr. | grs. | |
| Carp | 25 5 | 2,571 | 205,109 |
| Codfish | ... | 12,510 | 3,686,760 |
| Flounders | 24 4 | 2,200 | 1,357,189 |
| Herrings | 5 10 | 480 | 30,960 |
| Mackerel | 19 0 | 1,223½ | 546,681 |
| Perch | 8 9 | 766½ | 28,323 |
| Pike | 56 4 | 5,100½ | 49,304 |
| Roach | 10 6½ | 361 | 81,586 |
| Smelt | 2 0 | 119½ | 38,278 |
| Sole | 14 8 | 542⅛ | 100,402 |
| Tench | 40 0 | .. | 383,252 |
| Lobster | ... | 1,671 | 21,639 |

The salmon is far more productive than any of these; the ovarium of one female salmon will produce 20,000,000 eggs.—Ref. *English Encyclopædia*, Dallas, and the works of Jesse, Owen, Yarrell.

Fisheries, a term applied to various stations and localities around our own coasts and those of other nations, where the different shoals of fish used by man for food are to be found at certain seasons of the year; and where the business of catching or entrapping the selfsame fish is carried on by fishermen, an exclusive class devoted to the occupation. Fisheries or fishing-grounds have been often the subject of disputes and embroilments between different governments, and sometimes even treaties have been effected in their especial right; to instance which, it may be mentioned that a convention was signed at Paris on the 2nd of August, 1839, between France and England, to fix the limits of the oyster and other fisheries which approximated the coasts of the two nations. Fisheries are of the greatest importance to nations, and especially to England, whose extent is insular, and bounded on every side by the sea; because fish forms one of the articles of principal consumption as food, and is also an article of exchangeable nature with other nations in the paths of commerce. The principal kinds of fish which have separate fisheries are whales, cod, ling, hake, herrings, lobsters, mackerel, oysters, pilchards, salmon, anchovies, sardines, sturgeons, and tunny. In this country our fishermen are in the habit of fishing for all these, with the exception of the last four species; and each kind of fishery may be termed a separate instance of our national industry. The British fisheries are carried on in various parts of our dominions. Whales are principally caught along the shores of Greenland, in Davis' Straits, and the South Seas, as well as near the southern portions of Australia and the Cape of Good Hope. With regard to those fisheries which are carried on more closely to our own shores, that of the *herring*, on the coasts of Scotland and along the British Channel, must be especially noticed. The Caithness fishery is the most prosperous and remunerative of the Scotch fisheries, and the town of Wick may be said to be the centre of the herring fishery in that part. The average yield per boat engaged in fishing is about 100 *crans*, a cran measuring 45 gallons of ungutted herrings. The herring fishery commences in the month of May off the eastern side of Lewis, and continues into the month of June, or midsummer. It then spreads along the eastern and western shores of Scotland, reaching Caithness by August. During the autumn the shoals are off Yarmouth, and there continue during a portion of the winter, by which time they commence to work their way up to Lewis once more, where they reappear again in the spring. The herring is fished for by *drift-nets*, which are composed of several lengths, and by *trawl nets*; the latter, however, are the most useful. The Irish herring fisheries are not so productive as the Scotch, but they are yearly stimulated by public grants of money for their furtherance; and the same may be said of all other species of fisheries in Ireland: this is owing not so much to their unprofitableness as to lack of industry in their prosecution. The *pilchard fishery* is carried on along the coasts of Cornwall and Devon, and is of great importance in the trade. The pilchard is caught in the months of August, September, November, and December, and is salted and packed for exportation. The quantity of the pilchards exported by us to the Mediterranean and other foreign markets is about 30,000 hogsheads per annum. The salmon fishery is carried on chiefly on the rivers and estuaries of Scotland and Ireland. Aberdeen in Scotland, and Cork in Ireland, are the chief salmon stations, from whence the fish is sent to various parts of the kingdom. (For a description of the salmon, *see* article under that heading.) The *cod*, *ling*, and *hake* fisheries are carried on along Scotland and Ireland, and about the banks of Newfoundland. These fisheries themselves may be said to date their origin from the discovery of the Portuguese, in the year 1500, and they are the sole support of the dwellers in that unproductive land. The quantity of cod, ling, and hake cured and exported from Scotland and the Isle of Man in the year 1854 was 109,084 cwt. cured dried, 6,196 cwt. cured in pickle, and 19,557 cwt. exported, which were of dry cure. The mackerel and other minor fisheries are carried on along our own coasts, and do not need separate mention. The shell-fish which are so much consumed by us are found in the Channel islands and about the English Channel. (For whale-fishery, *see* descriptive article on the whale.) A rough estimate of the total value of the foreign and domestic fisheries of Great Britain would give a sum of about £20,000,000 per annum, although they have indeed been stated to be worth £8,300,000 annually.

Fishing. (*See* Angling.)

Fissirostres, *fis-se-ros'-treez* (Lat. *findo*, I cleave; *rostrum*, a beak), the name of a tribe of birds, consisting of the swallows, swifts, and goatsuckers. They are distinguished by having the bill short, broad, depressed, slightly curved, without any tooth, and so deeply cleft as to give peculiar wideness to the gape; a structure of great use to birds which prey so exclusively on insects taken on the wing. On account of the food on which they subsist, all the fissirostres migrate from northern countries towards the close of autumn, and return again in spring. Like the insectorial order, or birds of prey properly so called, the fissirostral tribe is capable of a binary division into diurnal and nocturnal species.

Fistula, *fis'-tu-lă* (Lat., a pipe or reed), in Surg., is a long and sinuous ulcer, having a narrow opening, sometimes leading to a larger cavity, and which has no disposition to heal. The most common form of this disease is the *fistula in ano*, the sinus extending into the cellular substance about the anus, or into the rectum itself. It is the result of abscesses formed in the cellular tissue around the rectum, and which having burst or been opened, are prevented from healing by the action and irritation of the sphincter ani. They are divided into two kinds,—*complete* and *incomplete*, or *blind*; the former having two openings or outlets, the one externally, the other into the rectum; the latter having only one, and being divided into blind-external and blind-internal, according as the

opening is external or internal. This disease is commonly attended with intense pain, especially when passing the fæces, and there is an irregular discharge of purulent matter, which is sometimes mixed with blood. The treatment consists in making a complete division with the knife of the whole of the parts between the fistula and the bowel, and the edges of the wound are kept apart by lint, in order to allow the cavity to fill up by granulation. A *fistula lacrymalis* is a disease of the lacrymal sac, caused by an obstruction to the flow of tears along the nasal duct. The symptoms of this disease are a watering of the eye, with a dryness of the corresponding nostril, a distension of the lacrymal sac, and a discharge of muco-purulent fluid mixed with tears, from the puncta lacrymalia, when the sac is compressed. In the earlier stage of this disease, when there is only a distended state of the lacrymal sac, a cure may be effected by the application of leeches and fomentations to the eye, with the use of astringent ointments to the edges of the lid. In the more advanced stages, however, where there is inflammation and suppuration of the sac, or where a fistulous opening has been formed in it, by the escape of purulent matter, an operation becomes necessary for its removal. This is effected by making an incision with a sharp-pointed knife into the lacrymal sac, and then passing a probe downwards into the nasal duct; after which a silver instrument called a style is inserted, and allowed to remain until the inflammation, which produced or accompanied the abscess has subsided. *Salivary fistula* is a fistulous aperture in one of the salivary ducts, opening externally, and through which the saliva escapes. It is generally caused by a wound, which, if recent, a cure may be effected by merely bringing together and uniting the edges of the wound; but if of some standing, a free canal ought to be formed for the discharge of the saliva into the mouth. In *fistula in perinæo*, which is almost always accompanied with a stricture of the urinary passage, the fluid passing out of the external opening of the sinus, an operation is necessary, which will require the aid of a competent surgeon. Fistulas generally require very skilful treatment, and are often extremely difficult to close; and though not in themselves dangerous, they are not unfrequently attended with fatal results, arising out of the constitutional depression, which they occasion by the long-continued wearing pains, and the drain upon the system, in consequence of the protracted discharge. Fistula in ano is often observed in consumptive patients.

Fitz, *fits* (old Nor.), signifying son, and evidently a corruption of the Latin *filius*. It is prefixed to proper names, like the Scotch *Mac*, the Irish *O*, and the oriental *Ben*, to signify descent; as in the names Fitzwalter, Fitzwilliam, Fitzherbert. It has also been employed in recent times to denote the natural sons of kings and princes; as in Fitzroy, Fitzjames, Fitzclarence.

Five Points, The, in Theol., are the five principal points of controversy between the Calvinists and Arminians. (*See* Calvinism.)

Fixed Air, *fikst* (Fr. *fixer*, to fix), in Chem., an old term for carbonic acid gas.

Fixed Oils. (*See* Oils.)

Fixed Stars, the common name given to all stars in the heavens, with the exception of the planets. They are so called because they appear to us to be stationary in the broad field of the heavens, having no apparent motion, and always preserving the same relative position with regard to each other. They are supposed to be the centres or suns of other systems, similar to our own. Sirius, the dog-star, in the constellation Canis Major, which is the brightest of all the stars, is considered to be nearer the earth than any other; and the distance of this from our planet is computed to be not less than nineteen millions of millions of miles. The fixed stars have been grouped into separate clusters called constellations, and divided into six classes according to their respective apparent magnitudes, the largest and brightest being called stars of the first magnitude, those that are next in size and lustre stars of the second magnitude, and so on. Stars of the sixth magnitude are the smallest that are visible without the aid of a telescope.

Fixing, in Photo., a term applied to the cleansing of photographs from the sensitive layer not acted on by the light. The principal fixing agents are hyposulphite of soda, which may be used either for glass or paper pictures, and cyanide of potassium, which can only be used for the former. (*See* Photography.)

Fixtures, *fiks'-tures*, in Law, are things annexed to houses or lands, which become, immediately on annexation, part of the realty itself, and are governed by the same laws as apply to heritable property. The question as to what are or are not fixtures is of some importance, as determining the rights of landlord and tenant, heir and executor, &c. Fixtures in general are personal chattels let into the earth, or cemented or otherwise fixed to some erection previously attached to the ground, and are thus legally immovable. If they be entirely clear of the soil, they are not fixtures, and may be carried off at pleasure. Hence a tenant may construct erections,—even barns, sheds, and the like, upon blocks, rollers, pillars, or plates, so that they shall not be deemed fixtures but remain movable chattels. The general rule is, that whenever a tenant has affixed anything to the premises during his term, he cannot again sever it without the landlord's consent. To this rule, however, various exceptions have been made in favour of what are termed trade fixtures. A tenant may safely remove such things as he has fixed to the freehold for purposes of trade or manufacture, provided the removal can do no material injury to the estate. As regards agricultural fixtures, it is provided by 14 & 15 Vict. c. 25, that if any tenant of a farm or lands shall, with the consent in writing of the landlord for the time being, at his own cost erect any farm-buildings, either detached or otherwise, or put up any other building, engine, or machinery, either for agricultural purposes or for the purposes of trade and agriculture (which shall not have been put up in pursuance of some obligation in that behalf), then all such building, engines, and machinery shall be the property of the tenant, and shall be removable by him, notwithstanding that the same, or any part thereof, may be built in or permanently fixed to the soil; so as the tenant, in making such removal, do not in anywise injure the land or buildings belonging to the landlord, or otherwise do put the same in like condition as they were in before the erection of anything so removed. But the tenant, before making any such removal, must give the landlord or his agent one month's previous notice in writing of his intention to do so; and if the landlord or his agent elect to purchase the things proposed to be removed, then the tenant's right to remove the same shall cease, and the value of the things shall be ascertained by two referees, one to be chosen by each party, or by an umpire to be named by such referees, and shall be paid or allowed in account by the landlord who shall have so elected to purchase. Another exception to the general rule is in favour of such fixtures as are put up for ornament or domestic use, as hangings, stoves, &c.; but not such as have become part of the tenement, and constitute permanent improvements. The distinction, however, is often very nice, and it is difficult to define it in general terms.—*Ref.* Amos and Ferard *On Fixtures*.

Flacourtiaceæ, *flā-koor-te-aï'-se-e*, named after M. de Flacourt, a director of the French East-India Company, in Bot., a synonyme for Bixaceæ (which *see*).

Flag, *flig* (Sax. *flegan*, to wave in the air), the name given to pieces of cloth, or bunting, of various colours, and often bearing various devices, that are hoisted in conspicuous places on poles or at the mast-head of vessels, and allowed to float on the breeze for different purposes. The primary object of a flag is to denote nationality, and it is more especially used for this purpose at sea, to allow commanders of vessels to show others to what country their ship belongs. The use of flags is probably of very early date, families and tribes, as well as nations, being distinguished, in the early ages of the world, by emblems embroidered on a small square banner. We are told in Numbers ii., that in the wanderings of the Israelites in the wilderness, they were ordered to pitch every man "by his own standard, with the ensign of his father's house;" and from Genesis xlix. we may gather what were the bearings that the twelve tribes bore on their banners. In mediæval times, we find that the practice was still continued. The Saracens, in the 7th century, had

adopted a green standard, which, with the addition of a crescent, is still the national flag of Turkey; and about the same period, the white horse of the Saxons, perpetuated in the armorial bearings of Hanover, and the black raven of the Danes, were well-known ensigns that floated over many a battle-field on English soil. The national flags borne by the principal nations of the world at the present time will be found in the plate of "Flags of All Nations," in vol. I. of this work. Of the flags peculiar to Great Britain, the principal is the Royal standard, consisting of the armorial bearings of England, Scotland, and Ireland combined, which is hoisted wherever her Majesty happens to be residing, or on vessels, when the queen or any of the royal family is on board. The Admiralty flag consists of a gold anchor borne on a red field; and the national flag, known as the Union Jack, consists of the red cross of St. George, and the red and white saltires of St. Patrick and St. Andrew, combined, on a blue field. The ship in which the admiral of the fleet happens to be always carries the union jack. When this flag is hoisted by a merchant ship, it is distinguished by having a white border round it, and is then called a merchant jack. There are also three other flags, which are used to distinguish admirals of different ranks in the navy, known as the red, white, and blue ensigns. The red, or British ensign, is a red flag with the union jack in the upper corner of the end attached to the haulyards; the white ensign is a white flag with a red cross; and the blue ensign a blue flag, both having the union jack in the same position that it occupies in the red ensign. The grade of an admiral is further distinguished by the mast at which he carries his flag; a full admiral of the red, white, or blue, bearing his flag at the main-mast, a vice-admiral at the fore-mast, and a rear-admiral at the mizen-mast. Flags of various shapes and colours are used as signals for communication in the royal navy and British merchant service, a new code of signals having been lately introduced to supersede that invented by Captain Marryatt, the well-known novelist. Different significations are also attached to plain flags of one simple colour; thus, a yellow flag indicates that there is sickness of a dangerous character on board the vessel which bears it, or that the ship is performing quarantine; a white flag is well known among all nations as a flag of truce, and betokens a desire for a temporary cessation of hostilities, for the purpose of communication between hostile parties, or for burying the dead slain in battle; a black flag, on the other hand, is the emblem of piracy, or betokens a determination, on the part of those who hoist it, to resist to the last, and to give or take no quarter. When a flag is hoisted half-mast high, it is a mark of mourning: when it is hoisted upside down, it forms a signal of distress. A blue flag, with a square white centre, called the blue-Peter, is hoisted when a vessel is about to sail, and is the signal of departure. A short triangular flag is called a burgee; a longer flag, of the same shape, a signal pendant; a square flag, with a triangular piece cut out of the end farthest from the haulyards, with the point turned towards the centre, a cornet; and a very long narrow flag, resembling a strip of ribbon tapering to a point, which is borne at the mast-head, is called a pendant.

FLAG, in Bot., a general term for a number of endogenous plants whose leaves are sword-shaped. (*See* ACORUS and IRIS.)

FLAGELLANTS, *flăj-el'-lănts* (Lat. *flagellare*, to beat), the name of a sect of religious fanatics that sprang up in Italy about the year 1260. They were so called from the flagellations or whippings which they administered to themselves, the leading doctrine of their creed being that by mortifying the flesh in every conceivable manner they propitiated the wrath and gained the favour of the Deity. Sects or bodies of persons holding this doctrine, and practising whipping and other mortifications of the flesh, had appeared at various times in the earlier history of the Church; but this was the first occasion on which they made a prominent figure. People were no longer satisfied to perform these acts in private, but took to practising them in public, by way of greater humiliation. They formed themselves into large bands or companies, and went about from place to place, carrying banners and crosses, singing penitential hymns and whipping themselves until the blood flowed. In 1261 they passed into Germany, and there made many converts; but on account of their irregularities and disorderly proceedings, a general outcry was raised against them, and they were at length put down. The second great outbreak of this mania took place after 1349, when that terrible scourge the black death had swept over Europe and carried off so many persons. The imaginations of the people, already excited by the pestilence, were ready to seize upon this superstition, which spread rapidly through Germany, Switzerland, Holland, Sweden, and even England. The scenes of the previous century were re-enacted with even greater excesses than before. Men and women indiscriminately now appeared in public half-naked, and underwent these self-inflicted scorgings. They held that flagellation was of equal virtue with baptism and the Lord's Supper; that forgiveness of sins was to be procured by it without the blood of Christ; that the law of Christ was soon to be abolished; and that a new law, enjoining a baptism of blood, to be administered by whipping, was to take its place. They were condemned by a bull of Clement VI., and other severities were practised against them, until at length they disappear. Again, in the year 1414, a new troop of these fanatics make appearance in Germany, under the leadership of one Conrad Schmidt. They were even more wild in their extravagances than their predecessors, rejecting all forms of worship, and holding that faith and flagellation were alone necessary to salvation. They were everywhere persecuted, and many of them were burnt as heretics; among whom was their leader Schmidt; but it was with difficulty that their system was at length suppressed.

FLAGEOLET, *flăj'-o-let* (Fr.), a small musical instrument of the flute kind, played on by means of a mouthpiece at the upper end. It is generally made of box, ebony, or other hard wood; but sometimes of ivory, and has a clear and shrill tone. Its compass extends from F, the first space in the treble clef, to F in altissimo. In the *quadrille flageolet*, it is a little less extensive, while in the *patent flageolet* the scale is an octave higher. There are also *double flageolets*, consisting of two tubes united by one mouthpiece. This instrument is now very seldom used, it being almost superseded by the *flauto piccolo*, or octave flute.

FLAG OFFICERS, a class of officers in the navy above the rank of captain, who have commands of fleets. Flag officers are divided into three ranks, and each of these three ranks into three different classes. The ranks are red, white, and blue, and the classes are admiral, vice-admiral, and rear-admiral. Flag officers may therefore be considered as numbering in all nine different ranks, which are as follows:—Admiral of the red, of the white, and of the blue; vice-admiral of the red, of the white, and of the blue; thirdly, rear-admiral of the red, of the white, and of the blue. The admiral wears his *flag* at *the main*; the vice-admiral at *the fore*; and the rear-admiral at *the mizen*. There is also an admiral of the fleet, who, if in command of a squadron, would wear his flag—a union jack—at *the main*. A commodore is occasionally a flag officer, and he is distinguished by wearing a broad pennant.

FLAG-SHIP, the nautical term applied to the line-of-battle ship, frigate, or other vessel, which carries the flag officers in command.

FLAIL, *flail* (Ger. *flegel*, Lat. *flagellum*), a wooden implement employed for threshing corn by hand; consisting of two parts; viz., the handle or *hand-staff*, and the swiple, or part which strikes the corn; these two portions being joined together by thongs of untanned leather, called *caplins* or *couplins*. It is now almost superseded by the threshing-machine. (*See* THRESHING-MACHINE.)

FLAKES, *flaiks* (Ang.-Sax., a layer or stratum), in Hort., carnations with large stripes of colour. (*See* DIANTHUS.)

FLAKE-WHITE, a pigment, consisting of a preparation of carbonate of lead. It is much used in painting in body-colours, being a substance with which transparent colours derived from vegetable matter may be mixed and rendered opaque, so that they may be laid on vellum or paper in the form of an even

coating, possessing some degree of thickness and consistency. It is also used for putting in the high lights in drawings in water-colours, and crayon drawings in two or three tints; but it is apt to become brown and discoloured in course of time. Chinese-white, or marine-white, both of which are preparations of carbonate of zinc, are far better for this purpose and as a vehicle for preparing body-colours from simple water-colours, as they afford a white pigment of the purest nature, which will always retain its brilliancy unimpaired and untarnished by exposure to the atmosphere.

**Flambeau**, *flăm'-bo* (Fr.), a kind of torch made of thick wicks, covered with wax, and used at illuminations and processions in the streets at night. A flambeau usually consists of four wicks or branches, about an inch in thickness and three feet long, made of half-twisted hempen yarn. These are suspended, and white or yellow wax is poured over them from a ladle, until a coating of the required thickness is obtained.

**Flamboyant**, *flăm-boy'-ănt* (Lat. *flamma*, a flame), the name given to French ecclesiastical architecture of the 15th century, derived from the beautifully carved tracery of the windows, which appears to run in waving lines somewhat resembling the various directions taken by lambent flames of fire. This style of French Gothic architecture is also known as *Opinal Tertiare*: it corresponds in a great measure with the Perpendicular English or third Pointed style; but it is characterized by far more elaborate ornamentation; and objects of rectilinear form and outline, which constitute such a marked feature of the latter style, are not so frequently introduced.

**Flame**, *flaim* (Fr. *flamme*), in Chem.—Flame may be defined as a shell of incandescent matter surrounding a mass of combustible vapour. To produce flame it is therefore necessary that the burning body should be capable of volatilization just below the temperature at which it undergoes combustion. Charcoal or iron will burn with a steady glow, more or less luminous according to the medium in which they are burnt, neither of these substances being susceptible of volatilization at the temperature at which combustion takes place. A piece of wood or paper, on the contrary, burns with a large luminous flame, in consequence of the combustible matter of which it is composed rising in vapour or becoming converted into mixed gases at the temperature required for kindling the substance. Flame is, in fact, produced whenever a continuous supply of inflammable vapour or gas is made to combine with a supporter of combustion, such as the atmosphere, at a sufficiently elevated temperature to cause ignition. That flame is hollow may be easily proved by several simple experiments. If a little spirits of wine or other inflammable liquid be ignited on a watch-glass, and a straw held across the flame, it will be found that the straw is charred only at the edges of the flame, the intermediate portion remaining uninjured. A still more instructive proof is afforded by placing a piece of glass tube or tobacco-pipe nearly upright in the middle of the flame of a candle, when the vapour and gaseous matter rising through the wick from the melted tallow will ascend through the pipe, passing out at the upper orifice of the tube, where they may be kindled. The heating power of a flame is in direct proportion to the energy of the chemical action that takes place, those flames being hottest and least luminous which proceed from gases containing no solid particles, as in the case of a mixture of oxygen and hydrogen in the proportion necessary to form water, which is one of the hottest flames we have at our command. The most luminous flames are from gases which contain just sufficient solid matter to give the maximum of incandescence without any of its particles passing away unburnt. Olefiant gas and the ordinary coal-gas are good examples of this as compared with the oxyhydrogen flame, which contains no solid matter on the one hand, and the flame of pitch or turpentine on the other, which contains too much carbon, the excess passing off in the form of smoke. The flames used for illuminating purposes are all produced by the combustion of compounds containing carbon and hydrogen. Besides the proper proportions of gaseous and solid matter contained in illuminating substances, care must be taken to regulate the supply of air. By paying proper attention to this, many substances are greatly improved in their illuminating properties, while others are made to give an intense light, which could not otherwise be burnt. The Argand burner and chimney, as applied to gas and camphine, are examples of this. (*See* Argand Burner.) The flame of an ordinary candle is a good illustration of the phenomena of flame. At the lower, or blue portion, the hydrocarbon contained in the gases resulting from the decomposition of the tallow by heat, mixed with so much atmospheric air that the whole of the carbon unites with hydrogen, none being left to give incandescence. Passing higher up, we see a dark part, which consists entirely of the gaseous matter formed by the decomposed tallow. This, on being heated by the blue portion of the flame, rises in luminous vapour until it comes in contact with the oxygen of the atmosphere, when it unites with it, forming a bright but not luminous envelope to the incandescent carbon,—the products of the combustion being water and carbonic acid. The influence of solid matter in increasing the luminosity of a flame may be aptly illustrated by sprinkling a little powdered magnesia in the flame of a spirit-lamp. (*See* Gas, Illumination.)

**Flamen**, *flai'-men* (Lat.), the name given to any Roman who was devoted to the service of one particular god. Each flamen received a distinguishing epithet from the name of the deity to whom he ministered. The most dignified were those of Jupiter, Mars, and Quirinus, and were called respectively *Flamen Dialis*, *Flamen Martialis*, and *Flamen Quirinalis*. The name is derived from the cap or fillet which they wore on the head. When the emperors were deified, they also had flamens.

**Flamingo**, *flă-mĭn'-go* (Sp.-Port. *flamenco*), (*Phanicopterus ruber*, Linn.).—This bird inhabits the warm climates of Asia, Africa, and America, and is one of the most remarkable of aquatic birds. Its height is about four feet. In its first year it is of one colour,—greyish white; in its second year, the white is purer and the wings are tinted rose-colour; in the third year it attains its full plumage,—wings roseate, back deep scarlet, and quill-feathers jet black; and as the bird grows older, these colours increase in tone. The neck is slender and of great length, equalling that of the legs, which are about two feet. The head is small and round, and furnished with a bill nearly seven inches long, which is higher than it is wide, light, and hollow, having a membrane at the base, and suddenly curved downwards from the middle, as if broken. The lower mandible, which is the larger, is so adjusted as to fit the angle with its edges, its under surface being greatly arched downwards. The edges of both mandibles are serrated. In operation, these mandibles act like a strainer, allowing the water to escape, but retaining any sort of prey the flamingo may capture. Its food consists of small fish and water insects, which it fishes up by means of its long neck, turning its head in such a manner as to take advantage of the crook in its beak. In searching among the mud at the bottom of the water for food, the upper, not the under, mandible is applied to the ground. In that situation the inferior mandible is uppermost, and by its motion works the disturbed water through the two. The tongue is large and fleshy, betokening an acute sense of taste. The flamingo's mode of incubation is peculiar. The great length of its legs, combined with the fact that the bird never sits down, but rests standing on one leg, renders a nest of the ordinary construction altogether unsuitable; so the flamingo constructs a tallish cone of mud, with a cavity at the top, and in this cavity the eggs are laid, and straddles across the whole, so that her feet rest on the ground and the under part of her body on her eggs. The latter are white, and rather larger than those of the goose.

**Flange**, *flanj* (of doubtful derivation), the metal rim bent over in gas-pipes, water-pipes, &c., in order to join on other lengths of the same. The term is also applied to the projecting outside circumference of a railway-carriage wheel, by which the wheel is prevented from running off the rails.

**Flank**, *flănk* (Fr. *flanc*), in Mil., a term frequently applied to either side of a body of troops; the extremities of a body of soldiers in line, or the sides of a column, being termed the right and left flanks respectively. In any defensive work, it is applied to that part

from which a fire may be directed against the side or flank of an attacking party. Thus, the flanks of a bastion are those parts of the rampart and parapet which connect its faces with the extremities of the curtains of the enceinte on either side of it. On reference to the diagram of a front of fortification given in the article on that science (*see* FORTIFICATION), it will be seen that a fire from the flanks is effective in preventing an attacking party from effecting a lodgement at the foot of the curtain that lies between them, which might be done with comparative ease and security if these portions of the work did not exist. A fire from the flanks of any bastion enfilades the ditch at the foot of the curtain.

FLANNEL and FLANNEL MANUFACTURE. (*See* WOOL MANUFACTURE.)

FLAT, *flăt* (Du. *plat*), in Mus., a character employed to lower or depress any note or notes in the natural scale one half-tone. An *accidental flat* is one which, although not occurring at the commencement of the staff, is inserted in any other part of it, and only affects the bar in which it is placed.

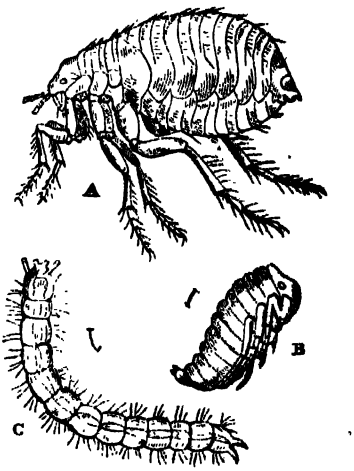
FLATULENCY, *flăt'-u-len-se* (Lat. *flatus*, a blast), in Med., is a morbid collection of gases in the stomach and bowels, commonly arising from indigestion, or from indulgence in certain kinds of vegetable food. When, from any weakness in the digestive powers, food remains in the stomach in an undigested state, fermentation takes place, and gases are formed. Flatulency is usually symptomatic of other diseases,—indigestion, colic, cholera, hysteria, or nervous debility. For its cure, carminatives, tonics, and aperients are resorted to; and strict attention to diet is necessary, taking only such food as is light and easy of digestion, and avoiding all oleraceous vegetables, peas, beans, and flatulent fruits. Weak brandy-and-water, as a beverage at dinner, is also very beneficial. When the pain is excessive, hot applications to the stomach and friction will frequently afford considerable relief.

FLAX, *flaks* (Sax. *fleax*, *flex*), the fibre of the *Linum usitatissimum*, separated from the woody portion of the plant, and ridded of any impurities, after which it is spun into thread, from which state it is woven into linen. (*See* LINEN.) It is supposed to be the fruit of Egyptian discovery, as the coverings of the mummies found in the pyramids all attest to their being composed of what is generally termed flax. The flax-plant is of slender form and of annual growth. It reaches generally the height of from two to three feet, and has small lanceolate leaves, which terminate at the extremities in delicate blue flowers, which are afterwards replaced by seed-vessels, containing each ten seeds. The plant itself grows over the whole extent of Europe, Asia, and America. The time for gathering the flax is when the leaves begin to drop off, and when the stalk has a yellow appearance. The stalks are then stripped, and the seed-bolls carefully gathered and stored up for the next year's supply. The first process in the preparation of the flax is to steep the stalks in water until decomposition and fermentation takes place; that causes the glutinous matter which binds the woody and fibrous parts together to become separated. The duration of this process is from six to twenty days, according to the quality of the water employed and the state of the flax-plant. After the first process, the stalks are dried, and in this state they may be kept in sheaves for years. After the flax has been "retted" (as the first operation is called) and dried, it is broken repeatedly, beaten with a flat piece of wood, and also "scutched," in order to remove all the woody particles from the fibre. The last operation is termed "heckling," which consists in combing the flax through and through, in order to separate the different threads; after which it is prepared for the spinner's hands. This process is required as much to straighten the fibre as to lessen any knots or irregularities in the filaments. The action of the heckles divides the scutched flax into two portions, the long ones, which remain straight after the operation, being termed "line," and the woolly mass "tow." Both of these are spun; but the line affording better "yarn," is, of course, the more valuable of the two. The great object in heckling is to produce the greatest possible amount of "line," and the least possible amount of "tow." (*See* LINUM, SPINNING, LINEN.)





FLEA, *flē* (Ang.-Sax.). — The proper position of this insect in entomological classification has been the subject of much dispute. By many authorities, including the distinguished names of Latreille, Kirby, and Spence, the fleas are considered to form a distinct order; the former naturalist treating of them under the order *Siphonaptera*, and the latter, the order *Aphaniptera*. By others, they have been arranged with the order *Diptera*, but with little reason; for in certain important characteristics they widely differ from them. It has been truly remarked, that "it is highly probable, when this group is better known,—when the numerous insects allied to the fleas are more common in our cabinets, it will be found that they do not constitute an order by themselves, but are aberrant forms of the other well-established orders. In these, there is a certain degree of uniformity, as regards number, variety of habits, &c., which cannot but lead us to doubt the validity of the so-called orders, containing only one or two genera and but few species, such as the present orders." The curious structure of the flea has doubtless greatly contributed to perplex and hinder those who have sought to find its correct genera. The most familiar species is the common flea (*Pulex*




A—THE FLEA.

B—PUPA OF DITTO. C—LARVA OF DITTO.

(All magnified.)

*irritans*), which is, unfortunately, very numerous in this country. The body of the flea is protected by a horny covering, composed of segments, which are very well defined,—those of the thorax are always distinct. Its mouth is suctorial, formed of three pieces, inclosed by two articulated lamiuæ, which, when united, form a cylindrical or conical proboscis, the base of which is protected by two scales. Although, to all appearance, apterous, the flea possesses the rudiments of wings, which are four in number, in the form of horny plates, on the sides of the meso- and meta-thoracic segments, the hindmost pair being somewhat larger than the other. Its head is small and compressed, on each side of which is a small round eye. The most singular organs of the flea are the two fine-pointed mandibles of the mouth, which, in combination with another sharp organ (supposed to represent the labrum), constitute the powerful attacking instrument of the insect, which permits it to pierce the hard skin of its victim with remarkable facility. Situated on the anterior part of the head, are two four-pointed organs, which were formerly supposed to be the antennæ, but now more correctly considered to be the maxillary

palpi. The *antennæ* are very minute, and concealed beneath a rake-like plate on the sides of the head behind the eyes. The legs are very strong, more particularly the hinder ones, which are used by the flea in its extraordinary leaps. This insect undergoes a complete metamorphosis; the larva is an elongated footless grub. On arriving at the pupa state, which occupies about twelve days, it incloses itself in a silken cover, and in a few days assumes its mature condition. Besides *Pulex irritans*, there are several other species peculiar to different animals. The dog possesses such a parasite (*P. Canis*); also the martin (*P. Hirundinis*); the mouse (*P. Musculi*); and the mole-flea, a large variety (*P. Talpæ*). A great pest of the West Indies and South America is the chegoe or jigger. (*See* CHEGOE.)

FLECHE, *flesh* (Fr. *flèche*, an arrow), a small work, so called because its outline resembles the shape of a broad arrow. It consists of two faces meeting in a point, and forming a salient angle. This defensive outwork is sometimes thrown up during a siege, to enable the besieged to pour an enfilading fire along some of the trenches of the enemy; or it is constructed in connection with the main works of any fortified place, to command any small valley or glen that might otherwise be made available by the enemy as a means of approach to the fortifications.

FLEECE. (*See* WOOL.)

FLEECE, ORDER OF THE GOLDEN, *flees* (Sax. *fleos*). —This order, one of the most distinguished in Europe, was founded in the year 1430, by Philip III., duke of Burgundy. One of its privileges conferred on the successors of Philip the title of hereditary grand master of the order; and, in consequence of this, it passed over both to the empire of Austria (on account of the inheritance of the dukedom of Burgundy) and to Spain, after the death of the celebrated Charles V. The order can be conferred both by the sovereigns of Austria and of Spain. The name evidently was derived from the classic legend of Jason and the Golden Fleece.

FLEET, *fleet* (Sax. *fiota*, *fliet*), the term applied to the different detachments, or squadrons, which form the navy of any country, which are stationed in various parts of the world, for defence, aggression, or intimidation. England has, for instance, her Channel *fleet*, her North-American *fleet*, and some others; as also have the chief naval powers. In the more extended interpretation of the term, it is also applied to any company of vessels united together, and sailing with one object, either mercantile or warlike. (For further information, *see* separate article NAVY.)

FLEET MARRIAGES were certain irregular marriages which were very prevalent in England in the latter half of the 17th and the earlier half of the 18th centuries, and were so called from being celebrated in the Fleet prison. The persons who celebrated these marriages were clergymen of the Church of England, imprisoned for debt, who, having lost all sense of propriety, were willing thus to prostitute their calling. Young ladies were compelled to marry against their wills, and young men were inveigled into marriages with the most worthless characters,—while profligates found it very convenient, as enabling them to enter into a union which they could dissolve at pleasure. The accounts of the number of marriages thus celebrated are almost incredible. Attempts were made to stop the practice by acts of parliament; but these were of no avail against persons who had nothing to lose. At length, however, this enormity was brought to a termination by 26 Geo. II. c. 33, which declared that marriages solemnized in any place other than a church or public chapel, and without due publication of the banns, or license obtained from a proper authority, were not only void, but subjected the person solemnizing them to felony, punishable by transportation for fourteen years. (*See* MARRIAGE.)

FLEET PRISON, a celebrated London prison, pulled down in 1845, and so called from being situated on the river Fleet, a rapid stream which flowed into the Thames, now covered over. This prison was in existence at least as early as the 13th century, and to it were formerly committed those who had incurred the displeasure of the Star Chamber. When that court was abolished, it became a prison for debtors, and for persons charged with contempt of the courts of Chancery, Exchequer, and Common Pleas. This prison was burned in the great fire of London, in 1666, and again during the Gordon riots, in 1780.

FLEMISH LANGUAGE AND LITERATURE, *flem'-ish* (Ger. *Flämisch* or *Vlämisch*).—The Flemish is the vernacular language of the Flemings, an ancient people who inhabit certain parts of Belgium and Holland, and who number upwards of 2,000,000. It is a form of the low German, and the Dutch of the present day is a modern offshoot of it. It is more palatal and nasal than the language of Holland, which, on the other hand, is more guttural; but the differences are not essential. So little change has taken place in this language, that the earliest monuments of its literature, an ordinance of Duke Henry I. of Brabant (1229), is perfectly intelligible in the present day. Among the more remarkable of the earliest works in this language are the *Rymbybel*, or Bible in rhyme; and the *Spiegel historicel*, the Historical Mirror, of J. Van Maerlant (born in 1235); the Civic Laws of Antwerp (1300); the Chronicle of J. Van Clere, and many others; a translation of Boethius, by Jacob Velt, of Bruges, of the 15th century; and the "Hive of the Catholic Church," by Philip Van Marnix (1569). Many French forms of speech were introduced during the Burgundian reign, and also many Du during the sway of the Hapsburgs, so that the o Flemish lost much of its purity and terseness. Hoof, Vondel, and Cats, are the three men whose names figure most prominently among the writers of the 17th century; but the 18th furnishes scarcely any name of note. Under Napoleon, every effort was made to suppress the use of this language and introduce the French; and it is only since the revolution of 1830 that the Flemish has again come to occupy its former position. Since that time numerous societies and unions have been formed, newspapers and periodicals published, and other means adopted, with a view to diffusing a knowledge and a taste for the cultivation of this language. Among the names of those who have most exerted themselves with this object, are Willems, Blommaert, Van Ryswyck, Conscience, Van de Voorde, Delecourt, Dautzenberg, Van Duyse, Snellaert, de Laet, Dedecker, David, and Bormann. The government was at first opposed to, or at least looked with coldness upon, this movement; but, latterly, it has come to recognize it and give it countenance. On the occasion of a linguistic congress at Ghent, in 1841, the members of the government, for the first time, publicly addressed the people in the Flemish language. Besides the Flemish grammars of Van Beers and Heremans, and the dictionary of Sleecx, we may mention Vandenbossche, *Nouvelle Grammaire raisonnée pour apprendre le flamand et le hollandais*, Lille, 1825; J. Desroches, *Grammaire flamande*, Antwerp, 1826; Vandenhoven, *La Langue flamande, son passé et son avenir*, Brussels, 1845; Lebrocquy, *Analogies linguistiques; du flamand dans ses rapports avec les autres idiomes d'origine teutonique*, Brussels, 1845; Desroches, *Nouveau Dictionnaire français-flamand et flamand-français*, Ghent, 1805; Olingor, *Nouveau Dictionnaire français-flamand*, Malines, 1834.—*See*, also, Sleecx on the *History and Relations of the Flemish to other Languages*.

FLESH, *flesh* (Sax. *flæc*), a compound substance, constituting a large portion of every animal; consisting of the softer solids, as distinguished from the bones and fluids. As a general appellation, it may be taken to include the blood-vessels, nerves, cellular tissue, &c. (*See* MUSCLE, TISSUE.) Chemically considered, flesh consists of fibrin in a coagulated form, permeated by at least three times its weight of water and fluid, consisting partly of blood and partly of substances secreted from it. The soluble matters consist chiefly of albumen, the soluble salts of the blood, two animal principles, called kreatine and krorite, and phosphoric, lactic, butyric, acetic, and formic acids. The salts consist of the phosphate of potash, magnesia, and lime, and a small quantity of chloride of sodium.

FLESH-FLY belongs to the general order of *Diptera* in the classification of the insect tribe, and the name by which it is distinguished in this order is *Musca vomitoria*, in contrast to the common house-fly, or *Musca domestica*. The insect is termed *flesh-fly*, from the fact of its depositing its eggs in fleshy viands, in which the

larvæ are hatched. It is generally larger than the common house-fly, and its wings indeed are sometimes nearly three-quarters of an inch in expanse. It is distinguished by a proboscis, always very apparent, membranous, and bibliate, generally bearing two palpi, and capable of being withdrawn entirely within the oral cavity: it also has a sucker of two pieces; the antennæ in a plate with lateral setæ.

FLETA, *flē'-tă*, is the name of a valuable treatise, in Latin, on the law of England, and is so called from its having been written in the Fleet prison. Nothing is known of the author; but it must have been written about the thirteenth year of the reign of Edward I. It is one of the earliest authorities on English law, and gives a complete account of it as it stood at the time the author wrote.

FLEUR-DE-LIS, *flur-de-lē'* (Fr), the heraldic term for the flower of the water-lily or yellow flag, which constituted the principal feature in the armorial bearings of the monarchs of France prior to the execution of Louis XVI. and the establishment of the first French republic. It was introduced into the arms of France about the year 1140, being first borne by Louis VII. This monarch, who had exercised regal power during the lifetime of his father, had probably adopted and worn it even prior to this date as his badge or cognizance, as the Plantagenets distinguished themselves by bearing a sprig of broom; and from this circumstance its present name may be derived, being a corruption of *fleur de Loys*, or flower of Louis. Some, however, believe it to be so called because it grew in great abundance on the banks of the Lys, a river rising in the north of France, and joining the Escaut near Ghent. It is used as an ornament of the crown of the English sovereign, and the regal insignia of many of the continental monarchs, and it forms, in Her., the mark of cadency for the sixth son.

FLEXIBILITY, *fleks-e-bil'-e-te* (Lat. *flectere*, to bend), a property which all bodies possess to a greater or less degree, which is evinced in their disposition to yield or change their form in a direction at right angles to their length, through their own weight or by means of any pressure or strain applied to them. Pieces of the same material differ from each other in the degree of flexibility they exhibit, in proportion to their length and thickness. Thus it is evident that a cylindrical bar of iron an inch in diameter and twenty feet in length will exhibit a far greater degree of flexibility than another which is only half the length, and has a diameter of two inches. This may be seen by resting the extremities of each on supports of equal height, when the long bar would become curved in form through its own weight, its centre being considerably below a chord drawn from one end of it to the other; while the thicker bar would be scarcely bent out of the straight line. Materials also exhibit a greater degree of flexibility in one condition than in another; metals, for instance, yielding far more readily to pressure when heated than when cold. A wrought-iron beam which would sustain a great weight without perceptible deflection when cold, would bend considerably under the same weight when red-hot. The great flexibility of ropes of hemp and metal renders it quite impossible to stretch them horizontally in a straight line, as may be seen in the case of a rope stretched for the performance of a tight-rope dancer. There is no material that will not exhibit flexibility in some degree, because there is no substance in nature that is perfectly rigid and inflexible; but the degree of flexibility possessed by any material is denoted by the extent to which it will bend, or by the weight which it will support without breaking. This property must not be confounded with that of elasticity: elastic bodies will return to their former shape when they have been bent or altered by pressure in any way; but bodies which possess flexibility without elasticity do not return to their original form in all cases. A straight bar of iron, though bent by its own weight only, will not exactly resume its original shape, although a rope will do so. The consideration of the deflection or flexibility of beams of wood and iron bars and girders, as well as of ropes and chains, and other materials, is an important point in the construction of buildings, bridges, and engineering works of various kinds. (*See* MATERIALS, STRENGTH OF.)

FLEXOR, *fleks'-or* (Lat. *flecto*, I bend), in Anat., is the name of certain muscles whose office it is to bend the parts into which they are inserted. The antagonistic muscles are termed extensors.

FLINT, *flint* (Ang.-Sax.), in Min., the well-known siliceous nodules and concretions occurring so abundantly in the chalk strata of England, and many other calcareous strata. Flints are composed almost entirely of silica, with traces of iron, clay, and lime. The formation of flint has long been a disputed question amongst geologists: the dialytic discoveries of Graham and Church throw great light on the matter. If a solution of silica be prepared by dialysis, and poured into a vessel containing a very minute quantity of carbonate of lime, the whole becomes rapidly pectised, assuming the gelatinous form in a few minutes. From this it will be easily seen what would happen if a lake or river, containing a notable quantity of silica in solution, were to suddenly flood a chalk plateau. Flint is of great importance as an economic product, being largely used, when calcined and ground, in the manufacture of china, porcelain, and glass. In parts of the country where flints are plentiful, it is much used as a building material, with excellent artistic effect.

FLINT GLASS. (*See* GLASS.)

FLINT IMPLEMENTS AND WEAPONS are relics of the primitive inhabitants of Europe, which have been discovered from time to time, by being accidentally turned up whilst ploughing in fields, or by the zealous search of some indefatigable antiquarian. Those which have already been discovered do not differ in the slightest respect from the rude weapons constructed of flint which are used even in the present day by the savages inhabiting portions of Asia, America, Africa, and the islands in the Indian Archipelago and the South Seas. Arrow-heads and hatchets are the forms in which the weapons are mostly discovered, and there is an unlimited variety in the shape and construction of even these. Some capital specimens can be seen by the inquiring reader in the British Museum; and amongst them must be specially noted the flint implements which were found alongside the remains of an elephant in the year 1715, in Gray's-Inn Lane, London. Not long since geological students invested these flint implements and weapons with some considerable amount of interest, as they thought that by these means the date at which the larger classes of mammalia, such as elephants, &c., ceased to exist in Europe, might be discovered. As yet (1862), however, their exertions have not met with much success, as it is nearly impossible to affix any assigned period at which these implements and weapons were commonly used. In the South of France, in Norway, and in England, these distant traces of our ancestors have been mostly discovered; and it is a fact that flint weapons were used by the Druids in England long before the invasion of the Romans.

FLOATING. (*See* SWIMMING.)

FLOATING BATTERY, *flōt'-ing bāt'-te-re* (Sax. *flotan*, to float), in nautical language, a term applied to a hulk which has been cut down and rendered as strong and shot-proof as possible, and in which are placed heavy cannon and mortars for the purpose of defending or attacking harbours and other maritime strongholds. This species of war-vessel was first used at the siege of Gibraltar, in the years 1779—1783; and it was again brought into use during the Crimean war. On account of their clumsiness, and the difficulty of navigating them, floating batteries are, however, not much in request at the present day.

FLOATING BRIDGE. (*See* FERRY-BRIDGE.)

FLOATING ISLANDS, GARDENS, AND HOUSES.—Gardens and islands, formed of patches of wood and weeds, covered with grass, flowers, and other vegetable productions, supported on the surface of the water. On the English lakes there are one or two of these natural eccentricities, and on the Ganges, in India, they are continually passing down the river, being detached from the banks by the force of the currents. On these latter, tall trees are often seen; and it presents a curious spectacle to observe these monarchs of the forest borne down by wind and tide on the bosom of the waters on some compact little island, which nature created for their especial sovereignty. In ancient mythology, the island of Delos, one of the Cyclades, was supposed to be endowed with floating powers, and to

be capable of sinking below the surface of the deep, and rising again at various intervals, in some new spot. In northern India, and on the borders of Thibet and Persia, *floating gardens* are often erected by the natives, for the purpose of raising melons, cucumbers, and other similar vegetables and plants, which require a very aqueous soil for their cultivation. These gardens, however, are of a very fragile nature, and rarely exceed a foot in depth of soil, their prime structure being composed of wickerwork, interlaced with reeds and watlings, and covered with matting, over which the earth is placed. *Floating houses* are built by the inhabitants of Bangk'ok, the capital of Siam, from motives of comfort and safety. These houses form whole streets, being anchored in rows, and are capable of being moved from one position to another at pleasure. From the depth of water, large vessels of from 200 to 300 tons burden can sail up this picturesque town, and pass alongside the houses of the inhabitants. These floating houses are made of bamboo-stems, wickerwork, and palms, with a verandah in front; and they are built on large rafts. Sir John Bowring gives a capital account of them in his sketch of Siam.

**Float-stone**, *flote'-stone*, in Min., a porous, soft, and friable mineral, consisting of silica, alumina, and carbonate of lime. From containing numerous pores, it holds a large quantity of air, and swims on water until it is saturated; hence its name.

**Flocculation**, *flok-sil-lai'-shun* (Lat. *floccultio*, from *flocous*, a lock of wool), in Med., is a term applied to the picking the bedclothes, which is sometimes observed in fever and other patients, and which is always regarded as a symptom of great danger.

**Flodden Field, Battle of**, *flod'-den*, was for the Scots one of the most disastrous encounters that ever took place between them and their southern foes. James IV. of Scotland, a warlike but rash king, crossed the Tweed at the head of a large army, on 22nd August, 1513. Henry VIII. was at the time in France; and the defence of the country fell to the earl of Surrey, who as quickly as possible assembled an armed force to meet the Scotch king. James, instead of at once taking decisive steps, lingered near the border, until, by desertion, his army was reduced to 30,000 men. On the 6th of September he encamped on Flodden, the last of the Cheviot hills, in Northumberland; and on the morning of the 9th, Surrey, by a skilful movement, took up a position between the Scotch and their own country. The battle commenced about 4 o'clock in the afternoon of the same day. The Scotch left wing, under the command of the earls of Huntly and Home, speedily put to flight the English right wing; but the Highlanders on the right wing were unable to stand against the severe execution of the English archers; they rushed upon them in disorder, and were soon forced to flee. Meanwhile, the battle was raging with great fury between the two centres. James, surrounded by his nobles, charged upon Surrey with such force as to penetrate within a few yards of the royal standard, when he was at length cut down, and all his followers perished with their king. The loss of the Scots was about 10,000, including the flower of the nobility; while the loss of the English was only about 7,000, and mostly men of inferior note. "Scarce a family of eminence," says Scott, "but had an ancestor killed at Flodden; and there is no province of Scotland, even at this day, where the battle is mentioned without a sensation of terror and sorrow." The last canto of Scott's "Marmion" contains an accurate and animated description of the battle of Flodden.

**Flogging**, *flog'-ging* (Ang.-Sax.), a term generally used instead of the more correct appellation of corporal punishment. Flogging is a degrading system, which has exploded from our code of punishments (except in cases of boys or youths convicted of misdemeanor), and it is only kept up in the army and navy; in both of which services, however, it has but a very feeble footing. Until within the last few years, the punishment of flogging, usually administered with "a cato'-nine-tails," used to be one of the most horrible features in our service; but it is now, happily, nearly banished. Except in the most extreme cases, it is seldom resorted to, and a man has every chance of avoiding it, being obliged to repeat the same offence, which must be disgraceful, twice before being liable to the "cat." In the middle ages, flogging used to be one of the most favourite methods of punishment, and criminals were often whipped through the town or towns on conviction of the most trifling offence.

**Flood.** (*See* Deluge.)

**Floor-cloth**, *flore kloth* (Sax. *flor*, floor), strong canvas woven from yarns made of hemp and flax combined, the surface of which is coated with paint, in order to render it a stout, solid, and durable covering for the floors of passages, entrance-halls, staircases, &c. The canvas used for this purpose is made in pieces about 100 yards long, and varying from 18 to 24 feet in width. This is done to obviate the necessity of joining narrow slips of canvas to form wider pieces, in which the seams would produce an unsightly appearance, and be attended with inconvenience when laid down, on account of the extra thickness of the floor-cloth in those parts where the lengths had been sewn together. For narrow floor-cloths for stairs and passages, the broad webs are cut to the width required. The following is the process used in the manufacture of this material:—The canvas is first cut into pieces of the required length and breadth, and the edges are fastened to the four sides of a large frame, which are then drawn apart by machinery, to stretch the canvas as tightly as possible, somewhat in the manner adopted in straining canvas for Berlin-wool work. The position of the frame is vertical, the height being equal to the width of the canvas: when this exceeds six or eight feet, the upper part is reached by means of light scaffolds or stages, which the workmen can move from one end of the piece to the other throughout the entire length, whenever occasion may require it during the process of painting. The canvas is then in a proper condition for the reception of the size and paint, which is laid on to render it fit to undergo the final process of printing. It is first coated with strong size on both sides, and while this is still damp, the canvas is rubbed all over with pumice-stone, to render it smooth and even. When the size is dry, the canvas receives two coats of paint on each side. The first coat is very thick, being more like mortar than paint; it is laid on in lumps and patches, and smoothed all over the web with a broad flat trowel, in a manner resembling that in which plaster is laid on a wall. When this is thoroughly dry, the surface is again rubbed with pumice-stone, and a second coat of thinner paint is laid on with a brush. The under side of the canvas requires nothing more to be done to it after this, but the upper side receives two or three more coats of thin paint, being rubbed with pumice-stone after each coat has been laid on, in order to produce a smooth surface to receive the printed pattern. The canvas is now removed from the frame and wound round a roller, from which it is allowed to pass over a flat table, to receive the impression of the blocks. Formerly the patterns were stencilled, as the walls of rooms were before paper-hangings were introduced; that is to say, they were produced by putting colouring matter on the surface, through holes and lines punched in a sheet of tin or pasteboard, so as to form the design required; but now the printing is effected by blocks, a separate block being required for every colour introduced into the pattern. The blocks are about fifteen inches square, and are made of deal, faced with wood of a fine close grain, with a handle at the back; that part of the pattern which each block is required to imprint on the canvas is left on its surface in relief, the remaining part being cut away, as in a wood-engraving. The surface of the projecting portion of each block is further cut into small squares, technically called teeth, by narrow grooves crossing each other at right angles. This is done to effect an equal distribution of the paint, as if the surface of the projecting part of the blocks were left smooth and even, it would take up the colouring matter unevenly, and transfer it to the floor-cloth in irregular patches. The impression is effected by applying the surface of the block to a pad or cushion charged with the colour required; after which it is transferred to the floor-cloth by means of the handle at the back, and pressed forcibly upon it. It is then removed, charged again with colour, and pressed on the canvas close by the side of the first impression, points being placed at the corners of the blocks to insure the regularity of the joining of the pattern. This process is repeated until the whole of the floor-cloth has been covered with that part of the

pattern which is imprinted by the first block that is used, after which the blocks intended to convey the remaining colours to its surface are used in a similar manner, until the pattern is complete. It must then be allowed to dry, care being taken to give the colouring matter sufficient time to harden thoroughly before the floor-cloth is taken into use. The borders along the sides of narrow pieces of floor-cloth intended for passages, are produced in the same manner, by blocks of the necessary width, similarly prepared for the purpose. It should be stated that worn-out Brussels carpets afford a good foundation for floor-cloth, and may be converted into that material at any floor-cloth manufactory. A cheap and durable covering may be made at home for passages, and even for rooms, by a method suggested by Mr. Loudon, in his "Encyclopædia of Cottage and Villa Architecture." For the former, a single length of strong unbleached calico will be required for the ground-work or foundation of the material; but for the latter, the lengths of calico must be joined together, until a piece has been produced of sufficient breadth to cover the room for which it is required. New calico, however, is not absolutely requisite, as any pieces of calico or linen that are useless for any other purpose will do quite as well for the basis of the floor-cloth, after they have been neatly joined together. The calico must first be stretched on the floor by tacks, or by pasting down the edges to the boards, after which it must be covered with two or three coats of stout waste paper or newspaper, pasted together with a strong paste, to which a little alum has been added while boiling. Over this a layer of paper used for the walls of rooms must be pasted, which may be laid on in lengths, or formed of separate pieces put together, to furnish a design suggested by the taste of the maker. When dry, the floor-cloth must be first painted over with a coat of strong size, next with two coats of boiled linseed oil, and lastly with copal varnish. Floor-cloths made in this manner are strong and inexpensive, and may be washed as well as those that have been made in the ordinary way. A cheap kind of floor-cloth has been lately introduced for the protection of carpets and stair carpets, somewhat similar to oil-baize, or oil-cloth for table-covers. It is made on a foundation of thin calico, and thinly coated with paint on one side only, after which the pattern is imprinted in the usual way, or by rollers.

**Floors, Flooring,** *flores, flore'-ing,* the name given to the stages or platforms which separate the successive stories of a building, from which the stories themselves are generally named in their order; as ground-floor, first-floor, second-floor, &c. In the large and lofty houses that are to be seen in Edinburgh, which are copied from those of continental cities, the floors are termed flats, and are let out to the tenants as complete and separate dwellings. The entire platform which separates any room from another, above or below it, consists of three distinct portions,—the joists, the flooring of the room above, and the ceiling of the room below. The joists are narrow beams of timber about 2½ inches in thickness, and varying in depth according to the extent of span from wall to wall. As the walls of the successive stories are raised to the proper height, the joists are laid across about fifteen or eighteen inches apart, and the ends are imbedded in the masonry. In building a row of houses, care should be taken to keep nine inches at least of masonry between the ends of the joists bridging the space from party-wall to party-wall, to prevent them from communicating the flames from one house to another by reason of their contiguity, should a fire break out in any one of them. To give greater stiffness and steadiness to the joists, they are often connected by short cross-struts of timber nailed transversely to the sides of the joists and across each other in the form of the latter X, at intervals of two or three feet. The ceiling is made by nailing laths across the bottom of the joists and covering them with two or three coatings of plaster. (*See* Plastering.) The flooring consists of red or yellow deal planks about nine or eleven inches in width. The boards are laid transversely on the joists, and secured to them by long floor-brads, after having been pressed tightly together by the action of a screw that can be attached to the joists in the position required, and at any part, like a vice, during the process of laying down and nailing the boards. When a very close floor is required, the planks are generally joined together by means of a groove and tongue. (*See* Joinery.) The thickness of the boards varies from one to 1¼ inch. After the planks have been nailed to the joists, the brads are driven below the surface with a punch, and the edges of the boards are planed, that any inequalities may be removed and the whole extent of flooring rendered perfectly level. The kind of floor that has just been described is termed a single-joisted floor, and is that which is usually found in buildings of an ordinary character, where the span from wall to wall does not exceed twenty-four or twenty-five feet. In small houses, the joists over a span of this extent are often rendered more steady by allowing them to bear on the framed partition between rooms below them, or on the semi-partitions on either side of folding-doors. When the span exceeds this length, and the platforms are intended to support any great weight, as in a concert-room, assembly-rooms, or warehouse, framed floors are adopted, in which girders are introduced, which are generally of wrought iron, on account of the flexibility and elasticity of this material, and by which the great strain of the weight above is divided and sustained. These girders are connected by binding-joists, and bridging-joists are attached to them above, on which the flooring is laid, and ceiling-joists below, to carry the ceiling of the room or rooms beneath. Fireproof floors may be made by filling a framework, peculiarly constructed for the purpose, with concrete or cement, on which tiles may be laid to form the flooring, or joists of timber, on which planks may be laid down and nailed in the ordinary way.

Floral Envelopes. (*See* Flower.)

**Floralia,** *flo-ral'-e-ă* (Lat.), a festival which, in ancient Rome, used to be celebrated in honour of Flora, the goddess of flowers. These *ludi florales*, according to Pliny, were instituted, by order of an oracle of the Sibyls, on the 28th April, 238 B.C., and, after having been discontinued, were re-established in 173 B.C. They were principally celebrated during the night-time in the patrician quarter; but some authorities allege that they were held in a circus erected on the hill Hortulorum.

Floriculture. (*See* Horticulture.)

**Floridæ,** *flor'-i-de* (Lat. *floridus*, flowery), in Bot., a term applied by some writers to the sub-class *Petaloideæ* (which *see*).

Florid English. (*See* Perpendicular English.)

**Florin,** *flor'-in* (Fr.), a name now applied to a two-shilling piece in England, but which was formerly a gold coin, circulated in Italy during the 13th century. Its name is supposed to be derived from the fact of its being struck at Florence, or from a flower (lily) being imprinted on its reverse. A coin of Austria and Germany is also called a *florin;* but it is not of the standard of the English one, as its value varies from two shillings to one-and-eightpence.

**Florinians,** *flor-in'-yans,* a sect of Gnostics of the 2nd century, who were so called after Florinus, a Romish priest, and who inclined to the views of the Valentinians. They maintained that light and darkness were two eternal principles, from which, respectively, all the good and evil in the universe had proceeded. (*See* Gnosticism.)

**Flotilla,** *flo-til'-là* (Sp.), signifies, properly, a little fleet; and though sometimes used in this sense, it is more frequently applied to a fleet of whatever size, composed only of small vessels. In this latter sense, the term was applied to that immense naval armament with which Napoleon meditated the invasion of Britain.

**Flotsam,** *flot'-sam* (floating), is a law term, generally used in connection with the equally uncouth and barbarous terms *jetsam* and *ligan*, and applied to the goods of a vessel wrecked at sea. Flotsam is applied to such of the goods as continue floating on the surface of the waves; jetsam is where they are cast into the sea, and there sink and remain under water; and ligan is where they are sunk in the sea, but tied to a cask or buoy in order to be found again. If no owner appears to claim them within a year and a day, they belong to the crown, and are regarded as derelicts. From legal wreck, that by a royal grant of wrecks, things flotsam, jetsam, and ligan will not pass.

FLOUNDER, *flown'-der* (Swed. *flundra*) (*Pleuronectes flexus*), a flat fish very similar to the plaice, but smaller, and of more obscure colour. It is very common about the British coast, and is found in the Northern, Baltic, and Mediterranean seas. Its body is covered with very small scales, and along its back runs a row of sharp spines.



FLOUNDERS.

FLOUR, *flowr* (originally *flower*, Fr. *fleur*), the finely-ground meal of wheat, and of any other corn or *cerealia* which has been reduced to powder in a mill. (*See* FLOUR-MILLS.) The component parts of *flour* are starch, gluten, sugar, gum, bran, and water, the prime element being starch. No substance is more adulterated than wheat-flour; and there are several modes of detection, the best of which is the specific-gravity test, as a vessel which contains one pound of wheat flour will contain nearly a pound and a half of any other. Some chemical tests are also extremely good. Firstly, nitric acid, which has the effect of colouring wheat-flour of a fine orange-yellow, while it does not affect the colour of fecula or starch; secondly, muriatic acid colours *bond fide* wheat-flour of a deep violet, but dissolves fecula and starch into a light viscous fluid, which is decomposable by the admixture of any alkali. Another test is the amount of ash left after the sample being burnt. Wheat-flour yields on the average 0·8 per cent.; rye-flour, 1·0; bean- and pea-meal, 3; and linseed-meal, 10 per cent. of ash, by which means adulteration can be detected.—*Ref.* Ure's *Dictionary*.

FLOUR-MILLS, mills used for the purpose of grinding flour. Before the invention of the steam-engine, the windmill was principally used for this purpose. (*See* the article on WINDMILL for the details of its mechanism.) In modern times, great improvements have been made in the machinery employed in grinding flour. In the ordinary method there are two circular stones used, each being about 4½ feet in diameter. They are in the form of flat discs, the lower one being fixed in a level position, while the upper one revolves horizontally on a vertical axis, with a speed of 100 to 120 revolutions per minute. Millstones are made of various substances; but those in general use for grinding wheat are made of a very hard silicious stone imported from France, the technical name for which is *burr* or *buhr*. This stone is so porous that it sometimes requires to be filled up in parts with a composition of alum and grit; and yet it is so hard that a pair of stones in full work will last for twenty or thirty years. The surfaces of the stones are channelled or grooved. On account of the friction and the velocity of the upper stone, much heat is generated in grinding; and the flour thus produced is overground, and apt to clog into lumps. In order to avoid this, many plans have been invented of late years. Among these may be mentioned that of Bovill, in which two ranges of millstones are driven by one central shaft. It is distinguished by an arrangement by which the meal or flour is dried by means of steam and hot air,—a method by which the manufactured flour, often in too dry a state after grinding, is moistened by steam; an arrangement for washing grain and then drying by means of hot air; and lastly a contrivance by which the passage of the ground flour is facilitated. In Westrupp's conical mill there is a conical revolving stone beneath the upper stone, which is fixed. The upper stone is a hollow cone, and the lower stone fits into it. This kind of flour-mill grinds the wheat more completely than an ordinary mill, as the flour comes away from the stones more easily, and leaves less farina in the bran. In Schiele's mill a concave revolving surface rubs against a convex fixed surface. This is done in order to avoid the friction which results from the contact of conical surfaces. Besides those mentioned, there have been improvements introduced into the mechanism of flour-mills by Corsoran, Gordon, Taylor, Pinel, M'Lellan, Banks, Goodier, Spiller, Valoi, Seeley, Harwood, White, and others. During the Crimean war, an important experiment was made by the English government. Two steamboats were despatched, one fitted up with apparatus for the purpose of grinding flour, and the other for baking. The mill was found to be capable of grinding twenty bushels of flour per hour, even when the vessel was going at the rate of seven or eight knots an hour. When the steamers arrived at Balaclava, the mill was able to grind 24,000 lbs. of flour per day. Flour-mills have recently been made on a very extensive scale. In one mill near Blackfriars Bridge there are upwards of thirty pairs of millstones.

FLOWER, *flow'-er* (Fr. *fleur*), in Bot., that portion of a plant which is formed by the union of all the organs which contribute to the formation of the seed. In common language, the word is used to convey the idea of the portion in which the gayest colours are found. A complete flower consists of the essential organs of reproduction, inclosed in two particular envelopes which protect them. These essential organs are called the *pistil* and *stamens*. The floral envelopes are termed *calyx* and *corolla*. The extremity of the peduncle, or pedicel upon which the parts of the flower are placed, is called the *thalamus* or *receptacle*. (*See* the italicised words.)

FLOWERING PLANTS. (*See* PHANEROGAMIA.)

FLOWERLESS PLANTS. (*See* CRYPTOGAMIA.)

FLOWERS, ARTIFICIAL. (*See* ARTIFICIAL FLOWERS.)

FLOWERS, COLOURING MATTERS OF.—Fremy and Cloez consider that the colouring matters of flowers may be divided into *cyanine*, or blue, which, with different portions of acid, forms purples and reds, and yellow, or *xanthine*, which, with alkaline juices, gives different shades of yellow and brown.

FLOWERS, LANGUAGE OF. (*See* LANGUAGE OF FLOWERS.)

FLUE, *flu* (probably from Lat. *fumus*), a narrow passage in the wall of a house, running from the bottom to the top, and constructed to carry off the smoke that arises from burning any kind of fuel in a grate or stove. The expression may be considered as being almost synonymous with the term chimney, although it is more particularly applied to that part of the passage which is between the gathering or funnel of the chimney (*see* FIREPLACE), at the base, and the upper extremity of the chimney-shaft, which generally rises for some distance above the roof. The part in which a junction is formed between the gathering and the flue is called the throat of the latter. When a number of flues are built close together in a party-wall between two houses, or in the gable-ends of a single house, the wall itself is called a stack, or chimney-stack; and that part of it which rises above the roof is called the chimney-shaft. The walls which separate flues built side by side in a stack are called withs, the walls which form their front and back being named the breast and back respectively. The horizontal section of a flue is generally oval or circular in form when the wall is built of stone, and rectangular when it is of brick. When flues are built side by side in the party-wall of two houses consisting of three or more stories, that which rises from each fireplace is constructed to pass upwards through the wall on one side of the flue which is connected with the fireplace in the room immediately above. Chimneys in party-walls, consequently, assume a winding form; but all turns in a chimney should be gradually curved, care being taken to avoid angles, which afford convenient places for the accumulation of soot, and impede the free passage of the sweeping-machine through the flue. In addition to this, angular turnings in flues frequently lessen the free draught of air that is necessary to carry off the smoke of the burning fuel below, and thus offer an obstruction to its ascent which cannot be readily removed. The cause of the ascent of smoke in a chimney is simply this:—the fire burning in the grate heats the air in the flue, and causes it to become much lighter than the cooler air that fills the apartment with which the chimney communicates; the cooler air being heavier than the heated air which has been rarefied and expanded by the warmth of the fire, rushes into the fireplace and forces it upwards; this becomes heated in its turn, and is displaced by a rush of cooler air; and

this process being continually and rapidly repeated, an upward current of air is produced, which carries off the smoke and vapour arising from the combustion of the fuel below. To prevent a chimney from smoking, it is necessary to let the flue be as high and as straight as it possibly can be; since the draught will be greater in proportion to the height of the chimney and the absence of all interior obstructions in the shape of elbows or angular turnings. In the next place, the opening of the fireplace and the throat of the chimney should be as small as they conveniently can be, that the greater part of the ascending air may pass through the fire prior to its ascent, and that the contraction of the chimney may cause it to rush through the narrow vent formed for its escape with greater force. The expediency of reducing the opening of the fireplace as far as appearance will admit, may be shown by holding a newspaper before the orifice above the cavity which contains the fire. This will cause the fire to "draw up" instantaneously, and break into a blaze; an effect which is produced solely by lessening the opening by which air is admitted into the chimney, and thereby causing the air itself to pass through the fire before it makes its way into the flue. If a chimney be constructed under the conditions above mentioned, it will very rarely be found to smoke; and even smoky chimneys may be cured by having recourse to these precautions, and by removing any obstacle that may exist in the interior to the free passage of the air and smoke. Even downward currents of air, which frequently cause a chimney to smoke when it is surrounded by buildings as high or higher than itself, may be prevented from causing any serious annoyance by the adoption of these means. To prevent the entrance of sudden gusts and eddies of wind, the chimney-pots, which are almost always placed on the chimney-shafts to contract the space through which the smoke escapes into the open air, are generally surmounted with a revolving cap or cowl made of metal, which is constructed in such a manner that it is turned by the wind like a vane, and constantly presents the orifice through which the smoke issues to that quarter which happens to be exactly opposite to the point from which the wind is blowing.—*Ref.* Count Rumford's *Essays, Political, Economical, and Philosophical.*

FLUID, *flu'-id* (Lat. *fluidus*, from *fluo*, I flow), is defined to be that whose component parts or particles yield to the slightest pressure, and are moved or disseminated amongst each other without any apparent sensible resistance. Some writers on scientific subjects distinguish between fluids and liquids. All liquids are fluids; but it does not necessarily follow that all fluids are liquids; for air, ether, mercury, water, and alcohol, are all fluids; but water and alcohol are also liquids, because they wet, or create moisture on bodies, which mercury and air do not do. Fluids are of two distinctive kinds,—elastic and non-elastic; the former are comprised under the general term Pneumatics, and include all airs and gases; while the latter, which only include water and other aqueous fluids, are comprised under the general head of Hydrostatics and Hydraulics. The terms *elastic* and *non-elastic* are only used here in a relative sense, and not absolutely, as all fluids are elastic more or less, water being compressible, although offering resistance.

FLUORESCENT RAYS, *flu-o-res'-ent raiz*, certain rays which exist beyond the blue end of the spectrum, invisible under certain circumstances. If the prismatic spectrum be interrupted by a bath of cæsulin or sulphate of quinine, it will appear to be elongated at the blue end. The fluorescent rays are those which have the greatest actinic influence.

FLUORIC ACID, *flu-or'-ik*. (*See* HYDROFLUORIC ACID.)

FLUORINE, *flu'-o-rine* (in Chem.), symbol F, equivalent 19, supposed density 1·31, combining volume 2. Many unsuccessful attempts have been made to isolate this body. Several chemists have succeeded in obtaining an impure form of it by using vessels of fluor spar, but its properties have never been satisfactorily determined. Its compounds, however, so closely resemble those of chlorine, that but little doubt is entertained as to its being very similar to that body in its leading characteristics. Its principal compounds are fluoride of calcium, or fluor spar, and hydrofluoric acid (which *see*). It also combines with most of the metals; also with boron, silicon, sulphur, chlorine, and phosphorus. It exhibits no tendency to unite with oxygen. It is found somewhat sparingly in the mineral kingdom, in fluor spar, apatite, topaz, and a few other minerals. It also exists in the ashes of sea-plants, in sea-water, and in blood, milk, and the human teeth. With boron and silicon it forms two compounds, which are absorbed by water, giving rise, respectively, to fluoboric and fluosilicic acids.

FLUOR SPAR, *flu'-or spar*, is a mineral of great beauty, found in different parts of the world, but principally at Castleton, in Derbyshire, and Alston Moor, in Cumberland. It occurs in cubes and octahedra and concretionary masses, being most commonly of a violet-blue colour, but also yellow, green, purplish-red, and red. In its rougher forms it is often used as a flux, and the finer specimens are fashioned into cups and vases, under the name of Derbyshire spar. It consists, chemically, of fluoride of calcium.

FLUTE, *flute* (Fr.), a popular musical instrument, the use of which, under various forms, may be traced to the most remote ages. Of its origin no direct account can be given: by the ancient poets, its invention was ascribed to gods and goddesses. Lucretius tells us that it derived its origin "from the breathing of the western winds over certain reeds." The sounds thus produced, he imagines, gave rise to the rural pipe, which, after undergoing many changes, has, by the ingenuity of later ages, been developed into one of the most elegant and fascinating instruments of which musical science can boast. In its primitive state, the flute was played like the modern flageolet, with a mouth-piece at the upper end; and from the shape of this mouth-piece, which resembled the beak of a bird, it received the name of *flute à bec*. In this form, with slight alterations, it continued until the beginning of the last century, when it was gradually superseded by the *flauto traverso*, or transverse flute, so called from its being blown at the side, and consequently held in a horizontal position. At its introduction, this instrument was about eighteen inches in length, and had but one key: even in this state it was a great improvement on the old *flute à bec*. Shortly after, a movable head-joint was invented, its length being increased, and more keys added; some flutes at the present time having more than a dozen keys, and few less than six. By means of these, they are enabled to execute any music, however chromatic, if within their compass, which extends from C below the treble to C in altissimo. Some few will go four notes lower, and an experienced player will reach E flat in altissimo. In December, 1832, a flute of an entirely new construction was invented by Mr. Boehm of Munich: it however remained in obscurity until 1837, when it was adopted and introduced to the French professors by Mr. Camus; but they considered its adoption would be attended with too much trouble, in consequence of its having an *open* G sharp key. This, however, was soon after remedied by Mr. Dorus, who put a *shut* G sharp key in its place. It now became universally adopted, and having, in its altered state, received the approval of the Royal Academy of Fine Arts in Paris, has been thoroughly established in France ever since. This instrument was first introduced to English players in 1841 by Mr. Clinton, who claims for it the following advantages: "perfection of tone," because every aperture is in its proper and natural position; "equality of tone," because the holes are equal in size and distance; "superior quality of tone," because the bore of the instrument is not sacrificed to a false arrangement and size of the finger-holes; and "greater susceptibility of sweetness," because every note is enlarged to the most available extent consistent with purity of sound. In the International Exhibition for 1862, Messrs. Clinton & Co. exhibited a curious collection of flutes, showing the progress made in the manufacture of this instrument from the earliest times; they also exhibited an improved eight-keyed flute of their own construction, with new key mechanism, designed for tropical climates; as well as one which is termed the *equi-sonant* flute, *&c.*

FLUX, *fluks* (Lat. *fluxus*, from *fluo*, I flow), in Med., is applied to any preternatural fluid evacuation from the body, but more especially to those that proceed

from the bowels. It is frequently applied to diarrhœa and dysentery was long known as the bloody flux. (*See* DIARRHŒA, DYSENTERY.)

FLUXES, *fluks'-ez*, in Chem.—Fluxes are those compounds which are used by the chemist either as aids to the fusion of bodies, or as reducing or oxidizing agents. Fluxes may be divided into four classes,—*reducing*, *oxidizing*, *double decomposing*, and *simple fluxes*. The most important reducing fluxes are the carbonates of soda and potash, used alone or mixed with charcoal; cyanide of potassium, and black flux, a compound formed by throwing into a red-hot crucible a mixture of two parts of cream of tartar and one of water. The nitrates of potash and soda are the principal oxidizing fluxes, and a mixture of three parts carbonate of soda and four of carbonate of potash forms an excellent double decomposing flux. The simple fluxes act as purifying agents, removing and dissolving any mechanical impurity contained in the substance acted upon. Borax, microcosmic salt, and powdered glass, are used as simple fluxes. The limestone used in iron-smelting is a good example of a flux.

FLUXIONS, *fluk'-shuns* (from Lat. *fluo*, I flow).—The more common appellation by which the theory of fluxions is known to the general reader or mathematical student, are the differential or integral calculus. The calculus of fluxions, which is one of the most important additions ever made to the abstract mathematical sciences, was invented about the middle of the 17th century. By the use of fluxions as an instrument of analysis, the science of geometry has been greatly enlarged; it has further rendered most efficient and incalculable aid in the investigation of the guiding principles of nature, more especially in establishing true theories of the definite motions of the stars and other heavenly bodies: astronomy without this theory would never have attained its present high position in the scale of human knowledge. In the beginning of the 17th century, the writings of Archimedes, and the works of the ancients on abstract science, greatly engaged the attention of the principal students of mathematics; the result was, that they thoroughly laid open the principles of Archimedes, which far surpassed those of the other ancient writers on this subject. The celebrated Kepler greatly extended the theory propounded by the ancient philosopher, and the *idea* of fluxions became apparent, as Archimedes' theorems were of too limited a description to satisfy so bold an investigator. The theory of fluxions, or calculation of the velocity in uniform or variable motion, necessarily depends on that higher system of trigonometry which treats on drawing tangents to curves. The facility which this new notion of velocity gave to the extension of geometry, induced various foreign mathematicians, as Descartes, Roberval, and Fermat, to employ it in their researches. So very near did the last-mentioned approach to the true theory of the fluxional or differential calculus, that Laplace says he ought to be reputed its inventor. To find the real discoverer, however, we must look to two men, Newton and Leibnitz, who both claim the honour of its invention. The candidateship for that honour led to such a fierce discussion, that one need not be surprised at the high position which mathematical discoveries take; but from all the contingent circumstances of the case, and from Newton having promulgated and published his method the first, which he did in the year 1665, we will not err in laying the authorship of this system to him. The principles of Newton's theory may be thus described:—1. Supposing two quantities to have a given relation to each other (for example, the one to be always equal to the square of the other), find the rate of increase of one of them at any instant of time to be known; to find the rate of increase of the other at the same instant. These rates of increase were called the *fluxions* of its quantities; and the rules for their determination constituted the *direct method of fluxions*, or *differential calculus*. 2. The second part of this theory was exactly the reverse of the first; it is a problem in which the relations between the rates of increase of two quantities, which depended the one on the other, being given, it was required to discover the relation of the quantities. This was the inverse method, or *integral calculus*. In the application of algebra to the theory of curves, or curve lines, some of the quantities under consideration are conceived as having always the same magnitude; as, for instance, the parameter of a parabola, and the axis of an ellipse or hyperbola; others again are indefinite in respect of magnitude, and may have any number of particular values; such are the co-ordinates at any point in a curve. This difference in the nature of the quantities has equally place in various theories of pure and mixed mathematics, and it naturally suggests the division of all quantities into two kinds; namely, such as are *constant* and such as are *variable*. A constant quantity always retains its same value, while a variable quantity varies its magnitude and value. These definitions have to be well remembered in working out the theories of the calculus of fluxions. According to Newton's theory, a plane, curve, or line, may be conceived as generated by a point moving uniformly in the direction of some fixed line, and having at the same time a lateral motion with respect to this line, which is governed by some law dependent upon the nature of the curve generated. The part of the curve which is generated at any instant of time is called the *fluent*, and that infinitely small element generated during the next infinitely small and *constant* period of time is called its *fluxion*. If, in addition to the two motions already explained, we conceive the point to have a third motion at right angles to the plane of the other two, and also regulated by a law which must depend upon the nature of the curve, the generating point will describe a curve in space, which may be either a plane-curve, or one of double curvature. It may be thus easily surmised that by suitably regulating the laws of motion of the generating point, any curve whatever may be described; it is also obvious from the theorem laid down, that, by the law of relation between the fluxions of the elements, the nature of the curve may be easily discovered. In the general deductions of mathematical science, if we suppose any line, which may vary according to some law, to move according to any fixed law, it will generate a surface, and the portion generated during any infinitely small portion of time will be the fluxion of the surface, while the whole portion generated will be the fluent. In a consequent manner, if a plain area move in any direction, the area being supposed to vary by a fixed law, then will the infinitely small volume generated in an infinitely small portion of time be the fluxion of the solid, and the portion generated will be the fluent. In this system, any magnitude may be regarded as flowing ultimately from a point; a point in its motion may generate any line; a line in its motion may be made to generate any surface; and, lastly, a surface may generate any volume. It may be well said that the system of fluents and fluxions developed great credit on its inventor, as it is exceedingly ingenious, and has no superior in conveying an idea of the operations of calculus. The methods of integral and differential calculus, however, which are less complex and more trustworthy, have now superseded them, although they are still employed in working out some problems. The notation of fluxions has been found to be their drawback, and this is the main superiority of differentials and integrals over them. In conclusion, it may be stated, that the great facility which the theory of infinitesimals in fluxions gives to the applications of the calculus in the higher branches of geometry, and more especially to the doctrines of physics, is a high recommendation in its favour, and will be one of the strongest reasons for including the system of fluxions in the ranks of working mathematical theorems.

FLY, *fli* (Sax. *fleoge*), a name applied almost indiscriminately to all insects possessing wings; by many, however, restricted to the various species of dipterous insects. The fly is characterised as possessing a pair of veined and membranous wings, with two movable bodies called balancers (*halteres*), placed a little behind them. The mouth is formed of between two and six setaceous pieces of scaly texture, and these pieces are either inclosed in a proboscis-like sheath, or covered by one or two *laminæ*, which form it. The head is globular or hemispherical. The mouth is only formed for transmitting fluids, and is consequently very delicate in structure. The sucker performs the part of a lancet, and pierces the envelope of vegetable or animal fluids, in order to allow of the fluid itself being transmitted up into the mouth of the insect. The antennæ

are united in front, and are approximate at the base. Above the true wings of the insect, and a little behind them, are the balancers, or *halteres*: these are slender membranous, and are furnished with two little knobs at their extremities, which are capable of dilation. The legs of this class of insects are long and slender; and the feet, it is well known, are furnished with skinny palms, to enable them to stick on glass and other smooth bodies by means of the pressure of the atmosphere.

FLY-CATCHERS, *fli-kitch'-ers* (*Muscicapidæ*).—This very numerous family is widely diffused throughout both the eastern and western continents. As their name implies, they prey on insects, which they seize in mid-air. They have the beak horizontally depressed, and armed with bristles at its base, with the point more or less decurved and emarginated. The value of the insectivorous family of birds to man is incalculable. As Buffon truly says, "Vain would be the efforts of man to destroy or banish the clouds of flying insects by which he would be assailed. Man and quadrupeds cannot defend themselves against them. They attack with their stings; they oppose the progress of cultivation, and devour the useful productions of the earth. They infect with their excrement, or their eggs, all the provisions which are necessary to be preserved. Thus we find that the beneficent birds are not even sufficiently numerous in such climates, where, nevertheless, their species are by far the most multiplied." One of the best types of fly-catchers is that presented by the tyrant fly-catcher (*Muscicapa Tyrannus*, Briss.). This bird is peculiar to America. It is eight inches in length, and fourteen in extent of wing. The general colour of the upper parts is dark bluish-grey, inclining to dull slate-black on the head, of which the central feathers along the crown form a gorgeous orange patch. It builds its nest on branches of trees; it is a rather bulky structure, composed of twigs and wool, or tow and cotton, and is very thick and snug. It scarcely deserves its ugly appellation, as it is only at those periods when its mate is attached to the nest by care for her little brood, that this fly-catcher is more fierce or tyrannical than any other. At such times, however, it cannot be denied that his conduct is rather outrageous. No matter the species of bird, no matter its size or strength, it is sufficient that it approaches any way near the tyrant's nest to excite his jealous rage, and out he sallies bent on instant satisfaction. It is said that eagles and hawks may not with impunity approach this bird's nest, made sacred by his fledglings, and that, darting up into the air, it will launch down on to the back of its enemy, and there anchor in such a way as to make it a difficult matter to dislodge him. Only two small species of this tribe are found in this country. The European species are distinguished from any other by having much more slender bills, with shorter bristles at the gape.

FLY, DRAGON. (*See* DRAGON-FLY.)

FLYING, *fli'-ing* (Sax. *flogan*, to fly), the power which many animals possess of raising themselves in the air, and in moving through it in various directions, supported by the atmosphere alone. (*See* WING.)

FLYING, ARTIFICIAL, a species of propulsion through the air by means of mechanical or artificial contrivances, often attempted by man. The art of flying, if it can be called an art, has been often attempted: even amongst the ancients it was tried, and, we are informed, succeeded to some slight extent. Friar Bacon affirms, in his writings, that this art is not only possible, but he also informs us that he himself knew how to construct a machine in which a man, in a sitting position, might be able to transport himself through the air like one of the feathered tribe. This secret of Friar Bacon consisted of a very simple mechanical contrivance: it was a pair of globes made of hollow copper, exhausted of air, on which a chair could be supported, by which means a man could float in the atmosphere above the earth, and could buoy himself along. Another friar asserts the truth of this invention, or, at least, of one similar. Father Francisco Lana declares that a round vessel of plate-brass, fourteen feet in diameter, weighing three ounces per square foot, will only weigh 1,948 oz.; whereas a quantity of common air of the same bulk will weigh 1,155½ oz.; consequently, he deduces the fact that the globe without only be sustained in the air, but that it will be capable of supporting a weight of 792½ oz. and, also, that a globe of the same weight, but greater in capacity, would support a man. This reasoning is a fallacy; for, from the fact of nature abhorring a vacuum, the globe would be crushed in by the pressure of the atmosphere. At many periods this subject has been taken up by philosophers, particularly in the reign of Charles II.; and it has been asserted that, at no distant period, by the march of improvement, flying in the air will be made as easy as walking on the earth. The truth of this assertion is, however, much to be questioned.

FLYING DRAGON. (*See* DRAGON.)

FLYING-FISH (*Exocætus*), a gen. of fishes that, on account of the extraordinary length and size of their pectoral fins, are enabled to spring from the water and support a kind of temporary flight through the air. Their distinguishing features are—pectoral fins nearly equal to the body in length; head flattened above and on the sides; the lower part of the body furnished with a longitudinal series of carinated scales on each side; dorsal fin placed above the anal; eyes large; jaws furnished with small pointed teeth. Although some few naturalists have supposed that these fish possess the true power of flying, that is, by beating the air with their members, it is generally agreed that their large fins sustain them, parachute-wise, when they have leapt from the water. "I have never been able to see any percussion of the pectoral fins during flight, and the greatest length of time that I have seen this fish on the fin has been thirty seconds, by the watch; and the longest flight mentioned by Captain Hall is two hundred yards; but he thinks that subsequent observation has extended the space. The most usual height of flight, as seen above the surface of the water, is from two to three feet; but I have known them come on board a ship at a height of fourteen feet; and they have been well ascertained to have come into the channels of a man-of-war, which is considered as high as twenty feet and upwards. But it must not be supposed they have the power of elevating themselves after leaving their native element; for, on watching them, I have often seen them fall much below the elevation at which they first rose from the water, but never in any one instance could I observe them rise from the height at which they at first sprang; for I regard the elevation they take to depend on the power of the first spring or leap they make on leaving their native element."—(*Wanderings in New South Wales*. Bennett.) Several instances are on record of the appearance of flying-fishes off the British coast, but the species is doubtful. It is probable that both the oceanic flying-fish (*Exocœtus volitans*) and the Mediterranean flying-fish (*Exocœtus exiliens*) may have made their appearance in our seas. In the Gulf of Mexico are found some species with curious appendages or filaments attached to the lower jaw.

FLYING FOX (*Pteropus rubricollis*).—This animal belongs to the Bat tribe, of which it is the largest species. It derives its common name of flying fox from a fancied resemblance of its head to that of a fox. It is found in the islands of the Eastern Archipelago, where it occurs in great numbers. These animals are vegetarians in their diet, and commit great ravages in the gardens and plantations in the countries in which they abound. That they may occasionally live on animal food, is inferred from the fact that, when in confinement, they have been known to devour the flesh of birds with great avidity. Like the rest of the bats, they are nocturnal in their habits, and, during the day, they remain suspended from the trunks of trees, usually affecting those of the fig genus for this purpose. So quietly do they keep in this clinging attitude, that any one not acquainted with the habits of the flying fox might readily mistake them for part of the tree itself, and only be undeceived when disturbed by his presence, this seemingly long, pendent fruit suddenly assumed animal life and flickered its masses round and round their roost.

FLYING LEMUR, or CONVEO (*Galeopithecus volans*).—This is another curious species, which possesses the power of flying or leaping considerable distances, by means of a membrane connecting its limbs with each other. The flying lemur forms the connecting link

between the *Quadrumana* and the *Chiroptera*; to the latter, indeed, it has a great resemblance, inasmuch as many naturalists of eminence have placed it in that order. It differs, however, from the bats in many respects, not the least important deviation of which is the absence of opposable thumbs on all the feet, which are composed of five fingers united by a membrane. Notwithstanding this, it certainly bears, in its appearance and habits, a remarkable similarity to the flying fox. In its diet, it is both carnivorous and frugivorous; feeding on birds and their eggs, insects, and fruits. It is found in the Indian Archipelago, living in the forests; seeking by night for its food, and remaining in a dormant state during the day, as already related of the flying fox. The natives occasionally eat this animal; but fastidious judges pronounce its flesh as being extremely nauseous.

Flying Squirrel.—By this name are known several species of squirrels, the more important being the Taguan flying squirrel (*Pteromys alpinus*), which is a native of India, where it is tolerably abundant. It has derived its name from the parachute-like appendage which it possesses. This consists of a broad fold of skin, stretching along each side of the animal, from the fore to the hind legs; and when it intends making a leap, it expands this curious membrane to the fullest extent, and is thereby enabled to jump a considerable distance, although always downwards, which, in fact, in all its so-called "flying" properties are capable of. It measures about three feet in length, of which its tail occupies more than half. Its general colour is chestnut, deepening into brown on the back and red on the sides; the abdomen, throat, and breast are covered with silvery greyish-white fur. The tail is greyish-black, becoming much darker towards its extremity. The assapan, or flying squirrel of America (*Sciuropterus volucella*) is another variety, agreeing with the above in its leading characteristics. There is also the polatouche of Siberia and the rasoo of India.

Fly-wheel, in Machan.. a wheel with a heavy rim, placed on the shaft of any machinery put in motion by any irregular or intermitting force, for the purpose of rendering the motion equal and regular by means of its momentum. The rim of a fly-wheel, after a few revolutions, acquires a momentum sufficient to cause it to revolve with a velocity depending upon the resistance of the machinery. In all cases where a rotary motion is to be obtained from a reciprocating one by means of a crank, a fly-wheel is necessary to continue the motion at those two points of the revolution in which the crank lies in the direction in which the moving force acts. The momentum acquired by the fly-wheel urges the crank forward in the direction in which it was previously moving, and continues the rotation; thus making the motion equal and uniform.

Focal Distance, *fo-kal'* (Lat. *focus*, a hearth), in Optics, the distance between the centre of a lens, or concave mirror, and the point to which the refracted or reflected rays converge.

Focus, *fo-kus'* (Lat. *focus*, a hearth).—When light is reflected from regular curved concave surfaces so that all the rays converge to one point, that point is called the focus. The same term is applied to that point towards which rays of light converge after passing through a refracting medium, such as a lens. A telescope, or other optical instrument, is said to be in focus when the arrangement of lenses is such that the object examined falls clearly and distinctly upon the retina of the observer. In the reflexion of heat, the point to which the rays converge is also called the focus. In Geom. and conic sections, the term focus is applied to certain points in the parabola, ellipse, and hyperbola, where the rays reflected from all these curves converge and meet.

Fodder, *fod'-der* (Sax. *fodder*, or *fother*), in Agr., a term used to express the food given to animals; such as the stems and leaves of plants; in fact, whatever is given as ordinary food is termed *fodder*, whilst corn, oats, beans, &c., are termed solid food. In some parts, hay and straw mingled together is peculiarly denominated *fodder*.

Fœtus, *fe'-tus* (Lat., from *feo*, I bring forth), in Physiol., is applied to the child in the uterus from the third month of pregnancy to the time of birth. Previous to that time, it is commonly called the *embryo*; but





these terms are rather arbitrary, and the one is frequently used for the other. (*See* Embryology.)

Fœniculum, *fe-nik'-u-lum* (from *fœnum*, hay), in Bot., the Fennel, a gen. of the nat. ord. *Umbelliferæ*, formerly placed under *Anethum*. Two species, namely, *F. vulgare*, the common fennel, and *F. dulce*, the sweet fennel, are much used in this country as potherbs, and for garnishing dishes. The former grows wild on rocks and walls, particularly near the sea; the latter is frequently regarded as a cultivated variety of the same plant. *F. capensis* is a common esculent at the Cape of Good Hope. The term is derived from the Latin word for usury, because the seed yields, or is returned with great increase.



Fennel.

Fog. (*See* Mist.)

Fog Signals, *fog sig'-nals* (Dan. *fog*; Fr. *signal*, signal), are those used at sea in order to prevent collisions between vessels when any thick fog or mist is hanging over the water. They usually consist of blowing a horn, beating a drum, ringing bells, or firing off guns at stated intervals. The Admiralty has fixed rules for ships belonging to the navy to adhere to during any fog, and certain known signals have been devised in order to let the other vessels of a fleet know what tack an approaching vessel is on. At the present time, by reason of our extended commerce, the Channel and other maritime highways are much crowded, and it would be as well for the merchant service to lay down a plan of rules somewhat similar to those used by the Admiralty. As the generality of vessels in the present day are propelled by steam, it would not be a bad plan to use the steam-whistle, as is done on railways; and different durations of the whistle might express the different tacks on which a vessel might be.—Ref. *English Cyclopædia*.

Foil, *foil* (Fr. *feuille*, a leaf), a term applied to a thin sheet of metal placed beneath transparent jewels to heighten their colour and improve their brilliancy; also to those sheets of tin amalgam placed behind mirrors to make them reflect perfect images. They are made of tin, copper, and silvered copper, and are much used in imitations of precious stones. Coloured foils are made by coating the white with any varnish of the required tint. The sheet-lead which is used for the lining of tea-chests is a species of foil, and the Chinese purchase about 4,000 tons of lead annually from England for this purpose.

Foil. (*See* Fencing.)

Folio, *fo'-le-o* (Ital., a leaf), as used in Book-keeping, denotes a page, or rather the two right and left-hand pages of an account-book, which are reckoned as one. In Lit., it is used to denote the size of a volume; thus a folio volume, or a book in folio, is one in which the sheet is only folded in two, each leaf making half a sheet.

Folk-lore, *foke'-lore* (Ang.-Sax.), is a word which has been recently applied, in the English language, to the ideas, prejudices, and superstitions—such as legends, and other similar stories—of the lower orders. The term is generally applied to all those customs and old habits generally handed down from father to son in old retired country villages and parishes; and the folk-lore of England, Scotland, Ireland, and Wales, would form sufficient matter to fill more than a volume. The fairy tales of the Irish, the "second sight" of the Scotch, the time-honoured old customs of the English, and the legends of the Welsh, are so many instances of what is meant to be designated by "folk-lore." Old Easter and Christmas ceremonies may also be regarded in a similar point of view. Prophecies with regard to the weather are examples of folk-lore. In some parts

of the country, if the salt at the dinner-table is seen to be damp, people immediately assert that there is going to be rain; if the glow-worms are seen shining at night, "there will be wet ere morn;" if woodpeckers utter their harsh cry, "there will be a shower soon." With regard to gardening operations, there is an old rustic prophecy,—

"When elm-leaves are as big as a shilling,
Plant kidney-beans, if to plant 'em you're willing;
When elm-leaves are as big as a penny,
You *must* plant kidney-beans, if you mean to have any."

On New Year's day, old gossips relate, that if the first person you meet in a morning is a male you will have good luck for a twelvemonth; if a female, the reverse. In illustrating particular periods in history, folk lore is sometimes a valuable adjunct.

**Folkmote, or Folkgemote**, *folk mote* (Sax., an assembly of the folk or people) in Anglo-Saxon times was applied to certain assemblies of the people, but respecting the exact nature of which antiquarians are not agreed. According to some, it was a kind of annual parliament or convention assembled on every May-day, for considering and ordering the matters of the realm. Others think that it was not essentially distinct from the *shiremote*, or common general meeting of a county, while a few speak of it as an inferior ordinary court held on a month to settle minor disputes among the people. According to Kennet, it was a common council of all the inhabitants of a city, town, or borough convened together in the mote-hall.

**Follicle**, *folliculus* (Lat. *follis*), in Bot., a superior one celled, one- or many seeded fruit, dehiscing by the ventral suture only, and consequently one-valved. By the latter character it is known at once from the legume, which opens by two sutures, and is two-valved; in other respects the two fruits are alike. Examples occur in the columbine, larkspur, hellebore, and aconite.

**Fomentation**, *fo men ta-shun* (Lat. *fomentatio*, from *foveo*, I bathe), is the application of heat and moisture to a part by means of flannel or other substance wrung out of hot water, in order to relieve pain or to stimulate the surface. Sometimes the water is medicated with various substances, and occasionally other liquids, as oil or milk, are employed. Care should be taken to wring the cloths well, so as to prevent the fluid from running about the patient and rendering him uncomfortable. They should be applied as warm as they can be borne, and renewed as soon as they begin to feel cold. To enable them to retain the heat still longer, they are often covered externally with oiled silk.

**Font**, *font* (Lat. *fons*, a fountain), a stone vessel in the form of a large bowl or basin, resting on a pedestal, and used for the reception of water required in the administration of the sacrament of baptism. The pedestal is perforated to receive a pipe, by which the consecrated water may be carried off at the conclusion of the ceremony. The proper position for the font is at the west end of the church, opposite the principal porch or entrance, which is to be found most frequently on the south side of the nave in parish churches, though in some instances it is situated on the north. Baptism was administered in the early churches in a part that was separated from the nave for that especial purpose by a party-wall or screen, or in a building that was entirely distinct from the church itself. These were called baptisteries (*see* Baptisteries), and contained a marble basin of great size in the centre, in which the candidate for baptism was subjected to total immersion. Subsequently, when this practice, which must have been attended with considerable danger in cold climates, particularly to infants, was abandoned for that of sprinkling those who were brought to be baptized with a few drops of water only, the font was introduced to take the place of the large laver of the baptistery, although it was still sufficiently large to admit of the total immersion of an infant, should this be desired by its parents. It was not then so necessary to have a distinct building in which the font might be placed, or to have a portion of the church separated from the rest for its reception; and it was therefore put in the body





of the building, at the lower end of the nave. This may occur, however, in some of our cathedrals and parish churches, in which the font is placed in a baptistery divided from the body of the building; and in many of our modern ecclesiastical structures, is has been placed in an inclosure formed by low walls, or in a chapel especially designed and constructed for it in this department of the belfry tower. The fonts that were placed in churches built in the Anglo-Saxon and Anglo-Norman styles of architecture, were generally circular or square, supported on a short but massive pedestal, cylindrical in form. In some examples of square fonts, the lower corners of the block are cut away in such a manner that the faces of the sides assume the form of a semi-circle. The bowl itself, and sometimes the stem, was often adorned with sculptured figures, scroll-work, or interlaced fret-work. The fonts of the three pointed of English Gothic architecture are more frequently octagonal in form, and more richly carved with figures and emblems placed in sunken panels or niches, while the angles of the pedestal are adorned with buttresses. They are also generally raised on a platform, furnished with two or three steps. Those of the Perpendicular or third Pointed style, were generally surmounted by a lofty octagonal canopy in the form of a spire, which was formed of wood, and magnificently carved and embellished with crockets at the angles, and a rich finial at the summit. This custom of covering fonts originated about 1250, in an order that was issued to the clergy to provide covers for these vessels, which were to be kept locked. In a few of our churches the fonts are made of lead, cast in a mould, many of these are covered with figures in bas relief. They are supposed to have been executed by workmen of no ordinary skill about the beginning of the 12th century.—*Rev.* Paley's *Illustrations of Baptismal Fonts*.

**Fontevraut** *fon te vrol*, in Ecclesiastical History, was the name of a monkish order connected with the Benedictines which arose in the 12th century, and was named after its first monastery. Its founder was Robert d'Arbrissel, and it comprised both monks and nuns; but had this peculiarity, that the latter had the pre-eminence, and the whole were subjected to an abbess in imitation, as he said, of Christ's commendation of the apostle John to the matronage of the Virgin. This order had several houses in England, and at the time of the French revolution they had about sixty houses in France.

**Food and Drink**, *food* (Sax. *foda*, food), those solid and liquid substances which are used either for sustaining animal life or for the purpose of reproducing the ever wasting flesh and fluids of animal bodies. Of the elementary bodies, only a small proportion enter into the constitution of animals; and the substances included in this small proportion are the only ones required to be present in food and drink. Out of about sixty elements, only oxygen, hydrogen, nitrogen, carbon, sulphur, phosphorus, chlorine, sodium, potassium, calcium, magnesium, iron, and fluorine, are absolutely necessary. Albumen, fibrine, and caseine, which occur both in animals and vegetables, together with vegetable gluten, furnish oxygen, hydrogen, nitrogen, and carbon. Animal flesh, milk, corn, and various other vegetable productions, contain one or more of these principles. Food containing a large proportion either of sugar, starch, or organic acids, introduces carbon, hydrogen, and oxygen largely into the system. Oleaginous alimentary substances contain carbon with a little oxygen and hydrogen: this class of substances includes fat, suet, butter, oily seeds, such as nuts, and fatty foods, such as liver, &c. Flesh, blood, and bones, used as food, supply phosphorus to the system; the flesh of fishes is particularly rich in phosphorus, and in the shape of phosphates, it exists in the juices of many edible vegetables. Sulphur is introduced into the system from the fibrine of flesh, from albumen, from the caseine of milk, gluten, &c. Chlorine and sodium exist in nearly every variety of animal food, and, in the shape of common salt, are taken separately with nearly all kinds of food. Potassium is found in various kinds of food, both animal and vegetable; in milk, in the juice of flesh, and in nearly all inland plants. Calcium is not only obtained from animal and vegetable food, but also from drinking-water, which usually

contains sulphate and carbonate of lime in solution. Magnesium is generally found along with calcium, and traces of fluorine have been observed in milk, blood, &c. These simple bodies are, however, not capable of being directly assimilated and converted into tissue; they must be previously in combination; and their assimilation depends upon certain chemical decompositions and physiological processes. The number of elementary substances in combination differs: thus, water contains two elements,—oxygen and hydrogen; sugar, starch, fat, &c., contain three; casein of milk contains five; and albumen and fibrine contain six. Baron Liebig, who has given much attention to this subject, has divided all kinds of food into two classes,—those substances which do contain nitrogen and those which do not. The first class, which is sometimes called nitrogenous or albuminous, is useful in forming blood, flesh, &c.; it is, in fact, nutritious food. The second, or non-nitrogenous class, assists the respiratory organs. Thus, in very cold climates, where more exercise is required in order to sustain the vital heat, more oxygen is consumed, and consequently more carbon is required in the food. Hence, it will be observed, that in such countries as Siberia, Lapland, &c., large quantities of non-nitrogenous substances, such as fat, oil, &c., are used by the inhabitants as food. In the temperate zone a moderate mixture of nitrogenous and non-nitrogenous food is used; while, in the tropics, where the system requires oxygen in particular, fruits and vegetables form the principal food. Although the theories of Liebig have not remained undisputed, his works on the subject are considered of very high value. (*See* Liebig's *Researches on the Chemistry of Food.*) In the preparation of food for eating, much depends upon the way in which it is cooked. As all the nutritious juices of meat are soluble in cold water, it is necessary, when preparing boiled food, to place the meat in boiling water in the first place. This coagulates the albumen on the surface; thus forming a crust or shell, which prevents the escape of the nutritious juices. If, however, the object is to make soup, the meat should be put into cold water, and gradually raised to the boiling-point. In roasting and broiling meat, the first application of heat should be vigorous and rapid, in order to coagulate the albumen and form a crust, and so retain the juices, as in boiling. In the process of roasting, the cellular tissue is converted into soluble gelatine, and the fat is melted out of its component cells. Baked meat is less digestible than either roast or boiled, as it contains more empyreumatic oil. Frying is the most unwholesome form of cooking, as it is mostly performed with the assistance of heated oil or fat, which is decomposed during the operation. Smoking, pickling, and salting meat, not only harden the animal textures, but, in the case of salting, the food is rendered less nutritious, as a large quantity of albumen, soluble phosphates, lactic acid, potash, creatine, and creatinine, are abstracted in the brine. Very few vegetables are roasted; they are, as a general rule, boiled. Those which contain saccharine matter, such as carrots, beetroot, parsnips, &c., are best cooked by steam, as boiling water dissolves out a large quantity of their nutritious ingredients. Vegetables, however, which contain much starch, as potatoes, should be boiled. By boiling, the granules of the starch are ruptured and partially dissolved, and any volatile oils which may be present are expelled. All kinds of flesh are not equal with regard to their nutritive value. Veal, for instance, is totally different from beef. It contains a smaller quantity of the alkalies, and there is 15 per cent. more phosphoric acid than is necessary for the formation of salts; it contains, also, little of the fibrine of flesh, and proportionately more of the fibrine of blood, which is less digestible than the former. Veal is rich in gelatine, which is not nutritious, and seldom contains any quantity of fat: it also contains very little iron. In all these points it is the reverse of beef. Hard-boiled eggs have little or no nutritive power, and the same may be said of boiled fish, the soup of which is generally thrown away. In order to make up the necessary deficiency of nutritive matter in veal, eggs, and fish, vegetables should be eaten with them. Celery contains 18 per cent., salad 16 per cent., and cabbage-sprouts 10 per cent., of their dry weight of salts, alkalies, and alkaline earths. Vegetable food in general contains a large proportion of iron. In the human body, iron is present in the blood, the bile, and other places. The presence of iron determines the colour of the hair, and persons of a sanguine temperament have more iron in their bodies than those of a lymphatic nature. When the blood is deficient in iron, the physician prescribes either iron, steel, or chalybeate waters. The presence of this metal is therefore necessary in food. Prolonged absence from fruits and succulent vegetables brings on scurvy. The absence of the acids which they contain produces this effect: thus lime-juice is used by sailors with good effect on long journeys. Amongst the condiments used for flavouring food, are mustard, cayenne pepper, black pepper, and various spices. They owe their action to the presence of a volatile oil. The volatile oils of fennel, thyme, parsley, anise, caraway, horseradish, mustard, and water-cress, stimulate the system, but do not incorporate themselves. Condiments and sauces (which are usually fluid mixtures of condiments), in time, generally weaken the organs, which they at first stimulate. The only exceptions are salt and vinegar. Dr. Beaumont, a surgeon in the United States army, about forty years ago, made some interesting experiments upon a Canadian who had been shot [illegible] he left side. In the process of healing, an aperture [illegible] s left, by means of which Dr. Beaumont was able [illegible] observe everything that took place in the stomach. According to his observations, vinegar and mustard, when used together, bear some analogy to the gastric juice. (*See* "Experiments and Observations on the Gastric Juice, and the Physiology of Digestion," by Dr. Beaumont.) Drinks for the most part are simply liquid food. They may be divided into the following classes:—1. Mucilaginous, farinaceous, or saccharine drinks; such as barley-water, *eau sucré*, &c. They are a little more nutritive than drinking-water.—2. Aromatic or stringent drinks; such as tea, coffee, chocolate, cocoa, &c. They all contain principles which act with a slightly exhilarating action upon the nervous system: chocolate and cocoa contain oil and starch.—3. Acidulous drinks; such as lemonade, ginger beer, raspberry vinegar, &c. They allay thirst, and form cooling antiscorbutic drinks.—4. Drinks containing gelatine and osmazome, including broths and soups. These, when properly made, ought to contain all the soluble constituents of the substance from which they are prepared.—5. Emulsive or milky drinks; such as animal milk, cocoa-nut milk, almond milk, &c. Animal milk contains all the essential ingredients of food; the others are slightly nutritive.—6. Alcoholic and other intoxicating drinks, including malt liquor or beer, wines and spirits. (*See* article on DRINKS.)—*Ref.* Pereira's *Treatise on Food and Diet.*



FOOD, ADULTERATION OF, the act of corrupting food by a foreign mixture, or of endeavouring to make inferior qualities of food pass for more than their intrinsic value, by their resemblance to something better. The adulterations practised differ in kind as well as degree. One form of adulteration consists in the addition of substances usually of a greatly inferior value, for the sake of bulk and weight. In this case, the choice of the adulterating substance depends upon its cheapness and fitness for the particular adulteration required. This description of adulteration is the one most frequently practised. A second form of adulteration consists in the addition of colouring matters, with a view to heighten the colour and improve the appearance of the article, as well as to conceal other forms of adulteration. This form of adulteration is the most objectionable of all, as several substances are employed for giving colour, which are not only hurtful, but in some cases poisonous. Various preparations of lead, copper, mercury, and arsenic, are used for this purpose. Another kind of adulteration consists in the mixture of substances, for the purpose of imparting smell, flavour, pungency, and other properties. The subject of the adulteration of food has excited much attention of late years.—See *Food and its Adulteration*, by A. H. Hassall, M.D.

FOOD, PRESERVATION OF.—During long journeys, either by sea or land, it is of great importance to be able to preserve fresh meat from decay. There are three methods by which this is effected. The first is by the application of cold; but this mode of preserva-

tion is necessarily very limited in practice. The second method is by keeping the food in air-tight vessels. This plan, although expensive, is the most efficacious, and the one most generally adopted: several great improvements have been made upon it in late years. The usual method of keeping meat for any length of time is by salting it; but, as has been pointed out in the article upon Food and Drink, the operation of salting deteriorates the nutritious power of the food. (*See* Antiseptics.)

Fool, Court. (*See* Court Fool.)

Fools, Feast of, *fools* (Fr. *fol, fou*), was the name of a festival regularly celebrated, with the most absurd ceremonies, both by clergy and laity, in several countries of Europe, from the 5th down to the 16th century. It is said to have been introduced in imitation of the Roman *Saturnalia*, and its celebration took place about the same time, the great day being New Year's day; but the ceremonies were often continued from Christmas to the last Sunday of Epiphany. At first only the boys of the choir and young sacristans played the principal part in them; but afterwards all the inferior servants of the church, and even laymen, engaged in them; while the bishop and other clergy formed part of the audience. A Bishop of Unreason was appointed, the forms and ceremonies of the Church were travestied, indecent songs were sung, dancing was carried on, and all manner of fooleries enacted. The ass often played an important part in the proceedings, being sometimes led towards the altar and having hymns sung in its honour. The feast of fools was condemned by several popes and bishops in the 15th century, and the council of Basle, in 1435, expressed its detestation of this and several other festivals; but it continued to be observed in many places down to the time of the Reformation.

Fools' Parsley. (*See* Æthusa.)

Foot, *foot* (Ger. *fuss*, Lat. *pes*), in Anat., is that part of the lower extremity below the leg with which we stand and walk. It is composed of three series or groups of bones,—the tarsal, or hindermost; the metatarsal, which occupy the middle portion; and the phalanges, which go to form the toes. The tarsal bones are seven in number. Above, they are connected with the tibia and fibula bones of the leg, and below form the heel and the hinder part of the instep. They are the *astragalus*, which articulates with the tibia and fibula; the *os calcis*, or bone of the heel; the *os naticulare*, or scaphoid bone, on the inner side of the foot, articulating with the astragalus; the *os cuboides*, on the outer side of the foot, articulating with the os calcis; the three cuneiform or wedge-shaped bones (the internal, middle, and external) in front of the scaphoid bone, near the middle of the foot. The metatarsal bones are five in number, and belong to the class of *long bones*. They are connected posteriorly with the tarsal, and anteriorly with the phalangeal bones. One is attached to each of the cuneiform bones, and two to the os cuboides; and they diverge slightly outwards as they proceed forward. Their anterior ends form the balls of the toes. The first metatarsal bone is the shortest and strongest, while the second is the longest,—the others all decreasing in length according to their distance from it. These bones form the anterior portion of the instep. The phalanges, or bones of the toes, are fourteen in number, three to each toe, except the great one, which has only two. The upper ones, which are the longest and largest, are named the metatarsal, the next the middle, and the most anterior the ungual phalanges. The bones of the foot, more particularly those that compose the tarsus and metatarsus, are firmly connected together, so that they are not liable to be displaced; and those parts where they articulate with one another being covered with a tolerably thick layer of highly elastic cartilage, they possess a considerable degree of elasticity. They are bound together in various directions, by a number of ligaments, one of the principal of which is the plantar ligament, which is of great strength, and passes from the under surface of the heel-bone, near its extremity, forward to the ends of the metatarsal bones. The movements of the foot, which are permitted by the connecting ligaments, are effected by a variety of muscles. The principal movements are, (1) that at the ankle, formed by the tibia and fibula with the astragalus, by which the foot is bent and straightened; (2) between the astragalus and os calcis, by which the foot is rolled inwards and outwards; (3) between the first and second range of tarsal bones, admitting of a *very* slight motion, by which the toes of the foot may be somewhat increased or diminished. Besides these there are the less-complicated movements of the metatarsal and phalangeal bones. The foot, naturally a beautiful structure, is usually so much interfered with in civilised life, as to be deprived of much of its beauty, and even of its utility. Its movements are impeded by its being confined in tight-fitting boots; while, in place of the boots being conformed to the shape of the feet, the feet are made to conform to the shape of the boots. The consequence of which are corns, bunions, cold feet, and a number of other evils, from which so many suffer in the present day. Attention has lately been called to this subject by Professor Meyer, of Zurich, who has published a pamphlet, entitled "Why the Shoe pinches; a contribution to applied Anatomy," which has been translated into English, and is well worth a perusal.

Foot, in Greek and Latin poetry, is a metre, or measure, composed of a certain number of long and short syllables. Some are dissyllabic, consisting of two feet, as the spondee, iambus, trochee; and some trisyllabic, as the dactyl, anapest, tribrach. These are what are called simple feet. There are others, consisting of four, five, or six syllables, which are reckoned double or compound feet, but which are commonly resolved into single feet. A verse is frequently named from the number of feet which it contains, or from the foot which prevails in it; as, hexameter, containing six feet; pentameter, containing five; dactylic, from the dactyl being the prevailing foot; iambic, the iambus.

Foot-ball, an old English out-of-door exercise or game, which used at one time to be a national pastime; now, however, it has nearly fallen into disuse, except in some parts of the country. It is played with a distended ox-bladder, lightly covered with dressed leather, and so sewn up as to retain its elasticity. Two different sets or *sides* of players are chosen, and there is a goal marked out on the extremity of the space allotted to each side. When all is ready, "play" is called, and the ball thrown up between the two sides. The object then of each is to endeavour to send this ball through the boundary or goal of their adversaries' ground, by means of vigorous kicks. The ball can never be sent forward fairly unless kicked, and this is one of the most stringent rules of the game. On the Scotch border it is still played annually by the men of different clans; and it is one of the most interesting of sights to see the two parties engaged in that amicable contest. From the fact of kicking being one of its strongest characteristics, this game is generally productive of broken shins and other contusions. It is still a favourite pastime in the large public schools of England.

Forage, *for'-áj* (Fr. *fourrage*), a military term applied to hay, oats, corn, barley, grass, clover, and other means of sustenance for horses brought into camp by troops with that object.

Foramen, *for'-ā-men* (Lat., a hole), in Anat., is a term applied to certain holes or openings of the human body, more particularly of the skeleton; as the various foramina of the skull. The *foramen ovale* is a passage or communication between the two auricles of the heart in the fœtus.

Foraminifera, *fo-rā-me-nif'-e-rā* (Lat. *foramen*, an orifice; *fero*, I bear), the name given by d'Orbigny to a group of minute organisms having calcareous shells, which are pierced with numerous holes or foramina. Until recently, the *Foraminifera* were regarded as microscopic cephalopods, but they are now looked upon as protozoa. The pores are for the protrusion of delicate filaments, by the aid of which locomotion and perhaps nutrition are performed. Recent *Foraminifera* are beautiful microscopic objects; they are procured by dredging, or sometimes from the sand of the sea-shore. In the fossil state these tiny shells occur in rocks of all formations; they constitute the greater bulk of the chalk and the tertiary limestones. In the stone of which the buildings in Paris are constructed, the shells of *Foraminifera* are so numerous, that this city may be said to be built of them. The shells of the nummulites, or coin-stones, which form mountains in the Mediter-

stream regions, and of which the pyramids of Egypt are principally composed, agree in essential structure with those of the *Foraminifera*.

FORBES MACKENZIE ACT is the name popularly given to act 16 & 17 Vict. c. 67, entitled, "An act for the better regulation of public-houses in Scotland," and which is so called from the late Mr. Forbes Mackenzie, M.P., the member by whom the bill was introduced. Some of the enactments of this statute are very stringent; but there can be little doubt that, as a whole, it has been attended with beneficial results. No excisable liquors are allowed to be sold on Sunday, or after eleven o'clock at night on any other day, except in the case of inn and hotel keepers, to *bond fide* travellers or persons lodging in their house. Grocers and provision-dealers, who may be licensed to sell excisable liquors, are prohibited from allowing it to be drunk upon the premises; and in the same way all public-house keepers who sell liquors to be consumed on the premises are not allowed to sell groceries or other provisions to be consumed elsewhere. Inn and hotel keepers, and keepers of public-houses, are prohibited from selling or giving out any liquor before eight o'clock in the morning; but grocers and provision-dealers, having a spirit license, are allowed to sell spirits after six o'clock. In 1859, a royal commission was appointed to inquire into the working of this act, and after collecting a great amount of evidence, they expressed themselves generally in favour of the act, as having been productive of beneficial results, but suggested a number of alterations, partly with a view to enabling the police to carry out its provisions with greater efficiency, and partly to lighten some of its more stringent enactments.

FORBIDDEN FRUIT. (*See* CITRUS.)

FORCE, FORCES, *fors* (Fr.).—In Mech., force is a term applied to any cause which is capable of producing motion in matter, or of stopping or altering its direction when produced. Every visible particle of matter is under the influence of several forces, exerted upon it both by distant and by adjacent particles, and upon which it acts in return; for the action of one body on another is always accompanied by a re-action of the latter upon the former, of the same intensity, in an opposite direction. The motions observed in some bodies are owing to these forces, and upon their balance the apparent state of rest in others is dependent. According to Sir John Herschel, the origin of the idea of force must be referred to the consciousness of each individual. He says: "We are conscious of a power to move our own limbs, and by their intervention, other bodies; and this effect is the result of a certain inexplicable process, which we are aware of, by which we exert *force*; and even when such exertion produces no visible effect (as when we press our two hands violently together, so as just to oppose each other's effort), we still perceive, by the fatigue and exhaustion, and by the impossibility of maintaining the effort long, that something is going on within us, of which the mind is the agent, and the will the determining cause." In the case of force exerted by the right hand, and met by an equal force from the left, the two, acting in opposite directions, exactly neutralize each other, and may be said to be *in equilibrio*, and the effect is called *pressure*. As this force is found to have its proximate seat in the muscles of man and other animals, it is called muscular or animal force. This force can be communicated to inanimate matter, as when a stone is projected from the hand. Muscular force may also be concentrated in the same mass by continued action, as when a stone, by means of a sling, is continuously acted upon by the same arm, it will at length be projected with an intensity of action capable of producing very violent effects. Force transferred to moving masses of matter is called mechanical force, and by multiplying the quantity of matter in a body by its velocity, we arrive at its *momentum*, or the quantity of force which it is capable of exerting upon other bodies opposed to it. The investigation of the laws of motion constitutes the province of Dynamics. In mechanics, the term decomposition of forces signifies the same thing as resolution of forces. Any force may be decomposed or resolved into a number of forces, and the original force will be equal to the resultance of these forces. Thus, if the given force be represented by the diagonal of a parallelogram, it can be resolved or decomposed into two forces of like intensity and direction, represented by the two sides of the parallelogram. Any one exerting muscular or animal force is soon made conscious that it may be opposed by other forces appertaining to inanimate matter. In lifting a lump of metal, stone, or other heavy substance from the ground, an opposing force is experienced, which is called *weight* or *gravity*. On pressing with the arm on a strong spring, another opposing force is observed, called *elasticity*. Some forces cause masses of matter to approach and others to recede from each other, retaining them in their second position against an opposing force: the former are called *forces of attraction*, and the latter of *repulsion*; thus, gravity is a force of attraction, and elasticity a force of repulsion. In electricity and magnetism the forces of attraction and repulsion are also shown. Polar forces are those which are conceived to act in opposite directions at the extremities of the axes of molecules or of masses of matter. The forces mentioned above are usually termed *external* forces, for they act upon matter at sensible distances; but there are others which act only upon its constituent molecules at insensible distances: these are frequently called *internal* or *molecular* forces; they include homogeneous attraction or cohesion, the univers[illegible] antagonist of which is the repulsive force of hea[illegible] which *see*). Another attractive force is that of hetrogeneous affinity, by which a piece of metal or glass is *wetted* when dipped into water. Heterogeneous attraction is seen in its highest degree in chemical affinity, an inquiry into the laws of which force constitutes the chemist's peculiar province. (*See* AFFINITY.) The correlation of the physical forces is a very important principle in natural philosophy, which has of late years been particularly enunciated by Mr. W. R. Grove, the inventor of the voltaic battery which goes by his name. Many philosophers had previously asserted that all the forces of nature were intimately connected, and dependent upon one common principle; but the correlation, or necessary mutual dependence and commutability of each of the physical forces upon and into any other, or into all, and of all, reciprocally into each other, was, at its original enunciation, the particular theory of Mr. Grove. His doctrine is, "that the various affections of matter which constitute the main objects of experimental physics,—namely, heat, light, electricity, magnetism, chemical affinity, and motion, are all correlative, or have a reciprocal dependence; that neither, taken abstractedly, can be said to be the essential cause of the others, but that either may produce or be convertible into any of the others: thus, heat may, mediately or immediately, produce electricity; electricity may produce heat; and so of the rest, each merging itself, as the force it produces becomes developed; and that the same must hold good of other forces, it being an irresistible inference from observed phenomena, that a force cannot originate otherwise than by devolution from some pre-existing force or forces."—Ref. *On the Correlation of Physical Forces*, by W. R. Grove.

FORCE AND FEAR, in Law, is a term applied to such restraint or interference with the freedom of action of an individual as will render an act performed by him, when in that condition, null and void. It is, therefore, not every kind of restraint that will have this effect in law. In fact, it must be of such a kind as may reasonably be supposed to have influenced his conduct; and hence, in questions of this kind, the age, sex, and other circumstances of the party, have to be taken into account. A contract entered into through force and fear is invalid. "If a man," says Blackstone, "through fear of death or mayhem, is prevailed upon to execute a deed, or do any other legal act; these, though accompanied with all other the requisite solemnities, may be afterwards avoided." But "a fear of battery, or being beaten, though never so well grounded, is no duress; neither is the fear of having one's house burned, or one's goods taken away and destroyed; because, in these cases, should the threat be performed, a man may have satisfaction by recovering equivalent damages."

FORCEPS, *for'-seps* (Lat.), in Surg., is the name given to certain instruments of various shapes, according to the purposes they are intended to serve; but the principle of all is that of a pair of pincers with

two blades, either with or without handles. They are made used in surgery, especially for taking hold of substances that cannot be conveniently laid hold of with the fingers. Certain kinds are used for tooth-drawing; others for securing the mouths of arteries, in order to their being tied; others are used in dissecting, others in lithotomy, and others in midwifery, for aiding delivery in difficult cases.

FORCIBLE ENTRY, or DETAINER, in Law, is an offence against the public peace, which is committed by violently taking or keeping possession of lands and tenements with menaces, force, and arms, without the authority of law. This was formerly allowable in certain cases, but being proved very prejudicial to the public peace, it was found necessary, by several statutes, to restrain all persons from the use of such violent methods, even in doing themselves justice, much less if they had no justice in their claim: so that, now, the only entry allowed by law is a peaceable one.

FORCING, *for'sing* (Fr. *forcer*, to force), a term applied to the system by which the growth and maturity of fruits, vegetables, and flowers are hastened by artificial means. The processes of forcing chiefly affect the admission of air, and the proper supplies of heat, light, and water. The grand effect is produced by heat, and the great art to be borne in mind is to supply only just so much of this as will harmonize with the light afforded by the sun, and the quantity of moisture which the nature of the plant under consideration requires. All the operations of nature being gradual, it will never do to accelerate the growth of plants to any very great extent, or in a hurry. The process of forcing must, therefore, be conducted on a graduated scale, and the heat, light, and moisture must be increased by degrees, as the plant is approaching its maturity. It must be likewise considered that exotics require a far higher temperature for forcing purposes than plants grown in a more moderate clime, and that therefore, the latter must not be subjected to as great heat as the former. Forcing is generally carried on in what are termed hothouses, which are heated by stoves and built of glass, with paved floors, in order to allow the heat and light afforded by the sun to enter. The Dutch, who are particularly celebrated for this horticultural art, however, carry on their forcing in pits heated by the fermentation of manure. Some of the best examples of forcing are carried on in hothouses and other similar contrivances, can be seen at the Royal Horticultural Gardens, and at the gardens attached to the palace at Kew. For further information on the subject, the reader is referred to Loudon's "Encyclopædia of Gardening," which dilates at large upon the art of forcing.

FORCING-PUMP (*See* PUMP.)

FORD, *ford* (Sax. *ford* or *fyrd*), a name applied to that part of a river where the water is sufficiently shallow to admit of any person or persons crossing by means of wading, without having recourse to a bridge, ferry, or any other means of transportation. In military operations, fords are of the greatest service to an army. They are generally found, either in the widest part of a river, where the current is not so strong, or in a diagonal line with the salient angles of any bend of the stream. Fords for infantry, to be really useful, should not be more than three feet in depth, and those for cavalry should not exceed four feet. From the rapidity of some currents, fords of greater depth are generally unsafe.

FORE, *fore* (Sax. *fore*, advanced), a nautical term, which includes all the distinguishing characteristics of that part of a ship's frame and belongings lying near the stem, as fore-mast, fore sheet, &c. &c.

FORECASTLE, *fore'-kas-tl*, a short deck placed in front of a ship above the upper deck. It is generally terminated at each end, in ships of war, by a breastwork, the foremost part reaching the beak head, and the after portion reaching to the fore-chains. This part of a ship used to be very much elevated, in former times, for the accommodation of archers and cross-bowmen; whence the term forecastle.

FORECLOSURE, *fore-klo'-zhure* (Ang.-Sax.), an Eng. Law, is the process by which a mortgagor is deprived, or foreclosed, of his right of redeeming the mortgaged estate. By what is called the equity of redemption, a mortgagor is enabled, within a certain





time, to call on a mortgagee who has possession of the estate, to deliver it back, and account for the rents and profits received, on payment of his whole debt and interest. But, on the other hand, the mortgagee, where there is a power of sale in the deed, which is usual, either compel the sale of the estate, or call upon the mortgagor to redeem it presently, or, on default thereof, to be for ever foreclosed from redeeming the same. For this purpose, the mortgagee files a bill of foreclosure, and if, on the day fixed for payment, the money be not forthcoming, the equity of redemption is declared to be forfeited, and the mortgagee obtains absolute possession of the estate.

FOREIGN ATTACHMENT (*See* ATTACHMENT.)

FOREIGN BILL OF EXCHANGE. (*See* BILL OF EXCHANGE.)

FOREIGN ENLISTMENT ACTS.—By 3 Jac. I. c. 4, it was made felony for any person whatever to go out of the realm to serve any foreign prince, without having first taken the oath of allegiance before his departure; and by 29 Geo. II. c. 17, it was declared, that if any subject of Great Britain enlist himself, or if any person procure him to be enlisted in any foreign service, or detained or enticed him for that purpose, without his consent under the king's sign manual, shall be guilty of felony, without benefit of the clergy. But these statutes were repealed by 59 Geo. III. c. 69, which enacts that any British subject may be punished by fine and imprisonment, who shall enlist in any foreign service, or fit out vessels to be employed in the service of any foreign power, except by license of the crown.

FOREIGNER (*See* ALIEN.)

FORELAND, *fore land* (Dan. *land*), a term which is nearly synonymous with promontory, cape, or headland, applied to any projecting point of land running into the sea—as the North and South Foreland at the mouth of the Thames. In Fort., the term is applied to the ground lying between the defences of any place or fortress and the most.

FORELOCK, *fore lok* (Ang.-Sax.), the hair that grows from the fore part of the head. In nautical language, it is applied to a small flat pointed wedge of iron, used at the end of a bolt, to retain it in its place. The expression to take time by the forelock, means to be early or first in setting about any undertaking.

FORE-SHORTENING, *fore short en-ing* (Ang.-Sax.), an expression in Paint. and Persp. intended to convey the method of drawing in strict accordance with the rules of perspective, the limbs or body of a human being, or the body of an animal, when we are looking directly against either of them, in a position which shows their breadth, while it conceals their length, either entirely or partially. Or, in other words, fore-shortening occurs when the latter is either approaching or receding from us, and when the former is extended, either towards us or from us in a direction varying from a line which is at right angles to the surface of the eye to another that is parallel with it, under the former of which conditions it would be seen fore-shortened to the greatest possible degree, while, under the latter, it would be viewed in its entire length. Great attention must be paid to the treatment of light and shadow in fore-shortening the arm, leg, or body of a human being, or the carcass and legs of an animal, that the effect produced may convey a correct idea of the intentions of the draughtsman, and that, although the object is shortened in drawing, so that the front or fore-part only is presented to the view of the spectator, it may be clearly seen that it possesses length, and, as in the case of an extended arm, that it is projecting from the trunk to an extent compatible with the position in which it is placed. Practice in fore-shortening may be best obtained by making drawings from plaster-casts of figures and animals placed in different positions; but the principle may be readily seen by placing a wooden cylinder on a vertical bar and turning it round, first in the horizontal plane passing through the eye of the observer, and then above and below that plane, while its outline assumes all forms between that of a circle when its end is directly opposite the eye, and that of a rectangular parallelogram when the eye beholds its entire length. In all positions between these extremes, the cylinder will present examples of fore-shortening, although the term is more strictly confined to the view an object presents when its length is in a

like perpendicular to the surface of the eye of the observer, or varying but little from it.

FOREST, *forest*, a large expanse of ground covered with trees. The word is derived from the low Lat. *foresta*, which is itself originated by the Ger. *forst*, signifying the same thing. Forests are interesting in many ways, as they may be said to mark the track of civilisation, besides being of the utmost utility to man, both from local as well as atmospherical influences. The Caledonian and Hercynian forests are the first we read of as celebrated in history; the former being the retreat of the Picts and Scots in North Britain, the latter extending from Switzerland to Transylvania. In the time of Cæsar, a journey through this forest was computed to last over sixty days, or more. Forests were greatly venerated by the Romans and other ancient peoples, temples being often erected and sacrifices ordained in their honour. This may be considered one of the greatest reasons for the Druids living in them, as it was thought much more sacred to dwell under trees than *en plein champ*—in the open field. Forests supply man with many necessaries. Timber and fuel, medicinal and nourishing plants, all trace their source to the luxuriant forest, which, moreover, affords shelter to the houseless and a field of occupation to the hunter. (For an account of the forests of England, *see* FOREST LAWS.) Forests abroad are mostly composed of (in Europe) oak, elm, beech, poplar, ash, alder, plane, willow, lime, and birch; not to speak of the numbers of wild apple, pear, and other fruit-trees; besides pine, fir, and cypress in profusion, with all species of bushwood and vines. In Norway, the forest-land extends up to Drontheim, which is in latitude 63° north. Switzerland is well wooded, and oaks and firs are found at a level over 1,000 feet above the sea. France has some fine examples, her variety of climate being favourable to the growth of all species of trees, some of which, indeed, belong to a much warmer climate: the forest of Ardennes and the Bois de Boulogne may be mentioned as instances of the expanses she has covered with trees. In Italy, the plains of Ravenna afford a wide scope for the luxuriance of forest life, and the pine grows there very extensively; most of the oak, too, used in our navy for shipbuilding purposes, comes from Italy. Russia, however, bears away the palm for her abundance of forests, and some of the finest timber in the world comes from her ports in the Baltic. The districts of Twer and Novgorod are regularly covered with wood, and the forest of Volkonsky is thought the largest in Europe. Poland, too, resembles Russia in this matter, and she may be considered the second well-wooded country. For the king of forests, the reader must look to the New World, where, in both the north and south of America, the vegetation appears to possess no limits. In North America, the forests are gradually disappearing, through the immigration into the country and the diffusion of settlers; but in South America, the whole of the valley of the Amazon, which embraces one-third of the entire area of that country, is one vast forest. It would be impossible to give an account of the various descriptions of trees which are to be found there; for they are apparently without limit, and the size of the individual trees is generally stupendous. It is recorded that a church at Chili, although it was sixty feet long, was built of one single tree. According to Humboldt, the direct influence of forests on climate is a diminution of temperature, which is effected either by screening the soil from the heat of the sun's rays; by the evaporation of moisture from the leaves; or, thirdly, by the uneven surface which the leaves offer to the cooling process of radiation. The indirect influence of forests is the due preservation of moisture in the different countries, in the supply of rivers, and in other ways.

FOREST LAWS (Ger. *forst*), in England, are laws for the regulation of the royal forests. A forest is, properly, an extensive surface of country naturally covered with trees and undergrowth, as distinguished from a plantation which has been made by art. In early times a great part of England, as of most other countries of Europe, was covered with forests, which subsequently as being waste lands, came to be regarded as the property of the crown, and, as abounding with game of various kinds, were carefully protected, all persons being prohibited from hunting in them but the king, or persons authorized by him. After the time of the Conquest, the forests came to be guarded with greater strictness, their number was increased, and their bounds enlarged, and trespassers were punished with greater severity. Finally, a system of laws and courts for their administration was established, by which not only all offences touching the royal forests were tried, but all persons living upon these properties governed. The Conqueror is said to have possessed 68 forests, 13 chases, and 781 parks. A chase is a smaller kind of forest, not subject to the forest laws, and which may be in the hands of a subject, whereas a forest can only be held by the crown. A park differs from a forest or chase in being of smaller extent and inclosed. The Conqueror, who is said to have loved the red deer as if he had been their father, enacted very severe penalties against trespassers, and the killing of a stag or boar was visited with loss of sight. His successors were guilty of still greater cruelties, and it is said that to kill any of the beasts of chase within a forest was as penal as to kill a man. Vast tracts of country were depopulated in order to create new forests or to extend the limits of old ones, and under the colour of forest law the most cruel and horrid oppressions were exercised. At length, however, many of these hardships were removed by the *carta de forcsta*, obtained in the 9th year of Henry III., the immunities of which, says Blackstone, were "as warmly contended for, and extorted from the king with as much difficulty, as those of the *Magna Charta* itself." It declares that "no man from henceforth shall lose either life or member for killing our deer; but if any man be taken and convict for taking of our venison, he shall make a grievous fine if he have anything whereof; and if he have nothing to lose, he shall be imprisoned a year and a day," and after that time, if he cannot find sufficient sureties, he shall abjure the realm. It also contains the following provision:—"Whatsoever archbishop, bishop, earl, or baron, coming to us at our commandment, passeth by our forest, it shall be lawful for him to take and kill one or two of our deer, by view of our forester, if he be present; or else he shall cause one to blow a horn for him, that he seem not to steal our deer; and likewise they shall do returning from us as it is aforesaid." As this law is still unrepealed, any bishop or nobleman may shoot one or two of the deer, if he pass through a royal forest in going to or returning from parliament. By this charter, many parts which had recently been afforested were disafforested and stripped of their oppressive privileges, and regulations were made in the regimen of such as remained. The forest courts were instituted for the government of the king's forests in different parts of the kingdom, and for the punishment of all injuries done to the king's deer or venison, to the *vert* or greensward, and to the *covert* in which such deer are lodged. These were (1) the court of attachment, *woodmote*, or forty days' court, held once in every forty days before the verderers, to inquire into all offences against vert and venison; (2) the court of *swainmote*, held thrice in the year before the verderers as judges, the *swains* or freeholders within the forest forming the jury, to receive and try presentments in all matters connected with offences against the forest laws, and to inquire into oppressions and grievances committed by officers of the forest; and (3) the court of justice-seat, or supreme court, held every third year before the chief justice in eyre or his deputy, to hear and determine all treapasses within the forest, and all claims of franchises, liberties, and privileges, and all pleas and causes whatsoever therein arising. There was also what was termed a court of *regard*, held every third year, for the lawing or expeditation of mastiffs, which was done by cutting off the claws and ball of the fore feet, to prevent them from running after the deer,—mastiffs being the only dogs that were permitted to be kept within the precincts of a forest. The principal officers of the forest were the justices in eyre, wardens, verderers, regarders, foresters, keepers, bailiffs, &c. The forest laws had long ceased to be much exercised, until Charles I. had recourse to this as one of the means of replenishing his empty exchequer. A court of justice-seat was held in 1632, and large sums of money were extorted from

many persons for illegal encroachments on the ancient boundaries of the forests, though the lands thus claimed had been in their possession for several centuries. This was one of the first grievances taken up by the Long Parliament; and an act passed by that assembly (16 Car. I. c. 16), which declared that the boundaries of every forest shall be those commonly known or reputed as such; and that no place where a justice-seat or other forest court has been held within sixty years, shall be accounted forest. Since the passing of that act, the old forest laws have practically ceased. In Coke's time, there were sixty-nine royal forests, all of which, with the exception of the New Forest in Hampshire, erected by William the Conqueror, and Hampton Court Forest, by Henry VIII., were so ancient that no record afforded any information as to their commencement. The principal of these were the New Forest, Sherwood, Dean, Windsor, Epping, Dartmoor, Wichwood in Oxfordshire; Salcey, Whittlebury, and Rockingham, in Northamptonshire; Waltham in Lincolnshire; and Richmond in Yorkshire. During the present reign, several of the royal forests have been disafforested by act of parliament.

FORESTALLING, *fore-stawl'-ing* (Ang.-Sax.), in Law is, by 5 & 6 Edw. VI. c. 14, described to be the buying or contracting for any merchandise or victual coming in the way to market; or dissuading persons from bringing their goods or provisions there; or persuading them to enhance the price when there. It is commonly associated with *regrating*, which is described by the same statute to be the buying of corn or other dead victual in any market, and selling it again in the same market, or within four miles of the place; and *engrossing*, or the getting into one's possession, or buying up, large quantities of corn or other dead victuals, with intent to sell them again; any of which practices were supposed to make the market dearer to the fair trader. Various subsequent statutes were passed at different times against these alleged offences, until they were at length all repealed by 12 Geo. III. c. 71, on the preamble that, "Whereas it had been found by experience that the restraints laid by several statutes upon the dealing in corn, meal, flour, cattle, and other sundry sort of victuals, by preventing a free trade in the said commodities, have a tendency to discourage the growth and enhance the price of the same," &c. Unfortunately, however, they still remained offences at common law; and even as late as the year 1800, a corn-merchant of the name of Rigby was indicted for regrating thirty quarters of oats, at an advance of two shillings a quarter. It was not, therefore, till the passing of 7 & 8 Vict. c. 24, that forestalling, regrating, and engrossing ceased to be indictable at common law. This statute, however, does not affect the offence of spreading false rumours to enhance or decrease the price of goods, which is still punishable.

FORFEITURE, *for'-fit-ure* (Lat. *foresfactura*, expulsion or outlawry), in Law, is a punishment by loss of lands, estates, offices, or personal effects, annexed to certain crimes, illegal acts, or negligence. Forfeiture is twofold,—of real and of personal estates. As to real estates, by attainder in high treason, a man forfeits to the king all his lands and tenements of inheritance, whether fee simple or fee tail, which he holds otherwise than as trustee or mortgagee, and all his rights of entry on lands and tenements, which he had at the time of the offence committed, or at any time afterwards, to be for ever vested in the crown; and also the profits of all lands and tenements which he had in his own right for life or years, so long as such interest shall subsist. This forfeiture relates backwards to the time of the treason committed, yet it does not take effect unless an attainder be had; and therefore, if a traitor dies, or is killed before judgment is pronounced, it works no forfeiture of his lands. In felony, the offender forfeits all his chattel interests absolutely, and the profits of all estates of freehold during life; and after his death, all his lands and tenements in fee simple (but not those in tail) go to the crown for a year and a day, after which they escheat to the lord of the fee. These are all forfeitures of real estates, created by the common law, as consequential upon attainders by judgment of death or outlawry. The forfeiture of goods and chattels accrues in every one of the higher kinds of offences,—in high treason or misprision thereon; felonies





of all sorts, whether clergyable or not; self-murder, and a few others. In all these cases the personal estate of the offender of every description, whether in action, passion, or settled by way of trust, which he had otherwise than as an executor, or trustee; or mortgagee, at the time of conviction, is forfeited to the crown. Goods are forfeited only upon attainder; goods and chattels are forfeited upon conviction. The forfeiture of goods has relation to the time of the fact committed, but that of goods and chattels has no relation backwards; but only such as a man has at the time of conviction are forfeited. Yet if goods be parted with collusively, in order to defraud the crown, the law will reach them; but a *bonâ fide* sale of goods made by a felon or traitor between the commission of the offence and his conviction, is valid. Forfeiture in civil cases may take place under many circumstances. It may result from a breach of express conditions between two contracting parties, as between landlord and tenant, or from a neglect or refusal on the part of a tenant to implement the conditions of his tenure. Lands may also be forfeited by alienation contrary to law, as by conveyance to an alien, or by tortious alienation, as where the owner of a limited or particular estate conveys a greater estate than that which he himself possesses, as where a tenant for life assumes to convey the fee simple. Offices are forfeited by the neglect or misbehaviour of the holders, and the right to the next presentation to ecclesiastical benefices is forfeited by lapse.

FORGE, *forj* (Ang.-Nor.), the name of the apparatus used by a blacksmith for heating bars of iron and hammering them into the desired form: it is not unfrequently applied to the place in which the avocations of a blacksmith are carried on, being used in the sense of the word "smithy." It consists of a hearth in the form of a platform about three feet above the level of the ground, on which a fire of small coal is kindled for the purpose of heating the iron; a pair of large bellows, or a blowing apparatus, worked by a lever or treadle, being attached to it, by which the blacksmith is enabled to make the fuel on the hearth throw out an intense heat and glow. A trough filled with cold water is placed in front of the hearth, in which the heated iron may be cooled when it has been hammered into the shape required; and in addition to these, and hammers of various sizes, as well as rasps, drills, punches, and other instruments, the blacksmith is provided with anvils on which he hammers the iron when it has been made red-hot. The centre of the anvil-head is flat, with pieces projecting from it at either end, one being made in the form of a wedge, on which the metal may be readily divided, and the other shaped like a cone, on which the iron may be bent into a curved or circular form. The forges in which anchors are made are provided with larger and more powerful instruments; but the shanks, arms, and flukes of large anchors, intended for men-of-war and merchant-vessels of considerable tonnage, are welded together by means of Nasmyth's hammer, a contrivance that is worked by steam-power. (*See* NASMYTH'S HAMMER.) Many machines have been invented for the purpose of carrying out the various operations included under the term "forging," and for effecting the process more rapidly. One of these—Condie's steam-forge—is worked by a small engine, as its name implies, which is attached to the framing of the forge. The operations of blowing the fire, and hammering and turning the iron, are effected by a combination of wheels, shafts, and levers, attached to the blowing apparatus, and various hammers and instruments are set in motion by the engine. The metal is fashioned into the desired shape by means of dies, which are fastened to the faces of the hammers; and this seems to be the leading characteristic of all forging-machines, although they differ greatly from one another in the general principles of construction and the manner in which the motive power is applied.

FORGERY, *for'-je-re* (Lat. *crimen falsi*), is defined to be "the fraudulent making or alteration of a writing to the prejudice of another man's right." By 2 Geo. II. c. 14, to forge or make, or knowingly to publish or give in evidence, any forged deed, court-roll, or will, with intent to affect the right of real property, either freehold or copyhold, was punishable by a forfeiture to the party aggrieved of double costs and damages;

by standing in the pillory, and having both his ears cut off, and his nostrils slit and seared; by forfeiture to the crown of the profits of his lands, and by perpetual imprisonment. As commerce increased, and when paper credits were established, various statutes were passed inflicting capital punishment on the forging, altering, or uttering as true when forged, bank-bills, notes, or other securities, bills of credit, &c.; so that in Blackstone's time, as he says, there was "hardly a case possible to be conceived wherein forgery that tends to defraud, whether in the name of a real or fictitious person, is not made a capital offence." But by 11 Geo. IV. & 1 Will. IV. c. 66, the statutes concerning this offence were consolidated, and, after long and reiterated discussions, the punishment of death was also abolished in all cases, except for the forgery of wills and bills of exchange. Finally, by 2 & 3 Will. IV. c. 123, and 1 Vict. c. 84, the punishment of death was abolished for all kinds of forgery, and a punishment varying from transportation for life (now penal servitude) to imprisonment for one year, according to the nature of the offence, substituted. It is by no means necessary to constitute a forgery, that the name of any person be counterfeited, though this is the most common mode in which it is effected; for any material alteration, however slight, — as the ante-dating of a deed, is as much a forgery as the other. Even if the name subscribed be a fictitious one, but appended for the purpose of deceiving, a forgery has been committed. The offence is complete by the making the forged instrument with a fraudulent intent, though it be not published or uttered. It consists in the fraud or deceit.

**Forget-me-not.** (*See* Myosotis.)

**Fork,** *fork* (Sax. *forc*), a common instrument, consisting of a handle and a blade, the latter of which is divided into two or more prongs, used generally for the table. The table-fork did not come into active use in England until the reign of James I., and then it was introduced from Italy. Ben Jonson, in "The Divell is an Asse" (act 5, scene 4), makes one of his characters, Mere Craft, speak of his "pains at court," to get a patent for his project for "the laudable use of forks, brought into custom here as they are in Italy, to the sparing of napkins;" and also that the forks are to be "of gold and silver for the better personages, and of steel for the common sort." We may therefore date their use in England from the latter end of the 17th century. The agricultural, or dung-fork, is used for the purpose of lifting manure and rubbish.

**Forlorn Hope,** *for-lorn' hope* (Sax. *forloren*, left without resource; *hope*, hope), in Mil. tactics, this term signifies a desperate case. A detachment of men, generally volunteers, from different regiments, are selected to assault a breach, or other position of danger, without which a town could not be taken; and this is termed taking a forlorn hope. The taking of the Cashmere gate, at the siege of Delhi, in the year 1857, may be mentioned as an instance of a forlorn hope successfully redeemed.

**Form,** *form* (Lat. *forma*, Fr. *forme*), is the manner and mode in which anything is presented to our ideas of conception. In Phys., the shape and external appearance of a body, the figure of the same as defined by angles or lines, or that manner of presenting itself to the eye peculiar to different bodies, is termed *form*; as, form of a circle; form of a square; the form of the human body; and other instances. Form is likewise to be distinguished from the real apparent nature of things; and if we take it in this light, the idea of form is used in a p[illegible]ical manner in our daily speech and scientific pursuits.—In Law, form is applied to a rule to be observed in legal proceedings. We also use the terms form of rhetoric, form of government, beautiful form, logical form, &c.—In Letterpress-printing, form is applied to an assemblage of types, composed and arranged in order, and disposed into columns, &c., locked up in a chase ready to receive an impression. Whoever esteems the form of a thing more than the thing itself, through narrowmindedness, is considered to be a *formalist*.

**Forma Pauperis,** *for'-mă paw'-pe-ris* (Lat., in the [illegible]er condition of a poor person), in Law, by statute [illegible]enry VII. c. 12, every poor person that is such as [illegible] swear that he is not worth five pounds, shall have original writs or *subpœnas* gratis, and counsel and attorney assigned to him without fee; and is excused from paying costs when plaintiff, by the statute 23 Henry VIII. c. 15, if unsuccessful; but, according to Blackstone, it was formerly usual to give such paupers, if nonsuited, their election either to be whipped or pay the costs. A pauper, however, in the event of success, may recover costs, though he pays none; but this only by order of the court or judge; for the counsel and clerks, though bound to give their labour gratis to him, are not bound to do so to his antagonist, unless he too be a pauper. To prevent trifling or malicious actions, various restrictions are made regarding the costs.

**Formedon,** *for'-me-don* (a corruption of the two Lat. words *formam doni*, according to the form of the gift), in Law, was an old form of action, which was in the nature of a writ of right, and was the highest action the tenant in tail could have. As a tenant in tail could not have an absolute writ of right, which was confined to such only as claimed in fee simple, this writ of formedon was granted to him by the statute *de Donis*. This writ was distinguished into three species,—a formedon in the *descender*, in the *remainder*, and in the *reverter*, according to the estate of the party who sued. This, with many of the other old forms, was abolished by 3 & 4 Will. IV. c. [illegible].

**Formic Acid,** *for* [illegible]*c* (in Chem.), $HO.C_2HO_3$, spec. grav. at 32°, 1·1227. This acid derives its name from the circumstance that it was first obtained from distilling the *Formica rufa*, or red ant, which, when irritated, ejects an acid liquor. It is a burning liquid of an irritating odour. It is exceedingly corrosive, producing a sore if dropped on the skin. Below 32° it crystallizes in brilliant scales. It boils at 221·5°, yielding an inflammable vapour burning with a pale blue flame. Formic acid is easily obtained by mixing, in a large retort, one part of starch, four of binoxide of manganese, and four of water. Four parts of sulphuric acid are then added, and when the mixture has ceased frothing, it is distilled, and yields a weak impure acid, which is neutralized with carbonate of lead, and re-distilled with an equivalent of sulphuric acid. With the metals, formic acid forms a series of soluble salts, called formiates. Although an organic product, formic acid has been formed by synthesis by Berthelot.

**Formica,** *for-mi'-kī* (Lat.), a gen. of insects belonging to the fam. *Formicidæ*, and distinguished by having the footstalks of the abdomen composed of a single joint, the mandibles triangular, and denticulated at the edges. (*See* Ant.)

**Forms of Address.** (*See* Address.)

**Formula,** or **Formulary,** *for'-mu-lă*, *for'-mu-lă-re* (Lat.), is a rule or model, or certain terms prescribed or decreed by authority, for the form or manner of an act, instrument, proceeding, or the like. The Roman law was full of formulas. In church matters a formula is a profession of faith; in medicine it denotes the constitution of medicines, either with respect to their prescription or consistence.

**Formula,** in Chem., is an expression of the composition of a substance by means of symbols. The formulæ of bodies may be either *empirical* or *rational*. An empirical formula is one giving the elements contained in a body, without reference to their arrangement. For instance, the empirical formula of crystallized sulphate of copper would be $CuO_4SH_{11}$, but the rational formula, showing its composition, would be $CuO.SO_3.5aq$. Formulæ are the most convenient way of expressing the decompositions taking place when certain substances are mixed, a few lines of symbols serving for pages of explanation.

**Formulary** (Lat.), is a book or writing containing stated and prescribed forms, as of oaths, declarations, prayers, and the like. The Book of Common Prayer is the formulary of the Church of England.

**Fornax,** *for'-năks* (Lat., a small furnace), in Astron., a constellation of the southern hemisphere, named by Lacaille, and situated in close proximity to Cetus, or the Sea Monster. It is one of the recognized constellations, but contains no stars of the first or second magnitude.

**Fort,** *fort* (Lat. *fortis*, strong), the name properly applied to a small inclosed work, generally erected near an important fortress or fortified town, to command any of the approaches to it. Forts are also frequently

erected on the sea-coast, for the defence of certain positions, and are garrisoned by a small body of troops. Although they do not inclose a space of any great extent, yet they are strongly constructed, and, being placed in commanding situations, often form an important line of defence. They are generally quadrilateral, with bastions or demi-bastions at the angles; but it depends mainly on the position they occupy, whether they are triangular, square, polygonal, or in the form of a crown-work or star. They consist for the most part of a rampart, surrounded with a ditch and glacis; but in some cases an outwork is constructed for the defence of any side on which it may be more easily assailed. Paris is completely girdled with a chain of carefully-planned forts, mostly pentagonal, in the shape of the enceinte, and situated at distances varying from a mile to 2¼ miles from the inner line of bastions that encircles the city. Cherbourg may also be cited as an example in which a town is effectively protected from attack by sea or land by a chain of detached forts and redoubts, which is doubled on the south-west side of the town.

FORTHCOMING, in Scots law, is a form of action by which the subjects of an arrestment are made available to the arrester. In an action of forthcoming, the arrester cites the party in whose hands the goods or debts are arrested, to appear before the judge, who, on hearing parties, orders the debt to be paid, or the effects to be delivered up to the arresting creditor.

FORTIFICATION, *for-tif-e-kā'-shun* (Lat. *fortis*, strong, and *facere*, to make), in Mil., the art of constructing works of defence and offence for the protection or reduction of any important town or position. Such works are always planned by the military engineer, and carried out under his direction and superintendence. They are commonly divided into two classes, respectively known as permanent fortifications and field-works. Under the former all works are included that are constructed for the defence of a town, harbour, arsenal, dockyard, &c., being carefully laid out and built with a view to durability and the resistance of an attack, whenever it may be made; while, under the latter, all works are classed that are intended to serve a temporary purpose; such as siege-works and batteries for an attack on a fortress, or lines of intrenchment hastily thrown up for the protection of an army in the field, or to check the advance of an enemy on an important strategical position. These works differ mainly in the manner in which they are built, the ramparts and parapets of permanent works being faced or revetted with blocks of granite; the terre-plein of the rampart on which the guns are worked, the cheeks of the embrasures, casemates, bomb-proof buildings for magazines, &c., being formed of the same material; while field-works consist of mounds of earth formed of that which is thrown up out of the ditch in front, having the ramparts and embrasures revetted with sods of turf, fascines, gabions, and sand-bags, the terre-plein for the support of the guns and their carriages being made of pieces of thick timber strongly bolted together. The principal works in each class, and their component parts, are noticed under their respective headings, an account being given in all cases of the peculiar purposes for which they serve and the method adopted in their construction. (*See* BASTION, CROWN-WORK, CURTAIN, CAPONNIERE, COVERED WAY, DITCH, GLACIS, FLECHE, FORT, LUNETTE, RAVELIN, TENAILLE, TRAVERSE, BRIDGE-HEAD, LINES OF INTRENCHMENT, REDAN, REDOUBT, STAR FORT, TRENCH, &c.) It will, therefore, be only necessary, in the present article, to glance briefly at the history of the rise and progress of the science from the earliest ages to the present time. The existing system of fortification doubtless found its origin in early ages, in the formation of a mound and trench round any small collection of dwellings, for the purpose of affording the inmates and their possessions some protection from the attack of a marauding foe; a gate being made in one part of the rampart for the ingress and egress of those that dwelt within it, with a movable bridge for the passage of the ditch. This method was pursued by the Gauls and Britons in the time of Cæsar; and they added strength to the earthen mound by throwing it up against a stockade of stout stakes or piles, which were driven into the earth in close proxi-





mity to each other, and interwoven with boughs and branches of trees. The field-works of the Romans were as effective as the permanent fortifications of the savage tribes of Central and Western Europe; remaining in many parts of England to this day, as a testimony to the skill of the Roman soldiers in fortifying even temporary camps, and the great strength of their works. But the field-works of the Gauls and Britons consisted of nothing more than their cars and waggons disposed round the camp, in the form of a circle, and strengthened by an abbatis, or barricade, formed of the branches and trunks of trees. At a very early period stone walls of considerable breadth and great strength took the place of the simple rampart of earth, for the defensive works thrown up around "fenced cities;" and these were furnished with battlements and machicolations (*see* MACHICOLATION) for the protection of the archers that manned the walls, and as a means of annoying the besiegers who might attempt to undermine the rampart. The spaces between the battlements, and the battlements themselves, were subsequently modified into the parapet-wall and embrasures, as we now have them, on the introduction of cannon. Examples of early fortifications are to be found in the remains of the Cyclopian walls that once surrounded the old Greek cities of Tiryns and Mycenæ. The Phœnicians are said to have been the first who regularly fortified their cities with stone walls; but, however this may be, it is certain that the cities of Egypt, and the great cities of Assyria,—Babylon and Nineveh, were girdled with fortifications of marvellous strength and size, on which several chariots could be driven abreast of each other. Until the year 1600, the characteristics of the defensive works of a town were nearly the same in all countries: first, they consisted of a lofty and massive polygonal wall of great thickness, with a *fausse-braye*, or bank of earth, thrown up in a sloping form against the exterior, to protect it from the attacks of the battering-ram. Then towers were added, in the form of large square or semi-circular buttresses, projecting from the angles, and also from the face of the wall in various parts, which enabled the defenders to enfilade that portion of the wall which lay between any two of them, and so defend it in a more effectual manner from the attacks of assailants who sought to make a breach at its base with their engines of war. These flanking towers were the origin of the modern bastions. Outworks were then constructed beyond the ditch, opposite to the different entrances to the town, for the better protection of the gates, connected with the main works by drawbridges. While this disposition of the wall, and its various parts, may be traced in all the fortifications of ancient cities, and those of the towns and castles of the middle ages, so it may be seen more fully developed in the curtains, bastions, crown-works, and bridge-heads of the fortifications of modern times. The old method of construction was efficient enough as long as battering-rams, scaling-ladders, and similar engines, formed the chief means of attack, and javelins and arrows the most formidable projectiles that could be showered on the assailants by those who manned the walls; and although the introduction of the inextinguishable Greek fire, in the 7th century, as a missile that brought death, terror, and destruction in its train, blazing fiercely even under water, and injuring everything wherever it fell, with the exception of stone walls, yet no modifications of the principles of construction were found absolutely necessary until the invention of cannon, which followed closely on that of gunpowder, in the 14th century, directed the thoughts of the soldier-architects of the succeeding cycle to seek means whereby the new weapon might be made as efficient for the protection of the walls, by a proper disposition of the faces of the works with reference to each other, as it was effective in causing breaches in the ramparts, that rapidly crumbled under the crushing shock of the heavy balls of stone and iron that were hurled point blank against them. The result was the introduction of bastions of the present form, instead of the old flanking towers, projecting from the corners of the work in salient angles, the rampart forming four sides of an irregular pentagon, the fifth, or gorge, being left open as a communication between the bastion and the interior of the fortress. But the chief fault of the

old flanking towers was equally perceptible in the new bastions: they were still too small, and too far apart, to defend each other in an efficient manner; and the platforms or terre-pleins of the majority were not calculated for the reception of artillery of any size. Towards the end of the 16th century, an attempt to remedy this defect was made by Errard de Bar le Duc, a French engineer, who introduced considerable improvements into the received methods of constructing fortifications. He made the faces of his bastions much longer, and the curtains connecting them much shorter, than they had hitherto been; but the faces of the bastions terminated at the shoulders in *orillons*, or pieces of the rampart in continuation of the face, which were in the form of an arc, and entered towards the interior of the bastion; and his flanks, which were bereft of their due proportions by the orillons, were disposed at an angle of 80° to the curtain, which would inevitably bring a fire of musketry, directed from the flank at right angles to its face, on the defenders occupying the opposite extremity of the curtain. De Ville, an engineer who flourished about 1630, lengthened the flanks, and constructed them at right angles to the curtain; but a still further advance to the present system was made about fifteen years later, by Count Pagan, who constructed the faces of his flanks in lines perpendicular to the faces of the collateral bastions produced, which caused them to splay outward from the curtain in such a direction, that a fire directed perpendicularly from the faces along their entire length, would enfilade the faces of the collateral bastions, and prevent an attacking party from effecting a lodgement in the ditch. He also constructed double and treble flanks to his bastions, which were parapets parallel to the faces of the outer flanks, rising above one another in tiers towards the interior of the bastion. It remained for Vauban to give a systematic method of constructing regular fortifications, which he effected by taking fractional parts of the length of the side of the polygon within which the *enceinte* was formed, and which was bounded by lines drawn to join the re-entering angles of the bastions (which, indeed, were connected with the angles of the polygon, as far as their purposes were concerned), to furnish the dimensions of various parts of the work. As this is the foundation on which all other systems are based which have been introduced since Vauban's time, and as a knowledge of it is required from all candidates for commissions in the army, a detailed account of the method of constructing a regular front of fortification, in accordance with that engineer's first system, will be given elsewhere, with a ground-plan of the same, as it has been already given (*See* VAUBAN'S FIRST SYSTEM.) His second and third systems arose out of modifications of the first, in applying it to the remodelling of the works of many old fortified towns. The chief features of these systems consisted in the bastions being detached from the *enceinte*, with a ditch in the rear, the curtains being continued, and meeting in an angle in the rear of the bastion, which was strengthened by a tower, also in the form of a bastion, the flanks of which defended the ditch. Vauban also improved the construction of the ravelin, and was the first engineer who introduced ricochet firing on attacking a fortress. He also formed traverses in the covered way, to protect the besieged from this kind of firing, and the places of arms at the salient and re-entering angles of the covered way. It will be observed, in the construction of works one in advance of another, that the reliefs of the different ramparts, or their heights one above another, must be sufficient to allow of a fire of musketry being kept up from the crest of the parapet of a lower work, while a cannonade is being directed against the enemy on their siege-works from the ramparts of the works above, without injuring the men in the work below. Thus the soles of the embrasures in the faces of the ravelin should be in a horizontal line that is, at least, four feet above the crest of the glacis, and the tenaille should be low enough to allow a musketry fire from the flanks of the bastion and the intervening curtain to pass over the heads of its defenders. The Dutch engineer Coehorn was contemporary with Vauban, and constructed the fortifications of most of the principal towns of Holland and Belgium. His system is very similar to those of Vauban; but it is distinguished by the introduction of large orillons, forming casemated batteries at the shoulders of the bastions. He also constructed works of great strength in the interior of the bastions, as well as in front of them; and redoubts in the interior of the ravelins, which protected his curtains. About 1740, Cormontaingne, a Frenchman, introduced a system founded on Vauban's, in which he extended the faces of the ravelin in front of the curtain, diminishing the extent of the salient angle formed by them. He also formed retrenchments in his bastions, and made the re-entering places of arms in the covered way large enough to admit of the construction of redoubts, having the main ditch immediately in their rear. These were useful in adding to the means of defending the covered way, and they also protected the openings that appear between the extremities of the tenaille and the flanks of the bastions, on either side of it. Various additions and modifications of these systems have been introduced from time to time, by English, French, and German engineers, since 1750. In the present century, however, the most remarkable is the new system, introduced by the Prussians, of surrounding the place with a polygonal *enceinte* without bastions, and protecting them by flank fires, from works resembling caponnières, projecting at right angles from the main walls at the centre of each side of the polygon, so that the guns of the *enceinte* flank the caponnières, while those of the caponnière flank the *enceinte*. The head of the projecting work is protected by a ravelin, the faces of which can also be enfiladed from the *enceinte* by guns placed in casemates cut in the proper direction. In the siege of Sebastopol, the Russian general Todleben, one of the most skilful engineers of modern times, employed large earthworks with singular success for the protection of the town (*See* EARTHWORKS.) The idea of substituting earthworks for stone fortifications has also been warmly supported by Mr. Fergusson. It is not improbable that the great improvements that have been lately effected by Sir William Armstrong and Mr. Whitworth in the construction of guns of heavy calibre, will lead to an inquiry into the form of structure and kind of materials best calculated to resist the shock of the heavy weight of metal that the breaching guns of the present day can launch against the walls of a fortress. With regard to the general plan of construction, whatever may be the new theoretical principles for works of defence that may be broached by modern engineers, it seems necessary, when we consider the great superiority of the guns that would now be used in a siege over the Lancaster guns and other heavy ordnance that were brought into position before Sebastopol, as lately as 1854-5, that all existing fortifications based on Vauban's systems should be strengthened by a judicious combination of exterior works, in order to enable their defenders to prolong their resistance to the utmost, if not with complete success. That the English government are fully alive to the necessity of doing this, is manifest from the additional fortifications now being constructed about Plymouth, Portsmouth, Pembroke, Chatham, Sheerness, Portland, Dover, Cork, and other places, for which an expenditure amounting to nearly ten millions sterling has been sanctioned by government.—*Ref.* Straith's *Treatise on Fortification*; Macaulay's *Field Fortification*; *Aide Mémoire to the Military Sciences.*

FORTITUDE, *for'-ti-tude* (Lat.), is one of the virtues termed cardinal. It may distinguish itself actively by resolution or constancy in adhering to duty in the face of difficulty and danger which cannot be avoided, or by courage or intrepidity in maintaining firmness and presence of mind in the midst of perils from which there may be escape. Fortitude displays itself passively in enduring with patience, submission, and resignation whatever misfortunes one may be called upon to suffer.

FORTRESS, *for'-tress*, a city or town surrounded by regular works of defence, that requires to be invested by an attacking force, and subjected to regular siege operations before it can be reduced. Fortresses are generally found on the frontiers of continental states, and in the immediate vicinity of important harbours on the sea-coast, where there are extensive naval dockyards and arsenals, and great quantities of government stores are gathered together. Plymouth and Portsmouth, with Portland, are our most important for-

tresses on the south coast; considerable additions having been made to the fortifications that surround these, as well as other places of importance, since the completion of the works at Cherbourg. There is no inland fortress in Great Britain; but when the subject of the coast defences was brought before parliament in 1859, the formation of a strong fortress at Cannock Chase, in Staffordshire, was suggested, in connection with large government works for casting artillery and the manufacture of firearms.

FORTUNATUS, *for-tu-nat'-tus*, is the title of one of the best German *Volksbücher* (people's books) ever written, and which has been translated into perhaps every language of Europe. It originated in the 15th century, though many of the tales included in it are of much older date. The oldest printed edition of the book now extant was published at Frankfort in 1509. The story is, that Fortunatus and his sons are the possessors of an inexhaustible purse of gold and a wishing-cap, which, however, in the end, prove their ruin. Thomas Decker made it the subject of his "Pleasant Comodie of Old Fortunatus" (1600); and Tieck gives the story in his "Phantasus" (3 vols., Berlin, 1816).—*Ref.* Ersch und Gruber's *Encyklopedie*, 1 sect., vol. 46.

FORUM, *fore'-um* (Lat. *forum*, a market), the name given to an open space in Roman cities, generally surrounded by a covered colonnade, that formed an ambulatory, and buildings of various kinds, such as temples, courts of law, prisons, granaries, &c. In the later period of the empire, when Rome had attained the summit of its glory, there were nineteen *fora* within its limits, which were divided into two classes, some being especially set apart for public meetings and the proceedings of the law courts, while others were devoted to business purposes and the requirements of trade. The Forum Romanum, the first that was erected in Rome, served equally for the purposes of trade and all public meetings, as well as for the administration of justice by the consuls, decemvirs, and other magistrates of Rome. This forum was subsequently distinguished for its magnificence; the shops were removed, and many temples of the heathen gods, the senate-house, and the comitium, were erected in its immediate vicinity, and in communication with it. It was also adorned with arches, statues, and pulpits, from which public meetings were addressed, and which were called *rostra*, from being surrounded with the brazen beaks (*rostra*), or ornaments of the prows of the ships of war that had been captured by the Roman triremes. Exhibitions of gladiators were often shown in the forum. The Roman forum corresponded to the *agora* of the Greeks, and no Roman city or colony was without this important centre for the transaction of business and public affairs. Plans of the forum at Pompeii and the principal forum of Rome are given in "Pompeii," a work published by the Society for the Diffusion of Useful Knowledge.

FOSSE, or FOSS, *fos* (Fr. *fosse*, a ditch; from Lat. *fodio*, *fossus*, I dig), a term in Fort., applied to a ditch, generally filled with water, encircling the rampart of a fort, lying between the scarp and the counterscarp.—In Anat., the term is applied to a large cavity in the bone, with no exit or perforation.

FOSSIL, *fos'-sil* (Lat. *fossus*, dug up), in Geol., the body, or any portion of the body, of an animal or plant buried in the earth by natural causes, or any recognisable impression or trace of such a body or part of a body. Such is the definition given by Mr. Jukes, one of the most philosophical geologists of the present day. The old geologists used to include minerals, or any other distinct bodies that were found in rocks, under the term of fossils. According to modern views, fossils are simply organic remains, allowing the word "remains" to apply even to foot-prints and other transient impressions. A fossil is not necessarily a petrifaction. Some fossil shells found in comparatively old rocks, such as the soft compact clays of the oolitic series, are less altered from their living state than many shells included in recent coral reefs. Wood, again, may be found in such rocks still soft and but little altered; while in much more recent formations it is entirely mineralized, and converted either into flint or into coal. That department of geology which relates to fossils is termed *Palæontology* (which *see*).

FOUGASS, *fou-gis'* (Fr. *fougasse*), in Mil., the name of a small mine. It is made by sinking a pit about ten or twelve feet below the surface of the ground, and putting a wooden case at the bottom, containing several pounds of powder, and occasionally some shells. It was formerly fired by means of a saucisson, a long narrow bag of linen filled with powder, which was protected from injury likely to arise from the dampness of the ground, by inclosing it in a casing of wood. The saucisson communicated with the fougass at one end, while the other was brought in a shallow trench under the earth to any point from which the train might be conveniently fired. Fougasses are generally made in the glacis of a work, to throw the attacking party into confusion when an attempt is made to take the work by storm. A very destructive kind of fougass is made by filling the hole that has been excavated to receive the powder with rough stones as well as earth. In modern warfare, fougasses are exploded by means of the electric spark and by detonating powder, with which wires communicate that are laid in the path by which the assailants advance to the attack. Fougasses that were contrived to be exploded by wires attached to them were found in the Russian works before Sebastopol at the termination of the siege and the occupation of the town by the allied forces.

FOUNDATION, *foun-dai'-shun* (Lat. *fundatio*), the name applied to the surface of the mass on which any superstructure is reared. Foundations are of two kinds—natural and artificial; but of whichever class the foundations may be on which a building is to be raised, care must be taken by the architect, or builder, to ascertain that there are no existing causes which would render them liable to lateral displacement, whatever may be the weight of the materials that are piled upon them. Rocks, gravel, loamy soil, and clay, are equally available for natural foundations, provided that there be no causes, arising from the position of the strata or from the presence of water underneath, that may tend to produce natural displacement; but the thickness of the lower part of the walls of the building must be in accordance with the nature of the foundations on which the building is erected,—a greater breadth being required for walls on foundations of loam or clay, than for those which are raised on rock or gravel, as the former soils are more susceptible of compression than the latter, and require the footing of the walls that are built on them to be spread out to a greater extent, that a larger area of bearing-surface may be secured. Artificial foundations, on soft, compressible soils of great depth, such as the alluvial deposits at the mouths of tidal rivers, loose shifting sand, and peaty *bogs*, are formed in various ways. One method is to drive in a number of large piles vertically, that are of sufficient length to enter and become fixed in a substratum of a harder and less-yielding nature. These piles, in some cases, support the entire weight of a building, as columns support a roof; in others, they render the soil into which they are driven more solid, by pressing the earth that is between them more tightly together, and therefore more capable of bearing the heavy weight of any superstructure raised upon it. After the piles have been driven in, bulks of timber are laid transversely across the heads, like sleepers, and the whole is firmly bedded in a mass of concrete, which affords a hard and level platform for the masonry that is to be placed upon it. Sometimes iron tubes are forced into the soil, which are afterwards filled with concrete; or, when it is practicable, piles of wood or iron are driven in closely together, so as to inclose a space with a close sheeting, and the soil in the interior is removed, and replaced by a mass of concrete and rubble. In forming foundations in sand for the piers of bridges, &c., tubes of brick-work, like the linings of wells, are formed and sunk in the same way (*see* WELL-SINKING), and the interior is afterwards filled with concrete. In securing foundations for some of the bridges and railway-bridges in various parts of England and France, among which may be named the Royal Albert Viaduct at Saltash, iron tubes of great size were sunk through the loose soil until the solid rock at the bottom was reached. In peat bogs, large square excavations are made, which are filled with faggots of brushwood, and sand and gravel laid on boughs of trees and rude hurdles, in the manner in which Stephenson constructed a railway across Chat Moss in

Lancashire. In all artificial foundations, when timber piles and concrete are used, the engineer has to look carefully to the nature of the materials at his command, and to consider if any change is likely to take place in the normal condition of the soil in which his foundation is made, by subsequent drainage or other causes. For a constant state of moisture, beech and elm afford the best timber for piles; but when the substructure is likely to be drier at some periods than at others, or, in other words, to be exposed to alternations of dryness and moisture, then pine is better than either of the kinds of timber that have been already named.

FOUNDATIONS, in Pol. Eco., are institutions established and endowed, usually by private individuals, for the promotion of some useful or benevolent purpose. During the middle ages, it was very common to bequeath property for various religious or scholastic purposes. The two great universities of England,—Oxford and Cambridge, owe their existence mainly to this source, as do also the greater number of the grammar and free schools throughout the country. Numerous hospitals have also been established in this way, and various other institutions for the relief and assistance of the poor.

FOUNDING, *fownd'-ing* (Fr. *fondre*, to cast metals, &c.), the term generally applied to the process of producing any article by causing molten metal or plaster of Paris to run in a liquid state into a mould of the requisite form, which is made in various ways, and of substances best suited for the reception of the liquid material that is to be poured into it. The process is applied to the manufacture of articles in iron, bronze, bell-metal, lead, steel, copper, porcelain, plaster, and cement of various kinds. The method of founding or casting cannons in iron and bronze will be found elsewhere (*see* CANNON), and as the process adopted in casting statues in plaster, and making ornamental pottery and busts in Parian ware, differs so materially from that which is used in forming metal castings, each will be described in the notice of that branch of art to which they respectively belong (*see* PORCELAIN, POTTERY, SCULPTURE), and the present article devoted to a brief account of the method adopted in founding iron castings of great size, and bells and statues in bell-metal and bronze. An account of type-founding will also be given under its proper heading (*see* TYPE-FOUNDING). After iron ore has been roasted, to drive off the arsenic, sulphur, and water that may exist in it, it is thrown in an enormous furnace (*see* BLAST-FURNACE, IRON MANUFACTURE), with a quantity of coke and limestone, the latter of which acts as a flux to the ore, and promotes the melting of the iron. The following proportion is generally observed; namely, a ton and a half of coke and 8 cwt. of limestone, broken in very small pieces, to every ton of ore; but if pig iron be used, or iron that has been extracted from the ore, the addition of limestone is not necessary. When this mixture is in the furnace, a strong current of air is directed against the glowing mass, and the metal sinks to the bottom of the furnace, leaving a quantity of scoriæ, technically called "slag," behind it, when the vent at the bottom has been opened, and the molten fluid allowed to escape. The model of the article to be cast is generally made in wood, and from these models moulds are constructed, being made of a peculiar kind of yellow sand, which has been well mixed and kneaded with a little water. If the article is to be made in a solid piece, there is not much difficulty in making the mould, which is generally fashioned in two pieces if the casting be cylindrical in shape, or in more than two if it be irregular in form; but when it is to be cast hollow, a core is formed, to occupy the greater part of the interior of the mould, leaving a certain thickness everywhere between the inner surface of the mould and the exterior of the core; the former of which gives the external form to the casting, and the latter the internal form. To make the core, a quantity of wax or clay is pressed into the mould, or parts of the mould if it be made in pieces, of the thickness required for the metal. The mould having been thus lined, is then built together, and the internal cavity filled with sand, or a composition made for the purpose. The exterior mould is then taken off, and the wax or clay, which represented the metal, is removed, leaving the core around which the mould is subsequently built up, being prevented from touching it by stops that are arranged to preserve the necessary space between the mould and the core. They are then thoroughly dried by being exposed to the action of heat, in a drying-stove. Great care is taken to insure perfect freedom from moisture, which would generate steam, and cause an explosion at the entrance of the metal. As soon as all parts of the mould are dry, they are built together and surrounded by sand, which is carefully banked up around and over the mould, to assist in resisting the weight of the metal when it enters; but if the casting be of considerable size, it is generally buried in a pit below the level of the furnace, which is filled with sand as soon as the mould has been built up in it, and in such cases the mould and core are strengthened by bars and hoops of iron, which have been introduced during the process of making them. Sometimes the moulds are packed with sand into frames of iron or casting-boxes. When all is ready, the furnace is opened, and the metal is allowed to run into the mould along channels made for the purpose, or if the mould be at some distance from the furnace, and the casting be of small size, it is carried from the furnace by men in large iron pots or crucibles. Sufficient time is then given to allow the casting to cool, after which the mould is broken off, and the iron, if necessary, is cleaned, and the external roughness removed by filing, &c. The above is an outline of the process used in making castings in iron, and is pretty nearly the same for castings in all kinds of metal, with some slight difference, that is required either by the form of the article (*see* SHELL), or the peculiar metal of which it is made. In casting large bells for churches, cathedrals, and clock-towers, and groups of figures, or statues of great size, very large furnaces are required, as the whole of the metal used in the casting must be melted and run into the mould at one time. The pit in which the bell is cast is made near the furnace. The core consists of a mass of brickwork covered with a composition of loam and horse-dung, which is carefully fashioned to the shape of the interior of the bell. Another coating of composition is then added, after sprinkling the core with tan-dust to prevent one coat from adhering to the other, and this is carefully moulded to the form of the exterior of the bell, forming what is called the model. More tan-dust is then applied, and on the model a third coating is laid, called the shell, which eventually gives the form to the exterior of the bell. This shell is then carefully taken off and the model removed, after which the shell is built up round the core, and the pit filled with sand or loam. The bell-metal, formed of tin and copper (*see* BELL-METAL), which has been melted in a furnace heated with wood, instead of coal or coke, is then allowed to run into the mould. After casting, the tone of the bell is duly regulated. (*See* BELL.) The method used in casting bronze statues is similar to that adopted for castings in iron and bell-metal; but the composition of which the mould and core are made is different, consisting chiefly of a mixture of plaster of Paris and brick-dust. It is unnecessary to make large bronze castings in one piece, as they can be made in parts, which are afterwards soldered together. The composition of bronze is given under its proper heading. (*See* BRONZE.)—*Ref.* Wyatt's *Treatise on Metal-work*.

FOUNDLING HOSPITALS, *fownd'-ling* (Aug.-Sax.), are charitable institutions established for the care and upbringing of foundlings, or children that have been abandoned by their parents. The object of such institutions is to prevent the destruction of children, either by actual violence, or through exposure in the streets or highways; and their establishment dates from the middle ages. In ancient Greece and Rome the exposure of children was a frequent practice, as it is among the Chinese at the present day. Neither Plato nor Aristotle condemns it; they content themselves with laying down general rules for the preservation of the healthier and stronger at the expense of the more weakly. Thebes was the only state of ancient Greece that is known to have forbidden by law the exposure of children. Abandoned children were declared by law to be the slaves or absolute property of those who brought them up. The practice of exposing infants seems also to have prevailed among the Germanic

nations before the introduction of Christianity. With the spread of Christianity, different feelings began to prevail on this subject; and the exposing of infants was forbidden by the emperors Valentinian and Gratian. At the same time, the stricter laws that came in force concerning marriage and against concubinage, rendered women more anxious than before to conceal their shame; so that, in fact, the danger to infants of being exposed or put to death was rather increased than diminished; and hence Gibbon has some reason to speak of child-exposure as one of the most stubborn remnants of heathendom. So early as the 6th century a species of foundling hospital is said to have existed at Trèves; the then bishop of that place permitting children to be deposited in a marble basin which stood before the cathedral, and giving them in charge to the members of the church. The first well-authenticated instance, however, is that established at Milan in 787, by the archpresbyter Datheus. Subsequently, foundling hospitals were established at Montpellier in 1070, at Embeck in 1200, at Florence in 1317, at Nürnberg in 1331, at Paris in 1362, and at Venice in 1380. In 1198, Innocent III., when rebuilding the great hospital of Santo Spirito at Rome, allotted a portion of it for the reception of foundlings. This system prevails in France, Spain, and Italy, and in general in all the Roman Catholic countries in Europe; whereas in Protestant countries it is not looked upon with favour. The principal objection that has been raised against foundling hospitals is, that they tend to encourage illegitimacy; and the great argument in favour of them is, that they have the effect of preventing child-murder. The question is one of very great difficulty; but the prevailing opinion in this country has always been opposed to these institutions, as being, on the whole, more pernicious than beneficial. Foundling hospitals, too, are more necessary in those countries where there is no legal provision made for the poor, than where, as in our own, the mothers of illegitimate children, if unable to support them, may have recourse to the parish poor-house. The mortality in foundling hospitals has always been very great, though the evil has in some measure been mitigated in more recent times by means of improved management and the practice of giving out children to be nursed. The usual mode of depositing children in the hospital is by means of a turning-box fixed in the wall, in which the child is laid, and, on a bell being rung, it is taken in by one of the watchers. The proportion of illegitimate children in Paris is about one in every three births; and of the total number of illegitimate children, about 58 out of every 100 become inmates of the foundling hospital, where more than one-half of them die before they are a year old. The Foundling Hospital in London was established in 1739, by Captain Thomas Coram, a benevolent sailor, as "an hospital for exposed and deserted children." So great, however, was the influx of inmates, that the funds of the institution were inadequate to its support, and as the system did not meet with much favour in this country, the character of the hospital was, in 1760, changed from a foundling to what it now is, an hospital for poor illegitimate children whose mothers are known. The committee requires to be satisfied of the previous good character and present necessity of the mother of every child proposed for admission. The qualification of a governor is a donation of £50. Among the principal benefactors to the hospital was the great Handel, who used to perform his oratorio of "The Messiah" in the chapel.

**Fountain**, *fown'-tin* (Lat. *fons*, Fr. *fontaine*), a spring or source of water rising above the earth in a jet or jets, forced up by either natural or artificial means. Artificial fountains flow from vases, statues, or other picturesque pieces of sculpture. Among the ancients, fountains were generally esteemed sacred, and sacrifices and libations were made in their honour. Horace, in his odes, gives a tribute of praise to one at Rome, distinguished by the appellation of *Fons Blandusiæ*. Many of the Greek cities were adorned with these beautiful and necessary objects of art, Corinth especially. In the ruins of Pompeii and Herculaneum, fountains were seen in nearly every situation, and, from the number of leaden pipes also found, it seems that every house was provided with one. In modern Rome this practice of having fountains distributed through the city is kept up in the present day; and those of Trevi and the Paulino, at San Pietro in Montorio, are splendid piles of architecture, adorned with imposing pieces of sculpture. In Paris, the fountains of Versailles and St. Cloud used to be considered the finest in the world; but since the erection in England of the system of fountains at Sydenham Palace, they cannot be compared with the latter. Within the last year or so, much attention has been given to the necessity of public drinking-fountains in the streets and thoroughfares of London, and now many of them are supplied with some really artistic *jets d'eau*, through the liberality of some of the chief citizens. They are a necessity to a large city, and there is no doubt that ere long London will be as well or better supplied than Rome was in this respect.

**Fourierism**, *foor'-ee-er-izm*, is the name given to a system of socialism promulgated by Charles Fourier (1772—1837), and which differs materially from the systems of communism strictly so called. It professes to be based upon natural laws, and to be founded on calculations which he maintained to be the counterpart of Newton's physical system. This system, unlike communism, does not, in theory at least, withdraw any of the motives to exertion which exist at present, nor does it contemplate the abolition of private property. According to the Fourierists, there is scarcely any kind of useful labour which is naturally and necessarily disagreeable, unless it be either regarded as dishonourable, or is immoderate in degree, or destitute of the stimulus of sympathy and emulation. They therefore endeavour to strengthen and foster those motives for exertion that are naturally inherent in man. Society was to be formed into associations, or phalansteries, each comprising 400 families, or 1,800 persons, numbers brought out by very careful calculations. The phalanstery was to include everything in structure and character which could gratify the highest taste and sense of enjoyment. The pursuits and functions of the members were to be infallibly adjusted through a distribution by which each person was to be set precisely to that occupation in life to which his passions and propensities directed him. Life was thus to be a perpetual enjoyment, and labour, instead of being a task, was to be as much a source of enjoyment as the pursuits of the hunter or the angler. The property of the association was to be held in 1,128 shares, and the whole products were to be divided into twelve parts; of which five were to go to labour, four to capital, and three to skill or talent. The capital of the community may be owned in unequal shares by different members, who would receive proportional dividends; and the claim of each person to the share of the produce appropriated to talent is estimated by the grade or rank which the individual occupies in the several groups of labourers to which he or she belongs. The remuneration, when received, would not of necessity be expended or enjoyed in common. The system, however, as a whole, is so complex, that Fourier himself never admitted that even the most ardent of his disciples understood it; and to the last he would sanction nothing as an announcement of his views that he had not himself written. An attempt was made to carry out Fourier's views practically in the neighbourhood of the small town of Rambouillet, easily accessible from Paris. About £20,000 is said to have been expended in the attempt, which proved a failure. According to J. S. Mill, Fourierism is "the most skilfully combined, and with the greatest foresight of objections, of all the forms of socialism." It "does no violence to any of the general laws by which human action, even in the present imperfect state of moral and intellectual cultivation, is influenced; and it would be extremely rash to pronounce it incapable of success, or unfitted to realize a great part of the hopes founded on it by its partisans."—Ref. *Encyclopædia Britannica*, art. *Communism*; *Principles of Political Economy*, by J. S. Mill.

**Fourth**, *fourth* (Ang.-Sax.), a distance comprising three diatonic intervals. There are three kinds of fourths; viz., the *diminished fourth*, composed of a whole tone and two semitones; the *perfect fourth*, consisting of two whole tones and a semitone; and the *extreme sharp*, or *superfluous fourth*, consisting of three whole tones.

FOUSIL OIL, *fow'-sil*, in Chem. ($C_{10}H_{11}OHO$), a substance found in brandies distilled from fermented potatoes, rye, barley, and the marc of grapes. Its chemical name is amylic alcohol, under which heading its properties are described.

FOVILLA, *fo-vil'-la* (Lat. *fovco*), in Bot., the matter contained within the membrane of the pollen-grains. It is a semi-fluid granular protoplasm, in which are suspended very minute starch granules, and what appear to be oil globules. It is, without doubt, the essential part of the pollen-grain. (*See* POLLEN.)

FOWL, *fowl* (Sax. *fugel*).—In its general sense, this term is nearly synonymous with *birds;* but in a more restricted sense it means those domestic birds brought up in a farmyard for the table. Fowls originally came from Persia and India, and they are valuable to the breeder in many ways, yielding profit as they do in eggs, in broods, and in feathers. The different kinds of this useful domestic creature are the Cochin-China, the Hamburo', the Spangled, the Spanish, the Bantam, the Malay, the Poland, the Brahmapootra, and the Dorking. Besides these there are several other scarce specimens; as the Japanese Bantam or Silky Fowl, the Emu or Silky Cochin, the Andalusian, the Rangoon, and the Ancona fowls, all of which are bred more for exhibition than for real utility. The Cochin-China is one of the largest of the different kinds, and the colours of its plumage are buff, lemon, cinnamon, grouse, partridge, white, and black. They are capital layers, and in a short time a pair will stock a yard. The Hamburo' fowl is one of the prettiest varieties, and has gold and silver plumage; these are also prodigious layers, but rarely have patience to bring up a brood. The Spanish fowl and the Dorking are the more commonly seen than the other varieties, and are certainly of more use to the breeder, being good sitters as well as layers. The Bantams are the greatest favourites, being remarkably small birds, and having delicate plumage. It would be vain idle to give a description of all the different varieties here, but the reader is referred to "A Plain and Familiar Treatise on the principal Breeds of Fowls," by Mr John Baily. The Guinea-fowl, or Pintado, is sometimes classed among the common order of fowls; they are very wild and restless in their nature, and, unlike the ordinary fowls, they give no notice to any one of their laying or sitting; they have consequently to be closely watched. The Guinea-fowl is very delicate eating, and is in season about Lent. Their eggs are something like those of turkeys, but not so gross. As the Guinea-fowl rarely watches over her nest and rears a brood, its eggs are generally put under a common hen, which performs in a satisfactory manner the duties of foster-mother.

FOX, *foks* (Ang.-Sax.).—Until very recently, the foxes were placed, by the most eminent naturalists, together with the wolf and dog, but, according to the classification of the mammalia in the British Museum, which system is now generally adopted by zoologists, it is separated from these animals, and placed in the genus *Vulpes*. In many particulars, it is true, the fox greatly resembles the rest of the genus *Canis;* but the shape of the pupil of the eye (which is elongated), the bullet head, the bushy tail, the long body, supported on short limbs,—all these characteristics fully establish the soundness and correctness of the position to which the fox is assigned in the collections of the great national repository of science. The common fox (*Vulpes vulgaris*) is the only species found in this country. Of so well-known an animal, any minute description would be superfluous. Its colour is reddish-fawn, intermixed with black and white hairs; its tail, or "brush," is of the same colour, except at the tip, which is white. It measures about two feet and a half in length, and twelve inches in height. Its coat is much heavier and thicker during the winter months, when its fur is of greater value than in warmer weather. Linnæus restricts its geographical range to Europe, Asia, and Africa: Cuvier says it is found from Sweden to Egypt inclusively. In eighteen months, the fox attains maturity; and its life varies from twelve to fourteen years. As thus, however, can only be said of those animals which have been captured young, or born in confinement, it is probable that, in a wild state, the fox lives to a much greater age. The fox emits a most unpleasant scent, which proceeds from certain glands





situated at the root of the tail. This powerful odour is rendered more disagreeable from the remarkable tenacity with which it clings to any object which it has once touched. The common fox lives on rabbits, hares, partridges; and when occasion offers it a chance of obtaining entrance into the farmyard, it often commits great havoc among the poultry. This food failing, it will resort to worms and insects for a means of subsistence; and, when dwelling near the sea-coast, sometimes makes a meal of the molluscs and crustacea it can manage to pick up on the shore. It burrows in the ground like the rabbit; and, indeed, often turns out that animal from its domicile to take up its own abode there. Besides the above species, there are several others,—the Persian fox (*V. flavescens*), the Arctic fox (*V. lagopus*), the American fox (*V. calsax*), the South-African fox, or Caama (*V. Caama*), the Senegal fox (*V. dorsalis*), the Kit fox (*V. cinereo-argentatus*), the Kokree (*V. bengalensis*), the Sahara (*V. zerda*), and one or two others, which are doubtful members of this family.

FOXGLOVE. (*See* DIGITALIS.)

FOX-GRAPES. (*See* VITIS.)

FOXHOUND, *foks'-hownd* (Ang.-Sax.), a species of dog used in the sport of fox-hunting. An extraordinary amount of care and attention has been given to the proper breeding of this animal, and no pack can be justly considered perfect without each particular animal composing being especially picked out as adhering to the rules laid down for the guidance of dog-fanciers. In the true foxhound, nearly all the individual good qualities which distinguish other varieties of dogs are combined, and, for fleetness, strength, fine scent, spirit, perseverance, and endurance, they have no equals. The foxhound is not a very large



FOXHOUND.

animal, his height averaging from twenty to twenty-two inches. The colour of the foxhound is generally pied; such as yellow, black, dun, fallow, and brown intermixed. In order to be perfect, an old authority on the chase observes, that the animal should be of the following proportions: his legs straight as arrows; his feet round, and of medium size; his shoulders black; his breast wide; his chest deep; his back broad; his head small; his neck thin; and his tail bushy, thick, and well-carried. A celebrated foxhound bitch, belonging to Colonel Thornton, named Merkin, has been known to run four miles in seven minutes and half a second,—a pace which nearly equals that of the fastest race-horse.

FOX-HUNTING. (*See* HUNTING.)

FRACTIONS, *frak'-shuns* (from Lat. *frango*, I break), a term applied in Arith. and Alg. to designate a part of any magnitude, integer (whole number), or unit. For example, "two and a fraction" means two units and that part of a unit which can be distinguished as one-half, two-fifths, and so on. In the fraction $\frac{1}{2}$ in arithmetic, or $\frac{a}{b}$ in algebra, the figure 1 or $a$ is the *numerator*, and 3 or $b$ is the *denominator;* and they represent that, if a whole number is divided into *three*

or *b* parts, only *one* or *a* parts are taken. In the addition of fractions, the fractions must be brought down to the same denominator, and their numerators (as expressed in the value of their new denominator) must then be added, when we have one whole fraction. Thus, if we want to add ½ to ⅜, we must find the least common multiple of 3 and 5, which is found to be 15; then, as 3 goes 5 times into 15, and 5 goes 3 times into the same number, we multiply the numerators of the different fractions by these respective quotients, and then add the two quantities together. Thus, ⅔ added to ⅖ will be 5 *added* to 6 *fifteenths*. The true definition of a *fraction* may be thus summed up:—It is the division of its numerator by its denominator; as *seven-eighths* are equivalent to the whole number 7 *divided* by 8,—whence a fraction is obtained. Decimal fractions simplify calculations greatly, as they are constructed on the principle of having one common denominator,—a multiple of ten; and thus fractions can be added, subtracted, and divided without repeating over and over the tedious process of bringing them down to a common denominator. (*See* ARITHMETIC and DECIMALS.)

FRACTURE, *frák'tshur* (Lat., from *frango*, I break), in Surg., is the term applied to broken bones. This is one of the commonest accidents to which one is liable, especially in very cold weather, when the bones are very brittle, and in certain conditions of the bones themselves. Fractures are divided into simple, compound, comminuted, and complicated. Simple fractures are those in which the fracture does not communicate with the external air. These are by far the most common, and usually affect the shaft of long bones, this part being the most subject to injuries of this description. Compound fractures are those in which one or more bones are broken, and the fracture communicates with the external air by means of a wound in the soft parts. Comminuted fractures are those in which the bones are broken into several portions; while complicated fractures are such as are complicated with some other injury; as a wound of the principal artery of the limb. Fractures are also distinguished as transverse, oblique, or longitudinal, according to their direction. A transverse fracture is usually much more easily treated than an oblique; for the parts, when placed in opposition, may be kept there without much difficulty; whereas, in the latter case, they are liable to be displaced by the movements of the muscles or parts; also, in the latter case, the contiguous soft parts are much more liable to be lacerated by broken edges of the bone than in the former. In treating the oblique fracture, the limb should, if possible, be placed in such a position as will relax the principal muscles connected with the bone; in the transverse fracture, the straight position is often the best. The general symptoms of a fracture are deformity of the limb, caused either by the overlapping of the bones, or effusion of blood, lymph, or serum into the cellular tissue, shortening of the limb, and crepitus, or a grating sound when the ends of the fractured bone are moved upon each other. The treatment of fractures consists in restoring the broken fragments, as nearly as possible, to their former positions, and securing them in that state. Where displacement has taken place, it is first of all necessary to soothe the muscular irritation by means of gentle friction or warm fomentations, after which, by a gentle application of force, the bone is to be restored, as nearly as possible, to its proper position. When the limb has been reduced, or set, it is to be placed in *splints*, which are thin pieces of wood, or other material of the requisite firmness and length, shaped and hollowed out, so as to fit evenly without making undue pressure upon any part. The skin is to be protected by folds of linen, or thin soft pads, a little wider than the splints, which are also useful to prevent them from slipping. These are to be bound upon the limb with a moderate degree of pressure, and they ought to be removed and readjusted occasionally, in order to detect and rectify any deviation that may be observable. The mode of healing, in simple fractures, differs little from the manner in which bone is originally formed. Immediately after the fracture has taken place, a quantity of blood is poured out into the surrounding cellular tissue by the vessels of the adjoining structures. Inflammation sets in, and the periosteum becomes thickened; lymph is poured out, by which the ends of the bone are united, and in which bony matter is formed, until a complete union is effected. The period taken for the accomplishment of this varies according to the bone broken, the age, constitution, &c. of the patient. It is quicker in children than in adults, and in adults it is slowest in old age. Taking all ages, however, the time occupied is from two to eight or ten weeks. The treatment of compound fracture consists in placing the broken bones in opposition, and healing the external wound, so as to convert the compound into a simple fracture. This is best done, where it can be effected, by bringing the edges of the wound together with adhesive plaster, or with sutures if necessary. But the modes of treatment in this, and the other complicated cases of fracture, are so varied, and depend in so great a measure upon the circumstances of each particular case, that our limits do not admit of our entering upon them; which is the less to be regretted, as they can only be properly treated at the hands of a skilful surgeon.

FRAGARIA, *fr.g-ai-re-a* (from Lat. *fragrans*, fragrant), in Bot., the Strawberry plant, a gen. of the nat. ord. *Rosaceæ*. Two species are natives of Britain; namely, *F. vesca*, the wood strawberry, and *F. elatior*, the hautbois strawberry. The latter is very rarely met with in a wild state. From these and several foreign species, a great number of varieties have been developed. The fruit is remarkably wholesome, and is regarded by most people as the choicest of our native fruits. In cultivating the strawberry, an open situation and a rich loamy soil are required. The plants, until the fruit is formed, demand copious supplies of water. The row-culture is most convenient, and frequent renewal insures vigorous plants and large fruit.

FRAMBŒSIA, or YAWS, *fram-be-ze-a* (Fr., from *framboise*, a raspberry), a disease of the skin, indigenous to the Antilles as well as Africa. It consists of imperfectly suppurating tumours, which gradually increase in size until they become as large as, and somewhat resemble, a raspberry. The period during which the disease is in progress varies from a few weeks to several months. When it has reached its height, it usually continues for some time without undergoing much change, and then passes away. It seldom proves dangerous, except from the mischievous interference of ill-directed art. The "master yaw," however, or one of the pustules that attains a much larger size than the rest, sometimes remains large and troublesome after the others have disappeared, and requires to be treated with gentle escharotics. The *framboesia* is propagated solely by the contagion of the matter discharged from the eruption when applied to the broken skin of another person who has not previously had the disease; for it only affects the same person once.

FRAME BRIDGE, *frambrid* (Ang.-Sax.), a bridge built of beams of timber, and framed together, as it is technically called, in such a manner that any weight which may be placed on the structure exerts a crushing or pulling strain on the timbers in the direction of the grain of the wood, any disposition of the pieces that may cause a strain to be exerted on them transversely to the direction of the fibres of the material, being carefully avoided. In making frame bridges of considerable span, the timbers are often put together to present the form of an arch, in the same manner in which centrings are formed on which arches of brickwork or masonry are constructed (*see* CENTRING); but, in the majority of bridges of this class, the weight is either thrown on a horizontal tie-beam by oblique timbers which support a pathway above, and are framed into the tie-beam abutting firmly against it, and transmitting the weight in the direction of its length, as in the bridge of Schaffhausen, on the Rhine, in which no outward thrust is exerted against the piers on which the tie-beam which supports the structure is laid; or, on the contrary, in some, a great part of the weight is thrown on the abutments of the bridge by diagonal struts through which a considerable outward thrust is conveyed against them. Frame bridges are common in Switzerland, where a roof is frequently constructed over them, to shelter the main timbers of the bridge from the action of the weather. In erecting bridges of this description, care should be taken to prevent

their decay, from exposure to the weather, as far as possible, by guarding against the settlement of water in the joints of the timbers, and to promote a free circulation of the air about the ends of the beams that rest on or are imbedded in the masonry of the abutments.

FRAMING, *frai'-ming* (Ang.-Sax.), the name applied to the process of jointing and fitting together any kind of work composed of a number of different parts, whether in wood or metal. In carpentry, however, this is generally called "joining," and the carpenter who is employed on such work is termed a "joiner."

FRANC, *frŏnk* (Fr.), a French silver coin of the value of nearly tenpence sterling. The equivalent in our coinage is, that twenty-five francs go to make one sovereign. The franc, or frank, which was used in ancient times, was a gold piece nearly equal to a crown in value; and the old silver franc was in value equal to a third of the gold one.

FRANCHISE, *frăn'-tshiz* (Fr., a privilege or freedom from any onerous duty), in Law, is defined to be "a royal privilege or branch of the king's prerogative subsisting in the hands of a subject." It thus must necessarily arise from a king's grant, or it may be held by prescription, which supposes a grant. The different kinds of franchise are almost infinite; but among them may be mentioned the privileges of bodies corporate, the right to hold courts leet, fairs, markets, ferries, forests, chases, parks, warrens, and fisheries. They may be lost or forfeited by the parties who enjoy them; and the remedy for the disturbance or interference with a franchise is an action on the case. The right of voting at an election for a member of parliament is also termed a franchise.

FRANCISCANS (GREY), or MINOR FRIARS, *frăn-sis'-kăns*, in Eccl. Hist., constituted one of the four orders of mendicant friars, and were termed Franciscans, after their founder, St. Francis; Grey, from their grey clothing; and Minor, or Minorites, in token of their humility. The order was established by St. Francis at Assisi, in Naples, in 1208. It was distinguished by vows of absolute poverty and a renunciation of all the pleasures of the world, the members being strictly prohibited from having any property whatever. The rule of the order, sanctioned by the pope in 1210 and 1223, destined them to beg and preach. The popes granted them many extensive privileges, which excited the envy and opposition of the secular clergy, upon whose rights they often made great encroachments; and they refused to acknowledge any authority whatever but that of the pope. They spread with great rapidity, and at length comprised many thousand monasteries, all established by alms and contributions. The rule of poverty, so strictly enjoined by their founder, came in time to be somewhat relaxed, and the monasteries were permitted to hold property. Learning, too, which was at first despised, came to be cultivated within their monasteries, and many of their members became distinguished as scholars; as Bonaventura, Duns Scotus, Roger Bacon, and others. Several of them have also risen to the highest offices of the Church; popes Nicholas IV., Alexander V., Sixtus IV. and V., and Clement XIV. being of this order. Many of their early austerities were greatly mitigated; and this and other differences led to numerous divisions and subdivisions among them. Among the minor orders of the Franciscans thus formed, are the Cæsarinians, Celestines, Spirituals, Soccolanti (or sandal-wearers), Observantes, Capuchins, Cordeliers, Alcantarines, &c. In the middle of the last century, there were above 7,000 houses of this order, having in them above 115,000 monks, besides about 900 convents, having 28,000 nuns. The Franciscans are not now very popular in Europe, and have been suppressed in more than one kingdom; but they are still one of the most numerous bodies of the Roman Catholic church, and have missions established in almost every part of the world. They are very numerous in the United States of America. The Franciscans are said to have come over into England in 1224, and to have had their first house at Canterbury and their second in London. They subsequently became very numerous in this country.

FRANCOACEÆ, *frăn-ko-ai'-se-e*, in Bot., the *Francoa* fam., a nat. ord. of *Dicotyledones*, sub-class *Calycifloræ*, consisting of stemless herbs with exstipulate leaves and regular flowers, the symmetry of which is quaternary. There are but two genera,—*Francoa* and *Tetilla*, and five species, all natives of Chili. The *Francoas* are reputed to be cooling and sedative; *Tetilla* is astringent, and is employed as a remedy for dysentery.

FRANK, *frănk*, is a name given by the Greeks, Turks, Arabs, and other eastern nations, to a Christian. It probably originated at the time of the Crusades, in which the French particularly distinguished themselves. This was also the name of a powerful German tribe that about the 3rd century of the Christian era were found inhabiting the lower Rhine, and which afterwards overthrew the Roman empire in the north-east of Gaul; whence, in German, that country is termed *Frankreich*, *i.e.* the kingdom of the Franks. About the middle of the 4th century they became divided into two groups,—*the Salic* and the *Ripuaric Franks*, the former inhabiting the Low Countries, the latter extending themselves up the Rhine as far as the Main. Each group had its own laws, which, however, did not differ much from each other, and are known as the *Lex Salica* and the *Lex Ripuariorum*. The Franks form at the present day the ground (*grundlage*) of the people of western Germany as far as the Neckar, Main, Murg, and the Lower Alsace, as well as the chief Germanic element of the people of northern France.—*Ref.* Brockhaus' *Conversations Lexikon*.

FRANK, or FRANKING LETTERS, was the privilege enjoyed by the members of both houses of parliament, and many official persons, of sending or receiving a certain number of letters, free of postage, which was abolished on the introduction of the penny postage system in 1840. Before that time each member of either house of parliament was allowed to send daily ten letters, not exceeding an ounce in weight each, to any place in the United Kingdom, and to receive fifteen free of charge; a privilege which was greatly abused.

FRANKALMOIGNE, *frank-all'-moin* (Ang.-Nor.), (Lat. *libera elemosyna*, free alms), in Law, is that kind of tenure whereby a religious corporation, aggregate or sole, holdeth lands of the donor to them and their successors for ever. This is the tenure by which almost all the ancient monasteries and religious houses held their lands. The service which they were bound to render for them was not certainly defined; but only in general to pray for the soul of the donor and his heirs, dead or alive; and therefore they did not fealty (which is incident to all other services), because this divine service was of a higher and more exalted nature. This form of tenure still continues, though the nature of the service was changed at the time of the Reformation, and made conformable to the purer doctrines of the Church of England. If those who hold their tenements in frankalmoigne fail or refuse to perform the enjoined service, the law gives no remedy by distress or otherwise to the lord of whom the lands are holden; he can only complain to the ordinary or visitor, praying him to correct and punish the omission, and provide that such negligence be no more done. The statute of 12 Car. II. c. 24, which abolished the old tenures, specially reserved tenure in frankalmoigne.

FRANKENIACEÆ, *frănk-e-ne-ai'-se-e* (after John Frankenius, professor of botany at Upsal), in Bot., the *Frankenia* fam., a nat. ord. of *Dicotyledones*, sub-class *Thalamifloræ*, consisting of herbs and undershrubs much branched, with opposite exstipulate leaves and sessile flowers; calyx tubular, furrowed, persistent; petals unguiculate, 4 or 5, hypogynous; stamens hypogynous, distinct; ovary superior, 1-celled, with parietal placentas; fruit capsular, 1-celled, inclosed in the calyx and dehiscing in a septicidal manner; seeds numerous; embryo straight, erect, in the middle of albumen. The plants of the order chiefly occur in the south of Europe and north of Africa, but are found in other parts. They are mucilaginous and slightly aromatic. The leaves of a species of Beatsonia are used at St. Helena as a substitute for tea.

FRANKINCAENSE, *frănk-in'-sens* (Ang.-Nor.), a name given to a species of gum-resin derived from the *Boswellia serrata*, and imported from the Levant. By melting it in water, and straining it through coarse cloths, it is cleaned from a good deal of the oil which is one of its component parts,—the oil which is extracted being termed Burgundy pitch, or white resin. If

frankincense is sprinkled on coals, it emits a peculiar aromatic odour; whence its name.

FRANKLIN, *frink'-lin* (Ang.-Nor.), was the ancient name for a freeholder of considerable property in England. In Chaucer's time, a franklin was a man of substance, enjoying abundance of good cheer, a chief man at the sessions, had been a sheriff, and frequently knight of the shire. The franklin of that day was evidently a person of importance; but, in Shakespeare's time, he stands much lower, being only a yeoman, a man above a vassal or villain. There appears, however, to be no foundation for Dr. Johnson's definition of a franklin as "a gentleman servant, steward, or bailiff."

FRANK-MARRIAGE, *frănk-măr-rĭdj* (Ang.-Nor.), (Lat. *liberum maritagium*), in Law, was a species of estate tail now gone out of use, and which is defined to be "Where tenements are given by one man to another, together with a wife, who is the daughter or cousin of the donor, to hold in frank-marriage." This implied that the donees should have the tenements to them and the heirs of their two bodies begotten; that is, they were tenants in special tail.

FRANK-PLEDGE, *frănk-pledj* (Ang.-Nor.), (Lat. *franci plegium*), in the early customs of England, denotes a pledge, or surety, for the behaviour of a freeman, called also *friburgh*. Before the Norman conquest, a law prevailed in this country, of the members of each district or circuit being made responsible for the good conduct of each other. Every free-born man, at the age of fourteen (religious persons, clerks, knights, and their eldest sons excepted), was bound to find surety for his truth towards the king and his subjects, or else to be kept in prison. Hence it became customary for a certain number of neighbours to become bound for one another, to see each man of their pledge forthcoming at all times, or to answer for the offence of any one absenting himself. This was called frank-pledge, and the circuit thereof was called *decenna*, because it usually consisted of ten households. The sheriffs at every county court did, from time to time, take the oaths of young persons as they grew up to fourteen years of age, and to see that they were settled in one decennary or another; whereby this branch of the sheriff's authority was called *visus franci plegii*, or view of frank-pledge. Whenever any one offended, it was forthwith inquired in what pledge he was, and then those of that pledge either produced the offender within thirty-one days, or satisfied for his offence.

FRASERA, *frā-zē'-rā* (named after John Fraser, a collector of North-American plants), in Bot., a gen. of herbs belonging to the nat. ord. *Gentianaceæ*. The root of the species *F. carolinensis*, or *Walteri*, has properties similar to gentian-root, but is less powerful. It is known as American columba, and is officinal in the Pharmacopœia of the United States.

FRATERNITY, *frā-tĕr'-ne-te* (Lat. *frater*, a brother), signifies literally a body of men united together in one brotherhood, and in Roman Catholic countries denotes societies originated for purposes of devotion. These are of several sorts, the more remarkable of them being,—1. of the Rosary, founded by St. Dominic, and divided into two branches, called the Common rosary and the Perpetual rosary, the latter being under very strict engagements, and enjoined to repeat the rosary continually; 2. of the Scapulary, whom, according to the Sabbatine bull of John XXII., the Virgin has promised to deliver out of hell the first Sunday after their death; 3. of St. Francis's girdle, who are clothed with a sack of grey colour, which they tie with a cord, and in processions walk barefooted, carrying in their hands a wooden cross; 4. of St. Augustine's leathern girdle, which comprehends a great number of devotees. Italy, Spain, and Portugal are the countries where the greatest number of these fraternities are to be seen, some of which assume the name of arch-fraternities. Pope Clement VII. instituted the arch-fraternity of Charity, which distributes bread every Sunday among the poor; and the fraternity of Death buries such dead as are abandoned by their relations, and causes masses to be celebrated for them.

FRAUD, *frawd* (Lat. *fraus*), in Law, includes all deceitful practices, in defrauding, or endeavouring to defraud, another of his known right, by means of some artful device, contrary to the plain rule of common honesty. It is condemned by the common law, and punishable according to the heinousness of the offence. All frauds and deceits for which there is no remedy by the ordinary course of law are properly cognizable in equity, and, indeed, constituted one of the chief branches of cases to which the jurisdiction of chancery was originally confined. There are few cases of fraud that are not cognizable by equity, though in most cases the courts of law have a concurrent jurisdiction. Where a fraud can be clearly established, courts of law exercise a concurrent jurisdiction with courts of equity. Wherever fraud or surprise can be imputed to or collected from the circumstances, equity will interpose and grant relief against it. It is impossible to lay down any general rules that shall be applicable to all kinds of fraud; for they are innumerable and ever varying, the ingenuity of man ever finding out new modes of deceit and new means of avoiding detection. A fraudulent conveyance of lands or goods to deceive creditors is, as to creditors, void in law; and a fraudulent conveyance to deceive purchasers is also to such purchasers void. Where a person is party to a fraud, all that follows by reason of that fraud shall be said to be done by him. A party prejudiced by a fraud may file a bill in equity for a discovery of all its circumstances. Mere inadequacy of price alone is not a ground for a court of equity to annul an agreement; but if there be such inadequacy as to show that the person did not understand the bargain he made, or was so oppressed that he was glad to make it, knowing its inadequacy, it will show a command over him which may amount to a fraud. If a person be fraudulently prevented from doing an act, equity will consider the act as done; and equity also relieves against bargains made under misconception of rights. In treaties, concealment of a material fact by one of the parties, in order to keep the other in ignorance, whereby to profit, is a gross fraud, and the contract will be set aside in equity. *Suppressio veri* (suppression of truth), *suggestio falsi* (suggestion of falsehood), in solemn conveyances, releases, or agreements, will afford a sufficient ground for setting them aside. *Constructive fraud* is applied to such acts or contracts as, though not originating in any actual evil design or contrivance to perpetuate a positive fraud or injury upon other persons, yet, by their tendency to deceive or mislead other persons, or to violate public or private confidence, or to impair or injure the public interests, are deemed equally reprehensible with positive fraud, and are prohibited by law, as within the same reason and mischief as acts and contracts done *malo animo*. Gross criminal frauds are punishable by way of indictment or information, such as playing with false dice, causing an illiterate person to execute a deed to his prejudice, &c. For these and such-like offences, the party may be punished with fine and imprisonment. Frauds are not indictable at common law unless they be such as affect the public; as vending unwholesome provisions, or using false weights or measures; or by way of conspiracy; or unless they affect the crown or the administration of justice.

FRAUNHOFER'S LINES. (*See* SPECTRUM.)

FRAXINUS, *frăks'-e-nus* (from Lat. *frango*, I break, in allusion to its brittleness), in Bot., the Ash, a gen. of the nat. ord. *Oleaceæ*, consisting of about fifty species, mostly natives of Europe and North America. The leaves are deciduous, and are pinnate, with a terminal leaflet. The flowers are very imperfect, the calyx being obsolete, and the corolla either wanting or 3—4-partite. The fruit is a *samara* (which *see*). *F. excelsior*, the common ash, a native of Britain, is a beautiful and umbrageous tree, rising to the height of 100 to 150 feet. The wood is white, tough, hard, and light, much valued by wheelwrights, coachmakers, and turners. It is peculiarly adapted for agricultural implements, handles for tools, and ladders. Some interesting varieties have been developed by cultivation: the weeping ash, with branches drooping to the ground; the curled-leaved ash, with dark-green wrinkled or curled leaves; and the entire-leaved ash, with many or all the leaves simple. *F. americana*, the American or white ash, is a very fine tree, common in Canada and New Brunswick, with wood similar to that of *F. excelsior*. The sweet concrete exudation known as *manna* is procured by making incisions in the stems

of certain species of *Fraxinus*, chiefly *F. Ornus* and *rotundifolia*, natives of Calabria, Apulia, and Sicily. Manna is a mild agreeable laxative. It owes its properties to a peculiar resin called mannite. The insect which produces the white wax of China feeds upon the species *F. chinensis*.

FRECKLES, *frek'-ls* (Lat. *lentigines*), are small yellow or brownish spots which appear on the face, especially of fair persons much exposed to the weather. Various applications have been proposed for their removal; and perhaps the best is a liniment composed of lime-water and oil, with the addition of a little ammonia.

FREE BENCH, *free bensh* (Sax. *frig*, fresh, *benc*, bench; Lat. *sedes libera*, or *fraxeus baucus*), in Law, is that share in copyhold lands which a widow hath on the death of her husband, and which is regulated, as to its quantity, quality, and duration, according to the custom of the particular manor. It is generally a third for life, as at common law; but it is sometimes a fourth part only, and sometimes but a portion of the rent. Frequently the customary right is during widowhood only, and in some manors, if this widow be found guilty of incontinency, she loses her free bench, unless she comes into court riding backwards upon a black ram, and repeating certain ridiculous words. Free bench differs from dower at the common law, in that the former does not attach, even in right, till the actual decease of the husband; whereas the right to dower attaches immediately on marriage.—*Ref.* Wharton's *Law Lexicon*.

FREEBOOTER, *free'-boot-er* (Ger. *freibeuter*, Fr. *flibustier*), is a name given to a class of adventurers who have existed at different times and in different countries, but more particularly in the New Continent, and who were usually remarkable for their daring and intrepidity. (*See* BUCCANEERS, FILIBUSTERS.)

FREE CHURCH, *free tshurtsh*, is the name assumed by the largest and most influential religious body in Scotland who differ from the principles of the established church, and who separated themselves from it at the disruption of 1843. They refuse to be called dissenters, because they contend that their principles are those of the Church of Scotland, and that it is the established church, and not they, that have departed from the principles of the Church, as set forth in the Confession of Faith and the other standards. They are also known as *Non-intrusionists*, from the great principle against which they contended being the intrusion, or establishing, of a minister in a church by the patron, contrary to the wish of the people. It is a characteristic feature of Presbyterianism, especially in Scotland, that the people have a considerable voice in the affairs of the Church, and that a certain amount of deference is to be paid to the popular mind. They have, also, always been opposed to any interference of the civil powers in ecclesiastical matters. By an act of the Scottish parliament in 1567, "anent the admission of them who shall be presented to benefices," it is ordained "that the examination and admission of ministers shall be only in the power of the kirk;" and while reserving the presentation of lay patronages to the ancient patrons, it provides that if the presentee of a patron should be refused to be admitted, it shall be lawful for the patron "to appeal to the General Assembly of the whole realm, by whom the cause being decided, shall take end as they decern and declare." After the union of the two crowns, an act was passed in 1711, as Bishop Burnet says, "merely to spite the Presbyterians, who, from the beginning, had set it up as a principle that parishes had, from warrants in Scripture, a right to choose their ministers." This act declared, that, from and after the 1st day of May, 1712, it shall and may be lawful for her Majesty, her heirs and successors, and every other person or persons who have any right to patronage or patronages, of any church or churches whatever, in that part of Great Britain called Scotland, to present a qualified minister or ministers to any church or churches whereof they are patrons." Attempts were made by the Assembly, from time to time, to obtain a repeal of this measure, but without success; but it is said to have been so unpopular, that, for some years, the patrons were afraid to use the power invested in them, and for fifty years after the passing of that act the Church frequently enforced the non-intrusion principle, pronouncing judgments in her courts which show that she either refused to recognize the act, or else regarded it as not interfering with her prerogative. By degrees, however, the right of patrons became more absolute, and the courts of law decided that the ecclesiastical powers might settle the minister in a parish, but that they could not secure him the stipend. About the middle of the last century, also, a large party sprang up in the Church, known as the Moderates, who adopted the views of the patrons against the people; and after many a fight, in which sometimes the assistance of the military had to be called in to settle a minister in his church, the right of the patrons had become absolute. The question of patronage had slumbered for about half a century, when it was again brought into life in 1833, by Dr. Chalmers, who brought his *veto* measure before the General Assembly, to the effect that the dissent of a majority of the male heads of families resident within the parish, being members of the congregation, and in communion with the church for a period of at least two years, ought to set aside the patron's nominee. The measure was at first rejected; but it was carried the following year, and became law. Nothing occurred to disturb this law till 1837, when the earl of Kinnoul, having as Iron presented Mr. Young to the vacant living of Auchterarder, the congregation were so dissatisfied with him, that a protest against his settlement was signed by 287 out of 330 persons on the communion roll. Against the decision of the church courts, Mr. Young appealed to the Court of Session. The highest legal talent was employed on both sides, and after lengthened pleadings, the judges decided, by a majority of eight to five, in favour of Young. The discussion turned mainly upon the question whether it was competent for the General Assembly to pass such an enactment as the Veto act. The civil court having decided that the Veto act was illegal, the struggle now took a new form,—resistance to civil encroachment on the spiritual jurisdiction of the Church, as well as the maintenance of popular rights. Resolutions in support of the independence of the Church were passed in the Assembly of 1838, and it was agreed to appeal from the decision of the Court of Session to the House of Lords, which was accordingly done. The House of Lords confirmed the decision of the inferior court, holding that the Church, in the matter of the fitness of a presentee, "must strictly limit herself to judge of his personal qualifications; that is, his life, literature, and manners." The decision gave great offence to the non-intrusionists. In another case, that of Lethendy, the presbytery ordained a clergyman to the parish church, in the face of an interdict from the Court of Session, and the members of the presbytery were brought before the bar of the court, and subjected to a severe censure. In the Marnoch case, on the other hand, seven clergymen, forming a majority of the presbytery, complied with the order of the Court of Session, and were suspended from their ministerial office by the commission of the General Assembly. The seven presbyters appealed to the civil court, and their opponents were interdicted from preaching in the churches, churchyards, or school-rooms, of the seven deposed presbyters. In 1840, Lord Aberdeen introduced a bill into parliament, with the view of composing these differences and putting the points in dispute on a proper basis; but it was regarded as unsatisfactory by the General Assembly, and was consequently abandoned. Another attempt to heal the breach by act of parliament was made in 1841 by the duke of Argyle, who brought a bill into parliament which was substantially a repetition of the Assembly's Veto act; but parliament having been suddenly dissolved, the measure fell to the ground. In 1842 the General Assembly drew up a claim of right, or "a claim, declaration, and protest anent the encroachments of the Court of Session," asserting the sole headship of Christ over the Church; citing the various statutes by which the independence of the Church and its civil rights and privileges had been secured; and claiming, in the name of the Church and on behalf of the nation and people of Scotland, as of right, freely to possess her liberties, and to be protected against the encroachments of the Court of Session. This claim was laid before the Queen, and in reply, Sir James Graham addressed a letter to the General As-

sembly, in which the claim of right was pronounced to be unreasonable, and the intimation conveyed that the government could not advise her Majesty to acquiesce in these demands.—The disruption took place on the 18th of May, 1843, "the greatest event," says Lord Cockburn, "that has occurred in Scotland since the rebellion in 1745, if not since the union." The General Assembly met on that day, and, after prayer, the moderator, Dr. Welsh, read a lengthened and solemn protest against the repeated encroachments of the civil power upon the Church, and concluded with a declaration that since they could no longer with a clear conscience remain within the Church, it was lawful for them, and others who might concur with them, to separate themselves from the establishment, and to adopt such measures as might seem proper for the advancement of God's glory and the proper administration of the affairs of His Church. Having read the protest, he turned towards the commissioner, and bowing respectfully, slowly retired, followed by Drs. Chalmers, Gordon, Macfarlane, and all who adhered to them.—The scene was deeply solemn and affecting. Whatever difference of opinion might exist as to the matters in dispute, no one could help admiring the nobleness of the men who had sacrificed all their worldly interests for what they believed to be right and true. The immense crowd of spectators looked on with feelings of the intensest interest, many of them being melted to tears. "There was no hurry, no rush, no confusion—bench after bench was vacant—man after man the protesters withdrew in silence, till one entire side of the Assembly, lately so crowded, was left with scarcely an occupant." It had been confidently represented by their opponents, and it is said that the government was influenced by the representation, that except a few of the leaders, who might be prevented by shame or wounded pride from retracing their steps, few, or perhaps none, would actually secede. That any large secession would take place, they never for a moment calculated upon. More than 400 ministers, however, left the church of their fathers, and, in that act, abandoned for ever their homes and their means of support, and now cast themselves without reserve upon the sympathies of the people and the good providence of God. They passed through streets crowded by an enthusiastic throng, who welcomed them with shouts of admiration and gratitude, and proceeded to Canon Mills, where a large hall, capable of accommodating 3,000 persons, had been previously prepared for them. Dr. Chalmers was chosen moderator of the first General Assembly of the Free Church, which continued its sittings to the end of May. On the 23rd of May, an "Act of Separation and Deed of Demission" was adopted, and signed not only by those clergymen who were members of assembly, but by all the others who participated in their views, the number being 474; and, in almost every case, the great majority of their congregations went along with them. The Disruption ministers met with much sympathy throughout the country, and before the new General Assembly rose, Dr. Chalmers announced that an aggregate sum of £232,347 had been contributed for the support of the Free Church: and during the first year of its existence, its income amounted to £396,720. But while it was thus meeting with so much popular sympathy, the moderate party and their adherents were doing everything in their power against them. The majority of the nobility and great landed proprietors went with the established church, and some of them were guilty of very cruel and oppressive acts towards the non-intrusionists. Some of them, for a long time, refused to grant any sites on their lands for churches or other buildings, though nearly all have now conceded this favour. Indeed, people at a distance could scarcely conceive how high party feeling ran, and what bitterness existed between the two parties; and scarcely less remarkable is the degree to which it has passed away in so short a time. Indeed, there are not wanting persons on both sides who entertain hopes that a union may yet be effected; for the Free Church has always kept tenaciously to the principle of an established church, and this has been the only thing that has prevented a union between them and other bodies who have seceded from the established church, and who are opposed to the principle of state endowments. There can be little





hope of a union, however, unless the State very considerably modifies the laws with regard to patronage. The progress of the Free Church since 1843 has been very remarkable. A sum of upwards of £6,000,000 sterling has been contributed to its various schemes down to the present time. It has upwards of 800 ministerial charges, besides numerous preaching-stations; it supports missionaries in all parts of the world; has established schools in almost every parish; built churches, manses, schoolhouses, &c.; and has colleges or theological halls for the education of its ministers in Edinburgh, Glasgow, and Aberdeen. A new source of annoyance has recently arisen, and brought them into collision with the civil power. In 1858, the Free Church minister of Cardross was charged with immorality, and was suspended by the General Assembly. From this decision he appealed to the Court of Session, for which proceeding the General Assembly at once deposed him. After much discussion, the case was at length thrown out on technical grounds, though the fact of the Court of Session entertaining the case was a recognition of the principle against which the Church contended; namely, the right of the civil courts to review their ecclesiastical decisions. The General Assembly opposed the civil jurisdiction on the ground that the minister was subjected to a declaration that he would conform to the regulations of the General Assembly, which preclude all appeal to the civil powers. The court, however, held that this could only apply to the ecclesiastical duties, and not to his civil rights, which had been affected by the decision of the General Assembly. The pursuer, Macmillan, has again (1863) commenced his action against the Assembly, in a revised form, and the issue of it remains to be seen. The tenets and government of the Free Church are identical, except in the points already indicated, with those of the Church of Scotland. (*See* SCOTLAND, CHURCH OF.)—*Ref.* Buchanan's *Ten Years' Conflict*; Bryce's *Ten Years of the Church of Scotland*; Marsden's *History of Christian Churches and Sects*.

FREE CITIES, *free sit'-eez*, is the name given to certain German cities which form of themselves independent states. They are Hamburg, Bremen, Lubeo, and Frankfort-on-the-Maine, and are all members of the Germanic Confederation.

FREEDOM AND NECESSITY. (*See* FREE WILL.)

FREEDOM OF THE PRESS. (*See* PRESS.)

FREEHOLD, *free'-hold* (Ang.-Sax.), (Lat. *liberum tenementum*, frank tenement), in Law, is an estate in lands or other real property, held either in fee, in tail, or for life, independently of the will of the feudal lord, and is used in opposition to copyhold lands, held during the will of the superior, or for a term of years. By the feudal law, none but a freeholder was regarded as having possession of the land, and no person who had an estate for less than a lifetime, either his own or some other person's, as his wife's, was regarded as a freeholder. Freehold also extends to offices which a man holds either in fee or during life.

FREEMAN, or FREEDMAN, *free'-man*, *freed'-man*, is a term used in contradistinction to a slave, and denotes one that is born or made free, and who enjoys certain privileges which are denied to the other. The title is also given to one admitted to the freedom of a corporate town, or of any other corporate body.

FREEMAN'S ROLL, *free'-manz role.*—By the Municipal Corporations Act, 6 & 7 Vict. c. 76, it is enacted that the town clerk of every borough shall make out a list (to be called the freeman's roll) of all persons admitted burgesses or freemen, who were entitled to a share or benefit of the lands and public stock of the borough before the passing of such act, for the purpose of reserving such rights, and as distinguishing them from the burgesses newly created by the act, and entitled to the rights which it newly confers; these last to be entered on another roll, called the burgess roll.

FREEMASONRY, *free-mā'-son-re* (Fr. *maçon*, mason), is a term applied to a secret and wide-spread association, who term themselves Free and Accepted Masons. Societies of Freemasons exist in all parts of the civilised world, and their members are of every religion and condition of life. Every candidate, before his initiation, comes under a solemn engagement never to divulge the mysteries of the order, nor to communicate to the uninitiated the secrets with which he may be intrusted,

and the proceedings and plans in which the fraternity may be engaged. After the candidate has undergone the necessary ceremonies, and received the usual instructions, appropriate words and significant signs are imparted to him, that he may be enabled to distinguish his brethren of the order from the uninitiated, and to convince others that he is entitled to the privileges of a brother, should he be visited by distress or by want in a distant land. After a due interval of probation, if the newly-admitted member be found qualified for a higher degree, he is promoted, till he has received that Masonic knowledge which enables him to hold the highest offices of trust to which the fraternity can raise its members. At regular and appointed seasons, convivial meetings of the fraternity are held in lodges, constructed for the purpose; and all distinctions of rank are laid aside, all differences in religious and political matters forgotten, and peace and harmony generally prevail. Every one strives to give happiness to his brother, and men seem to recollect for once that they are sprung from one common origin, and are possessed of the same nature. According to its own peculiar language, Masonry is founded on "the practice of social and moral virtue." Its character is charity in the most extended sense, and "brotherly love, relief, and truth" are inculcated in it. Like every other society of any duration, it has been subject to the influences of human frailties; and while it has been the means of effecting much good, it has doubtless at times also been productive of much evil. Recently much has been written both for and against Freemasonry, its ritual, benefits, and tendency; while books have even appeared professing to reveal all the secrets of the order; but most Masons maintain that the true secret of Masonry has never yet been divulged, and there are many even Masonic writers, defenders of the society, who yet call its secret signs and rites accidental and unimportant. No one, we believe, even among intelligent Masons themselves, credits the great antiquity which some of their authors claim for it. According to some, it is as old as the creation, while others only carry it back to the building of the tower of Babel, and some are content with tracing it no farther back than the building of Solomon's temple. It is asserted that the institution has been continued down, in uninterrupted succession, from that very remote period to the present day, through all the changes of governments, religion, civilization, and knowledge. It is indeed not improbable, that, after building rose to be a separate art, and to demand a certain amount of skill and training, those who were members of the order should seek to impart a mystery to their profession, and adopt certain initiatory proceedings, before communicating their knowledge to others. The later Eleusinian, or other mysteries, to which others trace its origin, may have also imparted to it something of their character; but there is nothing in history, or in the character of Masonry, to warrant us in giving it so high an origin. Without, therefore, attempting to unravel its early history, we may state, generally, that the desire for magnificent churches and monasteries by the Roman Catholic priests led to great encouragement being given to the artificers of such works. The pontiffs of Rome, and the other potentates of Europe, conferred on the fraternity of masons the most important privileges, and allowed them to be governed by laws, customs, and ceremonies peculiar to themselves. Such encouragement must have been productive of the most beneficial results to the fraternity. The association was composed of men of all nations; of Italian, Greek, French, German, and Flemish artists, who were denominated Freemasons, and who, ranging from one country to another, erected those elegant churches and cathedrals which still excite admiration. Their government was remarkably regular, and the members lived in a camp of huts reared beside the building which they were employed in erecting. A surveyor, or master, presided over and directed the whole, and every tenth man was called a warden, and had the oversight of the other nine. The most ancient lodge of Freemasons in England is that of York, founded in 926, under the patronage of Edwin, brother of King Athelstan, who obtained for it a charter from the king, and became himself grand master. The constitution of this lodge, which is still preserved at York, gives a history of Masonry from the earliest times, beginning with Adam, and comprising quotations from some rabbinical tales, respecting the building of the tower of Babel and the temple of Solomon, limited, however, to the information contained in the Bible. It then passes over to the Greeks and Romans, mentioning particularly Pythagoras, Euclid, and Vitruvius. Then we are told that St. Albanus, an honourable Roman knight, patronized the art about A.D. 300, settled the fundamental institutions of the Masons, procured them employment, wages, and a charter from the emperor Carausius, according to which they might form a society in Britain under the government of architects. The devastation of the country, and the destruction of the edifices by the northern tribes, and the Angles and Saxons, is related; and how the pious Athelstan had resolved to restore the ancient and venerable society. By virtue of this charter, all the Masons in the kingdom were assembled, and they established a general, or grand lodge, for their future government. Under the patronage and jurisdiction of this lodge, the fraternity very considerably increased. Freemasonry was first introduced into Scotland by those architects who built the abbey of Kilwinning; and the Kilwinning lodge is the most ancient in that country. After the establishment of the York and Kilwinning lodges, the principles of Freemasonry were rapidly diffused throughout both kingdoms, and other lodges were erected in different parts of the island, which remained under the jurisdiction and control of the two mother-lodges. In this way, Masonry continued to flourish in this country for several centuries after it had ceased on the continent; for the Church had come to regard them with suspicion, as being possessed of a power and influence which might, in time, be turned against itself. In this country, an act was passed against them in the third year of Henry III., at the instigation of the bishop of Winchester, which, however, was never enforced; and the king himself afterwards countenanced them with his presence. James I. of Scotland was also a great patron of the craft. Long before this time, however, the order had ceased to be confined to architects or builders; and noblemen, gentlemen, kings, and princes, were enrolled among its members as "accepted Masons." Among those who have held the office of grand master, may be mentioned Henry VII., Cardinal Wolsey, Inigo Jones, and Sir Christopher Wren. After a time, the society of Masons decreased, and sank more and more. In 1717, an entire change was effected in the constitution, and while retaining the name and customs of the ancient fraternity, the society ceased to be connected with building; but for brotherly love and mutual aid. The same year, the first regular grand lodge was formed in London, with power to grant charters for the holding of other lodges. The "Book of Constitutions," drawn up by James Anderson, and based upon the "Gothic Constitutions" of 926, for the use of the lodges, was published in 1723; and several editions have since been published. Since that time, Masonry has continued to flourish, and at present the grand lodge of England has upwards of 1,000 lodges under its jurisdiction. It is possessed of great wealth, and distributes several thousand pounds annually for philanthropic purposes; contributing, among other things, to the support of a Masonic girls' school, established in 1788; a Masonic boys' school, established in 1798; a benevolent fund for aged Masons, established in 1843; and a widows' fund, established in 1850. In Scotland, James VI. nominated to the office of grand master William St. Clair, earl of Orkney and Caithness, baron of Roslin, and founder of the chapel of Roslin; and subsequently made the office hereditary in his family. It continued hereditary in that family till the institution of the grand lodge of Scotland in 1736. The number of lodges in Scotland is about 400. The first lodge in France established after the English system was founded at Paris in 1725; the first in Germany, at Hamburg in 1735; and the first in America, in 1730. Masonry has made great progress in America, particularly in the United States.

**Free Port**, *free port* (Lat. *portus*, a port), in Com., is a port or harbour free to ships of all nations to enter and load or unload, on payment of moderate duties. They also form depôts where goods may be deposited

without payment of any duty, and afterwards either re-exported on payment of mere transit duty, or admitted for consumption on paying the usual customs dues.

FREE SPIRIT, BRETHREN OF THE. (*See* BRETHREN OF THE FREE SPIRIT.)

FREESTONE, *free'-stone* (SAX. *stan*, stone), in Build., the name generally given to any soft stone that can be readily sawn and worked with the mallet and chisel. The various kinds of stone that come from the quarries near Bath, and those near Portland and in the Isle of Purbeck, are freestones; and some kinds of limestone are also included under this term, as well as soft sandstones and oolites, among which may be named the magnesian limestone used in building the new palace at Westminster and the houses of parliament.

FREETHINKER, *free-think'-er* (SAX. *thincan*, to think), is a term applied to one who exercises freedom of thought, and is generally used in a bad sense to denote one who is sceptical on matters of religion. (*See* DEISM, ATHEISM.)

FREE TRADE, *free traid* (Sp.-Port. *trato*, trade), in Pol. Eco., denotes the freedom of buying and selling without any interference by way of improving or otherwise influencing trade. It is only lately that our government has come to see the importance of this principle, and that all attempts to encourage certain branches of trade and discourage others are detrimental and injurious. (*See* CORN LAWS, CUSTOMS DUTIES, BOUNTY, BALANCE OF TRADE, POLITICAL ECONOMY.)

FREE WILL, FREEDOM AND NECESSITY, LIBERTY AND NECESSITY, *free will, freed'-dom, ne-sess'-e-te, lib'-er-te* (SAX. *willa*, will; Lat. *necessitas*, necessity, *libertas*, liberty), in Phil., are terms employed to denote one of the most difficult questions in the whole field of mental science,—the power of a man over the determination of his own will. "If," says Reid, "in any action he had power to will what he did or not to will it, in that action he is free. But if in every voluntary action the determination of his will be the necessary consequence of something involuntary in the state of his mind, or of something in his external circumstances, he is not free; he has not what I call the *liberty* of a moral agent, but is subject to necessity." Freedom has commonly been distinguished into freedom from coercion and freedom from necessity. Freedom from coercion implies, on the one hand, the absence of all impediment or restraint, and on the other hand, the absence of all compulsion or violence. Thus, if we are prevented from doing what is in our power when we desire or will to do it, or if we are compelled to do it when we desire and will not to do it, we are not free from coercion. Freedom from necessity, called also liberty of election, implies freedom from anything invincibly determining a moral agent. This freedom from necessity, however, does not mean that the agent has no motive or no more inclination towards one course of action than another; for he may have motives prompting him more urgently to act in one direction rather than in another, and still have liberty of election, if he has the power of determining in favour of another course of action. The universal language and practice of mankind is founded upon a belief in a kind of free will. To choose, to deliberate, to determine, are expressions in every man's mouth; and the whole of our penal code is founded upon the conviction that men have the power of doing or abstaining from certain acts. But if we examine the matter more closely, and look at the particular acts of one's life, we will find that this freedom of choice does not actually exist to the extent that we might at first sight be inclined to suppose. We find that if we know the circumstances and character of an individual, we can calculate pretty correctly how he will act in a given case. A man's habits, his education, his character, all go in some measure to determine his acting in a given case in a particular way. Hence, therefore, every act of the will, in some degree at least, depends upon something going before, or in the circumstances of the individual; and in so far it is not absolutely free. "What," says Coleridge, "determines the man to a good and worthy act, we will say, or a virtuous course of conduct? The intelligent will or the self-determining power? True, in part, it is; and the will is pre-eminently the spiritual constituent in our being. But will any man admit that his own will is the only and sufficient determinant of all he is and all he does? Is nothing to be attributed to the harmony of the system to which it belongs, and to the pre-established fitness of the objects and agents, known and unknown, that surround him, as acting on the will, though doubtless with it likewise?" The whole question, however, is involved in difficulties which defy our limited faculties to solve. "How the will can possibly be free," says Hamilton, "must remain to us, under the present limitation of our faculties, wholly incomprehensible." "The assertion of absolute necessity is virtually the negation of a moral universe, consequently, of the Moral Governor of a moral universe,—in a word, atheism." "It would have been better," he said, in speaking of the view of the question as taken by the Scottish school of philosophers, "to show articulately that liberty and necessity are both incomprehensible, as both beyond the limits of legitimate thought; but that, though the free agency of man cannot be speculatively proved, so neither can it be speculatively disproved; while we may claim for it as a *fact* of real actuality, though of inconceivable possibility, the testimony of consciousness,—that we are morally free, as we are morally accountable for our actions."—*Lectures on Metaphysics.*

FREEZING, FROST, *freez'-ing, frost* (ANG.-SAX.), the solidification or congelation of water or atmospheric vapour by cold. Water begins to freeze when the temperature of the atmosphere is 32° Fahr., at which point ice begins to appear, and continues to be formed, unless some circumstance, such as the disturbance of the water, interferes. As the cold increases, other liquids, which are able to resist the temperature at which water congeals, begin to freeze, and pass into the solid form. During spring and the early months of summer, much harm is done to vegetation by frost; and during severe frosts almost all vegetables fall into a state of decay, and even a moderate frost is able to destroy tender plants. When there has been much rain, and when the plants are saturated with moisture, the occurrence of a frost is very disastrous; for as the water contained in the leaves begins to freeze, it expands, rupturing the vegetable fibres and destroying the plant. Fruits are destroyed by frost in a similar manner. When the morning dew freezes, it is called hoar-frost, or white-frost, and appears generally in spring and autumn. As the air begins to be warmed by the rising sun, the evaporation from the leaves of grass, plants, and shrubs, is accelerated, and the cold increased; hence the moisture which was only dew before the dawn, is often converted into hoar-frost shortly after sunrise. The disastrous effects of frost upon vegetation can only be averted in a very limited manner. That which will protect a plant from dew will protect it from frost; hence a covering of network or thin gauze will protect tender plants or the blossom of wall-fruit. The most efficient mode, however, is to shield the plant from the clear sky, and thus prevent the radiation which must otherwise take place.

FREEZING APPARATUS, a contrivance by which liquids are frozen artificially. The first apparatus of the kind was one invented by Sir John Leslie, by means of which liquids were frozen *in vacuo*. When the pressure of the atmosphere is removed, liquids evaporate much more rapidly than under ordinary circumstances, the heat producing the evaporation existing in the liquids themselves. When, therefore, a quantity of sulphuric ether is placed in a vessel under the receiver of an air-pump, and in it is placed a vessel containing a small quantity of water, on exhausting the receiver, the ether evaporates rapidly, and, in so doing, abstracts the latent heat of the water, which is soon converted into ice. Leslie introduced into the receiver a shallow vessel containing highly concentrated sulphuric acid, above which was placed another vessel containing water; when the air was abstracted, the water evaporated rapidly, and its vapour, on account of the strong attraction which sulphuric acid has for it, was immediately absorbed. In two or three minutes congelation began. Sulphuric acid is not the only substance which is capable of producing this result; any substance which has a strong attraction for water

will do as well. Dry potash, muriate of lime, or powder of basalt, are all used for the purpose. A number of machines of this kind, varying in many ways, have since been constructed. One of the most successful produced large blocks of ice by the evaporation of ether, and another welded slabs of ice as fast as they were formed. A detailed account of the former, which was patented by Mr. Harrison, is to be found in the "Pharmaceutical Journal," xvi. 477. Its principle generally, is the production of cold by evaporating volatile liquids *in vacuo*, the condensation of their vapours by pressure, and the continued re-evaporation and re-condensation of the same material.

FREEZING MIXTURES (in Chem.).—Many salts, while undergoing solution, produce a very considerable reduction in the temperature. By mixing 1 oz. of nitre and 4 oz. of sal-ammoniac, and throwing them into water, the temperature is reduced from 60° to 10°; and a mixture of equal parts of water, nitrate of ammonia, and carbonate of soda, the two latter in the crystallized condition, is capable of effecting a reduction from 50° to 7°. Equal parts of snow and salt will maintain a steady temperature of −4° for many hours; and if a mixture of three parts of crystallized chloride of calcium and two of snow be made, in a vessel cooled down to 32°, a cold of −50° will be the result. The following are a few freezing-points that may be found useful:—

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| Mercury | −39 Fahr. |
| Oil of vitriol | −30 |
| Bromum | −4 |
| Saturated solution of chloride of sodium | 4 |
| Sea water | 28 |
| Pure water | 32 |

FREEZING-POINT. (*See* THERMOMETER.)

FREIGHT, *fruit* (Du. *vragt*, Ger. *fracht*), in Com., is the money paid for the carriage of goods by sea, or the price paid by a merchant for the use of a ship to transport goods: the word freight is also sometimes used as synonymous with cargo. When an entire vessel is engaged for the transport of goods, there is usually an instrument executed known as a charter-party, in which the terms of the agreement and amount of freight are set forth. If, however, merely a part of the ship is engaged, or a certain amount of goods to be conveyed, there is usually a bill of lading made out. Where no formal agreement is entered into, the amount of freight is regulated by the custom or usage of trade. The freight is most commonly determined for the whole voyage, without respect to time; but sometimes it is made to depend upon time. In the former case it is either fixed at a certain sum for the whole cargo, or at so much per ton, barrel, bulk, or other weight or measure; or so much per cent. on the value of the cargo. The time and manner of paying the freight are frequently regulated by express stipulations in the charter-party or other written contract. The master is entitled to detain the goods until the freight has been paid; but the master cannot retain the cargo on board till such payment, as the merchant would in that case have no opportunity of examining the condition of the goods. No right of lien for freight exists unless the freight be earned; but if the freighter or a stranger prevent the freight from becoming due, the owner or master has a remedy by action of damages. When goods are deteriorated during a voyage by fault of the master or mariners, the owner is entitled to compensation; but if from natural causes or perils of the sea, the owner must bear the loss and pay the freight. The merchant, however, cannot set off his claim for damage against the amount of the freight, which must first be paid, and the merchant may then substantiate his claim to compensation for the damage. If a portion of the cargo be thrown overboard for the necessary preservation of the ship, and the rest reach its destination, the owner is bound to answer to the merchant, by way of general average, for the value of that which was lost, as the freight is to be paid to the owner. Legally, no freight is due until the voyage is completed, which, however, may be overruled by express stipulation. If a merchant covenant to freight a whole or a certain portion of a ship, he is bound to pay the sum stipulated for, though his goods do not occupy the entire space. Where the freight is to be paid for the voyage, the owner takes upon himself the risk of its being long or short; where by the time, the risk falls upon the merchant. As regards living animals, if the ship be freighted for *transporting* them at so much a head, freight is only due for such as are delivered alive; but if for *lading* them, it is due for all that were put on board. Where there is no express agreement, the law holds that freight is due for the dead as well as the living.—*Ref.* Abbott's *Law of Shipping*; McCulloch's *Commercial Dictionary*.

FRENCH BERRIES. (*See* RHAMNUS.)

FRENCH CHALK, *frentsh tshawk*, a kind of soap-stone of a soft and greasy nature, known by that name, and sometimes called Briançon chalk, because it is obtained in great quantities near that town, and in other parts of France. It forms a white pigment when properly prepared, and is much used by tailors in marking the pattern of garments on cloth, before cutting them out, as the marks made can be easily obliterated, and cause no injury to the material.

FRENCH HORN, *frentsh horn*, a wind instrument, consisting of a long tube twisted into several circular folds, gradually increasing in size from the mouth-piece to the *bell*, or end at which the sound issues. As it is not provided with holes, like the flute, its sounds are varied by the lips of the player, by greater or lesser pressure of his breath, and the insertion of the hand into the bell, or end from which the sound issues; it may also be tuned to a variety of keys, by means of *crooks* and *shanks*, or movable pieces added to, or removed from, the top of the tube, as required. The introduction of the horn, in common with that of the trumpet, dates less than a hundred years ago. Since then it has undergone many changes, and within the last fifty years the whole of this class of instruments have been greatly improved by the addition of keys, valves, crooks, &c.

FRENCH LANGUAGE AND LITERATURE.—The origin of the French language is to be traced to three distinct sources,—the Celtic, the Latin, and the German. Of the Celtic, or earliest of these, the language of the country prior to the Roman invasion, comparatively few traces are to be found in that of the present day. When the country came under the dominion of the Romans, the Latin being the language of the conquerors, came, by degrees, to be that of the people generally. Not, however, the classic form of that language, which is met with in authors, but a corrupt dialect of it, known as the *lingua Romana rustica*. On the overthrow of the Western Roman empire, this language became corrupted by the admixture of words and expressions from the Burgundian, Visigothic, Frankish, and other barbaric tongues. In the 7th century, two forms of speech prevailed in the country—a corrupt dialect of the *lingua Romana*, and a form of German known as the *lingua Francisca* or *Theotisca*, or the *Tudesque*. The latter prevailed in the north and east parts of the country, and the former was spoken south of the Loire. The council of Tours (813) recommended the use of both the Rustic and Tudesque versions of the homilies. In course of time these two became in some measure blended, the Latin element remaining the more prominent; and this corrupt language was called the Romance. It was divided into two branches, which took their names from their respective modes of expressing the word *yes*. The Visigoths and Burgundians south of the Loire said *oc* (Latin *oc*, German *auch*, also) for yes, while the Franks and Normans to the north said *oil*; and hence the dialect of the former was called *la langue d'oc*, and of the latter *la langue d'oil*; the former of these, which came to receive the name of Provençal, from the kindgom of Provence, which at one time included the whole of the south of France, was characterized rather by a modification of Latin words, than by the admixture of foreign words and idioms. Though much changed, it is still the dialect of the common people in Provence, Languedoc, Catalonia, Valentia, Majorca, Minorca, and Sardinia. Less troubled by wars, and of a more gay and sprightly turn of mind, the language of the southerns speedily became polished, and its glory was spread over Europe by the labours of the Troubadours. The dialect of northern France had a much greater admixture of the Germanic element than the south, which was still farther augmented by the establishment of the Normans in that part, in the

beginning of the 10th century. The *Trouvères* of the North, at a later period, in their ruder tongue, followed the example of the Troubadours;—but while the latter sang the soft strains of love, the former celebrated deeds of war and chivalry. After the commencement of the Crusades, both languages approached towards a fusion. The cruel persecution of the Albigenses checked the development of the Provençal language; and the extending of the political rule of the north southwards, brought with it the language of that people. The real French language began to be developed about the time of the conquest of Constantinople by the French Crusaders, at the beginning of the 13th century. Froissart's "Chronicles," of the 14th century, is the earliest work in genuine French,—French which is quite intelligible to the student of the present day. Francis I. greatly encouraged the development of the French, and substituted that language for Latin in public transactions. Rabelais greatly enriched it; Ronsard and Du Bellay, Amyot and Montaigne, and others, developed it still further. The religious reform, political troubles, the influence of the Italian wars and queens, modified it greatly. The introduction of Arabic words is chiefly due to the Crusades; and of Greek and Latin words, and of scientific terms, to the study of these languages and to the cultivation of the natural sciences. The *Académie Française*, established by Richelieu for the regulation of the national language (1635), the influence of the court, the labours of the Port Royalists, especially Pascal (1656), and a galaxy of great writers, purified, augmented, and diffused it more and more. It was first used as a diplomatic language at the conferences of Nimeguen (1678). The French is the most generally known of all languages among civilized nations; and many illustrious foreigners, as Leibnitz, Humboldt, Gibbon, and Sir William Jones, have written some of their works in it. It is a very clear tongue, on account of the strictly logical order of its syntax, but very monotonous, and incapable of the composition of words already fixed, as well as of bold poetic turns. The French language, in short, is, like every other, the exponent of the nationality, vicissitudes, intelligence, culture, and taste of the people that speak it. The earliest literature of France is that of the Troubadours and Trouvères. The former flourished most during the 11th and 12th centuries. Their productions were chiefly short lyrical effusions on love or matters of trifling import; and they exhibit little play of the imagination, little depth of emotion, and very slight traces of learning. The Trouvères, on the other hand, in their narrative poems known as *Chansons de geste*, and written in the energetic *langue d'oil*, treated of great national subjects, and celebrated the heroic deeds of illustrious kings and knights. Some of their compositions, especially the earlier, have a striking character of grandeur, which may sometimes be not unfavourably compared with that of the ancient epic poems. These *chansons de geste*, also called *romances*, are very numerous, and have been classified into three cycles, bearing respectively the names of Charlemagne, King Arthur, and Alexander,—the first celebrating the deeds of the great Frankish emperor, his descendants and vassals; the second comprising traditionary legends regarding the achievements of King Arthur of Britain and the Norman warriors; the third consisting of poems in which events in the history of Greece and Rome are strangely mixed up with chivalric notions and legends of fairy-land. These were succeeded by satirical and allegorical poems of equally vast proportions, some of which enjoyed unparalleled popularity; such as the "Roman de Renard," and the "Roman de la Rose." The former is the well-known story of "Reynard the Fox," the "Reinecke der Fuchs" of the Germans; the latter is a poem of 22,000 verses, 4,150 of which were written by Guillaume de Lorris in the early part of the 13th century; and the work was completed fifty years later, by Jean de Meun. This is, perhaps, the most celebrated French production of the middle ages. It is a kind of didactic allegorical poem, which professes to teach the art of love, and embraces the most varied subjects. It contains a great deal of learned lore, scholastic subtleties, and scraps of ancient history, freely mingled with abstractions and allegories. Another kind of poetry of this period is the *fabliaux*, or tales, which are partly





of oriental origin, and were introduced by the Crusaders into Europe. They are usually written in verse, but sometimes in prose and verse alternately; and are generally based upon some well-known proverb, anecdote, or adventure, often containing a great deal of wit or fun, being generally satirical in their character; they are, however, frequently disfigured by a coarse licentiousness. Songs were not neglected; and those of the illustrious Abelard, in the 12th century, enjoyed a wide popularity. The progress of prose was slower than that of poetry; but the 13th century presents two specimens, showing that it had already acquired a degree of power and polish. These are the "Chronicle of the Conquest of Constantinople," by Villehardouin (1207), and the interesting and simple Life of St. Louis, written by Joinville, who tells us of the heroic deeds and private virtues of the good king, whom he had accompanied to the Holy Land. In the latter half of the 13th century we also find some tolerably good specimens of the drama in the Mysteries and Moralities of that period. The whole of the literature of the 14th century culminates in Froissart's "Chronicles," which present the liveliest pictures of society and manners during that period of war and gallant enterprise. The greatest writer of the 15th century, also a chronicler like Froissart, is Philippe de Comines, who in his "Mémoires" presents a striking delineation of the characters of Louis XI. and his contemporaries. To the same period belong two of France's distinguished poets, who, strange to say, present a striking contrast to each other in their outward circumstances, the one the princely Duke Charles of Orleans, the other the low-bred and lawless Villon, a strange compound of villainy and inspiration. A new epoch in the history of French literature begins with the reign of Francis I. (1515). The study of Greek and Roman authors now began to prevail in France; and writers, dazzled by the hitherto unknown beauties of the classical writers, despised the works of their forefathers, and attached themselves to the imitation of the ancients. Thus arose the so-called modern classical school; while that which, instead of imitating the ancients, derived its materials from national elements, has been designated by the appellation of Romantic. Tolerably free from the classic element are the works of Clement Marot, the greatest French poet of the reign of Francis I.; while the leader of the new or classical school was Ronsard, an author long extolled far above his merits. A host of other writers characterize this century, chief among whom are Rabelais and Montaigne. In the 17th century Malherbe appeared as the reformer, or rather the regulator, of poetry, a man of fastidious taste but meagre imagination, who despised the artistic luxuriance of Ronsard, introducing in its stead a style of grammatical correctness and dry elegance, which sometimes reached pomposity. Balzac devoted his attention to the improvement of prose, and his semi-philosophical works, especially his Epistles, were valuable at the time as models of careful and harmonious style. Such were also the frivolous but witty letters of his friend Voiture. In 1634 the French Academy was instituted, under the auspices of Cardinal Richelieu, "to establish certain rules for the French language, and to make it not only elegant but capable of treating all matters of art and science." Three writers of this period enriched French literature with important works, and did much towards the improvement of its language. Pierre Corneille brought tragedy to a degree of grandeur which has not been surpassed; "Le Cid," "Horace," "Cinna," and "Polyeucte," being among the best of his works. Descartes, in his "Discours sur la Méthode," showed that the French language was equal to the highest philosophical subjects; and Pascal, in his "Lettres Provinciales," in which comic pleasantry and vehement eloquence are happily blended, first formed a standard for French prose. Such was the opening of the splendid literary epoch which is generally styled the Age of Louis XIV., and which is distinguished by a galaxy of superior intellects, who, under the royal patronage, applied themselves to perfecting every branch of literature. The pulpit is set forth by the eloquence of such men as Bossuet, Flechier, Bourdaloue, and Massillon. Tragedy lost little of its power in the hands of Racine, whose "Andromaque," "Iphigénie," and "Phèdre,"

remind one of the productions of ancient Greece; while comedy reached its highest pitch with Molière, whose masterpieces, "Le Misanthrope," "Tartuffe," "L'Avare," and "Les Femmes Savantes," are very humorous creations. In his Fables, La Fontaine showed himself the greatest master of that kind of composition in modern times. Didactic poetry was represented by Boileau, whose works are remarkable for symmetry and good sense, but are entirely deficient in poetical enthusiasm. Moral philosophy was cultivated by Malebranche, the disciple of Descartes, and author of "La Recherche de la Vérité;" by Bossuet, who wrote "Connaissance de Dieu et de soi-même;" by Fénélon, as in his treatise "De l'Existence de Dieu;" and by Pascal, in the fragments which have been collected under the title of "Pensées;" while La Rochefoucauld, in his "Sentences et Maximes," wrote a libel upon mankind, and La Bruyère, in his "Caractères," drew vivid and amusing sketches of human characters and manners. In the field of history, we also meet with Bossuet, as the author of "Discours sur l'Histoire universelle," and "Histoire des Variations des Eglises Protestantes." Here, too, we have Mézeray, author of the "Histoire de France," and Fleury, author of "Histoire de l'Eglise." In memoirs and letters, there are the personal "Mémoires" of Cardinal De Retz; Hamilton's "Mémoires du Comte de Grammont;" and the interesting letters of Madame de Sévigné to her daughter and friends. The 17th century had been, on the whole, a religious one; but the 18th was eminently an age of scepticism and infidelity. Literature now became a means of conveying bold opinions, or assaulting time-honoured creeds and institutions. The persons who exercised the chief sway during this period, and who exerted a powerful influence upon their contemporaries, were Montesquieu, Voltaire, J. J. Rousseau, and Buffon. Montesquieu, a writer of great force and brilliancy, and of unusual scope of mind, commenced his literary career by publishing "Les Lettres Persanes," attacking French manners, institutions, and even religion. His principal works, however, are his "Considérations sur la Grandeur et la Décadence des Romains," and his "Esprit des Lois," an able and profound disquisition upon general legislation. Voltaire, the true personation of his age in disposition, as well as in talents, was, for half a century, the leader of public opinion in France. His wonderful versatility enabled him to treat successfully almost all branches of literature,—tragedy, satire, romance, poetry, history, and philosophy. The passionate eloquence of Rousseau made him be listened to and believed in, even when he was declaring war against civilization, and attacking the social order of things. Buffon occupied a less-agitated sphere, devoting himself to the study and description of nature; and, by his "Histoire Naturelle," he introduced a new era in the study of natural history. Diderot and D'Alembert founded the "Encyclopédie," a vast review of human knowledge, but always hostile to religion. Helvetius, in his treatise "De l'Esprit;" D'Holbach, in his "Système de la Nature;" and Lamettrie, by his "L'Homme Machine" and "La Vie heureuse de Sénèque," far exceeded the encyclopedists in the destructive tendency of their doctrines. Among the few defenders of revealed religion during the period was J. Vernet. Among the metaphysical writers, the first place is due to Condillac, followed by Vauvenargues, Condorcet, and Bonnet of Geneva, all of whom remained on the side of moderation, and gave little support to the tendencies of the age. One of the most learned historians of that period was Mably. Charles de Brosses, Goguet, Barthélemy, Raynal, De Mechegan, Velley, are also names of note in this department. The mathematical and physical sciences made great progress in France during the 18th century; as witness the names of D'Alembert, Lagrange, Lalande, Lacaille, Maupertuis, Clairaut, Lemonnier, Condamine, and others. In natural history, we have Buffon and Charles Bonnet, Brisson, Vicq d'Azyr, Jussieu in botany, and Saussure in geology. In poetry, the drama, and general literature, we may mention the names of Crebillon and Ducis, both tragic poets; Le Sage, author of "Gil Blas" and of "Turcaret," perhaps the best comedy after those of Molière; Beaumarchais, author of the "Barbier de Seville;" Bernardin de St. Pierre, author of "Paul et Virginie;" St. Simon, whose "Mémoires" have gained a deserved celebrity; Marmontel, the author of "Bélisaire," and Lebrun, the lyric poet. The period of the Revolution was by no means favourable to literature, and little more so was that of the Empire which succeeded. Madame de Staël and Châteaubriand were the forerunners of a revival, which was, perhaps, less owing to their works than to the influence upon public taste of the master-pieces of English and German literature, which found more and more admirers in France. A new romantic school now sprung up; and, through the exertions of many young and original writers, new life was infused into nearly every branch of literature, poetry, history, philosophy, and the drama. An animated controversy was maintained between the supporters of reform and the adherents of the classical school; and the contest reached its utmost fury when Frédéric Soulié, Alexandre Dumas, Victor Hugo, Alfred de Vigny, and others, produced on the stage dramas framed according to their ideas of the Shakespearean style. It was only after several years that the younger body of combatants came out victorious. Novels which, during the excitement of this contest, had been scarcely noticed, became the rage soon after it was settled. George Sand (Madame Dudevant), one of the most elegant writers of her country, established her character by her "Indiana," which appeared in 1832; and has since published many popular works. Alexandre Dumas, the inexhaustible storyteller, has won immense popularity by his works, "Trois Mousquetaires," "Le Comte de Monte Christo," and numerous other works. Eugène Sue also obtained great popularity from his works "Les Mystères de Paris," and "Le Juif errant," which depict in glaring colours the miseries and depravities of society. Among other distinguished writers, we may mention Honoré de Balzac, Frédéric Soulié, Alphonse Karr, Alfred de Musset, Prosper Mérimée, Madame Emile de Girardin, Théophile Gautier, Jules Sandeau, and Emile Souvestre. A new generation of storytellers has been rising within the last few years, who, though their powers are scarcely to be compared with those of their predecessors, are nevertheless not devoid of talent. Some of them belong to what they themselves call the "realist school;" they are Henri Murger, Alexandre Dumas *fils*, Champfleury, Ernest Feydeau, Gustave, Faubert, Octave Feuillet, and Edmond About. Poetry is far from being as popular in France as the novel, and the country has produced few great poets during the present century. The four greatest poets are Béranger, Victor Hugo, Lamartine, and Alfred de Musset; besides whom, Casimir Delavigne, Auguste Barbier, and Victor de la Prade, are the only names requiring to be mentioned. History is, undoubtedly, the most successful branch of modern French literature. A larger number of valuable historical works has been published within the last thirty-five years than during any other equal period of its history; and the taste for such performances is still on the increase. M. Guizot, the great philosophical expounder of social institutions, and Augustin Thierry, the artistic historian of the middle ages, stand foremost among the promoters of this movement. Sismondi, Michelet, and Henri Martin, have each devoted their efforts to a full recital of the general history of France; while De Barante, after giving, in his "Histoire des Ducs de Bourgogne" (1824), an attractive specimen of purely narrative history, has recently published histories of the Convention and the Directory, in which his monarchical tendencies are strongly apparent. The revolutionary period has engaged the attention of many historians; among whom the most prominent are Thiers, Mignet, Michelet, and Louis Blanc. Lamartine also figures among the historians, having produced several works of that class, which, however, are more remarkable for their showy language than for their accuracy or research. The elegant and accomplished Villemain, although better known in the field of literature, has also produced several historical works; as his "Histoire de Cromwell," and his "Souvenirs Contemporains." As a lecturer and a critic, no man has contributed more to the diffusion of enlarged literary doctrines, healthy principles, and good taste. Archæology has

not been neglected; as is evinced by the works of Letrone, Raoul Rochette, and Beulé. Champollion, Sylvestre de Sacy, Ernest Renan, and Abel de Rémusat, have thrown great light upon Egyptian and oriental languages and literature. In philosophy, Victor Cousin and his disciples have, under the name of Eclectism, brought back the materialism of the preceding age to spiritualist principles. Jouffroy, Damiron, and Jules Simon, are among those who have contributed to this result. As writers on politics and political economy, are Joseph de Maistre, Bonald, Ballanche, Lamennais, Michel Chevalier, De Tocqueville, and Laferrière; while as socialists, figure the names of St. Simon, Fourrier, and Pierre Leroux. Auguste Comte, in his "Cours de Philosophie positive," offers a connected system of philosophy, embodying ideas derived from Hegel and various of the French socialists. The various branches of natural philosophy boast of many original and powerful writers. In natural history, are Cuvier, Geoffroy St. Hilaire, Isidore St. Hilaire, and others; mineralogy boasts of Elie de Beaumont, Bendant, and Dufrenoy; and chemistry and physics, of Thénard and Dumas, Gay-Lussac and Despretz. In medical literature, are the names of Bichat, Broussais, Corvisart, Magendie, Trousseau, and many others. The mathematical sciences have distinguished representatives in Lagrange, Laplace, Ampère, Biot, and Arago. The French essayists and literary critics are legion, and some of them have attained great eminence; among whom we may mention Silvestre de Sacy, St. Marc Girardin, Philarète Chasles, Ernest Renan, Hippolyte Rigaud, Gustave Planche, Ste. Beuve, Charles de Rémusat, Albert de Broglie, Edmond About, Theophile Gautier, Leon Delaborde, and Jules Janin, the dramatic feuilletonist. For the last few years, however, French literature has been falling off. The literary movement, which commenced with the Restoration, seems to be now nearly exhausted; and although there has been little falling off in intellectual activity, the rising generation of writers are not on the whole equal to their predecessors.—Ref. *Histoire littéraire de la France*, by Dom Rinet, and other Benedictine monks, continued by members of the Institute, 22 vols. (1733—1858); *Histoire littéraire de la France, avant le* 12 *Siècle*, by Ampère; *Tableau de la Littérature au Moyen Age*, by Villemain (1857); *Essais sur l'Histoire littéraire du* 16 *Siècle*, by Girardin and Chasles; *Histoire de la Littéraire Française*, by Demogest (1857).

FRENCH-POLISHING, a method of polishing flat surfaces with a solution of gum or gum-resin in spirit. For this purpose the polish is made more fluid than the hard-wood lacker used in polishing turned surfaces, in order that it may spread easily and dry less rapidly. As the friction is derived entirely from the motion of the hand in French-polishing, more time is required than in polishing turned works. There are a great many recipes for making French polish, which vary greatly, as some prefer it very thin and others tolerably thick. One of the simplest methods is to dissolve 1½ lb. of shell-lac in 1 gallon of spirits of wine without heat. Copal, sandarac, mastic, and gum Arabic, are sometimes employed. It is usual to make the varnish thicker than is required for use, and to thin it down with spirit when being used.

FRENZY, *fren'-ze* (Fr. *frénésie*, Gr. *phrenitis*, from *phren*, mind), denotes madness, distraction, rage, or any violent agitation of the mind, approaching to distraction.

FREQUENTATIVE, *fre-kwen'-tā-tiv* (Lat.), in Gram., is a term applied to certain verbs, which denote the frequent repetition of an action.

FRESCO PAINTING, *fres'-ko* (Ital. *fresco*, fresh), the art of painting in water-colours on the surface of a wall that has just been plastered, while the plaster is still in a moist condition. Fresco painting can only be managed with success by those who are proficients in the art, as it does not admit of any degree of finish, as paintings which are executed in oil or water-colours on canvas or paper; and no corrections can be made, if any part of the work presents an unsatisfactory appearance when the entire painting is completed. The Romans were in the habit of colouring their walls while the plaster was still wet, to produce a ground of one uniform tint; and they added decorating in distemper colours when the surface was perfectly dry. But,





although it was no new thing to cover walls when we with colouring matter which would preserve its original brilliancy of tint unimpaired for a considerable lapse of time, yet fresco painting, properly so called, cannot be considered to have been introduced earlier than the close of the 14th century, when the practice of painting designs on the damp surface of freshly-plastered walls was adopted for the decoration of cathedrals and churches at Florence, Orvieto, Pisa, and other towns in Northern Italy. Fresco painting was subsequently practised by all the Italian painters of celebrity,—Michael Angelo, Raffaelle, and others, having left exquisite specimens of their work in this branch of art in the palace of the Vatican and many of the churches of Rome. Fresco painting seems to have taken the place of encaustic painting in the 15th century, for the interior decoration of large buildings (*see* ENCAUSTIC PAINTING), the introduction of the former art having caused the decline of the latter. It fell into disuse about the end of the 16th century, and remained in abeyance until some German painters revived the art in the decoration of a villa at Rome about 1816; and Louis of Bavaria subsequently caused many of the magnificent buildings that were erected at Munich during his reign to be adorned in this manner. Fresco painting has been used for the decoration of many of the apartments and corridors in the new palace of Westminster; and a good example may be seen in the hall of Lincoln's Inn, which covers an area, at the north end of the building, of 1,700 square feet. It may be executed on any walls covered with a coating of plaster. Stone walls are, however, considered to be the worst of all kinds, as they are apt to condense the damp on their surface; while walls of brick or lath-and-plaster are the best. Frescoes should never be painted on walls built with mortar mixed with sand from the sea-shore; and every precaution should be taken to prevent damp rising in walls from the ground below, by placing sheet lead, coated with pitch, between any two of the lower courses of the material of which they are composed. The frescoes at Westminster are executed on lath-and-plaster, the walls behind being covered with slate, against which battens are fixed, to which the laths are nailed. The lime used for making the plaster, especially that of which the *intonaco*, or ground on which the painting is executed, is composed, should be as pure as possible, approaching as nearly as may be a pure carbonate of lime, without any admixture of iron or other mineral substances. The best limestone for the purpose found in England is that which is quarried on Durdham Down, near Bristol. When the stone has been calcined, the lime should be kept for some time before it is used, that its caustic properties may be destroyed, to a great extent, by the absorption of carbonic acid from the air. If the lime is used too soon, the plaster is apt to rise and break away from the surface in some places, and the tone of the colours will be injured. As fresco paintings cover a large superficial area, it is necessary to execute them at different times in several pieces, as much of the *intonaco* or surface being spread at one time as the painter can conveniently colour before it begins to harden; and it is contrived, if possible, to let the joint between the work of one day and that of another correspond with the outline of a figure, or with that of the drapery that is thrown around it. It is necessary that the walls on which fresco paintings are to be executed should have the first and second coats of plaster put on at least two or three years before the ground is applied for the reception of the painting. Before painting, the wall must be thoroughly soaked with water, and two very thin coats of the *intonaco* spread over it, both consisting of prepared lime and very fine river-sand, but the sand preponderating in the mixture used for the first coat. The design, of which the painter has a finished sketch already prepared, is then traced with a hard blunt tool on the *intonaco*, from cartoons laid on it, as soon as it is hard enough to withstand the action of the brush and receive the colour. The outline having been thus produced, the colouring is applied in washes, half an hour, or rather less, being allowed to elapse between the application of the successive washes, when two or three are necessary to produce a proper depth of tint. Roundness is given to figures, and the

proper effect of light and shade is produced by cross-hatching; and the whole is toned down by washes and glazes, all of which must be done while the plaster is still moist. The painter must be careful to abstain from adding more colouring matter when he finds that the plaster is thoroughly charged with moisture and unable to receive any more. The colours used are prepared from coloured earths and a few minerals, such as the oxides of iron and cobalt. Vegetable colours, or those made from animal matter, such as gamboge and Prussian blue, cannot be used, as lime has an injurious effect upon them. There is another kind of fresco painting, called *fresco secco*, or dry fresco, in which the whole of the ground is spread on the wall before the painting is commenced, the surface being moistened with lime-water before beginning to paint, and kept damp during the operation. Frescoes may be cleaned with bread or sponged with water when the surface appears dirty; and there is a process by which they may be detached from the wall on which they are painted, and transferred to canvas.—*Ref.* Taylor's *Manual of Fresco and Encaustic Painting*; Eastlake's *Materials for a History of Painting in Oil*; *English Cyclopædias*—Arts and Sciences.

**Frets**, *frets* (Ang.-Sax.), in Mus., are short pieces of wire placed across the finger-boards of stringed instruments under the strings, to mark those portions of them which are to be pressed on the finger-board with the fingers of the left hand, for the purpose of producing certain sounds.

**Friar**, *frī'ar* (Fr. *frère*, brother), is a common term applied to monks of all orders, founded on the supposition that there is a kind of brotherhood existing between the religious persons of the same monastery. More particularly, it was applied to those of the mendicant orders, of which the principal were the four following:—Franciscans, Minors, or Grey Friars; Augustines; Dominicans, or Black Friars; and Carmelites, or White Friars. In a more peculiar sense, friar is restricted to such monks as are not priests; the latter being usually dignified with the appellation of *father*.

**Friars Observant** (Lat. *fratres observantes*), were a branch of the Franciscans, who separated themselves from their brethren of that order, on the ground of a laxity of discipline, and lived apart in places of their own choosing. They were so called because, although not living together in any convent or corporation, they agreed among themselves to observe the rules of their order more strictly than the conventuals did.

**Friction**, *frik'-shun* (Lat. *fricto*), in Mech., the resistance which a moving body meets with from the surface of the body on which it moves. As no surfaces are perfectly smooth, the imperceptible asperities, which may be supposed to exist on all surfaces, however highly polished, become to some extent interlocked, and a certain amount of force is requisite to overcome the mutual resistance to motion of the two surfaces, and to maintain the sliding motion even when it has been effected. By increasing the pressure, the resisting power of friction is increased; while, on the other hand, by rendering the surfaces more smooth, and by lubrication, the resistance to motion is diminished, although it cannot be entirely avoided. Strictly, friction should not be called a force, except in a negative sense. In a general sense, the tendency of force is to produce motion, or, if it does oppose motion, it is only in virtue of a tendency to produce motion in the opposite direction. The peculiarity, however, of friction is, that it tends to destroy motion in every direction. Friction is essentially a passive resistance, a negative force, produced by pressure, to which it bears such relation that its amount may be measured by the same unit, and be enunciated in the same terms. The principal laws with regard to friction are as follows. Law 1.—The friction bears to the pressure upon the surfaces in contact a ratio which is constant for the same materials with the same condition of surfaces. Thus if the surface of one body be pressed upon that of another with a certain force, and if that force be doubled, the friction will be doubled; if the pressure be tripled, the friction will be tripled, &c. Law 2.—The measure of friction is independent of the extent of surface, the pressure and the condition and character of the surfaces remaining the same. Law 3.—The





friction is entirely independent of the velocity of continuous motion. These laws, although stated in reference to the movement of two smooth surfaces, are equally true with regard to the rubbing parts of every machine. It is always found that the friction is greater between substances composed of the same material than between the surfaces of heterogeneous bodies.

**Friendly Societies, or Benefit Societies**, *frend'-le* (Sax. *freond*, friend), are voluntary associations of persons, chiefly of the humbler classes, for the purpose of forming a fund, by mutual contribution, for the assistance of members in the case of sickness or other distress. It is scarcely possible to overrate the importance of such institutions, if founded on correct principles, either to their members or the community at large. Sickness, death, and other misfortunes, which are so uncertain in their occurrence to any one, may, when applied to a number, be made the subject of pretty accurate calculation, and thus be provided against. The poor man, then, by contributing a small sum periodically to such a society, will have the satisfaction of knowing that he will thus have the means of meeting such misfortunes, whether they come soon or late; while in this way, provident habits and a spirit of independence are fostered, and the community are saved from what might have otherwise fallen to be a burden upon them. In other words, friendly societies are mutual assurance associations. Each member contributes a certain sum weekly, monthly, or annually, while he is in health, and receives a certain allowance or pension when incapacitated by sickness or old age. It is to be regretted, however, that many of these excellent institutions are founded upon erroneous principles, and have resulted in disappointment. The contingencies which require to be provided for ought to be carefully calculated, otherwise they may soon find that their funds are by no means adequate to meet the various claims that are brought against them. (*See* Insurance.) The origin of friendly societies has been traced to the guilds, which existed in the middle ages. Mr. Turner, in his "History of the Anglo-Saxons," says "The guilds, or social corporations of the Anglo-Saxons, seem on the whole to have been friendly associations, made for mutual aid and contribution to meet the pecuniary exigencies which were perpetually arising from burials, legal exactions, penal mulcts, and other payments or compensations." The beneficial results that attend such associations have led the government, from time to time, to pass statutory enactments in their favour. In 1793, an act was passed authorizing such societies to be formed, and to draw up regulations for their government, which, on being examined by the justices at quarter sessions, and found not to be repugnant to the laws of the realm, were to be confirmed and made binding upon the subscribers. They were also relieved from the payment of certain stamp duties, and empowered, in the recovery of moneys and certain other cases, to proceed by summary process. Several acts were subsequently passed, conferring still further benefits upon them; and in 1827 and 1829, select committees of the House of Commons were appointed to consider the laws on friendly societies. In consequence of their reports, an act was passed in 1829 (10 Geo. IV. c. 56), which repealed all previous acts on this subject. This, with two subsequent acts (2 Will. IV. c. 37, and 4 & 5 Will. IV. c. 40), established these societies on a new footing, and obliged them to submit a statement of their rules and regulations for the approval of an officer appointed by government for that purpose, before being entitled to claim the benefits of those acts. It is, however, unnecessary to mention these, as the whole of the previous enactments on the subject were repealed and consolidated by 18 & 19 Vict. c. 63. This act applies to all societies established for any of the following purposes:—"1. For insuring a sum of money to be paid on the birth of a member's child, or on the death of a member, or for the funeral expenses of the wife or child of a member.—2. For the relief, or maintenance, of the members, their husbands, wives, children, brothers or sisters, nephews or nieces, in old age, sickness, or widowhood; or the endowment of members, or nominees of members, at any age.—3. For any purpose which shall be authorized by one of her Majesty's principal secretaries of state; or, in

Scotland, by the Lord Advocate, as a purpose to which the powers and facilities of this act ought to be extended: provided that no member shall subscribe or contract for an annuity exceeding thirty pounds per annum; or a sum payable on death, or any other contingency, exceeding two hundred pounds." Under this act three registrars are appointed; one for England, one for Ireland, and one for Scotland. Any persons wishing to establish a society of this description may make rules for that purpose; two copies of which must be made out and transmitted to the registrar; and when certified by him, as conformable to law and to the said act, one of them is to be returned to the society, and the other is to be kept by the registrar. Upon being so certified, the rules take immediate effect, and are binding, in point of law, on all parties concerned. "The trustee, or trustees, of such societies are required, from time to time (with the consent of the society), to invest the fund, either in savings banks or in the public funds, or in such other manner as in the act set forth; and all real and personal estate belonging to the society shall be vested in the trustee or trustees, and their successors, without any conveyance or assignation whatever, except in the case of stock in the public funds, which shall be transferred into the name of any new trustee or trustees; and in the event of the death, bankruptcy, or insolvency of, or process issued against any officer of the society, having its moneys in his hands, a priority of payment is secured to the institution. It is also provided, that if any officer of the society, or other person, shall, by false representation or imposition, obtain possession of any property of the society, or, having the same in his possession, shall withhold or misapply the same, the money may be recovered, and the offender subjected to a penalty by a summary proceeding before justices of the peace; and that applications for the removal of any trustee, or other relief, order, or direction, or for the settlement of disputes (where there is no other prescribed method), shall be made to the county court of the district within which the usual or principal place of business of the society shall be situate; and that the decision of such court shall not be subject to appeal."—(Stephen's *Commentaries on the Laws of England.*) Act 23 & 24 Vict. c. 58, provides, that where a written application is made by at least five-eighths of the members of a society, to the registrar, stating that the society is insolvent, the registrar is to investigate the same; and if he finds the society to be insolvent, and that it ought to be wound up, he is to make an award to that effect, and direct in what way the funds are to be divided; the foresaid award to be final and conclusive on all persons interested, and not appealable. According to the parliamentary report on savings banks for 1860, there were no fewer than 11,782 friendly societies as depositors, and the aggregate amount at their credit £1,912,541; in addition to which, there were 570 societies in direct account with the commissioners, whose deposits amounted to £2,089,952.

FRIENDS. (*See* QUAKERS.)

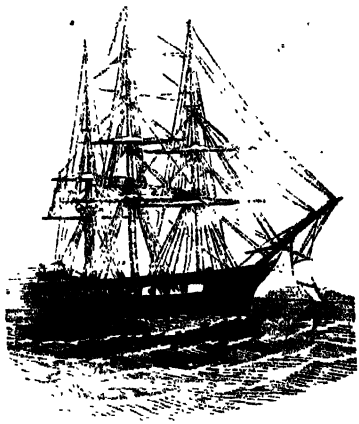
FRIEZE, *freeze* (Fr.), in Arch., that portion of the entablature which is between the architrave and the cornice. (*See* ENTABLATURE.) It was generally adorned with triglyphs in the Doric order, the intervening spaces, called *metopes*, being filled with sculptured figures in *alto rilievo*, or with the skulls of oxen and wreaths alternately; while in the Corinthian and Composite orders it was ornamented with figures or scroll-work in low relief, extending along its entire length. The term frieze was also applied to a broad band of sculpture, in low relief, that was frequently placed round the *cella* of a Grecian temple, immediately under the ceiling of the portico, and completely surrounding the exterior. In modern domestic architecture a frieze is frequently introduced immediately below the cornice of an apartment.

FRIGATE, *frig'-it* (Fr. *frégate*).—Formerly, the name frigate was only known in the Mediterranean, and applied to a long vessel or galley, propelled by oars and sails; in the present day, however, frigate signifies a fast-sailing ship of war, with two gun-decks, which lies between the two classes *sloop* and *line-of-battle ship*, and which mounts any number of guns from twenty up to fifty, which latter number is seldom exceeded. The





English were the first who started this species of vessel of war, and in England we have some of the best examples of frigates. In naval battles they are peculiarly useful vessels, being speedy and easily tacked, besides carrying a heavier armament than



FRIGATE.

sloops or brigs. At the present time (1862) the Admiralty seems to think very highly of them, as all the armour-plated vessels which have been built are manned and equipped as frigates; such as the *Warrior*, *Black Prince*, and others, which can hardly be eclipsed for excellence.

FRIGATE-BIRD (*Fregata Aquilus*, Ray), a bird common on the intertropical American coasts, and in the Atlantic and Pacific oceans. It is allied to the cormorants, but differs from them by having a forked tail, short feet, the membranes of which are very deeply notched, an extraordinary spread of wing, and a beak, both mandibles of which are curved at the tip. The plumage is, on the upper parts purple-black, the throat and belly white, and the beak red. The frigate-bird is incapable of either swimming or diving; yet it manages to satisfy its natural appetite for fish with tolerable certainty: this is accomplished by a system of highway robbery, perpetrated on such gannets and sea swallows as may be returning with full pouches to their nests in the rocks. The common mode is for the frigate-bird to soar above its victim, and then, plunging down, to strike it on the head with its beak; the result is an instant disgorging of the day's fishing, which, as it falls, is followed by the robber, who invariably overtakes and secures it before it reaches the water. The nest of this bird is usually built among the rocks, on solitary islands, or in high trees in retired situations near the sea. It lays two pinky-white eggs.

FRIGID ZONE. (*See* ZONE.)

FRINGILLIDÆ, *frin-jil'-le-de* (Lat. *fringilla*, a chaffinch), a term applied to a class of birds belonging to the ord. *Insessores* and its division *Conirostres*. They are characterized by a broad-based, sharp-pointed, conical beak, the size of which, in comparison with their head, is something enormous. It is well known that the *Fringillidæ* feed almost entirely upon different seeds of plants and nuts; consequently their beak is required to be strong in order to enable them to obtain their food; and, in some parts, where the nuts, &c., are covered with extremely hard shells, the beaks of these birds are found to be stronger and larger. The class includes all buntings, crossbills, grosbeaks, linnets, canary-birds, finches, and many other conical-beaked birds. The *Fringillidæ* are more vulgarly known under the general term of Finches, which *see*.

FRISIAN LANGUAGE AND LITERATURE, *friz'-shin*.—The Frisians were an ancient Germanic people, who inhabited the extreme north-west of Germany, between the mouths of the Rhine and Ems, and were subjected to the Roman power under Drusus. The language of

the Frisians is intermediate between the Anglo-Saxon and the Old Norse. Our knowledge of the old Frisian is derived from certain collections of laws; as the "Asegabuch," composed about 1200; the "Brokmerbrief," in the 13th century; the "Œnsiger Domen," about 1300, and some others. (*See* Richthofen's *Friesische Rechtsquellen*, Gött. 1840.) The modern Frisian is now spoken only in a few districts, and even in these only by the peasantry; not being used either in the churches or schools. It is further divided into a number of local dialects. Attempts have recently been made to revive an interest in the Frisian, and various specimens of its earlier literature have been published. An excellent Dictionary of the old Frisian, by Richthofen, was published in 1840.

FRITHJOF'S SAGA, *frith'-yofs sa'-ga*, an Icelandic myth, written down, apparently, about the end of the 13th century, but evidently belonging to a much earlier period. It narrates the adventures of the Norwegian hero Frithjof (properly Fridhthjofr, *i. e.* peace-stealer), and his love for the beautiful Ingebjorg, which some attribute to the 8th century, others to a much earlier period. This saga has been rendered famous, chiefly from being selected by the poet Tegnér as the subject of a beautiful poem of the same name, which has been repeatedly translated into English.

FROG, *frog* (SAX. *frogga*), (*Rana*).—The frogs are chiefly distinguished from the toads by the unusual length of the hind feet, which are strong and well-palmated; hence, their great power both of jumping and of swimming; their skin also is smooth; and there is not only a row of fine teeth round the upper jaw, but the palate also is furnished with another row placed transversely. It is one of the many singularities of these animals, that while in the young or tadpole state, they are herbivorous, living only, according to Cuvier, upon aquatic plants, yet no sooner do they effect their metamorphosis, than they become carnivorous, pursuing slugs, insects, &c., and consuming them alive or dead. The frog deposits its ova or spawn some time in March, in a clustered gelatinous mass. This lives for a month or five weeks, and at the end of that time, there issues from each little black globule a living tadpole. In this their first stage the young frogs have an elongated body, a laterally-compressed tail, and external branchiæ; their small mouth is furnished with small hooks or teeth, for the separation of vegetable matter, and they have a small tube on the lower lip, by which they attach themselves to aquatic plants, &c. The external branchiæ next disappear, and become covered with a membrane, being placed in a sort of sac under the throat; and the animal then breathes after the manner of the fishes. Furnished with eyes and nostrils, the body of the animal is distended with the great extent of the digestive canal, and it has a large tail for swimming. Soon, however, the posterior limbs are gradually put forth near the origin of the tail, and are developed first; the anterior feet then begin to show themselves; the tail gradually becomes less and less, shortens, shrinks, and seems at last to be absorbed; the mouth widens, and loses its horny processes or jaws; the eyes are guarded by eyelids; the belly lengthens and diminishes in comparative size; the intestines become short; the true lungs are developed, and the internal branchiæ are obliterated; the circulation undergoes an entire change; and the animal, hitherto entirely aquatic and herbivorous, becomes carnivorous, and for the most part terrestrial. In the frog the muscular system, especially the muscles of the abdomen, are more developed than in the other reptiles; offering in this particular some analogy to the abdominal structure of the mammifers. But it is in the disposition of the muscles of the thigh and leg in the frogs and other anurous batrachians, that the greatest singularity is manifested. These, whether taken conjointly or singly, present the greatest analogy with the muscular arrangement in the same parts in man. We find the rounded, elongated, conical thigh, the knee extending itself in the same direction with the thigh-bone, and a well-fashioned calf to the leg, formed by the belly of the gastrocnemii muscles. It is impossible to watch the horizontal motions of a frog in the water, as it is impelled by these muscles and its webbed feet, without being struck by the complete resemblance in this portion of its frame





to human conformation, and the almost perfect identity of the movements of its lower extremities with those of a man making the same efforts in the same situation. By the aid of these well-developed lower limbs, and the prodigious power of their muscular and bony levers, a frog can raise itself in the air to twenty times its own height, and traverse in a single bound a space nearly fifty times the length of its own body. There are several species of frogs, and among the most peculiar may be mentioned the bull-frog of North America (*Rana pipiens*) and the tree-frog (*Hyla leucomystax*, Graves). The former is a very large species, measuring eight inches in length and four in width. Its colour is olive on the upper part, and greenish-white darkly spotted on the belly. It is said that this frog affects springs only, and, although it is a great destroyer of young goslings, it is tolerated from the benefits derived from its scavenger habits. Its chief peculiarity is its voice, which resembles the distant bellowing of a bull. Of the tree-frog there are several species. They are found in France, Germany, and Italy, as well as in America and Asia. Says Sir Emerson Tennent, "In the shrubberies around my house at Colombo, these graceful little frogs were to be found in great numbers, crouching under broad leaves, to protect them from the scorching sun. Some of them utter a sharp metallic cry at night, like that produced by smacking the lips. They possess in a high degree the power of changing their colour; and one which had seated himself on the gilt pillar of a dinner-lamp was scarcely to be distinguished from the ormolu to which it clung. They are enabled to ascend glass by means of the suckers at the extremity of their toes. Their food consists of flies and minute coleoptera." Although this latter species live in trees, they lay their eggs in the water, and even hybernate in the mud during the winter. Africa also produces a singular race of frogs, which, from having some of their toes enveloped by a conical horny claw or cap, have been termed *Dactylethræ*, or thimble-toed.—*Ref.* Broderip, Swainson, Tennent, Yarrell, *English Cyclopædia*.

FROG-FISH. (*See* ANGLER-FISH.)

FROND, *frond* (Lat. *frons*), in Bot., the leaf of a fern or other acotyledonous plant. Fronds are seldom articulated; they are either sessile or stalked; are frequently toothed or incised in various ways, and are often highly compound.

FRONDE, *fronde* (Fr., a sling), in the history of France, is the name of a political faction which sprang up during the minority of Louis XIV., and opposed themselves to the government of the prime minister, Cardinal Mazarin. The people opposed to the court party were called *Frondeurs*, or Censurers, on account of the censures which they passed against the government; and hence they acquired the name of the Fronde. The despotic policy of the prime minister had given offence to all classes of the people; and at length the parliament rose in open opposition to him, and refused to pass or register his measures. In consequence of this, the cardinal ordered the arrest of the president and one of the councillors on 26th August, 1648. The people of Paris immediately took up arms against the government, and the following day (*la journée des barricades*) barricaded the streets, and compelled the liberation of the two prisoners. Peace was thus in some measure restored; but it was not of long continuance, for the people still continued tumultuous, and in January, 1649, the queen regent removed with her son to St. Germain, charging the prince of Condé to blockade the city. Among the leaders in the popular cause, were the prince of Condé, the dukes of Beaufort, Nemours, Vendôme, Longueville, the Cardinal de Retz, Marshal Turenne, and many others of the first rank. After some fighting, a truce was concluded on the 11th March, a general amnesty being granted by the queen, and the court returned to Paris in the month of August. In January, 1650, the queen, offended by the conduct of the princes of Condé and Conti, caused them to be arrested; by which proceeding she roused revolt in the provinces, and Marshal Turenne put himself at the head of the movement. Turenne was defeated at Rhetel, on the 15th of December, and was subsequently gained over by the queen regent. The war was waged by Condé for some time

…poppy and … When perfect, … namely, the shell or … In the majority of fruits, … of the walls of the ovary is … the calyx is adherent, is … complicated structure. It is … or regions,—the external, called … the middle, called *mesocarp*, or … to its fleshy or succulent nature, … the inner, called the *endocarp*, or … *stone* or *putamen*. The pericarp … the seeds to escape, or it remains … can only become free by its decay. … the fruit is said to be *dehiscent*; … *cent*. Dehiscent fruits open in … a fruit separates more or less … more pieces, called *valves*, or … single longitudinal slit, it affords an … dehiscence. When the opening … verse line through the fruit, so that … separated from the lower, like the … dehiscence is said to be *transverse* or … third kind of dehiscence, called *porous*, … The seeds escape through little pores … irregularly in the substance of the fruit, … called *rupturing*. (*See* OVARY, SEEDS.)

FRUSTUM, *frus'-tum* (Lat. *frustum*, a … bet), in Geom. and Math., the name … piece cut from any solid figure, but more … to the bottom of a cone or pyramid, … upper part, which contains the apex, … away.

FUCHSIA, *fu'-shs-a* (so named in honour … a famous German botanist of the 16th century), … of shrubs belonging to the nat. ord. *Onagraceæ*. … species *F. coccinea*, a native of South … introduced into this country at the close … century, and is now one of our commonest … and window shrubs. It is a very elegant … young wood and nerves of the leaves … purplish-red; the flowers are pendulous … of the leaves, and hang in a most graceful … thread-like peduncules; the calyx is tubular, … 4-lobed in the limb; the petals are equal in … the divisions of the calyx, and of a rich … the stamens are numerous, and, together … form a pretty tassel. Many species have been introduced into Britain, besides *F. coccinea*, … mense number of beautiful varieties have been developed by cultivation. The fruits of … are somewhat acid, and may be eaten.

FUCUS, *fu'-kus* (Gr. *phukos*, sea-weed), … gen. of marine plants or *Algæ*. Several … mannite; as *F. vesiculosus*, *nodosus*, *serratus*, … mer, commonly known as the sea-wrack, … during the winter months in some of … Scotland for feeding horses and cattle. … juice of its vesicles has been used as … internal remedy, and frictions of the … employed externally in glandular … affections. The substance called … which was formerly much used in … kind of charcoal, produced by the … alga in close vessels. The … remedies may be traced to the … plant. The sea-wrack was … ployed for making kelp.

FUEL, *fu'-el* (Fr. *feu*, … substances used for the … taining heat; such as … Gum, substances …

another kind of fuel, which must have been used in ancient times, is peat, or turf, a natural accumulation of vegetable matter. In many parts of England, Wales, and Scotland, where coal is not readily procurable, peat is still much used. Small deposits of peat are found in almost every country, but districts of immense extent occur in Holland, North Germany, the grand-duchy of Hesse, &c. In Germany, on the Rhine, the peat is cut by common spades into the shape of thick bricks, and then dried. In Holland, the preparation of peat for fuel closely resembles brick-making. In this country, the principal supply of fuel is furnished by coal, and its various kinds are employed in different ways and for different purposes, according to its nature, and that of the substance to be acted on by its agency. By partial combustion, both wood and coal can be freed from their more volatile constituents, namely, oxygen, hydrogen, and nitrogen, leaving the carbon more or less isolated. Wood so prepared is called charcoal; and coal, by a similar process, is converted into coke. Charcoal and coke burn for a longer period in a given bulk, and do not occasion any smoke. In some countries the excrement of animals is used for fuel; and the formation of coal ammonia was derived, in Egypt, from the burning of camels' dung, the chloride of ammonium (sal ammoniac) from excrement while it was burning. In small household operations tallow or wax candles are often employed as fuel; and at the present time, in laboratories, coal gas is almost entirely used for the purposes of boiling or evaporating small quantities of fluids. Within the last few years, artificial fuel has been manufactured. There are many methods, but the greater number consist of processes by which small coal or bituminous coal, anthracite, charcoal powder, &c. are made up into square or rectangular blocks, which can be easily stored away without loss of volume. The substances used for binding the dust or coal, &c. vary. Sometimes it is mixed with earthy substances, such as peat, marl, clay, or alluvial deposit, or with mineral bituminous substance, such as mineral tar, asphaltum, gas tar, pitch, resin, or asphaltic oil with sulphur, coke-dust, or breeze. A useful patent fuel may be made by compressing peat so as to form a dark brown combustible solid, not unlike the brown coal or turf of Germany. Some valuable information respecting fuel has been published of late years, in the government reports on the coals suited for the royal navy. The chief test of the value of any particular coal has always, in the investigations, been its evaporative power, or its power of converting water into steam. The best qualities of coal fuel for ships of war have been stated to be as follows:—1. The fuel should burn with a quick action, so that steam may be raised in a short period. 2. It should possess high evaporative power, that is, be capable of converting much water into steam with a small consumption of coal. 3. It should not be bituminous, lest so much smoke be generated as to betray the position of ships of war when it is desirable that this should be concealed.—4. It should possess considerable cohesion of its particles, so that it may not be broken into too small fragments by the constant agitation which it may experience in the vessel.—5. It should combine considerable density with such mechanical structure, that it may be easily stowed away in small space; a condition which, in coals of equal evaporative values, often involves a difference of more than 20 per cent.—6. It should be free from any considerable quantity of sulphur, and should not progressively decay, otherwise, in either case, it is liable to spontaneous combustion.

Fuero, *fu-a'-ro*, is a Spanish term, derived from the Lat. *forum*, which signifies a place where justice is administered; and hence, jurisdiction. From this latter sense it came, in Spain, to be transferred to collections of laws; thus the Spanish edition of the ancient "Lex Visigothorum" was called the "Fuero juzgo." From hence it came to be applied specially to the rights conferred by the crown on particular cities, the most famous of which were the fuero of Leon, and that of Sepulveda. As these city rights were chiefly liberties, franchises, privileges, the word *fuero* came to be generally used in this sense, and to denote, in particular, the various books of immunities and privileges which contained the enactments of Navarre, and that those



Basque provinces of Biscaya, Alava, and Guipuzcoa. It is in this last sense that the word is now almost exclusively used, the fueros of the other provinces and towns of Spain having long since become extinct. The subject has, in recent times, acquired a fresh importance, from having given rise to the revolution of 1833, in the Basque provinces, which led to a series of sanguinary conflicts, and which was only terminated by the queen and government, in 1844, entering into a formal recognition of the ancient rights and privileges of these provinces. These rights are based upon the ancient laws of the Visigoths, and were developed in the period between the fall of the Moors in the Spanish peninsula and the complete consolidation of the Spanish monarchy under the house of Hapsburg. The fueros thus owed their rise to the old Gothic laws, and as they took their form from the struggles between the people and their princes, they differ considerably in the different provinces. In 1236, in consequence of the contests carried on between the king Theobald and his court, the fueros of the kingdom of Navarre were collected and written down, and still exist under the name of "Cartulario del Rey Tibaldo." In Biscay the fueros arose chiefly in the contests between the tribal chiefs of the counties and their counts. They were collected together in a book in 1371, by Count Juan with Biscay and improved by Corregidor Martin Ruiz de Alava became united with Castile by its successive cession, in 1526, revised and confirmed by Charles I. of Spain, who was also Charles V. of Germany. In the province of Alava, which went over to the government of Navarre to that of Castile, in 1200 the fueros of Logroño formed the basis of their privileges, which however still further extended in the subsequent contests of the Alavese with their Castilian rulers and were confirmed by the constitution of John II. of Castile. The province of Guipuzcoa received its fueros from the kings of Navarre, and they were subsequently confirmed by the kings of Castile, when that province came under their dominion. The fueros were drawn up at different times and in different forms, in the several provinces, and hence they differ considerably, as regards their details, in the several provinces, but their main features are the same in all; the form of government being essentially republican, and the royal authority little more than nominal. In Biscaya, for example, the king has only the power of nominating the corregidor, or chief magistrate; and even his nomination requires to be confirmed by the juntas of the province, a legislative body elected by almost universal suffrage, and intrusted with the chief management of public affairs. The inhabitants are exempt from all taxes and imposts, except such as they vote themselves, and claim, by virtue of pure Biscayan account, the privilege of Spanish nobility. They are not obliged to appear before any tribunal beyond the bounds of their own territory, or to allow any royal monopoly, or admit royal troops within their territory, or to furnish recruits for the royal army.

Fugitive, *fu-jit-iv* (Lat. *fuga*, flight), is a person obliged to fly from his country, or remove from a place where he had some abode or establishment, on account of his crimes, debts, or other circumstances. In the Roman law, a fugitive slave was one that was given to flee or run away from his master; and in selling a slave, the master was obliged to declare whether or not he was fugitive.

Fugitive-Slave Law.—According to the constitution of the United States of America, slaves, or, as it is mildly put, "persons held to service or labour in one state, under the laws thereof," fleeing or escaping into another state, shall be delivered up, on claim of the party to whom such service or labour may be due. The previous enactments on this subject have been amended, and to a considerable extent superseded, by the act of 18th September, 1850. The judicial duties imposed by this act are to be performed by any United States' commissioners who may have the power of imprisoning or arresting for offences against the United States; by the judges of the circuit and other courts; and by such special commissioners as the respective courts may appoint. When any fugitive has escaped or shall escape into another state or territory, the owner of his duly authorised agent may pursue and reclaim the said fugitive, or may demand a

## Fugue

warrant and arrest from the officer having due authority, whom the fugitive must be taken before a commissioner or judge, whose duty it is to hear and determine the complaint in a summary manner, and, upon satisfactory proof as to the identity of the fugitive that he is escaped and owes service to the claimant, it is the duty of such judge or commissioner to deliver to the claimant a certificate of the proceeding had, with authority to remove the fugitive to the place from which he had fled The testimony of the fugitive is not admissible. Any assistance rendered to a fugitive to enable him to escape from the claimant, or any obstruction offered to his arrest, is made penal and also subject to the party to damages at the suit of the owner All citizens are required when called upon to render the officers personal assistance when thus may be required in the performance of their duties Such was the law on this subject previous to the commencement of the present unhappy struggle but what the future enactments may be, still remains to be seen —*Ref* hent s *Commentaries on American Law* Boston, 1828

FUGUE *fuge* (Fr ) a term signifying a composition vocal or instrumental, or both in which a short succession of notes called the subject are successively and alternately from one part to the other recurring to certain rules of harmony and melody There are four kinds of fugue, viz that of fugue," in which the subject is delivered in part and answered by another the subject being repeated in the third part the first fugue in which the composer is not so much restricted but allowed to introduce passages of his own invention, the " double fugue, in which two distinct subjects occasionally intermingled are managed together, and the " inverted fugue in which as the name implies the theme is inverted *Jay Dodd's Elements of Composition* Clarke *on Harmony*, and the *English Cyclopædia*

FULCRUM, *fulcrum* (Lat ) the prop, or other support, by which a lever is sustained and fixed point about which it moves (Mechanics)

FULGORA, *Fulgore* (Lat *Fulgur* lightning) a genus of hemipterous insects popularly called lantern flies, from their powerful luminous qualities The American lantern fly *Fulgora lucifera* is one of this family It has a large head, which is remarkable The head is divided into two tuberances and it is from this hollow part of the head that the light is said to proceed The other part " Two or three of these insects placed in a glass vessel afford light sufficient to read with little difficulty, if they be placed close to the glass From when the insects are dead their luminous quality considerable light, though less vivid than it was if bruised and rubbed over the hands or face they become luminous in the dark like a piece of wood English phosphorus —(*Mrs Phillips*) Madame Merrian, in her work on the insects of Surinam was the first to draw attention to this Indians," says she, "once brought me a live lantern that they chose by night a number of the insects flies, which I shut up in a large wooden box all the night they made such a noise that I awoke many times and ordered a light to be brought We got up that the noise came from the box, and opening it were much alarmed, and instantly let it fall to the ground with affright, on perceiving flames of fire issue from it, for as many animals came out, so many flames appeared. When we found this to be the cause, we recovered from our terror, and again collected the insects, much admiring their splendid appearance"

FULLER'S EARTH, *fullers earth*, in Min , a porous soft silicate of alumina, having a strong attraction for greasy matters If made into a paste with water, and laid upon a greasy spot, it removes the fatty or oily matter by capillary attraction It is found abundantly at Reigate, in Surrey It is largely used to cleanse woollen fabrics from the grease contained in the wool from which they are made.

FULMINATING GOLD, *fulminating gold* (Lat. *fulmen*, a thunderbolt), in Chem., a fulminating compound of gold, made by digesting terchloride of gold in solution of ammonia, the formula of which is said to be AuCl3NH3 HO.

## Fulminating

cating terchloride of gold for the [illegible] ammoniating compound of [illegible] manner by digesting [illegible] with ammonia. If simply [illegible] while still moist, is placed in contact [illegible] some hours, a great part is dissolved, but [illegible] pound remains, possessing powerful [illegible] perties It is regarded by chemists as [illegible] $Ag_3N$. These compounds all require [illegible] on account of their dangerous properties [illegible] been somewhat avoided by chemists. [illegible] be confounded with the fulminators, which [illegible] pounds of the metals with a true acid.

FULMINATING MERCURY, in Chem.—This [illegible] which is largely employed in the manufacture [illegible] cussion caps, is made by dissolving one part of [illegible] twelve of nitric acid, spec grav. 1 36, to which [illegible] five parts of alcohol, spec grav 0 850. The [illegible] gently heat, by means of a water-bath, [illegible] action takes place, during which metallic [illegible] separated and in a short time grains of the [illegible] al appear, which, when cold, are [illegible] with water This composition for filling percussion caps consists of six parts of nitre and one of [illegible] cury fulminate into a thin paste with water. [illegible] wet is harmless, but requires great precaution [illegible] hot, when dry

FULMINATING SILVER, in Chem —There are two [illegible] of silver known by the name, both of which [illegible] ar explosive by simple friction The first, which [illegible] ed by some chemists to be nitride of silver, [illegible] prepared by dissolving protoxide of silver in ammonia and adding solution of potash or soda, a black powder falls, which is allowed to dry in the [illegible] on separate morsels of filtering-paper. The [illegible] instantaneously of silver, and is formed when silver [illegible] is transmitted through saturated solution of [illegible] of silver

FULMINATION, *fulmination* (Lat. *fulmen*, a thunderbolt) is employed in a general sense as synonymous with [illegible] nunciation, but it is more particularly [illegible] of the anathemas or excommunications [illegible] in the papal see against offenders

FULMINIC ACID *fulminic acid* (Lat. *fulmen*, a thunderbolt) is from the name produced by the explosion of [illegible] mine) in Chem, an acid possessing the [illegible] cyanic and cyanuric acids, but having [illegible] very different properties It is not known [illegible] isolated but it forms compounds with the [illegible] of which are powerfully explosive properties.

Known of these, the fulminate of mercury, [illegible] fulminating percussion caps The fulminate of [illegible] mercury is used as a detonating powder, but [illegible] is attended with much greater danger than [illegible] employing that of mercury. The latter is [illegible] by dissolving one part of mercury in [illegible] of which seven parts of alcohol are [illegible] of application of a gentle heat, a violent [illegible] takes place, and other escaping, and [illegible] being gradually formed

FUMAGE, *fumage* (Lat *fumus*, smoke), was [illegible] rate formerly levied in England, and [illegible] known as the farthings. It is mentioned by [illegible] Conqueror, as being paid by custom to the [illegible] every chimney in the house; but it was first [illegible] by act of parliament in England by Charles II. (13 & 14 [illegible] c 10 when an hereditary revenue of [illegible] hearth, in all houses paying to church and [illegible] granted to the king for ever. It was [illegible] abolished upon the revolution, by 1 Will. & Mary, [illegible]

FUMARIACEÆ, *fu-ma-re-a'-se-e*, in Bot., a [illegible] tory family, a nat ord. of *Dicotyledones*, [illegible] *Thalamiflorae*, consisting of [illegible] species, principally occurring in [illegible] places in the temperate latitudes of [illegible] hemisphere They are smooth herbs, with [illegible] juice, and alternate, exstipulate, [illegible] flowers very irregular and [illegible] white, or yellow; sepals 2, [illegible] gynous, usually 6, diadelphous, and [illegible] opposite to the petals; ovary [illegible] placentas; ovules [illegible] *rarum* pennant [illegible] pinnatifid, and [illegible]

most important is *Diospyros operabilis*, which has very showy but scentless flowers. The order is named from *Fumeria*, one of the genera.

**Fund, Sinking.** (*See* National Debt.)

**Fundamental,** *fun-da-men'-tal* (Lat *fundus*, the bottom of a thing), in Mus., is a term applicable to either a chord or to a note; to the former, when its lowest component part is the note on which the harmony is founded; and to the latter, when it is both the lowest constituent part of a chord and the note from which the harmony is really and nominally derived.

**Funds,** or **Fundungi.** (*See* Rasfalum.)

**Funds, Funding System.** (*See* National Debt.)

**Funeral.** (*See* Burial.)

**Funeral Expenses,** *fu'-ne-ral* (Ital *funerale*), in Law, are a privileged debt, coming before all other debts and charges. This applies only, however, to such as may be regarded as necessary expenses, which must be regulated by custom and the condition of the deceased. If the executor or administrator be extravagant, it is a species of devastation or waste, and shall only be prejudicial to himself, and not to the creditors or legatees of the deceased. It seems that, according to the law of England, the widow has no claim for mournings, either against the executors or creditors of her husband, but, in Scotland, in mournings to the widow and those of the children who reside in family with the deceased are valid charges.

**Funeral Orations.**—The custom of delivering funeral orations on the occasion of the death of any distinguished person is of very great antiquity. They were in use among the ancient Greeks and Romans, and were very common among Christians in the early ages of the Church. The funeral orations (*Oraisons funèbres*) of Bossuet and Fléchier are justly celebrated for their eloquence.

**Fungi,** *fun'-ji* (Lat.), in Bot., the Mushroom tribe, a nat. ord. of *Acotyledones*, sub-class *Thallogens*, consisting of parenchymatous cellular plants, growing in any damp mould, in or upon the wood and the herbaceous parts of living or dead plants, upon animal or decaying animal substances, and in solutions of organic materials. A great number of species are microscopic plants. The vegetative structure of every fungus consists of a mass of exceedingly delicate, jointed and branched, colourless, interlacing filaments forming a kind of cottony or felty mass when growing in the ground. This vegetative structure, called the *mycelium*, or *spawn*, nourishes the reproductive structure which differs extremely in appearance in the various genera. Fungi have been divided into six sub-orders which respectively include the mushrooms and their allies, the puff-balls, the smuts, the mildews, the truffles and morels, and the moulds (*See* Agaricus, Amanita, Lycoperdon, Cordiceps, Uredo, Etc., Peziza, Tuber, Morchella, Penicillium.)

**Fungus,** *fung'-gus* (Lat.), in Surg., is a term applied to any luxuriant formation of flesh on an ulcer commonly known as proud flesh. It is also applied to a disease of the structure of a part which enlarges, is soft and excrescential.

**Fungus Melitensis,** *mel-i-ten'-sis*, the name used by the pharmacologists to designate a parasitic plant which formerly had a great reputation as a styptic. Its botanical name is *Cynomorium coccineum*, and it belongs to the nat. ord. *Balanophoraceæ*.

**Funiculus,** *fu-nik'-u-lus* (Lat *funis*, a cord or cable), in Bot., the stalk by which the ovule or the seed is attached to the placenta. When this stalk is absent, the seed is said to be sessile. (*See* Ovule, Seed.)

**Fur,** *fur* (Fr *fourrure*), the long, fine, silky hair of some wild animals, as the bear, wolf, marten, beaver, which is dressed and prepared as an article of dress. Fur being one of the principal non-conductors of heat, it is an especially warm covering, and those furs are the best which belong to animals which inhabit cold climates. The furs which are imported may be classed in two different sections,—the *felted fur* and *dressed fur*. The first section comprises the furs of the [illegible] rabbit, hamster, and nutria, and these are principally used for hatmaking. Dressed furs are those [illegible] are prepared along with the felt to which they [illegible] attached, and imported for the trimming of articles [illegible] shoulders, rugs, muffs, mantles, and such-like. Furs [illegible] this quantity from North America,



and Russia, and the trade is a very important one, as above 5,000,000 skins of fur-bearing animals are annually brought into Britain. The Russian sable is one of the most expensive, some single skins fetching £9, although the average price is between £2 and £3. The Hudson's Bay Company was established in the year 1670, by an especial charter from Charles II., for the purpose of carrying on this trade in North America, by means of hunters sent out for the purpose, and by traffic with the numerous wild tribes of Indians, which at that time populated nearly the greater part of America. Quebec and Montreal are the principal trading stations of the company. The operations by which furs are manufactured into a fit state for the covering of hats, &c. are termed "furriery," and are carried on in the following manner. Felted furs, for hats, are first spread out so as to exhibit a flat surface, and the skin is combed with a kind of saw termed a rake so as to clear off any impurities without detaching any of the hair or fur itself. This being achieved, the skin is then damped on the inner surface, and several are pressed together in the gross, so as to render them perfectly smooth and even, and take out any creases or folds. The next process is to separate the furry coat from the felt underneath. The coating is of two kinds,—long hairs which are not strictly fur, and shorter coarse underneath, which is the true fur required. These are separated by a long pair of shears, which first detaches the long rough hair. The real fur is then removed by a much more delicate operation. The skin is extended and stretched pretty even upon a cutting board made of willow, which is commonly wet to extend it during the knife used in the process. The knife is extremely sharp, in fact, as sharp as a razor, and is about six inches long by three broad, and it can be used either backwards or forwards, being shaped somewhat like a cheese cutter. With this instrument the fur is separated from the skin, the operator working down from the head to the tail (the natural direction which the fur takes on the animal which it belongs), and it is then carefully collected and sorted out according to the different degrees of excellence which it possesses. It is now fit for the purpose for which it is intended. *Dressed furs*.—The treatment of this species is much more simple than that of felted furs as the hair or fur has not to be removed from the felt. Only two processes are necessary, that of cleansing the skin from all impurities, and extracting the excess of oil from the fur itself. The skin is first steeped in a liquid composed of bran, alum and salt; it is then worked about and rubbed sufficiently to remove all particles of grease which might still cling to it. The fur is then washed several times with soda and fine soap, after which it is regularly cleansed in cold water repeatedly. The alum having rendered the skin soft and pliable, and the fur being fully prepared, the dressed fur can now be made up into the different garments and trimmings for which it is used. The use of furs seems to have been first introduced into Europe about the 6th century, about which epoch sable skins were brought to Rome from the shores of the Arctic Ocean by northern invaders. They appear to have been in regular use in England in the 11th century, as we learn that Edward III., in the year 1337, commanded that none of his subjects should wear them unless they had an income of £10 annually. The Hudson's Bay Company even still have the pre-eminence which they had some two centuries back, as their system is so vast that they command nearly every market. They hold annual sales in London in the month of March, and many foreigners come over for the express purpose of purchasing furs, which are disseminated over Europe through the agency of the grand fair at Leipsic. It is asserted, in a capital article on the subject in the *English Encyclopædia*, that the value of furs used in Europe every year cannot be much less than £7,000,000.

**Furious Driving** (*See* Driving, Furious.)

**Furlong,** *fur'-long* (Sax *furlang*), an English measure of length, which denotes the eighth part of a mile, or 220 yards.

**Furlough,** *fur'-lo* (Du. *verlof*), in Mil. language, the leave of absence granted to any officer or man to absent himself from duty for any length of time.

**Furnace,** *fur'-nis* (Lat. *fornax*), an inclosed fire,

the draft to which is only supplied at the bottom, and that with considerably increased velocity when compared with the common grate. Furnaces are of very extensive use, especially where metals and minerals are manufactured, as they require a great heat for their reduction or fusion. Furnaces vary in construction and size according to the particular manufacture in which they are employed. In glass-works, potteries, and similar manufactories, furnaces giving an intense heat are not so much required as those which give a steady temperature, but a fire of such magnitude as to keep a large quantity of material in fusion. Another class of furnaces of great importance are those used for heating steam boilers. In these furnaces great heat is not so much wanted as a large quantity for a rapid production of steam. For the smaller operations in chemistry a variety of furnaces have been invented, and the introduction of gas as a heating agent instead of coal, by Messrs. Brunn, St. Clair Deville, Griffiths, and others, has wrought a complete change in the forms of chemical furnaces, and the modern chemist employs as apparatus is a philosophical instrument compared with the dirty smoky furnace of twenty years ago, half in place half forge. The furnace of Dr. M'Dowall for fusing platinum, iridium, and other metals which have hitherto resisted all attempts to fuse them, is fed by combined oxygen and hydrogen, and such is the intensity of the heat elicited that according to M. Deville, platinum may not only melt but boil and volatilized. (See Crystal Williams, *Hand-book of Chemical Manipulation*.) Furnaces may be subdivided into two classes, viz. draught furnaces and blast furnaces. In the former case, a high temperature is produced without the use of bellows, by a careful management of draught. The blast furnace has the temperature raised to an intense heat by the introduction of heated air at the bottom by means of a pipe. The essay or cupelling furnace is a small furnace lined or muffled with fire clay, and containing a muffle. It is used for metallurgic purposes, and in many processes of chemical manufacture, reverberatory furnaces are employed. These furnaces are usually long with a low arch, the fire being placed at one end and the flame at the other. The manufacturing operations depend on the level of the furnace, between the fireplace and the flue. The draught from the external chimney draws the flame over towards the opening of the flue at the other end, keeps it down, so that any substance placed on the bed of the furnace is fully exposed to the heat of the direct flame above. In the manufacture of soda, the reverberatory furnaces are much used, and in the calcining process, where intense heat is required, the sulphurous flame is used for evaporating the first solutions of the liquors. Blast furnaces are used in the manufacture of iron. They are supplied with heated air by means of powerful fan blasts. (See Iron Manufacture.)

FURNITURE DISTRESS. (See Distress.)

FURUNCULUS (*furunculus*, a little thief), in Medicine, is the name given to an inflammatory tumour commonly known as a boil. (See Boil.)

FURZE. (See Ulex.)

FUSANUS, *fu-sa'-nus* (in Botany), a genus of the natural order *Santalaceæ*. The species *Fusanus fusiformis* (the quandong nut of Australia), an edible fruit resembling the almond in flavour.

FUSE, *fuze* (Lat. *fusum* from *fundo*, I pour out), a tube filled with an inflammable composition, chiefly used for exploding shells. There are two kinds of fuses, one made of wood, and the other of metal. The form of both sorts is that of a cylinder, slightly conical in shape, the smaller end being that which is inserted into the shell. The wooden fuse is made of close grained wood, well seasoned beech being most commonly used for the purpose. A hole about a inch in diameter is bored through the length of the cylinder, terminating in a cup-shaped cavity at the larger extremity, the exterior of the cylinder is marked with rings inch apart, which serve to regulate the length of time for which the fuse shall burn before the explosion of the shell takes place. This is effected by cutting off a part of the end of the fuse, which enters the shell, or by extracting some of the composition, which burns at the rate of inch per second. The composition with which the bore of the fuse is filled is composed of [illegible] sulphur to [illegible] of nitre, and [illegible] of powdered [illegible] is rammed tightly into the bore, and the larger extremity is filled with [illegible] where the shell is fired, and into [illegible]. Before the shell is fired, the fuse is [illegible] into the orifice left in the projectile for [illegible]. The metal fuses, which are principally used in [illegible] are made in three sizes, and constructed to burn the shell; the largest size is four inches in length, burns for twenty seconds; the next, three inches burning for eight seconds; and the third, long, which burns for two seconds only. [illegible] also been invented by Sir William Armstrong, Captain Boxer, R.A. In Sir W. Armstrong's time of the explosion of the shell can be regulated a graduated plate, attached to the larger end that made by Captain Boxer there are three entering the fuse longitudinally, one of which with composition, and the others with fine Perforations are made in the sides of the communicating with the chambers that contain powder. These holes are bored inch apart, row, the one row entering the fuse with those in the other, so that in reality a perforations is obtained only inch apart, the time between the discharge of the shell and its plosion can be regulated with greater precision; the holes that enter the chambers filled with stopped with putty, explosion at any required [illegible] is secured by boring into the composition through the [illegible] on the exterior of the fuse to which it is [illegible] down at the time desired for the explosion, the flame of the composition rushing through the [illegible] has been made in the side of the plug, and [illegible] powder in the chamber and that with which the shell is charged. In the old fuse, which was bored completely through from end to end, the composition often fell out when it was hammered into the shell, and the explosion of the shell was in consequence, often prevented altogether or delayed, but in Captain Boxer's fuse the occurrence of this mischance is obviated by making the smaller end of the cylinder solid, and boring the fire which ignites the charge in the shell to issue through the side of the fuse instead of the extremity.

FUSIBLE OR FUSIBLE OIL. (See Fusible Oil.)

FUSIBLE METAL, *fu-zi-bl* (Fr., from Lat. *fusum fundo*), an alloy of bismuth, composed of [illegible] of bismuth, one of lead and two of tin. It has the property of fusing below 212°, and expanding [illegible] in cooling, it of great value to the die-sinker, which has thus enabled to take a sharp cast of his work without pressure at a comparatively low temperature. An alloy of [illegible] bismuth, tin, and lead melts at a lower temperature, and is known as Wood's fusible metal.

FUSING POINTS, *fu zing*, in Chemistry.—The following is a selection of the fusing points of well-known substances:

| | Fahr. | |
|---|---|---|
| Mercury | 39° | |
| Oil of Vitriol | 30 | (Regnault) |
| Bromine | 4 | |
| Ice | 32 | |
| Phosphorus | 111·5 | (Schrötter) |
| Potassium | 132 | |
| Wax | 143·6 | (Pierre) |
| Sodium | 190 | |
| Iodine | 224·6 | |
| Sulphur | 239 | |
| Tin | 442 | |
| Bismuth | 512 | |
| Nitrate of Soda | 591 | |
| Lead | 620 | |
| Nitrate of Potash | 642 | |
| Zinc | 773 | (Daniell) |
| Antimony | 810 | |
| Silver | 1773 | |
| Copper | 1996 | |
| Gold | 2016 | |
| Cast Iron | 2786 | |
| Wrought Iron, about | 3000 | |

FUSIL, *fu-zil* (Old French, *fusil*), a [illegible] to the old [illegible]

six light infantry regiments in the British army were armed with this weapon prior to the introduction of the Enfield rifle, from which they acquired the distinctive appellation of fusiliers. Of these, the 23rd, or Royal Welsh Fusiliers, raised in 1688 or 1689, is perhaps the most distinguished. The 7th and 21st regiments were also raised about this time, as the English and Scotch Fusiliers, when the fusil was first introduced from France, having already been in use in that country for about half a century. One of the regiments of the foot-guards, or household troops, is also distinguished as the Scots Fusilier Guards.

FUSILIERS. (*See* FUSIL.)

FUSTIAN, *fust'-yan* (Fr. *futaine*), a species of cotton cloth somewhat similar in manufacture to velvet, having, in addition to the warp and weft, a species of pile, consisting of other threads doubled together, which are thrown up in ridges and conceal the original warp and weft, which are the groundwork of the fabric. When in the loom, this *pile* presents the appearance of a set of loops; but these are afterwards cut in two and sheared down. The fustian, when polished and finished, presents an evenly-ribbed surface on the exterior. The best descriptions of this class of goods are those known as cotton-velvet and velveteen; but, besides these, there are moleskin, corduroy, and several other kinds. (For further information on the subject *see* WEAVING.)

FUSTIAN, in Criticism, is applied to a forced, bombastic style of writing, abounding with metaphors or other rhetorical figures.

FUSTIC, *fust'-ik* (Sp. *fuste*).—There are two kinds of fustic used in dyeing,—old fustic, which is the wood of the *Morus tinctoria*, and young fustic, which is obtained from the *Rhus Cotinus*. They are both valuable for dyeing woollens yellow, and for imparting to them green and olive hues when mixed with indigo. (*See* MACLURA and RHUS.)

FUTURE DEBT, in Law, is a debt payable at some future and fixed period. Such differ from contingent debts, in that the payment of them is fixed, whereas in the other case payment depends upon some contingency. In the case of the death or bankruptcy of a debtor, future debts are allowed to rank on the estate, interest at the rate of five per cent. being deducted for the period that has to elapse before the debt becomes strictly payable.

## G.

G is the seventh letter in our alphabet, as well as in the Latin and all the other alphabets derived from it, while in the Greek and Oriental alphabets it occupies the third place. It has two sounds,—one hard, as in *gay, go*; the other *soft*, as in *gem, giant*. It is hard before the vowels *a, o, u*, and soft before *e* and *i*. It thus resembles *c*, which has the double sound of *k* and *s*. *G* is liable to many changes in different dialects or languages, as interchanging with *k, h, y, gu, w, b, d*, &c. (for which *see English Cyclopædia*, sect. Arts and Sciences, art. G).

G, in Mus., is the fifth note or sound of the natural diatonic scale, corresponding to the *sol* of the French and Italians.

G FLAT, the note G depressed half a tone; the fifth note introduced in modulating by fourths from the natural or diatonic mode.

GABELLE, *ga-bel'* (probably from the Ger. *gabe*, a gift, also a tax), in France, was a term originally applied to any tax or impost laid upon commodities, but which afterwards came to be specially applied to a duty upon salt. This salt-tax was first established towards the end of the 13th century, in the reign of Philip IV. It was very unequally distributed, some parts of the country being altogether free, and others more or less heavily taxed; and hence it was very unpopular, and frequently gave rise to disturbances. It was finally abolished in 1789.

GABION, *gab'-be-on* (Ital. *gabbione*), in Mil., a basket or cylinder made of wickerwork, open at both ends, used in the construction of earthworks. These baskets, which are 2 feet 9 inches in height and two feet in diameter, are thus made:—A number of stakes, ranging from about twenty-one to twenty-seven, according to the flexibility of the osiers or brushwood that are used in making the gabions, are driven into the ground at equal intervals round the circumference of a circle traced thereon, with a radius of eleven inches, that the outer diameter of the gabion may not exceed two feet when it is completed. The willow rods, or any other material that can be obtained which is suitable for the purpose, are then twisted between and about the stakes, each successive layer of rods being tightly pressed against the one below it, until the basket-work has attained the requisite height. The gabion is then pulled up, the osiers at the top and bottom are secured to prevent them from coming out of place, and the ends of the stakes are cut off about three inches from the basket-work at either end and sharpened. Before Sebastopol, where brushwood was scarce, the stakes were interwoven with hoop iron instead of withes, and the gabions made in this manner were found to be more serviceable than those which were constructed in the usual way. Tyler's gabion is a sheet of galvanized iron, about 6 feet 6 inches long and 2 feet 9 inches broad, that is brought into a circular form and retained in that position by passing a strong cord or wire through eyes punched along either end of the metal sheet. Gabions are used in making earthworks. They are placed on end and filled with earth taken from the ditch dug out in front of the rampart. They add considerably to the strength of the mound, by affording support to the earth that is thrown over and against them. When one line of gabions is placed on top of another, a row of fascines is generally placed between them.

GABLE, *gā'-bl* (Welsh *gafael*), in Arch., the name given to the upper part of the end-wall of a building, the sides of which meet in an angle and afford support to the ends of the rafters of the roof. The angle thus formed corresponds to the slope of the roof: it attains the greatest degree of acuteness in Gothic architecture. The gables of the different styles of Gothic architecture were often richly ornamented, the wall being raised above the roof and finished with a coping and finial, which generally assumed the form of a cross in churches and buildings designed for ecclesiastical purposes. In Elizabethan architecture, the outline of the gable was composed of curves and angles variously combined, that known as the ogee gable being the most common. It was often richly ornamented with open stonework. The sloping sides, particularly in old Scotch, Dutch, and German buildings, were sometimes finished in the form of a series of steps, which, in Scotland, were termed "corbie steps." In domestic Gothic architecture, the roof generally projects beyond the face of the gable-wall, and an ornamental barge-board is attached to the end of the rafters. The end of a house terminating in a gable is indifferently called the gable or gable-end of the building, as in the title of one of Hawthorne's best tales, "The House of the Seven Gables."

GAD, *gad* (Ang.-Sax.), a sharp-pointed wedge, used in Cornwall for splitting rocks.

GAD-FLY. (*See* BOT-FLY.)

GADIDÆ, *gad'-i-de* (Lat. *gadus*, a cod-fish), a fam. of fishes of the soft-finned order; as the Cod. They are easily known by the position of the ventral fins under the throat and the pointed character of those fins. The body is long, rather compressed, and covered with small soft scales. The head is scaleless; eyes lateral; jaws and anterior part of the vomer furnished with several ranges of unequal teeth; the gills large, 7-rayed, and opening laterally; a small beard at the tip of the lower jaw. Most of the species have the dorsal fin contained in two or three bundles; they have also fins behind the vent, and a distinct caudal fin. The greater number of the species live in cold or temperate seas, and furnish the greater portion of the fish obtained in England and America. Their productive powers are very great, and the numbers in which they exist in some parts of the ocean is perfectly incalculable.

GAELIC, OR ERSE, LANGUAGE AND LITERATURE, *gal'-lik*.—The language spoken by the Highlanders of Scotland is termed by them the Gaelic; but the name frequently given to it by the lowlanders is Erse or Irish, evidently a corruption of Irish. It is a dialect of that great branch of the Celtic languages termed

the Gwyddelian or Gaelic, and to which belong also the Irish and Manx, or that spoken in the Isle of Man. According to Dr. Prichard, the Celts are of Eastern origin, belonging to the great Indo-European family. They arrived before the Teutons from the regions on the Oxus, and from Media, and penetrated through the Allophylic races along the southern shores of the Baltic Sea, at a time of which we have no historic data. At the time of the Roman invasion, Celtic was the language generally spoken in Western Europe. The dialects of the Celtic still spoken, besides the three already mentioned, are the Welsh, and the language of Brittany; while the Cornish, another dialect, though not now spoken, is preserved in books. The three dialects, the Irish, the Scotch Gaelic, and the Manx, approach each other so nearly as to form, in fact, but one language, the peculiarities which distinguish them from each other not being sufficiently broad or vital to constitute either of them a distinct language. The differences between the spoken language of the Scottish Highlanders and the Irish exist partly in the pronunciation, partly in the grammar, and partly in the idioms. In the vocabulary, also, there are considerable differences, as where words now obsolete in Irish are still used in the Scotch Gaelic, and others are used in a different sense. There are also marked differences in the language, as spoken in different parts of the Highlands; and a native of Sutherland has some difficulty in understanding one of the southern districts of Argyle. The Gaelic, which, from a variety of causes, has retained, in a considerable degree, its original purity, is copious, bold, and expressive. It derives no assistance from the languages either of Greece or Rome, from which it differs in its structure and formation. Having affixes and prefixes, it greatly resembles the Hebrew, particularly in the inflections of its nouns and verbs. In Ireland, too, the Gaelic spoken in the different parts varies, and the difference is very marked between that spoken in the north and south parts of the island. The Scottish Highlands and the north of Ireland were, at an early period, inhabited by the same race or races, and an intimate connection subsisted between the two countries. For nearly four centuries, from about the middle of the 12th to nearly the middle of the 16th century, according to Mr. Skene, "there was not only a close political connection between the western Highlands and islands and Ireland; but the literary influence was equally close and strong; the Irish seanachies and bards were heads of a school which included the west Highlands, and the Highland seanachies were either of Irish descent, or, if of native origin, resorted to bardic schools in Ireland for instruction in the language and the accomplishments of their art." A powerful influence must thus have been exercised upon the language and literature of the Highlands, which must have become by degrees more and more assimilated to that of Ireland. The written and cultivated language of the Highlands thus came to be identical with that of Ireland; but, according to Mr. Skene, we have no reason to conclude, on that account, that there was not a vernacular Gaelic which preserved many of the independent features of a native language, and existed among the people as a spoken dialect. The introduction, however, of the Reformation, in the 16th century, gave rise to a religious literature, which, commencing in the written, or Irish Gaelic, gradually approached nearer and nearer to the spoken dialect of the country, and, accompanied by the preaching of the clergy in the vernacular dialect, tended to preserve and stereotype the language spoken in the Highlands in its native form and idiom. The first printed book in Gaelic was a translation of the form of prayer issued by John Knox, and printed at Edinburgh, 1567. The second was a translation of Calvin's Catechism, published along with an English edition, in 1631. In 1659, the Presbyterian synod of Argyle took up the work of issuing translations into Gaelic of the metrical Psalms and of the Scriptures. In 1690, the first Bible was published for the use of the Highlands. All these works were in the Irish orthography and Irish dialect, the last being simply an edition of the Irish version of the Bible, with a short vocabulary. The first work published in Scotch Gaelic was Baxter's "Call to the Unconverted," translated by the Rev. Alexander Mac-





farlane, in 1750, who, in 1753, also published the [illegible] in Scotch Gaelic. In 1767, the first translation [illegible] New Testament was published in the Scotch [illegible] and in 1783, a translation of the Old Testament undertaken by the Society for Propagating [illegible] Knowledge in Scotland, and completed in [illegible] 1846, a committee of the best Gaelic scholars [illegible] appointed by the General Assembly of the Church of Scotland to effect an improved translation of the Scriptures, the whole being published in 1853. The earliest specimens of Scottish Gaelic poetry are preserved in a collection made in the beginning of the 16th century, by Sir James Macgregor, vicar of Fortingall and dean of Lismore, and now preserved in the Advocates' Library in Edinburgh. A selection from it has recently (1862) been published, with translations, by the Rev. Thomas M'Lauchlan, and an introduction by Mr. W. F. Skene. Some of the poems are in pure Irish, others in pure Scotch Gaelic; and others in a mixed dialect, in which the one or the other idiom predominates. The MS. is of no mean literary value, as throwing some light upon the much-controverted subject of Ossian's poems. "It contains no fewer than twenty-eight Ossianic poems, extending to upwards of 2,500 lines: nine directly attributed to Ossian, two to Farris or Ferghus Filidh, and one to Caoilte Mellonan, the three bards of the Feine; two to Allan MacQuadri, and one to Gillecallum Mac an Gille, hitherto unknown; and eleven poems Ossianic in the style and subject, to which no author's name is attached." It is thus clear, "that the characters introduced into Macpherson's poems were not inventions, but were really the subjects of tradition in the Highlands, and that poems certainly existed which might be called Ossianic, as relating to the persons and events of that mythic age;" and "that Macpherson had used many such poems in his work; but by joining separated pieces together, and by adding a connecting narrative of his own, had woven them into longer poems and into the so-called epics." The Dean's collection affords a fair specimen of the poetic literature in the Highlands of Scotland before the fall of the Lords of the Isle, and the introduction of the principles of the Reformation.—Ref. *The Highlanders of Scotland, their History, Origin, and Antiquities*, by W. F. Skene, 1837. Also Mr. Skene's Introduction to the *Book of the Dean of Lismore*, 1862.

GAFF, *gaff* (Irish *guf*), a kind of boom, employed in small ships to extend the upper edges of those sails which are secured to the masts by hoops or lacings, and which are usually extended by a *boom* below; such, for instance, as the mainsails of sloops, brigs, and schooners.

GALACTODENDRON, *gál-ák-to-den'-dron* (Gr. *gala*, milk; *dendron*, tree). (*See* BROSIMUM.)

GALACTOMETER. (*See* LACTOMETER.)

GALANTHUS, *gal-án'-thus* (Gr. *gala*, milk; *anthos*, flower), in Bot., the Snowdrop, a gen. of the nat. ord. *Amaryllidaceæ*. The species *G. nivalis* is found growing wild in our thickets, and is much cultivated for borders for the sake of its early and pretty blossoms. It is a bulbous plant; the flower is solitary, white, and drooping, the inner segments being greenish. It is singular that no varieties have been developed from this favourite plant by cultivation.

GALATIANS, ST. PAUL'S EPISTLE TO THE, *gale-ay'-shanz*, the name of one of the canonical epistles of the New Testament, written, as is generally supposed, about the year A.D. 57. It is said at the end to have been written from Rome; but this is generally believed to be incorrect. The authenticity of the epistle has never been called in question, and is frequently cited by the apostolic and other early fathers. The journeys of the apostle to Galatia are mentioned in the Acts of the Apostles, and it was probably after its second of these that the epistle was written. Shortly after his departure, Judaizing teachers appear to have come among them, preaching "another gospel" than that of Christ, and to whom they were giving heed. These teachers also endeavoured to subvert the apostolic authority, by attacking his character and asserting that he was not divinely appointed. Paul, therefore, in his epistles, proceeds to controvert these errors. He vindicates his character and asserts his divine appointment and the truth of what he had taught them

declaring that "though we or an angel from heaven preach any other gospel unto you than that which we have preached unto you, let him be accursed." He then proceeds to point out the relationship of Judaism to Christianity; that they are now no longer under the law but under faith, being made the children of God through faith in Jesus Christ; and exhorts them to "stand fast, therefore, in the liberty wherewith Christ hath made us free," and not to be "entangled again with the yoke of bondage." He also exhorts them not to fulfil the lust of the flesh; but to be led of the spirit, the fruit of which is love, joy, peace, &c. The number of commentaries on this epistle are very numerous; among which may be mentioned those of Luther, Winer, Rückert, De Wette, Alford.

GALAXY. (*See* MILKY WAY.)

GALBANUM, *găl'-bă-nŭm* (Lat.), a fetid gum-resin used in medicine, internally as an anti-spasmodic, and externally as a stimulant and discutient application to indolent tumours and chronic swellings. It is imported from India and the Levant, having probably been brought down the Persian Gulf, and is usually met with in masses of a brownish-yellow colour, more or less translucent and shining. Botanists have, as yet, been unable to determine the plant yielding this resin. Species of at least four different genera have been suggested as the source by different writers. Galbanum is officinal in our Pharmacopœias, and is supposed to be the same substance as the *chelbenah* of Scripture.

GALBULUS, *găl'-bu-lus* (Lat., the nut of the cypress-tree), in Bot., a kind of fruit generally regarded as a modification of the cone. It is described and figured under the head of CONE.

GALENA, *gă-lē'-nă* (Gr. *galene*, tranquillity, on account of its supposed effect in mitigating disease), an important mineral, forming the principal ore of lead. It is a protosulphide of the metal, and is found crystallized more or less distinctly in cubes of a deep leaden colour and strong metallic lustre. It is found in veins in crystalline rocks, and most abundantly in carboniferous limestone.

GALENISTS, *gal'-len-ists*, in Eccl. Hist., was the name of a religious sect, a branch of Waterlandians, Mennonites, or Anabaptists, which arose in the 17th century. Their founder was Galen Abraham Haan, pastor of a Mennonite congregation in Amsterdam, a man of great penetration and eloquence, who was disposed to lay much more stress upon practice than faith, and held that all who acknowledged the divine origin of the Old and New Testament, and led holy and virtuous lives, ought to be received into their communion.

GALENISTS, in Med. Hist., was a term applied to those who adhered to the system of Galen, more particularly as opposed to the Chemical school. The former ran much upon multiplying herbs and roots in the same composition, which they usually prescribed in the form of tinctures or extracts; while the latter dealt chiefly with mineral substances, and professed, by means of various chemical processes or operations, to extract the virtues or essences out of them into a very small compass.

GALERITES, *gă-le-rī'-teez* (Lat. *galea*, a helmet), in Geol., a gen. of fossil sea-urchins, abounding in the Chalk formation, and from their shape popularly known in Kent and Sussex as "sugar-loaves." The shell is high, more or less conical, and oblong-oval at the base, narrowing towards the binder part. These helmet-shaped echini can be found in the chalk cliffs near Margate with little trouble.

GALIACEÆ, *găl-e-ăl'-se-e* (from *galium*), in Bot., the Madder fam., a nat. ord. of *Dicotyledones*, sub-class *Corolliflorœ*, consisting of 10 genera and 320 species; common weeds in the northern parts of the northern hemisphere, and also in the high mountainous districts of Peru, Chili, and Australia. The order has the following characters:—Herbaceous plants, with whorled exstipulate leaves and angular stems. Calyx superior, with the limb 4—6-lobed or obsolete; corolla monopetalous 4—6-lobed, regular; stamens epipetalous, equal in number to the lobes of corolla, and alternate with them; ovary inferior, 2-celled, with one solitary erect ovule in each cell; styles two; fruit 2-celled, indehiscent, with one erect seed in each cell;



albumen horny. The *Galiaceæ* are chiefly remarkable for the presence of a colouring matter in their roots. (*See* RUBIA.) Some have valuable medicinal properties. (*See* GALIUM.)

GALIPEA, *gă-le-pē'-ă*, in Bot., a gen. of the nat. ord. *Rutaceæ*. The species *G. officinalis* and *cusparia* yield the drug known as Angustura or Cusparia bark. They are natives of South America. (*See* ANGUSTURA BARK.)

GALIUM, *găl'-e-um* (Gr. *gala*, milk, the flowers of one variety being used for curdling milk), in Bot., the typical gen. of the nat. ord. *Galiaceæ*. The species *G. Aparine* is the common goose-grass or cleavers. The inspissated juice or extract of this plant has been used with success in *lepra* and some other cutaneous diseases. The extracts of *G. rigidum* and *G. Mollugo* have been employed in epilepsy.

GALLANTRY, *găl'-lăn-tre* (Fr. *galanterie*), denotes bravery, heroism, intrepidity, nobleness, as well as civility, or polite attention to ladies. It is easy to see how, in earlier times, when chivalry fostered alike valour and devotion to the fair sex, this word should have come to receive its double meaning. When the respect for ladies which chivalry cultivated degenerated more and more into frivolous attentions, the word gallantry came also to be used in a less favourable sense; and at length it has come to receive a bad signification, as synonymous with lewdness or debauchery, though it always retaining the meaning of bravery.

GALL-BLADDER, *gawl* (Sax. *geallа*, gall; Lat. *vesicula fellis*), in Anat., is an oblong membranous receptacle, situated on the concave side of the liver, under the right lobe. It is about the size of a small hen's egg, and resembles a pear in shape. It has three coats,—an external or peritoneal, a middle or fibrous, and an internal or villous. The inner coat has a reticulated honeycomb appearance, but does not possess any follicles for the purpose of secretion. It serves as a reservoir for the bile, which, when digestion is not going on, regurgitates through the cystic duct, and is retained for future use. The cystic duct connects the gall-bladder with the hepatic duct, which proceeds from the liver, and the two, when united, form the *ductus communus choledochus*, by which the bile is conveyed to the duodenum. The cystic duct presents internally a number of folds, which are generally circular.

GALLEON, *gal'-le-on*, a name given by the Spaniards to a very large kind of vessel, with three masts and three or four decks, such as those used by them in their commerce with South America, to transport the precious metals. In the Armada which was fitted out by the above nation in 1588 for the invasion of England, there were about sixty galleons. These were large, clumsy, round-sterned vessels, having bulwarks three or four feet thick, all of which were so encumbered with top hamper, and so overweighted in proportion to their draught of water, that they could bear very little canvas, even with smooth seas and light winds.—*Ref.* John Lothrop Motley's *History of the United Netherlands.*

GALLERY, *găl'-le-re* (Dan. *galleri*, Fr. *galerie*), in Arch., a passage open or closed on one side, and having on the other side the doors of a series of apartments which open into it. In this sense it is synonymous with the term "corridor." In ecclesiastical architecture, the name is given to a floor midway between the ground-floor of the building and the roof projecting from the walls on either side, or at the west end, and supported on a series of columns; or, if the span be short, a beam stretching from wall to wall. They are used to obtain additional accommodation, but they are a great disfigurement to churches, especially when they are erected along the north and south sides. The gallery at the west end of a church is usually set apart for the organ and choir. In theatres, the gallery is the range of seats above the upper boxes: it affords the worst view of the stage, on account of the great height at which it is placed above it, and the sum charged for admission is consequently low. The term is also applied to a large room devoted to the reception of paintings, sculpture, and other works of art; and in Mar., to the balcony that is generally made outside the stern of men-of-war and vessels of large size.

GALLERY, in Mil, the narrow passage leading to a mine in which powder is deposited, for the purpose of blowing up and destroying any portion of the fortifications of a town or siege-works. (*See* MINE.)

GALLEY, *gall-is* (Sp. *galera*), a low, flat-built vessel, much used in the Mediterranean Sea before the introduction of steamboats. They were long and narrow, fitted with two masts and fifteen sails, and being propelled by oars as well as by sails, they were of great use in those long calms so frequent in the above-mentioned sea. The largest of the common galleys were about 160 feet long, 32 wide, and contained 52 oars. In the Spanish Armada, in 1588, four vessels, called galeasses, were employed, which were about one third larger than the ordinary galleys, and were each of them rowed by 300 galley slaves. "They consisted," says Motley, in his "History of the United Netherlands," "of an enormous towering structure at the stern, a castellated structure almost equally massive in front, with seats for the rowers amidships. At stem and stern, and between each of the slaves' benches were heavy cannon. They were gorgeously decorated. There were splendid state apartments, cabins, chapels and pulpits in each, and they were amply provided with awnings, cushions, standards, guidons, saints, and kinds of music. Total privation and contagious pagan nothing could alter designed to fulfil the great objects of a war vessel to sail and to fight, they were the worst machines ever launched upon the ocean."

GALLIC ACID, *gall-ik* (from *gall*).—This important vegetable acid exists readily formed in the gall nut, in sumach, in valonia, and in many numerous other astringent vegetables. It is readily obtained by allowing an infusion of gall nut, or powdered gall nuts freely moistened with water, to stand in a warm place for some weeks. A species of fermentation is set up during which the gallic acid is formed in large quantities by the decomposition of the gallotannic acid or tannin contained in the galls. Gallic acid crystallizes in silky needles or brilliant rhombic prisms which dissolve in 100 parts of cold water and three parts of boiling water. It is freely but much more sparingly soluble in ether. Gallic acid is tribasic, forming three classes of salts, namely, one, two, and three equivalents of metal. The salts of the alkalies speedily absorb oxygen by exposure to air, those of the heavy metals decomposing but slowly. The most characteristic reaction of this acid is the formation of a deep bluish black, but when acid is a mixture of the proportions of iron. Gallates give no precipitate with gelatin, in which they are distinguished from the gallotannates. Heated to a temperature of from 410 to 420, gallic acid sublimes and is wholly converted into pyrogallic acid or gallic acids. If the temperature passes 518, only the latter acid is formed. Gallic acid is extensively used as a source of pyrogallic acid, so largely employed in photography.

GALLICAN CHURCH, *gall-ik-an* (from *Lat. Gallia*, Gaul), is the name given to the Roman Catholic church in France, which although in communion with the see at Rome, maintains in some respects a more independent position. It has, from the earliest times, enjoyed certain liberties and immunities, not as grants from the popes, but as forming part of her original constitution, which she has always striven to maintain. When the Church of Rome was grasping after temporal power, their efforts in France were frequently opposed by the sovereigns and more than one conflict was the consequence. There thus arose two parties in the French church,—those who were opposed to the encroachments of the see of Rome, and were known as the Gallican party, while the supporters of the Roman see were known as the Roman, Papal, or Ultramontane party. The earliest important manifestation of this opposition appears in the pragmatic sanction of Louis IX., issued in 1268, which made the paying of taxes to the pope dependent on the consent of the king and the national clergy, and forbade the interference of a foreign power in the affairs of the national church. The spirit of independence was strengthened by the decrees of the councils of Constance and Basel, which were adopted by France at the assembly of estates at Bourges in 1438, and promulgated in the pragmatic sanction of Charles VII.,





the fundamental law of the Gallican church. This placed the general council above the pope, forbade the paying of taxes to the pope for appointing bishops and prelates, and abolished the annates after the death of the then living pope. This sanction was repealed by Louis XI. in 1461, but restored by Charles VIII., and by Louis XII. through the edict of 1498. It was superseded, however, by the concordat entered into by Francis I. with Leo X., who had promised to confer upon the king greater power in ecclesiastical matters, than he had hitherto enjoyed. This pact gave great dissatisfaction both to the French people and the French clergy. In the reign of Louis XIV., a contest arose between that monarch and Pope Innocent XI. regarding the ecclesiastical rights of the crown, which led to the drawing up of the well-known declaration of the French clergy in 1682, which has since been regarded as the charter of Gallicanism. It was drawn up by Bossuet by order of Louis XIV., and contained the four following articles:—(1) Kings and princes are in temporal matters subject to no spiritual power, and the latter can never absolve subjects from their oath of obedience; (2) the pope is subject to the decisions of an œcumenical council; (3) the power of the pope is further limited as far as France is concerned, by the established prescriptions and usages of the Gallican church; and (4) in matters of faith, also, the decision of the pope is not infallible when not sanctioned by the consent of the whole Church. These articles remained valid, and formed the palladium of the Gallican party in the Church till the revolution of 1789, when the Church was formally abolished. Napoleon restored it, again established the Church by a concordat, which he concluded with Pope Pius VII. in 1801. The following year he added certain articles to the concordat, to the effect that the proclamation of papal decrees depends upon the discretion of the government, that there shall always be an opportunity for an appeal to the council of state against the abuses of ecclesiastical power, and that the priests in the seminaries shall be always bound by the formal proposition of the Gallican clergy. The protest against the validity of these articles, published and convicted at Paris in 1811, refused to declare the Church of France independent of the pope. The restoration of the Bourbon dynasty established the Gallican church in a state of greater dependence upon Rome than it had been before; and in 1817 Louis XVIII. concluded a new concordat with Pius VII. by which that of 1801 was abolished and that of 1516 restored. This concordat, however, was very unpopular, and it never received legal sanction. In consequence of the attempts of the Jesuits to subvert the Gallican church, the people became greatly excited, and in order to appease them the government, in 1828, demanded of the superiors of the ecclesiastical seminaries, and in 1826 of the bishops, that they should bind themselves to the declarations of 1682. The July revolution of 1830 had but little influence upon the inner development of the Gallican church, but by the constitutional charter of August, that full liberty and protection were accorded to every other sect. Louis Philippe, however, made as great concessions to the Roman party as the nature of his own authority would allow, and the bishops whom he appointed were mostly opposed to Gallican tendencies. The establishment of the republic in 1848 gave to the Church a liberty in ecclesiastical matters which she had not enjoyed for a long time. For the first time within more than 100 years the bishops held provincial and diocesan councils. Since that time, the tendency has always been to bring the Church into closer connection with Rome, and the old Gallican party has become almost extinct. As an instance of the spirit that prevails, the Roman liturgy has been introduced into one diocese after another, until it has entirely superseded the old national liturgies. Under Napoleon III., the bishops claim the right to meet without previous authority in provincial councils, and the government, without deciding the legal question, has permitted them to do so, in order to avoid a conflict. Indeed, recent events in that country show that there is nothing the State is more anxious to avoid than a conflict with the Church. The Gallican church has produced some men of distinguished eminence and

…ology; among whom may be mentioned Bossuet, Fénélon, and Pascal.—*Ref.* J. de Maistre, *De l'Église gallicane*; Dupin, *Les Libertés de l'Église gallicane*, and Frayssinous, *Les vrais Principes de l'Église gallicane*.

GALLICISM, *gill'-le-sizm* (Lat., from *Gallus*, France), in Lit., is applied to any phrase or mode of speech used in our language, but which is modelled after the French.

GALLINACEOUS BIRDS, *gill-lin ai-she-us* (Lat. *gallus*, a cock), the name applied to such birds as, in common with the domestic cock, have the upper mandible vaulted, the nostrils pierced in a large membranous space at the base of the beak, and covered by a cartilaginous scale, wings short, flight laborious and carriage heavy. Birds of this order have a muscular and powerful gizzard, and generally a large, globular crop; nest artless, and placed on the ground; eggs numerous; food pointed out to their young by the parent.

GALLIOT, *gal'-le-ot* (Ir. *gailiste*), a kind of vessel used on the Mediterranean Sea which is smaller than a galley, but larger than a tartan. The term is also applied to a strongly built flat-bottomed boat used as a bomb-ship. The Dutch have a light, strong, but heavily-rigged and commodious ship, rounded both fore and aft, and of about 200 tons burthen, which they call by this name.

GALLON, *gil'-lon* (Sp. *galon*), a measure of capacity both for dry and liquid articles, which contains four quarts. It is enforced by act 4 and 5 Geo. IV. c. 74, that "the imperial gallon shall be the standard measure of capacity, and shall contain the weight of ten pounds avoirdupois weight of distilled water (weighed in air at the temperature of 62° of Fahrenheit's thermometer, the barometer being at 30 inches); and that the inches, and all other measures of capacity, shall be taken as well for wine, beer, ale, spirits, and all other liquids, as for dry goods not measured by heaped measure, shall be derived, computed, and ascertained from such gallon, and all measures shall be taken to be multiples, or certain parts or proportions of the said standard gallon." The old Winchester gallon, or wine measure, contained 231 cubic inches, and the Winchester gallon, ale measure, contained 282 cubic inches. As the imperial gallon contains 277·274 cubic inches, it follows that it exceeds the former wine gallon by about one-third, while it is about one-sixth less than the old ale gallon.—*Ref.* Mozley and Whiting's *Law Dictionary*.

GALLS, *gawls* (Sax. *geal* = a gall), excrescences produced on the branches and leaves of trees by the attacks of insects. Oak-trees are especially liable to be thus attacked. Galls are extensively employed in tanning, for making ink, and for other purposes in the arts. The different kinds are described under the head of QUERCUS.

GALL-STONES. (*See* CALCULUS.)

GALVANIC BATTERY. (*See* BATTERY.)

GALVANISM. (*See* ELECTRICITY, VOLTAIC.)

GALVANIZED IRON, *gal'-van-nized* (from galvanism, a science which was named after its discoverer Galvani), is prepared by immersing the clean metal in a bath of molten zinc covered with sal ammoniac. The best quality is first coated with a small quantity of tin by voltaic action, before being dipped into the zinc; hence the somewhat absurd name by which it is commercially known.

GALVANOMETER, *gal'-van-om'-e-ter* (from *galvanism* and Gr. *metron*, a measure), an apparatus or instrument constructed for the purpose of detecting the presence of feeble electro-chemical currents. Instruments of this sort were first introduced by Schweigger, a German philosopher. The principle upon which his galvanometer or multiplier was made dependent upon the action which a voltaic current exercises upon a magnetized needle. A conductor traversed by a current placed above a needle, but very near it, and parallel to its axis, makes the needle turn to the east or west according as it is moving in a direction from north to south or from south to north. If the current is below, it causes the needle to turn to the east when it is moving from south to north, and to the west when moving from north to south, it follows therefore that when the conductor through which the current is transmitted passes first above and then below the needle, so as to form two parallel branches between which the needle is suspended, the action of the current upon the needle will be similar in both cases. The force thus produced is twice as much as that produced by a single conductor; if, however, the conductor be bent twice, the effect is four times as great; in short, by causing the conductor, usually made of wire, to make a very great number of convolutions, the action of the current upon the magnetized needle can be multiplied to such an extent that very feeble currents can readily be detected. In constructing an instrument of this kind, the copper wire used is covered with silk, so that the different convolutions may be juxtaposed and wrapped round without there being any direct metallic communication between them. The galvanometer has been greatly improved by Cumming, Nobili, and Melloni, and it has been brought to a remarkable degree of delicacy. Other instruments used for the same purpose are the *torsion galvanometer*, in which the magnetic needle is brought back by torsion to its normal position, and the angular distance passed over measured; but it was found that the intensities of the currents are not proportional to the angles of torsion. Weber's *electrodynamic balance* measures the strength of electric currents by means of a sensitive balance, which can weigh at about a hundredth of a grain. Gaugain's, sometimes called Rheometer, is founded on the Archimedean principle. I. Flow *metron*, a measure.

GAMBIER (*gam'-bier* or *gam'-beer*) (after Gambier), a catechu, prepared from the leaves of the *Uncaria gambir*, a plant of the ord. *Cinchonaceæ*, native of Malacca and the Indian Archipelago. It is sometimes called *pale terra japonica*, and is also known as *cutch* or *gambeer catechu*. It is one of the most powerful of astringents, and is largely employed in tanning and dyeing, also in medicine.

GAMBIT (*gam'-bit*), a word derived from an old Italian phrase, used to denote the tripping up of an adversary's heels, but applied in the game of chess to the first move by which the player puts forth a pawn or minor piece, forcing his antagonist to take it, and thus allowing the first player, to bring forward his attacking force more than by could otherwise have done. There are several gambits, but the one which is most in use is what is termed the "king's gambit," and by an experienced player of the game it is rare that the most brilliant and successful openings are those performed by means of a gambit. It is a game full of risk, but, to a dashing player, they afford time and opportunity for some of the best combinations on the board. (*See* CHESS.)

GAMBLING, or GAMING, *gam'-bling, gam'-ming* (Sax. *gamen*, to play at any sport), is a vice which has been in many nations, civilized and uncivilized. It is said that the ancient Germans were so addicted to it that when stripped of everything else, they would stake at last their liberty, and their very lives, the latter going into voluntary slavery, and though much younger and stronger than his antagonist, suffering himself to be bound and sold. In Rome, particularly during the empire, the practice was common, and various enactments were made against it. In England, also, gaming was early made the subject of penal enactments. By 33 Henry VIII. c. 9, "no person shall have in his gain, lucre, or living, keep any common house, place, or place of bowling, coyting, cloyth, ivie ball bowls, tennis, dicing-table, carding, or any unlawful game then or thereafter to be used, on pain of forfeiting 40s. a day," and every person haunting or using the said houses was declared to forfeit 6s. 8d. By 9 Anne, c. 14, all bonds and other securities given for money won at play were declared to be void, and any person losing £10 at one time or sitting might, within three months, recover the same, with costs, at any court of record, and after three months any other person might sue for and recover the same, and treble the value thereof, with costs. Various statutes were subsequently enacted on the subject; and in 1845, Act 8 & 9 Vict. c. 109, was passed, which greatly facilitated proceedings against common gaming-houses. It enacted that, in default of other evidence, it shall be sufficient to prove that a house or place is kept or used for playing therein at any unlawful game; and that it is not necessary, in order to constitute the house a

common gaming-house, to prove that any person found playing at any game was playing for any money, wager, or stake. Commissioners of police, or justices of the peace, may also authorise superintendents, without the necessity of an allegation by two householders, to enter any suspected room or house with constables, and, if necessary, to use force for that purpose, and to take into custody all persons found therein; and if any cards, dice, balls, counters, tables, or other instruments of gaming, be found in the room or house, or about the person of any of those found therein, it shall be evidence, until the contrary be made to appear, that it was a common gaming-house. This statute also enacts, that cheating at play is to be deemed obtaining money by false pretences, and is to be punished accordingly. It further provides, that all contracts or agreements, whether by parole or in writing, by way of gaming or wagering, shall be null and void; and that no suit shall be brought or maintained in any court of law or equity, for recovering any sum of money or valuable thing alleged to be won upon a wager. By 16 & 17 Vict. c. 119, "betting-houses" are declared to be within this act, and a penalty imposed on persons so betting. The act 18 & 19 Vict. c. 38, enacted penalties and imprisonment against any person attempting to interfere with the constables in the performance of their duty, or obstructing their entrance into any house regarding which there was evidence of its being a common gaming-house. Notwithstanding all these legislative enactments, there still exist within this metropolis not a few of those gaming-houses, and which go by the appropriate name of "hells." In most of the states of Germany gaming is allowed, and the sovereigns of several of them derive a large revenue from letting the exclusive privilege of keeping such establishments, as at some of the more fashionable watering-places. In France, prior to 1838, when the practice was abolished, the exclusive right of keeping public gaming-houses was let out to a company, who paid the government six millions of francs annually for the privilege. Much valuable information on this subject was obtained by the select committees of the House of Commons on gaming, in 1844. (For further information see also the *English Cyclopædia*, section Arts and Science.)

GAMBOGE. (*See* CAMBOGE, GARCINIA.)

GAME LAWS are a remnant of the ancient forest laws, by which all game was regarded as the property of the king, and no person had any right to kill such animals unless authorized by royal grant of a chase or free warren. Afterwards, a right to kill game was conceded to such as possessed a sufficient qualification: as, (1) the having a freehold estate of £100 per annum; (2) a leasehold for ninety-nine years of £150 per annum; (3) being the son and heir-apparent of an esquire or person of superior degree; (4) being the owner or keeper of a forest, park, chase, or warren. For unqualified persons transgressing these laws by killing game, keeping engines for that purpose, or even having game in their custody, various penalties were assigned. At length, after much discussion in and out of parliament, 1 & 2 Will. IV. c. 32, was passed, by which the necessity of any qualification for the killing of game was abolished, and the right was made to depend simply on the taking out of a game certificate, for which a certain annual sum was payable. In terms of this act, every certified person may kill game, subject to the law of trespass. Game is declared to include hares, pheasants, partridges, grouse, heath-game, moor-game, black-game, and bustards; but woodcocks, snipes, quails, landrails, and conies, though not game, are also protected, certificates being required to kill them, unless by the proprietors of warrens, or of any inclosed ground, or by the tenant of any land, either by himself or any person under his command. Uncertified persons who kill or take any game, or use any dog, gun, &c., for the purpose of searching for, or killing, or taking game, are liable, on conviction before two justices, to a penalty not exceeding £5 for each offence, with additional penalties under any statute or statutes relating to game certificates. Persons trespassing in the daytime upon any land in search or pursuit of game, woodcocks, &c., shall, on conviction thereof before a justice of the peace, be liable to a penalty not exceeding £2, together with the costs of



conviction. When any person shall be found trespassing upon land in the daytime in search or pursuit of game, it shall be lawful for any person having the right to kill game, or the occupier of such land, or any person authorised by them, or either of them, to require such person forthwith to quit the land, and also to give his name, surname, and place of abode; or, if he refuse to do so, or remain upon the land, he may be apprehended and brought before a justice of the peace, and shall be liable, upon conviction, to pay a sum of money not exceeding £5, with expenses; but the person so apprehended cannot, on any pretence whatever, be detained longer than twelve hours until he be brought before some justice of the peace. If any unauthorised person be found, either by day or night, upon any land in search or pursuit of game, and shall then have in his possession any game which appears to have been recently killed, any person having the right to kill game upon such land, or the occupier of such land, or any person or persons authorised by them, may demand such game, and seize it if not immediately given up. The destruction or taking away of the eggs of any bird of game, swan, wild duck, teal, or widgeon, renders the person liable to a penalty not exceeding 5s. for each egg so destroyed or taken away. The law is still more severe against any persons taking or destroying game by night. By 9 Geo. IV. c. 69, it is declared, that if any person, by night, shall take or kill game or rabbits on any land, or shall enter thereon with gun, net, engine, or other instrument for the purpose, he shall, upon conviction before two justices, be committed to hard labour in the house of correction for a term not exceeding three months; and at the expiration of that period find securities for twelve months, himself in £10, and one or two others in a like sum; in default of which, a further term of imprisonment of six months. Offenders under this act may be apprehended on the spot by owners or occupiers of lands, their servants or assistants; and if they assault or offer violence with gun, club, stick, or otherwise, they are liable to be transported for seven years (now penal servitude), or to be imprisoned, with hard labour, for two years. The punishment is still more severe where three or more persons enter any land for the purpose of taking or destroying any game. By 5 & 6 Vict. c. 29, the provisions of this act were extended to persons taking or killing game upon the public roads, or highways, and other roads and paths leading to inclosed gates, &c. It is unlawful for any person whatsoever (licensed or unlicensed) to kill or take any game, or to use any dog, gun, net, or other engine or instrument for killing or taking any game, on a Sunday or Christmas-day, under a penalty of £5. It is also unlawful for any person to kill or take any partridge between the 1st February and 1st September in any year, or any pheasant between the 1st February and 1st October in any year; or any black-game between 10th December and 20th August in the succeeding year (except in Somerset, Devon, or New Forest, Southamptonshire, to 1st September); or any grouse, commonly called red-game, between 10th December and 12th August; or any bustard between 1st March and 1st September, under a penalty of £1 for each head of game so taken or killed. To put any poison or poisonous ingredient, on any ground, whether open or inclosed, or in any highway, with intent to destroy or injure any game, shall be liable to a penalty of £5. By Act 25 & 26 Vict. c. 114 (1862), authorises any constable or peace officer of any county, borough, &c., in Great Britain or Ireland, to search in any highway, street, or public place, any person whom he may have good cause to suspect of having been unlawfully in search or pursuit of game, and if any game be found in his possession, or any gun, part of gun, or net or engines used for the killing or taking of game, such officer is authorized to seize and detain the same, and to cite such person to appear before the justices, as in previous acts; also, in like manner, to stop and search any cart or other conveyance which he has cause to suspect as aforesaid, and to proceed in like manner. Until the passing of 1 & 2 Vict. c. 32, no person was allowed to sell game; but by this act provision was made for granting annual licenses by justices at special sessions to be held in July or early in August, to persons to deal in game, for which a sum of £3

is payable annually to government. An annual game-license costs £3, but one for about half a year may be had for about £2. A gamekeeper's license costs £2. By 11 & 12 Vict. c. 29, an owner or occupier may, however, kill hares or rabbits on his own inclosed ground, or authorize another to do so, without any game-license. Such are the principal legal enactments in force on this subject at present. The game laws have long been a subject of discontent, and few unprejudiced persons can view them without coming to the conclusion that they are unreasonably oppressive and severe. They are a remnant of the ancient feudal system, and Blackstone says, in speaking of the ancient forest laws, "from this root has sprung a bastard slip, known by the name of the game law, now arrived to, and wantoning in, its highest vigour, both founded upon the same unreasonable notion of permanent property in wild creatures, and both productive of the same tyranny to the commons; but with this difference, that the forest laws established only one mighty hunter throughout the land, the game laws have raised a little Nimrod in every manor." The game laws are indeed an attempt to preserve, in the midst of cultivation and civilisation, the pursuits and amusements of an earlier and a ruder age. They are among the greatest hindrances to the improvement of agriculture, not only in many cases interfering with the operations of the cultivator, but, where plentiful, also causing a serious loss in the actual products. It is said that from three to five hares eat and destroy as much as would keep one sheep. The game is fattened at the tenant's expense, and the landlord derives all the advantage from them. Many landlords take means to preserve game which none but tenants in a wretched state of dependence would submit to. Further, it has been said that "there is perhaps no single cause more injurious to the morals of the rural populations than the game laws." They constitute that an offence which neither conscience nor common sense can regard to be one. For the peasant does not naturally see any more right of property in a partridge than in a sparrow, nor can he understand that right of property which only continues so long as the animal remains upon a person's land. It is an unfortunate peculiarity of these laws, as protecting not property but a privilege, that they cannot be enforced without arming man against man, and producing conflict and bloodshed. The evidence of the crime is the capture of the committer of it in the act; and hence has arisen an armed game police, acting not under a public responsible authority, but commanded in each instance by their private employers and owners of the soil. Offences, too, against the game laws are decided upon and punished by a class whose prejudices, if not their interests, favour a stringent application of the provisions of the code. The offender, too, is brought to associate in prison with thieves and housebreakers; and even though he may not have been directly contaminated by them, he cannot be expected to have the same horror for the baser crimes as he had before. It has indeed been said that the sports of the field are favourable to health, strength, and high spirit. This may have been true of the old system, but it can scarcely, we should think, be said of the modern system of battue shooting,—the woods and plantations being beaten by men and boys, the game driven within gunshot, and attendants loading the sportsmen's guns, so that many hundred heads of game are slaughtered in a few hours.—*Ref. English Cyclopædia*—Arts and Sciences; *Encyclopædia Britannica*; Paterson's *Game Laws of the United Kingdom*.

GAMES, *gaimz* (Sax. *gamen*, diversion, sport, pastime), a term applied to certain bodily exercises and mental recreations practised as a relaxation from business or study, or employed as a mode of passing the time. They are divided naturally into two classes, mental and physical, but more definitely they are distinguished as games of chance, games of skill, and mixed games. In the first class the result does not depend upon the attention and dexterity of the player, but is merely determined by chance; it includes games played with dice alone, such as hazard, and many of the games played with cards, such as quinze, vingt-et-un, commerce, loo, &c. The second class [illegible] which, when once begun,



are independent of chance, and are gained by the superior skill and experience of one party. In many games of this kind, however, where the skill of the parties is equal, he who plays first is most frequently the winner. There are very few mental games of this class; but chess and draughts hold the highest places. It includes several interesting and popular physical games; among others, cricket, curling, bowling, golf, tennis, billiards, &c. In the third class the games are generally decided by chance where the players are equal, but otherwise depend much for their event on the skill and caution of the players; the most important of these are whist, cribbage, piquet, casino, all-fours, and backgammon. Some games are very ancient, and dice were very early used by the ancient Greeks and Romans. Among the latter a game was played closely resembling the modern hazard. They had two kinds of dice,—the *tesseræ* and the *tali*; the former were exactly similar to modern dice, marked with Roman numerals on the six sides; the latter were oblong pieces of bone marked on four sides only. The game of chess is also very ancient, and is supposed to have had its origin in the East. (*See* CHESS.) The several games at cards are modern in their origin; they are said by some to have been invented about the close of the 14th cent for the amusement of the French monarch Cha VI., while others place the date of the invention n ch earlier. Most of the terms applied to games of cards are evidently of French origin. Within late years a great change has taken place in this country with regard to games at cards; a hundred years ago the principal games were ombre and basset, and the stakes played for very high. The game of quadrille, also a great favourite, is now quite out of fashion; and whist, which appears to be a genuine English game, is the greatest favourite. Hoyle's treatise on the Game of Whist was, in the time of Dibdin, sold at the rate of a guinea a copy: since that time it has been frequently enlarged and improved, directions and instructions being given for several other games of skill; such as billiards, backgammon, draughts, &c. The most important of the games mentioned above will be found described under their various headings.—*Ref.* Bohn's *Book of Games*.

GAMES, PUBLIC, OF ANTIQUITY, were contests and spectacles of varied kinds celebrated by the ancients, which, in the earlier ages, were connected with religious ceremonials. The public games of the Greeks were very numerous, and the origin of many of them is lost, on account of the religious mystery in which they were founded. Among the Grecian games, the most celebrated were the Olympic, the Pythian, the Nemean, and the Isthmian. The conquerors in the Olympic games were held in high respect, and were looked upon as the noblest and happiest of men. These games were held every five years at Olympia, in Elis, on the west side of the Peloponnesus. Among the exercises, some were designed to give strength, and others agility. The lighter exercises comprised running, leaping, throwing the quoit, and hurling the javelin. The more severe course of discipline included wrestling and boxing. Racing also constituted a particular feature in all the ancient games. The Isthmian games were held at Corinth, and, together with athletic exercises, horse and chariot races, constituted a large portion of the spectacle. Originally these games were connected with the worship of Neptune, the wide diffusion of which gained for them the great celebrity which they long enjoyed. The Persian war gave an impulse to the Isthmian games, while the Peloponnesian war dimmed their glory. Under the Romans, these games did not lose their importance, but were exhibited with increased celebrity. They were then held every three years, and comprised three leading divisions,—musical, gymnastic, and equestrian contests. The prize at the Olympic games was merely a chaplet of wild olive. These chaplets, together with branches of palm, which were carried in the hands of the victors, were placed on a tripod in the middle of the course, so as to be seen by all the spectators. At the Isthmian games, the prize was parsley during the mythic periods; in later times, however, the victor was generally crowned with a wreath of pine-leaves, although parsley was also often employed. The amusements in the Roman circus did not differ ma-

terially from those which were celebrated in the games of ancient Greece. The *theiomachiæ*, or beast-fight, was a favourite species of entertainment among them; and the men employed in this barbarous amusement, in which men fought with wild beasts, were called *bestiarii*. The combatants were divided into two classes,—those who fought voluntarily for amusement or pay, and who were provided with weapons,—and condemned persons, who were generally exposed to the fury of the animals naked, without arms, and sometimes bound. The Romans were passionately fond of these beast-fights, and very large numbers of animals were engaged in them. Under Pompey, no less than 600 lions were thus destroyed, and under Titus 5,000 wild and 4,000 tame animals perished in a similar manner. There is no doubt that, although these latter exhibitions produced a debasing effect upon the minds of the beholders, the athletic games of the ancients not only improved the physical development of the people, but tended directly to advance their intellectual and moral culture. The early and long training by which they were preceded, and the exercises through which the child, the youth, and the man were conducted by successive stages, ultimated at length in that union of beauty and strength in which physical perfection consists, and in which the ancient Greeks surpassed every other known nation.

GAMING. (*See* GAMBLING.)

GAMUT, *q. v.*, a term applied to the table or scale invented by Guido d'Arezzo, from his having adopted the *gamma*, or third letter of the Greek alphabet, as a sign for its lowest note, which was one note below the *proslambanomenos*, or lowest tone of the ancient. It consisted of twenty notes, viz., two octaves and a major sixth. In modern music, the term *gamut* signifies the diatonic scale, and is occasionally applied to the note G below the bass clef.

GANGLION, *gang'-li-on* (Gr.), in Anat., is a small rounded or elongated nervous mass, of a reddish grey colour, situated in the course of the nerves. They are of two kinds, one forming part of the cranial or spinal nerves, and situated near the origin of each of the cranial and all of the vertebral nerves; the other forming part of the sympathetic system, and forming a series along each side of the vertebral column and occurring numerously in other parts. They differ widely from each other in figure and size, some of them being large and conspicuous, while others may be almost termed microscopic. They are composed of two substances, one white, like the medullary matter of the brain, the other reddish grey, somewhat resembling the cerebral cortical substance. The internal medullary filaments are the continuation of the nerve upon which the ganglion is situated; they are invested externally by a thin but firm and closely adherent envelope, continuous with the sheath of the nerves and composed of dense areolar tissue. This envelope sending sends processes inwards through the interior mass, dividing it, as it were, into lobules, and supporting the numerous fine vessels which pervade it. A section through a ganglion in the direction of the nervous cords connected with it discloses to the naked eye merely a collection of reddish grey matter, traversed by the white fibres of the nerves.

GANGLION, in Surg., is a small indolent fluctuating tumour, developed in the course of the tendons, and containing a semi-fluid secretion inclosed in a cyst, generally communicating with the tendonous sheath. They sometimes form without any apparent cause, but generally they arise from some wrench or tension of the tendon. They are most frequently situated about the wrist, and the swelling is usually globular; but when much enlarged, it is rendered irregular by the pressure of the tendons. The treatment consists in rupturing the cyst, and allowing the contained fluid to be extravasated into the cellular tissue, where it is speedily absorbed, whilst the cyst inflames and becomes obliterated. A common mode of rupturing them is either by firm compression with the thumb, or by striking the swelling sharply with some obtuse body, as the back of a book, the part being subsequently bandaged, and rest enjoined for a few days.

GANGRENE, *gang'-green* (Gr., from *grao*, I feed upon), in Med., is a term applied to the first stage of mortification, so called from its eating away the flesh. It is divided into two kinds, the acute and the chronic. The former, called also inflammatory or senile gangrene, is that which is preceded by inflammation; while the latter, called also chronic or idiopathic gangrene, is that which takes place without any visible inflammatory action having preceded it. The most frequent causes of gangrene are violent inflammation, scirrhus, contusions, burns, cold, deficient circulation of the blood or nervous energy. When it results from high and active inflammation, there is at first severe pain in the part attacked, and generally a considerable degree of swelling. After a time, however, the pain, from being painful, loses all sensibility and becomes cold, the redness disappearing, and being replaced by an irregular dark colour of the skin, in some parts approaching to black, while in others it is of a dark brown or greenish hue. If there is a running sore, the discharge from it will cease; the cuticle is raised by vesications, from which, on breaking, there issues a bloody serum. The constitution sympathizes with these local changes; the inflammatory fever of the earliest period disappears, and is succeeded by great languor and debility, the pulse is weak, quick, irregular, and sometimes intermittent; the stomach is deranged, delirium frequently occurs, and hiccough is one of the most characteristic signs of the disease in its more advanced stage. The countenance also indicates the existence of great local and constitutional derangement, the features are collapsed and the eyes sunk. When the gangrene is not the result of high and active inflammation, the inflammatory or febrile symptoms are slight or altogether wanting; but there is the same discoloration of the skin, vesication, discharge of bloody serum, and morbific appearance. In the treatment of this disease, during the active inflammatory stage, local bleeding with leeches, and also bleeding from the arm, if the strength of the patient warrant it; but care has to be taken to reduce the general tone of the system as little as possible. Soothing fomentations and warm poultices should be applied to the part; and, as internal remedies, bark, wine, and opium will be found most beneficial. When the gangrene cannot be stopped in its first stages, then the separation of the mortified parts is to be expedited, which is best done by yeast or port-wine poultices, supporting the constitution at the same time. When this cannot be done, the removal of the limb, if practicable and not contraindicated by a too-weakened state of the body, is the only chance of saving the patient's life. Gangrene resulting from severe cold is remarkable for the little pain generally preceding, the part having frequently perished without the patient being aware of the circumstance. A part suffering from a severe degree of cold should first be rubbed with snow or a coarse towel in order to restore the suspended circulation, avoiding at first any artificial heat, which might be the means of inducing inflammation. Gangrene may also arise from a diseased state of the blood-vessels, attended with debility of the constitution, a form of the disease commonly known as *gangrene senile*. It rarely occurs except in advanced life, and usually attacks the lower extremities, proceeding from the toes upwards. Its progress is sometimes slow and sometimes rapid; in some cases it is attended with little or no pain, in others it is very painful. As the parts mortify, they become dry and hard. The constitution should be strengthened by the free use of bark, opium, and port wine, and the part should be covered with lint moistened with camphorated spirits of wine, and the limb wrapped in cotton. Hospital gangrene, or *gangrena gangrenosa*, is a form of this disease which attacks open wounds or ulcers, and is so called from its appearing most frequently in crowded hospitals, and causing a fearful mortality among the patients. Its symptoms and treatment are similar to those already mentioned.

GANGWAY, *gang'-way* (Ang.-Sax.), a term used in Mar. to denote a passage or thoroughfare of any kind. In deep-waisted ships, it designates a narrow platform built horizontally along the upper part of a ship's side from the quarter-deck to the forecastle, for the convenience of walking fore and aft, instead of descending into the waist. It is formed on the [illegible] stanchions, having [illegible]

other. This opening left in the upper part of a ship's hold for the purpose of entering in or depositing [illegible] and stores called a gangway. The term is likewise applied to a narrow passage left in the hold when a ship is laden, to enable the seamen to enter either to examine the cargo or provisions, to discover and stop leaks, or to bring out anything that may be required.

GANNET, or SOLAN GOOSE, *gân'-net* (Sax *ganet*) — In the north of Scotland, the Hebrides, and in Norway, this bird is very abundant It is almost the size of the tame goose The bill is about six inches long, [illegible] at the sides, and straight nearly to the point, where it inclines downwards A loose skin, bare, and capable of considerable distension, hung from the back of the lower bill, and extended over the throat, serves as a pouch in which to convey food to its young The neck of the gannet is long, body flat, and very full of feathers. The crown of the head and a small space on the hind part of the neck are buff colour, and with the exception of the quill and the bastard wing, feathers, the commander of the plumage is white The bill and legs are black, but the forepart of each is [illegible] with a bright green stripe The male and female are nearly alike The young are at first covered with very beautiful snow-white down at the age of [illegible] months, the feathers make their appearance at the end of three months they are nearly [illegible] The food of the gannet consists [illegible] fish, the herring and pilchard being the [illegible] It procures its prey by darting down on it from a [illegible] height. It makes its nests, which are composed chiefly of turf and sea-weed, in the [illegible] the purpose of rocks or on their ledges as well as on the surface of the ground In form [illegible] are rather [illegible] somewhat smaller than those of the [illegible] They differ, however, in that the three eggs or [illegible] of the gannet of the first and second [illegible] are [illegible] to its own devices the individual [illegible] These birds are found in great abundance [illegible] of Kilda, a little [illegible] the coast of Scotland in the Atlantic Ocean In the island of Ailsa [illegible] is computed at from twenty-fifty thousand [illegible] The egg crop is almost [illegible] The [illegible] resort for these sea fowl, according to the [illegible] Stanley, is a tremendous [illegible] [illegible] hundred feet high, formed by the [illegible] coast of Caithness, the most elevated [illegible] of Britain. The great dependence [illegible] for ropes of two sorts,—one made [illegible] the other of the hair of cows tails [illegible] darkness. These ropes vary in length from [illegible] hundred feet, and are three inches [illegible] value. So valuable are these ropes that a Scotch [illegible] having a dame who used [illegible] a small-hair rope, considers that he has made [illegible] a splendid match. The scientific name of this bird is *Sula Bassana*.

GAOL, or JAIL, *gâl* (Fr *geôle*, Sp *jaula*, a cage) (*Law Dictionary.*)

GAOL DELIVERY is a commission directed to the justices of assize, &c of each circuit empowering them to try and deliver every prisoner who may be in gaol when they arrive at the circuit town when [illegible] of before whomsoever indicted or for whatever crime committed. In this respect their authority differs from that of justices of oyer and terminer, who can proceed only upon indictment found before themselves [illegible] *gar'-bel* (Fr *garber*, to make clean), in Law [illegible] to separate or sever the good from the bad, [illegible] from the insufficient Hence in London [illegible] of spices was anciently one empowered to [illegible] any shop, warehouse, &c to view and search [illegible] spices, and make clean the same, or see [illegible] done.

GARCINIA, *gar-sin'-e-a* (in honour of Dr Garcin, an [illegible]), in Bot, a gen. of the nat. ord [illegible] The species *G mangostana*, a native of [illegible] the mangosteen, which is reputed [illegible] delicious of all fruits. This plant has [illegible] to bear fruit in stoves by Brit[illegible] [illegible] Jamaica, Trinidad, and [illegible] [illegible] climbing character, but much [illegible]



to applications to chapped hands, and has been recently imported into this country. One or more species of this genus are supposed to yield our commercial and officinal gamboge, which is brought from Siam in cylinders, either solid or hollow, and in large cakes or amorphous masses. The pipe, or roll gamboge, is the finest kind. In medicine, gamboge is used as an active hydragogue and drastic purgative. In over-doses it acts as an acrid poison. In the arts it is much employed as a water-colour, and to give a golden tint to lacquer-varnish for brass-work

GARDI NATIONALE (*See* NATIONAL GUARD)

GARDENIA, *gar de'-ne-a*, in Bot., a gen. of the nat ord *Cinchonaceæ* From the fruits of *G grandiflora*, *florida*, and *radicans*, beautiful yellow dyes are prepared, which are extensively used in China and Japan The genus was named after Dr Garden, of Charleston, South Carolina, who corresponded with Linnæus

GARDENING *gar'dn-ing* (Fr *jardin*, a garden), the act of laying out and cultivating pieces of ground, generally limited extent, and inclosed for the purpose of rearing vegetables, fruits, and flowers. As an art of design and taste gardening is of very ancient date, and with the exception of certain modern improvements such as glass-houses, &c, was in a high state [illegible] two thousand years ago The earliest [illegible] with which [illegible] is any account are those of [illegible] which are [illegible] ished as having been of quadrangular form surrounded by high walls They contained [illegible] and streams of water. The [illegible] Cyrus and the Persian monarchs were of [illegible] usually laid out in romantic situations, [illegible] and distinguished for the great variety of [illegible] products In first allusion [illegible] [illegible] to be found in the description [illegible] hanging gardens of Babylon Although the Hebrew historians do not mention it in [illegible] descriptions, there is little doubt that these [illegible] were [illegible] with vases, parapets, &c [illegible] [illegible] modern architectural gardens [illegible] connection with those of Babylon [illegible] described as being furnished [illegible] fountains, seats, parterres, [illegible] and [illegible] combining the minute [illegible] and foliage with masses of light [illegible] and [illegible] by Strabo, must be regarded as [illegible] and in the picturesque style: it [illegible] in unfrequented [illegible] In ancient Greece [illegible] is rather a neglected art, at first, but in [illegible] great advance was made The vale of [illegible], the Academus at Athens, and other public [illegible] were extremely elegant and were ornamented with temples, altars, tombs, statues, monuments, and [illegible] On account of the nature of the climate, the chief qualities required in a garden were shade, coolness, [illegible], fragrance, and repose The Greeks [illegible] their gardening from the Persians, and the Romans, in their turn, copied that of the Greeks. Little is known of the early style of Roman gardening; [illegible] consisted of projecting into the sea, and the immense artificial elevations, are apparently rescinded by Cicero and Varro About this time, however, the cultivation of odoriferous trees and plants began to be attended to and the planting of trees adjoining each other whose colours assimilated, was then as much a study with the gardener as the harmonious blending of colours at the present day The early French and Dutch styles of gardening were evidently adopted from the description of Pliny's garden. On this subject London remarks —"The terraces adjoining the house, the lawn declining from thence, the little flower-garden with the fountain in the centre, the walks bordered with box, and the trees sheared into whimsical artificial forms, together with the fountains, alcoves, and summer-houses, form a resemblance too striking to bear dispute" The use of glass in the construction of conservatories was early known to the Greeks and Romans; and the "Gardens of Adonis," mentioned by some of their most eminent authors, were probably of this kind. It is said that in these were to be seen [illegible] [illegible] and [illegible] [illegible] and [illegible] [illegible] [illegible]

grown there all the year round. The use of hot water in forcing vegetables was also employed at the same time. Gardening, like all the other arts, languished during the dark ages; but with the revival of learning, the invention of printing, and the Reformation, it began again to flourish. The art was revived and patronised by the family of the Medici in Italy; and their gardens, which were of the geometric and architectural style, long served as models for most of Europe. It continued to be imitated in France, Germany, and Britain, until the introduction of the English or natural style. In garden architecture very little progress, as far as hothouses are concerned, has been made in the south of Europe, the warmth of the climate rendering them all but useless. They are, however, plant houses in many places in Spain and Portugal. The French and Dutch styles of gardening resemble each other closely; symmetry and false ornament are the characteristics of both. The Dutch style is eminently adapted to the nature of the country, where there are no inequalities of surface as in England. The French style seems to have arisen about the middle of the 17th century, during the reign of Louis XIV. The most celebrated and extensive period was Le Notre, who laid out the famous gardens of Versailles. Le Notre's style was followed in other countries and was extensively employed in this country. The first specimen of Italian style occurred toward the end of the reign of Louis XIV. by M. Pagon in the Jardin des Plantes, at first magnificent attempt at hothouse building was that of Francis I. of Austria, in 1753. It has three ranges, extending altogether to the length of 320 feet; many of them being 50 feet high. Landscape gardening, and the adoption of the English style, rapidly spread into France, Germany, and Italy about the year 1762. In the latter country there are many magnificent conservatories, all surpassed by those at Kew, Chatsworth, and the Regent's Park. In this country the first example of the English or natural style of gardening were those of Lord Cobham, and of Admiral Boscawen at Bubton near Ilminster; these were on a small scale. The best examples were those of Stowe, Painshill, Claremont, Hagley, and Woburn Farm, near Weybridge. The earliest hothouses for the cultivation of plants that have been those of the duke of Richmond at Belvoir, in 1707. In succeeding times the best constructed, or most improved, hothouses and flower gardens, are those of her Majesty at Frogmore. The Royal Botanic Gardens at Kew are unequalled in Europe, while those of Chiswick, Luton Hoo, Trentham, are models of taste and judgment. The art of cultivating flowers and fruits in pots being well found more particularly described under the article Horticulture.

Garfish, *garfish* (*Esox Belone* Linn.), a fish of the Pike tribe, common on the English, Irish, and Scotch coasts. It is about two feet in length, only tapering towards the tail and of small circumference. Head long; snout; teeth minute and numerous; tail forked. It possesses many names besides those that have been applied to it, and among the rest, "mackerel pike," because of its supposed habit of preceding the shoals of mackerel in their annual visits to shallow waters for the purpose of spawning.

Gargle (Lat. *gargarisma*, from Gr. *gargarizo*, I wash the throat), in Med., a lotion or wash for the throat. It is used by taking a mouthful of the liquid and then throwing back the head, by which it is passed into the throat, where, by expelling air from the lungs, it is agitated and made to wash all parts of the inner surface. Gargles are extremely useful in various diseases of the throat, and differ in their composition according to the purpose which they are intended to serve. In order to allay inflammation or reduce swelling, warm water with a little vinegar is the best that can be used. Where a stimulating effect is required, a mixture of infusion of Peruvian bark, port wine, and tincture of capsicum; to promote suppuration, barley-water and infusion of linseed mixed together; and, as a mere astringent, a decoction of Peruvian bark, with alum, or [illegible]

[illegible] better than [illegible] part of a wall [illegible] front in medieval [illegible] of the wall. The [illegible] the Early English and [illegible] frequently in the form of a [illegible] heraldic monster, and [illegible] duced to mask the unsightly appearance of the leaden pipe sticking out of the wall [illegible] passed through a block of stone, which [illegible] quently carved into a form [illegible] general character of the architecture [illegible]

Garlic (*See* Allium.)

Garnet *gar'net* (*Fr. grenat*), in Min., [illegible] precious stones or gems. It is found in [illegible] dodecahedra, and consists chemically of [illegible] silicate of lime and alumina, colouring [illegible] manganese. When cut *en cabochon*, [illegible] known as carbuncles (from *carbunculus*, a [illegible] The pyrope is a species of garnet found in [illegible] coloured with sesquioxide of chromium.

Garnishment, *gar'nish-ment* (Mod. [illegible] warn) is a warning or notice given to a party [illegible] money to a defendant, but to appear and [illegible] plaintiff creditor a sum. By the Common [illegible] Justices, it is declared lawful for any [illegible] who has obtained a judgment in any of the [illegible] to apply to the court, or a judge, for a [illegible] that the judgment debtor should be [illegible] him as to any and what debts are owing [illegible] before a master of the court, or such other [illegible] the court or judge shall appoint; and the [illegible] judge may make such rule or order for the [illegible] of the judgment debtor, and for the production [illegible] books or documents. And it is lawful for a [illegible] upon the *ex parte* application of such judgment [illegible] creditor upon affidavit by him, or his attorney, [illegible] judgment has been and is still unsatisfied, and [illegible] the garnishee is indebted to the judgment-[illegible] of the immediately preceding from such third person (called [illegible] of the judgment debtor, shall be attached [illegible] such third-debt, and the garnishee [illegible] to appear before the judge, or [illegible] court, at a time to show cause why he should not [illegible] judge orders or the debt due by him to [illegible] judgment debtor or so much thereof as may [illegible] the judgment debt. If the garnishee does not [illegible] such sum, and does not [illegible] the judge may order execution to issue [illegible] against his goods; or, if the garnishee [illegible] suitable bail into the judge may, instead of [illegible] attachment, grant liberty to the judgment [illegible] to sue him by writ, calling upon him [illegible] why execution should not proceed [illegible] debt. Payment made by, or execution [illegible] upon the garnishee, under any such proceedings, [illegible] harge to him for such amount [illegible] judgment debtor, although the proceedings [illegible] set aside or the judgment reversed.—Hall's *Law of Attachment*.

Garrote or Garrote, *garrot'* (Sp. *garrote*, a cudgel) is the name given to a kind of [illegible] ment employed in Spain. The criminal [illegible] scaffold, with his back to a stake, and [illegible] instantly by means of a rope passed round [illegible] tightened behind with a stick (*garrote*), [illegible] collar is commonly employed, tightened [illegible] The term has recently been adopted [illegible] and applied to a mode of robbery, [illegible] from behind grasps tightly the throat [illegible] prevent him from crying out or [illegible] while another rifles his pockets. [illegible] mode of procedure in such cases [illegible] *Cornhill Magazine for January*, 1862.

Garrison, *gar'ri-son* (Fr. [illegible] Lat. *garnisio*, maintaining), [illegible] applied to a body of [illegible] fortified place, either [illegible] country, to keep the [illegible] merely to be [illegible]

GARRYACEÆ, *gar-ry-ā'-se-e* (after N. Garry, of the Hudson's Bay Company), in Bot., the *Garrya* fam., a small nat. ord. of *Dicotyledonæ*, sub-class *Monochlamydeæ*. There are but two genera, which include six species, all shrubs found in the temperate parts of North America, or in the West Indies. Nothing is known of their properties.

GARTER, ORDER OF THE, *gar'-ter* (Fr. *jarretière*), one of the most celebrated and ancient of all military orders of knighthood in Europe, was instituted by Edward III. The origin of this decoration is ascribed to a trifling incident which occurred at a ball at which the king and the countess of Salisbury were present. The countess is said to have dropped her garter whilst dancing; the king picking it up, and, observing some of the courtiers to be smiling, restored it to the countess, with the remark, *Honi soit qui mal y pense*, "Evil be to him who evil thinks;" and he shortly afterwards is said to have instituted the order of the Garter with the above motto, as an incentive to chivalry amongst his knights. Another account states that it dates its origin from the reign of Richard Cœur de Lion, who, during his battles in the Holy Land, ordered his knights to wear a white garter above their knee, to distinguish them from their Saracen foes, and that Richard, on his return to England, instituted the order, in commemoration of that circumstance. Still, according to Ashmole, the date of the order is 1344; and, as the first of its statutes is dated 1350, this seems tolerably accurate; whence it follows that it was established in the reign of Edward III. Upon the original constitution of the order, it consisted of the sovereign and twenty-five knights companions. The only alteration which has taken place in this respect, was caused by the statute passed on the 17th January, 1805, whereby it was decreed that the order should consist, thenceforth, of the sovereign and twenty-five knights companions, together with such lineal descendants of George II. as may be elected, always excepting the prince of Wales, who is a constituent part of the original establishment. Special statutes have likewise been, from time to time, passed for the admission of foreign sovereigns and extra knights; but these are always admitted into the twenty-five companions as soon as vacancies occur. The Military Knights of Windsor are also considered as adjunct to the order of the Garter. The officers of the order are, firstly, the Prelate, which dignity was first filled by William de Edyngton, bishop of Winchester, and which is now vested in the bishop of Winchester for the time being; the office enabling him to take his seat in parliament next to the bishop of Durham. The next officer is the Chancellor, who, until the year 1837, was the bishop of Salisbury; but since the see of Oxford has included Berkshire (and consequently the town of Windsor), the chancellor is always the bishop of Oxford. The Registrar, who is dean of Windsor, is the next official; and after these we have the Garter King-at-Arms (which *see*), and the Usher of the Black Rod. All these officers are bound to attend the chapters of the order held in St. George's Chapel, Windsor, on St. George's day, where the installations of knights are held, and they are sworn to adhere to all the institutes of the order, and to promote its well-being to the best of their ability. The peculiar dress which distinguished the order of the Garter from other similar institutions, at its first establishment, was a mantle, tunic, and hood of blue cloth lined with ermine, that of the sovereign differing from the knights by the fur of the lining being of miniver instead of ermine. All these three garments were embroidered with garters of blue and gold; and the garter itself was worn under the left knee, and was composed of dark blue velvet edged with gold, with the motto "Honi soit qui mal y pense" inscribed on it with letters of gold; the buckle and pendant were likewise of the same precious metal. Henry VIII. added a collar, composed of pieces of gold worked in the fashion of garters, the centres of each being alternately white and red (alluding to the junction of the York and Lancaster families in the house of Tudor), and these links, or garters, were exactly twenty-six in number, typical of the strength of the order. He also added the greater and lesser Georges, which consist of gold medallions with the figure of St. George and the Dragon thereon in relief. Charles II. made the last alterations, substituting crimson for the surcoat and hood, and a lining of white taffeta instead of ermine. The ribbon by which the medallion of St. George is suspended over the left shoulder is of blue,—whence the expression "receiving the blue ribbon," instead of being installed a member of the order of the Garter. Down to the reign of Edward IV., some ladies, as the queen, &c., were admitted to share in the honours of this magnificent fraternity; and the splendid appearance of Queen Philippa, clad in some of the habiliments of the Garter, is mentioned by Froissart as very imposing. The dress and ceremonies are at present exactly as they were when first instituted, with the exception of the alterations above mentioned; and the Garter is still held to be, and will no doubt continue to hold its fame of being, the first order of the kind in Europe in every sense.

GARTER KING-AT-ARMS, the fourth officer of the order of the Garter, is rendered exceptional from the circumstance of his being also the principal officer in the College of Arms, and chief of the heralds. He was first elected by the universal consent of all the knights companions in the reign of Henry V. The services which he afterwards performed were previously done by the Windsor herald-of-arms, an officer created by Edward III. The oath administered to him on appointment is, to yield obedience to the sovereign and knights companions; to keep silence, and not disclose the secrets of the order; to make signification of the death of each knight companion; to execute faithfully all things committed to his care; to inquire diligently after all the noble acts of the knights companions, and certify the same to the registrar; and, lastly, to be faithful in the exercise of his office. His dress is the same as that of the other officers, and differs but little from that of the knights of the order.

GAS, *gas* (probably from Ger. *geist*, a spirit), in Chem.—This word was first applied by Van Helmont to denote any permanent vapour produced from solid or liquid substances by chemical action. The elementary gases are,—hydrogen, oxygen, nitrogen, and chlorine. The principal compound gases are,—hydrochloric, hydrobromic, and hydriodic acids; sulphurous acid, nitrous acid, peroxide of chlorine, chlorous acid, hypochlorous acid, carbonic acid, sulphuretted, phosphoretted, selenuretted, and telluretted hydrogen; cyanogen, protoxide of nitrogen, deutoxide of nitrogen, carburetted hydrogen, olefiant gas, carbonic oxide, and ammonia.

GAS, MANUFACTURE OF.—The term gas is popularly applied to the important material which is produced by the destructive distillation of coal, those species being chosen which contain the largest amount of hydrogen. When coal is burnt in the open air, or in an ordinary stove, the principal products are carbonic acid and water, small quantities of ammonia and sulphurous acid, and finely-divided carbon in the form of soot. When, however, coal is burnt in closed vessels, the products are much more numerous and complicated. The most important gaseous matters are marsh gas, olefiant gas, hydrogen, carbonic oxide, carbonic acid, sulphurous acid, sulphuretted hydrogen, and ammonia. The liquid portions contain water, a mixture of benzol, toluol, cumol, and other hydrocarbons, commonly known as *coal-tar naphtha*, and a dark viscous substance called coal tar. To render the gaseous products available for lighting purposes, all the above-named, except the marsh gas and the olefiant gas, must be abstracted, not only from their interfering with the illuminating power of the gas, but from their combustion being deleterious to health. The earliest attempts at illumination by this means were made by Mr. William Murdock in Cornwall, about the year 1792, who carried on his experiments for several years, until he succeeded in illuminating a large portion of the manufactory of Boulton & Watt at Soho, near Birmingham, to celebrate the peace of Amiens in 1802. Ten years afterwards the Chartered Gas Company made the first great experiment of lighting the streets with gas; from which time the employment of this material has gone on steadily increasing, until the whole of the large towns and most of the small towns of England and the continent are illuminated by its means. The coal used for this purpose is that found

in the Durham coal-field, known as Newcastle coal, a ton of which will yield nearly 10,000 cubic feet of gas, leaving behind about 13 cwt. of coke of excellent quality. From Scotch coal is obtained a gas of higher illuminating power; but the quantity is smaller, and the coke produced is inferior. The average yield of coke is about 17 cwt. per ton. The process of manufacture is briefly as follows. Pit coal is heated in long flattened cylinders of clay or iron called retorts, arranged in long brick furnaces. The mouths of the retorts are fitted with movable lids, which may be rendered air-tight by clay tubmp. From the upper side of the end of each retort proceeds a tube, which dips into a larger tube containing the tar and condensed moisture called the hydraulic main. The gas passes through the tar and water, leaving a small portion of these substances behind it with a serpentine arrangement of tubes termed refrigerators, which separate the remaining portions of water and tar. From the refrigerators it passes to the lime-purifiers, which consist of large cylindrical vessels containing perforated shelves upon which the dry slaked lime is placed. Lastly, it passes through dilute sulphuric acid, by which means the last portions of ammonia are removed. In certain works the last washing with acid is superseded by a process termed scrubbing, which consists in passing the gas through a vessel filled with coke, upon which a stream of water is constantly trickling. The gas is stored in large reservoirs or gasometers, the general shape of which is that of a cylinder, closed at the top, and floating, or suspended, with its open end in a reservoir of water. The dimensions of the gasometers are regulated by the geometrical law that a cylinder has the greatest capacity with a given surface, when its height is equal to half its diameter; hence the capacity of the gasometer is such that, when raised to its highest point in the water, its height is equal to the radius of the base. It is customary, however, to increase this height by one or two feet, in order to prevent the gas from escaping under the edge. Thus a gasometer capable of holding 30,000 cubic feet of gas has a diameter of 12 feet and a height of 23 feet. On account of the enormous consumption of gas in London and other large towns, the gas-works which supply them require to be provided with very large gasometers. They are made of sheet-iron plates, riveted, and coated with tar on both sides, in order to make the joints gas-tight. The covered cylinder is suspended in the water by means of a chain, and counterbalanced and guided by weights and wheels, so as to rise and fall with ease. Two tubes pass under and through the water, reaching above its surface into the hollow of the gasometer. One of these admits the gas from the purifiers and the other carries it off when required for use. When full of gas, the gasometer is near the top of the water; and by lessening the counterbalancing weight, it is pressed down, and the gas forced out through the other pipe, which conveys it to the mains. As the gasometer voids the gas, it sinks and fills with water, when it is again ready to receive a fresh supply of gas. Most gas-works are supplied with a number of gasometers, some filling and others emptying; and nearly every gasometer is now furnished with some contrivance which indicates the exact quantity of gas which it contains. The gasometers above mentioned require a large space of ground, as so much depends upon the diameter of the cylinder. This fact led to the invention of the *telescope* gasometer, which, with the same diameter, will hold a larger volume of gas without increasing the area of the ground. This gasometer consists of two, three, or more *concentric cylinders*, the bottoms and tops of which, except the uppermost, are furnished with flanges turned in opposite directions, the flange turning outwards and upwards at the bottom, and inwards and downwards at the top. When the gas is introduced, the innermost cylinder rises first, and when its bottom reaches nearly to the surface of the water, its curved flange catches the flange of the next cylinder, which also rises; and when this has risen sufficiently high it lifts the next; and so on. The escape of gas and the admission of air are prevented by the lower flanges of each cylinder taking up a quantity of water, which acts as a water-lute. These gasometers are usually suspended at three points in their circumference by [illegible]





chains running over pulleys attached to three pairs of pillars. It is of the greatest importance that the temperature at which the gas is produced should be regulated with great nicety. If the temperature be too low, the coal distils into liquid hydrocarbons, whilst if too high, a great portion of the gas is burned in the retort; besides which, bisulphide of carbon is formed, which cannot be got rid of by any known process, and which, when burnt, gives rise to vapours of sulphurous acid, to the destruction of the furniture of the apartment in which it is used.

GASCONNADE, *gas-con-nad'* (Fr.), is a term used in the French language to denote a habit of boasting, or speaking beyond the truth in conversation. The name is derived from the province of Gascony, the inhabitants of that part having the character of being addicted to this vice. It is, however, by no means confined to this district of France, neither, we fear, can it be said to be peculiar even to France. There is the military gascon, who talks of his wonderful achievements; and the literary gascon, who speaks of the ability and value of his works. The French give an instance of the latter in an author who had executed a translation of a foreign work, and, in order to give the public an idea of the ability with which he had executed his task, gravely assured them that his translation was so much admired that it was to be translated back again into the language of the original author.

GASES, DIFFUSION OF. (*See* DIFFUSION OF GASES.)

GASES, LIQUEFACTION OF (in Chem.).—Many gases which are aeriform at ordinary pressures and temperatures, may be condensed into liquids, and even solids, by the combined action of pressure and cold. The experiments of Faraday in this direction have shown that the difference between gases and vapours is only one of degree, gaseous carbonic acid bearing the same relation to the solid gas that steam does to ice. The apparatus employed by this philosopher is extremely simple. It consists of a very strong tube closed at both ends and bent at an angle. One end contains the substances necessary for the production of the gas, while the other is immersed in a freezing mixture. Some of the gases are liquefied with greater facility than others, thus, a mere reduction of temperature to 0° is sufficient to reduce sulphurous acid to a liquid state. The gases which have been solidified, up to the present time, are the following:—

| | *Temp. of Solidificat.* | *Pressure at 32° F.* |
|---|---|---|
| Sulphur gas acid | − 105° | 1·53 atmos. |
| Cyanogen | − 30° | 2·37 ,, |
| Hydriodic acid | − 60° | 3·97 ,, |
| Ammonia | − 103° | 4·4 ,, |
| Sulphuretted hydrogen | −122° | 10· ,, |
| Protoxide of nitrogen | 150° | 32· ,, |
| Carbonic acid | − 70° | 38·5 ,, |
| Protylene | − 75° | |
| Hydrocyanic acid | −124° | |
| Fluoride of silicon | −220° | |

It will be observed from the − mark placed before the figures given above, that below 0° is meant. The following have only liquefied, having as yet resisted all attempts at solidification by combined pressure and cold:—

| | |
|---|---|
| Chlorine, | Olefiant gas, |
| Arsenetted hydrogen, | Fluoride of boron, |
| Phosphuretted hydrogen, | Hydrochloric acid. |

The lowering of the temperature that takes place in the surrounding atmosphere during the passage of a gas from the liquid to the gaseous state, by the abstraction of an amount of heat sufficient for it to re-enter its aeriform condition, has been taken advantage of by M. Carré, an ingenious French mechanician, in his ice-machine. It consists simply of two strong iron vessels connected by a tube, one of which contains strong liquor ammonia. Heat is applied to the liquor ammonia by means of a lamp or furnace. The ammonia immediately rises in vapour, and is condensed in a liquid form in the vessel at the other end. The lamp is removed, and the vessel containing the liquefied gas is plunged in another vessel containing the substance to be frozen. The liquid gas gradually resumes the gaseous form, abstracting from the

liquid to be frozen a sufficient amount of heat to convert it into ice. The apparatus is perpetual, the only condition necessary for its use being its perfect air-tightness.

Gas Meter (Gr. *metron*, a measure), an instrument through which coal-gas is made to pass, in order to ascertain the quantity consumed in a particular time or place. They are divided into two classes,—wet and dry gas meters. The former usually consists of a cylindrical case, within which is another cylinder, shut at both ends, and movable round an axis, divided into four parts. This vessel is so far filled with water, that the pipe which conveys the gas into it just rises above it. As the gas enters, it causes the cylinder to move on its axis, and as each volume of gas passes through, the wheel of the axis, which works in other toothed wheels, registers, by means of an index, the number of cubic feet passing through the meter in a given time. The dry meter is an improvement on the wet, as the latter admits of fraudulent means being employed by the consumer. The water in the wet meter is also liable to get frozen in winter. Dry gas meters are made in various forms; one of the most simple and accurate is that of Defries. It is similar to that of Messrs. Croll & Richards, and both contrivances depend on causing the gas to fill expansible chambers of definite volume, the alternate expansion and contraction of which are registered by clock-work. Of late years dry gas meters have come into extensive use in London.

Gasometer. (*See* Gas Manufacture.)

Gasteropoda, *gás-ter-op'-o-da* (Gr. *gaster*, stomach; *pous*, foot), a class of molluscous animals, whose means of locomotion consist of a fleshy disc or foot situated under the abdomen. They are both terrestrial and aquatic, and naked and possessed of a shell. Of the naked Gasteropoda the common slug will serve as an example. Among the terrestrial of the genus is found the snail; and among the aquatic, the whelk, winkle, &c.

Gastric Juice, *gás'-trik* (from *gaster*, the stomach), is the name given to the digestive fluid contained in the stomach, and which is secreted by the gastric glands on the introduction of food or other foreign substance. It is a clear transparent fluid, inodorous, a little saltish, and very perceptibly acid. Its most singular component is a peculiar organic substance called pepsine, to which its special properties are chiefly owing. The use of the gastric juice is to dissolve the various kinds of food in the stomach, reducing the albuminous and gelatinous portions of it to a state fit for absorption into the system. It has also an antiseptic property, as it suspends putrefaction and restores the freshness of tainted meat.

Gastritis, *gás-trí'-tis* (Lat.), in Surg., denotes inflammation of the stomach. It is known by pain in the epigastric region, increased when anything is taken into the stomach, vomiting, and hiccough; the pulse small and hard; and general prostration of strength, attended by fever and anxiety. It is produced by poisons of various kinds taken into the stomach, as arsenic or corrosive sublimate, by food of an improper nature; by draughts of any cold liquid when the body is much heated. It is a rapid and very dangerous disease, and requires prompt measures to be adopted. The means employed are copious and repeated general bleedings; the application of leeches to the epigastrium, followed by fomentations or the hot bath, after which a large blister may be applied. When acrid substances have been taken, mucilaginous drinks may be of use to aid their evacuation and protect the stomach, and when it arises from active poisons, the stomach-pump may require to be used.

Gastronemius, *gas-tro-ne'-me-us* (Gr. *gaster*, the stomach; *kneme*, the leg), is the name given to the belly or calf of the leg; and is also applied to two of the muscles of that part. The *gastronemius externus* arises by two distinct heads from the inner and outer condyles of the os femoris, which unite a little below the joint; and below it unites with the gastronemius internus, to form the tendo Achillis. The *gastronemius internus*, called also the *soleus*, is situate immediately under the above, and rises by two heads from the posterior part of the head of the tibula and the upper and posterior part of the tibia. The use of both these muscles is the same; namely, to raise the heel and extend the foot.





Gastronomy, *gás-tron'-o-me* (*gaster*, the stomach, and *nemos*, law), may be strictly defined to be the science of eating and drinking, or, in short, the physiology of taste. In the classics we read of many names rendered celebrated by the fact of their being excessive gourmands, or worshippers of good living, as Lucullus and Apicius; and, indeed, one Archestratus, of Syracuse, a contemporary of Pericles, has handed down to posterity a poem on the art of gastronomy, which has been translated by Ennius. This author is the first who appears to have treated on the subject, as M. Brillat-Savarin, who, in his *Physiologie du Goût*, has exhausted every argument which could be used in its favour, is the last. Gastronomy must not be confounded with cookery, from which it is wholly distinct.

Gastrotomy, *gás-trot'-o-me* (Gr. *gaster*, and *tome*, an incision), in Surg., denotes an incision into the cavity of the abdomen, an operation sometimes resorted to in desperate cases; as where, in consequence of a rupture of the uterus, the child escapes into the peritoneal cavity.

Gateway, *gat'-way* (Ang.-Sax.).—The gateways, or gatehouses, of the middle ages were most imposing structures, but, in the present day, this branch of architecture seems to have become neglected, or has fallen into disuse. They used to be erected over the principal entrances of the precincts of religious establishments, colleges, and other buildings, and sometimes also in the courts of private houses, and those before castles and other fortifications. In military edifices, the entrance usually consisted of a single archway, with a strong door, large enough to admit carriages, and portcullis at each end, with a vaulted ceiling pierced with holes, through which missiles might be rained down on an enemy. The sides of the gateway were generally flanked with large projecting towers pierced with loopholes, and the upper part terminated in a series of machicolations and a battlemented parapet. In civil edifices, the gateway admitted of much greater diversity of form. Sometimes it was formed of a single square tower, with the front ornamented; or it was extended to a considerable breadth, as at Battle Abbey, in Sussex. The gateways of religious houses had frequently a chapel attached to them. Examples of them may be seen in most of our old cathedral towns; as at Oxford, Canterbury, &c.—Ref. *Glossary of Architecture*.

Gauge, *gauje* (from. Fr. *jauger*, to gauge), an instrument or apparatus used for measuring the state of a phenomenon. Thus the gauge of an air-pump is a barometer, connected with the interior of the receiver, which shows the degree to which the air is rarefied. The wind-gauge, or anemometer, is used in order to measure the force or velocity of the wind: and the water-gauge, or hydrometer, for determining the specific gravity of liquids, and thence the strength of spirituous liquors. (*See* Anemometer, Hydrometer.) In various trades and manufactures, gauges of different kinds are employed; such as those used for measuring wires and sheet metals. These are generally thick plates of steel, of varied size and form, round, and near the edges of which, are drilled various holes, with notches sawed from the edge into every hole. Small parallel plates of hardened and tempered steel, called "drifts," are then driven into the notches, in order to smooth the sides and make them uniform. The Birmingham gauge for iron wire, and sheet iron and steel, differs from the gauge used for sheet brass, gold, silver, &c.; and both these differ from the Lancashire gauge for round steel wire. Many other gauges are used in particular trades: such as the rod-iron gauge, the nail-rod gauge, the button-makers' gauge, &c.; others are used in watch-work; gun-makers also use a gauge for the bores of guns and rifles.

Gauging, *gaú'-jing*, the method of determining by actual measurement the number of gallons contained in vessels intended to hold goods; chiefly casks, barrels, vats, &c. The principal use of gauging is in the collection of the revenue, in which it is necessary to measure the bulk of vessels, without disturbing their contents. The principles of gauging are those which are furnished in geometry for the measurement of solids. As, however, the men who are engaged either in commerce or by the excise, for the purpose of gauging, are not likely,

in general, to be acquainted with the principles upon which the art depends, a set of technical rules and appropriate instruments have been contrived, by which the art can be practised by any one of moderate intelligence. The instrument usually employed is the gauging rod, or diagonal rod, by which the contents of a cask are inferred from its diagonal length, measured from the bung-hole to the extremity of the opposite stave at the head. A scale of inches, for taking the measure of the diagonal, is described on one face of a square rule, usually about four feet long; and on the opposite face is a scale expressing the corresponding contents of the cask in gallons. Although this method, obviously, can only give approximate results, yet, by using larger sliding-rules for calculation, and the aid of habit, derived from experience, it is possible to attain considerable accuracy in measuring the contents of casks, which do not depart much from a given standard of form.

Gault, *gawlt*, in Geol., the term which is applied to a series of dark blue marls or calcareous clays, which occur between the upper and lower greensand of the Chalk formation. It can be examined very well at Folkestone and Cambridge. The marine shells contained in it are often beautifully preserved, having been well packed and protected from atmospheric influences. The word "gault" is a provincial term for the clay itself, which is much used for tile-making. When decomposed, it forms a very fertile soil, and is the main repository of the phosphatic nodules which are now so highly prized by the agriculturist.

Gavelkind, *gāv'-el-kind*, in Eng. Law, is a species of tenure of lands, which is supposed to have been previous to the Norman conquest, the general custom of the realm, and which is found to this day in Kent, in consequence, it is said, of the success that attended the struggles of the Kentish men to preserve their ancient liberties. The origin of the term is much disputed. According to Coke, it is formed from "*Gavel all kinde*; for this custom giveth to all the sons alike," but the more generally received opinion is that it is derived from the Saxon word *gavel*, or *gafol*, signifying rent, or a customary performance of husbandry service, and hence the land which yielded this kind of service, as opposed to knight-service, was called gavelkind. The chief distinguishing features of this kind of tenure are:—(1) that the lands descend not to the eldest, foremost, or any one son only, but to all the sons together; but the issue of a deceased son inherits his share, whether male or female; (2) that the tenant is of sufficient age to alienate his estate by feoffment at the age of fifteen; (3) that the estate does not escheat in case of an attainder and execution, their maxim being "the father to the bough and the son to the plough." In most places, the tenant had a power of devising lands by will, before the statute authorizing the devise of lands generally was made. In default of sons, the land descends in equal shares to daughters; in default of lineal heirs, the land goes to the brothers of the last holder; and in default of brothers, to their respective issue. The husband is tenant by courtesy of a moiety of his wife's lands, whether there be issue or not, so long as he remains unmarried; and a wife is endowed of a moiety of the lands of which her husband died seized, during her chaste widowhood. Though the lands of Kent have now, for the most part, been *disgavelled* by particular statutes, yet the presumption is still in favour of this species of tenure until the contrary be shown.—*Ref.* Robinson's *Treatise on Gavelkind*.

Gavot, *gā-cot'* (Fr. *gavotte*), a dance consisting of two light lively strains in common time, each being played twice. The first usually contains four or eight bars, and the second eight or twelve, and sometimes more. The first strain should close in the dominant or fifth of the key; for if it has its termination in the tonic or key-note, it is not a *gavot*, but a *rondeau*.

Gazelle, *gā-zel'* (Fr.), (*Antilope Dorcas*, Pallas), one of the most beautiful and graceful of the antelopes, chiefly inhabiting Arabia and Syria. It is about three feet six inches in length, and in height measures less than two feet at the shoulder. The horns of the adult male rise nearly perpendicularly above the orbits, are black, almost cylindrical, bending at first gently backwards, and finally forwards. The ears are long, narrow, and pointed; eyes large, mild, and black. The size of the gazelle about equals that of the roebuck; but the legs of the former are considerably longer, and the entire form more graceful. The face and cheeks are reddish fawn-colour, with a dark stripe down the nose; on each side of the face, passing over the eyes, from the horns down to the nose, there is a broad white stripe, and beneath this, from the anterior canthus of the eye, a narrower dark stripe parallel to it and separating it from the fawn-colour of the cheek. The remainder of the body is dark fawn above and white beneath, the latter colour being separated by a broad brown band along the flanks. The knees are furnished with brushes of dark hair, and the ears are filled internally with long white hair. It lives in large troops, and when pursued by the hunter, flees at great speed for some distance, then stands still to gaze on him, then bounds off again. When brought to bay, these animals defend themselves with courage and obstinacy, meeting in a close circle, with the females and fawns in the centre, and presenting their horns at all points to their enemies.

Gazette, *gā-zet'* (Ital. *gazzetta*), in *Lit.*, is the name of certain newspapers in this country and on the continent. It is said to be taken from *gazzetta*, the name of a Venetian coin worth somewhat less than a farthing, and which was the price of the earliest newspaper published in Venice (1563). According to others, it is derived from *gaza*, a treasure, or *gazza*, a magpie. The first Gazette published in France (under that name) appeared in 1631, the first in England in 1665. The first fourteen numbers of the *London Gazette* were published at Oxford, the court being then resident there on account of the plague in London. It is published under authority of the government, and appears regularly twice a week, on Tuesdays and Fridays. It contains all proclamations, orders of council, and an account of all matters done by the crown in her official capacity; promotions and appointments to commissions in the army and navy; the appointment of ambassadors, consuls, and other civil officers of the higher ranks; also various matters connected with legal proceedings, notices of bankruptcies, dissolutions and sequestrations, dissolution of partnerships, &c. Notices of intended applications to parliament for private acts, relating to railways, canals, &c., require to be published in the *Gazette*.

Gazetteer, *gaz-el-teer'*, is, in other words, a dictionary of geography, a work giving an account of the different places on the face of the earth, under their particular names, in alphabetical order. The first work of this kind with which we are acquainted is that of Stephen of Byzantium, who lived about the beginning of the 6th century. The first modern work of the kind is the "*Dictionarium Rust ico-Geographicum*" (Geneva, 1565), by Charles Ste. hens, with additions by N. Lloyd, (Oxford, 1670, and London, 1686). The works of Ferrari, "Lexicon Geographicum," and Bandrand, "Geogr. ordine Literarum dispos." (1682), are full of the strangest errors. Those of Maty (1701), Thomas Corneille (5 vols. folio, 1708), and Savonarola (1713), were based on the former, with additions and corrections. The "Dictionnaire Géographique, Historique, et Critique," of La Martinière (Hague and Amsterdam, 10 vols. folio, 1726; Paris, 6 vols. 1768), superseded all that had gone before it, though it still retained many errors. The "Geographisch-Statistisches Handwörterbuch," by Hassel (2 vols. 1817, with a supplement of 2 vols.), was the most complete and accurate work of its time. The "Edinburgh Gazetteer" (6 vols. 8vo, 1817-22), was a tolerably accurate book. Since that time, however, numerous valuable works of this class have appeared, both in this and in other countries. Among the more important of those that have recently appeared in this country, may be mentioned M'Culloch's "Geographical Dictionary" (2 vols. new edition, London, 1851); A. K. Johnston's "Dictionary of Geography" (2nd ed., London, 1855); W. G. Blackie's "Imperial Gazetteer" (2 vols. Glasgow, 1855); the "Gazetteer of the World," published by Fullarton & Co. (7 vols. Edinburgh).—In the United States, besides the special works of Lippincott's "Gazetteer of the United States" (Philadelphia, 1854), and Fisher's "Statistical Gazetteer of the United States" (New York, 1853), there are Lippincott's "Complete Pronouncing Gazetteer of

the World" (Philadelphia, 1856), and Harper's "Statistical Gazetteer of the World."—Of other countries may be mentioned Möller's "Geographisch-Statistisches Lexikon" (1847); Rüter's "Geographisch-Statistisches Lexikon" (4th ed. Leipsic, 1855); Hoffmann's "Encyclopædie der Erd-, Volker- und Staatenkunde" (Leipsic, 1865, *et seq.*); Kramer's "Geographisch Woordenboek" (Gouda, 1853); Castro's "Gran Dizionario Geografico" (Milan, 1855), "Dictionnaire Géographique universel," par une Société de Géographes (10 vols. Paris, 1922-37), Dictionnaire Géographique universel," par une Société de Géographes, (18 vols. Brussels, 1839); Beschereille's "Grand Dictionnaire de Géographie universelle, ancienne et moderne" (4 vols. Paris, 1856-7).—One of the most extensive and valuable Gazetteers of particular countries is the "Diccionario Geografico-Estadistico-Historico de España," by Pascual Madoz (Madrid, 1847-56), in 16 volumes.—A valuable dictionary of ancient geography is that recently published by Dr. William Smith. Nor under this head must we neglect to mention the geographical section of the "English Cyclopædia."

GEHENNA, *ge-hen'-na*, is the Greek form of the Hebrew *Ge-hinnaom*, the valley of Hinnom, and is used in Scripture to signify hell, or the place of eternal punishment. The valley of Hinnom was a narrow valley or gorge in the neighbourhood of Jerusalem, where the sewage and filth of that city was carried, and where perpetual fires were kept up to consume the noxious matter. In later times it became a favourite place for the celebration of idolatrous rites, one part of it, named Tophet, it is recorded, the abominable practice of infant sacrifice was exercised. Hence the terms Gehenna and Tophet came to be associated with hell.

GELATINE, or GELATIN, *jel'-a-tin*, *jel'-a-tin*, is a crystallised principle, which has hitherto been obtained by animal tissues only. Bones, skins, the horn and other parts of the animal, yield gelatine when boiled in water, but it does not appear to exist in a free state in any of the substances. Gelatine softens and swells in cold water, but does not dissolve until the liquid is heated. When the solution cools, it solidifies to a firm jelly, hence its name. It is insoluble in alcohol and ether, and may be precipitated from its aqueous solution by tannic acid. With tannic acid it forms an insoluble compound of a buff colour, which is the basis of leather. It is also abundantly precipitated by solutions of corrosive sublimate and bichloride of platinum. By continued boiling, gelatine is converted into metagelatine, which does not possess the property of gelatinizing as the liquid cools. The term is derived from the Spanish *gelatina*, from the Lat. *gelo*, I freeze.

GELATINE AND GLUE, in Manufac.—As gelatine is only glue in a greater state of purity, it will be as well to consider the two substances under one heading. Glue is obtained from the parings and refuse trimmings of ox and other hides, which generally contain from 10 to 50 per cent of glue. They are steeped for several days in lime-water, to remove the hair and blood, and then drained and dried in a current of air, in order that the lime may absorb carbonic acid from the atmosphere. They are then boiled down in a copper containing a perforated false bottom, fresh clippings being added until the liquor gelatinizes in cooling. It is then kept at a gentle heat until the impurities have settled, and it is transferred to wooden boxes, or coolers, in which it gelatinizes. The blocks so formed are cut into cakes while soft, and dried in nettings, the threads of which leave the well-known cross-bar markings. The drying is the most particular part of the process, a sudden rise of temperature will destroy the whole batch, by partially dissolving it, or a frost will split the cakes into fragments. Gelatine is simply glue which has been dissolved in a large quantity of water, and allowed to settle until colourless. Size is a less-tenacious kind of glue, made from parchment parings and the thinner pieces of skins.

GELIDIUM, *je-lid'-e-um*, in Bot., a gen. of *Algæ*. From the species *G. corneum*, commonly known as *Algue de Java* in France, M. Payen first obtained the principle to which he has given the name of *gelose*. According to the researches of this chemist, one part of gelose dissolved in 500 parts of boiling water will afford, upon cooling, a colourless transparent jelly; thus forming ten times more jelly than a like weight of the best animal gelatine. Jellies made from this seaweed are much employed for food in Japan.

GLOSE. (*See* GELIDIUM.)

GEMINI, *jem'-e-ni* (Lat., the twins), in Astron., the third constellation, or sign of the zodiac. The title is referred by the Greeks, not only to the fable of Castor and Pollux, but also to those of Hercules and Apollo, Triptolemus and Iasion, Amphion and Zethus, &c. The name of the Twins is given to the constellation from two remarkable stars of the first and second magnitude, to which the names of Castor (or $\alpha$ Geminorum) and Pollux (or $\beta$ Geminorum) are given. The two stars, when once known, can be easily recognized on account of their proximity. By drawing a straight line through the belt of Orion and the double star, the line of which cuts through the belt, the Gemini may be easily found; for the straight line, when lengthened upwards, will pass very near the two stars. They are also about halfway between Procyon and Aldebaran; and when Orion and the Great Bear are low together, Capella on one side and Castor and Pollux on the other, form the most conspicuous bodies or stars of the space between.

GEMOT, *ge-mote'* (A.-Sax.), was the name of [illegible] held at certain times among the Anglo-Saxons, as the shire-gemote, or county court, which met twice a year; the burg-gemote, which met the [illegible], and the hundred-gemote, which assembled every month. The witena-gemote was the great national council of the Anglo-Saxon kings.

GEMS, *jems* (Lat. *gemma*, a precious stone), a term commonly applied to all precious stones, and particularly to those which are used in jewellery. They are usually cut by the lapidary and set in gold, or carved as signets for rings, &c. The chief objects desired in minerals of this kind are brilliant lustre, perfect transparency, and richness of hue. Amongst those gems which are set, the diamond holds the first place for brilliancy of lustre, or *water*, as it is termed. (*See* DIAMOND.) The oriental ruby is next in value, when of considerable size, of perfect transparency and rich colour. It is chiefly found in the Capellan mountains, near Syriam, in the kingdom of Ava. The sapphire, which varies from a dark rich blue to a pale and almost colourless tinge of the same hue, holds the next place. It is found in comparatively large masses in Ava and Ceylon. The emerald, with its peculiar rich green colour, is held in high estimation by Eastern monarchs. The aquamarine is a pale blue variety of the same mineral. The topaz is found in all parts of the globe; and for the striking changes which it undergoes when it is exposed to heat, and the fine colours which it naturally displays, is peculiarly suited to the lapidary's art. Garnets of very rich colour are obtained in Ceylon and Greenland. Chrysolites of a pale green colour come from Constantinople; deep red hyacinths from Ceylon; and tourmalines of various hues from most parts of the world. Other stones also come under the designation of gems. Among these may be mentioned the opal, and many varieties of quartz, such as the amethyst, sarde, onyx, cat's-eye, and agate. The art of engraving on gems is very old, although it has been doubted whether the ancients understood the method of cutting the diamond, or sculpturing the emerald and topaz. The Eastern nations are still unacquainted with the proper mode of cutting and polishing the diamond. In the year 1500, an Italian, named Ambrose Caradopo, engraved the portrait of a father of the church on a diamond, which he sold to Pope Julius II., a great patron of the arts, for £5,500, a large sum for that period. His example was followed by other artists, diamond-dust being employed in reducing the gem. The minerals most used for purposes of engraving, both in modern and ancient times, are rock crystal or quartz, of various colours and degrees of purity, jasper, calcedony, cornelian, onyx, and bloodstone. Among those nations which practised the art of engraving on gems may be mentioned the Egyptians and the Hebrews, who probably learned the practice from the former when resident in their land. The stones used by the Egyptians were green jasper, calcedony, and cornelian. There are many interesting specimens of their art in the British Museum. Before

the decline of their country, the Greeks became much more eminent for their gems than any other nation of antiquity. They practised seal-engraving at an early period, but apparently not upon stones. Many celebrated names of engravers before the era of Alexander have been handed down. Among others, that of Theodore of Samos, who engraved a lyre on a celebrated emerald belonging to king Polycrates 750 years before Christ, which the owner, to mortify himself, threw into the sea. Between the period of Alexander and the Augustan age, the chief gem-engravers were Admone, Apollonides, Polycletes, who was also a sculptor, and Tryphon. The taste for engraving on precious stones was still preserved by both Greeks and Romans during the earlier part of the dark ages. With the introduction of Christianity, the art languished, and after the 7th century it almost entirely disappeared, and remained in obscurity till the 15th century, when it was revived by the Italians. From this period, engraving on gems fluctuated greatly, and it was some time before the art was fully re-established. Modern gems are considered inferior to those of ancient times; and hence many attempts have been made to substitute fictitious gems for those which are real. These are produced in three different ways,—either by attempting to improve a precious stone, or by producing an absolute counterfeit of it, or by inscribing the name of an ancient engraver on a production of modern origin. Independently, however, of these methods of producing counterfeit gems, the ancients were acquainted with several expedients for making artificial gems, and chemists in all ages have turned their attention to this branch of art. In modern times, Mitscherlich, Brothier, Gannon, and others, have succeeded in producing artificial rubies, corundum, blue and red spinelle, garnet, and emerald, by crystallizing mixtures containing their component parts at exceedingly high temperature. The artificial gems produced were found to possess all the properties of the real stones, both in colour, hardness, and crystalline form.

GENDARMES, *zhan(g)-darm* (Fr., from *gens d'armes*, men-at-arms), is the name of a body of military police in France, comprising both infantry and cavalry. In the 15th and 16th centuries, the gendarmes constituted the most distinguished cavalry corps in the French army. Afterwards, in 1660, the name was transferred to a squadron of the royal household troops, who constituted a kind of body-guard of the king. In 1791 this corps was abolished, and the name given to a body of police. It consists principally of soldiers taken from the army generally on account of intelligence, regard behaviour, and it is regarded as a kind of promotion, as they have better pay, and enjoy greater liberty. The corps still constitutes a part of the army, and is liable, in case of necessity, to be sent on active service. They have the character of being well-behaved and trustworthy men, and are frequently intrusted by government with the execution of matters of importance and delicacy. They amount to about 2,000 men.

GENDER, *jen'-der* (Fr. *genre*, from Lat. *genus*, race, kind), in Gram., is the distinction of nouns according to sex. Nouns denoting the male sex are said to be masculine, those denoting the female sex, feminine, and those which denote neither male nor female are said to be neuter (Lat. *neutrum genus*), of neither gender; and hence grammarians have come, somewhat incorrectly, to speak of three genders. There can, properly speaking, be but two genders, the masculine and the feminine, as the sexual distinction is the basis upon which this doctrine is built. There are many animals, however, of which it is difficult, or useless, to determine the sex; and there are also many things which cannot be so distinguished at all. These are generally regarded as belonging to what is termed the neuter gender. There are, however, certain ideas, as magnitude, strength, vigour, &c., which are considered as characteristic of males; while gentleness, timidity, submission, &c., are regarded as properties of females, which, when they come to be associated with a neuter noun, raise it to the masculine or feminine: thus we speak of the sun as *he*, and of the moon as *she*. Abstract nouns and general terms are also usually regarded as feminines. The masculine and feminine are sometimes denoted by different words, as boy, girl, horse, mare, cock, hen; sometimes by a change in the





termination, as count, countess; executor, executrix; songster, songstress; and sometimes by the addition of a word, as cock-sparrow, hen-sparrow, he-goat, she-goat.—Ref. *English Cyclopædia*, section Arts and Sciences.

GENEALOGY, *je-ne-al'-o-je* (Gr. *genealogia*, from *genos*, race, and *logos*, account), is an account or enumeration of the ancestors or relations of a particular person or family. No nation was more careful to trace and preserve its genealogies than the children of Israel. Their sacred writings contain genealogies which extend through a period of more than 3,500 years, from the creation of Adam to the captivity of Judah, and even after that time. Josephus informs us that he traced his own descent from the tribe of Levi by means of public registers, and that, however dispersed and depressed his nation were, they never neglected to have exact genealogical tables prepared from authentic documents which were kept at Jerusalem. Since, however, their destruction as a nation by the Romans, all their tables of descent seem to have been lost; and even the Levites, who are still distinguished from the rest of the people by the exercise of special honorary religious functions, are known as such only by being acknowledged as descendants of parents who exercised the same. The inequalities of rank and right which prevailed during the middle ages made genealogical inquiries highly important, and it was then that researches of this kind assumed the form of a science, which became closely connected with heraldry (which *q.v.*). Very little critical care, however, was usually employed in such cases, the chief object being to trace the origin of families into the remotest antiquity. Attempts to carry this to an absurd length are frequently manifested in the earlier genealogical works. Critical genealogical studies were not begun before the 17th century. Genealogical accounts are not only interesting to persons who feel a more or less natural curiosity about their ancestors, but are also useful to the historian, as elucidating the often complicated relations of dynasties, families, claims, and controversies of successions, &c. They are also of importance in legal cases concerning claims of inheritance; and, indeed are indispensable in states in which the enjoyment of certain rights is made to depend upon lineage or descent. A genealogy, or lineage, is frequently represented in the form of a tree (*arbor consanguinitatis*), giving a distinct view of the various branches of the family, and the degrees of descent from the common progenitor, who is generally represented in the root or stem. Genealogical tables are either descending or ascending. The former are chiefly used in historical records, presenting the descendants of a certain person in the order of procreation; the latter, documents of nobility, serving to show the claims of any man or family to the titles of paternal and maternal ancestors. Sometimes both forms are used together. Persons descended one from another successively, form a direct line; those descended from a common progenitor, but not one from another, a collateral line. The collateral line embraces the agnates, or the kindred on the father's side, and the cognates, or kindred on the mother's side.

GENERA, *j'-e-r-e* (Lat.), the plural of genus (which *see*).

GENERA, in Mus., the different scales by which the Greeks regulated their divisions of the tetrachord, of which there were three; viz., the enharmonic, chromatic, and diatonic, all of which will be found treated of under their respective names.

GENERAL, *jen'-er-al* (Fr. *général*), the name of the highest military rank, with the exception of that of field marshal, that can be conferred on officers in the British and continental armies. It is the title given to the commander-in-chief, unless he be a field-marshal, to the commanders of armies and military districts, and to the commanders of divisions and brigades, who exercise the functions of a general with respect to the different bodies of men under their command which compose the entire army in the aggregate. In the English army, general officers are of three grades,—generals, lieutenant-generals, and major-generals. In the French and continental services, the rank of general of division is equivalent to that of

lieutenant-general in our service, and that of general of brigade to the rank of major-general. The command of a division in our service is always given to a lieutenant- or major-general, but the colonel of a regiment may command a brigade with the temporary rank of brigadier-general. The title seems to have originated in France about 1450, when John, count of Dunois, was made lieutenant-general of the French forces, or commander-in-chief, representing the sovereign, who had delegated to his lieutenant-general the performance of the duties that would otherwise have devolved upon him as actual commander-in-chief of the armies. The title came into use in England in the reign of Henry VIII., when the appellation of captain-general was given to the commander-in-chief of the English forces, instead of that of lord-marshal of England. From that period the title of general, both alone and distinguished by various prefixes, has been preserved in the British service.

GENERAL ASSEMBLY. (*See* ASSEMBLY, GENERAL.)

GENERAL BASS, in Mus., is synonymous with thorough bass. (*See* BASS.)

GENERAL ISSUE, in English LAW, is a plea which thwarts or denies at once the whole declaration of the plaintiff, without offering any special matter whereby to evade it; as in action for wrong, "not guilty," or for debt, "not indebted." They are called the general issue because, by importing a general and absolute denial of what is alleged in the declaration, they amount at once to an issue, by which is meant a fact affirmed on one side and denied on the other. Formerly the effect of pleading the general issue was to leave everything open,—the fact, the law, and the equity of the case; but in this way much abuse crept in, and by statute 3 & 4 Will. IV. c. 42, the plea of general issue was restricted to its proper and ancient province.

GENERALISSIMO, *jen-e-ral-is'-e-mo* (Ital.), the name sometimes given on the continent to a general officer who has the chief command of two or more armies, or grand divisions of an army, which are also under the command of general officers who act independently of each other, and are subject only to the control of the generalissimo or commander-in-chief for the time being.

GENERALIZATION, *jen-e-rŭl-i-zai'-shun* (Lat. *generalis*, general), the act of extending from particulars to generals; the act of making general.

GENERALIZATION, in Log., "the act of comprehending under a common name several objects, agreeing in some point which we abstract from each of them, and which that common name serves to indicate." When we contemplate several objects resembling each other in some part of their nature, we can, by attending to that part alone, assign them one common name, which will express or stand for them all as far as they agree; and this is what is called generalization. Another kind of generalization is when, from observing that two or more objects have certain things or properties in common, that therefore they have others also in common; as when Newton, from the fall of an apple, discovered the law of gravitation. In this process of generalizing there is involved a principle which experience does not furnish, by which we affirm not only that all heavy bodies which have been observed gravitate, but that all heavy bodies, whether they have been observed or not, do so. In this there is implied a belief that there exists a certain order in nature, and that, under the same circumstances, the same substances will present the same phenomena. (*See* INDUCTION, CLASSIFICATION.)

GENERATION. (*See* PHYSIOLOGY.)

GENERATIONS, ALTERNATION OF, *jen-e-rai'-shunz* (Lat. *generatio*), a term applied by Professor Steenstrup to a series of phenomena connected with the mode of reproduction of many of the lower animals. In their development from the ovum to the adult state, a large number of these beings not only pass through various stages, as exemplified in the insect tribe, but also possess the power of multiplying themselves at certain periods of their growth. The animals which exhibit this peculiarity have been called "nurses," and the phenomenon has been particularly observed in the Acephala, Entozoa, Polypifera, Salpæ, and Vorticellæ. In the translation of Professor Steenstrup's work by the Ray Society, the alternation of generations is fully described. The mode of development by means of "nurses," or intermediate generations, is shown to be an ordinary phenomenon in nature. "The circumstance," he observes, "of an animal giving birth to a progeny permanently dissimilar to its parent, but which itself produces a new generation, which either itself or in its offspring returns to the form of the parent animal, is a phenomenon not confined to a single class or series of animals; the vertebrate class is the only one in which it has not yet been observed. It would consequently appear that there is something intrinsic in this mode of development, and that it occurs, as it were, with a certain necessity; on which account it will undoubtedly soon be recognized to a greater extent and more generally." If the whole system of development by means of "nursing" generations be collected and regarded in one view, it appears, as the essential feature in this course of development, that the species is not fully represented in the solitary, full-grown, fertile individuals of both sexes, nor in their development; but that to complete their representation, supplementary individuals, as it were, of one or of several precedent generations are necessary. The greatest incompleteness and the highest degree of mutual dependence is to be observed in the Campanularæ and similar polypes, in which the generations representing the unity of the species are very unlike each other, and in which all the individuals are fused into an outward unity, or into a set of polypes. "They exist organically connected with each other, and are normally free only in their first generation, and, indeed, only in their earliest stage of development, and only for a short time; since the free-swimming ciliated embryo swims about in the water at most for some hours, in order to find a suitable place for the foundation of a new polype stem. In the Coryne clavi-form polypes, the organic connection between the individuals and generations is rather more lax; the perfect gemmiparous or ovigerous individuals are usually quite free, often even at an early age; so that they do not attain their full development until after their separation from the "nursing" generations. In the Medusæ and Scalpæ, the generations which are connected together into one whole become more like each other." Among the Entozoa, similar attempts at becoming free and accomplishing a perfect growth are also described. The development of animals which do not belong to the water, but to the air, also presents similar phenomena, but in a still higher and more free stage. The propagation of the Aphides through a series of generations has been long known. In the spring, a generation is produced from the ova, which grows and is metamorphosed, and, without a previous fertilization, gives birth to a new generation, and this again to a third; and so on for ten or twelve weeks; so that in certain species which have been observed nine such changes have been noted. At last, there occurs a generation consisting of males and females, the former of which, after their metamorphosis, are usually winged; fertilisation and the deposition of eggs take place, and the long series of generations recommences in the next year and in the same order.—Ref. *Transactions of the Ray Society*,—J. J. Steenstrup *on the Alternation of Generations*.

GENESIS, *jen'-e-sis* (Gr. *genesis*, the generation), is the name given to the first book of the Bible, on account of its containing a narrative of the generation or production of all things. The Hebrew name is *Bereshith*, 'in the beginning,' from its commencing with that word. Its history goes back to the very earliest ages of the human race, and extends over a period of at least 2,370 years. It gives an account of the creation, the fall of man, the settlements, genealogies, arts, religion, corruption, and destruction of the antediluvian world; of the re-peopling and division of the earth, the dispersion of its inhabitants, the calling of Abraham, the rise and progress of the Jewish nation, &c. It is divided into two main parts, one universal and one special; the former being the ancient history of the whole human race, contained in chapters I.—XI., the latter the early history of the children of Israel (XII.—L.). There are some critics who maintain that this book was not written by Moses; and there are certainly some passages of it that must have been written by some one after his death, as they refer to subsequent events; but that the book as a whole was

written by Moses, there is little room to doubt. Much ingenious speculation has been expended, as to the manner in which Moses was made aware of what had taken place so many centuries before his own time. According to some, the different events recorded in the book were divinely revealed to him; others hold that he acquired his knowledge of them by tradition; and a third class, that he obtained it from old documents. The second of these is the commonly received opinion in this country, and the third is that which is generally maintained by the German theologians of the present day. Neither of these views necessarily militates against the belief in the inspiration of the book; for that divine gift would be necessary to enable him to distinguish the true from the false. We cannot help thinking, however, that if either or both of these had been the sole or only sources whence Moses had drawn his information, there would have been some allusion to, or evidence of it, in the book itself. His knowledge of the later events may, and probably was, obtained in this way; but we incline to the opinion that the earlier part of the book must have been the subject of divine revelation. For those that believe in prophecy, there is nothing hard of belief here; the one being a divine revelation of the future, the other a divine revelation of the past (Regarding the various subjects of controversy in this book, *see* CREATION, DELUGE, &c.) The authenticity of Genesis was distinctly recognized by Christ, and passages from it are cited in the New Testament, twenty-seven times literally, and thirty-eight times substantially.—*Ref.* Graves *On the Pentateuch*; Horne's *Introduction to the Scriptures*; Eichhorn's *Einleitung in's Alte Testament*; Jahn *On the Books of the Old Testament*; Turner's *Companion to Genesis*.

GENII, *je'-ne-i* (Lat.), among the Romans were supernatural beings, corresponding to the demons among the Greeks. According to them, every human being had his genius allotted to him at birth, who guided and accompanied him through life, and conducted him out of the world at the close of his career. But not only persons but places, and even inanimate objects, were fabled to have their genii. The collective Roman people also had their genius, who was sometimes represented on coins. The sect of the women were called Junones. They sometimes held that each person was accompanied through life by two genii, a white and a black; the former good and favourable, the latter bad and unfavourable; at other times they believed in but one, which was black and white by turns. Divine honours were paid to the genii; and it was usual for each one to offer sacrifice to his genius on his birthday. The genii or djinns of the East bear little resemblance to those of the Romans. They are regarded as an intermediate class of beings, between angels and men, but inferior in dignity to both, and are not objects of worship. In poetry they are described as having been created out of fire, and as having inhabited this world before its occupation by man, or the subjects of a certain Jân Ibn Jân. They rebelled, and God sent his angel Ibhs, or Eblis, who, after conquering Jân Ibn Jân, rebelled against God, and set himself up in his room, whereupon God condemned him to eternal punishment. The djinns, like men, are some good and some evil. They eat and drink, are subject to passions and death, but may live for centuries. They are capable of becoming invisible, or assuming the forms of men, beasts, or monsters, at pleasure. They frequent baths, wells, ruined houses, seas, rivers, cross-roads, and market-places. The evil genii delight in mischief for its own sake, raise and direct whirlwinds, and dry up the springs of the desert. The ghouls are a subordinate class of evil genii, haunting deserts and burial-grounds, and killing and devouring men and women that fall in their way. The peris, or fairies, are beautiful female genii, who believe in God, and in Mahommed, his prophet, and do good to man. The Mussulman doctors believe in the existence of djinns, as supernatural beings; but their ideas of them differ much from those of the poets and romancers.

GENIPA, *jen'-i-pâ*, in Bot., a gen. of the nat. ord. *Cinchonaceæ*. Some species have edible fruit; thus the *G. americana*, the lana-tree of South America, produces a delicious fruit called the *genipap*. In British Guiana a blueish-black dye is prepared from the juice of this fruit.





GENISTA, *jen-is'-tâ* (Lat. *genu*, knee, in allusion to the angular or jointed appearance of its twigs), in Bot., a gen. of leguminous plants, three species of which are found wild in Britain. *G. tinctoria*, the dyer's broom, yields a good yellow dye, or, when mixed with woad (*Isatis tinctoria*), a green.

GENITIVE, *jen'-i-tiv* (Lat. *genitivus*, Gr. *genikē*), in Gram., is the name of the second case in the declension of nouns, generally indicating the relation expressed in English by the preposition *of*. "The Latin genitive," says Max Müller, "is a mere blunder; for the Greek word *genike* never meant *genitivus*. *Genitivus*, if it is meant to express the case of origin or birth, would in Greek have been called *gennetikē*, not *genikē*. Nor does the genitive express the relation of son to father. For though we may say 'the son of the father,' we may likewise say 'the father of the son.' *Genikē* in Greek had a much wider, a much more philosophical meaning. It meant *casus generalis*, the general case, or rather the case which expresses the genus or kind. This is the real power of the genitive. If I say 'a bird of the water,' 'of the water' defines the genus to which a certain bird belongs; it refers it to the genus of water-birds."—(*Lectures on the Science of Language.*) In English, the genitive or possessive case is marked by the addition of the letter *s*, preceded by an apostrophe: as, the king's son, my father's horse. When the plural ends in *s*, the additional *s* of the genitive is omitted, and only the apostrophe added; as, kings' sons.

GENIUS, *je-ne-us* (Lat., from *gigno*, I beget or produce), was the term applied by the ancient Romans to a class of spiritual beings which attended upon man. Every human being, according to them, had his special genius allotted to him at birth, to guide and direct him through life; and his general character and conduct was ascribed to the influence of his genius; hence the word came to signify the natural powers and abilities of men, more especially their natural inclination or disposition. In modern times it has come to be employed in a still more restricted and special sense, as signifying the very highest condition of the mental powers, the perfection of human intelligence. Like many other words of a similar kind, it is difficult or impossible to define it in words; but there is always associated with it the idea of creative or inventive power. According to Emerson, it is the "constructive intellect" which "produces thoughts, sentences, poetry, plans, designs, systems. It is the generation of the mind, the marriage of thought with nature." "In the right of genius is spontaneous; but the power of poetic or expressive in the most enriched and flowing nature implies a mixture of will, a certain control over the spontaneous states without which no production is possible." Genius produces what has never before been accomplished; "it is the advent of truth into the world, a form of thought now for the first time bursting into the universe, a child of the old eternal soul, a piece of immeasurable greatness." Its chief faculties are the reason and the imagination; and according as one or other of these faculties predominates, it becomes either scientific or artistic. "In the first case it seizes at once those hidden affinities which otherwise do not reveal themselves except to the most patient and rigorous application, and, as it were, intuitively recognizing in phenomena the unalterable and eternal, it produces truth." In the latter it seeks "to exhibit its own ideal in due and appropriate forms; it realizes the infinite under finite types, and so creates the beautiful." Genius is sometimes used to signify that talent or aptitude which we receive from nature for excelling in any one thing whatever. Thus we speak of a genius for mathematics as well as a genius for poetry; of a genius for war, for politics, or for any mechanical employment. The distinction between genius proper and talent is thus given by De Quincey:—"Genius is that mode of intellectual power which moves in alliance with *genial* nature, *i. e.*, with the capacities of pleasure and pain; whereas talent has no vestige of such an alliance, and is perfectly independent of all human sensibilities; consequently, genius is a voice or breathing which represents the total nature of man, and therefore his enjoying and suffering nature; whilst, on the contrary, talent represents only a single function of that nature." And hence, also, it is, that, "'besides its relation to suffering and enjoyment,

genius always implies a deeper relation to virtue and vice; whereas talent has no shadow of a relation to moral qualities, any more than it has to vital sense."

*Gens, jens* (Lat.), was a term applied, in ancient Rome, to a clan or party, which included several families under a bond of alliance, whose religious ceremonies, sacrifices, &c., were performed in common. Persons who belonged to the same *gens* were called *gentiles*, and those of the same family were distinguished by the term *agnati*. At first patricians only could have the honour of being *gentes;* but, after the law passed which enabled the plebeians to intermarry with the higher ranks, the latter class likewise were admitted to share in the clanship; and hence there were both patrician and plebeian gentes, which, of course, often assimilated, by reason of the intermarriage law. The *gens Cornelia* may be mentioned as an instance of a *gens:* it embraced the families of the Lentuli, the Scipiones, the Cethegi, and many others too numerous to mention.

GENTIAN. (*See* GENTIANA.)

GENTIANA, *jen-she-ai'-nă*, in Bot., the typical gen. of the nat. ord. *Gentianaceæ*. The officinal gentian, so well known for its bitter tonic properties, is the root of *G. lutea*, a native of the mountains of central and southern Europe. From gentian the Swiss prepare a spirit much prized by them as a stomachic. The genus is stated to have been named after Gentius, a king of Sclavonia, who discovered it

GENTIANACEÆ, *jen-she-in-ai'-se-e*, in Bot., the *Gentiana* fam., a nat. ord. of *Dicotyledones*, sub-class *Corollifloræ*. Herbs, or rarely shrubs, usually smooth. Leaves usually simple, entire, opposite, sessile, and strongly ribbed; rarely alternate, or stalked, or compound, always exstipulate. Flowers almost always regular, variously coloured, axillary, or terminal. Calyx inferior, persistent, usually with five divisions, occasionally four, six, eight, or ten. Corolla persistent, its divisions corresponding in number to those of the calyx; æstivation imbricate, twisted or in duplicate. Stamens as many as the segments of the corolla, and alternate with them. Ovary 1-celled, or rarely partially 2-celled, from the projection inwards of the placentæ, with numerous ovules; placentas 2, parietal, anterior and posterior to the axis, and frequently turned inwards; style 1; stigmas 2, right and left of the axis. Fruit capsular, 2-valved, with septicidal dehiscence, or a berry. Seeds numerous and small; embryo minute, in the axis of fleshy albumen. The order has been divided into two sections or sub-orders, the characters of which are taken from the æstivation of the corolla. These are, *Gentianeæ*, with the corolla imbricate-twisted, and *Menyantheæ*, with the corolla plaited, or in duplicate. The plants included in the order are found in nearly all parts of the world, even in the coldest and the hottest regions. A bitter principle almost universally pervades them; hence many are used medicinally for their tonic, stomachic, and febrifugal properties. There are 61 genera and about 750 species.

GENTILE, *jen'-tile* (Lat. *gentilis*, from *gens*, a nation), a term used in Scripture to denote a pagan, or worshipper of idols. The Jews classed all the inhabitants of the earth, with the exception of their own peculiar race, under the general name of *goim*, which is equivalent to the Latin *gentes*, nations; and after a time the term Gentiles began to be applied in a reproachful instead of a general sense. All who were not circumcised and Jews, were regarded as Gentiles or heathens, and as such they were excluded as much as possible from all those privileges and relations by which the Jewish nation became so exalted. As the Gentiles were, consequently, considered as outcasts and aliens from the favour of God, it is not much to be wondered at that the Jews were very prejudiced against a Saviour and a Gospel which inculcated the union of the two different sects, and placed the Gentiles on an equal footing with the Jews. Those of the Gentiles who embraced Judaism, but were not Jews, were called proselytes; and the term Greeks, which is used often in the New Testament, is sometimes identical with Gentiles.

GENTLEMAN, *jen'-tl-măn* (Fr. *gentilhomme*, from *gentil*, of good birth, and *homme*, man).—It is a matter of difficulty to give a correct definition of what entitles a man to the appellation of gentleman, or to determine a standard by which persons who claim to hold this rank, as undoubtedly it is, may be distinguished from those who possess no right to it. It is generally applied to all who compose the bulk of the great middle class of English society, consisting of professional men, merchants, and others largely engaged in trade and commerce, and all whose income or education raises them above the lower classes of the grading community. Strictly speaking, it is the title of one who bears coat-armour, and takes rank next to an esquire and above a yeoman, or, according to the definition given by Jacobs, in the *Law Dictionary*, "one who, without any title, bears a coat of arms, or whose ancestors have been freemen; and by the coat that a gentleman giveth he is known to be, or not, descended from those of his name that lived many hundred years since." It may therefore be said, with truth and justice, that one who inherits the right to bear coat-armour from his father, and his mother if she be an heiress, is *bonâ fide* a gentleman by indisputable right, and, if it were worth while to contest the point, is entitled to take precedence of all others to whom the title is conceded in virtue of their professional standing, income, or education. The original derivation of the word is from the Lat. *gentilis*, belonging to a tribe or *gens*, and *homo*, a man. In the early days of Rome, the inhabitants of that city were divided into two classes,—the *populus*, or that portion of the community in whom all power lay, and the *plebs*, or commonalty. The *populus*, or body of the patricians or nobles, was further divided into tribes or *gentes*, and each *gens* into families, all the members of which bore the common appellation of the tribe. To belong to a *gens* or tribe, was to take rank among the nobles, and in after-times, when the privilege of admission to a tribe was conceded to men of plebeian origin, it was equivalent to the grant of a title of nobility by letters patent from the crown in our own times. Hence the term *gentilis* was applied to all who were free-born, being descended from free-born ancestors and belonging to a noble family; while that of *vulgus vulgi*, without family or standing, was applied to men of low rank and origin, and those that were born of slaves. The term has been adopted in all European languages of which Latin forms the foundation-stone and parent stock; while it is found in our own language in the word "gentleman," and gives the clue to the meaning of the expression "gentle," well-born, in contradistinction to its opposite "simple."—Ref. *English Cyclopædia*.—Arts and Sciences.

GENTLEMEN-AT-ARMS, a band of fifty gentlemen who were enrolled by Henry VIII., in the year 1509, to attend strictly about the royal person. They were first denominated "spears," but were afterwards called "gentlemen pensioners," which name they bore until the year 1834, when they were called gentlemen-at-arms. The members are elected exclusively from officers in the army or navy, who enjoy their half-pay at the same time that they receive their pension as gentlemen-at-arms. The officers are a captain, who has £1,000 per annum; a lieutenant, with a salary of £500; a standard-bearer, with £310; a clerk of the cheque with £120; and forty gentlemen with £70 per annum each. The duty of the gentlemen-at-arms, in the present day, is principally to attend at drawing-rooms and levees; but when they were first originated, they had the exclusive privilege of bringing in the royal dinner, and placing the same on the table, a service which they still have the honour of performing at coronations; in reward for which latter service, the sovereign has often conferred the rank of knighthood on one of the officers or gentlemen of the band, ordering the fees for the same honour to be paid out of the treasury. Their uniform is decidedly military, and very similar to that of the foot-guards, although on some occasions it has been assimilated with the prevailing costumes of the day.

GENUS *je'-nus* (Lat.), in Zool., a distinct group of species, allied by common characters and subordinate to an order, family, tribe, or sub-tribe. A genus is often an arbitrary group, since, although it is a natural assemblage, nearly every naturalist has his own views with regard to the propriety of uniting or separating particular assemblages of species. The synonymy of genera has thus become more copious as the study of

natural history has progressed, and presents one of the difficulties which the student of zoology has to contend against. (*See* SPECIES.)

GENUS, in Bot., the term *genus* is applied to a collection of species of plants which resemble one another in general structure and appearance, more than they resemble any other species. Thus the various kinds of brambles constitute one genus; the roses, another; the heaths, willows, clovers, oaks, and so forth, form also, in like manner, so many different genera. The characters of a genus are taken exclusively from the organs of reproduction, while those of a species are derived generally from all parts of the plant. Hence a genus may be defined as an assemblage of species which resemble one another in the structure and general characters of their organs of reproduction. It does not necessarily happen that a genus should contain a number of species; for if a single one presents peculiarities of a marked kind, it may of itself constitute a genus.

GEOCENTRIC, *je-o-sen'-trik* (Gr. *ge*, the earth, and *kentron*, a point, centre), an expression that is applied to the position of a planet as it would appear to an observer stationed at the centre of the earth. It is opposition to the term *heliocentric*, which is used to denote a planet's position as it would be seen by an observer at the centre of the sun.

GEODE, *je'-ode* (Gr. *geoides*, earthy, from *ge*, the earth), in Min., a term applied to a round lump of agate, or other mineral, or to a mere incrustation of the same. Its interior is sometimes empty, and in that case the sides of its cavity are lined with crystals, as in agate balls. Sometimes it contains a solid movable nucleus, and sometimes it is discovered to be filled with an earthy matter different from the external envelope.

GEODESY, *je-od'-e-se* (Gr. *ge*, the earth; *daio*, I divide), that science which enables us by measurement and direct observation to determine approximately the shape or figure of the earth, and ascertain the area of its entire surface, or any part of it, as well as the variations in the force of gravitation at different part of the earth. The figure of the earth was known to be nearly spherical some time prior to the Christian era, and even in the present day we are taught to consider its form to be that of a regular oblate spheroid, or sphere flattened at the poles, which is a sufficiently close approximation to its actual shape for all general and practical purposes. If the latitudes and longitudes of places on the earth's surface, deduced from geodetic measurements, coincided with those obtained from astronomical observations, the form of the earth would be that of a regular spheroid of rotation, but there is such a difference in the results obtained by the two methods, that no regular shape can be assigned to the earth by which these results can be reconciled. The measurements of arcs of the meridian that have been made during the 18th and 19th centuries, in various parts of the world, have, however, tended to show that the diameter of the earth from pole to pole is, to its diameter at the equator, as 299 to 300; but they have also served to prove that there is a dissimilarity of shape between the northern and southern hemispheres, and that the curvature of the earth's surface is different in meridional arcs of either hemisphere, that are at a great distance from each other; which shows that the earth cannot be a regular spheroid. The discrepancies in the shape of the hemispheres, and the irregularity of curvature in different parts of the same hemisphere, can only be accounted for by the supposition that the earth was once in a fluid state, and that the irregularity in the cooling, and consequent consolidation of various parts, had produced a corresponding irregularity of form in its surface, and a departure from the uniform spherical shape, which it would have undoubtedly assumed under the influence of centrifugal force, if the whole mass had been homogeneous, and the conditions under which it had cooled had been the same at all parts of its surface. The following is a brief notice of some of the more important attempts that have been made to obtain accurate measurements of arcs of the meridian at different parts of the earth's surface, with some account of the method by which trigonometrical surveys are made for this purpose, and for determining the area and obtaining correct delineations of large tracts of country. Eratosthenes was the first who attempted to determine the length of a geographical degree, about 230 B.C. A degree was also measured in the plains of Mesopotamia, rather more than a thousand years after, by order of the caliph Al Mamoum; and in 1617 Willebrod Snell measured a degree of the meridian at Leyden, and estimated it at about 66·75 English miles. There were, however, some errors in Snell's calculations, which he had detected himself, but which he was prevented from correcting by his death in 1626. In 1633, Norwood measured the meridian from London to York, and obtained a tolerably accurate value of the degree. In 1671, Picard and La Hire effected the measurement of the meridian between Amiens and Paris, and obtained a result of 69·1 English miles as the length of a degree. This was followed, in the commencement of the 18th century, by the extension of the measurement of the meridian began by Picard, to Dunkirk towards the north, and Collioure, in the Pyrenees, towards the south, when James Cassini, under whose direction the operation was completed, found the length of a degree between Paris and Dunkirk to be rather less than the result which was obtained by Picard, and also less than the length of a degree between Paris and Collioure, which gave rise to an idea that the length of a degree of the meridian must grow less in proportion to its distance from the equator, instead of greater, as it must do of necessity if the form of the earth be that of an oblate spheroid. This caused Cassini and others to conjecture that the earth must be in the form of a prolate spheroid; but this idea was shown to be erroneous by the measurement of an arc in 1736, in Lapland, to the north of the Gulf of Bothnia, from which it appeared that there was an increase, instead of a decrease, in the length of a degree of the meridian in proportion to its distance from the equator, although it was discovered that their computation erred in excess when a re-measurement of the arc was made by Svanberg in 1802. While Maupertuis was measuring an arc of the meridian in Lapland, Bouguer and La Condamine, assisted by some Spanish officers, were performing the same operation near Quito, in Peru, an iron toise being used as the standard of measurement, which has since been adopted as the standard for the expression of the length of the greater number of the degrees that have been measured on the continent, all of them, indeed, having been ultimately referred to this as the unit of measurement. In the measurement of the arc effected in Peru, the length of a degree was found to be about 68·72 English miles by the French mathematicians, and rather more by the Spaniards. The results, however, of the two measurements effected simultaneously in Peru and Lapland went far to prove that the form of the earth was that of an oblate spheroid. In 1752, Lacaille measured an arc of the meridian at the Cape of Good Hope, from which operation he obtained a result nearly equal to the length of the degree measured by Picard between Paris and Amiens, although the scene of his labours was about 30° south of the equator, while that part of France selected by Picard is 5° to the north of it; and, according to the received theory of the oblate-spheroidal form of the earth, the length of the degree measured at the Cape ought to have been less than that which was assigned to it by Lacaille. The discrepancy has, however, been accounted for and explained by Maclear, who has lately remeasured Lacaille's arc. In 1791 the arc of the meridian of Paris was remeasured from Dunkirk to Barcelona, by order of the French Convention, to establish the length of the metre, the new French standard of measurement, which was to be the ten-millionth part of a quadrant of the meridian. This was carried out with great care by Delambre and Mechain; but an error has since been discovered in the work, which affects the length of the measured arc to the extent of nearly sixty-eight toises, and makes the mètre to be shorter than it should be by a very small and trifling fraction of its present length. The trigonometrical survey of the British Isles was brought about by the means taken to establish a connection between the observatories of Paris and Greenwich, which was effected by carrying a series of triangles from Greenwich to Dunkirk: this was performed by General Roy with great accuracy. The survey itself was commenced in 1791 by Colonel Williams and

General Mudge, and has been continued by General Colby, Colonel Hall, and Colonel James, who have been successively superintendents of the Ordnance Survey. In connection with the survey, an arc of the meridian was measured from Dunnose, in the Isle of Wight, to Saxaford, in the Shetland islands; embracing an extent of nearly 10° 13′, the length of the arc being found to be a little more than 706¼ English miles. In the course of this survey, bases of verification were measured on Hounslow Heath, Salisbury Plain, and Misterton Carr in England; on Rhuddlan Marsh, in Wales; on Belhelvie Links, near Aberdeen, in Scotland; and on the shores of Loch Foyle, in Ireland. The base on Salisbury Plain was remeasured in 1849. The trigonometrical survey of India was commenced in 1801, by Colonel Lambton, who measured an arc of the meridian from Punnee, near Cape Comorin, to Damargida, near Beder, in the Nizam's territories. He was succeeded by Colonel Everest, who continued the system of triangulation from Damargida to Kalianpur, in the plain of Seronj. Colonel Everest, however, considered that the work performed by Colonel Lambton and himself had not been carried out, from various causes, with that degree of nicety and precision which should distinguish works of this nature. He therefore recommenced his labours in 1830, from which the most satisfactory results were obtained an arc of the meridian having been most accurately measured by him, assisted by Captain Waugh and Captain Renne, from Kaliana, near the Himalayas, to Damargida, the difference of the results of the actual measurement of the basis of verification, and their length when computed from each other being but a few inches. The extent of the arc measured from Kaliana to Damargida, by Colonel Everest, was 11° 27′ 33″; while that from Damargida to Punnee, measured by Colonel Lambton, was 8° 53′ 40″; giving an entire length of 21° 21′ 13″. In Europe, during the present century, General Krayenhoff has made a trigonometrical survey of Holland, which is a continuation of Delambre's survey of France. A survey of the Russian empire has also been made, and an arc of the meridian has been measured under the auspices of the Swedish and Russian governments, extending from Fugolmes, on the Arctic Ocean, to Ismail, on the Danube. This includes that portion which was measured in Lapland by Maupertuis, and subsequently by Svanberg. It is the largest arc that has yet been measured on the surface of the earth, its length extending over 25° 8′. Two small arcs of the meridian have also been measured in Denmark and Hanover, with great care and accuracy; and an arc of the meridian of Königsberg, in Prussia, by Bessel, when he was engaged in connecting the triangulation of the Russian survey with that of Central Europe and France and England. By means of these surveys, all the principal observatories of the continent of Europe have been connected by a system of triangles, and the geodetical position of its chief cities, and most striking physical features, have been ascertained by actual measurement. In commencing a trigonometrical survey, the first thing to be done is to obtain a base-line, in terms of which the sides of the triangles and distances from station to station are to be computed. To effect this, a piece of ground is selected that is as level and open as possible. The extremities of the base are then marked by the intersection of lines on a plate of metal that is fixed on a block of wood driven firmly into the ground. The course of the line is determined by setting pickets in the ground between the extremities, in the manner adopted for setting out a straight line in surveying. (*See* SURVEYING.) The distance from one end of the base to the other is then measured with the most scrupulous care by means of chains or rods, with various appliances to correct their expansion or contraction under the influence of changes in the temperature of the atmosphere. The best of all the different kinds of measuring-rods that have been proposed for effecting this portion of the work with accuracy, seem to be the apparatus of compound bars of zinc and iron which Bessel used to measure the base for the Prussian survey; and that invented by Colonel Colby, consisting of bars of brass and iron, with steel tongues at right angles to the bars at either end, by which the base on the shore of Loch Foyle was measured. As





soon as the base has been measured from end to end, its length is ascertained on a great circle of the earth, in terms of the standard to which the measuring-rods have been referred. But in order that the results of different surveys may be more easily compared, the radius of this circle must be determinate, or, in other words, the radius of the earth at the level of the sea, and the length of the base obtained at a height above the sea-level, must be reduced to its length at the mean level of the sea, which is found by dividing the measured length of the base multiplied by the radius of the earth, by the sum of the earth's radius and the height above the sea-level at which the measurement of the base has been made. When this has been done, the triangulation is commenced, stations being chosen which form the angular points of the principal triangles. In doing this the sides of the triangles should be made as long as may be practicable, and angles that are very acute should be avoided; for if the length of the sides of the triangles be as great as may be possible, and their angles not too acute, but approaching as nearly as may be to an angle of 60°, there will be less liability to error, since a very slight discrepancy in the measurement of an extremely acute angle will give rise to considerable error in the length of any side of a triangle that may be computed from it; and in triangulation from any base, the greater the number of intermediate triangles, the greater will be the error of a distance computed through the whole system of triangles. After determining the stations, signals are erected, from which the angles of the triangles are measured by means of the theodolite. When the stations are at a great distance from each other, lamps with reflectors have been used as signals when the observations have been made by night; and plates or hemispheres of polished metal, or pieces of looking-glass, as in the heliotrope invented by Gauss, when they have been taken by day. In observations made by day, pieces of stones or wood have also been erected as signals which have been visible with a powerful telescope even at the distance of a hundred miles. When the observations have been made, the angles are reduced to the centre of the station, if the theodolite has been removed from the vertical line, passing through the signal itself, and forming its axis, to a point on either side of it, or in front of or behind it; and they are also reduced to the horizon by trigonometrical formulæ. They are also further corrected with regard to spherical excess, and their relation to each other through the whole system of triangles, and the length of the sides of the various triangles is then computed by the aid of trigonometry. As it requires an extensive knowledge of the science of mathematics to enable any one to comprehend the minutiæ of the operations, and the calculations by which geodetic surveys are effected, and the results obtained, it will be manifestly out of place here to give more than the above brief notice of the more practical features, in such an elaborate and difficult operation, that may be intelligible to the general reader, and to refer those who may desire a greater insight into the science, to works written by those who have been engaged in carrying out the chief trigonometrical surveys in England and Wales, and on the continent. It should, however, be mentioned, that, in obtaining data for delineating the physical features of a tract of country contained within the limits of each of the great triangles of the entire survey, the surface thus bounded is subdivided into smaller or secondary triangles, and the position of the intermediate objects effected by the methods adopted in ordinary surveying.—*Ref.* Delambre's *Méthodes Analytiques pour la Détermination d'un Arc du Méridien*; Puissant's *Traité de Géodésie*; *English Cyclopædia*,—Arts and Sciences; *Encyclopædia Metropolitana*,—Figure of the Earth; Everest's *Account of the Measurement of Two Sections of the Meridional Arc of India*; Clarke's *Account of the Principal Triangulation, &c., relating to the Ordnance Survey of the British Isles.*

GEOGNOSY. (*See* GEOLOGY.)

GEOGRAPHICAL DISTRIBUTION OF ANIMALS. (*See* DISTRIBUTION OF ANIMALS.)

GEOGRAPHICAL DISTRIBUTION OF PLANTS. (*See* PLANTS, DISTRIBUTION OF.)

GEOGRAPHY, *je-og'-rif-e* (Gr., from *ge*, the earth,

and *graphe*, a description), is that science by means of which we obtain a knowledge of this earth, both as it is in itself and as it is connected with a system of other similar bodies. It comprises a knowledge of its figure and dimensions; of the natural features, divisions, and productions of its surface; of the position of the various places upon it; and of its various inhabitants. It is usually arranged under three principal branches,—Mathematical, Physical, and Political. *Mathematical Geography* deals with the earth principally in its planetary relations, as a member of the solar system; a great part of this being common to it with astronomy; and hence it is sometimes termed astronomical geography. It treats of the figure, magnitude, density, and motion of the earth; of the movements of the other heavenly bodies which exert an influence upon it; the relative positions and distances of the various places upon its surface; and the representation of the whole or portions of its surface upon globes or maps. By mathematical geography, we ascertain that the earth is spherical in form, or rather what is called an oblate spheroid, being a little flatter at the poles than at any other part of its circumference; that its mean diameter is 7,913 English miles, the equatorial exceeding the polar by 26 miles; that its orbit round the sun is slightly elliptical, while its mean distance from that luminary is about 95,000,000 of miles; that it performs its revolution in 365 days, 5 hours, 48 minutes, 50 seconds, the mean rate at which it travels being about 68,000 miles an hour; that the earth has also a motion round its own axis, which it completes every twenty-four hours, and that it revolves round the sun with its axis constantly inclined to the plane of its orbit at an angle of 66° 32'. To the former of these motions we are indebted for day and night; to the latter, for the vicissitudes of the seasons. In order to determine the relative positions of different places upon the earth's surface, geographers have supposed certain lines or circles traced upon it. One of these, the equator, being equally distant from both poles or points of rotation, divides the earth into two hemispheres,—the northern and southern. Another encircling line, drawn at right angles to the equator and passing through the poles, divides it into the eastern and western hemispheres. Parallel to the equator and numbered from it, are the lines or degrees of latitude, of which there are ninety in the northern, and as many in the southern hemisphere. The equator is divided into 360 equal parts, and lines drawn perpendicularly from the points of division to the poles constitute the lines or degrees of longitude. They are numbered east and west from a certain meridian, as that of Greenwich, Paris, Washington, &c. The meridian of a place is a line passing through that place to the poles at right angles to the equator. All places lying in the same latitude have equal length of day and night at the same time, while all places in the same longitude have mid-day at the same time. Degrees of latitude and longitude are of the same length at the equator; but the former, on account of the flattening of the surface of the globe, are slightly diminish in length as they recede from the equator. The length of a degree of longitude at the equator is 69·06 English miles. Each degree is divided into 60 equal parts termed minutes, and every minute into 60 equal parts termed seconds; marked thus, ′ ″. On maps, the latitude is denoted by figures at the sides, the longitude by figures at the top and bottom. The top of a map is the north, the bottom the south, the right hand the east, and the left hand the west. As the earth revolves round the sun with its axis constantly inclined to the plane of its orbit at a considerable angle, it follows that the sun does not remain perpendicular to the equator; but is one half of the year to the north and the other to the south of it. An imaginary circle, marking the sun's vertical position with regard to the earth, is termed the ecliptic, and cuts the equator obliquely at two points, termed the equinoctial points or nodes, the sun being then vertical to the equator. The vernal equinox occurs on the 21st of March, the autumnal on the 21st of September. The sun is vertical at different times of the year to all that portion of the earth's surface lying between 23° 28′ N. and 23° 28′ S. of the equator; and this region being subject to the greatest amount of heat, is called





the Torrid Zone, and is bounded on the north by a circle termed the Tropic of Cancer, and on the south by another termed the Tropic of Capricorn. The sun is on the parallel of 23° 28′ N. on the 21st of June and on the parallel of 23° 28′ S. on the 21st of December, termed respectively the summer and winter solstice. From this inclination of the earth's axis, it also follows that the whole region within 23° 28′ of either pole, or, in other words, above 66° 32′ of N. or S. latitude, is, for a certain period of the year, involved in continuous night or continual day. The northern of these regions is termed the North Frigid Zone, and is bounded by the Arctic circle; the southern, the South Frigid Zone, and bounded by the Antarctic circle. Between the tropic of Cancer and the Arctic circle is the North Temperate Zone; and between the tropic of Capricorn and the Antarctic circle is the South Temperate Zone.—*Physical Geography* comprehends a description of the principal features of the earth's surface, as consisting of land and water, the different animal and vegetable products; climate, elevation and direction of mountain-chains, &c. (*See* PHYSICAL GEOGRAPHY.) *Political Geography* describes the countries and nations of the earth as they are politically divided, and deals with mankind in their social aspect and organization. It gives an account of the laws and government of the different countries, their language, religion, civilization, resources, all of which fell to be treated of in the previous volume of this work, under the names of the different countries. Geography, in its practical application, "has for its object the determination of all those facts, as to any given country, which will enable us to judge of its fitness to provide man with food and to promote his civilization." It is thus a subject of the utmost importance; for it is well known that outward circumstances exert a very manifest influence upon mankind. The climate and physical characteristics of a country determine, in a good measure, the nature of its inhabitants, and its productions guide their pursuits. In order to convey a minute and correct account of a country, it is necessary for the geographer to separate the different parts from each other, and give a particular account of each, following some general plan. The following plan will be found to be pretty complete; but of course it may require to be more or less modified, to suit particular cases.—*Physical features:* including an account of position, extent, and natural divisions of the country; its boundaries; the extent and character of its coast; the height, form, and direction of its mountains; the extent and elevation of its plains; the character of its valleys; the length, direction, size, and velocity of its rivers; the nature and extent of its lakes and marshes; its springs.—*Climate:* account of, including variations of temperature; fall of rain; direction of prevailing winds; atmospheric pressure.—*Geology:* comprising an account of its geological formation, its various mineral resources, and the character of the soil.—*Botany and Zoology:* the number and distribution of the various species of animals and plants, their uses as ministering to the necessities or comforts of the people, as supplying them with materials for labour, or as furnishing them with articles of trade.—*Agriculture:* the extent of cultivated land, heaths, forests, pastures, &c; state and progress of agriculture; modes of cultivation; agricultural implements; fertility of the soil; the different kinds of crops; their amount, and the proportion they bear to the wants of the people; the number of the various kinds of cattle, and their uses in agriculture or domestic economy.—*Mining:* the number, character, and productiveness of the mines; the quantities and values of the different ores raised; the progress of mining, and the modes of carrying on operations.—*Fisheries:* the various kinds of sea and river fisheries; their importance, and the means and manner of prosecuting them.—*Manufactures:* their progress and present state; the different branches of manufacture; their principal seats; their importance as contributing to the wealth of the country, or as affording employment and means of subsistence to the people; the amount and value of the labour expended upon them; the machinery employed; how far the raw materials are home-produced or imported; how far the manufactured articles are necessaries or luxuries; and how far they are for home consumption, or for exportation.—*Commerce:* the amount of the exports and

imports; the quantities and values of the principal articles; the principal ports; the countries with which trade is chiefly carried on, and the principal articles exported to or imported from each; by whom or under what flags the trade is principally carried on; how far the imports are necessaries or luxuries; how far for direct consumption, for manufacture, or for exportation; how far the exports are raw or manufactured goods, are the natural production of the country, or imported or manufactured. It comprehends also an account of the nature, amount, &c., of the internal or coasting trade.—*Facilities for Commerce:* the amount of shipping belonging to the country, distinguishing sailing from steam vessels; the character of the harbours; length of the navigable rivers and canals; nature and length of the roads and railways; nature of the conveyances.—*Population:* the number of the people at different times; the different races; rate of increase; emigration and immigration; proportion of births and deaths; proportion of the sexes, and the marriage relations; the different ages of the population; the average duration of life, and how affected by locality, climate, occupation, or mode of life; the nature and prevalence of certain diseases; the proportion of the population to the production, wealth, and consumption of the country.—*Social Condition:* the general character, disposition, and habits of the people; their manners and customs; their progress in civilization; the different classes of society; their numbers and relations to one another; the social condition and intellectual and moral culture of each; the number of houses; distribution of wealth and power; occupations of the people; the proportion of capital to labour, skilled and unskilled labour; wages; price of provisions; amount of chief articles of consumption; national vices; pauperism.—*Language and Literature:* character and growth of the language; different dialects; affinity with other languages. The character, condition, and progress of its literature, the several branches in which it is principally distinguished; names of the principal authors; different classes of publications; literary associations; public libraries; restrictions on literature, or liberty of the press.—*Science and Art:* state and progress of, branches in which the country is chiefly distinguished, institutions for the promotion of, as academies, scientific associations, museums, picture-galleries, &c.—*Government:* its nature, form, and progress; the legislative, judicial, and executive functions, in whom vested, and how carried out; the character of its laws; the political divisions of the country; how far and in what way the different classes of the people are represented; public works, and other means adopted by government for the encouragement of industry and commerce, or for promoting the social and intellectual progress of the people.—*Religion:* its character, condition, and history; its connection with the State; toleration; the various religious sects; number of churches, and extent of accommodation; the various classes of the clergy; their emoluments; the amounts and sources of the church revenues, as provided by the State, by voluntary contributions, &c.—*Education:* the number and character of the various seminaries of education; their efficiency; how supported; fees; the number of teachers; their incomes; number and ages of the scholars, and their proportion to population, especially between the same ages; how far the State controls or interferes with education.—*Crime:* state of crime; different classes of offences; the social condition of offenders, age, sex, education, &c.; number of convictions; proportion of convictions to committals; the different kinds of punishment; means employed for the punishment or detection of crime; prisons, reformatories, police, &c.—*Defence:* the natural defences of the country; its fortresses, &c.; the amount and efficiency of its army, navy, militia, &c.—*Finances:* amount of national debt, its nature and growth; the various sources of revenue, the gross and net amount received from each; proportion of income to expenditure; the various branches of expenditure.—*Taxation:* amount of; its character, as direct or indirect; its several branches, the articles on which imposed; how levied; expenses of collection; how far protective or retaliatory; effects on industry or commerce; recent alterations, and consequences of.—*Money, &c.:* the weights, measures, moneys, &c., of the country, and their equivalents; banks and banking system, &c.—*Antiquities:* the different classes of antiquities; their character and age; their state of preservation, &c. Information on these various points, so far as they may be applicable to any particular state or country, is necessary, in order to a thorough geographical knowledge of it, *i. e.*, physically and socially,—in order to understand its present position, to trace the various circumstances by which it has arrived at that state, and to acquire some knowledge of the action and re-action that is constantly taking place among its various elements. The sphere of the geographer is thus a very extensive one, and demands of him to be familiar with a vast variety of subjects.

GEOLOGY, *je-ol'-o-je* (Gr. *ge*, the earth; *logos*, discourse or reasoning), that department of natural science which embraces all that can be known of the constitution and history of our planet. In the words of Mr. J. Beete Jukes, it is not so much one science as the application of all the physical sciences to the examination and description of the structure of the earth, the investigation of the processes concerned in the production of that structure, and the history of their action. The fact that geology rests upon all the natural sciences accounts for its modern origin. It was not till some very considerable advances had been made in all the sciences which relate directly to the earth, that geology could begin to exist in any worthy form. It was not till the chemist was able to explain to us the true nature of the mineral substances of which rocks are composed; not till the geographer and meteorologist had explored the surface of the earth, and taught us the extent and the form of land and water, and the powers of winds, currents, rains, glaciers, earthquakes, and volcanoes; not till the naturalist had classified, and named, and accurately described, the greater part of existing animals and plants, and explained to us their physiological and anatomical structure, and the laws of their distribution in space,—that the geologist could, with any chance of arriving at sure and definite results, commence his researches into the structure and composition of rocks, and the causes that produce them, or utilize his discoveries of the remains of animals and plants that are inclosed in them. He could not till then discriminate with certainty between igneous and aqueous rocks, or between living and extinct animals; and was, therefore, unable to lay down any one of the foundations upon which his own science was to rest. To enable our readers to form a clear conception of the scope and methods of geology, we take the liberty of quoting the philosophical and lucid explanations given by the writer already alluded to. "There is another, and a more restricted sense of the word geology, than the wide and general one in which we have been using it. This sense is rather the one formerly attached to the word *geognosy* (Gr. *ge*, the earth, *gnosis*, knowledge), by which we may understand the knowledge of the nature and position of the different masses of earthy and mineral matter of which different districts and countries are composed, without reference to the history of their production. This was the early and simple meaning of the word geology, when considered as synonymous with geognosy; namely, the examination and description of the different varieties of rocks, and the minerals they contained. Geology was looked upon in the light of a geographical mineralogy; and even yet it is regarded more or less under this aspect by many persons. No one, indeed, could have anticipated, from the mere study of masses of stone and rock, where, to a partial and local view, all seems confusion and irregularity, the wonderful order and harmony which arise from more extended observation, and the almost romantic, and seemingly fabulous, history which becomes at length unfolded to our perusal. To discover the records on which this history is founded, and to understand their meaning aright, frequent long-continued and wide-spread observation and research in the field, and patient and conscientious registration of the observed facts in the closet, are absolutely necessary. This collection and co-ordination of facts it is which is the proper and peculiar business of the geognost. The ditch, the cutting, the quarry, and the mine; the cliff, the gully, and the mountain-side, are

his *subjects*. These he has to study, to examine, to dissect, to describe the minutiæ of the structures they expose, and to classify and arrange the facts they may afford, depicting their lineaments on maps and sections, and recording them in written descriptions. The business of the geognost, then, is to make out, from indications observed at the surface, and in natural and artificial excavations, the internal structure, the *solid geometry* of district after district, and country after country, until the whole earth has been explored and described. If, while so doing, he notes all those facts which may enable him or others to understand and explain how that structure has been produced, he then becomes a geologist. It might at first be thought that, in order to make out the solid structure of lands and countries, it would only be necessary to understand the nature of the mineral matters of which they were composed, and that, for this purpose, no knowledge of organic or living beings would be required. It is, however, one of the most remarkable results of geological science, that an acquaintance with organic, and especially with animal forms, is at least as necessary for a geologist as a knowledge of minerals, and that a correct knowledge of organic remains (portions of fossil plants and animals) is a more certain and unerring guide in unravelling the structure of complicated districts than the most wide and general acquaintance with inorganic substances. The cause of this necessity, puzzling and paradoxical enough, perhaps, at first sight, may be briefly stated as follows. When we come to examine the crust of the globe, we find that its several parts have been produced in succession; that it consists of a regular series of earthy deposits (all called by geologists rocks), formed one after another during successive periods of time, each of great but unknown duration. Now the mineral substances produced at any one period of this vast succession of ages do not appear to have had any essential difference from those formed at another. We cannot, therefore, with any certainty, discover the order of time in which the series of rocks was formed, or the order of superposition, which they consequently preserve with regard to each other, from an examination of their mineral character or contents only. The animals and plants, however, living at one period of the earth's history were different from those living now, and different from those living at other periods. There has been a continuous succession of different races of living beings on the earth, following each other in a regular and ascertainable order; and when that order has been ascertained, it is obvious that we can at once assign to its proper place of production, and therefore to its proper place in the series of rocks, any portion of earthy matter we may meet with, containing any one, or even any recognizable fragment of one, of these once living beings. Just as when we find under the foundation-stone of any ancient building a parcel of coins of a particular sovereign, we know that the erection of that building took place during his reign; so when we find a fragment of a known *fossil* in any piece of rock, we feel sure that that rock must have been formed during the period when the animal or plant of which that fossil is a part was living on the globe, and could not have been formed either before that species came into existence or after it became extinct. In cases, therefore, where the original order of the rocks has been confused by the action of disturbing forces, or where the rocks themselves are only at rare and wide intervals exposed to view, their order of deposition and consequent succession of places, may be more easily and certainly ascertained by the examination and determination of their fossil contents than by any other method." Geology may be viewed in three great aspects,—Descriptive, Theoretical, and Practical; *Descriptive Geology* being that which restricts itself to a consideration of facts and appearances as presented in the rocky crust; *Theoretical*, that which attempts to account for the phenomena, and arrange them into a connected world-history; and *Practical*, that which, guided in its researches by the other two, treats of the mineral products of the globe, the methods of obtaining them, and their application to industrial or economic purposes. As a main topic, geology may also be conveniently studied under the three sub-sciences,—*Physical Geography*, *Mineralogy*, and *Palæontology*;





the first treating of the surface-configuration of the globe as depending on geological influences, the second restricting itself more particularly to a consideration of the mineral substances which enter into the composition of the crust, and the third devoting itself exclusively to a consideration of the fossil plants and animals found in the rocky strata. Each of these subsciences can be studied intimately in detail as separate departments; yet it must be seen at a glance that without an intimate acquaintance with all the three, there can be no true knowledge of geology. Those who are anxious to study this grand and useful department of natural science cannot choose a better guide than Mr. David Page, who has produced an "Introductory Text-book" for beginners, an "Advanced Text-book," and a "Hand-book of Geological Terms," three works of remarkable excellence. With the light of the "Advanced Text-book," an earnest student may obtain a thorough insight into geology, and soon fit himself for studies in the field. The "Physical Geology" of Mr. J. Beete Jukes is an admirable work for those actively engaged in examining a district. For the poetry and romance of geology, the reader is referred to the interesting works of the late Dr. Mantell, particularly to his "Wonders of Geology." Sir C. Lyell's "Principles of Geology," and the excellent treatises of Phillips, De la Beche, Austed, and Portlock, ought to be studied by the advanced student.

GEOMETRY, *je-om'e-tre* (Gr. *geometria*, formed of *ge*, the earth, and *metreo*, I measure), may be strictly defined to be the doctrine of the extension of such things as lines, surfaces, and solids. The attributes or properties of bodies may, in order to be more readily explained, be resolved into two classes, one comprising the general characteristics of all, and the other such only as are included in particular or peculiar bodies. Extension, figure, magnitude, mobility, divisibility, impenetrability, weight, and inertia, may be mentioned as some of the properties which belong to the first class; whilst some of those in the second are solidity, liquidity, transparency, and such-like. Of all these properties mentioned, only *extension*, *magnitude*, *figure*, and *divisibility*, come under the special branch of science denominated *Geometry*; the different properties which remain, coming under the head of Natural Philosophy, or Physics. The important science of geometry was first cultivated in Egypt, according to the testimony of Herodotus, which historian dates its origin from the following circumstance.—Sesostris, the king of Egypt, shared the lands at Thebes and Memphis between his subjects, and each portion was marked out by different landmarks, but, owing to the inundations of the Nile, these boundaries were frequently destroyed, and it became necessary, as often as this was done, to restore them by measurement; hence a system was invented, which was termed geometry. Thales, a philosopher who lived some 640 years before Christ, brought the science into Greece from Egypt, whither he had, it is related, gone in search of knowledge or rather a into period in life. He is said to have applied a circle to the measurement of angles, and to have instituted various comparisons and relations between triangles, by means of their proportions; one particular point he discovered too, that all angles in a semicircle are right angles, which must be looked upon as an important discovery, when it is taken into consideration that the science was yet in its infancy. After Thales came Anaximander, who is said to have invented geometrical charts, and the sphere and gnomon; next followed Anaximenes, who invented the sundial, and must thus have been acquainted both with astronomy and geometry. Pythagoras instituted the theory of regular solids; and under his school it was improved gradually during the two centuries which elapsed after the introduction of geometry, until the school of Plato took it in hand. Plato seems to have had the highest opinion of the science, and we read in the classics, that the inscription "Let no one ignorant of geometry enter here," was placed over the portals of his school. The theory of conic sections dates its birth from the Platonic schools, and to the same source may be ascribed the beautiful theory of *geometrical loci*, which is not only interesting from the hidden truths which it contains, but also from its importance in the solution of problems. The school of Aristotle cannot be said to have done

much towards the forwarding and improvement of geometry, although one of the writers of the same period has transmitted to us the only written accounts we possess; Eudemus having written a history of geometry in six books. The school of Alexandria is undoubtedly the first grand starting-point of geometry: it is justly celebrated in general history, but in mathematics its importance can hardly be over-rated. The school was founded shortly after the death of Alexander, when the vast empire which had been built up by that conqueror was dismembered, and the greater portion of it fell to Ptolemy Lagus, who established his capital in Egypt. His wealth and encouragement, coupled with the disturbed state of their homes, induced many of the Greek philosophers to place themselves under his protection; and amongst these was Euclid, who is entitled to one of the highest places in the history of geometry. Euclid's Elements are the foundation of the science, and all modern geometry is composed only of variations on his well-known theorems, axioms, and deductions. The writings of Archimedes are likewise most important; and although they are less studied in the present day, on account of their being less elementary than Euclid, yet they should be carefully conned by every mathematician, as they give a keen insight into the workings of ancient geometry —more so, in fact, than Euclid. The study of the mathematical sciences declined considerably in the 1st century of our era, but it regained its supremacy during the 2nd. Menelaus wrote on trigonometry and spherical geometry; and his work on the same reached us by means of a translation from the Arabic, which is in existence at the present day. Dr. Halley held Menelaus in great esteem, and prepared a careful edition of his works, which was published in 1758. From the 2nd century up to the 8th, geometry again languished considerably, and it was then taken up by the Arabians, as the Greeks had neglected it. It is from the Arabians, in fact, that some of the books of Euclid have been preserved for the benefit of science in general. The Persians have also possessed their geometricians, the most distinguished of whom was Nassir-Eddin al Tusi, who wrote a commentary on the great Euclid, which was published in Italy in the year 1590. The Hindoos appear to have been acquainted with some of the geometrical problems at even an earlier date than the Egyptians; but the evidence as to this is so obscure that much reliance cannot be placed on the fact. Geometry remained quiescent from the 8th century to the 17th, when it was again taken up with a similar zeal as that by which it was prosecuted in the old Greek empire. Lucas Valerius, an Italian, was the first who gave it his serious consideration; and his researches led him beyond the timeworn pathway in which his predecessors had been contented to work. He selected a subject which Archimedes seemed to have forgotten; namely the centre of gravity in solids, and he carried out his purpose in a very satisfactory manner. In England, geometry, or the spirit of it, seemed now to have been imbibed; and Robert Record was the author of the first book on the subject printed in this country, entitled the "Pathway of Knowledge;" Edward Wright, another geometrician, was the inventor of the "Mercator's Chart." Kepler was the first of the moderns, however, who thoroughly understood and enlarged his subject. He opened one of the unexplored pathways of science which had long been closed,—that of introducing the notion of infinity into science. The views of Kepler were eagerly adopted by Roberval and Cavalieri, and the earnest investigations of the three led to a fruitful harvest of discovery. The theory of tangents of Fermat, the differential calculus of Leibnitz, and the fluxional theory of Newton (*see* article on FLUXIONS), may be traced as consequences to the new views of Kepler. Guldin, a Jesuit, discovered the centre of gravity applicable to the measurement of solids formed by revolution; Galileo first suggested the *cycloid*; James Gregory was the author of the logarithmic curve; and Leibnitz showed the two properties of the catenary. Before the time of Newton, pure geometry and algebra were the only subjects on which mathematical students could exercise their genius; but his great and sublime discoveries opened a vast field for new studies. The fact of the orbits of the planets being in the form of ellipses, naturally connected their motions with the theory of conic sections; and this is ably portrayed in Newton's "Principia." From repeated tests, the truth of this was fully established, and the theory became generally understood: whence this first step served as a groundwork of reasoning in all speculations on physics, and geometry and astronomy became even more closely allied than the ancients presumed them to be. The principles of fluxions and the calculus may be said to have eclipsed the geometrical method in the investigation of natural phenomena after Leibnitz invented the Differentials; and this was because of the intricacy of the latter, which unfits it for the more delicate calculations in the higher branches of mathematics. In concluding this brief sketch of geometry, before entering on the subject itself, it may be mentioned that Euclid is one of the best treatises which could be had on the elementary part of the subject; and after him comes Legendre's Geometry, which admits the student into the higher ranks of the science. All notions of geometrical magnitude are obtained by means of contemplating a body or solid, which is extended in three different forms; that is, in length, in breadth, and in thickness. The outside boundary of a solid which separates that particular portion of space which it occupies from space in general, is termed the surface, or superficies, that is, the external area; and surface cannot be considered as possessing any other qualities except length and breadth. Sometime a surface is separated or divided into two or more parts within itself, by a boundary. This boundary is called a *line*, and has no other quality but length only. The termination of any line, which marks where it ends, or divides it into different portions, is termed a *point*, which possesses neither thickness, length, nor breadth. Solids, surfaces, and lines, therefore, are the subjects of geometrical investigation and discussion. There is no limit whatever to the number of these surfaces, solids, and lines which may be considered in this science. The elements of geometry, however, are restricted to a few, which include straight lines, circles, rectilineal plane figures, and their consequents, which constitute one branch of the science; and solids, bounded by planes, and the cylinder, the cone, and the sphere, all of which are formed by the intersection of planes, and which go to make up the other portion of the subject. Geometry is, consequently, divided into two branches, one of which treats of figures on a plane, the other of the formation and ramification of solids. 1st. *Lines and figures on a plane.*—Geometry treats on the properties and relations of quantities having or possessing the quality of extension; and such quantities are termed magnitudes, whilst extension is resolved into length, breadth, and thickness. A *point* has position, but no magnitude, and a *line* possesses only length: hence points and lines are closely allied; as the termination of every line, and the intersection of one line with another, must always be a point. A *straight line*, or *right line*, as it is termed in geometry, is always the shortest way from one point to another. Every line which is neither straight nor composed of straight lines, is a *curve line*. A *superficies* has only length and breadth; and, consequently, the extremities and intersections of superficies are always lines. A *plane superficies* is that in which any two points being taken, the *right line* drawn between them lies wholly in that superficies. Every superficies which is neither a plane, nor composed of plane superficies, is termed a *curve superficies*. A *solid* has length, breadth, and *thickness*; hence the boundaries of all solids are superficies, and the contiguous boundary to two solids which are connected is also a superficies. A *plane rectilineal angle* is the inclination of two straight lines to one another, which meet at one point, but are not in the same straight line. The point of meeting between them is called the *vertex* of the angle. Angles, in common with other quantities, admit of addition, subtraction, multiplication, and division. When one straight line erected on another straight line makes the adjacent angles equal to one another, then each of the angles thus formed is a *right angle*, and has 90 degrees; the line which makes them with the *base* is termed the *perpendicular*. An *obtuse angle* is that which is greater than a right angle; and an *acute angle* is less than a right angle. *Parallel straight lines*, which are

in the same line, are such as, when produced, can never meet. A *plane figure* is a plane terminated everywhere by lines; if the lines are straight, the space they inclose is termed a *rectilineal figure*, or *polygon*, and the lines themselves are termed the *perimeter* of the same. When this polygon has three sides (the least number it can possibly have), it is called a *triangle*; when four, a *quadrilateral*, when five, a *pentagon*, and so on An *equilateral triangle* is that which has three equal sides, an *isosceles* triangle has two sides equal, and a *scalene* triangle has all three sides unequal A *right angled* triangle has a right angle, and the side of the triangle opposite the angle is called the *hypothenuse* An *obtuse-angled* triangle has an obtuse angle, and an *acute angled* triangle has an acute angle Among quadrilateral figures, a *square* is that which has its four sides all equal to one another, and all its angles *right angles* A *rectangle* has all its angles right angles, but its opposite sides only are equal A *rhombus* has all its sides equal but its angles are not right angles A *parallelogram* or *rhomboid*, has its opposite sides parallel and equal and a *trapezoid* is a figure which has only two of its opposite sides parallel The straight line which joins the vertices of two angles which are not adjacent to each other is called a *diagonal* A polygon in which all its sides equal, is called a *regular* or *literal* polygon and if all the angles are all equal to each other, a *perfect* polygon, if both the angles and the sides of the polygon be all equal, it is called a *complete* polygon With regard to the terms used in geometry, an *axiom* is a proposition the truth of which is evident at first sight to the observer, a *theorem* is a truth which has been demonstrated or reasoned, and a problem is a question proposed which requires solution, a *lemma* is only a subsidiary truth employed in the solution of a problem or the demonstration of a theorem a *corollary* is a consequence which follows the demonstration of several propositions or problems solved as before a remark made upon one or more preceding propositions and it tends to show the application, the restriction or the extension of the same, an *hypothesis* is a supposition made in order to effect more easily the demonstration or enunciation of a problem or theorem lastly, the term *postulate* is applied generally to problems, theorems, and lemmas The *axioms* used in geometry are the same as those of algebra, the fundamental axioms on which the whole is based may be said to be six in number 1st Two quantities of which is equal to a third, must be equal to another.—2nd The whole of any thing is equal to all its parts taken together.—3rd The whole of any thing is always equal to the sum of its parts taken together.—4th. Only *one* straight line can be drawn between any two points —5th Two magnitudes, whether they are lines, surfaces, or solids, are equal, when applied to one another, they exactly coincide or fill the same space that is —6th All right angles are equal to one another. The application of the axioms, and the foundations of others, are laid down in the first and second books, whilst the properties of the circle occupy the third and fourth books of Euclid's Elements, and may be thus summed up —A *circle* is a plane figure contained by one line, which is called a *circumference*, and the characteristics of the figure are such that all lines drawn from its centre to its circumference are equal These lines are called *radii*, or *semi-diameters*, and the straight line which passes through the centre, and is bounded at either end by the circumference, is termed the *diameter*, and it divides the circle into two equal parts An *arc* is any portion of the circumference of a circle which is separated by a *chord*, or straight line, which does not pass through the centre A *segment* of a circle is the figure contained by an arc and its chord if the chord passes through the centre, then the segment will be a *semicircle* A *sector* is that part of a circle contained by an arc and two radii, drawn one to each extremity of the arc if the radii are at right angles to one another, then the sector is said to be a *quadrant* A straight line is said to be *applied* in a circle, when its extremities are in the circumference of the same. A rectilineal figure is *inscribed* in a circle, when the vertices of all its angles are on the circumference. A straight line is said to be a *tangent* to a circle, when it





meets it in one point only; and the point of meeting is styled the *point of contact*, A polygon is said to be described or *circumscribed* about a circle, when all its sides are tangents to the circle; and in this case the circle is said to be *inscribed* in the polygon. The drawing of tangents and chords are the most important propositions connected with the circle, and these are fully shown by Euclid *Proportion* is, however, the greatest of attributes which belong to plane figures. In comparing two quantities of the same kind, we are led, in order to have a just idea of their relative proportion, to inquire how often the less is contained in the greater magnitude When one contains the other a certain number of times, without leaving any remainder, the greater quantity is said to be a *multiple* of the less, and the latter is a *point* of the former: equimultiples are multiples which contain similar quantities a similar number of times, and are consequently equal to one another The relation between any finite magnitudes is termed *ratio*, and the two magnitudes compared, are the *terms* of the same; the first being called the *antecedent*, and the second the *consequent* of the ratio The terms of an equal number of ratios are called *proportionals* Thus, if four quantities, A, B, C, and D, are taken which are proportionals, A is said to be to B as C is to D, whence, A divided by B is equal to C divided by D, and so on The axioms with respect to proportion are three in number. 1 Equal quantities have the same ratio to the same quantity, and the same quantity has the same ratio to equal quantities.—2nd Quantities having the same ratio to the same quantity or to equal quantities, are equal to one another.—3rd Ratios equal to one and the same ratio, are equal to one another If four quantities are said to be proportionals by *inversion*, it is inferred that the fourth is to the third as the second is to the first By *composition*, is when the sum of the first and second is to the second as the sum of the third and fourth is to the fourth By *alternation*, when the first is to the third as the second is to the fourth By *division*, when the difference of the first and second is to the second as the difference of the third and fourth is to the fourth. By *conversion*, when the first is to the difference of the first and second as the third is to the difference of the third and fourth, and lastly, by *mixing*, when the sum of the first and second is to their difference as the sum of the third and fourth is to their difference The theorems of proportion in Euclid's fifth book applies alike to commensurable and incommensurable quantities but for the sake of simplicity, it is generally taken in the former sense *Equivalent figures* are such as are equal surfaces thus a circle may be equal to a square, and so on, although the figures are very dissimilar The last important branch of the geometry of plane figures, is the quadrature of the circle, on which depends the discovery of the relation between the diameter and the circumference of a circle, which was said have been known by the Chinese long before the Christian era The proportion between the circumference and diameter of a circle was found by constructing the proportion between the sides of an inscribed and circumscribed polygon about a circle; it being found that the areas of these differed so little, as to give very nearly the circumference of a circle; from which it was deduced, that if the diameter contains (1 part), the circumference will be 3 1415926, which is near enough for all practical purposes, although, for astronomy, it is necessary to have a larger number of places of decimals. The *second part* of the science of geometry concerns that relating to solids A *solid* has been already defined, as that which possesses length, breadth, and *thickness*, and in the latter characteristic, comprising its difference from a *plane* figure A *prism* is a solid contained by plane figures, of which two opposite ones are equal, similar, and parallel, and the others are parallelograms. The distance between the bases of a prism is termed its *altitude*. A *cube* is a rectangular parallelopiped, contained by six equal squares A *pyramid* is a solid contained by several planes which meet in the same point, and which terminate at the anterior extremity in a polygonal plane. An important theorem in solid geometry is, that the solidity of any parallelopiped, or, in general, of any prism, is equal to the product of its base and its altitude when multiplied together. Euclid treats on the elementary

sections of plane and solid geometry to his eleventh book, which contains most of the propositions and theorems on the subject The highest branch of geometry, although perhaps not the most useful to engineers, is undoubtedly that which treats of the cylinder, the cone, and the sphere A *cylinder* is a solid figure described by the revolution of a right-angled parallelogram about one of its sides which remains fixed The *axis* of the cylinder is the fixed straight line or side about which the parallelogram revolves; and the *bases* are the circles described by each extremity of the parallelogram A *cone* is a solid figure described by a right-angled triangle about one of the sides containing the right angle, which remains fixed A *sphere* is a solid figure produced by the revolution of a semicircle about its diameter, which remains fixed *Similar* cones and cylinders are such as have their axes and diameters of their bases equal or proportional In order to estimate the curvature of any surface at a proposed point, it may be observed, the surface of a sphere cannot be assimilated with the curvature of any surface whatever, because in the sphere the curvature is uniform about the same *normal*, whereas in surfaces in general this is far from being the case The mode of proceeding in such cases must, therefore be to imagine several planes drawn through the *normal* at the point under consideration, in order to calculate the radii of curvature of each of those sections at that point, and, by comparing them, to judge of the greatest and least curvature in those directions about the point, as well as towards what points the curvature is increased; for, curved surfaces contiguous to any point are situated partly below and partly above the tangent plane drawn to that point In making different planes pass through the same point of a surface, that some contain the normal to the surface and some do not, it will be found that the radii of curvature relative to that point, both of the normal and oblique sections, bear remarkable relations to one another independently of the particular form or curvature of the surface It would be impossible in the proportions of the present work to give even the rudiments of *analytical* geometry of *dimensions*, or to deduce the various propositions, theorems, and applications of Euclid's formulas, which, did space permit, might readily be done The reader is referred for more explicit information on the subject to Euclid's *Elements*, Newton's *Principia*, Hutton's *Mathematical Tracts*, Legendre's *Elements de Geometrie*, Hymer's *Analytical Geometry*, and Kepler's works which enter at large on both divisions of geometry both practical and theoretical (*See* also separate articles on CONIC SECTIONS ELLIPSE, FLUXIONS, GRAVITATION &c)

GEORGE, St, *jorge, scout*, the patron saint of England, was born in Epiphania, Cilicia or, according to some accounts, in Cappadocia, and was, during the latter years of his life, bishop of Alexandria Some historians, however, relate that St George was a soldier in the service of the emperor Diocletian, and that he suffered martyrdom along with many others on account of his embracing Christianity After the crusades, the fame of St George, who was termed by the Greeks "victorious," spread so much that, in the reign of Edward III, he became the patron saint of England In order to enhance his popularity among the illiterate, the fabulous story of St George and the Dragon was concocted as a reason for his canonization

GEORGICS, *jeorgiks* (Gr *georgika*, things relating to husbandry), is the title of a poem on agriculture and rural economy, by Virgil, in four books It is regarded as the most perfect of his works, and displays an intimate knowledge of the subject

GERANIACEÆ, *jeraniaseæ* (from Gr *geranos*, a crane), in Bot, the Crane's bill fam, a nat ord of *Dicotyledones*, sub class *Thalamifloræ* Herbs or shrubs with simple leaves membranous stipules, and articulated swollen joints Flowers usually symmetrical, sepals five, imbricated; petals twisted in estivation; stamens generally somewhat monadelphous. Fruit consisting of five carpels, attached by means of their styles to an elongated axis or carpophore, from which they separate when ripe from below upwards by the curling up of the styles. Seeds, one in each carpel, exalbuminous; embryo convoluted Some plants of this order are distributed over various parts of the





world, but the greater number are found at the Cape of Good Hope. There are now known and about 600 species, many very remarkable for the beauty of their flowers

GERANIUM, *je-rai-ne-um*, in Bot, the Crane's-bill, the typical gen of the nat. ord *Geraniaceæ*. The species are chiefly European plants, in many cases being mere weeds of no interest, and in others being extremely showy border-flowers The favourite plants called geraniums do not belong to this genus, but to the genus *Pelargonium* (which *see*). The root *G maculatum* is a powerful astringent, and is much used medicinally in North America, where it is called alum-root. *G pusillum* produces edible tubers, which are known in Van Diemen's Land under the name of native carrots

GERANIUM OIL (*See* ANTHROPOGON)

GER FALCON, or JER FALCON, *jer fauk'on* (Fr *gerfaut*) (*Falco Gyrfalco*), a species of falcon, considered as the boldest and most beautiful of the tribe In size it approaches closely to that of the osprey Its general colour is brownish grey, of varied tints above and white beneath, with brown longitudinal spots The tail is barred with a number of deeper and lighter bands, and the bill and legs are usually of a pale blue or yellowish colour Three varieties of the ger falcon are



GER FALCON.

mentioned by Buffon the first two are similar to the species above described, and the third is entirely white The ger falcon is a native of Russia, Norway, Iceland, and Baffin's Bay Of all the rapacious birds, except the eagle, it is considered the most formidable, the most active, and the most intrepid, it attacks the largest birds boldly, and when transferred from the coldest climate to the warmest, its strength is not diminished, nor is its vivacity checked in any degree

GERHARDT'S NOTATION, *ther hardts'*, a method of expressing chemical formulæ, proposed about twelve years ago, by an eminent French chemist, M Charles Gerhardt, and differing from that in general use by the doubling of certain equivalent numbers This system, which, at first, was somewhat slighted, has since gained ground in so remarkable a manner that it is easy to predict the result of the discussion now going on as to its merits between the most eminent chemists of all nations In this country it has been used for some time, both in teaching and writing, by such eminent men as Hofmann, Brodie, Williamson, Frankland, Odling, and many others, and has lately received an additional impetus by the publication of a Manual of Chemistry by the last-mentioned chemist, in which the system is adopted in its entirety In looking through a series of equivalents, side by side with the specific gravities of the elements to which they belong,

## Gerhardt's Notation

It will be seen that there is a discrepancy between the specific gravities and the equivalents of some few bodies. This will be plain from the following examples:—

| | *Equiv.* | *Spec. Grav.* |
|---|---|---|
| Hydrogen | 1 | 1 |
| Oxygen | 8 | 15·9 |
| Sulphur | 16 | 31·7 (vapour). |
| Chlorine | 35·5 | 34·9 |
| Bromine | 80 | 79·8 |

To remove this anomaly, M. Gerhardt doubles the equivalent numbers of oxygen, sulphur, carbon, selenium, and tellurium, on the assumption that *equal volumes of elementary gases and vapours contain the same number of atoms when compared under similar conditions of heat and pressure*; which is equivalent to saying that an atom of oxygen weighs sixteen times as much as an atom of hydrogen, because a cubic foot of the former gas weighs sixteen times as heavy as a cubic foot of the latter. According to this new system, therefore, the equivalents of oxygen, carbon, sulphur, selenium, and tellurium are doubled; and in most chemical books these doubled equivalents are indicated by a line drawn through the letter; thus—O C S Se Te.

A few compounds, formulated according to both systems, are given below; but, for convenience, the new equivalents are printed in italics:—

| | Old Formulæ. | New Formulæ |
|---|---|---|
| Water | HO | $H_2O$ |
| Potash | KO | $K_2O$ |
| Oxide of silver | AgO | $Ag_2O$ |
| Alumina | $Al_2O_3$ | $Al_4O_6$ |
| Sesquioxide of iron | $Fe_2O_3$ | $Fe_4O_6$ |
| Chloride of potassium | KCl | KCl |
| Sesquichloride of alumina | $Al_2Cl_3$ | $Al_4Cl_6$ |
| Hydrochloric acid | HCl | HCl |
| Sulphide of potassium | KS | $K_2S$ |
| Cyanogen | $C_2N$ | CN |
| Carbonic oxide | CO | *CO* |

Besides the change in the equivalents described above, Gerhardt revived and fully carried out a theory of the constitution of acids and salts, first propounded by Sir Humphrey Davy. According to the present theory, as first started by Lavoisier, Berzelius, and others, nitrate of silver would be formulated thus.—$AgO.NO_5$; being looked on as a compound of nitric acid and oxide of silver; but, on comparing this salt with its corresponding haloid, chloride of silver, a discrepancy occurs, which vanishes, if we consider nitric acid, as existing in nitrate of silver, to consist of $NO_4$ instead of $NO_5$. From numerous other anomalies, occurring chiefly in organic bodies, Gerhardt came to the following conclusions:—1. That every uncombined acid necessarily contained one or more equivalents of hydrogen.—2. That the bodies hitherto regarded as dry acids possessed no acid properties until united with hydrogen and oxygen.—3. That salts were formed by the substitution of one or more atoms of hydrogen, by one or more atoms of a metal, or some substance acting as such. Thus, the bodies known as $NO_5$, $SO_3$, and $CO_2$, are neutral and inert, until united with an equivalent of water, when they form respectively nitric, sulphuric, and carbonic acids.

| | *Old view.* | *New view.* |
|---|---|---|
| Nitric acid | $NO_5$ | $HNO_6$ |
| Sulphuric acid | $SO_3$ | $HSO_4$ |
| Carbonic acid | $CO_2$ | $HCO_3$ |

This brings the haloid and oxyacid salts into perfect harmony, both being regarded as acids in which the hydrogen is replaced by a metal.

$$HCl + K = KCl + H$$
$$HSO_4 + K = KSO_4 + H$$

or, in other words, the acid is regarded as the nitrate, sulphate, or carbonate of hydrogen, and the salt formed, as the nitrate, sulphate, or carbonate of the metal. Hence the terms nitrate of potassium, sulphate of sodium, and carbonate of ammonium, as used by Gerhardt's followers, instead of those in ordinary use.

## German Catholics

Gerhardt also originated the system of arranging compounds according to types, and fully worked out the theory of the formation of all bodies by the substitution of one element or group of elements by others of a similar character. (*See* SALTS, SUBSTITUTION THEORY, TYPES.)—*Ref.* Fowne's *Manual of Chemistry*, 8th edition, Appendix; Odling's *Manual of Chemistry*.

GERMAN CATHOLICS, *jer'-mân kăth'-o-liks*, is the name of a religious sect which has recently been formed in Germany, by secession from the Roman Catholic church. It originated in a proclamation of a special pilgrimage and service by Bishop Arnoldi, of Treves, to the holy coat of that city, to be accompanied by remission of sins. This proceeding called forth a letter from Johannes Ronge, an excommunicated priest of Silesia, dated 1st October, 1844, characterizing it as an idolatrous festival, and calling upon the bishop to suppress it. A short time before, another Catholic priest, Johann Czerski, had seceded from the Romish church, and attempted the foundation of an independent Christian congregation. The letter of Ronge met with many sympathizers, and a union having been effected between Ronge and Czerski, a number of congregations sprang up in a very short time, calling themselves German Catholics. The "Confession of Schneidemühl," drawn up by Czerski, Oct. 13, and presented to the government Oct. 27, 1844, rejected as unscriptural, and as merely human ordinances, the reception by the priests alone of the Lord's supper in both kinds; the canonization and invocation of the saints; indulgences and purgatory; fasting; the use of the Latin language in divine service; mass and vespers; the celibacy of the priests; the prohibition of mixed marriages; the supremacy of the pope, and other points. They declared themselves determined to sever their connection with the pope, to receive the Lord's supper in both kinds, and to recognize the Bible as the only rule of faith. They retained the seven sacraments and the mass, which they celebrated in the vernacular tongue. The "Confession of Breslau," which set forth the views of Ronge, proceeded further than that of Schneidemühl, —claiming free investigation of the Bible, and freedom of belief for every individual member. It regarded as essential doctrines only,—belief in God, the creator and governor of the world; in Jesus Christ, as having, by his doctrine, his life and death, redeemed men from sin and misery; and in the influence of the Holy Spirit upon earth. Of the sacraments of the Catholic church, it retained only baptism and the Lord's supper. A council met at Leipsic on the 22nd of March, 1845, in which Ronge, Czerski, and the delegates of twenty congregations, took part; and a new creed was adopted, based principally upon the Confession of Breslau. After that time the principles of German Catholicism spread very rapidly, being adopted not only by many Roman Catholic priests, but also by many Protestant clergymen and laymen. At the end of 1845, they comprised about 300 congregations. They, however, met with much opposition from the various governments, and many vexatious restrictions were imposed upon them in Prussia, Saxony, Bavaria, and other states. A more serious source of disquiet, however, arose among themselves. It has been seen that the tendency of Czerski was towards the doctrines and ritual of the Church of Rome; Ronge, on the other hand, approached towards rationalism. A series of dissensions, in this way, arose among the body, which was very prejudicial to their progress. An attempt was made to unite both parties in an assembly at Rawica, in the month of February, 1846, in which Czerski, Ronge, and others took part; but it had not the desired effect. The congregations sympathizing with Czerski met at Schneidemühl in the month of July in the same year, in order to effect a closer organization among themselves; but, from the great differences of opinion that prevailed among them, they were unable to come to any agreement. Nor were the followers of Ronge more successful in their attempts to effect the same object. A council was held at Berlin, in May, 1847, attended by deputies from 158 congregations, and new efforts were made to accomplish a union of the two parties, but with little better success. The revolution of 1848 was favourable to the German Catholics,

and generally led to the removal of some of the civil restrictions to which they were subjected. A conference was held at Köthen in 1850, at which an alliance was proposed with the free congregations which had formed themselves by secession from the Protestant churches; and a diet was fixed for 1852; but it did not meet. Since that time German Catholicism has been on the decline, partly on account of internal dissensions, and partly from oppressive measures adopted against them by the governments. Many congregations have been disbanded, while others have gone over in a body to the Protestant church. A conference was held at Gotha, Sept. 10, 1858, at which, however, only forty-two representatives were present.

GERMAN LANGUAGE AND LITERATURE (Ger. *Deutsche Sprache und Literatur*).—The German language is a branch of the Indo-Germanic class of languages, which separated from the parent stock at a very early period. The Germans called their language *Deutsch* or *Teutsch*, from their ancestors, the Teutons. In its widest sense the Teutonic consists of two branches,—the Northern, or Scandinavian, and the Southern, or German. The latter has three subdivisions,—the Eastern, or Gothic, the High German, and the Low German. The Gothic is the earliest of these of which we possess any literary remains, there being still in existence portions of a translation of the Bible into Gothic made by Bishop Ulfilas in the 4th century; but we possess nothing of the High or Low German till the 7th century. Hence many persons have been led to regard the Gothic as the original source of the German; but, according to Max Müller, the grammatical differences between the two are of such a nature as to show that this was impossible. "There never was," he says, "a common uniform Teutonic language, nor is there any evidence to show that there existed at any time a uniform High German or Low German language, from which all High German and Low German dialects are respectively derived." The Gothic language died out in the 9th century. The Low German (*Platt Deutsch*) comprehends many dialects in the north or lowlands of Germany, as well as the Friesian, Dutch, and Flemish dialects. The oldest literary document of Low German on the continent is the Christian epic the "Heljand" (Healer or Saviour), which is preserved to us in two MSS. of the 9th century. There are traces of a certain amount of literature in Saxon or Low German from that time onward, through the middle ages, up to the 17th century, but little of that literature has been preserved; and after the translation of the Bible by Luther into High German, the fate of Low German literature was sealed. High German (*Hoch Deutsch*) has been the literary language of Germany ever since the days of Charlemagne. Its history may be traced through three periods,—the Old High German, extending from the 7th to the 12th century; the Middle High German, from the 12th century to the time of Luther; and the New High German, from Luther down to the present time. In the present day there are various dialects of the German spoken in different parts of the country; as the Swabian, Bavarian, Franconian, Saxon, &c. (*See* Müller's *Lectures on the Science of Language*.) The earliest existing monument of German literature is the translation of the Bible into Gothic by Ulfilas, already alluded to. After the Gothic language ceased to be spoken, nothing was known of this work until towards the close of the 16th century, when a portion of it,—namely the four Gospels, was found in the abbey of Werden. The letters are in silver upon purple vellum; whence it is called the *Codex Argenteus*, and it is now preserved in the library of Upsala. Afterwards, in 1818, the Epistles of St. Paul, of the same work, were discovered by Cardinal Mai and Count Castiglioni in the monastery of Bobbio, in Lombardy. Of the translation of the Old Testament only a few lines remain. The earliest literature of Germany is known to us only by report or tradition. According to Tacitus, the Germans celebrated in songs, which were old even in his time, the praises of their national deity Tuisco, and his son Mannus, as well as the deeds of their great heroes. When the nations began to migrate, heroes of greater and greater renown march into the scene of song, and the historic forms of Attila, Theodoric, Günther, and others, appear. The two





most ancient German poems are the "Lay of Hildebrand and Hadubrand" and the Prayer of Weissenbrun, which belong to the 8th century. Many of the legends of this period were afterwards embodied in the lay of the "Nibelungen," the most celebrated production of German mediæval poetry. The introduction of Christianity exercised an important change in the early literature of Germany. The Latin language came to be that of the church, the court, and the law. A kind of religious poetry, after the model of the Roman poets, was introduced in place of the ancient heroic and mythical songs, and was fostered by the court as well as by the clergy. Charlemagne, indeed, was fondly attached to the ancient lays of his fatherland, and caused a collection of them to be made; but his successor, Lewis the Pious, looked upon everything German as heathenish; and the consequence was, the almost total destruction of every poem which bore a special mythological character. The "Heljand," a poem giving the life of Christ, was written at the instance of Lewis the Pious in the 9th century, and is one of the noblest productions of poetic genius that has ever appeared. Thirty years later appeared another sacred poem, known as the "Krist," composed by Otfried, a Benedictine monk of Weissenburg. Another poem of this period is the so-called "Ludwigslied," a poem in honour of the victory of the Frankish king, Lewis III., over the Normans in [illegible]. The other poetical remains of this period are chiefly of a religious nature, and, together with the contemporary prose literature, are not worthy of notice. Germany, by losing its French and Italian provinces, had become Germany again; and a desire to cultivate the national literature again began to manifest itself. The monks of St. Gall, Passau, and other places, translated some of the German epics into Latin verse; such as the poem of the "Nibelungen" of "Walther von Aquitaine," and of "Ruodlieb," the last two of which have been preserved and published. The stories of the fox Reinhart, and other animals, so peculiar to German poetry, attracted the attention of the monks; and it is [illegible] Latin translations that this curious style of poetry can be traced back so far as the 10th century. The 11th century presents almost an entire blank in the history of German literature. The old High German had become a literary language chiefly through the efforts of the clergy, and its character was pre-eminently [illegible]. The Crusades, however, put a stop to the [illegible] ment in the literature of Germany. The [illegible] emperors of the Hohenstaufen dynasty formed a rallying point for all national sympathies; and the interest of the people was with the knight not the priest. Poetry changed hands, and the [illegible] courts and knightly castles offered a new and more genial home to the poets of Germany than the monasteries of St. Gall and Fulda. Middle High German, the language of the Swabian court, became the language of poetry, and the poets took their inspiration from real life, though they borrowed their models from the romantic cycles of Brittany and Provence. The stories of Arthur and his Knights, of Charlemagne, of Achilles, Æneas, and Alexander, imported by French and Provençal knights, served them as their first models; and while foreign influence is seen in every branch of German poetry at this time, yet nothing can be more different than the same subject, as treated by French and German poets. The German Minnesänger, in particular, were far from being imitators of the Trouvères or Troubadours. Poets made bold for the first time to express their own feelings, their joys, and sufferings, and epic poetry had to share its honours with lyric songs. The poetry which flourished at the castles was soon adopted by the lower ranks, and the poems of the "Nibelungen" and "Gudrun," as we now possess them, were composed at that time by poets who took their subjects, their best thoughts and expressions, from the people; but imitated the language, the metre, and the manners of the court poets. Thus there are two kinds of poetry of this period,—the national, or people's poetry, the production of strolling minstrels; and the art poetry, or that of the courts, composed chiefly by kings and courtiers. Many of the poets were nobles by birth, several of them princes. Among the distinguished poets of this period, are Heinrich von Veldecke, Hartmann von Aue, Wolfram

von Eschenbach, Gottfried von Strasburg, and Konrad von Wurzburg. The fall of the Swabian dynasty of the house of Hohenstaufen, in the latter half of the 13th century, was the death-blow to German chivalric poetry. Lyric poetry continued to flourish for a time; but it degenerated into an affected sentimentality and unworthy idolatry of the ladies. Didactic poetry, however, began to be cultivated with some degree of success. The middle classes, the burghers of the free towns of Germany, were now beginning to rise into power, and poetry again changed hands. It now passed from the abodes of princes and knights to the homes of burghers and the workshops of artisans; and instead of the Minnesinger, we have the Meistersinger, and their strains were more subdued, practical, and homely. Poetry became a trade, like any other, and guilds were formed, consisting of master-singers and their apprentices. Henrich Frauenlob is called the first Meistersinger, and during the 14th, 15th, and 16th centuries, new guilds or schools were formed in all the principal towns of Germany. The poetry of the 14th and 15th centuries is uninteresting historically, but is not otherwise of [illegible] value. The best songs of the period are [illegible] Halbsuter and Veit Weber, celebrating the victories of Switzerland over Austria and Burgundy. Attempts were made to revive the spirit of the Crusades, both in the beginning and towards the close of the 15th century, but without success. In the 13th century, prose began to flourish, and several local chronicles, as well as works on jurisprudence, and some [illegible]. In the 14th century Germany possessed [illegible] mystic theologians, as Eckart and Tauler, of great intellect and energy of purpose, whose sermons and writings contributed to pave the way for the Reformation. In 1474, the first complete translation of the Bible into German was made by Matthias of Beheim. Another important event in this century, in its general influence upon the future progress of German literature, was the establishment of the university of Prague, which soon after by [illegible] universities in almost all parts of Germany. The literature was rich in [illegible] but poor in merit; [illegible] or strong thinker. During the latter portion of the [illegible] century, the art of printing was introduced, and in the 15th century, the works of [illegible] were [illegible] to the great mass of people. [illegible] about the prodigies [illegible] and [illegible] Bible [illegible] 1470 and [illegible] 1483 [illegible] editions of [illegible] were published [illegible] 1461 [illegible] Bible, [illegible] with the Bible [illegible] were written [illegible] the literature of Germany. Luther's [illegible] Bible [illegible] language and [illegible] [illegible], and its [illegible] expression. The religious [illegible] which agitated Germany during the 16th century gave to literature a theological cast; for, as the first scholars of that time were more or less engaged in religious controversy. Prominent in the class, after Luther himself, stand Zwingli, Johann Arnd, Bugenhagen, Bullinger, Melanchthon, and Ulrich von Hutten. Some of the best poets of the period, as Eoban Hessus, composed their poetry in Latin; and, indeed, there came out from the universities a tendency to exalt the Latin above their mother tongue, which was very prejudicial to the latter. The period before and after the Reformation was especially fruitful in satirical and allegorical works. One of the most remarkable of the former class was the "Ship of Fools" (*Narrenschiff*), by Sebastian Brant, a metrical satire on the follies of the age; and which was afterwards imitated by Thomas Murner, in his "Narrenbeschwörung" (Conjuration of Fools). The most able satirical and didactic poet of the 16th century was Johann Fischart, the author of numerous works; among which may be mentioned "Flohatz," a remarkably witty poem on fleas; and a romantic poem, "Das glückhafte Schiff." He has been called the German Rabelais. Of the popular songs (*Volkslieder*) of this period, some have been much admired. The works of Hans Sachs, the poet and cobbler of Nuremberg, display a very remarkable degree of fertility, liveliness, and humour. A great poet, in the strict sense of the word, he was not; but he possessed an uncommon talent for mastering any given subject, and he was the most popular poet in Germany during that century. His works are numerous, and in all styles of composition, from the most tragic touch of feeling to the most comic turn of thought. This period produced several distinguished scholars and men of science; among whom may be mentioned Melanchthon, Camerarius (classics and philology), Cornelius Agrippa, Theophrastus Paracelsus (mystical philosophy and natural history), Copernicus (astronomy), Leonhard Fuchs (botany and medicine), Conrad Gesner (botany and zoology), and Agricola (mineralogy). Towards the end of the 16th century, everything seemed drifting back into the middle ages; and then came the Thirty Years war which, in its consequences, was most disastrous to Germany. The physical and moral vigour of the nation was broken. We meet with no trace of originality, truth, taste, or feeling in the poetry of that period, except, indeed, in the sacred poetry, many of the hymns of Paul Gerhard being still sung in the Protestant churches of Germany. A rage for everything foreign that then prevailed was utterly opposed to nationality or originality. Opitz, the founder of the so-called Silesian school, is the true representative of the classical poetry of the 17th century. He was a scholar and a gentleman, most correct in his language and versification, never venturing on ground which had not been trodden before by some classic poet, whether of Greece, Rome, France, Holland, or Italy. Literary societies were formed at several of the courts of Germany, professedly for the improvement of the language and poetry of the country, after the model of those of Italy; but they were mere silly imitations, and produced little good. The "First Silesian school" is represented by men like Opitz and Weckherlin, and is characterized as pseudo-classical. It was imitated in the north of Germany by Simon Dach, Paul Flemming, and a number of less-gifted poets, who form the "Konigsberg school." The chief heroes of the "Second Silesian school" are Hoffmannswaldau and Lohenstein, whose compositions are more ambitious, bombastic, and full of metaphors than those of Opitz; but are also more disappointing. There were some independent poets who kept aloof from either of these schools, as Friedrich von Logan, Andreas Gryphius, and Moscherosch. Among the other works of this period we may mention the "Simplicissimus," a novel giving a lively picture of German life during the Thirty Years war; the patriotic writings of Professor Schupp, the historical works of Puffendorf; the pulpit sermons of Spener and of Franke, the founder of the orphan school at Halle; Professor Arnold's ecclesiastical history; the first political pamphlets of Professor Thomasius; and among philosophers, Jacob Boehme at the beginning and Leibnitz at the end of the century. The 18th century was marked by a revolution in the literature and modes of thought in Germany. Johann Christoph Gottsched, professor of eloquence at Leipsic, in the early part of this century, exercised great power as a critic, and was the means of defeating the Second Silesian school. He was, however, an advocate of French models in art and poetry; and it was through the opposition which he roused by his Gallomania, that German poetry was at last delivered from the trammels of that foreign school. Gottsched and his friends at Leipsic were opposed by Bodmer and his friends in Switzerland, who advocated the English style of literature; and a long literary warfare was carried on. For a long period Gottsched and his party prevailed; but at length public opinion became too strong against them, and the dictator lived to become the laughing-stock of Germany. Among those who distinguished themselves as advocates of the new school were Gärtner, Gellert, Kästner, Adolf Schlegel (father of the brothers Schlegel), Kleist, and Gleim. Of greater influence, however, than any of those here named, were Hagedorn of Hamburg, whose fables and songs have immortalized him in Germany; and Albert von Haller, the physiologist, remarkable also as a writer of descriptive and didactic poetry. During this literary struggle, the great names of German poetry sprang up,—Klopstock, Wieland, Lessing, Herder, Goethe, and Schiller. Klopstock's "Messiah" made a profound impression by its mystic, devout, and rapturous faith, as well as a work of art. The fashionable

and elegant portion of society was attracted by the semi-Gallican, semi-Parisian muse of Wieland. But it was reserved for Lessing to give a new direction to German literature. He established a new school of criticism, and exerted a powerful influence upon the progress of the drama, by unfolding, for the first time, to the German mind, all the beauty, originality, and vigour of Shakespeare. His tragedy "Emilia Galotti," his comedy "Minna von Barnhelm," and his philosophical drama "Nathan der Weise," are models of dramatic composition. Herder, a man of vast learning as well as a poetic genius, exerted a strong influence upon the poets of his time, and contributed powerfully to promote the study of Oriental poetry, as well as the ancient popular songs of different nations. The crowning work of his life is his "Ideen zur Philosophie der Geschichte der Menschheit." Another great impulse was given by Winckelmann, whose writings on the remains of ancient art modified all the old theories of the beautiful. Goethe came forward in 1773 with his "Goetz von Berlichingen," which was greeted as the commencement of an entirely new period in German dramatic literature. In 1781 appeared Schiller's first piece, "Die Räuber" (the Robbers), followed by "Fiesco" and "Cabale und Liebe." These impassioned tragedies gave a new impulse to the literary excitement. His "Don Carlos" (1784) shows greater moderation, and opens a long series of tragedies, in which the highest aspirations for liberty and humanity are interwoven with historical associations expressed in language of the most classic purity. It was only, however, after Schiller's union with Goethe (1795) that, by their combined labours, German literature was brought to that classic perfection which, from a purely local, has since given to it a universal influence. Schiller, by his enthusiastic and sympathetic eloquence and tenderness, became the favourite of the people; while Goethe, with his many-sided intellect and boundless sensibilities, controlled by a strong will, became the acknowledged sovereign of German literature. The philosophic spirit of this age also gave birth in rapid succession to the master minds of Kant, Fichte, Hegel, and Schelling. Jean Paul Richter is a peculiar and powerful writer of this period, whose works, though characterized by obscurity and irregularity, are frequently lighted up by flashes of humour and brilliant gems of thought and feeling. Novalis (von Hardenberg) is another strangely-constituted writer, whose works, though few and fragmentary, contain scattered thoughts of such wisdom and genius as to give them a high place in the literature of his country. Ludwig Tieck, a more voluminous and connected writer than his friend Novalis, was also much more of a creative genius. His dramas, and collection of ancient fairy and popular tales, often reflect the romance of mediæval poesy with much beauty and genius, but with a mystic feeling, bordering almost on superstition. To the so-called Romantic school belong the brothers Schlegel,—August Wilhelm, author of various critical and æsthetical works, and a metrical translation of Shakespeare; and Friedrich, known as a writer on the history of ancient and modern literature, and the philosophy of history. The other writers of that and the subsequent period to the present time, are so numerous, that we can only afford to mention a very few of them. In almost every department of literature, the writers of the present or last century, in Germany, occupy a chief place. In philosophy, the names are numerous; but they are all eclipsed by the great names of Kant, Fichte, Schelling, and Hegel, and generally belong to one or other of these schools. (*See* German Philosophy.) In theology, Schleiermacher, Paulus, Bretschneider, Reinhard, Eichhorn, Hengstenberg, and a host of others, have done good service in the field of biblical inquiry. In philological and critical inquiries, occur the names of Wolf, Hermann, Boeckh, Otfried Müller, W. von Humboldt, the brothers Grimm, Franz, Bopp, Bunsen, Benecke, Lachmann, Haupt. In history, Johannes von Muller, Heeren, Wachler, Friedrich von Raumer, Ranke, Lappenberg, Pertz, Niebuhr, Neander, Dahlmann, Gervinus, Menzel, Schlosser. In poetry, besides the names already mentioned, are Arndt, Körner, Heine, Uhland, Kinkel, Rückert, Schwab, Kerner, Mörike, Börne. In dramatic literature, are distinguished Kotzebue, Müllner,





Houwald, Grillparzer, Raupach, Grabbe, Immermann, Gutzkow, Mosen, Prutz, Laube, Hebbel, and Freytag. In the field of historical or social romance, are Witzleben, Van de Velde, Pichler, Häring, Spindler, Steffens, Koenig, Gutzkow, Prutz, Mugge, Von Sternberg; besides several ladies; as Ida von Hahn-Hahn, Paulzow. Among other literary writers of note, may be mentioned F. de la Motte Fouqué, Achim von Arnim, Brentano, Von Kleist, Amadeus Hoffmann, Chamisso, Kühne, Auerbach, and Stifter. The labours of A. von Humboldt in the field of natural science have given a powerful impulse to the German mind in that direction. Among their travellers, are Martius in Brazil, Pöppig in South America, Tschudi in Peru

scientific research. The cause of this lay, not only in the novelty and comprehensiveness of his investigations, but in that they exactly corresponded with the tendencies of the age at the time. Excluding all dogmatism and fanaticism, maintaining the independence of speculative inquiry, referring all theoretical speculation to the accessible region of experience, the elevation of the moral to the highest and ultimate of all human endeavour; these in general constitute the main features of his philosophy, which he wished to be cultivated rather with a view to its social than to its mere philosophic importance. He also entertained the hope that, by means of critical investigations into the nature of the human mind, it might be possible to reconcile the opposing systems of empiricism and rationalism, of sensualism and spiritualism, &c., and to discover a series of comprehensive principles to which the controversies of the philosophic schools might be referred in the last instance. That this hope was disappointed was owing to this, that Kant sought to support the old metaphysic of the schools by a psychology which itself rested on the basis of that metaphysic. Besides, there was wanting in the heyday of Kantism any sufficient point of unity for the several parts of philosophy. Of this want K. L. Reinhold was the first to become conscious; and scepticism, as in Schulze's *Aenesidemus*, and dogmatism, in the writings of Eberhard and others, raised their feeble opposition to the now triumphant criticism. J. G. Fichte believed that he had found that absolute point of unity which the criticism of Kant had indicated, in the fact of consciousness. Fichte, travelling on the path which Kant had pointed out, changed the half-idealism of Kant into a complete idealism, while he declared the Ego to be, not only the bearer and source of knowledge, but also the only reality, the representation and act of which is the world. In the Ego, knowing and being were identical; it was at once the principle of existence, and knowledge and nature appeared only as the reflex of its absolute activity. With this idealism began a kind of revolutionary excitement among the philosophic minds of Germany, which contrasted strongly with the quiet and sober spirit of Kant. System followed system, philosophic literature became overwhelming, and the public excitement was general for twenty or thirty years. The meteors which made their appearance in the philosophic heavens of Germany, for the most part disappeared as suddenly as they had blazed forth. Schelling was the first to exert a more general influence, and changed the idealism of Fichte, under the influence of Spinoza (who had been again brought into notice by Jacobi), into the so-called philosophy of identity. This system set out originally with the assertion that, as Fichte has deduced nature from the Ego, so, by reversing the process, the Ego may be deduced from nature; that both forms of philosophy find their basis in the absolute, as the identity of all opposites,—the ideal and real, subject and object, spirit and matter. In order to carry out this assertion, Schelling assigned intellectual intuition as alone corresponding to the absolute; yea as representing, and identical with, the absolute itself. The organ of this intuition was called reason, and, as such, was opposed to the reflection of the understanding, which was held to be quite incapable of comprehending absolute identity. The relation of the actual phenomenal world to the absolute was held to consist in this, that the latter represents itself in a multiplicity of appearances, steps out of "indifference" into difference, manifests itself in the latter, &c. He sought to demonstrate this identity in non-identity, and non-identity in identity,—especially with regard to natural philosophy in special cases, in which the highest merit to which he and his followers are entitled is the having opposed the empiricism of mere observation and computation in natural investigations, and to have contributed to the awakened interest in the natural sciences. For in contemning experience and reflection, occasion was also afforded to a fanciful mode of speculation, which frequently had nothing farther in common with science than the name, and on this account many dark opinions in the regions of poetry, religion, and social life came to unite themselves with the philosophy of Schelling, and which often led to the most strange aberrations into romanticism, mysticism, and a tendency to Catholicism. In





the direction indicated by Fichte and Schelling, the philosophy of Hegel also asserted itself, and attempted to develop in regular succession the contents of the intellectual intuition by the dialectic method. He indeed threw off the lawless play of fanciful combinations; but he sought for the expression of speculative thought, not in those laws of the connection of thought which have been recognized for thousands of years, but in a dialectic, the essence of which consists in the analysis of all the established principles of thought, and whose process consists therein that every conception generates out of itself its opposite, and uniting this with itself, inwardly enriches itself, and in this way proceeds to still higher stages. This method pretended to be identical with the thing itself; Hegel, with enduring perseverance, sought to carry out through the whole field of philosophic inquiry, and divided his system into the three provinces of logic, the philosophy of nature, and the philosophy of mind. While the systems above-mentioned form a tolerably straight line of progress, there arose certain other systems, as that of J. F. Herbart, in opposition to the idealism of Fichte, and which took a direction quite contrary to the philosophy of the time. Herbart, Schelling, and Hegel are the only thinkers that can claim to have exerted any general influence since the time of Kant. Among the numerous other thinkers of this time, who were chiefly occupied in defending or remodelling the older systems, we may mention Krug, Fries, and others, who were employed in the development of the Kantian system; Steffens, Oken, Schubert, F. von Baader, and Eschenmayer, who were employed chiefly in physical researches; those who attempted to exhibit systematically the philosophy of Jacobi; the different attempts to bring back philosophy to an empirical psychology; the peculiar speculative attempts of Schleiermacher, J. J. Wagner, Krause, Weisse, the younger Fichte, Branisz, E. Reinhold, A. Trendelenburg, H. Ritter, A. Günther, and others; the different tendencies within the Hegelian school; and, finally, the relation which Schelling latterly took up to his own earlier teaching, as well as to that which had been developed out of them. In the same proportion in which during the last fifty years the science of philosophy has been prosecuted in Germany, has also its history been studied; and indeed the Germans were the first who sought to comprehend and represent the history of philosophy as a whole, and to throw light upon the more important parts of it by valuable special treatises. The rapid change in the philosophic systems, and the extravagances which characterized some of them, have often been much blamed and made sport of, and it seems, as a consequence of that, that there has been for some time a lull in the interest taken in speculation, and a sort of sceptical aversion to all proper philosophic inquiry has taken the place of the former enthusiasm. Yet the influence of philosophy in elevating and strengthening the scientific spirit in Germany has been great and beneficial; and there is almost no region of inquiry in which a deeper and more thorough mode of treatment is manifest as the fruits of this philosophic spirit.—*Ref.* Brockhaus, *Conversations Lexicon.*

German Silver is a useful alloy, composed of 51 per cent. of copper, 30·6 of zinc, and 18·4 of nickel. It is, in fact, brass, to which nickel has been added to give it a white tinge. It is manufactured in large quantities at Birmingham, and is much used for forks, spoons, and other table requisites, in consequence of its durability, incorrodibility, and resemblance to silver. It is also much used for electro-plating.

German Theology.—The important position which the Germans in the present day occupy in the field of theological speculation entitles them to some special notice in a work of this kind. The phrase German theology is commonly restricted to the doctrines of Protestant Germany, as the theology of the Catholic church there does not differ materially from Roman Catholicism generally. It is, however, principally, the rationalistic tendencies of the German theology that more particularly call for notice. The growth of the philosophical spirit in Germany soon manifested its effects upon the theology, by gradually bringing the reason more and more to bear upon the doctrines of Christianity. The father of German rationalism is

generally regarded to have been Wolf (1679—1754), who introduced into theology his distinction between natural and revealed religion, and a number of rationalistic ideas. His system was adopted by numerous theologians, both of the Lutheran and Reformed churches, and thus at once deeply penetrated into theological literature and the schools. J. A. Ernesti, a contemporary of Wolf, established the historico-critical school of Protestant exegesis, by applying the rules of classical philology to the interpretation of the Bible. Semler (1725-91) distinguished theology from religion (*i. e.* morality); claimed the right to subject the whole canon of Scripture to the freest investigation, and laid down as a supreme principle, that the Scriptures are to be regarded as canonical and of divine origin, only in so far as their contents are of an ethical or moral nature. He also distinguished between a local, temporal, and therefore transitory part of the Bible, and the imperishable word of God. W. A. Teller (1734—1804) published, on the basis of the critical studies of Ernesti, Semler, and their followers Michaelis and Eichhorn, a new system of Christian doctrine, and proclaimed a practical religion of reason, as the essence of Christianity. A new theory of far-reaching influence was set forth by Tollner (died 1774), who distinguished between Holy Writ and the word of God, the latter of which he found also in all other religions, and in reason. He distinguished different degrees of inspiration, and maintained that the same degree did not exist in all parts of the Holy Scriptures. Against the assumptions of this new school, orthodox theology was principally defended by Bengel, Crusius, Oettinger, Zollikofer, and Spalding. English deism was transplanted into Germany by Reimarus (1694—1768), in the celebrated "Wolfenbuttel Fragments," first published by Lessing. He denied the possibility of a revelation, and declared, as the principal doctrines of natural religion, the existence of God, a divine providence and the immortality of the soul. Moses Mendelssohn, a Jew (1729-86), adopted the same views, and declared the happiness of man to be the principal aim of religion. Other writers of the same school were Steinbart (1738—1809), Basedow (1724-90); and Bahrdt (1741-92). An important organ of this school was the "Allgemeine Deutsche Bibliothek," published (1765-92) by Nicolai. Lessing (1729-81) also partially belonged to this school, and maintained that Christianity is essentially a system of education for mankind, in which the Scriptures are text-books, which may perhaps be superseded when humanity is educated for the reception of the new everlasting gospel. He also held that revelation gives to man nothing more than reason alone would have sufficiently developed in time. The path marked out by Lessing was further pursued by Kant, who declared the ideas of God, liberty, and immortality, indemonstrable by pure reason, and that the only thing certain in itself is the moral law, which conducts us to a practical faith in God and immortality. Through him, the terms *rationalist* (one who declares natural religion alone to be morally necessary, though he may admit revelation), *naturalist* (one who denies the reality of a supranatural divine revelation), and *supranaturalist* (one who considers the belief in revelation a necessary element in religion) came into use, and rationalism and supranaturalism became the principal division of the theological schools. The first rationalistic system of dogmatic theology was published by Henke, the most complete and celebrated by Wegscheider; besides whom, among the most distinguished were Paulus of Heidelberg, and Rohr of Weimar. The foremost representatives of the supranatural theology were Storr, Knapp, Hahn, and Steudel. A middle course between these two was first attempted to be established by Reinhard, and the most prominent of his successors in this work were Schutz and Bretschneider. Instead of attempting to pursue a middle course, Schleiermacher sought to merge the two into one entirely new system, acknowledging the claims of both. He found the proper source of all Christian life and knowledge in the pious sentiment or Christian consciousness, in which the subject comprehends itself, both in the totality of its being and in its being determined by the Christian principle reigning in the race. In this consciousness, it becomes assured of the reality of a new divine principle of life, which reveals itself in Christianity. Revelation is not, according to him, an external law, claiming submission from the subjective reason, and nothing more is demanded of the latter than to recognize itself as being determined by the Christian principle, and more and more to penetrate itself with it. The views of Schleiermacher not only met with many supporters, but likewise exercised an important influence upon the schools which were opposed to it. Most of the adherents of Schleiermacher defended from his standpoint all the essential doctrines of biblical orthodoxy; as Neander, Ullman, Lucke, Umbreit, Olshausen, Hundeshagen, &c. Others attempted a middle course between it and German Protestantism; as Twesten, Nitzsch, and J. Muller. A third school, claiming fuller independence of theological investigation, is represented by A. Schweizer and Baumgarten-Crusius. The most recent influence of lasting importance in the development of German theology came from the philosophy of the absolute, introduced by Schelling, and completed as a system by Hegel. According to this view, the popular religions which have existed in the world have been the several points by which the divine self-consciousness has developed itself. After the death of Hegel, his school became divided into those who used an orthodox and those who used a heterodox mode of expression; the one attempting to develop orthodox views of Christianity . . . of his system, the other maintaining that pantheistic ideas were the true results of it. Among the former were Daub, Marheinecke, Rosenkranz, Goschel, Erdmann, and Conradi; among the latter, Strauss, author of the "Life of Jesus," and L. Feuerbach, author of the "Essence of Christianity." The so-called Tubingen school originated with F. C. Baur, who introduced the philosophy of religion, as a Christian science, into the history of Christian doctrines, and sought to comprehend the historic development of the dogma as the dialect process of the idea itself. Rejecting the authenticity of most of the books of the New Testament, and ascribing to them a later origin, he endeavored, by numerous writings, to fill up the vacuum thus left in the history of Christ and earlier Christianity. Among his followers, Schwegler and Zeller were the most distinguished. Their writings called forth an immense number of opponents; among whom were Thiersch, Dorner, Schaff, Bleek, Hase, and Ewald. Attempts have recently been made by T. H. Fichte, C. P. Fischer, Weisse, Wirth, and others, to establish a system of speculative theism, in opposition to the pantheistic tendencies of Hegel. In opposition to rationalistic and speculative theology, there developed itself, in the beginning of the present century, a school for a restoration of the original orthodoxy of the Reformed churches. The *Evangelical Church Gazette*, of Hengstenberg, became an influential organ of this party. It was, however, almost wholly a Lutheran orthodoxy which was thus restored. Its principal theologians are Hengstenberg, Havernick, Keil, Kheforth, Kahnis, Rudelbach, Guericke, Delitzsch, and a host of others. This revived Lutheranism soon split into an old and a new school, and some of the latter were charged with having introduced into the system the most dangerous innovations. Notwithstanding the great diversities that have prevailed, and still prevail in Germany, the leading tendency is towards orthodoxy, and rationalism is on the wane. In every single department of German theology an exceedingly voluminous and thorough literature has been produced, and some branches of theology have been cultivated almost exclusively in Germany.—Ref *New American Cyclopædia*.

GERMINATION, *jer-min-ai-shun* (Lat. *germino*, I sprout), in Bot., the beginning of vegetation, or the development of the embryo (which *see*) into an independent plant, capable of supporting itself. The time required for germination varies much, according to the nature of the seeds and the conditions under which they are placed. Generally speaking, seeds germinate most rapidly directly after they are gathered. If preserved till they are quite dry, in some cases the process of germination requires months or even years. The seeds of the garden cresses will frequently germinate in twenty-four hours; but the majority of seeds do not germinate for from six to twenty days. Heat is the agent which most accelerates germination. A certain amount of moisture, and a free communication

with the atmospheric air, are in all cases necessary to the process. Absence from light is a favourable condition. Seeds sprout most readily during spring or summer, in loose pulverized and properly-drained soil, at a moderate depth; as, under such circumstances, air, moisture, and warmth have free access, while light is excluded. Certain chemical changes, the most important being the conversion of starch into sugar, take place in the seed, and the embryo is nourished by the products of these changes. Thus nourished, it increases gradually in size, and ultimately bursts through the integuments of the seed. Its lower extremity, or radicle, is commonly protruded first, and, taking a downward direction, becomes fixed in the soil. The opposite extremity soon elongates upwards, and is terminated above by the plumule or gemmule, which is the first terminal bud, or growing apex of the stem; and at the same time the cotyledonary portion is either left under ground, or is carried upwards to the surface. During the gradual development, the embryo continues to be nourished from the matters contained in the albumen or cotyledonary portion, and is ultimately enabled to produce its first leaves and root. The young plant is then in a position to acquire the necessary nourishment by itself, for its further support and growth, from the media by which it is surrounded; and being rendered independent of the seed, has no need of the cotyledonary portion, which accordingly perishes. The spores of acotyledonous plants develop roots indifferently from any part of their surface: this mode of germination is termed *heterorhizal*. In the germination of monocotyledonous embryos, the radicle is not itself continued downwards so as to form the root, but it gives off branches of nearly equal size, which separately pierce its extremity and become the rootlets. Each of these rootlets, at the point where it pierces the radicular extremity, is surrounded by a cellular sheath, termed the *coleorhiza*. This mode of germination is commonly termed *endorhizal*. The radicle of a dicotyledonous embryo is itself prolonged downwards by cell-multiplication just within its apex, to form the root; and this mode of germination is distinguished as *exorhizal*. (*See* Root, Stem.)

Gerund, *jer'-und* (Lat. *gerundium*, from *gero*, I carry), in Lat. Gram., is a part of the verb used to denote something as being done; thus, *legendum*, reading, from *lego*, I read. It is a sort of verbal substantive, being declined like a noun, but having the same power of government as its verb. In English the present participle occupies the place of the gerund.

Gesneraceæ, *ges-ne-rai'-se-e* (after Gesner, the naturalist), in Bot., the *Gesnera* fam., a nat. ord. of *Dicotyledones*, sub-class *Corollifloræ*. Herbs or soft-wooded shrubs. Leaves wrinkled, exstipulate, generally opposite, or whorled; flowers irregular, showy; calyx half-superior, 5-parted; corolla 5-lobed; stamens diandrous or didynamous, with the rudiment of a fifth. Ovary half-superior, 1-celled, surrounded by an annular fleshy disc, or by glands; style 1. Fruit capsular or succulent, 1-celled, with 2-lobed parietal placentæ. Seeds numerous, with or without albumen; embryo with minute cotyledons and a long radicle. The plants of this order are chiefly natives of warm or tropical regions. On account of the beauty of their flowers, they are much cultivated in this country. There are 59 genera and about 275 species.

Gesta Romanorum, *jes'-ta ro-ma-no'-rum* (Lat., the deeds of the Romans), is the title of a legendary work of the middle ages, written in Latin, and whose tales are chiefly taken from the history of the Roman emperors, or belong to that period, and are accompanied with moralizing expositions; whence it is also called *Historiæ Moralisatæ*. The stories are short, and display an almost childish simplicity. They were appointed to be read by the monks, and were generally much read down to the 16th century. They were translated into several languages, and formed a rich mine for the earlier fabulists and novelists. Grässe, in his German translation of this work (2 vols. Leipsic, 1842), assigns its authorship, apparently with reason, to a certain monk named Elimandus, who died 1227. The newest edition of the original text is that edited by Keller (Stuttgart, 1842).

Gestation, *jes tai'-shun* (Lat. *gestatio*, from *gero*, I carry), in Physiol., is applied to the period which intervenes between the time of conception and that of delivery. This period differs greatly in different animals. In the human species it is nine calendar months, or, more strictly, forty weeks, or 280 days; but by certain circumstances the period may be prolonged or shortened by several weeks; and sometimes the birth takes place as early as the seventh month. In the cow the period of gestation is nine months, in the mare eleven, in the dromedary twelve, and in the elephant twenty-one. In the smaller animals it is much less; being in the dog about sixty-three days, in the cat fifty-six, the rat twenty-eight, in the sow four months, and in the sheep and goat about five.

Geum, *je'-um* (Lat.), in Bot., a gen. of the nat. ord. *Rosaceæ*. The most interesting species is *G. urbanum*, the wood avens, a common herb in our hedges and thickets. The roots have an aromatic flavour, something like that of cloves. They were formerly much used for flavouring ale, and to some extent in medicine, for their tonic and astringent properties.

Geysers. (*See* Boiling Springs.)

Ghee, *ghee*, a sort of butter used by the natives of India, which undergoes a peculiar process in order that it may last for some time. The milk is first boiled in large earthen pots for an hour or two, after which it is allowed to cool, and a little dhye, or curdled milk, is added, in order to make the whole more readily coagulate: after the lapse of some hours, the mass is converted into curds, and is ready for churning. The contents of each jar, to the depth of some five or six inches, are then removed or skimmed off, and placed in a larger earthenware utensil, in which they are churned by means of a small piece of split bamboo for about half an hour; then some hot water is poured into the jar, and the churning continued for half an hour longer: after which time the butter is found to be formed. When this becomes rancid, as it necessarily does in a day or two, it is again melted in an earthen vessel, and boiled until all the water has evaporated from it; after which a little salt or betel-leaf is put into it, and it is covered up in closed pots to be kept for use. Ghee forms a very important article of internal traffic through India, as the natives consume great quantities of it, although it is not much esteemed by Europeans.

Ghibellines, *gib'-bel-lines*, in the history of the Middle Ages, was the name of a political party in Germany and Italy, which, with their opponents, the Guelphs, distracted the peace of these countries, particularly the latter, for several centuries. The Ghibellines were the supporters of the authority of the German emperors over Italy, to which the Guelphs were opposed. (*See* Guelphs and Ghibellines.)

Ghosts (*See* Apparition.)

Giant, *ji'-ant* (Fr. *géant*, from *gigas*, the Latinized form of a Greek word, probably formed from *ginesthai* and *ge*, signifying 'the earth-born'), an individual of extraordinary stature and bulk. The existence of a race of giants, or of individual instances far exceeding those exhibited in modern times, was fully believed in, up to the commencement of the present century. This belief was founded partly upon scriptural evidence, partly upon the discovery of enormous bones supposed to be those of human beings, and partly upon the accounts handed down by ancient and mediæval writers. In the Old Testament, the name of giant is applied to several races of men; but the appellation seems to refer more to violence and physical power than to stature. The Anakims and some other tribes seem, however, to have been distinguished from other races by their superior strength and proportions. There are several instances in the Scriptures of individual giants; such as Og and Goliath. The height of the former is not mentioned, but the latter, at most, did not exceed 8½ feet in stature. In most of the cases where the existence of giants has been based upon the discovery of colossal bones, it has been afterwards discovered that the remains were not those of human beings, but of extinct quadrupeds. In 1456, the bones of a supposed giant were exposed by the action of the Rhone. The height of this giant was estimated at 30 feet, but the bones were probably those of an elephant. In 1613, the remains of another supposed giant were found on the Rhone: it was stated

that the skeleton had been found in a tomb 30 feet long, bearing the inscription "Teutobochus Rex." The Parisians crowded to see the bones of the King Teutobochus; but it was afterwards found that the remains were not those of a man, but of a mastodon. In this country, Dr. Mather, in 1712, announced the discovery of the bones and teeth of a giant in the state of New York. The statement was published in the Philosophical Transactions; but it was subsequently ascertained that the bones in this case also were those of a mastodon. Among classical writers, instances are numerous of giants, but not worthy of belief. Plutarch states that, when the grave of Antæus was opened by Sertonius, the body was found to be full 60 cubits long. Pliny also relates that, at an earthquake in Crete, the bones of a giant 46 cubits in length were disclosed. Coming to more reliable evidence, it seems certain that a height of even more than nine feet has been attained. In the museum of Trinity College, Dublin, there is a skeleton 8 feet 6 inches in height; in the museum of the College of Surgeons of England, is another 8 feet 2 inches; and another in the Museum at Bonn, 8 feet. Great diversity, as to height and size, prevails among the human race. In northern latitudes, men are below the ordinary standard, many being less than four feet. In temperate climates, the height varies from 4½ feet to 6 feet; but this is sometimes exceeded, as mentioned above. As a general rule, giants are of rarer occurrence than dwarfs; they are usually of a lymphatic temperament, of a delicate complexion, often deformed, and generally badly proportioned. Their muscles also are flabby, and their voices weak. They are seldom long-lived, and in this respect are the reverse of dwarfs. O'Byrne, whose skeleton is in the Royal College of Surgeons of England, died at 22, while Borowlaski, the dwarf, died at 98. (*See* DWARF.) It has also been observed that giants show a want of activity and energy both in body and mind, while dwarfs are usually lively, active, and irascible. The causes which occasion the production of giants are not much understood. According to Geoffroy Saint-Hilaire, Bishop Berkeley attempted to manufacture a giant. He reared an orphan boy, named Magrath, on certain hygienic principles, and succeeded so far that at the age of 17 he was 7 feet in height. He died, with all the symptoms of old age, when he had completed his 20th year, at which time he was 7 feet 8 inches high. It is a singular fact, that in the mythology of all the Indo-Germanic nations, giants hold a marked position. Amongst the Greeks, they were represented as hideous beings of monstrous size, having the tails of dragons, and living in volcanic districts, to which they had been banished after their war against heaven. The gods, with the assistance of Hercules, were supposed to have imprisoned them under Etna and other volcanoes. They were fabled to have sprung from the blood which fell upon their mother Ge (the earth) from the slain Ouranus (heaven). This mingling of heavenly with earthly descent, together with the places of their abode, evidently points to the mysterious volcanic convulsions of nature, which they were intended to typify. In the mythology of northern nations, giants play a still more important part. They believed that the first created being was Ymir, "the Ancient Chaos," and the progenitor of the frost giants. The origin of Ymir was long before the creation of heaven and earth. In the beginning, a world existed in the far north, in which was a well, from whence flowed a poisonous stream hardening into ice. As this accumulated, it formed the northern part of Ginnungagap, or the abyss of abysses, the southern extremity of which was radiant with heat and light from another world. The meeting of heat and cold produced drops which, by the agency of the All-Father, or creative power, which had sent them forth, became a living being, and received a human form. Ymir, the giant, thus created, was nourished by four streams of milk, and, while he slept, a man and woman grew from under his left arm, while a son was produced from his feet. Other beings were afterwards formed from the salt and snow-covered stones, and from these the three brothers Odin, Vili, and Ve, were born. These three were gods, and having slain Ymir, they dragged him into the middle of Ginnungagap, formed the ocean and all waters from his blood, and from his huge body heaven and earth, and all solid bodies. All the frost giants, except Bergelmir, perished with Ymir. He became the father of the new giant race of the Jötuns. It is a common belief in many nations that mountains and islands have been raised, and rocks and mountains thrown down, by giants. Giants are also used to typify the heathen element in its conflict with Christianity.

GIAOUR, *djowr* (Turk., a dog), is a term applied by the Turks to Christians, or, indeed, to all who are not Mohammedans.

GIBBOSITY, *gib-bos'-e-te* (Lat. *gibbositas*, from *gibbus*, a swelling or protuberance), in Med., is applied to a hump or other irregularity or swelling on the back, or any other part of the body.

GIBBOUS, *gib'-bus* (Lat. *gibbus*, hunched, humped), an expression applied to the convex or protuberant shape that the moon presents in its second and third quarter, before attaining the perfect circular form that it exhibits when it is full.

GIDDINESS, *gid'-de-nes* (Sax. *gidig*, Lat. *vertigo*, from *verto*, I turn), in Med., is a dizziness or swimming of the head, with more or less of mental confusion, and a loss of power to balance the body. The objects around him in many cases appear to be moving about in different directions, often conjoined with a sense of dimness or darkness, with sounds of bells or drums in the ear. It generally comes on suddenly, and is symptomatic of various diseases, arising, as it does, from some disturbance or debility of the nervous power. It generally precedes a fainting fit, or an attack of apoplexy; attends fevers, inflammations, and many other diseases, and not unfrequently arises from some organic disease of the brain or heart. Most frequently, however, it arises from indigestion, and may be got rid of by means of some aperient medicine. When this fails, or when it is of frequent occurrence, medical advice ought to be sought.

GIFT, *gift* (Sax. *gift*, Lat. *donum*, *donatio*), in Law, is the transferring of the right and possession of a thing by one man to another, voluntarily and gratuitously. In this latter respect, gifts are distinguished from grants, which are always made upon some consideration or equivalent. The giver of the thing is called the donor, the receiver the donee. Gifts are divided, as regards their subject-matter, into gifts of chattels real and gifts of chattels personal. Under the former head may be included all leases of land for years, assignments, and surrender of these leases, and all other methods of conveying an estate less than freehold. A gift of chattels personal is the act of transferring the right and possession of them, and may be done either by writing or by word of mouth, attested by sufficient evidence, of which the delivery of possession is the strongest and most essential. The law generally looks with some degree of suspicion upon gifts, and they are usually considered to be fraudulent if creditors or others become sufferers thereby. Where a gift has been executed by delivery of possession, it is not in the donor's power to retract it; but so long as the gift has not been completed by delivery of possession, it is not properly a gift, but a contract, and this a man cannot be compelled to perform but upon good and sufficient consideration. The deed or conveyance creating an estate tail is also called a gift, from the operative words of the conveyance, which are always "I give," or "have given." It differs in nothing from a feoffment, but in the nature of the estate passing by it; and gifts in tail are equally imperfect without livery of seisin, as feoffments in fee-simple. (*See* ENTAIL.)

GILBERTINES, *gil'-ber-tins*, in Eccl. Hist., the name of a religious order, founded by St. Gilbert, in Sempringham, in Lincolnshire, about the year 1148. The monks of the order observed the rule of St. Augustine, and were accounted canons, and the nuns followed that of St. Benedict. There were about twenty-five houses of this order in England and Wales at the time of the dissolution of the monasteries.

GILDING, *gild'-ing* (Sax. *gildan*, to gild), the art of covering bodies with a thin coating of gold, either by chemical or mechanical means. In chemical gilding, the gold is applied to metallic surfaces by the agency of chemical affinity. One of the best metals for gilding on is a mixture of copper with one-seventh of brass,

Copper itself is too soft and dark-coloured; ordinary brass, however, serves the purpose quite well. The gold employed is called "fine gold," and is free from alloy. In order to apply the gold to the metal required to be gilt, it is first combined with mercury, a quantity of the former being boiled with five or six times its weight of the latter. When the gold is dissolved, and the amalgam sufficiently boiled, the fluid mass is poured out into cold water, and then becomes semi-fluid. It is next put into a piece of chamois-leather and squeezed; by which means the particles of quick-silver escape through the pores of the leather, whilst the gold is retained. The amalgam, if good, is then of about the consistency of stiff clay, and has a greasy and gritty feel when divided with a bone spatula. In order to apply the amalgam to the surface of the copper, or other metal, it is necessary to use a solution of nitrate of mercury, as otherwise there is no chemical affinity between the substances required to be brought in contact. This solution is called, in commerce, "gilder's aqua fortis," and when a piece of metal is immersed in it, its surface is immediately converted into an amalgam to which the mercury and gold amalgam closely adhere. The methods in which this operation is performed in detail depend upon the size and nature of the articles to be gilded. After receiving the gold covering, the gilded articles are washed and dried in a careful manner. Gilt articles of all the better qualities are submitted to an after-process, for the purpose of giving them a deeper orange hue, by first covering them with a chemical compound, and then placing them on a heated iron plate, when the warm gold surfaces become oxidized. Most gilt articles are also burnished by a stone burnisher, formed of a polished piece of black hæmatite. In the mechanical mode of gilding, gold-leaf or gold powder is applied and fixed to various substances by different means. Thus gold may be applied to wood, plaster, paste-board, leather; and also to metals, such as silver, copper, iron, tin, and bronze; so that gilding includes several arts exercised by men employed in very different trades. Wood-work is gilt by brushing over the surface desired to be operated upon with a solution of parchment size mixed with a little whiting. After filling up the holes and irregularities, the surface is again brushed over with a composition of the same sort. After this operation has been repeated several times, the plain parts are moistened and smoothed down with pumice-stone, &c., and when dry the work is covered with several coatings of gold size, a peculiar substance, of which deer's fat is said to form the principal ingredient. The gold-leaf is then carefully laid on with a sort of fine comb, called a "tip," and pressed into the cavities with a dry camel's hair pencil. When dry, the gold is burnished with a stone in some parts. This constitutes burnish-gilding: oil-gilding is performed with a gold size of an oily nature; and japan-gilding, effected with japan size, is intended for those surfaces which are to be exposed to the weather. For a description of the process for gilding by means of electricity, *see* ELECTRO-PLATING AND GILDING.

GILL, *jill* (from Low Lat. *gilla*, a drinking-glass), is a measure of capacity holding the thirty-second portion of a gallon, or the fourth portion of a pint.

GILLENIA, *gil-lē'-ne-ă*, in Bot., a gen. of the nat. ord. *Rosaceæ*. *G. trifoliata* and *stipulacea* are pretty North-American plants, with lobed, discoloured leaves and white flowers. The roots of both species are used medicinally, and are commonly known under the names of Indian physic and American ipecacuanha. In small doses they are tonic; in larger doses, emetic.

GILLIESIACEÆ, *gil-le-se-a'-se-e* (after Dr. Gillies, of Conception, in Chili), in Bot., the *Gilliesia* fam., a nat. ord. of *Monocotyledones*, sub-class *Petaloideæ*, consisting of small herbaceous bulbous plants, with grass-like leaves and spathaceous flowers. There are but two genera,—*Gilliesia* and *Miersia*, containing five species, all natives of Chili. Their properties and uses are unknown.

GILLS, *gills* (Swedish *gel*), a term applied to the apparatus possessed by all fishes, by means of which their respiration is effected exclusively through the medium of water. The gills, or branchiæ, are situated on each side of the neck, and are composed of several laminæ fixed on arches. These laminæ are covered with a vast number of minute blood-vessels, and are so formed as to present a considerable surface to the water, so that a sufficient portion of oxygen may be received by the blood. As the oxygen is continually being removed, the water becomes deteriorated, and it is consequently necessary that a constant current should flow over them. This is effected in most fishes by their taking the water in at the mouth and expelling it under the gill-covers in regular respirations. The blood, which is continually being sent to the gills from the heart, is distributed, by means of the arteries, to every part of the body; from whence, by means of the veins, it comes back again to the heart.

GIMBALS, *gim'-bălz* (Aug.-Nor.), the two hoops of brass in which the mariner's compass is suspended, in order to secure a horizontal position for the compass, card, and needle, under any circumstances. This is effected by means of their being fitted one within the other. The compass is suspended within the inner hoop by two pivots at opposite points, and the inner hoop is suspended in a similar manner within the outer hoop, by pivots that are in a line at right angles to that which passes through the pivots, by which the compass-box is suspended in the inner hoop. A compass supported in this manner is said to be suspended on gimbals.

GIN, or GYN, *jin* (contraction of *engine*), a machine employed for raising heavy weights, driving piles, &c. It consists of three poles, about twelve or sixteen feet long, placed in the ground eight or nine inches apart, united at the top by a rope twisted several times round each, or by an iron ring. Two of the poles are kept their proper distance apart at the bottom by a movable iron bar placed between them in a horizontal position; a windlass is also secured between the same two poles about 3½ feet from the ground. When in use, the gin is set up over the object to be lifted, and a rope, one end of which is secured round the windlass before mentioned, and carried thence through a pulley at the top of the poles, is then fixed to it, when, by turning the windlass, by means of handspikes, it may be raised the required height.

GIN (from Fr. *genièvre*, juniper), an ardent spirit, largely manufactured in London and other places, and originally flavoured with juniper berries, from which it derives its name. Geneva is frequently confounded with gin; the former is, however, merely procured by the fermentation of the berries of the *Juniper communis*. Hollands gin is a variety of corn spirit, which was formerly wholly imported from Holland. The popularity of this spirit induced the English distillers to produce a similar liquid; but a difference can easily be detected by good judges. At the present day, English gin consists of plain corn spirit, flavoured with oil of turpentine and a small quantity of other substances. It is possible that Hollands gin may contain a proportion of juniper, but as a general rule, it is not present in English gin. Every gin-distiller has a receipt of his own, which is usually kept a secret; hence the variety of flavours to be found in this spirit; as, the plain gin flavour, the Hollands flavour, the whiskey flavour, the smoky flavour, &c. A large variety of substances is employed in the flavouring of gin; among others may be mentioned sugar, bitter almonds, turpentine, creosote, lemon, cardamoms, caraways, cassia, garlic, Canada balsam, horseradish, grains of paradise, cayenne pepper, and several other herbs, seeds, fruits, &c.

GINGER. (*See* ZINGIBER.)

GINGHAM, *ging'-hăm* (its Indian name), a cotton fabric, originally manufactured by the natives of India, from whom also it derived its name. It generally bears a coloured check pattern, which is not produced by dyeing or stamping the manufactured material, but by interweaving coloured threads. Formerly, all the gingham in use was imported into this country from India; but at the present time it is largely manufactured in England, and great quantities are exported to India. The various kinds of gingham now manufactured are known by different names in commerce; and umbrella gingham is woven with threads all of the same colour.

GINSENG. (*See* PANAX.)

GIPSIES. (*See* GYPSIES.)

GIRAFFE, *ge-răf'* (Arab. *zarifa*), termed in Nat. Hist. *Camelopardalis Giraffa*, is one of the tallest

of quadrupeds, as it is the largest of the Ruminant order. In points of resemblance, the giraffe approaches the deer, the antelope, and the camel; and, besides this, has many singularities about it which are especially its own. In the length, slenderness, and flexibility of its neck, it surpasses all other quadrupeds, and peculiarities of conformation adapt it eminently for the life which it leads on the sandy desert. Its head resembles that of the camel, from the absence of a naked muzzle, and in the shape and organization of the nostrils, which are oblique and narrow apertures, defended by the hair which grows at their margins, and surrounded by cutaneous muscular fibres, by which the animal can close them at will. This is a beautiful provision of nature for the defence of the air-passages and the irritable membranes lining the olfactory cavities, from the fine particles of sand which the storms of the desert raise up and whirl about in suffocating clouds. The eyes of the giraffe are so



GIRAFFE.

placed as to take in a wider range of vision than those of any other quadruped, and it is thus able to see an enemy in the rear as well as in the front when its head is elevated during the time that it is browsing on its favourite acacia plant. The weapons by which it defends itself are its horns and its hoofs. The former it does not wield by *butting*, as is the case with other *Cervidæ*; but swings round with a lateral movement of the neck, and hits with them sideways: the latter are very powerful; and sometimes a giraffe has been known to prostrate a lion with a single kick. Its motion in progressing is most peculiar; travelling, as it does, in a sort of crab-like movement. It lifts both its hind and fore legs on each side of the body together, and its appearance when cantering is peculiar in the extreme. The tongue is formed to suit its habits of life, and is used to hook down the branches of trees which grow beyond the height at which its muzzle can reach. The two horns with which it is provided are peculiar to both sexes, the bony part of the same being articulated by a broad, rough, epiphysial basis to the cranium, and covered by a hairy tegument. It is mentioned in Rhande's Dictionary, that "a giraffe more than two-thirds grown will eat daily in confinement eighteen pounds of clover-hay and eighteen pounds of a mixed vegetable diet, consisting of carrots, mangel-wurzel, barley, split beans, and onions, and will drink four gallons of water. They copulate in March. The female has four inguinal udders: she brings forth one young one at a birth, and the period of gestation is fifteen months. The new-born giraffe measures six feet from the fore hoofs to the top of the head, and in a few hours after birth it is able to follow the dam."

GIRDER, *gir'-der* (from Sax. *gyrdan*, to bind), the name given in Civ. Eng. and Arch. to long beams of wood and iron, that are thrown across openings of considerable span, to support floors and the roadway of bridges. Girders are of two kinds, simple and framed; the former being merely wooden beams, or beams of cast or wrought iron; while the latter are beams of the above materials made of several pieces, put together in such a manner that they may be capable of offering a greater resistance to excessive pressure than a simple girder could exert. The depth and width of all girders must be proportioned to the greatest weight that is likely to be thrown on them, that they may be able to offer the greatest possible resistance to its pressure, with the least possible quantity of material. The strength of a girder is augmented by adding to its depth, rather than to its width, as its capability of resistance increases directly as the width and as the square of its depth. If, for example, a beam of Norway deal that is three inches wide and six inches deep will bear a certain weight, a beam that is three inches wide will bear twice that weight; while one that is twice as deep will bear four times as much, and one that is twice as wide and twice as deep, eight times as much. The longer it is, the greater will be its flexibility; or, in other words, if two beams of the same width and depth, but of which one is twice as long as the other, be supported at the ends, having equal weights suspended from their centres, the longer beam will exhibit a greater amount of deflection than the shorter one; the capability of resistance in girders of all kinds being inversely as the length. The manner in which the weight is thrown on a beam has considerable influence on its power of resistance. Thus a beam will not bear half as much, if all the weight be collected at its centre, as it will if the weight be distributed equally along its length. Beams will also bear a greater weight when their extremities are secured, or loaded with a weight of masonry, as in the case of girders stretching from wall to wall of a building, to support a floor. A dead uniform weight is less injurious to the power of resistance that a girder can exert, than a weight which is in motion; but it is found that the power of resistance of a beam loaded with a dead weight decreases considerably when it has sustained that weight for a long period of time. The amount of weight that should be thrown on a girder under any circumstances should never exceed one-third of the weight that would have to be applied to it in order to break it. Girders should also be shaped in accordance with the conditions under which they are to be loaded. Thus the upper surface of a girder supported at both ends, that has to sustain a great weight at one point only, should be in the form of a parabola; while that of a beam supporting a uniform weight at all points, should be elliptic, the under surface being perfectly straight in both cases. Wrought and cast iron girders are made with flanges, or projecting edges of metal at the top and bottom. In cast-iron girders, the bottom flange must have a sectional area equal to six times the area of the top flange, as the power of cast iron to resist compression is about six times as great as its power to resist a drawing strain; but in wrought-iron girders, on the contrary, the sectional area of the bottom flange need be only one-half of that of the top flange, as the power of wrought iron to resist compression is only half as much as its power to resist tension. In other points, the strength of iron girders varies in proportion to their depth.—*Ref.* Tate's *Strength of Materials*; Fairburn's *Cast and Wrought Iron for Building Purposes*.

GIRDLE, *gir'-dl* (Ang.-Sax. *gyrdel*, from *gyrdan*, to encircle; Gr. *zone*, Lat. *cingulum*), a band of leather, or some other substance, used in girding up the loins. It was more or less in common use among several of the nations of antiquity. In Scripture, the girding up of the loins is frequently alluded to as being practised by the Jews before undertaking a journey. Girdles of sackcloth were also sometimes worn as tokens of humiliation. Among the Greeks and Romans the girdle

was a military ornament; and hence to deprive a soldier of his girdle was a mark of the deepest ignominy. The tunic of the Romans was also fastened by a girdle or belt about the waist, and it was regarded as very effeminate to appear abroad with the tunic slackly or carelessly girded. Hence girt came to denote diligence, activity, cleverness, and ungirt, idleness, effeminacy. The young women always wore a girdle, or zone, before marriage; and hence the phrase "*Zonam solvere virginitatem*" was sometimes used to denote that ceremony. The girdle worn by Venus was called "cestus." Among the Romans the girdle served also as a purse; and in England it was formerly the practice for bankrupts, or insolvents, to give up their girdles in open court.

GIRONDISTS, *je-ron'-dists* (Fr. *Girondins*), the name of a celebrated political party in France during the Revolution. They were so called from the department of Gironde, which the leaders of the party represented in the Legislative Assembly which met in the month of October, 1791. These were Vergniaud, Guadet, Gensonné, Grangeneuve, Ducos, &c., men of great oratorical powers, and who soon obtained great influence in the Assembly. Their political views, however, were not sound; and they did great mischief by their opposition to the constitutionalists; thus leaving the way open for the extreme democratic party. They were republicans, who took their political notions chiefly from the writings of the ancient Greeks, and succeeded in gaining many over to their side. For a time they had a majority in the Assembly, and the king found himself obliged to select some of the more moderate of the party to form his ministry; among whom were Roland, Servan, Clavière, and Dumouriez. For a time they seemed reconciled to monarchy; but at length the king found it necessary to dismiss them; a proceeding which led to the insurrection of the 20th of June, 1792. They, indeed, did what they could to oppose the massacres which followed; but their popularity and influence with the people was wholly gone. They subsequently endeavoured to stir up the provinces against the Parisian party, but without success. The demagogues of the city rose in arms against them, assailed the Convention, and demanded their imprisonment. They were accused, tried, and condemned On the 31st of October, twenty-one of them perished by the guillotine, including Brissot, Vergniaud, Gensonné, and Ducos; others perished afterwards; a few escaped, and after the downfall of the Terrorists, again appeared in the Convention.—*Ref.* Lamartine's *Histoire des Girondins*, 8 vols., Paris, 1847.

GLACIAL DEPOSITS, *glaś'-e-al* (Fr. *glacial*), in Geol., belong to the Pleistocene period, and consist chiefly of clays, sands, and gravels, sometimes stratified, sometimes rudely piled together, and containing great blocks of rock, which also sometimes occur scattered loosely over the bare rock-surface. These deposits, which have evidently been formed by the agency of glaciers, are called by various names, as, the "Great Northern Drift;" "Till" (in Scotland), a brown clay with boulders; "Marls" in Wexford and Wicklow, where fossiliferous marl is interstratified with sand and gravel; "Limestone Gravel" in central Ireland, chiefly consisting of pebbles of carboniferous limestone, heaped sometimes into narrow ridges forty to eighty feet high, and from one to twenty miles long, which are called "Escars;" the "Boulder Clay" in northern and central England; and "Drift" almost universally. The "Erratic Block Group" is another well-known name for these deposits. (*See* GLACIER, BOULDERS, DRIFT, PLEISTOCENE.)

GLACIER, *glaś'-e-er* (Lat. *glacies*, ice), an accumulation of ice, or of snow and ice, formed in a valley or ravine of a snowy mountain. The average annual fall of snow in the region of the Swiss Alps, from 8,000 to 10,000 feet above the level of the sea, has been estimated at sixty feet; that is to say, sufficient snow descends in one year to form a bed of this thickness. The accumulation of snow on the high table-land is called the *névé*, and is found to consist of layers of more or less crystalline snow, which diminish in thickness as their depth increases. At a certain depth, these layers can scarcely be distinguished one from another, and still lower the substance of the *névé* passes into clear ice. The *névé* is the source of the





glaciers, or rivers of ice, which fill all the valleys radiating from the central mass of a great mountain. Sometimes valleys twenty miles long and three or four broad are filled up with ice to the depth of some 600 feet. Although apparently solid and stationary, glaciers move slowly down their valleys, and carry with them, either on the surface, frozen into their mass, or grinding and rubbing along the bottom, all the fragments, large and small, from blocks many tons in weight down to the finest sand and mud, that rain, and ice, and the friction of the moving glacier itself, detach from the adjacent rocks. The laws of this motion were first thoroughly investigated by Professor James Forbes, who was forced to admit that the ice-mass possesses a slight degree of plasticity, or a *demi-semi-fluidity*, by which it is enabled to flow down the valley just as a viscous substance, such as partially melted pitch, would flow. The researches of Professors Tyndall and Faraday have shown that ice may be plastic without being viscous, owing to its peculiar property of reuniting by the contact of adjoining surfaces after having been broken into fragments. (*See* REGELATION.) The motion of the glacier is not due to viscosity, as imagined by Forbes, but is the result of the minute, almost molecular, fracture and regelation of the ice particles, which move as if they were sand, continually thawing and re-freezing. The glaciers of the Alps, and probably those of other regions, descend to a vertical depth of nearly 4,000 feet below the line of perpetual snow, and into a warm climate, before they finally melt away and leap forth as rivers of running water. The heap of materials of all sorts and sizes, which they deposit at their melting extremity, is called the *moraine*, a term which is also applied to the lines of blocks that are being carried along on the surface of the glacier. Combined with the *avalanche* and the *iceberg* (*see* these words), the glacier is now, as it has been in ages past, one of the most important of geological agents. Professor Tyndall has lately advanced the theory that the present conformation of the Alps has been produced mainly by the action of ancient glaciers. All the great valleys have, in his opinion, been ploughed out by moving masses of ice; in other words, the glaciers have been the real excavators, and not, as usually supposed, mere accidental tenants of valleys previously formed by water denudation. The evidence of glaciers in any country during former epochs consists partly in the polished and grooved surfaces of the rocks over which they slid with their impacted boulders and shingle; and partly by the peculiar contour and composition of the moraines, which differ materially from beds of *débris* brought down by torrents and other currents of water. In North Wales, the traces of ancient glaciers are very distinct. In all the valleys of the Snowdon range, scratchings and polishings, together with the moraines and detached boulders, bear evidence to the existence of vast sluggish rivers of ice.

GLACIS, *glaś'-se* (Fr.), in Mil., the inclined plane or slope that extends from the exterior of the covered way towards the open country. The crest of the glacis is about seven or eight feet above the terreplein of the covered way, which coincides with the natural level of the soil surrounding the fortifications. The slope itself extends about 150 feet from the covered way, having an inclination of one foot in twenty, or thereabouts, from the crest of the work to the natural surface of the ground. The glacis covers the masonry or revetments of that part of the rampart which forms the scarp of the ditch, and serves to hide it from the batteries of the enemy. It also conceals soldiers who are in the covered way from the view of the investing force, and protects them from their fire. A banquette is usually constructed in the covered way at the foot of the interior of the glacis which enables the besieged to pour a fire of musketry from thence on any party engaged in the construction of field-works and approaches, or advancing to the assault of the fortress.

GLADIATORS, *gläd'-e-ai-tors* (Lat.), a term applied in Antiq. to those persons who fought, generally in the arena at Rome, for the entertainment of the spectators. The custom of gladiatorial combats was introduced into Rome from Asia, and some suppose that the reason of keeping up the diversion was to accustom the people to despise danger and death. The

origin of these combats seems to have been a custom in which many nations indulged, of sacrificing captives or prisoners of war to the manes of the great men who had died in the campaign. Thus, Achilles, in the Iliad, is represented as sacrificing twelve young Trojans to the manes of Patroclus; and Æneas, in the Æneid, sends captives to Evander to be sacrificed at the funeral of his son Pallas. In time it became the custom to sacrifice slaves at the funerals of all persons of distinction; but as it appeared barbarous to massacre them in cold blood, they were appointed to fight with one another, and endeavour to save their own lives by killing their adversaries. This took away somewhat of the horror of the spectacle, as there was a possibility of avoiding death by courage and skill. The diversion became very popular, and the profession of gladiator became an art, the masters of which were called *lanistæ* by the Romans. They purchased and trained up slaves for the purpose, and then sold them to those who had charge of the gladiatorial exhibitions. At first the contests took place near the sepulchre or funeral pile of the deceased; but they were afterwards removed to the circus and amphitheatres, and became ordinary amusements. In process of time the Romans became so fond of these bloody entertainments that not only heirs coming into property, but all the principal magistrates, presented the people with shows of this nature in order to court their favour. The emperors also found it was much to their interest to provide gladiatorial displays. Titus exhibited a show of gladiators, wild beasts, and sham sea-fights, which lasted more than 100 days; and Trajan a similar solemnity, which continued for 123 days, during which time 5,000 pairs of gladiators were brought out. From slaves and freemen the inhuman sport at length spread to people of rank and condition; so that Augustus was obliged to issue a public edict that none of the senatorial order should become gladiators. The number of gladiators, however, increased, and the evil increased to such an extent, that Constantine issued a decree abolishing the gladiatorial shows, which, however, continued a favourite pastime till the reign of Honorius. On several occasions Rome was in danger through the large number of gladiators. One of the most memorable instances happened in the year 76 B.C., when seventy-four gladiators, headed by Spartacus, a Thracian, overcame their master at Capua, and fled to the mountains. There they were joined by runaway slaves and peasants, and soon became the terror of the country, and spread alarm almost to the gates of Rome. The war lasted three years, when Spartacus was slain by M. Crassus, after displaying much valour. Gladiators were classed according to the weapons which they used and the manner in which they fought. The *Ordinarii* fought in pairs in the ordinary way; the *Catervarii* fought several together; the *Equites* fought on horseback; the *Retiarii* used a fork, called a *tridens*, and a net, which they threw over their opponent, who was generally armed with a short sword and a shield: the *Andabatæ* fought blindfolded, the helmets which covered their heads having no apertures,—their ludicrous motions were very amusing to the spectators: and the *Hoplomachi*, who fought in complete armour; together with various others. All the gladiators wore armour on the right arm, if nowhere else, and all wore helmets and carried shields, except the Retiarii. The Bestiarii, who fought with wild beasts for money, were not reckoned as gladiators. When a gladiator was so severely wounded as not to be able to continue the fight, his antagonist stood over him pausing, until he received the flat from the spectators, as to whether he should kill him or not. If he had fought well, the audience turned their thumbs downwards, to indicate that his life should be spared. If, however, he had neither shown courage nor address, they held up their thumbs, and the victor immediately passed his sword through the body of his fallen antagonist. Palms were awarded to the conqueror, and gladiators, on retiring from service, were presented with a wooden sword. On account of their training and profession, gladiators were admirable models for the sculptor. Two of the best statues are the "Fighting Gladiator," of the Borghese collection, now in the Museum of the Louvre, and the "Dying Gladiator," of the Capitoline Museum. In the tomb of Scaurus, at Pompeii, there is a series of bas-reliefs illustrating clearly the mode of fighting of the gladiators.

GLADIOLUS, *glăd-e-o'-lus* (Lat. *gladius*, a sword, in allusion to the shape of the leaves), in Bot., a gen. of the nat. ord. *Iridaceæ*, consisting of plants with ensiform leaves and very showy flowers, purple, red, or white. Many species and varieties are in cultivation as border flowers. *G. communis* and *cardinalis* are the favourite species: the latter is a splendid plant, with scarlet flowers, spotted with white.

GLAND, *gländ* (Lat. *glans*), in Anat., is an organ of the body, composed of blood-vessels, nerves, and absorbents, in which secretion is carried on; as the lacrymal, mammary, and salivary glands. They are variously divided by anatomists, according to their structure or their contents. In form, glands are—1. Simple; consisting of small hollow follicles, covered with a peculiar membrane, and having a proper excretory duct; as the mucous glands of the nose.—2. Compound; consisting of many simple glands, the excretory ducts of all of which meet in one common duct; as in the sebaceous glands of the face, &c.—3. Conglobate or lymphatic glands; composed of a texture of lymphatic vessels, connected together by cellular membrane.—4. Conglomerate; composed of numerous simple glands, with their ducts all entering one common trunk; as the parotid and salivary glands. According to their contents, they are divided into mucous, sebaceous, lymphatic, salival, and lacrymal. There are also what are termed ductless glands, which resemble the others in external conformation, but differ from them in the absence of any duct or opening for the removal of the secreted fluid, and indeed, few of them contain any secreted fluid. Glandular swellings are not unfrequent, especially in weak and scrofulous persons. They occur about the neck, or other parts of the body, are comparatively painless, and of very slow growth, with little or no tendency to suppuration. In such cases, the system should be strengthened with tonics, and stimulants applied to the part: sea-bathing is also very beneficial. Glandular swellings also occur in certain diseases; as scarlet fever, &c.

GLANDERS, *gländ'-ers* (from *gland*), a disease in horses, which is attended with a copious discharge of mucus from the nose, and which generally proves fatal to the animal affected. Scrofulous horses, on account of their weak constitution, are generally subject to glanders. The poison produces in the blood abnormal changes, which vitiate the fluid, and unfit it for healthy nutrition. From the irritant nature of the morbid fluids passing through them, the lymphatic glands and vessels become inflamed, and lymph is deposited. This being of an unhealthy nature, soon softens, and extends to the skin overlying the part, and ulcerating sores are formed. On the surface of the more vascular mucous membranes effusions of tubercular matter are also poured out. These bring on inflammation, and degenerate into chancrous ulcers, generally on the mucous membranes of the nostrils in extreme cases of disease. It is stated in Johnson's "Farmer's Encyclopædia," that blue vitriol (sulphate of copper) in drachm doses of thin gruel, has been given with success as a remedy in some cases, and that the nostrils should also be washed with a solution of lime. Glanders is often communicated to the human system from horses affected with the disease, and generally ends in death to any one who has taken the infection. The best plan, therefore, with regard to horses infected is to shoot them at once, as they seldom recover, and, if they do, are certain to spread the disease amongst other animals. In Germany, the conviction of the danger of glanders is so strong, that all horses that have even gone near another affected by it are ordered to be at once destroyed.

GLANDS, in Bot. (*See* EPIDERMAL APPENDAGES.)

GLANS, or NUT, *glănz*, in Bot., an inferior, dry, hard, indehiscent, one-celled, one or two-seeded fruit, produced from an ovary of two or more cells, with one or more ovules in each cell; all of which, except one or two, become abortive in the progress of growth. The three layers constituting the pericarp are firmly coherent and indistinguishable, and the whole is more or less inclosed by that description of involucre which is called a *cupule*. The acorn and the filbert are examples of this kind of fruit.

GLASGOW, UNIVERSITY OF, *glăs'-go*, was founded by William Turnbull, the then bishop of Glasgow, in 1451, in terms of a bull obtained from Pope Nicholas V. in the preceding year. Two years after, King James II. conferred upon it, by royal charter, certain important privileges. "This university," says Dr. Reid, "came into the world as *naked* as every individual does;" it had no property in lands or houses, being chiefly dependent upon the exertions of the bishop and clergy of Glasgow. In 1459, however, James Lord Hamilton bequeathed some property in Glasgow for the use of the College of Arts; and a few years later, Thomas Arthurlie bequeathed another tenement to the college. During the period of the Reformation, this university was almost completely annihilated; but in 1560, Queen Mary bestowed upon it the manse and church of the Preaching Friars, with thirteen acres adjacent; and in 1577, James VI. endowed it with the rectory and vicarage of the parish of Govan. Since that time the college has continued to flourish, and has given forth many learned men. The number of matriculated students now averages about 1,200. It possesses faculties of arts, law, medicine, and theology, with chairs for Latin, Greek, mathematics, logic, natural and moral philosophy, English language and literature, natural history, botany, chemistry, anatomy, physiology, materia medica, practice of physic, clinical surgery and medicine, midwifery, surgery, divinity, church history, Oriental languages, biblical criticism, civil law, conveyancing, civil engineering, and practical astronomy. Connected with the university are the library, comprising upwards of 100,000 volumes; the Hunterian museum, bequeathed by the celebrated Dr. William Hunter, comprising a valuable collection of anatomical preparations, coins, medals, &c.;—an observatory, and a botanical garden. The office-bearers of the university consist of a chancellor, rector, principal, and dean of faculties. It possesses a number of bursaries for the support of poor students, and ten exhibitions at Oxford, founded by John Snell, a native of Ayrshire, who, in 1688, bequeathed a considerable estate in Warwickshire for the support of Scotch students at Balliol College, Oxford, who had studied for some years at the University of Glasgow.



GLASS, GLASS MANUFACTURE, *glăss* (SAX. *glæs*).—The composition of this important substance differs materially, according to the use for which it is intended. It generally contains the silicates of potash, soda, lime, baryta, magnesia, alumina, and lead, coloured by small portions of iron, manganese, cobalt, uranium, copper, or gold. These different varieties must not be considered as definite chemical compounds, but as a mixture of silicates with an excess of silica. The best glass, however, is found to be that which contains the minimum of uncombined silica. The celebrated Bohemian glass, so much valued in the laboratory for its hardness and infusibility, contains the silicates of potash and lime in predominant proportions. The more fusible Bohemian glass, which is used for ornamental purposes, contains, in addition, a notable quantity of silicate of alumina. French plate-glass and ordinary window-glass consist principally of the silicates of soda and lime, soda producing a more liquid compound than potash. The ingredients used in the well-known French plate-glass from St. Gobain are 300 parts of white quartzose sand, 100 of any carbonate of soda, 43 of slaked lime, and 300 of cullet, *i. e.*, fragments of broken glass of previous meltings. The fuel employed in the furnace is wood. Ordinary window-glass is made of a mixture of 100 parts sand, 35 or 40 of chalk, 30 or 35 of soda-ash, and from 50 to 150 of cullet. The inferior opaque or semi-opaque kinds of glass used for wine-bottles, carboys, and other articles in which transparency is no object, consist of the silicates of alumina, iron, lime, magnesia, and soda or potash, mixed in varying proportions. Common bottle-glass is made from sand 100 parts, soapmakers' waste 80, gas-lime 80, common clay 5, and rock-salt 3. Bottle-glass contains a less amount of silica than any of the other varieties. The ordinary white glass used for table purposes in this country is a colourless silicate of potash and lead, and is commonly known as flint-glass, although all glass has just as good a right to this title. The oxide of lead contained in it gives it a density, softness, fusibility, and brilliancy, qualities which render it peculiarly valuable for the purposes to which it is applied. From its high refractive and dispersive power, it is much employed for optical purposes. Optical glass is made with great care from the purest materials. A good optical glass may be made from 100 parts of pure sand, 100 of minium, and 30 of refined pearl-ash. In making flint-glass, the melting-pots used are made of the finest Stourbridge clay, mixed with a certain quantity of old pots. The mass is worked up with water, and allowed to remain in this condition for three or four months. It is then made into pots, which are arched over at the top, having a side-opening by which the glass may be withdrawn. They are placed in the furnace in such a manner that the products of combustion may not have access to the hole, which would endanger the purity of the glass by reducing the lead to the metallic state. By increasing the quantity of lead, a very transparent glass, with still higher refracting power, is produced, termed *paste* or *strass*, which is used in the white state for cutting into false brilliants, and, in combination with various metallic oxides, for imitating gems and precious stones. Coloured glass is made by combining crown-glass with various metallic oxides, which are dissolved by the glass in small quantities. Protoxide of iron produces green; but sesquioxide of iron has but little colouring power, except when present in large quantities, when it gives a yellow tinge to the glass. The contrary is the case with the oxides of manganese, the protoxides producing no tint, while the sesquioxide colours the glass purple or violet. Advantage of this is taken in making colourless window-glass, in which protoxide of iron is a constant impurity. By adding a small portion of black oxide of manganese, the sesquioxide of iron and the protoxide of manganese are formed, neither of which has any colorific properties. It frequently happens that a slight excess of manganese is added; in which case the resulting glass turns purple when exposed to the light. Oxide of chromium gives an emerald-green tinge; oxide of cobalt, a deep blue; protoxide of copper, a green; deutoxide, a ruby-red; oxide of uranium, an opalescent greenish-yellow; gold with oxide of tin, a ruby-red; and the oxides of silver and antimony, varying shades of yellow. Coloured glass is of two kinds,—*flashed glass* and *pot-metal*. Flashed glass has only a superficial coating of coloured material, while pot-metal is coloured throughout the mass. Glass may be divided technologically into two kinds,—cast glass and blown glass. The former kind comprehends British plate, which is cast and polished; optical glass; and the glass used for heavy domestic utensils, which is made by a combined process of blowing and casting. Blown glass includes ordinary crown and sheet glass, and the lighter glass used for table purposes. British plate is cast in large sheets upon iron tables provided with a ledge to prevent the molten metal from running off. Were the glass allowed to cool suddenly, it would fly in pieces, from unequal tension, at the slightest jar or blow. It has, therefore, to be cooled or annealed very gradually in an oven or furnace, after which two sheets are placed together, with a layer of polishing paste between them, and rubbed backwards and forwards in every direction until perfectly smooth, the final polish being given to it by women's hands. Window glass is made by two different processes, one of which consists in blowing a large bubble of glass, reheating it and causing the opposite sides to coalesce into a flat disc, by twirling it like a mop while still in a melting state. Glass made by this process is called crown glass. Sheet glass is made by first blowing a long cylinder and cutting off the two ends; the remaining tube is cut down the middle with a diamond, reheated, and opened on an iron table into a flat sheet. This, when polished, forms the patent plate of commerce. Since the removal of the excise duties on glass in 1845, this article has been gradually improved in every direction, until it has reached a state of perfection beyond which it seems difficult to go. The exertions made by Messrs. Chance of Birmingham have principally brought about this result, and now a piece of table glass can be bought for a few pence that but a few years ago would have cost as many shillings. The introduction of glass-engraving has raised up quite a

new branch of art, artistic ornamentation being now applied to table glass of so high a degree of excellence that a small vase but a few inches high has been sold for two hundred guineas. The introduction of gas glass-furnaces (*see* FURNACE) will do much to lower the price of glass, and still further improve its quality; and even now this wonderful material is produced at so low a rate that it is used for roofing houses and cellars at little more than the cost of ordinary roofing materials. (For fuller particulars concerning the manufacture, *see* Ure's *Dict. of Arts*, article *Glass*.)

GLASS-BLOWING, the process by which flint, crown, sheet, and other kinds of glass, are manufactured. The tools employed in glass-blowing are simple, and have continued in use with slight alteration for more than two hundred years. Tact and skill supply the place of more elaborate aids. The principal instrument used is the blowing-tube, which is made of iron, from four to five feet in length, with a bore of from half an inch to an inch in diameter. It is smaller at the mouth end than at the end which gathers the metal. In the manufacture of flint glass, the blowing-tube, being heated at the end nearly to redness, is introduced into the pot of fused glass, or metal as it is called, which immediately adheres to it; and by turning it round, the workman can gather up as much metal as he requires. If a large quantity be wanted, the first gathering is allowed to cool by exposure to the air, and when somewhat solidified, another gathering of metal is made, or even a third and fourth. The utensil to be made is then finished by a process combining blowing, manipulating, annealing, cutting, &c. (*See* GLASS MANUFACTURE.)

GLASS, ETCHING ON, the art of producing designs upon glass, by the corrosive power of hydro-fluoric acid. In order to effect this operation, the glass is covered with a thin ground of bees-wax; the design is then drawn upon it with the needle, as in etching upon copper. Sulphuric acid is afterwards poured on, and fluor spar or fluoric acid sprinkled on it. The hydro-fluoric acid which is disengaged acts powerfully upon the exposed portion of the glass, while fumes of fluo-silicic acid are liberated. After four or five hours the acid is removed, and the bees-wax removed from the glass with oil of turpentine. The glass is then found to be etched with the design required. The operation may be reversed by drawing the design upon the glass with a mixture of bees-wax and turpentine, and then subjecting it to the action of hydro-fluoric acid.

GLASS OF ANTIMONY, in Chem., a transparent glass of a red colour, formed by fusing tersulphide of antimony in the open air. It is an oxysulphide of antimony, containing eight parts of oxide and one of sulphide.

GLASS-PAINTING, the art of painting designs upon glass, either stained or colourless, with substances consisting usually of metallic oxides combined with a vitreous vehicle. When subjected to a great heat, the colours thus applied become permanently united with the surface of the glass. Painted glass differs materially from stained glass, although the terms are considered synonymous. In stained glass, however, the substance of the glass itself has been coloured in the process of manufacture. The art of making coloured glass has been long known. It was introduced into Greece and Rome from Assyria and Egypt. Byzantine Greeks appear to have been the first persons who practised painting upon glass, and from Byzantium the art passed into the West of Europe, by way of Venice and Marseilles. In France, the art of glass-painting was practised with great success during the 12th century. After that time painted glass windows were regarded as essential in religious edifices of any pretension. Painted windows of the 13th century abound in France, Germany, and England, and belong to the First Pointed, or Early English, style of architecture. The painted glass of the 14th century was more vivid in colour, with greater breadth in style, and more careful painting, than that of the preceding century. It was, however, less pure in conception, and not so strictly subordinate to the architectural effects. In the glass-painting of the 15th century a great change took place. The windows became more individualized, and still less dependent upon the architecture. The designs were larger, and began to be treated as pictures.





After the 15th century, when Gothic architecture was declining, the mediæval spirit departed from the art of painting on glass, and palaces and domestic buildings began to be ornamented with painted glass windows, as well as churches. Glass began to be treated as if it were canvas or panel, and the works of Raffaelle and other celebrated artists were either copied or imitated. The results were not good. From that period, glass-painting declined more and more, and, until within late years, has never shown any symptoms of revival. The method by which glass-painting is now practised differs in different places; but the general plan is as follows, for a small work on a single plate of glass:—A careful cartoon, the size of the painting, having been procured, the glass is laid on it, a tracing made from it, and the outline is carefully traced on the glass, with black or brown, composed of a very fusible vitreous flux, coloured with a metallic oxide, and ground extremely fine in an essential oil. Those parts which are intended to be yellow, orange, or red, are then coated according to the tint required, with a mixture composed of an alloy of silver and antimony, ground up with the red oxide which is obtained by subjecting sulphate of iron to a red heat. The glass is then exposed in a furnace to a red heat, in which the tracing colour is fused, and adheres permanently to the glass. The mixture of silver and antimony colours the glass, but does not melt; so that the oxide of iron may be brushed off in the state of dry powder, leaving the glass coloured, but transparent. The other tints, composed of a very fusible glass, coloured with metallic oxides, are then added, and the whole once more exposed to heat. In most cases, the glass is heated, or "fired," as it is called, between the application of each colour. In making a painted window, many pieces of glass are fixed together in a leaden framework, great care being taken to arrange the several compartments from the cartoon.

GLASS, SOLUBLE, in Chem., an impure silicate prepared by melting 8 parts of carbonate of soda or 10 of carbonate of potash with 15 of pure quartz and one of charcoal. The charcoal assists in decomposing the carbonate, and a black glass is formed, soluble in five or six times its weight of boiling water. It is used in dyeing, to impart incombustibility to wood and woven fabrics, as a varnish to preserve stone, as a vehicle in fresco-painting, and in the manufacture of soap, instead of rosin.

GLASSES, MUSICAL, *glăs'-ses*, an instrument of music, composed of a number of drinking-glasses, tuned by filling them more or less with water, and played upon by rubbing them with the end of the finger damped. The smaller the quantity of water contained in a glass, the lower is its tone: hence, it is evident that by procuring a number of glasses, exactly alike in size and shape, and putting a certain amount of water in each, a complete scale may be formed. The skill, or rather trick of performing on these glasses, consists in producing instantly the required vibration, by a gentle and rapid action of the finger upon their edges. Mr. Pocherich, of Ireland, is said to have been the first who thought of producing music by this means. The instrument called the *harmonica* had its origin in the musical glasses. (*See* HARMONICA.)

GLASSITES, *glăs'-ites*, the name of a religious sect, which sprang up in Scotland about the year 1729, and was so called after its founder, the Rev. John Glass, who was originally a minister of the Church of Scotland, but was deposed by the General Assembly for holding opinions contrary to the standards of the church. He fully explained his opinions in a tract, entitled "The Testimony of the King of Martyrs concerning his Kingdom." He was opposed to all national establishments for the support of religion, and advocated a system of independent church government. In fact, his views on this subject approached very nearly those maintained by the Congregationalists. One of his principal disciples was Robert Sandeman, who formed a congregation in London in 1762, and, after him, this sect in England bears the name of Sandemanians. The leading tenets of the Glassites, or Sandemanians, relate to the efficacy of the atonement and the nature of faith. They hold that "the bare death of Christ, without a deed or thought on the part of man, is sufficient to present the chief of sinners spotless before

God;" and that "faith is no more than a simple assent to the divine testimony, passively received by the understanding." They maintain the necessity of a plurality of bishops, or teaching elders, in each church, but do not consider the want of learning, or employment in worldly business, any disqualification for this office. They also observe certain peculiar practices, supposed by them to have been prevalent amongst the primitive Christians; such as weekly sacraments, love-feasts, washing each other's feet, the kiss of charity, the use of lots; and in general, they attempt to carry out literally, as far as possible, the rules of Scripture. They contribute largely of their goods to the church and to the poor. For a long time they have been decreasing in numbers, and according to the census of 1851, there were only six small congregations of them in England, and a like number in Scotland; the aggregate number of sittings in all the English chapels being estimated at less than 1,000.

GLAUBER'S SALT, *glaw'-ber* (after Glauber), in Chem., the old name for sulphate of soda. (*See* SODA, SULPHATE OF.)

GLAZING, *glaï'-zing* (Ang.-Sax.), a term applied to the insertion of panes of glass into the sash-bars of window-frames, and a peculiar method of polishing cutlery, as well as to the art of coating articles of earthenware and porcelain with a vitreous glaze which gives them a smooth, polished, and lustrous surface. The term is also used in Paint., with reference to the employment of varnishes and certain transparent colours termed glazing colours; and in the culinary art, to the use of white of egg, to give a smooth and shining exterior to pastry and other articles intended for the table. In glazing earthenware, the ingredients that are used consist of red lead, white lead, felspar, ground flints, ground flint glass, Cornish stone and clay, soda, nitre, and borax. Various compositions are made for glazing, by mingling some of these substances together in different proportions, according to the nature of the material which is to be coated and the purpose for which the article is intended. Thus, in the glaze for common earthenware, white lead and ground flints predominate; in that for porcelain, felspar, borax, nitre, soda, Cornish clay and sand, are used; and for stoneware, red lead, white lead, and ground flints are mingled with the ingredients used for porcelain. For luting chemical retorts, sand, potash, lime, and nitre are used, without any admixture of lead. The substances of which these glazes are composed are mixed with water, until they assume the consistency of cream. When the mixture is perfectly ready for use, the ware is dipped into it, and afterwards subjected to the action of heat in an oven, which converts the liquid coating into a solid vitreous glaze. (*See* EARTHENWARE.) Metal-glazing is the production of a brilliant polish on cutlery and steel goods, as well as articles made of brass, tortoise-shell, horn, ivory, and white metals, by means of wooden wheels from ¼ inch to four inches in width, and from four inches to two feet in diameter, the edges of which are covered with leather coated with emery-powder moistened with water. Other wheels are also used in polishing, coated with thick buff-leather, which is covered with a mixture of fine sand and water, or rotten-stone and oil, according to the nature of the material which requires to be polished. The final polish is given with a wheel, the leather covering of which is sprinkled with crocus or metallic powder, in a dry state. Stones are polished by lapidaries in a similar manner, with wooden wheels, which have emery spread on their edges. In window-glazing, the glass is cut to the required size with a glazier's diamond, and fastened to the sash-bars with a mixture of whiting and linseed oil, called putty, which hardens after having been exposed to the air for a few days, and retains the glass in its proper position. Before the erection of the Crystal Palace, the duke of Devonshire's conservatories at Chatsworth were the largest structures made of glass in this country; but they were eclipsed completely by the former building, in which 82,280 square yards of glass were used in panes which measured 49 inches in length by 10 inches in breadth.

GLEANING, *glean-ing* (Fr. *glaner*, to glean), was an established practice among the Jews, and was sanctioned by the law of Moses, who enjoins them, when they reap the harvest, not wholly to reap the corners of the field, nor gather the gleanings, which were to be left for the poor and the stranger, as were also the gleanings of the vineyard; for they were not to gather every grape. (Levit. xix. 9, 10.) In modern times there exists a very general feeling in favour of gleaning; and in England it is popularly regarded as a right which an owner or occupier cannot oppose, and that the poor who enter a field for this purpose are not guilty of trespass. The act, however, has been decided to be illegal, though the practice still prevails all over England of allowing the poor to glean the fields after they are reaped.



GLEBE, *glebe* (Lat. *gleba*, a lump of earth), in Law, is the land belonging to a parish church.

GLEE, *glee* (Sax. *glie*), a vocal composition in three or four parts, generally consisting of more than one movement, the subject of which, notwithstanding the received sense of the word *glee*, may be either gay, tender, or grave. The term was not applied to vocal concerted music until long after the *madrigal*. The early glees were nothing but vocal music in parts, in which the singers began and ended together, singing the same words. Gradually, however, they became improved, and the play of words and phrases introduced. Certain words were elongated in musical expression, and points were taken up after the manner of the catch.

GLEEMEN, *glee'-men*, a name given by the Saxons before the Conquest to those who were afterwards called "minstrels." Their art consisted not only in being the poets and historians of their times, but they were also buffoons, rhymers, singers, storytellers, and jugglers, all these branches being sometimes filled by one man; but oftener by several. They were the immediate successors of the ancient bards. Among the early Saxons, who came to England professedly to aid the Britons against the Picts and Caledonians, they were divided into two classes, distinguished by two appellations, the one signifying merrymakers, and the other, harpers.

GLENCOE, MASSACRE OF, *glen'-ko*, in the history of Scotland, is an atrocious deed which was perpetrated by the regiment of Campbell of Glenlyon upon a tribe of the Macdonalds, who inhabited the lonely valley of Glencoe, in the district of Lorn, Argyleshire. After the revolution of 1688, many of the Scottish clans continued in arms against the new monarchy, and in August, 1691, a proclamation was issued by the government promising pardon to all who should lay down their arms or tender their submission before the 1st of January, 1692. Many of the chiefs submitted and tendered their allegiance within the prescribed time. Among others, the aged Macdonald, or Maclan, of Glencoe, repaired to Fort William, and tendered his submission, on the 31st of December; but the officer in command, not being authorized to receive it, referred him to the sheriff at Inverary. The journey was long and in the depth of winter; but the old man made what haste he could, and on the 6th of January, 1692, took the oath of allegiance. The news that Mac Ian had not submitted within the prescribed time was, says Macaulay, "received with cruel joy by three powerful Scotchmen who were then at the English court,"—breadalbane, Argyle, and the Master of Stair; the two former being hereditary enemies of the Macdonalds. The news of their submission was concealed, and the Master of Stair, who was secretary of state for Scotland, by representing to King William that the Macdonalds of Glencoe still held out, obtained an order from the king for their extirpation. On February, 1692, a body of soldiers, 120 in number, under the command of Campbell of Glenlyon, were sent to occupy Glencoe. They came professing friendship, and were received with the kindest hospitality by the people. On the evening of the 12th of February, the officers supped at Macdonald's house, and played cards with himself and family. The following morning at five o'clock was fixed for the bloody deed. Lieutenant Lindsay and a party of soldiers returned to the old chief's house, knocked, and were admitted. Macdonald rose from his bed to receive them, and while ordering his servants to bring some refreshment for them, he was shot through the head. Two of his

attendants were slain with him, and his wife received such cruel treatment that she died on the following day. Like butchery took place in the other houses. The intention was to slaughter the whole tribe; but owing to the inclemency of the weather, a detachment of soldiers sent to guard the outlets of the valley did not arrive in time, and about three-fourths of the people escaped to the mountains, where many of the women and children perished with cold and hunger. "About thirty corpses," says Macaulay, "lay wallowing in blood on the dunghills before the doors. One or two women were seen among the number, and a yet more fearful and piteous sight,—a little hand which had been lopped off in the tumult of the butchery from some infant." The deserted hamlets were then set on fire; so that, when the wretched inhabitants returned, they found no place to receive them. The matter was attempted to be kept as private as possible, and various attempts were made to conceal the truth, so that it was nearly a year after the crime was committed before it was published to the world. At length the popular cry became so great on this subject, that a commission was nominated in May, 1695, to investigate the whole matter. The report was laid before the house of the Scottish parliament on the 23rd of June; and though it contains a clear and just statement of the circumstances, yet no punishment was inflicted on the authors of the crime. A graphic account of the massacre of Glencoe is given by Macaulay in his History of England, vol. iv., and Campbell has made it the subject of a poem, "The Pilgrim of Glencoe." A writer in *Blackwood's Magazine* for July, 1859, criticises severely Lord Macaulay's account of the massacre, whom he accuses of partiality in attempting to screen William; and concludes that the king's "signature was affixed to the order with full knowledge of the facts, and that his intention was to strike terror into the Highlanders by the 'extirpation' of a clan too weak to offer any formidable resistance, but important enough to serve as a formidable example."

GLOBE, *globe* (Lat. *globus*, Fr. *globe*), a name that is commonly applied to any spherical body, but more especially to the earth, and to the spheres on which representations of the earth's surface, and the relative position of the heavenly bodies, are delineated. These are respectively termed the terrestrial and celestial globe.

GLOBE-MAKING, the art of making spheres, on which the surface of the earth and the field of the heavens, as it appears to our view, are represented. It is an operation requiring great care and nicety throughout the entire process. A spherical mould, which is generally turned out of a piece of hard close-grained wood, with wires projecting from diametrically opposite points, to represent the earth's axis and poles, is first covered with paper tightly pressed all over its surface. On this several layers of paper are pasted, one above another, until a pasteboard shell of sufficient thickness has been formed about the mould. This shell is then divided into two equal hemispheres, in a line corresponding to that of the equator of the globe, when it is completed. The edges of these hemispheres, which are readily removed from the mould, in consequence of the first coating not having been pasted to it, are fastened to a piece of wood, corresponding in length with the internal diameter of the sphere, or two pieces of wood joined at right angles to each other, if the globe be large, after which they are securely glued together, a wire being passed through the sphere and the wood in the centre, to form the poles of the future globe. Several coatings of plaster, made of whiting, oil, and glue, are then applied in succession, until the surface of the sphere presents a perfectly smooth and even appearance. During this part of the process, care is taken to make the sphere revolve easily and freely about its axis, and with regularity, by increasing or diminishing the weight of plaster at any point where it may be necessary. The lines of latitude and longitude that are necessary to guide the manufacturer in putting on the external covering are next drawn on its surface by the aid of a beam compass, and the sphere is now ready to be coated with gores of thin but tough paper, on which the outlines of the principal features of the earth's surface, and the names of the different parts of the land and water, have been printed from plates prepared by the engraver. The gores for globes of ordinary size are generally twelve in number, each embracing an extent of 30° of longitude along the equator, and extending to about the 67th parallel of latitude north and south of that line. The spaces left uncovered about the poles are covered with circular pieces of paper, extending as far as the arctic and antarctic circles. Great skill is requisite in pasting on the gores, to prevent the edges from overlapping. The globe is afterwards coloured and varnished, and the extremities of the axis are inserted in the ends of a semicircular meridian ring of brass in small globes, and of iron in large globes, made for school purposes, divided into 180 degrees, within which the globe revolves on its axis, and by means of which the latitude and longitude of any place on the globe's surface can be determined and read off. The metal meridian moves freely in a wooden hemisphere-frame, on which the astronomical horizon is represented by a broad ring which surrounds the globe in a horizontal plane, dividing it into two equal parts. This ring, called the wooden horizon, is covered with paper divided into 360 degrees and compartments of 30 degrees each, marked with the signs of the zodiac, and other things requisite for working problems in the terrestrial and celestial globes. Globes are made of all sizes, from three to thirty-six inches in diameter, eighteen inches being the diameter of globes of the ordinary size. They are sometimes made of paper, and constructed in such a manner that they may be folded up and laid aside when not in use. Globes of this description, for schools and public lectures, have been made measuring as much as ten feet in diameter. Embossed globes, or globes having the land raised in relief on the surface, are made in moulds. Globes have also been made of gutta-percha, which can be taken to pieces and put together again at pleasure.

GLOBULARIA, *glo'-bu-lai'-re-ä*, in Bot., a gen. of *Selaginaceæ*. The species are European shrubs and herbs. The leaves of *G. Alypum* form the *wild senna* of Germany, which have been sometimes employed to adulterate senna-leaves. In small doses they act as a tonic, and in full doses as a safe, mild, and efficient purgative.

GLOBULAR PROJECTION, *glob'-u-lar*, the name more particularly applied to a kind of projection, very seldom used in map-making, in which the eye is supposed to be situated at a point which is distant from the part of the globe that is represented by one half of the chord of an arc of 90°. In this description of projection most of the great circles that appear on the map take the form of ellipses.

GLOBULE, *glob'-ule* (Lat. *globulus*, a little globe), a small particle of matter of a spherical form. The term is more particularly applied to the microscopic particles which float about in the transparent serum of blood.

GLOBULIN, *glob'-u-lin* (Lat. *globulus*), a term applied in Org. Chem. to one of the protein bodies, or albuminates, when associated with hæmatin. As hæmatoglobulin it forms the principal ingredient of the blood globules; mixed with albumen, it is also found in the cells of the crystalline lens of the eye, and is then distinguished by the name of crystallin. Although closely resembling albumen in many of its relations, it differs from that substance in being precipitated from acid and alkaline solutions when perfectly neutralized. It is also, when in solution, completely precipitated by carbonic acid gas.

GLOMERULE. (*See* INFLORESCENCE.)

GLORIA IN EXCELSIS, *glo'-re-a in eks-sel'-sis* (Lat., glory to God in the highest), is the name of a hymn in the communion service of the Church of England, and is so called from the words with which it begins. It is founded on the hymn of the Angels, given in Luke ii. 14, and is very ancient, appearing nearly as now used in the Apostolic Constitutions. In the Roman Missal it stands at the beginning of the office for the communion.

GLOSS, *gloss* (Gr. *glossa*, a tongue or language), in Lit., is the explanation or interpretation of uncommon or foreign words; hence the term *glossary*, which is applied to a collection of such words arranged and explained in alphabetical order.—In Jurisprudence, the name is given to the interpretations or explanations

of the Justinian code, which were generally written between the lines of the text and on the margin, and were hence called *glossæ interlineares* and *glossæ marginales*. These glosses were sometimes held to be of equal authority with the text itself. Accursius, who died about 1260, collected and arranged the glosses of his predecessors. The practice of introducing glosses was also adopted with the books of the canon law.

GLOSSA, or GLOTTA, *glos'-sä, glot'-tä* (Gr.), in Anat., is a name given to the tongue, and forms part of the name of various parts connected with that organ. The glosso-pharyngeal nerves are the ninth pair of nerves, rising from the processes of the cerebellum, and terminating by numerous branches in the muscles of the tongue and larynx.

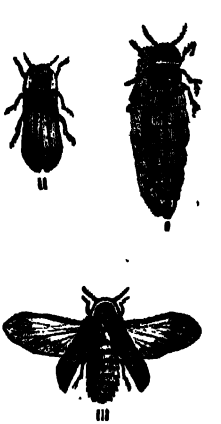
GLOSSITIS, *glos-si'-tis* (Gr.), in Surg., is applied to inflammation of the tongue. It may result from various causes; as mechanical injury, exposure to cold, the use of mercury, &c. The tongue becomes greatly swollen, and is painful to the touch; respiration and deglutition are much interfered with, and one of the chief dangers of the attack is suffocation. In mild cases, the application of leeches to the part, with the use of purgatives, will afford relief; but in the more severe forms the knife is to be freely used, and pretty deep incisions to be made into the inflamed part, which will afford almost instantaneous relief.

GLOTTIS, *glot'-tis* (Gr.), in Anat., is the name given to the superior opening of the larynx, situated immediately behind the root of the tongue, and covered by the epiglottis. (*See* LARYNX.)

GLOVE, *gluv* (Sax. *glof*), is a covering for the hand, which is divided into compartments for each separate finger. Xenophon asserts that the Persians used gloves in cold weather, and makes a charge against them, on that account, for their luxurious habits. They were in early use in England, as is learned by their Saxon name; and in the middle ages they were decorated with gold and precious stones, and formed a costly article in the dress of kings, nobles, and prelates. In the days of chivalry, it was the custom for the knights to wear the glove of a lady in their helmet, and this gift from the fair sex was esteemed a great favour, the knight's success in arms being considered as owing to the virtue of the lady. Throwing down the glove, or gauntlet, was likewise esteemed a challenge to single combat amongst our ancestors, and he who took up the glove thus cast down was deemed to have accepted the wager of battle. According to an ancient custom, it is the practice on a maiden assize,—that is, when there is no offender to be tried,—for the sheriff to present the judge with a pair of white gloves; also, during the time fairs were held, it was the custom to hang out a glove from the town-hall, and as long as it remained suspended there, all persons visiting the fair were privileged or exempt from arrest; and the taking down of the glove was a signal that the fair was closed and the privilege at an end.

GLOVE MANUFACTURE.—The principal substances of which gloves are made in the present day are dogskin, doe, buck, lambskin, kid, and various other kinds of leather; besides silk, cotton, wool, and admixtures of the same. Particular kinds of gloves are known more from the place in which they are manufactured, however, than from the substances of which they are composed; as Berlin, Woodstock, Limerick, and Kendal. Kid gloves are the most used, and obtain the highest price in the market; the best of these are of French make, and hardly any of English manufacture can come up to them in point of elasticity and general excellence. Sheepskin gloves are usually of a white colour, and are greatly used in the army. Doeskin gloves are of a soft leather; and Woodstock gloves are a coarser variety of these. The English glovers were incorporated as a "guild" in the reign of Charles II., in the year 1683. The process of glove-making is very simple; and, since the introduction of machinery into the trade, admits of no complicity of manufacture. The dressed skins are first cut out by cutting-machines, and the finger and thumb pieces are likewise separately cut. These disjointed particles of the glove are given into the hands of the sewers, who work it up into the desired form. The sewers use a clasp or clam, which is held between the feet and knees, and clasps the leather while being sewn. It is stated that, during the years 1856-7-8, French gloves were imported into this country at the rate of 4,000,000 pairs per annum. There is no doubt that the sewing-machines have considerably lessened the cost of glove-manufacture since they were introduced into England; and although we are not on a par with the French in the average quality of our gloves, yet some of what are termed the "best town-made" are equal to, if they do not surpass, any of the productions of the Paris glovers.

GLOW-WORM, *glo'-wurm* (Ang.-Sax.), (*Lampyris noctiluca*).—This well-known insect is rather more than half an inch in length, and of a blackish colour. The thorax is margined with dusky red, the legs and the segments of the body being of the same colour. The female resembles the male, but is quite destitute of wings. It is not certainly ascertained whether the male glow-worm is capable of emitting a phosphorescent light; and it is generally agreed, that if the power exists at all, it is in a very slight degree: it is to the female that the name of glow-worm applies. The light proceeds from the under part of the abdomen, and near the tip; and it appears that the insect has the power to increase or subdue the intensity of the light at will. Latreille ascertained by experiment that the glow-worm will live a long time without air, and in different kinds of gases. If the luminous part of the body be removed, it will continue for a considerable time to shine; and when the light is apparently extinguished, can be again kindled by softening the matter in water. If immersed in warm water, the insect still preserves its luminosity, but if placed in cold water, the power is suspended. The female being a slow-moving inactive insect, it is supposed by some naturalists that the light emitted by the female acts as a beacon to the opposite sex. The larvæ have been kept for a considerable period, living upon snails, and killing those of the largest size. "Sometimes they would seize a snail whilst crawling, and when the animal retired within its shell, they would still keep their hold, and allow themselves to be carried into the shell with the snail; and although they became enveloped in the mucous secretion, it very seldom appeared to adhere to their bodies. Upon being touched or disturbed in any way, the larva emitted the phosphoric light, but not to so great a degree as the perfect insect."—*English Cyclopædia*, art. *Lampyridæ*.



1. BRITISH GLOW-WORM, FEM.
2. DITTO, MALE.
3. MALE, FLYING.

GLUCINIUM, *glu-sin'-e-um*, in Chem. (symbol Gl., eq. 6·9), a metal of comparatively new occurrence in nature, where it is found in combination with silicic acid and alumina in the emerald, beryl, and enclase. It is prepared in the same way as aluminum, by decomposing the chloride with potassium or sodium. It is very similar in its properties to aluminum, forming, like it, a sesquioxide, *glucina*, $Gl_2O_3$. Glucina is generally prepared from a mineral called the emerald of Limoges, which contains silicate of alumina and glucina. It is a white, infusible, insoluble powder, closely resembling alumina, differing from it in forming a carbonate by exposure to the air, and by not forming alums in combination with alkaline sulphates. Its salts have a peculiar sweet taste; hence its name, from *glukus*, sweet. Its salts have not as yet received any application.

GLUCOSE, *glu'-koze* (Gr. *glukus*, sweet), in Chem., *starch*, or *grape sugar*. A sugar formed from starch, either in the natural organism, or by allowing a mixture of starch and water to flow into a vessel containing a solution of sulphuric acid of one per cent. strength, at a temperature of 130°. The liquid is continually stirred and kept in a state of ebullition for half an hour, as soon as all the starch has been added. The liquid is then drawn off and neutralized with chalk, the precipitate allowed to subside, and the clean solution set aside to crystallize. Glucose crystallizes in hard warty concretions, composed of hard, transparent cubes. With common salt, it forms a compound that crystallizes with facility. It also forms definite compounds with the alkaline bases, giving rise to a powerful uncrystallizable acid, called *glucic acid*. (*See* also SUGARS.)

GLUE, *glu* (Fr. *glu*). (*See* GELATINE.)

GLUMACEÆ, or GLUMIFERÆ, *glu-mai'-se-e* (from Lat. *gluma*), in Bot., a sub-class of the *Monocotyledones*, consisting of plants with parallel-veined, permanent leaves and glumaceous flowers. It includes the Sedges and the Grasses. (*See* CYPERACEÆ and GRAMINACEÆ.)

GLUMES, *glumes* (Lat. *gluma*), in Bot., the outer bracts of the locusta or spikelet of a grass. (*See* BRACT; GRAMINACEÆ.)

GLUTEN, *glu'-ten* (Lat.), in Chem., a characteristic ingredient in cereal seeds. If the flour of wheat or rye be made into a paste with water, and washed in a bag of fine linen, the starch is carried down by the water along with the sugar and dextrin: the remaining grey, sticky, and mucous mass is gluten. It cannot be regarded as a definite body, for, by means of hot alcohol, it may be separated into at least three distinct substances,—one soluble in cold alcohol, which may be precipitated by water in a form resembling albumen, and termed glutin; another deposited by the alcohol as it cools, which has the composition and properties of casein; and a third, which remains undissolved, which may be regarded as vegetable fibrin. Gluten may be assumed to be the principal flesh-forming substance contained in wheat.

GLYCERINE, *glis'-er-een* (Gr. *glukus*, sweet), in Chem., $C_3H_8O_3$, the sweet principle of oils and fats, which is separated from them during the process of saponification; in other words, it is the substance to which stearic, margaric, oleic, and the other fatty acids, are united in stearin, olein, margarin, &c. It is a viscid, colourless liquid of a sweet taste, soluble in water and alcohol in all proportions, but sparingly so in ether. It dissolves most of the deliquescent salts, and many other substances which are soluble in water. It is slightly volatile at 212°; but if distilled alone, decomposes. It may, however, be distilled unaltered in a current of superheated steam. From its possessing the property of never drying up at ordinary temperatures, it has received many applications in the arts and manufactures. In Med., it is also used in preference to oil or other fatty matters, to keep sores in a soft condition, on account of the ease with which it may be washed off. Chemists are somewhat at variance as to its true composition,—one party considering it to be the teratomic alcohol of a base, *glyceryl*, $C_3H_7$, as vinous alcohol is the alcohol of a base, *ethyl*:—

| *Glycerine.* | *Vinous Alcohol.* |
|---|---|
| Glyceryl $C_3H_7\}O_3$ | Ethyl $C_2H_5\}O_2$ |
| $H\}$ | $H\}$ |

in fact, the hydrated oxide of glyceryl. Gerhardt considers it to be formed on the base *glycyl*, thus:—

$$C_3H_4O_2\}O_4$$
$$H_4\}$$

The waxes and spermaceti are not compounds of glycerine. By a very complicated series of actions, Berthelot has been able to form glycerine by synthesis.

GLYCOCINE, or GLYCOCOLL, *gli'-ko-seen*, *gli'-ko-kol*, in Chem., a kind of sugar, obtained from gelatine by the action of dilute sulphuric acid. By transmitting nitrous acid through the aqueous solution, an acid is formed,—glycocollic acid, which is very similar to lactic acid in its properties.

GLYCOL, in Chem., a colourless slightly viscid liquid, with a sweet taste, obtained by distilling binoxide of ethyline, triturated with acetate of silver, and digesting the resulting binacetate of glycol with hydrate of potash. The mixture is distilled as soon as the action is complete, and glycol passes over. Its composition may be represented by the formula $C_2H_6O_2$, or vinous alcohol, in which the $C_2H_4$ has a doubly atomic power, being united with four equivalents of oxygen instead of two. It is a very interesting substance to the scientific chemist, the discoveries of Wurtz proving it to be the type of an extensive series of derivatives, as numerous as those derived from ordinary alcohol. In a paper read before the Chemical Society of London, he stated it to be the connecting link between the organic and inorganic products of chemistry. An elaborate article on the subject may be found in Miller's "Elements of Chemistry," vol. iii.

GLYCYRRHIZA, *glis-e-ri'-zā* (Gr. *glukus*, sweet; *riza*, root), in Bot., Liquorice, a gen. of *Leguminosæ*, sub-class *Papilionaceæ*. The roots or underground stems of *G. glabra*, the common or smooth liquorice, *G. echinata*, the echinate-podded liquorice, and other species, possess a remarkably sweet taste, which is due to the presence of an uncrystallizable sugar, to which the names of *Glycyrrhizin*, *Glycion*, and *Liquorice sugar*, have been given. The dark-coloured extractive matter which the rhizomes furnish on decoction, contains a large proportion of this peculiar substance. The extract inspissated is largely imported into this country, under the names of *liquorice juice*, *Spanish juice*, and *Italian juice*. That imported from Spain is prepared from *G. glabra*; that from Italy is the produce of *G. echinata*. About fifty acres of the former plant are under culture at Mitcham, and still more at Pontefract. The annual consumption of liquorice in England is from 1,200 to 1,500 tons. It is used for confectionery purposes and in medicine for flavouring, and as a demulcent pectoral. The great proportion is, however, used by the brewers for colouring porter. Various preparations of liquorice are commonly kept in the shops, and sold under the names of *pipe liquorice*, *Pontefract lozenges*, *extract of liquorice*, and *Solazzi juice*. In France there is an extensive use of liquorice-water in the promenades and public places, under the name of *coco*. It is also sold extensively under the name of *erguoos*, in the towns of Turkey and Egypt, like sherbet. Previous to the war, the consumption of liquorice in North America had reached 4,000 to 5,000 tons per annum. The great use of this extract, as a preservative of manufactured tobacco, will partly account for this enormous consumption. The price of liquorice in the United Kingdom has fallen considerably lately, in consequence of the heavy duty formerly paid upon it having been abolished by Mr. Gladstone.

GNAT, *nat* (Sax. *gnæt*, Lat. *culex*), the common type of the gen. *Culicides* of Latreille, which is a fam. of dipterous insects of the section *Nemocera*. The proboscis is long and slender, projecting forwards, and terminated by two little lip-like appendages; sucker composed of six slender bristle-like members; palpi 5-jointed, generally elongated; antennæ filiform, covered with hairs; eyes contiguous, no ocelli; wings inclined to the body, and having one marginal and two submarginal cells. The common gnat is less than a quarter of an inch in length, and is identical with the insect termed *cousin* in France and *mosquito* in America. The pain and irritation which ensue from its sting are caused by the proboscis piercing the skin and a poisonous fluid being injected at the same time. The humming noise which accompanies its flight is caused by the vibration of its wings, which move very rapidly. —Ref. *English Cyclopædia*, sect. *Natural History*.

GNEISS, *nise*, in Geol., originally a German term for a peculiar granitic-looking rock, occurring at the very base of the so-called "primary strata;" but now applied not only to the one rock, but to the whole suite of hard crystalline granitoid schists which constitute the lowest portion of the metamorphic or non-fossiliferous strata.

GNETACEÆ, *ne-tai'-se-e*, in Bot., the Jointed Fir fam., a nat. ord. of *Dicotyledones*, sub-class *Gymnospermia*, consisting of small trees or shrubs, with jointed stems and branches, and opposite, entire, net-veined leaves, sometimes small and scale-like. They occur in both tropical and temperate climates. Their properties and uses are unimportant. The seeds and leaves of some

are eaten. The term is derived from *gnemor*, the name of the jointed fir in the island of Ternate.

GNOME, *nome* (Gr., a sentence or opinion), in Lit., is a short sententious saying, conveying some maxim or moral precept. In the Bible, the Proverbs of Solomon and many of the sayings of Christ afford examples of the guome. The gnomic poets are those Greek poets whose remains consist chiefly of gnomes, short sententious precepts and reflections. The principal writers of this class are Theognis, Solon, Tyrtæus, Simonides. The best collection of these poets is that of Brunck (Strasburg, 1784; new edition, Leipsic, 1817).

GNOME (Gr. *gnomon*, knowing, cunning), is the name given by cabalistic writers to a certain class of elemental spirits, which they believe to inhabit the earth, and to preside over its treasures. They were of both sexes, and some were said to be beautiful, and others ugly. They sometimes did good, and sometimes evil, to man, the latter especially when they were irritated. The well-known German Rübezahl is a being of this class.

GNOMON, *no'-mon* (Gr. *gnomon*, the style of a dial), the plate which projects from the face of a dial, the shadow of which shows the time of day according to the sun, as it moves along the graduated edge of the dial-plate. In constructing a sundial, the plate is placed either in a vertical or horizontal position (*see* SUNDIAL), and the gnomon must be in the plane passing through the meridian of the place, having its sloping edge parallel to the axis of the earth, and forming an angle with the horizon equal to the latitude of the place.—In Math., this name is given to the figure formed by either of the parallelograms about the diameter of a parallelogram, and the complements or subsidiary parallelograms, that make up the entire figure when it has been divided into four parts, by two lines drawn parallel to its sides, and transversely to each other, through any point in the diameter.

GNOMONIC PROJECTION, *no-mon'-ik*, the name given to the method of projecting the whole or a part of a sphere on a plane surface, which is based on the method adopted in the construction of a sundial. The eye is in this case supposed to be in the centre of the sphere, and all its great circles are consequently projected on any plane surface, beyond that of the sphere in straight lines, a property which is entirely confined to this kind of projection. Sir John Lubbock's Maps of the Stars, originally published by the Society for the Diffusion of Useful Knowledge, and now by Stanford, are drawn in this manner; the sphere of the heavens being supposed to be inclosed within a cube, on each side of which a sixth part of the sphere is projected by straight lines drawn through the centre.

GNOSTICS, *nos'-tiks* (Gr. *gnosis*, knowledge), in Eccl. Hist., is the name given to various sects in the early history of the Church, who sought to incorporate the teachings of heathen philosophers with the system of Christianity. Their doctrines were very various, so that it is difficult to give any general account of their principles. According to some, they derived their doctrines from the Alexandrian philosophers; according to others, from the Jews or from the Orientals. There can be little doubt that each of these sources contributed to build up the fabric of Gnosticism, some sects taking from one, and others from another, and some, perhaps, from all the three. The apostle Paul, even during his ministry, complains of attempts being made to ingraft Jewish and heathen customs and opinions upon the Christian faith; and hence Gnosticism is frequently traced back to this early period. There can be no doubt that the sect became very powerful in the Church soon after that time; and their opinions exercised a great influence upon Christian theology. One of their leading principles seems to have arisen from their inability to account for the existence of evil in the world. They could not see how God, as all-wise, powerful, and good, could allow evil to exist at all; and they were led to conclude that matter must contain within itself the principle of evil. Hence they came to the conclusion that God had nothing to do with the creation or sustenance of the world, but that he created two beings, called Æons, or emanations, from which sprang other æons, and others from these, an innumerable host, the lower in descent being always less perfect than those above them. One of these æons was Demiurgus, who created this world, and was the God of the Old Testament. To counteract the evil that existed, God sent Christ, one of the highest æons, into the world, to restore man to the knowledge of himself. They had very inferior notions of the character of Christ, and denied that he suffered death, or that he really underwent the sufferings recorded of him. They did not believe in the resurrection of the body, deeming it too gross for a higher destiny. Their beliefs influenced their lives in two very different ways, leading some to mortify the flesh, in order to bring themselves into closer communion with God, and leading others to give way to every sinful lust and passion, in order to show their total disregard of the body. In process of time they split into various divisions, differing widely from each other both in faith and practice. Among the principal Gnostic sects may be mentioned the Nicolaitanes, Saturnines, Cerinthians, Basilidians, Valentinians, Ophites, Carpocratians, Antitactes, Docetæ, Marcionites, Tationists, and Bardesanists. The system of Gnosticism disappears about the 5th century.—*Ref.* Mosheim's and Neander's *Church Histories*; Möhler, *Versuch über den Ursprung der Gnostiken*, 1831; Baur, *Die Christlichen Gnosis in geschichtliche Entwickelung*, Giesler's *Ecclesiastical History*.

GNU, *nu*.—This animal is an *equine antelope*, belonging to the section denominated *Connochetes*. It has a broad, spreading muzzle; horns bent downwards and outwards, broad at the base, and tapering to a point; the tail long and bushy, like that of a horse; the frontal bone much depressed, and the intermaxillary bones elongated. The gnu, or kokoon, as it is variously termed, inhabits the plains and wilds of South Africa, where it roams about in extensive herds. In appearance it is very singular, and at a distance resembles a full-grown ass. The neck, body, and tail, as well as the pace of the gnu, are nearly identical with that of a donkey or small horse, while its horns, and the long hair which surrounds its face and muzzle, give it the most uncouth appearance imaginable. The gnus are extremely wild and difficult for the hunter to approach, and from their firmness and courage a good deal of danger is attendant in shooting them. In height they are generally about three feet and a half at the shoulder, and their colour is a dark brown. The horns are common to the female as well as the male. When they are surprised by the hunter, in the first alarm they commence flinging up their heels, and start about like a frightened horse; but they immediately afterwards take to flight, and career over the plains at a speed which soon out-distances the hunter, who must trust more to take them by stratagem than by hoping to gun them down. When they are wounded, they will often turn on their assailant, and attack him with the greatest fury, often besieging him in some mound or tree for days. Before attacking, they first drop on their knees, and then spring upon their foe with immense impetus. It is said that the gnu is subject to a sort of eruption on the skin or other cutaneous disorder, which attacks the different herds at a particular season of the year; and that if domestic cattle become infected with it, it is certain to end in their death. When taken young, the gnu is very easily domesticated, and is often adapted to the plough in South Africa.

GOAT, *gote* (Sax. *gæt*).—The domestic goat, according to Cuvier, varies more in size, stature, length and fineness of the hair, than any other animal, with the solitary exception of the dog. Its distinguishing characteristics, from the Linnæan system of zoology, are as follows: The horns are hollow, turned upwards, annulated on their surfaces, and knotted in front. There are eight cutting teeth in the lower jaw and none in the upper; and the male is generally supplied with a beard or tuft of hair under the lower jaw. The original stock from which this animal sprung has been discovered by the researches of modern students of natural history to have been the Ægagrus, or wild goat, which inhabits the mountains of Caucasus and Persia. The domestic goat is one of the most useful of animals to man, and it bears every temperature, from that of the tropics to as far north as Wardhuys, in Norway, where it remains exposed to all the inclemencies of the weather all day, being only sheltered at

night in hovels which are nearly as much exposed as the open fields. In Norway, it feeds on moss and the bark of the fir-tree. The milk of the goat is far richer than that of a cow, and the hair is particularly useful in manufacture. The skin, especially that of the kid, is used for the making of gloves, and the flesh is often eaten, although it is rather coarse,—that of the kid is esteemed quite a delicacy. The condition of the goat in the British islands is much more wild than that of any other of our domestic animals: from its being a courageous and powerful animal, its temper and motions are particularly inconstant, and it roams over the mountains of Wales as if it had never been domesticated, although, at the sight of the herdsman, it will be far more quick and playful and show more affection than the sheep, to which it is undoubtedly superior in many instances. The *Cashmere goat* is smaller than the domestic goat, and is likewise valued for the fineness of its fleece. This variety is a branch of the Thibet goats, which pasture on the Himalaya Mountains, in Hindostan. Both these species have a long outward hairy covering, and beneath this is a fine and beautiful coat of wool. From this wool are made the magnificent shawls which form such an important item in the Asiatic trade. Many attempts have been made to cross the breed of the goat with the sheep, and some very successful results have followed. The Cashmere goat having been bred in with the Merino, a mule has been the result, which partakes of the good qualities of both. The Rocky Mountain goat of North America is another variety, and ranks next to the Cashmere goat for the excellence of its fleece. (*See* also ANGORA GOAT.)

GOAT-MOTH (*Cossus ligniperda*) belongs to the section *Lepidoptera nocturna* moths, and its family *Hepialidæ*. It is the largest of European moths, the expansion of its fore wings sometimes exceeding three inches. The colour of the hind wings is brown, with darker variations or mottles throughout the surface; while the fore wings are a dusky white clouded with brown, and varied with black irregular streaks, forming a species of network. The thorax is a buff-colour, and the body is of a dark brownish-grey colour, with silver rings round it. The larva is about three inches in length when full grown, and takes three years to arrive at maturity, during which time it encloses itself in a tough cocoon, formed of pieces of wood gummed together with a glutinous sort of gum. The larva or caterpillar lives on the wood of the poplar, oak, and aspen, which it perforates in large holes; whence its name of *Ligniperda*.

GOAT-SUCKER, or NIGHT-JAR (*Caprimulgus europæus*), is a bird which derived its name from an absurd idea or supposition, that it was in the habit of sucking the teats of goats and other animals at night. These birds form the tribe of *Fissirostres nocturna* of some naturalists, and are closely allied to the swallows and swifts, from which, however, they may be readily distinguished by the largeness of their eye and the softness of their plumage,—characteristics which are common to the generality of night-birds. The bill is short and depressed, and is very broad, with an enormously wide gape, which extends beneath the eyes, and is bounded by long bristles; the tarsi are short, and the toes long and strong: the wings are long and pointed. The goatsuckers are found in all parts of the world, and their habits are nearly identical. They fly about at dusk, in pursuit of moths and beetles; and from the rapidity and elegance of their flight, they are frequently mistaken for swallows. Their colour is plain, but beautifully variegated by being freckled and barred with black, brown, and grey feathers diversely arranged. There are numerous varieties of this bird; as the banded goat-sucker and the crested goat-sucker; but they are all very closely alike. (*See* WHIP-POOR-WILL.)

GOBELIN TAPESTRY. (*See* TAPESTRY.)

GOD (Ger. *Gott*, Fr. *Dieu*, Lat. *Deus*, Gr. *Theos*) is the name given to the Creator and Sustainer of the universe, the High and Holy One, who is the object of human worship. The term is of SAXON origin, being a contraction of good. The belief in the existence of some being or beings superior to man, on whom he is dependent, and who demands his worship, is so universal that is may almost be said to be an instinct of





our nature. Those who worship many gods are termed polytheists; those who worship one only, monotheists. The department of knowledge which treats of the being, perfections, and government of God, is called theology. Many attempts have been made, by arguments, to prove the existence of one Supreme Being, all-powerful, wise, and good, through whom everything exists. Some of these arguments are *à priori*, others are *à posteriori*. "When we argue from the ideas we have of immensity, eternity, necessary existence, and the like, that such perfections can reside but in one Being, and thence conclude that there can be but one Supreme God, who is the cause and author of all things,"—this is an argument *à priori*. When, on the other hand, like Dr. Paley, we argue from the order and regularity that we observe in the objects of nature around us, that there is evidence of design and of a designer, this is an argument *à posteriori*. Each of these modes of argument, however, is incomplete of itself, and it is only by a combination of the two that we can expect to be able, if, indeed, the imperfection of our present faculties will ever admit of our being able, to prove by arguments the existence and attributes of God. At least we have not been left to such resources seeing that He has seen meet to give us a revelation of Himself.

GODFATHERS AND GODMOTHERS, *god'-fa-therz*, *god'-muth-erz* (Ang.-Sax.), the names given to the male and female sponsors of a child at baptism. According to the principles of the Church of England, for every male child at baptism there are required two godfathers and one godmother, and for every female child two godmothers and one godfather. Each sponsor must be a baptized person, of full age, acquainted with the Lord's Prayer, Creed, and Ten Commandments, and acquainted with the fundamental truths of Christianity. It was especially enjoined upon sponsors that they should see to the children being instructed in the principles of Christianity, and take care, by admonition and instruction, to enforce upon them the importance of their performing their part of the contract. Practically, however, it has become little more than a mere form, the godfathers and godmothers usually giving little or no heed to the future training of the child. The origin of this institution is very ancient, but the period of its rise is not exactly known. No trace of it occurs in the New Testament, but it was practised in the 2nd century, and was in general use in the 4th and 5th. It probably arose from the Church requiring replies to the interrogatives put at baptism; and hence, in the case of infants, the necessity of there having some one to answer for them. In the Roman Catholic Church a sort of spiritual relationship is regarded as established by this connection, constituting by the canon law an impediment to marriage between the sponsors and the baptized or the parents of the baptized. In the Presbyterian and other non-episcopal churches the parents stand in the place of sponsors, the father taking upon himself the baptismal vows as to the religious up-bringing of the child.

GOD'S TRUCE (Ger. *Gottesfriede*, Lat. *Treuga Dei*, or *Trewa Dei*) is the name of an institution of the middle ages; a means introduced by the Church to check in some measure the hostile spirit of the times, by establishing certain days or periods during which all private feuds were to cease. It seems to have taken its rise about the latter part of the 10th or beginning of the 11th century. At first the Church forbade all feuds on those days of the week which were specially consecrated by the death and resurrection of Christ; namely, from Thursday evening to Monday morning, and threatened with excommunication any who transgressed that order. Afterwards the period was extended so as to include the whole of Thursday, the whole of the period from the beginning of Advent to the Epiphany, and certain other times and saints' days. The precincts of churches, convents, and graveyards, were also interdicted from any hostile encounters. Though frequently disregarded, there can be little doubt that these enactments were of much use in these troublous times. By degrees the power of the State came to be exerted to promote peace, and these laws of the Church gradually fell into disuse.

GOG and MAGOG are two names that occur several

times in the sacred Scriptures. In Gen. x. 2, Magog is mentioned as one of the sons of Japheth; in Ezek. xxxviii. xxxix., the prophet is told to set his face "against Gog, the land of Magog, the chief prince of Meshech and Jubal, and prophesy against him;" and in Rev. xx. 8, Satan is represented as going forth "to deceive the nations, which are in the four quarters of the earth, Gog and Magog to gather them together to battle." Among Christians, the terms have been used as nearly synonymous with Antichrist, and in a general sense to include all nations hostile to Christianity. These names are also employed to designate two huge warlike figures, that adorn the Guildhall of London. Many fables are given of the origin of these worthies; but nothing with certainty is known regarding them, further than that from time immemorial they have been looked upon with pride by the people of London. The old giants, which were of wickerwork and pasteboard, were destroyed by the great fire of 1666, and the present ones, which are of stone, were constructed in 1708. They are fourteen feet high.

GOITRE, *goy-tr* (Fr. *goitre*, probably a corruption of Lat. *guttur*, the throat), is a preternatural enlargement of the thyroid gland, occasioning a swelling of the throat, which frequently attains a very large size. It is also termed *Bronchocele* (Gr. *bronchos*, the throat, and *kele*, a swelling), and *Derbyshire neck*, on account of its prevalence in the hilly parts of Derbyshire. It is, however, in the Alpine districts of Europe, especially Switzerland, Savoy, and Tyrol, that it is chiefly to be met with. It is also common in certain regions of the Andes and Himalayas. It is frequently associated with cretinism (which *see*). Little is yet known of the nature or cause of this disease. It is endemic, or common to certain regions; but from what peculiarity of these regions it is owing is very uncertain, though many are inclined to attribute it to a calcareous impregnation of the water. It also occurs hereditarily, independent of endemic influence. It is much more common among females than males, and usually occurs about the age of puberty. It is not of an inflammatory or malignant character, is free from pain, and generally of the natural colour of the skin. At first the tumour is soft and elastic; but as it increases in size, it becomes hard and firm. Its size often becomes so great as not only to be a serious inconvenience, but even to impede respiration and obstruct the voice. The great remedy for this disease is iodine, either administered internally in small doses for a long time, or applied externally, either in the form of an ointment, or of the tincture painted over it every night. Generally, if not of long standing, the swelling will in this way be removed.

GOITER-STICKS. (*See* SARGASSUM.)

GOLD, *gold* (Sax. *gold*), symbol Au. (*aurum*); equiv. 197; spec. grav. 19·3. Pure gold for chemical purposes may be obtained by dissolving standard gold in one part of nitric and four parts of hydrochloric acid. The solution is diluted and filtered, and evaporated almost to dryness, to expel the excess of acid. The remaining salt is then boiled with a solution of sulphate of iron, which precipitates the gold as a dark bluish-purple powder, which is subsequently washed with water and hydrochloric acid. Gold, in its ordinary metallic form, has a reddish-yellow colour, but when very much extended, it transmits a green light, being purple by reflected light. When pure it is nearly as soft as lead, and is the most malleable and ductile of all metals, but is inferior to many in its tenacity. It does not combine directly with any of the non-metallic elements, except chlorine, bromine, fluorine, and phosphorus. The oxygen acids do not combine with either of its oxides, and the only way in which the chloride can be formed is by dissolving it in hydrochloric acid, to which some oxydizing substance has been added, such as nitric acid, chromic acid, or binoxide of manganese. Selenic acid acts upon it by oxidation, its acid being converted into selenious. The hydrated alkalies do not act upon gold, except in a strong current of air, when auric acid is formed, which combines with the alkali. The higher alkaline sulphides dissolve it in the form of tersulphide.

GOLD, in Metall.—This important metal occurs in considerable quantity in different parts of the world, more especially in Mexico, Peru, Brasil, the Ural Mountains, California, Australia, New Zealand, and latterly in British Columbia and Vancouver's Island. It also occurs somewhat sparingly in the rivers of Hungary, Wicklow, and Wales. As the larger portion of the gold used by mankind is found in the British possessions, it will be necessary to consider its metallurgy somewhat fully. Gold is always found in the metallic state, generally alloyed with silver or tellurium; its extraction from the ore is therefore a simple matter. When the metal is disseminated through quartz pyrites or lead, the ore is pounded, and washed with a stream of water, which carries away the lighter portions of sand, leaving the heavy metal behind. It is further freed from impurities by being amalgamated with quicksilver, which is afterwards distilled off. In this state it generally contains from 2 to 10 per cent. of silver or tellurium. It is further refined by being finely granulated and boiled with concentrated sulphuric acid until every other constituent is dissolved out. Perfectly pure gold—24-carat, or fine gold, as it is termed—is too soft to be used as ornaments, coins, vessels, &c.; it is therefore alloyed with one part of copper to eleven of gold for coining purposes. This is called standard or 22-carat gold. Jewellery is generally made of 18-carat gold, which contains one quarter of copper. Gold, by being alloyed, loses much of its ductility and malleability, but gains in fusibility and hardness. To gild glass or porcelain, gold-leaf is made into a paste with turpentine and oil, and laid on with a brush, which is afterwards heated in a muffle and burnished. Wood, plaster, and *papier mâché* are covered with gold-leaf by the intervention of size or varnish. Metals are gilt either by the use of gold amalgam, by immersion in a solution of gold, or by the electrotype process. In gilding by amalgamation, the articles to be gilt are made perfectly clean, and rubbed over with a brush dipped in nitrate of mercury and the amalgam: they are then heated to expel the mercury. Copper articles are often gilt by immersing them in a solution of an alkaline sursté. Electro-gilding is described under that head. Gold alloys are assayed in two ways, —by rubbing the article on a touchstone so as to make a metallic streak, which is touched with *aqua regia*, and the effect is compared with that of a similar streak made by an alloy of known composition. By this means an experienced operator can estimate the amount of alloy in any mixture correctly within one per cent. When great exactitude is required, the process of cupellation is resorted to. A mixture of one part of the alloy to be assayed is made with three or four parts of silver and three or four of lead, which is fused upon a bone-ash cupel. The lead carries down the whole of the impurities, except the silver, into the cupel, leaving nothing but the gold, alloyed with three or four times its weight of silver. It is then beaten out and immersed in nitric acid, which dissolves out the silver, leaving the gold pure. The amount of silver used must be at least three times that of the gold, otherwise the silver diffused through the mass would be protected from the action of the nitric acid by the nobler metal. The first of these processes, where the gold is alloyed with the silver, is known as *quartation;* and the separation of the metals by nitric acid is termed *parting*. As gold is diffused through nearly all our colonies, a short method of testing for its presence will be useful. The minerals most usually mistaken for it are copper and iron pyrites, which may be easily recognized by their giving off sulphur when roasted on a metallic plate. They may, however, contain gold; in which case they should be roasted, powdered, and dissolved in *aqua regia* with the aid of heat. The solution should be carefully neutralized with carbonate of soda, filtered; and a solution of protosulphate of iron should be added as long as there is a precipitate. The precipitate is filtered and washed in nitric acid, and the remaining insoluble matter is the amount of gold contained in the mineral. This may be further confirmed by dissolving it in hot *aqua regia*, neutralising, and adding a solution of protochloride and perchloride of tin. Or if the gold is generally diffused through the mass of a mineral, it should be powdered finely and shaken up with a quantity of mercury, which, when poured off and distilled, leaves the gold behind.

GOLD, CHLORIDES OF, in Chem.—With chlorine,

gold forms two salts,—the protochloride, AuCl, formed as a pale yellow insoluble substance, when the terchloride is heated to 302° Fahr.; and the terchloride, $AuCl_3$, which is made by dissolving metallic gold in aqua regia. The latter salt is very soluble in water and alcohol, forming a yellow or orange solution, according to its strength. It has an acid reaction, and stains the skin purple. Ether dissolves it still more readily, abstracting it from its aqueous solution when mixed with it, and forming a yellow layer on the surface. The ethereal solution is the *aurum potabile* of the ancients. Terchloride of gold is easily reduced by the feeblest deoxidizing agents; its solution should therefore be kept in a dark place. It is greatly used as a toning agent in photography, and occasionally in medicine. It is capable of forming very distinct double salts with the alkaline chlorides, which are much more stable than the chloride itself. The aurochlorides of potassium and sodium are much used in photography. Digested with a solution of ammonia, it forms fulminating gold. It is formed by dissolving pure gold in aqua regia, and carefully crystallizing.

Gold, Cyanide of, and Potassium, in Chem.—The protocyanide is the only cyanide of gold known. It is easily formed by adding a solution of cyanide of potassium to a weak solution of terchloride of gold. It is a lemon-yellow powder, readily soluble in excess of cyanide of potassium, forming the double cyanide of gold and potassium, which is largely used for gilding by the electrotype process.

Gold Lace, a beautiful ornamental fabric, produced by applying a thin coating of gold to threads of silk. In the original method, a stiff thread was produced, long used for making cloth of gold, &c.; but manufacturers have been enabled to apply gold to flexible thread, by means of recent inventions. The first process is sometimes called fibre-plating, and has been long known to Eastern and European nations. The mode of making English gold lace in its commencement is similar to that adopted by the Hindoos. A bar of silver is roughened and coated with a film of gold; the rod is then drawn out into a wire, and finally twisted round orange-coloured silk thread. For the finer kinds of wire thus made, perforated rubies are used as dies, and an ounce of metal can be brought to the astonishing length of a mile and a quarter. A piece of this wire, twelve inches long, and finer than a human hair, will sustain a weight of twelve ounces. The process of coating flexible threads with gold film is called fibre-gilding. Chemists and manufacturers have long tried to overcome the many difficulties which stand in the way of fibre-gilding. Many processes have been tried both by chemical and metallurgical processes; but although it was found easy to attach the gold to the thread, yet the whole was too long in drying, and had too soft a foundation, to admit of burnishing. The brilliancy of gold lace produced by fibre-plating has never been surpassed or even imitated by any of the processes invented. Among the principal methods in use are the chemical processes of Mr. Albert Hock and Mr. Green, patented in 1839, and that of Dr. Kronig of Stolberg. Electro-metallurgy has not been rendered directly applicable; but by M. Barot's method, the material to be gilt is dipped in a solution of nitrate of silver and ammonia. After remaining two hours, and dried, it is exposed to a current of pure hydrogen gas. A silvered surface is thus produced, which can easily be gilt by the electro-metallurgic process.

Gold Mosaic.—This term is generally applied to the bisulphide of tin, which has a metallic lustre and colour resembling the precious metal. It is also popularly used to denote an alloy of copper and zinc or tin imitative of gold.

Gold, Oxides of, in Chem.—Gold forms two oxides. The *protoxide*, AuO, is a violet-coloured powder, obtained when a dilute solution of potassa is mixed with the protochloride: it dissolves in alkalies by forming metallic gold and auric acid, which combines with the alkali. Although it does not combine directly with the oxygen acids, it forms a peculiar compound with hyposulphite of soda, much used in photography under the name of *sel d'or*. It is regarded as a union of hyposulphite of protoxide of gold with three equivalents of hyposulphite of soda. In the same manner it forms a stannate of gold and tin,





much used to impart a purple-red colour to glass and porcelain, under the name of purple of Cassius. Both the compounds named above have been the subject of much discussion; the formulæ indicated represent the newest theories with regard to their composition. *Teroxide of gold*, or *auric acid*, $AuO_3$, is a powder of a yellow or brownish colour: it is easily reduced to the metallic state by exposure to light. It is insoluble in water, but dissolves readily in nitric, sulphuric, and acetic acids, without forming salts, the oxide being reprecipitated on adding water. It is precipitated by decomposing a solution of terchloride of gold with magnesia; the mixture of aurate of magnesia and magnesia formed is boiled with nitric acid, which dissolves the magnesia, leaving hydrated auric acid behind. Under the action of the hydracids it is resolved into the teroxide of the halogen. It forms salts with potash and soda, by dissolving it in the alkali and evaporating *in vacuo*. There are also said to be two other oxides of gold, $AuO_2$ and $AuO_5$, but their properties require investigation.

Gold, Sulphides of, in Chem.—There are two sulphides of gold,—the protosulphide and the tersulphide, corresponding to the oxides and chlorides; but little is known of their properties.

Goldbeater's Skin, a delicate membranous substance used by goldbeaters, and obtained from the large intestine of the ox. This intestine consists of three coats or sheathings,—the mucous membrane on the inside, the peritoneal membrane on the outside, and the muscular membrane between them. The peritoneal membrane is the one used in making goldbeater's skin. After the intestine has been freed from all greasiness by washing, scraping, &c., it is turned outside in, and allowed to steep for some hours in a tub containing strong alkaline liquor; the peritoneal membrane is afterwards removed, stretched, and dried. In finishing the process, individual manufacturers have their own processes. A packet of skins properly prepared is costly, but it will bear a great amount of beating without injury. Skins may be used for several months without becoming thinner or weaker. A *mould* or group of goldbeater's skin, containing about 800 pieces, is valued at £10.

Goldbeating, the art of reducing gold to the state of very thin leaves, for use in various methods of gilding. On account of the extreme malleability of gold, this art has been practised from very remote times; it is spoken of by Homer, and Pliny states that one ounce of gold was beaten out into 750 leaves, each leaf being four fingers square, or about three times the thickness of the ordinary modern gold-leaf. The ancient Peruvians made very thin sheets of gold; and the art seems to have been practised in India, to judge from the rude specimens of gilding found at Bangalore, in Tippoo Saib's palace. At the present day, according to experiments which have been made, it has been ascertained that one grain of gold can be beaten out so as to cover 75 square inches; and taking one cubic inch of gold at 4,900 grains, it will be found that the gold-leaf was the $\frac{1}{367,600}$th part of an inch in thickness, or 1,200 times thinner than ordinary printing paper. The manufacture of gold-leaf is a combined process of rolling and hammering. The gold, which is variously alloyed, according to the colour required, is melted in a small crucible by the heat of a wind-furnace; it is then cast into a mould, so as to form a flat oblong bar about three-quarters of an inch wide and two ounces in weight. After being annealed, cleaned, and cooled, the bar is transferred to the mill, where, by means of two rollers of polished steel, the gold is so far reduced that the two ounces are spread out over a surface of 960 square inches, with a thickness of rather more than $\frac{1}{360}$th of an inch. Before the introduction of the mill, this part of the process was performed with a forging-hammer, and in France the same method is still adopted. After being reduced to the proper thickness, the riband of metal is transferred to the goldbeater. The hammering does not take place on the gold itself, but thin membranes are placed between it and the hammer. These membranes are of three kinds; the last and finest set consists of goldbeater's skin, another set of very smooth and fine calf-skin vellum, and an outer coating of common parchment. The riband of gold is first cut up into small pieces, each an

inch square, and 150 of these are interleaved with an equal number of leaves of vellum, about four inches square, each piece of gold being placed in the middle of a sheet. A parchment case, open at both ends, is then drawn over this packet of vellum-leaves, and over this another parchment case, at right angles to the first. The beating then takes place upon a smooth block of marble, strongly embedded beneath, and inclosed with woodwork on every side but the front, which is furnished with a leathern apron to preserve any fragments of gold that may fall out of the packet. Very ponderous hammers, weighing 16, 12, and 10 lbs. respectively, are employed: the heaviest is used at first, and the lighter ones as the gold is beaten thinner. The beating is continued until the one-inch square pieces of gold are expanded to nearly the size of the vellum-leaves; each sheet of gold-leaf is then cut into four equal parts, and the 600 pieces so obtained are transferred from the vellum coverings to layers of goldbeater's skin. The whole is inclosed in parchment, and the beating continued with a lighter hammer until the gold nearly attains the size of the skin-leaves. at this point each sheet of gold-leaf is again cut into four pieces; the 2,400 being too many to be beaten in one packet, are divided into three parts, and beaten separately: by three beatings and two quarterings the gold-leaf attains the necessary degree of thinness required. One hundred square feet of gold-leaf thus produced only weigh one ounce.

Golden Age, *gold'-en aij*, a time set down in the mythologies of nearly all countries as having existed at some very remote period of antiquity, when the earth was the common property of all, and produced everything necessary to man without cultivation; when good prevailed and evil was unknown; when the lion laid down with the lamb, the land flowed with milk and honey, and peace reigned supreme. The Greeks and Romans believed that the earth became gradually degenerated from its first establishment, and that three ages, of gold, of silver, and of iron, were to exist successively, and had existed each in their turn, until the last, at the end of which all things would be changed, and the golden age once more resume its interrupted sway. There seems to be some analogy between this belief and the dream of Nebuchadnezzar in the book of Daniel, and there is no doubt that the idea has been inculcated in the mind of man, in order that he should look forward to a brighter and better state of existence.

Golden Bull. (*See* Bull, Golden.)

Golden Legend (Lat. *Aurea Legenda*), a work of a Dominican friar, James de Voraigne, who was born in or about the year 1230, and who became first provincial of his order, and afterwards archbishop of Genoa. The Golden Legend consists of a history and description of all the different saints and festivals in the calendar. From the fact of its being more descriptive than critical, it illustrates the religious habits of the period better than any other work could have done, and its tenor is rather to inculcate good by example than to convince by metaphysical or philosophical argument.

Golden Number.—This number, sometimes called the Prime, is that by which any year is numbered in the particular cycle of nineteen years in which it is included. It is said to be so called because it was distinguished in almanacs of former days by being put therein in letters of gold. It is used in determining the day of the year on which Easter falls. (*See* Easter, Metonic Cycle.) To find the golden number for the year current, add 1 to the date of the year and then divide by 19—the remainder will be the golden number for the year; but if there be no remainder, then 19 will be the golden number. Thus the golden number for the year 1864 is 3, the number which happens to be the remainder after adding 1 to the date of the year and dividing the sum by 19.

Goldfinch, *gold'-finch* (Sax. *gold-finc*), (*Carduelis elegans*), a species of bird included in the general class of *Fringillidæ*, and the gayest in appearance of all our native British birds. Its length from the tail to the tip of the bill is about five and a half inches, and the greatest expansion of the wings is nine inches. The bill is white, tipped with black; the forehead and throat scarlet, the head black, the back brown, and rump a pale brown, the belly white, and a beautiful yellow stripe runs across the wings, which are principally black, with white edges. Altogether, it is the handsomest bird we have, and as its song is very sweet, the goldfinch is a universal favourite. It feeds on the seeds of various plants, particularly that of the thistle. It is found throughout Europe, but principally in the United Kingdom of England and Ireland. Buffon says of it, "that beauty of plumage, melody of song, and sagacity of disposition, are all united in the goldfinch," and if it were not a native bird, it would be much higher prized than it is. Being of very lively habits, the goldfinch can be easily trained both to imitate other birds, and thus be of use as decoy, and to perform all manner of funny tricks for the diversion of its master. "There is a company of goldfinches, linnets, and canaries now exhibiting in London, which



GOLDFINCH.

perform a number of parts and different characters. One appears to be dead, and allows itself to be held up by the tail or leg, without showing any signs of life; another stands on its head, with its claws in the air; a third carries a couple of milk-pails, as if it had been bred up to the occupation; whilst a fourth bears a rifle, and fulfils all the duties of a sentry on guard. Another discharges a little cannon, which it attends to in the capacity of an artilleryman; while yet another draws a little carriage along with the greatest facility, in which two of its comrades are seated with the utmost *sang-froid*." Many anecdotes could be related, if space permitted, of the numerous tricks which these clever little birds are able to perform. The reader is referred to Yarrell's *British Birds*. (*See* also Fringillidæ.)

Gold-fish (*Cyprinus auratus*) belongs to the general class *Cyprinidæ*, and the section *Malacopterygii abdominales*, a species of fish distinguished by having the mouth small, formed by the intermaxillary bones, and devoid of teeth, the branchiostegous rays few, and the scales generally of large size. The gold and silver fish, as the gold carp is termed, has been long known in England; it was introduced into this country in the year 1691, from China, of which land it is a native. It is called the gold-fish from the splendid brilliant colour of the membrane which lies immediately beneath the scales. It is completely naturalized in Europe; in Portugal, in fact, it breeds freely in the open rivers. The colours of this fish are very various, some being all gold-colour, whilst others are of a fine bluish-brown or silver hue. When young it is very dark, nearly of a black colour. Sometimes the fins are doubled in the gold-fish, and they often have triple tails. It is not eaten, but valued from the beauty of its appearance.

Goldsmiths' Notes, *gold'-smiths*, was the name, originally given to bank notes, because the bankers of London were originally goldsmiths also.

Gold Thread. (*See* Coptis.)

Golf, *golf* (Ger. *kolbe*, a club), is the name of a very popular game in certain parts of Scotland, and occupies the same place as cricket does in England. It differs

from cricket in affording less violent exercise; and it may be engaged in by the old as well as the young. It is a very ancient game in Scotland, but the exact period of its introduction is unknown. It is played with a ball and clubs, on links or downs. The ball is of gutta-percha, painted white, and about an inch and a half in diameter. The clubs are of various kinds, according as the object may be to send the ball a long or a short distance, to raise it out of an awkward position, &c. The shaft is of considerable length, and is usually made of hickory or lancewood, while the head is large and flattened, loaded with lead behind, and faced with horn. Some of them have iron heads for striking the ball in certain positions. The principal clubs are the play-club, putter, spoon, sandiron, and cleek; but sometimes there are several kinds of some of these used by players. The game is played on extensive links, and to increase the hazard of the game, and call forth the skill of the players, it is of advantage that the surface be here and there diversified by knolls, sandpits, and other obstructions. A series of small round holes about four inches in diameter, and perhaps the same in depth, usually several hundred yards apart, and disposed so as to form a circuit or round, composed probably of six or eight of them; but much depends upon the nature of the ground. The game is properly played by only two persons; but sometimes there are two or more persons on each side, and then those on one side strike the ball alternately. The object of the game is to drive the ball from one hole into another with the fewest number of strokes, and the person who puts in his ball with the fewest number of strokes is said to gain a hole. The match is usually decided by the greatest number of holes gained in one or more rounds. Each person is usually attended by a *caddy*, or servant, who carries his clubs, assists to find his ball, &c. Golf is a most pleasant and healthy enjoyment, affording not only an agreeable excitement, but abundant healthful exercise in the open air. It demands a very considerable degree of skill to excel in it, requiring some strength of arm for the long distances, and a good eye and fine steady hand for the short ones, with some skill, in order to avoid the hazards or obstructions. Golf is much played on Bruntsfield Links, near Edinburgh, and on the links at Musselburgh, North Berwick, St. Andrew's, Montrose, Aberdeen, &c.

Goliath Beetle, *go-li'-ath bee'-tl* (*Goliathus Drurii*), comes under the general fam. of *Cetonidæ*, a class of coleopterous insects which belong to the *Lamellicornes*, or *Pentamera*. This family contains several sub-genera; but that which is generally known as the Goliath beetle is the *Goliathus cacicus*, which is a native of Africa and South America. This insect is remarkable for its large size; and, on account of its beauty and the difficulty of obtaining specimens, it is much prized amongst collectors. The Goliaths are said to be roasted and eaten by the natives of the countries they inhabit, who deem them a great dainty. It is said, also, that sometimes £40 or £50 has been known to be given by entomologists for specimens of this insect, and that even now they fetch generally £5 or £6! The *Goliathus polyphemus* is another variety of this species, as is also the *Goliathus micans*, the latter of which changes its colour as it is held in different positions to the light. From the reason already given, of its rarity, not much is known as to the habits of either species of this insect.

Gomato, or Gommuti Palm, *go-ma'-to* (*Saguerus saccharifer*, or *Areng*), a species of palm, found in the Moluccas and Philippines, which supplies abundance of sugar. Palm sugar is generally obtained from the juice which flows out from different palms upon wounding their spathes and adjacent parts. It is commonly known in India by the name of jaggery. The juice of the gommuti palm, when fermented, produces an intoxicating liquid or toddy. In Sumatra it is termed *sova*, and a kind of arrack is distilled from it in Batavia. From the trunk of this palm, when exhausted of its saccharine juice, a good deal of our commercial sago is obtained. A single tree will yield from 150 to 200 lbs. of sago. The juice of the fruit is very acrid. The stiff strong fibre known under the name of Gommuti, or Ejow fibre, is obtained from the leaf-stalks, and is extensively used in the manufacture of cables



and various kinds of ropes.—*Ref.* Bentley's *Manual of Botany*.

Gondola, *gon'-do-la* (Ital.), a peculiar kind of boat used at Venice for the same purposes as cabs and carriages in other cities. They are usually about thirty feet long, five in breadth, and light and elegant in form, having high prows, some of which are of elaborate workmanship and exquisitely carved. About the centre a cabin is erected for the passengers, which is carpeted, hung with curtains, and fitted with stuffed cushions. By the ancient republic a law was passed, ordaining that all these boats were to be painted black and hung with black cloth, except those for the use of foreign ambassadors and for state purposes. The boatmen who navigated these boats were called *gondolieri*, and were a very important body.

Gong, *gong* (Ang.-Sax.), a pulsatile musical instrument, used in Asia chiefly to give a national cast to the music, or to awaken surprise and arouse the attention of the auditors. It is of a shallow, circular, concave form, and is made of a composition of silver, lead, and copper, while its tones, which are anything but musical, are produced by striking it with a kind of drumstick, having a head covered with leather.

Goniometer, *go-ne- i'-e-ter* (Gr. *gonia*, an angle; *metron*, a measure), instrument for measuring angles, and especially determining the angles at which the planes of crystals are inclined to one another. The ordinary goniometer is made on the principle, that when two straight lines intersect one another, the opposite angles are equal. This instrument, however, is incapable of giving accurate results, on account of the ordinary minuteness of the planes and frequent irregularity of the fracture. The reflective goniometer, invented by Dr. Wollaston, is the instrument most used by mineralogists. The principle upon which it is constructed depends upon the law of optics, that the angle of reflection is always equal to the angle of incidence. It consists of a brass circle, graduated on the edge, and furnished with an index, by which the divisions can be accurately noted. The circle moves in a vertical plane, and is supported on a stand. To one extremity of the horizontal axis a movable pin is attached, having a slit for the purpose of receiving a small brass plate. The crystal to be examined is attached to this plate by means of a piece of wax, so that it may project over the edge of the plate; the pin, which is provided with a vertical and horizontal movement, is then raised or lowered till the reflection of any convenient object above seems to coincide with some other object beneath. When the goniometer is thus adjusted, the graduated circle is turned until a similar reflection is obtained from the contiguous face of the crystal; the arc which the circle will then have described will be found to be equal to the supplement of the angle formed by the two faces of the crystal. In order, however, to avoid calculation, the supplements of the angles are marked on the limb, and may be read off with considerable accuracy by means of the vernier.

Good Behaviour, Security for (Ang.-Sax.), in Law, consists in a person being bound, with one or more sureties, in an obligation to the crown to behave well or be of good behaviour, either generally or specially, for a certain time. If the condition of the said obligation be broken by misbehaviour, the party and his sureties become debtors to the crown for the several sums in which they were respectively bound. A justice of the peace may demand security for good behaviour, according to his discretion, when he sees cause, or at the request of any other person under the queen's protection.

Good, Chief (Lat. *summum bonum*), is a phrase sometimes employed in Phil. to denote that in the prosecution and attainment of which the progress, perfection, and happiness of human beings consist. An inquiry into the chief good is an inquiry into what constitutes the perfection of human nature, the subject of all religion and all philosophy. (*See* Ethics.)

Goodeniaceæ, *good-en-e-ai'-se-e* (in honour of Dr. Goodenough, bishop of Carlisle), in Bot., the *Goodenia* fam., a nat. ord. of *Dicotyledones*, sub-class *Corolliflorœ*, consisting of unimportant herbs, or rarely shrubs. They are principally natives of Australia and the islands of the Southern Ocean. The species *Scævola*

*Taccada* has a soft and spongy pith, which is employed by the Malays to make artificial flowers and ornaments.

Good Friday is the name given to the Friday before Easter, the anniversary day of our Saviour's crucifixion. It is termed good as denoting the benefits which have flowed from Christ's death; and it has been observed as a sacred day from the earliest ages of Christianity. In the Roman Catholic church this day is observed with much ceremony. The mass is celebrated, but the elements are consecrated not on this day, but the day before; the priests and attendants are robed in black, in token of mourning; the usual acclamations and doxologies are omitted; no bell is rung; the altar is stripped of its ornaments; none bow the knee in prayer, because in this way the Jews reviled Christ; the kiss of charity is omitted, because Judas betrayed his master with a kiss. The adoration of the cross, or, as it was anciently called in England, "creeping to the cross," is observed on this day; all the congregation approaching, and upon their knees kissing, a figure of our Saviour upon the cross, placed upon the altar. The offices called *Tenebræ* (darkness) are sung on this day, as well as upon the day preceding and succeeding. It is so called from the lights of the church being for a time extinguished, to symbolize the darkness at our Lord's crucifixion; and nearly at the end of the service, and amid solemn silence, there is a tremendous noise, to denote the rending of the veil of the temple. In the English church Good Friday is also observed with great solemnity, and all business is suspended. A sermon used to be preached at St. Paul's Cross in the afternoon, at which the lord mayor and aldermen attended in their robes. The practice of eating "cross buns" on this day, which is generally observed in England, is a remnant of Roman Catholic times, though it has now no religious import.

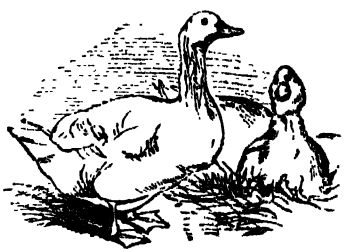
Goods and Chattels. (*See* Chattels.)

Goods, Finder of. (*See* Finder of Goods.)

Goods in Communion, in the law of Scotland, are the movable subjects belonging in common to husband and wife. They comprehend all the movable property belonging to either of the parties, except such as have been given to the wife expressly, excluding her *jus mariti* and the wife's paraphernalia, regarding which there is an implied exclusion of the *jus mariti*. The husband has the uncontrolled administration of the goods in communion during the subsistence of the marriage. Formerly, if the marriage had not subsisted a year and a day, or produced a living child, the goods in communion returned to the husband and wife, or to their representatives, as nearly as might be in the proportions in which they were contributed. If there were no child of the marriage on its dissolution, the goods were divided into two equal parts, one of which belonged to the survivor, the other to the next of kin of the deceased. If there were children, the division was three-fold, one third falling to the children as *legitim*. The share of the surviving wife was called *jus relictæ*; that of the husband's representatives, the *dead's part*. By 18 & 19 Vict. c. 23 (1855), this was all altered, and the representatives of a wife who predeceases her husband have now no right to any share of the goods in communion, and no bequest by her can affect these goods.—*Ref.* Bell's *Dictionary of the Law of Scotland*, by G. Ross, Edin. 1861.

Good-will, in legal or commercial language, denotes the custom of any business or trade,—that interest in it which is sold along with the goods and premises. By disposing of the good-will, the seller binds himself to do everything in his power to advance the interests of his successor in the business, and to recommend him to his customers. It is also usual to specify that the seller shall not enter upon the same business within a certain distance of that which he has sold. Such a contract is good at law, and the party infringing it is liable in damages.

Goose, *goose* (Sax. *gos*, Lat. *anser*), belongs to the order *Natatores*, *Anseres*, or *Palmipedes*, of the general family of *Anatidæ*. The following are its characteristics:—Beak about the same length as head, conical, and elevated at the base, which latter is covered by a cere or skin; the lower mandible is inferior in size to the upper; nostrils lateral in form and placed towards the middle of the beak, which is pierced anteriorly; the legs placed under the centre of the body; the tarsi long, the hind toe free, articulated upon the tarsus. The general recognised type of the whole class is the *Anser niveus*, or snow-goose of Pennant and Wilson. This bird feeds principally on rushes and insects, and in the autumn on berries. It is found generally in the barren regions of North America, where it breeds in the most prolific manner. The *grey-lag*, or common wild goose, is the origin of the domestic goose; and, according to Pennant, is our largest species of this family. The heaviest weigh about 10 lbs., their length being 2 feet 9 inches and their extent five feet. The bill is large, and of a flesh-colour tinged with yellow; the back grey; the breast and belly whitish, tinged with grey or ash-colour; and the wings and tail generally pure white, or at most merely tinged with the grey tint which prevails, more or less, over the whole body. It principally inhabits the sea-shores and marshes of oriental countries, and it rarely advances northward above the latitude of 53°. The tame goose is one of the most useful of birds to man, whether it is considered with respect to its flesh or its feathers. The naturalist Pennant writes that they are kept in "vast multitudes in the fens of Lincolnshire; a single person has frequently 1,000 old geese,



GEESE.

each of which will rear seven; so that towards the end of the season he will become master of 8,000. I beg leave to repeat here a part of the history of their economy from my Tour in Scotland, in order to complete my account. During the breeding season these birds are lodged in the same houses with the inhabitants, and even in their bed-chambers: in every apartment are three rows of coarse wicker pens placed one above another; each bird has its separate lodge divided from the other, which it keeps possession of during the time of sitting. A person called a gozzard, that is goosherd, attends the flock, and twice a day drives the whole to water, then brings them back to their habitations, helping those that live in the upper stories, without ever misplacing a single bird. The geese are plucked five times in the year; the first plucking is at Lady-day, for feathers and quills; and the same is renewed four times more between that and Michaelmas for feathers only. The old geese submit quietly to the operation, but the young ones are very noisy and unruly. I once saw this performed, and observed that goslins of six weeks old were not spared; for their tails were plucked, as I was told, to habituate them early to what they are to come to. If the season prove cold, numbers of the geese die by this barbarous custom. When the flocks are numerous, about ten pluckers are employed, each with a coarse apron up to his chin. Vast numbers of geese are driven annually to London to supply the markets; among them all the superannuated geese and ganders (called the 'cagmags'), which by a long course of plucking prove uncommonly tough and dry. The feathers are a considerable article of commerce; those from Somersetshire are esteemed the best, and those from Ireland the worst." The Bean-goose (*Anser segetum*) is a regular winter visitant to England, which country it generally arrives in in October, seldom leaving before April or May. The Canadian goose (*Anser canadensis*) is one of the great sources of food in the fur-countries of North America. When it arrives from more southern latitudes, it is shot and otherwise killed in large numbers, with sticks and stones, and is carefully preserved in ice with the feathers

on for the winter, during which rigorous season it is one of the principal articles of diet to the inhabitants of the fur-countries. The plumage of this bird is generally grey, and in its contour it approaches more closely to the swan (*cygnus*) than any of the other branches of the family *Anatidæ*. The Brent goose, or *Anser torquatus*, is another variety of this tribe, and it is one of the smallest, as well as the most numerous in the British islands. It is a regular winter visitor to the shores of our maritime counties, says Yarrell, and it remains with us through all the cold months of the year, its predilection being more for the south and east coast. In the adult male, the bill is black, and only an inch and a half in length; the irides very dark brown, almost black; the forehead low, the head small and black; the neck all round black, except a small patch on each side, which is white, but marked with a few regularly-placed black feathers; back, scapulars, wing-coverts, and tertials, dark brownish black, the edges a little lighter in colour; primary and secondary quill-feathers black; the rump black; upper tail-coverts white; tail-feathers black; upper part of the breast black; lower portion of the breast and the belly slate-grey, with lighter coloured margins; vent and under tail-coverts white; legs, toes, membranes, and claws black. This description is taken from Yarrell's *History of British Birds*, in which it is likewise added that the general length of the *Brent goose* is twenty-one inches, and the expanse from the carpal joint to the end of the wing thirteen inches. It may be mentioned that the livers of geese are esteemed as great a dainty in the present day as they were amongst the ancient Romans; a dish termed *pâte de fois gras* being made of them, which is a great favourite with epicures, and consequently high in price.—Ref. *English Cyclopædia*, section *Natural History*; Yarrell's *History of British Birds*. (*See* also GANNET.)

GOOSEBERRY. (*See* RIBES.)

GORDIAN KNOT, *gor'-de-an not*, in the Hist. of Antiq., a knot made in the harness of a chariot by Gordius, king of Phrygia, which knot was so intricate as to baffle every attempt to untie it, or even to find out where it began or ended. The oracle of the day having declared that he who succeeded in solving the complication should be the conqueror of the world, Alexander the Great determined to effect it if possible. Deliberating that if he failed, his followers would be dispirited, he determined to separate it with his sword, and with one blow he cut the momentous Gordian knot, which was fraught with such interest to the whole world. According to Quintus Curtius, he thus fulfilled the oracle or evaded it; but Aristobulus, however, gives a different version of the affair. The expression *cutting the Gordian knot* has consequently been used by the moderns to signify eluding any difficulty or task by bold or unusual means. The story itself is related in Plutarch's *Life of Alexander*.

GORGE, *gorje* (Fr.), in Mil., the name that is given to the entrance of any work, or that part which is open to the rear between the inner extremities of its flanks or faces. Thus the gorge of a ravelin is the space facing the main works behind it, between the extremities of its faces which meet in a salient angle towards the front; and the gorge of a bastion is that side of the irregular pentagon which forms the outline of the work and lies between the interior extremities of its flanks, where they join the curtains on either side. The lines formed by the prolongation of the curtains on either side of a bastion to a point in its capital within the interior of the work are called its demi-gorges. It is also the name of a concave moulding used in Arch., and the entrance to a narrow pass or defile between mountains.

GORGET, *gor'-jet* (Fr. *gorgette*), a small piece of steel armour, intended to protect the neck and throat. It was worn by officers in the army long after the use of armour had been abandoned.

GORILLA, *go-ril'-là* (*Troglodytes Gorilla*), a species of large ape which inhabits Western Africa. It is generally referred by naturalists to the same genus with the chimpanzee, but M. Geoffroy St. Hilaire has endeavoured to establish a separate genus for it. For a great number of years there was a vague tradition, unsubstantiated by reliable evidence, that apes of great size were to be seen on the west coast of Africa. It was not, however, till 1847 that the gorilla absolutely became known to naturalists. A skull of one of these large apes was sent to Dr. Savage, of Boston, by Dr. Wilson, an American missionary on the Gaboon river; and during the same year Dr. Savage, writing to Professor Owen concerning the gorilla, says, "As yet I have been unable to obtain more than part of a skeleton. It belongs to the Simiadæ, and is closely allied to the orango proper. It reaches nearly, if not quite, the height of five feet in the adult state, and is of a large size. I am considerably in doubt in regard to its identity with an animal said to have been known to Buffon as a large species of orang-outang, under the name of pongo." Since that period skeletons and skins of the gorilla have not only been received, but also considerable information concerning the animal's habits and mode of living. In M. Du Chaillu's "Explorations and Adventures in Equatorial Africa," there are some very interesting accounts of the gorilla. Considerable doubt has been cast over several of the statements in the work, but the narrative is considered trustworthy by Professor Owen and several of the highest scientific authorities. The points of difference between the gorilla and the chimpanzee are as follows: The gorilla is much longer than the latter animal; the ordinary height of a full-grown male is between 5 feet 6 inches and 5 feet 8 inches, and it is probable that many of the largest size exceed six feet in height. Its strength is tremendous, and its skeleton indicates great power in the jaws and limbs. The bony ridges above the eyes are very prominent, and the skull of the male exhibits a large occipital ridge on the top of the head. The brain is small, and the nasal bones project more than in the chimpanzee: these peculiarities give to the animal a hideous resemblance to the human face. The jaws and lower parts of the face project very much, and the teeth do not form an uninterrupted series, as in man. The canine teeth are very large, and the molars bear a greater proportion to the incisors; thus again approaching the features of a human being. It is very broad across the shoulders, has thirteen pairs of ribs, and approaches nearer to the human form in the shape of the pelvis than any other ape. The legs, although shorter in proportion than those of a man, are longer than those of the chimpanzee. When standing erect, the arms nearly reach the knees. The feet are formed for walking on the ground, and the great toe is a true thumb. The hands are remarkable for their great size and strength, the fingers being short but very thick. The skin of the gorilla is black in colour and covered with dark grey hair, which changes to a tawny brown on the head. The hair is longest on the arms. The face is hairy, but the chest is bare. The mouth is large and wide, and there is scarcely any appearance of neck. The eyes are much sunk, and in general the countenance is marked by a ferocious scowl. It is a voracious feeder, its food being exclusively vegetable; and its belly is very large and prominent. Gorillas are not gregarious in their habits; they generally live on the ground, but spend much of their time in climbing trees in search of food. Their immense strength enables them to defend themselves against beasts of prey. They live in the densest parts of the tropical forests, and are much dreaded by the inhabitants. As yet the gorilla has not been tamed, and it would appear as if it were incapable of being so in an adult state. Many stories are told of the gorilla being made to work by the inhabitants in some parts of Western Africa: these narratives are perfectly fabulous. In Du Chaillu's work there is a description of two species of Troglodytes discovered by himself,—one the koolo-kamba, and the other the pshiegombouvé, which is smaller than the gorilla, and remarkable for a shelter which it makes with leaves in order to protect itself from the rain. In shape this shelter is not unlike an umbrella. The gorilla is called by the inhabitants ngina or ingeena.—Ref. *Transactions of the Zoological Society*, vol. iii., and Du Chaillu's *Exploration and Adventures in Equatorial Africa*.

GORY DEW, *go'-re dew*, is a term frequently applied to the dusky red film seen upon the damp walls of cellars, or other moist situations. Its disagreeable and alarming nature is due to the unpleasant fact of its resembling the stains of blood.

GOSHAWK, *gos'-hawk* (Sax. *goshafoc*, goose-hawk), (*Astur palumbarius*), is a bird which belongs to the general fam. of the *Falconidæ*, of which it is more or less a type. Its generic characters, according to Yarrell, are as follows:—Bill short, bending from the base, with the cutting-edge of the upper mandible produced, — thus forming a festoon; nostrils oval. Wings short, reaching only to the tail-feathers, the fourth quill-feather being the longest. The legs stout, and the tarsi covered in front with broad scales. The toes of moderate length, the middle toe being the longest, and the laterals nearly equal in length. The great distinguishing points between the goshawk and the falcons, are the lobe, or festoon, instead of the sharp tooth on the cutting edge of the upper mandible, and the short and rounded form of the wings. Although inferior in powers to the falcon, the goshawk is the best of the short-winged hawks; but its habits and mode of flying its game are very different,—as it does not *swoop*, but glides along at a short distance from the ground, in an even line with the bird it pursues. A full-grown female measures from 23 to 25 inches in length; and the males one-third, or sometimes one-fourth less. When adult, the plumage is generally similar. The beak is horn-colour, or bluish-black; the cere and irides yellow; the top of the head, the whole of the back, upper surface of the wings and tail-feathers, of a dark greyish-brown colour; in the female this tint is more of a clove-brown. The upper surface of the tail-feathers is bound with even a darker brown colour; while a band of white, variegated with spots and bars of black, passes over the cere, the eyes, cheeks and ear-coverts, the nape of the neck, throat, breast, belly, and thighs. The under tail-coverts are white, the cere, cheeks, and ear-coverts, greyish-brown, forming an elongated dark patch on the side of the head; while the legs and toes are yellow and the claws black. The goshawk is used principally for the pursuit of hares, rabbits, and partridges, on account of its low flight. It is not very eager in hunting its prey, as, if its speed is eclipsed, it sits patiently on a tree and waits for other game to present itself.—*Ref.* Yarrell's *British Birds*.



THE GOSHAWK.

GOSPEL, *gos'-pel* (Sax., good news; Gr. *to euaggelion*), denotes the good news of the coming of Christ, and is, by Christians, employed to signify the whole doctrine of the Christian religion,—more particularly the books containing an account of the life of Christ,—*i. e.*, those of Matthew, Mark, Luke, and John, are termed the Gospels. There exist a number of apocryphal gospels, which, however, have generally been rejected by the Church, and which abound with absurd and improbable stories regarding the life of Christ, so as to leave no doubt as to their spuriousness. The authenticity of the four gospels rests upon the clearest evidence. In the latter half of the 2nd century Irenæus refers to and describes the four gospels as being inspired, and handed down in order to be the foundation and pillar of the Church. None of the other gospels were received by the fathers as being of Divine authority during the first three centuries. From the many verbal agreements that occur in the first three gospels, Dr. Marsh, in his dissertation on that subject, was led to maintain that they had all been drawn up from some common original work; and this opinion has been taken up and elaborated by several later German critics. There is,





however, not the least shadow of evidence of the existence of any such document, every trace and record of which it is impossible to conceive could have passed away. This is only another instance of the way in which men, in order to explain a minor difficulty, are often led to entertain even the wildest hypotheses.

GOSSIP, *gos'-sip* (Sax.), was a name formerly given, in England, to the sponsors at baptism. It is formed from *God* and *sib* (affinity), and hence denoted one who was considered to have a kind of spiritual affinity to another.

GOSSYPIUM, *gos-sip'-e-um* (Lat. *gossipeum*, the cotton-plant), in Bot., the cotton plant, a gen. of the nat. ord. *Malvaceæ*, or Mallow fam. Several species furnish cotton, which consists of hairs covering the seeds. These hairs upon the seeds, and the occurrence of three leafy bracts, united at their base outside the flower, constitute the distinctive characters of the genus. From the importance of cotton as a raw material, the genus *Gossypium* must be regarded as one of the most valuable to man in the whole vegetable kingdom. At the present moment (January, 1863) nearly half a million of operatives in Lancashire and the adjoining counties are more or less dependent upon the parochial and charitable funds, in consequence of the suspension of the cotton trade with America. There appear to be four distinct species from which our commercial cotton is derived. Many other so-called species have been described, but they are probably mere varieties. The first cotton fabrics were manufactured from the hairs of the species *G. herbaceum*, the common cotton-plant of India. The stems are less woody than in other species; hence its specific name, which signifies herbaceous. It is a pretty plant, and rises from eighteen inches to two feet in height during the first year of growth. It is usually cut down annually; but if allowed to grow, it will attain a height of five or six feet, and its branches will become rather woody. All the younger parts of the stem are covered with short hairs, and marked with black spots. The flowers are bright yellow, each petal being marked with a purple spot near the base. The flower is succeeded by a fruit, which gradually becomes dry, and then bursts into three or four valves, when the cotton-wool is seen issuing from it in all directions. This is the Surat cotton of commerce. The cotton is generally white; but much of that produced in China is of the yellow or tawny colour, peculiar to the fabric called "Nankeen." *G. arboreum*, the tree-cotton, is another Indian species, but, unlike the last, it assumes the aspect and dimensions of a small tree, from fifteen to twenty feet in height. The flowers are of a bright red colour. The cotton hairs are remarkably soft and silky, and are woven by the natives into a very fine muslin, used for turbans by the privileged religious classes only. *G. barbadense* is the species which yields all our best cotton. It is called the Barbadoes, or Bourbon cotton, but does not appear to have been originally a native of the New World. It is a perennial plant, and has a shrubby stem, from six to fifteen feet in height. The flowers are yellow, like those of *G. herbaceum*, and have a dark spot at the base of each petal. The fruit is capsular, and contains in its interior from eight to twelve black seeds, which, on being freed from the cotton-wool, are found to be destitute of down, unlike those of the preceding species, which are covered with firmly-adhering short hairs. The plant was introduced into Georgia from the Bahama Islands, where it had been grown from seed obtained in the West Indies. In the small American islands which fringe the coast of Georgia from Charlestown to Savannah, this plant has produced the celebrated Sea-island cotton, which is unrivalled for the length of its staple, its strength, and its silkiness. This cotton, when cultivated in the cooler and drier climates of the hill country of Georgia, is inferior in quality, and shorter in staple. This fact shows how great is the influence of external circumstances on the growth of the cotton-plant. The species *G. peruvianum*, or *acuminatum*, is supposed to be indigenous to America. Like the Bourbon cotton, it has black seeds and yellow flowers. The seeds adhere together, however, in a peculiar way, forming a kidney-shaped mass. This plant furnishes the South-American varieties of cotton; as Pernambuco, Peruvian, Maranham, and Brazilian. After the Sea-

island and Egyptian, these South-American cottons obtain the highest price in the market. Cotton is now extensively cultivated in South Africa, in the West Indies, and in Australia; but it will be long before the supplies from these parts can compete with those from the Southern Confederacy. The seeds of the cotton-plants, after the cotton has been separated from them, on being submitted to pressure, yield a fixed oil, which may be used for burning in lamps. If examined under the microscope, the cotton hair will be found apparently to consist of two delicate transparent tubes, the one twisted round the other. If, however, the hair be examined in its young state, it will be found to be an untwisted cylindrical tube. Its changed appearance when it reaches to maturity can be accounted for by the circumstances under which it is developed. As the seeds and hairs grow, the capsules do not appear to expand with equal rapidity; and, consequently, the hair is exposed to pressure on all sides. The result of this is, that the hair collapses in the middle, leaving a half-formed tube on each side. These uncollapsed portions of the hair give it the appearance of a flat ribbon, with a hem or border at each edge. The hair does not, however, grow out straight, but, coming in contact with other hairs and the sides of the capsular fruit, it becomes twisted. This twisting is undoubtedly the great fact that makes the cotton hair of value to man. There are many hairs, such as those of the cotton-grass and the *Bombax*, which are as long and apparently as strong as those of the *Gossypium*, but which, failing in this irregularity of surface, are utterly incapable of being twisted into a thread or yarn. The twisting gives the cotton hair the power of uniting with its fellows, and forming with them a cord strong enough to be woven.

GOTHA, ALMANACH DE, *go'-thă*, is a celebrated publication which takes its name from the city of Gotha, in Germany, where it is published. It is a small pocket volume, 32mo, containing nearly 1,000 pages, and has now reached the hundredth year of its existence, the first volume having appeared in 1763. It is chiefly remarkable for the large amount of statistical and political information which it contains, regarding all the different states of the world; and as these are always prepared with care from the most reliable sources, it is received as an authority upon such points. So careful are the publishers to maintain the character of the work, that in many cases the date of printing off is marked at the bottom of a page to show that the editor is not responsible for changes after that time. It is divided into four distinct parts,—Genealogy, Diplomatics, Statistics, and Chronology. The first part gives an account of the reigning and princely families of Europe, with the dates of the birth, marriage, children, &c. of the several members. The diplomatic portion gives a list of the ambassadors, plenipotentiaries, *chargés d'affaires*, &c., with the date of their nomination, of each government; the secretaries, *attachés*, &c. to the several embassies or legations; and the consuls-general and consuls stationed in all the principal towns. It also gives a list of the various ministers and other administrative authorities of each state, with the date of their nomination, &c.; also the names of the principal military authorities, the highest ecclesiastical dignitaries, and the principal officers about each of the courts, with any important changes that may have taken place in its constitution. The statistical portion gives the superficial area of each of the different countries, according to its general divisions, as counties, provinces, circles, &c.; the number of inhabitants in each of these divisions, according to the latest census; the numbers belonging to the various sects, &c.; the financial condition of each country, its income, expenditure, national debt, &c.; its military condition, the amount and divisions of its army, navy, militia, &c. Under the head of Chronology it gives a list of the principal events that have happened during the year, and which are either of general interest or of historical importance. It was originally printed in German; but when Napoleon I., who exercised a rigid supervision of this small publication, became Emperor, the language was changed to the French, in which it has since continued to appear. This almanac has the character of being slow to recognize political changes, and for years after the Revolution, it continued to represent Louis XVII. as the reigning monarch in France.

GOTHIC ARCHITECTURE, *goth'-ik*, the name given to the style of architecture that was adopted by European nations generally during the mediæval ages. By some the term is confined to that form of architecture which is peculiarly characterized by the pointed arch, while others consider that Romanesque architecture, which is distinguished by the use of the round arch in every form, and from which the pointed style of architecture was gradually developed, should also be included under this appellation. Adopting the latter and more comprehensive view of the subject, we may, therefore, consider Gothic architecture to consist of two grand divisions,—the Romanesque, or round-arched Gothic, and the Mediæval, or pointed Gothic, to which the term "Gothic" is more particularly applied, and, indeed, generally restricted. The early forms of the round-arched Gothic were based on the architecture that prevailed in ancient Rome about the time of the Christian era, in which the circular arch is a common feature. Prior to the dissolution of the Western empire, and even before the division of the great empire of Rome into the rival sovereignties of the East and West, the churches and public buildings that were erected in various parts of Italy, although they were for the most part copies of the old Roman basilicas, began to exhibit new features in the general plan of construction and ornamentation; and as soon as the cessation of the internal strife and the fierce assaults of predatory tribes of northern and central Europe, which preceded the overthrow of the Western empire, again permitted men to turn their attention to the development of the arts of construction and decoration, these new features expanded into a distinct style, marked with its own special characteristics, that is now known as Romanesque. (*See* ROMANESQUE ARCHITECTURE.) Under this style of architecture those known as the Lombardic and Norman styles are properly classed; and the oldest ecclesiastical buildings in England, such as St. Martin's Church, Canterbury, which was partly rebuilt in the 12th or 13th century, Earl's Barton Church, Northamptonshire, and the nave of Rochester Cathedral, which are assigned to the Anglo-Roman, Anglo-Saxon, and Anglo-Norman styles respectively, also belong to this division of Gothic architecture. During the 11th, and the early part of the 12th century, Gothic architecture was in a state of transition from the first stage to the second, round and pointed arches being used indiscriminately; and in the cathedrals and churches that were erected in England during this period, such as Canterbury Cathedral, the ruins of Glastonbury Abbey, and the Abbey Church of St. Albans; and in France, nearly to the close of the 13th century, many of the characteristics of the Romanesque and Pointed styles of Gothic architecture are to be seen in juxtaposition. Mediæval, or Pointed Gothic architecture, dates from the middle of the 12th century, and is divided, in England, into three distinct varieties, known as the First, Second, and Third Pointed, or, the Early English, Decorated English, and Perpendicular English styles of architecture. The principal characteristics of these styles, and the period of time during which each was successively the prevailing form of Anglo-Gothic architecture, are mentioned elsewhere. (*See* EARLY ENGLISH, DECORATED ENGLISH, PERPENDICULAR ENGLISH.) These three styles were all marked by the use of the pointed arch struck from two centres, which varied in form, the arches being termed obtuse or acute as the centres were taken within or without the span of the arch. Of the different forms of pointed arches that may be obtained by varying the position of the centres from which the curves that form the arch are described, the equilateral arch, in which the centres coincide with the extremities of the span, is considered as the characteristic of architecture that may be termed purely Gothic. During the prevalence of the Third Pointed, or Perpendicular English style, an arch was introduced which is known as the four-centred or depressed arch, being composed of segments of circles struck from four different centres, and having the point of the arch but a short distance above the span. This arch became the characteristic feature of the Tudor style of archi-

tecture (*see* TUDOR ARCHITECTURE); a style which is generally termed by architects debased English, and which was the last phase of Gothic architecture in England, being the prevailing style, especially in colleges and buildings of a private character, until the middle of the 16th century. From this time few, if any, buildings were erected after the Gothic style in this country, until its revival about 1825, which is mainly owing to the endeavours of A. W. Pugin, an architect of considerable eminence in his profession, to restore a taste for Gothic architecture, especially in buildings designed for ecclesiastical purposes, that had long lain dormant. Since that time considerable improvement has been effected in the style of our church architecture; and among other public buildings that have been erected in this style may be named that magnificent structure the New Palace of Westminster. A comparison of St. Paul's Cathedral with Westminster Abbey will at once show the superiority of Gothic architecture over the so-called classic style for churches and cathedrals; although it must be allowed that, except in the case of the new Houses of Parliament, which has just been cited, it is by no means well suited for buildings designed for the public service, or those of a private character. The origin of the name is involved in obscurity: it has been shown that the architecture of ancient Rome was the parent source from which Gothic architecture was derived; and although it is certain that the settlement of the Ostrogoths and Langobardi, or Lombards, in the north of Italy must have had a marked influence on Romanesque architecture, by the introduction of elements derived from the structures of northern Europe, it is equally clear that the origin of this style cannot be attributed to these rude nations, whose knowledge of the art of construction must have been as limited as the degree of civilization to which they had then attained. According to Mr. Bloxam, an eminent authority on English ecclesiastical architecture, the term Gothic was introduced by the architects who flourished at the close of the 17th century, to express the inferiority of mediæval architecture, according to their notions, to the classic style, which they were then endeavouring to introduce. French Gothic architecture, like that of England, is divided into three styles, termed Ogival primitif, Ogival secondaire, and Ogival tertiaire, or Flamboyant; corresponding to our First, Second, and Third Pointed styles in their principal characteristics, and the period of time during which they prevailed.—*Ref.* Bloxam's *Gothic Architecture*; Brandon's *Summary of Gothic Architecture*; Fergusson's *Handbook of Architecture*; *Glossary of Architecture*,—Parker, Oxford.

GOTHIC LANGUAGE. (*See* GERMAN LANGUAGE AND LITERATURE.)

GOTHS, *goths* (Lat. *Gothi*, *Gotones*, *Guttones*), the name of an ancient people of Germany, who in early times inhabited the coast of modern Prussia, from the Vistula as far as Braunsberg, or Heiligenbeil. The origin of this people has not been ascertained with any degree of certainty. It is generally believed that they once inhabited Scandinavia, a belief that is both supported by tradition and by the names of places there. The opinion further is, that they came from the south at a period long anterior to historic records. They are mentioned by Pytheas of Marseilles as inhabiting the shores of the Baltic, about the Frische Haff. They are afterwards mentioned by Tacitus; but from the time of Tacitus, no more is heard of them until the beginning of the 3rd century, when they are spoken of as a powerful nation on the coasts of the Black Sea. In the reign of the emperor Philippus, they took possession of Dacia, and laid siege to Marcianopolis, the capital of Mœsia Secunda, which purchased peace for a large sum of money. A few years later, they again entered Mœsia, but retreated before the army of Decius, upon which, however, they unexpectedly turned, and completely annihilated, near Philippopolis, at the foot of Mount Hæmus (A.D. 250). The following year they again encountered the Roman army, and defeated it with great slaughter, at Forum Trebonii, in Mœsia; the emperor Decius being among the number of the slain. His successor, the emperor Gallus, induced them to withdraw to their own territories, with a large sum of money. They then seem to have extended themselves more to the eastward, and possessing themselves of a fleet, they sailed against Pityus, which they took, and subsequently Trebisond shared the same fate. In a second expedition they took Chalcedon, Nicomedia, Nicæa, Prusa, Apamea, and Cius. In a third expedition, comprising a fleet of 500 vessels, they landed at Cyzicus, ravaged the coast of Attica, took and plundered Athens, Corinth, Argos, Sparta, and many other places. In 269 they undertook another vast expedition, in which they ravaged Crete and Cyprus, and laid siege to Thessalonica; but they were at length defeated in three separate engagements, by the emperor Claudius, with immense slaughter. They, however, still continued to harass the Roman frontier, and in 272, the emperor Aurelian was obliged to cede them the province of Dacia; after which, there was a period of comparative peace for about fifty years. In 332, their king, Ururic, crossed the Danube; but he was at length defeated, and obliged to sue for peace. In the reign of Valens, they carried on a war with the Romans for three years (367-69), but without any decisive result. About this time internal commotions produced the division of the great Gothic kingdom into the kingdom of the Ostrogoths, or Eastern Goths, who inhabited the shores of the Black Sea, from the Don to the Dnieper; and the Visigoths, or Western Goths, who occupied Dacia, from the Dnieper to the Danube. About 375, the Huns invaded Europe from the east, and the Visigoths implored the protection of the emperor Valens, and leave to settle on the east bank of the Danube, which was granted them. The Ostrogoths being refused admission into the Roman territory, took refuge in the mountains. The oppression of the Roman governors soon drove the Visigoths to rebellion, and in the war which ensued, they completely defeated the Roman army at Adrianople, in 378, and the emperor Valens himself lost his life. They threatened Constantinople, but were unable to take it, and afterwards settled in Thrace and Dacia. They soon became so numerous and powerful, that the court of Constantinople saw no other way of securing itself against their attacks than by making them an integral part of the empire. After many vicissitudes, the Ostrogoths also obtained a settlement in Pannonia and Sclavonia, but not till the destruction of the kingdom of the Huns in 453. The Visigoths, in process of time, obtained a degree of power which excited the alarm of Greece and Italy. In 396, Alaric made an irruption into Greece, laid waste the Peloponnesus, and became prefect of Illyria and king of the Visigoths. He invaded Italy about the beginning of the 5th century, and by that measure brought on the destruction of the Roman empire, since Stilicho, the Roman general, could only obtain a victory over Alaric, at Verona, in 403, by withdrawing all the Roman troops from the borders of the Rhine. Alaric himself soon returned to Italy, and sacked Rome in 409, and again in 410. From Rome, Alaric turned to the south of Italy, where death cut short his victorious career. In 412, the Goths quitted Italy, the south of Gaul having been given up to them; and after having remained there for a short time they crossed the Pyrenees and took possession of a large part of Spain, where Athaulf, the successor of Alaric, was assassinated. His successor, Wallia, assisted the Romans against the Vandals and Alani, in Spain, and was rewarded with a portion of western Gaul. The succeeding kings of the Goths extended their empire, both in France and Spain, and during the latter part of the 5th century it had reached the highest point of its prosperity, its capital being Toulouse. At that time it embraced the greater part of Spain, and a large portion of Gaul; but after that time the Goths in Gaul were compelled to retreat before the Franks, while in Spain their empire was overthrown about two centuries later, by the Saracens. After the fall of the Western Roman empire, by the invasion of Odoacer, in 476, the eastern emperor, Zeno, persuaded *Theodoric*, king of the Ostrogoths, to invade Italy in 489. He was successful, and established the kingdom of the Ostrogoths in Italy. Theodoric reigned for thirty-three years, and greatly strengthened his power and extended his kingdom; but, after his death, disputes arose as to his successor, and the country became embroiled in civil dissensions. Justinian, the Eastern emperor, in order to profit by these

disorders, dispatched Belisarius to Italy in 526, who took possession of Rome, and, gaining the admiration of the Goths, was invited to become their king. This, however, he refused, but held the people in subjection to his master. Totila, a noble Goth, rebelled, and made himself master of southern Italy. He was about to destroy Rome, but listened to the remonstrances of Belisarius, that it would add more to his honour to spare it, and contented himself with dispersing the inhabitants, and repeopling it before the arrival of a fresh army from Constantinople under Narses. Totila fell in battle, and his successor, Theias, shared the same fate; Italy was reconquered, and the Gothic monarchy, established by Theodoric, ceased to exist, 554. The Goths, originally savage and barbarous, had become civilized and enlightened before the time of Theodoric. This prince is much praised for his moderation, integrity, and love of justice. The public buildings of the city were kept in repair, and overseers were appointed to look after them, and to guard the statues. He was also distinguished in some degree as a patron of the fine arts, science, and learning. Religious liberty was accorded to all; and there is said to have never been in Italy a better administration than that of Theodoric. The Visigoths were the first of all the German tribes to have a written code of laws, which was drawn up in the 5th century, half a century before that of Justinian.—*Ref.* Smith's *Dictionary of Ancient Geography.*

Gourd, *gourd* (Fr. *courge*), the common name for a large cucurbitaceous fruit. (*See* Pepo.) The plant named *Cucurbita Pepo* yields the white gourd; *C. maxima*, the red gourd, or pumpkin, *Lagenaria vulgaris*, the bottle-gourd, often used as a receptacle for fluid; *Luffa fœtida*, the sponge-gourd; and *Trichosanthes anguinea*, the snake-gourd. The wild gourd of the Old Testament (2 Kings iv. 39) is supposed to have been the bitter cucumber, or colocynth

Gout, *gout* (Fr. *goutte*, Lat. *gutta*, a drop), in Path., is a painful disease of the joints, generally of the feet or hands, and more particularly of the great toes. It occurs mostly in persons advanced in life, and who indulge freely in the pleasures of the table; and is hereditary. The attack is usually preceded by a disordered state of the digestive system, and commonly begins by a painful swelling of the first joint of the great toe. It returns at longer or shorter intervals, when it may attack various other parts; but generally the great toe is the chief seat of the disease. Sometimes the attack comes on without any previous warning; but usually, for some days or weeks before, the patient has been suffering from indigestion, with diminished appetite, flatulence, costiveness, and a general feeling of lassitude and depression of spirits. He goes to bed, perhaps, in tolerable health, and after a few hours is awakened by the severity of the pain in the great toe, or sometimes the ankle, heel, or calf of the leg. The pain resembles that of a dislocated bone, and is attended with the sensation as if cold water was poured over the part; and this is succeeded by chilliness, shivering, and other febrile symptoms These gradually abate as the pain increases, and it continues usually to the following night, with sometimes, however, a period of intermission during the day. The pain is of a burning or gnawing character. The next night, after some time of tossing and restlessness, the patient succeeds in falling asleep; a gentle perspiration breaks out, and he awakes to find himself refreshed and the part comparatively free from pain. On examining the limb next morning, it is found to be considerably swollen, the toe red and shining, and the veins of the foot much distended. There are usually a number of subsequent attacks, becoming less and less severe, before what is known as "a fit of the gout" is over; so that it commonly extends over a period of several weeks, or even months. When the fit is over, the system is relieved, and the person feels, both in mind and body, much better than before the attack. At first, a fit of gout occurs only once perhaps in two or three years; but it becomes by degrees more and more frequent, more severe, and of longer duration every succeeding fit. In its progress, various parts of the body become affected, and translations take place from one joint or limb to another; and after frequent attacks, the joints lose their strength and flexibility, and become so stiff as to be deprived of all motion. Concretions of a chalky appearance are likewise formed about the joints; and affections of the kidneys arise from a deposit of the same kind of matter in them. This matter is a compound of uric acid and soda. The fits are more apt to occur in spring or autumn than at other seasons of the year; probably owing to the variableness of the weather at these times. As the fits become more frequent and severe, so the constitutional derangements become more marked and constant. The appetite fails, indigestion is more constant, there is a tendency to costiveness, the mind becomes restless and irritable, calcareous deposits are formed in the arteries, calculi form in the bladder, and frequently the heart becomes diseased. Such are the general features of what is termed the regular gout; but there are certain other kinds which differ widely from it in their general character. In atonic gout, the disease, instead of manifesting itself in the joints, attacks some of the internal organs, as the stomach, when the patient suffers from indigestion, nausea, vomiting, and severe pains; or the thoracic viscera, when palpitations, fainting, and asthma arise. Retrocedent gout (Lat. *podagra retrograda*) is when, after the inflammation has occupied a joint, it suddenly disappears and is transferred to some internal part, as the stomach, heart, lungs, or brain, when it may give rise to various fatal disorders. Misplaced gout is when, instead of attacking the joints, the disease proceeds inward, and causes an inflammatory affection of some of the internal parts, with the same symptoms that attend inflammation of these parts from other causes. The cause of gout has been shown by Dr. Garrod to be the excess of uric acid in the blood, resulting either from an excessive formation or a checked excretion, for there is reason to believe that this substance exists in very minute quantities in the blood even in perfect health. Topical remedies are of little use in gout. If the patient is plethoric, the inflammation is to be reduced by bleeding, purging, a low diet, and sudorifics. The use of colchicum is very beneficial during a fit of gout, but it requires to be used with caution. The great cure of this disease, however, is strict attention to diet and plenty of active exercise. The Scotch cure of "living on sixpence a day and working for it" is based upon the true nature of the disease.—*Ref.* Dr Garrod *On the Nature and Treatment of Gout.*

Government, *guv'-ern-ment* (Ang.-Nor.), in Pol., is a word employed to denote either the particular forms under which a state is governed, the collective body of its laws, or the person or persons in whom the supreme power is vested. There are three distinct forms of government,—a monarchy, in which the supreme power is in the hands of one person; an aristocracy, in which it is vested in a privileged minority; and a democracy, in which it is exercised either directly or indirectly by the great body of the people. Monarchy, in its abuse, becomes despotism; aristocracy tends to oligarchy; and democracy to ochlocracy, or mob government. The mixed form of government is that which combines all, or at least two, of these forms, and is an attempt to combine the good qualities of each, and to guard against their evil tendencies. Every government comprises within itself three distinct powers,—the legislative, judicial, and executive. In its legislative capacity, it lays down the laws by which its subjects are to be governed; its judicial power is exercised in deciding, by means of various courts and judges, all questions connected with these laws; and its executive power in carrying out or putting into execution its legislative enactments and judicial decisions. (*See* Aristocracy, Democracy, Monarchy, &c.)

Government, Federal. (*See* Federal Government.)

Governor. (*See* Steam-Engine.)

Grace, *graise* (Lat. *gratia*, Gr. *charis*), is a term frequently used in Scripture, and by theological writers. In its most general signification, it is employed to denote the love and favour of God towards mankind, more particularly in his sending his son Christ Jesus to die for sinners. It implies that the gift springs from the bounty and liberality of the giver, without any claim or merit on the part of the

recipients. It is also employed to designate the influence of the Divine Spirit upon the mind, by which an individual is brought to receive the truths of Christianity; and hence, when an individual has been brought into that condition, he is said to be in a state of grace. It is also used to signify the gospel dispensation, as distinguished from the legal; as when the apostle Paul speaks of our being "no longer under the law, but under grace." Some theologians assert that there are two kinds of grace,—common and special. Common grace they regard as being extended unto all men; special grace as that which is extended only to the elect, and by means of which they are brought unto Christ. Some speak of grace as being irresistible, efficacious, electing, justifying, sanctifying, &c. The nature of grace has been one of the most fruitful sources of controversy in the Church, giving rise to much bitterness of feeling, and introducing many hair-splitting distinctions, for which there are no grounds in Scripture.

GRACE, DAYS OF, in Com., are certain days allowed by custom to be added to the time when a bill becomes due. The number of days varies in different countries: here it is three. Thus a bill drawn on the 7th of January, payable three months after date, is not due till the 10th of April. (*See* BILL OF EXCHANGE.)

GRACILLARIA, or PLOCARIA, *grā-sil-lai'-re-a*, in Bot., a species of plants belonging to the nat. ord. *Algæ*, or Sea-weeds. The *Gracillaria lichenoides* is our commercial Ceylon moss. It is nutritive, emollient, and demulcent, and may be employed in the form of a decoction or jelly as a food for children and invalids; and medicinally in pulmonary complaints, diarrhœa, &c. It is sometimes imported under the name of agar-agar, but *Gracillaria spinosa* has also been imported under the same name. Both species are largely used in the East for making nutritious jellies, for stiffening purposes, and for varnishing. *Gracillaria Helmintho-corton* is Corsican moss. It has been used principally as a vermifuge, but its properties have been much overrated. *Gracillaria crassa*, or Ki-tsai, is cooked with soy or vinegar in China; and is also used by the Chinese ladies for giving a gloss to their hair.

GRACIOSO, *grath-e-o'-so* (Sp.), is the name given in Spain to the buffoon, who is a very popular personage on the stage in that country.

GRADIENT, *grai'-de-ent* (Lat. *gradus*, a step), a term applied to the proportionate ascent or descent on any portion of a line of railway; thus an inclined plane four miles long, with a total fall of 84 feet, is said to have a gradient of 21 feet in the mile. In all cases it is desirable in constructing railways to make the road as straight, and with as near an approach to a dead level, as possible. During the early days of railroad-making more importance was attached to this subject than is exhibited now. As late as 1846 Mr. Locke had great difficulty in persuading the French authorities to tolerate inclines with a gradient of 1 in 126. In this country, however, on the Birmingham and Gloucester line, the Tickey incline, with a gradient of 1 in 37, has been for years in successful work; and on the Vienna and Trieste railway the inclines are sometimes carried for great distances at a gradient of 1 in 40. Steep inclines always, however, constitute a heavy burden on the working expenses of a railway, and should never be admitted unless absolutely necessary. (*See* RAILWAY.)

GRADUAL, *grād'-u-al* (Lat., from *gradus*, a step), in the liturgy of the Roman Catholic church, is applied to the few verses of the Holy Scriptures, generally the Psalms, which are chanted after the reading of the Epistle, in the service of the Mass. It is so called from the priest, during the time, being on the steps of the altar.

GRADUATE, *grād'-u-ait* (Lat. *gradus*, a step), is one who has taken a degree at a college or university. The act of conferring degrees is called graduation. (*See* DEGREE, UNIVERSITY.)

GRADUS AD PARNASSUM, *grai'-dus ăd par-năs'-sum* (Lat., a step to Parnassus), is the name of a class-book used by scholars for assisting them in the composition of Latin verses. The words are arranged in alphabetical order, and the quantities of each marked. The first work of this kind was by the Jesuit Aler, and published at Cologne, 1702.





GRAF, *gräf* (Ger.), a title of nobility which corresponds in Germany with our English count. The first mention of this particular grade of nobility occurs in the 5th century. There are two classes of grafs in Germany at the present time, the first forming a section of the highest and oldest nobility, and the second representing the higher order of the lower nobles.

GRAFFITO, *graf-fi'-to* (Ital., a scratching), is the name given to a class of inscriptions which have been found in certain ancient cities, and which have recently excited some interest. They are street scribblings, the names, words, and sentences which are found rudely traced in charcoal or red chalk, or scratched with a stylus on the plaster of the walls or pillars in the public places. Many curious and interesting gleanings of them, found at Pompeii and elsewhere, have been made public, and more than one eminent scholar has applied himself to the subject as a special study. They are not only extremely curious in themselves, but are valuable as tending to throw light on the every-day life and manners of the ancient world. The subjects of this wall literature of the ancients appear to have been very miscellaneous. Many of the inscriptions are of a religious character, others political; but the great majority of them appear to have been personal, and often of a satirical or grossly libellous character. Very many, indeed, hardly admit of any regular classification, being, as might be anticipated, of a most motley character. Some are scraps of poetry from well-known authors; others are doggrel verses, or short sentences of unknown origin. Some are expressions of affection for a friend, while others denote disapprobation. Many of them, too, are mere ribaldry, sometimes of the grossest and most disgusting tendency. The literary value of the graffiti is, as was to be expected, very slender; but they are interesting as throwing light upon the manners, customs, and modes of thought of the people. A small selection of these writings was published by Dr. C. Wordsworth in 1837; but the most elaborate and interesting work on this subject is the "Graffiti di Pompei," 1856. But by far the most comprehensive and magnificent work on this subject will be, when completed, "Monumenta Epigraphica Pompeiana," by Jos. Fiorelli.—*Ref. Edinburgh Review*, October, 1859.

GRAFTING, *gräft'-ing* (Ang.-Nor.), is a mode of propagating plants which is applicable to most kinds of trees and shrubs, with the exception of heaths and herbaceous vegetables, which do not so easily admit of the operation. It is principally directed towards fruit-trees, in order to continue their varieties. A tree which is grafted consists of two separate parts,—the scion and the stock; the union of these two constitutes the graft, and the operation by which the union is effected is terme *grafting*. According to Loudon, the end of grafting consists—Firstly, in preserving and multiplying varieties of fruit-trees endowed, accidentally or otherwise, with particular qualities, which cannot be transferred to their offspring by seeds, and which would be multiplied too slowly or ineffectually by any other mode of propagation; secondly, to accelerate the fructification of trees, barren as well as fruit-bearing; thirdly, to improve the quality of fruits; fourthly, to perpetuate varieties of ornamental trees or shrubs; and lastly, to change the species of fruit on any one tree, and to renew its fruitfulness. *Whip, splice*, or *tongue-grafting*, is the mode most generally adopted in nurseries for propagating fruit-trees. It is necessary, in order to perform this correctly, that the top of the stock and the extremity of the scion should be of equal diameter. The scion and stock are cut off obliquely at corresponding angles, or as near the same as the operator can guess; a slit is then made in the sloped face of the stock downwards, and in the scion upwards; the tongue, thus constructed, of the scion is then inserted in the cleft of the stock, the inner barks of both being made to unite closely, and the whole is then bound round tightly with bass ribband from left to right. The next thing to be done is to clay all round, over the bass, from about an inch below the graft to an inch above, closing up all the apertures, so that no light, wet, or wind can penetrate; for which object the clay is applied. *Cleft-grafting* is another variety, and only differs from the above method in the

scion being shaped like a wedge, and being inserted in a corresponding cavity in the stock. *Budding* is another method of grafting by means of the germs or eyes of plants, and it consists in taking an eye or bud attached to a portion of the bark and transporting it to a similar position in another or different ligneous vegetable, The only difference between budding and grafting is in the fact of the scion being in an embryo state instead of being fully grown.—*Ref.* Loudon's *Encyclopædia of Gardening.* (*See* also GARDENING, HORTICULTURE, &c.)

GRAIN, *grain* (Fr. *grain*, Lat. *granum*), the smallest weight in the systems commonly used in England and America for denoting the weights of bodies The value of the grain is set forth in the act of parliament, 5 Geo. IV. c. 74. (*See* AVOIRDUPOIS.) The grain can be taken as the common unit in comparing the systems of weight known as avoirdupois, apothecaries', and troy. The ounce avoirdupois contains 437·5 grains; the apothecaries' and the troy ounce 480 grains. The principal terms of the decimal system of weights may thus be expressed in grains:—

| | | *Grains.* |
|---|---|---|
| 1 Kilogramme | = | 15434 |
| 1 Gramme | = | 15·4346 |
| 1 Centigramme | = | ·1543 |
| 1 Milligramme | = | ·0154 |

A proposition for altering the value of the grain in the British Pharmacopœia was advanced in 1862; but the General Medical Council, after much consideration, determined not to interfere with the well-known weight.

GRAIN TIN. (*See* TIN.)

GRAINS OF PARADISE. (*See* AMOMUM.)

GRALLÆ, GRALLATORES, *gral'-le gral-lai-to'-reez* (Lat. *grallæ*, stilts), the wading birds, the fourth of the six orders into which Linnæus divided the class *Aves*, or Birds. The order is thus described by him.—Bill sub-cylindrical and rather obtuse; tongue entire, fleshy; feet wading, the thighs half-naked; body compressed; the skin very thin and sapid; the tail short. Their food consists of fishes, water reptiles, and animalcules obtained in marshes, and their nests are generally found near the ground. The families of the order are the Gruidæ, or cranes; the Ardeidæ, or herons; the Scolopacidæ, or sandpipers, and snipes; the Rallidæ, or rails; the Charadriadæ, or plovers: and the Tantalidæ, or ibices. It comprises all those birds which live both on land and sea, and to which both elements are essential. Those which are essentially aquatic have a short web to their toes; their wings are long, and, having no settled district, they fly from one shore to another as the seasons change. Several fossil remains of the families of this order of birds have been found. In the Paris basin, bones of birds referable to the genera Scolopax, Tringa, and Ibis, have been found, and in the fresh-water formation of Tilgate Forest, the remains of a wader larger than a heron were found by Dr. Mantell. The fossil footsteps of wading birds, observed by Professor Hitchcock, in the new red sandstone valley of the Connecticut, show that formerly at least seven species of Grallatores existed, varying in size from that of a snipe to twice that of an ostrich.—Ref. *American Journal of Science and Arts*, vol. xxix.

GRAMINACEÆ, *grăm-in-ai'-se-e* (from Lat. *gramen*, grass), in Bot., the Grasses, a nat. ord. of *Monocotyledones*, sub-class *Glumaceæ*. Of all the orders in the vegetable kingdom, this is the most important to man, as it affords his principal food, and is eminently serviceable in other respects, by supplying fodder for cattle, sugar, and numerous useful products. As a botanical group, there is none more natural, for the variations observed in the herbs, shrubs, and arborescent plants composing it, are of the simplest kind, arising generally from differences in the proportions of parts. The stem of a grass is round, jointed, and commonly hollow. The leaves are alternate, with split sheaths, terminating above in membranous tongues or ligules. The flowers are perfect, or unisexual, and grow in bunches (*locustæ* or *spikelets*), or singly. There is no true perianth, its place being supplied by imbricated bracts (or chaff-scales), of which there are commonly two, called *glumes* (*see* first illustration, *b*, *b*), placed at the base of the solitary flower, or at the base of each locusta; rarely, there is only one glume. Occasionally these envelopes are altogether absent. Each flower is also usually furnished with two additional alternate bracts, called *paleæ* (*a*, *a*, in first illustration); sometimes the inner palea is wanting. There are also, in some cases, two or three scales, called *lodiculæ*, or *glumellules*, present. The stamens vary in number from one to six, or even more—the number is frequently three (*see* second illustration *c*, *c*, *c*); the filaments are capillary; the anthers versatile. The ovary (*a*) is superior and one-celled, with a solitary



FLOWER OF THE OAT.

ascending ovule; the stigmas (*b*, *b*) are feathery, or hairy. The fruit is a caryopsis. The seed has mealy albumen and a lenticular embryo, lying on one side at the base of the albumen. The form of inflorescence is a point of great importance in the classification of the grasses. The single flowers, or locustæ of flowers, may be arranged on a central column (*rachis*), so as to form a compact head or spike (as in wheat); or they may be placed on a more or less branched axis, so as to form a panicle (as in the oat). Grasses are universally distributed over the globe. In temperate and cold climates they are herbaceous, and of moderate height, while in tropical climates they become shrubby and arborescent, and sometimes grow to the height of fifty or sixty feet. Grasses usually grow together in large masses, and thus form the verdure of great tracts of soil: hence they have been termed social plants. There are 300 genera and probably about 3,800 species. The most important genera are *Triticum*, wheat; *Hordeum*, barley; *Avena*, oat; *Oryza*, rice; *Zea*, Indian corn, or maize; *Secale*, rye; *Panicum*, millet; *Saccharum*, sugar-cane; *Bambusa*, bamboo; *Andropogon dactylis*, and *Holcus*. (*See* these names.)

GRAMMAR, *grăm'-măr* (Fr. *grammaire*, Ger. *grammatik*, Gr. *grammatike*, Lat. *grammatica*), is the art of speaking or writing any language with correctness and propriety. Considered as an art, it necessarily supposes the previous existence of a language, the object of which is to communicate thought. Without attempting any alteration in a language already in use, it furnishes certain rules, founded on observation, to which the method of speaking adopted in that language may be reduced; and this collection of rules is called the grammar of that language. But apart from grammar, as applied to any particular language, there is the pure science of grammar, otherwise called universal grammar, which views language only as significant of thought, and, neglecting particular and arbitrary modifications, introduced for the sake of beauty, or otherwise, examines the analogy and relations between words and ideas; distinguishes between those particulars which are essential to language and those which are only accidental; and thus furnishes a certain standard by which different languages may be compared, and their several excellencies or defects pointed out. "Grammar," says Max Müller, "owes its origin, like all other sciences, to a very natural and practical want. The first practical grammarian was the first practical teacher of languages; and if we want to know the beginnings of the science of language, we must try to find out at what time in the history of the world, and under what circumstances, people first thought of learning any language besides their own. At that time we shall find the first practical grammar, and not till then. Much may have been ready at hand, through the less-interested researches of philosophers, and likewise through the critical studies of the scholars of Alexandria, on the ancient forms of their language, as

preserved in the Homeric poems. But rules of declension and conjugation, paradigms of regular and irregular nouns and verbs, observations on syntax, and the like; these are the work of the teachers of languages, and of no one else." Grammar, therefore, is of comparatively modern origin. No ancient Greek ever thought of learning a foreign language. It was through the study of the ancient dialects of their own language that the Greeks of Alexandria were first led to critical and philological studies. The general outline of grammar existed at an earlier period, but they were the first to study the language critically, analyzing and arranging it under general categories, distinguishing the various parts of speech, inventing proper technical terms for the various functions of words, &c. The first real practical Greek grammar was that of Dionysius Thrax, a Thracian, who went to Rome, and taught the language there about the time of Pompey. He was the first who applied the results of the labours of former philosophers and critics to the practical work of teaching. His work thus became one of the principal channels through which the grammatical terminology which had been carried from Athens to Alexandria flowed back to Rome, to spread from thence over the whole civilized world. "We can follow the stream of grammatical science," says Müller, "from Dionysius Thrax to our own time in an almost uninterrupted chain of Greek and Roman writers. We find M. Verrius Flaccus, the tutor of the grandsons of Augustus, and Quintilian, in the first century; Scaurus, Apollonius Dyscolus, and his son Herodianus, in the second; Probus and Donatus, the teacher of St. Jerome, in the fourth. After Constantine had moved the seat of government from Rome, grammatical science received a new home in the academy of Constantinople. There were no less than twenty Greek and Latin grammarians who held professorships at Constantinople. Under Justinian, in the sixth century, the name of Priscianus gave a new lustre to grammatical studies, and his work remained an authority during the middle ages to nearly our own times. We ourselves have been taught grammar according to the plan which was followed by Dionysius at Rome, by Priscianus at Constantinople, by Alcuin at York; and whatever may be said of the improvements introduced into our system of education, the Greek and Latin grammars used at our public schools are mainly founded on the first empirical analysis of language prepared by the philosophers of Athens, applied by the scholars of Alexandria, and transferred to the practical purpose of teaching a foreign tongue by the Greek professors at Rome."—(*Lectures on the Science of Language*, 3rd edition, 1862.) It is in the grammar of a language that we can trace its distinctive features. The English language, for instance, is made up of words borrowed from almost every country of the globe,—Latin, Greek, Hebrew, Celtic, Saxon, Danish, French, Spanish, Italian, German—nay, even Hindustani, Malay, and Chinese words, lie mixed together in the English dictionary; but not a single drop of foreign blood has entered into the organic system of the English language. "The grammar, the blood and soul of the language, is as pure and unmixed in English as spoken in the British isles as it was when spoken on the shores of the German Ocean by the Angles, Saxons, and Jutes of the continent." Grammar is, after all, but declension and conjugation. Originally, declension could not have been anything but the composition of a noun with some other word expressive of number and case. The like holds true with regard to verbs, though it may seem difficult to discover in the personal terminations of the Greek and Latin the exact pronouns which were added to the root of the verb in order to express, *I* love, *thou* lovest, *he* loves. It stands to reason, however, that originally these terminations must have been the same in all languages; namely, personal pronouns. "It is very likely," says the author already so frequently quoted, "that the gradual disappearance of irregular declensions and conjugations is due in literary, as well as in illiterate language, to the dialect of children. The language of children is more regular than our own. I have heard children say *badder* and *baddest*, instead of worse and worst. In treating of the grammar of any





language, grammarians usually divide the subject into four distinct heads:—*Orthography*, or the art of combining letters into syllables and syllables into words; *Etymology*, or the art of deducing one word from another, and the various modifications by which the sense of any one word can be diversified consistently with its original meaning, or its relation to the theme whence it is derived; *Syntax*, or what relates to the construction or due disposition of the words of a language into sentences or phrases; and *Prosody*, or that which treats of the quantities and accents of syllables, and the art of making verses. All language is made up of words, which may be defined to be sounds significant of some idea or relation, and may be distinguished as—1. Substantives; 2. Attributives; 3. Definitives; and 4. Connectives. Substantives are words expressive of things which exist, or are conceived to exist, of themselves, and not as the energies or qualities of anything else. They are nouns and pronouns, the latter being a species of word invented to supply the place of nouns in certain circumstances. They admit of the accidents of gender, number, and case. Attributives are words that are expressive of all such things as are conceived to exist not of themselves, but as the attributes of other things. They are verbs, participles, adjectives, and adverbs. The attributes expressed by verbs have their essence in motion or its privation; and as motion is always accompanied by time, therefore verbs are liable to certain variations called tenses. To denote the several kinds of affirmation expressed by verbs, all verbs have what are termed moods or modes; as the indicative, I write; subjunctive, I may or can write; imperative, write thou. Verbs are also distinguished as active-transitive when the action denoted by them passes from the actor to some external object; active-intransitive, when no such passing takes place; passive, such as express not action, but passion or suffering; and neuter, such as express an attribute that consists neither in action nor in passion. Participles are such words as express an attribute combined with time; as, *writing*, *written*. Adjectives express, as inhering in their substantives, the several qualities of things of which the essence consists not in motion or its privation; as, *good*, *bad*, *proper*. Some qualities are of a such a nature that one substance may have them in a greater degree than another; and therefore adjectives denoting these qualities admit, in most languages, of variations called degrees of comparison. Adverbs, from being attributes of attributes, have been called attributives of the second order, to distinguish them from verbs, participles, and adjectives, which denote the attributes of substantives, and are therefore called attributives of the first order. Adverbs are of two kinds,—those which are common to all attributives of the first order, *i. e.*, which coalesce equally with verbs, participles, and adjectives, and those which are confined to verbs. Definitives are such words as serve to define and ascertain any particular object or objects as separated from others of the same class. These are commonly called articles; of which there are two kinds,—the definite and the indefinite. Connectives are such words as are employed to connect other words, and of several distinct parts to make one complete whole. They are of two kinds,—conjunctions and prepositions. Conjunctions are those connectives which are commonly employed to conjoin sentences. They are of two kinds,—conjunctives, or such as conjoin sentences and their meanings too, and disjunctives, (or such as, while they conjoin sentences, disjoin their meanings. Prepositions conjoin words which refuse otherwise to coalesce; and this they do by signifying those relations by which the things expressed by the united words are connected in nature. Interjections are a class of words which are to be found in perhaps all languages; but they cannot be included in any of the above classes, for they are not subject to the rules and principles of grammar, as they contribute nothing to the communication of thought.—*Ref. Encyclopædia Britannica*; *Encyclopædia Metropolitana*. (*See* LANGUAGE.)

GRAMMARIAN, *gram-mā'-re-an*, was anciently a title of honour given to persons accounted learned in any art or faculty whatsoever; but now it is commonly applied to one who is skilled in or who teaches grammar.

GRAMMAR SCHOOLS. (*See* SCHOOLS.)

GRAMME, *gràm* (Fr.), the unit of weight in the French metric system. It is the weight of a cubic centimètre of distilled water at its greatest density, that is to say, at the temperature of 4·1° of the centigrade thermometer. It is somewhat under 15½ grains, its exact value in grains being expressed decimally by 15·4346. (*See* METRIC SYSTEM.)

GRAMPUS. (*See* WHALE.)

GRANADILLAS, *gran-a-dil'-las* (Sp.), the edible fruits of certain species of passion-flower. (*See* PASSIFLORA.)

GRAND COUTUMIER OF NORMANDY, *koo-too'-me-ai*, is the name of an ancient collection of the laws of Normandy, which formerly prevailed also in this country. It is said to have been compiled in the third year of Henry III. The islands of Jersey, Guernsey, Alderney, &c., which formerly belonged to Normandy, but were united to the English crown by the first princes of that line, are still governed according to the laws of *le grand Coutumier*.

GRAND DAYS, in Law, are those days in the terms which are solemnly kept in the inns of court and chancery; viz., Candlemas-day in Hilary, Ascension-day in Easter, St. John Baptist's day in Trinity, and All Saints' day in Michaelmas,—all *dies non juridici*.

GRANDEE, *grăn-dee'* (Sp. *grands de España*), is the name of the highest rank in the Spanish nobility. The collective body of the grandees is called *la grandesa*. To this class belonged that very powerful section of the nobility who, from their great wealth, were called the *ricos hombres* (rich men). The grandees were originally the descendants of the great feudatories of the crown, and were possessed of many important privileges; among which were exemption from taxation, and from the power of any civil or criminal court without a special warrant from the king. They had also the right of bearing a banner, and of enlisting soldiers on their own account, and might even enter the service of a foreign prince at war with Castile without being guilty of treason. At length Cardinal Ximenes succeeded in breaking their power and depriving them of many of their privileges. Subsequently it became the practice of the Spanish kings to raise new men to the rank of grandees, partly with the view of destroying the power of the ancient nobility, and partly to reward their friends. In this way three classes of grandees arose, differing in rank as well as in the privileges which they enjoyed. Under the government of Joseph Bonaparte the dignities and privileges of the grandees were entirely abolished, but they were partially restored at the restoration. There are very few of the old families now extant in the direct line.

GRAND JURY, in criminal jurisprudence, is a body of good and sufficient men, whose business it is to examine into the charges of crimes brought before them at assizes or sessions; and if satisfied that there is sufficient cause, they return a bill of indictment against the accused, upon which he is afterwards tried by the petty jury. The sheriff of every county is bound to return to every session of the peace, and every commission of *oyer* and *terminer*, and of general gaol delivery, twenty-four good and lawful men of the county, to inquire, present, do, and execute all those things which, on the part of the sovereign, shall then and there be commanded them. As many as appear upon this panel are sworn upon the grand jury, to the amount of twelve at least, and not more than twenty-three, so that twelve may be a majority. The grand jury are first instructed in the articles of their inquiry by a charge from the judge who presides on the bench. They then withdraw to sit and receive indictments, which are preferred to them in the name of the queen, but at the suit of any private prosecutor. They are only to hear evidence on behalf of the prosecution, for they are only to inquire whether there be sufficient cause to call upon the party to answer it. They ought, however, to be thoroughly persuaded of the truth of an indictment, so far as the evidence goes, and not to rest satisfied with mere probabilities. The institution of grand juries is very ancient, and can be traced back to the reign of King Ethelred. For grand jurors at assizes, no qualification by estate is necessary; at sessions, the qualification is the same as that of the petty jury. (*See* JURY.)





GRAND-MASTER, a name which was applied, during the middle ages, to the chiefs of the various dominant orders of knighthood; as the Templars and the Hospitallers, the latter of whom were later termed the Knights of Malta. The grand-master was, in a sort of a way, the sovereign for life of the order which he commanded, and his word was law in all matters, whether concerning life or death. Sir Walter Scott, in his romance of Ivanhoe, has given a very good sketch of how the post of grand-master was filled and abused by the men to whom it was intrusted. During the days of the ancient monarchy in France, there was an office termed the Grand-Master of France, who was chief of all the officers of the household; and later, during the empire, there were grand-masters of the universities; but the term has, in the present day, to all practical purposes, exploded.

GRAND SERJEANTY (Lat. *magnum servitium*, great service), in Law, was a tenure by which the tenant was bound, instead of serving the king generally in the wars, to do some special honorary service to him in person; as to carry his banner, his sword, or the like; or to be his butler, champion, or other officer at his coronation. It was of the nature of grand serjeanty that it held of the king: the like tenure held of a subject was only knight-service. Tenants holding by grand serjeanty were not bound to pay aid or escuage, as was the case in knight-service. Tenure by *cornage*, which was to sound a horn when the Scots or other enemies entered the land, in order to warn the king's subjects, was a species of grand serjeanty. This tenure was preserved by 12 Charles II. c. 24, which abolished the other feudal tenures, and still subsists in some cases.

GRANITE, *grăn'-it* (Lat. *granum*, a grain), in Min., a kind of rock, so named from its granular structure. The typical granite is a crystalline aggregate of the three minerals, felspar, mica, and quartz. The proportions of the three constituents vary indefinitely, with this limitation, that the felspar is always an essential ingredient, and never forms less than a third, rarely less than half of the mass, and generally a still larger proportion. Sometimes the mica, sometimes the quartz, becomes so minute as to be barely perceptible. The state of aggregation of the mass varies also greatly, some granites being very close and fine-grained, others largely and coarsely crystalline. The colours of the rock are generally either red, grey, or white,—the first when the felspar is flesh-coloured, the latter when it is pure white, the intermediate grey tints depending chiefly on the abundance and colour of the mica, but sometimes on that of the quartz. The hard and close-grained granite forms the most durable building-stone for heavy structures; the soft and decomposable yields the finest *kaolin*, or china-clay.

GRANITIC ROCKS, *grăn-it'-ik*, in Geol., those igneous rocks which partake of the character and appearance of granite. (*See* IGNEOUS ROCKS.) They are highly crystalline, and their component crystals are never rounded or water-worn; they present no traces of deposition or stratification; they occur in the earth's crust, as mountain-masses and veins, bursting through and displacing the sedimentary rocks; and they indurate, and otherwise alter (as all heated masses do), the strata with which they come in contact. From these circumstances they are held to be of igneous origin; and as far as geologists have been able to discover, they are the most deeply-seated of all rocks, forming, as it were, the floor or foundation for all the superincumbent formations. As the earliest of the igneous rocks, they are generally found associated with primary and transition strata, tilting them up on their edges, bursting through them in dykes and veins, and variously altering their positions and mineral characters. Granitic rocks form the principal mass of the most extensive mountain-ranges in the world. The mountains of Cumberland, Devon, and Cornwall, in England, the Grampians in Scotland, the Wicklow mountains in Ireland, the Dofrafelds in Scandinavia, the Alps in Switzerland, the Pyrenees in Spain, the Oural and Himalayan ranges in Asia, the Abyssinian and other ranges in Northern Africa, the hills of Damara and Namaqua Land in Southern Africa, the central range of the island of Madagascar, and the Andes in South America, are all less or more composed of granitic

rocks; or of primary strata, thrown up and altered in mineral character by these granitic intrusions.—*Ref.* Page's *Advanced Text-Book of Geology.*

GRANT, *grănt* (Nor. *granter*, to grant; Lat. *concessio*), in Law, is strictly a conveyance in writing of incorporeal hereditaments, or of things of which no livery can be had; for all corporeal hereditaments, as lands and houses, were said to lie *in livery*, and the others, as advowsons, commons, rents, reversions, &c., to lie *in grant*. The latter, therefore, pass merely by delivery of the deed. By 8 & 9 Vict. c. 106, it is enacted that estates, corporeal as well as incorporeal, may be conveyed by grant; by which means the conveyance of corporeal hereditaments is much simplified.

GRANULATION, *grăn-u-lai'-shun* (Lat. *granulatio*, from *granum*, a grain), in Surg., is the name given to that process by which small grain-like fleshy bodies form upon the surface of ulcers and suppurating wounds, and serve for filling up their cavities, and bringing nearer together and uniting their sides. This process is also sometimes called *incarnation* (from Lat. *caro*, *carnis*, flesh). Sometimes, in weak or unhealthy constitutions, granulation proceeds very slowly; at other times it is excessive, rising above the level of the surrounding skin, without showing any disposition to heal, but forming what is popularly termed proud flesh. (*See* WOUNDS, ULCERS.)

GRANULATION, in Metal., a process resorted to to obtain metals in a coarse state of division. The metal is melted in a crucible, and poured into water from the height of three or four feet.

GRAPES. (*See* VITIS.)

GRAPE-SHOT, *graip*, a kind of shot used against troops advancing in column at a short distance, or in naval warfare, to sweep the decks of an enemy's ship at close quarters. It consists of a number of balls fastened together, in the form of a short cylinder. The balls vary from half a pound to four pounds in weight, according to the calibre of the piece from which they are to be discharged. Grape-shot was formerly made by putting the balls into a canvas bag, which was secured to an iron plate, equal in diameter to the calibre of the gun, and having a pin passing through its centre and the bag of shot, about which the balls were secured by cord. This gave the shot in some measure the appearance of a bunch of grapes; whence its name. The shot are now placed between a series of iron plates, the whole being kept together by pressure, exerted by a nut screwed on to the end of the bolt which passes through them.

GRAPHIC GRANITE, *grăf'-ik* (Gr. *grapho*, I write), in Min., a species of granite having the appearance of being covered with letters of an Oriental character, owing to the angular arrangement of the quarts or felspar it contains.

GRAPHITE, *grăf'-ite* (Gr. *grapho*, I write), is black-lead, a mineral consisting of nearly pure carbon, found in Cumberland, Ceylon, Siberia, Canada, Brazil, and other parts of the world. It occurs in prismatic masses with a transverse foliated structure, also granular and compact. The finest quality is found at Borrowdale, in Cumberland. It is nearly pure carbon, and is perfectly free from grit. It is used principally in the manufacture of lead-pencils. The coarser quality is used, when ground, for polishing iron-work, for glazing gunpowder, as a lubricator for machinery, and in the manufacture of black-lead melting-pots. (*See* BLACK-LEAD, PLUMBAGO.) It is used for the latter purpose on account of its unalterability by heat. It is formed artificially during the fusing of cast iron containing large quantities of carbon. It dissolves in the melten iron, re-crystallizing as it cools, and being often thrown off from the surface of the iron in scales. Professor Brodie, of Oxford, has devised a plan by which the coarsest graphite may be purified. He heats the powdered mineral with sulphuric acid and chlorate of potash, which causes it to exfoliate in an extraordinary manner; a little fluoride of sodium dissolves the silicious impurities, and the whole is well washed in water.

GRAPNEL, *grăp'-nel* (Fr. *grappin*), a sort of small anchor with four or five flukes, or arms, used in boats and small vessels and in balloons. *Grapnels*, or *grappling-irons*, are likewise brought into action in boarding vessels during marine combats, when they are thrown into the rigging of the hostile ship, in order to fasten the two together, so that the boarding party may rush on the decks of the enemy from their own vessel.

GRASSES. (*See* GRAMINACEÆ.)

GRASSHOPPER, *grăss-hop'-per*, a species of insect common in the British islands and in foreign countries, which belongs to the general family of the *Gryllidæ*, which latter come under the class of *Orthoptera*, and its sub-section *Saltatoria*, or jumpers. The grasshoppers, like other Gryllidæ, are characterized by their legs and antennæ being very long and slender, the wings large and delicate, and the wing-covers often extending far beyond the extremity of the abdomen. In the male insects these wing-covers are furnished at the base, near the suture, with a round tail-like plate, surrounded by strong ridge-like bands; and the chirping noise peculiar to the family is produced by rubbing the ones of the wing-covers sharply over each other, these ridges serving the purpose of a sort of drum. The common great green grasshopper of this country (*Phaygomora Gryllus viridissima*) is one of the largest of our native insects, and measures about two inches in length and three and a half in the expansion of its wings. The field-cricket, or *Gryllus campestris* of Linnæus, is another species of grasshopper; it is of a black colour, and a little larger than the house-cricket; it frequents dry sandy districts, where it burrows in the ground. The female of this latter insect is said to lay upwards of 300 eggs.

GRASS-OILS. (*See* ANDROPOGON.)

GRASS-TREES. (*See* XANTHORRHŒA.)

GRASSUM, *grăs'-sum*, in Scots law, is the gross rent paid in anticipation of possession for a series of years. This transaction is valid with singular successors where the yearly rent payable over and above the grassum is not elusory. An heir of entail, prohibited from diminishing the rental, may take grassum, provided the former rent may be continued; but if prohibited against letting below a just rent, grassum is excluded.

GRATIOLA, *grăt-she-o'-lă* (Lat. *gratia*, grace,—a species having been named *Gratia Dei*, grace of God, by Matthiolus), the Hedge-hyssop, a gen. of the nat. ord. *Scrophulariaceæ*. The species *G. officinalis* possesses purgative, emetic, and diuretic properties, and was formerly employed in medicine. Its properties are due to the presence of an acrid poison.

GRATUITOUS DEEDS, *gră-tu'-e-tus* (Lat. *gratuitus*, free, voluntary), in Law, are instruments made without binding or equivalent considerations.

GRAVEL. (*See* CALCULUS.)

GRAVEL, *grăv'-el* (Fr. *gravelle*), the familiar as well as technical term for accumulations of water-worn rock-fragments, where the pebbles vary from the size of a pea to that of a hen's egg. Accumulations of finer detritus are known as *sands*, and those of fragments larger than an egg as *shingle*.

GRAVITATION, *grăv-i-tai'-shun* (Lat. *gravis*, heavy), is a term nearly synonymous with gravity,—which is applied to denote that tendency which all bodies in nature have more or less to approach each other. This force of gravitation varies directly as the masses of the bodies, and is inversely proportional to the squares of their distances apart from each other. Every particle of matter in the universe has an inclination to assimilate with other particles, and to press inwards; and this is a fact which is proved by our experience of the various daily phenomena observed on the surface of the earth, and from the recognised motions of all celestial bodies. The mutual attraction of all particles of matter is termed the *attraction of gravitation*, and the aggregate of all the particles of any one particular body, or mass of matter, is termed the *gravity* of that body. This great discovery owes its origin to Sir Isaac Newton, who, in his "Principia," works out all his theories on the subject, and applies them to the motions of the planetary bodies. It is plain to all, from everyday experience, that a body abandoned to itself, and left unsupported, immediately falls towards the surface of the earth. The direction which a falling body takes can be easily ascertained by a plumb-line, and will be found to be exactly perpendicular to the earth's surface, and, consequently, as the earth is a sphere, towards its centre. The direction, therefore, of terrestrial gravitation is towards the

centre of the earth. Newton also adds, that as the total force which solicits any given molecule, being the sum of the actions of each molecule of the attracting body, its intensity will be proportional to the number of molecules contained in the latter. For example, if we suppose that the earth, without undergoing any alteration of its dimensions, were to become more compact by a hundredth part, or, in other words, that within the same volume it contained a hundredth part more matter; then, the attractive force which it would exercise on bodies placed on its surface would be increased a hundredth part. All bodies must necessarily move towards, or in the direction of, the centre of the earth, by the effects of this gravitation, as a sphere always attracts an exterior body in a manner as if all its matter were condensed into a single point at its centre. From the axiom that all bodies, when deprived of support, fall from any height to which they may have been elevated, it may be justly inferred that gravity acts upon them during the whole time occupied in their descent with a uniformly accelerating force, which may be proved from the fact, that bodies which fall from a greater height than others arrive at the earth with a proportionably greater velocity. Galileo was the first who established the fact that the acceleration of all falling bodies is uniform; and he deduced the corollary that the spaces descended through are as the squares of the times of descent. He likewise proved that terrestrial gravity acts equally on all bodies, or, in other words, impresses on all of them an equal quantity of motion, whatever their nature may be. In order to demonstrate this, Galileo had several hollow spheres constructed of equal weight and diameter, and in these he inclosed equal weights, formed, however, of different substances; the spheres were then suspended by strings of equal length, and made to vibrate in small arcs with a pendulum movement; and it was found the time occupied in describing the arc, or the oscillation of each, was equal in all. This may not be clear to all, as light bodies—such as feathers and paper—fall more slowly to the ground than a piece of metal. But it must be remembered that this is due, not to the inequality of the attraction of gravitation, but to the buoyancy of the atmosphere, as in the exhausted receiver of an air-pump a feather and a piece of gold, if let fall from the top, will reach the bottom at the same time, and will descend with perfectly equal speed. That attraction is proportional to the mass, may be shown by the following induction. The variation of a mass, or the attractive force of the earth, becomes apparent by a corresponding variation in the velocity of the falling body. This velocity, which for a short space of time must be supposed uniform, will, in effect, be proportional to the force which generates it. As the force is proportional to the mass, it follows, therefore, that the velocity will also be proportional to that body. In the present day a body in the latitude of Paris falls through $16\frac{1}{12}$th feet during the first second of its descent. But if the earth's mass were increased by a hundredth part, as stated before, the space described by the falling body during the first second of time would also be increased in the same proportion, and the velocity, instead of being measured by 16·09 feet, would be expressed by the sum of 16·09 *plus* 0·16 feet, or 16·25 feet. The space through which a body falls in one second of time; from the action of gravity, diminishes as the height above the earth's surface increases, and on the top of a high mountain it is sensibly less than at the level of the sea. The force which generates this velocity, or the attractive force inherent in the molecules of matter, diminishes, therefore, as the distance increases. With regard to the measurements by which scientific men have been enabled to exemplify the principles of terrestrial gravitation, it must be determined how and what velocity is imparted to a body falling freely in a given time. First, in order to show that gravity is a uniformly accelerating force, Attwood's machine is the best experimental method by which the proof can be deduced. This apparatus consists of a pulley, having a groove on its edge to receive a silken cord which passes over it, and the axle turns on friction-rollers, so as to obviate any stoppage in its rotation. To each end of the string which passes over the pulley, two equal weights are attached, which





may be termed $x$ and $y$. Now these weights counterbalance one another, and no motion whatever ensues; but if another small weight $z$ be attached to $x$ or $y$, so as to give it a preponderance, the loaded weight will immediately begin to descend freely, and its velocity will be diminished in the proportion of the additional weight $z$, to the sum of the original weights $x$ and $y$, *plus* $z$; for the force which is impressed by the additional weight $z$ is expended not only in giving velocity to itself, but also to the two weights $x$ and $y$, which are attached to the ends of the string. This machine thus shows that the properties of uniformly accelerated motion hold true in the descent of falling bodies; and if the additional load be such as will be able to carry the weight to which it is added through one feet in the *first* second of time, it carries it through four feet in *two* seconds, and through nine feet in *three* seconds; and so on. In order to measure the velocity of descent of heavy bodies falling rapidly, Attwood's machine could not be used with any certainty; the only mode by which an accurate result can be obtained is by measuring the length of a pendulum, which gives a certain number of oscillations in a fixed time, as there can be no doubt that the number of oscillations which it makes must necessarily depend firstly on its length, and secondly . the intensity of gravity. If the amplitude of the oscillations of the pendulum (*see* PENDULUM) be very small, in other words, if it does not deviate from a vertical position more than 2°, or 3° at the utmost, the relations between the gravity of the earth and the length of the pendulum will be very simple indeed; as shown by the following theory,—that the square of the number of oscillations performed in a given time is directly proportional to the intensity of gravity, and inversely proportional to the length of the pendulum. Thus if $b$ is the length of the seconds pendulum, $\pi$ the ratio of the circumference to the diameter, and $g$ is the accelerating force of gravity (that is, twice the space through which a body falls by the action of gravity in the first second of time), then we have the equation that $g$ *equals* $b\pi^2$. Therefore, as the length of the pendulum vibrating seconds of mean solar time in London *in vacuo* has been determined to be 39·1393 British standard inches; and as $\pi$, or the relation of the diameter to the circumference of a circle, is well known to be 3·14159; then we deduce the relative value of $g$ to be 386·3 inches, or $32\frac{1}{6}$ feet. The length, therefore, through which a body would fall at London in a second of time would be $16\frac{1}{12}$ feet, or half the above quantity. It must be borne in mind, however, that this value of $g$ does not express the whole of the earth's attraction, as a small part of the same (about 1-464th) is counteracted by the centrifugal force corresponding to the latitude; $g$, therefore, is the force of gravity, diminished by the centrifugal force, or what is properly termed *gravitation*. It appears from many confirmed experiments, that the variation of gravitating force between the equator and the poles is as 194 is to 195; that is, a body which weighs 194 pounds at the equator, will weigh 195 pounds if transported to the poles. As the variation of the centrifugal force between the same latitudes is expressed by Newton in the fraction $\frac{1}{289}$, it follows that the difference between the gravitating force and the centrifugal force at the equator and at the poles might be expressed by the fraction $\frac{1}{578}$, which difference arises from the oblate figure of the earth. It hence results, that the variation of the intensity of gravity, or, in other words, the figure of the earth, may be deduced from the number of oscillations that pendulums of the same construction would perform in twenty-four hours in places situated under different latitudes; or it might also be determined from a comparison of the different lengths which must be given to a pendulum in order that it may perform in every place the same number of oscillations in a given time. So far for the different measurements of terrestrial gravity; the second and more important portion of the article comes under the head of *Universal Gravitation*. Although Kepler made some shrewd guesses at the motions of the planets and the causes of tides and other similar phenomena, it is to Sir Isaac Newton that we are indebted for the principles and applications of *universal gravitation*, and through it, by means of pure geometry (*see* GEOMETRY), we are able to possess the

correct information that we have with regard to the movements of the earth, sun, and moon, and other heavenly bodies. The first rule is one which is very comprehensive, and which gives a good idea of the whole basis of the science; it is, that the attraction of one body upon another body does not depend upon the mass of the body which is attracted, but is the same whatever be the mass of the body so attracted, provided that the distances be the same. For instance, the planet Jupiter attracts the sun, and also attracts the earth; but although the sun's mass is 300,000 times that of the earth, yet the attraction of Jupiter on the earth is exactly equal to his attraction of the sun, *because the earth and sun are equally distant* from Jupiter. One of the simplest illustrations of this force is that of throwing a stone in a straight or horizontal plane, when the stone's course will be evolved in a curve, and the stone at length will drop to the ground. The flights of shot and shells are likewise illustrative of the same rule. (*See* GUNNERY.) Newton, before applying his theory of universal gravitation, sought for a law by which he could regulate the diminishing intensity of the same, and, after several experiments and calculations, he laid down the rule that the force of gravity diminishes exactly as the square of the distance increases, or, in other words, that the attractive force of the earth at the distance of the moon must be as much less than it is at the surface of the earth, as the square of the radius of the earth is less than the square of the moon's distance from the earth. Newton also found, that since the true diameter of the moon is to the true diameter of the earth as 100 is to 365, the mass of matter in the moon is to the mass of matter in the earth in the proportion of 1 to 39,788; and also that the accelerative gravity on the surface of the moon is to the accelerative gravity on the surface of the earth, as 1 is to 3, or is just one-third of that of the earth. He also proved that bodies moving under an attractive force which diminishes according to the inverse square of the distance, must describe conic sections (which *see*), having a focus at the centre of force; and also that they must conform to the laws of motion which Kepler discovered to belong to the planetary orbs. Newton likewise was successful in determining that most of the inequalities of the moon and planets are consequences of the mutual gravitation of the different bodies which compose the various systems upon each other; and in addition, that the same incomprehensible power not only regulates the motions of the different planets and satellites, but also causes the precession of the equinoxes, produces the tidal action, and determines the figure of the earth. Gravitation, as applied to the celestial bodies, when we consider its effects, enables us to form many conclusions as to its nature, mode of action, and influence. We see that gravity is a force which is transmitted from body to body *instantaneously*, and not successively; for were we able to measure its transmission, that is, if we consider it in the light of being transmitted successively, we would find that the secular variation of the mean lunar motion would be sensibly affected. If we consider the question whether gravity is affected by the density of the bodies through which it has to pass in order to attract other bodies, we would be forced to agree with Laplace, that it is of so subtle and all-powerful a matter or force that not even the densest bodies in the universe can offer any obstacle to its free passage, or retard its effects on the body to be acted upon. In concluding the subject, it may be said that if the earth's flattening at each of its poles were greater or less than 1-300th of its diameter, then the effect of this alteration on the moon would, in changing the position of its fundamental plane, thus produce an inequality in the longitude greater or less than 8″, by which the moon is sometimes before or behind her mean place. And, consequently, the deduction can be drawn, that by observing the moon, the oblateness of the earth can be discovered. As this theory has been found to be true and just in its foundation, it is one of the most striking testimonies of the correctness of Newton's laws of *universal gravitation*.—*Ref.* Newton's *Principia*; Arago's *Astronomy*, &c. &c.

GRAVITY, CENTRE OF. (*See* CENTRE OF GRAVITY.)

GRAVITY, SPECIFIC. (*See* SPECIFIC GRAVITIES.)

GRAYLING, *gray'-ling* (Ang.-Sax.), (*Thymallus vulgaris*), is a fresh-water fish of the family of the *Salmonidæ*, and very like the trout in habits and appearance. Its body is long and flat, and seldom exceeds eighteen inches in length. The head is small, pointed, and flattened at the top. The back and sides are silvery-grey in colour (whence the name), but when the fish is fresh caught, this colour is seen to be variegated with blue, gold, green, and black spots. The grayling is very abundant in England, Sweden, Lapland, and Norway, and it partakes of the usual characteristics of the rest of the *Salmonidæ*, although it is in season generally when they are out. (*See* SALMONIDÆ.)

GRAY'S INN. (*See* INNS OF COURT.)

"GREAT GO," AND "LITTLE GO."—Terms current in Oxford, expressive of two different examinations which students for the degree of B.A. have to pass in order to obtain the same. The "Little Go," or Responsions, as the examination is termed in the calendar, must be passed before the fifth term of residence in the university; but in most of the colleges men are required to pass it very shortly after taking their residence in the university, in their first or second term. If the candidate be "plucked" (as is the technical phraseology for having failed) three times in his "little go," he is generally obliged to leave his college, and "migrate" to a "hall." Under the new system, the first public examination, or Moderations, is held from the eighth to the twelfth term, and the second public examination, or "Great Go," can be passed between the thirteenth and eighteenth terms of residence; and, being successful in the examination, the student assumes the degree of B.A.—Further information on these names, examinations, and subjects required for degrees, will be found under the articles DEGREE and UNIVERSITIES.

GREAT SEAL, *grait seal* (Ang.-Sax.), is the emblem of sovereignty, introduced by Edward the Confessor, and appended to all writs to summon parliament, treaties with foreign states, all public acts of state which concern the United Kingdom, and all patents and other matters relating to England. By art. 24 of the Union between England and Scotland (5 Anne, c. 8), it was provided that there should be one great seal for the united kingdom of Great Britain, which should be used for sealing writs to summon the parliaments and for sealing all treaties with foreign states, and all public acts of state which concern the united kingdom, and in all other matters relating to England, as the great seal of England was then used; and that a seal in Scotland should be kept and made use of in all things relating to private rights or grants which had usually passed the great seal of Scotland, and which only concern offices, grants, commissions, and private rights within Scotland. On the union of Great Britain and Ireland, no express provision was made by any article of that union as to the establishing of one great seal for the united kingdom. But various acts (as the summoning of parliament, &c.) are required to be done under the great seal of the united kingdom, and others under the great seal of Ireland; and by sect. 3 of the Acts of Union, 39 & 40 Geo. III. c. 67 (British), and 40 Geo. III. c. 38 (Irish), it is enacted that the great seal may, if his majesty shall so think fit, after the union, be used in like manner as before the union (except where it is otherwise provided by the articles of union), within that part of the United Kingdom called Ireland. Forging the great seal is treason, punishable by transportation (now penal servitude) for life.

GREAVES, *greevz* (Sp. and Port. *grevas*), pieces of armour used at a very early period to defend the leg between the knee and the ankle. They formed a part of the armour of Eastern nations in the time of Saul, as we learn from the story of Goliath of Gath, the champion of the Philistines, who "had greaves of brass upon his legs." The Greeks and Romans also wore metal greaves. The Saxons protected the leg by bands of cloth, the Danes by pieces of thick leather. At the time of the Conquest, armour for the legs consisted of hose, on which scales of rings of metal were fastened. When plate-armour came into use, the greaves consisted of plates of polished steel, covering the fore part of the legs. The metal shin-

piece still forms a part of the picturesque dress of the Albanians.

Grebe, *grebe* (Ang.-Sax.), a bird which belongs to the order *Natatores*, and its sub-section *Columbidæ*. Yarrell remarks, with regard to the class: "Of the true divers among our British birds, the grebes and dabchicks belong to that division which more particularly frequent fresh water; and the great crested grebe, the largest of the genus, is resident all the year in several parts of this country which afford reeds and other luxuriant aquatic vegetation, in which they find the required security. They breed and remain all the year, or by far the greater part of it, on some of the lakes of Wales, on the meres of Shropshire and Cheshire, on the broads of Norfolk, and in the fens of Lincolnshire. They are seldom seen to fly or walk, being mostly in the water. The form of the whole bird being that of an elongated cone, is admirably adapted for diving, and their habits can only be observed by those who live in the vicinity of their favourite pools." Besides the *great crested grebe*, there are the *red-necked grebe*, the *Solavonia*, the *tippet*, the *little*, the *horned*, the *eared*, the *dusky*, and the *black-chin* grebe. The generic characters of all are, however, very similar, and are as follows:—Bill of moderate length, straight, hard, slightly compressed and pointed, forming an elongated cone; nostrils lateral, concave, oblong, open in front and perforate, closed behind by a membrane; legs and feet long, attached behind the centre of gravity; tarsi very much compressed; three toes in front, one behind; anterior toes very much flattened, united at the base, surrounded by an extended membrane; no true tail; wings short. The length of the grebe is generally between twenty-one and twenty-two inches, and from the carpal joint to the end of the longest feathers is eight inches.—*Ref.* Yarrell's *History of British Birds*. (*See* also Dabchick.)

Greek Architecture.—The early architecture of Greece is exemplified in the massive remains of walls at Mycenæ, Argos, and others of the old Grecian cities, which are composed of huge, irregular, undressed blocks of stone roughly piled together. (*See* Cyclopean Architecture.) It is utterly devoid of ornament, but in one or two instances examples remain of attempts to adorn the stones forming the piers and lintel of a gateway with rude representations of animals, as in the principal entrance to the Acropolis of Mycenæ mentioned above. Grecian architecture, properly so called, was the production of a far later age, and may be traced to that of Egypt and Western Asia, combining, as it does, the strength and solidity of the former with the more elegant features and decorative principles of the latter. The Doric, the first of the three Greek orders, assimilates more closely to the architecture of Egypt than either of the others, in its substantial and massive proportions: it is simple in character, but always conveys to the mind of the spectator a striking impression of its dignity and beauty. The Ionic order, and its ornamentation, is derived from the architecture of Western Asia, and is characterized by a greater degree of lightness in its proportions than the Doric order possesses, and the introduction of decorations in minor details. The Corinthian, the last, and by far the most elegant of the Greek orders, surpasses the Doric and Ionic orders in its elaborate adornment and symmetry of proportion; but, even in this, a similarity to the architecture of Egypt can be traced in the bell-shaped capitals of its columns and the clusters of leaves that curl outwards from its surface. But, although each order exhibits a decided step in advance of that which precedes it, as far as elegance and ornament are concerned, the three orders were uniformly characterized by beauty and harmony of proportion; and it may be said that the buildings of ancient Greece, especially the temples, were superior to those of any climate and any age as regards simplicity of form, the purposes for which they were intended, and the habits and requirements of the people for whose use they were erected. The chief characteristics and the scale of proportions preserved in the three Grecian orders, will be found elsewhere (*see* Architecture); and the principal parts that compose what is termed an order in classic architecture have been treated under their respective headings (*see* Architrave, Base, Capital, Column, Cornice, Entablature, Frieze); but it may be desirable to state here the particular features and marks by which each order may be readily distinguished, and to point out some recent discoveries that have been made with regard to the method adopted by the Greeks to give the appearance of perfect beauty to their works, and to avoid anything that might offend the eye of any of this highly civilized and educated people. It should also be stated, that each order consists of two distinct parts,—the column and the entablature,—which are again subdivided, the former into the base, shaft, and capital; and the latter into the architrave, frieze, and cornice; and that it is by certain differences in these divisions and subdivisions that the orders themselves are distinguished. The Doric order may be readily discerned by having no base to the column, the lower end of the shaft resting immediately on the pavement; the shaft itself is also adorned with broad shallow flutings separated by a sharp ridge, the capital being composed of a broad echinus moulding surmounted by an abacus, while the frieze is adorned at intervals with projecting pieces called triglyphs, which are about half the width of the lower diameter of the column, having the appearance of being separated into three equal parts by two vertical grooves cut deeply into the material of which it is formed, the horizontal section of which is in the shape of the letter V, the outer edges of the piece being chamfered off at the same angle. This order was in some instances richly adorned with sculpture in low relief along the frieze, and in high relief on the metopes or spaces between the triglyphs, the tympanum of the pediment rising in an obtuse angle above the entablature being also filled with sculpture in high relief, and frequently with perfect statues. The Ionic and Corinthian capitals are to be distinguished from each other, the former by its volutes, and the latter by its exquisitely carved foliage and its height, which is considerably greater than that of the capitals of the Doric and Ionic orders. There is little perceptible difference in the shafts of the columns of the Ionic and Corinthian orders, or in their entablatures. The temples of the Greeks were generally placed on a level platform, consisting of three steps rising one above another, and of greater or less depth in proportion to the height and diameter of the columns that were placed upon them. These steps were too deep to afford the means of access to the temple, and it is supposed that intermediate steps were placed at intervals along the larger ones, to allow the worshippers to pass easily from one to another, and thus to gain the level of the portico. The Greek windows and doorways, like those of the Egyptians, were narrower at the top than at the bottom, the sides inclining inwards. They were generally surrounded by a moulding, which was broken at the top of the window by a right angle, and turned outwards on either side, for a short space, in a horizontal direction, before resuming its perpendicular course, so that an architrave or lintel was formed above the window of the same width as the sill below. The doorway was always in the centre of the pro-naos, or portico of the temple, and was carried up to a considerable height for the purpose of admitting light into the interior. The arch is never employed in Grecian architecture, which is chiefly characterized by the use of the beam supported on columns, by which an appearance of great strength and solidity is obtained. It is also marked by its strict adherence to outlines formed by horizontal lines, and lines that are vertical, or nearly so, being frequently slightly inclined inwards. It is a known principle in perspective, that straight lines proceeding to a great distance in the same direction present a slightly curved appearance to the eye of an observer. To correct this appearance, the Greek architects carefully constructed their vertical and horizontal lines in the form of a very slight and scarcely perceptible curve, giving their column an *entasis*, as it is termed, or a slight outward swelling near the middle; which principle of construction was effected by means of certain fixed rules. The columns also, instead of being vertical, had a slight inclination inwards, and their pavements, and the platforms on which the temples stood, were constructed with a very slight rise in the centre. Mr. Pennethorne discovered

the existence of these curves in 1837, and the truth of his statements was subsequently corroborated by Mr. Penrose, who examined many of the ruined temples of Greece, and made careful measurements of their proportions, which led to a discovery of the principles on which they were constructed. Of the three orders of Grecian architecture, the Parthenon at Athens, and the Temple of Minerva at Ægina, may be cited as the best examples of the Doric order; the Erechtheum and Pandrosium at Athens, of the Ionic order; and the choragic Monument of Lysicrates, in the same city, as the most beautiful, and almost the only existing pure Greek specimen of the Corinthian order. Examples of the Doric and Ionic orders, or rather adaptations of them, are common enough in the metropolis and its vicinity, the Grand Terminus of the London and North-western Railway, in Euston Square, being a specimen of the first, and the porticos of the British Museum and the General Post-office, St. Martin's le Grand, and St. Pancras's Church, being examples of the second. There are but imperfect data for determining the style of architecture adopted among the Greeks for dwellings of a private character.—Ref. *English Cyclopædia*, Arts and Sciences; Fergusson's *Handbook of Architecture*; Penrose's *Principles of Athenian Architecture*.

GREEK, or EASTERN CHURCH, originated in the dissensions that took place between the patriarchs of Constantinople and the popes of Rome. In consequence of the political position of the city as the seat of the imperial government, the church of Constantinople sought to render itself independent of the see of Rome. Disputes on various points of doctrine occurred from time to time between the two churches, but the great breach did not take place till 802, under the patriarch Photius. He reproached the Western church with having introduced various innovations; as the celibacy of the priests, the introduction of images into churches, and the double procession of the Holy Ghost, with the addition of "filioque" (and from the Son) to the Nicene Creed. On the fall of Photius, however, the breach was in a manner healed, though very imperfectly, and in the 11th century dissensions broke out afresh. The final separation took place in 1054, when Leo IX. excommunicated the patriarch Michael Cerularius, who had inveighed against the corruptions of the clergy, and attacked the errors of the Western church. Several attempts were made on either side to effect a reconciliation, but in vain. The popes were anxious to effect a union in order to extend their dominions; and the emperors of Constantinople, when pressed by the Turks, attempted to obtain the assistance of the West by a promised restoration of the Eastern church to that of Rome. At a later period attempts were made by some of the Protestant churches to come to an amicable arrangement with the Eastern church, but with like unsatisfactory results. The Greek church denies the authority of the pope, and maintains that the Church of Rome is not the only true Catholic church. It acknowledges no vicar of Christ upon earth like the pope; disclaims infallibility, works of supererogation, and indulgences. It rejects purgatory, but admits of prayers for the dead; and forbids all kinds of carved images, but permits paintings, and pays a kind of secondary homage to the Virgin and saints. It denies auricular confession to be a divine command, but practises confession attended with absolution, and sometimes penance. It admits the seven sacraments, but baptism is performed by immersion of the body three times in water; and the communion of both kinds is practised with leavened bread, and the wine is mixed with water. The anointing of the body with the chrism is allowed to all sick persons as a means of restoring them to health, and purifying them from their sins. The secular clergy are permitted to marry but once, and only a virgin; and laymen are allowed to marry only three times. Like the Roman Catholic church, it accepts tradition as well as the Bible, but differs from it, as well as from all Protestant churches, in maintaining that the Holy Ghost proceeds only from the Father, and not also from the Son. The ritual of the Greek church consists almost entirely in outward ceremonies, preaching or religious instruction being rarely resorted to. Their fasts are more numerous and more strictly observed than those of the Roman Catholics. The clergy are divided into two classes,—the higher and the lower; the former comprising patriarchs, metropolitans, archbishops, and bishops, all of whom are chosen from among the monks, and must live in celibacy; the latter the monks, or black clergy (from their dress), and the secular, or white clergy. The lower secular clergy are the archpriests, priests, deacons, hypodeacons, and lectors. The monks, as well as the nuns, who are less numerous, generally follow the rule of St. Basil, with the exception of those of Mounts Sinai and Lebanon, who follow the rule of St. Anthony. One of the most celebrated convents is that of Mount Athos. The total number of persons belonging to the Greek faith is estimated at about 66,000,000; of whom about 49,000,000 are in Russia, 12,000,000 in Turkey, 3,500,000 in Austria, 900,000 in Greece, 180,000 in the Ionian islands, 125,000 in Montenegro, and about 3,000 in Prussia. As regards its government, the Greek church is made up of ten independent groups, numbering in all 279 bishoprics. 1. The Church of Constantinople, governed by a patriarch, having under him 126 bishops; 2. the Church of Alexandria, under the patriarch of Alexandria, who resides at Cairo, and has five bishops; 3. the Church of Antioch, with its patriarch and 17 bishops; 4. the Church of Jerusalem, with its patriarch and 14 bishops; 5. the Russian Church, with 60 bishops, governed by a synod; 6. the Church of the island of Cyprus, with four bishops; 7. the Austrian Greek Church, with 11 bishops; 8. the Church of Mount Sinai, with one bishop; 9. that of Montenegro, with one bishop; and 10. the Hellenic Church in Greece, with 24 archbishops and bishops. Besides these ten divisions of the Greek church, which recognize each other as orthodox, there are a number of sects, particularly in Russia, which fully acknowledge the doctrinal basis of the Greek church, but for various reasons keep aloof from it. The Greek church predominates in all Russia, European Turkey, Greece, the Ionian islands, and Montenegro. In Turkey, the patriarch of Constantinople has not only spiritual, but also a kind of temporal jurisdiction, as he is regarded by the Turkish law as the head of the Greek Christians, who have to pay him a yearly tribute. The Russian Greek church asserted its independence on the fall of Constantinople, in the middle of the 15th century, when a patriarchate was established at Moscow. The patriarchate was abolished by Peter the Great, who organised a supreme court for the regulation of spiritual matters, to sit at the new capital of St. Petersburg. Since that time the Church of Russia has been virtually controlled by the Czar. The *United Greek Church* is a section of this body, which, by the continued efforts of the Roman church, were induced to acknowledge the supremacy of the pope, while they, on the other hand, were permitted to abide by all the peculiar usages of the Greek church which did not affect fundamental doctrines;—as the use of the Greek language in divine service, the reception of the Lord's supper in both kinds, &c. &c. In Russia, almost all the members of the United Greek church were induced, under the reigns of Catharine II. and Nicholas, to dissolve their connection with the Church of Rome; and at present this section of them is most numerous in Austria. For an account of the festivals, ceremonies, liturgies, &c. of the Greek church, *see* the Rev. John Mason Neale's *History of the Eastern Church*.

GREEK FIRE, the name of a composition of a highly combustible nature, said to have been invented about 670, by Callinicus of Heliopolis, in the reign of Constantine III., emperor of the East, and used by the generals of that monarch with terrible effect against the fleet of the Saracens. The secret of its manufacture is now lost; but its chief ingredients are supposed to have been naphtha, pitch, and sulphur. It possessed the property of bursting into a raging flame on exposure to the air, and could not be quenched by water. The only thing that would in any way counteract its destructive power was a mixture of vinegar, urine, and sand. It was attended with a disagreeable odour, and was hurled against the enemy from cross-bows, mangonels, and other engines of war. The Greek fire was thrown thrice a day into the camp of the Crusaders when Acre was besieged by Richard I., causing the greatest annoyance and injury to the Christian host.

GREEK LANGUAGE AND LITERATURE.—The earliest inhabitants of Greece were the Pelasgi, who, according to Herodotus, spoke a barbarous or foreign tongue. They were allied to the Iraman tribes of the north of India; consequently, that element in the Greek language which exhibits an affinity for the Sanscrit, is the Pelasgic; and hence the strong resemblance in words and inflections, which is found to exist between the two languages. The Hellenes, or Greeks proper, subsequently migrated into the country, and the language of the aboriginal inhabitants came to be looked upon as barbarous. The Hellenes were an Ionian race, and their language is said to have had an affinity to the Persian. It is but right to state, however, that this account of the origin of the Greek language is not universally received, for the subject is so involved in doubt, that no certainty can be arrived at regarding it. The Greek is a branch of the so-called Indo-Germanic, or Aryan family of languages. It consists of three principal dialects,—the Æolic, Doric, and Ionic; to which at a later period was added the mixed Attic dialect; and besides these there were several minor dialects. The Doric was a rough, hard, broad dialect, with long *a* predominant over all the other vowels. It was spoken originally in the mountains of Thessaly, whence it travelled southward, and became the language of the greater part of the Peloponnesus. It was purest in Messenia, and softest in Syracuse and Agrigentum. Its centre was Sparta. It is found in the writings of Pindar, Theocritus, Bion, and Moschus. The Æolic was a more ancient dialect than the preceding, but was refined at an earlier period, and was less harsh than the Doric, although also broad and open. It was spoken north of the Isthmus of Corinth (with the exception of Megaris, Attica, and Doris), in the Æolic colonies of Asia Minor, and on some islands of the Ægean sea. It contains some of the Pelasgic forms, and is to be found in the fragments of Sappho, Myrtis, and Alcæus. The Ionic is the softest and most musical of all the dialects. It abounds in vowels and diphthongs, and is partial to labials and linguals. It was the earliest cultivated of the dialects, and is that of Homer, and other of the early authors, as Hesiod, Herodotus, &c. It was spoken principally by the people of Attica and the Ionian colonies of Asia Minor. The Attic sprang from the Ionic, from which at first it differed but little. It was developed principally after the Persian wars, and was brought to perfection by the poets, philosophers, and historians of Greece, who flourished after that time. It held a middle place between the hardness of the Æolic and Doric and softness of the Ionic. It was harmonious and powerful in its expressions, concise and regular in its syntax. Æschylus, Sophocles, Euripides, Thucydides, Aristophanes, Plato, Demosthenes, and Isocrates, rendered it immortal. Grammarians afterwards distinguished between the genuine Attic, as it exists in these masters, and the Attic of common life, calling the latter the *common Greek*, or *Hellenic dialect*; and even the later Attic writers, posterior to the golden age of the literature, were called *Hellenes*, or *common Greeks*. In this latter class are Aristotle, Theophrastus, Apollodorus, Polybius, Plutarch, and others, many of whom, however, wrote genuine Attic.—At what time this language first began to be expressed in writing is a question of much uncertainty. According to tradition, Cadmus the Phœnician introduced the alphabet into Greece about 1500 years B.C. To him, sixteen of the letters of the present alphabet are attributed; four, according to Pliny, were introduced by Palamedes at the time of the Trojan war, and four by Simonides of Ceos during the Persian war. The ancient letters were all uncial, or what we call capital, the present cursive or round letters occur first in inscriptions of the age of Augustus, and resemble the Coptic forms. The Greeks wrote originally from right to left; afterwards alternately, the one line from right to left, and the next from left to right (called *boustrophedon*, as being the mode in which oxen ploughed in a field); and finally from left to right, as we do now. The Greek language is a branch of the great Indo-Germanic family of tongues. It is rich in roots, flexible in the formation of words, picturesque in its modes of expressing thought, highly plastic and euphonious; simple and sublime in Homer, playful in





Anacreon, majestic in Æschylus and Pindar, noble in Sophocles, pathetic in Euripides, elegant in Xenophon, subtle in the Sophists, distinct in the Stoics, clear in Aristotle, and fluent in the orators. Its syntax is free, full of inversions, subtle and perfect, yet without obscurity. Its antiquity, its intrinsic excellence, its literature, and its influence on the progress of the fairest portion of mankind, challenge our deepest admiration. "In order," says Mure, "to the attainment of the highest excellence, it is essential, first, that a language should be the original invention of the people who speak it; secondly, that this people should be gifted not only with a fine sense of euphony, but with variety and extent of intellectual powers. These favourable circumstances were combined in the case of the Greek in a greater degree than in that of any other known language. While it is in all essential respects a radically original tongue, its mechanism, both in sound and structure, reflects all the harmony, versatility, and precision, which mark the genius of the race by whom it is spoken."—(*Language and Literature of Ancient Greece.*) The language of modern Greece is what is termed Romaic, or Neo-Hellenic. It differs from the ancient Greek chiefly in the formation of the tenses, and in the termination of the nouns; but the difference between the two is not greater than between the Doric and the Attic dialects of ancient Greece. The tendency of late years has been to assimilate it more and more to the ancient tongue; and a good ancient Greek scholar will have little difficulty in making out a Greek newspaper of the present day. The origin of Greek literature is lost in the darkness of antiquity. The earliest existing monuments of it carry us back to nearly 1000 years B.C., and even then we find the art of poetical composition existing in the highest perfection. The admirable structure and the wonderful language of the Homeric poems imply a long period of antecedent culture. Although both the Iliad and Odyssey display traces of the infancy of the nation, and manifest a spirit of simplicity peculiar to the childhood of the human race, "yet the class of poetry under which they fall appears in them at its full maturity; all the laws which reflection and experience can suggest for the epic form are observed with the most refined taste; all the means are employed by which the general effect can be heightened; nowhere does the poetry bear the character of a first essay or an unsuccessful attempt at some higher poetical flight; indeed, as no subsequent poem, either of ancient or modern times, has so completely caught the genuine epic tone, there seems good reason to doubt whether any future poet will again be able to strike the same chord."—(*Müller.*) Of the poets previous to Homer nothing satisfactory is known. The names of many of them, as Olen, Linus, Orpheus, Musæus, and many others, are preserved to us; but their works are all lost. The poems which have come down to us under their names are manifest forgeries. The Iliad is founded on the legends of the war of Troy; the Odyssey, on the return of Odysseus (Ulysses). Various other poems, as the "Batrachomyomachia," or Battle of the Frogs and Mice, are attributed to Homer; but they evidently belong to a later period. The Homeric poems were made use of as models, and as a basis with which to connect their works, by a series of later poets, who are commonly known as the "cyclic," but of whose works only the titles, brief abstracts, and fragments, have been preserved. Hesiod, the next great epic poet after Homer, was a Bœotian, and is believed to have flourished about the middle of the 9th century before Christ. His principal poems are the "Works and Days," the leading subject of which is the various occupations and duties of life in its several relations; and the "Theogonia," containing a history of the origin of the world and the genealogies of the gods. Lyric poetry arose on the decline of the epic, and was much cultivated from about B.C. 776 to the commencement of the Persian wars. The spirit of the times and the various contests in which the different states were engaged, greatly favoured this kind of poetry. Next to the gods, who were celebrated at their festivals with hymns, their country, with its heroes, was the leading subject of their song; and in everything there was a more powerful impulse to-

wards meditation, investigation, and labour, for the attainment of a desired end than before. Among those who were distinguished in the field of lyric poetry, or in the improvement of music, history furnishes us with the names of Archilochus of Paros, inventor of the iambus; Tyrtæus of Miletus, author of war songs; Callimachus of Ephesus, inventor of the elegiac measure; Alcman the Lydian; Arion of Methymna, who perfected the dithyrambus; Terpander of Antissa, inventor of the barbitos (a kind of lyre); the tender Sappho of Mitylene; her countryman Alcæus; Erinna, the contemporary of both; Mimnermus of Colophon, the flute-player; Stesichones of Himera; Ibycus of Rhegium; Anacreon and Simonides of Ceos; Hipponax of Ephesus; Timocreon of Rhodes; Lasus of Hermione; Corinna of Tanagra, the friend and instructress of Pindar. As gnomic writers, Theognis, Phocylides, and Pythagoras, deserve to be named; and as a fabulist, Æsop. In the order of time, several of these belong to a later period, but they are properly placed here, on account of the connection. The greatest of all the masters of lyric song, however, was Pindar, born at Cynoscephalæ, in Bœotia, in B.C. 522. Of his numerous compositions, we have only the four series of Epinician odes, *i. e.*, odes written in commemoration of victories gained at the four national festivals,—the Olympic, Pythian, Nemean, and Isthmian. The earliest writers of prose were those who first engaged in philosophical speculations. Of their writings, however, only a few fragments have been preserved. Thales was the founder of the Ionic philosophy, to which belonged Pherecydes, Anaximander, Anaximenes, Anaxagoras, &c. Pythagoras established the Italian school, and was followed by Alcmæon, Timæus, Epicharmus, Theages, Archytas, and others. In history the Ionians took the lead. Cadmus of Melitus, about 540 B.C., is the earliest; Acusilaus of Argos soon followed; then Pherecydes of Leros, Charon of Lampsacus, Hellanicus of Mitylene, Dionysius of Melitus, all of whom preceded Herodotus, but are rather chroniclers than historians, in the strict sense of the term. The first great historian was Herodotus of Halicarnassus (484 B.C.), whose delightful work is still preserved, and well entitles him to the name of the "Father of History." The drama took its rise from the festivities with which the country people solemnized the gathering in of the vintage, and which were accompanied with songs and dances. By degrees, variety and some measure of art were given to these proceedings. The first direct step to the introduction of the drama was made by Thespis, who added action to the chorus (B.C. 536), and who exhibited on movable stages, at the cross-ways or in the villages. He was followed by Phrynichus, who flourished B.C. 511, and who was the first to bring female characters upon the stage. Æschylus, the great perfecter of the tragic art, was born at Eleusis 525 B.C. He first substituted actors who repeated their parts by rote, in place of an intermediate speaker, who related his story extemporaneously. Sophocles and Euripides, the other great masters of Greek tragedy, flourished soon after Æschylus. Comedy was first brought into regular form by Epicharmus, who lived about 500 B.C. Cratinus, Crates, Phrynichus, and Eupolis, are well-known names in this field; but the greatest is Aristophanes, who flourished in the early part of the 5th century B.C., and of whose comedies eleven have come down to us, though he is said to have written fifty-four. In what is termed the "old comedy," public and private characters were introduced by name; but subsequently it was forbidden by law to introduce any living person by name, and what is known as the "middle comedy" arose in consequence. The "new comedy" was a still farther modification, which comedy first assumed in the age of Alexander. Of the middle comedy period, only a few fragments of comedies have been preserved. The earliest writer of new comedy was Philippides, who flourished 328 B.C.; and the two most celebrated of his successors were Philemon and Menander. The fertility and excellence of the Greek dramatic literature were most remarkable. The prose compositions that belong to this age were equally distinguished by their appropriate excellences. In history we have Thucydides (born 471 B.C.), whose work on the Peloponnesian war is not only the first specimen of what has been called philosophical history, but remains unsurpassed down to the present time. The historical works of Xenophon (born 447 B.C.), though not equal to that of Thucydides in vigour of colouring and depth of reflection, are yet adorned with every grace of narrative and description. His other works are valuable for the light they throw on the spirit of Greek institutions and the peculiarities of Greek life. Of the works of Ctesias, Philistus, Theopompus, and Ephorus, which belong to a period somewhat earlier, none have come down to us entire. In philosophy, to which the teachings of Socrates (born 468 B.C.) gave a great impulse, we have the writings of Plato (born 428 B.C.), and his pupil Aristotle (born 384 B.C.). Plato was endowed with a brilliant imagination, and loved to soar into the highest regions of speculation; while Aristotle was a student and observer, practical results being the objects of his investigations. Plato's sense of the beautiful was exquisite, and his style was at once idiomatic and lofty; while in passages it moved in a rich and stately music which all ages have admired. Aristotle's style, on the other hand, was terse, logical, close, seldom adorned with poetical embellishments, and never with rhetorical exaggerations. He never entered the world of ideas with Plato, but everything he wrote embodied the results of careful and extensive observations, or comparison of observations. His works embrace the subjects of logic, rhetoric, physics, metaphysics, natural history, and politics. Plato founded the Academic school, whose point of reunion was the Academy on the Cephissus, north of Athens. Aristotle established the Peripatetic school in the Lyceum, near the Ilissus, on the opposite side of the city. In the same period, political eloquence, always a characteristic form of Greek eloquence, reached its highest perfection. Public discussion was the general rule in the Greek republics. In Athens, especially, it was indispensably necessary for the statesman who wished to acquire any influence to be an eloquent public speaker. Solon, Pisistratus, Miltiades, Aristides, Themistocles, and Pericles were orators as well as legislators, counsellors, and generals. Pericles was the first to cultivate the art, and to adorn his mind with the teachings of philosophy and general literary culture. The first rhetorical school at Athens was opened by Georgias of Leontini. Other sophists and teachers of rhetoric were Protagoras, Prodicus, Hippias, &c. Among the Athenian orators whose works are extant, in whole or in part, are Antiphon, Andocides, Lysias, Isocrates, Lycurgus, Hyperides, Æschines, Demades, Demosthenes, and Dinarchus. Mathematics was now cultivated, and geography served to illustrate history. Astronomy is indebted to the Ionic school, arithmetic to the Italian, and geometry to the Academic school, for many discoveries. As mathematicians, Theodorus of Cyrene, Meton, Euctemon, Archytas of Tarentum, and Eudoxus of Cnidus, were celebrated. Geography was particularly enriched by voyages of discovery, which were occasioned by commerce; Hanno's voyage to the western coast of Africa, the Periplus of Scylax, a description of the coasts of the Mediterranean, and the discoveries of Pythias of Massilia in the north-west of Europe, deserve mention. The study of nature was likewise pursued by the philosophers; and the healing art, hitherto practised by the Asclepiades in the temples, was raised to a distinct science by Hippocrates. The expeditions and achievements of Alexander furnished abundant materials for history and study; but, on the whole, the gain was rather in extent than in value. After the death of Alexander, although literature still continued to be cultivated in Greece, yet, till the Roman conquest, the principal seat of letters and science was Alexandria; and this period is called the Alexandrian age. Its characteristics were erudition, criticism, and the study of science; and in poetry, the only original species was the bucolic or idyl. The principal poets were Bion of Smyrna, Theocritus, Aratus, Lycophron, Callimachus, and Moschus. Mathematics, astronomy, and geography made great progress during this period. During the Roman supremacy, and down to the introduction of Christianity, the principal poet was Nicander; the most important prose writers Polybius, Apollodorus, Dionysius Thrax, Diodorus Siculus, Dionysius of Halicarnassus, and Dionysius Periegetes. From this period to the close of the Roman empire in

the west, are two parallel series of writers,—the Pagan, and the Jewish and Christian. Of the former, the most important are Babrius, Strabo, Epictetus, Plutarch, Dion Chrysostomus, Arrian, Pausanias, Marcus Antoninus, Aristides, Lucian, Diogenes Laërtius, Achilles Tatius, Dion Cassius, Athenæus Herodianus, Philostratus, Plotinus, Longinus, Iamblichus; of the latter, Josephus Philo, the authors of the books of the New Testament, Clement of Rome, Justinus, Polycarp, Irenæus, Clemens of Alexandria, and Origen. During the long period which elapsed between the establishment of the seat of government at Constantinople, A.D. 330, and the capture of that city by the Turks, A.D. 1453, the names in Greek literature are comparatively few. They comprise the series of authors known as the Byzantine historians; the ecclesiastical and other writers, as Eusebius, Athanasius, Gregory Nazianzen, Epiphanius, Synesius, Socrates, Basilius, Georgius Pisides, Malales, Georgius Syncellus, Nicephorus, Photius, Constantine Porphyrogenitus, Leo (Philosophus) Theodosius; the rhetoricians and grammarians; a few poets, as Moschus, Quintus of Smyrna, Colathus, Agathias; and in the 12th century, Ptochoprodromus; the romance writers Longus Xenophon of Ephesus, Heliodorus; the historians, as Zosimus, Procopius, Anna Comnena, and her husband Bryennius, Chalcocondylas, &c. After the capture of Constantinople, intellectual pursuits languished under the tyranny of the Turk. Since the establishment of the Greek kingdom, literature has made great progress in Greece. In the department of education, the publications have been innumerable. In history, works of distinguished merit have appeared, as the history of Souli and Parga, and the "Military Memoirs" by Perrhæbos, whose works are quoted with approbation by Niebuhr; the series of histories by Professor Paparrhegopoulos, distinguished by the eloquence of their style and the animation of their narrative; and the "History of the Greek Revolution," in four volumes, by Tricoupes. In cultivated poetry, we may mention the works of Rizos, of Alexander and Panagiotes Soutsos, the younger Rangabes, Zampelios, Zalacostas, Orphanides, Bernadakes, and numerous others. Among dramatic writers, Nervulos, Rangabes, and Charmonzis hold a foremost place. Works of erudition, such as the "Hellenica" of Rangabes, and the "History of Greek Literature" by Asopios, will sustain a fair comparison with similar works in other European countries; while the lectures and occasional discourses of the professors in the university, among whom we may mention Asopios, Pericles Argyropoulos, Philippos, and Kontogones, have great merit in point of style and learning. Many newspapers and other periodicals are now published at Athens and other parts of Greece, as well as at Constantinople, London, &c., in the Neo-Hellenic, and everywhere the people seem to be making rapid advances. Much that augurs well of their future success may be gathered from their conduct during and since their recent revolution (1862).—*Ref.* Browne's *History of Classical Literature*, 1851; K. O. Müller's *History of the Literature of Ancient Greece*, continued by J. W. Donaldson (3 vols. 8vo. London, 1858); *Critical History of the Language and Literature of Ancient Greece*, by William Mure (5 vols. London, 1850-57,—not completed).

Greek Philosophy.—The philosophy of ancient Greece is important, as being the great source of all subsequent speculation. Down to a recent period, the works of the two great masters, Plato and Aristotle, were universally received and followed. Having given special articles on these two systems (*see* Aristotelian Philosophy, Platonic Philosophy), our object here is to notice shortly some of the more important of the other systems that took their rise in this country. It is usual to divide the history of Greek philosophy into three periods,—its youth, its maturity, and its decline. The first period extends from the time of Thales to that of Socrates (600 to 400 B.C.), and is characterized by a striving after a knowledge of the ultimate causes of nature and liberty, in which reflection was not yet systematised nor separated from poetry. The Greek mind elevated itself through poetry to philosophy. The theogonies, cosmogonies, and gnomes formed the introduction to philosophy, and connected it with religion. The great subject of inquiry was respecting the origin of nature and the original matter of the world. The earliest of the schools was the Ionian, beginning with Thales, who held that water was the original element whence all things proceeded. Among his followers were Anaximander and Anaximenes, the latter of whom regarded air as the primary element of all things. The Italian, or mathematical school, was founded by Pythagoras, who was distinguished by his knowledge of the mathematical sciences, and defined numbers to be the principles of all things. The Eleatic school, so called from Elea, in Italy, from finding creation incomprehensible, pronounced experience a mere appearance, and endeavoured to determine the nature of things merely from notions of the understanding. Xenophanes, Parmenides, Melissus, and Zeno belonged to this school. Opposed to the Eleatic was the Atomic school, at the head of which were Leucippus and Democritus. They asserted the external world to be real, and all things to be made up of minute atoms, invariable, indivisible, and imperceptible, owing to their extreme tenuity. From these contending schools arose the class of the Sophists, who, being skilled in the arts of dialectics and rhetoric, distinguished themselves as disputants, and, pretending to universal knowledge, they entirely undermined all earnest striving after truth, and destroyed the differences between truth and error. The chief of the sophists were Gorgias, Protagoras, Prodicus, Hippias of Elis, Polus, Thrasymachus, and Callicles. The sophists compelled their antagonists to seek for some solid foundation on which philosophy might take its stand, and introduced the second period of its history, which begins with Socrates. The earnestness and thoroughness of Socrates opposed itself to the shallowness and flippancy of the sophists. From looking merely at external nature, he taught man to look inwards upon himself. His system was more practical than speculative, regarding the great object of philosophy to be the attainment of correct ideas respecting man's moral and religious obligations, and the perfection of his nature as a rational being. Among the followers of Socrates, who especially devoted themselves to the pursuits of philosophy, were Antisthenes the Athenian, founder of the Cynic school; Aristippus, chief of the Cyrenaic, and Pyrrho, gave their attention exclusively to questions of morals, and their practical application; while Euclid of Megara, Phædo of Elis, Menedemus of Erebria, were occupied with theoretical or metaphysical inquiries. The more comprehensive genius of Plato embraced at once both these topics, and attempted to build up a complete and connected system of philosophy. (*See* Platonic Philosophy.) His scholar Aristotle, characterized by a great knowledge of nature, as well as by great logical and reflective powers, became the founder of the Peripatetic school. (*See* Aristotelian Philosophy.) The Cynical school finally merged in that of the Stoics, and the Cyrenaic in that of Epicurus. From this time (about B.C. 300) dates the commencement of the third period of the history of Greek philosophy,—that of its decline. The contests between the different schools led to a spirit of doubt being introduced into philosophical speculation, scepticism began to prevail, and attempts were made to unite the different contending parties in a system of eclecticism.—*Ref.* Lewes's and Tennemann's *Histories of Philosophy*.

Green Hellebore, *green* (Sax. *grene*, green; Lat. *helleborus*, hellebore). (*See* Veratrum.)

Green Cloth, Board of, is a court of justice connected with the royal household, sitting under the lord high steward, and attended by various officers of the household. It has the charge and supervision of the royal household in all matters of justice and government, with power to take cognisance of all offences committed within the verge of the palace, and two hundred yards beyond the gates.

Greenfinch, *green'-finsh* (*Loxia chloris*), belonging to the *Coccothraustes*, a species of *insessorial* bird, of the class *Fringillidæ*. It is also called the green linnet and green grosbeak. The beak is conical, and very thick at the base, gradually tapering to a point, and of a white colour generally. The head and back of the bird are yellowish green, the breast and rump yellow; the tail slightly forked, black in the centre and yellow at the edges; the wings long, and green in

colour. The greenfinch is very common in England, and it is easily tamed. It imitates the songs of other birds, but is not much prized as a native songster. (*See* GROSBEAK.)



GREENFINCH.

GREENHOUSE, *green'-house*, in Gardening, a house with a roof and sides of glass, which is used for the cultivation and forcing (*see* FORCING) of plants which are too tender to endure the open air all the year, or which have been imported from foreign countries. The first of these structures appears to have been erected in the 17th century, according to Loudon, who states that the earliest was planned and carried out by one Soloman de Caus, of Heidelberg, about the year 1619, in order to shelter some orange-trees which had been transported to the gardens of the town. It is stated in Brande's Dictionary that the *greenhouse*, "being a structure of luxury, ought to be situated close to the house to which it belongs; and that its length and breadth may vary at pleasure, but that its height should never be less than that of the loftiest apartments from which it opens." The best aspect for greenhouses is the south or south-east, as in those facing the north or east delicate plants will not thrive so well in winter. In most of these buildings the plants and shrubs are placed in pots or boxes, which are placed on different stages or forms, so that the heat may be regulated to suit their different requirements. Sir Joseph Paxton, the architect of the Great Exhibition of 1851, has planned and erected some of the best examples of greenhouses and similar structures. (*See* also separate articles on CONSERVATORY, HOTHOUSE, and ORANGERY.)

GREENLAND WHALE. (*See* WHALE.)

GREEN-ROOM is the name given to the actors' retiring-room in a theatre, and was originally conferred probably on account of its being painted or otherwise ornamented with green.

GREEN-SAND, in Geol., the term applied to the lower portion of the cretaceous system (which *see*) as developed in the south of England, from the greenish colour of some of the beds of sand.

GREEN SICKNESS. (*See* CHLOROSIS.)

GREENSTONE, in Geol., a general name for the hard granular-crystalline varieties of *trap* (which *see*), consisting mainly of felspar and hornblende, felspar and augite, or felspar and hypersthene. The term has reference to the greenish or blackish-green colours which these igneous rocks commonly, though not invariably, exhibit.

GREEN VITRIOL. (*See* IRON, SULPHATE OF.)

GREENWICH HOSPITAL. (*See* GREENWICH, vol. I. of this work.)

GREGARIOUS ANIMALS, *gre-gal'-re-us* (Lat. *gregarius*, from *grex*, a herd), is a term applied, in Nat. Hist., to those animals which have the habit of assembling or living in flocks or herds.

GREGORIAN CALENDAR. (*See* CALENDAR.)

GRENADE, *gre-naid'* (Sp. *granado*), a missile invented and brought into use about 1594, consisting of a small shell about two or three inches in diameter, charged with powder, and fired by a fuse, or by percussion-caps placed on nipples projecting from the surface. It is thrown by the hand from the parapet of a fortress, among soldiers advancing to the assault along the covered way and across the ditch. Grenades are also thrown into the trenches when the approaches are driven close to the main works.

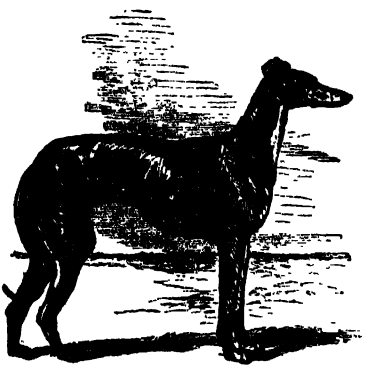
GRENADIER, *gren-a-deer'*, the name formerly given to any soldier belonging to the infantry or cavalry who carried grenades. Grenadiers were introduced into the French service in 1667, and into the English service by Charles II., about 1684. They were armed with muskets, swords, pouches containing grenades, and hatchets, and took the lead in the assault of a fortress. At first only two men were selected and trained as grenadiers from each company of the two English regiments of foot-guards that were then in the service; but shortly after there were two companies of grenadiers to each of these regiments, while horse grenadiers were attached to the regiments of life-guards and horse-guards. Until a few years ago, a grenadier company, consisting of the tallest men in the battalion, formed a part of every regiment of infantry, which took the right when the regiment was in line, and marched first when in column. They were distinguished by wearing bear-skin caps, and shako with fine lacing from them on the collar of the tunic; but they were armed with a rifle and bayonet, like the rest of the regiment; and although they retained the name, they did not perform the duties that were originally assigned to grenadiers.

GRETNA GREEN MARRIAGES, *gret'-nâ*, is the name given to a class of irregular marriages which were formerly very common, and took their name from the village of Gretna Green, on the borders of Scotland. They originated in the greater laxity admitted by the law of Scotland than by that of England, on the subject of marriage. In Scotland, a marriage may be contracted by a mutual declaration to that effect by the two parties in the presence of witnesses, a mode which is much more simple and expeditious than that of England; and hence it was largely taken advantage of by runaway couples from England; the rule being, that a marriage is valid in England if contracted according to the law of the place in which it was solemnised. Gretna Green being the most convenient place on Scotch ground for parties from England, the marriages usually took place there; but they were also celebrated at Springfield, Annan, Coldstream, and other places along the border. At Gretna Green and the other places there were usually one or more persons who took upon themselves the duties of the priest, and in whose presence the declaration was made. The marriage service of the Church of England was sometimes read, in order to please the parties. The practice is said to have been begun at Gretna Green rather more than a century ago, by a person named Paisley, a tobacconist. Afterwards it was carried on by various individuals, each inn, in fact, having its rival priest, besides various others, who carried on the business on their own account. Latterly, the best-known of these worthies was a blacksmith, though he is said to have had a formidable rival in a person who was employed in breaking stones on the roadside, and who in this way had the advantage of getting the first word of the parties in passing. Though sometimes large sums were received, the effect of competition had been to reduce the fee, in some cases, as low as half a crown. The marriages effected in this way were at one time estimated as high as 500 a year. The practice, however, has virtually been put a stop to by 19 & 20 Vict. c. 96, which declares that no valid marriage can be contracted in Scotland, unless one of the parties had, at the date thereof, his or her usual place of residence there, or had lived in Scotland for twenty-one days next preceding such marriage.

GREY FRIARS. (*See* FRANCISCANS.)

GREYHOUND, *gray'-hownd* (Ang.-Sax.), (*Canis gravius*), a species of dog used for the chase, which appears to have been known even in the most remote ages of antiquity, as it is represented on some of the oldest of Egyptian monuments. Its first portraiture that can be relied on is in a painting on one of the tombs of the fourth dynasty of Egypt, which must be upwards of 4,000 years old. The cultivated English greyhound, according to Blaine's "Encyclopædia of Rural Sports," exhibits a model of elegance, and a combination of symmetrical proportions probably unrivalled by any other animal but the race-horse; and this perfection

of the mechanism for speedy progression is apparent throughout its structure. As the greyhound hunts by sight rather than by smell, its eyes are placed more conspicuously forward than in other dogs. The head is beautifully shaped, and slender in proportion; its muzzle is long and pointed; the ears droop at the points; the back is broad and muscular; the body being lank, and very much contracted in its lower parts. The legs are long and muscular, while the chest is capacious and deep, with the tail slender and



GREYHOUND.

curved upwards at the end. The Irish greyhound, or *wolf-dog*, is a variety of this animal: it is stronger and larger, but it is not so fit for hunting purposes, as it lacks the speed and keen eyesight of the true greyhound. The *Italian greyhound* is a much smaller variety than the English, and is a very delicate animal. From its diminutive form and tender constitution, it is more fit for the duties of a lapdog than for those of the chase.—*Ref.* Blaine's *Encyclopædia of Rural Sports.*

GRIAS, *gri'-as*, a gen. of plants belonging to the nat. ord. *Myrtaceæ*, natives of Jamaica. The tube of the calyx adheres to the ovarium; the limb is small, 4-cleft, and obtuse; four petals, coriaceous; numerous stamens, inserted in a square disc; the filaments joined at the base into a series of five, the minor ones being very short; the anthers small and kidney-shaped; the style wanting; the stigma cruciate and hidden in the curved stamens; the fruit ovate, 8-furrowed, and crowned by the calyx. There is only one species, the *G. cauliflora*, or anchovy pear. In appearance it is a tall tree, with small branches, very long oblong leaves, and large white flowers, placed on short many-flowered peduncles. It generally grows in boggy places, and its fruit is an ovate, being as large as an alligator's egg, and of a brownish-russet colour. This fruit is pickled, and eaten in the same way as a mango. The anchovy pear is easily propagated by seed, and the young plants must be kept in a moist heat. It may also be propagated by large cuttings placed under glass in heat; and a loamy soil is best suited to its growth.

GRIFFIN, *grif'-fin*, or GRYPHON (Fr. *griffon*, Lat. *gryphus*), in ancient Myth., a fabulous animal, supposed to be generated between a lion and an eagle. It is represented with four legs, wings, and a beak; the upper part resembling an eagle, and the lower having the characteristics of a lion. This imaginary animal was supposed to watch over gold-mines and all hidden treasures, and was consecrated to the sun, whose chariot some of the ancient painters represent as drawn by griffins. Spanheim states that both the chariots of Nemesis and Jupiter were likewise provided with similar steeds. The griffin is found on many old medals, and it seems to have been a principal ornament of Grecian architecture. In heraldry, the griffin is the symbol of strength, swiftness, courage, and vigilance, and it thus finds a place on many escutcheons: it is usually blazoned rampant, although occasionally *segreant* is thought to be its proper position. The griffin, mentioned sometimes in Scripture, was a species of eagle, called by the Latins *ossifraga*, or osprey.

GRISELDIS, *gris-el'-dis*, is the name of the heroine of a popular tale of the middle ages, originally apparently Italian, but which was subsequently adopted by various other nations. She was originally a poor charcoal-burner, whom the Marquis Walter of Saluzzo took to wife, and then put her humility and obedience to the hardest tests; but having victoriously withstood them all, a reconciliation took place. As a tale, said to have an historical foundation, we first meet with it in Boccaccio's Decameron (x. 10). It was translated into Latin by Petrarch in 1373, and in the 15th century it was well known in Germany. It was dramatized in Paris in 1393, in England 1599, and in Germany, by Hans Sachs, in 1546.—Ref. *Conversations Lexikon.*

GROAT, *grawt* (Du. *groot*), a silver coin once current in England, equal in value to fourpence of our present money. It was introduced by Edward III., about 1351, and has been revived in our modern fourpenny piece (1835), though the name is not retained.

GROATS (Ger. *grutze*), oats divested of the integuments or hulls. They are used for making gruel; when crushed, they constitute the *Embden* and *prepared groats* of the shops. (*See* AVENA.)

GROOM, *groom* (from Flem. *grom*), the name of a servant in some inferior office, generally applied to servants in stables; but it has a special signification as applied to the groom of the chamber, groom of the stole, &c. The groom of the stole is a great officer of the royal household, who has control over all the duties pertaining to the bedchamber (the only portion of the royal chambers wherein the lord chamberlain has no authority). He does not take any fixed turn of duty, but attends only on state occasions. Stole signifies a robe of honour.

GROSBEAK, *grose'-beek* (*C. ecothraustes*), a bird which comes under the general head of *Fringillidæ*, in the sections of *Inessores*, *Conirostres*. The characteristics of the class are given under *Fringillidæ*, to which the reader is referred. There are several varieties; as the hawfinch grosbeak (*Coccothraustes vulgaris*), the pine grosbeak (*Loxia enucleator*), and the green grosbeak, which is treated under the head of GREENFINCH (which *see*). The *hawthorn grosbeak*, or hawfinch, however, will suffice to describe the appearance of the bird, as between it and the others there is little difference. The hawthorn grosbeak, or common grosbeak, inhabits England, France, some parts of Italy, Germany, Sweden, and even the south of Russia. The varieties in the colour of this bird are white, yellowish grey, and grey; the wings and tails are often white, and the plumage generally partakes of that colour. The grosbeak inhabits the woods in summer, and in the winter generally makes its appearance in towns and villages. The *nest*, which the female builds, is one of the prettiest kind, being coloured and decorated with all kinds of brilliantly-tinted mosses, and lined inside with down and feathers. The eggs are of a bluish-green colour, with brown spots. The bird is generally about seven inches long; it has no song worthy of notice, and is not a common bird with us, although it is to be met with in England. (*See* FRINGILLIDÆ.)

GROSS, *grose* (from Fr. *gros*), in Com., by which certain things are reckoned, is twelve dozen.

GROSSULARIACEÆ, *grost'-su-lā-re-ai'-se-e* (Lat. *grossula*, a gooseberry), in Bot., the Gooseberry or Currant fam., a nat. ord. of *Dicotyledones*, sub-class *Calycifloræ*, consisting of shrubs, natives of the temperate regions of Europe, Asia, and North America. Some of the species have spines or prickles. The leaves are alternate, lobed, and radiate-veined. The flowers are axillary, racemose, perfect, or rarely unisexual; with superior calyx 4—5-lobed; five minute petals inserted on the calyx; five stamens alternate with the petals, and inserted in the same manner; and an inferior 1-celled ovary, with two parietal placentas. The fruit is pulpy, with numerous seeds. There are but two genera and 95 species. Some are showy garden plants; but they are mostly remarkable for their agreeable acid fruits, known as gooseberries, and red, white, and black currants. (*See* RIBES.)

GROUND ANNUAL, *ground* (Ang.-Sax.), in Scots Law, is a ground-rent payable out of the ground before the

tenement in a burgh is built. It is used in contradistinction to feu annual.

GROUND LIVERWORT. (*See* PELTIGERA.)

GROUND NUT. (*See* ARACHIS.)

GROUND-RENT, in Law, is a periodical payment for the privilege of building on another's land.

GROUNDSEL. (*See* SENECIO.)

GROUSE, *grouse* (Ang.-Sax.), a species of game bird which belongs to the family of the *Tetraonidæ*. The bill is rather short, broad at the base, compressed and arched, with the tip obtuse, the nostrils being placed at the base of the bill, and protected with feathers, or a hard scaly substance; the legs are stout, with the *tarsi* naked and scutellate, but sometimes covered with feathers to the toes, the hind toe, which is rarely wanting, is rather small and elevated, the wings short and rounded, and the tail also rounded at the extremity. These birds live chiefly on the ground, on which they can run with great swiftness, and they feed principally on vegetable substances, such as berries, seeds, and the buds of trees and shrubs. They vary greatly in size, some being nearly as large as a turkey, while others scarcely exceed a pigeon in size. There are several varieties of the grouse. The most important bird of this class is called the capercailzie, or wood grouse. (*See* CAPERCAILZIE.) To speak correctly, however, the black-cock (*Tetrao tetrix*) is one of the largest species of grouse which can be termed truly British, as it is found both in England, Scotland, and Ireland. The form of the tail is one of the most peculiar features in this bird, as the four outer feathers are considerably elongated and curved outwardly at the tip, so that the tail has the appearance of a double hook. In its habits and other characteristics, the black-cock strongly resembles the capercailzie. The common grouse, or ptarmigan (*Lagopus vulgaris*), is another variety of this species, and the feathers of this bird extend to the very extremity of the toe. Like the preceding classes, it feeds on berries and the small shoots of plants; and, unlike them, it is not polygamous, the males and females pairing regularly in the breeding season. The red grouse (*Lagopus scoticus*) is peculiar to these islands, and inhabits all heathy districts, whether lowland or mountainous; whilst the ptarmigan (*Lagopus vulgaris*) only inhabits very hilly countries, as the northern parts of Europe and the mountainous regions of Spain and Italy. The red grouse is the same colour in plumage all the year round, whilst the ptarmigan acquires a white habit in the winter months. The red grouse is a most prolific bird, and it is wonderful how it can exist in such large numbers, when it is considered what quantities are shot every season to supply the London market between the months of August and April.

GRUB, *grub* (Ang.-Sax.), a small worm: it is a name, however, more properly applied to the hexapod worms produced from the eggs of beetles, &c., which are eventually transformed into winged insects. (For further information, *see* PUPA.)

GRUS, *grus* (Lat. *grus*, a crane), the name of one of Bayer's constellations in the southern hemisphere, between Eridanus and Sagittarius. It has no stars of the first or second magnitude.

GRYPHOSIS, *gri-fo'-sis* (Gr., from *grupoein*, to incurvate), in Surg., is a disease of the nails, which turn inwards, and irritate the soft parts below.

GUAIACUM, *gwai'-yă-kum* (fr. *guayac*, its native name), a gen. of the nat. ord. *Zygophyllaceæ*. The species *G. officinale* is a fine evergreen tree from 40 to 60 feet in height, and of a dark, gloomy aspect. It is a native of the West-India islands, particularly Cuba, St. Domingo, and the south side of Jamaica. The wood is remarkable for its hardness, toughness, and durability, qualities which render it particularly valuable for many purposes. It is known in commerce as *lignum vitæ*. This wood, and a resin obtained from it, are officinal in our pharmacopœias, and are commonly known in the shops respectively as guaiacum-wood and guaiacum-resin. The latter is generally procured by heating the wood, either by boiling chips in salt water, or more commonly by burning hollow billets, and catching the resin as it flows out from them. It also exudes to some extent spontaneously, and especially so when the tree is cut or wounded in any way. Both the wood and resin are used as stimulants, diaphoretics, and alteratives, chiefly in gout and rheumatism, and also in syphilitic and various cutaneous affections. *G. sanctum*, a native of Porto Rico, and *G. arboreum*, the guayacan of Cumana and Carthagena, are said to yield some of the lignum vitæ of commerce.

GUALTHERIA, *gwal-the'-re-ă*, in Bot., a gen. of the nat. ord. *Ericaceæ*. The species *G. procumbens* is a native of North America, and is commonly known as the partridge-berry. Its leaves possess aromatic, astringent, and stimulant properties, which they owe to the presence of a volatile oil and tannin. The oil is known in commerce under the names of oil of partridge-berry and oil of winter-green. An infusion of the leaves is employed in certain parts of North America as a substitute for China tea, and is called Mountain or Salvador tea.

GUANO, *gu-ân'-o* (from the Peruvian word *huano*, dung), the excrement of sea-fowls, found principally in large quantities upon some parts of the coasts of Peru, Bolivia, and Africa. Although of comparatively recent use in this country, guano has been employed as manure by the inhabitants of Peru from the most remote periods. By its means they have been able to render fertile the otherwise unproductive sandy soils along the coast. While the Incas governed the country, the birds were protected from violence by very severe laws. Any one landing on the guano-bearing islands during the period when the birds were breeding, was put to death; and a similar sentence was decreed against those who killed any of the birds at any time. Baron Humboldt first brought specimens of guano to Europe in 1804, and sent them, for examination, to Fourcroy, Vauquelin, and Klaproth,—the best analytical chemists of the day. He thus described it:—"The guano is deposited in layers of 50 or 60 feet thick, upon the granite of many of the South-Sea islands off the coast of Peru. During 300 years the coast birds have deposited guano only a few lines in thickness. This shows how great must have been the number of birds, and how many centuries must have passed over in order to form the present guano-beds." There seem to be three varieties of guano in Peru: the white, grey, and red. The red is the oldest deposit, and the white the most recent. Bones and feathers of birds, together with crystalline deposits, are found amongst the layers of excrement. A large portion of the so-called Peruvian guano is imported from the Chinchа islands. These islands, which are three in number, are respectively about five or six miles in circumference, composed of granite, and covered with guano, in some places to a height of 200 feet. No earthy matter is mixed with this great accumulation of excrement. During the last few years, the export of guano has increased considerably. Between 300,000 and 400,000 tons are the annual amount at present. A large number of men, many of whom are Chinese, are employed to remove the guano to the ships. They work their way through the mass with pickaxes, and leave a sort of wall on either side. It is then removed in wheel-barrows, either direct to the mouths of the shoots at the edge of the cliff, or to the huge waggons running on tramways for the same purpose. With regard to the operation of guano as a manure, there has always been a good deal of discrepancy in the statements put forth as to its operation. There can, however, be little doubt that it is a very efficient manure. Its operation in Peru is seen in the conversion of the sandy desert near Lima into a soil capable of bearing large crops of maize. The Peruvians have a proverb concerning it, which affirms that "Huano, though no saint, works many miracles." There are several commercial varieties of guano, the principal of which are —Peruvian, Angamos, Ichaboe, Patagonian, Saldanha Bay, Kooria Mooria, African, and Indian. In chemical analysis, guano shows that one of the most, if not the most, important of its constituents is ammonia: some varieties contain from 17 to 20 per cent. Guano also contains potash and a considerable quantity of chloride of sodium (common salt). Next to the ammonia, the phosphoric acid seems to hold the place of importance. The average quantity of phosphate of lime in the several kinds of imported guano varies from 12 to 25 per cent. Good guano, when analyzed, is found to contain

about 50 per cent. of ash or mineral substances, and 50 per cent. of combustible or organic matters. Good Peruvian guano is worth from £12 to £14 per ton. It is largely adulterated with umber, finely-ground stone, old mortar, and partially-decomposed sawdust. Instances have occurred when adulterating substances have been present in the proportion of 97 per cent.

GUARANA, or BRAZILIAN COCOA. (*See* PAULLINIA.)

GUARANTEE, or GUARANTY, *gär'-rän-te* (from Fr. *garantir*, to warrant), is a promise, or undertaking, to be responsible for the debts or duties of a third party, in the event of his failing to fulfil his engagement. To make such an obligation binding, there must be some good consideration moving from the party with whom it is made; as the delivery of goods to, or work to be done on credit for, the person on whose behalf the guaranty is given. It must be in respect of a contemporaneous, or future debt or act. If a guaranty be made in respect of a debt already incurred, there must be a new consideration to support it. A consideration, however, need not be expressed; for if it can be fairly implied from the circumstances, or the language used, it will ordinarily be sufficient. It is sufficient if the person for whom it is given receive a benefit, or to whom it is given receive, or may receive, a detriment. The Statute of Frauds enacts that a defendant cannot be charged to answer for the debt, default, or miscarriage of another person upon any special promise, unless the agreement upon which such action shall be brought, or some memorandum or note thereof, shall be in writing, and signed by the party charged therewith, or some other person duly authorised by him. This statute only applies, however, to engagements in which the guarantor is only liable conditionally upon the default of some other person: where he is liable coextensively with the other party in the first instance, it does not apply.

GUARD, *gard* (Ang.-Nor.), in Mil., the name applied to a body of soldiers charged with the care of prisoners, or the protection of baggage and military stores. A guard is always stationed at the entrance to a fortified town, citadel, or barracks. The number of men of which a guard is composed differs according to the rank of the officer, or non-commissioned officer, by whom it is commanded, or the purpose for which it is designed. There is always a room or separate building set apart for the accommodation and protection of the guard, the men taking it in turn to perform the duties of sentry outside. When the general in command is passing, and on similar occasions, the whole guard is turned out and presents arms. A guard of honour is a detachment on duty on special occasions, as a token of respect. The regiments which precede or follow an army or division on the march, at a short distance, are called the van-guard and rear-guard respectively. In the old coaching days, a man known by this name always accompanied a coach, and was generally armed, for the better protection of the mails and articles of value. Every railway train is under the charge of one or two guards, who see that the time between station and station is correctly kept, and look to the safety of goods and luggage, and the requirements of passengers.

GUARDIAN, *gar'-de-an* (Fr. *gardien*), in Law, is one who has the care of the person and property of a minor, who is called his ward. He performs the office of both tutor and curator in the Roman law; the former having the charge of the maintenance and education of the minor, the latter the care of his fortune. Of the several species of guardians, the first are guardians *by nature*, namely, the father, and in some cases the mother of the child; for if an estate be left to an infant, the father is by common law the guardian, and must account to his child for the profits. There are also guardians *for nurture*, which are of course the father and mother, till the infant attains the age of fourteen years; and in default of father or mother, the ordinary usually assigns some discreet person to take care of the infant's personal estate, and to provide for his maintenance and education. Guardians *in socage* take place only when the minor is entitled to some estate in lands, and then by the common law the guardianship devolves upon his next of kin, to whom the inheritance cannot possibly descend, for the law judges it improper to trust the person of an infant in his hands who may by possibility become heir to him. The guardianship in socage ends when the minor attains the age of fourteen, when he may appoint his own guardian. Guardians *by statute, or testamentary* guardians, are such as are appointed in virtue of the statute 12 Car. II. c. 24, confirmed by 1 Vict. c. 26, which enacts that any father under age, or of full age, may by deed or will, attested by two witnesses, appoint any person or persons (except a popish recusant), as guardians of their children, either born or unborn, until they attain the age of one-and-twenty years. There are also special guardians *by custom* in certain places, as in London the guardianship of orphans under age and unmarried belongs to the city. The guardian is considered as a trustee for his ward, and is accountable for the due management of the infant's property, and is answerable not only for fraud, but for negligence or omission. Guardianship *in chivalry*, which was abolished by 12 Car. II. c. 24, was a part of the ancient feudal system, the lord being entitled to the wardship of the heir, if a male, until the age of twenty-one, or if a female, until fourteen. This wardship consisted in having the custody of the body and lands of such heir, without any account of the profits during that time. If the female remained unmarried after fourteen, the lord might keep her in wardship till she was sixteen, in terms of the statute of Westminster I., 3 Edw. I. c. 22. This guardianship being considered a property, rather than a trust, was saleable, and if not disposed of, passed at the lord's death to his personal representatives. Guardian *of the spiritualities*, is the person to whom the spiritual jurisdiction of any diocese is committed during the vacancy of the see; while the guardian *of the temporalities* is he to whom the temporal jurisdiction and profits of the see are committed during the like period. Guardians *of the poor* are certain persons appointed in a parish, or union of parishes, to act in lieu of overseers, and to superintend all matters relative to the relief and management of the poor. (*See* POOR LAWS.)

GUARDS. (*See* HOUSEHOLD TROOPS.)

GUAVA. (*See* PSIDIUM.)

GUDGEON, *gud'-je-on* (Fr. *goujon*), (*Cyprinus Gobio*), a sort of *malacopterygious* fresh-water fish, inhabiting the waters of English rivers, as the Thames, Mersey, Avon, Kennet, and Colne, which produce remarkably fine specimens. The gudgeon is about six to eight inches long, and half-cylindrical in shape; its back is pale brown spotted with black, the belly white, and the tail forked. The gudgeon swims in shoals, and feeds on worms and aquatic insects. They afford great sport to anglers, from their greediness in seizing upon any bait presented to them. They spawn in May, generally in shallow water, to which they repair for the purpose.

GUEBRES, GHEBRES, or GAVRES, *gwe'-bres* (i. e. *giaours*, dogs, infidels), is a term applied by the Mohammedan conquerors of Persia to the disciples of Zoroaster in that country. They call themselves "Behendies," *i. e.*, followers of the true faith, and are generally known by Europeans as fire-worshippers. Zoroaster is believed to have flourished in the 6th century B.C. In course of time the system became very corrupted, and King Ardeshir Babekan (A.D. 226) reformed it, collected the sacred books, and caused them to be translated from the Zend language into the vernacular dialect of Persia, and built temples for the preservation of the sacred fire. Under the Mohammedan invaders in the 7th century, they were much persecuted, and most of them embraced Islamism. A small remnant, who clung to their old faith, were finally allowed to settle in one of the most barren parts of the kingdom. They now number about 100,000 souls, dwelling chiefly in the city of Yezd and the province of Kerman. They have the character of being industrious and virtuous, in comparison with the other Persians, but they are ignorant and depressed. A body of the Guebres left Persia at the time of the invasion and settled in Hindostan. At present they are numerous in Western India, where they are called Parsees, from the country of their origin. They are honoured by Europeans for their estimable qualities, and are the richest and most influential of the native citizens of Bombay. Their worship became corrupted with many Hindoo practices, and in 1863 an association was organised for the restoration of the creed of Zoroaster to its original purity, which has had a con-

siderable effect. They recognise one God, Ormuzd, invisible and omnipotent, the creator, governor, and preserver of all things. He sprang from primeval light, which emanated from a supreme incomprehensible essence, called Zernane Akerene, or the Eternal. Ormuzd created a number of good spirits to act as the medium of his bounty to men, and intrusted them each with the guardianship of a particular person or object, animate or inanimate. The sun is the eye of Ormuzd, and, like all the heavenly bodies, is animated with a soul. The spirits of the stars have a beneficent influence upon the affairs of men, and can reveal the future to those who understand their signs; hence astrology has always been a favourite subject of study with them. The worship of idols is prohibited, but a reverence for fire and the sun inculcated, as emblems of deity. To Ormuzd is opposed Ahriman, the author of evil. The sacred fire which Zoroaster brought from heaven is kept continually burning in holy places, and is fed with choice wood and spices. Their funeral ceremonies are very peculiar. Fasting and celibacy are considered as displeasing to the deity, and polygamy is strictly forbidden. Their priests pass their time in praying, chanting hymns, tending the fires on the altars, burning incense, and performing certain ceremonies. Prayer, obedience, industry, honesty, hospitality, and alms, are enjoined, while anger, revenge, envy, hatred, and quarrelling, are strictly forbidden. The precepts of this religion are contained in the Zend Avesta, or collection of sacred writings which Zoroaster received from heaven. The original was lost at the time of the invasion, but copies of it were preserved.

GUELDRE ROSE. (*See* VIBURNUM.)

GUELPHIC ORDER. (*See* HANOVERIAN GUELPHIC ORDER.)

GUELPHS AND GHIBELLINES, *guelfs gil'-bel-lines*, the names of two political parties that for several centuries during the middle ages continued to agitate the countries of Germany and Italy. The factions arose in the contest for the imperial throne between Conrad, duke of Franconia, and Henry the Lion, duke of Saxony, of the house of Guelph, or Welf. At the great battle of Weinsberg, in Suabia, in 1140, the adherents of Henry adopted the war-cry of Welf, while those of Conrad took that of Waiblingen, a seat of the Hohenstaufen family, to which Conrad belonged. The terms were continued to designate the two parties, the latter becoming corrupted into Ghibellines. The house of Hohenstaufen having become the ruling power in Germany, the name of Guelphs was given to all who were disaffected towards it, while the Ghibellines were those who supported imperial authority. As Italy became the chief theatre of the contests of these two parties, and as the Church was equally opposed with the Guelphs to the imperial power, it took part with the latter, and at length the popes became the leaders of that party. In the 13th century, under the reign of Frederic II., it came to be a contest between the temporal and spiritual power; and Italy was divided, as it were, into two camps, some cities ranging themselves on the Guelph side, while others remained attached to the Ghibellines. The former were generally the more powerful in the south of Italy, the latter in the north. After the German emperors lost their power in Italy, the names of Guelph and Ghibelline lost their original signification, and were applied to various contending factions among the Italians themselves. In general, the Ghibellines were regarded as aristocratical in their ideas, while the Guelphs were considered as entertaining popular views; but sometimes we find the reverse of this to be the case, the Guelphs being allied with the governing party and the Ghibellines forming the really popular party. In 1334 Pope Benedict XII. forbade, under pain of the censures of the Church, the use of these once potent names; and in the following century they had become a mere traditional shadow. — *Ref.* Sismondi's *History of the Italian Republic;* Raumer's *Geschichte der Hohenstaufen.*

GUERRILLA, *gwer-ril'-la* (Sp., a little warfare, from *guerra*, war), is a name applied in Spain to armed bands of peasants or others who keep up an independent system of hostile attacks upon an enemy. This mode of harassing an enemy is particularly effective in a mountainous or close country, and was adopted towards the French armies in the north of Spain during the peninsular war. The bands which conducted this desultory warfare were called *partidas*. In the recent civil wars which have distracted that country, the guerrillas have borne a prominent part.

GUETTARDA, *get'-tar-da* (after Dr. Guettard, a French botanist), in Bot., a gen. of the nat. ord. *Cinchonaceæ*. *G. speciosa*, a native of the West Indies, is the tree from which the beautiful zebra-wood of the cabinet-makers is obtained.

GUILD, *gild* (Sax. *guildan*, to pay), is a society or body of individuals associated together for carrying on commerce, or some particular trade or business. Each member contributes towards the expenses; and hence the name. There existed at Rome various fraternities of tradesmen, which bore a considerable resemblance to our modern guilds, and were permitted to regulate their affairs by their own laws; but it is usual to trace the origin of guilds to the middle ages. Mechanical industry would never have flourished under the feudal system, had it not been for the unions formed among the workmen and merchants themselves. When the advantages of these associations became known and felt, they rapidly increased, and in the struggles between the citizens and nobility, the principal resistance against the latter was made by the guilds or corporations. As soon as the citizens acquired an influence in the administration, the guilds became the basis of the municipal constitutions, and every one who wished to participate in the municipal government was obliged to become member of a guild. Hence we so often find distinguished individuals belonging to a class of mechanics, of whose occupation they probably did not know anything. Guilds introduced the democratic element into society, and in their progress became the bulwarks of the citizen's liberty, and the depositaries of much political power. By the close of the 12th century, merchants' guilds were general throughout the cities of Europe. The drapers' company of Hamburg dates from 1153, and that of the shoemakers of Magdeburg from 1157. With the increase of their wealth and strength, the guilds either purchased or extorted from their rulers privileges, which, once obtained, they were careful never to give up. By the 13th century, they had acquired considerable power, and in the two succeeding ages they counterbalanced the power of the nobles. By degrees, they themselves grew into intolerable aristocracies, especially in Germany, where their exactions had to be curbed by the laws of the empire. Guilds were abolished in Prussia in 1810; but the want of such associations having since been felt, laws were enacted in 1840 to favour their re-establishment. In France, they were suppressed in 1776, but soon re-established, and not finally abolished till 1791. In England and Scotland, the exclusive privileges of the guildry companies have now been abolished.

GUILDHALL, *gild-hawl*, is an important public building of the city of London, the seat of the municipal government, and the place of its civic meetings. Various courts are held here; and here, every 9th of November, the new lord mayor for the coming year gives a grand public dinner, at which her majesty's ministers and the great law officers of the crown are invariably present. This building was commenced in 1411, by contributions of several companies called guilds, aided by liberal donations from many private individuals. Of the original Guildhall little now remains but the stone and mortar of the walls, it having suffered greatly by the great fire of 1666. It was patched up by Wren, and again in the last century by Dance, who, in 1789, erected the present intensely barbarous front. The apartments contain some paintings and sculptures, but of very ordinary merit. The library contains a very large collection of early-printed plays and pageants, &c., connected with the city.

GUILLOTINE, *gil'-lo-teen*, is the name of an instrument used for the infliction of capital punishment by decapitation. In general form it usually consists of two upright posts surmounted by a crossbeam, and grooved so as to allow an oblique-edged knife with a heavily-weighted back to descend surely and swiftly, when the cord by which it is suspended is let go. The instrument took its name from Joseph Ignace Guillotin, a physician in Paris, who was a member of

the French National Assembly at the time of the Revolution, and proposed its adoption by the Assembly. This name, however, was bestowed upon it in derision and anticipation, and clung to it, in spite of an attempt to call it the *Louison*, after M. Louis, the secretary of the College of Surgeons, who actually presided over the construction of the machine, which Guillotin had only indicated. Its adoption was proclaimed in a decree of March 20, 1792. Dr. Guillotin sank into ridicule and contempt, and after being imprisoned during the Jacobin reign of terror, was released at the gaol-delivery on the 9th Thermidor, and died in his bed, in Paris, at the age of 76. It is a common error to suppose that he fell a victim to his own invention. To attribute the invention of the guillotine to Dr. Guillotin is also a mistake. It had been in use for centuries in Germany, in England, Scotland, and Italy. In Germany, the instrument was called *der Planke der Diel*, the plank of wood, and, in older language, *Fallbeil*, the falling hatchet. The English mode of decapitation had always been by the block and axe, with one local exception,—that of the *Halifax gibbet*, which was a perfect guillotine. Its use at Halifax is traced as far back as the reign of Edward III.: the last criminals who suffered by it were executed in 1650. In the museum of the Antiquarian Society of Edinburgh, a rudely-shaped guillotine, called "the Maiden," is still preserved. The regent Morton was beheaded by this machine. Pennecuik, in his "Description of Tweeddale," in speaking of the regent, says, "This mighty earl, for the pleasure of the place and the salubrity of the air, designed here a noble recess, and retirement from worldly business, but was prevented by his unfortunate and inexorable death three years after, A.D. 1581, being accused, condemned, and executed by the *Maiden* at the Cross of Edinburgh, as art and part of the murder of King Henry, earl of Darnley, father to King James VI., which fatal instrument, at least the pattern thereof, the cruel regent had brought from abroad to behead the laird of Pennecuick of that ilk, who, notwithstanding, died in his bed, and the unfortunate earl was the first himself that handselled that merciless Maiden, who proved so soon after his own executioner." A machine was also used by the Italians which closely resembled the guillotine. It was called *Mannia;* and an engraving of it, as used in Italy, is to be seen in the *Quæstiones Symbolicæ* of Achilles Bocchius, printed at Bologna in 1555. The eighteenth symbol in this work represents a Spartan about to die by a kind of guillotine. In Louis Cranach's woodcuts of the "Martyrdom of the Apostles," printed in 1539, there is a representation of the death of St. Matthew by the guillotine, with a legend to this effect, "It is said that his head was chopped off by a falling-axe (*fallbeil*), after the manner of the Romans." The guillotine was not, therefore, a new instrument when it was adopted by the French. After being in exercise for a few months, it became the delight of the Parisian mob; and not of the mob only, for it was canonized in the philosophical rubric as *la Sainte Guillotine*, and, in miniature, became the model of ornaments for women and toys for children. During the period of one year and one month, while the guillotine stood in the space now known as la Place de Concorde, 1,256 persons were executed by it. Afterwards it was removed to the barrière du Trône, where it dispatched 1,270 persons of both sexes. The guillotine is still the instrument of capital punishment in France; and one of the most important executions by it, in Paris, of late years, was that of Orsini, for an attempt to assassinate the emperor Napoleon III.

GUILTY. (*See* VERDICT.)

GUIMAUVE. (*See* ALTHÆA.)

GUINEA, *gin'-ne*, the name of a gold coin formerly current in Britain. It was first coined in the reign of James I., and received its name from being originally made out of gold brought from the coast of Guinea, in Africa. Its value, at first twenty shillings, was soon raised to twenty-one; and subsequently, owing to the depreciation of silver, rose by degrees as high as thirty shillings. When the value of the silver money was restored by the grand recoinage, it again fell, and at length, by common consent, it was fixed at twenty-one shillings, at which it remained till it was superseded by the sovereign in 1817. Though the coin has ceased, the name is still used to designate a sum of twenty-one shillings; and it is customary to reckon professional fees, voluntary subscriptions, &c., in guineas, which is supposed to raise them above mere pounds shillings and pence transactions.

GUINEA CORN. (*See* HOLCUS.)

GUINEA-FOWL. (*See* FOWL.)

GUINEA-PIG, *Cavia cobaya*, is an animal of the gen. *Rodentia*, a native of South America, but which is now quite domesticated in Europe. From the beauty of its appearance, this animal seems to have attracted the attention of Europeans. It is one of the species called agoutis, which are well known in South America and the West-India islands. Its ears are large and broad; the upper lip is divided in two, and the hair or fur is erect, and somewhat resembling that of a pig (whence its name). The colour of the guinea-pig is generally white, with black spots, although this is somewhat variegated by orange blotches on the coat. It has five toes on the fore legs and three on the hind ones, and it is utterly destitute of any caudal appendage. In their habits guinea-pigs are extremely neat, as they are constantly seen smoothing and arranging the hair which forms the outer tegument of their coat. Their general voice is a grunt or feeble squeal, which renders them even more analogous to the pig, to which they are so often likened. The guinea-pig, in its wild state, inhabits dry sandy places and its flesh is esteemed a great dainty by the natives of South America.

GUITAR, *git-tar'* (Fr. *guitare*), a musical stringed instrument, supposed to have originated in Spain, where it is very common; indeed, so much so, that there are few, even of the poorer classes, who cannot play on it, while gentlemen employ it to serenade their mistresses. About the middle of the last century it became so popular in England as to greatly injure the sale of other instruments. The demand for it is said to have been greatly lessened by Mr. Kirkman, a manufacturer of harpsichords, who having bought a number of cheap guitars, distributed them to ballad-singers, at the same time teaching them to play a few easy tunes, thus rendering it so common that fashionable people threw it by in disgust. The guitar is of a somewhat oval form, having a neck similar to that of the violin. The strings—six in number—are stretched from the head to the lower end, passing over the sounding-hole and bridge. The three first, E, B, and G, are, like the gut strings of the violin, called the treble; and the other three, which are of gut of silk, and wound with silver wire, constitute the bass. All the strings are tuned by fourths, except the third, which is tuned one third below the second.

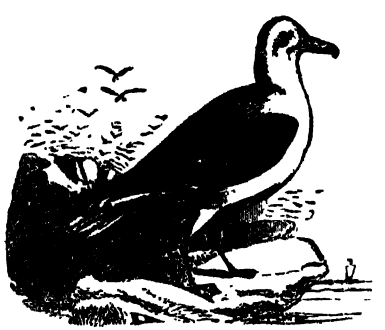
GULES, *gulez* (Fr. *gurules*), in Her., the term used to denote a red colour in armorial bearings. In engravings of coats-of-arms this colour is expressed by parallel lines crossing the field or charge in a perpendicular direction.

GULF STREAM. (*See* OCEAN CURRENTS.)

GULF-WEED. (*See* SARGASSUM.)

GULL, *gull* (Welsh *gwylan*), is a Linnæan species of aquatic birds, belonging to the longipennate division of *Palmipedes* in Cuvier's system. The birds of this web-footed well-known marine genus are dispersed over every part of the globe, and in some places, at certain seasons of the year, are met with in multitudinous quantities. Their characteristics are as follows:—A strong straight bill; the body clothed with a great quantity of down and feathers, which give these birds an appearance of greater bulk than their weight warrants; the legs are small and naked above the knees, and the feet are webbed. The gulls, which are seen on the different coasts, mostly assemble in flocks, and are characterized by the greediness and gluttony which seems natural to all sea-birds. There are several varieties of the gull. The common gull, or *Larus canus*, is the most numerous by far of the different genera. It generally measures about seventeen inches in length, by thirty-six in breadth, and it frequents the ledges of cliffs which overhang the sea round the coast. The bill is yellow, the back grey, the head, neck, tail, and under part part of the body perfectly white, and the legs are a dull white, tinged with green. It eats any sort of carrion which comes in its way, but its more general diet is fish, which it catches whenever in want of food. This gull is a great scourge to the herring-

shoals which frequent the waters round our coasts. The gull is a very courageous bird, and there are many anecdotes related of the encounters witnessed between it and some large fish, which it has selected for a prey, but which proves too strong for its assailant. The black-backed gull, the ivory gull, and the horny gull, have but little distinction from the common gull. The *skua gull* is about the size of a raven; the back and head, and upper parts of the body, are of a deep brown colour, the under parts pale ashy grey; the legs black,



SEA-GULL.

and the talons very strong and hooked. It is a native of the North, although occasionally found in England. It is a very formidable bird, partaking of the fierceness of the eagle, and not only feeds on fish, but it also preys on lambs and other small animals. In the Shetland isles, and in other northern rock-bound coasts, it is seen often. The *arctic gull* is very similar to the common gull, and needs no special signification. It is found in northern regions,—whence its name, and it is peculiar only from the fact of its parasitical propensities. It never fishes for itself, like other water-fowl, but pursues smaller gulls which have captured any booty, and makes them drop it. It then descends with great impetus, and catches its stolen prey before it can reach the water.

GULLET. (*See* (ESOPHAGUS.)

GUM, *gum* (Sax. *goma*), in Anat., is that cellular and elastic fleshy substance which covers the alveolar portions of the upper and lower jaw, and envelops the neck of the teeth.

GUM, *gum* (Fr. *gomme*), a vegetable product, which forms a slimy solution with water, but is insoluble in alcohol, ether, and oils. There are six varieties of gum,—gum arabic, gum Senegal, gum of the cherry and other stone-fruit trees, gum tragacanth, gum of Bassora, and the gum of seeds and roots. All these gums, except the last, flow spontaneously from the branches and trunks of their trees, and sometimes from the fruits in the form of a mucilage, which dries and hardens in the air; the gum of seeds and roots, however, requires to be extracted by boiling water. A number of very different substances are confounded in commerce under the name of gum. Thus, gum elemi and gum copal, which are true resins; gum ammoniacum, which is a gum-resin; and gum elastic (caoutchouc), which differs from both, are all called gums. Gum arabic is obtained from the *Acacia arabica*, or *Acacia vera*, which grow upon the banks of the Nile and in Arabia. The commercial gum of this kind consists of a number of small pieces rounded on one side and hollow on the other. It may be bleached by exposure to the atmosphere and sunlight at a temperature of 212°. Its specific gravity is 1·355. It is used in medicine, and also in order to to give lustre to crapes and other silk fabrics. Gum Senegal is collected from the *Acacia Senegal* by the negroes during the month of November. Its specific gravity is 1·436, and its chemical properties and uses are similar to those of gum arabic. It is largely used in calico-printing. Gum tragacanth is gathered in Crete and the neighbouring islands, from the *Astralagus tragacantha*, about the end of June. It is white or reddish in colour, almost opaque, and has the appearance of twisted ribands. It is difficult to pulverize it without heating the mortar. When plunged into water, it partially dissolves, swells, and forms a very thick mucilage. Gum tragacanth has a specific gravity of 1·384, and is used in calico-printing and by shoemakers. (For other gums, *see* BASSORA GUM, BRITISH GUM, DEXTRIN). Most of the substances called gums are resins or gum-resins. (*See* RESINS.)

GUM-BOIL, in Surg., is a small abscess, which forms in the cellular substance of the gum. At first it is sufficient simply to protect it against cold; but if it continues to advance, the process of ripening may be hastened by hot applications to the cheek, next to the swelling. If the pain be excessive, a leach applied to the part will usually afford relief. As soon as the presence of matter can be ascertained, it should be let out by a free incision.

GUM-TREES. (*See* EUCALYPTUS.)

GUN, *gun* (Ang.-Sax.), an instrument consisting of a barrel or tube, of iron or other metal, from which balls, shot, or other missiles, are discharged by the explosive force of gunpowder. The larger species of guns are called cannon; the smaller species are called rifles, muskets, carbines, fowling-pieces, &c. The manufacture and construction of cannon have been fully described in the articles on ARTILLERY and CANNON, to which the reader is referred. A description of the latest improvements in the manufacture of small fire-arms will also be found under the head RIFLE. The ordinary musket or fowling-piece consists of two distinct parts,—the metallic and the wooden part. The first comprises the barrel, the lock, and the mounting, together with the bayonet and ramrod for military arms; the second compriaes the stock, and, in fowling-pieces, the ramrod also. The interior of the barrel is called the bore, its diameter the calibre, the front end the muzzle, and the back end the breech. The proving of gun-barrels is indispensably necessary to insure confidence in their safety. Next in importance to the barrel comes the gun-lock. Formerly all guns were made with flint locks, working with a spring; but at the present day percussion or detonating locks only are used. Among the most important technical terms employed by sportsmen to distinguish the different parts of a gun are the following:—The *butt of stock*, the shouldered extremity of the *stock*; the *chain* or *swivel*, a small catch suspended from the neck of the tumbler, to receive the extremity of the mainspring; the *chamber*, a central cavity within the breech, to receive the powder; the *cock* in the flint gun holds the flint in its jaws, and in the percussion gun is often called the *striker*; the *guard*, the bow which protects the trigger; the *heel-plate*, the plate with which the butt of the stock is tipped; the *lock-plate* supports the principal works of the lock; the *mainspring* works the tumbler with the cock; the *sear*, that which catches the tumbler for half or whole cock, on being pushed up by the trigger; the *tumbler*, the movable centrepiece of a lock, which falls into, and is subservient to, the cock; the *worm* is the screw at the end of the ramrod.

GUN, AIR. (*See* AIR-GUN.)

GUNBOAT, a term formerly applied to a small vessel mounting only a single gun, and used for coast defence; but now the word gunboat is synonymous of a totally new class of vessel. The experience of the last Russian war showed us that vessels of light draught of water, which could be rapidly propelled through the sea, and which could carry one or two guns of large calibre, would be far more useful sometimes than line-of-battle ships; accordingly, our fleet of gunboats was constructed on entirely new principles. They are generally armed with one 68- or 100-pounder Armstrong gun, which can be used either ahead or astern, according as required. Some have, in addition to this, a 32-pounder, or brass howitzers. They are propelled by engines of from 2 to 80 horse-power. In the new gunboats constructed the crew are sheltered by shifting iron screens, and the vessels themselves are plated externally with armour-plates. Their rig is restricted to a very light form, and consists of three masts, very short in length, and fitted only with gaff-sails.—Ref. *The Screw Fleet of the Navy*, by Captain Halsted, R.N.; *Eng. Cyclopædia*—Arts and Sciences.

GUN-COTTON. (*See* PYROXYLINE.)

GUN-METAL, in Metall., an alloy containing 90·5 per cent. of copper and 9·5 of tin, used for casting pieces of ordnance and those parts of machinery which are subjected to considerable friction.

GUNNER, *gun'-ner*, in Mil., a name applied to soldiers belonging to the royal artillery, in contradistinction to those who are called drivers. Some artillerymen rank as master gunners, and there are others attached to the corps and considered as forming a portion of it, termed invalid gunners. In the royal navy the gunner holds the highest rank among warrant officers. Gunners in the navy are divided into three classes, with pay varying from £10 to £7 per month when at sea, and from £8. 10*s.* to £5. 10*s.* per month when in harbour. The gunner must be a man of tolerably good education, and has to pass a severe examination before he is considered as qualified to enter on the duties of his post. Whenever a gunner returns from service abroad, he has to go on board the *Excellent* gunnery ship at Portsmouth, to make himself acquainted with the latest improvements in the science. On board ship the gunner and his mates have to instruct the midshipmen and ship's crew in the great-gun, small-arms, bayonet, and cutlass exercise; and the chief gunner has the charge of the magazine, and serves out the ammunition and military stores, keeping a strict account of the expenditure. He must necessarily have a knowledge of geometry, and also be acquainted with the duties of practical seamanship. He has to superintend the fitting out of boats for active service. Gunners hold rank next to second masters. Although holding a position of such importance, the gunner is one of the worst paid officers in the British service. When he is no longer fit for service, he is allowed to retire on a small pension, averaging about £45 a year, and if he die on active service, his widow is also entitled to a pension of small amount.

GUNNERA, *gun'-ner-ă* (after Ernest Gunner, a Norwegian botanist), in Bot., a gen. of the nat. ord. *Araliaceæ*. The species *G. scabra*, a native of Chili, is remarkable for its enormous leaves, which are sometimes eight feet across. Its fleshy leaf-stalks, which resemble those of the rhubarbs in appearance, are eaten. Its roots are astringent.

GUNNERY, *gun'-ner-e*, the science which treats of the theory of the flight and motion of projectiles discharged from cannon and small-arms, and teaches the method of employing these weapons in the most effectual manner, for the purposes of attack and defence. The earliest treatise on the path described by a projectile during its flight, seems to be one written by a mathematician named Sartalea, about the middle of the 16th century. Galileo demonstrated that a shot fired from a gun would trace a parabolic curve in its passage through the air, if the resistance of the air had no influence, as it has, in materially altering the form of the path it describes. It will be readily understood, that if the resistance of the air and the attraction of gravitation could be removed, or, in other words, if a shot could be fired *in vacuo*, it would go on for ever in a line corresponding to that of the axis of the piece, produced indefinitely, with the same initial velocity, or the velocity which it possessed when it left the cannon's mouth. But supposing the effect produced by the influence of the air to be neglected, and gravity alone to act on the ball, it is found that the action of gravitation constantly acting on the projectile at every point of its flight, in a line which may be considered as perpendicular to the horizon, tends to draw it out of the straight line, which it would have described if the force of gravity did not exist, and eventually brings it to the ground, after describing a parabolic curve. It was generally considered by mathematicians, from the time of Galileo, that the path of a projectile was that of a parabola, and that the resistance of the air had but little, if any influence, in altering its form; but it was reserved for Newton to show that its true path, under the combined influence of the resistance of the air and the attraction of gravitation, was that of an hyperbola while passing through a medium offering a uniform resistance. He also showed that the resistance offered by the air to a projectile during its flight is proportional to the square of the velocity of the projectile, the resistance to spherical bodies also varying as the squares of their diameters and the density of the medium through which they pass. To determine and calculate the time of flight, the horisontal range, and the greatest height to which a shot will rise during its flight, requires a knowledge of trigonometry. It may, however, be said, that the range and time of flight depend entirely on the charge and the elevation of the gun. The greater the charge, the greater will be the range and the velocity imparted to the shot up to a certain point; and the same holds good with regard to elevation, provided that the same charge be used in firing each shot, at the different elevations. A knowledge of the time in which a projectile will describe its flight is most necessary, especially in firing shells, that the gunner may know how to regulate the length of the fuse, to insure the bursting of the shell at the time of reaching the object at which it is discharged. This is taught by the study of gunnery, which also makes the military engineer acquainted with the effect produced by shot when discharged in masses, and for a long time against wood, stone, and other materials, under various circumstances; and gives him data for the construction of walls, bomb-proof roofs, and vessels of sufficient strength to offer effectual resistance to the weight of the projectiles that may be directed against them. The effect of the resistance of the atmosphere to the motion of a projectile is one of the most important sections of the science of gunne It has engaged the attention of some of the most eminent philosophers, both in ancient and modern times, on account principally of the great difficulty of determining, by experiment, the correctness of any particular hypothesis. Much difference of opinion is entertained as to the absolute effect of this retarding force (which is, in fact, the science of aëro-dynamics) upon bodies moving in the atmosphere with great velocities; and although sufficient is known to guide the practical gunner, still, as a scientific question, it is one of considerable interest, from the fact of its solution being so difficult, more than of its practical importance. Dr. Hutton, in his "Mathematical Tracts," draws the best hypothesis on the subject; and although some of his results have been disproved by experimentalists who have inquired into the theory, and tested its results, since the time of Dr. Hutton, yet his deductions being generally found correct, are by far the most trustworthy to follow by any one who wishes thoroughly to investigate the science of aëro-dynamics. The resistance which a body meets with in its motion through the air will first depend upon its velocity, and the form and magnitude of the surface opposed to the fluid; secondly, upon the density and tenacity of the fluid, or cohesion of its particles, and also upon the friction which will be caused by the roughness of the surface of the body; and, thirdly, upon the degrees of compression to which this fluid, supposing it to be perfectly elastic, is subjected, as on this depends the rapidity with which it will close in and fill the space behind the body in motion. With regard to the velocity of the body, it is evident that a plane moving through a fluid in a direction perpendicular to its surface must impart to the particles of the fluid with which it comes in contact a velocity equal to its own; and from this cause alone the resistances should be in the proportion of the velocities; but the number of particles struck by the moving body in a certain time being also as the velocity, it follows from these two causes combined, that the resistance of a fluid to a body in motion, which arises from the inertia of the particles of the fluid, will be in the due proportion of the square of the velocity imparted to the moving body. Secondly, a body moving in a fluid must overcome the force of the cohesion of those parts which are separated, and the friction; both of which forces are totally independent of the velocity. The total resistance, therefore, from cohesion, friction, and inertia, will be partly constant and partly as the square of the velocity. Besides, the number of particles struck and the number that are separated will be as the densities of the media;—from which we draw the following formula:—Let *d* represent *the density of the fluid*, *v* *the velocity of the moving body*, *a* *the constant coefficient for inertia*, and *b* *the coefficient for cohesion and friction*: then $adv^2 + bv$ will be proportional to the whole resistance. The resistances, therefore, are as the squares of the velocities in the same fluid, and as the

squares of the velocities multiplied by the densities in different fluids. Thirdly, if the body can be moved so rapidly that the fluid cannot instantly rush in behind it, as is found to be the case in the atmosphere, the resisting power of the medium must be considerably increased; for the projectile being deprived of the pressure of the fluid on its hind part, must support on its fore part the whole weight of a column of the fluid, over and above the force employed in moving the portion of the fluid in contact with it, which force is the sole source of resistance in the discontinued fluid. Also, it must be added, that the condensation of the air in front of the body will influence considerably the relation between the resistances and the velocities of an oblique surface; and it is probable that, although the resistances to a globe may, for slow motions, be nearly proportional to the squares of the velocities, they will, for great velocities, increase in a much higher ratio. The recoil of a gun must necessarily diminish the velocity of its projectile; and this has been carefully borne in mind by men who have made gunnery their especial study, as Sir William Armstrong and Mr. Whitworth. It must be also remembered, that the increased extent of range and the greater certainty of hitting the object against which the firing is directed, is due to the method of rifling or grooving the interior of the bore of the piece, which imparts rotation to the missile after it has left the muzzle of the gun. The use of elongated shot and shell also contributes greatly to this result, as they do not present a greater amount of surface to be acted on by the air than spherical shot; but, in consequence of their greater weight, they possess a far greater power of maintaining their initial velocity. It is difficult to treat on such a subject in a satisfactory manner without entering fully into details; and this renders it manifestly impracticable to do more in the present instance than to give the briefest sketch of the objects and nature of the science of gunnery, the theory of which belongs entirely to the higher branches of mathematics.—*Ref.* Robins's *New Principles of Gunnery*; Hutton's *Mathematical Tracts*; Sir Howard Douglas's *Treatise on Naval Gunnery*; Boxer's *Treatise on Artillery*.

GUNPOWDER, *gun'-pow-der*, a mixture of nitre, charcoal, and sulphur, in proportions which vary slightly in different countries, and according to the uses to which it is applied. Its action is dependent on the rapid oxidation of the charcoal by the nitre, and the sudden evolution thereby of heated gas. The powder which appears to have the greatest propelling force is that which contains an equivalent of nitre and sulphur united to three of carbon. Many other chemical detonating compounds have been proposed, but none of them are equal to gunpowder as at present manufactured; the principal objections to their use being the comparative danger attendant on their manufacture and transport, and the too sudden evolution of gas at the time of their ignition. The following table contains the composition of most of the varieties of gunpowder:—

| | *Nitre.* | *Charcoal.* | *Sulphur.* |
|---|---|---|---|
| England | 75 | 15 | 10 |
| France, Prussia, United States | 75 | 12·5 | 12·5 |
| Austria | 76 | 11·5 | 12·5 |
| Sweden | 75 | 9 | 16 |
| China | 75 | 14·4 | 9·6 |

GUNPOWDER, LAWS RELATING TO.—In consequence of the danger arising from carelessness with regard to gunpowder, its manufacture and sale is regulated by several statutes. By 12 Geo. III. c. 61, it is enacted that no person shall use mills, or other engines for making gunpowder, or manufacturing the same, in any way, except in mills or other places which were actually in existence at the time of the passing of that act, or which, if erected afterwards, have been sanctioned by a license, under pain of forfeiting the gunpowder and two shillings a pound. It is further enacted that no mill worked by a pestle shall be used in making gunpowder, under the above penalty; and not more than 40 lbs. is to be made at one time under a single pair of millstones, nor shall more than 40 cwt.





be dried in any one stove or place at any one time (altered by 23 & 24 Vict. c. 130, to 50 lbs. and 50 cwt. respectively); which act also declares the quantity to be pressed at one time not to exceed 10 cwt., or the quantity to be corned 12 cwt. In terms of this act there must be a store magazine of brick or stone at least 140 yards distant from any house used in making powder. No dealer is allowed to keep more than 200 lbs., nor any person not a dealer more than 50 lbs., except in licensed mills, or to the amount of 300 lbs. for the use of collieries, and within 200 yards of them. By 23 & 24 Vict. c. 130, not more than 30 barrels are to be carried at once by land carriage, except in an inclosed wooden van, which may contain 40, or if it form part of a railway train, it may contain 100. Not more than 500 barrels at once to be conveyed by water, except in vessels importing or exporting, or going coastwise. All gunpowder must be contained in wooden boxes or in barrels, without any iron about them, and well secured, each box containing not more than 100 lbs. Carriages must be completely covered over, and vessels used must have a close deck. To smoke, have fires, lighted candles, or lucifer matches, on such vessel, while the hatches are open, involves a penalty of £5. The exportation of gunpowder may be prohibited at any time by proclamation, or by an order in council. Stringent regulations are enacted by the last-mentioned act regarding the making of percussion-caps, ammunition, fireworks, fulminating mercury, and other explosive compounds. Manufacturers must take out licenses, and not make percussion-caps or fireworks within 50, or ammunition, fulminating mercury, or other such article, within 100 yards of any dwelling-house or other manufactory. Not more than 50 lbs. of gunpowder or 30 lbs. of explosive compound to be in the respective buildings at one time. To sell fireworks without a license, or to a person apparently under sixteen years of age, involves a penalty of £5.

GUNPOWDER PLOT, the name of a conspiracy formed in the second year of the reign of James I. (1604), for the purpose of destroying the king and the parliament at a blow. The Roman Catholics having been disappointed in the expectations of indulgence from King James, Catesby and Percy, two Catholic gentlemen of ancient family, with a few others of the same persuasion, determined to run a mine below the hall in which parliament assembled, and on the first day of the session, when the king and royal family would be present, involve the whole in one common ruin. A house close to the old palace of Westminster was hired by Catesby, and mining operations commenced; but they were obliged to be abandoned. A vault below the House of Lords, which had been used to store coals, being to let, Catesby hired it March 25, 1605, as being admirably suited for their purpose, and two hogsheads and 36 barrels of gunpowder were lodged in it, the whole being covered with sticks and faggots, and the doors thrown open, so as to prevent suspicion. Everything was at length prepared for the execution of the plot, which was arranged for the 5th November, the day on which parliament was to be reopened. An anonymous letter was sent by one of the conspirators to Lord Monteagle on the 26th October, advising him not to attend the opening of parliament; "for God and man hath concurred to punish the wickedness of this time." This he communicated to the secretary of state, Lord Salisbury, who, although apprehending nothing, thought proper to lay it before the king. James saw the matter in a more serious light, and judging that the threatened danger was from gunpowder, ordered the cellars beneath the parliament house to be searched. There is good reason for believing, however, that Monteagle and James were cognizant of what was going on before this time, and that the letter and this account of the matter were got up for the purpose of concealing the treachery of some of those concerned. The vault was searched on the evening of the 4th November, and Guy Fawkes, an officer in the Spanish service, who was to fire the mine, was found at the door, with a dark lantern, and matches in his pocket. The other conspirators fled to Holbeach House, in Worcestershire, where they were attacked on the 8th November. Catesby, Percy, and a few others, fell sword in hand, and the rest were made prisoners, tried, and executed. An annual thanksgiving was appointed

on the 5th of November, in commemoration of the deliverance of the nation from the perils of the Gunpowder Plot.

Gunshot Wounds, *gun-shot wounds*, is a term employed in Mil Surg. to denote wounds produced by cannon-balls, bullets, &c., striking against the body. They differ in many respects from ordinary wounds, and constitute a distinct branch of science of themselves. Frequently, on a person being struck, he is not conscious of any pain, and he is first made aware of his wound by inability to use the part, or by feeling the blood trickling down. Generally, if the wound be at all severe, the patient becomes deadly pale, trembles, and seems about to die; but usually, with the aid of stimulants, these appearances pass off in a few hours. If they continue unabated, they give reason to fear the worst. It was long a generally received opinion that a person might be injured by the "wind of a shot," without being struck by it at all; but this idea is now exploded, for persons have had portions of their clothes carried off by large shot, and even their ears or noses shot off without at all suffering from the wind of the shot. The real cause of such injuries is a ball whose force has perhaps been somewhat spent by previous obstacles, striking the part obliquely, and then glancing off, not breaking the elastic skin, but breaking or bruising the parts underneath. When a ball enters the body, the wound appears somewhat smaller than the ball itself; its edges are ragged and inverted, and the part around has a bluish or black colour from the bruise. When it passes through the part, the aperture by which it makes its exit presents quite a different appearance. It seems somewhat larger than the ball, the edges are everted, and there is little discoloration about the wound. Frequently a ball, if it enter obliquely, or be nearly spent, instead of pursuing a straight course, becomes deflected, and may be found lodged in, or may pass out at a part at a considerable distance from that at which it entered. One is said to have passed completely round the neck, and to have been found close to the aperture by which it had entered. Excessive bleeding is not so common after gunshot wounds as after other kinds; but it sometimes occurs, and may be fatal if not attended to. Where it can be done, the finger should be inserted into the wound, and pressed upon the vessel, otherwise a handkerchief should be tied very tightly round the limb above the wound. It is well to examine the wound as early as possible, in order to ascertain the amount of injury; at least, so far as this can be done without aggravating the case. The ball or other foreign substance ought to be removed, if that can be easily effected; but otherwise they ought, in the mean time, to be let alone. As the walls of the wound slough and suppurate, the opening will become larger, and they may then fall out, or be easily removed. Sometimes they remain embedded in the tissues, without producing much or any inconvenience. If, after the sloughing and suppuration, the ball remains fixed, and if much irritation continues to be excited, and abscesses form about its track, then it may be necessary to find out its seat, and use every means to remove it. The simplest dressings should only at first be applied to the wound: as a piece of linen, spread with some mild ointment, fixed on lightly by strips of adhesive plaster, and covered with a rag kept constantly moist with cold water. Aperient medicine should also be given, and sometimes it is advisable to bleed the patient. After a few days, when suppuration has set in, the treatment should be changed, and in place of the cold application, some warm emollient poultice, or lint dipped in warm water, should be adopted, and the system strengthened by mild tonics and a nutritious diet. The inflammation which precedes suppuration is usually very intense, accompanied with great swelling, heat, and pain of the surrounding parts and severe constitutional disturbance, fever, sleeplessness, &c. These symptoms change when suppuration is fairly established, the surrounding inflammation is lessened, the fever subsides, and in slight cases the health may seem but little affected. In severe cases, however, hectic fever supervenes, with debility, copious night sweats, and diarrhœa. Secondary hæmorrhage not unfrequently occurs during the separation of the slough, in consequence of the ulceration of some of the larger blood-vessels, which may have been injured by the ball. In such a case, the vessels must be cut down upon, and tied both above and below the opening. In cases where the parts beneath are greatly bruised, but the skin itself is not broken, it is recommended to make one or two incisions, in order to clear out some of the coagulated blood, and to permit the discharge of the slough. Where the injury is very considerable, it is sometimes necessary to have recourse to amputation. When it may be necessary to adopt this course will depend upon the circumstances of each particular case; no general rule can be laid down regarding it. In military practice, however, it is often necessary to amputate in cases where, in civil practice, it would be scarcely justifiable, from the danger in healing being less, its not requiring so much attention, &c. The best time for amputating is immediately after the patient has recovered from the depressing effects which usually follow the reception of the wound.—*Ref.* Hunter *on Gunshot Wounds*; Guthrie *on Gunshot Wounds of the Extremities*; Larrey's *Mémoires de Chirurgie Militaire*; *English Cyclopædia*—Arts and Sciences.

Gunter's Chain, *gun'-ter-z*, a chain commonly used in the mensuration of land, and so named from its being invented by Mr. Gunter, a celebrated mathematician. The chain is 66 feet in length, and is divided into 100 links, of 7·92 inches each; from which arrangement, an acre of land is equal to 10 square chains.

Gunwale, or Gunnel, *gun'-nel* (Ang.-Sax.), the upper edge of a ship's side; the uppermost wale of a ship, or that piece of timber which unites on either side from the quarter-deck to the forecastle.

Gut Manufacture. (*See* Catgut Strings.)

Gutta-percha, *gut'-tä pert'-shä*, the concrete juice of the *Isonandra Gutta*, a tree belonging to the fam. of the *Sapotaceæ*. (*See* Isonandra.) It grows abundantly in Singapore, Borneo, and other islands of the Eastern Archipelago. The tree which is called *percha* grows to the diameter of five or six feet, and, on being notched, yields a milky juice, which solidifies after exposure to the air, forming the gutta-percha of commerce. It is a tough, inelastic substance, becoming soft and plastic at 212°, at which temperature it may be moulded into shape, which it retains without change until it is cool. Its plastic properties render it extremely useful in the arts, and it is much employed for copying casts and impressions. Beautiful mouldings, picture-frames, and a number of ornamental articles, are made from it. It also possesses the valuable property of welding together at the temperature of boiling water. It is a powerful insulator, and is consequently much used for coating the wires for telegraphic purposes. Being impervious to moisture, and resisting the actions of acids and alkalies to a great extent, it is of much use to the chemist as a material for making bottles, carboys, baths, &c. It was at one time much used for lathe-bands; but it has been superseded in a great measure by those made of vulcanized rubber. It is insoluble in water, but dissolves in benzole, chloroform, bisulphide of carbon, turpentine, and the essential oils in general. Payen states that the purified gutta-percha of commerce consists of 75 to 80 per cent. of chemically pure gutta-percha, which is insoluble in ether and alcohol, and a white and yellow resin, soluble in boiling alcohol. The crude lumps are imported in the forms of fish, animals, and blocks, which are softened by boiling water, and passed through a series of kneading, rolling, and cutting machines, by means of which all the stones and other solid matters are extracted. It is then submitted to the action of masticators, and rolled or fashioned into the desired shape. It may be rolled into thin transparent sheets, which are much used for surgical puposes, being perfectly impervious to moisture. Dr. Cattell, of London, has succeeded in purifying gutta-percha so perfectly from all extraneous matter, that it presents the appearance of ivory. In its purified condition it is useful for a thousand different purposes.

Gutta Serena. (*See* Amaurosis.)

Guttifere, or Clusiaceæ, *gut-tif'-e-re* (Lat. *gutta*, a drop; *fero*, I bear), in Bot., the Gamboge or Mangosteen fam., a nat. ord. of *Dicotyledones*, sub-class *Thalamiflora*, consisting of tropical trees and shrubs having the following diagnostic characters:—Leaves

opposite, simple, coriaceous, and exstipulate. Sepals and petals usually exhibiting a binary arrangement of their parts; the former imbricated and frequently unequal, the latter equal and hypogynous. Stamens almost always numerous; anthers adnate, without a beak, opening by a pore or transversely. Disc fleshy or lobed. Ovary superior, with sessile radiant stigmas and axile placentæ. Seeds exalbuminous. The larger proportions of the plants of this order are natives of South America; but a few occur in Madagascar, and on the African continent. There are 32 genera, including about 150 species. They are chiefly remarkable for yielding a yellow gum-resin of an acrid and purgative nature. In many cases, however, the fruits are edible, and are held in high estimation for their delicious flavour. (*See* GARCINIA, MAMMEA, MESUA.)

GUTTURALS, *gut'-tu-rals* (Lat. *guttur*, the throat), is a name given, in Gram., to certain sounds formed in the throat or back part of the mouth. In English there are, properly speaking, no gutturals; but the palatals, *g* and *k*, are nearly allied to them. In the Spanish language alone, of those derived from the Latin, are gutturals common. In German, the guttural *ch* is very common, as it was also in Greek; and it occurs in Scotch in such words as *loch*. The Arabian language is full of gutturals.

GUY-ROPE, *gi*, a lesser rope or ropes used to steady an extended cable. The guy-ropes extend laterally on each side of the central cable, and by being fastened at different intervals, keep the cable from swaying to and fro. They are more generally used in steadying the cables on which rope-walkers and dancers practise their perilous vocation; and the breaking of a guy-rope often leads to disastrous results.

GUY'S HOSPITAL is a celebrated hospital of London, founded by Thomas Guy, a wealthy bookseller. The foundation-stone of the building was laid in 1722, and the first patient was admitted in January, 1725, a few days after the death of the founder, who had reached the age of 80. The building of the hospital cost £18,783, and he further endowed it with a sum of £219,499; making in all £238,295. In 1829 Mr. Hunt, of Petersham, bequeathed £196,115 to this charity, to provide for accommodation for one hundred additional patients. The annual income of the hospital is now nearly £30,000, and the average number of patients received, about 3 · ·; besides 50,000 out-door patients.

GYMNASIUM, *jim-nai'-ze-um* (Gr. *gumnos*, naked), was the name given by the Greeks to those places in which their youth exercised themselves naked. The gymnasia of the Greeks and Romans were looked upon as an important part of their educational systems. The Greeks, indeed, devoted more time to the gymnastic training of their youths than on all the other departments of education. There were three public gymnasia in Athens,—the Academia, Lyceum, and Cynosarges, besides several smaller private ones. The administration of these institutions was given to a gymnasiarch, whose duty it was to place the youths under proper teachers, to conduct the games, and pay the athletæ. In these gymnasia there appear to have been ten gymnasiarchs; next in rank came ten other officers, called the *Sophronistæ*, or "teachers of wisdom," who seem to have looked after the moral development of the pupils at the gymnasium. The *Gymnastæ* and *Pædotribæ* assigned to the youths the different kinds of exercise adapted to the capabilities of each. The *Aliptæ*, or "anointers," prepared the youths for the day's exercise, by anointing them with oil, and then sprinkling them with dust. In the gymnasium the principal exercises were foot-racing, wrestling, boxing, leaping, quoit-throwing, dancing, &c.; and the younger pupils played a variety of games with balls, tops, &c. The gymnasium of the ancients was not one building, but rather a group of edifices, which could contain a vast number of people. It generally consisted of twelve parts:—The exterior porticos, where the philosophers, rhetoricians, mathematicians, and others, disputed or lectured publicly. Secondly, a place where the pupils assembled early to learn their exercise privately. The next, a sort of antechamber, called the *coryceum*, *apodyterion*, or *gymnasterion*, where they stripped either for the purpose of bathing or exercise. The fourth division was used for anointing purposes, and was called the *elæothesium*, *alipterion*, or *unctuarium*. The fifth and sixth portions were the *conisterium*, where they covered themselves with sand or dust; and the *palæstra*, the place where they practised boxing, wrestling, &c. A seventh portion of the gymnasium was reserved for ball exercise, and was called the *sphæristerion*. The *xysti* were porticos where the wrestlers contended during inclement weather; and there were other *xysti*, or open alleys, for fine weather, some of which were ornamented with trees. Between the porticos and the outer walls there were also large unpaved alleys used for various purposes. Lastly, there was the *stadium*, a large semicircular space covered with sand, and surrounded by seats for spectators; and the baths, which consisted of several apartments. In Rome, during the Republic, there were no buildings which could be compared with the Greek gymnasia. Under the Cæsars, the public baths bore some resemblance to them, but the gymnasia may be said to have disappeared with the thermæ. The name is employed, in the present day, to designate the higher class of schools in Germany,—those that are intended to be immediately preparatory to the university. The gymnasia differ from the real schools (*realschulen*), which are intended to give a suitable education for such as are destined for business or trade, in having as their object the bestowing of a mental and scientific education on such as are intended for the universities. The course of study usually extends over six or seven years, and includes Latin and Greek, history, geography, mathematics, religion and bible knowledge, natural and mental philosophy, natural history, German, French, English, and singing. The scholars leave about the age of 18 or 20, to enter the university; but on leaving they are required (in Prussia at least) to undergo a very strict examination before they can enter the university; and, indeed, they cannot pass from one class to a higher without giving satisfactory evidence that they have profited by their instructions. Not a few are, in this way, condemned to spend two years in one class. A committee is appointed by government for the examination of such as intend entering the university without passing through a gymnasium.

GYMNASTICS, *jim-nas'-tiks* (Gr. *gumnastikē*, from *gumnos*, naked), a term applied to those exercises of the body and limbs which tend to invigorate and develop their power. Gymnastic games are of very ancient origin. They are mentioned in the second book of the Iliad, where playing at quoits and javelin-hurling are mentioned; and in the 23rd book, where Achilles is represented as instituting games in honour of Patroclus, in which the sports were chariot-racing, boxing, wrestling, quoit-throwing, &c. Later on, games of this kind were dedicated to the gods, and the rewards being called *athla*, gave origin to the name of *athletæ*, applied to those who contended for them. Shortly before the time of Hippocrates, gymnastics were made a part of medicine, and gradually they were reduced into a complete system. Public buildings, called gymnasia, were erected for the purpose, and officers for their superintendence were appointed by the state. The Romans erected gymnasia on a magnificent scale; and on account of the extensive baths which were attached to them, they were latterly called *thermæ*. Among the exercises practised in these gymnasia, were dancing, wrestling, boxing, running, leaping, quoit-throwing, and hurling. Besides these, which formed the regular business of the gymnasium, were riding, driving, swimming, rowing, climbing ropes, swinging, mock fights of various kinds, &c. Various causes in later times have combined to cause gymnastics to go out of use as a part of education and a method of maintaining health. Modern warfare depends so much on military science and a knowledge of gunnery, and so little on physical strength, that military gymnastics have been much overlooked. It is only since the commencement of the present century that gymnastic exercises have been revived as a science. In 1806, the revival began in Prussia, when gymnasia were opened, and the science became so popular that it rapidly attracted attention. Sweden imitated Prussia; and from that time the practice of gymnastics has formed a leading feature in the course of education in both countries. As the gymnasia in Prussia began to be the scenes of political meetings

of a kind offensive to the government, they were abolished in 1818. The practice of gymnastics was, however, kept up by the troops, and with such evident success that a similar course of training was adopted in the French army in 1844. England was late in recognizing the advantages of this kind of training; but the troops at Aldershot and other camps are now regularly instructed in the science. Gymnasia have, however, been long in use in private life in this country. The gymnastic exercises adopted by the pugilists and wrestlers of the present day in their course of training are not able to produce on the mind or body any desirable effect; and the same was observed in the condition of the athletæ of old. But gymnastic exercises, practised under proper control, must act beneficially, both mentally and physically. As Montaigne observes, "It is a soul, not a body only, which we educate; it is a man, of whom we must not make two; we must not train the one without the other, but must guide and lead them like a pair of horses harnessed to one shaft." Gymnastics act upon the courage, and produce independence and presence of mind. Besides being a suitable interruption to mental labour, and the best recreation after it, they produce cheerfulness, and restrict the fancy and imagination to reasonable limits. "If you wish to develop the mind of a pupil," says Rousseau, "develop the power which that mind has to govern; exercise his body; make him healthy and strong, that you may make him prudent and reasonable." The gymnastic system of Ling, referred to in the article EDUCATION, is considered one of the best methods of training now in use. Under the name of free exercises, in Ling's system, are included such exercises as are performed without the help of technical apparatus, such as ropes, ladders, dumb-bells, &c. The different species of free exercises consist, first, in movements of the limbs on the spot, and without reciprocal support: second, in movements from the spot, and without support; third, in movements with support; fourth, in wrestling exercises; and fifth, in the exercises belonging to æsthetic gymnastics. The freedom of Ling's method from violent exertion, and the physiological principles on which it is founded, render it superior to every other system. In general all methods of instruction are divided into a number of courses regularly graduated, beginning with elementary and particular movements, so as to render every part of the body pliant, and to develop the muscles. These exercises are called elementary gymnastics; while exercises in leaping, vaulting, climbing, swinging, walking on stilts, &c., are called applied gymnastics. In ordinary gymnasia, the principal apparatus employed consists of the horizontal pole, the parallel bars, the masts or poles, the ropes, the triangle and trapèze, the ladder, the wooden horse, the inclined plane, and the flying-course, or giant's stride. The horizontal pole is used in order to develop the strength of the hands and arms, though many other exercises are performed on it. The parallel bars are mostly about 8 feet long, and fixed about 2 feet apart, at a height of 3 or 4 feet from the ground. The exercises upon them, which are of great variety, tend to strengthen the arms and chest, and to render the body pliant. The masts and poles, which vary in their inclination, are used for climbing purposes. The triangle and trapèze afford more amusement than any other instrument used in modern gymnasia, as the lightness of their construction, and their being constantly in motion, make the evolutions performed on them appear easy and graceful. The wooden ladder and the rope ladder are used generally to render the body supple. The wooden horse, which can be lowered or raised on its stand when required, is for exercise in vaulting and leaping. The inclined plane, usually a deal plank, between 30 and 36 feet in length and 2 feet in breadth, is used for a variety of exercises, tending to strengthen the hands, arms, chest, abdomen, legs, and feet. The flying-course, or giant's stride, is an amusing exercise, but is not superior to any of the others in its effects. The national games of England by themselves contain nearly all the advantages to be got by gymnastic exercises. These games, although not all, perhaps, originally belonging to this country, have been adopted, and have become peculiarly national through their popularity and regular improvement. Wrestling, a thoroughly English athletic sport, is only known theoretically on the continent. Boxing, an exercise which brings every muscle into action, gives elasticity to the limbs, improves the play of the lungs, gives quickness of eye and accuracy in measuring distances, is a practice particularly belonging to this country. As a nation, also, our recorded feats in riding, walking, and running, may challenge all Europe. Archery, from a very early period, has been a favourite pastime in which the English have excelled. The game of cricket is essentially English, and other games, such as golf and curling, belong almost exclusively to Scotland. In all cases gymnastic exercises of every kind should be practised with caution and moderation. Although the dangers connected with the practice of gymnastics are often exaggerated, nevertheless muscles may become strained through excess, and ruptures and other serious accidents occur.—*Ref.* Capt. Chiosso's *Gymnastics and Calisthenics*; G. Roland's *Gymnastics*; Walker's *British Manly Exercises*; and the *Gymnastic Free Exercises* of P. H. Ling, translated by M. Roth, M.D.

GYMNEMA, *jim-ne'-mă* (Gr. *gumnos*, naked; *nema*, filament), in Bot., a gen. of the nat. ord. *Asclepiadaceæ*. The species *G. lactifera*, a native of Ceylon, yields a nutritious milk, which is used as human food. It is called, on this account, the cow-plant.

GYMNOGENS, *jim'-no-jens* (Gr. *gumnos*, naked; *gennao*, I produce), a term applied in Lindley's Botany to those plants which are distinguished by having the seeds naked, or unenclosed by seed-vessels. The plants included in this class have nearly an equal relation to flowering and flowerless plants. They agree with the former in habit, in the presence of sexes, and in their vascular tissue being complete; among the latter, some accord in habit with the ferns and club-mosses. So great is the resemblance between some club-mosses and certain conifers, that they can be distinguished by no other external character except their size. Gymnogens are known from most other vasculares by the vessels of their wood having large apparent perforations or discs; they do not, however, differ in growth from other exogens, but are essentially the same, deviating in no respect from the plan upon which exogenous plants increase. In the gymnogens there is an unmistakable transition from the highest form of organization to the lowest. They are essentially exogens in all that appertains to their organs of vegetation, but they are analogous to reptiles, in the animal kingdom, inasmuch as their ova are fertilized by direct contact with the male principle. The Conifers and Cycads are the most remarkable orders. That of the Conifers is connected with club-mosses by means of the extinct genus *Lepidodendron*, and their branches sometimes so closely resemble those of certain lycopods that no doubt can be left of their relation. Some cycads have the gyrate vernation of the leaves of true ferns along with the inflorescence of conifers. The natural orders of the gymnogens are,—the *Cycadaceæ*, the *Pinaceæ*, the *Taxaceæ*, and the *Gnetaceæ*.

GYMNOSOPHISTS, *jim-nos'-o-fists* (Gr. *gumnos*, naked, and *sophistes*, a wise man), the name given by the ancient Greeks to a sect of Indian philosophers who went about naked, or almost naked. They dwelt in the woods, living on the wild products of the earth, and had a great reputation for learning and wisdom. They spent their time in mystical contemplation, and practised the most rigorous asceticism. Their most prominent tenet was the doctrine of the immortality and transmigration of the soul, and they were remarkable for their great contempt of death. They despised bodily pain, and inured themselves to the greatest tortures without manifesting the least indications of suffering. They practised suicide by burning, and in this way Calanus sacrificed himself at Babylon before Alexander the Great.

GYMNOSPERMS, *jim'-nos-perms* (Gr. *gumnos*, naked; *sperma*, seed), in Bot., flowering plants with naked seeds, that is, with ovules not inclosed in an ovary. They are so called in contradistinction to the *Angiosperms*, which have their seeds inclosed. The gymnosperms are made into a distinct class (*Gymnogens*) in Lindley's arrangement. In the arrangement adopted in this work, they constitute a division of the class *Dicotyledones*. (*See* ANGIOSPERMS.)

GYMNOTUS ELECTRICUS. (*See* ELECTRICAL EEL.)

GYNANDROUS. (*See* GYNOSTEMIUM.)

GYNŒCIUM, *je-ne'-shee-um* (Gr. *gune*, female; *oikos*, house), in Bot., a term applied to the female or pistilline organs of a flowering plant taken collectively. (*See* PISTIL.)

GYNOPHORE. (*See* RECEPTACLE.)

GYNOSTEMIUM, *jin-os-te'-me-um* (Gr. *gune*, female; *stemma*, crown), in Bot., a column formed in the centre of a flower by the complete union of the upper parts of the stamens and the pistil. Examples are afforded by the orchis and birthwort. Flowers that show this peculiar union are said to be *gynandrous*.

GYPSIES, *jip'-seez*, a term derived from a corruption of the word Egyptians, and applied to a wandering race of people, who are found distributed over many countries of Europe and Asia. They seem to have migrated into Europe from the East, at the beginning of the 15th century; and first appeared in Paris in 1427, representing themselves as Christian penitents, driven out of Egypt by the Saracens. They were more than a hundred and twenty in number, and, according to a French writer, "They had their ears pierced, from which depended a ring of silver; their hair was black and crispy, and their women filthy to a degree, and were sorceresses, who told fortunes." They and their people, who arrived in great numbers, obtained permission to remain in the kingdom; but after a short while, on account of their idleness and depredations, terrible laws were enacted, in order to suppress them and drive them from the country. The name of "Bohemians" was given to them by the French, probably because a large number of them had come into France through Bohemia. Many, in consequence of the severity shown towards them, were driven back into the woods and forests of the same country; others passed into Germany and Hungary; while bands of others swarmed over the Pyrenees, and poured down upon the plains of Spain. The names by which the gypsies are known, differ with the country in which they are found, although, with one or two exceptions, not materially. In Russia they are styled Zigani; in Turkey and Persia, Zingarri; and in Germany, Zigenner; all which words apparently spring from the same root, probably "Zingali," a term by which these people, and especially those of Spain, sometimes designate themselves, and the meaning of which is supposed to be "the black men of Zend, or Ind." The Zigani are found in all parts of Russia, except in the government of St. Peteraburg, from which they have been banished. Their principal employment is trafficking in horses and curing the diseases of cattle. In Moscow, however, they have given up their wandering habits, and inhabit stately houses, and go abroad in elegant carriages, being behind the higher orders of the Russians neither in appearance nor mental acquirements. The females are celebrated for their vocal powers. The Czigamy, or Hungarian gypsies, live in rags and filth, but are merry, and fond of music. They are addicted to horse-dealing, and are tinkers and smiths in a small way; the women tell fortunes, and both sexes are incorrigible thieves. In Wallachia and Moldavia, they call themselves Roumouni, and in all countries the gypsies style themselves, and the language which they speak, Rommanny. In the gypsy language, Rom means a husband, and Rommanny the sect of the husbands. Although no country appears less adapted for this wandering life, which seems so natural to these people, than England, it is nevertheless true that they do exist here, and the covered cart and little tent of the Rommanny seldom remain more than a day or two in one place. When the gypsies first arrived in England, they were much persecuted. After a time their persecutors got weary of pursuing them, and at present they are considered in some degree as a privileged people. Although their way of life is unlawful, it is connived at, the law of England having discovered, by experience, that its utmost fury is inefficient to restrain them from their habits. The male gypsies in England are all dealers in horses, and sometimes employ their idle time in mending the tin and copper utensils of the peasantry; the females tell fortunes. In all countries the gypsies are very handsome when young, but hideously ugly when they grow old. The climate of England is favourable to beauty, and in no land is the appearance of the gypsy so prepossessing as in this country. The dialect of the Rommanny which they speak is tolerably pure, but mixed with English words. Dabbling in sorcery has always been a profession of the gypsies in all times and countries, and is especially the province of the females. They are divided into classes or tribes in England, and the principal gypsy tribes now in existence are the Stanleys, whose haunt is the New Forest; the Lovells, who are fond of London and its vicinity; the Coopers, who live round about Windsor; the Smiths, who have taken up their abode in East Anglia; and the Hernes, who have appropriated the North of England, and Yorkshire in especial.

GYPSOPHILA. (*See* CARYOPHYLLACEÆ.)

GYPSUM, *jip'-sum* (Lat.), a term applied to amorphous sulphate of lime, from which plaster of Paris is made. It is also found in crystals as *selenite*, in compact semitransparent masses as alabaster. It has evidently been formed by the decomposition of the iron pyrites, giving rise to sulphuric acid, which, uniting with the chalk, formed sulphate of lime. Plaster of Paris is made by heating gypsum to about 250° Fahr., and powdering the calcined mass. Gypsum is also used as a manure. The addition of 1 or 2 per cent. of many salts, such as alum, sulphate of potash, or borax, confers upon gypsum the property of setting slowly into a mass capable of receiving a very high polish. When treated in this way, it is known as Keane's, Martin's, and Keating's cement.

GYR-FALCON. (*See* GER-FALCON.)

GYROMANCY, *jir'-o-măn-se* (Gr. *guros*, a circle, and *manteia*, a prophecy), is a kind of divination performed by a soothsayer, by means of a circle. The soothsayer usually describes a circle variously marked with letters, and then walks round it with various ceremonies, saying magic words and making mysterious motions, the more effectually to deceive the uninitiated.

GYROPHORA, *je-rof'-o-rā*, in Bot., a gen. of lichens, several species of which possess nutritive properties, and are used as food in the arctic regions. They have been denominated *tripe de roche* (rock-tripe). Franklin and his companions, in 1821, used them, and indeed owed their preservation, in a great measure, to the nutriment they afforded. The species *G. pustulata* is one of the lichens used in this country by the manufacturers of orchil and cudbear.

GYROSCOPE, *jī'-ros-kope* (Gr. *guros*, a circle or rotation; *skopeo*, I perceive), an instrument which has recently attracted attention on account of its supposed capability of rendering visible the rotation of the earth on its axis. The apparatus was originally suggested by M. Foucault, but has since been materially modified. The principle on which its action depends was discovered about 1750, by Frisi, and enunciated by him as the Composition of Rotary Motions; and the object of the instrument is to exhibit the real composition of rotations about different axes impressed at the same time on the same body. Thus, when a body is rotating about an axis, if any force tends to make it rotate about another axis, it will not rotate about either the old or the new axis, but about an intermediate one. In 1851, Signor Antinori, director of the museum at Florence, first brought the subject of the *apparent* displacement of the plane of vibration of the pendulum before the Academicians del Cimento; and on the 3rd of February, in the same year, M. Foucault communicated his discovery to the Academy of Sciences at Paris, and experimentally proved the rotation of the earth by his well-known pendulum experiment and his gyroscope. In the first case, if a pendulum is supposed to be suspended over either pole of the earth, and set in oscillation, it is evident that a spectator carried round by the rotation of the earth would so pass alternately under the two ends of the arc of the vibrating pendulum, that its plane of oscillation would appear to him to make a revolution from east to west in the same time as the earth revolves from west to east. If, then, the pendulum be supposed to be similarly suspended over the equator it is evident that no change in the plane of oscillation can take place. But if the pendulum is suspended at any intermediate latitude, the rotation of the earth round the polar axis may be considered as the resultant of two rotations, one round an axis passing through the place of observa-

tion, and another round a perpendicular axis. The rotation about the latter axis cannot, however, affect the apparent motion of a pendulum suspended at the equator of that axis which is the great circle through the place of observation. The pendulum will, therefore, only be affected by a motion round the axis through the place, and this motion will vary as the sine of the latitude. The gyroscope, as an instrument, is an application of the principle in dynamics, that if a mass be set in motion freely in space, it will preserve its original plane of rotation, unless it be disturbed. M. Foucault presented his account of the gyroscope to the Academy of Sciences in 1852; and in his apparatus there is a fixed plane below which the earth turns, and as the spectator is carried with it, causes it to appear to him as if the plane of the disc actually revolved. The experiments which can be performed with the gyroscope illustrate the following principles:—First, that matter in motion, as well as matter at rest, possesses inertia. Secondly, that the power possessed by the shots from rifled guns to resist the force of gravity, is due to the gyratory motion given to the ball. Thirdly, that orbital and axial motions are connected intimately, and mutually affect each other's speed. Fourthly, that the apparent stable equilibrium of bodies not stable, as of a spinning-top asleep, is due to their rotation.—*See* a description of a form of gyroscope by Mr. Wheatstone, in the *Transactions of the Royal Society* for 1854.

GYROSTEMONEÆ, *jir-os-te-mo'-ne-e* (Gr. *gyros*, round; *stemon*, filament), in Bot., the *Gyrostemon* fam., a small nat. ord. of *Dicotyledones*, sub-class *Monochlamydeæ*, allied to the *Phytolaccaceæ*. It is distinguished from that order by having unisexual flowers, the carpels arranged round a central column, two suspended seeds in each carpel, and a hooked embryo. The uses of these plants are not known.

## H.

H is the eighth letter and sixth consonant of the English alphabet. It may, however, be said to be a semivowel rather than a consonant, being pronounced merely by a forcible emission of the breath. The Greeks and Latins never, therefore, considered it as a consonant, but only as a breathing; and in the former language they had no distinct letter for it, but merely a sign. In Latin, many words were written indifferently with or without an *h*; as *arundo*, *harundo*. In those languages in which *h* is considered a consonant or pronounced hard, it is classed with the gutturals. It is a very delicate letter, and is frequently not sounded at all,—the tendency being, as a language gets softened, to make it always lighter. The Italians have almost entirely banished *h* as an independent letter out of their language. It interchanges, in different dialects, with various other letters; as with *c*, as Lat. *decem*, Ger. *zehen*; *ch*, as Gr. *chortos*, Lat. *hortus*; *g*, Lat. *digito*, Ger. *ehe*; *s*, as Gr. *hex*, Lat. *sex*, *f*, as Lat. *foris*, Fr. *hors*; *u* or *w*, as Lat. *homo*, Ital. *uomo*. H, as a Latin numeral, denotes 200, and with a dash over it 200,000.

HABAKKUK, *hăb'-ă-kuk*, is the name of the thirty-fifth in order of the books of the Old Testament, forming one of those of the twelve minor prophets. The author flourished about 600 years before Christ, but little further is known regarding him. The book relates chiefly to the invasion of Judea by the Chaldeans, the overthrow of the Babylonish empire, and the final deliverance of God's faithful people. It may be divided into two parts. In the first, which is in the form of a dialogue between God and the prophet, the latter begins by deploring the desolate condition of Jerusalem (i. 1—4). God foretells the destruction of the Jewish state by the Chaldeans (5—11). The prophet replies by expostulating, that though the Chaldeans may not be entirely destroyed, but is not superior to the Jews, they may be punished (i. 12—ii. 1). The national games of the Hebrews, that the captivity will only be nearly all the advantages of the victors will eventually be exchanged. These games, although the prophet originally belonging to this country, and have become peculiarly attached to his chosen popularity and regular improver





people in times past, and beseeches him to be merciful to them in their captivity (iii.). The style of this prophet has always been much admired: Eichhorn, De Wette, and Rosenmüller are loud in their praises of it, the first giving a detailed and animated analysis of the construction of his prophecies. His figures are all great, happily chosen, and properly drawn out. His denunciations are terrible, his derision bitter, his consolation cheering; while, with all the boldness and fervour of his imagination, his language is pure and his verse melodious. The famous psalm, or ode, in the third and concluding chapter, stands unsurpassed in the whole compass of Hebrew poetry, for the boldness and rapidity of its flights, the sublimity and grasp of its conceptions, the magnificence of its imagery, the music and melody of its rhythm. "He contends," says Eichhorn, "with words, he struggles with images; and who is not seized with a sacred shudder as he reads, like that of the prophet himself, as he beheld the sublime and terrible appearance of the Indescribable." The canonical authority of this book has never been called in question; and it is several times quoted in the New Testament.

HABEAS CORPUS, *hai'-be-ăs kor'-pus* (Lat., that you (the person to whom this writ is directed) have the body of), in Law, is the name of a writ, of which there are several kinds; but the great writ of that name is the *habeas corpus ad subjiciendum*, which, in the case of alleged illegal confinement, is directed to the person detaining, and calls upon him to produce the body of his prisoner, and state the cause of his detention, and receive the award of the judge or court. The personal liberty of the subject has always been regarded by the law of England as a constitutional right, unless forfeited by the commission of some great and atrocious crime. This doctrine has been handed down to us from Saxon times, and though sometimes assailed by the despotism of jealous or usurping princes, it still continued to maintain its ground, and was established on the firmest basis by the provisions of the Magna Charta, and a long succession of statutes enacted under Edward III. It is this which induces the absolute necessity of expressing upon every commitment the reason for which it is made, that the court may, upon a habeas corpus, examine into its validity, and, according to the circumstances of the case, discharge, admit to bail, or remand the prisoner. Yet in the early part of the reign of Charles I., the court of King's Bench held that they could not either bail or deliver a prisoner upon a habeas corpus, though committed without any cause assigned, if committed by the special command of the king, or by the lords of the privy council. This caused a parliamentary inquiry, and produced the Petition of Right, which recites this judgment, and enacts that no freeman hereafter shall be so imprisoned or detained. The court, however, still endeavoured to uphold the prerogative of the crown, and in consequence, the statute 16 Car. I. c. 10, was extorted by the parliament, which enacts that any person committed by the king himself in person, or by his privy council, or any of the members thereof, shall have granted unto him a writ of habeas corpus, upon demand or motion made to the court of King's Bench or Common Pleas, who shall thereupon, within three days after the return is made, examine and determine the legality of such commitment, and do what to justice shall appertain. Still means were adopted to evade this law, until at length the statute 31 Car. II. c. 2, was passed, called the Habeas Corpus Act, which is frequently regarded as another Magna Charta. It provides, that on complaint and request in writing, by or on behalf of any person committed or charged with any crimes (with certain exceptions, as in treason or felony, expressed in the warrant), the lord chancellor, or any of the twelve judges in vacation, shall award a habeas corpus for such prisoner, returnable immediately before himself or any of the other judges; the writ to be returned, and the prisoner brought up, within a limited time, according to the distance, not exceeding in any case twenty days. It has been usual in times of danger to suspend the Habeas Corpus Act; but this can only be done by an act of parliament authorising the Crown for a certain period to imprison suspected persons without assigning cause for so doing. As this act extended only to per

sons committed on criminal charges, all other cases of unjust imprisonment being left to the operation of the common law, the statute 56 Geo. III. c. 100, was passed, which declares that a writ of habeas corpus returnable immediately may be issued to bring up the body of any person restrained of his liberty (other than for some criminal matter), except persons imprisoned for debt, or by process in a civil suit. There are various other kinds of writs of this name made use of by the courts of Westminster for removing prisoners from one court into another for the more easy administration of justice; as the *habeas corpus ad respondendum*, when a man has a cause of action against one who is confined by the process of some inferior court, in order to remove and charge him with this new action in the court above; *ad satisfaciendum*, when a prisoner has had judgment against him in an action, and the plaintiff is desirous to bring him up to some superior court, to charge him with process of execution

HABENDUM, *hăb-en'-dum*, in Law, is the name of a clause in a deed of grant or lease, in which is described the estate or interest granted by the deed.

HABERE FACIAS POSSESSIONEM, *ha-be'-re fa'i-she-as poz-ses-she-o'-nem* (Lat., you may cause to have possession), in Law, is a writ of execution granted to a plaintiff who has obtained judgment in an action of ejectment, whereby the possession of land is awarded to him. It is directed to the sheriff of the county, commanding him to give actual possession to the plaintiff of the land so received; in the execution of which the sheriff is justified in breaking open doors, if necessary, and then delivering over possession to the plaintiff.

HABIT. (*See* CUSTOM AND HABIT.)

HABIT AND REPUTE, *hab'-it, re-pute'* (Ang.-Nor.), a phrase in Scots Law, denoting something well known or generally received. Where a man and woman cohabit as husband and wife, and are generally reputed to be married, this by itself is held by the law of Scotland to constitute marriage, and evidence to the contrary will be of no avail. A habit and repute thief is one who is notoriously such; and this forms an aggravation of the offence, *nominally* rendering it capital, and therefore not bailable.

HABITAT, *hăb'-a-tăt* (from Lat. *habito*, I dwell), in Bot., the country or district in which a plant grows wild; the tract or range to which it seems limited by external conditions of soil and climate.

HABITAT, in Zool., is a term used to express the natural abode or locality of an animal.

HACKNEY-COACH. (*See* VEHICLES.)

HADDOCK, *hăd'-dock* (Irish *codog*), a sub-brachial malacopterygious fish, belonging to the family *Gadidæ*. It is almost as well known, according to Yarrell, as the cod; and from the quantity taken of it at numerous localities around our coast, and the facility with which the flesh can be preserved, it is a fish of some considerable value. The haddock swims in immense shoals, which are in the habit of entirely changing their stations when they visit our coast: they are more abundant from Yarmouth to the Tyne, however, than elsewhere. They are caught with long lines and handlines, and their favourite bait is a herring. The common weight of the fish is about from two to four pounds, although there have been several instances of some weighing as much as ten pounds being seen in the London market. It is said that the haddock is the *asinus*, or *onos*, of the ancients; and there is a superstition which ascribes the dark stripes over the shoulders of this fish to the impression left by St. Peter when he took the tribute-money out of the mouth of one of its species: unfortunately, however, for this superstition, the haddock does not exist in the Sea of Galilee, which is fresh water. The length of the haddock is generally about twenty inches. The body is lance-shape, and the head slopes suddenly from the crown to the point of the nose, which latter projects beyond the mouth. The colour is throughout a dullish grey, with the exception of the belly, which is white.



HADDOCK.

HADJI, *hăd'-je* (Arab., a pilgrim), is the title of a Mohammedan who has performed a pilgrimage to Mecca, a religious act which every true believer is bound to perform at least once in his life; but minors, slaves, and lunatics are exempt from this obligation. *Hadj* is the name of the celebration which takes place on the arrival of the caravans of pilgrims at Mecca, and a Mohammedan who has made the pilgrimage commonly bears for the rest of his life the title of *hadji* prefixed to his name. As is well known, presence at these ceremonials is strictly prohibited to all but the faithful; but at least five European Christians are known to have been present at these ceremonies: the two last of these were the celebrated travellers Burckhardt (in 1814) and R. F. Burton (in 1853), both of whom have published interesting accounts of their journeys.—*Ref.* Burckhardt's *Travels in Arabia*, 1829; Burton's *Personal Narrative of a Pilgrimage to El-Medinah and Mecca*, 3 vols. London, 1856.

HÆMANTHUS, *he-măn'-thus* (Gr. *haima*, blood; *anthos*, flower), in Bot., a gen. of the nat. ord. *Amaryllidaceæ*. The juice of *H. toxicarius* is extremely poisonous, and is used by the Hottentots to poison their arrow-heads.

HÆMATEIN, *he'-mă-teen*, in Chem.—If hæmatoxylin be dissolved in water, and ammonia added to the solution, a purple liquid is formed, from which hæmatein may be precipitated by acetic acid as a reddish-brown powder. It is sparingly soluble in cold water, but somewhat more so in hot, from which it crystallizes in metallic-green masses. It must not be confounded with hæmatin.

HÆMATEMESIS, *he-mă-tem'-e-sis* (Gr. *haima*, blood, and *emesis*, a vomiting), in Med., is the vomiting of blood from the stomach. An individual, previously perhaps, to appearance, in robust health, after some strong mental emotion or physical exertion, is suddenly seized with a sense of fulness of the stomach and sickness, when he speedily ejects by vomiting a quantity of blood. The attack is usually preceded by various premonitory symptoms; as loss of appetite, indigestion, nausea, uneasiness or pain in the epigastric region, &c. The blood proceeding from the stomach is to be distinguished from that coming from the lungs, and will be known by its being almost always of a dark colour, while that proceeding from the lungs is generally bright and florid. Hæmatemesis may exist and yet no blood be ejected; for it may come in small quantities and pass through the alimentary canal; it may also proceed from the fæces, mouth, or nostrils. It may result from various causes; as (1), it may be idiopathic; (2), it may be vicarious of some other habitual hæmorrhage; (3), it may depend upon disease or injury of the stomach itself; (4), it may be the consequence of disease situate elsewhere, and producing mechanically a plethora of the veins of the stomach; (5), it may result from a morbid condition of the blood, and form one symptom of a more general disease. The mode of treatment will necessarily vary in particular cases; in general, every effort is to be made to tranquillize the circulation, and to arrest the hæmorrhage; for which purpose ice taken into the stomach is often very beneficial: the acetate of lead, in combination with opium, may also be given. All irritating substances should be avoided, and whatever nourishment is taken into the stomach should be in the form of cold liquids. This is a disease which is often feigned by impostors swallowing blood and afterwards vomiting it.

HÆMATIN, *he'-mă-tin* (from Gr. *haima*, blood), the true colouring principle of the blood, from which it is obtained by a very difficult process.

HÆMATITE, or HEMATITE, *he'-mă-tite* (from Gr. *haima*, blood), one of the most important iron ores. There are two kinds of hæmatite,—the red, which is an anhydrous peroxide of iron, and the brown, which is the peroxide in a state of hydration. A full description of these important ores will be found under IRON ORES.

HÆMATOIDIN, *hem-a-toy'-din* (from Gr. *haima*, blood), a crystalline body (an oblique rhombic prism), of a bright orange-red colour, formed in blood which has been effused into the tissue of a live animal. It is insoluble in ammonia.

HÆMATOXYLON, *he-mă-tok'-s-lon* (Gr. *haima*, blood; *xulon*, wood), in Bot., a gen. of the nat. ord. *Leguminosæ*, sub-ord. *Cæsalpineæ*. The species *H. campechianum* is a shrub of sub-tropical America. The wood, commonly known under the name of *logwood*, is employed in dyeing. Powdered logwood is mixed with sand and digested for several days in pure ether. The deposit is filtered and evaporated until it forms a syrup, when it is set aside to crystallize. In a few days hæmatoxylon is deposited in straw-yellow crystals, which form a solution that assumes a brilliant red colour under the influence of alkalies or oxygen. It is also an astringent and tonic in medicine. It contains crystalline colouring principles called *hæmatin* and *hæmatoxylin*.

HÆMATOZOA, *he-mă-to-zo'-ă* (Gr. *haima*, blood; *zoön*, a living being), a term applied to the animalcules, or entozoa, which exist in the blood of mammals, birds, reptiles, fishes, and many invertebrate animals. They are generally microscopic, without generative organs, and found existing in the blood circulating both in the arteries and veins. A very small proportion attain a large size and have organs of reproduction; these are generally found in some special part of the body. Thus the variety called *Distoma hæmatobium* is only found in the abdominal venous system; another variety is found restricted to the abdominal arterial system of the horse; and the *Pseudalius filum* is only found in the pulmonary artery and branches of the porpoise. Very little is known concerning the origin of these entozoa. It seems probable that some of the minute forms are the larvæ of a worm living in the organs surrounding the vessels. The most important of the human hæmatozoa is the variety mentioned above: it has only been observed in Egypt. The liver-fluke (*Distoma hepaticum*) has sometimes been found in the interior of the portal vein. Those hæmatozoa which have been found in tumours must have been conveyed there by the blood. Horses and dogs are frequently affected with these parasites; in the case of the latter animal, they are seldom large enough to be visible to the naked eye. The presence of hæmatozoa does not, however, seem to affect the general health of either men or the other animals.

HÆMODORACEÆ, *he-mo-do-rai'-se-e* (Gr. *haima*, blood), in Bot., the Blood-root fam., a nat. ord. of *Monocotyledones*, sub-class *Petaloideæ*, consisting of herbs or rarely shrubby plants, with fibrous roots and ensiform leaves. Perianth superior, tubular, 6-parted, regular, the divisions being usually scurfy or woolly on the outside; 3—6 stamens, having introrse anthers, and an inferior ovary, 1—3-celled. Natives of America, the Cape of Good Hope, and Australia. The roots of several species of the typical genus *Hæmodorum* are roasted and eaten by the natives of certain parts of Australia. They contain a red colouring matter. The blood-red root of *Lachnanthes tinctoria*, a plant of this order, is used for dyeing in North America.

HÆMOPTYSIS, *he-mop'-te-sis* (Gr. *haima*, blood, and *ptusis*, spitting), in Med., denotes in general the spitting of blood, and is generally used by pathologists to signify the expectoration of blood from the lungs and air-tubes. It is important to ascertain the source of the blood which escapes from the mouth, and, if determined to be from the lungs, to ascertain whether it is symptomatic of disease of these organs, or merely vicarious in its character. It is not so much dangerous in itself as an indication of some other dangerous disease, being most frequently connected with tubercular consumption. Bleeding from the lungs may occur without organic disease in plethoric and robust individuals living a life of excitement and excess, and in nervous, irritable individuals weakened by mental or bodily fatigue, and leading sedentary lives. It is often hereditary, and may be brought on by violent muscular effort, paroxysms of cough, blows or pressure on the chest, inspiration of irritating vapours, or of rarefied air on high mountains. The blood may be exuded from the tracheal or bronchial membranes, or it may proceed from capillaries communicating with the air-passages in any part of their extent. The amount varies from a drachm or two to as many pints at a time; originally bright florid, and more or less mixed with air, it may become dark, coagulated blood [illegible] popularity and from the stomach. An attack is frequently announced by a feeling of heat and oppression in the chest behind the sternum, followed by a cough, which brings up the blood. When the quantity is very great, it pours forth without cough, and almost by an act of vomiting, with considerable spasmodic effort. In all such cases, it is best to seek medical advice as early as possible. Among the agents that are useful in arresting hæmoptysis, may be noticed the essence of turpentine, 10 to 30 drops in a glass of water, tannin or gallic acid. Nauseating medicines, as tartar emetic and ipecacuanha, are also frequently employed. Common salt, in a dose of from 60 to 120 grains, is an excellent popular remedy. In all cases, calmness of mind, rest, silence, erect position, cool air, and freeness of the bowels, should be enjoined. When the attack proceeds from congestion, bloodletting is recommended in certain cases. If cough be present, it should be allayed by narcotics. After the attack, astringent tonics, as iron and quinine, may be given; and the return of the bleeding is to be guarded against by avoiding the exciting causes, and attending to the rules of health.

HÆMORRHAGE, *he'-mor-raij* (Gr. *haima*, blood, and *rhegnumi*, I break or burst), in Med., is an escape of blood from some of the vessels of the body. The most common cause of hæmorrhage is external violence, by which the blood-vessels of a part are divided. When an artery of some size is thus injured, a continuous stream of bright red blood is projected with a force proportioned to the size of the vessel, and with a motion corresponding with the pulsations of the heart. If a vein, on the other hand, be injured, the blood is of a dark crimson colour, and the flow is continuous and equable, with much less force than from an artery. Where merely a number of capillaries are injured, the blood flows in a more or less rapid oozing from the wound, but without being projected to any distance from the body. When a large artery is cut, the bleeding is so excessive as to cause almost instant death. If of smaller size, fainting is usually, after a time, produced by loss of blood, and, the heart ceasing its action, the blood coagulates about the wound, and thus stops it up. Frequently the returning action of the heart forces away the obstruction, and the blood flows afresh; and in this way, if not attended to, the patient may perish from exhaustion. With arteries of smaller size, the flow of blood is at first rapid, but after a few minutes, with exposure to the air, the orifice contracts, the blood coagulates, and the bleeding ceases, without much danger of returning. Hæmorrhage from wounded veins is much less dangerous, as the blood flows with much less violence, and the edges of the vessels tend more to come together. Hence bleeding from a vein is seldom immediately fatal. When blood gushes out from internal parts, through any of the natural apertures of the body, the person is commonly said to have "burst a blood-vessel." This, however, is very rarely the case. If there be any rupture, it is usually only of the minute capillaries; but even of this there is often no palpable evidence. Blood may exude abundantly from a surface which presents, to the naked eye at least, no appreciable injury or change. There are even well-authenticated instances on record of cutaneous hæmorrhage, where a dew of blood has appeared upon some portion of the skin, and been wiped away, and reappeared again and again, without any discernible change of the affected surface, beyond some occasional variation of its colour. There are also what are termed "habitual hæmorrhages," as from the nostrils, &c., which take place periodically with certain individuals, and belong to the original constitution of the body, and can scarcely be regarded as disease. Again, there are certain forms of hemorrhage not habitual, which may be denominated idiopathic, inasmuch as they are apt to arise without any perceptible connection with antecedent local disease. In other respects they differ considerably, and are distinguished as active and passive, the former being preceded by active congestion, and therefore akin to inflammation; the latter often occurring without any apparent previous congestion of any kind. Passive hæmorrhage derives its name from being ascribed to some change in the condition of the blood-vessels themselves, by which their textures become relaxed and debilitated; but more probably it arises from some altera-

tion in the condition and consistence of the blood itself, which becomes attenuated. Active hæmorrhage occurs principally in persons who are young and robust, who live well and lead indolent lives; and is, for the most part, to be regarded as an effort of nature to cure itself. It is followed by morbid consequences only when the quantity has been excessive, or when it inflicts some mechanical injury upon the parts along which the blood passes. Hence it is frequently improper to employ any direct means of stopping the flow of blood; but much will depend upon the circumstances of each particular case. As they are akin to inflammation, the treatment of inflammation may often be requisite. In all severe cases, the antiphlogistic regimen should be strictly enjoined. The patient must be kept in a state of absolute quiet; all motion of the body and emotion of the mind; all kinds of stimulating food and drink, should be carefully avoided; and the patient surrounded, as much as possible, by cool fresh air. Sometimes, as in inflammation, it is necessary to have recourse to venesection, in order to divert the current of blood from the suffering organ. Mercury is an important remedy for inward bleedings. Cold is also a valuable remedial agent, placed either in direct contact with the bleeding surface, or as near as possible to it. Acetate of lead, and the various vegetable compounds of gallic acid, are important astringent remedies in such cases. When a large artery is wounded, it is generally necessary to pass a ligature round it, above and below the wound.—*Ref.* Watson's *Principles and Practice of Physic*; *English Cyclopædia*,—Arts and Sciences.

Hæmorrhoids, or Piles, *he'-mor-roydz* (Gr. *haima* and *rheo*, I flow), is a disease of the rectum and anus, accompanied or followed by tumours in those parts, or by a flow of blood from them when the patient is at stool, recurring after intervals, and sometimes periodically. It is usual to apply the term either to a simple bleeding from the veins of the lower part of the rectum, recurring more or less frequently, yet not accompanied with any distinguishable tumours, either within or on the outside of the anus; or else swellings formed by a varicose distension and morbid thickening of those vessels, either with or without occasional hæmorrhage; or, lastly, tumours originally produced by effused blood, but subsequently converted into an organized substance. They are distinguished into external and internal piles, according as they are situated outside of or within the anus; and into *blind*, or such as do not bleed; and *open*, or such as are subject to occasional hæmorrhage. The tumours vary greatly in size and form, some of them being hardly as large as a pea, others as large as a walnut or apple. They are sometimes attended with great pain, so that the patient can neither sit nor walk, with generally more or less fever and restlessness. Sometimes the patient's strength is greatly reduced by discharges of blood or seropurulent matter; or inflammation of the neighbouring parts may be induced, causing abscesses, fistulæ, &c. Generally, however, the disease is of a less severe nature. It may be caused by anything which is capable of retarding the return of blood through the hæmorrhoidal veins. The pressure of the graved uterus, costiveness, and the frequent retention of hardened fæces in the rectum, are frequent causes. Persons of sedentary habits are often troubled with this disease. In its treatment it is of importance that the bowels be kept open by gentle laxative medicines, as castor oil; and great benefit will often be derived from the application of warm water to the part, or from sitting over a steam of warm water when at stool. An ointment composed of equal parts of the powder of oak-galls and hog's-lard, and applied to the part, is usually of great service. The application of leeches to the part is also recommended, if the disease be in a state of inflammation. Where all other remedies fail, it is often necessary to have recourse to an operation; but this should only be in very severe cases, as it is not unattended with danger. This is done either by cutting off the tumours with a pair of scissors or knife, or by applying a tight ligature round their base, so as to cause them to slough away.—*Ref.* Cooper's *Surgical Dictionary*; Copland's *Dictionary of Medicine*.

Hæreditas Jacens, *he-red'-e-tas jai'-sens*, in Scots Law, is a term applied to the estate of a deceased person, not taken up by his heir. A creditor attaches it by charging the heir to enter, and, on his renouncing, obtaining a constitution of his debt, and an adjudication of the estate.

Hæretico Comburendo, *he-red'-e-ko kom-bu-ren'-do*, is the name of a writ which anciently lay against a heretic who, having once been convicted of heresy, and abjured it afterwards, fell into it again, and was in consequence handed over to the secular power.

Haggai, *hăg'-gai*, is the name of one of the prophetic books of the Old Testament, whose author, Haggai, flourished during the reign of Darius Hystaspes, about five hundred years before Christ. He is classed among what are usually termed the minor prophets. His book comprises four discourses, of which, in all probability, we have only an epitome, and which are all concerning the same subject,—the building of the temple. In the first he reproves the indifference of the people respecting the building of the temple, assigning that as the reason why they are punished with great drought and unproductive harvests; and exhorts them to undertake the work, encouraging them with the promise of divine aid (i.). The second brief discourse consists of a consolatory promise, that the glory of the second temple shall surpass that of the first (ii. 1—9). The third censures the outward and legal righteousness prevailing among the people, by means of which they were deprived of the divine blessing (ii. 10—19). The fourth contains a promise of the future glorification awaiting the royal offspring of David and Zerubbabel, after the downfall of all earthly thrones. The style of Haggai in reproving is indeed vehement, but by no means poetic. In general, it is flat and destitute of power, though there are passages, where he treats of future events, in which he becomes somewhat elevated. There is also a marked poverty of language, as may be observed in the frequent repetition of the same expressions.

Hagiographa, *hăj-e-og'-ra-fă* (Gr., sacred writings), is a term sometimes applied to certain books of the Old Testament. The Jews divided the books of the Old Testament into—1. the Law, comprehending the five books of Moses; 2. the Prophets; and 3. the writings termed by them Cetubim, and by the Greeks Hagiographa; whence the word has been introduced into the English language. The last were held to be inspired in a lower degree than the others; but they did not always agree as to what books belonged to the second, and what to the third class. With us, the Hagiographa comprise the books of Psalms, Proverbs, Job, Song of Solomon, Ruth, Lamentations, Ecclesiastes, Esther, Daniel, Ezra, Nehemiah, and the Chronicles.

Hail, *hail* (Sax. *hægel*), drops of rain converted into pellets of ice, by a great and sudden reduction in the temperature of the region in which these raindrops have been forming, by means of the gradual condensation of the watery vapour of the atmosphere. A very cold current of air acting suddenly on vapour which has not quite attained that condition from which it would pass rapidly into the form of drops of rain, would cause the vapour to freeze, and fall to the ground as snow; but supposing that this vapour had just reached that point of saturation and condensation at which it would assume the form of rain, and was on the point of falling in that shape, the action of intensely cold air would cause it to turn into globules of ice in its descent, and reach the earth in that state. The formation of hail, therefore, may be considered to be the consequence of the sudden influence of a very cold current of air on a mass of vapour at rest, and nearly approaching that state of saturation which immediately precedes its conversion into rain. Hailstorms are always attended with wind, and are usually followed by a heavy fall of rain. The barometer also falls suddenly to a considerable extent immediately before a hailstorm, which is frequently accompanied by thunder and lightning. Showers of hail are of short duration, very seldom lasting as long as a quarter of an hour. The clouds from which hailstones fall are considered to be of great extent and depth, on account of the great obscurity which they produce. They are generally of a reddish-grey colour, with protuberances swelling out from the under surface, and deeply indented edges. Hailstorms are generally confined to a limited area, although they are

occasionally known to sweep across the face of a country in a long narrow track, as in the hailstorm which passed over France in 1788. This remarkable storm of hail traversed the land from south to north in two parallel tracks about 600 miles long, and from 6 to 12 miles broad, separated by an intermediate track 15 miles wide, over which there was a heavy fall of rain, but no hail. Hailstones vary considerably in weight and size. In England they have been seldom known to exceed an inch in diameter; but they are, for the most part, about the size of a small pea. It is, however, on record, that hailstones have fallen in this country as large as eggs, and even as much as three inches in diameter; while in Suffolk, in a hailstorm which took place August 3, 1824, the hailstones were large enough, and fell with sufficient velocity, to kill game and domestic fowls. In India they are commonly as large as pigeons' eggs, and frequently three or four inches in diameter, weighing as much as a pound; and some have been picked up as large as a water-melon, and as much as fourteen pounds in weight. Hailstorms have frequently caused great damage to the grain crops in various parts of England. From the chronological lists of hailstorms during the present century that have been already published, it appears that they are of most frequent occurrence in the months of June and July. Agriculturists can indemnify themselves from loss and injury to their crops from hail, by insuring themselves against its calamitous effects in the Royal Farmers' and General Insurance Institution, and similar assurance societies. The necessity of this is fully apparent, when it is stated that, in 1824, the corn crops on about 3,500 acres of ground in Hertfordshire, Middlesex, and Essex, sustained damage to the average extent of £4 per acre, and that it has been found that hailstorms have been of more frequent occurrence in later years than formerly.—*Ref.* Brande's *Dictionary*,—art. Hail; *Encyclopædia Britannica*,—art. Meteorology; Howard's *Climate of London*; Thomson's *Introduction to Meteorology*.

HAIMATURIA, *hai-mă-tu'-re-a* (Gr. *haima*, blood, and *ouron*, urine), in Med., is bloody urine, a discharge of blood with the urine, owing usually to a diseased state of the kidneys or bladder. It is usually a symptom of some other disease, upon the nature of which its treatment in general depends.

HAIR, *hair* (Sax. *hær*, Ger. *haar*), in Anat., is applied to the small cylindrical, transparent, insensible, and elastic filaments which arise from the skin, and are attached to it by means of small roots. Hair is found to grow on all parts of the surface of the human body except the palms of the hands and the soles of the feet. Hair, being a bad conductor of heat, serves to keep the surface of the body warm, as well as to protect it from the influence of external heat, moisture, and electricity: it thus performs an important part in the animal economy. Hair differs considerably in length, thickness, shape, and colour, according to situation, age, sex, family, or race. Hair is divided into two kinds,—long, which arises on the scalp, cheeks, chin, breasts, &c., of men; and short, which exists over most other parts of the body, and is much softer than the other. A hair is composed of two parts,—a shaft and a bulb, the former being that part which rises above the surface of the skin, the latter that which is inserted in the skin. The bulb is inserted in a follicle in the cutis or true skin, the follicle being, like the hair which is inside of it, bulbous, or larger at the lower part. The hair grows from the bottom of the follicle, being formed by the secretions of cells which line the sides of the follicles. Hair is composed of an outer cortical, fibrous or horny substance, which invests it, and an inner medullary or pith-like substance within. The cortex or bark of the hair is composed of a single layer of cells, which overlap each other and give a serrated appearance to the hair when seen under the microscope. The central portion is made up of a series of cells filled with pigment. The colour of the hair seems to depend on the presence of a peculiar oil, which is of a blackish-green colour in dark hair, blood-red in red hair, and nearly colourless in white hair. The grey hair which attends old age is the result of a deficient supply of pigment. Well-authenticated cases are given [illegible] of young persons whose hair has become grey even in a single night, in consequence of some strong mental excitement; as fear, sorrow, &c. Various attempts have been made to explain this phenomenon, but no satisfactory solution of the difficulty has been arrived at. Some races and persons are noted for the length and luxuriance of their hair, while in others it is very deficient. In some races, as the Kurilian, it grows nearly the length of the whole body. (*See* also BEARD.)

HAIR MANUFACTURE, the manufacture of certain articles with human hair and the hair of certain quadrupeds, upon which a considerable amount of industry is bestowed. Some of the articles made, depend upon the felting properties of a few kinds of hair, others upon the strength of the fibre, and others upon the fine gloss of which it is susceptible. The trade in human hair is very considerable, and much more important than would ordinarily be believed. A very large quantity is imported into London every year, principally for the purpose of making wigs, perukes, and false curls, &c., for ladies. According to a German who has studied the statistics of the hair trade, every adult female head contains an average number of 110,000 hairs, the blonde being the most numerous, and the red fewer and coarser. The light hair imported into this country nearly all comes from Germany, and the dark hair from France. In England, sometimes young girls with beautiful hair are urged by poverty to sell their tresses; but in France they make it a regular business. In Paris there are hair-merchants, who despatch agents into the country every spring to purchase the hair from young women. They attend the fairs, and carry with them a large stock of ribbons, handkerchiefs, &c., which they give in exchange for the hair. The young women cultivate their crops of hair with great care, and sell the result of their harvest to the best bidder. It is estimated that 200,000 lbs. of hair are purchased every spring, the usual price averaging five francs per lb. The hair is then sent by the agents to their employers, who, after dressing and sorting it, sell it to the hair-workers. Besides wigs, perukes, false curls, &c., hair is much used in making hair jewellery; for this kind of work the ordinary clippings are sufficient. The hair goes through numerous small manipulations, and is cleaned and curled according to the nature of the ornament it is intended for. The hair of the head often grows to a great length; in the Hair court of the International Exhibition of 1862, a specimen of jet-black hair was exhibited measuring seventy-four inches in length. Next to human hair-manufacture comes that of horse-hair. The fabrics made with this substance are woven by the workman with a hook-shuttle, which he passes under the threads of the warp from right to left; an assistant places a single hair over the end of the hook, and the weaver draws it through the warp. The process is very tedious. Twenty thousand hundredweight of horse-hair are imported annually, and half a million yards of horse-hair cloth are annually exported.

HAIRS, in Bot. (*See* EPIDERMAL APPENDAGES.)

HAKE, *hak* (Ang.-Sax.), *Merlucius vulgaris* of Cuvier, a species of fish belonging to the *Gadidæ* or Cod fam. Its generic characters are, head flattened; body elongated; the back furnished with two dorsal fins, the first short and the second long; one anal fin, and no barbule at the chin. It inhabits the seas of north Europe and the Mediterranean, and, although somewhat scarce off the coast of Scotland, it is found most abundantly along the southern coast of England, Portsmouth receiving the greatest supply of this fish. Yarrell, in his "History of British Fishes," states that "the hake may be traced nearly all round the coast of Ireland; and it is so abundant in the Bay of Galway, that, according to a recent writer, this bay is named in some ancient maps the *Bay of Hakes*. On that part of the Nymph Bank off the coast of Waterford, this fish is also so plentiful that 1,000 have been taken by six men in one night. It is a voracious fish, as its systematic name of *Merlucius*, sea-pike, implies. It is a coarse fish, not admitted to the tables of the wealthy; but large quantities are annually preserved both by salting and drying, part of which is exported to Spain." The colour of the hake is a dusky brown on the upper part of the body, with a lighter shade of the same colour below; the dorsal and caudal fins dark, and the ventral and anal fins pale brown.

## Hakluyt Society

HAKLUYT SOCIETY, *hăk'-luit*, the name of a society formed in the year 1846, for the purpose of printing in English, for distribution among its members, rare and valuable voyages, travels, and geographical records, including the more important early narratives of British enterprise. This society was named after the celebrated old English geographer and historian, Richard Hakluyt, or Hackluyt; and at a meeting held on the 15th December, 1846, at 12, St. James's Square, Sir Roderick I. Murchison being in the chair, the following resolutions were carried:—"That a society, to be called the Hakluyt Society, be formed, for the purpose of printing, for distribution amongst its members, the most rare and valuable voyages, travels, and geographical records, from an early period of exploratory enterprise to the circumnavigation of Dampier." 2nd. "That the annual subscription be one guinea, payable on the 1st January; and that each subscriber be entitled to receive, without further charge, a copy of every work produced by the society within the year subscribed for." In the report published in the year 1858, the number of members belonging to the society was stated to be 289.

HALBERT, or HALBERD, *hăl'-bert* (Fr. *hallebarde*), an offensive weapon consisting of a shaft about five feet long, made of oak, having a steel head formed somewhat like a crescent. It was much used formerly, but is seldom or ever now seen, except in some Scotch boroughs, where it is employed by the civil officers who attend the magistrates in processions and on other public occasions.

HALCYONIDÆ. (*See* ALCEDO.)

HALCYON DAYS, *hăl'-se-on*, was a term applied by the ancients to the seven days which immediately precede and follow the shortest day, from the circumstance that the halcyon or kingfisher selected that period for incubation, and they believed that, on that account, the weather was always remarkably quiet about that time. Hence the phrase "halcyon days" has passed into a proverb, as denoting times of peace and tranquillity.

HALF-BLOOD, *half'-blood* (Sax. *half*), in Law, is used to denote persons having only one parent in common; when they have both parents in common, they are whole blood. When the common parent is the father, they are brothers or sisters consanguineau; when the mother, uterine. In the succession to real or landed property in England, a kinsman of the half-blood inherits next after a kinsman of the whole blood in the same degree, and after the issue of such kinsman, when the common ancestor is a male, but next after the common ancestor, when such ancestor is a female. So that brothers consanguineau inherit next after the sisters of the whole blood, and their issue, and brothers uterine next after the mother. In Scotland, however, only the half-blood consanguineau succeed after the full blood; the half-blood uterine never succeed in any event. In England, as regards personal estate, a brother or sister of the half-blood, whether by the mother or father's side, shares equally with the whole blood, for they are both regarded as equally near of kin to the deceased. In Scotland, however, brothers and sisters german and their issue first take, exclusively; then brothers and sisters consanguineau and their issue, exclusively; and then brothers and sisters uterine and their issue.—*Ref.* Paterson's *Compendium of English and Scotch Law*, 1860.

HALF-PAY, a term applied in the English army and navy to an allowance given to commissioned officers who are not actively employed. When an officer joins the army, he is posted to a particular regiment, with which he is supposed to serve until removed, on gaining the rank of general. Superannuated officers attain by long service retired full pay, and half-pay is granted temporarily only to officers thrown out of employment by the reduction of the corps, or to those who are compelled by sickness to leave active service. Except for these causes, a removal to the half-pay list cannot be obtained, unless the officer desiring it can induce some other to exchange with him; but this exchange can only be made when the probabilities of each officer's life are equal. The charge for half-pay, although reduced every year, is very large; in 1865 it amounted to £360,000. The first army-grant for half-pay was made by William III., in 1698. When a regimental

## Hallelujah

officer receives a superior appointment on the staff, he is placed on temporary half-pay. In the navy, the arrangements for half-pay are very different. All officers are appointed merely to serve during the time while a certain ship is in commission; when this expires, their employment ceases, and they leave active service. As there are more naval officers than there are appointments to fill up, there is always a large number on the non-effective lists. These officers are then placed on half-pay until called into active service. The amount of this half-pay is usually 60 per cent. of the full pay of each grade in the service.

HALL, *hawl* (Sax. *heal*, Ger. *saal*, Lat. *aula*, Fr. *salle*), the principal apartment in the castles and mansions of the middle ages, which was used on all occasions of ceremony, and in which the meals were served. Some of the palaces of the early Saxon kings appear to have consisted of little else than the hall. The earliest existing specimens are of the 12th century; and though none of them retain their roofs or fittings, it is apparent that several of them were divided into three alleys, by rows of pillars and arches. In these halls the king, together with his courtiers and all his retainers, dwelt, sat at the same table, and round the same hearth. There was generally another smaller chamber attached, in which the king and his courtiers slept, while the retainers slept in the hall. The Normans built halls very similar to those of the Saxons; and with few modifications, similar buildings were erected until the 14th century. The population then being more numerous, and manners more refined, it became necessary to have more numerous apartments. The hall, however, held its place as the chief room of the house, in which the king or lord of the manor administered justice, gave audiences, or received and entertained his guests. From the 11th century downwards, numerous examples of large and stately halls still remain. The archbishop of Canterbury's palace, a ruin, at Mayfield, Sussex, the roof of which was supported on stone arches, reaching across the whole breadth of the room, is one of the finest of these relics. Another good example remains at Penshurst Place, Kent, which has an open timber roof. Halls of the Perpendicular style are very abundant; decidedly the noblest of these is Westminster Hall; but there are many others which are very fine; such as those at Eltham Place, Kent; Crosby Hall, London; Hampton Court; Athelhampton Hall, Dorsetshire; many of the colleges at Oxford and Cambridge; several of the inns of court in London, &c. These have all open timber roofs, considerably ornamented. The hall originally was essentially a part of feudal architecture. The principal entrance was at one end, where, in those which retain traces of the original fittings, a space is parted off by a screen, extending across the whole width, and supporting a gallery above. In the screen were doors leading into the body of the hall. At the upper end, a portion of the floor, called the dais, was raised one or two steps above the rest, on which was placed the principal table, at which the host and superior guests sat. The chief seat was in the middle, next the wall, commanding a view down the room. The fire, or open-hearth, was often in the middle of the floor, and the smoke escaped through a louvre on the top of the roof; sometimes, however, fireplaces were formed in the side walls. In halls of the Perpendicular date, there was a large bay window at one end (and sometimes at both ends) of the dais, where the "cupboard," or buffet, was placed. Many of these arrangements are still retained in the university halls. The walls were frequently lined for some part of their height with wainscoting, and an ornamental canopy was fixed over the principal seat. The walls were also sometimes hung with tapestry or carpeting.

HALLELUJAH, *hăl'-le-lu'-yă* (Heb., praise ye the Lord), is the name of a well-known doxology derived from the Old Testament, and frequently used in the ancient church. In some of the early churches it was sung generally throughout the year; in others it was sung only on Easter-day and the fifty days of Eastertide. It was occasionally, also, sung at funerals. In the fourth council of Toledo it is mentioned under the name of Laudes, and appointed to be sung after the gospels. The ancient church retained the Hebrew word, as did also the Church of England in its first

liturgy; but now the *English* translation, "Praise ye the Lord," is used.

HALLEY'S COMET. (*See* COMET.)

HALLOWEEN, HALLOWEVEN, or ALLHALLOW EVEN, *hăl'-lo-een'*, is the eve, or vigil, of All-Saints' day, which is the 1st of November. It is still customary in some parts of England to crack nuts, duck for apples in a tub of water, or to catch at them when stuck upon one end of a kind of hanging beam, at the other extremity of which is fixed a lighted candle, and that with their mouths only, their hands being tied behind their backs. In Scotland these ceremonies are of a more superstitious character, and though not now so common as formerly, they are still practised in some parts of the country. They burn nuts in the fire, with some sweetheart's name, in order to ascertain the nature of their courtship, and if they are to be married together; and the young women draw stocks of cabbage blindfold, in order to determine the figure and size of their future husbands. Of these, and the other ceremonies observed on that night, an excellent account is to be found in Burns's well-known poem of "Halloween."

HALLUCINATION, *hăl-lu-sin-ai'-shun* (Lat. *hallucinatio*, from *hallucinor*, I err), denotes an error or mistake of the senses. It was a favourite maxim of Kant's, "that the senses do not deceive us at all,—it is only the judgment that deceives us." This is indeed true of illusions, where what is represented to consciousness are objects really existing, but different from what they really are; but it is not true as regards hallucinations strictly so called, where the senses convey to consciousness what do not really exist, representing as an object what is only a subjective process. As regards illusions, they are often owing to inexperienced judgment, or may also proceed from a defective state of the organ itself, and may be corrected by observation. Hallucinations, on the other hand, do not depend upon the judgment, but are somatico-physical abnormities, which are not influenced by experience. They sometimes affect only one, sometimes several, and even all of the senses. Hallucinations of the sight are perhaps the most frequent, and are commonly visions of sparks, flames, luminous spectres, terrific phantoms, &c. Hallucinations of hearing are also very common,—humming or ringing in the ear, the sound of voices, &c. Hallucinations of smell are much more rare; but hysterical persons often smell objects which are not present; such as sulphur, musk, violets, &c. Hallucinations of taste wholly resemble those of smell; and hallucinations of touch are also rare. In illusions we have chiefly to consider the external occasion and the mental condition of the individual; in hallucinations, the organic and physical condition. The illusion is often in the object, and is frequently produced by emotions, heated fancy, passion, &c. The hallucination has always a subjective ground; either the receptive organ suffers, or the leading nerve, or the reacting cerebral centre, chiefly from pressure of blood, cramp, &c. The course and termination of these states of mind, which are only symptomatic, issue, after longer or shorter duration, either in health, from undeceiving the patient, or, if this does not happen, in a fixed idea,—in insanity. The hallucinations of sight and hearing, on account of the psychical dignity of their organs, are especially of a fatal import.—*Ref.* Feuchtersleben's *Medical Psychology*.

HALO, *hai'-lo* (Gr. *halos*, a circle), the name given to a luminous circle that occasionally surrounds the sun, moon, planets, and fixed stars. It is sometimes white, and sometimes faintly tinged with colours like the rainbow. Most commonly but one ring only is seen encircling the heavenly body, but at times the halo assumes the form of several concentric rings of light. The halos seen about the moon, the planet Jupiter, and the fixed star Sirius, generally have an apparent diameter from three to five degrees; but when these phenomena appear round the sun, they often have a diameter of 90 degrees, and the diameters of halos round the moon have been frequently known to reach this extent. This appearance around the heavenly bodies is said to be very frequent in Russia and North America. Artificial halos may be produced by placing a lighted candle in the midst of steam in cold weather. It was also noticed by Muschenbroek, that the moon, when viewed through a window, the panes of which were covered with a coating of thin ice, was apparently surrounded by a halo, although there was none to be seen about it when this medium was removed. There are many theories with regard to the formation of halos, which appear to arise from the double refraction of the rays of light proceeding from any heavenly body, on their passage through thin clouds and aqueous vapour, or from the transmission of the light of these bodies through particles of hail or snow. The name *corona* is frequently applied to these phenomena.

HALOGENS, *hal'-o-jens* (Gr. *hals*, a salt; *gennao*, I produce), in Chem., a natural group of non-metallic elements, which form direct saline compounds with the metals. They are chlorine, bromine, iodine, and fluorine. Odling defines halogens as those non-metallic elements which unite with hydrogen, volume for volume.

HALOID SALT, *hăl-oid'* (Gr. *hals*, sea-salt; *eidos*, likeness), in Chem., salt formed by the union of a halogen with a metal. Common salt, or chloride of sodium, may be taken as the type of the haloid salt.

HALORAGACEÆ, *hăl-or-ai-gai'-se-e*, in Bot., the Mare's-tail, or Water-chestnut fam., a small nat. ord. of *Dicotyledones*, sub-class *Calyciflorœ*, consisting of herbs or shrubs, generally aquatic, with small flowers, which are frequently incomplete and unisexual. The order is nearly allied to the order *Onagraceæ*. The most interesting genus is *Trapa* (which *see*); the other genera are of little importance.

HALYARDS, *hăl'-yards* (Ang.-Sax.), in nautical language, the smaller ropes or tackle by means of which yards, sails, and signals are hoisted or lowered; as the *topsail halyards*, *signal halyards*, &c.

HAM, *hăm* (Du. *hammen*), a term applied in Commerce to the thigh of a hog or boar, salted and dried, so as to preserve it in a state having an agreeable flavour. In England, the best hams are made in Yorkshire, Hampshire, Wiltshire, and Cumberland; and in Scotland, Dumfries and Galloway are the counties most famous for hams. Those of Ireland are comparatively coarse, and without flavour. On the continent, the hams which are held in the highest esteem are those of Westphalia and Portugal. The ordinary method of curing hams in the most celebrated districts is to rub them with bay or other salt; then to leave them on a stone bench, in order that the brine may discharge itself. This rubbing process is repeated in a few days; about half an ounce of saltpetre (nitrate of potash) being added to each ham. After remaining on the bench, or in the salting-tub, for another week or so, they are generally hung up to dry in the sides of large open chimneys. In some cases they are exposed to the smoke of wood, peat, coal, and other varieties of fuel; while in other cases they are carefully protected from the smoke. When not sold sooner, they are kept in their drying situations till the commencement of the warm weather, when they are packed up in casks with straw, or the seeds of oatmeal, and consigned for sale. In the process of drying, hams lose about twenty per cent. of their weight. In Dumfriesshire, the pickle for hams is sometimes made with one half ale, which renders the hams shorter, and adds greatly to the richness of their flavour. The imports of bacon and hams into this country amount to nearly 30,000 cwt. a year. (*See* BACON.)

HAMAMELIDACEÆ, *hăm-ma-me-li-dai'-se-e* (Gr. *hamameles*), the Witch-hazel fam., a nat. ord. of *Dicotyledones*, sub-class *Calyciflorœ*, consisting of small trees and shrubs, having the following characters:—Leaves alternate, with deciduous stipules. Flowers perfect or unisexual; calyx superior, 4- or 5-lobed; petals 4 or 5, with an imbricated æstivation, or altogether wanting; stamens 8, half of them sterile, and placed opposite to the petals, and half fertile, and alternate with them; anthers 2-celled, introrse; ovary inferior, 2-celled; styles 2. Fruit capsular, 2-valved, with a loculicidal dehiscence; seeds pendulous and albuminous. These plants are natives of North America, China, Japan, the central parts of Asia, Madagascar, and South Africa. *Hamamelis virginica* produces oily edible seeds; its bark and leaves possess astringent properties. *Rhodoleia Championi*, a Chinese plant of this order, has very showy flowers. It has recently flowered for the first time in England.

HAMESUCKEN, *haim'-suk'-en* (Ang.-Sax.), in Scots Law, is a premeditated assault, aggravated by being committed in the dwelling-house of the person assaulted, to which he had fled for safety, or to which the assaulter had gone for the purpose of committing the offence. An assault committed on a sudden quarrel within the house is not of this nature. Neither is it hamesucken to strike a man in his place of business, or in an inn, or in the house of a friend, where he is temporarily residing. It is regarded as a capital offence, and hence is not bailable. The distinction is not known in the law of England.

HAMILTONIAN SYSTEM, *ham-il-to'-ne-an*, is the name given to a system of teaching languages, after Mr. James Hamilton (1769—1831), an English merchant, who afterwards took to teaching languages. His system is simply this,—to have some simple book in the language about to be learned, usually the gospel of St. John, with an interlinear translation, so literal as to show at once the number and case of the noun, as well as the mood, tense, and person of the verb. Each word has under it its exact English equivalent, and in its primary signification. There is thus no attempt to produce a translation, properly so called, to give the meaning of a passage as nearly as possible to the original, but only to give the correct rendering of each separate word by itself. The system is by no means without its value to the beginner, and is a vast improvement upon the old system of setting the pupil to learn no end of grammar rules before he was called upon to make any practical application of them. The Hamiltonian system has the advantage of bringing the pupil at once to a practical acquaintance with the rules and idioms of the language; by which means his attention is awakened and kept up, while, at the same time, he is acquiring a knowledge of words in the best possible manner, by having the foreign word, with its English equivalent, presented through the eye to the mind, together, or at the same instant. It is to be remembered, however, that this method is not to supersede the learning of rules, but ought to be carried on along with them; and also that it is to be regarded only as an initiatory process, to be cast aside after some progress has been made in the language.

HAMMER, *ham'-mer* (Sax. *hamer*, Dan. *ham mer*), a term applied to the well-known tool used by mechanics, which consists of an iron head fixed crosswise upon a handle. The hammers, however, employed in the useful arts vary greatly in form, and the weights of individual examples may be estimated from several tons to the fraction of an ounce. The hammers used by blacksmiths are of several kinds. Amongst others, are the about-sledge, which is the largest of all, and is held by both hands at the furthest end of the handle, and being swung at arm's length above the head, is made to fall heavily upon the work. The up-hand sledge is not so large, but is used with both hands, and seldom raised above the head. The hand-hammer is the smallest, and may be used with one hand at the anvil. The class of hammers called riveting hammers have the handle fixed to them by passing it through a hole in the head, where it is made to fit or be wedged firmly; the face is formed of steel, as well as the riveting end, and welded to the iron. These hammers are used by carpenters, smiths, engineers, and numerous artisans, varying in size and form according to the purpose for which they are required. A variety of hammers having two claws, called claw-hammers, are much used by carpenters and other mechanics, as the claw, together with the handle, forms a powerful lever for drawing out nails, &c. The largest hammers are those used in the manufacture of iron. In this form they are not mere tools, but machines moved by steam or some other power. There are many varieties. Fromings's forge-hammer, which is used for heavy castings, as well as for edge-tools, knives, files, &c., may be moved either by hand, water, or steam-power. A heavy hammer-head with a guide-rod, cones, and vertical spring, accomplish the work by means of a driving-shaft made to rotate by any source of power. In Hutton's power-hammer, the weight is raised by a strap or chain, attached to a drum or pulley on an axis; when the blow is struck, the momentum is made to assist in raising the hammer again. This hammer is much used in beating iron and steel between pairs of dies. The frictional-action hammer can be worked by any continuously revolving power-shaft, and can be made to hammer 150 blows per minute with a very heavy hammer-head. Cotton's air tilt-hammer, and Waterhouse's compressed-air forge-hammer for light work in a smith's shop, are also useful varieties; and there are many more. The powerful machine called the steam-hammer was originally invented by Mr. Nasmyth, and in 1842. (*See* NASMYTH HAMMER.) Steam-hammers, since that time, have received many minor improvements in their construction. In some cases the hammer-block is a sort of plunger, working in the cylinder, instead of a heavy mass suspended from the piston-rod; in some the hammer, piston-rod, and piston, are all cast in one piece, while others are so contrived as to increase the space through which the hammer falls to the anvil. A class of cheaper and simpler steam-hammers is also made for certain purposes, either in iron-forging, boiler-riveting, or ore-crushing. Some of the hammers now in use are of great weight. At the Bowling Iron-works, near Bradford, there is a steam-hammer of 6 tons weight. Messrs. Morrison, of Newcastle, constructed a steam-hammer for the Russian government, of which the weight of the piston, and piston alone, was 5 tons. At New York, there is a steam-hammer of 7½ tons. It seems probable, from the magnitude of the works undertaken in iron manufacture at the present day, that still larger and more powerful hammers will be constructed.

HAMMOCK, *him'-mock* (Sp. *hamaca*), a term applied to the article which, suspended from the deck, supplies the place of a bed to the sailor. It consists of an oblong piece of strongly-woven hempen cloth, about seven feet long and three broad, to each end of which are attached several small cords, meeting in a ring, to which they are united; from each ring a lanyard, or small rope-line, suspends the "hammock" to the cleets or battens, fastened on the inner surface of the upper deck. The cleets are generally about nine feet apart; and inside the hammock are placed a pillow, a mattress, and a pair of blankets. In ships of war, during the day, the hammocks of the crew are placed in the nettings along the upper edge of the bulwarks of the main deck. The term *hammock* is likewise applied to a small mound, or protuberance of ice projecting above the frozen surface of a "floe," on account, no doubt, of the appearance of these mounds resembling the veritable article.

HAMPTON COURT CONFERENCE, *hamp'-ton*, was a conference summoned by James I., soon after his accession to the throne of England, to meet at Hampton Court, with a view to the settlement of religious differences, more particularly between the Episcopalians and the Puritans (January, 1604).

HANAPER OFFICE, *han'-a-per*, the name of an office belonging to the common law jurisdiction of the court of Chancery. It is so called because all writs relating to the business of the subject, and their returns, were in early times kept in a hamper (Lat. *in hanaperio*), and the others, relating to matters in which the crown was directly or indirectly concerned, were kept in a small sack or bag; and hence the Petty-bag Office, another office of the common law court in Chancery.

HANCORNIA, *han-kor'-ne-a*, in Bot., a gen. of the nat. ord. *Apocynaceæ*. The species *H. speciosa*, a native of Brazil, bears a very delicious fruit.

HAND, *hind* (Ger. *hand*, Lat. *manus*), in Anat., is the lower portion of the superior extremity, the great organ of touch and prehension. "In many respects," says Dr. George Wilson, "the organ of touch, as embodied in the hand, is the most wonderful of the senses. The organs of the other senses are passive; the organ of touch alone is active." "The hand selects what it shall touch, and touches what it pleases. It puts away from it the things which it hates, and beckons towards it the things which it desires." "Moreover, the hand cares not only for its own wants, but when the other organs of the senses are rendered useless, takes their duties upon it." "The blind man reads with his hand, the dumb man speaks with it; it plucks the flower for the nostril, and supplies the tongue with objects of taste. Not less amply does it give expression to the wit, the genius, the will, the power of man. Put a sword into it and it will fight, a

plough and it will till, a harp and it will play, a pencil and it will paint, a pen and it will speak. What, moreover, is a ship, a railway, a lighthouse, or a palace,—what, indeed, is a whole city, a whole continent of cities, all the cities of the globe, nay, the very globe itself, so far as man has changed it, but the work of that giant hand with which the human race, acting as one mighty man, has executed its will."—(*Five Gateways of Knowledge.*) The hand is that which distinguishes man in the class of mammals, he being the only animal possessed of two hands (*bimana*). That which constitutes the hand, properly so called, is the power of opposing the thumb to the other fingers, so as to seize upon the most minute objects. The hand is composed of a number of small bones, twenty-seven in all, so arranged as to combine the greatest possible degree both of strength and flexibility. These are arranged in three divisions,—those of the carpus, metacarpus, and phalanges. The carpus, or wrist, comprises eight bones, arranged in two rows, four in each; and are the scaphoid, naviculare, or boat-shaped bone; the semi-lunar, or halfmoon; the cuneiform, or wedge-shaped; the pisiform, or pea-like; the trapezium; trapezoid; os magnum, or great bone; and the unciform, or hook-shaped. The metacarpal bones are five in number, and constitute the bones of the palm and back of the hand. The phalangeal bones are fourteen in number, three for each of the four fingers, and two for the thumb. They are named in their numerical order from above downwards, *i.e.*, from the palm of the hand. The inferior extremity of the radius and ulna articulate with the scaphoid, semi-lunar, and cuneiform bones of the first row of the carpus. The articulations between the first and second rows of the carpal bones are very remarkable. These articulations are connected by numerous ligaments running in various directions, by means of which the bones are kept in their proper positions. The second row of carpal bones articulate with the metacarpal, and form the carpo-metacarpal articulations. They are connected by dorsal and palmar ligaments, stretching from the carpal to the metacarpal bones. The metacarpo-phalangeal and inter-phalangeal articulations are similarly formed, and are connected by lateral ligaments on each side, and a strong ligament in front. Besides these there are the various muscles of the hand, which give to it its several motions of flexion, extension, abduction, adduction, and circumduction. The hand is also richly supplied with blood-vessels and nerves.—To such as desire a particular account of the wonderful structure of this portion of the human frame, we would recommend Bell's excellent treatise *On the Hand*.

HAND HABEND, in *Law*, is applied to a thief caught in the very *fact*, having the thing stolen in his hand.

HAND-PLANT. (*See* CHEIROSTEMON.)

HANDS, IMPOSITION OR LAYING ON OF, is a ceremony performed in the conferring of holy orders, in which the hands are laid on the head of a person as a sign of a mission, or of a power given him to exercise the functions of the ministry belonging to the order. The missionaries appointed by the apostles in the early church were ordained by the laying on of hands.

HANDSPIKE, *hănd'-spike*, in Nautical Lang., a wooden lever used on board ship to work round the windlass or capstan. One end of the handspike is inserted in the holes at the capstan head, or in the bend of the windlass, and the men take hold of the other, and, by dint of pushing or pulling, as the case may be, hoist the yards or weigh the anchor, which they would be unable to do by mere mechanical labour, unassisted by leverage.

HANDWRITING, *hănd'-ri-ting*, in Law, is, in general, proved by a witness who has seen the person write. The mark of a person who cannot write is proved by a person who has seen him make his mark, and is acquainted with it. In some circumstances, as where the party is resident abroad, the evidence of one who has frequently received letters from him would be admitted, though he had never seen him write. It is sufficient that a witness swear according to his belief; but this belief must be founded upon rational grounds, and he may be asked to say what these grounds are. Evidence of handwriting by comparison is inadmissible, except where the writing acknowledged to be genuine is already in evidence in the cause, or the disputed writing is an ancient document. This rule does not, however, apply to the court or the jury. Inspectors of franks, clerks of the post-office, and such-like persons skilled in handwriting, have in some cases been allowed to give evidence; but great doubts are entertained as to the admissibility of such evidence.

HANGED, DRAWN, AND QUARTERED. (*See* HANGING.)

HANGING, *hăng'-ing* (Sax. *hangan*, to hang), is a mode of capital punishment which has been used in this country from time immemorial. In atrocious cases, it was formerly usual for the court, in passing sentence, to direct the criminal, after execution, to be hung upon a gibbet in chains near the place where the fact was committed; also that the execution take place on the day next but one after receiving his sentence, and that his body be delivered to the surgeons to be dissected. These severities were abolished by several statutes passed in the reign of William IV. Formerly, the punishment of high treason was very severe. The offender was to be drawn to the place of execution; to be hanged by the neck, and then cut down alive; his entrails taken out and burned before him; then his head cut off, and his body divided into four parts; the head and quarters to be at the king's disposal. But by 54 Geo. III. c. 146 the sentence now awarded is to be drawn on a hurdle to the place of execution, and there to be hanged until dead; and then afterwards the head to be severed from the body, and the body to be divided into four quarters, to be at the king's disposal. The king may, however, discharge all the punishment except the beheading. Hanging is applied to that kind of death in which the body is wholly or partially suspended by the neck, the constricting force being the weight of the body itself, while in strangulation it is due to some other cause. In both cases death commonly results from asphyxia. If, however, the cord be loose, or applied to the upper part of the neck, a small quantity of air may still reach the lungs, and in such cases death will arise from apoplexy, the cerebral circulation being interrupted by the pressure. In many cases death is produced by a mixed condition of asphyxia and apoplexy. In the execution of criminals, it has often been observed that death does not always ensue within the same period of time; which is to be accounted for from the greater or less degree of constriction produced by the ligature. In some rare cases, death has taken place with great rapidity, owing to a displacement of the dentiform process of the second cervical vertebra, by which the spinal marrow became suddenly compressed. This cause of death, however, is extremely rare, and is only likely to occur in very corpulent subjects, when a long fall is given to the rope, and when much violence is at the same time employed by the executioner. Sometimes violent convulsions are observed of the limbs and trunk; but there is no reason to believe that the individual suffers pain then any more than in an epileptic fit. It has often been found impossible to restore animation after the body has been suspended only a very few minutes. Sometimes here, as in drowning, a person may in the first instance recover, and subsequently die, in spite of the best medical treatment, from the depressing effects produced on the muscular and nervous systems. In attempting to restore animation in such cases, artificial respiration, cold affusion when the skin is warm, with the vapour of ammonia, and other stimuli, are recommended to be employed. The application of electricity, or electro-magnetism, in the course of the spine is also sometimes attended with benefit. If there should be much cerebral congestion on recovery, venesection may be cautiously resorted to. From experiments, as well as from the evidence of persons who have been resuscitated, we learn that asphyxia comes on in the most insidious manner in death from hanging; and that the slightest constriction of the trachea will speedily produce insensibility. Such persons have been conscious of a ringing in the ears, a flash of light before the eyes, then darkness and stupor. In medical jurisprudence it often becomes an important question to determine whether the individual was suspended before or after death, and which must often be determined by the circumstances of each case, as there is no distinctive sign by which the hanging of a living body can be determined, or which

may not be simulated in the dead subject. It is also often important to determine whether the individual hanged himself or was hanged by others; and here, too, an opinion can only be arrived at from a consideration of the circumstances. In such cases, however, the presumption is in favour of suicide, as hanging is a difficult mode of perpetrating murder, unless the strength of the parties be greatly disproportionate, or the assailants numerous. Hanging is also sometimes the result of accident.—*Ref.* Taylor's *Medical Jurisprudence.*

HANGING GARDENS, in Antiq., a series of magnificent gardens laid out on elevated terraces at Babylon, and supposed to have been constructed by Queen Semiramis. According to Diodorus and Strabo, the form of these gardens was square, each side being about 400 feet in length; so that the area of the base was nearly four acres. In Dr. Falconer's "Historical View of the Gardens of Antiquity," quoted in Loudon's "Encyclopædia of Gardening," it is stated that "they were made to rise with terraces constructed in a curious manner, above one another, in the form of steps, and were supported by stone pillars to the height of more than 300 feet, gradually diminishing upwards till the area of the superior surface, which was flat, was reduced considerably below that of the base. This building was constructed by vast stone beams placed on pillars of stone (arches not being then invented), which were again covered with reeds, cemented with bitumen, over which was placed a double row of bricks united with cement. These bricks were covered with plates of lead, which effectually prevented the moisture from penetrating downwards. Above all was laid a coat of earth, of depth sufficient for plants to grow in it; and the trees planted there were of various kinds, and were ranged in rows on the side of the ascent, as well as on the top, so that at a distance it appeared as an immense pyramid covered with wood. The situation of this extraordinary effort of human skill aided by wealth was nearly adjoining to, or upon, the river Euphrates, from which water was supplied by machinery for the fountains and reservoirs employed for cooling the air and watering the garden." The different terraces and groves also contained fountains, parterres, seats, and banqueting-rooms, and combined the minute beauties of flowers and foliage (only to be rightly estimated in those desert plains) with recesses of shade and extensive prospects. The existence of these hanging gardens has been doubted by some authorities; but it is said that their locality can be traced, and their ruins discovered, amongst the numerous mounds of sand which mark the position of ancient Babylon.

HANSARD'S DEBATES, *hăn'-sards*, the title of a work, started by Mr. T. C. Hansard in the year 1812, as a continuation of Cobbett's Parliamentary History, and in course of publication at the present day. Cobbett's Parliamentary History traces the early institution, history, and proceedings of the English Parliament, from the year 1066 to the year 1803 (12th August). Hansard's Debates takes up the thread of the history where Cobbett stopped, and gives clear and concise reports of all debates, bills passed, and motions made, both in the House of Lords and the House of Commons, from November, 1803, up to the present time. At the commencement of the publication of Mr. Hansard's Debates, it was planned that two volumes should be given annually; but latterly, the sittings in Parliament being greatly prolonged, and the subject matter of the debates correspondingly spread out, it has been found necessary to give sometimes four, and even five volumes, in order to chronicle the proceedings of each session. Without any literary or political bias, Hansard's Debates are merely reports of all that takes place in the houses of Parliament, and are consequently the best books of reference on the subject.

HANSEATIC LEAGUE, *hăn-se-ăt'-ik leeg* (Ger. *hanse*), was a celebrated commercial confederacy formed among certain commercial cities of North Germany, in the 13th century, and took its name from the old German word *hansa*, signifying an association or confederacy for mutual aid. As the commercial cities of the North began to increase in wealth and importance, they came to be harassed by the attacks of pirates and robbers, and various tolls were imposed which interfered seriously with trade. These circumstances





at length gave rise, in 1239, to an agreement between Hamburg, Ditmarsh, and Hadeln; and in 1241 a confederacy was formed between Hamburg and Lübeck, in which they mutually agreed to protect each other against all violence. This confederacy was joined by Brunswick in 1247. In a short time the number of the members had so much increased that in 1260 a diet was held at Lübeck, the chief city of the league. Regular meetings of the confederacy now took place there every three years, about Whitsuntide, and the general archives of the league were kept there. The confederacy was at its highest degree of power and splendour during the 14th and 15th centuries, and comprised at one time no fewer than eighty-five cities. These were distributed into four classes or circles. Lübeck was at the head of the first circle, and had under it Hamburg, Bremen, Rostock, Wismar, &c. Cologne was at the head of the second circle, with twenty-nine towns under it. Brunswick was at the head of the third circle, which comprised thirteen towns. Dantzic was at the head of the fourth circle, having under it eight towns in its vicinity, besides several others that were more remote. The supreme authority of the league was vested in the deputies of the different towns assembled in congress. In it they discussed all their measures, it decided upon the sum that each city should contribute to the common fund, and upon the questions that arose between the confederacy and other powers, as well as those that frequently arose between the different members of the confederacy. Any one might be chosen a deputy; and, besides merchants, the congress comprised clergymen, lawyers, artists, &c. When the deliberations were concluded, the decrees were formally communicated to the magistrates of the cities at the head of each circle, by whom they were subsequently communicated to those below them; and the most vigorous measures were adopted for carrying them into effect. One of the burgomasters of Lübeck presided at the meetings of congress, and during the recess the magistrates of that city had the sole, or, at least, the principal, direction of the affairs of the league. Sometimes congresses were held at other places besides Lübeck, as Hamburg, Cologne, &c., and extraordinary congresses were also occasionally held. As the power of the confederated cities increased, they became more ambitious; they endeavoured to acquire the monopoly of the trade of the North, and to obstruct and hinder the navigation of foreign vessels in the Baltic. They succeeded in obtaining, partly in return for loans of money and partly by force, various privileges and immunities from the northern sovereigns, which secured to them almost the whole foreign commerce of Scandinavia, Denmark, Prussia, Poland, Russia, &c. They now declared their object to be to protect themselves and their commerce from pillage, to guard and extend the foreign commerce of the allied cities, and as far as practicable to monopolize it; to manage the administration of justice within the limits of the confederacy; to prevent injustice by public assemblies, diets, and courts of arbitration; and to maintain the rights and immunities received from princes, and, if possible, to increase and extend them. The league exercised a judicial power, and inflicted the greater and lesser ban; any place which incurred these punishments, being said to be *verhanset*. At length there was no mart in Europe that was not gradually drawn within the circle of its influence; and by the greatness of its wealth, and the might of its arms, it became the mistress of crowns, lands, and seas. It conquered Eric and Hakon, kings of Norway; and Waldemar III., of Denmark. It deposed a king of Sweden, and gave his crown to Albert, duke of Mecklenburg. In 1426 it equipped a fleet of 248 ships, with 12,000 soldiers, against Eroc of Denmark. In the country under its immediate influence, it constructed canals, and introduced a uniform system of weights and measures. In order to facilitate and extend their commercial transactions, the league established various factories in foreign countries: at London in 1250, at Bruges in 1252, at Novgorod in 1272, and at Bergen in 1278. At London their factory was of considerable size and importance. They enjoyed various privileges and immunities; they were permitted to govern themselves by their own laws and regulations; had the custody of

one of the gates of the city (Bishopsgate) committed to their care; and the duties on various kinds of imported commodities were considerably reduced in their favour. Their factory in London was situated in Thames Street, and was known as the "Steelyard." (*See* STEELYARD.) In the Netherlands, Norway, and Russia, they enjoyed the like important privileges. The foreign factories were subjected to an almost monastic strictness of discipline, which even required the celibacy of the factors, clerks, &c. After the middle of the 15th century, the power of the league began to decline, not owing to any misconduct on the part of its leaders, but to the progress of that improvement which it had done so much to promote. The civilization, which had been at first chiefly confined to these cities, gradually spread from them, as from so many centres, over the contiguous country. The people began to be sensible of the advantages to be derived from commerce and navigation, and their princes also saw it to be for their advantage to encourage such enterprises; while at the same time the roads or seas were no longer insecure. In addition to these circumstances, the interests of the different cities which composed the league were becoming daily more and more opposed to each other; and the discovery of America led to a total revolution in the state of trade. The last diet of the confederation was held at Lübeck in 1680, when the union was dissolved. Hamburg, Lübeck, and Bremen subsequently formed an association among themselves, and remained free republics till 1810, when they were incorporated into the French empire. In 1813 they again became free, and, in conjunction with Frankfort-on-the-Maine, were recognized as the "Free Hanseatic Cities," and form a part of the Germanic Confederation.—*Ref.* M'Culloch's *Essay on the Rise, Progress, and Decline of the Hanseatic League;* Sartorius's *Urkundliche Geschichte des Ursprungs der deutschen Hansa* (3 vols. 1802-8), continued by Dr. J. M. Lappenberg (2 vols. Hamburg, 1830); Burmeister's *Beiträge zur Geschichte Europas im 16 Jahrh.* (1843); Lappenberg's *Urkundliche Geschichte des Hansischen Stahlhofes zu London* (Hamburg, 1851).

HAPPINESS, *hăp'-pe-nes* (Ang.-Sax.), is the great object of all human action, and, in its most general sense, includes all other objects. To be happy includes or supersedes all other gratifications. If we are happy, we do not miss that which we have not; if we are not happy, we want something more; whatever we have, the desire of happiness is the supreme desire. All other desires, of pleasure, wealth, power, fame, are included in this, and are subordinate to it. Since happiness is necessarily the supreme object of our desires, and duty the supreme rule of our actions, there can be no harmony in our being, except our happiness coincide with our duty. That which we contemplate as the ultimate and universal object of desire, must be identical with that which we contemplate as the ultimate and supreme guide of our intentions.—*Ref.* Whewell's *Morality;* Harris's *Dialogue on Happiness.*

HAPSBURG, or HABSBURG, *hăps'-burg, hăbz'-burg* (contracted from *Habichtsburg*, Hawk's Castle), is the name of the present imperial family of Austria, and is derived from the castle of Habsburg or Habichtsburg, on the Wülpelsberg, on the right bank of the Aar, in the present Swiss canton of Aargau. The castle was built in the 11th century, by Werner, bishop of Strasburg, grandson of Guntram the Rich, count of Alsace and Breisgau, and who is said to have been a descendant of Ethico I., duke of Alemannia and Alsace. The proprietors of Hapsburg became, at a later period, counts of Hapsburg; and, gradually extending their dominions, subsequently assumed the title of Landgrave. In 1273, Rudolf, of this house, became emperor of Germany, and is the founder of the reigning family of Austria. The subsequent history of this house forms part of the history of Germany and Austria.—*Ref.* Prince Lichnowski's *Geschichte des Hauses Habsburg*, 2 vols., Vienna, 1836-37.

HAQUEBUT, *hăk'-but.*—When the hand-gun and arquebus were first introduced, the butt or stock was perfectly straight, and in the form of a stick or broom-handle, which prevented the soldier who was using it from taking a proper aim by directing his eye along the barrel. To obviate this inconvenience and imperfection in the weapon, the Germans fitted the barrel to a hooked butt,—whence the name, by which means the firearm could be discharged from the chest as before, while an additional facility was given for taking aim at the object towards which the weapon was directed. It was introduced into England about 1485. The haquebut may be considered as the first step in the long series of improvements in small arms which seem to have culminated in the rifles produced by Whitworth, Jacob, Lancaster, Henry, and other makers and inventors.

HARBOUR, *har'-bour* (Ang.-Sax.), the ordinary name given to any port or haven communicating with the sea, or with a navigable river or lake sufficiently deep to float ships of moderate size. The chief characteristics of a good harbour are, that it should be free from all rocks or shallows; the opening should be extensive enough to admit large ships at all times of the tide; it should have good anchorage-ground, be easy of access, and be well protected from the violence of the wind and sea. The interior of the harbour should be sufficiently capacious for the reception of the shipping of various nations, and deep enough to allow ships to lie close alongside the quays or piers, in order that the expense of loading and unloading by means of lighters may be avoided. There should also be proper lights and lighthouses, and the quays should be furnished with proper rings, posts, moorings, &c., in order to remove or secure vessels. The principal harbours in Great Britain are those of Portsmouth, Milford Haven, and the Cove of Cork.

HARBOURS, or HAVENS.—According to the law of England, the king has the prerogative of appointing ports and havens, or such places only for persons and merchandise to pass into and out of the realm, as he in his wisdom deems proper. It has always been holden that the king is lord of the whole shore, and practically is the guardian of the ports and havens, which are the inlets and gates of the realm. Though the king had the power of granting franchise of ports and havens, yet he had not the power of resumption, or of narrowing or confining their limits when once established; but various acts were passed (the earlier being superseded by 6 Geo. IV. c. 105), enabling the crown, by commission, to ascertain the limits of all ports, and to assign proper wharfs and quays in each, for the exclusive landing and lading of merchandise. The crown, however, has the power of opening and shutting ports for the purpose of prohibiting the importation or exportation of goods. In 1847, an act was passed consolidating into one the provisions usually contained in acts authorizing the making and improving of harbours, docks and piers. The act 10 Vict. c. 27, provides for the making and improving of harbours, docks, and piers; authorizing the undertakers to levy rates, and laying down sundry rules for their guidance. The act has been in some measure altered by the "General Pier and Harbour Act," 1861 (24 & 25 Vict. c. 45), for facilitating the formation, management, and maintenance of piers and harbours in Great Britain and Ireland; and the "Harbours and Passing Tolls Act," 1861 (24 & 25 Vict. c. 47), to facilitate the construction and improvement of harbours, by authorizing loans to harbour authorities to abolish passing tolls, and other purposes. Many of the harbours are also regulated by private acts.

HARD LABOUR, in Law, is a punishment frequently added to imprisonment, and is said to have been introduced in the reign of Queen Anne. The kind of labour varies according to the nature of the prison and other circumstances, and is usually for ten hours a day.

HARDNESS, *hard'-ness* (Ang.-Sax.), a term applied to that condition of the force of cohesion in solids, which enables their constituent molecules to retain their relative position, and resist any physical force which tends to alter the figure of the body. Hardness is entirely different from density; for, although gold and platinum are denser than glass, yet glass is harder than gold or platinum. Iron and zinc are lighter, but harder, than gold or platinum. Sir Isaac Newton supposes the primary particles of all bodies to be perfectly hard, and not capable of being broken or

divided by any power in nature; but, with all our extended knowledge, it is impossible to determine, with any certainty, the conditions of the elementary particles which render bodies hard, brittle, malleable, ductile, &c. Some metals are rendered hard with great readiness. This is of inestimable value in the manufacture of steel especially, which can be varied in hardness by heating suddenly, cooling, and then tempering. Hardness is often accompanied by brittleness; but this can generally be overcome by heating and slow cooling; this process, however, often takes away from the hardness. In the production of alloys, another useful property is frequently developed. Copper and tin, neither of which is remarkable for hardness or elasticity, possess both these qualities when combined; in which form they constitute bell-metal.

HARDNESS OF MINERALS, in Min.—Mineralogists are accustomed to divide minerals into ten classes, according to their hardness, diamond being at one end of the scale and talc at the other. Their hardness is tested by their capability of being scratched, or of scratching the minerals, in the following table, invented by Mohr:—Talc 1, rock-salt 2, calc spar 3, fluor spar 4, apatite 5, adularia feldspar 6, rock crystal 7, topaz 8, corundum 9, diamond 10.

HARE, *hair* (Sax. *hara*, Lat. *lepus*) one of the *Leporidæ*, a fam. of mammalia belonging to the ord. *Rodentia* or *Glires*, and characterized by having two small teeth behind the upper cutters, and five rootless grinders, each formed of two plates in both jaws. Hares have large lustrous eyes placed laterally, long ears, a hairy tongue, an incomplete clavicle, weak forefeet, and a very short hairy tail. In disposition, they are gentle, timid animals, and, being possessed of remarkably quick hearing, are frightened at the least noise. Their mode of progression mostly is by a series of leaps, and their flight, when alarmed, is rapid in the extreme. They live on vegetable food, as the young shoots and bark of trees, growing corn, and other similar substances. They are very prolific; and were



HARE.

it not for the multitudes which are annually shot or otherwise slaughtered for the London market, they would soon overrun the country. Hares form a great object for pursuit on the part of sportsmen; and hunting them with the greyhound is termed "coursing." (*See* GREYHOUND.) They exist in Europe, America, Asia Minor, Syria, and in fact in nearly all countries; and of course there are many varieties of their conformation. The young are called *leverets*, and the nest of a hare, or the place in which it reposes during the day, is termed its "form." The Romans, it is said, prized the hare very much as an article of food; but it was forbidden to the Jews, the Mahomedans, and, it is also stated, to the ancient Britons. As the common hare is the type of the recognized family, it alone has been selected for the subject of the present article; but further information regarding the different varieties will be found under the separate articles headed LEPORIDÆ and LAGONYS.

HAREBELL. (*See* CAMPANULA.)

HARE-LIP (Lat. *labium leporinum*), in Surg., is applied to a congenital malformation of the lip, from its fancied resemblance to the lip of a hare. It is a cleft or division of one or both lips, but usually the upper. Sometimes there is a considerable space between the parts, and occasionally the cleft is double, there being a little lobe, or small portion of the lip, between the two fissures. Sometimes, also, the fissures extend through the bones of the mouth. The operation for hare-lip consists in paring off the edge of the separated parts on each side, and bringing the two new surfaces together, so as to close up the fissure, retaining them in their places by means of ligatures.



HAREM, *ha-reem'* (Arab., the sacred or inviolable), is the name given among Mohammedans to those apartments which are appropriated exclusively to the female members of a family.

HARICOTS. (*See* PHASEOLUS.)

HARLEIAN COLLECTION. (*See* BRITISH MUSEUM.)

HARLEQUIN, *har'-le-kwin* (Ital. *arlechino*, Fr. *arlequin*), is the name of a personage who figures largely on our stage in the pantomimes, and who has been borrowed from the Italian. The origin of the personage and the etymology of the name are matters of dispute. Probably, however, the character has been handed down from the ancient Greek or Roman dramas. Riccobini conjectures that the dress of the harlequin is no other than the *centunculus* of the old Roman *mimi*, who had their heads shaved, and were called *planipedes*. Harlequins and buffoons are also called *scurri* by the best Tuscan writers, probably from the Latin *scurra*, of which Cicero (*De Oratore*, ii. 61) gives a description applying so strongly to the harlequin as to place his derivation from the *planipedes* almost beyond a doubt. The character of the ancient harlequin was a mixture of extravagant buffoonery with great corporeal agility, while his expressions were characterized by impudence, drollery, satire, and often indelicacy. His character, however, changed about the middle of the 16th century. He became a simple, ignorant servant, who assumes all colours, and is easily induced, through fear or interest, to commit all sorts of tricks or knaveries. He excels in extempore sallies, and tries very hard to be witty, even at the expense of being malicious. In other countries where introduced, his character has been more or less modified. (*See* PANTOMIME.)

HARMONICA, *har-mon'-e-kă*, a musical instrument now seldom or ever used, which derived its origin from the musical glasses. Its sounds are produced from glasses blown as nearly hemispherical as possible, each having an open neck or socket in the middle, into which a perforated cork is fitted. Near the brim, the glass is about one-tenth of an inch thick, but increases towards the neck, which is, in the largest, about one inch deep and half an inch wide within, the dimensions lessening in proportion as the glasses diminish in size, all excepting the smallest, which ought not to be less than half an inch in length. The largest glass is nine inches in diameter and the smallest three. Between these there are twenty-three different sizes. They are distinguished by painting the apparent parts of the glasses on the inside, every semitone white, and the other notes of the octave with the seven prismatic colours; so that glasses of the same colour, white ones excepted, are always octaves to each other. The glasses are placed on a round iron spindle (fixed horizontally in the middle of a box, and made to turn on brass gradgeons at each end), one within the other, each leaving about an inch of its brim above that of the other. The spindle is turned by means of a foot-wheel, and the tones produced by rubbing the exposed parts of the glasses with the ends of the fingers damped and rubbed with chalk, to bring out the tone more readily. The glasses also should be occasionally wetted with a sponge and clean water. The production of the sound by means of the naked finger is said to have such an effect upon the nervous system as, in some cases, to have caused fainting-fits. Many attempts were made to play it by keys, but none have succeeded, no dead substance having been yet found capable of giving the same expression to the sound as the human fingers.

HARMONICS, *har-mon'-iks*, in Mus., a term applied to those concomitant, accessory sounds which accompany the predominant and apparently simple tone of any chord or string, as well as to the mathematical mensuration of musical sounds—whatever appertains to harmony; as the harmonic divisions of the monochord, the harmonic proportions, &c. The doctrine of the ancients was divided into seven parts; viz., sounds, intervals, systems, genera, tones, mutations, and melopœia.

HARMONITES, *har'-mon-ites*, the name of a sect of enthusiasts founded by one Rapp, a native of Würtemberg, born 1770. Finding no peace in his native place, he and his followers emigrated to America in 1803, and established themselves near Pittsburg, in Pennsylvania, where they founded what they termed the Pure Apostolic Church, living in a kind of social brotherhood, having all things in common, and the like times for rest and enjoyment. They subsequently removed to Ohio, where they founded the colony of Economy. Rapp died in 1847, and was succeeded as head of the Harmonites by one Becker. They number about 4,000.

HARMONIUM, *har-mo'-ne-um* (Gr.), a musical instrument of modern invention, bearing some affinity to the organ, but, unlike that instrument, made upon a principle technically termed the *free vibrating reed*, which was long supposed to have been a European discovery, but is now ascertained to have been known in China long before it was heard of in Europe. The free reed consists of a brass plate containing an oblong slit, having a thin elastic tongue fixed to one end, in such a manner, and so exactly fitting into the slit, as to completely close it, but so that it will, upon the pressure of the wind on the free end, pass either inwards or outwards, without touching the end or sides. It has several advantages over the beating-reed of the organ. In the first place, its tone is of a more agreeable quality; secondly, it requires no pipe, which is an indispensable addition to the organ; thirdly, it is much less liable to get out of order; and, fourthly, it gives an entirely new property,—viz., the power of *expression*. Debain, of Paris, was the first to construct a keyed instrument upon the free-reed principle of a really useful character. Several attempts had been made, but all had more or less failed, until Debain invented the harmonium. This instrument is about 3 feet high by 3 feet 9 inches broad, its depth varying according to the number of stops. The key-board is immediately below the lid, and its compass extends five octaves, from C to C. This now, however, in the best instruments, is virtually converted into seven by the more perfect arrangement of the stops. The valves are beneath the key-board and on the top of the wind-box, within which are the different rows of reeds, the pitch of which is regulated by their size, which varies from half an inch to 3¼ inches in length, whilst the quality of the sound is modified by the breadth of the vibrating portion and the shape of the hole covered by the valve. The wind is supplied by means of bellows with two feeders, which the player moves alternately with his feet. For the deep bass notes the springs are heavily loaded at the loose end, to make them vibrate slowly; while for the higher notes they are made thinner at that end. Some harmoniums have only one row of reeds, others four; some also have two rows of keys. Lately, a "knee movement" has been introduced, by which a small degree of crescendo may be produced on either bass or treble. The manufacture of this instrument has greatly increased within the last few years; they may now be bought at nearly every pianoforte-maker's, of various sizes and quality, varying in price from £5 to £50. In the International Exhibition for 1862, Messrs. Chappell & Co. exhibited a large harmonium, the great feature of which is, that it can be used either as an organ or harmonium, having a pair of harmonium treadles, which open out from the front of the instrument, coming over the organ pedals: these being shut up, and the wind supplied by another person, the instrument may be used as an organ. Messrs. Boosey & Ching also exhibited some of these instruments, the most important of which was their "large pedal harmonium."

HARMONY, *har'-mo-ne* (Gr. *harmonia*), the agreement of two or more united sounds. It may be either *natural* or *artificial*; the former consisting of the harmonic triad, or common chord, and the latter of a mixture of concords and discords, bearing relation to the harmonic triad of the fundamental note. With the Greeks, the word harmony was in all probability limited in its signification to that agreeable succession of sounds which is now called air, or melody; while in modern music it is now employed to designate a mere succession of unaccompanied sounds, but a union of melodies, a succession of combined sounds, composed





of consonant intervals, and moving according to the stated laws of modulation. Harmony is the combination of sounds and the succession of chords, and may be said to combine the life and soul of music. The ancients knew very little of harmony, and it has not yet been introduced into the music of the Chinese and other Eastern nations. It is a comparatively modern invention. The laws regulating the succession of chords were at first rather arbitrary. (*See* CHORD.) Harmony may be divided into simple and compound. Simple harmony is that in which there is no concord to the fundamental above an octave. Compound harmony is that which to the simple harmony of an octave, adds that of another octave. From the union of harmony and melody music is formed. Although melody may exist without harmony, harmony cannot exist without the melodious arrangement of each of its several parts. Melody is distinct from harmony, in that it is a succession of musical sounds, while harmony is produced by their combination. Every chord, whether consonant or dissonant, forms harmony. All harmony in music is derived from what is called the aliquot tones. If a string be made to vibrate, the sound produced at first appears to be single; but, upon a closer and more careful observation, it will be found that the fundamental sound, more especially if it be a deep one, is accompanied by others in the most perfect harmony. These accompanying sounds are exactly those on which the chords in music are formed, and on which the foundation of the whole system of harmony is built.—Some of the best works on harmony are those by Albrechtsberger, Dr. Marx, and Professor Dehn.

HARMONY OF THE GOSPELS is the name given to a certain class of books, which have for their object the reconciliation of the narratives given in the four evangelists, or the accounts contained in them digested into one continued narrative. There are many instances of things omitted by some, and given by others, of the evangelists; many repetitions, and not a few seeming contradictions. In order to show the concurrence or agreement of the several gospels, and to reconcile such discrepancies, is the object of these harmonies. By this means, each story or discourse is exhibited with all its concurrent circumstances; frequent repetitions are prevented, and a number of seeming oppositions reconciled. The great difficulty in such cases arises from the fact that each of the evangelists had a distinct end in view in writing his gospel, in the elucidation of which, strict chronology was not an essential element. The gospels are thus not, strictly speaking, systematic biographies; and hence the difficulty, if not impossibility, of establishing a perfect harmony among them. The first work of this kind was the "Diatessaron" of Tatian, who flourished in the latter half of the 2nd century. In the next century appeared a similar work by Ammonius; but from that time for many centuries no other work of the same kind was published. In modern times, however, the number of such works does not fall short of two hundred; a fact proving at once the difficulty of the subject and the interest taken in such matters. The best harmonies are those of Calvin, Chemnitz, Calixtus, Lightfoot, Cradock, Le Clerc, Bengel, Doddridge, Macknight, Newcome, White, Griesbach, Thompson, De Wette and Lücke, Chapman, Lant, Carpenter, Reichel, Wieseler, Robinson, Greswell, Da Costa, Stroud, and Mimpres. The term harmony is also used with reference to the agreement which the Gospel bears to natural religion and the works of God in general.

HARMONY OF THE SPHERES.—Many of the ancient philosophers held that the regular movements of the various heavenly bodies through space produced a kind of harmony, which they called the "harmony of the spheres." Our great poet has said,—

> "There's not the smallest orb which thou behold'st,
> But in his motion like an angel sings,
> Still quiring to the young-eyed Cherubim."
> *Merchant of Venice.*

HARMONY, PRE-ESTABLISHED, in Phil., is the name given to a doctrine which professes to explain the connection that subsists between spiritual and material substances, and which was introduced by Leibnitz. He holds that God, before creating the soul and body

of man, had a perfect knowledge of all possible souls and all possible bodies. Among this infinite variety of souls and bodies it would be impossible but that there should be souls whose series of perceptions and determinations would correspond to the series of movements which some of these possible bodies would execute. Now supposing that of such a soul and such a body God should make man, it is evident that between the two substances which constitute this man there would subsist the most perfect harmony. These would have no communication, no mutual influence, the one upon the other; each would act by virtue of its own nature, like two clocks accurately regulated, which point to the same hour and minute, although the spring which gives motion to the one is not the spring which gives motion to the other. This harmony being established before the creation of man, is hence called the pre-established or pre-determined harmony. This doctrine is frequently alluded to in philosophical works; but it is needless to attempt any refutation of it, as it is at best merely a hypothesis, and was probably regarded even by the author himself more as a specimen of ingenuity than as a serious doctrine.—*Ref.* Hamilton's *Lectures on Metaphysics*, vol. i. pp. 303-4.

HARP, *harp* (SAX. *hearpa*), a stringed instrument of music, highly esteemed by the ancients, which may be traced, under various forms, to the remotest ages of antiquity. It was held in high veneration amongst the Celts, and although it has disappeared from the Highlands of Scotland, may still be found amongst the Welsh and Irish. In Ireland, its former prevalence has led to its adoption as the national symbol. There is little doubt that it was brought to great perfection in Egypt, as its figure has been found drawn on buildings of the greatest antiquity, while at Thebes, a fresco painting of a harp was discovered by Bruce, which he thinks was executed by order of Sesostris, who reigned between fourteen and fifteen hundred years before the Christian era. In Holy Writ we find the harp continually mentioned, while its invention is ascribed to Jubal, seventh only in descent from Adam. There are three kinds of harps now known,—the Italian harp, the Double, or David's harp, and the Pedal harp. The first of these is very imperfect, and seldom or ever used. The double harp is a better instrument, of a triangular form, having gut strings and a sounding-board; but it was not until the invention of pedals, in 1720, by Hochbrucker, that this instrument became really useful. For its present improved and nearly perfect state we are indebted to M. Sebastian Erard, of Paris, who patented a harp with seven pedals in 1794, this being a single-action harp: the pedals only effecting one change on the strings, he produced, in 1808, a double-action harp, the pedals of which have two actions. This instrument is tuned in the key of C flat, but may, by fixing the pedals in the first groove, be at once transposed to that of C natural, while, by fixing them in the second, it is transposed into that of C sharp. The compass of this instrument is from E double below the bass to E in altissimo.

HARP, ÆOLIAN. (*See* ÆOLIAN HARP.)

HARPOON, *har-poon'* (Fr. *harpon*), an iron spear or javelin, shaped like a barbed arrow at one end, with a ring at the other, through which a rope is run, used for the purpose of spearing whales in the Greenland and other whale-fisheries. The gun-harpoon, or harpoon-gun, is a weapon used for the same purpose, but which is discharged from a swivel or gun, instead of being thrown by hand. This weapon is formed entirely of metal, and has a chain attached to it, to which the usual line is joined on, as in the former case. The manner in which the harpoon is used, and whales captured, will be given under the article WHALE.

HARPSICHORD, *harp'-se-kord*, a musical instrument exactly resembling a grand pianoforte in shape, formerly much used, but now entirely superseded by the piano. The date of its invention is unknown, although it is supposed to have been about the 16th century; it was not, however, introduced into England until the 17th. It consists of a mahogany or walnut-wood case, within which is the belly or sounding-board, over which the strings are stretched, supported by bridges. The sound is produced by small pieces of crowquill or hard leather, which project from the jacks (small pieces of wood that stand upright between the





strings), and which, when the instrument is in use, are pushed upwards by the keys till they touch the strings, causing a brilliant but rather harsh sound. The great fault in the harpischord is its deficiency of any means of modification in respect to piano and forte notes.

HARQUEBUS. (*See* ARQUEBUS.)

HARRIER, *hăr'-e-er* (ANG.-NOR.), is a species of hound employed in hunting the hare. This animal is supposed to be a cross between the foxhound and the beagle, and is remarkable for its sagacity in tracing, and the boldness with which it pursues its game. There are three prominent varieties in the *harrier*, according to Blaine, in his "Rural Sports;" namely, the old southern hound, the modern harrier, and the beagle. Many subordinate divisions, however, accrue, and a cross breed is used for otter-hunting. The modern harrier in appearance is little more than a dwarf foxhound. In choosing a pack of harriers, their size and form should be adapted to the country which they are to hunt over; some sportsmen appear to have a *penchant* for those that are undersized, as the open lands about Dorchester used to be hunted with a pack of seventeen couple, none of which were more than seventeen inches in height. Mr. Beckford states that the hounds most likely to show the best sport are those produced by a cross between the large slow hunting harrier and the little fox-beagle; the former having a good scent, and the latter being fleet of foot; and they thus produce a hound which possesses both advantages.

HARROW, *hăr'-ro* (ANG.-SAX.), an agricultural implement formed of bars of wood or iron, fastened together transversely, either at right angles to each other, or diagonally, with iron teeth projecting downwards from the points of intersection perpendicularly, or with a slight inclination. A harrow with the bars set diagonally is the best, as their inclination to each other may be regulated in such a manner that each tooth marks out a separate furrow; in consequence of which the implement performs its work more effectually than it would if the bars were disposed, as in the old harrow, at right angles to each other. There is also an expanding harrow, in which the framework of bars is fastened together by loose pins, so that the teeth can be set closer together or further apart, as the state of the soil may require. The harrow is used in bringing land that has just been ploughed into a proper condition for the reception of the seed, by breaking the clods of earth into smaller fragments, tearing out the roots of the weeds or stubble, and pulverizing and mixing the soil. To effect this, and to render the surface tolerably smooth and even, the land is rolled and harrowed two or three times with different harrows, a strong heavy harrow being used to break the furrows made by the plough, and lighter harrows, with the teeth set more closely together, in the final stages of the process. There are many patent harrows manufactured by Ransome & May, of Ipswich, Barrett, Exall, & Andrews, of Reading, and other agricultural implement makers; among which may be mentioned that invented by Finlayson, which consists of an iron framework running on wheels, having iron teeth attached to cross bars of the same metal, which clear the soil of weeds, and drag them from the ground, without clogging the machine. It is fitted with a lever, by which the depth to which the teeth enter the ground may be regulated. A bush harrow consists of a hurdle, or frame of wood, with some rough boughs and bushes interlaced between its rails. It is often drawn over newly-sown lands, for the purpose of covering the seed with a thin layer of earth; but it is chiefly used for pulverizing manure and earth that has been spread over pasture-lands.

HART. (*See* DEER.)

HARTFORD CONVENTION, *hart'-ford*, in the Hist. of the United States, was an assemblage of delegates from the New England states, which met at Hartford, Connecticut, December 15, 1814. The war between Great Britain and the United States, which began in 1812, was from the first distasteful to the great majority of the people of New England, who had suffered immense losses from it, by the destruction of their commerce and fisheries. The defence of the New England coast was neglected by the federal government, and the

British were beginning to attack it with vigour. A committee of the Massachusetts legislature recommended a convention of the New England states, and a circular letter was addressed to the others, calling upon them to meet in convention "to devise means of security and defence which may be consistent with the preservation of their resources from total ruin, and adapted to their local situation and mutual relation and habits, and not repugnant to their obligations as members of the Union." The convention sat for twenty days with closed doors, and on their adjournment embodied the result of their deliberations in a report addressed to the legislatures which they represented,—moderate in tone, patriotic in sentiment, expressing strong affection for the Union, and the greatest aversion to violent or unconstitutional measures. It, however, recommended to these legislatures the adoption of such measures as might be necessary effectually to protect their citizens from the operation of acts passed by Congress, containing provisions subjecting the militia and other persons to forcible drafts, conscriptions, or impressments, not authorized by the constitution of the United States. It also proposed certain amendments on the federal constitution. The holding of this convention and its supposed treasonable designs caused a great outcry among the democratic party, and much apprehension at Washington. The imputation of treasonable designs to it continued until a very recent period, and resulted in excluding from political power in the state almost every man implicated in its doings. It is now, however, generally believed that it was guiltless of any designs which could be regarded as treasonable.

HARTSHORN, SPIRITS OF. (*See* AMMONIA.)

HARVARD COLLEGE, *har'-vard*, is the oldest college of the United States, and is situated at Cambridge, three miles from Boston, Massachusetts. It was founded in 1636, only six years after the establishment of this region by the English. Afterwards, in 1639, the name, which was first Newtown, and then Cambridge, was changed to Harvard, in consequence of a liberal endowment of about £700 left to it by the Rev. John Harvard, in 1638. It has received various other public and private grants. The external government of the college, as provided for by its charter, and by subsequent enactments, is vested in two separate boards,—viz., the president and fellows, and the overseers; the internal, by the faculty, composed of such of the college officers as are brought into immediate connection with the students by supervising their studies and conduct. There are 33 professors, and 18 tutors, proctors, &c., and about 700 pupils, of whom more than half are undergraduates, the others attending the professional courses, of which there are four,—law, science, medicine, and theology. The number of actual graduates of the college exceeds 7,000, of whom 2,600 are living. The academic year is divided into two terms, with vacations of seven weeks in July and August, and six weeks in January and February. Of late years, the standard of education has been greatly raised and extended; and the institution at present enjoys a good name for its care and thoroughness in teaching. The college library contains upwards of 124,000 volumes.

HARVEST, *har'-vest* (Sax. *hærfest*), the period at which any crop is reaped, although it is more generally applied to the crops of corn and hay. It is one of the most important times to the husbandman, as, although he may have had a good season for the growth of his produce, yet a bad harvest will deprive him of the greater portion of the return he expected. In order to obviate some of the casualties which thus attend the farmer in moist climates, the times of sowing different grains, &c., are regulated so as to insure their coming to maturity in rotation. The first harvest in Britain is that of the forage grasses, or other plants that are made into hay; the next is the harvest of cereal grasses, or of corn crops (this is the true *harvest*); and the third, the potato harvest, or harvest of root crops; such as potatoes, carrots, turnips, mangel-wurzel: there is also a harvest of occasional crops; as hemp, flax, rape-seed, &c. Harvest time is generally a very joyous time, and great mirth and festivity celebrate the end of the husbandman's labours. The *harvest-home* is kept when the last of the crop has been carted into the farmer's storehouse, and the name is applied to the feast which the employer gives to all his "hands" at the termination of their labours. At this season, also, large numbers of Irishmen and Scotchmen come over into England, for the purpose of assisting in reaping the crops; and by this means, in consequence of the facility of labour, the standard of farm wages is much lowered during harvest time.

HARVEST MOON, the moon which during the autumnal months, when near its opposition, rises nearly at the same hour for several evenings. During the time that our satellite is full, and for a few days before and after, in all about a week, there is less difference between the time of her rising on any two successive nights than when she is full in any other month in the year. By this means an immediate supply of light is obtained after sunset, during the continuance of these *harvest moons*, which is extremely beneficial to the husbandman for gathering in the fruits of the season. In order to gain an insight into this phenomenon, it must be borne in mind that the moon is always opposite to the sun when she is full; that she is full in the signs Pisces and Aries, these being the signs opposite to Virgo and Libra, which the sun passes through in September and October, our harvest months. Thus, although, whenever the moon enters the two former signs (and she does so twelve times in a year), the same circumstance takes place with regard to the time of her rising, yet it is not observed on these other occasions, just because she is not *full* at the time. The reason of there being little difference in the time at which she rises on several consecutive nights, is, that at these periods her orbit is nearly parallel with the horizon. The harvest moons are as regular in southern latitudes as with us in northern latitude, only they happen at different periods of the year.

HASCHISCH. (*See* CANNABIS.)

HASP AND STAPLE, *hasp, staip'-pl* (fr. Sax.), in Scots Law, was the old form of entry of an heir on property situated in a royal burgh. It consisted in the heir, accompanied by a bailie and the town clerk, appearing on the premises, when the bailie directed the heir to take hold of the hasp and staple of the door as a symbol of possession; he then entered the house and bolted himself in; and on his coming out, the transaction was noted and registered. This form is now no longer necessary.

HASTA, *hast'-a* (Lat.), a spear used by the ancient Romans and Greeks, and called by the latter *paltôn*, or *doru calchares*,—a pole fitted with bronze. The *hasta* was often fitted up in the market-places, or auction marts, where slaves were to be sold. The term *hasta* was also applied to the long sceptre which the mythic gods generally appear holding in their hands; and it signifies indifferently both a lance, a spear, a javelin, and sundry other weapons of offence. (*See* SPEAR.)

HASTINGS, BATTLE OF, *haist'-ings*, a memorable event in the annals of English history, was fought between William, duke of Normandy, and Harold II., king of England, on the 14th of October, 1066. The Norman invader landed at Pevensey, on the coast of Sussex, on the 28th of September, and afterwards marched to Hastings, where he encamped, having with him an army of 60,000 men. Harold II., who was at that time in the north with his army, as soon as he received news of this event, hastened southwards, and came in sight of the Normans on the 13th of October. He unwisely resolved to risk a battle the next day, and both armies were drawn up in regular lines at a place called Senlac, now Battle, near Hastings. The conflict was long and bloody, lasting from sunrise to sunset; but at length the English were defeated, Harold, his two brothers, and many of the nobility, being among the slain. After this event William had little difficulty in establishing himself upon the English throne; and a memorable epoch was introduced in the annals of the country by what is known as the "Conquest." In 1067 William founded an abbey near the place where the victory was gained, which is now known as Battle Abbey.

HAT, *hât* (Sax. *hæt*), a covering for the head, made of different materials, and worn by men and women for the purposes either of defending the head from rain or heat, or for ornament. The period of the intro-

duction of the hat into England is not exactly known, but it is mentioned by some of the early chroniclers and historians. In the reign of Queen Elizabeth, Stubbs thus writes of the hats of the period:—"Sometimes," says he, "they use them sharpe on the crowne, peaking up like the speare or shafte of a steeple, standing a quarter of a yarde above the crowne of the head. Some others are flat and broade on the crowne, like the battlements of a house. Another sorte have round crownes, sometimes with one kind of band, sometimes with another: now black, now white; now russet, now red; now green, now yellow; now this, now that: never content with one colour or fashion two dayes to an end." Samuel Pepys, in his Diary, dated June 27th, 1660, states, "This day Mr. Holden sent me a beaver, which cost me £4. 5s." About the beginning of the 18th century, the crowns of hats were mostly round, and had very broad brims, much resembling the Quaker hats which are still in use. In 1704, the regular three-cocked hat came into use, and held the sovereignty of head-coverings until about 1760, when a flat-topped, full-brimmed hat usurped its place. About thirty-five years later, the cylindrical hat, now in general use, came in vogue, and at the beginning of the 19th century was generally adopted, to the extinction of the cocked hat. The only ceremonial or professional hat now in use is that adopted by bishops and other dignitaries of the English church; and this is a round hat made of beaver, with a very broad brim looped up at the sides and back, so as to resemble slightly a shovel in appearance; whence it is termed a "shovel hat." Hats for men are mostly constructed of the fur of the beaver, but are also made of felt, straw, and grass, although those of the latter materials come under the denomination of "tourist" hats. Those for women are made of braid, cloth, straw, and grass, and many other fancy materials. The mode in which hats are constructed, and the various processes they go through, will be found given under the article HAT MANUFACTURE (*see* next art.).

HAT MANUFACTURE.—The principal materials of which hats are manufactured are—fur, wool, silk, and straw. Hats made of silk plush, drawn over a coarse stiffened textile fabric as a foundation, are those that are most generally used in the present day, with hats of felted wool and fur, without any nap, that are either soft and yielding, or brought into the usual hat shape by being blocked and stiffened with a composition prepared for the purpose. Straw hats are made of lengths of straw-plait sewn together in the desired shape. Hats with a nap composed of the fur of the beaver are now but little worn; as the silk hat, although of the same objectionable shape, and exerting even greater pressure on the forehead, is cheaper and far neater in appearance. The body of the beaver hat is formed of lamb's-wool and rabbit's fur, that are first bowed or mixed together, and then felted by damping the materials and working them together with the hands. By these means the fur and wool are blended together in a thick close mass resembling a conical cap. This is reduced in size, and thickened by working it with the hands on the edge of a boiler containing sulphuric acid, beer-grounds, and water,—with which mixture the felt is repeatedly moistened, the manipulation being continued until the materials have united together as closely as they possibly can, and the felt will admit of no further contraction in size. After this the body is stiffened with a composition made of resinous substances, and then submitted to the action of heat, that the felt may be thoroughly penetrated and charged with the varnish that has been applied to it. To form the glossy nap of the hat, a little beaver fur, which has been shorn from the skin by a machine, is partially felted together and spread over the surface of the body, the two substances being united by the felting process, which causes the ends of the beaver fur to enter and adhere to the foundation of fur and lamb's-wool. Some beaver fur is also felted round the edge of the interior of the cone, in order to form the under part of the brim. The hat is then fashioned into shape by the hand, on a wooden block; after which the nap is combed, and the fibres are cut to a uniform length. After the hat has been boiled for some time in a dye of logwood, sulphate of iron, gall-nuts, and water, it is dried, and the crown stiffened by the insertion of a





circular piece of pasteboard. The last process to which it is subjected is that of brushing and ironing the fur until all the fibres lie in the same direction; after which it is lined, and the edge of the brim bound. Felt hats, or "wideawakes," whether soft or stiff, are made chiefly of wool, and a similar process is gone through in their manufacture, in which machinery and moulds are sometimes employed. In the manufacture of silk hats, the plush which forms the external covering is sewn together, and drawn over the stiffened body, which is made of coarse canvas, ship, horse-hair, thin sheets of cork, and a variety of substances. Before the plush is put on, the body is covered with varnish, which melts on the application of a heated iron, and causes the silk covering to adhere closely to the foundation. The edges of the plush that covers the sides of the hat are not sewn together, but fastened to the body with the varnish, the nap being carefully brought over the line in which the edges are joined, in order to hide it. In some hats contrivances are introduced, both in the crown and brim, for the purpose of securing ventilation, as the want of free circulation of the air in the interior of the hat, when placed on the head, is said to injure the roots of the hair and cause baldness. In the *gibus* hat, the sides are made of merino, or some similar material, and the crown and brim, which are stiff, as in an ordinary hat, are connected by a set of springs, so that the hat can be flattened or expanded at pleasure. Nothing can be said in favour of the shape of the hat that custom compels the majority of Englishmen to wear in public; it is far from becoming in appearance, and most uncomfortable when worn for any length of time, on account of the pressure that it exerts on the forehead. The only way in which some slight alleviation of the discomfort occasioned by wearing such a covering for the head can be obtained, is by holding the interior of the hat towards the fire until the stiffening varnish is melted to a certain extent, and the body softened. It should then be pressed firmly on the head, and allowed to remain there until the varnish has again grown cold, by which its shape is brought more in accordance with the formation of the skull of the wearer, and the hat is rendered a little more bearable than it was before the operation that has been mentioned.

HAT-MONEY, or PRIMAGE, is a small duty paid to the captain and mariners of a vessel, over and above the freight, for their care and trouble. The amount is regulated by the custom of each particular place.

HATCHING, *hätch'-ing* (Ger. *hecken*, to hatch), the incubation or lying down of an animal upon her own or another's eggs, and so communicating to them heat. By this means she maintains them at her own temperature, a condition essential to their development. The development of the fœtus takes place in many animals after the exclusion of the egg, and while it is kept in external contact with the parent's body, as in the case of the crab and lobster tribes, beneath the caudal plates; or agglutinated to the surface of the abdomen, as in certain species of pipe-fish; or concealed in cutaneous marsupial cavities, as in other species of the *Syngnatus* and the *Hippocampus*: in the case of these cold-blooded animals, however, the protection of the ova seems to be the object, and not communication of warmth. True hatching, or incubation, only takes place among the oviparous warm-blooded animals; namely, birds. A due degree of warmth is absolutely necessary in hatching. The mean temperature required is 100° Fahr.; it may vary from 95° to 105°, and towards the close of the process may be suspended for one or two hours, or even for a longer period, according to the amount of extraneous heat which the exposed eggs receive. The power which birds possess of communicating the proper amount of heat to their eggs depends upon a peculiar plexus of vessels distributed over the skin of the abdomen, which in most birds is connected with a derivation of blood from the internal organs of generation. The uncontrollable propensity which birds have to incubate arises from the vascular, hot, and sensitive condition of the abdomen. The eggs of the bird present several peculiarities in relation to the circumstances under which the fœtus is to be developed. By their oval form they present a large surface to the source of heat, while the hard calcareous nature and arched form of the shell preserve them from injury

from the incumbent pressure of the parent bird. The shell is also porous, which assists the heat and air to pass into the egg, and the germ is surrounded by a sufficient store of nutritive matter. This matter is of two kinds,—the internal part, called the yolk, and the external, called the white or albumen, which entirely disappears during the process of hatching. The germ is situated at the superficies of the yolk, beneath the membrane, in the circular opaque white spot usually called "the tread." The period of incubation is generally in proportion to the size of the bird; but the degree of development at which the young bird arrives differs in various species. Many birds show wonderful instinct in the manner in which they prepare their nests, not only for the process of hatching their young, but also for their protection and warmth after being hatched. The practice of artificial hatching was well known in ancient Egypt and China. At the present day artificial hatching by means of ovens, stoves, or steam, is greatly used in the former country. It has been calculated that nearly 93,000,000 chickens are annually hatched in the ovens of Egypt. The French philosophers have bestowed considerable attention upon artificial hatching, and one of the best results of their labours was the *Eccaleobion*, or egg-hatching machine, exhibited in London some years ago.

HATCHMENT. (*See* ACHIEVEMENT.)

HATCHWAY, or HATCH, *hatch'-way* (Ang.-Sax.).—Hatches are oblong or square openings in the decks of a ship, forming the communications between one deck and another. There are usually three; viz., the main hatchway, situated just before the mainmast, which is the largest; the fore hatchway, situated a little abaft the foremast; and the after hatchway, placed between the main and mizen masts. The fore and after hatches, being used principally for communication, are fitted with ladders. In merchant vessels there are frequently other hatchways. When not in use, the hatchways are covered with wooden gratings, and during stormy weather with tarpaulins, to prevent the water getting below.

HATTI SHERIF, or HATTI HUMAYUN, *hat'-te sher'-if, hoo-ma'-yoon* (Turkish, exalted, or august writing), is the name given by the Turks to every rescript of the sultan. It is in the Turkish language, and written in the Arabian court-hand,—Divâni. Above the text, as a sign of its authenticity, stands the ornamental name-flourish of the sultan, commonly black, sometimes red, and in some cases golden. This flourish is called *Tugra*, or *Rischanisherif*, *i. e.* exalted sign, and the official who supersoribes it is called *Rischandschi*, *i. e.* signer. The most celebrated hatti sherif of recent times is that of Gulhane (Nov. 3, 1839), guaranteeing life and property to all subjects of the empire, without distinction of creeds. This was confirmed by a new hatti sherif (Feb. 18, 1856), proclaiming equality of all creeds and nationalities, making non-Mohammedans admissible to public office, and permitting foreigners to hold landed property. A hatti sherif is irrevocable.

HAUTBOY, or OBOE, *o'-boy* (Fr.), a musical wind instrument of the reed kind, which at a very early date took its place as one of the essential instruments of the orchestra. It consists of a tube, made of box, ebony, or cocoa-wood, about twenty-one inches long, narrow at the top but gradually widening towards the lower end or bell, and divided into three pieces or joints. In the upper and middle ends are holes, by stopping or opening which with the fingers the natural scale is formed, the intermediate semitones being produced by means of the keys, of which some hautboys have but two, while others have fifteen, and sometimes more: they are seldom made now with less than fifteen keys. Its range of available notes extends from B to C in alt. The tone of the hautboy is rich and sweet, and is particularly adapted to *piano* and *dolce* passages. The best player on this instrument at the present time is Mr. Grattan Cooke. This term is also given by organ-builders to a reed stop similar in shape to the real hautboy, the sound of which it is intended to imitate.

HAVEN. (*See* HARBOUR.)

HAVILDAR, *hâv-il-dar'*, is the highest rank to which a non-commissioned officer can ascend in the native regiments of India and Ceylon; and consequently the rank is somewhat analogous to that of a sergeant-major in the English army.

HAWFINCH. (*See* GROSBEAK.)

HAWK, *hawk* (Sax. *hafoc*), a term applied in Orn. to the *Accipitrina*, a sub-family of the *Falconidæ*. The birds of this family are distinguished by the shortness of their wings, which extend no further than two-thirds the length of their tail. The fourth quill-feather is the longest, the first, second, and third gradually exceeding each other in length. The beak is short, and hooked from the base; and the upper mandible, though not furnished with distinct teeth, like the true falcons, has the festoon, or prominence, that generally supplies its place, more strong and angular than is usual among these tribes. Hawks are generally natives of cold climates; they skim the ground with a low and rapid flight, sometimes seizing their prey upon the wing, and sometimes swooping upon it from above. The common sparrow-hawk may be taken as a type of the family. It is to be found in nearly every part of Europe, and its range extends from Russia to the Cape of Good Hope: it is also to be found in Japan. In Great Britain, it has the reputation of being the most destructive of all the native rapacious birds. It is generally to be found in wooded neighbourhoods, and preys upon partridges, pigeons, &c., and is the terror of the poultry-yard. The female sparrow-hawk is nearly fifteen inches in length, and the male about three inches shorter. Their nest is built in high rocks, lofty ruins, or hollow trees; but their eggs are frequently laid in the deserted nests of crows or other birds. In former times this bird was used in falconry, and was considered the best hawk for landrails. In ancient times it was held in high estimation by the Egyptians, amongst whom it was an emblem of Osiris; the Greeks consecrated it to Apollo. The goshawk is a larger species than the sparrow-hawk, and is also found in many countries. (*See* GOSHAWK.) There are many other species of hawks, such as the *Accipiter dukhunensis*, found in the Deccan; others, such as the *Herpethetores cachinnans*, found in America. In South America there are several varieties, and a collared sparrow-hawk which possesses all the destructiveness and courage of its European ally, is found in Tasmania. In Africa, a sparrow-hawk (*Nisus musicus*) has been observed, which is commonly called the chanting falcon. It is the only raptorious bird gifted with the power of song; but its notes can hardly be called harmonious or musical; its voice is simply a little clearer than usual; but it seems to have a high notion of its own powers; for it will sit for half a day, perched on a tall tree, uttering its unceasing cry.



SPARROW-HAWK.

HAWKERS, PEDLARS, and PETTY CHAPMEN, *hawk'-ers* (Ang.-Sax.), are persons travelling from town to town, selling goods and merchandise. Act 50 Geo. III. c. 41, repealed the previous acts on this subject, and placed the duties of hawkers and pedlars under the management of the commissioners of hackney coaches. It imposed a duty of £4 per annum on every such trading person going from town to town, or to other men's houses, and travelling either on foot or with horse, &c.; and the sum of £4 yearly additional for every horse, ass, mule, or other beast, bearing or drawing burden, he or she shall so travel with. Before obtaining license, they are required to produce a certificate, signed by some clergyman, or by two respectable inhabitants, attesting that they are of good character and reputation. Every such person is required to have legibly written, painted, or printed in

large Roman capitals, on every pack, box, trunk, cart, waggon, &c., and likewise upon every handbill or advertisement which he may give out, the words "licensed hawker." A licensed hawker is not allowed to open a room or shop, and expose for sale any goods or merchandise by retail, in any town or parish where he is not a householder, or which is not his usual place of abode, in order to sell, by himself, or by any auctioneer, &c., by outcry, as in a sale by auction, or other mode whereby the best or highest bidder is, or shall be deemed to be, the purchaser. A licensed hawker, however, selling in such premises by retail, does not offend against this clause, which only applies to selling by outcry, &c., or by some mode of sale at auction. A licensed auctioneer, going from town to town, and sending goods by public waggons, and selling the same on commission by retail or by auction, at the different towns, is a trading person within the meaning of the act, and must take out a hawker's license. The act does not extend to hinder any person from selling any goods in any public market, mart, or fair, nor to prohibit any person or persons from selling any printed papers licensed by authority, or any fish, fruit, or victuals; nor the real workers or makers of any goods, wares, or manufactures of Great Britain, or their children, apprentices, or known agents or servants, usually residing with such real workers or makers only, from carrying abroad and exposing to sale, and selling by retail or otherwise, any of said goods, wares, or manufactures of their own making, in any mart, market, or fair, in any city, borough, or market-town; nor any tinkers, coopers, glaziers, &c., usually trading in mending kettles, tubs, &c., from going about and carrying with them proper materials for mending the same. Act 52 Geo. III. c. 108, declares that no wholesale trader in lace, woollen, linen, silk, or any of the goods, wares, or manufactures of Great Britain, and selling the same by wholesale, either by himself or his servants or agents, shall be deemed a hawker within the meaning of the above act. Act 1 & 2 Will. IV. c. 22, places the collection of duties paid by hawkers, &c., under the care and management of the commissioners of stamps for the time being. Act 22 & 23 Vict. c. 36, empowers justices, in convicting for offences under the Hawkers Act, to mitigate the penalties there prescribed to not less than one-fourth part over and above the necessary costs of proceedings; and no hawker's license required to be taken out by any worker or maker to sell his goods anywhere, either by himself, child, agent, or apprentice. By 23 & 24 Vict. c. 111, hawkers' licenses, granted either in England or Scotland, are good for any part of Great Britain; and the commissioners of inland revenue may remit penalties incurred by unlicensed hawkers, in whole or in part, although portions of these may be payable to other parties than the Crown. By 24 & 25 Vict. c. 21, hawkers having the proper excise license are authorized to sell sugar and tea; persons exposing goods for sale at private houses to be deemed hawkers, with the exceptions already specified. Licenses may also be granted by any inland revenue officer, on certificate by a justice of the peace or a police inspector. It is also provided, that a hawker, pedlar, or petty chapman, if he shall travel on foot without any horse or other beast, and carry his goods to and sell them at other men's houses, and not at any house, shop, room, booth, stall, or other place, in any town to which he may travel, may obtain a license, for a period not exceeding six months, at £1; exceeding six months, £2. If he shall travel with an ass, mule, or horse not exceeding thirteen hands in height (four inches to the hand), where the license shall be for a period not exceeding six months, £2; exceeding six months, £4.

HAWKING, *hawk'-ing* (Sax. *hafoc*, a hawk), the art of training and flying hawks, in order to take other birds. The practice of teaching one bird to fly at and catch another is frequently called falconry, and is of high antiquity. Amongst the Asiatics the sport seems to have been practised from the earliest period; and in the time of Ctesias, foxes and hares were hunted in India by means of rapacious birds. It is not certain, but very probable, that the ancient Greeks used hawks and other birds of prey in hunting and fowling. From the East the art gradually spread over Europe, and,





although scarcely known to the Romans in the days of Vespasian, was practised with enthusiasm by the ancient Britons, who maintained a considerable number of birds for the sport. In after-times, from the Heptarchy to the days of Charles II., hawking was a favourite amusement of the English. A person of rank scarcely stirred out of doors without his hawk on his hand; and in old paintings and seals this is the criterion of nobility. In the Bayeux tapestry, Harold, when setting out on a most important embassy to Normandy, is represented with a bird on his hand and a dog under his arm. In olden times this diversion was the favourite amusement of all ranks of men; and while it was the privilege of the poor, was the pride of the rich. The expenses of the sport were sometimes very great. Sir Thomas Monson, in the reign of James I., is said to have given £1,000 for a cast of hawks. The laws with regard to the protection of the birds were also very rigorous. Edward III. made it felony to steal a hawk; and to take its eggs was, even in a person's own ground, punishable with imprisonment for a year and a day, besides a fine at the king's pleasure. With these slight restrictions, hawking remained a favourite amusement in merry England till the reign of Queen Elizabeth, when the imprisonment was reduced to three months; but the offender had to find security for his good behaviour for seven years, or lie in prison till he did so. The sport of hawking was so universally popular in Britain at that period, that a certain quality of hawk was apportioned to every one, according to his station in life. Thus the eagle or vulture was given to the emperor, the ger-falcon to the king, the falcon gentle, or the tercel gentle, to the prince, the rock-falcon to the duke, the peregrine falcon to the earl, the bastard falcon to the baron, the sacre to the knight, the harrier and the lammeret to the esquire, the merlin to the lady, the hobby to the young man, the gos-hawk to the yeoman, the tercel to the poor man, the sparrow-hawk to the priest, the musket to the holy-water clerk, and the kestrel to the knave or servant. The birds most generally used in hawking were the peregrine falcon and the ger-falcon. When under a year old, hawks were called *red hawks*, on account of their plumage being dusky red in colour. When over a year old, the hawk was called a *haggard*. Several of the birds employed for the sport in this country are still to be found in Scotland and Wales. The peregrine falcon inhabits the rocks of Caernarvonshire; and the same species, with the ger-falcon, the gentil, and the gos-hawk, are found in Scotland, and the lanner in Ireland. In the old time, the Norwegian hawks were held in high esteem in England, and were not considered unbefitting bribes for the king. It is recorded that Jeoffrey Fitzpierre gave King John two good Norway hawks, in order to procure for his friend the right of exporting a hundredweight of cheese. In some cases hawks were made the tenures by which several of the nobility held their estates from the crown. Sir John Stanley and his heirs held a grant of the Isle of Man from Henry IV., by paying two falcons to the reigning sovereign on the day of coronation. Although hawking, as an exercise, has now gone nearly out of use, several of the terms employed still hold their place in the lan-



DRESSED HAWK.

guage. Every part of a hawk has its distinct name. The legs, from the thigh to the foot, are called *arms*; the toes, the *petty singles*; the claws, the *pounces*; the wings, the *sails*. The crop is called the *gorge*; the upper part of the bill, the *beak*, the lower part, the *clap*; the yellow part between the beak and eyes, the *cere*, and the small holes in it, the *nares*. The furniture, the leathers, with bells fastened on the legs, are called *bewits*; the leathern thong by which the hawk is held is called the *lash*; and the little straps fastening them to the legs, the *jesses*. A head-covering, in order to keep the bird in the dark, is called a *hood*; and to draw the strings, so that the hood may be in readiness to be pulled off, is called *unstriking the hood*. The *lure* is a figure or resemblance of a fowl made of leather and feathers; and the resting-place when the hawk is off the falconer's hand, the *perch*. Many of the particular actions of the hawk are also described by distinct terms. When the bird flutters on the hand or perch, it is said to *bate*; when standing too near, hawks fight with each other, it is called *crabbing*; when the young ones quiver in obedience to the elder, it is called *cowring*. The seizure of its prey by a hawk is called *binding*; when it pulls off the feathers, it is said to *plume*; when it forsakes the proper game, and flies at magpies, crows, &c., it is called *check*. The fowl or game flown at is called the *quarry*, and the dead body of a fowl killed by the hawk is called the *pelt*. The making of a hawk tame and gentle is called *reclaiming*; the bringing one to endure company, *manning*; and a hawk well enough trained to set an example to a young one is called a *make-hawk*. George, earl of Oxford, tried to revive hawking in the latter part of the 18th century; and, in Yorkshire, Colonel Thompson had a hawking establishment at a later period. As a general diversion, however, in this country, the sport has entirely gone out, although now and then occasional attempts have been made to revive it. In Sir Walter Scott's novels, there are some very graphic and interesting descriptions of this national sport. A list of the hawks in use at the time of Charles I. will be found in Walton's *Complete Angler* (*see* also *The Book of St. Albans*, by Juliana Berners, abbess of Sopwell; *La Fauconnerie*, by Charles d'Esperon; and Latham's *Falconry*).

Hawse, *hawze* (Ang.-Sax.), a term applied to the situation of the cables before a ship's stem, when she is moored with two anchors, one on the starboard and the other on the port-bow. When these cables verge from each other, the hawse is said to be *clear*; when crossed by the ship's swinging half-round, the hawse is said to be *crossed*; another cross makes what is termed an *elbow*, and then a *round-turn*:—in both these latter cases, the ship is said to have *foul hawse*. The process by which the cables are disengaged from these entanglements is called *clearing hawse*. *Freshening hawse*, means veering out more cable, in order to render the friction of the *fouled* cables more evenly distributed. *Athwart hawse* means crossing the bows of a ship at anchor.

Hawse-holes, the holes in the bows of a ship through which the cables pass that are attached to the anchors.

Hawser, *haw'-zer* (Ang.-Sax.), a large cable, of intermediate size between the cable and *tow-line* of the ship to which it belongs; it is used for various purposes; as warping out of dock, or towing, &c.

Hawthorn. (*See* Crataegus.)

Hay, Haymaking, *hay* (Sax. *hey*, *hiy*), grass cut and dried for fodder; grass prepared for preservation. Haymaking is the operation of cutting down, drying, and otherwise preparing the forage-grasses and other forage plants. When the plants are in full flower, as they are now supposed to contain the maximum amount of nutritious juices diffused throughout their system, they are mown down with a scythe. Fine, dry weather, when the sun prevails, is generally chosen for the time during which haymaking is to be prosecuted, and the mown material is spread out and tossed over several times for the purpose of exposing it to the sun's rays, even on the first day it is cut. In the evening it is collected into small heaps, which are again spread out to dry the next morning, as on the previous day. If the weather has been very warm and dry, and the sun very powerful, these heaps are carted away and stacked on the third day; but if the weather has been damp, they are again spread out, as previously, until four days have elapsed from the day the grass was cut. The grand object in making hay is to preserve all the colour and natural juices of the grass, &c., which is done by repeatedly turning it over, so as never to expose the same surface for any length of time to the influence of the sun. In stacking hay, these natural qualities are preserved; and besides, a slight fermentation is brought on, which renders the fibres more tender, and dissolves a part of the parenchymous matter into sugar, which renders the hay more palatable to horses.

Haybote, *hai'-bote* (Sax.), in Law, is a liberty to take thorns and other wood to make and repair hedges, gates, fences, &c., either by a tenant for life or years. It is said to include also wood for the making of rakes and forks used in the making of hay.

Hayward, *hai'-ward* (Sax.), is applied to the keeper of a common herd of cattle of a town, and part of whose duty is to see that they neither break nor crop the hedges of inclosed grounds.

Hazel. (*See* Corylus.)

Head. (*See* Brain, Anatomy.)

Headache, *hed'-aik* (Sax. *heafod*, head; *ace*, ache), or pain in the head, is a complaint of very common occurrence, and may result from so many different causes, that it is impossible to lay down many special directions regarding it. There are few diseases with which it does not occur symptomatically, and it is a prominent symptom in all fevers and inflammations, and in many nervous complaints. It occurs idiopathically, either from weakness or exhaustion of the nerve-power of the brain, or from a disordered state of the digestive apparatus. Sometimes it is an obtuse pain extending over the whole head, with a sense of heaviness, with a general torpitude of the sensorial power, disqualifying the person for continued mental effort. The sight is often dim, the hearing dull, and the memory defective. This arises from some weakness or exhaustion of the brain, and is produced by irregular circulation of blood in the head, by great mental exertion, or by violent mental passions. When it arises from an overloaded condition of the blood-vessels of the brain, there is usually a bloated countenance, full red eye, and a dull inanimate expression. Cold applications to the head, leaches to the temples, or cupping on the back of the neck, with spare diet and active aperients, are the proper means to be adopted in this case. Where it proceeds from nervous exhaustion or nervous irritability, soothing and strengthening measures are to be adopted, and stimulants to be as much as possible avoided. Tonics ought to be employed, and such other means, as out-door exercise, sea-bathing, &c., as tend to strengthen and invigorate the system. Bilious headache, or such as arises from a disordered state of the digestive organs, usually affects one side of the head only, or but a portion of it, most commonly over one eye, and increasing to an acute and often throbbing pain. It is commonly accompanied with a feeling of sickness, often leading to vomiting, and producing extreme languor and depression of spirits. This kind of headache seldom lasts more than a few hours at a time, and may generally be removed by taking a blue bill at bed-time, with a colocynth pill, or other aperient, in the morning. In rheumatic headache, which is commonly caused by exposure to cold, the pain is of a remittent, shifting nature, shooting from point to point, and is felt most at night, when the patient is warm in bed. (*See* Rheumatism.)

Headborough. (*See* Borough.)

Health, *helth* (Ang.-Sax.), is that condition of the living body in which all the vital, natural, and animal functions are performed easily and perfectly, and unattended with pain. It consists in a natural and proper condition and proportion in the functions and structures of the several parts of which the body is composed. From physiology we learn that there are certain relations of these functions and structures to each other, and to external agents, which are most conducive to their well-being and permanency, which constitute the condition of health. States which are deviations from the due balance between the several properties or parts of the animal frame constitute disease. The most perfect state of health is generally

connected with a certain conformation and structure of the bodily organs, and well marked by certain external signs and figures, a well-proportioned body, calm and regular circulation of the blood, free and full respiration, easy digestion, &c. There are, however, few persons who can be said to enjoy perfect health; and hence, in ordinary language, when we speak of health, we imply merely a freedom from actual disease. In this sense, the standard of health is not the same in every individual, that being health in some which would be disease in another. The healthy pulse in adults averages from 70 to 80 per minute, yet there are some in whom 90 or 100 is a healthy pulse. Muscular strength and activity, nervous sensibility, and the sensorial powers, vary exceedingly in different individuals, yet all within the limits of health. There is scarcely any earthly blessing men hold so lightly as health, and yet there is not one they so deeply deplore the loss of when deprived of it. In order to preserve health, it is necessary to be temperate in food, exercise, and sleep, and to pay strict attention to bodily cleanliness, abstaining from spirituous liquors and the over-indulgence of sensual gratifications.

HEALTH, BILL OF. (*See* BILL OF HEALTH.)

HEALTH, PUBLIC. (*See* SANITARY SCIENCE.)

HEARING. (*See* EAR, DEAFNESS.)

HEARSAY EVIDENCE, *hear'-say* (Ang.-Sax.), in Law, is the name given to that kind of evidence in which a witness speaks not from his own knowledge, but from what he heard another person say. As a general rule, such evidence is inadmissible in a court of law, as the person by whom the statement was first made cannot be sworn, neither can he be cross-examined; and the full truth or entire meaning of the statement may not have been carried away. But there are some cases in which such evidence is received; as in proof of any general customs, or matters of common tradition or repute; or an account of what deceased persons have said in their lifetime.

HEART, *hart* (Sax. *heort*, Lat. *cor*), in Anat., the great central organ of the circulation of the blood, is a hollow muscular organ in the form of an irregular cone, and placed obliquely in the lower or front part of the thorax, inclined most to the left side. The base is directed towards the spine, and corresponds with the fourth and fifth dorsal vertebræ, while the apex points between the cartilages of the fifth and sixth ribs on the left side. It rests upon the diaphragm, having the lower surface somewhat flattened. It is inclosed in a membranous bag, called the pericardium, but loosely, so as to allow free motion. The heart may be considered as double, the right side being pulmonary, and serving to transmit blood only to the lungs; the other systemic, forcing the blood into all parts of the system. It contains four cavities,—two at the base, termed auricles, and two at the apex, named ventricles. The right auricle has four apertures,—one from the superior vena cava, by which the blood is returned from the upper portion of the system; one from the inferior vena cava, returning the blood from the lower parts of the system; one from the coronary vein, by which the blood is returned from the heart itself; and one into the right ventricle. The blood passes from the right auricle into the right ventricle, the entrance to which is guarded by a fold of the lining membrane, forming a valve, called the tricuspid, from its presenting three points. The blood is sent from the right ventricle into the pulmonary artery, by means of which it is conveyed to the lungs. The entrance to the pulmonary artery is guarded by three semilunar valves, which prevent the blood from again flowing back into the ventricle. The blood is returned from the lungs to the heart by the pulmonary veins, which convey it into the left auricle. From this it is sent into the left ventricle, the entrance into which is guarded by the mitral, or bicuspid valve, consisting of two pieces, of which the right one is much larger than the other. The left ventricle has its walls much thicker than the right, and forces the blood into the aorta, for distribution over the entire system. At the commencement of the aorta, there are three sigmoid or semilunar valves, as in the pulmonary artery, for preventing the blood from returning. The heart of a fœtus differs from that of an adult, in having a foramen ovale, through which the blood passes from the right auricle to the left. The





exterior fibres of the heart are longitudinal, the middle transverse, and the interior oblique. The contraction of the heart is termed systole; its dilatation, diastole.

HEART, DISEASES OF THE.—The heart, from the important part which it plays in the animal economy, is subject to various, serious, and often fatal diseases. Like the other viscera, it is removed from the eye, so that little knowledge of its condition can be obtained by inspection; and hence we must have recourse to other means. The ear is the principal means of obtaining a knowledge of the state of the heart, and by auscultation and percussion (which *see*), we are enabled to detect the existence of various diseases. The heart gives out two sounds, known as the first and second, which are distinguished from each other. The first sound is longer than the second, and the interval between the first and second sounds is shorter than that between the second and first. They have been compared to the two syllables *lupp, dupp*. Any manifest alteration in these sounds is indicative of the existence of disease. They may be high or low, clear or dull, muffled, rough, intermittent, &c. Murmurs or regurgitant sounds may arise from disease of the valves. The power of distinguishing between the normal and abnormal sounds of the heart, and of the causes producing the latter, can only be obtained by lengthened experience. Diseases of the heart are usually divided into two classes,—1. functional or nervous, and 2. structural or organic. Chief among the former are palpitations, syncope, or fainting, and angina pectoris (which *see*). They are chiefly to be met with in persons of a naturally nervous temperament, more especially women suffering from hysteria, or other like complaints, and may be induced by great mental excitement. In such cases, great attention should be paid to the general health, and by means of tonics, sea-bathing, and gentle open-air exercise, the system is to be strengthened. Violent exertion, and strong mental excitement, are particularly to be avoided. Among the principal organic diseases to which the heart is subject, are pericarditis, carditis, endocarditis, atrophy, hypertrophy, dilatation, and valvular disease. Pericarditis, or inflammation of the pericardium, may be induced by exposure to damp or cold, or by other causes, which give rise to inflammation in other parts. It is characterised by great tenderness over the region of the heart, amounting, when pressed, to sharp cutting pains, which prevent him from lying upon the left side. If, as is usually the case, the pleura is involved, there will be acute pain on coughing or drawing a deep breath. Sometimes the attack is not so severe, and only a slight pain is felt, or only a sense of heaviness and oppression. Generally the action of the heart is increased, sometimes so much so as to constitute palpitation. Frequently there is a considerable quantity of fluid effused into the cavity of the pericardium, which is sometimes externally visible by the bulging out over that part. It is a frequent attendant of acute rheumatism (which *see*). Its mode of treatment depends very much upon the particular circumstances of each case. Where the disease is rapid and violent, bleeding may be of great service; in other cases tonics, and in some cases stimulants, are employed. Carditis, or inflammation of the heart itself, sometimes occurs, but it is usually accompanied with inflammation of the pericardium: the symptoms in both cases are the same, and the treatment will consequently be similar in both. The like remarks also apply, in great measure, to endocarditis, or inflammation of the interior lining membrane of the heart, which is usually accompanied by one or both of the above. In this case there is more or less of fever and anxiety, and a peculiar sound of the heart is heard upon auscultation. Atrophy, or a wasting of the heart's substance, arises from a deficiency in the supply of nutritive matter. It is usually accompanied by general emaciation, and will be pretty sure to terminate in death. When the heart is examined after death, its tissues are found to have undergone a change, and, instead of a striped, to present a homogeneous appearance. This is called "fatty degeneration." The treatment is to strengthen the system by tonics, wholesome and nutritious diet, open-air exercise, sea-bathing, and the like. Hypertrophy, on the other hand, is the result of an excess of nutrition, the nutritive pro-

cess appearing to go on more rapidly than the absorbent. In this way the heart is often greatly enlarged in bulk, and its operations seriously interfered with. It is usually distinguished into three kinds,—(1) simple, when the walls of the heart, or its divisions, are thickened, without any diminution in the capacity of the cavities; (2) eccentric, or aneurismal, when the walls are thickened, and the cavities likewise enlarged; and, (3) concentric, when the cavities are diminished in proportion to the thickening of the walls. The first of these is the least common, and the second the most frequent; and any of them may affect a single cavity or the whole heart. From the force with which the blood is propelled in such cases being greatly increased, the tendency is to produce hæmorrhages, aneurism of the aorta, apoplexy, &c. The pulsations are frequently regular but strong, sometimes even visibly raising the bedclothes, and the chest is bulged out over the part. Rest, abstinence, and more or less depletion, according to circumstances, are the proper means to be employed in such a case, and usually, with care and perseverance, the symptoms will be much alleviated. Dilatation of the heart is where one or more of the cavities are enlarged in size without the substance of the heart itself being increased. It is sometimes caused by increased action of the heart, and may be produced by excessive exertion or strong excitement of any kind; it frequently also arises from want of sufficient muscular strength in the heart itself, or from some obstruction to the free passage of the blood. It is characterized by want of vigour in the circulation, and by feebleness and inability for exertion in the patient; he will often be exhausted by the loss of even a small quantity of blood, and may even be carried off during a trifling hæmorrhage. Attention to the general health, so as to strengthen the patient and restore the circulation, while all exciting causes are to be avoided, are the means to employ in such circumstances. The valves of the heart are subject to a variety of diseases which interfere with their proper action: these are among the most easily detected of the organic diseases, on account of the sounds produced by them. The valves frequently become thickened, or even cartilaginous or osseous, so that they do not act freely, or close imperfectly, leading to obstruction or regurgitation of blood. Being connected with the endocardium, or internal lining membrane, diseases of the valves often result from repeated attacks of endocarditis. These obstructions tend to produce oppressions of the breath, apoplectic fits, sanguineous and serous congestions,—as hæmoptysis, albuminaria, dropsy, &c. The mode of treatment in such cases will depend upon the particular symptoms present, otherwise the general mode of treatment indicated above, of strengthening the tone of the system and equalizing the action of the heart, is to be followed.—*Ref.* Watson's *Lectures on the Practice of Physic*; Copland's *Dictionary of Medicine*; *English Encyclopædia*—Arts and Sciences.

Heartburn, *hart'-burn* (Lat. *cardialgia*, from Gr. *kardia*, the heart, and *algos*, pain), in Med., is an uneasy sensation in the stomach, ascending with acid eructations and a burning heat into the throat. Sometimes it is attended with oppression, faintness, nausea, and an inclination to vomit, or a plentiful discharge of a clear, lympid, fluid-like saliva, commonly termed waterbrash. In some cases a gnawing or burning pain is felt, chiefly at the cardia, or upper orifice of the stomach; whence the name is derived. It is usually a symptom of dyspepsia, but it may also be occasioned by other complaints; as worms, inflammation of the stomach or intestines, various diseases of the heart, &c. It may also be occasioned by violent emotions of the mind. Indigestible foods, as animal fat, oil, butter, cheese, &c., are very apt to occasion it. The best remedies are alkalies combined with mild aperients, such as magnesia, or tartrate of soda, and rhubarb. The great thing, however, is to restore the healthy action of the stomach, and to avoid such substances as tend to produce it. (*See* Dyspepsia.)

Hearth-money. (*See* Fumage.)

Heat, *heat* (Sax. *hætt*, *hæt*), a term applied in ordinary language either to the sensation excited in us by the approximation of a warm body or to the cause of that sensation. Heat, as a great natural agent, is universally diffused through all matter, and is capable of producing various phenomena; such as expansion, fusion, vaporization, and thermo-electric currents. There is nothing absolutely known as to the cause of heat. The question as to whether it is a substance or an accident has been discussed, without result, since the times of Bacon. By those who consider heat to be a material substance, it is called *caloric*, and is supposed to be a subtle fluid universally diffused, and capable of permeating the densest substances. The parts of this fluid are also supposed to be mutually repulsive, but attracted by the material particles of bodies; thus accounting for expansion and contraction. The other effects of heat are accounted for on principles analogous to those on which the undulatory theory of light is founded. Those who regard heat as merely accidental to matter, consider that the artificial production of heat is accompanied by vibratory motions in the interior molecules of the heated substances. This theory is open to a great objection, for heat is propagated through a vacuum; and even if it is supposed that all space is filled with a fluid, in order to account for solar heat, the hypothesis loses its simplicity, and is very vague. It is better to observe the properties of heat, and from them to measure and calculate its effects than to speculate on its nature; and instead of using the word *caloric* to conceal our ignorance, to use the word heat, in order to denote that state or condition of a body which excites in us the sensation of heat. Every existing substance may be looked upon as a source of heat. The most important of these is the sun, and its heat, when condensed by means of a lens, is very intense. Without the benign influence of the sun's heat, all nature would be bound in the adamantine chains of cohesion. The conflagration of every combustible on the face of the earth would not compensate for twenty-four hours' absence of the solar rays. The second source of heat is mechanical, and consists in the friction or rubbing together of solid substances. In this operation, strong mechanical force is opposed to the force of cohesion or adhesion, and heat is generated by the reaction of the two. Two pieces of wood rubbed rapidly together quickly become hot, and when the force and velocity are great enough, combustion ensues. The sparks of the common flint and steel are small particles of the metal struck off by the stone, and burning under the influence of the heat elicited by the blow. A third source of heat is chemical. All cases of common combustion, and all artificial processes for obtaining light and heat, are familiar examples of this action. But in all cases of this sort, the heat evolved, however copious and intense, is limited, and proportionate to the quantities of the substances reacting upon one another. Heat is obtained from a fourth source, which is probably allied to the last; namely, electricity. Another source of heat is physiological, and exists in ourselves. Heat is a product of animal life, and we can feel it and judge of it by our own sensations; we can increase it by muscular exertion, and can communicate the sensation of heat to others. When referred to our sensations directly, however, heat and cold become merely comparative terms, and depend upon the temperature of our bodies at the time of experience. Any estimation, therefore, of heat by sensation must be very vague. In all these sources of heat, notwithstanding the copious evolution of the wonderful agent, there is no loss of material substance. Solar heat has been concentrated by a number of powerful lenses on one scale of a balance of extreme sensibility; but no derangement of equilibrium ensued. As far as experiment can show, heat must consequently be looked upon as without weight,—an imponderable agent. Heat radiates from all bodies in straight lines and in all directions; and, like radiant light, its intensity decreases as the square of the distance from the source of the rays: thus, if a thermometer protected from the influence of all disturbing causes be observed to rise a certain number of degrees at one inch distance from a heated surface, it will indicate four times less heat at two inches; nine times less at three inches; and so on. Reflected heat also follows the same law as reflected light; and that the angle of reflection is equal to the angle of incidence may be proved by holding a bright metallic plate before a fire. When we see the reflection of the fire, we also feel the

heat. If two concave mirrors are fixed at a distance of 10 or 15 feet apart, with their axes in the same line, and their faces parallel and opposed to each other, upon placing a thermometer in the focus of one, it will be found sensitive to the effects of a heated body placed in the focus of the other. A piece of ice placed before one mirror will cause the mercury in the thermometer to descend, not through the radiation of cold, but through the radiation of heat from the thermometer to the piece of ice. The best absorbents of heat are the best radiators, and the best reflectors are the worst radiators. The increase of bulk for the same increase of heat varies much in different classes of substances. It is small in solids, larger in liquids, and greatest of all in aëriform bodies. From the freezing to the boiling point of water, 350 cubic inches of lead become 351; 800 cubic inches of iron, 801; and 1,000 cubic inches of glass, 1,001. Liquids augment their volumes in different proportion when subjected to the same change of temperature; but every aëriform substance, provided it be not in contact with a liquid, expands in the same proportion; 1,000 parts of air becoming 1,373, when heated from 32° to 212° Fahrenheit. These expansions take place gradually, and when the heat is withdrawn, the bodies return to their original bulks, by corresponding regular contractions. Accurate measurement and precision of instruments form the perfection of science. The correct measurement of heat cannot be effected by the unassisted senses. But by observing the expansion or enlargement of a certain quantity of air, or of a liquid, or a solid, an apparatus is obtained by which the effects of heat can be accurately measured and calculated. This is the principle of the thermometer. The first invention of this useful instrument is ascribed to Sanctorio, an Italian physician, who lived about 1590. (*See* THERMOMETER.) One of the most important properties of heat is conduction. If a stick of charcoal is held in the flame of a candle, no disagreeable sensation of heat will be perceived, even when the heated extremity is at a small distance from the fingers. But a metallic wire will speedily burn the hand at a greater distance from the extremity, and before any part becomes red even. The process by which the heat is conveyed along the metal is called conduction. This property varies in different solids, and it may be roughly stated that dense bodies possess conductive power in the greatest proportion. Thus, metals are the best conductors; stones are next; hard woods next; and so on. Diamonds and other gems are much better conductors of heat than glass; and thus may be distinguished from it, by touching the lips, which in general are very sensitive to changes of temperature. The gems feel cold, when compared with the glass. The metals themselves vary much in their conducting power. Many useful contrivances for the convenient management of hot bodies are dependent upon the differences of this property; thus wooden handles are used to protect the hand from a hot teakettle, or the handle of a silver teapot is insulated from the body, by the insertion of small plates of ivory, which prevent the conduction of heat to any disagreeable extent. By breaking the cohesion of solids, their conducting power is much decreased. Thus at the siege of Gibraltar, red-hot cannon-balls were carried to the batteries on wooden wheelbarrows, the bottoms of which were covered with layers of sand. Heat is conducted by liquids with such difficulty that some philosophers have doubted whether they are not altogether destitute of the power. They acquire heat, however, under particular circumstances, with such facility, that it might be hastily concluded that they possess the power of conduction in an eminent degree. That liquids conduct heat very imperfectly, can easily be proved by experiment. If a glass tube, four or five inches in length, be nearly filled with water, and the upper part be heated in a spirit-lamp, the water will boil on the surface, while the tube can be held in the hand at the lower end, without inconvenience, as the water is not able to conduct the heat downwards. In all such experiments, however, the heat is ultimately conveyed down the solid sides of the containing vessel. The difficulty of determining the power of conduction in aëriform bodies is much greater than that of liquids. It has never been proved that they are capable of conducting heat at all. A





simple experiment will show the comparative powers of conduction of solid, liquid, and aëriform bodies. Metals, when heated to 120°, will severely burn a hand placed upon them, on account of the facility with which the heat travels towards it. Water will not scald, provided the hand be kept without motion in it, till it reaches the temperature of 150°; while the contact of air can be endured at 300°. In the Philosophical Transactions, there is an account of an experiment, by Sir Joseph Banks and some others, who ventured into a room heated to 260°, and remained there for a considerable time without serious inconvenience; and in several processes of manufacturing art, it is necessary for workmen to enter stoves heated as high as 300°, from which no injurious effects follow. The bad conducting power of air is usefully applied for many purposes of convenience, and in the arts. Double doors are put to furnaces, in order to prevent the heat from being conducted outwards; and ice-houses are double-cased, in order to prevent the heat from being conducted inwards. In selecting substances for clothing, the same principles are observed. Articles of dress are warm in proportion to the quantity of air which they contain in their texture. Furs, feathers, wool, and down, retard the passage of heat in this way; and for the same reason, snow preserves the warmth of the earth in frosty weather. Although heat travels by conduction with difficulty through liquid and aëriform bodies, both these classes of substances speedily become heated. This is effected by processes of circulation, or rapid change in the relative position of adjacent particles; and the operation is called *convection*. When a liquid is heated, it expands and becomes lighter; the heated and lighter particles rise to the surface, and a new portion comes in contact with the source of heat; and so the motion continues as long as the heat continues to be communicated. The same process of convection takes place, but much more rapidly, in elastic fluids. The expansive and ascensional power of hot air is ordinarily illustrated in the fire-balloon. Montgolfier first applied this power to the construction of a balloon, and Pilatre de Rosier first ventured to float upon the atmosphere in it. (*See* BALLOON.) The ventilation of ordinary rooms, and the ascending currents in chimneys, are both due to the expansion of air by heat. In some of the grand operations of nature, the convection of heat is of great importance. It is principally by the circulation of elastic and non-elastic fluids that the distribution of temperature over the globe is regulated. Thus the heat of the tropics is moderated by the cold currents from the poles; and the low temperature of the Arctic and Antarctic regions is qualified by the warm currents from the equator. The constant current of the trade-winds owes its primary impulse and direction to this cause. The gulf-stream is another instance of the same action. This great current sets across the Atlantic, from the coasts of Africa, towards the shores of the Gulf of Mexico; from thence it passes northwards to the banks of Newfoundland; thus transferring a large portion of warm water to the cold regions of the north. There is a singular exception to the general rule that all substances expand under the influence of heat. This exception is water. When a large body of water, such as that in a deep lake, has been cooled down to 40°, by the perpendicular circulation described, the vertical motion ceases, and the surface water becomes lighter as the temperature falls, finally setting into a sheet of ice. The water underneath is protected from the further influence of the cold, by the cessation of the circulation, and its almost perfect power of non-conduction. If this were not the case in this climate, a lake once frozen could never be liquefied again. Thus far heat has been treated as a force freely developed, which could be measured by our sensations, and by the thermometer and pyrometer. Heat, however, also enters, as it were, into the composition of bodies, loses its character of temperature, and becomes concealed or *latent* to our instruments and our feelings. When equal volumes of the same fluid, at different temperatures, are mixed, they afford the mean temperature of the two. A pint of water at 50°, mixed with a pint at 100°, will show, by the thermometer, a temperature of 75°. If a quantity of mercury, however, at 100°, be mixed with an equal measure of water

at 40°, the resulting temperature will be 60°, or 10° lower than the mean; so that the mercury loses 40°, and the water only gains 20°; yet the water must contain all the heat which the mercury has lost. From this it appears that water has a greater capacity for heat than mercury; viz., it requires a larger quantity of heat to raise it to a given temperature. When matter passes from the solid to the liquid state, or from the liquid to the aëriform state, examples are to be found of *latent heat*. In these processes a large quantity of heat is absorbed, combined, or fixed; and in the opposite changes from aëriform to liquid, and from liquid to solid states, a quantity of heat is set free, and becomes sensible. If equal weights of water at 32° and of water at 212° are mixed, they will show a temperature of 122°; but equal weights of ice at 32° and water at 212° form a mixture, the temperature of which is 52°; the water losing 160° of temperature, while the ice only gains 20°. Therefore, 140° of heat are expended in changing the ice from the solid to the liquid state. Dr. Black, who first investigated these phenomena about the year 1757, drew the conclusion that this portion of heat became latent in the water; which owes its fluid state to its latent heat. The heat is not destroyed or annihilated, as can easily be proved; for if water be exposed to a degree of cold far below the freezing point, it will gradually part with its excess of temperature above that of surrounding bodies, and become colder and colder till it reach the freezing point. The temperature, however, will not descend below 32° till the whole has become ice, and yet it must continue yielding up heat at the same rate as before. There must be, therefore, within it a continued supply of heat, in order to keep it up to the fixed point. Thus the process of thawing ice or snow becomes a gradual one; and without such a provision sudden and disastrous floods would occur every spring in the polar and temperate zones. Artificial cold is easily produced by rapid liquefaction. The mere solution of nitrate of potash alone will lower the temperature of water from 50° to 35°; while a mixture of snow and common salt will cause the thermometer to sink from 32° to zero. (*See* FREEZING MIXTURES.) When liquids pass into the solid state, their latent heat becomes sensible; and by careful management water can be cooled several degrees below its freezing point without congelation; the moment, however, that it is agitated it is made to congeal, and the temperature rises to 32°. The natural processes of vaporization, like that of liquefaction, are gradual and progressive. If this were not the case, the boiling of an ordinary teakettle would be an extremely dangerous operation; for the whole volume of water would otherwise flash into steam in an instant. It is therefore hazardous to boil those liquids which have vapours with a small specific heat. When oil of vitriol is boiled in a retort, sudden explosions of dense vapour burst forth from time to time, and the retort is very liable to be broken by the concussion. When the pressure of the atmosphere is decreased or removed, liquids will boil at lower temperatures. Under the receiver of an air-pump, water may be made to boil at a temperature of 32°; that is to say, the pressure may be reduced till the vapour of water at that temperature, which is of no higher degree of elasticity than would suffice to support a column of mercury in the barometer of 0·20 inch, would be sufficient to remove it; but the full amount of latent heat must be absorbed in its passage into the aëriform state; and as this can be derived from no exterior source, its own free heat enters into combination. The boiling points of liquids are smaller on the summits of mountains than at their bases, in consequence of the diminished elasticity of the air. On the top of Mont Blanc, water boils at a temperature of 187°. When water is converted into vapour or steam by means of heat, it undergoes a much greater expansion of volume than any other liquid. It expands eight times as much as sulphuric ether, and nearly three times and a half as much as alcohol. The working of the steam-engine depends upon the elastic force of steam, communicated by heat and the instantaneous annihilation of that force by cold. The natural temperature of the surface of the globe is affected by so many causes, that it is impossible to calculate the mean heat of any country by its latitude. In the old and new continents, the most rapid decrease of mean temperature is between the parallels of latitude 40° and 45°. This circumstance has had an important influence in the civilization and industry of the people inhabiting that zone; as the slight variations of latitude produce changes in the vegetable productions that become objects of rural economy. When adjacent countries thus differ much in their products, stimulation of industry and vigorous commercial intercourse are the results: civilization is highly advanced by both these circumstances.—*Ref.* Humboldt's *Isothermal Lines and the Distribution of Heat over the Globe.*

HEATH, or HEATHER, *heeth, heth'-er* (SAX. *hath*), in its common signification, means a place or portion of waste land overgrown with shrubs of any kind, or a moor over which the prevailing plants or vegetation consist of one or more of the several species of *heath*, or *erica*. Heaths are common in Scotland, Ireland, some parts of England, and in countries having a similar climate on the continent; and many hundreds of acres are covered with the *erica*, which grows to a height of three or four feet. This plant is used for the purpose of thatching houses, making brooms, &c., and the tops of heather supply generally the place of a mattress in most Highland cottages. In countries, also, where the grass and clover do not begin to grow until late in the spring, the tops of heather, both in a green and dry state, supply forage for horses and cattle. (For a scientific description of the heath-plant itself, the reader is referred to the article ERICACEÆ.)

HEAVEN, *hev'-en* (SAX. *heafen*), a term which designates the region or expanse surrounding the earth, and which appears above and around us like an immense arch or vault, wherein the sun and moon, the planets and the constellations, apparently revolve in their orbits. Amongst the pagans the term *heaven* was applied to the abode of the celestial gods; and Aristotle and others believed the heavens to be composed of incorruptible materials, as likewise the sun, moon, and stars; which belief was a great drawback to the spread of astronomy, until it was overthrown by the reasonings of Galileo. Ancient astronomers also supposed that there were *eight* heavens, seven of which were named after the planets, and the eighth called the *firmament* (which *see*). The Hebrews acknowledged three heavens;—firstly, the air, or aërial heaven; secondly, the firmament, in which the stars were supposed to be placed; and lastly, the heaven of heavens, or third heaven, which was the seat of Jehovah. Modern astronomy has, however, shown us that the expanse above us is immeasurable space; and in metaphorical language amongst Christians, heaven is held to be the abode of the Deity;—that paradise in which the souls of the good will enjoy happiness, and for ever dwell in the life to come.

HEAVY SPAR, *hev'-e spar*, in Min., a term somewhat loosely applied to both the carbonates and sulphates of baryta and strontia. The true heavy spar of the mineralogist is sulphate of baryta. (*See* CELESTINE, STRONTIANITE, and WITHERITE.)

HEBREW LANGUAGE AND LITERATURE, *he'-brew.*—The Hebrew is one of the oldest and most remarkable of known languages, and is of especial interest to us, as being that in which the Old Testament Scriptures were originally written. It belongs to the so-called Canaanitish branch, or chief division of the Semitic family of languages, the other branches being the Aramaic and Arabian. It is matter of dispute whether the Hebrew language, as seen in the earliest books of the Old Testament, is the dialect which Abraham brought with him into Canaan, or whether it is the common tongue of the Canaanitish nations, which Abraham only adopted from them, and which was afterwards developed to greater fulness under the peculiar moral and political influences to which his posterity were exposed. There is every reason to believe, however, that Abraham, on his entrance into Canaan, found the language then prevailing among the different tribes inhabiting that country to be in, at least, dialectical affinity with his own. For a long time, down to very recently, Hebrew was universally regarded as the original language of the human race, coeval with its beginning; and that traces of it were discoverable in all subsequent tongues. The origin

and progress of the Hebrew language, until it became the language of Scripture, in the time of Moses, it is impossible to determine. According to some, the vernacular dialect of Abraham himself was Aramaic, and became gradually changed by the influx of Egyptian and Arabic words, to the time of Moses. From the time of Moses down to the Captivity, a period of a thousand years, notwithstanding the existence of some isolated, but important archaisms, as in the form of the pronoun, &c., it underwent but little change. So far is this the case, that it has been used as an argument against the received antiquity of the Pentateuch. The causes, however, are to be sought in the isolated and stationary character of the Hebrews themselves, and the genius of the language, as little susceptible of change. In even the earliest canonical books of this period, the language appears in a state of mature development, with precision of syntactical arrangement and great regularity of formation. One of the most remarkable features in the later language of this period is the difference which distinguishes the diction of poetry from that of prose. The language of simple narration and history limits itself to the forms necessary to common purposes; the poets, on the other hand, made use of unusual words and flexions, and harmonic arrangement of thoughts, as seen both in the parallelism of members in a single verse, and in the strophic order of longer periods. The rhetorical language of the prophets moves in a more free rhythm of thought, and in longer sentences, than the poets; but, in other respects, especially in its palmy state, falls in very much with it. The decline and corruption of the Hebrew language dates from the Babylonish captivity. From the time of the Assyrians the Aramaic made great inroads upon the Hebrew; and after the power of the Israelites had been broken by long wars and captivity, the Aramaic, owing to the influence of foreign authority and foreign colonists, spread rapidly. After their return from the captivity, Ezra and Nehemiah took care that the Hebrew, in its ancient form, should be made more familiar to the people; and they both wrote in Hebrew. Among the more strict Jews, the Hebrew was still retained, although within narrow limits, as appears from Daniel and the Maccabees. Still the progress of the Aramaic was not to be repressed; and if the ancient language was occasionally imitated, there was always a considerable admixture of the foreign idiom. From the second century on, the Hebrew was known only to the learned, whilst the Aramaic became the vernacular of the country. Yet, after it ceased to be the language of the people, it did not become unknown to them, as it was read in the Bible in the synagogues, and was frequently made use of by the learned among them to communicate information to those of their own faith. The earliest known character in the Hebrew writing bears a very strong resemblance to the Samaritan, both being evidently derived from the Phœnician. During the Babylonish captivity, they received from the Chaldees the square character in common use; and in the time of Ezra, the old Hebrew manuscripts were copied in Chaldee characters. The origin of the vowel-points is usually assigned to the seventh century of our era, and arose from the efforts made by the learned Jews to preserve the pronunciation of their sacred language, when it ceased to be a spoken tongue. The minute and complex system which we now possess was gradually developed, from a few indispensable signs, to its present elaborateness. There are three kinds of Hebrew alphabets now in use,—the square, or Assyrian, that commonly used in print; the rabbinical, or mediæval, that used chiefly in commentaries and notes; and the cursive, which is employed in writing. There are no capital letters, and the writing is from right to left. The alphabet consists of twenty-letters, or consonants, the vowels being expressed by marks above or below the letters. Five letters have a separate final form. The accents and marks of punctuation are very numerous. The Hebrew is deficient in grammatical technicalities, especially in moods and tenses of the verb, and, consequently, also somewhat in precision; but in euphony, simplicity, brevity, variety of signification, and power of poetical expression, it is hardly excelled by any tongue. The Hebrew literature is the





oldest in existence, and has claimed a high degree of attention on account of its connection with our religion. With the Hebrews, as with every other people, poetry was cultivated before prose; and in the songs of Moses and Deborah we have the earliest specimens of poetry. The Jews were pre-eminently a musical people. Everything calculated to excite the multitude was expressed in song; and young men and maidens emulated each other in beautiful odes at their festive gatherings. The art of poetry was taught in the schools, and their religious exercises and worship were always conducted with singing and instrumental performances. Hebrew poetry is remarkable for its wealth of imagery, not only in the way of illustration, but also of metaphor, substituting the image for the object to be described. There is also a great desire for the symbolic, giving to abstract ideas a concrete form, and investing even inanimate objects with thoughts, feelings, and speech. Hebrew poetry is sententious, each stanza or couplet being complete in itself; so that they would admit of increase or diminution, or of a different arrangement, without destroying the unity of the whole. The poetry of the Hebrews formed so much the groundwork of their higher thinking, that it gave colouring to their historical writings, and affected their philosophical speculations. Hence arose those anthropomorphisms which to us are frequently so offensive, but which naturally connect themselves with the religious views of the Hebrews. One peculiarity of their poetry is *parallelism*, or the regularly placing beside each other symmetrically-constructed propositions. The symmetry, however, is not so much external as ideal, being the same thought repeated several times in other words, or apprehended antithetically from opposite sides. All attempts to discover rhyme or metre in ancient Hebrew poetry have failed; but this may probably arise from our ignorance of the ancient pronunciation. Lyric poetry prevailed under the poet king David, who was equally successful in song and elegy. Strong religious feelings distinguish the spirit and subject of these poems. On the other hand, Solomon in his actions, as well as in the writings which bear his name, inclines evidently to a philosophic and even worldly spirit, very remote from the Jewish character. After the division of the kingdom, religion and literature alone preserved a residue of national vigour, and the prophets now became the instructors and comforters of this morally and politically degraded people. Before the unfortunate period of the Babylonish captivity, under the kings lived Jonah, Joel, Amos, Hosea, Isaiah, Micah, Obadiah, Nahum, and Habakkuk. During the captivity flourished Jeremiah, Ezekiel, Daniel, Zephaniah; and after the return, Haggai, Zechariah, and Malachi. That much must have been lost from the treasures of Hebrew literature, which was very rich, particularly in the age of Solomon, is evident from passages in the Old Testament itself. Of many of the works of the prophets, particularly those known as the minor prophets, we evidently possess only fragments. The period immediately after the return from the Babylonish captivity was of the highest importance to Hebrew literature. Learned men were appointed to make collections of the ancient writings, and the sacred Scriptures were authenticated, and arranged into a canon. When Judea was a province under the successors of the Macedonian hero, Greek refinement, science, and philosophy, spread among the Jews, and a number of errors crept into their religion, and led to the formation of different sects among them; as the Pharisees, Sadducees, Essenes, &c. The Greek language became common in Judea, and the Septuagint was used in the synagogues. During this period, and under the Romans, their literature made great progress, from the influence of the great successive schools, the most famous of which was that of the great Hillel, president of the Sanhedrim. The philosophical book of Ben Sirach and the first book of the Maccabees are the products of the earlier part of this period; and a number of the other apocryphal writings, whose date is unknown, may probably be referred to the same time. The simultaneous literary activity of the Jews in Africa is evinced by their numerous contributions to Hellenistic poetry and history (Jason, Alexander, Polyhistor, Ezekiel, &c.), and especially to Platonic philosophy (Aristobulus, Philo, &c.). The Roman

conquest and the persecutions which followed naturally exerted a very pernicious effect upon literature. After the desolation of Jerusalem, various other places in Palestine became distinguished for their schools of religious science, principally under the lead of the presidents of the Sanhedrim. The work of collecting, elucidating, systematizing, and further developing the decisions of the oral law, was also carried on; and these were finally converted into a written code, or compendium of teachings (Mishna), by the patriarch Jehudah the Holy, and his school, during the mild reign of the Antonines. To this were added the partly supplementary, partly explanatory works, Tosefta, Mekhilta, Safra, and Sifre. These works became the basis of religious study in the subsequent three centuries, in Palestine, as well as in Babylonia, where various flourishing schools existed. After new persecutions by the Christian emperors, which destroyed the schools (353) and the patriarchate (429) of Palestine, and by the Persian kings in the latter part of the 5th century, which destroyed the schools of Babylonia, the results of these studies were collected, though in chaotic disorder, in the two Gemaras or Talmuds (which *see*), the Palestinian and Babylonian; other extant products of the time were various ethical treatises; historical, legendary, and cosmogonal writings; stories, prayers, &c. The Chaldee, often with an admixture of Hebrew, was now generally used in literary works, while the people used the various languages of the countries in which they lived. Under Mohammedan rule, particularly under the later caliphs, who favoured science, the Jews enjoyed comparatively mild treatment, and their schools revived, particularly in Babylonia. Numerous works, historical and ethical, were composed; the critical notes of the Masora, and the Targum of Jerusalem elaborated; talmudical compendiums written; and medical, astronomical, and linguistic studies pursued. Scientific and literary pursuits also flourished among the Jews in Africa, who, with slight interruptions, enjoyed peace under the Saracenic princes. The Arabic was the language generally used by scholars. In the feudal states of Europe, the Jews generally enjoyed but few privileges, and were frequently subjected to the most cruel persecutions. In Spain, however, under the Moorish princes, they enjoyed civil rights, and nearly to the same extent under the Christian kings; and here they made great progress in literature and science. The most distinguished man of this time was Moses Maimonides, renowned as a philosopher, as well as a writer on law. Since that time the Jews have advanced with the surrounding nations, and have produced a number of distinguished men in almost every department of literature and science.—*Ref.* Kitto's *Biblical Cyclopædia;* Herzog's *Theological Encyclopædia;* the *New American Cyclopædia;* Brockhaus's *Conversations Lexikon*, and the numerous works therein referred to.

**Hebrews, Epistle to the.**—The name of one of the canonical books of the New Testament addressed to converted Jews, and designed to dissuade them from relapsing into Judaism, and to fortify them in the Christian faith. It contrasts the grandeur, efficiency, and perpetuity of the new covenant economy with the earthliness, feebleness, and temporary nature of the Mosaic; and exhibits the divine character and offices of the Redeemer, and his infinite superiority to Moses and the Aaronic priesthood. The reasonings are interspersed with numerous solemn and affectionate warnings and exhortations, addressed to different descriptions of persons. It consists of three parts:—1. demonstrates the deity of Christ by the explicit declarations of Scripture (i.—x. 18); 2. the application of the preceding arguments and proofs (x. 19—xiii. 19); and 3. the conclusion, containing a prayer for the Hebrews and apostolic salutations (xiii. 20—25). In the first part, the proposition is that Christ is true God (i. 1—3), and the proofs are: 1. his superiority to angels, by whom he is worshipped as their Creator and Lord (i. 4—14), therefore we ought to give heed to him (ii. 1—4); the superiority over angels asserted, notwithstanding his temporary humiliation, in our nature (5—9); without which he could not have accomplished the work of man's redemption (10—15); for which purpose he took not upon him the nature of angels, but that of the seed of Abraham (16—18). 2. His superiority to Moses, who was only a servant, whereas Christ is Lord (iii. 1—6); this argument applied to the believing Hebrews, who are exhorted not to copy the example of their unbelieving ancestors who perished in the wilderness (iii. 7—iv. 13). 3. His superiority to Aaron and all the other high priests demonstrated, he being the true priest adumbrated by Melchizedek and Aaron (iv. 14—viii.). 4. The typical nature of the tabernacle and its furniture, and of the ordinances there observed (ix. 1—10). 5. The sacrifice of Christ is that true and only sacrifice by which all the Levitical sacrifices are abolished (ix. 11—x. 18). In the second part the Hebrews are exhorted—1. to faith, prayer, and constancy in the gospel (x. 19—25), enforced by representations of the danger of wilfully renouncing Christ after having received the knowledge of the truth, interspersed with warnings, expostulations, and encouragements (x. 26—xi.); 2. to patience and diligence in their Christian course, from the testimony of former believers, and by giving particular attention to the example of Christ (xii. 1—13); 3. to peace and holiness, and to a jealous watchfulness over themselves and each other, enforced by the case of Esau (xii. 14—17); 4. to an obedient reception of the gospel and a reverential worship of God, from the superior excellency of the Christian dispensation, and the proportionably greater guilt and danger of neglecting it (xii. 18—29); 5. to brotherly love, hospitality, and compassion, charity, contentment, and the love of God (xiii. 1—3); 6. to recollect the faith and examples of their deceased pastors (4—8); 7. to watchfulness against false doctrines in regard to the sacrifice of Christ (9—12); 8. to willingness to bear reproach for him, and thanksgiving to God (xiii. 13—15); 9. to subjection to their pastors and prayer for the apostle. The authorship of this epistle has been much disputed in early, as well as in recent times, though the weight of evidence, both external and internal, greatly preponderates in favour of St. Paul. It has also been ascribed to Apollos, Silas, Clement, Luke, Barnabas, &c. It was probably written about A.D. 62 or 63. The language in which it was originally written; the Jews to whom it was addressed; whether it really was an epistle addressed to a particular community, or only a discourse or dissertation intended for general readers, have all been matters of dispute.—*Ref.* Horne's *Introduction to the Holy Scriptures.*

**Hecatomb,** *hek'-a-toomb* (Gr. *hekatombe*, from *hekaton*, a hundred; *bous*, an ox), in Grecian Antiq., a sumptuous or magnificent sacrifice; originally consisting of the sacrifice of a hundred beasts of the same kind, at a hundred altars, by a hundred priests or sacrificers. Pythagoras is said to have sacrificed a hecatomb of a hundred oxen to the muses, in joy and gratitude for his having discovered the demonstration of the 47th proposition of the first book of Euclid. Although a true hecatomb consisted of a hundred oxen, yet, in the time of Homer, the word had lost its real etymological meaning: it merely meant a great public sacrifice. Thus, in the Iliad, an allusion is made to a hecatomb of twelve oxen; to another of oxen and rams; and to another of fifty.

**Hectic Fever,** *hek'-tik* (Gr. *hektikos*, habitual), in Med., is employed to denote a protracted or habitual fever, and is generally applied to that intermittent fever which usually occurs in the latter stages of consumption. It is commonly characterized by morning and evening paroxysms, with intermediate remissions; but the evening paroxysm is usually the most marked. Towards evening, as the paroxysm comes on, the listless, languid manner which prevailed during the day becomes changed, the eyes brighten, the conversation becomes animated, and the cheeks assume a beautiful flush. This may continue for five or six hours, when the manner and appearance of the patient become entirely changed, the hectic flush passes away, and a chill spreads over the entire frame, followed by a profuse perspiration, which leaves the patient utterly prostrate. Day after day the sad story is repeated, the patient is gradually reduced in body and strength, and at length dies exhausted. (*See* Consumption.)

**Hedeoma,** *he-de-o'-ma* (Gr. *edus*, sweet), in Bot., a gen. of the nat. ord. *Labiatæ*. The species *H. pulegioides*, commonly known as American pennyroyal, is

much used in the northern states of America as an emmenagogue, and also occasionally as a stimulant and carminative.

HEDERA, *hed'-e-rä* (Lat., ivy), in Bot., the Ivy, a gen. of the nat. ord. *Araliaceæ*. *H. Helix* is the well-known climbing evergreen which grows over old trees and walls. The gardeners of the last century frequently trained it into fanciful shapes, as of human figures and birds, on skeletons of wire-work. Its black berries increase during the winter, and ripen in April, furnishing food for wild pigeons and song-birds in the spring. Sheep eat the leaves in severe weather. Medicinally, the ivy is reputed to be diaphoretic, and its berries are emetic and purgative.

HEDGE, *hedje* (Sax. *hege*), the best class of fence that we have, with the exception of a stone or brick wall, and one of the most lasting safeguards against trespassers. A hedge is constructed of most kinds of trees and shrubs, but the best is, undoubtedly, one which is made of shrubs of a thorny nature, and of these, *holly* is the best plant for the purpose. The method of procedure by which hedges are formed is very simple, and consists, after the trees or shrubs have been planted, in cutting off their tops, and shortening the side branches, by which means an undergrowth of smaller branches is obtained, and the hedge made thick and spreading; a compact mass of vegetation spreading in every direction, and nearly impenetrable. With *holly hedges*, however, more pains must be taken, as the ground has to be carefully prepared by manuring and trenching; the holly-shoots must also be judiciously planted after midsummer, when the soil is moist from recent rain-falls, and a convenient space must be left between the plants, in order to enable them to spread their roots, and derive ample nourishment from the soil. On account of its slow growth, holly takes a long time to mature into a good hedge, and consequently it is not so often used for the purpose as it would otherwise be. Yew forms a close and durable hedge, when well and carefully clipped, and for gardens and nursery-grounds, where shade is required as well as protection, a yew hedge is preferable to any other. Beech, lime, and hornbeam are used when high hedges and strong fences are required; also elder, which is such a rapid grower, that a complete hedge is soon obtained after planting: it has also got another merit, and that is, that cattle do not eat its branches. In gardens, *privet hedges* are more common than those composed of other shrubs, and in fields and grounds, the black and white thorns are by far the hedges which are most generally adopted. In France and Holland, hedges are often trained along stakes and rods, which have been placed for the purpose: these hedges have a very light and pleasing effect, from their neatness and regularity. The *English Encyclopædia*, in concluding an elaborate article on this subject, observes: "Well-managed hedges are the most effective fences, the cheapest, and the most pleasing to the eye. It is to the hedgerows that England owes much of its garden-like appearance." (*See* also article FENCE.)

HEDGEHOG, *hedje'-hog* (*Erinaceus europæus*), a gen. of animals belonging to the class *Mammalia*, ord. *Feræ*, and fam. *Talpidæ*. It is found in most parts of Europe and Asia, and also in South Africa, from which latter country a specimen of the *Erinaceus frontalis* has been placed in the British Museum. The hedgehog is known by its body being covered with spines, and its possessing the faculty of rolling itself up into a ball, protected by these same spines, when pursued; and it will not disengage itself until the danger has passed. It is generally about nine inches in length, its muzzle is pointed; its tail short; the head very conical; ears short, broad, and rounded; each foot five-toed, and armed with long claws; eyes prominent; body oblong, and conical on its upper surface; and its legs are short, and nearly destitute of any covering. Its colour is usually of a greyish-brown; and it is a nocturnal animal, while in the winter it burrows in the earth and becomes torpid. Its usual food is composed of beetles, slugs, and snails; and from its fondness for insects, and its nocturnal habits, it is often kept domesticated in London to destroy cockroaches and black-beetles. A foolish idea at one time prevailed, that the hedgehog was in the habit of sucking the udders of cows during the night-time, which is naturally without foundation. Another charge is also laid against this little animal, as it is said to be a great destroyer



HEDGEHOG.

of the eggs of game-birds. Its flesh is well-flavoured, and it is eaten on the continent, although few but gypsies consume it in England.

HEDGE HYSSOP. (*See* GRATIOLA.)

HEGIRA, *hej'-i-rah* (Arab. *hajara*, I remove, fly), the era from which Mahometan nations compute all chronological events subsequent to the flight of Mahomet from Mecca to Medina, on the night of the 15th of July, 622. The first day of the first year of the Hegira is, therefore, the 16th of July in that year. As there are only 354 days in the Mahometan year, it follows that thirty-three of their years are very nearly equivalent to thirty-two years according to our system of reckoning. We must, therefore, in bringing any date reckoned from the Hegira to its corresponding date according to the Christian era, subtract three years for every hundred years contained in it, or, to speak more accurately, one year for every thirty-three years, and then add to the result the number of the year of our Lord in which the hegira took place, less one; and in converting a date of the Christian era into its corresponding date reckoning from the Hegira, we must reverse the process, subtracting the number of the year in which the Hegira took place, less one, from it, and adding to the result one year for every thirty-two years contained in it. Thus, if we require the year of our Lord in which the year of the Hegira 1280 commences, we must subtract 38 from it, or 1 for every entire thirty-three years, and add 621 to the result, 1242, which gives 1863. If, on the other hand, we require the year of the Hegira that commences in 1863, we must subtract 621 from this amount, and to the result, 1242, add one year for every entire thirty-two years contained in it, which gives 1280.

HEIDELBERG CATECHISM, *hi'-del-burg*, is the name of a work which occupies an important place in the history of the Reformation. It was the joint production of Caspar Olevianus and Zacharias Ursinus, professors of theology in the university of Heidelberg; and its publication and use was ordered by decree of elector Frederick III., dated 19th January, 1563. The elector, to prevent the religious bickerings that had disturbed the first year of his reign, and feeling it his duty to provide for the religious wants of the people, caused it to be introduced into both church and schools. This catechism agrees with the theology of the Reformed church in general, and with that of the Calvinistic type in particular. Princes and theologians set themselves in array against it, the Roman Catholics detested it, the Lutherans assailed it, the Melanchthonian theologians of Wittemburg combated it; but the elector stood firm, and the catechism held its place.—*Ref.* Herzog's *Theological Encyclopædia*.

HEIGHTS, MEASUREMENT OF, *hites* (Ang.-Sax.).—The measurement of elevations above the surface of the earth, or above the level of the sea, may be effected in four different ways: firstly, by trigonometrical calculations and measurements; secondly, by levelling;

thirdly, by means of the barometer; and lastly, by observing the difference of temperature at which liquids will boil at different heights. (*See* BOILING-POINTS.) The means used to ascertain the heights of objects by the first and second methods named above are described elsewhere. (*See* LEVELLING, MENSURATION, TRIGONOMETRY.) In measuring heights by the barometer, the principles of which are explained in the article on that instrument (*see* BAROMETER), the differences of temperature and of the force of gravity at different elevations, which must be carefully registered and allowed for in correcting the results obtained by such an operation, if great nicety be required, render it a task of considerable difficulty, involving numerical calculations of great intricacy. Supposing, however, that the heights of the column of mercury in a barometer at two different elevations have been ascertained, the following rule, which has been laid down by Professor Leslie, for computing the difference of height in the elevations, will give a result sufficiently near for all practical purposes:—"As the sum of the heights of the mercurial columns is to their difference, so is 52,000 to the approximate height in English feet." To exemplify this rule, considering the height of the barometer at the sea-level to be 30 inches in round numbers, and assuming it to be only 27 inches at the top of a mountain, we get the following proportionals:—30 + 27 : 3 :: 52,000 : the height of the mountain in English feet, or the height of the mountain = 52,000 × 3 ÷ 57 = 2,737 feet nearly.—Ref. *English Cyclopædia*—Arts and Sciences; *Astronomical Society's Transactions*, vol. i.

**HEIMSKRINGLA**, *himsk'-kring-lă* (Icelandic, the circle of the earth), the name given to the greatest work written by Snorro Starleson, the last of the northern Scalds, who lived in the beginning of the 12th century. He himself called the book the "Saga, or Story of the Kings of Norway," and the term *heimskringla* was bestowed upon it on account of that word being the first prominent one in the old Scaldic manuscript of Snorro. The work is a connected series of memoirs of the kings and mighty men of the Scandinavian peninsula, Denmark, and England, from an almost mythological period down to his own time. It is written in a spirited and fascinating way, by a man who could recall vividly, and describe graphically, the scenes which passed before his imagination. Historical incidents, speeches, and anecdotes, constitute the work, interspersed with rude snatches of Scaldic song. These verses are evidently introduced by the author as a species of rough ornament, and at the same time to heighten the general effect of the narrative. In 1230, Sturla, the nephew of Snorro, made a copy of the *Heimskringla*, which is considered to be the most authentic text of the work. As late as 1567, copies were made of this manuscript. In 1814, Samuel Laing translated the *Heimskringla* into English, with a preliminary dissertation on the intellectual and social condition of the Northmen. The study of this work is calculated to put the English reader in a position to judge of the influence which the social arrangements and spirit of the Northmen may have had upon the character and free institutions of this nation.—Ref. *The Heimskringla; or, Chronicle of the Kings of Norway*, translated by Samuel Laing.

**HEIR**, *aire* (Lat. *hæres*, old Fr. *heire*), in Eng. Law, is one who succeeds, by descent, to an estate of inheritance, being lands, tenements, or hereditaments. The estate must be a fee, because nothing passes *jure hæreditatis* but a fee; and the word "heirs" is necessary in the grant or donation, in order to make a fee or inheritance. In the Scotch law the term heir does not mean merely the heir-at-law, but also the heir by destination or limitation; neither is it confined to lands only, but is applied also to the successors to personal property, who are, in the English law, distinguished as next of kin. There are different kinds of heirs; as (1) heir-general, or heir-at-law, he who, after his father or ancestor's death, has a right to inherit all his lands, tenements, and hereditaments; (2) heir-apparent is he whose right of inheritance is indefeasible, provided he outlive the ancestor; as the eldest son, who must, by the course of the common law, be heir to his father on his death; (3) heir-presumptive, is one who, if the ancestor should die immediately, would, in the present circumstances of things, be his heir, but whose right of inheritance may be defeated by the contingency of some nearer heir being born—as a brother or nephew, whose presumptive succession may be destroyed by the birth of a child; or a daughter, whose hopes of succession may be hereafter cut off by the birth of a son; (4) heir by custom, he whose right of inheritance depends upon a particular and local custom; as in borough-English lands the youngest son succeeds to his father, while in gavelkind lands all the sons inherit as parceners, and make but one heir; (5) heir by devise, or *hæres factus*, he who is made by will the testator's heir or devisee, and has no other right or interest than the will gives him; (6) heir special, is the issue upon whom an estate is entailed,—they may be either general or special, born of a particular mother, and these may be either male or female; (7) heir of blood and inheritance (*hæres sanguinis et hæreditatis*), is a son who may be defeated of his inheritance by his father's displeasure; (8) *ultimus hæres*, is he to whom lands come by escheat or forfeiture, for want of proper heirs, or on account of treason or felony; being either the lord of the manor or the crown. The eldest son, after the death of his father, is at common law his heir. The estate claimed by the heir must necessarily be one that remained in the ancestor or deceased owner at the time of his death, [illegible] of which he has made no testamentary disposition. The word heir is a *nomen collectum*, and extends unto all heirs; and, under heirs, the heirs of heirs are comprehended *in infinitum*. (*See* DESCENT.)

**HEIRESS**, in Law, is a female heir. Where there are several, they are called co-heiresses.

**HEIRLOOM**, in Law, is a term applied to such goods and personal chattels as, contrary to the nature of chattels, go by the special custom of a particular place to the heir, together with the inheritance, and not to the executors or administrators. They are usually carriages, implements, utensils, &c.; and though mere chattels, they cannot be devised away from the heir by will; any such devise being void, even by a tenant in fee-simple. The owner, however, is of course at liberty to sell or dispose of them during his life, as he may see meet. The term heirloom is frequently applied to such chattels as are sometimes directed by the testator to go to the heir, together with the inheritance; as pictures, plate, &c. But the term is not here used in its strict and proper sense, and the same rules do not absolutely apply; for such a destination is not valid against the claims of creditors; and on the death of the heir intestate, will pass, like other chattels, to his personal representatives, and not to his heir. The word "loom" is of Saxon origin, and signifies limb, or member; an heirloom being thus a limb or member of an inheritance.

**HEISTERIA**, *hi-stē'-re-ă*, a gen. of West-Indian plants, consisting of trees with alternate leaves and small axillary flowers. It received its name in honour of Laurence Heister, of Helmstadt. Class *Decandria*, order *Monogynia*. It is often said that the wood of *Heisteria coccinea* is the partridge-wood of the cabinet-makers; but this appears to be a mistake. In the corrupt French of Martinique, the wood of the *Heisteria* is called *bois perdrix*, a name not signifying partridge-wood, but partridge-pea, *bois* being used for *pois*. It is so called on account of the wild pigeons being fond of the berry.

**HELIACAL**, *he-lī'-ă-kăl* (Gr. *helios*, the sun).—When a star appears above the horizon, and becomes visible a short time before sunrise, its rising is said to be heliacal. In the case of a star that is close to the sun's orbit when the sun, by reason of its course along its orbit, is approaching the star, the sun rises after the star, and sets after it; but when the sun has passed the star, and is receding from it, the star begins to rise before the sun, and sets before it. When the sun is close to the star in its rising and setting, or when both bodies rise and set very nearly at the same time, the latter cannot be seen on account of the superior brilliancy of the former. When, therefore, the sun is approaching the star, and the star becomes visible at its setting, just after sunset, it is said to set heliacally; but when the sun has passed the star, and it is visible at its rising shortly before sunrise, it is said to rise heliacally.

HELIANTHUS, *he-le-an'-thus* (Gr. *helios*, the sun; *anthos*, flower), in Bot., the Sunflower, sjgen. of the nat. ord. *Compositæ*. The species *H. annuus* is a well-known annual. It is appropriately named the sunflower, as its large circular head of florets, surrounded by golden rays, forms a complete ideal representation of the sun; moreover, it never ceases to adore the sun while the earth is illuminated by his light; for when he sinks in the west, the flowers of *Helianthus* are turned towards him, and when he rises in the east, they are ready to be cherished by the first beams. Some writers on botany deny that the flowers turn with the sun; but their observations do not agree with popular experience. There are varieties of *H. annuus* with double flowers, the tubular florets being all changed into ligulate ones, like those of the ray. The pith of the stem contains nitrate of potash, and is sometimes used in the preparation of moxas. The fruits have lately been employed as an ingredient in a kind of soap, called sunflower soap. The species *H. tuberosus* produce the tubers known as *Jerusalem artichokes*, which are much eaten, like potatoes. The word Jerusalem is merely a corruption of the Italian *girasole*.

HELIOCENTRIC. (*See* GEOCENTRIC.)

HELIOMETER, *he-le-om'-e-ter* (Gr. *helios*, the sun, and *metrein*, to measure), an instrument invented by the astronomer and mathematician Bougner, about the middle of the 18th century, for the purpose of determining the diameter of the sun, moon, and stars. It consists of a conical tube, fitted with two object-glasses of the same focal length, or a single object-glass divided into two equal parts, which are made to slide along each other in the line of section, by micrometer screws, in connection with graduated scales. The glasses are contrived to move in a direction at right angles to the axis of the tube. When the heliometer is directed towards any heavenly body, two images are formed in the eye-glass of the instrument, which may be made to separate entirely from each other or coincide, at pleasure, by moving the object-glasses by the micrometer screw. When the images coincide, the angle subtended by the diameter of the heavenly body under observation is equal to that which is subtended by the distance between the centres of the object-glasses; and as this angle and the distance between the centres of the lenses are determinable by the graduated scales attached to the instrument, the diameter of the heavenly body can be determined when its distance from the observer is known, or, *vice versâ*, its distance can be determined if its diameter be known.

HELIOSCOPE, *he'-le-os-kope* (Gr. *helios*, the sun, and *skopein*, to observe), a telescope fitted with coloured glasses, or having the inner side of the eyeglass blackened by holding it over the flame of a candle, that the sun may be observed without injury to the eye of the observer, from the brilliancy of its rays. In observing an eclipse of the sun, the eye is similarly preserved from injury by looking at the phenomenon through a piece of smoked or coloured glass.

HELIOTROPE, *he'-le-o-trope* (Gr. *helios*, the sun; *tropeo*, I turn), an instrument by means of which the sun's rays can be reflected to a considerable distance. It is used in trigonometrical surveys to transmit signals from one station to another, and to render distant stations distinguishable when they are many miles apart, that the surveyor may be enabled to determine his angular measurements with accuracy. (*See* GEODESY.)

HELIOTROPIUM, *he-le-o-tro'-pe-um* (Gr. *helios*, the sun; *tropo*, I turn), in Bot., the Heliotrope, or Turnsole, a gen. of the nat. ord. *Boraginaceæ*. *H. peruvianum* and *europæum* are popular plants. They have a delicious odour, not unlike that of new hay.

HELIX, *he'-like* (Gr. *helix*, a wreath or circumvolution, from *helissein*, to wind round, environ), part of a spiral line, consisting of an entire turn of the thread of a screw round the central cylinder. In Arch., the term is applied to the small volutes introduced under the flowers of the Corinthian capital, which are also called *wilks*. A winding staircase, such as is commonly attached to the towers of churches to afford the means of access to the summit, is sometimes called a *helical* staircase, in contradistinction to a spiral staircase, which winds round a cone, the circumvolutions continually decreasing in diameter and approaching nearer to the axis. In Anat., the auricle or outer part of the ear is so called; and, in Zool., the snail, from the peculiar shape of its shell, which consists of a single spiral valve.

HELLEBORE. (*See* HELLEBORUS.)

HELLEBORUS, *hel-leb'-o-rus* (Gr.), in Bot., a gen. of the nat. ord. *Ranunculaceæ*, consisting of perennial herbs with palmately- or pedately-divided leaves, of a paler green and more rigid than in most other plants of the order. The most important species is *H. niger*, the black hellebore, so called from the colour of its roots. It is a native of the shady woods of the lower mountains in many parts of Europe. It flowers in winter, and on this account is sometimes called the white Christmas rose. Hellebore root is imported in bags and barrels from Hamburg, and is used medicinally as a drastic purgative. The species *H. officinalis viridis* and *fœtidus* possess similar properties. The two latter have been found wild in several parts of England. The derivation of the term is from the Gr. *helein*, to destroy, and *boru*, food for cattle; because, on account of its poisonous qualities, it is unfit to be eaten by cattle.

HELMET, *hel'-met* (Low Lat. *helmus*, Ital. *elmetto*), a piece of defensive armour for the head, which has been worn by the soldiers of all nations from the earliest ages. The oldest form of the helmet seems to have been that of a conical cap of metal, with a piece projecting downwards from the rim in front, called a nasal, that protected the face. Goliath of Gath is mentioned in the sacred writings as wearing a helmet of brass. The Egyptians wore helmets of quilted linen, as well as those of metal. The Greeks and Romans wore them in the form of a round skull-cap, with a ridge of metal rising along the centre, from the front to the back, which was ornamented with a fringe or crest of horsehair. Some of these helmets had broad triangular nasals, covering the whole of the upper part of the face, and narrowing gradually to a point at the chin, with holes for the eyes of the wearers. In ancient sculptures, Minerva is often depicted as wearing one of this kind, pushed back to expose the face, with the nasal resting on the upper part of the face. The Anglo-Saxons generally wore helmets of leather, strengthened with a metal ring; the nobility having them of metal in the form of a cone, with a small projecting nasal. The helmet of the Saxon monarch, called the *cynehealm*, or royal helm, was the emblem of his rank, like the crown, and is sometimes represented with a coronet surrounding it. The same kind of conical helmet, with the nasal, was also worn by the Danes, and subsequently by the Norman soldiers, at the time of the Conquest, and after that event, as may be seen in representations of the Bayeux tapestry, and other works of art executed in the 11th and 12th centuries. Little change seems to have been made in the form of the helmet until the reign of Richard I., when cylindrical helmets, flat at the top, were introduced, with an *aventaille*, or plate, to protect the face. After this, successive changes were made in the form of the *visor*, *beaver*, or *aventaille*, names applied at different periods to the front or movable part of the helmet, which was perforated with holes, to allow the wearer to see and breathe, and could be raised at pleasure to allow him to eat and drink, without removing his head-piece. When plate armour was worn, the face of the knight was entirely concealed by the helmet, which was constructed so as to cover the head and neck of the wearer; and this gave rise to the introduction of crests as a mark of distinction, by which he might be recognised. When the use of plate armour was partly abandoned, the iron breast and back pieces, and the pot or morion, a steel cap with a projecting rim, were retained for some time, being worn by the soldiers of the Commonwealth, and by troopers in the time of Charles II., and subsequent kings. In the present day, metal helmets are worn by the life-guards, horse-guards, and many dragoon regiments, and regiments of yeomanry cavalry; those of the household cavalry having a spike rising from the top, from which a plume of horsehair falls on all sides over the helmet.—*Ref.* Meyrick's *Critical Inquiry into Ancient Armour, &c.*; Meyrick's *Engraved Illustrations of Ancient Armour, from the Collection at Goodrich Court*; Grose's *Treatise*.

HELMET.—*In Heraldry*, the crest is always depicted on or above a helmet, the shape of which differs for different ranks. The sovereign and princes of the blood royal have a full-faced helmet of gold, with gold bars over the opening in front; dukes and marquises, the same, but of steel with steel bars; earls, viscounts, and barons, an open helmet of steel, in profile, with steel bars; baronets and knights, a full-faced steel helmet with the visor raised; and esquires and gentlemen, a steel helmet in profile, with the visor closed.

HELVETII, *hel-ve'-shee-i*, the name of a Celtic people who, according to Cæsar, occupied the country between the Jura on the west, the Rhone and Lake Leman on the south, and the Rhine on the east and north. Their country thus corresponded pretty closely with the limits of modern Helvetia or Switzerland. It was divided into four districts or *pagi*, and had twelve towns and 400 villages. Incited by one of their chiefs, Orgetorix, they determined to leave their country; burned their towns and villages; and taking with them provisions for three months, appointed a general rendezvous at Geneva, in the spring of B.C. 58. Cæsar, who was then at Rome, hurried off as quickly as possible to intercept them, and, arriving at Geneva, destroyed the bridge over the Rhone. The Helvetii sent to him soliciting a passage; but, demanding some time to consider of it, he employed the interval in raising a wall or rampart on the south side of the river. Having given a denial to their request, the Helvetii attempted to break through the wall; but in this they failed. They then took another route through the country of the Sequani and Ædui, followed by Cæsar. When within eighteen miles of Bibracte (Autun), he left the rear of the Helvetii and moved towards the town, in order to get supplies. On this, the Helvetii faced about and attacked him, and a general engagement was the result. The Helvetii fought with desperate valour, but they were at length defeated with great slaughter. Of 368,000 of the Helvetii who left their homes, of whom 92,000 were fighting men, only 110,000 returned to their own country, the rest being slain in battle, or afterwards massacred. Numerous Roman castles and colonies were planted in their land, which was known as the Ager Helvetiorum, until it was attached to transalpine Gaul. Having refused to acknowledge Vitellius as emperor, they suffered severely from his generals; and after that time they almost disappear as a people.—*Ref.* Smith's *Dictionary of Ancient Geography*.

HELWINGIACEÆ, *hel-win-ge-ai'-se-e*, in Bot., a nat. ord. of *Dicotyledones*, sub-class *Monochlamydeæ*. There is but one known species in this order, namely *Helwingia ruscifolia*, a shrubby plant found in Japan, where its leaves are employed as an esculent vegetable. The order is allied to *Garryaceæ*, from which it is distinguished by its alternate stipulate leaves, fascicled flowers, and 3—4-celled ovary.

HEMERALOPIA. (*See* NYCTALOPIA.)

HEMICARP. (*See* CREMOCARP.)

HEMIDESMUS, *hem-e-des'-mus* (Gr. *hemi*, half; *desmos*, a bond), a gen. of the nat. ord. *Asclepiadaceæ*. The root of *H. indicus*, or Indian sarsaparilla, is officinal in the Dublin Pharmacopœia. It has been for some time in use in India, under the name of country sarsaparilla, and was declared by the medical officers of the Madras establishment to be an efficient substitute for true sarsaparilla in the treatment of scrofulous, syphilitic, and cutaneous affections.

HEMIPTERA, *he-mip'-ter-ă* (Gr. *hemi*, half; *pteron*, wing), an order of haustellated insects having their wing-covers formed of a substance intermediate between the elytra of beetles and the other ordinary membranous wings common to most insects. When the *Hemiptera* quit the egg, they have the appearance of small hexapod larvæ, differing but little from the perfect insect, save in the absence of wings; and before these latter are acquired, the skin is shed several times, and the larva acquires a much larger bulk. The bed-bug (*Cimex lectularius*) and the water-boatman (*Notonecta*) are examples of the family of Hemiptera.—*Ref.* Baird's *Cyclopædia of the Natural Sciences*.

HEMISPHERE, *hem'-is-fere* (Gr. *hemi*, half, and *sphaira*, a sphere or globe), the solid obtained by dividing a sphere into two equal parts in the plane of any great circle passing through the poles, or in a plane passing through a diameter of the sphere in any part. In Astron. and Geol., the field of the heavens and the earth is divided into the northern and southern hemispheres, by a plane passing through the equator; and the latter is also divided into the eastern and western hemispheres, by a plane passing through the 30th meridian W. of Greenwich.

HEMLOCK. (*See* CONIUM.)

HEMORRHAGE. (*See* HÆMORRHAGE.)

HEMP. (*See* CANNABIS and LINEN MANUFACTURE.)

HENBANE. (*See* HYOSCYAMUS.)

HENNA. (*See* LAWSONIA.)

HENRY RIFLE, *hen'-re*, a fire-arm which takes its name from Mr. Alexander Henry, gunmaker, of Edinburgh, the inventor of the peculiar system on which the barrel is rifled. It is considered by many to be superior to any rifle that has yet been produced; and this seems to be borne out by the satisfactory shooting that has been made with this weapon by Mr. Edward Ross (the champion shot, 1860), Lord Vernon, and others, at the meetings of the National Rifle Association, at Wimbledon, and other gatherings of English and Scottish marksmen elsewhere. A horizontal or transverse section of the barrel shows the rifling to be heptagonal, with small ridges of metal, or "lands," projecting at each angle. The lands are made either acute in form, rectangular, or rounded. The interior of the barrel, consequently, presents a series of seven planes inclined to each other at an angle of nearly 128·58°, which wind along the interior of the barrel with a regular twist of one turn in 20 inches in a rifle with a gauge of ·451 inch; but the pitch varies according to the calibre of the arm, from 20 inches to 6 feet. The adoption of a projecting ridge at each angle of the rifling gives a double number of bearing-points to impart a rotatory motion to the bullet, and tends to diminish the windage, by leaving but little room for the expansion of the bullet when the piece is discharged, so that the missile leaves the barrel very slightly altered in shape. In consequence of this, the friction of the air on a bullet fired from a Henry rifle is far less than that which it exercises on a projectile discharged from any other description of rifled fire-arm, and there is less chance of the bullet "stripping," as it is termed, when the missile leaves the barrel without turning in the grooves or rifling. In some rifles made by Mr. Henry, the additional bearing-points are obtained by making a curved groove in the centre of each plane. This arm does not foul as quickly as other weapons that are loaded at the muzzle. The ball is cylindro-concoidal in form, and fits easily into the barrel. There is little recoil, and, as the bullet is not liable to strip, an increased charge of powder may be used, which gives a lower trajectory (*see* RIFLE, TRAJECTORY) and insures greater accuracy in the flight of the projectile. The Henry rifle is fitted with a patent wind-gauge sight, for regulating the aim according to the strength of the wind, and, if required, a patent elevating cheek-piece can be attached to the stock for long-range shooting.

HENSLOVIACEÆ, *hen-slo-ve-ai'-se-e*, in Bot., a small nat. ord. of tropical *Dicotyledones* in the sub-class *Calyciflorœ*. It contains but one genus, consisting of three or four species, which resemble in most respects the hydrangeas, the chief differences being in their tree-like habit, in the union of their styles into a cylinder, and in the total absence of albumen. Their properties and uses are unknown.

HENWARE. (*See* ALARIA.)

HEPATICACEÆ, *he-pit'-e-kai'-se-e* (from Gr. *hepar*, liver), in Bot., the Liverworts, a nat. ord. of flowerless plants, sub-class *Acrogenæ*,—small cellular plants, either with a creeping stem bearing minute imbricated leaves, or with a lobed leaf-like frond, or thalloid expansion. The reproductive organs are of two kinds, called respectively *antheridia* and *archegonia*, which may be either on the same plant or on different ones. The liverworts are generally diffused over the globe, but they are most abundant in damp, shady places in tropical countries. There are about 65 genera, which comprise upwards of 700 species. Their properties are unimportant. Some have been used medicinally in liver complaints. *Marchantia hemispherica*, and other species, have been employed in the form of poultices in dropsy.

HEPATITIS, *hep-ă-tī'-tis* (Gr. *hepar*, the liver), a term applied to inflammation of the liver. The history and symptoms of this disease have been particularly dwelt upon in all medicinal works from the earliest periods. Until very recent times, when the attention of physicians was more especially called to diseases of the gastro-intestinal mucous membrane,—heretofore a field comparatively unexplored,—this affection, and its subsidiary diseases, were more studied than any other lesion of the digestive apparatus. In temperate latitudes hepatitis is a rare disease; but in tropical climates it is often so acute, sudden, and fatal, as to defy medical treatment. The principal indications of the disease are, pain in the right side and shoulder, tenderness in the right hypochondrium when pressed, together with enlargement of the liver, often vomiting, always fever, with loss of appetite and a foul tongue. It is frequently accompanied by jaundice. Hepatitis sometimes terminates in abscesses, which, on some occasions, require to be opened externally. Professional assistance is necessary with regard to them, as the treatment is complicated. After the disease has been subdued, vegetable tonics are useful in restoring the digestive powers. When the disease has supervened in a warm climate, a removal to a more temperate region is always advisable.

HEPTAGON, *hep'-tĭ-gon* (Gr. *hepta*, seven, and *gonia*, angle), a term in Geom. applied to a plane figure composed of seven sides. The area of a regular heptagon is equal to the square of one of its sides multiplied by 3·633914 (or seven-fourths of the tangent of the angle at the base to radius 1). (*See* GEOMETRY.)

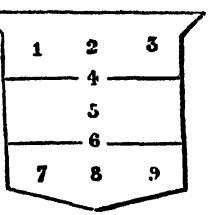
HEPTARCHY. (*See* vol. I. of this work.)

HERALD, *her'-ăld* (Low Lat. *heraldus*, Sax. *herault*).—Among the Greeks and Romans, heralds were employed to carry messages to friendly and hostile nations, to conclude treaties of peace and amity, or to declare war. (*See* FECIALES.) In mediæval times, their duties were very similar, and they had the direction and management of tournaments and jousts, and the regulation of ceremonies of state: it also fell to their part to make lists of the knights and soldiers who were slain in battle. The supervision of pedigrees of descent, and the armorial bearings of families, also came within the especial province of the heralds, who, with the kings-at-arms, held visitations in different counties at certain times for this purpose. Heralds are first mentioned under this title about the middle of the 12th century. The English heralds were formed into a body corporate by Richard III. (*See* HERALDS' COLLEGE.) In the present day, when Great Britain declares war against any other power, the heralds make a formal proclamation of the same in the city of London.

HERALDRY, *her'-ăld-re* (Nor., from Low Lat.), the science which teaches everything relating to armorial bearings, badges of honour, the order of precedence to be taken by all estates of the realm; the ceremonials to be observed at coronations, royal christenings, marriages, and funerals; the creation of peers, knights of the Garter, &c.; and on public occasions, such as the opening of parliament. Heraldry, as far as the distinction of families and tribes by various emblems is concerned, is a science of great antiquity. The twelve tribes of the Jews had each its cognizance, and the standards of nations from the earliest ages bore some particular heraldic device. (*See* BADGE, FLAG.) But the terms and distinctions of modern heraldry originated about the middle of the 12th century, when the use of armour, and the helmet with closed visor, which concealed the countenance, rendered the assumption of marks of distinction, such as the crest on the casque, and the armorial bearings on the surcoat, absolutely needful to enable the combatants to distinguish friend from foe in the heat of battle. Shortly after this period, armorial bearings, which had been assumed at pleasure by those who bore them, became hereditary, and confined to certain families. There are ten different kinds of armorial bearings; namely,—arms of Adoption, Alliance, Assumption, Community, Concession, Dominion, Patronage, Pretension and Succession, and arms Hereditary. The chief of these are arms of Dominion and Pretension, the first of which are borne by sovereigns in virtue of the territories over which they rule, and the second in virtue of countries over



which they claim a right to rule, but exercise no actual authority; arms of Community, or armorial bearings borne by cities, bishoprics, and bodies corporate; arms of Alliance, which are used by families, to show the intermarriage of an ancestor with an heiress, and to indicate their maternal descent; and arms Hereditary, which descend from father to son, the fourth bearer of any coat from the first possessor, or his great grandson, being considered a gentleman of ancestry. To proceed briefly with what may be termed the grammar of heraldry:—If the field of the shield be divided into three equal portions by horizontal lines, the upper part is distinguished as the chief, the middle part as the fess, and the lower part as the base. There are also nine points used to indicate the situation of charges: these are —1. dexter chief; 2. middle chief; 3. sinister chief; 4. honour point; 5. fess point; 6. nombril point; 7. dexter base; 8. middle base; 9. sinister base. The colours and metals used in blazonry are nine in number, the metals being or and argent; the colours, gules, azure, sable, vert, purpure, tenne, and sanguine. These are all indicated, in engraving, by various lines and dots, after the method said to be invented by Petrasancta, an Italian; they are severally noticed under their respective headings. Certain furs are also used, which consist of ten distinct sorts or varieties. (*See* ERMINE, POTENT, VAIR.) There are also nine principal ordinaries, or charges, termed "honourable," and fourteen subordinate ordinaries. The principal ordinaries are the chief, pale, bend, bend sinister, fess, bar, chevron, cross, and saltier. The fess occupies the third and central part of the shield, as shown above, and is considered to be derived from the broad baldric, or belt, that encircled the loins of the warrior. The cross, when considered as an ordinary, consists of two broad stripes or bars, one perpendicular and the other horizontal, crossing each other at right angles, in the centre of the shield. There are, however, numerous forms of the cross used in heraldry; such as the cross avellane, cross bottonny, and cross crosslet, which are classed among common charges. The remaining principal ordinaries, with their diminutives, are mentioned under their respective headings, as are also the lines of division or demarcation, used as outlines of the ordinaries, or to divide the field of the shield in directions indicated by the names of all these charges, except the chief; as, "party (or parted) per bend," when the shield is divided by a diagonal line, proceeding from the dexter chief to the sinister base. These lines of partition are termed Embattled, Engrailed, Dancette, Indented, Invected, Nebuly, Raguly, and Wavy. The subordinate ordinaries, are the canton, a third part of the chief on the dexter side; the gyron, a gusset-shaped ordinary, occupying the eighth part of the shield, and formed by a right line and diagonal line meeting in the centre of the shield, or fess point; the fret, formed of two diagonal bars, and a lozenge-shaped frame in the centre of the shield, interlaced; the quarter (*see* QUARTER); the pile (*see* PILE); the orle and tressure (*see* ORLE); the flanches, flasques, and voiders (*see* VOIDERS); and the lozenge, fusil, mascle, and rustre (*see* LOZENGE). To these charges, innumerable representations of the various heavenly bodies, the human form, and its different parts, the head, hands, &c., birds, beasts, fishes, flowers, trees, boughs, towers, weapons, and implements, or parts of implements, of various kinds, which are blazoned according to the position in which they are depicted, and their situation in the shield, or with regard to other ordinaries and charges that appear in it. Armorial bearings, in an extended sense, consist of four parts: the shield, and its charges; the crest, which is generally drawn surmounting a helmet (*see* CREST, HELMET), which is surrounded by pieces of silk or velvet, jagged at the edges, and lined with fur,



which are termed "mantlings," or "lambrequins;" the motto, which may be assumed at pleasure (*see* MOTTO); and the supporters, which are not borne by commoners (*see* SUPPORTERS). For further information respecting matters intimately connected with the science of heraldry, the reader is referred to the following articles, which bear directly upon them. (*See* BLAZONRY, DIFFERENCES, MARSHALLING OF ARMS.)—Ref. *Glossary of Heraldry*, Parker, Oxford; Burke's *Armorie of England*; Guillim's *Display of Heraldry*; Ferne's *Blazon of Gentrie*; Clarke's *Manual of Heraldry*.

HERALDS' COLLEGE, a corporation consisting of the three English kings-at-arms, six heralds, and four pursuivants, to whom a charter of privileges was granted by Richard III., in 1483. This king also gave them a house, in which they might hold their chapters and deposit their records; but it was taken from them shortly after by his successor, Henry VII. Edward VI., however, confirmed their charter, and Queen Mary gave them a building on Benet's Hill, St. Paul's Churchyard, known as Derby House, on the site of which the present college now stands. The kings-at-arms are Garter, Clarenceux, and Norroy; the heralds, Somerset, Chester, Windsor, Richmond, Lancaster, and York; the pursuivants, Blue Mantle, Rouge Croix, Rouge Dragon, and Portcullis. There is a king-at-arms attached to the order of the Bath, named Bath king-at-arms, who has no connection with the heralds' college. Pedigrees are preserved, and grants of arms are made and registered by the members of the college, who are privileged to receive certain fees, in virtue of their office, from those who wish to search their records or avail themselves of their services in any way. In Scotland, there is a college of arms, consisting of Lyon king-at-arms, six heralds, and four pursuivants; and in Ireland, the chief heraldic officer is termed Ulster king-at-arms.

HERBARIUM, *her-bair'-e-um*, a term generally applied to a collection of specimens of plants carefully dried and preserved. Such collections are very valuable,—for a well-preserved plant displays its botanical structure, in all its minutiæ, better than the most accurate engraving. In order to compose an herbarium, plants are usually collected in a tin box, called a "vasculum," which preserves them from withering for at least a short time. They should be gathered on a dry day, and those which have collected moisture in their leaves should be placed in a vessel of water and be allowed to dry there. It is necessary to kill plants with succulent stems or leaves, by immersing them for a short time in hot water. In order to complete the drying of the specimens, they are placed between layers of bibulous paper, so as not to distort their parts. Pressure is then applied, which varies according to the nature of the plants. Great care is necessary in order to avoid using too much pressure at first. The paper is changed every day, or every second day, and dry paper supplied for a short time. Those specimens which are quickly dried have the best appearance; and some plants which lose their natural colour and turn black in the ordinary mode of drying, can be beautifully preserved by a quick process. Thus, in the case of the orchids, and other similar plants, when placed between layers of paper, inclosed in a wire net-work frame, and hung before a fire, where the package is made to turn like meat roasting, they can be exquisitely dried in a few hours. By the ordinary process they would require eight or ten days. When properly dried, the specimens are placed in sheets of writing-paper, and may be slightly fastened by making the top and bottom of the stalk pass through slits in the paper for the purpose. The name of the genus and species, the locality where it was found, together with any other interesting information, are then marked beside each. The method of preserving cryptogamous plants is more difficult, on account of the greater quantity of moisture which they contain and the great delicacy of their texture. Herbaria are generally ranged on a botanical system; and great care is required in order to preserve their contents from the ravages of moths and beetles. Camphor and a little corrosive sublimate are good preservatives. There are some herbaria in existence which have lasted for centuries, and which are still





consulted for the identification of species. Those collected by travellers in distant countries are frequently of great value.

HERBS, *herbs* (Lat. *herba*), in *Bot.*, plants which have stems that die down annually to the surface of the ground. The term *caulis* is used to distinguish an herbaceous stem.

HERCULES, *her'-ku-leez*, a constellation in the northern hemisphere, formed by the old astronomer Aratus, but considered to have received its present name from some later astronomer. It is surrounded by the constellations Boötes, Draco, Lyra, and Ophiuchus. It contains no stars of the first and second magnitude.

HEREDITARY PRIVILEGES AND POSSESSIONS, *he-red'-e-tā-re* (Fr. *héréditaire*, fr. the Lat.).—In the government and social constitution of many countries, hereditary rights and privileges are allowed to certain individuals or families; and the question of the admissibility of these rights and privileges has frequently been agitated, especially in recent times. Hereditary monarchy has its supporters and its opponents. The "divine right" of kings is seldom urged now as an argument in its favour; and the advisability of hereditary transmission of the chief power in the state is at present principally rested on the ground of political necessity and expediency. It must also be allowed that the excitement and political animosities which the recurring election of a general governor would call forth are avoided by having hereditary power in a particular family. In this country, moreover, the dangers and evils which might arise through a governing power being dependent upon birth, are neutralized by the national institutions, even if honour and high position were not able to prove a restraint. Besides hereditary monarchy, however, in this country, there is the question of hereditary classes, dignities, and offices in the state. The hereditary transmission of posts in the state, the powers attached to which are almost monarchical, is inconsistent with the idea of a free state. An hereditary nobility, with rights similar to those of the petty princes of Germany, cannot be looked upon as an advantageous state of affairs. But the existence of a class with certain hereditary privileges, as in this country, may be of great advantage to a nation. Those families whose hereditary traditions form a portion of the national history naturally identify themselves with the prosperity and honour of the country. When such a class can command an excellent education, and possess well-assured property, together with a high sense of honour, they are raised above all pettiness and meanness, and are valuable examples in a country like our own. The hereditary privileges of the nobility, however, can be abused; and the great revolution of France was an example of the fearful results of such an abuse of power.

HERESY, *her'-e-se* (Gr. *hairesis*, choice, election), may be defined as the act of holding opinions upon religious matters contrary to the authority and teaching of any religious community to which a person may be presumed to owe obedience. Primitively, however, it was used to designate any opinion that a man or a sect might choose to adopt; and in this way it was applied to the philosophic sects of the Greeks and Romans. In the New Testament, even, the term is frequently used to designate a religious sect, without any reproach being implied. In this sense it is used in Acts v. 17; xv. 5; xxviii. 22; and Josephus terms the three great Jewish sects, heresies, without wishing to imply any censure. On the other hand, it was used in a reproachful sense by the Apostles towards those who denied their doctrines, and by the Jews towards Christianity. In the writings of the Christian fathers we find the term employed towards those opinions which differed from what was deemed to be the doctrine of the Apostles; and later, when Christian teaching came to be regulated by ecclesiastical councils, any one who rejected their decisions was proclaimed to be a heretic; whilst those who gave their adherence to what was settled by these councils were proclaimed to be orthodox, or catholic. It is necessary that heresy should not be confounded with schism, or with apostasy; the latter implying a complete renunciation of Christian doctrine, whilst schism means only the rejection of some point of discipline, just as heresy

denotes any division upon matters of doctrine. The early fathers gave the number of heresies as ranging between eighty and a hundred and fifty, although Lardner, in his "*History of Heretics*," demonstrates that these figures are somewhat exaggerated. Nearly all the heretical opinions current in the first two centuries of the Christian era appertain to the creation of the world, to the connection between Christianity and Judaism, and to the person of our Saviour. The two great sects were the Ebionites and the Gnostics. (*See* these words.) In the 3rd century the Manichæan heresy took birth. At the head of this sect was Manes, whose object it was to engraft upon the teachings of the Apostles the rites taught by the Persian magi. Passing over the heretical controversies of Sabellius, of Novation, and of Paul of Samosata, all of which arose during the 3rd century, we reach the great Arian heresy, which formed the chief object of theological discussion during the 4th century. The only new sects which require distinct mention are the Pelagian, which sprang forth in the 5th century; the Nestorians, and their adversaries the Eutychians; the Monothelites, the Monosophytes, and the Paulicians. Previous to the Reformation in England, heresy was enacted, by 2 Henry IV. c. 15, to be the holding of opinions contrary to the Catholic faith and the determination of Holy Church; and the offender might be convicted of heresy at common law by an archbishop in a provincial synod. After conviction, the criminal was to be dealt with according to the king's pleasure. When a person, after having abjured his heresy, again relapsed into it, the king in council might issue the writ *de hæretico comburendo*, upon which the criminal was handed over to the secular authority to be openly burnt alive. The first statute of the reign of Elizabeth repealed all previous enactments, leaving it at common law, although it did not determine what heresy actually is, merely limiting it to "such as heretofore hath been adjudged heresy," according to the scriptural authority and that of the four councils. Both Elizabeth and James I. are stated to have burnt heretics; and Lord Coke (3 Instit. c. 5) approved of burning heretics alive. The writ *de hæretico comburendo* was abolished by 29 Charles II. c. 9, and henceforth the punishment of heretics was vested in the ecclesiastical courts, who might punish heresy *pro salute animæ*, from a pure regard for the offender's soul. Thus stands the law at the present time, when it is a matter of the utmost difficulty to define either what heresy actually is, or what is the punishment for it. It is true that heresy is left completely to the jurisdiction of the ecclesiastical courts; but as the power of these tribunals has been much limited by the many toleration acts, no less than by the almost indefinite construction that may be placed upon the doctrinal forms of the Anglican church, the practical effect is found to be an almost complete toleration of doctrines opposed to the Articles of the Establishment. A glorious and instructive change is this from the practice of burning alive any one who dared to express a free opinion upon matters of religion. The reader is referred to the proceedings instituted against Dr. Rowland Williams, and to the judgment of the Court of Arches.—*Ref.* Mosheim's *Ecclesiastical History*, vol. ii.; Stockmann's *Lexicon Hæresium*; Walch's *Geschicte der Ketzereien*.

HERIOT, *her'-e-ot* (SAX. *heregeate*, literally war-treasure), is a feudal service due to the lord of the manor, upon the death, and sometimes upon the alienation, of a tenant. It consists in rendering to the lord the best jewel, beast, or chattel that was owned by the deceased. This fine was enforced in England prior even to the Norman conquest, and although at this latter period an analogous service, under the name of Reliefs, was introduced, the heriot was not abolished. The chattels which were first given in this way appear to have been the horse and armour of the deceased lease- or copy-holder. At first voluntary, it came in course of time to be compulsory. There are two kinds of heriots; heriot-service and heriot-custom, for the former of which the lord of the manor may either seize or distrain, while for the latter he cannot, although he has the right of choosing the best beast or chattel. Formerly the right of heriot-custom was freely exercised in the case of freehold lands; but at the present time it is almost exclusively confined to lands held by customary tenure, whether these latter be copyholders, conventionary estates under the duke of Cornwall, customary freeholds of the northern border counties, or lands in ancient demesne. In Scotland other similarly vexatious fines are levied upon land.

HERMAPHRODITE FLOWERS, *her-máf'-fro-dite* (Gr. *hermaphroditos*), in Bot., are those which possess both stamens and pistil.

HERMENEUTICS, *her-men-u'-tiks* (Gr. *hermeneutes*, an interpreter), is the science of interpreting or discovering the true meaning of the holy Scriptures. Although often confounded with exegesis, it bears a very marked distinction from that branch of study. (*See* EXEGESIS.)

HERMETIC BOOKS, *her-met'-ik* (Fr. *hermétique*), a term applied to the supposed literary compositions of the ancient Egyptian god Thoth, who was believed to have acted as the scribe of the other gods. Tradition varied as to the character and number of these inspired writings, which were held to contain all knowledge, whether divine or human, in its totality. Clement of Alexandria gives the number of the hermetic books as forty-two; Iamblichus, as 20,000; while Manetho raises the number to 36,525. According to the best authorities, these writings were:—one book containing the sacred hymns of Osiris; one book on the life of a king; four books of astrological precepts and observations; eleven books treating of the cosmography, geography, and chorography of Egypt and the Nile; ten upon the laws and discipline of the priesthood, and six treating of medicine. Several pretended Greek translations of these books have survived; but the true origin of these writings is held to be due to Egyptian, Persian, and Rabbinical sources. In mediæval times, the alchemists and astrologers were particularly prone to entitle their works hermetic writings.

HERMIT, *her'-mit* (Gr. *heremitis*, an inhabitant of a desert), a term often applied in the early, but more frequently in the later church, to a person who, in order to resist the temptations and cares of the world, withdrew himself from society to a cavern, a mountain, a desert, or other solitary situation, there to devote himself to prayer, fasting, and mortification of the flesh. (*See* ANCHORITE, ASCETICISM.)

HERMIT CRAB. (*See* CRAB.)

HERNIA, *her'-ne-ä* (Gr. *hernos*, a branch, from its protruding forwards), a general term in morbid Anat., applied to the protrusion of any viscus from its natural cavity. In a more restricted sense, however, the word only signifies a protrusion of the abdominal viscera. Hernia, in the latter form, is unfortunately very frequent. Many causes contribute to this frequency. There are three natural openings which are weak and unprotected in the walls of the abdomen. These openings yield easily, and permit the escape of any viscus that may be pressed towards them with even a moderate degree of force. The nature of the walls, too, which are principally composed of muscle, and the condition of the viscera within,—loose, liable to change of size and situation, and subject to irregular pressure by the contractions of these muscular walls,—all unite to render these weak situations still more weak. The places referred to are called the umbilicus, and the inguinal and femoral canals. There are, however, other situations where hernia may occur, though such cases are unfrequent. It is also evident that if the muscles or tendons of the diaphragm are wounded, some portion of the contents of the abdomen may escape; thus constituting the varieties of ventral and phrenic hernia. The forms of this disease have consequently been arranged and named according to the places where they occur. Besides this division as to situation, there is another, of great importance, derived from the nature of the viscus displaced. Men are much more liable to hernia than women, the proportion being about four to one; and the liability to the disease increases with years. A hernia is always composed of a "sac" and its contents. The former is a portion of the peritoneum pushed forward by the protruding viscera, and forming a pouch. The contents of the sac vary greatly; but generally consist of a portion of the small intestine, especially the *ileum*. A certain quantity of fluid is always found secreted in the sac together with the viscera. The principal divisions of the ordinary disease are,—reducible (when

it is returnable into the abdomen), irreducible, and strangulated hernia. Reducible hernia is treated either with a truss, so as to retain the protrusion within the cavity of the abdomen, or the treatment may be radical, the contrivances for which are purely surgical. In the former case, each particular kind of hernia requires its special form of truss; and before applying it, the hernia must be reduced by placing the patient on his back, relaxing the muscles by bending back the thigh, and pressing the tumour back in the proper direction. The protruded viscus cannot be returned into the abdomen in irreducible hernia. Cases of this kind are treated either by means of a truss having a hollow pad, so as to embrace the tumour, or radically, in some cases, by keeping the patient recumbent, on low diet, for two or three months; during which time the bowels are kept open by laxatives and injections, the tumour being equally pressed during the time. When a portion of the intestine protruded is so tightly constricted that it not only cannot be returned into the abdomen, but has its circulation arrested also, the disease is called strangulated hernia. If relief is not speedily obtained when the disease occurs in this form, it is highly dangerous; for the strangulated part becomes gangrenous. If the intestines cannot be returned by pressure, chloroform is administered internally, so as to relax the muscle, or a hot bath, or bleeding to the verge of faintness. If none of these methods are of any avail, the operator is obliged to divide the constriction by means of the knife.

Hero, Heroic Age, *he'-ro, he-ro'-ik* (Gr. *heros*, a being intermediate between gods and men).—During the Homeric period, any king, prince, leader in battle, or one who distinguished himself above his companions as a brave warrior, or in wisdom, or in beauty, was fabled to be of divine origin, and after death was worshipped as a deity by those cities or races of mankind that claimed him as founder or ancestor. Thus Perseus, Theseus, and other warriors of mythological history, were called heroes. The greatness and glory of these heroes were held up to the example and admiration of the whole Greek peoples. According to Thirlwall, the heroic age lasted during six generations, or about two hundred years, terminating with the death of the near descendants of those Greeks who fought at Troy. In Homer, however, the word hero is often synonymous with warrior, or even with wise man or king.

Heroic Verse, that in which epic poetry, devoted to a history of the exploits of heroes, is composed. In Greek and Latin, *heroic verse* is generally expressed in hexameter lines; in English, Italian, and German, by the iambic of ten syllables, either with or without the additional short syllable; and in French, by the iambic of twelve syllables. (*See* also articles Epic and Hexameter.)

Heron, *her'-on* (Fr.; Lat. *ardea*), belongs to the class *Grallatores*, a fam. of birds of which the common heron (*Ardea cinerea*) is the general type. The characteristics of the *Ardeidæ* are as follows:—Beak long, strong, straight, compressed in a lengthened cone; upper mandible slightly channelled, ridge rounded; nostrils lateral, basal, pierced longitudinally in the groove, and half-closed by a membrane; legs long, slender, naked above the tarsal joint; three toes in front, the two outer united by a membrane, one toe behind directed inwards; claws long, compressed, sharp, the middle claw denticulated on the inside; wings of moderate length, the first quill-feather a little shorter than the second or third, both of which are the longest in the wing. The common heron is one of the most numerous, as well as the best known of wading birds, and formerly the bird was considered royal game, and statutes were passed for its preservation. The heron is said to be very long-lived, and was formerly held in considerable estimation as an article of food. It visits most parts of the United Kingdom, and occupies the heronries, which are built for its comfort, from spring until the month of August. It visits Scandinavia in summer, going occasionally as far north as the Faroe islands, Iceland, and the southern coast of Greenland; but it is most abundant in Holland. The plumage is usually of a bluish-ashy colour, and the average length of the bird from the point of the beak to the end of the tail about three feet, while from the carpal joint to the end of the wing, the extent is about seventeen inches. The solitary habits of the heron are well known, for, except during the breeding season, when they congregate in large flocks, they are generally seen alone. Their food is nearly entirely composed of fish, and they will be seen standing for hours by the side of ponds and streamlets, watching for their prey, which they catch by a single dart of their powerful beak. Besides the common heron, there are the *purple heron*, which is found in the temperate parts of Europe, in Africa, and in Asia; the *great white heron*, an accidental visitor to this country, but common in the eastern parts of the Mediterranean; the *buff-backed heron*, and the *squacco heron*, a native of Egypt.—For further information on these latter varieties, the reader is referred to Yarrell's *History of British Birds*, which treats at length on the subject.

Hero's Fountain. (*See* Hydraulics.)

Herpetology, *her-pe-tol'-o-je* (Gr. *herpeton*, a reptile; *logos*, a discourse), a term applied to that portion of Nat. Hist. which treats of reptiles. This branch of science has received the attention of naturalists both in ancient and modern times. Linnæus gave much study to the subject, and Ray devoted considerable time to it. Lacépède, Brongniart, Latreille, and Dandin also contributed to its advancement in the end of the 18th and beginning of the 19th century. In later times the principal writers on herpetology have been Sklegel, Gray, Muller, Owen, and others. Additional interest is added to the study of this branch of science on account of the numerous fossil remains of reptiles belonging to former geological periods which have been found. Many of these possess extraordinary characters, and are of immense size. Until lately, the Batrachia, or Amphibia, have always been included with the reptiles; consequently, in most works on herpetology a description of them is to be found.—*Ref.* Bell's *History of British Reptiles*, which contains a full account of all the British species, including the Amphibia.

Herring, *her'-ring* (Ger. *heer*, an army, on account of the great numbers in which they visit our shores), belongs to the family of the *Clupeidæ*, a branch of the order termed *Malacopterygii*, on account of their being possessed of a scaly body like the salmons, no adipose dorsal fin, and by the upper jaw being formed in the middle by the intermaxillary, and on the sides by the maxillary bones. The length of the head, compared to the length of the body alone, without the head or caudal rays, is as 1 to 4; the depth of the body compared to the whole length of the fish, as 1 to 5; the commencement of the dorsal fin is halfway between the point of the upper jaw and the end of the fleshy portion of the tail; the longest ray is nearly as long as the base of the fin; the pectoral fin being rather large compared to the size of the other fins. The ventral fin arises considerably behind the line of commencement of the dorsal fin, and is small, with elongated axillary scales, its origin halfway between the point of the lower jaw and the end of the short central caudal rays. The anal fin begins halfway between the origin of the ventral and the end of the fleshy portion of the tail, and extends over half the distance between its origin and the end of the fleshy portion; thus occupying the third quarter division of the distance between the origin of the ventral fin and the end of the fleshy portion of the tail. The rays are very short; the tail considerably forked, with the outer rays double the length of the middle ones. The lower jaw is much the longest; the dorsal and abdominal lines of the body slightly convex; the belly carinated, but not serrated; the scales moderate in size, oval, and thin. The upper part of the fish is a fine blue colour, with green and other reflections, when viewed in different lights; the lower part of the side and belly, and the gill-covers, silvery white, exhibiting the appearance of extrava-



HERRING.

sation when the fish has been dead some twenty-four hours. The dorsal and caudal fins are of a dusky hue, and those on the lower parts of the body almost white. Such are the characteristics of the *herring*, according to Yarrell, who, in his account of British fishes, enters at large upon the subject. An account of the herring fishery, and their annual migration to the shores of Britain, is given under the article FISHERIES (which *see*); the herring being a constant visitor to our shores, where it continues some months. —*Ref.* Yarrell's *History of British Fishes;* Baird's *Cyclopædia of the Natural Sciences.*

HERRING FISHERY. (*See* FISHERIES.)

HESPERIDIUM, *hes-pe-rid'-e-um*, in Bot., a kind of fruit, examples of which are afforded by the orange, lemon, lime, and shaddock. It may be described as a superior, many-celled, few-seeded indehiscent fruit, having a separable rind formed of the epicarp and mesocarp combined together, and an endocarp projecting internally in the form of membranous partitions which divide the pulp into a number of portions or cells, which are easily separated from each other. This pulp is a development of succulent parenchyma, either from the inner lining of the ovary generally, or from the placentæ only. The seeds are imbedded in the pulp, and attached to the inner angle of each of the divisions into which the fruit is divided. By some botanists the orange is considered as a berry with a leathery rind; but the berry is essentially different in its origin, as it is an inferior fruit.

HETEROLOGOUS SERIES, *het-er-ol'-o-gus* (Gr. *heteros*, various), in Chem., heterologous series are those whose members manifest a similarity of origin from homologues, but which differ considerably in their properties. (*See* HOMOLOGOUS SERIES.)

HEXAGON. (*See* CUBE.)

HEXAMETER, *heks-im'-e-ter* (Gr. *hex*, and *metron*, a measure), the commonest and most important form of dactylic verse used amongst the ancient Greeks and Romans. It was termed *hexameter* in consequence of its consisting of six feet, either dactyls or spondees, which could be used indifferently throughout the verse, with two exceptions;—that the last foot must be invariably a spondee, and the last but one a dactyl. In a few rare cases, either to vary the rhythm or to produce some special effect, a spondee is introduced in the fifth foot, when the line is denominated a *spondaic* line. In modern times, several writers have endeavoured to introduce hexameter verse, with but little effect, as nearly all attempts have been utter failures, the specimens given being but of so many degrees of inferiority. Schiller hit on one of the best examples in his way, and Coleridge very excellently translated it in the same metre, carrying out fully the original author's idea.

"Schwindelnd trägt er dich fort auf rastlos strömenden Wogen;
Hinter dir siehst du, du siehst vor dir nur Himmel und Meer."

Which Coleridge translated:—

"Strongly it bears us along, in swelling and limitless billows;
Nothing before and nothing behind but the sky and the ocean."

However, the hexameters of Goethe and Schiller, although they contain much that is grand and beautiful, serve only for beacons, as is aptly said in the *Encyclopædia Britannica*, to "warn less skilful pilots off a coast where shipwreck is certain."

HEXYL, *heks'-il* (Gr. *hex*, six), in Chem. ($C_{12}H_{13}$), a liquid of agreeable aromatic odour, boiling at 395°, obtained from œnanthytate of potash by voltaic decomposition. It is the sixth of the series of the hydrocarbon radicles of the alcohols, and is also called caproyl.

HIATUS, *hi-ai'-tus* (Lat., a yawn, gap, or chasm), in Diplomatics and Bibliography, means a deficiency in the text of an author, from a passage erased. In Gram. and Prosody, it signifies the occurrence of a final vowel, followed immediately by the initial vowel of another word without the suppression of either by even an apostrophe. In the French language, the hiatus is most carefully avoided, but in England not so much attention is paid to it, although it is considered a blemish by the more careful writers.

HIBISCUS, *hi-bis'-kus* (Gr. *hubris*, haughtiness), in Bot., a gen. of the nat. ord. *Malvaceæ*. The species *H. cannabinus* yields the fibre known as *sunnee*, or *brown Indian hemp*, which is used in India as a substitute for true hemp. It is sometimes confounded with sunn hemp, which is the produce of a leguminous plant. (*See* CROTALARIA.) *H. arboreus*, a native of the West Indies, is also remarkable for the tenacity of its inner bark, and some authors declare that the whips formerly used by the slave-drivers were manufactured from its fibres. The petals of a Chinese species, *H. rosa-sinensis*, are astringent, and are used by the celestials to blacken their eyebrows and the leather of their shoes. Various other species of *Hibiscus* yield valuable fibres useful for textile fabrics, or for paper.

HICKORY. (*See* CARYA.)

HIDALGO, *hi-dăl'-go*, a distinction applied to a Spanish gentleman of the lower class of nobility, and derived from the words *hijo de alguna*, which mean, literally, "the son of somebody." The title, although frequently applied during the last century and middle ages, is now extinct.

HIDE, *hide* (Ang.-Sax.), an old English measure of land frequently mentioned in Domesday Book and other old chronicles. Its contents are almost uncertain, but are stated to have been 100 Norman, or 120 English acres.

HIERARCHY, *hi-e-rar'-ke* (Gr. *hieros*, sacred, and *archon*, government), literally means a *holy government*, and is used to signify either the constitution and government of the Christian church, or ecclesiastical polity, comprehending different orders of clergymen, and the government of the Church over the State. Taken in the former sense, with reference to the internal government of the Church, the *hierarchy* arose with the formation of the Christians on an independent establishment; for, although *presbyters*, or elders, were placed at the head of the earliest congregations of Christians, yet their constitution was essentially democratic, each and all of the members having a share in the concerns of the whole society, and a vote in the election of elders, the exclusion of renegades, and the reception of proselytes. Afterwards, the government of the Church became more and more transferred into the hands of the elders; and in the 2nd century, the bishops became chiefs, and took all authority in their own hands, although the elders were still possessed of some semblance of power. In the capitals of different provinces, the bishops were termed "Metropolitans," and were superior in office to the provincial bishops, and thus gradually an aristocratical hierarchy was formed, and the "metropolitans" of Constantinople, Antioch, Alexandria, and Jerusalem, were called "Patriarchs," and looked up to as the heads of the Church. In Greece, this constitution continued to prevail, but in Rome, it was transformed into a monarchy, and the Pope was established as the primate of the church of Western Christendom. In the second sense in which the word *hierarchy* is used, it refers to the relations of the Church and the State to each other; in which the former claims the superiority, and demands the subjugation of political influences to its own power. When the Christian church was first established, it did not seek or claim any influence whatever over the State, and the State considered itself bound often to persecute, and endeavour to destroy the Church; but when the Church was amalgamated with the State, in the time of Constantine the Great, it was protected by the State, which claimed for itself the privilege of interfering in the internal government of the same. Charlemagne, and others of the German emperors, claimed this sovereignty as a right, and after the feudal system arose, the bishops held the church lands as fiefs, from their temporal rulers. The *hierarchy* did not fully constitute itself until the Roman bishop, or Pope, was looked up to really as the head of the Church; and from that period the power of the Church over the State became gradually increasing. Of all the popes, Gregory VII. was the most energetic in spreading this power; and if he did not fully succeed in his object, his successors had a plain path marked out for them, which they followed to the letter. By the exertions of these latter members of the hierarchy, the

institution of the Church was elevated above the State, and its head ranked higher than any temporal ruler, as his power was supposed literally to emanate from the Deity himself. Papacy and the hierarchy began gradually to decline from the 14th century, as it had risen, and the disputes between Philip the Fair and the Roman pontiff, and the removal of the popes to Avignon, are instances of this decline in the spiritual supremacy of the Roman Catholic church. At the council of Basle, in 1431, the authority of the State was again proved superior to the Church, and the doubts and discussions stated by Huss and Wycliffe undermined considerably the power of the hierarchy. The Reformation was its last assailant, and by the Reformation, this institution was vanquished. The spiritual power of the pope became subjugated to civil law, and the State was elevated to a position from which it governed the churches. Thus the hierarchy received its death-blow; and the events which took place in Rome in 1861-62 tend to prove that the supremacy it once enjoyed is now and for ever annihilated. According to Dionysius the Areopagite, *hierarchy* also denotes a division of the angels, which were divided into three of these separate constitutions. The first hierarchy was composed of the cherubim, seraphim, and thrones; the second of dominions, virtues, and powers; and the third of principalities, angels, and archangels. In the commencement of Milton's "Paradise Lost," this subdivision of the angelic host is alluded to in the lines—

"Thrones, dominations, princedoms, virtues, powers,
Hear my decree."

Some of the Rabbins reckon four, and others ten hierarchies, or orders of angels.

HIEROGLYPHICS, *hi-e-ro-glif'-iks* (Gr. *hieros*, sacred; *glupho*, I engrave), a term generally applied to the representations of animals or other forms, used to express language, and more especially to those found sculptured on the monuments of Egypt. The ancient Egyptians appear to have used about 1,000 symbols, by means of which they were enabled to express themselves correctly and clearly. Amongst the ancient Greeks this mode of writing was called hieroglyphic, or hierographic; and its invention was attributed to Thoth, the Egyptian Hermes. In nearly all cases, hieroglyphics consist of representations of the sun, moon, and stars; the human form, animals, fishes; works of art, &c., which were either engraved in relief, sunk below the surface, or traced with a reed pen on slabs of stone, pieces of wood, or leaves of the papyrus. In the Egyptian monuments the hieroglyphics are sometimes plain, and sometimes decorated with colours. Those found on coffins appear to have been traced out and afterwards coloured; those inscribed on papyri are merely sketched out, and are called linear hieroglyphs. They are arranged in perpendicular or horizontal columns, separated by lines, and in some cases distributed in a sporadic manner in the area of the picture to which they refer. Hieroglyphics appear on the walls of the earliest tombs, and are even found scrawled on the blocks of stone which form the great pyramid of King Cheops. They continued in use for upwards of 3,000 years, when they were superseded by a more condensed writing, called the Demotic, and lastly by the modern Coptic, on the introduction of Christianity. All knowledge of the mode of deciphering hieroglyphics was lost from the 10th to the 16th century; and on the revival of learning, the task was undertaken in vain, till the discovery of the Rosetta stone in 1799, when a clue to their interpretation was gained. In 1814, Young was the first to discover, from the name of Ptolemy on this stone, and that of Berenice on a doorway in the south corner of Karnac, that certain hieroglyphics were used to represent sounds, and not ideas exclusively, as had been believed up to that time. The study of hieroglyphics has been pursued by many learned men, both in this country and on the continent, from that period. Hieroglyphs are divided into two classes,—ideographs, or symbols representing ideas, not sounds; and phonetics, which spell the sound of the word, the sense of which they are intended to convey. Nearly all the inscriptions are principally composed of phonetics, which are easily distinguished by their constant recurrence. The ideographs are divided into two classes,—





first, those which represent the object directly; as a wolf to represent that animal, a man having the head of an ibis to represent the god Thoth, a bundle of flax to represent flax, &c.; secondly, those which are enigmatic, and express the idea by less direct means; as a woman beating a tambourine to express joy, a smoking pail for milk, an ape for anger or irritability, and a jackal for cunning. The number of these particular signs, however, was not many, as a certain class of them was used to express more ideas than one. Thus a figure representing a seated man signified man in all his relations, functions, and offices; meaning either father, brother, governor, priest, &c.; the particular meaning being conveyed by the arrangement of phonetics before the sign. In the same manner all acts of locomotion were represented by two legs in the act of walking; all actions where the arms were required, by an arm holding a stick; all precious stones by a ring; and all beasts and objects made of leather by a skin. These hieroglyphics closely resemble in their use the cuneiform characters of the Assyrians. (*See* CUNEIFORM.) The Chinese mode of writing is also very similar to the hieroglyphs of ancient Egypt in the use of the phonetics. The ideographs are often preceded by a group of phonetics, indicating the spelling. Thus *Ansh*, a wol is preceded by a haro A, a line of water N, a basin SH; a jackal, *Sab*, "crafty," is preceded by the back of a chair S, and a chisel B. Those hieroglyphics called phonetics are fewer in number than the ideographs, and are divided into two classes,—those ending in vowels and those ending in consonants. The former are fifty-two in number; and as they represent eighteen sounds of the spoken language, answer the purposes of a pure alphabet. The grammatical forms, the abstract prefixes and affixes, substantive and auxiliary verbs,—in fact, the great body of the language, is composed of the phonetics. The groups of phonetics preceding the ideographs are constantly interchanged among themselves; and during the long period of three thousand years similar texts in the papyri show hundreds of words written with different symbols. The hieroglyphical inscriptions on stone among the Egyptians are all religious, historical, or sepulchral. All their books, with the exception of the Rituals, or hieratic books, were written in a cursive or flowing hand, of a very distinct, clear shape, with headings at the tops of the pages. This hieratic character, as it is called, did not employ so many symbols as the hieroglyphic, and approached nearer to the alphabetic system. It continued in use till the 2nd or 3rd century after the birth of Christ. After the 8th century B.C., it was only used for religious purposes. The demotic character was at first only an abridgement of the hieratic forms; but it rapidly lost all resemblance, and finally tried to accommodate the written language as nearly as possible to the alphabetical Greek and Phœnician systems then known to the Egyptians. It remained in use till the 3rd century A.D., when it gave way to the Coptic. During the time of Clement it was first learned by the beginners, who then proceeded to learn the hieratic; and afterwards the hieroglyphic, then an old and dead writing. The ancient Ethiopians carved hieroglyphics on their pyramids and monuments, as well as the Egyptians. The characters resemble those in use in the latter days of the Egyptian monarchy. Hieroglyphical inscriptions have also been found at Nineveh, Koyunjik, and in the islands of the Greek Archipelago. The term hieroglyphics has been applied to the picture-writing of the Aztecs, or ancient Mexicans. The subject delineated, such as a monarch or a town, was absolutely painted, and certain hieroglyphs were introduced in order to aid the explanation. The symbol expressing the king's name is attached by a cord over the head of the monarch; that of the town over it; and so on. After the introduction of Christianity, it is said that the monks used these symbols, according to their sounds, to write the Lord's Prayer and other religious formulas. The term hieroglyphics was applied by writers in the 16th century to emblemata or devices symbolising sentences taken from the Greek and Latin poets, and having no relation to Egyptian hieroglyphics. Almanac-makers and astrologers have also applied the term hieroglyphic to the symbolical pictures which are supposed to be prophetic

of coming events.—*Ref.* Young's *Account of Discoveries in Hieroglyphical Literature;* Champ. *Papyrus Magique d'Harris;* Birch's *Introduction to the Study of the Hieroglyphs.*

HIEROPHANT, *hi'-e-ro-fant* (Gr. *hieros*, sacred, and *phaino*, I show), in Antiq., a title applied to the chief priest who initiated candidates in the Eleusinian mysteries. He was obliged to be a citizen of Athens, and held his office, which was regarded as one of high religious importance, for life. In his duties he represented the Creator, and his privileges on public festivals were to adorn and carry the statues of the goddess. In consequence of his being the expounder of the sacred mysteries, he was termed the *mystagogue*, or *prophet;* and no one was permitted to utter his name in the presence of an uninitiated person. (*See* ELEUSINIAN MYSTERIES.)

HIGH CHURCH, an epithet first applied in English history in the year 1700, to those opinions which tended to exalt the ecclesiastical power, and also to the parties who embraced those opinions. At that period, the High Church party was thought unfriendly to the nation, and disposed to Jacobite principles. After the time of George I., the epithet lost whatever political force it originally possessed; and it is now applied in matters relating to the discipline of the church itself, in contrast to the term "Low Church,"— the former attaching more value, and the latter less, to the dignities, ordinances, and ceremonials of the English church.

HIGH CONSTABLE. (*See* CONSTABLE.)

HIGHNESS, *hi'-ness* (Ang.-Sax.), a title of honour given to kings, princes, and others of royal blood. The titles of "highness," and "your grace" were both used by Henry VIII.; but towards the close of his reign he substituted "your majesty" in preference. The children of kings and queens are addressed as "your royal highness," while those of emperors are addressed as "your imperial highness." Among other titles, that of "highness" was conferred by Louis XIV. of France on the prince of Orange, in the year 1644.

HIGH PRIEST, the chief priest and head of the Jewish synagogue, instituted by Moses, acting under the instructions of Jehovah. The importance of this office was indicated by the most gorgeous apparel, and the *high priest* was esteemed the most imposing personage of the nation. The dress of the functionary was characterized by his breastplate, termed the *urim* and *thumin*, or *light* and *right*, according to Luther's translation, composed of twelve precious stones, on which the names of the twelve tribes of Israel were inscribed. To him belonged the exposition of the oracles of God, and no other was allowed to enter the sanctuary, or holiest of holies, in the tabernacle, which he was only allowed to do once a year, in order to pray and sacrifice for the sins of the nation, which were believed to be thus expiated.

HIGH TREASON. (*See* TREASON.)

HIGH WATER is defined to be the utmost flow and greatest elevation of waters acted on by tidal influence, and it is also a term applied to the time of such elevation. The time of high water depends on the age of the moon, and is nearly always the same at the same place at the full of the moon. High water lasts about fifteen to twenty minutes, after which time the tide begins to ebb. The method by which the time is found is as follows:—Add four-fifths of the days of the moon's age, considering them as hours, to the time of high water at the full of the moon, and the sum thus obtained will be found to be the time of high water answering to the day in question. *High-water mark* is the line made on the shore by the tide at its utmost height. (*See* TIDAL ACTION.)

HIGHWAY. (*See* WAY.)

HILARY TERM, *hil'-a-re*, an English legal term, commencing on the 11th and ending on the 31st January, during which time the courts of law sit *in banco* at Westminster. The name is said to be applied in honour of St. Hilary, bishop of Poitiers.

HILUM, or UMBILICUS, *hi'-lum* (Lat.), in Bot., the point of attachment of the ovule, or the seed, to the *placenta* if sessile,—to the *funiculus* if stalked.

HINDOO ARCHITECTURE, *hin-doo'*.—The oldest buildings that remain as examples of the early architecture of India are considered by competent judges



not to have been erected earlier than 300 years prior to the Christian era. Indian architecture may be broadly classified as Buddhist, Brahman, and Mohammedan, which three styles derive their names from the religion professed by the dominant power in India during the period in which each prevailed; Buddhism giving place to Brahmanism, and Brahmanism yielding in its turn to the Mohammedan form of worship, introduced by the Saracenic conquerors of India about 1000 A.D. There are many points in which the architecture of Hindostan bears a striking resemblance to that of Egypt, temples being found in both countries that have been hewn out of the solid rock, and ornamented with statues attached to piers or walls, which are remarkable for their size and colossal proportions. The chief, and, indeed, almost the only, remains of Buddhist architecture, with the exception of the *topes*, or structures built to contain relics of Buddha, are the cave temples found in southern India, the principal of which are the temples of Elephanta and Salsette, near Bombay; Behar, Cuttack, and those of Ellora and Carli, in the province of Aurungabad. These temples consist of excavations cut out of the solid rock with considerable labour; and in addition to the temple itself, monasteries, if they may be so termed, are also hewn out of the stone in the same manner in some localities, to afford accommodation for the priests who were in attendance on the shrine of the divinity. The rock-temple of Carli is supposed to be one of the oldest of these curious excavations. It consists of a nave about 26 feet in width, separated from narrow aisles on either side by rows of massive pillars. The entire length of this temple is 126 feet, and its breadth about 47 feet. The roof is vaulted, and rises about 45 feet above the level of the floor in the centre. The columns on either side of the nave consist of a base, shaft, and capital. The base is very high, especially when compared with the bases of columns used in the various styles of European architecture; the shaft is octagonal, and about equal to the base in height; while the capitals are ornamented with kneeling elephants, on which male and female figures are seated. Entrance to the body of the temple is obtained through three doors, the largest being in the centre, and the two smaller ones on either side of it. There is a porch before these doors, which extends along the whole façade of the temple and a few feet beyond it; and above them is a gallery. The space above the gallery up to the roof itself is entirely open, forming a large semicircular window, by which light is admitted into the interior. The temple terminates in a semicircular apse, surmounted by a semi-dome, and in this apse the shrine and image of the divinity are placed. The temple of Elephanta is much larger, and excavated in the side of a mountain: it is about 130 feet square. It is filled with rich and varied sculpture, consisting chiefly of colossal figures in *alto relievo*. The columns are composed of a fluted shaft swelling outwards in the middle, standing on a high square base, and surmounted by a bulb-shaped circular capital, which is one of the chief distinctive features of Indian architecture. The Buddhist rock-monasteries consist of a series of cells ranged round a central hall. They are not so richly ornamented with sculpture as the temples; but many of the chambers are decorated with paintings representing events in the life of Buddha, and portraits of Buddha himself and Buddhist saints. The topes are generally in the form of circular buildings surmounted by a dome. They vary from 10 or 20 feet in diameter to 180 or 200 feet, and for the most part consist of a solid cupola erected on a flat terrace reached by steps, with a relic-case called a *tee*, or a square ornament in the form of a box, intended to represent a relic-case, on the summit. A column called a *lât* was placed in front of the Buddhist religious buildings, on which the Buddhist creed was inscribed. Some of the Buddhist temples in Ceylon, Burmah, and Java consist of a series of terraces rising above one another in a pyramidal form, with a relic of Buddha under a dome at the summit. (*See* BOHO BUDDOH.) On the decline of the worship of Buddha in India, a sect known as the Jains, or Jainas, sprang up. The temples erected by the Jains were characterized by great elegance and lightness of structure, combined with richness of ornamentation They consist of a central dome, surrounded by others

more or less in number, supported on sculptured columns. The ceiling of the cupolas, which are hollow, and not solid like the domes of the topes erected by the Buddhists, are panelled and adorned with elaborately designed scroll-work and foliage. The temples of the followers of Brahma consist of an inner temple, or sanctuary, called the *bimana*. This is in the form of a four-sided pyramid, which rises to a great height, and is formed of a succession of steps or terraces, adorned with figures and sculpture, and crowned by a small dome. In this was the cell, or sanctuary, which contained the image of the deity, and was lighted by lamps. A porch was placed before the entrance to this inner sanctuary, and the entire pile formed the centre of a rectangular court, surrounded by a high wall. The entrance to this court was flanked by pyramidal gate towers, called *gopuras*. Halls, or colonnades, consisting of a roof, supported on pillars, varying in number from four up to a thousand, according to the size of the building, were erected in the inclosures that surrounded the Brahman temples. These halls were called *choultries*: they served for the celebration of festivals and ceremonies connected with the worship of Brahma, that occurred at various seasons of the year. The temples at Tanjore and Bareilly are the best examples of this style of Indian architecture. When the Mohammedans conquered India, they introduced the arch, and various features of Saracenic or Moorish architecture, which were gradually blended with the more prominent features of the previous styles prevailing in that country, until a new style was produced similar in many respects to the architecture of Arabia, Northern Africa, and Spain, when the Saracens had the mastery over those countries, but containing other characteristics, which are sufficient to mark it as a distinct style. The ornamentation is as rich and minute in detail as that of Moorish architecture, and the pointed and horse-shoe arch are introduced in a square panel, but the bulbous cupolas swelling outwards, and extending considerably beyond the circle of the base, as well as the projecting galleries of the minarets and balconies, supported on cantilevers of great length, are peculiar, and belong entirely to the Mohammedan architecture of India. The mosques, and some of the tombs erected by the great Mohammedan sultans of India, afford the best examples of this style of architecture. Among these may be named the great mosque at Delhi, and the magnificent mausoleum built by Shah Jehan, near Agra, about 1640, to the memory of one of his queens. (*See* TAJ MAHAL.)—*Ref.* Fergusson's *Handbook of Architecture; English Cyclopædia*—Arts and Sciences.

HINDOOISM, *hin'-doo-izm*, a term applicable to the religion and social customs of those inhabitants of Hindostan who profess the worship of Brahma. One of the principal features in Hindooism is the system of caste, which divides society into four orders. (*See* CASTE.) The manners, customs, and laws of Hindoos are so intimately connected with their religion, that they can scarcely be described separately. The division into castes is a religious institution, which includes the whole detail and intercourse of life. The Brahmins, or the first of these castes, are the priests of their religion, which is a polytheism, or worship of many gods. The great vagueness of the Brahminical language with respect to the attributes of the gods, the long catalogue of fictions tacked on to their exploits, and the endless ramifications of sects, render any clear definition of the Hindoo religion very difficult. The code of Menu is one of the principal foundations of Hindoo faith, and is, besides, one of the few sacred documents out of which anything approaching to a precise idea of Hindooism can be extracted. Its date is given at about 600 B.C.; yet it yields in high antiquity to the Vedas, or sacred books of the Hindoos, the ages of which are stated at from eight to ten centuries before Christ. The code of Menu, however, has the advantage of being comparatively clearer than the older books, and is thus of more value to a modern student. All the sacred books of the Hindoos, although they inculcate the moral duties of justice, mercy, and benevolence, yet seem, like every system of false religion, to give the first place to the ceremonial law. The devotion of the Hindoos, consequently, consists in mere outward observances, and is not inconsistent with the most disgraceful crimes. The great triad of the Hindoo divinity is composed of Brahma the Creator, Vishnu the Preserver, and Siva the Destroyer; while beneath this trinity lurks the incomprehensible Brahm. Hindoo adoration, for the present period, is reserved for the Destroyer and the Preserver, Brahma having only one temple subsisting to his honour. The worship of this god ceased about the commencement of the Christian era. According to the Hindoos, the constant interposition of the Deity is required to maintain a proper balance in earthly affairs. Vishnu the Preserver is represented in the sacred books as having passed through ten incarnations, called Avaters. The first is the avater of the fish, when the world is described as being destroyed by a deluge. In the second avater, Vishnu, issuing from the side of Brahma in the shape of a boar, grows in an hour as large as an elephant, and remains suspended in the air, while a malignant giant rolls up the earth and flings it down into an abyss. Vishnu, however, descends into the water, and brings up the earth again on his tusk, spreading it out "like a carpet on the face of the water." In the third avater, Vishnu and Brahma churned the ocean like a "pot of milk," in search of the *amreeta*, or water of immortality. In the fourth, he appeared as a man with the head of a lion. In the fifth, sixth, and seventh, Vishnu went through a course of adventures in seeking out impious and cruel kings, and punishing them. In the eighth avater, he appeared as the beautiful Crishna, the shape in which he is most frequently worshipped. The ninth avater was the incarnation in the person of Buddha; while the tenth avater is still to come. Vishnu is then expected to appear mounted on a white horse, with a scimitar blazing like a comet, to mow down all incorrigible offenders who shall be living on earth. As the Hindoos began by dividing the divine power among a triad of rival gods, they soon began to split up into sects, each sect holding its own god to be the only true god. The followers of Vishnu and Siva invented new symbols, ascribing each, to their respective divinity, the attribute of creation. This contention for superiority ended in the total suppression of the worship of Brahma, and the temporary submission of Vishnu to the superior Siva. This, however, did not last long, and crusades were raised by the sects against each other. All the Hindoos, however, believe in one mysterious pre-eminent power, which they call Brahm, a power which can not only absorb the universe but all the gods. This absorption into the essence Brahm is the highest reward of the holy Hindoo. In order to attain this state of beatitude, a large number of injunctions have been laid down, to which he must duly attend. He must injure nothing animated, must subdue all sensual appetite, and perform all the rites prescribed in the Vedas. As the divinity can only be approached in a state of the greatest purity, and as the supposed causes of impurity are exceedingly frequent and numerous, the Hindoo has to perform a great number of religious ceremonials every day of his life. The modes of purification are very various and strange, many of them being very ridiculous. Of these bathing is the most rational: the other modes are by stroking a cow, looking at the sun, or having the mouth sprinkled with water. Inanimate objects need purification also: land is made pure by sweeping, by scraping, by allowing a cow to pass a night upon it, &c.; folded clothes must be sprinkled with hallowed water, and wooden utensils planed. The expiation of sin by voluntary penance is another favourite doctrine of the Brahmins, by which they contrive to awe superstitious minds into subjection. To such an extent will this fanaticism carry the Hindoo, that he will, as travellers have witnessed, keep his hands clenched till they are pierced by the growth of his nails; or hold his arms upraised till the limbs become paralyzed; or vow to remain in a standing position for years. Such spectacles have been frequently witnessed among the wandering professors of penance called Fakirs. (*See* FAKIR.) The junction of the Ganges and the Jumna is a place of peculiar sanctity, and a favourite dying-place of the devout Hindoo. Many of them drown themselves at the junction of the streams every year, and the rapidity with which the victim sinks is a token of his favourable acceptance by the god of the river. In order to gain

the good graces of the deity, the devoted person, with pots of earth fastened to his feet, is carried out into the middle of the stream. The devout multitude contemplate the scene from the surrounding banks, and applaud the victim if he retains a steady and resolute countenance to the last. The highest mode of sacrifice, however, is that of the wife who consents to be burnt alive with the dead body of her husband. In such case, should her husband have even killed a Brahmin, broken the ties of gratitude, or murdered his friend, she expiates the crime. The ancient and widely-diffused doctrine of metempsychosis, or transmigration of the soul, is also one of the Hindoo doctrines. The reward, however, of the highest virtue of the soul long engaged in pure and profound meditation, and of exquisite abstemiousness, is, that it shall be absorption into the divine essence, when it shall ever after be exempt from transmigration.

HINDOOS, LITERATURE OF THE.—In common with their religious traditions and the invention of their alphabet, the literature of the Hindoos is of the highest antiquity. Nearly all the literary compositions of the Hindoos are in verse. "For history," says Mill, "they have only certain narrative poems, which depart from all resemblance to truth and nature, and have evidently no further connection with fact than the use of certain names and a few remote allusions. Their laws, like those of rude nations in general, are in verse. Their sacred books, and even their books of science, are in verse; and, what is more wonderful still, their dictionaries." Because men feel before they speculate, therefore is poetry, which is the earliest form of expressing the feelings, the first literature. At this primary stage has the literature of the Hindoos remained. To commence with the Sacred Literature:—Under the general term of SHASTRAS, the Hindoos possess the four *Vedas*, named respectively the Rig, Yajash, Sama, and Atharva; the four *Upavedas*, or Sub-Vedas, the Ayash, Dhanush Ghandarva, and Artha; the *Vedanga*, or Six Angas; and, finally, the *Upangas*. The *Vedas* are written in Sanscrit (*see* HINDOSTAN, LANGUAGES OF), as is the Mantras, or prayers, the Brahmanas, or commandments, and, in short, the whole body of Hindoo theology proper. The *Upavedas* form a second class of sacred books, and consist of treatises upon surgery, medicine, music, dancing, war, architecture, and many mechanical arts. The *Vedangas*, or SIX ANGAS, are treatises subsidiary to the Vedas, and comprehend—rules for reciting the Vedas, and especially as regards the accents and tones to be observed; a treatise on grammar; besides dissertations upon metres, astrology, and astronomy. These works are held to have been given by inspiration of God to enable the Brahmins to read and understand the Vedas. Thus, we here perceive a double inspiration,—that of the Vedas and that of the Angas, the latter forming the key by which the Vedas are opened. The *Upangas*, or inferior bodies of learning, comprehend logic, theology, the institutes of the law, and certain legendary treatises, to the number of eighteen, which bear the name of *Puranas*. We will give a brief sketch of these latter. 1. The Kalika Purana contains a history of the goddess Kalika Parvadi, the wife of Siva. 2. Abhiatma Ramayana is a fragment of the history of Ramatshandra. 3. Brahma Vaivartika treats of the origin of the gods and the history of Ganesa, Crishna, and Durga. 4. Pedma Purana is the praise of the lotus (*pedma*), and a history of Lakshmi, the wife of Vishnu, in 55,500 stanzas. 5. Agru Purana forms a sketch of all Hindoo science, in 15,500 stanzas. 6. Vishnu Purana, in 23,000 stanzas. 7. Siva Purana, in 24,000 stanzas. 8. Linga Purana. 9. Scanda Purana, of the god Scanda, the son of Siva and Bhavani. 10. relates to religious customs. 11. Ontkal Khanda and Kasi Khanda; the former a description of Orissa and the old religious rites of Vishnu; the latter a history of the city of Kansi, now Benares. 12. contains the history of Nareda, the god of music, in 25,000 stanzas. 13. Markandeya Purana. 14. Bhawisia Purana. 15. Vaya Purana, the history of Vaya, the god of the winds. 16. Mateya, the history of Vishnu as the fish, in the first deluge. 17. contains the history of the same god as a man-lion. 18. treats of the history of Crishna, or Vishnu, in 12 books. The two oldest and most important epic





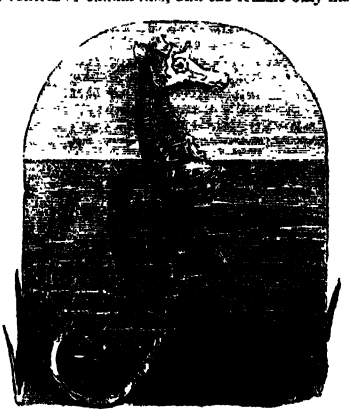
poems, which are also classed among the sacred books, are the "Ramayana," containing the history of Ramatshandra, king of Ayodya, the seventh great incarnation of Vishnu; and the "Mahabharata," detailing the war of the Pundus and Kurus, consisting of 18 books and upwards of 100,000 stanzas. We shall now proceed to touch, in a brief manner, upon the Profane Literature of the Hindoos, noticing the principal works. The "Mugdhabodha," or Beauty of Knowledge, by Goswami, is held to be the best Sanscrit grammar. There are in all eighteen dictionaries of high reputation, but the "Amarasinha" is deemed the best. The poetry of the Hindoos betrays throughout an elegiac earnestness and sweetness which owes its origin to their oldest poet, Valmiki, who sang in plaintive strains the murder of a youth who lived happily with his mistress in a beautiful wilderness, and was mourned by her in heartrending lamentations. Among the dramatic poets is Calidas, who has been called the Hindoo Shakspere. His finest drama is "Sakoontolah," or the Fatal Ring, which has been translated into English by Sir William Jones, and into German by Forster, Herder, and others. According to Herder, the scenes of this great drama "are connected by flowery bands; each grows out of the subject as naturally as a beautiful plant. A multitude of sublime as well as tender ideas are found in it, which we should look for in vain in a Grecian drama." Another great drama of this author is the "Megha Duta," or Cloud-Messenger, which has been rendered into English by Wilkins. The Hindoos have two kinds of feet in their verses, and also two kinds of rhyme; the one falls on the first letter or first syllable of the verse, and is called *yety*, or *nadi*; for example, *ki* in *kirti* and *kirtana* make a rhyme. The other falls on the second letter or second syllable from the commencement, and is called *prasam*; for example, *pa* in *capapuy* and *dipantram*. Among the most important philosophical works of the Hindoos, there are,—"Gangheswara Fatwa Schirtamani," which is a treatise on metaphysics; "Pratikhya Tippani," a commentary on visible objects; "Anumaka Didhiti," is a treatise on memory; "Smriti Tatwa," is an abstract of the laws; and "Hitopadesa," a Hindoo book of fables, called also the Fables of Bidpay or Pilpay. This latter was the first work published in Europe in the Hindoo language. It appeared in 1810.

HINDOSTAN, LANGUAGES OF, *hin-dos-tän'*.—A survey of the languages, no less than of the antiquities and the religious systems, which prevail in India, would seem to afford a sufficient proof that its inhabitants are a primitive people, and that its territory is truly *Medyama, Medhya-Dehsa*, 'the central land.' Our knowledge of the philology of this strange and wildly-magnificent country is due to the labours of the missionary Henry Roth and the Jesuit Hanxelben, and, since 1790, to the more searching investigations of Paolino, Sir W. Jones, Wilkins, Forster, Carey, Marshman, Wilson, Colebrooke, Marsden, Bopp, and others. Following Colebrooke, who took a Hindoo treatise upon rhetoric as his guide, we find there are four principal languages,—Sanscrit, Pracrit, Paisashi or Apadhransa, and Magadhi or Misra; the Apadhransa and Magadhi being considered the same, and the Misra and Paisachi as one; so that in reality the leading languages are the Sanscrit, the Pracrit, and the Magadhi. This is the opinion of the last-quoted author; but other English critics maintain that this statement requires considerable qualification. 1. The Sanscrit, known also as Gronthon (from *grandha*, book), is the sacred language of the Brahmins and of literature. Now a dead language, there is strong presumptive evidence that it was once a spoken tongue. Singularly copious, and perfect in construction to a degree, its alphabet, consisting of fifty letters, is termed *Devanagari* (the divine alphabet), on account of its supposed origin with the gods, whose language it is. It has three genders, a dual like the Greek, conjugations numbered according to the vowel or consonant endings; seven cases, after-nouns (instead of pronouns), and an abundance of particles. The period of its highest perfection was in the last century preceding the Christian era, when the great poet Calydos flourished, the author of "Sakoontalah" (the Fatal Ring) and of the "Megha Data" (the Cloud-Mes-

senger). In the Sanscrit, also, are written the old sacred books of the Vedas. The founder of the Sanscrit grammar is Panini, the supposed author of the "Sutras," or short grammatical precepts. His system was improved by Catugayana, in a work called "Mahabhasha," which again was amended by Cayata. Perhaps the most celebrated of the later works upon the grammar of the Sanscrit tongue are the "Casica Vritti," and the commentary upon it by Haradatta Misra, entitled "Padamanjari." Among the best modern grammars are those of Colebrooke and Wilkins. Coming to dictionaries of the Sanscrit, we find the "Amara Cosha," or the Treasure of Amara Singh, a writer who flourished anterior to the Christian era; the "Viswapracasa" of Maheswara, and the "Haravali" of Purushottama. By English authors, we possess the "Dictionary in Sanscrit and English," of Professor Wilson; the "Sanscrit and English Dictionary," printed at Calcutta in 1846; the "Elementary Introduction to the Sanscrit Language," by Monier Williams, &c. The learned Sir William Jones established in 1808, at Calcutta, a printing-office for the production of Sanscrit works; and to this great Oriental scholar we owe the comparatively deep acquaintance we possess of the Sanscrit, —a language that would be important for the literary treasures of which it is the storehouse, but which becomes in the highest degree valuable when we reflect that it contains the fundamental sounds of all the European languages. (*See* INDO-GERMANIC LANGUAGE.)—II. The Praerit is the common language, and comprehends within itself the various dialects used in writing and in social intercourse. Colebrooke mentions ten; but to these should be added the Punjabee and the Brija Bhasha. The five following dialects constitute the languages of Northern and Eastern Hindostan:—1. The Sareswata, spoken by the people who dwell upon the river of this name, a stream flowing through the Punjab: it is a language rich in dramas and poems. 2. The Kanyacubja, which appears to be the parent of the modern Hindostanee, interlarded with Persian and Arabic words. 3. The Bengalee, a dialect principally spoken in Eastern Hindostan: it is rich in translations from the Sanscrit, and forms, almost exclusively, the language of the learned Hindoos. Its alphabet is a close copy of the Devanngari. 4. The Mitilaw, or Tirhoot, is the chief language of Mitilaw, or the circle of Tirhoot, and the neighbouring districts lying between the rivers Cusi and Gundhac, and the mountains of Nepaul. 5. The dialect of Orissa, called Uriya. The five following form the languages of the southern extremity of the Deccan, of the Mahrattas, of the people inhabiting the middle of the Mysorean plateau, of the inhabitants of the tract of country lying between the Krishna river and the Godavery, and of the Guzeratese. They are named respectively the Drarida, the Maharashtra or Mahratta, the Carnata, the Tailanga, and the Gurjara or Guzerat.—III. The Paisachi, or Apadhransa, has been presumed to be a mixture of the dialects of mountaineers and the Sanscrit. It is never alluded to in dramatic writings, except to serve as a subject of ridicule.—IV. The Magadhi, or Misra, presumed to be analogous with the Pali and Magudhi of the Cingalese, is the language of the priests of Buddha. In common with the Chinese, the foundation of this series of dialects is monosyllabic. Broadly speaking, it may be said to comprehend all the various dialects spoken by the peoples inhabiting the coast and islands lying between India and China.

HINGE, *hinj* (Ang.-Sax.), a contrivance by which doors are fastened, or hung, to one of the jambs of a doorway, and on which they turn when they are opened or shut. It is also used to fasten shutters or casement windows to the window-frames, gates to gate-posts, and lids or covers to boxes. The simplest form of the hinge, and that which fully shows its principle of construction, is the common socket and staple by which gates are usually hung. The common hinge consists of two plates of metal, with hollow cylinders attached to each in such a manner that the cylinders projecting from one piece fit into the spaces between or at either side of the cylinders in the other piece, an iron pin about which they turn being driven through the perforated cylinders so as to fasten the whole together. There are many varieties of the common hinge, distinguished by technical names, some being in the form of two rectangular parallelograms of brass or iron, fastened together by an iron pin, while others, chiefly used for common doors and boxes, consist of two long tongues of iron similarly held together. In the rising hinges used for doors in the better class of houses, the cylinders that move about the central pin are divided by a curved line in a direction similar to that taken by the thread of a screw. This arrangement causes the door to rise when it is opened, and to swing to and fro freely without touching the carpet. Some kinds of hinges are constructed in such a manner that the doors to which they are attached will open readily either inwards or outwards. Those frequently have a spring attached to them to cause the door to close immediately. The doors of banks and places of public resort are generally hung in this manner, to allow of ready ingress or egress. In Gothic ecclesiastical architecture, the hinge was frequently made an ornamental feature, the doors of churches being frequently covered with elaborate scroll-work branching from the central part of that portion of the hinge which was fastened horizontally on the exterior of the door. A good example of a hinge of this sort may be seen on the principal door of the church of St. Saviour's, Dartmouth.

HIPPOCAMPUS, *hip-po kam'-pus* (Gr. *hippos*, horse; *kampto*, I bend), the *H. brevirostris* of Cuvier, a species of lophobranchiate fish, belonging to the family of the *Syngnathidæ*, which is known in England by the appellation of the Sea-horse or Pipe-fish. Its generic characters are: jaws united and tubular, like those of the *syngnathi*; the mouth placed at the end; the body compressed, short, and deep; the whole length of the body and tail divided by longitudinal and transverse ridges, with tubercular points at the angles of intersection. Both sexes have pectoral and dorsal fins, neither have ventral or caudal fins, and the female only has an



HIPPOCAMPUS.

anal fin. The length of the *hippocampus*, from the point of the nose to the end of the tail, is generally about five inches; the form of the body heptangular, and the number of segments into which it is divided about thirty. Its general colour is a pale ash-brown, relieved by a changeable iridescence; and variable tints of blue are dispersed over different parts of the head, body, and tail. With regard to the habits of this fish, Yarrell says,—"When swimming about, they maintain a vertical position; but the tail is ready to grasp whatever meets it in the water, quickly entwines in any direction round the weeds, and, when fixed, the animal intently watches the surrounding objects, and darts at its prey with great dexterity." It is stated that the food of the *hippocampus* is unknown; but it is most probable that it resembles that of other *syngnathi*, and, consequently, consists of worms, small molluscs, and the ova of other fishes.—*Ref.* Yarrell's *History of British Fishes*.

HIPPOCRATEACEÆ, *hip-po-krai-te-ai'-se-e*, in Bot., the *Hippocratea* fam., a nat. ord. of *Dicotyledones*, subclass *Thalasiflorœ*,—shrubs with opposite simple leaves and small deciduous stipules. Flowers small, regular, and unsymmetrical. Sepals and petals 5, hypogynous and imbricated, the former persistent. Stamens 3, hypogynous and monadelphous; the anthers with transverse dehiscence. Ovary 3-celled, with a single style. Fruit baccate, or consisting of 3 samaroid carpels. Seeds definite, exalbuminous; embryo straight; radicle inferior. The plants of this order abound principally in South America; some are found in Africa and the East Indies. Some have edible fruits, as the species of *Tontalea*, found in Brazil and Sierra Leone. *Hippocratea comosa* yields oily and sweet nuts.

HIPPODROME, *hip'-pod-rome* (Gr. *hippos*, a horse, and *dromos*, a racecourse), in Ancient Arch., a place appropriated by the Greeks to equestrian exercises, and in which prizes were contended for during the celebration of some of the Olympic games. (*See* GAMES.) The most remarkable of all the Grecian hippodromes was certainly that built at Olympia, which is stated by Pausanias to have been four leagues long and one in breadth. The one at Constantinople still remains, and may well create a feeling of astonishment in the mind of travellers, as it usually does. This latter was built in imitation of the grand circus at Rome, and was adorned with statues, both of marble and bronze; amongst the most important of which, it may be stated, were the fine bronze horses of Lysippus, possessed by Venice, which formerly ornamented the hippodrome of Constantine. The word itself is still in use, and is, even now, applied to circuses and other buildings set apart for equestrian purposes.

HIPPOPHAË, *hip-pof'-ä-e*, in Bot., a gen. of the nat. ord. *Elæagnaceæ* (which *see*).

HIPPOPHAGI, *hip-pof'-ä-ji* (Gr. *hippos*, a horse, and *phagein*, to eat), a term applied, in Ancient Geog., to a people of Scythia that fed on horseflesh. The descendants of these—the Kalmuck Tartars of the present day—still retain the peculiarities of the Scythians, and esteem horseflesh as a dainty. (*See* HORSE.) Many attempts have been made in Europe to introduce the flesh of the horse as an article of food; but all have been failures, with the exception of one made recently in Paris by some *savans*, who have formed themselves into a club of *hippophagi*, for the express purpose of spreading a taste for horseflesh amongst all classes of society. Whether these modern hippophagi will meet with success in their endeavours to create a new system of animal food, remains to be proved.

HIPPOMANE, *hip-pom'-ä-ne*, in Bot., a gen. of the nat ord. *Euphorbiaceæ*. The species *H. mancinella* is the famous manchineel-tree, which is asserted to be so poisonous that persons have died from merely sleeping in its shade. It flourishes in the Antilles and on the American continent, near the sea, and forms a very handsome tree, with foliage not unlike that of the pear-tree. The juice which fills the tree is of a pure white colour, and when dropped on the hand, it burns like fire, forming an ulcer very difficult to heal. Seemann states, that if sea-water be applied to the eyes when affected by the poison, it allays the inflammation in an effectual manner. The fruit, which resembles a very beautiful apple in appearance, contains a similar juice, but of a milder character. The burning of the lips immediately warns those who bite it of the danger of eating it. The timber is beautifully variegated, and susceptible of a high polish. It takes its name from the Gr. *hippos*, a horse; *manomai*, I rage.

HIPPOPOTAMUS, or RIVER-HORSE, *hip-po-pot'-ä-mus*, (derived from the Gr. *hippos*, the horse; *potamos*, of the river), a pachydermatous animal, which inhabits most of the rivers of Africa. Its generic characters are,—four toes on all the feet, inclosed in small hoofs; six molar teeth on each side of both jaws; large and strong canines, of which the upper ones are nearly straight, the lower ones curved, and working upon each other so as to produce a chisel edge; four incisors in each jaw, the upper ones short and conical and bent inwards towards the mouth, the under ones long and cylindrical, and pointing outwards. The skeleton of the hippopotamus approaches that of the ox and of the hog; but it presents also wide differences, which separate it from classification with any other animal. From the structure of the teeth, it is evident that the quantity of vegetable matter supplied to the digestive organs must be very great in proportion to the nourishment derived from the same, as the principle on which its jaws are formed seems more for the purpose of tearing and rudely dividing than thoroughly masticating the tough grasses and vegetables which form the staple food of the animal. The hippopotami live during the daytime immersed in the waters of their native rivers, and at night come to land for the purpose of feeding, when they do an enormous amount of damage to the neighbouring fields, not only from the large amount of produce that they consume, but also the still greater quantity which they tread under foot and lay waste with their ponderous, bulky proportions. From their being able to breathe under water, they appear to be possessed of some muscular arrangements for closing the nostrils, as is seen in seals and other marine animals. Remains of different species of hippopotami are often found in the tertiary geological formations of Europe; and in the tertiary strata at the foot of the Himalaya mountains, in Hindostan, an extinct species of hippopotamus has been discovered, which had six incisor teeth in each jaw. Bochart identifies the hippopotamus with the *Behemoth* mentioned in Scripture; but Cuvier, while agreeing with him that the identity is possible, still asserts that the description given in the book of Job is not sufficient to place the matter beyond doubt. That it was known to the ancients is conclusive from the fact that Herodotus, Aristotle, Pliny, and Diodorus, each and all give descriptions of the animal.* The specimens of the hippopotami in the gardens belonging to the Royal Zoological Society in Regent's Park consume daily upwards of 100 lb. weight of hay, chaff, corn, roots, and other green food.

HIPPURIC ACID, *hip-pu'-rik* (Gr. *hippos*, horse; *ouron*, urine), an acid contained in the urine of the herbivora. It is most easily obtained from that of the cow, which, according to Boussingault, contains 1·3 per cent. It crystallizes in rhombic prismatic masses. Hot alcohol and water dissolve it readily, but it only dissolves in 600 times its weight of cold water, and is almost insoluble in ether. It has a bitter taste, and reddens litmus-paper powerfully. By dry distillation, it is converted into benzoic acid, and a reddish oil of an agreeable odour. Its forms salts with the alkalies, which are very soluble.

HIPPURIS, *hip-pu'-ris*, in Bot., the Mare's-tail, a gen. of the nat. ord. *Halorayaceæ*. *H. vulgaris* is an insignificant plant, common in stagnant water and slow streams. The stem is simple, or sometimes branched at the base, and erect. The leaves are linear, pointed at the end, and growing in whorls of from six to twelve. The flowers are minute, and often without stamens: they are produced in the axil of each of the upper leaves.

HIPPURITE, *hip'-pu-rite* (Gr. *hippos*, horse), in Geol., a massive horseshoe-like bivalve of the chalk formation, having a deep conical or sub-cylindrical under-valve, with a flattish lid, or upper valve.

HIPPURITES, in Geol., a gen. of fossil plants of the coal-measures, so called from their close resemblance to the *Hippuris vulgaris*, or mare's-tail. If they grew in the same relative proportions as the existing plant, many of the fragments found would indicate a height of 18 or 20 feet.

HIRUDO. (*See* LEECH.)

HIRUNDO, *hir-un'-do* (Lat., a swallow), a genus which forms the type of the fissirostral or wide-gaping birds, belonging to the passerine tribe of the Cuvierian system. (*See* SWALLOW.)

HISTOLOGY, *his-tol'-o-je* (Gr. *histos*, a web; *logos*, a discourse), a term identical, or almost so, with general minute anatomy, or microscopic anatomy. Histology classifies and describes the structural or morphological elements which exist in the solid and fluid parts of organic bodies. This science did not make any great progress until the commencement of the present century, when the invention of the compound microscope caused its advancement. Its origin, however, may be traced back to Malpighi, who lived in the 17th century, and discovered the blood corpuscles. In later times, very valuable discoveries have been

made by uniting the use of the microscope to experimental chemistry. The structure of different horny tissues was thus first shown; and it was proved that whalebone, nails, and cow-horn, are similarly composed of aggregations of diminutive cells. Histology has also been useful in the investigation of the nervous tissues, and of many other structures. No department of medical science has made such rapid progress as histology in late years. Kölliker, Leydig, Frey, and Schwann, may be mentioned among those who have practised it successfully in Germany; Robin and Lebert in France; and in England, Todd, Bowman, Clarke, Beale, Queckett, Bennett, Goodsir, and Lockhart.

HISTORY, *his'-to-re* (Gr. *historia*, from the verb *historeo*, I inquire), means literally an account of facts It is a word first used by Herodotus, who calls his work by the title "Historia;" and there can be but little doubt that this ancient writer fixed the sense in which the word has since been applied; that is, as meaning the science which treats of man in all his social relations, religious, moral, commercial, political, or literary, as far as these are the result of general influences extending to large masses of men. Embracing both the past and present, *history* consequently considers everything which acts upon men,—regarding them in the light of members of a society. It should clearly represent the relations in which man exists towards his brother men, and should detail the influences to which he is subjected, the motives by which he is actuated, and the inferences drawn from the same, with clearness and truth. According to some commentaries, history may be either considered in the light of an intellectual exercise in the department of human knowledge or science, or as a form of literary composition. Bacon reckoned it as the chief component part of *learning*, and studied it in its relations to memory, while he placed philosophy and poetry below it, as appealing only to the understanding and imagination. It is therefore the business of history to record or remember the events, past and present, of the world, and to place them down in such a way that they can have the best hold on the memory, by appealing to other facts for their support and corroboration. This is the true definition of the word used by Herodotus, although it has been analogically used to express other branches of investigation; as in the term *natural history*, still in use; and some of the ancient writers defined the general use of the word by their adaptation of it; as Aristotle's "History of Animals," and Theophrastus's "History of Plants." Dr. Arnold, in his "Lectures on History," remarks on the widely different interpretations of the word, and also explains its correct meaning. "The general idea of history," says he, "seems to me to be that it is the biography of a society; it does not appear to me to be history at all, but simply biography, unless it finds in the persons who are its subjects something of a common purpose, the accomplishment of which is the object of their common life. History is to the common life of many what biography is to the life of an individual. Take, for instance, any common family, and its members are soon so scattered from one another, and are engaged in such different pursuits, that, although it is possible to write the biography of each individual, yet there can be no such thing, properly speaking, as the history of the family. But suppose all the members of the family to be thrown together in one place, amidst strangers or savages, then these immediately enter a common life,—a unity of action, interest, and purpose, distinct from others around them, which renders them at once a fit subject for history. Whether consciously or not, every society must have in it something of community; and so far as the members of it are members, so far as they are each incomplete parts, but taken together for the whole, so far it appears to me their past life is the proper subject of history." The history or life of a nation may be either rendered in parts, or as a whole. The most complete work is that which starts at the birth of a kingdom, or nation, and carries the reader upwards in its course amid its various ramifications, changes, and aspects, and finally leaves him when he has obtained a thorough insight into its life, past, present, and possibly future state. For instance, a complete history of France would have to commence with Roman Gaul, and would have to trace the life of England, and all contemporary kingdoms, at the same time as it gave the history of France *per se*, in order to enable the student to get a comprehensive glance at the extension of the kingdom, and the different influences which bore on it during its life and existence. A true historian must not merely satisfy himself in chronicling facts, for such a course would only reduce history to the level of chronological annals. Truth must be his greatest object, and justice his guide. When studying monarchy, if liberal in politics, he should not let republicanism actuate him; all bias of party must be waived in writing history correctly. Our most ancient civil history is found in the Old Testament; but its objects are confined, as it is written more as a chronicle of the acts of the Jewish race, than a general description of other nations, who were also connected with them, in relations of amity or war. Herodotus is the father of ancient history, as he is often rightly called; and to him we are indebted for the first work really deserving that title. The poems of Homer are sometimes regarded as an early history of Greece; but as his works were not written down when composed at first, it would be impossible to consider Homer in a true historic light, as they have only been handed down to us by word of mouth, and are thus liable to error. Thucydides and Xenophon are the writers who have bequeathed us the deeds of the Grecian commonwealth. Livy is the historian of Rome; Justin the compiler of a brief attempt at general history. The works of Cicero, Sallust, Tacitus, and Cæsar, also illustrate one of the most important eras in Roman history. After the downfall of that empire, a long series of revolutions took place in the rule of the world, and Europe became parcelled out in various dynasties and powers, giving rise to an increasing need of historical commentation. Of English historians, the venerable Bede is one of the first, and his writings give us the clearest view of the Saxon period. After the revival of letters, history became one of the greatest of literary works, and as such it is esteemed and valued in the present day. To follow its course in modern times would be a work of impossibility within the limits of the present article. Philosophical history is that in which the mere narration of facts is considered as subordinate to the elucidation of general truths and influences; and, consequently, it often lapses into the broaching of a favourite theory. Of philosophical historians, Gibbon on the "Decline and Fall of the Roman Empire" may be considered as entitled to the chief place; and Lord Macaulay's "History of England" is another instance of how grandly history has risen since first considered in the light of a science, united with literary composition. Whatever be the subject, whatever the political bias of the author, the value of the history will be in proportion to the general depth, greatness, and nobility of the historian's own nature, as a whole.

HOAR FROST. (*See* FREEZING.)

HOBSON'S CHOICE, *hob'-sons*, a vulgar proverbial expression, denoting without an alternative. It is said to be derived from the name of a livery-stable keeper, who used to let horses and coaches to students at Oxford, and who obliged every customer, in his turn, to take that horse which stood nearest the door. The students were consequently either to take that horse or have none; whence the expression, they had "Hobson's choice."

HOCUS-POCUS, *ho'-kus po'-kus*, a common epithet applied either to a juggler, or to a conjurer's trick or cheat. Its origin is uncertain, but it is said by Dr. Tillotson to be derived from the words *hoc est corpus*, the form used for consecrating the sacramental wafer in the Roman Catholic church; whence jugglers began to use it as a pass-word. Another etymologist, however, derives it from the Welsh *hocced*, a cheat, and *pocus*, a bag, applicable to the machinery by which a juggler performs his tricks.

HOE, *ho* (Ang.-Sax.), an implement of husbandry employed to remove weeds, to make furrows, and to raise the mould round the roots of plants, &c. There are several kinds of hoes: that most common consists of a flat iron blade, having a thin round crooked bar of the same material, about eight inches long, projecting from the middle of its upper edge, at an acute

angle with it. To the end of this bar an iron ring or tube is attached, into which a long wooden handle is fitted. This is termed the *draw-hoe*, because, when in use, it is drawn towards the operator, in contradistinction to the thrust or Dutch hoe, which consists of a blade of iron fixed to the end of a long handle in continuation of it; so called from its being thrust forward when in use. For the cultivation of crops on a large scale, another kind of hoe is employed, much larger, and drawn by a horse. It consists, like a plough, of a beam and two stilts or handles. To this beam, and to branches extending from it, the ends of iron hoes of the proper width to stir the entire surface between the rows are fixed: a small wheel is also attached, to keep them the proper depth in the ground. This implement can, of course, only be used for those crops which are sown in rows; as peas, beans, potatoes, &c. The system of horse-hoeing found a great promoter in Jethro Tull, a gentleman from Hungerford, in Berkshire, who, having observed the good effects of stirring and loosening the soil round plants, and of keeping it perfectly clear from weeds, imagined that tillage might be made to supersede manuring. In carrying out this idea, the horse-hoe was, of course, a great assistance; and although not so successful as he expected, the constant state of tillage in which the spaces between the rows were kept, greatly increased the produce of the land, more especially when combined with judicious ploughing and manuring.

HOE'S PRINTING-MACHINE. (*See* PRINTING.)

HOG, or HOG FAMILY, *hog* (Welsh *hwch*, Cornish *hoch*) (*Suidæ*), a fam. of pachydermatous animals, belonging to the ord. *Ungulata*, of mammalia; or forming, according to some arrangements, a sub-family of the *Elephantidæ*, under the title *Suina*. The *Suidæ* are distinguished by having the nose prolonged and cartilaginous, truncate at the tip, where it is strengthened by small button-shaped bones, by which means they are enabled to use their noses as grubbers to turn up the ground in search of food. With the exception of the genus *Dicotyles* (*see* PECCARY), they have four toes on each foot, two large principal ones shod with stout hoofs, and two lateral ones, which are much shorter, and barely touch the ground. The canine teeth are large, often projecting from the mouth, and curved in an upward direction, while the molars are tubercular. Their skin is covered with thick, strong bristles, and they have a distinct tail of moderate length. The genus *Sus* is the type of the family *Suidæ*, and contains two well-known varieties,—the wild boar (*Sus scrofa*) and the domestic sow. Although formerly very common, the wild boar no longer exists in Great Britain; it is now found principally in India, and in most parts of Europe, where it harbours in the most solitary places in retired forests. As a beast of chase, it is thought well worthy of attention by sportsmen; and in India hog-hunting, under the technical term of "pig-sticking," forms one of the most exciting of wild sports. The food of the hog, in a wild state, is generally composed of grass, roots, acorns, beech-nuts, and wild fruits. He is both extremely active and very ferocious, and when driven to bay, forms a powerful adversary to even the most intrepid of hunters. In its domestic state the hog feeds and thrives on nearly every kind of food, both vegetable and animal; and no other species of beast converts a given quantity of corn or other nutritive food into fat so soon, or can be made fat on so great a variety of food. Of this useful animal there are many varieties; but the brindled hog approaches more nearly to the wild species than any other. The Chinese variety is very short in the head, corpulent in the body, and short in the legs: although good for roasting when about three weeks old, they only make tolerable porkers, and are not of much service in making bacon, as their size is but small. The Neapolitan hog is black and very plump, with erect ears and without any hair, and forms a very good cross with the Berkshire hog. The hog is very prolific, the sow often having ten or twelve pigs at a litter, and two litters in the year. Its flesh, under the name of *pork*, constitutes a material part of the food of mankind, especially in Europe and America, although Linnæus recommends that it should only be eaten by those of a strong athletic temperament, who take a good deal of exercise. The Jews and Mahommedans abstain from the flesh of the swine, and even consider themselves defiled by touching it. To a naval and commercial nation, like Great Britain, pork is of great importance, as it takes salt better than any other flesh, and is consequently able to be longer preserved. The fat is called *lard*, and is used both for culinary and medicinal purposes. The best English hogs are those from Hants and Berks. The skin, when dried, is used for making the seats of saddles, and other purposes. The bristles are used by brushmakers, shoemakers, and other artificers; and a great quantity is imported of the same from Russia; those from Ukraine being held the highest estimation. (For a description of the manner in which the flesh of the hog is cured, *see* arts. BACON and HAM.) The Abyssinian hog (*Babirussa Alfurus*) is an inhabitant of the islands of the Indian Archipelago: it differs from the common hog, or boar, in consequence of the upper canine teeth being enormously developed, ascending upwards and curving back, while those of the lower jaw project straight outwards, and form long slender hooks. The Ethiopian hog (*Phacochærus æthiopicus*) is another variety; its only great distinction is the possession of a pair of lobes under the eyes, which give it a peculiar appearance; and, although much more muscular, in other respects it generally resembles the common type of the *Suidæ*. It inhabits Central Africa, and its flesh is esteemed a great dainty. Fossil remains of most of the members of the hog family have been found in tertiary formations, three alone of the species being found in the Eppleheim Sands, while their bones have been discovered in nearly every country.

HOG-GUM. (*See* RHUS.)

HOG-NUT. (*See* CARYA.)

HOG-PLUMS. (*See* SPONDIAS.)

HOGSHEAD, *hogs'-hed*, a term formerly employed to denote a measure of capacity; but as all excise measurements are now made in gallons, it is used to designate any large cask. The hogshead, in wine measure, contained 63 gallons, while in beer and ale measure, there were only 54 gallons.

HOLCUS, *hol'-kus*, in Bot., a gen. of the nat. ord. *Gramineæ*, the species of which are natives of Africa and Asia. *H. saccharatus* (the *Sorghum saccharatum* of some botanists) is called the North China sugarcane, or sweet sorgho, and is much cultivated in China and other parts for the sake of its sugar; it is said to yield from 10 to 15 per cent. of this product. Its grain is eaten in Africa, and is termed *dochna*. The plant has lately been introduced into Britain, and is highly recommended by some agriculturists for cultivation as a summer forage for cattle. *H. Sorghum* (*Sorghum vulgare*, or *Andropogon Sorghum*) is extensively cultivated in many parts of Africa, in Turkey, and in India, for the sake of its grain, which is known by the names of Guinea corn, durra, Turkish millet, and jaar. This grain is much used as human food in warm countries; in Britain it is occasionally employed for feeding poultry. A kind of beer, called *bouza*, is prepared from it. The stalks of the plant are used to make whisks and carpet-brooms.

HOLD, *holds*, in Mar. is a term applied to the whole of that portion of a ship which is comprehended between the floor and the lower deck. It is usually divided into several store-rooms by bulkheads. In ships of war, the hold contains the ballast, provisions, and stores; and in merchantmen, the whole or principal part of their cargo.

HOLIGARNA, *ho-le-gar'-na*, in Bot., a gen. of the nat. ord. *Anacardiaceæ*. The fruits of the species *H. longifolia*, with those of another plant of the same order, furnish the black varnish of Sylhet, which is much used in India for lacquer-work. (*See* SEMICARPUS.)

HOLINESS, *ho'-le-ness*, a title by which the ancient Greek emperors were addressed, but which is at present only applied to the Pope, as head of the Roman church. The term itself is equivalent to the Latin "Sanctissime," which is more commonly used.

HOLLAND. (*See* LINEN MANUFACTURE.)

HOLLY. (*See* ILEX.)

HOLLYROCK. (*See* ALTHÆA.)

HOLOCAUST, *hol'-o-kawst* (Gr. *holos*, the whole, and *kaio*, I burn), a solemn burnt-sacrifice, common

amongst the Greeks and other pagan nations of antiquity, in which the *whole* of the victim was consumed upon the altar, in contradistinction to the usual custom, which enjoined that only a portion of the sacrifice should be consumed. The Jews held to a similar custom, marked out to them by the ceremonial law of Moses, which sacrifice was termed, in scriptural language, a *burnt-offering*.

HOLOPTYCHIUS, *ho-lop-tĭ'-ke-us* (Gr. *holos*, entire; *ptuche*, wrinkle—literally, "all-wrinkle"), in Geol., a gen. of sauroid fishes, belonging to the Devonian and Carboniferous periods. Their enamelled scales have corrugated or wrinkled surfaces, and this character suggested the generic name. The *Holoptychii*, judging from their fragmentary remains, must have been of great size—from 8 to 10, or even 12 feet in length. They were armed with numerous sharp-pointed fish-teeth, and also with larger reptilian teeth of conical form, placed at intervals in either jaw, evidently for the purpose of seizing and cutting up their bulkier prey.

HOLY ALLIANCE, *ho'-le* (Sax. *halig*), the name given to a league formed by three of the principal sovereigns of Europe, with the exception of England, after the defeat of Napoleon at Waterloo, on the proposal, it is said, of the emperor of Russia. The Germans, who suffered more by the aggressions of Napoleon than any other nation in Europe, took refuge in religion, and thinking that it might be made the basis of an international treaty, readily agreed to the terms of the Holy Alliance. Alexander is said to have written the act in his own handwriting, and sent it to the emperor of Austria and the king of Prussia, to have it confirmed and accepted by them. The Holy Alliance was published by the emperor Alexander in the year 1816, and by the other powers shortly after. The original terms were, to say the least, indefinite, and did not embrace more than the preservation of peace, justice, and religion in the name of the gospel. It was afterwards determined by the heads of the governments of Russia, Austria, and Prussia, to admit other nations within the statutes of the alliance; and, subsequently, England and France joined it by the Declaration of November, 1819. After the Franco-Spanish war in 1823, the Holy Alliance gradually languished, through not fulfilling its purposes; and the French revolution, and other events in 1848, succeeded finally in destroying it; as ever since it has had only a passive existence.

HOLY GHOST. (*See* TRINITY.)

HOLY OFFICE. (*See* INQUISITION, vol. I. of this work.)

HOLY ORDERS. (*See* ORDINATION.)

HOLY THURSDAY, the day on which the ascension of our Saviour is commemorated,—ten days before Whitsuntide. It has been kept in the Christian church from the earliest ages. St. Augustine speaks of it as either instituted by the Apostles or by some early council of the primitive bishops. It is now greatly neglected in our church, for what reason it is difficult to account, except it be because it is not marked by any worldly festivities, that many neglect and pass it by. (*See* ASCENSION-DAY.)

HOLY WATER, in Greek and Roman Catholic churches, is water which has been blessed, or consecrated, by an appropriate service, and used to sprinkle the worshippers and the things used in the church. It is kept in a shallow basin, called the "holy-water stoup," placed at the entrance of the church. It was formerly used to wash the hands of the devotees, to purify them before commencing their devotions. Some Catholics keep holy water in their chambers to use before prayer, especially at bed-time. In Rome and Moscow, animals are sprinkled with it to keep them healthy and thriving; indeed, in the latter city, there is a particular church to which horses are taken annually for this purpose. According to some writers, vessels were not placed at the church doors for washing the hands until the 4th century, and the water was not blessed for this purpose until the 6th, while others say it was employed by the Apostles.

HOLY WEEK, commonly called Passion Week, because in that week our Saviour's *passion* and death took place. It is the last week in Lent, and immediately precedes Easter. By the primitive Christians it was called *Hebdomas magna*, or the great week, and it was kept by them with great reverence, by additional devotions, longer fastings, more liberal alms, vacation from all civil business, and a general release of prisoners, except some particular cases of criminals. (*See* PASSION WEEK.)

HOMAGE, *hom'-āj* (Fr. *hommage*, from Lat. *homo*, man), an incident of feudal tenure, by which a tenant promised submission, loyalty, and service to his lord or superior when first admitted to the land which he held of him in fee. According to Sir Edward Coke, the word is derived from the Latin *homo*, "a man;" because when the tenant did his service to his lord, he said, "I become your man," &c. The oath of *fealty*, or declaration of fidelity, was first taken, and then the vassal or tenant did homage to his lord, humbly kneeling, being ungirt, uncovered, and holding up his hands both together between those of his lord, who sat before him. In modern language, the term homage is generally applied to reverential worship or devout affection.

HOMALIACEÆ, *ho'-ma-le-ai'-se-e*, in Bot., the *Homalium* fam., a nat. ord. of *Dicotyledones*, sub-class *Calycifloræ*, comprising eight genera and thirty species, natives of the tropical parts of In[illegible] Africa, and America. They are trees or shrubs, w[illegible] alternate leaves; the calyx is superior and funnel-shaped, with from 5—15 divisions. The petals are equal in number to, and alternate with, the divisions of the calyx. The stamens are opposite to the petals, and inserted on them; they are either distinct, or in bundles of three or six. The ovary is 1-celled, with parietal placentas, numerous pendulous ovules, and from 3—5 styles. The fruit is a capsule, or berry, with small seeds, having the embryo in the axis of a little fleshy albumen. Some species of the typical genus *Homalium* are remarkable for their astringent properties.

HOME SICKNESS. (*See* NOSTALGIA.)

HOMICIDE, *hom'-e-side* (Lat. *homicidium*), the killing of any human being. Homicide is of three kinds,—*justifiable*, *excusable*, and *felonious*. The first has no stain of guilt; the second very little; but the third is the highest crime that man is capable of committing against a fellow-creature. Justifiable homicide is of various kinds, including such as arise from unavoidable necessity or accident, without any imputation of blame or negligence in the person killing. Homicide in the course of justice, in the execution of any criminal or civil process, is of this kind. The necessity must, however, be real and apparent in all cases of this sort. Homicide is justifiable in the prevention of any atrocious crime, as an attempt to murder, or to break into a house during the night. Justifiable homicide does not apply to crimes which are unaccompanied by violence; such as the picking of pockets. The general principle of the law is, that when a crime in itself *capital* is endeavoured to be committed by force, it is lawful to repel that force by the death of the party attempting it. Excusable homicide is committed either by misadventure or in self-defence. Homicide by misadventure is where a man doing a lawful act, without any intention of hurt, and using proper precaution to prevent danger, unfortunately kills another; as when a man is at work with a hatchet, the head flies off and kills a bystander; for the act is lawful, and the effect is merely accidental. As prize-fighting and sword-playing are unlawful, if either of the parties engaged be killed, such killing is felony or manslaughter. Homicide in self-defence, from a sudden affray or quarrel, is rather excusable than justifiable in the English law. Felonious homicide is an act of a different character from the two former, being the killing of a human creature, of any age or sex, without justification or excuse. It is divided into three classes,—murder, manslaughter, and self-destruction.

HOMILY, *hom'-e-le* (Gr. *homilia*, an assembly), a plain and familiar discourse on some point of religious faith or duty. The term homily was introduced into the Church in order to distinguish the practical nature of Christian discourses from the speculative and ostentatious harangues of the schools of philosophy. In the early days of the Church, only the bishops were allowed to preach; consequently, the homilies of the Greek and Latin fathers are all written by bishops. The privilege of writing homilies was not accorded to priests till the 5th century. St. Chrysostom was the first presbyter

who preached regularly, although St. Augustine and Origen preached, but only by a peculiar privilege or license. The difference between a homily and a sermon is thus distinguished by Photius:—"The homily was then delivered in a more homely manner, the prelate interrogating and talking to the people, and they, in their turn, interrogating and answering him." So that, originally, a homily was, correctly speaking, a conversation; whilst the sermon was spoken continuously from the pulpit, after the manner of the orators. Towards the close of the 8th century the practice of compiling homilies, which were committed to memory, and recited by ignorant or indolent priests, began to be prevalent. Charlemagne then ordered Paulus Diaconus and Alcuin to form homilies upon the Gospels and Epistles from the ancient doctors of the Church. The *Homiliarium* of Charlemagne was afterwards published, which acted as a model for the famous collection of homilies subsequently produced. Many of these productions were the work of private persons, and contributed much to nourish the indolence and perpetuate the ignorance of a worthless clergy. The book of homilies recognized by the English church is a collection of homely sermons on the doctrines of the gospel, with an especial view to illustrate the principles of the Reformation. The first portion of this work was published by Cranmer in the reign of Edward VI.; and during the reign of Elizabeth the second part was added by order of Convocation.

Homœopathy, *ho-me-op'-a-thy* (Gr. *homoios*, like, and *pathos*, state or feeling), is the name given to a system of medical treatment introduced by Samuel Hahnemann, a German physician, in 1796, and now extensively practised, and having many adherents. Hahnemann had observed that Peruvian bark, which acts as a specific in agues, produced upon the healthy subject exactly the same symptoms as those of the disease which it served to cure. Continuing his observations, he fancied that he had obtained a number of other substances to the same effect; and at length he came to the conclusion, that diseases are cured by such substances as produce symptoms similar to them on the healthy body: hence the great doctrine of this sect is, "Similia similibus curantur" (like are cured by like). The others they term allopathists (*Gr. allos*, other, and *pathos*, state), and assert their doctrine to be, "Contraria contrariis curantur" (contraries are cured by contraries). The general law, that like is cured by like, by no means originated with Hahnemann, but is as old as the time of Hippocrates, by whom it was first propounded. No one, however, previous to Hahnemann, had ever asserted it to be of universal application. Nothing is better suited for restoring circulation to a frozen limb than to rub it with snow; and the best mode of treating a burn is to take out the heat by holding it to the fire, or by applying oil of turpentine. The benefits that arise from vaccination are also owing to the same principle. Another characteristic feature of this system is the infinitesimally small doses in which their medicines are usually administered. In the case of a medicine where an ordinary medical man would prescribe perhaps a grain, the homœopathist would administer only the millionth part of a grain, or even less. They assert that only very minute doses are fitted to act upon a system already predisposed to their influence by the existence of the disease; and hence the amount of the medicine must be diminished so as to exert its curative power upon the system without aggravating the symptoms of the disorder. This system has been adopted by not a few medical men of distinction, and its adherents are to be found in most parts of the civilized world. There is reason to believe that the system is now on the decline, owing probably to the introduction of more liberal views among medical men generally. It is worthy of remark, that not a few homœopathists practise both systems; and their patients may be treated homœopathically or allopathically, as they prefer.

Homogeneous Bodies, *ho-mo-je'-ne-ous* (Gr. *homos*, the same; *genos*, kind), those bodies in which the constituent elements are all similar. In Math., homogeneous quantities are those which can be added to or subtracted from one another.

Homologous Series, *ho-mol'-o-gus* (Gr. *homos*, similar; *logos*, proportion), a series whose numbers differ from each other by a constant increment or decrement of an even number of equivalents of CH. They are generally classed under a generic term, such as the alcohols, hydrocarbons, &c. The following series of homologues will illustrate this:—

| *Hydrocarbons.* | | *Alcohols.* | |
|---|---|---|---|
| $C_2H_2$ | Methylene. | $C_2H_4O_2$ | Methylic alcohol. |
| $C_4H_4$ | Ethylene. | $C_4H_6O_2$ | Ethylic ,, |
| $C_6H_6$ | Tritylene. | $C_6H_8O_2$ | Tritylic ,, |
| $C_8H_8$ | Tetrylene. | $C_8H_{10}O_2$ | Tetrylic ,, |
| $C_{10}H_{10}$ | Amylene. | $C_{10}H_{12}O_2$ | Amylic ,, |

By examination it will be seen that each of the members of these series differs by exactly $C_2H_2$. The others, aldehyds, mercaptans, and many others, form similar homologous series. The corresponding difference in composition produces a corresponding difference in properties. Thus, the boiling-point of the alcohols rises exactly 33° Fah. for each increment of $C_2H_2$ in the alcohol. *Heterologous series* are those which differ in properties, but are related in composition. Thus methyl, methylic ether, and methylic alcohol, form a heterologous series differing entirely in their properties; and methyl, ethyl, and trityl, form a homologous series closely related in their properties. (*See* SERIES.)

Hone, *hone* (Sax. *han*, a stone), a term for the finer kind of whetstones. They are mostly talcose slate of very close texture, in which the particles of silica are very finely divided and evenly distributed. *Turkey oil-stones*, said to be the best of all the hones, are obtained from the interior of Asia Minor; the *German razor-hones* from the slate-hills near Ratisbon; the *Arkansas oil-stones* from North America. The *Charnley Forest* stones are next in repute to the Turkey stones.

Honey, *hun'-e* (Sax. *hunig*), a fluid, or semi-fluid substance, very similar in its properties to sugar. It is found in large quantities in a number of vegetables, and is collected by different kinds of bees from the nectiferous glands in the cup or chalice of flowers. Honey, in the ordinary sense of the word, however, cannot be called a purely vegetable production; for, after it is collected by the proboscis of the insect, it is transmitted to the sucking-stomach, or honey-bag, where it is elaborated, and afterwards disgorged, to be deposited in the cell of the honeycomb. When the bees are very young, the honey undergoes less change and remains nearly white; in this state it is called virgin honey. At all times it partakes of the qualities of the plant from which it has been derived. Hence, some varieties of honey obtained from the azalea, rhododendron, &c., are poisonous. The most wholesome kinds are derived from the genus *Erica*, called heather honey, and from most labiate plants. Honey differs much in colour and consistence; it contains a considerable quantity of saccharine matter, and some mucilage, from which it derives its softness and viscosity. It ferments very readily, and yields a strong vinous liquor called *mead*. There are two varieties of honey,—one yellow, transparent, and of the consistence of turpentine; the other white, and capable of assuming the solid form, and of concreting into regular spheres. These two species are often united, and may be separated by means of alcohol, which dissolves the liquid honey much more rapidly than the solid. Honey is the production of most countries, but is more particularly abundant in the island of Candia, and in the greater part of the islands of the Archipelago. The honey of Sicily appears to be particularly high-flavoured, and in some parts of the island to surpass even that of Minorca, owing, no doubt, to the quantity of aromatic plants which overspread that part of the country. This honey is gathered three times in the year,—in July, August, and October. It is found by the peasants in the hollows of trees and rocks. The country of the lesser Hybla is now, as of old, chiefly celebrated for its honey. In the woods of North America, considerable quantities of honey are produced by the wild bees. Honey is much used in making preserves and confectionery; and, in its natural state, to put on bread. It is also used as a demulcent medicine against hoarseness, catarrh, &c.; and externally to promote suppuration. In its clari-

fied state, it is used to sweeten certain medicines. It is more opevient and detergent than sugar, and is particularly serviceable in promoting expectoration in disorders of the breast. For these and other like purposes, it is often mixed with vinegar, and boiled down to a proper consistence over a slow fire, when it forms the oxymel of commerce. Honey was one of the first articles of human nourishment. The deities of ancient Greece were supposed to live on milk and honey. Aristotle, and several other learned writers, and probably the ancients generally, did not know where honey originally came from; they imagined that it fell from heaven like rain. Pliny was unable to decide whether it descended from the heavens generally or from the stars, or was a juice formed by the purification of the air, and afterwards collected by bees. In all the works of the ancients, much importance is attached to honey and the care of bees. Honeycomb, or the waxen structure framed by bees, in which they deposit their honey and eggs, is one of the most surprising of all the works of insects. By the peculiar organization of the bee, the wax is secreted in the form of small and thin oval scales in the folds of the abdomen. The materials, however, of which it is composed, though collected from the flowers of plants, are unknown, and have given cause for much speculation. The regular structure of the honeycomb is also remarkable. It is composed of a number of cells, most of which are exactly hexagonal, constructed with geometrical accuracy, and arranged in two layers, placed end to end, the openings of the different layers being in opposite directions. As the comb is placed vertically, the cells are horizontal. The construction of the cells is such as to afford the greatest possible number in a given space, with an expenditure of the least possible amount of material. The base of each cell is composed of three rhombodial pieces, placed so as to form a pyramidal concavity. The sides of the cells are also much thinner than the finest paper; and yet they are so disposed as to be strong enough to resist all the motions of the bee within them. (*See* Bee.)

Honeysuckle. (*See* Lonicera.)

Hong, *hong*, the name given by the Chinese to any factory belonging to European merchants at Canton. The Hong merchants were ten or twelve natives who were the only ones legally entitled to trade with foreigners, or "the outer barbarians." Since the last Chinese war, however, the facilities for trade have been greatly increased, and commerce, instead of being monopolized by the Hong merchants, has become more general.

Honour, *on'-or* (Lat. *honor*), a term which, in its ordinary sense, is capable of many and various significations, all of which, however, may be easily traced back to the original meaning of the word; viz.—*a certain esteem or regard built on opinion*. The Romans had such a high opinion of honour, that they actually deified the word; and in modern times it plays a part hardly inferior to that which it did in the days of antiquity. It is used in various terms of phraseology to mark out, or indicate, certain rules or notions by which society in general, and especially that more powerful portion of it denominated "the fashionable world," regulates its proceedings with a sort of tacit understanding; any deviation from which rigorous code incurs the risk of expulsion beyond its pale. The phrases *debt of honour*, *affair of honour*, *law of honour*, *court of honour*, with some slight modifications, emanate from the above meaning, and thus carry their own interpretation along with them. The title "your honour" was formerly applied to men of rank generally, but it is now limited to, and distinctly conferred on, the Vice-Chancellor and the Master of the Rolls.

Honour, Legion of. (*See* Legion of Honour.)

Honour, Maids of, in the courts of European sovereigns, are ladies whose duty it is to attend the queen when she appears in public. In England they are eight in number, with a salary of £300 per annum each.

Honours of War, in Mil., are certain stipulated terms granted to a beaten enemy, by which he is permitted out of a fortress or town, or from a camp or a line of intrenchments, with all the pomp and pageantry of military etiquette. The term is also used to signify the compliments offered to high personages or military heroes when they appear before a body of armed men, or such as are given to the remains of a deceased officer.

Hooded Snake, *hood'-ed*, in Nat. Hist., the Cobra di capello (Port., snake with the hood). This term is sometimes applied to the *Naja tripudians* alone, and sometimes to all the species of the genus *Naja*, which are very venomous serpents of the *Viperidæ*. They are all remarkable for the singular manner in which they dilate the back and sides of the neck when irritated or excited. To this faculty they are indebted for their name; since the elevated skin of the back of the neck, when viewed in front, presents much the appearance of a hood. Its length is generally three or four feet, of a pale dingy brown colour above, and bluish or yellowish-white below. It is characterized by a peculiar mark on the back of the neck, which closely resembles a pair of spectacles; for this reason the reptile is frequently called the "spectacle snake." It lives upon lizards and other small animals, and is easily killed, being sluggish animal. Its bite is extremely venomous, causing death within two hours. The hooded snake is often found in the neighbourhood of human dwellings in the East Indies, and is sometimes found in the houses themselves. It appears to be attracted by the young poultry and the moisture of the drainage and wells. The poison of the hooded snake is secreted in a large gland in the head; and when the animal closes its mouth on any object, the poison flows into the wound made through a cavity in the tooth; it is, however, little disposed to use its fangs, except for the purpose of supplying itself with food. The Indian jugglers tame some of these serpents, and teach them to play tricks and dance, to astonish the people,—after having taken care, however, to pull out their poisonous teeth. The same use is made of another species in Egypt.

Hookah. (*See* Pipe.)

Hooping-cough, *hoop'-ing* (Ang.-Sax.), in Med., a cough in which the patient hoops or whoops with a deep inspiration of breath. On account of the violence of the cough attending this disease, the term *pertussis* has been applied to it; and on account of the recurrence of the cough in paroxysms, it is also known by the name of "chin," or "kink" cough. Hooping-cough seems to have been unknown to the ancients, as no mention of it is made in the medical works of the Greeks, Romans, and Arabians. It has, however, prevailed for several centuries in various countries of Europe, and on account of its frequent occurrence, and the danger with which it is often accompanied, it has occupied the attention of physicians considerably. The symptoms commence with a simple catarrh, indicated by a cough, and the expectoration of a limpid fluid; by redness of the conjunctivæ, a watery discharge from the eyes and nostrils; hoarseness, and occasional sneezing. These symptoms are generally accompanied by slight feverishness, and the patient is low-spirited and languid. Thus far the disease closely resembles a common cold; but at the end of about one or two weeks, the character of the affection changes. The fits of coughing become more long and frequent; a sensation of tickling in the larynx and trachea accompanies each fit, during which the inspirations are irregular, especially in the case of children, whose faces bear an expression of anxiety and fear. When the fit comes on, they cling firmly to the persons or objects near, and, if asleep, start up. The efforts of coughing then become so rapid and violent, as to take away the breath: during the intervals between, it is difficult to perceive any inspiratory movements, excepting at times when the cough is interrupted by a peculiar whooping sound, which has given this disease its common name. In young children, hooping-cough often becomes complicated with other diseases. The most common complication with children at the breast is cerebral congestion, giving rise to convulsions. Hooping-cough prevails as an epidemic disease, and children from birth to the period of second dentition, are chiefly liable to it. Adult persons, however, are not exempt from it, and it sometimes happens in old age. The disease is very contagious, and when it once finds admission into a house, very few young persons, who have not had it

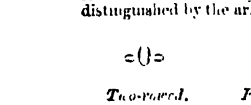
previously, escape. It rarely affects the same individual twice, although this sometimes occurs. Hooping-cough is a very fatal malady; the average number of deaths in London every year, for the ten years between 1849 and 1858, was 2,190. Hitherto, no treatment of hooping-cough has been discovered, by which its progress can be arrested: its severity, however, can be mitigated and its duration diminished. It must, necessarily, run a certain course, which often, in spite of skilful treatment, may be long. The administration of emetics in the earliest stages of the disease is often efficacious; and tartar emetic, on account of its easy solubility and certain action, seems to be best suited for the purpose. In protracted cases, nothing appears to be so effective in putting a stop to the cough as change of air, which frequently succeeds when all other methods have failed. The diet should always be of the mildest description at the commencement, but afterwards it is advantageous to adopt a more tonic and nourishing regimen.

Hoopoe, *hoop'-o* (*Upupa epops*), an insessorial bird, belonging to the family of the *Certhiadæ*. Its generic characters are: beak longer than the head, slightly bent, slender, triangular, and greater in length than in breadth; nostrils basal, lateral, oval, and partly concealed by the feathers on the forehead; wings of moderate size, the fourth and fifth quill-feathers being the longest; tail of 10 feathers, square at the end; toes 3 in front, 1 behind, the outer and middle ones being united as far as the first joint; claws short, and only slightly curved. The hoopoe is a summer visitor to the British islands, and comes from the north of Africa; it is also a native of Asia. This bird is generally about a foot in length, and its plumage is composed principally of black and white feathers; it is particularly distinguished by a crest on the top of its head, composed of buff feathers, tipped with black.—*Ref.* Yarrell's *British Birds*.

Hops. (*See* Humulus.)

Horary, *hor'-a-re* (Lat. *hora*, an hour), in Astron., the arc described by the sun, moon, or any of the planets, in the space of an hour, or the angle which is subtended by that arc is called its horary motion.

Hordeum, *hor'-de-um* (Lat.), Barley, a gen. of the nat. ord. *Gramineæ*. The principal species or varieties of cereal barley in cultivation are practically distinguished by the arrangement of the seeds; thus—



*Two-rowed.* *Four-rowed.* *Six-rowed.*

The two-rowed forms, which are generally regarded as varieties of the species *H. distichum*, are those ordinarily cultivated in England. The six-rowed barley, *H. hexastichum*, is more grown in Scotland, where it is known as *bere* or *bigg*. The four-rowed is perhaps only a variety of the six-rowed, though it is described as a distinct species, generally under the name of *H. vulgare*. Very various have been the opinions as to the wild species from which the cultivated barley has sprung; but as *H. distichum* is the only kind that has ever been found apparently wild, it is probable that all the varieties in cultivation have been derived from this type. Barley is used dietetically in the manufacture of bread; and in the form of *malt* (which *see*), most extensively in the production of ale, beer, and ardent spirits. It is the common grain in use for the latter purpose in this country. Barley deprived of its husk constitutes *Scotch*, *hulled*, or *pot barley*. When both husk and integuments are removed, and the seeds rounded and polished, they form *pearl barley*, and this, when ground, is called *patent barley*.

Horehound. (*See* Marrubium.)

Horizon, *hor-i'-zon* (Gr. *horizein*, to bound, limit).—The horizon, in the general acceptation of the word, is the line by which the view of the spectator is bounded, and in which the sea or land and sky appear to meet. When he is on a level plain of great extent, or at sea, the horizon will assume the form of a circle. This is termed the physical or natural horizon. In this case its extent is limited by a circle traced out by the revolution of a point about the position of the spectator as a centre, at which point a line drawn from his eye forms a tangent to any great circle described on the earth's surface, and passing through the spot on which he is standing. It should, however, be stated that the effect of the refraction of light causes the actual limit of vision to be extended a little beyond the circle that would be traced in the manner indicated above. The higher the position of the observer, the greater will be the field of view, or the more distant the horizon will appear; thus a man at the masthead of a vessel can see what is invisible to those who are on deck. To find the distance of the horizon at sea approximately, first ascertain the height of the observer above the sea-level in feet, extract the square root of this quantity, and add to the result three-tenths of the same; the amount thus obtained will give the distance of the horizon pretty closely in miles. The astronomical horizon theoretically is formed by a plane passing through the centre of the earth at right angles to another passing through the meridian of the spectator, which divides the heavens into two equal parts or hemispheres; but, practically, this is effected by the natural horizon, which divides the field of the heavens into two parts, and constantly changes as the spectator varies his position on the earth's surface. Thus, if he were at the north pole, he would see the stars in the northern hemisphere; at the south pole, the stars in the southern hemisphere; while at the equator he would see a hemisphere of the heavens, embracing part of the stars in the northern hemisphere and part of those in the southern. The distance between the earth and the fixed stars is so great, and the radius of the earth so insignificant in proportion to it, that the physical horizon, as it appears to a spectator on the earth's surface, and the astronomical horizon in which he is supposed to be at its centre, may be considered as coincident for all practical purposes. Observations on land are frequently taken by the aid of what is termed an artificial horizon, which consists of the level surface of a trough of mercury, which is parallel to the plane of the horizon, and in which the image of the heavenly body is reflected.

Horn, Horn Manufacture, *horn* (Sax.).—The term horn is, in general language, applied to a hard substance growing on the heads of certain animals, and particularly on cloven-footed quadrupeds, usually attaining some length and ending in a point. They serve as weapons of offence and defence to the animals which bear them. In England, the substance called horn may be divided into two distinct classes:—First, the branched, bony horns of the stag genus, and the simple, laminated horns of the ox genus and other kindred genera. The first of these kinds of horn is applied to the same purposes as bone and ivory, and the manufacture is almost similar. The other kind of horn, found in the ox, antelope, goat, and sheep, consists of a number of conical sheaths inserted one into another, the innermost resting upon the vascular membrane covering the bony core. The tip is very dense, and the layers of which it is composed are scarcely distinguishable. This kind of horn appears to consist of coagulated albumen; and there is a regular connection between horns, nails, claws, hoofs, scales, hair, feathers, and even skin. The horns of oxen are the principal ones used for manufacturing purposes; the horns of bulls and cows being preferred to those of bullocks, which are thin and of a coarse texture. The horns of goats and sheep are whiter and more transparent than those of any other animals. In horn manufacture, the first process necessary is to remove the core. This is effected by steeping the horn in water for about a month, when the horny sheath becomes so softened that the core can be readily withdrawn. The cores are not wasted, but are afterwards burnt, forming bone-ash, a substance valuable in making cupels for assaying purposes. They are also used in other ways,—for making glue, stiffening for cloth-dressers, and for manure. The solid tip of the horn, after being sawn off, is used for making knife-handles, umbrella-handles, &c. After being divided into thin laminæ, the remainder of the horn is used for various purposes. The lower part is frequently used for making combs, while the middle is used for making lanterns, &c. To prepare the horn for use, it is softened by means of boiling water, and then usually held in the flame of a fire till it gains the temperature

of melting lead, and becomes so soft as to be semi-fluid. While in this state, the slitting is performed by means of a pointed knife resembling a pruning-knife; then, by means of two pairs of pincers, the cylinder or cone of horn is opened till it is nearly flat. A number of pieces are then exposed to pressure between plates of iron previously heated and greased. The degree of the pressure depends upon the required use of the horn. The thin sheets of horn are then scraped with a blunt or wire-edged draw-knife upon a board covered with hide. After being smoothed and brought to the required thinness, they are polished with a woollen rag dipped in charcoal-dust, a little water being added at times. After being rubbed with rotten-stone, they are finally polished with horn shavings. When horn is to be converted into combs, the pressure requires to be as slight as possible, lest, by the breaking of the grain, the teeth become liable to split. Horns for combs are roughly cut by a hatchet or saw to the required shape, and then finished by rasping and scraping. Ornamental horn combs, with open work, are largely manufactured in France. Snuff-boxes, combs, and other ornamental articles, are often made by pressing horn shavings, after reducing them to a soft state by means of heat. Drinking-horns, are made by sawing the horn to the required length, scalding and roasting it over a fire, placing it in a conical wooden mould, and bringing it into the required shape by driving a wood-n plug firmly into the interior. It is afterwards fixed on a lathe, when cold and hard, and turned and polished both on the inside and outside. The bottom, a round flat piece of horn, is dropped in at the larger end of the cone of horn, while the latter is warm. At the smaller end of the vessel is a groove into which the bottom slips, and as the horn contracts in cooling, so the bottom becomes firmly fixed, and the drinking-horn water-tight. The process of dyeing horn of different colours is very easy. It is usually coloured of a rich reddish brown in this country, and spotted so as to imitate tortoise-shell. The whole of the refuse of horn manufacture is valuable. Hoofs and horn-cuttings are used for making prussiate of potash and Prussian blue; and the clippings of the combmaker are used as manure. An artificial horn is made from the gelatine obtained from bones by muriatic acid, and converting it into a horny substance by tanning. Large quantities of horn are imported into this country. In Sheffield alone nearly 800,000 deer-horns are required annually for making handles for cutlery. The imports of foreign horn average about 4,000 tons per annum.

**Horn**, a wind instrument, of which there are various kinds, made of different materials; such as wood, brass, copper, and sometimes silver. (For a description of the horn, *see* French Horn, Bugle, Cornet-a-piston, Sax-horn, &c.)

**Hornbeam.** (*See* Carpinus.)

**Hornbill,** *horn'-bill* (*Buceros*, from Gr. *bous*, an ox, and *keras*, a horn), a gen. of birds belonging to the conirostral tribe of the ord. *Passeres*. These birds are characterized by having their large hooked beak surmounted at the base by a horny appendage nearly as big as the beak itself, and of a cellular structure within. They live on animals and vegetables, and inhabit the warmest parts of Asia and Africa. On account of their perching on the branches of lofty trees, where their vision can command an extensive range, they are extremely difficult of approach. Like the toucans, they swallow their food whole, throwing it first up in the air and catching it as it falls. The rhinoceros hornbill (*Buceros rhinoceros*) is about the size of a turkey, and of a bluish-black colour. The horny appendage at the base of the bill of this variety is very large, and in the form of a reverted horn. It is a native of Java, and hops about on both legs like a raven, feeding chiefly on rats and mice. The African species (*Buceros africanus*) is considered a sacred bird by the negroes, who never destroy it on any account, from a superstitious belief that the death of a hornbill produces sickness over a whole district. The pied hornbill (*Buceros monoceros*) is about the size of a raven, and nearly as black. Its crest is thin, and frequently much injured by striking against the branches of trees, the bark of which the bird tries to detach, in order to get at the insects lying beneath. From its fondness for the same insects, this species is carefully reared in Ceylon, in order to keep the houses clear of vermin. The pied hornbill is a native of India, and lives in withered trees, in the holes of which it deposits its eggs. The undulated hornbill (*Buceros undulatus*) is the last variety, and the most beautiful specimen of the whole genus, as the bill is more proportionate to the size of the bird, and its plumage is distinguished by more than the usual vivid colours, which add to the magnificent appearance of oriental birds.—*Ref.* Baird's *Encyclopædia of the Natural Sciences*.

**Hornblende,** *horn'-blend* (Ger.), in Min., a mixture of the silicate and aluminate of magnesia, lime, protoxide of iron, with a variable quantity of the fluorides of calcium and potassium. It occurs in dark green or black crystals, in syenite, porphyry, basalt, and lava. It is also known as amphibole, a name bestowed on it by Hauy. *Asbestos* and *amianthus* consist of a fibrous variety of hornblende.

**Hornbook,** *horn'-book*, a name formerly given to a copy of the alphabet set in a frame and covered with a thin plate of transparent horn, to prevent the paper from being thumbed to pieces by the children who were made to study it. The hornbook was generally used as a child's first step towards knowledge, but it has now become obsolete as an instrument of elementary education.

**Hornet,** *hor'-net* (Sax. *syrnete*), (*Vespa crabro*), an aculeated hymenopterous insect, belonging to the *Vespidæ*, or Wasp family. The principal characteristic of the insect is taken from the structure of its wings; these, when it is at rest, are folded throughout their entire length. The fore wings have one marginal and three sub-marginal cells; and in all species the neuration is the same. The hornet is a much larger insect than the wasp, and is consequently much more formidable. It builds its nest in holes in the trunks of trees, or in old walls and ditches. Its colour is throughout of a dark brown mixed with yellow, and the head is oblong. It is very voracious and pugnacious, while the common wasp seems to be its favourite prey, although it eats almost any kind of flesh, as well as fruit and honey. The nest is smaller than those of the wasps, and is of a globular form, constructed with the mouths of the cells downwards. Hornets are the most active little insects; they fly rapidly, and have been observed to carry on the building of their nests by moonlight, unlike the habit of most insects. Their sting is very severe, and is often productive of serious consequences. (*See* also Vespidæ.)

**Hornpipe,** *horn'-pipe*, a rustic musical instrument seldom or ever now seen, except in Wales, where it is still very common. Its Welsh name is pib-corn, meaning hornpipe: it is so called from its being constructed of a wooden pipe, with holes at certain distances and a horn at each end, one to collect the wind blown into it, and the other to augment the sound. This term is also applied to a dance in triple time of six crotchets in a bar.

**Horn-work.** (*See* Crown-work.)

**Horologium,** *hor-o-lo'-je-um* (Lat. *horologium*, a clock, timepiece), a constellation of the southern hemisphere, formed by Lacaille, situated between Canopus and Eridanus, and formed entirely of stars of the fifth and sixth magnitudes.

**Horology,** *hor-ol'-o-je* (Gr. *hora*, time or hour; *logos*, a discourse), is the art by the principles of which the measurement of time is regulated. In a more general sense, it is the art which takes within its scope a knowledge of the action of certain machines used as time-measurers. It is a difficult thing to give a good definition of time. According to Locke, it is "the consideration of duration, as set out by certain periods and marked by certain measures or epochs." According to Aristotle, "our conception of time originates in that of motion, and particularly in those regular and equable motions carried on in the heavens, the parts of which, from their perfect similarity to each other, are correct measures of the continuous and successive quantity called *time*, with which they are conceived to co-exist. Time, therefore, may be said to be in the perceived number of successive movements." Undoubtedly the motions of the heavenly bodies form

the best standard for measuring time included within lengthened periods; but for the computation of such short divisions as hours, minutes, and seconds, we must call to our aid certain mathematically-adjusted machines, the knowledge of whose construction is regulated by the science of horology. The "father of history" ascribes the invention of the earliest time-measurers to the Babylonians. Pliny claims the honour for Anaximenes; whilst Phavorinus wishes us to accept Anaximander as the real inventor. At any rate, the first horologes of which we find mention are the *Polos* and *Gnomon*. The latter, which was the more simple, and, it may be inferred, older instrument, consisted merely of a staff or pole set up perpendicularly in a sunny spot, its shadow being measured upon the place where it fell, and time computed thereby. The *Polos*, or *Heliotropion*, was formed of a basin in which the twelve divisions of the day were marked by lines, and upon these the shadow of a perpendicular staff, set up in the centre of the instrument, was thrown by the sun. In modern days these machines are called sun-dials. (*See* SUN-DIALS.) Such instruments as these must have been known to the Jews, who are inferred to have derived their knowledge of them from the Babylonians; for we find mention made in Isaiah xxxviii. 8, of the dial of Ahaz, whose reign commenced 741 B.C. In 293 B.C., we learn that the Roman general Papirius Cursor set up a sun-dial near the temple of Quirinus, at Rome; and upon the walls of the still standing Temple of the Winds, at Athens, may be seen the lines of a dial, together with the holes in which were fixed the perpendicular pillars or gnomons. But these contrivances could only be of service in marking the progress of time during the bright days of summer. At night, and during the cloudy days of winter, they would be useless. Invention, therefore, had to be further spurred, that a more perfect instrument might be produced. The *Clepsydra* would appear to be the machine which was called upon to come up for the shortcomings of its progenitor the sun-dial. The clepsydra (Gr. *kleptein*, to steal; *hudor*, water), or water-clock, of the Greeks and Romans, was an instrument in which water escaped, as it were by stealth, in a more or less regular flow, from one vessel to another. Closely resembling this was the sand-glass, a more accurate instrument, because a column of sand, of a great or moderate height, will run through an orifice into another vessel at a uniform rate; whilst, in the case of a column of water, no uniform rate of velocity can be obtained, unless the cylinder containing the water be kept constantly full. Another rude form of marking time was the burning of graduated candles, a time-measurer employed by King Alfred. In a general way, all those pieces of mechanism which have for their motive power a weight, or the elastic force of a spring, are called *clocks* and *watches*; but they are also distinguished by certain names, indicative, either of their construction, or of the peculiar offices they are intended to perform. For example,—the name *timepiece* is given to any piece of horological machinery which merely marks the time without striking the hours; a *clock*, besides showing the time, strikes every hour on a bell or spring; a *quarter-clock* strikes the *quarters* of every hour, an *astronomical clock* is one which indicates sidereal time; a *watch* is a portable or pocket timepiece; a *repeater* is a watch provided with a mechanical contrivance, by means of which it can be made, at any time, to repeat the hours; a *chronometer* is a watch of the most superior character, or one that may be used for astronomical or maritime purposes. It is almost an impossibility to state who was the individual that invented either a clock or a watch; and a great deal of the obscurity attaching to the early history of clocks is due to the fact that formerly the term horologium was applied to a sun-dial or a clock indiscriminately, thereby rendering it a task of the utmost difficulty to state at what particular period it came to mean a clock. As far back as the close of the 13th or the beginning of the 14th century, striking clocks were known in Italy. In 1288, as we are told by Coke, a stone clock-tower was erected opposite Westminster Hall, and in it was placed a clock, the cost of which was defrayed out of a fine of eight hundred marks imposed upon a corrupt chief justice of the Queen's Bench. About 1370, a German horologer set up a





clock in the tower of the palace of Charles V. of France; and we glean from Rymer's "Fœdera," that in 1368 three Dutch horologers were invited to England, where they enjoyed the protection of Edward III. In a letter written by Ambrosius Camaldulensis to Nicolaus of Florence, it is stated that clocks were by no means uncommon in private houses on the continent towards the close of the 15th century, and we have some grounds for believing that they were general in England at the same time. Reviewing all the evidence we have before us, the conclusion may be drawn that the name of the inventor of a clock is unknown; that an horological machine driven by a weight is of more ancient date than is commonly allowed; that the clock of Henry de Wyk, which, on account of its having a balance for a regulator, marked the first great era in the art of horology, was not the invention of one man, but the result of a series of inventions made at different times by different persons. According to M. Ferdinand Berthoud, the progression of the successive improvements in horology was as follows:—1. Toothed wheel-work was known in ancient times, and particularly to Archimedes, whose instrument was provided with a motive power, but had no regulating or controlling mechanism; 2. the weight applied as a motor had, at first, a fly, most probably similar to that of a kitchen jack; 3. the ratchet-wheel and click for winding up the weight, without detaching the teeth of the great wheel; 4. the regulation of the fly depending upon the state of the air, it was abandoned and a balance substituted; 5. an escapement-wheel next became indispensable, as constituting, with the balance, a more regular check than a fly, upon the tendency which a falling weight has to accelerate its velocity; 6. the application of a dial-plate and hand to indicate the hours, was a consequence of the regularity introduced into the going part; 7. the striking portion, to proclaim at a distance, without the aid of a watcher, the hour that was indicated, and this was followed by the alarum; 8. the reduction and accommodation of all this bulky machinery to a compact and portable size, as in watches. Through the kindness of Mr. J. W. Benson, the eminent watchmaker of Ludgate Hill, we are enabled to give an illustration of a clock of the most ancient character, having a balance on the top as a regulating medium, and with an escapement of the verge construction. We borrow from the ninth edition of Mr. Benson's illustrated pamphlet on watches the description of this old time-measurer. Without entering into any minute detail of the manner in which motion in a clock is successively communicated from one toothed wheel (G or R) to a pinion (*e* or *g*) to another, which, indeed, would only tend to perplex the mind of the general reader, it will be sufficient to state the following:—S is a square piece of steel fixed to and forming part of the pinion P.

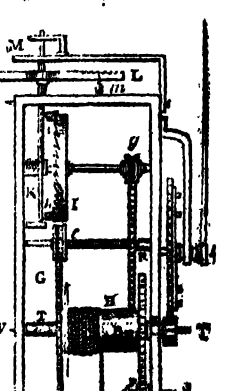



*Fig.* 1.

In winding the clock, the key is placed upon this square, and being turned round continuously in one direction, the pinion P turns with it. This communicates its motion to the wheel R, which is fixed to the

cylinder B, and which, in its revolution, coils or winds up the cord, to which is attached the weight A. While this takes place, the wheel G is held in check by another wheel, called "the ratchet," and a "click" (neither of which is seen in the sketch); but when the operation of the winding is completed, and the weight A begins to descend, the cylinder B, together with the wheel G, turn on their common pivots V V, and the motion is thus communicated from wheel to pinion, until it reaches the escapement-wheel I. The teeth of this wheel, in its revolution, act alternately on the pallets i k, which project from or form part of the spindle or verge K M, and this produces a vibratory or backward-and-forward motion of the balance L L. Were it not for this detention, the duration of which is much increased by the swing of the balance, the weight A would descend with greatly accelerated speed, till, in a few moments, the cord would be entirely unwound from the cylinder, and the clock at rest. The date at which the size of clocks was so far reduced as to render them portable, is uncertain; it must, however, have been anterior to 1544; for in this latter year the corporation of master clockmakers at Paris procured from Francis I. a statute precluding all but master clockmakers from constructing clocks or watches, large or *small*. At any rate, no clock or watch could be made small enough to be portable, without having a "mainspring" substituted for a weight, as the moving power; and whenever this object was attained, then was the second great era in horology reached, as from this period may be dated the application of the fusee, and the consequent total alteration in the form and application of horological machinery. The third era in clock-work was the application of the pendulum. Both the discovery of the pendulum, as well as its application to clocks to supersede the balance, have been a subject of great contention. Some writers, contending that Galileo discovered the pendulum, give to Huyghens the honour of first applying it to a clock. "Pendulums," says Mr. E. B. Denison, in his excellent treatise on clocks and watches, "like many other things, may have been invented several times over, in different ages, or even in the same." An old edition of the "Encyclopædia Britannica" maintains that the ancient astronomers of the East employed pendulums in measuring the times of their observations, patiently counting their vibrations during the phases of an eclipse or the transit of the stars, and renewing them by a little push of the finger when they languished; and Gassendi, Riccioli, and others in more recent times, followed their example. "If so," argues Mr. Denison, "it is plain that this knowledge had itself languished and died before the making of what has long been called Galileo's discovery, in the church at Florence, that a chandelier, and therefore, any other pendulum, vibrated different arcs in the same time, provided there were none of them large ones. When we consider the vast number of pendulums that there are swinging about the world, it certainly is difficult to imagine that nobody ever made that observation before the 16th century. The application of it to the regulating of clocks, however, is a different thing, as that required invention, as well as observation. There seems no doubt, however, that the first person who investigated and established the mathematical theory and properties of the pendulum, was Huyghens, the Dutch philosopher, in the 17th century; but it seems equally certain that the first pendulum clock was made for Saint Paul's church, in Covent Garden, by Harris, a London clockmaker, in 1621, though the credit of the invention was claimed also by Huyghens himself, and by Galileo's son, and Avicenna, and the celebrated Dr. Hooke, the undoubted inventor of the balance spring of watches, and the discoverer of its theory." In order to convey a clear idea of the action of the pendulum, and also to narrate the history of its many improvements, more space would be required than can be spared in this general view of horological machinery. It is therefore proposed to deal with the subject minutely in another place. (*See* PENDULUM.) After the application of the pendulum as the regulating power of clocks, the art of horology made rapid strides towards perfection, and it is generally admitted, even by continental writers, that the more important inventions and improvements belong to the English. The anchor escapement, as a substitute for the old crown wheel, was the invention of Clement, a London watchmaker, in 1690. In 1715, George Graham advanced horology, by introducing the mercury pendulum, and by improving the escapement of Clement. Harrison's pendulum, the dead-beat escapement of Graham, and the grid-iron pendulum, were the subsequent improvements. Leaving the subject of clockmaking at this point, as a sketch of its present state will be found under the article TURRET CLOCK, where an account of the history and mechanism of the Exchange and Westminster clocks will be found, it is proposed to take up the history of watchmaking. But first of all, to say something of the assemblage of wheels and pinions called the "movement" of a watch. The wheels in watches are urged on by the force of a spiral spring, contained in a hollow cylindrical barrel, to which one end of a chain is fixed, lapping round the barrel for several turns outside. The other end is fixed to the bottom of a solid, shaped like the frustum of a cone, known by the name of the "fusee," having a spiral groove cut on it. On the bottom of this cone, or fusee, the first great wheel is put. The axis, or "arbor," as it is called in watchmaking, on which the spring barrel turns, is so fixed in the frame that it cannot turn when the fusee is winding up. The inner end of the spring hooks on to the barrel arbor, and the outer end hooks on to the barrel. Now as the fusee is turned round in the proper direction, it will take on the chain, and consequently take it off from the barrel. This bends up the spring; and if the fusee and great wheel are left to themselves, the force exerted by the spring in the barrel, to unbend itself, will make the barrel turn in a contrary direction to that by which it was bent up. This force of the spring unbending itself being communicated to the wheels, will set them in motion, and they will move with considerable velocity. Their time of continuing in motion will depend on the number of turns of the spiral groove on the fusee, on the number of teeth in the first or great wheel, on the number of leaves in the pinion upon which the great wheel acts, &c. The wheels in any sort of movement, when at liberty, or free to turn, and when impelled by a force, —whether it be a weight or a spring, —would soon allow this force to terminate; for, as the action of the force is constant from its first commencement, the wheels would be greatly accelerated in their course, and it would be an improper machine to register time or its parts. The necessity of checking this acceleration, and making the wheels move with a uniform motion, gave rise to the invention of the "escapement," or "scapement," as it is generally called. To effect this, an alternate motion was necessary, which required no small effort of human ingenuity to produce. The "escapement" means that combination of parts in a watch which has for its object the conversion of the circular motion of the wheels into a vibratory one. Were it not for this, the motive force would have no check. Hence it is by this mechanism that the wheels in the movement are prevented from having their revolutions accelerated, which otherwise would take place to such a degree as to make the machine run down in a minute or two. When, towards the close of the 15th century, springs were placed as the motive power in clocks, it became apparent that timepieces might be rendered portable. We first hear of the manufacture of watches by Peter Hele, of Nuremberg; though it is affirmed they were invented at an earlier date than the period assigned to them. Johannes Coeclæus, commenting on the Cosmographia of Pomponius Mela, published in Nuremberg in 1511, says:—"Ingenious things are just now being invented; for Peter Hele, as yet but a young man, hath made works which even the most learned mathematicians admire; for he fabricates small horologes of iron filled with many wheels, which, whithersoever they are turned, and without any weights, both show and strike forty hours, whether they be carried in the bosom or the pocket." Adding to this, Doppelmayer says:—"Thus, already written by Coeclæus in 1511, shows in the clearest way that pocket clocks were made at Nuremberg 219 years ago; and he has fairly attributed the invention of them to this artist, since it

was the most deserving of admiration and the newest of his time; and which will be considered as a Nuremberg invention; since, also, clocks of this kind were for a long time called 'Nuremberg living-eggs,' because they at first used to make them in the form of small eggs, which name is to be found in the German translation (chap. 26) of a strange book, which F. Rabelais has left behind him. Hence it is evident how erroneous it is to ascribe, as many do, the invention of small striking clocks, as of the pocket clocks, to Isaac Habrecht, a well-known mathematician, who lived about the beginning of the last century, and dwelt at Strasbourg, whereas our Peter Hele had made them in Nuremberg one hundred years before." In one of the earliest watches, now in the possession of Mr. Octavius Morgan, the whole movement, including plates, pillars, wheels, and pinions, is made of iron, and the wheels have been cut by the hand. There are two mainsprings,—the larger for the going part, and the smaller for the alarum. These are not inclosed in a barrel or drum, as at present; neither is there fusee or catgut; but the outer end of the coiled spring is bent back as a hook, and clips round a strong pillar between the plates, as the support and resistance to the force which it is to exert at its inner extremity, which is fixed to the axis of the great wheel. Round this the spring is coiled or wound up, and by its expansion the train of wheels is set in motion. The balance which governs the movement is a small wheel, fixed on the verge as its axis, to which an oscillatory motion is given by the alternate impulses of the teeth of the crown-wheel upon the pallets which are affixed to the verge. This was the earliest escapement invented for watches and clocks, and continues in common use to this day. There does not appear to have been any contrivance for equalizing the power of the mainspring, which, when tightly coiled up, exerted a far greater force than when more expanded; and, consequently, the machine must have been a very imperfect measurer of time. On the arbor, which secured the inner extremity of the mainspring, was fixed a ratchet-wheel, which, by means of a spring fastened to the plate, enabled it to maintain its position, and also allowed its force to be adjusted to the weight of the balance; and this was the only way of regulating these watches. A variety of plans were made use of to remedy this defect; but the most ingenious and best one, moreover, which still continues in use, is the "fusee," the inventor of which is now unknown. After continuing almost at a stand-still for upwards of a hundred years, a great era dawned upon the art in 1658, when Dr. Hooke conceived the idea of regulating the action of the balance-wheel by means of a spiral spring. A watch upon the new principle was made for Charles II., having this inscription upon it:—"Robert Hooke inven. 1658; T. Tompion fecit 1675." The fame of this piece of horological machinery spread rapidly over the continent, and two were constructed for the dauphin of France. Previously to this time, watches had but a single hand; but in consequence of the new regulating power, a minute-wheel and minute-hand could be added. Both these are said to have been given to the watch by Daniel Quare, a London horologer, who also invented the "repeater." The cylinder escapement, with horizontal wheel, was the invention of Tompion, who brought it forward in 1695. This arrangement, which was very valuable, because it made watches more conveniently portable, was perfected subsequently by Graham. In 1705, there came to London Nicolas Facio, a Genevese, who, about five years before, had invented the process of jewelling watches; that is, the application of hard jewels, such as diamonds or rubies, so uninfluenced by friction as to allow the pivots to play in them without wearing away, as metals will do. Without this invention, we should have never possessed the beautiful and useful machine that a watch of the present time is. In 1714, a reward of £10,000 was offered for any method of determining the longitude of any place or ship at sea, within the limit of one degree; of £15,000 within the limit of forty geographical miles; and of £20,000 within the limit of thirty geographical miles, or half a degree, provided such method should be serviceable within eighty miles of the coast. In 1761, John Harrison, stimulated by the hope of gaining these rewards ro-





duced an instrument so perfect as to entitle him to the full sum of £20,000, which he subsequently received. Nor was this sum more than an adequate acknowledgement of his great talent; for, twenty-five years before he sent his instrument to sea, he had produced what may be termed the first chronometer. Worthy successors of Harrison have been such horologers as Arnold, Earnshaw, and Mudge. To proceed to describe the various escapements, &c. now in use. The power transmitted to the escapement through the train of wheel-work in a watch, is created by the elastic force of the mainspring, which serves the same purpose as the weights in a clock. (*See* fig. 2.) The mainspring of a watch is a thin flexible ribbon of steel, usually about 10 or 18 inches in length, which, when coiled into the barrel ready to be placed in the watch, occupies a space something less than ½ of an inch in diameter. To this barrel is attached, by a small hook, the "chain," which is rolled round it, and fixed by another hook to the fusee. When the watch is wound up, the chain is unwound from the barrel on to the fusee. The interior end of the spring being fixed to an immovable axis about which the barrel revolves, and the exterior end to the inside of the barrel, it may readily be perceived how the spring extends itself, how its elasticity forces the barrel round, and obliges the chain to give motion also to the fusee, and thence to the various wheels and pinions. The "verge escapement," as applied to watches, is shown at *fig.* 3: A, part of the balance; B, the verge body; CC, the pallets; D, the escape-wheel; E, escape-wheel pinion. The verge, or arbor B, of the balance, has two pallets C C, which stand out at right angles, so as to be acted on alternately by the sloping teeth in the opposite sides of the crown or escapement-wheel D. The "horizontal escapement," shown at *fig.* 4, is so called because the escape-wheel acts horizontally to the axis of the balance. It was invented by Tompion, after whose death it was perfected by Graham;



*Fig.* 2.

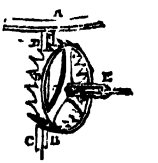



*Fig.* 3.

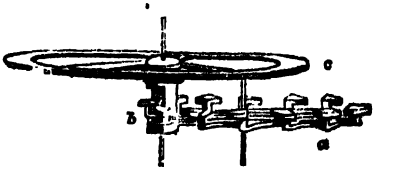



*Fig.* 4.

*a*, the escape-wheel, having pins or stems rising from it, on the tops of which are teeth of a wedge-like form, of such a length as to permit little freedom within and without the cylinder *b*, which is firmly fixed to the balance *c*. Although *b* is one piece, the two edges of the hollow part serve as distinct pallets, inasmuch as they receive, alternately, during each vibration of the balance, an impulse from the curved outer edge of each tooth in succession; and, as the wedge-shaped tooth passes from the pallet, the coming tooth falls on to the circular part of the cylinder, and there remains until the return of the balance, when that tooth which had previously rested on the circular portion of the cylinder, comes upon the edge or pallet, gives impulsion to the balance *c*, and falls upon the concave portion of the cylinder, and there remains until the balance again returns, when another impulse takes place; and so on in succession. The "duplex" closely approaches

the chronometer. It is shown at fig. 5. *A* is the escape-wheel, the teeth of which fall upon the roller E (made of ruby), fitted upon the axis of the balance C, and which has a notch F, cut through it vertically. When the balance returns towards the left, the point B of the tooth of the wheel falls into the notch F, and meets with a very small recoil from the balance, in what may be termed the returning vibration. This goes so far as to make the tooth for a little while to have the notch at

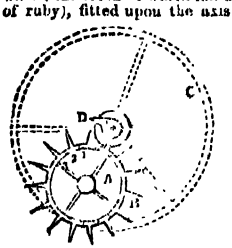


*Fig.* 5.

the side opposite to that by which it came in. The balance on returning, in the course of the vibration, receives impulse from the wheel, name lately on the tooth of the wheel in repose B, leaving the notch F, and the small cylinder; at this moment the pallet of impulse D has its face presented, ready to receive the cog I (or upper right tooth of the escape-wheel), which falls and gives impulse to the balance. So soon as the tooth of impulse escapes from the pallet, the next tooth of repose falls, and rests on the small cylinder of ruby

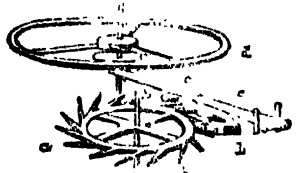


*Fig.* 6.

F; and so on. The "patent detached lever" was invented by T. Mudge, in 1750. It is shown at fig 6, *a a* the escapement-wheel, *b b* the ruby pallets, *c* the lever, *d* the balance. On the axis of the balance *d*, towards the lever *c*, is a small disc of steel, into which is inserted a small pin, made of ruby. This pin fits with great nicety into a notch, or opening in the end of the lever *c*, upon which are firmly fixed the two pallets *b b*, into which are secured rubies, very finely polished. The balance in its vibration on either side, carrying with it the steel disc and ruby pin, causes that pin to enter the notch in the lever, and carry the lever with it, and at the same time to draw the pallet from off the escapement-wheel *a*. Power being exerted upon this lever by the mainspring, the wheel tooth gets disengaged from the locking face of the pallet, forces itself down the slopes of the pallet, and thus gives impulse to the balance. At each vibration, the same unlocking takes place; but as soon as the wheel tooth falls from the slope, the opposite pallet is prepared to receive the advancing tooth of the escapement-wheel, and so on in succession, beat after beat takes place. The "detached, or chronometer escapement," shown at fig. 7, was invented about

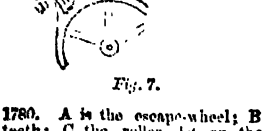


*Fig.* 7.

1780. A is the escape-wheel; B the escape-wheel teeth; C the roller, let on the verge or axis of the balance. This roller is a circle of polished steel, with a notch cut out of it, into one side of which, D, a flat polished piece of ruby is inserted for the acting part. Below this steel roller, carried on the same verge, is a smaller roller of steel, E, called the discharging pallet, having a sapphire fixed on its outer edge. F is a slender spring, which is screwed at I to the stouter one, having its fixture at the stud L, and polished away very thin at K, in order that it may bend readily, so as to cause very little resistance to the balance while forcing it on one side. G is a projecting piece carrying an upright pin made of ruby, against which the wheel-tooth B rests. At B is a small screw against which the spring LKG strikes, and thus prevents it from springing too far back. The action of these parts is as follows:—When at rest, the circular edge of C is just clear of the two teeth of the wheel B; but yet, if set in motion, the teeth could not pass both F and G whilst they remain quiescent. G rests against the screw at B, and the tooth resting against the locking pallet G, the escapement-wheel cannot turn. To set the chronometer going, it is necessary to give it a rotary motion, which sets the balance in action. This causes the lower piece on the verge (called the lifting-piece or discharging-pallet) to strike against the end of the spring F, which, from its overlapping the curved end of the prolonged spring KG, pushes it back, and thus releases the pin or locking-stone G from before the tooth of the wheel; that is, it unlocks the escapement-wheel, which is immediately set in motion on the action of the mainspring. The same vibration given to balance and verge brings the ruby pallet D round before the tooth B, which strikes against it and carries it round. The recoil of the spring F has now brought the locking-pallet G to catch the tooth B, the escapement-wheel being again stopped. But the stroke of the tooth from the face of the ruby pallet D has carried the balance on in its vibration till it is counteracted by the tension of the balance-spring, which brings it back again in this return vibration, the lifting-pallet E, by its curved back, passes the slender spring F before it, and passes it without affecting KG, which is still enough to remain unmoved by E, even when this strikes and rests against it in recoiling. The wheel, therefore, continues locked on the upright pallet G, and the vibration proceeds uncontrolled till the great pallet is again brought round, and the balance spring again checks the vibration, the above process being repeated. In this escapement, consequently, part of one vibration in one direction, and the whole of that in another, is performed without the balance being in any way under the influence of the maintaining power; while the parts are so contrived that the impulse given by the tooth of the escape-wheel affects very minutely the natural motion of the balance. It can be easily understood that the lifting-pallet E can pass in one direction the spring F without moving K and G; while in the other it carries F, and therefore G, with it. The "compensation balance" shown at fig 8, was the invention of the London horologer Thomas Earnshaw, who received a reward from government for it. When properly adjusted, this balance causes a watch to keep the same time whether the temperature be 32° or 90°.



*Fig.* 8.

The divided rim A A is composed of steel and brass run together by fusion, the more expansible metal, brass, being placed outwards; the result of which is as follows:—Heat elongates the pendulum spring, and thereby causes a slower vibration of the balance; but as the inner rim of steel does not expand so freely as the outer one of brass, the conflicting action of the two tends to draw the free end of the circular rim towards its centre, and thus decreases in all but one direction the diameter of the balance. This decrease tends to quicken its vibration, and thus counteracts the effects of elongation of the pendulum spring. In cold climates, the pendulum spring is contracted, making the vibrations quicker; but the contraction of the brass rim draws the free end outwards, thus increasing its diameter, retarding its vibrations, and counteracting the effect of the contraction of the pendulum spring. Many contrivances have been introduced to test the equality of compensation balances, but the majority have been cast aside, from the circumstance that the heat was not equally distributed to the watches under trial. In pursuance of the same object, Mr. J. W. Benson, of Ludgate Hill, has invented an oven heated by hot water, which has been found to answer perfectly the desired end. In this simple apparatus, even the cheapest watch may be regulated to suit any climate.

*Electrical and Illuminated Clocks.*—Although, at one time, it was fully expected that electrical clocks would be largely employed, these ingenious machines have never been much used. They are of two kinds,—electrical dials and electrical clocks, so called. The electrical dial has no body belonging to it, but is connected by means of a wire with a standard clock at some other place; as the Observatory at Greenwich. An apparatus is also provided for sending a galvanic current through the wire at certain regular intervals of time. By this means the dial hands are made to leap over a small portion of their course whenever a current is transmitted through the wire; and the time value of this movement is marked by the figures on the dial. An electrical clock, however, is one that carries with it its source of power, and is independent of any wire connected with another place. Electric time-balls are also connected with this branch of the subject. These balls have been found very useful, and show the time once every day. Regularly every day, at one o'clock, a large ball is seen to fall; and by this means mariners and others can correct chronometers, clocks, and watches. The time-ball at Greenwich observatory, and at the telegraph station in the Strand, London, are familiar instances of this method of marking time. The rendering of clocks visible by night has met with great improvements in late years. The dial is usually made of some semi-transparent glass, lighted up behind with gas. In some cases, however, as in the clock at the Horse-guards, the dial is lighted by reflected light in front.

*Clock and Watch Trade.*—In England, this branch of manufacture is principally confined to London, Coventry, and Prescot. The district of Clerkenwell is the head-quarters of the trade in London. Watch movements are generally made at Prescot, and other places in Lancashire; the London workmen make the other parts, and put them all together: thus, a Clerkenwell watchmaker buys his movements from Lancashire, and employs tradesmen to finish the making of the watch: these tradesmen are not mere workmen, but small master tradesmen. The motion-work is supplied by one, the spring by another, the escapement by another; while the case, dial, glass, &c., have each their respective furnisher. The work is again subdivided by these tradesmen in a wonderful manner. Different workmen are specially employed on every kind of escapement, motion-work, hands, dials, &c. An ordinary London watch passes through more than a hundred hands, even after the movement has been made in Lancashire. The principal makers of church and turret clocks live in London, and manufacture nearly all their own machinery on their premises. Prescot not only supplies the home trade with watch movements, but exports them to America. Swiss watches have long been celebrated; but although they are minute and delicate, and much cheaper, the best English watches are not equalled by any other in the world for strength and accuracy.—*Ref.* Denison on *Clocks and Watches*; Benson's Pamphlet on *Watches*; Berthoud's *Essai sur l'Horlogerie* and *Histoire de la Mesure du Temps*; Cumming's *Elements of Watch and Clock Work*; Derham's *Artificial Clockmaker*, Harrison's *Principles of his Timekeeper*; Earnshaw's *Explanations of Timekeepers*; Reid's *Treatise on Watch and Clock-making*; the article *Horology* in Knight's *Cyclopædia*, and in Brande's *Dictionary*.

Horse, *horre* (Ang.-Sax.), (Lat. *equus*), an animal belonging to the fam. *Equidæ*, a branch of quadrupeds distinguished by a single digit and hoof on each foot. Although, however, the *Equidæ* possess but one developed toe, there are on each side of the metacarpus and metatarsus joints, two small rudimentary processes which represent lateral toes. The system of the dentition of the family is represented by the following formula:—

$$\text{Incisors } \frac{6}{6}, \text{ canines } \frac{1-1}{1-1}, \text{ molars } \frac{7-7}{6-6}; \text{ total 42.}$$

Of the three great divisions into which the *Equidæ* are separated,—namely, the horse, the ass, and the zebra,—the former is the largest, the most docile, the most valuable, and, finally, more fully distributed over the surface of the globe, than any of the others. That the horse existed prior to the Flood, the researches of geologists afford the most satisfactory evidence; for there is not a portion of Europe, Asia, Africa, or America, in which the fossil remains of this animal have not been discovered, mingled with the bones of the elephant, the hippopotamus, and the deer, as well as the mastodon, and other animals which have passed away from the surface of the earth. In most cases these fossils agree with the size of the horse which exists in the present day; but in South America the bones of horses of gigantic size have been exhumed. The first allusion to the horse occurs in the book of Genesis (xxxvi. 24), where it is said that Anah, son of Zibeon, found the mules—the progeny of the ass and the horse—in the wilderness, as he fed the asses of his father. From the remains of Grecian art and writings, we find, also, that the horse was used for chariot-races and other purposes about 1450 B.C., from which date it became more and more employed for the use of man. It is questionable whether, in the present day, there exist any real wild horses, as those which are so called have been proved, in the case of America, to have been the descendants of horses let loose by the Spaniards; and those of Asia are but the progeny of horses which have escaped from the haunts of civilization. Both fore and hind legs of the horse have, on the inner side, an oval, horny, wrinkled plate, called a wart, sallender, or chestnut. The canine teeth are wanting in mares. The sense of touch, in general, is extremely delicate; the tongue soft; the upper lip capable of elongation and considerable mobility; and the senses of taste and hearing well developed and very acute. The eyes are large and the sight good; while the sense of smell is so particularly fine, that horses which run in a wild state are said to be able to scent their enemies at the distance of more than a league. The skin is generally covered with a coat of short hair, smooth in summer, and becoming rough and much more elongated during the winter season. The best of the wild Asiatic horses are those which inhabit Tscherkessi, Abassi, and the northern slopes of the mountains of the Caucasus. The principal varieties of these, according to Pallas, are, first, the "mousta-chood" horse, characterized by numerous strong bristles on the upper lip; next, the "woolly" horse, a Russian variety, covered with a crisp woolly hair, and common amongst the Bashkirs; thirdly, a "naked" or hairless horse, which is found amongst the valleys of Krim Tartary, by the natives of which it is kept always clothed; and, lastly, a variety delineated by Johnston, in which a sort of woolly mane is continued from the neck along the back, right down to the tail, which specimen Pallas asserts that he saw amongst the Buraeti. The wild horses appear to be free from nearly all those diseases and ills which prove such a burden to the domestic breed. They are generally of a pale or greyish-brown colour, with brown mane and tail, and a whitish muzzle, which subsides into a black colour about the mouth. They are less in size than the domestic horse, and have a larger head, larger ears, hoofs more contracted, and the mane more erect, whilst the tail is much shorter. They do not wander beyond the 50th degree of north latitude. They generally move about in droves, headed by a larger grey or black stallion, who constitutes himself the leader. On the Pampas of South America they are exceedingly abundant, and the Guachos, a semi-civilized race of men, live amongst them. Their mode of capturing and breaking-in these horses is very curious. The *capitar* (or chief), mounted on a powerful steady horse, rides into the *corral* (a large space inclosed by an impregnable boundary of wooden stakes, into which herds of wild horses are driven by the Indians), and, picking out the animal to be broken in, throws his lasso over his head, and drags him to the gate. For some few moments the idea in the horse is an unwillingness to lose his companions; but when once out of the gate of the corral, he endeavours to escape over the plains; but a timely check of the lasso stops him. The peons then run after him, and throw a lasso over his fore legs, and by a jerk throw him on the ground. In an instant a Guacho seats himself on his head, and cuts off the whole of his mane, whilst another cuts the hair from the end of the tail, in order to show that the animal has once been mounted. They then put a piece of

hide in his mouth to serve for a bit, and a strong hide halter on his head; the Guacho who is to mount him next arranges his spurs, which are unusually long and sharp, and, whilst the two peons hold down the horse, he girths on the saddle very tightly. He then jumps into the saddle, and the other men giving the horse his head, the rider grasps the halter and prepares for action. At first the animal jumps about, sometimes with all four of his legs off the ground at once; but the spurs of the Guacho soon set him going, and off he gallops, doing everything he possibly can to unseat his rider. After galloping him about, and flogging him until every *bit of spirit* seems taken out of him, the Guacho rides back slowly to the corral, and the horse, so lately unruly, is quite tamed, and fit for domestic use. Immense quantities of the skin of the horse are imported annually from South America; for during the period which elapsed between 1838 to 1842, Monte Video and Buenos Ayres yielded annually about 90,000,000 lbs. of oxen and horse hides, and 9,500,000 lbs. of horsehair. The horse is naturally an herbivorous animal, as his thin muscular lips, with his compressed mouth and sharp incisor teeth, are well fitted for seizing and cropping various species of grass. In a domesticated state, however, he is obliged to eat other and harder food, as oats and corn; and for this a provision is made by nature, who supplies him with a peculiar adaptation of the bones of the face, by means of which the horse can comminute and grind down his food better than carnivorous animals. As the teeth of the horse indicate his age, as well as being distinguished for their adaptation for masticating purposes, it will be necessary to give them some slight consideration. The colt is generally dropped with the first and second molar and grinding teeth apparent. When eight days old, the two incisor teeth (central) come out, and in the next five or six weeks he has the two next incisor teeth supplied. In three months' time these teeth will all be uniform, and a third grinder appears; and, after the colt has attained his eighth month, the third nipper above and below, on each side, will appear, and the colt will be found furnished with his full complement of front teeth. These teeth are provided with an elevated cutting edge of enamel, and this edge is bent inwards and over the tooth, so as to produce a sort of cavity or depression behind it, which constitutes *the mark*. it is gradually worn down by chipping the grass, and is at length totally obliterated. By the degree in which this mark is effaced, we are enabled to judge of the age of the animal. It may also be added that the deciduous teeth are lost in the order of their acquisition; the two middle incisors of both the upper and lower jaws being displaced between the second and third years. A three-year-old colt has the permanent middle incisors above the gum, but not on a level with the adjoining deciduous incisors; these are also characterized by a large deep groove containing a black substance crossing transversely the working edge of the corner of the tooth, and the sixth grinder is also coming into place. At four years the sixth grinder is on a level with the others, the third deciduous grinder is shed, and the mark is fainter. At six years the fissure on the middle incisors is worn away, but a discoloration still exists; at seven years the mark is worn away from the four middle incisors in both jaws; and at eight years the mark will be found gone from all the lower incisors, and ceases to afford any indication of the age of the animal. It may be added, that these marks are sooner worn away in a stall-fed horse (in consequence of its eating more oats and harder substances) than one at grass; and also that they are sometimes prematurely worn away in a "crib-biter." The mare goes with young upwards of eleven months, and foals standing. The age to which horses would reach, if untouched by disease, is not correctly known; many have exceeded thirty and even forty years, but the majority arrive at their end before they have attained their ninth or tenth year. The first change which domestication makes in this animal is in increasing the bulk of his trunk in comparison with his head and limbs; and of all varieties this change is more observed in the Arabian than any other. The head is not only proportionately smaller, but is remarkable for the breadth and squareness of the forehead, the shortness and





fineness of the muzzle, prominence and brilliancy of the eyes, and the smallness of the ears. The neck of the Arabian horse is long and arched, and beautifully joined to the chest; the withers are high, and the shoulder-blade has its proper inclination backwards; while the fineness of his legs and the oblique position of the pasterns might be supposed by the uninitiated to lessen his apparent strength; but the leg, although small, is deep, and composed of bone of the densest character. Besides, the tendons are sufficiently distinct from the bone, and the starting muscles of the fore-arm and the thigh indicate that he is fully capable of accomplishing many of those feats which the wandering Bedouins and Arabs of the desert relate of their horses. The Arabian horse generally stands in height 14 hands 2 inches. The Barb is another variety of the horse, and is smaller than the Arabian, which, however, it eclipses in general excellence, although it has not the Arabian's unflagging speed and spirit. The Persian horse is larger than the last-mentioned variety, and is more adapted for warlike purposes than for speed and endurance. The East-Indian horse is from 14 to 15 hands high, and is remarkable for a want of bone below the knee, and a fulness of the hocks, which places it far below the Arabian in the scale of excellence. The Burman horse is very small, but spirited and strong: he is generally about twelve hands high. The Tartar horse is of moderate size, but full of spirit, and very bold, active, and muscular. The flesh of this horse is a frequent article of food amongst the Tartars, who also regularly employ the milk of their mares for domestic purposes. The Spanish horse used to resemble the Arabian considerably, in consequence of an admixture of the blood; but the breed has now deteriorated considerably. The Flemish horse is a large muscular animal, strongly and beautifully formed. We are indebted to it for some of the best blood of our draught horses, and we have still frequent recourse to it for keeping up and improving the breed. The various types of horses will now be given under the head of the English horse, which, in the perfection of its different varieties, eclipses those of all other countries. With regard to the hackney, or road-horse, Mr. Youatt says: "He should be a hunter in miniature, with these exceptions: his height should rarely exceed fifteen hands and an inch; he will be more strong and more pleasant for general work below that standard; he certainly should be of a more compact form than the hunter, and have more bulk according to his height. It is of essential consequence that the bones beneath the knee should be deep and flat, and the tendon not tied in; the pastern should be short, and although oblique or slanting, far less so than that of the race-horse or hunter. The foot is a matter of the greatest consequence in a hackney: it should be of a size corresponding with the bulk of the animal, neither too hollow nor too flat, open at the heels, and free from corns and thrushes. The fore-legs should be perfectly straight; the back should be straight and short, yet sufficiently long to leave comfortable room for the saddle between the shoulders and the *huck*, without pressing on either; the road-horse should also be high in the forehead, round in the barrel, and deep in the chest." According, also, to Mr. Youatt, the origin of the better class of *coach-horse* is the Cleveland bay, which breed is confined principally to Yorkshire and Durham. Another breed of horses is termed the "Suffolk punch," from its round punchy form, which is supposed to have originated from a cross between a Norman battle-horse and a Suffolk cart mare: this, however, is only a supposition. According to our author, it was "the very horse to throw his whole weight in his collar, with sufficient activity to do it effectually and hardihood to stand a long day's work." The best dray-horses, of which we see so many splendid specimens in brewers' waggons, are produced by a cross between a Suffolk punch and a Flemish mare. Our fleetest variety is the *race-horse*, the breed of which is traced back to an Arabian stallion introduced into this country by a Mr. Darley; whence it was termed "the Darley Arabian." This horse was the sire of Flying Childers, and the great grandsire of Eclipse, which latter horse ran round the mile course at Newmarket in one minute. A good race-horse is "generally dis-

tinguished by his beautiful Arabian head; tapering and finely set-on neck; oblique lengthened shoulders; well-bent hinder legs; ample muscular quarters; flat legs, rather short from the knee downwards, although not always so deep as they should be; and his long and elastic pastern." Another variety of racer springs from an animal imported into this country, and designated as the "Godolphin Arab." The *hunter*, which is our next consideration, includes the blood and high breeding of the race-horse with the endurance of the hackney, together with a power of leaping peculiarly his own. Mr. Youatt says: "The first property of a hunter is that he should be light in hand; for this purpose his head must be small, his neck thin, and his knees wide. The head will then be well set on; it will form a pleasant angle with the neck, which gives it a light and pleasant mouth." The Shetland and Exmoor ponies are other varieties of the English horse, which are diminutive in size, and unfit for most of the purposes to which we adapt that quadruped. The age of all horses, with the exception of that of racers, is calculated from the 1st of May, no matter in what month they are dropped; and that of racers from the 1st January. It would be impossible, within the proportions of the present work, to enlarge on training, and other circumstances connected with the horse; the reader is referred, for further information, to Mr. Youatt's excellent treatise on the horse.

HORSE-CHESTNUT. (*See* ÆSCULUS.)

HORSEMANSHIP, *horse'-man-ship*.—The natural paces of the horse may be thus enumerated, in their proper order:—the walk, the trot, the gallop, the canter; and perhaps leaping may also be included, as it is undoubtedly a pace belonging to the horse, as to other saltatory animals. First, with reference to the walk, it is considered, when slow, to be the simplest of all paces; but when accelerated, even in the slightest degree, it is not so simple as imagined, for it is often intermixed with motions appertaining to other paces, by a successional displacement of the limbs, out of the more common course. It is stated by a writer in Blaine's "Encyclopædia of Rural Sports," with regard to the description of this mode of progression adopted by the horse, that he found that, supposing the off fore-leg to begin, it was immediately succeeded by the near hind one, but the off hind-leg seemed not to follow the fore-leg at the same time as before (*i. e.* that was in the walk of the pace which he had been previously noticing); but this was nothing more than the alteration of the form of the body, when either the one walk or the other took place. For when the off hind-leg began, it was succeeded by the off fore being lifted up, and when the off hind-leg was set down, the near hind-leg was lifted up. But the off fore and the near hind-legs seemed so connected together by the poise being on the same side, that it was the near hind-leg which appeared to begin the action. The poise being altered by the will of the horse, the off fore seemed to begin, and not to be succeeded by the off hind-foot being set down at the same time after it as in the walk of the pace. The near hind-leg is in both paces (*i. e.* the common walk and the pacing walk) taken up after the off hind-foot is set down; and when the off fore-foot is set down, the near fore-foot is taken up, to make room for the near hind-foot to be set down. In order to render the walk agreeable to the rider, it should be true; that is, it should be conducted by a harmonious and symmetrical elevation and depression, or setting down of the feet. To walk fast requires great liberty in the angles of the limbs, but particularly so in the elevation of the fore-parts, and obliquity of the shoulders; a corresponding length and angularity in the hind-legs is also requisite for the perfection of the pace. In the language of Blaine, the walk as a pace should be performed as harmoniously as any artificial cadence of the *manége*, and that whether it is quick or slow, each foot being dropped flat on the ground, and not, as is too often the case, the toe being placed first, and then the heel. The breaking of a horse will have much influence on his method of walking; the angles of his limbs will have much more; and not a little will depend on the hand of the rider. One horseman by seat and hand will force the horse to carry his head in the right place, and to elevate and extend his limbs, the one in unison with the other; and another rider, by his bad seat and coarse hand, will bring his horse to stop short and irregularly, and thus so mix the trot with the walk, as to do little more than shuffle over the ground. The maximum of speed in the true walk of the horse is six miles in the hour. There are few animals, however, that have accomplished this; and consequently, five miles per hour is a good rate of speed for a fast walker. The trot is the next pace after the walk, and it is always performed diagonally, the limbs being differently employed, according to the rate of progression, whether fast or slow. There are three varieties of the trot; namely, the moderate, the extended, and the running trot. In the moderate, or slow trot, the diagonal legs (as the off fore and near hind-legs) are elevated, and replaced on the ground together; while the two other legs remain on the ground to support the weight of the horse and his rider. The extended trot of a horse and the run of a man are nearly identical in their manner of employing motive power, as the fore and hind diagonal legs acting in unison form themselves into a sole support, like the single leg of a man; the only difference being that the centre of motion is placed diagonally across it; by which means the superincumbent weight, although moving on two distinct members, produces but one effect. The space of ground usually gone over at each change of the limbs in the fast trot is a sufficient proof that a spring is made in the action, which tends to detach the horse, at one particular moment in the pace, completely from the ground; and that, mathematically speaking, the body is propelled through a space corresponding in ratio to the force employed to gain the impetus. The running trot is often confounded with the darting or elongated trot, from a very erroneous impression that the method of procedure is identical; really, this pace is a compound of the true trot and the "amble," and it is not conducted diagonally, as the other varieties are. With regard to the gallop, it is stated by Blaine that it may be properly divided into three varieties, all effected, however, by a propulsive effort of the hind quarters. Of gallops, there are, the racing, or gallop at full speed; the slow, or hand gallop; and the canter; which latter, although treated as a separate pace of the horse, is really but a slow gallop. The first of these varieties, or the racing gallop, is nothing more than a succession of leaps. Simple as it is, it nevertheless cannot be commenced without the intervention of the slower gallop, in which one of the hinder legs is first advanced to establish a new centre; for it would require too great an effort to raise the fore parts at once from a state of rest by means of the loins, and to throw them forward at the first action to a considerable distance by means of the haunches and thighs. "In the extended gallop, the fore parts when raised are forced forwards by the alternate flexions and extensions of the angles of the under parts, and as both of the fore and both of the hind legs, in the racing gallop, become opposed to the ground in succession at the same moment, that is, as the two fore-feet beat the ground together and then the two hind; so it is evident that the gallop of full speed is nothing more than a repetition of leaps. Quickly as these leaps are repeated, yet the surface of ground passed over at each of them must necessarily be great to accomplish the pace at which the good racer goes. Hambletonian, in his match against Diamond, is said to have covered 33½ feet of ground in a second; and by the calculations of Mons. St. Bel, Eclipse covered 85 feet of ground in the same time when at the top of his speed."—(*Blaine.*) The hand gallop is a pace between the amble and the racing gallop, and differs from both, from the fact of its not being performed diagonally, and from the limbs not being thrown out and contracted equally, one generally taking the lead, as it were, of the other and being pushed further forward, while the other is more curved. The canter differs from the gallop in consequence of the movements of the legs, instead of being simultaneous, being directly the reverse. At no period of time is the animal wholly in the air, one of his legs being always touching the ground; and this it is that gives the pace its peculiar effect. When it is performed, say, on the right, the horse commences by first placing his off hind-leg a little beyond the other; at nearly the same instant he elevates the fore-hand and places first the near fore-leg on the ground,

when the off, doubling over and beyond, is placed in an instant after it. In the next movement, the hind-legs are thrown in, and, while elevated, the off fore-leg becomes raised from the ground; but the near fore-leg is never elevated until the hinder ones are replaced on *terra firma*. In order to insure the safety of progression of the horse, the Parthians used to place pieces of chalk and stones in the paths of their young horses, so as to accustom them to look to their steps, and to elevate their feet sufficiently; while the Romans tied clogs to the pasterns of their colts for a similar purpose. As *leaping* will be treated of in the article HUNTING, enough has now been said with reference to the natural paces of the horse. It would be impossible to find out who was the first horseman; but there is little doubt that even in the remotest ages of antiquity, men were accustomed to mount their steeds, causing them to career along with that irresistible speed and endurance with which the gen. *Equidæ* are so highly gifted. Good horsemanship seems more innate with Englishmen than with the natives of other countries in Europe, and it has always been considered as one of the corporeal accomplishments of a gentleman. There is a great difference between regimental riding and that of a genuine sportsman, as the following distinction, taken from an article in the *Encyclopædia Britannica*, will show:—"The military seat approaches nearer than any other to that of the *manège*; and, by reason of the horse-soldier having, in general, but one hand to hold his bridle with, is one which gives him great command over his horse, without disturbing his seat. He sits well down in his saddle, or his fork, or twist, with his body erect, and in perfect equilibrium with his horse; his legs well stretched down the sides, with a firm pressure of the calves, as well as of the knees and thighs, and the feet firm in the stirrups. But it is not by any *one* of these aids that he becomes a good horseman. He must be in perfect unison, as it were, with his horse's actions and paces to maintain a good and graceful seat; and in proportion to the just balance of his body will he be able to have a steady hand, a point of vast importance to the dragoon. The importance of this balance, and keeping himself in a proper equilibrium with his horse, is increased by the fact of his not being allowed to rise to the horse's trot, and, therefore, requires a still finer use of the bridle hand." To quote another authority:—"The man who rides with the aid of the proper equilibrium," says Colonel Peters, "will, in case of necessity, know when to apply the strength he has retained with a steady, light hand, and govern every motion according as he finds it necessary for his purpose; play light with his own weight upon the saddle (by a gentle spring in the instep of both feet on the stirrups), with an easy pressure of both thighs, knees, and calves of the legs. When the horse jumps or plunges, then these aids are also requisite to keep the seat; but in an easy, steady pace *forward*, it is most particularly to be pointed out to a young man, and cannot be too often repeated, that to become an easy, elegant, or proper horseman, he must learn to ride with comfort and pleasure to his horse as well as to himself; he must learn to seek his balance from his hip upwards, to keep the body with a slight inclination backwards from the perpendicular, and balance himself thus gradually on his horse in all the different paces; which, of course, cannot be expected all at once. A man that rides by the force of his knees alone, shaking his arms and hands although he rides his distance in the same period of time that the good rider would, yet he cannot be said to *ride* his horse, or to have any part of his body in the proper equilibrium; but the man who rides his horse with a light, steady hand, and elastic body (which, when disturbed even, has the power of restoring itself to its former seat), in unison with the horse's action, may be truly said to ride in the proper equilibrium." Mounting is the first step in horsemanship, and a certain precaution is necessary in this, as in everything pertaining to horses. The person must approach the animal by walking up to him on the left side, not directly in front, as this might alarm him and make him strike out. The rider is recommended by old writers on the subject to take the reins and the pommel of the saddle in his left hand, after having placed his left foot firmly in the stirrup, and by laying





his right hand fast on the hinder part of the saddle, to vault into his seat. When mounted, the first thing to set about is the proper adjustment of the reins. If the horse is to be ridden with a single-bridle rein, the reins must be drawn with the rider's right hand through his left, until the horse's mouth has been placed equally on both sides, and then the left hand must be shut, allowing the little finger to separate the two reins. With a double-rein bridle the same must be done. "The bridle-reins should be held at a convenient length; for, if short, they will discompose the attitude of the body, by pulling the left shoulder forward; and they should be held with a firm grasp, dividing them, as before mentioned, with the little finger. When a horse pulls at his rider, he should advance his arm a little, but not the shoulder, towards the horse's head, raising his hand towards his breast, and the lower part of the palm rather than the upper; but he should not shorten the rein in his hand if he can command his horse without it, or he may lose the proper *appui*, or bearing of his mouth. Old writers recommend the bridle-hand to be held perpendicularly, the thumb being uppermost and placed on the bridle. Modern practice is in favour of the knuckles being uppermost. The perpendicular hand may do very well in the school, or with the severe bit of the highly-drilled dragoon horse; but no man could ride a free-going race-horse over a course, or a hasty hunter over a country, in that manner." After due attention has been paid to the bearing of the bridle, the *seat* must be the next consideration of the learner. A great improvement has been made in this respect, by substituting the long stirrup-leathers for the shorter ones which were formerly in vogue. With short stirrup-leathers the rider's seat is thrown back in the saddle, instead of keeping the central equipoise, and, consequently, his weight is thrown on the horse's loins, the weakest part in the body of the animal. The thighs are the most essential parts of a horseman, in giving him a good, firm seat, and on their form will depend the position of the knees, also important to the acquisition of a firm seat. The thighs should touch the saddle and the sides of the horse with their inner surface chiefly, and the knees and toes should not protrude too much. The toes should be turned a little outward and upward; for the toes being turned in, necessarily cramps the knees, and prevents the animal from exerting his strength. The manner in which the foot is placed in the stirrup varies considerably with different riders. "The soldier always, the rider for pleasure or on the road generally, rests on the ball of the foot, with a gentle play of the instep; but the man who rides after hounds, and the jockey when he rides a race, find it necessary to have the foot more home in the stirrup, with the toes turned a little upward, as well as a little outward. The advantages of all this are twofold. First, it gives them more power over their horses, by furnishing them with a more substantial fulcrum; and, secondly, to the man following hounds, it is a great security against the foot being checked out of the stirrup, by the seat being disturbed in a leap, or from any of those causes which perpetually occur in crossing a country." As an easy seat is most important to persons who are obliged, whether by necessity or pleasure, to ride many hours in succession on the road, the following rules should be carefully observed, in order to obtain the same:—The rider should, in the first place, sit well down in the middle of the saddle, with just that length of stirrup-leather as will admit of the fork clearing the pommel of the saddle. The body of the rider should also incline forwards in the trot, as he thus furnishes a proper counter-balance to the movements of the horse; and, above all things, a steady seat must be maintained, as, unless such is the case, the latter will be incommoded in his pace and distressed beyond measure. As saddles and bridles are important adjuncts to perfect horsemanship, it may be as well to quote the following remarks on the same, by a well-known sportsman:—"Nothing sets off the appearance of a horse and his rider more than a good saddle and bridle; nor does anything contribute more to the comfort and safety of the latter than a well-made roomy saddle, with spring-bars for the stirrup-leathers; stirrups rather heavy than otherwise, and sufficiently large for the feet. Some

persons, not contented with the spring-bars, require spring stirrups as well; but in our opinion, no man can hang in a common stirrup, provided he do not wear thick boots, nor use small stirrup-irons. Of the various sorts of bridles, the snaffle is most in use on the turf, and the curb for military horses, hunters, roadsters, and coach-horses. Not one hunter in twenty has a mouth good enough for a snaffle only, although there are a few horses in every hunt that will not face the curb. Some, however, go very well on the snaffle up to a certain period of a run, when, all at once, they require the assistance of the curb. Such horses should be ridden with a double bridle, so that the rider may have recourse to the curb but when wanting." The seat and horsemanship required when following hounds will be found given under the article HUNTING, wherein the subject is fully discussed.

HORSE POWER is one of the most important terms employed in mechanical engineering, and it expresses the comparison between the unity of strength possessed by a steam or water-power machine, and that of a horse, for performing a certain definite amount of work in a given time. Although different mechanists are of opinion that the power of the horse, as a standard of strength, is capable of great variation, the celebrated engineer James Watt fixed it at one constant point; and from his theory, a horse is able to elevate a mass weighing 33,000 lbs. one foot high in one minute of time. As this basis is generally followed at the present time, all calculations with regard to the capacities and powers of different steam- and water-power machines are founded on this assumption, and the formula used is as follows.—If we call the effective pressure of the steam upon the piston of an engine (independently of that expended on friction and the force required to move the incidental machinery, as feed-pumps, &c.), calling this pressure A, the diameter of the piston D, and the velocity of the stroke per minute V, we derive the equation, that $x$, or the horse-power of the engine, will be equal to

$$A\frac{\frac{\pi}{4}D^2V}{33{,}000}$$

Now, taking A (the effective pressure of the steam on the piston) to be equal to 7 lbs. per square inch, and $\pi$ (the ratio of the circumference to the diameter of the piston) being equal to 3·14159, &c., we can simplify the equation, which will now be

$$x=\frac{7\times3{\cdot}14159\times D^2\times V}{33{,}000}\text{; or, being reduced, } x=\frac{D^2V}{6{,}000}$$

In engines which are fitted with condensing apparatus, this formula ceases to apply, as the point of stroke in which the steam is cut off materially affects the general pressure; and, in the present day, steam-engines are often capable of exerting a force some three times as great as that with which they are credited, an engine of 800 horse-power being able to perform sometimes an amount of work equal to that which would be done by the force expended by 2,000 horses. Two formulæ are often adopted by practical engineers for calculating the horse-power of an engine, which, although roughly brought out, are often useful as furnishing an approximate value, without attaching any importance to the precise indication so given. Thus, if the diameter in inches of the piston is called $d$, the number of strokes $n$, and the length of the stroke, in English feet, $l$; then the H.P. or

$$(1)\ x=\frac{d^2\times\sqrt[3]{l}}{47}\text{; or (2), } x \text{ or H.P.}=\frac{d^2\times ln}{6{,}000}$$

The horse-power exercised by falling water is calculated by multiplying the cubic quantity of the water which falls over the shuttle by the altitude of the fall, and the product thus derived by 62·5 lbs. (the weight of a cubic foot of water). As a large portion of real power is lost both by the friction and by the water which escapes from the water-wheel, and which is therefore non-effective, this calculation must be lessened considerably. Working engineers state that the effective results, as compared with those according to the above theory, are, in overshot-wheels, as 30 : 100, and in undershot-wheels, as 80 : 100. Therefore, if we call the quantity of water falling Q, the altitude of the fall H, and the coefficient of the real effective power expressed decimally C, we have the formula that the

$$\text{H. P. of a water-wheel}=\frac{QH\times62{\cdot}5}{33{,}000}C.$$

The different degrees of power possessed by the horse and other animals will be found given under the article ANIMAL STRENGTH.—Ref. *English Cyclopædia.*



HORSE-RACING.—There is much doubt as to when horse-racing was first adopted as a sport and pastime; but it may be surmised that, as trials between man and his fellow-man, both in speed and strength, must have been nearly coeval with his pristine state, so, when he had subjugated such animals as were swift of foot, he was led to promote emulous racings between them. Chariot-races were most probably those in which the horse first distinguished himself; and the Mithraic festivals in Persia, we are informed by Zoroaster, were attended with chariot-races in honour of the sun. This idolatrous form of worship, accompanied with its games, revelries, and races, extended itself from Persia to Greece and Rome, whence the introduction of horse-racing may be traced into Europe. The Olympic games, first practised at Olympia, are the earliest of which we have any credible account, and the chariot-races in the hippodrome were their greatest attractions. The carriages employed in these games were very small low vehicles, to which from one to six horses were attached, the charioteer standing up in the chariot, in order to urge on and control his steeds. The most opulent citizens in Greece expended great wealth and pains in producing those species of horses which were best adapted to the course; and they thus accomplished the original idea of the institution, which there is hardly any doubt was founded with the express intention of improving the equine breed. It is stated that at one festival, seven chariots were entered in the name of the celebrated Alcibiades, three of which gained prizes, and furnished an occasion to Euripides for inscribing a complimentary ode to the conqueror. Over the bar that ran across the entrance to the lists, a brazen dolphin was placed, and an eagle of the same metal stood upon an altar in the middle of the barrier. A piece of mechanism was attached to both of these, which could be put in motion by the president of the games; so that the eagle would spring up in the air, with its wings extended, to be seen by all the spectators, and, at the same moment, the dolphin sank into the ground, which was the signal for the chariots to range themselves in order for the race. Pindar speaks of no less than forty chariots being engaged in the same race; and when it is remembered that they had to run twelve times the length of the hippodrome in going and returning, and had to steer round a pillar or goal erected at either extremity, the confusion and jostling may be imagined, upon the signal for starting being given. At one of the boundaries, a narrow pass only was left for the chariots, and this often baffled the skill of the most expert driver; and there were also more than twenty turnings to make round the two pillars; so that at almost every moment some accident or ludicrous incident arose to excite the pity or mocking laughter of the spectators. As it was also extremely difficult for the charioteer to retain his standing attitude in his unsteady two-wheeled car, it often happened that he was thrown out head foremost; and the masterless horses plunging about the hippodrome added to the dangers of the other competitors, who were thus often overturned or discomfited when nearly sure of winning the laurel crown. Besides the statue of Hippodamia, there were also several statues and altars in the course, particularly that of the genius Taraxippus, who, as his name imports, was said to inspire the horses with a secret terror. There is no doubt, however, that some artifice was employed with this statue, to frighten the horses on reaching it; so that the confusion was increased, and greater opportunity allowed the drivers for showing their courage and dexterity. From Greece horse-racing next travelled to Rome; and here we are informed by Plutarch that chariot-racing was first held in honour of Mithras, during the time of Pompey; but it languished until Julius Cæsar restored the institution with increased magnificence and effect. Although the equestrian spectacles of the Romans were modelled much after those seen in the Olympic games

of Greece, yet they exhibited several distinctive features which plainly marked the advancement which had taken place. In lieu of the noble riders and charioteers of the Attic race, the horses of the Roman course and circus were more frequently ridden or driven by slaves and other persons employed for the express purpose, than by the owners themselves, who merely looked on their triumph or defeat, without personally taking part in it; and yet, notwithstanding this, the Romans were far more enthusiastic, both as jockeys and charioteers, than the Greeks; for horse-racing seems to have been their principal amusement. The mounted races of the *certamina equestria* were a favourite exercise; but saddles were not then in use, and it seems surprising how some of the riders could perform the feats which it is asserted that they did; such as leaping up and down from their horses, lying at length on their backs, standing upright on them: these riders were termed *desultores*, or leapers, and seem to have resembled those of our own theatrical circuses. In the Roman racing, as in the Grecian, certain prescribed rules and regulations were rigidly adhered to, and those competitors who went against them were deemed to have lost their chance. They were obliged to enter their names and send their horses to a given place at least thirty days before the races commenced; and a species of training was imposed during this interval, not only on the horses, but also on the jockeys and drivers of chariots. Like our own custom, the longer courses were appropriated to aged horses, and the shorter ones to colts; mares ran against mares, as at the Epsom Oaks stakes; while there were both a clerk of the course and a judge, who had all authority vested in themselves. The Roman jockeys rode in different colours, as ours do now, particularly the companies of charioteers, in order that the lookers-on might know the several owners. The principal colours used were, according to Kennet, four; namely, *prasina*, or green; *russata*, red; *alba* or *albata*, white; and *veneta*, sky-blue. We read in Suetonius, that Domitian added two more colours,—golden and purple; but these were soon laid aside after his death, and the old ones adhered to. It is supposed by historians that the first British chariot-races were introduced by the Romans shortly after their invasion of England, and there is every probability that this supposition is based on a true foundation. The first authentic account of local races which we read of, is that referring to the races held at Smithfield, where we are informed by Fitzstephen that races were common enough in the reign of Henry II. Between this period and that of the times of Henry VIII., we learn little or nothing of horse-racing; but during the latter monarch's reign it met with great improvement, a revival having taken place in the sport. Randel Holme, a Chester antiquary, states that, on Shrove Tuesday, the company of saddlers at Chester presented "the drapers a wooden ball, embellished with flowers, and placed upon the point of a lance. This ceremony was performed in the presence of the mayor, at the cross in the Roody, an open place near the city; but this year" (1540), observes he, "the ball was changed into a silver bell, valued at three shillings and sixpence, or more, to be given to him who shall run best and furthest on horse-back before them on the same day, Shrove Tuesday. These bells were denominated St. George's bells; and we are told that, in the last year of James I., John Brereton, innkeeper, mayor of Chester, first caused the horses entered for this race, then called St. George's race, to start from the point beyond the new tower, and appointed them to run five times round the Roody;"—the winner of the last course winning the bell; whence the old saying, "to bear away the bell," and, perhaps, the origin of plate-racing. Newmarket was first made a favourite spot for turf exploits at the commencement of the reign of Charles I., and by that monarch also races were established in Hyde Park; he likewise altered the prize to a silver or gold cup instead of a bell. Cromwell kept up a stud, and devoted considerable pains to the improvement of horses, although the fanaticism of the times prevented the continuance of the race meetings. With the Restoration, however, all field sports received a fresh impetus; and amongst them the turf came in for even more than its fair share of encouragement, as Charles took it under his especial patronage. He sent his master of the horse to the Levant, in order to purchase brood mares and stallions, principally Barbs and Turks; and to these he devoted so much trouble and time, that the breed of race-horses became considerably improved. So enthusiastic was Charles in this, his favourite sport, that he entered his horses in his own name; and it is said that most of the present turf rules and regulations emanated from him. During the reigns of William III. and Anne, some royal patronage was given to the turf,—during the latter reign particularly, George, prince of Denmark, having imported several racing stallions, and being distinguished for the excellence of the stud which he kept up. Mr. Darley, also, in this reign, brought forward the claims of the Arabian horse; and to him we are indebted for the racers of unequalled beauty, strength, and speed, that we possess at the present era. George II. did little for racing, and the same may be said of George III.; but in the latter reign, however, great improvements were made, and Eclipse was one of the greatest ornaments of the turf. (*See* Horse.) From this celebrated racer the modern race-horses may be traced, as Eclipse is said to have been the sire of upwards of one hundred and sixty winning horses. So much for the history of racing: it is now time to enter into the theory and practice of the subject itself. The first thing which has to be attended to in the education of the racer, is "breaking in" the colt; and this is commenced generally when the animal is about twelve months old. The great points to be aimed at in this rudimentary system of education are, to command obedience and inspire confidence; for if these are not well grounded into the colt at an early age, his future career will meet with many obstacles. The application of the cavesson is the first active restraint applied to all colts, whether destined for the turf or not; but with racers the colts are generally "booted" first, in order to prevent them from rubbing their legs together whilst "lounging." The colt is bitted, and a long halter attached to the front part of the nose-strap, which the trainer holds in his hand, while a lad walks behind the animal with a whip, and urges him on by cracking it, without, however, whipping him. In three or four days, when they go boldly and freely at full length of the rein each way in the lounge, for fifteen or twenty minutes, having by degrees been brought to this pace and time of lounging, the mouthing-bits, rollers, and cruppers may be put on; and when the colt has become accustomed to them, the saddling him is the next step to be gained. For the first time this operation requires the greatest caution and care; the girths should not be drawn tight, and the stirrups should not be left hanging loose; while the "bearing up" of the bridle should be gradual, and "reining back" must not be too roughly pressed on the colt, by way of suppling his shoulders and giving sensation to the mouth. Mounting him should be only very carefully attempted, and when he seems to be quite at home, with the saddle on his back; and the colt should be familiar with the person who first essays to "back him." In Darvill's work *on Training*, it is truly stated that the giving a good mouth to the young racer must be thus undertaken:—"To accomplish it requires a light hand in the application of the pressure with the bit in the colt's mouth. It should be done by the rider's giving and taking by gentle pulls, and thereby keeping the colt's mouth alive to the pressure of the bit. The rider should occasionally gently press the calves of his legs and heels to the colt's sides, to urge him on and up to the bit, pulling him up, and letting him stand for a few moments, and then reining him back a little, and again moving him forward, teaching him to turn and go in any direction that may be required of him; treating him at the same time with kindness." It is only by patience and gentleness that the colt can thus be trained properly; and when the mouth is very hard, a check-rein is sometimes necessary. Colts must be early accustomed to crowds, and all sorts of noises and bustling, in order to obviate any tendency they may have to starting. Blaine, in the "Encyclopædia of Rural Sports," remarks that "the full breaking of horses, however, at periods so early as is now not uncommon, has laid the foundation of the deterioration

so complained of among the breeds in general. Nevertheless, as the habit is fixed, we also are forced to recommend that a very early handling of all colts may be a common practice. They should also, when yearlings, be accustomed to wear a head-stall, and, occasionally, a surcingle, that they may be led about, to inspire them with confidence, and teach them obedience. It would likewise be prudent to supple them thus early, by a little lounging in a circle; but, further than this, were the horses only concerned, we would not recommend; indeed, were the real welfare of our blood breeds consulted, instead of two-year olds being brought to the starting-post, none would appear there before they had seen at least four summers; and if five had passed over their heads, it would be better for themselves." The training of race-horses depends naturally on their age, condition, and constitution; and the processes by which they are rendered capable of racing vary accordingly. A four- or five-year old must be trained so as to be able to run a course of from two to four miles; therefore, such a horse must in his exercises be habituated to go, at a good telling pace, a much longer distance than that which he will be obliged to do when he comes to the post. If he be deprived of that good training made commensurate with the length of the course he will have to run, he cannot obviously be expected to continue at a winning pace any considerable distance. It is also highly important that he should have his training sweats and gallops carried up to the time of his going to the post. If he is a hearty-feeding horse, not a sweat must be lost, as, if so, he would be found to have superfluous flesh on the day of the race, which would consequently incapacitate him for his trial. The careful trainer will also calculate what flesh best supports a horse, some horses being able to perform well under a load, and others not, unless nearly skin and bone. According to the authority quoted, training exercises for race-horses are confined to walking, cantering, and galloping; trotting forming no part of turf practice. Early in the morning, the horses having been rubbed over and combed, each being mounted by a boy, the whole are ridden out of the stable in their body-clothes and hoods, into the stable-yard, where they continue to walk round and round as long as it is thought necessary to steady the colts, and settle the saddles to their backs, which it is very necessary to do, to prevent the vice of kicking from growing on them. In very bad weather, the court-yard is often the limit of their exercise; but at all other times, they proceed to the ground, or "tan gallop," where they walk for a longer or shorter period, in proportion to their fitness for light or strong work. Sweatings are important agents in training, as by this process the body of the horse is relieved from all unnecessary matter; they promote speed, by lightening the body, and give increased endurance, by clearing the air-vessels. The process by which this is done, is to envelop the horse in blankets and heavy clothes, and start him into a canter; after which he is stripped and rubbed down, and his clothes resumed. Racers are generally clipped once in the winter; but if their coats be extremely rough, the process is repeated a second time. So much for the horse itself; but as one or two other incidental circumstances are connected with horse-racing, the jockey may be mentioned next. According to Nimrod, he should "possess the following not every-day qualifications:—considerable bodily power in a very small compass; much personal intrepidity; a kind of habitual insensibility to provocation, bordering upon apathy, which no efforts of an opponent in a race can get the better of; and an habitual check to the tongue. Exclusive of the peril with which the actual race is attended, his profession lays a heavy tax on the constitution. The jockey must at all times work hard; but, the hardest of all tasks, he must work upon an empty stomach. During his preparation for the race, he must have the abstinence of an Asiatic; indeed, it too often happens, that at meals he can only be a spectator;—we mean during the period of his wasting. To sum up all, he has to work hard, and deprive himself of every comfort, risking his neck into the bargain,—and for what? Why, for five guineas if he wins, and three if he loses a race. The famous Pratt, the jockey of the no less famous Gimcrack, rode eleven races over the Beacon course in one day,





making, with returning to post on his back, a distance of eighty-eight miles in his saddle." In riding a race, the length which the man rides should be so regulated that he should be able to stand easily in his stirrups, so as not to be so much raised above the saddle that the bridle is required as a means of support. Just before a race commences, the horses are ushered forth from their stables, and brought up to the "paddock" with their clothes on, when the business of stripping and saddling is commenced; and few things take the eye of the spectator more than the smallness and lightness of the jockeys' saddles, some of which weigh barely two pounds. A four-pound saddle is generally preferred by light weights, although a seven-pound saddle is often the favourite with some race-riders. All racing saddles are made of the very best materials, in order to avert any evil consequences which might accrue both to the horse and his rider from the accidental slipping of a strap or the rupture of a girth, or similar casualties. The horses, after being saddled, are mounted by their jockeys, who take a preliminary canter to get them in heat for the forthcoming race. They are then pulled up and ranged in a line at the starting-post, from which they go off at the signal given by the starter, who drops a flag for the purpose. As some horses are restless and uneasy, a reasonable indulgence is given by the judge for "false starts," and the whole batch are called back to the post and started once more. In a short course, the speed is generally husbanded until the finish, when the jockeys go to work with spur and whip to make the most of their various chances. In a long race, however, of three or four miles, if a jockey is mounted on an aged horse, and the rest of the competitors on two- or three-year olds, he generally puts forth the best speed at first, in consequence of his own horse being able to last twice the distance that the others can; and when they are exhausted, he is able to go in to win, on account of the superior endurance of the animal which he bestrides. There are about 120 race-courses in Britain; of which, according to the "Racing Calendar," there are six in Wales, nine in Scotland, eight in Ireland, and the remainder in England. Newmarket bears away the palm as the metropolis of racing; and after that come Epsom, Ascot, York, Doncaster, and Goodwood, all of which are celebrated for important races run during the year. The Turf is governed by the rules and regulations which were first instituted in its interest, and over it presides a court of honour, termed the "Jockey Club," which annually elects the different stewards of races, and decides all disputes which may arise during the settlement of matches, wagers, and similar sporting matters.—*Steeple-chasing* or *-racing* ought to be characterized as a hybrid species between hunting and true racing, and thus, as is well remarked, it may be considered as a substitute for the hunter's stakes of the turf, without the tendency to become debased by the fraudulent manœuvres which have too often deteriorated the character of the turf. Until recently, steeple-chasing was confined to Ireland; but of late years it has obtained a recognized status amongst British sports, and is getting more and more a favourite with the gentlemen of the country. The ground is marked out the morning of the race, unknown to the competitors, and leaps and jumps are included in the course to be gone over.—*Hurdle-racing* is a species of steeple-chasing; but, the leaps being only over low flights of hurdles, it is not so dangerous, and consequently less exciting. Racing is now reduced nearly to a speculative concern, and it is incredible what sums have been lost and won in backing and betting against horses. The betting-rooms at Newmarket and at Tattersall's, at Hyde-Park corner, are the principal betting markets; but turf speculations in a minor degree extend over every town in England where a race-course is situated. (*See* HORSE, HORSEMANSHIP, and HUNTING.)

HORSERADISH. (*See* ARMORACIA.)

HORSE-RAKE, an agricultural tool, of the toothed kind, of various sizes and forms, used for different agricultural purposes, and worked by horses. The drag-rake, in its simplest form, is merely a long cross-head with a row of teeth placed in it. In some, these are straight; they are, however, generally bent, with their points projecting forwards. Rakes of this kind are

used on fallows, when foul, to remove the couch-grass, and act as a harrow in getting together the rubbish. In harvest time they are sometimes used as an ordinary rake, to collect the loose corn which may have escaped from the scythe or sickle.

HORTICULTURE, *hor'-te-kul-ture* (from Lat. *hortus*, a garden), that branch of knowledge which relates to the cultivation, multiplication, and amelioration of the vegetable kingdom. The principles upon which the art of horticulture depends are borrowed from the general sciences. For the facts and theories of vegetable physiology it is indebted to botany; for assistance in regard to the nature of soils and manures, to chemistry; and for a knowledge of many circumstances affecting garden labour, to meteorology. Until lately, horticulture was practised and treated superficially;—hence it advanced slowly. But in recent times it has progressed rapidly, since it has been placed on a strictly scientific basis; and a close adherence to the laws of vegetable physiology has taken the place of the prejudices of former times. In the article GARDENING will be found a history of that branch of rural economy, considered as an art of design and taste. In this article, the horticulture of Great Britain will be more particularly alluded to. The subject is divided into three classes;—the fruit, kitchen, and flower garden; the first two, however, usually occupy the same locality. In many works on horticulture, fruits and culinary vegetables are treated as inseparable; but it is best in practice, especially where high culture is attempted, to keep the kitchen-garden distinct from the fruit-garden. This systematic arrangement, however, applies more particularly to large establishments, where order and system are leading features. In forming gardens of this sort, great attention is required to the size and situation. Ground having a gentle inclination towards the south is considered very desirable. On such a slope the greatest possible benefit is derived from the sun's rays, and the process of draining is easily effected. Shelter is another object especially necessary. Either natural rising grounds, or masses of trees, supply the shelter required; but the latter should not be nearer than 150 or 200 feet. The purpose of such screens is to break the force of the winds. Water is one of the most important elements in vegetation, and it is "the life and soul of a garden." In form, gardens are generally either square or oblong, and ought to be protected by an outer boundary, formed by a sunk wall or ha-ha, surrounded by an invisible wire fence to exclude hares and rabbits, or by a hedge and low wire fence on its inner side. Peaches, apricots, hardy grapes, and most of the delicate French and Flemish pears, require walls for their production in this climate. Walls facing the south are set apart for the more tender kinds of fruit-trees, while the east and west walls are set apart for fruits of a more hardy character. These walls are made either of brick or stone, and some are heated by means of heated air or steam passing through flues constructed in the interior. A considerable portion of the wall facing south is usually covered in with glazed structures, called hothouses or forcing-houses. (*See* FORCING, HOTHOUSE.) In many cases, the houses for ornamental plants are attached to these; but their position is properly in the flower-garden. The principal operations in the fruit-garden are propagation, planting, training, and protection of the blossom. Fruit-trees are propagated by seed, by layers, by grafting, and by budding. The process of laying is not much used in horticulture; but is occasionally employed as the means of dwarfing trees. It is thus described by Lindley:—"Laying is nothing but striking from cuttings, which are still allowed to maintain their connection with the mother-plant by means of a portion at least of their stem." Apple and pear trees, and sometimes plum and cherry trees, are propagated by grafting. (*See* GRAFTING.) Most kinds of fruit-trees may be propagated by budding. The process consists in removing a portion of the bark from one tree and inserting it in a slit of the bark of another tree. A strong shoot is thrown out in the next spring, and to this the stock is headed down in the course of the summer. There are several other important divisions of this branch of horticulture; namely, the planting of fruit-trees and the training of standard and wall trees, and, lastly, the culture of fruits. Although the fruit and kitchen gardens afford the most useful occupation to the horticulturist, the cultivation of flowers affords the most pleasing. At first, it is probable that flowers were confined to small portions, or borders in a garden, as is still the case in many old places. But with the advancement of the art, separate departments have been allotted to them, under the name of flower-gardens. Two varieties of flower-gardens have prevailed in England; one in which the ground is turf, with a variety of patterns cut out of it, and planted with flowers and shrubs; and another where the flower-beds are separated by gravel walks, without any turf. Flower-gardens being objects of pleasure, taste must be the guide in laying them out. In all ages, flowers have been universally cherished. The ancients paid particular attention to them, and they were in great request at the entertainments of the wealthy. They were scattered before the triumphal cars of conquerors and formed the distinguishing symbol of many of the deities. At the present day, in Europe, every city has its flower-market for the sale of bouquets and ornamental plants. Botanical gardens, containing conservatories and hothouses, for the production and cultivation of delicate or rare flowers, are also to be found in connection with nearly every large town. The collection of flowers in the gardens and conservatories at Kew, in this country, is unsurpassed by any other in the world.—*Ref.* Lindley's *Theory and Practice of Horticulture*; Loudon's *Encyclopædia of Gardening*.

HOSANNA, *ho-zăh'-nà*, a shout in praise of God, or an invocation of blessings. In Hebrew, it literally means *save now*, and the Jews call their feast of Tabernacles the *Hosanna Rabba*,—in other words, the great Hosanna. Anthony Nebrissensis observes, after Rabbi Elias, that the Jews call the willow branches which they carry at the feast, *hosanna*, because they sing hosanna, shaking them everywhere. The word itself was used in all their prayers. According to Buxtorf, it meant, *save, I pray*.—*Ref.* Hook's *Church Dictionary*.

HOSEA, *ho-zē'-ă*, one of the canonical books of the Old Testament, and the first of the minor prophets. The prophecies of this writer are principally directed against the ten tribes before their captivity, and the tenour of the whole, while threatening them with punishments for their disobedience, shadows forth the advent of the Messiah, and the future stability and good fortune of the Church.

HOSIERY MANUFACTURE, *hō'-zhe-ă-re* (from Sax. *hos*, coverings for the legs).—The manufacture of stockings, or coverings for the feet and legs, forms a considerable portion of the commerce of this country. It is principally carried on in Derby, Leicester, and Nottingham. Silk goods are generally manufactured at Derby, woollen hosiery in Leicester, and cotton in Nottingham. Next to the common warp-and-weft loom, the stocking-frame is the oldest machine in existence applicable to textile fabrics. Its inventor was the Rev. William Lee, of St. John's College, Cambridge, who lived about the close of the 16th century. A considerable period elapsed, however, before his invention was adopted, as trunk hose were then much worn in this country by all classes who could afford such an article of apparel. Lee accordingly settled down in Normandy, and carried out his manufacture under the patronage of Henry IV. The assassination of the king, and other political events, occurred shortly afterwards, and Lee went to Paris, where he died in great poverty. The stocking-frame received little or no improvement in its form till comparatively very lately. Frames with a rotary motion, worked by steam, are now much used at Nottingham, by which much time and labour are saved. The working of one of these frames, in which twelve fashioned stockings are made at the same time, requires only the superintendence of one man and a boy: in the old frame it required one man to make a single stocking. The process of manufacture of hosiery is a peculiar kind of interlacing, being a series of loops or links in one continuous thread; it is not unlike several kinds of ladies' netting, or crochet-work. The completed work, after leaving the frame, is not a stocking, but a piece

of knitted-work cloth, which is afterwards sewn up into a stocking by means of a needle and thread. Hence three varieties of operatives are engaged in the manufacture of hosiery,—the winders, who put the thread into the machine; the frame-work knitters; and the seamers, who make the stockings out of the cloth produced. The winders are usually children; the knitters are men or women, who hire the winders and seamers; and the seamers are women. Many other articles besides stockings are made of the knitted fabric manufactured in the stocking-frame; amongst these may be reckoned gloves, drawers, pantaloons, caps, jackets, comforters, &c. The processes for worsted, cotton, and silk, are nearly similar; but the greatest care is required for silk articles. The exports of hosiery from this country are very considerable, but the trade finds much foreign competition, especially from Saxony. In 1877, the export of cotton stockings alone amounted to 1,020,000 pairs, the value of which was estimated at £312,000.

Hospital, *hos'-pit-ăl*, a name given to a building set apart for the purpose of receiving sick, infirm, and helpless persons; the building itself being endowed and supported by charity; from which source, also, medical attendance is provided gratuitously for the *in* and *out-patients*. The name hospital was generally given in early ages to all houses which were kept open for the reception of travellers; and many of the charitable endowments in England are distinguished by a similar title, and are incorporated bodies, consisting of a master and brethren, and occasionally other extraneous members: the name, however, is now restricted to the sense explained above, with a few exceptions; as the Foundling Hospital, for the reception of illegitimate children abandoned by their parents; Christ's Hospital, for the education and classical instruction of youth; Bethlehem and St. Luke's hospitals, for lunatics; and Chelsea and Greenwich hospitals, for the reception of aged and infirm soldiers and sailors. It cannot be surprising that need has been seen, in large cities, for these hospitals, in the true sense of the word; and London, perhaps, is better supplied in this respect than any other city in the world, not excepting Paris. Even at the earliest times they were known; and hospitals for the poor and sick may be deemed one of the greatest characteristics of Christianity. The first hospital for the sick is said to have been founded in the latter part of the 4th century. As early as the council of Nice, in A.D. 325, they are spoken of as commonly known. The first celebrated one which we read of was that endowed by the emperor Valens, at Cæsarea, about A.D. 370. In London there are many of these noble institutions, and they will be found noticed under their separate names; as Bartholomew's Hospital, Guy's Hospital, &c., nearly all of which are very wealthy, and are supported by endowments, apart from general charity. In Low's "Charities of London for 1862," it is stated that there are 14 general hospitals, making up 3,526 beds for in-patients, which, during the year 1861, received 32,109 in-patients, and had 399,146 out-patients under treatment. There are also 66 special institutions which come under the same heading, and which may be thus analyzed:—1 for Germans, 1 seamen, 1 Spaniards, 1 fever, 4 consumption, 8 lying-in, 4 diseases of women and children, 3 for sick children, 3 for incurables and paralytic, 3 small-pox and vaccination, 5 ophthalmic, 1 for diseases of the ear, 9 distortions and internal affections, 4 diseases of the skin, 3 convalescent asylums, 6 lunatic asylums, 1 idiot, 3 institutions for nurses, 1 homœopathic, 1 mesmeric, 1 dental, and 2 sea-bathing institutions. The total number, therefore, of hospitals and infirmaries receiving in-patients is 49; of which we find that three have been in operation 300 years, ten above 100 years, and seven from 50 to 100 years. One of the greatest characteristics of the London hospitals is a noble one, and that is, that they are open to the reception of accidents or urgent cases at all hours, *without letters of recommendation*. The construction of hospitals is a subject which has of late years much engaged the thoughts of architects, physicians, and sanitary reformers; and many systems have been proposed as emendations on the old opinions. The *pavilion* and *corridor* styles have been brought up in contrast; but it would be impossible in the present article to enter upon their different advantages. Suffice it to say, that hospitals for the sick should be well situated, thoroughly drained, soundly built, and not hemmed in by other buildings; and the rooms and galleries for the reception of the patients should be lofty, well lighted, and effectively ventilated.

Hospitallers, *hos'-pit-ăl-lerz*, in its original acceptation, a term applied to certain religious bodies, residing in *hospitals*, who held it their sacred duty to supply lodging and entertainment to all engaged in pilgrimages. One of the most celebrated of these was the institution of the Knights Hospitallers at Jerusalem. This was a well-known religious body instituted about the end of the 11th or beginning of the 12th century, and much favoured by Godfrey de Bouillon and his successor Baldwin, king of Jerusalem. At the commencement of the 12th century, it is stated that they came to England and had a house built for their order in Clerkenwell, and became more celebrated, with a greater share of importance attached to them, than any similar body in Europe. In costume, they followed the rule of St. Augustine, and wore a black habit with a white cross embroidered upon it. They were first termed Knights of St. John of Jerusalem, afterwards Knights of Rhodes, and latterly Knights of Malta; those two islands having been conferred upon them by different monarchs. The order was suppressed in England in the reign of Henry VIII.

Hospodar, *hos-po-dar'*, a title, called also Woiwode, borne by the princes of Moldavia and Walachia, who are invested with the authority of the Porte, whose lieutenants they are. The Porte also gives them a standard, and they are under his protection, and obliged to serve him. He can depose them at any time he likes; but, in other respects, they are esteemed as sovereigns in their own dominions. By the treaty between Russia and Turkey in 1829, these officers were appointed to hold their offices for life, and are obliged to pay a fixed annual tribute to the Porte. The present government of both the principalities of Moldavia and Walachia is vested in one *hospodar* alone. In consequence of some difficulties which arose with Turkey in 1861-62, these principalities may be now deemed almost independent.

Host, *hoast* (Ang.-Nor.; Lat. *hostia*, a victim), a term applied, in theological language, to the consecrated bread or wafer used by the Roman Catholic church in her celebration of the Eucharist. It is unleavened, thin, flat, and of circular form, and has certain mystic signs impressed on its surface. The host is supposed, after being blessed, to be no longer bread and wine, but to be transformed into the real body and blood of Christ. (*See* Transubstantiation.) In all Catholic countries the elevation of the host is a ceremony which is generally adopted at certain times and seasons, when the consecrated wafer is raised aloft and carried in procession through the churches and streets of the city, the people falling on their knees and worshipping it in its passage past them. This custom is said to have originated in the 12th century, when it was thought necessary to make this public and conspicuous declaration of the Eucharist, on the occasion of Berengarius promulgating his opinions against transubstantiation.

Hostage, *hos'-tij* (Ang.-Nor.; Lat. *hospes*, a guest), a person delivered to an enemy or hostile power as a pledge to secure the performance of a treaty, or stipulations of any kind, and on the conclusion of which the person is to be released. Formerly the custom of taking hostages was so common that it gave rise to many questions in the law of nations; but now it is almost unknown in the relations between civilized communities. Hostages were divided into two different classes,—principal and accessory; the latter being when it was expressly stipulated by the treaty that the hostage should be answerable for the event. One of the great points argued during the middle ages, in international law, was whether such a hostage could stake his life, and whether, if he did so, it was lawful to take the same. It has also been questioned whether a hostage could be delivered up against his will, although Grotius decides the question in the affirmative.

Hot-blast, *hot'-blast*, in Metall.—The mass of air passing through a blast-furnace is about six tons per

hour. *Of late years*, much time and expense have been saved by using air already heated by a separate furnace to 600° or 700°. By using the hot-blast, many varieties of air before useless have been brought into use; and although for some purposes hot-blast iron is not so much used as cold-blast, still the increase of the iron manufacture has been very great since the introduction of this system. (*See* IRON MANUFACTURE.)

HOTEL, *ho-tel'* (Fr.), a word which signifies, in its general sense, a large inn for the reception of strangers; but which, in a restricted sense, particularly in France, is identical with the word palace, or mansion, and it is applied to the residences of the emperor, nobility, or other persons of rank. In another sense it is nearly synonymous with the term hospital, and is applied to buildings set apart for the reception of sick and infirm paupers; as the Hôtel de Dieu, Hôtel des Invalides.—*Ref.* Brande's *Dictionary*.

HOTHOUSE, *hot'-house* (Sax *hat*, hot; *hus*, house), a term applied, in Hort., to a building constructed in a garden, or elsewhere, and warmed by artificial means, for the purpose of rearing exotics and other tender plants, which require more heat than our climate affords. Mr. Loudon, in his "Encyclopædia of Gardening," observes,—"The imitation of warm climates by hothouses must not be confounded with the art of forcing the vegetables of temperate climates into the premature production of their flowers or fruits. The former was the first object for which hothouses were erected; and conservatories, greenhouses, and plant-stoves existed in this country before any description of forcing-houses; even pineries are of subsequent introduction to botanic and ornamental hothouses. The various climates and constitutions of plants require atmospheres of different degrees of temperature and moisture." The three great principles on which the construction of hothouses naturally depends, are *heat*, *moisture*, and *light*. With regard to the first consideration, heat, the structure must provide enough of this article to raise the internal temperature of the building from that of the lowest degree of the exterior atmosphere of this climate to that of the highest which prevails for any length of time in the country of which the plants to be introduced into the hothouse are natives. Moisture, to arrive at our second consideration, is more difficult to maintain in the hothouse than heat, and it is vitally necessary to the plants that an adequate supply of it should at all times be present in the atmosphere of the building. It follows, therefore, that that mode of heating is best which admits of the greatest quantity of vapour remaining uncondensed in the atmosphere of the hothouse. Thirdly, light cannot be admitted too copiously into these structures, and the transparent medium through which it enters should be such as reflects the greatest proportion of the sun's rays, which impinge obliquely on its surface. Hot water has now superseded the old method of heating by dry flues, and by this improvement, the distribution of heat can be better regulated, and the uniformity of temperature better maintained, than by any other known means. Ventilation should also be so provided for in hothouses, that it may be sufficiently effective in preventing excess of heat, while, at the same time, it is perfectly at command, so as to be employed, when requisite, in the most limited degree. (*See* CONSERVATORY, FORCING, GREENHOUSE, HORTICULTURE.)

HOUND, *hownd* (Sax. *hund*), a name applied generally to different dogs used in hunting and other field sports. The characteristic of a hound is its long pendulous ears. The bloodhound would appear to be the origin of the other sub-varieties, which are mentioned in this work under their different names. England, not only from her climate, but also on account of the great care bestowed in the breeding and management of these animals, excels all other countries in her different breeds of hounds. (*See* BLOODHOUND, FOXHOUND, GREYHOUND, HARRIER, STAGHOUND, &c. &c.)

HOUR, *owr* (Fr. *heure*, Lat. *hora*), the name given to the twenty-fourth part of the space of time that elapses between two successive periods of midnight or midday, or the time during which the earth completes an entire revolution about its axis, and in which a complete apparent revolution of the sun through the heavens is effected. An hour, in angular measurement, is equivalent to 15 degrees of space, being the twenty-fourth part of 360 degrees. Thus the sun rises nearly an hour earlier at Prague, in Bohemia, than it does at London, because the former is nearly 15 degrees to the eastward of the latter. The hour is subdivided into 60 minutes in time, and each minute into 60 seconds.

HOUR CIRCLE.—The meridian of any place, or any great circle of the globe passing through the poles, is so called, because the hour of the day at any place can be ascertained, when the great circle on which the sun happens to be at that time is known.

HOUR-GLASS, *owr'-glăss*, an instrument which measures the passage of time by the running of fine sand from one glass vessel to another, through a very minute aperture. Instead of sand, dry egg-shells powdered are sometimes used. The quantity of sand is so proportioned as to measure different spaces of time; as an hour, half-hour, quarter, or minute; the last-mentioned being generally used at sea when "heaving the log," to ascertain the speed of the ship.

HOURIS, *how'-reez*, according to the Koran, virgins who are promised as one of the rewards of the blessed in Mahomet's paradise. From the description given in the book on which the Mohammedan faith is grounded, it appears that the *houris* surpass both pearls and rubies in their dazzling beauty; they are subject to no impurity; are always represented with dark eyes concealed by long jet eyelashes, the languishing glances of which they reserve for the voluptuous enjoyment of "true believers" alone. They are not created of clay like mortal women, but of pure musk, and are endowed with immortal youth, and every intellectual and corporeal charm. They dwell in green gardens, which are beautiful beyond what imagination can conceive, and they are always reclining on green cushions placed in fragrant bowers, where they await the advent of their possessors into Paradise. The name houris is derived from the Arabic *hûr al oyûn*, signifying *blackeyed*. Mahomet omitted nothing to render his heaven enjoyable to his disciples; and here he followed the traditions of the Hindoo religion, among which there is one concerning the paradise, called *behisht* and *menou*, which was furnished with *hurani beshisht*, or *blackeyed nymphs*, endowed with similar attractions to those which the houris possess.

HOUSE, *howse* (Ang.-Sax.).—In the widest acceptation of this term, it may be applied to any erection calculated to afford shelter to man or cattle, or protection to goods and stores; but in a more restricted sense, it is confined to the dwellings in which the middle classes of English society reside, in contradistinction to the more extensive palace, castle, or mansion, of the titled and wealthy on the one hand, and the little cottage of the artisan and labouring man, on the other. The first form of the house, considered generally as a dwelling, may be found in the conical huts and wigwams constructed by uncivilized nations. These consist chiefly of a simple framework of sticks, tied tightly together at the top, and covered with various materials, in accordance with the climate of the country in which they are erected. When implements and tools fit for hewing and shaping timber, and working stone, had been brought into use, and men had attained a degree of semi-civilization, the buildings that they reared were most probably somewhat similar to the rude block-houses formed by settlers in the colonies, and in the back woods of America, from which the transition to more durable abodes, built of brick and stone, but still of one story only in height, and covered with thatch supported on an inclined framework, would be rapid. The houses of the ancient Egyptians, and those of all eastern nations, in the early ages of the world, consisted of a series of contiguous apartments, opening into a central court, that was frequently adorned with shrubs and a fountain in the centre, and always separated from the street by a high blank wall with a single door in it, for the purpose of affording the means of ingress and egress to the inmates. The walls were built of sun-dried bricks, plastered over with stucco; the windows were small, the heat, rain, and wind being excluded by wooden shutters that moved on hinges; the floors were paved with stone, or formed of cement; and the roof, which was often used as a terrace on which the occupants of the building were accustomed to sit and walk in the cool of the morning

and evening, and even sleep during the sultry nights of summer, was flat, being formed of tiles and earth, supported on beams of timber, and of sufficient thickness to prevent the entrance of the rain. (*See* ASSYRIAN ARCHITECTURE.) When the house was two stories in height, the upper rooms were used as sitting-rooms and bedrooms, while the lower ones served as receptacles for grain and stores. The houses of the Greeks and Romans were built on a similar plan. In Greece, the dwelling-house was situated at the lower end of a court, which was entered from the street through a passage, on either side of which were stables and offices. It was generally two stories in height, the women occupying the upper rooms, and the men those on the ground floor. On this floor large chambers were also formed, one of which served as a work-room for the female part of the household, and the other as a common dining-hall. Round this hall, and opening into it, were apartments which were devoted to the accommodation of guests and strangers. The general arrangement of the houses of the Romans is described in the following page. (*See* HOUSE, ROMAN.) The method of construction adopted by the Greeks and Romans, the main feature of which was a central court with chambers opening into it on every side, was followed, with a few modifications, in all European countries during the middle ages. Entrance into an inner quadrangle was afforded by a large arched gateway in one of the sides; the parlours, kitchens, and living-rooms being placed round this square court on the ground floor, and the sleeping-rooms on the floor above, all opening into a cloister, or gallery, as in the *Tabard*, an old English hostel described by Chaucer in the "Canterbury Tales." In the houses of the mediæval period, the walls of the basement story were strongly built, to afford protection to the inmates against the attacks of robbers and personal foes. The shop and store-rooms, and sometimes the stables of the owner of the house, were to be found on this floor. The principal apartments were situated on the floor immediately above, to which access was gained by a small winding staircase, lighted by narrow windows in the wall, which could be defended by a single resolute swordsman against a score of hostile visitants. In France, Scotland, and Belgium, the houses were often many stories in height, and of great size. The roofs were high and steep, and a picturesque character was given to many of these old buildings by the peaked gables, which were often richly adorned by carved woodwork. Another peculiar feature in mediæval houses, that may be seen in Chester, Dartmouth, and other English towns possessing buildings of some antiquity, was the projection of one floor over that which was immediately below it; so that in a street in which the houses were of considerable height, the upper stories of the buildings on either side were only a few feet apart. There were no ceilings; the floors were generally dirty, even in houses that were occupied by the nobility and the higher classes; and the rooms were dark, the light being admitted through pieces of horn, or small diamond-shaped panes of ill-made glass, defective in transparency and commonly of a greenish hue. Although the houses of Italy, Holland, Belgium, and Flanders, that were built during the 12th and 13th centuries, are frequently marked by great architectural beauty externally, yet little improvement was made in domestic architecture in England, especially in the interior arrangements, until the reign of Elizabeth, when the architects of the day began to construct dwelling-houses with some regard to the locality in which they were situated, and the purposes for which they were specially required, and also in accordance with the tastes, habits, and pursuits of the persons for whom they were erected. (*See* ELIZABETHAN ARCHITECTURE.) The houses of the 18th century, consisting chiefly of large square piles of red brick, pierced with numerous windows in front and at the back, with a porch over the entrance, and a heavy slated roof projecting beyond the face of the walls, and supported by a bold but simple cornice, were roomy and comfortable, if not picturesque and ornate in appearance; but those of the Victorian age exhibit examples in which external elegance of structure is combined with judiciously contrived internal arrangements that tend to the comfort and convenience of the occupants in every respect. Practical details respecting house-building, and matters in immediate connection with it, are given elsewhere. (*See* BUILDING, DOMESTIC ARCHITECTURE, BRICKWORK, &c.)

HOUSEBREAKING. (*See* BURGLARY.)

HOUSEHOLD TROOPS, *howse'-hold*, that part of the British army which is distinguished as the Guards, or Household Troops, consists of three regiments of cavalry and three of infantry. Although they were originally raised as a body-guard for the sovereign, and a portion of them is always on duty in the vicinity of the residence of the queen at Windsor and in London, they have seen as much active service abroad as any regiment in the service. The three regiments of cavalry are called the 1st and 2nd regiments of Life Guards, and the Horse Guards, or Oxford Blues; and the three regiments of infantry are termed the 1st, or Grenadier Guards; the 2nd, or Coldstream Guards; and the 3rd, or Scots Fusilier Guards. The origin of the 1st and 2nd Life Guards is found in a body of eighty cavalier gentlemen who were enrolled as a corps, under the name of "Life Guards," for the protection of Charles II. against the attempts of the fanatics of the republican party, and the reckless and desperate Fifth-monarchy men, who openly avowed their intention of assassinating him. It was not, however, until June 25, 1788, that the 1st and 2nd regiments of Life Guards were embodied under this title by George III., being formed out of four troops of horse, two of which had been previously distinguished as Horse Grenadier Guards, and the remaining two as Life Guards. The Horse Guards, or Oxford Blues, as they were called to distinguish them from the Dutch guards introduced by William III., that were equipped in uniform of a similar colour, were originally raised in the time of the Commonwealth, as a body-guard for Oliver Cromwell, and were continued after his death as a guard to the parliament, and to General Monk when he became lord-general of the kingdom. Of the foot guards, the 1st, or Grenadier Guards, is first mentioned as a part of the British army, under the name of the 1st regiment of Foot Guards, in 1662. It originally consisted of a number of royalist gentlemen, who were enrolled as a regiment for service in Spain under the duke of York, afterwards James II., in 1657. It was not distinguished as the Grenadier Guards until after the battle of Waterloo, when the regiment was so styled in consequence of its having defeated the grenadiers of the French imperial guard in that battle. The Coldstream Guards were General Monk's own regiment of infantry, that had served under him during the civil war and the time of the Commonwealth, and which he had recruited and reorganized at Coldstream, a small town on the borders of Scotland, during his sojourn there in 1659, prior to marching thence to London to bring about the restoration of Charles II. to the throne of his ancestors. The Scots Fusilier Guards were probably embodied as a regiment at the same time as the Scots Life Guards, which were subsequently amalgamated with the English household cavalry. One troop of the Scots Life Guards were raised in Edinburgh, shortly after the accession of Charles II., to enforce episcopacy in Scotland, and to act as a guard to the Scottish parliament and the representatives of the king in Edinburgh. The regiment is first mentioned as a part of the British army in 1686; but it was not put on an equal footing with the 1st Foot Guards and Coldstream Guards until the union of England and Scotland in 1707. The value of a commission in the household troops is considerably more than that of a commission in the cavalry and infantry of the line; and officers of the Guards have the privilege of holding that rank in the army which is immediately above the grade which they occupy in their own regiments; an ensign in the Guards being styled lieutenant and ensign in his commission; and so on. The uniform of the Life Guards consists of a scarlet tunic, white breeches, and jack boots, with a polished steel corselet and helmet, with a white plume. The Horse Guards wear a blue tunic, and a red plume in the helmet, but are similar to the Life Guards in other respects. The Foot Guards wear scarlet with blue facings, and bearskins when in full dress. The regiments are distinguished by the

ornaments on the collar of the tunic,—the Grenadiers wearing a shell, the Coldstreams St. George's cross in red on a white field, and the Scots Fusiliers St. Andrew's cross, also in red on a white field. The soldiers of the different regiments may also be distinguished, when in undress, by the band worn round the cap; that worn by the Grenadier Guards being red, that of the Coldstream Guards white, and that of the Scots Fusiliers red and white cheque. The Life Guards and Horse Guards are armed with rifled carbines and swords, and the Foot Guards with the long Enfield rifle and bayonet.—*Ref.* Rafter's *Guards, or Household Troops of England.*

HOUSE-JOINING. (*See* JOINERY.)

HOUSE OF CORRECTION. (*See* PRISON.)

HOUSE, ROMAN.—The houses of the poorer classes in Rome were extremely simple in structure and plain in appearance. It is said that they were exactly the same in every respect in the later days of the empire as they were when the republic was established. They were built of earth and unbaked bricks, and were thatched with straw or reeds. They were not more than a single story in height, and an old drawing of a Roman cottage, a copy of which is given in Mazois' "Ruines de Pompéi," represents them as being circular in form, with a wide doorway in front, and an overhanging roof not unlike a mushroom in shape. The houses of the wealthy Romans, which were built of marble, and richly adorned with paintings and sculpture, exhibited a striking contrast to the hovels of the poorer citizens—"*pauperum tabernas*," as they are termed by Horace. Their general plan and character may be gathered from the houses that were discovered when excavations were made in 1755 and subsequent years on the site of the buried city of Pompeii, which was destroyed by an eruption of Mount Vesuvius in the year 79. A description of that which is known as the house of Pansa, which is more perfect than any other that has yet been cleared of the superincumbent mass of ashes and scoriæ, will serve to furnish some idea of the manner in which the best houses of Rome were constructed. That part of the house which faces the street is divided into a number of small shops of two stories in height, as it is supposed, which were let out for different purposes. A passage between two of the shops leads into an open court or *atrium* (*see* ATRIUM), which was surrounded on all sides with a covered gallery or cloister resembling a wide verandah. The servants' chambers, a summer dining-hall, or *tablinum*, and reception-rooms for the accommodation of persons who desired to see the owner of the mansion on business, are ranged round this court, which contains a tank of water in the centre. A passage by the side of the summer dining-hall leads into an inner court, also surrounded by a covered gallery, the roof of which was also supported on columns, and round which were placed the picture-gallery, the private dining-room, or *triclinium*, and the private apartments of the family.

HOWITZER, *how'-its-er* (Ger. *haubitze*, from *hänfen*, to fill), a kind of gun, from which large shot and shell may be thrown at short ranges. These guns are constructed in brass and iron. Brass howitzers form part of a field battery, and are used for firing shell to clear a village, or any similar position that it is necessary to occupy. They vary in length from 2 feet to 4 feet 9 inches, and will throw 4⅔-inch and 5½-inch shells. Iron howitzers, from 4 to 5 feet in length, which throw 8-inch and 10-inch shells, are used in sieges, especially for ricochet firing. Howitzers are longer than mortars, and shorter than guns of the same calibre; they require a small charge of powder, but the angle of elevation at which they are fired is high. They were first used in the British service about the end of the 17th century.

HOY, *hoy*, a small vessel, usually rigged as a sloop, and employed on the sea-coast for the transport of both passengers and goods. The marks of distinction between the vessel and some others of the same size cannot be easily described, as those which are called *hoys* in one place would be termed *sloops* or *smacks* in another; indeed, even those who navigate these vessels are said to have very vague notions of their distinguishing marks.

HUDSON'S BAY COMPANY, *hud'-sonz*, a company established for carrying on the fur-trade, to which Charles II., in 1670, granted a charter, empowering it to trade exclusively with the aborigines in and about Hudson's Bay. Prince Rupert was at the head of the Hudson's Bay Company, and as the fur-trade was then very lucrative, the association soon rose to prosperity. In the winter of 1783, a new company, calling itself the North-west Fur Company, was established at Montreal, and actively opposed the Hudson's Bay Company. The earl of Selkirk was then at the head of the old company, and conceived the plan of establishing a colony on the Red River of Lake Winnipeg. The North-west Company was jealous of this movement; and in consequence of the evil feelings arising out of opposing interests, a war broke out between the servants of the two companies. In this calamitous affair, many outrages and much barbarity were displayed. However, the companies wearied of the strife at last, and united under the name of the Hudson's Bay Fur Company, which at the present time engrosses most of the fur-trade of British America. The new company established factories and settlements in various parts; on the south, chiefly on the west coast of Labrador, in the countries inclosing James's Bay, and along the banks of Albany river. The principal settlements in the north are on Hayes river and on Mackenzie river. There are numerous smart-houses, besides these factories, dispersed in all directions for upwards of a thousand miles in the interior, to which the natives bring furs, skins, feathers, &c., in exchange for cloths, blankets, trinkets, &c.

HUE-AND-CRY, *hu-and-kri* (Fr. *huer*, to shout; *crier*, to cry aloud), in Law, a custom of ancient origin, and the common process employed in the pursuit of a felon or offender. It is a form of procedure that may be had recourse to by a person who has been robbed, or otherwise injured, to obtain possession of the culprit's person. Any individual, whether he is a constable, peace-officer, or private man, may concur in the pursuit raised upon a hue-and-cry, and may be justified in the apprehension of the party pursued, even though it should transpire that he is innocent, or that no felony has been committed. If a pursued party take refuge in a house, to which admission has been refused, the door may be broken open to secure him. If, however, a person wantonly and maliciously raise a hue-and-cry without cause, he is liable to fine and imprisonment, as well as to an action at the suit of the party injured. Although the term has, in a great degree, fallen into disuse, the process is still acknowledged by the English law, which allows that a hue-and-cry may be raised by a precept of a justice of the peace, and even by a private person, in the absence of the constable; but should the latter be accessible, it is the duty of the individual to make known to him the circumstances of the felony and the person of the culprit.—*Ref.* Wharton's *Law Lexicon*; *English Cyclopædia*—Arts and Sciences.

HUGUENOTS, *hu'-ge-nots*, a term of contempt formerly applied in France to the early followers of Luther and Calvin. The origin of the word is uncertain; but it is stated to be derived from *eidgenossen*, 'bound together by oath,' a term borrowed from the motto of the confederate cantons of Switzerland by certain inhabitants of Geneva, who were among the earliest to introduce reformed notions upon religion into France. The word has now fallen into disuse in the French language, the followers of Calvin being called Réformés, whilst the disciples of Luther are included, together with the former, under the generic appellation of Protestant. The history of the rise and progress of the Huguenots forms one of the chief chapters in the annals of France. For some time after their establishment as a sect, the Huguenots continued to increase in numbers, although they were troubled with occasional persecutions under the reigns of Francis I. and Henry II., until the year 1560, when they took part in the conspiracy of Amboise. By the edict of January, 1562, the right of free exercise of their religion was restored to them; but in truth this edict was worthless to them, and they were forced to rise *en masse* to save themselves from the persecutions of the government. The leaders were the Prince de Condé, Admiral Coligny; and, indeed, they numbered

amongst them some of the noblest and most influential houses in France. Although thus powerful, the wars of the 16th century soon decimated them, and they gradually lost ground under the continual aggressions of the Catholic body. After the conversion, or perversion, of Henry IV., most of the nobles abandoned the failing cause of the Huguenots. They, however, managed to sustain two civil wars against Louis XIII. in the following century. The history of the Protestant church in France then ceased to have any political bearing, and the name Huguenot itself soon passed out of ordinary use.

Hulk, *hulk* (Sax. *hulc*), a term applied to any old vessel which has been stripped of her masts, rigging, &c., and laid by as unfit for sea-service. They are employed for such uses as the raising sand or ballast, &c., or for accommodating a ship's company while their own vessel is under repair.

Hull, *hull* (Sax. *hul*).—The hull of a ship is her frame or body, exclusive of the masts, yards, sails, or rigging. The term is usually applied to vessels either before they have been rigged, &c., or after they have been stripped and dismantled.

Humanities, *hu-ma'-e-tees*, a term employed in modern European schools and colleges to signify polite literature, or grammar, rhetoric, and poetry, including the study of the ancient classics. The term is employed in opposition to philosophy and science. In a more restricted sense, it is used for philology. *Humanitas*, in classical Latin, has the secondary sense of erudition, learning; and *studia humaniora* is used by modern writers to signify belles-lettres, or elegant literature.

Humerus, *hu'-me-rus* (Lat.), a term in Surg., applied to the bone of the arm. It constitutes the first of the radiated system of bones of the anterior extremity in vertebrated animals, articulated with the scapula.

Humiriaceæ, *hu-mi-re-ai'-se-e*, in Bot., the *Hapirium* fam., a nat. ord. of *Dicotyledones*, sub-class *Thalamifloræ*, consisting of three genera and 18 species, all natives of tropical America. They are trees, or shrubs, with a balsamic juice. Their leaves are alternate, simple, corneous, and exstipulate. The calyx is 5-parted and imbricated. The petals are also imbricated, and 5 in number. There are 20 or more stamens, hypogynous and monadelphous; the anthers are 2-celled; the connective is elongated beyond the anther lobes. The ovary, which is superior, is usually surrounded by a disc; it is 5-celled, and has 1 or 2 suspended ovules in each cell, a simple style, and 5-lobed stigma. The fruit is drupaceous and 5-celled, except in instances where the number of cells is reduced by abortion. The seed has a narrow embryo, lying in fleshy albumen. From the incised stem of the species *Humirium floribundum*, a yellow liquid, called balsam of umiri, is obtained: this is said to resemble copaiba and balsam of Peru in its properties. Other species are said to yield useful balsamic liquids.

Humming-birds, or Trochilidæ, *hurd'-ming*, a family belonging to the tenuirostral tribe of the order *Passeres*. This family contains a great number of species, above 300 having been described, and they have been divided into many genera and sub-genera; in the last ornithological catalogue, amounting to no less than 76. The *Trochilidæ* include some of the smallest known birds, many of which are remarkable for the wonderful splendour of their plumage. In this one respect alone, neither pen nor pencil could convey any adequate idea of their dazzling lustre. They are active little birds, and from the structure of their frames, it is apparent that they were intended to pass most of their time on the wing. Their food consists of small insects, and perhaps the nectareous juices of flowers, which their tongue is beautifully fashioned for obtaining. This organ is very long, and can be darted out of the bill to a considerable length, by a sudden motion, like that of a spring. Their feet are small, generally dark-coloured, and in several species which live high up in mountainous regions, the tarsi are warmly protected with large white plumelets, giving them the appearance of having downy muffs on their legs. Their wings are very long and narrow, and they are, by means of the rapid motion given to them, able to balance themselves in the air, hovering round flowering shrubs and plants, probing their tubular nectaries, and at the same time emitting a pretty loud humming noise, caused by the concussion of their wings with the air; whence their English name "humming-birds." The *Trochilidæ* are very pugnacious little creatures, and defend their nests with the greatest courage against all intruders, even man himself. They are exclusively seen in the New World, of which they are natives; the Spaniards having first made us acquainted with them, from their invasion of Mexico. They are found from one extent of the vast continent of America to another, though in greatest abundance in the tropical parts, in the dells, and along the banks of the great rivers both of the North and South. Humming-birds are also found in great abundance in the West-India islands, where, also, some species may be seen which do not occur on the mainland. One of these in particular, termed the *Mellisuga humilis*, has a very sweet note, and is perhaps the only species of the family that has a real song. The male bird of this variety is about 2½ inches in length, and is exactly like an humble bee when darting about in the air. The nests of the humming-birds are wonderfully made with cotton, wool, and twigs, beautifully interwoven with feathers, and lined with down; and almost all the species lay two eggs, which in some cases are extraordinarily small. The genus *Trochilus*, from which the family takes its distinctive characteristics, contains but comparatively few varieties. The typical bird, the *Trochilus colubris*, or "ruby-throated humming-bird," is a beautiful species, about 3½ inches in length, the body glittering with green and gold, and the throat and chin glowing with a beautiful ruby-colour, like that of a live coal. The smallest species of all is the *Mellisuga minima*, which is only about one inch and a quarter in length, and which weighs but twenty grains.

Humour, *hu'-mor* (Lat. *humus*, the ground, because moisture was supposed to spring from the ground), in Surg., a general name for any fluid, but more especially applied to the fluids of the human body, and often to these in their morbid state. The term is used without any reference to disease, in speaking of the fluids of the eye. It is frequently used as synonymous with disposition, and in the time of Shakspere, the word was greatly abused by an indiscriminate application.

Humulus, *hu'-mu-lus* (from Lat. *humus*, the ground, as, unless trained or supported, it creeps on the earth), in Bot., the Hop, a gen. of the nat. ord. *Cannabinaceæ*. The common hop-plant, *H. lupulus*, has a perennial root and annual pliable stems, which twine from right to left around any convenient support. The leaves are opposite, rough, 3—5-lobed, serrated, and veiny. The male and female flowers are generally on separate plants. The former are in loose panicles; the latter in dense catkins or strobiles, with membranous concave bracts. The hops of commerce consist of the female flowers and seeds of this plant. Their principal consumption is in the manufacture of beer, and they possess three properties which particularly fit them for this use. First, they impart to malt liquors a pleasant bitter aromatic flavour and tonic properties. Second, they give them a peculiar *headiness*, often confounded with alcoholic strength, and thus save the brewer a certain proportion of his malt. Third, by their chemical influence they clarify the liquors and check their tendency to turn sour. Hop-plants grown from root-sets come to perfection in the third year from planting. They spring out of the ground about the end of April, and flower about the end of August. The strobiles are fit to gather from the beginning of September to the middle of October, the time varying according to the sort cultivated and the differences in the seasons. When picked, they are dried by artificial heat, in kilns, and then packed in bags or pockets.



HOPS.

Upon the bracts and scales are numerous little yellow shining grains, generally roundish or kidney-shaped. They have been termed *lupulinic glands*, and are believed to be the most active parts of the hops. Of the cultivated hop there are many varieties; but in the principal English hop counties,—Kent, Surrey, and Sussex, only about five varieties are extensively grown. These are thus described by Johnston:—"1. The *goldings*, grown chiefly in middle and east Kent. They delight in a rocky calcareous soil, or a rich friable loam. They thrive only in the most naturally fertile kinds of soil. 2. The *white-bines* are the favourites of Farnham and Canterbury. They require the same description of soil as the goldings, are very similar in their appearance and growth, and have nearly the same value in the market. The flower of the white-bines is considered to possess the most delicate flavour, while that of the goldings is thought by some brewers to have more strength. These two varieties are the most esteemed for the brewing of pale bitter ale. They both require very long poles, and on the average of years produce smaller crops than the coarser kind of hop. 3. The *Jones's* stand next in favour with the brewer. They will grow on inferior land; and as they require very short poles, and are pretty good croppers, they are in general favour with many growers in Kent. 4. The *grape* has many sub-varieties, and requires longer poles than the Jones's This variety delights in stiff heavy soils, after thorough drainage, and produces very heavy crops. Hence its prevalence in the Weald. It is commonly used for the ordinary sorts of beer. 5. The *Colegate* is a smaller variety of hop than the grape, but produces enormous crops in Sussex and the Weald of Kent. It is often surreptitiously passed off in the market as goldings; but it is greatly disliked by the brewers on account of the rankness of its flavour." The hops of Retford, in Nottinghamshire, are known in the market as *north clays*: they are said to be pre-eminent in rankness. The Worcester hops, grown on the red soils of the vale of the Severn, are, on the other hand, remarkable for their mild flavour; in this respect, indeed, they excel the Kent goldings. The Lancashire beer-drinker, who has acquired a taste for Worcester hops, does not relish beer hopped with Kentish, and contemptuously styles it "porter-ale." Worcester hops do not answer, however, for the best descriptions of pale ale, because they do not impart so fully the keeping quality. From fifty to sixty millions of pounds of hops have, of late years, been consumed annually in the United Kingdom. Hops are used medicinally for their stomachic and tonic properties. They are, to some extent, narcotic; and a pillow stuffed with them is occasionally employed to induce sleep. (*See* Ale, Brewing.)

Hundred, *hun'-dred* (Ang.-Sax.), a part or division of a shire; so called, either because, of old, each hundred found 100 fide-jussors or sureties of the king's peace, or 100 able-bodied men for his wars. By others it is supposed that the hundred originally consisted of 100 families. It seems, however, probable that the term had different significations in different parts of the country. Hundreds were first introduced into England by Alfred, king of the West Saxons. Divisions of a similar kind seem to have existed before in Denmark; and in France a regulation of a similar sort was made 200 years before, by Clothaire and Childebert, with the view of making each district answerable for the crimes therein committed. An institution very similar to that of the hundreds may be traced back to the ancient Germans, from whom were derived the Franks, who became masters of Gaul, and the Saxons, who settled in England. To each English hundred belonged a court. (*See* Court of the Hundred.) As a convenient method of reference, the division into hundreds is frequently made use of in acts of parliament.

Hundred-weight, one of the terms of Avoirdupois weight, and generally expressed by the abbreviation *cwt.* A hundred-weight contains 112 lbs., and is subdivided into 4 quarters, each, of course, containing 28 lb..

Hunger, *hung'-ger* (Sax.), a peculiar sensation experienced in the regions of the stomach, in consequence of the want of solid food. The sensation of hunger is at first rather agreeable, but it quickly becomes unpleasant, when prolonged. The sense of keen appetite is always delightful when there is a prospect of satisfying it; but that sinking in the stomach which ensues, soon changes from uneasiness to absolute pain, which rapidly becomes acute; and if aliment be still held back, the sensation produced is as if the stomach were being torn by pincers. A state of general exhaustion, feverishness, headache, light-headedness, often passing into madness, follows. The whole being seems absorbed in one desire, before which even maternal instinct has been known to give way, and mothers have disputed with their companions for the flesh of their dead infants. The physiological causes of hunger are not well understood, and great differences exist in the opinion of scientific men. In one sense, we may all be said to know what hunger is; in another sense, however, no man can enlighten us. We have all experienced it; but as yet science has been unable to furnish any sufficient explanations. Between the agreeable stimulus called appetite and the terrible agony of starvation there are infinite gradations. In all living organisms, *waste* and *repair* go on with an incessant and reciprocal activity. Not the slightest movement of the body occurs, not a thought passes through the brain, without some part of the substance of the body being sacrificed. Thus the body is like a furnace, in which the fuel is constantly burning; and hunger is the instinct which teaches us to replenish that furnace. But although the want of food causes hunger, it does not itself constitute hunger. Food may be absent without the sensation of hunger. Idiots and insane people frequently subject themselves to prolonged fasting without any hungry cravings. Violent emotions of grief or joy destroy the sense of hunger; and the sensation may be allayed by opium, tobacco, and even inorganic substances, such as clay, although none of these can supply the deficiency of food. In the case of those animals which remain torpid for a certain portion of the year, no food is taken, and no hunger experienced. (*See* Hybernation.) Want of food is, consequently, the primary, but not the proximate cause of hunger. A French philosopher made several experiments on the subject of inanition, according to which it appears that death from hunger occurs when the waste reaches 0·4; that is to say, supposing an animal to weigh 100 lbs., it will die when its weight is reduced by fasting to 60 lbs. Death may possibly occur before that stage, but life cannot exist after it. In the case of human beings, death arrives on the fifth or sixth day of total abstinence from food and drink; but much depends upon the peculiar constitution of the individual, his age, health, habits, &c. Some die on the second and third days; while others can survive ten, twelve, and even sixteen days! There are many records of protracted fasting, but nearly all of them are not well authenticated, and most of them are obviously fabulous. The aspect of a starving man is terrible. In the first place he grows excessively thin, and this thinness is not the leanness of lean men, but manifests itself by unmistakable emaciation. The face grows lividly pale, the cheeks sunken, and all the vitality of the body seems to be centred in the feverish brightness of the eyes. The pupil becomes dilated and fixed in a wild stare, which is never veiled by the eyelids. All movements of the body are slow and difficult; the hand trembles, the voice grows feeble, and the mind weak; while the poor sufferer, when asked what he feels, can only answer faintly that he is hungry. There is very little definite information to be gleaned concerning the agonies endured by starving men. Those who have undergone the horrors are seldom able to recount them. Goldsmith says that the captain of a wrecked vessel told him that "he was the only person who had not lost his senses when they received accidental relief. He assured me his pains at first were often so great as to be often tempted to eat a part of the men who died, and which the rest of his crew actually lived upon. He said that, during the continuance of this paroxysm, he found his pains insupportable, and was desirous, at one time, of anticipating that death which he thought was inevitable. But his pains gradually ceased after the *sixth* day (for they had water in the ship, which kept them alive so long), and then he was in a state rather of languor

than desire; nor did he much wish for food, except when he saw others eating. The latter part of the time, when his health was almost destroyed, a thousand strange images rose upon his mind, and every one of his senses began to bring him wrong information. When he was presented with food by the ship's company that took him up, he could not help looking at it with loathing, instead of desire; and it was not till after four days that his stomach was brought to its natural tone, when the violence of his appetite returned with a sort of canine eagerness." In other authentic cases, one fact is always dreadfully apparent; namely, that thirst is always far more terrible than hunger. (*See* THIRST.) According to popular belief, the sensation of hunger is caused by the emptiness of the stomach, which, in the opinion of some physiologists, allows the sides of the stomach to rub against each other, and the friction causes the sensation. This, however, is wrong, for hunger is always felt some time after the stomach is empty; and, as is well known, it may be empty for days together, as in illness, without any sensation of hunger. Another theory is that the gastric juice accumulates, and attacks the walls of the stomach. This, however, has been proved not to be the case. Dr. Beaumont, in America, who made many valuable observations on a patient who had a hole in his stomach, produced by a wound, accounts for hunger thus:—"During the hours of fasting, the gastric juice is being slowly secreted in the follicles, and retained in their tubes, thereby distending them; this distension, when moderate, produces the sensation of appetite, and when more powerful, of hunger." According to other writers, however, it would appear that hunger is related to the general state of the system, and also to the particular state of the stomach. The stomach of a fasting animal is pale, and in a state of obvious *atony*. No sooner, however, is food, or almost any irritant substance introduced, than the pale surface becomes visibly congested, turgescent, and its secretions pour forth abundantly. With this rush of blood, the sensation of hunger passes away. It is therefore argued that hunger is in some way dependent on the state of the circulation of the stomach.—Ref. *Blackwood's Magazine*, January, 1858,—Hunger and Thirst.

HUNS, and HUNNI, *hunz, hun'-ni*, names given by historians to several nomadic Scythian tribes, which devastated the Roman empire in the 5th century. They inhabited the plains of Tartary, near the boundaries of China, it would appear, many centuries before the Christian era; and they were known to the Chinese by the name of Hiongnu, and also Han. It was in order to put a stop to the continual aggressions of the Huns that the great wall of China was built; and after this the Huns split up into two separate nations, named respectively the Northern and the Southern Huns. The first-mentioned of these gradually went eastward to the Volga, where they encountered the Alanni, whom they defeated. Here the Huns remained for some two centuries; but, under the emperor Valens, they crossed the Bosphorus; afterwards invading Rome, under their leader Attila. After the death of Attila, the Huns broke up into separate tribes, and were driven back by the Goths beyond the Tanais. The Hungarians of the present day are the descendants of Huns, who once more immigrated into Europe. Gibbon, in his "Decline and Fall of the Roman Empire," gives a fine sketch of this nation, their manners and customs.

HUNTING, *hunt'-ing* (from SAX. *huntian*, to hunt), a favourite British sport, which seems to have been pursued even in the earliest times. The classics have many and full accounts as to the hunting of wild animals for pleasure; but the fox-hunting of the present day eclipses, in its hardihood and naive recklessness, all the chases which were prosecuted both by the Greeks and Romans. As leaping is incidental to hunting, being one of the paces of the horse, it had best be here described. The act of leaping "is performed by a sudden extension of all the articulations of the hinder extremities, immediately after they have undergone an unusual degree of flexion. This extension, communicating its impulse to the centre of gravity of the body, the whole is projected forward with a velocity determined by the force applied and the weight of the mass. The degree of projectile force depends on the proportional length and obliquity of the angles formed by the bones, and on the strength of the muscles which act on them; hence becomes apparent what has before been insisted on,—the necessity that hunters, as well as racers, should be so formed behind as at once to unite great strength with length. Nevertheless, it does not necessarily follow that a large horse only can take considerable leaps; for, *cæteris paribus*, small animals leap proportionately farther than large ones; for the projectile force impressed on two bodies being in proportion to their different magnitudes, their velocities will be equal, and the extent of the space through which they pass will necessarily depend upon their respective velocities. Thus a small horse with a light weight will frequently leap very considerable distances, and to a very considerable height; but from the greater extent of the angles, and the increased force obtained from larger muscles, it is obvious that a certain size is necessary to the hunter to cover high and wide leaps; and the necessity is also increased if much weight is to be carried. The direction of a leap depends on the situation of the centre of gravity with respect to the limbs by which the impulse is given: men and birds, having the trunk situated immediately over the impelling limbs, are the only animals that leap vertically. Hence, when a horse attempts a standing leap of considerable height, as a wall, high gate, &c., he raises himself almost perpendicularly, and the elevation of his body will always be found correspondent to the height of the object he is to leap over."—(Blaine's *Encyclopædia of Rural Sports*.) The hunter is trained nearly in a similar manner to the racer (*see* HORSE-RACING), with this alteration, that the object with the latter is to "keep the length in him," or, in other words, to insure a burst of speed when called upon; while the former is trained to exhibit stoutness and increased endurance, with a proportionately less degree of speed. The *seat* in the hunting-saddle stands next to that of the jockey in importance, as on it depends the whole success of the fox-hunter. He must not only be firm in the saddle, in order to prevent falling during the performance of the leaps which his horse takes, but must also so ride his hunter as to make the most of him, and not weary him out by holding him in too tightly, or working him unnecessarily. In an article on the subject in the "Encyclopædia Britannica," it is stated, that above all things he must acquire a firm, close, and *well-balanced* seat in his saddle, which is not merely necessary in leaping, but in galloping over every description of ground. A swagging seat in the last-mentioned act is sufficiently bad to make a great difference to a hunter in a severe chase; but when we picture a horse alighting on the ground, after having cleared a high fence, and his rider alighting two or three seconds after in his saddle, so far forward, perhaps, as to fall beyond the pillars of support, or backwards behind the centre of action, and the part (just behind the shoulders) which ought to form the junction between the rider and his horse, we can readily imagine how distressing it must be to him, and how much a large fence, so taken, must exhaust him, over and above what would be the case if he had had the assistance of a firm hand to support him on alighting; but which, however, with such a seat as described above, no man can possess. The first and chief requisite, therefore, for a person who follows hounds is the combination of a light hand with a firm seat, without which no one will ever be foremost in the field; and fortunate is it for his horse, as well as for himself, if he possess it to the degree required to constitute a fine horseman over a country. (The different varieties of dogs used in hunting will be found given under their respective names; as FOXHOUND, GREYHOUND, HARRIER, &c.) Hunting generally became an organized sport during the past century; and from the time that has elapsed from its introduction, many alterations have occurred in it. In old times stag-hunting was the true royal pastime, but now fox-hunting has usurped its place, and stag-hunting is now but comparatively rarely followed. A writer on the subject in the *Quarterly Review* observes:—"In no one instance has the modern varied from the ancient system of hunting more than in the hour of meeting in the morning. Our forefathers threw off the pack as soon as they could distinguish a stile from

a gate, or, in other words, as soon as they could see to ride to the hounds. Then it was that the hare was hunted to her form (*see* HARE) by the trail, and the fox to his kennel *by the drag*. Slow as this system would now be deemed, it was a grand treat to the real sportsman. What, in the language of the chase, is termed the 'tender-nosed hound' had an opportunity of displaying himself, to the inexpressible delight of his master; and to the field (that is, to the sportsmen who joined in the diversion) the pleasures of the day were enhanced by the moments of anticipation produced by the drag. As the scent grew warmer, the certainty of finding was confirmed, the music of the pack is increased, and, the game being up, away went the hounds 'in a crash.' Both *trail* and *drag* are at present but little thought of; hounds merely draw over ground most likely to hold the game they are in quest of; and thus, in a great measure, rely upon chance in coming across it; for if a challenge be heard, it can only be inferred that a fox has been on foot in the night, the scent being seldom sufficient to enable the hound to carry it up to his kennel. Advantages, however, as far as sport is concerned, attend the present hour of meeting in the field. Independently of the misery of riding many miles in the dark, which sportsmen of the early part of the last century were obliged to do, the game, when it is now aroused, is in a better state to encounter the great speed of modern hands, having had time to digest the food which it has partaken of in the night, previously to its being started. But it is only since the great increase of hares and foxes, that the aid of the trail and drag could be dispensed with, without the frequent recurrence of blank days, which now seldom happen." There are many technical terms connected with hunting which must be well known by the would-be sportsman. With regard to the *tails* of animals, that of the fox is called its *brush*, that of the deer, its *single*; while the feet of a fox are called *pads*, its face, the *mask* or *front*, and that of a deer, its *snout* or *nose*. With regard to the *numbers* of dogs, "we say a *brace* of greyhounds, but a *couple* of hounds; a *leash* of the former, but a *couple-and-half* of the latter. In true sporting phraseology, it is a *kennel* of foxhounds, a *pack* being thought more appropriate to harriers; but many crack sportsmen are nevertheless heard to talk of a *pack* of foxhounds in common parlance." When it is observed that hounds, in drawing a cover, hit the scent the reverse way, they are said to *draw amiss*. When the game is up, and the hounds scent it in the opposite direction to that which it is taking, they are then said to *run to the heel*, or *run to counter*. When they take a fresh scent, *i. e.*, go off on another trail to that on which they started, in consequence of the two scents crossing, they are said to *hunt change*. The terms *run mute* and *run riot* are also employed when they run without any cry, or are disobedient to the huntsman. In a fox-hunt, when the sportsmen are assembled, and the hounds enter the first cover, they are said to *throw off*, and when they carry the scent to a given point, and no longer stoop their noses to it, they are said to *throw up*. When the goodness of the scent enables the whole pack to *stream away* at the top of their speed, they often do not cry, or, in sporting phraseology, *throw a tongue*. When the hounds acknowledge the scent, however, by lifting their tongues freely, they are said to be in *full cry*. Every pack of hounds, besides the huntsman, should possess at least two *whippers-in*, one in order to turn the hounds when at fault, and the other to keep up those that are trailing off. The place where the hounds and sportsmen assemble is termed *the meet*. Every sportsman usually sends forward two hunters here, under charge of his groom, and he himself rides to cover on his hack. The advantage of having two horses consists in having a second to mount, should the run be long, and the first horse worn out. To foreigners, fox-hunting seems a most extraordinary hallucination on the part of Englishmen, that they should often risk their lives for the attainment of its paltry brush; but there is not any doubt that it was first instituted for the purpose of getting rid of the vermin which had been always the plague of the farmyard. Hare-hunting and coursing are not such hazardous sports as fox-hunting, and, consequently, are not much liked by sportsmen accustomed to the latter. With regard to hunting the stag, her majesty's stag-hounds meet during the season at Windsor; but as the game is usually *park-bred* or carted to the meet, not much dashing sport can be expected, like that which is met with in fox-hunting. (*See* STAGHOUND.)

HUON PINE. (*See* DACRYDIUM.)

HURRICANE, *hur'-re-kain* (Span. *huracan*), a most violent storm, generally accompanied by thunder and lightning, and distinguished from every other kind of tempest by the extreme violence of the wind, and by its sudden changes. Hurricanes occur most frequently in the East and West Indies, Mauritius, and some parts of China. The West-Indian hurricanes usually occur in the rainy season, during the month of August, and sometimes, but rarely, in July and September. It has been described as a sudden and violent storm of wind, rain, thunder, and lightning, attended with a furious swelling of the sea, and sometimes with an earthquake. The labour of many years is often destroyed by these storms; whole fields of sugar-cane are sometimes whirled into the air, and scattered over the face of the country; while the strongest forest trees are torn up by their roots and driven about like stubble. The houses of the inhabitant are no protection; for the roofs are blown off at the first blast, while the rain, which rises five feet in an hour, rushes upon them with an irresistible violence. These hurricanes occur with very little warning; but the Indians know certain signs by which they can always prognosticate the coming tempest.

HUSBAND AND WIFE, *huz'-band* (Ang.-Sax.), in Law, are in many respects regarded as in peculiar circumstances, and particular laws are in force regarding them. For most purposes they are looked upon as only one person, the legal existence of the woman being hidden or incorporated in that of her husband; whence she is called a *feme covert*, and her condition during marriage, her *coverture*. For this reason a man cannot grant anything to his wife directly, nor enter into covenant with her; for the grant would be to suppose her separate existence, and to covenant with her would only be to covenant with himself; but a husband may grant to his wife, by means of a trustee or releasee to uses, and he may bequeath anything to his wife by will, seeing that that cannot take effect till the coverture is determined by his death. The husband is bound by law to provide his wife with necessaries as much as himself; and if she contract debts for them, he is bound to pay them; but for anything beyond necessaries he is not chargeable. If a wife elopes, and lives with another man, the husband is not chargeable, even for necessaries, at least if the person who furnishes them is sufficiently apprised of her elopement. If a wife be indebted before her marriage, the husband is bound to pay the debt, for he has adopted her and her circumstances together. If the wife be injured in her person or property, she can bring no action for redress without her husband's concurrence, and in his name, as well as her own; neither can she be sued without making the husband a defendant, except where he may have abjured the realm, or been banished; for then he is dead in law. In criminal prosecutions, however, the wife may be indicted and punished separately; for the union is only a civil one. In the ecclesiastical courts, also, a woman may sue and be sued without her husband, and also in courts of equity, by means of what is called a next friend, where the interests of the two are adverse. Though in general the law considers man and wife as one person, yet there are some instances in which she is separately considered as inferior to him, and acting by his compulsion. Therefore, all deeds executed, and acts done by her during her coverture, are void, except in execution of a power; in which case she must be solely and secretly examined, to learn if her act be voluntary. She cannot by will devise lands to her husband, unless under special circumstances; for at the time of making it she is supposed to be under his coercion. In some felonies too, and other inferior crimes, committed by her through constraint of her husband, the law excuses her; but this does not extend to treason or murder. The law regards marriage in no other light than a civil contract, and as such, treats it as it does all other civil contracts; allowing it to be good and valid in all cases where the parties at the

time of making it were in the first place *willing* to contract; secondly, *able* to contract; and, lastly, actually *did* contract, in the proper forms and solemnities required by law. In general, all persons are able to contract marriage, unless they labour under some particular disabilities and incapacities. These are of two sorts: first, such as are canonical, and recognized by the ecclesiastical laws; as consanguinity, or relation by blood; affinity, or relation by marriage; precontract, and certain particular corporal infirmities: and second, such as are created or enforced by the municipal laws; as a prior marriage, want of age, want of reason, &c. Lastly, in order to make a good legal marriage, it must be performed in due form of law. (As regards the dissolution of marriage, *see* DIVORCE.)

HUSBANDRY. (*See* AGRICULTURE.)

HUSSARS, *huz-zarz'* (Hungarian *husz*, twenty; *ar*, pay), a term applied to certain well-known cavalry troops employed in all European armies. The name was first applied to the troops raised by the nobles of Hungary when Matthias Corvin made his appeal to them in 1458. Every twenty houses furnished one man to the troop,—hence the origin of the term. The modern hussar equipments are very light and elegant, and their arms consist of a sabre, a carbine, and a pair of pistols. There are at the present time thirteen regiments of hussars in the English army.

HUSSITES, *hus'-sites*, an appellation given to the followers of John Huss, the Bohemian reformer. The latter was condemned to be burnt alive along with his books, because he endeavoured to overthrow the Roman Catholic church; and the sentence was carried out in 1415, contrary to the promise of safety given him by the emperor Sigismund. The council of Constance, which examined him in his religious opinions, and condemned him so unjustly, basely held that the emperor was not bound to keep faith with a heretic. The Hussites, his followers, believed that the church consisted only of those predestinated to glory, and that the condemnation of the five-and-forty articles of Wycliffe was wicked and unreasonable. In his account of them, Morери adds that they partly afterwards subdivided (after the death of John Huss), and opposed both their bishops and secular princes in Bohemia, where, if we believe the word of our author, they were the occasion of great disorders and civil commotions in the 15th century, after which date not much more is heard of them in history.

HUSTINGS, *hus'-tings* (Sax. *hustinge*, a council-house), the principal and supreme court of the city of London, held before the lord-mayor and aldermen, in the Guildhall. This court is of great antiquity, as honourable mention is made of it in the laws of King Edward the Confessor. In the Hustings court, at the present day, the aldermen and four members of parliament are elected. Other cities and towns have also had a court of the same name; as Winchester, York, Lincoln, &c. In common language, the term hustings is applied to the booth or elevated platform on which candidates at a parliamentary election are nominated, and from which they address their constituents before the show of hands is taken.

HUTCHINSONIAN PHILOSOPHY, *hutsh-in-so'-ne-an*, a term applied to a system of philosophy first promulgated by John Hutchinson, in the early part of the 18th century. In 1724 he published a strange work, entitled "Moses' Principia," in which he endeavoured to disprove Sir Isaac Newton's doctrine of gravitation. Three years later he followed up his attack upon Newton, and quoted Scripture in proof of the existence of a *plenum*, in opposition to the doctrine of a *vacuum*. His views, although they have not been largely adopted, have found supporters in many able men, both in the Church of England and in dissenting bodies. The leading points of the Hutchinsonian philosophy are as follows:—that the Bible contains a complete and infallible system of natural history and philosophy, as well as of religion and theology. This, however, is not to be gathered from the ordinary translations, but from the Hebrew original. According to Hutchinson, Hebrew is the only complete and perfect form of speech, and was, on that account, chosen by the Almighty as his instrument of communicating with man. The Bible, however, is not to be interpreted according to the literal meaning of the words. The true is the typical sense, which can only be understood by a deep acquaintance with Hebrew etymology: and according to the theory, every root of that tongue contains hidden meanings, and symbolizes some recondite object. The Hutchinsonian theory rejects the received doctrines of gravitation, attraction, magnetism, and electricity, and denies the existence of a vacuum; while it maintains that the operations of nature are carried on by the three agents, fire, light, and spirit. These three agents are also considered to be merely a modification of one substance, the air; they are consequently held to be typical of the Trinity. This principle of symbolism is carried out through the whole of the Old Testament, and it is maintained that all the ceremonies of the ancient Jews shadowed forth the life and sufferings of Christ; and that the Jews, knowing this, observed these rites in the same manner and spirit as the followers of Christ afterwards obeyed and followed him. Two of the most distinguished upholders of the Hutchinsonian theory were Robert Spearman and Julius Bate, who superintended the third edition of Hutchinson's works.—**Ref.** *The Philosophical and Theological Works of the late truly learned John Hutchinson, Esq.*

HYACINTH, *hi'-a-sinth* (Lat. *hyacinthus*), a gen. of plants of the nat. ord. *Liliaceæ*. They are bulbous-rooted, with bell-shaped flower, 6-cleft perianth, and dry capsular fruit. The numerous and splendid varieties of the garden hyacinth (*H. orientalis*) have always been general favourites; and the fondness for these flowers in some countries almost amounts to a mania. It is a native of Persia, Asia Minor, and Syria, and is now naturalized in some parts of the south of Europe. It has broad linear leaves, with a raceme of many flowers. The colours of the cultivated hyacinth vary greatly, and are chiefly white, purple, and blue: many of them are double. The fragrance of the hyacinth is most powerful about eleven o'clock at night. In Holland more than 2,000 varieties have received distinct names, and the price of 1,000 florins has been given for a single plant. The environs of some of the Dutch towns present, through the profusion of these flowers, a gorgeous appearance. Hyacinth bulbs, planted in pots or grown in hyacinth-glasses, produce beautiful flowers.

HYÆNA, *hi-e'-nă* (Lat.), belonging to the *Hyænina*, a tribe of animals of the class *Mammalia*, order *Feræ*, and family *Feluæ*. According to naturalists, the hyænas are digitigrade animals, with more or less elongate limbs, and the body depressed posteriorly. The type of the family is the genus *Hyæna*, the species of which are characterized by the possession of four toes on each foot; thick, short, and blunt claws; and no small tubercular teeth in the lower jaw behind the molars. The dentition is regular; thirty-four teeth in number, eighteen in the upper and sixteen in the lower jaw. There are five molar teeth on each side in the upper jaw, and only four on each side in the lower. The dental formula is thus expressed:—

$$\text{Incisors } \frac{6}{6},\ \text{canines } \frac{1-1}{1-1},\ \text{molars } \frac{5-5}{4-4};\ \text{total}=34.$$

By the structure of their teeth, the hyænas are able to crush the bones of even the largest prey, and the muscles of their jaws and neck are so powerful, that it is almost impossible to take anything from them that they have seized. In habits they are less sanguinary than animals of a similar nature to themselves, and live more on dead prey, even preferring flesh that has become quite putrid. In general form they resemble the *Caninæ*, but are easily distinguished from them by reason of the obliquity of their bodies and their peculiar walk, which gives them the appearance of having their hind legs shorter than their fore ones; not that they are really so, as this results from their always being in a state of flexion. The muzzle is obtuse, like that of a dog, and the tongue rough and furry, like that of a cat. They are nocturnal animals, and are useful in eastern cities, where they act the part of scavengers, and carry off all refuse and decomposing bodies, during the night. Of the hyæna in ancient times many fabulous stories used to be related, which had not the slightest probable foundation. They were said to be hermaphrodites, changing their sex every year; also it was reported that if the shadow of their bodies fell on those

of dogs, it would render the latter dumb; and, finally, they were said to be able to imitate the voices of men, and to call them by name! The family of the hyænas are natives of Asia and Africa, and the common *Hyæna* (*vulgaris*), or *striped* hyæna (*Hyæna striata*), is the best known of the different species. This animal is of a yellowish-grey colour, and the skin is crossed by deep transverse black bands. From the neck along the back a long black mane, mottled with yellow hair, extends to the tail, while the ears are of a brown colour, and nearly naked, broad at the base, long and erect. Of solitary retiring habits, it is, however, easily tamed by man, and will thus become a faithful watch-dog. It is called the *strand wolf* by the inhabitants of the Cape of Good Hope, where a variety of it is found. The spotted hyæna of the Cape (*Crocuta maculata*), or tiger-wolf, is smaller than the last-mentioned animal, and is of a brownish-yellow colour, diversified with numerous dark brown or black spots. The remains of hyænas have been found in most tertiary formations over the greatest part of Europe, and one variety, that of the *Hyæna spelæa*, according to Cuvier's system, has been found in nearly every part of England.

Hybernation, *hi-ber-nai'-shun* (Lat. *hybernus*, wintry), a term applied to that state in which certain animals pass a portion of each year in a more or less complete suspension of their customary functions. As this is frequently observed during the severity of winter, it has been designated hybernation. In the tropics, however, the hottest and driest weather produces the same effect, and causes many reptiles, and some insectivorous animals, to pass into a state of torpidity or inactivity, till the rainy season commences. In fact, hybernation depends less upon the alternation of temperature than on the abstraction of the means of subsistence dependent upon it. The continued application of cold to some animals induces a suspension of their active faculties, and their hybernation may be dissolved by artificial heat: it is evident, however, that this state is not the consequence of a low temperature. Without hybernation, or some similar law, insectivorous animals, in high latitudes and tropical climates, could not exist. In complete hybernation, on the approach of the season, the animals retreat to their places of temporary concealment; there their vital functions begin to be more slowly performed; they cease to eat, breathe slower, until finally their respiration seems to be totally suspended. The movements of the heart become more and more languid, and are performed at longer intervals of time; the animal heat is much diminished; and, lastly, profound insensibility takes place. In this country the bat and the hedgehog present the best examples of hybernating animals. When the cold season sets in, and there are no insects in the air, and when other insects have burrowed into the earth or concealed themselves, the bat and the hedgehog would starve if it were not for their hybernation. The bat retreats to his cave, and suspends himself in a state of dormant existence; and the hedgehog creeps to his concealed nest, and sinks into deep repose. In some other European mammals the hybernation, though somewhat analogous, is not so complete. The dormouse, the squirrel, and the marmot, lay up stores of vegetable food in their winter retreats; but the insensibility in these animals is less profound, and the respiration never wholly suspended. During six months of torpidity, the Alpine marmot only makes 71,000 inspirations, while in its active state it makes 72,000 in forty-eight hours. The ordinary bear also passes a large portion of the winter in deep sleep without food. Many genera of the family *Mus* also exhibit the same peculiarity. All these animals become fat in the autumn, which appears to supply the waste of the system during hybernation. Snakes, lizards, toads, frogs, and other cold-blooded animals, remain in a complete state of torpor during the winter. The lips of frogs are glued together, and they lie buried in mud at the bottom of stagnant water. The snakes and lizards of North America are hybernating animals, as with us, but in warmer climates they are active throughout the year. Insectivorous birds are less subject to hybernation than mammals in cold climates, since they are able to migrate easily to regions where insect food can be procured.

Hybrid, *hi'-brid* (Gr. *hubris*, a mule), a mongrel produced, whether in plants or animals, by the impregnation of the female of one species, genus, or race, by the male belonging to a different family. The commonest sorts of hybrids are those which arise from the interconnection of different varieties of the same species; to notice which, the produce of the wild boar and domestic sow (*see* Hog) need only be mentioned. It is stated, in an article on the subject in Brande's Dictionary, that "specifical hybrids have been produced from the artificial fertilization, by Kœlreuter, of the *Nicotiana rustica* with the pollen of *Nicotiana paniculata*; and Schiek has demonstrated, by numerous observations, that a multitude of plants produce specifical hybrids in a state of nature." Yarrell, in his "History of British Birds," states that the siskin and goldfinch are often bred with the canary, the pheasant with the common fowl, the swan with the goose, and many other birds, too numerous to mention. Among mammalia, however, although hybrids have been produced, they are not very common, although some have been obtained from the intermixture of the lion and tiger, the dog and wolf, and the horse and ass, the latter being extremely useful, and termed "the mule." Hybrids are generally sterile, and the intermixture of different species, according to Owen, is guarded against by the aversion of two specifically different individuals to sexual union.

Hydarthrus, *hi-d'r'-thrus* (Gr. *hudor*, water; *arthron*, a joint), a white swelling. The joints most subject to this disease are the knee, ankle, elbow, and wrist. At first the swelling is slight, of the same colour as the skin, but very painful, diminishing the mobility of the part affected. It can be distinguished from rheumatic swelling of the joints by its fixed and wearing pain, which often exists for a long time before any enlargement of the part is perceptible.

Hydatid, *hi'-dat-id* (Gr. *hudatis*, a vesicle, from *hudor*, water), a term applied rather vaguely to various cyst-like productions, which are sometimes found in the bodies of men and animals. Under the common denomination of hydatids, are included several very dissimilar objects. First, several species of entozoa, or parasitic animals, which have a distinct and separate vitality; secondly, simple unattached cysts; and thirdly, vesicular bodies, either wholly or partially connected with the tissues surrounding them. In 1680, Hartman first discovered that many of the bodies, or cyst-like tumours, were distinct parasitic animals. The discovery excited little attention till Linnæus and Pallas took up the investigation. Since that time the subject has been studied by many eminent naturalists. Hydatids are principally found in the bodies of mammals, and rarely in those of the lower animals. They occur in any part of the body, but are seldom met with in the mucous cavities and passages. The fluid which fills the proper cyst of a hydatid is nearly always colourless and limpid. The cysticercus, the cœnurus, and the echinococcus, are the principal forms of cystic entozoa recognized. The first of these is often generated in the disease of sheep called "the rot." Another species affects the hog, and produces the disease called leprosy, or measles. The *Polycephalus ovinus*, another hydatid of this kind, is found in the brain of sheep, oxen, and other ruminating animals. They occur frequently in one of the lateral ventricles of the brain of sheep, where they occasion a kind of giddiness, causing the animal to turn round and round in one direction. This disease is sometimes called "the staggers" in England. The treatment in all cases, for the prevention or removal of hydatids, is very imperfect. They generally occur in a disordered state of health; consequently, the best remedies are those which are likely to remove that state and improve the general health.

Hydnocarpus, *hid-no-kar'-pus* (Gr. *huduon*, tubercle; *karpos*, fruit), in Bot., a gen. of the nat. ord. *Pangiaceæ*, consisting of arborescent unisexual plants, found in the hotter parts of India. The species *H. venenatus* has a poisonous fruit, which is used for stupefying fish. The seeds of *H. odoratus*, commonly termed *Chaulmoogra*, are employed by the Indian doctors as a remedy in some cutaneous affections.

Hydra, *hi'-dra* (Gr. *hudra*, the water-snake), a constellation in the northern hemisphere, formed by Aratus. It is figured on the celestial globe as a snake of great

length, with a cup on its back, and a crow between the cup and the extremity of the tail. As it extends over such a great space in the field of the heavens, it has been divided into four parts, distinguished as *Hydra*, *Hydra* and *Crater* (the cup), *Hydra* and *Corvus* (the crow), and *Hydræ continuatio*, or the continuation of Hydra. The largest star in the entire constellation is of the second magnitude, and is found in the part termed Hydra.

Hydracids, *hi-drās'-sidz* (Gr. *hudor*, water, and acid), in Chem., acids in which hydrogen is the acidifying principle. In the first days of modern chemical discovery, oxygen was thought to be the only acidifying principle,—hence its name; but the experiments of Davy on chlorine proved that certain bodies, such as chlorine and fluorine, entered into combination with hydrogen, forming with it acids similar in composition to those formed from oxygen. (*See* also Salts.) The principal hydracids are the hydrochloric, hydrobromic, hydriodic, and hydrofluoric.

Hydragogue, *hi'-drā-gog* (Gr. *hudor*, water; *ago*, I expel), a term applied in Med. to violent cathartics, which bring away a large quantity of watery secretion from the intestines.

Hydrangeaceæ, *hi-drăn-je-ai'-se-e* (Gr. *hudor*, water; *aggeion*, vessel), in Bot., the *Hydrangea* fam., a nat. ord. of *Dicotyledones*, in the sub-class *Calycifloræ*. It is often regarded as a sub-ord. of *Saxifragaceæ*, with which it agrees in many important particulars; but it differs from that order in the plants composing it being of a shrubby nature; in their having opposite leaves, which are always exstipulate; and in having frequently more than two carpels, with a corresponding increase in the number of styles and cells to the ovary. About one-half of the species are natives of China and Japan. The typical genus *Hydrangea* contains some familiar cultivated plants; as *H. arborescens*, *quercifolia*, and *hortensis*. The latter is the common garden hydrangea, which is much valued for its large fresh-looking leaves and dense bunches of rose-coloured, white, or blue flowers. This plant requires a constant supply of water in warm weather. The leaves of *H. Thunbergii* form the *Ama-tsjâ*, or tea of heaven, of the Japanese. The root of *H. arborescens* is used medicinally in calculus complaints in some parts of North America, under the name of Leven bark.

Hydrargyrum, *hi-drar'-je-rum* (Lat.), quicksilver, or mercury. (*See* Mercury.)

Hydrastis, *hi-drăs'-tis* (fr. Gr. *hudor*, water), in Bot., a gen. of the nat. ord. *Ranunculaceæ*. One species only is known, namely *H. canadensis*, the golden seal, orange root, or ground raspberry. This is a low perennial herb, indigenous to North America. Its rhizome, or root-stock, sends up, in early spring, a simple stem, from six inches to a foot high, which is two-leaved near the summit, and bears a single terminal greenish-white or rose-coloured flower. The fruit is of a red colour, and somewhat resembles an unripe raspberry. This little plant has of late attracted much attention, and almost every well-known pharmacologist has written upon its medicinal properties. Two active principles, *hydrastina* and *berberine*, have been extracted from the rhizome. Another preparation, called *hydrastin*, is much used by the medical men of America, who style themselves *Eclectics*; it is procured by the solvent action of alcohol. The preparations of *H. canadensis* are stated to have a specific influence over the mucous surfaces, and to be useful in gonorrhœa, gleet, dyspepsia, piles, constipation, ophthalmia, catarrh, and various other diseases. There can be no doubt as to the valuable tonic properties of this plant. The rhizome may be used as a dyeing agent.

Hydrates, *hi'-drāts* (from Gr. *hudor*, water), in Chem.—In combination with certain metallic oxides, water seems to play the part of an acid, forming a compound that may be considered as a pseudo salt. Thus, with oxide of sodium water forms the compound $NaOHO$, or hydrate of soda, which is quite a different body to the simple $NaO$; in fact, such is the attraction existing between the two bodies, that they cannot be separated by the strongest heat. The hydrated oxides of the heavy metals also differ in properties to the anhydrous oxides; sesquioxide of chromium, for instance, is not attacked by any of the acids, even with the aid of heat, but in the hydrated condition it is readily soluble in most of them. The combination of water with the oxides is always attended with the evolution of a large amount of heat; a familiar instance of which takes place in the slaking of lime. In the case of oxide of potassium and sodium, the action is so violent that the mass becomes incandescent.

Hydraulic Engineering, *hi-drawl'-ik* (Gr. *hudor*, water; *aulos*, a pipe), that branch of engineering which treats of the appliance of water as a motive power for mechanical purposes, and the methods that must be adopted to offer an effective resistance to the pressure which is exercised by any great volume of that fluid, whether it be in a state of rest or in motion. A knowledge of hydraulic engineering enables the civil engineer to take proper precautions in forming the foundations of the piers of bridges, and raising embankments, either to check the influx of the ocean or to prevent a river from overflowing its banks. An intimate acquaintance with this branch of engineering is also necessary in constructing canals, docks, piers, &c., building lighthouses, sinking wells, conveying water from a distance for supplying towns or irrigating land, and for planning and carrying out the drainage of any district by the formation of sewers and the various works in connection with them.

Hydraulic Lime, in Chem. — Ordinary mortar, when placed in water, softens, and the lime gradually dissolves; it is therefore useless for subaqueous purposes. Lime, however, which contains a small amount of silica and alumina forms a mortar which hardens under water. Of this character is the porous material found at Puzzuoli, near Naples, which converts lime into hydraulic lime. Roman and Portland cement are made of lime burnt from an intimate mixture of chalk and clay at a carefully-regulated temperature.

Hydraulic Press, a machine by means of which an intense pressure can be applied by the agency of water. The principle on which it acts is founded on one of the fundamental laws of hydrostatics, that any non-elastic fluid, such as water, possesses the property of transmitting pressure exerted against it at any point equally in every direction. Hydraulic presses are used for reducing such substances as hay, wool, and cotton, and all goods that will bear compression without injury, into bales and packages of convenient size for conveyance by vessel. The machine consists of two cylinders, one of which is considerably larger than the other in diameter, which are connected by a small pipe that enters the larger cylinder at the bottom and the smaller one near the top. A ram works vertically through a water-tight collar in the upper end of the larger cylinder, and exerts a pressure upwards; and a plunger, or solid piston, works upwards and downwards in the smaller one, like the bucker of a pump. The bottom of the lesser cylinder is connected with a tank, and water is drawn into it through a valve opening upwards when the piston rises in the cylinder. When it descends again, the valve through which the water has been admitted closes, and the water is forced through another valve in the small pipe that connects the cylinders, into the larger one. At each successive stroke of the piston, water is driven into the larger cylinder, and the ram, being forced upwards by the pressure, transmits the force to the bed of the press placed above it, and compresses any substance that has been placed within the press. As every square inch of the area of the lower end of the ram receives exactly the same pressure upwards as may be directed downwards on every square inch of the sectional area of the plunger, it is manifest that the pressure exerted will be in proportion to the relative extent of the sectional areas of the piston and ram. Thus, if the sectional area of the ram be ten times as great as that of the piston, an upward pressure will be exerted by it equal to ten times the downward pressure exerted on the piston; but the larger the sectional area of the ram, that of the piston remaining unchanged, the more slowly it will rise in the cylinder, or, in other words, if the sectional area of the ram be ten times as great as that of the piston, it will rise $\frac{1}{10}$th of an inch for each inch through which the piston falls in its descent; and if it be twenty times as great, it will only rise $\frac{1}{20}$th of an inch for each inch through which the piston moves in a downward direction; for the volume of water displaced by the piston in each

inch of its descent will be distributed over the whole superficial extent of the sectional area of the ram, and will manifestly become less in depth as the area over which it is distributed is increased in size. The invention of the hydraulic press is due to Blaise Pascal, but it was first made available for the purpose for which it is used by Bramah, who prevented the escape of the water from the cylinder in which the ram works by causing it to move through a water-tight collar, for which he took out a patent.

Hydraulic Ram, a hydro-dynamic machine of simple and beautiful construction, invented by Montgolfier at the close of the last century. Its object is to raise water without the aid of any other force than that produced by the *momentum* or moving force of a part of the water that is to be raised. The effect of its action is so great, that the machine appears to act in opposition to the laws of hydrostatic equilibrium; for a moving column of water is made to overcome and move another column much higher than itself. The Ram itself consists, independently of the cistern, of a pipe, which carries the water to the working part of the machine, or *head* of the ram. This portion is composed of a short tube, at the end and upper part of which are two valves,—the ascension-valve and the stop-valve. The extremity ends in a receiver, filled in the upper part with air, and in the lower part with water, and communicating directly with the ascension-tube. The action of the ram is as follows:—The stop-valve being open and the ascension-valve shut, the water from the cistern passes out through the stop-valve. By this means the water passes from the cistern with increasing velocity, until at last the power of the current closes the stop-valve. The force which the water has acquired being thus momentarily checked, re-acts upon the ascension-valve, which is opened, and a quantity of water is forced into the air-vessel. The compressed air in this receiver, reacting upon the surface of the contained water, closes the ascension-valve, and forces the water up the ascension-tube. In the mean time, the stop-valve naturally opens again, and the same process is repeated. Hence, the hydraulic ram, when once set in motion with a continual supply of water, will work by the momentum generated and destroyed for any length of time, if kept in repair.

Hydraulics, that portion of Natural Philosophy which treats of fluids in motion and the methods by which useful results are obtained from them. (*See* Hydrodynamics; and for the application of hydraulic power, *see* Hydraulic Press, Hydraulic Ram, Archimedean Screw, Pump, Syphon, Waterwheel, &c.)

Hydrides, *hi'-dr'lz*, in Chem., compounds formed of metals and hydrogen. Only three metallic hydrides are known at present,—the hydrides of arsenic, tellurium, and antimony. The organic hydrides are of great importance. (*See* Hydrocarbons.)

Hydriodic Acid, *hid-re-od'-ik*, in Chem., symbol HI, equivalent 128, spec. grav. 4·443, combining volume 4,—a colourless acid gas, formed by heating iodine in hydrogen. It fumes in the air, and is very soluble in water, and possesses a pungent irritating odour. It is generally prepared for use by placing in a small retort 10 parts of iodide of potassium, 5 of water, and 20 of iodine. One part of phosphorus cut into small pieces is then dropped in cautiously, and a gentle heat causes the gas to be eliminated abundantly. It may be collected by displacement in dry bottles; but water absorbs it with great avidity. This gas does not support combustion, and is not combustible itself. It may be liquefied, under strong pressure, into a yellow liquid, which freezes at −60° Fahr. Solution of hydriodic acid gas in water may be concentrated by evaporation until it acquires a density of 1·7, when it may be distilled unchanged at 262°. With the metals, hydriodic acid forms iodides.

Hydrobromic Acid, *hi'-dro-bro'-mik*, in Chem., symbol HBr, equivalent 81, spec. grav. 2·71, combining volume 4.—Hydrobromic acid is a compound of bromine and hydrogen, formed when bromide of potassium is decomposed by a concentrated solution of phosphoric acid. It is a colourless, uninflammable gas, and a non-supporter of combustion. It produces a powerfully irritating effect on the lungs, and is readily absorbed by water to the extent of 47 per cent.



of the gas. With the metallic oxides it forms the bromide of the metal and water. The concentrated solution may be distilled at 259° Fahr. without change.

Hydrocarbons, *hi'-dro-kar'-bonz*, in Chem.—The hydrocarbons, in organic chemistry, fall into three groups:—1. Those of the general formula $C_nH_n$, which are homologous with olefiant gas, $C_4H_4$; 2. those of the general formula $C_nH_{n+1}$, $C_nH_{n+3}$, which are called alcohol radicles; and 3. those of the general formula $C_nH_{n+2}$, which are homologous with marsh gas, $C_2H_4$. The following table of a few of these important bodies will give a general idea of their constitution:—

*Olefiant gas series* ($C_nH_n$).

| | |
|---|---|
| Methylene | $C_2H_2$ |
| Olefiant gas (ethylene) | $C_4H_4$ |
| Tritylene (propylene) | $C_6H_6$ |
| Hexylene (caproylene) | $C_{12}H_{12}$ |
| Cetylene | $C_{32}H_{32}$ |

*Alcohol radicles* ($C_nH_{n+1}$, $C_nH_{n+3}$).

| | |
|---|---|
| Methyl | $C_2H_3$, $C_2H_5$ |
| Ethyl | $C_4H_5$, $C_4H_7$ |
| Tetryl (butyl) | $C_8H_9$, $C_8H_{11}$ |
| Hexyl | $C_{12}H_{13}$, $C_{12}H_{15}$ |
| Octyl (capryl) | $C_{16}H_{17}$, $C_{16}H_{19}$ |

*Hydrides of the alcohol radicles, or marsh gas series* ($C_nH_{n+2}$).

| | |
|---|---|
| Marsh gas (hydride of methyl) | $C_2H_3$, H |
| Hydride of ethyl | $C_4H_5H$ |
| Hydride of tetryl | $C_8H_9H$ |

Besides these, there is an extensive series of double hydrocarbon radicles, formed by the combination of two alcohol radicles. Thus we have ethyl-tetryl, methyl-ethyl, and so on. Discoveries in relation to the hydrocarbons are being made so frequently, that in order to gain a correct knowledge of the subject, it is necessary to read the current chemical journals of the day.

Hydrocephalus, *hi-dro-sef'-a-lus* (Gr. *hudor*, water; *kephale*, the head), in Med., is a term applied to dropsy, or water in the head. Physicians distinguish it into two kinds,—the acute and chronic, both of which are almost exclusively confined to infancy and childhood. Acute hydrocephalus is an inflammatory disease, rapid in its course, and requiring decided treatment; chronic hydrocephalus, on the other hand, may go on for many years. In acute hydrocephalus, the child is usually restless and fretful, the skin is hot and dry, the pulse quickened, the appetite is lost, and the bowels costive. The eyes are dull and heavy, the face flushed, and the child complains of pain and heaviness of the head. After a time, the symptoms become more manifest. The pain in the head becomes more intense, the restlessness is much increased, the expression of the countenance is altered, especially that of the eyes, which are often directed irregularly, with the pupils unequally dilated. The appetite is lost, and sometimes there is vomiting. The sleep is very much disturbed, and frequently the child awakes with a loud scream; the pulse is low and irregular, and frequently convulsions take place. The disease often proves fatal in two or three days, or even less; but sometimes it is protracted over two or three weeks, depending chiefly upon the age and strength of the child and the violence of the disease. The treatment of this disease must necessarily depend upon the strength and condition of the patient, the great object being to subdue the inflammatory action of the brain. Blood is to be freely abstracted by leeches, and some recommend the free use of the lancet. Active purgatives are also to be administered. When the active symptoms of the disease have been overcome, the system is to be gradually restored by tonics, cautiously administered. Chronic hydrocephalus differs from the other, not only in its progress being much slower, but from being rarely, or only slightly, attended with inflammation, and from there being always more or less of a collection of watery fluid in the brain, which is not invariably the case with the former. The chronic form is frequently hereditary, occurring in the children of weak or scrofulous parents, and it usually makes its appearance before, or speedily after birth. The fluid sometimes amounts to many pints, giving the head a very large and unsightly appearance. The fluid is

sometimes lodged in the membranes enveloping the brain, but more frequently it is contained in the ventricles, and other cavities of that organ itself. This disease is always attended with more or less of intellectual derangement. The vision is usually considerably impaired, with squinting; speech is imperfect, and the power over the voluntary muscles is partially lost. These symptoms gradually increase, convulsions and paralysis at length make their appearance, and death at last supervenes. The duration of the disease is extremely various; sometimes it may terminate fatally in a few months, at other times it may go on for many years. From the early period at which this disease usually makes its appearance, little can be done to arrest its progress. Sometimes puncturing the head has been attempted with success.

Hydrocharidaceæ, *hi-dro-kă-re-dā'-se-ē* (Lat. *hydrocharis*, the plant frog-bit), in Bot., the Frog-bit fam., a nat. ord. of *Monocotyledones*, sub-class *Petaloideæ*. The plants of this order are inhabitants of fresh water in Europe, North America, the East Indies, and Tasmania. Their flowers are spathaceous, regular, dioecious, or polygamous: the perianth is superior, in 1 or 2 whorls of 3 pieces, the inner whorl being petaloid; the ovary is inferior, 1—9-celled; the fruit indehiscent, with numerous seeds, which are without albumen. The fresh-water aquarium has made many of these simple plants familiar objects. One of them, *Valisneria spiralis*, is the best and most lasting of all aquarium plants. *Anacharis alsinastrum*, the American waterweed, or water-thyme; *Stratiotes aloides*, the water-soldier; and *Hydrocharis Morsus-Ranæ*, the frog-bit, are also plants of this order, which have been transplanted from our ponds and ditches to the aquaria of our parlours and conservatories.

Hydrochloric Acid, *hi-dro-klo'-rik* (from hydrogen and chlorine), in Chem., symbol HCl, equivalent 36·5, spec. grav. 1·2474, combining volume 4. *Synonyms*:—*Spirits of salt*, *marine acid*, *muriatic acid* (*chlorhydric acid*, Gerhardt). This most important compound of chlorine and hydrogen may be formed by direct synthesis of equal volumes of its components. Kept in the dark, they will remain separate for a length of a time; but the moment they are brought into the light, union takes place, gradually in diffused daylight, and with a powerful explosion if exposed to the direct rays of the sun. The affinity of chlorine for hydrogen is so strong, that if a solution of chlorine in water, or even the damp gas itself, is exposed to the light, hydrochloric acid is formed and oxygen is liberated. Hydrochloric acid gas is easily procured by pouring sulphuric acid over half its weight of common salt contained in a retort. The gas escapes abundantly, and may be collected either over mercury, or by displacement in dry bottles. The action is very simple, as will be seen from the following formula:—

$$NaCl + HO,SO_3 = HCl + NaO,SO_3,$$

or, in other words, the hydrogen replaces the sodium in the salt, the metal going to the sulphuric acid. It is a colourless gas, of a peculiar pungent odour, and an intensely acid taste, irritating the eyes and lungs considerably. It is heavier than air, having a spec. grav. of 1·247, 100 cubic inches weighing 39·04 grains. Under a pressure of 40 atmospheres, at 50° Fahr., it condenses to a colourless liquid. It is neither a combustible nor a supporter of combustion. It reddens litmus-paper powerfully, and forms white fumes in the air by condensing the moisture. Water absorbs 480 times its volume of this gas at 40°, increasing in volume by one-third, forming a colourless fuming liquid, known as hydrochloric acid in the laboratory. It is easily prepared by placing in a large retort three parts of fused chloride of sodium in fragments, and introducing five parts of sulphuric acid through a bent funnel. The retort is connected with a series of Woulfe's bottles, the first one containing a small quantity of water to absorb any impurities that may be present. The second bottle contains four parts of water, and should be immersed in cold water, as the condensation of the gas produces great heat. The acid is manufactured for commercial purposes in iron vessels connected with stoneware jars arranged as Woulfe's bottles. The amount per cent. of hydrochloric acid in solution is tested by a hydrometer. The metals liberate hydrogen from the solution, giving rise to water and the chloride of the metal. The following formula will illustrate this:—

| | | | | | | |
|---|---|---|---|---|---|---|
| NaO | + | HCl | = | NaCl | + | HO. |
| Soda. | | Hydrochl. Acid. | | Chloride of Sodium. | | Water. |

With organic bases, such as quinine, morphine, &c., hydrochloric acid appears to combine without the formation of water; but this is one of the many questions in chemistry still to be decided.

Hydrocotyle, *hi-dro-kŏ'-tile* (Gr. *hudor*, water; *kotule*, a cup or hollow vessel), in Bot., a gen. of *Umbelliferæ*. The species *H. asiatica* is now employed in India, both externally and internally, in leprosy and secondary syphilis, according to all accounts with considerable success.

Hydrocyanic Acid, *hi-dro-si-ăn'-ik* (from hydrogen and cyanogen), in Chem., symbol HCy, equivalent 27, spec. grav. 0·9476, combining volume 4. *Synonyms*:—*Prussic acid* (*cyanhydric acid*, Gerhardt). This important compound is composed of equal volumes of hydrogen and the compound gas cyanogen, which, in this instance, comports itself like one of the halogens, chlorine or bromine. It is prepared in an analogous manner to hydrochloric acid, by submitting a cyanide to distillation with a strong acid. Cyanide of potassium is placed in a retort, and half its weight of dilute sulphuric acid is poured upon it. At first, the distillation proceeds spontaneously from the heat developed.

Hydrodynamics, *hi-dro-di-năm'-iks* (Gr. *hudor*, water; *dunamis*, power), that branch of science which treats of the pressure, equilibrium, cohesion, and motion of fluids; and also of the machines by which water is raised, or in which water is used as the first mover. The subject is divided into two parts,—hydrostatics and hydraulics. The former includes the pressure, cohesion, and equilibrium of fluids, while the latter comprehends their motion, together with the machines with which they are connected. Many of the laws of hydrodynamics depend greatly upon the characteristic property of fluids; namely, that of *transmitting equally in all directions pressures applied at their surfaces*. As a science, hydrodynamics is, comparatively speaking, modern. It was cultivated with less success by the ancients than any other branch of mechanical philosophy. The general principles, however, upon which the science of hydrostatics is founded were first given by Archimedes, about 250 years before the birth of Christ. He maintained that each particle of a fluid in equilibrio is equally pressed in every direction; he also inquired into the conditions according to which a solid body floating in a fluid should assume and preserve a position of equilibrium. The first attempts at the construction of hydraulic machinery were made in the Greek school at Alexandria, which flourished under the patronage of the Ptolemies. The fountain of compression, the siphon, and the forcing-pump, were invented by Ctesibus and Hero, about 120 years after the birth of Christ. (The siphon, a simple instrument, used for emptying vessels, and the forcing-pump, a more complicated machine, will be found described in the articles Pump; Siphon.) The fountain of Hero, as it is usually called, is a machine, the principle of which depends upon the transmission of the pressure sustained by a body of water in one vessel to that in another, by means of the elasticity of air. An apparatus constructed on the principle of the fountain of Hero is employed for draining the water from the mines of Schemnitz, in Hungary. Notwithstanding these inventions of the Alexandrian school, its attention does not seem to have been directed to the motion of fluids. The first attempt to investigate this subject was made at Rome, in the reigns of Nerva and Trajan. From that time, very little advance was made in hydrodynamics till the end of the 16th century, when the discoveries of Castelli and Torricelli gave a new direction to the science of hydraulics. The discoveries of Sir Isaac Newton and other philosophers have caused this branch of science to progress rapidly in later years. The analytical theory of hydrodynamics resolves

itself into the integration of equations of partial differences. Euler, to whom this branch of the calculus is owing, gave the general formulæ for the motion of fluids, founded on the laws of their equilibrium, and thus reduced the whole mechanics of fluid bodies to a single question of analysis. Hydraulic machines are of great variety. They are of two kinds,—machines having a motion of rotation, and machines having an alternate motion. When water acts on a machine as a moving power, it exerts, on the part impinged on, a pressure. The immediate effect of this pressure will be to make the part struck move in the direction of the power, or in some constrained direction; in either case the space will be passed through by the part. Among the machines having a motion of rotation may be mentioned water-wheels of varied kinds. They may be divided into two classes,—vertical wheels, with the axis horizontal, and horizontal wheels, with the axis vertical. The hydraulic machines which possess an alternate motion are the water-column machine and the hydraulic ram (which *see*). The water-column machine consists of a cylinder in which a piston is driven backwards and forwards by the weight of a high column of water contained in an upright pipe. A working beam is attached to the piston-rod, which transmits a motion to the common pumps. This machine, used in Hungary, is mentioned above as an adaptation of the principle of Hero's fountain. The machines for raising water are pumps, the Archimedean screw, and pail or bucket machines. Descriptions of the different hydraulic machines are given under the respective names of each.—*Ref.* Sir David Brewster's article on Hydrodynamics in the *Encyclopædia Britannica*; Mosely's *Elementary Treatise on Hydrostatics and Hydrodynamics*; Bossut's *Hydrodynamique*.

Hydro-Electric Machine, a very powerful source of electricity, first observed by a workman in charge of a fixed steam-engine at Seghill colliery, near Newcastle-upon-Tyne. A large quantity of steam was escaping through a leak in the cement about the safety-valve; and the engineman, while endeavouring to adjust the weights on the safety-valve, noticed that a strong electric spark passed from the metal-work of the boiler, and from the boiler itself, if he tried to touch it while the steam was escaping. This phenomenon, he observed, was particularly apparent when one hand was immersed in the vapour. Sir William (then Mr.) Armstrong, having heard of the occurrence, investigated the subject experimentally. By means of an insulated brass rod, with a metallic plate at one end and a ball at the other, the former being immersed in the escaping steam, and the latter held near the boiler, he was able to obtain sixty or seventy sparks per minute. On the result of this experiment, Armstrong's hydro-electric machine was constructed. It consists of a steam-boiler, insulated by means of strong glass pillars, on which it rests. Attached to the upper part of the boiler a large number of bent iron tubes, terminating in wooden jets, allow the steam to pass out with considerable force. A conductor projects from the boiler, terminating in a knob, while in front of the bent tubes is a metallic case, containing several rows of points for carrying off the opposite electricity of the steam. It has been clearly shown by Professor Faraday that the electricity generated by this machine does not depend on the issue of steam through small orifices, nor on any chemical or physical change due to evaporation or condensation; but is merely the result of the friction of the water particles which are driven through the jets by the steam. These particles act similarly to the glass plate in the ordinary machine, and give out positive electricity; while the wooden jets and pipes act as rubbers, and give out negative electricity. The true source of electricity in the machine is in fact the friction of the steam; the boiler being negative and the escaping vapour positive. The best material for the orifice of the jet appears to be wood; while ivory is one of the worst. A small quantity of oil or turpentine in the exit-pipes produces a remarkable change in this machine; the electrical states become reversed, the boiler being positive and the steam negative.

Hydroferridcyanic Acid, *hi-dro-fer'-rid-si-an'-nik*, in Chem., symbol $H_3Fdcy$.—This compound is obtained in red crystals, by the evaporation of a solution of ferridcyanide of lead, which has been decomposed by sulphuretted hydrogen.

Hydroferrocyanic Acid, *hi-dro-fer'-ro-si-an'-nik*, in Chem., symbol $H_4Fcy$.—This acid is obtained, according to Liebig, by adding to a saturated solution of ferrocyanide of potassium, an equal volume of hydrochloric acid. The white precipitate of the acid thus obtained is washed with hydrochloric acid, dried in valves on a tile, and crystallized by the addition of ether to its solution in alcohol.

Hydrofluoric Acid, *hi-dro-flu-or'-ik* (from hydrogen and fluorin), in Chem., symbol HF, a very remarkable acid, formed of fluorine and hydrogen. It has a very powerful affinity for silicon, abstracting it from its compounds with great facility. It is therefore necessary to prepare it in metallic vessels, its solvent action on glass being very great. In commerce, vessels of lead are generally used; but when it is desirable to obtain an acid of perfect purity, platinum vessels are employed. To prepare this substance, one part of finely-powdered fluor spar is mixed with two parts of oil of vitriol, and the gelatinous mass so formed is distilled in a leaden retort, to which a U tube is fitted. The U tube is surrounded by a powerful freezing mixture, and the acid distils over. Hydrofluoric acid is a densely fuming colourless volatile liquid, boiling at 60°, and freezing at about −4° Fahr. The preparation of the acid must be conducted with great care, as the fumes of it are very deleterious, and a drop falling on the skin will occasion a deep and painful sore. Poured into water, it causes the evolution of great heat. It is easily recognized by its corrosive action on glass, and a weak solution of it is much used in the arts for etching that substance. The glass to be etched is covered with bees-wax, the design being traced on the wax with an etching tool. The whole is then exposed to the action of the acid, which eats away those portions unprotected by the wax. Diluted hydrofluoric acid dissolves the metals, extricating hydrogen and forming fluorides.

Hydrogen, *hi'-dro-jen* (Gr. *hudor*, water; *gennao*, I produce), in Chem., symbol Z, equivalent 1; spec. grav. 0·0692, combining volume 2.—Hydrogen is an elementary substance, first isolated as a constituent of water by Cavendish in 1766. It is a colourless, transparent, tasteless, inodorous gas, permanent at all temperatures, and resisting all efforts to liquefy it. It is almost insoluble in water, 100 volumes of that fluid only absorbing two volumes of the gas. It is the lightest substance in nature, 100 cubic inches of it weighing only 2·14 grains. It was at one time doubtful whether it existed in the uncombined state in nature; but the experiments of Bunsen prove that it is evolved, although in very variable proportions, by the solfaturas of Iceland. In combination with water, it is most extensively distributed throughout nature. It also exists in combination with hydrogen in most inflammable minerals. It is an important element in all organic substances, and enters into the composition of most substances in daily use, whether drawn from the mineral, vegetable, or animal kingdom. Having a very great attraction for oxygen and chlorine, when in the nascent condition, it is much employed in the laboratory for deoxidizing or dechlorinating purposes. It is prepared in a variety of ways, the most usual being by pouring dilute sulphuric acid on granulated zinc or iron clippings, when the following reaction takes place:—

$$Zn + SO_3HO = ZnO + SO_3 + H.$$

It may also be prepared by passing steam over red-hot iron filings, by plunging sodium or potassium into water, or by electrolysis of water; all of which methods are more scientifically interesting than practical. When zinc and dilute sulphuric acid are used, the gas passes off rapidly, and may be collected over water. Prepared in this way, it contains a number of impurities, such as arsenic, sulphur, antimony, &c.; but these may be removed by passing the gas through solutions of hydrate of potash, nitrate of silver, and oil of vitriol. Mixed with air, it may be breathed without any other effect than raising the pitch of the voice many notes higher. Mixed with oxygen, olefiant gas, or atmospheric air, it forms an explosive com-

pound of great power. The real nature of hydrogen has long been an interesting point of discussion amongst chemists, many supposing it to be a metal in a gaseous form, and prophesying with certainty, with Dumas, that if ever it is liquefied, it will present the appearance of quicksilver; while others contend, with Odling, that it is a neutral substance, possessing both the basic properties of a metal and the chlorous properties of a gas. Its power of being replaced by metals in its combinations has led Gerhardt and others to classify metals in accordance with their hydrogen-replacing power. Most metals replace one atom of hydrogen in its combinations, such as potassium, sodium, zinc, &c.; others replace two atoms of hydrogen, such as palladium, platinum, and tin; those which replace three atoms of hydrogen, such as bismuth, arsenic, and antimony. Others replace three atoms of hydrogen by two of metal; such as aluminum, iron, manganese, and others; two atoms of which replace one of hydrogen. In these cases, the basisity of the metal is often expressed by dashes over the symbol belonging to it. Thus, chloride of bismuth is written $Bi'''Cl_3$, and bichloride of platinum $Pl''Cl_4$. This system of expressing basic power was first used by Odling. Hydrogen is not only replaced in its compounds by metals, but also by complex organic compound atoms; such as ethyl, methyl, &c. The theory, too, that hydrogen can only exist separately in the state of a double atom, is daily gaining ground, much light being thrown on the subject by the consideration of the properties of the hydrocarbons forming alcohol radicles. Thus, hydrochloric acid is represented as a double atom of hydrogen, in which one atom is replaced by chlorine. Its union with other bodies forms four great types, in which all compounds are modelled. These four are $HH_1, HCl_1, HHO_1, HHHN$. (*See* also Types.) Hydrogen is used principally in the oxyhydrogen blowpipe. The chief compounds of hydrogen are water, ammonia, hydrochloric acid, and many others, which will be found described under their respective heads.

Hydrogen, Binoxide of, in Chem., symbol $HO_2$, equivalent 17.—This peculiar compound was discovered by Thenard, in 1817. It is generally prepared by digesting binoxide of barium with a dilute acid, at a low temperature. It is a colourless, transparent, syrupy liquid, with a harsh, bitter, and astringent taste. It does not freeze at −22° Fahr., and evaporates without decomposition. Its specific gravity is 1·452. From the extra equivalent of oxygen being so loosely combined, it is set free on nearly every occasion. As might be expected, peroxide of hydrogen is a powerfully-oxidating agent. It has as yet received no extensive use, although it has been employed occasionally in medicine.

Hydrogen, Persulphide of, in Chem., symbol $HS_8$ (?), a light yellow, transparent, oily fluid, possessing a peculiar acrid odour and bitter-sweet taste, produced by adding an excess of hydrochloric acid to the solution of an alkaline pentasulphide. Owing to its property of dissolving sulphur, its composition has not yet been exactly made out.

Hydrogen, Teroxide of, in Chem., symbol $HO_3$, a product of the electrolysis of water, according to the experiments of Baumert.

Hydrography, *hi-drog'-ráf-e* (Gr. *hudor*, water; *grapho*, I write), a term applied to that part of science which relates to the description of the waters existing on the surface of the earth; particularly with reference to the bearings of the coast, the depth, currents, and other circumstances important or useful in navigation. Hydrography implies the same thing with regard to the sea that geography implies with respect to the land.

Hydrometer, *hi-drom'-e-ter* (Gr. *hudor*, water; *metron*, a measure), an instrument for determining the relative densities, or specific gravities, of fluids; and thence the strengths of spirituous liquors, which are inversely as their specific gravities. The principle upon which the ordinary hydrometer is constructed is as follows:—When a body is immersed in a fluid, it loses as much of its weight as is equal to the weight of the fluid which it displaces. Thus, if a body be suspended from one arm of a balance, and counterpoised by applying weights to the other arm; and then, while suspended, it be immersed in water, it will be found that the counterpoising weight is not sufficient, and in order to restore equilibrium, a weight equal to the weight of the water displaced must be added. If, then, the same body be immersed in two different fluids, the weights which it will respectively lose in each will be directly proportional to the specific gravities of the fluids; because the loss of weight is always equal to the weight of the fluid displaced,—that is, the magnitude of the body multiplied by the specific gravity of the fluid. The same principle holds good in the case of substances which are lighter than the fluid; for when a body floats upon the surface of a fluid, the weight of the portion of fluid displaced is equal to the weight of the floating body. Upon this principle in hydrostatics, Sykes's hydrometer is constructed. This instrument is directed by act of parliament to be used in collecting the spirit revenue of the United Kingdom. It consists of a thin, flat stem, about six inches in length, divided on both sides into eleven equal parts, each of which is again subdivided into two. This stem carries a hollow brass ball, about one inch and a half in diameter, in which is fixed a conical stalk terminating in a pear-shaped weight, so that when the instrument is placed in a fluid, it may float with the other extremity perpendicular to the surface. Ten different weights of different magnitudes are also applicable to the lower portion of the graduated stem. Nine of these weights are circular, with a slit in each to fit the stem, and are numbered respectively 10, 20, 30, 40, 50, 60, 70, 80, and 90. By the successive application of these, the instrument may be sunk so as to obtain the whole range of specific gravities, from pure alcohol to distilled water. The tenth weight is in the form of a parallelopiped, and can be fixed, when necessary, to the upper part of the stem. In order to calculate the strength of a portion of spirit by this hydrometer, a portion of the liquid is placed in a tall glass vessel, and the temperature noted by means of the thermometer. The instrument is then floated, and one or more of the weights is added, until the lower part of the scale sinks beneath the surface. The number on the stem in contact with the surface is then observed, and added to the number of the circular weight employed; and this third number is referred to a series of tables calculated for the purpose. In these tables, under the proper temperature, will be found the percentage of strength required. The method adopted by chemists for finding the specific gravities of liquids is not by means of delicate glass hydrometers only, but also by means of the specific-gravity bottle, or thousand-grain bottle. (For other methods for obtaining like results, *see* Specific Gravity.)

Hydronitroprussic Acid, *hi'-dro-ni'-tro-prus'-sik*, $H_2Fe_2Cy_5NO_2$.—When binoxide of nitrogen is transmitted through a solution of hydroferridcyanic acid, it is absorbed, hydrocyanic acid being disengaged, and a new acid—hydronitroprussic acid—is formed, which, when combined with the metals, gives rise to the nitroprussides (which *see*).

Hydropathy, *hi-drop'-ă-thy* (Gr. *hudor*, water, and *pathos*, disease), is a mode of curing disease by means of the application of water. The system owes its origin to one Vincenz Priessnitz, who, in 1826, established an institution at his native place, Gräfenburg, in Austrian Silesia, for the cure of diseases on this mode. The system soon spread, and now there are in this country a number of hydropathic establishments. Without claiming for the system all that its votaries demand, there can be no doubt that it is of the greatest benefit in a large number of cases. Particularly is it of benefit in cases of indigestion, nervousness, an impaired constitution, a too full habit, or in such as have been living freely, without taking much exercise. The system of dietary and exercise that is kept up at these places is perhaps not less conducive to a cure than the baths. Having, under the head Bath, already noticed at length the different forms of baths, and the great importance of bathing, little more remains for us here than to notice shortly some of the forms in which it is employed as a remedial agent. These are very various. Besides the ordinary bath and the shower bath, one of the most common is the douche bath, in which a single jet of water, varying in size from the thickness of a quill pen to that of a man's

arm, is projected with great force, either from above, below, or one side, upon a particular part of the body. The sitz bath is taken sitting; besides which there are the foot-bath, hand-bath, &c. Sometimes, when the patient is sitting in a warm or tepid bath, cold water is poured over the head and upper part of the person. Pieces of coarse linen, saturated with cold water, are also applied to the skin, and covered over with dry cloths, and usually re-moistened several times a day. The wet sheet packing is one of the characteristics of the system. It consists in the patient being closely enveloped in a sheet, wrung out of cold water, and then covered over with dry blankets. The great importance of hydropathy consists in the healthy stimulus which it gives to the nerves, bracing them, and acting as a tonic, and soother to the whole system.

Hydrophobia, *hi-dro-fo'-be-ä* (Gr. *hudor*, water, and *phobeo*, I fear), is a disease occasioned by the bite of a rabid animal, and so called from the great dread that those who suffer from it manifest at the sight of water. The dog, cat, fox, and wolf, are the animals among whom this disease is most common,—among whom it is natural; but there is perhaps no animal to whom it is not capable of being communicated, as it is to man. A dog who is suffering from this disease, becomes solitary, morose, and sullen; runs about wildly, and bites at whatever comes in his way; but his respect for his master is at first unaltered. As the disease advances, he becomes more furious, gnawing and biting at whatever comes in his way; he forgets his master, he breathes quickly and heavily, his tongue hangs out, his mouth is continually open, and discharges a large quantity of froth. In this state he seldom lives more than four-and-twenty hours. The poison exists in the saliva of the rabid animal, and may be communicated either by a bite, or by licking a wounded part. After the poison has been received, the wound usually heals up in the ordinary way. At a period, however, varying from a month or six weeks to perhaps eighteen months, symptoms of the disease begin to manifest themselves. The part becomes painful, red, and swollen, and shooting pains are felt, extending from it to the central parts of the body. Very soon after this (within a few hours perhaps, but certainly within a few days), the specific constitutional symptoms make their appearance; he is hurried and irritable; speaks of pain and stiffness perhaps about his neck and throat; unexpectedly he finds himself unable to swallow fluids, and every attempt to do so brings on a paroxysm of choking and sobbing, of a very distressing kind to behold. The symptoms rapidly increase in severity. The nervous irritability becomes extreme, the paroxysms are greatly more violent, and are excited not only by any attempts to swallow liquids, but by the very sight or sound of them; even the waving of a polished surface, as of a mirror before the eyes, or the passage of a gust of wind across the face, being sufficient to excite it. Death occasionally takes place within twenty-four hours, but sometimes it may be protracted to the fifth or sixth day; usually, however, it terminates fatally on the second or third day. Nothing can be said to be known of the nature or character of this disease, and as little is known regarding its treatment. Various means have been tried, but few, or any of them, have met with any success, and none of them have received general adoption. It is not, however, every one that is bitten by a rabid animal that has hydrophobia. John Hunter records that in one case twenty-one persons were bitten by a mad dog, and only one of them had hydrophobia; and others have come to the conclusion, that on an average, only one person in twenty-five bitten will have hydrophobia. In the treatment of this disease, the great thing is to remove the poison before it has extended itself into the system. This is best done, where possible, by excision of the wounded part, care being taken that every portion of it is removed. Where it is impossible to use the knife effectually, a powerful caustic should be applied freely over the whole surface of the wound, so as to destroy the effect of the poison. As the poison is not very active, these means are usually effective, though employed some time after the receipt of the wound; but, of course, in such circumstances, all due haste is to be adopted, and it is well, before the arrival of medical assistance, to keep carefully washing the part with tepid water.





Hydrophyllaceæ, *hi-dro-fil-lai'-se-e*, in Bot., the *Hydrophyllum* fam., a nat. ord. of *Dicotyledones*, sub-class *Corollifloræ*, consisting of herbs, bushes, and small trees, having the following characters:—Leaves usually hairy, lobed, and alternate; flowers either solitary, stalked, and axillary, or arranged in cincinate racemes or spikes; calyx persistent, 5-partite; corolla regular, 5-cleft; stamens equal in number to and alternate with the segments of the corolla; ovary simple, 1—2-celled, with 2 parietal placentas; styles and stigmas 2, and 2 or many ovules; fruit capsular, 2-valved, 2- or 1-celled, with a large placenta filling the cell; seeds netted; albumen hard and abundant. The plants of this order are chiefly natives of the northern and most southern parts of the American continent. Many of them are cultivated in our gardens, and are highly valued for their pretty flowers. The most common are the species of *Nemophila* and *Hydrolea*.

Hydrostatics, *hi-dro-stät'-iks* (Gr. *hudor*, water; *statikos*, static, standing, or settling). (*See* Hydrodynamics.)

Hydrostatic Bellows, an apparatus for illustrating that singular property of liquids in virtue of which they transmit pressure in every direction equally. In general form it consists of two flat boards, united by water-tight leather or flexible cloth. Communicating with the interior of the bellows is a short tube fitted with a stop-cock, by which the liquid may be discharged. From this short tube a long tube rises perpendicularly, terminating in a funnel. Weights are then placed on the upper board of the bellows, and water poured into the funnel. The water passes into the bellows, and lifts the weights. The load which can be thus lifted may be determined thus:—Every portion of the board will be pressed upwards by a force equal to the weight of the water in the tube above the level of the board. Thus, if the section of the upright tube be 1 square inch, and the surface of the board 500 square inches, then a column of water in the tube weighing 1 lb. will lift a weight of 500 lbs. A very small quantity of water may thus be used to lift a very great weight.

Hydrosulphocyanic Acid, *hi'-dro-sul'-fo-si-an'-ik*, in Chem., $H,CyS_2$.—When dry sulphuric oxide of mercury is decomposed by a current of sulphuretted hydrogen, a colourless liquid is formed, which crystallizes in radiated masses at 10° Fahr. It has a pungent odour, somewhat resembling acetic acid, and is highly poisonous. It boils at 216°, and may be distilled at that temperature without undergoing decomposition.

Hydrosulphuric Acid, *hi'-dro-sul-fu'-rik*, in Chem., sulphuretted hydrogen,—symbol HS, equivalent 17, combining volume 2, spec. grav. 1·1912. This important compound of sulphur and hydrogen is generally known by its second name; but as it possesses acid properties, it may be called hydrosulphuric acid or sulphydric acid. It is generally prepared for use by submitting one of the metallic sulphides to the action of an acid, when it is disengaged in great abundance. For general purposes, the sulphide of iron is broken into small fragments, and placed in a bottle, a mixture of sulphuric acid and six or seven times its weight of water is added to it, and the gas gradually passes over. It is a transparent colourless gas, having the characteristic odour of rotten eggs. It is highly poisonous in a concentrated form, and is fatal to the lower animals, even when very much diluted. It is inflammable, burning with a pale bluish flame, depositing sulphur as it consumes. It dissolves in half or one-third of its bulk of water, forming a solution possessing weak acid properties. Exposed to the air, the solution becomes milky, and deposits sulphur. Under a pressure of seventeen atmospheres, sulphuretted hydrogen is reduced to a colourless invisible liquid, which freezes at —122° Fahr., into a transparent mass. It is a constituent of many springs; the baths of Aix-la-Chapelle and Harrogate owing their efficacy to this gas. It is of great use in analysis, in forming characteristic precipitates of the metals. When passed through solutions of the metals, it throws down the sulphide in the same manner that hydrochloric acid gives rise to the chlorides of the metals with which it is united. It exhibits a great tendency to unite with the soluble sulphides, compounds formed on the type of

KS,HS. The so-called hydrosulphate of ammonia of the laboratory is a hydrosulphate of the sulphide of ammonium.

HYGROMETER, *hi-grom'-e-ter* (Gr. *hugros*, moist; *metron*, a measure), an instrument for ascertaining the amount of aqueous vapour present in the atmosphere or other abriform fluid under examination. Several varieties of apparatus have been invented for this purpose. Any alterations in the state of the atmosphere, with respect to moisture or dryness, are manifested by different phenomena. The various forms of hygrometers are thus very great; but they can generally be divided into two distinct classes,—those which depend on absorption, and those which depend on condensation. A great number of substances in nature absorb moisture in a greater or less degree, and consequently undergo some change, either in regard to their physical qualities, their size, or their weight. Animal fibre is elongated, on account of being softened and relaxed; while vegetable fibre is shortened, on account of its swelling. Moisture is imbibed with avidity by many mineral substances, which gain weight by that means. Many of the hygrometers which depend upon this alteration of dimension or weight are known by the names of their inventors; as De Luc's, De Saussure's, Daniell's, &c. De Luc employed a thin slip of whalebone, the contractions of which indicated the variations of moisture. De Saussure employed a human hair, by means of which he constructed a far more delicate instrument; but unfortunately it was exceedingly liable to derangement, and, moreover, was uncertain, unless prepared with extreme care. The hygrometer invented by Mr. Daniell, the late professor of chemistry at King's College, London, has nearly superseded every other kind. It consists of two thin glass balls, of 1¼ inch diameter, connected together by a tube having a bore about ¼ inch. The tube is bent at right angles in two places, so as to form three arms of unequal length, the longest of which contains a small thermometer, having its bulb in the lower of the two glass balls. This ball, after being filled about two-thirds with ether, is held over a spirit-lamp till the air is entirely expelled through a capillary tube left open for the purpose. After the air is all expelled, the tube is hermetically closed. The other ball is then covered with a piece of muslin, and the instrument is placed on a stand to which another small thermometer is attached. In using the hygrometer, a small portion of ether is first poured upon the muslin, which, as it evaporates, lowers the temperature of the ball, and thus causes a rapid condensation of the ethereal vapour within. As it continues to condense, the ether in the lower ball continues to evaporate, by which the temperature of the included ether is reduced until a deposit of moisture is observed to take place on the exterior of the instrument. By observing the temperature indicated by the inclosed thermometer, the dew-point is ascertained,—that is, the point at which the precipitation of atmospheric moisture takes place. This instrument is very beautiful in principle, but it is doubtful as to whether it ever shows precisely the temperature at which the deposition of dew does take place. It is also costly, on account of its great consumption of ether. From 1840 to 1847 it was exclusively used at the Royal Observatory at Greenwich, since which time the observations have been taken from the simultaneous reading of two thermometers, the bulb of the one being wet and the other dry. In the use of Daniell's hygrometer, after the dew-point has been observed, together with the temperature of the external air, the actual quantity of moisture contained is found from the following formula,—where $t$ denotes the temperature of the surrounding air, and $p$ the elasticity of aqueous vapour at the temperature indicated by the inclosed thermometer:—

$$\text{Weight in grains} = \frac{5656{\cdot}2}{418+t} \times p.$$

HYLEOSAURUS, *hi-le-o-saw'-rus* (Gr. *hyle*, weald or forest; *sauros*, lizard), in Geol., one of the gigantic terrestrial lizards whose remains were discovered by Dr. Mantell in the Wealden strata of Tilgate Forest. The restoration of this old-world monster by Mr. Waterhouse Hawkins occupies a prominent position among the palæontological illustrations in the grounds





of the Crystal Palace. Dr. Mantell inferred, from the size and form of the bones of the head and jaws, that the creature must have attained a length of from twenty to thirty feet. The body was broader than high, and terminated by a long flexible tail; the limbs were relatively short; the skin was covered with scales and tubercles; and a row of very large thin angular spines extended down the back, and formed a serrated dermal crest.

HYMENÆA, *hi-men-e'-a* (from Gr. *humen*, a membrane), in Bot., a gen. of the nat. ord. *Leguminosæ*, and sub-ord. *Cæsalpinieæ*. The species *H. Courbaril*, the West-Indian locust-tree, is supposed to yield gum-anime or East-Indian copal. The inner bark is stated to possess anthelmintic properties. The fruit contains a mealy substance, in which the seeds are imbedded, sweet and grateful to the palate: this, when boiled and allowed to ferment, forms an intoxicating drink resembling beer. The timber is close-grained and tough, and is well adapted for planking vessels. The species *H. verucosa* probably furnishes some of the East-Indian copal; and some other species is probably the source of Mexican copal. Brasilian copal is said to be the produce of several species of *Hymenæa*, and also of a plant belonging to the same sub-order; namely, *Trachylobium martianum*. Again, several species of the genus, together with *Guibourtia copallifera*, furnish the three kinds of copal known respectively as African copal, African yellow gum, and African red gum.

HYMENOPTERA, *hi'-men-op'-te-ra* (Gr. *humen*, a membrane; *pteron*, a wing), one of the orders into which insects are divided. They are characterized by possessing four membranous wings, of which the anterior pair are the larger, and they cross horizontally over the body when in a state of repose. Of all the orders into which insects are separated, the hymenoptera contains the largest number remarkable for development of instinctive powers and social qualities. The females are provided with an ovipositor, consisting chiefly of three elongated slender processes, of which two serve as a sheath to the third. This ovipositor, in many species, is so organized that, with it, they are not only able to perforate the substances in which they deposit their eggs, but, in many cases, it serves as a weapon of defence, and is the part which, in bees and wasps, is called the sting. With this weapon, which is barbed at the apex, they are able to kill their enemies, or render them torpid or powerless. The antennæ are generally filiform or setaceous. The mesothorax and the metathorax are well developed; the prothorax is narrow. Hymenopterous insects are remarkable for the great development of the aërial trachea, which, in many species, are placed in their abdomen, in pouches, and are very large in comparison with the size of the insects. They undergo what is termed incomplete metamorphosis; and in the greater number the larvæ are soft, whitish-coloured, and destitute of feet. In the imago, or perfect state, most hymenopterous insects live upon flowers, or, at least, often frequent them; some for the purpose of gathering honey, and others in order to find a safe retreat from whence they can attack their prey. The order *Hymenoptera* is divided by Latreille into two great sections,—the *Terebrantia* and the *Aculeata*. In the former, the female possesses a distinct ovipositor, and in the latter that organ is replaced by a sting. Many of the ants, however, prove an exception, since they do not possess a sting, but merely defend themselves by ejecting an acid liquid. The best-known families of the *Hymenoptera* are the bees, the wasps, and the ants. A description of these particular insects will be found under their respective names.

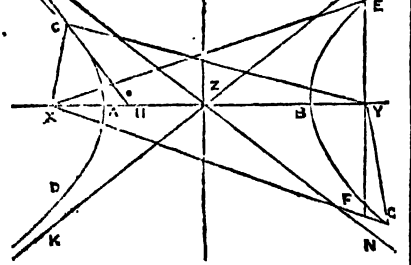
HYMN, *him* (Lat. *hymnus*, Gr. *humnos*), a song of praise or adoration in honour of a deity, generally accompanied by some instrument. It is supposed to have been originated by Orpheus and Linus, and Pindar is also said to have made his first essays in literature in the shape of hymns. Amongst the Greeks, the hymn consisted of three couplets,—the *strophe*, the *antistrophe*, and the *epode*. St. Hilary, bishop of Poictiers, is said to have been the first who composed hymns for churches. The Te Deum and Benedictus in our liturgy are both called hymns, while the composition of the former is attributed to St. Ambrose, who

succeeded St. Hilary in hymn-writing. Those in the Roman breviary were in all probability written by Prudentius. The term is now applied to any short religious poem, not being a version of a psalm, sung in places of public worship. They may be said to consist of three kinds,—1. *Metrical*, or such as were in use in the daily service of the unreformed Church, and of which the only one now formally authorized by the Church of England is the Veni Creator; 2. *Canticles* appointed to be sung or said in the daily service, and divided into verses, and pointed like psalms; and 3. those portions of the Communion service which are to be said or sung, but not arranged like canticles; as the Tersanctus and the Gloria in Excelsis.—*Ref.* Hook's *Church Dictionary*; Moore's *Encyclopædia of Music.*

Hyoscyamus, *hi-os-i'-a-mus* (Gr. *huoskuamos*), Henbane, a gen. of the nat. ord. *Atropaceæ*. The common Henbane, *H. niger*, is an indigenous plant, growing on waste grounds, banks, and commons. It is glandular and viscid, and exhales a peculiar odour, which is fœtid and powerful. It blossoms in June or July, the flowers being of a pale straw-colour, beautifully pencilled with purple veins. The fruit is the peculiar modification of the capsule termed a *pyxis*, from its opening transversely by a lid, like a pill-box. The whole herb possesses narcotic properties, and has been employed medicinally from the earliest times as a narcotic, anodyne, and soporific. It is sometimes used by oculists in place of belladonna to dilate the pupil. When swallowed in sufficient quantity, it is stated to cause loss of speech, disturbance of vision, distortion of the face, coma, delirium, phantasms, and paralysis. No antidote is known. Its activity is essentially due to the presence of the alkaloid *hyoscyamia*. Two varieties of henbane are commonly cultivated,—the *annual* and the *biennial*, the latter being generally regarded as the most active in its properties. The leaves only are used in regular practice: they are given internally in the form of powder, or in extract or tincture, and applied externally in fomentations or cataplasms. The fumes of the seeds heated in the bowl of a tobacco-pipe were formerly inhaled to allay toothache.

Hyper, *hi'-per* (Gr. *huper*, over, beyond), a Greek preposition, which is conjoined with other words in order to denote excess, or anything beyond, or over and above, the original quality of the word to which it is added. The term *hypercriticism* is an instance of the manner in which the preposition is applied, and the sense in which it is interpreted.

Hyperbola, *hi-per'-bo-lā* (Gr. *huper*, above, and *bolé*, from *ballein*, to throw), the name of one of the curves that are known as conic sections. (*See* Conic Sections.) It is formed by cutting the cone in a plane that passes through it in a direction parallel to its axis. Thus, in fig. 1, appended to the article on the ellipse (*see* Ellipse), OQP and RTS are hyperbolas




HYPERBOLA.

formed by planes passing through the cone ABC, in directions parallel to its axis AZ. In the annexed figure, CAD and EBF are two branches of a perfect hyperbola formed by the passage of a plane through a double cone, or rather through two cones, which are placed together, apex to apex, having a common axis, and their sides inclined to the axis at the same angle. Z is the centre of the hyperbola, X, Y, its foci, and AB its principal axis, or axis major. The difference between the distances of any point in either branch of the hyperbola is always equal to the principal axis; thus XE−YB=XG−YG=YC−XC=AB. The *latus rectum* of the hyperbola is the straight line drawn through either of the foci at right angles to the axis, as EF. The excentricity is denoted by a fraction, of which ZY is the numerator and ZB the denominator. The tangent drawn to any point in the branches of the hyperbola always bisects the angle made by the lines drawn from that point to the foci. The lines KL, MN, passing through the centre Z, are asymptotes to the curve. (*See* Asymptote.)

Hyperbole, *hi-per'-bo-le* (from Gr. *huperballo*, I throw beyond, exceed), a figure used in Rhet., which signifies more than it is intended to represent to the hearer or reader. When expressions are made use of and assertions made which might be deemed incredible or beyond belief, in order to induce credibility in some fact wanted to be proved, the argument may be said to be supported by hyperboles. As is well observed, exaggeration is but hyperbole applied to narrative, in order to produce a better impression than would be gained by plain facts alone.

Hyperborean, *hi'-per-bo'-re-ăn* (from Gr. *huper*, beyond, and *boreas*, the north), a designation applied to people who dwell in countries very far north. The ancients gave this denomination to the people and places to the northward of the Scythians, as their knowledge of the localities and the inhabitants did not extend beyond the country belonging to that nation. According to this argument, therefore, hyperboreans are Laplanders, Samoiedes, and the Russians who dwell about the White Sea.

Hypericaceæ, *hi-per-e-kai'-se-e*, in Bot., the St. John's Wort fam., a nat. ord. of *Dicotyledones*, sub-class *Thalamifloræ*, consisting of herbs, shrubs, and trees, having the following diagnostic character:—Leaves usually opposite, simple, exstipulate; flowers regular; sepals and petals hypogynous, with a quaternary or quinary distribution; the former with an imbricated æstivation, the latter unequal-sided, commonly marked with black glands, and having a contorted æstivation; stamens hypogynous, usually numerous and polydelphous, rarely few, and then distinct or monadelphous; anthers 2-celled, opening longitudinally; styles several, long; fruit 1-celled, or 3—5-celled. There are 16 genera of *Hypericeæ*, embracing about 276 species, which are generally distributed over the globe. They have commonly a resinous yellow juice, which is frequently purgative, as in the species of *Vismia*. Some have tonic and astringent properties, as *Hypericum perforatum* and *Androsæmum officinale*; and some again have diuretic properties, as *Cratoxylon Hornschuchia*. Many of the St. John's worts are cultivated in shrubberies.

Hyphæne, *hi-fe'-ne*, in Bot., a gen. of palms. *H. thebaica* is the Doum palm of Egypt, sometimes known as the gingerbread-tree, from the resemblance of the pericarp of its fruit to gingerbread. Unlike most of the palms, this has a stem forked above. The main stem, instead of developing a single terminal bud, develops two buds, each of which produces a branch. Each branch again develops two other buds at its apex in like manner; and this mode of growth is continued with the successive branches.

Hyphen, *hi'-fen* (Gr. *huphen*, together with), a mark, or short line, written thus (-), and placed between two words, in order to show that they are connected together and form a compound word; as, *pre-occupied, four-leaved.* In writing and printing, the hyphen is used to connect the syllables of a divided word, and is placed after the syllable that closes a line, denoting the connection between that syllable, or part of a word, with the first syllable in the next line.

Hypochlorous Acid, *hi'-po-klo'-rus*, in Chem., ClO, equivalent 43·5, spec. grav. 2·977, combining volume 2.—Hypochlorous acid is formed by pouring a current of perfectly dry chlorine through a tube filled with well-dried oxide of mercury, procured by precipitation from a solution of corrosive sublimate, by means

of potash. A gas is produced, which may be collected as a deep red liquid in a receiver, kept cool by a mixture of ice and salt. It boils at about 68°, emitting a vapour of a deeper colour than chlorine. It is easily decomposed with explosive violence, by the mere heat of the hand. Water dissolves 200 times its bulk of hypochlorous acid, forming a pale yellow solution. When concentrated, it is easily decomposed, the action of light being sufficient to eliminate chlorine from the compound. With bases it forms the hypochlorites, which are possessed of powerful bleaching properties, in fact, it is now the generally received opinion, that the chloride of lime owes its bleaching power to a certain portion of hypochlorite of lime, which it contains.

Hypochondriasis, *hip-o-kon-dri'-ă-sis*, in Med., is a disease characterized by extreme sensibility of the nervous system, leading the patient to believe himself to be suffering from some terrible and imaginary disease, or to be much worse than he really is. The ideas of such persons often partake of the most extravagant character. He may fancy that he is immensely tall, or inordinately small; that he is heavy as lead, or light as a feather; that he is composed of glass, or is a lump of butter. They are all extremely timid, and their fears are exercised upon trifles, or are altogether groundless. They dwell constantly upon their own sufferings, and are usually morose, peevish, suspicious, and misanthropic, and frequently suspect their nearest and dearest friends of designs upon their life. The causes of this disease are various, arising as it does usually from an impaired condition of the nervous system. Young men of studious habits are very apt to suffer from this disease. Those too who, from want of occupation and a due amount of exercise, acquire a luxurious habit, often fall a prey to it. The cure must of necessity vary somewhat according to the nature of the disease. In general, the great thing is to withdraw the patient's mind as much as possible from himself. For this purpose, cheerful society and change of scene should be adopted. The system ought to be strengthened by tonics and exercise in the open air. If it arise from idleness and luxury, the great cure is plenty of active exercise and a spare diet. In all cases, the state of the digestive organs should be attended to, and the bowels kept in a strictly normal condition.

Hypogynous, *hi-poj'-e-nus* (Gr. *hupo*, under; *gune*, female), in Bot., a term applied to the stamens when they are free from the calyx and pistil, and arise from the thalamus or torus below the latter organ: this is the normal position of the stamens, and may be observed in the poppy and ranunculus. The term is also applied to the corolla when it arises from below the pistil and free from the calyx. The insertion of the stamens is always regarded as the same as that of the corolla, so that when the former organs are epipetalous, their insertion with regard to the pistil depends upon the point where the corolla itself becomes free; thus, in the primrose the stamens, though attached to the corolla, are said to be hypogynous. The name *Hypogynæ* has been given to a subdivision of the *Petaloidæ*, from the perianth being free and the ovary superior. (*See* classification in article Botany.)

Hyponitric Acid, *hi-po-ni'-trik*, in Chem., symbol $NO_4$, equivalent 46 (peroxide of nitrogen, nitrous acid, pernitric oxide).—When binoxide of nitrogen is mixed with oxygen or atmospheric air, red fumes of hyponitric acid are formed. By heating thoroughly dry nitrate of lead in a retort, it evolves hyponitric acid mixed with oxygen. The hyponitric acid may be condensed by passing the mixed gases through a tube surrounded by a mixture of salt and ice. The first portions do not solidify; but if every care be taken to avoid moisture, the latter portions form transparent, colourless prismatic crystals, if the temperature be kept below 4° Fahr. At 15·8° Fahr. it melts into a liquid, which, if the temperature is raised, gradually becomes yellow, and lastly orange, until it reaches 82° Fahr., when it boils, the vapour being a dark yellowish red, turning to black as the heat increases. Hyponitric acid was formerly supposed to give rise to the nitrites, and was thence called nitrous acid; but experiment has proved that, on being added to alkaline bases, it is decomposed, giving rise to nitrates and nitrites.

Hyponitrous Acid, *hi'-po-ni'-trous*, symbol $NO^2$ (*nitrous acid*, which *see*).

Hypophosphorous Acid, *hi-po-fos'-fo-rus*, in Chem., symbol PO, equivalent 40.—This acid may be formed by cautiously decomposing the hypophosphite of baryta with sulphuric acid, a solution of that salt being formed when phosphorus is boiled in baryta-water. By evaporation, it forms a sour, bitterish, uncrystallizable syrup, with feeble acid properties. It has been determined with a great degree of certainty by Wurtz and others, that the proper formula for hypophosphorous acid is $PH_3O_2$, instead of PO, as it is found impossible to abstract the two equivalents of water contained in all hypophosphites, without causing their decomposition. The hypophosphites have lately received several important applications in medicine. The salts of soda, potash, ammonia, are formed by adding the carbonates to a solution of hypophosphate of lime, made by boiling four pounds of caustic lime slaked with a gallon of water, with one pound of phosphorus and four gallons of water. The filtered liquid is evaporated and crystallized.

Hypostaminæ, *hi-pos-tam'-e-ne* (Gr. *hupo*, under, and *stamen*), in Bot., the name given to that subdivision of *Corolliflorœ* in which the stamens are inserted into the thalamus, and do not adhere to the corolla, the ovary being superior. (*See* classification under Botany.)

Hyposulphuric Acid, *hi-po-sul-fu'-rik*, in Chem., symbol $S_2O_5$ (*dithionic acid*).—This acid is formed by passing sulphurous acid through water in which finely-divided peroxide of manganese is suspended. If the liquid is kept cool, hyposulphate of manganese is formed. By adding baryta-water, hyposulphate of baryta is produced, which may be decomposed by sulphuric acid. Its salts are unimportant.

Hyposulphurous Acid, *hi po-sul-fu'-rus*, in Chem., symbol $S_2O_2$, equivalent 48 (*dithionous acid*, *thiosulphuric acid*).—This acid is formed in combination with soda by fusing equal parts of carbonate of soda and sulphur, dissolving the impure sulphide of sodium formed, and passing through the solution a current of sulphurous acid until it ceases to be absorbed. The liquid is filtered and evaporated, and large crystals of hyposulphite of soda are formed. This salt has received important applications as a fixing agent in photography, and as an *antichlorine* in bleaching, to remove the last traces of chlorine from bleached paper or fabrics. The acid has never been isolated; for if a stronger acid be added to any of the hyposulphites, it splits up into $S+SO_2$. The hyposulphites are easily recognized by the property they possess of dissolving chloride of silver, forming with it an intensely sweet solution. Besides the double hyposulphite of soda and gold, which is used in photography under the name of *sel d'or*, the salt of soda is the only one which has received any important application.

Hypothenuse, *hi-poth'-e-nuse* (Gr. *hupo* under, and *teino*, I stretch), a term denoting the longest side of a right-angled triangle (*see* Geometry), or, in other words, that side which subtends the right angle. Euclid, in the 47th proposition of his first book, determines the theory by which the square of the hypothenuse is equal to the sum of the squares of the other two sides of a right-angled triangle, which admirable mathematical problem is said to have been discovered by Pythagoras. It is stated in Brande's Dictionary that Cameron, in the notes to his edition of the First Six Books of Euclid, in Greek and Latin, has collected no fewer than seventeen different demonstrations of this celebrated theorem from the plain principles of elementary geometry.

Hypothesis, *hi-poth'-e-sis* (Gr. *hupothesis*, supposition), a term applied to an argument deduced from an allowed fact. For instance, as it is forcibly observed in the "English Cyclopædia," the sun would disappear if it were deprived of its power of giving light, and also if an opaque body were to be inserted between it and the earth; either of these circumstances would be amply sufficient to explain a total eclipse, and would be the hypothesis from whence we would derive that conclusion. In all mathematical propositions, in which the manner of reasoning by hypothesis is so vitally necessary, there are two things to be taken into consideration,—firstly, the *hypothesis*, and, secondly, the

*conclusion*; the former being that which is granted, or built on supposition, either of which may be the case, and the latter being the necessary consequence of reasoning from the data. There are no better examples of this form of argument than those found in Euclid's problems, any of which will serve to illustrate the sense in which the word hypothesis is to be understood. For the instruction of the reader, the following will be amply sufficient:—*If two triangles have two sides of the one equal to two sides of the other, and the angles contained by these sides be equal; then shall the triangles be equal to one another.* Now the first part of this proposition, on which it is based, is the *hypothesis*, and the latter part, which is determined by the former, is the *conclusion*. In a well-written article on the subject in the "English Cyclopædia," the writer observes: "The following mode of argument is known in logic by the name of hypothetical syllogism:—If A exist, Z exists; but A does exist, therefore Z does exist. Or, establish the absolute truth of an hypothesis, and the phenomena which necessarily follow, may be asserted even without experiment. But this we are seldom in a condition to do. The preceding process cannot be converted: if A exist, let Z necessarily follow; Z has appeared, are we then entitled to say that A exists? By no means; for when we prove that Z necessarily follows from A, we do not show that Z follows from nothing but A. But if we can establish the following:—If A exist, Z follows; if B exist, Z follows; if C exist, Z follows; and Z cannot happen in any other way: then, from the arrival of Z, we are entitled to assume that one of the three, A, B, or C, must necessarily exist; perhaps two, and perhaps all three. At the same time, if the existence of the consequence can be denied, the hypothesis is overthrown. If A exist, Z follows; but Z does not happen; then it is perfectly certain that A does not exist. The following summary of the four cases may be more worthy of our readers' consideration than many of them will suspect:—

(1) When A is B, Y is Z; But A is B, } Therefore Y is Z.

(2) When A is B, Y is Z; But A is not B. } Nothing can be concluded: Y may be Z on some other grounds; or Y may not be Z, precisely because A is not B, or for some other reason.

(3) When A is B, Y is Z; But Y is not Z, } Therefore A is not B.

(4) When A is B, Y is Z; But Y is Z. } Nothing can be concluded: A may be B, and either because Y is Z, or for some other reason; and A may not be B, and there may be some other reason why Y should be Z."

In Physics, hypothesis is applied to a free supposition made to simplify or account for many of the phenomena and natural qualities of the world as we see it. Of all hypotheses that have been made, Kepler's (*see* GEOMETRY), which assumed that all the planets move in elliptic orbits, is one of the most beautiful, as it has been so fully confirmed by after-astronomers and mathematicians, that its truth manifests another strong proof in favour of this mode of argument. To conclude, in the words of Sir John Herschel, "A well-imagined hypothesis, if it have been suggested by a fair inductive consideration of general laws, can hardly fail at least of enabling us to generalize a step further, and group together several such laws under a more universal expression."—*Discourse on the Study of Natural Philosophy.*

HYPOXIDACEÆ, *hip-oks-e-dai'-se-e* (Gr. *hupo*, under; *oxus*, sharp), in Bot. the *Hypoxis* fam., a small nat. ord. of herbaceous *Monocotyledones*, closely allied to *Amaryllidaceæ*, from which they are distinguished by their habit, their dry harsh leaves, by the outer divisions of the perianth being of coarser texture than the inner, by their seeds being commonly strophiolate, and especially by having an embryo with the radicle remote from the hilum. There are four genera, embracing about 60 species, natives of the warmer regions of the globe. The fleshy roots of some species are eaten.

HYSTERIA, *his-te'-re-a* (Gr. *hustera*, the womb), in Med., is a nervous affection to which females are particularly subject, and which is generally connected with uterine irregularities. It occurs most frequently with persons between the ages of fifteen and forty-five or fifty, and is most common with single women of weakly constitution and who lead sedentary lives. This complaint appears in such variety of forms, and simulates such a variety of diseases, that it is scarcely possible to give a just character or definition of it. The attack is usually preceded by dejection of spirits, anxiety of mind, difficulty of breathing; a ball is felt advancing upwards from the stomach into the throat, and threatening to stop the passage of the air; then the trunk and limbs of the body become violently convulsed, the patient sobs and cries, and occasionally bursts out into fits of laughter. After a time, these symptoms gradually cease, a quantity of wind is evacuated upwards, with frequent sighing and sobbing, and the woman recovers the exercise of sense and motion without any recollection of what has taken place during the fit,—feeling, however, a severe pain in her head and a soreness all over her body. A fit of hysteria may last from a few minutes to several hours, or even days. It is to be distinguished from an epileptic fit by the absence of foaming at the mouth, by the sobbing and crying, by the milder expression of countenance, and by its being gradual, and preceded by the sensation of a ball. Hysteria assumes various other forms; as palpitations of the heart and difficult respiration; pains in different parts, as the head, left breast, &c.; different forms of paralytic affections, &c. The hysteric fit, however alarming and dreadful it may appear, is rarely accompanied with danger, and never terminates fatally unless it passes into epilepsy, or the patient be in a very reduced state. During the paroxysm, the first care is to see that the patient do no injury to herself, by striking her head or hands against any hard substances, nor to others by biting. If the fit be slight, it may frequently be arrested by dashing cold water on the face, or by filling the mouth with something of an unpleasant taste, or by applying some stimulating scent to the nostrils. If more serious, the face and neck ought to be freely exposed to the air, the forehead bathed with wet cloths, and a slight purgative administered. In some cases, hysteria is owing to plethora, or fulness of blood; in others to de-deficiency of it. In the former case, a spare diet, exercise, and occasional purgatives, are recommended, with sometimes the actual abstraction of blood; in the other case, the system is to be kept up and sustained by nourishing diet and tonics, particularly iron. The patient's mind is to be kept as cheerful and tranquil as possible, by agreeable company; and all tendency to excesses or irregularities kept in check. The great cause of the prevalence of this disorder among our young females is owing to the defective physical and mental training to which they are subjected. Were their physical frames developed and strengthened by proper exercise, and their mental powers kept in proper subjection, there would be much less of hysteria.

# I.

I is the ninth letter, and the third vowel, of the English language. It is pronounced by throwing the breath suddenly against the palate as it issues from the larynx, with a slight hollowing of the tongue, and nearly the same opening of the lips as in pronouncing *a* or *e*. In different countries the pronunciation of this letter varies considerably. In Italy, France, and other countries, it is pronounced similarly to the English *e*. In England its sound varies; in some words it is long, as *bright, fine;* and in others short, as *prince, tin;* in others, again, it is pronounced like *y*, as in *union, furrier;* and in a small number of words it is pronounced like double *e*, as in *magazine*. The letter *ι* (*iota*), in the Greek language, is the simplest of the alphabetical characters. Used as a numeral, the letter I signifies *one*, and represents as many units as it is times repeated; thus, I. one, II. two, III. three; and when put before a higher numeral, it subtracts itself; as, IV. four, IX. nine; and so on: when, however, it is

placed after a higher numeral, it adds itself; thus, VI. is 5+1, or six; VII. is 5+2, or seven; and VIII. is 5+3, or eight. In Roman coins the I was the mark of the *as* in value and weight; and as an initial letter in inscriptions, it stood for *Idæa, imperator, imperii, indulgentia, invictus*, &c. The dot over the i originated in the 14th century.

IAMBICS, *i-ăm'-biks*, a species of verse used by the Greek and Latin poets, and originally composed of a succession of iambi (⏑ –). The derivation of the word has never been ascertained, but, according to Aristotle, the iambic measure was first employed in satirical poems called *iambi*, which appear to have been acted dramatically. Amongst the Greek tragic poets, the iambic is the measure most commonly used. They consisted of three entire metres, or six feet, and were consequently called the tragic *trimeter acatalectic*. Although, as stated above, this species of verse originally consisted of iambi only, in time other feet were introduced into the metre. In the annexed table is a list of the variations admitted:—

| 1. | 2. | 3. | 4. | 5. | 6. |
|---|---|---|---|---|---|
| ⏑ – | ⏑ – | ⏑ – | ⏑ – | ⏑ – | ⏑ – |
| ⏑ ⏑ | ⏑ ⏑ | ⏑ ⏑ | ⏑ ⏑ | ⏑ ⏑ | |
| – – | | – – | | – – | |
| – ⏑ ⏑ | | – ⏑ ⏑ | | | |
| ⏑ ⏑ – | | | | | |

A tribrachys, it will therefore be observed, was admitted into all places except the last; a spondee in the first, third, and fifth; a dactyl in the first and third; and an anapæst in the first. The anapæst, in proper names, was also introduced in every place of the verse except the last, with this restriction, that the anapæst should be contained in one word. In the comic trimeter, the same number of feet is allowed as in the tragic; but in it a dactyl is allowed in the fifth place, and an anapæst in common words, in every place but the last. For a full account of the iambic metres, the reader is referred to Hermann's "Elementa Doctrinæ Metricæ," and Porson's editions of the tragedies of Euripides. In modern European languages, verses composed of five iambic feet form a favourite metre. Such verses are much used in the lighter French poetry; and in serious composition it is ordinarily used by the English, Germans, and Italians.

IBEX, *ī'-beks* (Lat. *Capra Ibex*), an animal belonging to the fam. of the *Capridæ*, of which it was thought by Cuvier to be the distinguishing type and parent stock. Its characteristics are similar to others of the Capridæ, and will be found given under the article GOAT. The ibex is sometimes termed the *steinbok*, and is found principally inhabiting the Alps, the Carpathian mountains, and the Pyrenees, in Europe, of which continent it is a native. Its horns are extremely long, and are very large. Their colour is a deep brown, and they are marked on the upper surface with protuberant transverse rings or half-circles. The nature of the ibex is gregarious, and, consequently, it is always met with in small flocks; and the animal is likewise remarkably swift, and able to climb the highest mountains and most precipitous ascents. When pursued, it is uncommonly fierce, and will turn on its hunters with the greatest courage, and endeavour to hurl them down the precipices which it affects. It is said, also, to have the faculty of throwing itself down from the most fearful heights and alighting in safety on the ground, as it receives the shock of descent on its horns, which, by their elasticity, preserve it from any injury; the pursuit of the ibex is, therefore, extremely difficult, and, to say the least, hazardous.

IBIS, *ī'-bis*, a gen. of grallatory birds, common throughout Africa, one of whose most remarkable species is the *Ibis religiosa* of Cuvier. This latter variety arrives in Egypt about the time that the inundations of the Nile commence, and it emigrates from thence into Ethiopia about June, when the waters have subsided. It is about the size of a fowl, the head and neck being bare and the body white, while the long quills of the wings are tipped with shining ashy black. It was worshipped by the ancient Egyptians, who considered it a sacred bird, and mummies of it are being continually discovered in large numbers in the catacombs of Memphis. The principal other variety is the glossy ibis (*Ibis falcinellus*), which is nearly two feet in length, and proportionate in size. The natural characteristics of the ibis are as follows:—Beak arched, long, slender, thick at the base, where it is quadrangular, and furnished with an obtuse tip; nostrils extending from the root to the tip of the beak, and linear, dividing it into three portions; head and throat bare; legs long and four-toed, the front webbed at their base as far as the first joint; the hind toe very long, and all provided with claws.—*Ref.* Cuvier's *Natural History*.

ICACINACEÆ, *ī-kă-sin-ā'-se-e*, in Bot., the *Icacina* fam., a nat. ord. of *Dicotyledones*, in the sub-class *Thalamiflorœ*, consisting of evergreen trees and shrubs, natives of tropical and nearly tropical countries. This order was formerly included in *Olacaceœ*. The plants are little known.

ICE, *īse*, the familiar and also the technical term for water in the solid state. Water, on being cooled, contracts until the temperature has fallen to about 39° Fahr., when it begins to expand. At the freezing-point, 32°, under ordinary circumstances, ice is formed, which, in consequence of the continued expansion, has only 0·93 the density of water at 39°. The ice, therefore, floats upon the surface. The increase of volume in the formation of ice is the cause of the splitting of stones and rocks by the frost; for water penetrates into the crevices, and there becomes frozen. The great expansive force of ice was experimentally investigated by Major Williams. He filled a mortar with water, and having rammed a wooden plug tightly into the muzzle, placed it in air at a temperature considerably below freezing-point. When the water froze, the plug was forcibly driven out to a distance of 400 feet. Ice has the peculiar property of re-uniting by the contact of adjoining surfaces, after having been broken into fragments. (*See* REGELATION.) The phenomena attending the conversion of water into ice are noticed under the heads FREEZING, LATENT HEAT, TEMPERATURE, and WATER.

ICEBERG, *īse'-berg* (Ger. *eis*, ice; *berg*, mountain), the name given to a mountainous mass of ice floating in the sea. Some icebergs are formed by the accumulation of ice and snow on the surface of the water; others are produced by the descent of glaciers into the sea. When numbers of icebergs freeze together, they form what are called "fields" or "packs," which are often of great extent, stretching across the ocean as far as the eye can reach, and often rising in perpendicular cliffs from 80 to 100 feet above the water. Solitary icebergs are also often of vast dimensions, and instances are given, both in Arctic and Antarctic voyages, of floating islands of ice several miles in circumference, rising from 40 to 200 feet above the sea-level, and loaded with blocks and shingle. As they are floated by the polar currents to warmer latitudes, they melt away, dropping their burdens of boulder and rock débris on the bottom of the ocean. Geologists regard the water-worn blocks, the gravel, and shingle of the "boulder-clay" as the deposits of ancient icebergs.

ICE-BLINK, an appellation given by seamen to a luminous appearance seen near the horizon in northern latitudes. It is caused by the light being reflected by the fields of ice, and it is seen long before the ice itself which causes it can be observed.

ICE-HOUSE, a term applied to cellars constructed for the purpose of preserving ice in warm temperatures for a considerable time. Cellars made for this object are surrounded with thick walls, and either arched over or provided with a conical wooden roof. The portion of ice which melts can be removed either by means of a drain under the cellar, or may be raised to the surface, and drawn off by a pump. The roof of the cellar may be covered with earth to any required extent in very hot climates. In all cases, air should be carefully excluded from ice-houses. The best soil for the foundation of an ice-house is chalk, since it permits the water from the melting ice to percolate through. In America, vast buildings are erected above ground for the storing and preserving of ice. Some of them are two hundred feet long, and resemble huge barns. Around Forest Pond, in Massachusetts, are nearly fifty of these immense structures.

ICELAND MOSS. (*See* CETRARIA.)

ICELAND SPAR, in Min., transparent crystalline calc-spar, possessing the property of doubly refracting objects seen through its mass: first found in Iceland.

ICE-PLANT. (*See* MESEMBRYANTHEMUM.)

ICE-SPAR, in Min., this name is applied to transparent crystals of felspar found in certain lavas.

ICE-TRADE.—The exportation of ice from cold to warm climates, as an article extensively used for a variety of economical purposes, has greatly increased since Mr. Tudor, of Boston, sent out the first cargo in 1803. For twenty-five years he continued to devote himself to the ice-trade, and after numerous misfortunes, established it as one of the most lucrative in the United States. In 1854, 150,510 tons were exported from Boston alone. Of the ice exported from America, comparatively a small quantity is shipped for Britain; the largest quantity imported into this country is received from Norway, probably the only other country which carries on a trade in ice. In America during December and January, when the ice is forming, it is kept as free of snow as possible. Holes are occasionally pierced in the forming ice to accelerate its formation, by allowing the water to overflow. After being carefully cleared of snow with scrapers made of wood, and of the snow-ice by means of an iron scraper, the ice is marked out by an iron plough into squares of about five feet each. The "cutters" follow in these tracks; and the ploughs, scrapers, and cutters are all drawn by horses. The square pieces, after having been disengaged by means of hand saws, are then ready to be floated to the shore. Four hundred tons can thus be cut and stored away in ice-houses by forty men and twelve horses in one day. The Wenham Lake Ice Company have an ice-store which is able to contain 20,000 tons of ice. The uses of ice are various in all parts of the world; either for cooling wines and other beverages, or for packing salmon, or for confectionery purposes. In warm climates, it is prized as a luxury; and in Bengal and other hot countries, artificial means are regularly used for its manufacture. Throughout the states of North America, the ice-trade gives employment to a large number of the working-classes during a period of the year when all ordinary avocations are suspended. The ice-farms of New York and Massachusetts are considered equal in value to the rice-crop of Georgia; and the whole capital invested in the trade is about £1,500,000.

ICH DIEN, *ik deen* (Ger., I serve), the motto of the prince of Wales. Besides the coronet, this prince has a distinguishing mark of honour, called the prince of Wales' feathers. This consists of a plume of three ostrich-feathers, with an ancient coronet; under which in a scroll is the motto "ICH DIEN." This device was first assumed by Edward the Black Prince, after the famous battle of Cressy, in which he slew with his own hand John, king of Bohemia, the stipendiary of the king of France, in whose wars he was then serving. It was from the head of this Bohemian potentate that Edward, then prince of Wales, took such a plume and motto, which have ever since been borne by his successors, in remembrance of the event.

ICHNEUMON, *ik-nu'-mon* (Gr. *ichneumon*, from *ichneuo*, I track; probably because it tracks the footsteps of the crocodile), a name applied in Zool. to a genus of quadrupeds and a family of hymenopterous insects. The name of *Herpestes* is now usually given to the mammalia. The genus has the following characters:—Feet short, with five demi-palmated toes, armed with claws, which are slightly retractile; tongue furnished with horny papillæ; ears small; a voluminous simple pouch, which does not contain odoriferous matter, and at the bottom of which the vent is pierced. Body very much elongated, with a long tail, strong at its base. The species of the genus *Herpestes* are found in Asia and Africa. The *Herpestes Ichneumon*, or *Ichneumon Pharaonis*, has fur of a chestnut-brown and yellow colour, each hair being annulated with those two colours; the feet and muzzle are black, or deep chestnut, and the tail is terminated by a tuft of long hair. It appears to have been one of the sacred animals of the ancient Egyptians; and according to Herodotus, it was buried in "holy repositories." Although many fabulous feats performed by this animal, in destroying crocodiles, are narrated by ancient writers, they would all appear to be founded upon its industrious searching for the eggs of that reptile, which tends materially to check its reproduction. The ichneumon, however, preys upon the eggs of other animals besides those of crocodiles. In Upper and Lower Egypt, during the inundations of the Nile, it is frequently found in gardens and near the villages; but in the dry season it resorts to the open fields and to the banks of the river. It feeds on plants, eggs, and fowls, killing the latter in the villages at night. In Upper Egypt, it searches for the eggs of the crocodile, which he hid in the sand on the shore, and eats them. The ichneumon can be easily tamed, and taught to go about a house like a cat. It makes a growling noise, and barks when angry. A grey ichneumon (*Herpestes griseus*) has been known to kill twelve full-grown rats, which were let loose in a room sixteen feet square, in less than a minute and a half. It also destroys small reptiles.

ICHNEUMON FLY.—The genus of insects called ichneumons belong to the order *Hymenoptera*, section *Terebrantia*, and family *Pupivora*, in the arrangement of Latreille. They are remarkable for the habits of their larvæ, which are parasitic in the bodies of other insects. The perfect ichneumons perforate these bodies by means of their ovipositors, and there deposit their eggs. They have derived their name from this destructive habit, a comparison having been drawn between them and the *Herpestes Ichneumon*, the quadruped above described. The development of these parasitic insects within the body of other insects afforded much speculation among early philosophers, who fancied that occasionally one animal had the power of being transformed into another. The eggs of the genus *Ophion* are of a singular form, being bean-shaped, and attached near one end by a long slender peduncle to the body of the victim. When hatched, the larva retains this position, and thus lives upon the juices of the insect it attacks.

ICHNITES, *ik'-nites* (Gr. *ichnos*, a footprint), in Geol., a term applied to all fossil footprints.

ICHNOGRAPHY, *ik-nog'-rŭf-e* (Gr. *ichnos*, and *graphein*, to write or draw), a term used to express the ground-plan of any building, and also applied to the delineation of the same. It is not used in the present day, but it will be found in old works on architecture and county histories, in which views and ground-plans of churches and buildings of interest are often given.

ICHOR, *ik'-or* (Gr.), a term used in Med. to denote a thin, acrid, and sanious discharge from wounds, ulcers, &c. By the ancient Greeks the term signified the divine liquor which flowed from the wounds of the gods.

ICHTHIN, *ik'-thin*, in Chem., the azotised albuminoid principle obtained from the yolk of the eggs of fishes. It corresponds to the vitellin found in the yolk of the eggs of fowls.

ICHTHYODORULITE, *ik-the-o-dor'-u-lite* (Gr. *ichthus*, fish; *doru*, spear; *lithos*, stone), in Geol., a fossil fin-spine. The spines of certain shark-like fishes of the lower coal-measures are often more than a foot long, and exceedingly strong.

ICHTHYOLITE, *ik'-the-o-lite* (Gr. *ichthus*, fish; *lithos*, stone), in Geol., a general term for a fossil fish, or any portion of a fish; as a scale, tooth, or spine.

ICHTHYOLOGY, *ik'-the-ol'-o-je* (Gr. *ichthus*, a fish; *logos*, a discourse), that branch of science which treats of the natural history of fishes. For a general description of the features and anatomy of these many-formed animals, the reader is referred to a former article. (*See* FISH.) The science of ichthyology, during many remote ages, consisted, in common with all similar branches of human knowledge, of merely a few partial, unconnected observations. Aristotle, about 350 years before the Christian era, made some progress towards connecting these together as a body of doctrine; but no real advance was made till the middle of the 16th century, when Belon, Rondelet, and Salviani, the true founders of modern ichthyology, made their appearance. These men, instead of merely compiling, like their predecessors, saw and examined for themselves, and made drawings from nature. About the end of the 17th century, Willughby, and the celebrated John Ray, first issued a history of fishes, in which the species were not only accurately described from nature, but distributed in accordance with characters drawn solely

from their structure. Finally, Artedi and Linnæus, about the middle of the 18th century, completed the work which the others had commenced, by establishing well-defined generic groups, consisting of species well ascertained and accurately characterized. The greatest stride that the science has made since that time is due to the zeal, accuracy, and perseverance of Baron Cuvier, whose great work,—"Histoire Naturelle des Poissons," treats comprehensively of the subject. In none of the greater divisions of the animal kingdom were Cuvier's labours in forming a natural arrangement of the species of more value than in the class of fishes, the lowest of the vertebrata, or those animals which possess a central bony axis, on which the soft parts are sustained, and from which the motive powers diverge. In the lowest known form of fish, the lancelet, the whole vertebral column is merely a pulpy nervous chord, invested by a membranous sheath. The vascular trunks and digestive organs in all the vertebrata are protected by the inferior processes and diverging appendages of the vertebra; and the type of this division of animals is essentially quadrupedal, though in several groups, one or both pairs of limbs are either rudimental or altogether absent. Deviations from the ordinary type of this nature are principally to be found among the classes of fishes and reptiles. In fishes, these limbs are called fins, the anterior being named the pectoral fins, and the posterior the dorsal fins. The vertical fins are of a different nature. Artedi denominated those fishes which have spinous rays on the back, Acanthopterygians (Gr. *acantha*, a thorn; *pteryx*, a wing), and those which have only flexible and jointed rays, Malacopterygians (Gr. *malakos*, soft; *pteryx*, a wing). According to Cuvier, the acanthopterygian character assumes a preponderance over all other divisions, and renders them secondary, and incapable of being placed in opposition to it. The malacopterygian families are distinguished by more marked differences and characters than the former; some are both naturally and distinctly limited, so that each is not only clearly separated from the other, but also retains within itself a great resemblance in the details. The history of fishes commences with the Acanthopterygians, which constitute one immense family. Amongst them are many varieties, useful as articles of food, and of considerable value to man in a commercial point of view. The Malacopterygians include the abdominal fishes, which have the ventral fins situated behind the pectoral. These are mostly fresh-water fishes, such as the carp, pike, and salmon: the herrings are also of the same nature. The sub-brachial and apodal fishes have cartilaginous fins. One of the best modern classifications of fishes is that of Professor Müller, who finds characters which he considers to be of the highest importance in the vascular system. There is in most fishes, close to the ventricle, a thick muscular swelling of the commencement of the arterial system, which might almost be called a third chamber of the heart. The blood is prevented from regurgitating into the ventricle, on the contraction of this bulb, by valves. The number of these openings, and the presence or absence of the thick muscular coating of the bulb, furnish distinct characters for the different groups. Müller says that these characters are so constant that he is unacquainted with any others, either anatomical or zoological, equal to them in certainty. The Plagiostomi, or cartilaginous fishes, have three or more rows of valves within the muscular valve. In the Ganoids, a still greater number is present; but in the large group formed by the osseous fishes, after the ganoids have been removed from them, there are only *two opposite valves* at the origin of the bulb. This large group of perfect osseous fishes Müller names Teleostei. Altogether he makes six sub-classes of fish:—Teleostei, Dipnoi, Ganoidei, Elasmobranchii, Marsipobranchii or Cyclostomi, and Leptocardii. In Professor Owen's modification of this arrangement, these sub-classes are not preserved, the class being subdivided into nine orders, and again into sub-orders. The first order, Dermopterous fishes (Gr. *derma*, skin; *pteron*, a wing) possess cutaneous vertical fins, in which the mucoid rays are soft and delicate, or altogether imperceptible. The species are not numerous, and are of a vermiform shape. They are divided into the following sub-orders:—1. Pharyngobranchs. 2. Sutebers, to which several species belong, one of which the New Zealanders roast and eat: the lamprey belongs to the same sub-order. 3. Ribbon-Apodals, delicate, semitransparent, and scaleless fishes, which are inhabitants of all the oceans.—The second order, Malacopterous fishes, have a well-ossified skeleton, and a head that is at once recognised as such; but with the bones of the face less developed than in more highly organized fishes. They are divided into the following sub-orders:—1. Serpentiform Apodals, which include the Anguillidæ. The eel (*Anguilla vulgaris*) grows in this country to the size of two or three feet, and is sometimes said to reach five or six feet in length. 2. Apodals, with articulated fin-rays. The best-known species of this sub-order is the *Gymnotus electricus*, or electric eel. It is remarkable for the violence of its electric shocks, which are often powerful enough to stupefy a man or horse. 3. Malacopterous Abdominal fishes. The species of this family are so numerous and so much alike, that considerable confusion prevailed concerning those described by early writers. The best known fishes of this tribe are the herring, pilchard, anchovy, salmon, trout, grayling, pike, carp, tench, bream, and chubb. The large family of the Siluroids complete the race of malacopterous fishes. They have an air-tube to their swim-bladder, and some of the rays of their fins are firmer, stouter, and nearly as hard as those of acanthopterous fishes.—The third order consists of the Pharyngognaths. In all these fishes, the lower pharyngeals are united to form one bone. They are divided into two sub-orders,—the Malacopterygii and the Acanthopterygii: amongst the former, the flying-fish is best known.—The fourth order is that of the Anacanths.—The only difference that exists between this order and that of the Acanthopterous fishes is the absence of spinous or pungent rays in the fins. It is divided into two sub-orders:—1. Ophidiids, containing the cod, haddock, dorse, whiting, and common hake. 2. Thoracici, which numbers the Echeneis and the Flounder family.—The Acanthopterous fishes form the fifth and most extensive of all the orders, and consist of twenty-four families.—The sixth order is composed of Plectognathous fishes (Gr. *plektos*, interlaced; *gnathos*, jaw). The bones of the Plectognaths differ in some degree from those of the great mass of osseous fishes, and there are fewer pieces in their skeletons. The upper jaw is immovable, and the dermal productions, scales, spines, roughness, and osseous plates, differ from ordinary fish-scales. The order consists of three families.—Fishes of the seventh order, Lophobranchs (Gr. *lophos*, a tuft; *branchia*, gills), possess an osseous skeleton and complete and free jaws; but the ultimate division of their branchiæ, instead of being pectinated, is divided into small tufts, which are ranged by pairs along the branchial arches. They are thus, as it were, encased in mail armour; and this, together with their angular form, gives them a singular aspect. The order contains three families, among the most interesting members of which are the sea-horse fish and the pipe-fish.—The eighth order is that of the Ganoids. The scales of the Ganoids are generally of a rhombic or quadrangular form, seldom rounded in outline, and always coated on the surface with a layer of enamel. The living ganoids have all bony skeletons, but in many of the fossil ones the skeletons have been cartilaginous, like that of the sturgeon. There are three families belonging to the order.—The Sirenoids form the ninth order, of which two distinct species are known,—one found in the river Amazon, and another, called the *Lepidosiren annectans*, which inhabits the river Gambia. Very little is known about the former, but the latter has been frequently examined, and has given rise to much discussion among naturalists as to whether it ought to be classed with reptiles or fishes. After the floods at the conclusion of the rainy season have begun to retire, this fish is left behind in the mud, which the tropical sun soon converts into a hard cake. An aperture, however, is left to admit air, and the Lepidosiren remains torpid in its chamber till the waters again overflow the country.—The tenth order consists of the Chondropterygians, or cartilaginous fishes, which contains the false shark.—The Plagiostomic fishes (Gr. *plagios*, sideways; *tomos*, a cut) or Sharks, form the

eleventh order, and are divided into two sub-orders,—the Squali and the Raiæ. The Squali, or sharks, are of several varieties: the Scyllidæ, or dog-fishes; the Carcharidæ, which are armed with teeth arranged in a linear series, so as to form a sharp saw, each tooth in the majority of species being also serrated on the edge. They have been known to divide the body of a man in two at one bite. Of the *Galeidæ*, or *Topes* and *Hounds*, there are two British examples, called by the fishermen of different localities "penny-dog" and "miller's dog." The Lamuidæ furnish the *Lamna cornubica*, the most formidable of the sharks met with in the English Channel. The *Alopecias vulpes* is distinguished from the rest of this sub-order by the great length of the upper lobe of its tail exceeding that of its body. It is often called the "thrasher" by seamen, on account of its attacking the whale and striking it violent blows with its tail. Another family of sharks is the Cestracions, of which two species have been observed; one near Japan, and the other in the Australian seas. The Raiæ, or sub-order of Rays, is familiarly known by the name of skates. The general character of its form is the extreme depression of its body and the lateral expansion of the dorsal fins: the torpedo belongs to this sub-order. The study of the geographical distribution of species is very important in its connection with ichthyology. It is especially of importance to a maritime nation like our own, anxious to extend her fisheries, thereby not only increasing the supply of a nourishing food, but also fostering and encouraging her school for seamen.—Ref. *Biographia Zoologica*, published by the Ray Society; and the article on Ichthyology, by the late James Wilson and Sir John Richardson, in the *Encyclopædia Britannica*.

ICHTHYOSAURUS (Gr. *ichthus*, fish; *sauros*, lizard), in Geol., a well-known genus of extinct marine saurians, so called from the combination of fish and lizard characters. The great era of ichthyosaur development was from the middle Trias to the Chalk inclusive, the Lias formation being the chief repository of their remains in England. In this deposit specimens of all ages and of all sizes have been found,—from the fœtus of a few inches to the adult more than thirty feet in length. The following are the most striking peculiarities in the structure of the fish-lizard:—The vertebræ resemble those of fishes in being concave at each end. The cranium resembles that of the crocodile, but is characterised by a remarkably large eye-orbit, furnished with a circular series of bony sclerotic plates,—a structure observable in the eyes of turtles, lizards, and many birds. The teeth, which are extremely numerous, resemble in structure those of the crocodiles, but are implanted in a deep continuous groove, and not in distinct sockets. The locomotive extremities are similar to the paddles of the whale; but they are four, instead of two, in number. From the form and position of masses of crushed and apparently half-digested fish-bones and scales in the abdominal cavity, it is concluded that the ichthyosaurs preyed upon fish; and from the shape of their *coprolithes*, or fossil excrements, it is obvious that their intestinal canals were furnished with spiral valves, as in the sharks. In one or two instances, very small, and to all appearance fœtal specimens, have been found within the pelvic cavities of large ichthyosaurs; and from this circumstance it has been inferred that these extraordinary creatures, like the whales, were viviparous.

ICHTHYOSIS, *ik-thi-o'-sis* (Gr. *ichthus*, a fish), a disease of the skin, which takes its name from the surface of the cuticle suggesting the idea of the scaly skin of a serpent or fish. It is distinguished from lepra and psoriasis by the absence of deciduous exfoliations, distinct or partial patches, and the constitutional disorders which more or less accompany those diseases. It is generally confined to patches in the armpits and on the breast or chest; but sometimes it attacks the face.

ICHTHYS, *ik'-this* (Gr. *ichthus*, a fish), a word found on many ancient tombstones, urns, seals, rings, &c., belonging to the early ages of Christianity. As each character forms an initial letter in the Greek words *Iesous Christos, Theou Uios Soter* (Jesus Christ, the Son of God, the Saviour), the word is supposed to have had a mystical meaning. It would appear as if this interpretation were correct, when the reverence with which the fish was symbolically regarded by the ancients is considered. Many signs and ceremonies were adopted by the Christians, with some change of meaning, from the religious rites of the nations amongst whom they dwelt.

ICICLE, *i'-sik-kl* (Sax. *ises-geal*), a pendant conical mass of ice, formed by the freezing of water or other fluid as it flows down an inclined plane, or collects in drops and is suspended. In the north of England it is called *ickle*.

ICONOCLASTS. (*See* vol. I. of this work.)

ICONOGRAPHY, *i-ko-nog'-rā-fe* (Gr. *eikon*, an image or representation, and *graphein*, to write).—In an extended sense, the word iconography is applied to the description of any figures found in paintings and sculpture, as well as monumental records of ancient date; but in its restricted signification it is confined to descriptions and drawings of any sculptured images on paintings of the human form, animals, and inanimate objects, that are found in buildings and their appurtenances, and furniture, that are devoted to ecclesiastical purposes. This is more properly termed Christian iconography, and embraces all objects connected with Christian art from the earliest times, as far as the close of the 15th century. When the word is understood in this sense, it is a branch of ecclesiology.—*Ref.* Didron's *Christian Iconography* (Bohn); Jameson's *Legendary and Sacred Art*.

ICONOLOGY, *i-kon-ol'-o-je* (Gr. *eikon*, an image, and *logos*, word, or discourse), a description and explanation of allegorical figures, symbols, emblems, and visible representations, or embodiments of abstract qualities.—*Ref.* Pistrucci's *Iconology*.

ICOSAHEDRON, *i-ko-sa-he'-dron* (from Gr. *eikosi*, twenty, and *hedra*, base), one of the five regular solids, according to the Platonic theory, and composed of equilateral and equal triangles. As it is composed, therefore, of twenty equal and similar pyramids, whose vertices all meet in the same point, the content of one of these multiplied by twenty will give the whole content of the icosahedron. If one of the linear edges of the faces of this solid be denoted by $x$, then the superficies, or surface, will be equal to $5x^2\sqrt{3}=8{\cdot}660254\,x^2$; and the solid content will be

$$\frac{5}{6}x^3\sqrt{\frac{7+3\sqrt{5}}{2}}=2{\cdot}181695\,x^3.$$ (*See* GEOMETRY.)

IDEA, *i-de'-ā* (Gr. *idea* and *eidos*; Lat. *forma*, *species*), in Phil., denotes in general whatever is the immediate object of thought. In the Platonic philosophy, however, the word possesses a different and a higher signification. According to him, ideas were the patterns after which the Deity made or fashioned the phenomenal or material world. He held that all things consisted of matter and form, and that the matter of which all things were made existed from all eternity, without form; but he believed that there also existed eternal forms of all possible things which exist without matter, and to these eternal and immaterial forms he gave the name of ideas. By Descartes and subsequent philosophers, the term idea has been employed to signify all our mental representations, all the notions which the mind frames of things; and when, in common language, we speak of having an idea of anything, we mean no more by that expression than that we are thinking about it. By idea, Kant designates every conception formed by the reason and raised above all sensuous perception. These he subdivides into empirical, or such as are partly drawn from experience, and pure, such as are totally free from any empirical element. Another division of ideas is into theoretical and practical. As to the origin of our ideas, some attribute all our ideas to sense; others admit that the earliest notions proceed from the senses, yet maintain that they do not produce the whole knowledge possessed by the understanding; while others deny the senses to be anything more than instruments conveying objects to the mind.

IDEAL, BEAU, *ie i-de'-al*, an expression applied in the Fine Arts to denote a selection of the finest parts of different subjects united, so as to form one

harmonious whole, of a more complete character than is usually found in nature. In other words, it is "the divesting nature of accident, in the representation of an individual. From the nature of the expression, and its definition, it is clear that it more immediately attaches to the arts of painting and sculpture; in architecture, it is susceptible of refinements, dependent on the selection of examples, upon which, however, a less universal agreement exists."—Braude's *Dictionary*.

IDEALISM, *i-de'-al-ism*, in Phil., is the doctrine that in external perceptions the objects immediately known are ideas. Of this doctrine there are several varieties. Some absolutely deny the existence of all material substances; others regard the real simply as ideal, and judge the material world to be merely assumed from the ideal; while a third class, without denying or asserting the existence of a material world, are content with confessing an ignorance of its nature. "I see a tree. The common psychologists tell me that there are three things implied in this one fact of vision; viz., a tree, an image of that tree, and a mind which apprehends that image. Fichte tells me that it is I alone who exist. The tree and the image of it are one thing, and that it is a modification of my mind. This is *subjective idealism*. Schelling tells me that both the tree and my *ego* (or self) are existences equally real or ideal; but that they are nothing less than manifestations of the absolute, the infinite, or unconditioned. This is *objective idealism*. But Hegel tells me that all these explanations are false. The only thing really existing (in this one fact of vision) is the idea, the relation. The *ego* and the tree are but two terms of the relation, and owe their reality to it. This is *absolute idealism*. According to this, there is neither mind nor matter, heaven nor earth, God nor man. The only real existences are certain ideas or relations. Everything else that has name or being derives its name and being from its constituting one or other of the two related terms, subject and object; but the only thing that is true or real is the identity of their contradiction, that is, the relation itself."—*Ref.* Lewes's *Biographical History of Philosophy*.

IDENTITY, *i-den'-ti-te* (Lat. *idem*, the same), denotes the sameness of one thing with the same thing under different circumstances. Thus, personal identity is the consciousness that one has that he is identically the same person that he was months or years ago. By absolute identity is meant that the two elements of thought, objective and subjective, are absolutely one, merely different aspects of one substance. This is maintained by Schelling and Hegel, and is a species of pantheism.

IDEOGRAPHS, or IDEOGRAPHIC CHARACTERS. (*See* HIEROGLYPHICS.)

IDEOLOGY, *i-de-ol'-o-je* (Gr. *idea*, idea, and *logos*, discourse), is literally the science of ideas, and is the term employed by the later disciples of Cordillac to designate their system of philosophy. The name was first employed by Destutt de Tracy in his work entitled *Elémens d'Idéologie*.

IDES, *ides* (supposed to be derived from the obsolete Latin verb *iduare*, to divide), the second of the three great divisions of the month in the ancient Roman kalendar. The *calends* were the first days of the month; the *ides*, days near the middle of the month; and the *nones*, the ninth day before the ides commenced. In March, May, July, and October, the ides fell on the 15th of the month, but, during the remaining months of the year, they fell on the 13th. The plan which the Romans pursued was very peculiar. Instead of employing the ordinal numbers first, second, third, and so on, they distinguished the various days of the month by the number which intervened between any given day and the division which next followed the one which was current. For example, as there were always eight days between the nones and the ides, the day after the nones was termed the *eighth before the ides*; the next the *seventh before the ides*; and so on.

IDIOM, *id'-e-om* (from Gr. *idios*, peculiar), a word made use of to express a mode of speaking or writing which is foreign to the usages of grammar or the general law of language, and which is restricted to some individual dialect. For example, a number of words arranged in any peculiar manner may be a Latin idiom; the same transposed and translated, an English or French idiom; and so on. The sense of the word itself is by no means restricted, as the French word *idiome* expresses any peculiar dialect or language, although *idiotisms* may be deemed a more correct equivalent for our own word idiom. There are several subordinate words to express the idioms of different nations; as Latinism for a Latin one, Gallicism for a French idiom, Hibernicism for an Irish one. The French idiom *Revenons à nos moutons* may serve as an illustration of the peculiar meaning of the word, as the literal translation of the phrase is, "Let us return to our sheep," whereas it is understood, in an idiomatic sense, to express, "Let us go back to our subject."

IDIOPATHIC, *id-e-o-pith'-ik* (Gr. *idios*, one's own; *pathos*, an affection), a term applied to a disease which is not dependent on any other complaint, and therefore opposed to those diseases called symptomatic.

IDIOSYNCRASY, *id-e-o-sin'-kra'-se* (Gr. *idios*, proper; *sun*, with; *krasis*, temperament), means a peculiar temperament of mind, or of body; a state of constitution peculiarly susceptible to be affected by certain agents, which in general produce no effect upon others. In this way, some persons are violently affected by honey, coffee, butter, &c. What are commonly called antipathies belong to this class. (*See* ANTIPATHY.)

IDIOT. (*See* INSANITY.)

IDLENESS, *i'-dl-ness* (Ang.-Sax.), a word capable of many acceptations, but the general meaning of which expresses abstinence from labour or employment; or, in other words, the state of a person who is unemployed in labour or unoccupied with business. Shakspere has *idleness* to express unimportance and trivialness, while Bacon deems it identical with foolishness and infatuation; as in *idleness of brain*. In the sense of laziness, in which the word is sometimes, in fact often, understood, idleness is but a form of moral degradation, one that debilitates the body in as great a proportion as it incapacitates the mind for healthy labour.

IDOCRASE, *id'-o-krais* (Gr. *idea*, form; *krasis*, mixture), in Min., a variety of the garnet, known also as the Vesuvian or pyramidal garnet. It was originally found in the ejected calcareous matter on Vesuvius, but it also occurs in the primitive rocks. There are two principal varieties,—the purple or violet, known as *hyacinth*, and the green, *chrysolite*.

IDOL, IDOLATRY, *i'-dol, i-dol'-a-tre* (Gr. *eidolon*, an image; *latreia*, worship).—The term idol is generally applied to those figures of metal, stone, or wood, used by the pagans to represent their deities; and the term idolatry, to the worship of them. In the Pentateuch and the book of Job,—two of the oldest books we possess, idolatry is spoken of; and it is supposed that the practice was conveyed from Egypt to India in the 17th century before the birth of Christ; and from India, in a modified form, to Northern Europe, about nine centuries later. Idolatry included the worship of all beings in heaven and on earth, visible or invisible, living or dead, and also the images or symbols of these. The worship of the sun, moon, and stars, was probably one of the first forms of idolatrous worship. Rapidly, however, it began to embrace other objects, and even assumed a degrading and repulsive aspect. In Egypt, beetles, bulls, and many other animals, were worshipped, and the idolatry of that time closely resembled the modern form called *Fetichism*. The ancient Greek and Roman idolatry was dignified by all the charms that art and poetry could throw around it; but the most popular Grecian idols were rude, and almost formless images. It is generally considered that the origin of idolatry was a deification of the unseen, incomprehensible powers of nature. The Roman idolatry was not abolished in 404 A.D., by Honorius, although Constantine had ordered the destruction of all idolatrous temples nearly a hundred years before. Images were neither worshipped nor used in the early Christian churches. The first actual notice of a decree to make an image of Christ is not to be found till the 7th century. Tertullian, and others of the fathers, held that painting and engraving were forbidden by the second commandment:—"Thou shalt not make unto thyself any graven image; thou shalt not bow down to them, nor worship them." Towards the close of the 4th century, pictures of saints and martyrs were admitted into churches. In

the next century, images followed, and a species of Christian symbolism was built up out of pictures and images, which represented the leading points of Christianity visibly. For several centuries afterwards, images of the Virgin, saints, martyrs, &c., were honoured with the same observances as the pagans paid to their idols. Lights were burned before them, incense was burnt, and prayers were offered up to them, hymns were sung to them, and miracles ascribed to them. At the period of the Reformation, however, the Protestant church abolished the worship of images.

IDYLL, or IDYL, *i'-dil* (Gr. *eidullion*, the diminutive of *eidos*, form), a short pastoral poem, or an animated description and representation of ordinary objects of nature in harmonious verse. The bucolic poems of Theocritus are called idyls, while those of Virgil are distinguished by the name of Eclogues, which renders it a difficult matter to decide why there should be any difference in name, as both compositions are of a similar nature throughout. That the ancients did not restrict the use of the word, may be seen by the works of Ausonius, which are called idylls. In English literature, Thomson's "Seasons," Burns's "Cotters' Saturday Night," and Goldsmith's "Deserted Village," are examples of idylls; while Tennyson, in his "Idylls of the King," has even extended the interpretation of the word to a farther degree than was done by the ancients.

IGNATIA, *ig-nai'-she-ă*, in Bot., a gen. of the nat. ord. *Loganiaceæ*. The species *I. amara* has been supposed to yield the seeds known as St. Ignatius's beans, but Bentham believes that these seeds are the produce of a species of *Strychnos* (which *see*). They come to us from the Philippine islands. They are intensely bitter, and contain the alkaloid strychnia in even larger proportions than the nux vomica seeds.

IGNEOUS ROCKS, *ig'-ne-ous* (Lat. *ignis*, fire).—The term igneous is applied in Geology to all agencies, operations, and results, which seem connected with, or to have arisen from, subterranean heat; and igneous rocks include the Volcanic, Trappean, and Granitic series, all of which are evidently the products of fusion, either in the interior or at the surface of the crust; geologists, consequently, use the term igneous as synonymous with Plutonic, pyrogenous, unstratified, and other similar terms.

IGNIS FATUUS, *ig'-nis făt'-u-us* (Lat., literally 'the foolish fire'), a term applied in Nat. Phil. to a sort of luminous meteor which flits about in the air a little above the level of the ground, and which appears generally in marshy places, in churchyards, and near stagnant waters, during the nights in summer. It is called in different country places in England, by the names of "Jack o' Lantern," or "Will o' the Wisp;" the people ascribing its appearance to the agency of evil spirits. It is, however, produced by the phosphorus evolved from decayed leaves, and other vegetable and animal matter in a state of decomposition.

IGNITION. (*See* INCANDESCENCE.)

IGNORAMUS, *ig-no-rai'-mus*, in Law, the term used by the grand jury when they throw out or ignore a bill of indictment. It is a Latin word, signifying 'we are ignorant of the matter,' or 'we have not sufficient evidence on the subject.'

IGUANA, *ig-u-ăn'-ă*, the type of the *Iguanidæ*, a fam. of Saurian reptiles, forming, along with the *Agauridæ*, the tribe *Strobilosaura*. With regard to the name of this family, Cuvier states, on the authority of Hernandez and Scaliger, that it was originally a St. Domingo word, where it was pronounced by the natives *hiuana*, or *iguana*. He next affirms that it was derived, according to Bontius, from the Javanese *leguan*: idle, the word must have been transported to America by the Portuguese or Spaniards, and there applied to the reptile. However, whatever the definition, the word itself has been Latinized, and is used to distinguish the class to which it is applied. The principal characteristics of the *iguana* are as follows:—A large thin fold of skin, or dewlap, under the chin; cephalic cuticular plates, polygonal, unequal in diameter, flat, or carinated; a double row of small palatal teeth; maxillary teeth with their edges finely dentilated; a crest on the back and tail; toes long and unequal; tail very long, slender, and compressed, and covered with small, equal, imbricated, carinated scales. It is a very nimble reptile generally, and lives in warm climates. Some of the species live upon vegetables, and others upon animal food. It particularly inhabits South America and the West Indies, where it is very numerous. From its cleanly habits and delicate flesh, it is esteemed a great dainty, and tastes very like chicken. It lives for the most part on trees; but when forced to take the water, it can swim very readily. This variety of the *Iguanidæ*—*i.e.* the common iguana, or *Iguana tuberculata*—is about five feet in length, although many exceed that. It is of a more or less green colour throughout, and its dewlap is of a bright yellow colour, as is also the crest which runs along the back. They are thought to be best fit for eating in the spring, when they are sought and hunted with great avidity. Although in reality very timid animals, they have a very formidable appearance, which is utterly denied by their harmless habits and endeavours always to escape when pursued. The female deposits her eggs in the sand, where they are hatched by the warmth of the sun.

IGUANODON, *ig-u-ăn'-o-don* (*iguana*, and Gr. *odous*, a tooth), an extinct gen. of gigantic reptiles, discovered by Dr. Mantell, and named by him on account of the resemblance of their teeth to those of the iguana. Soon after the discovery by Dr. Mantell of the bones of colossal reptiles in Tilgate Forest, his curiosity was excited by some teeth of a very peculiar character, since they were totally unlike any that had previously come under his observation. The first specimen that attracted his attention was a large tooth, which, from the worn, smooth, and oblique surface of the crown, had evidently belonged to an herbivorous animal, and so entirely resembled the corresponding part of an incisor of a large pachyderm ground down by use, that he was much embarrassed at finding it in such ancient strata. As no existing reptiles are capable of masticating their food, he could not venture to assign the tooth to a saurian. For some time the nature of the animal to which the tooth had belonged remained in doubt. Baron Cuvier, to whom the tooth was shown, pronounced it to be an upper incisor of a rhinoceros; while, in the Geological Society of London it was said that the teeth were of no particular interest, and either belonged to some large fish allied to the *Anarchicas lupus*, or wolf-fish, or were mammalian teeth from some diluvial deposit. Dr. Mantell and Dr. Wollaston alone contended that they were the teeth of some unknown herbivorous reptile. It was not, however, till afterwards, when other bones had been discovered, and these compared with the skeleton of an iguana, that the correctness of their opinions was admitted. The size to which these reptiles attained in former ages must have been enormous. There is a portion of a femur in Dr. Mantell's collection twenty-two inches in girth at the smallest part. It is therefore calculated that the thigh-bone of the iguanodon exceeded in bulk that of the largest elephant, and its length is estimated to have been from four to five feet. After comparing the bones of the iguanodon with those of the iguana, and taking an average from eight separate parts of the respective skeletons, Dr. Mantell gives the following as the dimensions of this giant of the Weald:—Length from snout to extremity of tail, 70 feet; length of tail, 52½ feet; circumference of body, 14½ feet. On the snout of the iguanodon was a horn; and the general appearance of the reptile must have fully realized the wildest ideas of the dragons of poetic lore. Professor Owen does not think that the iguanodon was so large an animal as Dr. Mantell infers, but believes that it was about thirty feet in length. It appears probable that the most formidable instrument of attack and defence possessed by this reptile was its long and powerful tail. During the age of Reptiles, the iguanodon seems to have occupied the same relative station in the scale of being, and fulfilled the same general purposes in nature's economy, as the mastodons, mylodons, and mammoths of the tertiary era, and the pachydermous animals of the present time.—*Ref.* Mantell's *Petrifactions and their Teachings*; Owen's *Report on British Fossil Reptiles*.

I.H.S., an abbreviation of the Latin phrase *Jesus hominum salvator* (Jesus the Saviour of mankind).

ILEUM, *il'-e-um* (Gr. *eileo*, I turn about, from its numerous convolutions), in Anat., is the name given

to the last portion of the small intestines, which terminates at the valve of the cœcum.

ILEUS, or ILIAC PASSION, *il'-e-us, il'-e-ăk* (Lat. *ileaca passio*), in Med., is a severe intestinal disease, characterised by violent griping pain, accompanied with retraction and spasms of the abdominal muscles, costiveness, and vomiting of fæcal matter. It arises from many causes, and is generally symptomatic of some other disease. Among the most frequent causes of this disease, are strangulated hernia, intus-susception, or the retention of one part of the bowel within another, unnatural adhesions between adjacent folds of the intestines, inflammation, &c. The medical treatment consists in removing the exciting cause. If there is evidence of an inflammatory state, blood should be freely abstracted from the arm, and leeches applied to the abdomen. For the rest, carminative aperients, fomentations, and glysters are to be used. Dry and humid fomentations, warm baths, and warm and copious glysters, afford the most reasonable chance of success.

ILEX, *i'-leks*, in Bot., the Holly, a gen. of the nat. ord. *Aquifoliaceæ*. The species *I. Aquifolium* is one of our most beautiful shrubs or low trees, displaying either character, according to situation, age, and application of art. It is found in most parts of Europe, and in North America, Japan, and Cochin-China. In Britain it is found in natural woods and forests, sometimes forming extensive assemblages of fine trees. Some of the noblest specimens are in Medwood Forest, Staffordshire, and in the woods of Dumbartonshire. By culture, more than a hundred varieties and subvarieties have been developed, differing in the variegation, margin, and size of the leaves, and in the colour of the fruit. The common green prickly-leaved holly makes the best of all hedges, whether we regard its qualities for defence, shelter, duration, or beauty. It is, however, very slow of growth, unless most carefully cultivated; and, for this reason, hawthorn is generally preferred as a hedge-plant. The custom of dividing gardens by trimly-shorn hedges of holly was very general about the end of the 17th century. Evelyn's impenetrable holly hedge at Deptford has been much celebrated: it was 400 feet long, 9 feet high, and 5 feet broad. The deep shining green leaves and beautiful coral berries of the holly are essential elements in the domestic decorations with which Father Christmas is honoured. Not merely as an ornamental evergreen is the holly noticeable. Its white wood is extremely hard, and is used by cabinet-makers for inlaying, and to some extent by engravers. From its inner bark birdlime is prepared. The leaves have been employed in intermittent fevers. The berries are purgative and emetic. The North-American species, *I. vomitoria*, has bitter leaves, of which the Creek Indians make a decoction which they use as an emetic, under the name of *black drink*. The leaves and young twigs of *I. paraguayensis*, the Brazilian or Paraguay holly, are extensively employed in South America as tea, under the name of *maté* or *Paraguay tea*. It is remarkable that *maté* contains *caffeine*, the principle existing in coffee and Chinese tea. It has somewhat similar properties to those of Chinese tea; but it is more exciting, and, when taken to excess, produces a kind of intoxication. Another *maté*, called *gongonha*, is prepared in Brazil from the species *I. gongonha* and *theezans*. Johnston has estimated the consumption of *maté* at 20,000,000 lbs. annually. The fresh leaves of the South-American hollies have great astringency, and on this account they are much used by the dyers of Brazil.

ILIAD and ODYSSEY, *il'-e-ăd od'-is-se* (Gr. *ilias* and *odusseus*, Ulysses), two great works, as it is supposed, from the hand of Homer, the greatest and most ancient of the poets of Greece. The Iliad is the first epic poem in existence, and its subject is the siege of Ilium, or Troy, or, more properly speaking, the quarrel between Achilles and Agamemnon, the general of the Grecian army before that city. It consists of twenty-four books, the first of which relates the origin of the quarrel, and the residue contain an account of the efforts made by Agamemnon and his chiefs to conquer the Trojans without the co-operation of Achilles, the defeat of the Greeks, the pacification of Achilles, and his resumption of arms in favour of the sons of Hellas, and the death of Hector (the Trojan champion) by his hand. The





Odyssey, on the other hand, merely contains the wanderings of Ulysses, and his return to his native land, Ithaca. There have been many arguments within the present century, on Homer and his works, and many doubts have been disseminated as to whether Homer really *did* write the Iliad and Odyssey; these doubts having been founded on the fact that the art of writing was unknown to the Greeks in the time of Homer. The "Wolfian theory," as it is termed, declares that the Iliad and Odyssey are but fragments of ballads, collected from different sources, and afterwards strung together, and handed down to us in a complete form by Pisistratus. A writer in the "Encyclopædia Britannica" thus observes on the subject:—"In an investigation of this kind, the presumptions with which a man starts, though not always distinctly set forth, are of the utmost consequence in determining his procedure. The false historical presumptions from which Wolf proceeded naturally led him to seek for flaws in the texture of the Homeric poems; and it is manifest that even Mr. Grote, who justly considers the extreme Wolfian theory as quite untenable, in propounding his wild scheme of resolving the Iliad into two distinct parts, has been influenced, partly by his desire to mitigate what he calls 'the wonder' of the creation, and the preservation of two such long continuous poems, bearing the stamp of one mind, in an age when writing was altogether unknown. That there are no external historical presumptions of this kind, there is every evidence to prove; but a presumption of another kind must now be stated. It is not to be surmised that Homer would be anxiously accurate about the mere articulation, or joint-work of his epic poems, for many reasons. In the first place, because he was a poet, and aimed, as all true poets do, mainly at producing an effect on the feelings and imaginations of his hearers, not on the mere cognitive capacity. Small mistakes in incidental matters, taken cognizance of by the curious understanding only, might, without offence, be committed by a great singer of poetry, as they would certainly not be observed by a healthy-minded hearer; and that mistakes of this kind actually have been made, and are made even daily at the present time, the literature of the day bears ample testimony. In the second place, Homer was a popular poet, or, to use poetical language, 'a wandering minstrel, with a lyre in his hand, as he is truly represented in ancient biographies,' and 'not a learned Southey, sitting in a library, with books, and desk, and pen and ink, printers' proof-sheets, publishers' quarterly reviews, and every sort of literary apparatus of the newest and most approved description.' Therefore, in judging the Iliad as a whole, it must never be forgotten, although such seems generally to be the case, that it was not Homer's immediate object to compose a great whole, as he had neither reason nor opportunity for doing so. His art, therefore, was to concatenate a series of parts, which, while they might be used with effect on a few great festive occasions as a whole, were meant to produce their general and most appreciable effect in the shape of parts, either absolutely complete in themselves, or admitting of being easily supplemented by the indwelling traditional lore which the poet could legitimately presuppose in the minds of his hearers. Something analogous to this we have in the great historical plays of Shakspere, consisting of several parts, in any of which, if there happened to be some small inconsistencies with the other parts, none but a curious person, making a business of criticism, would ever notice it, as the parts, though connected in conception, are so constructed as to give the impression of completeness when they are represented as separate wholes? If this point be duly considered,—and there is nothing more certain, or more duly attested in the history of these poems, the weakness of a great number of the objections made by Lachmann and Grote to the concatenation of the Iliad will instantly appear. The tenth book, for instance—that in which the midnight expedition of Diomedes and Ulysses is described—has, it is said, no necessary connection with the parts of the poem that precede or follow, and might be cut out without injury. Of course; because it was the object of the poet so to string together a number of little wholes, originally independent, that they might still remain little wholes, and yet become parts of a great whole,—an exquisite

task of art plainly, and which, as the whole history of popular poetry teaches, it required a mighty genius like Homer to perform." From these remarks it must not be for a moment supposed that there are no interpolations in the original text of the author, as there can be no doubt that additions have been made, as well as parts subtracted from the poem originally conceived by the blind poet. From the Iliad, it is not a very wide step to proceed to the Odyssey; and here another question arises, whether if, considering the Iliad to be the entire production of Homer, we cannot grant that there are reasonable grounds for supposing the Odyssey to proceed from the plastic powers of a different and inferior minstrel. There is a certain milder tone and current of song in the last poem which might well hold out the inference that the Iliad did not emanate from the same conceptive faculties. The great mistake, however, is that of the German school, in not placing any weight whatever on the Hellenic attribution of both poems to Homer. The writer in the "Britannica" proceeds:—"On this point, we differ *toto cœlo* from the Germans, and are nothing ashamed to believe, with our learned country-man Colonel Mure, that Aristotle, Plato, and the overwhelming majority of the highest intellects in Greece, had very sufficient reasons for placing a wide gulf between the two epic poems which they agreed to stamp with the name of Homer, and the very inferior works of a cognate nature, known afterwards under the name of the *Epic Cycle*. Nature did not produce twin Homers in those old Greek days, we may depend on it, any more than she has produced in these days twin Dantes or twin Shaksperes. If there had been a second Homer, of genius large enough to produce a counterpoise to such a work as the Iliad, no doubt the *Homeridæ* of some second Chios would have been equally eager to stereotype his memory in their composition, and to immortalize themselves with his name. But precisely, we imagine, because there was only one Homer, was there only one guild of gentile Homeridæ, and one uniform, undisputed authorship of the Iliad and Odyssey among the Greeks, till some pragmatical grammarians in meagre Alexandria (among whom a certain Xenon and Hellanicus are specialized), the prototypes of our modern Wolfians, began to nibble at imagined incongruities, and to moot the question of separate authorship. Such being the historical conditions under which the question is raised, it is manifest that the presumptions, as in the question about the unity of the Iliad, are all against the disintegrators; and a detailed examination of their array of minute and microscopic objection to the common authorship will, in all likelihood, bring the intelligent student to a verdict of *not proven*." So much for the arguments for and against the authorship of the Iliad and Odyssey. The great excellence of Homer's poetry lies in its extreme affection for nature, and the simple and healthy qualities with which it is endowed. Not the less admirable are the vigorous and luxuriant changes which we ever and anon come across, all of which show, what is well termed "the billowy enthusiasm" of the blind old poet. Mr. Newman, in his pamphlet on *Homeric Translation*, observes, with regard to the quaint style which we find so abundant through the Iliad and Odyssey,—"It is quaint to say, 'Patroclus kindled a great fire, *godlike man!*' or, 'Automedon held up the meet, *divine* Achilles sliced it;' quaint to address a young friend as 'Oh pippin!' or 'Oh soft-heart!' or 'Oh pet!' whichever is the true translation. It is quaint to compare Ajax to an ass whom boys are belaboring, Ulysses to a pet ram, Agamemnon in two lines to three gods, and in the third line to a bull; the Myrmidons to wasps, Achilles to a grampus chasing little fishes, Antilochus to a wolf which kills a dog and runs away, Menelaus striding over Patroclus's body to a heifer defending her first-born. It is quaint to say that Menelaus was as brave as a blood-sucking fly, that Agamemnon's sobs came thick as flashes of lightning, and that the Trojan mares, while running, groaned like overflowing rivers. All such similes come from a mind quick to discern similarities, but very dull to feel incongruities; unaware, therefore, that it is on a verge where the sublime easily turns into the ludicrous;—a mind and heart inevitably quaint to the very core." Such may be considered to be a brief description of the style in which the Iliad and Odyssey are written; in other respects these poems come under the general characteristics of *epic poetry*, upon which some remarks will be found given under the article bearing the same appellation. Homer has been translated into nearly every language, and his fame may well be said to be world-wide. The best Italian translations are by Cesarotti and Monti; French, by Dacier, De Rochfort, Bitaubé, and Dugas-Montbel; German, by Stolberg and Voss; English, by Chapman, Hobbs, Pope, Cowper, Sotheby, Newman, Gladstone, Herschel (in part), Arnold, and Wortley. The best editions of the original work, according to the *Encyclopædia Britannica*, are that of Florence, 1488, *curâ Demetrii Chalcondylæ*; the *Editio Princeps*, in two vols. folio, of which there are only about sixty copies extant,—Hague, 1802; Bekker, Berlin, 1843; Baumlein, Leipsic, 1854. The English editions too numerous to mention. (*See* article HOMER, vol. I. of this work.)

ILLECEBRACEÆ, *il-les-e-brai-se-e* (from Lat. *illicio*, I entice or induce; from its power to vesicate, when applied to the skin in cataplasms), in Bot., a synonym for Paronychiaceæ (which *see*).

ILLICIUM, *il-lish'-e-m* (Lat. *illicio*, I allure, from having a most agreeable perfume), in Bot., a gen. of plants remarkable for the fragrance and beauty of their flowers and foliage, belonging to the nat. ord. *Magnoliaceæ*. The species *I. anisatum*, or star-anise, has the odour and flavour of aniseed. The fruit is used by the Chinese as an aromatic and carminative, and as a spice. The oil obtained from the seeds is said to be substituted occasionally for oil of anise.

ILLUMINATI, *il'-lu-min-ai'-ti* (Lat., the enlightened), a name applied to the members of a secret society, founded in 1776, by Adam Weishaupt, professor of canon law at Ingolstadt. The professed object of the society was, by one single tie, to unite men of all countries, in spite of different opinions, religions, and ranks; to instruct all classes; and to surround monarchs with men of integrity, justice, truth, and courage. From the ablest of his law-students, Weishaupt selected apostles for his new scheme. These apostles he called *Areopagists*, and sent to various parts of Europe to work out his new system. Lodges, numbering 1,000 disciples, were established in Bavaria, Suabia, Franconia, Milan, and Holland, before the existence of the society was known at Ingolstadt. The society itself formed a hierarchy consisting of eight grades, exclusive of minor subdivisions; namely, the Novice, the Minerval, the *Illuminatus minor*, the *Illuminatus major*, the Scottish Cavalier, the Priest, the Regent, and the King. Young men were preferred, and Lutherans were taken rather than Catholics. The Baron de Knigge, and Bode the philosopher, zealously promoted the views of the society, which contained, in its most flourishing condition, 2,000 members. A dispute at length arose between Weishaupt and Knigge, whom the latter was deposed, retired to Brême, and wrote against the Illuminati. In 1785 the whole society was dissolved by order of the Bavarian government. The papers and documents of the leaders were seized in the following year, and Weishaupt fled to Halle, where he died. A new combination, the founder of which was Dr. Bahrdt, was soon afterwards formed, under the name of the Germanic Union. Although it is doubtful whether this second society ever attained to a perfect organization, it is generally believed that its political intrigues favoured and hastened on the French revolution.

ILLUMINATING, *il-lu'-min-ai-ting* (Lat. *lumen*, light; Fr. *illuminer*, to enlighten), the art of embellishing and adorning manuscripts with pictorial illustrations of various scenes and events, portraits, initial letters, borders, &c., which was practised in the mediæval ages prior to the introduction of printing. Illuminating was generally executed by the monks, almost every monastery having a *scriptorium*, or writing-room, in which copies of the Scriptures and other works were made with great labour, neatness, and care, and afterwards ornamented with pictures and devices in gold and colours. The colours employed by the artists were extremely brilliant, and the general effect was heightened by the introduction of gold and silver leaf, which

was highly burnished. The initial letters and ornamental borders are generally very elaborate, and executed with great skill and taste; and, although the figures are for the most part stiff and formal, the expression of various passions is frequently conveyed with great force and correctness; and the portraits of eminent persons, particularly those which were executed between the 5th and 10th centuries, are often extremely good. The illuminations that were executed in the 11th, 12th, and 13th centuries are not so carefully drawn and coloured, nor do they evince so much artistic skill as those of an earlier period; but from the commencement of the 14th century to the introduction of printing, they show considerable improvement in style and execution. The figures in the Bayeux tapestry (*see* BAYEUX TAPESTRY) may be taken as a fair specimen of the manner in which the human form and other objects were rendered by mediæval artists. The illuminators, and the art itself, were said by Felton to borrow their titles "from the illumination which a bright genius giveth to his work." Illumination was practised by the Romans, as Pliny mentions in his "Natural History," book xxv. chap. 2, a biographical work, written by Varro, which included the lives of 700 Romans of eminence, and was enriched with portraits executed by the author himself. Illuminated works are of great value to the archæologist and historian, as they show the manners, customs, and habits of the ancients, and the various nations of Europe, to the close of the 15th century, in matters ecclesiastical, military, and civil; and they afford illustrations of the various implements, utensils, armour, and weapons, that were used by them, as well as the prevailing style of architecture of the period. They are also of the greatest use in illustrating and explaining many important points which relate to the history of the times in which they were respectively drawn. Many valuable specimens of illuminated manuscripts are preserved in all the principal libraries of Europe, and copies of a great number of drawings illustrative of English antiquities, including portraits of the early kings and queens of England, with representations of the persons and costume of our ancestors, their arms, houses, ships, and household furniture, have been published by Mr. Strutt, an eminent English antiquary. Since the revival of Gothic architecture, and the introduction of mediæval ornamentation into our churches, the illumination of scrolls with texts of Scripture, for decorative purposes, in connection with churches, schools, &c., and a variety of ornamental work, has become a fashionable amusement, and affords easy and lucrative employment to many who practise it. Handbooks for instruction in the art, which is similar in its style and method of execution to heraldic painting and painting in body-colours, with boxes of colours and liquid gold and silver, prepared for the purpose, may be obtained from any bookseller or artists' colourman. —*Ref.* Strutt's *Regal and Ecclesiastical Antiquities of England;* Strutt's *View of the Customs, &c., of England;* Owen Jones's *Grammar of Ornament.*

ILLUMINATION, *il-lu'-min-ay'-shun*, the act of illuminating or making luminous. Through the invention of coal gas, the operation of supplying light to the streets and interiors of houses has advanced greatly within late years. The employment of gas for illuminating purposes can be traced back to remote antiquity; yet the substantial history of its application can be given in a few lines. Issues of inflammable gas have been observed at various times in different parts of the world. Amongst these may be reckoned the holy fires at Baku, on the Caspian Sea, and those of Pietra Mala, in Italy. Such issues were, however, only looked upon with suspicious dread by the ignorant people who observed them. If we could believe the accounts of the Chinese, which we cannot safely do, it would appear that many years ago they applied natural inflammable gases both to purposes of heating and illumination. In the coal districts of this country, large sources of inflammable gas exist in the coal-mines; and in some localities, such as Chat Moss, in Lancashire, so easily is this gas procured, that it is only necessary to plunge an iron rod a few yards deep into the soft peat, and then, on its withdrawal, to insert a tin tube, when a copious discharge of gas is evolved at a high pressure, and apparently for an unlimited





period of time. As early as 1659, Mr. Thomas Shirley communicated to the Royal Society a paper describing some experiments on an inflammable gas issuing from a well near Wigan, in Lancashire; and nearly a century later, the Rev. John Clayton discovered that an inflammable gas could be obtained from coal when exposed to heat in close vessels. Gas thus artificially produced was not practically used till 1792, when Mr. William Murdoch lighted his office and house at Redruth, in Cornwall, with it; and since that time this branch of the chemical arts has progressed rapidly and satisfactorily. (*See* GAS MANUFACTURE.) In all cases of artificial illumination, it is of great importance that we should be able to determine with facility the relative value of the light obtained. This is generally effected by comparing the illuminating sources employed with some standard source of light. After a number of experiments to fix upon a standard, Dr. Ure says,—"After comparing lights of many kinds, I find every reason to conclude that a large wax candle, of three to the pound, either long or short—that is, either 12 or 15 inches in length, as manufactured by one of the great wax-chandlers of London, and furnished with a wick containing 27 or 28 threads of the best Turkey cotton, is capable of furnishing a most uniform or nearly invariable standard of illumination. It affords one-tenth of the light omitted by the Argand lamps of the Trinity House, and one-eleventh of the light of my mechanical lamp, when each lamp is made to burn with its maximum flame, short of smoking." For many of his determinations, however, Dr. Ure used the French mechanical lamp, known as Carcel's lamp. The following table contains Péclet's estimation of the illuminating powers of various candles, and their consumption of material in the hour; the light given out by a Carcel Argand lamp, consuming 951 grains in an hour, being called 100:—

| | *Intensity of light.* | *Consumption per hour.* |
|---|---|---|
| Tallow candles, 6 in lb. ... ... | 10·66 | 8·51 |
| Stearine, or pressed tallow, 8 in lb. ..... | 8·74 | 7·51 |
| Ditto, 5 in lb. ..... | 7·50 | 7·42 |
| Wax candles, 5 in lb. ..... | 13·61 | 8·72 |
| Spermaceti, 5 in lb. ..... | 14·40 | 8·92 |
| Stearic acid, commonly called stearine, 6 in lb. ... | 14·40 | 9·33 |

The term Photometry is applied to the numerical estimation of the degrees of the intensity of light. "If," says Sir John Herschel, "light be a material emanation, a something scattered in minute particles in all directions, it is obvious that the same quantity which is diffused over the surface of a sphere concentric with the luminous point, if it continue its course, will successively be diffused over larger and larger concentric spherical surfaces; and then its intensity, or the number of rays which fall on a given space in each, will be inversely as the whole surfaces over which it is diffused; that is, as their radii, or of their distances from the source of light..... Let a candle be placed behind an opaque screen full of small equal and similar holes; the light will shine through these, and be intercepted in all other parts, forming a pyramidal bundle of rays having the candle in the common vortex. If a sheet of white paper be placed behind this, it will be seen dotted over with small luminous specks, disposed exactly as the holes in the screen. Suppose the holes so small, their number so great, and the eye so distant from the paper that it cannot distinguish the individual specks, it will still receive a general impression of brightness; the paper will appear illuminated, and present a mottled appearance, which, however, will grow more uniform as the holes are smaller and closer and the eye more distant; and if extremely so, the paper will appear uniformly bright. Now, if every alternate hole be stopped, the paper will manifestly receive only half the light, and will therefore be only half as much illuminated: and, *ceteris paribus*, the degree of illumination is proportional to the number of holes in the screen, or to the number of equally illuminated specks on the surface; *i.e.*, if the specks be infinitely diminished in size and infinitely increased in number, to the number of rays which fall on it from the original source of light." Reasoning in this man-

ner, Sir John Herschel establishes the following definitions:—1. The real intrinsic brightness of a luminous object is the intensity of the light of each physical point in its surface. 2. The apparent intrinsic brightness of any object, or luminary, is the degree of illumination of its image, or picture, at the bottom of the eye. 3. The absolute light of a luminary is the sum of the areas of its elementary portions, each multiplied by its own intrinsic brightness. 4. The apparent light of an object is the total quantity of light which enters our eyes from it, however distributed in the retina. Instruments made for the purpose of measuring the illuminating power of any body are called Photometers. They are of various forms. Wheatstone's photometer is one of the best known. It is a small sphere, with a reflecting surface. Being placed between the two lights, each light is seen reflected on it by the spectator. By an ingenious contrivance, a rapid rotary motion is given to the sphere; and by the principle of the persistence of impressions, the spectator sees two curves of different brightness. The brighter light is then removed till the brightness of the curves seems equal, and the intensities of the luminous points are then as the squares of the distances. The illuminating power of gas is often greatly dependent upon the burner employed. The chief burners now employed are the bat's-wing, fish-tail, Argand, Bude Argand, &c. The bat's-wing consists of a fine slit cut into an iron nipple, giving a flat fan-like flame. The fish-tail consists of a similar nipple, perforated by two holes, drilled so that the jets of gas are inclined to each other at an angle of about 60°. A flat film of flame is thus produced resembling somewhat the tail of a fish. (For the form of the Argand burner, *see* ARGAND LAMP; and for other methods of illumination, *see* CANDLE MANUFACTURE, LAMP.) One of the most brilliant methods of illumination discovered in late years, is that of the electric light. It is produced by the current of a powerful voltaic battery between two pencils of hard charcoal, such as that deposited in the retorts of gas-works. Charcoal being an imperfect conductor, becomes incandescent, and as it is not fusible at any known temperature, the splendour of the light is only limited by the power of the battery. After being formed into pointed cylinders, the charcoal is mounted in metallic holders connected with the ends of the voltaic battery, and the pencils are so fixed that their points can be brought into contact, or made to recede from each other, as required. When in contact, the current passes through them, and the charcoal becomes brilliantly luminous. When separated, a splendid flame passes between them. The electric light can be produced in an exhausted receiver, under water, or in gases which do not support combustion. M. Foucault has applied this light, with great effect, as a substitute for the lime light in the gas microscope. It has also been employed, both in France and England, on some occasions, to give light to workmen who were obliged to continue operations at night. The electric light has also been used on the theatrical stage, in order to produce striking effects; and in illuminations of cities, as manifestations of joy, this light is often used to render public buildings luminous.

ILLUSTRATION, *il-lus-trai'-shun* (Lat. *illustrare*, to show), a term used in Rhet., and distinct from comparison, or simile, in this fact only, that illustration is used to illumine an argument, while the former are only used to give force to expression. *Illustration* is sometimes used in a wider and far more extended sense, in which, according to Brande, it seems to comprehend example, in which case it is the recital of a particular fact or instance, evincing the truth of a general proposition laid down in argument.

IMAGE, *im'-aj* (Lat. *imago*), in Rhet., a term applied to denote a metaphor which has been dilated and made into a complete word,—painting by an assemblage of different ideas moving through it, but which is not sufficiently expanded to be allegory.

IMAGE, in Optics, is the spectrum, or appearance of an object made by reflexion or refraction. "The brightness of an image depends evidently on the quantity of light concentrated in each point. Setting aside the effects of aberration, the brightness must therefore be proportional to the apparent magnitude (as seen from the object) of the mirror or lens by which the





rays are reflected or refracted, multiplied by the area of the object, and divided by the area of the image. But the apparent magnitude of the lens, as seen from the object, is proportional to the square of the diameter of the lens divided by the square of the distance of the object; and the area of the object divided by the area of the image is equal to the square of the distance of the object divided by the square of the distance of the image from the lens: therefore the brightness of the image is proportional to the square of the diameter of the lens divided by the square of the distance of the image from the lens; that is to say, the brightness, or degree of illumination, of the image depends only on the apparent magnitude of the lens, as seen from the image, and not in any way on the distance of the object." For this reason certain stars are rendered visible by the aid of large telescopes, and are perfectly invisible when a smaller one is used.

IMAGE-BREAKING AND WORSHIP. (*See* IDOLATRY and ICONOCLASTS, vol. I. of this work.)

IMAGERY.—A general term applied to allegories, metaphors, similes, and such-like figures, used in rhetoric (which *see*).

IMAGINARY QUANTITIES, *im-aj'-e-nä-re*, a term applied in Algebra to the even roots of negative quantities, or the imaginary results of some impossible operation. By infinite series, and continued fractions, it can be easily proved that—

$$\sqrt{x^2-1} = x - \frac{1}{2x} - \frac{1}{8x^3} - \frac{1}{16x^5} - \&c.;$$

where, if $x = \pm 0$, we shall have $\sqrt{-1} = \pm 0 \mp \frac{1}{0}$ &c., to which no definite arithmetical meaning can possibly be attached; and, consequently, $\sqrt{-1}$ cannot be assigned, and not even an approximation can be made to its value. This circumstance shows that though $\pm\sqrt{-1}$ may have arisen from the generalizations of symbolical algebra, the origin and meaning must be looked for in other quantities than numbers; for in *arithmetic*, considered without reference to its *applications*, every *inverse* operation implies the previous performance of the corresponding *direct* operation; and therefore *surd* quantities, whereof the arithmetical values can never be *exactly* ascertained, have their origin in the application of arithmetic to geometry. Although imaginary quantities have no real value, yet they are of important aid in the higher parts of mathematical analysis, as they indicate a marked distinction between quantities which have no natural or necessary dependence on each other.

IMAGINATION, *im-aj-in-ai'-shun* (Lat. *imago*, an image), in Phil., is a term used in various significations. According to Dr. Reid, imagination, in its proper sense, signifies a lively conception of objects of sight, being distinguished from conception as a part from a whole; and Addison says that "the pleasures of imagination are such as arise from visible objects, since it is the sense of sight that furnishes the imagination with its ideas." Others, however, employ the word in a much wider signification; some as synonymous with fancy; others as denoting generally that faculty of the human mind by which thoughts or ideas are produced at will. Philosophers have divided imagination into two,—the reproductive and the productive. By the former, they mean imagination considered as simply re-exhibiting or representing the objects presented by perception, that is, exhibiting them without addition or retrenchment, or any change in the relations which they reciprocally held when first made known to us through sense. The productive or creative imagination is that which is usually signified by the term imagination or fancy in ordinary language. According to Sir W. Hamilton, "imagination, in the common acceptation of the term, is not a simple, but a compound faculty, a faculty, however, in which representation—the vivid exhibition of an object—forms the principal constituent. The reproductive imagination is not a simple faculty: it comprises two processes; first, an act of representation, strictly so called, and secondly, an act of reproduction arbitrarily limited by certain contingent circumstances; and it is from the arbitrary limitation of this second constituent that the faculty obtains the only title it

can exhibit to an independent existence." In like manner, "the imagination of common language—the productive imagination of philosophers—is nothing but the representative process *plus* the process by which I would give the name of the comparative." The imagination represents ideas in three principal orders: (1) the natural order, that in which we receive the impression of external objects, or the order according to which our thoughts spontaneously group themselves; (2) the logical order, presenting what is universal prior to what is contained under it as particular, or presenting the particular first, and then ascending to the universal which they constitute; (3) the poetical, which consists in seizing individual circumstances, and grouping them in such a manner that the imagination shall represent them so as they might be offered by the sense. There are different kinds of imagination, as there are different kinds of intellectual activity. There is the imagination of abstraction, the imagination of wit, the imagination of judgment, the imagination of reason, the imagination of feeling, the imagination of the passions.

IMBROGLIO, *im-brole'-yo* (Ital. *broglíare*, to confound or mix together), a term applied in Lit. to the plot of a romance or drama, when it is much perplexed, complicated, and interwoven. The Italians themselves also term small burlesques, when rendered ludicrous by similar absurdity, by the same title.

IMIDES, *i'-mídez*, in Chem., a class of bodies intermediate between the amides and nitrites, supposed to contain a hypothetical radicle, imidogen, or ammonia less two equivalents of hydrogen. Though not numerous, several of them are well known.

IMMACULATE CONCEPTION, *im-mák'-u-lait kon-sep'-shun* (Lat. *immaculatus*, spotless, pure; *conceptio*, the act of conceiving) of the Holy Virgin, a festival observed in the Roman Catholic church on the 8th December, in honour of the alleged conception of the Virgin Mary without sin. This doctrine was first promulgated about the middle of the 12th century. The devotion to the Blessed Virgin had reached such a height, that many obscure theologians set on foot the idea, that not only was she sanctified from her birth, but also that she was conceived without sin. For a long time there were many disputes as to its acceptation; and it was not defined as an article of faith until the 8th December, 1854, when Pope Pius IX. declared it in the following words:—"We define the doctrine which holds the most blessed Virgin Mary, in the first instant of her conception, to have been preserved free from all stain of original sin, &c. &c." From the ample testimony offered by the Scriptures, however, there is full proof that no one except our Saviour was born thoroughly free from sin; and, consequently, the whole doctrine of the Immaculate Conception rests but on a very slender basis.

IMMATERIALISM. (*See* MATERIALISM.)

IMMERSION, *im-mer'-shun* (Lat., from *in*, into, and *mersus*, part. of *mergere*, to plunge), in Astron., the disappearance of one heavenly body behind another, or within the shadow cast by another during an eclipse. Immersion, or incidence of an eclipse, takes place as soon as the disc of the body that is eclipsed begins to pass behind the disc or shadow of the other.

IMMERSION, BAPTISM BY. (*See* BAPTISM.)

IMMOLATION, *im-mo-lai'-shun* (from Lat. *immolare*, to sacrifice), a ceremony used amongst the Romans with regard to their sacrifices. It consisted in throwing frankincense, wine, and a species of cake, on the head of the victim, before it was sacrificed; consequently, when *immolation* was performed, the victim was already doomed, and the term became applied to the sacrifice itself.

IMMORTALITY, *im-mor-tál'-e-te* (Lat. *immortalis*), that quality of perpetual existence which differs only from eternal in the one respect, that the former has a beginning, which does not belong to the latter. Eternity is the attribute of the Deity himself, while immortality only applies to some of his creations; as the soul, for example. The dogma which insists on the immortality of the soul is very ancient, and is connected with almost all religions, although, of course, under a variety of conceptions. Some philosophers have pretended to prove the immortality of the soul from its immateriality; but the idea cannot be carried out, as, after the destruction of the body, the soul might be in a state of coma, or swoon, and thus would be, as it were, annihilated also. Consequently, the hope of immortality must be considered a religious conviction, and not an argument which can be proved by any common-place similes of every-day life.



IMPACT, *im'-pákt* (from Lat. *impingo*, I impinge), in Mech., the single instantaneous blow or stroke communicated from one body in motion, to another body, which may be either in motion or at rest. If the body moves in the direction of the stroke, the impact is said to be direct; if in a different direction, it is said to be oblique. The theory of direct impact, or collision, is as follows:—Let the masses of two balls, or material particles, be $m$ and $m'$, and let them move with uniform velocities, $v$ and $v'$, in the same direction along a straight line; $v$ being greater than $v'$, so that $m$ overtakes $m'$. Let $u$ be the common velocity of the two balls when the compression at the moment of impact is at a maximum degree; also let P be the momentum expended in order to produce this compression, and $e$P the momentum acquired during the restitution, $e$ the force of the bodies, $e$ being the coefficient of elasticity. Let V and V' be the velocities of the balls when collision ceases. Hence, we have the three following cases:—

(1) $mv$ = momentum of $m$ at the beginning of collision.
P = momentum spent in producing compression.
$mu$ = momentum of $m$ when compression is a maximum.

(2) $m'v'$ = momentum of $m'$ at the beginning of collision.
$m'u$ = momentum of $m'$ when compression is max. $\therefore m'v' = m'u - $P.

(3) At the instant when collision ceases, we have similarly—

$$mV = mu - e\text{P}$$
$$m'V' = m'u + e\text{P}$$

From which equations we shall get—

$$u = \frac{mv + m'v'}{m + m'} = \frac{m\text{V} + m'\text{V}'}{m + m'}$$

$$\text{P} = \frac{m.m'}{m + m'}(v - v')$$

$$\text{V} = \frac{mv + m'v'}{m + m'} - \frac{em}{m + m'}(v - v'); \text{ and}$$

$$\text{V}' = \frac{mv + m'v'}{m + m'} + \frac{em}{m + m'}(v - v').$$

In oblique impact, it must be assumed that the mutual action of the balls during collision is along the line which joins their centres at the instant when compression is at a maximum, and along that line only; that is, we assume the balls to be perfectly smooth. Hence, if a smooth ball impinges obliquely on a smooth plane, the line of reaction of the plane will be perpendicular to its surface, and the momentum of the impinging ball will be affected along that line only. For further information, the reader had better consult Professor Walker's treatise on Mechanics, where he will find the subject treated on at length.

IMPALEMENT, *im-pail'-ment* (from Lat. *in* and *palus*, a stake), a mode of punishment which was practised formerly by the Turks and other uncivilized nations. It consisted in thrusting a stake through the body, and thus leaving the victim to a lingering death. Instances are recorded of persons who endured this horrible torture for several days, before death released them from their sufferings. It is stated by Mr. Layard in his "Nineveh," that impalement was commonly practised by the Assyrians towards their captives, and that the instrument of punishment, the stake, was thrust through the body immediately under the ribs (vol. ii. p. 374). When Darius took Babylon, he impaled no less than 3,000 prisoners, as is stated by Herodotus (iii. 159). Impalement is said to be still in use in the East, the Chinese being the people amongst whom it is most employed as a mode of punishment.

IMPANATION, *im-pán-ai-shun* (Lat. *panis*, bread), in Theol., is a term used to signify the opinion of the

Lutherans with respect to the sacrament of the Lord's supper; but which was held by others long before the time of Luther. According to this view, the body and blood of Christ become united with the elements of the eucharist without any change in their nature. "The body," according to Luther, "is really present in the bread, the substances being in each case so mixed together, that each retains its own proper operation and nature, and yet together they constitute a single object."

IMPARLANCE, *im-par'-lănse* (Fr. *parler*, to speak).—Formerly, a defendant in a suit at law was entitled to demand one imparlance, or *licentia loquendi*, and might have more granted by consent of the court, before he pleaded, to see if he could end the matter by talking with the plaintiff, without further suit. It is now discontinued.

IMPATIENS, *im-pai'-shens*, in Bot., a gen. of the nat. ord. *Balsaminaceæ*. The species *I. balsamina* is commonly known as the Balsam, and is one of the most beautiful of garden annuals, forming a showy cone of finely-variegated carnation-like flowers. Those are regarded as the most choice varieties which have the flowers double and striped; but none of the varieties are permanent, or can be continued by seeds. The prevailing colours of the petals are white and red, the latter extending to every shade of orange, scarlet, purple, lilac, pink, and especially carnation, or flesh-colour. The way to procure very large plants is to sow early in the season, as in March; to commence transplanting into three-inch pots, as soon as the plants have two proper leaves; and to shift every week or ten days into pots a size larger every time, until at last they are in very capacious ones, and in the richest light mould. *I. nolitangere*, the touch-me-not, is the only species found wild in Europe. When the seeds are ripe, the slightest touch will cause the capsule to burst with elastic force; hence the names *impatiens* and *nolitangere*.

IMPEACHMENT, *im-peetsh'-ment* (Lat. *impeto*, I prosecute), in Law, is a prosecution before the Lords, by the Commons in parliament, of persons accused of treason, or high public crimes, and misdemeanours of an inferior description. A commoner cannot, however, be impeached before the Lords for any capital offence, but only for high misdemeanour: a peer may be impeached for any crime. The first regular instance of this proceeding appears in the reign of Edward III., when the king demanded the earls, barons, and peers, to give judgment against Simon de Bereford, who had been an accomplice in the treason of Roger, earl of Mortimer. Previous to that time, the Lords seem to have exercised a kind of irregular jurisdiction over state offences. In 1376, the Commons first appear as public prosecutors. For some time after this, cases of impeachment were common; but from the reign of Edward IV. down to Elizabeth, no instances occur, bills of attainder, and prosecutions in the Star Chamber, being the means usually resorted to for the punishment of state offenders. In the reign of James I., the practice of impeachment was revived, and has been continued since, the last memorable instances being Warren Hastings in 1788, and Lord Melville in 1805. The mode of procedure is briefly as follows:—A member of the House of Commons charges the accused with certain high crimes, and moves that he be impeached. If this is agreed to, the member is ordered to go to the bar of the House of Lords, and there impeach the accused. Articles of impeachment are then drawn up, and, having met with the sanction of the house, are laid before the House of Lords. The accused replies to them, and then a day is nominated for the trial, and managers are appointed to conduct the prosecution on behalf of the Commons. It is enacted (12 & 13 Will. III. c. 2) that no pardon under the great seal shall be pleadable to an impeachment by the Commons; but this does not affect the prerogative of the crown in granting pardon after judgment on an impeachment. The decision is come to by the lord high steward taking the opinion of each member on each article, beginning with the junior baron.

IMPENETRABILITY, *im-pen-e-tră-bil'-e-te* (from Lat. *impenetrabilis*, impenetrable), a term applied to one of the properties of matter, inferred by experience, and resting on the fact that, at the same instant of time, no two bodies can occupy the same portion of space. When an attempt is made to place one solid body in the part of space occupied by another, it is either resisted by the latter, or the latter is removed. Impenetrability is therefore only another name for this resistance. As regards solid bodies, the property requires no proof, being obvious to the touch. The property can also be proved for liquids by very simple experiments. If a solid body is immersed in a vessel brimful of water, it will displace a quantity of water equal to its own bulk; and if a cork be forcibly pressed into the neck of a bottle full of water, the bottle will burst. The impenetrability, however, of all matter can only be taken in conjunction with the hypothesis of its porosity. Otherwise the existence of the property might be successfully disputed. Sugar or salt may be dissolved in water without increasing the bulk of the fluid. Matter, in such cases, must be permeated, or else the matter of the fluid has pores or interstices. The researches of science will doubtless throw a clearer light upon impenetrability, the definition of which rests at present wholly on an assumption.

IMPERATIVE MOOD, *im-per'-ă-tiv* (Lat. *impero*, I command), in Gram., is that part of the verb which is employed in commanding, exhorting, entreating, or permitting; as, Depart in peace, Avoid evil companions.

IMPERATOR, *im-per'-ă-tor* (Lat.), according to Tacitus (Annal. iii. 74), a title bestowed among the early Romans by the acclamations of the soldiery, and afterwards by a vote of the senate, on a commander-in-chief who had signalized himself by killing a certain number of the enemy in battle. The consuls themselves originally bore the title of imperator before they were called *consuls*. After the republic was overthrown, imperator became the highest title of the supreme ruler,—whence the modern word emperor was brought into use. (*See* EMPEROR.)

IMPERFECT NUMBER, *im-per'-fekt* (Lat. *imperfectus*), a number, the sum of whose aliquot parts or divisions is not equal to itself. It is the reverse of a perfect number, whose parts, when added together, are equal to it. Thus 12 is an imperfect number, for example, as its divisors, 1, 2, 3, 4, 6, amount to 16, which is over 12,—which latter number is therefore deemed imperfect. (*See* NUMBERS, PROPERTIES OF.)

IMPERFECT TENSE, in Gram., is that tense, or part of a verb, which expresses the action or event of which we speak, as at a certain time, to which we refer, in an unfinished or imperfect state; as, I was reading when he arrived.

IMPERMEABILITY, *im-per-me-ă-bil'-e-te* (Lat. *in*, not; *permeo*, I pass), a term applied to that property by which some substances resist the passage of other substances through their mass. Thus glass is impermeable, for its pores are so small that no pressure hitherto applied has been able to drive fluids through them. Gold, however, is permeable, as was proved in the experiment of the Florentine Academicians. In endeavouring to determine whether water was compressible, they filled a hollow sphere of gold with it, and then applied great pressure to the surface; the consequence of which was, that the water was forced out through the pores of the gold. Some substances are impermeable on account of their repulsion to other bodies; thus oil-skin, or water-proof cloth, is impermeable to water.

IMPERSONAL VERBS, *im-per'-so-năl* (Fr. *impersonnel*), in Gram., are such as are used only in the third person; as, It rains, it snows, it thunders. The word impersonal, however, as implying a total absence of persons, cannot, with strict propriety, be applied to these verbs, nor, indeed, to any verbs; and hence some grammarians reject the name altogether.

IMPETIGO, *im-pet-i'-go* (Lat., from *impetire*, to infest), in Med., is an eruption of yellow itching pustules, appearing in clusters, and terminating in a yellow, thin, scaly crust. It is also known as humid or moist tetter, and discharges a thin acrid ichor. It occurs on all parts of the body, but most commonly on the extremities. A variety of it is produced by the action of certain irritants upon the skin, as on the hands of those who work among sugar, known as the grocer's itch; also on the hands of bricklayers, known as the

brickla̱yer's itch. The eruption is not contagious. Cleanliness, cooling ointments, and mild aperients, are recommended by way of cure.

IMPETUS, *im'-pe-tus* (Lat.), in Mech., a term which signifies the same thing as *momentum*, or quantity of motion; and is generally estimated by the product of the velocity and mass of the body. This subject, however, has led to considerable controversy among philosophers; some estimating it by the mass into the velocity, while others maintain that it varies as the mass into the square of the velocity. This difference seems to have arisen from a misconception of the term rather than from any other cause; those who maintain the former opinion consider impetus, or momentum, to signify the momentary impact, and the latter the sum of all the impulses till the motion of the body ceases. In Gunnery, *impetus* is the altitude through which a body must fall in order to gain a velocity equal to that with which the ball is discharged from the gun.

IMPLICATION, *im-pli-kai'-shun* (from Lat. *implico*, I enfold), in Law, denotes something inferred, without being expressed directly in words; as where a man devises lands to his heirs at law after the death of his wife, the latter is said to have an estate for life by implication, though no estate is given to her in express terms.

IMPORTS AND EXPORTS. (*See* COMMERCE.)

IMPOSITION OF HANDS. (*See* HANDS, IMPOSITION OF.)

IMPOST. (*See* TAXATION.)

IMPREGNATION. (*See* REPRODUCTION OF PLANTS AND ANIMALS.)

IMPRESSMENT, *im-press'-ment*, in Law, is the forcible levying of seamen for service in the royal navy. The practice of impressing and granting powers to the Admiralty for that purpose is of very ancient date, though no statute has expressly declared this power to be in the crown, yet many of them very strongly imply it. The statute 2 Rich. II. c. 4, speaks of mariners being arrested and retained for the king's service, as of a thing well known and practised without dispute, and provides a remedy against their running away. The arguments against this system are given by McCulloch, in his edition of Smith's *Wealth of Nations*, note xii.

IMPRIMATUR, *im-pri-mai'-tur* (Lat., let it be printed), is the permission granted by the censor, in those countries where a censorship of the press is established, for a book to be printed. The form was also used with books printed in England in early times; and even in the present day, books printed with the sanction of certain of the Scottish universities, as St. Andrew's, carry the "imprimatur" of the senatus academicus.

IMPRIMIS, *im-pri'-mis* (Lat., in the first place), a word generally used in cataloguing a series of things, ideas, or arguments. It means "in the first place," and its application may be seen in several of Shakspere's plays, particularly in "Henry IV." It is somewhat out of date now in common phraseology.

IMPRINT, *im'-print* (from Fr. *imprimer*, to impress), the designation of the place where, by whom, and when, a book is published, always placed under the title of the same. By the act 39 Geo. III. cap. 79, every printer is obliged to affix his name and residence to each article he shall print; and if it consists of more than one leaf, then upon the first and last leaves, under a heavy penalty: there are some exceptions to this law, however. In newspapers, the imprint is generally placed at the end of the last column of the final page. In books, the name of the printer is sometimes placed at the back of the title-page, and sometimes at the end of the work.

IMPRISONMENT, *im-pris'-on-ment* (Fr. *emprisonner*), the restraint of a man's liberty under the custody, charge, or keeping of another. Imprisonment extends not only to a gaol, but to a house, stocks, or where a man is held in the street, &c.; for in all these cases the party so restrained is said to be a prisoner, so long as he hath not his liberty freely to go about his business as at other times. No man can be imprisoned except by the lawful judgment of his peers, or by the law of the land; and no man can be imprisoned except as the law directs, either by command and order of a court of





record, or by lawful warrant, or the queen's writ, by which one may be lawfully detained to answer the law. (For further information on the subject of imprisonment, see ARREST, BAIL, CONSTABLE, CORONER, FALSE IMPRISONMENT, and HABEAS CORPUS.)

IMPRISONMENT, FALSE. (*See* FALSE IMPRISONMENT.)

IMPROMPTU, *im-prompt'-u* (Lat., in readiness), in Lit., is applied to something given out on the spur of the moment, or without premeditation, usually of a witty or epigrammatic character.

IMPROPRIATION, *im-pro-pri-ai'-shun*, in Law, is where the tithes, glebe, or other ecclesiastical dues of a parish, are in the hands of a layman; when such are annexed to any spiritual corporation, they are said to be appropriated.

IMPROVISATORE, *im-pro-ve-sa-to'-re* (Ital., unpremeditatedly), is a term applied to one who has the power of composing and reciting a number of verses upon any given subject without premeditation. The Italians particularly excel in this species of composition, owing, no doubt, in great measure, to the richness and flexibility of their language. The poetry, however, so produced is of no very high character, being chiefly remarkable for its natural flow of language and quick adaptation of ideas and images to the main subject. None of the poems so produced have acquired any permanent reputation. The improvisatore generally accompanies himself on the guitar while he is giving forth his verses. Several females have likewise distinguished themselves in this art, and are styled *improvisatrici*.

IMPULSE, *im'-puls* (Lat. *impulsus*), the force of one body communicated to another in a continuance of motion after the force has been withdrawn. When a body rolls down a gently-inclined plane, it is possible to see the gradual changes in its velocity, and it is apparent that between the instants at which the body has two different velocities it takes in all intermediate velocities, or that the change of velocity is perfectly gradual. But when a body is violently struck, as in the case of a ball by a cricket-bat, no gradations of velocity are seen; but the ball appears to change from a point of rest, as it were, to a state of rapid motion, without passing through any of the intermediate states. In this case it is said to receive an impulse, which may, therefore, be said to be any cause by which velocity is communicated suddenly and without gradations.

INAUGURATION, *in-awg-u-rai'-shun*, a word borrowed from the ceremonies used by the Romans when they were received into the college of Augurs, and applied to the act of inducting into office with ceremony. Kings and emperors are *inaugurated* by coronation, prelates by consecration; and the heads of colleges and other important officers by such ceremonies and forms as give weight and authority to the transaction.

INCA. (*See* vol. I. of this work.)

INCANDESCENCE, *in-kan-des'-ens* (Lat. *incandescens*), the luminous glow given by a substance when intensely ignited. Ignition and incandescence are properties belonging to some bodies, by which they give out light when raised to certain high temperatures, the quantity of light increasing with the temperature. The light at first is of a dull red; then bright, and indicating what is called cherry-red heat: it becomes orange-coloured or yellow at a higher temperature; and, lastly, a white heat, when the light becomes painful to the eye. The degree at which incandescence begins to be visible in the dark was placed by Sir Humphrey Davy's experiments at 810° Fahr.; but a dull red heat, visible at daylight, is probably about 1,000°; a cherry-red heat, 1,200°; an orange heat, 1,700°; and a white heat, 2,000°. According to Daniell's pyrometer, the high white heat of a good wind-furnace is 3,300°.

INCARNATION, *in-kar-nai'-shun* (fr. Lat. *caro*, flesh), in Theol., is a term used to denote the taking upon him of our human nature by Christ Jesus. What the nature of this union of the human and the divine was, we have no means of knowing; that such a union actually did take place, we have the clearest evidence in scripture; for St. John says: "The word was made flesh, and dwelt among us." Yet many sects have arisen, who have maintained the contrary, and held that the Son of God did not take human nature upon him; as the Arians, Socinians, Nestorians, &c.

INCENDIARY, *in-sen'-de-a-re* (Lat. *incendo*, I burn), is one who wilfully sets fire to the house, or other property, of another person. It is also used in a metaphorical sense to denote a political agitator, one who goes about to inflame people's minds against the government.

INCENSE, *in'-sens* (from Lat. *incendere*, to burn), a dry resinous compound, which, when burnt, produces a pleasant perfume. According to Bingham, the use of incense in connection with the Eucharist was unknown in the Church until the time of Gregory the Great, in the latter part of the 6th century. It then became prevalent, but has long been disused in the Church of England; although it is still adopted by the Romish church. Amongst ancient pagan nations, the perfume of incense was generally offered to the gods, and as the representative of God, the Persians used to burn incense before the king. The word used to denote incense arising from spices, is also used in Hebrew to denote the smoke arising from the fat of burnt sacrifices. The incense used by the Jewish priests was a compound of stacte, onycha, galbanum, and pure frankincense. This compound was to consist of equal parts of each ingredient, to be broken into very minute particles, which were to be deposited before the ark. It was to be used specially in the service of Jehovah, as its use in private life was specially forbidden (Exodus xxx. 34—38). The origin of incense in the Jewish form of worship, according to Maimonides, in "More Nevochim," quoted in an article on the subject in the "Encyclopædia Britannica," was to prevent the disagreeable effects of having such numbers of animals slaughtered for sacrifice. The burning of the incense was proceeded with in the following manner:—The priests having drawn lots, to ascertain who should offer it, the person destined took a large silver dish, in which was a censer full of incense; and, being accompanied by another priest, carrying some live coals from the altar, went into the temple, where, in order to give notice to the people, he struck upon an instrument of brass, resembling a gong, placed between the temple and altar. Immediately after the burning of the holocaust (which *see*), the incense was set fire to, all the multitude without the temple continuing in prayer during the time that it was consuming.

INCEST, *in'-sest* (Lat. *incestum*, *i. e. non castum*, not pure), is the marriage, or living together as husband and wife, of persons within certain degrees of consanguinity. During the Protectorate, incest was made a capital offence; but at the Restoration this law was abolished, and it is now cognizable only by the ecclesiastical courts.

INCH, *insh* (Ang.-Sax.), a lineal measure, the twelfth part of a foot, and equal to three barleycorns.

INCH OF CANDLE. (*See* AUCTION.)

INCIDENCE, ANGLE OF, *in'-se-dens* (Lat. *incido*, I fall upon), a term used in Catoptrics, &c., to express the angle between the direction in which a line strikes on a plane and the perpendicular to that plane. When rays of light striking a body are reflected, the angles of incidence and the angles of reflexion are said to be equal. The *point of incidence* is that point in which a ray of light is supposed to fall on a piece of glass. *Line of incidence*, is that line in which light is propagated from a radiant point to a point in the surface of the speculum, otherwise called the *incident ray*.

INCISORS, *in-si'-sors* (Lat. *incisores*, fr. *incido*, I cut), in Anat., is the name given to the four front teeth in each jaw, so called from their use in cutting the food.

INCLINATION, *in-klin-a'-shun* (Lat. *inclinatio*), a term used to express the angle which two lines, or planes, make with each other. Thus, two lines which make a very small angle are said to have a very small inclination to one another. Inclination is therefore synonymous with angle, and the angle of *incidence* is the technical term for what should properly be called the angle of inclination.

INCLINED PLANE, *in-klinde' plain*, one of the five simple mechanical powers in statics, the theory of which can be easily deduced from the proposition termed "the decomposition of forces." If a body be placed on a horizontal plane on which there is no friction, it stands to reason that the body will be entirely supported, and that any horizontal pressure, however small, will cause motion. If the same plane be made vertical instead of horizontal, the weight cannot be placed upon it; for if the heavy body were made to touch the plane and then left to itself, it would fall down the plane, exactly in the same manner as it would fall if there were no plane; that is, if it be supposed that no friction exist. It follows, consequently, that if the plane be made to assume an oblique or inclined position, the effect produced will be intermediate between those of the two preceding cases; for the weight will not rest, nor will it acquire velocity as rapidly as when it falls freely. The inclined plane, then, is a plane which forms an angle with the horizon. The force which accelerates the motion of a heavy body on an inclined plane is to the force of gravity as the sine of the inclination of the plane to the radius, or as the height of the plane to its length. If $f$ = force accelerating the body on an inclined plane, of which the inclination is $i$, and if $s$ = force of gravity, it will be found that $f = g \times \text{sine } i$. Hence the motion of a body on an inclined plane is accelerated in a uniform manner. If two bodies begin to descend from rest, and from the same point, the one on an inclined plane and the other falling freely to the ground, their velocities, at equal heights above the earth's surface, will be equal. Hence the velocity acquired by a body in falling from a rest through a given height is the same whether it fall freely or descend on a plane with any inclination whatever. When a power acts on a body on an inclined plane, so as to keep that body at rest, then the weight, the power, and the pressure on the plane, will be as to the length, the height, and the base of the plane, when the power acts parallel to the inclined surface; from which the following rules can be deduced:—

$$\text{The power} \ldots\ldots = \frac{\text{weight} \times \text{height of plane}}{\text{length of plane}};$$

$$\text{Weight} \ldots\ldots = \frac{\text{Powor} \times \text{length of plane}}{\text{height of plane}};$$

$$\text{Pressure on the plane} = \frac{\text{weight} \times \text{base of plane}}{\text{length of plane}}.$$

These rules express, however, the conditions of equilibrium, and it is obvious that if either the weight or the power be increased (friction excepted), motion of the body must ensue. (*See* STATICS.)

INCLOSURE, *in-klo'-zhur*, a term applied to the closing in and partitioning of those lands in England and Wales which are comprehended under the title of commons or common lands. Before inclosures were made, the land used for agricultural purposes was of three kinds,—commons, commonable, and intermixed lands. The first of these are lands in a state of nature, or waste, of which no individuals have the severalty. Commonable lands are those which are in severalty for a portion of the year; that is to say, they are occupied severally by individuals as their own, other people being excluded for the time. Lands of this sort, exclusive of wood-lands, are of three kinds. First, open arable and meadow land, held severally by intervals till the gathering in of the crop. After that time it becomes commonable to persons who have severalty rights in it, and they turn their cattle on it. Second, there is open arable and meadow land that is held in severalty for a part of the year, like the first class, but, after the removal of the crop, it is not only commonable to those parties who have severalty rights, but also to other classes of individuals. Lands of this sort are usually called Lammas lands. Commonable rights either belong to a particular class, as a body of freemen, or to all landholders. Many of the ancient usages of England, like to this, bear a close resemblance to those of the nations usually called barbarous. Tacitus mentions a similar custom as commonable rights amongst the ancient Germans; Cæsar among the Gauls; Herodotus among the Egyptians; and Strabo among the Dalmatians. The third class is that of grazing lands, where the rights of parties are settled and defined to the ordinary stinted pasture, but are subject to very varied and peculiar regulations. It is obvious that common fields must be ill-cultivated under a system such as this. Intermixed lands cannot be treated according to the laws of good farming. It is said that the simple redistribution of intermixed

lands, now held in inconvenient lots, would raise the fee-simple value of the lands in many instances from 15s. to 30s. In 1844, it was the opinion of witnesses examined on the commons' inclosure, that judicious inclosure would make a large portion of common land much more productive. They also shewed that effectual drainage was impossible in some intermixed open arable lands. Before that time, in 1836, an act (6 & 7 Will. IV. c. 115) was passed for facilitating the inclosure of open and arable fields in England and Wales. The provisions of this act are limited, since it "applies solely to lands held in severalty during some proportion of the year; with this exception, that slips and balks intervening between the cultivated lands may be inclosed." The lands which cannot be inclosed under the act, are "the uncultivated lands, the lands in a state of nature, intervening between these cultivated lands, beyond those that are fairly to be considered as slips and balks." In 1844, a select committee of the House of Commons was appointed "to inquire into the expediency of facilitating the inclosure of commons and lands held in common, the exchange of lands, and the division of intermixed lands, and into the best means of providing for the same, and to report their opinion to the House." An act in accordance with the objects of this inquiry was passed in 1845 (8 & 9 Vict. c. 118). The provisions of this act appear to be perfectly able to meet the evils it was intended to counteract, and agriculture has, without doubt, greatly benefitted by its action.

In Cœna Domini, *in se'-nà dom'-i-ni* (Lat., at our Lord's supper), is the name of a celebrated papal bull, one of the most arrogant and pretentious of all that have issued from the papal see. Founded on more ancient papal decrees, it was first given forth by Pope Urban V. (1362-70), and afterwards renewed and altered by Pius V. (1567) and Urban VIII. (1627). It lays down the claims of the Church, and pronounces excommunication against all heretics. It was ordered to be read annually in all the churches every Holy Thursday; but this now only takes place at Rome.

Incognito, *in-kog'-ne-to* (Lat., unknown), is commonly applied to a prince, nobleman, &c., travelling in such a way as not to be recognized or known, which is usually done by assuming a feigned name, and dispensing with retinue or other marks of distinction.

Incombustible Substances, *in-kom-bus'-tib-l* (Lat.), are those which have been so prepared as to be incapable of being kindled or of being consumed by fire. Cloth made of the fibres of asbestos, by weaving, will bear a considerable heat without injury. Incombustible cloth is also made by preparing cotton and linen fabrics with solutions of borax, phosphate of soda, phosphate of ammonia, or sal-ammoniac. Cloths so prepared may be placed in contact with ignited bodies without suffering active combustion or bursting into flames. Tungstates of the alkalies have also been successfully used for similar purposes. All these substances act by forming a species of glaze on the surface of the fibres, which excludes them from the air. They do not, however, prevent carbonization from taking place when the temperature is very high. Solutions of alum and common salt have also been used for similar purposes; and, latterly, a starch mixed with sulphate of zinc and sulphate of ammonia.

Income-Tax. (*See* Taxation.)

Incommensurable Quantities, *in-kom-men'-su-rà-bl*, are those which are so related that while one is capable of being represented in the terms of a certain unit, the other is not. The reason of this is thus stated: Any two whole numbers, or fractions of the same unit, must have a common measure: thus all whole numbers have the common measure 1, and any two fractions $\frac{a}{b}$ and $\frac{p}{q}$ ($a$, $b$, $p$, and $q$, being whole numbers), have the common measure $\frac{1}{bq}$, which is contained exactly $aq$ times in the first and $bp$ times in the second. Conversely, any two magnitudes which have a common measure can be arithmetically represented by the same unit; for if A and B have the common measure $m$, and if this measure be contained 7 times in A and 10 times in B, then it is evident that by taking $m$ as





the unit, A is represented by 7 and B by 10. If, therefore, there be two magnitudes which cannot be represented by means of the same unit, they cannot have any common measure whatsoever, and are therefore *incommensurable*. (*See* Irrational Quantities.)

Increment, *in'-kre-ment* (Lat. *incrementum*), a term used in the calculus to express the increase in the function of any quantity by an infinitely small quantity, in opposition to *decrement*, which is of directly the reverse signification. In old English writers, the differential calculus is sometimes called the "method of increments." (*See* Integral Calculus.)

Incubation. (*See* Hatching.)

Incubus, or Nightmare, *in'-ku-bus* (Lat., from *incubo*, I lie upon), is a distressing sensation sometimes experienced during sleep, and usually accompanied by frightful dreams. The patient is pursued by some enemy or wild beast, or endeavours to escape from some danger, but cannot; there is a dreadful weight upon his chest; he strives to cry out, but is unable; at length he awakes in terror, and feels great relief. Nightmare is most frequently caused by a heavy supper just before going to bed: dyspepsia, mental irritation, great fatigue, lying in an uneasy position, may all occasion it. The cure is avoidance of these causes and attention to the state of the stomach.

Incumbent, *in-kum'-bent* (from Lat. *incumbo*, I lie upon, or occupy), a term applied to the holder of an ecclesiastical benefice.

Incunabula, *in-ku-nàb'-u-là* (Lat., a cradle), in Bibl., is a term applied to early books, printed before the year 1500. The most complete catalogue of these books is given in Hain's "Reportorium Bibliographicum," 2 vols., Stuttg. 1826-38.

Indeclinable, *in-de-klì'-nà-bl* (Lat. *indeclinabilis*), in Gram., is applied to a word which admits of no declension or inflection; as adverbs, prepositions, conjunctions. In Latin and Greek, indeclinable nouns are such as have the same termination for all cases.

Indehiscent, *in-de-his'-sent* (Lat. *in*, not, and *dehisco*, I gape), a term applied in Bot. to a fruit, the pericarp of which continues perfectly closed, as in the hazel-nut. When it separates regularly round its axis, either wholly or partially, into several pieces, the separation is called *dehiscence*, and such pieces *valves*; and the axis from which the valves separate, when there is a distinct axis, is called the *columella*.

Indemnity, *in-dem'-ne-te* (Lat. *in* and *damnum*, loss), denotes, in a general sense, the making good, or compensating for any loss. An act of indemnity is necessary to be passed by parliament, when ministers, in order to meet some sudden and unforeseen emergency when parliament is not sitting, adopt measures which are not strictly within their constitutional powers.

Indented, *in-dent'-ed* (Lat. *dens*, a tooth), one of the eight lines of partition used in Her. for dividing one part of the field of the shield from another, or for forming the outline of any ordinary or sub-ordinary. It consists of a zigzag line, resembling the teeth of a saw.

Indenture, *in-dent'-shur*.—In Law, if a deed be made by more than one party, there ought to be regularly as many copies of it as there are parties, and, until recently, each was, or should have been, cut or indented (formerly in acute angles, *instar dentium*, like the teeth of a saw, but more usually in a waving line), on the top or side, to tally or correspond with each other, which deed so made is called an indenture. Now, however, since 1845, a deed purporting to be an indenture shall have the effect of an indenture although not actually indented.

Independence, Declaration of, *in-de-pen'-dens*, in the history of the United States of America, was that declaration which was drawn up and adopted by Congress, on 4th July, 1776, declaring the freedom and independence of the American colonies, and their absolution from all allegiance to Great Britain. A committee of five was appointed to draw up this document; namely, Jefferson, Adams, Franklin, Sherman, and Livingston; but it was mainly the work of Jefferson.

Independents, or Congregationalists, *in-de-pen'-dents, kon-gre-gà'-shun-àl-ists*, is the name of a large and influential sect of English Protestant dissenters. They take the name of Independents, because they hold that every single congregation of Christians,

when properly constituted with deacons and a pastor, forms an independent body, competent to its own direction and government, without interference from any other church, or any presbyteries, bishops, &c. They therefore hold that each congregation has inherent in itself power to fix its own tenets and form of religious worship, and to exercise ecclesiastical government. They hold a Christian church to be a congregation of true believers; *i. e.*, persons who both openly profess their faith in the essential doctrines of the Gospel, and evince the earnestness of their belief by a corresponding change of disposition and demeanour. They have only two descriptions of church officers,—pastors and deacons; the former to promote the spiritual, the latter to advance the temporal welfare of the church. The only valid call to the pastorate is held to be an invitation to that office by an individual church; and to a person so invited, no license nor ordination is considered requisite, in order to confer authority to preach, or to administer the sacraments. Still, after this election by an individual church, an ordination by ministers of the neighbouring churches is general, when the newly-chosen pastor makes a profession of his belief, and receives fraternal recognition from the other pastors present. In the selection of its minister, a church is not restricted to a special class prepared by education for the office; yet an educated ministry is considered very desirable, and practically almost all the Congregational ministers in modern times receive preparatory training at some of the theological academies belonging to the body. Religious exhortation is permitted and encouraged in all those who, having gifts appropriate, feel prompted to use them. The doctrines of the Congregational churches are almost identical with those embodied in the Articles of the established church, interpreted according to their Calvinistic meaning. They are opposed to all state interference in religious matters, and to all state endowments for religious purposes. They disavow all subscription to creeds, confessions, or articles of faith; nevertheless, they are distinguished by a singular degree of uniformity in faith and practice. The "Declaration of Faith, Order, and Discipline," issued by the Congregational Union in 1833, though not binding upon any of the churches, is believed to be dissented from by none. The Congregational Union of England and Wales was founded in 1831. It is a delegated conference of ministers and laymen, meeting twice a year, for consultation on the state and prospects of the body; the constitution providing that it "shall not in any case assume a legislative authority, or become a court of appeal." As to the origin of Independency, it is probable that some conventicles were secretly established soon after the accession of Elisabeth; but the first prominent advocate of Congregational principles appeared in 1580, in the person of Robert Brown. (*See* BROWNISTS.) His followers rapidly increased, so much so, that an act of parliament was passed in 1593, specially directed against them. They were treated with great rigour, and several suffered martyrdom for their opinions in the reign of Elizabeth. Many were driven to the continent, and churches were established at Amsterdam, Rotterdam, Leyden, and other parts; Mr. Robinson, who was pastor of the church at Leyden, being frequently regarded as the real founder of Independency, as he modified many of the principles of the Brownists. Mr. Jacob, one of the exiles, returned to England in 1616, and established an Independent church in London. During the Long Parliament, they enjoyed a season of comparative freedom, meeting openly, and gathering strength; and when Cromwell (himself an Independent) assumed supreme authority, their principles obtained a legal recognition, and a general toleration was in a great measure effected. With the Restoration, however, their prosperity came to an end, and by the Act of Uniformity in 1662, about 2,000 non-conforming clergymen were excluded from their places in the church. The Revolution of 1688 again brought them comparative freedom, which was confirmed by the Toleration Act of the following year. Yet, for some time after this, Independency did not flourish; and indeed it was not till the revival of religion, excited by the labours of Wesley and Whitfield, that it again began to prosper; and since that time it has gone on greatly increasing the number of its adherents. They have upwards of 1,600 churches in England, 690 in Wales, and 150 in Scotland and the Channel islands. They have also a number of colleges and educational seminaries for the training of young men for the ministry, in different parts of England, and at Edinburgh.



INDETERMINATE COEFFICIENTS, *in-de-ter-min-ait*, a form of analysis, said to have been invented by Descartes, which is much used, even in the highest branches of mathematics. The system is based on the following formula:—If $A+Bx+Cx^2+ \&c. = a+bx+cx^2+ \&c.$, be an identical equation, that is, if it hold for all values whatever of $x$, then the coefficients of like powers of $x$ are equal to each other; that is, if $A=a$, $B=b$, $C=c$; and so on. For if $A+Bx=a+bx$, then $A-a+(B-b)x=0$, an equation which admits of one value of $x$ only; unless $B-b=0$, or $B=b$, when also $A-1$ will be $=0$, or $A=a$. Again, if $A+Bx+Cx^2=a+bx+cx^2$, then $A-a+(B-b)x+(C-c)x^2=0$, a quadratic equation which admits of but two solutions to the distinct values of $x$. The application of indeterminate coefficients may be seen by the manner in which the following fraction $\frac{a-bx}{a+cx}$ can be expanded to four or more terms by the aid of the theory. Let—

$$\frac{a-bx}{a+cx} = A+Bx+Cx^2+Dx^3+ \&c.$$

Then, $a-bx=Aa+Bc+Cax^2+Dax^3+ \&c.$
$+Ac+Bcx^2+Ccx^3+ \&c.$; or, $a-bx=Aa+(Ba+Ac)x+(Ca+Bc)x^2+(Da+Cc)x^3+ \&c.$

Whence, by equating the coefficients of the like powers of $x$, we find that $Aa=a$, or $A=1$;

next, $Ba+Ac=-b$, $\therefore Ba=-(b+c)$, or $B=-\frac{b+c}{a}$;

then, $Ca+Bc=0$, $\therefore Ca=\frac{b+c}{a}\cdot c$, or $C=\frac{b+c}{a^2}\cdot c$;

lastly, $Da+Cc=0$, $\therefore Da=-\frac{b+c}{a^2}\cdot c^2$, or $D=-\frac{b+c}{a^3}\cdot c^3$;

consequently, we gain the result that—

$$\frac{a-bx}{a+cx}=1-\frac{b+c}{a}x+\frac{b+c}{a^2}cx-\frac{b+c}{a^3}c^2x^2+ \&c.$$

The application of indeterminate coefficients thus enables the student to solve questions by ordinary algebra that would otherwise come under what is termed infinitesimal analysis. (*See* FLUXIONS and INTEGRAL CALCULUS.)

INDETERMINATE EQUATIONS, a mathematical term applied to problems which are capable of more than one solution, in consequence of there being more unknown quantities than independent equations. The rule for solving these may be thus given:—If a simple equation express the relations of two unknown quantities, and their corresponding integral values be required, divide the whole equation by the coefficient which is the lesser of the two, and suppose that part of the result which is in a fractional form equal to some whole number; thus a new simple equation is obtained, with which we can proceed as before. Let the operation be continued until the coefficient of one of the unknown quantities is 1, and the coefficient of the other a whole number; then an integral value of the former may be obtained by substituting 0, or any whole number, for the other; and from the preceding equations integral values of the original unknown quantities may be found. For instance, let $5x+7y=29$, to find the corresponding integral values of $x$ and $y$. Dividing the whole equation by 5, the lesser coefficient, we have—

$$x+y+\frac{2y}{5}=5+\frac{4}{5}$$

or, $x=5-y+\frac{4-2y}{5}$, a whole number:

$\therefore \frac{4-2y}{5}=$ a whole number; say $p$

$\therefore \frac{4-2y}{5}=p$; and $4-2y=5p$

$\therefore y=2-2p-\frac{p}{2}$, a whole number

$\therefore \frac{p}{2}$ is a whole number, say 8

$\therefore y=2-8$, because $p=8$

Then, substituting 0 for the value of S,—

$y=3$, or a *minus* quantity,

and $x=3$, or some larger number that ratifies the equation, for S may be put equal to any whole number whatever. Converging fractions, and other theories, are connected with that of indeterminate equations; and the reader is referred for full particulars to Legendre's works, which enter at length upon the subject.

INDEX, *in'-deks* (Lat. *indico*, I point out), in Bibl., is an alphabetical list at the end of a work, of the principal subjects treated of or contained therein, with a reference to the place where they are to be found. Nothing enhances the value of a book more than a good index, and there are few books, except those of a merely ephemeral character, that should be without one. Nor is the getting up of an index so simple a matter as it would at first sight appear. It requires a knowledge of the subject treated of, and some care in selecting the proper heads under which to enter the various topics.

INDEX, a term used both in arithmetic and algebra, to imply the power to which a number, or quantity, is to be raised. (*See* INVOLUTION.)

INDEX EXPURGATORIUS, and INDEX LIBRORUM PROHIBITORUM, *in'-deks eks-pur-gā-to'-re-us, li-bro'-rum pro-hib-e-to'-rum* (Lat., purified index (of books), index of prohibited books), is the catalogue of those books which the Roman Catholic church, on account of heresy, forbids to the laity. The catalogue of such books as are only heretical, or contrary to the principles of the Catholic church in certain parts, is called the *Index Expurgatorius*. As early as 1546, such catalogues were made public in Louvain, and soon after at Venice, Paris, Cologne, and other places. In 1559, Pope Paul IV. caused the Inquisition to publish a list of prohibited books; and this is the first Roman index proper. A regular form was prepared for them by the council of Trent, which received the approval of Pius IV. in 1564. The index of Trent was enlarged, by Sixtus V. and Clement VIII., the former of whom appointed a special congregation at Rome for taking charge of it.

INDIA, ARCHITECTURE OF. (*See* HINDOO ARCHITECTURE.)

INDIAN BAEL. (*See* ÆGLE.)

INDIAN BREAD. (*See* PACHYMA.)

INDIAN CORN. (*See* ZEA.)

INDIAN CRESS. (*See* TROPÆOLUM.

INDIAN FIG. (*See* OPUNTIA.)

INDIAN FIGTREE. (*See* FICUS.)

INDIAN FIRE, in Chem., a bright white fire, used in pyrotechny, composed of—sulphur 7 parts, realgar 2 parts, and nitre 24 parts.

INDIAN HEMP. (*See* CANNABIS.)

INDIAN INK. (*See* INK.)

INDIAN MILLET. (*See* PANICUM.)

INDIAN SARSAPARILLA. (*See* HEMIDESMUS.)

INDIAN TEAK. (*See* TECTONA.)

INDIAN TOBACCO. (*See* LOBELIA.)

INDIA-RUBBER. (*See* CAOUTCHOUC.)

INDICATIVE MOOD, *in-dik'-ā-tiv* (Lat. *indico*, I point out), in Gram., is that particular form or state of a verb which simply indicates or declares a thing; as, I love, He is feared.

INDICTION, *in-dik'-shun* (Lat. *indictio*, establishment, order), in Chron., a period of fifteen years, different from other cycles, in the fact of its having no reference to astronomical phenomena. The indiction is supposed to relate to certain judicial acts, as tariffs of the taxes and such-like decrees, at stated intervals, under the old Greek emperors. The Cæsarean indiction fell on the 8th of the calends of October (24th September); the Constantinopolitan indiction on the 1st September; and the Pontifical indiction on the 1st January. The year of indiction may be computed by the following formula, to correspond with the year of our era:—Add 3 to the date, divide the sum by 15, and the remainder will be the year of the indiction. If the remainder be 0, it will signify the 15th of the cycle. The reader will find the subject fully discussed in Gibbon's "Decline and Fall of the Roman Empire."—*Ref.* Brande's *Dictionary*.

INDICTMENT, *in-dite'-ment* (Lat. *in* and *dico*, I speak against), in *Law*, is a written accusation of one or more persons, of a crime or misdemeanour, preferred to, and presented upon oath by, a grand jury. Indictments must have a precise and sufficient certainty. They should set forth the Christian name and surname, with the addition of the state and degree, down or place, and country, of the offender; but mistakes on these points are not generally held to be material. The time and place in which the fact was committed are also usually given; but neither is a mistake here generally held to be material. The offence itself must also be set forth with clearness and certainty. The grand jury sit and receive indictments; and their duty is only to hear evidence on behalf of the prosecution; for the finding of an indictment is only in the nature of an inquiry or accusation. They ought, however, to be thoroughly persuaded of the truth of an indictment, so far as their evidence goes, and not rest satisfied with mere probabilities. When, having heard the evidence, they think it a groundless accusation, they used formerly to indorse on the back of the bill "*Ignoramus*," or, "We know nothing of it;" now, they write, "Not a true bill," or "Not found," and then the party is discharged without further answer. A new bill may, however, be preferred against him before the same, or another, grand jury. If satisfied of the truth of the accusation, they then indorse upon it, "A true bill," anciently, *Billa vera*. The indictment is then said to be found, and the party stands indicted. In finding a true bill, twelve, at least, of the grand jury must concur.

INDIGESTION. (*See* DYSPEPSIA.)

INDIGO, *in'-di-go* (Fr., It., Sp. *indigo*), in Chem., a blue dyestuff, extracted from a variety of plants, growing principally in India and America, especially from species of *Indigofera* (which *see*). The common woad, or *Isatis tinctoria*, also yields indigo. It has been found in minute quantities in the milk of cows and in human urine. It is one of our most important dyestuffs, both from the beauty and permanence of the colour it yields, and from the ease with which it is applied to fabrics of all materials. The juices of the plants from which indigo is obtained give no evidence of its presence while in their natural state, but require to undergo a process of fermentation before the dark-blue colouring matter, known in commerce as indigo, is precipitated. The method of manufacture consists in steeping the plant in water until fermentation sets in, the colouring matter dissolves in the water, forming a yellow solution, which is drawn off from the rest of the vegetable matter. This solution, by agitation and continual exposure to the air, gradually deposits indigo as a blue precipitate, which is dried, and pressed into the form in which it is sold to customers. India and the islands of the Indian Archipelago produce four-fifths of the indigo consumed, the remainder being furnished principally by Central America, only a very small proportion being found in other parts of the world. The indigo of commerce contains *indigotine*, or indigo-blue, its most important constituent, indigo-brown, and indigo-red; besides many other substances, in varying proportions, which must be looked on as accidental impurities or adulterations. Indigotine, or indigo-blue, may be obtained in crystals from the red or brown colouring matter, by sublimation between two watch-glasses; but as this process is attended with considerable loss, the following method is usually adopted in commerce:—Four ounces of commercial indigo in fine powder, and four ounces of grape sugar, are placed in a flask capable of holding, at least, ten pints of liquid; and six ounces of a saturated solution of caustic soda is added to them, and the flask filled up with boiling alcohol. The mixture is shaken, the flask being first closed, so as to exclude the air, and set aside. In a few hours it becomes clear, and the yellowish-red solution is drawn off, and exposed to the air. It becomes brown, and deposits crystals of indigotine, which are rendered perfectly pure by treatment with boiling alcohol and hot water. Pure indigotine is not soluble either in water, weak acid, or alkalies. In order, therefore, to use it as a dyestuff, it has to be reduced to the state of white indigo, which is readily soluble by means of copperas and potash, or some other deoxidising agent. White indigo contains one equivalent more of hydrogen than blue indigo, and is

soluble in alkaline liquids. The processes for dyeing fabrics with indigo are consequently all founded on the same principle—the use of a deoxidising agent for reducing the blue indigo to white, and an alkaline solution for dissolving it when formed. The indigo is, therefore, fixed in the fibre in its white and soluble condition, the blue colour being afterwards developed by exposure to the air. Indigotine dissolves readily in sulphuric acid, forming *sulphindylic acid*, known in dyeing as sulphate of indigo, or Saxony blue. Schunck supposes that the indigo obtained from woad is the result of the decomposition of a yellow, transparent, amorphous, deliquescent substance, which he has extracted from the juice, and which he names *indican*. When heated with sulphuric acid, it forms indigo-blue, indigo-red, and a species of sugar. This appears to be exactly what happens during the fermentation of the indigo plants; a strong acid is developed, which converts the indican into indigo-blue, indigo-red, and sugar. Under different treatment, indigo-blue yields a variety of substances, a full account of which will be found in Miller's *Elements of Chemistry*, vol. iii.

INDIGOFERA, *in-di-gof'-e-rā* (*indigo*, and Lat. *fero*, I bear), in Bot., a gen. of the papilionaceous division of the nat. ord. *Leguminosæ*. The species *I. tinctoria*, *cærulea*, and probably some others, yield commercial indigo, one of the most important of dyeing materials. Indigo is very poisonous; but in proper doses it has been employed in epilepsy and erysipelas: its value in such diseases is by no means well established. (*See* INDIGO.)

INDIRECT TAXES. (*See* TAXATION.)

INDIVISIBLES, *in-de-viz'-e-blz*, a peculiar method of the calculus invented by Cavalieri, a disciple of Galileo, which was much used by mathematicians before the invention of fluxions and the differential and integral calculus. In this theory, lines are considered to be composed of an infinite series of points, surfaces of an infinite number of lines, and solids of an infinite number of surfaces. The purpose, therefore, of the method is to give an infinite series of successive approximations, and it is extremely useful in discovering the contents and areas of innumerable plane and solid figures. (*See* FLUXIONS, INTEGRAL CALCULUS.)

INDO-GERMANIC, INDO-EUROPEAN, or ARYAN LANGUAGES, *in'-do-jer-man'-ik*, are the different names given by different philologers to one of the three great families into which the tongues of mankind are divided. The family was also formerly called the Caucasian and the Japhetic family; but it is held by the more scientific grammarians of the present time, that the Aryan is the most appropriate technical term, inasmuch as Aryan was the name adopted by those colonists who left their ancient home in India to settle upon the shores of Europe. There are likewise two other great families of language, known respectively as the SEMITIC and the TURANIAN, both of which will be treated of in their proper place. To deal here with the Aryan languages:—The Aryan family of languages may, at the outset, be broadly classified into two great divisions; the Southern division, containing two great classes,—the Indic and Iranic. The Indic branch comprehends within itself, as living languages, the dialects of India and the dialect of the Gypsies; as dead languages, the Praikrit and Pali, the modern Sanskrit and the Vedic Sanskrit. The Iranic branch comprehends, as living languages, the dialects of Persia, Afghanistan, Kurdistan, Bokhara, Armenia, Ossethi; and as dead languages, the Parsi, Pehlvi, the cuneiform inscriptions of Darius and Xerxes, the Zend, and the old Armenian. The Northern division of the Aryan family of languages contains five chief classes. 1. The Celtic has two branches,—the Cymric and the Gadhelic. To the Cymric belong the dialects of Wales and Brittany, and the Cornish, the last being a dead language. To the Gadhelic branch of the Celtic class belong the dialects of Scotland, Ireland, and of the Isle of Man. 2. The Italic class embraces the dialects of Portugal, Spain, Provence, France, Italy, and Wallachia, as well as the dead languages known as the Langue d'oc, Langue d'oil, and the Oscan, Latin, and Umbrian. 3. The Illyric class contains the dialects of the Grisons and Albania. 4. The Hellenic class comprehends the dialects spoken in Greece at the present time, together with the Doric, Æolic, Attic, and Ionic, the four latter being dead languages. 5. The Windic class comprehends within itself the living dialects of Lithuania, Kurland, and Livonia (Lettish), as well as the old Prussian, which last is reckoned as a dead language; the living dialects of Belgium, Russia (Great, Little, and White), Illyria (Slovenian, Croatian, Servian), Poland, Bohemian (Slovakia), and Lusatia; in this class, also, are included the dead languages known as the Ecclesiastical Slavonic, the old Bohemian, and the Palabian. 6. The Teutonic class contains: the High German branch, in which are included the living dialects of Germany, and the dead languages, called the Middle High German and Old High German;—the Low German branch, containing the living dialects of England, Holland, Friesland, and the north of Germany (Platt Deutsch), together with the Gothic, Anglo-Saxon, old Dutch, old Frisian, and old Saxon, the five latter being dead languages;—the Scandinavian branch comprises the living dialects of Denmark, Sweden, Norway, and Iceland, as also the dead language known as the old Norse. It may be asked,—Why are these great streams of language, rolling on through centuries, set down as converging to one common source? To this question the greatest philologers of our day reply, that, in all these languages and dialects the common roots and the common organic type are deducible by means of a comparison and from a scrutiny of the laws of the human mind, of our organs of speech and of hearing, as well as of the laws of objects and phenomena. Yet, even if we attempt to assert that all the dialects of the Indo-Germanic family have diverged from one common type, how shall we able to prove this to be the original language? It might be the language of conquerors which had pushed away and survived numerous previous idioms. All that we can say is, that in the Aryan languages, the only field in which the scientific comparison of languages has as yet been successfully prosecuted, the closest affinity has been discovered in the roots and in the inflexions, those two chief tests of all inflecting languages. The great German philologers Bopp and Pott, together with their brilliant expounder Max Müller, show, by their general preference for Sanskrit, that they believe the Sanskrit form of the root to be the oldest in existence. That which gave to Sanskrit this high importance, was mainly the fact that the languages of Europe, whose relation to one another had either never been perceived or not thoroughly comprehended, stood at once in an intelligible relation to Sanskrit: the latter was the missing link that united them all. Even previous to the year 1794, the great orientalist Sir William Jones declared that no philosopher could examine the Sanskrit, Greek, and Latin, without believing them to have sprung from one common source; and, says Max Müller, "as sure as the six Roman dialects point to an original home of Italian shepherds on the seven hills at Rome, the Aryan languages together point to an earlier period of language, when the first ancestors of the Indians, the Persians, the Greeks, the Romans, the Slaves, the Celts, and the Germans, were living together within the same inclosures, nay, under the same roof." There was a time when a small clan of Aryans, dwelling probably on the highest elevation of Central Asia, and enjoying a high state of agricultural civilization, spoke a language which, although not Sanskrit, or German, or Greek, nevertheless contained the germs of the languages we employ to-day in our cathedrals, our courts of justice, and in our marts of commerce. And whatever may have been the name of this so-called mother of the Aryan languages, it can be demonstrated that she has distributed her property equally amongst all her children, without having granted the exclusive property to any; that the Greek, Roman, Celtic, Teutonic, and Slavonic colonies, marching towards the shores of Europe, brought away with them from their Asiatic birthplace the dialectic germs of their several languages, as we still hear them. Did space permit, an extensive list of examples in a tabular form might be given, to prove the unmistakable family likeness which exists between the chief representatives of the great Aryan family of languages. We must, however, be content with referring the reader to the list of valuable works appended to this article, wherein satisfactory

proof of the close affinity between these dialects, sprung from a common source, may be found. The Indo-Germanic family is the most important of the three great divisions of languages. By this is meant that the various modifications of time, person, number, gender, fact or potentiality, or degree of comparison, which may attach to the various notions of which speech is composed, are expressed by modifications of the notional words themselves, not by distinct words. It therefore accommodates itself to the nicest shade of meaning. Produced by the most gifted race in the most favourable area for human life and action, it has reciprocally aided in the development of that race above all others.—*Ref.* Sir Wm. Jones, in the *Asiatic Researches;* Fr. Schlegel's *Ueber die Sprache und Weisheit der Indier;* A. W. Schlegel's *Indische Bibliothek;* Bopp's *Comparative Grammar;* Grimm's *Deutsche Grammatik;* Pritchard on the *Eastern Origin of the Celtic Nations;* Zeus on the *Grammar of the Celtic Languages;* Max Müller's Lectures on the *Science of Language;* and generally the Proceedings and Transactions of the Philological Society of London.

INDORSER. (*See* BILL OF EXCHANGE.)

INDUCTION, *in-duk'-shun* (Lat. *inductio*), a method of philosophical and mathematical reasoning, but better known in the latter branch of science under the name of *successive induction*. As it collates truth from a demonstration, and this demonstration implies the examination of every particular case of which it is formed, it follows that the mathematical sense of the word is truly logical in its expression. The following examples are taken from the "English Cyclopædia." The sum of any number of successive odd numbers, beginning from unity, is a square number, namely, the square of half the even number which follows the last odd number. Let this proposition be true in any one single instance; that is, $n$ being some whole number, let 1, 3, 5, up to $2n+1$, put together, give $(n+1)^2$; then the next odd number being $2n+3$, the sum of all the odd numbers up to $2n+3$ will be $(n+1)^2+2n+3$, or $n^2+4n+4$, or $(n+2)^2$. But $n+2$ is the half of the even number next following $2n+3$; consequently, if the proposition be true of any one set of odd numbers, it is true of one more. But it is true of the first odd number 1, for this is the square of half the even number next following; consequently, being true of 1, it is true of 1+3; being true of 1+3, it is true of 1+3+5; and so on *ad infinitum*. Next, the formula, $x^n-a^n$, $n$ being a whole number, is always algebraically divisible by $x-a$

$$x^n-a^n=x^n-a^{n-1}x+a^{n-1}x-a^n$$
$$=x(x^{n-1}-a^{n-1})+a^{n-1}(x-a).$$

In this last expression the second term $a^{n-1}(x-a)$ is obviously divisible by $x-a$; if, then, $x^{n-1}-a^{n-1}$ be divisible by $x-a$, the whole of the second side of the last equation will be divisible by $x-a$; and therefore $x^n-a^n$ will be divisible by $x-a$. If, then, any one of the successive—

$$x-a,\ x^2-a^2,\ x^3-a^3,\ x^4-a^4,\ \&c.$$

be divisible by $x-a$, so is the next. But this is obviously true of the first; therefore it is true of the second: being true of the second, it is true of the third; and so on *ad infinitum*. It will be readily seen by the reader from the foregoing examples, that hypothesis is one of the strongest proofs used in reasoning by induction.

INDUCTION COIL, a term applied originally to an apparatus, by which Faraday, in 1832, showed that an electric current, or a magnet, is able, by induction, to develop, at a distance, electric currents in a conducting wire; just as a body charged with static electricity electrizes an insulated conductor by induction. The method by which this remarkable result is obtained is as follows:—Two silk-covered wires are bound round a wooden cylinder, so as to make two perfectly similar helices, the spirals of which are parallel, and as near to each other as possible. The two ends of one of the wires are made to communicate with a delicate galvanometer, and the two ends of the other with the two poles of a voltaic pile. Whenever this latter communication is established, the first having been established previously, the needle of the galvanometer is seen to deviate; but this deviation





immediately ceases, even though the current of the pile continues to circulate. As soon as the current is interrupted, the needle of the galvanometer experiences, a second time, a sudden and non-permanent deviation. This time, however, the deviation occurs in a contrary direction to that in which the former had occurred. The voltaic current that traverses one of the wires determines, in the other, an instantaneous current, at the moment when it commences to pass, and determines it in a second at the instant it ceases to pass. These two currents are called *induced currents*, and the current of the pile the *inducing current*. A similar experiment may also be made thus:—About a wooden or glass tube a single silk-covered wire is wound, and its two ends placed in communication with a galvanometer. Into the hollow of the tube is then inserted an electro-dynamic cylinder, namely, a helix, traversed by an electric current. At the moment of introduction, an induced current is shown in the outer coil, the movement of which is in a contrary direction to that passing through the inner helix; and upon withdrawing the cylinder, a second induced current is shown, the movement of which is in a direction similar to its own. These two experiments equally show that when a conductor traversed by a current is suddenly brought near to a conductor forming a closed circuit, an instantaneous current is determined in the latter, moving in a direction contrary to that of the current brought near it; and that, on removing it, a second current is determined, moving in the same direction as the current removed. On account of the analogy existing between the properties of magnets and those of electro-dynamic cylinders, Faraday supposed that the same results would be obtained by introducing a magnet into the interior of the hollow helix of the second experiment. His supposition proved correct. Two induced currents are instantaneously produced, which are much more intense than those produced by inducing currents. By these and similar means, very considerable effects can be produced. Experiment has also shown that the phenomenon of induction may be manifested with a single conductor, in which the inducing current is transmitted, and at the same time the induced current is perceived. When a soft iron rod is introduced into the helical coil, then, as observed by Mr. Jenkins, the volta-electrical effect becomes wonderfully increased. If the ends of the secondary coil are grasped through metallic cylinders, and contact made or broken with the battery, a smart shock is immediately felt through the animal frame, and is of such a nature as to be, with powerful arrangements of the apparatus, perfectly insupportable. Bright, vivid sparks can also be obtained from the secondary wire, and an amount of ordinary electricity developed quite unprecedented. In this modification of the induction-coil, the effects of electro-dynamic are combined with those of magno-electrical induction.

INDUCTION, ELECTRICAL. (*See* ELECTRICITY.)

INDUCTION, in Log. (*See* DEDUCTION.)

INDUCTIVE PHILOSOPHY, *in-duk'-tiv* (Lat. *in* and *duco*, I lead), that process of reasoning which raises individual cases into general, and those again into still higher generalities. Every deduction, properly so called, must rest on a prior induction. As this would necessitate an impossibility, for the particulars to be observed are infinite in number, it is necessary to allow some spontaneous action of the understanding in every inductive process. "Two things," says Dr. Whewell, in his "History of the Inductive Sciences," "are requisite to the formation of science, facts, and ideas,—observation of things *without*, and *inward* effort of thought; or, in other words, sense and reason. Neither of these elements by itself can constitute substantial general knowledge." It is easy to point out how a defect in this mental process has at different times retarded the advancement of science; indeed, in by far the greater part of the course of the world, the history of most times and countries, exhibits a condition thus stationary with regard to knowledge. Many facts in physical science, such as the motions of the stars and the weights of bodies, were familiar to man long before the rise of Greek astronomy and mechanics. What was wanted was the act of thought. At the present day even, tribes of uncivilized and half-civilized men, over the surface of the earth, have before them the immense

body of facts, out of which the civilized world has erected the stately fabric of physical philosophy. Yet, except among European nations, the process of intellect by which these *facts* became science seems to have been unknown. Almost every part of the career of the Greek schools of philosophy, of the schoolmen of Europe in the middle ages, of the Arabian and Indian philosophers, shows, that extreme ingenuity and subtlety, invention and connection, demonstration and method, may exist, without the development of any physical science. Logic and metaphysics, and even geometry and algebra, may be obtained by such means, but never mechanics and optics, chemistry and physiology.—*Ref.* Whewell's *History of Ideas*; and *Novum Organon renovatum*.

INDULGENCE, *in-dul'-jens* (Lat.), is the remission of the penalty due for sin, either in this world or in purgatory, a power claimed by the Roman Catholic church. Indulgences were first introduced in the 11th century, by Urban II., as a recompense to those who engaged upon the Crusades. They were afterwards granted to those who gave money for the purpose; and hence was introduced the sale of them; and at length every sin came to have its price. The sale of indulgences was one of the causes that led to the Reformation.

INDUS, *in'-dus* (Lat. *indus*, an Indian), a constellation of the southern hemisphere. It lies to the south of Sagittarius, being between that constellation and the south pole. It was formed and named by Bayer. Its largest star is one of the third magnitude.

INEQUALITIES, *in-e-kwol'-e-teez* (Lat. *inæqualitas*, difference, or want of equality), in Math., a term used in algebra to express that one quantity is greater or less than another, or than nothing, when it is termed an *inequality*. Thus, the expression $x-a \gtrless b-x$ is an *inequality*, of which $x-a$ forms one *side* and $b-x$ the other. One of the strongest propositions of this rule is, that any quantity may be added to, or subtracted from, each side of an inequality, and yet the sign of inequality will remain as before. Thus, if $a \gtrless b$, it may be consequently assumed that $a \pm x \gtrless b \pm x$; for if $a \gtrless b$, it is evident that $a+x \gtrless b+x$. And similarly, if $a < b$, it follows that $a+x < b+x$. Hence any quantity may be transposed (as in equations) from one side of an inequality to the other by changing its sign; thus, if

$$a^2+b^2 \gtrless 2ab+c^2$$
$$a^2+b^2-2ab \gtrless 2ab-2ab+c^2$$
$$\text{or, } (a-b)^2 \gtrless c^2.$$

Also, in a series, if $a \gtrless b$, $c \gtrless d$, and $e \gtrless f$, &c., then $a+c+e+$ &c. $\gtrless b+d+f+$ &c.

Also, if every term on each side of an inequality be multiplied or divided by any positive quantity, the sign of inequality will remain as before; thus, if $a \gtrless b$, it follows that $2a \gtrless 2b$, &c. Both sides of an inequality may be raised to any power, or any root of them be extended, and the sign of inequality will remain as before, provided each side be a positive quantity, $7 \gtrless 5$, or $7^2 \gtrless 5^2$; and so on.—*Ref.* Wood's *Algebra*.

INERTIA, *in-er'-she-a* (Lat.), is that property of matter by which it would always continue in the same state of rest or motion in which it was put, unless changed by some external force. Kepler conceived this as indicating a degree of power, and termed it *vis inertiæ*. "The *vis insita* (*vis inertiæ*), or innate force of matter," says Newton, "is a power of resisting by which every body, as much as in it lies, endeavours to persevere in its present state, whether it be of rest or of moving uniformly forward in a straight line. This force is ever proportional to the body whose force it is; and differs nothing from the activity of the mass but in our manner of conceiving it." A body, from the inactivity of matter, is not without difficulty put out of its state of rest or motion. Upon this account, this *vis insita* may, by a most significant name, be called *vis inertiæ*, or, force of inactivity."—[*Princip.*, def. 3.) In conclusion, it may be said that *inertia* is the principal law of the material world, that all bodies are absolutely passive, or indifferent to a state of rest, and would continue for ever so unless disturbed by the action of some extrinsic force. Inertia itself is one of the inherent properties of matter, and is unceasingly recalled to our notice in every incident of life. (*See* GRAVITATION.)

IN ESSE, *in ess'-se* (Lat., in being), in Phil., is a term applied to things actually existing; and is distinguished from *in posse*, applied to things which are not, but which might be.

INFAMY, *in'-fam-e* (Lat. *infamia*), is defined to be "a permanent legal incapacity to which a man is subjected in consequence of a conviction and judgment for an offence, and which is not removed by suffering the punishment for the offence." Among the Romans, the consequence of infamia was incapacity to obtain the honours of the state, with the loss of political rights, and also of certain private ones. Persons who, in consequence of bribery, &c., are deprived of their right of voting at elections, are infamous, having lost part of their political rights. Certain offences were formerly considered of so heinous a nature as to render a man infamous and incompetent to be a witness. The endurance of the punishment, however, restored the man's competency as a witness. Act 6 & 7 Vict. c. 85, however, declares that no person offered as a witness is to be excluded on account of incapacity from crime, though such may be urged as an argument against his credibility.—Ref. *English Cyclopædia*,—Arts and Sciences.

INFANT, *in'-fint* (Lat. *infans*), in LAW, is a person under twenty-one years of age. In general, an infant can neither aliene his lands, nor do any legal act, nor make a deed, nor indeed any manner of contract that will bind him; but to these rules there are some exceptions. Infants have thus various privileges and various disabilities; but their very disabilities are privileges, in order to secure them from hurting themselves by their own improvident acts. An infant, when sued, appears to defend his cause by a guardian; but he may sue, either by his guardian or *prochein amy*, his next friend, who is not his guardian. In criminal cases, an infant of the age of fourteen years may be capitally punished for any capital offence; but under seven years he cannot. The period between seven and fourteen is subject to much uncertainty; for the infant is, generally speaking, judged to be *primâ facie* innocent; yet, if he be *doli capax*, and could discern between good and evil at the time of the offence committed, he may be convicted, and undergo judgment and execution of death, though he has not attained to years of discretion.

INFANT SCHOOLS. (*See* SCHOOLS.)

INFANTA, *in-fant'-a* (Sp.), a word signifying child, and generally applied as a title of honour to the princesses of the royal houses of Spain and Portugal. The pre-eminence implied by the appellation may be seen by infanta, signifying *the* child *par excellence*.

INFANTICIDE, or CHILD-MURDER, *in-fint'-e-side*, has been practised from very early times. Among certain of the Greek states, it was the practice to expose or destroy weak or deformed children. In Rome also it was common to expose or put to death children. In the present day, the Chinese are chiefly notorious for the extent to which they practise this crime; but in the islands of the Pacific, in some parts of India, in Africa, and South America, it is by no means uncommon. Unfortunately, however, the practice is not confined to heathen countries, but prevails to a considerable extent even in our own, notwithstanding the deep abhorrence with which it is viewed, and the severity with which it is punished. One of the most difficult questions of medical jurisprudence is to ascertain the murder of a child newly born. It has first to be determined whether the child was born dead or alive, and next, whether its death was occasioned by violence, or was the result of natural causes. If it be proved that the child was born alive, and subsequently destroyed, either by violence or wilful neglect, the offence is murder, and punishable accordingly.

INFANTRY, *in'-fin-tre* (Lat. *infans*, a child; Ital. *fante*, a child, or young person), a name that is applied to all soldiers who serve on foot, in contradistinction to horse-soldiers, or cavalry, who serve on horseback. In the feudal times, the retainers of the nobles and large land-owners were bound to render suit and service to their feudal lord in time of war, as the nobles themselves were under an obligation to aid the king under the same circumstances, in virtue of the peculiar tenure on which they held their lands. In return for this, their dependents were entitled to protection from

wrong and injury at the hands of others; and as the relationship between the feudal superior on the one side, and his vassals on the other, was somewhat analogous to that which exists between a father and his children, the men that were supplied as a contingent to the king's army, by any nobleman or chartered town, were always called "fanti," or children. For this reason, the word "infantry," under various modifications, according to the language of different countries, is now the recognised appellation of the foot-soldiers of every nation. The infantry formed the most important part of the armies of the Greeks and Romans. The northern nations of Europe also fought on foot, and the principal part of the English troops, from the establishment of the Saxon heptarchy to the time of the Conquest, consisted of infantry. It was not until chivalry had become a prominent institution in all European countries, that infantry fell into disrepute. It was, indeed, impossible that it should be otherwise; for while the cavalry was completely armed and disciplined, but little attention was paid to the equipment of the foot-soldiers of the middle ages, whose want of organization too often rendered them comparatively useless. The English infantry has always sustained its renown. Both before and after the Conquest, the foot-soldiers of England were armed with pikes, battle-axes, long knives, or "whittles," and swords, and furnished with iron helmets, and wadded tunics or coats of thick leather, as defensive armour. The service rendered by the archers of England in the wars of Edward III. and Henry V., in France, are too well known to require mention here, and the superiority of the English infantry over the foot-soldiers of the continental powers at that time, who seem to have borne the very worst of characters, the Swiss alone excepted, is clearly demonstrated by the accounts of the battles of Cressy, Poitiers, and Agincourt. The infantry began to regain their old reputation after the introduction of fire-arms; and the glorious deeds of the Scottish archers, pikemen, and musketeers, in France, Sweden, Denmark, Germany, and the Low Countries in the 16th and 17th centuries, form many a brilliant page in the history of Europe. It was not until the latter part of the 17th century, that regiments of infantry were embodied in England, to form part of a standing army in the service of the Crown. (*See* HOUSEHOLD TROOPS.) Of these, the oldest are the 1st Royal regiment of foot, familiarly styled the 1st Royals, and the 3rd Buffs. The discipline and organization of infantry have been brought to the highest degree of perfection of late years, and, as far as arms are concerned, the introduction of the rifled musket leaves room for little, if any, improvement.

INFECTION, *in-fek'-shun* (Lat.), in Med., is the propagation of disease by means of deleterious or offensive effluvia contained in the atmosphere. The offensive matter may either proceed from the decomposition of animal or vegetable substances, or may emanate from the bodies of persons affected by particular diseases. The presence of some of these agents may be recognised by the smell, of others only by their mischievous effects. The most important means of disinfection is ventilation. Various chemical agents are also employed for this purpose; as chlorine, chloride of zinc, perchloride of iron, sulphurous acid, &c.

INFEOFFMENT, *in-fe'-of-ment*, in the Law of Scotland, denotes the manner in which a person is invested in any real or heritable property. Until very recently, the form was for several persons to proceed to the ground, when earth and stone thereof were handed to him who represented the new possessor. The transaction was attested by a notary, in a deed called an instrument of sasine, which had to be recorded, within sixty days after the ceremony, in the Register of Sasines. This ceremony is now done away with, and only the registration of the deeds required.

INFERNAL MACHINE, *in-fer'-nāl* (Fr., from Lat. *infernus*), a name given generally to all machines containing powder and projectiles, and destined to destroy human life. Infernal machines are often employed in war, being commonly placed under water and fired by means of electricity; thus often causing great damage to a hostile fleet, if the presence of the machine be not perceived in time. The name *infernal machine*, however, applies more particularly to those made use of in conspiracies and political plots, as the one tried against Napoleon Buonaparte in 1800, against Louis Philippe in 1835, and against Louis Napoleon on the 14th January, 1858, none of which were successful, the conspirators in each case meeting with the punishment their attempts at murder deserved.

INFIDEL, *in-fi-del* (Lat. *infidelis*, unbelieving), is one who does not believe the truth of the Christian religion. (*See* CHRISTIANITY, ATHEISM, DEISM.)

INFINITE, *in'-fin-it* (Lat. *in* and *finitum*, unlimited, boundless), in Phil., denotes the entire absence of all limits or bounds; and is applicable to the one infinite Being in all his attributes. As to our idea of the infinite, two opposite opinions exist among philosophers. According to some, the idea is purely negative, without anything positive in it, except what may be furnished by the imagination, which goes on enlarging the finite without limit. According to others, the enlarging of the finite can never furnish the idea of the infinite, but only of the indefinite. "We must," says Sir W. Hamilton, "believe in the infinity of God; but the infinite God cannot by us, in the present limitation of our faculties, be comprehended or conceived. A deity understood would be no deity at all; and it is blasphemy to say that God only is as we are able to think him to be. We know God according to the finitude of our faculties; the infinite God is, to use the words of Pascal, infinitely inconceivable." The Scriptures indeed declare that now we know only in part.

INFINITE, INFINITESIMAL. (*See* INTEGRAL CALCULUS.)

INFINITIVE MOOD, *in-fin'-i-tiv* (Lat. *infinitivus*), in Gram., is that form or state of the verb which expresses a thing in a general manner, without any distinction of number or person; as, to walk, to speak, to be feared.

INFIRMARY, *in-fir'-mā-re* (Lat. *infirmus*, infirm), is an hospital for the reception and medical treatment of the sick poor. Fortunately, in almost all of the considerable towns of this country, there are now establishments of this description, supported either by public subscriptions or by private endowments. (*See* HOSPITALS.)

INFLAMMATION, *in-flăm-mā'-shun* (Lat. *inflammatio*, from *inflammo*, I burn), in Pathol., is a preternaturally hot, red, swollen, and painful condition of any portion of the body: when the inflammation is general, it takes the form of fever. It is usually distinguished by a particular name, according to the part which is attacked; as *pleuritis*, inflammation of the pleura; *peritonitis*, of the peritoneum; *gastritis*, of the stomach; *hepatitis*, of the liver, &c. Inflammations may be produced by various causes,—by external injury, as a cut, bruise, or burn; by the action of some chemical or other agent, as poisons, alcoholic liquors; or from exposure to cold, wet, &c. Inflammation may be acute or chronic; diffuse or circumscribed; healthy, with a disposition to heal and return to the natural state, or unhealthy, when, on the contrary, there is a disposition to ulceration, &c. It may terminate in one of three ways,—in resolution, in suppuration, in mortification. The first of these is the most desirable mode of termination, being the gradual subsidence of the inflammatory action, and the return of the parts to their natural state, without any visible morbid change in their structure. In suppuration, the inflammation goes on to the formation of pus, when the swelling increases in size, becomes more red and shining, then grows soft in the centre, and at length the matter makes its escape either through a natural or an artificial opening. The most dangerous termination is in mortification, which is caused by the inflammatory action being too violent for the vital process of the part. The pain is at first very severe, then the bright red colour of the part becomes livid, vesicles form on the surface, the pain abates, and the death of the part ensues. The immediate cause of inflammation is believed to be the exudation of the liquor sanguinis through the softened or ruptured walls of the capillary vessels of the part, in consequence of an increased flow of blood there. The mode of treatment in inflammation will of course vary according to the seat and character of the general symptoms. Commonly, when the patient is strong and of a full habit, general bleeding is recommended. Local

bleeding, by means of cupping, leeches, &c., should also be had recourse to. A low diet, purgative medicines, cooling drinks, diaphoretics, and the avoidance of all excitement, are also necessary. Dr. Hughes Bennett, of Edinburgh, however, maintains that the abstraction of blood does not exert any beneficial effect upon the inflammatory state, and that its influence on the system is injurious; and hence he condemns its being resorted to for the sake of the inflammation. This, however, is not the generally received opinion among medical men. (*See* PLEURITIS, PERITONITIS, &c.)

INFLEXION, or INFLEXION, *in-flek'-shun* (Lat. *inflecto*, I bend), in Gram., means any change which takes place in a word, from a modification of its sense between the *root* and the *termination*. The inflexion must therefore not be confounded with the termination itself. For example, the syllable *am* is the root of all the words employed in the conjugation of the Latin verb *amo*, 'I love;' in the imperfect tense the inflexion is the syllable *ab*. The termination varies according to the person: *amabam, amabas, amabat.* — *Ref.* Brande's *Dictionary*.

INFLEXION, in Optics, is synonymous with the term diffraction, or that property of light by reason of which, when it passes very near the borders of an opaque body, it is turned from its rectilinear course. (*See* LIGHT.)

INFLEXION, POINT OF, in Geom., is that point of a curve line where the curvature in relation to the axis changes from concave to convex, or from convex to concave. To find the point of inflexion in a given curve, it is only necessary to find, from the equation of the curve, the value of $\frac{d^2y}{dx^2}$: this value made equal to 0, or infinity, will give an equation by which $x$ can be determined. In the above equation, $d^2y$ stands for the second differential. (*See* INTEGRAL CALCULUS.)

INFLORESCENCE, or ANTHOTAXIS, *in-flor-es'-ens anthō-tāk'-sis* (Lat. *inflorescens*; Gr. *anthos*, flower; *taxis*, a placing), in Bot., a term applied to the arrangement of the flowers on the axis, or to the ramification of the floral axis. The forms under which the flower-stalk is presented to our notice are described under PEDUNCLE; and many particulars relating to inflorescence are noted under BRACT. In describing the principal forms of inflorescence, we shall follow Professor Bentley, to whose excellent Manual we refer the student for full details. Flowers are variously arranged upon the floral axis, and to each arrangement a particular name is applied. These modifications are always the same for the same species of plant, and frequently throughout entire genera, and even natural orders; and hence their discrimination is of great practical importance. All the regular forms may be arranged in two great classes, the principles of which being understood, their subordinate modifications will be readily intelligible.

Class I. *Indefinite, Indeterminate, or Axillary Inflorescence.*—The primary floral axis is terminated by a growing point analogous to the terminal leaf-bud of a stem or branch; it has consequently the power of growing or elongating in an upward direction, or of dilating more or less horizontally, there being no necessary limit to its growth. Such an axis, as it continues to grow upwards, develops on its sides other buds, from which flowers are produced. The general characters of the inflorescence in this class depend, therefore, upon the indefinite growth of the primary axis; while the secondary, tertiary, or other axes which are developed from it, are terminated by flower-buds. The simplest kind of indefinite inflorescence is that presented by such plants as the pimpernel and moneywort, in which solitary flowers are developed in the axils of the ordinary leaves of the plant, the primary axis continuing to elongate in an upward direction, and bearing other leaves and flowers. The flowers are then said to be *solitary* and *axillary*. When such flowers are arranged in whorls round the stem, each flower being axillary to a leaf, as in the common mare's-tail, they are said to be whorled. When a number of flowers are developed, instead of a single one, upon an elongated or depressed axis which is placed at the extremity of a branch or in the axil of a bract, a number of kinds of inflorescence arise, depending upon the extent to which the axis is divided, the mode in which the branching takes place, the comparative length of the flower-stalks, and other subordinate circumstances. These modifications are arranged by Professor Bentley under two heads:—1. Those with an elongated primary axis; and, 2. those with a shortened or dilated primary axis.

1. *Kinds of Indefinite Inflorescence with an elongated primary axis.*—These are as follows:—

*The spike.*—An elongated axis, simply bearing sessile flowers, or flowers in which the pedicels are too short to be clearly distinguishable. Examples may be seen in the rib-grass and vervain. In this kind of inflorescence the flowers at the base open first, and those at the apex last. This mode of opening is called *centripetal*: it is universal in the different kinds of indefinite inflorescence, which in all cases open from the base to the apex, if the axis is elongated, or from the circumference towards the centre, if it is depressed or dilate.



SPIKE.

*The ament* or *catkin.*—A kind of spike, bearing only barren flowers,—that is, only stamens or pistils. These are separated from each other by squamous bracts, and the whole inflorescence usually falls off in one piece soon after flowering or fruiting. Examples are furnished by the hazel, willow, birch, poplar, &c.



CATKIN.

*The Spadix.*—A spike with a succulent axis, in which the individual flowers have no bracts, but the whole inflorescence is inclosed in a long bract called a spathe. The common arum, or cuckoo-pint, affords an excellent example.

*The Locusta, or Spikelet.*—The partial inflorescence of a grass or cyperaceous plant, consisting of a spike with a few flowers, which are destitute of calyx and corolla, but have, in place of those envelopes, membranous bracts called *palew*: the whole inflorescence is surrounded at the base by one or two empty bracts called *glumes*. The spikelets may be either arranged sessile on the primary axis, as in wheat, or placed on a more or less branched axis, as in the oat.

*The Cone.*—The kind of spike found in coniferous plants, as the pine, fir, larch, &c. It is composed of female flowers, each of which has at its base a persistent woody scale or bract.

*The Strobilus, or Strobile*, a kind of spike with female flowers, each of which has a membranous bract or scale at its base. It is seen in the hop.



RACEME.



THYRSUS.

*The Raceme.*—In this kind of inflorescence, the pri-

mary axis is elongated, and bears flowers placed on pedicels of nearly equal length. It differs from the spike only in the flowers being stalked instead of sessile. Examples occur in the currant, mignonette, hyacinth, laburnum, &c.

*The Corymb.*—In this, the pedicels, or flower-stalks, are of different lengths, those at the base of the primary axis being longer than those towards and at the apex, so that all the flowers are nearly level. It occurs in the hawthorn, &c. When the stalks of a corymb divide, instead of bearing flowers immediately, as in some species of pyrus, a *branching* or *compound* corymb is formed.

*The Panicle*, a modification of the raceme, produced by the subdivision of the secondary axes. Instead of producing flowers directly, those axes branch into tertiary ones, which bear the flowers. The inflorescence of the *Yucca gloriosa*, and the general arrangement of the spikelets of the oat, are examples.

*The Thyrsus, or Thyrse*, a kind of panicle, in which the pedicels are generally very short, and the whole so arranged as to form a compact cluster of blossoms. Examples may be found in the grape-vine, horse-chestnut, and lilac.

2. *Kinds of Indefinite Inflorescence with a shortened or dilated primary axis.*—The principal are the following:—

*The Capitulum, Anthodium, or Head.*—This kind of inflorescence constitutes the *compound flower* of Linnæus. It is formed by a number of sessile flowers crowded together on a receptacle, the whole being surrounded by an involucre. The heads of flowers take a variety of forms dependent upon the shape of the receptacle, which may be flattened, slightly convex, conical, or globular. In this kind of inflorescence the centripetal order of expansion is often very evident, the outer florets being fully expanded, those within them partially opened, and those in the centre in an unopened condition. Examples are seen in the cotton thistle, dandelion, chamomile, American button-bush, &c.



CAPITULUM.

*The Hypanthodium*, a slight modification of the last, formed by a receptacle, which is usually of a fleshy nature, becoming more or less incurved, and thus partially (as in the Dorstenia), or entirely (as in the fig), inclosing the flowers which it bears on its surface.



UMBEL.

*The Umbel.*—In this, the primary axis is shortened, and gives off from its apex a number of secondary axes, or pedicels, of nearly equal length, each bearing a flower, and arranged like the ribs of an umbrella. Examples of the simple umbel are seen in the primrose, cowslip, &c. When the secondary axes divide, and form tertiary axes, which are also arranged in an umbellate manner, a *compound umbel* is produced. This is seen in the carrot, fennel, fool's parsley, hemlock, and other allied plants, which are hence called *umbelliferous*.

Class II. *Definite Determinate, or Terminal Inflorescence.* — In this class of inflorescence, the primary axis is arrested in its growth, at an early age, by the development of a terminal flower-bud; and if the axis bears no other flowers, this is called a *solitary terminal* flower, and is the simplest form of definite inflorescence.





It may be seen in the stemless gentian, the wood anemone, &c. When other flowers are produced on such an axis, they must necessarily arise from axillary buds placed below the terminal flower-bud, and if these form secondary axes, they will, in like manner, be arrested in their growth by a terminal flower-bud; hence this mode of inflorescence *is definite*, in contradistinction to the former, *or* indefinite inflorescence, where the primary axis elongates indefinitely, unless stopped by some extraneous cause. In definite inflorescences, the order of unfolding in the flower-buds is from the apex to the base, if the axis be elongated, or from the centre to the circumference, if the axis be depressed or dilated. Such an order of expansion is termed *centrifugal*. The general name of *cyme* is applied to all inflorescences of this class; but it is customary to distinguish a few by special names, as follows:—

*The True Cyme.*—A definite inflorescence, more or less branched, the whole being developed in a corymbose manner. It assumes the form of a somewhat flattened head in the laurustinus and elder, of a rounded mass of blossoms in the hydrangea, and of a more diffuse bunch in the chickweed. By attention to the centrifugal order of expansion, such cymes may be always distinguished from the umbel, corymb, or other indefinite kinds of inflorescence, to which, otherwise, they bear in many cases a great resemblance.



CYME.

*The Spiked Cyme.*—A definite inflorescence, formed of sessile flowers, and bearing a resemblance to the spike. Example, the inflorescence of the sedum, or stone-crop.

*The Racemose Cyme.*—A cyme having flowers on pedicels of nearly equal length, as in the campanula.

*The Panicled Cyme.*—This is a definite inflorescence, resembling in appearance the panicle. The privet affords a good example.

*The Helicoid, or Scorpioid Cyme.*—This kind of cyme has flowers only upon one side, and its upper extremity is more or less coiled up in a circinate manner, so as frequently to resemble a snail, or the tail of a scorpion. These cymes are especially developed in the nat. ord. *Boraginaceæ*, as in the forget-me-not. It is extremely difficult to distinguish this kind of inflorescence from the raceme, as the order of expansion *appears* to be *centripetal*.

*The Fascicle, or Contracted Cyme.*—In this, the flowers are placed on short pedicels, of nearly equal length, and consequently crowded together. It is seen in the sweet-william.

*The Glomerule.*—A cyme consisting of a number of sessile flowers, or flowers with very short pedicels, collected into a rounded head or short spike. It bears nearly the same relation to the true cyme as the capitulum does to the umbel. It is seen in species of nettle, and in the box.

*The Verticillaster.*—This kind of cyme is seen in the white dead nettle, and other plants of the labiate tribe. In it the flowers appear at first sight to be arranged in a whorl round the stem, but upon examination, it will be readily seen that there are two clusters axillary to the opposite leaves, the central flowers of which open first, proving the mode of expansion to be centrifugal. To each of these clusters the name of *verticillaster* is applied.

Examples of *Mixed Inflorescence* are by no means uncommon. Thus, in plants of the nat. ord. *Compositæ*, the terminal capitulum is the first to expand, and the capitula, as a whole, are therefore developed in a centrifugal manner; the individual capitula, however, open their small flowers or florets centripetally; hence, here, the general inflorescence is definite, and the partial inflorescence indefinite.

INFLUENZA, *in-flu-en'-za* (Ital., influence; so called because it was believed to be produced by the influence of the stars), in Med., is an epidemic febrile catarrh, differing from a common catarrh in the greater severity of its symptoms. It comes on sud-

denly, attacking many persons at once; but though the symptoms are alarming, it is seldom fatal, except to the aged, or those of weakly constitution. The person is first seized with slight chills; there is great heaviness and pain over the eyes, great prostration of strength, loss of appetite, quick, irregular pulse, cough and difficulty of breathing, with running at the nose and eyes. The duration of the disease varies from two or three days to as many weeks; and frequently the debility continues much longer, occasioning, not uncommonly, relapses. Differences of opinion exist as to the immediate cause of this disease, some attributing it to a noxious principle existing in the atmosphere; others to sudden changes of the weather, &c.; but nothing is definitely known on the subject. In its treatment, little is required to be done beyond keeping the patient in bed, in a warm and agreeable temperature, and the administration of aperient and cooling medicines. When the difficulty of breathing is considerable, mustard poultices may be applied to the chest. When the fever has subsided, tonics and stimulants should be employed; and should the cough remain obstinate, change of air will generally be found to be the most effectual means of removing it.

INFORMATION, *in-for-mai'-shun* (Lat. *informatio*), in Law, is an accusation, or complaint, against a defendant for some criminal offence. Informations are of two sorts: first, such as are partly at the suit of the crown and partly at that of a subject; and, second, such as are in the name of the crown only. The latter are of two kinds,—those that are truly and properly her majesty's own suits, and filed by her own immediate officer, the attorney-general, and those in which, though the queen is nominal prosecutor, yet it is at the relation of some private person, or common informer, and they are filed by the queen's coroner and the attorney in the court of Queen's Bench. The former are for such enormous misdemeanours as peculiarly tend to disturb or endanger her government, or to molest or affront her in the discharge of her royal functions; the latter, any gross and notorious misdemeanours, riots, &c., not particularly tending to disturb the government, but yet deserving public animadversion.

IN FORMÂ PAUPERIS. (*See* FORMÂ PAUPERIS.)

INFUSION, *in-fu'-zhun* (Lat. *infusio*, a pouring in or upon, a steeping; Fr. *infuser*, to infuse), a solution of some of the principles of vegetables, generally in water, but sometimes in other vehicles. Either hot or cold water may be employed, according to the particular infusion required. The digestion, however, must be longer when cold water is used. The vegetable substances may be either fresh or dried; when fresh, they must be cut in pieces, and when dry, bruised or coarsely powdered. Water is then poured on the substance employed, and allowed to stand in a covered vessel for a space of time varying with the nature of the vegetable matter. It is afterwards strained, and is then fit for use. Infusions are liable to spoil soon, especially when made with warm water, or if the substance be of a fermentable nature. To assist in keeping the infusion, or to increase its powers, alcohol is sometimes added after straining. Wholesale chemists are now accustomed to prepare concentrated infusions for the use of general practitioners. These can be diluted to the ordinary strength at the time of using them, and not only possess the advantage of keeping better, but save much trouble and loss of time. Infusions are also made by percolation, or, as it is termed by the French, *par déplacement*.

INFUSORIA, *in-fu-so'-re-â* (Lat. *infundo*, I pour in), a class of very minute animalcules inhabiting stagnant water, fresh or salt, in which plants are growing, or in which an abundance of decayed animal or vegetable matter is contained. The invention of the microscope revealed the existence of myriads of living creatures whose presence, up to that time, was unsuspected; and by its means we are able to perceive that a drop of water, though apparently perfectly clear to the naked eye, is really swarming with living beings. Species have been described from $\frac{1}{20}$th to $\frac{1}{200}$th of a line in length. They are, indeed, so extremely minute in size, that it is calculated that a moderate-sized drop of water may contain 500,000,000 of them. The infusoria are of very simple organization, as they have neither vessels nor nerves, are not symmetrical, have not distinct sexes, have no visible eggs, and are without determined or apparent digestive cavities. Their chief organs seem to be internal spherical cavities, frequently containing foreign particles derived from the surrounding water, and supposed to serve as food. Some of them have no apparent locomotive organs; others have either cilia, or changeable processes, as they are called,—expansions of the substance of the body. In most cases the substance of the bodies of infusoria consists of a glutinous, homogeneous, or slightly granular, transparent mass. Red specks resembling eyes have been observed in some varieties, and by many zoologists they are so considered; while others deny it, on account of the absence of any nervous system and no appearance of any cornea or lens. The food of infusoria consists of decomposing vegetable and animal matter, and they frequently devour each other. They are the prey of other aquatic animals, and, as soon as they accumulate in large quantities, contribute largely to the nourishment of more highly organized beings which are useful to man. This has been particularly observed in cold climates, where vegetable life ceases to exist in the ocean. Infusoria are found to exist in these latitudes in inconceivable numbers, and form the principal nourishment of the fishes inhabiting those parts. Their mode of propagation is very remarkable: it consists in spontaneous division, which is either longitudinal or transverse; in gemmation, the buds arising from the posterior part of the body; in the incysted process, cysts forming, which, when they burst, liberate animalcules which do not resemble their parent in form; and also in alternation of generations. (*See* GENERATIONS, ALTERNATION OF.) Infusoria frequently occur in such large numbers as to colour large tracts of water. Some of these impart a blood-red hue to the water, others a blue colour; while others tinge the surface with green. They can resist a temperature of 24° below freezing-point, and a degree of heat equal to 260°. Ehrenberg, whose labours have principally contributed to the knowledge of the nature and structure of the infusoria, has divided them into two large groups,—*Polygastrica* and *Rotifera*. The latter family, however, has lately been proved to be of a much higher organization than the former, and has consequently been removed into a separate class away from the infusoria. The Polygastrica have also been shown to contain several families which are not true infusoria. Among these may be mentioned the Diatomaceæ, which have been proved to be varieties of algæ. (*See* DIATOMACEÆ.) The greater portion of the fossil infusoria described by naturalists has also been removed to the Diatomaceæ.—*Ref.* Ehrenberg's *Die Infusionsthierchen; Memoirs of the Berlin Academy*, and translations in Taylor's *Scientific Memoirs*; Mantell's *Medals of Creation and Annals of Natural History*.

INGOT, *in'-got* (Fr. *lingot*), a word of rather doubtful derivation, signifying the small masses or bars of gold and silver intended either for coinage or importation.

INGUINAL. (*See* GROIN.)

INHERITANCE, *in-her'-e-tâns* (from Lat. *hæres*, an heir), a term applied, in Law, to a perpetual or continuing right to an estate invested in a person and his heirs. The *canons of inheritance* by which it was governed, directed the descent of real property throughout the lineal and collateral consanguinity of the owner, dying intestate, who is technically called the purchaser. These canons were materially altered by 3 & 4 Will. IV. c. 106. (*See* DESCENT.) The new and revised canons are as follows:—(1) That inheritances shall lineally descend to the issue of the person who last died entitled, *in infinitum*; (2) that the male issue shall be admitted before the female; (3) that where there are two or more males in equal degree, the eldest only shall inherit, but the females altogether; (4) that the lineal descendants, *in infinitum*, of any person deceased, shall represent their ancestor,—that is, shall stand in the same place as the person himself would have done had he been living; (5) that on failure of lineal descendants, or issue of the person last entitled, the inheritance shall ascend and descend to the lineal ancestors, and to the collateral relatives of the purchaser; (6) that the nearest lineal ancestor shall be the heir of the purchaser, in preference to

any of the descendants of such lineal ancestor, and to more remote lineal ancestors and their descendants (other than himself); and the descendants of every such lineal ancestor shall succeed next after, or in default of him; so that the father shall be preferred to a brother or sister, and a more remote lineal ancestor to any of his issue, other than a nearer lineal ancestor or his issue; and subject to this rule and to the next, the descent to collaterals shall be subject to the second, third, and fourth canons; (7) that, as between collaterals of a purchaser, a relation of the half-blood shall succeed next after any relation in the same degree of the whole blood and his issue, where the common ancestor shall be a male, and next after the common ancestor, where such common ancestor shall be a female. So that the brother of the half-blood, on the part of the father, shall inherit next after the sisters of the whole blood on the part of the father and their issue; and the brother of the half-blood on the part of the mother shall inherit next after the mother. The collaterals of the half-blood of a person last entitled, who was not a purchaser, will take in a course of descent from the purchaser of whose whole blood they are, by force of the direction, that in every case the descent shall be traced from the purchaser. (8) That in lineal ascending, and in collateral inheritances, the male stock shall be preferred to the female (that is, the male ancestors and kindred derived from the blood, however remote, shall be admitted before female ancestors and kindred derived from their blood, however near), unless where the lands have in fact descended from a female. Therefore, under the new law, none of the maternal ancestors of the person from whom the descent is to be traced (viz. the purchaser), nor any of their descendants, are capable of inheriting, until all his paternal ancestors and their descendants shall have failed; and also no female paternal ancestor of such person, nor any of her descendants, is, or are, capable of inheriting, until all his male paternal ancestors and their descendants shall have failed; and no female maternal ancestor of such person, nor any of her descendants, is, or are, capable of inheriting until all his male maternal ancestors and their descendants have failed. (9) When there shall be a total failure of heirs of the purchaser, or where any lands shall be descendible, as if an ancestor had been the purchaser thereof, and there shall be a total failure of the heirs of such ancestor, then, and in every such case, the land shall descend, and the descent shall thenceforth be traced from the person last entitled to the land, as if he had been the purchaser thereof (22 & 23 Viet. c. 35, s. 19). This enactment is to be read as part of the 3 & 4 Will. IV. c. 106, s. 20. (*See* also 2 Sug. V. & P. 238, 10th edition.)—*Ref.* Wharton's *Law Lexicon*.

INJECTION, *in-jek'-shun* (Lat. *injicio*, I cast in), in Med., is a medicated liquor thrown into some cavity of the body by means of a syringe or other apparatus. (*See* CLYSTER.)

INJUNCTION, *in-junk'-shun* (Lat. *injunctio*), in Law, is a writ which issues under the seal of a court of equity, in order to restrain proceedings in other courts, &c. Injunctions are usually divided into common and special, the former being granted to restrain proceedings in a court of law, but do not extend to stay proceedings in the admiralty or spiritual courts; the latter being granted to stay proceedings in the spiritual courts, the courts of admiralty, or in some other courts of equity, to restrain the negotiation of notes and bills of exchange, the sale of land, the sailing of a ship, transfer of stock, &c. In fact, the variety of cases is endless in which a court of equity grants relief to a plaintiff, in restraining the commission or the continuance of some act of the defendant.

INJURY, *in'-ju-re* (Lat. *injuria*), in Law, denotes something done contrary to law, to the hurt of another person or his property. According to Blackstone, injuries or private wrongs are an infringement or privation of the private or civil rights belonging to individuals considered as individuals. He distributes the several modes of redress of private wrongs into three several species: first, that which is obtained by the mere act of the parties themselves, as reprisal, self-defence, arbitration; secondly, that which is effected by the mere act and operation of law, as retainer, remitter; and, thirdly, that which arises from suit or action in courts, which consists in a conjunction of the other two, the act of the parties co-operating with the act of law; the act of the parties being necessary to set the law in motion, and the process of the law being in general the only instrument by which the parties are enabled to procure a certain and adequate redress.

INK, *ink* (Du. *inkt*, Fr. *encre*).—The basis of writing-ink is gallotannate of iron. It is generally made by mixing gall-nuts, sulphate of iron, and gum-arabic in different proportions. The following receipt gives an excellent ink, black, fluid, and permanent. Digest three-quarters of a pound of bruised nut-galls in a gallon of cold water, then add six ounces of sulphate of iron, and an equal weight of gum-arabic, and four or five drops of kreasote as an antiseptic. Let the mixture digest for three or four weeks, shaking it up now and then, after which decant the clear fluid. Ink long exposed to moisture and the atmosphere turns brown through becoming converted into peroxide of iron. The writing of documents which has become yellow and pale from age, may be restored by passing over it, with a fine brush, a solution of gall-nuts, which, uniting with the iron, re-forms a black gallotannate. Ink-stains submitted to the action of an alkaline carbonate during washing become converted into spots of yellow peroxide, or iron-moulds. These may be removed by dissolving the iron oxide with an acid that will not attack the fibre of the cloth, such as oxalic acid, a weak solution of hydrochloric acid, and several others. *Blue ink* is now frequently used; it is sometimes made from indigo, and sometimes from Prussian blue. *Red ink* may be made by infusing Brasil wood, cut into small pieces, for two or three days in weak vinegar. The infusion may then be boiled with the wood for an hour, and afterwards strained and thickened slightly with gum-arabic and sugar: a little alum improves the colour. A decoction of cochineal, with a little liquid ammonia, forms a beautiful red ink, but the colour is not permanent. *Indian ink* consists of cakes made of lamp-black and size, or animal glue. The Chinese, however, in manufacturing this ink, do not use animal glue, but vegetable juices, which render it more brilliant and lasting. When Indian ink is prepared with the best lamp-black, levigated with the finest gelatine, or solution of glue, it forms an ink of good colour, but wants the shining fracture and permanency of Chinese ink. Indian ink is used in Europe for designs in black and white, in which it possesses the advantage of being able to afford gradations of tone according to the degree of its dilution with water. *Marking inks* are of various kinds, and are used for marking linen. They generally consist of solutions of nitrate of silver. In some cases the fabric to be marked is previously moistened with an alkaline solution. By this means, oxide of silver is precipitated upon, and combines with the cloth when it is written upon, so as scarcely to be removed by any re-agent. *Sympathetic inks* are such as are invisible until heat or some other power is employed to develop them. Hellot's sympathetic ink consists of chloride of cobalt. The letters are invisible till the paper on which they are written is held to the fire: when the water evaporates, and the letters appear green. *Printing ink* consists essentially of a mixture of lamp-black, finely-divided carbon, and oil. The qualifications of a good printing ink are—1. that it should distribute freely and easily, and work sharp and clean; 2. that it should not have too much tenacity for the type, but should have a much greater affinity for the paper, and so come off freely upon it; 3. it ought to dry almost immediately on the paper, but not dry at all upon the type or rollers; this is particularly necessary in newspaper printing; 4. it should be able to withstand all the effects of time and chemical re-agents, and should never change colour. The quality of the linseed oil employed, and even the character of the seed from which the oil is obtained, requires great attention. In making printing ink, the linseed oil is first clarified from all fatty matters, and the pure oil is boiled at a carefully regulated temperature. During the boiling, the best pale yellow soap is added, and the required driers are then mixed with it. The best lamp-

black is obtained from the smoke of naphtha, the combustion of which has been regulated with care. This black is ground up intimately with the drying oil, which has assumed almost the character of a varnish, and the ink is complete.

INLAYING, *in-lai'-ing* (Aug.-Sax.), is that branch of decorative art, applied chiefly to the manufacture of ornamental furniture, desks, workboxes, &c. It is performed by cutting grooves in the surface of any material, and filling up the hollows thus produced with some substance of a different kind or colour, so that a marked contrast may be obtained between the ground-work and the pattern that is inserted in it. Inlaying may be executed in any kind of hard wood, metal, tortoise-shell, ivory, horn, mother-of-pearl, &c., in the manner described, or by sawing out a pattern simultaneously in two veneers, or thin layers of wood, of different colours, that have been placed together for the purpose, and are afterwards glued to the surface of a piece of wood of inferior quality, the pattern that is cut out of each veneer fitting exactly in the space that is left in the others when the device has been sawn out and removed. This method resembles mosaic-work in some respects, but differs from it in this essential point, that the materials are not fitted together in such small pieces. (*See* MOSAIC-WORK.) Damaskeening is a species of inlaying in metals in which the natives of the East are very skilful. (*See* DAMASKEENING.) Two kinds of inlaying, often seen in old pieces of furniture, called "Buhl-work" and "Reisner-work," took their names respectively from two cabinetmakers who practised the art in Paris in the latter part of the 17th century. The former is the insertion of slips and scroll-work of brass into a groundwork of dark or clouded wood, and the latter, the insertion of a pattern, cut in ebony, into tulip-wood, or any other wood of a light colour. In some specimens the effect of painting is produced by the use of a variety of pieces of wood of different colours. Inlaying, when applied to the formation of flooring, is called marquetry and parquetry. (*See* MARQUETRY, PARQUETRY.)

INN, *in* (Sax. *inn*), is a place of entertainment for travellers. If an innkeeper, or other victualler, hangs out a sign and opens his house for travellers, it is an implied engagement to entertain all persons who travel that way, and upon this universal assumption an action will lie against him for damages if he, without good reason, refuses to admit a traveller. Innkeepers are also responsible for the safe custody of the goods of their guests while they are under their roof; but if the goods are lost through any negligence of the owner himself, then the responsibility of the innkeeper ceases.

INNATE IDEAS, *in'-nait* (Lat. *innatus*, inborn), in Phil., are such as are inborn, and belong to the mind from its birth. "These," says Descartes, "I have called innate in the same sense in which we say that generosity is innate in some families, or that certain diseases (as the gout or stone) are innate in others; not that the children of those families labour under such diseases in their mother's womb, but that they are born with a certain predisposition or faculty of contracting them." It is now generally agreed among philosophers, that the mind is originally constituted with its own fundamental laws of thought, which will inevitably cause it to develop only to certain effects, and that at the same time a certain external influence, a contact with the outward world, is absolutely necessary, without which it would not develop at all.

INNOCENTS' DAY, *in'-no-sents*, a festival celebrated in the calendar on the 28th December, in commemoration of the murder of the infants by Herod, whom he wished to destroy the infant Saviour.

INNOMINATUM, Os, *in-nom-in-ai'-tum* (Lat. *in*, without; *nomen*, a name), is the name given to the large irregular bone situated at the side of the pelvis. It is composed of three bones, which are distinct in the young subject, and are the *os ilium*, or haunch-bone; the *os ischium*, or hip-bone; and the *os pubis*, or pham-bone.

INNS OF COURT.—When the court of Common Pleas was fixed at Westminster, in terms of an article in the Magna Charta, which declared that it should no longer follow the king's court, but be held in some certain place, numerous professors of the municipal law were thus brought together and formed into an aggregate body. They naturally fell into a kind of collegiate order, purchased or became possessed, at various times, of certain houses between Westminster and the City, where exercises were performed, lectures read, and degrees at length conferred in the common law. The degrees were those of barrister, answering to bachelor in the universities. According to Fortescue, there were two sorts of collegiate houses,—one called Inns of Chancery, in which the younger students of the law were usually placed, and the greater inns, called the Inns of Court, into which the more advanced students were admitted. The Inns of Court are Lincoln's Inn, the Inner Temple, the Middle Temple, and Gray's Inn. These four courts alone possess the power of conferring the rank of barrister-at-law, a rank which constitutes an indispensable qualification for practice in the superior courts. (*See* BARRISTER.) Lincoln's Inn appears to have taken its name from one of the earls of Lincoln, whose house came to be appropriated to students of law. It has a magnificent chapel, built by Inigo Jones, and an elegant hall and library, built by Hardwick, in the Tudor style, in 1845. The library contains a very large and valuable collection of books. The Inner and Middle Temples came into the hands of the professors of law after the dissolution of the Knights Templars. In the reign of Henry VIII. the members of the Temple divided into two societies, afterwards known as the Inner and Middle Temples. The magnificent Temple church, common to both societies, was founded by the Templars upon the model of that of the Holy Sepulchre at Jerusalem. Gray's Inn takes its name from the lords Gray of Wilton, and was established in the reign of Edward III. The chapel and hall are plain buildings. Each inn of court is governed by a body of their own, known by the name of Benchers. Besides the four inns of court, there are eight Inns of chancery, which are now only used as chambers, principally by solicitors and attorneys. They are Furnival's Inn, Thavies' Inn, Clifford's Inn, Clement's Inn, New Inn, Lyon's Inn, Staple Inn, and Barnard's Inn.

INOCARPUS. (*See* THYMELACEÆ.)

INOCULATION, *in-ok-u-lai'-shun* (Lat. *inoculatio*), in Med., is the insertion of a poison into the body of a person, more particularly applied to the practice of producing small-pox by taking a small quantity of the fluid from the eruption on the skin of one person, and inserting it under that of another. In this way a much milder form of the disease was produced than if it had been taken in the natural way. Hence the mortality of the disease was much lessened; for, whereas of those that take the disease in the natural way, one in every five or six dies; of those that are inoculated, there are not more than one in five or six hundred carried off. It was also, however, not without its evils, as it exposed the person to some risk, who might not have taken it naturally, and, by introducing the disease into a district previously free from it, might be the means of communicating it to others. Inoculation is generally said to have been introduced into this country about 1721, by Lady Mary Wortley Montague, who had seen it practised in Turkey, where it had been long known. It appears, however, to have been known before this time in the south of Wales and the Highlands of Scotland. Since the introduction of vaccination, inoculation has fallen into disuse. (*See* VACCINATION.)

INORGANIC CHEMISTRY. (*See* ORGANIC and INORGANIC CHEMISTRY.)

INQUEST, *in'-kwest* (Lat. *inquisitio*), in Law, is an inquiry into any cause, civil or criminal, by jurors impanelled for that purpose. An inquest of office is an inquiry made by the king's officer, his sheriff, coroner, or escheator, or by writ to them sent for that purpose, or by commissioners specially appointed, concerning any matter that entitles the king to the possession of lands or tenements, goods or chattels; as forfeiture for offences, wreck, treasure trove, &c. A coroner's inquest, held by a coroner and a jury, is for the purpose of inquiring when any person is slain, or dies suddenly, or in prison, concerning the manner of his death, and is one of the greatest safeguards of life in this country. It is indispensable that the coroner and the jury should have a view of the body; for if the body

be not found the coroner cannot sit. If any be found guilty by this inquest, of murder or other homicide, the coroner is to commit them to prison for further trial, and is also to inquire concerning their lands, goods, and chattels, which are forfeited thereby. If a body liable to inquest has been buried before the facts came to the knowledge of the coroner, he has power to cause it to be disinterred, for the purpose of holding the inquest. The coroner is required to put in writing the evidence given to the jury before him, or as much thereof as shall be material; and to deliver the same to the proper officer of the court in which the trial is to be, before or at the opening of the court, in all cases in which any person shall be indicted for manslaughter or murder; and he has also authority to bind, by recognizance, all such persons as know or declare anything material touching the said manslaughter or murder, to appear at the trial, and there to prosecute, or give evidence against the party charged. (*See* CORONER.)

INQUIRY, COURT OF, *in-kwi'-re* (inquiry, from Nor. *enquerre*, from *querer*, to seek), an office sometimes appointed by the crown to ascertain the propriety of resorting to ulterior proceedings against a party charged before a court-martial.—*Ref.* Wharton's *Law Lexicon*.

INQUIRY, WRIT OF, a term applied in Law to a judicial process addressed to the sheriff of the county in which the *venue* is laid, to summon a jury, in order to inquire what damages a plaintiff has sustained in an action upon the case where judgment goes by default.

INQUISITION. (*See* vol. I. of this work.)

IN RE, *in re* (Lat., meaning literally, *in the affair*), an abbreviative expression used in Law for *in the matter of, in the case of*, &c.

INSANITY, *in-sân'-e-te* (Lat. *in*, not; *sanus*, sane, sound), is one of the most terrible disorders to which the human race is subject; and one, also, the nature of which is the least understood. Of the nature of that spirit by which the body of man is animated we know little, and not more of the diseases or infirmities to which it is subject. The causes which may lead to insanity, particularly in those whose mental constitution is weak, are very numerous. In many cases, the tendency to insanity is hereditary, and transmitted from parents to children. One of the most fertile causes of insanity in this country is drunkenness. Excessive study, strong mental excitement, grief, jealousy, disappointment, frequently, also, lead to it. Religious excitement is also not an unfrequent cause. Sometimes insanity comes on quite suddenly, without any warning whatever; at other times there is a previous derangement of the animal functions, loss of appetite, restlessness, and want of sleep. It is usual to distinguish insanity into different kinds; as,—1. Moral insanity, in which there is a morbid perversion of the feelings, affections, and active powers, without any illusion or erroneous conviction impressed upon the understanding. 2. Intellectual insanity, affecting the reasoning powers, and which may be either general or partial,—the latter as in monomania. 3. Mania, or raving madness, in which the mental faculties are notoriously impaired, but the patient gives way to all sorts of extravagances, and, if not prevented, will do mischief to himself or others. 4. Dementia, imbecility, fatuity, when the mental powers become gradually impaired, the sensibilities diminished, and the person at length becomes careless, or dead, to all that is going on around him. Usually, however, two or more of these kinds occur together. Moral insanity frequently manifests itself in a desire to steal, or appropriate the property of others. In monomania, the patient reasons correctly upon all matters except one, which forms the subject of his insanity. Imbecility usually commences with loss of memory and the power of concentrating the attention, for any time, upon one subject; then all control is lost over the thoughts, and the mind wanders meaninglessly from one subject to another; at length there is a carelessness to all that is going on around, and life may become a mere existence, the mental faculties being entirely lost. Idiotcy differs from imbecility, in being congenital, while the latter is acquired, or produced by disease. Idiotcy may be produced by various causes connected with the parents; as intemperance of near relations, intemperate, scrofulous habits, some powerful influence acting on the mother during pregnancy. The present query degree of mental imbecility, down to the lowest guide, without sense sufficient to satisfy the mere wants of nature. The head of the idiot is usually very small, particularly in the region of the forehead. In some cases, however, it may be quite natural, and in others large and misshapen. The beneficial effects of attention to the physical health, and of education, are manifested even in the case of idiots. (*See* CRETINISM.) The chance of recovery depends greatly on the complication, or otherwise, of insanity with other diseases, particularly epilepsy or paralysis, with either of which it is nearly hopeless. It is also influenced by the form of the disease, the period of its duration, the age, sex, and constitution of the patient. The mean duration of cases terminating favourably is from five to ten months; after the latter period, recovery is very doubtful. In advanced life, insanity is generally permanent, and imbecility is very rarely curable. While insanity may arise from some affection of the brain which speedily terminates in death, yet, in general, it is not necessarily a fatal disorder, for lunatics have been known to live thirty, forty, or fifty years after being seized with their disease. It is one of the signs of the advance of the present age, that the treatment of the insane is no longer what it was; they are no longer loaded with chains and confined to some dungeon, but are treated with kindness and consideration, and allowed all the liberty that the nature of their malady admits of. In the cure of insanity, in which great progress has recently been made, the means adopted naturally resolve themselves into medical and moral. When the malady proceeds from, or is accompanied by, physical derangement, as it usually is, it is necessary to ascertain the nature of this, and to take means for its removal. If there be excitement and inflammatory action, mild antiphlogistic measures will be necessary, together with aperients and a low diet. If, on the contrary, there is debility and prostration of strength, a nourishing diet will be required. When, as is often the case, want of sleep is an attendant symptom, opiates are to be given. In all cases, exercise, fresh air, and cleanliness, are required. The moral treatment of the insane consists in diverting their thoughts by occupations and amusements, and in gaining their confidence by kind and conciliatory measures. To M. Pinel, of France, is the world indebted for having been the first to introduce conciliatory measures in the treatment of the insane.

INSCRIPTION, *in-skrip'-shun* (Lat. *in* and *scribo*, I write), a term applied, in Archæol. to designate any monumental writing intended to commemorate a remarkable event, or to hand down to posterity the name of the builder of a monument, or of the person in whose honour it was erected. From the very earliest period in the history of antiquity, when documents are rare, and, indeed, often wanting altogether, inscriptions appear to form one of the most important sources from which we have derived our knowledge of the public, private, religious, and social life of the ancients. After the invention of the alphabet, the earliest application of the art of writing was by means of engravings on wood, stone, and metals; and even after other, and far more convenient, materials came into use, this method was still preferred; the reason for which was, no doubt, on account of its durability. From all nations, therefore, who have arrived at a certain stage of civilization, have we inscriptions, and these self-same records have been handed down to us on the walls of temples, on tombs, triumphal monuments, statues, tablets, vases,—in fact, every idea which could lead to the furtherance of inscription, was eagerly seized upon; and the result has been a perfect museum to the moderns of this form of ancient lore. Inscriptions, more commonly, are limited to portraying the deeds and names of memorable men; but we have also records of battles, dates of important events, chronicles of laws, customs, legends, moral and scientific precepts, and chronological tables beyond number. We have thus important records of the annals of antiquity; and the Assyrians, the Egyptians, the Indians, Persians, Etruscans, Greeks, and Romans, all have left such traces behind them.

The Assyrian inscriptions have been found in immense numbers, on the walls, bricks, and other substances which graced the cities of Nineveh and Babylon, and these have been mostly found written in the cuneiform character. The subject of these is generally the histories of the different kings; among whom are many who have left no farther traces behind them. The Egyptian inscriptions are nearly totally confined to hieroglyphics, and the hieratic, demotic, and Coptic, or ancient Egyptian characters. These latter have served, even more than those of Assyria, to throw light on some of the darkest points of antiquarian history. The monuments of Phœnicia which bear inscriptions are but few in number; most of the records of this people being found on medals, at least up to the time of Alexander. The earliest Greek inscriptions that we may really consider as genuine, are those which commemorate the victors in the Olympic games. All those belonging to the Attic race are composed either in prose or verse; but the former inscriptions are by far the most numerous. "All Greek inscriptions are written in capital letters, and without any punctuation, or separation of the several words, which renders it difficult to read and understand them properly. Some of the earliest inscriptions are written like the Hebrew, from the right to the left; others varied their lines, the first being written from the left to the right, and the second from the right to the left. In this manner, which is called boustrophedon, the laws of Solon were written, and some specimens are still extant. The method of later times was to write, like ourselves, from the left to the right. But besides these general distinctions, there occur a great variety, and some modifications of writing, which are the result of mere fancy. Another important point, which it is necessary to know before attempting to read Greek, and more especially Roman inscriptions, is the abbreviation of names and words (*sigla*), which is described and explained in several works, such as Nicolai's "De Siglis Veterum," Lugdun. 1730, 4to; Maffei's "De Græcorum Siglis lapidariis," Verona, 1746, &c. &c. The oldest Latin inscriptions are those which were found at Rome, and which are now kept in the monastery of Einsiedeln: they are written on parchment, and probably belong to the 10th or 11th century. The whole number now known to exist exceeds 600,000. For those who wish to enter fully into the subject, the following works are the best references:—Zaccaria's *Instituzione Lapidaria*, Rome 1770, and Venice 1792; Morcelli's *De Stilo Inscriptionum Latinarum Libri tres*, Rome, 1781, and reprinted in his *Opera Epigraphica*, Patavii, 1819, 5 vols. 8vo; also Orelli's *Introduction to his collection*.

INSECTA, *in-sek'-tă* (Lat. *insectus*, divided into segments), a class of invertebrate animals, belonging to the sub-kingdom *Annulosa*. According to Latreille's arrangement, in the "Règne Animal," the class Insecta forms the third great division of the articulated animals, referring to the articulations, or innumerable joints, of which this class of animals is composed. The following may be taken as a definition of a true insect:—An articulated animal having six legs, two antennæ, two compound eyes; a small brain at the anterior extremity of a double medullary chord; circulation effected by a pulsating dorsal vessel provided with numerous valves; respiration by tracheæ, which form two lateral trunks, and ramify through the body; generation oviparous; two distinct sexes; adult state attained through a series of metamorphoses. (*See* INSECT-TRANSFORMATIONS.) In general, every insect possesses two pairs of wings; the trunk in the adult animal is usually composed of three chief parts,—the head, thorax, and abdomen. The trunk of an insect may also be described as consisting of thirteen segments; of which one constitutes the head, three the thorax, and nine the abdomen. The principal parts of the head are the clypeus, or upper part adjoining the labrum; the vertex, or summit of the head; the occiput, or hinder portion; and the genæ, or cheeks. Ocelli, the eyes, are almost always two in number, placed on either side of the head, and composed of hexagonal lenses. The stemmata are minute simple eyes, and may be seen in the orders Hymenoptera, Orthoptera, and Hemiptera. They are also possessed by the larvæ of coleopterous insects. The antennæ are two-jointed organs, usually springing from the upper surface or side of the head, near the eyes. These organs vary greatly, not only in different species, but often in the sexes of the same species. Much difference of opinion exists as to the use of these antennæ. By some, they are considered organs of hearing, while others aver that they are organs of touch or smell. It is probable that they are used for different purposes by different varieties of insects. The trophi, or parts of the mouth, consist of the labrum, or upper lip; the labium, or under lip; the mandibles, or jaws; and maxillæ, or feeder-jaws. The term thorax is applied to all that portion of an insect which lies between the head and the abdomen, and to which the legs and wings are attached. The three segments of the thorax mentioned before are called the prothorax, the mesothorax, and the metathorax respectively, passing from the head to the abdomen. The prothorax bears the anterior pair of legs, and is largely developed in the Coleoptera, Orthoptera, and Hemiptera; but in the Lepidoptera it merely forms a narrow ring, and in the Hymenoptera, frequently a distinct neck. The mesothorax is more complicated than the first section, since it bears a pair of legs and the anterior pair of wings. It is well developed in all insects. The metathorax bears the posterior wings, and is well developed in those animals which have them; but in those insects which want them, as the Diptera, the metathorax is small. In the abdomen of insects, although nine segments are always visible in the larvæ, there are seldom more than seven or eight visible joints in the perfect insect. The substance of which the abdominal segments are composed is always softer and more flexible than that of the head and thorax. To the abdomen, which never possesses organs of locomotion, are attached various appendages, which differ very much in different families. The digestive system is well developed, and consists of an intestinal canal, in which a crop, gizzard, stomach, and small intestine, are generally distinct; but these parts vary according to the nature of the food, similarly to those of the higher order of animals. The circulation of the blood in insects is carried on by distinct vessels, and also by a channel in the intestines. Its central organ is the dorsal vessel. The muscular system of insects is highly developed, and their locomotive powers far surpass those of any animal whatever. Insects possess great powers of multiplication. Their eggs are very variable in shape, but their general form is oval; they are, however, often round, and sometimes cylindrical. In the ordinary language of entomology, the term "larva" is applied to the insect from the date of its escape from the egg to the time when its wings begin to appear. (For classification of insects, *see* ENTOMOLOGY.)

INSECTIVORA, *in-sek-tiv'-o-rä* (Lat., insect-eaters), an order of carnivorous quadrupeds synonymous with Glires, and deriving its name from the habits of the species belonging to it. Their distinguishing characteristics are the conical points on their teeth, for the purpose of crushing the hard outer coverings of the insects on which they feed. They are divided into four different families:—the Talpidæ, or moles; the Soricidæ, or shrews; the Erinaceadæ, or hedgehogs; and the Tupaidæ, or banxrings, a group of animals inhabiting the East Indies, and bearing a close resemblance to squirrels in their appearance and habits. The term Insectivora is also applied to an order of birds in the ornithological system of Temminck.

INSECT-TRANSFORMATIONS, *trăns'-for-mā'-shuns* (Lat. *trans*, beyond; *forma*, I make).—When the larvæ of an insect leave the egg, they are often very unlike the parent, and require several changes of form before they assume the perfect shape. As the young animal increases in size, its integument becomes too small, and is thrown off, while a new one forms in its place. This moulting or change of skin takes place several times, generally as many as five, before the larvæ attain their full growth. At the period of the last change, many insects spin a cocoon of silky fibres, others dig a hole in the ground, and in these retreats await their second transformation, changing into the state of nymphs or pupæ while there. They continue immovable, and in a state of repose, for a certain time, varying from a few

days to some weeks, months, or even, in a few, to a couple of years. Many changes take place in the organs of insects during this period. They gradually become developed, till, at the proper time for becoming mature, the perfect insects burst forth from their pupa-cases. In the course of insect-transformation, the grade of development at which the insect primarily leaves the egg is very different in the several orders and families. In all cases, the embryonic mass within the egg is first converted into a footless worm, resembling the higher Entozoa, or the inferior Annelida, in its general organization, but possessing thirteen segments, the typical number of the class of insects. In the Diptera, Hymenoptera, and in some of the Coleoptera, the head of the larva, which are known as "maggots," differs little from the segments of the body, the eyes in many cases not being developed, and the mouth being furnished with a mere suctorial disc. In the Lepidoptera, and most of the Coleoptera, at the time of escape, the larva possesses the rudiments of three pairs of thoracic legs, although they are little else than simple claws, except in the carnivorous beetles. These larvæ are usually designated "caterpillars." The transformation of insects was observed by the ancient Greeks and Romans, and amongst them a butterfly, or perfect insect, was used as a symbol to represent the soul.

INSOLVENCY, *in-sol'-ven-se* (Lat. *in*, not; *solvo*, I pay), in Law, the state of a person who has not sufficient property for the full payment of his debts. Several statutes at various periods were enacted for the relief of insolvent debtors, until the union of the Bankrupt and Insolvent courts in 1861. Up to that period, debtors were relieved by means of the Insolvent court, which consisted of four commissioners, and other officers, with a court-house in London. Single commissioners, however, made circuits three times a year through England and Wales. The method of procedure was as follows:—The court either acted upon petition from prisoners in actual custody, or, if the prisoner did not pray, on petition from a creditor. An order was then made, vesting the prisoner's estate and effects in the provisional assignee of the court, which, however, was void, if the petition were dismissed. The duty of the provisional assignee was to receive and dispose of the property, and account for the produce to the court. The insolvent debtor then delivered into court a schedule, containing a full account of his property. The petition was then heard; and at the hearing, all creditors might oppose, and compel a full investigation of the prisoner's accounts. The court had the power to discharge the insolvent, or to remand him for a discretionary period, not exceeding three years. This law was embarrassed with several evils, injurious alike both to debtors and creditors. An act was consequently brought in for the purpose of repealing the various acts for the relief of insolvent debtors, and more especially to amend "the Bankrupt Law Consolidation Act, 1849." This act received the royal assent on the 6th of August, 1861. The amendments in the statute are of a disconnected character; but the principal object is, that the property of any one who is unable to pay his debts in full, or perform his engagements with his creditors, should be administered by the court of Bankruptcy, for the benefit of all his creditors, without reference to those distinctions which before prevailed, as to traders and non-traders. The inconvenience of these distinctions caused numerous alterations to be made in the department of the law of debtors and creditors during the last half-century, and a most artificial system was the result. The principal alterations made by the act of 1861 will be found detailed in the article BANKRUPT. The benefit of the act, known as the Great Insolvent Act, from the time of its passing in 1814, to March, 1827, a period of thirteen years, was taken by 50,733 insolvents. A large number of imprisoned insolvents were released in November, 1861.

INSPIRATION. (*See* REVELATION.)

INSTALLATION, *in-stăl-lā'-shun* (Lat. *in* and *stallum*, a seat), a term applied to the ceremony of instating persons in honours and dignities. Thus, we speak of the installation of a knight of the Garter in the chapel of St. George at Windsor; the installation of a chancellor in a university; or of a dean, prebendary, or other ecclesiastical dignitary, in the stall of the cathedral to which he belongs.

IN STATU QUO, *in stāt'-u kwo*, literally, 'the place in which,'—a phrase synonymous with 'in the same plight.'

INSTINCT, *in'-stinkt* (Lat. *instinctus*, inwardly moved, suggestion, impulse), in Phil., according to Dr. Reid, "is a natural, blind impulse to certain actions, without having any end in view, without deliberation, and very often without any conception of what we do;" and, according to Sir W. Hamilton, it is "an agent which performs, blindly and ignorantly, a work of intelligence and knowledge." Various other definitions are given. Brougham says that instinct is distinguished from reason, in that "it acts without teaching, either from others,—that is instruction, or from the animal itself,—that is experience;" "it acts without knowledge of consequences; it acts blindly, and accomplishes a purpose of which the animal is ignorant." In general, we find that instinct and reason prevail in an animal in the inverse ratio to each other. Hence, in man, whose reasoning powers are highly developed, the instincts are few, and manifest themselves principally in children and barbarians. An instinctive action is performed without any consciousness on the part of the agent, of the end which it serves; it is effected as perfectly the first time as at any subsequent period; and is unsusceptible of any adaptation to particular emergencies; while a reasonable action, on the contrary, is one which always implies a consciousness, on the part of the agent, of the end in view,—which becomes only progressively perfect, and which is capable of being variously modified according to existing circumstances. Some philosophers have held that there is no real distinction between instinct and reason. Darwin (*Zoonomia*) regarded all instinctive acts as really intellectual operations; while Smellie, on the other hand, viewed reason itself as really an instinct. Hume, too, asserts "that the experimental reasoning itself, on which the whole conduct of life depends, is nothing but a species of instinct or mechanical power, that acts in us unknown to ourselves; and its chief operations are not directed by any such relations or comparisons of ideas as are the proper objects of our intellectual faculties." Three classes of theories have been proposed, to account for the instinctive actions:—1. The physical, which makes them depend upon the structure and organization of the animal. 2. The psychical, which regards them as the result of mental powers or faculties possessed by the animals, analogous to those of the understanding in man. 3. The supernatural, which views them as the workings of an intelligence superior to man, or the Supreme Being. Of this last opinion was Sir Isaac Newton. According to Dr. Bushnan, instinctive acts can be traced to the direct effect of sensation, and are dependent on either external or internal stimuli; as externally from the senses, internally from feelings,—as hunger, thirst, &c. The great source of instinctive acts in the lower animals are, he says, smell and taste. They are all, however, referable to some uneasy sensations proceeding from certain irritations of particular organs; or, according to Broussais, they arise from "sensations which solicit a living being to execute involuntarily, and often unconsciously, certain acts necessary to its welfare."

INSTITUTE, *in'-stit-ūte* (from Lat. *instituere*, to found), a learned body which was organized in France shortly after the first storm of the revolution of the last century had spent its fury. Its necessity arose from the fact of all the academies and art institutions having been destroyed; consequently, the *Institut National* was formed on the 25th October, 1795, out of the remnants of the five academies; namely, the French Academy, the Academy of Inscriptions and Belles-Lettres, that of the Mathematical and Physical Sciences, of the Fine Arts, and of the Moral and Political Sciences, all united in one harmonious whole. The great object designed by the Institute was the advancement of the arts and sciences, by continual researches, by the publication of new discoveries, and by a correspondence with the most distinguished scholars of all nations, and especially by promoting such scientific and literary undertakings as would lead to the national glory and welfare. The Institute, since the restoration of the empire in France, is known by the name of the *Imperial Institute*.

INSTITUTION, *in-stit-u'-shun*, a name given to a system, plan, or society, established, either by law or by the authority of individuals, for promoting any object, public or social. Thus, a college is termed a *collegiate institution;* an academy of belles-lettres, a *literary institution;* an almsgiving society, a *benevolent* or *charitable institution;* while a banking company or insurance office is a *commercial institution.* Hospitals are likewise charitable institutions, and will be found given under their respective heads. (*See* also MECHANICS' INSTITUTIONS.)

INSTRUMENTAL MUSIC, *in-stru-men'-tăl* (from Lat. *instrumentum*, an instrument).—All music composed for instruments is so called, in contradistinction to *vocal music.* This term is more especially applied to all the greater compositions, in which there is no part for the voice. Until the middle of the last century, the Italian composers used no other instruments in their great pieces than violins and bass-viols; at that time, however, they began to use the hautboy and the horn. Even to the present time, the Italians employ wind instruments much less than either the French or Germans. In general, symphonies, overtures, sonatas, fantasias, solos, dances, marches, &c., belong to instrumental music.

INSTRUMENTS, ASTRONOMICAL.—The instruments used for astronomical purposes are numerous and varied in construction. Among the principal of them may be named the telescope, mural circle, transit circle, altitude and azimuth circle, repeating circle, equatorial instrument, sextant, collimator, zenith sector, &c., many of which are described under their respective headings. (*See* TELESCOPE, MURAL CIRCLE, TRANSIT INSTRUMENT, REPEATING CIRCLE, EQUATORIAL INSTRUMENT, ZENITH SECTOR.) Chronometers and sidereal clocks are also used for measuring time, latitude and longitude, and the right ascension of heavenly bodies. (*See* CHRONOMETER, HOROLOGY, PENDULUM, SIDEREAL CLOCK.) The micrometer and vernier are contrivances that are attached to astronomical instruments, for measuring the apparent diameter of the sun, moon, planets, and stars, and very minute divisions of space. (*See* MICROMETER, VERNIER.)

INSTRUMENTS, MATHEMATICAL.—A set of implements for describing mathematical diagrams and drawings, of which the figures, or elementary parts, are composed of straight lines, circles, or arcs of circles. The most useful mathematical instruments are,—a drawing-pen; a pair of plain compasses, usually called *dividers;* a pair of drawing compasses, with a foot adapted for pen and pencil; a pair of bow compasses; a pair of triangular compasses, consisting of three legs, two of which are movable at the head in the same manner as the dividers or the drawing-compasses,—the third leg, made of steel, is fitted into a socket through a knob projecting from the side of the head, by which means it is movable in almost any direction, while the other two remain stationary; a pair of proportional compasses; a set of spring bows for small work, consisting of spring dividers, spring bow-pen, and bow-pencil; a protractor in the form of a semicircle or of a rectangle; a plain scale; a sector, and a parallel rule. The *drawing-pen* is used in making ink lines by the edge of a ruler; the cavity between its plates receives the ink, which is supplied either by a common quill pen or a camel's-hair brush. The *dividers* are used in order to take the extent of any line or surface from one point to another, in order to transfer it to some other line; to repeat any extension upon a straight line in an equimultiple; to divide a straight line, or the circumference of a circle, or any part of it, into equal parts; to proportion the parts of a drawing by scale, or to construct a drawing similar to one already drawn; to construct an angle of any number of degrees, or to measure the quantity of any angle in degrees. *Drawing-compasses* are used either for describing temporary arcs or whole circumferences with black-lead pencil, or permanently in ink. *Bow-compasses* are used in describing small circles. *Triangular compasses* are used in transferring a given angle from one place to another, or in taking the three angles of a triangle at once, and transferring them to any given place. These compasses, though very useful, are not well known; they are serviceable in copying all kinds of drawings, as from two fixed points the position of a third can always be determined. *Proportional compasses* are used in making one drawing similar to another without the use of scales or triangular lines. The use of the *protractor* is to lay down an angle of any number of degrees: the *rectangular protractor* is also used for the same purpose. The *parallel rule*, as its name implies, is an instrument by which straight lines are drawn parallel to one another. The ordinary *plain scale* has the following lines or scales upon it:—a line of 6 inches; a line of 50 equal parts; a diagonal scale: these are put on one side; on the other side are a line of chords marked C, and seven particular scales of equal parts, or decimal scales of different sizes; the numbers at the beginning of each denoting how many of the small divisions at the beginning are contained in an inch. The *sector* is a most useful instrument, since it forms a universal plain scale.

INSTRUMENTS, MUSICAL.—Sonorous bodies artificially constructed, for the production of harmonious sounds. They may be divided into four classes; viz., keyed, stringed, wind, and pulsatile. To the first of these divisions belong all such instruments as the organ, piano-forte, harmonium, &c. To the second, all of the violin and harp kind, &c. The third includes flutes, clarionettes, hautboys, ophicleides, &c., and all brass instruments; while the fourth contains drums, cymbals, tambourines, &c. All modern, as well as the most important of the ancient, musical instruments, will be found described under their respective names.

INSURANCE, or ASSURANCE, *in-shu'-răns* (Fr. *sur*, sure, certain), is a contract between two parties, in which one of them, the insurer, undertakes, in consideration of a certain sum received or promised, called the premium, to indemnify, or assure, the other against a certain amount of loss from the occurrence of a specified contingency, as the burning of certain premises, the loss of a certain ship, or the death of a certain person. Such contracts are for a certain period, either a fixed time, or for a period terminable on the occurrence of an uncertain event, as the termination of a voyage. The deed by which the insurer becomes bound is called a policy of insurance, and the contingency assured against is termed the risk. The principle of insurance is founded upon the doctrine of probabilities. According to this latter, if we take a sufficiently extended range of instances, the probability of a certain event happening can be ascertained with a considerable degree of accuracy. Thus, though, as regards any individual, it is impossible to predict that he shall die within twelve months, yet, if we take a number of individuals, say 10,000, and find that, over a period of 10 years, so many have died annually, we may generally predict, with tolerable certainty, that a like number will die annually in similar circumstances. If, however, in place of 10,000 persons, we take 1,000,000, and in place of 10 years, 50 years, we shall so much the more counteract the minor disturbing elements, that, when acting on smaller numbers, materially affect the result, and thus arrive at a greater degree of certainty. It is in this way that insurers calculate their risks and estimate their premiums. From extended series of observations and carefully prepared tables, they know the chances of the event insured against happening, and determine the amount of premium accordingly. Thus, if, out of 100 risks, the insurer expects to have two losses, he calculates so as that the 100 premiums may cover the two losses, together with his own business expenses, &c. The business of insurance is generally carried on by companies having a large subscribed capital, by means of which they are able, without difficulty, to meet any heavy loss, while their premiums being proportioned to their risks, their profit is, at an average, independent of such contingencies. The advantages of insurance are very great. While, to one person, a merchant, the loss of a vessel might be a very serious matter, he can thus, by the payment of a certain sum, provide against it, so that he may carry on his business with a feeling of perfect security. The principle of insurance is that of equalizing the accidents of life or fortune, by uniting many persons together, who agree to bear jointly the losses of any individual. "It is, in fact,"

says Prof. De Morgan, "in a limited sense and a practicable method, the agreement of a community to consider the goods of its individual members as common. It is an agreement that those whose fortune it shall be to have more than average success shall resign the overplus in favour of those who have less. And though, as yet, it has only been applied to the reparation of the evils arising from storm, fire, premature death, disease, and old age, yet there is no placing a limit to the extensions which its application might receive, if the public were fully aware of its principles, and of the safety with which they may be put in practice."—(*Essay on Probabilities.*) It has been disputed whether the system of insurance was known or practised by the Romans, from certain passages occurring in some of their historians; but be this as it may, there is evidence to show that it was practised in Italy as early as the 14th century, and Uzzano, a Florentine merchant, whose writings are placed about 1400, quotes the rate of assurance from London to Pisa, also from Bruges. It is generally believed that the system was introduced into England by the Lombards, who established themselves in London at a very early period. The first English statute relative to assurance is 43 Eliz. c. 12, 1601, and the system is there designated as "tymo out of mynde, an usage amongste merchants." The three great divisions of insurance are marine, fire, and life insurance. The last two are of much later origin than the first. A marine insurance is a contract entered into between persons having some interest in vessels, their cargo or their earnings, on the one side, and the insurers, or persons who, on the payment of a certain premium, undertake to indemnify the former against specified losses during a particular voyage, or for the time specified in the policy. The insurers are usually called underwriters, because they write their names at the foot of the policy. The largest underwriting business in the world is carried on by the underwriters at Lloyd's, who have their agents stationed all over the world. The contract of insurance is one pre-eminently based on the assumption of perfect good faith between the parties; and hence any concealment, or misrepresentation of material facts, likely to affect the underwriter's estimate of the risk, will render the policy void, even where the concealment or misrepresentation may have resulted from a mistake, without the intention to deceive. The policy of insurance is printed with blank spaces, to be filled up with the particulars of each case; and the perils insured against are described as "the adventures and perils of the seas, men-of-war, fire, enemies, pirates, rovers, thieves, jettisons, letters of mart and counter-mart, surprisals, takings at sea, arrests, restraints, and detainments of all kings, princes, and people, of what nation, condition, or quality soever; barratry of the master and mariners, and all other perils, losses, and misfortunes, that have, or shall come to the hurt, detriment, or damage, of the said goods, merchandises, and ship, &c., or any part thereof." The risk on the ship in voyage policies commences at and from the place specified in the policy, and continues till she has been moored for twenty-four hours in safety at the destination specified. If the ship should deviate from the regular and usual course of the specific voyage insured, without necessary or reasonable cause, the underwriter is thenceforth discharged from all liability under the policy. In all voyage policies, it is implied in the contract, that the ship shall be seaworthy at the commencement of the risk; but it has recently been decided that there is no such warranty of seaworthiness implied in time policies. In case of any loss or misfortune, the insured and their servants are expected to labour for the recovery of said goods, merchandise, or ship, or any part thereof, for the insurers, who will bear the expenses thereof. When an absolute total loss occurs, the assured are entitled to recover the amount of the policy, without giving any notice of abandonment; when the subject insured is so seriously damaged that its recovery might cost more than its eventual value, it forms a "constructive total loss," and notice of abandonment requires to be given by the insured, when the underwriters become owners of the vessel, and bound for the amount of the insurance. When there is partial loss, or damage, arising from any of the causes insured against, it is determined by what is





termed particular average. In every case of partial loss, the underwriter is liable to pay such proportion of the sum he has subscribed as the damage sustained by the subject of insurance bears to its whole value at the time of insurance. A stamp duty is levied on all policies of marine insurance, which is made to increase with the amount of the risk. On voyage policies, it is for every £100 or part of £100 insured, if the premium does not exceed 10*s.* per cent. 3*d.*; 10*s.*, and not more than 20*s.*, 6*d.*; 20*s.*, and not more than 30*s.*, 1*s.*; 30*s.*, and not more than 40*s.*, 2*s.*; 40*s.*, and not more than 50*s.*, 3*s.*; more than 50*s.*, 4*s.* On time policies, for every £100, or part of £100, when the time does not exceed six months, 2*s.* 6*d.*; exceeding six months, 4*s.*; it being unlawful to insure for any period exceeding twelve months. The amount yielded by the tax on marine insurances in 1802 was £339,043.—(*Ref.* Arnould *On Marine Insurance.*) *Fire Insurances* are almost invariably effected by joint-stock companies, of which there are, with few exceptions, one or more in all the considerable towns throughout the empire. Some of these insure entirely at their own risk, and for their own profit; in others, which are called mutual insurance companies, every person insured becomes a member or proprietor, and participates in the profits or loss of the concern. The great fire of London in 1666 directed people's minds to the means of avoiding the calamities of such an event, and various schemes for mutual protection and relief were submitted to the common council. At length, in 1681, a company was formed for this purpose, and after a time, it was succeeded by several others. In 1696, the Hand-in-Hand fire-office was established, and in 1706 the Sun. There are now upwards of seventy different offices in the United Kingdom. In fire insurance, the insurers, in consideration of a certain premium received by them, either in a gross sum or in annual payments, contract to indemnify the insurer against all loss or damage he may sustain in his houses, or other buildings, stock, goods, or merchandise, by fire, during a specified period. Usually the period is for one year, and renewed annually by payment of another premium, the company generally allowing fifteen days after the expiring of the year, for the renewing of the policy. As in marine insurance, a misrepresentation, whereby the property insured may be charged at a lower rate of premium than it otherwise would be, invalidates the policy. The party effecting the insurance must also have a *bonâ fide* interest in the property insured. Fire insurances are not in this country subject to the law of average, as in marine insurances; and the amount insured is payable to its full extent, provided the loss or damage is equal to the sum insured. The conditions on which an insurance is granted are in all cases printed upon the policy, and form a part of the contract. A policy of insurance is not in its nature assignable, nor can it be transferred without the express consent of the office. Risks are of various kinds, and are commonly divided into common, hazardous, doubly hazardous, and special. The rate of premium usually charged on common risks is 1*s.* 6*d.* per cent., hazardous 2*s.* 6*d.* per cent, and doubly hazardous 4*s.* 6*d.* per cent. For special risks, the rate is variable, according to the nature of the property, being in some cases as high as 10*s.* or 12*s.* per cent., or even higher. It is much to be regretted that such a valuable institution, and one calculated to do so much good, should be subject to a very heavy tax. In 1782, the large amount of business transacted by the insurance offices induced Lord North, then premier, to impose a tax of 1*s.* 6*d.* per cent. on the amount of property insured, and this has been increased from time to time until it has reached its present amount. The duty now charged on property insured is 3*s.* per cent. per annum, besides a stamp duty of 1*s.* on each policy, which is paid by the company; thus the insured, instead of 1*s.* 6*d.* per cent. per annum on ordinary risks, have to pay 4*s.* 6*d.* Public hospitals and workhouses, also agricultural produce, farm stock, implements of husbandry, or workmen's tools, not exceeding £20, are exempted from this tax, though why the agriculturist should be thus favoured it is difficult to see. The insurance companies have also an interest in not being opposed to the tax, as they are allowed a drawback of five per cent. on the amount for their trouble in collection. The amount

yielded to government by this tax in 1862 was £1,611,651, which gives the immense sum of £1,074,454,000 as the amount of property insured in the United Kingdom, exclusive of farm produce, &c.—*Life Insurance*, or *Assurance*, is a contract for payment of a certain sum in the event of the death of a particular person, in consideration of a premium paid at once or periodically. Assurances are said to be *absolute* when the amount of the assurance is payable on the death of the party assured; *contingent*, when the payment depends also upon some other event; as the existence of some other person or persons at the time of the death. They are also *temporary* when the sum is payable only on the expiry of the life within a certain time; *deferred*, when payable only in the event of the expiry of the life after a certain time; and for the whole life, payable at the death of the individual, whenever that may happen. Assurances are also effected on joint lives under various contingencies. The system of life assurance seems to have been borrowed from the marine, and the pratice at first was for individuals to underwrite life risks in the same way as marine; and this probably existed during the greater part of the 17th century. The Mercers' Company is generally supposed to have been the first to institute a widows' fund, having done so in 1699; and in 1706 the Amicable Society for a perpetual assurance office was started. The Royal Exchange Assurance Company and the London Assurance Corporation were both established in 1720, and the London Equitable in 1762. Soon after this time, a number of other offices sprung up, and at present there are about two hundred of them in England and Scotland. The amount insured in these offices is not known with certainty, but in 1849 it was computed at not less than £150,000,000; while in 1853 the amount insured in Scotland was £34,000,000. There are several kinds of societies; as the proprietary, mutual assurance, and mixed societies. The proprietary, or joint-stock companies, are formed of persons who have subscribed a capital, on the assurance of which the business of the company is carried on, and who divide the profits entirely among themselves. In the mutual assurance societies, on the other hand, there is no proprietary, the assured being likewise the assurers, and dividing the profits among themselves, after deducting the expenses of management, and reserving a guarantee fund. In the mixed class of offices, there is a proprietary, but, at the same time, the assured are allowed to participate largely in the profits of the society, which are usually divided in the form of bonuses at stated periods. The premiums to be paid are adjusted according to the age of the party on whose life the assurance is made; being lowest on young lives, and increasing from year to year as the expectancy of life diminishes. Before effecting an assurance, there are certain forms to be filled up, and certain regulations to be complied with, so as to ascertain the state of health of the proposer; for unless he be in good health, the office will not undertake the risk at the ordinary rate. If the proposer misstates or conceals anything that may affect the rate of premium, it vitiates the policy, though some offices now declare their policies to be indisputable after a certain time. If an assurance is effected by one person on the life of another, the assurer is generally required to prove that he has a sufficient interest in the life to warrant him in taking out a policy to the extent proposed. Most offices will generally lend the value of a policy at a moderate rate of interest on its security. It is also the practice among offices to allow a policy-holder to resign his assurance, and to return him a certain portion of the premiums paid. The sum so returned is generally about one third of the premiums paid and the bonuses declared on the policy. In general, when the insured goes to reside out of Europe, a moderate extra premium is required, varying with the healthiness of the part. On the expiry of the life of the insured, the company requires the production of certain documents; as the register of the burial of the deceased, and references to the medical men and others who attended him in his last illness. It is due to insurance offices to state that generally, on being satisfied as to the death of the party, their payments are prompt; and the number of cases in which they have disputed claims is very limited. The stamp duties upon policies of assurance is as follows:—Where the sum insured shall not exceed £500, then for every £50, and every fractional part of £50, 6d.; where it shall exceed £500 and shall not exceed £1,000, then for every £100, or fractional part of £100, 1s.; and where it shall exceed £1,000, then for every £1,000, and every fractional part of £1,000, 10s. The expense of the stamp is generally defrayed by the offices.

Intaglio, *in-tăl'-yo* (Ital. from *in*, into, and *tagliare*, to cut).—All gems, sculpture, and the dies from which coins and medals are struck, in which the design is hollowed out, or sunk beneath the surface of the stone, are said to be cut in intaglio. Gems and stones cut in intaglio are thus designated to distinguish them from cameos (*see* Cameo), in which the device is raised in relief above the surface. A cameo, therefore, will give an impression in wax, or any soft substance, in intaglio, while the impression from a seal or signet engraved in intaglio exhibits the device embossed, or projecting in relief from the surface, like a cameo. Thus the terms are used in contradistinction to each other. The art of cutting gems in intaglio must have been practised at a very early age, as we find from Genesis xxxviii. 18, that signets were in use at that period, and Moses was directed to have the names of the twelve tribes engraved on the twelve stones that were set in the breast-plate of the high priest. It was also practised, to a great extent, among the Greeks and Romans, the latter especially being passionately fond of wearing a profusion of engraved gems on the fingers and about their clothing, and making collections of these works of art; while the Greek engravers seem to have excelled in their production, both in beauty of design and excellence of execution. Stones of all sorts, such as agate, cornelian, onyx, jasper, the amethyst, and the garnet, were employed by the ancient engravers for gems in intaglio; but some of the best that are now extant are executed in paste, or gems made artificially. The method of cutting intaglios that was practised by the Greek and Roman engravers, is supposed to be very similar to that which is adopted by the modern seal-engraver, who sinks the design into the stone, by means of finely-pointed cutting-tools, to which a rotatory motion is imparted by a wheel and treadle, as in the turning-lathe. The operation is materially assisted by the introduction of a little diamond dust and sweet oil into the orifice made by the cutting-tool, at various stages of the operation.

Integer, *in'-te-jer* (Lat., entire), in Arith., is the name of a whole number, in contradistinction to a fractional number. Thus, in the number 94·7, 94 is an integer, and 7 a fraction, or seven-tenths of a unit.

Integral Calculus, *in'-te-grăl kăl'-ku-lus* (from Lat. *integer*, entire).—As the integral calculus forms one of the most important branches of modern mathematics, and as it is so intimately connected with differentials, it has been deemed best, in the present work, to combine the two in their approximate relationship, rather than to enter upon each separately. A definition of the words, therefore, has been merely given under the headings Calculus and Differential Calculus, the subject being fully entered into under the present article. (1) The object of the differential calculus may be stated briefly to be to find the ratios of the differences of certain variable magnitudes, on the supposition that these differences become *infinitely small*; and this hypothesis gives rise to considerable abbreviations in the general calculation of differences. It may be as well here to inquire, Are they all intimately connected with the subject? what are the terms *infinite* and *infinitely small*? It must, however, be first borne in mind, that every magnitude which serves the purpose of mathematical investigation can be augmented or diminished, without any limit as to extent. We may, consequently, imagine a quantity to become so great as to exceed any finite assignable quantity of the same nature as itself, or so small as to be less than any finite assignable quantity as itself: in the former case, the quantity is said to be infinite, and in the latter infinitely small. From these data it may be said that a finite magnitude may be regarded as nothing, or zero, in comparison with one infinitely great, and an infinitely small magnitude as nothing, or zero, in comparison with a finite magnitude. The infinitely

small quantities which come under consideration in the differential calculus are called *differentials*; and hence the connection between the terms infinite and infinitely small with the present subject. The following are the principles of the differential calculus, and will explain the synonyms which will be made use of in the article. One quantity, $u$, is said to be *a function* of another, $x$, when the value of the magnitude of $u$ depends upon the variation of $x$. Thus, the area of a triangle is the function of the base when the altitude remains unaltered; since the area will increase or decrease with the increase or decrease of the base. If $u = ax^n \pm bx$, where $a$ and $b$ are constant quantities, and $x$ a variable one, $u$ is said to be a function of $x$, since if $x$ changes, the value of $u$ will be altered: this relation between $u$ and $x$ is usually expressed by writing $u = f(x)$, or $\varphi(x)$, the symbols $f$ and $\varphi$ expressing the word function. The quantity $x$ is called the independent variable, and $u$ the dependent variable. The differential of a variable may be truly defined to be the infinitely small difference between two successive states of the same variable, and the object of the calculus is to find this differential for all possible cases; that is to say, for all the possible functions of the proposed variables, such as $x$, $y$, $z$, &c., of which the particular differentials are expressed by $dx$, $dy$, $dz$, &c. Before any explanation is entered into as to how this operation is performed, it will be necessary to examine into the distinctions that must be made between the process by which an ordinary, or finite difference, is obtained, and that to which we must have recourse when the difference is infinitely small, or, in other words, is a differential. If we consider the proposed system or function in any two determinate states different from each other, the difference of the two values of the same quantity taken in the two states will be determinate, and consequently cannot be considered as minute as we please, so that no part of its expression can be omitted; but if the two states of the function approach indefinitely near each other, the difference of the two values of the same variable may be rendered as small as we please. It then becomes a differential, and is in fact nothing more than the ordinary difference simplified by the suppression of the quantities which in its expression may be regarded as infinitely small in comparison with the other quantities of which it is composed. Such may be said to be the general principle of differentiation, or, in other words, the manner in which the first differential coefficient A, or $\frac{du}{dx}$, is found. The differential coefficient of the term of any functions equals the sum of the differential coefficients of each function; for, let $u = z + v + w + \&c.$, $z$, $v$, $w$, being functions of $x$; therefore—

$$u + \frac{du}{dx}h + \&c. = z + \frac{dz}{dx}h + v + \frac{dv}{dx}h + w + \frac{dw}{dx}h + \&c.$$

$$\therefore \frac{du}{dx} = \frac{dz}{dx} + \frac{dv}{dx} + \frac{dw}{dx} + \&c.; \text{ or,}$$

$$\frac{d^{\cdot}(z+v+w+\&c.)}{dx} = \frac{dz}{dx} + \frac{dv}{dx} + \frac{dw}{dx} + \&c.;$$

which proves the truth and application of the formula. The utility of these first principles of the differential calculus may be shown by the following problem:—The radius of a circular plate of metal is 12 inches; find the increase of area when the radius is increased ·001 inch.

If $s$ = area of a circle, radius = $x$

$\therefore s = \pi x^2$; and $ds = 2\pi x dx$

Make $x = 12$, $dx = \cdot001$, then $ds$ = increase of area;

$\therefore ds = 3{\cdot}1416 \times 24 \times \cdot001 = \cdot0753984$ of a square inch.

In the differentiation of angular, exponential, and logarithmic functions, when $u = \sin x$ · $\frac{du}{dx} = \cos x$, or $\frac{d^{\cdot}\sin x}{dx} = \cos x$; when $u = \cos x$, $\frac{du}{dx} = -\sin x$; when $u = \tan x$, $\frac{du}{dx} = \frac{d^{\cdot}\tan x}{dx} = \frac{1}{\cos^2 x}$. Another formula will be found very useful,—that the differential coefficient of the logarithm of a function equals the differential coefficient of the function divided by the function itself.





The primal principle of the differential calculus may be defined to be its application to the equations of curves, by which means the radii of curvature are also to be discovered by a few simple formulæ. It also applies to the finding of the maxima and the minima, investigations with regard to these, and numerous other mathematical inquiries, which, without its aid, could only be solved by the most laborious and difficult methods. It was invented by Leibnitz; and the dispute between him and Newton on the subject of the discovery will be found narrated under the article FLUXIONS. The Integral Calculus is the direct reverse of the differential, its object being to discover the original function from a given relation between the differential coefficients and functions of $x$ and $u$. The process by which $u$ is formed from $\frac{du}{dx}$ is called integration, and when performed, is expressed by prefixing the symbol $\int$. Thus, if $\frac{du}{dx} = \phi(x)$, $u = \int x \cdot \phi(x) = \Phi(x)$. Since $\int$ is the initial letter of *summa*, or sum, the integral is said to be the sum of the differentials of the function. A constant quantity, C, is added, since constant quantities connected with the original function by the sign ± disappear in differentiation; and therefore, when we return to the original value $u$, an arbitrary quantity, as C, is added, which must be determined by the nature of the problem. The simplest case to be decided in the integral calculus is when $\frac{du}{dx} = ax^m$. Let $u = Ax^n + C$; $\therefore \frac{du}{dx} = nAx^{n-1} = ax^m$; $a = nA$, and $n = m - 1$; $\therefore u = m + 1$; and $A = \frac{a}{n} = \frac{a}{m+1}$; $\int ax^m = \frac{a}{m+1} \cdot x^{m+1} + C$; or to integrate a monomial, *add unity to the index, divide by the index so increased, and add a constant.* The integrals of the sum of any number of differential coefficients = the sum of the integrals of each differential coefficient. The method usually given for the integration of $\int \frac{1}{x(x^n+1)^m}$ is called "integration by parts," which is very general in its application, and which may be here explained. Since $\frac{d}{dx}(pq) = p\frac{dq}{dx} + q\frac{dp}{dx}$; $\therefore p\frac{dq}{dx} = \frac{d}{dx}(pq) - q\frac{dp}{dx}$ $\therefore \int p\frac{dq}{dx} = pq - \int q\frac{dp}{dx}$. If any differential coefficient can be divided into two parts, one of which is a function of $x$, as $p$, and the other is the differential coefficient of a known function of $q$, then $u$, the required function, is equal to the product of $p$ and $q$, *minus* the integral of $q$ multiplied by $\frac{dp}{dx}$. The utility of this method depends upon $q\frac{dp}{dx}$ being less complicated than the original function $p\frac{dq}{dx}$. In the integration of the preceding examples, the differential coefficient has either been a given function of one of the variables, or else has been expressed in such terms of the two, that by a very evident process it has been reduced to a function of one only. The next step, therefore, by which we proceed, is to integrate differentials when the differential coefficients and the variables $x$ and $y$ are mingled together. This class of equations, termed *par excellence* "differentials," is divided into minor classes dependent upon the *order* and *degree* of the differential coefficient. Thus, an equation involving $\frac{dy}{dx}$, $\frac{d^2y}{dx^2}$, $\frac{d^3y}{dx^3}$, &c. ..... $\frac{d^ny}{dx^n}$ is called a differential equation of the $n$th order, and of the first degree, while one containing $\frac{dy}{dx}$, $\left(\frac{dy}{dx}\right)^2$, $\left(\frac{dy}{dx}\right)^3$, &c. ..... $\left(\frac{dy}{dx}\right)^n$ is said to be of the first order and of the $n$th degree. The application of these equations may be briefly sketched by the following problem. Find the curve in which the subtangent is equal to the sum of the abscissa and ordinate;—

$$\text{Here } y\frac{dz}{dy}=s+y;\text{ and let } s=ys;$$

$$\therefore \frac{dz}{dy}=s+y\frac{ds}{dy}=\frac{s+y}{y}=s+1;$$

$$\therefore \frac{dy}{ydz}=1;\ \therefore \log\left(\frac{y}{a}\right)=s=\frac{s}{y}.$$

Lagrange has worked out three different classes of differential equations, and his theorems on the subject, and the formulas he has laid down for eliminating the integrals, are easy enough for the mathematical student to follow. The *Calculus of Variations* is that which treats on the finding of the maximum and minimum, and also on the nature of the functions which possess that property. This variety of Fluents is merely another form of differentiation under a new symbol, consequently it need not be treated on here. The problems termed isoperimetrical, invented and named by James Bernouilli, come under this latter system. Isoperimetrical figures are such as have equal perimeters, or circumferences. Bernouilli's problems rest on the following question:—"Given the length of a curve, find its equation when the area included by it is a maximum," which can be thus mathematically put:—Find $y=f(s)$, so that $\int_x u$ may be a maximum while $\int_x u_1=c$; which can be easily brought out, and the integral found. The *Infinitesimal Calculus* is the art of employing infinitesimal quantities as auxiliaries, in order to discover the relations which exist among the proposed quantities. The subject will be found treated under the article FLUXIONS (which *see*).—*Ref.* Carnot's *Réflexions sur la Métaphysique du Calcul Infinitésimal*; Hall's *Differential and Integral Calculus*, &c. &c.

INTELLECT, *in'-tel-lekt* (Lat. *intellectus*, from *intelligo*, I perceive a difference, I understand), in Phil., is applied to one of the principal divisions of the human mind, as distinct from the will and the sensational powers. The intellect includes all those powers by which we acquire, retain, and extend our knowledge; as, perception, memory, imagination, judgment, &c. "It is," says Stewart, "by those powers and faculties which compose that part of his nature commonly called his intellect or understanding, that man acquires his knowledge of external objects; that he investigates truth in the sciences; that he combines means in order to attain the ends he has in view; and that he imparts to his fellow-creatures the acquisitions he has made." It is usual to distinguish the intellectual from the moral powers. Aristotle employs the word *nous* for intellect, and uses it in two principal significations, —the one (like reason in its first meaning) denoting, in general, our higher faculties of thought and knowledge; the other, in special, the faculty, habit, place of principles, that is, of self-evident and self-evidencing notions and judgments. Kant distinguishes the intellect into two faculties,—the understanding and the reason. Intellectual knowledge denotes what has its origin in the intellect, in opposition to that which is derived through the senses. Intellectualism, or intellectual philosophy, is applied to a particular system of philosophy which regards the intellect as the only true source of our knowledge, in opposition to sensualism, which regards the senses in that light.

INTENTION, FIRST AND SECOND, *in-ten'-shun* (Lat. *intentio*, having the mind bent on an object), in Log., were terms introduced by the schoolmen to distinguish certain classes of thought. A first intention is a conception of a thing, or things, formed by the mind from external materials, or materials existing without itself. A second intention, on the other hand, is a conception of another conception, or conceptions formed by the mind from materials existing in itself. Thus man, animal, stone, are first intentions, being conceptions formed from external materials; while genus, species, &c., are second intentions, being formed from first intentions.—*See* "Review of Whately's Logic," by Sir W. Hamilton, in *Edinburgh Review*, No. 115, or in his *Discussions*.

INTERCALARY, *in-ter-kăl'-a-re* (Lat. *intercalarius*, inserted between others), the name that is applied to any day or days that are inserted out of the usual course, for the purpose of preserving the equation of time. The actual length of the year is 365 days 5 hours 48 minutes 50 seconds; but as such a division of time would be attended with inconvenience, as it involves the fractional part of a day, the length of the year was arbitrarily fixed at 365 days of 24 hours each, at the introduction of the Julian calendar, and an intercalary day was, and still is, always inserted in every fourth year, or leap-year, between Feb. 23 and March 1, to compensate for the difference that would arise from neglecting the odd hours entirely, and to bring the sun to the same point in the heavens at the commencement of every period of four years, of which leap-year always forms the last.

INTERCOLUMNIATION, *in'-ter-kol-um'-ne-ai'-shun* (Lat. *inter*, between; *columna*, column), the open area between columns measured by their lower diameters. Upon this important element in architecture depend the effect and proportions of the columns themselves, and the harmony of the whole edifice. There are five kinds of intercolumniation:—*picnostylos*, or columns thick set; *systylos*, having an interval of two diameters; *eustylos*, with two and a quarter diameters; *diastylos*, with three diameters; and *araeostylos*, with four diameters, or columns thin set.

INTERCOSTAL, *in-ter-kos'-tăl* (Lat. *inter*, between, and *costa*, a rib), in Anat., is a term applied to certain muscles, vessels, &c., situated between the ribs. There are two sets of intercostal muscles,—the external and internal, which decussate each other like the strokes of the letter X.

INTERDICT, *in'-ter-dikt* (Lat. *interdictum*, prohibition), in the Roman Catholic church, is a mode of censure adopted against a kingdom, province, or town, in consequence of some offence alleged to have been committed by the people or rulers. In terms of this interdict, all kinds of church benefits are denied to such place; there is no church service and no administration of the sacraments. Sometimes, however, the rigour of these interdicts has been mitigated in particular cases, permitting the baptising of infants, the giving absolution to dying persons, &c. In the middle ages, this was the most terrible blow that could be inflicted upon a prince or people, and had sometimes the effect of throwing a people into a state of rebellion, in consequence of which the prince was compelled to sue for pardon from the pontiff. Interdicts appear to have been first made use of by the bishops in the 9th century; but they were afterwards adopted by the popes. In 998, when Robert of France was married to Bertha, his cousin, Gregory V. interdicted the whole country, and obliged the king to dissolve the union. After a time, they became so common, that they, in a great measure, lost their effect, and fell into disuse. To interdict of fire and water (*interdictio ignis et aquæ*) was a censure pronounced against individuals, and prohibited any one from receiving them or granting them fire or water.

INTERDICT, in the law of Scotland, is an order issued by the Court of Session, or the Sheriff's court, forbidding some act from being done. Usually, before interdict is granted, intimation is given to the opposite party, who gives in answers; but, in pressing cases, an interim interdict is granted on application, before the opposite party has an opportunity of being heard.

INTEREST, *in'-ter-est* (ANG.-NOR., from Lat.), the annual sum or rate agreed to be paid by the borrower of a sum of money to the lender for its use. The sum so lent is called the principal; the sum per cent. agreed on as interest, the rate. The system of lending money on interest seems to have existed from very early times; and Moses has laid down rules regarding it. The Jews were enjoined not to take interest of a fellow-countryman, but were allowed to do so of strangers. Still, however, it seems to have been practised, and the taking of interest, or usury, is frequently condemned in Scripture. In Greece and Rome, too, the system was common. In Greece, the rate of interest not being regulated by law, was generally high, being from 10 to 18 per cent., and upwards. In Rome, during the republic, the rate of interest was excessively high,—sometimes 30 or 40 per cent. In Mohammedan countries, notwithstanding the prohibition in the Koran, the ordinary rate of interest is at least three or four times as great as the ordinary rate in Europe. In England, as in most other countries, after the Conquest, Christians were forbidden, both by

the ecclesiastical and civil law, from taking interest; but the practices of the Jews in that respect were connived at. In 1545, a statute (37 Henry VIII. c. 7) was passed legalising interest to the extent of 10 per cent., as the statutes prohibiting interest altogether had so little force. In the reign of James I., the legal rate of interest was reduced to 8 per cent.; and during the Commonwealth it was still further reduced to 6 per cent. Finally, by 12 Anne, c. 16, the rate was fixed at 5 per cent., at which it continued till 1839, when all legal restrictions as to rate were abolished. Generally speaking, the rate of interest depends on the profit that may be yielded by its employment in industrious undertakings. "The rate of interest," says Mr. Tooke, "is the measure of the net profit on capital. All returns beyond this on the employment of capital are resolvable into compensations under distinct heads, for risk, trouble, or skill, or for advantages of situation or connection." The rate of interest also varies according to the security for the repayment of the principal and the duration of the loan. If there is any degree of risk as to the repayment of the loan, the rate of interest must necessarily be higher to compensate for that risk; and supposing the security to be equal, capital lent for a fixed and considerable period always fetches a higher rate than that which is lent for a short period, or repayable at the pleasure of the lender. Interest is usually paid yearly or half-yearly; and in this case the loan is said to be at simple interest. Though the payment of interest be not made when it becomes due, no interest can be charged upon the accumulated interest, though it is difficult to see how it should not be so. Thus, if £100 be lent at 5 per cent., and the interest allowed to accumulate for four years, when it would amount to £20, the borrower has had the use of the several interests after they became due as much as he has had of the principal. Sometimes, however, money is so invested that the interest is not paid as it becomes due, but is progressively added to the principal, the two sums together afterwards bearing interest; and this is what is termed compound interest. Interest is reckoned at so much per cent. per annum, that is, so many parts of one hundred annually. Thus, 5 per cent. means £5 of every £100 annually; 4 per cent., £4 of every £100, &c. There are various books of tables for the calculation of interest. In order to find the interest of a given sum at any rate for a year, multiply the sum by the rate of interest, and divide by 100. Thus the interest on £312. 10s. for 3½ years at 4 per cent. is

| | |
|---|---|
| £312 .. 10 | £12 .. 10 |
| 4 | 3½ |
| 12 \| 50 | 6 .. 5 |
| 20 | 37 .. 10 |
| 10 \| 00 | £13 .. 15 |

Where there are days in the calculation, they must be treated as fractional parts of a year; that is, the interest for a year must be multiplied by them, and the product divided by 365.—Ref. *Encyclopædia Britannica*; McCulloch's *Commercial Dictionary*.

INTERIM, *in'-ter-im* (Lat., in the mean time), in Eccles. Hist., is the name given to a formulary of faith and discipline drawn up by order of the emperor Charles V., with a view to reconcile the differences existing between Protestants and Roman Catholics. It received its name because it was only a temporary measure, adopted till a general council should decide upon the disputed points. It was mostly in favour of the Catholics, almost the only points conceded to the Lutherans being the marriage of the clergy and the use of the cup in the sacrament of the Lord's Supper. The project pleased neither party; it was condemned by the popes, and rejected by the Lutherans; and, although Charles attempted to force it on his subjects, his efforts signally failed, and the measure was abandoned.

INTERJECTION, *in-ter-jek'-shun* (from Lat. *interjicio*, I throw between), in Gram., is a word used to express some passion or emotion of the mind; as joy, grief, wonder, &c. Interjections have usually been considered, by grammarians, as forming a distinct part of speech, though some regard them as not entitled to this dignity, most of them being nothing more than mere ejaculations.



INTERLOCUTORY, *in-ter-lok'-u-tor-e* (Lat. *inter*, between, and *loquor*, I speak), in Law, is applied to those judgments which are given in the middle of a cause upon some plea, proceeding, or default, which is only intermediate, and does not finally determine or complete the suit. Of this nature are all judgments for the plaintiff upon pleas in abatement of the suit or action. The term, however, is most commonly applied to those incomplete judgments whereby the right of the plaintiff is indeed established, but the *quantum* of damages sustained by him is not ascertained, which can only be done by the intervention of a jury.

INTERLUDE, *in'-ter-lude* (Lat. *inter*, between; *ludus*, a play), a short play, or dance, accompanied by music, introduced between the acts of a piece, or between the play and the afterpiece. It is not of modern invention. The ancients were acquainted with certain short pieces, loosely connected, which served to make an easy transition from one play to another. Interludes are not so much used now as formerly, when a song or dance, at least, was generally given between every act of a tragedy or comedy. According to Arteaga, modern *interludes* were at first madrigals, which were sung between the acts of a play by several voices, and were connected with the piece. These, however, soon lost their primitive form, and represented some action. Those short pieces of church music seldom exceeding a few bars, and generally produced *extempore*, and played after each stanza, excepting the last of the metrical psalm, to give breathing-time to the singers, are called interludes.

INTERMENT. (*See* BURIAL.)

INTERMITTENT, *in-ter-mit'-tent* (Lat. *inter*, between, and *mitto*, I send), in Med., is applied to diseases which are not continuous, but intermit for a time, and then return again, as in intermittent fevers. (*See* FEVER and AGUE.)

INTERNATIONAL and INDUSTRIAL EXHIBITIONS, *in-ter-nash'-un-al, in-dus'-tre-al* (Lat. *industrius*, diligent; *inter*, between; *natio*, a nation; *exhibeo*, I show).—Displays of manufactures and manufacturing art, in which excellence, and not commerce directly, is the primary object. Industrial exhibitions, in this sense, belong only to the present century, and, in this country at least, have been originated by individuals or societies, independently of any government assistance. The first exhibitions of industry were certainly fairs, which, for many years, have been established in this country. But the displays at those meetings differ from the modern exhibitions; since, at the former, each exhibitor strove to part with his goods to the highest bidder. As early as 1756-57, the Society of Arts in London offered prizes for the best specimens of manufactures,—tapestry, carpets, porcelain, &c., and exhibited the works sent in for competition. About the same period, the Royal Academy, as a private society, patronized by the monarch more in a personal capacity than as representing the head of the legislature, had organized its exhibitions of painting, sculpture, and engraving. The first exhibition of industrial productions in France recognized as a national institution was held in 1798. It remained open three days, and the articles were of an aristocratic and costly, rather than of a popular character. The second exhibition was held in 1801, and the third in 1802, when the exhibitors had increased from 110 to 540; and their productions showed an extraordinary progress in every department. The fourth exhibition was opened in 1806; but it was not till 1819 that the expositions of French industry took place systematically; and it is only since that time that their influence has been markedly felt throughout Europe. In England, "the National Repository," formed at the King's Mews, Charing Cross, in 1828, under the patronage of George IV., with a board of titled persons and the chairmanship of the practical Dr. Birkbeck, failed after three exhibitions, and ended its short career in a room in Leicester Square. During the last thirty-five years, however, in each of the principal cities of the United Kingdom, and the most important manufacturing towns, one or more exhibitions of machinery

and manufactures have been held. As early, however, as 1829, the Royal Dublin Society founded an exhibition of works of art, science, and manufactures, to be held triennially; at which, however, Irish productions only were admitted till 1850. But the local exhibition at Birmingham, held in 1849, originating with individuals, self-supporting in its management and comprehensive in the scope of the objects exhibited, may be said to have most resembled the exhibition of 1851. Within two years of the acceptance of the presidency of the Society of Arts by the late Prince Consort, the minutes record several attempts to establish a national exhibition in England. The French exposition of 1844 had met with such great success that several representations were made to the cabinet, showing the benefits that would arise from similar exhibitions in the United Kingdom. Efforts were also made to obtain government support to carry out a like object, but without result. In 1848, a proposal to establish a self-supporting exhibition, to be controlled by a royal commission, was submitted to the Prince Consort, who laid it before the government. The Society of Arts petitioned parliament for pecuniary aid, and the Prince Consort warmly supported the cause, imparting to the project a much more magnificent form, by suggesting that the exhibition should be thrown open to the industry of the world. The council adopted his suggestion, and measures were taken for enlisting the sympathies of manufacturers. In all great works of this country, it is a marked feature that they are always the consequences of popular wishes. The idea of an international exhibition of industry at once seized the public mind. Eloquent appeals were made at banquets given at the cities of London and York, and the sentiments there enunciated were re-echoed throughout the country. Public meetings were held in the manufacturing districts, where nearly 5,000 persons registered themselves as promoters of the exhibition. The royal commission was then formed, and the commissioners took the responsibilities. A guarantee fund was formed, the Prince Consort putting his name down for £10,000; and upon the guarantee deed for £230,000, the sum of £32,500 was borrowed from the Bank of England, and afterwards repaid, with interest, out of the receipts at the doors, before the Exhibition had been open three weeks. The royal commissioners then organized 297 district committees, and appointed about 450 local commissioners. Two special travelling commissioners—Dr. Lyon Playfair and Lieutenant-Colonel Lloyd—were appointed to communicate with the local committees; and commissioners were appointed, or committees formed, in eleven British colonies and thirty foreign countries. On the 21st of February, 1850, the commissioners were able to announce the general plan of the exhibition, and to communicate the royal permission to hold it in Hyde Park. The site granted was on the south side of the park, between Kensington Drive and Rotten Row. In March, the building committee appealed to architects and others to assist them with designs for a building. A large number of professional men, both English and foreign, answered the appeal; but the committee finally adopted an entirely new plan, proposed by Sir Joseph (then Mr.) Paxton. The building he proposed was to be constructed entirely of glass, and closely resembled in principle the large conservatory which he had constructed for the duke of Devonshire at Chatsworth. From the first, the plan became popular with the public, and Messrs. Fox and Henderson undertook to erect the building for £79,800, the materials of the building remaining their property. Everything went on smoothly from that time, and on the 3rd of February, 1851, the completed building was formally handed over to the executive committee. The plan of the *Crystal Palace*, as it was called, was cruciform, with a transept, nave, and side aisles. It consisted of a framework of wrought and cast iron, firmly braced together, and based upon a foundation of concrete. In its general form, the building was a parallelogram, 1,848 feet long and 408 wide. About the middle it was crossed by a transept at right angles, 72 feet wide, the semicircular roof of which rose 108 feet, so as to preserve three fine old elm-trees; two other groups of trees caused open courts, which were inclosed within the building. The whole area roofed over was 19½ acres; and 293,600 panes of glass were used, most of which were 49 inches by 9 in size. The roof was the most novel and interesting portion of the building; it was supported by the upper ties of girders and trusses; in its general form it was flat, but in detail it consisted of a series of ridges and furrows, of moderate rise and fall, and the total length of the gutters was nearly 24 miles. Mr. Owen Jones, well known by his works on the Alhambra, was intrusted with the colouring of the building. The decoration consisted of the scientific application of the three primary colours, red, blue, and yellow, upon narrow surfaces. Its effect was at first much questioned; but it proved admirably artistic and suitable. Within the building, the whole available space was divided into two parts; one half was given to England and her colonies, and the other half to foreign countries. According to the plan laid down by the Prince Consort, the Exhibition had its four great compartments:—1. Raw materials, four classes. 2. Machinery, six classes. 3. Manufactures, nineteen classes. 4. Fine Arts, a class by themselves. The Exhibition was opened by her Majesty on the 1st of May, 1851, in the presence of 25,000 spectators. For 141 days the Exhibition remained open, and during that time the entire number of visits paid to the building was 6,063,986, being an average of 42,111 per day. The estimated value of the articles exhibited, excluding the Koh-i-noor diamond, was:—

| | | | |
|---|---|---|---|
| United Kingdom | £1,031,607 | 4 | 9 |
| Dependencies of ditto | 79,901 | 15 | 0 |
| Foreign Countries | 670,420 | 11 | 7 |
| Total | £1,781,929 | 11 | 4 |

The general results of the jury awards were as follows:—Prize medals, 2,918; council medals awarded by juries, 170; "honourable mentions," 2,042; making a total of 5,130 honorary distinctions of all kinds. The whole receipts, from all sources, to Feb. 29, 1852, were £506,000. The greatest number of persons ever present in the building was on Oct. 7th, when 109,915 visited the exhibition. At the conclusion of the display, the balance left in the commissioners' hands, after all expenses had been deducted, was £213,305. 15s. 8d. The success of the Great Exhibition of 1851 naturally led to similar exhibitions in several parts of the world. The building was sold by Messrs. Fox and Henderson to the Crystal Palace Company, and now forms part of the building at Sydenham, which is larger than its predecessor by 1,628 feet, and by nearly one half its cubic contents. In this building, sculpture is picturesquely grouped with luxuriant vegetation. In other portions are spaces set apart for the purpose of illustrating the ethnology, zoology, and botany of different lands. Throughout the building, there are also galleries for the display of objects of industry and fine art; and courts representing the architecture and sculpture of each nation—Egyptian, Greek, Roman, Pompeian, Alhambra, Assyrian, Byzantine, and Romanesque; German, English, French, and Italian mediæval; Renaissance, Elizabethan, Italian, &c. The Crystal Palace is placed at the head of a landscape garden and park, designed by Sir Joseph Paxton. After the Exhibition of 1851, the more immediate results were the Cork Exhibition of 1852, and in the next year the Universal Exhibitions in Dublin and New York, both in buildings constructed of iron and glass. The result of the former, however gratifying in many ways, was far from being a financial success, seeing that a heavy loss fell on Mr. Dargan, a wealthy and liberal railway contractor, who had generously advanced large sums of money to further the scheme. The New York Exhibition was also a failure; the choice of the locality was bad, and the area to be built on was only 450 feet square; far too small for the object in view. The building ought to have been open on the 1st of May, 1853, but it was not till the 14th of July that it was really opened; thus seriously limiting the number of summer days when it could be open. This delay was disappointing to the public and the exhibitors, and disastrous to the company. It remained open 119 days; the receipts during that time were £71,000, and the final cost for everything was little short of £200,000; absorbing all their share capital, all the receipts from visitors,

and two loans raised at interest. In 1855, the twelfth exhibition in Paris followed. This was the first great French international exhibition, and the plan of the Exhibition of 1851 was closely followed in it. The whole cost was borne by the government, and the management was intrusted to special commissioners, appointed by the emperor. One of the points of difference between the Paris and London exhibitions, was the admission of paintings and engravings into the former. There were four classes of medals distributed, and one grade of "honourable mention." In 1857, the Manchester Art Treasures Exhibition took place. It was an exhibition solely of artistic objects, sent by their possessors, and not by their producers or dealers. The scheme was favourably received, and an ample guarantee fund provided. The Queen and the Prince Consort gave their hearty support to the undertaking, and the owners of works of art cheerfully and freely responded to the appeal. 1,115 paintings of all kinds by ancient masters, and 680 by modern masters, were exhibited. The pictures by ancient masters were arranged chronologically; and for completeness and value, such a collection was probably never brought together before. The exhibition remained open for five months, during which period it received over a million and a quarter visits. The Italian National Exhibition at Florence, and during the present year (1863), the Turkish Exhibition at Constantinople, were steps in the same direction as the Exhibition of 1851. The result of the first International Exhibition in England was such as to leave a surplus or profit, which promised to be the nucleus of future important operations. In order to apply this money properly, and keep faith with the subscribers to the fund, the royal commissioners applied to her Majesty for a supplemental charter, which being granted, empowered them to dispose of the surplus as they might think fit. The first proposal was to form a "Trade Museum," in which were to be stored articles presented to them by the exhibitors in 1851. The Gore-House estate was purchased for this purpose, and £280,000 were paid for it out of the surplus fund. In extent, this property comprised about twenty-one acres; and to it were added several nursery-gardens and market-grounds, together with Cromwell House, and other lands belonging to the earl of Harrington and the baron de Villars. Government supplied other funds, and entered into a sort of partnership with the commissioners, by whom eighty-six acres in all were purchased for £280,000. The object of these purchases of land was to secure a large space to which some of the national exhibitions might be removed. In 1858, however, the commissioners dissolved partnership with the State; the sums advanced by government were repaid by the commissioners, subject to a deduction for the ground and buildings of the South Kensington Museum, now a government institution in connection with the department of Science and Art. Since that time, the commissioners are stated to have nearly doubled their original capital. The international character of industrial exhibitions assumed greater importance with the Society of Arts after each of the displays following the Crystal Palace of 1851. It was considered desirable to hold such an exhibition periodically. At first, the year 1861 was chosen; but, on account of the Italian war and the disturbed state of the continent generally, it was ultimately postponed till 1862. By a guarantee agreement, in the case of a loss by the exhibition, each subscriber was to contribute in ratable proportion to his subscription. Earl Granville, the marquis of Chandos, Mr. Thomas Baring, and Mr. Dilke, consented to be the trustees for the exhibition. The next proceedings were as follows, according to the *Quarterly Review*, vol. cxii., No. 223. "The steady-going Society of Arts was now called in, and a very odd triangular arrangement consummated. The commissioners of 1851 leased to the Society of Arts the desired plot of ground for ninety-nine years, in order that a third body, viz., the commissioners of 1862, might cover the ground with an additional building. Of this building, one part was to be considered temporary, and either to be reckoned the property of the contractors, after a vast royalty had been paid for its use, or else bought out-and-out for a further sum; and the other part was to be held permanent, and to pass for the term of the lease of





the Society of Arts, supposing the speculation to be solvent. If the returns were insufficient, this portion was to be pulled down at the close of the exhibition. The motive power of the whole scheme was a select phalanx of Englishmen, some of them men of capital, and some men of enterprise, who had from various motives subscribed a deed of guarantee to the amount of several hundred thousand pounds, and on the strength of this deed, the Bank of England found the money for the immediate undertaking. So there were the bank that advanced, the subscribers who guaranteed, the new commission that managed, the Society of Arts that advised and that waited for its windfall, and the old commission that sat in its counting-house counting out its money." The list of guarantors was headed by the Prince Consort with a subscription of £10,000. After a site had been determined upon, the queen granted a charter to the trustees in February, 1861; and a design for a building by Captain Fowke, of the Royal Engineers, was declared to be accepted. The principal feature of this design consisted at first of a great central hall, with an arched roof and rounded ends, 500 feet long, 250 feet wide, and 210 feet high. The estimates for the original structure, including this hall, amounted to £580,000. Messrs. Kelk and Lucas having sent in the lowest tenders for a modified form of this building, were appointed contractors for the work, and the building was to be completed by the 12th of February, 1862. The work of constructing the exhibition building may be said to have been begun at the beginning of April, 1861, and to have been practically finished about the beginning of April, 1862. The main building then occupied about sixteen acres of ground; it was nearly rectangular in shape, being 1,200 feet from east to west and 560 feet from north to south. Its situation was south of the Horticultural Society's gardens and the Kensington road. The whole ground was covered with permanent buildings; and two long strips of ground, east and west of the gardens, were roofed in by temporary sheds called "annexes," in which were displayed machinery and large and heavy objects. Within the permanent structure, the space was covered in by roofs of various heights, and divided into nave, transepts, aisles, and open courts; the roofs of the latter were of glass, but the others had opaque roofs with clerestory windows. The most particular features of the building externally were two huge domes at the east and west fronts, each rising to the height of 260 feet. In the appropriation of the several portions of the building, the naves, transepts, galleries, and courts were devoted to the display of industrial productions; the brick building on the north, inclosing the narrower court, for refreshments; and the grand picture-galleries extending along the south side, with auxiliary wings in front of the east and west transepts. To Mr. Crace was intrusted the decoration of the entire building; and although his plan met with some severe criticism, it was generally admitted that the decorations not only gave lightness to a building naturally heavy, but in some portions were grand, harmonious, and rich. Upon the national and local committees devolved the task of allotting the space and selecting the articles to be sent for exhibition. The classification was based on that of 1851, and embraced thirty-six classes, besides those of the fine arts. By an extraordinary effort of labour, the executive committee were enabled to open the exhibition on the 1st of May, 1862. But on this occasion there was not the same brightness and splendour which had attended the ceremonial of 1851. The Prince Consort, by whom the great work of the day had been encouraged and helped on, was dead, and a deep gloom seemed to hang over all the proceedings. In the absence of her Majesty, the building was opened with great state and ceremonial by the duke of Cambridge. After remaining open for six months, the exhibition was closed on the 1st November, 1862. The total number of visitors, excluding the staff and exhibitors' attendants, was 6,117,460, or 87,000 over the corresponding numbers in 1851. The jurors and their associates engaged in examining the objects of the exhibition amounted to 612 persons, of whom 287 were foreigners and 325 English; and the number of exhibitors whose objects they had to examine was 26,000. Nearly 7,000

medals were voted by the juries, and 5,300 "honourable mentions." Altogether the exhibition of 1862 may be considered as a success, if the difficulties with which the commissioners had to contend are rightly considered. To the Prince Consort the exhibition of 1851 was mainly indebted for its success. The absence of his directing counsel and assistance was apparent in nearly every act of the commissioners for 1862. The death of the prince, as a natural consequence, led also to the absence of the queen and the comparative seclusion of the court. To add to these calamities, the American civil war broke out, thereby stopping the staple trade of the country, and reducing half a million of people into objects of private charity or public relief. Notwithstanding these drawbacks, the International Exhibition of 1862 proved a success both numerically and practically, and showed clearly the advancement of manufactures and manufacturing art during the foregoing eleven years.—*Ref.* Hollingshead's concise *History of the International Exhibition of* 1862, printed for her Majesty's Commissioners; and Timb's *Year-Book of Facts*, 1851 and 1862.

INTERNATIONAL LAW. (*See* LAW.)

INTERNUNCIO, INTERNUNTIUS, *in-ter-nun'-she-o, in-ter-nun'-she-us* (Lat. *internuncius*), is generally a messenger between two courts or governments, and more particularly applied to a representative of the pope, sent to small states and republics, as distinguished from the nuncio, who represents the pope at the courts of kings and emperors.

INTERPLEADER, *in'-ter-ple'-der*, in Law, is a proceeding in a suit where a person owes a debt or rent to one of the parties, but, till the determination of it, he does not know to which. He accordingly desires that they may interplead, so that he may be safe in the payment; in which case it is usual to order the money to be paid into court, for the benefit of such of the parties as the court, upon hearing, shall decree it to be due. Formerly, recourse was almost always had to a court of equity, but by stat. 1 & 2 Will. IV. c. 50, it is enacted, that upon application of a defendant sued in the courts of law, in any action of assumpsit, debt, detinue, or trover, showing that the defendant does not claim any interest in the subject matter of the suit, but that the right thereto is claimed, or supposed to belong to some third party, the court may make an order on such party to appear and state his claims; and powers are given to the court to direct an issue to try the same.

INTERPOLATION, *in-ter-po-lai'-shun* (from Lat. *interpolo*, I place between), a term applied in Alg. and Astron. to a method employed for filling up the intermediate terms of a series of numbers or observations, by numbers which follow the same law. The method itself is dependent upon the following problem:—Let there be given two series of numbers, the corresponding terms of which have some determinate relation to eath other, and of which the first is called the series of roots, and the second the series of functions (*see* INTEGRAL CALCULUS); to find the function corresponding to any term in the series of roots, from the numbers in the series of functions, which precede or follow that which is required, this is a question of *interpolation*. In other words, its application may be shown as follows:—The most extensive table of logarithms in common use is a succession of values of log. *a*, answering to $x = 10{,}000$, $x = 10{,}001$, $x = 10{,}002$, and so on up to $x = 99{,}999$. The process of interpolation is that of inserting in a table values of the tabulated function, intermediate to those given in the table. For example, suppose that $p$, $q$, $r$, $s$, &c., are written in a table opposite to $a$, $a + b$, $a + 2b$, $a + 3b$, &c., if it is demanded what is the value of the function corresponding to $a + 2\frac{1}{2}b$, it would be a question coming under the heading interpolation. In astronomy, also, it teaches us a mathematical law which will connect together a number of observed facts. Thus, supposing that twenty places of a comet have been determined by observation, these places are said, in mathematical language, to be interpolated when a curve, defined by an analytical equation, has been formed, which passes through them all; for, by means of this curve, the point of location of the comet at any intermediate time can be easily discovered.—*Ref.* Lacroix's *Differential and Integral Calculus*, translated by Sir John Herschel; also Newton's *Principia*, 3rd Book. (*See* also articles GEOMETRY and INTEGRAL CALCULUS.)

INTERPOLATION, in Philological Criticism, signifies the insertion of spurious passages in a work. In some printed texts, passages that are suspected of not being genuine are often inclosed in brackets.

INTERREGNUM, *in-ter-reg'-num* (Lat. *inter*, between; *regnum*, kingly government), is the period during which a throne is vacant, the interval between the death of one king and the accession of another.

INTERREX, *in'-ter-reks* (Lat. *inter*, and *rex*, a king), a person usually appointed to discharge the functions of royalty during a vacancy on any throne. The Romans were the first people who had an interrex, and they appointed one after the death of Romulus. An interrex was also sometimes appointed under the Republic, to preside over elections of magistrates and other officers, when the consuls were absent.

INTERROGATION, *in-ter-ro-gai'-shun* (from Lat. *interrogo*, I question), the act of questioning, also a note in writing and printing, which marks a question being put, thus (?).

INTERSECTION, *in-ter-sek'-shun* (from Lat. *inter*, and *seco*, I cut), a term applied in Geom. to the point of meeting, or function of lines or surfaces. The intersection of two lines, or of a plane and a line, is a point, and the intersection of two surfaces is a line. (*See* GEOMETRY.)

INTERVAL, *in'-ter-val* (Lat. *intervallum*, space between things), in Mus., the difference in point of gravity or acuteness between any two sounds. By the ancients, intervals were divided into simple, or uncomposite, and composite; the first of these they termed *diastems*, and the second, *systems*. According to Bacchius, the enharmonic diesis, or fourth of a tone, was the least of all the intervals in the Greek music; but as all our tones concur in consonances (to which order only the *diatonic* of the three ancient genera was accommodated), our scale does not notice so small a division. In modern music, the semitone is considered as a simple interval; thus from B to C is a semitone, or simple interval, and only those which consist of two or more semitones are termed composite, as from C to D, which is two half-tones, or a compound interval.

INTERVENTION, *in-ter-ven'-shun* (Lat. *inter*, and *venire*, to come between), in Pol., a word used to express the armed interposition of one state in the domestic affairs of another. Since the congress of Vienna, this right of intervention has become distinctly recognized, and has been acted upon more frequently than formerly. The right of every nation to increase its national dominions, wealth, and power, by all innocent and lawful means, is an incontrovertible right of sovereignty, generally recognised by the usage and opinion of nations; but when the exercise of this right directly interferes with the sovereign rights of other states, then the right of intervention, or interference of other states, is requisite to preserve the balance of power. As is rightly observed in Wheaton's "International Law," the internal development of the resources of a country, or its acquisition of colonies and dependencies, at a distance from Europe, has never been considered a just motive for such interference. Interventions, therefore, to preserve the balance of power, have been generally confined to preventing a sovereign, already powerful, from incorporating conquered provinces into his territory, or increasing his dominions by marriage or inheritance, or exercising a dictatorial influence on the councils and conduct of other independent states.

INTESTACY, *in-tes'-ti-se* (Lat. *in*, not, and *testor*, I testify), in Law, denotes the dying without having made a will.

INTESTINAL WORMS, *in-tes'-ti-nal* (Lat. *intestina*, an intestine), a class of animals which infests the interior of other animal bodies, and, as its name implies, especially the intestinal tube. All animals seem destined to be preyed on by others, not only after death, but during life. The frequency of worms in the bodies of human beings, as well as of the lower animals; their situation generally in those portions of the body where they would be expelled by the efforts of nature alone, —thus almost forcing them on observation, rendered them objects of interest in physiology and pathology from a very remote time. Yet, though so long and so

frequently investigated, the science of Helmithology (Gr. *helmins*, a worm; *logos*, a discourse), or the natural history of worms, has only made great progress in the last half-century. There is scarcely any disease which has not at some time been attributed to worms. The entozoa, or intestinal worms, form a family, or class, of the sub-kingdom of Zoophytes. Rudolphi introduced the term entozoa into the language of natural history; and the word has been adopted, not only in this country, but also in France and Germany. It includes all those animals which naturally and permanently inhabit the intestines, or any other internal part of animal bodies. These creatures do not, however, infest every animal indiscriminately; on the contrary, the parasites of nearly every species are peculiar to itself, or they are confined to a few, the habits and structure of which are analogous. The reasons which determine these parasites to select individual animals are unknown; but it would appear that worms generally infest the delicate and sickly; that in some cases youth seems to favour their production, and in others maturity. In human beings, the use of a crude farinaceous diet has been much blamed; yet the poor of Scotland, who subsist mostly on food of this sort, are not more troubled with worms than the poor of England. The generation of an intestinal worm, called the *fluke*, in sheep and cattle, is said to be favoured by rich moist pastures. Salt pastures, on the contrary, are said to be destructive to the fluke and worm. According to Dr. Paris, "salt, when taken in moderate quantities, promotes, while in excessive ones, it prevents digestion: it is therefore tonic and anthelmintic, correcting that disordered state of the bowels which favours the propagation of worms." Lord Somerville also adduces an instance of the results of the want of salt, a punishment formerly existing in Holland. "The ancient laws of that country ordained men to be kept on bread alone, unmixed with salt, as the severest punishment that could be inflicted upon them in their moist climate. The effect was horrible: those wretched criminals are said to have been devoured by worms engendered in their own stomachs." Although intestinal worms are found principally in the alimentary canal and the viscera subservient to its functions, they are, however, not confined to this portion of the body. Some species have their appropriated seats in the cellular, adipose, and serous tissues, and in the parenchyma of the most secret organs. One species is found in vast numbers in the voluntary muscles, and more than one has penetrated the heart. Several are developed in the brain, the lungs, and air-passages, the liver, and the kidneys; one or more have entered the blood-vessels, or tumours connected with them; others are to be found in the humours of the eye, and several species in the urinary secretions. The variety of external form in all intestinal worms is sufficiently great to form the basis of their classification into five subordinate divisions. 1. Nematoidea (Gr. *nema*, a filament; *eidos*, a form): round worms. The body of these worms is cylindrical and elastic, with the intestinal tube terminated at one end by the mouth, at the other by an anus: the sexes are separate. 2. Acanthocephala (Gr. *acanthos*, a thorn; *cephale*, a head): hooked worms. Their characteristics are,—a roundish body, utricular and elastic; proboscis retractile, armed with spinules arranged in rows; sexes distinct. 3. Trematoda (Gr. *trema*, a hole): fluke-worms. Their characteristics are,—a flattish soft body, of various forms, often tending to oval; one or more pores on its under surface. They have no intestinal canal, and the organs of generation of the two sexes co-exist in the same individual. 4. Cystoides (Gr. *kestos*, a band; *eidos*, a form): tape-worms. These parasites have a soft elongated body, flat like a riband, in some continuous, in others articulated; the head is either only simply labiated, or provided with pits, or with two or four suctorious orifices. There is no trace of an intestinal canal, and the male and female organs are present in each individual. 5. Cystica (*kustis*, a bladder): hydatids (which *see*). The characteristics of these worms are,—a flattish, or rounded body, terminating posteriorly in a transparent bladder-like cyst, filled with a pellucid fluid, which is sometimes common to many individuals; head provided with two or four pits, or with four suckers, and with a circle of booklets, or with four unarmed or incinated tentacles. The sexual organs have been hitherto undiscernible.



Intestines, *in-tes'-tins* (from Lat. *intus*, within), in Anat., is that part of the alimentary canal which extends from the stomach to the anus, and is situated in the cavity of the abdomen: the entire length of the intestinal canal is about six times that of the body. It is composed of three coats, or membranes,—the peritoneal, the muscular, and the villous. It is divided into the small and large intestines. The small intestines have three divisions,—the duodenum, so called from its length being about twelve finger-breadths; and which commences at the pyloric end of the stomach; the jejunum, so named from being generally found empty; and the ileum. The large intestines have likewise three divisions,—the cæcum, colon, and rectum. Each of the parts will be found described separately under their own names. The small intestines have internal membranous folds, called *valvulæ conniventes*; while the large intestines have three strong muscular bands, which run parallel upon the surface.

Intonation, *in-to-nai'-shun* (Lat. *intono*, I utter a sound), the art of tuning and giving to the tones of the voice, or instruments, that occasional impulse, swell, and decrease, upon which all expression, to a great extent, depends. The intonation of a singer may be true or false, according to the observance or non-observance of the just proportions that belong to the intervals sung. True intonation is an exception amongst singers, and among players upon bowed instruments, such as the violin, violoncello, &c. In church music, those antiphonies which are first sung by the priest and then responded to by the choir or congregation, are called *intonations*.

Intoxication, *in-toks-e-kai'-shun* (Lat. *in*, and *toxicum*, a poison), the state produced by the excessive use of alcoholic liquids or inebriating substances. In general, intoxication comes on gradually, and several stages may be noted in its progress. Thus, it shows itself at first by a general liveliness and excitability; during this stage, the circulation of the blood becomes more rapid, and all the functions of the body are performed with more freedom. No surcharge of blood, however, is produced, either in the head or lungs, by the excitement. While in this condition, indeed, the mental powers seem to act more freely; the imagination is stimulated, the fancy is more lively, and the feeling of strength and courage is increased. The effect on the brain is much more decided in the second stage of intoxication. Then, all the peculiarities of character, the weaknesses and failings of temperament which the individual can keep under and conceal in his sober moments, manifest themselves. Consciousness begins to be attacked, secret thoughts and the sense of propriety are lost. The peculiarities of this stage are summed up in the old proverb, *in vino veritas*, "in wine there is truth." In the next stage, consciousness is still more weakened, the balance of the body cannot be kept, the sight becomes confused, and the brain dizzy. After this point, the mind seems to be entirely overwhelmed by the tumult of animal excitement, consciousness is utterly extinguished, the tongue can only mutter incoherent gibberish, the face becomes suffused with blood, the eyes protrude, and perspiration streams from the pores of the skin. Lastly, when completely prostrated, the victim of intoxication sinks into a heavy slumber, closely resembling the stupor of an apoplectic fit. (*See* Temperance.)

Intrados, *in-trai'-dos* (Lat. *intra*, within; *dorsum*, back).—The outline or curve formed by the junction of the lower ends of the voussoirs of an arch is called its intrados or soffit; while the curve similarly formed by the upper ends of the voussoirs is termed its extrados.

Intransitive, *in-trăn'-si-tiv* (Lat. *intransitivus*, passing over).—In Gram., an intransitive verb is one which expresses an action or state that is limited to the agent, or, in other words, an action that does not *pass over* to, or operate upon, an object.

Intrenchment. (*See* Lines of Intrenchment.)

Intrigue, *in-treeg'* (from Ital. *intrigo*), an assemblage of events or circumstances which occur in any story, and lead to the perplexity of the persons acting therein. In this sense it is used to signify the plot of a play or romance, or that point in which the principal characters

the most embarrassed, through artifice or through unfortunate accidents and incidents.

Intrusion, *in-troo'-zhun* (Lat. *intrudo*, I thrust upon), in Law, is the entry of a stranger, after a particular estate of freehold is determined, before him in remainder or reversion. It happens where a tenant for term of life dies seised of certain lands and tenements, and a stranger enters thereon after such death of the tenant, and before any entry of him in remainder or reversion.

Intuition, *in-tu-ish'-un* (Lat. *intuor*, I behold), in Phil., is applied to that power of the human mind by which a thing is known or comprehended immediately, as soon as it is perceived or attended to. When the mind perceives the agreement or disagreement of two ideas, immediately by themselves, without the invention of any other, this is intuitive; for in this the mind is at no pains of proving or examining, but perceives the truth, as the eye does the light, only by being directed towards it. Thus, the mind perceives that white is not black, that a circle is not a triangle. Things that are known by intuition cannot be made more certain by arguments than they are at first. Axioms are propositions known by intuition. "Intuitive knowledge," says Sir W. Hamilton, "is complete and perfect, as affording the highest certainty of the highest determination of existence, the actual, the here, and the now existent; representative, incomplete and imperfect, as affording only an inferior assurance of certain inferior determinations of existence,—the past, the future, the possible,—the not here and not now existent."

Inula, *in'-u-lă* (its Latin name), in Bot., a gen. of the nat. ord. *Compositæ*, consisting of numerous species, found in every part of the world. The root of *I. Helenium*, or elecampane, one of the largest of British herbaceous plants, yields a starch called *inulin*, which has been used medicinally from the time of Hippocrates. It is an aromatic, tonic, expectorant, and diaphoretic, and has been prescribed in chronic catarrh and in dyspepsia.

Inulin. (*See* Inula.)

Invariable. (*See* Variation.)

Invected, *in-vek'-ted* (Lat. *in*, into, and *veho*, to carry), one of the eight partition lines used in heraldry. It resembles the line termed "engrailed" in form (*see* Engrailed), as it consists of a series of semicircular or scolloped indentations; but it differs from it in having the points of the indentations turned inwards and projecting into the charge, instead of into the field of the shield.

Invention and Discovery, *in-ven'-shun, dis-kuv'-e-re* (Lat. *invenio*, I find out; Fr. *découvrir*, literally, to uncover, lay open what was before concealed).—Invention is the creation or construction of something which has not before existed; discovery is the making manifest something which has hitherto been unknown. Galileo invented the telescope; Harvey discovered the circulation of the blood. In older times, however, this distinction was not observed, and the two terms were used synonymously: thus Locke and Bacon talk of the invention of sciences. The rights of individuals to the honour due to inventions or discoveries are matters of constant discussion in the history of letters and science, and the subject is as yet but little understood. (For a long and interesting article on the subject, we would refer to the *English Cyclopædia*—Arts and Sciences.) It is a very remarkable fact that not unfrequently discoveries are made by more than one person at the same time.

Invention of the Cross, the name of a festival celebrated by the Roman Catholic church on the 3rd of May, in honour of the finding of the cross on which Christ suffered, by the empress Helena, mother of Constantine, A.D. 326.

Inverse Proportion. (*See* Proportion.)

Inversion, *in-ver'-shun* (Lat. *inversio*, change of order), in Rhet., is the placing of words out of their natural order. In every language there is a certain customary arrangement observed in the ordering of words in a sentence. In English the order generally is, first the nominative, then the verb, and afterwards the accusative, if the verb be active. This order, however, is, for the sake of effect, frequently varied; as in the sentence "*Great is Diana of the Ephesians*," which is infinitely more forcible than "Diana of the Ephesians is great." In this respect, the Latin language admits of much more liberty than ours does. Milton, in his prose works, and some of the older English writers, in attempting to imitate this, produced obscurity.

Inversion. (*See* Integral Calculus.)

Invertebrata, *in-ver-te-bra'-tă* (Lat. *in*, not; *vertebra*, a joint of the backbone), in Zool., is a negative term, first employed by Lamarck to designate animals destitute of a vertebral column or backbone. The Invertebrata constitute three out of the four great divisions of the animal kingdom; viz., Articulata, Radiata, and Mollusca. (*See* Vertebrata, or Animal Kingdom.)—*Ref.* Professor Owen's *Lectures on the Invertebrate Animals*.

Investiture, *in-ves'-ti-ture* (Fr.), in the Feudal Law, was the actual conveyance of feudal lands by a lord to his vassal. According to Mr. Hallam, it "was of two kinds,—proper and improper. The first was an actual putting in possession upon the ground, either by the lord or his deputy, which is now called, in our law, livery of seisin. The second was symbolical, and consisted in the delivery of a turf, a stone, a wand, a branch, or whatever else might have been made usual by the caprice of local custom. Du Cange enumerates no less than ninety-eight varieties of investitures." Investitures were introduced at a time when the art of writing was but little known, and by the open and notorious delivery of possession in the presence of the other vassals, who, in case of a disputed title afterwards, might bear witness to the fact.

Invocation, *in-vo-kai'-shun* (Lat. *invoco*, I call upon), in Lit., is applied to that part at the commencement of a poem in which the poet calls upon the Muses, or some one capable of giving him inspiration, to aid him in his labour.

Invocation of Saints, in the Roman Catholic church, is the calling upon or praying to the saints that they intercede with God for men. The invocation of saints is believed to have been introduced as early as the 4th century, and it soon became general in the Church. In the creed of Pius IV. it is said "that the saints reigning together with Christ are to be honoured and invocated, that they offer prayers to God for us;" and in the catechism of the council of Trent they are said to be invoked "because they always see the face of God, and are constituted by him the willing advocates of our salvation."

Invoice, *in'-voys* (Fr. *invoi*), is a list or account of goods or merchandise sent by merchants to their correspondents, giving the quantity, value, &c. of the several articles.

Involucre, *in-vo-lu'-kr* (Lat. *involucrum*), in Bot., a whorl of bracts placed round the base of an umbel, a capitulum, or sometimes a single flower. In some umbelliferous plants,—as, for instance, the carrot,—there are two kinds of involucre, one at the base of the primary divisions of the floral axis or general umbel, and another at the base of each of the partial umbels or umbellules: the former is then called the *general involucre*, and the latter an *involucel*, or *partial involucre*. In the involucres of the heads of flowers in the nat. ord. *Compositæ*, such as the marigold, daisy, &c., there are frequently two or three rows of bracts overlapping each other. To these overlapping bracts the term *phyllaries* has been applied. (*See* Bract.)

Involute Curve, *in'-vo-lute* (Lat. *involutio*, unfolding), in Geom., a curve supposed to be described by the extremity of a string unwinding itself from another curve (evolute) about which it has been rolled.

Involution and Evolution, *in-vo-lu'-shun, ev-o-lu'-shun* (Lat. *involuto*, I enwrap, enfold), in Math., two distinct operations, one of which is the reverse of the other. *Involution* consists in raising the power or index of a number by multiplying it successively into itself. Thus, to raise 4 to $4^3$, or 64, is a process of involution, and is performed by multiplying 4 by 4, and again by 4. Involution in algebra is exactly the same as in arithmetic, symbols only being used instead of figures. *Evolution* is the reverse of involution, and consists in finding the original power of the number from the index to which it has been raised; and the method of the operation will be found given under the separate articles entitled Cube Root and Square Root respectively.

Iodic Acid, *i-od'-ik* (from iodine), in Chem., symbol

$IO_4$, equivalent 167. Iodic acid corresponds in composition to chloric and bromic acids. It is prepared in several ways, the best perhaps being that of M. Millon. Equal parts of iodine and chlorate of potash are mixed in five parts of water. Chlorine is evolved, and iodate of potash remains dissolved in the water. Chloride of barium is next added, which yields an abundant precipitate of iodate of baryta, which is sparingly soluble in water. It is washed and just enough sulphuric acid is added to it to combine with the baryta. The iodic acid dissolves in the water, and sulphate of baryta is precipitated. The iodic acid may be obtained in crystals of the formula $IO_5HO$, by careful evaporation. By a heat of 460° it is rendered anhydrous, and at about 700° it is decomposed into iodine and oxygen. Dissolved in water, it forms a colourless inodorous solution. Organic bodies decompose it; owing to which circumstance litmus-paper is first bleached, and then reddened by it. It forms with different bases three classes of salts, containing one, two, and three equivalents of acid. Thus with potash it forms the iodate, biniodate, and teriodate. The iodates have as yet received no important application.

Iodine, *i'-o-dine* (Gr. *iodes*, violet-coloured), in Chem., symbol I, equivalent 116·8, combining volume 2, spec. grav. of vapour 8·716. Iodine was discovered by Courtois, in 1811, in the waste liquors produced in the manufacture of soda from sea-weed. It is contained in nature, principally in sea-plants and sea-water, in the forms of iodide of sodium, potassium, and magnesium. It also occurs combined with silver in *iodite*, a mineral found sparingly in Peru. The great source of iodine is burnt sea-weed, commonly known as kelp. It is largely manufactured at Glasgow from kelp made on the Scotch and Irish coasts. The following account of the method of manufacture is taken from Graham's "Elements of Chemistry." The sea-weed having been dried in the sun, is burned in shallow excavations at a low heat. Owing to the volatility of the iodide of sodium at a red heat, the loss of this salt would be considerable if the temperature were raised too high. The half-fused ash, or kelp, which remains is broken into fragments and treated with boiling water, which dissolves about one half the ash. The liquid thus obtained is then evaporated in shallow pans, and all that can be separated by crystallization is removed: sulphate of soda, carbonate of soda, and chloride of potassium are thus extracted. The iodine remains in the mother liquor, in company with the sulphide of sodium and some other salts. Oil of vitriol is now mixed with the mother liquor, and the mixture allowed to stand. The supernatant liquor is then decanted, heated in a retort to about 140°, powdered binoxide of manganese being introduced. The temperature is then raised, care being taken not to reach 212°, when the iodine distils over and forms crystals in the receiver, which are resublimed several times, in order to purify them. Iodine generally occurs in commerce in the form of bluish-black scales having a metallic lustre somewhat resembling plumbago. By carefully-conducted sublimation, it may be obtained in rhombic plates an inch long. At ordinary temperatures, it is volatile, emitting an odour closely resembling chlorine, but somewhat weaker. Its specific gravity is 4·947. It fuses at 250°, and boils at 347°, giving forth a magnificent violet vapour, from which it derives its name. Taken internally, in large doses, it is a violent poison, but in small quantities, it is much employed in medicine to remove glandular swellings and goitres. It turns the skin, and most organized bodies, a deep brown, corroding them, if present in large quantities. Water dissolves only a small quantity, which gives the solution a yellow colour. Its bleaching properties are feeble. Alcohol, ether, and solutions of the iodines, dissolve it freely. Iodine attacks the metals freely, iron or zinc being dissolved if placed with it in water. The compounds of iodine with the metals are decomposed by chlorine. Iodine forms a blue compound with starch, a property used as a test to determine the presence of either body. By its means, one part of iodine dissolved in one million of water, may be discovered. An improved method of obtaining it from sea-weed has lately been patented by the inventor, Mr. R. C. C. Stanford. Instead of allowing the weed





to dry on the shores where it is found, Mr. Stanford compresses it into cakes while it is wet, and afterwards dries them by artificial heat. The dried cakes are then submitted to destructive distillation; by which means Mr. Stanford not only gets double the usual amount of iodine, none being lost by heat or washed away by rain; but, in addition, he obtains gas for illuminating purposes, various oils, besides the charcoal left in the retorts. The principal compounds of iodine are iodic acid, hydriodic acid (which will be found described under their respective headings), and the chloride and bromide of iodine. With chlorine, iodine forms two compounds,—the protochloride, a deep brown deliquescent liquid, obtained by distilling iodine with chlorate of potash; and terchloride of iodine, a compound formed by the prolonged action of chlorine upon iodine. It occurs in crystalline orange needles, soluble, with partial decomposition, in water. With bromine it forms two unimportant compounds,—the protobromide and pentabromide. The compounds in which iodine is united to a base will be found described under the heads of the bases. In examining the properties of iodine, bromine, and chlorine, it is impossible not to be struck with the close analogy between these bodies. They form one of those remarkable triads which we find existing amongst the elements, of which sulphur, selenium, and tellurium, lithium, sodium, and potassium, are examples. If we add together the largest and smallest equivalent numbers of any of those triads, and divide it by 2, we obtain a number closely corresponding to the equivalent of the third member of the group. Thus,—

Equivalent of chlorine ..... 35·5
Equivalent of iodine .....127·0

2)162·5=81·25

80 being the equivalent of bromine; or, in other words, the equivalent of bromine is exactly half-way between the other two. Now, we find bromine to occupy an exactly intermediate position between chlorine and iodine in all its properties. From these facts, M. Dumas has ventured to draw the conclusion that bromine is made up of half an equivalent of iodine and chlorine. It is, of course, vain to speculate upon the truth of this hypothesis in the present state of science; but these, and many other facts, point to the inevitable conclusion that many of the substances which we consider to be elements are, in reality, compounds.—For a more complete discussion of this subject, *see* L. Grenville Williams's *Handbook of Chemical Manipulation*, p. 480.

Iodite, *i'-o-dite*, in Min., an exceedingly rare mineral, containing iodide and bromide of silver, found in Mexico and Chili. It occurs in flexible plates of a pearl-grey or yellowish-grey colour. It has also been found in small quantities at Guadalarga, in Spain.

Iodoform, *i-od'-o-form*, in Chem., a compound in which three equivalents of iodine occupy the place of the three equivalents of chlorine or chloroform, *i.e.* $C_2HI_3$, instead of $C_2HCl_3$. An analogous compound is formed with bromine.

Iolite, *i'-o-lite* (Gr. *ion*, a violet; *lithos*, stone), in Min., one of the gem family, known also as dichroite, cordierite, and prismatic quartz. It occurs in granite and primitive rocks, associated with garnet, quartz, and iron and copper pyrites. Its colour varies from violet to dark blue.

Ionian Philosophy, *i-o'-ne-an*, was the earliest of the philosophic systems of ancient Greece, and was so called because its advocates were principally natives of Ionia. The principal members of this school are Thales, its founder, who is also styled the father of Greek philosophy, Anaximander, Anaximenes, Diogenes of Apollonia, Heraclitus, and Anaxagoras. Philosophy in Greece first concerned itself with speculations regarding the origin of nature and the primary materials of the world. Thales taught that water was the original element, out of which all things proceeded. According to Anaximenes, air was the primary material out of which all things rose; while Heraclitus attributed the existence of all things to fire. The two last, however, are not to be regarded as materialists, for they regarded these elements as spiritual essences, [illegible] the soul of man. To what may be considered another

branch of this school, belong Anaximander and Anaxagoras. The former of these regarded the world as made up of numberless small particles, of different kinds and shapes, to the different combinations of which all things owed their existence. Out of primary chaos, certain contraries, as earth and heaven, cold and heat, were first evolved. The whole was moved and directed by an eternal substance, which he called the infinite. This system was also adopted by Anaxagoras, who dwelt still more upon the moving principle by which the elements are brought into combinations of order and beauty, and who may be regarded as the first who clearly and broadly laid down the leading distinctions between mind and matter, the former being the moving principle, perfect and simple, the latter inert matter. The Ionian school became extinct before the more highly-developed system of Socrates.

IONIC DIALECT. (*See* GREEK LANGUAGE AND LITERATURE.)

IONIC ORDER. (*See* ARCHITECTURE.)

IONIDIUM, *i-o-nid'-e-um*, in Bot., a gen. of the nat. ord. *Violaceæ*. The root of the species *I. Ipecacuanha* was supposed by Linnæus to be the true ipecacuanha. It is now known as the *woody* or *false ipecacuanha* of Brazil, and is employed as an emetic in that region. It contains the principle *emetina*. Other species, as *I. parviflorum*, *I. tuber*, &c., have similar properties; the roots of the former constitute the *Cuchunchully de Cuenca*, which is much used in Venezuela as a remedy for elephantiasis.

IPECACUANHA, *ip'-e-kak-u-an'-nă*, a name adopted from the language of the South Americans, has been applied to a variety of emetic roots, but is restricted in the Pharmacopœias to the roots of a species of *Cephaëlis* (which *see*). The officinal root is sometimes called *annulated ipecacuanha*. The root known as *undulated*, *white*, or *amylaceous ipecacuanha*, is the produce of a species of *Richardsonia*; that known as *black*, or *striated*, is obtained from a species of *Psychotria*; and that called *woody* or *false ipecacuanha*, from a species of *Ionidium*. (*See* the above-named genera.)

IPOMŒA, *ip-o-me'-ă* (Gr. *ips*, a worm which infests the vine; *omoios*, like, from its habit of twining round other plants, like the creeping of a worm), in Bot., a gen. of the nat. ord. *Convolvulaceæ*. The roots of the species *I. orizabensis* are sometimes found intermixed with those of *Exogonium purga*, the true jalap of the Pharmacopœias. This spurious jalap is known in Mexico as *male jalap*, and in English commerce as *woody jalap*. It has similar properties to those of the well-known drug, but is less powerful. The roots of *I. Turpethum*, or *Turpetti*, were formerly much used as a purgative. The large roots of *I. macrorhiza* contain much farinaceous matter, and are used as food by the inhabitants of Georgia and Carolina.

IRIDACEÆ, *i-rid-ai'-se-e*, in Bot., the Iris or Cornflag fam., a nat. ord. of *Monocotyledones*, sub-class *Petaloideæ*, consisting of herbaceous plants, usually with bulbs, corms, or rhizomes; parallel-veined leaves, and spathaceous flowers. The perianth is superior, petaloid, and 6-parted, in 2 whorls. The stamens are 3 in number, and are inserted upon the outer segments of the perianth; their anthers are 2-celled, and extrorse: The ovary is inferior, 3-celled, with a single style, having 3 stigmas, often petaloid. The fruit is capsular, 3-celled, and 3-valved, with loculicidal dehiscence. The seeds are numerous, with horny or hard albumen. The plants of this order are chiefly natives of temperate and warm climates; they are particularly abundant at the Cape of Good Hope. There are 57 genera and 557 species. The rhizomes of several species have acrid properties, which render them purgative or emetic; those of others are fragrant. Colouring matter is obtained from some species. Some of the genera furnish the horticulturist with showy border flowers. (*See* IRIS, CROCUS, GLADIOLUS.)

IRIDIUM, *i-rid'-e-um* (Lat. *iris*, the rainbow, from the variety of colours exhibited by its salts), in Chem., symbol Ir, equivalent 98·56,—a somewhat rare metal, found native, and nearly pure, amongst the Uralian platinum ores. It also occurs combined with osmium. Iridium is obtained from either of these sources,—by fusing the chloride of potassium and iridium, by a process too long for description here, and reducing the iridium by means of a current of hydrogen. Iridium is a very hard white brittle metal, only fusible by the strongest heat of Deville's gas furnace. In its pure state it is unacted on by any of the acids or aqua regia. It forms three compounds with oxygen,—IrO, $Ir_2O_3$, and $IrO_2$, which readily pass one into the other, causing the solutions of their salts to assume a variety of colours. From these changes of colour the name has been conferred on the metal. It also forms sulphides and chlorides, but its salts have been very imperfectly examined. It has been used occasionally for pointing gold pens instead of rhodium.

IRIS, *i'-ris*, in Bot., the Flower-de-luce, the typical gen. of the nat. ord. *Iridaceæ*. The species are very numerous, and are generally remarkable for their large yellow, white, or blue flowers, and sword-like leaves. They abound in Europe, but are rare in America. The rhizomes of several species are more or less purgative and emetic. Those of *I. florentina*, *pallida*, and *germanica* possess a violet odour, and are used in perfumery for imparting an agreeable odour to the breath, and by the French especially for making issue-peas. These rhizomes, dried and scraped, constitute the *orris-root* of the shops. The roasted seeds of *I. Pseudacorus*, the yellow flag of this country, have been recommended as a substitute for coffee, but they do not appear to have any of the valuable properties of that beverage. The genus is named from Latin *iris*, the rainbow, on account of the variety of colours exhibited by it.

IRIS. (*See* EYE.)

IRISH MOSS. (*See* CHONDRUS.)

IRITIS, *i-ri'-tis*, in Med., is an inflammation of the membrane of the eye. It usually commences with pain in the eye and intolerance of light; afterwards the colour of the iris changes, owing to the secretion of coagulable lymph, which spreads over it in a fine flake. Iritis, if it go on, is likely to end in adhesion of the iris to the neighbouring parts, in which case there is a loss of the power of contracting and dilating, or it may even be completely closed. Sometimes an abscess forms and bursts, discharging its contents into the anterior chamber of the eye, and causing an entire loss of vision. In the treatment of this disease, leeches and cupping, and cold applications to the eye, are to be employed; mercury is also usually administered in large doses.

IRON, *i'-run* (Sax. *iren*), in Chem., symbol Fe (ferrum), equivalent 28, spec. grav. 7·844. This important metal is most extensively diffused over nature, occurring not only in the inorganic kingdom, but entering into the composition of vegetable and animal structures. It occurs in nearly every part of the earth, in the form of ores, a full description of which will be found under IRON, METALLURGY OF. It has also been occasionally found native amongst the ores of platinum. It occurs in the metallic state with nickel, cobalt, and other metals, in meteoric stones, some of which weigh as much as fourteen or fifteen tons. Iron may be obtained chemically from the following process, recommended by Berzelius. Filings of the best bar iron, or pieces of pianoforte wire, are mixed with one-fifth of their weight of pure peroxide of iron, and placed in a crucible, with a quantity of powdered glass free from lead. The whole is then exposed to the highest temperature of a wind furnace or smith's forge. By means of the oxygen contained in the peroxide of iron, all traces of carbon and silicon are oxidized, and the result is a button of pure iron of silver-like lustre. Such iron is very tough, and much softer than ordinary bar iron. Pure iron may also be obtained by heating the pure peroxide in a current of hydrogen. Iron reduced in this manner is used in medicine, under the name of Quevenne's iron. In its pure state, iron presents a dusky-grey colour and a rather feeble lustre, which is greatly improved by polishing. Its physical properties are described under IRON, METALLURGY OF. It is not affected by dry air or oxygen; but if moisture be present, it gradually passes into the state of hydrated sesquioxide, or rust, as it is termed in common parlance. At first, the process is slow, but after a time the spot of oxide forms the negative pole of a voltaic combination, and the oxidation proceeds rapidly. The same thing occurs if any other metal be present; thus, the parts of iron railings which are in contact with the solder used in

joining them together, are rapidly eaten away when exposed to the weather. Iron combines with most of the metals to form alloys, and directly with the iron metallic elements. It decomposes the diluted hydrogen acids with great facility, eliminating hydrogen. Nitric acid attacks it with evolution of binoxide of nitrogen. Under certain circumstances, iron is capable of assuming what is termed the *passive condition*. If a piece of clean iron wire be introduced into nitric acid of about 1·35 specific gravity, it is acted upon with great rapidity; but if the metal be touched beneath the surfaces of the acid with a piece of gold, platinum, or plumbago, the action ceases. If a second wire be made to touch the first, and then dipped into the acid, it is also rendered passive. The second wire may also be used to render a third wire inactive. If, however, any of these wires be exposed to the air for a few seconds, they return to their original condition. The same occurs when iron is plunged into nitric acid of specific gravity 1·45, in which it may be kept for years without losing its brilliancy, and if withdrawn and plunged into acid of 1·35, it has no action on it. If it be wiped, however, before doing so, it is dissolved by the weaker acid. The passive condition of iron is supposed to be due to a change in its metallic condition. Dilute sulphuric acid also dissolves iron with evolution of hydrogen. Iron, in the metallic state, is of great use to the chemist for precipitating certain metals, such as copper, from their solutions in the metallic form. By careful fusion and gradual cooling, iron may be obtained in cubical and octahedral crystals.

IRON, MANUFACTURE OF, may be divided into three divisions:—1. *The preparation of the ore.* 2. *The extraction of the metal.* 3. *The purification of the metal.* The preparation of the ore is effected in a very simple manner, either by pounding and levigating, to separate the clay and silica, and other impurities, or by roasting, to draw off sulphur and carbonic acid, and to render the ore the more easily crushed. The extraction of the metal from the ore was formerly effected by means of charcoal, in what was termed a Catalan forge,—a method much employed in America and Sweden; but it is only used in a few instances in this country. On account of the loss of metal during the process, it will be better to describe the usual method of smelting ores in England by the blast-furnace. A blast-furnace consists of a long cone inverted upon a shorter cone, at the bottom of which is a vertical passage called the crucible, into which are inserted three pipes, termed tuyères, through which the blast is conveyed; also a larger opening, through which the slag may be withdrawn at intervals. At the bottom is a hole called the tap-hole, usually closed with clay, for drawing off the reduced metal when a sufficient quantity is formed. The furnace is fed with coal, limestone, and ore, from a hole near the top, the charge being renewed from time to time, as the materials burn down. The action by which the ore is reduced to the metallic state may be traced as follows:—The oxygen of the air of the blast combines with the carbon of the coal to form carbonic acid during the process of combustion. The carbonic acid, in its passage through the rest of the heated fuel, is decomposed, being converted into carbonic oxide. The carbonic oxide still ascending, meets with the hydrogen and coal-gas, together with which it forms a reducing mixture, abstracting the oxygen of the ore and setting free the iron in a metallic state, which sinks down to the bottom of the furnace, where it comes in contact with the carbon of the coal. With this carbide of iron is formed, increasing the fusibility of the reduced iron to such an extent that the lime, clay, and silica present, which have been converted into a fusible slag, float on the top as an imperfect glass. The slag runs over through the side apertures provided for the purpose, and the metal is withdrawn every twelve or twenty-four hours through the tap-hole. It is run into moulds, consisting of a long channel, from each side of which run shorter ones. The central channel is known as the *sow*, the side ones as the *pigs*; hence the term pig-iron, as applied to rough cast-iron. Great improvements have lately been made in the process of smelting iron, by the introduction of a heated blast for urging the combustion, and by using the combustible gases issuing from the top of the furnace for heating the blast, or the boilers of the





steam-engines used for the blowing-machines. These improvements are now in use at most of the principal ironworks throughout the kingdom; and an idea of their importance may be gathered from the fact that, fifteen years ago, a yield of 200 tons per week per furnace was thought to be a large quantity; whereas now, at the Ulverstone and other works, 600 and 650 tons per week is thought an ordinary yield. Not only this, but the amount of fuel used has been reduced to one-quarter by the same means. The iron that comes from the furnace is generally much too impure to be used for any but the very roughest castings; it therefore has to be remelted, to drive off as much as possible of the uncombined carbon, or graphite, silicon, phosphorus, sulphur, and other impurities. A single refusion converts it into what is termed "No. 2 pig," or grey iron, a fusible and liquid metal; a second and third still further purifying it from carbon, until it is converted into refined or white iron, in which the whole of the carbon is combined with the metal. This description of cast-iron is only used for conversion into malleable iron; for, although it melts easily, it forms a much more pasty mass than some of the intermediate qualities of grey iron, which melt into a more liquid metal, fitting them for casting purposes. Refined iron made from the German spathose ores contains a large quantity of combined carbon and manganese, and crystallizes in large plates. It is termed *spiegel-eisen*, or *mirror iron*, from the brilliancy of its crystalline structure, and is much valued for making steel. Founders are accustomed to divide cast-iron into three or four qualities. No. 1, pig or black cast-iron, which contains a large proportion of uncombined carbon. No. 2, or grey cast-iron, which contains more combined carbon. No. 3, or mottled, which contains only a few grains of uncombined carbon here and there, giving it a mottled appearance. No. 4, or refined iron, in which the whole of the carbon is combined. No. 4 is very hard and brittle, and is fit for puddling or conversion into malleable or wrought iron. This is effected by bringing an ingot of refined iron to a state of fusion in a reverberatory furnace, taking care to avoid the contact of fuel. The heat is continued until the ingot parts with its carbon, which is assisted by throwing on it scales of oxide, if produced in the forge. As the carbon burns off, the ingot becomes more and more pasty, until at length it is converted into a granular sandy mass. The heat is now raised until it becomes very intense, and the air is excluded by closing the damper and doors. The metal begins to agglomerate into round masses, or blooms, which the puddler collects on the end of an iron rod, and subjects, while still hot, either to the action of a hammer or to a powerful press, called a sloughing-press, which squeezes out the slag and other impurities, and forces the particles of the iron closer together. The iron is then rolled into bars, and forms what is termed homogeneous iron, a quality of metal much used where great hardness is required. It is distinguished by its granular texture when notched and broken. It is much used for the tops of railway bars and for the wearing surfaces of railway wheels. Where the fibrous quality of iron is required, it is cut into lengths, after the first process of rolling; then piled longitudinally, heated in a reverberatory furnace, and hammered out. This process is repeated several times. Fibrous iron has a fracture like a piece of cane, and is used where resistance to a pulling strain is required, such as in the case of chains, anchors, &c. Railway bars are mostly made with the interior of the rail of fibrous iron, to bear the weight of the passing trains, while the exterior are made of granular iron, to bear the wearing action of the wheels. The malleable iron of commerce is nearly pure, and may be taken as the type of iron used for metallurgical purposes. Wrought-iron is of a bluish-white colour; it is hard and lustrous when polished, and when rubbed forcibly, it emits a peculiar odour. Its average specific gravity is 7·7 to 7·8, and it requires the most intense heat of a wind-furnace to melt it. It passes into a pasty condition before melting, a property which enables it to be joined together, or welded, by hammering. At a red heat, it is possessed of considerable malleability, especially when free from sulphur or phosphorus; but when cold, it possesses but little of this property, as compared with gold and silver. In

ductility and tenacity, it exceeds all other metals, a piece of iron 1¼ inch square having been known to bear a strain of 64 tons. It is inferior to many metals as a conductor of heat and electricity. One of its peculiarities is its capability of being attracted by the loadstone or electro-magnet, and of being converted by them into a permanent magnet, when combined with carbon, as in steel, or with sulphur and oxygen, as in magnetic oxide and certain varieties of pyrites. Thus, magnetic oxide, $Fe_3O_4$, and the two varieties of pyrites, $Fe_2S_3$ and $Fe_7S_8$, are all capable of being magnetized permanently; but if the oxygen or sulphur is present in other proportions, they are completely indifferent to magnetic action. Heated to redness, iron loses its magnetic property, but regains it on cooling. Its uses are too well known to need description. The purest variety of commercial iron is piano-forte wire, which may be used as a source of this metal in all chemical experiments. It is converted into steel by being combined with a certain amount of carbon, a process fully explained under the head of STEEL.

IRON, METALLURGY OF.—It will be best to commence the account of the manufacture of this important metal by a description of the typical ores from which it is obtained. The principal ores of iron may, for convenience, be divided into two great classes:—1. the OXIDES; and, 2. the CARBONATES. It will be unnecessary to take into consideration the meteoric masses of iron found in different parts of the world, as their economic use only obtains among savage nations, or as a mere matter of curiosity. The oxides used as ores are somewhat numerous; but may be divided into four distinct classes:—1. *Magnetic iron ore*, or *loadstone*. This ore consists of the protoxide and sesquioxide of iron, mixed with small quantities of silica. It generally contains 69 per cent. of peroxide and 31 of protoxide,—the impurities being so small as not to be counted. It occurs in massive beds in different parts of the earth, more especially at Arendahl and Dannemora, in Sweden. It is also found abundantly in different parts of America. The iron made from it is of great purity, being perfectly free from sulphur or phosphorus; hence the Swedish iron, which is made from it almost entirely, is more valuable than any other. A large deposit of this ore has lately been found in Yorkshire. The titaniferous iron sand found at Taranaki, in New Zealand, consists almost entirely of magnetic iron ore and titanium. Titanium appears to exercise a most beneficial influence on steel containing small portions of it; the Taranaki sand is therefore much valued on this account.—2. *Specular iron*, *oligist*, or *iron glance*. This ore, which is found principally in the island of Elba, occurs in rhombohedral crystals, which possess great lustre. It is composed of sesquioxide of iron, with a small admixture of magnetic oxide. *Micaceous iron ore* has nearly the same composition, the crystals being in brilliant plates instead of in rhombohedral masses. It is found in small quantities amongst the hæmatites of Wales and Lancashire.—3. *Red hæmatite*. This important ore is found in uniform radiated fibrous masses, in different parts of the world, and consists of the sesquioxide of iron nearly in a state of purity. It is found in large quantities in Wales and Lancashire, some of the specimens from the latter locality containing nearly 99 per cent. of sesquioxide, the remainder being silica. It makes excellent iron.—4. *Brown hæmatite*. This ore consists of sesquioxide of iron in a state of hydration, and occurs in reddish-brown masses of a botryoidal, stalactitic, or reniform shape. Hydrated sesquioxide of iron is also found in amorphous masses mixed with clay. Bog-iron ore belongs to this class. It is a valuable ore, and is found in England, Wales, and Scotland. The CARBONATES are principally two:—1. The *spathose ore*, or sparry protocarbonate, which is found principally in crystalline masses in and about Siegen, in Prussia. It occurs also at Weardale, in Yorkshire, and in one or two other localities in England and Wales. It is valued exceedingly, from producing iron crystallizing in large plates, and known in commerce as *spiegel-eisen*. This iron contains certain proportions of manganese and carbon, which render it extremely valuable for steel-making. 2. The *clay*, or *black band ironstone* of the coal-measures, which consists of protocarbonate of iron associated with clay and carbonaceous matter.





It is the principal ore of the Staffordshire and Scotch iron districts, where it occurs associated with the flint and fuel necessary for smelting it. The position England occupies with respect to the production of iron may be said to result from this extraordinary association of the three necessary materials for the manufacture of this metal. Iron pyrites cannot be said to be an ore of iron in the strict sense of the word, being only available as a source of sulphur and sulphate of iron.

IRON, OXIDES OF, in Chem.—Iron yields, at least, four compounds with oxygen,—1. the *protoxide*, FeO; 2. the *sesquioxide*, or *peroxide*, as it is often called, $Fe_2O_3$; 3. the *black* or *magnetic oxide*, which is looked on by some chemists as $Fe_3O_4$, and by others as a compound of the protoxide and peroxide, FeO + $Fe_2O_3$; and 4. *ferric acid*, a weak metallic acid, only known in combination with the alkalies, $FeO_3$. The protoxide, FeO, has never been obtained in a pure state, and does not appear capable of existing in the anhydrous condition. It is precipitated as a white hydrate when a solution of potash is added to a solution of protosulphate of iron; the precipitate, however, rapidly absorbs oxygen from the air, passing first into the green hydrated magnetic oxide, and afterwards into the red hydrated sesquioxide. It forms well-marked salts with the acids. The *protonitrate of iron* is best prepared by decomposing the protosulphate with nitrate of baryta or lead. It forms a light-green solution, from which it crystallizes with difficulty *in vacuo*. If heat be applied, it deposits a basic salt of the peroxide. Its solution is much used in photography as a developing agent, from the greediness with which it absorbs oxygen. (*See* PHOTOGRAPHY.) The *protosulphate of iron*, which is also known by the names of *sulphate of iron*, *green copperas*, and *green vitriol*, is formed when iron or its sulphide is dissolved in dilute sulphuric acid. It is generally prepared from the sulphide, or iron pyrites, by first abstracting a portion of the sulphur by roasting, and then oxidizing the mass by exposure to the air and moisture: by this means oxygen is absorbed, which converts the remaining sulphur into sulphuric acid, and the iron into protoxide. The mass is exhausted with water, and the solution evaporated and crystallized. For chemical purposes, it may be obtained by dissolving 1 part of pure iron in 1½ parts of sulphuric acid diluted with 4 parts of water. It crystallizes in bluish-green rhomboidal crystals, containing 7 atoms of water. The sulphate of iron obtained in commerce has a grass-green colour, owing to a portion of persulphate being present. Its solution has a strong affinity for oxygen, and is greatly used in photography as a developing agent, having been introduced into that art by Robert Hunt. It is largely used in dyeing and in ink-making; it also forms an important ingredient in medicines which are exhibited in cases of deficiency of iron in the blood. With the sulphates of the alkalies and manganese it forms double sulphates, which must not be confounded with the double salts of the sesquisulphate, which are alums. At a strong heat it is decomposed into *colcothar*, or sesquioxide of iron, much used in polishing metals. The *protocarbonate of iron* occurs in nature as spathose ore and clay ironstone. The other proto-salts are unimportant. *Sesquioxide*, *peroxide*, or *red oxide* of iron, is obtained in a variety of ways, the best of which is by precipitating a solution of the sesquichloride by ammonia. It falls as a flocculent hydrate, soluble in acid, which may be converted by a moderate heat into the anhydrous sesquioxide, which is attacked by acids with difficulty. It occurs abundantly in nature, and forms most valuable ores of iron. It is much used in colouring glass. It is also extensively employed for the purpose of purifying coal-gas from sulphuretted hydrogen, with which it forms a protosulphide, which, when it ceases to absorb any more sulphuretted hydrogen, is reconverted into the sesquioxide for future use, by exposure to a current of air. It has also been applied to the purification of water. Sesquioxide of iron, under certain circumstances, appears to exhibit feebly acid properties; Pelouze having succeeded in forming a white compound of the composition $4CaO,Fe_2O_3$. The magnetic oxide is regarded by many as a compound of the protoxide and sesquioxide. Heated to whiteness, it forms the magnetic oxide. The sesquinitrate is formed by heating

metallic iron in nitric acid. It is an unimportant salt, crystallising in yellow four-sided, rectangular prisms. The sesquisulphate is obtained by heating a solution containing one equivalent of the protosulphate with half an equivalent of sulphuric acid, and adding to the solution nitric acid in small quantities, as long as red fumes are given off. A yellowish-white deliquescent mass is obtained. Sesquisulphate of iron, like the sesquisulphates of alumina and chromium, unites with the alkaline sulphates to form alums. The other sesquisalts of iron are unimportant. The *magnetic oxide, black oxide, ferrous-ferric oxide*, or *protosesquioxide*, as it is variously termed, occurs in nature as loadstone, and forms several very important ores of iron. It may be made by exposing fine iron wire to the action of steam at a red heat, or in a hydrated condition, by peroxidising two parts of protosulphate of iron with nitric acid, to which is afterwards added one part of protosulphate. The whole is then poured into a solution of ammonia, with constant stirring. The hydrated oxide is of a green colour, and is attracted by a magnet. The black oxide produced by heat contains a large proportion of magnetic oxide. *Ferric acid* has not been yet obtained in a separate state. The potash salt may be formed in solution by heating a mixture of one part of sesquioxide with four of nitre to full redness. A brown mass is obtained, which, when washed, gives a violet solution of ferrate of potash. It has never been crystallized, being extremely unstable. It may be obtained in the form of a brownish-black precipitate, by passing chlorine through a strong solution of potash in which peroxide of iron is suspended. Ferrates of soda, lime, baryta, strontia, &c., have also been formed. With chlorine, iron forms two chlorides,—the *protochloride*, which is made by passing dry hydrochloric acid over ignited metallic iron, when it sublimes in yellowish crystals. By dissolving pure iron in a slight excess of hydrochloric acid, it may be obtained in pale-green rhomboidal crystals, containing four equivalents of water. The sesquichloride is obtained by dissolving the sesquioxide in hydrochloric acid, from the solution of which it may be obtained in yellow scaly crystals, with five equivalents of water, or by passing chlorine over heated iron filings, which produces the anhydrous salt in brown scales. The impure solution has been greatly used as a sewage deodorizer. Iron forms two bromides, which are unimportant. Iodine combines with it in two proportions,—FeI, the protoxide, made by dissolving iron wire or filings in water containing four times their weight of iodine, forming a solution which yields pale green crystals on evaporation; and the sesquiiodide, $Fe_2I_3$, formed by dissolving sesquioxide of iron in hydriodic acid. It is a red volatile deliquescent mass. The protiodide is used in medicine in combination with syrup, which retards its decomposition. Iron forms numerous compounds with sulphur, the only important ones being the *protosulphide*, FeS, and the bisulphide, $FeS_2$, or iron pyrites. The protosulphide is occasionally found in nature, but it is generally made by projecting into a red-hot crucible a mixture of thirty-two parts of iron filings and twenty-one parts of flowers of sulphur. It is largely used in the laboratory as a source of sulphuretted hydrogen. The *bisulphide* occurs abundantly in nature as iron pyrites, and is used exclusively as a source of sulphur and green copperas. The compounds of iron with phosphorus are unimportant, except as exercising a deleterious influence on metallic iron containing them. With carbon it forms one carbide, $FeC_3$; however, very small quantities of carbon exercise an important action in the formation of steel. (*See* STEEL and CAST-IRON.) Boride of iron has been obtained by reducing the borate by hydrogen, and silicide of iron is supposed to enter into the composition of *woots*, or Indian steel. A nitride of iron has been obtained by Fremy, as a white powder of uncertain composition. The compounds of iron salts, with the salts of the organic acids and bases, are numerous and important, being much employed in medicine. The citrate of quinine and iron, of ammonia and iron, and many others, form elegant preparations much in vogue. They are mostly uncrystallisable, and are generally prepared in the form of scales, by evaporating their solutions on glass, and stripping off the horny transparent masses formed.

IRONY, *i'-ron-e* (Gr. *eironeia*), in Rhet., is a form of expression in which the words used convey a meaning the direct contrary of what is intended. The essence of irony consists in its being simple and natural, not too closely concealed, as that its meaning may be hid, and yet not so patent as to deprive it of its natural character. In speech, there is usually a particular tone in which irony is expressed. The meaning given to this word by the ancients was somewhat different from that in which it is now employed: it denoted an ignorance purposely affected, to provoke or confound an antagonist, and was much employed by Socrates against the Sophists, who indeed obtained the name of the Ironical.

IRRADIATION, *ir-rid-e-ā'-shun* (from Lat. *irradio*, I shine), a term generally used to signify the apparent enlargement of the disc of a celestial body. In a more restricted sense, the word properly denotes the emission of rays from any luminous object. Irradiation, as an enlargement, is caused either by a deviation of the rays of light from a rectilinear direction, or by some illusion caused by the action of light on the eye. When rays of light from points on the surface of an object fall on the retina, an agitation may be produced, extending to within short distances near the points to which the humours of the eye cause the rays to converge. A perception may consequently arise, of a fringe or border round a luminous body, which will give an apparent enlargement of such body. A star, for instance, seen with the naked eye, seems to be a disc of sensible magnitude. On account of its distance it would appear to be a point, if the rays of each pencil of light produced no effect beyond the axis of convergence. Thus, the discs of both the sun and moon are in like manner conceived to be apparently enlarged. When the moon is new, the part which is rendered luminous by the sun appears to be a portion of a larger sphere than the part which is more faintly illuminated by the reflected light from the earth: this phenomenon is also accounted for by the apparent enlargement, by irradiation, of the part enlightened by the sun. A kind of irradiation may also be produced, more or less, in a telescope, from defects in the object-glass, the irrationality of dispersion and diffraction, all of which give an apparent magnitude to a luminous point. The apparent magnitudes of celestial bodies were very erroneously estimated before the invention of the telescope. Tycho Brahe estimated the diameter of Venus to be twelve times, and Kepler seven times, greater than it is now known to be. The cause of such mistakes is not removed by the telescope, but, by increasing the seen diameters without magnifying the effect of radiation, a proportional diminution is made in the error caused by the apparent enlargement. Objects which are of equal size, through the effect of irradiation, often appear to differ in size: this effect depends either on their colour or the quantity of light which falls upon them. It was remarked by Sir William Herschel, that when a bright circle was viewed together with a dark one on a bright ground, the former always appeared larger than the other; and in order to correct the error in estimating the magnitudes of the columns about temples, when seen against a bright ground, the ancients made the thickness of the columns to increase proportionately to the distance between them. Vitruvius, in his work on architecture, explains this practice by saying that the columns with wide intervals, being more surrounded by the air, appear on that account to be more slender than those which are closer. The perceptions of magnitude, however, depend partly on those of distance, and a contrary effect frequently takes place with objects viewed against the sky, when they are believed to be more distant than is really the case. (*See* INTERCOLUMNIATION.)

IRRATIONAL, *ir-rish'-o-nal* (Lat. *irrationalis*), a term applied, both in Arithmetic and Algebra, to numbers or quantities whose roots are incommensurable with unity, and which cannot, therefore, be accurately extracted. Thus, the root of 2, or $\sqrt{2}$, is irrational, because it cannot be expressed by any finite number. If the side of a square be equal to 1, then $\sqrt{2}$ will be its diagonal, and will consequently be irrational; for geometry teaches us that the diagonal of a square is incommensurable with its sides. In Algebra, irrationals are termed *surds*, and although they cannot be

expressed in any finite numbers, yet close approximations can be made to their intrinsic values. Nothing shows this more plainly than the evolution of binominal surds, which gives as near a value as possible to the result aimed at. The theory is as follows:—Assume $\sqrt{x}+\sqrt{y}=\sqrt{a+\sqrt{b}}$; then, by squaring each side, we gain $x+y+2\sqrt{xy}=a+\sqrt{b}$; $\therefore x+y=a$, and $2\sqrt{xy}=\sqrt{b}$. From these two equations we find $x$ and $y$ thus,—

$$\left.\begin{matrix} x^2+2xy+y^2=a^2 \\ 4xy \quad\quad =b \end{matrix}\right\} \therefore x^2-2xy+y^2=a^2-b$$

And, $x-y=\sqrt{a^2-b}$; but $x+y=a$

$$\therefore x=\frac{a+\sqrt{a^2-b}}{2}, \text{ and } y=\frac{a-\sqrt{a^2-b}}{2};$$

which gives us the nearest approximation to the value of the root $\sqrt{a+\sqrt{b}}$.

Irreducible Cases, *ir-re-du'-si-bl* (Lat.), are well expressed to be those peculiar cases in the solution of cubic equations in Algebra, where Cardan's theory, or formula, fails in its application, on account of its imaginary expression. This unfortunate circumstance caused great difficulties to arise in the paths of early analysts; and even up to the present day all efforts may be deemed unsuccessful. In Brande's Dictionary, a clever article on the subject well explains the difficulty. "In order to show in what it consists, let the proposed cubic equation be $x^3+ax+c=0$; then, by Cardan's rule, we have $x=(\frac{1}{2}c+\sqrt{\frac{1}{4}c^2+\frac{1}{27}a^3})^{\frac{1}{3}}+(-\frac{1}{2}c-\sqrt{\frac{1}{4}c^2+\frac{1}{27}a^3})^{\frac{1}{3}}$. Now if, in this expression, $a$ is negative, and $\frac{1}{27}a^3$ is greater than $\frac{1}{4}c^2$, then $\frac{1}{27}a^3+\frac{1}{4}c^2$ will be a negative quantity, and consequently the extraction of its square root will be impossible, as the expression $\sqrt{\frac{1}{27}a^3+\frac{1}{4}c^2}$ will be imaginary. (*See* Imaginary Quantities.) But it is known, from the theory of equations, that every cubic equation must have at least one real root; and it is a circumstance not a little remarkable, that those cubic equations in which this imaginary expression occurs have not only one real root, but have all the three roots real. It is possible to disengage the expression for the value of $x$ from the imaginary quantities by expanding it by the binominal theorem; for the imaginary quantities, which will be the same in both the resulting series, will be positive in the one series and negative in the other; and therefore, on adding the series together, they will be eliminated." However, the series which results from this source will rarely be what is termed convergent, and, consequently, the method will be deprived of any utility it might have appeared to possess. The following method is, perhaps, the simplest of the many which have been devised wherewith to solve the difficulty of cubic equations. Suppose $x^3-xy=s$ be the proposed equation, an arc, $a$, must then be found in the trigonometrical tables whose natural cosine is $3s\sqrt{3}+2y\sqrt{y}$; then the three roots of the equation will be—

$$x = 2\sqrt{\tfrac{1}{3}y}\times\cos\tfrac{1}{3}a$$

$$x = 2\sqrt{\tfrac{1}{3}y}\times\sin\tfrac{1}{3}(90^\circ-a)$$

$$x = -2\sqrt{\tfrac{1}{3}y}\times\cos\tfrac{1}{3}(90^\circ-a).$$

These formulæ will apply whether $s$ be negative or positive; but when $s$ is negative, it would simplify the elimination if the arc $a$ should be chosen, so that its *sine*, and not its *cosine*, be equal to $3s\sqrt{3}+2y\sqrt{y}$, when the roots will be found in a much easier manner.

Irrigation, *ir-re-gai'-shun* (Lat. *irrigo*, I water).—In general language, this term is employed in Agriculture to signify the watering of the earth to increase its fruitfulness. In a more confined sense, the term is applied to that species of flooding which consists in spreading a sheet of water over a field or meadow, in such a manner that it can be readily withdrawn. Water is the most essential of all the substances which concur in the vegetation and growth of plants: no seed can germinate, and no plant receive nourishment, without moisture. No verdure exists in those warm climates where the rains are periodical and the soil is dried up by continual evaporation, unless springs or rivers supply the moisture required; and vegetation is





always the most luxuriant where there is abundance of water, a warm temperature, and rapid evaporation. The observation of these circumstances suggested various methods of irrigation. The artificial watering of the earth, chiefly to produce increased crops of grass, has been in use from a very remote period. In many parts of the East the climate is such that, in various situations, soils now fertile would be rendered sterile, were not the ground enriched with copious supplies of water. In patriarchal times, various hydraulic machines were used for the purpose of supplying the ground with water. Some of these resembled the water-wheels of the fen-districts of England, and were worked by the feet of men, somewhat after the manner of the modern treadmill. It is to this custom that Moses alluded when he reminded the Israelites of their sowing their corn in Egypt and watering it with their feet (Deut. xi. 10). In the sandy soils of Arabia, a similar practice still exists. At the present day, in Egypt, water is sometimes raised, for purposes of irrigation, by means of a wicker basket lined with leather, which is held by cords between two men, who, by this laborious means, swing it over the banks of the Nile into the canal which conveys it to the lands intended to be irrigated. The early employment of irrigation by the Egyptians and Chinese was most probably the result of the good effects which were observed to be produced by the overflowing of the Nile and the Chinese rivers. In Italy, especially on the banks of the Po, irrigation has been carried on since before the time of Virgil; and the process is still employed in the same district with great care and zeal. After the fall of the Roman empire, agriculture rapidly declined; but, singularly enough, irrigation continued to be practised throughout the dark ages with great success. This was more especially the case in Lombardy, where the princes patronized and followed the example of the various religious establishments. The waters of the chief rivers of Northern Italy, such as the Po, the Adige, the Tagliamento, and of all the minor streams, are used at the present day in irrigation. No other country possesses so large an extent of rich water-meadows as that portion of Italy. The whole country, indeed, from Venice to Turin, may be said to be formed into one great water-meadow. From Italy the practice spread into France and Spain, and lastly into Britain. In Bengal, wells are dug in the highest parts of the fields, and from them, by means of bullocks and a rope over a pulley, water is raised in buckets, and conveyed to all parts of the fields by small channels. Long before the discovery of the new world by Columbus, irrigation was practised by the Mexicans. They collected the water from mountain torrents, and conducted it to their lands by means of proper channels, with great care and skill. It was not till the end of the 17th century, however, that water-meadows were constructed in Britain upon anything like a scientific system. Of these, those in Wiltshire, which are amongst the most celebrated in England, were constructed between 1700 and 1705. The water-meadows of Hampshire and Berkshire were made about the same time. Towards the conclusion of the 18th century, great improvements took place in this branch of agriculture. With regard to the precise manner in which irrigation acts, it would seem that much depends upon the chemical properties of the river-water employed. Atmospheric air and water contain all the principal elements of vegetables; namely, oxygen, hydrogen, nitrogen, and carbon; the rest are either present in the soil, or held in solution in the water. Besides, it seems probable that water has an important office with respect to the growth of plants. If the principle discovered by Macaire is admitted, namely, that plants reject through their roots those portions of the sap which form the residue of its elaboration, these portions can be of no further use to the plant, and may, in fact, be injurious to it. It may be, therefore, necessary to remove this residue, or excrement, as it may be called; and the percolation of water through the soil would appear to be the means which nature has provided for this purpose. It can, therefore, be readily supposed that the simple washing of the roots with pure and soft running water has a beneficial effect upon plants. If water be allowed to grow stagnant, and to evaporate, leaving the hurtful

matter in solution to remain in the soil, all the advantages of irrigation are lost. In such cases, rushes and coarse aquatic plants grow instead of grasses, as may be seen in all marshy places. Irrigation, to be effectual, depends, therefore, upon the circulation of the water; and the more porous the soil, and especially the sub-soil, the more vigorous is the vegetation. In all cases of irrigation, the water, whether it comes from natural lakes and rivers, or artificial wells and ponds, must first be above the level of the land to be irrigated. This is generally the most important point to be considered. There must also be a ready exit for the water; consequently, the land must not lie lower than the natural receptacle of the water. One of the first and most important steps in irrigation is, therefore, taking the level. This becomes a simple matter when the ground lies along the banks of a running stream. A channel, receiving the water at a higher point than that to which the river flows, may be dug at a less declivity than that of the bed of the stream, and made to carry water higher than the banks of the river; from which level it can be allowed to descend slowly, and irrigate a considerable space, before it returns to the stream. This form of irrigation is the most common; and the size, shape, and direction of the channels depend on the nature of the soil, surface, &c. In all irrigation, the general principle may be described as the supply of an abundance of water to every portion of the surface, and taking it off again with rapidity. Artificial modes of effecting these two results are often necessary. When the surface to be irrigated is flat and level, it is frequently necessary to form artificial slopes for the water to pass over. The whole of the ground is then laid in broad undulating beds, the upper part of which is quite level from end to end when the supply-channel is cut. All the supply-furrows are fed by a main channel at right angles to the beds and somewhat above them. When the flood-gates are opened, the water flows into all the upper channels very regularly, till it fills them to overflowing in their entire length. The best water-meadows are those which have a perfect command of water and a regular supply. During frost, when the vegetation of dry meadows is suspended, the water-meadows are allowed to have a current of water flowing over them. By this means they are protected from the effect of frost, and the grass continues to grow as long as the water flows over it. Whenever the temperature is above freezing, however, the flow of water is stopped, as too much moisture would be injurious to the vegetation. By this means, at the first sign of spring, before the dry meadows have recovered from the effects of winter, the grass grows rapidly in the water-meadows. By careful and judicious management, two or three crops of grass can also be obtained in one season. When the water is suited for irrigation, the land never requires manure. The best soil for a water-meadow is a good gravel. The water of the Avon, in Wiltshire, would appear to contain all the principles essential to rapid vegetation; for the finest and richest water-meadows on its banks are situated in a mere bed of shingle matted together by the roots of the grass. In England, the great advantage of water-meadows is not so much the superior quantity and quality of the grass produced, as the early spring crops furnished by them. They thus afford pasturage to ewes and lambs, which can, by this means, be brought earlier into the market. Christmas is the usual time for letting the water on to water-meadows, and it is generally allowed to flow over while the frost lasts: if the weather is mild, it is shut off during the day and turned on at night. The grass begins to grow rapidly, and is soon ready to be fed off. There is, perhaps, no agricultural question of greater importance, in a national point of view, than the improvement of land by irrigation; for, by its means, all the rich organic and other matters diffused through the rivers, which would otherwise be borne to the sea, are saved to agriculture.

**Irvingites**, *ir'-ving-ites*, is the name commonly given to a sect of Christians, after the Rev. Edward Irving; but who style themselves "the Catholic Apostolic Church." In the winter of 1829-30, Irving delivered a series of discourses in his church in Regent Square, London, on the subject of spiritual gifts,





and soon after various persons of his congregation professed to be gifted with unknown tongues, the spirit of prophecy, &c. By these persons Irving was led away, and, being expelled from his own body, became the founder of a new sect,—the Irvingites. They recognise, as the only standards of faith, the three creeds of the catholic church—the Apostles', the Nicene, and St. Athanasius's. They hold that supreme rule in the Church ought to be exercised, as at first, by twelve apostles, not elected or ordained by men, but called and sent forth immediately by God. Besides apostles, they have prophets, evangelists, and pastors, forming the ministry of the Church. These, together with the powers and gifts of the Holy Ghost dispensed and distributed among her members, they regard as necessary for preparing and perfecting the Church for the second advent of the Lord. The congregations are placed under the pastoral rule of angels or bishops, with whom are associated in the work of the ministry priests and deacons. The deacons are a distinct and separate order of ministers, chosen by each congregation out of their own number, and ordained either by apostles or angels. The priests are first called to their office by the word through the prophets, and then ordained by apostles; and by a like call and ordination are the angels chosen from among the priests. The holy eucharist is celebrated every Lord's day, and there is divine worship several times daily. The worship is conducted by means of a ritual which embodies portions of the rituals in use in all different sections of the Church, Greek, Roman, and Protestant. In their ritual observances and offices of worship, external and material objects occupy a large place. Music and painting, vestments of divers colours, incense, lights, &c., are all employed to minister through the senses what is conveyed to the intellect and the spirit by words. When the numbers and means admit, the worship is conducted with the greatest magnificence, while it is also capable of adaptation to very narrow circumstances. Besides free-will offerings, members contribute a tenth part of their income to the support of the priesthood. The great object of interest with them is the hope of the speedy coming of Christ. In England there are about thirty congregations of them, comprising about 6,000 communicants; and there are also congregations of them in Scotland and Ireland, Germany, Switzerland, France, Canada, and the United States.

**Isaiah**, *i-zai'-yâ*, is the name of the first, in order, of the prophetic books of the *Old* Testament, and called after its author. Isaiah prophesied under the reigns of Uzziah, Jotham, Ahaz, and Hezekiah. According to a Jewish tradition, he was sawn asunder, by order of Manasseh; but this is very doubtful. Down to the latter part of the last century, Isaiah was universally regarded, both by Jews and Christians, as the author of this book; but since that time, the German rationalists have been endeavouring to prove that the book is a collection of prophecies made by different persons, and collected and arranged during the Babylonish captivity. For the arguments against this view, see Jahn's "Introduction to the Bible;" Prof. Lee's "Sermons and Dissertations;" Hengstenberg's "Christologie des alten Testaments;" Horne's "Introduction to the Holy Scriptures." The predictions of Isaiah may, according to Horne, be divided into six parts, each containing a number of discourses, delivered by the prophet to the various nations or people whom he was commissioned to address. 1. Contains a general description of the estate and condition of the Jews, in the several periods of their history; the promulgation and success of the gospel, and the coming of Messiah to judgment (i.—v.), delivered during the reign of Uzziah, king of Judah; 2. comprises the predictions delivered in the reigns of Jotham and Ahaz (vi.—xii.); 3. contains various predictions against the Babylonians, Assyrians, Philistines, and other nations, with whom the Jews had any intercourse (xiii.—xxiii.); 4. contains a prophecy of the great calamities that should befall the people of God,—the merciful preservation of a remnant of them, and of their restoration to their country,—of their conversion to the gospel, and the destruction of Antichrist (xxiv.—xxv.); 5. comprises the historical part of the prophecy of Isaiah (xxxvi.—xxxix.); 6. comprises

a series of prophecies, delivered, in all probability, towards the close of Hezekiah's reign. Isaiah has been denominated the evangelical prophet, on account of the number and variety of his prophecies concerning the Messiah. This prophet, says Lowth, abounds in such transcendant excellencies, that he may be properly said to afford the most perfect model of prophetic poetry. He is at once elegant and sublime, forcible and ornamental; he unites energy with copiousness, and dignity with variety. In his sentiments there is uncommon elevation and majesty; in his imagery the utmost propriety, elegance, dignity, and diversity; in his language uncommon beauty and energy, and, notwithstanding the obscurity of his subjects, a surprising degree of clearness and simplicity. To these we may add, that there is such sweetness in the poetical composition of his sentence, whether it proceed from art or genius, that, if the Hebrew poetry is at present possessed of any remains of its native grace and harmony, we shall chiefly find them in the writings of Isaiah.—*Ref.* Horne's *Introduction to the Holy Scriptures.*

**Ischuria**, *is-kew'-re-ă* (Gr. *ischo*, I retain; *ouron*, the urine), in Med., denotes a retention of urine, and is distinguished from dysuria in that, in the latter case, the discharge is attended with much difficulty, whereas in the former there is a total retention. They are both either acute, arising from inflammation, or chronic, from calculus, &c.

**Isinglass**, *i'-sing-glăs*, a very pure form of gelatine or animal jelly, prepared from certain parts of the entrails of several fish. The best isinglass is prepared in Russia, from the membranes of the sturgeon, especially from its air-bladder and sounds, which are very large. When removed from the fish, they are washed with cold water, and exposed to the air for a short time, to make them stiffen. The outer skin is then removed, and the remainder cut out, and twisted loosely into rolls, according to the size required. These twisted rolls are called "staples," and are known commercially as long and short staples. The first of these is dried in the air, and is considered the best. Isinglass of the purest kind is used in confectionery, and also largely in refining wine and beer. Isinglass is almost without colour, taste, or smell; is usually in thin pieces; and is soluble in water. It is dissolved readily by most acids, but is not soluble in alcohol. The annual importations of isinglass into this country, from Russia, Brazil, the East Indies, Prussia, Guiana, and other places, amount to about 180,000 lbs. Though commonly derived from *ice* and *glass*, the term is probably a corruption of the German correlative term, *hausing-blase*.

**Isis**, *i'-sis*, was the name of one of the chief deities of the ancient Egyptians, the wife of Osiris. She was the goddess of the earth and of fecundity, and the cow was sacred to her. Her annual festival lasted for seven days. She was usually represented as a woman with the horns of a cow. Her priests were bound to observe perpetual chastity. Her worship came to be widely spread through Greece, where she was identified with Demeter. In Rome too her worship was common, and here her rites were characterized by the grossest licentiousness, so that they were repeatedly prohibited. Tiberius, with a view of putting a stop to them, caused her images to be thrown into the Tiber; but they were afterwards revived.

**Isochromatic Lines**, *i-so-kro-mat'-ik* (Gr. *isos*, equal; *chroma*, colour).—When a pencil of polarized light is transmitted along the axis of a crystal, such as mica or nitre, and then received into the eye, after passing through a plate of tourmaline, coloured rings are perceived. To these coloured rings the term isochromatic lines has been applied. If between two plates of tourmaline, having their axes at right angles to one another, a plate of nitre be placed, having its surfaces perpendicular to the axis of the natural prism, and highly polished; and the system held close to the eye be turned towards the sky, or a sheet of white paper, there will be seen a series of oval rings about each of two points as poles, forming together figures resembling the curves called *lemniscata*. The curves receive their name from the circumstance that throughout each the tint is constant.

**Isochronism**, *i-sok'-ro-nizm* (Gr. *isos*, equal; *chronos*, time), a remarkable property appertaining to all systems in equilibrium, by which, when slightly disturbed more or less, the oscillations resulting are all performed in the same time, or so nearly in the same time that any retardation or acceleration is imperceptible. When a pendulum, for instance, is allowed to vibrate till it rests, it will be found that no perceptible difference exist between the vibrations of longer or shorter extent, the same number of vibrations being made in the same length of time. Again, in the sound produced by a musical string, the finest ear cannot detect any difference in the pitch of a note made by a smart blow on the piano-forte key and a gentle touch; yet a very small difference in the number of vibrations per second would be perceptible to the ear. Oscillations or vibrations performed in equal times are termed *isochronous* or *isochronal*; and *isochronal lines* are those along which a heavy body descends with a uniform velocity.

**Isologous Series**, *i-sol'-o-gus* (Gr. *isos*, equal), in Chem., carbon compounds, that differ from each other by one or more equivalents of hydrogen, but still bear a close relationship. Thus, the derivatives of ethyl, $C_4H_5$, are isologous with those of allyl, $C_6H_5$, both of these radicles commencing a series of acids, ethers, alcohols, aldehydes, &c.

**Isomerides, Isomerism**, *i-som'-e-rīdz*, *i-som'-e-rizm* (Gr. *isos*, equal; *meros*, part), in Chem., isomerides are substances which have the same ultimate composition, but different properties, owing to their elements being grouped together in a different manner. Thus, formiate of ethyl and acetate of methyl have precisely the same ultimate composition, but their elements are disposed in a different manner:—

Formic acid, $C_2HO_2$, Oxide of ethyl, $C_4H_5O$ = $C_6H_6O_4$; and
Acetic acid, $C_2H_3O_2$, Oxide of methyl, $C_2H_3O$ = $C_3H_6O_2$.

(*See* also Polymerides and Metamerides.)

**Isomerous Flower**, *i-som'-e-rus* (Gr. *isos*, equal; *meros*, a part), a term applied in Bot. to a flower which has the whole of its parts equal in number.

**Isometrical Perspective**, *i-so-met'-re-kăl* (Gr. *isos*, equal, and *metrein*, to measure), a method of drawing any building, or range of buildings, in such a manner that the height, length, and breadth may be exhibited in the proportion which they really bear to each other, and not as they appear when the drawing is made in accordance with the rules of perspective; in other words, the perspective plane of the paper must be imagined as making equal angles with the three principal dimensions of the figure and the eye, at an infinite distance. Thus lines in the three principal directions will be drawn on the same scale, and that scale the same for all parts of the line. The manner in which an object is represented when drawn in isometrical perspective will be best understood by reference to the accompanying engraving, in which a

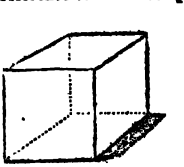


FIG. 1.

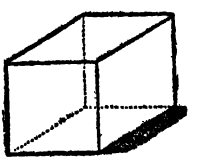


FIG. 2.

cube is represented in accordance with the rules of perspective in *fig.* 1, and according to isometrical perspective in *fig.* 2.

**Isomorphism**, *i-so-mor-fizm* (Gr. *isos*, equal; *morphe*, form), in Chem., the property discovered by Mitscherlich, possessed by certain bodies of similar composition, of crystallizing in similar forms. Substances possessing this property are found to be strangely allied in their chemical nature; and the fact of two bodies crystallizing in the same form has often led to the discovery of points of great similarity between them. The alums, for instance, no matter what their components, all crystallize in octahedra, and a crystal of potash alum in alum may be transferred to a solution of ammonia

chrome-alum, which will continue to deposit upon it. The relations subsisting between the following selection of isomorphous groups are well known :—

| 1. | | 2. | |
|---|---|---|---|
| Alumina | $Al_2O_3$ | Chloride of Potassium | KCl |
| Sesquioxide of Iron | $Fe_2O_3$ | Iodide | KI |
| ,, of Chromium | $Cr_2O_3$ | Bromide | KB |
| | | Fluoride | KFl |

| 3. | | 4. | |
|---|---|---|---|
| Sulphuric acid | $SO_3$ | Magnesia | MgO |
| Selenic acid | $SeO_3$ | Lime | CaO |
| Chromic acid | $CrO_3$ | Zinc (oxide of) | ZnO |
| Manganic acid | $MnO_3$ | Cadmium (oxide of) | CdO |

The notation employed to denote certain minerals, containing varying proportions of isomorphous bodies, requires explanation. It often happens that a mineral contains the same collective amount of isomorphous substances united to a certain quantity of oxygen, or any other substance, which may vary in their proportion to each other, within any conceivable limit; in which case the compound is symbolized thus :—$(Al\ Fe)_3\ O_3$, which means that the proportions of aluminum and iron are not known, but that, together, they form a quantity equivalent to $Al_2$ or $Fe_2$.

Isonandra, *i-son-an'-dra*, in Bot., a gen. of the nat. ord. *Sapotaceæ*. From the species *I. Gutta*, and other species, the valuable substance called gutta-percha is obtained. The *I. Gutta*, which is commonly known as the taban-tree, is a native of Singapore, Borneo, and other Malay islands. Dr. Seemann states that it is nearly extinct. (*See* Gutta-percha.)

Isosceles Triangle. (*See* Geometry.)

Isostemonous, *i-sos-tem'-o-nus* (Gr. *isos*, equal; *stemon*, a stamen), in Bot., a term applied to a flower in which the stamens are equal in number to the petals, or divisions of the corolla.

Isothermal Lines. (*See* Climate.)

Issue, *ish'-nu* (Fr. *issues*, to go out; Lat. *fonticulus*, a little fountain), in Surg., is an ulcer artificially formed, and kept open, so as to discharge matter, for the purpose of removing an unhealthy condition from some neighbouring part of the system. It is usually formed by making an incision through the integuments with a lancet, or other sharp instrument, sufficiently large for the insertion of one or more peas, which are retained there by a strip of adhesive plaster, so as to prevent the wound from healing, and keep up a state of constant irritation. The actual cautery and caustic potash are also employed in forming issues, being applied to the part till it sloughs, and the ulcer thus formed being kept open, either with peas or some irritating substance. A blister kept open by repeated renewals of the irritating matter, is an issue. Setons are another form of issue, made by passing a broad flat needle, threaded with silk or other suitable substance, under a portion of the skin, and leaving the silk in the passage, with an end hanging out on each side. Issues are principally employed for the removal of chronic disorders of the internal organs, particularly such as are of an inflammatory nature, the object being to withdraw the action from the internal organ, where it might be attended with danger, to without, where it is unimportant. In the management of all issues, great cleanliness should be observed, and the part dressed several times a day.

Issue, in Law, has various significations. Sometimes it denotes the children begotten between a man and his wife; sometimes the profits growing from emeroements and fines; sometimes the profits of lands and tenements; but it generally signifies the point of matter in dispute between a plaintiff and defendant in a cause. When, in the course of pleading, the parties in a cause come to a point, which is affirmed on one side and denied on the other, they are then said to be at issue. Issues concerning causes are of two kinds,—upon matter of fact and matter of law. An issue in fact is where the plaintiff and defendant have agreed upon a point to be tried by a jury, an issue in law is determined by the judges. Issues are also general or special. A general issue is where the defendant denies the whole, or the principal part, of the allegations of the plaintiff; a special issue is where some special matter, or material point, is in dispute between the two parties. When a special plea is pleaded, evidence is only admissible as to the truth or falsehood of that particular fact which is the subject of that plea; but in the general issue, the plaintiff is usually compelled to prove his whole case to the satisfaction of the jury; and, at the same time, the defendant is enabled to prove any circumstances whatever which discharge his liability. There must be in every issue an affirmative on the one part and a denial on the other, and the negative should be as full as the affirmative. When either party admits the facts, but denies the law of the other, he is said to demur. The statements and counter-statements of the parties are called the pleadings. (*See* Pleading.)

Isthmian Games. (*See* Games.)

Itacolumite, *i-tak'-ol-u-mite*, in Min., a micaceous granular quartz rock, found in Brazil, in which gold and topaz are associated.

Italian Architecture, *it-ali'-yan*, a style of architecture founded on the old Roman orders, and the characteristic features of the ancient buildings of Rome, which may be considered to have been initiated in Italy by Brunelleschi and the Italian architects of the day, in the 15th century, and brought to perfection by Palladio and other architects of eminence, in the 16th century, who flourished in the times of the Medici. In buildings designed both for public and private purposes, it is chiefly characterized by the use of the Roman orders of architecture, rather as decorative than constructive features. These are mainly obtained by the use of pilasters placed along the façade of each story of a building at intervals, each row of pilasters being surmounted by an entablature running along the entire length of the edifice, like a string-course. When engaged columns, or columns attached to the wall, and projecting from its face to the extent of one-half or three-fourths of their diameter, were used, the entablature was broken over each column, to prevent the heavy appearance that it would have presented if it had been of the same depth throughout; and this was frequently done in the case of pilasters. The cornices of the entablatures were richly ornamented. The windows and doors were decorated with pilasters or columns, rising from a massive and projecting sill, and surmounted by circular, pointed, or broken pediments, on which recumbent figures were frequently placed. The roof was partially hidden by a balustrade, which crowned the edifice, and rose above the attic story, and the pedestals of the balustrade generally supported statues or sculptured vases. (*See* Balustrade.) In this, and other respects, Italian architecture seems to bear some slight affinity to the architecture of the Elizabethan period; for, in both styles, the stories are divided by entablatures supported on pilasters, and carved ornaments are introduced on the summit of the buildings in each. Here, however, all resemblance ends, and these points of similitude are merely suggested here, to show that similarity of treatment may be frequently traced in the styles of architecture prevailing in different countries at the same period; although there is no reason to suppose that the architects who have developed and perfected either style have been influenced by the mode of treatment adopted by those who have originated the other. It was not until the 17th century, indeed, that the style of architecture that had prevailed in Italy during the previous century was followed and copied in England. Many of the buildings erected during the reigns of the monarchs of the house of Stuart, by Inigo Jones and others, present good examples of this style; among which may be mentioned the Banqueting-house at Whitehall, Somerset-house, built after designs by Sir William Chambers, in 1775, and many of the modern club-houses, as those belonging to the Carlton, Reform, and Travellers' clubs, are also built after this style.

Italian Language and Literature.—There are many doubts as to the exact origin of the Italian language, and in fact the era of its birth would appear to be lost in obscurity. Some writers on the subject seem to think that the harmonious tongue spoken by the people of Italy has originated from an intermixture of the classic Latin with the barbarous dialects of the hordes that overran Italy after her fall. When the subject, however, is fully inquired into, it will be found that this opinion is nearly, if not quite, erroneous; for it will be seen, on reference to the history of Rome, that after

the departure of the Huns, the Goths, and Visigoths, Latin was spoken and written in the middle ages long prior to the revival of learning, with a grace and facility which tend powerfully to impress us with the conviction that there could not have been much intermixture of foreign tongues with the Latin, at least of the educated classes. It must be borne in mind, nevertheless, in considering this point, that the language of the literary and cultivated portion of the Italian community was not the language of the people taken as a whole, and that the latter was composed of many foreign elements. An Italian writer of the 15th century, Leonardo Bruni, surnamed L'Aretino, from his birthplace, Arezzo, maintains the theory that the Italian language is coeval with the Latin, and that both were used at the same time in ancient Rome; the Latin by the learned and polished, and the Italian dialect by the common people. Two other writers, Cardinal Bembo and Francesco Saverio Quadrio, have maintained the same opinion since the time that Bruni wrote. To bear out this assertion, these writers cite the language used in the plays of Plautus and Terence by plebeian personages. There they find many words and expressions, which bear some resemblance to the modern Italian, and which have never gained admittance into the works of other classic writers; and from these examples, and from some interchange of letters, such as the use of *o* for *e*, as in *vostris*, for *vestris*, and *e* for *b*, as in *vellum*, for *bellum*, they draw the ready conclusion, that as the vulgar Latin was not classic Latin, it must have been Italian. The reader may judge from the following examples of words which are quoted by Quadrio to sustain his opinion :—

| *Vulgar Latin.* | *Italian.* | *Classic Latin.* |
|---|---|---|
| Essero, | *Essere*, | Esse. |
| Vernus, | *Verno*, | Hyems. |
| Minacia, | *Minaccia*, | Minæ. |
| Batuere, | *Battere*, | Percutere. |
| Bellus, | *Bello*, | Pulcher. |
| Russus, | *Rosso*, | Rubeus. |
| Caballus, | *Cavallo*, | Equus. |

From this list it will easily be seen that there are words now in use in the Italian language which were of old in the mouths of the Roman populace, and others which bear a much stronger resemblance to vulgar than to classic Latin. The only conclusion, however, that can be drawn from this evident similarity, is that there was a difference between the classic and the common language; beyond this, the arguments of the writers before mentioned can sustain no foundation. For, if the argument be found proved, it could be deduced from the same hypothesis, that the English language is essentially German, from the fact of many words in the two tongues being similar. The third theory on the subject of the origin of the Italian language is that of the Marquis Scipio Maffei. This writer rejects the opinion of Bruni and his disciples; for he reasonably lays down the argument, that "vulgarisms are not sufficient to form a language, nor to render it adequate to literature." He also rejects the theory first mentioned, that Italian was formed by the intermixture of the classic tongue with barbarous dialects; and the opinion he advances is, that the Italian language, as it stands at present, was formed by the gradual corruption of the classic Latin, without the intervention of any extraneous influence whatever. To quote Maffei, "It originated from abandoning, in common conversation, the classic, grammatical, and correct Latin, and generally adopting in its stead, a vulgar mode of speech, incorrect in structure and vicious in pronunciation." So much for the different theories on the subject. The first authentic specimen of the Italian language belongs to the close of the 12th century. It is a *canzone* of Ciullo d'Alcamo, by birth a Sicilian, and the earliest Italian poet whose name is on record. There is no doubt that the new language was opposed to the great variety of dialects which had grown into use after the invasion of the Northerners; but the formation of it was indeed slow, for the learned and the poets (from whom it was necessary for the infant language to receive its stamp and *entrée* into fashionable life) were averse to its introduction, as they deemed it a sorry scion of the classic Latin, which latter was esteemed, both for its age and for its recollections of former greatness, which the





Italians were only too eager to maintain, after the downfall of their empire. Even at the present time, that idiom which we find in the better class of authors, and which charms us by its harmonious roll, is not to be found as the common idiom of the peasants in any part of Italy. From the 12th century to the close of the 13th, but little was done to ground the Italian language; but shortly after the latter period came the glorious epoch of Dante, Petrarch, and Boccaccio. Their praise is universally upheld by all writers, as men who initiated a new era for the Italian language and Italian literature. They were emphatically the giants of an early age, when gigantic strength was wanted to fix the uncertain foundations of their national language and literature on a scale broad and deep and massive. In the words of a critic on the subject, they did not strike the first spade into the soil, but they drew the stone from the quarry, set the landmarks, polished the rough marble, and piled and cemented the misshapen blocks, till beneath their hands the noble structure rose, majestic, towering, and beautiful. By such writers was the Italian language brought to the highest point of its literary culture before the close of the 14th century. From the commencement to the end of the 15th, and, indeed, until the middle of the 16th, there is nothing remarkable in its history; but at this latter date, a great contest arose with regard to it, which resulted in the complete triumph of the writings of Dante, Petrarch, and Boccaccio, and the firm establishment of the Italian language as a complete whole, both in the literary world and amongst the people generally. The Italian language, as it at present stands, is essentially a Latin dialect, although somewhat changed in its grammar and construction, by the infusion of the modern spirit into the antique, as the character of the people underwent the same change. There are seventeen leading dialects in the Italian, which may be ranked in the following order:—the Sicilian, the Calabrian, the Neapolitan, the Roman, the Norcian, the Tuscan, the Bolognese, the Venetian, the Friulian, the Paduan, the Lombardian, the Milanese, the Bergamask, the Piedmontese, the Genoese, the Corsican, and lastly, the Sardinian. Of these the Sicilian is the first of the Italian dialects which was converted to literary uses; and it may be, in fact, called the mother tongue of the Italian muse, as Sicily is generally called her cradle. It exhibits traces, more or less, of the different dominant rulers of the island, and words may be clearly discovered which are undoubtedly of Grecian, Carthaginian, Roman, Byzantine, Arabian, Norman, German, French, and Spanish origin. The peculiarity in the Sicilian dialect consists chiefly in the use of *u* for *o*, *i* for *e*; as *timu* for *temo*; *oufuritu* for *colorito*; *un* for *uno*; and in many other instances too numerous to mention. It would be impossible, within the limits of the present article, to touch in detail upon the different dialects individually. A few general remarks will suffice instead. The Florentine is that in which the greatest portion of the literary monuments of Italy is written, in consequence of the great poets and other authors being born at Florence, and hence using their native dialect. But there cannot be much doubt that the classic Italian tongue is based principally on the Tuscan dialect, which has done more to its formation than any other spoken throughout the length and breadth of Italy. The study of the language in modern times has much increased, and great pains have been bestowed on vocabularies, dictionaries, and other works of an educational class. Considered in any light, the Italian language is one of the most beautiful and harmonious of European tongues, and is rightly deemed to be the true medium for the interpretation of real poetic feeling. The liquid sound of the language is owing to the prevalence of labials and vowels throughout it, which, even in the roughest dialects, as in the Tuscan, which is more composed of gutturals, combined with the soft pronunciation peculiar to the sons of Italy, renders the Italian language the most euphonious in Europe —indeed, in the world. To turn to the second part of our subject—*Italian literature* may, at the commencement, be divided into periods, according to the general plan pursued by historians on the subject. In the first and second periods, which, according to the "Conversations Lexicon" of Brockhaus, embrace the

years between the era of Charlemagne and the peace of Constance in 1183, not much was done in Italy towards the spread of literature, the principal authors being not of much influence, either in a philological or ethical point of view. They are as follows:—In theology: the popes Eugene, Adrian I., Leo V., Nicholas I., and Sylvester II.; also Paulinus, patriarch of Aquileia, and Theodolphus, bishop of Orleans. In the second period, the principal theologians were, Fulbert, bishop of Chartres, and the two celebrated archbishops Lanfranc and Anselm. Among the historians, both of the first and second periods, may be mentioned Disconus, Andrew of Bergamo (author of a Chronicle of Italy from 868 to 875), Luitprandus of Pavia, Amalphus, Sire Raoul, and many other obscure writers, too numerous to mention. In the third period, from the peace of Constance to the end of the 13th century, literature gradually underwent a change, which was, step by step, leading to a more pleasing aspect. Attempts were now being made to write works in the *lingua volgare*, instead of in barbarous Latin, and everything pointed on to the glorious era of Dante, and the enlightened school which he was the means of establishing. The emperor Frederick I. may be said to be the prime mover in this desire for enlightenment, and his court was thronged by the learned in every branch, either of science, of art, or of literature. In philosophy, the most celebrated man we meet with in this era is Thomas Aquinas, who wrote a commentary on the works of Aristotle. In mathematics, Campano wrote a commentary on the works of Euclid; and many others, as Lanfranco, Leonardo, and Guido Bonatti, followed in his footsteps. The study of law became also greatly improved. In history, the name of Matteo Spinello must be honourably mentioned, as he wrote the first lengthy and complete work in Italian prose. Brunetto Latini, the instructor of Dante, must likewise not be passed over with neglect. The fourth period, which embraces the whole of the 14th century, is, however, the grandest, as it is the starting-point in the real history of Italian literature. Albert of Padua, Gregory of Rimini, Bonaventura of Perugia, and Ludovico Marsigli, are the theologians of this period. Petrarch is the real philosopher of the times, who does honour to his country, and he wrote numerous Latin works on moral subjects, which reflect the wisdom of his scientific brain. Paolo, surnamed Geometria, is said by Villani to be the first of mathematical discoverers, and he likewise lived in this century. In history we have also Petrarch, who wrote the "Rerum Memorandarum;" and Boccaccio, who was the author of "De Genealogia Deorum," and many other works. In this period also occur the first collection of Italian tales and romances; and here, again, we have to thank Boccaccio for his "Decameron" and "Fiametta," which will always be remarkable in literature. Dante, however, must be given the prime place in the literature both of this period and of his country in general. Of all his works, his "Divine Comedy" must rank highest; but he was also the author of the "Vita Nuova," the "Convito," and also his work, "De Vulgari Eloquentia" (in which he lays down the basis of the new Italian language), and his "De Monarchia." Hallam, in speaking of Dante, in his "Literature of Europe," says that Varchi, in a passage of the "Ercolano," having extolled Dante even in preference to Homer, gave rise to a controversy, wherein some Italian critics did not hesitate to point out the blemishes of their countryman. Bulgarini was one of these critics; and Manzoni undertook the defence of Dante in a work of considerable length. However this may be, the poet was, and is, much esteemed in his country, as he is elsewhere; and particularly in the period we are considering, much was done in his honour, and endeavours were made to further his attempts for benefitting his country in literature. In concluding this period, as is well said by an eminent authority, in the early part of the 14th century, according to Lord Macaulay, in his essay on Machiavelli: "The progress of elegant literature and of the fine arts was proportioned to that of the public prosperity. Under the despotic successors of Augustus, all the fields of the intellect had been turned into arid wastes, still marked out by formal boundaries, still retaining the traces of



old cultivation, but yielding neither flowers nor fruit. The deluge of barbarism came. It swept away all the landmarks, it obliterated all the signs of former tillage; but it fertilised while it devastated. When it receded, the wilderness was as the garden of God, rejoicing on every side, laughing, clapping its hands, pouring forth, in spontaneous abundance, everything brilliant, or fragrant, or nourishing. A new language, characterised by simple sweetness and simple energy, had attained perfection. No tongue ever furnished more gorgeous and vivid tints to poetry; nor was it long before a poet appeared who knew how to employ them. Early in the 14th century came forth the 'Divine Comedy,' beyond comparison the greatest work of imagination which had appeared since the poems of Homer. The following generation produced, indeed, no second Dante; but it was eminently distinguished by general intellectual activity. The study of the Latin writers had never been wholly neglected in Italy. But Petrarch introduced a more profound, liberal, and elegant scholarship, and communicated to his countrymen that enthusiasm for the literature, the history, and the antiquities of Rome, which divided his own heart with a frigid mistress and a more frigid muse. Boccaccio turned their attention to the more sublime and graceful models of Greece." We pass over the fifth period, which lasts from 1400 to 1500, and enter upon the sixth, or 16th and 17th centuries, which is the most glorious of any in the literary history of Italy. The power of her republics and the magnificence of her princes had done much to restore the former splendour and greatness of the country, and Italy could well, at the time of which we are speaking, point proudly to herself as an example for the rest of Europe to follow. The number of academies and libraries had increased to such a degree, that few, even of the small cities, were without them, and learning, and a fostering of the arts, had spread likewise in a proportionate manner. Among the popes there were many who promoted this general desire for improvement; and the names of Julius II., Leo X. (the Magnificent), Gregory XIII., and Urban VIII., well deserve the prominence they occupy in history, even on this account alone. Next must the princes be mentioned; for they were by no means behindhand with the popes in their activity for the spread of literature. Among these latter we come across the names of Gonzaga of Mantua, the Prince d'Este da Ferrara, the Medici of Florence, and Duke Charles Emanuel of Savoy. In history much was done, and well done too. Carlo Sigonio wrote a general history, in Latin; Girolamo Briani a similar chronicle, but in Italian; Machiavelli, a "History of Florence," which latter must ever bear up the reputation of its author,—among many others who did something for history, but whose names even are too numerous to be even mentioned in the present article. In poetry, we have the honourable names of Bernardo and Torquato Tasso (the former celebrated for his Letters and the latter for his Dialogues and Philosophical Essays); also Pietro Badoaro, a poet of no mean repute; Alberto Lollio and Claudio Tolommei, besides many others. The novelists of this period were numerous, indeed, and criticism was also beginning to be judiciously exercised, as we have evidence of, in the attack and defence of Tasso's "Jerusalem Delivered." During the seventh period, which lasted from 1660 up to the year 1820, much cannot be said to have been done for Italian literature,—the few names that occur, touching on the history of literature *per se*, being Crescimbeni, Quadrio Fontanini, A. Zeno, Mazzucchelli, Fabroni, Tiraboschi, and Comiani. Passing on to the last period, which embraces the years between 1820 and the present time, we must notice the decade of Italian literature, with, however, a hope of its rise again in future years, now that Italy has become once more a kingdom. The restraints which naturally arise in a country entrammelled by politics are undoubtedly one of the chief causes which have led to this fall, combined with the indolence induced by too warm a climate and one too favourable for idleness. Another cause must likewise be noticed, and that is the infringement of the copyrights of one city by another,—one of the greatest drawbacks to the spread of literature. Of the writers of this period, few occupy any prominent

place, with the exception of Andrea Maffei, who has done much, both by original works and translations, for the advancement of literature. In science and art, the 19th century has not been unproductive to Italy, but in poetry and literature there has been a sad falling off from the noble era ushered in by Dante. Perhaps it will not be out of place here to give a short glance generally at Italian poetry, which is, indeed, one of the most remarkable features in the literature of the nation. If we compare the literature of Italy generally with that of other European countries, we will find reason for believing its characteristic peculiarity to consist in the sedulous cultivation and systematic moulding of the lyric. It is little to say that the number of lyrical poems written in the Italian language has been greater than the number of poems belonging to any other cultivated nation. The lyric, in one or another of its forms, is the vehicle of expression which naturally suggests itself to minds struggling rather to give vent to poetic feeling than to create works of poetic art. But it is a different thing to assert, what is equally true, that, by the Italians, the lyrical poem has been more thoroughly elaborated into a work of art than by the poets of any other country; and that, in the standard poetical literature of Italy, the lyric holds a more distinguished place than that which belongs to it in the poetry of any other European language. Of the pure lyric, the model was the symmetrical canzone, though several freer forms were allowed as occasional indulgences; the Sicilian sonnet, whose name has passed with its rules to other countries, was the recognised name of a mixed species, in which the lyrical poem was modified by elements borrowed from the didactic. Dante set his hand to the plough, and hosts of young poets followed in his footsteps, anxious to cultivate the soil thus left open to them. It was thus that the poetical literature of Italy put on the aspect of a garden, boasting, indeed, but a few magnificent specimens of those lordly plants that need ample care as well as a kindly climate and a genial soil, but glowing everywhere with the fragrant loveliness which skilful culture imparts to the native wild flowers of the meadow and the wood. So much for Italian poetry. The best references on the language, literature, and poetry of Italy, are as follows:—Quadrio, *Storia d'ogni Poesia;* Maffei, *Verona illustrata;* Nardini, *Saggi di Prose e Poesie de' più celebri Scrittori d'ogni Secolo;* Monti, *Amor Patrio di Dante;* Dante, *De Vulgari Eloquentia;* Machiavelli, *Discurso in cui si esamina se la lingua in cui scrissero Dante, il Boccaccio, e il Petrarca, si debba chiamare Italiana, Toscana, o Fiorentina;* Ginguène, *Histoire Littéraire d'Italie;* Sismondi, *De la Littérature du Midi;* Corniani, *Secoli della Letteratura Italiana;* Hallam, *Introduction to the Literature of Europe;* and Brockhaus' *Conversations Lexicon.*

Italian Millet. (*See* Setaria.)

Italian Philosophy. (*See* Greek Philosophy.)

Itch, *itch* (Ang.-Sax.; Lat. *scabies*, from *scabo*, I scratch), in Med., a disease of the skin, characterized by an eruption of pustules or of small vesicles, the two being frequently intermixed, and accompanied by an intolerable itching; whence it derives its name. It has been divided into different classes; but the distinction is of no practical importance. It occurs chiefly about the fingers and the wrists and the flexures of the joints; but it may also attack other parts of the body, the face being the only part on which it never appears. It is caused by a minute insect—the *Sarcoptes scabiei*—lodging under the skin, and is readily communicated by contact. The itch is never got rid of without medical treatment, and the great specific for its removal is sulphur. It is commonly used in the form of an ointment, smeared over the part once or twice a day, washing it carefully with soap and water before each fresh application. The cure usually takes from three to eight or ten days, according to the nature and extent of the disease.

Ite missa est, *i-te mis'-sa est* (Lat., Go, it is dismissed), in the Roman Catholic church, is a formula by which, on joyful feasts, the end of low mass is announced to the people, and the assembly is dismissed. The priest steps into the centre of the altar, and sings these words after the *Deus vobiscum.*

Itinerary, *i-tin'-e-ra-re* (Lat. *iter*, a journey), in Lit., is the name given to a work containing a list of the stations and halting-places on a road between two places, with a statement of the distances between them. Of the most important itineraries of antiquity are—1. the *Itinerarium Antonini*, including the *Itinerarium Provinciarum*, or a list of the routes through the Roman provinces of Europe, Asia, and Africa, and the *Itinerarium Maritimum*, exhibiting the most frequented tracts along the coasts and at sea; and, 2. the *Itinerarium Hierosolymitanum*, made by a Christian in A.D. 333, for the use of travellers from Burdigale (Bordeaux) to Jerusalem. The edition of these itineraries by Pinder and Parthey (Berlin, 1848) has superseded all others. Itineraries of districts little known, or unknown to Europeans, are of importance to geographers and the makers of maps; as are, for our knowledge of the ancient world, the itineraries of antiquity.

Itis, *i'-tis* (Gr., from *ietai*, denoting violent or impetuous action), in Med., is a termination added to the genitive case of the Greek name of an organ, to indicate inflammation of that part; as, *gastritis, hepatitis, carditis;* meaning inflammation of the stomach, liver, or heart.

Ivory, Ivory Manufacture, *i'-vo-re* (Fr. *ivoire*), the substance which composes the teeth or tusks of elephants. Ivory is largely used in the arts for making or ornamenting a great variety of small articles in general use. The west coast of Africa and Ceylon are the districts from which the principal supplies of elephants' teeth to this country are obtained. The Cape of Good Hope, Madagascar, Siam, and the coast of Barbary, also supply us with ivory. Fossil ivory is also sometimes exported from Russia to England. The trade in ivory has greatly increased of late years, and as much as £20,000 worth is sometimes shipped from Alexandria in one cargo. This portion of the trade chiefly consists of wild elephants' tusks, which have been shed in the Arabian deserts, and bought up by the pachs of Egypt for sale in England. Although the ivory made from elephants' tusks is the best, varieties are also made from the teeth and tusks of the hippopotamus, wild boar, and narwhal. The fossil mammoth of Siberia furnishes the Russians with a kind of ivory very similar to that furnished by the elephant of the present day. Mammoth tusks are sometimes obtained ten feet long, weighing nearly 170 lbs, and solid to within six inches of the end. The white keys of pianofortes are frequently veneered with this kind of ivory. For manufacturing purposes, ivory is cut up by means of saws with sharp but coarse teeth, set in steel frames. Great art is required in cutting the tusks, as their peculiar turns and twists render them liable to be cut to waste. Veneers can be cut in a ratio of thirty to an inch thickness of ivory; and as the sawdust and scrapings afterwards effect a waste of one half, it frequently happens that sixty finished ivory veneers will not be more than an inch in thickness. These thin plates are principally used for painting miniatures upon, and making memorandum-books. Ivory forms a fine and delicate substance for making graduated scales for mathematical instruments. It is liable, however, to expansion and contraction in changes of weather. After being cut with the saw, ivory is smoothed and polished in a variety of ways. Fine glass-paper is sometimes used; at others, emery-paper, whiting and water, oil on a piece of rag, putty-powder, Flanders brick, powdered chalk, &c. It is also sometimes scraped and rubbed on list wheels, consisting of ten to twenty circular pieces of woollen cloth screwed tightly between two wooden discs of rather smaller diameter; the cloth forms a pliant edge projecting beyond the wood. Such wheels, when moistened with Trent sand, are used for polishing parasol handles and similar articles. The chief consumption of ivory in England is in the manufacture of knife-handles and combs. Ivory is frequently engraved by French artists. Having covered the surface with a wax or composition coating, they etch the design in it, by means of a dilute solution of nitrate of silver; the etching is then bitten in, the whole washed in distilled water, dried with blotting-paper, and exposed to the sun's rays. When the ground is removed, the design is seen as a series of brownish lines, which speedily become black. Sometimes the ivory is itself engraved, and the lines filled in with hard black varnish. Hitherto, no European

artist has been able to cut concentric balls of ivory after the manner of the Chinese; and their boxes, chessmen, and other ivory articles, far surpass those of any other nation. *Vegetable ivory*, as it is called, is the seed of a genus of plants named *Phytelephas* (Gr. *phuton*, a plant; *elephas*, ivory), occurring in South America. The natives have used these seeds from time immemorial for making buttons, heads to walking-sticks, and various trinkets. It is only within a recent period that they have been brought to Europe. They are not so useful as ivory for delicate purposes; but they are used in the manufacture of a number of articles.

IVORY-BLACK.—When bone is burnt, it forms a mixture of charcoal and phosphate of lime, which is sold under the name of ivory-black. Like other forms of animal charcoal, it is very effective in depriving certain substances of their colour and odour. When ivory-black is prepared by calcining the shavings and dust of ivory, and then ground and levigated on a porphyry slab, it gives the velvety black material which forms the principal ingredient of the ink used in copper-plate printing.

IVY. (*See* HEDERA.)

IXOLYTE, *ikz'-o-lite*, in Min., mineral resin of a hyacinth-red colour, found in Austria, in amorphous lumps, amongst the tertiary lignites. It softens at 166° Fahr., and remains viscid at 212° Fahr.

## J.

J is the tenth letter and the seventh consonant in our alphabet. Its sound in English resembles that of *dzh*, and in French it has the sound of *sh* or *zh*. In German, however, it is always pronounced like our *y* before a vowel; as *ja*, pronounced *ya*. In Spanish it is a guttural, a little softer than the *ch* in *ach*. Its pronunciation in Latin is disputed; but there is reason to believe that the English sound was not unknown to them; for, originally, Jupiter was written *Diupiter*, and Janus, *Dianus*. The distinction in form between I and J is only of recent date, and in dictionaries down to lately the two were intermixed.

JACAMAR, *jăk'-ă-mar* (*Galbula*, Brisson), a name applied to a gen. of birds belonging to Cuvier's third order, *Scansores*, or climbers. These brilliant birds are closely allied to the kingfishers, by their elongated, sharp, quadrangular bill, and by their short feet, whose anterior toes are for the most part united; nevertheless, these toes have not the same formation exactly as in the kingfishers. The plumage also of the jacamars is not so smooth as that of the kingfishers, and has always a metallic lustre, which it is almost impossible to imitate by art. They live solitarily in humid woods, feed on insects, and build their nests on low branches. Most of the true jacamars are natives of tropical America. There are some found in the Indian Archipelago, whose bill, shorter, thicker, and a little bent, approximates them to the bee-eaters. To these Le Vaillant has given the generic name of Jacamerops.

JACK, *jăk*, in Mech., a sort of crane for lifting heavy weights. It consists of small pinions worked with a common winch. The pinion works in the teeth of a large wheel, on whose axis there is fixed a small pinion with teeth working in a rack. By turning the pinion, the rack is raised, and with it any weight attached to it. If the length of the handle of the winch be seven inches, and the pinion which it drives contains four leaves, working in the teeth of the large wheel, having twenty teeth, then five turns of the handle will cause one revolution of the wheel. But the length of the arm of the winch being seven inches, the circumference through which the handle moves will be about forty-four inches, and from one turn of the wheel the handle must pass through 5 × 44 = 220. Say that the wheel carries a pinion of three leaves of a pitch of one-third of an inch, working the rack that carries the weight, one turn of the pinion will therefore raise the rack one inch, and 220 will be the power of the jack, as the power moves through 220 in the same time.

JACK.—This nickname, or diminutive for the name John, is used in various ways. It is difficult to explain why, in the principal modern languages, *John*, or its equivalent *Jack*, is a name of slight or contempt. The Italians use the word *Gianni* in this sense, from which *Zani* is derived. Amongst the Spaniards, *Juan*, foolish John, and the French *Jean*, have a similar signification. The term Jack-fool is used by Chaucer, as the *Sots Jeans* of the Spaniards; and probably *Zanni* is derived from the same source. Amongst the Germans, *Hans*, the nickname for John, is used in the same way; as, *Hans Narr*, Jack-fool; *dummer Hans*, stupid Jack, &c. It is also singular that most nations give the name of their favourite dish to the mountebank's jesting attendant. Amongst the Italians he is called *Macaroni*; among the Dutch, *Pickle-herring*; among the French, *Jean potage*; among the Germans, *Hans Wurst*, Jack sausage; and amongst the English, *Jack pudding*. In England, also, *Jack Ketch* has long been the generic nickname for the hangman. The terms boot-jack and roasting-jack seem to have been derived from the circumstance that boys were formerly employed to pull off boots and turn spits. Many of these boys had the common name of Jack; hence, when instruments were invented for these purposes, the common name of the boys was applied to them. The ordinary *roasting-jack* used for turning a spit consists of a double set of wheels, a barrel, round which the chain attached to the weight, or moving power, is wound; a perpetual screw, and a fly, which secures a steady uniform motion. Occasionally a multiplying wheel is added, in order that the weight may be longer in running down. The *smoke-jack* is used for the same purpose as the roasting-jack, and is so called because it appears to be moved by the smoke in the chimney. It is in fact moved by means of a fan placed horizontally in the chimney, which is carried round perpetually by the current of heated air from the fire. It requires no machinery to wind it up, and the motion may be obtained in various ways. Sometimes spiral fliers, coiling about a vertical axle, are used, and sometimes a vertical wheel, with sails like the float-board of a mill. In former times, the term *Jack* was applied to a coat of mail; and *jack-boots* were large boots to cover the legs. It has also several other diverse applications: thus, it signifies a horse or wooden frame to saw timber on; a large leathern pitcher, in which drink was formerly put; the small bowl which is used as a mark in the game of bowling; and also a young pike. In sea language, a *Jack* is a sort of flag displayed from a mast at the outer end of the bowsprit of a ship.

JACK. (*See* PIKE.)

JACKAL, *jăk'-awl* (Arab. *tschakkal*, Fr. *chacal*), a species of wild dogs, the *Canis aureus* of Linnæus. The dental formula of the jackal is that of the dog. The pupil of the eye is round, like that of the dog and wolf. In colour it is yellowish grey above and whitish below; the thighs and legs are yellow, the ears reddy; the muzzle very pointed; the tail hardly reaching to the heel. The jackal is gregarious in its habits, hunting in packs, frequently attacking the larger quadrupeds, but more commonly preying on the smaller animals and poultry. Its cry is very piercing and peculiar, and travellers describe it as being somewhat appalling when heard for the first time at night. Says Captain Beechey, in his remarks upon this animal, "We hardly know a sound which partakes less of harmony than that which is at present in question; and, indeed, the sudden burst of the answering long-protracted scream, succeeding immediately to the opening note, is scarcely less impressive than the roll of the thunder-clap immediately after a flash of lightning. The effect of this music is very much increased when the first note is heard in the distance (a circumstance which often occurs), and the answering yell bursts out from several points at once, within a few yards or feet of the place where the auditors are sleeping." Jackals are said to devour the corpses left on the field of battle, and to scratch away the earth from shallow graves, in order to feed on dead bodies. The belief that the jackal is the lion's provider probably arose from the notion that the piercing cry of the pack gives notice to the lion that prey is on foot. The disagreeable odour of the jackal is one of the reasons why it has not been reduced to a state of domesticity. It interbreeds, however, with the common dog; its period of gestation is the same, and the hybrid progeny is fertile. The jackal is an inhabitant of India, and other

parts of Asia and Africa. It is believed by some that the three hundred foxes between whose tails Samson is said to have put firebrands, in order that they might set fire to the crops of the Philistines (Judges xv. 4, 5), were jackals.

JACKDAW, *jăk'-daw* (Ang.-Sax.) (*Corvus Monedula*, Linn.), a common English bird of the crow kind, very much resembling the rook, particularly in its sociability. Jackdaws live together in considerable numbers throughout the year, and, whether seeking for food or rearing their young, they always appear to live in perfect harmony. The length of the jackdaw is about thirteen inches, with a black bill and white eyes; the hinder part of the head and neck of a hoary-grey colour; the rest of the plumage of a rich glossy black above, beneath dusky; the legs are black. The jackdaw is much more bold and familiar than the rook, approaching nearer to the residence of man, and sometimes taking shelter under his roof. It has also an aspect of greater cheerfulness, and there is more activity in its movements. Cultivated districts are preferred by jackdaws, and they frequent and build in church towers, belfries, and steeples. The female lays from four to six eggs; these are usually produced in May, and the young are hatched by the end of the month, or early in June. The eggs are of a pale bluish-white, spotted with ash-colour and clove-brown. The young birds are easily tamed, and become much attached to those who feed them. Very soon they begin to imitate the sounds of the human voice, and exhibit other amusing qualities. These birds are not particular as to the quality of their food, eating, indiscriminately, insects, seeds, grain, eggs, or carrion; on the sea-shore shell-fish, or the remains of other fish, and crustacea. They may be seen perched on the backs of sheep, gathering wool for their nests, or picking out parasitic insects. Jackdaws are notorious thieves, not only stealing food, but appearing to have a particular predilection for shining substances, as money, &c. On account of this propensity, they have frequently occasioned suspicions of theft in persons who were afterwards proved innocent. They carry this little weakness so far, that they have been known to purloin spectacles from persons who were in the act of reading. The jackdaw is not only found in this country but also farther north, in Denmark and Scandinavia, in Russia, Western Siberia, and Iceland. It does not exist in America, but is to be found in Germany, France, Italy, and the northern shores of Africa. It is also found at Corfu, Sicily, Malta, and Crete.

JACK-FRUIT. (*See* ARTOCARPACEÆ.)

JACOB RIFLE, *jā'-kob*, a description of rifle invented and perfected by the late General Jacob, of the Scinde Irregular Horse, after making a long and careful series of experiments at Jacobabad, in Scinde. After repeated trials, General Jacob came to the conclusion that the best method of rifling the barrel of a musket was to cut four grooves in the interior, of tolerable depth, each being about the eighth part of the circumference of the interior of the barrel in breadth; or, in other words, equal to the lands in breadth. The barrels of the most effective rifles made on General Jacob's principle are 24 inches in length, and of 32 gauge, or ·536 of an inch in diameter, the rifling taking four-fifths of a turn in the entire length of the barrel. The weight of a barrel of this length and calibre should not be less than 6 lbs., great weight being absolutely necessary to insure accuracy of aim. A spherical bullet was used at first, with two bands projecting from its surface, and surrounding it at right angles to each other, which fitted into the grooving of the barrel; but afterwards a bullet was used with a spherical base and conical head, the bands being cast about the base as before. A modification of this form of bullet was subsequently introduced, the outline of the head being formed by curved instead of straight lines, and the bands being made in such a manner that they formed four projections about the hemispherical base, the lower ends of which were of very little width, and could be driven into the grooves by the force of the explosion, which would tend to diminish the windage. The diameter of the ball used for a rifle of 32 gauge is ·531 of an inch, and its weight is 225 grains. General Jacob also invented a kind of rifle-shell, somewhat similar in construction and purpose to those which were invented by Captain Norton. They were cast on the same pattern as the bullet, but with a deep hole at the upper end, in which a copper tube filled with detonating powder was inserted. Although excellent shooting has been made with rifles grooved on General Jacob's principle, the depth of the grooving seems to be an objection, as it reduces the strength of the barrel unless it be made of great weight and thickness, and necessitates the formation of projections on the ball, besides rendering the rifle tedious to load.—*Ref.* Busk's *Rifle, and How to Use it.*

JACOBINS. (*See* vol. I. of this work.)

JACOBITES. (*See* vol. I. of this work.)

JACOBITES, *jak'-o-bites*, in Eccles. Hist., is the name of a sect of Monophysite Christians in the East, called after their founder Jacobus Baradæus, bishop of Edessa, who flourished in the 6th century. They hold with the Monophysites, that the divine and human natures in Christ were so united as to form only one nature; but, in other respects, they deviate less than the other Monophysites from the discipline and liturgy of the orthodox Greek church. They agree with the Greeks and other Eastern Christians with respect to purgatory and prayers for the dead; they consecrate unleaven bread at the Eucharist, and are against confession. After the death of Baradæus, they became very numerous in Syria, Mesopotamia, Armenia, Egypt, &c. The Egyptian Jacobites, in the 14th century, separated themselves from their Asiatic brethren, and formed the Coptic church. The Asiatic Jacobites at present number about 200,000 persons, and are divided into two sects, each governed by a patriarch, one of whom resides at Diarbekir, and bears the title of patriarch of Antioch; the other resides in a monastery near Mardin.

JACOBUS, *jăk-o'-bus*, a gold coin of the value of twenty-five shillings, and so called from King James I. of England, in whose reign it was struck. Two kinds of jacobus are known, distinguished as the old and the new. The former weighed six pennyweights ten grains, and had a value of twenty-five shillings; the latter weighed five pennyweights twenty grains, and was only valued at twenty-three shillings: it was sometimes called a *carolus*.

JACQUARD LOOM. (*See* LOOM.)

JACQUERIE. (*See* vol. I. of this work.)

JAGGERY, *jăg'-ger-re*, the name by which palm sugar is commonly known in India. (*See* SAGUERUS.)

JAGUAR, *jăg'-war* (*Felis onca*, Linn.), the American panther, the form of the leopard found in the New World. The form of the jaguar is robust, stouter than the leopard, and strongly and almost clumsily built. The body is thicker, the limbs shorter and fuller, and the tail barely reaches the earth when the animal stands well upon its feet. The head is larger and somewhat shorter than that of the leopard, and the profile of the forehead is more prominent. The animal is said to measure from four to five feet from the nose to the root of the tail when full grown. On the whole of the upper part of the body it is of a bright yellowish fawn-colour, which passes, on the throat, belly, and inside of the legs, to a pure white. Upon this ground, the head, limbs, and under-surface are covered with full black spots of different sizes; the rest of the body is covered with annular patches, either having a black point in the centre, or formed of small black spots arranged in a circular form. The jaguar is a native of South America,—Paraguay and the Brasils principally; but it is said to have been met with in all parts between the Isthmus of Darien and the southern extremity. Anatomically, the jaguar presents an immense volume of chest when contrasted with the abdominal cavity,—a circumstance which furnishes an index to the habits and vital energy of these active and ferocious animals. The following circumstance, narrated by D'Azara, gives a notion of its power of swimming, as well as of its enormous strength:—A jaguar, after having attacked and destroyed a horse, carried the body of his victim to the bank of a broad and rapid river about sixty paces distant, over which he swam with his prey, and then dragged it into the neighbouring wood. This was all witnessed by the man whom D'Azara had placed in concealment in order to watch. The jaguar is a most adroit climber, and Sonnini states that he

saw the scratches left by the claws of one on the smooth bark of a tree nearly forty feet high, without branches. Baron Humboldt also heard the yell of the jaguar from the tops of the trees, followed by the shrill whistle of the terrified monkeys. Possessed of such tremendous powers, the jaguar becomes the terror of the inhabitants of the countries which he infests. None of the living quadrumana or quadrupeds seem to come amiss to its voracious appetite, and it devours with relish birds, fish, and even reptiles. The shells of turtles which had been emptied by jaguars were pointed out to Humboldt. Notwithstanding all this ferocity, the jaguar seldom attacks the human race, though he will not shun man when he meets him. Indeed, according to Sonnini and Humboldt, he will often follow travellers. His favourite prey seems to be the larger quadrupeds; such as oxen, horses, sheep, and dogs, which he attacks indiscriminately, and in the same treacherous manner as the rest of the *Felidæ*. When he has made choice of a prey, he springs on its back, and placing one of his paws upon the back of the head, whilst he seizes the muzzle with the other, twists the head round with a sudden jerk, dislocating the spine, and thus killing his victim at once. The inhabitants of South America hunt the jaguar in various ways, either with a pack of dogs or by means of the lasso: the latter mode, however, can only be adopted upon plains or open grounds. Notwithstanding the strength and ferocity of the jaguar, he finds a powerful opponent in the great ant-eater. Although the latter animal has no teeth, whenever he is attacked by the jaguar, he lies on his back, and suffocates or strangles his opponent with his long claws. There is a black variety of the jaguar,—*le jaguar noir* of the French, and probably the jaguarete of Marcgrave.

JAIL. (*See* PRISONS.)

JAINS *or* JAINAS, *jainz*, *jaï'-nâs* (Sans. *jins*, victorious), is the name of a religious sect among the Hindoos. They are very numerous in the southern and western provinces of Hindostan, and are principally engaged in commerce. It is believed that Jainism is of much later origin than Buddhism or Brahamism, and that it did not rise into importance till the 8th or 9th century of our era. It seems to partake of both of these earlier worships, and was probably an attempt to reconcile Buddhism with Brahamism. The principal points of difference between them and the Brahamical Hindoos are,—1. a denial of the divine origin of the Vedas; 2. the worship of certain holy mortals, who, by living exemplary lives here and by self-mortification, had raised themselves superior to the gods; and, 3. extreme tenderness for animal life; in all of which points they resemble the Buddhists. Their moral code, or "great duties," are,—1. refraining from injury to life; 2. truth; 3. honesty; 4. chastity; 5. freedom from worldly desires. Their four "merits" are—liberality, gentleness, piety, and penance. For further information, see *English Cyclopædia*—Arts and Sciences, and the numerous works therein referred to.

JALAP, *jäl'-läp* (from Chalapa or Xalapa, its native place). (*See* IPOMŒA.)

JALAPIN, *jäl'-ăp-in*, in Chem., a resin insoluble in ether, found in jalap, and supposed to constitute the purgative principle of that substance. It is also called *convolvulin* and *rhodeocetin*.

JAMBS, *jämbz* (Fr. *jambes*), in Arch., the sides of an aperture which connect the two sides of the wall. The two vertical linings of a doorway or aperture, which connect two walls, are called the *jamb-linings*. Jamb-posts are such as are introduced sometimes on the side of a door, in order to fix the jamb-linings. They are particularly used when the partition is of wood.

JAMES, EPISTLE OF, *jaimz*, is the name of one of the canonical books of the New Testament. The authorship of this book has been disputed. There are three persons of this name mentioned in Scripture: 1. James the Apostle, son of Zebedee, and brother of John; 2. James the Less, son of Alpheus and Mary, who was also an apostle; and, 3. James, the brother of our Lord. It is generally held by divines that it was James the son of Alpheus that wrote this book. The epistle is addressed "to the twelve tribes which are scattered abroad," evidently, from the context, meaning those that had embraced Christianity. The design of the apostle in writing this epistle was,—1. to prevent the Jewish Christians from falling into the vices which abounded among their countrymen, and to caution them against covetousness and sensuality, distrusting the divine goodness, &c.; 2. to set them right as to the doctrine of justification by faith; 3. to intimate to such as laboured under bodily disorders, that, if they were penitent, they might hope for a miraculous cure; and, 4. to prevent their being impatient under their present persecutions or dark prospects, and to support and comfort them by the assurance that the coming of the Lord was at hand. The language of this epistle surpasses all the other writings of the New Testament in the purity of its Greek, in liveliness, and in felicity of expression. No regular plan appears in it, and the ideas sometimes follow one another loosely, the writer passing from one subject to another without points of transition; but it contains an abundance of fine striking images, which, considered together, have no parallel in any other apostolic letter. The canonical authority of this epistle has been much disputed both in early and more recent times. It is classed by Eusebius among the *antilegomenai*, or writings whose authenticity was questioned, and it was rejected by Luther and some of the other reformers. The great argument in its favour is its being found in the Syriac version of the New Testament executed at the end of the 1st or early in the 2nd century.

JANIPHA. (*See* MANIHOT.)

JANISSARIES. (*See* vol. I. of this work.)

JANSENISTS, *jän'-sen-ists*, a party in the Roman Catholic church, which arose about the middle of the 17th century, and took its name from Cornelius Jansenius, bishop of Ypres, who died in 1638. He was a great advocate for the doctrines of Augustine, some of whose works he is said to have read thirty times, and left a work, which was published after his death, under the name of *Augustinus*, in which, supported by quotations from the works of Augustine, he set forth the doctrine of irresistible grace and absolute election and rejection. This doctrine was not new, for it had already several times agitated the Church. Michael Baius, professor at Louvain, had already asserted this doctrine, and seventy-six propositions, taken from his writings, were condemned by a papal bull in 1567. Jansenius's work was fiercely attacked by the Jesuits as heretical, and as containing the five following propositions:—1. That there are certain commandments of God which good men are absolutely unable to obey, though they desire to do so, God not having given them a sufficient measure of grace; 2. that no person in the fallen state of nature can resist the influence of divine grace; 3. to render themselves meritorious in the sight of God, it is not requisite that men should be exempt from internal necessity, but only from outward constraint; 4. that the semi-Pelagians are heretical in maintaining that the human will is able to resist or obey the influences of divine grace; 5. that to say that Christ died for all men, is semi-Pelagianism. After much intriguing and delay, the five propositions were condemned by Pope Innocent X. as heretical; but this by no means ended the dispute, for the Jansenists contended that they were condemned in a sense different from that which they were intended to bear by the author. An appeal was again made to the pope, and in 1666 a new bull was issued by Alexander VII., declaring that Jansenius meant the propositions in the sense condemned by the previous bull. A formulary was now drawn out, conformably to the new bull, and all ecclesiastical persons were required to sign it, on pain of being suspended from their offices. Most of them refused, and a schism was thus occasioned in the French church, which lasted for some time. The Port Royalists (*see* PORT ROYAL), Arnauld, Pascal, Nicole, Perrault, were conspicuous for their defence of Jansenism, and, not content with acting on the defensive, carried the war into the enemy's country, attacking the errors and corruptions of the Romish church, especially of the Jesuits; one of the ablest of their attacks being the "Provincial Letters" of Pascal. They also, as a means of dissipating error, encouraged the diffusion of education, and published a number of valuable educational works. At length, Clement IX., in order to bring about peace, attempted to compromise

matters, by asking merely a rejection of the five propositions, without ascribing them to Jansenius. The liberal policy of Innocent XI. tended still more to restore peace. In 1698, however, the smouldering fire was again stirred up into a fierce flame by the appearance of Father Quesnel's "Moral Observations on the New Testament." Quesnel was banished from the country; and in 1709, Louis XIV., at the instigation of his Jesuit confessor, suppressed and destroyed the monastery of the Port Royal, and the most revolting indignities were offered to the ashes of its illustrious dead. In 1713, Clement XI. issued his famous bull *Unigenitus*, condemning 101 propositions of Quesnel's work. The strife continued for some time after this, and many of the Jansenists emigrated to Holland. A number of the French clergy still hold the principles of Jansenius, and since 1854, they have had an organ in the religious press, *L'Observateur Catholique*. While Jansenism remained in France a theological school, it became in the Netherlands an independent church. In 1704, Codde, the vicar-apostolic of the archbishopric of Utrecht, was deposed by the pope for holding Jansenistic views; but the chapter refused to acknowledge the validity of this deposition, and in 1723 they chose an archbishop of their own. Since that time they have had an archbishop at Utrecht, and bishops at Haarlem and Deventer. These Jansenists call themselves by preference the disciples of St. Augustine, whose doctrines they maintain, upholding moral strictness, and regarding the inward service of God as the greatest proof of piety. The Jansenistic principles also extended to Italy, especially to Tuscany, where Bishop Ricci and his party effected a temporary schism.—*Ref.* Tregelles, *The Jansenists*, Lond. 1851; *History of the so-called Jansenist Church in Holland*, by Rev. J. M. Neale, Oxford, 1858.

JANUARY, *jăn'-u-ă-re*, the name of the first month of our year, so called from the god Janus, who is commonly represented with two faces, as it was considered both to look back upon the past year and forward to that which was coming. It was likewise the first month in the Roman calendar, to which it was added, together with February, by Numa. It was not uniformly, however, the first month of the year among the Latin Christian nations until the 16th century; and even in some parts of this country the year commenced with the month of March till 1751, when an act was passed adopting the Gregorian in place of the Julian style, and declaring that the legal year shall be uniformly deemed to begin on the 1st of January.

JAPAN LACQUER, *jăp-ăn'*, a valuable hard black varnish, much used by the cabinet-makers of the Eastern Archipelago. It consists of the gummy juice which exudes from the *Stagmaria vernicifua*, a tree belonging to the nat. ord. *Anacardiaceæ*.

JAPAN SAGO. (*See* CYCADACEÆ.)

JAPANESE PEPPER. (*See* XANTHOXYLON.)

JAPANESE WAX. (*See* RHUS.)

JAPANNING, *jăp-ăn'-ning*, the method of giving a hard and highly-polished surface to articles made of wood, metal, paper, or leather. It is applied to tea-trays and bread-baskets of iron or papier-mâché (*see* PAPIER-MÂCHÉ), boxes and tea-caddies made of wood, candlesticks, snuffers, and a great variety of articles of every-day use. Japanning, when applied to common tea-trays of sheet-iron, saucepans, grates, and other articles of hardware, merely consists in covering the surface of the metal with a hard and lustrous black varnish. In iron bedsteads of a common kind, the metal frame and laths are merely painted with colouring matter mixed with a clear transparent varnish. When applied to wooden bedsteads, wash-stands, chairs, &c., it consists in coating the same with colouring matter that has been mixed with turpentine instead of oil. In the better kinds of japanned-work there are four separate stages,—priming, putting on the ground, putting on the pattern in gold or colours, and finishing. The first stage consists in covering the article to be japanned, if it be made of wood, with a composition of size and whiting, to produce evenness and smoothness of surface; but this is said to be detrimental to the durability of the coats of varnish that are laid on it, from its brittle nature, so it is seldom applied unless the wood be soft and porous. For articles made of hard close-grained wood and metal, a simple coat of varnish is the only priming required. When this preliminary coat is quite dry, the ground is put on, which consists of various kinds of colouring matter of an earthy nature, mixed with copal varnish, or varnish made of seed-lac or gum-animi. One or two coats of this mixture are applied, after which the work receives three or four coats of varnish, and is dried in a stove. If a ground of gold, silver, or bronze be desired, the work is coated with japanner's gold size, over which metallic dust is spread to produce the required appearance. When the ground is dry, the pattern is produced upon it by painting it in colours prepared in the same manner, or by gilding with gold size and gold dust, if the whole, or any part of the pattern, is to be produced in gold. Sometimes engravings that have been printed on paper prepared for the purpose, with a coating of gum or isinglass, are transferred to the surface of the work, the print being laid face downwards on the ground, and the paper removed by moistening the back with warm water, which dissolves the gelatinous matter on which the impression has been taken. The final stage is that of finishing, which consists in covering the whole work with several successive coats of varnish, each being allowed to become quite dry before the next is applied. When the last coat is thoroughly dry and hard, the surface is polished first with rotten-stone, and afterwards with a little oil. The art derives its name from the island of Japan, where a hard exterior and extremely brilliant polish is put on articles chiefly made of wood, by means of a natural varnish procured from a tree that is indigenous to the east of Asia. The term lacquering is sometimes applied to this art.

JAR, ELECTRICAL, or LEYDEN JAR, *jar* (Sp. *jarra*, a jar), a jar or phial used in electrical experiments. It is an example of a solid dialectric between two conducting substances. By means of this instrument the electric fluid can be accumulated and preserved in large quantities. The author of this great invention is not distinctly known; the merit appears to be claimed for three persons independently,—a monk of the name of Kleist; a person of the name of Cuneus; and Professor Muschenbrock, of Leyden; all of whom lived about 1745. The invention, however, was called the *Leyden jar*, because it was either invented or applied principally in that city. Muschenbrock had observed that excited electrics soon lost their electricity in the open air, and that their loss was accelerated when the atmosphere was charged with moisture or some other conducting material; he therefore conceived the idea that the electricity of bodies might be retained by surrounding them with bodies which were not conductors. In order to test this idea by experiment, some water was electrified in a glass bottle; an assistant held the bottle, and, whilst trying to disengage the communicating wire, he received a sudden shock in the arms and breast. This is said to have been the origin of the Leyden jar. Its present form is that of a glass bottle, coated within and without with tin-foil,—the upper part of the jar being left uncovered in order to insulate the two coatings. A wire, surmounted by a brass knob and terminating in a brass chain, passes through a wooden lid. When the knob of the jar is presented to the conductor of the machine in action, a succession of bright sparks passes from the conductor to the knob. Conducted by the wire and brass chain, the electricity spreads itself, by means of the coating of tin-foil, over the interior of the glass, the particles of which become polarized, decomposing the electricity of the outside of the jar, and leaving it in an opposite state. At the same time, the electricity of the same name must pass from the outer coating to the earth; in order to act, it is therefore necessary that the jar be uninsulated. If a jar be insulated, it is only capable of bearing a feeble charge; but if a conductor be held near the outer coating, sparks will pass from the outer coating to the conductor for every spark that passes from the prime conductor to the knob of the jar. In this way a large number of jars may be charged, in which every one is insulated except the last. Electric equilibrium, after disturbance, may be restored either by conduction, disruption, or convection. When a charged jar is discharged by means of a discharging-rod (which *see*), the electricity is conducted quietly through the wire of the discharger as

long as contact is maintained; but when it is made to traverse the air between the knob of the jar, a brilliant spark passes, accompanied by a characteristic crackling sound. When the outside foil is touched with one hand, while the knob or chain communicating with the inside of a charged jar is touched with the other, a bright spark and a powerful shock are produced. The glass of the Leyden jar should be thin. Cavendish ascertained that the quantity of electricity produced in the Leyden jar, with given surfaces, was inversely proportional to the breadth of the glass.

JARL. (*See* EARL.)

JASHER, BOOK OF (Heb., book of the upright), is the name of a book referred to in two passages of the Old Testament (Josh. x. 13; 2 Sam. i. 18), but now lost. Some have held that it was the book of Deuteronomy, others Judges; others the books of Samuel themselves. St. Jerome and some others were of opinion that it was the book of Genesis. Bishop Lowth, from the poetical nature of the citations from it, considered that it was a collection of national songs; in which opinion he was followed by Gesenius, who thought that it acquired its name, the "book of the upright," from being written in praise of upright men. The general opinion is that the book of Jasher is one of those writings which perished during the captivity. Dr. W. J. Donaldson published in 1854 a book entitled "Jasher; Fragmenta archetypa Carminum Hebraicorum in Masorethico Veteris Testamenti textu passim tessellata," in which he attempts to restore this ancient record in accordance with his own idea of its scope and contents. He asserts that it was written during the reign of Solomon, probably by Nathan the prophet, assisted perhaps by Gad the seer; and that its object was to show that at first man was upright, but, by following carnal wisdom, had fallen away, while the Israelites were chosen to preserve and transmit this law of uprightness. He believes that it comprised the marrow of what is contained in the sacred scriptures, which were not then written; and that it was subsequently worked up in a careless or arbitrary manner into the books as they now stand, at least as far as the book of Psalms. With this view, he proceeds to build up his imaginary book of Jasher. Whatever in the sacred books exhibits the nature of uprightness, celebrates the victories of the true Israelites, predicts their prosperity, or promises future blessedness, was taken from the book of Jasher. Among the strange results of his arrangement, is that Shem, Ham, and Japhet are sons of Adam, not of Noah, who is Israel under a figure; Cain and Abel are sons of Shem, and Abraham is the son of Abel. There are also two rabbinical works that bear the title of the "Book of Jasher,"—one a moral treatise, written in the end of the 14th century by R. Shabbatai Carmuz Levita,—a copy of which, in MS., is in the Vatican library; the other, a treatise on Jewish laws, by R. Tham, written in the 13th century, and printed at Cracow in 1617. Another mediæval work, in Hebrew (printed at Venice and Prague in 1625), bears the same title, and is said to have been discovered at the destruction of Jerusalem by Titus, and to have been brought to Spain and preserved at Seville. It is probably the work of a Spanish Jew of the 13th century, containing the historical narratives of the Pentateuch, Joshua, and Judges, with many fabulous additions. A clumsy forgery was perpetrated in 1751, by one Jacob Ilive, a typefounder in Bristol, who published a work entitled the "Book of Jasher, with Testimonies and Notes explanatory of the Text; to which is prefixed various readings; translated into English by Alcuin of Britain, who went a pilgrimage into the Holy Land." This clumsy fraud was revived at Bristol, 1827; at London, 1833, edited by C. R. Bond; and at New York, 1840, edited by M. M. Noah.—*Ref.* Smith's *Dictionary of the Bible*.

JASMINACEÆ, *jăs-mĭn-ā'-se-e* (Arab. *jasmen*, jasmine), in Bot., the Jasmine fam., a nat. ord. of *Dicotyledones*, in the sub-class *Corollifloræ*. Shrubs often twining, with the following characters:—Calyx persistent, having 5—8 divisions; corolla regular, 5—8-partite, with imbricated æstivation; stamens 2, included; ovary 2-lobed, 2-celled, with 1—4 erect ovules in each cell; fruit a capsule or a berry; seeds with very little or no albumen; embryo erect. The *Jasminaceæ* are



chiefly natives of the East Indies; but a few species are found in other warm regions of the globe. The flowers are generally fragrant. The *volatile oil of jasmine* used in perfumery is chiefly obtained by distillation from the flowers of *Jasminum officinale* and *grandiflorum*. The leaves of some species are very bitter, and have been employed medicinally. The flowers of the species *Nyctanthes arbor-tristis* are used in India for dyeing yellow.

JASPER, *jăs'-per* (Gr. *iaspis*), a mineral of the quartz fam., which occurs in the form of rocky masses, often making up large portions of hills of considerable size. In hue, it is of various shades of red, yellow, brown, and green, sometimes arranged in stripes, when it is called ribbon jasper. Its varied colours are generally derived from iron in different degrees of oxidation. Jasper is much used for ornamental purposes, on account of its hardness and susceptibility of taking a high polish. Bloodstone, or heliotrope, is a deep-green variety of jasper, with blood-red spots. Touchstone is a velvet-black flinty variety, used for testing the purity of gold alloys. The alloy is rubbed on the stone, so as to leave a metallic streak, and the quality is estimated by the brightness of the colour when nitric acid is washed over it. The principal deposit of jasper is the gorge of the Korgon, in Siberia. The labour of cutting out the blocks of jasper at this place is enormous: the workmen drill holes five inches apart, the whole length of the block, to the depth required; into these they drive dry birch-wood pegs, which are kept wet till they expand and burst off the mass. At the Crystal Palace of 1851, several cases of this jasper were exhibited, and a medal was awarded to them.

JATRORHIZA, *jăt-r-o-rī'-zā*, in Bot., a gen. of the nat. ord. *Menispermaceæ*. The root of the species *J. palmata*, sometimes named *Cocculus palmatus*, forms the columba of the Materia Medica. Columba is extensively used as a tonic: its properties are evidently due to a crystalline alkaloid, called columbine.

JATROPHA, *jăt'-ro-fā* (Gr. *iatros*, physician; *trophe*, food, in allusion to the medicinal properties of the plants), in Bot., a gen. of plants belonging to the nat. ord. *Euphorbiaceæ*. The seeds of *J. purgans* and those of *J. multifida* are called physic-nuts. They yield by pressure fixed oils, and both the oils and seeds are drastic cathartics. The oil of *J. purgans* is commonly known as *oil of wild castor-seeds*, or *Jatropha oil*, and is well adapted for burning. It is sometimes employed to adulterate East-Indian croton oil. The seeds of *J. gossypifolia*, called bastard French physic-nuts, also possess purgative properties. The cassava, formerly included in this genus, is now placed in the genus *Manihot* (which *see*).

JAUNDICE, *jawn'-dis* (Fr. *jaunisse*, from *jaune*, yellow), in Med., is the name of a disease characterised by yellowness of the skin and eyes, the urine being saffron-coloured and the fæces usually whitish or drab-coloured. It is usually preceded by symptoms of a disordered state of the liver and digestive organs, as loss of appetite, irregular bowels or constipation, colic pains, nausea, headache, languor, &c. Sooner or later, the yellow colour begins to appear, usually first in the eye, then the face, and then the whole body. Sometimes the yellowness is the first symptom. From the time of the appearance of the yellow hue, many of the preliminary symptoms may diminish. The shades of yellowness are various, from a light yellow to a deep orange hue, and in some cases greenish, or even almost black, when it is known as green or black jaundice. Jaundice arises from the excretion of bile being prevented and retained in the blood, or re-absorbed and diffused throughout the system. It depends upon various and different internal causes. Any kind of pressure upon the excretory ducts will occasion it, as by tumours, &c.; by the ducts being plugged up by mucus, inspissated bile, or biliary calculus. Fits of anger, fear, alarm, &c., have sometimes been directly followed by jaundice. It may also occur as a symptom of acute or chronic inflammation of the liver. A high atmospheric temperature long continued has also a decided influence in producing certain forms of this disease. In general, we may expect a favourable termination of this disease, except when it depends upon structural disease of the liver, or supervenes suddenly upon some great mental or bodily shock. Therapeutic

darkish varieties are the most dangerous. The course and duration of this disease is various, in some cases disappearing or proving fatal as early as the fourth day; in others continuing for months or years. Some kinds of jaundice are absolutely irremediable, others will pass away without any treatment. In general, the obvious treatment is to promote the secretion of the bile and to favour its removal. In general, mercury forms an essential part in its treatment, together with active purgatives. If there be any spasmodic pain in the right side, opium and the warm bath should be used; a mild diet, and the avoidance of all stimulants, to be strictly enjoined.

JAY, *jai* (Fr. *geai*, Sp. *gayo*), a bird belonging to the fam. of the *Corvidæ*, ord. *Insessores*, and termed by Bewick the *Corvus glandarius*. Its generic characters may be thus summed up:—Beak shorter than the head, conical, slightly compressed, straight at the base, with the upper mandible distinctly notched and suddenly bent over the lower; nostrils basal, lateral, and hidden from view by superincumbent bristles; wings of moderate size and rounded, with the first three quill-feathers pectinated, while the fourth, fifth, and sixth are of nearly equal length, and the longest in the wing; legs of moderate size; tarsus longer than the middle toe, the outer toe being joined to the middle at its base, and rather longer than the inner one; claws stout, curved, and sharp; tail slightly rounded. The jay is a very handsome bird, well known in most of the well-wooded districts of England. It has been called by the appellation *glandarius* on account of its partiality for feeding on vegetable productions, such as acorns, berries, beech-mast, and other similar substances. The jay is generally about thirteen inches in length, and its general colour is a light purplish buff, which is paler in the under parts. Yarrell observes of this bird, in his "British Birds," "I have heard the jay perform an uninterrupted song; it mocked the greenfinch most inimitably, and it was a considerable time before I could persuade myself that it was an imitation. But what amused me most of all was its imitation of the neighing of a horse; this was so near the truth that some companions who were with me were a long time before they could be convinced that the sounds proceeded from the bird. The neighing was very subdued and suppressed, but it bore the most striking resemblance to the neighing of a colt at a distance; indeed, so close was the imitation, that, without a sight of the bird, no person could possibly, I think, be persuaded that the sound proceeded from such an agent. These imitations were accompanied, occasionally, with more subdued and very melodious notes." Besides being common in England, the jay is also found scattered over most parts of Europe; and in America there is also a variety termed the blue jay (*Garrulus cristatus*), which is very common in the northern portions of that continent.

JEHOVAH, *je-ho'-va*, is a name given in Scripture to the Supreme Being. Its true pronunciation has been lost, as the Jews scrupulously avoid making any mention of it; and, according to their tradition, it was pronounced but once a year, by the high priest on the day of atonement, when he entered the holy of holies.

JELLY, *jal'-e* (Sp. *jalea*, from Lat. *gelo*, I congeal), a term applied to every translucent juice which, when cold, thickens, so as to coagulate into a trembling mass; thus the juices of acid or mucilaginous fruits, currants, &c., are called jellies when, by the addition of one part of sugar to two parts of juice, and by boiling, they have obtained a proper consistence. The term is also applied to a concentrated decoction of Iceland moss, rendered agreeable to the taste by the addition of sugar, &c. When the horns, bones, or extremities of animals are boiled to such a degree as to be stiff and firm when cold, without the addition of any sugar, they are also called jellies. Fruit jellies, when diluted with water, are good as medicines in all disorders of the *primæ viæ* arising from alkalescent juices: in their nature they are cooling, saponaceous, and acescent. Jellies made from animal substances, on the contrary, are alkalescent, and are therefore good in all cases in which acidity of the humours prevails. Animal jelly is soluble in water, glutinous, becomes fluid by heat, coagulates in the cold, and combines with oil and resins.

JELLY-FISH, in Nat. Hist., a general term applied to the Medusa, or that division of the class *Acephala* called *Discophora* or *Palmogradæ*. All the animals belonging to it are entirely gelatinous, consisting of a large hemispherical disc, more or less convex above, and closely resembling a mushroom or umbrella in shape. (*See* MEDUSA.)

JEMIDAR, *jem'-e-dar*, a native officer in the East-Indian army, who holds a rank somewhat similar to that of a lieutenant in the regular service.

JENNY. (*See* SPINNING.)

JEREMIAH, *jer-e-mi'-ah*, the name of one of the prophetic books of the Old Testament, called after its author, the prophet Jeremiah. It embraces a period of upwards of forty years, between B.C. 628 and 586. The various prophecies of this book are arranged without any regard to the order of time in which they were delivered. The following arrangement will serve to make the book more intelligible to the reader:—1. The prophecies delivered in the reign of Josiah (i.—xii.); 2. in the reign of Jehoiakim (xiii.—xx., xxii., xxiii., xxxv., xxxvi., xlv.—xlviii., and xlix. 1—33); 3. in the reign of Zedekiah (xxi., xxiv., xxvii.—xxxiv., xxxvii. —xxxix., xlix. 34—39, l., li.); 4. under the government of Gedaliah, from the taking of Jerusalem to the retreat of the people into Egypt, and the prophecies of Jeremiah delivered to the Jews in that country (xl.—xliv.). The last chapter (lii.) was added by some other hand, probably Ezra, subsequently to the return from the captivity, of which it gives a short account, and forms a proper argument or introduction to the book of Lamentations by the same author, which immediately follows. Some have professed to see in the style of Jeremiah marks of rusticity; but though wanting the dignity and splendour of Isaiah, it is by no means destitute of elegance or sublimity. His prevailing tone is that of melancholy; and his mind is so deeply and sorrowfully impressed with certain scenes and events, that he dwells upon them with all the tenacity of overwhelming anguish. "Though his sentiments are not always the most elevated, nor his periods uniformly neat and compact, yet his style is in a high degree beautiful and tender, especially when he has occasion to excite the softer passions of grief and pity, which is frequently the case in the earlier parts of his prophecies. These are chiefly poetical. The middle of his book is almost entirely historical, and is written in a plain prosaic style, suitable to historical narrative. On many occasions he is very elegant and sublime, especially in xlvi. to li. 1—39, which are wholly poetical, and in which the prophet approaches very near the sublimity of Isaiah."—*Horne*.

JER-FALCON. (*See* GER-FALCON.)

JERVIN, *jer'-vin*, in Chem., a white crystalline fusible base, found, along with veratin, in the *Veratrum album*, or white hellebore.

JESTER. (*See* COURT FOOL.)

JESUITS, or SOCIETY OF JESUS, *jez'-u-its*, is the name of a religious order in the Roman Catholic church, which rose in influence and power far above all the others. Its founder was St. Ignatius Loyola, but the order owed its greatness more to the shrewd policy and energy of his successors than to the ability of its founder. He was a Spaniard, the son of a nobleman, and was a page at the court of Ferdinand and Isabella. A wound received at the siege of Pampeluna, in the twenty-ninth year of his age, changed his ideas of life, and made him resolve to devote himself to the service of the Church. After a pilgrimage to the Holy Land, he, at the age of thirty, entered the university of Paris, in order to fit himself for the duties of a missionary. He seems to have possessed the rare faculty of attracting around him and swaying minds of superior strength and more varied accomplishments than his own. While at the university, he induced Le Fèvre (Faber), Francis Xavier, Laynes, and six other young men, to agree to make a pilgrimage to the Holy Land, and to labour there for the conversion of the Saracens. A war between the emperor Charles V. and the Turks prevented their journey to Jerusalem. They therefore went to different universities in Upper Italy, to gain new associates; and in 1539 Ignatius convoked his companions, and laid before them the plan of a new order, to be called the Society of Jesus. Besides the three vows of poverty, chastity, and obedience, they also bound themselves by a fourth

vow, to go, without hesitation, wherever the pope might send them, in order to labour for the salvation of souls. The order was confirmed by papal bull of Paul III., in 1540. Loyola possessed, in the highest degree, the administrative faculty, which eminently fitted him for carrying out the necessary details of such a work,—classifying the different duties, and distributing the various offices; and hence, in the space of a very few years, the society had established itself in almost every country in Europe, as well as in many places throughout the old world and the new. The Jesuit was a man everywhere in request, as a man perfectly qualified for whatever task he undertook, whether as adviser, confessor, teacher, or superintendent of affairs. The superior thus held in his hand the reins of a spiritual government which was rapidly spreading itself over and beyond the Christianized world. With deep sagacity of the remoter consequences, he strictly forbade any Jesuit to accept ecclesiastical dignities of any sort; but, at the same time, they were not forbidden, but eagerly sought after, the office of confessors to emperors, kings, and princes, and thus they obtained great power, to be used for the advantage of their order and of the Church in general. Loyola expired at Rome, July, 1556, in the sixty-fifth year of his age, after having governed the society for sixteen years. Loyola seems to have been actuated by the belief "that all things would go well in the world, in a world-wise sense, if it were brought into a state of absolute, unreasoning, ungainsaying submissiveness to a single hand ruling it for its good." At a very early period, however, after the death of Loyola, and while his immediate successors were still living, certain writers gave themselves to the task of moulding an ethical system suited to the varied requirements of the Jesuit confessors, based upon a system of casuistic reasoning which found means to sanction or excuse the deepest crimes. The history of Jesuitism derives a deeper colour and a fouler stain, "not so much because crimes more flagitious were committed by the hands, or at the instigation of Jesuit agents, but because the Jesuit, whether suggesting crimes or employed in smoothing the path of the criminal, or in extracting the sting of remorse, went about the work with refined reasonings, with an apparatus of orderly logic, with a carefully adjusted scheme of spurious ethics, which, as often as it made one man actually a criminal, prepared a hundred for walking in the same path." The casuistry of this body is immortalized in the "Provincial Letters" of Pascal. The privileges granted to the order were such as specially enabled them to extend their power. At a time when Protestantism was so weakening the ranks of the Church of Rome, the popes saw the policy of having such a body of men to oppose them as the Jesuits; and hence they received privileges such as no body of men, either in church or state, had received before. They are totally exempted from the performance of those duties which form the chief business of other monks. They do not consume half their time in the repetition of tedious offices; they practise no rigorous austerities, appear in no processions. They are permitted to enjoy not only all the rights of the mendicant and secular orders, but are exempt from all episcopal and civil jurisdiction and taxes, so that they acknowledge no authority but that of the pope and the superiors of their order; and are permitted to exercise every priestly function, parochial rights notwithstanding, among all classes of men, even during an interdict, but also (what is not even permitted to archbishops unconditionally) they can absolve from all sins and ecclesiastical penalties, change the objects of the vows of the laity, acquire churches and estates without further papal sanction, &c. The general, who is at the head of the order, has more absolute power than the general of any other religious order. He is elected for life, appoints nearly all the officers of the order, and receives monthly reports from the provincials, and quarterly reports from the superiors of the professed houses, the rectors of the colleges, and the masters of the novices. Every third year the catalogues of every province, with detailed reports on the capacity and conduct of every member, must be sent to him. The order is divided into provinces, each of which is governed by a provincial; each professed house, or



house of full members, is governed by a *præpositus*; each college by a rector; and each residence by a superior. A provincial congregation consists of all the professed members and such coadjutors as are rectors of colleges. A general congregation consists of all the provincial, and two delegates from each provincial congregation; and meets only for the election of a new general, or for deliberating on subjects of very great importance. The general council, which elects a new general, elects also a monitor, whose duty it is to observe the conduct and actions of the general, and, if necessary, to admonish him; and a certain number of assistants, whose advice the general is bound to seek. A strict examination precedes the admission of new members, and five points are absolute impediments to admission; viz., murder, apostasy or other grievous offences, subjection to a degrading sentence, membership in a monastic order, marriage, and insanity, or decided weakness of intellect. Previous to admission, the novice must make a confession to a superior, of his sins and natural infirmities, his desires, prejudices, &c., and these confessions must be frequently repeated during the period of his probation. At the same time, the members of the order keep a strict watch over the words and actions of the novices, of whom they are bound to report to the superior whatever of importance they discover in their conduct. The novitiate lasts for two years, during which the novices are not allowed to study, but must devote their whole time to prayer and meditation, the "Spiritual Exercises," a work composed by Loyola, being their chief guide. The novice may then offer himself for admission into the society, and being found qualified, takes the vows of poverty, chastity, and obedience, and becomes a scholastic. In this second stage, he generally devotes fifteen or seventeen years to study and teaching in the colleges of the order, first studying belles-lettres, rhetoric, philosophy, the physical and mathematical sciences; then teaching in succession various branches; and afterwards spending four or six years in the study of theology and the oriental languages. The candidate then spends a second novitiate, lasting for one year, during which he lives in retirement, making himself acquainted with the constitution of his order, and preparing himself for receiving the final degree of the order. A detailed report is then made by his superior to the general of the order, and in accordance with this he is admitted to the rank of either *coadjutor spiritualis*, or *professus*. The coadjutors have on the whole the same rights as the professi, but cannot take part in the provincial and general congregations of the order, and cannot be elected to a higher office than the rectorate of a college. The professed members, in whose hands the supreme government of the order lies, take upon themselves the fourth vow to go as missionaries wherever the pope may send them. Besides the above classes of members, there are also lay coadjutors, who are received for domestic employments. The Jesuits wear no monastic habit, but dress in black, nearly like secular priests. The power acquired by the Jesuits, their intrigues, and their misdeeds, speedily rendered them hated and detested in most countries where they were established. The order was suppressed in England in 1604, in Venice 1606, in Portugal 1759, in France 1764, and in Spain 1767. In 1773 the order was totally suppressed by decree of Pope Clement XIV. In Prussia, although they had to abandon the constitution of the order, they were permitted to continue as an organized society till the time of Frederick William II. In Russia also the order found an asylum, from which they were not expelled till 1817. On the 7th August, 1814, Pius VII. issued a bull, by which he restored the order, with all the privileges which it possessed at the time of its suppression. The Church of Rome had felt its hold over the minds and consciences of the people being gradually diminished by the diffusion of heresy and atheism, and this seemed the most likely means by which it might be restored. A novitiate was opened at Rome on 11th November, 1814, and received in 1824 the direction of the *Collegium Romanum*, and in 1830 that of the Propaganda. In Modena, Sardinia, and Naples, they were restored in 1815, and reinstated in the possession of a part, or the whole, of the former property of the order, and several new houses were established.

They returned to Lombardy in 1837, to Parma and Venice in 1844, and to Tuscany (for a short time) in 1846. The revolution of 1848 endangered their existence in all Italy; mobs attacked their houses in Genoa and Naples, and they were expelled from nearly every state, even from the dominions of the pope. After the success of the counter-revolution in 1849, they returned to most of the states, except Sardinia and Tuscany; but they were again expelled by the revolutions of 1859-60, from Lombardy, Parma, Modena, and Naples. The order has again obtained a footing in most of the countries of Europe, and in various parts of the New World; and in some countries there are considerable numbers of them. In the 19th century, however, the order possesses little of the power which it wielded in the 17th, nor is it of the nature of things that it should be so. The diffusion of knowledge, the general formation of enlightened views, the advances of science, are all against the extension of the power of this system. "Jesuitism we must believe to be in itself unchanged and unchangeable;" but "those things in which consist the welfare of nations are every year coming to be better understood than heretofore; the folly—not merely the criminality—of violence, of ambition, of political fraud and chicane, is coming to be more and more seen and felt; the few and the intelligible axioms of private morality, embodying the requirements of truth, honesty, and open dealing, are now in course of being applied more and more widely to the public conduct of public men, and also to the policy of governments.....Those, therefore—the conspirators against the rights and liberties of mankind—whose practices lead them to court the hour of darkness, will find themselves continually driven into narrower and still narrowing corners, until at length the world will rid itself of them for ever."—(*Taylor.*)—Ref. *Jesuitism*, by Isaac Taylor, in *Encyclopædia Britannica*; A. Steinmetz's *History of the Jesuits*, 3 vols. London, 1848; Abbé Guettée's *Histoire des Jésuites*, 2 vols. Paris, 1858-9; Cretineau-Joli's *Histoire religieuse, politique et littéraire de la Compagnie de Jésus*, 6 vols. Paris, 1844-6.

JET, *jet* (*Du. git, Fr. jayet*), a solid, dry, inflammable fossil substance, susceptible of a good polish, and glossy in its fracture, which is conchoidal or undulated. It has a resinous lustre, and a spec. grav. from 1·25 to 1·30. The colour of jet is a pure and deep black, with sometimes a tinge of brown. It occurs in opaque compact masses, so solid and hard that they can readily be turned in a lathe. By friction it acquires a weak electricity, even when it is not insulated. Sometimes it presents the form of branches of trees, and exhibits traces of a ligneous texture. When burning, it has a flame often greenish in colour; but it does not melt like solid bitumen. It exhales during combustion a strong and sometimes aromatic odour, sensibly different from that of coal or bitumen. It is most frequently found in detached masses, of a moderate size, in beds of sandstone, marl, limestone, and secondary trap, and is connected with coal formations, especially those that are associated with secondary trap rocks. In Galicia and other parts of Spain, and in Wittenburg in Saxony, good specimens of jet are obtained, also in the department of Aude, in France, where it sometimes contains amber. In England, it is found near Whitby. It occurs in trap rocks in the Faroe Islands, and in the Isle of Skye, and in the coal formation in Massachusetts, in America. Although used for fuel in some parts, jet is more frequently cut and polished for ornamental purposes, necklaces, bracelets, buttons, &c. By some mineralogists jet is considered as being intermediate between bituminous wood and coal.

JET D'EAU, *jet do'*, a French term, largely used in England, signifying a fountain which throws up a stream of water to a great height in the air. (*See* FOUNTAIN.)

JETSAM, JETSON, or JETSOM, *jet'-sŭm* (Fr. *jeter*, to cast away), in Law, is anything thrown out of a ship being in danger of a wreck and cast on shore.

JETTY, *jet'-te* (Fr. *jetée*), a small pier or projection into a river, for narrowing it and raising the water above that place. A jetty-head is the projecting part of a wharf, or the front of a wharf whose side forms one of the cheeks of a dock.

JEU D'ESPRIT, *zhe(r) zes-pree'* (Fr., meaning *a game of wit*), a term applied to a witticism formed from some unexpected association of ideas. Bouillet, in his "Dictionnaire des Sciences, des Lettres et des Arts," enumerates charades, enigmas, acrostics, and similar efforts of genius, as coming under the general appellation of *jeu d'esprit*.

JEUX FLORAUX, *zhe(r) flor-o'* (Fr., floral games), is the name given to a poetical contest which takes place annually at Toulouse, in France, under the presidency of the *Académie des Jeux Floraux*. It originated in the early part of the 14th century, in an attempt by the citizens of Toulouse to revive the poetry of the Troubadours. Seven persons were united into a society under the name of the *Sept Trobadors de Tolosa*, and, in 1323, they sent a letter in verse to all the poets of Provence, inviting them, on the 3rd of May, 1324, to a poetical contest, when the composer of the best poem was to receive a violet of fine gold. The celebrated troubadour Arnaud Vidal gained the prize. Two other prizes were soon after added, to increase the splendour of the festival,—a wild rose and a pansy, both of silver. Similar institutions were afterwards established at Barcelona and Tortosa, and the original institution began to decline, and at the end of the century was nearly extinct, when it was revived by Clemence Isaure, who left by will a considerable sum for the continuance of this festival. M[illegible]ostly flowers now rewarded the talent of the competitors. Four prizes were now offered,—an amaranthus of gold of the value of 400 livres, for the best ode; a violet of silver, of the value of 250 livres, for the best essay in prose; a silver pansy, value 200 livres, for an eclogue, elegy, or idyl; and a silver lily, value 60 livres, for the best sonnet or hymn in honour of the Holy Virgin. It afterwards took the name of *Académie des Jeux Floraux*, and was made to include a chancellor, 35 mainteneurs or judges, and 20 masters. Afterwards, in 1773, the office of chancellor was abolished, and now one of the members presides, with the title of *modérateur*, and is appointed by lot every three months. The seal of the society is kept by a standing secretary. After an interruption of fifteen years, from 1790 to 1806, the academy again assembled for the awarding of prizes, and, since that time, the festival has been annually celebrated.

JEW, THE WANDERING, *joo*, a mythical personage who forms the subject of many popular traditions. According to one account, he was a carpenter; and as our Saviour passed his workshop on his way to execution, the soldiers begged that he might be allowed to enter for a few moments and rest; but he not only refused, but insulted him. By another account he was a shoemaker, sitting at his bench as our Saviour passed to Calvary, and not only refused to allow him to rest for a few moments, but drove him away with curses. Jesus calmly replied, "Thou shalt wander on the earth till I return." Driven by fear and remorse, he has since wandered, according to the command of our Lord, from place to place, and has in vain sought death amid all the greatest dangers and calamities to which human life is subject. The legend first appears in the Chronicle of Matthew Paris, in the 13th century, where the Wandering Jew is called Cartaphilus, and is said to have been a servant of Pilate. His name in the later legends is Ahasuerus. In the 16th and 17th centuries there appeared several impostors claiming to be the Wandering Jew. This legend has formed the subject of long poems by Schubart and Mosen; of a tragedy by Klingemann; of a mystico-philosophical drama by Edgard Quinet; of prose romances by the Rev. George Croly ("Salathiel"), Alexander Dumas the elder (Isaac Lakedem), Eugene Sue, M. Colckers, and David Hoffman ("Chronicles selected from the Originals of Cartaphilus, the Wandering Jew," London, 1854); of the poem of the "Undying One," by Mrs. Norton; and of numerous small lyrical pieces.

JEWELLERY, or JEWELRY, *joo'-el-e-re, joo'-el-re* (Du. *juweel*, Ger. *juwel*, a jewel).—In the primary acceptation of the word, the term jewellery is applied to any ornaments made of precious stones set in gold or silver for the adornment of the person. In an extended sense, it includes any small article made of gold or silver, even though no precious stones or jewels be used in its manufacture. The principal of the precious stones or gems are described under their respective headings. (*See* AMETHYST, DIAMOND, EMERALD,

GEMS, RUBY, SAPPHIRE, &c.) The work of preparing the stones, by cutting them into a suitable form and polishing them, belongs to the lapidary. (*See* LAPIDARY-WORK.) It is the peculiar province of the jeweller to make settings of metal for the stones, and secure them therein, and to manufacture trinkets of any kind in gold or silver, whether in combination with jewels or not. The settings of ornaments are made by casting the metal in small moulds or stamping it with dies, after which a finish is given by chasing, burnishing, and lacquering. Gems are fixed in their setting by cement and the aid of the blowpipe, a small hammer, and some very fine files. Articles of jewellery are not required to have the "hall mark," or the stamp of Goldsmiths' Hall, upon them, which must be placed on all articles of plate made by goldsmiths. This is done to prevent the reduction of the gold below a certain standard, by the addition of too much alloy to the pure metal. The value of gold is estimated by the ratio that exists between the gold and the alloy, the whole mass being considered to be divided into 24 equal parts. Thus, pure gold is spoken of as being "24 carats fine;" old standard or sterling gold, as being 22 carats; and new standard gold 18 carats; which means that sterling gold contains 22 parts of gold to 2 of alloy, and new standard gold 18 parts of gold to 6 of alloy. This is the lowest standard of gold admitted at Goldsmiths' Hall. Pure gold, or gold of 22 carats, is too soft for the purposes of the jeweller; and as articles of jewellery bear no mark to determine the quality of the gold, purchasers who have no means of testing it may often be led by specious announcements to give a high price for a chain or ornament of no intrinsic value. Gold used in jewellery may be mixed with such a large proportion of alloy as to be comparatively worthless, while it presents a fair appearance to the sight. The tint of the metal or composition may be made paler or deeper, according to the preponderance of silver or copper in the alloy; and the introduction of zinc has the effect of improving the appearance of the metal, and rendering its similitude to pure gold still greater; while the intrinsic value of the composition thus produced is very small.

JEWELLING, *jew'-el-ling*, a term particularly applied to the art of setting precious stones of a hard nature in different parts of a watch, so that the spindles or pivots of the wheels may work in them. After the watchmaker has bored holes in the various pieces of the watch in the exact spots where the jewels are to be inserted, the parts are sent to the jeweller, who enlarges the holes on one side of the plate in such a manner that the small ring of brass in which the stone has been set may sink into it. He must, however, always take care that the centre of the hole made by the watchmaker may coincide with the centre of the cavity that he himself has hollowed out to receive the jewel and its setting. After the jewel has been fitted into the cavity, it is secured in its place by two screws with broad heads, which project over the setting and prevent it from slipping out. The jewel and its setting is always let into the plate deep enough to allow the latter to be flush with it. When a jewel is required with a hole right through it, one stone is sufficient, which is drilled and let into the plate in the manner described above; but when a cavity is required in the stone instead of a complete perforation, so that the end of the pivot may have something to work against, two stones are used, fixed in separate settings,—one of which is bored right through, while the other is not pierced at all, but serves to close the hole made in the first stone on one side of it, by fitting over it. In this case the jeweller cuts away the metal of the plate about the hole that is to be jewelled, deep enough to receive the two settings, which he places in the cavity one above another, taking care that the surface of the last may be flush with the plate, after which he secures them by screws as before. The stones are fixed in the setting by turning a hollow in the ring to receive the jewel, and pressing a thin brass rim, which is left for the purpose, closely about the stone with a burnisher. Diamonds for end-pieces, however, are generally braised into settings of steel. The jeweller cuts the jewels to the required shape, and polishes them in a small lathe on a little disc of copper, which is charged with diamond-powder, known in the trade as "bort." The





holes in the stones are drilled by means of small drills of steel, diamond-powder and oil being introduced into the cavity while the process of drilling is going on. The stones are finally polished by rubbing them on a piece of plate-glass on which a little diamond-powder and oil has been placed.

JEWS. (*See* vol. I. of this work.)

JEW'S EAR. (*See* EXIDIA.)

JEW'S-HARP, an insignificant instrument of music, the form of which is too well known to need description. It is a mere plaything, and is totally incapable of being played in conjunction with either the voice or other instruments: its sounds are produced by holding it between the teeth and striking the projecting end of an iron spring with the finger. It is sometimes called the Jew's trump, and is vulgarly believed to derive its name from the Jews, and to be employed in their music. This is, however, entirely wrong, as they do not possess any instrument of the kind, and its present name is most probably a corruption of the French *jeu-trompe*, a trump to play with; or it may come from what seems to be its proper name, and what it is often called, *jaw's harp*, from its being played between the teeth.

JEW'S MALLOW. (*See* CORCHORUS.)

JIB, *jib*, the foremost sail in a ship, extending from the outer end of the jib-boom towards the foretop masthead. In cutters and sloops it is placed upon the bowsprit, and extends to the lower masthead. A flying jib is a sail which is occasionally set upon a boom rigged out beyond the jib-boom. The jib-boom is a continuation of the bowsprit forward, to which it is usually secured by means of two large boom-irons, or sometimes by only one, and a cap on the outer end of the bowsprit.

JIG, *jig* (Ital. *giga*, Fr. *gigue*), a quick, animated dance-tune, supposed to have been of English invention, although the term is derived from the Teutonic *gieg*, or *gheige*. Jigs were very popular amongst most Europeans. In Bartholomew Fair they were danced by buffoons during the exhibitions of Dives and Lazarus, and scriptural stories.

JOAN, POPE, *jone*, is a fictitious personage, who was long supposed to have succeeded Leo IV. in the papal chair in 855, and to have occupied it above two years. She is said to have been a native of Mentz, who, falling in love with an Englishman at Fulda, travelled with him, and studied at Athens and Rome, concealing her sex, and taking the name of Johannes Angelicus. She became distinguished for her talents and learning, and rose at length to the papal chair, under the name of John VIII. She governed well, but having become pregnant, she was seized with the pains of labour one day in procession, and died in the street, near the Coliseum. The story is first mentioned by Marianus Scotus, a monk in the abbey of Fulda, in the 11th century; but it has been sufficiently disproved.

JOB, BOOK OF, *jobe*, is the name of one of the books of the Old Testament, so called from the patriarch whose history and whose patience under adversity and suffering it depicts. Many questions have been agitated with respect to this book, particularly regarding the reality or fiction of the history, the period in which the author lived, and the piety and ethics which the book is intended to teach. Many eminent critics have endeavoured to prove that the whole poem is a mere fictitious narration, intended to instruct through the medium of a parable, while the actual truth of the narrative has been maintained by men equally distinguished, and has, besides, been the uniform belief both of the Jewish and the Christian church. Besides, Job is spoken of in several other passages of Scripture as being a real personage. "Ye have heard of the patience of Job," says the apostle James. As to the age in which he lived, there is great diversity of opinion. Some regard him as living in the time of the patriarchs, others in the time of Moses, others during the Judges, others in the reign of Solomon, others in the time of the Captivity, &c. The book itself bears undoubted marks of antiquity. Usserian, or Bible chronology, dates the trial of Job about the year 1520 B.C., or twenty-nine years before the departure of the Israelites from Egypt. In support of its high antiquity, have been adduced, besides the general air of antiquity which pervades the sentiments

recorded in the poem, the longevity of Job, which was characteristic of early or patriarchal times; his holding the office of priest in his own family; his allusion to that species of idolatry alone which is generally admitted to have been the most ancient,—that of the heavenly bodies; and the silence of the book respecting the history of the Israelites and the Mosaic laws. Dr. Hales has, by means of astronomical calculations, based upon the position of the stars referred to by Job, attempted to fix the date of his trial, and makes it to have been 184 years before the birth of Abraham. The scene of the poem is stated to be the land of Uz, which most probably is Idumæa. The different parts of the book are so closely connected together, that it must all have been the work of one author, and many conjectures have been made as to who that author was. Elihu, Job, Moses, Solomon, Isaiah, Ezekiel, and Ezra, have all been brought forward as having written it. There is no reason, however, to doubt; indeed, it is highly probable that Job was the writer of his own story, of whose inspiration we have the clearest evidence, when he says, "I have heard of thee by the hearing of the ear, but now mine eye seeth thee" (xlii. 5). In this book we have an account of a man of distinguished wealth, as well as of eminent piety, suddenly precipitated from the very summit of prosperity into the lowest depths of misery and ruin, —first bereaved of his wealth and children, and afterwards afflicted with a loathsome and excruciating bodily disease. Yet, under these heavy afflictions, we are told that he sinned not, nor charged God foolishly. He is visited by three of his friends, Eliphaz, Bildad, and Zophar, on the pretence of affording him consolation. After a long silence, Job's grief breaks forth into passionate exclamations, and a vehement execration of the day of his birth. The minds of his friends are suddenly exasperated, and their consolation, if any was intended, is changed into contumely and reproaches. Eliphaz reproves his impatience, questions his integrity, by insinuating that God does not so punish the righteous, and finally admonishes him not to despise the chastisement of God (iv., v.). Job replies, apologizing for the intemperance of his grief by the magnitude of his calamities; prays for speedy death, accuses his friends of cruelty, and supplicates the mercy of God (vi., vii.). The argument of Eliphaz is resumed by Bildad, who reproves Job with still greater acrimony, telling him that the death of his children had been owing to their transgressions, and that he should reform, not murmur (viii.). In reply, Job acknowledges the justice and sovereignty of God; argues that his afflictions are no proof of his wickedness; and, in despair, again wishes for death (ix., x.). Zophar prosecutes the argument with still greater severity, and exhorts him to repentance, as the only means by which to recover his former prosperity (xi.). Job replies, censuring their pretensions to superior wisdom, charging them with hypocrisy and uncharitableness, and appealing to God, professing his hope in a future resurrection (xii.—xiv.). The second series of controversy begins with another speech from Eliphaz, who accuses Job of impiety in justifying himself (xv.). Job replies, complaining of the increasing unkindness of his friends, protests his innocency, and looks to death as his last resource (xvi., xvii.). Bildad continues his former line of argument with increased asperity, inculcating the general idea that Job's sufferings are the tokens of God's displeasure at his wickedness (xviii.). In reply, the sufferer complains bitterly of the cruelty of his friends and the hard treatment of God; also he craves pity, and professes his belief that God would yet appear to vindicate his cause against his accusers (xix.). The second speech of Zophar enlarges upon the sure downfall and portion of the wicked (xx.). Job, on the contrary, dwells upon the fact that the wicked are often prosperous in this world, and end their days in peace (xxi.). The third series of controversy is opened by Eliphaz asserting more directly than before that Job's misfortunes were the result of his crimes, and concludes with renewed exhortation to repentance and prayer (xxii.). In reply, Job ardently desires to plead his cause before God, and maintains that the wicked frequently escape punishment in this life (xxiii., xxiv.). The reply of





Bildad, who expresses the holiness of God, before whom no man can be pure (xxv.). Job, in reply, revindicates his own conduct with great warmth; takes a retrospect of his former life as a husband, a master, a magistrate; and concludes with an ardent wish for an immediate trial before God's tribunal (xxvi.—xxxi.). Another speaker is now introduced, Elihu by name, who sums up the whole argument. After condemning the conduct of all the disputants, whose reasonings were not calculated to produce conviction (xxxii.), he proceeds to contest several of Job's positions, and to show that God frequently afflicts the children of men for the best of purposes, and that, in every instance, it is our duty to submit. He concludes with a fine description of the various attributes of God (xxxiii.—xxxvii.). Jehovah himself now interposes, and addresses Job out of a whirlwind, in a speech of the sublimest kind. He shows Job the folly of questioning the justice or wisdom of the Divine government, when he is unable to control, or as much as comprehend, the commonest phenomena of nature (xxxviii.—xli.). Then follows Job's submission, and his restoration to prosperity, his possessions being doubled (xlii.). Some commentators have regarded this book as a regular epic, possessing unity of action, delineation of character, plot, and catastrophe,—not exactly in the Greci , but in the Oriental style; others regard it as a reg ar drama, divided into acts and scenes; while others call its form lyrical. But, whatever class of poetry we regard it as belonging to, it stands in the first rank of Hebrew poesy. "The poetry of the book of Job," says Dr. Blair, "is not only equal to that of any other of the sacred writings, but is superior to them all, except those of Isaiah alone. As Isaiah is the most sublime, David the most pleasing and tender, so Job is the most descriptive of all the inspired poets. A peculiar glow of fancy and strength of description characterize the author. No writer whatever abounds so much in metaphors. He may be said not to describe, but to render visible, whatever he treats of."—*Ref.* Horne's *Introduction to the Holy Scriptures.*

Joel, Book of, *jo'-el*, the name of one of the books of the Old Testament, called after its author, who is one of what are termed the minor prophets. He lived in Judah, but under what reign is doubtful, some placing him under Uzziah, others under Josah, &c. The book consists of two parts; the first (i. 2—ii. 18) giving a description of a famine caused by the ravages of locusts, and exhorting the people to repentance, in which he becomes very urgent towards the close, denouncing still greater judgments against them if they continue impenitent; and the second part (ii. 19—iii. 21), containing the divine promise respecting the removal of this judgment upon the people, the destruction of all nations hostile to the theocracy, and the glorification of that theocracy by the richest blessings of nature and the outpouring of the spirit upon all flesh. The canonicity of this book has never been doubted. The style is pure, elegant, and copious, and the ideas are noble and vigorous.

John Bull, *jon*, a collective name, used in a sportive manner, in order to designate the English people. It was first employed by Dean Swift. Amongst the English themselves, the term is used in order to convey the idea of an honest, blunt, but, on the whole, good-natured character. Amongst foreigners, the term *John Bull* is employed in order to express the insular peculiarities and prejudices of the English nation, and especially their inability to accommodate themselves to the circumstances of foreign countries. The generic sobriquets applied to the inhabitants of other countries differ from the English *John Bull*. Thus, the terms *Sawney* in Scotland, and *Paddy* in Ireland, refer more to individuals than to the Scotch or Irish people generally. The former of these is derived from *Saunders*, a contraction of Alexander, and the latter from *Patrick*. The term *Yankee* also signifies an individual American, particularly a native of the eastern states. It is probably a corrupt Indian pronunciation of the word *English*, whom the Indians called *Yengeese*. *Uncle Sam*, a common colloquial expression, is derived from U.S., the abbreviation of the United States.

John Dory. (*See* Dory, John.)

JOHN, EPISTLES OF, the name of three of the books of the New Testament scriptures, which, though bearing no name, are unquestionably the work of the apostle John. The author of the first epistle describes himself at its commencement, as an eye-witness of the life of our Lord; and the style and language manifestly harmonize with those of the author of the gospel of John. For the authenticity of the first epistle very ancient testimony can be adduced. The design of this epistle is to refute, and to guard the Christians, to whom he wrote, against erroneous and licentious tenets, principles, and practices; to stir up all who profess to know God, to have communion with him, and to believe in him, that they walk in the light and not in darkness, that is, in holiness and not in sin; and to help forward and provoke real Christians to communion with God and Christ Jesus, to constancy in the faith, and purity and holiness of life. The style is simple, clear, and flowing, and the epistle breathes a spirit of love and devotion, with zeal for moral strictness. The second epistle is addressed to Kuria, "the elect lady," and is an epitome of the first, touching in few words on the same points. Kuria is commended for the religious upbringing of her children, and is exhorted to abide in the doctrine of Christ, to persevere in the truth, and carefully to avoid the delusions of false teachers. Chiefly, however, he beseeches her to practise the great and indispensable commandment of Christian love and charity. The third epistle is addressed to a converted gentile, named Gaius, but of whom nothing is known with certainty. Its scope is to commend his steadfastness in the faith and his general hospitality, especially to the ministers of Christ; to caution him against the ambitious and turbulent practices of Diotrephes, and to recommend Demetrius to his friendship; referring what he may further have to say to a personal interview.—*Ref.* Horne's *Introduction to the Holy Scriptures.*

JOHN, GOSPEL OF, is the name of one of the books of the New Testament, written by John the Evangelist and Apostle, the son of Zebedee, and the younger brother of James the elder. The precise date of this gospel is not known, some placing it as early as 68 or 69, others as late as 97. There has been much speculation in modern times as to the object the apostle had in view in writing his gospel. According to some, his design was to supplement the deficiencies of the three other gospels; according to others, to confute the errors of the Nicolaitans and Cerinthus; while others are of opinion that it was to state the true doctrine of the divinity of Christ. Probably all of these and other motives may have been in the mind of the apostle; but, judging from what he himself has said, the last of these seems to have been the main motive. "Many other signs truly did Jesus in the presence of his disciples, which are not written in this book. But these are written, that ye might believe that Jesus is the Christ, the son of God, and that, believing, ye might have life through his name" (xx. 31). The four following doctrines are more particularly insisted upon in this book:—1. The mystical relation of the Son to the Father; 2. that of the Redeemer to believers; 3. the announcement of the Holy Ghost as the comforter; 4. the peculiar importance ascribed to love. It is usual to divide this book into three parts:—1. The Introduction or prologue (i. 1—18); 2. the History, narrating the various events in connection with our Lord's ministry, and giving an account of his death (i. 19—xx. 29); 3. the Conclusion, giving an account of the person of the writer of this gospel, and of his design in writing it (xx. 30—xxi.). No doubt has ever been entertained at any time in the Church, either as to the canonical authority of this book or to its being written by John. The circumstantiality of its details proves it to have been written by a hearer and an eye-witness; besides which there is the uninterrupted testimony of the ancient fathers in its favour.—*Ref.* Smith's *Dictionary of the Bible.*

JOHN'S COLLEGE, ST., CAMBRIDGE, was founded by Lady Margaret, countess of Richmond and Derby, and mother of King Henry VII., in 1511. She died before the full completion of her designs, and much difficulty was experienced in establishing the college on as large a scale as was originally intended; but by the exertions and munificence of Fisher, bishop of Rochester, then





chancellor of the university, and others, sufficient funds were obtained to endow thirty-two fellowships. This number was afterwards augmented by numerous subsequent benefactors. The college now consists of a master, fifty-six fellows, and sixty foundation scholars, the fellowships and scholarships being open to all British subjects, without any restriction on appropriation. Candidates for fellowships must be bachelors of arts, law, or medicine; and all fellows, except those holding the office of tutor, &c., are obliged to be in priests' orders within seven years from the degree of M.A. The value of a scholarship is £30 per annum, and is tenable till the scholar shall become of standing to be an inceptor in arts. There are also eight minor scholarships, tenable for two years, and a number of exhibitions attached to this college. The number of undergraduates in 1862 was 246; of members on the boards, 1,442.—Ref. *Cambridge University Calendar.*

JOHN, ST., KNIGHTS OF. (*See* HOSPITALLERS.)

JOINERY, *joyn'-er-e*, a term that may be generally applied to the art of connecting and fitting separate pieces of timber together, whether large or small, but which is more properly confined to the operations of the carpenter, who makes the doors, staircases, window-frames, and other internal fittings of a house, and who is, in consequence called a joiner. One of the most important joints in carpentry is the "scarf," by which two thick pieces of timber are scarfed or fastened together, that they may present the appearance of being one continuous piece of the same width and thickness throughout. It is principally used in preparing the keels of vessels and beams, in which great length is required. Masts are also sometimes joined together in this way. The form of the scarf is various. The most common method is that which is used in fastening small pieces of timber, or the joints of a fishing-rod, together, in which a plain bevelled joint of some length runs diagonally through the piece, and is formed by bringing together the extremities, which have been cut in such a manner that the bevelled surface of the ends of each piece form a very small angle with the external surface of the side that meets it at the sharpened end; but this would not be sufficiently strong for joining together pieces of timber of considerable size; so the ends are generally cut and fitted together in the form of steps, from which this kind of scarf has obtained the name of the "step scarf." The French have a method of cutting the ends of each piece into a sloping zigzag or notched form, which is perhaps better adapted to resist longitudinal tension; but all timbers joined by scarfing should be secured with bolts, having nuts and screws at either end; and it is better to put substantial plates of iron across the ends of the joints that appear in the upper and under surfaces of the beam through which the bolts are passed, so that each end of the scarf is bound and tied together by a framework of iron. Sometimes pieces of iron of some breadth are fitted to the sides of the beam, and fastened together by bolts passing above and below the beam: this plan is adopted when the timbers have to resist any transverse strain. If no bolts are used to strengthen the scarf, it must be much longer, in proportion to the depth of the beam. With bolts, the length of the scarf should be at least twice the depth of the beam in elm, oak, beech, ash, and all kinds of timber of a similar nature to these materials; but in deal, it must be four times the depth. Without bolts, the length of the scarf, for all kinds of wood, must be three times as long as it would be if bolts were used, to add to the security of the joint. When joints are made in timber in which the grain in each piece runs in the same direction, and parallel to the sides of the wood, they are called "longitudinal joints;" but when the grain of one crosses that of the other at right angles, it is called an "abutting joint." A simple method of joining small pieces of timber at right angles to each other is by notching or cutting away half the thickness of the end as far into the length of the timber as may be required. This is done to each of the pieces that have to be fastened together. When two pieces cross each other at right angles, or indeed at any angle, a joint is made in this way, by cutting a piece out of each piece of wood to the extent of half its thickness, and corresponding in width or shape to that of the piece which is to fit into it. When broad pieces of

timber or planks are joined at the ends, they are dovetailed into each other, or notched and dovetailed. The dovetail joint is sometimes used in joining square pieces of wood end to end, but it is not so strong as the scarfed joint for this purpose. Notched joints of any kind, such as those already described, and the notches made to allow the ends of rafters to fit into girders and wall-plates, or to fit against the inner edge of the latter, are always secured by nails or wooden pegs. The joint most commonly used for putting pieces of wood together to form strong rough frames, and for putting together partitions and large structures of timber, is the "mortise-and-tenon" joint. A square hole is sunk in one piece of timber by means of the mortise-chisel and mallet, and the end of the piece of timber that is to fit into it at right angles is cut to the shape of the hole by the tenon saw. When the pieces have been fitted together, the joints are nailed or pegged, or the tenon is looked closely into the mortise by splitting its extremity and inserting one or more thin wedges. The above are the different descriptions of joints used in carpentry. Those adopted in joinery are similar in principle; thus the component parts of the framing of a door or shutter are put together by mortise-and-tenon joints; but the mortises and tenons are long and very narrow, instead of being square, or twice as long as they are broad, as in carpentry, when heavy timbers are fitted together. The dovetailed joint is used for joining the ends of planks that form the sides of drawers and boxes, while different varieties of the mitre joint are used for fitting and joining the corners of picture-frames and ornamental beading placed round a panel. In making staircases, a broad groove is generally cut in the under side of the horizontal board called the head, at a short distance from the edge, or nosing, in front, into which the top of the vertical board, or riser, below it is fitted. This method of joining boards is called notching. In joining the edges of boards to form a plane surface, a rebate is formed in the edge of each plank by cutting it away on one side in the form of a step, and the boards are then fitted over each other; or a groove is cut in the centre of the edge of one board, which receives a corresponding projection formed on the edge of that which comes next to it. Sometimes a groove is cut in the edges of both boards, into which a narrow slip of wood is inserted.—*Ref.* Tredgold's *Elementary Principles of Carpentry*; Nicholson's *Architectural Dictionary*.

JOINT, *joynt* (Ang.-Nor., fr. Fr. *joint*).—In Build. and the constructive arts, this term is applied to the various means that are adopted to connect or fasten any two or more pieces of material together. Joints are of two kinds,—fixed and movable. A rigid or fixed joint is that which serves to unite pieces of wood, stone, or metal together, in such a manner that they may answer the same purpose as a single piece of the same material would, if it could be procured of the requisite shape on the one hand, or of sufficient size on the other, and such as could be readily placed in position. A movable joint is such as enables pieces of woodwork to be attached to each other in such a manner that one may work or turn about the other, as a door moves about the jamb to which it is suspended. The various kinds of joints by which this is effected are described elsewhere (*see* HINGE), and the different methods of connecting pieces of timber are noticed in the preceding article (*see* JOINERY). It will therefore only be necessary, in the present article, to mention the joints that are used in connecting masonry and metal-work. The term joint in masonry is applied for the most part to the vertical junctures of the ends of pieces of stones and bricks, and to the slanting junctures of the voussoirs of an arch. When large blocks of stone are joined together, they are sometimes dovetailed and secured at the top by iron clamps set in melted lead, or they are fitted together by what is termed a "joggle," in which a projection, left on the side of one stone, is fitted into a groove that is cut for its reception in the side of another that is adjacent to it. In joining thick bars and pieces of metal, joints similar in form to those used in carpentry are employed, the pieces being also further and more intimately connected by welding, brazing, or soldering, or by the insertion of iron rivets into holes bored through both of the pieces that are to be fastened together. Welded joints are made by heating the ends of the pieces to a red or white heat, and then hammering them together. Brazed joints consist of the union of the edges of pieces of metal by the aid of an alloy that is mostly made of brass and zinc. Soldered joints consist of the union of a small and narrow part of the surfaces of contiguous pieces of metal lying along the edge of either—the pieces being made to overlap each other about the eighth of an inch, or more if necessary—by an alloy or solder that fuses readily at a low heat. Different alloys are used for joining two pieces of metal of the same kind and two pieces of different kinds.

JOINT, in Anat. (*See* ANATOMY.)

JOINT-STOCK COMPANIES are a kind of partnership entered into by a number of individuals for the purpose of carrying on some trade or business with a view to individual profit. In ordinary partnerships, the members (except in the case of what are termed "sleeping partners") contribute more or less of their own personal labour or management to the affairs of the company. In joint-stock partnerships, on the other hand, the members only contribute to the funds or "stock" of the company, without having any direct share in the management; and hence their name. The capital of the company is generally divided into equal parts, called "shares," a certain number of which are held by each member of the company; and in proportion to the number of these he is entitled to participate in the profits of the undertaking. These shares are freely transferrable without the consent of the company. The immediate superintendence of the affairs of the company is usually delegated to a portion of the members called directors, subject, nevertheless, to the general control of the body assembled at stated intervals, or on particular occasions, when they may be convened; except on such occasions, however, the general body of the shareholders have no power to interfere in its concerns or to bind the company. The increased facilities which the wealth and influence of a number of individuals, concentrated in the hands of a few, give for carrying out commercial projects, were seen and taken advantage of early in the history of commerce. The most noted among the earlier associations of this kind was that of the Hanse Towns, which continued to flourish for several centuries. The last three centuries of the history of England afford many instances of memorable joint-stock companies. In 1553 was established the company of "Merchant Adventurers for the Discovery of Lands, Countries, Isles, &c., not before known by the English," which afterwards became the Russian Company, and which, under the fostering care of Queen Elizabeth, acquired so much power as to spread its transactions into Persia on the one hand, and to embark in the whale-fishery of Spitzbergen on the other. The celebrated Turkey or Levant Company was chartered in 1581; and eighteen years afterwards the East-India Company was formed, which has been destined to effect such important results. Many African and American companies were formed in the 17th century, and created much excitement by their rivalries and aggressions. The unfortunate Scottish Darien project was formed in 1695, and the disastrous South-Sea scheme in 1710. These projects are not without their counterparts in more recent times. During the last century, a large number of useful public undertakings, canals, bridges, harbours, docks, water and gas works, &c., have been carried into effect by companies formed on the joint-stock principle; and, more recently, our gigantic system of railways has been formed in the same way. Previous acts having been found ineffectual for the prevention of frauds and irregularities in such companies, act 8 & 9 Vict. c. 110, was passed, which required every company not requiring or obtaining an act of parliament, projected after a certain day, to be registered with the registrar of joint-stock companies, under severe penalties, and rendered all the shareholders liable for the debts of the company. The company, however, had many of the advantages of being incorporated, and could sue and be sued in its proper name. This act was subsequently repealed by 19 & 20 Vict. c. 47, called the Joint-Stock Companies' Act, 1856; amended by 20 & 21 Vict. c. 14, called the

Joint-Stock Companies' Act, 1857. By these two acts it is provided that any seven or more persons associated for any lawful purpose may, by subscribing their names to a memorandum of association, and otherwise complying with the requisitions of the act relative to registration, form themselves into an incorporated company, with or without limited liability, said memorandum, with articles of association (if any), to be delivered to the registrar of joint-stock companies, who shall register the same; on which said company becomes a body corporate, with power to hold lands, &c., as by act provided. A list of the shareholders has to be annually furnished to the registrar of joint-stock companies, and is open to public inspection. Each shareholder is individually liable for the debts of the company, limited, if the company be "limited," to the amount which may still remain due on the shares held by him; or, if "unlimited," then to an amount sufficient to pay the debts of the company, with all costs and expenses. In the case of a limited company, this liability continues for one year after a shareholder may have transferred his shares,—in the case of an unlimited company, for three years; but in the latter case the liability does not extend to such debts as may have been contracted after the date of the transfer. If more than twenty persons unite for the purpose of carrying on any trade or business for gain to the partners, and be not registered or constituted by some act of parliament or royal charter, or engaged in working mines within the jurisdiction of the Stannaries, they shall be severally liable for the payment of the whole debts of the company, and may be sued for the same. A company may be wound up either voluntarily or compulsorily. A company may be voluntarily wound up when a special resolution to that effect is passed at a general meeting, supported by the votes of three-fourths of the shareholders assembled; in which case the official liquidator is appointed by the company itself, and exercises all his powers,—calling upon contributories, &c., without the intervention of any court. A company may be wound up compulsorily,—1. by virtue of a special resolution to that effect; 2. when the company does not commence its business within a year from its incorporation, or suspends business for a year; 3. whenever the shareholders are reduced in number to less than seven; 4. whenever the company is unable to pay its debts; 5. whenever three-fourths of the capital have been lost or become unavailable. A company is deemed unable to pay its debts whenever a creditor for more than £50 has served a demand, under his hand, requiring payment of the sum due, and has not obtained satisfaction within three weeks, when he may take proceedings to have the company wound up. The winding up takes place upon a petition presented by the creditor to the proper court, which, if the company be limited, is the court of Bankruptcy having jurisdiction in the place where the company's registered office is situate; and if the company be unlimited, the high court of Chancery. Such court may accordingly make an order for the winding up, and may appoint, to assist in that operation, an official liquidator, who is to take into his custody all the property, effects, and choses in action of the company, and dispose of them by way of sale or otherwise, under the sanction of the court. He also collects the assets of the company, and applies them in discharge of its liabilities, and may also proceed to make calls on the several shareholders or contributories to the extent of their respective liabilities. As soon as the affairs of the company have been completely wound up, the court shall make order for its immediate dissolution. A petition for winding up a company may be presented by a contributory as well as by a creditor, whenever it is unable to pay its debts. By the Joint-Stock Banking Companies' Acts, 1857, 1858 (20 & 21 Vict. c. 49, and 21 & 22 Vict. c. 91), joint-stock banking companies have been subjected generally to the Joint-Stock Companies' Acts. By the Joint-Stock Companies' Amendment Act (21 & 22 Vict. c. 60), it is declared that any order made by the court in England, for or in the course of the winding up of a company under the Joint-Stock Companies' Acts, shall be enforced in Scotland and Ireland in the courts that would respectively have had jurisdiction in respect of such company, if the registered office of the company had been established in Scotland or Ireland; and in like manner orders or decrees made by the court in Scotland or Ireland, for or in course of the winding up of a company, shall be enforced in England.—*See* Stephen's *Commentaries on the Laws of England*; Smith's *Compendium of Mercantile Law*, by Dowdeswell.



Joint Tenancy, in Law, signifies the joint ownership of two or more persons in land or other property. The creation of an estate in joint tenancy depends on the wording of the deed or devise by which the tenants claim title; for this estate can only arise by purchase or grant,—that is, by act of the parties, and never by mere act of law. The properties of a joint estate are derived from its unity, which is fourfold:—1. unity of interest,—that is, one joint tenant cannot be entitled to one period of duration or quantity of interest in the lands, and the other to a different; one cannot be a tenant for life and the other for years; 2. unity of title,—their estate must be created by one and the same act, as by one and the same grant; 3. unity of time,—the estate must be vested at one and the same time, as well as by one and the same title, with a few exceptions, as where a feoffment was made to the use of a man and such wife as he should afterwards marry; 4. unity of possession,—that is, each of them has the entire possession, as well of every parcel as of the whole (*per my et per tout*, by the half or moiety, and by all). In all actions relating to their joint estate, one joint tenant cannot sue or be sued without joining the other; neither can one joint tenant by himself do any act which may tend to defeat or injure the estate of the other. The interest of joint tenants being not only equal or similar, but also one and the same, it follows that when two or more persons are seised of a joint estate of inheritance for their own lives, or *pur auter vie*, or are jointly possessed of any chattel interest, the entire tenancy, upon the decease of any of them, remains to the survivors, and at length to the last survivor; and he shall be entitled to the whole estate, whatever it be, whether an inheritance or a common freehold only, or even a less estate. Joint tenants may agree to part their lands and hold them in severalty, when they are no longer joint tenants, and the right of survivorship ceases. Things personal may belong to their owners in joint tenancy as well as real estates. Thus, if a horse or other personal chattel be given to two or more persons absolutely, they are joint tenants thereof; and, unless the jointure be severed, the same doctrine of survivorship shall take place as in estates of lands. Either party may also sell his share, by which the right of survivorship is destroyed. Partners in trade are joint tenants of the partnership stock; but on the death of a partner, his personal representatives become tenants in common in equity with the surviving partners.

Jointure, *joynt'-tshur*, in Law, was originally used to denote the interest of joint tenant, but it is now commonly applied to that portion of lands and tenements conveyed to a wife, in the event of her surviving her husband. Before the passing of the Statute of Uses (27 Hen. VIII. c. 10), the greatest part of the land of England was conveyed to uses, and thus not subject to dower; and hence it became usual, on marriage, to settle by express deed some special estate to the use of the husband and his wife, for their lives, in joint tenancy or jointure, which would be a provision for the wife in the event of her surviving her husband. By the Statute of Uses, all wives would have become dowable of such lands as were held to the use of their husbands, and also entitled at the same time to any special lands that might be settled in jointure, had not the same statute provided that upon the husband's making such an estate in jointure to the wife before marriage, she should be for ever precluded from her dower. It must be made before marriage; for if the jointure be made to her after marriage, she has her election after her husband's death, either to accept it, or to refuse it and betake herself to her dower at common law, for she was not capable of consenting to it during coverture. The jointure must be limited to take effect immediately on the death of the husband; it must be for her own life, or during widowhood at least, and not *pur auter vie*, or for any term of years; it must be made to herself, and to no other in trust for

her, although a trust estate is a good equitable jointure; and it must be made in satisfaction of her whole dower, and not of any particular part of it. In consequence of the inconveniences arising from the limitation of land by jointure, it has become common to convert it into an annuity for life, chargeable upon the land, with power of distress, and also right of entering upon the land, in the event of the annuity not being paid. In this way a more certain income is provided for the widow, and the heir obtains possession of the whole estate.

JONAH, BOOK OF, *jō'-nă*, is the name of one of the sacred books of the Old Testament, the fifth in order among those of the minor prophets. Its author, Jonah, was the son of Amittai, a native of Gathhepher, in the tribe of Zebulon, and is generally believed to have flourished during the reign of Jeroboam II., though some place him forty years earlier, towards the close of Jehu's reign. With the exception of the sublime ode in the second chapter, the book of Jonah is a simple narrative. It gives an account of the prophet's commission to denounce Nineveh, and of his refusal to undertake the task; his attempt to flee to Tarshish, and its frustration, together with his delivery from the stomach of the great fish, which had swallowed him (i., ii.). He is again sent on his mission, and, in consequence of his preaching, the Ninevites repent in dust and ashes (iii.). Jonah was exceedingly angry at God's merciful forbearance towards the Ninevites, probably dreading lest his veracity as a prophet might be called in question, and retired from the city to a spot from whence he might witness its destruction. God caused a gourd to spring up to shelter him; and from its speedy death he took occasion to reprove Jonah for repining at the divine forbearance. The scope of the book is to show the value of real repentance; and from the conduct of the Ninevites, our Lord takes occasion to reprove the perfidiousness of the Jews. Many have attempted to deny the literal interpretation of this book; some regarding it as an allegory, others as a mere fiction, designed to serve a moral purpose. There are also some who, while not questioning the truth of the narrative, yet have recourse to the most absurd and ridiculous hypotheses in order to explain away the account given of Jonah's being swallowed by a great fish. The word translated whale in the New Testament means any large fish; and the general opinion now is, that the animal was a species of shark, within some of which whole human bodies have been found. From the manner in which the sacred historians and Jesus Christ speak of the incidents of this book, it is evident that it is a true narrative of a real personage, and that Jonah was a prophet of considerable eminence.

JOSHUA, BOOK OF, *josh'-u-ă*, is the sixth in order of the books of the Old Testament, and is a history of the Israelites under the government of Joshua, the successor of Moses, embracing the period between 1451 and 1425 B.C. The general opinion is that the book was written by Joshua himself (except the last five verses), though some regard it as the work of a later hand. The book may be conveniently divided into three parts:—1. The history of the occupation of the land of Canaan, by the Israelites (i.—xi.), and a recapitulation of the conquests, both of Moses and Joshua (xii.); 2. a description of the land of Canaan (xiii.), and a particular apportionment of it among the different tribes (xiv.—xxii.); 3. the dying address, death, and burial of Joshua (xxiii., xxiv.). The scope and design of the book is to demonstrate the truth and faithfulness of God, in the perfect fulfilment of all his promises to the patriarchs, regarding the possession of the land of Canaan by their posterity. A further design of the book is to show the portion which was allotted to each tribe. The canonical authority of this book has never been called in question, and in all the copies of the Old Testament its place is immediately after the Pentateuch. The style is clear, simple, and unpretending. There is some accidental derangement in the order of the chapters of this book. Chronologically, they should read thus:—"First chapter to the ninth verse; then the second chapter; then from the tenth verse to the end of the first chapter; after which should follow the third and consecutive chapters to the eleventh; then the twenty-second chapter, and the twelfth to the twenty-first chapter inclusive; and, lastly, the twenty-third and twenty-fourth chapters."—(*Horne.*) The Samaritans have two books extant, bearing the name of Joshua, the one being a chronicle of events from Adam to the year of the Hegira 808 (A.D. 1403), and the other a similar chronicle, from the death of Moses to the death of Alexander Severus. Of the latter of these an edition was published in Arabic and Latin, by Juynboll,—Leyden, 1848.

JOURNAL, *jur'-năl* (Ital. *giornale*, daily), denotes, properly, a record of daily occurrences; but it is commonly applied to a newspaper, magazine, or other periodical publication; as the proceedings of a society.

JOURNEYMAN, *jur'-ne-măn* (from Fr. *journée*, a day's work), was originally applied to one who wrought with another by the day, but is now used to designate any mechanic who labours in his employment for another, whether by the day, month, year, or any other term.

JOUST. (*See* TOURNAMENT.)

JUAN, DON. (*See* DON JUAN.)

JUBILATE, *ju-bil-ai'-te* (Lat.), is the name given to the third Sunday after Easter, from the practice in the primitive church to commence divine service on that day with the] 66th Psalm, *Jubilate Deo omnes terræ*,—Sing to the Lord all ye lands.

JUBILEE, *jū'-be-le* (] .. *jubilum*), one of the Jewish festivals, which was cel ..ated every fiftieth year. This festival was proclaime . by sound of trumpet throughout the land, on the evening of the day of Atonement. All slaves and captives were to be free, all estates which had been sold reverted to their original proprietors or their descendants, and every man returned unto his family. The ground was not to be sown, nor was that to be reaped which grew of itself during that year. The political object of this institution was to preserve the distinction of tribes and families, and to prevent too great a social inequality among the people, by restoring to each his previous possessions. Some have been of opinion that the jubilee was celebrated every forty-ninth, and not every fiftieth year. According to the Hebrew ritual, not only was every seventh day observed as a period of rest, but likewise every seventh year, when they were to cease from labour, and the land was to remain uncultivated. Hence, it is objected to the fiftieth year, that in that case the land would remain for two consecutive years uncultivated. The language of Scripture, however, is so decided as to the fiftieth year, as to leave no room for entertaining the other opinion. The jubilee did not continue to be observed after the Babylonish captivity. In modern times the term has been applied to the year in which all who visited the church of St. Peter at Rome, for a certain number of days, with pious offerings, received plenary indulgence. A jubilee was first declared by Pope Boniface VIII., in 1300, and was to recur every hundred years; but being the means of bringing vast wealth to the Church, the period was shortened by Clement VI. to fifty years. This period was subsequently shortened by Urban VI. to thirty-three years, and by Paul II. to twenty-five, at which last it still remains. The condition of visiting Rome is no longer in force, certain acts of devotion or charity being substituted for it. The last jubilee of the Church was celebrated in 1850.

JUDAISM, *jū'-dā-izm*, is a term applied to that religious and moral system of the Jews which was communicated to them by Moses, and which is still observed by them in the present day. Many of the early Christians, even in the time of the Apostles, manifested a Judaizing spirit, and are frequently alluded to by the apostle Paul. After the destruction of Jerusalem, a sect, known by the name of Judaizing Christians, separated themselves from communion with their brethren. They afterwards became merged in other sects.

JUDE, EPISTLE OF, *jude*, is the name of one of the books of the New Testament, whose canonical authority has been much disputed in ancient and more recent times. It is placed by Eusebius among the controverted books, as having been rejected by many of the ancients; and Luther, Grotius, Dahl, Michaelis, also call it in question. The doubts thrown upon its genuineness, however, arise solely from the writers being supposed to quote two apocryphal books. As regards the prophecy of Enoch, the language of the author does not imply that he is quoting from any

book; the fact may have been handed down by tradition among the Jews, and the words may have afterwards been copied by the author of the apocryphal book of Enoch, in order to give colour to his forgery. The same remarks apply to the notice of the dispute between the archangel Michael and the devil, respecting the body of Moses, which some consider to have been taken from a book entitled the "Assumption or Ascension of Moses." The author of this book simply calls himself Jude, the brother of James, and servant of Jesus Christ; and hence it has been doubted whether he was Jude the apostle, or Jude the Lord's brother, if, indeed, these were two distinct persons, which is by no means clear. Some suppose the book to have been written about 64 or 66, others not till about 90. The design of the epistle is to guard believers against the false teachers who had begun to insinuate themselves into the Church, and were disseminating dangerous tenets of insubordination and licentiousness. The epistle concludes with admonitions and counsels to believers to persevere in faith and godliness, and to rescue others from the snares of false teachers. The language of the epistle is animated, the expressions are remarkably strong, and the figures and comparisons bold, apt, and striking.

JUDEX, JUDICIUM, *jw'-deks ju-dish'-e-um* (Lat., judge). —It appears that there was no class among the ancient Romans corresponding to our judges. The judices were not necessarily lawyers, and it would seem that any Roman citizen might act as judex in civil causes. The judices were allowed to have their assessors, learned in the law, to advise with. A judex judged both of fact and law, but only in such cases as were of smaller importance. An *arbiter* determined what seemed equitable in a matter not sufficiently defined by law. The *recuperatores* were another class of judges, and were so called because by them every one recovered his own. The *centumviri* were judges chosen from the thirty-five tribes, three from each; being in all 105, but named by a round number 100. They formed a court in which weighty matters of the law were decided. The *judicia* were of two kinds, *privata* (private) and *publica* (public), the former being civil trials, having relation to differences between private individuals, the latter criminal trials.—(*See* further on this subject, the *English Cyclopædia*—Arts and Sciences.)

JUDGE, *judje* (Fr. *juge*, Lat. *judex*), is one invested with authority to try any cause or question in a court of judicature, and to pronounce sentence or judgment thereon. The judges of the superior courts at Westminster are appointed by the crown, and do not, as formerly, hold office during pleasure, but (by 12 & 13 Will. III. c. 2) during good behaviour, and they can only be removed on the address of both houses of parliament. Neither do they, as formerly, vacate their seats upon the demise of the crown; and their full salaries are secured to them during the continuance of their commissions. Judges are not liable to prosecution for anything done by them as judges, at least within their own jurisdiction; nor are they in any way punishable for a mere error of judgment or for wrongful imprisonment. Judges are, however, punishable for wilful offences against the duty of their situation. Bribery is punishable by loss of office, fine, and imprisonment. A judge ought to judge by law, and not by examples (*Judex est lex loquens*).

JUDGES, BOOK OF, *judj'-ez*, is one of the historical books of the Old Testament, containing the history of the children of Israel from the death of Joshua to the time of Eli, during which time the government of the people was in the hands of judges; whence the book takes its name. It comprises the history of about three hundred years, and consists of three parts. The first contains the history of the elders who ruled the Israelites after the death of Joshua, and the subsequent transactions to the commencement of their troubles (i.—iii. 4). In the second part of the book we have the history of the judges from Othniel to Eli (iii. 5—xvi.); being Othniel (iii. 9), Ehud (iii. 15), Shamgar (iii. 31), Deborah (iv. 4), Barak (iv. 6), Gideon (vi. 11), Abimelech (vi. 12—ix.), Tola (x. 1), Jair (x. 3), Jephthah (xii. 7), Ibsan (xii. 9), Elon (xii. 11), Abdon (xii. 13), Samson (xv. 20). The third part gives an account of an idol that was worshipped, first in the family of Micah (xvii.), and afterwards in the tribe of Dan (xviii.); followed by an account of a barbarous act committed by the Benjamites of Gibeah, which led to a war between them and the other tribes, in which the tribe of Benjamin was almost extirpated (xix.—xxi.). In this book we find most remarkable instances of God's dealings with the children of Israel. His justice and mercy are alternately and strikingly displayed: the people sinned, and were punished; they repented, and found mercy. We have also presented to us some illustrious examples of faith and goodness in the characters of Gideon, Barak, Samson, Jephthah, &c. The authorship of the book, and the time at which it was written, are subjects on which considerable diversity of opinion exists. The general opinion, and that which is held by the Jews, is that it was written by Samuel, the successor of Eli, though some have ascribed it to Phinehas, Hezekiah, Jeremiah, Ezekiel, Ezra, &c.; being compiled from the public registers or records of the events. The canonical authority of the book is undoubted.

JUDGMENT, *judj'-ment* (Fr. *jugement*, Lat. *judicium*), in Law, is the sentence pronounced by a court of law upon the matter contained in the record. It is restricted to the decisions of a court of common law,—those of a court of equity being denominated decrees. Judgments are of four sorts:—1. On *demurrer*, where the *facts* are confessed by the parties and the law determined by the court; 2. on *verdict*, where the law is admitted by the parties and the facts disputed; 3. by *confession* or *default*, where both the fact and the law arising thereon are admitted by defendant; and, 4. on *nonsuit* or *retrazit*, where the plaintiff is convinced that either fact or law, or both, are insufficient to support his action, and therefore abandons or withdraws his prosecution. All judgments are either interlocutory or final. Interlocutory judgments are such as are given in the middle of a cause. (*See* INTERLOCUTOR.) Final judgments, on the other hand, are such as at once put an end to the action, by declaring that the plaintiff has either entitled himself, or has not, to recover the remedy he sues for. Judgment may, for certain causes, be suspended, or finally arrested. Formerly it could not be entered till the next term, after trial had, and that upon notice to the other party; but now, by the Common Law Procedure Act, 1852, a plaintiff or defendant having obtained a verdict, judgment may be signed thereon in fourteen days, unless otherwise ordered by the judge. The judge may also order immediate judgment and execution. If any defect of justice happened at the trial, by surprise, inadvertence, or misconduct, the party may have relief by a new trial; or if, notwithstanding the issue of fact be regularly decided, it appears that the complaint was either not actionable in itself, or not made with sufficient precision and accuracy, the party may supersede it by arresting or staying the judgment. A sufficient ground must, however, be laid before the court to satisfy them that it is necessary to justice that the cause should be further considered. The costs of the suit (after being taxed) generally fall to be paid by the party against whom judgment is delivered. Judgment being signed, the party in whose favour it is given may immediately sue out execution thereon, before the judgment is entered on the roll. In criminal cases, judgment, unless any matter be offered in arrest thereof, follows upon conviction, being the pronouncing of that punishment which is expressly ordained by law.

JUDGMENT, in Log., is that operation of the human mind through which, by joining different ideas together, it affirms or denies the one or the other; as when, for instance, having the ideas of the earth and roundness, it affirms or denies that the earth is round. Our judgments, according to Aristotle, are either problematical, assertive, or demonstrative. The problematical judgment is merely based upon opinion; but it may be the expression of our presentiment of certainty, and may afterwards be proved to demonstration; or it may be only an opinion in which we must admit the possibility of error at the moment of uttering our decision. The assertive judgment is one of which we are fully persuaded ourselves, but cannot give grounds for our belief that shall compel men in general to coincide with us. The demonstrative judgment may

be either certain in itself, as a mathematical axiom is, or capable of proof by means of other judgments, as the theories of mathematics and the laws of physical science. When expressed in words, a judgment is called a *proposition*. (*See* PROPOSITION.)—*Ref.* Thomson's *Laws of Thought*.

JUDGMENT NON OBSTANTE VEREDICTO, a legal term applied to the leave granted to a plaintiff by the court to sign judgment, even after the jury have found for the defendant, in consequence of the defence put upon the record being not a legal defence in point of substance. The merits of the case, however, must be very clear; and when the plea contains no confession of the cause of action, the proper course which ought to be pursued, is to award a repleader, and not to give judgment *non obstante veredicto*. No defendant can obtain this judgment in any case, but he can arrest it. It must be moved for, according to the language used in Wharton's "Law Lexicon," within four days from the time of trial, if there are so many days in term, and it cannot by any means be moved for after the expiration of the term, provided the jury precept be returnable in the same term. "The judgment is interlocutory; after which a writ of inquiry must be executed, and final judgment signed, as in ordinary cases. If the defendant has succeeded in any of his pleas, he will be entitled to retain his verdict on them, and there must be a trial *de novo*: the successful party is entitled to the costs of the material issues."—Ref. 2 *Chit. Arch. Prac.*, by Prew, 1483.

JUDICIUM DEI, *ju-dish'-e-um de'-i* (Lat., judgment of God), a term applied in the middle ages, in reference to all extraordinary trials of secret crimes; such as those by arms, single combat, ordeals, walking over red-hot ploughshares, &c., in which it was believed that God would interfere to clear the innocent and to punish the guilty. This practice was long observed, even among Christians. The trial usually took place in the church, in presence of the bishop, priest, and secular judge, generally after a period of fasting, and after many adjurations and ceremonies. The system is very ancient, and has prevailed among various nations other than Christians. It was known to the ancient Greeks; for in the "Antigone" of Sophocles a suspected person declares himself ready to handle hot iron and to walk over fire in order to manifest his innocence.

JUDITH, BOOK OF, *ju'-dith*, the name of one of the apocryphal books of the Old Testament, giving an account of the invasion of Judæa by Holofernes, general of Nabuchodnosor, king of Assyria; and of the delivery of the town of Bethulia, in Judæa, the destruction of the Assyrian army, and the death of Holofernes through the stratagem and courage of Judith, an inhabitant of that town. The historical and geographical difficulties of this book are too great to admit of its being literally true, or even carefully based on truth. The general opinion among critics is, that it is a Jewish romance, written, probably, in the age of the Maccabees, in order to animate the Jews in their struggles against the Syrians. It is disputed whether the original language of this book was the Chaldee or the Greek. The Latin translation by Jerome is from the Chaldee, the English translation in the authorized version from the Greek. The two differ from each other in many respects. There is also a Syriac version which was made from the Greek.

JUGGERNAUT, *jug'-ger-nawt* (Hind.), 'the lord of the world,' a name applied to one of the most celebrated of the sacred temples of India, which is built at Cuttack, on the coast of Orissa. The deity worshipped in the temple of Juggernaut is Vishnu, the *Preserver* (*see* HINDOO RELIGION), under the form of a hideous idol, carved out of wood, with a black painted face and widely-extending red mouth. On the great religious festival of Juggernaut, this idol is placed in a tower fully sixty feet high, moving on wheels; and there are two other idols which accompany the former; viz., his "white brother Balaram" and his "yellow sister Shubudra," who likewise sit on separate thrones. The tower is drawn along then by ropes, which are pulled by the people, and during its progress numbers of fanatics throw themselves beneath its wheels and are crushed to death, in the belief that they thus obtain an entrance into Paradise. Twice a year, pilgrims from all parts of India flock to this temple, and the revenue derived from this pressure used to exceed £12,000 per annum.

JUGGLERS, *jug'-glers*, are such as perform tricks of legerdemain by quick and artful motions of their hands, bodies, and limbs, and, by various preparations, delude the senses, so that the spectators fancy that they hear and see what they really do not hear and see. The name is said to be derived from the French *jongleurs*, the name given to the instrument-players who accompanied the troubadours, and who are said to have afterwards employed themselves in tricks and games. "The arts of juggling," says Beckmann, "convey instruction in the most acceptable manner, and serve as a most agreeable antidote to superstition, and to that popular belief in miracles, exorcism, conjuration, sorcery, and witchcraft, from which our ancestors suffered so severely." This art is one of great antiquity, and in early times was employed as a means of sustaining the power of the priesthood. The magicians of the ancient Egyptians, Persians, &c., were of this class; and doubtless most of the miracles ascribed to the heathen deities were effected by sleight of hand. The investigations of Salverte have shown in what manner most of these could have been done, and with what effect, in the de[illegible]s of temples, before witnesses filled with awe and d[illegible]d of doubt. Feats of agility, as tossing knives and balls, balancing the body in the most dangerous positions, were practised in ancient as well as in modern times. Ancient jugglers performed extraordinary feats by mechanism, which is defined by Cassiodorus as "the science of constructing machines whose effects shall seem to reverse the order of nature." The Egyptian priests made gods and statues which prophesied and explained dreams. In the East, particularly in India and China, jugglery is largely practised, and brought to great perfection as an art. Many of the tricks of modern Eastern jugglers have not yet been found out. The more remarkable jugglers of modern times have been Pinetti, Eckhartshausen, and the famed Katterfelto. More recently we have had Bosco, Houdin, Anderson, Hermann, Heller, Bartolommeo, &c. Most eminent of these is the Frenchman Robert Houdin, whose memoirs were published in 1859.—*Ref.* E. Salverte, *Des Sciences occultes*, 1843; Sir D. Brewster, *Letters on Natural Magic*; K. O. Eckhartshausen, *Ueber die Zauberkräfte der Natur*, 1819.

JUGLANDACEÆ, *ju'-glān-dā'-se-e* (from Lat. *Jovis glans*, the nut of Jupiter, on account of its excellence), in Bot., the Walnut fam., a nat. ord. of *Dicotyledones*, sub-class *Monochlamydeæ*, consisting of fine trees with the following characters:—Leaves alternate, pinnate, exstipulate; flowers unisexual, the male in amenta with calyx 2—6-partite, irregular—the female solitary, or in small terminal clusters; calyx superior, regular, 3—5-lobed; ovary inferior, 2—4-celled at base, and 1-celled above; ovule solitary, erect. The fruit called a *tryma*; seed 2—4-lobed, without albumen; embryo with sinuous oily cotyledons, and a short superior radicle. There are 5 genera and 27 species, chiefly natives of North America; a few are found in the East Indies, Persia, and the Caucasus. They are remarkable for their valuable timber and oily edible seeds. (*See* CARYA, JUGLANS.)

JUGLANS, *ju'-glānz*, in Bot., the Walnut, the typical gen. of the nat. ord. *Juglandaceæ*. *J. regia*, the common walnut-tree, is a native of the countries between Greece and Cashmere, but has long been naturalized in the western parts of Europe. It is a very beautiful and valuable tree. The timber is hard, of a rich deep brown, and beautifully marked; it is used for ornamental furniture, handles of tools, and gun-stocks. The seed of this tree is the well-known edible walnut. This yields, by expression, a useful fixed oil of a drying nature, like linseed oil. The bark possesses carthartic properties. *J. nigra*, the black walnut, a native of North America, is also esteemed for its timber. *J. alba*, the white walnut, or butter-nut, is another useful timber tree with edible seeds. The inner bark of the root is used in North America as a mild purgative.

JUGULAR VEINS, *jug'-gu-lar* (Lat. *jugulum*, the neck), in Anat., is the name given to the veins which run down the sides of the neck, and carry the blood down-

wards from the head. They are divided into external and internal; the two afterwards uniting and going with the subclavian vein to form the superior *vena cava*, which terminates in the superior part of the right auricle of the heart.

JUJUBE, *ju-jube'* (Arab.), a term properly applied to the fruit of *Zizyphus vulgaris* and *Z. Jujuba*, closely resembling a small plum, and sometimes used as a sweetmeat. The articles of confectionery called jujubes are composed merely of a mixture of gum-arabic and sugar slightly coloured.

JULIAN ERA. (*See* CALENDAR.)

JULIAN PERIOD, *ju'-le-an*, an arbitrary period of time invented by Joseph Scaliger about 1580, and produced by multiplying the solar cycle 28 by the lunar or Metonic cycle 19 and the Roman indiction 15. It was introduced by Scaliger to enable dates of events occurring before the Christian era to be computed more readily, as authorities differ to so great an extent in the dates that are assigned to the creation of the world. The Julian period consists of 7980 years, and is considered to have commenced 4713 years before the Christian era. To express the date of any event happening before the Christian era in terms of the Julian period, subtract the date itself from 4714; but, to reduce any year A.D. to the corresponding date of the Julian period, add the date of the year to 4713. Thus, the year 1864 A.D. is the year (4713+1864) 6577 of the Julian period.

JULY, *ju-li'* (Lat. *Julius*), the name of the seventh month of the year. It formed the fifth month of the old Roman year, and was called *Quintilis* by the Romans; but shortly after the calendar had been re-arranged by Julius Cæsar, the name Julius was given to this month by Marc Antony, in honour of Cæsar, whose birthday fell in it. It contains thirty-one days.

JUMPERS, *jump'-ers*, the name given to a class of religious fanatics, from their practice of jumping during the time allotted for divine service. They arose in Wales in 1760, and several of the more zealous itinerant preachers encouraged the people to it. They were taught to cry out *gogoniant* (Welsh for glory), amen, &c.; then to put themselves in violent agitations; and, finally, to jump until they were quite exhausted, so as often to be obliged to fall down on the floor or the field where this kind of worship was held.

JUNCACEÆ, *jun-kai'-se-e* (Lat. *juncus*, a rush), in Bot., the Rush fam., a nat. ord. of *Monocotyledones*, sub-class *Petaloideæ*,—sedge or grass-like herbs, with tufted or fibrous roots. The leaves are parallel-veined, either fistular or more or less flattened and grooved. The flowers are regular, usually glumaceous, or sometimes petaloid; perianth inferior, 6-parted, persistent; stamens 6 or 3, perigynous; anthers 2-celled, introrse; ovary superior, 1—3-celled, with single style, having 3 stigmas, or sometimes 1. The fruit is capsular, 3-valved, with loculicidal dehiscence, and with 1 or many seeds in each; rarely 1-celled, 1-seeded, and indehiscent; embryo very small, in horny or fleshy albumen. The *Juncaceæ* are found chiefly in cold and temperate climates, but a few inhabit tropical regions. Lindley enumerates 19 genera and 200 species. The chief use to which the plants of this order are applied is in making floor mats, bottoms of chairs, &c. The pith from the fistular leaves of species of *Juncus* is used for the wicks of rushlights.

JUNCAGINACEÆ, *jun-kâ-jin-ai'-se-e* (from Lat. *juncus*, a rush), in Bot., the Arrow-grass fam., a nat. ord. of *Monocotyledones*, sub-class *Petaloideæ*, consisting of herbaceous marsh plants, found more or less in nearly all parts of the world, but most abundantly in temperate and cold regions. Leaves with parallel veins; flowers perfect, whitish or greenish; the perianth small, scaly, inferior, in two whorls, each consisting of 3 pieces; stamens 6; carpels 3—6; ovules 1—2. Fruit dry, separating into as many parts as there are carpels; seeds attached to axile or basal placentas, without albumen; embryo straight, with a lateral cleft.

JUNE, *june* (Lat. *Junius*), the name of the sixth month in the year, which was formerly the fourth among the Romans. It is supposed to have derived its name from the Latin *juniores*, young persons, as the preceding month of May was taken from *majores*, elders, or old persons. By some the month is said to be named after Juno, the wife and sister of Jupiter, and queen of heaven. It consists of thirty days.

JUNGERMANNIACEÆ, *jun-ger-man-ne-ai'-se-e* (after the German botanist Jungermann), in Bot., the name given to a sub-ord. of the Diverworts or *Hepaticeæ* (which *see*). They are usually called scale-mosses.

JUNGLE-FOWL, *jung'-gl* (Hindoo), or *Megapodius tumulus*, a species of birds belonging to the fam. of the *Megapodidæ* (large-footed), and its order *Gallinæ*, a fam. peculiar to Australia, where they were first discovered. The jungle-fowl is about the size of a common fowl, and the mounds which it rears for the purposes of incubation are said to be very large. In some instances they have been seen fifteen feet high, and are sixty feet in circumference at the base. Mr. Gould, in his description of the birds of Australia, says that it is almost exclusively confined to the dense thickets immediately adjacent to the Nasbur, and that it appears never to go far inland. It is always met with in pairs, or quite solitary, and it feeds on roots, berries, and insects. The head and crest of the jungle-fowl are of a deep cinnamon-colour, while the back of the neck and all the under surface of the body are a very dark grey; the bill is a reddish-brown, and the tarsi and feet a bright orange.

JUNIPER. (*See* JUNIPERUS.)

JUNIPERUS, *ju-nip'-e-rus* (Lat.), in Bot., a gen. of plants belonging to the nat. ord. *Coniferæ*. The species *J. communis*, the common juniper, is a bushy shrub with evergreen sharp-pointed leaves. It grows in all the northern parts of Europe, in fertile or in barren soils, on hills or in valleys, on open sandy plains or in moist and close woods. In England it is generally found on open downs, in a chalky or sandy soil. In Scotland it is found on the hills and mountains, but not on the highest summits. In the south of Europe it is only found in elevated situations: it abounds in the Alpine region of Switzerland. All parts of the plant, when bruised, exhale a more or less agreeable terebinthinate odour. The fruits and young tops are used in medicine, having stimulant and diuretic properties. The volatile oil (oleum juniperi), obtained from the fruits and other parts by distillation with water, is officinal in our Pharmacopœias. The fruits or berries are used to flavour gin and Hollands. They are imported from the northern countries of Europe. Turpentine is frequently substituted for them in the preparation of English gin. Juniper-wood has a reddish colour, and is used occasionally for veneers. The species, *J. Oxycedrus* yields, by dry distillation, the tarry oil known in France as *huile de cade:* it is principally used in veterinary medicine. The timber of this species is very durable. *J. bermudiana* is the red or pencil cedar, and *J. virginiana* the Virginian red cedar. The wood of these species is used for pencils; that of the former is considered the best. *J. Sabina*, the common savin, is another interesting species: it is a native of the midland parts of Europe, and forms a small bushy shrub. The young branches, which are completely enveloped in the small imbricated leaves, are officinal in our Pharmacopœias. They, and the oil obtained from them, have acrid, stimulant, diuretic, emmenagogue properties. In large doses they are irritant poisons, and have been frequently taken to cause abortion. Savin ointment is a useful acrid application to keep open blistered surfaces.

JUNIUS, *ju'-ne-us*, is the name assumed by a political writer, whose letters appeared in Woodfall's "Public Advertiser" between 21st January, 1769, and 21st January, 1772. After their completion, they were published collectively, including those signed Philo-Junius, and those of Sir William Draper and Horne to Junius. Besides these (59 in all), there are 113 letters on various political subjects, and under different signatures, as Mnemon, Atticus, Lucius, Brutus, &c., which appeared in the "Public Advertiser" between 28th April, 1767, and 12th May, 1772, and which are attributed to the same hand. Some of these are of doubtful authenticity. There have also been preserved 40 brief business letters, addressed by him to Woodfall, between 20th April, 1769, and 19th January, 1772, and 10 letters written by him in private correspondence with John Wilkes, between 21st August and 9th November, 1771. The utmost period, therefore, in which

the agency of Junius can be traced, is less than six years, and the period within which he wrote his acknowledged letters exactly three years. The letters of Junius were directed against the ministry and the public characters connected with it, and excited the greatest public interest. The classic purity of their language, the exquisite force and perspicuity of their argument, their studied and epigrammatic sarcasm, dazzling metaphors, and fierce and haughty personal attacks, attained for them a popularity which no series of letters ever possessed, and arrested the attention of the government as well as the public. Not less startling was the intimate and minute knowledge which they evinced of court secrets, showing an intimate acquaintance not only with ministerial measures and intrigues, but with every domestic incident. Every effort was made by the government to discover the author of these letters, but in vain. "How comes this Junius," said Burke, "to have broke through the cobwebs of the law, and to range uncontrolled, unpunished, through the land?" "No sooner has he wounded one, than he lays down another dead at his feet. For my part, when I saw his attack upon the king, I own my blood ran cold. I thought he had ventured too far, and there was an end of his triumphs,—not that he had not asserted many truths." "But while I expected in this daring flight his final ruin and fall, behold him rising still higher, and coming down souse upon both houses of parliament. Yes, he did make you his quarry, and you still bleed from the wounds of his talons. You crouched and still crouch beneath his rage. Nor has he dreaded the terrors of your brow, Sir; he has attacked even you, he has; and I believe you have no reason to triumph in the encounter. In short, after carrying away our royal eagle in his pounces, and dashing him against a rock, he has laid you prostrate. Kings, lords, and commons, are but the sport of his fury." Who the author of these letters was, is as much matter of uncertainty now as it was then. Many volumes have been written on the subject, and nearly fifty have had their claims advocated to be considered that personage. Among these we may mention Sir Philip Francis, Edmund Burke, his brother William, Dr. Philip Francis, Earl Temple, Lord Chesterfield, George Grenville, Lord Sackville, James Grenville, Thomas Lord Lyttelton, Horace Walpole, John Horne Tooke, John Wilkes, Charles Lloyd, &c. Several of these persons laid claim to the honour of which they were ambitious. The strongest case appears to be made out in favour of Sir Philip Francis, though even here there are difficulties which it is hard to get over. The first attempt to fix the authorship upon Sir Philip Francis was made in 1816 by John Taylor, in his "Identity of Junius with a distinguished living Character established." The arguments are drawn principally from external considerations;—his absence on a journey to the continent coincides with an interruption to the letters; his departure for India, with a high appointment, with their cessation; his receiving that appointment without any apparent cause, just after being dismissed from the War-office; his station in the War-office, with all the details of which Junius is so familiar; his knowledge of speeches delivered in the House of Commons, reports of which had been furnished by Francis; coincidences of thought and expression between the letters and speeches of Sir Philip Francis and the letters of Junius, and certain peculiarities of spelling which were common to both; resemblance of the handwriting. More recently, various other points have been brought out in favour of Sir Philip Francis; so that, according to Macaulay, "the case against Francis, or, if you please, in favour of Francis, rests on coincidences sufficient to convict a murderer." One strong objection urged against Francis is, that he never before or after exhibited any proofs of a capacity or knowledge equal to the compositions of Junius, and that when the first letters were written he was only 27 years of age. It is further said, that Sir Philip Francis never directly denied his being the author; and Lady Francis affirmed that his first gift to her after marriage was a copy of "Junius;" and that he made a posthumous present to her of a sealed copy of Taylor's "Identity of Junius," found in his bureau. According to her, he made himself known as Junius to the king, Lord North, and Lord Chatham, under an engagement of secrecy, and received, in consequence, his Indian appointment. Mr. Henry G. Bohn, in his preface to the fifth part of his edition of "Lowndes' Bibliographer's Manual" (1859), attempts to throw some light on the author of these letters, or at least to point out where information was to be obtained. He states, that in July, 1850, he was called to value some political papers, manuscripts, and a library of books, at No. 3, St. James's Square, which had been the residence of the late earl of Holdernesse. He found a number of letters from the king, Sir William Draper, and a number of other political characters, to the earl of Holdernesse. In one of the drawers was a rough draft, in the well-known upright kind of writing of Junius, but corrected by another hand, of an unpublished letter by Lucius to the duke of Grafton. There were two large parcels set aside, sealed at every aperture, and marked on all sides "most secret;" and Mr. Bohn says, that he was "under a strong impression that the Junius correspondence was there." There is a correspondence in the *Athenæum* for the first half of 1860, between Mr. Bohn and Mr. Wright, in whose custody the papers then were, in which the latter denies several of the statements of Mr. Bohn. A new edition of the Letters of Junius, with his private letters to Mr. Wood[illegible], and an essay regarding the authorship, strengthening the claims of Sir Philip Francis, forms two of the volumes of "Bohn's Standard Library." The most complete bibliography of Junius is given in "Lowndes' Bibliographical Manual," by Bohn.

JUNK, *junk*, a flat-bottomed vessel, of about 100 or 150 tons burden, employed by the Chinese. Junks are built in the shape of a slipper, and carry three masts, and a short bowsprit placed on the starboard bow. The masts are supported by shrouds, and on the fore and main mast is a kind of bamboo lug-sail. The quaint shape in which these vessels are built is accounted for by the Chinese in the following manner:—Between two and three hundred years B.C., say they, the emperor, who had been for some time endeavouring to arrest the progress of navigation, in order to keep the "Celestial Land" free from the contamination of strangers, was one day thrown into a violent passion by a shipbuilder of southern China, who laid before him a perfect model of a sharp-keeled vessel, imploring his majesty to patronize his invention; but no sooner had he finished speaking, than the "heaven-descended monarch," grasping his slipper, threw it with unerring aim at the miscreant's head, at the same time crying, "Avaunt, monster! from henceforth build all thy vessels on the model of that old shoe."

JUNO, *jū'-no* (Lat. *Juno*), one of the asteroids, or planetoids, a group of small planets that revolve in orbits between those of Mars and Jupiter. (*See* ASTEROIDS.) It was discovered by a German astronomer, Herr Harding, of Lilienthal, on Sept. 1, 1804. It holds the third place among the asteroids in order of discovery, and the fourth in point of size, being 112 miles in diameter. Its mean distance from the sun is about 253,526,000 miles, and it accomplishes its revolution around that body in 4 years and 132 days.

JUNTA, *jun'-tâ* (Span., an assembly), is a term applied in Spain to legislative assemblies or administrative councils. In the middle ages, the assemblies of the representatives of the nation without any preliminary call of the monarch were termed juntas. It was sometimes, also, used as synonymous with cortes. In 1808, Napoleon summoned together 150 representatives of the nation, under the name of junta, for the adoption of a constitution which he wished to establish. After the insurrection, a new junta was formed, composed of the principal leaders of the insurrection, and numbering forty-four members; besides which there was, in every province not subjugated by the French, a provincial junta subordinate to it. In English, the term junto (evidently of Spanish origin) is used to denote a cabal or faction.

JUPITER, *jū'-pit-er* (Lat. *Jupiter*), the sixth of the greater or primary planets, reckoning them in order from the sun, and including the planet Vulcan, which was discovered between Mercury and the sun in 1859. It is the largest of all the heavenly bodies in our solar system, with the exception of the sun itself. Its diameter is calculated to be about 90,750 miles, while its

mean density is about one-fourth of that of the earth, or 1·42 when compared with the density of an equal bulk of water represented by unity. The shape of the planet is that of an oblate spheroid; its polar diameter, or the length of its axis of revolution, being 85,300 miles, which is, to its equatorial diameter, very nearly in the proportion of 16 to 17. The mean distance of Jupiter from the sun is calculated to be 494,000,000 miles; it accomplishes its revolution about its own axis in 9 hours 55 minutes, and its revolution round the sun in 11 years 317 days. The inclination of its orbit to the ecliptic is about 1° 19′, while the inclination of its equator to the ecliptic is 3° 5′ 30″. Cassini was the first who ascertained the length of the time in which Jupiter performs a complete revolution about its axis; but Hooke first discovered the fact of the actual rotation of the planet. When viewed through a telescope, the planet seems to be surrounded by several narrow bands or belts of a dark colour, which are parallel to each other and its equator. Astronomers differ as to the cause of this singular appearance; but it is supposed to arise from the presence of dense masses of cloud about the planet. Jupiter is accompanied by four satellites or moons, which revolve about it in the same manner as the moon revolves about the earth. The following table shows the approximate time of revolution of each satellite about the planet, with its distance from the planet and its diameter in miles:—

| *Satellites.* | *Period of Rev.* | *Mean Dist.* | *Diam.* |
|---|---|---|---|
| | Day. Hours. | Miles. | Miles. |
| 1 ..... | 1 18·466 ..... | 272,250 ..... | 2,430 |
| 2 ..... | 3 13·233 ..... | 435,600 ..... | 2,180 |
| 3 ..... | 7 3·716 ..... | 694,250 ..... | 3,660 |
| 4 ..... | 16 16·533 ..... | 1,225,125 ..... | 3,045 |

All the satellites, with the exception of the fourth, suffer an eclipse in each revolution round the planet. The eclipses of the satellites of Jupiter, especially of the first, afford the means of determining the longitude of any place on the earth's surface, and the time at which any eclipse of Jupiter's satellites commences is consequently registered in the "Nautical Almanac" for the guidance of sailors, the time named therein being the hour at which the eclipse would commence at Greenwich, if visible there. Now at whatever parts of the earth these eclipses are visible, they are always seen by observers at exactly the same moment of time, in consequence of the great distance of Jupiter from the earth. The observer, wherever he may be, has merely to note the exact time at which the eclipse commences when viewed from his position, and then refer to the "Nautical Almanac" to ascertain the time at which it commences at Greenwich. The difference between the times when reduced to degrees and minutes, an hour of time corresponding to 15 degrees of space, will show the longitude of the observer's position, which will be east of Greenwich if the time at which he observes the commencement of the eclipse be later than at Greenwich, and west of that place if it be earlier. Thus, if the commencement of the eclipse of a satellite of Jupiter be 8 p.m. according to Greenwich time, the time of immersion to an observer 15° E. of Greenwich, will be 9 p.m., and to an observer 15° W. of that place it will be 7 p.m.

JURASSIC FORMATION. (*See* OOLITIC SYSTEM.)

JURISCONSULT, *ju-ris-kon'-sult* (Lat. *juris-consultus*, learned or skilled in law), is one who gives his opinion on cases of law, a master of the Roman jurisprudence. Among the Romans, the juris-consulti were men who studied the forms and principles of law, and gave opinions upon difficult points.

JURISDICTION, *ju-ris-dik'-shun*, in Law, is derived from the Latin word *jurisdictio*, signifying the declaration of law, and was used by the ancients to denote the administration of justice as well as the right to administer justice. It is now commonly used to denote legal authority. The courts of Westminster have jurisdiction over the whole of England and Wales; the jurisdiction of the other courts is limited to certain districts and certain kinds of causes. Where a party is convicted by a court or judges who exceed their jurisdiction, the matter may be removed to the court of Queen's Bench by writ of certiorari, and the proceedings quashed. A court is not to be presumed to have jurisdiction where it does not appear to have one.

JURISPRUDENCE, *ju-ris-prū'-dens* (Lat. *jurisprudentia*), is the science of right, or of positive law. It is divided into general and particular. The former is the science or philosophy of positive law, and investigates the principles which are common to all positive systems, apart from the local, partial, and accidental circumstances and peculiarities by which these systems respectively are distinguished from one another. Particular jurisprudence treats of the laws of particular states; which laws are, or at least profess to be, the rules and principles of universal jurisprudence itself specifically developed and applied. (*See* LAW.)

JURY, *jū'-re* (Lat. *jurata*, from *juro*, I swear), in Law, is a number of men duly authorised to inquire into or determine certain facts, and bound by oath to a faithful discharge of their duty. The time when trial by jury was instituted in this country is matter of much dispute, as well as whether it is of Anglo-Saxon or of Norman origin. It was, however, not till the reign of Henry II. that this institution became fully established and was reduced to a regular system. It was then made a mode of deciding facts in real actions, which a subject might claim as a matter of right. It is worthy of remark, that until about the reign of Henry VI., trial by jury was in reality a trial by witnesses; and hence they were sworn—not "to give a true verdict, according to the evidence," but merely "to speak the truth." Inquiry into matters on behalf of the crown, by means of juries, was frequent in England long before trial by jury was commonly in use in courts of justice. At present, a jury is composed of twelve men, sworn to decide facts according to the evidence brought before them, either in civil or criminal matters. The three kinds of juries in the ordinary courts of justice in England, are the grand juries, the petty or common juries, and special juries. Grand juries are exclusively connected with criminal jurisdiction. (*See* GRAND JURY.) By act 6 & 7 Geo. IV. c. 50, a juror must be twenty-one years of age, and if above sixty, he is exempted, but not disqualified, from serving. He must also possess freehold or copyhold property of the clear yearly value of ten pounds, or have leasehold property, held by lease for twenty-one years or longer, of the annual value of twenty pounds, or occupy a house containing not less than fifteen windows. In London, the occupation of a house, shop, or place of business within the City, or the possession of real or personal property of the value of one hundred pounds, constitutes a qualification. There are certain classes of persons exempt from serving on juries; namely, judges, clergymen in holy orders, Roman Catholic priests and dissenting ministers, serjeants, barristers and advocates, attorneys and proctors, officers of courts, coroners, gaolers, &c.; physicians, surgeons, and apothecaries, officers in the army or navy, pilots and masters of vessels, officers of customs and excise, the household servants of the sovereign, sheriffs' officers, constables, and parish clerks, and the like. Lists of persons qualified to act as jurors are made out annually by the churchwardens and overseers of each parish. Copies of this list are fixed on the church doors on the three first Sundays in September; objections are heard, and the lists allowed and signed by the justices of the peace, at a special petty sessions held for that purpose within the last seven days of the same month. The functions and duties of the high constables are repealed by 26 & 27 Vict. c. 107 (1863); and now, the clerk to the justices, as soon as the lists have been approved of and signed, has to forward them by post to the clerk of the peace for the county, who causes them to be copied into a book, which he has to deliver to the sheriff. This book is used for the following year, commencing on the 1st day of January. From the list received from the clerk of the peace, the sheriff takes the names of all those persons who are described as esquires, or persons of higher degree, as bankers or merchants, which are copied out in a separate list, called the "special jurors' list," from which special jurors are to be summoned when required. In an ordinary trial by jury in civil cases, when an issue is joined, the court awards a *venire facias* upon the roll or record, in these words,—"Therefore let a jury come, &c.;" and the jurors are summoned by the sheriff, in virtue of a precept issued to him for that purpose. By 25 & 26 Vict. c. 107, all persons liable to

serve may be summoned by post, the sheriff, or other proper officer, affixing his seal to the letter, which is to be addressed "Jury summons," and directed to his place of abode as given in the jurors' book. In this case two additional days are allowed, beyond the number required by law for the service of a summons, before the day on which the juror is required to attend. The panel is open to inspection in the sheriff's office for seven days before the trial, whereby the parties may have notice of the jurors, and of their sufficiency or insufficiency, characters, connections, and relations; so that they may be challenged upon just cause. The sheriff returns his execution of the precept issued to him to summon jurors, with the panel of jurors annexed, to the judge's officer in court, when the cause comes on for trial. The jurors contained in the panel are either common or special. Special juries were originally introduced in trials at bar, when the causes were of too great nicety for the discussion of ordinary freeholders. Either party is entitled to have a special jury for the trial of any issue, as well at the assizes as at bar; he paying the extraordinary expense, unless the judge will certify that the cause required such special jury. When a special jury is to be summoned, forty-eight names are taken by ballot from the special jurors' list, in the manner particularly described in the statute; and from this number twelve are then struck off by each party, and the names of the remaining twenty-four are the jurors to be summoned for the cause, the first twelve of whom that answer to their names constituting the special jury. The names of the jurors being written on tickets, are put into a box or glass; and when each cause is tried, twelve of those persons whose names shall be first drawn out of the box shall be sworn upon the jury, unless absent, challenged, or excused. Challenges are of two sorts,—challenges to the array and challenges to the polls. Challenges to the array are at once an exception to the whole panel in which the jury are arrayed or set forth by the sheriff in his return, as on account of some default in the sheriff, or his under-officer who arrayed the panel. Challenges to the polls, *in capita*, are exceptions to particular jurors, and are reduced to four heads:—1. *Propter honoris respectum*, as if a lord of parliament be impanelled on a jury; 2. *propter defectum*, as where one has not an estate sufficient to qualify him to be a juror; 3. *propter affectum*, from being suspected of bias or partiality in the cause; 4. *propter delictum*, on account of some crime or misdemeanour that affects the juror's credit and renders him infamous. If, by means of challenges or other cause, a sufficient number of unexceptionable jurors do not appear at the trial, either party may pray a *tales*, that is, a supply of such men as are summoned upon the first panel, in order to make up the deficiency. If any man summoned to attend on a jury shall not attend in pursuance of such summons, or, being thrice called, shall not answer to his name; or if any such man, or any talesman, after being called, shall not appear, or withdraw himself from the presence of the court, the court shall set such fine upon him as it may see fit, and in the case of a viewer, not less than £10. When a sufficient number of persons impanelled, or talesmen, appear, they are then separately sworn well and truly to try the issue between the parties, and to give a true verdict, according to the evidence. The jury are now ready to hear the merits, and the pleadings are opened to them by counsel, on that side which holds the affirmative of the question in issue. The evidence on the same side is next gone through, and summed up if necessary, after which the advocate on the other side opens the adverse case, and supports it by evidence, and sums up if necessary; and then the party which began is heard in reply. The judge then sums up the whole of the evidence to the jury, omitting all superfluous circumstances, observing wherein the main question and principal issue lies, stating what evidence has been given in support of it, with such remarks as he thinks necessary for their direction, and giving them his opinion in matters of law arising upon that evidence. The jury then, unless the case be very clear, withdraw from the bar to consider their verdict; and, in order to avoid intemperance or undue delay, they are kept without meat, drink, fire, or candle, unless by permission of the judge, till they are unanimously agreed. When they are unanimously agreed, they return back to the bar, and before they deliver their verdict, the plaintiff is bound to appear in court by himself, attorney, or counsel, according to the old form, to answer the amercement to which he was liable if he failed in his suit. It is usual for a plaintiff, when he perceives that he has not given evidence sufficient to support his issue, to withdraw himself, and thus be nonsuited; in which case no verdict can be given, and he may commence the same suit again for the same cause of action; but if a verdict has been delivered thereon, he is for ever barred from proceeding upon the same ground of complaint. In case the plaintiff appears, the jury, by their foreman, deliver in their verdict, which is recorded in court, and they are then discharged. These remarks regarding juries in civil causes apply for the most part also to juries in criminal suits. The qualifications, disqualifications, and exemptions, are the same in both cases. When a prisoner, on his arraignment, has pleaded not guilty, and has put himself for trial upon the country,—that is, the jury, the sheriff of the county must return a panel of jurors for that purpose. If the proceedings are before the court of Queen's Bench, the trial in case of a misdemeanour is had at *nisi prius*, unless it be of such consequence as to m[illegible] a trial at bar; but in either case a special jury may be obtained on the motion of either the prosecutor or the defendant. When the trial is called on, the jurors are sworn as they appear, to the number of twelve, unless challenged by either party. Challenges may be made either on the part of the queen or the prisoner, and may be either to the whole array or to separate polls, as in civil causes. Besides the four kinds of causes on account of which a juror may be challenged in civil cases, there is, in criminal cases, or at least in capital ones (and in legal phraseology all felonies are capital), allowed to the prisoner an arbitrary and capricious species of challenge to a certain number of jurors, without showing any cause at all, which is called a peremptory challenge. The number of jurors that may thus be peremptorily challenged is fixed at twenty in felonies and thirty-five in treason. Where an alien is indicted or impeached of any felony or misdemeanour, he has the right of craving to be tried by a jury *de medietate linguæ*, or half foreigners; and the sheriff, or proper minister, shall return for one half of the jury a competent number of aliens, if so many are to be found in the place where the trial is had; and if not, then as many aliens as shall be found. No such alien juror is liable to be challenged for want of freehold or other qualification, but may be challenged for any other cause. When the number of jurors is deficient, talesmen may be awarded, as in civil causes. Formerly, if the verdict of the jury were notoriously wrong, they might have been punished, and their lands and chattels forfeited to the king, and their verdict might have been set aside by attaint, at the suit of the king, although not at the suit of the prisoner; but this mode of punishment is abolished, fine and imprisonment being substituted in lieu thereof after indictment or information. The practice formerly in use of fining, imprisoning, or otherwise punishing, merely at the discretion of the court, because their verdict was contrary to the direction of the judge, was arbitrary, unconstitutional, and illegal. If the jury find the prisoner not guilty, he is then for ever quit and discharged of the accusation; but if guilty, he is then said to be convicted of the crime whereof he stands indicted.—(*Ref.* Forsyth's *History of Trial by Jury*; Kerr's *Comment on the Laws of England.*) In Scotland, in criminal cases, the number of the jury is fifteen, and the *majority* of that number give the verdict; and in civil causes the number of the jury is twelve, and they must be unanimous, as in England; but it is provided, that if, after three hours' deliberation in any civil cause in the Court of Session, nine of said jury shall agree, their verdict shall be taken.

JURY-MAST, a temporary mast erected in a ship in the place of one that has been lost either in action or by storm. A *jury-mast* is sometimes erected in a newly-built vessel to navigate her down the river or to a neighbouring port, where her proper masts are awaiting her.

JUS, *jus* (Lat.), is a word borrowed from the Latin language, and very frequently used in law and other-

wise. It admits of several significations, the chief of which are,—that which is right or conformable to law; also the obligation which the law imposes; also a man's privileges, whether singularly or collectively: it means likewise the power which originates from the law, as well as the place where justice is administered.

Jus Divinum. (*See* Divine Right.)

Jus Mariti is the term applied in Scots law to the uncontrolled power of administration of the goods in communion vested in the husband, by which he acquires an unlimited right of management and disposal of the movable estate of the wife, whether belonging to her at the time of the marriage or acquired during its subsistence.

Jus Quiritium signified the fullest enjoyment of a Roman citizen of the right of security of personal liberty, of registration on the list of property, of participation in the service of the legion, in public honours, of the right of suffrage, &c.

Justice, *jus'-tis* (Lat. *justicia*), is one of the four cardinal virtues, and was regarded by Plato as including all human virtue or duty. It is the doing what is just or right, and may be distinguished as ethical, economical, and political. The first consists in doing justice between man and man, as men, as members of the same human family; the second, in doing justice between the members of a family or household; and the third in doing justice between the members of a community or commonwealth. Justice, as opposed to equity, means merely doing what positive law requires, while equity is doing what is fair and right in the circumstances of each particular case. Justice is not founded in law, as some assert, but in our idea of what is right; and laws are just or unjust just in so far as they do, or do not, conform to that idea.

Justice Clerk, the Lord, of Scotland, was originally the clerk and assessor of the justiciary, and was first assumed as a judge in 1663 and confirmed in 1671, when the court was remodelled. He was soon after raised to the dignity of second president of the Justiciary court, and is the presiding judge in that court in the absence of the lord justice-general. He is always one of the lords of the Court of Session, and on the division of that court into two chambers in 1811, he was made *ex officio* president of the second division. The office of lord justice clerk is now, in point of rank, the second judicial appointment in Scotland. He is one of the officers of state for Scotland, and one of the commissioners for keeping the Scottish regalia.

Justice-General, the Lord, of Scotland, was the president or head of the court of Justiciary, and was formerly an officer of high rank and consideration. For many years it had become a sinecure, being usually held by some of the Scottish nobility, while the duties of the office were discharged by the lord justice clerk; so that at length, by 1 Wm. IV. c. 69, the office was declared to be abolished on the termination of the then existing interest, and the duties to devolve upon the lord president of the Court of Session, with which office they were afterwards to remain conjoined.

Justices of the Peace are persons appointed by royal commission to keep the peace within a certain district. The queen is, by virtue of her office and dignity, the principal conservator of the peace within her dominions, and may give authority to any other to see the peace kept, and to punish such as break it. All the judges of the superior courts are conservators of the peace, and are sometimes called justices; but justices of the peace, commonly so called, are persons appointed by the queen's special commission under the great seal, the form of which was settled by all the judges in 1590, and continues, with little alteration, to this day. This commission appoints them all, jointly and severally, to keep the peace in the particular county named, and to cause to be kept all the ordinances and statutes for the preservation of the same; and to chastise and punish all persons that offend against the same. Any two or more of them (in which number some particular justices, or one of them, are always to be included) are also authorized to inquire into and determine felonies and other misdemeanours committed in said county, and to chastise and punish the said offenders, and every one of them, for their offences, by fines, ransoms, amerciaments, forfeitures, and other means, as according to law. When any justice named in the commission intends to act under it, he sues out a writ of *dedimus potestatem* from the clerk of the crown in chancery, empowering certain persons therein named to administer the usual oaths to him; *i.e.*, an oath of qualification as to estate, to which are added the oaths of allegiance, supremacy, and abjuration, which being done, he is at liberty to act. By 18 Geo. III. c. 20, every justice of the peace for any county, riding, or division within England or Wales, is required to have, in law or equity, in possession and for his own use and benefit, a freehold, copyhold, or customary estate for life, or for some greater estate, or an estate for some long term of years determinable upon life or lives, or for a certain term originally created for twenty-one years or more, in lands, tenements, or hereditaments in England or Wales, of the clear yearly value of £100 over and above all incumbrances affecting, and all rents and charges payable out of or in respect of, the same, or shall be seised of, or entitled to, in law or equity, for his own use and benefit, the immediate reversion or remainder of and in lands, tenements, and hereditaments leased for one, two, or three lives, or for any term of years determinable on lives upon reserved rents, and which are of the yearly value of £300. Certain official persons are excepted from these provisions. By 6 & 7 Vict. c. 73, no attorney or solicitor shall be capable of being a justice of the peace for any county during such time as he practises as an attorney or solicitor. The office of justice of the peace subsists during the pleasure of the crown, and is determinable either directly by writ under the great seal, or indirectly by a new commission from which his name is omitted. The commission is also determined by the death of the sovereign by whom it was issued. No action can be brought against a justice of the peace for any act done by him in the execution of his duty with respect to any matter within his jurisdiction, however erroneous his decision may be, unless it be proved that the act was done maliciously and without reasonable or probable cause; and in such a case he is answerable to the court of Queen's Bench, which exercises a general superintendence over the conduct of those to whom the administration of criminal justice in the country is committed. The court will not take up the question whether the proceeding was right or not in itself, but solely whether it proceeded from unjust, corrupt, or oppressive motives. The powers and duties of a justice of the peace are laid down in his commission, and in various statutes. Act 5 & 6 Vict. c. 38, defines the jurisdiction of justices at quarter sessions, and acts 11 & 12 Vict. cc. 42 and 43, define the duties of justices out of sessions.

Justiciar of Scotland, *jus-tish'-e-ar*, was the ancient criminal judge in Scotland, an officer of great power and authority, being at the head both of the law and the military force of the kingdom. About 1626, the office became hereditary in the noble family of Argyll, in whose hands it continued for upwards of a century, and afterwards became merged in that of justice-general.

Justiciary, Chief, of England.—This office is traced back to that of grand seneschal, or dapifer, of the early Franks. The seneschal was originally a sort of steward of the household of the Frank kings, who, after their conquest of Gaul, rose to be the highest officer of the state, after the king, and acted as his representative in all the departments of the state. In England, the office was divided into two parts, having two distinct officers, the one the chief justiciary, to whom the judicial affairs of the state were committed, and the other the chief officer of the royal household. The authority of the chief justiciary extended over every court in the kingdom; he presided not only in the king's court and in the exchequer, but when the office of the lord high steward fell into abeyance, he was regent of the kingdom during the king's absence, and writs ran in his name. The power of the chief justiciary was broken towards the end of the Norman period, and the *Aula Regis*, in which he presided, was divided into four distinct courts; viz., Chancery, Exchequer, King's Bench, and Common Pleas. It ceased about the 45 Hen. III.—*Ref. English Cyclopædia*—Arts and Sciences.

Justiciary, High Court of, is the supreme criminal court of Scotland, composed of five lords of the

Court of Session, added to the lords justice-general and justice clerk. Its constitution was settled by act 1672, c. 16. It sits from time to time in Edinburgh, during the year, according to the amount of business to be transacted; besides which, the lords of justiciary are directed to hold circuit courts regularly twice a year, in spring and autumn, in different parts of the country. There are three circuits: the South, consisting of the burghs of Jedburgh, Dumfries, and Ayr; the West, consisting of Glasgow, Inverary, and Stirling; and the North, consisting of Perth, Aberdeen, and Inverness. Besides which, a winter circuit court is held in Glasgow. Each circuit court is attended by two judges; but in Glasgow they may sit separately in different courts. The jurisdiction of this court extends to all crimes, and includes the whole of Scotland; and it has also the power of reviewing the sentences of all inferior criminal courts in Scotland. From its decisions there is no appeal, either to the House of Lords or any other house. The Circuit Court has also a civil jurisdiction as a court of appeal. The cases are tried by a jury of fifteen, who do not require to be unanimous, as in England, the verdict being according to the opinion of the majority.

JUSTIFIABLE HOMICIDE. (*See* HOMICIDE.)

JUSTIFICATION, *jus-tif-e-kai'-shun* (Lat. *justus*, just, and *facio*, I make), denotes a judicial act,—the declaring or pronouncing a person just or righteous according to law. It is used either in a legal or theological sense. Where a person is found not to have broken the law, he is said to be justified in a legal sense. But in this way none of the human race can be said to be justified or stand acquitted before God; for we are told that there is none righteous; no, not one. The justification, therefore, of which the Scriptures principally treat, is not a personal, but an imputed righteousness. It is through the righteousness of Christ, the spotless obedience, bitter sufferings, and accursed death of the son of man, who became surety for him, that the sinner is justified before God. Justification, according to the Assembly's catechism, "is an act of God's free grace, whereby he pardoneth all our sins, and accepteth us as righteous in his sight, only for the righteousness of Christ, imputed to us, and received by faith alone." "Justification," says Bishop Hopkins, "is a gracious act of God, whereby, through the righteousness of Christ's satisfaction imputed, he freely remits to the believing sinner the guilt and punishment of his sins; and through the righteousness of Christ's perfect obedience imputed, he accounts him righteous, and accepts him into love and favour, and unto eternal life. This is justification, which is the very sum and faith of the whole gospel, and the only end of the covenant of grace." Justification is (1) an act of God's free grace, without any merit whatever in the creature; (2) it is an act of justice, as well as of grace,—the law being perfectly fulfilled in Christ, and divine justice satisfied; (3) it is an individual, an instantaneous act, done at once, and admitting of no degrees; and (4) it is irreversible, and an unalterable act. The effects or blessings of justification are—(1) peace with God; (2) access to God through Christ; (3) acceptance with God; (4) peace of conscience, and a holy confidence and security under all the difficulties and securities of the present state; and (5) finally, eternal salvation.

JUSTINIAN'S CODE, or LEGISLATION, *jus-tin'-e-ăne*, is the name given to the code of laws drawn up by order of the Roman emperor Justinian, soon after he ascended the throne. His object was to establish a complete system of written legislation for all his dominions; and to this end to make two great collections,—one of the imperial constitutions, or the best and most useful laws of his predecessors from the time of Hadrian; the other of all that was valuable in the works of the jurists. In A.D. 528, he named a commission, consisting of Joannes and nine other persons, to compile the preceding constitutions, with ample powers to correct and retrench, as well as to consolidate and arrange. Partial compilations had previously been made, as by Gregory and Hermogenes, in the reign of Constantine, and the Theodosian code effected under Theodosius II. The commission executed their task speedily; and on the 7th of April, A.D. 529, it received the imperial sanction. At the end of the following year, Tribonian, who was one of the previous commission, and had given great proofs of ability, was authorized to select fellow-labourers to assist in the other and more difficult part of the undertaking. He selected sixteen coadjutors, and they set to work with such earnestness that their task was completed in little more than three years, and received the imperial sanction on 30th December, 533. The compilation, termed "Digests," or "Pandects," from its comprehensive character, was divided into fifty books, and arranged on the model of the Perpetual Edict. It comprehends upwards of 9,000 extracts, in the selection of which the compilers made use of nearly 2,000 different books, containing more than 3,000,000 lines. Justinian wished that his body of laws should supersede all others, both for practice and for study; but the Digest and Code led too far into details, and could not be well understood by beginners; hence the necessity for having an elementary work composed for that purpose. Already, in the constitution of December, 530, Justinian had declared his intention of having an elementary work composed. Its preparation was intrusted to Tribonian, in conjunction with Theophilus and Dorotheus; and it received the imperial sanction 21st November, 533. This elementary work is the Institutes, and is divided into four books, being formed on the basis of the Institutes of Gaius, but altered so as to harmonize with the Digest and Code. There were still some points which had been debated by the old jurists; and, at the suggestion of Tribonian, the emperor began, while the compilations were yet in progress, to issue constitutions, having for their object the decision of these controverted points. These were collected and published, to the number of fifty, and formed what is known as the "Fifty Decisions." As the code of 529 was a very imperfect work, it was determined to revise it, and to incorporate the "Fifty Decisions" in the revised edition. The work was committed to Tribonian, with four others, and received the imperial sanction on the 16th November, 534. This, the "Codex Repetitæ Prælectionis," is the code which we now have, the earlier one having been carefully suppressed, and no trace of it remaining. It is divided into twelve books, and the books into titles, with rubrics denoting their contents. Under each title the contents are arranged chronologically. The arrangement in general corresponds with that of the Digest. Justinian, however, was not content with being a collector, he must also be a maker of law. He could not see that his having systematized the law should exclude him from law-making. He announced in the Code, that any legislative reforms he might at any future time see fit to make should be published in the form of "Novellæ Constitutiones." Many such novellæ were afterwards published,—the first in January, 535; the last in November, 564. Altogether, they amount to 165, though but few of them bear a later date than 545, the year of Tribonian's death. No collection seems to have been made of them during the lifetime of Justinian. These works of Justinian, notwithstanding their defects and faults, are deserving of very great praise. They have exercised an incalculable influence over the thoughts and actions of men, and are to be found pervading most of the systems of law of the civilized world. The "Digest" is especially valuable, as preserving remains of the works of jurists which would otherwise have been lost, and which are of great value as illustrating the history of these times, and affording models of legal reasoning and expression.—*Ref.* Smith's *Dictionary of Ancient Biography*, art. *Justinianus*; *English Cyclopædia*—Arts and Sciences; *The Institutes of Justinian*, by T. C. Sandars, 1853.

JUTE. (*See* CORCHORUS.)

JUVENILE OFFENDERS, *jū'-ve-nile* (Lat. *juvenis*, young).—A number of statutes have of late years been passed regarding the reformatory treatment of juvenile criminals. By 17 & 18 Vict. c. 86, any person under sixteen years of age who shall be convicted of any offence before a magistrate, or two or more justices of the peace in England, or any sheriff, or magistrate of burgh, or police magistrate, in Scotland, may, in addition to the sentence passed as punishment, be sent to a reformatory school, to be detained for a period of not less than two or more than five years: there must, however, be a previous imprisonment of not less than fourteen days. The Treasury is to defray the whole or a portion of the cost of the care and

maintenance of such offender, at such a rate per head as shall be determined on. The court may, however, compel the parent, or step-parent, to support such offender, if of sufficient ability to do so. The offender absconding from school, or wilfully neglecting or refusing to abide by the rules thereof, may be punished by the foresaid magistrates by imprisonment with hard labour, for any period not exceeding three months.

IYAR, *ji'-ar*, is the name of the eighth month of the Jewish year, corresponding, at the earliest, with our April; but it may be as late as May. It has only 29 days.

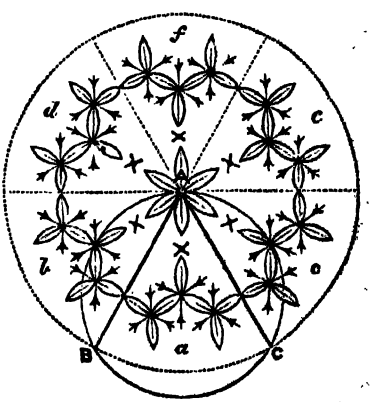
## K.

K, *kai*, is the eleventh letter and eighth consonant in our language. Its sound is that of *c* before the vowels *a*, *o*, *u*, and the two are sometimes interchangeable as in German, *carl* or *karl*; Latin *kalendæ* or *calendæ*. K was borrowed from the Greek *kappa*, or the Oriental *kaph*, and finds only an ambiguous place in occidental languages. Sallust, a Roman grammarian, attributes its introduction into the Latin to one Sulvius; and Priscian looked upon it as a superfluous letter, and says that it was never used but in words derived from the Greek. Quinthian denies it a place in the Latin, and blames its use even in such words as *kalendæ*, *kalumnia*. According to Scaurus, *k* was anciently used instead of the syllable *ca*, *c* instead of *ce*, *ci*; and it is owing to this ancient usage that, in our modern alphabets, *k* is pronounced *ka*, and *c*, *ce* and *ci*. K alternates, in the Semitic languages, with *g*, *i*, *q*, *h*, *kh*, *ghain*; and in the Indo-European with those letters and with *c*, *j*, *y*, *w*. In English, *k* is for the most part used only before *e*, *i*, and *n*, in the beginning of words, as *ken*, *kill*, *know*, and the like. Formerly it used to be joined with *c* at the end of words, as in *publick*, *musick*; but it is now omitted, except in words of one syllable, as *jack*, *block*. Among the Romans, slanderers used to be branded on the forehead with *k* (*kalumnia*). As a numeral, K denotes 250; with a stroke over it, thus—$\overline{K}$, 250,000.

KAABA, *ka'-a-ba*, is the name of a famous mosque in the city of Mecca, and the object of as much veneration to Mohammedans as the Holy Sepulchre was to Roman Catholics. It is an oblong edifice of fine grey granite, standing in the centre of a large open court; and is, according to Burton, 55 feet in length by 45 in breadth. It is surrounded by a covering of black silk, hanging down from the roof, with a golden band running round the top, and a golden curtain in front of the door. The door, by which free admission is granted only ten or twelve times in the year, is in the north-west side, about seven feet from the ground, and is covered with silver and adorned with ornaments of gold. The entrance is gained by a flight of steps of carved wood, which is moved away on rollers when not used. The interior is plain, and destitute of windows, or any other opening besides the entrance, except a small door, called the *Bab el Taubah*, or Gate of Repentance, leading to a staircase by which access is gained to the roof. The floor and walls consist of a sort of chequer-work of marble, of various colours, principally white, and the roof and top part of the walls are covered with red damask embroidered with gold. The *Hajar el Aswad*, or black stone, which is the object of so much adoration on the part of pilgrims, stands at the east corner of the building, at the height of four or five feet from the ground, and is composed of a number of small stones, cemented together, and carefully smoothed, having the appearance of having been broken in pieces and then mended. The constant wear which it has undergone at the lips and hands of worshippers renders it extremely difficult to determine the nature of the material; but most travellers regard it as of volcanic origin; and, according to Burton, it is a large aerolite. On the outside, in the south-west wall, is a stone of a dark-red colour, which is also touched and kissed by the devotees. On the north-west side of the Kaaba are situated what are said to be the graves of Ishmael and Hagar, inclosed by a semi-circular wall five feet high and four feet thick, covered with white marble. The *Zem-Zem*, or sacred well, said to be that of Hagar, is inclosed in a square substantial building, opposite the east corner of the Kaaba.

KABONYL. (*See* CACODYL.)

KALEIDOSCOPE, *kil-i'-dos-kope* (Gr. *kalos*, beautiful; *eidos*, form, and *skopos*, view or sight), an optical toy, which was suggested by Baptista Porta and Kircher, but invented and perfected by Sir David Brewster. By a peculiar arrangement of mirrors, or reflecting surfaces, it produces the appearance of a perfectly symmetrical pattern, which undergoes an endless variety of changes, by turning the tube in which the mirrors are fixed. It is chiefly useful in furnishing ideas to designers of patterns for paper-hangings, carpets, &c., and any woven or printed fabric, in which symmetry of design is desirable. The simplest form of kaleidoscope consists of a cylinder of tin, in which two plane rectangular mirrors of polished metal, or of glass, having the back blackened, are fixed at such an angle of inclination to each other as may be obtained by dividing 360° by the numbers 3, 4, 5, 6, 7, 8, &c. The cylinder is covered at one end with a circular plate of metal, having a small hole in the centre, while a rim of metal is fitted over the other end, which is so constructed that two circular pieces of glass may be fixed in it, at a short distance from each other, having some pieces of coloured glass, beads, lace, feathers, &c., in the space between them. The piece of glass that is placed at the extreme end of the cylinder should be ground glass, so that while the light is admitted into the interior of the instrument, external objects may be prevented from becoming perceptible to the observer. An angle of 60° is perhaps the best angle of inclination for the mirrors, as it may be readily determined, and affords a six-fold repetition of the pattern, which presents a tolerably uniform appearance of colour in all parts. If the angle of inclination be greater than 60°, the pattern will not be multiplied to so great an extent; but if less, although the pattern will be repeated a greater number of times, it will lose considerably in brilliancy, at and towards the part where the reflections of the pattern meet, by the frequency of the multiplication. In some kaleidoscopes, the mirrors are made trapezoidal in form, instead of rectangular, the broader ends being placed at the lower end of the tube. The principle of the kaleidoscope will be understood from the accompanying figure, in which the




KALEIDOSCOPE.

smaller circle, ABC, represents a section of the tube of the instrument, and AB, AC, sections of the mirrors, which are represented as inclined to each other at an angle of 60°. The objects in the space *a*, between the glasses, are seen directly by the eye; the part of the pattern in the space *b* is formed by the reflection of the objects in the space *a*, in the mirror AB, and the part *c*, by the reflection of the objects in the space *a*, in the mirror AC; these reflections are again mutually reflected by the opposite mirrors, and form the parts *d*, *e* of the pattern, while the images reflected in each mirror for the third time unite in the part *f*, so as to

form a corresponding appearance to the other parts. It is manifest, that unless the angle at which the mirrors are inclined be accurately determined, the reflections will not coincide, and the pattern will not be complete in the part *f*. Kaleidoscopes are made in which the angle of incidence of the mirrors may be varied at pleasure, and by the aid of a lamp and a system of lenses in connection with the instrument, the pattern may be projected on a screen, in an enlarged form, like the image thrown from a slide in a magic lantern. A pleasing effect of a similar nature, in which the images of the original object are multiplied, and produced in different directions, may be produced by fitting the edges of three, four, or six trapezoidal mirrors together, so as to form a hollow prism, and putting them into a tube, similar to that in which the two mirrors of the ordinary kaleidoscope are inserted. Instruments of this kind, which were invented by Dr. Roget, are called polycentral kaleidoscopes. An instrument resembling the kaleidoscope in its general principles, to which the name of dehuscope has been given, was invented in Paris in 1860. It is used for forming patterns for calico-printing.—*Ref.* Brewster's *Treatise on the Kaleidoscope*; Lardner's *Museum of Science and Art*; *Annals of Philosophy*, vol. xi.

KALENDAR. (*See* CALENDAR.)

KALENDS. (*See* CALENDS.)

KALMIA, *kăl'-me-ă* (so named in honour of Peter Kalm, the Swedish traveller), in Bot., a gen. of plants belonging to the nat. ord. *Ericaceæ*. The species are beautiful shrubs, and belong to the class of ornamental plants commonly called American. At the horticultural shows they are always exhibited with rhododendrons and azaleas.

KAMALA. (*See* ROTTLERA.)

KAMI (*kä'-me*), a name given in Japan to certain spirits or divinities, the belief in which seems to have characterized the ancient religion of that country, before it became intermingled with foreign doctrines, and still constitutes its basis. The kami are believed to be partly elemental, subordinate to the deities of the sun and moon, and partly the spirits of men,—in fact, every natural agent and phenomenon is supposed to have its own spirit or genius. The spirits of human beings survive the body, and, according to the actions of the individual in life, receive reward or punishment. When a man's life has been distinguished for its piety, or for the good he has done to his fellow-men, after death he is deified, and his *kami* is worshipped. The number of these kami at the present day is estimated at 3,000, and they are worshipped in temples without statues or images. Each kami is represented by a mirror, as the emblem of purity; and all the rites and ceremonies seem to be typical of purification. The priests who superintend the worship of these temples are called kami-nusi, or the ministers of the spirits.

KAMPTULICON, *kămp-tu'-la-kon* (from Gr. *kamptos*, flexible, and *tulē*, a coverlet), a species of floor-covering which has, of late years, superseded oil-cloth and other similar substances. It was first patented by the Messrs. Goodyear, which firm exhibited the first specimen of kamptulicon in the Great Exhibition of 1851. It is manufactured by combining cotton, cork, wool, and other fibrous materials with india-rubber, and spreading the semi-fluid mixture on a back or ground of canvas or woollen cloth. While in this state the floor-covering undergoes a sort of embossing process, effected either plain or in colours. When it is completed and thoroughly dried, the kamptulicon will be found to have the softness of a velvet-pile carpet combined with far more durability, besides being much less in price.

KAMSIN. (*See* SIMOOM.)

KANGAROO, *kăng-gă-roo'*, a native term applied to an extensive family of animals, distinguished by the female having no *placenta*, and by their young being nursed in a peculiar pouch in the body of the mother. (*See* MARSUPIALIA.) The scientific term *Macropus* is also used to designate the same family, which varies much in appearance and habits. Some are carnivorous, whilst others live on vegetables. They are nearly all confined to Australia, and are characterised by a very low degree of intelligence. The phalangers form a sub-family, having the second and third toes so completely included within the skin as to appear like a single toe, were it not for the claws, which project distinctly. They are covered with a close, thick, soft fur, and live on trees or bushes. They have a strong prehensile tail, with which they hook themselves to the branches upon which they dose during the day. They possess a very strong odour, but their flesh is eaten. In the genus *Cuscus*, the tail is long, scaly, and rat-like, and the ears are short. In the genus *Petaurus*, the skin of the body is expanded between the anterior and posterior limbs, which enables the species to leap from one tree to another. Four or five species are known, of which the most familiar is the flying squirrel of Norfolk Island. The genus *Phascolarctos*, or koala, bears some resemblance to the phalangers, but has no tail. The *Macropina*, or kangaroos proper, have the tarsus and middle toe of the hind foot elongated, and the two inner ones rudimentary, equal, and united together. This genus has very large posterior limbs, and the tail is of remarkable length and strength. This organ is of great importance to the animal, since it is used as an organ of locomotion, a weapon of offence, and also as a third point when the kangaroo rests on its haunches. It also assists in the astonishing leaps which these animals continually take when moving about. Their progress actually consists of a series of springs, sometimes twenty feet in length. They seldom stand on all-fours, except when feeding, and are harmless and inoffensive creatures. The *Macropus major*, or great kangaroo, is the largest species. It measures five or six feet from the tip of the nose to the end of the tail, and, when sitting, appears about the height of a man. The kangaroo forms an important article of food, and the flesh is represented by those who have tasted it as being a little like venison. Soup made of the tail is said to be far superior to the ox-tail soup of Europe. Individual specimens have been brought alive into this country, and have been successfully kept in some of our parks. The great kangaroo inhabits New South Wales, Southern and Western Australia, and Tasmania. Other genera, the *Lagorchestes*, or kangaroo hare, and the *Hypsiprimnus* (*see* KANGAROO RAT), are also found in Australia. The *Dasyurina*, or opossums, which also belong to the kangaroo family, are found in America and the West Indies. (*See* OPPOSSUM, MACROPIDÆ.)

KANGAROO RAT (*Hypsiprimnus*), a marsupial animal found in Australia. It is the size of a rabbit. General colour greyish, reddish-brown above, whitish below; triangular head; large ears; tarsi very long; and tail elongated, flexible, terminated by a pencil of hairs. The manners of the kangaroo rat are gentle and timid; it feeds upon vegetables, and it is said to burrow in the ground.

KANTIAN PHILOSOPHY, *kănt'-e-ăn*, is the name given to that system of philosophy which was promulgated by Immanuel Kant, professor of logic and metaphysics in the university of Königsberg in the latter half of the 18th century, and who was one of the greatest philosophers of modern times. His system, like that of Dr. Reid, was a recoil against the scepticism of Hume, and it was equally opposed to the dogmatism of Leibnitz and Wolff. His philosophy is nearly all contained in his "Critique of Pure Reason." He insisted upon the necessity of a stricter analysis of our intellectual powers, in order to ascertain the nature, and determine the limits, of human knowledge: the result was, that a whole system of knowledge underived *from* experience was proved to exist in the mind. The materials of *pure* or *à priori* knowledge are supplied by the three departments of sense, understanding, and reason. In the world of sense the transcendental, or pre-existent, elements of knowledge are space and time; these are pure sensuous intuitions, without which empirical sensations would be impossible. Sense delivers up its presentations in space and time to the understanding, whose office it is to introduce into them unity and system. All its operations are generalised into modes or forms of conception, which, after the example of Aristotle, he names "Categories of the Understanding." These are,—(1) Quantity, comprising unity, plurality, totality; (2) Quality, comprising reality, negation, limitation; (3) Relation, comprising substance, cause, reciprocity; (4) Modality, comprising possibility, existence, necessity. These are the forms, as it were, in which the rude

material of the senses is shaped into conceptions, and becomes knowledge, properly so called. He laboured to show that without them no connection of the materials of sense is possible. They are the constant and invariable conditions of all mental conceptions, and are the things which connect or bind the understanding with all external objects. All our judgments he divides into two kinds,—analytical and synthetical, the former being a kind of experimental sketch, the result of a separation of the different qualities or properties of any thing, the latter being independent of experience and universal in its nature. The third, and highest faculty is the reason,—the faculty of ideas. Reason creates no new materials of its own; it only enlarges the data of the understanding, by taking in all the conditions on which they depend. "All our knowledge," he says, "begins with sense, proceeds thence to understanding, and ends with reason, beyond which nothing higher can be discovered in the human mind for elaborating the matter of intuition and subjecting it to the highest unity of thought." "Of reason, as of the understanding, there is a merely formal—that is, logical—use, in which it makes abstraction of all content of cognition; but there is also a real use, inasmuch as it contains in itself the source of certain conceptions and principles which it does not borrow either from the senses or the understanding." The three great attributes of reason are absolute unity, absolute totality, and absolute causation. All these absolute ideas are involved in every act of reasoning. There are, also, according to Kant, three grand forms or ideas soaring above pure intellect, and having an existence independent of experience, which come within the province of pure reason. These are the universe, the soul, and God. The first embraces the entire mass of all real or possible physical knowledge, forming the science of cosmology; the second, the feelings, emotions, passions, &c., which constitute our moral and intellectual nature, forming psychology; and the third, all the reasonings relative to the mode of being, the attributes, and moral nature of the Deity, forming theology. These three ideas Kant maintains to have their birth in human reason irrespective of all experience, and to spring up inevitably so as to control and influence the working of the understanding as applied to experience. As regards the moral and religious principles of our nature, these are based upon consciousness. In order to learn our duty both to man and our Maker, we must penetrate into our internal structure, examine all the motives, impulses, and aspirations of the soul, and look at the final ends or purposes which its various faculties are fitted to produce. In this way we discover the nature of duty and of right; what is necessary and what is expedient; what is good and what is pernicious. All moral laws exist *à priori* in the mind, and are completely independent of the thinking principle. The whole moral economy of man points to another great truth—that of the existence of Deity. The practical reason of mankind clearly demonstrates that there must be a supreme, universal, infinite existence. Such is a brief outline of the philosophy of Kant. The system, as a whole, looks grand and imposing, and has an air of great strength and solidity. It is hedged round with a ponderous array of logical axioms, rules, definitions, and forms, and has a phraseology at once original and scholastic. But with all these appliances, the system is strangely defective when closely examined, though its influence upon the history of philosophy can scarcely be overestimated. "Taken altogether," says Dr. Cairns, "it is impossible to regard his writings as any other than a prodigy of human intellect, and his influence as one of the mightiest forces that has ever ruled philosophical opinion. His mark is still on all the speculative sciences in Germany and Europe; and though his sceptre has long been broken, the most imposing systems meet in homage at his tomb. Great as the currency of his leading ideas has been, much still remains in his works to be developed by the struggle and collision of future systems; and it may be safely pronounced that no philosopher of the eighteenth century—perhaps none since the days of Aristotle—has left behind such monuments of thought, or has so firmly imposed the task of mastering them on the speculation of all succeeding ages."—Ref. *Encyclopædia Britannica*, art. *Kant*; Blakey's *History of Philosophy*; Lewes's *History of Philosophy*.

KAOLIN, *kaol'-o-lin* (Chinese), in Min., a pure white clay, resulting from the decomposition of felspar, in granitic rocks. It was originally found in China, but has been discovered near St. Austle, in Cornwall, and at St. Yrieix, near Limoges. It consists of nearly pure silicate of alumina, with small quantities of oxide of iron, potash, and water. It is used for making the finer kinds of porcelain; also by photographers for abstracting organic matter from their nitrate of silver solutions. It has been employed to discolorise sugar, but without much success.

KAPNOMOR, *kap'-no-mor* (Gr. *kapnos*, smoke; *meiro*, a part), in Chem., a colourless oil, of peculiar odour, boiling at 360°, obtained from crude kreasote by distillation with potash. It is insoluble in water and solution of potash, but dissolves readily in alkaline solution of kreasote.

KARAITES. (*See* CARAITES.)

KARPHOLITE, *kar'-fo-lite* (Gr. *karpho*, I dry or shrivel; *lithos*, a stone), a mineral, which occurs in minute crystals and in stellated silky fibres. It consists principally of silica, alumina, and oxide of manganese. In colour it is straw-yellow; is able to scratch fluor spar, and is scratched by felspar. The lustre of the crystals is vitreous, and that of the fibres silky. Its specific gravity is 2·93. Before the blowpipe, karpholite fuses into a dark glass, which becomes darker in the interior flame. With borax it fuses into a transparent glass, which presents a reddish colour in the outer flame and a greenish colour in the inner.

KAT, or KHAT. (*See* CATHA.)

KAWRIE PINE. (*See* DAMMARA.)

KEDGE, or KEDGER, *kedje*, *ked'-jer*, a small anchor, used to steady a ship and keep her clear from her bower anchor when riding in a harbour or river, especially at the turn of the tide, when she might, if not so secured, drive over her principal anchor and entangle the stock or flukes with her slack cable, so as to loosen it from the ground. They are also employed to remove a vessel from one part of a harbour to another: for this purpose they are carried out from her in the long-boat, and let go by means of ropes secured to them.

KEEL, *keel* (Sax. *cele*, Du. *kiel*), the lowest and principal piece of timber in a ship. The carcass of a ship is not unlike the skeleton of the human body,—the keel representing the backbone, and the timbers the ribs. The entire fabric is supported by the keel; as the stem and stern posts, which are elevated on its ends, are merely continuations of it, and serve to connect and inclose the extremities of the sides by transoms, as the keel forms and unites the bottom by timbers. Some vessels are provided with what is termed a *false keel*, consisting of a strong thick piece of timber bolted to the bottom of the keel. It is chiefly employed when the planks which form the real keel cannot be obtained of sufficient depth.

KEEL-HAULING, a method of punishment employed in the Dutch navy, and although not entirely unknown in our own, is seldom or ever now practised. It is extremely dangerous. The culprit is generally let down from the bows under the bottom of the ship, and drawn along the length of the keel by two ropes stretched from each side of the ship; after which he is once more taken on board over the stern. By reason of the number of barnacles and other obstructions on the bottom of the ship, this punishment inflicts nearly cuts and bruises on the culprit, and is severe in the extreme.

KEELSON, or KELSON, *keel'-son*, *kel'-son*, one of the principal timbers in a ship; it is laid over the keel, of which it forms the interior or counterpart, and across all the timbers inside the vessel. It consists, like the keel, of several pieces scarfed together, but of only *half* the breadth and thickness of those of the latter. In order that it may fit with greater security upon the floor timbers and crotchets, it is notched opposite to each to the depth of an inch and a half, and secured upon them to that depth by copper spike-nails.

KEEP. (*See* CASTLE.)

KEEPER, *keep'-er* (Anc.-Sax.), means, literally, one who holds possession of anything for the use of another. The *keeper of the forest*, or chief warden, is an officer

who has the principal government of all things connected with royal forests, and is above all other officers having rule over the same. The *keeper of the tench* was the name formerly given to an officer of the royal mint, now called the *master of the assay*. (*See* LORD-KEEPER.)

KELP, *kelp*, the ashes of seaweed, from which are extracted iodine and bromine. A ton of good kelp yields about 8 lbs. of iodine by the ordinary and very wasteful process of working. Mr. E. C. C. Stanford, by carefully collecting and compressing the weed, and afterwards submitting it to dry distillation, not only doubles the yield of iodine and bromine, but obtains various valuable hydrocarbon oils. The shores washed by the Atlantic are those which yield the richest seaweed for the manufacture of kelp.

KENNEL, *ken'-nel* (Fr. *chenil*), a term properly applied to the house in which a pack of hounds is lodged, but frequently used to denote the pack itself. The kennel constructed by the duke of Richmond for his hounds cost £10,000; it is well drained, healthily situated, and provided with airing-yards, breeding-places, &c., together with dwelling-houses for the huntsman and whipper-in. Thatched kennels are highly spoken of on account of their maintaining an equable temperature.

KEPLER'S LAWS, *kep'-lerz*, the term applied by astronomers to the statement of certain analogies that exist between the relative distances of the planets from the sun and the times in which they complete their revolutions round that body; and also between the rate of motion at which any heavenly body travels in its orbit, and its distance from the body or centre about which it revolves. Kepler's first law, so called because it was the first which was discovered and enunciated by that astronomer, is that "equal areas are described in equal times." By this it is meant that if a straight line were drawn from the earth to the sun, round which the earth revolves, this line would pass over equal portions of the area of the ellipse which the earth describes in its orbit in equal times, wherever the planet might be in its course. Kepler arrived at this conclusion from observing that the planets travelled fastest when they were nearest to the sun, at their perihelion, and slowest when they were at their aphelion, or greatest distance from that body. His second law, which was deduced, like the first, from observations of the planet Mars, is that "planets describe ellipses, having the sun as a common focus;" while his third is that "the squares of the periodic times of the planets are in proportion to each other as the cubes of their mean distances from the sun."—*Ref.* Herschel's *Outlines of Astronomy*.

KERI-CHETIB, *ke'-re ket'-ib*, a term applied, in Philol., to various readings in the Hebrew Bible. The signification of *keri* is, that which is read; while *chetib* means that which is written. When instances of such readings occur, the *chetib*, or false reading, is placed in the text, while the *keri*, or true reading, is placed in the margin with a Hebrew character under it. The number of keri-chetibs is estimated at a thousand, and most of them are attributed to Ezra; but, as several corrections of this kind appear in his own writings, it is probable that many were made at some subsequent period.

KERMES MINERAL, *ker'-mez* (Arab. *kirmer*), a compound used in Med., consisting of a mixture of ter-oxide and tersulphide of antimony. It is prepared by boiling finely-powdered sulphide of antimony with carbonate of soda and a large quantity of water. The liquid, as it cools, deposits the kermes, which is collected on a filter and dried at a low temperature. Its chemical composition may be represented by the formula $2Sb_2S_3.Sb_2O_3$, according to Liebig; but crystals of the teroxide of antimony may be easily descried with a microscope.

KERR RIFLE, *ker*, a rifle manufactured by the London Armoury Company, at their works in Bermondsey, S.E., and which takes its name from Mr. Kerr, the inventor of the principle on which the interior of the barrel is grooved. The barrel is interchangeable with that of the machine-made long Enfield rifle, constructed by the same company; but it is superior to the Enfield barrel in being shorter, smaller in the bore, and sighted on a different principle. The bore is ·451 inch in diameter, with six grooves, cut on what is called the "ratchet" principle; that is to say, the grooves are deeper on one side than on the other, the deepest part being on the side from which the bullet turns, which has the effect of reducing the resistance of the air to a minimum. The lands are left from the original cylindrical bore of the barrel; and as the bore itself is mechanically and mathematically true, the lands must be perfectly true also. At the breech, and where the charge lies, the grooves are nearly straight. This is the chief point in Mr. Kerr's patent, in which barrels bored on his principle differ from those of other inventors and makers. By this simple arrangement, and the absence of all angles in the grooving, fouling is obviated, while the straightness of the grooves at the breech allows the bullet to expand properly into them before it commences the rapid rotatory motion. The barrel is 37 inches in length, and its weight is 5¼ lbs. The bullet is cylindro-conoidal in form, and weighs 530 grains; it has a diameter of ·442 inch, which leaves a windage of ·009 inch. A solid greased wad is used in loading, and the charge is 2¾ drachms of No. 6 powder, up to 700 yards, beyond which range it may be increased to three drachms with advantage. The fore-sight, either bead or knife, move transversely in a dovetail, in front of which there is a graduated scale, to show to what extent the sight is shifted to the right or left of the centre. A screw is used to fix the fore-sight in the required position. By this due allowance may be made at all times for the effect of the wind. The precision of the machinery employed causes this rifle to be more accurately finished than those which are made by hand. It is a cheap and trustworthy weapon; and its excellence, and the correctness of the theory on which the principles adopted in its construction are based, are clearly demonstrated by the good practice that has been made with it in trials at the Royal Arsenal, Woolwich, and elsewhere.

KERSEY, *ker'-ze*, a sort of rough cloth, generally ribbed and woven from long wool. The name is probably a corruption of Jersey, from which island it originally came. Kersey is principally manufactured in the North of England. *Kerseymere* is a very different fabric; it is a thin stuff, generally woven plain from the finest wools. It is said to derive its name from Cashmere, a country where the finest wool is produced, and consequently much celebrated for its woven cloths. Kerseymere is principally manufactured in the western districts of England.

KESTREL, *kes'-trel* (Ang.-Nor.), (*Falco tinnunculus*), one of the most common species of the British *Falconidæ*. It is elegant in shape, attractive in colour, and graceful in its movements through the air, and is best known by its habit of sustaining itself in the air in the same place, by means of a short but rapid movement of its wings. During this pause, its powerful eyes search the surface beneath for mice, which form its principal food. The kestrel is also called the windhover, from this habit of remaining suspended in the air. On all such occasions, its head points to windward. Although the kestrel lives principally on mice, it also attacks and devours small birds. The kestrel frequently takes possession in spring of the nest of a crow or magpie in which to deposit its eggs. Sometimes, however, they build in high rocks or old towers. They lay four, and occasionally five eggs. The kestrel is found in nearly all parts of the world. In length, it is from thirteen to fifteen inches, dependent upon the sex. In the male, the beak is blue, pale towards the base; the top of the head and nape of the neck ash-grey, with dusky streaks; the back and wing-coverts reddish fawn-colour, with small black triangular spots, one occupying the point of each feather; the tail-feathers are ash-grey, with a broad black band near the end, each feather being tipped with white; the breast and belly are pale rufous fawn-colour, with streaks on the former and dark spots on the latter; the legs and toes are yellow, and the claws black. The colour of the female differs little from that of the male, the under surface of the tail-feathers of the former being more uniform in colour, and less distinctly barred than in the male.

KETCH, *ketsh* (Fr. *quaiche*; Ger. and Du. *kitz*), a vessel of about 100 to 250 tons burden, carrying two

masts; viz., a main and mizen mast, chiefly employed as yachts, but sometimes built very strong, and used as bomb-vessels. (*See* BOMB-KETCH.)

KETCHUP, or CATSUP, *ketsh'-up*, the juice of certain vegetables, strongly salted and spiced, so as to be used as sauce. The best-known ketchup is that made from mushrooms. For its manufacture, the following will be found a useful receipt:—Sprinkle mushroom flaps gathered in September with common salt; stir them occasionally for two or three days; then lightly squeeze out the juice, and add to each gallon cloves and mustard-seed, of each bruised ¼ oz.; allspice, black pepper, and ginger, of each bruised 1 oz.; gently heat to the boiling-point, in a covered vessel, macerate for fourteen days, and decant or strain. Should it exhibit any indications of change in a few weeks, boil it again, with a little more salt and a little more spice. In preparing ketchup, vessels made of glazed earthenware or stone-ware, or well-tinned copper pans, only should be used.

KETONES, or ACETONES, *ke'-tonez*, a series of compounds obtained from volatile organic acids, the normal hydrates of which contain four equivalents of oxygen, by submitting their lime, or baryta-salt, to dry distillations. Acetone, $C_3H_6O_2$, may be taken as the type. (*See* ACETONE.)

KETTLE-DRUM. (*See* DRUM.)

KEY. (*See* LOCK.)

KEY-BOARD, *ke'-board*, a name applied in Mus. to that portion of a pianoforte, organ, harmonium, &c., upon which those pieces of wood or ivory, called keys, by means of which the sounds are produced, are placed. The key-board of a pianoforte presents various numbers of keys, according to the compass of the instrument to which it belongs; thus, one containing six octaves presents forty-three white keys and thirty black; the black keys representing the sharps and flats, and the white, the natural notes.

KEYS, those movable projecting levers of ivory or wood which are placed on the key-boards of all such instruments as the pianoforte, organ, or harmonium, &c., to receive the fingers of the performer.

KEYS, or KEY-NOTE, in Mus., a certain fundamental sound or tone, to which the whole of a piece must have a certain bearing, and with which it usually begins and always ends. There are only two principal keys; viz., the *major*, or that of C, and the *minor*, or that of A. From these two natural keys are deduced all the other keys in which we employ flats and sharps. The key in music is the same as the subject in an oration: in the latter, some principal person or thing, to which the discourse is referable, is always kept in view; so in every regular piece of music there is one fundamental note,—viz., the key-note, by which all the rest are regulated, and with which the piece begins and ends. Again, in an oration there may be several distinct articles which refer to different subjects, at the same time having a visible connection with the principal subject; so in a musical composition, there may be several keys to which the different parts belong, but they must all be under the influence of, and have a sensible connection with, the principal key.

KEYS, POWER OF THE, is a power claimed by Roman Catholics for the pope to open and shut paradise when he pleases, founded upon the saying of Jesus Christ to Peter,—"I will give thee the keys of the kingdom of heaven" (Matt. xvi. 19). It denotes the power of inflicting spiritual punishment and of absolving from it.

KEY-STONE, in Arch., is the stone placed at the top or vertex of an arch to bind the two sweeps together. In the Tuscan and Doric orders it is merely a plain stone projecting a little; in the Ionic it is cut and waved somewhat like consoles; and in the Corinthian and Composite orders, it is a console ornamented with sculpture. In making an arch, the length of the key-stone, or thickness of the archivolt at top, is allowed by the best architects to be about one-fifteenth or one sixteenth of the span.

KHALIF. (*See* CALIF.)

KHAN, *kân*, is a Tartar word, signifying sovereign or chief. It is a title adopted by the sovereign princes of Central Asia, and is one of the titles of the Turkish sultan. It was first assumed by *Gengis* when he became supreme ruler of the Moguls and Tartars. In Persia the word is used in a more extended sense, being applied to governors of provinces and officers of a certain rank. Khan is also the Turkish name for a caravansary, a place for the accommodation of travellers. (*See* CARAVANSARY.)

KHOTBAH, *kot'-bah* (Arab.), a particular form of prayer used by the Mohammedans at the commencement of public worship in the great mosques on Friday, at noon. It was originally performed by the prophet himself, and by his successors, up to A.D. 906. At that time Mohammed VIII. appointed special ministers for the purpose, and that arrangement has been adhered to ever since. The khotbah consists of a confession of faith in the Mohammedan religion, and a general petition for its success. It is divided into two portions, between which the officiating priest makes a considerable pause, which is regarded by the worshippers as the most solemn part of the ceremony. The sultan of Turkey has always considered it one of his chief prerogatives to have his name inserted in the khotbah.

KIDNAPPING, *kid'-nâp-ping* (Ang.-Sax.), in Law, is the forcible abduction and conveying away of a man, woman, or child, from their own country and sending them to another. It is an offence at common law, punishable by fine and imprisonment, and formerly also by pillory. According to the Jewish law, "He that stealeth a man and selleth him, or if he be found in his hand, he shall surely be put to death."—(Exod. xxi. 16.) By the civil law, likewise, the offence of spiriting away and stealing men and children, called *plagium*, was punishable with death. By 9 Geo. IV. c. 31, the wilfully leaving any man on shore, or refusing to bring him home, by the master of any merchant vessel, is a misdemeanour, and punishable by imprisonment for such time as the court may direct. The same statute declares, that if any person shall maliciously, either by force or fraud, lead or take away, or decoy or entice away, or detain, any child under the age of ten years, he shall be guilty of felony, and, being convicted thereof, shall be liable to be transported beyond the seas for the term of seven years, or to be imprisoned, with or without hard labour, for a term not exceeding two years; and (if a male) to be once, twice, or thrice publicly whipped (if the court shall see meet) in addition to such imprisonment.

KIDNEY, *kid'-ne* (Ang.-Sax.; Lat. *ren*), in Anat., is the name of a double gland, having for its office the secretion of the urine. The form of the kidney resembles that of a French bean; its average length being from four to four and a half inches, its breadth two inches, and its thickness one inch. The two kidneys are situated in the lumbar region, one on each side of the spine, on a level with the last two dorsal and the first two lumbar vertebræ: they are of a brownish-red colour, flattened from before backwards, and grooved on the interior border for the great vessels. They are covered by a thin, firm, transparent cellular envelope; and internally are composed of two substances,—an exterior or cortical, and an interior or medullary. The cortical substance is the seat of the greater part of the secretory process, and is made up of a great number of uriniferous tubes, much convoluted, and inosculating with each other, and lined with epithelial cells of a spheroidal and projecting form. Scattered through the plexus formed by these tubes and the blood-vessels, are dark points, which have been called *corpora Malpighiana*, from their discoverer. These last are convoluted masses of minute blood-vessels included in flask-like dilations of the uriniferous tubes, forming a close relation between the circulating and secreting systems. The medullary substance is composed principally of tubes passing nearly straight inward to the central receptacle of the secretion. Both substances are imbedded in interlacing fibres, most abundant in the medullary. The kidneys are well supplied with blood-vessels and nerves, in accordance with the importance of their function. The renal arteries come directly from the aorta, and the large veins terminate in the vena cava. The nerves come from the renal plexus. The renal arteries divide, soon after entering the organs, into minute twigs, which pierce the capsule of the Malpighian tufts. From the convolutions of these tufts arise the efferent vessels, which surround the uriniferous tubes, and from which the renal veins are formed; and thus the urinary secretion is prepared from

blood which has passed through the Malpighian capillaries. The uriniferous tubes end in a number of conical bundles pointing towards the interior, and are there embraced by membranous ducts proceeding to the central reservoir or pelvis of the kidney, from which arises the ureter, the membranous tube which conducts the renal secretion of the bladder.

KIDNEY, DISEASES OF THE.—The kidneys are subject to a variety of dangerous and painful diseases, arising from various causes. They may be arranged in two distinct classes,—those which are the result of some cause acting locally, as calculi, retention of urine, or a blow on the loins, and those which are the result of a constitutional cause acting upon the kidney by inducing an abnormal condition of the blood. (For disease of the kidney arising from renal calculi, *see* CALCULUS.) In retention of urine, the ureter, pelvis, and infundibula, become much dilated, and the cortical substance expanded and lobular on the surface. The mucous membrane frequently becomes ulcerated, inflammatory deposits occur in the substance of the kidney, and the gland is destroyed by a slow atrophy, or more rapidly by suppurative inflammation. Both kidneys are usually affected, but in different degrees. Disease of the kidney from external violence is not of frequent occurrence. Among the diseases resulting from a constitutional cause is scrofulous disease of the kidney, which occurs in the form of small scattered deposits of tubercular matter, or it presents itself in the form of a thick curdy deposit, which leads to the formation of a large abscess. Cancer of the kidney is a disease less uncommon than it was formerly supposed to be. In the great majority of cases, some of the neighbouring parts are complicated, in one or other of which the disease obviously originated. Hydatids are occasionally found in the kidney. They are generally numerous or multiplied, and contained in a mother-cyst, which frequently acquires a large size, forming a tumour which may be often felt externally. Inflammation of the kidneys (nephritis) is characterized by pain in the lumbar region, often extending anteriorly through the abdomen, or descending to the groin and testes, with retraction of the latter, disordered state of the urinary secretion and excretion, febrile disturbance, sometimes numbness of the thigh, and nausea or vomiting. The whole of these symptoms are not always present, except in some of the more severe cases. Inflammation of the kidneys, like other inflammatory diseases, results from cold, wet, intemperance, &c.; and its treatment requires to be very active, local depletion by leeches, and cupping, being freely employed, followed by warm fomentations. (*See* BRIGHT'S DISEASE.)

KILOGRAMME. (*See* METRIC SYSTEM.)

KILT, *kilt* (Scottish), a loose petticoat, extending from the waist to the knee, worn by men in the Highlands of Scotland. The national Scottish dress, with the kilt, hose, and plaid, is not much worn at the present day; it is principally confined to a few Highland regiments.

KIN, or KINDRED, *kin, kin'-dred* (ANG.-SAX.), in Law, is applied to certain persons of kin, or related to each other. There are three degrees of kindred recognized in law,—one in the right line descending, another in the right line ascending, and the third in the collateral line. In the right line descending, the kindred of the male line are called *agnati*; of the female, *cognati*. It proceeds from father to son and daughter, grandson and granddaughter, and so on. The right line ascending is directly upwards, from son to father and mother, grandfather and grandmother, &c. The collateral line is either descending by the brother or sister, and their children downwards, or ascending by uncle or aunt, grand-uncle, grand-aunt, &c., upwards. There are several rules to know the degrees of kindred. In the ascending line, take the son and add the father, and it is one degree ascending; then add the grandfather, and it is a second degree (a person added to a person in the line of consanguinity making a degree); and if there are many persons, take away one, and you have the number of degrees; thus, if there are four persons, it is the third degree; if five, the fourth, &c.; so that father, son, and grandson, in the descending line, make but two degrees. To know in what degree of kindred the sons of two brothers stand, begin with the grandfather, and descend to one brother, the father of one of the sons, which is one degree; then to his son, the ancestor's grandson, which is a second degree; and then descend again from the grandfather to the other brother, father of the other of the sons, which is one degree, and descend to his son, which is a second degree; thus, the sons of two brothers are distant from each other two degrees, for in what degree either of them is distant from the common stock, the person from whom the computation is made, they are distant between themselves in the same degree; and in every line the person must be reckoned from whom the computation is made. If the kindred are not equally distant from the common stock, then in what degree the most remote is distant, in the same degree they are distant between themselves; and so the line of the most remote makes the degree.

KING, *king* (Sax. *cyning*, Swed. *kong*, Germ. *könig*), the title given to the principal person in any state, who exercises a greater or less degree of sovereign power, according to the nature of the laws of that state, and in whom the principal exective functions are vested. The term itself is of Teutonic origin, and implies a person who has attained a greater degree of knowledge than those around him, and is therefore entitled to exercise the chief power among them. In former times this knowledge would consist chiefly of an intimate acquaintance with the rules and stratagems of war, by which he was enabled to gain the mastery over any portion of his own people who might be disposed to dispute his authority, as well as over hostile tribes and nations. The first king of England was Egbert, originally king of Wessex, who brought under his away the other kingdoms of the Saxon Heptarchy, and united them under himself as sole sovereign. This monarch, and some of his immediate descendants, seem to have deserved the title in the strict signification of the Saxon word *cyning*, or king, from their skill and excellence in the arts of peace and war. The office of king is hereditary in England, and has been so ever since the accession of William the Conqueror, although the descent has not been preserved in an unbroken line from father to son since that time, but has passed into other branches of the royal family, or into families closely allied to them by marriage. At present, in accordance with the spirit of the saying, "The king never dies," the king or queen of England, as the case may be, comes to the throne immediately on the death of his or her predecessor, and enjoys full and immediate possession of the sovereign power; but formerly, a short period of time elapsed between the close of the reign of one king and the commencement of the reign of his successor, which was requisite to a certain extent to obtain some recognition of the authority of the latter from the people. At his coronation, the reigning sovereign of England enters into a solemn contract with the people to govern according to the laws, to cause justice to be duly administered, and to maintain the Protestant church. The person of the king is sacred, and no legal measures can be taken against him to bring him to account for any act that he may have committed; but, according to the constitution of the government of this country, it is impossible for the monarch to do anything prejudicial to the interests and welfare of the people, as the king always acts through his ministers, who may be impeached for any transgression of the laws; and the houses of parliament and the people, through their representatives in the House of Commons, virtually exercise a direct control over his power, since no law can be brought into operation and enforced without the concurrence of both these bodies, although, at the same time, every enactment passed by them requires the royal assent before it becomes the law of the land. It is the province of the sovereign to send embassies, to conclude treaties, and make war and peace with other nations. He bestows titles; convenes, prorogues, and dissolves parliament; appoints the judges and high officers of state, the bishops and governors of colonies, and grants commissions to officers in the army and navy. Charters of incorporation for companies, collegiate bodies, and towns, are also granted by the king. Some monarchs are styled emperor instead of king; but the functions discharged by both are similar, although the title seems to imply supremacy of an absolute nature, and does so in some cases. The words czar, sultan, and shah, ap-

plied to the monarchs of Russia, Turkey, and Persia, and elector and grand-duke applied to the rulers of Hesse-Cassel and many of the smaller German states, are equivalent to the term king.

KING-AT-ARMS. (*See* HERALD'S COLLEGE.)

KINGFISHER. (*See* ALCEDO.)

KINGS, THE BOOKS OF, is the name of two of the historical books of the Old Testament. Originally, they formed only one book, and were first divided by the Seventy, by whom they are entitled the third and fourth books of Reigns or Kingdoms, the books of Samuel, which they divided in the same way, being the first and second. The books of Kings take their name from their contents, being a history of the theocracy under the kings from the reign of Solomon till the dissolution of the state. They may be divided into three parts,—1. giving an account of the reign of Solomon (i.—xi.); 2. the history of the two kingdoms of Judah and Israel (xii.—2 Kings xvii.); 3. the history of the kingdom of Judah after the breaking of Israel (xviii.—xxv.). The period embraced by the two books is 455 years. Great uncertainty exists as to the author and the time at which these books were written; some ascribe the authorship to Ezra, others to Jeremiah or Isaiah; but it is mere matter of conjecture. Jewish tradition ascribes the authorship to Jeremiah, and there is present throughout a considerable resemblance to his style. The books, though compiled to a considerable extent from more copious annals, yet present a tolerable degree of unity and compactness. A definite plan is seen running through the whole, and there is a uniformity of style and method. The scope of the work is to show God's merciful dealings with his people, and his keeping promise with them. The kingdom is preserved to Solomon entire, and after it was divided, God endeavoured to recall both Israel and Judah to a sense of their covenant-relation to him by admonitions and chastisements, though they were finally subverted because they continued rebellious and stiff-necked. But though severely punished, the seed of David was not allowed to perish, and the exiled king Jehoiakim is brought back to Judah and set upon the throne of his ancestors, as an evidence of God's remembrance of his promises made to his servant David. The historical character and credibility of these books commend themselves to the reader by strong external and internal evidence; besides their being repeatedly referred to in the New Testament. The Jews have uniformly regarded them as divinely inspired.—*Ref.* Horne's *Introduction to the Holy Scriptures.*

KING'S OR QUEEN'S BENCH, COURT OF. (*See* COURT OF QUEEN'S BENCH.)

KING'S COLLEGE, LONDON, is an educational institution occupying the east wing of Somerset House, which was built up to receive it, having before been left incomplete. The site was presented to the college by George IV. King's College owes its origin mainly to the opposition made by the friends of the Church to University College, on the ground of theology having no place in its curriculum. They therefore set about establishing another institution of a similar kind, but on principles which accorded with their views. The funds for the institution were raised partly by shares and partly by donations; and a charter of incorporation was obtained in 1829. The fundamental principle upon which it was established was, "that every system of general education for the youth of a Christian community ought to comprise instruction in the Christian religion, as an indispensable part, without which the acquisition of other branches of knowledge will be conducive neither to the happiness of the individual nor the welfare of the state." The queen is patroness of the institution, and the archbishop of Canterbury is visitor. There are sixty-three professorships and lectureships, in the several departments of theology, science and general literature, the applied sciences, and medicine. Rooms are provided within the walls of the college for a limited number of matriculated students, under the superintendence of the censor. There is also a school in connection with the college.

KING'S EVIL. (*See* EVIL, KING'S, and SCROFULA.)

KING'S YELLOW, a pigment of a fine yellow colour, which is a mixture of arsenious acid and tersulphide of arsenic or orpiment.

KINIC or QUINIC ACID, *kī'-nik*, a peculiar dibasic acid, occurring in chinchona bark, in combination with lime and the chinchona alkaloids. It is prepared by mixing an aqueous decoction of the bark with milk of lime, until a faint alkaline reaction is perceived, the tannic acid and the alkaloids being precipitated and kinate of lime remaining in the supernatant liquor. The salt is crystallized from the mother-liquor by evaporation, and decomposed by oxalic or sulphuric acid. Kinic acid crystallizes in colourless oblique rhombic prisms, freely soluble in boiling water, less so in cold water, and still less so in alcohol and ether. Most of the kinates are soluble in water, with the exception of the sub-kinate of lead.

KINO. (*See* PTEROCARPUS.)

KINONE, *ki'-none*, a yellow crystalline substance, obtained by heating one part of kinic acid, four parts of peroxide of manganese, and one part of sulphuric acid, diluted with water. It crystallises in long needles, which fuse at 212° Fahr. It is sparingly soluble in water, but dissolves more freely in alcohol.

KIOSK, *ki-osk'*, a Turkish word, signifying a pavilion or summer-house, with a tent-shaped roof open on all sides, and isolated. It is generally square in shape, and supported by pillars, round the foot of which is a balustrade. From Turkey and Persia, the kiosk has been introduced into the English, French, and German gardens. It is built of wood, straw, or similar materials, and is chiefly erected to afford a free aspect in the shade, while, at the same time, it embellishes a rural or garden view.

KIPPER, *kip'-per* (Teut. *kippen*, to hatch, from which the English word *chip*, to break the egg), a term applied to a salmon taken out of season, or at spawning-time, when it is unfit to be eaten. The term is also used in Scotland to signify fish which have been cured by means of salt and pepper; as, kippered salmon, kippered haddock.

KIRCHEN-TAG, *kirk'-en-tāg* (Ger., church diet), a Protestant association, founded in Germany in 1848. It is of the nature of the Evangelical Alliance in this country, but takes a wider range of subjects, embracing questions of social reform, as well as those of a more strictly religious nature. The inner mission is specially patronized by it. It consists of delegates, lay and clerical, from the more important religious communions; but it is possessed of no legislative power. Its doctrinal basis rests upon the confessions of the 16th century. It is to be regretted that the power for good, of this association, has been much weakened by the fierce animosities which have arisen within it, in the discussion of questions that have come before it. Bethmann-Hollweg, the late Prussian minister for religion and education, has been a leading member of this association, and presided at its meetings.

KIRK SESSION. (*See* SESSION.)

KIRSCHWASSER, *kersh'-vās-ser* (Ger., cherry-water), a spirituous liquor, obtained in Germany by fermenting the sweet and small black cherry. From the rude manner in which this beverage is obtained from the bruised fruit, and from the distillation of the cherry-stones (which contain prussic acid) with the liquor, it has frequently a nauseous taste, and is sometimes poisonous. When properly made and sweetened, it bears a close resemblance to noyau in taste.

KISS, *kis* (Sax. *cyssan*, to kiss).—Among the first converts to Christianity, the kiss, according to ancient oriental custom, was the token of brotherly love; and hence we several times read in the New Testament of greeting with a holy kiss. The practice of saluting each other at the sacrament of the Lord's supper was long observed in the Church, being omitted only on Good Friday, on account of the treacherous kiss of Judas. The practice appears to have ceased in the 13th century.

KIT-CAT CLUB is the name of a celebrated association, founded in London about 1698. It was originally formed for convivial purposes, and met in Shire Lane, in the house of Christopher (Kit) Cat, who supplied the members with mutton pies, and gave name to the club. Most of its members being Whigs, it gradually assumed a political character, and came to be regarded as the head-quarters of the friends of the Hanoverian succession. It comprised among its members, Addison, Steele, Walpole, Marlborough, and Sir Godfrey Kneller. It was dissolved in the year 1720. The name of

the club has been chiefly handed down by the collection of portraits of the members, painted by Sir Godfrey Kneller.

KITE, *kite* (SAX. *cyta*), in Ornith., one of the *Falconidæ*, readily distinguished even at a distance on the wing, by its long forked tail. Its flight is characterized by gracefulness and ease, and in some districts it retains the old name of gled or glead, probably derived from the SAXON *glidan*, to glide. Sometimes the kite flies in circles, governing the curve with its rudder-like tail; it then stops, and remains stationary for a time, with its tail expanded widely and its wings fully stretched out. The kite is distinguished from the falcons and hawks generally by pouncing on its prey upon the ground. It preys upon moles, frogs, leverets, rabbits, snakes, and particularly on the young of various gallinaceous birds. Like the sparrow-hawk, it frequently visits the poultry-yard; but it is deficient in courage: hens have been known to drive a kite away by the noise of their cackling. The kite has become comparatively rare in England. Its nest is formed of sticks, and lined with various soft substances, and is usually placed in the forked branch of a tree in a thick wood. It lays two, and sometimes three eggs, of a soiled white colour, marked with a few reddish-brown spots over the larger end. The eggs are laid early in the season, and the birds defend their nest vigorously against all intruders. The principal colours of the feathers are brown, dusky grey, and white. The females are rather larger than the males, but there is hardly any difference in their plumage.

KITE, a well-known toy, formed of a slender framework of wood and packthread, and terminating in a curve at one end and in a point at the other; the whole being covered with paper. Near the centre of gravity, a long string is attached, the end of which can be held in the hand. In order that the kite may be raised in the air, it is necessary that its flat surface be held obliquely to the direction of the wind. To effect this, a string or *tail*, carrying some light substance, is attached to the pointed end of the kite, and thus the proper inclination is maintained by means of its gravity. When the wind impinges obliquely on the exposed surface, its force is divided into two parts; one of which, that perpendicular to the surface, is counterbalanced by the string held in the hand; while the other, parallel to the surface, is expended in causing the kite to ascend. The wind acts with the greatest effect when the perpendicular to the surface is inclined to the direction of the wind, that is, to the horizon, in an angle of about 54½ degrees. The kite was first used by Benjamin Franklin in America, and Romas in France, to show that lightning and the electric spark are identical.

KLEPTOMANIA, *klep'-to-mai'-ne-â* (Gr. *klepto*, I steal, and *mania*, madness), in Law, is applied to a species of insanity which manifests itself in an irresistible propensity to steal.

KNAVE, *nave*, an old SAXON word, which, in its original signification, denoted a boy; whence a knave child is used by several old writers to denote a boy, as distinguished from a girl. Afterwards it came to signify a servant boy, and at length any male servant. It was also applied to the servant or officer that bore the weapon or shield of his superior. In its present use, it denotes a false, dishonest, or deceitful fellow.

KNEE, THE, *nee* (SAX. *cneow*, Ger. *knie*, Dan. *knæ*), in Anat., is one of the most important joints of the human body, and is formed by three bones,—the lower extremity of the femur or thigh-bone, the upper extremity of the tibia or larger bone of the leg, and the patella or knee-pan, which is situated in front of the joint, and serves to protect it from injury as well as to afford leverage to the muscles of the thigh in moving the leg. It is a small flat triangular bone, anteriorly a little convex and rough, for the insertion of muscles and ligaments; posteriorly smooth, covered with cartilage, and divided, by a middle longitudinal ridge, into two slightly concave surfaces, corresponding with the two convex eminences or condyles of the femur. The entire joint is bound together by a number of ligaments.

KNEELING, as a posture in prayer, is recommended by numerous examples in Scripture, and prostration was occasionally practised as a sign of deep humiliation and contrition. By the early Church, kneeling was understood to denote humility of mind before God, and to indicate that man was a fallen creature before God, and needed mercy. From Tertullian and others, we learn that it was the custom in their time not to kneel, but to stand during prayer on Sundays,—said to be emblematic of Christ's resurrection from the dead and the forgiveness of sins.

KNEES, crooked pieces of timber having two branches or arms, generally used to connect the beams of a vessel with her sides or timbers. The angle formed by the branches of these knees is of greater or smaller extent, according to the mutual situation of the timbers they are intended to connect; they strongly resemble a common bracket, and are used in a like manner, one arm being bolted to the deck-beams and the other to a corresponding timber in the ship's side. Knees are of great use, as they not only connect the beams and timbers together in one solid frame, but contribute greatly to the strength and solidity of the vessel.

KNIGHT, *nite* (SAX. *cniht*, the king's servant), a title of honour, which gives the person to whom it is applied precedence next to a baronet, and above an esquire. A knight takes the title of "Sir" before his Christian name, and the wife of a knight is styled "Lady," although her legal appellation is that of "Dame." The title seems to have been first adopted when the feudal system came into operation in Europe. (*See* KNIGHTHOOD.) It is now occasionally bestowed for services in the field, or for attainments in literature and distinction in various branches of science and art. In addition to those who are simply knights by royal creation, there are others who are knights in virtue of belonging to the first and second class of some order of knighthood, especially the order of the Bath. (*See* BATH, ORDER OF THE.) There are also some who are styled knights and belong to some inferior order which does not carry rank with it, and who do not in consequence prefix the title of "Sir" to their Christian names, such as the Naval Knights of Windsor; and there are degrees of knighthood connected with Freemasonry which are merely nominal, and are not recognized except by the members of the society, although the recipients assume the knight's helmet (*see* HELMET), and wear it on their armorial bearings. The degrees of knighthood to which allusion has been made are those of Knight Commander of the Temple, Knight of St. John of Jerusalem, &c. The sovereign alone has the power of conferring knighthood, which is done by laying the blade of a sword on the shoulder of the recipient of the honour, and uttering a short form of words, by which he is declared to be a knight. The lord-lieutenant of Ireland, as representative of the sovereign in that country, has also the power of granting this honour. In feudal times there was another description of knight, who was termed a knight banneret. (*See* BANNERET.)

KNIGHTHOOD, *nite'-hood*, a term which is applied to the institution to which knights belong. The order of knighthood, when it was first established as a general system, was a purely military institution, which dates its commencement as such from the beginning of the 11th century. It arose out of the disturbed state of Europe which prevailed after the dismemberment of the empire of Charlemagne, when all owners of territory, whether small or great in extent, erected a castle on it for purposes of defence, and were constantly engaged in committing acts of aggression on each other and on the persons of peaceful travellers. To put an end to the practice of these enormities, the leading men in various states entered into a league for the mutual protection of each other's property and families. This league ultimately became the institution of knighthood. Admission into the order was attended by a religious ceremonial, and all members were obliged to take upon themselves a vow of obedience to the superior of the order, and to swear that they would faithfully perform the duties that they had taken upon themselves. When the feudal system came into operation throughout Europe, and every landowner was supposed, by a legal fiction, to hold his land from the sovereign as nominal owner of the whole country, every one who possessed land above a certain extent of acreage, or a certain yearly value (*see* KNIGHT'S FEE), was obliged to take upon himself the order of knighthood.

and, by doing so, to show that he was possessed of the necessary arms and had received the training requisite to enable him to render effective service to the king in time of war. If any one whose estate was of sufficient value omitted to become a knight, the king was enabled to compel him to do so by process of distress upon his land, taking the whole or part of it from him until he had performed the duties which his fealty to his sovereign demanded. There were certain cases under which exemption from service could be procured by paying a sum of money as a fine to the king. Persons, therefore, who were prevented from becoming knights by bodily infirmity, or any impediment which could be received as a reasonable excuse, were, in the later feudal times, obliged to appear before two commissioners, who arranged the amount to be paid by way of composition for exemption. In the 12th century, several orders were instituted which partook equally of a military and religious nature, those who took the vows being obliged to abstain from marriage like the monks and clergy. Among the most famous of these were the orders of the Knights Hospitallers and Templars, and those of Alcantara and Calatrava. About 180 orders of knighthood have been instituted at various periods since the 6th century, when the order of the Round Table is said to have been instituted by the British king Arthur. Among these are a few orders for females only; such as the Spanish order of Maria Louisa, the Austrian order of the Star of the Cross, and the German order of the Slaves of Virtue. Every European court possesses several orders of knighthood, but they are far more numerous in continental courts than in the court of St. James's, as the English court is styled. The orders of Great Britain and Ireland are those of the Garter and the Bath for England, the Thistle for Scotland, and St. Patrick for Ireland. In addition to these, a new order, named the order of the Star of India, was instituted by Queen Victoria in 1860. This, and the other British orders, are noticed under their respective headings. (*See* Bath, Order of the; Garter, Order of the; Patrick, Order of Saint; Star of India, Order of the; Thistle, Order of the, and Chivalry.)

Knight of the Shire, the designation by which the representative of a county or shire is distinguished from the representative of a borough town, or any city or town which is a county in itself. Knights of the shire were originally paid for their services in parliament at the rate of four shillings a day, during the time that they were obliged to be absent from home in the performance of their duties. The requisite sum of money was raised by a county rate, to which all freehold lands, with a few exceptions, were liable to contribute. Lands which belonged to the clergy, who were represented in parliament by their bishops and mitred abbots, and the nobility who sat in the common house of representatives as lords temporal, were also exempt from contribution to this rate. In former times, persons were as anxious to evade serving in this capacity as they are now emulous of obtaining the honour. At the conclusion of an election, when the state of the poll is declared by the high sheriff of the county, that functionary causes each member to be girt with a sword, and spurs to be buckled on his feet, in token of his election as a knight of the shire. The qualifications requisite to enable any one to exercise the right of voting at an election of a county member, and the disqualifications which prevent any man from sitting in parliament as such, are mentioned elsewhere.

Knight's Fee (Med. Lat. *feoda*), the term applied to land which was granted by the king, or any nobleman who was possessed of a large extent of territory, to any man and his heirs, on condition that he and they should perform suit and service as a knight in return for the land thus granted, or provide a substitute in case of bodily infirmity or any other hindrance. The extent and estimated value of a knight's fee varied according to its situation and the period at which the grant was made. With regard to the former, the quantity of land that was considered sufficient to enable the holder to support the dignity of a knight varied from 600 to 800 acres, while the yearly value of a knight's fee was estimated at from £15 to £20 during the time of the Norman kings, and was fixed at double that amount in the reign of Edward II.

Knight's Service, Tenure by (Lat. *tenere*, to hold), the most general method of holding land in England, from the time of the Conquest to the termination of the civil war. The whole country was supposed to be divided into knights' fees, for each of which the owners of the land were obliged to furnish a knight, completely armed and equipped, for the service of the king in time of war. Thus every noble who owned a great extent of land was obliged to serve the king in time of war, and for a certain period in each year, with as many knights under him as there were knight's fees upon his estate or estates; and such noble became, in turn, the feudal superior of a certain number of knights, who held land under him on the same conditions as the noble himself held his lands from the king; and were obliged to render him suit and service in a similar manner, and in proportion to the extent of land in their occupation. There were, also, other burdens, besides military service, which fell heavily at times on those who held lands by this kind of tenure. The holder of a knight's fee was obliged to pay a sum of money towards the amount required for the ransom of his feudal superior when he was taken prisoner in battle, and towards the expenses that were incurred when his eldest son was made a knight and when his eldest daughter was married. Such payments were termed "aids;" and, in addition to these, the tenant was obliged to contribute when the heir had to pay a composition to the king for leave to enter on the enjoyment of property which had come to him after he had attained his majority. When any heir had inherited land during his minority, his feudal superior became his guardian, and was entitled to the management of his land, and the profits arising therefrom, until the rightful possessor became of age; and he also had a right to demand a sum of money from his ward, whether male or female, in case he or she refused the wife or husband that he might be pleased to select for him or her. Besides these, there were also rights arising from primer seisin, fines upon alienation and escheat (*see* Alienation, Escheat), the first of which was the king's right to demand a sum equivalent to a year's profit of the land from any heir who held land direct from the sovereign when he happened to have attained his majority before the land descended to him from his father, or any other relative or connection. This system of tenure was virtually brought to an end during the time of the Commonwealth under Oliver Cromwell, and finally abolished by act of parliament in the reign of Charles II.

Knot, *not* (*cnotta*, Du. *knot*), a term properly applied to the union of threads or cords by interweaving. Among seamen, however, the word knot also implies a division of the log-line, which bears the same relation to a mile as half a minute bears to an hour. When a ship is said to be going eight knots, for instance, it signifies that she is progressing at the rate of eight miles per hour. (*See* Log.)

Knout, *nowt* (Rus., whip), is the name of the severest judicial punishment inflicted in Russia. The culprit is bound to two stakes, and receives on his bare back the specified number of lashes from a whip of plaited thongs interwoven with wire. From 100 to 120 lashes are the highest number inflicted, and are considered equivalent to a sentence of death. If the criminal survive, he is banished for life to Siberia. Formerly, the nose was slit, the ears cut off, and the letter V (for *vor*, rogue) branded on the forehead; but this aggravation was abolished by Alexander I. Although the punishment is still in use in the Russian army, it is now rarely resorted to, except in the infliction of a small number of lashes, usually from three to ten, and that more with the view of disgracing than of injuring the culprit.

Knowledge, *nol-ej* (Lat. *cognitio*, Gr. *gnosis*), according to Locke, "is the perception of the connection and agreement, or disagreement and repugnancy, of any of our ideas." Knowledge is the possession of truth, and may be historical or empirical, philosophical or scientific, or rational. Historical knowledge is so named, because in it we know only the fact—only that the phenomenon is. It is also called empirical or experiential, if we may use the term, because it is given us by experience or observation, and not obtained as the result of inference or reasoning.

In philosophical, scientific, or rational knowledge, we have the knowledge of the cause why or how a thing is. It is the knowledge of effects, as dependent on their causes, and is synonymous with science. The schoolmen divided all knowledge into two species,—*cognitio intuitiva* and *cognitio abstractiva*. By intuitive knowledge, they signified that which we gain by an immediate presentation of the real individual object; by abstractive, that which we gain and hold through the medium of a general term; the one being, in modern language, a perception, the other a concept.

KOBOLD, *ko'-bold*, a German word signifying a spirit, which differs from the spectre in never having been a living human creature. It corresponds to the English *goblin*, of which it is probably the origin. The kobold is said to be connected with a house or a family, and always to appear in human shape. Among the superstitious peasantry, the kobolds are believed to be inclined to mischief and teasing, but, on the whole, more desirous of doing good than evil to men, except when irritated. In the mines they are believed to appear, sometimes in the form of a blue flame, sometimes in that of a dwarfish child, and to point out rich veins. The miners, however, are afraid of disturbing the underground kobolds. The name of the metal *cobalt* is derived from this word.

KOHINOOR, *ko-e-noor'* (Hind. *koh-i-noor*, mountain of light), a large diamond in the possession of the British crown, said to have been found in the mines of Golconda in the middle of the 16th century, which weighed nearly 800 carats in its rough state? It belonged, in turn, to Shah Jehan and the Indian monarchs of the Mogul dynasty, and at last came into the hands of Runjeet Sing, the powerful ruler of the Punjaub. When this territory was annexed to the British empire, the kohinoor, the weight of which had been reduced to 279 carats by the unskilfulness of the lapidary that had been engaged to cut and polish it, was added to the crown jewels, and presented to her majesty in 1850. It formed a feature of interest in the Industrial Exhibitions of 1851 and 1862; but its appearance in each was widely different, as it was recut in 1852 by M. Coster, an eminent lapidary of Amsterdam, who was engaged for the purpose by Messrs. Garrard, to whose care the work was intrusted. The recutting was effected by an apparatus made for the purpose by Messrs. Maudslay and Field, which was driven by a small steam-engine constructed by the same engineers. The lustre and brilliancy of this superb gem, which may be described as conoidal in form, was materially increased by the operation, which occupied several weeks; but its weight was reduced to 147 carats.

KOHL-RABI. (*See* BRASSICA.)

KOKUM BUTTER. (*See* GARCINIA.)

KOLA-NUTS. (*See* STERCULIA.)

KOPP'S LAW, *kops*.—Two laws, the one relating to the proportional connection existing between the atomic volumes of certain liquids; the other to a similar relation observed between the boiling-points of the same substances. A few examples will render this more clear:—

| | *Atomic vol.* | *Diff.* |
|---|---|---|
| Formic acid, $HO.C_2HO_3$ ..... | 522·5 ..... | |
| Acetic acid, $HO.C_2H_3O_3$ ..... | 797·5 ..... | 275·0 |
| Propromic acid, $HO.C_3H_5O_3$ | 1067·5 ..... | 270·0 |
| Butyric acid, $HO.C_4H_7O_3$ ... | 1347·5 ..... | 280·0 |
| Valeric acid, $HO.C_{10}H_9O_3$ ... | 1640·0 ..... | 292·5 |

From the above table it will be seen that for each difference of $C_2H_2$ in composition there is a corresponding mean difference of 279·0 in the atomic volume The same law holds good between the limits of 250 and 300 for the alcohols, the ethyl and methyl compounds, and other organic groups differing in composition in the same degree. The law may be stated in general terms as follows:—That homologous compounds differing by $C_2H_2$ have a constant difference in their atomic volumes; but that the number expressing differs slightly in different groups; thus, mean difference for the alcohols is 283, for the acids 279, and for the ethers 283. The second law shows the corresponding rise of boiling-point for each increment of $C_2H_2$, which is, for the acids 36°, for the ethers 44° Fahr., for the alcohols 31·4° Fahr., for the aldehyds 47° Fahr.; and so on. This interesting subject will be found fully discussed in Miller's "Elements of Chemistry," part III. pp. 774—794.

KORAN. (*See* ALCORAN, vol. I. of this work.)

KORNTHAL, SOCIETY OF, is the name of a religious community in the kingdom of Wurtemberg, founded by one Hoffmann, a burgomaster of Leonberg. Perceiving that a difference of religious belief led many of the inhabitants to emigrate to other countries, he thought that this would be prevented if dissenters were removed from under the jurisdiction of the Lutheran consistory, and were allowed the free exercise of their own religious worship. In 1819 he obtained a royal edict granting relief and toleration to about forty families of dissenters, who bought the lordship of Kornthal, about two leagues from Stuttgart, and formed themselves into a community somewhat after the Moravian model. Their numbers, for a period, rapidly increased. Their mode of worship nearly resembles that of the Protestant churches, and their discipline resembles that of the Moravian Brethren.

KOSSACKS. (*See* vol. I. of this work.)

KOUSSOO. (*See* BRAYERA.)

KRAAL, *kral'-al*, a Dutch term, signifying stockaded places, within which the dwellings of the Hottentots in South Africa stand. Thus, one kraal can contain several huts. The word is also used in order to denote a large space railed off with strong stakes, into which wild beasts are driven by hunters. The inclosures surrounded by strong palisade-work, into which the elephants are driven in Ceylon, are called kraals.

KRAKEN, or KRAKEN, *krai'-ken*, a name given in the fabulous epoch of natural history to a sea-monster of enormous size. Bishop Pontoppidan, in his "Natural History of Norway," gives an entertaining, if not very satisfactory and accurate, account of this surprising creature. The term, he says, is applied by way of eminence to the fish otherwise called *horsen*, *soe-horsen*, *aucker-troll*, and *kreuzfisch*, which is the largest sea-monster in the world. According to the learned bishop, the kraken is round, flat, and full of branches. "The Norwegian fishermen unanimously affirm, and without the least variation in their accounts, that when they row out several miles to sea, particularly in the hot summer days, and, by their situation (which they know by taking a view of certain points of land), expect to find eighty or a hundred fathoms of water, it often happens that they do not find above twenty or thirty, and sometimes less. At these places they generally find the greatest number of fish, especially cod and ling. Their lines, they say, are no sooner out, than they may draw them up with the hooks all full of fish; by this they judge that the kraken is at the bottom. They say this creature causes these unnatural shallows, mentioned above, and prevents their sounding." The account goes on further to state, that when the fishermen, by their lines, found that the water was getting shallow, they knew that the kraken was raising himself to the surface; whereupon they immediately left off fishing, took to their oars, and got away as fast as they could. "When," he continues, "they have reached the usual depth of the place, and find themselves out of danger, they lie upon their oars, and, in a few minutes after, they see this enormous monster come up to the surface of the water. He then shows himself sufficiently, though his whole body does not appear, which, in all likelihood, no human eye ever beheld, excepting in the case of one of the young of this species, which shall afterwards be spoken of. Its back, or upper part, which seems to be, in appearance, about an English mile and a half in circumference—some say more, but I choose the least for greater certainty—looks at first like a number of small islands, surrounded with something that floats and fluctuates like sea-weed. Here and there a large rising is observed, like sand-banks, on which various small fishes are seen continually leaping about, till they roll off into the water from the sides of it. At last several bright points, or horns, appear, which grow thicker and thicker the higher and higher they rise above the surface of the water; and sometimes they stand up as high and large as the masts of middle-sized vessels. It seems these are the creature's arms; and it is said that if they were to lay hold of the largest man-of-war, they would pull it down

to the bottom." These arms are supposed to be tentacula, and the kraken itself to be an enormous polypus. Besides these arms, "the great Creator has given this creature a strong and peculiar scent, which it can emit at certain times, and by means of which it beguiles and draws other fish to come in heaps about it." The young kraken referred to by the bishop seems to have been a young and careless one, which came in among the rocks and cliffs near Alstahoug, in 1680. It appears to have caught hold of some trees standing near the water, and was afterwards found entangled among some clefts of the rocks. From the remarks and conclusions of other naturalists, it seems probable that monsters do exist in the northern seas of which philosophy has not yet dreamed. Mr. Maclean, in 1808, reported that he saw, near the island of Coll, an object which at a distance looked like a small rock. Observing it closely, he saw it elevated considerably, and after a slow movement distinctly perceived that which he believed to be the eye of a huge animal. The monster having seen the boat in which Mr. Maclean was, gave chase, and pursued it till it reached the shore. This animal seems to have had a broad oval head, with a neck somewhat smaller, its shoulders being somewhat broader; from which point it tapered towards the tail, which was mostly under water. Its length was estimated at between 70 and 80 feet, and it seemed to move progressively by undulations up and down. The appearance described by Mr. Maclean bears a close resemblance to the descriptions of the sea-serpent which came from America a few years ago. Whatever the animal may be which gave rise to these descriptions, it seems certain that the animal described by Bishop Pontoppidan cannot be looked upon as a reality. The story probably arose from the observation of floating islands or rocks, only visible at particular times. The young kraken was probably some large sea-monster, the dimensions of which became exaggerated in course of time.

KRAMERIACEÆ, *krä-me-re-aï'-se-e* (after Kramer, a German botanist), in Bot., a nat. ord. of *Dicotyledones*, sub-class *Thalamiflorœ*. It comprises the single genus *Krameria*, which Lindley and some other botanists refer to the order *Polygalaceæ*. Professor Bentley thus distinguishes the two orders:—"The *Krameriaceæ* resemble the *Polygalaceæ* in their exstipulate leaves; in having hypogynous unsymmetrical flowers; in their few stamens with porous dehiscence; and in their definite pendulous ovules. They are distinguished from the *Polygalaceæ* in their flowers not presenting a falsely papilionaceous arrangement; in their stamens being 1, 3, or 4, and distinct; in their ovary being 1-celled, or incompletely 2-celled; and in their exalbuminous seeds." The solitary genus *Krameria*, the rhatany, contains 14 species, natives of the warm and temperate regions of Central America and South America. Their roots are intensely astringent; those of *K. triandra* are officinal in our Pharmacopœias, and are commonly known as rhatany-roots. But little of the root of this species is now imported into Europe, our supplies of rhatany being chiefly derived from an unknown species growing in New Granada. The root of *K. triandra* is sometimes distinguished as Peruvian or Payta rhatany, and that of the unknown species as Savanilla rhatany. In medicine, rhatany-root is used as an astringent, and is well adapted to all those diseases which require astringent remedies. It is also employed, mixed with equal parts of orris-rhizome and charcoal, as tooth-powder. A saturated tincture of the root in brandy is called wine-colouring, and is used in Portugal to give roughness to port wines.

KREASOTE. (*See* CREASOTE.)

KREATINE. (*See* CREATINE.)

KREATININE. (*See* CREATININE.)

KTISTOLATRÆ, *tis-tol'-ä-tre* (Gr. *ktistos*, created), in Eccles. Hist., is a branch of the Monophysites, which maintained that the body of Christ, before his resurrection, was corruptible.

KUMQUAT. (*See* CITRUS.)

KUPFERNICKEL, *kup'-fer-nik-el* (Ger.), a mineral containing 44 parts of arsenic to 56 of nickel ($Ni_2As$). It occurs in Saxony and other parts of Europe, in company with the ores of cobalt, silver, and copper, and forms one of the principal sources of nickel. It is also found sparingly in Cornwall.



KUSSEER, *kus-seer'*, a Turkish musical instrument, somewhat resembling the ancient lyre. It consists of five strings, stretched over a skin that covers a kind of basin.

KUTHERA. (*See* STERCULIA.)

KYANITE. (*See* CYANITE.)

KYAN'S PROCESS, *kyï'-an*, a process for preserving wood, sail-cloth, cordage, and similar materials, by soaking them in a solution containing from 1½ to 2 per cent. of corrosive sublimate. (*See* ANTISEPTICS.)

# L.

L is the twelfth letter of our alphabet, and is derived from the old Hebrew *lamed*, or the Greek *lambda*. In the ancient Greek, the Celtic, and the Etruscan alphabets, it is formed by two straight lines making an angle with each other, but sometimes placed horizontally and sometimes vertically. It is one of the four liquids of grammarians (*l*, *m*, *n*, *r*), and is sounded by placing the tip of the tongue against the upper incisor teeth, while the breath issues at its sides, and the larynx vibrates; whence it is called a linguidental letter. In English it is often mute before consonants, as in *could*, *calm*, *psalm*, &c. It is wanting in some languages, as the Japanese, where *r* is used instead. The Romans often put *l* for *r* in words taken from the Greek, as the Italians have done in words taken from the Latin. It also interchanges with *n*, *m*, *d*, *i*, *u*. As a numeral, L denotes 50, and with a dash over it (thus, $\overline{L}$), 5,000.

LA, *lä*, in Mus., is the monosyllable by which Guido denominated the last sound of each of his hexachords. It answers to the note A in the natural hexachord, and is applied to that note in solfaing.

LABADISTS, *läb'-ä-dists*, were a sect of religionists, named after their founder, Jean de Labadie, a French mystic. He was originally a Jesuit, but joined the Reformed church, and laboured with acceptance in France, Switzerland, and Holland. Afterwards he propounded a species of mysticism, laying great stress upon the internal light by which alone the outer revelation can be made intelligible, and maintaining that the contemplative life is a state of grace and union with God, and the very height of perfection. He likewise advocated a community of goods. His party assembled first at Middleburg, in Zealand, then at Amsterdam, and then at Hervorden, in Westphalia. They afterwards removed to Altona, where Labadie died, in 1674, and finally to Wiewert. They do not now exist.

LABARUM, *läb'-ä-rum*, the name given to the standard of Constantine, which he adopted in commemoration of the vision of the cross which he had seen in the heavens. It is described by Eusebius as a long gilt spear, with a cross-beam towards the top and a golden crown on the summit, inclosing the two first letters of the Greek name of Christ, intersecting each other, and representing the form of a cross. From the cross-beam was suspended a silken banner, with images of the emperor and his children inwrought into it.

LABEL, *laï'-bl* (Ang.-Nor.), in Her., a figure, consisting of a fillet, with three or more pendants attached, used chiefly to distinguish the arms of an eldest son during the life of his father; also employed to distinguish them from those of the younger son. The label is considered the most honourable of all differences, and is formed by a fillet generally placed in the middle and along the chief of the coat, without touching its extremities. Its proper width is a ninth part of the chief; when more than three pendants are employed, the number is specified in blazoning.

LABIALS, *laï'-be-älz* (Lat. *labium*, a lip), in Gram., is a term applied to certain letters of the alphabet, on account of their being chiefly formed by the lips. They are *b*, *p*, *v*, *f*, *m*.

LABIATÆ, or LAMIACEÆ, *laï-be-aï'-te*, *laï-me-aï'-se-e* (from *labium*, a lip), in Bot., the Labiate fam., a nat. ord. of *Dicotyledones*, sub-class *Corolliflorœ*. Herbs or shrubby plants, usually with square stems. Leaves opposite and exstipulate, commonly strong-scented. Flowers irregular, generally in axillary cymes, which are arranged in a somewhat whorled manner, so as to

form what are called verticillasters; calyx persistent; corolla more or less bilabiate; stamens didynamous, or, rarely, 2 by abortion; ovary deeply 4-lobed; style 1, basilar; stigma bifid. Fruit containing from 1—4 achænia, inclosed by the persistent calyx. Seeds erect, with little or no albumen. The order is a very large one, comprising 129 genera, or 2,350 species, mostly natives of temperate climates. The plants are altogether free from any deleterious qualities; they abound in volatile oil, and are commonly aromatic, carminative, and stimulant. Several are used in perfumery on account of their sweet odours; as the species of *Lavandula* (lavender) and *Pogostemon* (patchouli); while many are employed in the culinary art for flavouring; as *Thymus vulgaris* (common or garden thyme), *Thymus citriodorus* (lemon thyme), *Salvia officinalis* (sage), *Origanum vulgare* (common marjoram), *Marjorana hortensis* (sweet marjoram); the species of *Mentha* (mint), *Satureja* (savory), and *Melissa* (balm).

LABIATIFLORÆ, *lăb'-be-ăt-e-flor'-e*, in Bot., the name given to a sub-ord. of *Compositæ*, characterized by the division of the hermaphrodite florets, or at least the unisexual ones, into two lips. No important plants belong to this sub-order. A few have aromatic and mucilaginous properties, and one, *Printzia aromatica*, a native of the Cape of Good Hope, is said to furnish a substitute for tea.

LABORATORY, *lăb'-o-rā-to-re* (Lat. *laboritorium*, from *laboro*, I toil), a place for chemical operations, whether intended for scientific research or for manufacturing purposes. The importance of experiments with relation to the science of chemistry cannot be overrated; for although, by the simple observance of nature, the properties of numerous substances can be ascertained, and several forces developed capable of producing chemical changes, still chemistry as a science, both theoretically and practically, mainly depends upon experiment. To the laboratory properly belong nearly all the facts of the science, and all the arts and useful manufactures depending upon it. At first the apartments where the chemist carried on his researches were constructed underground, and all his operations were carried on in a badly-lighted and badly-ventilated room. The reason for this was probably the custom of the alchemists, who seem to have preferred to work in dark, dingy, and unwholesome dens. As impure air and imperfect light were found to be unnecessary for laboratories, they began to be built above ground, and, as a general rule, at the present day resemble other buildings wherein the investigation of science is carried on. A laboratory devoted to scientific purposes ought to be one story in height, in order to facilitate access to the apartments, and to render more easy the bringing in of heavy articles; such as wood, coals, carboys, &c. The same arrangement, also, is favourable for the construction of openings in the roof either for ventilation or skylights. When a laboratory is connected with a theatre or lecture-room, the two are sometimes united in the same apartment, and sometimes divided by a partition. The advantage gained by the former arrangement is, that the furnace operations can be rendered more easy before a class. It has the disadvantage, however, of being too large for private research, and the seats and room generally become soiled and injured by the operations. A laboratory, the apartments of which are distinct, ought to be from fifty to eighty feet in length, and from twenty to twenty-five feet in breadth. There should be plenty of light, both from lateral windows and from skylights. The theatre, or lecture-room, should occupy two-thirds of the length of the building, and the partition which separates it from the working-room, &c., ought to contain the flues from all the furnaces in the building. The flues may be spread over the wall, and gathered together, and carried out of the roof in one large chimney. The floor of the lecture-room before the partition should be of brick or stone to the extent of eight or twelve feet. In front of this, a long table should stretch the full breadth of the building, close to the seats of the class. At the end of the space inclosed by the table should be cupboards with glass doors, for containing the jars of the pneumatic cistern, measures, retorts, flasks, and other apparatus required by the lecturer. The table should be abundantly supplied with drawers of various sizes, for the reception of ordinary substances and re-agents used in demonstration and not requiring to be kept in phials. Amongst these should be the common metals and many earthy and metallic salts. Besides these, other drawers should contain numerous tools, such as knives, gimlets, files, &c., and other indispensable articles, such as glass, corks, stoppers, stirrers, tapers, bladders, matches, sand, tubes, &c. Two or three portable furnaces are usually necessary, and a recess in the partition wall, having a strong draught, in order to carry off pernicious fumes, if any such should result from an experiment. The working-room of the laboratory, on the other side of the partition, may be divided into two compartments, one of the two being double the size of the other. The larger of the two ought to be used as a working-room, and the smaller for containing delicate articles of apparatus, such as balances, electrical machines, air-pumps, &c., which might be injured by the atmosphere and moisture of the working-room. The floor of the working-room should be of brick or stone. Among the fixtures of a laboratory the general working furnace is the most important. Its uses are partly to heat the building, to heat water, to raise a crucible to ignition, and to afford a high temperature to a number of flasks and evaporating-basins by means of a sand-bath. By means of a flat top, covered with layers of sand, this furnace should be able to supply every gradation of temperature, from a dull red heat to that of 100° Fahr., or even lower if necessary. Over the top of the sand-bath should be a large open hood, for the purpose of collecting and conducting to the chimney, the fumes and vapours arising from the evaporating liquids. Near the general furnace there ought to be another furnace for heating a large copper boiler intended for supplying the laboratory with hot water; it should also be provided with a still, in order to furnish distilled water, an absolute necessary in every laboratory. Throughout the apartment there ought to be as much table space as possible. One large table ought to be in the middle, in such a position as to receive plenty of light; it should be strong, covered with sheet-lead to protect it from the action of acids, &c., and should be provided with numerous drawers or cupboards. A stone sink should be constructed in the corner of the room, as much out of the way as possible: it ought to be connected with a cistern or aqueduct, as an abundant supply of water is always required. The pneumatic trough or cistern is a portion of the apparatus which is of great importance: it should be larger than that used in the lecture-room, and capable of holding several jars of gas at once. It should be filled with water to within 1½ or 1¾ inches, and provided with a stop-cock, in order to remove and replace the water when it becomes acidified or foul. The best pneumatic cisterns are made of japanned copper, supported in a wooden frame about 39 inches from the floor. A mercurial cistern is also necessary: it should be made of marble, soap-stone, or cast iron, and mounted on a firm frame. In a laboratory there should always be plenty of cupboards and shelves; the former are useful in protecting preparations and apparatus from the dust which naturally falls and accumulates in the room; and the whole of the walls within reach should be covered with shelves, in order to receive bottles and jars. A tube-rack, for holding glass tubes, from one to three feet long, should also be provided; and a portion of the wall should be furnished with long spikes, on which to hang retort and flask ring-holders, large bent tubes, siphons, coils of wire, iron tongs, &c. Amongst the ordinary apparatus required for chemical experiments in a laboratory may be classed a quantity of filtering-stands, supports for retorts and flasks, wooden forms for holding glass evaporating-basins, flasks, and receivers; and also a great variety of ordinary open furnaces. With these, it is also necessary to have strong wooden blocks, on which to rest heavy mortars; an anvil, a vice fixed to a side-table, several hammers, chisels, and saws; a screw-driver, with various gimlets, bradawls, files, &c.; forceps, a trowel, a soldering-iron, a glue-pot, nails, screws, spatulas of silver, steel, ivory, and wood; a blowpipe, scissors, corkscrew, scratching diamond, &c. Besides laboratories intended for scientific research, there are others which are devoted to artizes

of chemical manufacture; as the alkaline, earthy and metallic salts, pigments, &c. In all these cases, however, the processes of manufacture differ so greatly that the laboratories of each have to vary according to the nature of the process. In military language, the term laboratory is that place where fireworks, both for actual service and experiments, are prepared.—*Ref.* Faraday's *Handbook of Chemical Manipulation.*

LABOUR, *lā'-bor* (Lat. *labor*), in Pol. Econ., is defined to be "the voluntary exertion of bodily or mental faculties for the purpose of production."—(*Senior.*) Nature spontaneously furnishes the matter of which commodities are made; but, independently of labour, matter is seldom of much use, and is never of any value. "Labour was the first price, the original purchase-money, that was paid for all things. It was not by gold or by silver, but by labour, that all the wealth of the world was originally purchased." — (*Adam Smith.*) The progress of the human race, at different times and in different countries, has generally been pretty much in proportion to their expertness in appropriating the raw products of nature and adapting them to their use. "Labour," says McCulloch, "is the talisman that has raised man from the condition of the savage, that has changed the desert and the forest into cultivated fields, that has covered the earth with cities and the ocean with ships, that has given him plenty, comfort, and elegance, instead of want, misery, and barbarism." Labour is not creative of objects, but of utilities. All the labour in the world could not produce one particle of matter; it can only change what is useless into what is useful to man. The utilities produced by labour are, according to J. S. Mill, of three kinds :—" First, utilities fixed and embodied in outward objects, by labour employed in investing external material things with properties which render them serviceable to human beings: this is the common case, and requires no illustration. Secondly, utilities fixed and embodied in human beings, the labour being, in this case, employed in conferring on human beings qualities which render them serviceable to themselves and others: to this class belongs the labour of all concerned in education, not only schoolmasters, tutors, and professors, but governments, so far as they aim successfully at the improvement of the people; moralists and clergymen, as far as productive of benefit; the labour of physicians, as far as instrumental in preserving life and physical or mental efficiency," &c. "Thirdly, and lastly, utilities not fixed or embodied in any object, but consisting in a mere service rendered, a pleasure given, an inconvenience or a pain averted, during a longer or a shorter time, but without leaving a permanent acquisition in the improved qualities of any person or thing, the labour being employed in producing a utility directly, not (as in the two former cases) in fitting some other thing to afford a utility; such, for example, is the labour of the musical performer, the actor, the public declaimer or reciter, and the showman." Some good, or it may be evil, may be produced beyond the moment, but it is the immediate pleasure that is the effect intended. (*See* POLITICAL ECONOMY.)

LABOURING, *lā'-bor-ing* (from Lat. *laboro*, I toil), in nautical language, a term applied to a ship when she does not answer her helm readily in a heavy sea, but jerks or yawns from side to side in a restless and uneasy manner.

LABRADOR TEA. (*See* LEDUM.)

LABRADORITE, *lăb'-rā-dor-ite*, a silicate of alumina and lime, with certain admixtures of soda and iron. It receives its name from having been first found in Labrador. It is much valued as an ornamental stone, in consequence of the beautiful opalescent blue, or golden brown, lustre reflected from it when held in certain positions, owing to its translucency and nacreous structure.

LABYRINTH, *lăb'-e-rinth* (Lat. *labyrinthus*), is a place, usually underground, with numerous and intricate passages, which it is impossible to traverse without a clue. Three famous labyrinths are mentioned in ancient history. The earliest and most renowned was that of Egypt, situated at Arsinoë, near Lake Mœris. Herodotus visited and describes it. It had 3,000 apartments, 1,500 underground and the same number above it, the whole being surrounded by a wall. It was divided into courts, each of which was surrounded by colonnades of white marble. It was extant in the time of Pliny. Ruins at the modern village of Howara, in Fayoom, have recently been identified with those of the labyrinth. The second labyrinth was that of Crete, in the neighbourhood of Cnossus, said to have been built by Dædalus, at the command of King Minos, as a place of confinement for the monster Minotaurus. It was built on the model of that of Egypt, but on a much smaller scale. None of the ancient authors who have left accounts of it seem to have seen it, and no traces of it are now to be found; hence modern writers generally deny its existence. A third labyrinth was that in Lemnos, commenced by Smilis, an Æginetan architect, and completed by Rhœcus and Diodorus of Samos, about the time of the first Olympiad. It was similar in structure to the Egyptian, from which it was distinguished only by a greater number of columns. Remains of it were still extant in the time of Pliny. A similar structure was said to exist on the island of Samos, but no particulars of it are known.

LABYRINTH, in Anat. (*See* EAR.)

LAC, *lăk*, a Hindostanee term, which, in its original acceptation, is applied to the computation of money in the East Indies. Thus, a *lac of rupees* is equal to 100,000, and, supposing them to be standard (*sicca*), equivalent to £12,500.

LAC-DYE and RESIN (Dan. *lak*, said to be from the Arabic).—Lac is a resin which exudes from the branches of several trees in tropical climates, particularly from the *Ficus religiosa*, *Ficus indica*, and *Rhamnus Jujuba*. The resin is formed in consequence of the punctures made in the bark of the tree by the female of a small insect of the cochineal tribe, the *Coccus ficus*. The resinous juice which exudes hardens over the insects, fastening them to the twigs, which, when cut off, constitute the *stick-lac* of commerce. The crude stick-lac is bruised, the fragments of the twigs removed, and the resin digested in a weak solution of carbonate of soda. The alkaline solution dissolves out a red colouring matter, known as lac-dye. The residue, which is insoluble in the alkaline lye, forms the *seed-lac* of commerce. *Lac-dye* is now extensively used in lieu of cochineal for dyeing scarlet. The pinks produced by it are, however, inferior. *Seed-lac*, when melted, forms *shell-lac*, which is used for various varnishes, as a stiffening for hats, and as the principal ingredient in sealing-wax. Mixed with half its weight of sandarach and a small quantity of Venice turpentine, and dissolved in alcohol, it forms *lacquer*, a varnish much employed to heighten the colour of brass and bronze, and protect these alloys from tarnishing.

LAC SULPHURIS (Lat., milk of sulphur).—Sulphur precipitated from solutions of alkaline persulphides by the addition of an acid, was formerly used in medicine under this name.

LACE, *lās* (Lat. *lacinia*, the hem or fringe of a garment), a term properly signifying a network of gold, silver, flax, or cotton threads, forming a transparent texture. The origin of this delicate fabric is not known, but it appears to have been worn by the Grecian and Roman ladies. At Venice it was early in use, and it is said that Mary de Medici was the first to introduce it into France from Italy. In England, from a prohibition, in 1483, of the importation of foreign lace, the manufacture would seem to have been established there prior to that date. But as pins, which are required in lacemaking, were not used in England till 1543, the lace produced must have been of a coarse kind. The lace-manufacture is said to have been introduced into this country by some refugees from Flanders, who settled at Cranfield, in Bedfordshire. In 1640, the weaving of lace had risen to the position of a flourishing trade in Buckinghamshire, and twenty years later a royal ordinance was passed, establishing a mark on the thread-lace exported from this country. The original manufacture was called *pillow* or *bobbin lace*, and was usually made of thread or silk, woven into net with hexagonal, octagonal, &c., meshes. Afterwards it was ornamented with a thicker thread, called *gimp*, so interwoven with the meshes as to form flowers or curved designs. Lace of this kind was made on a hard-stuffed pillow or cushion, covered with parchment, on which the pattern was drawn. Each

thread was wound upon a bobbin, and, to form the meshes, pins were stuck in the cushion, and the threads woven or twisted round them. The spots for the insertion of the pins were indicated by the pattern, and also showed the place for the insertion of the gimp. As many as from 50 to 60 bobbins are required for every inch of breadth, and only one mesh can be made at a time. A piece of lace, one inch wide, with 50 threads per inch, will have 25 meshes in the breadth, or 625 meshes in each square inch of length, or 22,000 meshes in the yard; while the cost of such a piece is seldom more than 1s. 8d. The most celebrated laces are,—1. *Brussels lace*, a hexagon mesh, the most valuable, which is divided into two classes,—*Brussels ground*, which is made of flax threads, and *Brussels ceire ground*, which is made of silk. The pattern is worked separately in both these cases, and set on by the needle. 2. *Mechlin lace*, a hexagon mesh of three flax threads twisted and plaited to a perpendicular line or pillar, with the pattern worked in the net. 3. *Valenciennes lace*, an irregular hexagon, formed of two threads, partly twisted, and plaited at the top of the mesh, with the pattern worked in the net. 4. *Lisle lace*, a diamond mesh, formed of two threads plaited to a pillar. 5. *Alençon lace*, also called *bloud*, a hexagon mesh of two threads twisted similarly to Buckingham lace, and considered the most inferior of any cushion-made lace. 6. *Alençon point-lace*, formed of two threads to a pillar, with octagon and square meshes alternately. In the portraits painted by Vandyke during the reign of Charles I., and also in those painted afterwards by Sir Peter Lely and Sir Godfrey Kneller, the lace represented is *Brussels point*, in which the network is made on the cushion with bobbins, and the pattern worked into the net with the needle. About 1777, a new ground was attempted by the lacemakers of Buckingham, which quickly superseded all others: this was the point-ground, which had, it is believed, been imported from the Netherlands. From the first appearance of this ground the origin of the modern pillow-lace trade may be dated. It was not, however, till the beginning of the present century that the most striking improvements were made. After 1812, at Honiton, the manufacture had arrived at that perfection, was so tasteful in design and delicate in workmanship, that the best specimens of Brussels lace did not excel it. During the war with France, veils of Honiton lace were sold in London at from 20 to 100 guineas. After that time, however, the effects of the competition of machinery began to be felt; and gradually the pillow-lace trade sank into insignificance. Lace is said to have been manufactured by machinery as early as 1768, by a stocking-weaver of Nottingham, named Hammond. Various other attempts in the same direction were made about the same time, and a few years afterwards the *warp-frame* for making *warp-lace* was invented. The invention of this machine has been ascribed to four persons,—Vandyke, a Dutchman; Mr. Clare, of Edmonton, near London; Mr. Marsh, Moorfields, London; and Mr. Morris, of Nottingham. By these machines lace of an inferior kind was produced in large quantities, and Nottingham became the centre of the new trade. In importance, however, it was soon far eclipsed by the bobbin-net manufacture. In 1800, Mr. Heathcote, of Tiverton, took out a patent for a machine for making bobbin-net lace. This invention made a complete revolution in the manufacture of the fabric. From that time, the machine became the subject of frequent improvement, and was worked by steam-power in 1816. Lace became a general article of consumption, and that which had been sold at five guineas a yard fell to 1s. 6d. Instead of smuggling French lace into England, English lace was smuggled into France, until the French makers were obliged to use machines themselves. The quality of bobbin net lace depends upon the smallness of the meshes, their equality in size, and the regularity with which their hexagonal shape is displayed. At the present time its manufacture is largely carried on in France, having been established, by English workmen in Calais in 1817, at which town there are now 600 machines. Bobbin-net lace may be said to surpass every other branch of human industry in the complex ingenuity of its machinery.

Lace-Bark. (*See* Lagetta.)

Lacerta, *lă-ser'-tă* (Lat. *lacerta*, a lizard), a constellation in the northern hemisphere, named by Helvetius. It is situated between the constellations Andromeda, Perseus, Cygnus, and Cepheus, and contains no star above the fourth magnitude.

Lacertinidæ, *lă-ser-tin'-e-dē* (Lat.), the Lizard fam.—Under this title is included a family of reptiles belonging to the order *Saura*, and characterised by having a round and very elongated body, the tail especially long, being sometimes four times the length of the trunk; four strong feet, with four or five unequal toes, armed with hooked claws; a quadrangular flat head covered with horny plates, and eyes furnished with a membranous expansion, resembling a third eyelid; a wide mouth, and a long, flat, forked tongue. Although they are usually found in the Old World, a small number of species is found in Australia. The *Lacertinidæ* correspond with the genus *Lacerta* of Linnæus. They are very nimble in their movements, springing from one spot to another with great alacrity, and cling to and creep along rocks or walls with facility by means of their hooked claws. In their habits they are gentle and timid, and they live in holes in the sand. They are not sociable in their habits, but live in pairs. Great heat or great cold renders them torpid; and their general food consists of insects, worms, small molluscs, &c. The females lay between five and seven eggs, which they leave to be hatched by the warmth of the air. Some of the species are, however, viviparous, and the whole family is long-lived. The scaly lizard, *Zootica vivipara*, a native of England, is said to hatch its eggs within its own body if it be kept in a dry place, but to deposit eggs if retained in a damp one. The most common species of the *Lacertinidæ* is the green lizard, *Lacerta viridis*, which is from 10 to 15 inches long, of a rich and varied green colour, with spots and marks of brown and yellow. It is an active animal, feeding upon insects, and pursuing them with great agility. When the tail is broken off, the green lizard has the power of forming a new one. It is found in all the warmer portions of Europe and Asia Minor, and has been met with as far north as the Channel isles.

Laches, *lăsh'-ez* (Fr. *lâcher*, to loosen), in Law, denotes slackness or negligence. The law shows no favour to those that are tardy or negligent, and throws upon the party guilty of it its consequences. It is laid down as a general maxim, that no laches or negligence shall be imputed to an infant; but this is chiefly true of the exemption that he enjoys from the ordinary bar by lapse of time. The law in general is, that, in the case of the sovereign, there can be no laches or negligence. This was formerly absolutely the case; but in certain respects it has been limited by statute. Thus, by 9 Geo. III. c. 16, the crown is barred from its civil rights in suits relating to landed property, by the lapse of sixty years, and by 7 Will. III. c. 3, an indictment for treason (except for an attempt to assassinate the sovereign) must be found within three years after the commission of the offence.

Lachrymæ Christi, *lăk'-re-me kris'-ti* (Lat., tears of Christ), a name given to one of the best of the wines grown in Italy. It is of a dark red colour, and some critics say, of exquisite flavour. It is grown at Galitta, in Naples, although an inferior quality is grown around Vesuvius, which is exported as the genuine wine. The Lachrymæ Christi is said to be identical with the old Falernian wine frequently mentioned by Horace.

Lachrymal, *lăk'-re-măl* (Lat. *lacryma*, a tear), is a term applied, in Anat., to various organs in the neighbourhood of the eye, and connected with the tears; as the lacrymal glands by which they are secreted, and the lacrymal duct by which they are conveyed away. (*See* Eye.)

Lachrymatory, *lăk'-re-mă-to-re*, is a small vessel of glass or earthenware, generally having a long neck, and found in the tombs of the ancients. It was long the opinion of antiquaries, that these were intended to hold the tears of the relatives and friends of the deceased; but there is no ground for such an opinion; and it is more generally held now, that they were used for the purpose of containing perfumes.

Lacistemaceæ, *las-tis'-te-mā'-se-e*, in Bot., the *Lacistema* fam., a nat. ord. of *Dicotyledones*, sub-class

*Monochlamydeæ.* Shrubby plants, with simple alternate stipulate leaves and flowers in axillary catkins. They are natives of woody places in tropical America. Nothing is known of their properties and uses.

Laconism, *lăk'-o-nizm*, in Lit., is a short, pithy, and pointed saying, for which the ancient Lacedæmonians were remarkable; whence the name (from *Laconia*). One of the most remarkable of the ancient laconisms was that of the Spartan mother to her son, on presenting him with his shield—"With it, or on it,"—either bring it back or be carried back upon it.

Lacquering. (*See* Japanning.)

Lacteals, *lăk-te-ălz* (Lat. *lac*, milk), in Anat., is the name given to certain vessels of the human body, on account of their containing a milk-like fluid, the chyle. They serve to convey the chyle, or nutritious part of the food, from the intestines to the thoracic duct. They are very tender and transparent vessels, and are furnished with an infinite number of valves. They have their origin in the internal vellous coat of the small intestines, perforate the other coats, and then proceed through numberless converging branches between the layers of the mesentery, to the thoracic duct, the main branch of the absorbent system, which, at the part where the chief lacteal branches join it, is dilated into what is called the receptaculum chyli. In their passage through the mesentery, the lacteals traverse numerous mesenteric absorbent glands, where they communicate with veins, and the fluid contained in them is exposed to the influence of the blood, from which it acquires colouring matter and fibrin. (*See* Digestion.)

Lactic Acid, *lăk'-tik* (from Lat. *lac*, milk), ($2HO, C_{12}H_{10}O_{10}$).—Lactic acid is produced by natural or artificial fermentation from milk and other animal matters containing lactose, or sugar-of-milk. Starch, cane sugar, dextrin, and gum, also pass into lactic acid under certain circumstances. Thus it is formed in *sauer-kraut*, in malt vinegar, and during the manufacture of wheaten starch. It is easily made by dissolving 8 parts of cane sugar in 50 of water; to this solution are added 1 part of casein, or poor cheese, and 3 parts of chalk. The mixture is set aside in a warm place for two or three weeks, during which time the mass becomes gradually filled with crystals of lactate of lime. These crystals are purified by recrystallisation, and treated with their exact equivalent of sulphuric acid. The residue is digested in alcohol, which dissolves the lactic acid and leaves the sulphate of lime. The lactic acid is obtained from the solution by evaporating the alcohol. In its pure state it forms a transparent, inodorous, uncrystallizable, syrupy liquid, with a sharp acid taste. It is soluble in water, alcohol, and ether, and may be distilled unchanged if air be excluded. Exposed to a heat of 266°, it loses water, and is converted into a yellow bitter fusible substance, nearly insoluble in water. Heated to 500° Fahr., it changes to a volatile acid, the citraconic, and *lactide* distils over. Lactide dissolves in alcohol, crystallizing from it in brilliant rhombic prisms. At 223° it fuses, and may be sublimed unchanged. Dissolved in water, it assumes four equivalents of that substance, and becomes converted into hydrated lactic acid. Lactide absorbs ammonia with great greediness, forming *lactamide*. The lactates are mostly soluble in water; a few of them may be crystallized. Lactic acid enters into the composition of the gastric-juice, the perspiration, and, in cases of diabetes, of the saliva and the urine.

Lactin, Lactose, sugar-of-milk. (*See* Sugars.)

Lactometer, *lăk-tom'-e-ter* (Lat. *lac*, milk; *metrum*, a measure), an instrument used for the purpose of ascertaining the proportion of cream contained in the milk of any particular cow, or of the general produce of a dairy. It is generally in the form of a glass tube set perpendicularly in a stand. The tube is about a foot high and half an inch in diameter, with a graduated scale marked on the outside. Milk fresh from the cow is poured into it, and allowed to remain in it till the cream separates and floats on the surface, when, by observing the marks on the scale, the proportions of milk and cream can easily be ascertained.

Lactone, *lăk-tone*, a volatile liquid, with a strong pungent odour, boiling at about 198° Fahr., found amongst the products of distillation of sugar-of-milk.

Lactuca, *lăk-tu'-kă* (Lat. *lac*, milk, from its milky juice) in Bot., the Lettuce, a gen. of the nat. ord. *Compositæ*. The species *L. sativa* is the common or garden lettuce, so largely cultivated as a salad. *L. virosa* is the wild or strong-scented lettuce. If the stem of the common lettuce, when it is coming into flower, be wounded with a knife, a milky juice exudes, which dries in the open air into a friable mass of a brown colour. This inspissated juice is called *lactucarium*, or *lettuce-opium*, and is sometimes employed in medicine for its narcotic properties. *L. virosa* yields the best and the largest quantity of lactucarium. Professor Johnston says,—"The lactucarium is one of those narcotics in which many of us unconsciously indulge. The eater of green lettuce as a salad takes a portion of it in the juice of the leaves he swallows; and many, after this is pointed out to them, will discover that their heads are not unaffected after indulging copiously in a lettuce salad. Eaten at night, the lettuce causes sleep; eaten during the day, it soothes and calms, and allays the tendency to nervous irritability. And yet the lover of lettuce would probably take it very much amiss if he were told that he ate his green leaves partly, at least, for the same reason as the Turk or Chinaman takes his whiff from the tiny opium-pipe."

Lactucarium, or Lettuce-Opium. (*See* Lactuca.)

Ladanum. (*See* Cistaceæ.)

Ladder, *lăd'-der* (Ang.-Sax.), a simple contrivance which affords means of access to any part of the exterior of a house, or from one level to another. In the former case, and in all constructive and decorative operations, painting, glazing, &c., movable ladders are used; but in gaining access from one part of a mine to another, or from the ground-floor of a warehouse or factory to the floors above, fixed ladders are used. Ladders answer the purpose of a staircase in all cases; but in ascending and descending it is necessary to hold the sides of the ladder with the hands, as very few could manage to retain their footing on the rounds without doing so. The ladder consists of two vertical pieces or sides, generally made of a fir pole sawn down the middle, and a number of rounds or transverse pieces of oak, or some hard wood, the ends of which are inserted into holes bored laterally into the sides for their reception, about ten or twelve inches apart. The rounds are fastened and kept in position by wedges that are driven into a slit made in either end of each round. The holes in the sides should be bored before the pole is sawn asunder. The sides of the better kinds of ladders are made of pieces of deal squared and planed; but when fir poles are used, the flat part of the side is generally turned outwards. The rounds vary from an inch to an inch and a half in diameter in the middle, and are rather less in size at either end. An iron bar, with a nut and screw at either end, is generally substituted for a wooden round at a short distance from the top and bottom of a ladder, to lock the whole tightly together. The companion-ladders of ships, and ladders in mills and factories, from one deck or floor to another, have flat heads instead of rounds, and a handrail at the side. They are, indeed, more like a staircase, or a set of steps such as are used by painters, paperhangers, and upholsterers, than a ladder properly so called. A ladder may be made available in gymnastic exercises for strengthening the arms, by placing it against a wall, at any angle between 30 and 45 degrees, and endeavouring to ascend and descend underneath the ladder by stepping the rounds hand over hand. The ladder may also be suspended horizontally for the same purpose, either end being supported on a wall about 8 or 10 feet in height.

Lading, Bill of. (*See* Bill of Lading.)

Lady, *lā'-de*, a term supposed to have signified originally loaf-giver (Goth. *hlaif*, loaf, and *dius*, to serve or distribute), from the practice of the wives of the rich distributing bread to the poor or to their domestics. Tooke derives it from *hlifdan*, to lift, *i. e.*, one raised to the rank of her husband. As a title of honour, it is the correlative of lord. It belongs, of right, to the daughters of all peers above the rank of viscount, and is extended by courtesy to the wives of baronets and knights. In common usage, the term is employed in speaking of the women of the upper classes generally.

LADY-BIRD, or LADY-COW, a well-known little insect, belonging to the family *Coccinellidæ*, which comes under the class of *Coleopterous insecta*, according to Linnæus. The lady-bird is distinguished by a hemispherical and convex form of body, by the second joint of the tarsi being large and deeply bilobed, and by the colour of the spots on the elytra. Different species are found in various parts of the world, and in England it is common enough. The lady-bird is a very small insect, and its colour is generally red or yellow, with black spots, which vary both in size and number; or it is sometimes black, with white, red, and yellow spots. It creeps very slowly, but flies rapidly; and, when alarmed or caught, it ejects a yellow mucilaginous fluid of a strong disagreeable odour. This insect is very abundant in gardens troubled with *aphides* or plant-lice, which it is very useful in destroying; in hop-plantations, particularly, it is mostly seen. The young lady-birds are grubs of a small flattened appearance, which are produced from little yellow eggs, which the parent insect deposits among the *aphides;* so that, as soon as they are hatched, they are at once within reach of their prey, which they are easily able to destroy.

LADY-DAY. (*See* ANNUNCIATION.)

LEMODIPODA, *le-mo-dip'-o-dă* (Gr. *laimos*, throat; *pous*, a foot), the name of an order of *Crustaceans*, placed by Latreille between the *Amphipoda* and the *Isopoda*. The head of this order is confluent with the first segment of the thorax, and supports the four anterior feet. They are described by Latreille as being the only form among the *Malacostraca* with sessile eyes, whose posterior extremity does not present distinct tracheæ, and which have hardly any tail. The *Læmodipoda* have all four setaceous antennæ, carried on a three-jointed peduncle; mandibles without palpi; a vesicular body at the base of four pair of feet at least, beginning with the second or third pair, reckoning those of the head. The body, usually filiform or linear, is composed of eight or nine joints, and the feet are terminated by a strong hook. The eggs of the female are carried in a pouch formed by approximate scales, under the second and third segments of the body. All the species are marine. Among the subdivisions are the *Filiformia*, which keep among the marine plants and sponges, walk like caterpillars, turn frequently and rapidly on themselves, or set up their bodies while their antennæ continue to vibrate. The subdivision *Cyamus* has three species, all of which live on the *cetacea;* and one of them, *Cyamus ceti*, is also found on the mackerel. It is called, by fishermen, the whale-louse.

LAGENARIA. (*See* GOURD.)

LAGETTA, *lag-get'-ta* (*lagetto* is the name of the species in Jamaica), in Bot., a gen. of the nat. ord. *Thymelaceæ*. The species *L. lintearia* is the celebrated lace-bark tree. The bark, when macerated, may be separated into laminæ, the number of which depends upon the age of the specimen: these have a beautiful lace-like appearance, and possess great strength. It may be used for making ropes, and was at one time in great demand in the West Indies for making slave-whips. Sloane says that caps, ruffles, and complete dresses for ladies, have been made from the lace-bark. Lagetta cloth has been imported into this country under the name of *guana*.

LAGOON, *lă-goon'* (Ital. *laguna*, Lat. *lacuna*, a morass), a name applied to extensive creeks which run far inland, and are nearly encircled by the land. In the Adriatic there are many instances of them, as also along the coast of America and amongst the West-Indian islands.

LAIRD, *laird* (Sax. *hlaford*), is a term used in the Scottish dialect, and properly signifies the lord of a manor, a proprietor holding his lands immediately of the crown:—

> "A laird and twenty pence pronounced with noise,
> When construed, but for a plain yeoman go."

It is in common language used in a much wider sense, and applied to any proprietor of lands or houses.

LAITY, *lat'-e-te* (Gr. *laos*, the people), is a term applied collectively to the whole people that are not clergy, or not in holy orders. (*See* CLERGY.)

LAKE, *laik* (Lat. *lacus*), a term applied in Geog. to a quantity or collection of water surrounded by land. Lakes may strictly be divided into four distinct classes:—Firstly, those which neither have an outlet, nor receive any addition to their contents from running water; secondly, those which have an outlet and are fed by springs, receiving no superficial running water; thirdly, the class which is by far the most numerous, that both receive and discharge streams of water; and, lastly, those which receive tributaries, but have no visible outlet or communication with the sea. Of these latter, the Caspian Sea and Lake Aral are instances. It is, however, remarkable that all lakes of this description are found to be salt. There are many peculiar phenomena connected with lakes which are wholly unaccounted for. Among the rest, the faculty of disappearing, and reappearing again at intervals; as Lake Chirtunitz, in Illyria, and also Lake Welter, in Sweden, which experiences violent agitations during severe weather.

LAKE IRON-ORES.—Hydrated peroxide of iron is deposited in large quantities by certain lakes in Sweden and Norway. It is similar in composition to the bog iron-ore found in other parts of Europe.

LAKES, insoluble compounds formed between the colouring matters of dye-stuffs and hydrate of alumina and other metallic oxides. The process of mordanting depends on this property. By soaking the fabrics to be dyed in a solution of a salt of alumina, binoxide of tin, or the sesquioxides of iron and chromium, a union takes place between the fibre and the salt; when the fabric is passed through the dye-stuff, an insoluble lake is formed in the fibre of the cloth. It is generally supposed that the lakes are insoluble precipitates, formed between the metallic oxide and the acid of the dye-stuff. Numerous lakes thus formed are made into pigments, the names of which indicate their origin.

LAMA, LAMAISM, *lă'-ma*, *lă'-ma-izm* (Thibetan *lama*, a priest), is the name of the prevailing religion of Thibet and other parts of Asia. It is an offshoot of Buddhism, which it very much resembles. The Dalai Lama, or chief of this religion, is the successor, or rather, a pretended incarnation, of Buddha. He is looked upon as an omniscient and eternal divinity; and hence his death occasions no visible grief or mourning, as it is only regarded as his disappearance, and his reappearance is patiently waited for in his successor. The Dalai sometimes points out his successor; at other times the books are consulted for that purpose. When officiating, the Dalai sits cross-legged and statue-like upon magnificent cushions over the altar, dressed in splendid robes, noticing nobody, and moving only his hands to bless the people. Sometimes he distributes balls made of paste, clay, or other materials, which are regarded of infinite efficacy. The title of lama is given to the head of every monastery, and every lama is considered a vicar of the Deity, and requires implicit obedience to all his commands, like the Dalai Lama himself. Their temples are in the Indo-Chinese form, square, fronting the east in Thibet and the south in Mongolia. They have three gates and three interior divisions; viz., the entrance-hall; the body of the edifice, with two parallel rows of columns; and the sanctuary, with the throne of the high lama. There are numerous statues, paintings of the gods, ornaments, and implements of all sorts. The walls and columns are inscribed with prayers, and there are also poles bearing flags with prayers. Prayer-wheels, the turning of which is supposed to be equally efficacious with vocal supplication, are to be seen everywhere. Festival days, ceremonies, and pageants of all kinds, varied with the performances of magicians, as well as fasts, sacraments, and noisy music, animate the zeal of the faithful. Dead lamas are commonly embalmed and preserved in pyramids. The bodies of rich laymen are burned, and their ashes preserved; while those of the common people are either exposed to be devoured by birds, or eaten by sacred dogs kept for the purpose. Rich persons about to die are assisted by lamas, who open a passage for the soul through the skull. The principal holy place in Thibet is Lassa, in and around which are an immense number of monasteries. The most renowned of the Lamaic schools is that of the Lhabrang, or cathedral of Lassa. In many of the monasteries are also schools of magic. The lamas also act as physicians, effecting

their cures by prayers and some innocent medicaments. —*See* Huc's *Souvenirs d'un Voyage dans la Tartarie, le Thibet, et la Chine, pendant les Années* 1844-45-46; K. F. Koeppen's *Lamaische Hierarchie, &c.* (Berlin, 1859); *New American Cyclopædia.*

LAMBDOIDAL SUTURE, *lăm-boy'-o-dăl*, in Anat., is the suture that unites the occipital to the two parietal bones of the skull, and is so named from its resemblance to the Greek letter *lambda*.

LAMBETH ARTICLES, *lăm'-beth*, in Eccl. Hist., is the name given to certain articles drawn up by the archbishop of Canterbury and the bishop of London, at Lambeth, in 1595. They are decidedly Calvinistic in their form; but they were never imposed by authority. They are to the effect that God hath, out of his good pleasure, from all eternity, predestinated certain persons to life, others to inevitable condemnation; a true believer is one who is endowed with justifying faith, which faith doth not utterly fail nor vanish away in the elect; no man is able to come to Christ unless the Father draw him; and all men are not drawn by the Father, that they may come to the Son.

LAMB'S LETTUCE. (*See* VALERIANELLA.)

LAMELLÆ, *lă-mel'-le* (Lat.), a term applied in Conch. to those little plates of which the shells borne by crustaceous fishes are composed.

LAMELLICORNES, *lă-mel'-li-korns* (Lat. *lamella*, a plate; *cornu*, a horn), one of the sections of the order *Coleoptera*, according to the system of Latreille. They have five joints to all the tarsi. The antennæ are inserted in a small hollow in front of the eyes, always short, and usually composed of 9 or 10 joints, the last of which are large and flat, and open out like a fan. The clypeus is generally very large, and the labrum small and hidden beneath it. The mandibles of several are membranous—a character observed in no other coleopterous insects. The family is numerous, and is noted for the brilliancy of the metallic colours which ornament those species which feed on living vegetables. The larva is soft, somewhat cylindrical in form, with a large vertical head. Six small legs are attached to the thoracic segments, and the body is always bent. Some of them require three or four years to become pupæ. When about to assume the pupa form, the larvæ inclose themselves in an oval case, or one resembling an elongated ball, composed of earth, rotten wood, or other surrounding substances, which they have gnawed and cemented together with a glutinous matter. Their food consists of the dung of various animals, mould, and the roots of vegetables. Some of them live in decayed vegetable and animal substances, upon which they feed. They sometimes destroy immense quantities of vegetables which are useful to man.

LAMENTATIONS OF JEREMIAH, BOOK OF, *lam'-en-tai'-shuns* (Lat. *lamentatio*), is the name of one of the canonical books of the Old Testament. That this book is the work of the prophet whose name it bears is attested by the most ancient and uniform tradition, and is confirmed by the subject of the book, and by its language and style. This book was evidently written in metre, and consists of a number of plaintiff effusions, composed after the manner of funeral dirges. It is, in our Bible, divided into five chapters, and consists of five distinct elegies. According to Jahn, the book does not relate to a single subject, but in each of the poems a different calamity is bewailed. These are:—1. the carrying away of king Jehoiakim, with 10,000 of the principal Hebrews (i.); 2. the assault of Jerusalem (ii.); 3. the calamities undergone by the prophet (iii.); 4. the overthrow of Jerusalem, the carrying away of king Zedekiah, and the slaughter of the Hebrews (iv.); 5. the wretched condition of the people, and of Jerusalem after the destruction of the city (v.). Each elegy consists of twenty-two periods, according to the number of letters in the Hebrew alphabet; and in the first four chapters the initial letters of each period follow the order of the alphabet, after the manner of an acrostic. In the third chapter each period contains three verses, all having the same initial letter. The fifth chapter, likewise, has twenty-two verses, but the order of the initial letters is neglected. The style, as the poetic character of the composition required, is somewhat more elevated than that of the prophecies. The tropes correspond with the sorrowful nature of the subject. "Never, perhaps, was there a greater variety of beautiful, tender, and pathetic images, all expressive of the deepest distress and sorrow, more happily chosen and applied, than in the lamentations of this prophet; nor can we too much admire the full and graceful flow of that pathetic eloquence in which the author pours forth the effusions of a patriot heart, and piously weeps over the ruin of his venerable country."—(*Horne.*)

LAMIA, *lăm'-e-a* (Gr.), in fabulous Hist., a monster said to inhabit the centre of Africa, with the face and upper part of the body like a woman, and the extremities like a serpent. The first lamia, according to classic mythology, was the daughter of Neptune, who, having become insane through the jealousy of Juno, caught and devoured all new-born children she came across. The lamiæ, however, of the ancients, were sometimes represented as a species of monstrous animal, or again as a vampire. This latter character is seized upon, and carried out, by Goethe, in his "Bride of Corinth," where a young man is represented as marrying a lamia, who sucks his life-blood at night. A tale, somewhat similar in construction, occurs also in Philostratus' "Life of Apollonius of Tyana."

LAMIACEÆ. (*See* LABIATÆ.)

LAMIAN WAR, *lăm'-e-ăn*, in the ancient history of Greece, is the name given to that war which sprang up after the death of Alexander, the dependent Greek cities regarding this as a favourable opportunity for regaining their independence. The Athenians took the lead, and were cordially seconded by the Ætolians; and a confederacy was formed, composed of most of the other states of Greece. A numerous force was raised, the command of which was given to Leosthenes, who marched against Antipater, then presiding over Macedonia. Antipater entered Thessaly at the head of 13,000 foot and 600 horse, but was beaten by the superior force of the confederates. With the remains of his force, amounting to about 8,000 or 9,000 men, he took refuge in Lamia, where he resolved to maintain a siege. Leosthenes being unable to take the city by storm, began to besiege it; but his operations were frequently disturbed by the sallies of Antipater, in one of which Leosthenes himself was killed by a stone hurled from an engine. The march of reinforcements to the aid of the besieged, under the command of Leonnatus, compelled the confederates to raise the siege and advance to meet this new force, before a junction should be effected. In the engagement which ensued, Leonnatus was slain, and his army defeated. Craterus next marched to the aid of Antipater, having, besides veterans, 4,000 heavy-armed, 1,000 Persian bowmen and slingers, and 1,500 cavalry. The united Macedonian army then numbered between 40,000 and 50,000 heavy infantry, 3,000 light troops, and 5,000 cavalry; while the Greek forces were little more than half as numerous. At length an engagement took place on the plain of Crannon, in which, though the Greeks were on the point of gaining the victory, they gave up the struggle, though they had lost not more than 500 men. The vanquished army sued for peace. The states found themselves no longer able to maintain the contest, and peace was granted to them on very easy terms, except the Athenians, who were compelled to receive a Macedonian garrison in Munychia, to pay a sum of money for the cost of the war, and deliver up a number of their obnoxious orators, including Demosthenes and Hyperides, who had been the means of inciting their countrymen to war. Demosthenes escaped by taking poison, but Hyperides was condemned to have his tongue cut out, and then to be put to death.

LAMINA, *lăm'-e-nă* (Lat.), meaning a layer, applied to the different plates of minerals, or coats of bone, lying one above another. In Bot., the lamina means the broad and spreading part of the petal of a polypetalous corolla. In Anat., *lamina* are the two plates or tables of the skull.

LAMINÆ, *lăm'-e-ne*, the name of a tribe or family of longicorn beetles, distinguished, according to Latreille, by their head being vertical; their palpi filiform, with the terminal point more or less oval in shape, and tapering to a point; the maxillæ have the outer lobe slightly narrowed at the end; the thorax nearly equal throughout, exclusive of the lateral spines or tuber-

cules. Some varieties are *apterous*, a modification of structure possessed by no other family of longicorn beetles.

LAMINARIA, *lăm-e-nai'-re-ă* (Lat. *lamina*, a plate or layer), in Bot., a gen. of *Algæ*, or sea-weeds. *L. saccharina* is remarkable for containing upwards of 12 per cent. of the sugary matter called *mannite*. The young parts mixed with those of *L. digitata*, are eaten in Scotland, under the name of *tangle*. In China, *L. saccharina* is called *sea-tape*, and is a common article of food along the coast. *L. potatorum* is another edible species, used as a table vegetable in Australia.

LAMMAS-DAY, *lăm'-mās* (Sax. *hlaf*, loaf; *mæsse*, holiday or feast), the 1st day of August, which was so called because the Saxons, among whom it was accounted a feast of first-fruits, were accustomed to make offerings of loaves made of new corn on this day; or because tenants were in the habit of bringing a portion of the corn that had been recently cut on the land they occupied, to their landlord, on this day at the latest.

LAMP, *lămp* (Gr. *lampas*, a torch, a lamp), a general term applied to those contrivances which are used for producing light by the combustion of materials that are liquid at ordinary temperatures, such as most of the fixed oils; the solid fats being made into candles. The invention of the lamp is ascribed to the Egyptians. Its use was known in the days of Moses and Job. The application of lamps passed from Egypt into Greece, where they were consecrated to Minerva, the goddess of learning, as indicative of the scholar's nocturnal study. From Greece the use of lamps passed to Rome. Among the Egyptians, Hebrews, Greeks, and Romans, oil lamps were generally used, and they vied with each other in the construction of these instruments. Some of the specimens which have been preserved to the present time display much taste and elegance of design. The interiors of all of them, however, are rough and meagre. The first person who is known to have published a collection of ancient lamps, is Fortunio Liceto, an Italian, whose chief design appears to have been to prove the possibility of constructing lamps which would burn for ever. The sixth hall of the museum of Portici is now entirely filled with lamps and candelabra discovered in the houses of Pompeii and Herculaneum. It would appear that the ancients constructed their earliest lamps of baked earth; but subsequently of various metals—bronze especially. There are a few ancient lamps of iron extant; but they are rare, either because that metal was little used for the purpose, or on account of its rapid decomposition in the ground. There are four specimens in the museum of Portici, and one specimen of a glass lamp, which is entirely solid and in one single piece. A golden lamp in the temple of Minerva is mentioned by Pausanias; and St. Augustine speaks of lamps of silver. There was a strong belief among ancient writers, that perpetual lamps existed. Instances have been cited by various authors where lamps were found burning in ancient sepulchres, which were extinguished as soon as the air was admitted. The most remarkable instance is that of the tomb of Tulliola, daughter of Cicero, discovered at Rome in 1540. The notion, in most of those cases, probably arose from the inflammation of the hydrogen gas which escaped from the tombs when opened. The lamps or candles used by the Jews in their own houses were put into a high stand, raised from the ground. The lamps used by the wise and foolish virgins mentioned in the New Testament were of a different kind. Critics and antiquaries seem to agree that they were a kind of torches, made of iron or potters' earth, wrapped about with linen, and moistened from time to time with oil. It was customary among the Romans to have a lamp either hanging from the ceiling or placed on a stand in the room. These stands were often richly ornamented. (*See* CANDELABRUM.) It was also the custom among the Romans, on occasions of national rejoicing, to have public illuminations; on which occasions lamps were suspended at the windows. The practice of placing lamps in the sepulchres of the dead was probably meant to be allegorical of the cessation of earthly existence. Some of the sepulchral lamps are sculptured with the figure of a butterfly, in reference to the escape of the soul. The early Christians adopted this usage in their monuments; and lamps have been found in the tombs of many saints and martyrs. In treating of the construction of modern lamps, it is necessary to take into consideration the nature of flame. By referring to the article on FLAME, it will be seen that, in order to insure a constant and steady flame, it is necessary that the supply of combustible matter be steady and uniform. It must, therefore, be either in a liquid or gaseous state, so that it may approach the flame in an uninterrupted current. The combustible substance may either be made to approach the flame by capillary attraction through wicks, or by mechanical pressure. A good lamp must have the following properties. It must be supplied with carbonaceous matter and with oxygen; it must convert the former into a gaseous state; and it must bring the gas so produced into contact with oxygen at such a temperature that the carbon will combine with oxygen in the highest degree without producing smoke. The kind of oil used for burning in lamps varies, in different parts of the world, according to the sources of supply. In Great Britain whale-oil is used; but seal-oil, fish-oil, and oils obtained from seeds by pressure, are also largely employed. The oils of rape-seed and poppy-seed are used in Paris, and in the south of France and Italy an inferior kind of olive-oil. In other parts of Italy, lamp-oils are obtained from expressed grape-seed and from walnuts. Oil of sesamum-seed is burnt in the eastern and southern coasts of the Mediterranean; while in tropical countries, cocoa-nut oil is generally used, although it is solid in this country. On account of the deficient supply of tallow during the war with Russia, a number of new oils have been introduced of late into the commerce of this country. They are all used for burning in lamps. The simplest way in which a lamp can be formed is that practised in making night-lights to burn in sick chambers. A small quantity of water is poured into a glass tumbler, or other vessel, and above that a quantity of oil; a piece of cork is then pierced so as to admit a few threads of cotton to pass through it, and the cork being placed upon the oil, will float; the cotton threads will draw up the oil by capillary attraction, and a feeble, but clear, light will be given. The antique lamps spoken of before, many of which possess great artistic beauty of form, cannot claim a higher construction than those of many rude nations. In general, they consist of a vessel, open or closed, with an unspun round wick, which is held by a nozzle at the beak. As combustion can only take place on the outside of the flame, more carbon is likely to be liberated from the oil than the oxygen in contact with the flame can consume. Hence all lamps of this sort give a dim light, easily go out, and possess a smoky flame. The old kitchen-lamp had the beak removed to a considerable distance from the reservoir, so as to lessen the shadow cast by the flame, and increase the illuminating power. Till 1789, however, all lamps continued to be dim, smoky, ill-made articles, soiling everything they came near, and filling the air with anything but an agreeable odour. The invention and introduction of the argand lamp at that time, by Ami Argand, made a revolution in illumination. (*See* ARGAND LAMP.) Among the inventions which appear to indicate important progress in the history of lamp-illumination, may be enumerated the following:—The *Worms lamp*. This lamp is used and well known in the countries bordering on the Rhine. It is characterized by the shape of the wick. The fibres of the wick, instead of being collected into a round bundle, are placed in small bundles side by side, forming together a flat ribbon. The effect produced by this arrangement is that the edges of the flame are at no point so distant that a nucleus can form in the centre, which, from want of air, will burn incompletely and smoke. Another advantage possessed by this and other lamps to be described, is the movability of the wick. This is effected by means of screws. The wick is raised or lowered, according as the screws are turned, and a larger or smaller quantity of air is employed in the combustion. When the wick is high, a large quantity of oil is decomposed, and when low, a small quantity.—The *Study-lamp*. In the common study-lamp, the oil-vessel is more flat, and, instead of being situated below, is behind and at the side of the flame, so that its shadow falls much beyond the immediate

vicinity of the flame, and in no way interferes with the person in front of the lamp. The greater part, too, of the light passing upwards, is collected by a conical shade and reflected downwards.—The *Astral lamp* was constructed by Bordier-Marcet, with the idea of making the sinking of the level of the oil as imperceptible as possible, and, at the same time, the diminution of the flame by means of a very flat oil-vessel, in which, therefore, a larger quantity of oil only occupies a very insignificant height. The principle of the astral lamp was applied to the argand.—In the *Sinumbra-lamp* (*sine umbra*, without shadow), the shadow is greatly reduced by making the circular oil-vessel in such a way that its three surfaces meet in the form of a flat wedge, the sharp edge being directed towards the flame. The position of the flame in relation to the oil-vessel is such, that two tangents drawn from the base to the apex of the flame to the latter, meet a few inches behind it. Beyond this point the lamp can cast no shadow; but even in this small space, it is almost entirely destroyed by a ground-glass shade, which, resting upon the oil-vessel, surrounds the chimney and scatters the light in all directions around. In all these lamps one common evil is to be noticed; namely, that of having the oil-vessel at all events within a few lines of the level of the burner, in a position which, consequently, throws the most objectionable shadow. A large number of contrivances have been invented in order to remove the cistern, either to a considerable distance above the flame—when its shadow would fall on the ceiling—or to a position much below the flame, when it would fall at the foot of the lamp. In the former of these cases, from the peculiar arrangement of the oil-cistern, the height of the oil in the burner cannot be quite constant, but will alternately sink and immediately rise again to its former height; whilst in these lamps described previously, the suction of the wick is always rendered more difficult by the sinking of the oil. When the oil-cistern is transposed to the foot of the lamp, all shadow is avoided; but the advantage of the free flow of oil is lost: in all lamps of this sort, therefore, the oil must be raised. They are, therefore, interesting on account of their ingenious, but at the same time complicated, apparatus, which partly depends upon hydrodynamic, partly upon hydrostatic laws, and is partly also a mere mechanical arrangement.—In *Girard's lamp*, the oil is raised by the compression of air somewhat after the manner of water in a fire-engine, or as in Hero's fountain, where the pressure exerted in one vessel is transferred to another distant vessel by means of the compressed air.—The *Hydrostatic lamp*. The principle on which this lamp is constructed is as follows; when two different fluids are brought into tubes connected at the bottom, they will balance each other at different heights in the respective tubes, according to their densities.—In *Keir's* lamp the oil is raised and supported by a column of salt and water, sufficiently dense to support a column of oil four-thirds of its own height. Instead of the salt and water, other heavy liquids, such as syrup, honey, mercury, or a solution of sulphate of zinc, may be used. The zinc solution is 1·57 times denser than oil; hence a column 10 inches high will support a column of oil 15·7 inches in height. —In *Carcel's mechanical lamp* was first carried out the idea of pumping up the oil from the foot of the lamp to the wick by simple machinery, like that of clocks, and in such proportions as to exceed the quantity consumed during the whole period of burning. Carcel brought out his invention about 1800, and carried it to such perfection, that only unimportant points connected with the works and the pump were left for the improvements of his successors, Gagneau, Nicod, Careau, and others. The complex arrangement of the machinery in Carcel's lamp, and other similar instruments, soon caused them to fall into disuse. All the difficulties which encompassed these arrangements seem, however, to have been surmounted in Meyer's elliptic, and in the French moderator lamp. In the *elliptic lamp*, a spiral spring acting on a piston is the motive power, and the constant flow of oil to the wick is regulated in an ingenious manner by means of a tube of narrow bore. A lamp of this kind will yield a good light for eight or ten hours, and will allow of the combustion of crude vegetable oils. The *moderator* lamp, which has become very popular of late years, is similar in principle, but of somewhat different construction. The whole body of the lamp forms a reservoir for the oil, and at the same time the barrel of the pump, in which the piston is worked by a spiral spring firmly attached to it, and to the upper part of the barrel. When the piston presses on the surface of the oil, it forces the fluid up a tube to the burner. The lamp derives its name from a small wire, or moderator, which is placed in the ascending tube, in order to regulate the supply of oil to the wick, and keep the quantity invariable. Volatile oils, such as camphine, are applicable for illuminating purposes in lamps, when they can be obtained at a sufficiently low price; but they require special management and a well-regulated and abundant supply of air to consume completely the large amount of carbon which they contain. When employed instead of oil in ordinary lamps, they evolve a great quantity of smoke, and much of the oil escapes combustion. In many parts of England and the continent, *vapour lamps* are employed. In these lamps, which consume either spirits of wine, mixed with volatile oils rich in carbon, or coal-tar naphtha, the liquid is generally converted into vapour before it reaches the burner, and they are therefore distinguished as *vapour*, or *self-generating gas* lamps. Amongst these may be mentioned Lüdersdorff's lamp, for burning pure oil of turpentine; Mansfield's lamp, for burning mixtures of pyroxylic spirit, or acetone, with various hydro-carbons; Holliday's lamp, for consuming rectified coal-tar naphtha mixed with air; and Beale and D'Hanen's lamps, for the same purpose. Within the last few years, large numbers of inexpensive lamps have been manufactured for the purpose of consuming the paraffin procured from the distillation of the petroleum obtained in the recently-discovered oil-wells of America and elsewhere. The necessity for artificial light in mining operations below the surface, where explosive gases often impregnate the air, at an early period turned the attention of scientific men to the construction of lamps which could be safely used in an explosive atmosphere. In 1815, the discovery of the safety-lamp was made independently, by Sir Humphrey Davy and George Stephenson. Although many modifications of form have been made since that time, the modern safety-lamp is still similar in principle to the "Davy" and "Geordy" lamps. (*See* SAFETY-LAMP.)

LAMP-BLACK, a very fine description of infinitely divided charcoal, much used as a pigment in the arts. It is largely manufactured by heating in an iron vessel vegetable matters rich in carbon, such as resin and tar,—the vapours of which are burnt in a current of air insufficient for complete combustion. The hydrogen consequently burns away, leaving the carbon behind in a finely-divided condition on the walls of the chamber, which are hung with coarse cloths. The lamp-black thus obtained generally contains certain quantities of unburnt resinous or fatty matter. Where very fine lamp-black is required in small quantities, it is best made by holding a cold plate over a gas flame until a sufficient deposit is obtained. This is ground up with gum, water, or oil, and forms an excellent pigment for the amateur artist. Lamp-black is one of the ingredients of which printers' ink is made.

LAMPETIANS, *lăm-pē'-shē-ănz*, a religious sect of the 17th century, the followers of one Lampetius, a Syrian monk. He held that man, being born free, ought to do nothing by necessity; and hence, that it was unlawful to make vows; to which he added various Arian and other heresies.

LAMPOON, *lăm-poon'* (Fr. *lampons*, a drunken song), is a personal satire, a censure, written not to reform but to vex.

LAMPREY, *lămp'-re* (Dan. *lamprei*), (*Petromyzon marinus*), belongs to the *Petromyzidæ*, a family of chondropterygious fishes. The lamprey is distinguished by a cylindrical form, compressed towards the tail, and without any scales. It has seven branchial openings on each side, and another small opening communicating with them on the upper surface of the head, situated nearly between the eyes; its maxillary ring, or mouth, is supplied with strong teeth, and in the inner disc there are smaller, rasp-like tubercles; its tongue is so formed that, by a movement of the mouth, it acts like a piston,

and enables the lamprey to attach itself to any foreign body by means of suction. It is usually about two feet in length and of a yellowish colour, mottled with brown irregular streaks. The two dorsal fins are distinctly separated, the second one joining with the tail-fin, as well as with a small strip which represents the anal fin. Mr. Yarrell says, with reference to this fish, that "the lampreys, like the sharks and rays, have no swimming-bladder, and being, also, without pectoral fins, are usually seen near the bottom. To save themselves from the constant muscular exertion which is necessary to prevent them from being carried along with the current of the water, they attach themselves



LAMPREY.

by the mouth to stones or rocks, and were in consequence called petromyzon, or stone-sucker; while the circular form of the mouth induced the name cyclostomes, or round-mouth fishes, which was bestowed upon them by M. Duméril." The lamprey generally quits the sea in the spring for the purpose of spawning, and then returns back to its element after an absence of a few months. It is a fish in high repute as an article of food, and it is, consequently, much sought after for the table. Those from the river Severn are held in the highest esteem, while those from Worcester especially command the market. It is an historical fact that our king Henry I. died from the effects of a surfeit of lampreys.

LAMPYRIDÆ, *lăm-pĭ'-re-de* (*Lampyris*, Linn.), a family of coleopterous insects, of the section *Malacodermi*. The *Lampyridæ* have five joints to all the tarsi; flexible elytra, with the body usually elongated and somewhat depressed. The head is more or less concealed by the thorax, the mandibles generally small and terminated in a sharp point; the penultimate joint of the tarsi is always bi-lobed, the claws simple, and the antennæ closely approximated at the base. The family of the *Lampyridæ* contains several genera, the most important of which are,—1. *Lycus*, the distinguishing characters of which are, that the fore part of the head is prolonged into a snout, the antennæ serrated, and the elytra usually dilated in the middle or near the posterior part. A species of this genus is found in England,—the *Lycus minutus*; in length it is about a quarter of an inch, and of a black colour, except the antennæ, which are of a brilliant red.—2. *Omalisus*. This genus has the joints of the tarsi elongated and nearly cylindrical, with the penultimate joint heart-shaped; the head not sensibly prolonged in front; the antennæ simple; and the elytra tolerably firm.—3. *Omalisus sutularis*, a black variety, closely resembling the insect last described: it is found in France.—4. *Lampyris*, the glow-worm. (*See* GLOW-WORM.)

LANARKITE, *lăn'-ark-ite*, in Min., a sulpho-carbonate of lead, found in small quantities at Leadhills, in Scotland.

LANCASTER GUN AND RIFLE, *lănk'-as-ter*, two weapons which take their name from Mr. Lancaster, a gentleman who introduced the system of elliptic rifling, which he applied to cannon as well as to small-arms. The transverse section of any part of the barrel would show the bore to be elliptical in shape; the eccentricity, however, is so slight that it can scarcely be discovered without the application of a gauge. Although the invention may be original as far as Mr. Lancaster is concerned, the method appears to have been practised in England many years ago, as the system is accurately described in an old work on gunnery, called "Scloppetaria," which was published in 1809, and is characterized as a "very old invention, quite obsolete." The oval form of bore tends to reduce the windage without increasing the friction or resistance of the air to the bullet when it is passing through it. The twist of the grooving, if it may be called so, is one turn in 32 inches. The diameter of the bore is ·698 inch, an eccentricity of ·01 inch in half an inch being sufficient to cause the bullet to rotate on its axis during the entire period of its flight. The bullet used is conical, elliptic in form, and made of the softest lead that can be procured. It should fit the barrel accurately, having a windage of 4 or 5-1,000ths of an inch. From the peculiar formation of the bore, no other kind of bullet can be used in the Lancaster rifle except those that are made expressly for the purpose. The Lancaster guns are rifled on the same principle. Several experiments were made with them at Shoeburyness, and they were used at the siege of Sebastopol; they did not, however, prove as serviceable and effective as the authorities of the Board of Ordnance expected. This was owing to the imperfect manner in which the parts that formed the shells were joined together, the flame produced by the ignition of the charge often penetrating into the interior of the shell and causing it to burst as soon as it had left the mouth of the gun. In addition to this, the elliptic shells were expensive and difficult to make; and from the shape of the bore, and the unyielding nature of the iron of which they were constructed, there was often a difficulty in ramming them home. In addition to this, if a shell stuck fast in its passage through the bore and did not break when the charge was fired, the gun would burst and become useless. *Ref.*—Busk's *Rifle, and how to use it*; Howard's *Treatise on Naval Gunnery*.

LANCE. (*See* SPEAR.)

LANCEOLATE, *lăn'-se-o-lait* (Lat. *lancea*, a lance), a term used in Bot. to signify a leaf, or other part of a plant which is of a narrow oblong form, gradually tapering towards each extremity. In a similar sense, the same term is used in conchology and entomology.

LANCERS, *lăn'-serz*, regiments of light cavalry, common in most European armies, and so called because of their being armed with lances. These weapons are fitted with a shaft of ash or beechwood, between eight and sixteen feet in length, and a steel point about nine inches long, adorned with a small flag, the waving of which is said to frighten the enemy's horses. At the present time, there are five regiments of lancers in the British army.

LANCET, *lăn'-set* (Fr. *lancette*), a sharp-pointed two-edged surgical instrument, used in venesection, and in opening tumours, abscesses, &c.

LANCEWOOD. (*See* DUGUETIA.)

LAND, *lănd* (Sax.), in its general sense, a term applied to soil, or the solid matter of which the earth is composed. In the more restricted and legal acceptation of the word, it signifies every species of ground or earth; as meadows, pastures, woods, moors, waters, marshes, furze, and heath. It also includes dwelling-houses, &c.; for, with the conveyance of land, the structures upon it pass also. Land is considered to extend indefinitely upwards, and downwards to the centre of the globe. The relations of landed property are amongst the most complicated and most important in civil society. They lie at the basis of nearly all the relations and institutions of the state; and the strength and vigour of the government depend on their right direction. In them it is possible to trace the progress of a country's civilization;—from hunting and fishing to raising of cattle; from thence to agriculture, conducted by slaves and bondmen, or by freemen with or without a right in the soil. In nearly all modern constitutions, landed property has been taken as the foundation of the more important institutions, and a power has been given to the owners of property over the other members of society. In many modern states it is so provided by the constitution, that the representative body is composed entirely of landed proprietors; it is, however, a very grave question whether this principle is just or not; consequently, in many representative governments, arrangements are made for producing a variety in the condition and rank of the representatives.

LANDAMMANN, *lănd'-ăm-măn* (originally *Landamtmann*), in Switzerland, is the title of the highest magistrate in the country, as distinguished from *Stadtamtmann*, the chief magistrate in the city. The highest

magistrate in many of the cantons, as Uri, Schweitz, Underwalden, Glarus, &c., is termed landammann. Most of the cantons have two or more, who command alternately; some only one. The president of the diet of all Switzerland is also called landammann.

LANDAU, *lăn-dow'*, a carriage of peculiar construction, and so called on account of its having been first made at Landau, in Germany. It is so constructed that the upper part can be thrown open occasionally in fine weather. This is effected by means of jointed metal levers, called *irons*, on the upper quarters. When the carriage is required to be open, the two quarters separate in a joint in the top, and each folds back. These carriages, which are hung and fitted up like coaches, are very convenient, as they serve the purpose of a close and an open carriage, without the expense of keeping two. The landau is a carriage, on the whole, well suited to the uncertain climate of this country, and if built light, without a perch, and with elliptic springs only, is found to be extremely useful.

LANDGRAVE, *lănd'-graiv* (Ger. *graf* or *grave*, count or judge), a title which was formerly common among the rulers of petty German principalities and kingdoms, but which is now borne only by the ruler of Hesse-Homburg, and a few German noblemen of high rank; among whom may be named the Landgrave Wilhelm of Hesse-Cassel, the grandfather, on her mother's side, of the Princess of Wales. The graves, in early times, were men of integrity and experience, who were chosen by the people of different districts to administer justice among them. The title was afterwards given to persons who were appointed by the sovereign, and were intrusted with the civil administration of a province, having judges under them, who were set over the different districts of which the province was composed. In course of time there were three classes of graves, distinguished as palgraves, margraves, and landgraves, of whom the first acted as judges in the king's court, and settled all cases which it was not considered necessary to bring before the king in person; while the margraves guarded the frontiers of the land, and the landgraves, as it has been said, administered the government of extensive provinces. Subsequently, many of the landgraves asserted their independence, and became the sovereigns of the countries over which they had ruled as viceroys; and among these were the landgraves of Thuringia and Hesse. In the 16th century, Hesse was subdivided into the landgravates of Hesse-Cassel, Hesse-Darmstadt, and Hesse-Homburg; but, in 1803, the landgrave of Hesse-Cassel took the title of elector, and, three years later, the landgrave of Hesse-Darmstadt took the title of grand-duke; and by these they are still known.

LANDING-STAGE, *lănd'-ing*, a platform raised on the side of a river or canal for the purpose of landing passengers and goods from vessels that are brought alongside, and receiving the same on board. A landing-stage may be fixed like a wharf, and provided with cranes and appliances for raising heavy bales of merchandise, coals, corn, &c., out of the holds of vessels, or they may be constructed so as to rise and fall with the tide, like the stages and piers erected at various points along the river Thames, between Battersea Bridge and Gravesend, to allow passengers to enter and quit the steamboats that ply on the river. Landing-stages intended chiefly for passengers are provided with offices for the issue of tickets, and means for insuring the receipt of the same from passengers who have arrived at the stage by steamer; while stages for the reception of goods are provided with machinery for weighing the same, and facilitating the loading and discharge of cargoes. Piers that are built on piles, and project a long way into the sea down a gently-shelving beach, afford examples of another kind of landing-stage for landing passengers and goods, and taking them on board at seaports, where the nature of the coast prevents vessels from coming alongside a quay at all times.

LANDLORD AND TENANT, *lănd'-lord*, one of the common relationships of social life, out of which arise many rights, duties, liabilities, and remedies. It lies between the landlord, of whom lands or tenements are holden, and the tenant, who, on certain conditions, has temporary possession and use of that which is in reality the property of the landlord. Tenancies may be held for fixed periods, or may exist at will and by sufferance. A tenant at will cannot be turned out of possession lawfully, nor can the landlord succeed in an action of ejectment against him, until after a demand to quit has been made upon him by his landlord; but a tenant by sufferance may be turned out by an action of ejectment without a demand. Generally, the tenant is not entitled to set off against his rent debts due to him from the landlord: he is also bound to repair the premises. In agricultural tenancies, the mode in which the farm is to be treated is usually stated in the lease. A tenant in occupation of premises is liable for all taxes and rates of every description due in respect of the premises; the collector, therefore, may proceed against the tenant in occupation to recover them: an agreement is generally arranged beforehand between landlord and tenant that the latter shall pay all rates and taxes except the land-tax. When a fixed rent has been agreed upon, becomes due, and is neither paid nor offered, the landlord, under certain conditions, has a right to seize growing crops, any kind of stock, goods, or chattels, upon the premises, whether such things are the actual property of the tenant or not; and if the rent remains unpaid, he may sell them. The exceptions are,—things in actual use, as clothes then being worn, or a horse on which a person is actually riding; things sent by a tradesman for the purpose of being worked up; goods sent by a principal to his factor for sale; goods and cattle belonging to the guests at an inn: goods that are already in the custody of the law, &c., are also exempt from being seized. (*See* DISTRESS.) The deed, or note in writing, between landlord and tenant must proceed upon mutual agreement, and must be signed and duly stamped. A yearly tenancy, when no period of notice is agreed on, must be determined by a notice to quit at the expiration of the current year, given six months previously. In the case of lodgings, the time, when less than a year, for which they are taken, will be the time for which a notice is necessary; thus, lodgings taken by the month or week need a month's or a week's notice. A notice to quit may, however, be waived by an acceptance of rent, or by a distress for rent due, after the expiration of the notice.

LANDMARK, *lănd'-mark*, an object to ascertain the boundaries of an estate or property. The correct division of lands was an object of great importance in ancient times. Various means were consequently adopted to render the boundaries of property distinct and permanent. The most general landmarks were stones and hillocks. Amongst the ancient Hebrews, the importance attached to these objects may be judged of from the objurgation of Moses: "Cursed be he that remov eth his neighbour's landmark." In naval language, a landmark is any conspicuous object on shore which serves as a guide in entering a harbour, in marking a fishing-station, or in avoiding a danger.

LANDRAIL. (*See* CORNCRAKE.)

LANDSCAPE, *lănd'-skaip* (Du. *landschap*), in general language, a portion of country which the eye can comprehend in a single view, including mountains, rivers, lakes, and whatever else the land may contain. The word landscape is also very commonly used to denote a picture representing the form of a district of country as far as the eye can reach. The art of painting landscapes may be said not to have originated till the 14th or 15th century. From that time, however, it claimed the attention and admiration of artists, who, by imparting ideal beauty to the scenes which they depicted, elevated the art to the high position in which it now stands. (*See* PAINTING.)

LANDSCAPE GARDENING. (*See* GARDENING.)

LANDSCAPE PAINTING. (*See* PAINTING.)

LANDS, FINE OF. (*See* FINE OF LANDS.)

LANDSLIP, *lănd'-slip*, a portion of land which has been separated from the main body, or which has slid down, usually from the side of a mountain or hill, in consequence of disturbance by an earthquake, or from being undermined by long-continued rains, or from some other cause. Landslips of considerable extent sometimes occur, and are occasionally attended with great injury. In Switzerland and other mountainous countries they are not unfrequent.

LAND-TAX, *lănd'-taks*, a tax laid upon land and houses, which has superseded all the previous methods

of rating either property or persons in respect of their property, whether by tenths or fifteenths, subsidies on land, hydages, scutages, or tallages. The land-tax is levied neither on landlord nor tenant, although generally a charge upon a landlord, but on the beneficial proprietor, as distinguished from the mere tenant at rack-rent. If a tenant have a beneficial interest to any extent, he becomes liable to the tax *pro tanto*, and can only charge the residue to his landlord. Houses and buildings appropriated to public purposes are not liable to land-tax.

LANDWEHR, *länd'-vair* (Ger., land-guard), a term applied in Prussia and Austria to the militia of the country. (*See* also article MILITIA.)

LANGREL, or LANGRAGE SHOT (*läng'-grel*), a peculiar species of missile, formed of bolts, nails, and other pieces of iron, tied together, and shaped like a cylinder, so as to suit the bore of the gun from which it is to be discharged. It used formerly to be employed at sea for the purpose of destroying the spars and rigging of hostile vessels, but in the present day its use has nearly, if not quite, exploded.

LANGSAT. (*See* LANSIUM.)

LANGSDORFFIA. (*See* BALANOPHORACEÆ.)

LANGUAGE OF FLOWERS, *läng'-gwaj* (Fr. *langage*), means an emblematical mode of expressing and interchanging ideas by means of flowers. The origin of this practice was doubtless suggested by the natural characteristics of certain flowers. "Lovely as the rose," "Fair as the lily," and "Modest as the violet," are phrases that seem to come naturally into use. Acting upon this principle, several elegant little works have been drawn out, in which nearly every known flower is tabularly arranged, with the object which it is supposed to symbolize placed beside it. Amongst the best known are the carnation, signifying fascination; the dahlia, instability; the rose, love; the geranium, gentility; the *forget-me-not*, remembrance; the fuchsia, elegance; and the ivy, friendship.

LANGUAGE, SCIENCE OF. (*See* PHILOLOGY.)

LANGUAGES, DEAD. (*See* DEAD LANGUAGES.)

LANSIUM, *lăn'-shum*, in Bot., a gen. of plants of the nat. ord. *Meliaceæ*, inhabiting the East-Indian Archipelago. They yield fruits which are much esteemed, and known under the names of the *langsat* or *lansăh*, and the *ayer-ayer*.

LANTANIUM, or LANTHANIUM, *lăn-tai'-ne-um* (Gr. *lanthanein*, to conceal),—symbol La, equiv. 47. An extremely rare metal, found in small quantities in the minerals *cerite*, *yttrocerite*, and one or two more, in company with cerium and didymium. It forms a grey infusible non-volatile powder, that becomes lustrous when burnished. It forms only one oxide, LaO, which is a white powder, soluble in acids, and in the salts of ammonia, from which it expels the alkali. Its salts have a sweet astringent taste, and are unimportant.

LANTERN, *lăn'-tern* (Lat. *laterna*, Fr. *lanterne*), a common contrivance used for carrying a lamp or candle in, consisting of a case or vessel made of tin, with sashes of some transparent substance, such as horn or glass. Lanterns are first spoken of by Theopompus, a Greek comic poet, and Empedocles of Agrigentum. Lanterns were used by the ancients in augury. They were also carried before troops on the march by night, being then borne on the top of pikes, and so constructed as throw lights only behind them. Dark lanterns are provided only with a single opening, which can be closed up when the light is required to be hidden, or opened when there is occasion for its assistance to discover some object. In architecture, the lantern signifies a small dome raised over the roof of a building to give light and serve as a sort of crowning to the edifice.

LANTERNS, FEAST OF, a celebrated feast held in China on the 15th day of the first month of the year. It derives its name from the vast number of lanterns which are hung out of the houses and in the streets, the number of which has been stated even to have exceeded 200,000,000. The lanterns used are often of great value, some being estimated at 2,000 crowns. They are richly ornamented with gilding, painting, japanning, sculpture, &c. Some of them are of great size, reaching nearly thirty feet in diameter, and are so constructed as to resemble halls or chambers; and two or three together would make an elegant house. In this way the Chinese may be said to live, to receive visits, dance, and act plays in a lantern. When lighted up with torches, these lanterns have a beautiful effect at a distance. Besides the large lanterns, there are also a vast number of smaller ones, which usually consist of six faces or lights, each about four feet high and one and a half broad, framed in wood, finely gilt and adorned. Over these they stretch a fine transparent silk, painted with flowers, trees, and other objects; the colours are very vivid, and, when the lanterns are lighted up, the effect is lively and picturesque.

LANTERN-FLY. (*See* FULGORA.)

LANTERN, MAGIC. (*See* MAGIC LANTERN.)

LAPIDARY-WORK, *lip'-e-dă-re* (Lat. *lapis*, a stone).—The employment of the lapidary consists in cutting and polishing gems and precious stones, and any description of hard mineral substance that may be used for ornamental purposes. Lapidary-work is entirely performed by the friction of small metal or wooden wheels, which revolve with great rapidity, being frequently driven by means of a small steam-engine. For cutting gems and stones, the wheels are made of iron, and have a sharp edge, to which diamond or emery-powder moistened with water applied during the operation; but for polishing the same, wheels made of softer metal, or wood, are used, the edges of the wooden wheels being sometimes coated with buff leather; but when the wheels are without a coating of leather, the stone is frequently held against the side instead of the edge. Gems and precious stones differ greatly from each other in hardness, and require a different mode of treatment accordingly, although the means used for cutting and polishing are the same in all cases. The softest substances that are cut by the lapidary are alabaster, mother-of-pearl, coral, malachite, and glass; the emerald, agate, garnet, amethyst, opal, topaz, carbuncle, and many kinds of ornamental stone, are considerably harder than the substances that have just been mentioned, but not so hard or difficult to cut as the diamond, sapphire, and ruby. Among the most important examples of lapidary-work may be cited the re-cutting of the large Indian diamond known as the *Kohinoor*, or Mountain of Light. (*See* KOHINOOR.)

LAPIS LAZULI, *lai'-pis läz'-u-le* (Lat., azure-stone), a well-known mineral of an ultramarine or azure-blue colour, formerly much used for the production of the pigment known as ultramarine. It varies considerably in composition, according to the locality in which it is found. It may be described chemically as a silicate of alumina and lime, coloured with variable amounts of iron and sulphur. Since the introduction of artificial ultramarine, it is principally employed for ornamental purposes. (*See* ULTRAMARINE.)

LAPSE, *läps* (Lat. *lapsus*, a slip), in Eccl. Law, is a slip or omission of a patron to present a clergyman to a benefice in his gift within six months after its vacancy, in which case the benefice lapses to the bishop; and if he does not collate within six months, it lapses to the archbishop; and if he neglect to collate within six months, it lapses to the crown. A lapsed legacy, is where the legatee dies before the testator, or where a legacy is given upon a future contingency, and the legatee dies before the contingency happens.

LAPSED, *läpsd*, in Eccl. Hist., is a term applied to such as in the time of persecution denied the faith of Christ. Much controversy arose in the Church in early times as to how such persons should be dealt with on their seeking to be re-admitted.

LAPWING, or PEEWIT, *läp'-wing*, one of the best-known of the British birds, belongs to the snipe and plover tribe. The generic characters of this bird, whose scientific name is *Vanellus cristatus*, are,—straight slightly-compressed bill, shorter than the head; points of both mandibles hard and horny; legs slender, with lower part of tibiæ naked; four-toed feet—three before, one behind; large wings, tuberculated or spurred in front of the carpal joint; first three quill-feathers shorter than the fifth. The names which this bird bears have been suggested, the first by the slow flapping of its wings during flight, and the second by its often-repeated note, with which the sound peewit is closely similar. An inhabitant of heaths, commons,

and the marshy grounds near rivers or lakes, these birds resort in numerous flocks to certain districts in Norfolk, Lincolnshire, Cambridgeshire, and Essex, where the trade of collecting them for the table continues for about two months.

LARBOARD, *lar'-bord* (Ang.-Sax.), a term formerly applied to that side of a ship which is on the left hand of a person looking forward from the stern. At present, the term *port* is used instead.

LARCENY, *lar'-se-ne* (Nor., from Lat. *latrocinium*), is another term for theft. It is divided into two kinds,—simple larceny, or plain theft, when it is unaccompanied with any aggravating circumstances; and mixed, or compound larceny, when accompanied by circumstances which are considered as aggravating the offence. Formerly, larceny was distinguished as grand and petty larceny; the former, when the value of the goods stolen was above twelve pence, the latter when not more than that value; but by 7 & 8 Geo. IV. c. 29, that distinction was abolished. Simple larceny, then, is defined to be "the felonious taking and carrying away of the personal goods of another." In larceny there must be,—1. a taking against the will of the owner; for wherever the owner is induced willingly to part with his goods, there is no larceny; as where goods are delivered upon trust. If A. lends a horse to B., and he rides away with him, this is not larceny. Larceny is not committed when possession is obtained in the first instance without fraudulent intention. Where a finder of goods or money converts the same to his own use, and at the time of conversion knows, or has the means of knowing, the real owner, he is guilty of larceny; but if he find it with the intent to restore it, but afterwards appropriates it to his own use, he does not commit larceny. A servant intrusted with his master's goods, as a butler with plate, a shepherd with sheep, and embezzling them, is guilty of larceny at common law; but if the goods have never been in the possession of the master, as money or goods received by a servant from a third party, and embezzled, it is not larceny. If a guest robs his inn or tavern of a piece of plate, or if a lodger run away with goods from his lodgings, it is larceny; for he had not the possession delivered unto him, but the use. Under some circumstances, a man may be guilty of larceny in taking his own goods; as if he steals them from a pawnbroker. The distinction as to what constitutes larceny will thus be seen to be often very nice; and hence various statutes have been passed providing for particular cases; as for frauds by bankers, brokers, agents, trustees, &c. —2. There must not only be a taking but a carrying away (*cepit et asportavit*), to constitute larceny. A bare removal from the place in which he found the goods, though he does not quite make off with them, is a sufficient asportation or carrying away. Thus, where a thief, intending to steal plate, takes it out of a chest in which it was, and lays it down upon the floor, but is surprised before he can make off with it, this is larceny.—3. The taking away must be felonious, that is, *animo furandi*, or, as the civil law expresses it, *lucri causâ*. The ordinary discovery of a felonious intent is where the party does it clandestinely, or, being charged with the fact, denies it; but there are numerous other circumstances that may be taken as evidence of a felonious intent so complicated and mingled, that it is impossible for us to enter upon them in this place. —4. The felonious taking and carrying away must be of the personal goods of another; for if they are things real, or savour of the realty, larceny at common law cannot be committed of them. Lands, tenements, and hereditaments, cannot in their nature be taken and carried away; but even corn, grass, trees, and the like, were regarded as part of the real estate, absolutely fixed and immovable, and therefore unable to be the subject of theft by the common law. Most of these cases are now made felonies by statutes, particularly 7 & 8 Geo. IV. c. 29. Upon the same principle, the stealing of writings relating to a real estate was no felony, but a trespass, because they concerned the land. By the above statute this is made a misdemeanour, punishable with transportation (now penal servitude) for seven years, or fine or imprisonment. Bills, bonds, and notes, being of no intrinsic value, and not importing any property in possession of the person from whom they were taken, were not at the common law held to be such goods whereof larceny might be committed; but by 7 & 8 Geo. IV. c. 29, they are now put, with respect to larcenies, upon the same footing as the money they were meant to secure. No larceny can be committed of things which are not the subject of property; as of beasts that are *feræ naturæ* and unreclaimed, as deer, hares, and conies, in a forest, chase, or warren; fish in an open river or pond; or wild fowls in their natural liberty. But if they are reclaimed or confined, and may serve as food, it is otherwise. Of all valuable domestic animals, as horses and other beasts of draught, and of all animals *domitæ naturæ* which serve for food, as neat or other cattle, swine, poultry, and the like, larceny may be committed. But the stealing of dogs, cats, and ferrets, though tame and valuable, and of monkeys, bears, &c., though reclaimed or confined, does not amount to larceny. By 7 & 8 Geo. IV. c. 29, every person convicted of larceny of any amount is declared liable to be transported for seven years, or imprisoned for not more than two years. But by 12 & 13 Vict. c. 11, the punishment of transportation for persons convicted of simple larceny was taken away; and, according to the provisions now in force, the punishment for this offence is, in ordinary cases, imprisonment with hard labour (with or without solitary confinement) for not more than two years, and (if the offender be a male) whipping, at the discretion of the court; in case of having been before twice convicted of any of the offences punishable upon summary conviction under 7 & 8 Geo. IV. cc. 29, 30, or 10 & 11 Vict. c. 82, penal servitude for not more than seven or less than three years; and in case of a conviction after a previous conviction for felony, penal servitude for not more than ten or less than four years. In certain cases, however, where the larceny relates to a subject for which the policy of the law provides with more anxiety, the punishment is even more severe; for if any person shall steal (to the value of ten shillings) goods or articles of silk, woollen, linen, or cotton, while laid or exposed in any place during any stage or process of manufacture, he shall be liable to penal servitude for not more than fifteen or less than ten years, or imprisonment for a term not exceeding three years, with hard labour and solitary confinement if the court shall see meet. The like punishment is accorded to cattle-stealing. By statute 1 Vict. c. 36, if any officer or servant of the post-office shall steal, secrete, embezzle, or destroy, any post letter containing any chattel or money, or valuable security, or shall steal money or valuable security out of any post letter, he shall be guilty of felony, punishable with transportation for life, or not less than seven years, or imprisonment for four. Larceny by clerks and servants is punishable by penal servitude or by imprisonment (7 & 8 Geo. IV. c. 29). Simple larcenies, where the value of the property does not exceed five shillings, or where the age of the offender is not more than sixteen, may now be tried and determined, with consent of the accused person, by magistrates in petty sessions, the punishment in such cases being limited to six months' imprisonment. Persons confessing charges of simple larceny may also, by 18 & 19 Vict. c. 126, be tried and summarily sentenced by the same tribunal. Compound larceny is such as has all the properties of the former, but is accompanied by circumstances which are considered as aggravating the offence and requiring an increase of punishment; as stealing from one's house or person. The stealing in any dwelling-house any chattel, money, or valuable security, to the value of £5 or more, or counselling the commission thereof; the breaking any dwelling-house, and stealing therein any chattel, money, or valuable security, to any value whatever, are offences punishable with penal servitude for not less than seven or more than fifteen years, or imprisonment for three years. When the breaking the house is by night, then it constitutes another offence,—namely, burglary. Larceny from a church, or, as it is sometimes called, sacrilege, may be punished by penal servitude for life. Larceny from the person is either by privately stealing, or by open and violent assault, usually called robbery. This last is the unlawful and forcible taking from the person of another of goods or money to any value, by violence, or putting him in fear. The taking may not be strictly from

his person,—it may be in his presence only; but if neither from his person nor in his presence, it is no robbery. The value is immaterial,—a penny as well as a pound may constitute robbery. The taking must be by force, or a previous putting in fear; being that which distinguishes robbery from other larcenies. The putting in fear does not necessarily imply any great degree of terror or fright; it is enough that such force or threatening by word or gesture was such as to create an apprehension of danger, or induce him to part with his money without his consent. By 7 & 8 Geo. IV. c. 27, and subsequent statutes, it is provided that whosoever shall rob any person, and at the time of such robbery shall stab, cut, or wound any person, shall suffer death; whoever being armed with any offensive weapon or instrument shall rob, or assault with intent to rob, any person, or shall rob any person, and at the time of such robbery shall beat, strike, or use any other personal violence to any person, shall be guilty of felony, and may be sentenced to penal servitude for life, or not less than fifteen years, or imprisoned for not more than three years; whoever shall rob any person or steal any property from the person of another, shall be kept in penal servitude for a period not exceeding fifteen years, nor less than ten, or be imprisoned for not more than three; whoever shall assault any person with intent to rob, shall be guilty of felony, and be imprisoned for not more than three years.—*Ref.* Stephen's *Commentaries on the Laws of England.*

LARCH. (*See* ABIES.)

LARCH, USES OF THE, *larch* (Lat. *larix*).—The larch is a kind of fir, of elegant and graceful appearance, which is much grown in England for the sake of the timber that is obtained from it. There are many points in which the wood of the larch is superior to any other for certain purposes. For timbers that are exposed to the action of water, and for posts, the ends of which are driven into the ground or into the banks of rivers, the larch is more durable than either oak or elm; and for this reason it is much used by civil engineers in the construction of railways, canals, wooden bridges, &c. It will bear a considerable degree of heat without shrinking, warping, or cracking. It is tolerably free from knots, and the grain is close and capable of receiving a high degree of polish. It is not as easy to saw and plane as deal, chestnut, and oak; and, consequently, it is not used to any great extent in housejoining. It is as good as oak for planking the sides of small vessels; and, on account of the manner in which it will bear the changes of temperature and the variations of the weather, it is particularly useful for railway-sleepers, the shafts of mill-wheels, and other purposes where it is exposed to damp. Pipes for the conveyance of water are made from the larch in France and Switzerland, and larch poles are used in the continental vineyards for the support of the vines. The wood yields an excellent charcoal, and a superior kind of turpentine, known as Venice turpentine, is procured by making incisions in the tree, and collecting the sap that exudes from it in vessels placed to receive it. Squared logs of larch are used for building houses in Switzerland; and in the Rhenish provinces of Prussia, France, and Germany, wine-casks are made from it. The bark is used in tanning leather, but it is not as good as the bark of the oak. The planting of the larch has been much encouraged of late years in Great Britain, nearly fifteen million of trees having been planted on the estates of the duke of Athole in Scotland between the years 1764 and 1826. It will grow on any land, however poor or barren it may be; and land which is utterly worthless for other purposes may thus be made valuable and remunerative.

LARD, *lard* (Fr. *lard*, Lat. *lardum*), the fat of swine after being melted and separated from the flesh. In the pig, the fat differs from that of almost every other quadruped, as it covers the animal all over, and forms a thick layer between the flesh and the skin, not unlike the blubber in whales. Lard is applicable to various purposes, both in medicine and in cookery. In the former case it is specially useful in making ointment. It is generally prepared by melting it in a jar placed in a kettle of water, and in this state to boil it and run it into bladders that have been cleaned with great care. The lard keeps better in small bladders. That portion of the fat which adheres to the parts connected with the intestines is used for greasing carriage-wheels, and differs from common lard.

LARDIZABALACEÆ, *lar-de-zăb-ă-lā'-se-e* (after Lardizabal, a Spanish naturalist), in Bot., the *Lardizabala* fam., a nat. ord. of *Dicotyledones*, sub-class *Thalamifloræ*. Twining shrubs, with alternate, exstipulate, compound leaves and unisexual flowers. Carpels distinct, superior; seeds parietal, and imbedded on the inner surface; embryo usually minute, with abundant homogeneous albumen. Two genera inhabit the cooler parts of South America, one is tropical, and the remainder are found in the temperate parts of China. The order has furnished our greenhouses with some pretty evergreen climbers.

LARK. (*See* ALAUDA.)

LARUS. (*See* GULL.)

LARVA, *lär'-vă* (Lat., a mask), a term applied to an insect in its first state after leaving the egg, and previous to its assuming the chrysalis or pupa form. Larvæ are generally known by the names of grubs, maggots, and caterpillars. (*See* INSECTA, INSECT-TRANSFORMATION.)

LARYNGITIS, *lăr-in-jī'-tis* (Lat.), in Med., is inflammation of the larynx, more particularly of the mucous membrane that covers the laryngeal cartilages, including the epiglottis. This disease is characterized by a high degree of fever; the pulse is frequent and hard, and the patient manifests a considerable degree of restlessness and anxiety; he likewise complains of sore throat; and among the earliest symptoms that bespeak danger is difficulty of deglutition, for which no adequate cause is visible in the fauces; and to this is presently added difficulty of breathing. The act of inspiration is protracted and wheezing, and the patient points to the *pomum Adami* as the seat of the disease. He speaks either hoarsely, or, what is more common, all power of audible voice in the larynx is lost, and he speaks only by means of his lips and tongue in a whisper. As the disorder advances, the patient's general distress increases. His countenance, from being flushed, becomes pale or livid; his look anxious and ghastly; he struggles for breath, and if he does not obtain timely relief, dies strangled. Its course is generally rapid, terminating fatally before the fifth day, and even, in some cases, within twelve hours. Active remedies, therefore, require to be promptly applied. Bloodletting, both generally and locally, and blistering, are to be immediately resorted to during the periods of the fever; but if the powers are beginning to sink, bloodletting will be of little use. In such cases, however, tracheotomy may be resorted to with advantage, and the operation of breathing carried on by means of an artificial opening till the parts of the larynx recover. (*See* TRACHEOTOMY.)

LARYNX, *lăr'-inks* (Lat.), is the name given to the organ of the voice situated at the upper and fore part of the neck, where it forms a considerable projection. It extends from the base of the tongue to the trachea; is narrow and cylindrical below, but broad above, where it presents the form of a triangular box, being flattened behind and at the sides, whilst in front it is bounded by a prominent vertical ridge. It is composed of cartilages connected together by ligaments, moved by numerous muscles, lined by mucous membrane, and supplied with vessels and nerves. The cartilages of the larynx are nine in number, three single and three in pairs; viz., the thyroid, cricoid, epiglottis, the two arytenoid, the two cornicula laryngis, and the two cuneiform. The thyroid cartilage consists of two plates, of a dense, tough, fibro-cartilaginous substance, irregularly quadrilateral in form, and united at an acute angle in front, forming that prominence which is felt in front of the throat called *pomum Adami*. The lower border is connected with the cricoid cartilage, so called from its resemblance to a signet-ring (Gr. *krikos, eidos*, like a ring). It is smaller, but thicker and stronger, than the thyroid cartilage, and forms the lower and back part of the cavity of the larynx. The arytenoid cartilages are each of the form of an irregular triangular pyramid, and are placed upon the upper edge of the broad part of the cricoid cartilage, at the back of the larynx. The base of each cartilage is broad, and presents a concave smooth surface for arti-

culation with the cricoid cartilage. The apex of each cartilage is surmounted by a small conical-shaped cartilaginous nodule, — the corniculum laryngis. The cuneiform cartilages are two small elongated cartilaginous bodies placed one on each side in the fold of mucous membrane which extends from the apex of the arytenoid cartilage to the side of the epiglottis. The epiglottis is a thin lamina of fibro-cartilage shaped like a leaf, and placed behind the tongue, in front of the superior opening of the larynx. During respiration, its direction is vertically upwards, its free extremity curving forwards towards the base of the tongue; but when the larynx is drawn up beneath the base of the tongue during deglutition, it is carried downwards and backwards, so as to completely close the opening of the larynx. The upper opening of the larynx is termed the glottis. The mucous membrane of the larynx is continuous with that lining the mouth and pharynx, and is prolonged through the trachea and bronchi into the lungs. The vocal ligaments are two narrow bands of dense fibrous and highly elastic tissue, stretched between the anterior angle of the thyroid and the anterior surfaces of the arytenoid cartilages.

LASCAR, *lăs-kar'*, a term borrowed from the Hindoo, and applied to a native Indian seaman, many of whom are employed in the English mercantile navy.

LAST, *lăst*, a measure, varying in different counties as well as with respect to different districts. The general rule, however, is to accept a last as containing 4,000 lbs.

LASTREA, *lăs'-tre-ă*, a gen. of ferns containing several species, belonging to the tribe *Aspidiæ*; such as the *Lastrea filix-mas*, or male fern. This fern has been used in this country and other parts of Europe in medicine; the rhizome, when powdered, is considered an excellent vermifuge, especially in cases of tapeworm. It is also used for tanning.

LATEEN SAILS, *lă-teen'*, in Mar., triangular sails employed in various kinds of vessels. They are extended by long yards called *lateen yards*, slung at one quarter the distance from the lower end, and brought down at the tack, while the other end is elevated at an angle of 45 degrees.

LATENT HEAT. (*See* HEAT.)

LATERAL OPERATION, *lăt'-e-răl* (Lat. *latus*, the side), in Surg., is one of the methods of cutting for the stone.

LATERAN COUNCILS, *lăt'-e-răn*, is a name given to certain councils of the Roman church, from being held in the church of St. John of Lateran, at Rome. The first of these was assembled in 1123, by Pope Calixtus II., who presided in person. It decreed that investiture to ecclesiastical dignities was the exclusive right of the Church. It also decreed the celibacy of the clergy. Lateran II. was held in 1130, under the presidency of Pope Innocent II. It affirmed the due election of this pope, and condemned the errors of Peter de Bruys and Arnold of Brescia. Lateran III., held in 1179, under Pope Alexander III., condemned the "errors and impieties" of the Waldenses and Albigenses. Lateran IV., in 1215, under Innocent III., had for its objects the recovery of the Holy Land, the reformation of abuses, and the extirpation of heresy. Lateran V., in 1512, was assembled by Pope Julius II., to oppose another held by nine cardinals the year before, at Pisa, with a view to check his turbulence and contumacy. It declared that council schismatic, abolished the pragmatic sanction, and strengthened the power of the Roman see.

LATERITIOUS, *lăt-er-ish'-us* (Lat. *latus*, a brick), in Med., is applied to the red sediment deposited from the urine in some stages of fever.

LATH, *lath* (Fr. *latte*, a thin board), the name given to thin and narrow pieces of wood, used for a variety of purposes. Laths may be either split from oak or fir, in the direction of the grain, or for fine work, such as making trellises, the slips are sawn out of deal planks and planed. Laths used in plasterers' work are split out of fir, and are nailed to the battens of walls or the joists of partitions, at a short distance apart, to form a support to the first coat of plaster that is spread over them. Laths of the same kind are also used in roofing, to form bars transversely to the timbers of the roof on which the slates or tiles may be suspended, by means of wooden pegs driven through them. Laths of this description are about an inch in width, and from three to four feet in length. Laths of oak, six feet and more in length, and six or eight inches in breadth, are used for a kind of fence known as "park paling." The manufacture of laths, or lathrending, as it is technically called, is a trade in itself.

LATHE. (*See* TURNING.)

LATIN CHRISTIANITY is that system of Christianity which was established among the nations of Western Europe. Christianity may be said to have been originally a Greek religion. Greek was the commercial language of the Jews among whom it was first disseminated; its primal records were all, or nearly all, written in the Greek language; it was promulgated with the greatest rapidity and success among nations either of Greek descent, or of those who had been Greceised by the conquests of Alexander; its most flourishing churches were in the Greek cities. Greek Christianity was eminently speculative in its tendency. For centuries it continued to be agitated by those primary questions that lie at the bottom of all religions—the formation of the world, existence and nature of Deity, the origin and cause of evil. It was by no means aggressive, and achieved few conquests. Latin Christianity, on the other hand, seemed endowed with an inexhaustible principle of expanding life. It was constantly pushing forward its frontier, and advancing into the strongholds of northern paganism. Gradually it became a monarchy, with all the power of a concentrated dominion. It was, in fact, the Roman empire again extending itself over Europe, by a universal code and a provincial government; by a hierarchy of religious prætors or proconsuls, and a host of inferior officers, each in strict subordination to those immediately above them, and gradually descending to the very lowest ranks of society. The clergy assumed an absolute despotism over the mind of man. Not satisfied with ruling princes and kings, themselves became princes and kings. They were a second universal magistracy, exercising always equal, asserting, and for a long period possessing, superior power to the civil government. They had their own jurisprudence—the canon law—co-ordinate with, and of equal authority with, the Roman, or the various national codes; only with penalties infinitely more terrific, almost arbitrarily administered, and admitting no exception, not even that of the greatest temporal sovereign. In the Latin church, Latin was the religious language, the Latin translation of the Scriptures the religious code of mankind. Latin theology, for the most part, left to Greek controversialists to argue out the endless transcendental questions of religion, and contented itself with resolutely embracing the results which she fixed in her inflexible theory of doctrine. The only controversy which violently disturbed the Latin church was the practical one, on which the East looked almost with indifference,—the origin and motive principle of human action,—grace and free will. This, from Augustine to Luther and Jansenius, was the interminable still reviving problem. Latin Christianity was the religion of the western nations of Europe for a period of at least ten centuries. It maintained its unshaken dominion until what may be called Teutonic Christianity, aided by the invention of paper and of printing, asserted its independence, threw off the great mass of traditionary religion, and, out of the Bible, summoned forth a more simple faith, which seized at once on the reason, the conscience, and the passions of men.—*Ref.* Milman's *History of Latin Christianity*, 1854.

LATIN LANGUAGE AND LITERATURE.—The Latin language, the speech of the ancient Romans, derived its name from the country of Latium, the central region of Italy. Latium was surrounded, in the south by colonies of Greeks, by the Tyrrhenian Pelasgi on the plain of the Po, by the Ligurians at the foot of the Alps, by the Umbrians, by the Ausonians on the Tiber, the Oscans at the foot of Vesuvius, and the Etruscans on the Arno. The territory of Latium, therefore, having Greeks on the one side and barbarians on the other, overrun in turn by both, and at last peopled by different tribes, gave rise to a language partaking of various elements. Many of the Latin words are of Greek derivation, a number of which are probably simple transplantations adopted after the language was formed; but there are many others that have been

more or less changed; and probably not a few that were originally Greek have come to lose all traces of their origin. The terms of husbandry and domestic occupation are mostly Greek, while those of warfare, on the contrary, are evidently not Greek. Hence it is concluded that the indigenous Pelasgi were subdued by victorious invaders. This view is confirmed by the fact, that the terms for the simplest ideas are Greek; as, *sto*, I stand; *sedeo*, I sit; *maneo*, I remain; while the terms referring to government and laws do not appear to be Greek; as, *rex*, a king; *jus*, law; *civis*, a citizen. Words relating to religion are usually not Greek, and may have been furnished by the Etruscans. That the conquerors did not come by sea is indicated by the fact that most of the maritime terms are Greek. As the Romans became masters of Italy, the other languages of the country disappeared. During the period preceding the first Punic war, the Roman language was in no settled state. It was necessarily exposed to a mixture of various idioms, from the diversity of foreigners who composed the early population of Rome. It was not until the close of that period that any attention was paid to the regular settling of the principles and forms of the language, and not until a still later time that any approved author laboured upon the cultivation of style. Traces of the old forms of the language are found in fragments of the earliest poets, and also in the comedies of Plautus. The Latin language has only twenty-three letters, corresponding to those of the English, except that *w* is entirely wanting, that *i* was used to represent both *i* and *j*, and *u* to represent both *u* and *v*. Distinctive forms for these letters were not introduced until the middle ages. The letter *k* seldom occurs, and *y* and *z* exist only in a few Greek words, and came late into use. X is also a letter of late origin; and, at an early period, *i* was used instead of *y*, and *s* instead of *z*. There is no article in the Latin language, a defect which frequently gives rise to ambiguity. The characters used in writing greatly resembled, in the earliest period of the language, those of the Greek. The Romans used only capital letters, and, on account of the inconvenience in rapid writing, they formed abbreviations, by using the initial letters, or some of the principal letters of a word. Until the time of the poet Livius Andronicus, who flourished about 240 B.C., there exist few monuments of the Latin language. The oldest of them is a hymn, which was chanted at their annual festival, by the *fratres arvales*, a college of Roman priests. It was dug up at Rome in 1778, and is believed to be as old as the time of Romulus. It contains but few words that remained in the language. The next specimens belong to the time of Numa, and are the Salian hymn, which was unintelligible to Horace, and the laws of Numa; after which come the laws of the Twelve Tables, about B.C. 450. After the Romans had conquered the south of Italy and Greece, Greek terms and phrases were grafted on the old Latin stock, and the language lost much of its original form. What, however, it lost in originality, it gained in refinement and polish; so that its golden age dates nearly from this transformation,—from the death of Sylla through the reign of Augustus. The progress of the Romans in the arts and sciences during this period has excited the admiration of posterity, and secured them a rank among the distinguished nations of antiquity second only to the Greeks. They had seen their inferiority in these respects to the Greeks, and had been brought to admire and copy their poetry, oratory, and works of art. Much, too, was owing to the comparative tranquillity which they enjoyed during this period, and the protection and encouragement which was afforded to them. The language of the upper classes (*lingua nobilis, classica*) was distinguished from that of the common people (*lingua plebeia, vulgaris*), the latter of which is only preserved to us in a few phrases in the comic poets. There was also a *lingua urbana* distinct from the *lingua rustica*, as well as a *lingua provincialis*. After the death of Augustus, the language became more and more corrupt, by the introduction of foreign terms from almost every language with which the people came in contact. The degeneracy became more rapid after the time of the Pliny, as there was no writer capable of moderating it. The successive incursions of the Goths, Vandals, and Lombards flooded it with





foreign words and forms. That the Latin language did not share the destruction of the Roman empire was due to Christianity, which had adopted it; and though it at first deteriorated it, it afterwards secured its perpetuity. It remained, in Europe, the ecclesiastical, political, and official language, long after it had ceased to be spoken, except in cloisters. At the revival of letters, Latin was the common language of the savants of Europe, and was written by many of them with great ease and purity. Bacon wrote the principal of his works in Latin, believing that it was destined to be the universal and common language of learned men. The Reformation was a great blow to the general use of the Latin language, by depriving it of its prestige and authority, and exalting the vernacular languages above it. Still, however, even in the present day, many learned works are produced in Latin, particularly in Germany and Holland. The Romans being chiefly devoted to war, politics, and legislation, for five centuries were possessed of no literature worthy of the name. From the first it was an imitation of that of Greece, and hence its general characteristics are correctness and precision, with little of the buoyant vigour and various colouring of original genius. Even in its most cultivated period, the poets seem to have had little conception of originality, except as the importation of a new style from Greece. It was not till after the Romans had conquered Magna Græcia and Sicily, and had thus become intimately acquainted with Greek literature, that they began to turn their attention to that subject. Their first poet was Livius Andronicus, a Greek taken at the capture of Tarentum, and who produced Latin tragedies and comedies, translated from and modelled after the Greek. The poet Ennius (B.C. 239—169) was regarded by the Romans as the father of their poetry. He wrote tragedies, satirical and didactic poems, and the "Annales," an epic on Roman history, for which he was the first to use the Latin hexameter. Distinguished as tragic poets about this time, were Pacuvius, the nephew of Ennius, and his contemporary Attius. Next follows the comic poet Plautus, whose plays, though rather of a low and coarse nature, abound in genuine touches of wit and humour, and were much admired. Under Terence (195—159) Latin comedy rose to its highest, though not to Attic excellence. His comedies are all translated or adapted from Greek sources, chiefly Menander, and are distinguished for the elegance and purity of their style. He sought to delineate the pathetic as well as the ridiculous features of daily life; and though inferior to Plautus in native vigour, he surpassed him in constructive talent and depth of feeling. Nearly contemporary with him were Novius and Pomponius, authors of popular farces; Cæcilius Statius and Afranius, who introduced Roman instead of Greek manners upon the stage. Lucilius (148—103), a patrician by birth, gave to literature the advantage of his rank as well as genius, and was regarded by the Romans as the father of satire, a style of poetry in which he eminently distinguished himself. The Romans, after this period, had no distinguished dramatic writers; their pieces were mostly translations or imitations of Greek works. The later tragic writers of the Augustan age, Asinius, Pollio, Varius with his Thyestes, and Ovid with his Medea, are praised, but they were never very popular. The ten tragedies which are ascribed to Seneca were never acted, and are too bombastic and rhetorical to please cultivated minds. The first rude annalists of Rome were Q. Fabius Pictor and L. Cincius Alimentus, who were succeeded by the elder Cato (234—149), author of the "Origines" of Rome, a work now lost. The last historian of importance in the pre-Augustan period of Roman literature, was L. Cassius Hemina, who wrote five or six books of "Roman Annals," fragments of which are still extant. Pre-eminent among the numerous other authors of this period were L. Cælius, Antipater, Cn. Gellius, Bablius, Sempronius, Asellio, C. Junius, Piso Frugi, Scaurus, Rufus, Catulus, Sylla, Valerius Antias. Distinguished among the orators who flourished before the time of Cicero were Sulpicius, the two Gracchi,—whose speeches were stated to have been learned and majestic,—Catulus, Crassus, Hortensius, and Antonius. Jurisprudence, as well as oratory, was suited to the genius of the Roman people;

and among those most distinguished for their legal acquirements were the elder Cato, the Servolas, and Manilius. The Stoical philosophy had many partisans, the first famous disciples of which being Panætius and Rutilius Rufus. The golden age of Latin literature is usually reckoned from the death of Sylla to that of Augustus (B.C. 78—A.D. 14). It was then that the influence of Greek learning and Greek philosophy came most to be felt. A knowledge of Greek was an essential part of a liberal education, and it was usual for the young men of means to finish their education by a residence of some time in Greece. In this period was Virgil (B.C. 70—19), one of the greatest epic poets that ever lived, and whose great work the "Æneid," has ever been admired for its elegance and taste not less than for its genius. It represents the landing of Æneas and the foundation of his dominion in Latium; and although the poet did not live to give it his finishing touches, and desired it to be destroyed, yet it will ever remain a noble monument of his great genius. More perfect of its kind is his "Georgics," a treatise of agriculture in the form of a didactic poem, and exhibiting his views and feelings respecting human life. His earlier Eclogues or pastorals manifest the same love for nature and a country life. Few writers have exerted so wide an influence upon æsthetic culture as Virgil. His contemporary and life-long friend was Horace (B.C. 65—8), whose odes and epodes are models of skill and taste, and who introduced a number of new lyric metres. This poet is also eminent in satire, a species of writing original with the Romans, and which appears to have had a decided influence on the character of their literature. The works of Horace abound with maxims of practical wisdom and happy philosophical apophthegms; so that no classical author of antiquity is more frequently read or quoted from. Ovid (B.C. 43—A.D. 14) in imaginative power is scarcely surpassed by any other Latin poet. He was also possessed of a brilliant sportive wit, and great power of versification. Less generally and highly esteemed are Lucretius, the sublimest of didactic poets, whose "De Natura Rerum" served at once to illustrate the atomic theory of the world and the Epicurean system of morals, and to polish and enrich the Latin language; Catullus (born 87 B.C.), who introduced lyric poetry into the literature of Rome, and whose elegies and epigrams are admired for their simplicity, beauty, and unaffected imagery; Tibullus, who gave to the elegy its highest degree of excellence; and his successor Propertius (born about B.C. 51), an amatory poet, who is also learned, awkward, and obscure. The place of the legitimate drama was now occupied by the mimo or melodramatic farce, in which the characters of common life were represented with the help of gesticulation and with low jests, for the entertainment of the populace. It was invented by Mattius, and acquired its greatest celebrity from Labernius and Publius Syrus, the latter of whom interspersed it with moral sentiments, expressed with great felicity; but it never reached the standard of an elevated class of poetry. The greatest master of Latin prose of this or any other period was Cicero, who, in fact, has given name to the purest Latin composition. He flourished B.C. 106—43, and distinguished himself as an orator so as to dispute the first place with Demosthenes. The orations of Cicero are remarkable for their copiousness and luxuriance of expression. He is master at once of the impassioned, the sublime, the pathetic, the grave, and the simple style, and has the art of adapting to every subject the appropriate form and the fitting hue of expression. He also rendered most important service to the intellectual cultivation of his countrymen by the introduction to them of the more elevated moral philosophy of the Greeks. Originally a follower of Plato, he often adopted the ethical lessons of the Stoics, or, when their excessive austerities repelled him, embraced those of Aristotle. The doctrines of Epicurus he rejected as injurious to men, and especially in their relation as citizens. His works also afford much information in regard to the history of ancient philosophy; as, for example, his Tusculan questions. Poetry, also, history, and the epistolary style, he touched only to adorn. His letters are admitted to be the most perfect specimens which the literature of Greece or Rome can produce. Next to him, as orators were the accomplished Hortensius, the obscure Cælius Rufus, the cold, cautious, and accurate Lucinius Calvus, and especially Julius Cæsar (B.C. 100—44), whom his contemporaries believed to be capable of rivalling even Cicero in eloquence. Pollio, Corvinus, and Cassius Severus, were also distinguished in this walk. Cæsar was Cicero's rival, also, in improving and refining the language. His "Commentaries on the Gallican War" are but little inferior to Herodotus in charm of diction. The historian next to him, in respect of style, is Cornelius Nepos, whose "Lives" are models of style in biographical composition. Sallust (B.C. 86—34) approximated to his model Thucydides in richness and vigour of thought, and terseness of expression, though he marred his clear conception by an affectation of antiquated forms. His accounts of the Catilinarian conspiracy and the Jugurthine war are carefully prepared and ambitious works, always profound, though often partisan in their judgments. Livy (B.C. 59—A.D. 17), pre-eminently the general historian of Rome, excels in pictorial effect, surpassing even the Greeks in the liveliness and richness of his colouring, and the animation and spirit of his delineations. The work, however, is more picturesque than accurate, and marked more by patriotism than candour. His style commands the admiration of classical scholars; but circumstantial truth must be sought elsewhere. In what is termed the Silver age of Latin literature, from the death of Augustus to the accession of Hadrian (A.D. 14—117), everything is changed. Liberty had disappeared, and talent was made subservient to flattery, or to bombast and an affectation of wit. Every subject was rendered comic; prose and poetry were confounded, and new grotesque forms of expression were invented. The purity of the language was no longer maintained, and it became corrupted by barbarisms. Seneca, who, with great talents, was ambitious of shining by the brilliancy of his wit, the structure of his antitheses, and the general terseness and point of his style, contributed not a little to the degeneracy of the period. His various prose writings abound in moral sentences and maxims, but reveal the pride of a Stoic in a style full of literary affectation. Eloquence was cultivated by Julius Florus, by Domitius, and by Julius Africanus. Plays were produced by Pomponius Secundus, Varginius, and Martinus. The epic degenerated from poetry to history; the "Pharsalia" of Lucan, the greatest effort in this line, being rather declamatory than poetical. Valerius Flaccus, author of the "Argonautics," a work neither original nor brilliant, introduced an affectation of learned display. To this period belong Silius Italicus, author of "Punics;" Statius, author of "Thebais;" and Manilius, author of "Astronomica." In satire this period is more distinguished. Persius and Juvenal are the chief masters of this art,—the latter disputing the palm of superiority with Horace. Martial first gave to the epigram its present meaning, as a short poem, in which all the thoughts and expressions converge to a striking and unexpected conclusion. His twelve books of epigrams exhibit a singular flow of wit and fertility of imagination, and afford much information regarding the social habits of the people. In prose, Paterculus ranks among the best authors of this period. His work on Roman history is elegant and elaborate, and is conceived in an impartial spirit, though it manifests an opposition to republicanism, and a tendency in favour of the empire. The greatest of Roman historians, however, is Tacitus, who, to great powers for observation, unites intellectual strength; and whose experience of men and affairs furnishes the most sombre colours and sagacious maxims. He displays great acuteness in penetrating into the inner nature of men, exposing their hidden motives of action, their cunning, servility, immorality. With eloquence derived from indignation, and with a skill in graphic representation, such as only Thucydides and Sallust have given us examples of, he wrote a narrative of his time. Not to be compared with him, are Suetonius, the avid biographer of the emperors; the florid panegyrist Florus; Valerius Maximus, a collector of anecdotes; and Quintus Curtius, the Roman historian of Alexander the Great. Quintilian (born A.D. 40), in his great work "Institutiones Oratoriæ," displays a highly cultivated mind and a polished and graceful style. He

attempts to restore eloquence to its former position, and lays down rules for the training of the orator. The elder Pliny displayed a great love for the study of nature, and drew attention to the physical sciences, which previous to his time had been entirely neglected. The letters of the younger Pliny are of much value for the light they throw upon the period in which they were written; but many of them are ridiculously studied and elegant. The Brazen age, from the accession of Hadrian to the fall of the Western empire (A.D. 117—476), exhibits not only the decline of taste, but the corruption of the language. The intercourse of the Romans with barbarians became much more extended. Under the Antonines, especially, the language became overlaid with exotic words, phrases, and constructions. Literature was also cultivated at Byzantium, Alexandria, Milan, and the principal cities of Gaul, as well as at Rome. As the literature declined, and the language became corrupt, the number of grammarians increased; for classical Latin had become almost a dead language, to be learned only from the ancient models. Ausonius, a grammarian, rhetorician, and poet, wrote idyls and epigrams marked by learning and wit; Claudian wrote epical sketches; Aurelius Prudentius, the greatest of primitive Christian poets, wrote a great variety of hymns and lyrical and heroic pieces, portions of which are still employed in the services of the Catholic church; St. Ambrose wrote Latin poems, remarkable for their austere simplicity and sublimity. The decline of prose appears in the "Historia Augusta," a collection of imperial biographies from Hadrian to Diocletian. The summaries of Aurelius Victor, Eutropius, and Sextus Rufus, succeeded. Almost the last noteworthy Roman history was that of Ammianus Marcellinus, extending to A.D. 378. The grammarian Cornelius Fronto, and the rhetoricians Apuleius and Eunodius, are the best of their class. The "Golden Ass" of Apuleius is almost the only example in Latin literature of anything like a prose novel or romance. The church fathers, as Tertullian, Minucius Felix, St. Cyprian, Arnobius, Lactantius, St. Hilary, St. Ambrose, and St. Jerome, are generally more remarkable for theological vigour than literary grace. In the reign of Justinian was drawn up that admirable system of laws which bears the imperial name. (*See* JUSTINIAN'S CODE.) Aulus Gellius, Nonius Marcellus, Festus Donatus, Macrobius, Servius, Priscianus, Cesariensis, and Isidore of Seville, continued to cherish its traditions by criticisms, analyses, and such like. Maternus wrote on mathematics, Frontinus and Vegetius on strategetics, Palladius on rural economy, Solinus Publius Victor and Vibius Sequester on geography and cosmography.—*Ref.* Dunlop's *History of Roman Literature*, 3 vols., 1828; Bähr's *Geschichte der Rom. Literatur*, 2 vols., 1844-45; Bernhardt's *Grundriss der Rom. Literatur*, 1850; Eschenburg's *Classical Literature*, 1844; Browne's *History of Roman Classical Literature*, 1853; *The New American Cyclopædia*, 1860.

LATISSIMUS DORSI, *lăt-is'-se-mus dor'-si* (Lat. *latissimus*, broadest, and *dorsum*, the back), in Anat., is the name of a broad flat muscle of the back, which serves to move the humerus downward and backwards, and to turn it upon its axis.

LATITUDE AND LONGITUDE, *lăt'-e-tude* (Lat. *latitudo*, breadth; *longitudo*, length).—Latitude and longitude are the means by which the exact position of any place on the earth's surface, or any star in the field of the heavens, may be determined and described; but latitude and longitude in geography are not identical with latitude and longitude in astronomy, and the terms will require a separate definition, according to their acceptation in each science. In Geog., the position of any place on the earth's surface is indicated by the intersection of two imaginary circles at right angles to each other, one of which is a great circle passing through the place itself and the poles perpendicularly to the plane of the equator; and the other, the equator itself, if the place happen to be situated on that line, or a circle, the plane of which passes through the place in question in a direction parallel to the plane of the equator. Of these circles, the former shows the degree of longitude on which the place is situated, and the latter the degree or parallel of latitude. Longitude is measured along the equator, E. and W. of the meridian of Greenwich, from 0° to 180°, while latitude is measured N. and S. of the equator, from the equator to the poles, on any great circle that is perpendicular to the plane of the equator, from 0° to 90°. Longitude may also be described, in other words, as the angle contained between the plane of the meridian of any place and the plane of the meridian of Greenwich, which intersect in the earth's axis; and latitude as the angle that is subtended at the earth's centre by the arc of the meridian, or great circle, which is intercepted between the position of any place on the earth's surface and the equator. This is not strictly true, however, as far as latitude is concerned; as the earth is a spheroid in shape, and not an exact sphere (*see* EARTH, DEGREE, GEODESY); but, in the construction of maps and globes, and for all practical purposes of an ordinary nature, the difference is not appreciable; and as this angle, for any position on the earth's surface, would be equal to the altitude of the pole of the heavens at that place, the latitude of any place is usually determined by ascertaining the altitude of the pole at the place in question, wherever it may happen to be. In Astron., the latitude of any star is its angular distance from the ecliptic measured on a great circle, the plane of which passes through the star and the poles of the heavens; or it may be defined as the arc of this great circle that is intercepted between the position of the star and the ecliptic, while its longitude is the angle made by the inclination of the planes of two great circles which intersect in the axis of the heavens, one of which passes through the star and the poles of the heavens, and the other through the poles of the heavens and the intersection of the equator and the ecliptic at the vernal equinox; or, in other words, the arc of the ecliptic intercepted between the planes that pass through the star and the first point of Aries, and the poles of the heavens, at right angles to the plane of the ecliptic. In astronomy, therefore, the longitude of heavenly bodies is measured along the ecliptic instead of along the equator, as in geography; and celestial longitude is reckoned all round the ecliptic eastward in one direction, from 0°, or the first point of Aries, to 360°. It should be said that, in astronomical writings and calculations, the longitude of places on the earth's surface is reckoned and noted in the same manner, and not E. and W. of Greenwich, as in geography. The positions of the heavenly bodies are not now determined by latitude and longitude, but by their right ascension and declination. (*See* ASCENSION, RIGHT; DECLINATION.) The determination of latitude and longitude of any place on the earth's surface is effected by calculations based on observations of the positions of the heavenly bodies, with accurate instruments; the latitude of any place being, as it has been observed, the altitude of the pole of the heavens at that place, and the longitude, the difference between Greenwich time and the time at the place itself at the same instant. The methods of determining the latitude of a place are various. The following is generally adopted at fixed observatories, especially in Europe, where the pole is situated high in the heavens, and circumpolar stars are far above the horizon, and it is effected by means of accurate transit, mural, or altitude and azimuth circles. The precise situation of the pole is found by observing the altitudes of stars which are close to the pole, and describe small circles round it, at their culminating points above the pole and below it. When these observations have been duly corrected, the position of the pole, which lies midway between the culminations of the star above and below it, may be determined, and its altitude, and consequently the latitude of the place, may be found. This is a method by which the latitude of a place is determined independently, that is to say, without reference to known data of the positions of stars which have been ascertained elsewhere. In determining latitudes at or near the equator, the altitudes of the sun must be observed, both before and after either the summer or winter solstice, from which the altitude of the point midway between them, which lies in the equator, may be deduced, and the latitude determined. There are other methods by which the latitude of a place is determined differentially, as it is termed, in which the use of data of the polar distances of stars ascertained at other observatories is involved,

and the polar distance of the zenith, which corresponds to the co-latitude of the place, is ascertained from observations of the meridian zenith distances of stars which pass near the zenith, and of which the polar distances are known. This is effected by means of the zenith sector, and there are other methods of obtaining the latitude differentially, in which the transit instrument, the repeating circle, and Troughton's reflecting circle, are used; but it is beyond the compass of the present work to describe the *modus operandi* in each case *seriatim*. At sea the latitude is sometimes obtained by taking the altitude of the sun above the visible horizon when on the meridian, by means of a sextant, and sometimes recourse is had to observations of the moon, the planets, and some of the more brilliant stars, when on the meridian. The method employed will be found in detail in any work on navigation. With regard to the determination of the longitude of any place on the earth's surface, as it may be known as soon as the difference between Greenwich time and the time at the place in question has been ascertained, it is manifest that these two points must be known before its longitude can be determined. The time at Greenwich may be known by reference to the chronometers, which are always carried on board ship for this purpose, and by persons who are engaged in expeditions for the advancement of the sciences of astronomy and geography, the chronometers being accurately set according to Greenwich time prior to leaving England; but Greenwich time may also be ascertained astronomically from the observation of such phenomena as the eclipses of Jupiter's satellites (*see* JUPITER), solar eclipses, and the occultations of fixed stars by the moon, as tables of these phenomena, including the occultations by the moon of all fixed stars to the sixth degree of magnitude, are noted in the "Nautical Almanac," according to the time at which they would take place at Greenwich. As soon as the commencement of any of the phenomena that have been mentioned is remarked, Greenwich time is known on reference to the almanac, and may be preserved by setting a watch to the hour indicated. Another method of finding the longitude of a place consists in taking observations of the transit of the moon and certain stars, which happen to be near her parallel of declination, across the meridian with a transit instrument. The stars which should be observed with the moon, to afford the means of correcting the moon's transit, are noted in the "Nautical Almanac," as well as the variations in the right ascension of the moon for an hour of longitude. The right ascension of the moon having been ascertained, which will be less than its right ascension at Greenwich if the place be east of Greenwich, and greater if west, the difference between the right ascension at each place must be obtained, and the result divided by the variation in an hour of longitude, which gives the longitude of the place in hours and decimal parts of an hour. At sea, where a transit instrument cannot be used, the longitude is found by taking lunar observations,—that is to say, by observing the distance of the moon from the sun, or any of the planets or fixed stars, by means of a sextant. These distances are calculated and registered in the "Nautical Almanac" for every successive interval of three hours, according to Greenwich time, by which the observer is enabled to determine the Greenwich time that corresponds to the time of observation at the place. The method of taking a lunar observation will be found in any work on navigation. The computation of lunar distances is readily effected by the aid of tables of the lunar motions, —those known as Thomson's Tables being recommended as convenient and sufficiently accurate. The time at the place of which the longitude is required is ascertained by means of a transit instrument (*see* TRANSIT INSTRUMENT), or from observations of the altitude or zenith distance of the sun or any of the planets or stars when not on the meridian, from which the hour angle must be determined. If the altitude of the sun has been taken, the hour angle gives the apparent time after 12 A.M., if the sun be to the west of the meridian, and before 12 A.M. if it be to the east; and this apparent time must be reduced to mean time by the aid of tables given in the "Nautical Almanac." When a planet or star is the object observed, the hour angle must be added to its right ascension when it is to the west of the meridian, and subtracted from it when it is to the east. This gives the sidereal time, which can be readily reduced to mean solar time. Greenwich time, and the time at the place of which the longitude is required, having been ascertained, the difference between the two, when reduced to degrees, minutes, and seconds, will give the longitude of the place in question, and the place will be known to be east or west of Greenwich, according as the time there is later or earlier than Greenwich time. It is manifestly impossible to do more in the present article than give a brief statement of the principles on which the determination of the latitude and longitude at any part of the earth's surface depends, and a bare enumeration of some of the methods that are used. The details of the various operations and calculations employed in practice may be gathered, as it has been already said, from any work on the science of navigation as well as from works on astronomy and geodesy.—Ref. *Eng. Cyclop.*

LATITUDINARIAN, *lit-e-tu-din-ai'-re-an* (Fr. *latitudinaire*), among divines is applied to one who is regarded as holding loosely by denominational distinctions, and as believing that heaven is open to persons of very different denominations. More particularly the term was applied to certain theologians of the English church, in the latter part of the seventeenth century. They endeavoured to allay the contests that prevailed between the more violent Episcopalians on the one hand, and the more rigid Presbyterians and Independents on the other, with respect to the forms of church government and public worship, and also between the Arminians and Calvinists, with respect to certain religious tenets. Many of them were men zealously attached to the forms of government and worship of the established church, but they did not consider these as absolutely necessary to the constitution of a Christian church, and therefore held that those who followed other forms were not to be excluded from their communion, or to forfeit the title of brethren. They reduced the fundamental doctrines of Christianity to a few points, and thus showed that the disputed subjects were matters of indifference with respect to salvation. The chief leaders were Hales and Chillingworth; but More, Cudworth, Gale, Whitchcot, Wilkins, and Tillotson, were also among the number. They met with much opposition, and were branded as atheists and deists by some, and as Socinians by others; but upon the restoration of Charles II. they were raised to the first dignities in the church, and held in general esteem.

LATTER-DAY SAINTS. (*See* MORMONS.)

LATTICE BRIDGE. (*See* RAILWAY.)

LATUS RECTUM. (*See* ELLIPSE, HYPERBOLA, PARABOLA.)

LAUDANUM. (*See* OPIUM.)

LAUDS, *lawds* (Lat. *laus*, praise), in the monastic service, follow next after the nocturns, and consist principally of psalms, hymns, &c.; whence their name. In the reformed Church of England the lauds are now merged in the matins.

LAUGHING-GAS, protoxide of nitrogen; so called from its effects upon the human system. (*See* NITROGEN, PROTOXIDE OF.)

LAUGHTER, *laf'-ter* (Ang.-Sax.), a well-known action, or emotion, peculiar to the human species. It is occasioned physically by a grateful titillation, rising suddenly and irresistibly, and manifests itself principally in the face, but extending also to the throat, thorax, and abdomen. As to the mental cause of laughter, much difference of opinion exists among philosophers. According to Aristotle, "the ridiculous implies something deformed, and consists in those smaller faults which are neither painful nor pernicious, but unbecoming." He is speaking, however, here only of the ridiculous in manners. Cicero says that the seat of laughter "lies in a certain offensiveness and deformity, for those sayings are laughed at, solely or chiefly, which point out and designate something offensively in an inoffensive manner." Hobbes defines laughter to be "a sudden glory arising from a sudden conception of some eminency in ourselves by comparison with the infirmity of others or with our own formerly." Dr. Campbell controverts this opinion, and maintains that laughter "doth not result from the contempt,

but solely from the perception of oddity, with which the passion is occasionally, not necessarily, combined;" as is manifest from the following considerations:—1. that "contempt may be raised in a very high degree, both suddenly and unexpectedly, without producing the least tendency to laugh;" and, 2. that "laughter may be, and often is, produced by the perception of incongruous association, where there is no contempt." The proper object of laughter is a curious and unexpected affinity, rightly expressed by the word oddity. Kant makes the source of laughter to be a sudden conversion into nothing of a long-raised and highly-wrought expectation. In oratory, the power of exciting laughter is often of the greatest advantage, and sometimes more powerful than the strongest arguments. It is resorted to either merely to divert by that grateful titillation which it excites, or to influence the opinions and purposes of the hearers.—*Ref.* Campbell's *Philosophy of Rhetoric*; Hutcheson's *Essay on Laughter*; Beattie's *Essay on Laughter and Ludicrous Composition*; Kant's *Kritik der Urtheilskraft*.

LAUNCH, *launch* (Ang.-Sax.), a wide flat-bottomed boat, strongly resembling the long-boat (which it has almost superseded); but is longer, and carries a greater number of oars, and is, therefore, better fitted for going up narrow and shallow rivers.

LAUNCHING. (*See* SHIP-BUILDING.)

LAURA, *law'-ra*, is a name given to a collection of little cells, at some distance from each other, in which the hermits of ancient times lived together in a wilderness. These hermits did not live in community, and thus differed from monks in a monastery; but each provided for himself in his distinct cell. The most celebrated lauras mentioned in history were in Palestine.

LAURACEÆ, *law-ray'-se-e* (Lat. *laurus*, a laurel), in Bot., the Laurel fam., a nat. ord. of *Dicotyledones*, sub-class *Monochlamydeæ*. Trees or shrubs with exstipulate leaves, usually alternate and dotted. Flowers generally perfect, sometimes imperfectly unisexual; calyx inferior, deeply 4—6-cleft, coloured in two whorls; stamens perigynous, definite; some always sterile; ovary superior, with 1 or 2 pendulous ovules. Fruit a berry or a drupe. Seeds exalbuminous; embryo with large cotyledons and a superior radicle. The order comprises 54 genera and 450 species. They are chiefly natives of tropical regions; but a few occur in North America, and one (*Laurus nobilis*) in Europe. The possession of aromatic properties, which are due to the presence of volatile oils, characterizes nearly all the plants of this order. Several have edible fruits, and many yield valuable timber. Among the useful products of this order are *cinnamon*, *cassia*, *camphor*, *sassafras*, and *bibiru bark*. (*See* LAURUS.)

LAUREATE, POET, *law'-re-at*, is an officer of the royal household, in the lord chamberlain's department. The appellation is derived from the Latin *laurus*, a laurel, from the ancient custom of crowning the successful poets in the musical contests with a wreath of laurel. This custom prevailed among the ancient Greeks, and was also adopted by the Romans. In the 13th century it was renewed by the Italians, and the crowning of Petrarch, at Rome, was solemnized with great ceremony in 1341. The German emperors also conferred this title on their court poet. The earliest mention of a poet laureate, under that title, occurs in the reign of Edward IV., when John Kay received the appointment, though this is believed to be the same office which was held as early as the reign of Henry III., by Henry de Avranches, who is styled "king's versifier," and was paid a hundred shillings a year by way of stipend. Poet laureate, however, was also an academical title in England, conferred by the universities for proficiency in grammar, which included rhetoric and versification. The poet Skelton was thus laureated, and was among the last that received that honour. He was likewise laureate to Henry VIII. Ben Jonson was court poet to James I., but does not seem to have had the title of laureate formally granted him. The first patent of this office was granted in the reign of Charles I. (1630), and assigns to the laureate a salary of £100 a year, and a tierce of Canary wine out of the royal cellars. Dryden was appointed laureate to Charles II., and afterwards to James II. The successors of Dryden have been Nahum Tate, Nicholas Rowe, Laurence Eusden, Colley Cibber, William White, Thomas Warton, Henry James Pye, Thomas Southey (who consented to a commutation of his wine for £27), William Wordsworth (with a salary of £300), and Alfred Tennyson.

LAUREL. (*See* LAURUS and CERASUS.)

LAURUS, *law'-rus*, in Bot., the typical gen. of the nat. ord. *Lauraceæ*. The species *L. nobilis* is the sweet-bay, or laurel, and probably the *Ezrach*, or green bay-tree of the Bible. It is the classic shrub that furnished the heroes of antiquity with their laurel crowns. The fruit is officinal, under the name of *bay* or *laurel berries*, and reputed to be aromatic, stimulant, and narcotic. By distillation with water, these berries yield the *volatile oil of sweet bay*. A substance called *expressed oil of bays*, or *laurel fat*, is also obtained from the fruits, both fresh and dry, by pressing them after they have been boiled in water. Laurel-leaves have somewhat similar properties to the fruit. They are used in cookery for flavouring. They must not be confounded with the leaves of the poisonous cherry-laurel. (*See* CERASUS.)

LAVA, *lal-va* (Ital.), a general term applied to the mineral substances produced by active volcanoes. When an eruption occurs the lava is expelled in a semi-fluid mass, about the consistence of butter; it soon cools, however, on the exterior surface, while the internal mass remains liquid for a considerable length of time. Lava consists principally of pyroxene, or augite; but various minerals enter into its composition.

LAVANDULA, *lav-an'-du-lă* (Lat.), in Bot., the Lavender, a gen. of the nat. ord. *Labiatæ*. The flowering heads of *L. vera*, the well-known lavender, yield by distillation with water *English oil of lavender*, which is largely employed in perfumery; and also in medicine, as a stimulant, stomachic, and carminative. The flowering heads of *L. spica* or *latifolia*, French lavender, yield *oil of spike*, or *foreign oil of lavender*, which has a much less agreeable odour than the English oil, and is not employed medicinally. It is used principally by painters and varnish-makers, and to adulterate the English oil. *L. Stœchas* also yields by distillation an essential oil, which is commonly distinguished as *true oil of spike*.

LAVENDER. (*See* LAVANDULA.)

LAVER. (*See* PORPHYRA.)

LAW, *law* (Lat. *lex*; from *lego*, I gather or collect), in its most general and comprehensive signification, denotes a rule of action, and is applied indiscriminately to all kinds of action, whether animate or inanimate, rational or irrational. Thus we speak of the laws of motion or of gravitation, as well as that of nature and of nations. It is, farther, a rule of action, prescribed by some superior, and which some inferior is bound to obey. In a more restricted sense, it is applied, not to rules of action in general, but of human action or conduct. Laws of human action are divided into divine and human,—the laws of God and the laws of man. The laws of God are either natural or revealed. The natural laws are such as God has implanted in the nature of man; the revealed laws, such as he has revealed to us in the sacred Scriptures. If man were to live in a state of nature, unconnected with other individuals, there would be no occasion for any other laws than those of nature and of revelation. But man was formed for society; and hence the necessity for having another class of laws for his guidance,—the human. These are of various kinds; as the law of nations, civil law, municipal law, &c.

LAW, FICTION OF. (*See* FICTION OF LAW.)

LAW MERCHANT. (*See* LEX MERCATORIA.)

LAW, MUNICIPAL, or POSITIVE, is the rule by which particular districts, communities, or nations, are governed. Municipal law, strictly speaking, denotes only the laws of a single *municipium*, or free town, yet, in common language, it is applied to the laws of a state or nation. It is defined to be "a rule of civil conduct, prescribed by the supreme power in a state." The sovereign power is the power of making laws, which is sometimes vested in an aggregate assembly, consisting of all the free members of a community, when it is called a democracy; sometimes in a council composed of select members, when it is styled an aristocracy; and sometimes it is in the hands of a single individual, when it is termed a monarchy. All

other species of government are either corruptions of, or reducible to, these three. It is in the power of the legislature at any time to alter the law. The proper function of the executive is to administer the law, not to make it; to act upon its true construction, not to fix it. The legislative power of a government is generally employed in mere acts of amendment and supplement. Its office is not so much to create systems of laws as to supply defects and cure mischiefs in systems already existing. Frequent experiments have shown that laws at variance with the manners and religious views of a people cannot be forced upon them, however well meant and however beneficial may have been their influence upon other people; and that by means of laws a legislator can no more elevate his countrymen to a higher degree of refinement, without passing through the intervening steps, than he can reduce them again to a condition above which they have risen in the natural course of events. The legislation of no country probably ever gave origin to its whole body of laws. In the very formation of society, the principles of natural justice and the obligations of good faith must have been recognized before any common legislature was acknowledged. Wherever we trace positive laws in the early stages of society, they are few, and not of any wide extent. The formation of codes or systems of general law for the government of a people, and adapted to their wants, is a business which takes place only in advanced stages of society. The Institutes, Pandects, and Code of Justinian were made in the latter ages of Roman grandeur, not by instituting a new system, but by embodying the maxims, the rules, and the principles which the ablest jurists had collected in different ages, and from the various lights of reason, experience, and juridical decision. Laws may be divided into declaratory, directory, remedial, and prohibitory or penal. Declaratory laws are such as declare what the law is or shall be. Directory laws are such as prescribe rules of conduct, or limit or enlarge rights, or point out modes of remedy. Remedial laws are those whose object is to redress some private injury or some public inconvenience. Prohibitory and penal laws are those which forbid certain things to be done or omitted, under a penalty or vindicatory sanction. Municipal law is also divided into written and unwritten, or statute and common law. Statute law is the express written will of the legislature, rendered authentic by certain prescribed forms and solemnities. The common law includes those principles, usages, and rules of action applicable to the government and security of person and property, which do not rest for their authority upon any express and positive declaration of the will of the legislature, but which have come into use by gradual adoption, and received from time to time the sanction of the courts of justice, without any legislative act or interference. According to Sir Matthew Hale, the common law of England is "not the product of the wisdom of some one man, or society of men, in any one age; but of the wisdom, counsel, experience, and observation of many ages of wise and observing men." The best evidence of the common law is to be found in the decisions of the courts of justice, and in the treatises and digests of learned men. This distinction between written and unwritten law is of great antiquity, having been in use among the ancient Greeks and Romans, though it does not seem to have been regularly made by the jurists.

LAW OF ENGLAND, THE, is divided into written or statute law, and unwritten or common law. The former of these comprises the statutes, acts, or edicts made by the sovereign, by and with the consent of the lords spiritual and temporal, and the commons in parliament assembled. It is a principle in the English law, that an act of parliament, delivered in clear and intelligible terms, cannot be questioned, or its authority controlled in any court of justice. A statute begins to operate from the time that it receives the royal assent, unless some other time be fixed by the act itself for the purpose. In interpreting statutes, the courts are governed by former adjudications, or, in the absence of these, by analogy and general reasoning. The words of a statute are to be taken in their natural, plain, obvious, and ordinary signification and import. It is to be construed, not according to the mere letter, but





the intent and object for which it was made. Remedial statutes are to be construed liberally, and penal more strictly. Statutes are either public or private. A public statute is a universal rule that regards the whole community; private acts are such as concern the particular interest or benefit of certain individuals, or of particular classes of men. Generally speaking, statutes are public, and a private statute may be regarded as an exception to the general rule. Of private acts, some are local, as affecting only particular places; others personal, as confined to particular persons. Formerly the courts of law were not bound to notice judicially private statutes; so that it was necessary, in order to plead one of these, to set it forth particularly; but now, by 13 & 14 Vict. c. 21, every act is to be taken as a public one, and judicially noticed as such, unless the contrary be expressly declared. For convenience of reference, acts are now also divided, in our printed statute-books, into public general acts, local and personal acts declared public, private printed acts, and private acts not printed. The common, or unwritten law (*lex non scripta*), is so called, not as being, strictly speaking, unwritten, but because its original institution and authority are not set down in writing. It is what has been called by Mr. Bentham "judge-made law," the monuments and evidences of which are contained in the records of the several courts of justice, in books of reports and judicial decisions, and in the treatises of learned jurists preserved and handed down to us from the earliest times. It includes, not only general customs, or the common law properly so called, but also the particular customs of certain parts of the kingdom, as well as those particular laws that are, by custom, only observed in certain courts and jurisdictions. The unwritten, or common law, is thus distinguishable into three kinds: —1. General customs, which are the universal rule of the whole kingdom, and form the common law in its stricter and more usual signification. 2. Particular customs, which affect only the inhabitants of particular districts. 3. Certain particular laws which, by custom, are adopted and used by some particular courts of pretty general and extensive jurisdiction. General customs, or common law strictly so called, "is that law by which proceedings and determinations in the ordinary courts of justice are principally guided and directed; this, for the most part, settles the course in which lands descend by inheritance; the manner and form of acquiring and transferring property; the solemnities and obligations of contracts; the rules of expounding wills, deeds, and acts of parliament; the respective remedies of civil injuries; and an infinite number of minuter particulars, which diffuse themselves as extensively as the ordinary distribution of common justice requires." Judicial decisions are the principal and most authoritative evidence that can be given of a general custom. When questions occur which do not happen to be fixed by any known decision, these are disposed of by the judges in the manner that they think most conformable to the received rule in analogous cases; or, if there be none such to guide them, then according to the natural reason of the thing. The judges are the depositaries of the laws,—the living oracles who must decide in all cases of doubt, and who are bound by oath to decide according to the law of the land. The second branch of the unwritten laws of England are particular customs or laws which affect only the inhabitants of particular districts, and which are commonly distinguished by the word "customs" *per se*. A custom, therefore, so far as it extends, supersedes the general law. Such is the custom of gavelkind in Kent, which ordains that not the eldest son only, but all the sons alike, shall succeed to the father's inheritance; and the custom of borough-English, which prevails in certain boroughs, that the youngest son shall inherit the estate in preference to all his elder brothers. Such, also, are the special and particular customs of manors, of which every one has more or less, and which bind all the copyhold and customary tenants who hold of the said manors. A custom, in order to be legal and binding, "must have been used so long that the memory of man runneth not to the contrary." Now, legal memory dates from the first year of Richard I.; so that if a custom can be shown to have commenced since that date, it is void

as a custom. It is not necessary, however, to prove its existence for so long a time, the presumption being, in want of evidence to the contrary, that it has prevailed during the whole of that period. Farther, by 2 & 3 Will. IV. c. 71, it is declared that customary and prescriptive claims of rights to be exercised over the lands of other persons (as the rights of common way, or the like) shall be sufficiently established by an uninterrupted enjoyment, in some cases for thirty, in others for twenty years. A custom must have been continued, because any interruption would give rise to a new beginning, which would be within time of memory, and thus invalid. It must have been peaceable and acquiesced in,—not subject to contention and dispute; for a custom derives its force and authority from common consent; but where it has been disputed, this consent is wanting. It must also be reasonable; or rather, it must not be unreasonable. Farther, customs ought to be certain, and must be consistent with each other. It is also a rule, that customs in derogation of the common law must be construed strictly; and no custom can prevail against an express act of parliament. Besides local customs, properly so called, there are, in different parts of the country, certain *usages* existing, which, unless excluded expressly or impliedly, by agreement between the parties, regulate to some extent the relation of landlord and tenant, or affect the reciprocal rights of incoming and outgoing tenants, and are usually known as "customs of the country." Similar to these are the "usages of trade" which exist in certain places; and, in order to be effective, must be proved by apt evidence. The third branch of unwritten, or common law, comprises those laws which are in use only in certain particular courts and jurisdictions. These are the civil and canon laws. The reason why these are classed under unwritten law is that, though contained in codes, institutions, decretals, &c., they have their force and efficacy in this country, not on that account, but because they have been admitted and received by immemorial usage and custom in some particular cases and in some particular courts. By civil law, absolutely taken, is generally understood the civil or municipal law of the Roman empire, as comprised in the Institutes, Code, and Digests of the emperor Justinian, and the Novel Constitutions of himself and some of his successors. (*See* CIVIL LAW, JUSTINIAN'S CODE.) The canon law is a body of Roman ecclesiastical law relative to such matters as that church either had, or pretended to have, the proper jurisdiction over. (*See* CANON LAW, DECRETALS.) There is another branch of unwritten law to which no reference has yet been made, but which has long formed part of the general system, and constitutes one of its principal divisions. This is equity, which is distinct from common law, strictly so called. (*See* EQUITY.) The division adopted by H. Stephen in his "Commentaries on the Laws of England," differs, in some respects, from that of Blackstone. The first great division of all municipal law is into rights and wrongs; the liberties and advantages secured to subjects on the one hand, and the wrong done by violations of them on the other. Rights he divides into—1. Personal rights, or such as regard a man's own person; 2. rights of property, such as regard his dominion over the external and sensible things by which he is surrounded, being (*a*) as to things real, (*b*) as to things personal; 3. rights in private relations, as (*a*) between master and servant, (*b*) husband and wife, (*c*) parent and child, (*d*) guardian and ward; 4. public rights, as regards one's social condition as a member of the community, being (*a*) as to the civil government, (*b*) as to the church, (*c*) as to the social economy of the realm. Under each of the divisions of rights are included the converse or reciprocal consideration of duties. Wrongs are divided into civil injuries and crimes; the former when the injury done is to a particular individual, the latter when to the public at large. The object of a civil action is the redress of the plaintiff by conferring on him the right or compensation for the violation of a right which he claims from the defendant. The object of a criminal prosecution is to inflict punishment on the defendant for the breach of a legal duty which is imputed to him. Criminal law is not identical with penal law; for an act or omission may be liable to legal punishment in consequence of





an action instituted by a private person. *Criminal Law.*—A crime or misdemeanour is an act committed or omitted, in violation of a public law either forbidding or commanding it. Crime and misdemeanour are, strictly speaking, synonymous terms, though in common usage the former is applied to greater offences, the latter to such as are of less consequence. All crimes ought to be estimated merely according to the mischief which they produce in civil society; for human laws ought only to concern themselves with social and relative duties, being intended only to regulate the conduct of man, considered under various relations as a member of civil society. Hence, private vices, or breaches of mere absolute duties, which man is bound to perform considered only as an individual, cannot be the proper object of any municipal law, any farther than their evil example or other pernicious effects may be prejudicial to the community. There are, however, some misdemeanours which are punished by the municipal law, that have in themselves nothing criminal, but are made unlawful by the positive constitutions of the state, for public convenience; as poaching, &c. The offences which are either directly, or by consequence, injurious to civil society, and therefore punishable by the laws of England, are divided into the following general classes:—1. those which are more immediately injurious to God and his holy religion; 2. such as violate and transgress the law of nations; 3. such as more especially affect the sovereign executive power of the state, or the king and his government; 4. such as more directly intringe the rights of the public or commonwealth; and 5. such as derogate from those rights and duties which are owing to particular persons, and in the preservation and vindication of which the community is deeply interested. The several species of offences against God and religion are apostasy, heresy, offences against the established church, blasphemy, swearing and cursing, witchcraft and conjuration, religious impostors, simony, profanation of the Lord's day, drunkenness, lewdness. The principal offences against the law of nations, regarded as such by the municipal laws of England, are of four kinds:—1. Violation of safe-conducts; 2. infringement of the rights of ambassadors; 3. piracy; 4. offences connected with the slave-trade. The crimes more especially affecting the supreme executive power are treason, felonies injurious to the king's prerogative, præmunire, and misprisions, and contempts affecting the king and his government. Of crimes affecting the commonwealth are—1. Offences against public justice; as falsifying records, perjury, bribery, and the like; 2. offences against the public peace; 3. offences against public trade; 4. offences against the public health; and 5. offences against the public police and economy. Of those crimes which in a more particular manner affect and injure private individuals, there are three classes,—against their persons, their habitations, and their property. Of crimes against the persons of private individuals, are homicide, in its several kinds of justifiable, excusable, and felonious; mayhem, or the violent depriving another of the use of such of his members as may render him the less able in fighting, either to defend himself or annoy his adversary; the forcible abduction of an heiress; rape; sodomy, &c.; concealing birth, assaults, batteries, wounding, false imprisonment, kidnapping. The offences against the habitations of individuals are arson and burglary. Against private property the offences are larceny, simple and compound; malicious mischief, and forgery. (These offences will be found more particularly noticed under their several names, in other parts of this work.) Crimes are farther, as regards the mode of proceeding peculiar to each, divisible into two great classes,—1. such as are punishable on indictment or information (the common-law methods of proceeding); and 2. such as are punishable on summary conviction before a justice or justices of the peace, or other authorized persons, without the intervention of a jury, as directed by various acts of parliament. Indictable offences are distributed into four classes; namely, treasons, præmunires, felonies, misdemeanours. Offences punishable on summary conviction are principally such as are against the laws of the excise, or other branches of the revenue; disorderly offences and petty assaults; petty thefts, not amounting to larceny; injuries to property, &c.

## Law of Exception

LAW OF EXCEPTION (Fr. *loi d'exception*), in political affairs, is applied to those extraordinary measures that are sometimes necessary to be adopted when the situation of a state is so critical that the ordinary powers and laws are no longer considered sufficient. These extraordinary measures are various. Among the ancient Romans, for such an emergency the two consuls were invested with greatly augmented power, and if that was not sufficient, a dictator was appointed. In England, the first and most important measure in such a case is the suspension for a limited time of the *Habeas Corpus* act. The government can then take into custody suspected or dangerous persons, without following the regular course of law. (*See* HABEAS CORPUS ACT.) Another regulation of this kind is the alien bill, which invests the government with a power over all foreigners dwelling in England, such as does not constitutionally belong to it, giving the right not only to order them out of the country at pleasure, but also to send them to any part of the continent. Bills of pains and penalties, which are admissible in single cases, constitute also a sort of law of exception. Parliament must have the right to pass such bills, which could not belong to it under a correct division of public power and thus to punish individuals without a judicial sentence. The sentence is passed by a simple majority of voices in each house, like other laws, but it must be sanctioned by both houses of parliament and receive the assent of the king.

LAW OF NATIONS, or INTERNATIONAL LAW, is defined "as consisting of those rules of conduct which reason deduces as consonant to justice from the nature of society existing among independent nations, with such modifications and deviations as may be established by general consent." It depends entirely upon the rules of natural law, or upon mutual compacts, treaties, or leagues between communities, in the construction of which compacts, also, there is no other rule to resort to than the law of nature. International law is a science of modern origin. Among the Romans the *jus gentium* generally signified what is commonly called natural law, viz., the principles of right which are dictated by reason, and are common to all men. The *jus fetiale*, which regulated the ceremonies attending a declaration of war, or the mode of arranging terms of peace, &c., was of this nature; but under the emperors it fell into disuse. The first systematic treatise upon the practice of nations in the conduct of war was the "De Jure et Officiis Bellicis" of Balthasar Ayala, which appeared in 1581. In 1625 appeared at Paris the celebrated treatise "De Jure Belli et Pacis," by Hugo Grotius, who, according to Sir James Mackintosh, "was, without dispute, the first to give a new form to the law of nations, or rather to create a science, of which only rude sketches and undigested materials were scattered over the writings of those that had gone before him." This treatise is not limited to the law of war and of peace, but embraces, also, a view of the general principles which should govern the intercourse of nations. The sources of international law are, according to Grotius, natural law, divine law, customs, and compacts. The law of nations may, therefore, be divided into two great classes or principles, viz., those which arise from natural or universal law and those which are of mere human institution,—the former being the universal, the latter the positive law of nations. The latter is again divisible into the customary law, or that which arises from the silent consent of nations, as evidenced by general usages and customs and habits of intercourse, and the conventional law, which arises from express compacts or treaties between nations. Another division of international law is into the public and private law of nations,—the former regulating the rights, intercourse, and obligations of nations, as such, with each other, the latter regulating the rights and obligations more particularly belonging to their respective subjects; as the rights of the subjects of one state to property situated within the territory of another. States, then, are the proper and immediate subjects of this national law. To every state are awarded the attributes of sovereignty,—independence, and equality with every other. Every nation which governs itself independently of any other nation is deemed a sovereign state. In respect to each other, nations possessed of sovereignty are deemed equals,

## Law of Nations

and are entitled to the same general rights and privileges, whatever may be their relative strength or weakness. Every sovereign state may adopt whatever form of government and whatever political institutions it may prefer, free from the control of any foreign power. It may also form alliances, provide land and sea forces, build fortifications, or employ any other usual means for its defence. It is possessed of exclusive jurisdiction within its own territory over all persons and things therein. It possesses the power, in virtue of its sovereignty, to punish all crimes committed against it, and to enforce all civil obligations due to it from persons subjected to its authority. Among the duties incumbent upon a state are to provide for the safety, peace, and happiness of its own subjects; to redress wrongs; to promote industry and commerce. The basis on which all the rights and duties of nations in their intercourse with each other rests, is the fundamental maxims that they are all moral persons, and that each has a perfect equality in sovereignty and social rights with every other. They are regarded as moral persons possessed of a sense of right and wrong, and responsible to God for a proper discharge of their duties. They are thus bound not only to do justice but to perform the offices of humanity and to render mutual assistance to each other, upon the same principles that individuals are bound to the like duties. Hence it is the duty of every state to cherish, as far as may be, an honest and frank intercourse with all others upon principles of reciprocal benevolence, to abstain from doing injury and wrong to others, and to succour and assist such as may be suffering from famine, pestilence, or other calamity. The rights and duties of nations towards each other may be divided into those which belong to a state of peace and those which belong to a state of war. Among the rights which belong to a state of peace, is that of the exclusive power of every state within its own domain; and consequently no nation can rightfully exercise any jurisdiction or sovereignty within the territories of another, either over persons or things; for, in respect to foreign nations, not only public domain, but all the private property of the subjects of a nation situated within its limits, is deemed the property of the nation. The state's exclusive jurisdiction extends, of course, over all rivers and lakes which are entirely within its own territory. Where a river forms the limit of conterminous states, the presumption is that both have the right of navigation of the whole river, though, according to the Roman law, the middle line of the river forms the strict limit between the two. By the general law of nations, a state's right over the waters which wash its coasts extends to a marine league, or the distance measured by a cannon-shot from the shore at low water. The open ocean is the common territory of all nations. Though a sovereign state concedes no proper force to foreign laws, yet, upon the principle of reciprocity, complete or partial, or upon consideration of equity or international comity, they may be recognized and allowed their effect. But in no case will a state admit the operation of other laws than its own when that would prejudice the rights or interests of its citizens or in any degree infringe its own sovereign authority. The jurisdiction of a state also extends so far as to exempt its sovereign, or his ambassador, or his fleets and armies, from the operation of the laws of a country where they may be. Special conventions may also concede to consuls an authority over their countrymen residing in a foreign state. In civilized countries this authority is usually limited to such civil matters as arise out of disputes between shipmasters and seamen, and to the acts of attesting contracts and protests, and authenticating other mercantile instruments. In criminal affairs, the consul's jurisdiction is limited to the infliction of fines, and in grave cases it is his duty to collect evidence and send the accused to his own country for trial. In barbarous states, consuls often possess complete and exclusive jurisdiction over all matters in which their countrymen are interested. The judicial power of a state punishes all offences committed against its laws, whether by its own subjects or by aliens. If an offender against the laws of one state has escaped within the jurisdiction of another, the former may demand the surrender of the criminal. Murder, rape, arson, perjury, embezzlement by public officers, and the fabrication and circulation

of counterfeit money, are usually enumerated as causes of extradition. In most of the European states, fraudulent bankruptcy is also included. Neither England nor the United States of America admit of the extension of this law to political refugees. Every nation has a right to regulate its own commerce and intercourse with other nations in such a manner as is most conducive to its own prosperity and interests, without depriving others of their just rights. The property held by foreigners within a country according to the laws ought to be protected in the same manner as that of natives. It is a general rule among nations, to regulate the descent, distribution, and alienation of immovable property exclusively by the laws of the country wherein it lies. As to movable property, it is now a common custom, and seems most reasonable and just, to allow foreigners the liberty of disposing of it, by will or otherwise, according to the laws of their own country or of their permanent domicile. In order that the intercourse between nations may be beneficially carried on, public functionaries are necessary to represent a state at foreign courts, to promote its interests and adjust disputes. Hence the right of every nation to send and receive ambassadors and other public ministers. The privilege of continuous residence, however, rests in comity, and is not matter of right. The law regarding ambassadors occupies an important place in the law of nations. (*See* AMBASSADOR.) Treaties and compacts are not generally deemed final till they have received the sanction of their respective governments. Treaties are to be understood and construed according to their obvious meaning and the intention of the contracting parties. Treaties may be dissolved in various ways; as, 1. by the voluntary assent of the parties, or by their express limitation; 2. by a formal dissolution pronounced by one of the parties, acting upon its own responsibility, in the exercise of sovereign authority; 3. by operation of law, as in cases where the contracting parties lose their distinct sovereignty; 4. by implication, as where new treaties are formed between the parties upon the same subject, or where circumstances so change as to make the treaty utterly foreign to the existing state of things. Sovereign states being equal, it follows that there can be no supreme tribunal of appeal. Except, therefore, by submission of their wrongs to arbitration, nations can have no redress for them except by resorting to force. When these differences have arisen, and they cannot be composed by negotiation or other peaceful means, the injured state may employ the forcible measures of retaliation, reprisals, embargo, or the sequestration of the goods of the offending party, or finally, of war. Embargoes or sequestrations are often declared, as preliminary measures to active hostilities. A declaration of war has a retroactive effect, and the property already seized is placed upon the same footing as that taken during the war. Reprisals are general or special. They are general when a state authorizes its subjects to capture the goods and attack the subjects of the offending power wherever they may be found. In modern practice, general reprisals are deemed synonymous with war, and are, indeed, the initiative step to hostilities. When wrong is done to particular individuals in time of peace, and justice is refused, or unreasonably withheld, letters of marque may be issued to the parties, or a public ship commissioned to avenge their wrongs. These are instances of special reprisals. The debt having been satisfied, or the injury compensated for, the surplus must be restored to the government of the subject against whom the right has been exercised. As to the mode of declaring war, it may be formal, as by public declaration, or informal, as by actual hostilities. In modern times, nations are accustomed generally to make a public declaration, and to justify themselves before the world by a manifesto of their reasons. A declaration of war puts the subjects of each of the states in a state of hostility to each other, and all public and private social intercourse are suspended between them. They are not at liberty to engage in trade or commerce, or contract with each other; yet, for good reasons, either power may, by express license, permit a partial intercourse. Forthwith all the enemy's property is, by the law of war, subject to confiscation; thus debts due from one state to the other may be sequestered, or property lying within the territory of the one may be seized by the other as prize of war. But, in the exercise of international comity, these rights are not usually enforced. The obligation of debt is, as it were, suspended during the war, but the right of recovery revives with the peace. The wanton destruction of the enemy's property, or the lives of his subjects, is, in the modern practice of nations, unjustifiable and illegal; and generally all those who are engaged in the merely civil duties of life are exempted from the direct effects of war. Property at sea, however, makes an exception to the usual indulgence shown to the goods of an enemy, and ships and their cargoes upon the ocean are liable, without exception, to seizure and confiscation. In general, each nation restrains the right to make captures and to carry on hostilities to such persons as are in the public employment, or to such as receive a public commission for that purpose. Mere private warfare is seldom allowed. Thus, the usual modes of carrying on war are by armies, navies, and privateers, acting under the immediate authority of the government. Privateering, though admitted by the present law of nations to be a legitimate mode of carrying on war, is held by some statesmen to be contrary to correct and liberal notions of modern warfare. The validity of all claims of prize and capture is determined by the prize courts of the captor's country. These exercise jurisdiction over captured property lying either in their own ports or in those of an ally or neutral. They adjudicate on all captures made by subjects of their sovereign exclusive of the tribunals of all other nations, excepting only in cases where the capture was made upon the territory of a neutral, or by vessels fitted out within a neutral's limits. These cases involve an invasion of the neutral's sovereignty, and must be adjudicated in his court. The decisions of the prize courts are final and conclusive upon the rights of property involved; and if their judgments work injustice to the subjects of other powers, their claims must be adjusted between the sovereigns of their respective states. The belligerent powers may enter into general or special conventions, either for the general conduct of the war or for lightening its rigours. The former are often made at the beginning of a war, and may regard the abstaining from certain modes of warfare, the exchange or redemption of prisoners, passports, safe-conducts, and such-like. Particular conventions are made during war, and concern either truces or partial suspensions of hostilities, or capitulations, that is, surrenders of particular forces or places. The power of concluding a truce is generally implied in the character of every high officer, as a general or admiral. While a truce lasts, all warlike acts and preparations must entirely cease, though it does not hinder acts which are allowable in time of peace. Though no state is bound to take part in the wars in which other states may be engaged, yet no independent state can retain the same complete independence which it enjoys in a time of general peace. Belligerents have a right to insist that neutrals shall conduct themselves with good faith towards both parties, and abstain from all interference in the contest. In matters which do not directly concern the war, a neutral must not refuse to one belligerent what it grants to the other. General trade with belligerents is not interdicted by war; but a neutral must not send his ships to blockaded ports, for that would be interfering directly with the measures of the belligerents. But, to subject a neutral to its operation, the blockade must exist in point of fact; there must be a squadron present, and strong enough to constitute an actual blockade of the port. A neutral must not carry goods contraband of war, as arms, ammunition, or the like; nor bear despatches, nor transport troops to either party, unless, indeed, it be bound to do so by previous stipulations. Contraband property is subject to confiscation by the captor. By a declaration, signed at Paris, by the representatives of the chief European powers, in 1856, the principle that neutral ships may carry enemy's goods has been established. The same declaration sanctions the rule that neutral property, except contraband, is not subject to capture though laden in an enemy's ships. The persons and property of enemies within the jurisdiction of a neutral are deemed inviolable, and entitled to

neutral protection. The right of search exercised by belligerents over the vessels of neutrals for articles contraband of war is strictly confined to merchant ships, and is never extended to ships of war belonging to the state. In the case of a civil war, neutrals are bound to abstain from all active interference, either on the one side or the other; but if it gives rise to the formation of a new government, it is not an act of hostility to recognize it as an independent state, though to do so would be regarded as such, so long as the contest was dubious. When the objects of war are accomplished, peace has to be concluded. Generally a formal treaty of peace is entered into between the two parties, which takes effect from the day on which it is ratified. The treaty puts an end to the war, and puts at rest for ever the debated matters which were the cause of it; conquered lands and fortresses remain with the conqueror, unless otherwise stipulated. The violation of one article is a breaking of the whole treaty, and ends the peace.—*Ref.* Vattel's *Law of Nations;* Wheaton's *Elements of International Law;* Mackintosh's *Discourse on the Study of the Law of Nature and of Nations;* Kent's *Commentaries on American Law.*

Lawn, *lawn* (Fr. *linon*), a fine variety of cambric, formerly made exclusively in France and Flanders. The lawn of Scotland and the north of Ireland has recently come to almost equal the production of the Flemish manufacture.

Lawn, in Gard., signifies a piece of turf or grass, kept smoothly mown, in front of gentlemen's mansions or in pleasure-grounds.

Lawsonia, *law-so'-ne-ă*, in Bot., a gen. of the nat. ord. *Lythraceæ*. *L. inermis* is the plant from which the *henna* or *alkanna* of Egypt, &c., is derived. It is used by the women of the East to dye the nails, palms of the hands, and soles of the feet an orange-brown colour. It is likewise employed for dyeing skins and morocco leather.

Lay Baptism, *lai* (Fr. *lai*, from Gr. *laos*, people), is baptism administered by lay or unordained persons. It was practised and regarded as valid by the laws of the early Church; but it was looked upon as an exceptional proceeding, and only to be resorted to in cases of emergency.

Lay Brothers, among the Roman Catholics, are pious but illiterate persons, who, in convents, devote themselves to the service of the monks. The institution of lay brothers began in the 11th century. They wear a different habit from the monks, and never enter the choir nor are present at the chapters. The only vow they take is of obedience and constancy. There are also lay sisters in the nunneries, who are retained for the service of the nuns.

Lay Chancellor is an officer found in the Church at an early period. Bishops being often appealed to in civil causes, at length found it necessary to devolve some part of this service upon others; and hence the institution of lay chancellor.

Lay Elders were a class of office-bearers in the early Church, but were not of the clergy, nor had they any concern in the discipline or government of the Church; and hence they differed from the modern ruling elders. The office of ruling elder, as existing in the Presbyterian church, was unknown before the 16th century. The passage, 1 Tim. v. 17, where the office of ruling elders is referred to, evidently denotes ordained ministers. The lay elders of the early Church were intrusted with the utensils, treasure, and outward affairs of the church.

Lazaretto, or Lazar-house, *laz'-zar-et'-to* (Ital.), is the name given in Italy, and other parts of southern Europe, to certain public buildings for the reception of the poor, and such as are afflicted with contagious disorders. The name is derived from St. Lazarus, who is the patron saint of lepers; and during the middle ages, when leprosy was common in Italy and other parts, the hospitals in which the lepers were confined received that name, and the lepers themselves were called lazzari. Howard wrote "An Account of the principal Lazarettos in Europe," 1789. Those buildings and inclosures attaching to seaport towns, chiefly on the Mediterranean, where the crews and passengers of ships from places where contagious disease is known to prevail, are also called lazarettos. These lazarettos consist generally of various detached buildings, with courts between, the whole being surrounded by a wall, and placed in an airy situation outside the town, or sometimes on a small island near the coast. (*See* Quarantine.)

Lazarists, *laz'-a-rists*, in Eccles. Hist., is the name of a religious order of missionaries, founded by St. Vincent de Paul, at Paris, in 1632, and named from the priory of St. Lazarus there, where they had their head-quarters. Besides their religious and educational duties, they specially devoted themselves to the care of the sick. In Poland this order has been particularly active, and its members are there known as the Mission Fathers.

Lazulite, *laz'-u-lite*, a light-blue mineral, resembling lapis lazuli only in colour. It is a hydrous combination of the phosphates of alumina, magnesia, lime, and iron. It is also known as *azurite* and *prismatic azure spar*.

Lazzaroni, *lat'-zar-ro'-ne*, is the name given to the lowest class of inhabitants in Naples, from the hospital of St. Lazarus, which served as a refuge for the destitute in that city. They constitute a particular class of themselves, living mostly, day and night, the whole year through, on the streets, and earning a precarious livelihood as messengers, porters, day-labourers, &c. They elect, annually, one of their own body as chief, who has the title of *Capo Lazzaro*, and is formally recognized by the government, for the reason that through him they are best able to control this great mass of people, numbering from 50,000 to 60,000.

Lead, *led* (Sax. *lead*), one of the most important of the metals, both itself and its compounds being applied to many useful purposes. It occurs in nature in combination with a large number of substances; but its most valuable ore is galena, or sulphide of lead, found in large quantities in various parts of the world. In this country it is found mixed with quartz blende, iron pyrites, heavy spar, and fluor spar, in veins running through the primitive rocks of Cornwall and Cumberland. It generally contains a small proportion of sulphide of silver, often in sufficient quantity to allow of its being separated profitably. The ore having been brought to the surface, is first sorted by hand, the purest portions being set aside ready for smelting. The rest is broken by hammers into lumps as large as a walnut, and again sorted. The remainder is then crushed in a mill, and sifted through coarse sieves, the coarser portions being set aside for the stampers, and the finer being subjected to the process of *jigging*. This consists in plunging a sieve containing the ore into water, and shaking it dexterously, so that the smallest particles pass through, leaving the larger pieces in the sieve, with the lightest and least metallic portions uppermost. If the sorted galena be tolerably free from gangue, about 1½ ton of the ore is mixed with ½ to ¾ its weight of lime, and heated to dull redness in a reverberatory furnace, through which a current of air is passing. By this means a large portion of the sulphur is burnt off as sulphurous acid, oxide of lead and sulphate of lead being formed, and much of the ore remaining undecomposed. When the roasting has been carried sufficiently far, the furnace doors are shut and the heat is raised. The sulphate and oxide of lead react on the undecomposed sulphide, a large quantity of sulphurous acid is formed, which passes off, leaving large quantities of metallic lead behind. The fire is now damped, and a quantity of lime thrown in, which forms a very infusible slag, allowing the metallic lead to be drawn off into moulds. The slag, which contains a large proportion of lead, is smelted with an additional portion of ore. Lead is refined by being melted in a shallow iron pan in a reverberatory furnace. By this operation any tin or antimony that it may contain is oxidized and removed as skimmings. When a ladleful of the lead under this operation cools with a peculiar crystalline surface, the process is discontinued, and the metal is run off into pigs. For some purposes, such, for instance, as the making of red lead for the manufacture of flint glass, it is necessary that the lead should be almost chemically pure, as a proportion of copper, for instance, amounting only to a few grains per ton, would colour the glass and spoil the batch. Silver may be profitably extracted from lead, even when it contains only three or four

ounces to the ton, by Pattinson's process. This process depends upon the fact, that as lead solidifies, the first portions that crystallize are pure lead. The operation is therefore performed by melting the metal in an iron pot and allowing it to cool gradually; as it cools, the crystals of pure lead are removed by a perforated ladle, and the process continually repeated with fresh portions of lead until the mass contains about 300 oz. to the ton. It is then submitted to cupellation, which is fully described under that head. In 1861, no less than 600,000 oz. of silver were extracted in this way from argentiferous lead. Lead is a bluish-white metal, so soft that it may be marked with the nail. It may be beaten into pretty thin sheets, as well as drawn into wire; but its malleability and tenacity are both low. It fuses at 630°, and may be obtained in cubic or octahedral crystals as it cools. It does not cast well, owing to its contracting at the moment of solidifying. The uses of lead are very numerous,—its softness, fusibility, and durability rendering it valuable for a variety of purposes. It is used by the manufacturing chemist for the chambers of his sulphuric acid and hydrofluoric acid apparatus. Its compounds are well known. The red oxide is employed extensively in making glass; the carbonates, oxychlorides, and chromates, are used as pigments; and its alloys are numerous and important. Its alloys with tin are harder, but more fusible, than their component metals, the most fusible containing 3 equivalents of tin and 1 of lead, which fuses at 367° Fahr. *Pewter* consists of lead with 80 or 90 per cent. of tin. The alloy used for lining tea-chests contains 9 of lead and 1 of tin. *Type-metal* is composed of 4 parts of lead and 1 of antimony. *Plumbers' solder* contains equal parts of tin and lead. *Shot* are made of an alloy of lead, and from 0·3 to 0·8 per cent. of arsenic, to give the shot a spherical form. The fused metal is poured through a sieve from a height, the shot cooling as they descend. If too little arsenic is added, they assume a pyriform shape, lenticular masses being the result if the proper proportion is exceeded. The shot are afterwards sorted and polished by rolling them about in a barrel containing plumbago. The lead of commerce is nearly pure, the purest specimens being the softest. To obtain it chemically pure, it should be reduced by black flux from the oxide left by igniting pure acetate of lead, or by reducing sulphate of lead by charcoal. The annual produce of our English lead-mines exceeds 90,000 tons, being equal to 65,000 tons of metal.

Lead, in Chem.,—symbol Pb (plumbum), equiv. 103·57, spec. grav. 11·44.—The method of obtaining chemically pure lead has been described above. Chemically speaking, lead occupies a position between silver and mercury, being closely allied to these two metals in many of its re-actions. The salts of lead are mostly colourless. They are all highly poisonous, the best antidote being sulphate of soda, or magnesia, which forms a comparatively inert and insoluble sulphate. In the more usual forms of lead-poisoning, when, for instance, the metal becomes introduced into water from the incautious use of lead pipes, these antidotes are ineffectual. The best tests for the presence of lead are the formation of an insoluble white precipitate, when sulphuric acid, or sulphates, are added to the suspected solution. This test should be confirmed by forming a black sulphide with sulphuretted hydrogen, a yellow chromate with chromate of potash, and a yellow iodide with iodide of potassium. Lead has a comparatively weak affinity for oxygen; it consequently remains almost unoxidized even in damp air. It is easily precipitated in a metallic form from its solutions by other metals. Under the combined action of air and pure water, lead is liable to corrosion; great care should therefore be exercised in using lead pipes in districts supplied with pure water.

Lead, Acetates of, in Chem.—Acetic acid forms at least four compounds with lead; viz., the

Neutral acetate ..... $PbO, C_2H_3O_3Aq.$
Subsesquiacetate ..... $3PbO, 2C_4H_3O_3Aq.$
Tribasic acetate ..... $3PO, C_4H_3O_3Aq.$
Hexacetate ..... $6PbO, C_4H_3O_3Aq.$

The most important of these are the neutral acetate and the tribasic acetate. The former is made by dissolving litharge in excess of acetic acid and evaporating. With care it may be made to crystallise in fine right rhombic prisms; but its most usual form is a mass of confused crystals resembling loaf-sugar; from which circumstance, joined to its sweetish metallic taste, it has received the name of sugar of lead. It dissolves readily in water and alcohol. Exposed to the air it effloresces, and heated, it becomes anhydrous, and fuses into a clear liquid. Heated further, it gives off carbonic acid, acetone being formed. In this form it consists of the *subsesquiacetate of lead*, a salt having a distinct alkaline reaction, and crystallizing in pearly scales. *Triacetate of lead*, which forms the basis of *Goulard water*, is prepared by digesting 7 parts of finely-powdered litharge with 6 parts of the neutral acetate dissolved in 30 parts of water. It has a strong alkaline reaction, and crystallizes in opaque needles.

Lead, Black, in Min.—The substance known by this name contains no lead, nor any metallic substance, being simply carbon in a peculiar state of aggregation. (*See* Graphite and Plumbago.)

Lead, Borate of, in Chem.—Boracic acid unites mechanically, when fused with oxide of lead, in all proportions. But little is known of the chemical borate of lead. It enters into the composition of Faraday's optical glass.

Lead, Carbonate of, in Chem., $PbOCO_2$.—This salt, commonly known as *white lead*, forms, when ground with oil, one of our most important white pigments. The most usual method of manufacturing it in this country is that known as the Dutch method. It consists in exposing lead cast in thin gratings to the combined action of acetic acid vapour, moist air, and carbonic acid gas. The gratings are supported a little above the bottom of earthen pots, similar to flower-pots, in each of which a small quantity of weak acetic acid is placed. The pots are built up in alternate layers with spent tanners' bark, until a stack is formed, each layer of pots being covered with a board. Fermentation soon takes place in the tan, and serves the double purpose of generating heat and furnishing carbonic acid. After the lapse of six or eight weeks, the metallic lead is found converted into white masses of carbonate, mixed with hydrated oxide. It is then levigated, washed, dried, and ground with oil. About 16,000 tons of white lead are annually made in England by this process. Pure carbonate of lead, for chemical purposes, may be precipitated from pure nitrate of lead by an alkaline carbonate.

Lead, Chlorides of, in Chem.—Lead forms with chlorine a sparingly soluble white precipitate when a soluble chloride is mixed with a soluble salt of lead. If fuses into a semitransparent horny mass, which may be volatilized at high temperatures. Chloride of lead combines with the oxide to form oxychloride in several proportions. The most important of these ($PbClPbO$) is used as a white pigment, under the name of Pattinson's white. Another ($PbCl_7PbO$), known as patent yellow, or Turner's yellow, is also much used for the same purpose.

Lead, Chromates of, in Chem.—Lead forms with chromic acid, two chromates,—the neutral chromate, $PbOCrO_3$, and the dichromate, $2PbOCrO_3$. The former is the well-known brilliant yellow pigment chrome yellow, and is made by precipitating a solution of acetate or nitrate of lead with chromate or bichromate of potash. It is extensively used in the arts both as a pigment and in calico-printing. The dichromate is of a splendid scarlet colour, and is made by adding to a solution of nitrate or acetate of lead a solution of chromate of potash, to which an equivalent of hydrate of potash has been added. It is much used as a pigment.

Lead, Iodide of, in Chem., PbI.—This compound is easily obtained by throwing down the nitrate or acetate of lead by iodide of potassium. It is sparingly soluble in cold water, but more so in hot, from which it is deposited in brilliant yellow spangles. Iodide of lead forms double salts with the alkaline iodides and cyanides.

Lead, Nitrates of.—Of these there are four, of which three are basic, containing one equivalent of nitric acid united to 2, 4, and 6 equivalents of oxide of lead. The neutral nitrate, which is an important salt used extensively in calico-printing, is prepared by dissolving the metal, its oxide or carbonate, in nitric acid,

and crystallizing. Nitrate of lead crystallises in hard anhydrous octahedra, which are sometimes opaque and sometimes transparent. It is somewhat sparingly soluble in water, requiring seven parts of cold water for solution

LEAD, NITRITES OF —There are several nitrites of lead. Basic nitrite of lead is prepared by boiling metallic lead in the solution of its nitrate. This gives rise to a pink basic nitrate containing four equivalents of base, from which a yellow neutral nitrate may be prepared by passing through it a current of carbonic acid

LEAD, OXIDES OF —The principal oxides are the *suboxide*, $Pb_2O$; the *oxide*, PbO, and the *binoxide*, $PbO_2$. Several intermediate oxides also exist Suboxide of lead is made by heating oxalate of lead in an oil-bath to 572° Fahr as long as any gas is eliminated It is a black powder, convertible by heat into the oxide. The oxide is known in commerce as *litharge* when obtained by fusion, and as *massicot* when amorphous It is manufactured in very large quantities by exposing metallic lead to a current of heated air It varies from the well-known brownish-red of litharge to a pure white, according to the state of aggregation of its particles It forms numerous salts with the acids It also forms compounds with the alkalies, which are regarded by some chemists as *plumbites* It is slightly soluble in pure water. A solution of sugar is capable of dissolving a large quantity It is employed commercially in the manufacture of white and red lead, in making glass, in assaying, and in glazing certain kinds of earthenware The binoxide, peroxide, or plumbic acid, is of a dark purplish brown, and is formed by heating the protoxide with some powerful oxidizing agent, such as chlorate of potash or nitric acid It is, in itself, a powerful oxidizing agent, and has been much employed in making certain of the aniline colours It acts as a true acid, forming a distinct plumbate with potash, crystallizing in colourless cubes Red lead, or minium, is somewhat uncertain in its composition, but it is now generally regarded as a plumbate of oxide of lead It is largely used in glass making, and is one of the commonest of our mineral pigments. It is made by heating litharge, or massicot, in a reverberatory furnace. Miniums containing one equivalent of plumbic acid united with one, two, and three equivalents of oxide of lead have been analyzed They differ but slightly in colour and physical properties

LEAD, SULPHATE OF, in Chem —This salt occurs in nature as *lead vitriol*, which is found crystallized in transparent octahedra It is obtained in the laboratory as a white precipitate, by adding dilute sulphuric acid to a solution of a soluble salt of lead It is very sparingly soluble in water and in dilute sulphuric acid It is, however, soluble to a much greater extent in concentrated sulphuric acid, hence the chloride of sulphate of lead thrown down when water is added to the ordinary oil of vitriol made in leaden chambers It is obtained in large quantities as a by-product in the preparation of acetate of alumina for dyeing, by decomposing sulphate of alumina with acetate of lead

LEAD, SULPHIDE OF, in Chem —The sulphide of lead occurs abundantly in nature, in the form of galena, which is the principal ore from which this metal is obtained It may be obtained artificially by fusing sulphur with metallic lead, or by passing sulphuretted hydrogen through a solution of the metal

LEAD, TARTRATE OF, in Chem —This salt is principally remarkable for forming the *lead pyrophorus* of the old chemists Tartrate of lead is made by precipitating acetate of lead by tartrate of ammonia, washing and drying If a little of the dry tartrate is heated in a test tube until it is decomposed into finely-divided lead and carbon, and scattered on a piece of paper, it burns with a red flash

LEAD-TREE, in Chem —A piece of zinc twisted into a fanciful form, and suspended in a bottle containing a solution of acetate of lead, precipitates the metal in arborescent crystals, forming the well-known lead-tree, or Saturn's tree

LEADER, *lē'-der* (Ang.-Sax.), in concerted music, is that performer who plays the principal violin, and receives the time and style of the various movements from the conductor, and communicates them to the rest of the band. After the conductor, the leader holds the most important place in the orchestra, as all the other performers look to him for direction in the execution of the music, and the entire effect depends in a great measure upon his skill and judgment.

LEADING NOTE, *lē'-ding*.—The seventh note of the scale of any key, when at the distance of a semitone below the key-note, is so called. By this note the scale is known, and its tonic or key-note discovered. For example, if the key of two flats, the leading notes are A natural or F sharp, A natural leading to B flat, and F sharp to G natural, the key-note of this key being either B flat or G natural.

LEAF, *lēfe* (Sax *leafe*), the organ which, in the higher orders of plants, is specially concerned in the elaboration of the various vegetable secretions. It invariably grows from the stem, and is generally a flat expanded body, formed of parenchyma or vegetable tissue, strengthened by a woody framework or skeleton. The parts of the stem from which the leaves spring are called *nodes*, and the spaces between such parts, *internodes* The leaf usually grows horizontally, so that one surface looks to the sky and the other to the earth; but in some plants the leaves are placed vertically, with their edges directed to those points The latter mode of growth is rare, and the terms *upper* and *lower* are generally applied to the two surfaces The part of the leaf next the stem is called the *base*, the opposite extremity the *apex*, and the lines connecting these two points the *margins* or *edges* The angle formed by the upper surface of the leaf with the stem is styled the *axil*, and everything which springs from this angle is said to be axillary The leaf is sometimes articulated with the stem, and when it falls off, a scar remains, at other times it is continuous with it, and then decays gradually without dropping off When leaves fall off annually, they are said to be deciduous, when they remain for two or more years, they are *persistent* or *evergreen* A leaf usually consists of two distinct parts,—a flat expanded portion called the *blade*, *lamina*, or *limb*, and a narrower portion which joins it to the stem, and which is termed the *petiole* or *leaf stalk* The apex of the blade is the oldest part of such a leaf, and the base of the stalk the youngest



LEAF OF THE PEAR.
*a*, blade.
*b*, petiole.

When a leaf has no distinct stalk, but consists of the flat portion only, it is said to be *sessile* The occurrence of two little organs at the base of the leaf-stalk is frequent, and as these usually resemble the expanded part of the leaf, they have been termed *stipules*, or little blades. But though commonly of a leafy character, stipules sometimes take such curious forms that they can only be identified by their position at the base of the petiole, or the blade if the leaf be sessile. In the rose, the stipules appear as little membranous parts adhering to the base of the leaf stalk In the common mallow, and in the geranium, they take the form of little leaves, and proceed not from the leaf-stalk, but from the stem of the plant, at either side of the base of the leaf-stalk. In the wild heartsease they are extremely large, and are divided into several segments. In the robinia they occur as sharp prickles, and in the smilax as delicate tendrils. Stipules, when present, whatever their form, are to be regarded as portions of the leaf, and



SESSILE LEAVES OF THE BOX.



STIPULES OF THE ROSE.

not as distinct organs. They appear at a somewhat late period of the development of the leaf, but their growth is exceedingly rapid, owing to their close proximity to the stem. Leaves generally consist of vascular tissue, in the form of *veins*, *ribs*, or *nerves*, and of soft cellular tissue, or *parenchyma*, filling up the interstices between the veins. The term *venation* has been applied to the distribution of the veins. In most leaves this can be easily traced; but in the case of some succulent plants the veins are obscure, and the leaves are said to be *hidden-veined*. Again, in the lower tribes of plants, as the mosses and seaweeds, the leaves are not strengthened by vascular tissue, and from being destitute of true veins, they have been termed *veinless*. In an ordinary leaf there may be observed a central vein larger than the rest, which is called the *midrib*; this gives off veins laterally, which either end in curvatures within the margin, as in the leaf of the lilac, or proceed directly to the edges, as in the oak-leaf. The veins give origin to smaller ramifications, which are distinguished by the term *veinlets*. Some leaves, as those of the common sycamore, have, in place of a midrib, three or more large veins, which proceed from the base to different parts of the margin, such veins being simply termed ribs. Leaves in which the veins form a sort of network are said to have a *reticulated* or *netted venation*: the leaves of all our forest trees and most of our herbs are examples. Those leaves in which the main veins are more or less parallel, and simply connected by unbranched veinlets, are said to have a *parallel venation*:



RETICULATED LEAF OF OAK, SKELETON.



PARALLEL-VEINED LEAF OF THE BANANA.

the grasses, lilies, palms, and most monocotyledonous plants, furnish examples. Leaves have been divided into *simple* and *compound*. A leaf is simple if it has only one blade, however much this may be divided: the pear, the oak, the lilac, and the cabbage, have simple leaves. A leaf is compound when the blade is separated into two or more distinct portions, each of which bears the same relation to the petiole as the petiole itself bears to the stem from which it arises. The separate portions of a compound leaf are called *leaflets*; and these may either be sessile or furnished with stalks, called *petiolules*, or *partial petioles*; the main axis which supports them being termed the *rachis* or *common petiole*. The leaflets of a compound leaf may be at once distinguished from the separate leaves of a branch by their being all situated on the same plane; moreover, the entire leaf, when it dies, commonly falls off the stem in one piece, and not leaflet by leaflet. The leaves of the rose, clover, elder, and horse-chestnut are familiar examples. The margins of leaves are sometimes smooth and undivided; but more frequently indented or scalloped. A leaf is said to be *entire* when its margins are smooth, as in the garden nasturtium and the whole orchis tribe. Of the *indented* or *toothed* leaves, botanists name several varieties, the following being the principal:—



SERRATE LEAFLET OF ROSE.

*Serrate.*—Having teeth, like those of a saw, directed towards the apex; as in the common nettle.

*Biserrate.*—With teeth which are themselves serrate; as in the nettle-leaved bell-flower.

*Serrulate.*—Minutely serrate; that is, having very small teeth.

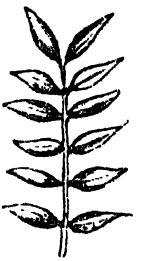
*Dentate.*—With large sharp teeth, not pointing in any particular direction.

*Crenate.*—Having rounded projections in place of angular teeth; as in the ground-ivy and the horse-radish.

*Bicrenate.*—With rounded projections which are themselves scalloped.

*Crenulated.*—Minutely scalloped.

A simple leaf is sometimes more divided than in the above instances, and the segments produced receive different names, according to their nature. If the incisions reach about midway between the margin and midrib, or petiole, the leaf is said to be *cleft*, and its divisions are called *lobes*; if they extend almost as far as the midrib, or base, the leaf is *partite*, and the divisions are then termed *partitions*; and if they quite reach the midrib, or base, *segments* are formed, and the leaf is said to be *dissected*. These segments differ from the leaflets of a compound leaf in never being articulated, and also in each being united to the midrib or petiole by a broad base. In describing incised leaves, such terms as *bifid*, or two-cleft; *trifid*, three-cleft; *multifid*, many-cleft; *tripartite*, *trisected*, and so on, are generally used. Special terms are applied to the various modifications of the compound leaf. It is *pinnate* when the leaflets (or *pinnæ*, as they are sometimes called) are arranged along the rachis in pairs; it is *abruptly pinnate* when it ends with a pair of leaflets, and *unequally pinnate*, when there is a single terminal leaflet. Sometimes the leaflets of a pinnate leaf are themselves so divided as to appear pinnate; such a leaf is *bipinnate*. The secondary leaflets, or *pinnules*, as they are termed, may in like manner become pinnate, and so produce a *tripinnate* leaf. When the division extends beyond this point, a *decompound* leaf is the result: examples are afforded by many umbelliferous plants. In many compound leaves the leaflets proceed from the same point instead of being arranged along each side of a common stalk. If such a leaf consists of three leaflets, it is *ternate*, as in the strawberry; *quadrinate* if there are four, as in herb Paris; *quinate* if there are five; *septernate* if there are seven, as in the horse-chestnut; and *multifoliate* if there are more than seven, as in lupin. These leaves, like those which are pinnate, may be again divided and subdivided; thus the common petiole may divide at its apex into three partial ones, each of which bears three leaflets; such an arrangement producing a *biternate* leaf. (For further information respecting leaves, *see* the articles BOTANY and PHYLLOTAXIS.)



ABRUPTLY PINNATE LEAF.



TERNATE LEAF OF STRAWBERRY.



SEPTERNATE LEAF OF HORSE-CHESTNUT.

LEAGUE, *leeg* (Fr. *ligue*), in Pol., is an alliance entered into between two or more powers, for the purpose of carrying out some common enterprise.

LEAGUE, SOLEMN, AND COVENANT, in *Eccles. Hist.* (*See* COVENANT.)

LEAGUE, THE HOLY, in French Hist., was an association formed in the early part of the reign of Henry III., at first with the view of uniting all parties in the Roman Catholic church against the Protestants; but the princes of Guise having placed themselves at its head, changed its character, and induced it to adopt the project of placing the duke of Guise upon the

throne. At the instigation of the league, the citizens of Paris expelled Henry III. on the day of the Barricades, 1588. After the death of Henry, in 1591, much division arose as to the choice of a successor; the league party were defeated; and from that time their power was at an end, although they continued to exist for some time after.

LEAKAGE, *leak'-áj* (Ang.-Sax.), in Com., is an allowance made on liquids for what may be lost by leaking.

LEAP-YEAR, or BISSEXTILE. (*See* BISSEXTILE.)

LEASE, *lease* (Ang.-Nor), in Law, is defined to be "properly a conveyance of any lands or tenements (usually in consideration of rent or other annual recompense) made for life, for years, or at will, but always for a less time than the lessor has of the premises; for if it be for the whole interest, it is more properly an assignment than a lease." The usual words employed to constitute a lease are—"demise, grant, and to farm let," from the Latin *demisi, concessi, et ad fermam tradidi*. By this conveyance, an estate for life, for years, or at will, may be created, either in corporeal or incorporeal hereditaments. By the Statute of Frauds (29 Car. II. c. 3), all leases, estates, interests of freehold, for terms of years, are required to be in writing, otherwise they would have the force and effect of leases or estates at will, only except in the case of leases for a term not exceeding three years from the making thereof, upon which the rent shall amount to at least two-thirds of the full value of the thing demised. The act 8 & 9 Vict. enacts that a lease required by law to be in writing, made after 1st October, 1845, shall be void in law unless made by deed; but leases which are not required to be in writing, *i. e.*, leases for periods not exceeding three years, are not affected. By the common law, all persons seised of any estate might let leases to endure as long as their own interest lasted; and therefore tenants in fee might let leases of any duration; but a tenant in tail, or for life, could make no leases which should bind the issue in tail or reversioner, nor could a husband, *jure uxoris*, make a valid lease for a longer term than the joint lives of himself and wife, for then his interest expired. Yet some tenants for life, where the fee-simple was in abeyance, might (with the concurrence of such as had the guardianship of the fee) make leases of equal duration with those granted by tenants in fee-simple; such as parsons and vicars, with consent of the patron and ordinary. These laws have been changed by various statutes, and now all parsons and vicars, colleges, cathedrals, and other ecclesiastical or eleemosynary corporations, are restrained from making any leases of their lands, unless under the following regulations:—1. They must not exceed twenty-one years, or three lives, from the making.—2. The accustomed rent, or more, must be yearly reserved thereon, and the premises demised must have been commonly letten.—3. Houses in corporations or market-towns may be let for forty years, provided they be not the mansion-houses of the lessors, nor have above ten acres of ground belonging to them, and provided the lessee be bound to keep them in repair. By 6 Wm. IV. c. 20, certain provisions are made with respect to the renewal of leases granted by ecclesiastical persons; by 5 Vict. c. 27, incumbents of ecclesiastical benefices are allowed to demise the lands belonging to their benefices on farming leases; and by *5 & 6 Vict. c. 108*, ecclesiastical corporations, both aggregate and sole, are allowed to grant leases for long terms of years, for building and other purposes of improvement; but the provisions of these statutes are so numerous that we cannot enter upon them. Leases in general require either an *ad valorem* or a common deed stamp.

LEASE AND RELEASE, in Law, is one of those modes of conveyance which has been swept away by recent legislation, but which was formerly in very common use. Before the passing of the Statute of Uses (27 Hen. VIII. c. 10), it appears that a lease for two or three years was sometimes made and perfected by entry of the lessee, for the single purpose of his afterwards receiving a release of the reversion; and hence arose a sort of compound conveyance, called lease and release. After the passing of the Statute of Uses, which operated so as to give an estate in land without entry, this mode of conveyance became very common. A lease, or rather bargain and sale, upon some pecuniary consideration, for one year, was made, as supposed to be made, by the tenant of the freehold to the lessee or bargainee, and this, without any enrolment, made the bargainor stand seised to the use of the bargainee, and vested in the bargainee the use for the term of a year. He was thus capable of receiving a release of the freehold and reversion which could only be made to a person having a vested interest; and, accordingly, the next day a release was granted to him. This was held to supply the place of livery of seisin, and so a conveyance by lease and release was held to amount to a feoffment. Not only estates in possession, but estates in remainder and reversion, as well as incorporeal hereditaments—indeed, all that could be conveyed to uses, might be conveyed by lease and release. The lease for a year has been rendered unnecessary by act 4 Vict. c. 21, which declares that every deed of release executed after 15th May, 1841, and said to be in pursuance of this act, shall be effectual and take effect as a conveyance to uses or otherwise, equally as if the releasing party or parties had also executed in due form a lease for a year. Subsequently, the act 8 & 9 Vict. c. 106, by enacting that all corporeal hereditaments shall be deemed to lie in grant as well as in livery, took away the necessity of a release. The stamp duty chargeable on the lease and release continued to be charged on the deed of conveyance till abolished by 13 & 14 Vict. c. 97.

LEASH, *leesh* (Fr. *laisse*, from Lat. *laqueus*, a thong of leather), a term employed by sportsmen with regard to game, &c., in order to signify three, or one brace and a half; as a leash of hares, a leash of partridges. It also signifies a line to hold dogs by, especially hounds in coursing.



LEATHER MANUFACTURE, *leth'-er* (Germ. *leder*, leather), the process by which the skin of any animal is rendered fit for making various articles of common use, such as boots, shoes, gloves, saddles, harness, coverings for books, belts for machinery, buckets, hose for fire-engines, &c. The skins of the larger animals, such as oxen, horses, and buffaloes, are called hides, while the skins of pigs, sheep, calves, lambs, goats, dogs, rats, and seals, are known in the leather trade by the unaltered name. The hides which furnish the thickest leather in ordinary use are sent from South America, and are taken from the cattle that roam in vast herds, and in an almost wild state, over the vast *pampas* of that continent. The hides of bulls are thicker than those of oxen, which are, in their turn, stouter and stronger than the hides of cows. The leather made from these hides is used for the soles of boots and shoes, soldiers' belts, and all purposes for which leather of a thick and durable kind is required. The hides of horses are generally used for making harness. Calves' skins are used for the upper leathers of boots and shoes, being thinner and more supple; they are also used in book-binding. The skins of sheep afford a still thinner and cheaper kind of leather, which is useful for a variety of purposes, such as leather aprons, the coverings of chairs, shoes, whip-lashes, bags, &c. Wash leather is also made from the skins of sheep, and leather for the inferior kinds of bookbinding. The skins of dogs, lambs, goats, kids, and rats, are chiefly used in glove-making, some furnishing materials for the finer kinds of ladies' shoes. Seal-skins supply a soft and durable leather for boots and shoes, and pig-skins are used entirely for making saddles. The appearance of the skins of various animals, when converted into leather, is widely different; but this is entirely due to the difference in the processes to which they have been subjected. There are three methods of preparing hides and skins for the uses which have been enumerated, which are known as tanning, tawing, and shamoying. Either operation prevents the decay of the skins, which would be a natural consequence if they were left in the state in which they were stripped from the carcase. In tanning, the change is due to the chemical action of an astringent matter contained in many vegetable substances, but principally in the bark of the oak, larch, and willow, which converts the soluble skin, that consists entirely of gelatin after the hair and scarf-skin have been removed, into the hard and insoluble substance which is called leather. When foreign hides are brought to the tanner, they require to be soaked and beaten to make them as supple as pos-

sible, since they must necessarily be salted or dried previous to exportation, which renders them stiff and hard, and unfit to be subjected to the tanning process without the preliminary treatment that has been mentioned. Fresh hides are merely scraped to remove any pieces of fat or flesh that may still adhere to the inner side, and the horns and hoofs are removed. The hair and scarf-skin, a thin cuticle which covers the skin itself, are then loosened by soaking the hides in lime-water, or by suspending them in a place called the smoke-chamber, where they are subjected for some time to the constant action of moderate heat. After this the hair is easily removed by scraping, and the hides are next plunged into a weak solution of sulphuric acid and water, which has the effect of thickening the hide and opening the pores for the reception of the tannin. This part of the process is technically termed "raising." All that now remains to be done is to soak the hides in a mixture of oak bark, ground to small fragments in a bark-mill, and water, until they are found to be thoroughly impregnated with tannin, after which the hides are dried slowly and subjected to heavy pressure by passing them through heavy rollers, or by beating, in order to give substance and firmness to the leather. There are many different methods of applying the astringent solution that converts the hides into leather; but the process of soaking the hides in an infusion of bark and water, which must be renewed as soon as the bark is found to have lost its strength, is considered to be the best. It is also found that leather which has been tanned by the usual slow and gradual process is far more durable than that which has been manufactured more rapidly by the use of very strong solutions; a hide that has been quickly tanned being found to be heavier after the process than one of the same weight originally which has been tanned slowly, and consequently less durable and valuable, as it contains less animal matter in proportion. The time in which the process is effected varies considerably; ordinary leather that is used for the soles of boots and shoes requiring to be soaked for not less than six months, while thicker leather cannot be produced in less time than a year or eighteen months. Many processes have been invented for making leather more rapidly by filling the pores of the hide with the astringent solution by means of mechanical and hydrostatic pressure. Among other methods is one invented by Mr. Preller, in which the hides are covered with a composition made of meal or starch and grease, and then whirled round with great rapidity in a cylinder, into which a jet of steam is admitted at intervals. The inner side of calf-skins, and all thin hides that are used for the upper leathers of boots and shoes, is always pared before they are immersed in the tanning solution, to render them thinner in substance and better fitted for the purpose for which they are intended, and they are curried by the currier after they leave the hands of the tanner, to render them soft and supple. Thin skins used for covering chairs, bookbinding, and other ornamental purposes, are tanned with an infusion of sumach. Among these the most valuable is that which is known as morocco leather, which is made from goat-skins. In the manufacture of what is termed sumached leather, care is taken to remove the lime which has entered the skin while it has been soaking in lime-water, by plunging the skins in an alkaline solution, which acts in much the same way as the solution of sulphuric acid in which hides are plunged previously to their immersion in the mixture of bark and water. The skins are then sewn together so as to form bags, which are filled with a mixture of sumach and water, and distended as much as possible by the injection of air. After the opening has been secured, they are thrown into a shallow vessel containing sumach soaked in hot water, in which they float. When the process of tanning is complete, which is generally effected in a few hours, the skins are unsewn, and washed and dried, after which they are dyed, and the peculiar grain by which morocco leather is distinguished is produced on the surface by means of an instrument, the surface of which is furrowed by numerous grooves. The process by which skins are made into soft leather, chiefly for gloves, is called tawing. The skins are prepared in the same manner as those which are to be tanned;





but instead of being immersed in the tanning liquid, they are put into a solution of alum and salt, flour and the yolk of eggs being added to this solution to prepare the skins which afford the better and more delicate kinds of leather. The skins and a quantity of the mixture are put into a cylinder, which is made to revolve with great rapidity, and this causes the skins to become thoroughly impregnated with the preparation in a short space of time. After this they are cleaned, dried, dyed, and worked by the hand over a piece of iron to render them soft and fit for use. Skins that are to be dressed with the wool or hair still on them, are prepared with a solution or paste, in which alum is the chief ingredient. The process of preparing leather which is termed shamoying, and by which chamois or shamoy leather is made, consists in impregnating the pores of the skin thoroughly with oil or grease. The grain surface, or the surface of the side from which the hair has been removed, is entirely taken off by rubbing it with pumice-stone. The skins are then soaked, first in lime-water and next in an infusion of bran and water, or very weak sulphuric acid and water, after which they are beaten in a mill with heavy hammers until no moisture whatever remains in them. Fish oil is then poured on the skins, which are again subjected to the action of the hammers until the oil has been thoroughly beaten into them. This is repeated until the skins have imbibed a sufficient quantity of oil, after which they are hung for some time in a heated room to cause the oil to act completely in every part of the skin. The process is concluded by washing them in a solution of potash, which removes any superabundance of oil that may still remain about the leather. Before any leather, except stiff hard leather for the soles of boots and shoes, can be used, it passes through the hands of the currier, who first soaks it in water and beats it to render it supple. It is then scraped on the inside with a two-handled knife, something like a spoke-shave, and the grain on the outer side is rubbed with pumice-stone, the leather being frequently wetted during this part of the process. After this it is rubbed on both sides with a flat block called a pommel, the surface of which is cut into ridges. This has the effect of making the leather still more supple. It is finally dressed with a circular knife resembling a very flat bowl or saucer, with a hole in the centre, through which the currier inserts his hand in order to grasp the instrument; and with this the skin is pared and brought to a uniform thickness all over. Leather intended for the upper-leathers of boots and shoes is dressed with "dubbing," a composition of a greasy nature. Among other kinds of leather used in the present day, and held in great estimation in times past, those known as buff, Cordovan, Russia, shagreen, and patent or enamelled leather, deserve notice. The buff leather, formerly used for military purposes, was very thick, and pistol-proof. It was made from the hide of the urus, which was common in Western Europe. This animal was called the *buffe*,—whence the name of the leather, which in turn gave its appellation to the colour so called, from the tawny yellow hue which it always presented when new. The Cordovan leather was first made at Cordova, in Spain, from the hides of horses which were dressed to be used with the grain side outwards. The shoemaker derived his old title of "cordwainer" from this leather. Russia leather is tanned with an infusion of willow bark, and derives its peculiar odour from the aromatic saunders-wood with which it is dyed. Shagreen, which is not so much used now as formerly, is prepared by pressing the hard globular seeds of a plant called goose-foot into the leather, which causes it to become very hard and pitted all over with hemispherical indentations. The surface is then scraped until the holes have nearly disappeared, after which the leather is soaked, which causes the indentations to rise again and produce a rough granular surface. After this, the leather is dyed and dressed with oil. Shagreen was much used for mathematical instrument-cases and the cases of watches. Patent leather and enamelled leather are prepared by covering the surface with a kind of japan, in which boiled linseed-oil and vegetable-black are the chief ingredients. The latter is the most pliant, and as it may be folded without cracking the surface that is put upon it, it is used for belts, boots, and

various articles of dress. Although machinery cannot be made available to any great extent in tanning and currying leather, yet a machine has been contrived by which thin skins can be split into three parts, each of which is available for a different purpose; whereas, prior to its invention, a skin could only be reduced by paring, and as what was taken away by the knife was all in little pieces, it was only fit for making glue. The skin is passed through rollers, the upper one of which consists of a number of narrow discs arranged on an iron rod, that it may adapt itself to the varying thickness of the skin passing under it. It is split by the action of a very sharp horizontal knife, which oscillates backwards and forwards, through a short space, with great rapidity, and divides the skin which meets the edge as it emerges from between the rollers. There are many substitutes for leather; among the best of which are the American leather-cloth and vegetable leather. Both are formed by spreading a preparation of India-rubber upon some textile fabric. The latter is made in pieces fifty yards long, and may be made of any desired thickness. Excellent harness is made from it, while the leather-cloth is much used for covering sofas and chairs. Leather is often used for forming imitation carving in wood, by embossing, or by pressing it when moist into moulds; and of late years many pretty articles of ornamental furniture, such as flower-stands, vases, tables, and picture-frames, have been produced by attaching pieces of leather, cut in various shapes, to a foundation of stained wood, the whole being subsequently coated with a transparent varnish. Stamped leather was frequently used for the hangings of apartments in the middle ages.—Ref. *English Cyclopædia—Arts and Sciences.*

**Leaven**, *lev'-n* (Fr. *levain*, from Lat. *levo*, I raise), is a piece of sour dough used for fermenting bread. By the law of Moses, leaven was strictly forbidden to the Jews during the Passover; and, in a figurative sense, it is applied to anything that powerfully, but gradually, undermines right principles of heart and life, in opposition to unleavened, denoting sincerity and truth. "The leaven of malice and wickedness;" "the unleavened bread of sincerity and truth."

**Lecanora**, *lek'-a-no'-rā* (from Gr. *lekane*, a basin, in allusion to the form of the shields), in Bot., a gen. of lichens. The species *L. tartarea* is the principal lichen used in the preparation of the dye called *cudbear*. *L. esculenta* and *affinis* form important articles of food to man and the lower animals in Persia, Armenia, Tartary, &c. They sometimes appear in such enormous quantities as to cover the ground to the depth of several inches. Dr. O'Rorke has endeavoured to prove that *L. esculenta* formed the true *manna of the Hebrews*—that which supported them in the wilderness.

**Lector**, *lek'-tor* (Lat. *lego*, I read), in the early Christian Church, was a person appointed to read portions of Scripture and other good books to the people. Among the Jews there were persons who performed the office of readers in the synagogue. Both in the synagogue and in the church, any person who was able to discharge the duty was allowed to hold the office of reader; and hence boys of ten or twelve years of age were frequently employed in this way. The raising of this to a distinct office in the church, to which the holders were consecrated by prayer and ceremonies, does not appear to have taken place before the third century.

**Lecture**, *lek'-tŭur* (Lat. *lego*, I read), strictly and etymologically, signifies a discourse read; but commonly it is used in a more general sense, to denote any formal or methodical discourse intended for instruction. The communicating of instruction by means of public lectures has been in use from the earliest times, and, when properly conducted, it has advantages over every other mode of teaching. For that purpose, however, it is necessary that the matter be drawn up and arranged in an easy, natural, and consecutive manner, and that it be delivered in an attractive mode. It is to be regretted, however, that lectures are generally got up, not so much with a view to instruct the hearer, as rather to exhibit the attainments or propagate the prejudices of the lecturer. "Perspicuity of statement is the first and highest quality of a lecturer," without which "other qualities can avail little or nothing. To attain this essential quality, the subjects of the lecture should be so arranged that they may follow each other naturally and easily; the sentences should be clear and distinct, neither too long nor too short; the illustrations should be apposite, and of a kind fitted to excite and keep awake the attention of the hearer; and the lecture so composed should be delivered in a plain, distinct, and impressive manner."—(*Brande's Dictionary.*) In the Scotch and continental universities, as well as in those recently established in England, instruction is communicated chiefly by means of lectures. In such cases, each lecture should be followed up, next day, by a searching examination of the students on the subjects treated of, and explanations given of such difficulties as may have occurred to them. On this subject the remarks of the late Professor Jardine, of Glasgow, are worthy of attention. "A professor," he says, "in composing lectures to be delivered to young persons, must be supposed to have studied the several branches of knowledge which he teaches with a reference to this particular end; to have selected and adopted every topic which he introduces into them with a strict regard to the capacity and previous acquirements of his pupils, as well as to the precise point to which he proposes to conduct them in their progress through science. He must be supposed to have read and thought for his students nearly as they might be imagined to read and think on the subjects which *he* is about to communicate to them; not, indeed, that he may thereby do their work for them, but that, on the contrary, he may occupy their time and their industry with the most important, the most suitable, and consequently the most useful studies. In the prosecution of these objects, it ought to be the aim of the teacher, in every part of his lectures, to lay before his students, at the proper time, those particular elements of knowledge with which they ought to be first acquainted; to facilitate their progress towards more recondite subjects of inquiry; to prevent all unnecessary labour; to obviate all perplexity; to assist all their endeavours; and gradually to lead them into those paths which will guide them with ease and certainty to still higher degrees of scientific attainment."—*Outlines of Philosophical Education.*

**Lecythidaceæ**, *le-se-thi-dai'-se-e*, in Bot., the Brazil-nut or Monkey-pot order, a nat. ord. of *Dicotyledones*, sub-ord. *Calycifloræ*. Large trees, with alternate dotless leaves, and small deciduous stipules. Flowers large and showy; calyx superior; petals 6, imbricated, distinct, or sometimes united at the base; stamens numerous, epigynous,—some of them cohere and form a unilateral petaloid hooded body; ovary inferior, 2 to 6-celled; placentas axile. Fruit woody, either indehiscent or opening in a circumscissile manner. Seeds several, large, and without albumen. The *Lecythidaceæ* are principally natives of Guiana and Brazil. They are remarkable for their large woody fruits, the pericarps of which are used as drinking-vessels, &c. Their seeds are frequently eaten. (*See* Bertholletia, Lecythis.)

**Lecythis**, *lek'-e-this* (from Gr. *lecuthos*, an oil-jar), in Bot., the typical gen. of the nat. ord. *Lecythidaceæ*. The fruits of *L. ollaria* and other species are termed *monkey-pots*, and contain large edible seeds, some of which have lately been imported under the name of *Sapucaya nuts*. The bark of some species of lecythis separates into thin papery layers, which are used as wrappers for cigarettes by the Indians.

**Ledum**, *le'-dum* (from Gr. *ledon*, a plant now called *Cistus ledum*), in Bot., a gen. of the nat. ord. *Ericaceæ*. An infusion of the leaves of *L. palustre* and *latifolium* is used in North America as a substitute for China tea under the name of Labrador tea, or James's tea. It possesses narcotic properties.

**Lee** and **Leeward**, *lee, lu'-ward* (Ang.-Sax.), terms generally applied to the side of a ship, or the quarter opposite that from which the wind blows, the latter being termed the windward side or quarter, or the *weather side*. A *lee shore* is that on which the wind blows, or, in other words, is on the lee side of a ship. A vessel is also said to be *under the lee* of a shore when the wind blows off the land. The terms windward and leeward are likewise applied to some islands in the West-Indian group, in consequence of the direction in which they lay in a voyage from Port of Spain to Carthagena. The Leeward Islands extend from

Demerara to Porto Rico, and include Grenada and many others.

LEECH, *leetah* (Sax. *lacran*, Lat. *hirudo*, from *haurio*, I draw), a genus of red-blooded worms, or annelide animals, which have an oblong body, with a sucker at one end and a mouth at the other. In the mouth there are three small jaws, tongues, or plaits of skin, by which they are enabled to extract the blood of other animals, which forms their principal nourishment. Leeches are oviparous, and take nearly five years to arrive at maturity. They are found in ponds and rivers in nearly every country; and derive their chief interest from their use as a remedial agent. The species generally employed for medical purpose belong to the genus *Sanguisuga*. Of this genus two species are employed in Europe,—*S. officinalis*, the Hungarian, or green leech, used in the south of Europe, and the *S. medicinalis*, the German, brown, speckled, or English leech, used in the north of Europe: the latter variety is now rare in this country, on account of the draining of so many marshes, bogs, and ponds, where it was formerly abundant. The same is nearly the case with France, which is now principally supplied from the frontiers of Turkey and Russia. The large number of leeches used in England are mostly derived from Sweden, Hungary, and Poland. The English, or speckled leech, is composed of from ninety to one hundred rings; is convex on the back, which is olive-green in colour, with six red longitudinal stripes spotted with black. The belly is flat, greenish-yellow, spotted with black. The oral and caudal extremities are narrowed before they spread out into discs or suckers, and the anterior extremity is rather narrower than the caudal. The sucker at the tail is an organ of prehension, or holding, by which the animal is enabled to progress. The leech breathes by pores, which open into small vesicles ranged on either side. The stomach occupies two-thirds of the length of the animal, and is divided into eleven compartments, each furnished with two cæcal sacs; it is closed by a sphincter valve at its lower end. The leech has no heart, but four large pulsating vessels instead, one on each side, one on the dorsal, and the fourth on the abdominal surface. In its native abode, the true medicinal leech seems to take no solid food, but subsists entirely on the fluids of fish, frogs, &c. They are caught in various ways,—by the hand, or by a person wading in the shallow waters during the spring season, when they adhere to his naked legs; but in summer, when they retire to deeper water, a raft is constructed of twigs and rushes, by which a few are entangled. They are sometimes taken by means of decayed animal matter or liver, as bait; but this method is considered injurious to the health of the animal. If active in the water, and plump when taken out, a leech may be known to be in good health. Leeches vary in the quantity of blood which they can abstract, from one drachm to half an ounce: from one to two drachms is the average. When forcibly pulled away whilst sucking, the leech is very apt to leave the teeth, or plaits of skin, in the wound, giving rise to pain and inflammation of the part; the leech is also rendered incapable of biting again. One of the most certain methods of making leeches bite is to cleanse the skin thoroughly; and the leeches should be exposed to the air for a short time previous to their application, as by this means they will bite more eagerly. They may be applied to the part by holding them lightly in the fingers, if they are voracious; or they may be placed in a cup, which should be inverted over the part from which the blood is to be drawn. A leech should not be disturbed whilst sucking, but should be permitted to fall off. When it has dropped off, it should be seized by the tail, and stripped between the finger and the thumb, in order to make it disgorge most of the blood, allowing it to retain about one-third,—this is better than applying salt or vinegar to the mouth; it should then be placed in many successive fresh waters, when it may survive, and after many months be again fit for use. The increasing scarcity of leeches renders their propagation and preservation matters of great importance; and large numbers die through errors in the method of keeping them. Leeches have not been observed to propagate when kept in small bodies of water; but in large reservoirs, with a bottom of turf and rushes and clay sides, in which to deposit their cocoons, they have been known to propagate. The consumption of leeches in this country has greatly diminished of late years. A short time ago, four of the principal dealers in London used to import 7,200,000 annually. According to the French official returns in 1847, the number of leeches imported into France was 23,581,680, the value of which was estimated at 353,710 francs.

LEEK, *leek* (Sax. *leac*), (*Allium Porrum*), a hardy biennial plant. Although the leek attains perfection in size and for culinary purposes in the first year, it does not run to seed until the second, the perfecting of which it often also survives. The whole of the plant is eaten, being used in soups, &c., and by some persons is boiled and eaten with meat. There are four varieties,—the Musselburgh and the large London leek, which are by far the best; the Scotch, or flag, which is larger and harder; and the Flanders. The leek is raised sol 'y from seed. (*See* ALLIUM)



LEEKS.

LEET. (*See* COURT LEET.)

LEG, *leg* (Du. *lag*), is commonly applied to the whole of the lower limb from the hip to the ankle, but which properly belongs to that portion which extends from the knee to the ankle, the upper portion being the thigh. The leg proper is formed of two bones,—the tibia and fibula. The former of these is the larger, and articulates above with the os femur, or thigh-bone, presenting for that purpose two articulating surfaces,—an external and internal, known as the condyles of the tibia, and separated from each other by a large bony prominence termed the spine, and two rough surfaces, one in front the other behind the spine. Below the articulating surface, and in front, is a large eminence termed the tubercle, which gives insertion to the ligamentum patellæ. On the outer side of the tibia is a projection marked inferiorly by a smooth surface for articulation with the upper extremity of the fibula. The body or shaft of the tibia is large and triangular above, but becomes smaller and more circular inferiorly to the inferior or tarsal extremity, where it expands and assumes a quadrilateral form. Internally it descends farther than in any other direction, forming a projection termed the internal malleolus: externally is a rough triangular surface which gives lodgment to the fibula and attachment to the ligaments which connect these bones together. It articulates below with the astragalus. The superior extremity, or head of the fibula, is round and irregular, and presents, on its inner side, a smooth cartilaginous surface for articulation with the tibia. The tarsal extremity is large, and more prominent than the superior, and forms a large irregular projection of a triangular shape, termed the external malleolus. It articulates with the astragalus. The principal muscles of the leg are the tibialis anticus, extensor digitorum longus, extensor pollicis proprius, peronous tertius, peroneus longus, peroneus brevis, gastrocnemius, plantaris, soleus, popliteus, flexor longus digitorum perforans, tibialis posticus, flexor pollicis longus.

LEGACY, *leg'-a-se* (Lat. *lego*, I bequeath), in Law, is a bequest or gift of goods and chattels by testament. The person to whom it is given is styled the legatee, which every person is capable of being unless particularly disabled by common law or statutes. The bequest confers only an inchoate property on the legatee, for the legacy is not complete till the assent of the executor has been obtained; for in the event of a deficiency of assets, all the *general* legacies must abate proportionally, in order to pay the debts; but a specific legacy does not abate at all, unless there be not sufficient without it. A general legacy is when it is so given as not to amount to the bequest of a particular thing or particular fund; a specific legacy is a bequest of a specified thing or a specific part of the testator's estate. A specific legacy has this disadvantage, that if the subject specified be lost or disposed of by the testator during his lifetime, the legacy is said to be adeemed, or taken away, and the legatee is not entitled to any satisfaction out of the

estate. Thus, the bequest of a particular horse, which is afterwards disposed of by the testator during his lifetime, does not entitle the legatee to another horse in lieu of it. If a legatee dies before the testator, the legacy is lost or lapsed; and if a contingent legacy be left to any one, and he dies before that time, it is a lapsed legacy. A legacy, however, to be paid when the legatee attains the age of twenty-one years, is a vested legacy, and is payable to his representatives if he be dead before that time; but if such legacies be charged upon a real estate, they shall lapse for the benefit of the heir. By act 1 Vict. c. 26, however, it is provided that legacies bequeathed to a child, or other issue of a testator, do not lapse in the case of his predeceasing the testator, if he shall have left issue who shall be living at the testator's death, unless a contrary intention appear by the will. As a general rule, legacies are payable twelve months after the death of the testator, and with interest from that time at the rate of four per cent., unless some special provision is made as to the time of payment and interest. A duty is payable to government on legacies of the value of £20 and upwards, but a legacy to a husband or wife is exempt from duty. The duty on a legacy to a child, the husband of a child, a parent, or any lineal ancestor or descendant of the deceased, is at the rate of £1 per cent.; to a brother or sister, or their descendants, £3 per cent.; to an uncle or aunt, or their descendants, £5 per cent.; to a grand uncle or grand aunt, or their descendants, £6 per cent.; to any other relation, or any stranger in blood, £10 per cent.

Legate, *leg'-at* (Lat. *legatus*), is an ambassador, or nuncio, of the pope, usually a cardinal or bishop, sent to a foreign court. Legates are of several kinds:—*Legati a latere*, legates sent from the side, or the immediate presence, of the pope, and invested with most of his functions. *Legati nati* are such as hold the office as annexed to some other office, or *ex officio*. *Legati dati*, or special legates, were such as were despatched on a special mission, and were *pro tempore* superior to the other two orders.

Legatine and Provincial Constitutions, *leg'-a-teen*, are a kind of national canon law adapted to the exigencies of this church and kingdom. The legatine constitutions were ecclesiastical laws enacted in national synods, held under the cardinals Otho and Othobon, legates from popes Gregory IX. and Clement IV., in the reign of Henry III. The provincial constitutions are principally the decrees of provincial synods, held under divers archbishops of Canterbury, from Stephen Langton, in the reign of Henry III., to Henry Churchill, in the reign of Henry V., and adopted also by the province of York in the reign of Henry VI.

Legend, *lej'-end*, or *le'-jend* (Lat. *legendum*, something to be read), as generally used, denotes a fictitious or doubtful narrative; as the exploits of the heroes of the middle ages. Originally, however, it was applied to a book containing lessons to be read in the divine service of the Roman Catholic church. Subsequently the word came to be applied generally to books containing lives of the saints, and which abounded with incredible and ridiculous stories. These were recommended to the laity to be read, as affording evidence of the truth of the Catholic religion. One of the best known of these is the Golden Legend, compiled by James de Varasc, about 1290, and containing many absurd stories; hence the word came to be used by Protestants to signify any incredible or unauthentic narrative.

Legerdemain, *lej'-er-de-main'* (Fr., light of hand), denotes sleight-of-hand, or jugglery; those deceptive tricks which are owing, either entirely or mainly, to dexterity and address.

Legion, *leje'-un* (Lat. *legio*, from *legere*, to choose, select), the name given to a division of the Roman army, which corresponded to a great extent, both in numbers and constitution, to a brigade of the English army. The legion was first instituted by Romulus, shortly after the foundation of Rome. As the rising state was chiefly composed of fugitives from various parts of Italy, and men who were proscribed in their own country for criminal and political offences, and as its rapid growth soon provoked the jealousy of the surrounding states, it was necessary to give a military organization to the inhabitants of the new city, and Romulus accordingly enrolled three bodies of 3,000 men each for active service, each of which was levied from one of the three tribes into which he had divided his people. These bodies he called legions, and each was commanded by an officer of high rank, styled a prefect (from *præficere*, to set before or over) or tribune, whose rank may be considered as equivalent to that of a general officer in our own service. The legion was originally divided into smaller bodies of 300 men each, called *manipuli*, or maniples; but, subsequently, when the strength of the legion was increased, each legion was divided into ten cohorts, each cohort into three maniples, and each maniple into two *centuriæ*, or centuries. Considering a Roman legion to correspond to a brigade in our own army, each cohort would be equivalent to a regiment, though not equal to it in point of numbers, and each century would be equivalent to a company. Each century, which varied in numbers at different times, but which consisted of 100 men, like the original maniple, when at its maximum strength, was commanded by a centurion, who had under him two sub-centurions and a standard-bearer, besides decurions. In these we find the equivalents to our own captain, lieutenant, ensign, and non-commissioned officers of a company. Two centuries composed a maniple, and the senior centurion of the maniple, styled *centurio prior*, probably took command of the entire body, as the senior captain takes the command of two or three companies of volunteers enrolled in the same town, whose complement is not sufficient to entitle them to have a major in command, under the title of captain-commandant. Three maniples composed a cohort. Thus, a legion consisted of ten cohorts, which were divided into thirty maniples, and again subdivided into sixty centuries; and as each century consisted of 100 men, the maximum strength of a legion was 6,000. Each centurion carried a vine rod as the emblem of his authority, and the senior centurion of the entire legion was called *centurio primi pili*, and took rank as a knight, or one of the *equites* (*see* Equites), in virtue of his position. To his care the principal standard, or eagle of the legion, was confided. In addition to the main body of infantry, about 300 horse-soldiers were attached to each legion, who were drawn up on the wings when the legion was about to enter into action. These were divided into ten *turmæ*, or troops of thirty men each. The foot-soldiers composing a legion were also distinguished as *hastati*, *principes*, and *triarii*, of which the last-named were veteran troops. When the legion was drawn up in order of battle, the hastati occupied the first rank, in ten bodies, each consisting of ten ranks of sixteen men each. The principes were drawn up in rear of the hastati, in bodies of similar extent, the triarii being in the rear of the principes, but in six ranks of ten men each. Thus, the hastati were first engaged in the battle, the principes forming, as it were, the supports, and the triarii the reserves. Each cohort had its regular number of these three classes of troops. When in battle-array, the Roman soldiers were drawn up in open order, that each man might have room to use his weapons. Besides these, who were armed with sword and javelins, a long buckler, helmet, cuirass, and greaves, each cohort had a certain number of *velites*, or light-armed troops, who had no particular station, but acted as skirmishers, being sent in any direction whence they might harass the enemy during his advance. These were armed with slings, light darts, short swords, and circular bucklers. The number of men comprising a legion seems to have varied at different times, but its strength appears to have been as mentioned above during the most famous wars of the Roman empire. Two legions formed a consular army. At first the legions were enrolled for a brief period, whenever their services were required, and were disbanded as soon as the war was over, the men being chosen by lot by the military tribunes from those who were liable to serve; but, in later times, each legion seems to have been kept up as a standing force, being distinguished by a number, and recruited from time to time, as our own regiments are. They were also further distinguished by the names of those who had raised them, or that of the place where they were raised, just as a regiment of our household troops is known as the Coldstream Guards, and the 11th hussars as Prince Albert's Own. The term legion was originally derived from the circumstance of

the tribunes choosing the soldiers that were to form the legion by lot, and as the body was composed of a great many soldiers, the expression was afterwards taken to signify any great number. The name is still applied to bodies of foreign troops in the service of a foreign power. Thus, a German legion was enrolled in England, and temporarily stationed at Shorncliffe, for service in the Crimean war; and the English troops that fought in Spain, in 1835 and subsequent years, in the civil war between the Carlists and the Christinos, under Sir De Lacy Evans, were called the British Legion.

Legion of Honour, an order of merit instituted by Napoleon in 1802, as a national reward for services of a distinguished character. It was given for military and civil services alike; those who were distinguished in literature, science, scientific discoveries, and commercial pursuits, being equally eligible for the decoration with the soldier and sailor. The order consists of five classes: grand crosses, grand officers, commanders, officers, and chevaliers, of whom there may be any number. Although established by Napoleon when he filled the office of First Consul, it was kept up on the restoration of the monarchy, and has suffered little material change during the revolutions that called Louis Philippe to power and drove him into exile, and those which have raised Napoleon III. to the summit of his greatness. The recipient of the cross of the Legion of Honour is entitled to a small annual pension, which is now fixed at 400 francs. The grand cross of the order was sent by Napoleon III. to the Prince of Wales on the occasion of his marriage.

Legislation, *lej-is-lai'-shun* (Fr., from Lat.), is the making of law. (*See* Law.)

Legislative. (*See* Government.)

Legislature, *lej'-is-lā-ture* (Lat.), in Pol., is applied to the body or bodies in a state vested with the power of making laws: thus the king, lords, and commons in this country constitute the legislature.

Legitimacy, *le-jit'-e-mā-se* (Lat.), in Law, denotes a child born in lawful wedlock. (*See* Bastard, Affiliation.)

Legitimate, *le-jit'-e-māt* (Lat.), in Pol., denotes what is in accordance with, or not contrary to, the positive law of a country. When the enactments of a government transgress the higher laws of nature, then they too cease to be legitimate. While obedience to civil authority is enjoined both by reason and revelation, yet when that outsteps its proper province, resistance to it may become a duty. Farther, a government to be legitimate must be lawfully established; and hence the term has come to be applied to old hereditary dynasties, in opposition to those which may have sprung up by revolutionary means.

Legitimation, *le-jit-e-mai'-shun* (Lat.), is the act by which natural children are rendered legitimate.

Legumin, *leg-u'-min* (from Lat. *legumen*, a legume), a substance similar to casein, found in the seeds of most leguminous plants. Legumin may be extracted from pease or almonds by digesting the pulp of the crushed seeds in warm water for two or three hours. The undissolved portion is strained off, and the turbid liquid allowed to deposit the starch which it holds in suspension; it is then filtered, and the casein is precipitated by dilute acetic acid in the form of a flocculent precipitate, which is washed, dried, powdered, and digested, first in alcohol and then in ether. It is coagulated by rennet, like the casein of milk; and the Chinese make a kind of cheese from pease and beans.

Leguminosæ, or Fabaceæ, *leg-u-min-o'-se*, in Bot., a nat. ord. of *Dicotyledones*, sub-class *Calycifloræ*, having the following essential characters:—Herbs, shrubs, or trees. Leaves nearly always alternate and stipulate, and usually compound. Flowers regular or irregular, often papilionaceous (having a fancied resemblance to a butterfly); calyx inferior, 5-parted, the odd division being anterior; petals 5, or fewer by abortion, sometimes entirely wanting, perigynous, odd one, when present, posterior; stamens distinct or coherent, in one or more bundles; ovary superior, simple, and 1-celled; style simple, proceeding from the ventral suture. Fruit usually a *legume*, sometimes a *lomentum*, rarely a *drupe*. Seeds 1 or more, with or without albumen. The order may be generally distinguished by having papilionaceous flowers or leguminous fruit. It is divided into three sub-orders; namely,—

1. *Papilionaceæ*.—Petals papilionaceous, imbricated in æstivation, the upper or odd petal exterior; as in the pea, bean, furze, broom, &c.

2. *Cæsalpiniæ*.—Petals not papilionaceous, imbricated in æstivation, the upper or odd petal interior; as in the tamarind, cassia, &c.

3. *Mimoseæ*.—Petals equal, and valvate in æstivation; as in the acacia, &c.

The leguminous order is not only among the most extensive that are known, but also one of the most important to man, whether we consider the beauty of the numerous species, which are among the gayest-coloured and most graceful plants of every region, or their applicability to a thousand useful purposes. The Cercis, which renders the gardens of Turkey resplendent with its myriads of purple flowers; the Acacia, not less valued for its airy foliage and elegant blossoms than for its hard and durable wood; the Brazilletto, Logwood, and Rosewoods of commerce; the Laburnum; the classical Cytisus; the Furze and the Broom, both the pride of the otherwise dreary heaths of Europe; the Bean, the Pea, the Vetch, the Clover, the Trefoil, the Lucerne,—all staple articles of culture by the farmer,—are many leguminous species. The gums Arabic and Senegal, Kino, Senna, Tragacanth, and various other drugs, with Indigo, the most useful of all dyes, are products of other species; and these may be taken as a general indication of the purposes to which leguminous plants are applied. There is this, however, to be borne in mind in regarding the qualities of the order in a general point of view; viz., that upon the whole it must be considered poisonous; and that those species which are used for food by man or animals are exceptions to the general rule, the deleterious juices of the order not being in such instances sufficiently concentrated to prove injurious, and being, in fact, replaced, to a considerable extent, by either sugar or starch.

Leipsic, Battles of, *lipe'-sik* (Ger. *Leipzig*).—Twice have the destinies of Germany been decided by arms on the plains of Leipsic,—on 7th Sept., 1631, and 18th Oct., 1813; while a third contest,—that of 2nd Nov., 1642, was by no means unimportant in its consequences. In the first of these the military talents of Gustavus Adolphus, and the superior tactics of the Swedes, prevailed over the German Catholic generals Tilly and Pappenheim, and Tilly was shown not to be invincible. Of his army of 35,000 or 40,000 men, 8,000 fell and 3,000 were taken prisoners. The victory was decisive, and Protestant principles triumphed in Northern Germany. Eleven years later, Torstenson, the Swedish general, defeated at the same place the imperial Saxon troops, under the archduke Leopold Wilhelm. But the most eventful battle for Germany, and indeed for the whole of Europe, was that of October, 1813. This memorable battle of Leipsic, called by the Germans the great *Völkerschlacht*, precipitated the downfall of Napoleon, already weakened in his resources by the disastrous Russian campaign. He had assembled his troops in and around Leipsic to the number of about 80,000 or 90,000 men, the corps of Ney and Regnier not having yet come up. The allied forces, amounting to about 120,000 men, were under the command of Prince Schwartzenberg, although the three monarchs of Austria, Prussia, and Russia, were also present. About 7 o'clock in the morning of the 16th October, the allied troops put themselves in motion, carried the French outposts, and about 9 o'clock the battle became general. Both parties displayed the most brilliant courage. Wachau was the scene of the most obstinate conflict. From this place Napoleon adopted his favourite measure of making a grand attack upon the enemy's centre. The corps of Ney, which arrived at this juncture, might have decided the day, but Blücher's army, of about 60,000 strong, also made its appearance. The latter had, after an obstinate conflict, driven Marmont out of the village of Möckern, and now threatened Leipsic from that quarter; so that Ney had to be despatched against it, and the decisive moment was lost. At nightfall both armies remained in nearly the same position as they had occupied in the morning; the only decided success

of the French being on the western side of Leipsic, where General Bertrand had driven back the Austrians under Gyulai, and preserved a line of retreat through Lindenau in case of disaster. On the 17th, both armies rested by tacit agreement, and Napoleon, conscious of his weakness, made an ineffectual attempt to procure an armistice. The 18th found his forces, about 160,000 in number, arranged in a semicircle around the north, east, and south of the city; while, to oppose him, Schwartzenberg, strengthened by the arrival of the Russian reserves under Benningsen and Bernadotte's army of the north, brought into the field 300,000 men and nearly 1,400 cannons. Against these odds the French fought with heroic courage. Gradually their circle of defence was narrowed, and at a critical period of the day they were weakened by the defection of large bodies of Saxon and Würtemberg troops, who immediately turned their guns against their former comrades. The allies having at length penetrated into the suburb of Schonfeld, Napoleon became convinced that the city was no longer tenable, and, taking advantage of a cessation of hostilities, at nightfall commenced a retreat. Amid a scene of the wildest confusion, the French filed off through Lindenau. Early in the morning of the 19th the allies forced an entrance into the city, and a terrible conflict took place with the rear-guard of the French army, who were encumbered with immense trains of baggage and artillery, and a multitude of wounded. To add to their disasters, the bridge over the Elster was blown up too soon, leaving 15,000 soldiers, besides 23,000 sick and wounded, and more than 200 pieces of artillery, in the hands of the allies. Marshal Macdonald succeeded in swimming his horse across the river, but Prince Poniatowski, in attempting the passage, was drowned. The total loss of the French during the three days' fighting is estimated at about 60,000 men; that of the allies at 45,000.

LEMMA, *lem'-mă* (Gr., a thing taken or assumed), in Math., is a term used to denote a preliminary proposition taken as demonstrated for the purpose of being used in the demonstration of a subsequent proposition. Thus propositions in geometry may be taken as lemmas to prove some proposition in mechanics. In logic, a premise taken for granted is sometimes called a lemma.

LEMMING, *lem'-ming*.—The *Myodes norvegicus* is a native of Norway and Finland. It belongs to the family *Murina*, which includes the mouse, rat, and other similarly formed animals. It is about five inches in length, with a tail about half an inch long, and is of a tawny colour, variegated with black. In its habits the *lemming* is extremely peculiar. It subsists entirely on vegetable food, and lives in shallow burrows under ground in summer, and makes long passages under the snow in winter. In Baird's "Cyclopædia of the Natural Sciences," its peculiar habits are thus described:—"The most remarkable feature in the history of the lemming is the periodical emigrations the animals make from one part of the country to another. They descend in great bands from the mountains which divide Nordland and Finmark, eating up everything before them. They pursue their course in a straight line, climbing walls and houses, and not avoiding man himself, should he stand in their way; but attempting to climb over him. Rivers and lakes are swum across, the band forming again on the other side, and corn and hay stacks are gnawn through. Like an army of locusts, they pass on, leaving a desolate track behind them; nor do they stop till they reach the sea, where thousands are drowned. During their march great numbers are destroyed by hawks, owls, weasels, &c.; and so great is the havoc thus committed, and by their being swept away in crossing rivers, and by similar casualties, that but few ever reach their native haunts again. The cause of these migrations is not well known, but is supposed to arise from want of food. They appear to take place at irregular intervals; but, upon an average, about once in ten years." In former times, the lemmings were superstitiously regarded by the peasants of the countries they went over, the popular belief being that they fell from the clouds; and in such dread were they held, that it used to be the custom for priests to exorcise them with bell, book, and candle."—*Ref.* Baird's *Cyclopædia of the Natural Sciences.*

LEMNIACEÆ. (*See* PISTIACEÆ.)

LEMNIAN EARTH, or SPHRAGIDE, *lem'-ne-an*, a species of bole, or kind of earth, found in the island of Lemnos, in the Ægean Sea. Amongst the ancients this substance was celebrated as a sovereign remedy against poisons and the bites of venomous reptiles. It was also much used in medicine, not only as an alexipharmic, but also as an astringent, sudorific, vulnerary, &c. There were three varieties of Lemnian earth,—the white, the red, and the yellow; of which the two former were considered the most valuable. They were brought from the Levant, mostly in the shape of small cakes, bearing the impression of a seal, from which circumstance it gained the name of *terra sigillata*. In external appearances it resembles a clay, with a smooth surface like agate, especially in recent fractures. It is of a fatty consistence, and has a soapy feel, adheres slightly to the tongue, and falls to pieces when immersed in water. When analyzed, it is found to consist of—silica 60, alumina 14·5, soda 3·5, oxide of iron 6, water 8·5, with slight traces of magnesia and lime. Till within the present century, the Turks and Greeks believed that the Lemnian earth was possessed of imaginary virtues. The cups and goblets used by the Sultan and chiefs were invariably made of this substance. The alexipharmic and astringent properties of this and other boles are now held in little or no esteem; but, used in the same manner as soap, it is still used in order to remove impurities.

LEMON, *lem'-on* (Fr. *limon*, Low Lat. *limonium*).—The fruit of the lemon-tree (*Citrus limonum*) was originally brought to this country from the tropical parts of Asia, but is now very extensively cultivated in the south of Europe, and especially in Sicily, where the fruit forms an important article of commerce. The lemon is a variety of the citron, and belongs to the natural family *Amantiaceæ*. The juice of the lemon makes one of the most popular and refreshing beverages,—lemonade. The fresh rind of the lemon is a gentle tonic, and when dried and grated, is used in flavouring a variety of culinary preparations. Lemons appear in company with the orange in most orange-growing countries. They were only known to the Romans at a very late period, and, at first, were only used to keep the moths from their garments, their acidity being unpleasant to them. In the time of Pliny the lemon was hardly known otherwise than as an excellent counter-poison. At the present time, lemon-juice is employed by calico-printers in order to discharge colours.



LEMON.

LEMONADE, *lem'-on-aid* (Fr. *limonade*), is a drink prepared of water, sugar, and the juice of lemons, literally speaking; but cream of tartar forms the principal ingredient of a good deal of the lemonade manufactured in London. It was first publicly sold in England in the years 1630-35, when it was imported from Italy, in which latter country it was first made.

LEMON-GRASS OIL. (*See* ANDROPOGON.)

LEMUR, *le'-mur* (Lat. *lemur*, a ghost), a term formerly applied, in the Linnæan system of zoology, to several of the lower quadrumanous animals of different structure and habits. However, it is now restricted to such as have the inferior incisors long, compressed, and sloping forwards, and the lower canines approximated and of similar form and direction. "Each of the four extremities is provided with an opposable thumb; but the index digit of the hinder hand has its nail developed into a long curved sharp-pointed claw." The lemurs are natives of Madagascar, and of some of the smaller islands in the immediate neighbourhood. Their food is composed of a mixed diet of fruits, insects, and small birds, they being able to surprise the latter while at roost during the night-time. (*See* FLYING LEMUR.)

LEMURES, *lem'-u-reez*, a term applied, in Roman

antiquity, to the ghostly souls of the dead, that tormented men in the night-time; whence they are also called *nocturnal*, or *black*. A ceremony, called indifferently either *lemuria*, *lemuralia*, or *remuria*, used to be observed on the 9th, 11th, and 13th of May; and was thus celebrated on account of its supposed efficacy in laying the souls of the departed. The ceremony of the lemuralia is thus described in the "Popular Encyclopædia:"—"About midnight, when everybody was asleep, the head of the house arose, and went, barefooted, softly, and in silence, to a fountain; with a snap of the fingers, still keeping silent, he protected himself from the spectres. Having washed his hands at the fountain, he returned, took some black beans in his mouth, and, without looking round, threw them nine times over his head, repeating each time—*Hæc ego mitto; his fabis me meosque redimo* (These I send; with these beans I redeem me and mine). He then washed his hands again, struck a hollow copper vessel, saying nine times, during the operation, in a supplicating tone—*Manes, exite, paterni* (Ye souls of my ancestors, depart). He now looked round, and the ceremony was finished. It was believed that the spirits came and collected the beans."

**Lenitives**, *len'-e-tivs* (Lat. *lenis*, gentle), in Med., is applied to purgatives which act in a gentle manner, and have a soothing effect.

**Lens**, *lenz* (Lat., a small bean), a name given in Optics to a piece of glass, or other transparent medium, bounded on both sides by two spherical surfaces, or on the one side by a spherical and on the other by a plane surface. A lens has the property either of collecting parallel rays of light into a point or focus, or of causing them to diverge, according to the laws of refraction. Lenses vary in form, that is, are terminated by various surfaces, from which they acquire different names. A *spherical lens* is a sphere or globule of glass. A *double convex lens* has both sides convex; a *plano-convex* has one side plane and the other convex. A *double concave lens* has both sides concave; a *plano-concave lens* has one side plane and the other concave. A *meniscus lens* (so called from its resemblance to a little moon) has one side convex and the other concave, both of which meet at the edges; while in the *concavo-convex lens* the sides are parallel, and are joined by a flat surface. Those lenses which are thicker in the middle than the edge cause the rays of light to converge in passing through them; and those which are thicker at the edges than at the middle cause pencils of light which are refracted through them to diverge. From a very early period it was observed that a transparent body of spherical form was able to collect at a point parallel rays of light. It was also remarked that the illumination at these points was feeble, on account of the thickness of the glass which the light had to pass through. By taking two small segments only, instead of the entire sphere, the inconvenience was removed; since the refraction, in the latter case, takes place only at the surfaces, and not in the interior of the glass, the very same refraction of the rays is produced as when the entire sphere is used. In the manufacture of lenses, the spherical surfaces are produced by grinding them in counterpart tools, or discs of metal, prepared to the same curvature as the lenses. The glasses for lenses are first brought to a rough circular form, and afterwards ground and polished with fine emery and puttypowder. The grinding and polishing of the finer varieties of lenses for telescopes, microscopes, and other delicate apparatus, requires extremely nice manipulation.

**Lent**, *lent* (Lat. *quadragesima*), is a period of forty days observed in the Christian Church in commemoration of our Saviour's fasting in the wilderness. The name is derived from the Saxon *lenz*, spring, from the time of the year in which it is observed. It is used as a preparation for Easter, and begins on Ash-Wednesday. The observance of Lent is of great antiquity, for from the first ages of Christianity it was usual to set aside some time for humiliation and special exercises immediately before Easter. At first this fast extended only to forty hours, then to thirty-six days; and four additional days were added in the 9th century. Anciently, the mode of observing Lent was to abstain from food till the evening, the only refreshment being supper, which, however, might include flesh or any other kind of food; the restrictions as to particular kinds being subsequently introduced. The Church of England has retained the Lent season in its calendar, and has appointed appropriate collects, epistles, and gospels; but it has left to individuals to prescribe for themselves that rule of life which is best fitting to habits of self-denial.

**Lentibulariaceæ**, *len-ti-bu-lā-re-a'-se-e*, in Bot., the Butterwort fam., a small nat. ord. of *Dicotyledones*, sub-class *Corollifloræ*, consisting of herbs growing in water, marshes, or wet places. The leaves are radical, entire, or divided into thread-like filaments, bearing little pouches or air-vesicles. The flowers are irregular, with persistent 2-lipped calyx, and a 2-lipped corolla. The species *Pinguicula vulgaris* is termed butterwort, from the property its leaves possess of coagulating milk.

**Lentigo**, *len-tī'-go* (Lat.), in Med., is a freckle on the skin; so named from its resemblance to lentil-seeds.

**Lentils.** (*See* Ervum.)

**Leo**, *le'-o* (Lat. *leo*, the lion), a constellation of the northern hemisphere, which gives its name to the fifth sign of the zodiac. It is situated between the constellations Ursa Major, or the Great Bear, Virgo, and Cancer. The most conspicuous stars in this group are Regulus, or $\alpha$ Leo[illegible], of the first magnitude, and Deneb, or $\beta$ Leonis, [illegible] magnitude midway between the first and second, which is intersected by a straight line drawn through the polar stars and the star $\gamma$ in Ursa Major.

**Leo Minor**, or the Little Lion, a constellation of the northern hemisphere, formed and named by Helvetius, lying immediately to the south of the Great Bear, and between Lynx, Leo, and Cancer. It is composed of small stars, all of them being less in apparent size than stars of the fourth magnitude.

**Leonine Verses**, *le'-o-nine*, is a species of poetry much in fashion during the middle ages, and consisting of the introduction of rhyme into Latin verse. The term is said to be derived from a poet Leo, or a monk Leoninus. As an instance, is the famous song of Walter de Mapes:—

"Mihi est propositum in taberna mori;
Vinum sit appositum morientis ori."

Sometimes the rhymes fall in the same line, the end rhyming to the middle; as—

"Dæmon languebat, monachus tunc esse volebat;
Ast ubi convaluit, mansit ut ante fuit."

**Leopard**, *lep'-pard* (*Felis leopardus*), a name applied to the larger spotted cats (*Felidæ*), which are found both in the Old and New worlds. In the continent and islands of the Old World, the leopard appears to have its most perfect development; but the American jaguar far excels the leopards of Asia and Africa in size, strength, and sturdiness of make. There is much discrepancy of opinion among naturalists as to whether the leopard and panther (*Felis pardus*) are distinct species or only varieties. Cuvier separated the panther from the leopard specifically. He describes the panther as being yellow above and white beneath, with six or seven rows of black spots, formed by a cluster of five or six simple spots on each side. He speaks of the species as being found all over Africa, in the warm countries of Asia, and in the Indian Archipelago. The leopard is referred to as differing from the panther in having ten rows of smaller spots. Linnæus, however, could not see sufficient grounds of distinction between them, and referred both names to one and the same animal (*Felis leopardus*). The leopard properly so called is a beautiful but savage animal, and is spread over the African continent as widely as the lion. Over this vast extent he varies little, and that merely in magnitude and in the size and form of his markings and their depth of colour. Everywhere, however, he is the same in respect to form and structure, disposition and character. The general colour of the leopard is yellowish fawn, which grows paler in the sides till it merges into the white of the under part of body. Over the head, neck, back, and limbs are scattered black spots of various sizes; while the sides are covered with numerous rose-shaped spots. The leopard's general aspect is fierce, and its disposition is characterized by all the fierceness and craftiness which

is noticed in the rest of the cat tribe. He preys upon antelopes, monkeys, and the smaller quadrupeds; but avoids man except when closely pursued, when he fights obstinately. Leopards have been known to attack solitary travellers. When they fall in with a flock of sheep, they commit almost incredible slaughter. Two leopards, a male and female, with three young ones, have been known to enter a sheepfold near the Cape of Good Hope, when the old animals killed nearly a hundred sheep. After having gorged themselves, they fed their young, and each seizing a whole carcass tried to carry it away; they were waylaid, however, and killed. The mode by which the negroes capture the leopard is by digging pitfalls and slightly covering them with hurdles, over which a piece of meat is laid as a bait. From the great flexibility of the limbs of this animal, he is able to ascend trees with great ease, and when pursued, is in the habit of taking refuge among the branches. He can be somewhat tamed when taken very young. According to the accounts of African travellers, the flesh of the leopard is excellent, resembling veal in flavour. The skins are valuable for making rugs, &c., and are sold in Europe at from £5 to £10. Among the larger spotted cats of the Old World is the rimau-dahan, which partakes, in some measure, of the markings of the tiger and leopard, though it seems to be more allied to the former than to the latter. Its probable size, when full-grown, will be about four feet from the nose to the root of the tail; and its height, at the shoulder, about one foot ten inches. Its colour is brownish grey, with no yellow or red tints. Its spots and stripes are large, dark, irregular, and oblong in form; the larger ones being marked by lines of velvety black. It inhabits Sumatra. According to Sir Stamford Raffles, who made personal observations on two individuals of the species, while young, these leopards are very gentle and playful. He brought one specimen alive to England; but it died shortly after its arrival, during the process of dentition. "On board the ship," he relates, "there was a small Musi dog, who used to play round the cage and with the animal; and it was amusing to observe the playfulness and tenderness with which the latter came in contact with his inferior-sized companion." This specimen was taken very young in the forests of Bencoolen. The natives assert that the rimau-dahan never attacks man, but lives principally upon poultry, birds, and the smaller kinds of deer; and that it sleeps, and often lays in wait for its prey, on trees; from whence it derives the name of *dahan*, which signifies the fork formed by the branch of a tree. One of the most interesting forms of division of the *Felidæ* is the chetah, or hunting leopard (*Cynailurus jubatus*); it is inferior in size to the leopard proper, not being more than thirty-two inches high; besides which, his limbs are not so graceful nor his fur so sleek as the majority of the cat tribe. The claws of the chetah are not retractile, or, at most, so slightly that naturalists have found a difficulty in agreeing as to the animal's genus. The chetah is of much lighter build than the panther, shows better flight when hunted with dogs, and commonly inhabits the lower branches of the great trees of the forest, where the female brings forth her young. It is common with the European inhabitants of Ceylon to style the leopard there found, chetah; but the true breed of hunting-leopard does not there exist. Whether the chetah is taken as a cub and trained to the business of deer-hunting, or whether, as a full-grown animal, it may be trapped and broken in, does not seem clear; it would, however, seem most probable that the former system was adopted; for although we have instances of leopards and panthers becoming so far docile as to tolerate the society of man, it requires the utmost care that they do not relapse to their naturally ferocious habits. When the trained chetah is required for a day's sport, he is placed in a sort of cart, drawn by a horse, and accompanied by the hunters and the usual company that belong to the chase in India. When an antelope is started, it is shown to the chetah in the tumbril, who, as soon as his leash is slipped, leaps after it. The speed of the deer is much greater than that of the chetah; but it invariably happens, that as soon as the former becomes aware of its terrible pursuer, it becomes panic-stricken, and its swift and regular paces change to spasmodic leaping and stumbling, while the chetah, eager for the sanguinary reward for his services, increases his speed, and is presently on the back of the struggling animal, with its fangs buried in its throat. The hunters hasten up with the chetah's hood and chain, and after he has been enticed from the deer by the offer of pieces of meat, the hood is slipped over his eyes, and he is led back to the tumbril and held till fresh game is started. The behaviour of the chetah in confinement is that of an ordinary savage dog. The chetah in its external form and habits presents a mixture of the feline and canine tribes; from whence it derives its name of *Cynailurus*, from the Greek *kuwos*, a dog. The jaguar (*Felis Onça*), or American panther, is the form which the leopard takes in the New World. (*See* JAGUAR.)

LEOPOLDINIA, *le-o-pold-in'-e-â* (so named after the empress of Brazil), in Bot., a gen. of Palms. *L. Piassaba* is a very interesting and useful plant. Its persistent petiole-bases terminate in long pendulous beards of bristle-like fibres: these are cut off from the young plants after having been previously combed out by means of a rude comb, and now form an important article of commerce in Brazil. These fibres are known under the names of Piassaba or Piaçava, para-grass and monkey-grass, and are used for brooms, cleaning-brushes, &c. The pulpy envelope of the fruit yields a delicious drink resembling cream.

LEPIDOLITE, *lep'-e-do-lite* (Gr. *lepis*, a scale; *lithos*, stone), in Min., a mica containing lithia, rubidia, and cæsia. It is generally employed as the source of these rare alkalies.

LEPIDOPTERA, *lep-e-dop'-ter-â* (Gr. *lepis*, a scale; *pteron*, a wing), an order of insects which contains those generally known by the name of butterflies and moths. They have four membranous wings, covered on both sides with minute generally coloured scales, which appear to the naked eye like a quantity of fine dust scattered over them. They possess also a long proboscis, or trunk, rolled up spirally; and two antennæ, generally long, of variable form. The Lepidoptera undergo perfect metamorphosis. In general, the females are rather larger than the males, and their colour less brilliant. In the *imago* state they are very short-lived; the males die shortly after the act of generation is accomplished, and the female soon after she deposits her eggs. The nectar of flowers forms their principal food, and they suck it up from the depths of the narrowest blossoms by means of their proboscis, which is wonderfully adapted for the purpose. The females of different species lay their eggs upon different plants, according to the proper food required for the young caterpillar. Thousands of eggs are sometimes laid by one insect, and they are made to adhere to the surface of the leaf on which they are deposited. The larvæ of the Lepidoptera are well known by the name of caterpillar. When ready to be hatched, they come out in a worm-like form, the body being cylindrical and composed of thirteen segments. They have three pairs of simple articulated feet, which serve the purpose of walking; and from two to five pairs of false legs, short and thick, armed at the end with hooks, which enable the animal to fasten itself on leaves, branches, &c. Most of these larvæ move forwards, but some walk backwards, with a sort of leaping motion; while others draw the body into a loop-form, then suddenly straightening, spring forwards with an energetic bound. During this state of their existence, they do considerable damage to trees, shrubs, &c., and change their skin several times. They then cease feeding, and change into the chrysalis or pupa state. (*See* INSECT-TRANSFORMATIONS.) When the perfect insect emerges, the wings are at first moist and unexpanded; it then appears weak; but, soon after being exposed to the air, its wings become dry and expand, and the insect seems full of life and activity. There are supposed to be about 12,000 species of Lepidoptera, or nearly one-sixth of all the insect tribes. More than 2,000 are said to be natives of Britain. They present many points of interest to the entomologist, especially in their larva and their pupa state; while the beauty and elegance of the forms of the perfect insects are admired by all. The value of the silk cocoons of the pupa of certain species is almost equal to the damage done by the larvæ of others. The Lepidoptera have been divided into three large classes: the *Diurna*, or

those which fly by day; the *Crepusculatia*, or those which fly in the evening; and the *Nocturna*, or those which fly by night. Many of the Nocturna, however, fly by day, and *vice versâ*; in consequence of which another arrangement has been adopted, based upon the construction of the antennæ. In the butterflies, the antennæ are always club-shaped at the extremity; they are, therefore, classed in the group *Rhopalocera*, club-horned. The moths, on the contrary, never have the antennæ with club-shaped ends; they are generally setaceous, filiform, fusiform, or pectinated; they have been, consequently, classed in the group *Heterocera* varied-horned.

LEPIDOSIREN, *lep'-e-do-si'-ren* (Gr. *lepis*, a scale), the Mud-eel, an animal which in late years has given rise to much discussion among naturalists, as to whether it belongs to the class of reptiles or fishes. It is one of the most perfectly amphibious of all animals. Its organs of respiration are twofold. As in all fishes, it has well-organized gills on the inner edge of the branchial arches, and a regular gill-cover, with a small oblong aperture in front of the base of the anterior members. Besides these, it has two well-developed cellular lungs of nearly equal size. The body is elongate and fish-like in form, covered with oval imbricated scales, and furnished with dorsal and caudal membranes resembling fins, strengthened with soft-jointed rays. According to the supporters of the reptilian theory, these members are feet; while those who regard the animal as a fish look upon them as fins. Two species of Lepidosiren are known,—the *L. paradoxa* and the *L. annectans*: the former is found in the Amazon and the latter in the Gambia. Several living specimens of the animal found in the Gambia have been brought to this country. During the inundations of the river, large portions of country are flooded; upon the retreat of the waters, the lepidosirens that are left behind burrow into the mud. The sun soon converts this into a hard cake, and they remain cased up in a sort of cocoon of dried mud. They remain torpid, and covered with a thick secretion of mucus, till the rainy season again commences, and the flooded river releases them. A short time ago, several of these animals were brought over to this country in their hard cocoons, and afterwards exhibited alive at the Crystal Palace at Sydenham. The natives eat the lepidosirens, and it is said that, when fried, they closely resemble eels in taste, and have a rich oily flavour.

LEPIDUM, *lep'-e-dum* (from Gr. *lepis*, a scale), in Bot., a gen. of the nat. ord. *Cruciferæ*. *L. sativum* is the garden cress, well known as a pungent salad, being commonly used with the young herb of the mustard-plant. (*See* SINAPIS.)

LEPRA, or LEPROSY, *lep'-ra lep'-ro-se* (Gr. *lepra*, scaliness), in Med., is a disease characterized by the formation of scaly patches on the skin, of different sizes, but having always nearly a circular form. Physicians distinguish three varieties of this disease,—*Lepra vulgaris*, or common leprosy; *Lepra alphos*, or white leprosy; and *Lepra nigricans*, or black leprosy. Leprosy first manifests itself in small distinct reddish elevations of the cuticle, which enlarge till they sometimes attain the size of a crown-piece. They are covered with scales, which accumulate and form a thick prominent crust, and are quickly reproduced as they fall off. This disease usually makes its appearance first about the knee or elbow, and extends by degrees along the extremities, till sometimes the whole body becomes affected by it. Its progress is, in general, very slow, and it may continue in the same state for years. The general health of the patient is but little disturbed by this disease. In lepra alphos the scaly patches are smaller than in lepra vulgaris, and have also their central parts depressed or indented. The lepra nigricans differs from the others chiefly in the colour of the patches, which are dark and livid. This disease sometimes makes its appearance without any apparent cause, sometimes it may be induced by exposure to cold or damp, and sometimes it is evidently hereditary. It is generally tedious of cure. The diet should be light and moderate, and all heating and stimulating liquors avoided. Externally, warm baths, sulphur-baths, and preparations of tar or creosote, are useful. The constitutional treatment will depend upon the condition of body; if weakly, tonics, as quinine and iron, are to be administered. A solution of arsenic is often of advantage; but, of course, it can only be used under medical superintendence. This disease appears to have been much more prevalent, and of a severer type, in ancient than in modern times, if indeed this is the same disease,—many being of opinion that the leprosy of ancient times resembled rather what is now known as elephantiasis. (*See* ELEPHANTIASIS.)

LEPTOSPERMEÆ, *lep-to-sper'-me-e* (Gr. *leptos*, slender; *sperma*, a seed), in Bot., a tribe of the nat. ord. *Myrtaceæ*, characterized by having capsular fruit. The typical gen. is *Leptospermum*, two species of which, *L. scoparium* and *thea*, have leaves which are used in the Australian colonies as a substitute for tea.

LEPUS. (*See* HARE.)

LEPUS, *le'-pus* (Lat. *lepus*, the hare), one of the original constellations of Aratus and Ptolemy, situated in the northern hemisphere, to the south of Orion. Its most considerable stars are of the third and fourth magnitude.

LE ROI (or LA REINE) LE VEUT, *le(r) rwaw (la reine) le(r) vuh(r)*, (Fr., the king, or queen, wills it), is the form in which the royal assent is given to the passing of public bills in parliament. (*See* ASSENT, ROYAL.)

LESION, *le'-zhun* (Lat. *lædo*, I hurt), in Surg., is a term used to denote any kind of wound or bodily injury.

LESSONS, *les'-sunz* (Lat. *lego*, I read), are certain portions of Scripture read in church during Divine service. The reading of the holy Scriptures formed an important part of public worship from the earliest ages of the Church. It seems to have been late, however, before any systematic table of lessons was prepared, though certain parts of Scripture appear to have been read at certain periods of the year; as the account of our Lord's resurrection during Easter. In the Church of England, the course of lessons begins, at the beginning of the year, with Genesis, and continues till the books of the Old Testament, and also portions of the Apocrypha, are read over, with the exception of the books of Chronicles, and such chapters in the other books as are less profitable to ordinary readers. The book of Isaiah is reserved for the end of the year, near to Christmas. The second lessons are taken in regular course from the New Testament; those for the morning service from the gospels and the Acts of the Apostles; those for evening service from the epistles. In the Presbyterian churches, the word lesson is not used in this sense, and the portions of Scripture which are read at public worship are selected for the occasion by the officiating clergyman.

LETHARGY, *leth'-ar-je* (Gr. *lethe*, forgetfulness; inactivity), is a state of unnaturally profound and continuous sleep. It is intermediate between heavy sleep and a state of complete coma, and may result from severe exertion of the body or mind; but it is also frequently produced by congestion of blood in the vessels of the brain; and hence it is often a symptom of great danger, frequently preceding an attack of apoplexy. It may also be caused by the action of any narcotic substance, or by alcoholic liquors. In general, the cure is effected by the removal of the cause by which it has been brought about. If the result of a determination of blood to the head, then topical bleedings by cupping, and purgatives, are required; but if, on the other hand, it proceed from nervous weakness, then tonics, stimulants, and a generous diet are necessary. (*See* APOPLEXY, COMA.)

LETTER OF CREDIT, is an order given by a banker, or other person, at one place, to his agent in another, authorizing him to pay to a particular individual a certain sum of money. A letter of credit is not a negotiable instrument, and therefore only the person named in it can legally demand payment.

LETTER OF POWER OF ATTORNEY, is a letter or instrument by which one person authorizes another to do some act for him, such as to sign a deed, collect rents, &c., the party so authorised to act being called the attorney of the other. The terms of the letter must be strictly adhered to, for the principal is only bound for the acts of his agent to the extent that he authorised him to act. It includes, however, an authority to do everything that is absolutely necessary in

carrying out the orders of the latter. The authority to act ceases on the death of the person granting it.

LETTERS, *let'-ters* (Ang.-Nor.), are those marks, signs, or characters, painted, engraved, or printed, used as the representatives of sound, or of an articulation of the human organs of speech; thus representing ideas by phonetic signs. Letters form the elements of written language, just as simple sounds constitute the elements of spoken language, or speech. Sounds communicate ideas through the agency of the ear; letters forming the visible representatives of sounds, communicate thoughts by means of the eye. (*See* ALPHABET, PHILOLOGY, WRITING.)

LETTERS OF MARQUE. (*See* MARQUE.)

LETTERS PATENT (Lat. *literæ patentes*, open letters), are letters of the queen, conferring some honour or privilege upon a party, and are so called because they are not sealed up, but exposed to view, with the great seal pendent at the bottom, and are usually directed or addressed by the queen to her subjects at large. They thus differ from certain other letters of the queen (*literæ clausæ*), which are directed to particular persons; and not being for public inspection, are closed up and sealed on the outside. Queen's grants, whether of lands, honours, liberties, franchises, or anything else that can be granted, are contained in charters or letters patent. The old mode of obtaining grants has been abolished by statute 14 & 15 Vict. c. 82, which provides that, in every case where any gift, grant, or writing whatsoever, to be passed under the great seal, would have required a queen's bill or bills from the offices of the signet and privy seal, her majesty may, by warrant under the royal sign manual, addressed to the lord chancellor, command him to cause letters patent to be passed under the great seal, according to such warrant, and that such warrant shall be prepared by the attorney or solicitor-general, and shall set forth the proposed letters patent, and be countersigned by one of the principal secretaries of state, and sealed with the privy seal. The granting of letters patent for an invention is specially regulated by 15 & 16 Vict. c. 83. (*See* PATENT.)

LETTER-WRITING is a branch of literature which, unfortunately, is but little studied. It is to be regretted that more pains are not taken to excel in an art which is so commonly and so universally practised. There are comparatively few persons that can write a good letter; and yet it is an attainment that may be reached by comparatively little pains an study. A good letter requires to be easy, natural, and well expressed, suited to the circumstances, and to the character of the person to whom it is addressed. The French, from being more natural, and having the power of expressing their feelings more vividly, greatly excel us in this line; and published collections of letters form a considerable branch of their literature. Among the more celebrated published letters of this country are those of Sir William Temple, Addison, Pope, Swift, Bolingbroke, Lady Montague, Chesterfield, Gray, and Cowper.

LETTRES DE CACHET. (*See* CACHET.)

LETTUCE, *let'-tus* (Fr. *laitue*), a smooth, herbaceous, annual plant, containing a milky juice, which has been cultivated from very early times. It is much used as a salad. There are many varieties of cultivated lettuces, which are divided into two families,—the cos and the cabbage. The cos varieties are distinguished by being of an upright growth, and are more grown in summer than winter. The cabbage lettuce is grown at all seasons, but more especially in winter, on account of its superior hardihood. It grows close to the ground, and produces a blanched heart like the cabbage, without assistance. When young, the cabbage varieties are generally sweeter than those of the cos at the same age, but at full growth this is reversed; hence the latter are preferred for salads, and the former for soups. (*See* LACTUCA.)



LETTUCE.

LEUANILINE, *lu-an'-e-leen*, in Chem., a base obtained from aniline by acting on a salt of rosaniline with sulphide of ammonium. It is a dazzlingly white crystalline solid, soluble in water, and forming well-defined salts with the acids. It differs from rosaniline in containing two equivalents of hydrogen less than that alkaloid; in other words, leuanilite seems to bear the same relation to rosaniline that white indigo does to the blue variety.

LEUCINE, *lu'-sine*, in Chem., a substance formed during the decomposition of cheese, muscle, or gluten, in the presence of water. It forms crystalline salts with several of the acids. It is somewhat cholesteric in appearance. It is sparingly soluble in cold water, but readily so in hot. It has an unctuous feel, and sublimes at 340° in woolly flocculi.

LEUCOMA, *lu-ko'-mâ* (Gr. *leukos*, white), in Med., is applied to a white opacity of the cornea of the eye. It is occasioned by acute inflammation, causing a deposition of lymph either upon the surface or into the substance of the cornea. When merely superficial, it often passes away with the cessation of the inflammation, but when deep-seated it is often incurable. Astringent lotions are generally recommended.

LEUCOPETRIANS, *lu-ko-pet'-re-ănz*, in Eccl. Hist., is the name of a fanatical sect of Christians which sprang up in the Eastern Church towards the close of the 12th century. Their founder was Leucopetrus, and his chief disciple Tychicus. They asserted that there dwelt in every individual an evil genius, which could only be expelled by continued prayer and supplication, in which alone they believed religious service to consist; and hence they rejected all external forms of worship. They professed to believe in a double trinity, rejected marriage, abstained from flesh, and treated the sacraments with contempt. They disappear from history after the death of their leaders.

LEUCOPOGON. (*See* EPACRIDACEÆ.)

LEVARI FACIAS, *le-vai'-ri fai'-she-ăs*, in Law, is a writ of execution directed to the sheriff, commanding him to levy the plaintiff's debt on the lands and goods of the defendant. By it the sheriff may seize all the defendant's goods, and receive the rents and profits of his lands till satisfaction be made to the plaintiff. This writ is now little used, the remedy by elegit, which takes possession of the lands themselves, being much more effectual.

LEVATOR, *le-vai'-tor* (Lat. *levo*, I lift up), in Anat., is a name given to certain muscles which serve the purpose of lifting the parts to which they are attached.

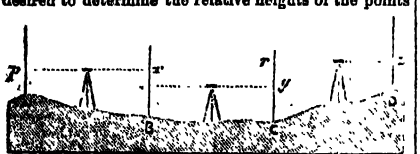
LEVEE, *lev'-e* (Fr. *lever*, to *rise*), properly denotes the time of rising, and is commonly applied to the visits which princes and other distinguished personages receive in the morning. It is specially applied in this country to the stated public occasions on which the sovereign receives visits from persons of rank or fortune. A levee differs from a drawing-room only in that ladies are admitted to the latter but not to the former.

LEVÉE EN MASSE (Fr., universal rising), a military term applied to the rising of a whole people in arms; including all those capable of bearing them that are not actually engaged in the regular service. The volunteer movement in England would produce a *levée en masse* in case any invasion should threaten us. A writer in the "Popular Encyclopædia" ably remarks on the movement in the following words:—"When animated by patriotic feelings, it is the most formidable obstacle an enemy can encounter; and it is unconquerable if favoured by the nature of the ground, because almost every advantage is on the side of the people. They fight on their own soil; they know the ground; they find support and assistance in every house, from every woman and child; they fight for their own hearths; they inclose the enemy on all sides, and can destroy whatever can be useful to him, cut off his communications, pursue, annoy, disturb, assail, harass him incessantly, so that he can effect nothing, except getting possession of the strong places. It is called *landsturm* in Germany, meaning *land storm*, in distinction to the militia, or *landwehr*. This distinction was first made in 1796, when the peasants of Bavaria and Franconia fell upon the rear of the flying French under Jourdan with much success. The *landsturm* was yet more effective in 1799, and in 1813 the governments of Northern Germany called it forth in every part of the country. It consisted of every male person

capable of bearing arms of any sort, whom age or other reasons exempted from the militia service. Orders were issued to turn anything into weapons, to defend the country by every means, and to injure the enemy in all possible ways, by destroying provisions and wells, attacking stragglers, intercepting couriers, and escorting prisoners. The *landsturm* was useful also at the siege of several fortresses. Its organization was founded on municipal decisions. Napoleon ordered the *levée en masse* when the allies entered France, and it threatened to become dangerous to them; but the capture of Paris put an end to the war. The last trace of the kind may be said to have taken place in Poland. The chief differences between a *levée en masse* and militia may be stated, in conclusion, to be, that in the former all persons are comprised that are not included in the latter; that they do not march from home; and that their service is more irregular, and even owes its strength to that very irregularity.

**Levellers**, *lev'-al-lerz*, in Eng. Hist., is the name of a party which arose in the army of the Long Parliament, and whose professed object was to level all ranks of society, and to establish equality in titles and estates throughout the country. When Cromwell departed for Ireland in 1649, they raised mutinies in various quarters, and were put down, not without bloodshed, by Fairfax.

**Levelling**, *lev'-el-ling* (Sax. *læfel*, even, flat), the name of the method by which the heights and depths of rising grounds and hollows may be estimated above or below a curved surface, corresponding to the curvature of the globe when the distance is considerable, or above or below an horizontal plane passing through a certain point in the earth's surface when the distance is short. In geodetic surveys, where the operations extend over a great part of the earth's surface, great nicety is required, and the measurements must be made with reference to the actual spheroidal shape of the earth; but in levelling a piece of ground for a railway or canal, it is sufficient to consider the surface to which the measurements are referred as being perfectly spherical. If it be desired to find the heights of a successive series of points in a line, straight or curved, running along the surface of the earth, it is manifest that the heights of these points can only be determined by referring them to other points, which are called level-points, and which are themselves equidistant from the centre of the earth, its form being assumed to be spherical. Such points are found by thesid of a pirit-level and by an instrument called a theodolite. (*See* Theodolite.) Suppose that it is desired to determine the relative heights of the points




A, B, C, D, along the surface of the ground, in a line proceeding direct from A to D. When the most convenient stations have been determined at intervals along the line between its extremities, which in the present instance are assumed to be at B and C, and the distances between them have been ascertained by measurement, the operator proceeds to place the theodolite midway between the first and second stations A and B, and, by the aid of the spirit-level, brings the telescope into such a position that the line passing through the centres of its lenses (called the line of collimation) may remain perfectly parallel to the plane of the horizon when the instrument is turned about its vertical axis. All points, therefore, in distant objects, which would be intersected by the line of collimation produced, would be level-points, since they are in a plane passing through that line, provided always that they are equidistant from the vertical axis of the telescope, and if any two points in a straight line with each other and the axis of the instrument be determined, the relative heights of any points above or below these may be readily ascertained. The surveyor having brought his instrument into a position parallel to the horizon at a point midway between the stations A and B, looks towards the station-staff at A and gives signals to the assistant standing there, to move the index up or down the staff as may be requisite, until it comes directly in the plane in which the line of collimation lies, which is ascertained by means of the coincidence of the point in question with the point of section of two wires, fixed within the telescope at right angles to each other, in the line of collimation, and crossing in the centre of the field of view. Turning the telescope towards the station at B, he goes through the same operation, and as the staves are divided into feet and inches, the distance between the index and the surface of the ground at each station is known, and the relative heights of the points A and B are determined; the difference between the numbers shown on each staff denoting the number of inches that the point B happens to be below the point A. As the heights are successively taken from positions midway between each pair of stations, they are registered in a field-book, the heights Bx, Cy, Oz, being entered in one column as fore-sights, while the heights Ap, Bq, Cr, are entered in another as back-sights. By the aid of these heights, and a table of the distances between each station, an accurate sketch of the profile of the ground along the whole extent of the line can be made according to scale, the distances between the stations being drawn on a less scale than the heights, for the sake of clearness, as they are so very long in proportion to the extent of the heights. This enables the engineer to regulate the extent of the embankments and cuttings that must be made in the construction of a railway or canal along the line that has been thus determined by levelling. The method employed in measuring a base-line for a trigonometrical survey of a country may be ascertained from the works to which reference is made at the end of the article on Geology.—Ref. *English Cyclopædia*—Arts and Sciences.

**Lever**, *le'-ver* (Lat. *levo*, I lift up), in Mech., an inflexible right line, rod, or beam, movable about a fulcrum or prop, and used for the raising of weights, being either without weight itself, or at least having such a weight as may be conveniently counterbalanced. The lever is the first of the mechanical powers, and on account of its simplicity was the first that was attempted to be explained. Its properties are treated of by Aristotle, and also by Archimedes. The forces applied to the lever are distinguished by different names,—the *power* and the *weight*. There are three kinds of levers, the difference between which depends upon the relative positions of the power and the weight. In a lever of the first kind, the fulcrum is between the power and the weight. Instances of this kind are to be seen in the crowbar, the handspike, the poker, scissors, nippers, &c. In a lever of the second kind, the weight is between the fulcrum and the power. Examples of this order are to be seen in the oars of a boat, nutcrackers, the common door, the wheelbarrow, &c. In a lever of the third kind the power is between the fulcrum and the weight, as in sheep-shears, the treddle of a turning-lathe, tongs, &c. The bones of animals are principally levers of the third kind. The socket of the bone forms the fulcrum; a strong muscle attached to it near the socket is the power; and the weight of the limb, together with the resistance opposed to its motion, the weight. Thus considerable motion is given to the limb by a very moderate action of the muscle. (*See* Mechanics.)

**Leviathan**, *le-vi'-a-thăn*, is a Hebrew term signifying a great fish, and is the name of a great marine animal described in Job xli. It is very uncertain what animal is really meant by the description; some supposing it to be the crocodile, others a whale.

**Levigation**, *lev-e-gat'-shun* (Lat. *lænigo*, I rub or grind fine), in Chem., the process of rubbing down or pounding minerals into a paste with water. Camphor, for instance, is easily reduced to powder by levigation with a few drops of alcohol; whereas, if it is pounded in the dry state, great difficulty is experienced in reducing it.

**Leviticum**, *le-vit'-te-kum* (a corruption of *ligusticum*, from Liguria, a place in Italy where it was abundant), in Bot., a gen. of umbelliferous plants. The species *L. officinale*, the lovage, was once much used as a pot-herb, and as an ingredient in salads. The

fruits (commonly called seeds) have somewhat similar properties to those of the dill and caraway.

LEVITES, *lē'-vites*, was applied in a general sense to all the descendants of Levi, who were set apart for the ministration of religious services, and who had no distinct territory allotted to them in the land of Canaan, like the other tribes. They were, however, to receive a tenth of the vegetable produce of the land and of the cattle. The office of the priesthood was confined to the family of Aaron, and in a more restricted sense the term Levite is applied to those of the tribe who performed the lower services of religion in the temple and throughout the country. They were also the ordinary judges of the country. In the time of David they numbered 38,000 men fit for official service; of whom 24,000 were "set over the work of the Lord," 6,000 were officers and judges, 4,000 were musicians, and 4,000 were porters.

LEVITICUS, *le-vit'-e-kus*, is the name of the third book of the Old Testament Scriptures, which treats principally of the rites, ceremonies, and sacrifices of the Hebrew religion. That this book was written by Moses is proved not only by Jewish tradition, but by passages in the book itself, and other parts of Holy Scripture where it is attributed to Moses. It contains the history of one month, viz., from the erection of the tabernacle to the numbering of the people who were fit for war; that is, from the beginning of the second year after the children of Israel's departure from Egypt to the beginning of the second month of the same year, 1490 B.C. The four leading topics of this book are—1. The laws concerning sacrifices, in which the different kinds of sacrifices are enumerated, together with their concomitant rites (i.—vii.); 2. the institution of the priesthood, in which the consecration of Aaron and his sons to the sacred office is related, together with the punishment of Nadab and Abihu (viii.—x.); 3. the laws concerning purifications, both of the people and the priests (xi.—xii.); 4. the laws concerning the sacred festivals, vows, things devoted, and tithes (xxiii.—xxvii.). These were all "shadows of good things to come;" and this book is of great use in explaining numerous passages of the New Testament, especially in the epistle to the Hebrews, which, in fact, would be unintelligible without it.—*Ref.* Horne's *Introduction to the Holy Scriptures.*

LEWIS, *lew'-is*, in Mech., an ingenious contrivance for securing heavy blocks of stone to the tackle for hoisting. It is said to derive its name from Louis XIV., during whose reign the invention was supposed to have been first employed. This would appear, however, not to have been the case; for in the ruins of Whitby Abbey, founded in 658, there appear in the crown of the heavy keystones of the arches, cavities like those now made for the lewis in similar blocks. These are quadrangular, and spread out at the bottom on two opposite sides, as in dovetailing. Into this hole three slips of iron are inserted to fill it, altogether forming a wedge in shape, the head of which is at the bottom of the cavity. The three ends projecting out of the stone present each an eye for a bolt, which is passed through the whole, and forms a handle for raising the block. To liberate the lewis, the bolt is removed, and the middle slip, which is a straight rectangular piece of iron, is readily taken out, setting free the other two. The chain, or double lewis, has been much used in America; and in constructing the dry dock at Brooklyn, stones were suspended by it weighing from 500 to 10,000 lbs.

LEWISIA, *lu-iz'-e-ā* (in honour of Captain Lewis, who accompanied Clarke to the Rocky Mountains), in Bot., a gen. of the nat. ord. *Mesembryaceæ*. The root of *L. rediviva*, an American species, is eaten in Oregon. It is sometimes called tobacco-root, from the smell which it acquires by cooking. M. Geyer states that it is the *racine amère* of the Canadian voyageurs. When cooked, it is agreeable and wholesome.

LEXICON, *leks'-i-kon* (Gr. *lexis*, a word), is a vocabulary or dictionary of words, more particulary applied to dictionaries in the Greek or Hebrew language. (*See* DICTIONARY.)

LEX LOCI CONTRACTUS, *leks lō'-si kon-trak'-tus* (Lat., law of the place where contracted), is the doctrine that all contracts made, or obligations incurred, have an implied reference to the laws of the place where the transaction occurred, unless it appear otherwise on the face of the contract.

LEX MERCATORIA, or LAW MERCHANT, *leks mer-kā-tō'-re-a* (Lat.), in a general sense, denotes the body of usages and customs which, among civilized countries, regulate matters relating to commerce. In this general sense of the term, the subject is very indefinite, for different countries have different customs, and the mercantile usages common to all of them are few in number. In this country, it is applied to that system of laws which applies to mercantile contracts, and is based upon the custom of merchants. The law merchant is frequently referred to in the early English statutes as a well-known system, and distinct from the ordinary law. The principal subjects embraced within it are the law of shipping, including that of marine insurance; the law of negotiable bills of exchange and promissory notes; and the law of sales; all of which are treated specially in other parts of this work.

LEX TALIONIS, or LAW OF RETALIATION, *leks tāl-e-ō'-nis* (Lat.), is used to denote a mode of punishing crime, by doing to the criminal the same hurt which he has done to his neighbour. Among the Jews, as well as among the ancient Greeks and Romans, the Egyptians, &c., the law of retaliation was frequently enforced; as we read of "an eye for an eye, a tooth for a tooth," &c. In general, however, retaliation cannot be a proper measure of justice, for the difference of persons, place, time, provocation, or other circumstances, may enhance or mitigate the offence. There are, besides, many crimes that will not admit of retaliation without manifest absurdity and injustice.

LEY, or LYE, *lai*, *li*, in Chem., a technical term for the solution of an alkali.

LEYDEN JAR. (*See* JAR, ELECTRICAL.)

LEZE MAJESTY, *leeze mâd'-jes-te* (Lat. *læsæ majestatis crimen*), in Law, is applied to any crime committed against the sovereign power of a state.

LIAS, *lī'-as*, a term applied in Geol. to denote a peculiar formation, consisting of thick argillaceous deposits, which constitutes the foundation on which the oolite series rests. The word *lias* is believed to have had its origin in a provincial mode of pronouncing the English word *layers*. To a considerable depth, the upper portion of these deposits consists of beds of deep-blue marl, containing a few irregular beds of limestone. In the lower portion, however, the limestone beds increase in frequency, and assume the characteristic aspect of lias, presenting a series of thin stony beds, separated by narrow argillaceous partings, so that the quarries of this rock assume a striped or ribbon-like appearance when viewed from a distance. When in their purest state, these limestone beds contain about 90 per cent. of lime, the other constituents being alumina, iron, and silica. The lime afforded by the blue lias is strong, and is distinguished by having the property of setting under water. The lias clay often occurs in the form of soft slate or shale, which divides into thin lamiæ, and is frequently impregnated with bituminous and iron pyrites. In consequence of this, when laid in heaps with faggots and set on fire, it continues to burn till the pyrites is decomposed. It also ignites spontaneously when it falls in large masses from the cliffs on the sea-shore and becomes moistened. The alum slate of Whitby is of this kind. The whole of the lias formation is rich in fossils, and is remarkable for its numerous remains of chambered univalves and bivalves, and certain species of fish and vertebral animals allied to the order of lizards, some of which are of enormous size. The ichthyosaurus and plesiosaurus were amongst these. (*See* ICHTHYOSAURUS, PLESIOSAURUS.) The lias crosses England from Whitby, in Yorkshire, to Lyme, in Dorsetshire. Its most valuable productions are water-setting lime and alum shale. A similar formation is found in France, in the Alps, and in the Jura.

LIBATION, *li-bā'-shun* (Lat. *libo*, I pour), in the religious worship of the ancients, the pouring of wine or some other liquid on the altar or on the ground during sacrifice. Libations were also in use among the Hebrews, who poured a bin of wine on the victim after it was killed. It was also a custom among the Greeks and Romans at their feasts to pour out a small quantity of wine by way of libation to the gods.

Libel, *lī'-bel* (Lat. *libellus*, Fr. *libelle*), in Law, is a malicious defamation of any person, made public by either printing, writing, signs, or pictures, in order to provoke him to wrath or expose him to public hatred, contempt, and ridicule. Libel, which is written slander, is looked upon, in law, as a greater offence than mere slander, being regarded as committed with greater deliberation, and as usually inflicting more extensive and permanent injury. Every libel is viewed as a public offence, as having a direct tendency to a breach of the public peace, by provoking the person libelled. In order to constitute a libel, it must be published; but the communication of it to any person is a sufficient publication in the eye of the law; and, therefore, the sending an abusive private letter to a man is as much a libel as if it were openly printed, for it tends equally to a breach of the peace. For the same reason it was, until very recently, immaterial whether the matter of the libel were true or false, since it was the provocation, and not the falsity, that was considered to be the thing to be punished; but by 6 & 7 Vict. c. 96, it is allowed to a defendant, in pleading to an indictment for a libel, to allege the truth of the matters charged, and that it was for the public benefit that they should be published. The truth of the libel may then be inquired into at the trial; but it shall not amount to a defence, unless it was for the public benefit that the matter charged should be published. If, after such plea, the defendant shall be convicted, the court may, in pronouncing sentence, consider whether the guilt of the defendant is aggravated or mitigated by the plea. In a civil action, however, a libel must appear to be false, as well as scandalous; for, if the charge be true, the plaintiff has received no private injury, and has no ground to demand compensation for himself, whatever offence it may have been against the public peace; and therefore, upon a civil action, the truth of the accusation may always be pleaded in bar of the suit. The sending an abusive private letter to a man does not constitute publication so as to support a civil action. By 6 & 7 Vict. c. 96, the publishing, or threatening to publish, a libel, or proposing to abstain from publishing anything, with intent to extort money, shall be punishable by imprisonment for any term not exceeding three years; and the publication of any defamatory libel, knowing the same to be false, is punishable with imprisonment for any term not exceeding two years, and such fine as the court shall award; and the bare publication of such libel shall be punishable with imprisonment for any term not exceeding one year. The printer of a libel is liable for prosecution as well as the writer; and so also is the person who sells it. In an action for a libel in a newspaper or other periodical, the defendant may plead that it was inserted without malice, and that he made, or offered to make, an apology before the action was commenced, or as soon thereafter as possible. There are certain kinds of communications that are regarded as privileged, and cannot be viewed as libellous, unless malice be proved, or may be inferred from the circumstances. Such are charges made by a master against a servant in giving his character to a party inquiring after it. Before 32 Geo. III. c. 60, the jury on a criminal trial for libel could only decide upon the fact of publication, and whether the libel meant that which was ascribed to it in the indictment; but now they may take the whole matter into consideration, and may find a general verdict of guilty or not guilty upon the whole question in issue. There is no truth in the vulgar maxim, that "the greater the truth the greater the libel." Libel is also the name given in the proceedings in the ecclesiastical courts to the articles drawn out in a formal allegation, setting forth the complainant's ground of complaint.

Libellula. (*See* Dragon-fly.)

Liber, *lī'-ber* (Lat., bark), a term used in Bot. to denote the interior lining of the bark of exogenous plants. In this part of the bark only the woody or longitudinal tissue occurs. In many instances it is very abundant, and exceedingly tough and thick-sided, in consequence of which it is of great value for many useful purposes. When freed from the cellular tissue adhering to it, it is often manufactured into cordage, especially in trees and shrubs of the natural order *Malvaceæ*. The useful articles commonly called Russia mats are made from the thin lamina into which the *endophlæum* of the lime-tree (*Tilia europæa*) readily separates. The lace-bark of Jamaica, remarkable for its beautiful lace-like appearance when pulled gently in a lateral direction, and for its great toughness, is the laminated liber of *Lagetta lintearia*; in consequence of its latter quality, it is twisted into whiplashes. The liber appears to be formed annually, at the same time as the concentric zones of wood, and is intended by nature to convey downwards the secretions elaborated in the bark and leaves. The term *bass*, or *bast*, is applied by gardeners to the liber of the lime-tree, which is used for making packing-mats, and also for binding up bunches of flowers, &c.

Liberal, *lib'-e-răl* (Lat. *liberalis*), in Polit., is a term applied to one who advocates liberal principles, the extension of popular rights or influence.

Liberties of Franchise. (*See* Franchise.)

Libertine, *lib'-er-tin*, is a term derived from the Latin *libertinus*, which signified a freedman, a slave that had received his liberty. Libertine, in its modern sense, denotes one freed from restraint, more particularly one who leads a licentious life.

Libertines, or Libertini, in Eccl. Hist., were a sect of fanatics that arose in Flanders about the year 1525. They maintained that religion consists in the union of the spirit with the Supreme Being; and that, when this is attained by sublime contemplation and elevation of mind, those who have reached it may indulge, without exception or restraint, their appetites and passions, as all their actions are then perfectly innocent. They held that the Deity was the sole operating cause in the mind of man, and the immediate author of all human actions, and that men could not, properly speaking, commit sin. They spread principally in Holland and Brabant; and through the favour and protection of Margaret of Navarre, they obtained a footing in France. Calvin wrote a special treatise against them, and their spread in France was prevented. A party at Geneva got the same name, being resolute opponents of Calvin's church rule, and calling out for liberty. They made no pretence of any religious system, and were mostly persons of licentious and immoral lives, who could not bear the severe discipline of Calvin.

Liberty, *lib'-er-te* (Lat. *libertas*), denotes, in a general sense, a state of freedom, in contradistinction to slavery or restraint. It is either natural or civil: the former consists properly in a power of acting as one thinks fit, without any restraint or control, unless such as the law of nature imposes, being a right inherent in us by birth, and one of the gifts of God to man at his creation, when he endowed him with the faculty of free will. But every man, when he enters into society, necessarily gives up a part of his natural liberty, and, in consideration of receiving the advantages of protection, commerce, &c., he is obliged to conform himself to those laws which the community has thought fit to establish. Civil liberty, therefore, is no other than natural liberty restrained by human laws as far as is necessary and expedient for the common weal. Hence, the law which restrains a man from doing mischief to his fellow-citizens, though it diminishes the natural, increases the civil liberty of mankind; but every wanton and causeless restraint of the will of the subject, whether by a monarch or a popular assembly, is a degree of tyranny. Even laws which regulate or constrain our conduct in matters of indifference, without any good end in view, are destructive of liberty. Laws, when prudently framed, are by no means subversive, but rather introductive of liberty; for "where there is no law there is no freedom." Civil liberty, rightly understood, consists in the power of doing whatever the laws permit. The rights and liberties enjoyed in this country are, in the law books, divided into three classes:—1. The right of personal security, which accords to each individual legal and uninterrupted enjoyment of his life, his limbs, his body, his health, and his reputation; 2. the right of personal liberty, or the power of moving one's person to whatsoever place his own inclination may direct, without imprisonment or restraint, unless by due course of law; 3. the right of private property, which consists in the free use, enjoyment, and disposal of all his acquisitions, without any control or diminution, save only by the laws of the land. Liberty, in a philosophical sense, is

the power to will, or not to will, a certain act. (*See* FREEWILL.) Liberty of conscience, in church matters, denotes the power to exercise any particular form of worship free from any restraint.

LIBERTY, CAP OF, a term which may be said to arise from the following facts. The right of covering the head was always esteemed the symbol of liberty; and the first act of slaves, when they were set free, used to be the setting of a cap on the head, as, during their slavery, they always went bareheaded. The cap thus became symbolical of their restoration to freedom. This simple sign of liberty has played an active part in many a revolution. Gessler's order to salute his hat was the cause of the Swiss outbreak, and the subsequent recovery of the liberty of Switzerland. The arms of the Swiss cantons are expressive of this fact, as they have a round hat for a crest. In England, a blue cap with a white border, on which is the inscription "Liberty" in golden letters, forms the symbol of the constitutional liberty of the nation; and Britannia is often represented holding this up on the point of her spear. The term *cap of liberty* is, however, more generally applied to the French revolutionary reign. It consists of a red cap (taken from those worn by the liberated slaves of Marseilles), and it was first used in the great revolution of 1789. The Jacobin club afterwards made the red cap a badge of membership, and it was afterwards called the *Jacobin cap*.

LIBERTY OF THE PRESS. (*See* PRESS)

LIBERTY, TREE OF, a revolutionary symbol, first used by the Americans in their outbreak with England in the last century. A large elm was adopted at Boston, on which obnoxious characters were hung in effigy, and the following inscription was placed on it:—"This tree was planted in 1646, and preserved by order of the sons of liberty in 1706." It was thenceforth termed the *liberty tree;* but, in 1775, it was cut down by the British troops, who occupied the town. On the breaking out of the French revolution in 1789, a similar device was adopted, and a liberty tree planted by the Jacobins in Paris. The Lombardy poplar was first used, but the French name of it (*peuplier*) affording much derision, oaks or fir-trees were used instead.

LIBRA, *lī'-brī* (Lat. *libra*, the balance), a constellation which gives its name to the seventh sign of the zodiac. It seems to have once formed a part of the constellation Scorpio, which then occupied two signs of the zodiac, the body being in one part, and the claws, now called Libra, in the other. It lies between Scorpio, Virgo, the Centaur, and Lupus. Its largest stars are of the second magnitude. The sun enters Libra at the commencement of the vernal equinox, and the name was probably given to this constellation and sign of the zodiac, in allusion to the equality that exists at that time between day and night.

LIBRARIES, PUBLIC.—The importance of establishing public libraries was first brought under the notice of parliament in 1849, when Mr. W. Ewart, M.P. for the Dumfries burghs, moved for the appointment of a select committee of the house to report upon the subject. Information was collected regarding the management and benefits of public libraries in other countries, witnesses were examined; and the conclusion arrived at was, that this country was far behind others in the matter of public libraries, and that "our present inferior position" was "unworthy of the power, the liberality, and the literature of the country." In 1850, Mr. Ewart moved for leave to bring in a bill for enabling town-councils to establish public libraries and museums by levying a rate, not exceeding one halfpenny in the pound, on the general assessment of the town. After considerable opposition, it passed both houses, and received the royal assent on the 14th of August. On 20th March, 1854, Mr. Ewart moved for leave to introduce a bill to "amend and extend an act for enabling town-councils to establish libraries and museums freely open to the public;" but various delays and difficulties prevented the successful prosecution of the measure until next session, when it was carried through, and obtained the royal assent on 30th July, 1855. This act (18 & 19 Vict. c. 70) is applicable—(1) to all municipal boroughs having a population, by the last census that shall have been taken, of more than 5,000 persons; (2) to all districts of like population having an improvement-board; (3) to all parishes of like population; and (4) to any two or more neighbouring parishes that may unite for that purpose, and which have an aggregate population of more than 5,000. In order to its adoption, a public meeting of the ratepayers must have been duly convened, and the proposition for its adoption must have been voted by at least two-thirds of the persons then present. The town-council, or improvement-board, or parish vestry, as the case may be, then becomes empowered to levy a library-rate, not exceeding one penny in the pound, on the rateable value of the assessable property in the borough, district, or parish. The library rate may be applied wholly to the establishment of a library, or partly to a library and partly to a museum. The management and control of the libraries and museums thus established is, in a city or borough, vested in the council; in a district, in the improvement-board; and in a parish, in commissioners to be named by the vestry. The commissioners must be ratepayers, and not less than three or more than nine. This managing body has power to provide books, newspapers, maps, specimens of art and science, and all other needful matters; and to employ the requisite officers and servants: admission to all the libraries established under the act to be free of all charge. Other acts make similar provisions for Scotland and Ireland. The first library established under the Public Libraries Act of 1850 was that of Manchester. Liverpool speedily followed the example; then Norwich, Winchester, Sheffield, &c. Almost all the libraries which have been founded under the act include both reference and lending departments. In the lending department of the Manchester library, no one is allowed to borrow a book from the library without having first obtained an obligation signed by two ratepayers on the burgess-roll of Manchester or Salford, undertaking to replace any book which may be lost or materially injured by the person borrowing.

LIBRARIES, ITINERATING, are libraries or collections of books which are removed from one place to another after a certain time, when a new collection takes their place. The idea originated with Mr. Samuel Brown, of Haddington; and as an instance of the working of the institution, we quote his words as given in McCulloch's "Geographical Dictionary," art. Haddington:—"In 1835 there were, in East Lothian, forty-three divisions of these libraries of fifty volumes each. Each division remains for two years in the same place, when it is removed to another locality, and succeeded by a new supply of books of the same number; so that each locality has a fresh supply of new useful reading every two years. ..... The use of the books is gratuitous, if so wished, but never more than a penny per annum has been systematically taken from any reader; but voluntary contributions, either in books or money, are received." The system has been extended to various other parts of Scotland, as also of England, Ireland, Canada, &c. The numerous parish and other libraries that have been established since that system was introduced, have rendered it less necessary, and now it is carried on but in few parts.

LIBRARY, *lī'-brā-re* (Lat. *liber*, a book), denotes both a collection of books and the apartment or edifice in which they are contained. The most ancient library on record was founded by Osymandyas, king of Egypt, a contemporary of David, king of Israel. At a very early date the Jews attached collections of books to most of their synagogues; and we are told that Nehemiah founded a public library at Jerusalem. In the recent discoveries in Assyria, a vast collection of clay tablets, bearing cuneiform inscriptions, was found in the palace at Nineveh, forming what has been termed a "library in clay." Pisistratus of Athens is said to have established the first public library in Greece, and to have collected, at great trouble and expense, the works of Homer. Aristotle is the first person on record who was possessed of a private library. After the death of Alexander, the love of science and literature generally passed from Athens and Greece to Alexandria, where was formed the most magnificent library of ancient times: it is said to have contained no fewer than 700,000 volumes. (*See* ALEXANDRIAN LIBRARY.) Next to the Alexandrian library, that of Pergamus was the most renowned, and is said to have contained 200,000 volumes. The first library established at Rome

was probably that founded by Paulus Æmilius, B.C. 167. Having defeated Perseus, king of Macedonia, he brought his library to Rome; and this collection was subsequently augmented by the library of Apellicon the Teian, brought by Sylla from Athens. From the intercourse of the Romans with the Greeks, the passion for forming libraries rapidly increased, and individuals began to pride themselves on their private collections. Among the illustrious Romans who have been noted for their magnificent libraries, are Asinius Pollio, Crassus, Cæsar, Lucullus, and Cicero. Among the projects formed by Cæsar was the establishment of a public library; and the duty of selecting and arranging it was assigned to Varro; but the design was frustrated by the assassination of the emperor. Among the benefits conferred by the emperor Augustus upon Rome was the erection of two public libraries,—the Octavian and the Palatine. The successors of Augustus, though they did not equally encourage learning, were not altogether neglectful of its interests. Tiberius founded a library in the new temple of Apollo; Vespasian established a library in the new temple of Peace; and even Domitian, in the early part of his reign, restored, at vast expense, the libraries in the Capitol which had been burned; and to this end both collected MSS. from various countries, and sent scribes to Alexandria expressly to make copies of works there. The most magnificent library, however, founded by the emperors at Rome was that of the emperor Ulpius Trajan, from whom it received the name of the Ulpian library. Constantine the Great, after removing the seat of his empire to Constantinople, is said to have given a large share of his attention to the formation of a library, and to have bestowed especial pains in the rescue, as far as possible, of those Christian works which had been doomed to destruction by his predecessor Diocletian. The task was continued by his son Constantius, Theodosius II. and others, until it comprised, according to some accounts, upwards of 100,000 volumes. The emperor Leo III. is stated to have burnt a considerable library at Constantinople in 730; and between this time and the capture of Constantinople by the Crusaders, several such casualties are related to have occurred. This last calamity, however, eclipsed all previous losses, and, two hundred and fifty years later, it was followed by the final destruction of the empire; the imperial library, however, was preserved by the express command of Mohammed, and was kept in some apartments of the seraglio. Whether it was destroyed by Amurath IV., as is commonly supposed, or allowed to fall into decay, is uncertain; but there are not a few scholars of eminence who still believe that ancient and valuable MSS. are concealed in the seraglio of the Sultan, though it has been repeatedly asserted that the library of the Sultan does not contain one Greek or Latin MS. of any importance. The manner in which the ancient books were written (upon rolls) greatly increased the number of volumes; and it is said that "the largest libraries in ancient times might be represented by the contents of a modern library containing from 50,000 to 100,000 volumes."—(*Edwards.*) Comparatively little is known of the libraries of the middle ages. It is usual to speak of these as "the dark ages," and to look upon them as a period when learning and intellectual culture were almost extinct. Among the people generally this may have been the case; but they still had an abiding-place in the monasteries, to an extent that those unacquainted with the inner history of the period would scarcely credit. Many of the monks gave themselves not only to the study but to the transcribing of books; and to their care and labour we are indebted for many of the ancient works that have come down to us. Foremost among the cultivators of learning and the arts stands the order of St. Benedict, which had the good fortune to include a number of men remarkable for mental vigour and force of character. Many of these religious houses had considerable libraries attached to them, catalogues of several of which have been printed in recent times. In Alexandria, the Arabians had a considerable collection of Arabian books; and Al Mamoun collected many Greek manuscripts in Bagdad. In the West, libraries were formed in the second half of the 8th century by the encouragement of Charlemagne. In France, one of the most celebrated was that in the abbey of St. Germain des Près, near Paris. In Germany, the libraries of Fulda, Corvey, and, in the 11th century, that of Hersefeld, were valuable. In Spain, in the 12th century, the Moors had seventy public libraries, of which that of Cordova is said to have contained 250,000 volumes. In England and Italy libraries were also founded with great zeal, particularly in the former country by Richard Aungerville, in the latter by Petrarch, Boccacio, and others. The revival of learning is usually dated from the middle of the 15th century. On the fall of Constantinople in 1453, many of its inhabitants emigrated into Italy, and were the means of awakening an interest in classical learning. The appetite for books was revived and quickened, and no labour or expense was spared in acquiring them, learned men being despatched in all directions to collect manuscripts. The invention of printing was of great service, as enabling collections of books to be made at less trouble and expense. Several of the great libraries of Europe date their first beginnings prior to 1465, when the art of printing had been established, but without having, as yet, materially affected the labours of the copyists; as the imperial libraries of Paris and Vienna, the Laurentian library at Florence, and the library of the Vatican. Town libraries had also begun to be formed in various parts, particularly of Germany and France. In this respect England stands in striking contrast to other countries, being centuries behind them. In 1570, Sir Humphrey Gilbert in vain pressed upon the attention of Queen Elizabeth the importance of establishing a public library, after the pattern set us by "the more civilized nations; as Germany, Italy, and France." In fact, it was not until the reign of James I. that Great Britain could boast of even a royal library worthy of the name. The Bodleian library was founded in 1597, and down to 1753, when the British Museum library was formed, it continued to be the only one of national importance. Referring for further information on this subject to Edwards's "Memoirs of Libraries and Handbook of Library Economy," and his article on Libraries in the "Encyclopædia Britannica," to Guild's "Librarian's Manual," Rhees's "Manual of Public Libraries in the United States," and a long and interesting article on Library in the "English Cyclopædia," we give here a table of the principal libraries, with the number of volumes, &c., in each, according to the latest reports:—

| Place. | Name. | When Founded. | No. of Volumes. Printed. | MSS. |
|---|---|---|---|---|
| London..... | British Museum | 1753 | 600,000 | 40,000 |
| Oxford ..... | Bodleian ..... | 1597 | 260,000 | 22,000 |
| Cambridge ... | University ..... | 1475 | 197,000 | 3,163 |
| Edinburgh .. | Advocates' ..... | 1680 | 172,000 | 2,000 |
| ,, | University ..... | 1580 | 100,000 | 400 |
| Dublin ..... | Trinity College | 1602 | 126,000 | 1,600 |
| Paris..... | Imperial ..... | 1377 | 850,000 | 8,400 |
| ,, | Arsenal..... | 1789 | 202,000 | 6,000 |
| ,, | St. Geneviève... | 1624 | 180,000 | 3,500 |
| ,, | Mazarin ..... | 1660 | 132,000 | 3,000 |
| Strasburg.. ... | Town..... | 1531 | 180,000 | 1,500 |
| Bordeaux..... | Town..... | 1738 | 123,000 | 320 |
| Munich..... | Royal..... | 1550 | 600,000 | 18,500 |
| Berlin ..... | Royal..... | 1661 | 500,000 | 10,000 |
| Vienna ..... | Imperial ..... | 1440 | 350,000 | 20,000 |
| ,, | University ..... | 1777 | 120,000 | — |
| Dresden ..... | Royal ..... | 1555 | 300,000 | 2,800 |
| Göttingen ... | University ..... | 1736 | 300,000 | 5,000 |
| Wolfenbüttel | Ducal ..... | 1604 | 200,000 | 4,500 |
| Tübingen ..... | University ..... | — | 200,000 | 20,000 |
| Stuttgart ..... | Royal ..... | 1765 | 200,000 | 18,000 |
| Leipsic ..... | University ..... | 1543 | 160,000 | 2,500 |
| Hamburg..... | Town ..... | 1529 | 150,000 | 5,000 |
| Gotha ..... | Ducal ..... | 1640 | 180,000 | 5,000 |
| Darmstadt ... | Grand-Ducal ... | 1760 | 300,000 | 4,000 |
| Heidelberg ... | University ..... | 1703 | 200,000 | 3,000 |
| Weimar ..... | Ducal ..... | — | 140,000 | — |
| Prague ..... | University ..... | 1350 | 130,000 | 4,000 |
| Breslau..... | University ..... | 1811 | 350,000 | 2,000 |
| Augsburg..... | Town..... | 1537 | 118,000 | 394 |
| Hanover ..... | Royal ..... | 1690 | 120,000 | — |
| Erlangen ..... | University ..... | 1743 | 160,000 | 500 |
| Brussels ..... | Town..... | 1350 | 200,000 | 18,000 |
| ,, | Royal ..... | 1837 | 115,000 | 15,000 |
| The Hague ... | Royal ..... | 1735 | 100,000 | 2,000 |

| Place. | Name. | When Founded. | No. of Volumes. Printed. | MSS. |
|---|---|---|---|---|
| Rome ..... | Vatican..... | 1450 | 300,000 | 24,000 |
| Bologna ..... | University ..... | 1690 | 150,000 | 11,000 |
| Naples ..... | Royal ..... | 1780 | 150,000 | 4,780 |
| Turin..... | University ..... | 1436 | 115,000 | 3,000 |
| Venice ..... | St. Mark's ..... | 1486 | 103,000 | 10,000 |
| Florence ..... | Magliabecchian | 1714 | 150,000 | 12,000 |
| " | Laurentian ..... | 1444 | 120,000 | 6,000 |
| Milan ..... | Brera ..... | 1763 | 125,000 | 1,000 |
| Madrid ..... | Royal ..... | 1712 | 125,000 | 2,500 |
| St.Petersburg | Imperial ..... | 1747 | 450,000 | 25,000 |
| " | Academy ..... | 1726 | 110,000 | — |
| Copenhagen | Royal ..... | 1550 | 410,000 | 18,000 |
| " | University ..... | 1730 | 100,000 | 4,000 |
| Upsal ..... | University ..... | 1621 | 135,000 | 7,000 |
| Christiania ... | University ..... | 1811 | 120,000 | 600 |
| New York ... | Astor ..... | 1839 | 100,000 | — |
| Boston ..... | Athenæum ..... | 1804 | 75,000 | — |
| " | Public City..... | 1852 | 70,000 | — |
| Cambridge, Mas. ..... | Harvard College | 1764 | 75,500 | — |
| Philadelphia | Library Co., &c. | 1731 | 70,000 | — |
| Washington D.C. ..... | Congressional... | 1851 | 50,700 | — |
| Albany, N.Y. | State ..... | 1818 | 53,500 | — |

Even though these figures were more reliable than we believe them to be, it is evident that the accuracy of this mode of estimating the size of a library will depend very much upon what is reckoned a volume. In the continental libraries, works are regarded as separate volumes which, in the British Museum library, would be counted only as one. Thus, three-volume novels, at the Museum, are usually bound into one, and reckoned only as one volume, whereas in the other libraries they would be counted as three; and the same with many others. Hence, relatively, the number of volumes in the Museum library is much greater than appears on this list; and we believe that actually, in point of size, it is inferior only to that of Paris.

LIBRATION OF THE MOON, *li-brai'-shun* (Lat. *libra*, a balance).—The term libration signifies a slight oscillation or rocking motion from side to side of a certain position, the body in libration inclining first to one side and then to the other, as any body will do whose equilibrium has been disturbed. The expression "libration of the moon" is applied to an irregularity in the moon's motion, through which the moon does not at all times present the same face to an observer on the earth's surface. The moon accomplishes her revolutions about her axis and in her orbit in the same *mean* time. Now, if the moon's motion in her orbit were uniform at all times during the period of revolution, and if the plane of her equator passed through the centre of the earth, the moon would always exhibit the same face to an observer in that position; but as this is not the case, and as the moon's orbital motion is irregular, the axis of the moon does not always preserve the same inclination to an observer on the earth, but appears to have a slight oscillatory motion, through which very small crescent-shaped portions of the moon's surface, at all parts of her circumference, north, south, east, and west, are alternately presented and withdrawn from view at regular periodic times.

LIBRETTO, *le-bret'-to* (Ital., a small book), a term applied to the words constituting the text of an opera. Perhaps the best, and certainly the most fertile, writer of libretti, is Eugène Scribe, the French author. Among the best German writers of libretti may be quoted Kind for Weber's "Freeschutz," and Von Chezy for "Euryanthe."

LICENSE, *li'-sens* (Lat. *licentia*), in Law, is a power or authority given to one to do a lawful act. It is a personal liberty to the party to whom it is given, and cannot be transferred; but it may be made to a man or his assigns. Thus, A grants to B a license to go through his ground; but by this, none but B may go through it. A license may be by parole, as well as in writing; and if it be for no specified time, it may at any time be countermanded. The term license is more particularly applied to the authority given by government to persons to carry on certain trades or professions, and for which a duty is payable to the state. (*See* TAXATION.) License of marriage is a permission





which may be granted by bishops for marrying certain persons; and parsons marrying without a license, or without publishing the banns of matrimony, incur a penalty. (*See* MARRIAGE.)

LICENTIATE, *li-sen'-she-ait* (Lat. *licentia*), means one who has a license to exercise a profession. In some foreign universities it means a degree; but in England it is unknown, except in the instance of the degree of licentiate of medicine granted by the university of Cambridge.

LICHENES, LICHENS, *li'-ken-eez*, *li'-kens*, or *litch'-e-neez*, *litch'-enz* (Gr. *leichen*), in Bot., the Lichen ord. of thallogenous *Acotyledones*, consisting of perennial plants, composed of parenchymatous cells, arranged so as to form a foliaceous, somewhat woody, scaly, crustaceous, or leprous thallus, living and fructifying in the air, and growing on the bark of trees, on old palings, walls, rocks, &c.; usually epiphytic, but sometimes parasitic, and commonly presenting a dry, shrivelled, more or less lifeless appearance. Lichens are distributed over all parts of the world, and form a considerable proportion of the vegetation of the polar regions and of mountain-tops. Many species possess nutritive properties, from containing starchy matter, such being also emollient and demulcent. Others contain bitter principles, which render them tonic and astringent. Several, again, are important as dyeing agents. None are known to be poisonous. (*See* CETRARIA, GROPHORA, LECANORA, ROCCELLA.)

LICTOR, *lik'-tor* (probably from Lat. *ligare*, to bind), Roman officers of state who attended on the early Roman kings, and afterwards on the chief magistrates of the republic,—the consuls, decemvirs, dictators, and master of the horse. Each bore on his shoulder a bundle of rods bound about an axe, which was emblematical of the power of the magistrate to inflict punishment by death and by scourging. It was the duty of the lictors to carry out the orders of the magistrate with regard to those who were found guilty of any offence against the state or private individuals, and it is supposed that they derived their name from having to bind criminals before inflicting capital or corporal punishment on them. The bundles of rods and axes that the lictors carried as emblems of the regal and consular dignity were termed *fasces*.

LIEGE, *leeje* (Fr. *lige*, from Lat. *ligare*, to bind), properly denotes one bound, or united by allegiance, to another. Hence a liegeman is one who owes allegiance to a superior, and a liege lord is a superior to whom such allegiance is due. Subjects are liegee of their king, who is their liege lord.

LIEN, *le'-en*, or *li'-en* (Fr., bond), in Law, is the right of a creditor to retain the property of his debtor until his debt has been paid. Liens are either general or specific. A general lien is a right to retain certain goods until all the claims of the holder against the debtor are satisfied. This sort of lien is not favoured by the law. A specific lien is the right to retain certain goods for claims arising from these goods. Thus, in the sale of any article, the vendor has a right to retain it until the price agreed be paid. As a general rule, a workman may retain any article which he has improved for the price of his labour; as a tailor who has received cloth to make into a coat may retain the coat until he is paid for the labour of making it. An innkeeper may retain the goods of his guest until the amount of his bill is paid. Liens are implied by law, or authorized by custom; or they may be created by express contract. The custom, however, to be legal, must be reasonable; but this does not apply to special contract, which is good, though it may also be foolish or hard. Lien can exist only where the possession of the goods has been legally obtained, and ceases to exist the moment they are parted with. A lien can only be based upon a present existing claim. It is not affected by the lapse of time, like a simple debt; for the lien exists so long as the creditor continues to retain the goods in his possession. *Maritime lien* applies to ships, freight, or cargo, and differs from the other in not depending upon possession, and requiring a legal process for its enforcement. It may arise by law or by special contract. Seamen have a lien on the vessel for their wages. Bottomry is also a lien established by special contract, on a vessel for repairs or necessaries supplied to her to enable her to complete her voyage.

(*See* Bottomry.)—*Ref. English Cyclopædia*—Arts and Sciences.

Lienteria, *le-en-te-re-ă* (Gr. *leitos*, smooth; *enteron*, the intestine), is a species of diarrhœa in which the food passes through the body in an almost unaltered state. (*See* Diarrhœa.)

Lieutenant, *lef-ten'-ănt* or *lu-ten'-ănt* (Fr.), a subaltern officer, who takes rank next to the captain of a company, and who fills his place and discharges his duties in case of his death, or whenever he happens to be absent from the men under his command. In Mil., the term is applied as a prefix to the words general and colonel, to form the titles of officers who take rank next in order to generals and full colonels, and who form the second grade of general and field-officers respectively. (*See* General, Lieutenant-Colonel.) In the marines, two lieutenants are allotted to a company instead of a lieutenant and ensign, the junior lieutenant being styled second-lieutenant; and in the artillery there are two lieutenants to every battery; but the junior lieutenant only receives a lower rate of pay, and is not distinguished by any difference of title, as in the marines. This is also the case in the engineers. In fusilier regiments, the junior subaltern officer of a company was formerly styled second-lieutenant, but he is now called ensign. In the army, the lieutenant is distinguished by a crown on either side of the collar of his coat or tunic. In the navy, the senior lieutenant on board any vessel is distinguished as first-lieutenant, except he be in command of a gunboat or small vessel. Lieutenants in the navy rank with captains in the army. A lieutenant in the navy receives 10*s. per diem* when on active service; but when he has the command of a vessel, or is a first-lieutenant of seven years' standing, he receives a shilling a day more. The number of lieutenants appointed to vessels varies in proportion to their rating; a vessel of the first-rate carrying eight, with supernumeraries; one of the second rate, seven; and one of the third rate, six; and so on to sloops, which carry two.

Lieutenant-Colonel, a field-officer that takes rank above a major, and next to a full colonel. The lieutenant-colonel always has the actual command of the regiment or battalion to which he is attached, and is responsible for the drill and discipline of the men under him; the colonelcy of the regiment being an honorary appointment, involving certain privileges without the performance of any duties in connection with the post, which is always bestowed on some general officer for long and distinguished services.

Lieutenant-General. (*See* General.)

Life, *lîfe* (Sax. *lif*, *lyf*), is defined to be that "state or condition of a being that exhibits vital actions;" and it is thus placed in opposition to the term death, which implies the state of a being in which those actions have altogether ceased, and whose structure is subject to no other forces than those of inorganic matter, which speedily effect its decomposition. The class of phenomena to which we apply the term vital, and which differs in its character both from those of physics and chemistry, is only manifested by bodies of that peculiar structure which we term organized. It was long regarded as sufficient to attribute to the vital principle all those actions of a living body which cannot be referred to the laws of chemistry or physics. The laws of vital phenomena, however, are, in fact, as open to investigation as those which comprehend the phenomena of gravitation, electricity, or chemical affinity. A strict examination into their character will show that, although not identical with physical phenomena, they are analogous to them, in so far as they take place according to a regular plan, and present themselves under fixed conditions, a definite acquaintance with which would give to physiological science the same kind of precision and comprehensiveness as it is the aim of the physical philosopher to attain in his branch of study. The intricacy, however, of the combinations under which the vital phenomena are usually presented to our observation renders a knowledge of their laws more difficult of attainment; but the success which has attended the philosophical method of inquiry of late pursued by scientific physiologists, is a most satisfactory proof that they are not beyond the reach of persevering and well-directed search. Life commences with the first production of the germ; it is manifested in the phenomena of growth and reproduction; and it terminates in the death of the organised structure, when its component parts are disintegrated more or less completely by the operation of the common laws of matter. Life is thus "the sum of the actions of an organized being." It includes all those phenomena which it is the province of the physiologist to consider. (*See* Physiology.) The changes exhibited by any one living being, in its normal condition at least, have one manifest tendency,—the preservation of its existence as a perfect structure. By these it is enabled to counteract the ever-operating influence of chemical and physical laws, and to resist to a greater or less extent the injurious effects of external agencies. In the investigation of vital phenomena, the fact has been too much overlooked, "that we always find a similarity of action when the organized structure on the one hand, and the stimuli which call its properties into activity on the other, are identical; and a difference in either of these conditions always produces a difference in the result." We do, indeed, occasionally find variations in the result, without being able to detect any change in either of the conditions; but knowing how very imperfect our powers of discovering minute changes at present are, and bearing in mind that every increase of our means of observation has gone to strengthen the force of our rule, we cannot look upon them as exceptions. In attempting to reduce the mass of phenomena presented to us by vital actions to distinct classes, we find that all living beings introduce into their own structure alimentary substances derived from external sources; and likewise that all submit their fluid ingredients to the influence of the element which they inhabit, so as to produce a reciprocal change between them. Thus, the function of respiration is essentially the same throughout the whole organized world. Hence we conclude that the action of each particular organ is dependent upon the excitation of its properties by agents external to it. When these stimuli are withdrawn, vital action ceases. Farther, every class of organs in the living body may be said to require its particular stimulus for the display of its properties. There are also other conditions of a more general nature necessary for the support of vital actions. All vital actions require a certain amount of heat for their performance, and this amount varies in different cases. Light, again, is essential to many others, especially in the vegetable kingdom. Electricity is also an important agent in the vital economy; but our knowledge of its operations is still very imperfect. Many physiologists argue for the existence of a distinct set of vital affinities, from the fact that the tissues and fluids which maintain a certain composition when possessed of vitality, rapidly resolve themselves into new combinations when this has become extinct; but there appears to be more reason to infer that the preservation of the normal constitution of organic compounds in the living body is dependent on the continuance of the vital actions of the economy, rather than due to its mere possession of the property of vitality. In fact, it may be reasonably maintained "that the vitality of each tissue, that is to say, its possession of vital properties, is dependent on the perfect condition of its organization; and that, so far from preserving the organism from decay, it merely remains until decay has commenced." There are many organized beings, at particular periods of whose existence all vital action seems to be suspended; and this may result either from the absence of the stimuli necessary to maintain it, or from some change in the organism itself, by which it is, for a time, less capable of responding to these stimuli. The former is manifested in a remarkable manner in the case of seeds of plants, which have been found to preserve their vitality during many centuries; the latter, in the case of certain animals which pass the winter in a state of torpor.—*Ref.* Todd's *Cyclopædia of Anatomy and Physiology*; Carpenter's *Principles of Physiology*; Carpenter's *Principles of Human Physiology*; Müller's *Elements of Physiology*.

Life Annuity. (*See* Annuity.)

Life-boat, *life'-bōte*, is a boat constructed with great strength to resist shocks, for preserving lives in cases of shipwreck or other destruction of a ship or steamer. Besides being made very strong, life-boats

## Life-boat

are so constructed as to possess sufficient buoyancy to enable them to float though loaded with men and filled with water. Boats of this kind are maintained at most of the ports of this kingdom, and are always in a state of readiness to put to sea when a vessel is seen to be in danger of shipwreck. They are also provided with means for being conveyed to the shore and launched as quickly as possible. In 1785 Mr. Lukin obtained a patent for a life-boat with projecting gunwales, and hollow cases or double sides under them, together with air-tight lockers under the thwarts. The buoyancy of the boat was increased by these contrivances, and the stability to roll was counteracted by the air-tight cases under the gunwales. This boat, however, was not strong enough, and was liable to be staved in at the sides. Greathead's life-boat, invented in 1789, was a superior vessel; it had five thwarts or seats for rowers, double-banked, so as to be manned by ten rowers, and was cased and lined throughout with cork, so that it could float serviceably when almost knocked to pieces. In 1804 this boat had saved nearly three hundred lives from vessels wrecked off the mouth of the Tyne, when the Society of Arts presented Greathead, its inventor, with their gold medal and fifty guineas. During the next forty years several other life-boats were introduced, but their form was merely a modification of those in use before. A lamentable accident occurred, about 1850, to a life-boat at South Shields, when twenty pilots were drowned. In consequence of this casualty, the duke of Northumberland, as president of the National Shipwreck Institution, offered a reward for the best model of a life-boat. This offer was responded to by boat-builders and others from many parts of this kingdom, as well as from France, Germany, Holland, and America. About fifty of the best of these were exhibited by the duke in the Exhibition of 1851. All the models sent in were patiently examined by a committee, who drew up a list of all the good qualities of a life-boat, and noted down the rank of each of the plans in reference to each quality. After being examined in this way, the prize was given to Mr. Beeching, of Great Yarmouth, as the constructor of the life-boat which combined the largest number of good qualities. This boat had a moderately small internal capacity, under the level of the thwarts, for holding water, and ample means for freeing herself readily of any water that might be shipped. She was ballasted by means of water admitted into a well or tank at the bottom after she was afloat; and by means of that ballast, and raised air-cases at the extremities, she was able to right herself in case of being upset. Mr. Peake, the master shipwright of Portsmouth, was one of the committee who decided upon the bestowal of the prize; he afterwards designed a boat which comprised many of the features of the competitive boats, and added others suggested by his experience. This boat, gradually improved in time, is now looked upon as the English model life-boat, and is exclusively adopted by the Life-boat Institution. Boats similarly constructed have been sent to Russia, Prussia, Spain, Portugal, and the colonies. Peake's life-boats are of two sizes; the larger is 32 feet long, 8 feet wide, and 4 feet deep; it weighs 2 tons, costs £156, and is worked by 10 oars. The smaller boat is 28 feet long, 7 feet wide, and 3 feet deep; it weighs 25 cwt., costs £126, and is worked by 6 oars. In connection with these life-boats may be mentioned the National Life-boat Association, founded in 1824, the objects of which were,—to grant funds for making life boats, boat-houses, and life-buoys; to assist in training boatmen and coast-guardsmen to aid ships in distress; to interchange information with local bodies concerning appliances for the saving of life; and to reward those who might afford assistance to ships in distress, &c. During a period of thirty-one years this association was instrumental in saving 9,222 persons from shipwreck. In 1854 the supervision and control of merchant ships was vested in the Board of Trade by an act of parliament which also related to life-boats. In 1869 there were 88 life-boats belonging to the Life-boat Institution, besides 70 others belonging to various harbour commissioners, dock trustees, Trinity-houses, ballast-boards, fisheries commissioners, local committees, &c. A little manual has been published by the Institution, giving full instructions how to manage a life-boat.



## Life-buoy

Life-buoy, *life'-boy*.—The first of these contrivances for saving human life was the invention of Lieutenant Cook, and his invention was immediately adopted by the Admiralty for the use of the British navy. It consisted of two casks connected by a bar, each about as large as an ordinary-sized pillow, and of buoyancy and capacity sufficient to support a man standing on them. In case more than one person should require support, several could lay hold of rope beckets (*i. e.*, handles or loops made of rope), fitted round the buoy, and thus they could sustain themselves. Between the two casks a hollow pole or mast was erected, into which was inserted an iron rod loaded with lead at the lower extremity, so that when the buoy was let go, this rod slipped down to a certain extent, thus lengthening the lever and enabling the lead to act as ballast: by this means the mast was kept upright and the buoy prevented from upsetting. The weight, also, at the end of the rod was so managed as to afford firm footing for two persons, should that number reach it, and the rope beckets before alluded to supplied assistance to many more. To the head of the perpendicular mast a fuse is attached at night-time, on a brass fuse-plate, the shank of which is secured into a socket by a thumb-screw. The buoy is fastened to the ship by the chain only, the ring of which hangs on the hook of the sheave of the trigger-plate. Attached to the stern of the vessel are two iron rods cased with copper tubing, together with the screw-bolts from which they are suspended; just above the forked stay which keeps the rods parallel at a proper distance from the stern, is the trigger-plate and the brass fuse-case which covers and protects the fuse on the head of the staff. In addition to this, there is also a brass case for the lock, and a percussion-hammer placed so as to communicate with the fuse-case by means of the horizontal tube; all these, together with the pulleys and guard-iron, are firmly attached to the stern of the vessel, inside of which, immediately opposite the pulleys, are fixed the caps and handles, the one for firing the lock and lighting the fuse, the other for raising the trigger-bolt and disengaging the buoy from the vessel. As soon as the trigger-bolt is raised, the sheave revolves, the stop turns round, and the life-buoy slides off the rods into the water, bearing on the head of the mast a brilliant flame. This apparatus admits of being lighted and let down into the water in the short space of five minutes after the alarm of "man overboard" has been given; and Lieutenant Cook obtained the gold medal of the Society of Arts for its invention in the year 1818. Many forms of life-buoys have been made of india-rubber, as is mentioned in another article (*see* Life-Preservers); but the buoy which is generally used in the mercantile marine in the present day, as well as in some of the ships of the royal navy, may be thus described:—It is composed of slices of cork, so arranged as to form a buoyant zone or belt of about thirty-two inches extreme diameter, and six inches in width, with a thickness of four inches, and containing about twelve pounds' weight of cork. This mass is compactly covered with painted canvas, and is furnished with loops of rope all round its circumference. Several of these are generally supplied to sea-going vessels, and they are placed in conspicuous positions, so as to be at hand in case of emergency. A new life-buoy was invented by Mr. W. B. Dennys, of H.M.S. *Britannia*, in the year 1859, and it is thus described by him in a letter to the "Mechanics' Magazine" of the 7th October in that year:—"This invention consists of a hollow copper buoy, with a suspended stanchion in the centre to support the light. Two indentations, one on the upper and the other on the under surface of the buoy, opposite to each other, allow this stanchion to assume a perfectly horizontal direction to the plane of the ring when suspended; on being let go, it becomes perpendicular, and is locked in that position by a catch. It is nearly impossible to capsize this buoy. Hollow copper balls suspended on the same guides, or on others at the ship's quarters, give an additional chance of safety to a drowning person, as, even if ten or twelve feet distant from the buoy, he may manage to draw himself to it by their aid. It may be either freed in the usual way, the present guides, slip, and percussion-hammer being retained, or a friction-tube may be used, firing the fuse by the weight of the buoy on being let go." This

form of life-buoy is annular, like the common cork buoy just previously described, and it appears to possess many advantages over that, as well as over the old form of Lieutenant Cook's invention. (*See* LIFE-PRESERVERS.)

LIFE ESTATES, in Law, are estates of freehold, not of inheritance, but for life only; and of these some are conventional, or expressly created by the act of the parties; others merely legal, or created by construction or operation of law. Estates for life of the former kind, expressly created by deed or grant, are where a lease is made of lands or tenements to a man to hold for the term of his own life, or that of any other person, or for more lives than one; in any of which cases he is styled tenant for life; only when he holds the estate for the life of another, he is usually styled *pur autre vie*. These estates for life, like inheritances, are of a feudal nature, and were at one time the highest estate that one could have in a feud which was not in its origin hereditary. They are given or conferred by the same feudal rights and solemnities, the same investiture or livery of seisin, as fees themselves are. Estates for life may also be created by a general grant, without defining or limiting any specific estate. As if A grant to B the manor of Dale, this makes him tenant for life: for, as there are no words of inheritance, it cannot be construed as a fee, yet it shall be construed to be as large an estate as the words of the donation will bear, and therefore an estate for life. Also, such a grant at large shall be construed to be for the life of the grantee, in case the grantor hath authority to make such a grant. Besides these estates, which, generally speaking, endure as long as the life for which they were granted, there are estates for life, which may determine upon future contingencies before the life for which they are created expires; as where an estate is granted to a widow during her widowhood, or to a man until he be promoted to a benefice. These, while they subsist, are reckoned estates for life; because the period of their duration is uncertain, and they may possibly last for life. The incidents to an estate for life are principally the following:—1. Every tenant for life, unless restrained by covenant or agreement, may, of common right, take, upon the land demised to him, reasonable estovers or botes, that is, an allowance of wood for fuel, repairs, &c.; but he is at the same time liable for waste or injury done to the premises during his inheritance.—2. He, or his representatives, shall not be prejudiced by any sudden or unforeseen determination of his estate; therefore, if a tenant for his own life sows the lands and dies before harvest, his executors shall have the emblements or profits of the crop.—3. Under-tenants, or lessees, have the same, nay, even greater indulgences, than their lessors, the original tenants for life; for the law of estovers and emblements, as affecting the tenant for life, apply also to the under-tenant; and further, where the tenant for life shall not have the emblements because the estate determines by his own act, the exception does not reach his under-tenant, who is a third party. A tenant for life, or for any greater estate, either in his own right or in right of his wife, may now, by 19 & 20 Vict. c. 120, subject to the exceptions and limitations therein contained, make effectual leases of the same, or any part thereof, for a term not exceeding twenty-one years. By 14 & 15 Vict. c. 25, it is enacted, that where, in the case of under-tenants, the lease or tenancy shall determine by the death or by the cesser of the estate to the landlord, the tenant shall, instead of claims to emblements, continue to hold until the expiration of the then current year of his tenancy, and shall then quit, upon the terms of his lease or holding, in the same manner as if his tenancy were determined by effluxion of time, or other lawful means, during the continuance of his landlord's estate; and the succeeding owner shall be entitled to recover a fair proportion of the rent for the period elapsed from the termination of the landlord's interest to the time of quitting.

LIFE-GUARDS. (*See* HOUSEHOLD TROOPS.)

LIFE INSURANCE. (*See* INSURANCE.)

LIFE-PRESERVERS, a term applied to certain arrangements for rendering the human body buoyant in the water. The weight of the human body is a little less than that of an equal bulk of water, so that it naturally floats in that liquid. When, however, a man floats on his back on the water, his mouth will most probably sink under the surface, unless he use some strong muscular effort, so as to throw the head back. It is a well-known fact, that many persons unable to swim, who fall into still water, might be saved, if they retained their presence of mind, so as to preserve a proper position. By attaching to the chest some buoyant substance, it becomes an easy matter to keep the upper part of the body above the surface of the water. The arrangements for effecting this purpose are not large in bulk, and are generally known by the name of life-preservers. They are principally made of cork, in the form of jackets and belts, or of India-rubber cloth belts or cylinders, which, when inflated, are able to sustain a person above the surface of the water. One of the best life-preservers is that of M. Scheffer. This invention consists of a hollow air-tight cylinder, made ready for use when distended with air. It may, perhaps, be more properly called a cylindrical ring, without a seam and without a break. The external diameter of this ring is about twenty-two inches, and the internal diameter about twelve, the diameter of the cylinder itself being about five and a half inches, but varying with the size of the person for whom it intended. It contains a small stop-cock, to which an ivory pi is fixed. Air can be injected into the cylinder fr the mouth by this pipe, and retained by means of the stop-cock; the whole inflation and arrangement can be completed in one minute. When uninflated, this life-preserver folds up into a very small compass; it can easily be carried in the pocket, and only weighs twelve ounces. There are many other varieties of life-preservers; but in general they closely resemble that of M. Scheffer. Of late years the term life-preserver has been applied to a small weapon, about a foot long, made of twisted whalebone, and heavily loaded at each end. Although originally intended for protection against attack, it seems to have become the special weapon of burglars and other ruffianly characters.

LIFE RENT, in Law, is a rent which a man receives for a term of life, or for the sustentation of it.

LIFTING, *lift'-ing* (Swed. *lyfta*, to lift), on Easter holidays, is a custom which formerly prevailed throughout the country, and which still lingers in some of the more distant parts. On Easter Monday the women form parties of six or eight, and surround such of the opposite sex as they may meet, and with or without their consent, lift them thrice above their heads, with loud shouts at each elevation. On Easter Tuesday the men in similar parties do the same to the women. A small sum or fine is always extorted from the persons so lifted. This custom, it is said, is designed to commemorate our Saviour's resurrection.

LIGAMENT, *lig'-a-ment* (Lat. *ligamentum*), in Anat., is a strong elastic membrane connecting the extremities of movable bones. They are divided into capsular and connective, the former surrounding the joints like a cap.

LIGAN, *lī'-gan* (Fr. *lier*, to tie), in Law, is a wreck consisting of goods sunk in the sea, but tied to a cork or buoy in order to be found again.

LIGATURE, *lig'-a-ture* (Lat. *ligatura*), in Surg., is applied to anything used in binding any part of the body. More particularly it is applied to the thread or silk used in the tying of arteries or veins that have been cut. In such cases, ligatures should admit of their being tied with some force without the risk of breaking.

LIGATURES, among printers, are types consisting of two or more characters joined together; as *ff*, *fi*, *fl*. The old editions of the Greek authors are extremely full of ligatures, and those of Stephens are very beautiful. Ligatures are little used in modern printing.

LIGHT, *lite* (Sax. *leht*, *liht*), a term applied to the natural agent by which objects are rendered perceptible to the sense of seeing. The study of the nature and properties of light has been an object of philosophical disquisition from ancient times; but it must be acknowledged that the subject is as little understood at the present day as any of the most abstruse subjects of philosophical inquiry. Amongst the earliest speculations on the subject are those of Pythagoras, who considered that vision was caused by particles continually emanating from the surfaces of bodies and

entering the pupil of the eye. Plato and his followers, however, believed that vision was the result of the emission of particles from the eye meeting with certain emanations from the surfaces of things. Notwithstanding this improbable hypothesis, the Platonists seem to have detected several properties of light; such as its propagation in straight lines, and the equality of the angles of incidence and reflexion when it falls on a reflecting surface. The ancients were also acquainted with the fact that the sun's rays could be concentrated by means of a concave mirror. Light was regarded by Aristotle as a mere quality of matter, and Ptolemy the geographer wrote a treatise on optics, which has not been handed down. After this era of speculation, a long period of darkness occurred, till the Arabians began to cultivate the learning of the Greeks, and several of their philosophers treated of optics. The earliest Arabian work on this subject was written by Alhazen; it contains a description of the eye, and details many experiments on reflexion and the refracting power of air. The work of Alhazen was commented upon by Vitelio, a native of Poland, in 1270; and from a passage in Roger Bacon's works, it would appear that spectacles were used about the same time. There is, however, no absolute certainty as to the discoverer of spectacles. After the revival of letters, Maurolycus of Messina, one of the earliest cultivators of mathematics, made optics his study. Baptista Porta, and afterwards Lord Bacon, also made light a subject of investigation. The latter philosopher complained that the *origin* and *form* of light had been too much neglected. Antonio, bishop of Spalatro, first gave the true theory of the rainbow. The next important step was the discovery of the telescope, by Zacchias Janson, a spectacle-maker of Middelburg, in Walcheren, in 1590. This valuable invention was immediately applied, by Galileo, to physical astronomy with great success: in a short period of time he discovered by its means the satellites of Jupiter, the structure of the Milky Way, the phases of Venus, the spots on the sun's disc, and a number of stars hitherto unknown. The invention of the compound microscope seems also to belong to Jansen. After a number of philosophers had given their attention to the subject, the interesting discoveries of the century were crowned by the researches of Newton concerning the optical properties of light. Notwithstanding the brilliant discoveries that have been made in this branch of science, very little is known concerning the nature of light. Philosophers are agreed, in so far that they acknowledge that the phenomena of vision depend upon the agency of a subtile, extremely attenuated matter, set in motion by the sun and other luminous bodies. That it is material, is inferred from its deflection from its rectilinear course in passing near various bodies; from its being arrested by some substances, while it passes freely through others; from its capability of condensation and dispersion; from its producing chemical changes in certain compounds; and from its seemingly entering into the composition of certain substances, from which it can be again extracted. Thus far philosophers agree; but with regard to the propagation of light, and the mode in which it makes itself perceptible to our senses, there are two hypotheses,—the hypothesis of *emission*, and the hypothesis of *undulation*. The hypothesis of emission supposes that light consists of a highly attenuated fluid, the particles of which are not affected by gravity, but are endowed with a great self-repulsive force, and are actually projected from luminous substances in straight lines with inconceivable velocity. In the hypothesis of undulation, on the contrary, the whole universe, including the interstitial spaces of all matter, is conceived to be filled with a highly elastic rare medium, which possesses the property of inertia, but not gravitation, to which the name of *ether* has been given. This medium is not light, but light is produced in it by the excitation, on the part of luminous bodies, of an undulatory motion, analogous to the waves of water. By this theory, luminous bodies are supposed to act on the universally diffused fluid somewhat in the same manner that sonorous bodies do on air in the production of sound. Whichever hypothesis be adopted, it seems that the propagation of light is a process of the most astonishing rapidity. It was observed by Roemer that





the eclipses of Jupiter's satellites happened sometimes sooner and sometimes later than the times given by the tables of them, and that the observation of them was before or after, according as the earth was nearer to or farther from, Jupiter. It was therefore concluded that this circumstance depended upon the distance of Jupiter from the earth. Subsequent observations showed that planetary light requires about fourteen minutes to cross the earth's orbit. Whether light, therefore, be looked upon as an emanation or an undulation, it must be regarded as travelling with a velocity of 200,000 miles per second. The following extract from Sir J. Herschel's "Discourse" may give some conception of this velocity.—"A cannon-ball would require seventeen years, at least, to reach the sun, supposing its velocity to continue uniform from the moment of its discharge; yet light travels over the same space in seven minutes and a half. The swiftest bird, at its utmost speed, would require nearly three weeks to make the tour of the earth; light performs the same distance in much less time than is required for a single stroke of its wing." The origin of light, like that of heat, may be traced to various sources. The sun is not only the great fountain of heat, but also of light, which it imparts to the earth and to the other members of the solar system. Light emanates, also, from terrestrial matter in different states of activity. It is thrown off when certain homogeneous substances act upon one another by the mechanical force of friction; thus, when two pieces of quartz or rock-crystal, or two pieces of loaf-sugar, are rubbed together, they emit flashes of light in a dark place. Flashes of light have also been observed when bodies suddenly change their state under the force of crystallization. It is generated in still greater abundance when heterogeneous substances act upon one another under the force of chemical affinity. All the common means of artificial illumination by lamps, candles, and gas-lights, are dependent upon this action. When solid bodies are heated to a temperature of 800°, they begin to shine in the dark; and if a current of air at 900°, which is in itself non-luminous, be made to strike upon pieces of metal, earth, &c. it will speedily communicate to them the power of radiating light. The passage of electricity excites it with a degree of intensity only surpassed by that of the solar ray; while in the glow-worm and firefly we see that the processes of life are capable of evolving it. When bodies are in this state of activity, they are said to be self luminous; but by far the greatest number possess no such property at ordinary temperatures. Although unable to be luminous themselves, all substances are capable of becoming so when placed in the presence of a self-luminous body, since a process of secondary radiation commences from them. A lamp, for instance, brought into a dark room, is not only visible itself, but renders all the objects in the room visible. A sunbeam admitted into a dark chamber only renders luminous the objects directly in its course; but if any of these be white, as a sheet of paper, the whole apartment will become illuminated by this secondary radiation. Amongst the heavenly bodies this fact is illustrated on a splendid scale. The sun is the great self-luminous source of the system; the moon and the planets possess no such inherent property; but those parts of them on which the sun's light falls, become for the time luminous, and perform all the offices of self-luminous bodies. It is, therefore, evident that the communication which we call *light* not only subsists between luminous bodies and our eyes, but between luminous and non-luminous bodies, or between luminous bodies and each other. The investigation of the properties of light constitutes the peculiar province of optics. This science is completely mathematical (*see* OPTICS); but its basis, like that of all other branches of natural knowledge, must be experiment. The physiological relations of light will be found described in the article EYE; it is only further necessary to say here, that the radiant force produces the sensation of light by striking against the expanded nerve of vision,—the retina of the eye; and that the effect is persistent during a definite portion of time. Hence it is, that winking with the eyelids forms no impediment to correct vision. Experiment has also shown that the impression received by the mind lasts for about the eighth part of a second, but varies with

the intensity of the light; so that a luminous point, revolving with a velocity sufficient to complete a circle in that time, will not appear as a fiery point, but a fiery circle. One of the first relations of light to ponderable matter is, that most bodies possess the property of intercepting it in its progress, whilst a few allow it to traverse their substance. From this circumstance arises the distinction of bodies into opaque, transparent, and diaphanous. The light of the sun reaches us freely through a plate of glass, but is entirely excluded by a plate of metal. A sheet of white paper or a piece of porcelain also allows light to pass through it; but not in straight lines parallel to its first direction,—the rays become broken up, as it were, and radiated again from a new self-luminous centre. When an opaque screen is placed between a luminous body and another object, such as a sheet of paper, a shadow is cast which is similar in outline to the section of the body producing it: from this phenomenon we learn that the rays of light are transmitted in straight lines. When a pencil of light traverses space, or a perfectly homogeneous medium, its course is rectilinear and its velocity uniform; but when it encounters an obstacle or enters a different medium, it undergoes certain modifications; it separates itself into several portions; one of these is *reflected*, that is, turned aside, after which it pursues a course wholly exterior to the obstacle or new medium; a second portion enters the medium and is *refracted*, or bent out of its original direction; a third portion is *absorbed*, or lost; and a fourth portion is radiated, or repelled in all directions from the surface. In reflexion the primary law is, that the angle of incidence is equal to the angle of reflexion. It is thus that the images are formed in a looking-glass; and as we always see objects in the direction in which the ray of light arrives at the eye, we judge the image to be as much behind the surface of the glass as the object is before it. Every known substance, not excepting air, the most diaphanous of all, reflects some portion of light. It is calculated that if a person were plunged 150 feet in the clearest water, he would find the light of the sun no more than that of the moon. When objects are looked at through glass, they become more dim in exact proportion to its thickness. There is, indeed, no such thing in nature as perfect transparency. On the other hand, also, there is no substance possessing the property of perfect reflexion; a piece of leaf-gold held up between the eye and any strong light, permits bluish rays to pass through. Light may be so reflected from regular curved concave surfaces that all the rays may converge to a point or focus. In these cases the direction of each ray is the same as if it had been reflected at the point of incidence from a plane surface tangent to the curve. When a ray of light is admitted into a dark room, it may be almost wholly turned aside by reflexion from a metallic mirror in any direction, according to the angle at which the mirror is presented to it. If it be made to fall on any object, it will affect that object as the original ray, a portion of it becoming irregularly repelled or scattered. It is this portion which renders an object visible in all directions. When this scattered light falls upon other bodies, it is again reflected and dispersed from them, making them visible, but in a less degree, on account of the partial absorption which is continually taking place, and the whole apartment is lighted. If the ray falls on a sheet of white paper, the room will be well lighted, but if upon black velvet, the room will remain dark; since nearly the whole of the light will be absorbed. To ordinary vision this property is of the highest importance. All bodies on the earth possess it in various degrees, and the atmosphere which surrounds it, in a remarkable manner. The sun's light, by this means, is diffused, and that milder radiance maintained which is so agreeable to the eye, and which renders objects visible when the rays do not fall upon them. Without this property all objects shaded from the sun would be totally invisible, and without an atmosphere the sun would appear as a fiery disc in a black sky. Travellers state that on lofty mountains, where the atmosphere is rare, the sun's rays are painfully intense and the sky of the darkest blue, almost amounting to black. When a pencil of light, that is an assemblage of rays passing from a luminous point, falls on the surface of any transparent uncrystallised medium, a portion pursues its course through it. If it enters perpendicularly, it passes through in a straight line; if at an angle, it is bent from its course, and is said to be *refracted*. In refraction, each different medium has its own action on light; some turning a ray incident at a given angle more out of its way than others. As a general rule, the refractive power of substances is in some degree proportional to their densities: for instance, water acts more powerfully than air, and has its power increased by the solution of different salts; and glass, again, is superior to either. The effect of refraction is familiarly illustrated if a stick be held obliquely in water, when it appears bent at the point of immersion. The direction of a ray of refractive light depends not only upon the surface where it enters, but also at its point of exit. Thus, by modifying the surfaces of reflecting media, the rays of light transmitted can be diverted almost at pleasure. (*See* LENS.) Since the deflecting power acts at the surfaces of bodies, the original deviation of a ray entering a piece of glass may be doubled at its emergence by a proper adjustment of surfaces. In the case of a triangular prism, the light which falls upon one of the faces is refracted at the first surface, and also at the second; but the second refraction does not bring the ray into a direction parallel with the incident ray, as is the case when the surfaces of the glass are parallel; but they are bent permanently in another direction. If a pure ray of white light from the sun be admitted into a dark room through such a prism, instead of being refracted altogether and appearing still as a white ray, it is divided into several rays of very vivid colours. In this state it is said to be analyzed, or decomposed into its elementary rays. Seven distinct colours can be distinguished; namely, red, orange, yellow, green, blue, indigo, and violet. The red ray is the least bent, and the violet the most. If these coloured rays be again collected by refraction through a convex lens, or by reflexion from a concave mirror, they reproduce white light at the respective foci. The space illuminated and coloured by a pencil of rays from the sun thus analyzed is called the solar spectrum. (*See* SPECTRUM, SOLAR.) This analysis of white light, however, is not wholly dependent upon the refractive power of a transparent medium, but from an effect called *dispersion*. The mean refractive and dispersive powers of bodies are not proportional to each other. If a hollow glass prism be filled with oil of cassia, the spectrum produced will be two or three times longer than that of a solid glass prism. Different substances not only exhibit a difference of dispersive power generally upon all the rays of light, but are found to act unequally on the different rays. Thin plates or scales of different substances, or substances divided by fine regular lines, or consisting of minute fibres, have also the property of decomposing light which falls upon them; but the phenomena which they present are totally different, and depend upon different principles. The simplest case of this property occurs when a beam of divergent light enters a dark room by an aperture not more than $\frac{1}{20}$th part of an inch in diameter, and a thin rod such as a pin is placed in its course. On examining the shadow, fringes of coloured light will be found on both sides. (*See* DIFFRACTION OF THE RAYS OF LIGHT.) These fringes are caused by the *interference* of the rays bent into the shadow on one side of the body with the rays bent into the shadow on the other. Interference is accounted for by the undulatory hypothesis; and the alternate cessation and increase of sound produced by two musical notes nearly in unison, known by the name of *beats*, presents a marked analogy with the alternate luminous and black fringes arising from the interference of light. Thin plates of different substances, such as mica, produce similar phenomena of colour; and the same effects are seen in the splendid colours exhibited in soap bubbles, and also when a small quantity of oil is poured on the surface of water. The iridescent tints in mother-of-pearl, the beautiful and varied plumage of many birds, and the colour of many shells and fishes, are all dependent upon the same cause. The law of ordinary refraction is far from general. Rays of light, in traversing the larger number of crystallized bodies, are commonly split into two pencils: one of these, called the *ordinary ray*, follows

the common laws of refraction; whilst the other, called the *extraordinary ray*, obeys very different laws. This phenomenon is observed in all crystallized bodies which do not belong to the tessular system, or that class which may be supposed to be constructed of spherical particles; such as the regular cube, octohedron, &c. According to the nature of the crystal, and the direction in which it is cut, the division of the beam is greater or less. The best exemplification of this mode of refraction is to be found in a substance called *Iceland spar*, the crystallized carbonate of lime. If a small illuminated object be looked at through a rhombohedron of this substance in certain positions, two images of the object will appear; and on turning the crystal round in its own plane, so as to make a complete revolution, the two images will assume a regular movement with regard to each other, and one will fall upon the other, or coincide with it, twice in the revolution. If the rays of light separated by passing through Iceland spar be passed through another crystal placed similarly to the first, no further subdivision of the light will take place. If, again, the crystals be so placed that the principal sections are at right angles, there will still be but two images; but the ordinary and extraordinary rays of the first will become reversed in the second: at all intermediate positions, however, there will be a subdivision of each ray, and, consequently, four images. Each ray has then suffered a physical change, which has been called *polarization*, a term which indicates, according to Dr. Whewell, "opposite properties in opposite directions, so exactly equal as to be capable of accurately neutralizing one another." Many crystallized minerals, when cut into parallel plates, are sufficiently transparent to allow of abundance of light to pass through them, which, in consequence, is found to be polarized. Through a well-polished plate of *tourmaline*, cut from a crystal of a brown colour, in a direction parallel to the axis of the prism, a candle may be seen as through a piece of coloured glass, and no change will be observed on turning it round. If another similar plate be interposed between the first plate and the eye, and made to revolve slowly in its own plane, the candle will appear and disappear alternately at every quarter revolution; passing through every degree of brightness, to total, or nearly total, evanescence, in each quadrant. If the rays separated by a crystal of Iceland spar be examined by means of a plate of tourmaline, it will be seen that the *ordinary* image is most intense when the axis of the tourmaline is perpendicular to the principal section of the rhombohedron, and that it becomes extinct in the opposite direction. When the axis of the tourmaline lies in the principal section itself, the *extraordinary* image presents similar phenomena. The polarization of a ray of light may also be effected by reflexion. When a ray of light falls upon a polished glass surface at an angle of 56° 45′, if the reflected ray be examined through a plate of tourmaline, it will exhibit the same series of phenomena as if it had passed through another plate of the same substance. The light is invisible when the axis of the tourmaline is parallel to the plane of reflexion. Different substances polarize light by reflexion at different angles: water at 53° 11′, and the diamond at 68° 1′. The most interesting, as well as the most splendid phenomena of polarized light, are the brilliant and gorgeous colours which, under certain conditions, are developed by crystallized plates. If a ray of light which has been polarized be made to traverse a thin plate of mica, or sulphate of lime, which is colourless to common light, and then examined through a plate of tourmaline in that position where, without the plate, it would disappear, the ray will be seen, but splendidly coloured with tints depending upon the thickness of the plate and its inclination. The polarization of light has been made useful in detecting the nature of substances which elude the direct process of chemical examination, and also for the purpose of detecting rocks and shoals at the bottom of the sea. By viewing objects at the bottom of the sea through a polarising tube, nearly the whole of the glare of the reflected light is extinguished. For many years it has been known that solar light is capable of producing powerful chemical changes. One of the most striking of these is its power of darkening the chloride of silver. This effect takes place slowly in diffused light, but very rapidly in the direct rays of the sun. It was at first thought that this effect was caused by the luminous rays; but through later observations it appears that solar light may be divided into three parts,—the light-giving rays, the heat-giving rays, and the chemical rays. It is by the latter rays that the salts of silver are decomposed. The greatest chemical action, it has been observed, takes place just beyond the violet rays of the spectrum, and the property gradually diminishes till the green division is reached; beyond which it does not exist. (*See* Photography.) Light is of great importance in the vegetable kingdom; when deprived of it, plants grow white and contain an excess of aqueous and saccharine particles. To the influence of the sun's rays, flowers owe all the variety, beauty, and intensity of their colours; and to man and all the superior animals, the light of the sun is necessary for life, health, and strength.

Light, Aberration of. (*See* Aberration.)

Light-balls, in Mil., cases filled with a composition that ignites readily and burns with a brilliant flame, which are thrown from mortars to illumine any position in which a party of the enemy is supposed to be working. They are chiefly used by the besieged in order to discover the troops that are engaged in tracing and forming the trenches at the commencement of operations against a fortified town, and in case of an assault, when the balls are thrown by hand into the ditches on either side of the breach and on the débris of which it is composed, that the light proceeding from them may enable the defenders to direct a fire with precision against their assailants. The composition that is used consists of 10 parts of saltpetre to 3 of rosin and 4 of sulphur. These ingredients are first powdered and passed through a sieve, and then mixed into a stiff paste by the addition of a little boiling linseed oil. This is placed in a spherical case of cartridge-paper, or canvas made of gores sewn together, or in cylinders formed by two hemispherical ends of metal kept apart by a few strong wires fastened at either end to the rims of the metal cups, the framework thus formed being covered with canvas or stout paper. The case made in this manner is about half as long again as it happens to be in diameter, and the diameter varies in accordance with the calibre of the piece from which it is to be discharged. Either kind of case is filled with the composition through a hole made for the purpose, which also serves as a fuse-hole for the introduction of a piece of quick-match that ignites the mixture as soon as the case is discharged from the mortar. These cases are sometimes filled with a composition that emits a dense smoke when it is set alight. They are then used to mask the operations of troops, or to compel men who are working in the galleries of mines to abandon them in order to escape suffocation from the smoke and stifling odour that issues from them. The composition that is used in making these consists of 10 parts of mealed powder, 2 of saltpetre, 3 of coal-dust, 4 of pitch, and 1 of tallow. The powder, saltpetre, and coal-dust are pulverized and sifted, after which they are mixed with the pitch and tallow in a melted state.

Light Cavalry. (*See* Cavalry.)

Lighter is a large, open, flat-bottomed vessel, employed to carry goods to or from a ship.

Lighthouse, a building erected on any part of the coast, or on islands at a little distance from it, to enable the sailor to determine the position of his vessel when it is approaching land at night, and to shape his course so that he may avoid any dangerous shoals, reefs, or headlands that may lie in its vicinity. Lighthouses are generally built in the form of a cylindrical tower, the lower chambers of which often afford accommodation for the keeper of the light and his family, while the uppermost story constitutes a gigantic lantern; being a room with glazed sides, and having a lamp in the centre. This is lighted at nightfall by the keeper, and burns with a brilliant flame, the light of which is reflected seawards for some miles by the aid of a combination of highly-polished reflectors. There is generally some peculiarity in the appearance of the light shown by every lighthouse, which enables it to be readily identified,—in some a steady light is exhibited, which may be made to appear to be coloured by transmitting it through coloured glass; while in others the light is intermittent, the light appearing at certain in-

tervals of longer or shorter duration, or a flash of one colour being sometimes succeeded by a flash of another colour. The obscuration of the light for any fixed interval of time, or a change of colour, is effected by bringing an opaque screen, or screen of coloured glass, before the lamp and withdrawing it successively; the revolution of the screen or coloured medium being effected by machinery which is attached to it, and which is similar in its nature to clock-work. In places where the navigation is intricate on account of sandbanks and shoals, as it is at the entrance to any large tidal rivers, vessels are moored in the necessary positions on which the lights are displayed. The best-known light of this description is the floating light off the Nore; but they are to be found in the Mersey, off Liverpool, and other rivers; while lighthouses, among which the Start lighthouse, on Start Point, Devon, and the Eddystone (*see* EDDYSTONE LIGHTHOUSE), may be specially named, appear on almost all the principal headlands of the United Kingdom. All beacons and buoys laid down to mark out certain channels for the guidance of mariners, and all lighthouses and floating lights, belong to, and are under the management of, the Trinity Board. (*See* TRINITY HOUSE.) Every vessel is provided with instructions respecting the peculiar way in which the light is exhibited from any lighthouse or floating light, and its bearings with regard to other parts of the coast and headlands in its immediate vicinity, that the captain or master may be enabled to recognize the light, and so determine the position of his vessel. The erection of any new light or beacon, and any changes with regard to those that have already been in operation, are duly notified by the Trinity Board in the advertising columns of the *Shipping Gazette* and principal daily London papers.

LIGHT INFANTRY. (*See* INFANTRY.)

LIGHTING AND WATCHING.—By 11 Geo. IV. c. 27, provision was made for the lighting and watching of parishes in England and Wales. It was repealed by 3 & 4 Will. IV. c. 90, which enacts that, on the application of three rated inhabitants, the churchwardens of any parish are to convene a meeting of the ratepayers to determine whether the provisions of the act shall be adopted; and the majority in favour of the adoption must consist of two-thirds of the votes of the ratepayers. In the event of their adoption, inspectors are to be appointed for carrying them into effect. The power to raise rates under 3 & 4 Will. IV. c. 90, and under local acts, to cease where districts are taken under the care of county and district constabulary force, by 3 & 4 Vict. c. 88; and the powers, property, and liabilities of trustees for paving, lighting, &c., may be transferred to the body corporate of incorporated towns, under 20 & 21 Vict. c. 50.

LIGHTNING, *lit'-ning* (Ang.-Sax.), a sudden discharge of electricity from one cloud to another, or from a cloud to the earth, or from the earth to a cloud; producing a vivid flash of light, accompanied generally by a loud report, called thunder. When a thunder-storm commences, light clouds with jagged edges are observed, the motions of which are often opposite and variable. At the surface of the earth, the atmosphere is still and calm, with a slight elevation of temperature and considerable barometric and hygrometric changes; producing sensations of closeness, faintness, and oppression. Low murmurings of distant thunder are then heard, after which the lower region of the air is refreshed by cooler, but light breezes of uncertain direction. The thunder-clouds appear nearer, larger, and blacker, and the sensations of uneasiness increase. At short intervals, flashes of lightning are observed. Their course is sometimes zigzag, when it is called *forked lightning:* the breaking up of its course shows that it is dangerous, since the lightning must be near terrestrial objects. After the discharge, heavy showers of hail or rain descend, and the atmosphere is again cooled. The blackness then becomes universal, and the thunder is heard in a loud burst, almost instantaneously with each brilliant flash of lightning. The colour of lightning varies, being generally a changeable yellow, and sometimes red, blue, or violet, according to the density of the atmosphere. The identity of lightning with the discharge of ordinary electricity was discovered by Benjamin Franklin in America, and Dalibard in France. Franklin, in June, 1752, having perceived a thunder-cloud approaching, sent up a silk kite attached to a dry hempen cord. Soon afterwards he noticed that the loose threads of the cord stood erect, and upon approaching his finger to the cord, he drew sparks. A little rain falling, the conducting power of the cord was increased, and the violence of the shocks received from the sparks warned him that it was dangerous to continue the experiment. The experiments were repeated in Europe, and atmospheric electricity became a favourite study, till it was checked by the death of Professor Richmann, of St. Petersburg. He had attached a simple species of electrometer to his apparatus for measuring the intensity of the electricity in a thunder-cloud. After a loud clap of thunder, he proceeded to read off the degree indicated by his instrument, when a globe of electric fire was discharged through his body, and killed him on the spot. The causes which produce atmospheric electricity are not well known. In general, when a flash of lightning occurs, the earth and the cloud may be looked upon as the terminal planes of a highly-charged system of di-electric air, the tension of which goes on increasing until any further increase causes it to give way, when the opposite electricities rush together with violence, producing equilibrium by disruptive discharge, or a flash of lightning. There are several varieties of lightning, known by different names.—*Forked lightning*, the only kind probably that strikes terrestrial objects, frequently divides into two or more zigzag ribbons or lines of light. When forming a long rippling line of light, it is called by the sailors *chain lightning*.—*Sheet lightning* seems to be spread over an immense surface, and varies in colour, being often red, but sometimes blue and violet. When lightning of this kind appears without thunder, it is called *summer lightning*, and is generally considered to be the reflexion of some very far-distant storm.—*Globular lightning* appears like a luminous ball or globe of fire, and travels comparatively slowly, while those mentioned previously are almost instantaneous. This variety of lightning, in a milder form, is known to the French and Spaniards as St. Elmo's fire; to the Italians as the fires of St. Peter and St. Nicholas; and to the Portuguese as corpos santos, which has been corrupted by English sailors into *comazants*. In this form it appears as tufts of fire on the top of ships' masts, the tips of bayonets, on the alpen-stocks of Alpine travellers, or on the tips of the outspread fingers, when the atmosphere is in a peculiar state of electrical excitement. When lightning strikes the earth, it has generally been remarked that the flash is succeeded by a suffocating odour, often compared to that of burning sulphur. To others, the odour appears to resemble that of phosphorus or nitrous acid. It seems probable that the smell is in reality due to the presence of ozone, generated by the action of the electric fluid on the air. One of the commonest effects of lightning is the fusion of metals. There is an instance on record of an iron chain being converted into a solid rod by the passage through its length of a flash of lightning. It has also been known to fuse sand and other siliceous minerals into a kind of glass or enamel. When solid imperfect conductors are struck by lightning, they are torn and scattered to pieces. The masts of ships have in this way been shattered to fragments in an instant. Lightning is very fatal to human life. Between 1835 and 1853, no less than 1,308 persons were killed by lightning in France. In all cases, accidents from lightning are more frequent in elevated situations than in the plains, and in villages in the open country than in populous cities. When lightning strikes any person, it is particularly attracted by any metal that may be worn at the time. The best place for timid persons, who may be in a house unprotected by a lightning conductor, is the middle of the room, and at a distance from all walls, and especially from the fire and chimney.

LIGHTNING CONDUCTOR, a bar of metal, or a collection of bars of metal, attached in a particular manner to a building or a ship, and extending from below the level of the ground, or from below the sheathing of the ship, to a point several feet above the highest part of the building or ship. The object of these contrivances is to conduct the electric fluid to the earth without doing any damage. (*See* CONDUCTORS and NON-CONDUCTORS of ELECTRICITY.)

LIGHTS, FLOATING. (*See* LIGHTHOUSE.)

LIGHTS, NORTHERN. (*See* AURORA BOREALIS.)

LIGNIN, *lig'-nin* (Lat. *lignum*, wood), the incrusting matter contained within the cellular tissue, giving hardness to the wood and other parts of plants. At one time it was supposed that lignin was a true chemical principle; but the researches of Payen and others prove that it is not always constant in composition. It is, however, always characterized by being soluble in weak alkalies and insoluble in water.

LIGNITE, *lig'-nite* (Lat. *lignum*, wood), fossil wood, more or less mineralized and converted into coal. The lignites are generally dark brown, and woody in their structure. They are distinguished from true coal by burning with little flame and much smoke, owing to their containing a smaller proportion of carbon. The brown coal of Germany, which belongs to the tertiary formation, is much used as a source of paraffin and paraffin oils.

LIGNUM VITÆ. (*See* GUAIACUM.)

LILAC. (*See* SYRINGA.)

LILIACEÆ, *lil-e-ai'-se-e* (Lat. *lilium*, the lily), in Bot., the Lily fam., a nat. ord. of *Monocotyledones*, subclass *Petaloideæ*. Herbs, shrubs, or trees, with bulbs, rhizomes, tuberous or fibrous roots, and parallel-veined, sessile, or sheathing leaves. Flowers regular; perianth green or petaloid, inferior, 6-leaved, or 6-parted; stamens 6, inserted in the perianth or rarely into the thalamus; anthers introrse; ovary superior, 3-celled; style 1; stigma simple, or 3-lobed. Fruit a loculicidal capsule, or succulent and indehiscent, 3-celled. Seeds with fleshy albumen, numerous. The *Liliaceæ* are widely distributed throughout the temperate, warm, and tropical regions of the globe. There are 147 genera, and about 1,200 species. Among the useful plants of this order are the onion, leek, asparagus, squill, and aloe; and among the valuable products yielded by them are fibres, used for twine and cordage, edible seeds, and balsamic resins.

LILIUM, *lil'-e-um* (Lat.), in Bot., the Lily, the typ. gen. of the nat. ord. *Liliaceæ*. *L. candidum*, the white lily, has always been considered the emblem of purity; and this and many other species form beautiful border flowers. *L. Martagon* and its varieties are known as Turk's-cap lilies, from the turban-like form of their flowers. The bulbs of some species, as those of *L. tenuifolium*, *kamschaticum*, and *spectabile*, are commonly eaten in Siberia.

LIMB, in Astron., the name given to the border or edge of the disc of the moon or any planet, and also further applied to the edges of circles that form part of any astronomical instrument. The term is used more particularly in reference to the moon in descriptions of lunar eclipses.

LIMBO, *limb'-bo* (Lat. *limbus*, edge or border), in Roman Catholic Theol., signifies a place on the borders of hell. The *limbus patrum*, which is also called the *sinus Abrahæ* (Abraham's bosom), is the place on the borders of hell where the patriarchs and other good men who lived before the time of Christ remained, and who were set free by Christ when he descended into hell, and admitted into heaven; and since that time this limbo has remained closed and unoccupied. Some theologians also adopt another limbo (*limbus infantum*), where those infants who die without being baptized are confined. Dante describes the limbo in which he met with the distinguished spirits of pagan antiquity as the outermost circle of hell. Milton's limbo,—"large and round, since called the paradise of fools, to few unknown,"—is borrowed from the *limbus fatuorum* of the scholastic theologians. Limbo is now commonly used figuratively to denote any place of confinement or restraint.

LIME, *lime* (Sax. *lim*, *lime*), in Agr. and Build., a substance termed in Chem. oxide of calcium (*see* CALCIUM), which is used in the former as a manure, and in the latter as the principal ingredient in making mortar, by means of which stones and bricks are bound together in a compact and solid mass. It is also used in making plaster and cement for giving a smooth and uniform surface to the walls of buildings, internally and externally. It is obtained by burning limestone, chalk, marble, or any stone which contains carbonate of lime, in kilns, in order to produce calcination. The process of burning expels the water and carbonic acid gas from the stone, which falls to pieces on exposure to the air after removal from the kiln, and crumbles into a white flaky powder, which is called quicklime, and is possessed of highly caustic properties. When it is required for building purposes, it is slaked, as it is technically termed, or caused to go to pieces by throwing as much water upon it as it will imbibe, and allowing it to remain in the air for a considerable period. This treatment destroys its caustic properties in a great measure, and it is then known as slaked lime. Limes are divided into three classes, and distinguished as rich, poor, or hydraulic, according to the constituents of the various limestones from which they are produced. Rich limes contain very little silicate of lime in proportion to pure carbonate of lime, being composed of about 1 part of the former to 19 parts of the latter. They are so called because the stones from which they are procured imbibe a considerable quantity of water when they are slaked after calcination, and consequently increase to a great extent both in bulk and weight. The mortar made from limes of this description never becomes thoroughly hard; and they should not therefore be used in making mortar or plaster which is likely to be exposed to the action of the weather. They are, however, well suited for making plaster for the internal surfaces of walls and for manures. Chalk affords a lime of the purest and richest kind after calcination. The poor limes, of which class the lime produced from oolitic limestones is a fair specimen, are obtained from stones which contain a large per-centage of metallic oxides and insoluble flinty grit, and are so called because they do not increase in volume to any extent when they are slaked. They are similar to hydraulic limes in this respect, but they are distinguished from them in not possessing the property of setting or hardening rapidly under water, which is an eminent characteristic of the hydraulic limes. The limestones from which hydraulic limes are made, such as the blue lias and greystone lime, are those which contain a quantity of silicate of alumina in conjunction with pure carbonate of lime. When water is mixed with hydraulic lime after calcination, hydrated silicate of lime and alumina is formed, which gives the mortar thus made the power of hardening under water and resisting its influence. The hydraulic limes are classed according to the proportion of silicate of alumina that they contain; limes which contain 1 part of silicate of alumina to 2 or 3 parts of carbonate of lime being termed eminently hydraulic, as they are most capable of resisting the action of water; while those which contain a less proportion of silicate of alumina are known as hydraulic and moderately-hydraulic limes. The best limes, however, for resisting the action of water are those which are made artificially by burning clay which contains soluble silicate of alumina and pure carbonate of lime together. (*See* CEMENT.) Rich lime, or pure carbonate of lime, when mixed with a quantity of water, forms an opaque white fluid termed whitewash, used for coating the walls of houses within and without. Coloured washes may be produced by the addition of any coloured earth, such as red and yellow ochre. A little glue or size should be added to the whitewash or wash of any colour, to bind it and cause it to adhere to the walls without coming off on anything that may touch them. Lime is also valuable as a disinfectant, and is used in tanning for removing the hair from the skins of animals that are to be converted into leather.

LIME (*Fr. lime*), the fruit of *Citrus limetta*. It is imported into this country in a preserved state for use as a dessert. Its juice is also largely imported for the preparation of citric acid, and for the prevention of scurvy on board ship. (*See* CITRUS.)

LIME, CHLORIDE OF. (*See* CALCIUM, CHLORIDE OF.)

LIMEKILN, *lime'-kil* (Sax. *cyln*, from *cylene*, a furnace), the pit or species of oven in which limestones are burnt or calcined in order to obtain lime for building and other purposes. Limekilns are built of brick, with an interior lining of fire-bricks or of hard stone, that is calculated to resist the action of fire for a long period of time. When the fuel that is used in burning the limestone is placed in a mass by itself at the bottom of the kiln, and the stone above it, the kiln is termed an intermittent kiln, as the fire must be let out and the

kiln cooled before the lime can be withdrawn. Kilns of this description are square or cylindrical in shape, while running kilns are in the form of an inverted cone or funnel, the diameter of the pit being larger at the top than at the bottom. They are so called because the fuel and limestone are thrown in in alternate layers, and the lime is withdrawn from the bottom of the pit as it is burnt; so that the operation of burning can be kept up for some time by throwing in fresh limestone and fresh fuel at the top as the lime is taken out at the bottom. Either wood, peat, or coal, may be used for burning lime in an intermittent kiln; but only coal can be used in a running kiln. It appears that when limestone is burnt in a running kiln, less coal in proportion is required to effect the process of calcination than when it is burnt in an intermittent kiln. On approaching a limekiln when alight, a shimmering vapour will be seen ascending from the top of the pit, which is carbonic acid gas disengaged from the stone while burning.

LIME-LIGHT. (*See* DRUMMOND LIGHT.)

LIMESTONE, a general term applied to a great variety of rocks which contain a certain quantity of lime. Chalk is an earthy, massive, opaque variety, generally soft and without lustre. (*See* CHALK.) In nature, carbonate of lime is found more or less pure, both perfectly crystallized, as in calc-spar and arragonite; imperfectly, as in granular limestone; and in compact masses, as in common limestone, chalk, &c. Concretionary limestone, generally called stalactitic carbonate of lime, is formed by the filtration of water through rocks containing lime, which is dissolved out; and as the water drips slowly out in cavernous recesses, it parts with its carbonate of lime, which is deposited in zones, more or less undulated, which have a fibrous structure. These fibres are very beautifully shown in the long fibrous pieces called stalactites. The stratified variety called stalagmites shows a similar structure, varied only by the circumstances under which it was produced.—*Incrusting concretionary limestone* is similar to the above. It is found in calcareous springs, which are common in Derbyshire, Yorkshire, and other places. It is a common practice to place vegetable substances in these springs, when they become incrusted with carbonate of lime, and present all the appearance of fossils. There are several remarkable wells of this kind in volcanic districts, in some of which the water flows in almost a boiling state.—*Spongy limestone* is found at the bottom of those lakes the water of which is impregnated with lime.—*Travertino* was a limestone deposited by the waters of the Anio and the Solfaterra of Tivoli. Most of the monuments in ancient Rome were constructed of it.—*Compact limestone* has a close texture, usually an even surface of fracture, and dull shades of colour.—*Granular limestone* includes statuary and architectural marble, and has a texture somewhat resembling that of loaf-sugar. (*See* MARBLE.)—*Oolite* consists of rounded particles of limestone like the roe or eggs of a fish. Coarse lias is sometimes called *Coarse-grained limestone.*—*Marly limestone* is found in lake and fresh-water formations; its texture is fine-grained, its colour is white or pale yellow, and it is apt to crumble in the air. *Siliceous limestone* is a combination of silica and carbonate of lime; and *stinkstone* is a carbonate of lime combined with sulphur and organic matter, which emits the smell of sulphuretted hydrogen when struck or rubbed. It is found in Derbyshire, Sutherlandshire, and some parts of Ireland. All limestones seem to have been the result of deposition effected by chemical changes. The vast space of time required to accumulate the great limestone ranges of this country cannot be estimated.

LIME-TREE. (*See* TILIA.)

LIME-WATER. (*See* CALCIUM.)

LIMITATION, *lim-e tai'-shun* (Lat. *limitatio*), in Law, is a certain time assigned by statute within which an action must be brought, or other legal act done. In Scotland it is termed prescription. The use of these statutes of limitation is to preserve the peace of the kingdom, and to prevent those innumerable perjuries which might ensue if a man were allowed to bring an action for an injury committed at any distance of time. There is also the danger to the defendant that, if an action be long delayed, the documentary or other evidence of his rights may have been lost or destroyed; and also the hardship of finding himself unexpectedly deprived of what he had long had in possession. The limitation of actions naturally divides itself into two classes,—those which relate to the recovery of things real, and those which relate to the recovery of other things than real. It was in reference to real actions that the law of limitations was first established; and, originally, such actions were limited from some particular event or fixed era, as by the statute of Merton (20 Hen. III. c. 8), the demandant in a writ of right could not claim upon any seisin earlier than the reign of Henry II., nor by the statute of Westminster the first (3 Edw. I. c. 39), earlier than that of Richard I. At length, the Statute of Limitation (32 Hen. VIII. c. 33) was passed, which limited real actions, not from any fixed date or event, but a fixed period of time. It provided that where, in any writ of right or action possessory, the demandant claimed upon his own seisin, the seisin must be within thirty years; where on the seisin of his ancestor in a writ of right, it must be within sixty, in a possessory action, within fifty years. By 21 Jac. I. c. 16, it was enacted that all writs of formedon should be brought within twenty years after the title and cause of action first descended or fallen; and also that no person should make entry into any lands or hereditaments but within twenty years after his right should first accrue. By this act the time of limitation, as applicable to the crown, was extended to sixty years precedent,—namely, to 19th February, 1623; a period which, in course of time, became actually no limitation at all; and hence, by 9 Geo. III. c. 16, the period of sixty years was fixed within which an action must be brought. By 3 & 4 Will. IV. c. 27, entitled "An act for the limitation of actions and suits relating to real property, and for simplifying the remedies for trying the rights thereto," a variety of most important changes have been introduced. In general, twenty years is fixed upon as the time for the recovery of corporeal hereditaments, provided the claimant labour under no disability to assert his pretensions; and real actions are, with one or two exceptions, abolished, so as to leave parties deprived of land no remedy in general but those of entry or ejectment. This statute now governs the law of limitation in all proceedings to which the crown, if not a party (the limitation of sixty years being, as regards it, still in force), whether at law or in equity, for the recovery of things real, or of money secured or charged upon the realty. It provides that no person shall, after 31st December, 1833, make an entry or distress, or bring an action to recover any land, rent, or annuities charged upon land, &c., but within twenty years next after the time that the right of such action shall first accrue; but where the claimant labours under disability, as of infancy, lunacy, absence beyond the seas, &c., then within ten years next after such disability shall cease, or the person die, whichever shall first happen; but in no case shall the right of entry, &c., extend to forty years, even though the claimant may have remained during the whole of that time under disability. Except in cases of fraud, and certain others, no person claiming any land or rent in equity shall bring any action to recover the same but within the period during which he might have made an entry of distress, or brought an action of recovery, if his estate had been legal instead of equitable. Neither shall any action, suit, or other proceeding, be brought to recover any sum of money secured by any mortgage, judgment, or lien, or otherwise charged upon, or made payable out of, any land or rent, at law or in equity, or to recover any legacy, except within twenty years next after a present right to receive the same shall have accrued to some person capable of giving a discharge for the same, unless in the mean time some interest or acknowledgment shall be paid or made by the party indebted, to the creditor or his agent, in which case the twenty years are reckoned from the last of such payments or acknowledgments. No arrears of dower, or of damages on account of such arrears, and no arrears of rent or interest, shall be recoverable for a longer period than six years. With respect to actions not brought for the recovery of things real, it was enacted that all actions, suits, bills, indictments, or information upon any penal statutes, where any forfeiture is to the crown alone, shall be sued within two years from the

commission of the offence; where to a common informer alone, then within one year; where to both jointly, then by the common informer within one year, and by the crown within two years after that one year is expired. By 3 & 4 Will. IV. c. 42, all actions for penalties, damages, or sums of money, given to the party aggrieved, by any statute, must be commenced and sued within two years after the offence shall have been committed. By 11 & 12 Vict. c. 43, it is provided that all informations for offences punishable on summary conviction shall be laid within six calendar months of the offence, unless otherwise specially limited; and by 11 & 12 Vict. c. 44, no action can be brought against any justice of the peace for anything done in the execution of his office, unless within six calendar months from the offence. Several statutes limit the time within which actions may be brought against officers of excise, customs, &c., for acts done in the performance of their duties, to different periods, but in no case exceeding six months. By 21 Jac. I. c. 16, it is enacted that all actions of trespass for injuries to person, land, or personal property,—all actions of detenue, trover, replevin, account (except such as concern the trade of merchandise),—all actions of debt grounded upon any lending or contract without specialty,—all actions for arrears of rent,—shall be limited to six years; actions of trespass, menace, battery, wounding, and imprisonment, to four years; and actions on the case for verbal slander to two years. An exception, however, is made in favour of such persons as labour under disabilities; the limitation counting from the time when such disabilities are removed. By 3 & 4 Will. IV. c. 42, it is provided that all actions of debt for rent upon an indenture of demise, all actions of covenant or debt upon any bond or other specialty, all actions of debt or *scire facias* upon any recognizance, must be commenced within twenty years after the cause of such actions or suits shall have arisen; all actions of debt upon an award where the submission is not by specialty, or for a copyhold fine, or for an escape, or money levied upon any writ of *fieri facias*, within six years; and all actions for penalties, damages, or sums of money, given to the party aggrieved, by any statute, within two years after the cause of such actions or suits. Provision is made, as in the other cases, for persons labouring under disabilities; and also, in the case of any acknowledgment in writing signed by the party liable, or his agent, or any payment made on account of any arrears of principal or interest, the limitation reckons from the last of such payments or acknowledgments. Limitations as to tithes and other ecclesiastical property are now regulated by 2 & 3 Will. IV. c. 100, and 3 & 4 Will. IV. c. 27. (*See* also PRESCRIPTION.) Limitation of estate is a modification or settlement of an estate, determining how long it shall continue.—*Ref.* Stephen's *Commentaries on the Laws of England*.

LIMITED LIABILITY. (*See* PARTNERSHIP.)

LIMNANTHACEÆ, *lim-nan-thai'-se-e* (Gr. *limne*, a marsh; *anthos*, a flower), in Bot., a small nat. ord. of *Dicotyledones*, sub-class *Thalamifloræ*, included by Lindley in the *Tropæolaceæ*, with which it agrees in general characters. It is, however, distinguished from that order by having regular flowers, more evidently perigynous stamens, and erect ovules. There are but two genera and three species, natives of North America.

LINACEÆ, *lin-ai'-se-e* (Lat. *linum*, linen), in Bot., the Flax fam., a nat. ord. of *Dicotyledones*, sub-class *Thalamifloræ*, having the following essential characters:—Herbs, or very rarely shrubs, with exstipulate, simple, entire leaves. Flowers hypogynous, regular, and symmetrical; sepals, petals, and stamens 3—4—5 each; the sepals persistent and imbricate; the petals deciduous and twisted in æstivation; the stamens united at their base, and having little tooth-like abortive stamens alternating with them; ovary 3—4—5-celled, styles distinct; stigmas capitate. Fruit capsular, many-celled, each cell more or less divided by a spurious dissepiment, and each division containing one seed. Seeds with little or no albumen, and having a straight embryo. The *Linaceæ* are chiefly natives of the south of Europe and north of Africa. There are four genera and 90 species. They are generally remarkable for the tenacity of their liber fibres, and also for the mucilage and oil contained in their seeds. (*See* LINUM.)

LINDEN-TREE, (*See* TILIA.)

LINE, *line* (from Lat. *linea*, a line), in General, a series or succession of relations from a common progenitor.—In Naut., a *ship of the line* is a vessel with three tiers of guns. (*See* NAVY.)—In Mil., *troops of the line* are regular foot regiments.—In Geog., *the line* is an imaginary line drawn round the earth to represent the equator; and "crossing the line" is passing this fictitious boundary; on which occasion formerly great ceremonies used to be performed, which are now, however, abandoned.

LINE, in Math. (*See* GEOMETRY.)

LINE OF BATTLE, a general name given to the arrangement or order in which a fleet of ships of war are disposed to engage an enemy. This disposition, which is best calculated for the operations of naval warfare, is formed by drawing up the ships in a long file, or right line, prolonged from the keel of the foremost to that of the foremost, and passing longitudinally through the keels of all the others, from the van to the rear; so that they are, in nautical parlance, in the *wake* of each other. In the line of battle, all the ships of which it is composed sail one point free when upon a wind on the starboard or port tack, and about one hundred fathoms distant from one another. A fleet is more particularly drawn up in line when in the presence of the enemy; and the ships are so arranged as to be able to fire upon the enemy without incommoding the ships of their own squadron. All the ships composing the line have not less than two decks; hence they are called *line-of-battle* ships.

LINEAL. (*See* CONSANGUINITY, KIN OR KINDRED, DESCENT.)

LINEAR PERSPECTIVE. (*See* PERSPECTIVE.)

LINEN, LINEN MANUFACTURE, *lin'-en* (Lat. *linum*, flax).—Linen is a general name for a cloth of very extensive use, made of flax, and differing from cloths made of hemp only in its fineness. The manufacture of linen is of so ancient a date that its origin is unknown. At a very early period linen cloths were made in Egypt, the cloth wrappings of the mummies being all composed of this substance. In the time of Herodotus linen was exported from Egypt; it also formed the dress of the Egyptian priests, who wore it at all their religious ceremonies; hence they were called "linen-wearing" by Ovid and Juvenal. Linen passed from Egypt to the Romans, but not until the time of the emperors, when the Roman priests began to wear linen garments. Linen was also used as a material for writing: the Sibylline books, and the mummy bandages covered with hieroglyphics, are instances of this use of the fabric. Linen and woollen cloths formed the only material for dresses during the middle ages; and fine linen was held in very high estimation, the manufacture being carried to the greatest perfection in Germany and Brabant. Cotton, on account of its cheapness, has taken the place of linen for many purposes; but good paper cannot be manufactured without linen. In Britain, linen has been manufactured for a very long period. During the reign of William III, the woollen manufacture in Ireland was suppressed, because it was alleged that it interfered prejudicially with the clothiers of England. To this circumstance the growth of the Irish linen manufacture is ascribed; for at the same time the linen-weavers were encouraged by premiums given by public boards authorized by act of parliament. As early as the 11th century linen was woven in Ireland, and Louis Crommelin, about 1696, driven from France by the revocation of the edict of Nantes, established the manufacture on a new basis. In 1725 machinery was first used in the manufacture of linen; and, shortly afterwards, the processes were greatly improved by a new method of bleaching invented by Dr. Ferguson, of Belfast. Flax was first spun by machinery by Messrs. Mulholland, of the same town, in 1820. The Linen Board was dissolved in 1828, and in 1841 a society was established for the encouragement of the growth of flax in Ireland. It is difficult to ascertain the exact quantity of linen exported from Ireland, but the average quantity, about 1790, was about 34,000,000 yards. In 1857, the exports from all Ireland were supposed to amount to about 105,600,000 yards, valued at £4,400,000. Early in the last century the

linen manufacture was introduced into Scotland, and in 1727 a board of trustees was established for the superintendence and improvement of the linen manufacture. Notwithstanding the institution of this board, and the bestowal of premiums on the production and exportation of linen, the manufacture did not progress in the same way as that of cotton and other similar fabrics. In 1745 only 74 tons of flax were imported into Dundee, the grand seat of the Scotch linen manufacture. In 1791 the imports of flax amounted to 2,444 tons, and in 1858 the average imports of flax and hemp had increased to 46,360 tons. The quantity of linen cloth exported from Dundee in 1850 amounted to about 1,000,000 pieces, containing about 120,000,000 yards. In the process of manufacture, the flax fibres are first steeped and freed from woody particles. (*See* FLAX.) Very little machinery was used in the manufacture of linen cloth till recently. After being freed from the woody particles, the distaff and spinning-wheel were used in order to make the thread or yarn, and the hand-loom was employed for the purpose of weaving the cloth. About the middle of the 18th century, the inventions of Hargreaves and Arkwright were first applied to the manufacture of linen, at Leeds. (*See* COTTON MANUFACTURE.) When brought to the spinning-mills, the flax is in small bundles, weighing a few pounds each. The first process is called *scutching*, by which the fibres are subjected to a sort of combing action, in a machine. They are next *heckled*, an operation by which they are cleaned, the coarser parts being removed, and the rest arranged in a parallel direction to each other. This used to be done with the *heckle*, a sort of large comb with iron teeth; but the operation is now effected by a rotating machine, on the outer circumference of which the flax is fixed, and drawn against or between a series of sharp teeth. The fibres pass through six heckling machines in succession, each of which has finer teeth than the one preceding it. After being heckled, the flax is divided into portions, selected according to their fineness, &c. The next process is that of *drawing*, similar to the carding process in the cotton manufacture. (*See* CARDING MACHINE.) In this operation the flax is doubled and carded repeatedly, till it presents the appearance of a smooth glossy band, about an inch in width, called a *sliver*. All the good portion of the flax at this point is called *line*, and all the irregular short fibres, *tow*. This tow is not the rough substance generally known by the name; the latter is the refuse of hemp. Flax tow can be drawn, doubled, carded, and spun into yarn of coarse quality. The principal object in drawing the heckled fibres is to form a sliver of uniform thickness, or such that a foot in length taken at any one place will be equal to a foot in length taken at any other place, or as nearly so as possible. The drawn sliver is next taken to the *roving*-frame. The use of this machine is to give the sliver another drawing, also a slight twist, and to wind it upon a bobbin. These processes are all preparatory for the spinning of the yarn. This is effected on the bobbin-and-fly principle, and the flax spinning-frame acts similarly to the *throstle* used in cotton-spinning. Flax, however, differs from cotton, wool, and silk, as it requires to be wet while under the process. Formerly it was wetted with cold water, but it is now found that finer yarn can be produced when warm water is used. In general, the rove or twisted sliver, before it passes through the retaining rollers, is led through a trough of water kept hot by steam. The spun yarn is applicable either for making thread, or for weaving into linen cloth. The quality of flax is denoted by numbers expressing the number of *leas* in a pound weight; a lea being a measure of 300 yards. Thus, No. 50 has 50 leas, or 15,000 yards. Flax is seldom spun finer than No. 200, which contains 60,000 yards. No. 200 is applicable for making cambric of fine quality. Leeds is the great centre for flax-spinning; the weaving is carried on in other places. Linen, duck, cheque, tick, huckaback, diaper, drill, towelling, and other flax fabrics, are woven at and about Barnsley; while sail-cloth, dowlas, sheeting, and other strong textile fabrics, are manufactured at Dundee and also at Aberdeen. Shirtings, damasks, tablecloths, and other fine fabrics, are produced at Dunfermline; while Belfast is famous for good





linen and the finer kinds of textile goods. Amongst these are duck made in widths from three to five quarters of a yard; drill, or twilled linen, white or coloured, mostly used for summer trousers. Damask, diaper, and cambric, are noticed under their respective headings. Many of the fabrics called linen cloths are made either of flax or hemp, according to the prices at which they are to be sold. Sail-cloth is dressed with starch or flour before weaving; and most kinds of flaxen and hempen fabrics require some similar dressing. The manufacture of linen is not carried on in this country only, but extensively on the continent, in Bohemia, Moravia, Silesia, and Galicia. Within the Austrian dominions the most important linen fabrics manufactured are table-cloths, napkins, veils, cambrics, dimities, twills, and drills. The manufacture of thread in Bohemia, Moravia, and Lombardy, is also of considerable importance. The linen trade is divided into three parts, which relate respectively to the seed, the fibre, and the woven goods. The annual importation of linseed is 4,000,000 bushels, four-fifths of which are used for making linseed-oil, and one-fifth for sowing into a flax crop. The principal supply comes from Russia, the sowing-seed being carefully prepared, and imported in casks officially branded. The crushing-seed, for making oil, is coarser, and is packed in malt-bags or sent in bulk. The computed value of the seed and fibre imported in 1858 was £2,700,000. The import of woven flaxen goods is very small in this country. The North American States, Brazil, Cuba, and the Hanse Towns, but especially the first, are by far the largest importers of manufactured linens. According to McCulloch, the entire value of the linen manufacture of Great Britain and Ireland is estimated at about £12,000,000. The duty on imported linen, which was raised in France in 1812, was abolished by the commercial treaty signed with France, Jan. 23rd, 1860.

LINES, *lineæ*, in Mus., those members of the stave between and upon which the notes are placed. The stave itself consists of five lines only, but other and smaller lines, called *ledger-lines*, are placed above and beneath, for the reception of all notes that are too high or too low to come within the stave. The invention of lines is attributed to Guido. At their first introduction the spaces between them were not used.

LINES OF INTRENCHMENT.—When an army is encamped for a brief space of time in the open field, or engaged in offensive operations against a beleaguered town, it is not considered necessary to construct a continuous series of works, which are termed lines of intrenchment, for its defence; but a few redoubts and breastworks, thrown up here and there, are deemed sufficient for the protection of any weak part of the position that may be easily approached and assailed by the enemy's forces. Circumstances, however, may occur, under which an army is compelled to remain entirely on the defensive, when continuous lines of intrenchment, or a series of redoubts skilfully disposed, must, of necessity, be thrown up for its protection. All fieldworks of this kind consist of a parapet of earth about seven or eight feet high, with a banquette behind it and a ditch in front of it; the earth which is taken out of the ditch being used in making the parapet. This part of the work should be three or four feet thick at least, if required for a protection against musketry only; but if it is intended to withstand a fire from field-pieces, it should be twelve feet in thickness. The inner and outer slopes of the parapet should be revetted with turf, and a row of palisades or sharpened stakes should be fixed at the foot of the counterscarp. The outline of the work depends entirely on the nature of the ground along which the intrenchments are to be thrown up. The best form for a continuous breastwork of great length in an open country is that of a series of redans, each formed by two faces, about 150 feet in length, meeting in a salient angle of 60°, the extremities of the adjacent faces of each pair of redans being connected by a curtain extending about thrice their length on two faces, which meet in a point a little in advance of the straight line along which the curtain would otherwise be constructed, forming an angle of 135° or 140°. When the lines of intrenchment run along the side of a river or road, and it is consequently impossible to construct them after the manner just described; from want of room to throw out the salient angles of

the redans so many feet in advance of the curtains that connect them, a breastwork, resembling a set of steps in form, and consisting of a long face and a short face successively, inclined to each other in salient and re-entering angles of 100°, may be thrown up. Care must be taken to dispose the lines of direction of the faces of the works in either case in such a manner that it may be difficult for the enemy to obtain positions from which they could enfilade them with artillery. In the form of intrenchment first described, the entrances should be in the centre of the curtains, and in the zig-zag lines of breastwork they should be formed in the re-entering angles. Detached works, constructed on the elevations that can be secured about the position occupied by an army, are considered better for its defence, provided that they are not at too great a distance from each other, than a continuous line of parapet; as the troops are able to issue readily from them to form an extensive front for offensive operations against the enemy, and to retreat with equal facility and safety, if compelled to do so; while it is a matter of great difficulty to do either when the only means of ingress and egress are afforded by the narrow entrances in the curtains connecting the redans or the re-entering angles of the zigzag line of parapet, on which the fire of the enemy would be immediately concentrated. In addition to this, if the enemy penetrate a continuous line of intrenchments at any point, the whole line is at once turned; but they cannot advance between detached redoubts without being exposed to a galling and destructive cross-fire from them.

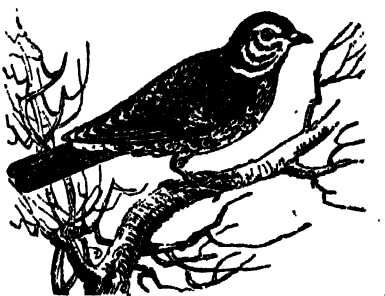
LING, *ling* (Du. *leng*), (*Lota molva*), a well-known and valuable fish, belonging to the family of the *Gadidæ* (Codfish family). In addition to the generic characters of the *Gadidæ*, which will be found given under article HAKE, it possesses the following especial one; namely, that it has a chin with one or two barbules upon it. The body of the ling is a little more elongated than the hake, being usually from three to four feet long. The back and sides are of a grey colour, somewhat inclining to olive, although occasionally cinereous; the under portion of the body silvery; ventrals white; dorsal and anal fins edged with white; and, lastly, the caudal, marked near the end with a transverse black bar, the extreme tip, like the other fins, being white. The ling is naturally an inhabitant of the northern seas, like the rest of its family. Great quantities of them are taken round the Western Islands, in the Orkneys, and on the Yorkshire and Cornish coasts. The mode of fishing for ling is by means of hand-lines and long lines; and besides a portion that is consumed fresh, the fish are split from head to tail, cleaned, salted in brine, washed, and dried. The demand, however, often falls short of the quantity cured; and thus the fishermen are poorly requited for their toil and outlay. The ports of Spain are the markets generally supplied; and so important an article of commerce was it considered, that an act for regulating the price of ling, cod, hake, &c., was passed. The air-bladders of the ling are, like those of the cod, prepared separately, and are sold under the name of sounds. When in season, the liver abounds with a fine oil. In 1854 it was calculated that the take in Scotland of cod and ling amounted to 3,523,269 fish, of which 1,395,099 were from the Shetland Islands. Of these, 109,634 cwt. were cured and dried, and 6,166 barrels were cured in pickle; whilst 58,042 cwt. were disposed of fresh; making a total of 167,726 cwt., cured or fresh; of which large quantity 19,577 cwt. were exported. Mr. Yarrell observes of it, "In Zetland, the principal fishing for ling is from May to August. On the Yorkshire coast, the young are called drizzles. In Cornwall, they are caught in January and February, and their favourite haunts are about the margins of the rocky valleys of the ocean. The ling is exceedingly prolific, and of most voracious appetite, feeding on young fish, not sparing anything that has life, and the prey is swallowed whole; so that no great art is required to catch it. It is tenacious of life, and survives great injury." (*See* FISHERIES and HAKE.)

LING, the name given by the Chinese to the plant termed *Trapa bicornis*, which produces edible seeds, said to be very delicious.

LINIMENT, *lin'-e-ment* (Lat. *lino*, I anoint), in Med., is an oily substance of a consistence intermediate between an ointment and oil, but so thin as to drop. The term is also applied to a spirituous or other stimulating application for external use.

LINNÆAN SYSTEM, *lin-nē'-an*, in Bot., the order or methodical arrangement of plants adopted by Linnæus, the Swedish naturalist, early in the 18th century. This system had the most surprising success, on account of its extreme simplicity, and the singular facility which it affords for attaining a knowledge of the names of plants. Up to that time each species was named by a characteristic phrase, in which the distinctive characters were frequently not included. These phrases were so long, that it was very difficult to retain any number of them in the mind. By the Linnæan system, a proper or generic name was given to each group or genus; and each species of these genera was designated by a specific name added to the generic. By this ingenious contrivance, the study of botany, then very extensive, was quickly simplified. (*See* BOTANY, and LINNÆUS, in vol. 1. of this work.)

LINNET, *lin'-net* (Fr. *linot*, Sax. *linetwege*), a bird belonging to the fam. *Fringillidæ*, ord. *Insessores*, division *Corrirostres*. Its characteristics have been described under the article FRINGILLIDÆ, and therefore they need not be here alluded to. The common linnet (*Linota cannabina*) is well known in England, where it is sometimes also called the brown linnet, or rose linnet. The male of this bird, in summer, has the beak of a bluish lead-colour, the irides hazel; the feathers of the fore part and top of the head greyish brown at the base, but vermilion-red at the top; round the eye, the ear-coverts, and back of the neck, greyish brown; the whole of the back, wings, and upper tail-coverts, uniformly of a rich chestnut-brown; the quill-



LINNET.

feathers are nearly black, with narrow outer margins of white; tail-feathers black, with narrow outer edges, and broad inner ones of white; the chin and throat are coloured with a mixture of brown and grey; the breast is vermilion-red, with a few pale brown feathers intermixed; the flanks and remainder of the bird are in general brown, including the legs, toes, and claws. In winter and autumn the linnet has no red colour on the head or breast, and the plumage is altogether of a more dusky hue than in summer. The female bird is a little smaller than the male, and the colour of the plumage is much lighter also. The *Mountain Linnet* is distinguished from the common linnet by the greater length of its tail, which gives the bird a more elongated and slender appearance. It is also still further distinguished by the colour of the feathers on its head, which are of a tawny reddish colour, in lieu of the vermilion-red of the common type. This bird is a winter visitor to the southern parts of England; but it often breeds both in the north of England and Scotland. Mr. Macgillivray observes of it, in a quotation extracted from Mr. Yarrell's "British Birds," that the mountain linnet "is plentiful in the Hebrides, and in winter frequents the corn-yards in large flocks, clinging to the stacks of oats and picking out their seeds. Its flight is rapid and undulated, and it flies in circles over the fields previous to alighting, uttering a short twitter at intervals. In spring it forsakes its winter haunts and disperses over the hilly tracts, where it forms its nest

on the ground, amongst short heath, or on the grassy slopes of craggy spots. The nest is neatly constructed, being composed externally of fine dry grass, fragments of heath, and a little moss; internally of fibrous roots, wool, and hair. The eggs are bluish-white, marked towards the larger end with light brown and purplish red, sometimes with a few blackish dots." (*See* also article FRINGILLIDÆ.)

LINSEED. (*See* LINUM.)

LINSEY-WOOLSEY, *lin'-zy wool'-zy* (Ang.-Sax., from linen and wool), a coarse kind of flannel cloth, the woof of which only is made of wool, the warp being made of thread. It is usually employed to make clothing for those who are entirely dependent upon public charity.

LINT, *lint* (Sax. *linet*, from *linum*, flax), a term applied to old white linen cloth, scraped by hand or machinery, so as to render it soft and woolly. It is used for dressing wounds, ulcers, &c., either alone, or smeared with some suitable ointment or cerate.

LINTEL, *lin'-tel* (Fr. *linteau*), in Arch., the head of a doorway or window, which is generally formed by a cambered arch of brick or masonry, or a stout beam of timber resting horizontally on the vertical jambs or sides of the aperture, to support the weight of that part of the wall which is built immediately above it.

LINUM, *li'-num* (Lat.), in Bot., the most important genus of the nat. ord. *Linaceæ*. The liber-fibres of *L. usitatissimum*, when prepared in a certain way, constitute *flax*, of which linen fabrics are made. Linen, when scraped, forms *lint*, which is so much used for surgical dressings. The short fibres of flax which are separated in the course of its preparation constitute *tow*. The seeds of the flax-plant are called *linseed*. The seed-coat contains much mucilage, and the nucleus of the seed oil. The oil may be readily obtained from the seeds by expression; the amount depends on the method adopted, and varies from 18 to 27 per cent. *Linseed-oil* is especially remarkable for drying rapidly when applied to the surface of any body exposed to the air, and thus forming a hard transparent varnish. This property of drying quickly is much developed by previously boiling the oil, either alone or with some preparation of lead. The cake left after the expression of the oil is known as *oil-cake*, and is much used as food for cattle. When powdered, it is commonly sold as *linseed-meal*, which is much used for making poultices and for other purposes. The linseed meal, however, as directed to be used in the London Pharmacopœia, is merely linseed powdered; hence it contains the oil, which is not present in ordinary meal.

LION, *li'-on* (Fr., from Lat. *leo*, *leonis*).—This animal, erroneously described by the ancients as the king of beasts, belongs to the family of the *Felidæ*, a genus of the class *Mammalia*, order *Fera* (rapacious beast), of which family the lion is the type. The dental formula of the lion may be thus scientifically expressed:—

$$\text{Incisors } \frac{6}{6}, \text{ canines } \frac{1-1}{1-1}, \text{ molars } \frac{4-4}{3-3}; \text{ total } 30.$$

When called into action, these teeth act like the antagonistic blades of a pair of scissors upon the substance submitted to their cutting edges. The canine teeth are very long and large. The feet of the lion, like the rest of the cat family, exhibit one of the most beautiful conformations of nature. In walking, only the soft parts touch the ground; and hence their tread is noiseless. The lion thus glides along with a stealthy pace until it crouches within proper distance, when it springs with fearful velocity and force upon its unsuspecting prey. Another adjunct of terror with regard to this animal is the fearful roar which it emits at the moment it pounces on its prey; its unhappy victim being deadened, as it were, with fright at the same moment as it feels its enemy's talons and murderous teeth. The other generic characteristics of the animal will be found given under the article FELIDÆ. Formerly only one species of the lion was admitted by zoologists; but of late, as discovery has opened fresh fields for investigation, it would appear that there are several degrees and varieties of this animal. At one time they must have been, from the frequent allusions made to them in Scripture, tolerably abundant in Syria, Palestine, and Egypt; but at the present day they have totally disappeared from those countries. Of all the different varieties which have been observed by naturalists, the African lion (*Leo africanus*) is by far the finest, most powerful, and the most ferocious. Of this there are three different specimens, which may be thus enumerated,—the Barbary lion, from Barbary and North Africa; the Senegal lion, from Senegal and the west of Africa; and, lastly, the Cape lion, from South Africa and the Cape of Good Hope. The general prey of the African lion consists of the larger herbivorous quadrupeds; and there are few of these which it is unable to master. When aroused, lions retreat slowly; and if no cover is near, when they have got to a sufficient distance, they bound away at a prodigious rate. They seldom, if ever, invite conflict with men, always trying to retreat; but when they are shot at, and are wounded, they then turn on their pursuer with fearful ferocity. The following recital, which is taken from a work entitled "Zoological Anecdotes," refers to Mr. Cuming's work on hunting in South Africa, and furnishes a tolerably characteristic sketch of the habits of the lion:—"Mr. Cuming had shot three rhinoceroses near a fountain, and soon after twilight had died away, he came down to the water to watch for lions. With him was his Hottentot, Klinboy, 'On reaching the water, I looked towards the carcass of the rhinoceros, and, to my astonishment, I beheld the ground alive with large creatures, as though a troop of zebras were approaching the water to drink. Klinboy remarked to me that a troop of zebras were standing on the height. I answered, 'Yes;' but I knew very well that zebras would not be capering around the carcass of a rhinoceros. I quickly arranged my blankets, pillow, and guns in the hole, and then lay down to feast my eyes on the interesting sight before me. It was bright moonlight, as clear as I need wish. There were six large lions, about twelve or fifteen hyænas, and from twenty to thirty jackals, feasting on and around the carcasses of the three rhinoceroses. The lions feasted peaceably, but the hyænas and jackals fought over every mouthful, and chased one another round and round the carcasses, growling, laughing, screeching, chattering, and howling, without any intermission. The hyænas did not seem afraid of the lions, although they always gave way before them; for I observed that they followed them in the most disrespectful manner, and stood laughing, one or two on either side, when any lions came after their comrades to examine pieces of skin and bone which they were dragging away." The following account of an attack by one of these man-eaters, as they are termed (for, having once tasted human flesh, they will eat nothing else if it can be obtained), makes the blood run cold. Mr. Cuming and his party had, unknown to them, pitched their camp in the proximity of a lion of this description. All had retired to rest, when (says Mr. Cuming) "suddenly the appalling and murderous voice of an angry and bloodthirsty lion burst upon my ears within a few yards of us, followed by shrieking of the Hottentots. Again and again the murderous roar of attack was repeated. We heard John and Ruyter shriek 'The lion, the lion!' still, for a few moments, we thought he was but chasing one of the dogs round the kraal; but the next instant John Stofulus rushed into the midst of us, almost speechless with fear and terror, his eyes bursting from their sockets, and shrieked out, 'The lion! the lion! He has got Hendrick! He dragged him away from the fire beside me! I struck him with the burning brands upon his head; but he wouldn't let go his hold. Hendrick is dead! O God! Hendrick is dead! Let us take fire and seek him.' The rest of my people rushed about shrieking and yelling as if they were mad. I was at once angry with them for their folly, and told them that if they did not stand still and keep quiet, the lion would have another of us, and that very likely there was a troop of them. I ordered the dogs, which were nearly all fast, to be made loose, and the fire to be increased as far as could be. I then shouted Hendrick's name; but all was still. I told my men that Hendrick was dead, and that a regiment of soldiers could not now help him; and hunting my dogs forward, I had everything brought within my cattle kraal, when we lighted our fires and closed the entrance as well as we could. It appeared that when the unfortunate Hendrick rose to drive in the ox, the lion had watched him to his fireside, and he had scarcely

lain down when the brute sprang upon him and Rayter (for both lay under one blanket) with his appalling murderous roar, and roaring as he lay, grappled him with his fearful claws, and kept biting him on the breast and shoulder, all the while feeling for his neck; having got hold of which, he at once dragged him away backwards round the bush into the dense shade. As the lion lay on the unfortunate man, he faintly cried, 'Help me! help me! O God! men, help me!' After which the fearful beast got hold of his neck, and then all was still, except that his comrades heard the bones of his neck cracking between the teeth of the lion." Many more anecdotes of a similar nature will be found in Mr. Greenwood's interesting work, "Wild Sports of the New World." The colour of the African lion is generally a tawny yellow, like the general class *Leo*; the only exception being the Cape lion, which is of a more brownish colour. Of Asiatic lions there are three varieties,—the Bengal, the Persian, and the maneless lion of Guzerat. The first of these is smaller in size, with a less expansive mane, and it is usually of a lighter colour than the African. It also does not possess the same degree of courage which distinguishes the latter. The Persian lion is characterized by the pale yellow colour of its fur. The maneless lion of Guzerat (*Leo gujratensis*) is distinguished from the other species of lions by its being nearly destitute of that appendage, the mane, which is such a striking feature of the African and Bengal lions. This variety is found in Guzerat, along the banks of the river Sombermuttee, near Ahmedabad, extending through a large tract of country about forty miles in length. A very excellent sketch of this animal, which we are unable to insert, will be found in the "Transactions of the Zoological Society" for the year 1833. The lion has been hailed by the title of "king of beasts," and "monarch of the forests," and has been considered as the emblem of majesty and might. It is the symbol of the British nation, and is borne on the royal arms. But all the poetic imagery with which it has been surrounded is altogether unlike its real nature, which is characterized by its overwhelming its prey merely by surprise in attack, and its running away, generally, at the slightest display of resistance from man,—sometimes even the sight of man is sufficient to cause the "king of beasts" to take to degrading flight. (*See*, also, articles FELIDÆ and MAMMALIA.)—*Ref.* Baird's *Encyclopædia of the Natural Sciences*; Owen's *Natural History*.

LION and UNICORN.—These heraldic supporters of the royal arms of England were first adopted on the accession of James I., A.D. 1603. The lion was previously the supporter of the English, and the unicorn the supporter of the Scottish shield.

LIP, *lip* (SAX. *lippa*, Lat. *labium*), in Anat., constitutes the outer edge or border of the mouth. The lips are formed by muscular fibres, glands, and cellular tissue, covered by mucous membrane. They owe their extremely red colour to the thinness of the covering membrane, and their sensitiveness to an abundant supply of minute nervous fibres. They are not unfrequently affected with cancer. (*See* CANCER.) The lips form part of the organs of speech, and are necessary to the pronunciation of certain letters, which are hence called labials or lip letters.

LIPIC ACID, *li'-pik*, in Chem., one of four fixed fatty acids remaining in the retort when oleic acid is distilled with nitric acid.

LIPOGRAMMATIC, *lip-o-grăm-mat'-ik* (Gr. *leipo*, I omit, and *gramma*, a letter), in Lit., is a term applied to certain compositions in which particular letters are invariably left out. Thus, Tryphiodorus is reported by Hesychius to have written an Odyssey in which there was no *a* in the first book, no *b* in the second, and so on. Lope de Vega wrote a novel without using the letters *l* and *a*; and G. W. Burmann wrote a poem in German without the letter *r*. The production of such works is laborious trifling; it serves no purpose, and the selection of particular words must seriously interfere with the natural course of the poem or narrative.

LIPOMA, *li-po'-mă* (Gr. *lipos*, fat), in Surg., is a soft indolent tumour, arising from a luxuriancy of fat in the cellular membrane.

LIPPITUDO, *lip-pe-tu'-do* (Lat. *lippus*, blear-eyed), is a chronic inflammatory disease of the eyes, commonly called bleared-eyes. It consists in the exudation of a puriform humour from the margins of the eyelids, which often causes them to stick together during the night. (*See* OPHTHALMIA.)

LIPYL, OXIDE OF, *lip'-sil*, in Chem., $C_6H_5O$, a hypothetical body, supposed by Berzelius to form the base of oils and fats, and to unite with two equivalents of water to form glycerine at the moment of decomposition.

LIQUEFACTION, *lik-we-fak'-shun* (Lat. *liquefactio*), the act or operation of melting or dissolving, or the conversion of a solid into a liquid by the agency of heat. When heat is applied in sufficient quantity to any solid body, it changes its form and becomes liquid. In the case of ice, this change is called liquefaction; but in the case of the metals it is more frequently called fusion. Under the combined influence of pressure and cold, nearly all the gases have been liquefied. Bodies require very various degrees of temperature for liquefaction. Mercury, for example, fuses at 39° below zero; while wrought iron requires a temperature as high as 3280°. (*See* FUSING-POINTS.)

LIQUEUR, *lik'-yure* (Fr.), a palatable spirituous cordial composed of water, alcohol, sugar, and some aromatic infusion extracted from fruits, seeds, &c. Different liqueurs vary according to the proportions of sugar and alcohol contained in them. Amongst the French they are divided into three classes. First, the *ratafias*, or simple liqueurs, in which the sugar, the alcohol, and the aromatic substance are in small quantities. Amongst these are anise-water, noyau, and the apricot, cherry, and other ratafias. The second division consists of the oils, or fine liqueurs, with more saccharine and spirituous matter; as the anisette, curaçoa, &c. The third are the creams, or superfine liqueurs, such as rosoglio, maraschino, Dantzic water, &c. In some cases, the same aromatic infusion may give its name to two different liqueurs, according to the proportion of their constituent materials; as *eau de noyau* and *crême de noyau*.

LIQUID, *lik'-wid* (Lat. *liquo*, I melt), a fluid; a material substance the particles of which have a perfect freedom of motion, without any sensible tendency to approach to or recede from one another, except by the action of some external power. Liquidity, as a condition of matter, is therefore comprehended in the condition of fluidity. (*See* FLUID.) The particles of a liquid are held together with considerable force, notwithstanding their freedom of motion; since a small quantity of a liquid has a tendency to take a spherical form when at a distance from any substance for which its particles have greater affinity than for one another. This is particularly apparent in mercury, oil, and water. The first of these, upon being allowed to drop on a table, separates itself into globules; and the two others take a similar form when a small quantity of either is suspended from the extremity of a pointed object. The form of the dewdrop is also another familiar instance.

LIQUIDAMBAR, *lik'-wid-ăm-bar*, in Bot., a gen. of balsamiferous trees, constituting the nat. ord. *Altingiaceæ*, or *Balsamiflueæ*. There are three species, which are natives of the warmer parts of India, North America, and the Levant. *L. orientale* yields the *liquid storax* of the shops: this is obtained from the inner bark, which is afterwards used by the Turks for the purpose of fumigation, and is the *cortex thymiamatis* or *storax bark* of pharmacologists. In Cyprus the tree is called *xy'on effendi* (the wood of our Lord). *L. styraciflua*, an American tree, yields by incision a fluid balsamic juice, called *liquidambar*, or *copaiba balsam*. *L. altingia*, a native of Java, yields a similar fragrant balsam. In their effects and uses, these products resemble the balsams of Peru and Tolu, benzoin, &c.

LIQUIDS, *lik'-wids* (Lat. *liqueo*, I flow), in Gram., is a term applied to the four letters *l*, *m*, *n*, *r*, from their readily uniting with other consonants, and flowing, as it were, into their sounds. They are also called semi-vowels.

LIQUORICE. (*See* GLYCYRRHIZA.)

LIST, *list* (Ang.-SAX.), is used to signify the inclosed field or piece of ground wherein the ancient knights held the jousts and tournaments. It was so called from being surrounded with pales, barriers, or stakes, as with a list or border, like a piece of cloth. Some of

these were double, one for each cavalier, separating them from each other, so that they could not approach within a spear's length. Hence, to enter the lists is used figuratively to denote engaging in a contest.

LIST, CIVIL.—(*See* CIVIL LIST.)

LIT DE JUSTICE. (*See* BED OF JUSTICE.)

LITANY, *lit'-a-ne* (Gr. *litaneia*, supplication), signifies a general supplication for the removal of any calamity by which a church, community, people, or nation, may be afflicted. As to the form in which litanies are made,—namely, in short petitions by the priest, with responses by the people, St. Chrysostom derives the custom from the primitive ages, when the priest began and uttered by the spirit some things fit to be prayed for, and the people joined in the intercessions, saying, "We beseech thee to hear us, good Lord." Several of these forms were afterwards written down, and were the original of our present litanies. About A.D. 400, litanies began to be used in processions, the people walking barefoot, and repeating them with great devotion. At first the use of litanies was not fixed to any stated time; they were employed only as exigencies required. The council of Orleans, A.D. 511, expressly recognizes litanies as peculiarly solemn supplications, and enjoins their use preparatory to the celebration of a high festival. In the Spanish church, in like manner, they were observed in the week after Pentecost. Other countries subsequently appointed them at a variety of other seasons, till, in the seventeenth council of Toledo, A.D. 694, it was decreed that they should be used once in each month. By degrees they were extended to two days in the week; and Wednesday and Friday, being the ancient stationary days, were set apart for that purpose. These days are appointed by the fifteenth canon of our church for using the litany, to which, by the rubric, Sunday is added, as being the day of the greatest assembly for divine service. About A.D. 600, Gregory the Great, from all the litanies extant, composed the famous Seven-fold Litany (*Litania septiformis*), by which Rome is said to have been delivered from a grievous pestilence. This has been the model followed by all the Western churches since that time, and ours comes nearer to it than that in the present Roman missal, wherein later popes had put invocations of saints and such-like, which our reformers justly expunged. The Church of England litany, however, is not an exact transcript of any ancient form, though composed of materials of very ancient date. Before the last review of the common prayer, the litany formed a distinct service by itself, not used at the time of the other services; but it has since been united with the morning prayer, though still retaining its separate place in the Prayer-book. The litany is usually considered as embracing four main divisions; viz., invocations, deprecations, intercessions, and supplications.

LITCHI. (*See* NEPHELIUM.)

LITERARY PROPERTY. (*See* COPYRIGHT.)

LITERATI, *lit'-e-ra'-te* (Lat. *litera*, a letter), denotes, in general, learned men, or men of letters. In China, it is applied to all such as are able to read and write their own language; and is also the name of a particular sect, composed principally of the most learned men of that country, and called the *jukias*, or learned. The literati alone are capable of being made mandarins.

LITERATURE, *lit'-e-ra-ture* (Lat. *litera*, a letter), in its widest signification, denotes the whole of what has been written. This is the meaning which the word usually bears on the continent; but with us it is generally restricted to what may be termed elegant literature, or *belles-lettres*, to the exclusion of works of positive science and mere erudition. Taken in its widest signification, it is usual to divide it into several distinct parts, according to periods or countries, or its different kinds. Thus we have the literature of the ancient world, of the middle ages, and of modern times; the literature of Greece, Rome, &c.; prose literature, poetical literature; and so on. Under the names of the different countries will be found an account of their literature. The history of literature is a subject of vast extent and importance, and demanding for its execution a union of some of the highest faculties. It demands an extensive and minute acquaintance with books on the greatest variety of subjects; a power of critically discerning their various merits; a knowledge of their different authors; and a power of tracing the dependence or bearing of one work upon another. To literature, "in the most especial manner, belongs poetry, and, next in degree, narrative and descriptive history; then reasoning and pure speculation, in so far as they influence the actions of human life; finally, wit and eloquence, provided they do not evaporate in the fleeting breath of words, but display themselves in the enduring form of written productions."—(*Schlegel.*) The main object of literary history is to show the general progress and phases of intellectual development, and of æsthetic and moral culture. Political history deals chiefly with events, literary history with thought; each merges into the other, and they are necessarily connected in any complete narrative. "If we contemplate the tree of collective knowledge and art, with its branches ramifying through all ages and tongues, through all gradations of mental culture, we find that it may be traced more particularly to ten nations. Our eye is first captivated by the flowery fields of Greek literature and art, the conspicuous beginning of all mental culture. On examining it more closely, we are carried back into oriental regions, where the stupendous monuments of Hindostan, the gigantic ruins of which stand forth as the relics of a former world, meet our wondering gaze on the firmest rock of this primordial world. Moses laid the foundations of the temple of Hebrew prophecy, the glory of which irradiated the olden poetic and sacred tradition of Persia with a kindred refulgence as far as it can be discerned amid the impure admixtures of Arab creed. Both elements of mental culture, Greek and Oriental, after passing through the earnest Roman world, flow into Christian ages, in which a new living stem of noble intellect, grafted on the old northern stock, has shot forth with great vigour among the four most cultivated nations of the west,—the Italians, French, Spaniards, and English—in poetry and criticism, in arts of every kind, and in philosophy, both true and false. The German mind forms the connecting bond of this intellectual development of the four great Romanic nations; inasmuch as it has been the cause and mainstay of the great intellectual burst throughout Europe. "The spiritual culture of those four nations rests on what we have already more than once characterized as the four elementary powers of common objective perception; accordingly, we see in the Italians imagination and a love of art; in the French, reason and oratory; in the English, keen perception and historic powers; and in the Spaniards, intense nationality and poetical feeling. But the German mind explores the more profound hidden springs of the inner life, where those elementary forces no longer appear disunited, but the entire power of living consciousness, both in thought and art, proceeds from one common root."—(Schlegel's *History of Literature.*) From the difficulty of the undertaking, it is not to be wondered at that works on general literature are so rare. Even to take up the literature of a particular people, or time, or science, is a labour that few are equal to; but some excellent works on these departments exist, and those on the literature of the different countries are referred to in these articles. The classical and mediæval writers have rendered scarcely any service to this department, except by leaving materials. The classics contain only scattered and detached materials for a literary history, partly in biographies of poets, philosophers, orators, &c.; partly in criticisms and extracts from their writings. The nearest approach to a history of literature among the ancients occurs in a single chapter of Quintilian (B. x. c. i.), in which he passes rapidly over the names and characters of the poets, orators, and historians of Greece and Rome. Paterculus, also, in a remarkable passage, shows from historical instances how great men are found to cluster together at particular times and in particular places. The father of literary history is the celebrated Conrad Gesner, whose work "Bibliotheca Universalis" (1545-55) contains vast stores of knowledge on the subject of authors and their writings, arranged, however, not in chronological, but in alphabetical order. An Italian Jesuit, Possevin, made a somewhat nearer approach to a work of this kind in his "Bibliotheca Selecta," published at Rome in 1593. Still, notwithstanding

these works, Bacon might with justice deny that, up to his time, any real history of letters had been written; and he compares the world lacking this to a statue of Polyphemus deprived of his single eye. He gives the outlines of a scheme which should contain "the antiquities and originals of knowledges, and their sects, their inventions, their traditions, their divers administrations and managings, their flourishings, their oppositions, decays, depressions, oblivions, removes, with the causes and occasions of them, and all other events concerning learning throughout the ages of the world." Such a history, he says, would "make learned men wise in the use and administration of learning." No one has presumed to fill up the outline which Bacon himself could but sketch. The "Prodromus Historiæ Literariæ" of Peter Lambeck, which was published at Hamburg in 1659, was an attempt to frame a universal history of letters; but he was unable to carry it farther than the times of Moses and Cadmus. In 1688, Daniel Morhof, professor at Kiel, in Holstein, published his well-known "Polyhistor," a work of great erudition and judgment, and which in the next age received considerable additions at the hands of Fabricius. "In his review of books," says Hallam, "in every province of literature, Morhof adopts a sufficiently chronological order; his judgments are short, but usually judicious; his erudition so copious that later writers have freely borrowed from the 'Polyhistor,' and in many parts added little to its enumeration." But he was more conversant with writers in Latin than the modern languages; and in particular shows a scanty acquaintance with English literature. Another century elapsed before another great work of this kind appeared. The "Origine, Progressa, e Stato attuale d' ogni Letteratura" of Andrés, a Spanish Jesuit, was published at Parma (1782-99), in five vols. 4to. It is an extraordinary performance, embracing both ancient and modern literature in its full extent. His learning is very extensive, but not, generally speaking, profound, and his style is rather diffuse and indefinite; but his taste is correct, and his general views not injudicious. The work of J. G. Eichhorn,—"Geschichte der Literatur vom ihrem Anfange bis auf die neuesten Zeiten" (1805-11) (2nd edition, 12 vols., Göttingen, 1818), is more methodical and specific than any that had preceded it, but shows a less thorough acquaintance with science and the modern languages than with Oriental and theological literature. Of subsequent general literary histories the most important are Wachler's "Handbuch der Geschichte der Literatur" (3rd edition, 4 vols., 1833), and Grasse's "Handbuch der allgemeinen Literaturgeschichte" (1837-55). The first great work on the literary history of any particular country is that of Tiraboschi, of Italy. It appeared in 1772-82, in twelve volumes, 4to., and comes down to the close of the 17th century. "In full and clear exposition, in minute and exact investigation of facts, Tiraboschi has few superiors; and such is his good sense in criticism, that we must regret the sparing use he has made of it."—(*Hallam.*) A writer, inferior in reputation, but who devotes more attention to the analyzing of works than Tiraboschi, is Corniani, whose "Secoli della Letteratura Italiana dopo il suo Risorgimento" was published in nine volumes (1804-13). The French author Ginguéné has also written a history of Italian literature (1811-19). Sismondi's "History of the Literature of Southern Europe" is a pleasing and popular work, yet by no means superficial or unsatisfactory. There is no esteemed complete history either of French or English literature. The colossal literary history of France, undertaken by the Benedictines in 1733, is still unfinished. In 1837, Demogeot published a brilliant summary in one volume. Warton's "History of English Poetry," extending only to the reign of Elizabeth, has remained a favourite work. Hallam's "Introduction to the Literature of Europe in the 15th, 16th, and 17th Centuries" is a work hardly surpassed, in respect of learning and philosophical criticism, by any literary history. In Germany, Bruckner, Tennemann, Buhle, and others, have written histories of philosophy. Vilmar is the principal general historian of German literature; Bouterwek, of modern poetry and eloquence (1801-19); Wilhelm von Schlegel, of dramatic literature (1809-11); and Ferdinand Wolf, of Spanish and Portuguese literature (1859). The most authoritative history of Spanish literature is that by George Ticknor, 3 vols. (1849). The love of literature is one of the most marked characteristics of an advanced civilisation, and it exercises an important influence on practical life, on the destiny of nations, and on the progress of ages. As civilisation becomes diffused, the literature of a country comes more and more into sympathy with ordinary life. Nor does literature lose anything by being thus brought into contact with common life; for those works are ever the best and most useful which speak to the feelings and sympathies of the great mass of the people. Too frequently, and too long, have literature and life been completely alienated from each other, like two distinct worlds, having no interests, no sympathies in common, to the great injury of both. Literature has been despised in the eyes of the world, and the world has been too much overlooked by men of letters. "The isolation of the learned, as a distinctive body," says Fred. Schlegel, "from the great mass of the people, is the most formidable obstacle in the way of national civilization. The various innate inclinations, nay, the very conditions and circumstances of men, should, to a certain extent, co-operate, if the productions of the mind are to be perfected or appreciated." "The products of the mind cannot really be said to have any other fertile soil in which to take root than those sentiments common to all noble-minded and God-seeking men, and with these the genuine patriotism and national reminiscences of a people, whose accents they breathe and whose welfare they are intended to promote." "It is curious among ourselves to trace the decline of the favourite amusements of our ancestors. The theatres are almost deserted by the ranks which used to frequent them. The public assembly-rooms of the rich, the suburban places of resort for nightly entertainments, once so common among the middle classes, are alike falling into comparative disuse. Of the increased infrequency of play, or even games of skill in society, every-one can judge. Of wine, the consumption has certainly not increased one half in a century, while the number of consumers has probably been quintupled or sextupled. All these things afforded a certain quantity of occupation, and the substitute for one and all has been the same,—*literature*."—(Brande's *Dictionary*.) One effect of this great spread of literature in the present day is to be regretted. The great demand upon the powers of distinguished men of letters, and the temptation to satisfy the cravings of the public, lead to the production of works not thoroughly matured; and hence there is in the literature of the present day a lamentable amount of loose thinking and careless writing; nor is there that proportion of works of an enduring nature that might be expected. The remarks that have been levelled at literature, as a profession, are no longer applicable to it. In this, as in any other walk of life, talent, industry, and perseverance will invariably command success.

LITHARGE. (*See* LEAD, OXIDES OF.)

LITHIASIS, *lith-ĭ-ă-sis* (*Gr. lithos*, a stone), in Med., is the disease of stone in the bladder or kidney (see CALCULUS). Also a disease of the eyelids, in which their margins are beset with small hard tumours.

LITHIUM, *lith'-e-um*, in Chem.,—symbol Li, equiv. 6·5, spec. grav. 0·59,—one of the alkaline group of metals, of which potassium, sodium, cæsium, and rubidium, are the other members. It closely resembles these metals in most of its properties, forming its alkali by its union with oxygen, decomposing water at ordinary temperatures, and having so low a specific gravity that it will float in the lightest known fluid. It is found in nature, in available quantities, in triphyline, petalite, and lepidolite; and from the experiments of Messrs. Bunsen and Kirchoff, it appears to be very widely distributed in minute quantities in mineral springs, soils, and the ashes of plants. The oxide lithia, LiO, forms a hydrate like soda, ash and soda. It differs from them by being less soluble in water, by not deliquescing in air, and by acting on platinum at a high temperature. The salts of lithia are colourless. The *nitrate* is very soluble and deliquescent; the sulphate is soluble and forms fine crystals; the carbonate is sparingly soluble, giving an alkaline reaction. The chloride of lithium crystallizes

in cubes, and is very deliquescent and soluble in alcohol; therein differing from the chlorides of potassium and sodium. The salts of lithia, when exposed on platinum wire to the inner blowpipe flame, colour the outer flame a brilliant red. It will be seen from the above brief description, that lithia forms the connecting link between the alkalies and the alkaline earths. Lithia, and its salts, have remained without any practical value from the time of their discovery, in 1817, by Arfwedson, until a few years since, when Dr. Garrod introduced its use in cases of gout and stone. Its action on the uric concretions is much more rapid than that of the salts of potassium and sodium. It is generally exhibited in the form of aërated carbonate or effervescing citrate. Its name is derived from *lithos*, a stone, it having been found in the mineral kingdom only.

LITHOGRAPHY, *li-thog'-rā-fe* (Gr. *lithos*, a stone, and *graphein*, to write), an important branch of the art of printing, by which impressions can be taken from drawings or writing of any description, executed on stone with compositions of a greasy nature, termed lithographic chalk and lithographic ink. The process is a chemical one, based entirely on the antipathy which exists between water and oil, or grease of any kind, and which prevents them from entering readily into combination. This will be seen from the description of the method by which lithographic printing is effected; and as the impressions are taken from a plain and even surface, which is prepared to receive printers' ink in some parts and to reject it in others, it differs entirely from ordinary printing from movable type and wood-engravings, on the one hand, in which the impression is derived from projecting pieces of the original surface, between which spaces have been cut away by the graver,—and from printing from steel and copper-plates on the other, in which the impression is obtained from hollow lines that are sunk below the surface by the corrosive action of acid and by the etching-needle and graver. The invention of the art is due to a German, Alois Sennefelder, who first practised it about 1795, and introduced it into Germany two or three years after. One of the first to whom he communicated his discovery was a gentleman of Frankfort, named André, who applied it with success to printing music. His son, Mr. P. H. André, introduced the art into this country in 1801. He did not, however, take out a patent for the process, lest it should be discovered by the specification which he would be obliged to make. He brought out a series of lithographic drawings by West, Fuseli, and others; but the art did not obtain any decided success, owing to its capabilities not being sufficiently explained. Although the process was adopted at the War-office for printing rough maps and the plans of battles, it was not practised in England to any extent until about twenty years after its discovery, when it was brought into general use by Mr. Ackermann, an artists' colourman and print publisher of celebrity. Since that time the process has been greatly extended and improved, and is now applied to the production of coloured prints, which can scarcely be distinguished from highly-finished water-colour drawings. The stone on which designs for lithographic printing are drawn is brought principally from Bavaria. It is a kind of calcareous slate, soft and porous, and of a pale grey or yellowish colour. It is dug from the quarries in large blocks, which are sawn or split into layers, varying from one inch to three inches in thickness; but great care is required in the operation, as the stone is of a brittle nature. To render them fit for the artist's use, the surface of the slabs must be made perfectly level and even, and this is done by rubbing or grinding the face of one stone on that of another,—a little fine sand, moistened with water, having been placed between them to facilitate the operation. Stones treated in this manner are said to be grained, a granulation having been produced on the surface which can be made either fine or coarse, as may be required. These are used in the production of prints, in imitation of drawings in chalk and pencil; but for the imitation of writing and etching, in which sharp and well-defined lines are required, and the production of prints in chromo-lithography, the surface of the stone must be rendered as smooth as possible, and polished, by rubbing it with pumice-stone and water. The lithographic chalk and ink which are used in the execution of drawings and writing on the stone, are both made of a mixture of tallow, white wax, soap, and shell-lac, which is coloured by the addition of a little lampblack, to allow the artist to see the effect of his work while the drawing is in progress. A little Venice turpentine is generally added to these ingredients when it is desired to produce lithographic ink, and there is some little difference in the proportions in which they are mixed for each composition respectively. The whole is melted and blended together over a slow fire, and the mixture is then poured into moulds, in which it is allowed to dry and harden for use. The chalk is moulded in the form usually adopted for crayons, and it is used in its dry state; but the ink is rubbed on a palette, like any ordinary water-colour, and applied to the stone by means of a pen or camel-hair pencil. The soap which is used in the above compositions causes them to be soluble in water, and when the design is completed, it must therefore be fixed on the stone. This is done by pouring a weak solution of nitrous acid over it, which has the effect of destroying the soluble nature of the composition by combining with the soap and neutralising its properties, so that the chalk or ink is no longer liable to injury from the application of water to the stone. After this the stone is delivered to the printer, who damps the surface with water rendered slightly acidulous by the addition of a very small quantity of nitrous acid. As the stone is porous, all the parts which are untouched by the greasy ink or chalk imbibe the water readily; but the design remains perfectly dry, on account of the greasy nature of the composition with which it has been executed; since grease and water will not combine. A roller charged with printing-ink is now passed over the stone, and as oil enters largely into the composition of printing-ink, the ink will be absorbed immediately by every part of the design; but it will have no effect whatever on the wetted portions of the stone which are untouched by the chalk or ink, and will pass over them, leaving them perfectly clean and unsoiled. A piece of paper which has been previously damped is then laid on the stone, and an impression of the drawing or writing is obtained in the usual manner by the aid of a printing-press. Another method of preparing a stone for lithographic printing, is to cover the surface with a coating of gum-water coloured with a black or red pigment. The design is then executed with an etching-needle, which scrapes away the coating of coloured gum wherever it is applied, and allows the surface of the stone to appear through it, giving the drawing or etching the appearance of having been executed in white on a black or red ground, as the case may be. Oil is then applied to the stone, which readily imbibes it through the openings made in the ground by the etching-needle. After this the ground is washed off, and impressions are taken from the stone in the manner already described. Drawings executed in black and white on a tinted ground, or in three tints, as it is usually termed, are imitated in lithography by printing two impressions on the same piece of paper from two different stones. From one of these the design, which is drawn upon it with chalk in the usual manner, is obtained, and the tint is produced from the other by means of colouring matter, the parts which are to appear white in the impression having been scraped out before any impressions are taken from the stone. In printing from two or more stones, the printer must take care that the impressions register accurately, or fit exactly together; that is to say, that the imprint of the second and following stones, if more than two be used, as in chromo-lithography, may fall exactly on that part of the surface of the paper on which the imprint of the first has been received. In chromo-lithography (from the Greek *chroma*, colour) the process is similar; but each colour and tint required in the picture is imprinted from a separate stone. In the first place the design is traced on stone, in outline, and from this impressions are taken, which are transferred to other stones, and serve to guide those who are employed in preparing them for the work in hand in placing the various colours in their proper positions, so that the successive imprints may blend and harmonise together, and so produce a picture that is pleasing in its general effect when the

whole have been applied to the paper. Accurate copies of the outline having been transferred to as many stones as may be required, the lights and shadows of the drawing are produced on two of them, in what may be termed washes of sepia and neutral grey, and these form the second and third stones from which imprints are taken. Others are charged in the requisite parts with the primary tints that appear in the drawing and those that are necessary to modify these and blend them together. The sharp, dark, finishing touches, and the final coat, consisting of a sort of glaze or wash which softens and subdues the tints that have been already laid on, are placed on others, and the whole are applied to the paper in succession in the order required. It will be seen that the process is one which demands great nicety in its execution, and that the greatest skill and care are necessary in preparing the stones and insuring perfect accuracy of register, without which the picture produced would be entirely spoilt, as the edge of one colour would lap over and encroach on the space allotted to another, and the work would be blurred in tint and indistinct or ill-defined in outline. Trade circulars, and specimens of MS. and handwriting, which are often given in biographical works, are written in lithographic ink, on what is called transfer-paper, and the writing is afterwards transferred from the paper to the stone. The paper is unsized, but a thin coating of gum, prepared in a particular manner for the purpose, is spread over the side which is intended to be written upon. When the ink is dry, the paper is damped on the reverse side, and laid with the writing downwards on a polished stone. The moisture that has been applied to the back of the paper partially dissolves the gum, and the paper can be removed, leaving the gum and the writing beneath it upon the stone. The next step in the process is to wash away the gum, after which impressions can be taken from the stone in the usual manner. Impressions of maps, charts, armorial bearings for book-plates, and designs of a similar nature, are taken from engravings executed on steel or copper plates in lithographic ink, and transferred to polished stone while the ink is still wet. Maps printed in this manner are but little inferior to those which are printed from the plate itself, and they can be produced at a far cheaper rate, owing to the tediousness of the process of printing from plates compared to that of printing from stone. When the engraving is of small size, several impressions can be ranged side by side, in rows, and taken off at once by a single stroke of the press. When the work is very large, the transfer may be made to a plate of zinc instead of stone, as stones of considerable size are liable to break under the pressure that is brought to bear on them. The transfer is made and impressions are taken from zinc plates in the same way as from stone. On account of the substitution of zinc plates for stone, the term zincography is applied by some to this kind of printing from a plane metal surface. With regard to the preparation of drawings on stone, it should be remarked that stones should be selected that are perfectly free from flaws, and of a sufficient degree of hardness. They should also be free from scratches; and to secure similarity of texture throughout the work, the granulation of the stones should be uniform all over the surface for drawings in imitation of chalk and pencil. While executing the drawing, the artist should be careful to prevent anything whatever from falling on the stone, as many instances have occurred in which a good picture has been injured by allowing fragments of the chalk to fall on the stone while sharpening the crayon, or even specks of saliva; while some have been irretrievably destroyed by the imprint of the thumb or finger incautiously placed on the surface in handling the stone while the hand was warm. Stones that have been already used can be made available a second time by scraping off the original drawing and rubbing down the surface.—Ref. *English Cyclopædia*,—Arts and Sciences; Hullmandel's *Art of Drawing on Stone*.

LITHOMANCY, *lith'-o-man-se* (Gr. *lithos*, a stone, and *manteia*, divination), is a species of divination performed by means of stones. In this way Helen is reported to have foretold the destruction of Troy.

LITHONTRIPTIC, *li-thon-trip'-tik* (Gr. *lithos*, a stone, and *tribo*, I wear away), in Med., was a term used to denote certain medicines which were believed to have the power of dissolving calculi in the bladder. They were chiefly preparations of alkalies, which, by correcting the acid state of the urine, tended to alleviate the pain; but experience has abundantly proved that they possess no power of breaking up or dissolving the stone. The term is now generally applied to such medicines as are useful in counteracting the formation of calculi.

LITHOTOMY, *li-thot'-o-me* (Gr. *lithos*, a stone, and *temno*, I cut), in Surg., is the operation of cutting into the bladder, in order to extract one or more stones or calculi from it. In the article CALCULUS we have already given an account of the nature and formation of these substances; and here we shall notice shortly the operation that is generally had recourse to in order to remove them. It is first of all necessary to ascertain the actual existence of the stone in the bladder, and that it is not encysted, or adherent to any portion of its substance. This is done by introducing a metallic instrument, called a *sound*, through the urethra into the bladder, by which the stone may be felt, and a sound produced by striking it. Several methods have been recommended of extracting the stone; but there are only two of them that can be adopted with any propriety: one of these is called the "high operation," from being performed immediately above the pubes. There are, however, several objections to this mode of operation, and it is now rarely adopted, except for some special reason, as where there is disease of the urethra. The other is called the "lateral operation," on account of the prostate gland and neck of the bladder being cut laterally. In this case the incisions are made in the perinæum, and the neck and lateral part of the bladder laid open, so as to allow of the extraction of the stone: it is to be removed by the finger if possible, and if not, by a forceps. Where large, it is sometimes necessary to crush the stone, and take it away piecemeal; in every instance the cavity of the bladder ought to be examined with the finger, to ascertain that there is no other stone present. Where numerous, they may be removed with a scoop; and if broken down, tepid water should be injected, so as to remove every portion of the calcareous matter, and prevent a nucleus remaining for the formation of a future stone. The after-treatment is simple; the wound is left open or only covered with some simple ointment, and in a dependent position, that the urine may flow freely through it. The patient is to be kept quiet, and on a low regimen, and diluent drinks administered; and any symptoms of inflammation are to be met by prompt antiphlogistic treatment. In the course of two or three days the urine begins to flow by the urethra, and is soon wholly discharged in that way.

LITHOTRITY, *li-thot'-re-te* (Gr. *lithos*, a stone, and *teiro*, I break into pieces), in Surg., is the operation of breaking into pieces a calculus in the bladder by means of instruments passed into that organ through the urethra, so that the fragments may be discharged through the latter, and thus the performance of the operation of lithotomy rendered unnecessary. This is one of the great triumphs of modern surgery, and its introduction has taken place since the commencement of the present century. Various modes of performing the operation have been adopted, but the most approved is that of passing a pair of strong sliding forceps, furnished with teeth, through the urethra into the bladder, and laying hold of the calculus, when the lower limb of the forceps is fixed in a vice, and the upper struck smartly with a hammer, so as to break the stone. The instrument is then withdrawn, and the fragments are afterwards voided with the urine. If portions remain, the operation is repeated from time to time. This operation is so simple, attended with so little danger, and productive of so little pain, as to render it, where it can be used, immeasurably preferable to lithotomy. When the calculi are very large or very hard, it cannot be adopted.

LITMUS, *lit'-mus*, in Chem., a blue colouring matter obtained from the *Roccella tinctoria*, and moistened with a solution of carbonate of potash. The chemical character of this convenient test deserves investigation. It is much used by chemists as a rough test for the presence of free acid or alkali in a solution or gaseous mixture. It is generally used in the form

of litmus-paper, which is prepared in the following manner:—Common commercial litmus is digested in water until a deep-blue solution is formed. It is then filtered, and pieces of bibulous paper are dipped into it and dried. It often happens that the litmus itself contains alkaline matter; in which case it will be necessary to add dilute acid until the blue colour just begins to burn, when a few drops of the alkaline litmus solution should be added to restore the balance. Blue litmus-paper is burnt red by acids. Reddened by being suspended for a few seconds over the fumes of acetic acid, it serves as a test for alkalies, which restore it to its original colour. It is hardly necessary to direct the student to keep litmus-papers out of the reach of the light and acid or alkaline fumes. (For the rationale of the action of acids and alkalies on litmus, *see* SALTS. *See* also ROCCELLA.)

LITOTES, *li-to'-tees* (Gr.), in Rhet., is a figure of speech, wherein, by denying the contrary of what we intend, more is signified than we would seem to express. Thus, "a man of no mean ability;" meaning "of considerable ability."

LITRE. (*See* METRIC SYSTEM.)

LITTER, *lit'-ter*, a term applied in Agr. to the straw, fern, or other dry substances which are placed under horses and cattle, in the stables, cow-houses, farmyards, &c., for the purpose of keeping the animals clean and warm, and providing a supply of manure. For this latter object all sorts of dry materials ought to be carefully collected and stacked for winter use. The term is also used to denote a brood of young pigs, puppies, kittens, and other quadrupeds. A vehicle formed with shafts, supporting a bed between them, in which a person may be borne by men or by a horse, is called a litter. In the latter case it is usually called a *horse-litter*; and a similar carriage in India is called a *palanquin*.

LITURGY, *lit'-ur-je* (Gr. *leitourgia*, from *leitos*, public, and *ergon*, work), denotes, in the original, any public act or service, whether of a sacred or secular nature. It afterwards came to be applied generally to the public service of God in the Church, and in this sense is frequently used in the Septuagint translation of the Old Testament. At a later period the term was restricted to the office of the holy Communion, and in this sense it is to be understood when we speak of the Liturgy of St. James, St. Chrysostom, &c. At the present day the word is employed to designate the ordinary prescribed service of the Church, either with or without the Communion office. In the first ages every bishop was at liberty to order the form of divine service in his own church; and accordingly each particular church or diocese had its proper liturgy. This privilege the bishops retained for several ages. Hence we find that in early times different liturgies were in use in different parts of this country; the cathedrals of York, Lincoln, Hereford, and Bangor, and even Aberdeen, in Scotland, having their respective uses. Christian liturgies are divided into three classes,—those of the Eastern, the Roman Catholic, and the Protestant churches. In the Eastern church several liturgies are in use. That ascribed to St. James is used by the church at Jerusalem, and may date as far back as the 2nd century; but many additions have been made in later times. The liturgy of St. Mark (Alexandrine liturgy) is ascribed to Cyril of Alexandria, and still forms the main part of the Coptic and Ethiopian liturgies. A third very important liturgy is contained in the Apostolic Constitutions, and has been ascribed to Clement of Rome; but modern investigations have shown that its origin must belong to a later period. The liturgies of Basil and Chrysostom are revisions of the liturgy of St. James, and are the main sources of the liturgy of the Russian church. The first beginnings of the Roman liturgy undoubtedly reach back to the time of the earliest bishops. In the Romish church the liturgy is divided into several books or offices; as the Breviary, containing the matins, lauds, &c.; the Ceremoniale, or office peculiar to the pope; the Missal, or office of the mass; the Pontificale, directing the functions of the bishops; and the Rituale or Pastorale, for the guidance of the simple priests or inferior clergy. In the language of the Church, the word liturgy is applied only to the office of the mass. Its history can be traced back as far as the middle or end of the 5th century. Gregory the Great made many additions to it, and gave it pretty much the shape that it now has. Pius V., in 1570, established it as *Missale Romanum*, which was revised by Clement VIII. and Urban VIII. The Ambrosian liturgy, which is used in the cathedral at Milan, is by tradition ascribed to Barnabas; but it takes its name from St. Ambrose, who made some changes in it. It differs from the Roman in form, but not in doctrine. The Mozarabic liturgy in Spain had undoubtedly a very early origin. It was approved by Isidore of Seville, and the fourth council of Toledo. The Gallican liturgy is that which was anciently in use in the Gallican church, and is said to have had Hilary of Poitiers among its authors. It was supplanted by the Roman liturgy introduced by Pepin and Charlemagne. The whole of the Roman liturgy is in Latin; those of Protestants in the vernacular of the different countries. In 1523 Luther drew up a liturgy or form of prayer and administration of the sacraments, which in many points differed but little from the mass of the Church of Rome. He did not, however, confine his followers to this form; and hence every country in which Lutheranism prevails has its own liturgy, agreeing with the others in essentials, but differing in many things of an immaterial nature. In recent times, Lutherans have begun to lay more and more stress upon the liturgical parts of divine service; and in many parts of the continent changes have been introduced in the liturgies which have given rise to violent controversies, those in favour of the changes being accused by their opponents of leaning toward the views of the Roman Catholic church. Calvin prepared no liturgy; but his followers in Geneva, France, Holland, and other places, drew up forms of prayer, of which the Genevese and the French are the most important. In Scotland, the Presbyterian churches make use of no liturgy. The most celebrated among the liturgies of the Protestant churches is that of the Church of England. The publication of Henry VIII.'s "Primer," in 1535, was one of the first steps in the reformation of doctrine and worship in this country. Two years later the Convocation appointed a committee to compose a book entitled "The Godly and Pious Institution of a Christian Man," containing a declaration of the Lord's Prayer, the Ave Maria, Creed, ten commandments, seven sacraments, &c. In 1545 a second Primer came out, and in 1547, the 1st of Edward VI., Archbishop Cranmer, Bishop Ridley, and eleven other eminent bishops and divines, were commissioned by the king to draw up a communion-service, and to complete the whole liturgy by adding public offices for Sundays and holidays, for baptism, confirmation, matrimony, burial, and other special occasions. Our excellent liturgy, thus compiled, was revised and approved by the archbishops, bishops, and clergy of both provinces of Canterbury and York, and then confirmed by the king and three estates in parliament, 1548. Some objections being taken to certain parts of it, it was ordered to be revised; and, in 1551, again received the sanction of parliament. These acts, however, were repealed in the first year of Queen Mary, who restored the Latin liturgies of the Roman church. In 1559, the first year of the reign of Queen Elizabeth, the act of repeal was reversed, and the former liturgy, the second book of Edward, was restored. It was, however, subjected to a further revision, by which some few passages were altered, and the petition in the litany for being delivered "from the tyranny of the bishop of Rome and all his detestable enormities," left out, in order that conscientious Catholics might not be prevented from joining in the common service. In the first year of James I. (1604) it underwent another revision, in consequence of a conference held at Hampton Court between some bishops and divines of the Church of England on the one side, and some Puritans on the other. The principal changes introduced were additions of some prayers and thanksgivings, and of that part of the Catechism which contains the doctrine of the sacraments. Some alterations were also made in the rubric relative to the absolution, to the confirmation, and to the office of private baptism, which was confined to the lawful minister, so as to prevent laymen from presuming to baptise. In this state it continued till the reign

of Charles II., who, in 1661, issued a commission empowering twelve bishops, and as many Presbyterian divines, to make such reasonable and necessary alterations as they should jointly agree upon, nine assistants being added on each side, to supply the place of any of the twelve principals who should happen to be absent. These commissioners had several meetings at the Savoy, but to very little purpose, as the two parties could not come to any agreement, some of the Presbyterians maintaining that it was too bad to be mended; and Baxter prepared one of his own, which he proposed in its place. The conference, therefore, broke up without anything being done, except that some particular alterations were proposed by the episcopalian divines, which, in the May following, were considered and agreed to by the whole clergy in convocation. The English liturgy was then brought into the state in which it at present stands, and was unanimously subscribed by both houses of convocation of both provinces on the 20th December, 1661; and being brought to the house of Lords the March following, both houses passed an act for its establishment. The English liturgy was adopted in Ireland shortly after the Reformation in England. The English liturgy, says Bishop Jebb, "possesses a peculiar temperament, equally remote from all extremes, and harmoniously blending all excellencies: it is not superstitious, it is not fanatical, it is not cold and formal, it is not rapturous and violent; but it unites, beyond any other human composition, sublime truth and pure spirit, the calmest wisdom and the most energetic devotion." Liturgies, as a special branch of practical theology, have been divided into three parts; viz. (1) Dogmatical, or an investigation into the nature and essence of liturgy (divine service); (2) historical, or the history of the various liturgies; and (3) practical, or the application of the results of the two former parts to the present condition of divine worship.

Liver, *liv'-er* (Sax. *lifer*, Gr. *hepar*), in Anat., is the secreting organ or gland by which the bile is formed. It is situated in the right hypochondriac and epigastric regions, below the diaphragm, and is of a reddish-brown colour. Its form is irregular, being convex on the upper surface, irregularly concave below, very thick behind, and very thin in front, and in the adult it generally weighs from three to four pounds. It is divided into two principal lobes, the right and left,—the former of which is by much the larger. They are divided on the upper side by a broad ligament, and below by a considerable depression, or fossa. Between and below these two lobes is a smaller lobe, called lobulus Spigelii. To the left it has the fissure for the lodgment of the ductus venosus; on the right, the fissure for the vena cava. The lobulus caudatus is a tail-like process of the liver, stretching downwards from the middle of the right lobe to the lobulus Spigelii. The liver, like the other viscera of the abdomen, receives an investment from the lining membrane of that cavity,—the peritoneum, which being reflected from it at different points, forms broad bands, connecting the liver with the surrounding parts. An investment of areolar tissue is also spread over the organ, extending into the interior, and forming thin but dense sheaths to the vessels and canals, called the capsule of Glisson. The blood-vessels of the liver are the hepatic artery and veins, and the vena portæ; the lymphatics are numerous, and the nerves are supplied from the pneumogastric and phrenic, and the hepatic plexus. The proper tissue of the liver is composed of a great number of granular bodies, of the size of millet, and called lobules, of a foliated appearance. The liver thus receives two kinds of blood,—arterial, by means of the hepatic artery, in small quantity, destined principally for the nourishment of the gland; and venous, by the vena portæ, in much larger quantity, from which the bile is principally formed. The tributary branches, by the junction of which the main trunk of the portal vein is formed, comprise the veins which receive the blood from the stomach and intestinal canal, the spleen, pancreas, and gall-bladder. From these various sources, then, venous blood is poured into the liver by the vena portæ, which divides and subdivides, like an artery, till it reaches the interlobular spaces, forming a freely anastomosing network throughout the organ, and constituting the interlobular veins. From these interlobular veins proceed, on every side, minute capillaries, which form dense networks, that seem to make up nearly the whole substance of the lobules. Through the capillaries the blood passes into *intra*-lobular veins, of which one, with its outspread branches, occupies the centre or axis of each lobule; and these intralobular veins, by successive junction and conflux, make up the trunks of the hepatic veins, by which the blood of the portal vein, after secreting the bile, is carried from the liver. The secretion of bile (*see* Bile), though the chief and most obvious of the functions of the liver, is not the only one which it has to perform; for recent discoveries have shown that important changes are effected in certain constituents of the blood, in its transit through this gland, whereby they are rendered more fit for their subsequent purposes in the animal economy. From the labours of M. C. Bernard, it appears that the low form of albuminous matter conveyed from the alimentary canal by the blood of the portal vein, requires to be submitted to the influence of the liver before it can be assimilated by the blood. The liver also possesses the remarkable property of forming sugar out of principles in the blood which contain no trace of saccharine or amylaceous matter. The excretory apparatus of the liver consists of the hepatic, common, and cystic ducts, and the gall-bladder. The biliary ducts commence by small twigs in each lobule, and join, forming, where they emerge from the gland, the hepatic duct. This duct, after passing down for a short distance, is joined at an angle by the cystic duct from the gall-bladder. The common duct thus formed is called the ductus communis coledochus, and empties itself into the duodenum. The retention of the materials of the bile in the blood acts like a poison upon the nervous system, and if the suspension of secretion is complete, death soon takes place. Much of the cerebral disturbance accompanying dyspepsia, some forms of which are popularly known as "liver complaint," is doubtless due to deficiency of the biliary secretion, and the non-elimination of certain deleterious constituents. (For diseases of the liver, see Bile, Bilious, Dyspepsia, Hepatitis, *&c.*)—*Ref.* Todd's *Cyclopædia of Anatomy and Physiology*; Carpenter's *Physiology*; Budd's *Treatise on Diseases of the Liver*.

Liver of Sulphur, in Chem., a brown-red mass, sometimes used in medicine, prepared by fusing two parts of carbonate of potash with one of sulphur. It is a compound, composed of tersulphide of potassium, hyposulphite of potash, and sulphate of potash.

Liverwort. (*See* Hepaticaceæ.)

Livery, *liv'-e-re* (Fr. *livrée*), is applied to the distinctive dress given by masters to their male servants. It is said to be derived from the custom of the early kings of France of presenting to the servants throughout the palace particular sets of clothes at the royal expense. In the days of chivalry, livery was not any mark of degradation; for the duke's son wore a prince's livery; the earl's son a duke's; and so on. Cavaliers distinguished themselves at tournaments by wearing the livery or badges of their mistresses. For a considerable period, the "retainers" of noblemen wore their masters' livery. Their service lasted for one year; but so formidable did this body become, that no nobleman was at length allowed to retain such followers without license. Licenses and retainers were alike abolished in the reign of Charles II., and, since that period, livery has only been worn by the lower class of male household servants. The coachman is the recognized chief of the liveried corps. A servant in livery is addressed by his Christian name; but when promoted from the servants' hall to the steward's room company, he is distinguished by his surname. The word livery is also applied to the ninety-one companies of the city of London, the members of which wore habiliments in form and colour resembling those of the lord-mayor and sheriffs.—*Ref. Encyclopædia Britannica.*

Livery, in Law, has several significations. It was applied to a delivery of possession to those tenants who held of the king *in capite*, or by knight's service. It was also applied to the writ which lay for an heir to obtain the possession or seisin of his lands of the king's hands. By 12 Car. II. c. 24, all wardships

liveries, &c., are taken away. *Livery of seisin* is a ceremony in the common law, used in the conveyance of lands, tenements, and hereditaments, where an estate in fee simple, fee tail, or other freehold, passeth. It is a testimonial of the willing departing of him who makes the livery from the thing whereof the livery is made, and of willing acceptance of the other party receiving the livery. This livery of seisin is no other than the pure feudal investiture or delivery of corporeal possession of the land or tenement, which was held absolutely necessary to complete the donation. By the common law, it was necessary to be made upon every grant of an estate of freehold in hereditaments corporeal, whether of inheritance or for life only; but by 8 & 9 Vict. c. 106, it is declared that after the 1st day of October, 1845, all corporeal tenements and hereditaments shall, as regards the conveyance of the immediate freehold thereof, be deemed to lie in grant as well as in livery. Livery of seisin is of two kinds,—in deed, and in law; the former being an actual delivery of some symbol of possession on the land with apt words, the latter a verbal delivery within sight of it. Livery in law does not transfer the freehold till an actual entry is made by the feoffee; and hence, if either the feoffor or feoffee dies before an entry is made under the livery thus given, it becomes void. (*See* FEOFFMENT, GRANT, SEISIN.)

LIVERYMAN, means a freeman of the city of London, admitted member of some one of the numerous city companies or guilds; by which right of entrance he enjoys certain privileges and powers. The common councilmen, sheriffs, and similar superior officers of the city, are elected from the mass of liverymen.

LIVING, *liv'-ing* (from SAX. *libban*, to live), a benefice, or an ecclesiastical estate, which is granted to some priest or clergyman for term of life, to be enjoyed by him on account of his ministry in the Church.

LIVRE, *leen* (*r*) (Fr., from Lat. *libra*, pound), a French coin now not much in use, and equal in value to 98 centimes; it is consequently slightly less in value than a franc, 81 livres being equivalent to 80 francs. But still, the franc of the present day is identical with the *livre* of old, its name having been changed at the revolution of the last century.

LIXIVIATION, in Chem., a process of separating the soluble from the insoluble portions of compounds by steeping and washing in water. The extraction of the soluble salts contained in kelp is an example of lixiviation. The solution so formed is termed a ley or lye.

LIZARD. (*See* LACERTINIDÆ.)

LLAMA, or GUANACO, *lu'-ma*, a genus of animals belonging to the class *Mammalia*, ord. *Ungulata*, fam. *Bovida*, and tribe *Camelina*. The llama bears a strong resemblance to the camel, and may be looked upon as the representative of that animal in the New World, being confined to South America. Their teeth are very similar to those of camels, but their backs are not furnished with humps; their tails are short and hairy, their toes slender, and their soles narrow and separated in front. In Peru, where they are principally found, they live in a wild state, in herds of sometimes one or two hundred. The ancient Peruvians, however, completely subdued and domesticated the llama as a beast of burden; and to them it answered all the purposes of the camel or dromedary of the Old World. In a wild state, the herd keeps a careful look-out, and when disturbed gallops off with great rapidity. There are two distinct species found in South America,—the *Lama vicugna* and the *Lama guanacus*. They both inhabit the Peruvian Alps, the Pampas, and the mountains of Chili, extending as far as the Straits of Magalhaens. The former animal, the vicuna, is principally found in the most elevated land and mountains of Bolivia and Chili. This species is quite wild, and hitherto has defeated all attempts of the aborigines to domesticate it; and has an awkward habit of jumping and kicking with its hind legs. The guanaco is the characteristic quadruped of the plains of Patagonia, and is very common over the whole of the temperate parts of South America. They live in herds, but are easily domesticated after being caught. In their habits they resemble a flock of sheep, and, when caught, appear to have no idea of defending themselves. Two other species of llama, which are thoroughly domesticated, are also mentioned by travellers,—the *L. glauca*, which is of a whitish colour, and has long slender legs; and the *L. Pacos*, which is of a blackish hue, and has short legs. The wool of llamas is made into cords and sacks as well as into stuffs for ponchos, &c.; and in Mexico the bones are converted into instruments for weaving the wool. The dung is also used for fuel. The llama is, however, rapidly disappearing, and its place is being supplied by the more useful and profitable European sheep.

LLOYD'S LIST, *loyds*, a publication in which the news received at Lloyd's Rooms, with reference to shipping and the quotations of foreign prices, is published. On account of the extensive information which it contains, it is of the greatest use to merchants and others engaged in foreign trade. It has been in existence ever since the year 1716, from which time its merits have been fully recognized.

LLOYD'S ROOMS, a portion of the Royal Exchange devoted to the use of shipping-agents and insurance-brokers. Meetings of traders used formerly to take place at the coffee house kept by one Mr. Lloyd, in Cornhill, and consequently the name was applied to that portion of the Exchange dedicated to the purposes stated above. Lloyd's Rooms are kept up by the subscription of the frequenters, and they are stored with much valuable information with reference to maritime interests.

LOADSTONE. (*See* [illegible]ON and MAGNET, NATURAL.)

LOAM, *loam* (SAX. [illegible]), a term generally applied to a dark-coloured rich mould, principally composed of dissimilar particles of earth and decomposed vegetable matter. Loam is moderately cohesive, and therefore neither retentive of moisture, like clay, nor too ready to part with it, like a sandy soil. It is a continued source of carbonic acid, as almost every particle of it is surrounded by an atmosphere of that gas, which is absorbed by the roots of plants, and replaced by atmospheric air, to be again converted into carbonic acid. Upon this transformation, the influence of loam on vegetation may be readily understood: it does not itself nourish plants, but it presents to them a slow and lasting source of carbonic acid which is absorbed by the roots.—*Ref.* Johnson's *Farmer's Encyclopædia*.

LOAN, *lone* (SAX. *lænan*, to lend), in Law, is a contract by which the use of anything is given under condition of its being returned to the owner. A loan is said to be gratuitous when the borrower receives the thing for his own benefit, without payment of hire or reward to the lender. There are two kinds of gratuitous loans,—the one called *mutuum*, for use and consumption, an equivalent in kind to be returned; the other a *commodatum*, which is the loan of a specific thing, to be used and returned *in individuo*. In loan by way of mutuum, the parties stand in the relation of debtor and creditor to each other; in loan by way of commodatum, they are known in law as borrower and lender. A loan of money is a mutuum; of a horse or book, a commodatum. It is of the very essence of a commodatum, that the loan be gratuitous; for if anything be paid for the use of the chattel, then the contract is one of letting and hiring. In a loan by way of mutuum, the chattel lent becomes the absolute property of the borrower, to do what he pleases with it, and to use it in any way he thinks fit; but in loan by way of commodatum, the temporary right of possession and user only is transferred, and the borrower is consequently obliged to render back the identical thing lent. As regards the borrower, he has a right to receive and hold the thing borrowed; but only as the property of the lender. For many purposes, he is, in the eye of the law, in the position of owner; and certain of the rights of an owner are conferred upon him, as against every one but the owner. The borrower has a right to use the article borrowed, but only to use it. He has no more right to lend it than he has to give it away or sell it. He is expected to take as much care of it as if it were his own property under the like circumstances, and is liable for any damage arising from even slight negligence. He is, however, not liable, if the thing be lost through no imprudence or negligence of his. The borrower is not liable for such injury as naturally results from the use of a thing; but, on the other hand, he is bound to pay all the expenses or charges which naturally result from or accompany the use. A lender has no right to compensation for loss through want of the care or skill which he had no right to ex-

pect. If he lends a thing for an illegal act, he is no longer a lender in the eye of the law, but an accomplice in the wrong done. If the thing lent be used according to the purpose for which it was lent, and is lost or perishes, not through the default of the borrower, then the owner shall bear the loss. If it be used in any other manner than according to the lending, then in whatever manner it may perish, if it be not by default of the owner, then the borrower shall be liable for the loss. Thus, if a horse is lent for an ordinary ride along the high road, and the borrower takes it off the high road into wet and slippery ground, and the horse slips and breaks his knees or is otherwise injured, then the borrower must make good the loss. If the borrower keeps the thing borrowed after it is his duty to return it, or after a reasonable time after it has been demanded, then his relation to the lender changes totally, and he becomes liable for any loss or injury that may occur, although wholly without his fault. The borrower has no right to detain the thing borrowed for any antecedent debt due to him, nor can he set up a right to detain the chattel for payment of necessary expenses incurred by him in the keeping and preserving it. In the case of a mutuum, the borrower is bound to restore at a time agreed upon, or within a reasonable period after request, an article of the same kind and quality as the one originally lent to him. This is essential to the character of a mutuum; for if by agreement an article of different kind is to be returned, then the contract is not a mutuum, but an exchange or sale. As the right of property is transferred by mutuum, so is also the risk of loss; and hence if the thing borrowed is destroyed before it can be used, the borrower is nevertheless bound to pay to the lender the equivalent which he owes at the time appointed. Such is loan in its strictly legal signification; but, in common phraseology, the term is used even when compensation is included, which legally comes under the designation of hiring. Money lent at so much per cent. is also called a loan. A loan of money to be used for hire is a loan for use and consumption, the identical thing lent not being intended to be returned, but its equivalent in value and kind.

Loan, Public, is the name given to money borrowed by the state, which constitutes the national debt. (*See* National Debt.)

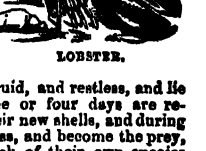
Loasaceæ, *lo-a-sai'-se-e*, in Bot., the Chili-nettle fam., a nat. ord. of *Dicotyledones*, sub-class *Calyciflorœ*. Herbaceous plants with stiff hairs, which are sometimes stinging. Leaves without stipules; calyx superior, 4 or 5-parted, persistent; petals 5 or 10, in 2 whorls, often hooded; stamens numerous, in several whorls, either distinct or united in bundles; ovary inferior, 1-celled, with several parietal placentas, or 1 axile placenta; style 1; ovules pendulous, anatropal. Fruit capsular or succulent. Seeds having an embryo lying in the axis of fleshy albumen. The *Loasaceæ* are all natives of North and South America. Several species are cultivated on account of the beauty of their flowers. A Mexican species, *Mentzelia hispida*, possesses a purgative root, which has been used medicinally.

Lobe, *lobe* (Lat. *lobus*), in Anat., is a term applied to the more or less separate parts of which the glands of the body are composed. Thus we have the lobes of the brain, lungs, liver, &c. Lobe is also applied to that pendent portion of the ear which is more fat and fleshy than any other part.

Lobelia, *lo-be'-le-a* (in honour of Lobel, a botanist), in Bot., the typical gen. of the nat. ord. *Lobeliaceæ*. The most important species is *L. inflata*, Indian tobacco, a native of North America. The flowering herb and seeds have been extensively employed, especially in America, for their sedative, antispasmodic, emetic, and expectorant effects. Lobelia resembles tobacco in its action, but requires to be used with care, as several fatal cases of poisoning have resulted from its empirical use. *L. syphilitica* is reputed to be efficacious in syphilis; *L. urens* has blistering qualities.

Lobeliaceæ, *lo-be-le-ai'-se-e*, in Bot., the *Lobelia* fam., a nat. ord. of *Dicotyledones*, sub-class *Corolliflorœ*. Herbs or shrubs, with a milky juice. Leaves alternate and exstipulate; calyx superior; corolla monopetalous, irregular, and valvate; stamens 5, syngenesious; ovary inferior, 1—3-celled; placentas axile or parietal; style 1; stigma surrounded by a fringe of hairs. Fruit capsular, dehiscing at the apex. Seeds numerous, albuminous. The plants of this order should generally be regarded with suspicion, as many are acrid poisons. They are chiefly natives of tropical and sub-tropical regions. There are 29 genera and 375 species.

Lobster, *lob'-ster* (Ang.-Sax.), (*Homarus vulgaris*), a crustaceous animal belonging to the ord. *Macroura*, and fam. *Astacidæ*. When alive, its general colour is a bluish-black, beautifully variegated with paler spots and clouds. Its thorax is smooth, its snout short and serrated, and it has very long antennæ, with two shorter bifid ones between them. The claws and fangs are large, the greater being tuberculated, and the lesser serrated on their anterior edges. It has four pairs of legs; the tail has six joints, and the caudal fin is rounded. The two great claws of the lobster form its instruments of provision and weapons of defence; they open and close like a pair of nippers, and are very strong. The head of the lobster is small, and furnished with two eyes, which are projectile or retractile at will. The mouth resembles that of an insect, opens longitudinally, and is furnished with two teeth for the mastication of its food, and between them is a fleshy substance shaped like a tongue. When the young leave the parent lobsters, they seek the minute crevices of the rocks and other secure places, and in a few weeks they acquire hard, firm shells. Lobsters, like crabs, change their shells every year; previous to this process they appear sick, languid, and restless, and lie torpid and motionless. Three or four days are required before they acquire their new shells, and during that period they are defenceless, and become the prey, not only of fish, but also of such of their own species as are not in a similar condition. While in a soft state lobsters increase in size; and in comparing the dimensions of an old shell with a new, the latter is found to be one-third larger than the former. When boiled, the lobster becomes red. In a commercial point of view, the lobster is perhaps the most important of all the crustaceans, on account of the esteem in which it is held as an article of food. 150,000 are annually sent to Billingsgate market from the coast of Scotland and the Orkney and Lewis Islands; 600,000 annually arrive there from Norway; and it is not uncommon to see 20,000 to 25,000 lobsters in the market in one day. They are principally sent to London during the period between March and August. According to most accounts, they are very stationary in their habits, and differ in colour and appearance in the different places where they are taken. They are caught in pots, similar to those used in the capture of crabs. Lobsters very readily part with their large claws; and, when seized by one of them, the animal gives it up at once. When suddenly alarmed by a peal of thunder, or the report of a cannon, they shoot their claws immediately. Considerable time elapses before the lost member is restored, and attains the size of the old one.



LOBSTER.

Local, *lo'-kil* (Lat. *locus*, a place), is applied to something supposed to be tied or annexed to some particular place. Thus, in Law, real actions are local, and require to be brought in the county where the lands lie; but a personal action, as of trespass or battery, is transitory, not local; and it is not material that the action be brought in the same county where the fact was done. A thing is also said to be local that is fixed to the freehold. Local customs are customs peculiar to some particular lordship or other district, and differing from the general customs of the country.

Location, *lo-kai'-shun*, in Law, is a contract by which a hire is agreed to be given for the use of anything, or for the labour of any person.

Lock, *lok* (Ang.-Sax.), a well-known instrument used for fastening doors, chests, &c. It may be defined as a kind of fastening, which is only intended to be opened by one particular instrument, called the *key*, or by some secret mode of manipulation. In smith-work the lock is considered the masterpiece, as a great deal

of art and delicacy is required in contriving and varying the wards, springs, bolts, &c., and adjusting them to the places where they are to be used, and to the several occasions for using them. The earliest lock of which the construction is known, is the Egyptian, which was in use 4,000 years ago. It was so made that three pins dropped into three holes in the bolt when it was pushed in, and so held it fast. They could be raised again by putting in the key through a large hole in the bolt, and raising it a little, so that the pins in the key pushed the locking pins up out of the way of the bolt. This lock had very little security, for it was easy to find the places of the pins by inserting a piece of wood covered with clay or tallow, on which the holes marked themselves; and the depth could be easily ascertained by experiment. The Chinese lock is very superior to the Egyptian, and is founded on the same principles as the Bramah lock, which was regarded for a long time as the most secure lock ever invented. Until about eighty-five years ago, there were no locks in England so good as the Chinese lock, which was provided with sliders or tumblers of different lengths, and could not be opened unless they were all raised to the proper heights, and no higher. The locks used in this country were simply a mere bolt, held in its place, either shut or open, by a spring, which pressed it down, and so held it at either end of a convex notch. The only impediments to opening these locks were the wards, which the key had to pass before it could turn in the keyhole. The shape of these wards, however, could always be ascertained by inserting a blank key, covered with wax. Thus, a small collection of skeleton keys was all that the lock-picker required. The principle of all modern locks is the application of a lever to an interior bolt, by means of a communication from without; so that, by means of the latter, the lever acts upon the bolt, and moves in such a manner as to secure firmly the door or lid from being opened by any push or pull from without. The security of locks, therefore, depends upon the number of impediments which can be interposed between the lever,—that is the *key*, and the bolt. These impediments are generally known by the name of wards; but, as we have observed above, they can be opened by a mechanic of equal skill with the lockmaker without the key, unless some further obstacles be added. Various complicated and difficult locks have been invented within late years. The first step in advance was the use of tumbler locks. In these the bolt, although shot backwards and forwards, has no spring or notches to catch on the back rim of the lock, to hold it in any required position; but it is furnished with two notches in its upper edge. Behind the bolt is a piece of metal, called a *tumbler*, pivoted to the plate of the lock, and continually forced down by a spring, which presses on its upper edge. Near the end farthest from the pivot, the tumbler carries a projecting stud, which, when the bolt is fully shot, drops into one of the notches, and holds it firmly, until, by the application of the key, the tumbler is lifted up. By this action the bolt is released, so that the further turning of the key moves the bolt, till the stud falls into the other notch; thus securing the bolt either when locked or unlocked. The Chinese lock, before mentioned, may be looked upon as an example of the tumbler-lock. Notwithstanding the antiquity of the tumbler principle, its first important application in this country was by Barron, who patented his lock in 1778. In the simple form of the single tumbler just described there is this disadvantage, that whilst it effectually prevents the removal of the bolt unless the tumbler be raised high enough, it presents no impediment when the tumbler is raised beyond the proper degree. In Barron's lock this defect was remedied by the use of several tumblers each of which required to be raised to a different degree, and if any one of them were raised too high, it formed as effectual a barrier to the movement of the bolt as if it were not lifted at all. The next lock of any importance was the celebrated lock originally patented by Mr. Joseph Bramah, in 1788. Bramah came up to London from Barnsley as a joiner, and raised himself to eminence by the invention of this lock, of the machine for numbering bank-notes, the beer-engine, the water-closet, ever-pointed pencils, and the hydraulic press. In the Bramah lock the use of tumblers is applied in a very different manner to that described in Barron's lock, and the use of wards is entirely abandoned. The ordinary method of shooting the bolt by the action of the bit of the key is also abandoned; a stud attached to the end of a cylindrical barrel mounted in the lock, performs the office of the end of the bit. The Bramah lock consists of an outer barrel, which is screwed to, or cast with, the lock-plate, with a cylinder or inner barrel turning within the other. The security of the lock depends upon a number of sliders made of plates of steel doubled and sprung open a little, so as to make them move with a little friction in the slits of the cylinder or revolving barrel in which they lie; they are pressed up against the cap of the lock by a spiral spring. A deep groove is cut round the barrel, and in each of the sliders is a deep notch which can be pushed down to that place in the barrel by a key slit to the proper depth. When all the sliders are pushed down to that position, the barrel presents the appearance of having no sliders in it. At the place where the groove is, a steel plate made in two pieces, so as to get it on, embraces the barrel; it is provided with notches corresponding to the sliders, and is affixed to the body of the lock by screws. When pushed up by the spring, the sliders fill the notches in the plate and prevent the barrel from turning; but when they are pushed down by the key, the notches in the sliders all lie in the plane of the plate, and so the barrel can turn with the key, and the pin in the end of it turns the bolt. For many years the construction of Bramah's lock remained the same, and it was long considered a lock that could not be picked. It was clearly proved, however, that by the tentative process, as it is called, any lock can be picked,—that is, by cautiously trying one tumbler after another till they are all freed. Proceeding in this way, Mr. Hobbs, in 1851, opened the challenge lock with eighteen sliders or guards, which had hung in the window of Messrs. Bramah's establishment for years, in the short space of nineteen hours; and he would have done it sooner had not one of his instruments broken in the lock. He afterwards repeated the operation three times within the hour, before the arbitrators. It is a mistake to suppose that impressions cannot be taken from a Bramah lock. Cotterill's lock is on the same principle as Bramah's, the difference being that the sliders, in Cotterill's, are pushed out radially by a very thick key with inclined slits in it. Letter-locks, which were in use some years ago, could only be opened by setting a number of rings or discs to a particular combination of letters. It was generally supposed that these locks could not be opened by anybody: they were also called puzzle-locks. Afterwards it was found that they, too, could be readily opened by the tentative process. Chubb's locks have enjoyed more celebrity than all the locks which have been made on the many-tumbler principle invented by Barron. Their success arose partly from their superior workmanship, and use of more tumblers than usual, and from having applied the name "detector" to a certain part of the machinery; thus captivating the public with the idea of discovering whether any one had been tampering with the locks. The "detectors," however, were not able to withstand Mr. Hobbs's mode of picking locks. Amongst the principal inventions in tumbler-locks since 1851, may be mentioned Hobbs's locks, Parnell's locks, and Restell's lock. Another series of locks are those in which the tumblers or sliders are not moved one way by springs, and the other way by the key. The tumblers, or sliders, or discs, which stop the bolt, are kept in their places by friction only, and will stand anywhere, having their plates lying between them, and being pushed or turned one way in locking, and the other way in unlocking. Amongst these may be enumerated Andrew's American lock and Tucker's lock on the disc principle. A set of locks is frequently so arranged for convenience, that the key of one will open none of the others, yet there may be one master key which is able to open them all.—For further information on the subject of locks, the reader is referred to a comprehensive article on the subject by Mr. E. B. Denison, Q.C., in the *Encyclopædia Britannica*.

LOCK. (*See* CANAL.)

LOCKED JAW. (*See* TETANUS.)

LOCKER, *lok'-er*, a sort of box or chest made along the sides of ships, for the purpose of stowing away

various articles. They are built, as it were, into the ship, and have their various names; as *bread-locker*, &c. The shot-lockers are racks made of strong plank, and put in the hold near the pump-well, where the shot is kept.

Locofoco, *lo'-ko-fo'-ko* (probably from Lat. *loco foci*, instead of a fire), a term applied to the ultra-democratical or Tory party in America. Lucifer-matches are termed locofocos in America, and the application of the word to this particular political party arose thus:—In 1834, a certain number of the extreme democratical party met at Tammany Hall, New York, and there happening a great diversity of opinion, the chairman left his seat, and the lights were extinguished, with a view to dissolve the meeting; but those in favour of extreme measures produced locofoco matches, rekindled the lights, continued the meeting, and accomplished their object.

Locomotive Engine, *lo-ko-mo'-tiv* (Lat. *locus*, a place; *moveo*, I move), a steam-engine employed to draw loads in transport overland, especially on railways. The employment of steam as a locomotive power dates from a later period than the general application of steam to nearly all other mechanical purposes. Many fruitless attempts were made to construct engines which would work on the common English roads; but it soon became apparent that locomotives could only succeed on the most perfectly prepared railways. In the mining districts, railways of wood and iron had long been in existence, and of these the steam locomotives at once took possession. In 1804, Richard Trevethick made and patented the first steam locomotive, which ran on a railway near Merthyr Tydvil. This engine in several respects resembled those which have since been used for a like purpose, both in form and structure. The cylinder was laid horizontally below the front of the body, or boiler, with its rod proceeding backwards, and continued by another rod, jointed to it, working the crank in the middle of an axle having a fly-wheel; and on the same axle, two cogged wheels, driving two others on the axle of the hinder supporting wheels, by whose resistance alone against the rails, which were of iron, the engine was urged along, drawing ten tons, in addition to itself, at the rate of five miles an hour. Under the notion that smooth rails and wheels could not be depended on to drive a carriage, in 1811, a toothed iron rail and driving-wheel were patented, but failed, on account of the great wear and tear. It was, however, soon proved that the weight of an engine must always press its wheels to the rails hard enough to insure their advancing without slip, even when drawing a train of considerable weight. In 1814, an engine was constructed by Mr. George Stephenson, which was considered the most perfect that had been made for many years. In this locomotive were two cylinders, with a cylindrical boiler; it worked two pair of wheels by cranks, placed at right angles; so that when one was in full operation the other was at its *dead points*. By this means, the propelling power was always in action. The next stimulus which the progress of this invention received, was when the Liverpool and Manchester Railway Company had completed their line. Their railroad vastly exceeded all former roads in amount of artificial levelling and high finish, and the company offered a premium of £500 for the production of the best locomotive. In October, 1829, the prize was awarded to George Stephenson, whose "Rocket" attained a speed of 12½ miles with thrice its own weight attached, and of 29 miles when alone. This engine combined in its construction all those mechanical arrangements to which the extraordinary speed of the locomotive engine of the present day is due. The success of this engine at once introduced the idea of *railway travelling*, such roads having previously been regarded as only for the carriage of goods. The principal requirement in a locomotive engine is *compactness*, and the production of the largest amount of power in the smallest amount of space. Hence, no idea of a condensing apparatus has ever been applied, the steam being merely expelled from the cylinders into the air; since the power has to be obtained from the smallest amount of machinery that will afford it, and not from the least *fuel*. The principle introduced by the "Rocket" boiler, which constituted the superiority of that engine, was the carrying of the heat from the furnace through the water by numerous small parallel flues, or rather tubes. By this means the surfaces by which the heat was communicated were numerously multiplied. The locomotive boiler is a flat cylindrical body, laid horizontally, with flat and vertical ends and a nearly cubical addition of its own breadth depending from the hinder part and containing the fire-box. The furnace or fire-box is a square box formed of two casings, the one within the other, with a space between them to contain water, and communicating with the interior of the boiler. Above the fire-box, and communicating with the upper part of the boiler, is a sort of bell-shaped receiver, covered at the top and opening into the boiler. A pipe opening into this receiver by a knee-joint, traverses horizontally along the whole of the upper part of the boiler. At its further extremity it opens into two pipes of smaller bore; these are bent downwards in order to supply the cylinders. The hot air and smoke pass from the fire-box through the tubes in the interior of the boiler and pass out at the funnel. There are generally two safety-valves, one being of the steelyard kind; but instead of the pressure being regulated by a movable weight, it is regulated by a spiral steel spring, the elastic force of which is measured on a graduated scale. The other safety-valve acts in a similar way, but is protected from the driver; so that if the first valve is too heavily weighted or will not act, the second valve will. The engine is a high-pressure one, and is provided with two cylinders, which lie in a nearly horizontal position, being a little inclined upwards towards the fire-box or back of the carriage. By the alternate motion of the piston-rod, motion is given to a crank on the axle of the back wheels, and thus the carriage is propelled. Levers for putting on or off the steam, and also for working the eccentrics that cause the carriage to move either backwards or forwards, are placed at the end of the fire-box, in a convenient position to be used by the driver. The whole engine is supported on powerful springs. The foregoing is a description of an ordinary locomotive; but they vary according to the purposes for which they are required. Some passenger-engines weigh from 23 to 27 tons, and a heavy goods engine often weighs from 28 to 32 tons, with water and fuel. In the larger locomotives there are six wheels, and some are able to convert 1,200 gallons of water into steam in an hour, with a force equal to 400 or 500 horse-power. On the Great-Western line, the large locomotives are capable of exerting 1,000 horse-power. The locomotives drawing express trains travel at the rate of 45 miles, and the speed is frequently equal to 65 miles an hour, or nearly 100 feet in a second. The most powerful goods engines are able to draw a load of 200 to 240 tons, amounting, with the weight of the waggons themselves, to 400 tons altogether. There are about 5,000 locomotives on the railroads of this country; and of this number more than one half are in daily use. Their total cost is more than £10,000,000. Another class of locomotive engines are those for use on common roads, usually called *traction-engines*. Of these Boydell's is known as the "endless railway." Flat boards are disposed round the periphery of the wheels, furnished with rails of flat bar-iron, which are thrown on the ground in succession by a self-acting arrangement, so that the wheels roll over a continuous series of rails laid on the ground. In Bray's traction-engine the wheels are made very large, with broad bearing-surfaces, and are furnished with claws at the periphery, which can be protruded when necessary to grasp the ground. (*See* Steam-Engine, Railway.)

Locumtenens, *lo'-kum te'-nens* (Lat., a place-holder), a deputy or substitute; one who fills the position of another, and discharges his duties.

Locus in quo, *lo'-kus in kwo'* (Lat., the place [locality] in which), a term applied in Law to the locality which has been the scene where any event in a case takes place. *Locus partitus* is another term used to signify the division made between two towns or counties, in order to make trial where the land or place in question lies.

Locust-bean and Locust-wood. (*See* Hymenæa.)

Locusta, Locustidæ, *lo'-kusta* (Lat. *locusta*, a locust), a fam. of insects belonging to the ord. *Orthoptera*, and containing several genera and many species. Locusts are spread all over the globe, and generally

appear in great numbers. The produce of whole countries has been destroyed by them, on account of the rapidity with which they multiply. The species found in Europe are rather small, but some of the exotic varieties are large. Their principal food consists of leguminous plants. During spring and the beginning of summer, they are in their larva state, without wings; but in the latter part of the summer they become perfect insects. Locusts, like many other insects belonging to the order *Orthoptera*, have the faculty of producing sounds. They produce a harsh, creaking noise, by acting upon their elytra, or wing-covers, with their hind legs. On account of the veins being considerably elevated in the elytra, and the inner edge of their thighs being rugose with spines, the rubbing of the one against the other produces the noise. Of all the species, the migratory locust (*Locusta migratoria*), although a small insect, is one of the most destructive to man. Its powers of destruction are immense, and as they are produced in great numbers, they soon destroy the vegetation where they are born. After consuming all within their reach, they take flight in swarms to some adjoining district. At times the number of locusts is so great that the sky is absolutely darkened during their passing, and the spots where they alight assume the appearance of a barren waste, almost in an instant. These insects appear periodically in several parts of central Europe, in Egypt, Syria, and almost all the south of Asia, and spread terror and dismay before them. Rewards are offered for the collection of both the eggs and the perfect insects in the south of Europe. It is on record that in 1613, at Marseilles, 20,000 francs were paid for this purpose. A similar plan is adopted in Turkey and in China. A large species of locust, beautifully coloured, *Locusta cristata*, is common in Southern Africa, and is very destructive at certain seasons. The inhabitants of some countries make use of the large species of locusts as food. They pull off their wings and fry them in butter or oil, or pickle them.

Lode, *lode*, in Min., a Cornish term for a running vein of metal, or even stone, of any particular kind. When the lode is valuable, it is called a *live lode*, and when worthless, a *dead lode*.

Lodge, *loj* (Fr. *logis*), a term applied in Arch. to a small house situated in a park or domain, subordinate to the mansion; also the cottage situated at the gate of the avenue which leads to the mansion. In this last sense it is nearly synonymous with the term "gate-house."

Log and Loglinn, *log*, *log'-line* (Ang.-Sax.), nautical terms expressive of the means used to ascertain the rate of a ship's speed. The *log* is a piece of wood in the form of the sector of a circle (usually a quadrant) of five or six inches radius. The following description is taken from Brande's Dictionary. It is about a quarter of an inch thick, and so balanced by means of a piece of lead nailed to the circular part, as to swim perpendicularly in the water, with about two-thirds immersed under the surface. The logline is a small cord, one end of which is fastened to the log, and the other wound round a reel in the gallery of the ship. The log thus poised keeps its place in the water; while the line is unwound from the reel as the ship moves through the water; and the length of line unwound in a certain time gives the rate of the ship's sailing. The term or phrase generally employed with reference to employing the log is termed "heaving the log." Knots along the line allow the calculation of the speed to be made; and the time is generally checked by a sand-glass running a certain number of seconds,—generally 30 or 45; some to 60 seconds, indeed. The length between the knots is so proportioned to the time of the glass, as the number of knots unwound is to the number of miles the ship is sailing per hour. The first knot is placed about five fathoms from the log, in order to enable the latter to get clear of the ship before the reckoning commences; and the part of the line between the lead and the first knot is called the *stray line*. A patent form of log, by which the calculation is made by a species of clockwork, whose motive power is water, is now, however, generally adopted, particularly in steam-vessels.

Loganiaceæ, *lo-gin-e-ai'-se-e*, in Bot., the *Spigelia* or *Strychnos* fam., a nat. ord. of *Dicotyledones*, sub-class *Corollifloræ*; consisting of tropical shrubs, herbs, and trees, with the following characters:—Leaves opposite and entire, with stipules, the latter occasionally existing only in the form of a raised line or ridge; calyx 4—5-parted; corolla regular, 4—5 or 10-cleft; æstivation valvate or convolute; stamens sometimes anisomerous; anthers 2-celled; pollen 3-lobed; ovary 2, 3, or 4-celled; style simple below, and with as many divisions above as there are cells to the ovary; stigma simple. Fruit capsular or drupaceo-baccate; placentæ axile, ultimately detached. Seeds usually peltate, sometimes winged, with fleshy or cartilaginous albumen. The *Loganiaceæ* are almost universally poisonous, acting on the nervous system, and producing frightful convulsions. There are 25 genera and about 200 species. (*See* Ignatia, Spigelia, Strychnos.)

Logarithmic Curve, *log-ă-rith'-mik*, a curve in the higher branches of analytical geometry, which possesses the property of having its *abscissæ* proportional to the logarithms of the corresponding *ordinates*.—*Ref.* Leslie's *Geometry of Curves*. (*See* Conic Sections and Geometry.)

Logarithms, *log'-ă-rithms* (Gr. *logos*, proportion, and *arithmos*, number).—The *logarithms* of numbers may be briefly stated to be the exponents of a series of other numbers, which render the powers of the latter, denoted by the exponents, equal to the former series. In most elementary mathematical works, the definition of the word is thus given:—The logarithm of a number $y$ is such a value of the index $x$, of a *fixed* magnitude $a$, as will satisfy the equation $y = a^x$: that is, $x$ is *defined* to be the logarithm of $y$ in a *System of Logarithms*, whose *Base* is $a$: and the logarithm of $y$ will therefore depend entirely upon the quantity $a$, which may be assumed to be any finite magnitude whatever,—*unity* only excepted, on account of every arithmetical power or root of 1 being only 1, which thus prevents that number from obeying the conditions stated above. In order, therefore, to constitute a logarithm, it is necessary that the exponent should refer to a system, or series of numbers, in arithmetical proportion, corresponding to as many others in geometrical proportion. If we take, for example, the series of 10, we have $10^1 = 10$; $10^2 = 100$; $10^3 = 1{,}000$; and $10^4 = 10{,}000$: we thus attain the results that the logarithm of $10 = 1$; the logarithm of $100 = 2$; of $1{,}000 = 3$; and of $10{,}000 = 4$. This can be thus explained, by saying that a logarithm is a mathematical term for a number, by which the magnitude of a certain fundamental ratio is expressed in reference to a fixed fundamental ratio. Thus, in the two runs of arithmetical and geometrical proportion, the numbers thus proceed:—

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Ar. Pro. ... | 0, | 1, | 2, | 3, | 4, | 5, | 6, | &c. |
| Geo. Pro. ... | 1, | 2, | 4, | 8, | 16, | 32, | 64, | &c. |

Consequently, if we add 1 and 3 together in the first line, 4 corresponds to 16 (standing under it), which is identical with the multiple of 2 and 8, which stand under the 1 and 3. The upper line in arithmetical proportion forms the logarithms of the lower, in geometrical proportion, and logarithmic tables furnish these intermediate fractions, corresponding with the intermediate numbers in the lower line. A table of logarithms, made according to an assumed basis or fundamental ratio of all numbers to a certain limit, is called a *logarithmic system*. Logarithms were first invented by Lord Napier, Baron of Merchiston, in Scotland; and were first made known by him in a work published in 1614, under the title, "De Mirifici Logarithmorum Canonis Constructione." This system was varied by Henry Briggs (a cotemporary of Lord Napier), who constructed another system, having for its base the number 10, which, corresponding with our system of numeration, has many advantages over that constructed by Napier, being much more convenient for ordinary purposes of calculation. Briggs calculated his on the fundamental basis of the ratio 10 to 1: consequently, the logarithm of 10 is 1; of 100, 2; of 1,000, 3; and so on. It is, therefore, evident that all logarithms of numbers between 10 and 1 must be more than 0, but less than 1; in other words, must be fractions;—thus, the logarithm of 6 is 0·7781513. Again, all logarithms of numbers between 10 and 100 must be greater than 1, but less than 2; or, that is to say, must be whole

numbers *plus* a fraction; for instance, the logarithm of 95 is 1·9777236. The properties and advantages of logarithms are very great by their utility in facilitating the arithmetical operations of multiplication and division, which, when large numbers are concerned, usually take up much time. If the multiplication of two large numbers has to be effected, it is only necessary to take from the logarithmic tables the logarithms of the numbers in question, add these together, and the result will be the logarithm of the required product. In division, logarithms of the numbers have merely to be deducted from each other, and the result will be the logarithm of the dividend. If numbers have to be raised to powers, then logarithms are multiplied; if roots are to be extracted, the logarithms are merely to be divided by the exponent of the root. The integral part of a logarithm is called its *characteristic*, because it shows at once of how many digits the natural number corresponding to the logarithm to which it is prefixed is composed. If, therefore, we know the logarithm of any number, we need only add 1, 2, 3, &c., to its characteristic, in order to obtain the logarithm of a number 10 times, 100 times, or 1000 times as great. For instance,—

| | | |
|---|---|---|
| log. | 7359·4 | = 4·8668424 |
| log. | 7359·4 | = 3·8668424 |
| log. | 73·594 | = 1·8668424 |
| log. | 7·3594 | = 0·8668424 |
| log. | ·73594 | = $\bar{1}$·8668424 |

In this last example, the negative sign is only placed over the characteristic, as that alone is negative; but the general mode of procedure with regard to these minor logarithms is to give them their arithmetical complements, substituting the real value in the final result. In the Napierian system, the *modulus*, or basis, of the tables is 1; and consequently the Napierian logarithm is easily found from the common logarithms (those of Briggs), by multiplying the modulus of the latter by 2·3026. The Napierian logarithms are often called *natural logarithms*, on account of the modulus of their system being unity; while the common logarithms of Briggs are called *tabular logarithms*, in contra-distinction to the former. The method which was first employed to compile logarithmic tables was founded on the successive extraction of roots, and consequently calculations arose of vast difficulty and tedium; in the present day, however, the method is far more simple, and the computations are thus rendered much more expeditiously. Suppose, for instance, it be required to find the logarithm of any number $x$, by means of converging series. In the first place it must be assumed that log. $(1+x)=Ax+Bx^2+Cx^3+Dx^4+$ &c. (1), in which A, B, C, D, &c., are coefficients, like determinates. (*See* INDETERMINATE COEFFICIENTS.) Therefore, taking another number, $z$, we have, in a similar manner, log. $(1+z)=Az+Bz^2+Cz^3+Dz^4$ &c. (2); then subtracting the second equation (2) from the first (1), we shall have the result—

$$\log.(1+x)-\log.(1+z)=A(x-z)+B(x^2-z^2)+C(x^3-z^3)+\&c. \quad (3)$$

But from the properties possessed by logarithms we know that log. $(1+x)-$ log. $(1+z)=$ log. $\frac{1+x}{1+z}=$ log. $\left(1+\frac{x-z}{1+z}\right)$; and on our bringing out the equation by the same means as log. $(1+x)$ was treated in the first equation, we obtain the result that log. $\left(1+\frac{x-z}{1+z}\right)=A\frac{x-z}{1+z}+B\left(\frac{x-z}{1+z}\right)^2+$ &c. Substituting, therefore, this development for log. $(1+x)-$log. $(1+z)$ in the third equation (3), and dividing both by $(x-z)$, there results,—

$$A\frac{1}{1+z}+B\frac{x-z}{(1+z)^2}+C\frac{(x-z)^2}{(1+z)^3}+\&c.$$
$$=A+B(x+z)+C(x^2+xz+z^2)+\&c.$$

Now, as this equation is true independently of any particular values of $x$ and $z$, let us suppose that $x=z$, and it becomes—

$$A\frac{1}{1+z}=A+2Bz+3Cz^2+4Dz^3+\&c.$$





which, on expanding the quantity $\frac{1}{1+z}$ by division, gives $A(1-z+z^2-z^3+z^4-$ &c.$)=A+2Bz+3Cz^2+4Dz^3+$ &c. Therefore, by the theory of indeterminate coefficients, we must have the separate equations $A=A$, $-A=2B$, $+A=3C$, $-A=4D$, &c.; and on substituting the resulting values of B, C, $D_4$ &c., in terms of A in equation (1), we get—

$$\log.(1+x)=A\left(\frac{x}{1}-\frac{x^2}{2}+\frac{x^3}{3}-\frac{x^4}{4}+\frac{x^5}{5}-\&c.\right)$$

The quantity A, which is still indeterminate, being the modulus, and assigning to it any particular value, we can at once characterize the system which we wish to consider. It would be impossible in the present article to enter at length upon the different theorems for the compilation of logarithmic tables, and nearly as useless, as the tables at present in existence are amply sufficient for all practical purposes. The history and theory of logarithms will be found in Hutton's "Mathematical Tracts," which enter upon the subject at length. The best tables extant are those of Babbage, which are most carefully collated and compiled. For navigation and astronomy, Farley's "Tables of Six-figure Logarithms" are the best. The use and application of logarithms in trigonometry will be found under TRIGONOMETRY.—*Ref.* Brande's *Dictionary of Science, Literature, and Art.*

LOGIC, *lod'-jik* (Gr. *logike*), considered in its most catholic relations, is the science of formal and material reasoning. In its strictly formal aspect, logic is the science of the necessary laws of thought; in its material aspect, again, it is the science of the laws of thought applied to practice. In the former sense it is a Science, in the latter it is an Art. In the one sense, thought is regarded as complete, perfect; in the other, it is regarded as limited, imperfect. The formula for material logic is *some is all*, the formula for pure logic is *all is all*. The latter, or *deduction*, is always expliositive of the contents of a thought; the former, or *induction*, is always ampliative or adding to the contents of a thought. As it is usual to consider these two phases of human reasoning apart, in the following brief outline, pure logic, or Deduction, will first be treated of, and next applied logic, or Induction.

I. *Pure Logic, or Deduction.*—It is necessary to observe that no progress in logic can be made without the preliminary assumption of the facts of psychology. In other words, the existence of sense, perception, memory, association, and so forth, lies at the basis of every process of reasoning. Pure logic is an *à priori* science, not an *à posteriori* one, for it deals exclusively with those truths on which all experience depends, rather than those truths which form the substance of experience itself. This system of doctrine owes its existence to Aristotle, who not only indicated its outline, he virtually created the science. In the progress of its history it has received various minor modifications and additions from various philosophers; but until Sir Wm. Hamilton's time no logician made material improvements on it from the days of the Stagirite himself. It is usual to divide formal logic into three parts:—1. *Concepts or notions*; 2. *Judgments*; 3. *Reasonings*. In other words, the formation of general notions, the decision whether those concepts agree or not, and the drawing of one such judgment from another. These parts in their order, and first of *Concepts*. This, by the way, is the most important part of logic, and one on whose laws the entire science may be regarded as in a great measure depending. What, then, is a concept? It is the result of an act, known as conception, which includes the comprehension of the various qualities of an object up to unity. Notions, again, are rather the apprehension of these qualities than the final bundling up of them, which belongs exclusively to conception. The two terms, however, are frequently used synonymously. When the mind, after surveying a series of objects, draws away (*abstrahère*) or abstracts a number of qualities from those objects, and classifies them, arranges them into orders or genera, generalises them in short, and gives a name to each class so formed, the process of conceiving or forming concepts may be said to have been gone through. It is obvious that a considerable variety will take place in the character of the concepts

so formed; some will be more general, some will be less general, though all will be reducible to genera and species. Thus, the individual, or single objects, as *this horse, that man*, being the names of so many facts or things on which logic is supposed to operate, belong neither to genus nor species, and are properly beyond its domain altogether. The lowest species (*infima species*) can never be a genus. The highest genus (*summum genus*) can never be a species. The subaltern genera (*genus subalternum*) are genera to those beneath them, and species to those above them. Thus, *Socrates* is an infima species, *being* is a summum genus, and *man* is a subaltern genus to Socrates and being. If we regard the *Quantity* of a concept, we recognize the classes or things of which it may be predicated, or the characters of which it is made up. In the former case, we regard the Extensive Quantity of concepts; in the latter, their Intensive Quantity. Thus, in the expression *man*, or *rational animal*, if I abstract the *rational* from *animal*, I thereby diminish the intensive or internal quantity of the concept, but increase its extension. For the term *animal* covers a much greater number of objects than *man*. The leading words that are employed in designating the quantity of concepts are, for their extension, *class* or genus; for their intension, *mark*, note, attribute, character. We amplify the extension of concepts by abstraction or generalization; we amplify their intension or comprehension by determination. We resolve the extension of a notion by division; we resolve its intension by definition. Hence an individual notion cannot be divided (*in-dividuum*), and a simple, or definite notion (*de-finitum*) cannot be defined. Again, as the characters of a concept may be more or less firmly seized by consciousness, more or less perfectly grasped, we have the logical *Quality* of concepts, or their relative clearness or distinctness, and their obscurity or indistinctness. The peculiar form which a concept assumes when recalled by the mind, brings us abreast of the most important controversy in all speculation,—that of Nominalism and Realism. Leibnitz's answer to this question is the one now adopted by all intelligent logicians. It is that, when concepts are recalled, we either comprehend the essential marks contained under the notion, or we only comprehend a few of those marks at the time, though we assume we know them. In the former case it is *intuitive* or notative knowledge we have of the notion, in the latter case it is *symbolical*. In the third place, concepts may be mutually compared as to their *Relation*, which consists in the reciprocal comparison of their various attributes. That is to say, that notions can only be compared as to their mutual extension, and as to their mutual comprehension one with another. So much for the doctrine of Concepts. We proceed now to the second part of logic; namely, *Judgments*. A judgment is the affirmation that two concepts can or cannot be reconciled, or (more correctly, that two concepts, a concept and a thing, or two individual things) agree or disagree. As we have just recognized a certain quantity, quality, and relation among Concepts, so we must now recognize a quantity, quality, and relation as affecting Judgments. This is why it was remarked some time ago, that the thorough comprehension of the doctrine of Concepts may be regarded as the thorough comprehension of the master principle of logic. In the judgment, *Socrates is rational; Socrates* is called the subject, *rational* the predicate, and *is* the copula. But in numerous propositions the copula is not expressed, it is merely understood. The first great distinction of judgments is taken from their quantity, or their relation of subject and predicate, as reciprocally whole and part. Is the predicate viewed as the containing whole? The judgment is pronounced an extensive one. Is the subject regarded as the containing whole? The judgment is an intensive or comprehensive one. Thus, in the proposition, *All plants grow*, if we view *grow* as the containing whole, we have a proposition in extension, as *All plants belong to the class of growing objects*. And if, in the same proposition, we view *plants* as the containing whole, we have a proposition in Comprehension, as *The attribute or mark of growing belongs to all plants*. But judgments have a certain quality as well as quantity, according as the subject and predicate reciprocally agree or disagree, affirm





or deny, in the quantities of extension and intension. In reference to their quantity and quality together, propositions are usually designated by the vowels A, E, I, O. The Universal Affirmative are denoted by A, the Universal Negative by E, the Particular Affirmative by I, and the Particular Negative by O. Or, to employ the mnemonic lines of Petrus Hispanus:

*Asserit A, negat E, sed universaliter ambæ;*
*Asserit I, negat O, sed particulariter ambæ.*

But these four species of proposition are obtained solely by determining the *quantity of the subject alone*, together with the quality of both subject and predicate. Now this is where the importance of Sir William Hamilton's "thorough-going quantification of the predicate" comes in. He proposes *not only to quantify the subject, but the predicate also*. Eight species of proposition are thus evolved, which taking A and I for universal and particular as in the Aristotelic notation, but extending them to either quality, and marking affirmation by an *f*, and negation by an *n*, we have the following sets of propositions:—

*Affirmatives.*

1. Toto-total=AfA=All X is all Y.
2. Toto-partial=AfI=All X is some Y. (A)
3. Parti-total=I =Some X is all Y.
4. Parti-partial: fI=Some X is some Y. (I)

*Negatives.*

5. Toto-total=AnA=Any X is not any Y. (E)
6. Toto-partial=AnI=Any X is not some Y.
7. Parti-total=InA=Some X is not any Y. (O)
8. Parti-partial=InI=Some X is not some Y.

Of all these judgments 6 and 8 are the weakest, yet it is always possible to allege that *any man is not some brute*, or that *some man is not some brute*. Yet it must be acknowledged that though these propositions are conceivable, they are of little practical utility. The third great division of judgments is their relation, or the coincidence or non-coincidence of subject and predicate. This relation is either simple or conditional. On the former alternative the proposition is *Categorical*, on the latter—inasmuch as the condition lies either in the subject alone or in the predicate alone, or in both the subject and predicate—it is *Hypothetical, Disjunctive*, or *Dilemmatic*. So there are four kinds of relation between the subject and predicate of a proposition, which may be exemplified as follows. *A is B* is the formula for a categorical judgment; *If B is, A is*, is a hypothetical one; *D is either B or C or A* is a disjunctive one, and *if X is A, it is either B or C*, is a dilemmatic one. We may remark in conclusion on this part of our subject, that the Aristotelic doctrine of the categories and of the predicables, as properly extra-logical, of course finds no place here. The third grand division of logic is *Reasoning*, or Syllogism, or the process by which one judgment is derived from another or more. And as in Concepts and in Judgments we have here recurring again the old relations of quantity, quality, relation. It must not be forgotten that the essence of syllogism consists in the production of a new and distinct judgment, not in the *truth* of any one of the given judgments. The *Premises* are the two given propositions or the antecedent, and the *Conclusion* is the proposition sought, or the consequent. The premise which announces the general rule is called the *Major*, the one which announces the application of the general rule is called the *Minor*, and the *Middle term* is that with which the two extremes of the conclusion are separately compared. The three propositions of a syllogism are frequently correctly expressed by the *Sumption, Subsumption*, and the *Conclusion*. Now there are two kinds of inference,—immediate and mediate. When we can decide at once, as soon as we understand the terms of the two propositions involved, whether they agree or disagree, the inference is termed *immediate*; but when we require to go in quest of a third or *middle* judgment or term with which each of the other judgments may be compared, the inference is called *mediate*. For example,—All good rulers are just, therefore no unjust rulers can be good, is a specimen of immediate inference; and,—All consumptions are mortal; this disease is a consumption; therefore this disease is mortal, is an example of mediate reasoning.

The different sorts of immediate inference can be pursued no farther here. There is a general canon for conducting Mediate reasoning, which may be thus expressed. The agreement or disagreement of one judgment with another is ascertained by a third judgment, inasmuch as this, wholly or by the same part, agrees with both or with only one of the conceptions to be compared. There are a number of general rules for the proper construction of syllogisms, which may be conveniently condensed as follows. Distribute the middle term (*i.e.* take it in its widest signification), let there be no fourth, and both premises must be neither particular nor negative. The conclusion then will follow the worst part (as "some flowers are blue"), and will neither distribute nor deny unless when the premises do so. All Mediate inference is properly one, —that often called by logicians the categorical, for the conditional and hypothetical syllogisms are all reducible by immediate inference. The regular syllogism, then, regarded as to its essential form, comes now to be considered. And first of the *figure*, or the position of the middle term in the premises, and of the *mode* or mood, or the formal value of the three judgments of a syllogism as to their quantity, quality, and relation. There is only one figure according to some logicians, three according to others, and four according to a third party. These are as follows, where S represents the subject, P the predicate of the conclusion, and M the middle term. Fig. I.—MP, SM, ∴ SP. Fig. II.—PM, SM, ∴ SP. Fig. III.—MP, MS, ∴ SP. Fig. IV.—PM, MS, ∴ SP. The Terms alone being here stated, the quantity and quality, indeed the Mood of the whole of the syllogisms, remain to be filled up; in other words, between M and P, for example, we may place either a negative or affirmative copula, and we may prefix either a universal or a particular sign to P. The Moods are ordinarily applied to each figure by the three letters which severally denote the quantity and quality of each judgment. Thus, AII, Fig. I., reads as follows, which can be readily verified by turning back to the mnemonic lines which were given under Judgments. All M is P; some S is M; therefore some S is P. And EIO, Fig. II., reads,—no P is any M; some S is some M; therefore some S is no P. IAI, Fig. III., reads,—some M is some P; all M is some S; therefore some S is some P; and so on. A few mnemonic lines of considerable convenience have been invented which serve to point out the various moods in each of the four figures, according to the old notation. They are as follows:—Fig. I.—bArbArA, cElArEnt, dArII, fErIOque prioris. Fig. II.—cEsArE, cAmEstrEs, fEstInO, bArOkO secundæ. Fig. III.—tertia, dArAptI, dIsAmIs, dAtIsI, fElAptOn, bOkArdO, fErIsO, habet; quarta insuper addit. Fig. IV. — brAmAntIp, cAmEnEs, dImArIs, fEsApO, frEsIsOn. There will be found nineteen legitimate modes in the whole of these figures, but sixty-two according to Sir William Hamilton's extended notation (for which see above to his extended judgments). Before leaving this part of the subject, it may be well to state that the first figure is the most perfect, that is to say, it exemplifies best the Aristotelic dictum *de omni et nullo*, or whatever is affirmed or denied of a class may be affirmed or denied of any part of that class. To take an example. All plants need light; sunflowers are plants; therefore sunflowers need light. Some logicians, as Aristotle, Kant, and Sir William Hamilton, throw overboard all the figures but the first, and with them of course annihilate reduction. Reduction is the process by which the other figures are brought under the form of the first figure. This is usually effected by changing the order of the terms, or where that cannot be done, by substituting a privative conception (as "unwise" for example) for a positive judgment, and then changing the order of the terms by conversion as it is called. As often occurs, many a piece of reasoning, being without subjects or predicates expressed, belongs properly to no figure. There have been, in all, three peculiar schemes of syllogistic notation,—those of Lambert, Euler, and Sir William Hamilton. The last is by far the simplest and most complete, but cannot be exhibited here. A conditional or hypothetical syllogism contains, of course, a conditional or hypothetical judgment, and a disjunctive syllogism contains a disjunctive judgment. These





have all been disposed of as belonging properly to immediate inference. When syllogisms are taken in their external form, we have three species of reasoning which require some elucidation. There is first the Epicheirema, or reason-rendering syllogism; there is, secondly, the Sorites, or chain-argument, as the Germans call it; and there is, thirdly, the Enthymeme, with one premise suppressed. To illustrate,—the Epicheirema is B is A; but C is B, for it is D; therefore C is also A. The Sorites is, A is B, B is C, C is D, D is E; therefore A is E; reduced to B is C, A is B, therefore A is C; C is D, A is C, therefore A is D; D is E, A is D, therefore A is E. The Enthymeme, as a kind of colloquial argument, needs but little illustration here. All these species of reasoning have various forms. Besides these, there are the Monosyllogism, where the reasoning is viewed as an independent whole; the Prosyllogism, whose conclusion is a premise in a given syllogism; and the Episyllogism, whose premise is a conclusion in a given syllogism. These arguments very frequently occur in life. It should not be forgotten, however, that the simple syllogism is the type of all reasoning. So much for formal logic.

II. *Material Logic, or Induction* (the *epagoge* of Aristotle), signifies properly the drawing of a general law from a sufficient number of particular cases. It is distinguished from pure logic by caring wholly for the *matter*, or facts, or truth of its objects, while the former is occupied entirely with the correctness of the *form* of thought. And here, at the outset, it is necessary to take a distinction, which may be of great use afterwards. There is what is called a *perfect* induction and an *imperfect* one. The perfect one is when the investigator has been able to examine *all* the particular instances on which this law is founded; the imperfect induction, again, forms ninety-nine one-hundredths of all inductive reasoning, and mounts at once from the *some* cases in which the law holds to the *all*. Perfect induction was denominated by Bacon *res puerilis*, as it on very few occasions can *add* anything to what one is already in possession of. Indeed, it is often taken up under the formal syllogism. The latter, again, *imperfect* induction, is the peculiar kind of all ordinary scientific induction. And the great canon or principle, which is itself a principle of induction, on which this form of material science rests, is the constancy and uniformity of nature's laws. Or, more articulately expressed, it runs thus,—*under the same circumstances, and with the same substances, the same effects always result from the same causes.* Material, or applied logic, to fulfil its aim, must have attained,—1. to as true statements as possible respecting the objects with which it deals; 2. it must be able to define those objects with as much clearness and precision as possible; 3. it must be able to indicate the extent of those objects; and, 4. it must exhibit its results in a systematic manner. These preliminary obligations being imposed upon it, it requires, in the second place, to be able to answer the following four leading questions:—1. How are the causes of phenomena to be distinguished among a multitude of other phenomena all open to observation? 2. How are causes to be discovered which are less open to observation than the effects produced by them? 3. When should an incomplete enumeration of facts be deemed sufficient, and on what principle? 4. How should new laws be expressed and recorded? These questions, in their order.—1. How the causes of phenomena are to be distinguished. It must be here observed, respecting causation, what the scholastic writers never forgot, that it is properly all the associated causes—the concauses, as it is sometimes phrased, that make up what is ordinarily denominated "the cause" of a thing. And every event has more than one cause when strictly analyzed. Yet men, nevertheless, inquire for "the cause" of a phenomenon; and justly enough, for what they want is the most influential agent in the production of the result. It requires no labour beyond "simple enumeration," to enable one to discover such very uniform and regular laws as the recurrence of the tides, and the law that all weighty bodies fall. But it requires a great degree of patient observation and research to discover that the one phenomenon is connected with the moon's influence, and that the other depends on the higher law of gravitation. All may

open to the observation of these phenomena had a rude notion of the tides and of falling bodies, but it required a Newton to complete the theory of both the phenomena. The chief rules which regulate the inquiry after causes are the following:—1. While the same effect may sometimes arise from different causes, yet the cause must always be sought among the invariable concomitants of the effect. 2. If an effect is not produced under certain circumstances, this either indicates the absence of the cause, or the presence of a counteracting one. 3. The cause is often suggested by analogy. 4. The cause is often indicated by the variation of degree of the effect. 5. The more forms of the effect that are studied, the greater is the probability of finding out the cause. 6. A suspected cause may be tested by allowing it to operate under less-complicated circumstances. 7. Where complications exist, every cause should be noted and registered down to the minutest detail. So much for the answer to the first question.—2. Causes are sometimes discovered which are not obvious, even after careful observation and detailed experiment, by what is called Anticipation. Such was Oken's discovery of the vertebrate character of the skull of the reindeer, which he stumbled over during an excursion to the Hartz mountains. Such, too, was Goethe's discovery of the morphology of plants,—that the various parts of a plant are only metamorphosed leaves. The facts of an induction being given, a "Conception," as it is sometimes called, must step in, in order to afford a provisional support or temporary cause to the phenomena. Again, Conceptions not wholly correct may often serve for a Colligation of facts until a better Colligation is afforded those facts. Thus, the *circular* motion of the heavenly bodies was for a long time only a conception; now it is known they move in elliptical orbits.—3. This third question has in a great measure been answered by the preliminary observations on the laws of nature. As soon as a process of induction has been completed, it then forms the ground for a legitimate induction. Analogy depends upon the principle that the same qualities may be assigned to distinct but similar objects, provided those qualities can be shown to accompany the points of resemblance in those objects, and not their points of difference. Thus, if we remark the analogy between man and a tree, and observe that they both grow gradually to a certain height, after which they both decay, and that both depend for their subsistence on receiving appropriate food, moisture, and air, we have noted those qualities which belong to them in common. But if we proceed farther with our analogy—"carry out our analogy," as the phrase is—we go wrong; for man is not stationary like a tree, neither does he grow up conically, and has no "bravery" of leaves. Reasonings involving Chance may likewise be admitted into inductive philosophy, for chance is just the amount of probability with which we expect one or other out of two or more uncertain events. The laws that govern this department of "probabilities" are various, and cannot be entered upon here.—4. New laws may be expressed,—1. by applying fresh definitions to old words; 2. names possessing an explanation of their own may have new ideas attached to them; 3. entirely new names may be invented, but accompanied always with a precise definition; 4. chemistry affords excellent examples of the mode of forming new names. The principles of inductive reasoning are afforded (*a*) by the senses, (*b*) by instruments, which constitutes properly observation, (*c*) by the testimony of others, (*d*) by the aggregate observations of men. No logical principle can be put into practice without the possibility of conscious or unconscious *Error*. Where error is consciously unfolded, it is for the purpose of deceiving others, and is properly a Sophism; where it is unfolded unconsciously, we deceive ourselves and fall into a Paralogism. In either case we commit what logicians denominate a *Fallacy*. The causes and occasions of error arise as follows:—1. In the general circumstances which govern the intellectual character of the individual; 2. in the constitution and habits of his powers of thought, feeling, and desire; 3. in the language which he employs; 4. in the nature of the objects upon which he is engaged. Again, the fallacies which men are guilty of are properly of two classes,—formal and material. The formal fallacy most frequently occurs in the regular syllogism, and usually arises from the vice of having four instead of three terms. Under this genus are comprised three species. The material fallacy is the most frequent. It arises from making a universal conclusion where we are not warranted to do so by the premises, or from a notion which is not in reality a middle term, we infer a conclusion. Some five or six fallacies belong to this genus. The various degrees of belief, according to Aristotle, are, 1. problematical, 2. assertory, or 3. demonstrable,—in other words, are the results of opinion, belief proper, and science. 1. The problematical judgment is neither subjectively nor objectively true; it is neither maintained with complete certainty by the mind, nor can the object about which we judge be truly represented. Meanwhile, it is mere opinion, but it may afterwards become matter of proof, and then this opinion is elevated to demonstrable truth. Every great discovery is at first a problem, or a thing to be proved; and it depends on the sagacity and genius of the investigator whether it is to take its place among the proven theorems of knowledge. The best course of conduct for us under doubtful circumstances, historical records about which there is conflicting testimony, and so forth, are all of this problematical character.—2. In the next place, the assertory kind of knowledge is one of which we are fully persuaded ourselves, but cannot lay down the grounds for our belief so as to compel men to side with us. It is subjectively true, but not objectively certain. We have what is called "a moral persuasion" of it, but cannot exhibit the common grounds of our conviction.—3. Demonstrative knowledge, again, is either subjectively or objectively true, or both. It may either be certain in itself, as an axiom in mathematics, or conditionally certain, as, The sun will rise to-morrow, if the laws of nature maintain their constancy.—*Ref.* On Pure Logic, consult *Lectures on Logic*, by Sir William Hamilton, 2 vols., 1860; *An Introduction to Logical Science*, by Professor Spalding, 1857, or the art. "Logic" in the 8th edition of the *Encyclopædia Britannica*; Archbishop Thomson's *Laws of Thought*, 5th edition, 1860; Archbishop Whately's *Elements of Logic*, 1850; &c. &c. On Material Logic, the best work is that of John S. Mill, *Logic, Ratiocinative and Inductive*, 2 vols., 1862.

LOGOGRAPHY, *log-og'-ráf-e* (Gr. *logos*, a word; *grapho*, I write), a method of reporting speeches without having recourse to shorthand. It was put in practice during the French revolution. About twelve reporters arranged themselves round a table, each of them having a long slip of paper numbered before him. The first three or four words were taken down by the writer of No. 1; and as soon as they were spoken, he gave notice to his neighbour by touching his elbow, or some other sign. No. 2 then passed the sign to No. 3; and so on till the first line of each slip was completed, when No. 1 commenced the second line. When filled up, all the slips were placed parallel to each other, and formed a single page. Logography was not found to answer in practice; it required too great attention and quickness for correctness. It was first employed in the National Assembly, in October, 1790, and continued till the 10th August, 1792, when Louis XVI., with his family, took refuge from the insurrection in the Assembly, and occupied the box of the logographe: from that time it was discontinued. The term logography also denotes a mode of printing, in which whole words are used instead of letters. It was used for a short time in the *Times* printing office, but soon abandoned.

LOGOGRYPH, *log'-o-grif* (Gr. *logos*, a word; *graphos*, an enigma), a word used by Ben Jonson, and almost obsolete, signifying a sort of riddle to exercise the mind.

LOGOS, *log'-os*, is a Greek term, signifying the word. In theological language, Logos, or the Word, is applied to the Son of Man. The Jews used the term *memra*, which corresponds to logos, or word, but as synonymous with Jehovah, or as denoting the mere token or symbols of the Divine presence. There are some eminent critics, however, who are of opinion that the Targumists employed this word to denote the future Messiah. The term logos, as used by Plato, is rather ambiguous. It is uncertain whether by it

he means to denote a distinct intelligent being, or merely the divine attributes of deity. "St. John," says Professor Burton, "was as far as possible from being the first to apply the term *logos* to Christ. I suppose him to have found it so universally applied, that he did not attempt to stop the current of popular language, but only to keep it to its proper channel, and guarded it from extraneous corruptions." He holds that it is one of the peculiar objects of St. John's Gospel to show in what sense the term *logos* can properly be applied to Christ. Mystical notions regarding the logos were derived, by the Christian Platonists, from the school of Alexandria; and hence many of the Fathers maintained that the Logos was an attribute of God, and that this attribute became the person of the Son, and was afterwards united to Jesus Christ. The Unitarians consider the word logos to be applied either to God himself, or to certain of his attributes; as reason or intelligence. The Arians look upon the Logos as an emanation from the Supreme Being, superior to all other created beings, and which supplied the place of a human soul in Christ. Dr Lardner, in his "Letter on the Logos," states that he was at first favourable to the doctrine that the Logos was the soul of Christ; but being at a loss to conceive how that high being, the highest of God's creatures, should gain any exaltation by receiving, after his resurrection, and ascension, a bright resplendent human body, and being made lord and king of men, the judge of the world, and higher than the angels, to whom he was vastly superior before, abandoned this hypothesis as throughout inconceivable and irreconcilable to reason. Trinitarians regard the term as being specially appropriate to Christ, who is a revelation of God the Father unto men.

Logwood, *log'-wood*, a very valuable dyestuff, consisting of the cuttings or raspings of the wood of the *Hæmatoxylon campechianum*, a tree growing in Mexico and the neighbouring countries. It is extensively employed for dyeing black with alum; but acids change the colour to red immediately. Its dyeing properties are due to its containing a crystalline matter called *hæmatoxylon*, which is straw-yellow in its pure state, but assumes a brilliant red under the influence of oxygen and alkalies.

Loimic, *lo-im'-ik* (Gr. *loimos*, contagion), in Med., denotes relating to the plague, or to contagious disorders.

Loins, *loins* (Welsh *llwyn*), is applied to the lower and posterior part of the trunk of the body, or the space between the upper edge of the pelvis and the last of the ribs. The lower end of the vertebral column is in this region, and the vertebræ composing it are termed the lumbar vertebræ.

Lollards, *lol'-lards* (Ger. *lollharden*), were a class of persons who appeared in Germany and the Netherlands about the beginning of the 14th century. The name is believed to come from the German word *lullen*, or *lollen*, to sing with a low voice, and the termination *hard*, denoting frequency, and not, as some are of opinion, from Walter Lollard, who suffered martyrdom at Cologne in 1322. A number of pious laymen formed themselves into a society at Antwerp, for the purpose of visiting the sick and burying the dead during a season of pestilence, when the clergy deserted their duties. They soon spread to other parts, and succeeded in attracting the attention and love of the great mass of the people. On this account they excited the envy of the clergy, who accused them of holding many heretical opinions. Doubtless, too, they may have held certain opinions at variance with the teaching of the Church of Rome, but there is no shadow of ground for accusing them of holding the extreme views, or of practising the vicious conduct, that has sometimes been attributed to them. The term came afterwards to be applied generally to all who were believed to hold heretical opinions; and hence the followers of Wickliffe were called Lollards.

Lombard, *lom'-bard*, was a term anciently applied in England to a banker or money-lender, from the Lombards, a company of Italian merchants, chiefly from Lombardy, who were settled in London as early as the middle of the 13th century, and had their residence in a street which still bears their name. These were the great bankers and money-lenders of the day. Stow, in his "Survey of London," says, "Then have ye Lombard Street, so called of the Longobards, and other merchants, strangers of divers nations, assembling there twice a day."

Lombardic Architecture. (*See* Romanesque Architecture.)

Lomentum, *lo-men'-tum* (Lat.), in Bot., a kind of fruit. It may be described as a *legume* or *pod*, which is contracted between each seed in a moniliform manner. When ripe, the lomentum commonly separates into as many pieces as there are contractions on its surface; sometimes, however, it remains entire.

London Clay, *lun'-dun klai*, a term applied in Geol. to the older group of regularly-deposited tertiary strata in England. It is distinguished from the more recent group, which is called "crag." The different strata which together compose what is called the London clay deposit, are chiefly exhibited in basin-shaped depressions in the chalk, one of which occurs between the line of the North Downs and the chalk of Cambridgeshire, Hertfordshire, and Suffolk; and another between the South Downs and the continuation of the same range into Dorsetshire and the English Channel: the former is called the London, and the latter the Hampshire basin. In the Isle of Wight there is also a third basin, remarkable for the presence of some fresh-water fossiliferous strata, not found in the other parts of the formation. London clay proper consists of tenacious brown and bluish-grey clay, with layers of concretions called septaria, which chiefly abound in the brown clay, and are obtained in sufficient quantities from the cliffs near Harwich, and from shoals off the Essex coast, to be used in the manufacture of Roman cement. The principal localities of fossils in the London clay are Highgate Hill, near London, the Isle of Sheppey, and Bognor, in Hampshire. The total thickness of the London clay amounts to considerably more than a thousand feet. Its lower part consists of an indefinite number of beds of sand, shingle, clay, and loam, irregularly alternating with one another, and formerly looked upon as a distinct formation, and described under the name of the "Plastic Clay." For more than half a century the strata called London and Plastic clay in England have been studied, and about 400 species of shells, 50 or more of fish, besides several kinds of chelonian and saurian reptiles, were known before a single mammifer was detected. At length, in the year 1839, there were found in this formation the remains of a monkey, an opossum, a bat, and a species of the extinct Hyracotherium, allied to the Peccary or Hog tribe. Some years later, in 1846, the jaw of another British species of fossil monkey, *Macacus pliocenus*, was announced by Mr. Owen as having been met with in the newer pleiocene strata in Essex, along with the remains of the hippopotamus, elephant, and other quadrupeds. The presence of the fossils of crocodiles, turtles, shells of the genus nautilus, and many curious fruits, lead geologists to believe that the climate of the era when the London clay was deposited was warm, and nearly tropical.

Long, *long* (Lat. *longus*), the name applied in ancient music to that note which was second in duration to the Large, and equal to two breves, or four semibreves, or eight minims, or sixteen crotchets; and so on.

Longevity, *lon-jev'-e-te* (Lat. *longa vita*, long life), signifies length of life. After the creation of the world, when its inhabitants were few, the age of man was much longer than it now is. The age of the greatest part of those recorded to have lived before the Flood was upwards of 900 years. After the Flood, Shem is the only one that we read of that reached the age of 500. In the 2nd century we do not find that any reached the age of 240; and in the 3rd century (about the latter end of which Abraham was born), none except Terah arrived at 200. By this time the world was so well peopled that they had built cities, and were formed into distinct nations, living under their respective kings. By degrees, as the number of people increased, their longevity decreased, till it came down at length to 70 or 80 years; and there it has stood ever since. Instances, however, are by no means rare of persons who have exceeded that limit. According to the census of Great Britain in 1851, more than 125,000 had passed the limit of fourscore years; nearly 10,000

had lived 90 years or more. A band of 2,038 aged pilgrims had been wandering 96 years, or more, on the unended journey, and 319 reported that they had witnessed more than 100 revolutions of the seasons. Many instances are cited of men living in the ancient world more than 100 years; and Lord Bacon, in his "History of Life and Death," quotes as a fact unquestioned, that, a few years before he wrote, a morris dance was performed in Herefordshire, at the May games, by eight men, whose united ages amounted to 800 years. In the 17th century, some time after Bacon wrote, two Englishmen are reported to have died at ages greater than almost any of those which have been attained in other nations. According to documents which are printed in the "Philosophical Transactions of the Royal Society," Thomas Parr lived 152 years and 9 months, and Henry Jenkins 169 years. The evidence, however, in these cases is by no means conclusive, as it evidently rests on uncertain tradition, and on the very fallible memories of illiterate old men. There is every reason to believe that as civilization extends, as the laws that affect health are understood and acted upon, the duration of life will be much increased. Instances of longevity show what the human frame is capable of attaining to; and as the laws of health come to be more acted upon, healthier parents will give birth to healthier children from generation to generation; indeed, there are not wanting those who look upon the natural duration of life as a hundred years, and who literally receive the language of the prophet, that "there shall be no more thence an infant of days, nor an old man that hath not filled his days; for the child shall die a hundred years; but the sinner being a hundred years old shall be accursed. And they shall build houses and inhabit them; and they shall plant vineyards and eat the fruit of them. They shall not build and another inhabit: they shall not plant and another eat: for as the days of a tree are the days of my people, and mine elect shall long enjoy the work of their hands."—(Isaiah lxv. 19—22.) The preservation of health ought to form an essential part of municipal and national policy.—(*See* Sanitary Science.)

Longicorns, *lon'-je-korns* (Lat. *longus*, long; *cornu*, a horn), an order of coleopterous insects, so called on account of the length of their antennæ, which are generally longer than their bodies, and very seldom shorter. Longicorn insects also possess other distinctive characters. The under part of the first three joints of the tarsi, in all of them, is furnished with a brush; the second and third joints are cordiform; the fourth is deeply bilobate; and at the base of the last there is a little nodule, resembling a joint. The antennæ are either filiform or setaceous; being sometimes simple in both sexes, and sometimes serrate, pectinate, or flabelliform in the males. In some species, the eyes are rounded and entire; in others, slightly emarginate; in the latter case, the thorax is trapezoidal or narrowed anteriorly. In most cases, however, the eyes of the longicorns are reniform, and surround the base of the antennæ. The larvæ of a great number of the longicorns are destitute of feet, or have very minute ones, as a large proportion of them live in the interior of trees or under the bark. Their body is soft, whitish, and thickest in the fore part; and the head is squamous, and furnished with strong mandibles. The larger varieties of the longicorns often do great damage to trees, sometimes drilling them in every direction. Some species attack the roots of plants.

Longissimus Dorsi, *lon-jis'-si-mus dor'-si* (Lat., the longest [muscle] of the back), in Anat., is a muscle of the back, which rises from the posterior surface of the os sacrum and transverse and oblique processes of the lumbar vertebræ, and is inserted by small double tendons into the posterior and inferior part of all the transverse processes of the vertebræ of the back, sending off also bundles of fibres to all the ribs between their tubercles and angles. Its use is to support the spine, and bend it backwards and to one side.

Longitude. (*See* Latitude and Longitude.)

Longus Colli, *long'-gus kol'-li* (Lat., the long [muscle] of the neck), in Anat., is a muscle situated close to the anterior and lateral part of the vertebræ of the neck. It rises from the three superior vertebræ of the back, and is also connected by tendons with the four last vertebræ of the neck, being inserted into the fore part of the second vertebra of the neck, near its fellow. Its use, when acting singly, is to move the neck to one side; but when both act, they serve to bring the neck directly forwards.

Lonicera, or Honeysuckle, *lon-is'-e-rā* (*Lonicera*, named after Adam Lonicera, a German botanist, who died in 1586), a gen. of very ornamental shrubs, closely allied to the genus *Caprifolium*. The species grow in any common soil, and are readily increased by cuttings taken off in autumn and planted in a sheltered situation. There are several indigenous species in England, amongst the best known of which are,—1. The pale perfoliate honeysuckle (*L. caprifolium*), which grows in woods and thickets, but is not common; when it meets with support, it grows to a considerable height. The leaves are sometimes used in detersive gargles. 2. Common honeysuckle, or woodbine (*L. periclymenum*), is a common shrub in almost every grove, thicket, and hedge, and flowers from June to October. This is a favourite plant in gardens and shrubberies. Goats are very partial to the leaves of woodbine, for which reason the French call the plant *chèvre-feuille* (goat-leaf). 3. The upright fly honeysuckle, a species which flourishes in thickets on rocky places. It is a shrub of little beauty, and no known utility. The flowers, however, of several of the species are highly fragrant and ornamental, and the form of the common European honeysuckle is supposed to have given rise to one of the most beautiful ornaments of Grecian architecture.

Looking-glass. (*See* Mirror.)

Loom, *loom* (Ang.-Sax.), a machine or framework of wood or metal, for manufacturing cloth by interweaving a series of parallel threads, which run lengthwise, called the *warp*, with another series of threads which run transversely, called the *woof* or *weft*, by means of the shuttle. (*See* Weaving.)

Loosestrife. (*See* Lythracem.)

Loquat, *lo'-kwāt*, the fruit of the *Eriobotrya japonica*, a rosaceous plant.

Loranthaceæ, *lo-rān-thā'-se-e*, in Bot., the Mistletoe fam., a nat. ord. of *Dicotyledones*, sub-class *Monochlamydeæ*. Parasitic shrubby plants. Leaves commonly opposite, exstipulate, greenish. Flowers perfect or dioecious; calyx superior, with 3—8 divisions, æstivation valvate, — sometimes the calyx is absent; stamens equal in number to, and opposite, the lobes of the calyx; ovary inferior, 1-celled, with 1—3 ovules, erect or suspended, and a free central placenta. Fruit commonly succulent, 1-celled, with a solitary seed; embryo in fleshy albumen, with radicle remote from the hilum. Miers has separated this order into two, *Loranthaceæ* and *Viscaceæ*, the former being characterized by its large showy crimson dichlamydeous perfect flowers; and the latter by its pallid dioecious monochlamydeous flowers. Lindley and Bentley do not adopt this division. The plants of the order are more remarkable for their curious mode of growth than for their useful properties. One species, *Loranthus tetrandus*, a native of Chili, produces a black dye. The mistletoe yields a viscid pulp, used for making birdlime. (*See* Viscum.)

Lorcha, *lor'-ka*, is the name of a coasting vessel used in the Chinese seas. It was the boarding of one of these vessels, sailing under the British flag, by the Cantonese, that led to the war with China in 1856.

Lord, *lord* (Sax. *hlaford*, *laford*, contracted lord), denotes a ruler or governor. It primarily denotes a bread-giver, from *hlaf*, bread, and *ford*, to give or afford. In feudal times the lord (*seigneur*) was the grantor or proprietor of the land, who retained the dominion or ultimate property of the feud or fee; and the grantee, who had only the use or possession of the land, was styled the feudatory or vassal. A person who has the fee of a manor, and consequently the homage of his tenants, is called the lord of the manor. The superior lord is styled lord paramount, and his tenants, if they grant a portion of the land to other persons, while they remain tenants in reference to the lord paramount, are lords in reference to their own tenants, and are hence styled mesne or middle lords. Lord in gross is one who is lord not by reason of any manor; as the king in respect of his crown.

Very lord is he who is immediate lord to his tenant, and very tenant he who holds immediately of his lord. Thus, where there is a lord meane, he is very lord to his tenant, and not the lord paramount. Lord is also a mere title of dignity attached to certain official stations, which are sometimes hereditary, but sometimes only official or personal. All who are noble by birth or creation, otherwise called lords of parliament and peers of the realm, are styled lords. The five orders of nobility constitute the lords temporal, distinguished from the prelates of the Church, who constitute the lords spiritual in the House of Lords. (*See* PARLIAMENT.) Lord is also applied to persons holding certain offices; as the lord chief justice, the lord mayor, &c. It is likewise given by courtesy to the sons of dukes and marquises, and to the eldest sons of earls. In the authorized translation of the Scriptures, it is used, without much discrimination, for all the names applied to God; but when it represents the great name of Jehovah, it is printed in small capitals. In the New Testament, it is applied to Jesus Christ, the term in the original Greek being *kurios* (owner or master).

LORD ADVOCATE is the principal law officer of the crown in Scotland, analogous to the Attorney-General in England. He has to plead in all causes that concern the crown, and he also acts as public prosecutor. He exercises a superintending power over all prosecutions in inferior courts and the general administration of criminal justice, and has the nomination of a certain number of deputes. These deputes assist him in the Court of Justiciary, and are despatched by him to the several circuits of that court to prosecute indictments there. He and his deputes have power to pass from or restrict any charge. He can prosecute, independently of the private party, in any court, superior or inferior; but he cannot be compelled to prosecute. He has a seat in the House of Commons, and attends during the sitting of parliament, introducing such bills as relate to Scotland, and taking charge of their details in passing through the house. He is also the adviser of the government in all matters of difficulty connected with Scotch affairs, and is in constant confidential communication with the home secretary of state, and transacts many of those duties in Scotland which in England form the business of the home secretary. He receives a salary of £1,500, with £1,000 additional as a commutation for his fees in the justiciary business. The office is not very ancient; for it seems to have been established about the beginning of the sixteenth century. Previous to that time, indictments seem to have been under the superintendence of the clerk of court, or justice-clerk. (*See* JUSTICE-CLERK.)

LORD KEEPER, an ancient officer of the crown, who was intrusted with the custody of the great seal, with authority to affix it to public documents. He was created by the mere delivery of the king's great seal into his custody, without writ or patent. Prior to the reign of Henry III. the office of keeper of the great seal appears to have been distinct from that of chancellor; but in that reign both offices were conjoined in Ralph Nevill. The act 5 Eliz. c. 18, declared that the same place, authority, and power belonged to the office of the lord keeper of the great seal as to that of lord chancellor. Now the lord chancellor is keeper of the great seal, and when there is no chancellor, it is ordinarily put in commission. (*See* CHANCELLOR.)

LORD LIEUTENANT OF IRELAND is the chief executive officer of the Irish government, representing, in some respects, the power and majesty of the crown. Before the legislative union of that country, and when the means of communication were slow and difficult, the lord lieutenant wielded the powers of the crown almost as completely as the monarch himself could have done during any temporary residence in that country. By degrees, however, this functionary has been stripped of much of his regal independence, and practically he is now little more than the resident official through whom the secretary of state for the home department conducts the government of that country. It now rarely happens that the lord lieutenant takes any important step without the advice and sanction of the home secretary. In cases of sudden emergency, however, his power of independent action is complete, and of as much authority as that of the crown. He is





always a nobleman of high rank and commanding station, and maintains an establishment of a regal character, holding courts, levees, and drawing-rooms, and conferring the honour of knighthood. He bears the sword of state as a symbol of his viceregal power. He is at the head of the administration of justice, and has power to pardon criminals or to commute their sentences. His household consists of a private secretary, steward, comptroller, chamberlain, gentleman usher, master of the horse, and subordinate officers. He has a fixed yearly salary of £20,000 and two residences, one in Dublin Castle, another in Phœnix Park. In the discharge of his public duties he enjoys the assistance of a privy council composed of the great officers of the crown in Ireland, and others appointed by the crown. His chief secretary, who may be said to be his prime minister, exercises many of the vice-regal functions. He is usually a member of the House of Commons, of considerable ability, and chiefly manages the affairs of the Irish government in London, having for that purpose an establishment of under-secretaries and clerks, both in London and Dublin. Both these high officers resign on the formation of a new ministry.

LORDS LIEUTENANT OF COUNTIES are permanent provincial governors appointed by the crown by letters patent under the great seal, and holding office during pleasure. These officers began to be introduced as standing representatives of the crown to keep the counties in military order about the reign of Henry VIII. or his children, previous to which it was usual for the kings, from time to time, to issue commissions of array, and to send into every county officers in whom they could confide, to muster and array (or set in military order) the inhabitants of every district. The lords lieutenant are generally of the principal nobility, and of the best interest in the county. They are at the head of the magistracy, the militia, and the yeomanry, and are the chief local executive authorities. Their chief authority is military, and is exerted for the preservation of the peace, for which they are considered responsible within their respective counties. They have the nomination of the entire staff of deputy-lieutenants and of the officers of the militia and volunteer corps, and also for the commission of the peace. He is also an officer under the lord chancellor, having charge of the records of the county, and appoints the clerk of the peace. The lords lieutenant are appointed from party motives, but hold their offices independent of politics, for life.

LORD OF MISRULE was the title borne by the master of revels at Christmas, in any nobleman's or other great house. "First in the feast of Christmas," says Stow, "there was in the king's house, wheresoever, a lord of misrule or master of merry disports, and the like had ye in the house of every nobleman of honour or good worship, were he spiritual or temporal." "These lords, beginning their rule at Allhallows eve, continued the same till the morrow after the feast of the Purification, commonly called Candlemas-day; in which space there were fine and subtle disguisings, masks, and mummeries, with playing at cards for counters, nayles, and points, in every house, more for pastime than for gain." According to an original draft of the statutes of Trinity College, Cambridge, founded in 1546, one of the masters of arts is to be placed over the juniors every Christmas for the regulation of their games and diversions at that season of festivity. Under his direction and authority, Latin comedies and tragedies were to be exhibited in the hall; as also *six spectacula*, or as many dialogues. His sovereignty was to last during twelve days at Christmas, and he was to exercise the same power on Candlemas-day. A Christmas prince, or lord of misrule, was also a common temporary magistrate in the colleges at Oxford. At the inns of court, too, a Christmas prince, or revel-master, was constantly appointed. The lords of misrule in colleges were preached against at Cambridge in the reign of James I. as inconsistent with a place of religious education, and as a relic of the pagan ritual. They disappear after 1640. In Scotland, where the Reformation took a more severe and gloomy turn than in England, the Abbot of Unreason, as he was called, was suppressed by legislative enactment as early as 1555.—*Ref.* Brand's *Popular Antiquities*.

LORD PRIVY SEAL is the fifth great officer of state

in England. His office is one of great trust, honour, and antiquity. He derives his title from the fact of his having the custody of the privy seal, which he must not put to any grant without good warrant under the monarch's signet; nor to any warrant if contrary to law and custom, or inconvenient, without first acquainting his sovereign therewith. This seal is used to all charters, grants, and pardons signed by the sovereign before they come to the great seal. The lord privy seal is appointed by letters patent, is a privy councillor by his office, and takes place next after the lord president of the council, and before all dukes. His salary is £2,000 per annum.—*Ref.* Thom's *Book of the Court*.

LORD'S DAY (Lat. *dies dominica*) was the term generally made use of by early Christian writers to distinguish their sabbath from that of the Jews, as well as from the Sunday of the pagans. Regarding the institution of this day as one specially set apart for religious worship, we find little information in the New Testament; we are only told of one occasion on which the disciples came together on the first day of the week to break bread, when Paul preached unto them. It is not till the time of Justin Martyr (A.D. 140) that we find a distinct account of its observance; he states that Christians were in the practice of assembling for public worship on the first day of the week, as being that on which the work of creation was commenced, and on which Christ rose from the dead. According to Eusebius, "Christ, by the new covenant, translated and transferred the feast of the Sabbath to the morning of light, and gave, as the symbol of true rest, the saving Lord's day, the first day of the week. On this day we do those things according to the spiritual law, which were decreed for the priests to do on the sabbath; all things proper to do on the sabbath we have transferred to the Lord's day." The early Church, for several centuries, kept both the Jewish sabbath and the Lord's day, the former being observed as a fast, or season of preparation for the latter. The council of Laodicea, A.D. 364, at length reprobated this practice, and condemned those who abstained from work on the seventh day, "for it was Judaising; but on the Lord's day men should rest as Christians." Constantine the Great (A.D. 321) first made a law for the proper observance of the Lord's day. Though the practice was to abstain from worldly callings on that day, a portion of it at least came to be devoted to sports and pastimes, such as are still common in continental countries. Plays are said to have been performed on Sunday at the court of Queen Elizabeth, and even of Charles I.; and James I., in his "Book of Sports" (1618), declares that dancing, archery, leaping, vaulting, May-games, Whitsun ales, and morris-dances, were lawful on Sundays after evening service. By the laws of King Athelstan, all merchandizing was forbidden on the Lord's day, under severe penalties; and by 27 Henry VI. c. 5, no fair or market should be held on any Sunday (except the four Sundays in harvest), on pain of forfeiting the goods exposed for sale. By 1 Elis. c. 2, all persons, without lawful excuse, are to resort to the parish church on Sundays, or to forfeit twelve pence. By 1 Car. I. c. 1, no persons shall assemble out of their own parishes for any sport whatsoever upon this day; nor in their parishes shall use any bull or bear-baiting, interludes, plays, or other unlawful exercises or pastimes, on pain that every offender must pay 3*s.* 4*d.* to the poor. By 29 Car. II. c. 7, no tradesman, artificer, workman, labourer, or other person whatsoever, shall do or exercise any worldly labour or business, or work of their ordinary callings, on the Lord's day (works of necessity and charity only excepted); and it also prohibits the sale and hawking of wares and goods. By 21 Geo. III. c. 49, no house or other place shall be opened or used for public amusement, or public debate on any subject whatever, upon any part of the Lord's day. The statute 29 Car. II. c. 7, is still regarded as the basis of the law on this subject, and being prohibitory, it is construed rigorously. Thus the words "any worldly labour" are limited to works of one's ordinary calling; and a man who sold a horse on Sunday was allowed to recover the price thereof, as it was not his ordinary calling; and a contract of hiring between a farmer and a labourer on Sunday has been held to be good. The words "other person whatever" are restricted to persons of the same classes as those enumerated by name; and hence drivers and proprietors of stage coaches are not included, and a contract to carry passengers on Sundays is valid. A bill of exchange drawn on Sunday is not void. In law, this is a *dies non juridicus*, a day on which no law proceedings can be taken; but an arrest for crime can be effected on this day; and bail can arrest their principal, and a sergeant-at-arms can apprehend. (*See* SABBATH.)

LORDS, HOUSE OF. (*See* PARLIAMENT.)

LORD'S SUPPER. (*See* EUCHARIST.)

LORICA, *lor-i'-kă* (Lat. *lorum*, a thong), a cuirass, or coat of mail, worn by the ancient Greek and Roman soldiers. At first, the cuirass was made of linen, but afterwards pieces of horn, cut in the shape of scales, were bored and sewn together, so that the scales overlapped one another, and in general appearance resembled the surface of a green fir-cone. These loricæ were used in hunting, and not in fighting. The use of cuirasses of this sort immediately preceded the wearing of metallic scale armour. The basis of the lorica was sometimes a skin, or a piece of strong linen; and the front was frequently ornamented with enriched bronze shoulder-bands, beautifully embossed.

LORIMER, *lor'-e-mer* (Fr. *lormier*), a word now obsolete, which signified a bridle-maker, or one who made bits, spurs, a metal mounting for military bridles and saddles.

LORY, *lo'-re*, a bird of the Parrot fam.,—the *Psittacus Lorius* of Linnæus; sub-fam. *Loriinæ*. The characteristics are,—bill only slightly curved; the margin of the upper mandibles sinuated; the notch obsolete; lower mandible slender, conic, much longer than high; the gonys (typically) straight.

LOTION, *lo'-she-on* (Lat. *lotio*), is a form of medicine made up of a solution of various medicinal substances in water or some other liquid, and designed for external application. They serve various purposes, according to the ingredients of which they are composed; some tending to allay pain, others to stimulate indolent tumours; some to reduce the inflammation of a part, others to remove deformities. Many of the nostrums that are sold as lotions are composed of very active substances, and frequently produce very serious effects.

LOT, *lots* (Sax. *hlot*), is a method of determining an uncertain event by an appeal to the providence of God, frequently alluded to in Scripture. The manner of casting lots is not particularly described. It is the opinion of some that the stones, or marks, which were used in determining the lot were thrown together into the lap or fold of a garment, or into an urn or vase, and that the person holding them shook them violently, so that they should be thoroughly commingled and prevent all preference by the hand of him that was to draw. "The lot is cast into the lap, but the whole disposing thereof is of the Lord" (Prov. xvi. 33). The choice of the apostle Matthias was by lot; Jonah was discovered by lot as the one who had offended God; and the division of the promised land among the different tribes was expressly commanded to be by lot. The orders of the priests and their daily service were also assigned by lot. The use of lots is a distinct appeal to the providence of God, and can only be regarded as a species of taking God's name in vain, when resorted to lightly or in trivial matters, or where a solution of the doubt is possible in any other way. Wantonly and without necessity to make this appeal is, therefore, highly blameable. The Moravian Brethren have recourse to the lot in the case of marriage and other appointments in their community,—though they are not determined solely by it. The use of lots has always been more or less resorted to among nations but little advanced in civilization, and less guided by reason than by superstitious beliefs. The Greeks and Romans were accustomed to divine auguries from lots by having each of them marked with a prophetic verse or other inscription.

LOTTERIES, *lot'-ter-ees* (from *lot*), are games of chance, in which, by payment of a small sum, one has the chance of obtaining a considerable prize. Most European states have had recourse to lotteries as a means of raising a revenue. The earliest English lottery of which we have any record was in 1569, when

40,000 chances were sold at ten shillings each, the prizes consisting chiefly of plate, and the profits going for the repair of certain harbours. Private lotteries soon became very common, and being generally conducted on fraudulent principles, an act of parliament was passed early in the reign of Queen Anne, suppressing them "as public nuisances." In 1694, a loan of a million was raised by the sale of lottery tickets at £10 each, the prizes in which were funded at the rate of 14 per cent. for sixteen years certain; and in 1710 a million and a half was raised by £10 tickets, each ticket being entitled to an annuity for thirty-two years, the blanks at 14*s.* per annum, the prizes in sums varying from £5 to £1,000 per annum. From that time up to the year 1824, the passing of a lottery bill was in the programme of every session. Up to about the close of the 18th century the prizes were generally paid in the form of terminable and sometimes of perpetual annuities. Loans were also raised by granting a bonus of lottery tickets to all who subscribed a certain amount. In 1778 an act was passed obliging every person who kept a lottery-office to take out a yearly license, and to pay £50 for the same. In 1808 a committee of the House of Commons was appointed to inquire "how far the evils attending lotteries had been remedied by the laws respecting the same;" and they reported that "the foundation of the lottery system is so radically vicious, that your committee feel convinced that, under no system of regulations that can be devised, will it be possible for parliament to adopt it as an efficacious source of revenue, and, at the same time, divest it of all the evils of which it has hitherto proved so baneful a source." At length, in 1823, the last act that was sanctioned by parliament for the sale of lottery tickets contained provisions for putting down all private lotteries, and for rendering illegal the sale, in this country, of all tickets in any foreign lottery—a provision which is still extensively evaded. Lotteries for productions of art in Art Unions were legalized by 9 & 10 Vict. c. 48. State lotteries were long carried on by the French government; but they were at length abolished in 1836. They are still carried on in the Austrian dominions and in several of the smaller German states. Lotteries are productive of the greatest evils to society, as may be abundantly seen from the report of the parliamentary commissioners already referred to. "The chance of gain," says Adam Smith, "is by every man more or less overvalued, and the chance of loss is by most men undervalued." "The world neither ever saw, or ever will see, a perfectly fair lottery, or one in which the whole gain compensated the whole loss; because the undertaker could make nothing by it. In the state lotteries the tickets are really not worth the price which is paid by the original subscribers, and yet commonly sell in the market for twenty, thirty, and sometimes forty per cent. advance. The vain hope of gaining some of the great prizes is the sole cause of this demand. The soberest people scarce look upon it as a folly to pay a small sum for the chance of gaining ten or twenty thousand pounds; though they know that even that small sum is perhaps twenty or thirty per cent. more than the chance is worth. In a lottery in which no prize exceeded twenty pounds, though in other respects it approach much nearer to a perfectly fair one than the common state lotteries, there would not be the same demand for tickets. In order to have a better chance for some of the great prizes, some people purchase several tickets, and others small shares in a still greater number. There is not, however, a more certain proposition in mathematics than that the more tickets you adventure upon the more likely you are to be a loser. Adventure upon all the tickets in the lottery, and you lose for certain; and the greater the number of your tickets, the nearer you approach to this certainty."—*Wealth of Nations*, book i. c. 10.

LOTUS. (*See* NELUMBIUM, NYMPHÆA, and ZIZYPHUS.)

LOUIS D'OR, *lu-e-dor'* (Fr., louis of gold), a French gold coin, which receives its name from Louis XIII., under whom it was first struck, in 1641. It has fluctuated in value, but was usually about 20*s.* sterling. They ceased to be struck in 1810, being replaced by the Napoleon of 20 francs.

LOUSE, *lowse* (Sax. *lus*), a term applied to certain disagreeable and unseemly parasitic insects. They are distinguished by having six feet formed for walking, a mouth furnished with a proboscis, antennæ as long as the thorax, with the abdomen, which is formed of several segments, depressed. Many, if not all mammals, and perhaps all species of birds, are infested with lice; and it would appear that each species of mammal and bird has its own peculiar species of louse, and sometimes even two or three distinct species. They breed very rapidly, several generations occurring in a short period. Their increase seems to be favoured by certain circumstances,—as infancy, and that condition of the system which gives rise to *phthiriasis*, or the lousy disease. The human species is subject to the attacks of several species; among which are the *Pediculus humani corporis*, or body louse, principally occurring in adults who are dirty in their personal habits; and the *P. humani capitis*, or common louse, most frequent in children. The best antidote against these disgusting insects is cleanliness. Although of rare occurrence now, the lousy disease was not unfrequent among the ancients. Herod, Antiochus, Callisthenes, Sylla, and many others, are supposed to have perished from this complaint. The genus *Phthirus* differs from the *Pediculus* in having the body wide and rounded, the thorax very short and confounded with the body; the anterior feet are simple, and the two hinder pairs are didactyle. Among some nations, the louse is looked upon as a gastronomic luxury, and at one time it was considerably used in medicine. (*See* EPIZOA.)

LOUVRE, *loov(r)*, is the name of a celebrated public building of Paris, situated in the N. part of the city, near the right bank of the Seine. In the time of Dagobert, a hunting-seat existed here, the woods extending over all the space which is now occupied by the northern part of the city down to the banks of the Seine. It was converted into a stronghold by Philip Augustus in 1214, and used as a state prison. Charles V. (1364-80) added some embellishments to it, and brought thither his library and his treasury; and Philip I., in 1528, erected that part of the palace which is now known as the Gallery of Apollo. Henry IV. laid the foundation of the gallery which connects the Louvre on the south side with the Tuileries. Louis XIII. erected the centre; and Louis XIV., according to the plan of the physician Perrault, the elegant façade towards the east, together with the colonnade of the Louvre. That monarch afterwards chose the palace at Versailles, and from that time to the middle of the 18th century the works were interrupted. They were again commenced, under the direction of M. de Marigny, but were again interrupted by the Revolution, when the Louvre was declared to be national property, and its contents roughly handled by the populace. When the great number of works of art seized in Italy by the armies of Napoleon made it necessary to assign a proper place for their reception, the architect Raimond was selected to conduct the work; and Percier and Fontaine, who, in 1808, were charged by Napoleon with its resumption, built the great staircase of the museum proper, the museums of ancient art, the Egyptian museum, &c. After the Restoration, the work was again brought to a standstill; and nothing was done until after the revolution of 1848. Two million francs were devoted by the provisional government to the repair of the old Louvre, under the direction of M. Duban, who restored the Apollo gallery. A resolution having been passed by the provisional government in favour of the completion of the whole building, the foundation-stone of the new Louvre was laid on 25th July, 1852, and the work completed in 1857, at a cost of nearly six million francs. The Louvre now consists of two parts,—the old and new Louvre. The former is nearly a square, 576 feet long and 538 wide, and inclosing a quadrangle of about 400 feet square; its eastern façade, looking towards the church of St. Germain l'Auxerrois, is a colonnade of 28 coupled Corinthian columns, and is one of the finest works of architecture of any age or country. The new Louvre consists of two vast lateral piles of buildings, projecting at right angles from the two parallel galleries, which join the old Louvre with the Tuileries, and forming the eastern boundary of the Place du Carrousel. Turning into the Place Napoléon III., they present on each

side a frontage of 590 feet, intersected by three sumptuous pavilions, intended to accommodate the minister of state, the minister of the interior, and the library of the Louvre. Some of the galleries on the upper stories are set apart for permanent and annual exhibitions of works of art. In the central part of the building is the council-chamber, to be used as an assembly-room for the public bodies of the empire on the opening of the legislature, and on other solemn occasions. The Tuileries and the Louvre, both now completed and harmonized, may be regarded as forming together a single palace, of a magnitude and splendour which can be paralleled nowhere else. The total space covered or inclosed by the entire structure is nearly 60 acres.

LOVAGE. (*See* LEVISTICUM.)

LOVE, *luv* (SAX. *luvian*), in Ethics, is one of the primary passions of the human mind, and in Theol. is the chief of Christian graces. It has been defined to be the internal feeling of good-will and kindness which one intelligent being bears to another, and the expression of that benevolence in words and acts which gratify and benefit another. In its full and proper sense, the inward emotion and the outward act are united; for neither the doing good nor wishing good to another can, of itself, in strict propriety, be termed love. Reciprocity is almost an essential element of love; all durable love is mutual. This passion forms one of the most prominent features of the Christian religion; and hence the incomparable superiority of Christianity to any other system of religion or morals. The sum of the Christian religion is love to God and love to our fellow-man. "We love God because he first loved us;" "If a man say that he love God and hate his brother, the truth is not in him." The love of man to his Maker has its origin and its sustentation in Scripture; for without revelation this love could not exist. The rationalist may, indeed, in contemplating the works of nature, have certain feelings of awe and admiration; but it is only when we come to know the personal and moral character of God, as a judge as well as a maker, a guide as well as a ruler, and above all, as a father and a redeemer, that we love him. This is the aim and object of revelation to set forth. From this relation of love in which God in his Word has condescended to place himself in regard to man, flow all human duties, hopes, and expectations. Love to man ensues from the universal love of God, as the one creator and governor of all men, who, in consequence, stand in the relation of brothers to one another. The claims of mutual love and service that ought to prevail among men are rooted and grounded in divine revelation. "It is this specific Christian affection,—the love of man as a brother, purified and enlarged by the consciousness of being an object of Divine mercy and goodness so as to become a properly Christian emotion, which is to actuate the disciples of Christ in their benevolent efforts for the good of others."—(Kitto's *Biblical Cyclopædia.*) The love of God is a fruit of the Holy Spirit, and can only exist in the souls which he has regenerated. It is essential to true obedience; for when the apostle declares love to be "the fulfilling of the law," he in effect declares that the law cannot be fulfilled without love, and that every action which has not this for its principle, however virtuous in appearance, is defective. "Love is not only the shortest and most compendious way to perfection, but the greatest height and pitch of it. The more we have of love, the nearer advances we make to God, who is love itself!" "Heaven is but a state of the more perfect and consummated love; and, therefore, the best thing we can practise on earth is to tune our hearts to this divine strain." "Love will draw along after it all other virtues, will perfect and improve them, and will at least hide those faults of them which it cannot correct." "By faith we live upon God, by obedience we live to him; but 'tis by love alone that we live in him, as St. John saith, God is love, and he that dwelleth in love dwelleth in God and God in him."—(John Norris's *Letters concerning the Love of God.*) On what is commonly termed *Platonic love*, very mistaken ideas prevail. It is generally regarded as a pure spiritual affection, abstracted from all carnal desires and terminating in itself. The dialogue in which Plato treats of love is indeed very mystical and allegorical; but the thing principally intended to be brought out by him, and consequently that which ought to be understood by Platonic love, evidently is the ascent of the soul unto God by the steps of inferior and subordinate beauties,—from the many beauties to the chief beauty, that is, to God. The steps thereof are, according to his idea, as follows;—from the beauty of bodies to the beauty of the soul; from the beauty of the soul to the beauty that is in the offices of life and laws; and from thence to the beauty that is in the sciences; and lastly, from the beauty of the sciences to the immense ocean of beauty, that is, God, of whom he gives a noble and magnificent description, and details the happiness of him that shall enjoy him. Love is also used to denote that affection which becomes the bond of attachment and union between individuals of the different sexes, and makes them feel, in the society of each other, a kind of happiness which they experience nowhere else. "Nuptial love maketh mankind; friendly love perfecteth it; but wanton love corrupteth and embaseth it."—(*Bacon.*)

LOVE, FAMILY OF, in Eccl. Hist., a sect of religious fanatics that originated in Holland about the middle of the 16th century, and had for their founder a Westphalian named Henry Nicholas. He taught that the essence of religion consisted in the feeling of Divine love; and that it was a matter of perfect indifference what opinions men entertained respecting the Divine nature, provided their hearts burned with divine love. Dr. Henry More wrote against this sect in his "Explanation of the Mystery of Godliness."

LOVE-FEASTS are a kind of religious social meetings, held periodically among the Methodists, and to which only members of their church are admitted. They are evidently in imitation of the *agapæ* or love-feasts of the early Christian Church.

LOW CHURCHMEN is a term originally applied to those who disapproved of the schism made in the Church by the non-jurors, or high-churchmen, who refused to acknowledge William III. as their lawful king. It is now commonly applied to those who form the more moderate party in the Church, having less ambitious notions of its authority and power, and being more tolerant in their conduct towards dissenters.

LOW DUTCH and HIGH DUTCH are terms somewhat improperly used for Dutch and German. The confusion seems to have arisen from Deutsch signifying German in the language of that country.

LOWER EMPIRE is a term applied to the Roman empire from the time of the establishment of its seat at Constantinople down to the time of the capture of that city by the Turks. After the division of the Roman dominions, it was known as the Eastern or Byzantine empire, and at a later period, as the Greek empire. Gibbon, in his "Decline and Fall of the Roman Empire," embraces the whole of this period. (*See* BYZANTINE EMPIRE.)

LOW GERMAN (Ger. *Plattdeutsch* or *Niederdeutsch*), is that softer German dialect which was formerly spoken over a great part of Germany, and which is even now the language of the common people in most parts of North or Lower Germany. It has also maintained itself in some legal forms; thus the Hamburg oath of citizenship is in Low German. It is not, as is sometimes supposed, a corrupt language, but a distinct dialect as much as the High German, though circumstances have caused the latter to become the language of literature and of the educated classes. (*See* GERMAN LANGUAGE AND LITERATURE.)

LOWLANDS, a term applied to the southern parts of Scotland, in contradistinction to the Highlands, which comprise the northern and western parts.

LOW SUNDAY was applied to the first Sunday after Easter. It was a lower festival than Easter-day, and some part of the service proper to Easter-day was repeated on that day.

LOZENGE, *loz'-enj* (Fr. *losange*), in general language, a figure with four equal sides, having two obtuse and two acute angles: in geometry this figure is usually called *skrhomb*, and when the sides are unequal, a *rhomboid*. A lozenge, in heraldry, is a figure resembling a pane of glass in an old-fashioned casement, on which are represented the coats of arms of maidens and widows. In confectionery, a lozenge is a small cake of pressed

fruit, or of sugar, so called from its original rhomboidal form.

LUCIFERIANS, *lu-sif'-e-ra-ans*, the name of a religious sect which arose in the 4th century, being founded by Lucifer, bishop of Cagliari, who was banished by the emperor Constantius for having defended the Nicene doctrine of the three persons in the Godhead. The persecutions he had undergone made him bitter and irascible, and his zeal on behalf of orthodoxy alienated even Athanasius against him. He was particularly opposed to the Arians. The Luciferians spread mightily for a time in Gaul, Spain, Egypt, &c.; but they disappear in the following century.

LUCIFER MATCHES, *lu'-se-fer* (from Lucifer, the name of the morning star, from *lux*, light; *fero*, I bring).—These little necessaries are made by dipping the tops of thin slips of pine-wood into melted sulphur, and when cool, into a mixture of green phosphorus, nitre, Prussian blue, and oxide of lead. The use of phosphorus in its ordinary condition is attended with very serious results to the workpeople engaged in the manufacture. The paste used constantly exhales phosphoric vapour, which is breathed by the workpeople, giving rise to bronchial affections of a severe character, caries of the teeth, and necrosis of the bones of the jaw. The danger, too, of using easily inflammable matches is very great, so much so that the French government at one time seriously contemplated the abolition of lucifer matches and a return to the primitive flint and steel. Important improvements have lately taken place in the manufacture, by the successful introduction of the use of Schötter's amorphous phosphorus instead of the ordinary kind, by MM. Cournerie in France and Messrs. Bryant and May in England. Being perfectly fixed at ordinary temperatures, the workmen employed enjoy an absolute immunity from the fearful disorders mentioned above, and the amorphous phosphorus being only inflammable when rubbed in contact with chlorate of potash or black oxide of manganese, safety from accidental fire is insured by separating these two substances, the chlorate being placed on the match tip, and the amorphous phosphorus on the friction-tablet. Another great improvement has also been made in the use of stearine or paraffin, instead of sulphur, for rendering the wood splint more inflammable. The invention is equally applicable to wax vestas and to cigar-lights. The great centre of the match manufacture is at Vienna, where the four principal makers employ no less than 6,000 workpeople.

LUDDITES, *lud'-ites*, was the name given in England to the rioters who, in 1812, destroyed the machinery in the manufacturing towns. They were so called from one of their leaders named Ludd.

LUFF, *luff* (Dan. *loeven*), a term used in Mar. when ordering the helmeman to put the tiller on the lee side, in order to make the ship sail nearer the wind; as, *Keep your luff*. It also designates the roundest part of the bow of the ship.

LUFFA, *luf'-fa* (from *louff*, its Arabic name), in Bot., a gen. of the nat. ord. *Cucurbitaceæ*, or Gourd fam. *L. purgans* and *drastica* have fruits which are violently purgative. They constitute the drug commonly called *American colocynth*. The fruit of *L. fœtida*, termed the *sponge-gourd*, consists of a mass of fibres entangled together: those fibres are used for cleaning guns.

LUGGER, *lug'-ger* (Du. *loger*), a small vessel carrying two or three masts and a running bowsprit, upon which *lug sails*, and two or three jibs, are set. Topsails are sometimes adapted to them.

LUKE, GOSPEL OF ST., *luke*, is the third of the four gospels of the New Testament. The genuineness and authenticity of this gospel are confirmed by the unanimous testimony of ancient writers. It is repeatedly cited by Justin Martyr; and all admit that, at the time of Irenæus and Tertullian, it was accepted throughout the whole Church in its present form. These testimonies are confirmed by a host of later writers, whose evidence has been collected by Dr. Lardner. Notwithstanding this, there have not been wanting German critics to call in question the authenticity of this gospel, or particular parts of it. Luke was a physician, probably of gentile descent, and a frequent companion of the apostle Paul. That this gospel was specially written for the benefit of the gentiles, is evident, both from its general tenour as well as from its being dedicated to Theophilus, one of his gentile converts. He thus condescends to many particulars, and notices various points, for the benefit of those who were remote from the scene of action and ignorant of Jewish affairs. Hence, also, he is particularly careful in specifying various circumstances of facts that were highly conducive to the information of strangers, but which the Jews could supply from their own knowledge; on this account, he begins his history with the birth of John the Baptist, and traces Christ's lineage up to Adam, showing that he is the seed of the woman promised for the redemption of the world. He has likewise introduced many things not noticed by the other evangelists, tending to encourage the gentiles to hearken to the gospel; as the parables of the publican praying in the temple, the lost piece of silver, and the prodigal son; Christ's visit to Zaccheus, and the pardon of the penitent thief upon the cross. This gospel is divided by Rosenmüller and others into five distinct parts; viz.—1. Containing the narrative of the birth of Christ, together with all the circumstances that preceded, attended, and followed it (i.—ii. 40); 2. comprising the particulars relative to our Saviour's infancy and youth (ii. 41—52); 3. including the preaching of John, and the baptism of Jesus Christ, whose genealogy is annexed (iii.); 4. comprehending the discourses, miracles, and actions of Jesus Christ during the whole of his ministry (iv.—ix. 50); 5. containing an account of our Saviour's last journey to Jerusalem, with all the circumstances relative to his passion, death, resurrection, and ascension (ix. 51—62, x.—xxiv.). The style of this gospel is pure, copious, and flowing, and bears a considerable resemblance to that of his great master Paul. From his medical knowledge, he has described, with singular accuracy and skill, the various diseases which he had occasion to notice. With regard to the time when this gospel was written, some difference of opinion exists, but the majority of critics are now agreed in judging it to have been about the year 63 or 64.—*Ref.* Horne's *Introduction to the Sacred Scriptures*.

LUMBAGO. (*See* RHEUMATISM.)

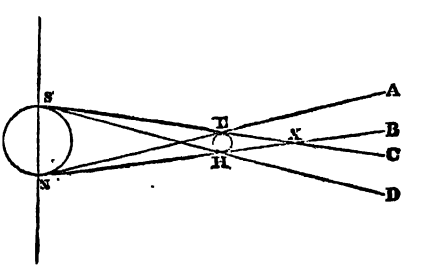
LUMBAR, *lum'-bar* (Lat. *lumbus*, the loin), in Anat., denotes of or belonging to the loins; as, lumbar region, &c. (*See* LOINS.)

LUNACY, *lu'-nā-se* (Lat. *luna*, the moon).—"A lunatic," says Blackstone, "is one that hath had understanding, but by disease, grief, or other accident, hath lost the use of his reason; he is, indeed, properly, one that hath lucid intervals, sometimes enjoying his senses and sometimes not, and that frequently depending upon the change of the moon." The common belief in the connection between the accessions of madness and the phases of the moon, from which the name is derived, has long since been exploded; and in medical science, the terms insanity and mental alienation have taken the place of lunacy; but in law it is still a common term, and is applied to all persons of unsound mind and incapable of managing their own affairs. Some law writers prefer the phrase *non compos mentis* (Lat., not of sound mind), as a generic appellation to include the various conditions of mental disease, or fatuity; and the English equivalent, *of unsound mind*, is also sometimes employed; but lunacy is still the ordinary term, and may be fitly taken as the title under which to treat of the legal relations of insanity (which, physiologically, has been already treated under INSANITY). Formerly, a distinction was made between lunatics and idiots, which produced some important differences in the management of their property; but these having now fallen into disuse, the distinction is of little importance. An idiot was regarded as one who had no understanding from his infancy, and was therefore presumed by law as never likely to attain any; a lunatic, on the other hand, was one that had at one time been possessed of understanding, but by some means or other had lost it; and in his case, the presumption was that he might recover. In the case of the idiot, the custody of him and his lands was vested in the king, to prevent him from wasting his estate and reducing himself and his heirs to poverty and distress,—the king taking the profits, without waste or destruction, and finding him necessaries, and after his death rendering the estate to

his heirs. The crown had also the guardianship of lunatics, but acted only as trustee to protect their property, so as to account to them for all profits received, if they should recover, or after their decease, to their representatives. Since the dissolution of the Court of Wards, the care and custody of idiots and lunatics have been intrusted to the lord chancellor. By act 16 & 17 Vict. c. 70, commonly called the Lunacy Regulation Act of 1853, most of the laws and regulations previously in force regarding lunatics have been consolidated. It authorizes the lord chancellor to appoint two serjeants or barristers-at law, to be called masters in lunacy, to have and execute all the powers, duties, and authorities formerly had and executed by commissioners named in commissions of the nature of writs *de lunatico inquirendo*. The masters conduct their proceedings either separately or together, under the direction of the chancellor. The lord chancellor also appoints three visitors, two medical and one legal, to visit and report upon the condition of every lunatic under the care of the court. The method of proving a person insane is by a petition or information to the lord chancellor, who grants a commission in the nature of a writ *de lunatico inquirendo*, to inquire into the state of the person's mind, directed to the "masters in lunacy;" and if the lunatic be found *non compos*, the master usually commits the care of his person, with a suitable allowance for his maintenance, to some friend, who is then called his *committee*. The next heir, however, is seldom permitted to be this committee of the person of the lunatic, as it is his interest that he should die. The care of the estate is also committed to the same, or some other person, who is called the committee of the estate. By the Lunacy Regulation Act of 1862 (25 & 26 Vict. c. 86), it is enacted that in every inquiry or commission of lunacy, the question shall be confined to whether or not the person who is the subject of the inquiry is at the time of such inquiry of unsound mind, and incapable of managing himself or his affairs; and no evidence as to anything done or said by him beyond two years from the time of inquiry, shall be receivable. The lord chancellor is also empowered to direct land or other property of the lunatic to be sold, and applied for his maintenance, or that of his family, or for carrying on his trade or business. Lunatics are to be visited at least four times a year, and visitors are to report every six months to the lord chancellor. Persons of unsound mind may inherit or succeed to land, or personal property, but they cannot be executors or administrators, or make a will, or bind themselves by contract. Though conveyances of insane persons (except during a lucid interval) are, generally speaking, void, yet it is said that feoffments are not absolutely void, but voidable only, on account of the solemnity of livery with which they are accompanied; the chief practical difference between a void and a voidable transaction being that the former is a mere nullity, and therefore incapable of confirmation; but the latter may be either avoided or confirmed *ex post facto*. A person of unsound mind, though afterwards restored to reason, is not allowed to plead his past insanity in order to avoid his own act, it being a maxim in law, in regard to merely voidable transactions, that no man shall be allowed to stultify himself, or plead his own unsoundness of mind in a court of justice. But this maxim does not apply to transactions which are of themselves void. An insane person is competent to purchase, and also to retain what he purchases; but he cannot be compelled to retain it; the transaction (if found to be disadvantageous to him) being liable to subsequent voidance on account of his insanity. The marriage of a lunatic, except it be solemnized during a lucid interval, is absolutely void. As it might be difficult to prove the exact state of a person's mind at the celebration of marriage, it has been declared by statute (15 Geo. II. c. 30), that the marriage of persons found insane under a commission, or committed to the care of trustees by any act of parliament, before they are declared of sound mind by the lord chancellor, or the majority of such trustees, shall be totally void. In criminal cases, lunatics are not chargeable for their own acts, if committed when labouring under defect of understanding, not even for treason itself. By the common law, if a man in his sound memory commits a capital offence, and before arraignment for it becomes mad, he ought not to be arraigned for it, because he is not able to plead with that caution that he ought; if after he has pleaded he should become mad, he shall not be tried; for how can he make his defence? If after he be tried and found guilty, he loses his senses before judgment, judgment shall not be pronounced; and if after judgment he becomes of non-sane memory, execution shall be stayed; for, peradventure, says the humanity of the English law, he might have alleged something to stay judgment or execution. By statute 39 & 40 Geo. III. c. 94, it is enacted that if a person indicted for any offence appear insane, the court may (on his arraignment) order a jury to be impanelled to try his sanity, and if they find him insane, may order him to be kept in custody till the pleasure of the Crown be known; and if upon a trial for treason, murder, or felony, insanity at the time of committing the offence be given in evidence, and the jury acquit on that account, the court may order him to be kept in like manner till the Crown's pleasure be known. It is not, however, every kind or degree of insanity that will exempt a man from responsibility for his act; and in general, a partial unsoundness will form no excuse. But the entire law on this subject is in a painful state of uncertainty, and it is impossible to lay down any general rules as to what may be regarded as partial or perfect insanity, or what degree of insanity will exculpate a man from his acts. Generally speaking, however, if it is of such a nature as to render the person incapable of exercising self-control, he will not be held responsible.

LUNAR CAUSTIC, a term applied to nitrate of silver, cast in sticks, and used by surgeons for cauterising purposes. A great improvement has been lately made in its manufacture by melting with it a certain proportion of chloride of silver, which has the effect of rendering the stick flexible instead of brittle.

LUNAR ECLIPSE, *lu'-nar* (Lat. *luna*, the moon).—When the moon passes through the earth's shadow, a portion of the light which usually falls upon the surface of the former is intercepted, and the phenomenon is called a lunar eclipse. In the annexed diagram, SN




LUNAR ECLIPSE.

represents a section of the sun drawn through a great circle on its surface, and EH, a similar section of the earth's surface; both sections being considered to be in the same plane. To these sections let there be drawn the common tangents, NA, NB, SC, SD, which, on account of the great distance of the sun, may be supposed to intersect each other at S, N and E, H, the opposite extremities of two parallel diameters. The space EXH will, therefore, be a section of a cone, within the limits of which there is a total interception of the sun's light. When the moon passes into this darkened cone during her monthly revolution, it is evident that she will undergo an eclipse, which will be total or partial according as she passes wholly or partially into the shadow cast by the earth. The region represented in the diagram as AEX and DHX is called the penumbra, in which there is a partial interception of the solar light. The moon, if she revolved in the plane of the ecliptic, would pass through the shadow of the earth on each occasion that the earth came between her and the sun; consequently there would be an eclipse every month; but the lunar orbit is, in reality, inclined to the plane of the ecliptic at a mean angle of some-

what more than five degrees. Therefore a lunar eclipse can only occur when the moon is near either of the nodes of her orbit. By calculation, it has been found that when the distance of the node from the points of the ecliptic opposite to the sun exceeds 11° 29′ 40″, there can be no eclipse; but if the distance of the node from the same point is less than 9° 20′ 29″, there must be an eclipse. When there is a total lunar eclipse, that is, when the moon is completely enveloped in the earth's shadow, she is still visible, her surface appearing of a dull copper-colour, on account of the refraction of the light passing through the earth's atmosphere. The air has the property of absorbing the violet rays of solar light: hence the reddish colour presented by the moon. In the course of a year there may be three lunar eclipses, which is the largest number that can happen; but there must always necessarily be two.

LUNAR EVECTION, a term applied in Astron. to an inequality in the longitude of the moon, caused by the disturbing force of the sun. Its occurrence depends on the variable eccentricity of the lunar orbit and the movable position of the apsides. The discovery of lunar evection is attributed to Ptolemy, the celebrated astronomer of Alexandria.

LUNATIC ASYLUMS, *lu'-nā-tik.*—It is one of the marks of the civilization of the present age—the care that is now taken of lunatics. In some parts they are excluded from human society, inhabiting graveyards or ruinous places. Formerly, in England, harmless lunatics, while allowed to wander about the country, were subjected to much hardship and ill-usage; while those that were less tractable were confined in asylums and treated like wild beasts. Mackenzie, in his "Man of Feeling," published in 1771, has described a visit to the old hospital of Bethlehem, in Moorfields, London. Here they were made a show of, like wild beasts, and were even excited to rage, in order to make the exhibition more stimulating. "The clanking of chains, the wildness of their cries, and the imprecations which some of them uttered, formed a scene inexpressibly shocking." "I think it," says Harley, "an inhuman practice to expose the greatest misery with which our nature is afflicted to every idle visitant who can afford a trifling perquisite to the keeper." The first attempt to introduce a milder system of treatment of the insane was made by M. Pinel, at the hospital of Bicêtre, near Paris, in 1792; but notwithstanding the success of this attempt, the practice was long in being introduced in England. The evidence brought before the parliamentary committees in 1815 shows that every species of cruelty was practised against this unfortunate portion of the human race. The keepers were of the lowest and most brutal character, and the severest restraint and most cruel neglect seem to have been the almost uniform practice. From this time improvements were gradually introduced in the treatment of the insane. Chains were removed, and leathern restraints of much milder kinds substituted; more care was given to the warming and clothing of the patients; and the furnishing them with employment was introduced. The credit of declaring the abolition of all mechanical instruments of restraint to be practicable belongs to Mr. Hill, of the Lincoln asylum, and was adopted there in 1837, and is now followed in all the more important asylums of the kingdom. Act 14 Geo. III. c. 49, introduced the system of licensing lunatic asylums and subjecting them to inspection; and 48 Geo. III. c. 96, makes various provisions for the better care and maintenance of lunatics, for the building and endowment of asylums, &c. These and various others, however, have been superseded by recent enactments, particularly by 16 & 17 Vict. c. 97, called "the Lunatic Asylum Act, 1853." It enacts that the justices of every county and of every borough not having an asylum for the pauper lunatics thereof, shall take measures to provide one for the same, either separately or in union with one or more counties or boroughs, or with the subscribers to some asylum already established by voluntary subscription; and the expenses of such institutions, so far as they are not covered by voluntary contributions, to be defrayed by the county or borough rates, and the management to be vested in a committee of visitors, to be elected yearly by the justices of the county or borough, or





partly by the justices and partly by the subscribers. Two visitors, at least, are to visit every lunatic asylum of which they are visitors, at least once every two months, and annual reports are to be made by committees of visitors to justices at quarter-sessions, &c., and copies to be sent to commissioners in lunacy. Provision is made for having any pauper resident in a parish, and who is deemed to be a lunatic, examined before a justice and a medical officer, and if found to be insane, committed to the asylum. In like manner, insane persons (whether paupers or not) found wandering at large in the county or borough, or not under proper care or control, may be sent to the asylum. It is further enacted that no person, not being a pauper, can be received as insane into an asylum except under a written order of some person by whose direction the lunatic is confined, accompanied by a medical certificate of two physicians or surgeons, who shall have visited him separately and have no interest in the asylum in which he is to be confined. By 8 & 9 Vict. c. 100, a board of commissioners is appointed, comprising three physicians and three barristers, with salaries, and five others who act gratuitously. They have the general superintendence and control of all lunatic asylums. Every house for the reception of lunatics must be duly licensed either by the commissioners of lunacy, if in London or the neighbourhood, or, if in the country, by the magistrates at quarter sessions. No additions to, or alterations in, a licensed house can be made without the consent of the commissioners; and no license is to remain in force more than thirteen months. Houses having a hundred or more patients are required to have a resident medical attendant; those having fewer to be visited by a medical attendant at defined periods, according to their size. Act 25 & 26 Vict. c. 111 (1862), has a number of minute provisions regarding the construction and plans of asylums, the inspection of licensed houses, providing superannuation allowances for officers of asylums, the admission and visitation of pauper lunatics, &c. According to the Fifteenth Report of the Commissioners in Lunacy, there were, at 1st January, 1861, in all, 24,834 lunatics in asylums in England and Wales; 19,718 being pauper, and 5,116 private patients; 11,673 being male, and 13,161 female. Of these, 18,587 were in county and borough asylums; 2,144 in hospitals; 1,953 in metropolitan licensed houses; and 2,150 in provincial licensed houses. The total number admitted during the previous year was 9,240; the number discharged as recovered, 2,905; the number of deaths, 2,749. The law on the subject of lunacy in Scotland is now consolidated in 20 & 21 Vict. c. 71, as amended by 21 & 22 Vict. c. 89. The total number of insane in Scotland on 1st January, 1860, was estimated at 8,084; being 3,923 males and 4,162 females; 3,858 private and 5,226 pauper patients; 2,632 were in public and 852 in private asylums; 866 were in poorhouses and 3,734 in private houses. In Ireland, the number of lunatics, idiots, and epileptics, exclusive of those in asylums, gaols, or workhouses, on April 1, 1861, is given at 8,991, being 4,959 males and 4,032 females; the number in union workhouses was 2,534, being 965 males and 1,569 females; the number in district asylums was 4,289, being 2,165 males and 2,124 females; the number in gaol, 293, being 184 males and 109 females. The total number of lunatics, idiots, and epileptics in Ireland on 1st April, 1861, was thus 16,107; of whom 8,273 were males and 7,834 females. Ireland thus presents the anomaly of having more insane males than females.—Ref. *The English Cyclopædia*—Arts and Sciences; various Parliamentary Reports; and the Acts of Parliament referred to.

LUNETTE, *lu-net'* (Fr.), a term applied rather vaguely in Fortification to a work somewhat similar to a ravelin or demi-lune, but generally of smaller dimensions. It is probable that in its original signification the word comprised every detached work built in the form of an angle, and consisting of only two faces. It was afterwards used in a more restricted sense, to denote small advanced works placed before the ravelin or other outworks, for the purpose of covering such places of the chief rampart as might be seen from the fields, or of defending from the side such points as were left unprotected through a mistake in the original plan of the fortification. The best disposition for a series of lunettes is that in which they are alter-

nately more or less advanced from the fortress, since in that position they afford one another a reciprocal defence by the crossing fires which may be kept up from the nearest faces of every salient and retired lunette. In case the besiegers should carry their approaches up the glacis of the latter, the guns on the flanks of the two salient lunettes on either side would effectually prevent them from forming a battery on its crest; consequently, the operations against any retired lunette must be postponed till the two collateral lunettes are taken. If all had been equally advanced before the fortress, the three might have been breached and assaulted at the same time. Advanced lunettes about a fortress form strong posts for artillery, and tend to check the besieger for a considerable time, by obliging him to make his trenches at a greater distance than he would otherwise have done, and subjecting him to losses in the capture of each lunette. The faces of such works may be from sixty to seventy yards, and that of their flanks from sixteen to twenty. It is considered that a well-disposed series of lunettes would prolong the defence of a place about ten or twelve days. They can only be employed, however, for fortresses of the first magnitude, since they would require a large garrison.

**Lunge, Longe, or Allonge,** *lunje* (Fr.), in Fencing, is the third mode of attack, and is executed by first making the movement termed the "extension," and afterwards advancing the right forward, as far as can be done with ease, towards the opponent. The right foot is firmly planted on the ground, the body quite erect, resting equally upon both legs, the height of the shoulders equal, the right thigh nearly horizontal with the ground, and the leg perpendicular. The thrust of the weapon proceeds from the wrist, the point of the foil being elevated, and advanced towards the breast of the adversary.

**Lungs,** *lungs* (Sax. *lungen*), in Anat., are two large conical bodies placed one in each of the lateral cavities of the chest, and separated from each other by the heart and large vessels and by two layers of the pleura, which form the mediastinum, or median partition. They occupy by far the larger portion of the cavity of the chest, and during life accurately adapt themselves to its varying dimensions. Each lung is invested by an exceedingly delicate serous membrane, termed the pleura. Each pleura forms an independent shut sac quite distinct from the other, inclosing the corresponding lung as far as its root, and then reflected back upon the inner surface of the thorax. The portion investing the surface of the lung is called the *pleura pulmonalis*, while that which lines the inner surface of the chest is called the *pleura costalis*. The root is that part of the lung which is connected to the heart and the trachea; being formed by the bronchial tube, the pulmonary artery and veins, the bronchial arteries and veins, &c., all of which are inclosed by a reflection of the pleura. Each lung is of a conical shape, with a broad concave base resting upon the convex surface of the diaphragm. The apex forms a blunted point, which extends into the root of the neck about an inch above the level of the first rib. The outer or thoracic surface is smooth, convex, and of considerable extent, corresponding to the form of the cavity of the chest, and of greater depth behind than in front. The inner surface is flattened or concave, presenting in front a depression corresponding to the convex surface of the pericardium, and behind a deep fissure (the *hilum pulmonis*) which gives attachment to the root of the lung. The posterior border is obtuse or rounded, and is received into the deep groove formed by the ribs at the side of the vertebral column. The anterior border is thin and sharp, and overlaps the front of the pericardium. The anterior portion of the right lung corresponds to the median line of the sternum, and is in contact with its fellow, the pleura being interposed, as low as the fourth costal cartilage, below which they are separated by an irregularly-shaped interval formed at the expense of the left lung. Each lung is divided into two lobes, a lower and an upper, by a long and deep fissure, which commences upon the upper portion of the posterior border of the lung, about three inches from the apex, and extends obliquely downwards and forwards to the lower part of the anterior border, penetrating nearly to the root of the organ. The upper lobe is smaller than the lower, and is conical, with an oblique base, while the lower lobe is more or less quadrilateral. In the right lung, the upper lobe is partially divided by a second and shorter fissure, extending from the middle of the principal fissure forwards and upwards to the anterior margin of the organ, and marking off a small triangular portion, called the middle lobe. The right lung has thus three lobes, and is larger and broader than the left. The weight of the lungs varies much, according to the quantity of blood, mucus, or serous fluid that they may contain; but in general they are found to be between 36 and 42 ounces,—the right lung being about two ounces heavier than the left. The lungs are heavier in the male than in the female, being in the former in proportion to the body as 1 to 37, in the latter as 1 to 43. The substance of the lung is of a light, porous, spongy texture, and when healthy, is buoyant in water; but in the fœtus, before respiration has taken place, and also in cases of congestion or consolidation from disease, the entire lungs, or portions of them, will sink in that fluid. The specific gravity of a healthy lung after death varies from 345 to 746, water being 1,000. At birth the lungs are of a pinkish-white colour; but as life advances they become darker, and are mottled or variegated with patches of a dark slate-colour, assuming at length a dark black colour. The pulmonary tissue is endowed with great elasticity, in consequence of which the lungs collapse by atmospheric pressure, when the thorax is opened, to about one-third of their bulk. The lungs are composed of an external or serous coat, a subserous areolar tissue, and the pulmonary substance. The serous coat is derived from the pleura, as already mentioned, beneath which is a thin layer of subserous areolar membrane, containing a large proportion of elastic fibres. It invests the entire surface of the lung, and extends inwards between the lobules. The substance of the lung itself is composed of numerous small lobules, which, although closely connected together by an interlobular areolar tissue, are quite distinct from one another, and are easily separable in the fœtus. These lobules are of various sizes, those on the surface being large and of a pyramidal form, with the base turned toward the surface; those in the interior being smaller, and of various forms. Each lobule may be regarded as a lung in miniature, the same elements entering into its composition as go to form the lung itself. Each is composed of one of the ramifications of the bronchial tube and its terminal air-cells, of the ramifications of the pulmonary and bronchial vessels, lymphatics and nerves; all being connected together by areolar fibrous tissue. Each bronchus, on entering the substance of the lung, divides and subdivides dichotomously throughout the entire organ. Sometimes three branches arise together; and occasionally small lateral branches are given off from the sides of a main trunk. Each of the smaller divisions of the bronchi enters a pulmonary lobule, and again subdividing, ultimately terminates in the intercellular passages and air-cells, of which the lobule is composed. After entering the substance of the lobules, each lobular bronchial tube is said to divide and subdivide from four to nine times, according to the size of the lobule, diminishing in size until they attain a diameter of $\frac{1}{75}$ to $\frac{1}{75}$ of an inch, when they become changed in structure, lose their cylindrical form, and are continued onwards as irregular intercellular passages through the substance of the lobule. Within the lungs, the bronchial tubes are not flattened behind like the bronchi and trachea without, but form completely circular tubes. The air-cells are small polyhedral alveolar recesses, separated from each other by thin septa, and communicating freely with the intercellular passages. They vary from $\frac{1}{175}$ to $\frac{1}{75}$ of an inch in diameter, and are larger on the surface than in the interior. The pulmonary artery conveys the venous blood to the lungs. It divides and subdivides into branches, which accompany the bronchial tubes, and terminates in a dense capillary network upon the walls of the intercellular passages and nerves. From this network, the radicles of the pulmonary veins arise, and, coalescing into large branches, at length accompany the arteries and return the blood, purified by its passage, through the capillaries to the heart. In their course through the lung, the branches of the pulmonary artery are usually

found above and in front of a bronchial tube, and the vein below. The pulmonary arteries and veins differ from the same vessels in other parts of the body, inasmuch as the former convey dark blood, the latter red blood. The pulmonary veins are also destitute of valves. The bronchial arteries and veins are much smaller than the pulmonary vessels, and are designed for the nourishment of the substance of the lungs. The lungs are supplied with nerves from the pulmonary plexuses, formed chiefly by the par vagum, together with filaments from the sympathetic. The absorbents are deep-seated and superficial. They pass to the bronchial glands at the roots of the lungs, and then proceed partly to the thoracic duct on the left side, and partly to a corresponding vessel on the right. The lungs are the great organs of respiration. The air passes through the bronchial tubes until it reaches the minute air-cells, on the walls of which the blood circulates in a network of capillaries in such a way that it is brought into immediate connection with the atmospheric air, which is drawn in by each inspiration. In the act of breathing, the capacity of the chest is increased by the action of certain muscles, when the air rushes in to fill the vacuum, and expansion of the lungs takes place; and then, the muscular movement ceasing, the ribs by their weight and elasticity contract and force out the air. From fifteen to twenty-two is the average number of respirations in a minute; but this number may be very greatly increased by excitement, exercise, or disease. The lobules are not all distended with air in ordinary inspiration, nor by the most powerful efforts that can be made. Those of the upper parts of the lungs seem to be most filled, and are most constantly in action. The average quantity of air contained in the lungs is estimated at about 200 cubic inches. In each ordinary act of inspiration, or expiration, a change of from 20 to 30 cubic inches is supposed to take place. The lungs, from their highly-organized structure and their incessant exercise, are, perhaps, more liable to disease than any other part of the body. The diseases to which they are mostly liable are, in their first stages at least, of an inflammatory character, and are mostly produced by exposure to damp and cold, sudden atmospheric changes and transitions of temperature, want of proper nourishment, &c. The state of the lungs can now be ascertained with tolerable certainty by means of auscultation (which *see*). For particular diseases of the lungs, *see* ASTHMA, BRONCHITIS, HEMOPTYSIS, PLEURITIS, PNEUMONIA, PHTHISIS.—*Ref.* Quain's *Anatomy*, by Sharpey; Gray's *Anatomy*.

LUNG-WORT. (*See* STICTA.)

LUPUS, *lu'-pus* (Lat. *lupus*, the wolf), a constellation of the southern hemisphere, which originally formed part of the constellation Centaurus, according to Aratus and Ptolemy. It lies to the south of Scorpio, having Centaurus on one side of it and Ara on the other. Its largest star is one of the third magnitude.

LUPUS (Lat., a wolf), in Path., is a name given to a malignant disease of the face, which eats away the parts attacked with great rapidity; and hence its comparison to a wolf.

LURCHER, *lur'-tsher*, a sort of hunting-dog, resembling a mongrel greyhound, with pricked ears, a shaggy coat, and generally of a yellowish-white colour. It runs very swiftly, so that, if it get between the burrows and the rabbits, it seldom misses taking them; in hunting, this is its usual practice. The lurcher is much used by poachers.

LUSIAD, *lu'-se-ăd*, is the name given to the great epic poem of Portugal, written by Camoëns, and published in 1571. As the Italians boast of Tasso, so do the Portuguese of Camoëns; and, indeed, the two poets were contemporary, but the Lusiad appeared before the Jerusalem. The subject of the Lusiad is the first discovery of the East Indies by Vasco de Gama, an enterprise splendid in its nature and extremely interesting to the author's countrymen, as it laid the foundation of their future wealth and consideration in Europe. The poem opens with Vasco and his fleet appearing on the ocean, between the island of Madagascar and the coast of Ethiopia. After various attempts to land on that coast, they are at length hospitably received in the kingdom of Melinda. Vasco, at the desire of the king, gives him an account of Europe, recites a poetical history of Portugal, and relates all the adventures of the voyage which had preceded the opening of the poem. This recital takes up three cantos or books. It is well imagined, and contains a great many poetical beauties, its only defect being an unreasonable display of learning to the African prince in frequent allusions to the Greek and Roman histories. Vasco and his companions afterwards set forth to pursue their voyage. The storms and distresses which they encounter; their arrival at Calicut, on the Malabar coast; their reception and adventures in that country, and at last their return homewards, fill up the rest of the poem. Both the subject and the incidents of the Lusiad are magnificent, and, joined with some wildness and irregularity, there appear in the execution much poetic spirit, strong fancy, and bold description; but the machinery of the poem is perfectly extravagant. It consists of a singular mixture of Christian ideas and heathen mythology, and is so conducted that the pagan gods appear to occupy the chief place. The great protector of the Portuguese is Venus, and their great adversary Bacchus, whose displeasure is excited by Vasco's attempting to rival his fame in the Indies. It contains, however, some fine machinery of another description; as, for instance, when the genius of the river Ganges is made to appear to Emanuel, king of Portugal, in a dream, inviting him to discover its secret springs, and acquainting him that he was the monarch for whom the treasures of the East were reserved; and when the huge and monstrous phantom appeared to them, rising out of the sea, at the Cape of Good Hope, which had never been doubled by navigator before, menacing them for daring to explore these seas, and foretelling the successive calamities that were to befall them. This poem has been frequently translated into foreign tongues. There are two English translations, one by Fanshaw, the other by Mickle.

LUSTRUM, *lus'-trum* (probably from Lat. *luere*, to wash or expiate).—Among the Romans, this name was given to each successive period of five solar years, at the close of which a census of the people was taken, which was followed by a solemn expiatory sacrifice of a sow, a sheep, and a bull. The sacrifice was made under the direction of the censor, and the animals were slain in the Campus Martius, or Field of Mars, near Rome, after having been led three times round the people that had assembled there to witness the ceremony. It was afterwards used to denote any period of five years; a man who had commenced his 36th year being said to have completed his seventh lustrum, and to have entered on the eighth. After the establishment of the Julian calendar, and the adoption of the solar year of 365 days, the old Roman year of 304 days was still retained for religious purposes; and Niebuhr considers the lustrum to mean the periods of time at the conclusion of which the commencement of the Roman civil and religious years again coincided; six religious years of 304 days being just equal to five civil or solar years of 365 days.

LUTE, *lute*, a term probably derived from the Teutonic *lut* (whence, modified, it has passed into most European languages), employed to designate an ancient musical instrument of the guitar kind, somewhat resembling in shape the section of a pear, and consisting of four parts; viz., the table; the body, which has nine or ten sides; the neck, containing as many steps or divisions; and the head or cross, in which the screws are inserted. It is played upon by striking the strings with the fingers of the right hand, and regulating the sounds with those of the left. Its origin is unknown, but generally believed to have been very ancient: it was, in all probability, derived from the ancient lyre. Vincentio Galilei ascribes its invention to the English, among whom, according to Burney, the first author who mentions it is Chaucer. Until the end of the 17th century, a knowledge of this instrument was considered an almost indispensable part of a good education; after that time, however, it became gradually superseded by the guitar. It is said to have gone out of fashion from its being considered to occasion deformity in ladies.

LUTE (Lat. *lutum*, clay), a soft adhesive mixture, principally earthy, used either for closing apertures or the junction of different pieces of apparatus, or for

coating the exterior of vessels which are to be subjected to a high temperature, in order to strengthen them and prevent their fracture. Lutes for the purpose of making the junction of apparatus tight are numerous, in consequence of the variety of vapours which require to be confined, and the difference of temperature to which they are subjected. The principal lutes are,—Stourbridge clay, in fine powder, which sustains a higher heat than any other English lute; Windsor loam, obtained at Hampstead, a natural mixture of clay and sand; Willis's lute for making earthenware retorts impervious to air or vapours,—it is composed of borax and slaked lime; Fat lute, prepared by beating dried and finely-pulverized clay with drying linseed-oil. Plaster of Paris, mixed with water or a thin solution of glue, makes a hard stony cement, but it will not support a very high temperature. Iron cement is used for making permanent joints, generally between surfaces of iron: it consists of clean iron borings or turnings, slightly pounded, sifted coarsely, and then mixed up with powdered sal-ammoniac and sulphur, with enough water to moisten the whole slightly. Several other lutes are employed, which vary according to the objects for which they are designed.

LUTHERANISM, *lu'-ther-an-izm*, is the name given to that system of Protestantism adopted by the followers of Luther. The Lutheran church professes no other rule of faith than the Holy Scriptures. The Confession of Augsburg (*see* AUGSBURG CONFESSION), with Melancthon's defence of it, the Articles of Smalcand, the larger and smaller Catechisms of Luther, and the Formula Concordiæ, are generally received as containing the principal points of doctrine; but these books have no authority but what they derive from Scripture. Luther reduced the number of sacraments to two,—Baptism and the Lord's Supper; but he maintained the doctrine of impanation (which *see*) or consubstantiation, which forms the main difference between the Lutheran and English churches. He maintained the mass to be no sacrifice; opposed the adoration of the host, auricular confession, monastic vows, indulgences, purgatory, meritorious works, the worship of images, celibacy of the clergy, &c. There are, however, certain religious rites and institutions of the Romish church which are regarded by Lutherans as tolerable, and some of them as useful; as the distinguishing vestments of the clergy, the use of wafers in the administration of the eucharist, the forms of exorcism in the celebration of baptism, the private confession of sins, the use of images, of incense, and of lighted tapers in their churches, with a crucifix upon the altar. Some of these, however, are not general, but confined to particular parts. Hence Lutheranism is regarded as more nearly allied to Romanism than any other reformed system of worship. Some of the doctrines which were warmly maintained by Luther are now generally abandoned by his followers; as, for instance, the doctrines of absolute predestination, human impotence, and irresistible grace, which are so distinct from Lutheranism now, that they are generally known as Calvinistic doctrines. The Lutherans now maintain, with regard to the Divine decrees, that they respect the salvation or misery of men in consequence of a previous knowledge of their sentiments and characters, and not as free and unconditional, and as founded on the mere will of God. Towards the close of the 17th century, the Lutherans began to entertain a greater liberality of sentiment than they had before adopted; and their teachers now enjoy an unbounded liberty of dissenting from the decisions of those symbols or creeds which were once deemed almost infallible rules of faith and practice, and of declaring their dissent in the manner they deem most expedient. The constitution of the church is simple, and in every country where it is established, the head of the state is acknowledged as the supreme visible ruler of the church. It is governed by a consistory composed of divines and civilians, frequently appointed by the sovereign himself. The German Lutherans reject episcopacy; but as the Reformation extended, and Sweden and Denmark embraced the Lutheran faith, these countries retained the episcopal form of government, and are governed by bishops and superintendents under the authority of the sovereign. The forms of worship vary in different countries. Every country where Lutheranism prevails has its own liturgy, which is the rule of proceeding in all that relates to external worship and the public exercise of religion. The liturgies used in the different countries agree in all the essential branches of religion, but differ widely on matters of an indifferent nature regarding which Scripture is silent. Festivals in commemoration of the great events of gospel history were once observed, as well as a few saints' days; but these are now suffered to pass almost unnoticed. Ecclesiastical discipline is almost unknown; and religion itself has long, it must be confessed, been at a low ebb in most of the Lutheran churches. Lutheranism has been for centuries a state machine, from which little was expected, and by which little has been done. It has never grappled with the warm affections of an ardent people, or subdued and governed the intelligence of a thoughtful race. Its career has been monotonous and undisturbed. When its children have been awakened to a due sense of the importance of religion, the have forsaken its communion. To the Lutheran church, however, belongs the honour of having been the first of Protestant communities in the missionary field. At present Lutheranism is most powerful in Denmark and Sweden. In the Protestant states of Germany and in Holland the Lutheran is, upon the whole, the prevailing faith, though the proportion of Roman Catholics is often great. In France, Russia, Poland, Hungary, there are also a number of Lutheran churches. The number of members of the Lutheran church throughout the world is estimated at 30,000,000. Various attempts have been made to unite the Lutherans and Calvinists; but with little success. A sort of mechanical union of the two churches was effected in Prussia in 1817, on the basis of a declaration promulgated by a synod convened by royal authority at Berlin. The united church forms what is known as the evangelical church of Prussia, a church in which the Lutheran is not compelled to embrace Calvinism, nor the Calvinist Lutheranism. The two confessions are thus held within the pale of the same church, and not unfrequently preached by collegiate ministers within the same walls. The differences between the two systems are of such a nature as to have hitherto presented insuperable obstacles to an efficient union. Calvinism was a return to the primitive sources of revelation; Lutheranism was little else than a new phase of Latin Christianity; Calvinism was systematized from Scripture alone; Lutheranism accorded to tradition a regulative power.

LUXATION, *luks-ai'-shun* (Lat. *luxatio, from luxo*, I put out of joint), in Surg., is the dislocation of a bone from its proper cavity. (*See* DISLOCATION.)

LUXURY, *luks'-u-re* (Lat. *luxuria*), in Pol. Econ., is a word of very indefinite signification, and may be taken in a good or a bad sense. "In general," says Hume, "it means great refinement in the gratification of the senses, and any degree of it may be innocent or blameable, according to the age, or country, or condition of the person." The gratification of any of the senses is not of itself a vice, and only becomes so when pursued at the expense of some virtue. "Luxury," says Dr. Clarke, "does not consist in the innocent enjoyment of any of the good things which God has created to be received with thankfulness, but in the wasteful abuse of them to vicious purposes, in ways inconsistent with sobriety, justice, or charity." Men of severe morals have been found in all ages to blame even the most innocent luxury, and to represent it as the source of all the corruptions, disorders, and factions incident to civil government. In particular the ancient moralists regarded the luxury of the rich, or their more refined mode of living, as an evil of the first magnitude. They considered it as subversive of those warlike virtues which they principally admired, and consequently denounced it as fraught with the most injurious consequences. "But it would be easy to prove," says Hume, "that these writers ascribed to luxury and the arts what really proceeded from an ill-modelled government and the unlimited extent of conquests. Refinement on the pleasures and conveniences of life has no natural tendency to beget venality and corruption." On the contrary, he maintains "that the ages of refinement are both the happiest and most virtuous; and that wherever luxury ceases to be innocent, it also

ceases to be beneficial; and when carried a degree too far, is a quality pernicious, though perhaps not the most pernicious, to political society." "Luxury when excessive is the source of many ills; but is in general preferable to sloth and idleness, which would commonly succeed in its place, and are more pernicious both to private persons and to the public." What are to be regarded as necessaries or luxuries to an individual, depend partly upon the habits in which the individual has been brought up, partly on the nature of his occupation, and partly on the climate in which he lives. The same style of living which would be reckoned moderate, or even penurious, among the higher orders, would be censured as extravagant luxuries in a day-labourer; while the cottage and clothes of the labourer would be thought luxuries to an Indian prince. In this country there formerly existed a number of penal statutes against luxury. Excess in apparel was legislated against, chiefly in the reigne of Edward III., Edward IV., and Henry VIII., all of which were repealed by 1 Jac. I. c. 25. As to excess in diet, 10 Edward III. stat. 3, ordained that no man should be served at dinner or supper with more than two courses, except upon some great holidays there specified, in which he might be served with three. This last statute was only expressly repealed by 19 & 20 Vict. c. 64.

LYCANTHROPY, *li-kăn'-thro-pe* (Gr. *lukos*, a wolf, and *anthropos*, a man), is defined by Cotgrave to be "a frenzie or melancholie which causeth the patient (who thinks he is turned woolf) to flee all company and hide himself in dens and corners." Herodotus says that, according to the Scythians, every Neurian once a year changes himself for some days into a wolf, and afterwards resumes his own shape; but adds, "they cannot make me believe such stories, though they not only tell them, but swear to them." A similar superstition is noticed by Virgil in his Eclogues, Pliny, Pausanias, and other writers. A belief in lycanthropy appears to have been extremely prevalent in the 16th century, and numerous authentic narratives remain to us of victims committed to the flames for this practice, for the most part in consequence of their own confessions. They were called *loups-garous* by the French, *were-wolves* by the Anglo-Saxons, *wehr-wölfs* by the Germans, and were believed to be extremely ferocious, devouring not only beasts, but human beings. From the prevalence of this superstition, many persons were led to believe themselves wolves, and to imitate the howl and actions of these animals; a species of insanity to which the term lycanthropy was also applied. It was said to manifest itself "by the patient's going out of doors at night and imitating the actions of wolves, and in the daytime wandering in burial-grounds." (See a learned article on this subject in the *Encyclopædia Metropolitana*.)

LYCEUM, *li-se'-um*, was the name of an academy at Athens, so called from its position near the temple of Apollo Lyceus. Here Aristotle and his disciples taught, and were called Peripatetics, from their habit of walking up and down its porches while delivering their lectures. In the present day, on the continent, the name is given to preparatory schools for the universities, as in them the Aristotelian philosophy was formerly taught.

LYCOPERDON, *li-ko-per'-don* (Gr. *lukos*, wolf; *perdomai*, I break wind, because supposed to spring from wolf's dung), in Bot., the Puff-ball, a gen. of *Fungi*. When the species *L. giganteum* is submitted to combustion, fumes arise which are powerfully narcotic. In this way the fungus has been employed to stupefy bees when removing honey from the hive. Lately, the vapour has been proposed as an anæsthetic agent instead of chloroform.

LYCOPERSICON, *li-ko-per'-si-kon*, in Bot., a gen. of the nat. ord. *Polemoniaceæ*. The species *L. esculentum* produces the juicy acid fruits called *love-apples*, or *tomatoes*, much employed in the preparation of sauces.

LYCOPODIACEÆ, *li-ko-po-de-ai'-se-e* (Gr. *lukos*, wolf; *pous*, foot), in Bot., the Club-moss fam., a nat. ord. of *Acotyledones*, sub-class *Acrogenæ*. Herbaceous plants, usually resembling mosses, with creeping stems and forked ramification; or aquatic plants, with corn-like stems. The order includes six genera and about 200 species, which occur in cold, temperate, and warm climates.





LYCOPODIUM, *li-ko-po'-de-um*, in Bot., the typical gen. of the nat. ord. *Lycopodiaceæ*. The species *L. clavatum* is the common club-moss, an inconspicuous plant found on heaths. Pharmacologists state that it possesses well-marked emetic and purgative properties. The spores have been employed externally for their absorbent qualities in erysipelas and various cutaneous affections. They are of a yellow colour, and are sometimes styled *vegetable sulphur*. They are commonly employed in pharmacy for covering pills, the object sought being to render the pills tasteless, and to prevent their adhering together. The spores are highly inflammable, and are much used in the preparation of fireworks, and in the production of artificial lightning at the theatres.

LYMPH, *limf* (Lat. *lympha*, water], in Anat., is a thin, transparent, colourless fluid, which is found in the lymphatic or absorbent vessels abundantly distributed over the body. (*See* LYMPHATICS.) Its taste is saline, and it has a faint, scarcely perceptible smell. When examined with the microscope, it is seen to consist of a clear liquid, with corpuscles floating in it, which agree entirely with the pale corpuscles of the blood. The liquid part bears a strong resemblance in its physical and chemical constitution to the plasma of the blood. The constituent parts of lymph are as follows:—

| | |
|---|---|
| Water | 96·926 |
| Fibrin | ·520 |
| Albumen | ·434 |
| Ozmazome | ·312 |
| Fatty matters | ·264 |
| Salts | 1·544 |
| | 100· |

Lymph is a nutritious fluid, and not excrementitious, as was maintained by Hewson and Hunter.

LYMPHATICS, *lim-fit'-iks*, in Anat., is the name given to a class of vessels in the human body, from their containing lymph. They are also called absorbents, from the property they possess of absorbing certain materials for the replenishing of the blood, and conveying them into the circulation. The lymphatics are found in all animals which have a lacteal system, the two forming one set of vessels; and, indeed, under the head of lymphatics, in works on anatomy, are generally included the lacteals. The lacteals differ from the lymphatics proper only in containing a milk-like fluid,—the chyle, which they take up in the intestines during the process of digestion, and convey into the blood through the thoracic duct. The lymphatics are exceedingly delicate vessels, their coats being so transparent that their fluid contents are readily seen through them. They are found in nearly all the textures and organs of the body which receive blood, with the exception of the substance of the brain and spinal cord. In the different regions of the body, and in the several internal viscera, they are arranged into a superficial and a deep set,—the former running immediately beneath the skin, or under the membranous coats enveloping organs internal; the latter usually accompanying the deep-seated blood-vessels. The origin of the lymphatics may be either superficial or deep, and most commonly is in the form of networks or plexuses, out of which single vessels emerge at various points, and proceed directly to lymphatic glands, or to join larger lymphatic trunks. The fluids imbibed by these plexuses must pass into them by transudation. The lymphatics of any part or organ exceed in number the veins, but in size they are much smaller. They are interrupted at intervals by constrictions, which give to them a knotted or beaded appearance; and these constrictions correspond to the presence of valves in their interior. Like the veins and arteries, the lymphatics are composed of three coats,—an internal, middle, and external. The lymphatic, or absorbent glands, named also conglobate glands, are small solid bodies, situated in the course of the lymphatic and lacteal vessels, and through which their contents pass in their course towards their union with the blood. A lymphatic vessel may pass through two, three, or more of these bodies in its course, while, on the other hand, there are some which reach the thoracic duct without encountering any. Their size is very various, some

being not much bigger than a hemp-seed, others as large or larger than a kidney-bean. They are collected in numbers along the course of the great vessels of the neck, also in the thorax and abdomen, especially in the mesentery and alongside the aorta, vena cava inferior, and iliac vessels; also in the axilla and groin, and on the popliteal vessels. A lymphatic or lacteal, previous to entering a gland, divides into several small branches, which are named afferent vessels. As they enter, their external coat becomes continuous with the capsule of the gland, and the vessels, much thinned, divide and subdivide while pursuing a tortuous course, and, finally anastomosing, form a plexus. The vessels composing this plexus unite to form two or more efferent vessels, which, on emerging from the gland, are again invested with their external coat. Capillary vessels are abundantly distributed on the walls of the lymphatics in the glands. The absorbent system discharges its contents into the veins at two points,—namely, at the junction of the subclavian and internal jugular veins of the left side by the thoracic duct, and in the corresponding part of the veins of the right side by the right lymphatic trunk. The openings are guarded by valves.—*Ref.* Quain's *Anatomy*, by Sharpey and Ellis.

Lynch Law, *linsh*, is a term applied to the administration of justice at the hands of the populace, which is not uncommon in certain parts of the United States of America. This barbarous system is said to be owing to the imperfect provision made for the due administration of justice, and the difficulty of enforcing the law against offenders, and is said to take its name from one Lynch, a Virginian farmer, who had recourse to this mode of punishing an offender. In such cases, the offender is seized by the populace, or the person against whom he has offended, is summarily tried and sentenced, and the sentence at once carried into execution, being usually to be flogged or put to death. In many other countries, where civilization is not far advanced and the laws little observed, a species of lynch law will be found to prevail. It is, however, a most iniquitous and brutalizing system, and is the usurping, with unhallowed hands, the most sacred of trusts committed to a state.

Lynx, *links* (Lat.), a general name applied to the short-tailed *Felidæ*. Under this head several species were formerly confounded by Linnæus, and at the present day there is still much confusion with respect to them. *Felis cervaria*, the largest and most beautiful, is found in Asia and Europe. *Felis lynx*, the European lynx, has become rare, and is only found in the Pyrenees and part of the Apennines. In length this animal is about three feet, and is very destructive to the smaller quadrupeds. Among the ancients it was celebrated as having been harnessed to the car of Bacchus when he made his Indian conquest. Great quickness of sight was also attributed to it, and it was supposed that its urine was converted into a precious stone. The skin of the male is spotted, and is more valuable in winter than in summer. Another species of lynx is the caracal, which is slightly larger than a fox. It derives its name from the black colour of its ears, *caracal* being a Turkish word signifying black. In North America there are several species of these animals, the best known of which is the northern or Canada lynx, distinguished by the name of *loup-cervier* and *le chat* among the French Canadians. In the region round Hudson's Bay it is found in great abundance, about seven to nine thousand skins being annually exported. Although a timid creature, and incapable of attacking the larger quadrupeds, it is very destructive to rabbits and hares, on which it chiefly preys. When brought to bay by a hunter, it makes but a slight resistance; for, though it spits and erects the hair on its back like a cat, it is easily killed by a blow with a slight stick. In appearance it is clumsy and awkward, on account of its large paws, slender loins, and long but thick hind legs, with large buttocks, scarcely relieved by a short thick tail. It moves in straightforward bounds, with the back a little arched, and lighting on all four feet at once. It is not swift on land, but swims well. Its flesh is eaten, and somewhat resembles the rabbit in flavour. It breeds once a year, and has two young ones at a time. There are two other American species, both of which are smaller than the preceding; they are named respectively *Felis rufa* and *Felis fasciata*.

Lynx, a constellation of the northern hemisphere, formed and named by Helvetius. It is surrounded by the Camelopard, the Great Bear, Leo Minor, and the modern constellation called Herschel's Telescope. Its largest stars are of the fourth magnitude only.

Lyon King-at-Arms. (*See* Heralds' College.)

Lyra, *lī'-rā* (Lat., a lyre), in Anat., is the name given to a portion of the brain, between the posterior crura of the fornix of the cerebrum, and marked with prominent medullary fibres, so as to give it the appearance of a lyre.

Lyre, *lire* (Lat.), the most primitive of all stringed instruments, invented, according to the traditions of the Egyptians, by Mercury, in the year of the world 2000. We find it first spoken of under this name by Aristophanes; it is also mentioned by Aymerie in the Life of Charlemagne. The Greeks, in all probability, derived their lyre from the Egyptians. It was at a very early period of its existence undoubtedly capable, even with a very few strings, of producing a great variety of sounds differing in pitch. At first it possessed only three strings; to these, however, one was afterwards added by the Muses, and one each by Orpheus, Linus, and Thomyris; thus forming it into a heptachord: this number was at last increased to eleven. The lyre was of a very graceful form, possessing a hollow body to swell the sound, and was played upon with a *plectrum*, or lyre-stick, of ivory or polished wood. Some lyres are said to have been constructed of tortoise-shell. One was invented by Leonardo da Vinci, in the shape of a horse's skull. The ancient names for this instrument were, *lyra phorminx*, *chelys*, *barbiton*, *barbiton*, and *cithara*.

Lyric Poetry, *lir'-ik*, is commonly understood to be poetry intended to be sung or accompanied with music. This distinction was not at first peculiar to any particular species of poetry, for, originally, music and poetry were always joined together. After a time, the bards began to compose pieces which were to be recited or read, not to be sung; such poems as were still designed to be joined with music were, by way of distinction, called odes. The ode was that form of poetry under which the original bards poured forth their enthusiastic strains, praised their gods and their heroes, celebrated their victories, and lamented their misfortunes. It was chiefly in the spirit and manner of its execution that it was distinguished from other kinds of poetry. The subject being of a lofty and transporting nature, justified a bolder and more passionate strain than belonged to the simple narrative. Hence the enthusiasm that belongs to it, and the liberties it is allowed to take beyond any other species of poetry. Hence, too, that neglect of regularity, those digressions, and that disorder which it is supposed to admit of. The term lyric poetry is commonly applied to all kinds of verse that partake in any degree of the characteristics of that to which it was first applied. Thus we have lyrical ballads, which might with equal propriety be termed epical, and hear of the lyrical measures of Horace, where we have no ground to suppose that they were sung, and which have no fitness for musical rehearsal. A writer in the "English Cyclopædia," in distinguishing between lyric and epic poetry, defines the former to be "that class of poetry which has reference to, and is engaged in delineating, the composer's own thoughts and feelings, in distinction from epic poetry, which details external circumstances and events." The ancient Greeks speak of nine as the principal of their lyric poets; viz., Alcman, Alcæus, Sappho, Stesichorus, Ibycus, Anacreon, Simonides, Pindar, and Bacchylides; but, with the exception of Anacreon and Pindar, nothing remains to us of the works of these authors but a few fragments. To these two, however, the judgment of all has ascribed the palm of pre-eminence in lyric poetry. Each of these excels in his particular line. Anacreon sings of women and roses and wine; Pindar, of heroes, of public contests, of victories, and laurels. The one melts away in amatory softness; the other is ever like a foaming steed of the race, vaulting in the pride of conscious strength, or the furious war-horse, dashing fearlessly on over every obstacle. Under these masters, Grecian lyrics were advanced to their greatest perfection. Among the Romans, who principally followed the Greek models, Horace stands almost alone as the

representative of Greek poetry. To him, even the Greeks themselves can present a superior only in the bold and lofty Pindar. That Horace borrowed freely from the Greeks has been clearly shown, yet the universal admiration that his odes have awakened is manifest proof of the power of his genius. The most important branch of the Roman lyric is satire. English lyric poetry, strictly so called, is late in its full development. Scarcely any poems occur before the time of Milton that are worthy of the name of lyrical. In "Lycidas," "Il Penseroso," and "L'Allegro," we have, perhaps, the most beautiful examples of which our language can boast. In Dryden, Pope, Gray, and Cowley, we meet with some good specimens of lyrics. The works of Wordsworth and Coleridge are eminently lyrical in their character, and our present laureate, Tennyson, has produced a number of beautiful specimens of lyric poetry. Lyric poety is said, from its nature, to have "flourished better at court than the dramatic and epic, both of which, like history, require liberty, because they must represent truly the character of man, in his manifold strivings, which cannot be done but by viewing life impartially, and depicting it freely; whilst the lyric poet, in most of his highest efforts, aims to express his adoration,—be it of a hero, or his mistress, or nature, or God; and this tone coincides well with the adulation of courts. Hence, when the drama and epic have gone down with the decay of national independence and spirit, and genius, debarred from action, lives only in contemplation, lyric poetry continues, and not unfrequently even flourishes; because man always *feels*;—adoration, love, and hatred cannot die."

LYRUS, *li'-rus* (Gr. *lura*, a harp or lyre), one of the old constellations of Aratus and Ptolemy, supposed to represent the lyre that was carried by Mercury. It is situated in the northern hemisphere, to the south of the constellation Draco, having Cygnus on one side and Hercules on the other. The name Vega is given to its largest star, which is one of the first magnitude, and situated nearly in the centre of the constellation.

LYTHRACEÆ, *li-thrai'-se-e* (from Gr. *luthron*, blood mingled with dust, because of its colour), in Bot., the Loose-strife fam., a nat. ord. of *Dicotyledones*, sub-class *Calyciflorœ*, having the following essential characters:—Herbs or shrubs, with entire, exstipulate, and usually opposite leaves. Calyx tubular, ribbed, persistent, bearing deciduous petals and stamens, the latter being inserted below the petals; anthers 2-celled, adnate, bursting longitudinally; ovary superior, with axile placentation; style 1. Fruit membranous, dehiscent, surrounded by the non-adherent calyx. Seeds numerous, exalbuminous. The greater number of these plants are tropical, but a few are found in the temperate regions of Europe and North America. The species *Lythrum Salicaria* is the purple loosestrife, a common British plant. This is said to be useful as an astringent in diarrhœa. The order contains 35 known genera and about 300 species.

## M.

M, *em*, is the thirteenth letter and the tenth consonant of the English alphabet. It is the labial letter of the liquid series, and in all positions has one uniform well-known sound, as in *mine*, *camp*, *jam*. It is pronounced, says Ben Jonson, with a kind of humming inward, the lips closed; open and full in the beginning, obscure in the end, and meanly in the midst. It is one of the easiest to articulate, and is therefore one of the first uttered by children, and in most languages it forms a prominent letter in the words for mother. The letter *m* has a place in all known languages, and the English sound of it is that which it has also in most of the European tongues. In French and Portuguese, however, at the end of a word, and in most cases at the end of a syllable, it loses its proper sound, and serves only to give a nasal sound to the vowel which precedes it. Among the ancient Romans, too, *m* was but very faintly pronounced, being rather a rest between two syllables than an articulation; and hence it was subject to elision. *M* passes easily into other letters, losing itself in the preceding or succeeding letters,—a circumstance which the etymologist must bear in mind in seeking the derivation or connection of words having that letter in their root. *M* interchanges with *n*, *b*, *p*, *v*, and *w*, and frequently disappears altogether. Like other liquids, it also not unfrequently changes its position with regard to the vowel of a root. The Greek and Hebrew *m*, as a numeral, denoted 40; the Roman *m* (probably as being the initial letter of *mille*, a thousand) denoted 1,000; and this is its numerical value in English. *M* is likewise used by printers for the unit of measure of printed matter. Types of the same fount have bodies of equal thickness in one direction, and the square of this dimension is used in determining the amount of printed matter in a given space, and is termed an *m*.

MAB, *mab*, is the name of a fairy celebrated by Shakespeare and other English poets. The name has been variously derived; but the most probable derivation of it is from the Cymric *mab*, a child. According to Voss and others, Mab was not the queen of the fairies, that dignity having been ascribed to her from a mistaken use of the old English word queen, or quean, which meant only a woman.

MACADAMIZING, *mâk-âd-âm-i'-zing*, a method of forming roads, invented by Mr. M'Adam, whose name is perpetuated in the verb *to macadamize*. In this method the road is made entirely of angular pieces of stone, without any kind of binding material. The stones used for this purpose must be hard and tough, such as the whinstones, basalts, granites, and beach pebbles, so that they may resist the action of the wheels. Hardness alone is not sufficient, for flint-stones are hard but brittle, and are soon crushed into powder, as are also the softer sandstones. The angular stone fragments used in macadamizing must be of such a size as to pass freely, by their largest dimensions, through a ring 2½ inches in diameter.

MACARONIC VERSES, *mâk-a-ro'-nik* (Fr. *macaronique*, from Ital. *maccheroni*), is a species of ludicrous metrical composition, in which the words of a modern language are Latinized. It is said to have been invented by Theophilo Folengo, a Benedictine monk of Casino, who flourished early in the 16th century, and wrote under the name of Merlino Coccaio. His principal poem, "Maccaronea," is a burlesque mixture of Latin, Italian, Tuscan, and plebeian words and forms, and satirically narrates the adventures of its hero until he finally arrives in hell; the three last books being a parody on part of Dante's "Inferno." In the preface, or "apologetica" to the work, he describes this new species of poetry, deriving its name from macaroni; because, like that mélange, it should be coarse and popular. Antonius de Arena, a lawyer at Avignon, wrote in this style as early some say as 1519; and it soon became highly fashionable in England, France, Germany, and Italy. Macaronics were fondly cherished by Rabelais, who often referred to Merlin the Cook (Coccaio). John Skelton introduced it into England in the reign of Henry VII., and it continued fashionable during the reign of Elizabeth. Dunbar, a Scotch poet of Skelton's own age, was also distinguished in this way. His "Testament of Maister Andro Kennedy" represents the character of an idle, dissolute scholar, and ridicules the funeral ceremonies of the Romish church, almost every alternate line being composed of the formularies of a Latin will and shreds of the breviary. Thus,—

"I will no priestis for me sing,
*Dies ille, dies iræ;*
Nor yet no bellis for me ring,
*Sicut semper solet fieri;*
But a bag-pyp to play a spring,
*Et unum ale-wisp ante me,*" &c.

Drummond of Hawthornden has also written in this style. His "Polemo Middinia," or War on a Dunghill, describes a feud between two fishwomen, Vitrina (the Lady Scotstarbet) and Neberna (the Lady Newhaven). The following are some of the assistants whom Neberna summons to her aid:—

"Convocat extemplo barrowmannos atque lairdos,
Tumultuosaque simul rookoso ex kitchene Bessa,
Hunc qui dirtiferas tersit cum dishclouty dishes,
Hunc qui gracilas scivit bene bakere plettas,

Coalhenghos nigri grinantes more divelli,
Meggyam magis doctam milkare coumas,
Et doctam suepare flouras et sternere beddas
Nansyam, claves bene quæ keepaverat omnes,
Quæque lanam cardare solet greasy-fingris Betty."

The following is an account (from the *Frosteidos*, in a pamphlet entitled "The University Snowdrop") of one of the Edinburgh "bickers," which are of more than local celebrity:—

"Anno incipiente happenabit snowere multum
Et gelu intensum streetas coverabit wi' slidas,
Constanterque little boys slided et pitched about snowballs,
Quorum not a few bunged up the eyes of studentes
Irritate, studentes chargebant policemen to take up
Little boys, sed Charlies refusabant so for to do, then
Contemptim studentes appellabant 'Pedicatores.'
Studentes indignant reverberant complimenta.
Cum multi homines 'blackguards' qui gentlemen vocant,
Bakers, et butchers, et bullies, et colliers atras,
Et alios, cessatores qui locus ecclesiæ frequent
'Tron Church' et Cowgate cum its odoriferous abyss.
Assanitant studentes stickis et umberelibus.
'Hit 'im hard! hit 'im hard!' shoutant 'damnatos puppies,'
'Catamitosque tonos' appellant et various vile terms
Studentes audiebant, sed devil an answer returned."

The author of the following book inscription seems resolved, at all hazards, to maintain his right of property:—

"Si quisquis furetur
This little libellum,
Per Phœbum, per Jovem,
I'll kill him! I'll fell him;
In ventrem illius
I'll stick my scalpellum,
And teach him to steal
My little libellum."

Some very successful macaronics have appeared in *Punch*.—Ref. *Macaroneana, ou Mélanges de Littérature macaronique des différents peuples de l'Europe*, par M. O. Delepierre, Paris, 1852; *De la Littérature macaronique et de quelques Raretés bibliographiques de ce genre*, par M. O. Delepierre, 1856.

MACAW, *mă-kaw'* (*Macrocercus*), a bird belonging to the family *Psittacidæ*, or Parrot tribe, and distinguished from other *Scansores* (the class of the family, so named from their being climbers) by reason of their having their cheeks destitute of feathers, and their tail-feathers being long. The macaws are natives of South America, where they were first discovered. The scarlet macaw, *Ara* (*macrocercus*) *Macao*, is, perhaps, the most splendid, as well as the largest species of the entire parrot family. Some of them measure thirty-six inches and more from the tip of the bill to the extremity of the tail, and their plumage is a bright scarlet, relieved with different shadings of blue, yellow, and green. The great green macaw, *Ara* (*macrocercus*) *militaris*, is a native of the Andes, where it is often found at an elevation of 3,000 feet from the sea. In former times this bird used to be presented, as an inestimable gift, by the Indians to their Incas, who valued the macaw extremely. It is extremely gregarious and mischievous, by reason of its predatory nature, as it commits great damage upon plantations and gardens, which it plunders right and left. The characteristics of the macaw are the same as the rest of the *Psittacidæ*, and will be found given under the article PARROT FAMILY.

MACCABEES, BOOKS OF, *măk'-a-bees*, is the name given to certain apocryphal books of the Old Testament, containing principally the details of the struggles of the Jews against the civil and religious tyranny of the Syrian kings in the heroic period of the Maccabees. The books are connected only by their subjects, being by different authors, and of widely unequal literary merit. The two first in order were declared canonical by the councils of Florence and Trent, and are also contained in the original translation of Luther. The first book of Maccabees contains a history of the Jews from the reign of Antiochus Epiphanes till the death of the Jewish priest Simon, *i. e.* from 175 to 135 B.C. It may be divided into four parts; viz.,—1. From the commencement of Antiochus Epiphanes's reign till the death of Mattathias (i. ii.); 2. the history of the presidency of Judas Maccabeus (iii.—ix. 22); 3. the government and high priesthood of Jonathan (ix. 23—xii. 53); 4. history of the high-priest Simon (xiii.—xvi.). The Greek text of the Septuagint version is the original of all the others; but there is little doubt that it was written originally in Hebrew. Of the author nothing is known; but he must have been a Palestinian Jew, and have lived some time after the events recorded in the book. Though in some instances unsatisfactorily defective and uncritical, and occasionally extravagant, it is upon the whole entitled to credit for general accuracy. The second book of Maccabees is inferior in many respects to the first in simplicity, credibility, naturalness, correctness, &c. It professes to be an abridgment of an earlier historical work by a Jewish writer of Cyrene, named Jason, relating the principal events of Jewish history in the reigns of Seleucus IV., Antiochus Epiphanes, and Antiochus Eupator. It partly goes over the same ground with the first book, but commences ten or twelve years earlier, and embraces in all a period of fifteen years. The precise age, either of the author or his predecessor Jason, is unknown. The two letters with which the book begins are generally regarded as spurious, and the other parts abound with inaccuracies, and even self-contradictions. The third book of Maccabees is prior in time to the first and second, and, indeed, does not touch on the time of the Maccabean heroes. It gives an account of a sacrilegious attempt of Ptolemy Philopator, after his victory over Antiochus the Great, at Raphia (217 B.C.), to enter the holy of holies at Jerusalem, which was baffled by a miracle. Upon his return to Egypt he resolved to avenge himself upon the Jews there; and those of them who would not consent to be initiated into the orgies of Bacchus, he caused to be chained in the great circus at Alexandria, in order to be trampled to death by elephants. Two angels appeared, in a terrible form, between the Jews and the elephants, when the latter went backwards and crushed the soldiers. The king caused the Jews to be released, appointed a festival, and made an edict that none of his subjects should injure a Jew on account of his religion. The author and his age are both unknown; and, indeed, the entire history is nothing else than a most absurd Jewish fable. The fourth book of Maccabees is generally supposed to be the same with the "Supremacy of Reason," attributed to Josephus by Jerome, Eusebius, and others. It contains an ascetic treatise on the dominion of right reason over the passions, as illustrated by the history of the martyrdom of Eleazar, the seven brothers, and their mother, being an inflated amplification of that history as given in 2 Macc. vi. vii. The author makes many historical blunders, and the whole manner and diction disprove it to be the work of Josephus. Nothing is known of its author, and it is believed not to be earlier than the 2nd century of our era. The fifth book of Maccabees is now extant only in the Arabic. It comprises a history of Jewish affairs from the attempt on the treasury at Jerusalem by Heliodorus, and brings it down to the extermination of the house of the Maccabees by Herod the Great. The work was originally written in Hebrew, but who the translator was it is impossible to say; but he seems to have lived after the destruction of the temple, at Jerusalem by Titus. Only the first two books of Maccabees are printed in the Apocrypha of King James's version.

MACE, *maise*, a term of doubtful etymology, originally signifying a club of metal used in warfare. The gradual course of improvement having rendered armour impenetrable by edged weapons, the mace was used as an instrument of effectual demolition. In its simplest form the mace was only a short strong iron club, and its shape varied among different nations and at different times: sometimes a ball was attached to the end by a triple chain. At present the mace, in a more ornamental form, is used as an ensign of authority borne before magistrates: of this kind is the mace placed before the Speaker of the House of Commons whilst

that officer presides at the sittings of the House. In a "committee of the whole house," or when any other member presides in the place of the Speaker, the mace is laid under the table. When Cromwell dissolved the Long Parliament, he stigmatized the mace as "a bauble," and ordered it to be "taken away." The old mace of the House of Commons was broken up, melted, and sold by order of the House, Aug. 9th, 1649.

MACE, in Bot. (*See* MYRISTICA.)

MACERATION, *más-e-rá'-shun* (Lat. *macero*, I soften with water), is the infusion of substances in cold liquids. The term is usually employed with regard to vegetable substances, when they are reduced to powder and exposed to the action of water, or any other liquid, without the assistance of heat, in which last respect it differs from *digestion*. Maceration is useful either when it is required merely to soften the parts of the substance operated on, as when cinnamon and cloves are macerated in water before distillation, or in cases where heat would be injurious, as when volatile or aromatic substances are used.

MACHIAVELLIANISM, *mák-e-á-vel'-le-án-izm*, is a term applied to a detestable system of politics, after Nicolo Machiavelli, a native of Florence (1469—1527). The obnoxious principles are set forth more particularly in a work of his called "Il Principe." The meaning and object of this work have been much discussed; but from a letter of the author's, discovered only in 1810, in which he speaks of being then engaged upon it, there can be little doubt that it was written with a view to recommend himself to the Medici. The "Principe" is an account of how tyrannical power is to be acquired and preserved,—by overlooking every law, and making use of any means, however criminal, to promote its purposes. Some have regarded the work as satirical; others that its object was to make tyrants odious; others that he was desirous of seeing a free and united Italy, and that he believed any means to be lawful for the attainment of that object. In judging of the work, we must take into account the circumstances and character of the times in which it was written. Had his book taken the form of a commentary upon history, all that he says would have only been matter of fact; but whatever may be the character of the book, the term Machiavellianism is used to denote whatever is infamous and perfidious in politics.

MACHICOLATION, *má-shik'-o-lai-shun* (Fr. *máchecoulis*, from *mèches*, lighted materials; *couler*, to pour down), a term bestowed on those openings in the parapet of a fortified building through which ignited substances, or melted lead, stones, &c., were poured or hurled down at the besiegers. Machicolations were made in the soffit or under surface of the projecting parapet, which was supported on corbel-stones, the perforations themselves being in the soffit between those stones. By means of these arrangements the besieged, while protected by the parapet, were enabled to harass the attacking party in a most formidable manner.

MACKEREL, *mák'-e-rel* (Du. *mackreel*, from Lat. *maculatus*, spotted), a member of the *Scomberidæ*, a family of acanthopterygious fishes, and known by the scientific appellation of *Scomber scomber*, according to the Linnæan system. The generic characters of the mackerel are as follows:—Scales on the body small and smooth; vertical fins not bearing scales; two dorsal fins widely separated; some of the posterior rays of the second dorsal and the anal fin free, forming finlets; sides of the tail slightly carinated; one row of small conical teeth in each jaw; the parts of the gill-covers without denticulations or spines; and, lastly, the branchiostegous rays seven in number. Its usual length varies between twelve and sixteen inches; but it is occasionally found in northern seas of even greater size. The nose is pointed, and the under jaw is the longest. The colour of the back above the lateral line is a fine green, traced with rich blue, and marked with broad dark descending lines. It is said that the males have these dark transverse bands nearly straight, while the females have them beautifully undulated. The sides and under surface are of a silver-colour, traced with brilliant golden tints; altogether, the mackerel is one of the most beautiful of fishes. It was supposed, originally, to be a fish of passage; but there is no doubt that this assertion is untrue, as it is caught nearly the whole year round off the Cornish coast. As an article of food, the mackerel is in great request, and those taken in May and June are said to be superior to those caught later in the year. The fishery is very extensive, and the returns they bring in to the different boats engaged in the trade are something wonderful. The most common mode of fishing is by drift-nets, and the method is thus described by Mr. Yarrell:—"The drift net is twenty feet deep by one hundred and twenty feet long, well corked at the top, but without lead at the bottom. They are made of small fine twine, which is tanned of a reddish-brown colour to preserve it from the action of the sea-water; and it is thereby rendered much more durable. The size of the mesh is about two and a half inches, or rather larger. Twelve, fifteen, or sometimes eighteen of these nets are attached lengthwise by tying along a thick rope, called the drift-rope, and at the ends of each net, to each other. When arranged for depositing in the sea, a large buoy attached to the end of the drift-rope is thrown overboard, the vessel is put before the wind, and as she sails along, the rope, with the nets thus attached, is passed over the stern into the water till the whole of the nets are run out. The net thus deposited hangs suspended in the water perpendicularly, twenty feet deep from the drift-rope, and extending from three-quarters of a mile to a mile, and even a mile and a half, depending on the number of nets belonging to the party or company engaged in fishing together. When the whole of the nets are thus handed out, the drift-rope is shifted from the stern to the bow of the boat, and she rides by it as if at anchor. The benefit gained by the boat's hanging at the end of the drift-rope is, that the net is kept strained in a straight line, which, without this pull upon it, would not be the case. The nets are shot in the evening, and sometimes hauled once during the night, or allowed to remain in the water until the morning. The fish roving in the dark through the water hang in the meshes of the net, which are large enough to admit them beyond the gill-covers and pectoral fins, but not large enough to allow the thickest part of the body to pass through. The nets are thus hauled in:—a capstan on deck is manned, and the drift-rope attached to it; one man stands forward to untie the upper edge of each net from the drift-rope, while others hand in the net with the fish on one side of the vessel, the other being devoted to hauling in the drift-rope. The whole of the net in, and the fish secured, the vessel runs back into harbour, or deposits her cargo on board some swifter boat in company, which carries it to the nearest market." The mackerel is also taken by line-fishing, one of the best baits being a small tapering piece of red cloth, which it eagerly bites at. (*See* FISHERIES.)



MACKEREL.

MACLURA, *mák-lu'-rá* (in honour of William Maclure, a North-American geologist), in Bot., a gen. of the nat. ord. *Moraceæ*. The wood of the species *M. tinctoria*, a native of the West Indies and South America, is of a golden-yellow colour, and is much employed in this country and elsewhere as a dyeing agent. It is commonly known as *fustic*, or *old fustic*, to distinguish it from *young fustic*. (*See* RHUS.) The fruit is edible. Another species, *M. aurantiaca*, supplies the fruit called the *Osage orange*, the juice of which is used by some of the Red Indians as a yellow war-paint.

MACRABIOTICS, *mák-krá-bi-ot'-iks* (Gr. *makros*, long, and *bios*, life), is applied to the science of prolonging life. (*See* LONGEVITY.)

MACROPIPER, *mák-kro-pí'-per* (Gr. *makros*, long; Lat. *piper*, pepper), in Bot., a gen. of the nat. ord. *Piperaceæ*. The species *M. methysticum* is the celebrated Ava pepper-shrub, from the rhizome of which the South-Sea islanders prepare an intoxicating and narcotic drink, called *ava*, or *cava*. The plant has been used medicinally in chronic rheumatism and venereal affections.

MADAME, *mad'-ame* (Fr. *ma*, my, and *dame*, lady), a

French title, originally applied only to female saints and ladies of quality, but which is now common to all married women, of whatever rank or condition. Under the old French monarchy, the daughters of the sovereign received this title; the eldest being simply Madame, the others Madame Elizabeth, &c. More strictly, however, it belonged to the wife of the king's eldest brother, the sister of the king's father or mother, or the eldest daughter of the dauphin, by only one of whom could the title be borne at the same time. Mesdemoiselles was the title of honour borne by the daughters of the king's younger sons, and of his brothers and uncles; the one taking precedence of the others in rank or birth being Mademoiselle.

MADDER. (*See* RUBIA.)

MADHOUSE. (*See* LUNATIC ASYLUM.)

MADNESS. (*See* LUNACY, INSANITY.)

MADONNA, *mâ-don'-nâ* (Ital., my lady), a word originally used in Italy, like Madame in France, as a title of honour and dignity; but now more particularly applied to the Virgin Mary, as, in other languages, she is called Our Lady. It is also applied to a number of celebrated pictures in which the Virgin forms the sole or principal object; as the Madonna di San Sisto, of Raffaelle, now in the picture-gallery at Dresden.

MADREPORE, *mâd'-re-pore*, a term first employed by Imperati to designate a genus of coral-building animals, in which the calcareous axis has its whole surface beset with small lamellate and stellate depressions. Etymologically, the word is a compound of the French *madré*, spotted, and the Latin *porus*, a pore. The genus was adopted by Linnæus, who ranked it among his *Vermes Zoophita*, and characterized it as follows:—"Animal resembling a medusa; *coral* with lamellate star-shaped cavities."

MADRIGAL, *mâd'-re-gâl* (Sp., Fr.), is a kind of short poem, having generally fewer verses than the sonnet, and admitting of greater liberty in the arrangement of the rhymes and verses. It expresses in simple language some tender and delicate thought, generally of an amatory or pastoral character, though occasionally it ventures upon a higher strain. The etymology of the word is uncertain, and numerous opinions have been hazarded regarding it. The earliest madrigals were those of Lemmo of Pistoia, set to music by Casella, who is mentioned by Dante. They were generally cultivated in Europe from the latter part of the 15th to the end of the 16th century. In England they attained a high degree of excellence during the reign of Elizabeth, and are said to be in no way inferior to those of Italy; the best known among English madrigal writers being Orlando Gibbons. The madrigals of Tasso are among the finest specimens of Italian poetry.

MAGAZINE, *mâg-â-seen'* (Fr. *magasin*), in Lit., is the name given to certain periodical works of a miscellaneous character, containing a variety of essays in prose and verse, reviews, &c. The use of the word in this sense is of modern introduction, being in England first adopted in "The Gentleman's Magazine," the first number of which was published in January, 1731, and which has been regularly continued monthly to the present time. Soon after "The Gentleman's Magazine," a rival work appeared under the title of "The London Magazine;" but it was discontinued in 1785. "The Scots Magazine," which was commenced at Edinburgh in 1739, is also numbered with the things that were. Before the establishment of "The Gentleman's Magazine," the periodical publications were almost wholly confined to political transactions and to foreign and domestic occurrences. The magazines, however, have opened up extensive and various fields of inquiry, and have been the means of diffusing a general habit of reading throughout the country. In the present day articles by our most distinguished literary men and men of science are to be found in our magazines, so important a branch of literature have they now become.

MAGDALEN ASYLUMS, *mâg'-dâ-len*, is the name given to certain institutions which have recently been established in some of our larger towns, to afford a retreat to penitent prostitutes, and to enable them to forsake their evil mode of life. A society for this object was established in London in 1758, principally by the exertions of Dr. Dodd. These institutions have been the means of effecting much good, and of restoring to their families and to society many who would have otherwise been lost. By far the greater number of those who have been protected in such asylums have subsequently continued respectable and correct in their behaviour. In the asylum they are employed in various kinds of work, and no one who has conducted herself with propriety in the house is allowed to leave it unprovided for.

MAGDALEN COLLEGE, OXFORD, *mawd'-â-len*, was founded in 1458, by William of Waynflete, bishop of Winchester, and lord high chancellor of England, for a president, 40 fellows, 30 scholars called *demies*, a schoolmaster, an usher, 4 chaplains, an organist, 8 clerks, and 16 choristers. The statutable restriction of fellowships to certain counties and dioceses is abolished by an ordinance framed for the college under powers granted by 17 & 18 Vict. c. 81; and ten of the fellowships are to be suspended, and ten demyships added to the statutable number. Demyships hereafter to be filled up are to be tenable, without reference to place of birth, for five years, and no longer. Twenty exhibitions are to be established for deserving persons in need of support, at the university; and four professorships (to be called the Waynflete professorships) are to be founded and maintained within the college, in lieu of the lectureships mentioned in the existing statutes. Among the eminent scholars who received their education at this college are Cardinal Wolsey, Lilly the grammarian, Fox the martyrologist, Hampden, Hammond, Addison, and Gibbon. The number of members of convocation is 163, of members on the books 256.—Ref. *Oxford University Calendar for* 1863.

MAGDALEN HALL, OXFORD, was erected by Bishop Waynflete, for students previous to admission into his college, and was governed by one of the fellows till 1602, when it became an independent hall. This hall is possessed of one benefice, four scholarships for persons educated at Worcester-cathedral school, four open scholarships, two exhibitions for persons educated at the Hampton Lucy school, and two exhibitions in the appointment of the principal. All the scholarships and exhibitions are tenable for three years. If, in the judgment of the principal, candidates from the above-mentioned schools shall not be of sufficient merit, the scholarships and exhibitions are to be thrown open to general competition. Number of members of convocation 153, of members on the books 273.—Ref. *Oxford University Calendar for* 1863.

MAGDALENE COLLEGE, CAMBRIDGE, was built by Edward Stafford, duke of Buckingham, in 1519, under the name of Buckingham House, on the site of an ancient hostel, belonging to the abbeys of Ely, Ramsey, and Walden. On the attainder of the duke, it fell to the crown, and was granted to Thomas lord Audley of Walden, lord high chancellor of England, who in 1542 endowed it for a master and four fellows. It had also fourteen bye fellowships; but by the new statutes it is declared that,—(1) "No person shall hereafter be elected to any bye fellowship now existing in the college; (2) there shall hereafter be eight open fellowships on the foundation of the college, the conditions of tenure being specified in the new statutes; (3) the additional fellows and their successors shall be denominated respectively the Spendluffe, Wray, Drury, and Millington fellows, in commemoration of the benefactions made to the college by Mr. Spendluffe, Sir Christopher Wray, the Rev. Drue Drury, and Dr. Millington." It is also declared that (except those scholarships and exhibitions, the right of preference to which is by act 19 & 20 Vict. c. 88, preserved to particular schools) all restrictions shall be entirely removed, and the total amount of such scholarships and exhibitions shall form a general fund for open scholarships. There shall hereafter be three open scholarships of at least £60, three of at least £40, and six of at least £20 a year each.—Ref. *Cambridge University Calendar*.

MAGDEBURG CENTURIES. (*See* CENTURIES OF MAGDEBURG.)

MAGGOT, *mâg'-got* (W. *magrod*), in general language, a term used to designate the larvæ of dipterous, hymenopterous, and some coleopterous insects. (*See* INSECT-TRANSFORMATIONS.)

MAGI, *mâ'-ji*, was the name given to the caste of priests among the ancient Medes and Persians.

The etymology of the word is doubtful, but it has been conjectured to be connected with the root of the Greek *megas* and Latin *magnus*, signifying great. The magi formed one of the six tribes into which the Medes were originally divided, and on the downfall of the Median empire, they continued to retain a great degree of power and authority with the conquerors, being the recognised ministers of the national religion. The great apostle of their religion was Zoroaster. They were so celebrated for their enchantments, that they have given name to the art of magic or enchantment. They were also learned as astrologers, and their name was applied to any one celebrated for wisdom; hence the wise men of the East who came to see Jesus are simply called magi. (*See* GUEBRES.)

MAGIC, *mâj'-ik* (Lat. *magia*).—In its ancient sense, this word signified the science and doctrine of the magi, or wise men of Persia; in a more modern sense, magic is a science which teaches how to perform wonderful and surprising feats, or to produce unexpected effects. Originally, the word magic carried with it an innocent and praiseworthy meaning, being used to signify the study of wisdom and the more sublime parts of knowledge. When, however, the ancient magi engaged themselves in astrology, divination, sorcery, and other similar branches of the occult sciences, the term magic became in time of bad repute, and was only used to signify an unlawful and diabolical art, depending on the assistance of the devil and of the spirits of the dead. The possession of magical powers has formed a portion of superstitious belief among all nations at all times; but of all people, the ancient Romans were the most superstitious in this and other respects. They placed the utmost belief in auguries and divinations. It is also a remarkable fact, that while their religion decreed these rites, they were always searching after fresh excitement from others, which were not only unauthorized but condemned by their own laws. Amongst these may be mentioned the magical practices of the Thessalian witches, of the Persian magi, and of the sorcerers of Egypt and Phrygia, and the numberless other foreign nations with whom they were brought in contact by their conquests. The emperors were constantly issuing and renewing edicts against these practices in the most ineffectual manner, and it is probable that from this circumstance magic began to be looked upon as a black and unholy art,—an idea which became rooted in the minds of the inhabitants of southern Europe. In the North, supernatural power was looked upon with high respect; and in the East, the favourite land of sorcery and magic, the professors have been looked upon as venerable rather than as hateful from time immemorial. According to Cornelius Agrippa, magic may be divided into three kinds,—natural, celestial, and ceremonial or superstitious. *Natural magic* is simply the application of natural active causes to passive subjects, by means of which many surprising, but yet natural, effects are produced. Without doubt, such have been some of those miracles wrought by ancient magicians, whose knowledge of the various powers of nature, there is reason to believe, was much greater than the self-sufficiency of modern vanity is willing to admit. Amongst the Crusaders and other Christian warriors of the middle ages, magic was looked upon as a peculiar ally of the infidels, with whom they were in contact. In their imagination, also, the inhospitable North was peopled with enchanted castles and spectral illusions. In the romances of the period, founded on historical encounters, there is usually a good magician, who sides with the Christian party; while necromancers, who work evil, back up the infidels. *Celestial magic* closely resembles judicial astrology. It attributes to spirits a kind of rule or dominion over the planets, and to the planets a rule over the destinies of men. On this foundation, a ridiculous kind of system was built up. *Superstitious magic* consists in the invocation of devils. Its effects are usually evil, but surpassing the powers of nature, being supported by some supposed compact, either tacit or *express*, with evil spirits. There is every reason to believe that this species of magic originated in Egypt. The first magicians mentioned in history were Egyptians; and that people, so famed for their wisdom, not only believed in the existence of demons, but also that different orders of these spirits presided over the elements of fire, air, earth, and water, as well as over the persons and affairs of men. Consequently, every disease which flesh is heir to was laid to the charge of some particular demon. When a person was seized with a fever, or other complaint, they never thought of searching for the natural cause of the disease, and so curing it; but, attributing the complaint to the possession of some demon, they endeavoured to drive it forth by means of incantations and charms. These notions spread from the Egyptians to the Hebrews, amongst whom we find a belief that nearly every disease was due to the agency of demons or devils. Superstitions of a similar stamp were also brought from Egypt and Chaldea by Pythagoras, and transmitted by him and his followers to the Platonists of Greece. The advance of the Christian religion, the revival of learning, and the progress of natural science, long ago banished this kind of superstition from all the enlightened European nations.—*Ref.* Scott's *Demonology and Witchcraft*; Brewster's *Letters on Natural Magic*; *Quarterly Review*, vols. 48, 59; Windischmann's *Inquiries respecting Astrology, Alchemy, and Magic* (in German, Frankfort, 1816).

MAGICIANS, *mâ-jish'-ans*, is applied to such as practise the art of magic. The early Christians were derided by this name because it was pretended that our Saviour wrought his miracles by magic. Even in the time of Augustine, that writer speaks of a popular belief among the enemies of the Church, that Christ had written books on magic, which he delivered to Peter and Paul for the use of his disciples.

MAGIC LANTERN, a species of optical instrument, the object of which is to obtain an enlarged representation of figures on a screen in a darkened room, by means of light issuing from a lamp or candle and passing through a convex lens. The instrument consists of a lantern, generally of tin, and of a cubical form, in the interior of which is the light. At a perforation in one of the sides is applied a tube, projecting horizontally from it. Within the tube, and immediately before the aperture, is a lens, often nearly a hemisphere in form, and three or four inches in diameter; the tube also carries within it another, which is furnished with a convex lens, and is capable of a small movement for the purpose of adjustment. Between the lenses in the tube and the front of the lantern is a groove, which receives a rectangular frame containing a glass plate, on which are painted, in transparent colours, the objects of which an enlarged view is required. It is generally used as a toy, and affords amusement from the grotesque character of the figures; it is also used to enlarge the diagrams in astronomical and other lectures, so as to be clearly seen by the audience. The magic lantern is said to have been invented by Kirsher in the 17th century. It is described by him in his "Ars Magna Lucis et Umbræ." The invention, however, is also attributed to Cellini, who died in 1570.

MAGISTER, *mâ-jis'-ter* (Lat., master), was formerly a title conferred upon one who had attained to some degree of eminence in literature or science. Those who are now styled doctors were formerly termed magistri.

MAGISTRATE, *mâj'-is-trait* (Lat. *magistratus*), is a public civil officer vested with the executive government, or some branch of it. Of magistrates some are supreme, in whom the sovereign power of the state resides; others are subordinate, deriving their authority from the supreme magistrate, accountable to him for their conduct, and acting in an inferior or secondary sphere. In this country the supreme legislative power is vested in the parliament, and the supreme executive power in the crown. The subordinate magistrates are principally sheriffs, coroners, justices of the peace, constables, surveyors of highways, and guardians and overseers of the poor. Under their particular names in other parts of this work will be found an account of the different kinds of magistrates.

MAGNA CHARTA, *mâg'-nâ kar'-tâ* (Lat., the great charter), in the constitutional history of England, is the "Great Charter of Liberties" extorted from King John in 1215. This charter is usually regarded as the constitutional basis of English liberties; but in many of its provisions it seems only to have been a declaration of the rights which had been enjoyed in England before the Conquest. The Anglo-Saxon institutions and

usages, which were very favourable to liberty, had been almost entirely suppressed by the Norman conquerors. Henry I., when he first seized the crown, to the exclusion of his elder brother Robert, being desirous to win the favour of the Saxon as well as the Norman inhabitants of the country, granted a charter, restoring many of the ancient liberties, and removing many of the feudal oppressions to which the military tenants of the crown were liable at the hands of the king. To the weakness or imbecility of King John we owe the possession of the Magna Charta, which, if it did not found the liberties of the English nation, at least defined and settled them. The barons, by the illegal and violent measures of the king, were driven to take measures for their own defence. At length a conference was held at Runnymede, on the Thames, between Staines and Windsor, on the 15th of June, 1215, and after a long discussion the Magna Charta was signed. To secure the execution of the charter, John was compelled to surrender the city and Tower of London, to be held by the barons till August 15, or until he had completely executed the charter. Further, the barons chose twenty-five of their number to be guardians of the liberties of the realm, with power to make war upon the king if he should violate the charter. The Magna Charta redressed many grievances incident to feudal tenures; prohibited unlawful amercements, distresses, or punishments, and restrained the royal prerogative of purveyance and pre-emption; it regulated the forfeiture of lands; established the testamentary power of the subject over part of his personal estate; laid down the law of dower; enjoined a uniformity of weights and measures; gave new encouragement to commerce; forbade the alienation of lands in mortmain; guarded against delays and denials of justice; fixed the court of Common Pleas at Westminster, and brought the trial of issues within the reach of all freemen by means of assizes and circuits; confirmed and established the liberties of the city of London, and other cities, boroughs, towns, and ports of the kingdom; and protected every individual of the nation in the enjoyment of his life, liberty, and property, unless declared to be forfeited by the judgment of his peers or the law of the land. More particularly it declares that "the Church of England shall be free and have her whole rights and her liberties inviolable;" that "neither we nor our bailiffs shall seize any land or rent for any debt so long as the chattels of the debtor are sufficient to pay the debt; nor shall the sureties of the debtor be distrained so long as the principal debtor is sufficient for the payment of the debt;" that "no scutage or aid shall be imposed in our kingdom unless by the general council of our kingdom, except for ransoming our person, making our eldest son a knight, and once for marrying our eldest daughter, and for these there shall be paid a reasonable aid;" "a freeman shall not be amerced for a small fault, but after the manner of the fault, and for a great crime according to the heinousness of it, saving to him his contonement (*i. e.*, the means of his livelihood; as the tools of a mechanic, or the like), and after the same manner a merchant, saving to him his merchandise; and a villein shall be amerced after the same manner, saving to him his wainage (his plough, waggons, &c.); and none of these aforesaid amerceaments shall be assessed but by the oath of honest men in the neighbourhood;" "no freeman shall be taken, or imprisoned, or disseised, or outlawed, or banished, or anyways destroyed; nor will we pass upon him, nor will we send upon him, unless by the lawful judgment of his peers or by the law of the land; we will sell to no man, we will not deny to any man, either justice or right;" "all merchants shall have safe and secure conduct to go out of and to come into England, and to stay there and to pass, as well by land as by water, for buying and selling, by the ancient and allowed customs, without any evil tolls, except in time of war, or when they are of any nation at war with us;" "it shall be lawful for the time to come for any one to go out of our kingdom and to return safely and securely by land or by water, saving his allegiance to us;" "we will not make any justices, constables, sheriffs, or bailiffs, but of such as know the law of the realm and mean duly to observe it;" "if any one has been dispossessed or deprived by us without the legal judgment of his peers, of his lands, castles, liberties, or right, we will forthwith restore them to him, and if any dispute arise upon this head, let the matter be decided by the five-and-twenty barons hereafter mentioned for the preservation of the peace." These concessions being unwillingly granted by the king, would gladly have been withdrawn; but the barons were watchful of their interests, and his son Henry III. was obliged to make one or more solemn ratifications of the charter. "It was," says Sir James Mackintosh, speaking of the Magna Charta, "a peculiar advantage that the consequences of its principles were, if we may so speak, only discovered gradually and slowly. It gave out on each occasion only so much of the spirit of liberty and reformation as the circumstances of succeeding generations required, and as their character would safely bear. For almost five centuries it was appealed to as the decisive authority on behalf of the people, though commonly so far only as the necessities of each case demanded." "To have produced it, to have preserved it, to have matured it, constitute the immortal claim of England upon the esteem of mankind."—Ref. *The Great Charter and Charter of the Forest*, by Sir W. Blackstone; *The English Constitution*, by Sir E. S. Creasy.

MAGNANIMITY, *măg-nă-nim'-e-te* (Lat. *magnus*, great, and *animus*, mind), is literally great-mindedness, the possession of a mind above being swayed to and fro by the good or evil of this life. Magnanimity was a virtue much extolled by the ancient philosophers.

MAGNESIA, *măg-ne'-she-ă* (from Magnesia, a city of Lydia, near which it was originally found), one of a group of alkaline earths, of which baryta, strontia, and lime, form the other members. It is the oxide of the metal magnesium (which *see*), and is generally prepared by calcining the carbonate at a high heat, until it glows with a peculiar luminous appearance, called *brightening*. It is much used in pharmacy, under the name of *calcined magnesia*. For the laboratory, it may be procured in a state of purity by igniting the pure nitrate. It is a white powder, varying in density according to the source from which it is obtained. It is unalterable by heat, and has never been fused. It slowly absorbs carbonic acid and water from the air; moistened with water, it combines with it, raising the temperature during the union, and giving rise to *hydrate of magnesia*. Crystallized hydrate of magnesia occurs in nature as the mineral brucite. It forms a white powder, which slowly absorbs carbonic acid from the air. Its water is easily expelled by heat. It is sparingly soluble in water, forming a solution exhibiting an alkaline reaction. It is used in pharmacy as an antacid and cathartic.

MAGNESIA, CARBONATES OF.—There are three carbonates of magnesia,—the bicarbonate, monocarbonate, and subcarbonate. The monocarbonate is found in nature in a hydrated condition, as the mineral magnesite. The anhydrous salt may be prepared by placing a tube containing a solution of carbonate of soda in a strong glass tube containing a solution of sulphate of magnesia, sealing the outer tube hermetically, heating it to 320° Fahr., and inverting the whole, so that the solutions may mix; crystalline grains of anhydrous carbonate being deposited. It is insoluble in water, but dissolves in acids. Heated, it becomes converted into magnesia. It dissolves in water saturated with carbonic acid, forming bicarbonate of magnesia. The subcarbonate is prepared by boiling a solution of the sulphate with excess of carbonate of potash or soda, and filtering and washing until the washings give no precipitate with chloride of barium. Prepared thus, it forms a bulky white powder, and is known as *light carbonate of magnesia*. The *heavy carbonate* has the same composition, and is prepared by mixing hot solutions of carbonate of soda and sulphate of magnesia. It is much less bulky than when prepared in the preceding manner. Both forms are extensively used in medicine as a cathartic and antacid. Carbonate of magnesia is capable of combining with other carbonates to form double salts. The double carbonates of magnesia, potash, soda, ammonia, and lime, are instances of this.

MAGNESIA, CITRATE OF.—This salt is much used in pharmacy as a gentle aperient. It is prepared by mixing powdered carbonate of magnesia and citric acid into a paste with a small quantity of water, and granu-

lating. A teaspoonful in water forms a pleasant effervescing cathartic of a gentle character.

MAGNESIA, NITRATE OF.—Nitrate of magnesia occurs in the mother-liquors of the sulphate refiners. It may be prepared by evaporating a solution of the carbonate in dilute nitric acid to crystallization. The salt forms deliquescent prisms of the formula $MgNO_3+6Aq$. Exposed to a temperature of 482° Fahr., it is converted into a basic nitrate, and all the nitric acid is expelled by a red heat.

MAGNESIA, PHOSPHATE OF.—The bibasic salt may be obtained by mixing hot concentrated solutions of the sulphate with phosphate of soda. It crystallizes in hexagonal needles, containing fourteen equivalents of water, which are entirely expelled at a high temperature, giving rise to pyrophosphate of magnesia. Phosphate of magnesia is only interesting from entering into the composition of bones of animals. It is also found in combination with ammonia, as a constituent of urinary calculi.

MAGNESIA, SILICATES OF.—Numerous examples of these occur in the mineral kingdom. Meerschaum, steatite, chrysolite, olivine, and peridote, are all silicates of magnesia. Augite, amphibole, asbestos, and hornblende, are double silicates of lime and magnesia, more or less coloured by oxide of iron. Serpentine is a mixture of the silicate and hydrate, coloured with metallic oxides, and talc is a hydrated silicate.

MAGNESIA, SULPHATE OF.—This salt occurs in nature as *hair salt*, as an efflorescence on certain magnesian minerals. It exists in sea-water and certain spring waters in considerable quantity. The springs of Epsom, Cheltenham, Seidlitz, and Pullna, are famous for the amount of this salt they contain. The sulphate of magnesia of commerce, so extensively used in medicine as a cathartic, is prepared in several ways; the most common of which is to dissolve dolomite, or magnesian limestone (carbonate of lime and magnesia), in dilute sulphuric acid; by which means sulphate of lime is precipitated, and the sulphate of magnesia may be obtained by evaporating to crystallization. Its other sources are the mother-liquor of sea-salt, and refuse alum-liquors. This salt crystallizes in rectangular four-sided prisms, containing six equivalents of water, which effloresces slightly in dry air. It is very soluble in water, 100 parts of water dissolving 68 parts of the salt at ordinary temperatures, and 150 parts at boiling-point. It is sparingly soluble in alcohol. It is employed in the laboratory as a re-agent; in which case it should be made by dissolving the pure carbonate in sulphuric acid, as the commercial salt is largely adulterated with sulphate of soda. Its water of constitution is capable of being replaced by alkaline sulphates, giving rise to double salts.

MAGNESITE, in Min., native carbonate of magnesia, occurring in serpentine in compact hard amorphous masses.

MAGNESIUM, *mǎg-ne-shē'-um*, in Chem.,—symbol Mg., equiv. 12, spec. grav. 1·743,—the metallic base of the alkaline earth magnesia, first isolated by Bussy, who obtained it by decomposing the chloride with potassium at a high temperature. It is a white malleable silvery metal, constant in dry air, but becoming covered with a white film of magnesia in the presence of moisture. It decomposes water at the boiling-point, eliminating hydrogen. Heated to dull redness in air or oxygen, it burns with a bright light, and is converted into magnesia. It fuses at a red heat, and may be distilled out of contact with the air. It forms only one oxide,—magnesia. The best method of preparing magnesium is that lately patented by Mr. E. Sonstadt, which consists in evaporating a mixed solution of the chlorides of magnesium and sodium to a dry mass, which, when heated with sodium in an iron vessel, yields the metal in a state of comparative purity. This process promises to yield magnesium in quantities, at a price that would secure its common use. In many of its characters, metallic magnesium resembles zinc. It is the lightest known metal that remains constant in the air at ordinary temperatures.

MAGNESIUM, CHLORIDE OF, in Chem.—This salt is found in large quantities, in company with the iodide and bromide, in the mother-liquors of salt-works; but the pure salt is best prepared by dissolving the carbonate in hydrochloric acid, evaporating and crystallising. The anhydrous chloride is made by saturating hydrochloric acid with carbonate of magnesia and adding excess of chloride of ammonium, evaporating to dryness, and heating in a platinum-dish. The double chloride is decomposed, the whole of the chloride of ammonium being expelled, and the anhydrous chloride of magnesium remaining behind. The anhydrous chloride forms white deliquescent masses. The crystallized salt forms colourless deliquescent needles, containing six equivalents of water. It forms double salts with the chlorides of the alkaline metals.

MAGNESIUM, SULPHIDE OF, in Chem.—This compound is obtained with difficulty by precipitating sulphate of magnesia with sulphide of barium. Its properties have not been much investigated.

MAGNET, NATURAL, *mǎg'-net* (from *Magnesia*, a province in Lydia, whence the Greeks obtained the loadstone), a body endowed with magnetic polarity. The *natural magnet*, or *loadstone*, is a species of iron-ore found in various parts of the earth in irregular or crystalline fragments, and occasionally in beds of considerable thickness. Its property of attracting small pieces of iron was recognized at a very early date by the Greeks, and its wondrous directive power has been known to the inhabitants of China from time immemorial. If a piece of this magnetic iron-ore be carefully examined, it will be found that the attractive force for ferruginous particles is greatest at certain points of its surface, while elsewhere it is much diminished, or even altogether absent. These attractive points are called the *poles* of the magnet. If one of the pole surfaces of a natural loadstone be rubbed in a particular manner over a bar of hardened steel, its characteristic properties will be communicated to the bar, which will then be found to attract iron-filings like the loadstone itself. Further, the attractive force will appear to be greatest at two points situated very near the extremities of the bar, and least of all towards the middle. The bar of steel so treated is said to be *magnetised*, or to constitute an *artificial magnet*. For general purposes artificial magnets are made from straight bars, or from bars bent into a curvilinear form, resembling a horse-shoe. The latter are particularly well adapted for displaying the attractive force, as the two poles can be brought into contact with the object to be lifted. Straight bars must, of course, be used in experiments upon the directive power. Many artificial magnets, either straight or curved, may be combined together so as to form a *compound magnet*. The poles of a compound horseshoe magnet are generally armed with pieces of very soft iron, to which a movable piece of soft iron, called a *keeper* or *lifter*, may be conveniently applied. This keeper is found to preserve and increase the force of the poles in a very remarkable manner. A natural magnet may be armed in a similar manner. An *electro-magnet* is a bar of soft iron in which magnetism is temporarily induced by a circulating current of electricity.—For full directions for forming all kinds of artificial magnets, the reader is referred to Sir W. S. Harris's *Rudimentary Magnetism*. (*See* MAGNETISM, ELECTRO-MAGNETISM, and MAGNETO-ELECTRICITY.)

MAGNETIC IRON PYRITES, a variety of iron pyrites having magnetic properties, found in hexagonal prisms of a bronze colour. The composition of magnetic pyrites may be represented by the formula $F_7S_8$.

MAGNETIC NEEDLE. (*See* COMPASS and DIPPING NEEDLE.)

MAGNETISM, *mǎg'-net-izm*, literally, the attractive and repulsive power of the loadstone; generally, that peculiar property possessed by many mineral bodies, and by the whole mass of the earth, through which, under certain circumstances, they mutually attract and repel one another, according to determinate laws. When a magnetized bar, or natural magnet, is suspended at its centre in any convenient manner, so as to be free to move in an horizontal plane, it is always found to assume a particular direction with regard to the earth, one end pointing nearly north and the other nearly south. If the magnet be moved from this position, it will tend to reassume it, and, after a few oscillations, settle at rest as before. The extremity which points towards the astronomical north is usually distinguished as the *north pole* of the magnet, and that which points southward as the *south pole*. Every

magnet, whether natural or artificial, has the two poles; and as these are the points of greatest attraction, their position can be readily ascertained by plunging the magnet into fine iron filings. A suspended bar magnet serves to exhibit certain phenomena of attraction and repulsion in the presence of a second magnet, which deserve particular attention. When a north pole is presented to a south pole, or a south pole to a north, attraction ensues between them; the ends of the bars approach each other, and, if permitted, adhere with considerable force. When, on the other hand, a north pole is brought near a second north pole, or a south pole near another south pole, mutual repulsion is observed, and the ends of the bars recede from each other as far as possible. Poles of an opposite name attract, and of a similar name, repel each other. A small bar, or needle of steel, properly magnetized and suspended, and having its poles marked, thus becomes an instrument fitted not only to discover the existence of magnetic power in other bodies, but to estimate the kind of polarity affected by their different parts. A piece of soft iron brought into the neighbourhood of a magnet acquires itself magnetic properties; the intensity of the power thus conferred depends upon that of the magnet, and upon the interval which divides the two, becoming greater as that interval decreases, and greatest of all when in actual contact. The iron, under these circumstances, is said to be magnetized by *induction*, and the effect, which in an instant reaches its maximum, is at once destroyed by removing the magnet. When steel is substituted for iron, the inductive action is hardly perceptible at first, and only becomes manifest after the lapse of a certain time. The steel bar, on being removed from the magnet, does not entirely lose the induced polarity. It becomes, indeed, a permanent magnet, similar to the first, and retains its peculiar properties for an indefinite period. Magnetic attractions and repulsions are not in the slightest degree interfered with by the interposition of substances destitute of magnetic properties. Thick plates of glass, shell-lac, metals, wood, &c., may be placed between a magnet and a suspended needle, or a piece of iron under its influence, the distance being preserved, without the least perceptible alteration in its attractive power or force of induction. One kind of polarity cannot be exhibited without the other. If a magnetized bar of steel be broken at its neutral point, or in the middle, each of the broken ends acquires an opposite pole, so that both portions of the bar become perfect magnets; and if the division be carried still further, if the bar be broken into a hundred pieces, each fragment will be a complete magnet, having its own north and south poles. The direction spontaneously assumed by a suspended needle indicates that the earth itself has the properties of an enormous magnet, whose south magnetic force is concentrated in the northern hemisphere. A line joining the two poles of such a needle or bar indicates the direction of the so-called *magnetic meridian* of the place. This is not usually coincident with the geographical meridian of the place, but makes with it a certain angle, called the *declination* of the needle. The amount of the declination of the needle from the true north and south not only varies at different places, but in the same place is subject to daily, yearly, and secular fluctations, which are called the *variations of declination*. At the commencement of the 17th century the declination was eastward of our meridian; in 1660 it was 0, that is, the needle pointed due north and south. Afterwards it became westerly, slowly increasing until the year 1818, when it reached 24° 30′; since which time it has been slowly diminishing. If an unmagnetized steel bar be supported on a horizontal axis passing exactly through its centre of gravity, it will of course remain equally balanced in any position in which it may happen to be placed; if the bar so adjusted be then magnetized, it will be found (in the latitude of London) to take a permanent direction, the north pole being downwards, and the bar making an angle of about 66° 32′, with a horizontal plane passing through the axis. This is called the *dip* or *inclination* of the needle, and shows the direction in which the force of terrestrial magnetism is most energetically exerted. The amount of dip is different in different latitudes: near the equator it is very small, the needle remaining nearly, or quite, horizontal; as the latitude increases, the dip becomes more decided, and over the magnetic pole the bar becomes completely vertical. Like the horizontal declination, the dip is subject to change at the same place. In the year 1773 it was about 72°; at the present time it is near 68° 32′ in London. The mariner's compass, which is nothing more than a suspended magnetic needle attached to a circular card marked with points, was not in general use in Europe before the year 1300, although the Chinese have had it from very remote antiquity. Its value to the navigator is now very much increased by correct observations of the exact amount of the declination in various parts of the world. Probably every substance in the world contributes something to the magnetic action of the earth; for, according to the discoveries of Faraday, magnetism is not peculiar to those substances which have more especially been called magnetic, such as iron, nickel, and cobalt, but is rather to be considered as a universal agency. Faraday divides all bodies into two classes, calling the first *magnetic*, or better, *paramagnetic*, and the other *diamagnetic*. The matter of which a paramagnetic body consists is attracted by both poles of a powerful horseshoe magnet; on the contrary, the matter of a diamagnetic body is repelled. When a small iron bar is hung by untwisted silk between the poles of the magnet, so that its long diameter can easily move in a horizontal plane, it arranges itself axially, that is, parallel to the straight line which joins the poles. A diamagnetic bar formed of bismuth, for instance, arranges itself equatorially, that is, at right angles to the magnetic axis.—For a concise exposition of the chief phenomena of magnetism we may refer the reader to Fownes's *Manual of Chemistry*, and for fuller details to Sir W. S Harris's *Rudimentary Magnetism*, and Faraday's *Experimental Researches*.

MAGNETISM, TERRESTRIAL. (*See* MAGNETISM.)

MAGNETO-ELECTRICITY, an important branch of electrical science which has sprung from Faraday's discovery of the development of electrical currents by the action of magnetism. If two extremities of the coil of an electro-magnet be connected with a *galvanometer* (*see* this word) and the iron temporarily magnetized by the application of a permanent steel horseshoe magnet to the ends of the bar, a momentary current will be developed in the wire and pointed out by the movement of the galvanometer needle. It lasts but an instant, the needle returning, after a few oscillations, to a state of rest. On removing the magnet, whereby the polarity of the iron is at once destroyed, a second current or wave will become apparent, but in the opposite direction to that of the first. By employing a very powerful steel magnet, surrounding its iron keeper or armature with a very long coil of wire, and then making the armature itself rotate in front of the faces of the magnet, so that its induced polarity shall be rapidly reversed, magneto-electric currents may be produced of such intensity as to give bright sparks and powerful shocks, and exhibit all the phenomena of voltaic electricity. Many powerful arrangements of this kind have been devised for the medical application of current electricity. (*See* ELECTRO-MAGNETISM.)

MAGNOLIACEÆ, *mäg-no'-le-ai'-se-e*, in Bot., the Magnolia fam., a nat. ord. of *Dicotyledones*, sub-class *Thalamiflorœ*, having the following essential characters:—Trees or shrubs with alternate leaves; stipules usually present, and then large, sheathing the leaf-bud, and deciduous. Sepals and petals with a ternary arrangement of their parts, hypogynous, the former deciduous, the latter with an imbricated æstivation. Carpels distinct. Albumen homogeneous. The plants of this order are remarkable for the fragrance and beauty of their flowers and foliage; hence they are favourite objects of culture in this country, either as hardy plants, as several magnolias and the tulip-tree (*Liliodendron tulipifera*), or as stove and greenhouse plants. Medicinally, the plants are chiefly remarkable for their bitter, tonic, aromatic properties. The bark of *Magnolia glauca*, the swamp-sassafras, or beaver-tree, resembles cinchona in its action. The unripe fruits of other species of the typical genus, as *M. Fraseri* and *acuminata*, have similar tonic and aromatic properties. The majority of the order are found in

North America. Some also occur in the West Indies, Japan, China, India, South America, Australia, and New Zealand. There are 13 genera and 168 species.

MAGPIE, *mág'-pie* (*Pica caudata*), a bird belonging to the fam. *Corvidæ*, whose generic characters are as follows:—Beak strong, compressed laterally, slightly arched and hooked at the tip; nostrils basal, covered with short stiff feathers, and directed forwards; wings short and round, the first quill-feather being very short, and the fourth or fifth the longest in the wing; tarsus longer than the middle toe; tail long and graduated. The magpie can be well distinguished as one of our handsomest native birds; but with a handsome exterior, yet, on account of its thieving habits, it has a most suspicious character. With regard to its appearance, the beak is black, the irides hazel; the head, neck, and upper tail-coverts jet-black; the scapulars pure white; the wing-coverts and tertials of a fine shining blue; the primaries black, with an elongate patch of pure white on the inner web of each of the first ten feathers; the tail graduated, the outside feather on each side not exceeding five inches in length, while the inner one extends eleven inches, and is of a beautiful iridescent colour; blue and purple near the end, and green from thence to the base. The chin and throat of the bird are black, the shaft of some of the feathers shining greyish white; the upper part of the breast black, while the lower part of the same, the belly, sides, and flanks, are of a pure white colour; finally, the thighs, legs, toes, and claws, are uniformly black. —(*Yarrell.*) The male magpie is generally eighteen inches in length, while the female is slightly smaller. It feeds on both animal and vegetable substances, destroys great numbers of grubs and slugs in pasture land, and performs a very friendly office to sheep and oxen, by getting on their backs and freeing their wool and hides from troublesome vermin. It is a social, and yet not a gregarious bird, and has always been an object of superstition to the vulgar. Magpies, to refer once more to Mr. Yarrell's excellent work, generally continue in pairs all the year round. They build in high trees, sometimes in a lofty hedge, and occasionally in a low but thick bush, returning to the same nest for many years in succession. The nest is well constructed for security against enemies; it is of an oval shape, and large, framed on the outside with sharp thorny sticks, strongly interwoven, and forming a dome over the top, the inside being plastered with mud and lined with dry grass. One small aperture is left on the side, just large enough to admit the parent bird, who generally sits with her head to the hole, ready to quit the nest on the slightest alarm. The magpie breeds early in spring, producing six or seven eggs of a pale bluish-white colour, spotted all over with ash-colour and two shades of greenish brown; the length of each egg being about one inch and four lines and a half, while the breadth is about an inch. The magpie is one of the most destructive birds under the sun, as Montagu observes, it "is governed by self-interest, it is a great enemy to the husbandman and the preserver of game, but has cunning enough to evade their pursuit. No animal food comes amiss to its carnivorous appetite; young poultry, eggs, young lambs, and even weakly sheep, it will attempt to destroy by first plucking out their eyes; the young of hares, rabbits, and feathered game, share the same fate; fish, carrion, insects, and fruit, and lastly grain, when nothing else can be got. It is an artful, noisy bird, proclaiming aloud any apparent danger, and thereby gives notice to its associates. Neither the FOX, or other wild animal, can appear without being observed and hunted; even the fowler is frequently spoiled of his sport; for all other birds seem to know the alarming chatter of the magpie." —*Ref.* Yarrell's *British Birds.*

MAHABHARATA, or BHARATA, *ma-hah-a-ra'-ta*, is the name of the most celebrated epic poem of the Hindoos, after the Ramayana. This poem is chiefly devoted to an account of a long civil war between two dynasties of ancient India,—the Kurus and Pandus; but around this history an immense collection of ancient traditions, moral reflections, and popular stories, have been gathered. The earlier sections of the book are chiefly occupied in solving theogonical and cosmogonical problems, while in the last chapters are didactic and moral episodes on religious duties and sacrifices, forming an almost complete system of Hindoo ethics, and a compendium of the Brahminical faith. As compared with the Ramayana, the Mahabharata is wanting in unity and internal coherence; but, at the same time, it contains a greater variety of pleasing scenes and attractive situations. The poem is a work of great antiquity, but neither the time of its composition nor the period in which it assumed its present shape can be ascertained. The great war is, undoubtedly, an historical event, and is supposed to have taken place in the 12th century B.C.; and the entire poem is a valuable mine of antiquarian lore on the early history of the Hindoos. A complete edition of the Mahabharata, in the original Sanscrit, has been published by the Asiatic Society of Bengal; and a number of detached fragments and stories have been translated by Sir Charles Wilkins, Prof. Wilson, and Mr. Milman.—Ref. *English Cyclopædia*,—Arts and Sciences, where an able analysis of this poem is to be found.

MAHOGANY. (*See* SWIETENIA.)

MAHOMETANISM. (*See* MOHAMMEDANISM.)

MAIDEN, *maid'-en*, the name given in Scotland to an instrument formerly used in beheading criminals, resembling in its construction the guillotine of the French. (*See* GUILLOTINE.)

MAIDEN ASSIZES, is a term applied to those assizes at which no person is condemned to die.

MAIDENHAIR. (*See* ADIANTUM.)

MAIM, or MAYHEM, *maim*, *mai'-hem* (Lat. *mayhemium*), in Law, is defined to be "the violently depriving another of such of his members as may render him the less able in fighting, either to defend himself or to annoy his adversary." Hence the cutting off or disabling, or weakening a foot, a hand, or a finger, the striking out an eye or a foretooth, are mayhems; but the cutting off an ear or nose, or the like, are not held to be mayhems, because they do not weaken a man, but only disfigure him. The distinction, however, has, by statutory alterations, become of little importance. By the ancient law of England, mayhem was punished by inflicting upon the offender the same injury which he had caused to the person maimed. Afterwards the offence was only punishable by fine and imprisonment. The previous acts bearing upon this subject were repealed by stat. 1 Vict. c. 85, which enacts that the stabbing, cutting, or wounding, or causing bodily injury to any person, dangerous to life, with intent to commit murder, is felony, and punishable with death; the attempting, by any means, to maim, disfigure, or disable any person, or to do him some bodily harm, or with intent to resist or prevent the apprehension or detainer of any one, is punishable by transportation for life or not less than fifteen years (now penal servitude), or by imprisonment not exceeding three years. By 9 & 10 Vict. c. 25, any mayhem occasioned by maliciously causing gunpowder or other substance to explode, or the causing to be taken by any person any dangerous thing, or the casting at or applying to any person any corrosive fluid or dangerous substance, with intent to maim, is a felony, and punishable with transportation for life or imprisonment for three years. Besides these proceedings, taken in name of the crown on behalf of public justice, the party injured may recover compensation in the shape of damages in an action of trespass.

MAINOUR, or MANOUR, *main'-oor*, *măn'-oor* (Fr. *manier*, to handle), in Law, denotes the thing taken or carried away by a thief; thus, to be taken with the mainour is to be taken with the thing stolen about him. Formerly, by the common law, a thief taken with the mainour might be brought into court, arraigned, and tried without indictment.

MAINPRISE, *main'-prize* (Fr. *main*, the hand, and *pris*, taken), in Law, is the taking or receiving of a person into friendly custody, who might otherwise be committed to prison, upon security given that he shall be forthcoming at a time and place assigned. Mainprise differs from bail in that he who is mainprised is said to be at large until the day of his appearance; but he that is bailed is not said to be at large, or at his own liberty, but may be confined by his sureties. The writ of mainprise is directed to the sheriff, commanding him to take sureties for the prisoner's appearance, usually called mainpernors, and to set him at large.

MAINTENANCE, *main'-ten-ăns* (Lat. *manutenentia*), in LAW, is the unlawful taking in hand, or upholding of any cause or person,—the officious intermeddling in a suit that in no way belongs to one, by maintaining or assisting either party with money or otherwise to prosecute or defend it. By the common law, persons guilty of maintenance may be prosecuted by indictment, and be fined and imprisoned, or be compelled to make satisfaction, by action, &c.; but prosecutions for maintenance are now rarely instituted. Where more than one person is implicated in this offence, the practice is to indict them for a conspiracy.

MAIZE. (*See* ZEA.)

MAJESTY, *măj'-es-te* (Lat. *majestas*), is a title of the highest honour, derived from the Romans, by whom it was first used to designate the supreme power and dignity of the people collectively (*majestas populi Romani*). The majestas was also ascribed to the highest chosen representatives of the people; as dictators, consuls, and the senate. On the overthrow of the republic, this title and dignity was assumed by the Roman emperors, and after them it was adopted by the emperors of the West. The attribute of majesty was not given to kings till a much later period. The courtiers introduced the title in France under Henry II., and in England it was first adopted by Henry VIII. It is now generally borne by all emperors and kings of Europe, except the sultan of Turkey, who is styled highness. The official title of the emperor of Austria is imperial-royal majesty (*kaiserlich-königlich majestat*). On the continent of Europe, majesty is used also to denote the royal dignity and privileges derived therefrom, even in the case of princes who have not personally the title; and it has sometimes also been retained in the case of abdicated monarchs. The pope conferred the title of apostolic majesty on Stephen, the first king of Hungary, and this is still borne by the emperor of Austria, as his representative. At a later period, the papal see conferred the title of Catholic Majesty on the kings of Spain, of Most Christian Majesty on the kings of France, and of Most Faithful Majesty on the kings of Portugal. The term *majestatsbrief*, charter of majesty, is applied to the act by which the emperor Rudolf II. (11th June, 1609) granted free exercise of their religion to the Protestants of Bohemia; the abolition of which act by the emperor Matthias, in 1618, was one of the principal causes of the Thirty Years' war, and of the intellectual debasement which is still manifest in that fair country. Violations of the majesty of the people were termed by the Romans *crimina læsæ majestatis*, a term also applied to violations of monarchical dignity or treason.

MAJOLICA, or FAIENCE, *ma-yol'-e-ka*, a kind of fine pottery made to imitate porcelain, and superior to common pottery in its glazing, beauty of form, and richness of colouring. Its name of faïence, is derived from the town of Faenza, in Romagna, where it is said to have been first manufactured in 1299. This fine pottery was called by the Italians Majolica, probably from the name of its inventor. Some of the great artists of the period, Raffaelle, Giulio Romano, Titian, and others, painted upon this material, and the preserved specimens are highly valued as works of early art. Between 1530 and 1560 the majolica reached its highest perfection. The king of Wurtemburg possesses a valuable collection of it. Modern faïence seems to have been invented about the middle of the 16th century, and obtained its name in France, when a man from Faenza discovered a similar clay at Nevers, and introduced the manufacture of it. English stone ware, made of powdered flint, has some resemblance to majolica ware, but is, in reality, very different. The manufacture of majolica has greatly improved in this country of late years. The majolica fountain exhibited at the International Exhibition of 1862, by Messrs. Minton, was a very elegant work of art.

MAJOR, *mā'-jor* (Lat.), in MUS., is the name applied to that of the two modern modes in which the third is four semitones above the tonic or key-note. It is also employed to indicate those intervals which contain the greatest number of semitones under the same denomination; as a third consisting of four semitones instead of only three, is called a *major third*; or a sixth containing nine instead of eight semitones, is termed a *major sixth*.

MAJOR, in Logic, is a term applied to the first proposition of a regular syllogism, because it has a more extensive sense than the minor proposition. Thus, No unholy man is qualified for happiness in heaven (*major*); every man in his natural state is unholy (*minor*): therefore, no man in his natural state is qualified for happiness in heaven (conclusion or inference).

MAJORANA, *maj-o-rā'-nă* (said to be a corruption of the Arab. *maryamych*), in BOT., a gen. of the nat. ord. *Labiatæ*. The species *M. hortensis* (*Origanum Majorana* of Linnæus) is the sweet marjoram of the gardens, so much used as a flavouring herb by the cook. It is retained in the materia medica as a stimulant and carminative, but is scarcely ever used medicinally. The common marjoram belongs to the genus *Origanum*.

MAJORAT, *ma'-jor-a*, is a term used on the continent of Europe to denote, in its widest sense, the order of succession, which is determined by age and the right of preference which hence belongs to the oldest. There are three kinds of majorats:—1. Primogeniture, or the right of the first-born, by which the eldest in the eldest line always succeeds to an inheritance. This law regulates the succession to the throne in almost all the European states in the present day. 2. Majorat, in the stricter sense, which, among relatives of the same rank, gives the inheritance to the eldest. 3. Seniority, which, without regard to the nearness of relationship, always selects the eldest in the family. All the three kinds of majorats differ from the ordinary modes of succession in that they do not admit of any division of property. The tendency of majorats is to retain the property of a state in a few hands, and where they prevail, have generally been regarded with disfavour by the great majority of the people. The more the wealth of a country is concentrated in a few hands, the more liable is the bulk of the population to experience the evils of want.

MAJOR DOMUS, *mai'-jor do'-mus* (Fr. *maire du palais*), was in the Frankish kingdom under the Merovingian monarchs the title of the highest officer of court and state. The major domus was, originally, the superintendent of the royal domains; and from the influence and power which they thus acquired, together with the weakness of the monarchs, they rose to the possession of almost supreme power, and play an important part in the history of the period. At length Pepin, who held this office, made himself king.—Ref. *Geschichte der Merovingischen Hausmaier*, by G. H. Pertz, Hanover, 1819. In Italy, the term *major-duomo* is frequently used to signify a steward or master of the household.

MAJOR-GENERAL. (*See* GENERAL.)

MAJORITY, *mā-jor'-e-te* (Fr. *majorité*), is a term used to designate the greater number of persons constituting any body or corporation, by the opinions of whom their acts are generally determined; as a majority of the House of Commons. The term is also used to denote the state of being at full age.

MAL, *măl* (Lat. *malus*, bad), is a prefix of certain words, meaning bad, wrong, fraudulent; as, mal-administration, mal-practice, &c.

MALACHI, BOOK OF, *măl'-ă-ki*, is the last of the canonical books of the Old Testament. The name denotes "my angel," or rather, "angel of Jehovah;" and hence some have been led to the opinion that the author of the book was an angel; others hold that the word is not a proper name, but only an appellative, and ascribe its authorship to Ezra, Nehemiah, and others. At all events, nothing is known definitely concerning the author. That Malachi flourished after the time of Zechariah is evident from the fact that he is not mentioned along with him in the book of Ezra; and, from the contents of the book itself, he is judged to have been contemporary with Nehemiah, and therefore to have lived from about B.C. 420. The book is a connected prophetic discourse respecting the relation of Jehovah to his people, and may be divided into three parts:—1. Setting forth the loving, fatherly, and merciful providence of God towards his covenant people, reproving them for not honouring him as a father, and denouncing the priests for not teaching the people their duty (i.—ii. 9); 2. censuring intermarriages of Jews with women of another country (ii. 10—16); 3. announcing the approach of the Messiah, "the messenger of the covenant," and of his forerunner, John the

Baptist, under the name of Elijah, to purify the priests and smite the land with a curse, unless there be repentance; declaring, also, the distinction that shall be finally made between the righteous and the wicked, and concluding with an impressive assurance of approaching salvation to those that feared God, and a solemn injunction to the people to observe the law of Moses while expecting the promised Messiah (ii. 17—iv. 6). The language of this book wants the fire and force of the earlier prophets, indicating clearly the decay of the prophetic spirit. The authenticity of it is established by various allusions to it in the New Testament.

MALACHITE, *măl'-ă-kite*, a mineral found in Siberia, South Australia, and other parts of the world, in concretionary masses consisting of carbonate of copper. When cut and polished, it shows its structure in series of concentric circular markings of different shades of green, corresponding to the concretions. It is much admired as an ornamental stone for inlaying purposes, the fitting together of the circular markings affording much scope for artistic treatment. The amorphous and less regular masses form an important ore of copper. Malachite is found in small quantities in Cornwall and Wicklow. The term is derived from the Gr. *malache*, the mallow flower, or *malakos*, soft; hence called also *velvet* copper ore.

MALACOLOGY, *măl-a-kol'-o-je* (Gr. *malakos*, soft, and *logos*, a discourse), a name applied by some naturalists to the study of conchology, which will be found treated under MOLLUSCA.

MALACOPTERYGIANS, *măl-ă-kop-ter-ij'-e-ănz* (Gr. *malakos*, soft; *pterugion*, fin), a term applied in ichthyology to such fishes as have the rays of their fins bony, although not pointed or sharp at the extremities like those of the class termed acanthopterygious fishes.

MALA FIDES, *mā'-lā fī'-dees* (Lat.), in Law, denotes bad faith, in opposition to *bona fides*, or good faith. Questions of bad faith must be referred to a jury.

MALA IN SE, *mā'-lā in se* (Lat.), in Law, is applied to wrongs of themselves; as murder, robbery, perjury, &c. *Mala prohibita* are wrongs which are not wrongs of themselves, but which are prohibited by human laws; as treason, forgery, &c.

MALAMBO BARK. (*See* CROTON.)

MALA PRAXIS, *mā'-lā prăk'-sis* (Lat.), in Law, denotes bad or unskilful practice. If the health of an individual be injured by the unskilful or negligent conduct of a surgeon, or apothecary, or general practitioner, an action for compensation may be sustained.

MALARIA, and MIASM, *măl-ai'-re-ă, mī'-ăzm* (Ital. *mala aria*, bad air, and Gr. *miaino*, I infect).—The former of these words is now generally employed to designate a certain effluvium or emanation from marshy ground; and the latter, with the adjunct of marsh, is used in the same sense. Miasma, or miasm, by itself, denotes simply contagion (which *see*). This poison is not cognizable by the senses, nor can it be detected by chemical tests; it is known only by its effects upon the system. The observation of centuries, however, has rendered us well acquainted with the effects of this subtle poison. Marshes, whether salt or fresh, are prolific sources of malaria, especially in a certain stage of the drying process under a hot sun. But this poison is the product also of various sorts of soil; as wet meadows, grounds alternately flooded and drained, the mud left by the retiring tide in seaports and estuaries, parts covered with low and dense brushwood or with reeds and grass, a country newly cleared of its wood,—all these, particularly in warm climates, are fertile sources of malaria. The concurrence of vegetable matter susceptible of decay, of moisture, either on the surface or a short distance below it, and of a certain elevation of temperature, is necessary for its evolution; and of these long-continued heat has the greatest influence in increasing the intensity of the poison. Comparatively harmless in the northern parts of the temperate zone, it becomes malignant and deadly in places equally favourable to its production, just in proportion to the increase in the mean annual temperature. It is not necessary that the amount of vegetable matter be great, or its growth recent, since malarious diseases are often caused by the drainage of ponds and lakes; neither is the quantity of water required to be large for the generation of malaria. In tropical countries it is remarked, that the evolution of malaria commences immediately on the falling of the rain, and the sickness abates as the ground gets thoroughly wetted. A marsh completely covered with water is innocuous; it is only when the moisture is being dried up under a hot sun that it becomes pestilential. In the case of inundations, it is at their subsidence that sickness prevails. Dr. Ferguson, who was with the British army in Spain, has furnished us with many instances of the small degree of moisture that may serve to produce malaria in its most intense degree. "The army," he says, "advanced to Talavera through a very dry country, and in the hottest weather fought that celebrated battle, which was followed by a retreat into the plains of Estremadura, along the course of the Guadiana river, at a time when the country was so arid and dry for want of rain, that the Guadiana itself, and all the smaller streams, had in fact ceased to be streams, and were no more than lines of detached pools in the courses which had formerly been rivers; and there they suffered from remittent fevers of such destructive malignity that the enemy and all Europe believed that the British army was extirpated." Also, the approach to the town of Ciudad Rodrigo is through a bare, open, barren country; and on more than one occasion, when this low land, after having been flooded in the rainy season, had become as dry as a brick ground, with the vegetation utterly burnt up, there arose fevers among our troops which for malignity of type could only be matched by those before mentioned on the Guadiana.—(*On the Nature and History of Marsh Poison*, by William Ferguson, M.D., &c., Edinburgh, 1821.) As regards water, Dr. Ferguson lays it down as a rule, to which there is no exception in climates of high temperature, that the only condition indispensable to the production of the marsh poison, on all surfaces capable of absorption, is the paucity of water where it had previously recently abounded. Heat is the agent most active in the production of malaria, in all soils and situations capable of engendering it; hence, in this country, even the milder forms of malarious disease are rarely seen before the vernal or after the autumnal equinox; and wherever they exist, their prevalence is terminated by the cold of winter. It has often been observed, that a summer of unusual warmth, especially if occurring after a wet spring, causes intermittent and remittent fevers to reappear in districts whence they had long been banished by the improvement of agriculture. As a general rule, malaria is more pernicious in proportion to the proximity to its source; but to this rule there are various exceptions. Places at some distance, especially if situated upon an eminence, are sometimes affected with the same, if not greater intensity, than places in the vicinity. The distance to which marshy emanations may extend by gradual diffusion has been calculated to be 1,400 to 1,600 feet in elevation, and from 600 to 1,000 feet in an horizontal direction; and these limits, it is said, cannot be exceeded in Europe; but in equatorial regions the activity of the poison is greater; and in the West Indies, vessels 9,000 feet from the marshy coast have felt the effects of its baneful influence. But when winds are in operation, the extent to which the poison may be transported is unknown; but instances are recorded of its being conveyed three or more miles. Though malaria is principally owing to heat, it is not in the hottest part of the day that its influence is most pernicious, but in the evening or night. Besides the more familiar effects of malaria,—intermittent and remittent fevers, there are a number of organic affections of the spleen, liver, stomach, intestines, and mesenteric glands, also dropsy, apoplexy, palsy, and idiocy, that are traced to its long-continued application; while cholera, dysentery, and diarrhœa, are referred to its more brief agency. Natives of marshy districts, who constantly reside in them, have their whole bodily and mental constitution contaminated by the poison which they inhale. Their aspect is sallow and prematurely senile; their muscles flaccid, hair lank, stature stunted, and their intellectual and moral character low and degraded. The progress of civilization and of agriculture is a principal means in diminishing the domain of malaria. In marshy situations a screen of woods has often been found of great benefit between the habitations and the marshes.

Nutritious diet, and whatever is most conducive to health, should be observed by persons exposed to the influence of malaria.—Ref. *The Cyclopædia of Domestic Medicine*, by Forbes, Tweedie, and Conolly.

MALEDICTION, *măl-e-dĭk'-shun* (Lat. *maledictio*), in Law, is applied to a curse which was anciently annexed to donations of lands, &c. to churches and religious houses, imprecating the most direful punishments on those who should infringe them.

MALESHERBIACEÆ, *măls-hairb-e-aĭ'-se-e* (in honour of Lamoignon de Malesherbes, an illustrious French patriot and agriculturist), in Bot., the Crownwort fam., a small nat. ord. of *Dicotyledones*, sub-class *Calyciflorœ*, consisting of herbaceous or somewhat shrubby plants, resembling *Passifloraceæ*; but differing in never being climbers, in the want of stipules, and in some other minor characters. There are but two genera, *Malesherbia* and *Gynopleura*, which include five species, all natives of Chili and Peru.

MALIC ACID, *maĭ'-lik* (Lat. *malum*, an apple), a vegetable acid found abundantly in most acidulous fruits, especially in unripe apples, gooseberries, and currants. The footstalks of the ordinary garden rhubarb also furnish large quantities of it; but it is most usually obtained from the berries of the mountain ash. To prepare it, the juice of berries of the ash, or the footstalks of the garden rhubarb, are neutralized with milk of lime, a quantity of chloride of calcium being also added, to decompose the malate of potash that is always present. The liquid, which contains bimalate of lime, is filtered and boiled for several hours, until neutral malate of lime separates as an insoluble powder. The malate of lime is washed with water, and added to dilute nitric acid until it ceases to be dissolved. The liquid thus obtained is filtered and set aside to crystallise; well-defined crystals of bimalate of lime being formed. The solution of the bimalate is then decomposed with acetate of lead, and the resulting malate of lead with sulphuric acid. The syrupy solution of malic acid being set aside, deposits radiated masses of crystals, composed of four- and six-sided prisms, deliquescent in moist air. Malic acid is dibasic, exhibiting a strong tendency to form acid salts. The bimalate of ammonia and bimalate of lime may be obtained in large well-defined crystals. The only use to which malic acid has yet been applied is in the manufacture of succinic acid by the fermentation of neutral malate of lime. Impure malate of iron has also been used in medicine. Malic acid appears to exist under two modifications, one of which exercises an influence on a ray of polarized light, the other being destitute of any such action.

MALICE, *măl'-is* (Lat. *malitia*), in Ethics and Law, is a formed design of doing mischief to another. In its common acceptation, it implies a desire of revenge, a settled anger against a particular person; but in its legal sense, it implies little, if anything, more than merely without just cause or excuse. In murder, it is malice makes the crime, and the words *ex malitia præcognitata* (of malice aforethought, or malice prepense) are necessary to an indictment of murder. Malice prepense is either express or implied; express, when the design is evidenced by external circumstances, or even if, upon a sudden provocation, one beats another in a cruel and unusual manner, so that he dies, even though he did not intend his death; implied, as where a man wilfully poisons another, or a man kills another suddenly without any, or without a considerable provocation. In general, all homicide is malicious, and thus murder; unless justified by command or permission of the law, excused on account of accident or self-preservation, or alleviated into manslaughter by extenuating circumstances, the burden of proving any of these to the satisfaction of the court and jury being incumbent upon the prisoner. Previous to 7 & 8 Geo. IV. c. 30, an act "for consolidating and amending the laws in England relative to malicious injuries to property," it was necessary in such cases to prove express malice in the offender towards the owner, which frequently rendered it difficult to convict the party. This statute, however, contains an express enactment that its provisions shall equally apply and be enforced whether the offence shall be committed from malice conceived against the owner of the property in respect of which it shall be committed, or otherwise.

MALL, or PALL MALL, *mell*, or *mawl*, the name of a game formerly very popular in England. It was played by striking a box ball with a stick or mallet, through a ring or arch of iron, one of which stood at each end of an alley; and he that could do it with the smallest number of blows was victor. The game of mall, says Strutt, was a fashionable amusement in the reign of Charles II., and the walk in St. James's Park, known as the Mall, received its name from having been appropriated by the royal party to this game. At an earlier period, the site of the street now called Pall Mall was used for this purpose. The name mall seems to have been given to the game itself from the mallet with which the ball was struck, and pall mall to the ground or alley on which it was played.

MALLEABILITY, *măl-le-a-bĭl'-e-te* (Lat. *malleus*, a hammer), a property possessed by some bodies, especially metals, which renders them capable of being beaten out with the hammer or converted into plates between rollers. Gold is extremely malleable; it can be beaten 1,200 times thinner than ordinary writing-paper. Iron has been rolled into sheets the 2,500th of an inch in thickness, and a square inch of the leaf only weighed three-quarters of a grain.

MALLEUS, *măl'-le-us*, in Anat., is a term applied to one of the bones of the ear, from its resemblance to a mallet. (*See* EAR.)

MALLOW. (*See* MALVA and ALTHÆA.)

MALPIGHIACEÆ, *măl-pig-e-aĭ'-se-e* (in honour of Marcello Malpighi, an Italian naturalist), in Bot., the *Malpighia* fam., a nat. ord. of *Dicotyledones*, sub-class *Thalamiflorœ*, having the following essential characters:—Trees or shrubs with simple stipulate leaves. Flowers perfect or polygamous. Calyx and corolla with five parts; the sepals having usually large glands at the base, and imbricated or very rarely valvate; the petals unguiculate, without appendages, hypogynous and convolute. Stamens usually 10, sometimes 15, with a fleshy prolonged connective. Ovary usually composed of 3 carpels (rarely 2 or 4) partially or wholly combined; ovules solitary, pendulous from long stalks. Seeds exalbuminous, usually with convoluto embryo. The plants of this order are confined to tropical climates. Some have edible fruits, as the species *Malpighia glabra* and *punicifolia*, which yield the Barbadoes cherries; others are chiefly remarkable for their large and showy flowers; while some are interesting to the botanist on account of their anomalous stems, the peculiarity of which consists in the presence of several woody axes without annual zones. The order is generally characterized by astringency. Lindley enumerates 43 genera and 550 species.

MALT, *mault* (Sax. *mealt*).—In its general sense, this word signifies any grain which has become sweet in taste on account of the commencement of germination. In a more restricted sense, it signifies the preparation of barley from which ale, beer, and porter are brewed, all of which are called *malt liquors*. In order to convert it into malt, barley is steeped in water for three or four days; it is then taken out and suffered to lie quiet until it begins to sprout, or germinate. It is afterwards dried in a kiln and treated with boiling water, in order to form *wort*, as explained in the art. BREWING. By being converted into malt, barley increases two or three per cent. in bulk, and loses, on an average, 20 per cent. in weight, of which 12 are ascribed to kiln-drying, and consist of water which the barley could not have lost had it been exposed to the same temperature: so that the real loss does not exceed 8 per cent. The roots appear, from the process, to be formed chiefly from the mucilaginous and glutinous portions of the kernel. The starch is not employed in their formation, but acquires a sweetish taste and the property of forming a transparent solution with hot water. It approaches, in fact, somewhat to the nature of sugar. The peculiar manner to which malt is subjected to duty has given rise to most of the changes which have occurred in the malt trade. In England the malt duty began in 1697; in Scotland in 1713; and in Ireland in 1783. From 1716 to 1816 there was apparently no increase in the quantity of malt made in England; 24,000,000 being the quantity per annum. This was caused principally by the duty and restriction, and partly by the growing taste for tea and coffee. The duty rose from 6d. in 1702, to 4s. 6d.

in 1804. The present duty on barley-malt is about 2s. 6d. In 1859, the quantity of malt paying duty was 40,408,447 bushels; 546,743 bushels, however, over and above this quantity, were rendered exempt from duty on various grounds.

MALTESE TERRIER. (*See* TERRIER.)

MALTHUSIAN DOCTRINE, *măl-thu'-se-ăn*, in Pol. Econ., is the name commonly given to a doctrine advanced by the Rev. T. R. Malthus, which has given rise to much discussion among economists. The doctrine, in brief, is that there is a tendency in population to increase faster than the means of subsistence; hence the pressure of population against subsistence may be expected to become greater and greater in each successive generation (unless new and extraordinary remedies are resorted to), and thus to produce a progressive diminution of human welfare. "There are few states," he says, "in which there is not a constant effort in the population to increase beyond the means of subsistence. This constant effort constantly tends to subject the lower classes of society to distress, and to prevent any great permanent amelioration of their condition." This is just one of those cases in which theory ignores facts. What, for instance, is the picture presented by the earliest records of those nations which are now civilized, but a scanty population and still scantier means of subsistence. As civilization extends, the population increases, but the means of subsistence increases at a greater rate. In every civilized country there will be found to be much less poverty than is universal in the savage state; and hence it must be true that, under the circumstances in which that country has been placed, the means of subsistence have a greater tendency to increase than the population. (*See* POPULATION.)—*Ref.* Senior's *Political Economy*.

MALVA, *măl'-vă* (Lat.) the Mallow, the typical gen. of the nat. ord. *Malvaceæ*. The species *M. sylvestris* is the common mallow, a handsome plant with large purplish flowers, growing at roadsides and in waste places. The French name for the plant, *mauve*, has of late been applied to a delicate shade of purple. The bark of the mallow yields strong fibres. The root and leaves have similar properties to those parts of the marsh-mallow. (*See* ALTHÆA.) The petals of the species *M. aloea* have astringent properties, and yield a black dye.

MAMELUKES, or MEMLOOKS, *măm'-ă-looks, mem'-looks* (Arab. *memalik*, a slave), is the name given to a body of soldiery who ruled Egypt for several centuries. They were introduced into that country by the sultan Malek Saleeh about the middle of the 13th century, being Asiatic youths, chiefly from the Circassian region, purchased as slaves from Gengis Khan, whose captives they were. These were trained to military exercises and formed into a corps of 12,000 men, called Memlooks. They soon exhibited a spirit of insubordination, and, in 1254, assassinated the sultan Turan Shah, successor of Malek Saleeh, and raised Eybek, one of their own number, to the throne. A line of sultans, known as the Bahree, or Turkish dynasty, now followed, all of whom were raised to power by the Mamelukes, and many of them deposed and slain. This dynasty conquered Syria, took Damascus, and put an end to the domination of the Abbaside caliphs. In 1382 the Bahree dynasty was overthrown by a new band of Mamelukes called Borghees, from a word signifying a castle, because they were first employed in garrisoning the fortresses of Egypt. They made their commander, Doulot-el-Memlook, sultan; and this dynasty continued to rule the country till 1517, when they were subdued by the Ottoman Turks, and Egypt became a dependency of Constantinople. The Turkish sultan, however, did not deprive the Mamelukes of all power, but maintained them as a military aristocracy in the country. He divided Egypt into twenty-four provinces, each of which was placed under the jurisdiction of a Mameluke bey or chief; and this body served as a check upon the pasha, to whom the general government of the country was intrusted. The beys had also the right to elect the Sheik-el-belled, or governor of Cairo, an officer of great power. The beys soon after the Turkish conquest contrived to obtain such influence and power, that eventually they became the virtual rulers of Egypt, while the viceroys had only the shadow of rule. Each of the twenty-four beys maintained 500 or 600 followers, magnificently armed and equipped. The office of bey was not hereditary, but elective. This state of things continued till Bonaparte's invasion of the country in 1798. At the battle of the Pyramids, July 21st, 1798, the Mamelukes mustered in great force and attacked the French with desperate courage, but were repulsed with terrible slaughter, their broken and dispirited remains, about 2,500 in number, fleeing into Upper Egypt. After the French were driven out of the country, the Mamelukes regained some degree of power; but the Turks, dreading their return to their former position, did what they could to oppose them, and on more than one occasion had recourse to treacherous massacres of them. The final blow, which utterly destroyed them as a military or political body, was struck by the pasha Mehemet Ali, who, on March 1st, 1811, invited their chiefs and principal men, to the number of 470, to a conference in the citadel of Cairo, and then, closing the gates, ordered his Albanian soldiers to fire upon them. Only one escaped, by leaping his horse from the ramparts, and alighting unhurt, though the horse was killed by the fall. Immediately after a general massacre of the Mamelukes was ordered in every province; a few escaped into Dongola, where they subsequently dispersed themselves; and as a body they are now extinct.

MAMMALIA, *măm-mā'-le-ă* (from Lat. *mamma*, the breasts).—This important class in Zoology, which has been placed by Linnæus at the head of the vertebrated series in the animal kingdom, includes all such animals as are provided with organs for suckling their young. Even excluding man, who necessarily belongs to the class, we find amongst the *mammalia* the greatest number of faculties, the most delicate sensations, the most varied action, and an extraordinary aggregate of properties for the production of intelligence; there is every reason, therefore, for Linnæus having classed the mammalia as first amongst animals. They are most fruitful in resources, least subject to mere instinct, and, finally, most susceptible of progressive improvement. With but a moderate amount of respiration, they are generally intended for locomotion by walking with strength and continuity; and hence all the articulations of their skeletons have the forms very exact; thereby determining, with unvaried precision, the nature of their movements. Some fly through the air by means of membranes affixed to their limbs, although typically adapted for walking on the earth; while others have the extremities so short that they move with ease only in the water; both of these exceptions retain, however, in all other respects, as a rule, the general characteristics of their class. It may be here stated that all mammalia are endowed with warm blood, which results from the great development of their respiratory apparatus; the heart being double, and containing four cavities; that is to say, an auricle and ventricle on the right side, and the same on the left. The circulation is carried on in the following manner. The veinous blood passes through the cavities on the right side and is distributed through the lungs, where it combines with the oxygen or vivifying portion of the air; it is then conveyed by the pulmonary veins to the left auricle, from whence it flows into the ventricle, and is propelled through the arterial system. (*See* HEART.) The females suckle their young with milk secreted in breasts or *mammæ*, and are viviparous, or ovo-viviparous; they are consequently placental or implacental; the placental including the higher order of mammals, from man to the last true rodent, and the implacental composing the marsupialia and monotremata. Both of these divisions have the upper jaw fixed to the skull, and the lower is formed of but two pieces only, and is articulated to the temporal bone. The neck (to pursue our investigation) is composed of seven vertebræ; but in different descriptions of animals some of these bones are either more or less in number; the anterior ribs are affixed to the sternum, or breastbone, by cartilaginous processes. The anterior extremities of these commence with a shoulder-blade which is not articulated but rests between the muscles, and often, indeed, leans on the sternum by means of the clavicle on each side. This is continued by an arm, forearm, and hand. The latter is formed of two rows of bones, called the *carpus*, a third row,

called the *metacarpus*, and fingers, each consisting of two or three joints. With the exception of the cetacea, or whale family, all mammalia have the pelvis attached to the spine; the pubes forming the anterior, and the ilia, ischia, sacrum, and coccyx, the lateral or posterior parts. At the point where the first three mentioned bones unite, on each side, is the articulation of the femur, or thigh-bone, to which are attached the leg-bones, tibia, and fibula, which are in most cases distinct; and are succeeded by those composing the foot, which correspond to the bones of the hand; namely, a tarsus, metatarsus, and toes. In different orders and genera of animals, the extremities vary considerably; in some, those of the fore parts are considerably lengthened, so as to form the supporters of a wing,—as in bats; in others, they are shortened, as is evinced in the jerboa and kangaroo; while in both of these last-mentioned varieties the posterior extremities are enlarged in the apparently greatest disproportion. The cetacea and similar animals, which have been briefly alluded to, have no pelvis whatever; their hinder extremities are likewise wanting; they are, however, supplied, instead of these, at the end of the spine or vertebral column, with cartilaginous bodies forming a kind of feet, or the flukes of the tail, which, in this species, is always horizontally placed. The fore-foot (*metatarsus*) usually counts as many bones as there are toes present. The metatarsus in the ruminant and solidungulate animals is conformable to the metacarpus. In the genus Dipus (the jerboa), amongst the rodents, the three middle metatarsal bones unite, so as to form a single bone, which terminates below in three processes, to which the three large toes are connected, and which thus resembles the principal bone at the root of the foot in birds. The digits of the foot in the ruminants, the solid ungulates, and commonly, also, in the pachyderms, correspond in number and form to those of the hand. Such, also, is the case in most of the carnivorous animals, although in the genera *Felis* and *Canis* the thumb (pollex) of the hind foot is not developed, of which a trace only is observed in the fore foot. In the monkeys the thumb is shorter; but the other digits are longer than in the human foot. The head is, in all mammalia, articulated by two condyles upon their atlas or first vertebra: as the seat of intelligence, it has excited the greatest interest in all ages; and it has been remarked, that the approach to reason observed in animals bore some relation to the size and configuration of the head. The brain is the centre or origin of the nervous system, and will be found fully described under an article bearing that name. (*See* Ear and Eye.) The tongue of mammals is always fleshy, and is attached to a bone termed the *os hyoides*, which is composed of several pieces, and suspended to the cranium by ligaments. The lungs are two in number, and are divided into lobes, which are composed of an immense quantity of small cells: they are suspended without adhesion in a cavity formed by the ribs and diaphragm, and lined by the pleura. The skin of mammalia is, as a rule, usually covered with hair. Some exceptions, however, have horny plates, as the tribe *Manis*, or bony plates, as the armadilloes (the genus *Dasypus*); and, indeed, some have spines. The sense of touch is variously developed in the extremities of the limbs in the different species, according as the feet move only for progression, for standing, or for seizing alone. In the apes, which appear to be in this respect one of the most privileged, the hand is much less adapted for feeling than in man, who, in his erect position, can move and apply his fore limbs for the sense of touch more easily. The whiskers which are attached to the lips serve also, like the fleshy appendages attached to the jaws of some fishes, to give warning of external obstacles, on account of branches from the fifth pair of nerves being attached to their roots. The motions of mammals consist principally in progressing. Some are able to spring to great heights; others, again, are formed for swimming. In the cetaceans, or whales, swimming is the sole means of motion. Other mammals are able to fly, as was stated before, by means of a membranous substance below the elongated fingers of the four limbs; like the bats for instance. With regard to the physical distribution of this class of animals much might be said. Some reside entirely in the sea, as the cetaceans and most of the seals. (*See* Seal Family.) Although some species, especially of the animals last named, live in fresh water, many varieties of the genus *Sorex*, the otters, beavers, and the duck-mole, reside in lakes and rivers. Others, again, live under ground, as the family *Talpa* and *Bathyergus*. The greater part, however, live on land,—some on high mountain-tops; as the antelope, ibex, &c.; others on trees, as the apes, squirrels, and monkeys; and some resort, by flying and flapping in part, even to the air (the *Galeopithecus* and *Cheiroptera*). This difference of resort is naturally in relation with the general bodily form of the animal, and the constitution of its various parts, especially of the organs of motion and sense. In the geographic distribution of the mammalia, it may be as well stated that the numbers of its various classes increase from the pole to the equator,—as well the various classes as the sub-genera; although the cetaceans and seals must be excepted from the rule. There are species in the north polar regions, to quote the remarks made use of in Van der Hoeven's "Handbook of Zoology," common to the old and new world; as *Canis lagopus*, *Ursus maritimus*, and *Cervus tarandus*; without the polar circle, also, some species are found in the northern countries of both hemispheres, as *Mustela Martis*, *Mustela erminea*, and *Castor Fiber* (some writers, indeed, maintain that the beaver of America is specifically different from that of the old world). In the temperate parts of North America, almost all the species are such as do not appear in the eastern hemisphere; while in South America no single species is found which also lives in the old world,—nay, even the genera differ for the most part from those of the old world. South American genera, of which no species in the old world are hitherto known, are the following,—*Dicotyles*, *Auchenia*, *Dasypus*, *Myrmecophega*, *Bradypus*, *Cavia*, *Loncheres*, *Nasua*, the genera of the bat tribe; *Glossophaga*, *Phyllostoma*, *Molossus*, *Noctilio*, and many genera of Quadrumanes; namely *Callithrix*, *Ateles*, *Myactes*, *Pithecia*, and *Hapale*. *Procyon* is peculiar to the new world in the northern and southern hemispheres. *Fiber* is an animal form of North America. Other genera are peculiar to the eastern hemisphere; as *Sus*, *Equus*, *Camelus*, *Rhinoceros*, *Manis*, *Myoxus*, *Spalax*, *Cricetus*, *Viverra*, *Herpestes*, *Erinaceus*, the genera of bats; *Megaderma*, *Nycteris*, *Rhinolophus*, *Pteropus*, the family of the *Lemurida*, the genera of the apes; *Cercopithecus*, *Semnopithecus*, *Inuus*, *Cynocephalus*, *Hylobates*, *Simia*. To Africa, in particular, are peculiar the genera *Camelopardalis*, *Hippopotamus*, *Orycteropus*, *Cercopithecus*; while in a similar manner to the island of Madagascar are peculiar the *Centetes*, *Lemur*, *Lichanotus*, and the genus *Cheiromys*, a sciurean rodent which approaches the *Lemurida* in form. Most of the species of antelopes are also exclusively African. Most of the *Marsupial* species are found in Australia and the adjoining islands; while the genus *Didelphys* alone is American,—Africa, as well as Europe, not possessing a single species of this division. If we take into consideration the entire class of mammals, exclusive of the *Cetaceans* and *Phoca*, then the *Rodents* will be found to form one-third of the entire number of species, the *Carnivores* and *Cheiropters* together about one-third also, while the remaining third is formed, for the greater part, of the Quadrumanes and Ruminants; and especially of the Marsupials and insectivorous *fera*. With the exception of some species of bats and of the true whales, Mammals are not tied, like birds of passage, to make strictly limited migrations; but inhabit the same districts in winter and summer both. On the other hand, different species hybernate, and pass a greater or less portion of the year without food in caves and hiding-places. Amongst such in Europe are, for example, the bat, the hedgehog, the hamster, the marmot, and various other species of rodents, forming the genus *Myoxus*; and in the north the bears. (*See* article on Hybernation.) With reference to the classification and division of animals of the section *Mammalia*, that proposed by Cuvier is undoubtedly one of the best, if not the best, *par excellence*, as it possesses many advantages over that adopted by Linnæus. In the present article, therefore, Cuvier's system has been followed; and the great naturalist himself gives an outline of his object and reasons in the last edition of

his "Animal Kingdom." The following are his words:—"The characters by which Mammalia differ most essentially one from another, are derived from the organs of touch, from which results their degree of dexterity, and from the organs of mastication, which determine the nature of their food; and upon these very closely depends not only everything which is connected with the digestive functions, but a variety of other circumstances relative even to their degree of intelligence. The perfection of the organs of touch is estimated by the number and mobility of the digits, and the extent to which they are inclosed in a claw or hoof. A hoof which completely incloses that part of the digit which touches the ground, precludes the exercise of it as an organ of touch or prehension. The opposite extreme is where the nail, in the form of a single lamina, covers only one side of the end of the digit, leaving the other side in possession of all its delicacy of touch. The kind of food is indicated by the molar teeth, to the form of which the articulation of the jaws invariably corresponds. For cutting flesh, the molar teeth must be trenchant and serrated, and the jaws fitted together so as to move like the blades of a pair of scissors, simply opening and closing in the vertical direction. For bruising grains and roots, the molar teeth must have flattened crowns, and the jaws a horizontal motion; and further, that the grinding surface may be always unequal, like a millstone, the teeth must be composed of substances of different degrees of density, and consequently wearing down in different proportions." (With regard to this last-mentioned peculiarity, *see* art. HORSE.) Cuvier's arrangement is as follows:—

Class MAMMIFERES.

Order I. BIMANA.—Man.

Order II. QUADRUMANA.—Two families.—1. Apes and Monkeys; and 2. *Macaucos* (*Lemur*, according to Linnæus).

Order III. CARNASSIERS.—Family 1. *Cheiroptera* (Bats).—2. *Insectivora* (Hedgehogs, Tenrecs, *Tupaia*, Shrews, *Mygale*, *Chrysochloris*, *Talpa*, *Condylura*, *Scalops*).—3. *Carnivora*. Tribe 1. *Plantigrades:* Bears, Raccoons (*Procyon*), *Panda*, *Benturongs*, Coatis (*Nasua*, Storr.), Kinkajous, Badgers, Gluttons, Ratels. Tribe 2. *Digitigrades:* Martens, Skunks, Otters, Dogs, Civets, Genets, *Paradoxurus*, *Ichneumons* (*Herpestes*, Illiger), Surlcates, *Crossarchus*, *Proteles*. The last subdivision of the Digitigrades is composed of the Hyænas and the Cats, in which last the sanguinary development is at its height. Tribe 3. *Amphibia:* the Seals (*Phoca*, Linn.), and the Walruses (*Trichecus*, Linn.).

Order IV. MARSUPIALIA.—Subdivision 1. Opossums, Dasyurus, *Perameles*. Subdivision 2. *Phalangista*. Subdivision 3. The Kangaroo Rats (*Hypsiprimnus*, Illiger), the Kangaroos, the Koalas, and the *Phascolomys*.

Order V. RODENTIA.—The Squirrels (*Pteromys* and *Cheiromys*, Cuvier), *Echimys*, *Hydromys*, Capromys, the Rats proper, the Jerbilles, *Meriones*, the Hamsters, *Criostus*, and *Arvicola*, the Rats, the Souslik, *Myoxus*. Also the Field Mice and Rats, the Lemmings, the Jerboas (*Dipus*), the Beavers, the Porcupines, the Hares (*Lepus*, Linn., including the *Lagomys* of Cuvier), the *Capybara*, the Guinea-pigs, the Agoutis (*Chloromys*), the Pacas, and the Chinchillas.

Order VI. EDENTATA.—Tribe 1. *Tardigrades:* the Sloths (*Bradypus*, Linn.). Tribe 2. Ordinary *Edentata:* the Armadilloes (*Dasypus*, Linn.) and the subgenus *Chlamyphorus*, the Aard-Vark and the Ant-eaters, the Pangolins (*Manis*, Linn.). Tribe 3. The Monotremes, the *Echidna*, and the *Ornithorhynchus* (*Platypus*, Shaw).

Order VII. PACHYDERMATA.—Family 1. Proboscidians: Elephants and Mastodons. Family 2. Ordinary *Pachydermata:* the Hippopotamus, the Hogs, the Rhinoceroses, the Damans (*Hyrax*), and the Tapirs. Family 3. *Solipeda:* the Horses, &c. (*Equus*, Linn.).

Order VIII. RUMINANTIA.—1. No horns: the Camels, including the Llamas, and the Musks. 2. True horns, shed periodically: the Stags or Deer (*Cervus*, Linn.). 3. Persistent horns: the Giraffe. 4. Hollow horns: the Antelopes, the Goats, the Sheep, and the Oxen.

Order IX. CETACEA.—Family 1. Herbivorous Cetaceans: the Manatees, the Dugongs, and the Rytines (Illiger). Family 2. Ordinary Cetaceans: the Dolphins and the Porpoises, the Narwhals (*Monodon*, Linn.), the Cachalots, and, finally, the Whalebone Whales (the *Balænæ* of Linnæus, including the *Balænoptera* of Lacépède).

The above is a digest of the classes as given in Cuvier's last edition of the "Règne Animal." Amongst the ungulate animals, according to Cuvier, the first is Man, and the order which comes nearest to Man is termed the *Quadrumana*,—*i. e.*, has hands on the four extremities. Another order, termed the *Carnivora*, has not the thumb free. Those animals whose digits are much sunk, and which are distinguished by the absence of incisor teeth, are called *Edentata*. The *Ruminantia*, by their cloven feet, their want of upper incisor teeth, and by their complicated stomach, form an entirely separate class to themselves. All other quadrupeds with hoofs might be united into a single order, which, according to the French naturalists, might be called *Pachydermata*, or *Sumata*, the elephant alone excepted, having some remote affinities to the order Rodentia. In the last degree in the scale of mammals come those which have no hinder extremities, and whose fish-like form and entirely aquatic habits would lead us to place them in some separate class, if it were not that their domestic economy is in all respects perfectly similar to the class in which they are catalogued. These are the warm-blooded fishes of the ancients, and the *Cetacea* of our naturalists; and they combine the powers of other Mammalia with the faculty of suspending themselves in or upon the sea; they consequently appear to possess double advantages. In the affinities between the various classes of Mammalia, the different species will be seen to descend in a corresponding ratio as they diverge from the *Quadrumana*; so, as it is well observed in an article on the subject in Brande's Dictionary, "the scheme may be likened to a cone, of which Man is the culminating pinnacle."—*Ref.* Cuvier's *Animal Kingdom*; Professor Owen's *Works*; Hoeven's *Handbook of Zoology*; the *English Cyclopædia*—Natural History; &c. &c. (*See* also separate articles on the various classes.)

MAMMEA, *mäm-me'-a* (*mamey* is the aboriginal name of the species), in Bot., a gen. of the nat. ord. *Guttiferæ*. The species *M. americana* produces the fruit called the mammee apple, or wild apricot of South America, which has a most delicious flavour. From the flowers a kind of brandy is distilled, and the sap when fermented forms a wine. The seeds are anthelmintic.

MAMMON, *mäm'-mon*, is the name of the Syrian god of riches, and is mentioned in the teachings of Christ as a personification of worldliness. Milton makes him a fallen angel; and Spenser has personified him in his noblest manner in the "Fairie Queene" (book II. canto 7), where he represents Sir Guyon amid the secret treasures of the "god of the world and worldliness."

MAMMOTH, *mäm'-moth* (*Elephas primigenius*), the Russian name for an extinct species of elephant, the bones of which resemble those of the existing Asiatic species, but whose grinders have the ribands of enamel narrower and straighter, the alveoli of the tusks longer in proportion, and the lower jaw more obtuse. The mammoth was thickly covered with hair of three different kinds; one consisting of stiff black bristles a foot in length; another of coarse flexible hair, and the third of a kind of wool. The bones and tusks of the mammoth are found throughout Russia, and more particularly in Eastern Siberia and the Arctic marshes, &c. The tusks form an article of commerce, and are much used in making the inferior kinds of ivory goods. In Siberia, during 1799, a whole mammoth was discovered by a Tunguesian, named Schumachoff, with the whole of the soft parts preserved in the snow. Schumachoff, who generally went to hunt and fish on the peninsula of Tarnut after the fishing season of the Lena was over, erected a cabin for his wife on the bank of the lake Oneone, and then embarked to search along the coasts for mammoth tusks. One day he saw among the blocks of ice a shapeless mass, but did not then discover what it was. In the course of the next year, he saw that this object was more disengaged from the ice, and that it had two projecting parts, towards the end

of the summer of 1801, the entire side of the animal and one of his tusks were quite free from ice. The summer of 1802 was cold; but in 1803, the ice between the earth and the mammoth having melted more rapidly than the rest, the plane of its support became inclined, and the enormous mass fell by its own weight on a bank of sand. Dogs and wild beasts soon devoured most of the flesh; but it was found to be a male, with a long mane on the neck, but without tail or proboscis, both having been probably devoured. It is asserted that the places of the insertion of the muscles of the proboscis were visible in the skull. The entire carcass was 9 feet 4 inches high; 16 feet 4 inches long, from the point of the nose to the end of the tail, without including the tusks, which were 9 feet 6 inches, measuring along the curve. The two tusks together weighed 360 lb. avoirdupois, and the head, with the tusks, 414 lb. Remains of the *Elephas primigenius* have been found in large quantities in the British isles. They have been found off the coasts of Norfolk and Suffolk, and in many parts of Essex; at Herne Bay, in the valley of the Thames; at Sheppey, Lewisham, Woolwich, and the Isle of Dogs. They have been dug up in the streets of London, as in Gray's Inn, and in Charles Street, St. James's Square. They have also been dug up at Kensington, Kew, Henley Bottom, Wallingford, and Dorchester. They have also been found at Brighton, and in districts of Worcestershire, Warwickshire, Staffordshire, Northamptonshire, Yorkshire, and the celebrated cave at Kirkdale.

MAN, *mân* (Ger. *Mann*, Fr. *homme*, Lat. *homo*, Gr. *anthropos*), is the highest and noblest of all created beings that inhabit this earth,—incontestably the lord of the creation. Him all other creatures serve, by him even the elements are brought into subjection. He alone possesses the power of adapting himself to the most opposite circumstances, and he alone is found to be improving his condition generation by generation. Considered as an object of natural history, man is a mammiferous animal belonging to the order *Bimana*, or two-handed, of which he constitutes the sole genus *Homo*. The distinguishing characteristics of man are two hands, the erect posture, teeth approximated and of equal length, the inferior incisors perpendicular, prominent chin, rational, endowed with speech, unarmed, defenceless. "That," says Cuvier, "which constitutes the *hand*, properly so called, is the faculty of opposing the thumb to the other fingers, so as to seize upon the most minute objects; a faculty which is carried to its highest degree of perfection in man." The next series of characters are those by which he is by nature adapted to the erect posture, the head nicely balanced on the summit of the vertebral column, and the muscles of the trunk and limbs which contribute to the maintenance of the erect posture, largely developed. The face is placed immediately beneath the brain, so that its front is nearly in the same plane as the forehead, which is peculiarly characteristic of man. The vertebral column in man has its curves so arranged that when the body is in an erect posture a vertical line from its summit would fall exactly on the centre of its base; and it increases considerably in size in the lumbar region. The lower extremities in man are remarkable for their length, which is proportionally greater than in any other mammal except the kangaroo. The human foot is, in proportion to the size of the body, larger, broader, and stronger than that of any other mammal save the kangaroo; and hence man alone has the power of standing upon one foot. The brain of man does not differ so much in conformation from that of the higher mammals, as the superiority of his mental endowments might have led us to anticipate. (*See* BRAIN.) The absence of any natural weapons of offence and of direct means of defence are remarkable characteristics of man, and distinguish him from even the most anthropoid of apes, whose enormous canines have no relation to a carnivorous regimen, but are instruments of warfare. The slow growth of man, and the length of time during which he remains in a state of dependence, are also peculiar to him. He also possesses, in a remarkable degree, the power of adaptation to varieties in external condition which renders him in a great measure independent of them. He is capable of sustaining the highest as well as the lowest extremes of temperature and of atmospheric pressure, and of subsisting on a great variety of food. But most of all is man distinguished from other animals by those mental endowments, and by the habitudes of life and action thence resulting, which must be regarded as the essential characteristics of humanity. It is in adapting himself to the conditions of his existence, in providing himself with food, shelter, weapons of attack and defence, &c., that his intellectual powers are first called into active operation; and when thus aroused, their development has no assignable limit. The capacity for intellectual progress is one of the most remarkable peculiarities of man's physical nature. The power of articulate speech, which, so far as we know, is peculiar to man, is one of the most important aids in the use and development of the human mind. But the mainspring of human progress may be said to lie in that aspiration after something nobler and purer which is peculiar to the human race, and which is connected with another element in his nature which it is difficult to isolate or define, but which enters, penetrates, and blends with his whole physical character. It is the soul, in whatever way we may define it, which seems to constitute the distinctive peculiarity of man. — (Carpenter's *Principles of Human Physiology*.) "Man," says Professor Green, "is unquestionably endowed with that structure the perfection of which is revealed in such a balanced relation of the parts to a whole as may best fit it for a being exercising intelligent choice and destined for moral freedom. It is not, therefore, an absolute perfection of the constituents singly, but the proportional development of all, and their harmonious constitution to one, for which we contend; a constitution which implies, in a far greater degree than in any other animal, a balanced relation of the living powers and faculties, and which requires, therefore, in man, pre-eminently, the endowment of rational will as necessary for the control and adjustment of the balance. Man has not the quick hearing of the timid herbivorous animals; but it was not intended that he should catch the sound of distant danger and be governed by his fears: he has not the piercing sight of the eagle nor the keen scent of the beast of prey; but neither was man intended to be the fellow of the tiger or a denizen of the forest. Hence the departure from the perfect proportion of man, which we observe in the inferior animals, may be regarded as deformities by exaggeration or defect, dependent upon a preponderance of a part that necessitates a particular use, or the absence of a part that deprives the animal of a power." "Protrude the jaws, you have a voracious animal; lengthen the ears, timidity is expressed; let the nose project, and the animal is governed by its scent; enlarge the belly, and you are reminded of the animal appetites."—(*Vital Dynamics*.) The plan of our work does not require that we should say more here on the subject of man, seeing that the various particulars regarding him are taken up in their alphabetical order. Under ETHNOLOGY, for instance, will be found an account of the different races; HISTORY and CIVILIZATION give an account of the progress of the race; COMMERCE, &c., an account of the different social institutions; LAW, POLITICAL ECONOMY, &c., the laws that regulate the social system. Regard we man as an individual, his physical structure, with its wonderful application of bone and muscle, nerves, blood-vessels, &c., is treated of under ANATOMY; its growth and development, from infancy to age, fall under PHYSIOLOGY; the means by which he may be brought into the highest state of perfection of which his nature is capable, belong to EDUCATION; his moral nature is treated of under ETHICS; his intellectual under PSYCHOLOGY and METAPHYSICS; LOGIC deals with the laws of thought; PHILOLOGY with the principles of language. As a being endowed with a religious sense and a capacity for worship, he is treated of under THEOLOGY and CHRISTIANITY. These may be said to regard man in a state of health. In a diseased condition, we have PATHOLOGY, SURGERY, DISEASE; together with an account of the different diseases, which are to be found under their proper heads; as INSANITY and the like.

MAN BOTE, in the laws of the Anglo-Saxons, denoted the compensation to be paid for killing a man. In King Ina's laws, certain rates are fixed for the expiation

of this crime, according to the quality of the person slain.

MANCHINEEL, in Bot. (*See* HIPPOMANE.)

MANCIPATE, *mán'-si-pāit* (Lat. *mancipatio*, from *mancipo*, I enslave or bind, i.e., *manus capere*, take with the hand), among the ancient Romans, a species of sale by which the ownership of a person, or of certain things, could be transferred from one to another. It was effected in the presence of not less than five witnesses, who required to be Roman citizens and of the age of puberty, and also of another person, who held a pair of brazen scales. The purchaser, taking hold of the thing, said, "I affirm that this man is my property according to the Quirital law, and he is purchased by me with this piece of money and brazen scales." He then strikes the scales with the piece of money, and gives it to the seller as the price. Gaius calls this a kind of imaginary sale; for though the law required this form in certain cases, yet the real contract of sale was the agreement between the parties. This mode of transfer belonged to all things mancipable (*res mancipi*), for all things, as objects of ownership, were either *res mancipi* or *res nec mancipi*. It appears that the ownership of property generally, belonging to the former class, could only be transferred by these formalities, and included free persons and slaves, animals and lands; whereas those of the latter could be transferred by mere tradition,—the distinction between things *mancipi* and things *nec mancipi*.—Ref. *English Cyclopædia*; Smith's *Dictionary of Greek and Roman Antiquities*.

MANDAMUS, *mán-dai'-mus* (Lat., we command), in Law, is a writ issuing in the queen's name from the court of Queen's Bench, and directed to any person, corporation, or inferior court of judicature, commanding them to do some particular thing therein specified, which appertains to their office and duty. It is a high prerogative writ of a most extensive remedial character, and issues in all cases where the person applying for it has a legal right to have anything done, and no other specific means of compelling its performance. It may also be issued in some cases where the injured party has another but more tedious mode of redress, as in the case of admission or restitution to an office. It being the peculiar business of the court of Queen's Bench to superintend all inferior tribunals, and to enforce the due exercise of their judicial or ministerial powers, this writ issues to the judges of any inferior court, commanding them to do justice according to the powers of their office, whenever the same is delayed. It also lies to compel the admission or restoration of the party applying to any office or franchise of a public nature, whether spiritual or temporal, to academical degrees, to the use of a meeting-house, &c.; also for the production, inspection, or delivery of public books and papers; the surrender of the *regalia* of a corporation; to compel bodies corporate to affix their common seal; to compel the holding of a court, and an infinite variety of other purposes. In order to obtain a mandamus, the applicant lays before the court the affidavit of himself or others, setting forth the facts upon which his claim or title to have the thing done is founded. The court, thereupon, if it see probable cause for interference, grants a rule calling upon the party complained of to show cause why a writ of mandamus should not issue, or the court may grant a rule absolute in the first instance. If at the appointed time the party called upon does not appear, or does not show sufficient cause, then the writ itself is issued, as prayed for. At first, it is in an alternative form, requiring the party to do the act or signify some reason to the contrary; to which a return or answer must be made on a certain day. If the person to whom the writ is directed returns or signifies an insufficient reason, then there issues in the second place a peremptory mandamus to do the thing absolutely, without allowing him any alternative. Failure to do this is punishable by attachment. Where a sufficient cause is returned, the mandamus is at an end, even although the statement may be false, the remedy for which is by action for false return. However, by 1 Will. IV. c. 21, the prosecutor may now engraft an action upon the mandamus by traversing the matters in the return; and by 6 & 7 Vict. c. 67, he may object to the validity of such return by way of demurrer, and error may be brought for reversing the same, as in ordinary civil actions.





MANDARIN, *mán'-da-rin* (Port. *mandar*, to command), is a term used by Europeans to designate the officers of state in China. They are all men of learning, who have passed certain examinations and had their names inscribed on a register. When an office in the administration is vacant, a list of those that stand foremost on the register is presented to the emperor, who nominates one for the vacant office. The origin of the system of competitive examinations in the bestowment of government offices thus belongs to the Chinese.

MANDATE, *mán'-dāit* (Lat. *mandatum*), in Law, denotes generally a judicial command, charge, or commission. More particularly it denotes a bailment (delivery) of goods to a person who is to do something with or about the things bailed, entirely without compensation. The person delivering the goods is called *mandator*, the person receiving them and undertaking the service is styled *mandatary*. The essential element in the contract lies in the service rendered not being to be paid for. Hence, as the act or service is wholly for the benefit of the mandator, it follows that a mandatary is only responsible for the loss of, or injury done to, a thing when it is caused by his gross negligence. The mandator may recall the thing delivered at any time; but if the mandatary has rendered the service in part, and will suffer damage if it be not completed, the mandator cannot rescind it without indemnity to the mandatary. The contract may also be dissolved either by the renunciation by the mandatary at any time before he has entered upon its execution, or by his death. A mandator contracts to reimburse a mandatary for all expenses and charges reasonably incurred in the execution of the mandate, and also to indemnify him for his liability on all contracts which arise incidentally in the proper discharge of his duty. In the canon law, a mandate is a rescript of the pope, commanding an ordinary collator to put the person therein named in possession of the first vacant benefice in his collation.

MANDATS, *mán'-da*, is the name given to a species of paper money issued by the French government in March, 1796, to supply the place of the assignats, when they had lost credit and suffered an enormous depreciation. They were founded, like the assignats, on the credit derived from the confiscated property; but with this essential difference, that specific pieces of property, enumerated in a table, were pledged for the redemption of the bills, whilst the assignats furnished only a general claim. The mandats could be realised at any moment, as the owner was authorized to take any portion of the property enumerated on the table, on paying a quarter part of its assigned value.

MANDIBLES, *mán'-de-blz* (from Lat. *mando*, I chew), the upper and lower parts of the beak in birds. In Ent., the upper and under pairs of jaws.

MANDOLIN, *mán'-do-lín*, a Spanish musical instrument of the violin kind, the *cordatura* of which consists of four strings: it has frets like the guitar, and is tuned in the same manner as the violin.

MANDRAGORA, *mán-drá-gy'-rá* (Lat. *mandragorus*), in Bot., a gen. of the nat. ord. *Atropaceæ*. *M. officinalis* is the true mandrake, the devil's apple of the Arabs, and the dudaim of Scripture. Its root has a fancied resemblance to the human form, and is connected with many absurd superstitions. It must not be confounded with the root of *Bryonia dioica*, which is often called mandrake. The mandrake is an acro-narcotic poison, and was used by the ancients as an anæsthetic.

MANDRAKE. (*See* MANDRAGORA and BRYONIA.)

MANES, *mai'-neez*, among the Romans, was the name given to the souls of the dead. The etymology of the word is doubtful, but is generally derived from an ancient word *manus*, signifying good. The manes were divided into two kinds,—the *lares*, or the spirits of those that had lived virtuous lives, and the *larvæ*, the spirits of such as had been wicked. The term manes seems also to have been applied to the good and evil genii which were understood to accompany a man through life. It was likewise applied to certain of the infernal deities. The superstitious belief that the spirits of the departed continued to take an interest in the affairs of this world, and could exert a powerful influence either for good or evil, made the people very cautious of offending them. Hence libations, and sometimes victims, were offered to the manes, and their remains

were held sacred. The 19th of February was dedicated as an annual festival for offering sacrifices and libations to the manes.

MANGANESE, *măn-gă-neese'*, in Chem.,—symbol Mn, equiv. 27·57, spec. grav. 8·013. The ores of manganese are somewhat abundantly distributed throughout the mineral kingdom, generally in the form of black oxide. Manganese is of a greyish-white colour, brittle, hard enough to scratch steel, and slightly magnetic. If exposed to the air, it speedily becomes oxidized; for which reason it should be preserved in some liquid hydrocarbon, such as benzole. Manganese combines with carbon and silica, forming unimportant compounds. Its principal use is chemical, under the form of oxide. It is employed in this state for decomposing hydrochloric acid, in the manufacture of chlorine, as a cheap source of oxygen, and as a colouring material in the manufacture of glass and enamels. Mixed with iron, it gives that metal increased hardness and elasticity: hence its use in the manufacture of steel.

MANGANESE, CARBONATE OF, in Chem.—The anhydrous carbonate occurs in nature as manganese spar, and frequently accompanies spathose iron-ore. The famous Siegen ore, from which the celebrated German *spiegel-eisen* is made, contains a certain proportion of this mineral, which renders the iron made from it peculiarly hard and tough. The artificial carbonate may be obtained in a hydrated condition by precipitating the chloride by an alkaline carbonate.

MANGANESE, CHLORIDES OF, in Chem.—Manganese forms three chlorides. The *protochloride*, $MnCl+4aq$, occurs as a waste product in the manufacture of chlorine, by acting on the black oxide with hydrochloric acid. It crystallizes in delicate pink tables, which are slightly deliquescent. The *sesquichloride* is formed by acting on the sesquioxide with hydrochloric acid in the cold. It is of a dark brown colour, and can only be obtained in a solid form by evaporation in vacuo. The *perchloride*, $Mn_2Cl_7$, is a greenish-yellow gas, which condenses at 0° Fahr. into a greenish-brown fluid. It is obtained by dissolving permanganate of potash in sulphuric acid, and adding chloride of sodium in small portions at a time. It is supposed by some chemists that this compound is an oxychloride of the metal, corresponding to chloro-chromic acid.

MANGANESE, ORES OF.—The principal ores of manganese are *pyrolusite*, the anhydrous binoxide, and black wad, which is the hydrated binoxide. Both these ores are worked extensively in different parts of the world.

MANGANESE, OXIDES OF.—The combinations of manganese and oxygen are principally five in number:—1. The *protoxide*, MnO; 2. the *sesquioxide*, $Mn_2O_3$; 3. the *binoxide*, *peroxide*, or *deutoxide*, as it is sometimes erroneously called, $MnO_2$; 4. *manganic acid*, $MnO_3$; and 5. *permanganic acid*, $Mn_2O_7$. The *protoxide* may be obtained as an olive-green powder, by igniting carbonate of manganese in a current of hydrogen. It is also procured as a white hydrate by decomposing any salt of manganese with an alkali. It is soluble in ammonia, especially if any ammoniacal salt be present. It unites with acids, forming characteristic salts. The *sesquioxide* is found in nature as *braunite*, and in a hydrated condition as *manganite*. It is obtained as a brown hydrate by passing chlorine through the protocarbonate suspended in water, and afterwards removing the excess of carbonate by nitric acid. Sulphuric acid dissolves it slowly, forming a deep red solution; and hydrochloric acid in the cold also forms with it a soluble compound, both of which are decomposed when the solutions are heated. The *binoxide* or *peroxide* is the most important of the oxides of manganese. It is the black oxide of manganese of commerce, and is found in nature as a *pyrolusite* and *psilomelane*. Black wad is a hydrated form of this oxide. When ignited, it gives off one-third of its oxygen, leaving the red oxide ($MnOMn_2O_3$) behind. It is used in commerce for the production of oxygen, and in the manufacture of chlorine, permanganic acid, and violet glass. *Manganic acid* is not known in an isolated condition. When peroxide of manganese and caustic potash are fused together, and the mass heated with a small portion of water, a green solution is obtained, from which crystals of manganate of potash may be procured by evaporation in vacuo over sulphuric acid. The manganates are very unstable, being decomposed by boiling and even by remaining in dilute solution. The green solution of manganese of potash, when largely diluted, gradually changes to a deep claret colour, and forms the well-known material called *mineral chameleon*. *Permanganic acid* is described under its proper heading.

MANGANESE, SULPHATE OF, in Chem., $MnO,SO_3+5aq$. This salt is obtained by dissolving the binoxide in sulphuric acid. It forms large transparent crystals of a pinkish hue, varying in shape and composition, according to the temperature at which they are deposited and the number of equivalents of water which they contain. The salt is extensively used in dyeing and calico-printing, and occasionally in medicine. It forms double salts with potash and soda, and an alum with sulphate of alumina, which must not be confounded with the alums formed by the sesquisulphate of manganese with the sulphates of the alkalies. The formulæ of these alums will help to explain this matter:—

$Al_2O_3,3SO_3,MnOSO_3+24aq$, manganese-alumina-alum.

$Mn_2O_3,3SO_3,KO,SO_3+24aq$, manganese-potash-alum.

It will be seen from this that in one case the proto-manganic salt replaces the alkaline sulphate; while, in the other, the aluminous sesquisulphate is replaced by the corresponding sesquisulphate of manganese. The sulphate of the sesquioxide is formed by dissolving the sesquioxide in sulphuric acid at a gentle heat. It crystallizes with difficulty, the solution being instantly decomposed by heat.

MANGANESE, SULPHIDES OF. — Protosulphide of manganese occurs native in black masses in manganese blende. The anhydrous sulphide may be obtained as a dark green powder by treating together a mixture of sulphur and binoxide of manganese. The hydrated salt is obtained as a flesh-coloured precipitate when a solution of a salt of manganese is decomposed by an alkaline sulphide. An oxysulphide of manganese has been formed by passing hydrogen over sulphate of manganese at a red heat. Sulphide of manganese forms compounds with the sulphides of potassium and sodium, containing three equivalents of the former to one of the latter.

MANGEL-WURZEL, or MANGOLD-WURZEL. (*See* BETA.)

MANGIFERA, *măn-jĭf'-e-rā* (from *mango*, and Lat. *fero*, I bear), in Bot., a gen. of the nat. ord. *Anacardiaceæ*. *M. indica* produces the mango, a fruit which is highly esteemed in tropical countries. This fruit is a drupe, large, flattened like a lens, and kidney-shaped. When ripe, it is yellow or reddish, with soft and pulpy flesh, filled with juice. Several varieties of the mango-tree are cultivated, which yield fruits differing greatly in size and flavour. Unripe mangoes are used for making the pickle called *chutney*.

MANGLE, *măng'-gl* (Ger. *mangel*), a well-known machine for smoothing linen and cotton articles. In its usual form it consists of an oblong rectangular wooden chest, filled with stones, which load it to the degree of pressure which it is required to exert upon two cylinders on which it rests, and which, by rolling backwards and forwards over the linen spread upon a smooth surface beneath, render it smooth and level. It is worked by the hand, the moving wheel being furnished with teeth upon both surfaces of its periphery; and, having a notch cut out at one part, allows a pinion, uniformly driven in the direction, to act alternately upon its outside and inside, so as to cause the reciprocating motion of the chest. There are several varieties of patent mangles; amongst which may be mentioned one in which the linen is rolled round a cylinder revolving in stationary bearings, and pressed downwards by heavy weights hung upon its axes, against a curved bed made to slide backwards and forwards, or alternately from side to side.

MANGO. (*See* MANGIFERA.)

MANGO-FISH, *măng'-go* (*Polynemus Risua*), a gen. in Ichth., usually termed the *Polynemus*, and belonging to the class *Percida* of Cuvier, on account of the ventral fins being inserted farther back than the pectorals. The mango-fish is further distinguished by having several long filaments beneath the pectoral fin, which filaments are, in fact, free rays of that fin. The teeth are

very minute and dense in quantity, and are reserved, like the teeth of a carding-machine. The form of the body generally resembles that of the perch, with the peculiar exceptions mentioned above; the mussle projects over the mouth; the eyes are large, and placed very forward; and, finally, the dorsal fins are short and widely separated, while the caudal fin is large and more or less forked. The mango-fish is esteemed a great delicacy in India, and it is found principally in Channel Creek, off Saugor, and in and about the mouths of the rivers which intersect the Sunderbunds. The greatest interest is attached to it from the fact of its yielding isinglass; which fact was first discovered by Dr. Cantor, in the year 1838. Dr. Cantor found that a mango-fish weighing two pounds would yield, on the average, sixty-five grains of isinglass, an article which sells in India at the rate of sixteen rupees, or £1. 12s. per pound. Several other varieties of the mango-fish are found in the warm latitudes of Africa and America, and nearly all bear a close resemblance to the type which has just been described.

MANGOSTEEN. (*See* GARCINIA.)

MANGROVE. (*See* RHIZOPHORA and AVICENNIA.)

MANIA. (*See* INSANITY.)

MANICHEANS, or MANI, *mân-i-ke'-ânz, mai'-ni*, is the name of a religious sect founded towards the close of the 3rd century, by one Mani, or Manes. He was a Persian by birth, educated among the Magi, and his system was an attempt to blend Christianity and the religions of ancient Asia. The system is based upon dualism, there being supposed to be two distinct opposing principles from which all things proceed; the former being presided over by a good being,—God; the latter by an evil being,—Hyle. God, the father of light, is described as being all splendour, truth, holiness, goodness, and happiness, and surrounded by twelve æons, or worlds of light, which, as a heavenly sodiac, preside over the great year of the world. These, however, are not emanations from God, but God is one with the kingdom of light, the whole forming one substance. Opposed to the kingdom of light is that of darkness, which is divided into five regions, and in which the prince of darkness sustains the same relation to his inferiors as the god of light occupies in his kingdom. By an inroad made by the powers of darkness into the kingdom of light, the primitive man, the first-born of God, was overthrown and imprisoned. He was subsequently delivered; but a portion of the light remained imprisoned in the darkness. God then brought into existence the present universe, that it might be a receptacle for this lost light; and two new heavenly powers, Christ and the Holy Ghost, proceeded from God to redeem the detained light. The man Adam is then formed by the prince of darkness after the image of the primitive man, comprising, as in a microcosm, the clearest light with the grossest darkness. From him proceeded the human race, each member of which presents a mixture of the two elements light nd darkness; and in each succeeding generation the power of the light is weakened by the ascendancy of the darkness. To break this dominion, Christ himself appeared in order to reveal again the lost truth; but his life upon earth, his sufferings and death, were a mere semblance, for the essentially pure light of his being could not unite itself to gross matter. The statements of the New Testament were only partially true; the full truth regarding Christ was first revealed by the Paraclete (Manes). They denied the genuineness of the Gospels, and Acts of the Apostles; the Epistles were regarded as interpolated; while many apocryphal writings, especially the Acts of Thomas, were made use of by them. The work begun by Christ required for its completion Manes, the Paraclete promised by Christ, to lead men to a knowledge of the complete truth, by revealing the secret relations of the universe, and securing the means of human freedom. The redemption of man they held to consist in a knowledge of the revelations made by Christ and Manes, respecting the character of the two empires, the soul and its relation to the body, and a corresponding mode of life. Their system of ethics was thus of a severely ascetic nature, based on the conviction of the intrinsic evil of the body, from the fetters of which their great aim was to set the soul free. For their higher class of members, the *electi* or *perfecti*, a rigorous system of asceti-





cism was prescribed. They were forbidden to eat any kind of food which might increase the power of the body over the spirit; in particular were they to abstain from flesh, which, as the product of Hyle, and as being entirely destitute of light, could only depress the soul. Every kind of work through which man cultivates the world, which is the kingdom of darkness, or makes it a pleasant home, was forbidden. Abstinence from sexual intercourse was regarded as a moral duty, as it was a continuing of the first sin and a preparing of new prisons for the soul. The *auditores*, or lower class of members, were permitted to eat meat, to marry, to occupy themselves with material and industrial pursuits, and to fill public offices; but were also bound to supply the elect with all the necessaries of life. Manes sent out twelve apostles, and these were afterwards represented in the church by twelve magistri, with a thirteenth invisible one, doubtless Manes himself, at their head. After these were seventy-two bishops, who had under them presbyters, deacons, evangelists, and the other electi. They had no temples, and their worship consisted chiefly in hymns and prayers. After the death of Manes, his adherents in Persia were subjected to a long persecution, and many of them are said to have fled to Hindostan. In Syria, Egypt, Palestine, and other countries, they early made their appearance, and the northern coast of Africa became one of their principal seats. Under Constantine they enjoyed toleration; but the succeeding Christian emperors issued severe decrees against them. Nevertheless, they continued to prosper for a long time. Their congregations were numerous, and had many able leaders. In Italy, and especially at Rome, they were very numerous, and maintained intimate relations with the congregations in other countries. Pope Leo I. took severe measures against them, Valentinian III. punished them with exile, and Justinian ordered them all to be put to death. By these persecutions the sect gradually became extinct, although traces of it are found in later centuries in Gaul and Spain, and its influence is to be traced in many of the new sects of the middle ages. Augustine was for nine years a member of this sect, but left them when he found not among them the thoroughness of learning nor the purity of character that he had expected; and he became afterwards their most zealous opponent.—*Ref.* Mosheim's *Ecclesiastical History*; Neander's *Church History*; Dr. C. F. Baur's *Das Manichaische Religions-System nach den Quellen untersucht*, Tübingen, 1831.

MANIFEST, *mân'-i-fest* (Lat. *manifestus*, clear, plain, open), in Com., is a paper containing the particulars of a ship and cargo, including the name and tonnage of vessel, the name of the place to which it belongs and name of master; the names of the places where the goods on board have been laden and for which they are destined; a particular account of the packages on board, with their marks, contents, shippers, consignees, &c., as far as may be known to the master. The manifest must be made out, dated, and signed by the master of the vessel at the place or places where the goods, or any part of them, are taken on board.

MANIFESTO, *mân-i-fes'-to*, is an apology, or public declaration, in writing, made by a prince, showing his intentions to begin a war, or other enterprise, with the motives that induced him to it, and the reasons on which he founds his right and pretensions.

MANIHOT, *mân'-e-hot*, in Bot., the Cassava, a gen. of the nat. ord. *Euphorbiaceæ*. The species *M. utilissima*, the bitter cassava, is an important food-producing plant. Cassava-meal, which is largely employed in the making of the cassava bread or cakes in common use among the inhabitants of tropical America, is obtained by grating the washed roots and then subjecting the pulp to pressure and heat. The roots and expressed juice are virulent poisons, owing chiefly to the presence of hydrocyanic acid; but their poisonous qualities are removed by the washing and heating. Cassava-starch, tapioca-meal or Brasilian arrowroot, and tapioca, are likewise prepared from the roots. The starch is deposited from the expressed juice, and is purified by washing with water. Tapioca is prepared by heating this starch, while moist, on hot plates; it is largely employed in Britain and elsewhere as a dietical substance. The sauce called *cassareep* in the West Indies is the juice concentrated by heat and

flavoured with aromatics. The species *M. Aipi*, the sweet cassava, has none of the poisonous properties of the former species. Its root is a common article of food in the West Indies and some parts of South America. It is as mealy as the potato when boiled. Cassava meal, bread, and starch, as well as tapioca, are prepared from the sweet root in small quantities.

MAN-OF-WAR, a term generally applied to all vessels belonging to the royal navy, whether ships of the line, frigates, or of any other denomination of vessel. The classes of her Majesty's navy may be thus described from the rules on the subject in the "Navy List."—1. *First Rates*, which comprise all ships carrying 110 guns and upwards, or those in which the complement consists of 1,000 men or more. 2. *Second Rates*, which comprise one of her Majesty's yachts, and all ships carrying under 110 guns, and more than 80 guns; or the complements of which are under 1,000 and not less than 800 men. 3. *Third Rates* comprise her Majesty's other yachts, and all such vessels as may bear the flag or pendant of any admiral-superintendent or captain-superintendent of one of her Majesty's dockyards; and



MAN-OF-WAR.

all ships carrying 80 and not less than 60 guns; or the complements of which are under 800 and more than 600 men. 4. *Fourth Rates*, which comprise all frigate-built ships of which the complements are 600 and not less that 410 men. 5. *Fifth Rates*, which comprise all ships the complements of which are 400 and not less than 300 men. 6. *Sixth Rates* are those which comprise all other classes of ships bearing a captain. The remainder of the vessels of the royal navy are enumerated under the title of "sloops," which embraces all vessels commanded by "commanders," and the rest of the vessels commanded by lieutenants; both of which latter classes are not "rated" as the former denominations are. The cut in the present article represents a *first-rate*, as is apparent from her rig and the number of tiers of guns which she bears. (*See* NAVY.)

MAN-OF-WAR BIRD. (*See* FRIGATE-BIRD.)

MANOR, *mǎn'-or* (Lat. *manerium*, from *maneo*, I remain), in Law, so called from being the usual residence of the owner, seems to have been a piece of territory held by a lord or great personage, who occupied a part of it, as much as was necessary for the use of his own immediate family, and granted or leased the remainder to tenants for stipulated rents or services. The former was called *terra dominicalis*, or demesne land, as being occupied by the lord and his servants; the latter, *terræ tenementales*, or tenemental lands, from being distributed among tenants. The tenemental lands of baronies were anciently distinguished by different names, according to the modes of tenure. *Book-land*, or charter-land, was that which was held by deed under certain rents and free services, and in effect differed nothing from free socage lands. Hence have arisen most of the freehold tenants who hold of particular manors. *Folk-land*, on the other hand, was held by no writing, but distributed among the common people at the pleasure of the lord, and resumed at discretion, being, indeed, land held in the villenage. Manors were formerly called baronies, and every lord or baron was empowered to hold a domestic court, called the court baron, for redressing misdemeanours and nuisances within the manor, and for settling disputes among the tenants. This court is an inseparable ingredient of every manor, and if the number of suitors should so fail as not to leave sufficient to make a jury or homage, the manor itself is lost. As to the origin of manors, we are told that anciently a certain compass of ground was granted by the king to some man of worth, for him and his heirs to dwell upon and to exercise some jurisdiction, more or less, as he thought good to grant within that circuit, but performing such services and paying such yearly rent as by this grant was required. These superior lords afterwards parcelled out their lands to others, receiving rent and services for them, and were the lords paramount over these smaller manors. These smaller manors came to be subdivided in like manner, to the detriment of the superior lords; till, by the Statute of Westminster 3 (18 Edw. I. c. 1), it was directed that upon all sales or feoffments of land, the feoffee shall hold the same, not of his immediate feoffor, but of the chief lord of the fee of whom the feoffor himself held it. In the present day, a manor signifieth rather the jurisdiction and royalty incorporeal than the land or site; for a man may have a manor *in gross*, *i.e.* the right and interest of a court-baron, and the perquisites thereto belonging, without any part of the land.

MANSARD ROOF, *mǎn-sard'*, in Arch., a curb roof formed of four contiguous planes, of which each two have an external inclination, the ridge being the line of concourse of the two middle planes. It is well adapted to a house surmounted by a parapet so high as to cover the lower plane of the roof. It derives its name from that of its inventor, François Mansard, a French architect.

MANSE, *mǎnse* (Lat. *mansa*, or *mansum*), in Law, denotes a house or habitation, either with or without land. In Scotland, the term was originally applied to a portion of ground in a parish set apart for the clergyman; but now it is used to designate his house, the ground to which he is entitled being called his *glebe* or glebe land.

MANSION, *mǎn'-she-on* (Lat. *mansio*), in Law, is commonly used to denote the lord's chief dwelling-house within his fee. Among the ancient Romans, *mansio* was a place appointed for the lodging of the princes, or of soldiers in the journey. Mansion-house, in cases of burglary, &c., is taken for any house or dwelling of another.

MANSLAUGHTER, *mǎn-slaw'-ter*, is the unlawful killing of another, without malice, express or implied. (*See* MURDER.)

MANSTEALING. (*See* KIDNAPPING.)

MAN-TRAPS, *mǎn'-trăps*, are engines to catch trespassers, now unlawful, unless set in a dwelling-house for defence, between sunset and sunrise, by 7 & 8 Geo. IV. c. 18.

MANUAL, *mǎn'-u-ăl* (Lat. *manualis*, from *manus*, the hand), is applied to something that may be employed or used by the hand. It is also the name of a service-book used in the Church of Rome, and containing the rites, directions to the priests, and prayers used in the administration of the sacraments, the form of blessing holy water, and the service used in processions. In Literature, it is frequently applied to a class of books of a size to be easily handled, and professing to give a concise account of the subjects of which they treat.

MANUCAPTIO, *mǎn-u-kăp'-she-o* (Lat., from *manus*, hand, and *capio*, I take), in Law, a writ that lay for a man taken on suspicion of felony, &c., who cannot be admitted to bail by the sheriff or others having power to let to mainprise.

MANUDUCTOR, *mǎn-u-dŭk'-tor*, was an ancient officer of the Church, who gave the signal for the choristers to sing, marked the measure, beat time, and regulated the music, by the motions of his hand.

MANUFACTURE, *mǎn-u-făk'-tshur* (Lat. *manus*, the hand, and *facio*, I make), in Pol. Econ., may, in its

widest sense, be said to comprise the various changes or modifications effected by art and industry in the form or substance of material articles, with the view of rendering them of use to man. It may thus be said to include all the various branches of industry, except such as are employed in obtaining the material products in their natural state; as mining, fishing, &c. The value of any article is made up of the value of the raw material and the value of the labour or skill that has been expended upon it. In some cases the one, and in others the other element predominates. Frequently, even a great deal of labour is expended upon what is termed the raw material; indeed, strictly speaking, the entire value of the raw material is made up of the value of the labour required in obtaining it, and in its conveyance to the place of manufacture. The mere matter of commodities costs nothing. The object of the manufacturer is to produce his articles as cheaply, or at as small an expenditure of labour, as possible; and hence the perfection of a manufacture consists in the being able to effect the desired changes in the raw material at the least possible expense of labour. Competition acts as a powerful stimulus upon the manufacturer to produce his articles as cheaply as possible. In order to secure the greatest amount of profit, he must strive to lessen as much as possible the expense of production. This is principally effected by the introduction of machinery. "There is," says Babbage, "perhaps no single circumstance which distinguishes our country so remarkably from all others, as the vast extent to which we have carried our contrivances of tools and machines for forming all those conveniences of which so large a quantity is consumed by almost every class of the community. The amount of patient thought, of repeated experiment, of happy exertion of genius, by which our manufactures have been created and carried to their present excellence, is scarcely to be imagined." The chief advantages of machinery result from the addition they make to human power, and the economy they effect of human time. With every contrivance of a new tool, every introduction of a new machine in manufacture, human labour is abridged. In all our larger manufactories, numerous instances occur of the application of the power of steam to overcome resistances which it would require far greater expense to surmount by animal labour. So extensive and important is the economy which machinery produces of human time, that almost all its advantages might be embraced under this one head. Among the other advantages of machinery are the economy of materials employed; the accuracy and identity of the work; the executing operations too delicate for human touch; the increase or diminution of velocity; the accumulating, regulating, and registering powers; and the system of copying, taken in its largest sense, by which a large number of copies are obtained from one original. Besides the introduction of machinery, there are certain economic principles which, by being carried out in manufacture, tend to diminish the expense of labour. One of the most important of these is a proper division of labour among the persons employed. A great waste of time and labour is necessarily incurred when one has to carry on successively several operations. There is always some time lost in the changing from one operation to another; and neither the human hand nor head can instantly change its employment with full effect. There is also a large degree of skill acquired by frequent repetition of the same processes. (*See* DIVISION OF LABOUR.) There is a further important principle in division of labour; viz., that the master can thus purchase the precise amount of skill or power necessary for each process; whereas, if the whole work were executed by one workman, he must possess skill to perform the most difficult as well as strength to execute the most laborious. But it may readily be supposed that this division of labour can only with advantage be carried to a certain point. In order to conduct an establishment most profitably, it is evident that the whole time of each person ought to be fully occupied. If it be found that a certain number of individuals are necessary to carry out a manufacture with a due subdivision of labour, so as to afford full occupation to each, then every such manufactory ought to employ a direct multiple of this number, in order to produce their articles at the least cost. If, for instance, in the manufacture of pins, ten be found to be the number of individuals by which it can be most advantageously carried on, then it is evident that the manufacturer who can only employ five persons must, upon the principle of subdivision of labour, produce his articles at a greater cost; and in the same way any large manufacturer who employs a number not a multiple of ten must do so likewise. A good deal depends, too, upon the size of manufacturing establishments. Where the article in the course of manufacture has to be conveyed from one operator to another, it is evident that this can be done at least expense when they are all working in the same establishment. The circumstances that more particularly tend to the success of manufacturing industry in a country are various, but may be divided into two classes,—physical and political. Among the more prominent of the physical circumstances that tend in that direction, one of the principal is readiness of access to supplies of the raw material to be manufactured. Where the raw material has to be brought from a distance, its cost, especially if it be of a bulky or heavy nature, will be very much increased, and consequently, also, the cost of the manufactured article, which, unless favoured by other circumstances, cannot be produced so cheaply as in those places that are more favourably situated in that respect. In the early history of a manufacturing community, where the means of transport are few, it will be almost always found that the article will be manufactured near those spots where nature has placed the raw material. Even more important than the possession of the raw material is the command of power which a country may afford for the carrying on the manufacture; as water-power, fuel, &c. To our valuable mines of coal more than anything else is this country indebted for her enormous manufacturing industry. Without a cheap and abundant supply of fuel, our steam-engines would be of comparatively little use. The climate of a country has also an important influence over manufacturing industry, as well as the situation of a country for commerce, and the possession of rivers that may serve as means of conveyance. Among the circumstances of a political nature that contribute to the progress of manufacturing industry, are security to property and freedom to carry on the various operations of their manufacture; the absence of monopolies and the non-interference of government in industrious undertakings. Some are disposed to maintain that the taxation to which we are subjected in this country has been favourable to the progress of industry, by causing a man to put forth all his energies to prevent himself from sinking in the social scale. There can be little doubt that the great inequality of fortune that has prevailed in this country has had a material influence in exciting a spirit of invention and industry among the less opulent classes.—Ref. *Encyclopædia Britannica*; *Encyclopædia Metropolitana*; being a Treatise on the Manufactures and Machinery of Great Britain, by P. Barlow, with Introduction by C. Babbage; Ure's *Philosophy of Manufactures*, by Simmonds.

MANUFACTURE OF CARPETS.—Carpets were first brought into use by the inhabitants of Eastern countries, who threw them on the ground or floor, or over the low couch on which they were in the habit of sitting or sleeping. The small thick woollen carpet of the East was also materially calculated to add to the personal comfort of those who dwelt in tents, as it afforded warmth and protection from any dampness arising from the earth over which their tents were pitched. In Egypt, Syria, Turkey, and Persia, the carpet is the chief article of furniture to be found in ordinary houses, the peculiar habits of the people requiring but little more in addition. The use of carpets in this country dates from the middle of the 12th century, but their manufacture was not carried on to any extent until the middle of the 16th century, nearly 200 years after it had been introduced into France from Persia. In olden times, even the floors of the rich and powerful were covered with straw or rushes, and presented anything but a desirable appearance, from the dirty habits for which our forefathers in all classes of society were, unhappily, notorious. The Turkey carpets are made in one piece, and generally consist of a dark central ground, figured with a small irregular angular pattern,

in various rich colours, surrounded by a border. There is little or no attempt made to produce the regular and symmetrical patterns that are seen in carpets of European manufacture. A genuine Turkey carpet should be free from any admixture of green, which is the sacred colour of the followers of Mahomet. The warp is made of very strong linen or cotton thread, and the coloured worsted, is tied to it in tufts, which are afterwards cut, to bring them to the same level. As the terms *warp*, *weft*, *chain*, *shoot*, will be often used in this article, it will be necessary to mention, that the warp or chain consists of the strings of cotton, linen, or hemp, that extend longitudinally from end to end of the length of carpet, and the weft or shoot is the line or lines that are introduced transversely, from side to side of the piece, between the threads of the warp, as the alternate threads of this component part of the carpet are raised and depressed by turns by the action of machinery. The principal kinds of carpets made in this country are the Brussels, Wilton, Kidderminster, Tapestry, Axminster, Dutch, Venetian, and Printed Felt carpet. Brussels carpets consist of an upper surface of worsted yarn attached to a strong coarse linen web; lines of worsted are arranged with those of the warp, proceeding in the same direction from end to end of the length of the piece. As many threads of worsted are put in each of these lines, or "ends," as they are generally called, as there are colours in the piece. Two wefts, or shoots, are used, one passing above and the other under the woollen yarns, by which they are bound tightly together, and give substance and solidity to the whole fabric. The pattern is made by drawing loops of these yarns above the surface of the linen basis, between each passage of the shoots from side to side. The means by which this arrangement is effected are rather complicated, and require to be seen to be thoroughly understood. Each coloured yarn that aids in forming the pattern passes through a small metal loop, called a "mail;" cords are attached to these mails, which pass over pulleys arranged in a frame above the loom, and fastened to a roller near the floor; strings, called "lashes," are attached to the cords that are fastened to the mails, every lash being passed round all the cords attached to the yarns that it is necessary to raise above the surface in each transverse ridge of the pattern; and there are as many lashes as there are ridges or stripes necessary to complete the entire pattern from beginning to end. The longer the space the pattern occupies, the greater will be the number of lashes required; thus, in a pattern which occurs once in every yard of the length, there will be three times as many lashes required as there will for a pattern which occurs three times in every yard. When the process of weaving carpets is in progress, each successive ridge is formed in this manner:—The lash which holds the cords attached to the yarns which must then be brought above the surface of the linen basis, is pulled towards him by the weaver: this raises the required yarns to a considerable extent, and the weaver is enabled to thrust a long thin piece of wood, called a "sword," about four or five inches wide, under the loops that have been thus raised; a thin wire is then introduced, and the sword is withdrawn. The loops are next drawn tightly over the wire; half of the linen threads of the chain are raised, and the other half and the woollen yarns are lowered. The upper weft is then shot through by means of the shuttle, the position of the alternate threads of the chain and the yarns reversed, and the under weft is shot through. The whole is then pressed tightly together with an instrument called the "batten;" when this has been done, the yarns required to form the next ridge are brought above the surface, and the process already described is repeated until the piece is completed. When a sufficient quantity of carpet has been made, the wires are pulled out. In the Wilton carpets, the loops thus formed over the wires are cut, and form a velvet-pile surface; each wire is grooved, and a sharp knife, the point of which works in the groove, is drawn through the worsted, and the wire is freed thus, instead of being pulled out. Kidderminster carpets, sometimes called Scotch carpets, present the same pattern on both sides, with the colours reversed; thus, if red stars are shown on a white ground on one side, the other side will present white stars on a red ground. These carpets consist, for the most part, of the interweaving of two cloths, which are woven at the same time, each cloth being perfect in itself, and necessarily of different colour. Kidderminster carpets, consisting of three, and even four cloths, called three-ply and four-ply carpets, have been made; but those which consist of two cloths only are the most common. Many colours can be introduced into Kidderminster carpets by using different coloured wefts; but this gives a striped appearance to the surface, which deteriorates from its appearance. In manufacturing this sort of carpets, two chains of different colours are used, and two shoots corresponding in colour with the chains. The process of weaving is complicated, and it was formerly effected by means of intricate and cumbersome machinery. This, however, was simplified by the introduction of the barrel-loom, which has, in its turn, been superseded by the Jacquard loom (*see* WEAVING), which is used in the manufacture of Brussels and Wilton carpets as well as in making Kidderminster carpets. Tapestry carpets are made in a manner similar to that in which Brussels and Wilton carpets are manufactured; but only one yarn is used instead of five or more of different colours, as in the carpets just named. This yarn is dyed at different parts of its length, to suit the requirements of the pattern, and as the whole pattern is printed on the yarn the machinery required is of a far less complicated nature than when it is required to pull many yarns of different colours above the surface of the cloth which forms the basis in order to produce the desired design. Axminster carpets are made at Axminster, in Devonshire, in a manner similar to that in which Turkey carpets are manufactured. Tufts of worsted are tied to a warp of strong linen and secured by a linen weft. The process is tedious, and the carpets are necessarily expensive: they are made in one piece, to suit the size of the rooms for which they are required. Dutch and Venetian carpets are made in ordinary looms. The patterns adopted are usually stripes or large plaids. The chain consists of stripes of worsted yarns of different colours, and the shoot is generally a thick black cord of wool or cotton, or these materials combined. When a transverse stripe of a different colour is required to give the appearance of plaid, a different shoot must be used. The Dutch carpets are a coarse variety of the Venetian, the chain consisting of dyed hemp, on which account they are sometimes called string carpets. The printed felt carpets are made of coarse wool and hair, brought into a compact mass by the process of felting (*see* FELTING), and the pattern is imprinted in colours by means of rollers on which it is cut. Of the carpets that have been mentioned, the felt carpets are the cheapest; they are also serviceable and comfortable, being warm, and quite impervious to draughts. Brussels carpets are the most expensive; but this is, in a great measure, compensated by their durability. Tapestry carpets are cheaper, but the colours are not so lasting as those of the Brussels carpets. Dutch and Venetian carpets are sometimes laid down in sitting-rooms, but they are more generally used for covering staircases: they are cheap, but far from durable.

MANUMISSION, *măn-u-mish'-un* (Lat. *manus* and *mitto*), in Rom. Antiq., was the form by which slaves were released from their condition; so called because they were sent, as it were, out of the hand or power of their master. There were three ways in which slaves were manumitted,—by *vindicta*, census, or will. The first of these was the most ancient, and in it the slave was brought before the magistrate, who laid his wand, *vindicta*, upon his head, and declared him to be free. The manumission by census was effected by the name of the slave, with his master's consent, being inserted in the census or public register of the citizens. By will, a slave could be made free conditionally or unconditionally, or free and an heir of the testator. By manumission the relationship of patron and freedman was established between the parties. There have been various forms of manumission in England. In the time William I., villeins were manumitted by the master delivering them by the right hand to the viscount in full court, showing them the door, giving them a lance and a sword, and proclaiming them free. Others were manumitted by charter. There was also an implied manumission, as when the lord made an obligation for

payment of money to the bondman at a certain day, or used him where he might enter without suit, &c.

MANURE-DISTRIBUTOR, *mân-bro'*, an agricultural implement, used for distributing manure easily and at regular distances. It is usually combined with the ordinary corn-drill, so that the corn and the manure are delivered together. The machine is generally so arranged that the manure can, at the pleasure of the cultivator, be deposited, not only from two to three inches deeper in the ground than the seed, but from ten to twelve in advance of it, so as to give the soil time to cover the manure before the next coulters deposit the seed. The progress of the manure-drill has been very slow, although the advantages arising from its use are many and palpable. By placing the seed in direct contact with manure in the process of germination, it is well nourished at that period in its growth when it most needs assistance, in order to develop its fibres and to extend its roots.

MANURES, *mân-ûrs'* (Fr. *manœuvrer*, from *main*, the hand, and *œuvrer*, to work), a term applied in Agr. to vegetable, animal, or mineral matters introduced into the soil, either for the purpose of improving its texture or for directly nourishing the plants which grow in it. Thus, if the soil be too stiff with clay, sand is used; if, on the contrary, it be too loose with excess of sand, it will be benefitted by the addition of clay. *Marl*, a natural mixture of clay and lime, sometimes containing a little silica and bitumen, is very useful as a manure in the improvement of soils. Its great advantage is, that it dilates, cracks, and is reduced to powder by exposure to moisture and the atmosphere; and it operates by subdividing the soil and hastening decomposition. *Quick-lime*, especially that derived from fossil or living shells, is a very excellent manure. In cold marshy soils, abounding in organic matter, it is particularly efficacious in converting animal and vegetable matters into nourishment for plants. In consequence of the alkali which *ashes* contain, they attract moisture from the atmosphere, and thus accelerate vegetation. The most universal mineral manure known is *gypsum*, or sulphate of lime; but chemists are not agreed as to the way in which it acts upon vegetation. Ordinary manure consists of organized bodies, either animal or vegetable, in a state of decomposition. Decomposing animal matter of every description forms one of the most active manures, and in many cases accelerates the decomposition of inert vegetable matters mixed with it; as in the mixture of dung and straw, which forms the ordinary refuse of the stable. Those bodies which are subject to the most rapid decomposition are most generally employed as manure. All animal excrements are powerful manures, and when properly applied to the soil, soon show their action by the improved appearance of the crops. Esculent vegetables, however, soon acquire a coarse and rank flavour if they are over-manured. In the use of animal manures, it is very important that they should be applied as soon as they begin to decompose, or as soon as possible afterwards, and not suffered to rot and exhale their best constituent parts whilst lying in the farm-yard. The drainings and evaporation of a dunghcap contain its most valuable component parts. Animal manures which decompose slowly generally operate most effectually. Of those the best is ground bones, the effects of which are long-continued: the earthy matter contained in bones is freqently beneficial to many crops. Amongst excrementitious solid substances, one of the most powerful is the dung of birds which feed on animal food, especially the dung of sea-birds. Guano is a manure of this kind. (*See* GUANO.) Vegetable manures are often effective, especially in the case of ploughing in a green crop. *Rape-cake*, when used recent and kept dry, forms an excellent dressing for turnip crops. *Sea-weeds*, consisting of various species of *fuci*, *algæ*, and *confervæ*, are considerably used as manure in many parts near the coast. The effect of sea-weed manure is transient, and does not last for more than a single crop. *Soot* is also a powerful manure; it requires no preparation, but is thrown into the ground with the seed. The most ordinary manure used consists of a mixture of animal, vegetable, and mineral substances. It is better to manure land in the spring than in the autumn, lest the winter rains should dissolve it too much, and endanger its sinking below the roots of the crop. As the stock of manure is generally limited, it is the study of agriculturists to discover some means of compensation for a deficiency. In a judiciously arranged rotation of crops, this compensation is obtained. (*See* SUPERPHOSPHATE OF LIME.)

MANUSCRIPT. (*See* PALÆOGRAPHY.)

MANUSCRIPT, ALEXANDRIAN. (*See* ALEXANDRIAN MANUSCRIPT.)

MAP, *map* (Lat. *mappa*, a towel, or cloth; maps may have been originally drawn upon cloth), a delineation of the surface of the earth, or any part of it, exhibiting the lines of latitude and the relative positions of countries, mountains, seas, rivers, &c. For the construction of maps different mathematical hypotheses have been adopted. *Projection* is one method of construction, in which the boundaries of countries and their more remarkable features are represented according to the rules of perspective, on the supposition of the eye being placed on some point of the sphere, or at some given distance from it, which may be increased indefinitely. This method answers very well when the surface to be represented is of small extent and the point of view nearly over the centre; but when the surface is of great extent, places near the border of the *projection* are much distorted. *Development*-maps are constructed on the supposition that the spherical surface of the earth to be represented is a portion of a cone, the vertex of which is situated somewhere in the polar axis produced, and the conical surface is supposed either to touch the sphere in the middle parallel of the map, or to fall within the sphere at the middle parallel, and without it at the extreme parallels. The surface of the cone is then supposed to be spread out into a plane. Another method of constructing maps depends upon the development of a cylindrical surface, by which means they have the parallels of latitude and circles of longitude respectively represented by parallel straight lines. Terrestrial maps of this description are usually called *Mercator's Charts*, although the invention is due to an English mathematician, Edward Wright. *Celestial maps* are representations of the positions of the stars on a plane surface, constructed on similar principles.

MAPLE. (*See* ACER.)

MARABOUT, *mâr'-â-boo* (Arab. *marbouth*, or *morabeth*, saint, or hermit), is a name given to a class of religious devotees among the Mohammedans of the Barbary states. They frequently affect to work miracles, and some of them are held in high estimation; but most of them are little better than vagabonds.

MARANTA, *mâ-rân'-tâ* (after Maranti, a Venetian physician and botanist), in Bot., the typical gen. of the nat. ord. *Marantaceæ*. The species *M. arundinacea* yields West-India arrowroot, one of the most pure and best-known of the amylaceous substances used as food. This is extracted from the rhizomes and tubers of the plant: it forms a very firm jelly, and is the most palatable and digestible starch known. The name arrowroot was originally applied to the rhizome of this plant from the fact of its being employed by the native Indians to form a sort of poultice for wounds inflicted by poisoned arrows. The name arrowroot has since been given to other starches used as food in this country. The species *M. ramosissima* also yields arrowroot, and is largely cultivated in the East Indies.

MARANTACEÆ, *mâr-an-tâ'-se-e*, in Bot., the *Maranta* or Arrowroot fam., a nat. ord. of *Monocotyledones*, sub-class *Petaloideæ*, consisting of herbaceous plants having a close resemblance to *Zingiberaceæ*. Their distinctive characters are, in their more irregular perianth; in one of the lateral stamens being fertile and the other two abortive; in the fertile stamen having a petaloid filament, and an entire or 2-lobed anther with one lobe sterile; in the style being petaloid or swollen; and in the embryo not being inclosed in a vitellus. There are seven genera and 160 species, all natives of tropical regions. The rhizomes of some species contain starch, which, when extracted, is extensively used as food. (*See* CANNA and MARANTA.)

MARASMUS, *mâ-rîz'-mus* (Gr., emaciation), in Med., is a term often used by older writers to denote a wasting of the body for which no particular cause could be discovered. It is now rarely used, as the nature of these diseases has come to be better understood, and they are attributed to their proper causes.

MARBLE, *mar'-bl* (Fr. *marbre*), a term applied by mineralogists to limestones, white or coloured, capable of receiving a polish. In the ordinary parlance of the mason, it means almost any rock which may be polished; such as *steatite*, serpentine, breccia, &c. The use of marble for ornamental and artistic purposes dates from the remotest antiquity. Italy is the principal marble-producing country of the world; the far-famed quarries of Carrara having supplied statuaries with this beautiful material from time immemorial. The principal quarries of the district are at Carrara, Massa, and Seravezza, and produce between forty and fifty thousand tons per annum of white and coloured marbles. La Spezzia, Moriti, Pisani, Campiglia, Elba, Sienna, and Gerfalco, also produce marble of great excellence and beauty, but in comparatively small quantities. The principal Italian marbles are *Carrara (often* miscalled Sicilian), pure white; *Giallo antico*, yellow, more or less veined; *Rosso antico*, blood-red, and speckled with white; *Portoro*, black, with gold rings and veins; *Bardiglio*, dove-coloured and veined; *Lumachello*, dark brown, with iridescent particles; *Cipalin*, white, with green rings and veins; *Mandeluto*, red, with yellow spots; *Brocatello di Siena*, yellow, with purple spots; and *Verde antico*, clouded green. Parian marble occurs in the island of Paros, and is almost as celebrated as that from Carrara. The former has a more wavy look than the latter; for which reason it is preferred by many sculptors for nude statues. The principal marbles found in Great Britain are the Kilkenny and Connemara, black and green marbles; Bristol, Sussex, and Derbyshire marbles, containing shells; the encrinital marbles of Derbyshire; the Cornwall, serpentine, and steatite.

MARBLES, ARUNDELIAN. (*See* ARUNDELIAN MARBLES.)

MARBLES, ELGIN. (*See* ELGIN MARBLES.)

MAROGRAVIACHÆ, *mark'-grai-ve-ai'-se-e*, in Bot., the *Maregravia* fam., a small nat. ord. of *Dicotyledones*, sub-class *Thalamiflorœ*, generally regarded as being allied to *Clusiaceœ* and *Hypericaceœ*. The species belonging to it are, however, distinguished from *Clusiaceœ* by their alternate leaves, unsymmetrical flowers, versatile anthers, and very numerous minute seeds. They are distinguished, on the other hand, from *Hypericaceœ* by their equal-sided petals, distinct stamens, and sessile stigmas. There are four genera and 26 species, generally natives of equinoctial America. Little is known of their properties. *Maregravia umbellata* is said to be diuretic and antisyphilitic. Curious pitcher-like bracts occur in some of the genera.

MARCH, *marsh* (Lat. *Martius*, Mars), is the name of the third month of our year, containing thirty-one days. It was so named, according to tradition, by Romulus, in honour of his father Mars, and was the first month of the Roman year; and, indeed, till the alteration of the style in 1752, the legal year in England commenced on the 25th of March. The Anglo-Saxons commonly called this month *Hlyd monath*, the loud or stormy month; and the last three days of it are still known in some parts as the borrowing days (which *see*).

MARCH, a military air in duple time, played by pulsatile and inflatile instruments, to regulate the steps and enliven the spirits of soldiers. A march ought always to be written in common time, beginning with a broken bar with an odd crotchet or quaver. On parade occasions, it is played in slow, but for ordinary marching in quick time. Although properly belonging to martial music, the march has long since obtained admission into all kinds of music, and is adapted to every kind of instrument. Thus, we find it in the compositions of the greatest masters; as, for instance, the march in "Guillaume Tell," the religious march in Mozart's "Zauberflöte," and in Gluck's "Alceste," the wedding march of Mendelssohn, and the "Dead March" in Handel's oratorio of "Saul."

MARCHANTIA, *marsh-an'-te-ä* (after M. Marchant, a French botanist), in Bot., a gen. of liverworts. *M. hemisphærica*, and other species, have been employed in the form of poultices in dropsy.

MARCHES, *marsh'-es* (Ang.-Sax.), denotes the country lying near or about the *marks* which indicated the limits of two kingdoms, &c. In England, the march lands were those lying adjacent to the borders of Scotland and Wales. (*See* BORDER, THE.)

MARE, the female of the horse. (*See* EQUIDÆ and HORSE.)

MARGARIC ACID, *mar-gär'-ik* (from Gr. *margaron*, a pearl), a fatty acid, supposed at one time to be distinct, but ascertained by Heintz to be a mixture of one part of stearic acid and nine or ten of palmitic acid. It is a singular fact, that although the melting-point of stearic acid is 158° Fahr., and that of palmitic acid 143·6° Fahr., yet the mixture of the two melts at 140° Fahr.

MARGARIN, *mar'-gä-rin*, a neutral fat, at one time supposed to be distinct, but now ascertained to be a mixture of stearine and palmitin. It is called margarin from *margaron*, Gr., a pearl, on account of its crystallizing in pearly scales.

MARGRAVE, *mar'-graiv* (Ger. *markgraf*, count of the Mark), a title originally bestowed on a commander intrusted with the protection of a *mark*, or country on the frontier. Marks and margraves begin to appear in history as early as the reign of Charlemagne. In rank, margraves stood next to the kings and emperors, and above the dukes in whose country the margraviate was established. In some cases, however, some margraves were dependent upon the dukes. In the 12th century margraviates became hereditary, and the rank of margrave was equal to that of a prince of the empire, standing between counts and dukes in the German empire.

MARIA THERESA, ORDER OF, *mä-ri'-ä te-re'-zä*, is the name of an Austrian military order, founded in 1757, and having grand crosses, commanders, and knights.

MARIGOLD. (*See* CALENDULA.)

MARINE INSURANCE. (*See* INSURANCE.)

MARINES, *mä-reenz'* (Lat. *marinus*, pertaining to the sea), a band of soldiers enrolled and disciplined to serve on board ships in a naval engagement, or on shore, where they might co-operate with a fleet in attacking an enemy's coast. There is no positive information as to what time distinct corps of troops were appointed in the naval service of Great Britain. There is some mention in 1684 of the Duke of York's marine regiment of foot-soldiers. In the reign of William III., several regiments were enrolled for the service of the navy; but they appear to have been considered more as embryo seamen than anything else, for as soon as they were duly qualified, they were struck off the muster-roll and entered for seamen, as foremast men. In the reign of Queen Anne six regiments of marines were raised, and these may be said to have formed the nucleus of the present force. In the year 1755, on the recommendation of Lord Anson, the marine force was altogether reconstructed, and raised to 130 companies, consisting of about 5,000 men. In the year 1759 the force numbered about 18,000 men, and during the war at the end of the last century and beginning of the present one, the marines mustered some 20,000 men. In the present day the marines are divided into two branches,—the *Marine Artillery* and the *Marine Light Infantry*; the former being composed of 17 companies and the latter of 116. The total strength may be estimated at 106 staff officers, 435 commissioned officers, and 17,459 non-commissioned officers and privates. The several depôts are stationed at Plymouth, Portsmouth, Woolwich, and Chatham, which ports they garrison, the head-quarters of the artillery being Portsmouth. The latter are dressed in blue with white facings, and the former in a scarlet uniform with blue facings. The marines annoy the enemy at sea by a fire of musketry, directed from the tops or deck, and they also repel by means of their bayonets any attempt made to board the ship. This gallant corps has also distinguished itself in duty on shore, and shared victoriously in the capture of Belleisle, the battle of Bunker's Hill, the defence of Acre, and also, under the command of Lord John Hay, on the coast of Spain during the Peninsular war. The officers of the Royal Marines take their rank by seniority, up to the step of lieutenant-colonel, there being no system of purchasing, as in the army.—*Ref. English Cyclopædia—Arts and Sciences.*

MARITIME LAW, *mär'-e-time* (Lat. *mare*, the sea), as a branch of international law, is that collection of principles and usages that pertains to the rights, duties, and obligations of nations with respect to the

sea. (*See* LAW OF NATIONS.) It forms also an important branch of the commercial law of all maritime countries, relating more especially to individuals, to the property of ships, the rights and duties of masters and seamen, contracts of affreightment, average, salvage, &c. Besides the general maritime law, every commercial state has certain admiralty regulations of a municipal character, peculiar to itself; as navigation acts, laws with respect to harbours, obstructions in rivers, wrecks, &c. Cases arising under these laws fall within the jurisdiction of the *maritime courts*. These are, in this country, the Court of Admiralty (which *see*), and its court of appeal, the Judicial Committee of the House of Lords, together with the courts of Vice-Admiralty, established in her majesty's possessions beyond the seas, with jurisdiction over maritime causes. To Rhodes belongs the honour of having framed the first authoritative code of maritime laws, which was the source of the maritime jurisprudence of the Romans. Fragments of this code are preserved in the Digest of Justinian, under the title *De Lege Rhodia de jactu*; and these fragments, together with a few brief rules of the Roman law, embraced in the works of Justinian, are all that remain to us of the maritime law of the ancients. These, nevertheless, constitute the basis of modern maritime law in some of its most important principles. The earliest code of modern sea laws was compiled for the republic of Amalfi towards the end of the 11th century, and is known as the Amalfitan Table. Though mentioned by authors as being in existence as late as the 16th century, it has since been entirely lost. The next work of this nature is the "Consolato del Mare," a collection of the maritime laws and usages observed by the commercial cities of the Mediterranean at the time of its compilation. Its origin is involved in some obscurity, the Spaniards claiming the honour of its paternity for Barcelona, where it appeared about the middle of the 13th century; while others contend that it was the production of the Pisans about two centuries earlier. The earliest maritime code of Western Europe is known as the "Laws of Oleron," the origin of which, like that of the Consolato, is involved in obscurity. Earlier English writers contend that these laws were compiled by Richard I. at the isle of Oleron, on the coast of France; while French writers maintain that they were prepared by order of Queen Eleonora, duchess of Guienne, and mother of Richard I. Recent authors reject both stories, and now the general opinion seems to be that they were compiled in France in the reign of Louis IX. They were the estatablished regulations of the early commercial states of Western Europe, and are still respected in England, France, and the United States. "The Laws of Wisbury," or Wisby, once an important city of trade in the island of Gothland, were promulgated about the year 1288. They are still observed in their fundamental principles by the nations of the Baltic, and are deservedly received with respect in the courts of this country. The Hanse towns compiled and adopted a system of their own, based principally upon the laws of Oleron and Wisbury, in 1591. It was afterwards corrected and enlarged at a general assembly of the deputies at Lubeck in 1614, and became the rule of decision in every contested point. In France, under the reign of Louis XIV., and at the instigation of his minister Colbert, the marine ordinances of 1673 and 1681 were issued, enlarging the foundations of maritime law, arranging its parts, and out of various materials constructing a harmonious system. The former of these ordinances treats largely of bills of exchange and negotiable paper; the latter embodies, in systematic order, the subjects of navigation, shipping, insurance, and bottomry. The present commercial code of France, adopted in 1807, is substantially but a republication of the ordinances of 1673 and 1681. In this country, no system or code of maritime law has ever been issued by authority. The laws and practices that guide us in reference to maritime affairs are founded principally on the practices of merchants, the principles laid down in the civil law, the laws of Oleron and Wisbury, the judicial decisions of our own and foreign countries, &c. The decisions of Lords Mansfield and Stowell have done much to fix the principles and to improve and perfect the maritime law of





England.—*Ref. A Treatise on Maritime Law*, by Henry Flanders.

MARJORAM. (*See* MAJORANA and ORIGANUM.)

MARK, St., GOSPEL OF, *mark*, is the second in order of the four gospels of the New Testament. St. Mark was not an apostle or companion of Jesus Christ during his ministry; but is said, by tradition, to have been secretary of Peter, and to have written his gospel according to the discourses of that apostle. Some suppose that a number of those who had publicly listened to Peter's preachings at Rome had entreated Mark, as he had been a long time the apostle's companion and had a clear understanding of what he had delivered, that he would commit the particulars to writing. The minuteness with which the various circumstances are recorded shows that the person who dictated it must have been an eye-witness of what has been recorded, while the great humility with which Peter is always introduced, his weakness and fall being fully exposed, give colour to the tradition that it proceeded principally from him. Some critics have maintained that this gospel is merely an abridgment of that of Matthew; and there certainly occur many striking coincidences between them, both in style and words; but the frequent deviations of Mark from the order in time and arrangement of facts observed by Matthew, as well as the introduction of many things not noticed by the latter, are opposed to this view. This gospel was originally written in Greek; but from the number of Hebraisms discoverable in it, there can be little doubt that its author was, by birth and education, a Jew; while, on the other hand, its numerous Latinisms show that it was composed by a person who had lived among the Latins. The authenticity of this gospel is proved by the unanimous testimony of the early fathers. Some critics have thought that the last twelve verses of the 16th chapter were not written by the evangelist, as they are not to be found in some of the ancient manuscripts; but there is nothing to oppose the view that they may have been written by him at a later period, and thus some copies been in circulation without them. Considerable difference of opinion exists as to the time when this gospel was written; some placing it as early as 56, others after Peter's death, as late as 65. The probability seems to be that it was written about 63 or 64. It consists of sixteen chapters, and may be divided into three parts;—viz., 1. Containing an account of the transactions from the baptism of Christ to his entering on the more public part of his ministry (i. 1—13); 2. the discourses and actions of Christ to his going up to Jerusalem to the fourth and last passover (i. 14—x.); 3. the passion, death, and resurrection of Christ (ix.—xiv.). From the style and character of the book, there can be little doubt that it was written for Gentile Christians. The explanations that are introduced would have been unnecessary if it had been written exclusively for Hebrew Christians, as, where he uses the word *corban*, he adds "that is, a gift." This gospel is characterised by clearness, exactness, and conciseness, combined with an almost picturesqueness of narration. Indeed, it has been said that, considering the copiousness and majesty of the subject, the variety of great actions which it relates, the surprising circumstances that attended them, and the numerous and important doctrines which it contains, it is "the shortest and clearest, the most marvellous, and at the same time the most satisfactory, history in the whole world."—*Ref.* Horne's *Introduction to the Holy Scriptures*.

MARK is an old English term for a coin formerly current. Its value was two-thirds of a pound sterling, or 13*s.* 4*d.* The Scotch mark, or merk, was two-thirds of a pound Scots, or 13⅓*d.* sterling. It is also the name of a weight used in several parts of Europe, and for several commodities, especially gold and silver. In France and Holland, the mark equalled eight ounces.

MARKET, *mar'-ket* (Lat. *mercatus*), in Law, is an appointed place and fixed time for the meeting of buyers and sellers. A market can be set up only by virtue of a royal grant, or by immemorial usage, which presupposes a grant. A grant to hold a market must not be prejudicial to others, more especially to the owners of existing markets; and hence the first step of the crown, with the view to confer such grant, is to

issue a writ *ad quod damnum*, directed to the sheriff of the county, authorising him to summon a jury to inquire whether the proposed grant would damage the queen or any of her subjects. Formerly, markets were held chiefly on Sundays, and frequently in churchyards; but statutes were subsequently passed prohibiting these. Sales in markets may be either of goods actually brought to the market, or of goods not so brought, the latter being generally by sample. All contracts for anything vendible in fairs or markets overt shall be binding if made according to the following rules:—1. The sale to be in a place that is open, so that any one that passes by may see it, and be in a proper place for such goods; 2. it must be an actual sale for a valuable consideration; 3. the buyer is not to know that the seller has a wrongful possession of the goods sold; 4. the sale must not be fraudulent between two, to bar a third person of his right; 5. there is to be a sale and a contract by persons able to contract; 6. the contract must be originally and wholly in the market overt; 7. toll ought to be paid when required by statute; 8. the sale ought not to be in the night, but between sun and sun, though, if made in the night, it may bind the parties.

MARKING-INK. (*See* INK.)

MARKING-NUT. (*See* SEMECARPUS.)

MARK, ORDER OF SAINT, is the name of a Venetian order of knighthood, said to have been established in honour of St. Mark, the patron saint of that republic. The doge, as well as the senate, elected knights, who enjoyed a pension. Foreigners also, particularly learned men, were elected.

MARL, *marl* (Welsh), strictly speaking, is clay containing carbonate of lime; but the term is now loosely applied to any clayey earth used in fertilizing land.

MARMOT, *mär'-mot* (Ital. *marmotta*) (*Arctomys*), a gen. of rodent animals, of which there are many types. Cuvier observes, with regard to the marmots, that they have five molar teeth on each side above, and four below, bristling with points; accordingly, some species are easily induced to feed on flesh, and will eat insects as well as vegetables. They are short-legged animals, with a tail round and rather short; they also possess a large and flattened head. They pass the winter in a state of torpor, in deep holes, the entrance of which they close up with hay. They are generally gregarious and are easily tamed. The Alpine marmot (*Arctomys alpinus*) is about as large as a rabbit, with a short tail, and covered with a yellowish-grey fur, varied with ash-coloured tints towards the head. This species inhabits the Alps and Pyrenees just below the region of perpetual snow. The Polish marmot is about the same size as the one last mentioned, and of nearly the same colour. It inhabits small hills, and mountains which are but slightly elevated, in Poland, and it frequently burrows in the hardest soils. Besides these, there are many other European and Asiatic specimens. In conclusion, it may be observed that the marmots partake of many of the characteristics of the squirrels, and that they are both herbivorous and carnivorous. The American marmot (*Arctomys ludovicianus*) will be found described under the article PRAIRIE DOG (which *see*).

MARONITES, *mar'-o-nites*, in Eccl. Hist., are a sect of Christians in Asiatic Turkey, dwelling principally about Mount Lebanon. Their origin, and the derivation of their name, are matters of some uncertainty; but the prevailing opinion is, that they were called either after a hermit Maro, who lived in the 5th century, or after their first patriarch, John Maro, who flourished two centuries later. The general opinion is, that the Maronites are sprung from the Monothelites, who arose in the 7th century, and held the opinion that Christ, though he united in himself the divine and human nature, had but one will. They were supported by several emperors, particularly Heraclius; but they were condemned and banished by Anastasius. In the country of Lebanon they became a warlike mountain people, and defended their freedom first against the Greeks and subsequently against the Saracens. At length, in 1182, they renounced Monothelitism and were received within the pale of the Roman Catholic church; yet they retained their ancient rites and ceremonies, and accepted no popish doctrines except the supremacy of the Romish pontiff. By this slight tie they still continue united to the Church of Rome. In 1584, Pope Gregory XIII. founded at Rome a Maronite college, from which they have since received most of their priests. In 1736, Clement XII. prevailed on a national synod to accept the resolutions of the council of Trent. They are, however, permitted to retain many of their old traditional usages; thus their priests are permitted to marry, receive the Lord's Supper in both kinds, use the Arabic language in the church service, &c. Their head is the patriarch of Antioch, whose residence, however, is the convent of Dair-al-Shafee, on Mount Lebanon. Every tenth year he has to give an account of the condition of the church to the pope at Rome. Under the patriarch are bishops and several other orders of clergymen. In the district of Lebanon there were upwards of 200 religious houses under the rule of St. Anthony; but in consequence of the recent war with the Druses, many of these have been destroyed. Their political constitution is that of a military commonwealth; the supreme government being in the hands of four chief sheiks, who are also their leaders in time of war. Their dependence on the Ottoman empire is little more than nominal, consisting merely in the payment of an annual tribute. In 1841 a fierce war raged between the Maronites and the neighbouring Druses, in which the former suffered greatly. In May, 1860, the war again broke out with unprecedented fierceness, the Druses being aided and excited by the Mohammedan population, and even by Turkish troops. The Maronites were soon overpowered; about 160 towns and villages were destroyed, and nearly their entire territory laid waste. Many of the people were cruelly massacred. At length peace was concluded; and to prevent the return of similar atrocities, the European powers, at a conference held at Paris, agreed upon an intervention in Syria for the protection of the Christians. The number of the Maronites is variously estimated from 150,000 to 500,000.

MARQUE, LETTERS OF, *mark* (Fr.), are commissions for extraordinary reprisals for reparation to merchants taken and despoiled by strangers at sea, grantable by the secretaries of state, with the approbation of the sovereign and council, and usually in time of war. By the law of nations, they are grantable whenever the subjects of one state are oppressed and injured by those of another, and justice denied by that state to which the oppressor belongs. The term, however, as commonly used, has come to bear a somewhat different signification. If, during war, a subject should take an enemy's ship without commission from the crown, the prize would belong, not to the captor, but to the crown. To encourage merchants and others to fit out privateers or armed ships in time of war, the lords of the Admiralty have been empowered, by various acts of parliament, to grant commissions to the owners of such vessels; so that the prizes captured by them may be divided between the owners of such vessels, their captains and crews. Before such commission is granted, the owners are required to give security to the Admiralty to make compensation for any violation of treaties with peaceful powers. These commissions are ordinarily termed letters of marque. During the late war with Russia, our government did not issue any letters of marque.—*Ref.* Wharton's *Law Lexicon*.

MARQUETRY, *mar'-ket-re* (Fr. *marqueterie*, *marqueter*, to inlay), a peculiar kind of inlaid cabinet-work, in which thin slices of different coloured woods, and sometimes of gold, silver, copper, tortoise-shell, mother-of-pearl, ivory, horn, &c., are inlaid and put on a ground. These substances, after being reduced to laminæ of proper thinness, are cut out into the required form by punches, which produce at once the full pattern, or mould, and the empty one which inclosed it; and both serve their separate purposes in marquetry. This species of inlaid work, when executed in glass, precious stones, or marble, is more commonly called mosaic.

MARQUIS, *mar'-kwis*, an English title of honour next in rank to that of a duke. This title has always been conferred by letters patent, and though of slow introduction, and, at first, seldom conferred, it now holds a conspicuous place among hereditary titles. The original duty of a marquis was to guard the marches, or frontier territories of a kingdom, from which circumstance the name is derived. The title was unknown

in this country till 1397, when Richard II. conferred on his favourite, Robert de Vere, earl of Oxford, the title of marquis of Dublin for life. The first occasion upon which the title of marchioness is known to have been conferred was in the 24th of Henry VIII., when Lady Anne Rochford received that dignity in her own right. An English marquis has this privilege over an earl, that his younger sons are addressed as "My lord;" as, Lord Robert Grosvenor, son of the marquis of Westminster; and Lord Dunkellin, son of the marquis of Clanricarde. In England, the marquises furnish the fewest number to the peerage of any rank of the nobility; as is also the case in Scotland; but in Ireland, where there is only one dukedom, the title of marquis is more frequent. The reign of George III. supplied the peerage with nearly all the existing marquisates.

MARRIAGE, *mar'-rij* (Lat. *maritagium*), is a solemn contract, dictated by nature and instituted by Providence, between two persons of different sexes, with a view to their mutual comfort and support, and for the procreation of children. The importance of regulating the nuptial alliance has been recognized in all civilized countries. In Old-Testament history, we find intermixed marriages of the worshippers of God with the heathen nations around them strictly forbidden by Divine authority. The ancient Greek legislators considered the marriage relation, as not merely of private, but also of public or general interest. By the laws of Lycurgus, criminal proceedings might be taken against those who married too late or unsuitably, as well as against those who did not marry at all. The great object of marriage they regarded as being the rearing of healthy progeny for the state. Among the Romans, marriage proper (*connubium*), by which the children became Roman citizens, could only take place between a Roman citizen and the daughter of a Roman citizen. Between a Roman citizen and a female slave there was no *connubium*; and, in consequence, the children were not Roman citizens. Children were in the power of the father only when the fruit of a legal marriage. The Roman notion of marriage was that of a complete personal unity of husband and wife; for the dissent of either party, when formally expressed, could dissolve the relation. The Roman matron was in a much more favourable position, socially, than the Greek wife; for she shared in the honours and respect shown to her husband, presided over her household, and watched over the education of her children. In all Christian communities, the marriage relationship is regarded as the most solemn of contracts, and, excepting in Protestant countries, it is regarded as a sacrament. In this country, although not a sacrament of the Church, yet until very recently it fell almost exclusively under the cognizance of the ecclesiastical courts. Now, however, the new court of Probate and Divorce exercises some of the functions that formerly fell to the ecclesiastical courts, especially in the matter of divorce. (*See* DIVORCE.) Marriage being a mutual contract, it follows that each party must enter into it of his or her own free will, and also that neither of them labour under any legal disability,—as proximity of relationship, want of age or reason, a prior contract of marriage still subsisting, certain physical disabilities, &c. (*See* HUSBAND AND WIFE.) Marriage is dissolved (1) by death, (2) by judicial separation, (3) by judicial dissolution. As regards the validity of a marriage, the general principle is that it is to be decided by the law of the place where it is celebrated; if valid there, it is valid everywhere; and if invalid there, it is not valid anywhere. The ecclesiastical law required, for the solemnisation of this contract, that there should be not only a mutual contract of espousal, *per verba de presenti*, or words in the present tense, but that it should be solemnised by a priest, without which it was not considered a complete legal marriage. The ecclesiastical law, however, has long ceased to govern this contract, and the principal acts which now bear upon it are 4 Geo. IV. c. 76, and 6 & 7 Will. IV. c. 85. The former of these acts prescribes the previous publication of the banns upon three successive Sundays in manner therein mentioned, in the church or chapel where the marriage is to be solemnised, or, in lieu thereof, a special license from the archbishop of Canterbury, or a common license from the ordinary of the place or his surrogate; and no license to be granted to marry in any church or chapel unless one of the parties has had his or her usual place of abode in the parish to which it belongs for fifteen days immediately preceding; and no marriage to be solemnised after more than three months from the publication of the banns or grant of the license. The act 5 & 6 Will. c. 76, provides, further, that a marriage might be celebrated upon a certificate of the superintendent-registrar of the district, with or without a license. The party intending to be married is to deliver to the superintending registrar of the district within which both parties have dwelt for not less than seven days (if in different districts, to the superintendent-registrar of each), a notice of his or her intention to marry in the form prescribed; the same to be entered into a book called the "Marriage Notice-Book," open at all reasonable times, without a fee, to persons desirous of inspection. Where the marriage is without a license, this notice, or a copy of it, is required to be suspended or affixed to some part of the superintendent's office during twenty-one successive days after the day when it was entered in the notice-book, after which, if no objections have been lodged, the registrar issues, at the request of either party, a certificate in the prescribed form, any time within three months of which the marriage may take place. If with license, the notice or copy does not require to be suspended or affixed in the office, and the certificate may be obtained after the expiry of one day after the entry of the notice; also, if the parties reside in different districts, the notice only requires to be entered in one; but a residence of fifteen days in place of seven is required in the district. Contracts to marry at a future time are recognised by law, and actions for the breach of them are by no means uncommon. The promises, however, must be reciprocal, and a woman is bound by such a contract as much as a man; but actions for breach of promise are not often brought by the man, nor would such be much favoured by court or jury. The action may be brought by an infant; but not against one. The very words, manner, or time of the promise are not often provable, nor is it indispensable to do so. The defence in such cases is either usually a denial of the promise, or, if that be proved, anything that would make the marriage unlawful. But a previous and existing marriage of the defendant would not be a defence against such an action if unknown to the plaintiff at the time when the promise was made to her. Frequently it is attempted to prove the bad character of the plaintiff, and if this can be done, it forms a sufficient defence to the action; but if it fail, the attempt may be regarded by the jury as a ground for increasing the damages. But if the bad character was known to the defendant at the time of making his promise, it forms no defence, though it may be received in mitigation of damages. This contract, like any other, may be upon condition, and if the condition be reasonable, the law will respect it, and will not sustain an action on the promise unless the condition be performed.

MARRIAGE CEREMONIES.—In almost every country marriage is regarded as a season of rejoicing among the friends and relatives, and is celebrated with certain ceremonies. Respecting the customs of the ancient Persians, Babylonians, Indians, and other inhabitants of Asia, ancient writers have left us little or no information. A curious custom is said to have existed in Assyria of disposing of the marriageable girls by public auction; the money received for the best-favoured of them being given as portions with those whose charms were not sufficient to attract purchasers. Usually with the ancient inhabitants of the East, the bride was obtained by presents made or services rendered to her parents, a practice which still prevails in some parts of that region. With the ancient Hebrews an interval of ten or twelve months usually intervened between the betrothment and the celebration of the marriage. On the day of the wedding, the bridegroom proceeded, anointed and ornamented, accompanied by a friend (*paranymph*) and followed by several companions, into the house of the bride, and conducted her, veiled and followed by her companions, with beating of music (at a later period also with torches), into his or his father's house, where the wedding feast was celebrated at his expense. It generally lasted for seven days; but if a widow was married, only for three. The

bride and bridegroom were each adorned with crowns, and the conversation was enlivened by songs and epigmas. The duty of the paranymph was to play the part of the host at the feast. The men and women indulged themselves in feasting and conviviality in separate apartments. At length the nuptial blessing, viz., a numerous offspring, was implored upon the parties concerned (which appears to have been anciently the only ceremony performed in constituting the marriage), and the bride and bridegroom were led, the former still veiled, into the bridal chamber, where the bridesmaids accompanied them with torches and song. The wedding ceremonies of the modern Jews deviate considerably from those of their forefathers, though the rabbis maintain that they strictly follow the ceremonies observed at the wedding of Tobias. The Jews marry very young, and hold it to be a direct sin against the commandment given to our first parents if they are not married by their eighteenth or nineteenth year. Marriage is permitted to males at the age of thirteen years and a day,—to females at twelve years and a day. Barrenness is esteemed a great misfortune among them. After the suitor has obtained the consent of the girl and her guardians, the betrothment takes place with certain ceremonies, the bridegroom paying, or at least was formerly wont to pay, a so-called "morning gift," a remnant of the custom of buying the daughter from her father. The ceremony of the wedding generally takes place in the open air, seldom in a room, and usually on Wednesday. The couple sit under a canopy generally carried by four boys. A large black veil covers both, besides which, each of them has a black cloth (*talad*) with tassels at the four corners, upon the head. The rabbi, precentor of the synagogue, or nearest relative of the bridegroom, offers the couple a cup of wine, saying, "Praised be thou, O God, that thou hast created man and woman, and hast ordained matrimony." Both then drink. The bridegroom puts a gold ring without a stone on the finger of the bride and says, "With this ring I take thee as my wedded wife, according to the custom of Moses and the Israelites." The matrimonial contract is then read, and the bridegroom shakes hands with the parents of the bride. Wine is again brought, prayers are spoken, the couple drink, and the cup is then broken. The company then proceed to the house of the bridegroom, where the marriage feast is held. Among the ancient Greeks marriage was accompanied by numerous ceremonies. It was usually preceded by a formal betrothment, when the bridegroom bestowed a present on the bride as a pledge of his honour. A dowry was usually given with the bride. At the nuptials, the betrothed pair, as well as the place of festivity, were adorned with flowers and garlands. (*See* BRIDE AND BRIDEGROOM.) The Romans had three different ways of concluding a marriage,—*confurreatio*, *usus*, and *coemtio*. The first of these was the most solemn, and was always preceded by a ceremonial betrothment, which often took place many years before the marriage of the parties. In fixing the day of marriage care was taken to select what was esteemed a lucky day; the month of May, the calends, nones, and ides, and the days following them, the feast of the Salarians, &c., were esteemed *atri dies* (black, or unlucky days). The confarreatio was when a man and woman were joined together in marriage by the pontifex maximus, or flamen dialis, in presence of at least ten witnesses, by a set form of words, and by partaking of a cake called *far* or *farreus panis*. There were certain offices in the priesthood that could only be held by the sons of parents who had been married in this way. Usus, or usage, was when a woman, with consent of her parents or guardians, lived with a man for a whole year without interruption, when she became his lawful wife by prescription. If the wife wished to avoid the legal consequences of a marriage, absence for three nights during the year from her husband was regarded as a sufficient legal interruption. Coemtio was a kind of mutual purchase, the marriage being effected by one delivering to the other a small piece of money, and repeating certain words. (For a further account of the Roman marriage ceremonies, as well as for those that formerly prevailed in this country, *see* BRIDE AND BRIDEGROOM.)

MARRIAGE SETTLEMENT is a conventional arrangement, usually made before marriage, whereby a jointure is secured to the wife, and portions to the children, in the event of the husband's death. It is based on what is called the "marriage consideration," which is the highest consideration known to the law, and may be made good against the husband's estate, and satisfied before any other debts. If made after marriage, it will, as a general rule, be fraudulent and void against all persons who are creditors of the husband at the time of the settlement, unless such settlement contain a provision for debts, or be made in pursuance of articles entered into before marriage. In case articles are entered into before marriage, and afterwards a settlement is made different therefrom, the court of Chancery will set up the articles against it; but where both are concluded prior to the marriage, when both parties were at liberty, the settlement will be taken as a new agreement. These settlements appear to have been in use among the ancient Gauls and Germans.

MARROW, *mar'-ro* (Lat. *medulla ossium*), in Anat., is a light fatty substance lodged in the interior of the bones. Like ordinary adipose tissue, it consists of vesicles containing fat, with blood-vessels distributed to them. It is usually of a yellow colour, with 96 parts of fat, 3 of water, and 1 of areolar tissue, in 100 parts. In some parts it is of a reddish colour. In birds, for the sake of lightness, the larger bones, instead of being filled with marrow, contain air, which passes into them from the lungs. In the fœtus the bones do not contain marrow, but a transparent reddish fluid like bloody serum, only more consistent.

MARRUBIUM, *mar-ru'-be-um* (Heb. *marrob*, a bitter juice), in Bot., a gen. of the nat. ord. *Labiatæ*. The species *M. vulgare* is the common horehound, which is much employed as a domestic remedy in coughs.

MARS, *marz*, in Astron., one of the principal planets in our system, the fourth in the order of distance from the sun, and consequently the next above our earth. The mean distance of Mars from the sun is 140,000,000 miles; it performs its sidereal revolution in 1 year, 10 months, and 21·98 days; and revolves on its axis in 24 hours, 39 minutes, 21 seconds. At the mean distance of the earth from the sun, the apparent diameter of Mars would amount to 8·9 seconds, an arc indicative of a real diameter of 3,976 miles. Of all the planets known in ancient times, Mars is the one which has the greatest eccentricity. When the planet begins to emerge from his conjunction with the sun, his disc appears perfectly round; at the time of opposition, for some days before and after, he exhibits the same form; at a greater distance, however, from the opposition, he exhibits a sensible phase, which never imparts to the planet the aspect of a crescent, nor even that of the moon at her first quarter, but attains its maximum at the quadratures. On the surface of Mars, permanent spots can be perceived, by means of which it has been proved that the planet revolves on an axis inclined at an angle of 59°27′ to the plane of the ecliptic, or 61°18′ to the plane of his orbit. In Mars there must be two different seasons analogous to those we observe on the earth. In proof of this may be mentioned a singular phenomenon which manifests itself towards the north and south poles of Mars. At these points are two whitish spots, the brilliancy of which is more than double that of the other parts of the planet. The north spot diminishes in size during the spring and summer of that hemisphere, and increases during the two following seasons: the contrary takes place at the south pole. From these facts it may be concluded that these form round the poles of Mars extensive coverings of a whitish substance similar to the snows which fall from our atmosphere. Among the Jews, the planet Mars bore a name which signifies fiery; the Greeks also, who called the planet Hercules, applied to it the epithet *purocis*, incandescent. Even at the present day, Mars is the object in the heavens which exhibits the most intense tinge of red. This colour, however, appears more intense to the naked eye than in a telescope. It is generally supposed that Mars possesses an atmosphere similar to our own.

MARSDENIA, *mars-de'-ne-ä* (in honour of William Marsden, F.R.S., secretary of the Admiralty), in Bot., a gen. of the nat. ord. *Asclepiadaceæ*. *M. tinctoria* produces a kind of indigo; *M. tenacissima* has very tenacious fibres, which are used for bowstrings by the mountaineers of Rajmahl.

MARSEILLAISE, THE, *mar-say-yaise'*, is the name of the celebrated national song of France. It was composed by Rouget de l'Isle, an officer in the engineer corps at Strasburg, early in the French revolution. It was first called *L'Offrande à la Liberté*, and soon became very popular throughout the country, contributing in no small degree to the success of the revolutionary arms. It received its present name from being sung for the first time in Paris by a band of men who were brought from Marseilles by Barbaroux, to aid in the revolution of August 10, 1792. It has since continued to be the favourite song in all popular movements in France.

MARSHAL, *mar'-shăl* (Fr. *maréchal*), is a high title of honour in various European countries, though not of the same dignity in all. It is said originally simply to have meant a groom or manager of horses; and from the importance of such an officer among rude warlike nations, he came to be possessed of great military autaority. The office of earl-marshal of England seems to have been introduced into this country by William the Conqueror. (*See* EARL-MARSHAL.) On the division of the Aula Regis, or King's Great Court, the earl-marshal appointed a deputy in each of the new courts, whose duty it was to take into custody all persons committed to him by the court. The marshal of the Queen's Bench had the custody of the Queen's Bench prison. There was also a marshal of the Exchequer, to whom that court committed the custody of the queen's debtors for securing the debts. Both these offices have been recently abolished. The marshal of France is the highest military rank in that country, as a field-marshal is in this. Marshal is also sometimes applied to a person who regulates the ceremonies on certain solemn celebrations.

MARSHALLING OF ARMS, *mar'-shăl-ling*, in Her., the arrangement and distribution of several coats of arms, belonging to distinct families, in the same escutcheon or shield, together with their ornaments, parts, and appurtenances, so as to denote the several marriages and alliances of the families.

MARSHALSEA, *mar'-shăl-se*, was the name of a court originally held before the steward and marshal of the royal house, for administering justice in cases in which the sovereign's domestic servants were concerned, that they might not be drawn into other courts. This court being ambulatory, Charles I. erected a new court of record, with authority to try all manner of personal actions whatsoever which might arise between any parties withiu twelve miles of the royal palace at Whitehall, not including the city of London. This court was abolished by 12 & 13 Vict. c. 101, as was also the old Marshalsea prison.

MARSH-MALLOW. (*See* ALTHEA.)

MARSH'S TEST FOR ARSENIC, in Chem., a method of testing for arsenic, which consists in forming arseniuretted hydrogen, and afterwards depositing the metal from it. A wide-mouthed bottle is charged with a little pure granulated zinc. Through the cork pass two tubes, one of which reaches to the bottom of the bottle; the other, which passes only just through the cork, is bent at right angles, and drawn out to a capillary orifice. Distilled water is then poured through the first tube, and afterwards a little pure sulphuric acid. Hydrogen is immediately evolved, and as soon as the whole of the atmospheric air has been expelled, the gas is tested for arsenic in a way presently to be described. If found pure, the suspected material is added to the contents of the bottle, when, if arsenic be present, arseniuretted hydrogen is immediately evolved. The presence of arsenic in the gas is detected in two ways,—by heating the tube through which it passes with the flame of a spirit-lamp, and by burning it as it passes out of the capillary orifice. In the first case, a metallic ring will be formed in the tube; in the second, a metallic mirror will be formed on holding a piece of cold porcelain in the flame. The ring and mirror may possibly be antimony: this, however, is determined by touching them with a drop of hydrosulphate of ammonia, when, if formed by antimony, they will disappear, but the arsenic will be entirely unacted upon. A confirmatory test may be applied in the form of a drop of a dilute solution of chloride of lime, the arsenic dissolving, and the antimony remaining in this case. Marsh's





test is one of extreme delicacy, and very easy of application. The principal difficulty attending its use is the liability of the organic matter contained in the suspected material to froth up and cause inconvenience. This may be obviated by adding to it one-tenth of its bulk of hydrochloric acid and a small quantity of chlorate of potash. This destroys the organic matter, and renders the test perfect in its mode of application. It is hardly necessary to state that all the materials used must be rigorously tested for arsenic beforehand; otherwise serious mistakes may arise,—as in the famous Smethurst case, in which Dr. Taylor, in applying Reinsch's test, used copper wire containing a notable quantity of arsenic. (*See* also ARSENIC and REINSCH'S TEST.)

MARSILEACEÆ, *mar-sil-e-ai'-se-e* (after Count Marsigli, founder of the Academy of Sciences, Bologna), in Bot., the Pepperwort fam., a nat ord. of *Acotyledones*, sub-class *Acrogenæ*, consisting of aquatic herbs with small floating or creeping stems. They are widely distributed, but are most abundant in temperate regions. There are four genera and about 20 species. Their properties are unimportant.

MARSUPIALIA, or MARSUPIATA, *mar-su-pe-ai'-le-ă*, *mar-su-pe-ai'-tă* (Lat. *marsupium*, a bag), a term applied to an extensive group of mammalia, which differ altogether from others, both by their organization and by the different varieties of nourishment which they consume. As a necessary consequence to these peculiarities, we find their structure altered accordingly, and we find among them the organs of progression, prehension, and digestion, so adapted to their various wants and habits, that we may trace in them some of the prominent characteristics of the carnivorous, insectivorous, herbivorous, and rodent forms of other mammalia. Scaliger christened the first species of marsupialia brought under the notice of zoologists, by the name *Animalia cremenata*; that is, in other words, Purse-bearing animals. The leading feature in these mammals is the premature birth of their young, which are nourished, after their exit from the uterus, by the pouch or marsupium of the mother, in which the teats are placed, to which latter they attach themselves immediately on birth. The ursine opossum is an instance of this class, and is a native of Van Diemen's Land. The great type of the genus, however, is the KANGAROO, a description of which will be found given in an article bearing that name. (*See* KANGAROO, OPOSSUM, SQUIRREL, &c.)

MARTELLO TOWERS, *mar-tel'-le*, a series of circular fortifications, consisting of towers of two stories high, which were erected along the Kentish coast, in Ireland, Jersey, and in other parts, in order to repel the threatened invasion of Napoleon Buonaparte in the early part of the present century. The buildings are formed of masonry, the first story being divided into chambers, for the reception of stores, and the upper portion being casemated, and serving for troops: the room is bomb-proof. They were erected at intervals of about a mile between each. The wall of the building terminates above in a parapet, while on the terre-plein of the roof are placed pieces of artillery which rest on traversing platforms of timber, which can be moved all round in order that the guns may be fired in any direction. The whole work is generally surrounded with a ditch and glacis, and the entrance is some considerable height from the ground, and above it are machicolations. The name of these towers is derived from one built at Martella Bay, in Corsica, which afforded a determined resistance to the English troops in the year 1794. The martello towers in Ireland are generally termed round towers. These, at the present time, are usually devoted to the service of the coast-guard force.

MARTEN, *mar'-ten* (Du. *marter*), an elegant little animal, belonging to the family *Mustelidæ*, or Weasel tribe. There are two varieties of this species; namely, the beech marten and the pine marten; the former being possessed of a white throat, and the latter of a yellow one. The beech marten (*Mustela Martes*) differs but little from the weasel in form, with the exceptions of the body being slightly more elongated, the head a little more pointed, and the fur generally longer. The martens have also an additional molar tooth in both jaws, and also the larger grinder of the lower

jaw has a small internal tubercle, which does not exist in that of the weasels. The tail is about as long as the body; the upper parts greyish or yellowish-brown, and the feet and tail of a chocolate hue; the throat has already been described. The limbs are of moderate length; on the fore foot the first toe is very short, the second and fifth equal in length, and the fourth the longest; on the hind foot the proportions are similar: the soles of all are covered with hair, and the claws are large, compressed, tapering, and arcuate,—that is to say, linear and bent like a bow. The fur is dense, rather soft, and long, being longer on the hind parts, especially on the tail. The under fur is thick and woolly. When young, the marten is of a darker colour, and in summer the fur is always of a lighter hue than in winter. The marten is generally distributed throughout England and Scotland, and in Europe. In the north of Scotland, it is termed the taghar and polecat. In its habits it partakes of the qualities of the fox, as it is a destructive depredator at night-time of farm-yards, although it shuns men as much as possible. Its general length, from nose to tail, is about a foot and a half. The female has two litters, at least, in the year, and produces two or three cubs at a time. The *pine marten* is an inhabitant of North America, where it frequents the woody districts from the Atlantic to the Pacific: it is also found about the region of Mount Caucasus, in Europe, and even in Sweden and Norway. These martens are very destructive to small game and the eggs of birds, their lives being one continual plundering of the nest of the partridge, the retreats of the squirrel, and the *form* of the hare. When deprived of these, they prey on field-mice, dormice, and even lizards and serpents. When the time has arrived for the female to bring forth her young, she takes forcible possession of a squirrel's nest, and enlarges it so as to suit her requirements. The skins of the pine marten are imported in large quantities into Great Britain, as their fur is much used by furriers; upwards of 100,000 being annually brought into the country. (*See* also WEASEL.)

MARTIAL LAW, *mar'-she-al* (Lat. *martialis*, pertaining to war), is often confounded with military law; but the terms are by no means synonymous. "Martial law" is defined by an old authority to be "the law of war, that depends on the just but arbitrary power and pleasure of the king. For though he doth not make any laws but by common consent in parliament, yet in time of war, by reason of the necessity of it, to guard against dangers that may often arise, he useth absolute power, so that his word is a law." When in time of extreme peril to the state, either from without or within, the general safety cannot be trusted to the ordinary administration, or the public welfare demands the adoption and execution of extraordinary measures, it may become necessary to declare the existence of martial law. It is sometimes known as drum-head law, complete submission being enforced by military authority, and all acts of insubordination punished summarily on the spot. In public riots, when the military are called out, and the Riot Act read, a species of military law is enforced. Military law, on the other hand, is the code of regulations, consisting chiefly of the Articles of War, which are used for the government of the army and navy. It does not supersede the general municipal law, but is rather a branch of it. The special tribunals employed for the administration of this law are termed courts-martial. No officer or soldier is, on account of his being amenable to military law, therefore exempt from being proceeded against by the ordinary course of law; and where he is accused of any offence against a subject of the realm, punishable by the known law of the land, he shall be delivered over to the civil magistrate. No person can by the Articles of War be subjected to any punishment of transportation, or any punishment extending to life or limb, for any crime which is not expressed to be so punishable by the Mutiny Act itself, nor shall be punished in any manner or under any regulations which shall not accord with its provisions.

MARTIN. (*See* PISTACIA.)

MARTIN, *mar'-tin* (Fr. *martinet*), *Hirundo urbica*.—This bird belongs to the *Hirundinida* or Swallow fam., a class of birds belonging to the ord. *Passeres*, tribe *Fissirostres*, and sub-tribe *Fissirostres diurnæ*. The martin usually makes its appearance in this country a few days later than the swallow. It appears to commence its northern migration in Africa, crossing the Mediterranean along with the swallows; but its wings being on a smaller scale, it is prevented arriving so soon as the larger-winged bird. It always endeavours, like the swallow, to establish itself near the habitation of man, and as it is not a destructive bird to plants or grain, it is usually regarded with favour. The nest of this bird is generally fixed under the eaves of houses, or in the upper angles of windows; whence its name of *house-martin* and *window-martin*, according to Mr. Yarrell. The nest is built of clay, which is laid on in alternate stripe, day after day, until the whole is completed. After the exterior wall is finished, the cavity within is lined with hay and soft feathers. The martin produces three, and occasionally four broods in the season. The eggs are four or five in number, and are smooth and white. After incubation and hatching has been completed, which operation lasts thirteen days, the parent birds devote themselves to feeding their nestlings. The little birds put out the head on the arrival of the food, and eagerly receive it from the beaks of the old ones. The martin is one of the most regular of summer visitors to this country, and considerable numbers also go to Denmark, Sweden, and Norway; some even as far north as Lapland. It leaves about the middle of October; and if any of its last brood are unfledged, it deserts them without the slightest compunction. In the adult male the beak is short and black; the top of the head and back of a glossy bluish black; the wing and tail dull black; the chin and under surface of the body white; and the claws curved, sharp, and of a greyish horn-colour. The whole length is slightly more than five inches and a quarter; and from the carpal joint to the end of the first quill-feather of the wing the extent is about four inches and a quarter. The *sand martin*, or *bank martin*, is another variety. This bird is the smallest of the *Hirundinida* that visit this country, as it is also the earliest. The whole length is about four inches and three-quarters. The beak of the adult bird is dark brown, the irides hazel; the head, with back and wing-coverts, as well as tail-coverts, of a mouse-brown colour; the throat, breast, and under surface of the body, pure white; and the legs, toes, and claws, dark brown, with a few short buff-white feathers on the posterior edge of the tarsus, just above the junction of the hind toe.—(*Yarrell.*) The American purple martin (*Progne purpurea*) is a visitor to North America, where it arrives in February at New Orleans, and Boston towards the end of April. The colour of the male is a rich deep purplish blue, with the wings and tail brownish black: the female is of a more dusky appearance, and has the under surface of the body varied with yellowish stains. The purple martin feeds on the larger-winged insects; as wasps, bees, &c. It builds its nest of sticks and grass about ten days after its arrival, and lays from four to six eggs. Audubon the naturalist observes of this bird, with regard to the estimation in which it is held: "I had a large and commodious box built and fixed on a pole for the reception of the martins, in an inclosure near my house, where, for some years, several pairs had reared their young. The erection of such houses is a general practice, the purple martin being considered as a privileged pilgrim, and the harbinger of spring." In its flight, the purple martin resembles the common martin first mentioned, and it sweeps along at a short distance from the level of the ground, in the pursuit of its favourite prey. Some specimens of this bird have been shot in England. (*See* also SWALLOW FAMILY.)

MARTINET, *mar-ti-net'*, in military language, a phrase applied to a severe disciplinarian. The term is said to be derived from a Colonel Martinet, of the army of Louis XIV. of France, who was notorious for his rigorous conduct, and who invented a peculiar whip, called by his name, for the purpose of military punishment. In nautical phraseology, martinets are small lines fastened to the leech of a sail, and reeved through a block at the masthead, coming down the mast to the deck. Their use is for facilitating the furling of sails, as they bring the leech close to the yard.

MARTINMAS, *mar'-tin-mas* (*martin* and *mas*), is the feast of St. Martin of Tours, held on the 11th of

November, and often corrupted to Martilmass, or Martlemas. It is the third of the four cross quarter days of the year

MARTYR, *mar' ter* (Gr *martur*, or *martus*, a witness), is generally applied to one who has suffered death on account of his religious opinions In the early Church, many suffered in this way at the hands of the Romans, bearing witness to the truth of Christianity with their blood Many of these underwent, with astonishing fortitude, the most cruel tortures, and doubtless in this way contributed greatly to the spread of Christianity Those who suffered persecution on account of their faith, but short of death, were called Confessors The martyrs were supposed to enjoy very peculiar privileges According to some, they passed at once to the full enjoyment of heaven, for which others had to wait till the day of judgment Martyrdom was thought so meritorious that it was called the second baptism or baptism in blood and in any case in which a catechumen was apprehended and slain for the name of Christ before he could be admitted into the Church by baptism his martyrdom was deemed sufficient to answer all the purposes of that sacrament — Ref Rumart s *Acta Martyrum*, Dr C Middleton s *Free Inquiry into the Miraculous Powers supposed to have subsisted in the Christian Church*, Gallonius, *De Sanctorum Martyrum Cruciatibus*

MARTYROLOGY (Gr *martur*, and *logos*, a discourse) is a catalogue or list of those who have suffered martyrdom in the cause of Christ, with an account of their lives and sufferings Martyrologies are very numerous but many of them contain very absurd and ridiculous narratives The Martyrology of Eusebius was celebrated in the early Church, and was translated into Latin by Jerome, but it is now lost Among Protestant martyrologies is Fox s "Book of Martyrs, which is a valuable record of the sufferings of the English reformers

MARTYRS, FESTIVALS OF THE, in the early Church were occasions on which the Christians assembled at the graves of the martyrs, when orations in commendation of their deeds and sufferings were delivered, praise and thanksgiving offered unto God, and the Lord s Supper administered On these occasions the rich bestowed largely of their goods among the poor

MASONRY, *mas'-son re* (Fr *maçonnerie*) the art of cutting stones and building them into a mass so as to form the regular surfaces which are required in the construction of an edifice The chief business of the mason is to prepare the stones, make the mortar, raise the wall, with the necessary breasts, projections arches, apertures, &c , and to construct the vaults &c , as indicated in the design A wall built of unhewn stone, whether it be built with or without mortar, is called a *rubble wall*, and this kind of work is of two kinds,—coursed and uncoursed In the former case, the stones are gauged and dressed by the hammer, and the masonry, which may be of different thicknesses, is laid in horizontal courses In uncoursed rubble, the stones are placed promiscuously in the wall, without any attention being paid to their being placed in courses Walls are also built with ashlar facings and rubble masonry in brick backing In either case thorough stones, to bind the mass together, ought to be introduced The subject of walling forms the basis of the art of masonry, when, however, it comes to be applied to the construction of domes, groins, and circular arches, it becomes difficult and complicated, depending upon a thorough knowledge of descriptive geometry

MASONRY, FREE (*See* FREEMASONRY )

MASQUE, *mask* (Fr ), a species of dramatic performance at one time greatly in vogue It appears to have originated from the custom in processions and other solemn occasions of introducing personages in masks in order to represent different characters Many of these, even in the religious shows of Italy, were of a grotesque nature, and the performance was often mingled with buffoonery On the introduction of the masque into this country, a dramatic character was added to the exhibition During the progresses of Queen Elizabeth, monologues or dialogues in verse were often recited by masked performers, and in the reign of James I masques had assumed all the forms of dramatic compositions With the exception of Milton, who wrote the magnificent masque of "Comus,"





the only classical English writer who devoted much labour and taste to this class of exhibition was Ben Jonson His productions were acted at court, and the queen of James I and Queen Henrietta Maria took part in some of them During the reign of Charles I., the taste for masques died out, and never came into fashion again after the Commonwealth

MASQUERADE, *mask e rad'* (Ital *mascherata*), a term applied to a species of amusement, in which persons of both sexes mask or disguise themselves, and engage in dancing, festivities, or miscellaneous conversation Masquerades are said to have been the invention of Granacci, an Italian, who lived in the beginning of the 16th century. In Italy, they were fashionable in 1512, and during the reign of Henry VIII. they were first introduced into England Says quaint old Hall, in his ' Chronicle '—"On the date of the Epiphanie at night (1512 13), the king (Henry VIII.), with a xi others, were disguised after the maner of Italie called a maske, *a thyng not seen afore in Englande*, they were appareled in garmentes long and brode wrought all with gold, with visers and cappes of gold, & after the banket doen, these maskers came in, with six gentlemen disguised in silk, bearying staffe torches, and desired the ladies to daunce, some were content, and some that knew the fashion of it refused, because it was not a thing commonly seen And after they daunced and commoned together, as the fashion of the maske is, they took their leave and departed, and so did the quene and all the ladies '

MASS *mass* (Germ *masse*), the quantity of matter which a body contains, upon the supposition that differences of weight are always the consequence of different quantities of matter The mass is directly as the volume of the body multiplied into its density The weight is constituted by the mass multiplied into the constant force of gravity (*See* MECHANICS )

MASS *mass* (I at *missa* sent), is the office or prayers used in the Roman Catholic and Greek churches in the celebration of the Eucharist, or in the consecration of the sacramental bread and wine into the body and blood of Christ Some derive the term from the Hebrew *missah*, an oblation or sacrifice, others from the Latin *missa*, because, in the early ages of the Church the catechumens, or new converts, were sent away before the consecration of the host The prayers of the mass are all in Latin in the Roman Catholic church, and in ancient Greek in the Greek church. Mass is performed entirely by the officiating priest, standing before the altar, and attended by a clerk who says the responses The mass is divided into four parts —1 The preparation or the prayers made before the offering which was formerly called the mass of the catechumens, 2 the consecration, in which the priest consecrates the bread and wine, repeating the words Hoc est corpus meum,' &c , and then shows the people the bread and the cup, upon which all the congregation kneel down 3 the breaking of the host and the communion 4 the post communion, or thanksgiving, when the priest blesses the people There are different kinds of masses A high or solemn mass is celebrated by a priest or prelate, attended by a deacon and subdeacon, and is sung by choristers, accompanied by the organ and other musical instruments, but the principal mass on Sundays and festivals is also called high mass, though there are neither deacons, subdeacons, nor choristers present A low or ordinary mass is one in which no part is sung, and at which the priest has no assistant but his clerk The ordinary duration of a low mass is half an hour; the high mass is a long and pompous service Every member of the Roman church is bound, under pain of mortal sin, by one of the precepts of the Church, to attend mass every Sunday, and on certain holidays called days of obligation, unless prevented by sickness or other grave impediment In every parish church mass is said daily, and the priest must not break his fast from the previous midnight until he has said mass The officiating priest is dressed in various-coloured garments, according to the festival or ecclesiastical season of the year. The following explanation of the mass and its attendant ceremonies is taken from Picart's "Religious Ceremonies "—1. The priest goes to the altar, in reference to our Lord's retreat with his apostles to the Garden of Olives.—2. Before he begins mass, he says a pra-

parstory prayer; he is then to look upon himself as one abandoned of God, and driven out of Paradise for the sin of Adam.—3. The priest makes confession for himself and for the people; in which it is required that he be free from mortal and venial sin.—4. The priest kisses the altar as a token of our reconciliation with God, and our Lord's being betrayed with a kiss.—5. The priest now goes to the opposite side of the altar, and purifies or perfumes it with incense. Jesus Christ is now supposed to be taken and bound.—6. The introit is said or sung, applicable to the circumstances of our Lord's being taken before Caiphas.—7. The priest says the "Kyrie eleison" (Lord, have mercy upon us) in allusion to Peter's denying our Lord thrice.—8. The priest turning towards the altar says, "Dominus vobiscum," the people returning the salutation by "et cum spiritu tuo," and this means Christ looking at Peter.—9. The priest reads the epistle relative to Jesus being accused before Pilate.—10. The priest bowing before the altar says "Munda cor," and the devotion is directed to our Saviour's being brought before Pilate and making no reply.—11. The priest reads the Gospel in which Christ is sent from Herod to Pilate; and the Gospel is carried from the right of the altar to the left, to denote the offering of it to the Gentiles after it had been refused by the Jews.—12. The priest uncovers the chalice, and this means the stripping of our Lord in order to be scourged.—13. The oblation of the Host: the priest then kisses the altar and offers up the Host to represent the scourging of Christ.—14. The priest elevates the chalice and then covers; this means the crowning with thorns.—15. The priest washes his fingers as Pilate washed his hands; declares Jesus innocent; blesses the bread and wine, blesses the frankincense, and perfumes the bread and wine, &c.

**Massicot**, *mât-se-kot* (Fr), in Chem., protoxide of lead, prepared by the oxidation of the metal in a current of air at a temperature below that necessary for the fusion of the oxide. It is a yellow powder, much used as a pigment.

**Mast**, *mâst* (Sax. *mæst*), a long piece of timber, composed either of one continuous pole, or of a series of such, and placed nearly perpendicularly to the keel of a ship, extending upwards above the surface of the deck, for the purpose of supporting the yards and sails of a ship. The trunk of the mast is called the *lower mast*, the next piece the *topmast*, the third the *top-gallant mast*; and should there be a fourth, as there is in barques and full-rigged ships, it is called the *royal mast*. Each mast is supported on the one next below it by means of cheeks placed a little below the head; on these cheeks are placed, horizontally, two short pieces of wood, fore and aft, called *trestle-trees*, and across them are the *cross-trees*, while on the masthead is a *cap*. The topmast is then raised perpendicularly along the mainmast below the trestle-trees, and through the foremast hole in the cap; and when the *heel* of the mast is nearly on a level with the cross-trees, a piece of iron bolt, called a *fid*, is pushed through a hole in the same; and on the fid, whose ends are supported on the trestle-trees, the topmast rests. When the mast is to be taken down, it is first raised, in order to pull out the fid, and then it can be lowered to the deck. The supports of the masts of a ship are strong ropes, extending on each side, and also forward and aft. The one leading forward is called the *stay*, and those aft are termed respectively *backstays*; while the side supports are called either *shrouds* or *breast-stays*. The *mizen-mast* is that which is nearest the stern of a ship; the *mainmast* is the centre one; and the *foremast* is nearest the bows. Of these, the main is the largest, the foremast the next in size, and the mizen the smallest. The length of the lower mainmast, according to the old rule on the subject, ought to be one-half of the sum of the breadth and length of the ship, and the other masts to be on a reciprocal scale; but as the rule is merely built for purposes of convenience, more than practical principles, it is not often followed. Masts in the present day, for ships of the navy, and indeed for many mercantile vessels, are constructed of iron, on a tubular plan, and on the same scale as those last mentioned.

**Master**, *mast'-er* (Lat. *magister*), denotes, in a general sense, the governor, director, or owner of a thing; also one skilled in any particular pursuit or science; it is also sometimes used as a title of honour. Among the ancient Romans, *magister*, with some qualifying word or phrase, was used as a title of honour; as *magister equitum*, master of the cavalry, who held the first rank in the army after the dictator.—Master of arts (*magister artium*) is a degree conferred by the philosophical faculty of a university, being the first degree taken in foreign universities, as well as in those of Scotland, but the second in those of Cambridge and Oxford. (*See* Degree.)—Master of the ceremonies, an officer instituted by James I. for the more solemn and honourable reception of ambassadors and other strangers of quality to be introduced into the royal presence.—Master of the household is an officer of the royal household under the lord steward, whose duties are chiefly the selection and superintendence of the servants, and examining certain of the accounts.—The master of the horse has the government and direction of the royal stables; and the master of the buckhounds attends at and controls the royal hunts.—The master of the Mint and his deputy are the ostensible executive heads of that department under the Treasury.—Masters in chancery were assistants to the lord-chancellor, usually twelve in number; but these offices were abolished by 15 & 16 Vict. c. 80.—Master in lunacy. (*See* Lunacy.)—The Master of the rolls is the assistant of the lord-chancellor in chancery. He has the keeping of the rolls and grants which pass the great seal and the records of chancery. He administers equity in the Rolls court, having certain causes assigned to him to hear and decree; but his judgments require to be signed by the lord chancellor.

Master, in Commercial Navigation, is the person intrusted with the care and navigation of a ship. He is the confidential servant of the owners, who are bound to the performance of every lawful contract entered into by him relative to the usual employment of the vessel. The master has power to pledge both ship and cargo for repairs executed in foreign parts, but not for repairs executed at home. The Mercantile Marine Act, 13 & 14 Vict. c. 93, authorized the Board of Trade to establish local marine boards in ports having 30,000 tons or upwards of ships trading to foreign ports. These boards were empowered to examine all candidates for the situation of masters and mates who came before them, and to grant "certificates of competency" to such as they found qualified. Under the provisions of the Merchant Shipping Act of 1854 (17 & 18 Vict. c. 104), it is declared that no foreign-going ship or home-trade passenger-ship can obtain a clearance or transire, or legally proceed to sea from any port of the United Kingdom, unless the master thereof, and, in the case of a foreign-going ship, the first and second mates, or only mate (as the case may be), and, in the case of a home-trade passenger-ship, the first or only mate (as the case may be), have obtained and possess valid certificates either of competency or service appropriate to their several stations in such ship, or of a higher grade; and no such ship, if of 100 tons burden or upwards, can legally proceed to sea, unless at least one officer besides the master has obtained and possesses a valid certificate appropriate to the grade of only mate therein or to a higher grade. A master must be twenty-one years of age, and have been six years at sea, of which one year must have been as first or only mate, and one year as second mate, or two years as first and only mate. The master is examined as to his knowledge of the various subjects connected with navigation; the laws of tides; the nature of attraction of the ship's iron upon the compass; the management of his crew; construction of rafts; his knowledge of charter-party, invoices, bottomry, &c.—*Ref.* McCulloch's *Commercial Dictionary*; *The Mercantile Navy List*.

**Master and Servant**, in Law, is a certain relationship, constituted by mutual consent, whereby a person calls in the assistance of others, where his own skill and labour are not sufficient to carry out his own business or purpose. Such arrangements are subject to the laws that govern ordinary contracts, must be entered into voluntarily and by persons qualified to give their consent. The law will not regard the most formal contract, if it appear to have been extorted by force or fear, or obtained by fraud. The existence of the contract may be proved by writing or, within certain

limits, by witnesses; and it may sometimes be inferred from circumstances. The duties to be performed, the recompense for those duties, and the duration of the contract, are matters of arrangement; or they may be guided by custom; but no custom will prevail against express stipulation. A master or mistress is not legally bound to give a character; but if a good character be given to an undeserving servant, the person giving such character is liable to action by the new master, and if the servant has been guilty of robbery, will have to compensate for the loss. If a bad character be untruly and maliciously given, the person giving it will be liable to an action for defamation, though both the truth and the malice require to be proved. In general, a master is liable, civilly and sometimes criminally, for wrongs committed by his servants in the course of or under colour of his employ; but he is not answerable for the wilful misfeasance of his servant, who has wholly lost sight of his duty. There are two classes of servants,—those who receive wages, and apprentices. The contract for service in the two cases is quite different: in each, the servant is bound to render service; but in one the master is bound to pay the stipulated wages, in the other to give instruction. Apprentices are usually bound for a term of years by deeds indented, or indentures, to serve their masters, and be maintained and instructed by them. (*See* Apprentice.) Of servants who receive wages, there are several kinds. Menial or domestic servants are generally engaged at a fixed amount of wages per annum; but there is generally no express stipulation as to the time the service is to last; and when the terms are not otherwise defined, it is generally understood that either party may terminate the service upon a month's warning, or upon payment of a month's wages. Clerks, tutors, governesses, &c., though in a sense menial (*intra mœnia*), cannot, like common domestics, be turned off at a month's notice, if there be no stipulation to that effect; for such a one is understood to be engaged by the year (at least if the wages or salary be payable by the year or quarter). If a yearly servant be dismissed before the year expires, for misconduct which will justify his dismissal, he is not entitled to wages even for that part of the time which he has served. Labourers, *i.e.* servants in husbandry or manufactures, not living *intra mœnia*, though sometimes engaged by the day or week, are understood to be hired for a year, where no particular time is mentioned, and the wages are so much per annum. Various acts of parliament have been passed regulating the hours of work, &c., of certain classes of labourers, and also empowering justices to determine differences arising between such labourers and their masters. A master cannot, by way of correction, even moderately beat his servant or labourer in husbandry, or otherwise, as he might his child or apprentice; and if he do so, the servant may lawfully depart or obtain his discharge by application to a justice, and support an action for battery. An exception is made with regard to soldiers and sailors, from the necessity of larger powers to preserve discipline and prevent mutiny.—*Ref.* Burn's *Justice*, art. Servants.

Masters-Singers, or Meistersänger. (*See* German Language and Literature.)

Mastiff, *mäs'-tif* (*Canis molossus*), one of the noblest, as well as the most powerful, varieties of the canine family. The mastiff is distinguished by a large head, with a broad muzzle to match, ears of moderate size and dependent, a heavy brow, thick drooping lips, and a well-proportioned strong body, and a full tail. The strength of the mastiff is immense, and its vigilance and faithfulness as a house-dog and guard are unrivalled. In Jesse's "Anecdotes of Dogs" there are many stories related of the mastiff, which exhibit its character in very favourable lights. The following is amply corroborated. A baronet of Oxfordshire had a large mastiff which guarded the premises, but which was never shown any kindness or attention beyond being retained for his fidelity. One night, as this gentleman was going to bed, attended by his valet, an Italian, the mastiff silently followed them upstairs, and tried to gain admittance into the baronet's chamber. At first this was refused; but on the animal's continuing to make a noise at the door, it was admitted, and suffered to lie down on the floor. At





midnight the chamber-door opened, and the mastiff sprung up with a growl, and fixed on the intruder, holding him firmly until a light could be brought, when the person was found out to be the Italian valet, who confessed that it was his intention to murder his master and rob the house. It is really wonderful what presentiments of approaching danger these animals have, on account of their close observation and watchful jealousy.

Mastodon, *mäs'-to-don* (Gr. *mastos*, a nipple; *odous*, a tooth), the name given by Cuvier to a genus of extinct fossil quadrupeds, allied to the elephant, so called from certain remarkable mamillary processes on the teeth. The remains of the mastodon are found associated with those of the mammoth in the tertiary beds of England. A species of mastodon, however, larger than that found in Europe, has been found in many parts of North America. A specimen of the animal, nearly perfect, was obtained in the state of Missouri in 1840. It was exhibited at the Egyptian Hall, Piccadilly, London, in 1842 and 1843. It was greatly distorted; but having been purchased by the trustees of the British Museum, it was made to assume its natural proportions, and now forms an attractive feature in the portion of that building devoted to palæontology. Its proportions are as follows:—Extreme length, 20 feet 2 inches; height, 9 feet 6½ inches; cranium, length, 3½ feet; width, 2 feet 11 inches; tusks, extreme length, 7 feet 2 inches; circumference at the base, 27 inches. The remains were found imbedded in a brown sandy deposit, full of vegetable matter, with recognizable remains of the cypress, tropical cane, swamp moss, stems of the palmetto, &c.; and this was covered with beds of blue clay and gravel to a thickness of about fifteen feet. Indian flint arrow-heads were also found about and under the bones of the skeleton.

Matador. (*See* Bull-fights.)

Mate, *mait* (Du. *maat*, a companion), in the Commercial Marine, the designation applied to the deputy, or next in command to the captain; there being *first*, *second*, and *third mates*. In men-of-war there used to be a grade of officers ranked between the lieutenants and midshipmen, styled mates; but, in the present day, the term has given place to the appellation *sub-lieutenants*. There are, however, still *master's mates*, *gunner's mates*, and *boatswain's mates*, which are the deputies of those officers selected from the crew.

Materialism, *mä-tē'-re-al-izm*, in Phil., is commonly used to characterize such systems as deny the existence of a spiritual or immaterial principle in man apart from matter. From the loose and general way in which the term is used, it embraces systems that differ widely from each other. A very modified system of materialism, if, indeed it ought to be called materialism at all, is one which, while admitting the existence of a soul, attempts to account for the various mental phenomena by physical causes. Then there is what we may term the materialism of Dr. Priestley, which denies the existence of a soul in man capable of surviving the body, but yet believes in the resurrection of the body and a future state of rewards and punishment. Again, there are those materialists who deny the existence of anything in this world but matter, and consequently do not believe in the existence of Deity, or in a future state. The last of these are strictly and purely atheists. (*See* Atheism.) Dr. Priestley has more clearly and fully than any other person expounded the principles of materialism in the pure and proper sense of the word. He denies the existence of an immaterial principle in man, because he thinks that it could not exist in union with a material body; and because he thinks that all the mental phenomena may be explained by "medullary vibrations," and other supposed movements of the material parts. The corporeal and mental faculties are inherent in the same substance; grow, ripen, and decay together; and whenever the system is dissolved, it continues in a state of dissolution till it shall please the Almighty Being, who called it into existence, to restore it to life again. In this view the question of materialism is not, perhaps, of so much consequence as some may imagine. Its advocates deny that their doctrine militates against the hope of a resurrection; on the contrary, they maintain that it points out "more fully the necessity and value of a

resurrection from the dead," on which alone they say that the sacred writers build all their hope of a future life; for the apostle Paul says "If the dead rise not, then is not Christ risen," &c. (1 Cor. xv. 16). These views were at one time held by Robert Hall, though he afterwards saw reason to change them. Materialism almost of necessity involves the doctrines of Socinianism and philosophical necessity. The great objection to it is that it is unphilosophical. It rests entirely upon hypotheses and conjecture. We have no evidence for the assertion of Mr. Lawrence, that "medullary matter thinks." Much as is known that mind depends upon matter for its development in man, every property of mind and every property observable in matter are so essentially different, that the idea of homogeneity in the two substances is too extravagant to be admitted except on much stronger evidence than materialists have yet been able to bring forward. Until it can be inductively established that the modes of *extension* and the modes of *thought* are alike ultimately referrable to one common substance, the laws of a sound philosophy demand the ascription of the one class of phenomena to one substance, termed matter, and of the other class of phenomena to another substance, termed mind. Much mischief is often done to philosophy by mixing up the results of observation with what can only be matter of conjecture. The true philosopher, setting aside all speculation regarding the ultimate nature of matter or spirit, will set out from these as fixed principles, and apply himself to observing their qualities, capabilities, and laws.—*Rcf.* Priestley's *Disquisitions on Matter and Spirit*; and his *Three Dissertations on the Doctrine of Materialism and Philosophical Necessity*; Price's *Letters on Materialism and Philosophical Necessity*.

MATERIALS, STRENGTH OF, *mă-tē'-re-ălz* (Fr. *matériel*), the power which any substance, such as a rod, bar, beam, rope, or chain, possesses, so as to enable it to resist any attempt made to sever the adhesion of the various parts of which it is composed. The strength of materials consequently depends, in the first place, on the relative disposition of the particles of the substance to each other; secondly, on the intensity of the force by which the particles adhere to each other; and, lastly, on the manner in which the straining power is applied. The relative properties of a beam between its strength and the strain to which it is subjected, can only be made the subject of mathematical investigation by supposing the material to consist of an infinite number of threads, or fibres, arranged in lines parallel to each other in the direction of its length. These particles must also be supposed to cohere together by means of powers exerted in that direction, and also to cohere laterally by powers which may be either equal or unequal to the powers that act along its length. In glass, and some metals,—in fact in the generality of homogeneous bodies, the particles are disposed of symmetrically through the substance, and attract each in every direction with equal force. In timber, however, the lateral cohesion of the particles is less than the longitudinal cohesion of the various particles in each fibre. In trying, therefore, the load which a piece of timber will sustain, we must first find out the weight that will suffice to break it, and anything less than that will be the weight which it can bear. The stiffness of a beam is the proportion that exists between its deflection and its length, and the deflection is the extent to which it sinks, when loaded, below a horizontal line. The deflection of beams of the same timber similarly loaded varies as the weight applied and the cube of the length directly, and as the breadth and cube of the depth inversely; and this deflection, according to an eminent authority on the subject, should never be permitted to extend beyond $\frac{1}{360}$ part of the length, or $\frac{1}{10}$ part of an inch to the foot. The lateral strength of a beam is less than its absolute longitudinal strength, either against compression or extension, from the causes stated above with regard to the cohesion of the particles. Timber will bear considerable weight if it is suspended to it perpendicularly, or when pressing in the direction of its length, provided the timber is prevented from bending; and, therefore, in using timber, a lateral strain should be avoided where a longitudinal one can be substituted. The fibres of ropes have no lateral cohesion, and the strength must necessarily depend on the twisting of the fibres together, and the cohesion of all the particles in any transverse section must be destroyed before a disruption can take place. In an article in the "Penny Cyclopædia," the writer observes, that in a rod of any material consisting of parallel fibres as supposed above, being placed in a vertical position and strained by a weight applied at the lower extremity, the particles in every fibre will be separated from each other by the action of the weight, and consequently, its length will be increased. The cohesive power by which the particles are kept together will, in most cases, be lessened by the separation; and if the weight be heavy enough, or if it be allowed to act long enough, the cohesive power will be altogether overcome; that is to say, the rod will be torn asunder in some part or other. The elongation of a rod, when strained by a weight, and the amount of the weight necessary to produce fracture will, of course, depend considerably on the nature of the material. The following is a table of breaking weights in pounds avoirdupois, taking the area of a transverse section of each rod to be one square inch:—English oak, 8,000 to 12,000 lbs.; fir, 11,000 to 13,488; beech, 11,500; mahogany, 8,000; teak, 15,000; cast steel, 134,256; iron wire, 93,964; Swedish bar-iron, 72,064; best English malleable iron, 60,000; cast iron, 18,656 to 19,488; wrought copper, ,792; platinum wire, 52,987; silver wire, 38,257; ge wire, 30,888; zinc wire, 22,551; tin wire, 7,129; lea wire, 3,146; and rope of one inch circumference, 1,000 to 12,500. A piece of timber has been proved to be of the greatest strength when cut out of a round tree, by dividing the diameter into three equal parts, raising perpendiculars upon them, and prolonging these until they cut the circumference; a rectangle uniting these points shows the form of the strongest beam that can be obtained. The strain upon a beam fixed at one end in a wall, and loaded at the other, is four times greater than when the same weight is hung upon the middle of the same beam, and the latter is supported at both extremities. When a beam is fixed at both its extremities, and is loaded in the middle, its strength is to that when only supported at its two ends as 3 to 2; and when a weight is uniformly distributed over a beam, its mechanical action to produce fracture is only one-half of what it is when collected in the middle. If a body is compressed in a direction perpendicular to the length of the fibres, the points of support being very near together, and on opposite sides of the place at which the force is applied, the strain to which the body is subjected has been called the force of detorsion. A writer in the "English Cyclopædia" observes that "such machines as capstans, windlasses, and axles, which revolve with their wheels, are, when in action, subject to be twisted; so that their fibres tend to become curved in oblique directions; and the strain thus produced is called that of torsion. The most natural way of investigating the strength to resist this kind of strain is probably that which was adopted by Dr. Robison. This mechanician imagined the cylindrical body to be composed of an infinite number of concentric hollow cylinders inserted in each other, and, supposing the whole to be cut by a plane perpendicular to the axis, he conceived that two particles in the circumference of any one of the concentric circles would resist the effort to separate them by a force proportioned to their distance from the common axis." Some useful tables with regard to the different resistances made by various substances to efforts of compression and extension will be found given in Willis's edition of Barlow's *Materials and Construction*; Carr's *Synopsis of Practical Philosophy*; Cressy's *Encyclopædia of Civil Engineering*; and in many other useful works, particularly in Claudel's *Formules à l'Usage des Ingénieurs*. *See* also article on MECHANICS.

MATERIA MEDICA, *mă-tē'-re-ă med'-e-kă* (Lat.), a general name for the substances and agents which are employed for the relief or cure of disease. The term is also applied to that branch of study which elucidates the nature and properties of such substances and agents. In medical schools it is customary to connect Materia Medica with Therapeutics, and to expound both departments of science in one course of lectures. Therapeutics may be described as that branch of study which treats of the application of the Materia Medica for the prevention and cure of the various diseases.

## Materia Medica

These allied branches of professional study are of the utmost importance; for before a thorough knowledge of the nature and action of medicines is obtained, it is impossible to know how and when to prescribe them. Medicines have been defined as "all substances which have the power of modifying the actual state of one or more of our organs, and which possess this property independent of their nutritive qualities." It is not easy to define medicines or remedies as distinct from poisons, for there are many substances that act either as remedies or poisons according to the quantities in which they are applied to our organs. The Materia Medica may be classified in two ways; the first being according to their natural history, and the second according to their physiological and therapeutic effects. In the natural history arrangement, remedies obtained from the inorganic kingdom (mineral and chemical substances) form the first class; remedies yielded by the vegetable kingdom (herbs, fruits, roots, leaves, principles separated from plants, &c.) form the second class; and remedies yielded by the animal kingdom (insects, fats, animal secretions, &c.) form the third class. Many classifications, based upon the effects of remedies, have been proposed; but they are all more or less imperfect, as several remedies produce very different effects, and many diseases are curable by different modes of treatment. The arrangement adopted by Dr. Royle, in his excellent "Manual of Materia Medica and Therapeutics," comprehends the principal features of all the best schemes of classification. The divisions of this arrangement are shown in the following table:—

A.—Mechanical Remedies.

Diluents, Demulcents, Emollients.

B.—Chemical Remedies.

Escharotics, Acids, Alkalies, Antilithics, Disinfectants, Astringents, Antidotes.

C.—Vital Agents.

1. *Evacuants or Local Stimulants.*

Alteratives, Errhines, Sialogogues, Emetics, Expectorants, Diaphoretics, Diuretics, Cathartics, Anthelmintics, Emmenagogues, Rubefacients.

2. *General Stimulants.*

Tonics, Stimulants, and Aromatics. Diffusible and Special Stimulants.

3. *Depressants, or Contra-Stimulants.*

Narcotics, Antispasmodics, Refrigerants, Sedatives.

The groups of medicinal agents ranged under the head of "Mechanical Remedies" are supposed to act only as ordinary physical agents, or by their simple mechanical properties. *Diluents* are remedies which are supposed to increase the fluidity of the blood: their general effect is to allay thirst and to diminish the heat of the skin; to promote transpiration from the skin, as well as to increase the flow of urine. *Demulcents* and *Emollients* are substances which are calculated to soften and lubricate the parts to which they are applied. The former term is restricted to such as are intended for internal exhibition, and the latter to such as are intended for external application: thus, arrowroot, calves'-feet jelly, and liquorice, are demulcents; while liniments, embrocations, and cataplasms, are emollients. Under the head of "Chemical Remedies" are placed those agents which seem to act chiefly by producing chemical changes in the solids or fluids of the body. *Escharotics*, usually called *caustics*, are substances employed for destroying the vitality of the part to which they are applied. *Acids* and *Alkalies* act upon the secretions as they act upon substances out of the body, and respectively counteract alkalinity and acidity. *Antilithics* are medicines which counteract the tendency to the deposition of urinary sediments or calculi. *Disinfectants* are substances suited to free the air of buildings, and infected bodies in general, of the invisible particles which propagate disease; while *Antiseptics* are those chemical agents which prevent the decomposition of organic structures, whether vegetable or animal. *Astringents* are remedies which have the power of corrugating, or of producing a contraction, of the muscular fibres of the part to which they are applied, as well as of coagulating or precipitating albuminous fluids. *Antidotes* are agents which counteract the effects of poisons. The division "Vital Agents" includes those groups of medicines which are considered to act in a more special manner upon the living structures,—upon the muscular, sanguineous, and secerning systems, and all as dependent upon the nervous system. The groups placed in the first subdivision, *Evacuants*, cause increased secretion or evacuation from the different organs. *Alteratives*, according to the usual interpretation of the term, are remedies which, when taken in comparatively small doses, and continued for some time, by degrees, and almost without any perceptible effect, produce changes in the secretions and in disordered actions. *Errhines* are medicines which are applied to the mucous membrane of the nostrils: those which cause sneezing are sometimes distinguished by the term *Sternutatories*. *Sialagogues* are medicinal agents which increase the secretion of saliva; *Emetics*, those which evacuate the stomach by vomiting; *Expectorants*, those which favour the expulsion or secretion of mucus from the organs within the chest; and *Diaphoretics*, those which increase exhalation from the surface, and the natural function of perspiration: to the latter, when acting so as to produce sweating, the term *Sudorifics* is applied. *Diuretics* are medicines which are considered to have the power of augmenting the secretion of urine; *Cathartics* increase the peristaltic movements of the intestinal canal, evacuate its contents, and usually augment its mucous secretions. These were formerly divided into *Hydragogues*, causing watery evacuations, and *Cholagogues*, favouring the secretion of bile. Cathartics are also often distinguished according to their energy of action; as *Laxatives*, which merely evacuate the intestinal contents, and *Purgatives*, which stimulate secretion and accelerate evacuation. The more violent purgatives are further distinguished as *Drastics* and *Hydragogue Cathartics*. *Anthelmintics* are medicines which are prescribed against the production of worms, also to destroy or prevent them. Those which destroy or expel worms are also termed *Vermifuges*. *Emmenagogues* are medicines which are considered to have the power of promoting the menstrual discharge, when either retained or suspended. *Rubefacients*, as their name indicates, produce redness of the skin, with warmth and increased sensibility. These are also known as *Counter-irritants*, and when concentrated, as *Epispastics*, or *Vesicants*. The second subdivision, *General stimulants*, includes those remedies which excite all the principal functions of life, by directly influencing the nervous system. *Tonics* are those which possess the power of gradually increasing the tone of the muscular fibre when relaxed, and the vigour of the body when weakened by disease. *Stimulants* or *Excitants* are medicines which exalt nervous power; *Aromatics* are those stimulants which are grateful in odour and taste, as the spices, &c.; and *Diffusible stimulants* those which excite the whole system with great rapidity through the medium of the brain. Of the latter group alcohol and ether are examples. The subdivision *Depressants* includes those medicines which are employed to subdue inordinate action; the *Narcotics*, which, by acting on the brain or spinal marrow, assuage pain, control restlessness, and procure sleep; the *Antispasmodics*, which allay the irregular muscular contractions called spasms; the *Refrigerants*, which diminish the force of the circulation, and so reduce the heat of the body; and the *Sedatives*, which directly, and primarily depress the powers of life without previously exciting nervous action or increasing the circulation.

For particulars respecting the substances employed as medicines, the reader is referred to the botanical and chemical articles of the Dictionary; also to Dr. Royle's *Manual*, mentioned above.

## Mathematics

Mathematics, *math-e-mat'ics* (from Gr. *mathesis*, learning), a term applied to that science which investigates the consequences which are logically deducible from any given or admitted relations between magnitudes or numbers, without being descriptive of their subject matter. Mathematics are divided into two classes; namely, *pure* and *mixed*. Pure mathematics embrace such subjects where magnitude is only considered in the abstract. From the fact of this branch being founded on the simplest notions of quantity, the conclusions which are deduced from it have the same evidence and certainty as the elementary principles from which they are obtained. Pure mathematics

consequently comprehend *Arithmetic*, treating on the properties of numbers; *Geometry*, treating of extension as dependent on the three qualities of length, breadth, and thickness, without considering any physical qualities with which bodies may be endowed; *Algebra*, which compares together all quantities, whatever may be their value; and, lastly, the *Differential* and *Integral Calculus*, which operations consider magnitudes as of two kinds,—constant and variable; the variable magnitudes being generated by motion, the operations of the calculus being to determine the values of these quantities from the velocities of the motions with which they are generated. On the other hand, *mixed mathematics* consider the application of *pure mathematics* to certain established physical principles; and this branch comprehends all the mathematical sciences which appertain to physics; as *mechanics*, *hydrodynamics*, *optics*, *astronomy*, *acoustics*, *electricity*, and *magnetism*. A writer in the "English Cyclopædia" observes, "The unavoidable certainty and definite character of mathematical conclusions have obtained for mathematics the name of *exact science*; but to this name it has not exclusive right. The laws under which we must think are the foundation of a science which has an equal claim with mathematics to any epithet which indicates either necessity or precision. Accordingly, logic and mathematics are separate branches of exact science. There are but three things of which we cannot divest ourselves so long as we imagine ourselves to retain both existence and consciousness of existence,—they are, thought, space, and time. With everything else there is a possibility of dispensing; that is, the imagination can conceive everything got rid of and out of existence, except its own consciousness in some kind of activity, and the space and time without which it cannot conceive existence. The necessary laws of thought are the subject matter of logic; the necessary properties of space and time are the subject matter of mathematics. *Number* is an offspring of the notion of time; enumeration is a succession in time: in no other way can *number* be distinguished from *multitude*. And geometry is, without need of illustration, the offspring of the notion of space." The rise of mathematics from the days of Thales and Pythagoras will be found given under the art. GEOMETRY, and it need not be commented upon here. Mathematical science may be either used as a discipline of the mind, or it may be applied as an instrument in the advancement of the arts and in studying the wonderful panorama of the world around us. Taken in the former point of view, the object of mathematics is to strengthen, by frequent examples, the power of logical deduction; to put forth a view of the difference between reasoning on probable premises and on certain ones, by constructing a body of results which do not involve, in any case, the uncertainty arising from the introduction of that which might have been false. Mathematics also tend to form the habit of concentrating the attention closely to difficulties which can possibly be only overcome by thought, and over which victory is certain, so that the right means be used. As an instrument in advancing the arts and investigating the laws of nature, mathematics enable us to acquire vast knowledge; and without their aid most of the physical and other sciences would still be in a state of embryo. This knowledge, therefore, is gained by our applying abstract truths and tried formulas in order to obtain results before hidden; and, by advancing fictitious premises, to arrive at the real truth, which custom might endeavour to conceal. It would be impossible, in the present article, to enter at length upon the metaphysical discussion of the subject, as it would be alike not our purpose so to do. The various branches of mathematics, however, will be found given under their respective headings, and to those articles the reader is referred for further information. (*See* FLUXIONS, GEOMETRY, INTEGRAL CALCULUS, &c. &c.)

MATICO, *mät'-e-ko*, the name applied in South America and Mexico to leaves of certain plants employed to stop bleeding. The matico was first brought into notice as a styptic in leech-bites, wounds of arteries, &c., by Dr. Jeffreys, in 1839; and it is now officinal in the Dublin Pharmacopœia. Its action is probably simply mechanical, depending on the hairs which cover its under surface. It is probably useless as an internal styptic, as which, nevertheless, it has been recommended by some writers. (*See* ARTANTHE and EUPATORIUM.)

MATRICARIA, *mät-re-kat'-re-à*, in Bot., a gen. of the nat. ord. *Compositæ*. The species *M. Chamomilla* bears flowers which have similar properties to those of the true chamomile plant. (*See* ANTHEMIS.)

MATTHEW, ST., GOSPEL OF, *mätth'-yu*, is the first in order of the four Gospels of the New Testament, and is generally believed to have been first also in point of time; but the exact date is unknown. Opinion is divided as to whether this Gospel was originally written in Greek or Hebrew, or whether Matthew did not write it in both languages. On the genuineness and authenticity of St. Matthew's Gospel we have the most satisfactory evidence, though there have not been wanting critics to call them in question. The Gospel of St. Matthew, as compared with the other Gospels, is characterized by the clearness and particularity with which many of our Saviour's discourses and moral instructions are related; as in the sermon on the Mount, &c. In general, it may be said that the narration of our Lord's actions is commonly made subservient to his instructions which are introduced. The style is everywhere plain and perspicuous. This Gospel was evidently primarily written for Christians of Jewish descent in Palestine. Every circumstance is carefully pointed out which might tend to strengthen the faith of that people, and every unnecessary expression is avoided that might tend to obstruct it. Everywhere there is kept in view the evolution of the twofold title of the first verse, "son of David," "son of Abraham." This Gospel consists of four parts:—1. On the infancy of Jesus Christ (i. ii.); 2. the discourses and actions of John the Baptist preparatory to our Saviour's commencing his public ministry (iii.—iv. 11); 3. the discourses and actions of Christ in Galilee, by which he demonstrated that he was the Messiah (iv. 12—xx. 16); 4. containing the transactions relative to the passion and resurrection of Christ (xx. 17—xxviii.).—*Ref.* Horne's *Introduction to the Holy Scriptures*.

MAUNDAY THURSDAY, in the Church, is the Thursday before Easter, being the day on which our Lord instituted the holy sacrament of the Eucharist. The name maunday is said to be a corruption of mandati (*dies mandati*, day of the commandment), in allusion to the commandment which our Saviour gave on this day, after washing his disciples' feet, to love one another. Others suppose that the name is from the *mannds*, or baskets of gifts, which Christians were in the way of presenting to each other on this day in token of mutual affection. It is customary in some parts of the continent for bishops, sovereigns, and others, to wash the feet of twelve poor persons on this day; and in this country it is still the custom for the lord almoner to distribute certain royal donations to the poor in the royal chapel at Whitehall on Maunday Thursday.

MAUSOLEUM, *maw-so-le'-um*, a term applied in modern times to a sepulchral building erected for the purpose of receiving a monument. It originally signified the sepulchre of Mausolus, king of Caria, a magnificent edifice erected by his queen Artemisia, at Halicarnassus, B.C. 353. In order to raise this splendid monument to the memory of her deceased husband, the queen employed the most eminent architects and artists of the Ionian and Attic schools. The description of the mausoleum as given by Pliny is very unsatisfactory, although it is the most complete which we possess. The very site of the building was in doubt until a few years ago, when Mr. C. T. Newton, keeper of the Greek and Roman antiquities in the British Museum, discovered its remains at Budrum, in Asia Minor. Representations having been made to the English government, an expedition was fitted out in 1856, and by careful excavations and examinations, the original site was clearly made out and some very extraordinary statues and sculptures in marble obtained. According to Pliny, the original building was an oblong quadrangular *cella*, 63 feet from north to south, 411 feet in circumference, and 37½ feet in height, decorated with a peristyle of 36 columns, and carried up into a pyramid surmounted by a chariot and four horses, executed in marble by Pheleus, one of the architects. In many respects Mr. Newton's measurements agree with those

given by Pliny. — Ref. *A History of Discoveries at Halicarnassus, Cnidus, and Branchidæ*, by C. T. Newton, M.A.

MAXIMA AND MINIMA, *mâks'-e-mâ, mĭn'-e-mâ* (Lat., the *greatest* and *least*), terms employed not to signify the absolute greatest and least (as the words imply) values of a variable quantity, but the values it has on the instant when it ceases to increase and begins to decrease, or *vice versâ*. A variable quantity may, therefore, have several *maxima* and *minima*. The theory of the *maxima* and *minima* will be found given in most elementary works on the differential calculus.

MAY, *may* (Lat. *Maius*), the fifth month of the year, has thirty days. It was second in the old Alban calendar, third in that of Romulus, and fifth in that of Numa Pompilius. In the Alban calendar it only had twenty-six days, in the calendar of Romulus thirty-one days, and in that of Numa thirty days. The odd day of which Numa deprived it was restored by Julius Cæsar. The etymology of the word is doubtful. It was called *Maius* by Romulus, in respect to the senators and nobles of his city, who were called *Majores*, as the month following was called *Junius*, in honour of the youth of Rome, who served him in war, and were named *Juniores*. Some etymologists are of opinion that it was called *Maia* from the goddess of that name, the mother of Mercury, to whom they offered sacrifices on the first day of this month. The sun enters Gemini during May, and the plants of the earth generally begin to flower.

MAYACEÆ, *may-ai'-se-e*, in Bot., the *Mayaca* fam., a nat. ord. of *Monocotyledones*, sub-class *Petaloideæ*, consisting of a single genus of small moss-like plants closely allied to *Commelynaceæ*. They are found in America, from Brazil to Virginia. Their properties and uses are unknown.

MAY-APPLE. (*See* PODOPHYLLUM.)

MAY-DAY, *may'-day*, the 1st of May. From an early period it was the custom for all ranks of people to go out "a maying," as it was called, early on the 1st of May. In all parts of England, at the dawn of May-day, the lads and lasses left their towns and villages and repaired to the woodlands with music and singing. There they gathered the *may*, or blossoming branches of the trees, and bound them with wreaths of flowers. Returning home by sunrise, they decorated the lattices and doors of their dwellings with their scented spoil, and spent the rest of the day in sports and pastimes. According to Bourne, the after-part of May-day was chiefly spent in "dancing round a tall pole, which is called a Maypole, which, being placed in a convenient part of the village, stands there, as it were, consecrated to the goddess of flowers, without the least violation offered to it in the whole circle of the year." At one time, as we can see from the writings of Chaucer, Shakspeare, Browne (author of "Britannia's Pastorals"), and others, the customs of May-day were not only observed by the vulgar but also by royal and noble personages. The Maypole became very popular, and was raised in every town and village; and Robin Hood, Friar Tuck, Maid Marian, and the Morris-dancers, together with other fantastic masques and revellers, performed their antics round the May-day pole in every town and city. These customs gradually fell into disuse, till the celebration of the day was left entirely to the chimney-sweepers, with their "Jack in the Green," who still go about on May-day in their tawdry finery, merely to beg money from the street spectators. In some country villages, however, a feeble attempt at "going a maying" is made at the present day. The celebration of May-day probably had its origin in the worship of Flora, who was supposed to be the goddess of flowers, and whose rites were solemnized at that season by the ancients. The earliest notice of the celebration of May-day in this country was by the Druids, who used to light large fires on the summits of the hills in honour of the return of spring.—*Ref.* Hone's *Every-Day Book*.

MAY-FLY, *may'-fly* (*Ephemera vulgata*), is the common type of the neuropterous insects of the genus *Ephemera*. It is very plentiful in the early part of summer about the banks of rivulets and stagnant waters. In appearance it is of a somewhat greenish-brown colour, with transparent wings mottled with brown; and there are thin, long, black bristles attached to the extremity of the body. During the day the May-fly is generally observed with its wings closed in a quiescent posture; but in the evening it flutters about over the surface of the water which it affects. (*See* article EPHEMERA, which enters into the scientific description of this insect.)

MAYOR, *may'-or* (Lat. *major*, Fr. *maire*), is the chief magistrate in a borough or corporate town, and in London, York, and Dublin, is styled lord mayor. Their powers and duties depend generally on the provisions of charters, corporate usages, or express enactments in acts of parliament. They are elected annually, and are justices of the peace *pro tempore*.

MAYOR OF THE PALACE. (*See* MAJOR DOMUS.)

MAZURKA, or MAZOURKE, *ma-zur'-kâ*, a Polish national dance in three-eight time, of a peculiar rhythmic construction, somewhat resembling that of the *polacca*.

MEAD, *meed* (Sax. *medo*, *medu*), a vinous liquor extracted from honey. It is formed from a solution composed of one part of honey to three of boiling water, flavoured with spices, a portion of ground malt and a piece of toast being added, in order that fermentation may ensue. There is no doubt that mead formed the favourite beverage, for centuries, of the northern people; it is also frequently mentioned in *Ossian*. (*See* HONEY.)

MEADOW-SAFFRON. (*See* COLCHICUM.)

MEADOW-SWEET. (*See* SPIRÆA.)

MEAN, *meen* (from Lat. *medium*), a term applied in Math. to a quantity which possesses an intermediate value between several others, which are formed according to any assigned law of succession. The *Arithmetical Mean* is the *average* of any series of numbers, and is found by adding the values of the quantities together and dividing by their number. The arithmetical mean $a$ and $b$, any two quantities, therefore, is $\frac{a+b}{2}$; if $a+b+c = \frac{a+b+c}{3}$, and so on. The *Geometrical Mean* between any two quantities, or the *mean* proportional, is a quantity which forms the middle term of a duplicate ratio, or, in other words, is the continued proportion of those terms; so that the first quantity is to the number sought as the number sought is to the third term. To find the geometrical mean between $a$ and $b$, any two quantities as before, let $x$ be the required mean,—

$$\therefore\ a : x = x : b$$

and, consequently, $x = \sqrt{ab}$; therefore the geometrical mean between any two quantities equals the square root of their product. The *Harmonical Mean* is such a number that, the first and third terms being given, the first is to the third as the difference of the first and second is to the difference of the second and third. The harmonical mean, therefore, between $a$ and $c$ may be, say $b$, and $b$, or the mean required, $= \frac{2ac}{a+c}$.

MEASLES, *meaz'-ls* (Lat. *Rubeola*), is a contagious fever of an inflammatory type, attended with a characteristic eruption, and all the symptoms of a violent cold; watery discharge from the eyes and nose, dry cough, hoarseness, &c. It commences with the ordinary symptoms of fever,—chilliness, loss of appetite, lassitude, and almost invariably attended with inflammation of the mucous membrane lining the air-passages. The eruption commonly appears on the fourth day; at first about the head and neck, then the trunk and arms, and finally reaching the lower extremities. It takes two or three days to complete its course, and when it reaches the feet and legs, it has usually begun to disappear from the face. At the end of six or seven days from their first appearance, the papulæ have again disappeared. The eruption consists of little papulæ somewhat resembling flea-bites of a dark-red colour. When the eruption is fully out, the cough, at first dry and troublesome, generally becomes softer and less frequent. All ages are liable to attack, though infants at the breast are not so liable as those somewhat older. It is not commonly a dangerous disease, though sometimes it has proved exceedingly fatal. Where danger occurs, it is from inflammation of the air-passages, when the disease may become complicated with croup; or in subjects predisposed to consumption,

the seeds of that disease may be developed. In general, a simple diet and the maintenance of an equable temperature is almost all that is required, with, perhaps, the exhibition of a mild diaphoretic or expectorant. Sometimes the application of a mustard cataplasm to the chest is of advantage.

MEASURE, *mezh'-er* (Fr. *mesure*), that division of the time by which the air and motion of music are regulated. Although some affirm it to be of modern invention, there is no doubt that the ancients not only practised the division of time, but formed it upon very severe rules, founded upon principles unknown to the modern musicians.

MEASURES. (*See* WEIGHTS AND MEASURES, and METRIC SYSTEM.)

MECHANICS, *me-kăn'-iks* (Gr. *machina*, a machine), a term applied in Nat. Phil. to one of the most important branches of practical mathematics. Mechanics comprehend the laws of motion, and the action of bodies on one another, to give a simple definition of the word. The term, as originally understood, embraced only the application of machinery; but in the present day, mechanics have been extended to comprehend the theory as well as practice of motion and equilibrium, both with and without the aid of machinery. As this branch of mathematics has much to do with the spread of civilization and the march of improvement, it may be as well to give a slight sketch of the rise and early history of the science. From the remnants left us of the customs and exploits of the ancients, there can be no doubt that mechanics and mechanical powers were known many years prior to the birth of Christ. The stupendous pyramids of Egypt are striking evidences of the wonderful mechanical aids which the Egyptians must have been acquainted with, powers so vast, that even in the present day, with our amount of theoretical and practical knowledge, they could not be equalled, much less eclipsed. Aristotle is the first author about whom we have any proof of having written on mathematics, and he describes the simple powers of forces clearly, but somewhat erroneously. The first great mechanist is, however, undoubtedly Archimedes, and he did much, not only for geometry, but also for hydrostatics, of which he discovered and explained the general principles. Archimedes also discovered the centre of gravity (*see* GRAVITATION), and many useful and important machines which have not descended to our own times. Water-mills are the oldest of mechanical inventions that have come down to us from the ancients, although hand-mills for grinding corn were well known to the Romans. The inclined plane (*see* article on the subject) was invented by Cardan. Simon Stevens, of Bruges, discovered and applied the theory of the parallelogram of forces; and the centre of gravity, as applied to solid bodies, was modelled, *in extenso*, from the early theory of Archimedes, by Lucas Valerius. Galileo was the first modern mathematician who did much for mechanics; for, under his hands, that science assumed perfectly different proportions from what it had done before. Toricelli, his pupil, further enlarged the theories which Galileo had started. The names of Pepin, the marquis of Worcester, Huygens, Wallis, and Wren, may likewise be added as illustrating mechanics in the 17th century. One of the greatest inducements, however, to the prosecution of this study was the publication of Newton's "Principia" (*see* PRINCIPIA). The steam-engine may be said to be the greatest of discoveries which have been made in this path, and a full description will be found given of it under articles headed LOCOMOTIVE ENGINE and STEAM-ENGINE. Euler's treatise on mechanics is one of the best works on the subject extant, and the student would do well likewise to consult Lagrange's "Mécanique analytique," and also Wood's, Whewell's, and Moseley's works. According to an excellent article on the subject in the "Encyclopædia Britannica," the theory of mechanics properly comprehends — 1. dynamics; 2. the motion of projectiles; 3. the theory of simple machines, or the mechanical forces; 4. the theory of compound machines, and their maximum effects; 5. the doctrine of the centre of gravity; 6. the doctrine of the centre of oscillation, gyration, &c.; 7. the collision of bodies; 8. the theory of rotation; 9. the theory of torsion; 10. the strength of materials; 11. and lastly, the equilibrium of arches and domes. The elementary machines, or mechanical powers, properly speaking, are six in number, and may be thus enumerated:—the lever, the wheel and axle, the pulley, the inclined plane, the wedge, and the screw; all of which will be found duly described under their usual appellations. (*See* LEVER, INCLINED PLANE, &c. &c.) Under the articles STATICS, DYNAMICS, HYDRODYNAMICS, and so on, the description of the elements of mechanics will be found fully given, and consequently they need not be treated on in the present article, which only has for its object the uniting of the several component parts of this branch of natural philosophy under one head.

MECHANICS' INSTITUTES is the name given to certain establishments which have been instituted in most of our larger towns for affording instruction to the working classes. The first idea of them is attributed to Dr. Birkbeck, who, in the year 1800, delivered a course of lectures on natural philosophy to working men in Glasgow. It was not, however, till about twenty years later that mechanics' institutions came to be established; and for a time they were very popular, and almost every town of 8,000 or 10,000 inhabitants came to have its mechanics' institute. Short courses of lectures on various popular subjects, as chemistry, natural philosophy, botany, political economy, &c., were delivered. In some cases reading-rooms and libraries were attached, and classes for English grammar, arithmetic, French, &c., established. They are supported partly by subscription and partly by contributions of the members. For some reason or other, however, mechanics' institutions have not been so successful as might have been expected; many of them had to be given up, and others were obliged more or less to alter their original intention and become more popular. As a general rule, it will be found that working men do not care to attend courses of lectures on any subject, especially on one that they cannot turn immediately or directly to account. After two or three lectures, the interest begins to flag. Wherever, then, a special subject is taken up, it ought to be exhausted in two or three lectures; and particularly the subject ought to be of an interesting and popular character; as accounts of men and places, travels, readings from popular authors, and occasional concerts. Reading-rooms and libraries in connection with mechanics' institutes are generally found to be well appreciated by working men.

MEDALLION, *me-dăl'-le-on*, is a term applied to those larger medals which, if gold, exceed the *aureus* in size; if silver, the *denarius*; and if copper, the first or large brass. There have been many discussions among antiquaries as to the purposes for which medallions were designed; they are generally, however, supposed to be struck, like the medals of our own time, to commemorate some important event. Yet there are circumstances connected with them which render it not at all improbable that they were intended for circulation as money. They are not very numerous. Those of Greece, or those struck in the Grecian empire, are more common than those of Rome, but are of inferior workmanship. There exist in the present day a gold medallion of Augustus and one of Domitian; but few, in any metal, are found of the eras of Adrian and Antonine: those of brass are the largest, several being many inches in diameter. Impressions of both medals and medallions can easily be taken by pouring a little isinglass, previously melted in brandy, over the coin to be copied, and letting the solution spread over the whole surface. After standing a day or two, it will be quite hard, and on being taken off, will be found to contain a clean impression. The subjects COINS and MEDALS are so bound up together, that they will be found more scientifically described under the article NUMISMATICS (which *see*).—Ref. *Encyclopædia Britannica*, art. Numismatics; also *The Popular Encyclopædia*.

MEDALS, *med'-dls* (from the Gr. *metallon*, metal), are those coins belonging to the study of Numismatics (which *see*), that are cast on some especial occasion to celebrate some important or remarkable event or personage; the first, strictly speaking, medals of antiquity being undoubtedly the medallions of the Romans.

## Medicago

The greatest difference that exists between the medals of ancient and modern times is owing to the fact that those of the later period have often portraits of illustrious personages who are not of regal origin, while those of the former never bear any but royal or imperial celebrities. The study of this branch of science and art is indispensable to archæology, and indeed to a thorough acquaintance with the fine arts. Medals indicate the names of provinces and cities, while determining their position, and they also present pictures of many places celebrated in history. They also fix the period of events, determine occasionally their character, and at the same time enable us to trace the different races of sovereigns who at various times have governed particular parts of the world. They also show us the different metallurgical processes, they enable us to discover the various alloys, the mode of gilding and plating practised by the ancients, the metals which they used, and their weights and measures, their different modes of reckoning, the names, titles, and orders of their various magistrates and princes, while also giving us their portraits; their different characters, modes of worship, with all their attributes and ceremonies, are likewise disclosed, and in fact everything that pertains particularly to civil, military, and religious usages. The ancient medals were either struck or cast; some, however, were first cast and then struck. Medals have two sides; the obverse side (*pars adversa, antica, l'avers*), which contains a portrait of the person in whose honour it was struck, or other figures relating to him. This portrait consists either of the head alone, or the bust, or of a half or full length figure. The reverse of the medal (*pars adversa, postica, le revers*) contains mythological, allegorical, or other figures. The words which are around the border form what is termed the *legend*, while those in the centre are the *inscription*. Of all medals those from Egypt are the most ancient; and next to these rank those of Greece, the latter far surpassing the former in beauty of design and clearness of execution. Those of ancient Rome are extremely beautiful, the engraving being fine, the taste unexceptionable, and the invention simple. These latter are divided into two classes,—consular and imperial. Of these the former are the most ancient, for the copper and silver ones do not go further back than the 484th year of the Roman period, while those of gold do not extend further back than to the year 546. The imperial medals first commenced under Julius Cæsar, and continued until the year A.D. 260, the lower empire containing a space of 1200 years, ending with the capture of Constantinople. In the arrangement of medals, it is observed, in an article in the "Encyclopædia Britannica," that a general uniformity is no slight gain, and may reconcile us to partial defects. These defects must be remedied, in large collections, by the use of cross references from one cabinet to another, and by the formation of independent series to illustrate the general one. The latter suggestion is well worthy of careful consideration. A series illustrative of Greek art, and another of Roman art, might be formed. A series of portraits, and another of groups, would be equally valuable. Others might be made to show the changes of states, by the weights and values of the materials used in their construction, while illustrating the history of the particular country or city in question.

MEDICAGO, *med-e-kai'-go* (said to be from *medike*, a name given by Dioscorides to a Median grass), in Bot., a gen. of papilionaceous *Leguminosæ*, including many valuable fodder-plants. The name of *Lucerne* is commonly applied to species and varieties cultivated in this country.

MEDICAL JURISPRUDENCE is that department of science in which medical knowledge is called in to the aid of legislation, and consists in the application of the principles of medical science to the administration of justice and the preservation of the public health. Even as early as the institution of the Mosaic economy, we find traces of a medical jurisprudence, when the judges were enjoined to consult the priests, who were then the only physicians, on the modes of distinguishing leprosy from other diseases, &c. In ancient Greece, though the principles of medical science were successfully cultivated, they seem to have been little



## Medical Jurisprudence

employed in legislation. In the Justinian code, we find very obvious traces of the relation between medicine and law. But the origin of medical jurisprudence as a science cannot be considered to date farther back than the middle of the 16th century, when the celebrated Carolinian Criminal Code was published in Germany. This code of Charles V. enjoined the magistrate, in all cases of doubt respecting asserted pregnancy, infanticide, the means of homicide, and other cases of death by violence, to consult the opinions of living medical men; for, singularly enough, the Justinian code referred the decision of medical questions, not to living witnesses, but "the authority of the learned Hippocrates." During the latter part of the 16th and the earlier part of the 17th century, medical jurisprudence made marked progress. Ambrose Paré, the first writer on this subject in France, wrote on monstrous births and simulated diseases; in 1602, Fortunatus Fidelis published, at Palermo, his system of legal medicine, and about twenty years later, Paulus Bracchias commenced the publication of his celebrated "Quæstiones Medico-legales," which, for completeness and learning, was the first great work on the subject. In France, in 1600, Henry IV. authorized the appointment of two persons skilled in medicine and surgery, in every considerable town, to make examinations and report in all cases of wounded or murdered persons; and from the middle to the end of the 17th century, various decrees of the parliament of Paris were directed to the improvement of legal medicine. Bartholin, Swammerdam, and Jan Schreyer, are distinguished names in this science in the latter half of the 17th century. About the middle of that century, Michaelis gave the first course of lectures on it in the university of Leipsig: these were soon after followed by the lectures of the celebrated Bohn. The 18th century teems with important works on this science; among the more important of which may be mentioned the "Pandectæ Medico-legales," of Valentine (1722); "Systema Jurisprudentiæ Medicæ," of Alberti (6 vols., Halle, 1725-47); "Institutiones Medicinæ Legalis et Forensis," of Tischmeyer; "Elementa," of Plenck (1781); "Systema," of Metzger, (1795); and the "Collectio Opusculorum," of Schlegel. The celebrated lectures of Holler were published after his death, in 1782-84; and just before the close of the century, Foderé published his "Les Lois éclairées par les Sciences physiques." Among the other distinguished names in this science during the period are Plouequet, Daniel, Portal, Camper, Loder, Antoine Louis, and Chaussier. The short elementary treatise of Dr. Samuel Farr (1788) may be said to be the only work that had yet appeared in the English language. The most important accessions to medical jurisprudence during the present century are derived from our increased knowledge of the nature of mental disease and the nature and effects of poison, with the means of detecting them. In 1813, Foderé issued a new and much enlarged edition of his treatise, and in the following year appeared the valuable work of Orfila on toxicology ("Toxicologue générale"), followed, five years, later by his "Leçons de Médecine légale." Devergier, Briand, Capurori, Biessy, Esquirol, and Marc, are authors of learned treatises, or of dissertations on single subjects. Among the Germans, Schmidmüller, Rose, Willberg, Gmelin, Remus, Bernt, Henke, and many others, have made various and valuable additions to the science. The first respectable English work on this subject was by Dr. Male in 1816, entitled "Epitome of Juridical or Forensic Medicine for the Use of Medical Men, Coroners, &c." In 1818, Dr. Haslam published his "Medical Jurisprudence as it relates to Insanity," and Dr. Gordon Smith his "Principles of Forensic Medicine," in 1821. Two years later appeared the formal and elaborate work of Messrs. Paris and Fonblanque (a lawyer and a physician), in 3 volumes 8vo. The works of Dr. Christisson on poisons, of Drs. Beck, Traill, and Taylor, may be referred to, as in their latest editions being the most able and complete treatises in our language. Medical jurisprudence is usually divided into forensic medicine and medical police; the first comprising—(1) questions affecting the civil rights or social duties of individuals; (2) injuries to property; and (3) injuries to the person; the latter (1) questions affecting the preservation of individuals;

(2) what relates to the health of men collected in communities. Under the head of questions affecting the civil or social rights of individuals come to be considered —(*a*) the development of the human frame, with the periods of growth, maturity, and decay; (*b*) duration of human life; (*c*) personal identity; (*d*) marriage, with the physical circumstances affecting its legality or which may justify divorce; (*e*) impotence and sterility, with the causes and marks of; (*f*) pregnancy, its signs and limits; (*g*) parturition; (*h*) monsters and hermaphrodites; (*j*) paternity and affiliation; (*k*) presumptions of survivorship, as where a mother and new-born infant are found dead together, it is often of importance to find out which survived the other; (*l*) mental alienation, and the means of distinguishing between real and affected cases of insanity; (*m*) the rights of the deaf and dumb; (*n*) maladies exempting from public duties; and (*o*) simulated diseases. Under injuries to property are included—(*a*) nuisances from manufactories, &c.; (*b*) arson; (*c*) forgery and falsification of documents; (*d*) coining of false money. Injuries against the person include—(*a*) defloration; (*b*) rape; (*c*) mutilation; (*d*) criminal abortion; (*e*) infanticide; (*f*) homicide, including drowning, hanging, strangling, &c.; (*g*) death from starvation; (*h*) death from extremes of temperature; (*j*) wounds; (*k*) toxicology, comprising a knowledge of the various kinds of poisons, their action upon the human body, and the means of their detection. In the second department of the science, or medical police, the circumstances affecting the health of individuals are—(*a*) cleanliness; (*b*) aliment; (*c*) the regulation of apothecaries' shops; (*d*) clothing; (*e*) temperance; (*f*) exercise; (*g*) prostitution; (*h*) celibacy and marriage; (*j*) lactation and care of offspring; (*k*) effects of profession and trade upon health. The circumstances affecting the health of communities are—(*a*) climate; (*b*) the sites of towns and habitations; (*c*) drains and sewers; (*d*) paving of streets and care of public ways; (*e*) cemeteries; (*f*) hospitals; (*g*) schools; (*h*) prisons; (*j*) quarantine and quarantine establishments; (*k*) punishments.—These various subjects will be found treated of under their respective names in other parts of this work.—*Ref.* the several works on *Medical Jurisprudence* by Drs. Beck, Traill, and Taylor.

**Medicine**, *med'-e-sin* (Lat. *medicina*), is the art and science of curing disease. From the accidents and infirmities to which human nature is liable, we may readily suppose this art to be almost as old as the human race. Even among the most rude and barbarous people of the present day, we find some kind of appliances to wounds and injuries, and some means adopted to overcome internal disease. In the earliest ages of civilization, we find medicine in the hands of the priests, perhaps from the idea that disease is occasioned by the anger of the gods; and hence its treatment was accompanied with many superstitious rites. The Egyptians must have been possessed of a considerable knowledge of the human body and the nature of disease, from the high degree of perfection to which they had brought the art of embalming; and hence, probably, Moses, who was learned in all the knowledge of the Egyptians, may have acquired that practical knowledge of the nature of disease which appears in his writings. In the Odyssey of Homer, mention is made of a drug "that frees men from grief and from anger, and causes oblivion of all ills." The early history of medicine in Greece is involved in obscurity; but it must have made considerable progress before the time of Hippocrates (born about B.C. 460), who collected the scattered knowledge of his time and added to it by his own genius and observation. The improvements which he made in medicine appear to have been so considerable that for many centuries his successors were content to follow him in reverential imitation. The great merit of Hippocrates lies in his descriptions of disease; and, bearing in mind the limited scope of his inquiries, we cannot but admire the sagacity of his observations. Soon after its foundation, Alexandria became the centre of the science and learning of the time, and medicine, in particular, was assiduously cultivated, and a knowledge of the human body was acquired by dissection, particularly by Herophilus and Erasistratus; for up to that time the knowledge of the human body had been drawn by analogy from dissections of the lower animals. For some centuries after this time, physicians were divided into two classes,—the Dogmatics, or followers of Hippocrates, who maintained that, to treat disease, we must be acquainted with its occult as well as exciting causes, and with the natural actions of the human body; while the empirics, on the other hand, held that such knowledge was unattainable and unnecessary, and that experience ought to be the sole guide in practice. During the early period of the Roman empire, medical science appears to have been but little cultivated. The first physician of note who practised at Rome was Asclepiades of Bithynia, who was a contemporary of Cicero. His pupil, Themison of Laodicea, was the founder of the sect of the Methodists, who were intermediate between the Dogmatists and Empirics; and while the Dogmatists regarded the fluids as the seat of disease, the Methodists believed that the solids were first affected, and that the derangement of the fluids was but secondary. The most distinguished succeeding physicians of the Methodists were Soranus and C. Aurelianus. Celsus, who flourished probably towards the end of the 1st century, has, in his work *de Medicinâ*, given us a digest of all that was known on the subject up to his time. This work takes almost equal rank with the Hippocratic writings, and shows the great progress which medicine has made through the labours of the anatomists of Alexandria. He treats of most of the great operations of surgery, of wounds in the intestines, injuries of the brain, the use of ligatures, &c. Aretæus of Cappadocia, who flourished probably in the early part of the 2nd century, has left a treatise on diseases, which is one of the most valuable of ancient medical works, and is remarkable for its accuracy and spirited description. The next individual of note in medical science is Galen, a native of Pergamus, who came to Rome at the invitation of the emperor Marcus Aurelius, about A.D. 165. Having mastered all the theories and knowledge of his times, he gave his talents and labour to constructing a summary of them. His works are therefore very voluminous, and constitute a perfect encyclopædia of the medical science of the day. For many centuries after his time physicians were content with rigidly following him. His writings were regarded as the ultimate authority on all points; and everything that seemed opposed to them was at once rejected. The only writers of note were Oribasius (A.D. 360), Aëtius (525), Alexander of Tralles, Procopius (540), and Paulus Ægineta (600—640). The last of these, a learned and talented physician, was a voluminous compiler, and may be said to have brought the science of medicine in the Eastern empire down to his own time. From that time down to the 12th century, the Arabians were the only people among whom medicine made any progress. On the taking of Alexandria, they became acquainted with the writings of Hippocrates, Galen, and others, whose works were soon after translated into Arabic, and diligently studied. One of the most distinguished of the Arabian school was Rhazes, who flourished at Bagdad towards the end of the 9th century. He was a voluminous writer; but his works are chiefly compilations from the Greeks, though he also wrote some original treatises, particularly one on smallpox and measles. But the most distinguished author of this school was Avicenna (born 980); who has been styled the Galen of the Arabian empire. His great work, the "Canon," became the text-book of Arabian commentators and teachers during the 12th and 13th centuries. Avenzour and Averrhoes, who flourished in Spain in the 12th century, were also distinguished members of the Arabian school. During the rest of the middle ages there existed a sort of Galeno-Arabian science of medicine, mostly fostered by ignorant monks, and suffering, perhaps more than any other science, from every superstition and misconception of nature. Two of the principal medical authors were Albertus Magnus and Roger Bacon, the one a prelate in high favour with the papacy, the other a Franciscan monk. In the 12th century the medical school of Salerno was established, and followed by several others; and in the beginning of the 14th century, the study of practical anatomy was restored by Mondini at Bologna. With the fall of Constantinople in 1453, and the consequent

dispersion of a number of learned men, who established themselves as teachers in Italy and other parts, and thus gave a new impulse to the cultivation of Greek medical science and literature, the study of Hippocrates was revived, and faith in Galen began to be shaken. In the beginning of the 16th century medical science in England derived great assistance from Linacre, who gave lectures on physic at Oxford, and founded the College of Physicians. With Paracelsus, in the 16th century, began the sect of chemical physicians, who, contemning the learning of the Galenists, devoted themselves to the study of chemistry, maintaining that the operations of the human body are subject to the same laws as govern inorganic matter. In the 17th century, a number of very distinguished names appear in medicine; as Harvey, who discovered the circulation of the blood, Asellius, Sydenham, Malpighi, Riolan, Pecquet, Bartholin, Fabricius, Sylvius, Willis, Fallopius. The beginning of the 18th century was characterized by the establishment of clinical medicine, or bedside teaching on a systematic plan, by Boerhaave, who was appointed lecturer on the theory of medicine at Leyden in 1701, and four years later became physician to St. Augustine's hospital, when he commenced a systematic course of clinical lectures. He was, besides, a man of extensive erudition, and brought order and system out of the vast mass of materials that had been accumulating during the preceding century. He likewise advanced practical medicine in all its departments. Among his pupils were Van Sureten and Haller, the former of whom followed his master too closely to add much of real value to the science; but the latter greatly improved it, particularly in the department of physiology. In England, William and John Hunter laid the foundation of the English school of physiology. Dr. Cullen, of Edinburgh, with his varied knowledge and great original powers, rendered eminent service in systematizing the study of practical medicine. In the present century medical knowledge has made great advances. A much more minute and accurate knowledge of the human body has been obtained; the nature of many of its vital processes has come to be understood; and the characteristics of the different diseases, and the means of counteracting or controlling them, are much better known. The various branches into which medicine is now commonly divided are, *Anatomy*, or a knowledge of the structure of the human body, including *histology*, which treats of the minute structures of parts discernible only by the microscope; *Practical Anatomy*, which applies a knowledge of structure to a right performance of the operations of surgery, and *Pathological Anatomy*, which points out the aberrations from the normal or healthy structure of the organs or tissues of the human body; *Physiology*, or a knowledge of the vital actions; *Pathology*, comprising the nature, cause, and cure of disease; *Nosology*, which treats of the various kinds of diseases, and tries to arrange them systematically; *Surgery*, treating of mechanical injuries, and the modes of relieving diseases and derangements by mechanical means; *Obstetrics*, or *Midwifery*, dealing with the modes of facilitating delivery, and the diseases of children; *Materia Medica*, or the science of medicines, their nature, composition, and effects; *Pharmacy*, or the preparation of medicines; *Therapeutics*, the application and administration of every kind of remedy; *Hygiene*, treating of the laws of health; *Dietetics*, dealing with the rules of diet; *Medical Jurisprudence*, or the application of the science of medicine to the administration of law; *Clinical Medicine*, or the instruction communicated at the bedside of the patient; *Psychological Medicine*, or the nature and treatment of mental diseases. Intimately connected with medicine are the sciences of *Natural Philosophy*, *Chemistry*, *Zoology*, *Botany*, *Mineralogy*, *Meteorology*, &c.

MEDLEY, *med'-le* (Ang.-Sax.), in the melopœia of the ancients, was that part which consisted of the proper intermixture of the modes and genera called by the Greeks *agoge*. At the present day, the word medley is employed to designate a numerous assemblage of the detached parts of different popular songs, so arranged that the latter words of the sentence or tune of one song connect with the beginning of another.

MEDUSA, *me-dū'-sā*, or GORGON-HEADS (*Ophiuridæ*), a species of marine animals belonging to the class *Echinodermata*, and commonly known by the appellation of lizard-tailed star-fishes. The *gorgon-heads* have all an orbicular depressed body, with five arms, which are cylindrical, jointed, and very flexible; these arms are often extremely long, and subdivided into branches; they are covered with scales, somewhat like the tails of serpents, and are very fragile. Their means of progression are consequently very different from those of the true star-fishes; as, when they move, they employ the two arms that are nearest the point to which they wish to proceed; and the one also farthest from that point. The two in front pull the animal along by means of hooks at their ends, while the one behind is pushed into the sand, and is employed to shove it on. The *Ophiuridæ* live nearly exclusively on sandy shores, and on the approach of any danger they hide themselves in the mud; like several others, they quickly recover the loss of their arms, as they grow again in a few days. There are numerous varieties of this family, of which the one just described is the type.

MEERSCHAUM, *meer'-shaum* (Ger., foam of the sea), a peculiar silicated magnesian mineral found in several parts of Europe, but mostly in Greece and Turkey. In the last-mentioned country it is extensively used as fullers' earth; but in Austria and Germany it is adapted to the manufacture of tobacco-pipes, which are prepared for sale by being first soaked in tallow, afterwards in wax, and being finally polished with shave-grass. The true meerschaum always turns from a pure milk-white to a brownish-black colour when smoked for some time, by reason of the influence on it of the tobacco-oil; and to connoisseurs this is a true criterion between true and false meerschaum, the latter of which is also extensively manufactured.

MEGATHERIUM, *me-gā-thē'-re-um* (Gr. *megas*, great, and *therion*, beast), a name given by Cuvier to the typical representative of a series of endentate quadrupeds, the largest and most gigantic of terrestrial mammals. Two specimens of this animal have been found in America, the one termed the *Megatherium Cuvieri*, and the other the *M. Jeffersoni*,—the latter being first described by President Jefferson, as may be seen by the "Transactions of the American Philological Society" (iv. 246). The haunches of the megatherium named after Cuvier must have exceeded five feet in width, while its body was about twelve feet long and eight high. Its feet were a yard in length, and terminated in formidable compressed claws of great size; its tail was also of great length and thickness, exceeding the size of that member in either living or extinct quadrupeds. The head of the megatherium was of comparatively small size, and the cranium presents many of the peculiarities of the sloth; from which circumstance it has been termed the *giant sloth*. Not much—indeed, to say truly, nothing—is known of the habits of this immense animal, except that it must have, according to the authority of eminent naturalists, possessed a scaly armour; whence it must also have been closely allied to the armadillo family.

MELALEUCA, *mel-ill-lū'-kā* (Gr. *melas*, black; *leukos*, white, because the trunk is black and the branches white), in Bot., a gen. of the nat. ord. *Myrtaceæ*. The species *M. minor*, or *Cajeputi*, is a small tree of the Moluccas Islands. Its leaves, when allowed to stand so as to undergo a species of fermentation, and then distilled with water, yield a volatile oil of a limpid nature and a light-green colour. This product, which is called cajeput-oil, was formerly much employed as a remedy in cholera, but without any success. It has been used internally as a diffusible stimulant, antispasmodic, and diaphoretic, and externally, when mixed with olive-oil, as a stimulant embrocation. It has the property of dissolving caoutchouc. In Australia the leaves of the species *M. scoparia* and *genistifolia* are used as substitutes for tea.

MELANOSPOREÆ. (*See* ALGÆ.)

MELANTHACEÆ, or COLCHICACEÆ, *mel-an-thā'-se-ē, kol-tshi-kā'-se-ē* (Gr. *melas*, black, and *anthos*, a flower), in Bot., the Colchicum fam., a nat. ord. of *Monocotyledones*, sub-class *Petaloideæ*. Herbs with bulbs or corms, tuberous or fibrous roots. Flowers regular, usually hermaphrodite, rarely unisexual; perianth inferior, white, green, or purple, petaloid, 6-parted or 6-leaved; stamens 6; anthers extrorse; ovary supe-

rior or nearly so, 3-celled; style 3-parted. Fruit 3-celled, 3-valved, with septicidal, or rarely loculicidal dehiscence. Seeds with a membranous testa; embryo minute, in fleshy albumen. The plants of the order are generally diffused, but most abundant in Europe, North America, and Northern Asia. There are 31 genera, which include 130 species. They are generally poisonous, owing to the presence of powerful alkaloids. In proper doses, however, several are valuable medicines. (*See* VERATRUM, COLCHICUM.)

MELASTOMACEÆ, *mel-as-to-mai'-se-e*, Gr. *melas*, black; *stoma*, the mouth; the black berries of some of the species are eaten by children, whose mouths they stain black), in Bot., the *Melastoma* fam., a nat. ord. of *Dicotyledones*, sub-class *Calyciflorœ*. Trees, shrubs, or herbs, with opposite leaves, almost always ribbed and dotless. Calyx 4-, 5-, or 6-lobed, more or less adherent to the ovary, imbricated; petals equal in number to the divisions of the calyx, twisted in æstivation; stamens equal in number, or twice as many as the petals, filaments curved downwards in æstivation; anthers long, 2-celled, curiously beaked, usually dehiscing by two pores at the apex, or sometimes longitudinally, in æstivation lying in spaces between the ovary and sides of the calyx; ovary more or less adherent, many-celled. Fruit either dry, distinct from the calyx, and dehiscent, or succulent, united to the calyx, and indehiscent. Seeds very numerous, minute, exalbuminous. The plants of this order are principally natives of tropical regions, but a few are also extra-tropical. They are generally characterized by astringency. Many produce edible fruits, and some are used for dyeing black and other colours. A number of species are cultivated in this country on account of the beauty of their flowers.

MELIACEÆ, *me-le-ai'-se-e* (from Gr. *meli*, honey, from its aromatic flavour), in Bot., the *Melia* fam., a nat. ord. of *Dicotyledones*, sub-class *Thalamiflorœ*, having the following essential characters:—Trees or shrubs with usually alternate, simple, or pinnate exstipulate leaves. Flowers hypogynous and generally symmetrical; calyx and corolla with 3, 4, or 5 divisions; stamens twice as many as the petals, distinctly monadelphous; anthers sessile; disc hypogynous and often surrounding the ovary like a cup; ovary 2—5, rarely 10- or 12-celled; style 1; ovules 1, 2, or 4, attached to axile placentas. Fruit succulent or capsular, with loculicidal dehiscence. Seeds few, not winged; albumen fleshy, or altogether absent. The order is very nearly allied to *Cedrelaceæ*, the Mahogany family. There are 33 genera and 150 species, found more or less in all tropical regions. Some produce edible fruits, others have valuable oil-yielding seeds, and some are remarkable for their medicinal properties, which in general are bitter, tonic, and astringent, but in some cases purgative and emetic. The most interesting member of the order is *Melia Azedarachta*, the *Neem-tree* or *Pride of India*, or, as it is sometimes called, the *Margosa-tree*. It possesses febrifugal properties. The pericarp yields, by expression, a fixed oil, which is used for burning. The tree also yields a kind of toddy, which is employed as a stomachic.

MELIANTHUS, *mel-e-an'-thus* (Lat. *mel*, honey; *anthos*, a flower), in Bot., a gen. of the nat. ord. *Zygophyllaceæ*, or, according to the views of some botanists, the type of a distinct ord. termed *Melianthew*. The flowers of the species *M. major* contain much saccharine matter, which is extracted and used as food by the natives of the Cape of Good Hope, where the plant abounds.

MELILOTUS, *mel-e-lo'-tus* (from Lat. *mel*, honey, and *lotus*; honey-lotus), in Bot., the Melilot, a gen. of papilionaceous *Leguminosæ*. The flowers and seeds of *M. officinalis*, and other species, possess a peculiar fragrance, which is due to the presence of *coumarine*. They are used to flavour *gruyère* and other kinds of cheese.

MELISSA, *mel-is'-sä* (Gr. *melissa*, a bee), in Bot., a gen. of the nat. ord. *Labiatæ*. *M. officinalis*, common balm, possesses mild stimulant properties, and its decoction is used as a diaphoretic in fevers, as an exhilarating drink in nervous affections, and as an emmenagogue. The bees obtain a great deal of honey from the balm.

MELOCACTUS, *me-lo-kăk'-tus* (Gr.), in Bot., the Melon-cactus, a gen. of the nat. ord. *Cactaceæ*. The fleshy stems of this genus have been likened to large green melons, to turbans, and to hedgehogs. In the dry districts of South America they are eaten by cattle on account of their juice.

MELODRAMA. (*See* DRAMA.)

MELODY, *mel'-o-de* (from Gr. *melos*, a song), a term synonymous in modern music with air, a succession of simple sounds so arranged as to produce a pleasing effect upon the ear. It may be defined as a series of sounds more fixed, and generally longer, than those of common speech, arranged with grace, and of proportionate lengths, such as the mind can easily measure and the voice express. Of the relative importance of melody and harmony it is useless to speak, as they may be said to generate into each other, the one being the selection of single sounds from a harmonic source, and the other a union of two melodies simultaneously heard. Thus they are closely connected and of equal importance, the one being necessary to the other. (*See* HARMONY.)

MELON. (*See* CUCUMIS and CUCURBITA.)

MEMORY, *mem'-o-re* (Lat. *memoria*, Gr. *mneme*), in Mental Phil., is one of the most important of all our faculties. It is obviously the great foundation of all mental improvement, being that which enables us to treasure up for future use the knowledge we acquire, and without which no advantage could be derived from the most enlarged experience. Memory, perhaps more than any other faculty of the mind, is dependent upon the physical condition of the body. We may smile as we read in the old writers on memory, of plasters and powders and perfumes for strengthening the memory; but even in the present day, Sir B. Brodie says that it is possible that, by accurate observation, the proper means may be discovered of preserving that temperament of the brain which is favourable to memory; all indicating a belief in the dependence of memory upon physical conditions. The term memory implies two things; namely, retention and reproduction—the capacity of retaining knowledge and the power of recalling it to our thoughts when we have occasion to use it. These vary greatly in different individuals, some having a good retention but a bad recollection; others a good recollection but a bad retention. Though apparently so different in character, yet we are inclined to regard them as the result of one principle,—that of association; the man of recollection having his ideas so connected that the one readily calls up the other; the man of retention having them so intermixed and interwoven that it is only after a time or by some lucky chance that the right idea comes up. Indeed, so far as retention is concerned, it is held by many philosophers that whatever has once been the object of consciousness is ever after retained, its being recollected or not depending entirely upon the laws of association. In support of this doctrine, we have numerous instances of persons recollecting, in the delirium of a fever, things which had long since been forgotten, or even speaking in a language—that of their childhood—which had otherwise long passed from the mind. Not the least singular feature of memory is the way in which it is affected by certain diseases of the brain. Sometimes the patient loses the whole stock of his knowledge acquired previous to the disease, the faculty of acquiring and retaining new information remaining entire. Sometimes he loses his memory of words and retains that of things, or he may retain his memory of nouns and lose that of verbs, or *vice versâ*. But, perhaps, the most singular case—and it is not very uncommon—is when one language is taken entirely out of his retention without affecting the memory of others. Memory, then, as we have said, depends upon the association of ideas, by which one thought, feeling, or emotion tends to recall or reproduce another. In the article ASSOCIATION OF IDEAS (which *see*), we have attempted to refer the different laws of association to one,—that of contiguity; ideas that have been in the mind together, or in close succession, ever after manifesting a tendency to recall or reproduce one another. Hence it follows, as a general rule, that the closer two or more ideas are brought together in the mind, the more strongly will they be associated, and the greater will be their power of reproducing one another. Where any interval takes place between ideas which we wish to associate together, irrelevant ideas will be apt to intervene and

weaken their adhesion. Hence, the importance to memory of sound health and a mind free from anxieties. The objects of memory are either things external to us, or internal states and modes of consciousness. There are different kinds of memory,—as for figures, names, places, events, and so on; some persons being distinguished for one kind of memory, others for another. The circumstances which have a tendency to increase the retention or recollection of anything are chiefly vividness, repetition, and attention. Ideas that make a vivid impression on the mind are readily recalled, as also, on the same principle, those to which the attention has been specially directed. The longer an idea is before the mind, or the more frequently it is recalled, the better is it remembered. (*See* MNEMONICS.)

MENISPERMACEÆ, *men-e-sper-mai'-se-e* (Gr. *mene*, the moon; *sperma*, seed), in Bot., the Moon-seed fam., a nat. ord. of *Dicotyledones*, sub-class *Thalamiflorœ*; consisting of trailing or climbing shrubs, with alternate, simple, and exstipulate leaves, and usually dioecious flowers. The sepals, petals, stamens, and carpels, have a ternary arrangement. The carpels are distinct, and supported on a gynophore. The fruits are drupaceous, curved around a central placental process, and 1-celled. Seed solitary, curved; embryo curved; albumen absent, or small in amount. The plants of this order are chiefly found in the forests of the tropical regions of Asia and America: none occur in Europe. They are remarkable for their narcotic and bitter principles. (*See* ANAMIRTA, COCCULUS INDICUS.)

MENNONITES, *men'-non-ites*, the name applied to the Anabaptists of Holland after they had placed themselves under the leadership of a native of Friesland, named Menno, who engaged to abate the fanatic zeal of his new followers. (*See* ANABAPTISTS.)

MENSURATION, *men-su-rai'-shun* (Lat. *mensura*, measure), is that art or science which treats on the measurement of the surfaces, areas, and solidity of different figures or bodies. As mensuration, properly considered, embraces geometry and trigonometry, on which subjects separate articles will be found given, the present paper will be only devoted to the consideration of a few simple formulas which relate more particularly to arithmetical mensuration, if the science can be so designated. Any quantity is always measured by some other quantity of the same kind, of a known magnitude, called the *measuring unit*. Thus, for example, a line is measured by a straight line of a known length, as 1 inch, 1 foot, 1 yard, and so on. In like manner a plane surface is measured by a *square*, of which the side is 1 inch, 1 link, 1 foot, &c.; and the number of such squares that any plane surface is found to contain is called the *area*, or *content*, of the surface in question. The area of a parallelogram, or rectangle (*see* GEOMETRY), is found by multiplying the height by the length. Thus if we want to find the area of a piece of wood 10 inches long and 5 wide, we multiply 5 by 10, and the content will be 50 *square* inches. In the mensuration of land, the unit of measure is generally the link, in order to render the result less intricate, by means of the imperial chain. Thus if the content of a piece of ground 575 links long by 425 links broad is desired to be known, 575 is multiplied by 425, and the result is 244,375 links. But 100,000 square links are equivalent to an acre; and, consequently, dividing by that number, we find that the field contains 2·44375 acres, the decimal of which, on being reduced, will be found to contain 1 rood, 31 perches; therefore the field contains 2 acres, 1 rood, 31 perches. The area of a triangle is found by multiplying the base by half the perpendicular height, and the half of this product will be the area. The reason of this may be thus deduced:—The area of every parallelogram has been shown to be equal to its length multiplied by its breadth or height; and it is well known that every parallelogram is double a triangle of the same height or the same base; consequently, the area of a triangle is equal to half the product of its base and height. To find the area of any quadrilateral or four-sided figure, it is only necessary to divide it into two triangles, and by proceeding according to the rule last given, the result will be obtained. The area of a regular polygon is found by multiplying half the perimeter by the perpendicular, drawn from the centre to one of the sides, and the



product will be the area of the polygon. The following table, which is usually given in works on this subject, will be found extremely useful, as it will save the complex calculation which would otherwise be required. In order to use it, multiply the square of a side of any regular polygon by the corresponding area in the table, and the product will be the area of the polygon in question.

| Name of Polygon. | No. of Sides | One-half the angle of Polygon | Area when the side is 1. | Perpendicular when the side is 1. |
|---|---|---|---|---|
| Equilateral Triangle | 3 | 30° | 0·4330127 | 0·2886751346 |
| Square | 4 | 45° | 1· | 0·5 |
| Pentagon | 5 | 54° | 1·7204774 | 0·6881909602 |
| Hexagon | 6 | 60° | 2·5980762 | 0·8660254038 |
| Heptagon | 7 | 64°2/7 | 3·6339124 | 1·0382608984 |
| Octagon | 8 | 67°1/2 | 4·8284271 | 1·2071067812 |
| Nonagon | 9 | 70° | 6·1818342 | 1·3737387097 |
| Decagon | 10 | 72° | 7·6942088 | 1·5388417685 |
| Undecagon | 11 | 73°1/11 | 9·3656399 | 1·7028436194 |
| Dodecagon | 12 | 75° | 11·1961524 | 1·8660254038 |

For example,—what is the area of a pentagon whose side is 20 feet? We find from the table that the area of a pentagon whose side is 1 foot equals 1·7204774; therefore, by multiplying this number by 20², or 400, we find the area will be 688·1900 feet, the answer of the question. With regard to the circle, it has been shown in art. GEOMETRY, that the circumference is nearly equal to the diameter multiplied by 3·14159, &c.; and this must be remembered when we want to find the area or surface of a circle; the rule for obtaining which is as follows:—1. Multiply half the circumference by the radius, and the product will be the area: 2. Multiply the square of the diameter by ·7854, and the result will also be the area. 3. Multiply the square of the circumference by ·0795775, and the product will likewise be the area. By any of these rules the result arrived at will be true, and the area of the circle be obtained. The solid content of a rectangular figure is obtained by multiplying together its length, height, and breadth. Thus the solid content of a cube 3 feet long, 4 high, and 2 broad, will be 3×4×2=24 solid feet. The solidity of a pyramid or cone is found by the multiplication of the area of the base into the perpendicular height, and, taking one-third of the product. The area or surface of a sphere, or solid circle, is obtained by multiplying its circumference by its diameter: thus, the surface of a sphere whose diameter is 36 inches will be 36×3·1415926=4071·504 square inches. The total content of a globe or sphere is found by multiplying,—1. the cube of the diameter by 0·5236; or, 2. by multiplying the surface or area by one-sixth of the diameter. Thus, the solidity of a sphere whose diameter is 36 inches, and whose area in that case has been just shown to be 4071·504 square inches, would be 4071·504×1/6=4071·504×6=24429·024 solid inches; or, by the first rule given, will be 36³×·523592, &c.= the same as before, 24429·024 solid inches. The method of measuring land, briefly touched upon at the commencement of this article, will be found fully given under the head of SURVEYING. In artificers' work there are many varieties of measurement used, although the usual calculations on the same are brought out by duodecimal multiplication. In order to find the solid content of squared timber, the mean breadth is multiplied by the mean thickness, and the product by the length; the result being the solid content. In round or unsquared timber, the content is obtained by multiplying the square of a quarter of the mean circumference, or of the mean quarter girth by the length. When a tree tapers regularly, according to writers on the subject, the girth may be taken at the middle for the mean girth, or it may be taken at both ends, and half the sum will be the mean girth. When a tree tapers irregularly, however, that is to say, when it is thick in some places and small in others, the girth may be taken at the ends and at equal intervals; in such cases, then, half the sum of the extreme girth, added to the intermediate girths, and then divided by the number of intervals between them, will be the *mean girth* required. When hard-wood trees are sold by the

cubic foot while growing, along with the body of the tree, only such of its branches as are 4½ inches or more in quarter girth are measured: if the purchaser has to pay for the cutting down of the trees, then he is generally allowed the wood from the branches below that size to meet his expenses. With reference to masonry, brick-work is measured by the *square rod* in England, containing 272¼ square feet. When the thickness of a wall contains the length of one brick and the breadth of another, that is to say, when it is about 14 inches, it is reckoned of standard thickness, and it is paid for by the rod in *square* measure. Painters' work is paid for by the square yard; but in mouldings and panellings of lines and shades, by the lineal foot. The measurement of casks, or of substances liable to excise duties, is termed gauging. The content of a cask is usually calculated by the measurement of its length, and the diameter of its middle and end. The rule which is generally applied is as follows:—Multiply the length of the cask by the sum of the squares of the bung and head diameters, and twice the middle diameter, and the whole product of these numbers by ·000472. For instance, suppose the gauge of a cask whose bung and head diameters are respectively 32 and 24, the middle diameter being 30·2, and the length of the cask being 40, is required. Then proceeding according to the above formula, $40 \times [(42)^2 \times (24)^2 \times (2 \times 39{\cdot}2)] \times {\cdot}000472 = 99{\cdot}1$ gallons, the answer sought. It would be impossible, within the narrow limits of the present article, to dilate at length upon the subject of mensuration, or even to furnish the reader with a comprehensive *précis* of the matter embraced under this designation. Those who really would know the science fully, must make it their especial study, and the reader will find a capital digest under the different articles on measures and mensuration, in Davidson's *Practical Mathematics*. (*See*, also, Geometry, Surveying, and Trigonometry.)

Mentha, *men'-thâ* (Lat.), in Bot., Mint, a gen. of the nat. ord. *Labiatæ*. Several species are used in medicine, and as sweet herbs for flavouring, &c. Three are official; namely, *M. viridis*, spearmint; *M. piperita*, peppermint; and *M. Pulegium*, pennyroyal. They all possess stimulant and carminative properties.

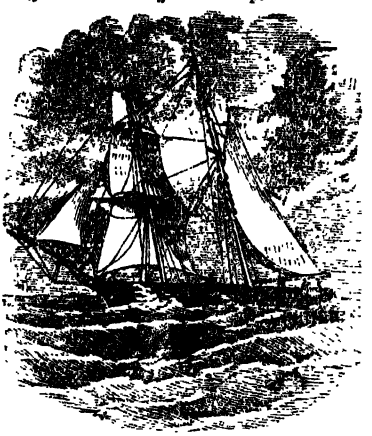
Menyanthes, *men-o-ăn'-thēez* (Gr. *men*, a month; *anthos*, a flower, in allusion to the duration of the flowers), in Bot., a gen. of the nat. ord. *Gentianaceæ*. *M. trifoliata* is known commonly by the names *buck-bean*, *bog-bean*, or *marsh trefoil*. The leaves and rhizome are tonic and astringent, and in large doses cathartic and emetic. In some parts of Germany the plant is employed as a substitute for hops in beer.

Mercaptan, *mer-kăp'-tăn*, in Chem., a name given to a characteristic series of compounds derived from the alcohols by the substitution of sulphur for oxygen, of which ethylic mercaptan may be taken as the type.

| Ethylic alcohol. | Ethylic mercaptan. |
|---|---|
| $C_2H_5HO$. | $C_2H_5S.HS$. |

Ethylic mercaptan is a colourless transparent mobile fluid, with an intensely alliaceous smell, boiling at 96° and freezing at −8°. It is very inflammable, burning with a blue flame; it is sparingly soluble in water, but readily so in ether and alcohol. It forms compounds with the metals, corresponding closely to the hydrosulphates.

Merchantman, *mertsh'-ănt-măn*, in nautical phraseology, a term applied to a vessel employed in the transport of goods and articles of commerce, in contradistinction to a man-of-war, or vessel used for warlike purposes. Some of the best examples of this class of vessel are the liners and clippers employed in the East-Indian and Australian traffic, some of which, although sailing merely under canvas, have been known to make surprisingly rapid voyages to and from their respective ports. They are generally full-rigged ships, although many barques are employed. In coast trade and inter-colonial trade, as between the islands in the West Indies and the American continent, a lighter class of vessel is used,—generally a brigantine, of which a cut is given below. This craft, the brigantine, possesses eminently fast-sailing powers, and used to be much employed in the slave-trade, when that traffic was at the height of its infamy. Though the greatest amount of speed is sought to be obtained by building the bows and anterior parts of the vessel upon as fine lines as possible, yet, in the interior,—as, for instance, the hatchway and hold,—a large amount of stowage-room is obtained by making these last as roomy as is practicable, consistently with the tonnage of the ship.



MERCHANTMAN.

Mercury, in Astron., the planet nearest the sun, from which it is distant about 36,470,000 miles, or somewhat more than a third of the Earth's distance. Its mean sidereal revolution is performed in 87·9826 mean solar days. Mercury being an inferior planet always appears in the neighbourhood of the sun, and is very seldom visible to the naked eye. During the interval which elapses between the disappearance of Mercury in the evening and its reappearance in the morning, a beautiful black spot is sometimes observed on the sun, which enters at the eastern margin of the disc, passes over the centre, and then vanishes. This spot is Mercury passing between the sun and the earth, and producing a veritable partial eclipse of the sun, which is called a *transit*. The mean distance of Mercury from the earth is about 29,500,000 miles. The apparent diameter of Mercury oscillates between 4·4″ and 12″; its real diameter is 3,082 miles, or a little more than a third of the diameter of the earth. Mercury is the densest of the planets, its density being 1·234, that of the earth being taken as unity. The light of Mercury is bright and twinkling; and when observed through a telescope with a high magnifying power, in the evening, regular phases may be observed. When it emerges from the rays of the sun, its form almost resembles a complete circle; as it recedes from the sun, the western part preserves its circular form, while the eastern region becomes elliptical; gradually it changes its form, and grows more hollow, till it finally plunges into the rays of the sun, resembling a very slender crescent. If the planet is observed on the day when it emerges in the morning from the rays of the twilight, and on the following days, the same series of phenomena will be perceived, only occurring in a reverse order. From these facts it is affirmed that the planet derives the whole or greater part of its light from the sun, and that it revolves round that body in a curvilinear orbit.

Mercury, *mer'-ku-re* (after the God), symbol Hg (hydrargyrum), equivalent 100, spec. grav. at −40° Fahr. 13·39, at 60° Fahr. 13·59. Mercury is one of the seven metals known to the ancients, and is, with the exception of bromine, the only element fluid at ordinary temperatures. It is found in nature in the form of cinnabar, or sulphide, in the clay-slate and red sandstone underlying the coal-measures. The most famous cinnabar-mines are those of Almaden in Spain, Idria in Transylvania, and New Almaden in California. It is also found in large quantities in China and Japan, and at Huancavelica, in Peru. The extraction of the metal from its ore is effected in two ways; either by

simple distillation, after having first burnt off the sulphur, or by mixing the cinnabar with iron filings or lime; in which case the sulphur forms a fixed sulphide with the iron or calcium, and the metal distils over nearly pure. The former process is pursued at Almaden; but great waste is common, owing to the imperfect method of condensation adopted. Mercury also occurs native as an amalgam with gold and silver, as an iodide, and as horn mercury, or subchloride. As imported into this country, it is nearly pure. The presence of foreign metals may be detected by shaking up a few drachms in a bottle, and allowing it to remain exposed to the air for a day or two. Should lead or any other metal be present, it may be detected by forming a film of oxide on the brilliant surface of the mercury. Any metallic impurity may be removed by digesting the metal in cold dilute nitric acid for several days. The economic uses of mercury are numerous. It is principally employed in extracting gold and silver from quartz and other matrices in which these metals occur. It forms with them an amalgam or pasty mass, from which it may be separated by distillation. The great increase it undergoes in volume between the freezing and boiling points of water renders it useful for thermometric purposes; and its great specific gravity has caused its employment in barometers. It is used as a developing agent in the daguerreotype. The chemist uses it instead of water, for collecting gases which would be absorbed by the latter fluid. With many metals it forms a pasty mass, termed amalgam. This property is taken advantage of in the extraction of gold and silver from their matrices, stated above; in the manufacture of mirrors and gilding. An amalgam of two parts of zinc and four parts of mercury is used to give a partially metallic surface to the rubbers of frictional electric machines. It readily unites with zinc, and is rubbed on the plates of that metal in voltaic batteries to protect them from the action of the acids in which they are immersed. The amalgams formed with other metals are unimportant. Mercury freezes into a malleable mass at $-10^{\circ}$, and boils at about 660° Fahr. It was supposed at one time to be non-volatile at ordinary temperatures; but the experiments of Karsten prove that even at 32° the volatilization of the metal is perceptible. When pure it is not tarnished by exposure to the air, and does not decompose water at any temperature. Heated in a current of air to 700° or 800°, it becomes gradually converted into the red oxide. Hydrochloric acid does not act upon it, either hot or cold. Sulphuric acid does not act on it in the cold, but when heated, sulphurous acid gas is formed, which passes away, leaving the sulphate of the metal behind. Strong nitric acid dissolves it readily, nitrate of mercury and deutoxide of nitrogen being formed. In combination with sulphur, it is used in the arts as the pigment vermilion. It is extensively employed in medicine as a cathartic and alterative. By trituration with saccharine or oleaginous substances, it admits of being minutely divided, and a small portion becomes oxidized, to which the properties of mercurial ointment appear to be owing.

MERCURY, CHLORIDES OF, in Chem.—Mercury forms two chlorides,—the subchloride, or calomel, $Hg_2Cl$, and the protochloride, HgCl, or corrosive sublimate. These two compounds are often mentioned in old text-books as the protochloride and bichloride of mercury respectively. In fact, the popular name of corrosive sublimate is bichloride of mercury. Calomel is much used in medicine, and is generally prepared by triturating 13 parts of the metal with 17 of the chloride until no metallic globules are visible. The mixture is then sublimed, and the calomel is deposited in fibrous masses. The chloride or corrosive sublimate is made on a large scale by mixing two and a half parts of sulphate of mercury with one part of common salt and subliming in glass vessels. Corrosive sublimate is soluble in 16 parts of *cold water*; and in three of *hot* water its solution decomposes, and calomel is deposited if exposed to the light. Ether and alcohol both dissolve it freely. It is an exceedingly powerful and acrid poison. Its antidote is white of egg, with which it forms an insoluble compound. With oxygen it forms three oxychlorides. It is used in dyeing and calico-printing, and in photography; also in medicine in certain skin diseases.

MERCURY, FULMINATING. (*See* FULMINATING MERCURY.)

MERCURY, IODIDES OF, in Chem.—Mercury forms three iodides,—the green, or subiodide, $Hg_2I$, formed by triturating 127 parts of iodine with 200 of mercury; the protiodide, HgI, made by precipitating a solution of corrosive sublimate with iodide of potassium, and an unimportant intermediate iodide. The protiodide (or biniodide as it was formerly called) illustrates, very curiously, the difference of colour resulting from difference of form. The precipitate, when first formed, is salmon-colour, but gradually passes into a brilliant scarlet. It fuses at 400°, and sublimes in yellow rhombic tables. By simply rubbing the yellow salt, or even by touching it with a point, it immediately becomes transformed into brilliant red octahedra with a square base.

MERCURY, NITRATES OF, in Chem.—Mercury forms several nitrates. It will be only necessary to mention two. The subnitrate, $Hg_2O.NO_5$, is prepared by acting on excess of mercury with nitric acid in the cold. It forms fine colourless crystals with two equivalents of water. If dissolved in water, it decomposes into the basic nitrate. The nitrate of mercury, $HgO.NO_5$, is prepared by dissolving mercury in excess of nitric acid by the aid of heat. It may be obtained in crystals by exposing the solution in nitric acid to a freezing mixture; but if solution in water be attempted, a basic nitrate is formed.

MERCURY, OXIDES OF, in Chem.—Mercury forms two oxides,—the black, or suboxide, $Hg_2O$, and the red, or oxide, HgO, both of which form salts with acids. The suboxide, though a strong base when in combination, is very unstable when isolated. It is obtained by sublimating finely-levigated calomel with solution of potash or soda, and washing the black precipitate with cold water. It is decomposed by a strong light, or a gentle heat, into the red oxide and the metal. The red oxide may be made by exposing metallic mercury to a current of air at 700°, or more readily by decomposing the nitrate by heat. It is thrown down as a yellow powder when potash or soda is added to a solution of corrosive sublimate. The precipitated oxide does not differ from the red form, but appears to be a merely molecular variation. This oxide, when heated, becomes converted into the metal and oxygen gas, and was used both analytically and synthetically by Lavoisier, in the determination of the composition of atmospheric air.

MERCURY, SULPHATES OF.—There are several sulphates of mercury, the most important of which is that formed by decomposing with water the sulphate of the protoxide, which gives rise to a tribasic insoluble yellow sulphate, known as *turbith mineral*.

MERCURY, SULPHIDES OF, in Chem.—There are two sulphides of mercury,—the subsulphide, $Hg_2S$, and the sulphide, HgS. The first is formed as a black precipitate when a solution of an alkaline sulphide is gradually added to a solution of a subsalt of mercury. The sulphide exists as cinnabar in the mineral kingdom. It is made artificially as vermilion, by rubbing together 300 parts of mercury and 114 parts of sulphur in a mortar for two or three hours. The black sulphide obtained is thrown into a solution of 75 parts of hydrate of potash to 400 of water, and kept at a temperature of 122° Fahr., until the whole has assumed a fine red colour. The sulphide exists also in a black form, obtained by precipitating a salt of mercury with sulphuretted hydrogen. It is transformed by sublimation into the red variety.

MERIDIAN, *me-rid'-e-an* (from the Lat. *meridies*, the mid-day), is, in Astron., the great circle of the sphere which passes through the earth's surface and the zenith of the spectator. It is consequently the circle on which the latitudes of places are reckoned, commencing from the equator, which it intersects at right angles. What is termed the *terrestrial meridian* is the great circle formed by the intersection of the surface of the earth by the plane passing through the poles and the spot on which the spectator may be standing. The *first meridian* is the meridian from which longitudes are reckoned; it differs accordingly as the position is perfectly arbitrary, most nations fixing it from the capitals of their several countries. For instance, the first meridian of French astronomers is reckoned

from Paris; that of England from Greenwich. (*See* LATITUDE AND LONGITUDE.) The *meridian* of a globe is a brass ring in which it is inclosed, and capable of being moved round in any direction. This meridian is graduated with meridian lines, traced generally 15° from each other; so that the difference of longitude corresponds to any hour of time.

MERMAID, *mer'-maid* (from ANG.-SAX. *mere*, the sea, and *maid*), a fabulous creature, described by seamen as possessing a figure, the upper part of which is like a woman, while the extremities, are those of a fish. Mermaids are usually represented with long hair, which they are believed to be constantly combing. The supposition, no doubt, owes its origin to the appearance of some of the cetaceans, as the phocæ, which at a distance resemble the description given of the mermaid.

MERULIUS, *mer-u'-le-us*, in Bot., a gen. of *Fungi*. The species *M. lacrymans* and *vastator* are two of the fungi which occur in the *dry rot* of timber.

MESEMBRYACEÆ, or FICOIDEÆ, *me-sem-bri-a'-se-e* (Gr. *mesembria*, mid-day; *anthemon*, flower), in Bot., the Ice-plant or Fig-marigold fam., a nat. ord. of *Dicotyledones*, sub-class *Calycifloræ*, having the following essential characters:—Succulent herbs or shrubs, with simple exstipulate leaves; sepals definite, generally more or less united to the ovary; petals very numerous, or absent; stamens perigynous; ovary inferior or nearly superior; styles distinct; placentas axile, free, central, or parietal. Fruit capsular or indehiscent. Seed with a curved or spiral embryo on the outside of mealy albumen. The plants of this order are natives exclusively of warm and tropical regions. There are 16 genera and 440 species. Several are edible, others yield large quantities of soda when burnt. (*See* next article.)

MESEMBRYANTHEMUM, *me'-sem-bri-an'-the-mum* (Gr. *mesembria*, mid-day; *anthemon*, flower), in Bot., the typical gen. of the nat. ord. *Mesembryaceæ*. The species *M. crystallinum* is the *ice-plant*, so called from its surface being studded with little watery vesicles of an ice-like appearance. Its ashes contain a large proportion of soda. The leaves and fruits of some species are eaten by the natives of South Africa.

MESMERISM, *mez'-mer-izm*, a term generally applied to the phenomena of animal magnetism, and so called after the name of Mesmer, its first propounder, who lived in the latter part of the 18th century. Up to the present day, the phenomena of mesmerism have not been satisfactorily accounted for; but originally it was supposed that an analogy really existed between the action of the mineral magnet and human energy. Animal magnetism—an incorrect but convenient phrase—may be described as a power which a stronger is supposed to be able to exert over a weaker person, or a healthy over a diseased; whereby, through a mere exertion of the will in some cases, but more generally by this means accompanied by stroking with the hands, the former throws the latter into a state of sleep. During this state, certain peculiar sensations are experienced, which arise from nervous excitement, and may have good effects upon the health of the patient. The method by which mesmerism is generally performed is as follows:—The patient is placed in a sitting posture, in a convenient elbow-chair or couch. The mesmeriser, seated on a chair a little more elevated, and at the distance of about a foot from the patient, collects himself for some moments, during which he takes the thumbs of the patient between his two fingers, so that the interior parts of the thumbs are in contact with one another. He fixes his eyes upon the eyes of the patient, and remains in this position till he feels that an equal degree of heat is established between the thumbs of both parties. Withdrawing his hands, he then places them on the shoulder, where he allows them to remain for about a minute, and then conducts them slowly, with a very slight friction, along the arms to the extremity of the fingers. This operation is called a *pass*, and is repeated five or six times. *Passes* are then made over the rest of the body, ending finally with several transvere *passes* before the face and breast, at the distance of from three to four inches, the hands being approximated to each other and then separated abruptly. There are many variations of the mesmeric process, but the result, when there is no obstacle or deranging cause, is that the patient falls involuntarily into a [illegible] trance, the progressive sensations of which have been thus classified by Kluge, a German philosopher.—The *first degree*, called *waking*, presents no remarkable phenomena. The intellect and the senses still retain their usual powers and susceptibilities. In the *second* degree, called *half-sleep*, or the *imperfect crisis*, most of the senses still remain in a state of activity, that of vision only being impaired, the eye withdrawing itself gradually from the power of the will. In the *third* degree, called the *magnetic* or *mesmeric sleep*, the senses refuse to perform their respective functions and the patient is unconscious. In the *fourth* degree, called *simple somnambulism*, or the *perfect crisis*, the patient is said to "wake, as it were within himself, and his consciousness returns." He is in a state which cannot be called sleeping or waking, but which appears to be something between the two. In the *fifth* degree, called *lucidity*, or *lucid vision*, the patient is placed in what is called the state of *self-intuition*. In France, and in this country generally, this state is called *clairvoyance:* in Germany, *Hellsehen*. When in this state, he is said to have a clear knowledge of his own internal mental and bodily state, is enabled to calculate with accuracy the phenomena of disease which will naturally and inevitably occur, and to determine what are their most appropriate and effectual remedies. In the *sixth* degree, called *universal lucidity*, the *lucid vision*, possessed in the former degree, extends to all objects, near and at a distance, in space and time. Many persons, however, who practise mesmerism, are sceptical with regard to the existence of the two last degrees, although such cases are recorded by the best authorities on the subject. The dispassionate investigation of mesmerism has been shunned by men of science, *on* account of the imposture of some and the credulity of others of its professors. M. Reichenbach, a distinguished German chemist, gave a more scientific aspect to the phenomena of animal magnetism, by stating that he had discovered a new force in nature, called the Od force, or Odyle. He regarded this as a peculiar force in nature, the presence of which could only be detected by persons of a highly susceptible nature. As, however, his conclusions were arrived at principally through the medium of others, and those in a morbid state, his theory has been generally rejected. Electro-biology is only another form which the public exhibition of animal-magnetism has assumed. Sleep is produced by making persons gaze for a certain length of time on a piece of money which is placed in the hand. In susceptible individuals, this produces a kind of cataleptic sleep, in which they exhibit all the phenomena of the mesmeric state.—Ref. *An Inquiry into the Origin, Progress, and Present State of Animal Magnetism*, by J. C. Colquhoun; *Foreign Review*, vol. v.; and Braid's *Neurypnology; or, the Rationale of the Nervous Sleep*.

MESS, *mess* (from Fr. *mets*, a dish of meats), in nautical language, denotes any particular company or class of the crew of a ship who mess together, or, in other words, partake of their meals in company; as the *gun-room mess*, &c. In the army, the word *mess* is capable of a more extended signification, as it applies to the whole of the officers of a regiment, who in a species of club mess together. The mess is kept up by a certain proportion contributed from each officer's pay. The funds thus collected are termed the *mess funds*, out of which all expenses connected with the victualling department of the officers are defrayed. A bottle of wine is supplied to each officer every day at mess gratis, on the part of the commander-in-chief; it is termed the "Regent's allowance," on account of its being instituted by George IV. when regent.

MESSENGER-AT-ARMS, *mes'-sen-jer*, in Scotland, is an officer employed to execute the writs issued from the superior courts. Each messenger is obliged to find security for the proper performance of his official duties, which require to be executed with great precision, as they are not only amenable to questions regarding the liberty of the subject, but upon the legal accuracy of some of their acts the title to landed property may afterwards depend.

MESSENGER, KING'S or QUEEN'S, certain officers employed under the secretaries of state, who are kept in readiness to carry despatches either at home

or abroad. They were formerly employed for serving the secretaries' warrants for the apprehension of persons accused of high treason; and in such cases it was not at all uncommon for them to detain their prisoners at their own houses. As a remarkable instance of this practice, we may mention that in the year 1713, the ambassador of Morocco was taken into custody by a king's messenger, on January 9, and was not released until July 14, a space of six months.

MESPILUS, *mes'-pi-lus* (Gr. *mespilon*), in Bot., a gen. of the nat. ord. *Rosaceæ*. *M. germanica* is one of our orchard trees, yielding the peculiar fruit called the medlar.

MESSIAH, *mes-si'-ah*, a Hebrew word, signifying "the Anointed," and applied, as expressive of eminence, to our Saviour. In the Greek translation from the original, the word is read *Christos;* whence our Christ. It was the custom of the Jewish nation to anoint all high personages, as kings, &c.; and thus the title was applied to Jesus on account of his high position, as next to God himself. The Jews, however, deny that the Messiah has yet come, and they are looking out for and expecting his arrival, in order that their kingdom and nation may be restored to its former elevation.

MESUA, *me-zu'-a*, in Bot., a gen. of the nat ord. *Guttiferæ*. The species constituting it are remarkable for their very hard timber. The flower-buds of *M. ferrea* occur in the bazaars of India under the name of *Nag-rassar:* they are highly esteemed for their fragrance, which somewhat resembles that of violets. In Bengal, these flower-buds, as well as the leaves of the same plant, are employed as antidotes to snake-poisons. It is named in honour of two celebrated Arabian physicians and botanists, father and son, who resided at Damascus, and flourished in the 8th and 9th centuries.

METALLURGY, *me-tăl'-lur-je* (Gr. *metallon*, metal; *ergon*, work). — Percy defines metallurgy as "the art of extracting metals from their ores, and adapting them to various processes of manufacture." The miner first extracts the ores from the earth, and by mechanical processes of dressing frees them from foreign matter more or less completely, so as to render them fit for treatment by the metallurgist. The best way of acquiring a knowledge of the art of metallurgy is by practically inspecting the different processes of smelting as carried on in different localities both at home and abroad. An excellent acquaintance with the subject may, however, be gained by the study of such books as Percy's "Metallurgy," Karsten's "System of Metallurgy," and Le Play's "Traité de Métallurgie," accompanied by a close examination of the typical ores, the illustrations of the various processes of smelting, and the sections and drawings of furnaces, —of which there is a most complete collection at the Museum of the School of Mines, Jermyn Street. Metallurgical processes are divided into *dry* and *wet:* the ordinary process for smelting copper, and the method of reducing the same metal from its solution in hydrochloric acid by means of iron, may be taken as examples of these two grand divisions. The methods of reducing the various metals from their ores will be found described under their respective heads.

METALS, *met'-alz* (Lat. *metallum*, a metal).—Metals may be divided into classes according to two systems, the one having for its foundation the physical, the other the chemical properties of those bodies. Percy (*Metallurgy*, vol. i.) classifies them according to their fusibility, including however only the economic metals in his classification. *a. Fusible below redness*,—tin, lead, &c. *b. Fusible above redness, but at temperatures easily attainable in furnaces*,—copper, gold, &c. *c. Fusible only at the highest heat attainable in furnaces*, —nickel, manganese, &c. *d. Practically infusible in ordinary furnaces*,—platinum, iridium, &c. He also divides them into—*a. Fixed metals*,—gold, copper, nickel, &c. *b. Volatile metals: after fusion*, cadmium, zinc, &c.; *without fusion, passing directly from the solid to the gaseous state*,—arsenic. The specific gravity of metals at ordinary temperatures has an exceedingly wide range, from lithium ·596, which is lighter than any known fluid, to osmium, which is as high as 21·5. All metals bear a definite form of crystallization, which is produced principally in three ways,—by slow solidification after fusion, by condensation from vapour, and by electrolytic decomposition. Metals differ considerably in their structure, not only with regard to each other but in relation to themselves. Some are crystalline, as zinc, antimony, and bismuth; others are granular, like pig-iron; others fibrous, like bar iron and copper; while some few are columnar, like grain-tin; and concholdal, as in some brittle alloys,—speculum metals for instance. Two of the principal physical characteristics of metals are, ductility, the property of being permanently extended by traction, as in wire-drawing, and malleability, which is the property of extending in all directions under the hammer. The following tables show that these properties are distinct:—

| *Malleability.* | *Ductility.* |
|---|---|
| Gold. | Gold. |
| Silver. | Silver. |
| Coppor. | Platinum. |
| Tin. | Iron. |
| Platinum. | Nickel. |
| Lead. | Copper. |
| Zinc. | Zinc. |
| Iron. | Tin. |
| Nickel. | Lead. |

The power of metals for conducting electricity is shown in the following table from Matthiessen (*Phil. Trans.* 1863):—

| | | |
|---|---|---|
| Silver | 100· | at 32° Fahr. |
| Copper | 99·95 | |
| Gold | 77·96 | |
| Zinc | 29·02 | |
| Iron | 16·81 | |
| Tin | 12·36 | |
| Lead | 8·32 | |
| Antimony | 4·62 | |
| Bismuth | 1·24 | |

Their power of conducting heat is exhibited in the following table by Weidemann and Franz:—

| | | |
|---|---|---|
| Silver | 100· | at 12° C. |
| Copper | 73·6 | |
| Gold | 53·2 | |
| Tin | 14·5 | |
| Iron | 11·9 | |
| Lead | 8·5 | |
| Bismuth | 1·8 | |

The order of conductivity for heat and electricity is nearly the same. So much for the physical properties of metals. Chemically speaking, they may be divided into seven principal groups:—1. The metals of the alkalies,—potassium, sodium, lithium, rubidium, cæsium. They all have an intense affinity for oxygen, and decompose water at ordinary temperatures. They form two or more oxides, both soluble in water. Thallium is supposed by Lamy to belong to this group; but the experiments of Crookes, its discoverer, prove conclusively that it is a heavy metal belonging to the lead group.—II. The metals of the alkaline earths,—barium, strontium, calcium, magnesium. These metals, with the exception of magnesium, which seems closely allied to zinc in many of its properties, decompose water at all temperatures, and form one oxide; pretty soluble in water.—III. Metals of the earths,—aluminium, glucinum, cerium, and seven others of great rarity. These oxides are insoluble in water, and they do not decompose water at ordinary temperatures.—IV. Metals analogous to tin,—zinc, cadmium, cobalt, nickel, uranium, iron, chromium, manganese. These metals, heated to dull redness, decompose the vapour of water when transmitted over them, becoming converted into oxides while hydrogen escapes. Three of them, iron, chromium, and manganese, form powerful acids.—V. Metals forming powerful acids with oxygen,—tin, titanium, molybdenum, tungsten, vanadium, arsenic, antimony, tellurium, and one or two more.—VI. The next group contains bismuth, copper, lead, and thallium, metals which exert no decomposing action on water even at a full red heat. They form strong basic oxides, and exhibit a strong tendency to form subsalts. The last group contains the noble metals, mercury, silver, gold, platinum, and the heavy metals associated with it. These metals do not decompose water at any temperature, and have so feeble an affinity for oxygen, that their oxides, with the exception of osmium (which is

allied to arsenic in some of its properties), are reduced far below a red heat. Tellurium, arsenic, and antimony form connecting links between the metallic and non-metallic elements, being allied to the phosphorus and sulphur group in many of their chemical properties. As our knowledge of these valuable and interesting bodies extends, uses are found for many raw metals, their rarity decreasing with the demand. Sodium, lithium, aluminium, magnesium, tungsten, cerium, uranium, are instances of this; and no doubt as the sciences of metallurgy and chemistry progress, many other metals, at present only seen in the laboratory, will become common in the workshop.

METAMERIDES, *me-tăm'-e-rides* (Gr. *meta*, together; *meros*, a part), contain the same centesimal composition, but differ so completely in their physical and chemical characters as to be considered distinct; thus, acetate of methyl and formic ether, fruit, sugar, and hydrated lactic and acetic acid, have respectively the same composition in 100 parts, but are essentially different in their properties. The formulæ adopted for the first two of these will illustrate this:—

*Acetate of Methyl.*

$C_3H_3O,C_4H_3O_3=(C_6H_6O_4)$, and

*Formic ether.*

$C_1H_3O,C_2HO_3=(C_6H_6O_4)$

It will be seen from this that the ultimate atoms of C, H and O are grouped together in two different ways.

METAMORPHOSIS, *met'-ă-mor'-fo-sis* (Gr. *meta*, change; *morphe*, form), transformation; the change of a person or thing into another form. The ancients held two kinds of metamorphosis,—the one real, the other apparent. The metamorphosis of Jupiter into a bull, and of Minerva into an old woman, were only apparent; whilst the transformations of Lycaon into a wolf, and of Arachne into a spider, were held to be real metamorphoses. The idea of metamorphosis presents a great charm to the active imagination of nations in the first stages of their history; and early man, unable, from his limited knowledge, to refer the changes of nature to their proper causes, allows his imagination to ascribe these mysteries to metamorphosis. Most of the ancient metamorphoses include some allegorical meaning. Ovid's collection of narratives respecting the change wrought by the power of the gods of Greece and Rome is a history of transformations poetically related. In Natural History, the word *metamorphosis* is occasionally applied to any change in the organization of matter; as for instance, the transformation of food or rain into animal or vegetable organic substances; but the term is more strictly applied to those sudden changes in the form of things which are so obvious and interesting to even the unscientific observer; as the change of the pupa into a butterfly, to quote an instance from the insect world. (*See* INSECT-TRANSFORMATIONS.)

METAPHOR, *met'-ă-for* (Gr. *meta*, over, and *phero*, I carry), a figure in Rhet., expressing a short similitude, that is to say, one that is exemplified in a single word. The metaphor is transferred, as its name implies, from the subject to which it properly belongs to another to which it is added in order to convey a peculiar sense. It must be merely an epithet or an auxiliary term; whence arises its difference from COMPARISON (which *see*). Thus, to say "that man is a serpent" is a metaphor; whereas "that man is like a serpent" would be a comparison, or similitude. In respect to this latter quality, the metaphor may either put something animate or intellectual for something inanimate and material; for example, one may say, "the wrath of the sea," "bountiful earth," so as to represent water as endowed with will. As those impressions which we receive through the senses are the liveliest, so the designation of things spiritual by images taken from the material world may often produce a striking effect. Brevity and power are the characteristics of the metaphor; while novelty shows the original wit: unexpected contrast may thus produce an effect sublime and ridiculous in the highest degree.

METAPHYSICS, *met'-a-fiz-iks* (Gr. *ta meta ta phusika*), —a word probably manufactured by Andronicus Rhodicus, the first editor of Aristotle,—when taken in its widest signification, is a term applied to the philosophy of mind in general. Considered in its more special senses, it is synonymous with (1) psychology, or that branch of science that deals particularly with the manifestations or phenomena of mind; and (2) with ontology, as it is called, or with the rational inferences to be derived from those phenomena. Thus, the term is properly applied to two sets of mental manifestations,—to phenomenal psychology on the one hand, and to inferential psychology on the other. In the former department, the phenomena or facts of consciousness may be studied in themselves simply as such and such mental appearances, or they may be studied in their necessary and universal manifestations as such and such laws of mind. In the latter, again, or the science of being, as it has been called, the facts of consciousness, as such, simply form the ground-work of legitimate conclusions respecting the existence of something out of and beyond their own immediate phenomena. The one, indeed, classifies mental modes and their laws, the other investigates, so far as this can be done, the existences of self, the world, and Deity. It must be distinctly understood, from first to last, that the science of being, properly so called, can make no pretensions to a deductive *à priori* knowledge of its objects. The human mind can and does logically know nothing of things in themselves; mind, or matter, or Deity, *per se*, can only be known, if known at all, by man, from the phenomena or manifestations which each respectively casts on the mirror of the human consciousness. It is simply by the effects revealed to us by such objects that their existence can approximatively be concluded. If certain appearances come to light in the soil of the mind, certain inferences are, and even must be, made from those appearances respecting the existences that are implied by them. In a word, no rational induction of the mental phenomena, legitimately considered and followed out, can help landing the investigator in the heart of conclusions, or at least surmises, respecting the existence of the soul, of the universe, and of God. So much for the science of being, or metaphysics proper. To take up now psychology proper. It was customary in this country, previous to the time of Kant, to resolve all the phenomena of the human mind either into Understanding and Will, or, which was hardly a preferable arrangement of them, to classify them into the Intellectual and Active powers. The former terminology was inherited by Locke from the Middle Ages; the latter, Reid and Stewart did nothing to purify. Kant was the first to arrange the phenomena of consciousness into Cognition or Knowledge, Feeling and Desire, and Will. This threefold classification was considered so happy by philosophers, that every one of any distinction immediately adopted it as soon as it came to his knowledge. Consciousness, it must be remarked, is by no means one of those faculties. It is, properly, the mind itself in such or such a state or condition of activity or passivity. Consciousness belongs equally to each and to all of the above threefold set of phenomena. If I know, I must be conscious of knowing; if I feel, I must be conscious of feeling; if I will, I must be conscious of willing. Thus, consciousness is the condition of all mental energy. A philosophy of consciousness is all but a philosophy of the mind, and mind and consciousness are often used synonymously. The following is Sir William Hamilton's distribution of consciousness or mind:—1. *Facts*, Phenomena, Empirical Psychology; and under these he would consider the Cognitions, Feelings and Conative Powers of Will and Desire. 2. *Laws*, Nomology, Rational Psychology; and under these he would consider the laws of our Cognitions (or Logic), the laws of our Feelings or Æsthetic (or the Beautiful, &c.), and the laws of our Conations or Moral Philosophy (or Ethics), and Political Philosophy. 3. *Results*—Ontology, Inferential Psychology; and under these he would consider the Being of God, and the Immortality of the Soul, &c. As these subjects have been, or are to be, taken up in this book, the only subject that now remains is the facts of consciousness themselves. Consciousness in itself, and in its spheres of application, has a double potency, a twofold region over which it rules. There is an internal and an external consciousness,—the one taking cognizance of all our mental states, properly so called, the other taking cognisance, through the senses, of the outer world, and

the peculiar forms of external perception. Sensation proper is the consciousness which we have of certain affections of our bodily organism, and usually ascribes to the outer world the source or cause of those affections. Perception proper, again, is the consciousness which we have of our bodily organism,—as extended, figured, and so forth; and in and through this consciousness, the immediate apprehension of an external material world. Thus, sensation is the consciousness which we have of the secondary qualities of matter, as they are called; namely, colour, taste, flavour, savour, and sound; and perception is the consciousness which we possess of the primary qualities of matter; viz., trinal extension, divisibility, size, density or rarity, shape, situation, and so forth. Sensation and perception co-exist in an inverse ratio, as Sir William Hamilton has shown, in each of the five senses. In the senses of smell and taste, for example, the sensational or subjective element is so obtrusive as to be universally regarded as quite special. Again, those of hearing, sight, and touch are nearly as universally, though not quite so correctly, regarded as objective or perceptional. In other terms, the senses of smell and taste are usually regarded as vehicles of pleasure and pain, while the senses of hearing, sight, and touch, are viewed as informing us respecting the material attributes of sound, colour, and resistance. Yet the latter quality—that of resistance—belongs more peculiarly and obtrusively to the locomotive faculty, as it has been called, or the power which the living body possesses of removal from one position or state to another. It is this faculty which first informs us immediately of the existence of an extra-organic world. The external world, previous to the exercise of this power, is wholly intro-organic; but as soon as the will chooses to exert its energy, we are immediately conscious of something offering a resistance to it, and to the locomotive power at one and the same time. In addition to the five senses, there is sometimes recognised a muscular sense, or the peculiar consciousness we experience on the movement of a limb. Such are the feelings of lassitude, of fatigue, of ennui, of restlessness. This sense, it is obvious, can give us no information of anything save the special states of our own nervous organism. There is a seventh sense, the tactus venereus, as Julius Scaliger called it, which is obtrusively subjective. In addition to the primary and original powers possessed by the senses, there is a secondary or acquired power, which some of them obtain by the education of experience. Such are the knowledge of distance and of solidity, which every one of us at first sight ascribes to the sense of sight, and which is no less demonstrably certain to be derived originally from the sense of touch. It is only by a series of oft-repeated judgments respecting the colour and the comparative size of objects, that we learn to ascribe to each something like its proper distance and size, and this always at first in conjunction with the sense of touch.

It has been already observed that consciousness properly belongs to whatever occupies the regards of the mind, be it an external object or an internal one, a thought, a feeling, or a volition. Consciousness is in every mind occasionally clear or indistinct, according to the degree of attention which is given to the objects of consciousness. Are the objects of consciousness indistinct? This arises, *cæteris paribus*, from the degree of attention being obstructed and faint which is brought to bear on those objects. Are the objects of consciousness clear? This arises from the degree of attention given to them being intense and free. It is impossible here to pursue the subject of indistinct or unconscious states of mind, but those who are curious will find much interesting speculation on an obscure subject in the "petites perceptions" of Leibnitz, and the "latent modifications" of Sir William Hamilton. Attention then may be defined as consciousness in pursuit of a definite object, or consciousness intensified. And it is to be observed that attention often exists to a high degree where volition has no place whatever. Such, for example, as when one is excited by some violent passion, it is notorious that the will, exert itself how it may, cannot withdraw the mind from fixing its most violent attention on the object of admiration or dislike, until the passion has in some degree cooled. Of course, where the will and the attention go together, or where the will and the desire point in the same direction, it is then that we may be said, really to be conscious of the objects which occupy us. Attention, then, being necessary to every act of consciousness, and particularly to every clear and distinct act, those two powers taken together constitute the acquisitive power of the mind. But if the mind were destitute of any power of retaining its acquired perceptions, all knowledge, and even all consciousness, save of the most transitory kind, would be utterly impossible. So also would it be if the mind were destitute of any power of reproducing its ideas, and of representing them when they were summoned before its bar. Thus we have, by the combination of retention and recollection, the faculty of *memory*, as ordinarily understood. And it may be observed, that it is very probable that no object which has once occupied the distinct consciousness of any mind can ever be entirely effaced. We cannot often recollect at the moment something that we are assured our memory has got stored away in some out of the way recess, and the chances are that we shall stumble over this very thing that we are in search of, it may be days, months, or years after. It is the recollective power that we all are more or less deficient in much more than the retentive. Again if I try, through my memory, to recall some event or scene in which I am interested, the mind must have some *where* or place to put that which is summoned before its consciousness. It must either hold it in the grasp of the pure intellect, or, if being picturable, it must be handed over to the *imagination*. If the former, it belongs properly to the intuitive and symbolical knowledge of logic; if the latter, it is properly the work of the fancy. Dr. Mansel, of Oxford, combines both powers under the general head of representative consciousness, without apparently discriminating very sharply in this relation the conceptive power of the mind from the power of forming pictures. (For conception, judgment, and reasoning, *see* LOGIC.) As closely connected with the phenomena of memory and imagination, we have the laws of *mental suggestion* or association, not only as lying very near the foundation of those faculties, but ruling in a large measure the entire territories of the mind; for suggestion holds sway over all its phenomena, except those that come under the category of necessary truths. A syllogism affords a convenient example in logic, and the relations of parent and child, of greater and less, and of cause and effect, are instances in metaphysics. There is, probably, no subject that has called forth more of the attention of the highest minds in speculative philosophy than this very one of suggestion. Without going into the history of the subject, it can only be observed that probably the subject has been treated best by Aristotle, Hobbes, Hume, and Sir Wm. Hamilton. The views of the latter respecting the phenomena of association are that they resolve themselves into the special laws of—1. repetition; 2. indirect remembrance; and 3. preference. This appears to be the most complete analysis which those laws have yet received. 1. The law of repetition runs thus: Thoughts co-identical in mode, but differing in time, tend to suggest each other. 2. The law of indirect remembrance is that thoughts once co-identical in time, are—differ as they may among themselves—again suggestive of each other, and that in the mutual order which they originally held. 3. The law of preference is this, that thoughts are suggested, not merely by a general relation between each other, but in proportion to the interest these thoughts have to the individual mind. (*See* ASSOCIATION.) (For an analysis of the passions, emotions, desires, the moral faculty, and the will, the reader is referred to the article ETHICS.) There are certain facts of consciousness of a necessary character, that though at first mainly derived through experience, yet, when once acquired, possess an irresistible truth. These are what are called *à priori* truths in the Kantian and modern philosophy, as contrasted with those other branches of knowledge which we derive wholly through experience, and which receive the name of *à posteriori*. Such are, to take the easiest instances, the truths of arithmetic, geometry, logic, and so forth. No conceivable power can make us, as

we are at present constituted—and this is all that psychology troubles itself about—think of two and two as being anything else than four, or that two straight lines, by any possibility, can inclose a space, or that the same individual can be both tall and short at the same time, judged by a single standard of height. It is quite the reverse with such a truth as that day and night succeed each other every twenty-four hours; for we have only to go to Lapland to find that truth no longer holding. The former are necessary or *à priori* truths, the latter is a contingent or *à posteriori* one. Now, the laws of association, which have just been considered, while they can readily afford explanations of the contingent facts of consciousness, can give no clue at all to an explanation of those necessary ones. One is not a whit surer that two and two make four, after the hundredth experiment, than he was after the first; which is not the case where suggestion holds sway. Do I know any better after having examined a thousand objects, that the qualities of each and all of them express to consciousness as many distinct substances, than I did after examining the first object? Do I know any better after observing a thousand changes, that each and all of them imply a cause, than I did after witnessing the first change with intelligence? Can my knowledge of the fact that ingratitude is at all times worthy of condemnation be said to be improved by my years? Are not each and all of those truths incontestable once and for ever? Those judgments which seem to possess this quality of necessity, which no theory of the laws of suggestion can explain, are reducible to three heads:—1. Logical judgments, springing from the laws of identity, contradiction, and excluded middle, are wholly of this class. Such are the truths of arithmetic and geometry; as, the sums of equals are themselves equal, and two straight lines cannot inclose a space. Dr. Mansel, in his "Metaphysics," ranks the latter judgment under the head of mathematical judgments, as distinguished from logical ones; but there appears to be no necessity for this, as the judgment is wholly explicable on the logical principle of contradiction. Mathematical judgments are only logical ones applied to continuous or discrete quantity.—2. Metaphysical judgments expressing an apparently necessary relation between what is known and what is unknown; as that every quality implies a substance in which it inheres, and that every change implies some cause. Such are the laws, when carried into their highest development, on which hang entirely our beliefs of the permanent existence and identity of the human self, of the permanence and reality of the outer world and of the perpetual existence of a Maker of both the outer world and the inner.—3. Moral judgments, or such as state the immutable obligation of certain courses of conduct,—as, Be just, be kind, be courageous, be honest, be grateful,—are, so far as we can see—and that is all that psychology has to do with—altogether incontestable. There is no man in his senses who would impose on his fellow the general obligation "be unjust," however many men our law courts may find to transgress the general obligation in special instances.

If the mind possesses necessary and universal truths, a question of some interest here arises, Can we hereby transcend the experience of consciousness, transcend, indeed, the bounds of all possible experience? Necessity not being a result of experience, arising, indeed, from the application of certain native principles of the mind to the facts or phenomena of consciousness, at first sight would seem to warrant the belief that by those very principles of universality and necessity which have just been evolved, it is possible for thought to contemplate in their realities those truths which transcend experience. Let us reflect. We have never seen a perfect geometrical surface, or that *pons asinorum* of schoolboys, a perfect point or line. Yet how readily we can abstract from the wood or paper, on which such objects are usually presented to us, the material element which clogs the apprehension, and seize upon the pure point, line, surface which lurk behind. Now, no one requires to be told that for the exercise of such abstraction, the necessary conception of pure space is essential. What does this show us? It shows that there must always be a basis for the necessary truth to work upon, and that it is wholly a mental element which is gained by the application of such truths. We have experience of nothing but finite and relative objects, as we had experience just now only of material surfaces. Have we any faculty or faculties which will enable us to transcend those limited objects and enable us to contemplate infinitude and absolute existence? If we weigh those necessary truths one by one, we shall find no warrant for maintaining that logic can give us such powers, and the question is, can metaphysics or ethics do so? But when we put logic out of court, we put *comprehension*, clear and distinct, out of court along with it. What then remains? Nothing but *belief*. Logic deals wholly with the comprehensible; ontology deals wholly with belief. We cannot comprehend things in themselves, yet we all *believe* in them. Experience rules logic; ontology rules the highest beliefs we possess.—*Ref.* Hamilton's *Lectures on Metaphysics*; Dr. Mansel's *Metaphysics*, or the article in the *Encyclopædia Britannica* under this head; Hamilton's edition of Reid's *Works*; Dugald Stewart's *Works*; Kant's *Kritik der reinen Vernunft*; Cousin's *Lectures on the History of Speculative Philosophy*, &c.

METASTASIS, *me-tăs'-tăs-sis* (Gr. *methistemi*, I transfer), in Med., is the sudden transference of a diseased action from one part of the body to another; as when a cutaneous eruption is suddenly checked by exposure to cold, and the disease attacks a deep-seated part; or, in gout, where the disease suddenly shifts from the foot to the stomach, or some other internal part.

METEMPSYCHOSIS, *me-tem-se-ko'-sis* (*Gr. meta*, beyond, and *empsucho*, I animate), is the supposed transmigration of souls from one body to another. This idea belongs to the oldest religions of India and Egypt. Pythagoras, who is said to have borrowed his notion from the Egyptians, held that after death men's souls passed into other bodies, of this or that kind, according to the life they had led. This is also a prominent feature in the systems of Brahminism and Buddhism, which represent the soul as passing after death into the body of a higher or lower animal, as a reward of virtue or a penalty for vice. Human life is regarded only as a link in a chain of conditions through which the soul passes in a long career of procession from God and return to him. A period of 12,000 divine years, each embracing 360 human years, is assigned as the period for transformations and purification, after which the soul receives its reward of being absorbed in the divine nature. Plato maintained the pre-existence of the soul before its appearance in man, and that of this prior state it retained some dim reminiscences. After death, according to its peculiar qualities, it seeks a new body suitable to it. Every soul, according to him, returns to its original source in 10,000 years. The idea of metempsychosis subsequently appears in the speculations of the Neo-Platonists, in the Cabala of the Jews, and even in the writings of Origen. In recent times, the system was revived by Fourier.

METEMPTOSIS, *me-temp-to'-sis* (Gr. *meta*, after, and *pipto*, I fall), in Chron., is a term used to express the solar equation necessary to prevent the new moon from happening a day too late; as *proëmptosis* signifies the lunar equation necessary to prevent the new moon happening too soon.

METEORIC STONES. (*See* AEROLITE.)

METEOROLOGY, *me-te-or-ol'-o-je* (Gr. *meteoros*, raised in the air; *logos*, a discourse), the science which treats of the phenomena which occur in the atmosphere and leads us to inquire into their properties and relations. In all conditions and stations in life, men are led, by motives of necessity or comfort, to study the appearance of the atmosphere and sky, in order to arrive at some indications of the weather. Every varying appearance which may betoken some change is carefully stored up in the minds of sailors, fishermen, husbandmen, shepherds, and hunters. These results form a vague body of rules, in which facts are often stated correctly, but, through credulity, ignorance, and superstition, they are so frequently mixed up with erroneous deductions, that they form an unsafe basis for the science. From these causes arises the disposition to refer the ordinary changes of the weather to the influence of the moon or stars, and also to look upon comets and meteors as the forerunners of catastrophies, either in the moral or physical world. The history of

meteorology is difficult to trace, since little information is cast upon it by the records of antiquity. The observations of the ancients were chiefly directed to changes in the weather; and by personal assiduity they were enabled to prognosticate often with considerable certainty. The philosophers of old were willing to explain the phenomena by the most vague hypotheses, referring them to stellar and planetary influences. There were also to be found, in those times, persons who were believed to possess supernatural influence over atmospheric changes. The priests of Samothrace promised auspicious winds to such as consulted their sacred oracle; and Empedocles, of Sicily, boasted in his song of a knowledge of the mystic art. At the fountain Hagno, in Arcadia, in the time of drought, the priests of Jupiter were accustomed to offer up sacrifices—touching the water with an oaken wand—when presently a vapour rose, and shortly afterwards a pleasant rain descended. Such miraculous powers were believed to be given to mortals even in more recent times; in the reign of Constantine, Sopater of Apamea was put to death because he was supposed to have stilled the winds and thereby caused the plague which then raged at Constantinople. As the study of natural science progressed, the casual precursors of phenomena were separated from the real causes, false conclusions were refuted, and the empty terrors to which they gave rise were dissipated. By widely-extended observations in all the realms of natural science, at length were gained the general rules by which the phenomena of the atmosphere are regulated. From chemistry, meteorology borrows her analysis to determine the composition of the air itself, of the substances which it contains and by which it is acted upon; the manner in which the different processes of evaporation, freezing, thawing, &c., go on, and how they affect the state of the atmosphere; the action of those invisible and imponderable agents, light, heat, electricity, &c., and their tremendous results. From physics, meteorology takes the mechanical action of these and similar powers and substances, the weight and velocity of the air, the laws of the reflection, refraction, and motion of light, &c. By these aids, the science of meteorology explains the formation, fall, or deposition of hail, snow, rain, dew, and frost; the action of thunder and lightning; the prevalence of certain winds and their particular properties; the effect of the position of a country and the nature of its surface on its climate and productions; and the nature and cause of meteors. In order to arrive at correct results with respect to several of these branches of meteorology, several useful instruments have been invented, which will be found described under the articles BAROMETER, HYGROMETER, and THERMOMETER. The reader will also find branches of this interesting and important subject treated of under the articles AIR, ATMOSPHERE, CLOUD, EVAPORATION, FREEZING, HEAT, LIGHT, ELECTRICITY, PHYSICAL GEOGRAPHY, SNOW, &c.—*Ref.* Saussure's *Essais sur l'Hygrométrie*; De Luc's *Idées sur la Météorologie*; and Daniell's *Meteorological Essays and Observations.*

METEORS, *me'-te-ors* (Gr. *meteora*).—In a general sense, this term is applied to any of the various physical phenomena which have their origin in the atmosphere. (*See* METEOROLOGY.) In a more restricted sense, however, the word denotes those fiery and luminous bodies which appear suddenly and at uncertain times either in the atmosphere or in higher regions. Amongst these may be mentioned the *bolis*, or fire-ball, a luminous meteor of great splendour, moving with considerable velocity at various altitudes, and frequently of great magnitude. The meteor is generally accompanied by a tail, and disappears in scintillations, attended sometimes by an explosion, occasionally leaving a luminous track behind, after it has become invisible. Fire-balls occasionally accompany meteoric stones in their descent; nevertheless, these phenomena must be considered independent, for the bolis may appear without the meteorolite, and *vice versâ*. Many extraordinary meteors have been seen and recorded: one of the most remarkable is that described by Blagden in the "Philosophical Transactions." It occurred on the 18th August, 1783, about 9 p.m., and was visible over a wide extent of Europe, from the north of Ireland to Rome, frequently changing its form and colour. It crossed the zenith at Edinburgh, and then appeared round and of a greenish colour, casting a shade upon the ground of a similar tint; a tail of considerable length attended it. At Greenwich it appeared like two bright balls, followed by a number of others, connected together by a luminous body, and finally terminating in a blaze, tapering to a point; the colours of the balls were different. The height of this meteor was estimated to be far above the surface of our atmosphere, its speed was not less than 1,000 yards per minute, and its diameter was computed at 2,800 yards. Cavallo describes this meteor as seen at Windsor, when its explosion was heard like a peal of thunder, ten minutes after its rupture was observed. On the 18th November, 1803, about 8·5 a.m., a brilliant meteor appeared in London, rendering legible the writings on the signboards. Many other meteors, of more or less brilliancy, have been observed at various times.

METHOD, *meth'-od* (Gr. *methodos*, a way), is the means or path by which we proceed to the attainment of some object or aim. It this sense, every art and science has its own proper method; but besides this, there is a universal method, or a science of method, by which every step in our progress through the whole circle of art and science should be directed. "The relations of things," says Coleridge, "form the prime objects, or, so to speak, the materials of method; and the contemplation of those relations is the indispensable condition of thinking methodically." (*See* Coleridge on *Method*, introduction to *Encyclopædia Metropolitana.*) Descartes has also written a discourse on *Method*, in which he lays down four general rules to be observed in carrying out investigation. (*See* CARTESIAN PHILOSOPHY.) Method is usually described as the fourth part of logic, and "may be called, in general, the art of disposing well a series of many thoughts, either for the discovering truth when we are ignorant of it, or for proving it to others when it is already known. Thus there are two kinds of method,—one for discovering truth, which is called analysis, or the method of resolution, and which may also be called the method of invention; and the other for explaining it to others when we have found it, which is called synthesis, or the method of composition, and which may be also called the method of doctrine."—*Port Royal Logic.* (*See* LOGIC.)

METHODISTS, *meth'-od-ists*.—Under this term are comprehended two principal and several subordinate sects, having totally distinct ecclesiastical organizations. The two grand sections also differ from each other upon points of doctrine, the one professing Arminian, the other Calvinistic sentiments. The former are the followers of John Wesley, and known as "Wesleyan Methodists," the latter the followers of George Whitfield, and commonly termed Calvinistic Methodists. The Wesleyan Methodists comprise the "Original Connexion," "New Connexion," "Primitive Methodists," "Bible Christians," "United Methodist Free Church," and "Wesleyan Reformers." The Calvinistic Methodists are the "Countess of Huntingdon's Connexion," and "Welsh Calvinistic Methodists." In 1729, John Wesley, when a fellow of Lincoln College, Oxford, with his brother Charles and a few others, began to hold small evening meetings for religious exercises. The name of Methodists was given to them on account of their regularity and strictness of conduct. The society was broken up by the departure of the Wesleys for Georgia, as chaplains for the colony which had been planted there. They returned to England in 1738. Hitherto they had held the opinions of extreme high churchmen; but a change having taken place in their views, they were debarred from officiating in the pulpit, and had recourse to preaching in private houses, fields, or wayside. The result of their preaching was a general awakening on the subject of religion throughout the land, and their followers became so numerous that it was necessary to form them into societies, and to draw up certain rules for their guidance. The only condition of membership was "a desire to flee from the wrath to come, and be saved from their sins." Members, however, after admission were expected (1) to abstain from doing harm, by avoiding evil of every sort, as quarrelling, fighting, drunkenness, swearing, profaning the Lord's day, un-

charitable or unprofitable conversation, the buying or selling of uncustomed goods, &c.; (2) to do good of every possible sort, and, as far as possible, to all men; (3) to attend upon all the ordinances of God. The peculiarities of the Wesleyan polity now developed themselves. In June, 1844, the first conference was held in London; the different parts of the kingdom were divided into circuits, and lay preachers were appointed. The doctrines held by the Wesleyans are substantially according with the Articles of the Established Church, interpreted in their Arminian sense. They maintain the doctrines of original depravity, an unlimited atonement, justification by faith, and a divine assurance of acceptance with God. Wesley distinctly declared himself an Arminian on the subject of predestination, understanding it in a sense not contrary to the doctrine of redemption, and the possible salvation of the whole human race. The public services of the Methodists present a combination of the forms of the Church of England with the usual practice of dissenting churches. In the larger chapels, the Church liturgy is used, and in all, the sacrament is administered according to the Church of England rubric. Love-feasts are occasionally celebrated, and on the last day of every year a solemn midnight meeting is held. One principal feature of Methodism is the system of classes, each being composed of about twelve persons, one of whom is appointed leader, whose duty it is to meet his class once a week, converse with each member, hear from him a statement of his spiritual condition, and give appropriate counsel. A society consists of one or more of these classes, and several of these societies form a circuit, which generally includes a town and the neighbouring villages. The public worship of these societies in each circuit is conducted by two descriptions of preachers,—the one clerical, the other lay. The former are set apart entirely for the work of the ministry, and are supported by funds raised for that purpose. From one to four of these "itinerant preachers" are appointed annually, for not exceeding three years in succession, to each circuit. Their ministry is not confined to any particular chapel, but they act interchangeably according to a plan generally re-made every quarter, a preacher seldom officiating more than one Sunday in a chapel without a change. The lay, or "local" preachers, as they are called, follow secular callings, and preach on the Sundays at the places arranged for them on the above plan. Besides preaching in the various chapels in their respective circuits, the itinerant preachers administer the sacraments of baptism and the Lord's supper. One or other of them, according to arrangement, meets every class in his circuit once every quarter personally, converses with every member, and distributes to all who have walked orderly during the past three months a ticket of membership. One of the ministers in each circuit acts as superintendent. The highest Wesleyan court is the Conference, composed exclusively of ministers. It derives its authority from a deed of declaration, executed by Mr. Wesley in 1784, and which provided that after his death 100 persons, named in the deed, being preachers and expounders of God's Holy Word, should exercise the authority which Wesley himself possessed to appoint preachers to the various chapels. Vacancies are to be filled up by the remainder at the annual conference. Representatives selected by the district meetings, and such other ministers as are appointed or permitted to attend, are allowed to take part in the proceedings, and even to vote, though no decision is binding that has not the sanction of the legal hundred. The Conference must sit for at least five days, and not more than three weeks. It examines into the moral and ministerial character of every preacher, receives candidates on trial, and admits ministers into the connexion, and appoints preachers to particular circuits or stations. It also exercises a general superintendence over the various institutions of the body, including the appointment of various committees. In the "Original Connexion," to which the above remarks mainly apply, there were, according to the religious census of 1851, 428 circuits in Great Britain, with 1,024 ordained preachers, and between 13,000 and 14,000 lay preachers. In England and Wales, there were 6,579 chapels, with accommodation for 1,447,580 persons. On 31st March, 1851, the attendance was—morning, 492,714; afternoon, 383,964; evening, 667,850. The "Methodist New Connexion" originated in a dispute that took place soon after Wesley's death, in 1791, regarding the admission of the laity to some participation in the government of the body. In the Original Connexion, all authority is virtually vested in the preachers; the New Connexion, on the contrary, admits the principle of lay participation in church government. The separation took place in 1797, and the New Connexion was formed under the leadership of the Rev. Alex. Kilham. In doctrine, and all the essential and distinctive features of Wesleyan Methodism, they are both alike; the Arminian tenets, and the outline of ecclesiastical machinery, comprising classes, circuits, districts, and conference, are the same in both. In 1851, they had 297 chapels and stations, with accommodation for 96,064 persons. The "Primitive Methodists," sometimes known as the Ranters, originated in Staffordshire, in 1810, in consequence of a desire among certain persons to revive the spirit and fervour of the early preachers. Their doctrines and ecclesiastical polity are similar to those of the Original Connexion, except in the admission of lay members to the Conference. The number of chapels and other places of worship in 1851 was 371, with accommodation for 369,216 persons. The "Bible Christians," or Bryanites, are not the result of any secession from the Methodist body, but grew up as an independent community, and adopted the essential principles of Methodism. Its founder was one William O'Bryan, a Wesleyan local preacher in Cornwall, who left that body in 1815, and began to form societies upon the Methodist plan. In doctrine, they do not differ from the other bodies of Arminian Methodists. In 1851, they had in England and Wales 482 chapels, &c., with 66,534 sittings. The "Wesleyan Methodist Association" originated in a dispute in 1834, regarding the establishment of a theological institution, and one minister who opposed it, and certain of his sympathizers, were expelled from the connexion, and formed a new body. The lay element has here more influence in matters of church discipline than with the Old Connexion, and the Annual Assembly (answering to the Conference) is composed of such itinerant and local preachers and others as the circuits, societies, or churches may elect, the number of representatives being regulated by the number of constituents—circuits with less than 500 members sending one; from 500 to 1,000, two; and above 1,000, three representatives. In 1851, there were in England and Wales 419 chapels, &c., with 98,813 sittings. This body has lately become united with a number of the Wesleyan Reformers, under the name of the "United Methodist Free Church." The "Wesleyan Reformers" separated from the Original Connexion in 1850, in consequence of the expulsion of certain ministers, who refused to repudiate all connexion with certain anonymous pamphlets, reflecting against certain proceedings of the Conference. It is calculated that this proceeding led to the loss of 100,000 members to the connexion. The Reformers, however, do not wish to be regarded as a separate church, or even as an independent connexion, but profess a high regard for the communion from which they consider themselves to have been illegally expelled. Nearly a half of them have, however, as already stated, united themselves with the "Wesleyan Methodist Association." The "Calvinistic Methodists" were the followers of George Whitfield, after he separated from Wesley, on the doctrine of election. The only sects now existing of this class are the Countess of Huntingdon's Connexion and the Welsh Calvinistic Methodists, most of the other congregations having become gradually absorbed into the Congregational body. The countess of Huntingdon was one of those that were deeply impressed by the preaching of Whitfield, and by his advice she assumed a kind of leadership over his followers, erecting chapels, appointing preachers, and establishing a college. The doctrines of this connexion are almost identical with those of the Church of England, and the form of worship does not differ materially. In ecclesiastical government, the congregational polity is practically adopted. In 1851, the number of chapels belonging to this connexion was 109, with

38,727 sittings. The "Welsh Calvinistic Methodists" originated from the preachings of one Howel Harris, about 1736. The movement spread very rapidly, and societies were formed, and a system of organization carried out. The "Quarterly Association" corresponds to the Wesleyan Conference, and consists of all the preachers and leaders of societies in the connexion. The preachers are itinerant, and only a certain number of them are ordained to administer the sacraments. Their doctrines are substantially in accordance with the Articles of the Established Church, understood in their Calvinistic sense. The number of their chapels in 1851 was 828, with accommodation for 211,951 persons.

METHYL, *meth'-ile* (Gr. *methu*, wine; *ule*, wood), in Chem., $C_2H_3$, $C_3H_3$. The first of the hydrocarbonic radicles of the alcohols. It is a gaseous body, slightly heavier than air, and burning with a bluish flame. It is not liquefied by a cold of 0° Fahr. It is obtained by acting on iodide of methyl with zinc. Its most important compound is methylic alcohol, or wood spirit. It also enters into the composition of the essential of *Gaultheria procumbens*, which is a salicylate of the oxide of methyl, and may be prepared artificially by distilling wood spirit with sulphuric and salicylic acids.

METHYLATED ALCOHOL, or METHYLATED SPIRIT, *meth'-e-lai-ted*, spirits of wine to which have been added certain proportions of shell-lac and methylic alcohol, or wood spirit, for rendering the mixture unpotable. The mixture is allowed by the government to be sold without excise duty, for the purposes of manufacture only. Numerous instances have, however, lately occurred in which the methylated spirit has been "doctored" and sold for the purposes of dram-drinking. Methylated spirit is extensively employed as a solvent of resins and gums for varnishes, aniline colours, and for nearly every use to which ordinary alcohol was formerly applied.

METONIC CYCLE, *me-ton'-ik*, the cycle of the moon, a period of 19 solar years, after which the new and full moon fall on the same days of the year as they did 19 years before. This cycle was the invention of Meton, a celebrated Athenian philosopher, who flourished about 432 B.C. The Metonic cycle contained 6,940 days, which exceeds the true length of 19 solar years by nine and a half hours nearly. On the other hand, it exceeds the length of 235 lunations, or synodic revolutions of the moon, by seven hours and a half only. The framers of the ecclesiastical calendar altered the distribution of the lunar months when they adopted this cycle, in order to accommodate them to the Julian intercalation. By this alteration, every three periods of 6,940 days were followed by one of 6,939. Consequently, the mean length of the cycle was 6,939¼ days, which coincides exactly with 19 Julian years. In the ecclesiastical calendar, the number of the year in the cycle is called the *golden number*. The cycle is supposed to commence with the year in which the new moon falls on the 1st of January.

METONYMY, *me-ton'-e-me* (Gr. *metonumia*, from *meta*, change, and *onoma*, a name), in Rhet., is a figure of speech by which the name of one thing, or idea, is substituted for that of another, to which it stands in the relationship of cause and effect, container and contained, or sign and thing signified; as when grey hairs are used to denote old age; the cup for the liquor contained in it; the sceptre for regal power.

METOPE, *met'-o-pe* (Gr. *meta*, between; *ope*, an aperture), in Arch., the square piece or interval between the triglyphs in the Doric frieze. In its original Greek meaning, the word signified the distance between one aperture or hole and another, or between one triglyph and another, the triglyphs being supposed to be solives or joists that fill the apertures. The ancients were in the habit of ornamenting the metopes with carved works or with paintings representing the heads of oxen, vessels, and other objects used in sacrificing. The metope is omitted in the Ionic and Corinthian orders, probably on account of the difficulty experienced in disposing the triglyphs or metopes in symmetrical proportion.

METRE, in versification. (*See* PROSODY.)

METRIC SYSTEM, *met'-trik*, is the name given to a system of weights and measures at present in use in France, Belgium, Holland, Spain, Italy, Portugal,



Greece, and other countries, and which a select committee of the House of Commons has recommended to become legalised in England. This committee, including, among other scientific gentlemen, the astronomer royal, Mr. Fairbairn, the master of the mint, and Professor De Morgan, pronounces the present state of weights and measures a system of legalised disorder, and recommends the adoption of a simple and uniform system, with a view not only to the benefit of our internal trade, but to facilitate our commercial intercourse with foreign countries. The weights and measures of the British empire are enforced, by various acts of parliament, in ten different systems, all of which are in actual use:—1st, Grains divided decimally for scientific purposes; 2nd, Troy weight; 3rd, Avoirdupois weight; 4th, Bankers' weight; 5th, Apothecaries' weight; 6th, Diamond and Pearl weights; 7th, Avoirdupois weight; 8th, Hay and Straw weights; 9th, Wool weight; 10th, Coal weight. Of measures, there are the yard, foot, inch, ell, nail, knot, league; the geographical, Scotch, Irish, and common mile; three sorts of fathoms, &c. Land is measured in the United Kingdom by several sorts of acres; such as the common, Scotch, Irish, &c. In dry measure, twenty different sorts of bushels are used. The price of wheat is in one place at so much the quarter; in others at so much the barrel, sack, bushel, stone, boll, bag, bolt, coomb, hobbet, winch, windle, strike, measure, or weight. A load, a bag, or a stone, varies in nearly every market-town in England. In fluid measures, a pipe varies with each particular sort of spirit or wine it is to contain. A ton of iron is 20 hundredweights; a ton of copper ore is 21 hundredweights; of lead, 19½ hundredweights, and is, in this last instance, termed a fodder. The troy ounce is greater than the avoirdupois ounce, yet the avoirdupois lb. is greater than the troy lb. These are a few out of the interminable mass of perplexities of which the present system is made up. The metre was originally deemed to be the ten-millionth part of the distance from the pole of the earth to the equator, measured along the surface of the sea. In 1799, however, it was declared to be the length of the platinum standard preserved in the archives at Paris. In English measure, its equivalent value is nearly equal to three feet, three inches, and three-eighths of an inch. In the metric system the metre is the fundamental unit of measurement; whence the units of superficies, of capacity, and of weight, are derived. The whole system consists of four principal elements, with their decimal multiples and decimal parts; such as the metre for length, the are for surface, the litre for capacity, and the gram for weight. All these are subdivided into tenth, hundredth, and thousandth parts, which are denominated by the syllables derived from the Latin *deci, centi*, and *milli*; the multiples are similarly, by tens, hundreds, thousands, tens of thousands, &c., distinguished by the prefixes, borrowed from the Greek, of *deca, hecto, kilo*, and *myria*. The subjoined scale shows the whole metric system at a glance:—

| Measures of | | | | Proportions. |
|---|---|---|---|---|
| *Length.* | *Surface.* | *Capacity.* | *Weight.* | |
| Millimetre. | | | Milligram. | 1.000th part. |
| Centimetre. | Centiare. | Centilitre. | Centigram. | 100th part. |
| Decimetre. | (Not used). | Decilitre. | Decigram. | 10th part. |
| Metre. | Are. | Litre. | Gram. | One. |
| Decametre. | Decare. | Decalitre. | Decagram. | 10 times. |
| Hectometre. | Hectare. | Hectolitre. | Hectogram. | 100 times. |
| Kilometre. | | Kilolitre. | Kilogram. | 1 000 times. |
| Myriametre. | | | Myriagram. | 10 000 times. |
| | | | Quintal. | 100,000 times. |
| | | | Ton. | 1,000,000 times. |

The whole of the multiples and subdivisions of the metric system are decimal, and the reduction from one denomination to the other is performed by multiplying by 10 or its multiples, or dividing by them. There is no necessity to alter the figures, but merely to read them differently by placing the decimal point so many places to the right or left of its place in any given number, according to the terms of the required denomination. For example, if we desire to represent 5274 metres in decimetres we write 52740; if we wish to reduce it to centimetres we write 527400. For the higher denominations we write 5274·9 decametres, or

·627·49 hectometres, &c. For measures of capacity and weight the reduction is carried on in precisely the same manner as in that of the metre and its multiples. The annexed equivalents of our present system are useful in comparing scales of either weight or measure. An inch is about 25 millimetres; a foot, 30½ centimetres, or 305 millimetres; a yard, 0·914 metre; a quart, 1·136 litres; a pound, ·0·454 kilogram; an acre, 0·405 hectare. It is suggested that the introduction of the decimal coinage should be postponed until the working of the other parts of the metric system has been ascertained. The advocates of the metric system ask for its introduction into the United Kingdom on the ground that our weights and measures being so confused and contradictory, we should adopt such trading medium with other nations as shall enable us to buy and sell according to a simple and substantial plan. The metric system has, it is said, all the qualities that we can desire for our purposes. On the other hand, those who pretend to be sceptical as to the merits of the novel system aver that the metric system, although it has been introduced into France for upwards of half a century, has never been uniformly carried out, either in scientific or commercial calculations, or in ordinary trade transactions. — Ref. *London Review*, vol. vi., No. 156; *The Times*, July 9, 1863.

**Metronome**, *met'-ro-nome* (Gr. *metron*, measure; *nome*, division), an instrument employed to mark the time of music, constructed of rosewood or mahogany, in the shape of an obelisk, and nearly a foot in height. There are two kinds: the one rather complicated, having a pendulum kept in motion by means of a spring and wheelwork, while the other is extremely simple, consisting merely of a pendulum without any machinery, which is made to vibrate by striking it with the finger. As early as 1698, an instrument upon a like principle was known in France; but it was not till 1812 that the metronome at present in use was invented, some say by J. N. Maelzel, while others attribute the discovery of the mechanical principle of this instrument to Winkel of Amsterdam, and assert that Maelzel only added the scale of numbers affixed to the pendulum. Although this ingenious little instrument was greatly opposed at its introduction, it is now generally acknowledged to be of great utility both to composers and performers.

**Metropolis**, *me-trop'-o-lis* (Gr. *meter*, mother, and *polis*, city), is the capital or principal city of a country or province, and, as it were, the mother of all the rest. The Roman empire having been divided into thirteen dioceses and 120 provinces, each diocese and each province had its metropolis or chief city, where the proconsul or vicar of the empire had his residence. To this civil division the ecclesiastical was afterwards adapted; and the bishop of the capital city had the direction of affairs, and the pre-eminence over all the bishops of the province. He hence received the name of metropolitan or archbishop. The erection of metropolitans is referred to the end of the 3rd century, and was confirmed by the council of Nice.

**Metropolitan Building Acts.**—The subject of making general laws to govern the establishment of neighbourhoods would be an interesting study. In all countries, the idea has either never been conceived, or, if considered, not acted upon. Communities have sprung up in an arbitrary manner, commencing, as they must have done, by the erection of a single dwelling. Others have been superadded, and so a neighbourhood has been formed. Each owner has been left to exercise his choice, and the law of property has not been interfered with to check his caprice or personal convenience. In this irregular manner, cities, towns, and other populous districts have been formed. A tenacity of ownership has been inherent in the possessor of his particular domain. The law of every country is jealous of every attempt to disturb a man in the enjoyment of that which is exclusively his own. No legislature will permit this right to be interfered with, except to carry out some plan for the general good or convenience of the people at large. In this country, until very lately, the legislature has not thought it fit or prudent to interfere with private property, and, generally speaking, prohibitory or constraining laws, affecting the same, have been applied only to the metropolis. These were not introduced until the reign of Elizabeth, and they were very limited in their operation. After the fire of London, Sir Christopher Wren suggested a plan for rebuilding the city. If this had been carried into effect, it would have formed the nucleus of a splendid metropolis. Shortly after this fire, viz., in the 19th & 22nd of Charles II., two statutes for regulating buildings in London were passed. These were followed by the act of 6 & 7 Anne. Another statute was passed in the 33 of Geo. II., and some others were enacted in the reign of Geo. III. The chief object of all these was to prevent the spread of fire, and the public health or safety formed little or no ingredient in any law previous to that which is now in operation. This is "the Metropolitan Building Act, 1855," which extends to all places within the limits of the metropolis, as defined by an act of the same session of parliament, intituled *An Act for the better local Management of the Metropolis*. The building act applies to the regulation and supervision of buildings, the structure and thickness of walls, recesses and openings in walls, the timbers in walls, bressummers, height and thickness of parapets and party walls, the construction of roofs, chimneys, and flues, close fires and pipes, projections, the size of rooms and warehouses, uniting buildings and otherwise. The supervision of these works is intrusted to district surveyors, to whom notice must be given previous to a building or alteration being commenced who can compel compliance with the act by an order of justices. Power is also given to protect dangerous structures, until application can be made to the owner to do so, and an order can be obtained for the purpose; on failure to comply with which, the commissioners are enabled to pull down and remove the same. This act was amended by an act called "the Metropolitan Building Act (amendment), 1860," which directed that the rules of the former act, as to the cubical dimensions of buildings, should not apply to such as shall be beyond three miles from St. Paul's, and used for the manufacture of machinery and boilers of steam-vessels, provided such buildings shall consist of one floor only, and be constructed as therein mentioned. In districts beyond the limits of the metropolis, some provisions were made by the act passed in 1847, for consolidating in one act certain provisions usually contained in acts for paving, draining, cleansing, lighting, and improving towns, which to some extent regulates buildings, more especially as to projections, setting back houses, ruinous and dangerous buildings, repairs, consumption of smoke in factories, and the erection and supervision of slaughterhouses. This act is incorporated with the Local Government Act, 1858, and is operative in all places under the jurisdiction thereof, and the latter act, in conjunction with the Public Health Act, 1848, applies to whitewashing or cleansing houses, and prohibits the erection of houses over sewers, and establishes authority over the construction and cleansing of drains.

**Metrosideros**, *me'-tro-si-de'-ros* (Gr. *metos*, the heart of a tree; *sideros*, iron), in Bot., a gen. of the nat. ord. *Myrtaceæ*. The clubs and weapons of the South-Sea Islanders are made of the hard wood afforded by various species. The *lignum vitæ*, or *Aki* of New Zealand, belongs to this genus.

**Mexican Antiquities**, *mek'-si-kăn.*—The early condition of Mexico has been partly ascertained by means of Mexican pictures, most of which were destroyed by the Spaniards. These pictures contain chronological histories, and copies of many of them were made by the Mexicans shortly before they were destroyed. The most celebrated of these was in the possession of Siguenza y Gongora, professor of mathematics in the university of Mexico in 1698. Although the original is lost, a genuine copy remains, of which Humboldt gives a description. It commences with the deluge of Coxcox, or the fourth destruction of the world according to the Aztec cosmogony. Coxcox and his wife having been saved from drowning, the gift of speech was bestowed on their descendants, and fifteen families arrived in Mexico. Another Mexican author, who wrote shortly after the conquest, divides the history of the world into four great parts:—the age of giants, which lasted 5,206 years; the age of fire, 4,804 years; the age of winds, 4,010; and the age of water, 4,008 years. The Mexican paintings were executed on

skins, cotton cloth, and the leaves of the maguey or agave. When the Spaniards arrived in Mexico, civilisation had so far advanced, that, amongst the Aztecs, the right of private property was understood, cities were built, professions and distinctions of rank existed, the arts were cultivated with considerable success, &c. The *teocallis*, or pyramids, are amongst the most remarkable objects of Mexican architecture. The pyramid of Cholula is 177 feet high, and comprises a square of 1,440 feet. It is built of unburnt bricks and clay, and is supposed to have been built by the Toltecs, who preceded the Aztecs. The object of these pyramids is unknown; they are generally truncated, and the larger ones are often surrounded by a number of smaller ones, which are supposed to have been tombs. In the cathedral at Mexico is fixed a circular stone, marked with hieroglyphical figures, by which the Aztecs denoted the months. Not far from it is a stone altar, where human sacrifices were offered up. A large idol is also preserved in the Dominican convent representing a huge serpent devouring a human being. The pyramids of Papantla, near Vera Cruz, are built of large masses of porphyry, and some remarkable antiquities have been of late years discovered at Yucatan.

MEZEREON. (*See* DAPHNE.)

MEZZO, *mel'-so*, literally, half, middle; a term in Mus. generally employed in conjunction with some other word; as *mezzo-forte*, moderately loud; *mezzo-piano*, rather soft; *mezzo-soprano*, the middle species of female voice. The C clef, when placed on the second line of the staff, in order to accommodate the mezzo-soprano voice, is termed the *mezzo-soprano* clef.

MEZZOTINTO. (*See* ENGRAVING.)

MI, *mi*, the syllable applied by Guido to the third note of his hexachords. It is expressed in the natural hexachord by the letter E, and is the third note of the major scale.

MIASMA. (*See* MALARIA.)

MICA, *mi'-kă* (from Lat. *mico*, I shine), in Min., a mineral having a somewhat metallic lustre, and capable of being split into thin plates. It enters into the composition of most of the primary rocks. It also occurs in shales, sandstones, and other sedimentary deposits, being derived from the broken-down granitic rocks. It consists chemically of the silicates of potash and alumina, more or less coloured by peroxide of iron. The alumina is often partly replaced by lithia, magnesia, and lime. Mica has lately received important applications in the manufacture of transparent letters for shop-windows and of smoke-shades to gas jets.

MICAH, BOOK OF, *mi'-kă*, is one of the books of the minor prophets in the Old Testament, bearing the name of its author, Micah, who, as we are told, prophesied during the reigns of Jotham, Ahaz, and Hezekiah, and was consequently a contemporary of Isaiah (B.C. 759—690). The book may be divided into three parts. It commences with a majestic exordium, in which is introduced a sublime theophany, the Lord descending from his dwelling-place to judge the nations of the earth, who approach to receive judgment; then follows a prophecy that Samaria shall fall, and that Judah also shall suffer injury and be carried into captivity, followed by a promise of the reunion of the whole people (ch. i. ii.). In the second part the destruction of Jerusalem is foretold, the return of the Jews from Babylon, and the glories of the future Zion, with the advent of the Messiah (iii. 5). The third part consists of a dialogue between the Lord and his people, in which he reproves them for their sins, and threatens them with punishments, ending with the promise of a return from their captivity. The style and ideas of Micah are not unlike those of Isaiah. He is clear and distinct, powerful and animated, rising in many cases to vehemence and sublimity. Micah is the only prophet that pointed out Bethlehem as the birthplace of the future Messiah.

MICE, or MOUSE FAMILY, *mise* (Ang.-Sax.), a family of rodent mammalia belonging to the order *Glires*. The domestic mouse (*Mus musculus* of Linnæus) has its ears about half the length of the head, the tail a little shorter than the head and body, and the general colour of the upper portions of the body is greyish brown, while that of the lower parts is yellowish grey. The mouse is, in fact, but a small edition of the rat, although its head may be said to be proportionately less elongated than the former species. The body of the mouse is moderately full, the head tapering, the muzzle pointed, the eyes prominent, and the ears broad and rounded, the legs being short, and the feet rather delicate than otherwise. It seems to be entirely dependent on man, as it is never found far from his dwelling. Although naturally timid, mice occasionally exhibit great boldness, and they venture quite close to any one who does not molest them. On account of their fecundity, coupled with their thievish propensities, they are extremely destructive in houses, devouring everything they can get at,—meal, flour, bread, cheese, butter, tallow; in fact nothing edible seems to escape them. Their great enemy is the cat; but even she is unable quite to extirpate them, and thus they do considerable mischief. Their ravages, however, are not confined to houses merely, as they do much damage in farmyards by entering corn-stacks, where they gnaw away to their heart's content. Their enemies, besides man, and the cat and ferret, are weasels, owls of various species, and the kestrel, all of which make the mouse their prey. It has many litters during the year, and from five to seven young ones in each litter; consequently it soon increases considerably if undisturbed. The domestic mouse is common throughout the whole of Europe, and, indeed, has extended to America and Australia. Another variety of the *Murina*, the wood-mouse (*Mus sylvaticus*), is likewise found throughout Europe, where it proves a powerful and bitter enemy to the agriculturist. It is generally found in fields and gardens, and it has a habit of piling up large stores of grain, acorns, nuts, and such-like, as a provision for the winter season. It often takes possession of the deserted holes of moles, where it lays up its magazine. Its ears are about half the length of the head, the tail nearly as long as the head and body; the upper parts reddish brown, and the lower greyish white, with a little orange-red spot on the breast. The harvest mouse (*Mus messorius*) is one of the prettiest varieties of this little animal, and, in fact, it is one of the most elegant of our native quadrupeds. It builds its nest in standing corn, and during the harvest season it is carried into the barns along with the sheaves, in which places it breeds and multiplies in considerable numbers. Its whole length does not exceed two inches. Its colour is a light reddish brown.

MICHAELMAS, *mik'-l-măs*, is the feast of the archangel Michael, celebrated on the 29th of September. It is one of the regular periods in this country for settling rents.

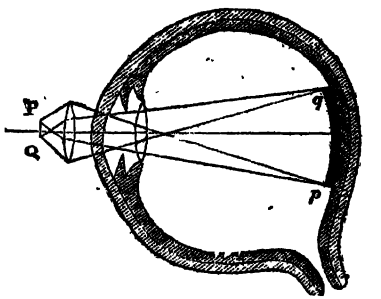
MICROCOSM, *mi'-kro-kozm* (Gr. *mikros*, small, and *kosmos*, world), denotes, literally, a small or little world, and is a term often metaphorically applied to man. Astrologers used to maintain that the organization of man accurately corresponded to the organization of the universe, which they called the macrocosm (Gr. *makros*, great, and *kosmos*). The different parts and limbs of man were made to correspond to the different parts of the universe, and engravings are to be found in works of the time in which man is represented as standing in the centre of the universe, surrounded by lines indicating the various connections of the heavenly bodies with his limbs.

MICROCOSMIC SALT, *mi-kro-kos'-mik*, in Chem., the phosphate of soda and ammonia. It is much used in blowpipe experiments, and is made by dissolving six or seven parts of phosphate of soda and one part of chloride of ammonium in hot water, and allowing the solution to crystallize.

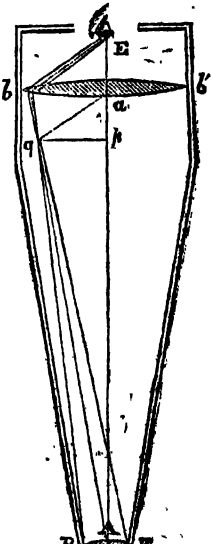
MICROMETER, *mi-krom'-e-ter* (Gr. *mikros*, small; *metron*, a measure), an instrument applied to telescopes and microscopes for the purpose of measuring small spaces or angles with great accuracy or convenience. Numerous contrivances of various kinds, depending on different principles, have been employed for this purpose. Amongst the most useful may be noted—1. The *wire micrometer*, which is placed in the tube of a telescope at the focus of the object-glass. 2. The *circular micrometer*, consisting of a disc of parallel plate-glass, having in the centre a round hole half an inch in diameter, to the edges of which a ring of metal is cemented. This instrument is conveniently used for comparing the place of a small star or comet with that

of a known star in nearly the same parallel of declination. 3. The *divided object-glass*, or *double image micrometer*. This instrument is formed by dividing the object-glass of the telescope or microscope into two halves, the straight edges being ground smooth, so that they may easily slide by one another. From this instrument being used to estimate the diameter of the sun, it is sometimes called the heliometer. For further information on the subject of the micrometer, the reader is referred to an article on the subject by Sir David Brewster in the *Encyclopædia Britannica*.

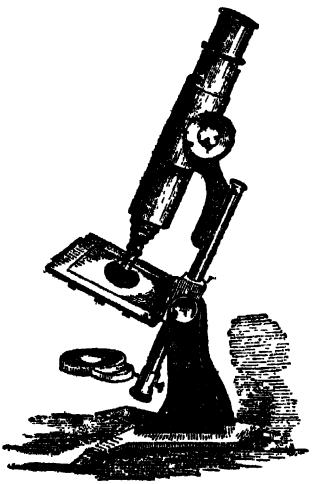
MICROSCOPE, *mi'-kros-kope* (Gr. *mikros*, little; *skopeo*, I see), an instrument, the purpose of which is to enlarge considerably the images of objects that are either totally invisible or not readily seen with the naked eye. The early history of the microscope, like that of many other scientific instruments, is involved in considerable obscurity, so that not even the time of its discovery, nor the name of its inventor, can be fixed on with any degree of certainty. As the microscope, however, in its simplest form, consisted of little or nothing else than the magnifying power or lens, which must of necessity have been made of glass or some other transparent and highly refracting material, it is evident that its invention may be referred to a period anterior to the Christian era. From a passage in Aristophanes, who lived five centuries before Christ, it would seem that "burning-glasses" were sold at the shops of the grocers of Athens. Several other circumstances tend to show that magnifying-glasses were used by the ancient Greeks and Romans. In the French cabinet of medals there is a seal, said to have belonged to Michael Angelo, the fabrication of which, it is believed, ascends to a very remote epoch, and upon which fifteen figures have been engraved in a circular space of fourteen millimètres in diameter. These figures are not all visible to the naked eye. Mention is also made by Cicero of an Iliad of Homer written upon parchment, which was contained in a nut-shell. Seneca, who was born in the first year of the Christian era and died A.D. 65, in his "Natural Questions," lib. i. cap. 7, says:—"However small and obscure the writing may be, it appears larger and clearer when viewed through a globule of glass filled with water." Pliny, who died A.D. 79, mentions the burning property of lenses made of glass; and Ptolemy, the celebrated astronomer of Alexandria, who flourished in the latter part of the 1st century, was evidently acquainted with the existence of magnifying-glasses, and he makes use of the word refraction in his work on optics. In 1852, at the meeting of the British Association, Sir David Brewster showed a plate of rock crystal, worked into the form of a lens; which had been recently found among the ruins of Nineveh. Sir David maintained that this lens had been destined for optical purposes, and was never used as an article of dress. The lens is now among the Nineveh remains in the British Museum. It is not, however, a difficult matter to fix the period when the microscope began to be generally known, and used for the purpose of examining minute objects. Although we are ignorant of the name of the first inventor, we are acquainted with the names of those who first introduced it to public view. Zachias Jansen and his son are said to have made microscopes before the year 1590; and in 1685, Stelluti published a description of the parts of a bee which he had examined through a microscope. In this country, with the formation of the Royal Society in 1660, a new era of optical science may be said to have commenced; for not only do the early volumes of the Transactions describe new microscopes, but literally teem with improvements in the construction of these instruments, and with discoveries made through their medium. Soon after the invention of the microscope, the field it presented to observation was cultivated by men of the first rank in science, who enriched almost every branch of natural history with the discoveries they made by means of this instrument. The Single, or Simple Microscope, was invented long before the Double, or Compound Microscope: the former will, therefore, first claim our attention. By referring to the articles upon LIGHT and LENS, the reader will be able to understand how an object is magnified by means of a simple microscope. A very small convex lens of short focal length, or a sphere of glass, may be used for magnifying purposes. When an object is placed very near to the eye, a magnified image is formed on the retina; but on account of the too great divergency of the rays, the eye is not able to obtain a distinct perception of the object. If, however, a very small lens, not exceeding in breadth that of the pupil of the eye, and of focal length so short that the object




PQ shall be in its principal focus, be placed close to the eye, the rays of light emerging from the lens will be nearly parallel, and therefore fit to produce distinct vision; at the same time the image *p q* will be magnified to the same extent as before. When the lenses of single microscopes are very convex, the magnifying power is great, but the field of view is small; and it is so difficult to adjust their focal distance with accuracy, that it requires some practice to render the use of them familiar. The microscopical investigations of Leeuwenhoek and Swammerdam, of Lyonet and Ellis, were all accomplished with microscopes of this description. About the year 1665, glass globules began to be occasionally applied to the single microscope instead of convex lenses; but the greatest improvement which this instrument received was made by Lieberkuhn in 1740. It consists in placing the small lens in the centre of a highly-polished concave speculum of silver, by means of which a strong light is reflected on the upper surface of an object; thus enabling it to be examined with greater ease and satisfaction. The simple microscope may consist of one, two, or three lenses; but these latter are always so arranged as only to produce the effect of a single lens. In the compound microscope, however, not less than two lenses must be employed, —one to form an inverted image of the object, which, being nearest to the object, is called the *object-glass*; and the other to magnify this image, and, from being nearest to the eye of the observer, called the *eye-glass*. There is every reason to believe that the earliest compound microscopes which were used by Jansen and Galileo consisted of a convex lens for an object-glass, and a concave one for an eye-glass, similar to the telescope in use at that period. In 1646, Fontana used two convex lenses, Dr. Hooke three, and Eustachio Divini four; the two next the eye being plano-convex and placed in contact, with their convex sides towards each other, to give a high power



and a large and flat field. In 1661, Philip Bonani used a compound microscope with three lenses, and added to it an illuminating apparatus with two lenses. The compound refracting microscope, in its simplest form, will be understood by consulting the preceding diagram. BAB′ is a small convex lens, before which, and at a distance from it a little greater than its focal length, if a small object PQ be placed, an inverted image *pq* will be formed of it. The adjustment is such that *pq* is formed in the focus of a convex lens *bab′*, and therefore the rays, after being reflected through it, are parallel when they emerge, and consequently in a state fit to produce distinct vision. An eye, therefore, placed at E will see a magnified image of PQ at *pq*. The reflecting compound microscope was first suggested by Sir Isaac Newton, and its construction varied, and rendered more complex by Dr. Barker and Dr. Smith, of Cambridge. In 1738, Lieberkuhn's invention of the solar microscope was communicated to the public; and since that time the microscope and microscopic science have made rapid advance. In 1812, Dr. Wollaston proposed a very useful form of the instrument, called by him the periscopic microscope, in which two hemispherical lenses were cemented together by their plane surfaces, having a stop between them to limit the aperture. A similar proposal was made by Sir David Brewster in 1820, who achieved his result by cutting a groove in a whole sphere and filling the groove with opaque matter. Seven years previously, Sir David had first pointed out the lasting value of precious stones, such as the diamond, ruby, garnet, &c., for the construction of microscopes. Lenses of glass undergo decomposition and lose their polish in course of time. At the same period, the subject of achromatism engaged the attention of some of the most profound mathematicians in England. From that time the manufacture of the achromatic compound microscope in this country rapidly improved, and the instruments now made in London are unequalled in any part of the world. The mode in which the microscope is usually mounted will be seen by the accompanying illustration



of an ordinary student's microscope. In all the mechanism connected with it, the principal requirement is steadiness, or freedom from vibrations not equally communicated to the object under examination and to the lenses by which it is viewed. The investigation of the minute structure of animals and plants by means of the microscope may be truly said to be the creation of this century, notwithstanding the previous discoveries of Leeuwenhoek, Malpighi, Hooke, and others. During the greater part of the 18th century, except as a mere toy, the microscope fell into disuse; nor was it till within the last thirty years that it was really rendered capable of yielding such a magnifying power, together with such clearness of definition, as is necessary for the investigation of the science of histology. One of the principal results of microscopic research is, that a closer unity of organization has been found to exist among the minute structures of organized beings than among the larger organs. In organized beings, Nature works out her most general processes by structures far too minute for observation with the unassisted eye. Hence we find that the best modern books on human and comparative physiology are filled with descriptions and illustrations of minute structures. The processes of secretion, of nutrition, of generation, and even the mysterious action of the brain and nervous system, unintelligible, save in their results, by the means formerly employed, are now being gradually evolved by the labours of microscopic physiologists. Among those who have employed the microscope not only with the greatest assiduity but with the utmost benefits to science and to their fellow-creatures, have been the members of the medical profession. An extended microscopic examination has also shown that animals and plants gradually approach each other as we descend in the scale, until they meet in a common centre,—the simple or individual cell. At this point, all means of distinguishing between vegetable and animal organism end, and no feature exists which, in the present state of science, can enable any one to determine to which of the two kingdoms the individual cell belongs. One of the chief distinctions between the elementary tissues of plants and animals is, that while in the plant the cell, however modified in form, still possesses all the characters of a cell, in the animal it usually undergoes a development into tissues, in which the cellular form entirely disappears. —*Ref.* Quekett's *Lectures on Histology*, and *Practical Treatise on the Use of the Microscope*; *The Microscope and its Revelations*, by W.B. Carpenter.



Middle Ages, *mid′-dl*, is that period in the history of Europe which begins with the final destruction of the Roman empire, and is considered, by some, to end with the taking of Constantinople; by others, with the Reformation, the discovery of America, or the invention of printing. According to Hallam, who has written a history of this period, it extends from the invasion of France by Clovis, A.D. 486, to that of Naples by Charles VIII., 1495. In any case, it comprises a period of about ten centuries. In general, it was that period in the history of Europe in which the feudal system was established and developed down to the most prominent events which led to its overthrow. The first centuries of this period are often called the Dark Ages, a name not inappropriate when we consider the condition of the barbarous tribes by whom the Roman institutions were overthrown. The acquisitions of civilization were ruthlessly trampled under foot by barbarous warriors, and the civil development of society, which had been the work of ages, received a severe check. It is more than doubtful, however, whether civilization has in the long run been a loser by this state of things. The civilization of Rome was degenerate and rotten to an enormous extent, while those rude and ruthless barbarians afforded materials for carrying on a more healthy and permanent state of advancement. "The first moiety of these ten ages," says Hallam, "is almost absolutely barren, and presents little but a catalogue of evils. The subversion of the Roman empire and devastation of its provinces by barbarous nations, either immediately preceded, or were coincident with, the commencement of the middle period. We begin in darkness and calamity; and though the shadows grow fainter as we advance, yet we are to break off our pursuit as the morning breathes upon us and the twilight reddens into the lustre of day. No circumstance is so prominent on the first survey of society during the earlier centuries of this period as the depth of ignorance in which it was immersed; and from this, more than any single cause, the moral and social evils which those ages experienced appear to have been derived and perpetuated." When Latin ceased to be a living language, the whole treasury of knowledge was locked up from the eyes of the people. The schools were confined to cathedrals and monasteries, and exclusively designed for the purposes of religion; so that for centuries it was rare for a layman, of whatever rank, to know how to sign his name. Even

the clergy were, for a long period, not very materially superior as a body to the uninstructed laity. Whatever of learning existed, however, was to be found within the pale of the Church, which, indeed, was pretty extensive, and comprehended many who did not exercise the offices of religious ministry. In the 6th century the best writers in Latin were scarcely read; and perhaps from the middle of this age to the 11th there was, in a general view of literature, little difference to be discerned. With such a state of society it cannot be doubted that morality was at a very low ebb. The seeds of social virtues must have existed even during the darkest time of this period; but history, which reflects only the more prominent features of society, affords us but little evidence of it. These remarks apply more particularly to the dark ages of the period, which may be considered to come down to the end of the 11th century. In the course of the 12th century a considerable change took place. Polite literature, as well as the abstruser science of antiquity, became the subject of cultivation; and several writers of that age, in different parts of Europe, are distinguished, more or less, for elegance, though not absolute purity of Latin style, and for their acquaintance with those ancients who are its principal models. In the 13th century there seems to have been some decline of classical literature, in consequence, probably, of the scholastic philosophy which was then in its greatest vigour; at least we do not find as many good writers as in the preceding age. But about the middle of the 14th century, or perhaps a little sooner, an ardent zeal for the restoration of ancient learning began to manifest itself. The copying of books rose to be a branch of trade, and their price was consequently reduced. A search now began to be made for ancient manuscripts, in which Petrarch particularly distinguished himself. In the succeeding century the search was carried on with unabated vigour, and the whole lives of Italian scholars were devoted to the recovery of manuscripts and the revival of philology. The discovery of an unknown manuscript, says Tiraboschi, was regarded almost as the conquest of a kingdom. During the 14th and 15th centuries colleges began to be established in Germany, England, and other parts of Europe, libraries became more numerous, and books, after the happy invention of paper, though still very scarce, might be copied at less expense. Last of all, the invention of printing, about the middle of the 15th century, was the great means of dispelling the ignorance and darkness of the middle ages, and of introducing the dawn of civilization of modern times. During this latter period, the moral character of society was much improved, owing, in no small degree, to the advance of chivalry; commerce and the manufactures made great progress; the use of the popular languages became more general, and greater freedom of thought in religious matters began to manifest itself. —*Ref.* Hallam's *Europe during the Middle Ages.*

**Midge**, *mij* (Sax. *mygge*), a dipterous insect, belonging to the genus *Chironomus*, of the family *Tipulidæ*. It frequents marshy situations, and has a good many points of resemblance to the gnat. The proboscis is short, thick, and ends in two large fleshy lips; the antennæ are longer than the head, and are simple, being rarely pectinate; the palpi are longer than the proboscis, the eyes acute, and the ocelli wanting. The body and legs are long and slender, the wings narrow and elongate, and the halteres, or balancers, are naked, and proportionately longer than those of the diptera. In their flight, midges can be seen continually moving about in the air during the autumn, and they ascend and descend in a vertical line with a humming, buzzing noise.

**Midsummer Day**, *mid-sum'-mer*, is the festival of St. John the Baptist, held on the 24th of June. It was long the custom in this country to kindle fires at midnight on Midsummer eve in honour of the summer solstice.

**Mignonette.** (*See* Reseda.)

**Migration of Birds.** (*See* Birds.)

**Mildew**, *mil'-dew* (Sax. *mildeaw*), the term applied to the thin whitish coating sometimes found on the leaves of vegetables, on paper, cloth, &c. It consists of innumerable minute fungi. The mildew of wheat is produced by the fungus called *Puccinia graminis*.

**Mile**, *mile* (Lat. *mille passus*, a thousand paces).—Amongst the ancient Romans, each pace was five feet, and each foot contained about 11·62 modern English inches. At this calculation, each Roman mile contained 1,614 yards, or nearly nine-tenths and one-sixtieth of an English mile. The English statute mile is 8 furlongs, each of 220 yards; or 40 poles of 5½ yards or 16½ feet each. It is, consequently, 1,760 yards, or 5,280 feet. It would appear that the English statute mile was defined incidentally in the 35th year of Queen Elizabeth's reign. An act was then passed, by which persons were forbidden to build within three miles of London. In that statute, the mile was declared to be "8 furlongs of 40 perches, of 16½ feet each." In nearly every country of Europe, the mile is used as an itinerary measure, particularly in those countries which at one time were subject to the Romans. Its length, however, varies greatly among different nations, and in some countries has evidently become confounded with the Celtic *league*. The following list will show the difference between the principal European miles:—

| *Yards.* | | *Stat. miles* |
|---|---|---|
| 1,760 | English statute mile | 1·000 |
| 1,614 | Ancient Roman mile | ·917 |
| 1,628 | Modern Roman mile | ·925 |
| 1,984 | Ancient Scottish mile | 1·127 |
| 2,240 | Irish mile | 1·273 |
| 4,363 | French posting league | 2·422 |
| 4,860 | French league of 25 to the degree | 2·761 |
| 4,635 | Spanish judicial league | 2·634 |
| 6,760 | Portuguese league | 3·841 |
| 10,126 | German long mile | 5·753 |
| 6,859 | German short mile | 3·897 |
| 8,244 | Danish mile | 4·684 |
| 11,700 | Swedish mile | 6·648 |

In France, Italy, and the Netherlands, the metrical mile of 1,000 French mètres, or 1,093 English yards, is used. The geographical mile, or the sixtieth of a degree of latitude, or about 2,025 yards, is used in England and Italy. The geographical league of three such miles, or 6,075 yards, is used in England and France. In Germany, the geographical mile is four English geographical miles, or 8,100 yards, which is also the length of the mile in Holland. The Arabian mile is 2,148 yards; the Chinese *li* 632 yards; the Persian *parasang*, 6,086 yards; the Russian *werst*, 1,167 yards; and the Turkish *berri*, 1,826 yards.—*Ref.* Kelly's *Cambist*; and the *English Cyclopædia*—article Mile.

**Military Education.** (*See* Education, Military.)

**Military Schools** are establishments in which soldiers are instructed, or youths educated for the army. The *soldier schools* of Prussia belong to the first of these classes, and are the most remarkable; they are established in every regiment or battalion, and in them the privates are taught the rudimentary branches of education, and sometimes singing. Military schools of a similar kind exist in the British, Austrian, and other European armies. Institutions of the second class, intended for the education of officers, have been in existence since the days of antiquity, and now form an indispensable part of the military system of all great nations. Louis XV. founded the first military school in France in 1751; it had 500 pupils, all of whom were young noblemen. In 1803, Bonaparte founded the celebrated school of St. Cyr, which still retains the principal features of its first organization. Before the Seven Years' war, the French had established artillery schools in every town where a regiment of that arm was garrisoned. In Prussia, the education of officers is provided for by high schools for each arm in every division of the army; and by the Royal Military School, founded by Frederick the Great, to which the most deserving young officers are admitted from the line. In this country, the military schools which hold the highest reputation are the Royal Military College at Sandhurst, which comprises a cadets' college and a staff college (*see* Cadet, Military), and the Royal Military Academy at Woolwich, designed as an artillery and engineer school. The Addiscombe Military College was established by the East-India Company for the education of cadets for their own army. The best-known military academy

in the North American States is that at West Point, founded in 1802. Cadets are admitted on the recommendation of members of congress and the president. The number of cadets is limited to 250. The education and subsistence are gratuitous, but the graduates are expected to spend eight years in the public service.

Militia, *mil-ish'-yă* (Lat. *miles*, a soldier), a term employed to distinguish from the regular forces a body of citizens who may be called out for a limited time, and embodied as soldiers on occasion of emergency. Under different names, such an establishment exists in most European countries. In this country, after the Norman conquest, the proprietors of land were compelled to contribute to the defence of the realm in the event of a threatened invasion, by providing men and arms in proportion to their estates. The troops were raised under the authority of "commissions of array," which were issued by the crown. At first, the militia seem to have been liable to be marched to any part of the kingdom, when required; but in Edward the Third's reign it was decreed that no militia-man should be sent out of his county except in time of public danger. From the reign of Philip & Mary, the lords lieutenant have had the charge, under the sovereign, of raising the militia in their various counties. After the celebrated dispute between Charles I. and the parliament, regarding the right to command the militia, it was decreed at the Restoration, that "the sole supreme government, command, and disposition of the militia, and of all forces by sea and land, and of all forts and places of strength, is, and by the laws of England ever was, the undoubted right of his majesty (Charles II.) and his royal predecessors." In 1757, a bill was passed by which the militia was reconstructed; and in 1802 the militia laws of England and Scotland were consolidated by 42nd Geo. III. c. 90 and 91. New regulations were passed in the 15th, 16th, 17th, 18th, and 19th Vict., which contain the law applicable to the militia at present. By the constitution of the militia in the United Kingdom, the sovereign appoints lords lieutenant in Britain, and governors in Ireland, to each county or province, with power to call out and train the militia annually; and to appoint deputy-lieutenants or deputy-governors, and other officers, subject to the royal approval. All persons not labouring under bodily infirmity, and not specially excepted, are liable to be chosen by ballot as militia-men; and are compelled, under a £10 penalty, either to serve or provide a substitute. The persons excepted, are—peers of the realm; commissioned and non-commissioned officers and privates in the regular forces; half-pay officers in the army, navy, and marines; and commissioned officers who have served four years in the militia; members of corps of yeomanry or volunteers; seamen and persons doing duty at the royal docks, at the gun-wharfs and powder-magazines; also persons employed under the Board of Ordnance; resident members of the universities; clergymen of the Established Church; constables, articled clerks, apprentices, and some others. The militia is trained and exercised twice a year, and during fourteen days each time; or once in a year, for twenty-eight days, at the discretion of the lords lieutenant or their deputies. During the war with Russia, in 1855, the whole of the militia in England, Scotland, and Ireland, amounted to 61,754. Within a month, this number decreased to 51,183; but during that time 19,450 had volunteered into the line.

Milk, *milk* (Sax. *melce*), an opaque whitish secretion peculiar to the females of the class *Mammalia*, or those animals which feed their young from their teats. Milk differs as procured from various animals, but its general characteristics are the same in all. The most familiar variety is that of the cow. Milk may be looked upon as a serous fluid, holding in suspension minute white globules, composed of casein and fatty matter. When examined microscopically, these globules are found to have a diameter of ·00039 inch, and to disappear on the addition of a solution of potash.—(*Rasspail.*) According to the researches of Professor Nasse, of Marburg, milk is thus constituted:—1st. Smooth, homogeneous, transparent oil-globules, and large oil-globules, also the common milk-globules; 2nd. cream-globules, distinguishable by their fasette-like appearance; 3rd. granulated yellow corpuscles; 4th. the





lamellæ of the epithelium; 5th. the more or less turbid medium in which the four preceding kind of corpuscles are suspended. When milk is allowed to stand for some time, it undergoes spontaneous changes; a thick yellowish substance, called *cream*, collects on the surface, and the milk beneath becomes thinner and of a pale bluish colour. Butter, buttermilk, and cream-cheese, are made from cream by processes which will be found described under the articles on Butter and Cream. Milk from which butter has been taken also undergoes spontaneous changes; it becomes much sourer, and congeals into a mass of the consistency of jelly. The fermentation of this coagulated mass is hastened by heat; and when certain substances are added it very rapidly takes place. Thus, acids and spirits of wine *curdle* it, as it is called; but the most powerful coagulator in use is a decoction from the stomach of animals, especially that of a calf, called *rennet*. After being thus treated, if the whole is put into a bag and squeezed, a thin fluid is forced out, and a tough whitish matter is left behind: the latter substance is called *curd*, and the former *whey*. (See Cheese.) According to Berzelius, the specific gravity of milk is 1·033; that of cream, 1·204; and their composition is,—

*Skimmed Milk.*

| | |
|---|---|
| Water | 928·75 |
| Caseous matter, or curd, with a trace of butter | 29·00 |
| Sugar of milk | 35·00 |
| Hydrochlorate and phosphate of potash | 1·95 |
| Lactic acid, acetate of potash, and a trace of lactate of iron | 6·00 |
| Earthy phosphates | ·30 |
| | 1000·00 |

*Cream.*

| | |
|---|---|
| Water | 920·00 |
| Curd | 35·00 |
| Butter | 45·00 |
| | 1000·00 |

The statements respecting the composition of human milk are much at variance, owing, probably, to the difficulty of obtaining it in sufficient quantity for analysis, and also from its mutability in regard to the relative proportions of the component parts. Its specific gravity, however, appears to vary between 1·020 and 1·035; and its solid contents, according to Meggenhofer, vary between 11 and 12·5 per cent. The milk of cows and other animals is very much used as food, and is very important as a constituent of diet, even among adults. It is also valuable as a food for invalids, especially those who have a consumptive tendency. In some cases of poisoning by metallic salts, such as corrosive sublimate, sulphate of copper, &c., milk is used as an antidote. By evaporating to dryness and powdering, milk can be brought into a condition in which it will keep for a length of time. In this state an artificial milk can be formed by dissolving the powder in liquid water, which is useful in sea voyages, especially for children. Within late years considerable progress has been made in treating milk so as to render it capable of keeping for a length of time. Moore's essence of milk is made by evaporating the milk first in long shallow copper vessels, heated by steam to 110° Fahr.; during this process, which continues for four hours, a little sugar is added, and the liquid is frequently stirred. By evaporation the milk loses three-fourths of its bulk, and the remainder, as a very thick cream, is put into small tin cases, soldered down, steeped in boiling water for a short time, and then allowed to cool. This essence of milk will keep good for a length of time. Various other forms of preserved milk are known. Grimwade's desiccated milk, used by Miss Florence Nightingale in the Balaclava and Scutari hospitals, is made by mixing the milk with a little sugar and alkali. After the mixture has been heated over hot water till it is of the consistency of dough, it is dried into hard cakes, crushed between iron rollers, and bottled. At the Aberdeen meeting of the British Association in 1859, four kinds of preserved milk were exhibited by the Abbé Moigno. One of these, prepared by putting milk into a vessel, excluding

the air, and exposing it to a steam atmosphere of 100° centigrade, and then packing in bottles, was perfectly sweet and fresh after five and a half years' keeping. All processes for preserving milk require great care and precision.

MILKY WAY, *milk'-ke*, an appellation bestowed in Astron. upon a whitish zone of light which everybody must have observed in the sky. This zone makes a complete tour of the heavens, passing through the following constellations:—Cassiopeia, Perseus, Gemini, Orion, Monoceros, Argo, the Southern Cross, the Centaur, Ophiuchus, Serpens, Aquila, Sagitta, Cygnus, and Cepheus. The milky way thus traces almost a great circle of the celestial sphere; whence results a secondary arc, which, after separating from the principal arc throughout an extent of about 120° from *a* Centauri to Cygnus, becomes again confounded with it. Concerning the milky way Sir William Herschel says:—"This remarkable belt has maintained, from the earliest ages, the same relative situation among the stars; and when examined through a powerful telescope is found (wonderful to relate!) *to consist entirely of stars scattered by billions*, like glittering dust on the black ground of the general heavens." So crowded are the stars in some parts of the milky-way, that the same astronomer, by counting the stars in a single field of his telescope, was led to conclude that 50,000 had passed under his view in a zone two degrees in breadth during one hour's observation. The milky way was called by the Greeks *galaxias*; from which we derive our word galaxy. The Chinese and the Arabians call it the Celestial River: it is the path of the spirits among the savages of North America, and the path of St. James of Compostella according to the peasants of Italy. According to the ancient Greeks, the galaxy arose from the milk which the infant Hercules let fall from the breast of Juno when she pushed him away, on learning that he was the son of Maia; others considered that it was not milk, but ears of corn which Isis dropped on her flight from Typhon. Some of the Pythagoreans believed it to be an old and disused path of the sun: Anaxagoras thought it was the reflection of the earth; and Aristotle considered it sublunary, and consisting of exhalations of the same matter as comets. Although Democritus hit upon the true solution of the difficulty, it was not till the discovery of the telescope that Galileo was enabled to announce that he had resolved the whole of the milky way into stars. It is calculated that the light from the nearest stars in the milky way employs about three years in reaching the earth; the light of the most distant will not arrive at the earth in less than 1,600 years.

MILL, *mill* (Lat. *mola*, Gr. *mule*), originally a machine used for dividing, crushing, or pulverizing any substance; but more extensively applied in modern times to almost all machinery consisting of wheel-work, whether intended to change the form or the position of the object to be operated upon. Machines of this kind, therefore, take their name from the processes for which they are used,—as saw-mills, stamping-mills, fulling-mills, grinding-mills, &c.; from the motive power,—as wind-mills, water-mills, steam-mills, hand-mills, &c.; or from the material operated on,—as cotton-mills, sugar-mills, flour-mills, oil-mills, &c. These different kinds of mills will be found described under the articles to which they refer. One of the earliest uses of the mill was the grinding of corn. Among the rudest nations, this was done by pounding it between two stones. With the advance of art, however, a simple hand-mill was constructed, composed of an immovable nether stone, called the *mule*, and an upper stone, called *molos*, put in motion by the hand. These mills were used by the Hebrews and Greeks, and were commonly worked by criminals or slaves. Asses were afterwards employed. Water-mills appear to have been used by the Romans, and the wind-mill was invented in the reign of Augustus. At the present day, the ordinary mill for grinding grain is constructed with two circular stones, made of buhr or burr-stone, syenite or granite, placed horizontally. (*See* FLOUR-MILLS, and BUHR- or BURR-STONE.)

MILLBANK PRISON, *mil'-bank*, is a prison situate on the Middlesex shore of the Thames, and lying between Lambeth and Vauxhall bridges, for the reception of convicts under sentence or order of transportation, to be there confined until the sentence or order shall be executed, or until the convict be entitled to freedom, or removed to some other place of confinement. It is placed under the authority of certain of the inspectors of prisons appointed for that purpose, who form a body corporate under the name of the "Inspectors of the Millbank prison," and who report yearly to one of the principal secretaries of state on all matters relating to the prison.

MILLENARIANS. (*See* next art.)

MILLENNIUM, *mil-len'-e-um* (Lat. *mille*, a thousand; *anni*, years), is a term applied by ecclesiastical writers to that period predicted in Scripture when Christ is to reign with his saints upon earth for the space of one thousand years (Rev. xx.). Many have held, from the earliest period of Christianity, that this is to be received literally, and have drawn up ideas of this earthly paradise. Those who hold this doctrine are commonly called millennarians. The ancient millennarians held that the city and temple of Jerusalem were to be rebuilt and splendidly adorned with gold and jewels, and that Christ, having come down from heaven, would reign there a thousand years with his saints, both those who were already dead and those who were still alive. The productions of nature were to be prodigiously increased, and everything in nature was to minister to their corporeal delights. The Jews were to be restored to their own land, and raised to the first rank among the nations of the earth. Irenæus and others of the early fathers held these views; but they were warmly opposed by Origen and others. These maintained that the passages founded upon were to be understood figuratively as pointing to a period when Christianity should prevail in the world; and in consequence, physical and moral evil abated. The latter is now the view generally held; but some, as the Irvingites, still look for a personal reign of Christ upon earth.

MILLET, *mil'-let* (Fr.), the common name for a great number of cereal plants, the grains of which are used as food and for making a kind of beer, in various countries. *Holcus Sorghum* is the Turkish millet; *Panicum miliaceum*, the Indian; *Paspalum exile*, the Sierra Leone; *Setaria germanica* and *italica* the German and Italian millet respectively.

MILL-STONE GRIT, in Geol., a group of strata, consisting of coarse-grained quartzose sandstone, which occurs between the mountain limestone and the superincumbent coal formations.

MIMOSEÆ, *mi-mo'-se-e*, in Bot., a sub-ord. of the *Leguminosæ* or Bean fam., characterized by the petals being equal and valvate in æstivation. The plants included in this sub-order are mostly natives of tropical regions, and are remarkable for yielding gum and astringent principles. (*See* ACACIA.)

MINARET, *min-ā-ret'* (Arab. *menarat*, a lantern), in Eastern architecture, a slender and lofty turret, with one or more projecting balconies around it, which divide it externally into several stories. In Mohammedan countries, the minaret is used for the purpose of calling the people to prayers. Generally, however, they are more numerous than this purpose requires; there being usually one at each angle of the building, and sometimes a greater number. By this means they become highly characteristic features of the architecture, not only on account of their frequency, but also from their tall, graceful, column-like shape, which contrasts well with the cupolas which generally crown the edifices. The exterior carving of some of the minarets in India, such as that in the mosque at Ahmedabad, is profuse in its splendour; but the outline of the Saracenic examples is usually more picturesque.

MINE, *mine* (Fr.).—In its strict sense, a mine is an opening in the ground from which anything is dug. The name is not properly applied until an opening is made; although now, the term is generally used to signify coal, lead, iron, and similar minerals before an opening is made for digging them out. In opposition to the underground works, which constitute the mine properly so called, the term usually comprehends all the ground on the surface, together with the steam-engines, water-wheels, and other machinery and appendages for drainage, the extraction of ores and their mechanical preparation, with various buildings and

erections. From the earliest antiquity, the art of mining has been practised, and it has formed a branch of industry in the most barbarous, as well as the most civilized countries. In this country, mining had a very early origin; and it was most probably the first source of trade to the British islands. The tin from the English mines was so celebrated that the Phœnicians traded to Cornwall for this metal. In Law, mines belong to the tenant in fee simple of the land, except in the case of gold and silver mines, which are the property of the king by his prerogative. In Mil. engineering, a mine is a subterraneous passage leading to a chamber intended to be blown up by gunpowder. (*See* MINING.)

MINERALOGY, *min-e-răl'-o-je* (Fr. *minéral*, and Gr. *logos*, discourse), "A science which describes the kinds of mineral material forming the surface of our planet, points out the various methods of distinguishing minerals, makes known their uses, and explains their mode of occurrence in the earth"—(*Dana.*) The best method of studying this important science is by attentively studying the different specimens of minerals existing in our museums, more especially those at the British Museum and Museum of Economic Geology. They should be examined in company with some experienced mineralogist, or else with the assistance of the manuals of Dana, Nicol, or Philips. When the student has made himself pretty well acquainted with the external characters of the leading minerals, the work of collection should commence—hammer and book in hand. If, however, mineral districts cannot be visited, the student should procure from some friend, or professional mineralogist, a number of unnamed minerals. These should be made out and named by means of their hardness, fracture, colour, lustre, blowpipe reactions, and, if necessary, by chemical analysis. Too many young mineralogists begin the work of collection long before they have any knowledge of the specimens they accumulate. By this means a mass of useless rubbish is got together, which is only an encumbrance to the student. The science of mineralogy is still in a very unsatisfactory state, mineralogists having hardly agreed as to a system of classification. That of Dana is, perhaps, the simplest. The science is also, unfortunately, encumbered with numberless synonymes and so-called species, the same mineral being known under several different names. Of late years, too, a most unphilosophical method of nomenclature has gained ground. Instead of naming a new mineral after its leading characteristic, or at any rate after the locality in which it is found, the discoverer generally manufactures some such name as Smithite, or Brownite, either after himself or some eminent man whom he wishes to honour.

MINERAL WATERS, *min'-e-răl.*—From the powerfully solvent properties of rain-water, that fluid no sooner reaches the ground and percolates through the soil, than it dissolves some of the substances with which it meets in its passage. Under ordinary circumstances, however, it takes up so small a quantity of soluble substances that their presence does not materially affect its sensible properties: in this state it is known by the names of *river*, *spring*, and *well* water. On some occasions, however, it becomes so strongly impregnated with saline and other substances, that it acquires a peculiar flavour, and is thus rendered unfit for ordinary domestic duties: it is then known by the name of *mineral water*. The different kinds of mineral water may be arranged in six divisions; namely, Acidulous, Alkaline, Chalybeate, Sulphureous, Saline, and Silicious springs.—1. *Acidulous springs*, of which those of Seltzer, Spa, Pyrmont, and Carlsbad are the best known, generally owe their acidity to the presence of free carbonic acid. When poured from one vessel into another, they sparkle, in consequence of the escape of carbonic acid gas.—2. *Alkaline waters*, or those which contain a free or carbonated alkali, either in their natural state or when concentrated by evaporation. These springs are rare; but some are found at St. Michael's, in the Azores. The water contains carbonate of soda and carbonic acid, and is almost entirely free from earthy substances.—3. *Chalybeate waters*, which are characterized by a strong, styptic, inky taste, and by producing a black colour when mixed with an infusion of gall-nuts. The iron contained in these waters is most frequently in the form of protocarbonate held in solution by free carbonic acid. On exposure to the air, the protoxide is oxidised, and the hydrated peroxide descends, leaving the reddish-yellow deposit ordinarily observed in the neighbourhood of chalybeate springs. Waters of this kind are not uncommon. The most noted in this country are those of Tunbridge, Cheltenham, and Brighton.—4. *Sulphureous waters* contain hydrosulphuric acid, and may easily be recognized by their odour. They also cause a brown precipitate when mixed with a salt of lead or silver. The springs of Aix-la-Chapelle, Harrowgate, and Moffat, afford examples of sulphureous waters.—5. *Saline springs* derive their characters from saline compounds held in solution. The salts which are most frequently contained in these waters are the sulphates and carbonates of lime, magnesia, and soda, and the chlorides of calcium, magnesium, and sodium. In a few, potash is found; and Berzelius discovered lithia in the spring of Carlsbad. Among instances of saline springs may be mentioned those of Epsom, Cheltenham, Bath, Bristol, Barèges, Buxton, Pitcaithly, and Toeplitz. Sea-water may be regarded as one of the saline mineral waters. The water of the Dead Sea, however, possesses a far stronger saline impregnation than sea-water, as it contains one-fourth of its weight of solid matter. It has a peculiarly bitter, saline, and pungent taste, and its specific gravity is 1·211.—6. *Silicious waters* are very rare, and in those hitherto discovered the silica appears to have been dissolved by means of soda. The most remarkable of these are the boiling-springs of the Geyser and Rykum, in Iceland. (*See* GEYSER.) The term mineral waters is sometimes applied to those springs which have no claim to repute except for their extreme purity; such as those of Malvern and Holywell.

MINIATURE, *min'-e-ă-ture* (Fr.), a picture or a representation of nature on a very small scale. In the ordinary acceptation of the term, the word miniature includes two widely different kinds of painting. Of these, one is that ornamental painting or illuminating which is seen in its highest perfection in Mediæval bibles, psalters, missals, and other costly manuscripts on vellum; the other kind is that of minute or diminutive portraits generally painted on ivory, to which, in popular language, the word has been confined exclusively in late years. The first kind of miniature is of very ancient origin: they are to be seen among the hieroglyphics of the Egyptians. The books of the ancient Romans were often decorated with small paintings in a costly style. The oldest existing manuscripts with miniatures are Byzantine, and of the latter part of the 4th or beginning of the 5th century. The manner of the Byzantine miniatures was closely imitated in the Italian monasteries as late as the 13th century; but early in the 15th century the works produced by the Italian monks assumed a higher place than that of their Greek masters. The earliest school of miniature-painters in the West of Europe seems to have been that founded at Finian, in Ireland, in the first half of the 6th century, by St. Columba. There is great diversity in the miniature-painting of different ages and countries, not only in style, but in the methods of execution. They were generally painted on vellum or paper, with colours very finely levigated and rendered opaque by being—for the shadows as well as the lights—mixed with white; the usual vehicle being gum, glue, or white of egg. Gold was also freely used, gold backgrounds being frequent at most periods. The second class of *miniatures* includes the small portraits painted either for decorative purposes or to place in cabinets, lockets, or brooches. Ivory was adopted for this purpose at an early date; it was found to form a more suitable ground than vellum for independent works, and its adoption led to a change in the technical processes. The ivory required for miniatures is cut into very thin sheets, and when mounted is backed up with some very white material. The painting is executed in water-colours, and the flesh-tints and other parts requiring great delicacy of finish are entirely dotted, stippled, or hatched upon the surface. Art in miniature-painting has been successfully prosecuted in England. One of the first was Nicholas Hilliard, limner to Queen Elizabeth; and this country

has always taken its stand above the continental nations in its miniatures. In late years, however, the art seems to have entirely succumbed before the rapid advance of photography.

MINIM, *min'-im*, a character or note employed in Music, equal in duration to half a semibreve, or two crotchets.

MINING, *mi'-ning*, is the art of discovering and extracting metals, metallic ores, or other mineral produce from the earth, by means of subterranean excavations. Generally speaking, mineral produce lies in veins, or layers, beneath the surface of the earth. The miner, in order to reach them, sinks a vertical pit, or shaft, in such a manner as to cut the vein or layer, which is suspected to exist either from the well-known nature of the district, or from part of it making its appearance at the surface. Occasionally, it happens that the mineral forms part of the regular strata of the country. Thus, in Staffordshire, we find thin bands or seams of coal, ironstone, and limestone, varying in thickness from a few inches to several feet, and extending over many square miles of country. Usually, however, metalliferous mineral matter is found in fissures, which traverse the ordinary strata of the district. These fissures, when filled with granite, trachyte, or other igneous rocks, are termed *dykes*, but when they contain metallic ores, they are called *veins*, or *lodes*. The business, then, of the miner is to follow these lodes as far as possible. As soon as the shaft is sunk, and the lode is reached, a horizontal gallery or level is driven right and left in the direction of the lode,—the ore being conveyed to the shaft and thence by buckets or kibbles to the surface. If the lode is pretty rich, and the strata give indications of the existence of other veins, more shafts are sunk, and levels driven. As might be expected, the lodes often differ considerably in thickness even within the length of a few yards. Sometimes they dwindle away altogether, and at others disappear suddenly by the subsidence or dropping down of the strata. In the latter case, the miner drives several levels in different directions, until the broken lode is found once more. One of the greatest difficulties with which the miner has to contend is water, which often oozes into the mine in all directions. When the mine is situated on the side of a hill, it is simply necessary to open an adit-level at the lowest part of the hill-side, to serve as a watercourse; but when the workings extend below this point, a shaft is sunk to the lowest part of the mine, and the water is led into it and pumped up either to the adit-level or to the surface, where it is used for washing the ore. In some of the Cornish mines, the pumps work night and day, and an hour's stoppage would be sufficient to flood the mine. Much of the excavation is done by hand with the pickaxe, and *gad*, or iron, wedge; but if the strata allow of it, large masses are removed at once by blasting with gunpowder. A hole, eighteen inches in depth, is bored into the rock, and about two ounces of powder are inserted; a slow-burning fire is then carried from the powder to the mouth of the hole, and the whole is closed by ramming in clay. The ore, when it is brought to the surface, is dressed or sorted, an operation differing according to the value of the ore and its specific gravity. Taking copper, tin, or lead ores as types, the process pursued is as follows:—The ore is first sorted by hand, the purest portions being set aside ready for smelting. The rest is broken by hammers into pieces the size of a walnut, the best bits being again set aside. The remainder is then crushed, the finer portion being subjected to the operation of jigging, which consists in sifting the crushed ore in a stream of running water, which carries away the lighter portions. These, with the coarser pieces left from the crushers, are stamped and then *buddled*. A buddle is a wooden trough, from which flows a stream of water, spread out into a thin layer by a distributing-board. Below this, the crushed ore is placed, and the gentle stream flows over it, carrying away the lighter portions and leaving the heavier behind. It will be seen that the operations of jigging and buddling depend on the difference of specific gravity between the ore and its matrix. When the two assimilate, these processes cannot be resorted to. The dressed ore is then either smelted on the spot, or else carried to some other part of the country where fuel is abundant. The operations of mining in Great Britain are conducted on a scale unknown in other countries. The extraordinary variety of minerals we possess renders us not only independent in this respect; but, from the large amount of cheap fuel supplied by our coal-mines, we find it profitable to import ores for smelting from all parts of the world. Our coal, iron, salt, copper, tin, lead, and zinc mines, to say nothing of immense deposits of sandstone, chalk, limestone, granite, serpentine, &c., annually bring into the coffers of the nation no less than £32,000,000, an amount which is steadily increasing year by year by discoveries of new mines, and by improved methods of working. —*Ref.* Ure's *Dictionary of Arts, Manufactures, and Mines*; Budge's *Practical Miner's Guide*; *Atlas du Mineur*, Paris, 1837; Karten's *System der Metallurgie*, Berlin, 1830; Taylor's *Mining Records*; the *Mining Review*; Dunn's *Winning and Working of Coal-mines*. (*See* MINE.)

MINION, *min'-yon* (Fr. *mignon*), is an insignificant or low dependent, a favourite on whom benefits are undeservedly lavished. Minion is also the name given to a certain kind of type, intermediate in size between nonpareil and brevier; thus, a, b, c. Why it received this name is unknown; "probably," says Johnson, "it was held in great estimation on its first introduction, and consequently received the title of *minion* (darling)."

MINISTER, *min'-is-ter* (Lat.), is properly a servant, or one who acts under another. In Pol., it is one to whom a sovereign intrusts the direction of affairs of state. In this country, the term ministry is used as a collective noun for the heads of departments in the state, but the individual members are not so designated. The ministry is, in fact, a committee of the leading members of the two houses. It is nominated by the crown, but consists exclusively of statesmen whose opinions on the pressing questions of the time agree in the main with those of the majority of the House of Commons. Some eminent party leader, who has the confidence of the House of Commons, is authorized by the sovereign to form a ministry, the members of which he selects from his party, or from those favourable to his policy, he himself being the prime minister, and taking commonly the office of first lord of the Treasury. Those of the ministers who are peers sit in the House of Lords, the others sit in the House of Commons, in virtue of being elected members, which is indispensable. When the House of Commons, by a decisive vote on a test question, shows that it no longer approves of the policy of the cabinet, the ministers are expected to resign and make way for a new cabinet. (*See* CABINET.) A foreign minister is one who represents his sovereign at a foreign court. (*See* DIPLOMACY, AMBASSADOR.) Minister, in religion, is applied to a pastor of a church, chapel, or meeting-house.

MINIUM, *min'-i-um* (Lat.).—Red-lead was formerly called minium: it is a compound of the protoxide and peroxide of the metal.

MINNESINGERS, *min'-ne-sing'-ers* (Ger. *Minne*, love; and *Sänger*, singers), were a school of German poets which sprang into existence in the latter half of the 12th century, and flourished until near the close of the 13th. Their themes were amatory and heroic, and were treated in much the same style as those of the troubadours of Provence, though in a more earnest spirit. (*See* GERMAN LANGUAGE AND LITERATURE.)

MINNOW, *min'-no* (Fr. *menu*, small), (*Leuciscus phoxinus* of Cuvier), an abdominal malacopterygious fish, belonging to the fam. *Cyprinidæ*. It is variously termed the minnow, minim, or pink, and is one of the most prettily marked, as well as smallest, of the British Cyprinidæ. The top of the head and back are a dusky olive, mottled and lighter in colour on the sides; the under surface of the body is white and a fine rosy pink in summer; the irides and gill-covers silvery; dorsal fin pale brown; pectoral, ventral, and anal fins lighter in colour; the tail being brown, and of a lightish hue. —*Ref.* Yarrell's *British Fishes*.

MINOR, *mi'-nor* (Lat., less), in Law, is a person under age, one who, by the laws of the country, is not arrived at the power of administering his own affairs,

or the possession of the lands. Such a person is a minor till the age of twenty-one. (See LEGALITY.)

MINOR, in Mus., the appellation given, a term used in music to distinguish the mode or key that takes a minor third, as well as to designate all the diatonic intervals, more especially the third, which comprises a tone and a semitone (A—C), while the major third consists of two whole tones (C—E).

MINSTREL, *min'-strel* (Fr *menestral*), is a term introduced into this country by the Normans, and applied to a class of men who gained a livelihood by the arts of poetry and music, singing to the harp their own verses, or the popular ballads and metrical histories of the time They sometimes accompanied their music with mimicry and action; so that they were often called *mimi*, *histriones*, *joculatores* They were everywhere held in the highest estimation, being welcomed and caressed by all classes of society, and no great entertainment was considered complete which was not enlivened by their talents From the Conquest downwards, for many ages in England, the profession of the minstrel was a popular and privileged one Numerous instances occur in the early history of England showing the esteem in which they were held even by royalty itself, and they were often more amply paid than the clergy "In the year 1141, says Warton, "eight priests were hired in Coventry to assist in celebrating a yearly obit in the church of the neighbouring priory of Maxtoke as were six minstrels called *mimi* belonging to the family of Lord Clinton who lived in the adjoining castle of Maxtoke, to sing, harp, and play in the hall of the monastery during the extraordinary refection allowed to the monks on that anniversary Two shillings were given to the priests and four to the minstrels, and the latter are said to have supped *in camerâ pictâ*, or the painted chamber of the convent, with the sub prior, on which occasion the chamberlain furnished eight massy tapers of wax As learning and culture began to prevail, the high admiration in which this class of persons was held began to subside, poetry was cultivated more by men of letters, and the poet and minstrel became two distinct persons. So late as the reign of Henry VIII these reciters of verses found free access into all companies, the mansion of the noble as well as the village tavern But they were gradually sinking into contempt, and in the reign of Elizabeth so singular a phenomenon had a veritable minstrel become, that when one of these ancient singers made his appearance at Kenilworth Castle, in 1575, before the queen, he excited so much interest that old Laneham has given a minute description of his person and dress in his "Princely Pleasures of Kenilworth" Towards the end of the 16th century this class of persons had lost all credit, and by an act passed in the thirty-ninth year of Elizabeth they are classed with rogues, vagabonds, and sturdy beggars, and adjudged to be punished as such In the present day a minstrel is merely a musician, a player upon some instrument —*Ref* Warton's *History of English Poetry*; Wright's *Biographia Literaria Britannica*

MINT, *mint* (Ang.-Sax *mynet*, money or coin), a name given to the place where the national money is coined. There is no accurate account of the manner in which coins were manufactured in this country at an early period, but it is generally supposed, from a passage in Cæsar, that the value of pieces of metal was determined only by their weight It would appear, however, that the Britons, at the time of the Roman conquest, had brass and silver coins. In the Anglo-Saxon and early Anglo-Norman mints, the coins were made by the moneyers, who were the principal officers in these establishments An officer called the reeve seems to have had some connection with the mint, or some authority over it. All the officers of the mint, after the Norman conquest, appear to have been placed, in some degree, under the authority of the court of Exchequer, as they assumed their respective stations and took the oath of office before the treasurer and barons of that court. During this period there were many mints beside the king's, and some of these remained in existence till a much later date. Money was struck by barons and bishops, especially in King Stephen's reign, and in some instances, the privilege of coining was granted to the larger monasteries. The moneyers of the Mint seem to have enjoyed important and exclusive privileges from a very early period. From the time of Henry second Henry, they seem to have been exempted from the payment of taxes. Although this seemed to be understood by all parties, it was not till the reign of Edward I. that these privileges were granted by charter. They were extended and added to by Edward III., Richard II., Edward IV., Henry VII., Henry VIII., Edward VI., and Philip & Mary. In the first year of Elizabeth's reign important privileges were secured to the workers of the Mint, many of which were enjoyed to a recent period, but all of which are now abolished In 1799, under George III., the salary of the master and worker of the Royal Mint was fixed at £3,000 a year, in lieu of all fees, perquisites, &c. In 1837, under William IV., this sum was reduced to £2,000 A government commission was at length appointed in 1848 to investigate the system of working at the Mint, and to report thereon The result of the inquiry was a statement that the system was extremely complicated and that the refiner, smelter, and moneyers received excessively large profits from these offices These persons considered themselves a close corporate body with vested rights; and it was with great difficulty that the commissioners could obtain any information from them with regard to their profits or receipts When Mr Shea was master of the Mint, in 1850, the government requested him to draw up a plan of reform based on a report of the commissioners This he did, and upon his being appointed to the embassy at Florence, Sir John Herschel, as a man of science, instead of a mere political adherent, became master of the Mint All the officials of the Mint are now paid regular salaries, the old plan of retaining fees or perquisites being abolished. By a certain agreement, moreover, all the gold and silver of the Mint is refined, between a fixed maximum and minimum, at the price of four shillings per pound for gold and sixpence per pound for silver. Although the Mint, as it stands at the present day, is bound by law to convert into coin, at the public expense, any gold bullion that may be brought to it for that purpose, it quit, or of nearly standard fineness, nevertheless the Bank of England is practically the only regular customer which the Mint has This results from certain facilities in monetary matters which that great establishment possesses. In exchange for the bullion received, the Mint transmits gold coins to the Bank of England In the case of silver, copper, and bronze coins, the method is different, the officers of the Mint purchase the metals required, convert them into coins, and exchange them for gold or notes to any purchaser. The Mint itself is divided into several distinct departments – the Mint office where the bullion or coin is delivered and stored, the assay department; the melting establishment for converting the bullion into bars of the proper value, the coining establishment, for converting the bars into medals or coins; the die establishment, for providing the dies or engraved devices to impress on the coins; and the machinery department In early times, the method of coinage was very rude and simple One die was fixed firmly in a wooden block, while the other one was held in the hand as a punch by striking the latter repeatedly with a hammer, the design was at length worked up. This unartificial mode of coining appears to have been in use till the 16th century, when the screw was applied to coinage in the French mint. When ingots of gold arrive at the Mint, they are carefully weighed and assayed, in order to ascertain their value; they are then passed to the melting-room, where they are again weighed, and the melter gives a receipt for them. Each ingot is valued at about £800. During the melting, a certain amount of alloy is added, to bring the gold to the standard value. The melted gold is then run into cast-iron moulds, and when cooled is taken out in bars about 21 inches long, 1½ inches wide, and 1 inch thick, if for sovereigns, and somewhat less and narrower for half-sovereigns. The processes of weighing, assaying, melting, and running into bars of silver, are almost identical with those for gold, but requiring larger apparatus, on account of the greater weight of metal employed. On being removed from the moulds, the bars are transferred to the

milling-mill, through which they are passed over and over again till they attain a length of seven or eight feet they are cut into five pieces each, annealed in a furnace, then rolled again, until brought down to a thickness slightly greater than that of the different kinds of coin These operations are almost the same for silver and copper coins as for gold After being flattened and rendered uniform, the fillets of gold are cut out into blanks by means of twelve powerful presses arranged in a circle. These machines are fed by boys; and so rapidly can the work be effected, that the twelve presses can cut 200,000 sovereign blanks in a day The waste cuttings are sent back to the melting house The blanks are then weighed in delicate and ingenious weighing machines, invented in 1855 by Captain (afterwards Col.) Harness then deputy master The blanks are fed into each machine through a spout, and pass singly on to a delicate balance If correct in weight to the tenth of a grain, it passes at once into the "correct" box; but if it is "heavy" or "light," it passes into receptacles prepared for each respectively An average of between ninety-eight and ninety nine blanks out of 100 falls into the "correct" box The blanks are then passed to the marking-machines, eight in number where their peripheries are made perfectly circular After this, they are heated for a few minutes to a cherry-red heat, cooled in water pickled or blanched in dilute sulphuric acid, dried with heated beech wood sawdust, and made up into bags of definite weight A bag of sovereign blanks contains about 700 pieces and weighs about fifteen pounds The next process is the coining or stamping For this purpose there are eight powerful and massive presses The blanks pass singly on to the lower die, which is supported by an anvil; the upper die is then brought down upon the blank with a combination of screw power and pneumatic power, and a sovereign stamped on both sides and milled on the edge drops out A similar process differing somewhat in details is employed in the manufacture of other coins The average amount of coinage during the last twenty years has been a little above £5 000 000 per annum Besides the Royal Mint on Tower Hill, in which Professor Graham is the master and Professor Brande superintendent of the die department, there are several colonial mints In Canada the decimal system has been adopted in the mint. The Calcutta mint is of great magnitude and there are also large mints at Madras and Bombay In 1854, a mint was established in New South Wales, the colonists transmitting £10,000, being the cost for buildings and machinery, and in a year and a half about 450,000 ounces of gold were coined into sovereigns and half-sovereigns Since that time more powerful machines have been sent out.

MINT. (*See* MENTHA.)

MINUET, *min-u-ett'* (Sp *minuete*), a slow graceful dance, consisting of a *coupée*, a high step and a balance, supposed to have been originated in Poitou about the middle of the 17th century A movement of three crotchets or three quavers in a bar is also called a minuet

MINUTE, *min'-ute* (Lat *minutum*), the sixtieth part of an hour of time, or the sixtieth part of a degree of a circle. Minutes of time are generally denoted in astronomical works by the letter *m*, and minutes of space by the dash or acute accent, which was first introduced by Pliny. Every minute (1′) is also divided into sixty equal parts, each called a *second* (1″)

MIRABILIS, *mi-rab'-i-lis* (Lat., wonderful) in Bot., the Marvel of Peru, a gen. of the nat ord *Nyctaginaceæ*. The species form highly ornamental border plants. The roots of *M. jalapa* and *longiflora* have purgative properties; those of the first named species were long erroneously supposed to constitute our medicinal jalap *M. dichotoma* is commonly called the Four-o'clock plant, on account of its opening its flowers in the afternoon

MIRACLE, *mir'-a-kl* (Lat. *miraculum*, from *miror*, I wonder), may be defined to be a sensible deviation from the known laws of nature, by an act of the Supreme Being, or such a control of natural causes as transcends the intervention of a cause to which they are ordinarily. Hume defines it to be a transgression of the law of nature by a particular volition of the Deity, or by the interposition of some invisible agent. A miracle, then, has a supernatural origin; it supposes a contrast between the natural and supernatural, and manifests itself in such a way as to be subject to the scrutiny of the senses, and an object of human testimony The true notion of a miracle is that it is inconsistent with and cannot take place by virtue of the laws of nature. If the raising of Lazarus from the dead took place agreeably to some law of nature, though unknown to us, such is inconsistent with our idea of a miracle Hence, we cannot accept the definition of Spinoza, that "a miracle signifies any work the natural cause of which we cannot explain after the example of anything else to which we are accustomed, or, at least, he who writes about or relates the miracle cannot explain it" The miraculous, however, consists in being not *contra* natural, but *extra* natural; for as Augustine says, "How is that against nature which comes from the will of God, since the will of such a great Creator is what makes the nature of everything? In miracles, God does nothing against nature, what is unaccustomed may appear to us to be against nature, but not so to God who constituted nature The objections that have been urged against miracles, have respect either to the abstract possibility of miracles or the violation of the laws of nature supposed to be involved, again, to the possibility of their proof, allowing it ever to be possible in the abstract The former of these objections may be said to have gained strength from the increased knowledge of the laws and operations of nature in modern times but if it be conceded—and this is a question belonging to the much more extensive field of natural theology—that there is a Supreme Being by whom all things were made, and who established the laws of nature, it cannot be supposed that he has not also the power of suspending them To deny the possibility of miracles is to deny the existence of a Supreme Being Hume, while admitting the abstract possibility of miraculous intervention, takes the ground that testimony, through which alone we know of miracles is often fallacious, while constant experience is in favour of a uniformity of nature. "Miracles, he says "are incredible, because they are contrary to experience' If he means by experience, the uniform experience of mankind, then he is merely begging the question, if he means their general experience, then his statement is true, but it is nothing to the purpose Miracles are, from their very nature, of rare occurrence, and, being rare, are necessarily at variance with the general experience of mankind If they were not, they would, as Paley remarks, be no miracles It has also been urged that by the mode in which Hume makes use of his positions it would be impossible to prove many facts which are generally admitted, since there has been no experience reaching to such facts The miracles recorded in Scripture were wrought to introduce a new dispensation, or to confirm its introduction The writers who mention them were eye witnesses of the facts, which they affirm to have been performed publicly in attestation of the truth of their doctrines The two are, indeed so incorporated together that the one cannot be separated from the other, and if the miracles be not really performed, the doctrines cannot possibly be true. The repetition of miracles in proof of any particular doctrine would have impaired their character and validity, and if allowed at all, would have been perpetually necessary Our Lord and his apostles reprehend the desire to behold miracles beyond the limit of their first and chief design, as a disposition of unhallowed curiosity and presumption. "It appears to me, says Dr Pye Smith, "the most probable supposition, that miracles ceased *gradually*, as those persons died who had received these gifts from the apostles. The miracles displayed in the writings of the fathers are often of a character puerile and unworthy, and are deficient in some of the marks of credibility."

MIRAGE, *me-rajh'* (Fr.), a term applied to an optical phenomenon very common at sea, especially in high latitudes. It is sometimes also seen on land, especially in Egypt and Persia. The name of "looming" has long been applied at sea to that distinct or apparent bringing near of coasts, mountains, ships, &c.; that which the latter phenomenon is accompanied

*by individual, it is termed a mirage.* The appearance presented is very singular, being that of a double image of the object in the air,—one of the images being in its natural position, and the other inverted, so as to give the appearance of a distinct reflection in the water. The mirage is produced when the rays of light are unequally refracted in the lower strata of the atmosphere The surface of the earth or sea becomes heated, and transmits a portion of its heat to the layer of air lying directly above it, which thus becomes less dense than the superincumbent layers When rays of light pass from an object in the heated layer, they are bent downward, and thus arrive at the eye in such a direction as to make the object appear elevated above its true position Thus, in the desert, where the surface is level, the mirage takes the form of a lake, deceiving the thirsty traveller with an appearance of cool water and green trees, which vanishes as he approaches nearer, and changes the angle of vision In the whale-fishery, ships are often seen, and sometimes recognized, at considerable distances by means of the mirage Captain Scoresby thus recognized his father's ship at a distance of thirty miles In the "Memoires des Instituts for 1809 the mathematical theory of the phenomenon of the mirage is elucidated by M Biot

MIRROR, *mir'-or* (Fr *miroir*) any glass, metal or polished substance that forms images by the reflection of light In ancient times mirrors were made of metal but at the present day they are usually smooth plates of glass, tinned or silvered on the back, and are either plane, convex, or concave A *plane* mirror, or looking glass, reflects the rays in a direction similar to that in which they fall on it, hence objects are represented of their natural size, by it In a *convex* mirror the rays are made to diverge, and the images of objects seen in it are consequently diminished, while, in a *concave* mirror, the rays are collected into a focus and then, at a certain distance, images are seen inverted and magnified A concave mirror also acts in the same manner as a burning glass when exposed to the rays of the sun and the body to be ignited is placed in the focus In scientific language, the mirror, whether made of glass or metal, is generally called a speculum The astronomical value of any speculum is dependent on the quantity of light that it can concentrate, and on the precision with which it forms the optical image of a distant object, for which reasons the magnitude, the curvature, and the surface polish, are all of importance. Speculum metal is an alloy of tin and copper The alloy used by Newton in the first reflecting telescope consisted of 126 parts of copper to 58 9 of tin, or 32 to 15 nearly. It is very brilliant, but very brittle, and so hard and friable that it cannot be worked with steel tools The six-feet speculum of Lord Rosse's telescope weighs four tons The processes of casting, grinding, and polishing these large mirrors are very difficult. Silver is sometimes used instead of speculum metal in making astronomical specula, the former reflects more incident light than the latter, but is liable to tarnish.—*Ref* article Speculum in Nichol's *Cyclopædia of the Physical Sciences*

MISADVENTURE, *mis-ad-ven'-ture* (Fr *mésaventure*), denotes mischance or misfortune, something happening amiss —In Law, homicide by misadventure is where a man, doing a lawful act, without any intention of hurt, unfortunately kills another; as where a man is at work with a hatchet, and the head thereof flies off and kills a bystander, or where a person is shooting at a mark and undesignedly kills a man. The homicide, in such cases, is excusable (*See* HOMICIDE)

MISANTHROPY, *mis-an'-thro-pe* (Gr *misos*, hatred, and *anthropos*, a man), denotes a general dislike or aversion to man or mankind. It is thus opposed to philanthropy, or a general love of mankind.

MISCELLANY, *mis-sel'-la-ne* (Lat *miscco*, I mix), is a mixture or medley of things of various kinds or sorts. In Lit. it is applied to a collection of *works*, or treatises of various kinds; as Constable's *Miscellany*, Chambers's *Miscellany*.

MISDEMEANOUR, *mis-de-mean'-or* (Ang.-Nor.), in Law, a term applied to all crimes and offences, whether of omission or commission, less than felony. Misdemeanours are of two kinds,—*matter those which exist at common law*,—*mala in se*, or those created by statute. The former class includes whatever misdemeanour affects the person or property of another, openly outrages decency, disturbs public order, or injurious to the public morals, or a corrupt breach of official duty. Misdemeanours created by statute are of two kinds; viz., those that consist in the omission or commission of acts enjoined or forbidden by statute, but not specially made the subject of indictment, and hence punishable at common law, it being a common-law offence to disobey a statute; and in those offences which are by statute made especially indictable, if the punishment is expressly defined, the provisions of the statute must be strictly followed, but if the statute merely attaches a new penalty to what was already an offence at common law, the remedy may be pursued either as at common law or under the statute The ordinary punishment of a misdemeanour at common law is by fine or imprisonment (short of imprisonment for life) or by both fine and imprisonment, at the discretion of the court By several statutes special modes of punishment are provided for particular offences.

MISERERE, *miz-e-re're* (Lat., have mercy), is, in general applied to any sacred composition of a penitential character More particularly in the Roman Catholic church, it denotes a celebrated penitential hymn formed from the fifty first Psalm, which, in the Vulgate, begins with the words "Miserere mei, Domine." It has been set to music by several great composers; but the most distinguished is that of Allegri, which is performed annually in the Sistine Chapel at Rome in Passion week

MISERICORDIA, *miz-er-e kor'-de-a* (Lat., mercy), in Law, is an arbitrary amercement or punishment imposed on any person for an offence —*Misericorde* (Fr.) was also the name of a dagger used by the knights in the middle ages, so called, according to some, because used to put persons out of pain who were mortally wounded according to others, because the sight of it caused the vanquished to cry for mercy —*Miserieordia Domini* is the name given to the second Sunday after Easter, because the mass on that day begins with these words

MISJOINDER, *mis-join'-der*, in Law, is the joining parties in a suit or action that ought not to be so joined. In equity, if the plaintiffs be misjoined, all the defendants may demur, if the defendants are misjoined, only the sect in demur who are improperly joined.

MISNOMER, *mis-no'-mer* (old Fr. *mes*, wrong; *nommer*, to name), in Law, is a wrong name, or the using of one name for another In real and mixed actions at common law, a misnomer is a ground for abatement, but in personal actions no plea for abatement in a misnomer is allowed. Misnomers in proceedings are now frequently amended by the court, provided the other parties have neither been misled nor prejudiced by them

MISPRISION, *mis-prizh'-shun* (Fr *mépris*, a neglect or contempt), in Law, is generally understood to apply to all such high offences as are under the degree of capital, but closely bordering thereon; and it is agreed that a misprision is contained in every treason or felony whatsoever, and that if the crown so please, the offender may be proceeded against for the misprision only Misprisions are generally divided into two sorts, negative, the concealment of something which ought to be revealed, and positive, the commission of some thing which ought not to be done The latter, however, are now commonly described as contempts or high misdemeanours Misprision of treason implies bare knowledge and concealment of treason, without any degree of assent thereto; *for any assent* makes the party a principal. Misprision *of felony* is the mere concealment of a felony, and is a public offence punishable by statute Westminster the first, with imprisonment for a year and a day, and in a common person imprisonment for a less but discretionary time; and in both, fine and ransom at the king's pleasure. Positive misprisions, contempts, or high misdemeanours are such as the mal-administration of such high officers as are in public trust and employment, punishable by parliamentary impeachment; contempts of the public laws, punishable by fine and imprisonment; and such contempts of the inferior magistrates as demonstrate themselves by some outward act of disrespectful behaviour towards the sovereign and govern-

ment. The term misprision is also applied to mistakes arising from negligence or carelessness, as in writing or keeping records, or what are commonly termed clerical errors.

MISSAL, *mis'-sal* (Lat. *missale*), in the Roman Catholic church, is a book containing the services of the mass for the various days of the year. In the ancient church, the several parts of divine service were arranged in distinct books; as the *Sacramentarium*, containing the collects and the invariable portion of the communion service; *Lectionarium*, the lessons from the Old and New Testaments, *Evangelistarium*, sections from the four gospels. About the 11th or 12th century, it was found convenient generally to unite these books, and the combined volume was called the complete or plenary missal. Considerable deviations and corruptions having crept into the missal, the council of Trent recommended its revision, which was commenced under Pius IV., and published under Pius V., in 1570. New revisions were made under Clement VIII. and Urban VIII. The missal consists of three principal parts; viz., 1. the *Proprium Missarum de Tempore*, containing the formularies of the masses for the Sundays; 2. the *Proprium Missarum de Sanctis*, containing special formularies of masses for the festivals of a number of saints, 3. the *Commune Sanctorum*, containing general formularies for classes of saints (as apostles, martyrs, confessors, &c.), serving as an appendix to the second part for such saints as have no special service assigned them. (*See* MASS.)

MISSION, *mis'-shun* (Lat. *missio*, from *mitto*, I send), in a theological sense, denotes the efforts made by the professors of a religious creed to propagate their doctrines in foreign countries. In the traditions of many barbarous nations, there is a floating recollection of a change effected in their religious opinions and worship at the suggestion of teachers from some other clime. The advances of the Brahmins over India, and the progress of the Buddhists in disseminating a foreign creed as far as Japan and Central Asia, are evidences of a missionary spirit. Judaism, unlike other forms of worship, did not strive to make converts. Missionary effort is, however, more closely connected with Christianity than with any other creed. "Go ye," said Christ to his disciples, "into all the world, and preach the gospel to every creature," and, in compliance with this command, the apostolic church began a series of missionary labours, such as the world had never seen before. Towards the close of the 1st century, flourishing churches had been established in the towns of Asia Minor, Greece, Italy, the islands of the Mediterranean, Northern Africa, and probably several other countries. In the 2nd and 3rd centuries, we find missionaries labouring successfully in southern Germany, Gaul, Arabia, and Ethiopia. Under Constantine, Christianity became the state church, and the custom was gradually introduced of using coercive measures for the advancement of the Christian doctrines. The popes do not seem to have done much for the diffusion of Christianity by missionary effort. Their attention was generally too much occupied with the dissensions of nominal Christendom, and the opportunities of increasing their power at the expense of the secular powers. Individual effort, however, was not wanting to carry on the work, and through the labours of St. Patrick in Ireland and St. Columba in Scotland, these two countries became celebrated nurseries of missionary enterprise. Gallus, the apostle of Switzerland; Boniface, the apostle of the Germans, Anschar, the apostle of the North, and Frumentius, the apostle of the Ethiopians, were also distinguished. A new missionary zeal awoke in the Church after the foundation of the mendicant orders, each striving to excel the others in extending the territory of the Church. The discovery of America in 1493, and the circumnavigation of the Cape of Good Hope in 1497, opened up new and extensive fields for missionary labour. An extraordinary impulse was given by the establishment of the order of Jesuits, all the members of which were under a vow to go as missionaries wherever it might please the pope to send them. Among these, none distinguished himself more for his missionary zeal and labours than Francis Xavier, the apostle of the Indies and Japan. In every accessible country—in India, China, Japan, Morocco, Abyssinia, Madagascar, Mexico, Chili, Peru—missionaries were to be found. In 1622 the pope instituted a congregation of cardinals *de propaganda fide*, and a few years later, a college was established for the propagation of the faith. During the early part of their existence, the Protestant churches did not engage largely in missionary labour, probably partly on account of the unsettled state of their affairs at home, but we believe, to some extent also, from a feeling of opposition to whatever seemed to savour of the Church of Rome. Even so late as the end of the last century, and in the General Assembly of the Church of Scotland, there were persons who spoke against missionary societies as being dangerous in their tendency to the good order of society, and eulogized the innocence of savage life as not requiring a gospel. The earliest attempt made by Protestants was the sending of fourteen Swiss missionaries to Brazil, in 1556. Gustavus Vasa, of Sweden, and a number of the German princes, endeavoured to awaken an interest in the missionary cause, but with little success. In 1621 the Dutch opened a church in the city of Batavia, and from thence ministers were sent to Amboyna. At Leyden missionaries were educated under the celebrated Walaeus, and sent into the East, where thousands embraced Christianity. The settlement of New England by a company of nonconformists was soon enlarged by the arrival of John Eliot who laboured among the North American Indians, having as his colleagues John Cotton, the Mayhews, and others. Cromwell conceived the idea of uniting all the Protestant churches of the world into one great society for the propagation of the gospel in foreign parts, but though the scheme was not carried out, it turned the attention of England to the importance of missionary labour. In 1701, the "Society for the Propagation of the Gospel in Foreign parts" was established under the sanction of William III. About 1705, Frederick of Denmark applied to the university of Halle for missionaries to preach the gospel on the coast of Malabar, and Messrs. Ziegenbalg and Pintcho were dispatched on this important mission. The Moravians have, however, exceeded all others since the apostolic times in their zeal for missionary enterprise. They selected people the most low and abandoned, countries the most difficult and miserable, as the scenes of their labours. the Hottentots of Southern Africa, the Arrowack Indians, and the negroes of Surinam and Berbice, and the inhospitable regions of Greenland and Labrador. The missionaries supported themselves by mechanical or agricultural labour, and the converts were organized after the model of the church at home. (*See* BOHEMIAN BRETHREN.) The Methodists have also done much good in the missionary field. The "Baptist Missionary Society" was founded in 1792, and has laboured more particularly in the East and West Indies, and Western Africa. In 1795, the "London Missionary Society" was formed consisting of Episcopalians, Presbyterians, and Independents. The islands of the Pacific were selected as the first missionary field, and twenty-nine young men, selected from a large number that had offered themselves, were sent out. Its principal stations are now in the South-Sea Islands, Southern Africa, India, China, British Guiana, Jamaica, Mauritius. The "Church Missionary Society" was founded in 1799, by a number of distinguished men belonging to the Evangelical school of the Established Church. The "Scottish Missionary Society" was organized at Edinburgh in 1796, and in 1824 the General Assembly of the Church of Scotland established their society. At the "disruption" of 1843, the Free Church also established a missionary society. It is reckoned that about £800,000 is annually expended by the various Protestant churches on missions among the heathen; of which nearly two-thirds is expended by British societies, about £50,000 by continental, and £160,000 by American. For a time Roman Catholic enterprise languished; but since 1814 it has been carried on with renewed zeal, and the number of missionaries greatly increased, without, however, any extraordinary marks of success.—*Ref.* Dr. Brown's *History of the Propagation of Christianity among the Heathen*, 3 vols. 1854; Newcomb's *Cyclopædia of Missions*, 1860; Allman's *Cyclopædia of Christian Missions*, 1850; and the *Reports* of the various societies.

**Mist**, *mist* (Sax.), the vapour of water rendered visible by the lowering of the temperature of the atmosphere. All ordinary temperatures, at all times, water is rising into the air in the state of vapour, and when the air is of the same or a higher state of temperature, it is invisible. The sole cause of the evaporation of water is heat; the amount of vapour produced is consequently in proportion to the temperature; and it therefore follows that there is more water vapour in the air in summer than in winter, and in hot countries than in temperate climates. As the quantity of vapour which the atmosphere will contain at any given temperature is limited, whenever that quantity approaches the point of saturation, a slight reduction in temperature produces *mist*, while a further reduction converts the vapour into rain. When the mist is very dense, it is generally called a *fog*. The London fogs are produced in winter by the condensation by cold of the large quantity of vapour produced by a great city. This condensed vapour is also mixed with smoke, which renders it heavier, and causes it to hang over the valley of the Thames about London. When the vapours in the upper portions of the atmosphere are condensed, and become visible, they are called *clouds*.

**Mistake**, *mis taik'* (Ang. Sax.), is an error or misconception, an unintentional act or omission, arising from ignorance or imposture. The law carefully distinguishes between mistakes of law and mistakes of fact. As regards the former, it is an ancient and well known maxim, *ignorantia legis neminem excusat* (ignorance of the law excuses no one). To this rule, however, there are some important qualifications, thus if a person ignorant of a settled principle of law is induced to give up a right or a portion of his indisputable property, equity will step in and protect him. In general, too, equity will grant relief against an act done under a mistake or ignorance of a material fact, or a fact essential to the character of the act. Obvious mistakes in a will or other deed will be rectified or supplied in equity when they are apparent on its face, or may be made out on a due construction of its terms. In criminal cases, a mistake of fact is an excuse as where a man intending to do a lawful act, does one which is not lawful, but it must be an ignorance or mistake of fact, and not an error in point of law.

**Mistletoe**, in Bot. (*See* Viscum.)

**Mite**. (*See* Acarus.)

**Mite**, *mite* (Ang. Sax.), is the name of a small coin that once was current, equal to about one third of a farthing. The moneyers also use a small weight among the same name, and equal to the twentieth part of a grain, and divided into twenty four doits.

**Mitre**, *mi'-tr* (Gr. *mitra*), is a sacerdotal ornament worn on the head by archbishops and bishops in the Roman Catholic and Greek churches, and also by abbots of certain orders. It consists of a stiff cloth cap rising in two points, one before and the other behind and having two ribbon like pendants which fall upon the shoulders. The high priests among the Jews wore mitres; and we find similar head ornaments among various nations of antiquity. Bacchus was often represented with a mitre, whence the Greeks styled him *Mitrophoros*. It is much disputed whether mitres were worn in the early ages of the Church, or when they were introduced.

**Mittimus**, *mit'ti mus* (Lat., we send), in Law is a precept or command in writing addressed by competent judicial authority to a gaoler or keeper of a prison to receive into custody, and safely keep, the person charged with the offence therein named, until he be delivered by due course of law. It is also applied to a writ for removing and transferring records from one court to another.

**Mixed Actions**, in Law, are suits partaking of the nature of real and personal actions, real property being demanded, and also personal damages for a wrong sustained. They have now been abolished by 3 & 4 Will. IV., except the action of ejectment.

**Mnemonics**, or **Mnemotechny**, *ne-mon'-iks ne-mo tek'ne* (Gr. *mneme*, memory, and *techne*, art), is the art of improving the memory by artificial means. According to the account of the ancients, the discoverer of this art was Simonides the poet, who flourished about B.C. 500; the story being that during his temporary absence from a feast, the house in which they were assembled fell, killing all that were present, and mutilating their bodies so that they could not be recognised; but Simonides, recollecting the place that each had occupied at the feast, was able to distinguish them. His attention is said to have been thus directed to the important and afforded to memory by the observation of material objects. This art was recommended by Cicero, Quintilian, and others of antiquity; but in modern times it does not seem to have met with that degree of general attention that its importance demands. This is, doubtless, mainly owing to the fact that its advocates have been chiefly desirous of exhibiting mere feats of memory, which Lord Bacon says that he esteems "no more than rope-dancing, antic postures, and feats of activity, and, indeed, they are nearly the same things,—the one being the abuse of the bodily as the other is of the mental powers; and though they may cause admiration, they cannot be highly esteemed." The value of any system of mnemonics must necessarily depend upon the extent to which it is based upon the principles and laws of memory (*See* Memory). Ideas recall or reproduce each other in the mind according to certain laws, known as the laws of association (*See* Association of Ideas). Some ideas are much more easily retained and recalled than others. The mind is first awakened to consciousness by sensations, and ideas connected with them are ever the most easy of retention and reproduction. Most persons may have observed how the sight of some particular object may recall a long train of ideas, as, for instance, the return to the scenes of one's childhood after a long absence will recall, in a most marked manner, long-faded ideas. Taking advantage of this principle, then, mnemonicians associate with some material object those ideas which they wish to remember. A person wishing to remember the heads or principal points of a discourse, would connect each of them in his mind with some object before him, so that the sight of the object would immediately recall the idea connected with it. In carrying out this principle, the system now generally adopted is to have a series of rooms, each so divided in the imagination as to present fifty places. Thus in the first room, the front wall (as that opposite into the entrance) is divided into nine equal parts, or squares three in a row, for containing the units; the right hand wall the tens, left the twenties, fourth wall the thirties and the floor similarly divided, the forties. The Nos. 10, 20, 30, and 40 are placed in the centre above the four walls, while 50 star is in the centre. Other rooms are divided in the same way, to the number required. The learner has then to fix the different places accurately in his mind, so that on a number being given he may at once be able to recollect its place. When he has mastered this, he has then to associate each place with some familiar object; so that on the object being suggested to his mind, the place may be recalled, or, when the place is before the mind, the object may spring up. Of course, any objects will do provided they are familiar and easily recalled. Some may find it of advantage to classify them as on one wall or room to have articles of dress, another articles of furniture, another birds, and so on. When these are thoroughly mastered, so that they may be run over in any order, then all that is necessary is to associate the ideas we wish to remember with the objects in the different places, so that, by thinking upon the objects, we will be able to recall the respective ideas in any order that may be required. In this way, some are able to repeat after hearing only once, several hundred disconnected or unmeaning words—backwards forwards, or in any other order. Next, as to the manner of connecting ideas together, so as to be able to recall them at will, for remembering, as recollection is merely the bringing up ideas before the mind similar to those that were before it on a previous occasion. Ideas, or notions as they are sometimes termed, are of two kinds,—familiar and non-familiar. A familiar notion is one that has been frequently before the mind and readily recalls a number of others. Thus, a house is a familiar notion, because, in thinking about it, a number of connected circumstances occur to the mind; but to many persons a Roman as would be a non-familiar idea, as they never happen to think of it. In attempting to connect together in the mind two such

*like notions, the way is to compare them together and seek out some notion common to both. The effort of the mind in effecting this strengthens the attention, while the common notion serves infallibly to connect the one idea with the other. Thus, in connecting together the two ideas tallow and knowledge, we compare them and find that tallow enlightens, and so does knowledge. In order to avoid confusion and perplexity, one must take care to have no more than the two ideas before the mind at the same time. When we have to connect a familiar with a non-familiar notion, or two notions which present us nothing in common, then the non-familiar notion has to be converted into a familiar one, and the two then united; and in the same way, when both notions are non-familiar, they require to be converted into familiar ones. As a general rule, the more closely two ideas are brought together in the mind the more strongly will they be associated and the greater their power of reproducing one another. Hence, proximity is another principle available in mnemonics, it being said that "the rapidity and strength with which two given notions stick together is in the inverse ratio of their phrenotypic distance," i.e., the time that elapses between the two notions acting upon the brain. It is upon this principle that what is called the Hamiltonian system of teaching languages is constructed; that, namely, of bringing the foreign word and the English equivalent into the nearest possible proximity. "The rapidity and strength with which two given notions stick together is in the ratio of their joint familiarity." In remembering dates or sums, the way is to substitute letters for figures and form them into words, for the sake of euphony, the vowels being of no value. Thus, $t=1$; $n=2$; $m=3$; $r=4$; $l=5$; $d=0$; $c$, $k$, $g$, $q=7$; $b$, $h$, $v$, $w=8$; $p$, $f=9$; $s$, $x$, $z=0$. For the application of mnemonics to the various departments of learning, we must refer to some of the various books on the subject. An account of the more important works on mnemonics is to be found in Feinagle's "New Art of Memory," 1813; or in Reventlow's "Lehrbuch der Mnemotechnik," 1843; and a good brief practical treatise is Major Beniowski's "Handbook of Phrenotypics," 1845.*

MOAT. (*See* ADVANCED DITCH.)

MOBILIER, CRÉDIT. (*See* CRÉDIT MOBILIER.)

MOCKING-BIRD, *mok'-ing* (Fr. *moquer*, to mock), a bird belonging to the dentirostral tribe, of the ord. *Passeres* and fam. *Turdidæ*. The mocking-bird is a native of America and the West Indies, and is remarkable for its vocal powers and faculty for imitating the songs of other birds, as well as different noises which it hears. Its voice is very full and strong, besides being musical, and capable of any modulation, to the softest notes: from the clear tones of the wood-thrush it can reach the savage scream of the eagle. It feeds on berries and fruits, and builds its nest in the immediate vicinity of man.

MODALITY, *mo-dal'-e-te*, in Phil., is a term used to denote the most general points of view under which the different objects of thought present themselves to the mind. These are possibility and impossibility, existence and non-existence, necessity or contingency.

MODE, *mode* (Fr., from Lat. *modus*), the melodious arrangement of the octave, which consists of seven essential natural sounds besides the key or fundamental. Although, in ancient music, the terms mode and *key* were synonymous, there is a great difference between them at the present day, the one denoting an octave with respect to the manner of its division, while the latter term is used with regard to its place in the scale of music. There are two modes only in modern music,—the major and the minor. The major mode is that by which the intervals between the second and third, and fifth and sixth, become half-tones, and all the others whole ones. In the minor mode, the intervals between the second and third, and fifth and sixth, become half-tones. Between these two modes there is also another distinction,—the major being precisely the same whether ascending or descending, while the minor, in ascending, sharpens the sixth and seventh, thus removing the half-tone between the fifth and sixth to between the seventh and eighth. In the Gregorian Chant there are eight modes (or, as we should now call them, keys), four of which are called authentic and four plagal. The authentic modes are the Dorian, Phrygian, Lydian, and Mixo-Lydian, these corresponding to Dr. Burney, answer to our D and A minor and C and D major. The plagal modes are the Hypo-Dorian, the Hypo-Phrygian, the Hypo-Lydian, and the Hypo-mixo-Lydian, which are also synonymous with our G and A minor and F and G minor.

MODE (Lat. *modus*, manner), in Phil., is the manner in which a thing exists; as, wax may be round or square, solid or fluid. "Modes," says Locke, "I call such complex ideas which, however compounded, contain not in them the supposition of subsisting by themselves, but are considered as dependencies on, or affections of substances." Modes are either simple or mixed, the former being only variations or different combinations of the same simple idea; the latter made up of several simple ideas of various kinds. They may be either internal, conceived to be in the substance, or external, taken from something not in the substance."

MODELLING, *mod'-el-ling* (from Fr. *modeler*, to model), a term used in the Fine Arts, and applied to the art of forming a design in clay, or of making a mould from which works in plaster are to be cast. Modelling is essentially a practical art, and depends greatly upon the experience and artistic skill of the modeller. It is mostly executed with the fingers; and the tools employed are generally made of wood and wire, and so constructed as to be able to do what the fingers cannot perform. As wire tools can be fashioned into loops of various sizes and shapes, they are the most useful, and accomplish any required form without moving the clay on to any already finished part, the superfluous clay remaining in its place while the wire passes under it. Wire tools are most effective in working upon concave surfaces, such as the narrow folds of draperies. The wooden tools employed are of various shapes, and are composed of box and ebony. The wooden tools used in fine modelling are usually kept steeped in oil, as, by that means, the clay is less liable to adhere to them. Common potter's clay of the best quality is the clay used in modelling. It ought to be so wet as to be able to stand in a mass much higher than its own width without support, as it is then much more easily and quickly worked. The support of a figure in modelling is of great importance; the main parts of the trunk and limbs are built up on supports of wood-work; the arms, when not covered with drapery, may be made of twisted thick copper wire with small pieces of wood twisted in with it at short intervals, like the tufts in the tail of a kite. The whole model, indeed, should be built up on a complete skeleton of supports. Very little support is required in modelling a bust. The preservation of the uniform moisture of the clay is another essential part of modelling; it should never be allowed to dry, and while the modeller is at work and the figure exposed, especially in warm weather, it should be frequently sprinkled with water. A plasterer's brush is best adapted for this purpose, and superior to a syringe. In Smith's biography of Nollekens it is stated that when that sculptor was modelling a bust of George III. in the king's own presence, he kept his clay moist by dexterously using his mouth as a squirt at intervals. After the model is complete, the cast is taken from which the marble is sculptured or other casts made. The whole model, while wet, must be covered with three or four masses, or more if necessary, of plaster of Paris. When fixed and dry, the whole may be separated at the joints; and when the component parts are placed again together, the place of the original model is filled with plaster of Paris; and when the cast is well set, the mould can be carefully broken off in fragments. The cast is then exposed complete and finished. The ancient sculptors baked their clay models; but clay shrinks and cracks in drying; this plan is not so good as making plaster casts from the models. In making small models, for bronzes, the ancients used wax, which is still the modelling material used by goldsmiths and medallists. It is prepared by melting virgin wax with a small quantity of Venice turpentine and flake-white in fine powder. When coloured wax is required, a colour in fine powder must be substituted for flake-white. The tools employed are made of wood and ivory, and are similar in shape to those used in modelling in clay.

**Moderator**

**Moderator**, *mod'-er-a-tor*, is the name given to the president, for the time being, of the General Assembly of the Church of Scotland, and also of the Free Church. The Moderator is chosen annually. Then is also the name of two officials of the university of Cambridge, appointed annually to perform certain duties. (*See* CAMBRIDGE UNIVERSITY.)

**Modern**, *mod'-ern* (Fr. *moderne*, a corruption of Lat. *hodiernus*), is applied to what belongs to recent times. It is used in different senses. It is frequently used in contradistinction to ancient or classical, as modern philosophy, modern languages. Modern authors are said to be those who have written since Bacon; modern philosophy to have commenced with Galileo, and modern astronomy with Copernicus. "Modern civilization," says A. W. Schlegel, "arose from the blending together of the elements of northern origin and the fragments of antiquity." Modern history is sometimes applied to the whole period from the destruction of the Roman empire down to the present time; at other times, the term Middle Ages, or Mediæval history (*see* MIDDLE AGES), is applied to the earlier portion of this period, and the term modern only to the later. The Germans often date the end of modern history with the French Revolution, and call the subsequent period "most recent history." Shakspeare uses the term for vulgar or common. As a substantive, it is chiefly used in the plural, for those who live, or have lived, in recent or modern times. To modernize, is to adapt something ancient to modern form or usage. A modernism is something unduly modern or unclassical.

**Modulation**, *mod-u-la'-shun* (Lat. *modulatio*, forming anything to a certain proportion), that portion of the harmonic science which teaches the lawful transitions of harmony or melody from key to key, and from one combination to another. The exact meaning of the term *modulatio*, as applied by the ancients, is not known to us, but we may presume it to have signified the rise and fall of the voice and the measures of the syllables in recitation and declamation. In modern music, *modulation* is of the highest importance: it may be divided into three kinds, viz., *natural* modulation, in which we pass from a given key to another closely related to it, *abrupt* modulation, by which are to be understood all changes into keys which are not analogous to the original key, and *enharmonic* modulation, which changes from one key to another entirely unanalogous to it, by means of an enharmonic interval.

**Modus**, or **Modus Decimandi**, *mo-dus-de-sim'-di* (Lat., mode of tithing), in Law, is a term applied to any customary mode of tithing, arising from immemorial usage, and differing from the payment of one-tenth of the annual increase. It is sometimes a pecuniary compensation, as twopence per acre, for the tithe of land; sometimes it is a compensation in work and labour, sometimes in lieu of a large quantity of crude or imperfect tithe, a less quantity at greater maturity is received: any means, in short, whereby the general law of tithing is altered and a new method introduced.

**Modus Operandi**, *op-e-răn'-di*, is a Latin term, denoting the manner of operating.

**Mogul, The Great**, *mo-gul'*, was the title by which the chief of the Mogul empire, founded in Hindostan by Sultan Baber, a descendant of Tamerlane, in the beginning of the 16th century, was known in Europe. The last of this title was Shah Allum, who died in 1806, when his great possessions fell chiefly into the hands of the East-India Company.

**Mohair**, *mo'-hair* (Ger. *Mohr*, Fr. *moire*), a material for textile manufactures, consisting of the hair of a goat which inhabits the mountains in the vicinity of Angora, in Asia Minor. The Angora goats, after completing their first year, are clipped annually in April and May, and yield progressively from one to about four pounds weight of hair. That of the female is considered to be of more value than that of the male, but both are mixed together for the market. Up to the year 1820, there was very little demand for this article in England, but now the quantity is very large. By a return of the Board of Trade, the total quantity of mohair imported into this country during the year 1836 was 2,029,412 lbs. In England, mohair

**Mohammedanism**

is mostly spun, and to some extent manufactured, at Bradford, and also in a less degree at Norwich. Mohair yarn is also worked up in Glasgow. The average price of Angora goat's hair is about 15d. per pound. A large variety of articles are made from mohair, amongst others, many kinds of camlets, which exhibit great beauty and brilliancy of surface. It is manufactured into plush, and is also used for coach and decorative laces, for pattern braidings, and other trimmings for gentlemen's coats. It is, moreover, made up into a light and fashionable cloth, suitable for paletots, &c. Mohair dresses were worn by ladies a few years ago; but they have been superseded by alpaca cloth and other similar materials. At Bradford, and other places, much ingenuity is displayed in combining mohair with two or more different substances, to produce what are termed fancy stuffs.

**Mohammedanism**, *mo-hăm'-me-dăn-izm*, is the name commonly given, in Christian countries, to the religion established by Mohammed, born at Mecca, in Arabia, A.D. 570, died at Medina 8 June, 633. Mohammedans call themselves by the name of Moslem, and their creed Islam, which means "full submission to God." The doctrines of Mohammedanism may, in large measure, be traced to the national religion of the Arabs and to those forms of Judaism and Christianity which existed in Arabia at the time of the prophet. The old belief that Mohammed was a base, heartless impostor, has, by the recent labours of Mohler, Carlyle, Irving, and others, been very much shaken if not entirely dispelled. Notwithstanding the many bad features of his character, if we look to the simplicity of his mode of life to the very last, his endurance for twelve years of every species of insult and persecution, his steady resistance of every offer of wealth and power made on the condition of his desisting from his endeavours, the conviction wrought upon those nearest him, we cannot think otherwise than that the man believed in what he taught. It is impossible to say how far an ardent imagination, acting under the belief of divine inspiration, and but little controlled by an intellect in many respects but narrow and limited, will lead one into all manner of wickedness. "I maintain," says Möhler, "that if one admits the possibility of any man's being able to give out his own individual religious impressions, ideas, and thoughts, without suspicion, for divine inspirations, I cannot perceive the impossibility of his considering God also to be the author of all his other inward impulses." Farther, we cannot think that Mohammed would have acted as he own recording and immortalized his offences in the Koran, had he been conscious of them wickedness. Mohammedanism is commonly regarded as half-way between paganism and Christianity, but it approaches much more nearly the latter than the former, and must be viewed as a great improvement upon the religions which it supplanted. It is a stern monotheism, opposed alike to pantheism and idol-worship, and throws aside with disdain all those gradations of sons or emanations by which God is approximated to man and man to God. Nothing exists but the Creator and the creation, the latter comprehending angels, devils, genii, and every being intermediate between God and man. Regarding the connection between Mohammedanism, Judaism, and Christianity, we quote from Dean Milman's "Latin Christianity":—"The creation," he says, "as affirmed in Islam, was strictly biblical; the history of man was that of the Old Testament recognised in the New, though not without a large admixture of Jewish legend. The forefathers of the Mohammedan, as of the Jewish and Christian religions, were Adam, Noah, Abraham; and to the old prophets of God, among whom were included Moses and Jesus, were only added two local prophets sent on special missions to certain of the Arab tribes, to Ad and to Thamud. Even Mohammedan fable has none of the inventive originality of fiction. There is scarcely a legend which is not either from the Talmud, or rather the apocrypha of most of the Talmud, the religious traditions of the Jews, or the spurious (not the genuine) gospels of Christianity. The last day, the judgment, the resurrection, hell, and paradise, though immeasurably in the circumstantiality of detail, much of it fantastic beyond what we can judge, to the Pharisaic notions of the Jewish day, and singularly contrasting with the doctrine and

less material images of the New Testament, were already parts of a common creed. The Koran has scarcely surpassed the grosser notions of another life which were already received by the Talmudic Jews and the Judaising Christians,—the Chiliasts of the early ages. It only adapted this materialism to the fears and hopes of a Bedouin and a polygamous people. It may be doubted whether it goes beyond the terrific imaginations of the Talmudists in those minute and particular accounts of hell-fire which glare in all its pages. In its paradise it dwells on that most exquisite luxury to a wanderer in the desert—perennial rivers of cool pure water,—and it adds a harem to the joys of the blessed." The six great articles in the faith of Islam are neither repugnant to human reason nor to prevalent habits of thought, and, indeed, are the elemental truths of all religions. There are—1. Belief in a Supreme Being; 2. in his angels; 3. in divine revelation; 4. in his prophets; 5. in the resurrection and day of judgment; 6. in God's absolute decree, and predestination of good and evil. The new and startling doctrine was the divine mission of Mohammed, the apostle of God. (*See* ALCORAN, vol. I.) Besides the Alcoran, Mohammedans generally receive the Sonna, or traditions, which comprises acts and sayings of Mohammed not contained in the Alcoran. Mohammedanism, like Christianity, has numerous different sects, who differ from each other in their doctrines and forms of worship. There are five fundamental points of religious practice which are specially enjoined on Mohammedans; viz., purification, prayer five times a day, fasting, almsgiving, and the pilgrimage to Mecca. Washings and purifications are enjoined as necessary preparations for the duty of prayer, and for reading or touching the Koran, &c., for "the practice of religion is founded upon cleanliness, which is the one half of faith and the key of prayer." In every town the faithful are invited to prayer by the public crier, or muezzin, when the Moslem may perform his prayers in any decent place, except on Friday, when he is bound to perform them in the mosque. Fasting is regarded as a duty of so great moment, that the prophet used to say that it was the gate of religion, and that "the odour of the mouth of him that fasteth is more grateful to God than that of musk." Almsgiving is not strongly inculcated in general; but every Moslem who is not poor is obliged to give the fortieth part of his property to the poor. The pilgrimage to Mecca is deemed so necessary that it is said that he who dies without performing it "may as well die a Jew or a Christian." They are forbidden the use of wine or swine's flesh, and are prohibited from gaming and usury. On its first promulgation, the doctrines of Islam spread with amazing rapidity; and in twelve years the whole of Arabia had embraced that faith. The extension of the power of the Arabs soon carried this religion into other countries; and Syria, Persia, and Northern Africa were compelled to submit to their power and to receive their faith. At the beginning of the 8th century they crossed over into Spain, one province after another was speedily subdued, and for nearly 800 years the Saracens retained a dominion in that country. In Asia they advanced eastward to India and China; and in the former country they founded vast empires on the shores of the Indus and Ganges, which for a long time were strongholds of Islamism; but in the latter country their progress was soon stayed. Fresh energy was infused into the Moslem communities by the accession of the Seljook Turks; both they and their successors, the Osmanlis, voluntarily receiving Islamism from the very people they had conquered. The Ottoman rulers gradually undermined the Byzantine empire, which at length fell with the taking of Constantinople in 1453. The power of the Islam was now at its height; and for a time the Turks were the terror of Italy, Hungary, and Germany. Their power, however, soon began to fail. Sicily was lost to them; and in 1492 their last strongholds in Spain were taken. In the interior of Africa, Mohammedanism has long been making peaceable conversions. But while advancing among races inferior in civilization to the Mohammedans, this religion has been losing power wherever it has been brought into contact with Christianity. The consciousness of this superiority of the Christian nations has been spreading for years throughout the extent of the Mohammedan world, and has gradually kindled those sentiments of fierce and uncompromising hostility to the Christian name which have manifested themselves within the last few years in so bloody a manner in India, Arabia, Northern Africa, and Syria. These feelings, however, are not participated in by the more enlightened among the Mohammedans,—those who have seen and tasted the fruits of Christian civilization. They no longer exhibit any confidence in the power of the Islam. The total number of Mohammedans at the present time is estimated at about 160,000,000. In Europe they are almost confined to Turkey; and even there they form, in the European part of it, a minority of the population. They prevail in Asiatic Turkey, Persia, Afghanistan, Beloochistan, Arabia, and Tartary, and are largely represented in India, Asiatic Russia, and the Malay Archipelago, and to some extent in China. Their number in Asia is estimated at about 50,000,000. In Africa, Mohammedanism is still the prevailing religion in the entire north; and its rule extends far down eastward and into the centre of the continent, numbering, it is believed, not fewer than 100,000,000 souls.

MOIDORE, *moy-dore'* (Port.), an old gold coin of Portugal, value 26*s.* 11½*d.*

MOIRE, *moyre* (Fr. clouded, or watered), a term applied to a variety of manufactured textile goods. The production of this watered effect is usually called *moire antique*, and is principally used in making the broad silk for ladies' dresses. It is a superior kind of *watering*, and the different modes by which it is effected are kept secret by the *moireurs*, or calenderers. The effect is not produced during the spinning, weaving, or dyeing, but by passing the fabric through cylinders, hot or cold, embossed or plain, and, sprinkling the silk with water or not, by folding layers of silk over each, either rectangularly or diagonally, and other methods by which various degrees of moire can be produced. Certain threads, either of the warp or weft, which happen to receive most pressure, have the most gloss; some are flattened, and the reflection from their surfaces becomes more or less glossy, according to the angle from which it is viewed. This produces the brilliant play of light and shade called *moire*, or *watering*.

MOIRÉ MÉTALLIQUE, *moy'-re met-ăl-leek'*, is a beautiful crystalline appearance given to tin plate by brushing over the heated metal a mixture of 2 parts of nitric acid, 2 of hydrochloric acid, and 4 of water. As soon as the crystals appear, the plate is quickly washed, dried, and varnished.

MOLARS. (*See* TEETH.)

MOLASSES, *mo-lăs'-sez* (Sp. *melaza*), a term applied to the brown viscid uncrystallized syrup produced in the manufacture of sugar. It is allowed to drain from the casks into a cistern before the sugar is sent away from the plantation. Molasses is employed in the preparation of spirits of wine. The syrups which remain after sugar passes through the processes of a refining-house are sometimes called *molasses*, but are more generally known as *treacle*. (*See* SUGAR.)

MOLE, *mole* (Dan. *mol*), (*Talpa europæa* of Linnæus).—This animal belongs to the family *Talpidæ*, of which it may be taken as the type. The moles are small quadrupeds, having their bodies nearly of a cylindrical form; the neck short and thick; the head tapering to a pointed snout; the fore limbs very short and strong; the fore feet of great breadth, being furnished with remarkably long, strong, and straight claws; the hind feet small, with slender claws; the eyes minute, and concealed by the fur; the tail short and slender, and the hair soft and velvety. Moles possess six incisors in the upper, and eight in the lower jaw; and seven grinders above, and six in the lower jaw. The canine teeth are large and angular, being compressed. Their pointed muzzle, strong fore feet, and sharp teeth, enable them to make their way underground without much difficulty. The common mole is about five or six inches long, and the colour of its fur is usually black, although the tint varies considerably from that colour down to white. Earthworms form its principal staple of food, although it also feeds on frogs, snails, and small insects. It lives the greater part of its time underground; and it labours incessantly in excavating galleries, up and down which it can run and procure its prey, as will as

escape its enemies. It is a native of Great Britain; but another variety of it exists in the Apennines, in Italy.

MOLECULAR ATTRACTION, MOLECULAR THEORIES, *mol-ek'-u-lar.*—In Chem., it is conceived that bodies can be divided into indivisible atoms, each having a definite uniform weight and general character. These ultimate particles are generally in this country called *atoms*, while those are called molecules which are constituent or aggregated into a heterogeneous whole. If the specific nature of these molecules were known, and the laws of the forces that retain them, whether these forces be of attraction or repulsion, it is evident that we should have the true key to tell the changes and sequences of the material universe. A number of attempts has been made to construct theories on this ground, sufficiently general to enable the inquirer to avoid restrictive conditions, and at the same time to afford a base for wide and important conclusions. One of the earliest explorers in the field of molecular theories was Boscovich, who asserted that matter did not consist of solid particles but of mere mathematical centres of forces. Each body is supposed by his theory to be made up of a number of geometrical points, from which emanate forces following certain mathematical laws, in virtue of which the forces become at certain small distances attractive, and at certain other distances repulsive, and at greater distances again attractive. "From these forces of the points arise the cohesion of the parts of the same body, the resistance which it exerts against the pressure of another body, and, finally, the attraction of gravitation which it exerts upon bodies at a distance."—(Whewell's *History of Scientific Ideas*.) Mr. Grove, Q.C., more lately has followed up the subject in his investigations concerning the correlation of the physical forces (which see). The most important works on the subject are those of Gauss on 'Terrestrial Magnetism,' and Dr. Simon George Ohm's "Contributions to Molecular Physics." In the latter work, Ohm supposes that ultimate molecules have both *simple* and *polar* powers, and on the ground of this hypothesis, attempts to deduce a complete system from which the phenomena of light, heat, and electricity necessarily and harmoniously flow forth.

MOLECULE, *mol'-le-kule* (Lat.), a term used in Chem. to signify the constituent particles of bodies. They are divided into integrant and constituent molecules. Integrant molecules have similar properties to the mass, and are, therefore, simple or compound as the mass is either one or the other. Thus a mass of pure metal consists of integrant particles, each of which has metallic properties similar to those possessed by the whole mass. In the same manner, a mass of alloy consists of integrant particles each of which is a compound of the different metals forming the alloy. When a compound integrant molecule is decomposed we arrive at the constituent molecules. Oxygen and hydrogen are thus the constituent molecules of an integrant molecule of water.

MOLE-RAT (*Bathyergus*), a genus of animals that belong to the order *Rodentia* or *Glires*, and are natives of the Cape of Good Hope. It is about the size of a rabbit, and burrows underground, like its prototype the mole, throwing up large hillocks, which are exceedingly dangerous to travellers on horseback. There are two varieties of this animal at the Cape: one called the sand mole (*Bathyergus maritimus*), just described, and the other the Cape mole-rat (*B. capensis*), which is called "*blesse* moll" by the Dutch.—*Ref.* Baird's *Encyclopædia*.

MOLE, WATER (*See* DUCKBILL.)

MOLINISTS, *mo le'-nists*, is the name of a sect in the Roman Catholic church, which adopted the opinions of Molina, a Spanish Jesuit and professor of theology at Evora, in Portugal (1535—1600). In order to remove the difficulties attending the doctrines of predestination and free will, and to reconcile the jarring opinions of Augustines, Thomists, semi-Pelagians, and others, he had recourse to the hypothesis that the decree of predestination to eternal glory was founded upon a previous knowledge and consideration of the merits of the elect, that the grace from whose operations those merits are derived, is not efficacious by its own intrinsic power only, but also by the consent of





our own will, and because it is administered in those circumstances in which the Deity, by that branch of his knowledge which is called *scientia media*, foresees that it will be efficacious. This consists mainly in that foreknowledge of future contingents that arises from an acquaintance with the nature and faculties of rational beings, of the circumstances in which they shall be placed, the objects that shall be presented to them, and the influence of these upon their actions. This doctrine was soon violently assailed, especially by the Dominicans, and at length Pope Clement VIII. appointed a congregation to investigate the matter. Opinion was so much divided upon the subject, that the pope decided that both doctrines (that of Molina and that of his opponents) might safely be taught in the Church. The Molinists, however, soon disappear, as other views involving the question of predestination and grace were advanced. (*See* JANSENISTS.)

MOLLA, *mol'-la*, is the name of a spiritual and judicial officer among the Turks, superior to the cadis or inferior judges, and having civil and criminal jurisdiction over towns or large districts. Over the mollas are the cadileskers, or supreme judges of the empire, who sit in the divan.

MOLLUSCA, *mol lus'-kă* (Lat.), a class of animals belonging to the second great division of the animal kingdom, haracteristically designated as being without a backbone. Mollusca may be briefly described to be animals covered with a soft moist skin, mostly forming over the back a duplication, free at the margin, and termed a *mantle*. The head is more or less distinct, is furnished with tentacles, and is often provided with two eyes. The shell is calcareous, mostly univalve in some this covering is multivalve, in a few internal, and in others absent altogether. The organs of circulation and respiration are generally distinct, and the heart is always aortic. A nervous ring is also around the œsophagus, while the nerves proceed from ganglia, are various in number, and are principally directed to the peripheral parts of the body. Cuvier supposes that the veins of molluscous animals perform the functions of absorbent vessels, their blood is of a white or bluish white colour, and appears to contain a smaller portion of fibrin than vertebrated animals. These muscles are attached to various points of their skin, forming three tissues, which are more or less complex and dense. Their motions consist, principally, of contractions in different directions, which produce inflections and prolongations, or relaxations of their various parts. By which means they creep, swim, and seize upon objects just as the form of those parts may permit, but as the limbs are supported by articulated and solid levers, they cannot proceed rapidly. To continue the remarks of Cuvier: the mantle is in most of them extremely great, and continues to grow long after they are divided. Their blood is pale, very sensible, and usually covered with a humour that oozes from its pores. No particular organ of smell has been discovered in them, although they possess that sense, it may, however, possibly reside in the entire skin. All the acephala, brachiopoda, cirrhopoda and part of the gasteropoda and pteropoda are destitute of eyes. The cephalopoda, on the other hand, have them quite as complicated as those of warm-blooded animals, they also possess the peculiarity of being supplied with organs of hearing; and they are the only class in which the brain has been discovered to be inclosed in a particular cartilaginous box. Nearly all molluscs have more or less a development of the skin termed the mantle, as before stated, and this is often narrowed into a simple tube, formed into a pipe, hollowed into a sac, or extended and divided in the form of fins. The *naked molluscs* are those in which the mantle is simply membranous or fleshy, most frequently, however, it forms by its thickness one or several lamina, of a substance which is more or less hard, and is deposited in layers always increasing in extent as well as in thickness, because the recent layers always outedge the old ones. When this substance remains concealed in the thickness of the mantle, it is customary still to apply the term naked molluscs. Generally, however, it becomes so much developed that the animal, when contracted, can find shelter beneath it. In such a case it is then termed a *shell*, and the animal is said to be *testaceous*.

The shells are various, and differ in form, colour, surface, substance, and brilliancy. Some are calcareous, while others are horny, and they always consist of matter deposited in layers, and exuded from the skin under the epidermis, like the enamel covering the nails, horns, scales, and teeth of other animals. All modes of mastication and deglutition can be traced in the molluscs. Their stomachs are sometimes simple, at other times multiple, and frequently provided with a peculiar anatomy, while their intestines are variously prolonged. They commonly have salivary glands, and always a large liver, but neither pancreas nor mesentery; several, also, have secretions which are peculiar to themselves. Their modes of generation vary considerably. Several possess the faculty of self-impregnation; others, although hermaphrodites, have need of a reciprocal intercourse; while many, indeed, have the sexes distinct and separated. Some, again, are viviparous, others oviparous; the eggs of the latter are sometimes enveloped with a shell, more or less hard, but sometimes covered with a simple viscosity. These varieties of the digestive and generative processes are found in the same order, and sometimes in the same family. The molluscs, in general, appear to be animals that are but slightly developed, possessed of but little industry, and which are only preserved by their fecundity and vital tenacity. Molluscs convert nearly every substance, both animal and vegetable, into food, which some take in a decomposed state, while others will only eat such substances as are perfectly fresh. Some are terrestrial, while others inhabit only the sea and fresh waters: a few varieties are also amphibious; but this class is much restricted in number. The uses and advantages of molluscs are various. Some supply food to man, while others supply nutritive provender to birds and fishes. Their shelly coverings are also converted into useful articles of commerce, and the celebrated Tyrian dye of the ancients was made from the veins of different shells termed *purpura* by the Romans. The molluscs are divided into numerous classes, according to their structure; those possessed of a shell with one valve are termed univalve molluscs, and are furnished with a distinct head; from which circumstance they are called *encephalous*. These are divided into three classes, the first of which is termed,—1. *Cephalopoda*, or *cuttle-fishes*. These have their feet, or, strictly speaking, arms, attached to the head, forming a circle round the mouth. (*See* CUTTLE-FISH.)—2. The next class is the fam. *Gasteropoda*, or *snails*, which Cuvier divides into several orders or divisions, according to the structure of the gills; as the *Pulmonaria*, *Nudibranchiata*, *Inferobranchiata*, *Tectibranchiata*, *Heteropoda*, *Pectinibranchiata*, *Scutibranchiata*, and *Cyclobranchiata*.—3. The third class of the univalves is termed *Pteropoda*, which swim in the sea with a pair of fins that extend outwards from the sides of the head. The subdivision *Clio* of Linnæus, of this class, is the type of the whole: the family Pteropoda are mostly hermaphrodital. The *acephalous*, or bivalve molluscs, are divided into two classes,—1. the *Conchifera*, and secondly the *Brachiopoda*, both of which classes have been united into one order by later naturalists. The respiratory apparatus of these is externally situated, and is placed either between the mantle and the body in the form of plates, or in the substance of the mantle itself. Besides the several classes which have been catalogued, there is yet another, called the *Tunicata*, which are destitute both of head and shell. Cuvier, in his supplement to Mollusca, in his great work, says that the diseases of these animals are not very numerous, but yet very little is known about them; and he puts forward the query whether oysters in a state of greenness, as they are often observed to be, ought not to be regarded as unhealthy.—*Ref.* Cuvier's *Règne Animal*; Hoeven's *Handbook of Zoology*, &c. &c.

MOLOCH, MOLECH, or MELCHOM, *mo'-lok*, was the national god of the Ammonites, and is frequently mentioned in Scripture. It is highly probable that the Hebrews were addicted to the worship of this deity before they came out of Egypt; and Moses in several places forbids them, under pain of death, to dedicate their children to Moloch. Solomon, seduced by his foreign wives, built a high place for him; and Manasseh imitated his impiety by making his son pass through the fire to Moloch. The idolatry continued from that time, chiefly in the valley of Tophet and Hinnom, till the captivity, after which all traces of this worship disappear. There are various opinions as to what is meant by "causing to pass through the fire." Some think that the children leaped over a fire sacred to the idol; others that they passed between two fires; and others that they were really burned in the fire by way of sacrifice to the god. The last opinion seems the most probable, and to accord most with portions of Scripture in which it is mentioned. According to some accounts, the image of the god was of brass, seated on a throne of the same metal, and with arms extended, as if to embrace some one. When sacrifices were offered to him, the image was heated from within, and the miserable victim was placed within the arms, its cries being drowned by a great noise of drums and other instruments. The place where these sacrifices were offered was so abhorrent to the minds of the later Jews, that they employed its name to designate the place of future torment. Moloch is sometimes identified with the Phœnician god Baal.

MOLUCCA BERRIES. (*See* ELÆOCARPUS.)

MOLYBDENUM, *mo-lib'-de-num* (Gr. *molubdaina*), in Chem., symbol Mo., equivalent 46, spec. grav. 8·625,—a rare metal found in nature principally as the bisulphide, in Bohemia and Sweden. It is also found oxidized in combination with lead, as molybdate of lead. The metal is obtained by roasting the bisulphide in excess of air, and mixing the remaining molybdic acid into a paste with oil and charcoal. If this be exposed to the heat of a smith's forge, it is reduced to the metallic state as a white, brittle, difficultly fusible mass. It forms three oxides,—the protoxide, deutoxide, and teroxide. The two former are possessed of basic properties, and form salts; the latter is molybdic acid, the only important salt of which is the phosphomolybdate of soda, which is a test for ammonia. The sulpho-molybdates of the alkalies are beautiful iridescent metallic salts, rivalling in brilliancy the rosaniline and murexide compounds. Its other compounds are unimportant.

MOMENTUM, *mo-men'-tum* (Lat.), in Mech., a term applied to express the quantity of motion in a moving body; in other words, the impetus of the same. The momentum is always equal to the velocity multiplied into the weight. (*See* IMPETUS.)

MONACHISM, *mon'-ă-kism* (Lat. *monachus*, a monk, from Gr. *monachos*, solitary), is used to denote the monastic system of life which has prevailed in the Church from a very early period. Some Protestant historians are of opinion that monachism was originally foreign to primitive Christianity, being adopted from the Alexandrian philosophy; others, again, hold that its rise was owing to circumstances within the Church itself, particularly the hardships to which it was exposed, by which many of the believers were driven from their homes and compelled to seek for safety in desert places. Long before the rise of Christian monachism, the Essenes in Palestine, and the Jewish sect of the Therapeutæ in Egypt, seem to have formed regular communities of ascetics. Christian monachism may be regarded as having its first beginning in the 2nd century, when we find some ascetics who lived in celibacy and voluntary poverty, and shunned intercourse with the world. They, however, lived isolated, and not in communities. The father of monachism proper is generally agreed to have been Antony, who, in the year 305, collected a number of ascetics into an associated community in Egypt, and regulated their mode of living by fixed rules. His disciple Hilarion soon after undertook the same thing in Palestine and Syria. Almost at the same time, Aones, or Eugenius, with his associates Gaddanas and Aggsus, introduced this mode of life into Mesopotamia and the neighbouring countries. These were imitated by many others with so much success, that in a short time all the East swarmed with persons who, abandoning the occupations and conveniences of life, and all intercourse with society, pined away amidst various hardships, hunger, and suffering, in order to maintain a closer communion with God and his angels, ignoring the fact that they were living in opposition to the true spirit of Christianity, which enjoins Christians to live for the benefit of others, and to let their light so shine

before the world that others seeing their good works may glorify God. From the East, this austere discipline passed into the West, and first into Italy and the adjacent islands; but who conveyed it thither is uncertain. Afterwards, St. Martin, the celebrated bishop of Tours, erected some monasteries in Gaul, and by his example and discourses produced such an effect, that two thousand monks are said to have assembled at his funeral. This way of life gradually extended over the other countries of Europe. The ancient monks were not like the modern, distinguished into orders, but took their names from the places which they inhabited, or were distinguished by their different mode of living, as—1 the Anchorets, who lived alone in private cells in the wilderness, 2 the Cœnobites who lived in community, several of them in the same house, under the direction of a superior; and 3 Sarabites, or strolling monks, who had no fixed rule or residence. The first and last of these came gradually to be absorbed in the regular Cœnobite system, which was principally regarded by the Church, and most under its direction. Originally, monks were no more than laymen, whose office, says Jerome, "is not to teach but to mourn." Not only were they prohibited the priesthood, but priests were expressly prohibited from becoming monks. Pope Siricius was the first who called them to the clericate, on the occasion of a great scarcity of priests which the Church was then supposed to labour under, and since that time the priesthood has been usually united to the monastical profession. The manner of admission to the monastic life was usually by some change of habit or dress, not to signify any religious mystery, but only to express their gravity and contempt of the world. No solemn vow or profession was required at their admission, but they underwent triennial probation, during which time they were inured to the exercises of the monastic life. If after that time they chose to continue the same exercises, they were without further ceremony admitted into the community. They were also at liberty to return at any time to secular life again. Nor was any solemn vow of poverty required, though it was usual for men voluntarily to dispose of their estates for charitable purposes before they entered into a community. The monasteries were commonly divided into several parts, and proper officers appointed over each of them. Over every ten monks was a *decanus* or dean, and over every hundred a *centenarius*. Above these were the *patres*, or fathers of the monasteries, called also the abbots or presidents. The business of the dean was to exact every man's daily task, and to bring it to the *œconomus*, or steward, who gave a monthly account of it to the father or abbot, for as the monasteries at that time had no standing revenues all the monks were obliged to exercise themselves in bodily labour, so as to maintain themselves and not be burdensome to others. The monk that did not work was viewed as no better than a contemptible drone. Towards the close of the 5th century, the monks who had formerly lived only for themselves in solitary retreats, and had never thought of assuming any rank in the Church, came to be gradually endowed with such honourable privileges and wealth that they soon found themselves to be in a position of great power and influence. The fame of their piety and sanctity was very great, and the passion of erecting edifices and convents for their benefit was carried beyond all bounds. A new epoch in the history of western monachism began with Benedict of Nursia, whose rule (529) came gradually into general use, transforming the previously independent communities into a hierarchical religious order. It became the bond of union for most of the western convents, but the many favours received from church, state, and individuals, facilitated the growth of moral corruption to a great extent, and called forth repeated attempts at reform; so that for many centuries the history of monachism presents a continued struggle of reformers with the laxity, indifference, or immorality obtaining in a greater or lesser number of the convents of their times. Among the earlier of these reformers were Benedict of Aniane, who died 821, and whose commentary on the rule of St. Benedict enjoyed a high character; Benno, who became abbot of Cluny 910, and laid the foundation of the congregation of Cluny;





Romuald, who founded the congregation of Camaldoli in 1023; and Gualbert that of Vallombrosa in 1039. Towards the end of the 11th century arose the Cistercian and Carthusian orders, the other of St. Augustine, the Hospitallers, &c. The warlike spirit of the times brought about a union of the monastic with the military life, and hence arose the various military orders; as the Knights of St. John, the Templars, the Teutonic Knights, the orders of St. Jago, Calatrava, Alcantara, &c. The large increase of orders called forth much opposition, and the council of Lateran, in 1215, passed a resolution that no new order should be established. Notwithstanding this prohibition, there almost immediately arose an entirely new class of orders,—the mendicants, including the Franciscans, Dominicans, Carmelites, Augustinians, and others, who inaugurated a new era in the history of western monachism. They directed their attention more particularly to the lower orders of society, among whom they became very popular. They spread with great rapidity, and had many important privileges conferred on them by the popes. Several of their members filled the highest offices in the Church, even to the papal chair. In the 14th century, a general degeneracy of monachism commenced, until at length the name of monk came to be almost synonymous with ignorance, rudeness, and every species of immorality. The dawn of the Reformation in the 16th century had an important influence on this state of things, and strong efforts were made to enforce a more strict observance of the rules of the respective orders. The council of Trent passed a number of regulations for the internal management of religious houses. Several new orders were formed upon improved rules, the most famous of which is that of the Jesuits who were, more than any other order, under the absolute power of the pope. Since the Reformation however, monachism cannot be said to have manifested any inherent vitality or power; and with the advance of modern civilization its highest meaning and only conservative use are gone. An account of the principal monastic orders will be found under their own names in other parts of this work. The number of monastic institutions in 1860 was estimated as follows:—Male orders and congregations, 83, with with about 7,065 establishments and 100,000 members; female orders and congregations, 94, with 9,217 houses and a little more than 100,000 members. At present they are most numerous and influential in France, and latter in Belgium. In Austria since 1848 they have met with much support and encouragement. In Spain and Portugal they have been almost entirely suppressed, and in Italy, in consequence of recent events, they have been very much reduced.—*Ref.* Mosheim's Neander's, and Milman's *Church Histories*; Helyot's *Histoire des Ordres Monastiques*; Döring's *Geschichte der Mönchorden*, Montalembert's *Les Moines del Occident*.

MONAD *mo'nad* (Gr *monas*, a unit).—In Nat. Hist., this term is given to the simplest kind of minute animal life. In Metaphysics, the word, according to Leibnitz is used to denote a simple substance, having no parts, a compound substance being an aggregate of simple substances or monads. The basis of the monad theory lies in the various philosophical systems of Democritus, Zeno, and Epicurus. Leibnitz was the first to arrange the different theories in a system.

MONAR CHIANS, *mo nar'-ke-ans*, in Eccles. Hist., were a sect of Christians that arose about the end of the 2nd century, and insisted upon the unity or oneness of God, as opposed to the commonly received doctrine of three persons in the Godhead. The upholders of this doctrine, however, differed greatly from each other on other points, more particularly regarding the nature of Christ, some of whom held that he was God himself; others, that he was a power or manifestation of the Deity, but that he did not exist as a distinct person before his incarnation; whilst others regarded him only as a mere man. Their opinions were thus quite like those of the Unitarians of the present day.

MONARCHY, *mon'-ar-ke* (Gr. *monos*, alone, and *archein*, to govern), in Pol., is that form of government in which the supreme power is vested in the hands of a single person. Of the three forms of government—democracy, aristocracy, and monarchy,—the last is the most powerful; all the shows of government being

knit together and united in the hand of one person, who can thus carry out his plans with promptitude and decision. In some monarchies, the will of the sovereign is uncontrollable; in others, his authority is restrained by laws. The former are termed despotic or absolute, the latter constitutional monarchies. "To a constitutional monarch the laws are not manacles, but garlands. They adorn rather than oppress him." "The well-being of a people is perhaps never so perfectly secured as under a constitutional monarchy, which is, in fact, a republic with safeguards against revolution; or, rather, a commonwealth under which the people do not learn the 'sacred right of insurrection,' but accomplish all the necessary revolutions quietly, surely, and according to law."—(Dr. Doran, in *Encyclopædia Britannica.*) Some monarchies are hereditary, descending regularly from father to son; others are elective, where, on the death of a monarch, his successor is appointed by election, as was the case in Poland before its dismemberment. Historians usually reckon four grand or universal monarchies,—the Assyrian, Persian, Grecian, and Roman. The first of these commences with Ninus, the son of Belus, who reigned in Assyria, built Nineveh, and captured Babylon about B.C. 2060. On the death of Sardanapalus, the Assyrian empire was split into three kingdoms,—the Median, Assyrian, and Babylonian. These monarchies continued separate until B.C. 606, when Assyria was united to Media; and in 538 the Babylonian kingdom was brought to an end by the conquest of Cyrus, who established the second great monarchy, called the Persian. This stood under alternations of glory and disaster till the conquering Alexander subjected the country and laid the foundation of the Greek empire, B.C. 331. That part of the Greek empire which comprised Macedonia, fell before the Roman general Æmilius Paulus, and was made a Roman province; the king, Perseus, and his sons, being carried captive to Rome. The Roman monarchy, if dated from the building of the city, commenced B.C. 752. There first reigned seven kings, and then consuls were appointed, B.C. 509. The imperial monarchy commenced in the person of Julius Cæsar, B.C. 48. On the death of Jovian, A.D. 363, the Roman empire was split into two divisions,—the Western and Eastern. The former fell with the deposition of Romulus Augustulus by Odoacer, king of the Heruli, A.D. 476; the latter, as the Byzantine empire, continued down to 1453.

MONARDA, *mo-nar'-dă* (after Monarda, a Spanish physician), in Bot., a gen. of the nat. ord. *Labiatæ*. The species *M. punctata*, commonly called horsemint, is used medicinally in the United States. This herb resembles the ordinary mints in its properties, but it is more stimulating. *M. fistulosa* is said to be febrifugal. The leaves of *M. didyma* and *purpurea* are used as tea in North America under the name of Oswego tea: the flowers of the former are said to contain the same colouring principle as cochineal.

MONASTERY, *mon'-ăs-ter-e* (Fr. *monastère*, Low Lat. *monasterium*), is a religious house built for the reception of religious persons, whether it be abbey, priory, nunnery, or the like. More properly, however, it is applied only to the houses of monks, mendicant friars, and nuns, the rest being called religious houses. (*See* MONACHISM.) The following calculation has been made as to the number and wealth of the religious houses in England, dismantled and scattered, from first to last, at the time of the Reformation, so far as any evidence exists:—

| | |
|---|---|
| Lesser Monasteries, of which we have the valuation | 374 |
| Greater Monasteries | 186 |
| Belonging to the Hospitallers | 48 |
| Colleges | 90 |
| Hospitals | 110 |
| Chantries and Free Chapels | 2,374 |
| Total | 3,182 |

Besides the friars' houses, and those suppressed by Wolsey, and many small houses of which we have no particular account. The clear yearly revenue of the several houses at the time of their dissolution, so far as we have any account, seems to have been as follows:—

| | £. | s. | d. |
|---|---|---|---|
| Of the greater monasteries | 163,919 | 12 | 6 |
| Of the lesser monasteries of which we have the valuation | 29,702 | 1 | 10 |
| Knights Hospitallers' head house in London | 2,365 | 12 | 8 |
| Twenty-eight of their houses in the country | 3,026 | 9 | 6 |
| Friars' houses of which we have the valuation | 781 | 2 | 0 |
| Total | £140,794 | 19 | 2 |

Taking into account the value of money at the time,—at least six times as much as at present, and considering that the estimate of land is generally supposed to have been much under the real value, and making some allowance for omissions, the entire revenues of these houses must have been enormous.

MONDAY, *mun'-dai* (Sax. *Monandæg*, Ger. *Montag*, Lat. *lunæ dies*, Fr. *lundi*), is the name of the second day of our week; so called from being formerly regarded as sacred to the moon.

MONGOLIAN RACE, *mon-go'-le-ăn*, is one of the great ethnological divisions of the human race. (*See* ETHNOLOGY.)

MONEY, *mun'-e* (Lat. *mynet*), the common medium of exchange in civilized countries, by which the value of commodities is estimated. Barter is naturally the first form in which commerce is carried on; but this mode of dealing is only suitable to a very rude state of society. Although, in every nation, this mode of dealing was the foundation of business, it was obliged to give way in time. Without the use of money of some kind, exchanges would soon have been embarrassed, and the divisions of labour very imperfectly established. In different countries, and at different times, a great variety of commodities has been employed to serve as money; but, before long, it was found that no commodity could be used as money unless it possessed certain properties:—First, that it should be a material having a value of its own; second, that it should be of such a value that every man should accept it in exchange for his property; third, its value should be readily ascertained. When such a material as this is moulded into a particular form, and stamped with a mark which denotes its value, so that it is exclusively employed as an exchange for articles of value, it is called money, in distinction from those articles which have value, but are not used as a medium of exchange. At all periods, and in all countries, the metals seem to have been used to serve the purposes of money. Many other articles have been used; such as paper, in the more highly civilized nations, and cowrie-shells in Africa; but in all, the metals form some portion of the currency. Among the Chinese, Egyptians, Persians, Hebrews, Greeks, and Romans, metal was employed as money. Metals are of great utility, and have always been eagerly sought after for various useful and ornamental purposes; but the precious metals gold and silver are the principal objects of desire. These, with some other metals, easily changed from articles of value to articles of exchange. All nations as they advanced in trade gave the preference to them, for the following reasons:—First, they derive value from the smallness of their quantities compared with the demand for them in the ornamental and useful arts; second, they are not liable to corrosion and destruction by use; third, they are susceptible of minute division, and may be used in small quantities or masses; fourth, they are easily transported, and their transportation to any distance costs only a small part of their value; fifth, the quantity is increased by labour. For a universal currency, the advantage of using the precious metals is still greater, when it is not left for private individuals to divide, weigh, and fix the value of pieces of metal, but persons are appointed by law to decide what pieces shall be circulated as money, to stamp them so as to fix their weight and fineness, and to furnish them with the superscription of the authority by which their issue is legalised. The pieces of metal so circulated are called *coins*. (*See* MINT.) In rich countries, the three metals, gold, silver, and copper, or bronze, are very convenient substances for the

manufacture of coins, on account of the differences in their relative value. Gold coins, containing a high value in a small compass, are convenient for large payments; silver coins for smaller payments; and copper, or bronze coin, for those of less value: while all the larger coins are multiples of the smaller. Payments of larger amounts, however, cannot be made conveniently in coins. Promissory notes, bills, and various forms of credit, have, therefore, been used as substitutes in this and other countries. These substitutes are sometimes improperly called *money*. Promissory notes, or bills of exchange, are only of the same value as real money when they can be readily exchanged for coin, they lose their value as the credit of their issuer sinks. This must be the case with all *paper-money*, as it is called, and with all coins issued at a higher value than their real value. (*See* the articles on BANK, BANKING, BILL OF EXCHANGE, EXCHANGE, CURRENCY, &c.) In all countries where the use of coins has once been adopted, all values in contracts and other arrangements are rated or estimated in money, and in most cases it is enacted that coins of the legal or standard weight and purity shall be legal tender, and to enact that no legal proceedings shall be instituted on account of any debt or pecuniary obligation against any individual who has offered to liquidate the same by payment of an equivalent amount of the coin recognized by the country. The metal of which English silver coins are made consists of a mixture of pure silver and alloy, every 1 oz. containing 11 oz. 2 dwt. pure silver and 18 dwt. alloy. These 12 oz. are coined into 66 shillings, so that the money pound of 20 shillings contains 1614 55/62 grains of pure silver and 1745 45/62 grains of standard silver. The fineness of gold is estimated by carat grains, equivalent to 1/24 dwt. troy, the finest gold ever said to be 24 carats fine. The present standard gold coins consists of 11 parts fine gold and 1 part alloy. The sovereign, or twenty shilling piece, contains 11·00 grains of fine gold and 123·274 grains of standard gold. In order to prevent the great inconvenience and confusion which would necessarily arise were private individuals to coin money, the governments of nearly every civilized country have not only taken upon themselves the supply of the coins in circulation (*see* MINT) but have found it necessary to inflict severe penalties on the forging of coin or the fabrication of counterfeit coin. It is found, however, that the best method for the prevention of forgery lies in the improvement of the fabric of the coins and the perfection of the dies and machinery.

MONIMIACEÆ, *mon-im-e-ai'-se-e*, in Bot., a small nat. ord. of *Dicotyledones*, sub class *Monochlamydeæ*, consisting of eight genera of fragrant trees or shrubs, chiefly natives of South America, but found also in Australia, Java, the Mauritius, and New Zealand. The flowers generally resemble those of *Atherospermaceæ* (which *see*), but they differ in always being unisexual, in the longitudinal dehiscence of the anthers, and in the absence of feathery styles to the fruit.

MONITEUR, *mon-e-tuhr'* (Fr.), is the name of one of the most celebrated of the French newspapers. It was commenced as a daily journal at Paris on 24th Nov., 1789, under the title of *Gazette Nationale ou le Moniteur Universel*. At first it was a simple gazette, without any official character, but on the 7th Nivose, of the year VIII. (1799), it was declared an official organ, and it still continues to be the official organ of the French government. Since 1811, it has dropped the title *Gazette Nationale*, and retains only that of *Moniteur Universel*. It contains, in addition to news foreign and domestic, literary notices, &c., not only the official ordinances and documents of the government, but also such political information as the government intends to be regarded as official. It now comprises upwards of 100 thick folio volumes, and contains a vast amount of valuable information connected with the history of France. Entire sets of it are now rare and very valuable. In 1790, an introductory volume was published "contenant un abrégé des anciens états-généraux, des assemblées des notables et des principaux événements qui ont amené la revolution;" also in 1828, "Tables chronologiques du Moniteur Universel."—*Ref.* Bidault, *Notices historiques et bibliographiques sur la Collection et les Tables du Moniteur depuis son origine jusqu'à ce jour.* Paris, 1838.

MONITOR, *mon'-e-tor* (Lat., one who warns), a genus of large lizards having teeth in both jaws, and bones in the palate. The greater part have the tail compressed laterally, as an adaptation to their aquatic habits. The first of the two distinct groups into which the genus is divided bears the name of Nilotic monitors, their chief characteristics being numerous small scales upon the head and limbs, and a keel above the tail, formed of a double range of projecting scales. The second group carries angular plates upon the head, whilst the body and tail carry large rectangular scales. The monitors are found in most parts of the world, and the fossil remains of species larger than any at present in existence have been discovered in Europe. Their name is said to be derived from their making a whistling sound as a warning of the approach of crocodiles and alligators, whose haunts the monitors frequent.

MONK (*See* MONACHISM.)

MONKEY, *munk'-e* (Ital. *monachio*).—In the article on MAMMALIA the reader will find that the largest section of the animal creation has been divided into various classes in a descending scale, from the highest animal, man, to the lowest group of the cetaceans or whale tribe. Ranking next to man are the Quadrumana, under which heading apes, baboons, gorillas, and monkeys are generally classed. As the other subdivisions have been already described in distinct articles, the present one will be only devoted to the consideration of the monkeys proper, whose technical characteristics will be found given under the article SIMIADÆ. The true monkeys, the *sapajous*, are only such as have prehensile tails, and are inhabitants of South America exclusively, but as the name has become extended in its signification, the monkeys of the whole world may as well be described at the same time. The monkeys form by far the largest portion of the quadrumana. The *sapajous* are very active, climb well, and by the aid of their tail, which is as good as an other hand, they can spring from tree to tree in the vast forests of South America with inconceivable rapidity and agility. The fore-hands, however, are not so perfectly organized as those belonging to the monkeys of Africa, the thumb being longer and more in line with the other fingers. The facial angle of the *sapajou* is 60°, which forms a marked contrast to those of the species. They are small in size, and very playful. Foremost amongst them may be placed the weeper (*Cebus lpella*). Its fur is of a rich olive-colour, inclining to golden on the lighter parts. There is also the horned sapajou (*Cebus fluellius*), the large-headed sapajou (*Cebus monachus*), and more than fifteen or sixteen other species. To turn to the monkeys of Asia and Africa, we find a great change in the generic character. The first variety is the spotted or Diana monkey (*Cercopithecus Diana*), a native of Congo and Guinea, and one of the most lively and playful of the whole tribe. It has a long white beard, and the upper parts of the body are of a reddish colour, marked with white specks, and the tail is about as long as the body. The Green monkey (*Cercopithecus sabæus*) is one of the most abundant of the group, and is often seen in a state of captivity. It is a native of the Cape de Verde Islands and of the continent of Africa. In its disposition it approaches the long armed apes, although it is more lively and playful. The colour is greenish yellow above, arising from the hairs being arranged according to different shades of yellow and black; but the colour is more of a dark grizzled appearance on the sides of the body and on the sides of the limbs, which becomes gradually darker towards the hands. The face, ears, and naked part of the hands, are of a jet black, the former is of a triangular shape, bounded above the eyes by a straight line of stiff black hairs, and on the sides by spreading tufts of light hairs, with a yellowish tinge, meeting in a point beneath the chin. The neck and chest and the under parts of the body have a yellowish tinge, and the inside of the limbs is greyish in colour. The length of the head and body is about from sixteen to eighteen inches, while that of the tail is somewhat more. One of the most singular of the monkey class is the genus termed the Proboscis monkey (*Nasalis larvatus* of Geoffroy), which, in the-

tinguished by the extraordinary elongation of its nose, which gives it the most grotesque appearance. This nose is about four inches long; the body is unshapely, protruding in front, like the orrange; the arms are of considerable proportionate length, like the gibbons; while, like the howling monkeys, it possesses a large guttural sack; the presence, also, of a very long tail and naked callosities, combine, with the protrusion of the nasal organ, to give the proboscis monkey the most eccentric and peculiar appearance of the whole tribe. It is about three feet in height, and is a native of the island of Borneo. The *Red monkey* may next be mentioned, as it is one of the oldest known to naturalists. It is a native of Senegal. The length of the body is about a foot and a half, or one foot four inches, while that of the tail is nearly equal. All the upper parts are of a brilliant reddish fawn-colour, which is shaded into a pale greyish tinge on the arms and legs, while the face, cheeks, breast, and under surface of the body are pure white; a band of black hair crosses above the eyebrows, and there are two lines of the same colour upon the upper lip, in the shape of a moustache, which tends to give this monkey a most peculiar appearance. The Entellus monkey (*Semnopithecus entellus* of F. Cuvier) is another variety; but it is little known in European collections. It is a native of the Indian archipelago, and of some parts of the Asiatic continent. According to Cuvier, the height of the Entellus monkey is generally about one foot five inches, and the length of the tail two feet. Another species, the Negro monkey (*Semnopithecus maurus*) is a native of Java and Sumatra; is somewhat larger than the variety last described; the length of the body being about two feet and a half, and that of the tail nearly equal. According to Doctor Horsfield's description, this class of monkey inhabits the extensive forests of the Spice Islands, and associates in numerous bands or societies, numbering more than fifty at a time, and is pursued by the natives for the sake of the fur. In these pursuits, which are regularly organized and prepared beforehand by the chiefs of the various tribes, the animals are attacked with cudgels and stones, and are destroyed in large numbers. The skins are then prepared by a simple process, which the natives learned from Europeans, and are exported. The fur is of a jet-black colour, covered with long silky hairs. The Simpai (*Semnopithecus melalophos* of F. Cuvier) is also a native of Java and Sumatra, and is remarkable from the flatness of the face and the development of the facial angle. The last variety which can be mentioned in the present article is the White-eyelid monkey (*Cercopithecus fuliginosus of* Geoffrow), which is distinguished by the peculiar colour of the eyelids; they are of a clear greyish white, but with a dead chalky line. The hair is soft and fine to the touch, and in the upper parts is sooty black, which is even darker on the hands, but which generally shades into a yellowish tint on the breasts, belly, and inside of the thighs, and on these parts the thin coating of hair plainly shows the skin, which is of a very pure flesh-colour. (*See*, also, Ape, Gorilla, Baboon, Ourang-Outang, Quadrumana, and Simiadæ.)

Monkey-apple. (*See* Clusia.)

Monkey-pot. (*See* Lecythis.)

Monkshood. (*See* Aconitum.)

Monsnia, *mon-sē'-nă* (in honour of Monino, a Spanish botanist), in Bot., a gen. of the nat. ord. *Polygalaceæ*. The bark from the roots of *M. polystachya* and *salicifolia* is especially remarkable for the presence of a saponaceous principle; it is used in Peru as a substitute for soap, and for cleaning and polishing silver. This bark is, moreover, said to be a valuable medicine in diarrhœa and similar diseases.

Monochlamydeæ, or Apetalæ, *mon-o-klăm-id'-e-e* (*monos*, and *chlamys*, a short cloak), in Bot., a sub-class of *Dicotyledones*, comprising those plants of the division *Angiospermia* in which the flower has a calyx only, or is without both calyx and corolla. Fifty-eight natural orders are included by Professor Bentley in the sub-class; namely, Polygonaceæ (the Buckwheat ord.); Nyctaginaceæ (the Marvel of Peru ord.); Amaranthaceæ, Chenopodiaceæ (the Spinage ord.); Basellaceæ, Scleranthaceæ, Phytolaccaceæ, Surianaceæ, Calycereæ, Gyrostemoneæ, Piperaceæ (the Pepper ord.); Chloranthaceæ, Saurureæ, Podostemaceæ,





Thymelaceæ (the Mezereon ord.); Aquilarieæ, Elæagneæ (the Oleaster ord.); Proteaceæ, Penæaceæ, Lauraceæ (the Laurel ord.); Cassythaceæ, Atherospermaceæ, Monimiaceæ, Myristicaceæ (the Nutmeg ord.); Begoniaceæ, Datiscaceæ, Samydaceæ, Lacistemaceæ, Chailletiaceæ, Ulmaceæ (the Elm ord.); Urticaceæ (the Nettle ord.); Cannabinaceæ (the Hemp ord.); Moraceæ (the Mulberry ord.); Artocarpaceæ (the Bread-fruit ord.); Platanaceæ (the Plane ord.); Stilaginaceæ, Ceratophyllaceæ, Callitrichaceæ, Euphorbiaceæ (the Spurge-wort ord.); Hocpaceæ, Empetraceæ, Batideæ, Nepenthaceæ (the Pitcher-plant ord); Aristolochiaceæ, Santalaceæ (the Sandal-wood ord.); Loranthaceæ (the Mistletoe ord.); Helwingiaceæ, Garryaceæ, Juglandaceæ (the Walnut ord.); Corylaceæ (the Oak ord.); Myricaceæ, Casuarinaceæ, Betulaceæ (the Birch ord.); Altingiaceæ, Salicaceæ (the Willow ord.); Balanophoraceæ, Cytinaceæ, Rafflesiaceæ. By many botanists, the four orders, Coniferæ, Taxaceæ, Gnetaceæ, and Cycadaceæ, are included among the *Monochlamydeæ*, but they really form a very distinct nat. group; and in Bentley's classification they form the division *Gymnospermia*.

Monochord, *mon'-o-kord* (Gr. *monos*, sole; *chordos*, cord), an instrument consisting of a single string (hence its name) stretched over two bridges, standing one at each end of a graduated scale, employed to measure the variety and proportions of musical sounds. Dr. Crotch, in his "Elements of Musical Composition," gives very clear and concise directions for constructing a *monochord*.

Monocotyledones, *mo-no-ko-til-e'-dōnez* (Gr. *monos*, single; *kotuledon*, a cotyledon), in Bot., one of the two great classes into which the phanerogamous or flowering plants are divided. It agrees with the *Endogenæ* of some botanists, and includes the *Exdogens* and *Dictyogens* of Lindley. (*See* Botany.)

Monodon. (*See* Whale.)

Monogram, *mon'-o-grăm* (Gr. *monos*, single, and *gramma*, letter), is a character or cipher composed of one, two, or more letters woven together. They were very common in antiquity, on coins, standards, &c. (*See* Cipher.)

Monograph, *mon'-o-grĭf* (Gr. *monos*, and *graphe*, writing), is a treatise on a single subject in literature or science; as a monograph on mummies, a monograph on roses. The advantage of a treatise of this sort is, that it allows more minuteness of detail in reference to all the properties and relations of the subject.

Monolithic, *mon-o-lith'-ik* (Gr. *monos*, and *lithos*, a stone), denotes something composed of a single stone. In Egypt, some striking specimens of monolithic obelisks and monolithic temples are still to be seen. According to Herodotus, there was a monolithic sanctuary attached to a temple at Sais, 21 cubits long, 14 wide, and 8 high, brought from Elephantine, the carriage of which employed 2,000 men for three years.

Monologue, *mon'-o-log* (Gr. *monos*, and *logos*, discourse), in the drama, is a part in which a person speaks by himself, or soliloquizes, as distinguished from a dialogue, in which two persons speak.

Monomania. (*See* Insanity.)

Monophysites, *mo-nof'-e-zites* (Gr. *monos*, and *physis*, nature), a sect of Christians that arose in the 5th century, and maintained that there was only one nature in Christ, in opposition to the decision of the council of Chalcedon (451), that Christ had two natures. Eutyches, the leader of this sect, maintained that everything human in the nature of Christ was absorbed by his divinity, and became one with it. This doctrine led to violent disputes in the Church. In Egypt, Palestine, and other parts of the East, the Monophysite doctrine met with many adherents. In Antioch, a leader of the Monophysites was raised to the patriarchal dignity. They were encouraged by the emperor Anastasius; but Justin I., Justinian, and others, adopted severe measures against them. They were also divided among themselves,—the Severians maintaining the corruptibility, the Julianists the incorruptibility of the body of Christ. By the zeal of Jacob Baradæus, bishop of Edessa (541), they were permanently organized in Syria and Mesopotamia, with a patriarch at their head; and from him they are fre-

quently termed Jacobites. The efforts of Baradeus were ably seconded in Egypt and the adjacent countries by Theodosius, bishop of Alexandria. In the present day, the Monophysites are divided into two sections,—the Asiatic and African,—the head of the former being the patriarch of Antioch, of the latter, the patriarch of Alexandria. The former are subdivided into Jacobites and Armenians, the latter into the Coptic and Abyssinian churches.

**Monopoly**, *mo-nop'-o-le* (Gr. *monos*, and *poleo*, I sell), in Pol. Econ., is an exclusive right secured to one or more persons to carry on some branch of trade or manufacture, in contradistinction to a freedom of trade or manufacture enjoyed by all the world, or by all the subjects of a particular country. The ancient laws and customs of this country were decidedly opposed to monopolies, and a clause is inserted in the Magna Charta to the effect that all merchants shall have safe and sure conduct to come into England, and to depart from it, and to buy and sell without the obstruction of evil tolls. During the reigns of the princes of the house of Tudor, monopolies were largely introduced, and were carried to an enormous height during the reign of Queen Elizabeth. The outcry against them at length became so great, that in 1624, 21 Jac. I. c. 8, was passed, abolishing a number of monopolies, and restoring the freedom of internal industry. It did not, however, touch any of the fundamental principles of the mercantile or manufacturing system, and the privileges of all bodies legally incorporated were exempted from its operation. It, however, says McCulloch, "did perhaps more than any other in the statute book to accelerate improvement." Since that time, more particularly in recent years, more enlightened views have been diffused and carried out, so that now, except as regards patents and copyrights for a limited period, monopolies may be said to be extinguished in this country. (*See* Commerce.) For monopoly, as understood of forestalling, regrating, engrossing, *see* Forestalling.

**Monotheism**, *mo-no-the'-izm* (Gr. *monos*, and *theos*, God), is a belief in, and worship of, only one God, in opposition to polytheism, which acknowledges a plurality of gods.

**Monothelites**, *mo-noth'-e-lites* (Gr. *monos*, and *thelema*, from *thelo*, I will), were a sect that arose in the early Church, which, while accepting the doctrine of the two natures in the person of Christ, maintained that there was but one manifestation of will. They arose in the early part of the 7th century, and being for a time nurtured and protected by imperial approbation, which thus sought to unite the opposing parties of the orthodox and the Monophysites, they spread very rapidly. The first council of Lateran under Pope Martin I. (649) condemned the Monothelites; and in 1680 the sixth œcumenical council at Constantinople affirmed two wills in Christ, and excommunicated Macarius, patriarch of Constantinople, and other leaders of the party. After a time, being much reduced by persecution, they retired to the neighbourhood of Mount Libanus, where they maintained themselves till the 12th century, when they abjured their opinions, and were received into the Roman Catholic church.

**Monotropaceæ**, *mo-no-tro-pa'-se-e* (Gr. *monos*, one; *tropeo*, I turn;—the flowers are turned one way), in Bot., the Fir-rape fam., a nat. ord. of *Dicotyledones*, sub-class *Corolliflorœ*, consisting of parasitic plants with scaly stems, found growing on firs. There are six genera and ten species.

**Monseigneur**, *mon(g)-sain'-yhur* (Fr. *mon*, my, and *seigneur*, lord), is a French title, originally applied to saints, but subsequently to princes, nobles, and certain high dignitaries of the Church. It is now only given to prelates and princes, the dauphin's eldest son, under the monarchy, being styled Monseigneur, without any addition. The Italian Monsignore has a similar signification.

**Monsieur**, *mon'-yeu* (Fr. *mon*, my, and *sieur*, sir), is a French title of civility, applied to persons of every rank or condition, corresponding to the English Mr. or Sir. By the earlier English writers, it was applied in a contemptuous sense to Frenchmen. Under the monarchy, it was given, with the addition of the name, to the king's eldest brother. The plural is Messieurs.

**Monsoon**, *mon-soon'* (Fr. *mousson*, corrupted from the Malayan word *mausem*, a year), the name given in Phys. Geog. to the periodical winds of the Indian Ocean. From a very early period these winds have attracted the attention of the navigator, as, by taking advantage of their regular blowing, a quick and easy journey can be depended upon. Monsoons blow with the greatest force and with most regularity between the east coast of Africa and Hindustan. A north-east wind blows over this part of the ocean when the sun is in the southern hemisphere, and a south-west when it is in the northern hemisphere. When the sun crosses the equator, the winds are variable, and gales, hurricanes, calms, and thunderstorms occur. The north-east monsoon blows from November to March, while the south-west monsoon, which does not extend south of the equator, blows from the end of April to the beginning of October. It is difficult to account for these periodical winds: they appear to be a modification of the trade winds, produced by the peculiar form of the countries lying within and around the Indian Ocean.

**Monster**, *mon'-ster* (Lat. *monstrum*), in Phys., is applied to any creature whose formation deviates in some remarkable way from the usual formation of its kind. (*See* Deformity, Teratology.)

**Montanists**, *mon'-tân-ists*, a religious sect that sprung up towards the end of the 2nd century, and were called after their leader Montanus, a Phrygian. He pretended to inspiration, and gave out that the Holy Ghost had instructed him in several points which had not been revealed to the apostles. Two of the most celebrated of his followers were Maximilla and Priscilla, two ladies of fortune, who were early converted to his opinions, and pretended to prophesy. Soon after he found a zealous and gifted advocate in Tertullian. The Montanists preached a most rigid asceticism; they held it unlawful to fly from persecution, condemned second marriages, and forbade for ever communion to such as had been guilty of certain notorious offences. They represented the millennium as being near at hand, and taught that Pepuza, in Phrygia, was to be its centre. Hence they were sometimes called Pepuzians, Phrygians, and Cataphrygians. They spread rapidly in Phrygia and other parts, but were violently opposed by the Alexandrian school, and condemned by several provincial councils; and they at length disappear about the end of the 4th century.—*Ref.* Neander's *Church History*.

**Mont de Piété**, *mon(g) de(r) pe'-ai-tay* (Ital. *monte di pietà*), is a public benevolent institution, existing in Italy and other parts of the continent, and said to have been first established at Perugia in the latter half of the 15th century by Father Barnabas of Terni, and to have taken its name from the hill on which it was situated. The object was to deliver the needy from the usurious Jewish money-lenders, by lending money upon pledges at a very moderate rate of interest, so as barely to cover the necessary expenses. Popes Leo X. and Paul III. issued bulls approving of these institutions, which were soon established in other towns of Italy, as well as in Spain, the Netherlands, and other countries. There are at present, besides those in Italy, about 50 monts de piété in France, upwards of 100 in Holland, about 20 in Belgium, and some in Germany. The mont de piété of Paris advances to the value of about two-thirds of the pledges, charging interest at the rate of 6 per cent. per annum, besides ½ per cent. per month for the expenses of the establishment. Its annual receipts and expenditure amount respectively to about 40,000,000 francs. The *monti frumentarii* are granaries established in different parts of Italy to supply the needy with grain on the same principle as the monts de piété.

**Montem**, *mon'-tem*, was the name given to a singular custom that was celebrated triennially at Eton School on Whit-Tuesday. On that day, the scholars marched in procession with flags and music to a mount (Lat. *ad montem*) near the Bath road, known as the Salthill. Contributions, or "salt," as it is termed, were then levied from the passers by and spectators; and as many of the nobility, and sometimes even royalty, were present on such occasions, the sum collected has sometimes amounted to £800 or £1,000. After defraying certain expenses, the sum went to the senior boy, or captain, of the school, for his support at the university.

This custom was at length abolished in 1647 on the representation of the master of the school to government, that its celebration was attended with certain inconveniences, though the measure was vigorously opposed by many influential persons.

MONTH, *munth* (Sax. *mona*, the moon), in its proper acceptation, denotes the time taken by the moon in performing a revolution round the earth, equal to 29 days, 12 hours, 44 minutes, 3 seconds. This mode of marking time by the revolutions of the moon was used by the Chaldeans and Egyptians, and is so still by the Jews, Turks, and many uncivilized nations. These periods are now commonly known as lunar months. The ancient Romans used lunar months, and made them alternately of 29 and 30 days. As the solar and lunar revolutions do not correspond with each other, by following the lunar mode of reckoning, the seasons of the year would be found to fall back, so as in 34 years to effect a complete change from summer to winter; hence it was found necessary to regard the month as the twelfth part of the solar year, being 30 days, 10 hours, 29 minutes, 5 seconds: this is called the solar month. The calendar months consist of 30 or 31 days, except February, which has 28, and 29 each leap year. (*See* CALENDAR.) In popular language, a month is frequently used to express four weeks, and in common law and equity law, unless otherwise expressed, it is so understood. Hence, a lease for twelve months is taken to mean only 48 weeks, whereas a lease for a twelvemonth means a solar year. Formerly, in statutes, month denoted a lunar month, unless calendar month was specified; but, by 13 Vict. c. 21, the word month is declared in future statutes to mean a calendar month, unless words be added showing that a lunar month was intended. In commercial practice, in all cases of negotiable instruments, a month is deemed a calendar month, but in contracts for stock it means a lunar month.

MONTH'S MIND is the name of an office in the Roman Catholic church, performed for a month for the dead.

MONUMENT, *mon'-u-ment* (Lat. *monumentum*), includes in its widest sense everything by which the memory of a person or event is perpetuated. The monuments of antiquity include the writings as well as the productions of the fine and useful arts of the ancients; for all these serve to illustrate the manners, customs, and institutions of the people; but the term is most generally understood of those productions of sculpture and architecture intended to transmit to posterity the memory of remarkable persons or events. In all ages, and among almost every people, we find the use of monuments, from the first rude attempts of art to its greatest perfection. The oldest monuments known to us are the obelisks and pyramids of Egypt; but no ancient country abounded with so many monuments as Greece, where they were erected in honour of victors in battle, in the Isthmian and Olympic games, and other distinguished persons. Among the Romans also monuments were common, and to them we are indebted for originating one species,—the triumphal arch. The Greeks and Romans were also wont to erect monuments to deceased persons, either over their ashes, or in some public place. The rude stone so used was by degrees converted into the noble pillar; and at length small buildings, in the form of temples, followed; whence we have our modern mausoleums. At first, among Christians, the usual device upon monuments for the dead was a figure of the cross. Afterwards, it became common to indicate by some sign the profession of him whose dust they honoured; as a crosier and mitre upon the tomb of a bishop, a sword and shield on that of a knight. By-and-by a human figure was added, recumbent, and arrayed in the dress of the deceased; so that from these venerable remains the antiquary gathers a knowledge of the costumes of the period. The lion or the serpent is frequently found at the foot of the recumbent figure; probably to symbolize the treading on the lion and dragon referred to in Scripture. It was also early the practice to introduce religious allegories of various kinds, indicating the victory of the cross over the devil. Angels were frequently introduced, supporting the dying figure, or conveying the soul into bliss.

MONUMENTAL BRASSES. (*See* BRASSES, MONUMENTAL.)

MOON, *moon* (Sax. *mona*), the satellite of the earth. Next to the sun, the moon is not only the most conspicuous, but the most interesting of the heavenly bodies. The mean distance of the moon from the earth is about 240,000 miles, which is a short distance when compared with the interval which separates us from any other globe. This distance also can be so largely diminished by the power of the telescope, that we know more of the side of the moon turned towards us than we do of the geography of any one hemisphere of our own globe. The diameter of the earth is 7,926 miles, while that of the moon is only 2,163 miles; consequently the hemisphere which we see is only equivalent to a fourteenth of the terrestrial hemisphere. The surface visible is indeed not more than twice the size of Europe, but on it there are unmistakable indications of vast cosmical forces. In density, the moon is little more than half that of the earth, and at its surface gravity is not more than one-sixth of our terrestrial gravity; if, therefore, explosive or upheaving forces exist there, and are independent of the size of the globe, we should expect to find disruptions on its surface much exceeding in comparative magnitude any of the disruptions that have occurred in the most rugged places of the earth. Again, the moon turns towards the earth always the same face: this is equivalent to the fact of her rotation in space round an axis in the same time that she performs her monthly revolution. Although disputes have arisen as to whether the term rotation ought to be applied to a phenomenon like this, they are merely verbal ones. The shape of the moon, like that of all the celestial bodies, is nearly spherical. It is scarcely possible to conceive a more remarkable contrast than that between the appearance of the moon to the naked eye and the forms she presents to the telescope, whether in quadrature or when she is full. Instead of a plain bright surface, we discover a body of most strange character, broken by irregularities, which in extent and form present few analogies with the mountainous regions of the earth. In one region may be seen vast mountains throwing their long shadows on a plain; while in others are various pits or caverns, as deep as Mont Blanc is high, often crowded together with the compactness of a honeycomb. Many careful maps of the moon's surface have been made at various times. The lunar plains were formerly considered seas; whether or not they were seas ages ago we cannot say, but it is certain that there is no water in them now; but it is impossible not to be struck with the similarity between their outlines and the general aspect of our terrestrial system of oceans. The lunar plains are also distinguished by great variety of colouring, giving the appearance of the formation of successive shores, probably by the gradual retirement of an ocean. The mountain forms in the moon are of three kinds.—First, a number of perfectly isolated peaks, or sugar-loaf mountains, unconnected with any group or range whatever. The finest instance of these is *Pico*, a very brilliant rock, about half as high as the loftiest of the Alps, which towers almost precipitously north of the crater *Plato*. Second, mountain-ranges or chains, which do not occur frequently: their usual position is that of a curvilineal but broken skirt of the greater flats or plains. Some of these masses attain a height of from eighteen to twenty thousand feet. Third, lunar craters. The objects thus called may be termed the characteristic feature of the moon's disturbed region. Not less than three-fifths of the moon's surface are studded with vast caverns, or rather circular pits, penetrating into its mass, and generally girded round at the top with a wall of rock, which is sometimes serrated and crowned by peaks. These pits vary in diameter from fifty or sixty miles to the smallest space visible, probably about five hundred feet. It would seem that on the moon's surface there is no atmosphere, or at least none dense enough to refract the rays of light. There is also, as stated before, no water on its surface, and consequently no animal similar to those which exist on the earth. There is no appearance of vegetation, or of the variations which accompany the seasons. The hemisphere which we can see is a vast rugged desert, desolate and void of life. Various

other phenomena connected with the moon will be found described under their various headings. (*See* ACCELERATION OF THE MOON, LUNAR ECLIPSE, LUNAR EVECTION, METONIC CYCLE, LIBRATION OF THE MOON.)

MOORS, *moors* (Lat. *Mauri*, Sp. *Moros*), is the name by which the Arab conquerors of Spain are known in Europe, on account of their having come from Mauritania, or Morocco. In the 7th century the Arabs conquered this latter country and converted the people to Mohammedanism. The conquerors and the conquered amalgamated together, and in 711 an army of this mixed population, under Arab leaders, crossed at the Straits of Gibraltar, and began the conquest of the Spanish peninsula. This they speedily effected, with the exception of the mountainous districts of Asturias and Galicia. When almost the whole of the rest of Europe was sunk in ignorance and barbarism, learning and the arts flourished among the Moors in Spain, where some remarkable monuments of their labours are still to be seen. About the middle of the 11th century, many of the local governors threw off their allegiance and established themselves as independent potentates. The wars that followed so weakened the power of the Moors, that the Christians rose against them under Alfonso "the Battler," and took Castile with its capital, Toledo. Their progress was for a time checked; but subsequently they continued to extend their conquests till the power of the Moors was restricted to the kingdom of Granada, and in 1238 the king of that territory became the vassal of Ferdinand III., king of Castile. At length, in 1491, Ferdinand V., king of Castile and Aragon, after a ten years' war, conquered this also, and put an end to the dominion of the Moors in Spain, after it had lasted nearly 800 years. A portion of the Moors then returned to Africa; but most of them remained in Spain, where they became peaceful and industrious subjects, and adopted generally the external forms of Christianity. Philip II., however, in his mad zeal for Christianity, resolved upon their entire destruction, and by his oppressions and cruelties drove them into insurrection, in Granada (1571), after the suppression of which, over 100,000 of them were banished. Their expulsion from the country was completed by Philip III.; and this has been regarded as one of the leading causes of the subsequent decline of Spain; for they were ingenious and industrious inhabitants, and, after their departure, agriculture, trade, and manufacture fell into decay. The term *Moor* is frequently used in a very loose sense, particularly by Spanish writers, denoting sometimes the Mohammedan inhabitants of Northern Africa, and sometimes even the whole Mohammedan or Moslem race. Even the Turks, who, in descent, language, and everything but religion, are foreign and alien to both Moors and Arabs, are sometimes spoken of as Moors.—*Inf.* Conde's *History of the Moors in Spain.*

MOOSE-DEER. (*See* ELK.)

MORA, *mo'-ra*, in Bot., a gen. of the nat. ord. *Leguminosæ*. *M. excelsa*, a large tree flourishing in Guiana, furnishes the mora-wood, which is now largely employed for shipbuilding.

MORACEÆ, *mor-ai'-se-e*, in Bot., a nat. ord. of *Dicotyledones*, sub-class *Monochlamydeæ*. Trees or shrubs with a milky juice. Leaves with large stipules. Flowers unisexual, in heads, spikes, or catkins; the male flower with a 3—4-partite calyx, or achlamydeous, and 3—4 perigynous stamens; the female flower with 3—4—5 sepals, and a superior 1—2-celled ovary. Fruit a sorosis (as the mulberry), or a synconus (as the fig). Seed solitary, pendulous; embryo hooked, in fleshy albumen; radicle superior. The order includes about 22 genera, and nearly 200 species. They are natives of both hemispheres, and are found in temperate and tropical climates. From the milky juice of some, caoutchouc is prepared. The fig-tree and mulberry-tree belong to the order. (*See* FICUS and MORUS.)

MORAL, *mor'-al* (Fr. *morale*, Lat. *moralis*), is relating to the actions or conduct of life, or that which determines an action to be good or virtuous; hence, moral philosophy is the science of duties, or what *ought to be* in human character and conduct. (*See* ETHICS.) A moral agent is one that is capable of those actions which can properly be denominated good or evil in a moral sense. Moral fitness is the agreement of the actions of any intelligent being with the nature, circumstances, and relation of things; and moral obligation is the necessity of doing or omitting any action in order to being happy and good. Moral sense is that whereby we perceive what is good, virtuous, and beautiful in actions, manners, or character; or it is a kind of satisfaction in the mind arising from the contemplation of those actions of rational agents which we call good or virtuous. A moral certainty is a very strong probability, and is used in contradistinction to a mathematical demonstration. A moral impossibility is a very great or almost insuperable difficulty, in opposition to a physical or natural impossibility. The moral of a fable is the doctrine or general duty inculcated by it.

MORALITIES, MIRACLE PLAYS, or MYSTERIES, *mo-răl'-i-teez*, are terms applied to the religious and allegorical plays which constituted the drama in the Middle Ages. Though, as generally used, the terms are synonymous, the Miracles, properly so called, were the earliest form, and represented either subjects of Scripture, or legends of the lives of saints. The Moralities appear later, and were allegorical representations of virtues or vices, so contrived as to make virtue always desirable and vice ridiculous and deformed. The Mysteries were usually more elaborate and lengthened performances, representing some of the sacred mysteries of Christianity, particularly in the life of Christ. The early fathers of the Church were much opposed to the drama; but, probably finding their efforts unsuccessful, about the 4th century, Apollinaris, bishop of Laodicea, and others, wrote plays adapted for the stage on some of the great events of Scripture. Nothing farther is known of them till about the 11th century, when Theophylact of Constantinople introduced certain Christian plays to attract the people from the pagan revels that were then common. These were not only composed by ecclesiastics, but were also acted by them, usually in churches and the chapels of monasteries. They were afterwards exhibited by trading companies, each guild sharing the expense, and undertaking a portion of the performance, and they were performed for the purpose of amusing the people on public occasions and festivals. The earliest of these mysteries belong to the 12th century: Chester and Coventry in England were particularly celebrated for the performance of them. "The Whitsun plays were acted at Chester, seven or eight on each day, during the Monday, Tuesday, and Wednesday of the Whitsuntide week, by the various crafts in the city, to each of whom a separate mystery was allotted. The drapers, for instance, exhibited the Fall of Lucifer; the water-carriers of the Dee reproduced the Deluge; the cooks had the Harrowing of Hell. The performers were carried from one station to another by means of a movable scaffold, a huge and ponderous machine mounted on wheels, gaily decorated with flags, and divided into two compartments, the upper of which formed the stage, and the lower, defended from vulgar curiosity by coarse canvas draperies, answered the purposes of the green-room. The performers began at the abbey gates, where they were witnessed by the dignitaries of the church; they then proceeded to the High Cross, where the mayor and civil magnates were assembled; and so on throughout the city, until this motley history of God and his dealings with man had been played out."—("Early English Life in the Drama," in *Edinburgh Essays.*) The Chester Mysteries have been published by Wright, and the Coventry Mysteries by Halliwell. The Townley Mysteries, so named from the family having possession of the MSS., and supposed to have been written and performed by the Augustinian friars of Woodkirk, have been published by the Surtees Society (London, 1836). In these mysteries they represented not only men, angels, and devils, but even the persons of the Trinity. Heaven, hell, the creation and consummation of all things, were vividly presented to the eyes of the spectators. According to Malone, the last mystery performed in England was that of Christ's Passion, in the reign of James I. They are still occasionally performed in some parts of the continent, particularly at Ober Ammergau, in Bavaria, where they are celebrated every ten years, in consequence, it is said, of a vow made by the inhabitants of that place

in 1633, on their deliverance from a plague which then prevailed in the district. This *Passions-Spiel* represents the entire history of Christ from his entry into Jerusalem to his appearance to Mary Magdalen after the resurrection.

**Morality**, *mo-räl'-e-te* (Fr. *moralité*), in general, denotes a conformity of our actions to the necessary relations of life. It is a studious conformity of our actions to the relations in which we stand to each other in civil society. Morality comprehends only a part of religion, but religion comprehends the whole of morality. The highest principle in morals is a just regard to the rights of men, the first principle of religion is love to God.

**Moravians.** (*See* Bohemian Brethren.)

**Morchella**, *mor-kel'-lä*, in Bot., the Morel, a gen. of *Fungi*. *M. esculenta*, the edible morel, is much prized by cooks as a flavouring agent. In England it is generally employed in a dry state, being thus imported from the continent. It is found in greatest abundance in places where trees have been burned, and in Germany the practice of burning down masses of forests for the sake of future morels once became so common that it was necessary to suppress it by law.

**Mordants**, *mor'-dants* (Fr.)—The use and action of mordants will be found explained under Calico-printing and Dyeing.

**Morel.** (*See* Morchella.)

**Morgana, Fata.** (*See* Fata Morgana.)

**Morganatic Marriage**, *mor-gan-ät'-ik* (from the Gothic word *morgjan*, to shorten, to limit), a marriage in which it is stipulated that the wife (who is interior in rank to her husband) and her children shall not enjoy the privileges of the rank nor inherit the possessions of her husband. In Germany, morganatic marriages are not uncommon among the sovereign princes and high nobility; they are, however, restricted to personages of these exalted classes. The late king of Prussia contracted an alliance of this kind with the princess of Liegnitz.

**Morgue**, La, *mörg, la* (Fr.), the name given to a place in Paris and other French towns, where the bodies of unknown persons who have perished by accident, murder, or suicide, are exposed, that they may be recognized and owned by their friends. The clothes in which the deceased are found are hung near the body. In Paris, each body is placed upon a slab of black marble, and the corpses may be publicly seen through a glazed partition. This spectacle, although one of the most disgusting in the world, is largely patronized by British visitors. If the bodies exposed at the morgue are not claimed after remaining three days, they are buried.

**Morinda**, *mor-in'-dä*, in Bot., a gen. of the nat. ord. *Cinchonaceæ*. The roots of *M. citrifolia* and *tinctoria* are used in India and other parts of Asia for dyeing red. They have been occasionally imported into this country under the names of *madder*, *munjeet*, and *chay-root*; but such names are improperly applied to these roots.

**Moringaceæ**, *mor-in-gat'-se-e*, in Bot., the *Moringa* or Ben-nut fam., a nat. ord. of *Dicotyledones*, subclass *Calycifloræ*. Trees with bi- or tri-pinnate leaves and deciduous coloured stipules. Flowers white, irregular; sepals and petals 5 of each; the former deciduous, petaloid, and furnished with a fleshy disk; æstivation imbricated. Stamens 8 or 10, placed on the disk lining the tube of the calyx, in 2 whorls, the outer of which is sometimes sterile; anthers 1-celled; ovary stalked, superior, 1-celled, with 3 parietal placentas. Fruit long, pod-shaped, capsular, 1-celled, 3-valved, with loculicidal dehiscence. Seeds numerous, without albumen. The order contains but one genus; viz., *Moringa*, which consists of four species, natives of India and Arabia. The root of *M. pterygosperma* resembles that of horseradish in taste and odour, and has been used as a stimulant and rubefacient. A kind of gum resembling tragacanth exudes from the bark when wounded. Its seeds are called ben-nuts in this country, *pois quénigues* in France. They yield a fixed oil (oil of Ben), which is sometimes used by painters, and also by perfumers and match-manufacturers.

**Mormons, or Latter-day Saints**, *mor'-mons*, are a sect of religious fanatics that has recently arisen, and gained over many converts. Its founder was one Joseph Smith, an American, born in Sharon, Windsor County, Vermont, 1805. (*See* Smith, Joseph, vol. I.) He was but poorly educated, and he and his family had the reputation of being bad characters among their neighbours. He affirmed that in 1823 an angel appeared unto him, informing him where certain ancient records were to be found. These were a collection of three gold plates engraven with "Reformed Egyptian" characters. He set to work to translate them, and produced the "Book of Mormon." The angel then carried off the plates, no one being allowed to see them but a few of his own disciples. Some of these afterwards quarrelled with Smith, and acknowledged the falseness of their testimony. On the other hand, it is asserted that a clergyman of the name of Spalding had written a religious tale a few years before, entitled "The Manuscript Found," the story corresponding to that of the Book of Mormon. After Spalding's death, the manuscript fell into the hands of one Sidney Rigdon, an intimate acquaintance of Smith. The Book of Mormon was succeeded by a "Book of Doctrine and Covenants," being a collection of the special revelations made to Smith and his associates upon all points connected with the course and welfare of the Church. This was continually enlarged as further revelations, consequent upon the varying fortunes and requirements of the body, were received. Among these was one by which the Aaronic priesthood was revived; another by which baptism by immersion was commended; a third for the institution of apostles; and others for the temporal regulation of the Church from time to time. In these productions the peculiar phraseology of Scripture is profusely imitated. At first, they were much persecuted and suffered gross ill-treatment at the hands of the mob, Smith himself being on one occasion tarred and feathered. In 1839 they took refuge in the state of Illinois, where they built the town of Nauvoo, or Beautiful. Here, in 1841, they commenced the erection of a splendid temple, which was to be more wonderful than that of Solomon. In June, 1844, however, in consequence of a riot in the town, Smith and his brother Hyrum were apprehended and lodged in Carthage prison; but the mob were so excited against them, that they broke into the prison and shot both of them. Brigham Young succeeded to the post of prophet, which he still retains. (*See* Young, Brigham, vol. I.) The hostility and riots being renewed against them from time to time, and finding themselves unable to cope with their antagonists, they at length quitted the state in 1846, resolved to seek a home beyond the Rocky Mountains, away from any settled habitation. After suffering immense hardships from cold and hunger and disease, and being obliged to spend a winter on the way, they reached the valley of the Great Salt Lake, where they established themselves. Here their object has been to strengthen themselves by inviting persons of their own faith from all parts to settle there. Agents were despatched to almost every portion of the globe to make converts and to facilitate their transmission to America. It is computed that at least 30,000 persons have left England for the Lake district. Since their settlement in Utah, various disputes have arisen between them and the United States authorities, and at length a military force was sent by president Buchanan to compel obedience. The approach of this force caused great excitement among the Mormons; but at length they agreed to submit to Federal authority, and, after remaining for a time, the troops, in May, 1860, left the territory. The number of Mormons in Utah is probably about 60,000; in other parts about 100,000. According to their own accounts, they believe in the three persons of the Godhead; that all mankind are in a state of sin in consequence of Adam's transgression; but that, in consequence of the sacrifice of Christ, they are free from the guilt of original sin, and only punishable for actual transgressions. In order to salvation, four things are necessary:—1. Belief in Christ's atonement; 2. remission of sins; 3. baptism by immersion for the remission of sins, administered by one authorized of Christ; and, 4. the laying on of hands for the gift of the Holy Ghost, to be administered only by duly-authorised apostles or elders. All who comply with these conditions obtain forgiveness of their sins, and are made partakers of the Holy Ghost,

enjoying the gifts of prophesy and healing, visions and revelations, and the power of working miracles. They believe in the literal gathering of Israel, and in the restoration of the ten tribes; that Zion will be established upon the western continent; that Christ will reign personally upon earth a thousand years; and that the earth will be renewed, and receive its paradisical glory. They profess to copy the primitive Church in having apostles, prophets, pastors, teachers, evangelists, &c. They further profess to "believe in being honest, true, chaste, temperate, benevolent, virtuous, and upright, and in doing good to all men;" but if the accounts of travellers and others are to be believed, these virtues have little place in their practice. Indeed, the grossest immoralities appear to be practised among them, and to have even the sanction of the church. Though polygamy is repeatedly denounced in the Book of Mormon, it is said that Smith's conduct was such as to excite the jealousy of his wife, and, to pacify her, he pretended to receive a revelation (12th July, 1843) authorizing the adoption of "spiritual wives." In 1852 the church openly avowed and defended the doctrine of polygamy; so that now many of them have four, five, or six wives; and according to one account, Young has as many as ninety.

MORPHIA, *mor'-fe-ä* (from Gr. *Morpheus*, the god of sleep), in Chem., the most important of the opium alkaloids (which *see*).

MORRIS, or MORRICE DANCE, *mor'-ris*, a peculiar kind of dance, supposed to have been originated by the Moors, in which bells were fastened to the feet of the performers. The great art consisted in so moving the feet as to produce something like concord from the tones of the bells. The English are said to have derived it from the Spaniards, who had previously received it from the Moors. Some writers say the morris dance was introduced into England by Edward III.; but few, if any, traces of it can be found before the time of Henry VIII. This dance is still continually practised in Spain under the name of *fandango*.

MORSE. (*See* SEAL.)

MORTALITY, BILLS OF. (*See* BILLS OF MORTALITY.)

MORTAR, *mor'-tär*, a variety of short cannon of a large bore, with chambers, employed to throw shells or carcasses at considerable elevations, so that the missile may range to a great distance, and fall vertically upon the object. Mortars were first used in sieges for throwing large balls of stone and of red-hot iron, before the invention of shells. In consequence of this, the calibre of a mortar in Germany is estimated by the weight of a stone ball, equal in bulk to the size of the bomb which it is intended to throw. In Russia and Denmark, the calibre of a mortar is estimated by the weight of an iron ball exactly fitting it; and in England and France by its diameter in inches. The calibres of mortars in the English service are 4⅕, 5⅘, 8, 10, and 13 inches. All these different kind of mortars are used on land; the two last being also employed in the navy. In the latter service, however, the pieces are about 16 inches longer than the land-service pieces of the same calibre; they are also much heavier,—the land-service 13-inch mortar weighs 36 cwt., and the sea-service 101 cwt. The interior parts of a mortar are the chamber, the bore, the mouth, and the vent. The chamber is the place where the charge of powder is lodged. The shape of the chamber varies, but it is generally conical, and more or less truncated. The use of mortars is considered to be older than that of cannon by some writers. Shells were thrown out of mortars at the siege of Wachtendouk, in 1588, by the count of Mansfeld. (*See* BOMB, GUN.)

MORTAR-VESSEL.—For a considerable period this term was applied to small vessels used in the navy, and armed with mortars for the purpose of bombarding. The increased use of shells in naval warfare, to be fired from ordinary guns, converts every vessel of war into a bomb-vessel; consequently, the term mortar-vessel will not long designate any particular kind of boat. In ordinary language, the term is applied, in the navy, to a few small craft of light draught of water. It is probable that the term mortar-vessel will merge into that of gunboat. (*See* GUNBOAT.)

MORTGAGE, *mor'-gij* (Fr. *mort*, dead, and *gage*, pledge; Lat. *vadium mortuum*), in Law, is the conveyance of an estate, real or personal, by a debtor to his creditor, as a pledge or security for a debt. The debtor is called the mortgagor, the creditor the mortgagee. The conveyance is absolute in form, but subject to a proviso by which it is to become void, or by which the pledge is to be reconveyed upon repayment to the grantee of the principal sum secured, with interest, on a certain fixed day. Upon the non-performance of this condition, the mortgagee's estate becomes absolute at law, but remains redeemable in equity during a limited period. (*See* LIMITATION.) In general, every description of property, and every kind of interest in it which is capable of absolute sale, may be the subject of a legal mortgage, or its equivalent in equity. A deed, if really intended only as a security for money, will be treated as a mortgage, although, in form, it purports to be an absolute conveyance or assignment. So long as the mortgagor remains in possession, the mortgagee's estate is not absolute. As to the rights of the mortgagee, he is entitled to enter into possession of the lands, and after notice to the tenants, to recover the rents and profits, unless there is some agreement to the contrary. He may grant leases, subject to the equity of redemption, and avoid by ejectment, without notice, any leases that may have been made by the mortgagor without his concurrence subsequently to his mortgage. He must, however, account for the rents which he receives, and pay an occupation rent for such parts as he may keep in his own possession. A mortgagee is not allowed to obtain any advantage out of the security beyond his principal and interest. Though the mortgagee, after the mortgagor's default in payment of the principal sum and interest, has the absolute legal estate, he is still considered in equity to hold only as a security for his debt. In order to obtain absolute possession of the estate, the mortgagee has to file a bill of foreclosure against the mortgagor, calling upon the latter to redeem his estate forthwith, by payment of the principal money, interest, and costs, and if he fail to do so within the time specified by the court (usually six months), he is for ever barred and foreclosed of his equity of redemption, and the mortgagee becomes owner in equity as he before was in law. (*See* FORECLOSURE.) In the event of a sale, the surplus, after deduction of the principal sum, interest, and expenses, must be accounted for and paid to the mortgagor, his heirs, executors, administrators, or assigns. The above general remarks apply principally to mortgages of land; the entire subject is vast and intricate, so that here we can do nothing more than refer for further particulars to special treatises on the subject, as those of Coote or Fisher.

MORTICE, *mor'-tis* (Fr. *mortoise*), a term applied in joinery to an excavation made within the surface of a piece of timber, to receive a projection made in another piece of timber, and called a tenon: when the tenon is placed in the mortice, the two pieces of timber will consequently be firmly united together. The sides of the mortice are generally four planes at right angles to each other, and also to the surface in which the excavation is made. (*See* JOINERY and CARPENTRY.)

MORTIER, *mor'-te-ä* (Fr.), was a cap of state anciently worn by the kings of France, and afterwards by the presidents of parliament in Paris. It resembled that at present worn by the presidents of the courts of justice.

MORTIFICATION, *mor-tif-e-kai'-shun* (Lat. *mors*, death, and *fucio*, I make), in Med., is the death of any tissue. (*See* GANGRENE.) In Scots law it is used in the same sense as mortmain. (*See* next article.)

MORTMAIN, *mort-main'* (Fr. *mort*, dead, and *main*, hand; Lat. *mortua manus*), in Law, is an alienation of lands and tenements to any guild, corporation, or fraternity, and their successors. Under the system of feudal tenures, the lords of estates enjoyed certain privileges on the death or change of their vassals. But it being a distinctive quality of a corporation that it never dies, lands held by such bodies produced none of these feudal fruits, but, in the language of Lord Coke, "were said to come to dead hands as to the lords." Soon after the Conquest, ecclesiastical corporations came to acquire landed property so largely as to perceptibly curtail the lords of the fruits of their seigniories, and diminish the feudal services ordained for the defence of the realm. To remedy this evil,

legal enactments began to be issued against it, the earliest of which is contained in the Magna Charta, which declares "that it shall not be lawful for any to give his lands to any religious house, and to take the same land again to hold of the same house, &c., upon pain that the gift shall be void, and the land shall accrue to the lord of the fee." The ecclesiastics having found means to evade this statute, 7 Edward I., commonly called the Statute of Mortmain, or *De Religiosis*, was passed, providing that "no persons, religious or otherwise whatsoever, should buy or sell any lands or tenements, or, under the colour of any gift or lease, or any other title whatsoever, receive the same, or by any other craft, shall appropriate lands in any wise to come into mortmain, on pain of forfeiture; and within a year after the alienation the lord of the fee may enter." They found out a way also to evade this statute, and the 13th of Edward I. was passed; and afterwards the 15th of Richard II. c. 5, declared that no feoffment, &c., of any lands and tenements, advowsons, or other possessions, to the use of any spiritual persons, or whereof they shall take the profits, shall be made without license of the king, and of the lords, &c., upon pain of forfeiture. For the augmentation of small livings, it was enacted by 17 Car. II. c. 3, that all benefices under a certain amount per annum may be augmented by the purchase of lands without license of mortmain in either case; and the like provision has since been made in favour of the governors of Queen Anne's bounty. And by the statute 43 Geo. III. c. 137, any real or personal property may be given by deed enrolled, or by will, for the augmentation of this bounty, notwithstanding the statutes of mortmain. The British Museum, the universities of Oxford and Cambridge, and various other public bodies, have been exempted from the statutes of mortmain by various acts of parliament. The history of mortmain is intimately connected with the ecclesiastical and civil history of this country.

MORTUARY, *mor'-tu-a-re* (Lat. *mortuarium*), in Eccl. Law, is a gift left by a man at his death to his parish church, for the recompense of his personal tithes and offerings, not duly paid in his lifetime. A mortuary is not properly and originally due to an ecclesiastical incumbent from any but those of his own parish to whom he ministers spiritual instruction, and has a right to their tithes; but, by custom, they are sometimes paid to the parsons of other parishes, when the corpse passes through them. Selden says that it was anciently the usage to bring the mortuary along with the corpse when it came to be buried, and to offer it to the church, as a satisfaction for the supposed negligence and omissions of the deceased in not paying his personal tithes; and from hence it was called a corse present. Mortuaries are not due by law, but by custom. The uncertainty that prevailed regarding mortuaries giving rise to frequent disputes, they were by 21 Hen. VIII. c. 6, commuted into money payments as follows: where the defunct left movable goods to the value of ten merks and under £30, clearly above his debts, he paid a mortuary of 3*s.* 4*d.*; above the value of £30 and under £40, 6*s.* 8*d.*; above £40, then 10*s.*

MORUS, *mor'-us* (Gr. *moron*, a mulberry), in Bot., the Mulberry, the typical gen. of the nat. ord. *Moraceæ*. The fruit of *M. nigra* is our common mulberry. The leaves of this species, as well as those of *Morus alba*, white mulberry, and of others, are in common use as the staple food of silkworms. *M. nigra* is supposed to be identical with the sycamine tree of the Bible.

MOSAIC GOLD. (*See* AURUM MUSIVUM.)

MOSAIC WORK, *mo-zai'-ik* (Fr. *mosaique*), is a species of inlaid work, by which a design is produced by joining together small surfaces of variously-coloured substances. Work of this kind is of great antiquity, and it is believed to have had its origin in Asia. In the book of Esther, mention is made of a "pavement of red and blue, and white and black marble," in the court of the garden of King Ahasuerus; this was without doubt a pavement of mosaic work. In Greece, during the time of Alexander, mosaic pavements made with variously-coloured marble were amongst the sumptuous decorations of the period. These were for the most part geometric in design; but Pliny mentions a celebrated work of Sosos of Pergamos,—the "Unswept Hall;" this was a pavement of inlaid work, representing the crumbs and fragments left on the floor after a banquet. The art was carried from Greece by workman to Rome, where it was called *opus musivum*, and acquired universal popularity, and soon came to be applied not only to floors but also to walls and ceilings. In Italy, and in most of the countries occupied by the Romans, many floors ornamented with mosaic work have been found amongst old ruins. They consist generally of a centre piece, frequently of human beings or animals, with a border or frame of a regular pattern. The different parts of which the mosaic is formed consist of cubes of different-coloured stones, or earthenware, cemented together. Some exquisite specimens of this kind of mosaic work have been found at Pompeii. One of the finest examples found is supposed to represent the battle of Issus, and was found in 1831 in the Casa del Fauno. In the 5th century, when the arts and sciences were driven from Italy, the art of mosaic work was preserved by the Byzantine Greeks, and was restored to Greece in the 13th century. It attained its highest perfection at the beginning of the 17th century, when Clement VIII. had the whole of the interior of the dome of St. Peter's ornamented with mosaic work. Giambattista Calandr[illegible] improved mosaic by the introduction of a new cem[illegible] He and other artists who followed after him employed the art for copying original paintings by celebrated artists. One of the great advantages of this kind of work is its wonderful power of preservation, by which many of these paintings are represented in all their original freshness and beauty. Guercino's Martyrdom of St. Petronilla, and Domenichino's Communion of the dying St. Jerome were thus preserved. A school for mosaic was founded at the beginning of the 18th century in Rome, by Peter Paul of Christopheris, and many of his pupils carried the art to a high degree of excellence. In modern times, two kinds of mosaic are particularly famous,—the Roman and the Florentine. In Roman mosaic, the pictures are formed by joining very small pieces of stone, which gives greater variety, and facilitates the representation of large paintings. In the Florentine style, the mosaic is made of large pieces of stone, and is consequently more troublesome, and only adapted for small paintings. The Italians call mosaic work in wood *tansia* or *tarsia*; the French, *marqueterie*. (*See* MARQUETRY.) In the most costly mosaics, precious stones have been cut to furnish materials; but in common works of this art, enamels of different colours, manufactured for the purpose, are the materials employed.—*Ref.* Merrifield's *Ancient Practice of Painting*; M. D. Wyatt's *Specimens of the Geometrical Mosaic of the Middle Ages*; and Donaldson's *Pompeii*.

MOSLEM. (*See* MOHAMMEDANISM.)

MOSQUE, *mosk* (Arab. *mesjid*, place of prayer), is the term applied to a Mohammedan temple or place of worship. They are generally distinguished externally by cupolas and minarets, but internally they are little remarkable, forming merely a single hall or apartment, with numerous lamps, the floor covered with carpets, and the walls with arabesques and mosaics. The principal Arabian and Syrian mosques are remarkable for their vast quadrangles, surrounded with numerous columns. The revenues of the mosques are often considerable, and connected with them are usually institutions for education, hospitals for the sick, asylums for the poor, &c. The principal mosque of Constantinople was originally the Christian church of St. Sophia, built by the emperor Justinian in the 6th century; but it is surpassed in beauty and taste by that of Solyman the Magnificent, begun in 1550. The mosque of the prophet at Medina, the great mosque at Mecca, and the mosque of Omar at Jerusalem, are considered peculiarly holy, and are among the finest extant specimens of Moslem architecture.

MOSQUITO, *mos-ke'-to*, a troublesome little insect, resembling the gnat, and belonging to the family *Culicidæ*: it is a native of the West Indies, the American continent, South Africa, and India. The common mosquito (*Culex Mosquito*) is about the same size as the gnat, and possesses a snoker, with five sharp-pointed needle-like organs, with which it pierces the skin and sucks the blood. The mosquito seldom appears in the daytime; but at night, in the tropics,

when the unhappy traveller endeavours to sleep, the tantalising little insect generally succeeds in banishing all idea of repose, both by its power of suction as well as the continuous buzzing sound made by its wings.

MOSSES. (*See* MUSCI.)

MOSS TROOPERS were the warlike plunderers who inhabited the borders of England and Scotland, and are said to have been so called from living in the mosses or morasses, and riding in troops together. After the union of the two crowns they gradually disappeared. (*See* BORDER, THE.)

MOTES, or GEMOTES, *mōtes*, among the Anglo-Saxons, were certain public courts or assemblies for legislative or municipal purposes, of which there were various kinds; as wittenagemote, folkmote, burgemote, &c. Hence comes the word *mote* or *moot*, signifying to plead. Moteer was applied to a customary service, or payment, at the mote or court of the lord.

MOTET, *mo-tet'* (Fr.).—The Latin psalms and hymns sung in the Romish church are so called. The term was formerly applied to certain elaborate vocal compositions in several parts, generally on sacred subjects; in fact, any sacred composition which does not come under the denomination of *mass* or *anthem* may be called a motet.

MOTH, *moth* (Sax. *mogthe*), an insect belonging to the family *Lepidoptera*, which includes all diurnal and nocturnal moths and butterflies. Moths are seldom seen except in the evening and at night. As the scientific description of these insects will be found fully given under the articles INSECT-TRANSFORMATIONS and LEPIDOPTERA, it need not be here touched on; a few general remarks being more in keeping. The moths are well known for their habit of destroying clothing and furs, in which they can hardly be stopped, no matter what remedies are adopted; particularly in tropical climates. The *Tinea sarcitella* attacks woollen clothes; the *Tinea pellionella* furs; the *Tinea flavi-frontella* damages collections of natural history, while the *Tinea granella* commits great havoc amongst corn and grain. The damages caused to clothes are, however, chiefly owing to the caterpillar, which begins to form a nest as soon as it has left the egg. In order to effect its object, it first spins a thin coating of silk round its body; it then cuts filaments of thread or cloth from the garment on which it has located itself, and applies the pieces to the outside of its case, which it never leaves until it has developed itself into a small nocturnal moth, of a silvery grey colour. Turpentine, camphor, and tobacco, will generally keep off these troublesome intruders. (*See* LEPIDOPTERA, APPLE-MOTH, TIGER-MOTH, EMPEROR-MOTH, DEATH'S-HEAD HAWK-MOTH, &c.)

MOTHER-OF-PEARL, *muth'-er*, the hard, lustrous, brilliant internal layer of shells, especially oyster shells, and more particularly the pearl oyster. In English oysters, this substance is too thin to be workable for manufacturing purposes; but the oysters of the Eastern seas yield it of considerable thickness. The brilliant hues of mother-of-pearl do not depend on the nature of the substance, but on an exquisitely fine series of furrows upon the surface, which produce this chromatic effect, according to the angle at which the light is reflected. In working this delicate substance great care is required; but it may be cut by saws, files, and drills, with the aid of sulphuric or muriatic acid. It is polished by colcothar, or the brown-red oxide of iron, left after the distillation of the acid from sulphate of iron. In all ornamental manufactures, where pearl is said to be used for flat surfaces, such as inlaying, mosaic-work, &c., it is not real pearl, but mother-of-pearl that is employed. Very large quantities are consumed in the manufacturing establishments of Birmingham and Sheffield. An instance has occurred of a ship arriving at London from Panama with more than two million pearl shells.

MOTION IN COURT, in Law, is an occasional application to the court by the parties or their counsel, in order to obtain some rule or order of court, which becomes necessary in the progress of a cause. Motions are either of a civil or criminal nature; the latter for an attachment, a misbehaviour, &c. A motion is in general accompanied by an affidavit, and is usually preceded by a notice to the opposite party.





MOTION, LAWS OF, *mō'-shon* (Lat. *motio*), those laws which direct and control the continued successive change of place of various bodies; in other words, their motion. The first law of motion may be thus described. A body always remains in a state of rest, or of uniform motion in a straight line, until it is made to change its state on account of the motion upon it by some external force.—2. This change of motion is proportional in an exact ratio to the force impressed, and is produced in the same straight line in which the opposing force acts.—3. Action, and consequently reaction, are always to be estimated in the same right line, and are equal in opposite directions. According to Dr. Arnott, in his work entitled the "Elements of Physic," all motion is really considered, with regard to itself, absolute, or the change of absolute space; for, motion once begun would be continued for ever, were it not for the interruption of external causes, the power of gravitation, and many other circumstances which affect it relatively and apparently. *Equable motion* may be briefly stated to be the effects of a single stroke or impetus given to a body; as the momentum imparted to a ball discharged from the mouth of a cannon by the charge of gunpowder. (*See* GUNNERY.) *Accelerated motion* is produced by a constant application of power or impulse to the body which had been in a state of rest. (*See* GRAVITATION.) To sum up our remarks, force is not required for the maintenance of motion, but only for its change, that is, for producing, in the first place, a change of state from rest to motion, or from motion to rest; secondly, a change in the velocity of motion, either by accelerating or retarding it; or thirdly, a change in its direction, by deflecting it upwards or downwards, to the right or to the left. Not only such bodies as are at rest, but also such as are performing uniform rectilinear motion, may thus be regarded as being in a state of equilibrium (*see* FORCES); for it is only while their velocity or direction is changing, that is, while they are being accelerated, retarded, or moving in a curve, that the forces acting on them can be unbalanced, or can produce a resultant pressure; and as long as this pressure remains unbalanced, the motion will continue changing in velocity, in direction, or in both; because, whenever it becomes straight and uniform, the resultant of all the forces acting on the body will be equivalent to *nil*, or, in other words, the body will not be subject to any unbalancing force. The dynamical effect of force being then a change of motion, a continued force must produce a continuous change, whether in velocity or direction. The simpler effect of a sudden change of velocity, or an angular deflection, can be only produced by an instantaneous exertion of force, or an impact, as it is termed. (*See* IMPACT.) In an article in the "English Cyclopædia," it is well stated that, "among the many absurdities which have arisen out of a misapprehension of the laws of motion, is the attempt to discover what is called a *perpetual motion*, or a machine which of itself would never stop. The earth and planets are such machines in their rotations on their axes, and we have seen that any particle of matter, unacted on by any other matter, and once in motion, is a perpetual motion. If a wheel attached to an axle could be deprived of friction at the pivots, and inclosed in a permanently air-tight and perfectly exhausted receiver, it would also, when once in motion, be a perpetual motion. But as long as any friction or resistance, however small, is perpetually retarding the motion, it is obvious that the velocity, if maintained, must be indebted to some external supply of moving power. To take the case of friction, which arises from the roughness of the supports, and which, independently of *adhesion*, may be considered as a rapid succession of very small jolts, by which the roughnesses of the one surface strike upon those of the other, and communicate a portion of momentum to the frame and finally to the earth; to suppose that a wheel, as above described, could go on for ever with friction would be to suppose that there could be action without reaction. In fact, a perpetual motion, such as is intended to be made by the speculators on the subject, is nothing less than a machine which will work for ever without new moving power; it being not one bit less absurd to suppose that it would perpetually overcome friction and atmospheric resistance, than

that it would continue to supply the impetus necessary to carry on the sawing of a plank or the weaving of lace." The ancient philosophers had many peculiar and erroneous impressions with regard to the laws of motion, but their original ideas seemed to be the guiding points in the investigations of the moderns. Galileo modelled some of the first theories, but we are indebted to Sir Isaac Newton for the first real investigation of the laws of motion.—*Ref.* Tomlinson's *Cyclopædia of the Useful Arts and Manufactures; English Cyclopædia*—Arts and Sciences.

Motive Power, *mo'-tiv* (Fr. *motif*), a term applied in Mech. to the whole power or force acting on a body, or any quantity of matter, so as to produce motion. (*See* Motion, Laws of.)

Motto, *mot'-to* (Ital.), an Italian term, used to signify a word or sentence added to a device, and commonly used when put on a scroll, as an external ornament of coat armour. The use of mottoes for this purpose is very ancient, and when appended to a coat of arms, a motto is frequently hereditary in a family. Strictly, the motto should bear an allusion to something in the achievement; but in modern times the taking of it entirely depends upon the pleasure of the bearer, and it may be changed at will. The term motto is also applied to a sentence or quotation prefixed to anything written or published.

Mouflon, *mu'-flon*.—This member of the sheep family belongs to Corsica and Sardinia, and is known generally by the designation *Ovis musmon*. It inhabits mountainous regions. The head is long, with the muzzle compressed, and the nose somewhat raised; the horns of the males are large and long, and triangular, bending with an arch, which constitutes more than half a circle; the ears are moderately large, and are erect and acute; the general tint of the body is



MOUFFLON.

yellow, tending to a chestnut or ash-colour, which is deepest on the neck and lighter on several parts of the back and under-surface of the body. The moufflon is provided with long hair, besides wool, and it is to this hair that the gradations of colour are due. The female is distinguished from the male by the absence of horns, as may be seen by the specimen in the foreground of the cut. The mouflons are very gregarious, going about in herds composed of more than a hundred, which herds are generally placed under the leadership of some old and courageous male. As they have few enemies but men, they multiply considerably, and populate the mountains of the islands of Corsica and Sardinia, where they are principally found.

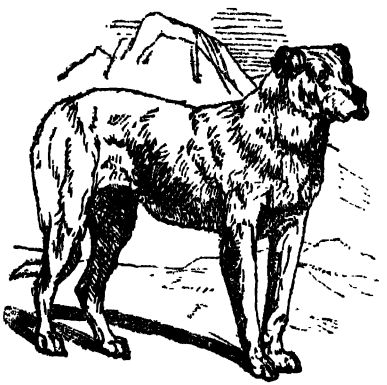
Mountain, *mown'-tain* (from Lat. *mons*, a mountain), a name given to those great elevations above the earth's surface which extend in various degrees over the whole globe. Any mountain of small dimensions is termed a *hill*, especially when it rises above the plain by almost insensible degrees. There are various parts in a mountain, which it is as well to observe; for we have the *base*, the *sides* or *declivities*, and the *top* or *summit*. When the summit of a mountain is detached, so to speak, from the general mass, by assuming all at once a very steep ascent, it is called a *peak*; such as the *Pic-du-Midi* in the Pyrenees, the *Pic Blanc* in the Alps, near Mount Rosa, and the peak of Teyda in the island of Teneriffe. Every flat summit is termed a *plateau*, while a rounded one is called a *drove* or hummock. The intervening space between two chains of mountains is termed a *valley*; and this is said to be of the first class when it serves as the basin of a large river. The lateral subdivisions which mountain-chains frequently exhibit, and which form smaller valleys leading into the principal one, bear the name of branches. An offset is a series of smaller mountains which detach themselves from the principal chain, receding from it in a direction almost parallel. If this offset be of small extent, it is termed a spur, while the name of crest is applied to the upper ridge, whether of a branch, an offset, or a spur. If we regard the declivity of a mountain as a plane surface joining the top and bottom, it is easy to determine its inclination with respect to the horizon. This inclination is the more or less acute angle made by the horizontal plane drawn through the foot of the mountain with the plane which we have just defined. The inclination of the northern declivity of the Pyrenees is from 3° to 4°; that of the southern declivity of the greater Alps is only 3½°. Notwithstanding this circumstance, it is necessary, even in following the ridge of a branch, to mount much steeper slopes. Even a slope between 7° and 8° is very considerable, in fact, it is almost the maximum for vehicles. In France, the regulations are that the great roads shall never exceed an inclination of 4° 46'. An inclination of 15° can hardly be overcome by animals encumbered with a load, while man himself cannot climb a slope of 35° if the ground be composed of rock, or is too hard to allow steps being formed in it. The sea-coasts are generally the lowest part of a country that rises gradually, and, consequently, the centre of a continent contains the loftiest mountains. The chief, or principal chains, are connected nearly all over the globe. The Ural mountains, for instance, that separate Asia from Europe, nearly extend to the boundary between Norway and Sweden, formed by the Scandinavian mountains. Another chain stretches from the northern part of India to Thibet and Cashmere, where it forms the highest regions, not only of Central Asia but of the known world, running westward through Persia and eastward through China. The most elevated countries in Europe are Switzerland and Savoy, whose Alps are connected with the neighbouring chains of Germany, France, and Italy. Countries covered with high mountains possess, in the summer, different climates at different elevations within a very narrow compass; and thus we may ascend, in Europe, from fruitful valleys teeming with vegetation, to pastures covered with odoriferous alpine plants, and near the declivities with evergreens, the vegetation gradually decreasing towards the summit until we arrive at a region of perpetual ice and snow. The air on mountains is purer than on table-lands, but it is only healthier at moderate heights.

Mountain Dew is a name not unfrequently applied to Scotch whiskey, because, formerly, much of it was made in the remote parts of the Highlands to evade the duty; and this being reckoned the best, was called mountain dew.

Mountain, The (Fr. *La Montagne*), a name applied, during the French revolution, to a party in the Convention which occupied the highest benches on the left, and was composed of the most ultra of the revolutionists and the leaders of the Jacobins and Cordeliers. It hence came to denote any association of persons of similar principles.

Mount St. Bernard Dog, *mownt-saint-ber'-nard*, termed the Alpine spaniel in the arrangement of Cuvier, presents the characters of a breed between the Newfoundland dog and mastiff, and is well known from the fact of its being employed by the charitable houses of monks in the Alps to rescue travellers who have been buried in the snow, or have lost their way amongst the mountainous regions around them. The Mount St. Bernard dogs are characterised as possessing nearly a larger amount of sagacity, approaching to reason, than

any of the varieties of the canine race. Although the unfortunate traveller whom they go out to rescue may lie fifteen or twenty feet beneath the snow, yet these animals at once take up the scent, and scratch away at the snow, all the time continuing a hoarse bark, which can be heard more than a mile distant, and which brings the monks to the rescue. In an anecdote related in the "Library of Entertaining Information," it is mentioned that one of the Mount St. Bernard dogs was decorated with a medal for having saved the



MOUNT ST. BERNARD DOG.

lives of twenty-two persons. This dog died in the year 1816, in a vain attempt to convey a poor traveller to the convent; but his memory is still kept up in the recollection of the Alpine guides, who have never forgotten his faithful services. The present cut illustrates what is termed the *Great Mount St. Bernard Dog*; but there is another variety which performs nearly as useful services, and which is more strictly allied to the Molossian breed,—it is termed the smooth Alpine spaniel. (*See* DOG.)

MOURNING, *mor'-ning* (Ang.-Sax.), is an outward manifestation of grief, more particularly on occasions of death. Every nation has some conventional form of mourning. The ancient Hebrews rent their garments, tore their hair, smote their breasts, threw ashes on the head, abstained from washing, sat on the ground, and went bareheaded and barefooted. The usual period of mourning was seven days, but for Moses and Aaron they mourned a month. The Greeks withdrew into privacy, cut off their hair, put on black, or in some parts, as in Argos, white garments, rolled themselves on the ground, threw ashes on their heads, tore their clothes, and never appeared in public without a veil. The Roman forms of mourning did not differ greatly from the Grecian. Hired mourning women were employed at funerals, both by Greeks and Romans. In Europe, the ordinary colour for mourning is black; in China and Japan it is white; in Turkey, blue or violet; in Egypt, yellow; in Ethiopia, brown. The time varies in different countries, and according to the degree of relationship, from a week to a year. Hired mourners appear as attendants at funerals in England, but their office is one of mere show, and they are commonly called mutes; but in some parts of Ireland the hired mourners, generally old women, are famous for their extravagant lamentations. Court mourning in Europe for members of the reigning family, even in remote degrees, is prescribed by ceremonials, which give the minutest directions as to dress.

MOUSE. (*See* MICE.)

MOUTH, *mouth* (Sax. *muth*), the aperture in the head of an animal by which he utters his voice and receives his food. In a more general sense, the mouth consists of the lips, the gums, the insides of the cheeks, the palate, the salival glands, the uvula, and tonsils.

MOVABLE FEAST. (*See* FEAST, or FESTIVAL.)

MOVABLES, *mo'-vā-blz* (from Lat. *moveo*, I convey, or draw from one place to another), are goods which are capable of being removed from one place to another. Movable goods or effects are ready money, merchandises, bonds, book debts, cattle, and household furniture not fastened with iron or nail, nor sealed in the plaster, but which may be transported without either fraction or deterioration.

MOVEMENT, *muve'-ment* (Fr. *mouvement*).—Most musical compositions are divided into several parts, which generally differ from each other in time and key. Each of these divisions is called a movement. For instance, symphonies are as a rule divided into six movements; viz., an *introductory slow movement*, a *quick movement*, an *andante*, a *minuet*, a *trio*, and another *quick movement*. In short, every piece of music consists of as many movements as it contains positive changes of time or measure.

MOVEMENT, in Mil., is applied to any regular or preconcerted change of position for some particular object.

MOVEMENT, in clock or watch-making, is a term applied to the train of wheel-work.

MOXA, *mok'-sā*, a name given to a soft woolly substance made in Japan from the leaves of the *Artemisia chinensis*, or Chinese mugworts. It is used as a cautery by placing a small cone of it on the skin and then setting fire to it. On burning down to the part on which it rests, it makes a sore, which is kept open if requisite. It is principally used in cases of gout or rheumatism.

MUCILAGE, *mu'-sil-āj* (Fr.), a term in Chem. applied to a substance which water heated to 160° or 180° extracts from certain seeds or roots when they are infused in it, and then subjected to pressure in a linen strainer: when the liquor is evaporated, the residue resembles gum. When bruised linseed is thus treated, it yields a mucilaginous solution, which is precipitated by acetate and sub-acetate of lead, by chloride of tin, and by alcohol. Quince-seed furnishes a similar solution. The mucilage appears to reside in the husk or outer coating of the quince-seed; it is used by ladies under the name of *fixature*, to retain the hair in curl.

MUCK, RUNNING A, is an expression derived from the Javan word *amok* or *amuk*, to kill, and is applied to that peculiar frenzy that sometimes seizes upon individuals in certain parts of the East, in consequence, it is said, of over-indulgence in opium. They suddenly rush into the street with a drawn weapon, and kill every one that comes in the way, till either themselves are killed or taken prisoners.

MUCOR, *mu'-kor* (Lat., mouldiness), in Bot., one of the genera of *Fungi* which form the various kinds of *mould* on bread, cheese, preserves, paper, &c.

MUCOUS MEMBRANE, *mu'-kus* (Lat.), in Anat., is the membranous substance which lines all those internal passages and cavities of the body which are exposed to contact with the air, or by which foreign substances are taken into the body or eliminated from it. These membranes are soft, velvety, and extremely vascular. They are distinguished as lining the digestive, respiratory, and genito-urinary passages. In each of these parts they present some slight modifications, adapted for special functions.

MUCUNA, *mu-ku'-nā* (*Mukuna guaco* is the Brazilian name of one species), in Bot., a gen. of papilionaceous *Leguminosæ*. The hairs covering the legumes of the species *M. pruriens* and *prurita* are used as a mechanical anthelmintic, under the name of *cowhage* or *cow-itch*. The pods, being dipped into treacle or honey, have the hairs scraped off, until the mass has the consistency of an electuary.

MUCUS (Lat.), in Anat., is a thick viscid substance, secreted by the various mucous surfaces of the body. All secretions poured upon mucous membranes are more or less mingled with mucus, as the saliva, urine, &c. Its principal office is to protect the mucous surfaces from injury by the contact of foreign substances, and to lubricate the several passages. In certain parts it has special functions; as that of the nose, which is favourable to smell; that of the stomach and intestines, aiding digestion. Its properties are variously altered by disease; becoming acid, mixed with pus, or otherwise changed.

MUDAR BARK. (*See* CALOTROPIS.)

MUEZZIN, *mu-ez'-zin*, in Mohammedan countries, is

an officer of the mosque, whose duty it is to call the faithful to prayer five times a day, as prescribed by the Koran He commonly stands on a balcony of the minaret chanting in a loud voice, that "prayer is better than sleep (or than food), come to prayer" As, from his elevation, he can overlook the roofs and the interior of the dwellings, this office is said to be usually conferred on blind men, and stories are told of persons who have feigned to be blind in order to obtain the appointment

MUFTI, *muf' te*, is a name given to the head doctors of the law of the Koran, in Turkey, of which there is one in every large town He is of great authority in the empire, being, as interpreter of the law, consulted on judicial proceedings particularly in criminal cases, and in general on all affairs of importance The grand mufti at Constantinople, called "Sheikh ul Islam, chief of Islam, is the head of the Turkish church, and takes rank immediately after the grand vizier He is the chief interpreter of the law, and formerly no person could be put to death without his consent but of late years, by the reorganization of the Turkish government, the power and prerogatives of the grand mufti have been much curtailed

MUGGLETONIANS *mug gl to'-ne anz*, a sect of religious fanatics founded by one Ludovic Muggleton a tailor (1608—1698), who, in conjunction with one Reeves (a person of equal obscurity), declared themselves to be the "two last witnesses" mentioned in the Apocalypse, having the power of prophecy and to bless or condemn whom they pleased They commenced by denouncing all other religious sects, especially the Ranters and Quakers, and in 1656 published an exposition of their views, under the title of 'The Divine Looking-Glass" Among other absurdities, they propounded that God had the body of a man that there were not three distinct persons in the Trinity and that God, when he came down to earth to suffer, left Elias as his representative in heaven William Penn attacked them in a book entitled 'The New Witnesses proved Old Heretics,' 1672 Muggleton was arraigned at the Old Bailey for blasphemy in 1676 A complete edition of his works was published in 1764, and another as late as 1832, in 3 vols 4to, containing also works by Reeves and others of the sect

MULATTO *mu lät' to* (Sp *mulato*, from *mulo*, a mule), is commonly applied to the offspring of parents one of whom is black, the other white The mulatto is of a yellowish colour, with frizzled or woolly hair, and usually exhibits more resemblance to the white than the black race In the United States, the West Indies, and Spanish and Portuguese America, mulattoes are numerous

MULBERRY (*See* MORUS)

MULE, *mule* (Sp and Ital *mulo*), an animal which is a hybrid between the horse and the ass It has a large clumsy head, erect ears, a short stiff mane, and a thin tail Those mules which are produced by a male ass and a mare are by far the best, and they are highly valued in Spain, Portugal, Italy, in the East and in Spanish America, where their sure footedness and general adaptability for carrying large burdens, make them of great utility in crossing mountains, &c The Roman ladies of old used to have their coaches drawn by mules and in the present day they are used for the same purpose in Spain, which latter country produces by far the best breed, although those from Savoy are larger Mules are much hardier than the horse, are cheaper to keep, have fewer diseases, and will live and work twice as long

MULLEIN (*See* VERBASCUM)

MULLET, *mul' let* (Fr *mulet*) —The common mullet, or grey mullet (*Mugil capito* of Cuvier), is the type of a family of acanthopterygious fishes, termed *Mugilidæ*, to which it necessarily belongs Its generic characters are as follows —Body nearly cylindrical, covered with large scales, two dorsal fins, widely separated, the rays of the first fin being spinous, and those of the second flexible, ventral fins behind the pectorals the middle of the under jaw with an elevated angular point, and a corresponding groove to receive it in the upper, the teeth small, the head depressed, and the branchiostegous rays six in number The colour of the back and top of the head is a dusky grey, tinged with blue; the sides and under-surface of the body silvery white, marked with longitudinal parallel dark lines, the membranes of the fins dull white, cheeks silvery white, and the irides reddish brown The grey mullet seldom proceeds to any distance from land, as it delights in shallow water, and often proceeds to some distance up the mouths of rivers It is found in large numbers in Cornwall and Devonshire, and, in fact, along the whole line of our south coast That the grey mullet was well known to the ancients, the historian Pliny bears ample testimony, as he has celebrated the great fisheries of this one species which the Romans possessed at Languedoc The mullets prey generally on food in a state of decomposition, and reject live prey



GREY MULLET

ides the common mullet, there are several other arieties, as specified in Baron Cuvier's "Regne Animal" There is the *thick-lapped grey mullet*, which differs only from the specimen last described by the lip being thicker, and the colour of the head and back being more of a greenish hue The *plaice d mullet*, found in the Mediterranean and the seas and rivers of America, Africa, and even India, and the *striped red mullet*, which is also found distributed as above, may be enumerated among the mullets, but they belong more properly to the family *Percidæ* These are smaller in size than the grey mullet, and, although some specimens have been caught, are not often seen on our coasts

MULTIPLE, *mul' te pl* (Lat *multiplex*) —The multiple of any number is the sum of any number of its *equal* magnitudes Thus, for example, 20 is a multiple of 5, as four times five = 20, or, that is to say, 5 + 5 + 5 + 5 = 20 As 20 is the multiple of 5, the latter number is inversely termed the *sub multiple* of 20, meaning that it is contained a certain number of times in the larger one

MULTIPLICATION, *mul-te pli kat-shun* (Lat. *multiplico*, I multiply), is the operation of finding the *multiple* of a number The number to be multiplied is termed the *multiplicand*, the number by which that is increased is termed the *multiplier*, and the result of the operation is called the *product* There are many simple methods for the multiplication of high numbers, but by the aid of LOGARITHMS (which *see*), all tedious ness can be easily avoided The rules of multiplication will be found given in the most elementary works on arithmetic, so they need not be treated on here.

MULTIPLYING-GLASS, *mul' te-ply' ing*, a term applied to a lens or glass by means of which objects appear to be increased in number It is ground into several planes that make angles with each other, and through which the rays of light, issuing from the same point, undergo different refractions, so as to enter the eye from every surface in a different direction, and thus appear as if they came from several points

MUMMY, *mum'-me* (Pers and Abrab *mom*, wax), a term applied to a body which has undergone the process of embalming The operation by which the body was preserved from decay after death will be found described in the article EMBALMING. During the space of two thousand years, the mode of preparing mummies differed at different periods Recent writers on the subject have divided the art into four kinds — 1 Drying the bodies in sand, a method chiefly employed among the poorer classes, 2 salting in natron, and then drying, 3 boiling in resins and bitumen, 4. preparing with fine resins, and removing the brains and viscera Great diversity of opinion exists with regard to the substances employed Within or about the bodies of different mummies have been found sulphate of soda, saltpetre, common salt, soda, oil of cedar, turpentine, asphalt, myrrh, and cinnamon The bandages of mummies are always of linen, the use of wool being prohibited. The greater portion of these bandages were made of old linen, either collected by

the deceased during his lifetime or else by the *taricheutes*. Shirts and darned portions of garments are often found, and sometimes the initials of the deceased embroidered on the cloth. The cloth is of various qualities, from that of canvas to that of fine muslin. The large mass of the bandages, however, consists of strips of about three or four inches wide, and from one to several yards in length, wound round the body with great skill and symmetry, and apparently laid on in a wet condition. All inequalities are carefully padded, so as to bring the body to a symmetrical shape. The length of these bandages is very great, as much as 1,000 ells having been found wrapping a single mummy. On the inner bandage of some mummies are found, inscribed in a caustic ink, the name of the deceased, the years that he lived, and the name of the monarch in whose reign he died. Straps of scarlet leather have been found on some mummies, prepared with the greatest care. These straps are about one and a half inch wide, and are found crossing the shoulders and breast. On the ends are stamped, apparently by a heated metal punch, like that used by bookbinders, the names and titles of the reiguing king, or the monarch, worshipping Amen-Ra. The earliest of these bears the name of Rameses XIII. of the 20th dynasty, and they continued to be used till B.C. 525. Mummies have frequently a case composed of as many as twenty or forty layers of cotton cloth, closely pressed and glued together, and then covered with a thin layer of lime, on which have been painted, in tempera, the face and dress of the mummy, various deities connected with funeral rites, and texts of chapters from the ritual. In general, a scarab is painted on the head, a flying ram-headed hawk on the chest, the goddess Nu on the stomach, and at the feet, frequently made of a piece of board, the enemies of Egypt, sometimes painted under the sandals, or the bull Apis, bearing a mummy on its back. These cartonages, as they are called, are found on the mummies of the kings of the 11th dynasty, and continue till the time of the Ptolemies. Sometimes, instead of a cartonage, the outer bandages of the mummy are covered with copious extracts from the ritual for the dead, written in black carbonaceous ink. Papyri, generally rolled up, were often deposited with the mummies. In the hand of a Greek mummy exhumed at Thebes was found a papyrus containing the 17th book of the Iliad. The mummies, with or without their cartonages, were deposited in coffins or sarcophagi, generally of wood, either of cedar or sycamore, made in the shape of a mummy, placed upon pedestals. The Egyptian tombs are generally hollow rock-chambers, excavated in the Arabian chain of hills to the west of the principal cities. Mummies are principally found in the bournah quarter of Thebes, and in the plains of Sakhara. Few mummies of children have been found. It has been calculated that 420,000,000 mummies were made from the commencement of the Egyptian monarchy to the cessation of the art in the 7th century. The bodies of sacred animals were also embalmed by the Egyptians from an early period of the monarchy; but they did not bestow so much care upon them as upon the human mummies. Mummies have been found of the ape, the emblem of the god Khons; and of the dog, the emblem of Anubis. A large number of cats, sacred to Bast, have also been found, some in bandages made up in the form of the animals; others of conical shape, with feet close to the body, and the head modelled in linen. The mummies of wolves have been found at Lycopolis. The larger animals were only partly embalmed. Mummies of rams and lambs, sacred to Ammon, have been found at Thebes. Mummies of the sacred vultures of the goddess Mut, and of different kinds of falcons, sacred to the sun, have also been found, together with mummies of the owl, sacred to Buto, and of the swallow. The bird, however, most commonly embalmed was the ibis, sacred to Thoth; and extensive catacombs of it mummied have been found at Sakhara. Many mummies of the crocodile, sacred to the god Sebak, have been found; and serpents embalmed in packets of bitumen, in the shape of an egg, with sometimes as many as six in a packet. Other nations besides the Egyptians endeavoured to preserve the human form after death, but in no case can they be considered mummies. The Persians used wax, the Assyrians honey, and the Hebrews embalmed their kings with spices. The Guanches, or ancient inhabitants of the Canary Islands, seem to have been the only people who adopted a mode of preserving the body similar to that of the Egyptians.—*Ref.* Pettigrew's *History of Mummies*; and Gannal's *Traité d'Embaumement*.

MUMPS, *mumps* (Ang.-Sax.), (Lat. *cynanche parotidea*, *parotitis*), in Med., is an inflammation of the parotid and submaxillary glands, of a contagious or epidemic origin. It is generally preceded and accompanied by some degree of fever, and commences with a feeling of pain and tension beneath the ear; a swelling forms, and the motion of the jaw becomes painful. It usually attains its height in four days, and four days more are occupied by its decline. It ordinarily requires little treatment, beyond the administration of a laxative, and protection from cold, with the application of poultices or other warm substances to the part, or, in severe cases, of leeches.

MUNICIPAL CORPORATION, *mu-nis'-i-pāl* (Lat. *municipium*), is a body politic or corporate established in some town, and consisting of the burgesses or freemen thereof, to protect the interests of its inhabitants as such, and for the maintenance of order therein. The origin of this institution is to be sought in the ancient Roman *municipium*, by which certain of the rights of Roman citizens were conferred upon particular towns; the inhabitants of such towns at the same time enjoying their own laws and customs. Such municipalities were established in various parts of the empire, as Spain, Gaul, and Britain; and after the breaking up of the empire, the municipal system came to be amalgamated with the feudal system of the continent and the Saxon institutions of Britain. In England, little is known regarding municipal corporations prior to the time of the Conquest; but there can be little doubt that the charters granted by the Norman kings were only a confirmation of the privileges already enjoyed. These charters conferred upon the boroughs the right of having for their government such officers as mayors, aldermen, bailiffs, and the like, with power to hold courts of their own for the administration of justice within the bounds of the borough, and to enjoy many other liberties and privileges, exemption from certain burdens, &c. Charters continued to be granted to the same, and to other towns, by different monarchs, until a very large proportion of the towns of England were incorporated. These, however, being granted by different kings, and at very different times, were subject to great variety of structure, and gave rise to great inconvenience. At length it was deemed necessary to pass an act placing them under one uniform plan of constitution. This led to the passing of the Municipal Corporation Act (5 & 6 Will. IV. c. 76), which provides that in every borough there shall be elected annually a mayor, and periodically a certain number of aldermen and councillors, who together shall constitute the council of the borough; that they shall be respectively chosen from among persons on, or entitled to be on, the burgess-list, and otherwise qualified as in the act described; that the councillors shall be elected by the burgesses, and the mayor and aldermen by the council; that the council shall meet once a quarter (and oftener if due notice be given), for transaction of the general business of the borough, and make their decisions according to the majority of the members present (if those present amount to one-third of the whole), and that the mayor, or other member presiding in his absence, shall have a casting vote; that at any meeting at which two-thirds at least of the whole shall attend, the council may make by-laws for the good rule and government of the borough, for the prevention and suppression of nuisances, and for the imposition of fines on persons in that behalf offending; that the burgesses shall annually elect from among those qualified to be councillors two auditors and two assessors; the former to audit the accounts of the borough, the latter to assist in revising the burgess-list; and that the council may also appoint a town-clerk and a treasurer (neither of whom is to be a member of the council), and such other officers as have been usual, or shall be necessary, and shall be empowered to fix their salaries; and if the borough have a separate court of Quarter Sessions, shall also appoint a coroner and a

clerk of the peace. The rents, profits, and interest of all corporate property shall be paid to the treasurer, and carried to the account of the borough fund; and the accounts shall be at all times open to inspection, and regularly audited and printed for the use of the ratepayers. The act further distinguishes between the rights newly conferred by it and the former rights of the corporators, with regard to the corporate property, and as to voting at parliamentary elections, both which former rights are expressly preserved.

Municipal Law is that which pertains solely to the citizens and inhabitants of a particular state, as distinguished from international law, commercial law, &c. (*See* Law, Municipal.) It is frequently, however, applied to the customary laws which prevail in any particular city or province, as distinct from the rest of the state.

Muniments, *mu'-ne-ments* (Lat. *munio*, I defend), in Law, are written records upon which claims and rights are founded and depend. Where, however, the number of these documents, or the interest to be defended, is small, this term is seldom used, but the correlatives *title-deeds* or *evidences*.

Munitions of War, *mu-nish'-unz* (Lat. *munitio*), are materials used in war for defence or for annoying an enemy, including guns of all kinds, their loading, &c. (*See* Law of Nations.)

Munnert. (*See* Rubia.)

Mural Circle, or Mural Quadrant, *mu'-rál* (Lat. *muralis*, pertaining to a wall), an astronomical instrument, generally of large size, attached to a stone wall or pier of solid masonry, and fixed in the meridian, for the purpose of measuring the distances of stars from the pole or the zenith. In 1690, the first mural quadrant used at Greenwich was erected by Flamsteed, and divided by Abraham Sharp. Two quadrants still remain in the Observatory, each having a radius of about eight feet; one of them was erected for the observations of Halley in 1725; the other was erected by Bird in 1750, and is the instrument with which Bradley and Maskelyne made their most important observations. It was soon found that entire circles were susceptible of much more accurate division, and were much less liable to derangement than quadrants; and a mural circle is now regarded as the principal fixed instrument in all the great public observatories. The mural circle is used for measuring angular distances in the meridian.—*Ref.* Vol. ix. of the *Memoirs of the Royal Astronomical Society*; *Description of the Mural Circle of the Armagh Observatory*.

Murder, *mur'-der* (Sax. *morthor*), is said to be "when a person of sound memory and discretion unlawfully killeth any reasonable creature in being, and under the king's peace, with malice aforethought, either express or implied." It can only be committed by a person of sound mind and discretion, for lunatics and infants, unless where they show a consciousness of doing wrong, are incapable of committing any crime. The unlawfulness arises from killing without any lawful warrant or excuse; and the person killed must be a reasonable creature in being, and under the king's peace; and therefore, says Blackstone, "to kill an alien or Jew, or an outlaw (who are all under the king's peace and protection), is as much murder as to kill the most regular-born Englishman, except he be an alien enemy in time of war." Lastly, the murder must be with malice aforethought; and it is this which distinguishes murder from every other species of killing. Malice may be either express or implied in law; express when one evidently and of set purpose designs the killing of another; implied, as when one kills another suddenly without any or great provocation. The malice need not be against the individual killed; for if one shoots at a person intending to kill him, but misses him and kills another, this is murder; and in like manner, if one shoots into a crowd without knowing a person there, and kills one of them, this also is murder; for the malice is regarded as against the human race. As a general rule, all homicide is malicious and amounts to murder, unless where justified by the command or permission of the law, excused on account of accident or self-preservation in sudden quarrel, or alleviated into manslaughter by being either voluntary upon a sudden heat, or involuntary, but in the commission of some unlawful act. In all such cases the prisoner has to make out the justification, excuse, or alleviation; for all homicide is supposed to be malicious until the contrary appeareth upon evidence. Manslaughter, which differs from murder, as being without malice either express or implied, is either the involuntary consequence of some act not strictly lawful, or, if voluntary, then occasioned by some sudden and sufficiently violent provocation. Even where a person does an act lawful in itself, but in an unlawful manner, or without due caution and circumspection, and kills another, this may amount to manslaughter, or even in some circumstances to murder. By Act 9 Geo. IV. c. 31, it is declared that every person convicted of murder shall suffer death as a felon. Manslaughter is punishable at the discretion of the court by penal servitude for life, or for a term of not less than three years, or by imprisonment, with or without hard labour, for any term not exceeding four years, or by payment of such fine as the court may award. Besides the punishment of manslaughter as a crime, it is attended with a liability to make pecuniary satisfaction to the relatives of the deceased.

Muriatic Acid. (*See* Hydrochloric Acid.)

Murrain, *mur'-rin* (Ang.-Nor.), a contagious disease among cattle, generally caused by a hot dry season, which occasions inflammation of the blood and a swelling in the throat, which soon become fatal. The symptoms of the disease are a hanging down and swelling of the head, a short and hot breath, profusion of gum in the eyes, rattling in the throat, palpitation of the heart, staggering, and a slimy tongue. The early stage of murrain is one of fever, and the treatment should be regulated accordingly. It is of great importance that the infected animal should be immediately removed from the sound ones.

Musa, *mu'-zá*, in Bot., the typical gen. of the nat. ord. *Musaceæ*. *M. paradisiaca* is the plantain, and *M. sapientum* the banana, two important food-producing plants, their fruits being remarkably rich in starch and sugar. Dr. Shier states that a new plantain-walk will yield 17 cwt. of starch per acre. The fibrous material of the spurious stems of the different species of *musa* may be used for textile fabrics and in paper-making. The fibres obtained from *M. textilis* constitute the Manilla hemp of commerce. The finer fibres of the same plant are used for the celebrated Indian muslins. The young shoots of the banana are boiled and eaten as table vegetables; the large leaves are used for various domestic purposes.

Musci, *mus'-si* (Lat.), in Bot., the Mosses, a nat. ord. of *Acotyledones*, sub-class *Acrogenæ*. Cellular plants with erect or creeping stems, and, usually, spirally imbricated leaves. Their reproductive organs are of two kinds,—*antheridia* and *archegonia*, which are either placed on the same plant or on separate plants. The antheridium is a more or less rounded, elliptical, or cylindrical sac, containing, when mature, a number of cells, each of which incloses a spirally-twisted filament. The archegonium is usually a flask-shaped body, which, after fertilization, develops an urn-shaped *sporangium*, containing spores. The sporangium is commonly placed on a stalk, and is at first covered by a hood, beneath which is a kind of lid. When ripe, the sporangium usually opens in a transverse manner, from the separation of the lid or operculum; sometimes it opens vertically, by splitting into four equal valves, which are connected at the summit by the persistent operculum. Mosses are both terrestrial and aquatic. They are of little importance in an economic point of view. The species of *Sphagnum* furnish food to the reindeer, and even to man in the polar regions.

Muscle, *mus'-l* (Lat. *musculus*), in Anat., is a term applied to the fibrous contractile tissue forming the flesh of men and animals, by means of which the many highly complicated voluntary and involuntary motions of the body are performed. Muscular tissue is of two kinds, distinguished by structural peculiarities and mode of action, the one including the muscles of organic life (with the exception of the fibres of the heart), consisting of simple smooth filaments; the other comprising the muscles of animal life and the heart, and consisting of compound and apparently striated fibres, or tubes inclosing fibrils. The muscles of organic life, or unstriped muscles, consist of fibres, or, rather, elongated spindle-shaped fibre-cells, which,

in their most perfect form, are from $\frac{1}{1000}$ to $\frac{1}{1250}$ of an inch broad, very clear, granular, and brittle, many of them being marked along the middle or one of the edges either by a fine continuous dark streak, or by short isolated dark points. These fibres are collected in divers numbers in fasciculi, and form the proper contractile coats of the digestive canal, urinary bladder, gall-bladder, arteries, &c. The muscles of animal life, or striped muscles, are composed of fleshy bundles inclosed in coverings of fibro-cellular tissue, by which each is at once connected with, and isolated from, those adjacent to it. Each bundle is again divided into smaller ones similarly ensheathed, and similarly divisible through an uncertain number of gradations, till just beyond the reach of the naked eye one arrives at the primitive fasciculi, or the muscular fibres properly so called. These consist of tubes of delicate structureless membrane,—the *sarcolemma* of Bowman, varying in breadth from $\frac{1}{2500}$ to $\frac{1}{1000}$ in., and inclosing a number of filaments. They are of a pale yellow colour, and marked by strim which pass transversely round them. The primitive fibrils, of which each fasciculus contains several hundreds, are the proper contractile tissue of the muscle, cylindrical but somewhat flattened in form, and about $\frac{1}{1500}$ths of an inch in greatest thickness. The peculiar property of muscular tissue, its contractility, although commonly brought into action by the nervous system, appears to be inherent in the muscular tissue, and not derived by it from the nerves, for it may be manifested in a muscle after being isolated from the influence of the nervous system by division of the nerves supplying it. Muscular contraction is generally believed to be effected by an approximation of the constituent parts of the fibrils, which, without any alteration in their general direction, become closer, flatter, and wider. It is a uniform, simultaneous, and steady shortening of each fibre and its contents. Muscles are usually styled voluntary or involuntary, according as they are, or are not, subject to the influence of the will; but this division is not strictly accurate, and is of little value in a scientific point of view. Many muscles, especially such as are under the immediate dominance of reflex nervous action (as the respiratory and sphincter muscles), partake of both characters; since volition can interfere only temporarily with their contraction; and all muscles, even the most confessedly voluntary, are subject to emotional and instinctive influences, in which the will has no share. Muscles are either elongated and fixed at their two extremities, or hollow and inclosing a cavity. They are so disposed as to give beauty as well as strength to the human body, and for the most part are arranged in pairs; as flexors and extensors, abductors and adductors, supinators and pronators, &c. Muscles are attached to bones by means of tendons, white and shining, rounded or flattened, fibrous cords, and very resisting. The fixed point of a muscle is called its origin, the movable one its insertion. Muscular fibres, especially those of animal life, are constantly in a state of slight contraction, as is evident from the fact that when the action of certain muscles of a part are injured, the antagonistic muscles always draw it towards them. Thus, when the muscles of one lateral half of the face are paralyzed, those of the other half draw the features towards their side. There are in the human body no fewer than 527 distinct muscles, of which 261 are in pairs, and 5 single on the median line. Of these there are 83 in the head and face, the *orbicularis oris* being single; 49 in the neck, the arytenoid of the larynx being single; 78 in the thorax, the *triangularis sterni* and the diaphragm being single; 33 in the abdomen, the *sphincter ani* being single; 78 in the back, 98 in the upper extremities, and 108 in the lower. Yet with all this complicated machinery, everything is in perfect order and harmony.

MUSCOVY DUCK, *mus'-ko-ve* (*Cairina moschata*), a bird which obtains its name, not, as might be supposed, from the fact of its being a native of Russia, but on account of the strong musky smell with which it is imbued. It is sometimes upwards of two feet in length, and its plumage is usually black, with glosses of green and blue. The muscovy ducks are much more prolific than other species of the family, and their eggs are larger, and are tinged with a greenish hue.—(*See* also DUCKS.)

MUSÆ, *mu'-se*, the name of certain goddesses of the Greek mythology, who were supposed to preside over the liberal arts and sciences. (*See* vol. I. of this work.)

MUSETTE, *mu-set'*, the name given to a soft and sweet kind of air in common time, from the style of which dances were often invented and called musettes. This word was also applied as the name of a small kind of bagpipe, much employed in most European countries, and played on by certain itinerant musicians, who were called musars.

MUSEUM, *mu-se'-um* (Gr. *mouseion*), originally a place dedicated to the muses; hence the term began to be applied to any place where learning was pursued, or which was set apart as a repository for objects which have some relation to the arts and sciences. One of the earliest museums on record was that founded by Ptolemy Philadephus in 280 B.C., at Alexandria, for the encouragement of learning and the support of learned men. At the present day, every collection of interesting objects of nature or art, brought together for the instruction of the student or the satisfaction of the curious, is called a museum. Collections of this sort in Europe had their origin after the 15th century. The most famous of Italy is the museum of the Vatican, which occupies nearly all the rooms of that vast palace, and includes pictures, statues, *relievi*, books, and manuscripts. It contains the celebrated fresco paintings of Rafaelle, together with the Apollo and Laocoon, and many other grand and beautiful works of art. After the museum of the Vatican, that of Florence holds the second place. Its greatest ornaments are the Medicean Venus and the Farnesian Hercules. The museum of Paris is exceedingly rich in works of art. In France, however, the term *musée* is also applied to galleries of painting. In England, the Ashmolean Museum, at Oxford, is the oldest; but the largest and most important is the British Museum, in London. (*See* BRITISH MUSEUM.) The Museum of Practical Geology was opened in connection with the government School of Mines in 1851, and now forms a portion of the department of Science and Art, under the Committee of the Privy Council on Education. In this museum are extensive and admirably arranged collections found during the progress of the geological survey of the United Kingdom. They are illustrative of the structure of the British islands, and of the application of geology to the useful purposes of life. In most of the principal towns of Great Britain, public museums are erected. No country has more museums than Germany. Those of Berlin, Dresden, and Munich, are the most celebrated. In Italy, the *Museo Borbonico* contains the treasures found in the buried cities of Pompeii and Herculaneum. In St. Petersburg, Copenhagen, and Greece, there are also museums of an extensive and interesting character.

MUSHROOM. (*See* AGARICUS.)

MUSIC, *mu'-zik* (Lat. *musica*, Fr. *musique*), one of the seven liberal arts. It teaches the properties, dependencies, and relations of melodious sounds, or the art of producing harmony and melody by the combination and arrangement of those sounds. Rousseau defines it as the art of combining tunable sounds in a manner agreeable to the ear. Music, in common with all other arts, is chiefly derived from the ancients. Of its origin no certain knowledge can be obtained, nor is it easy to determine what it was in its primitive state. There are, of course, many fabulous stories attributing its invention to gods and goddesses. It was, in all probability, coeval with man, and it may almost be assumed that vocal music preceded that for instruments. The simple elevation or depression of the voice in expressing the passions or emotions of the mind would most likely have led to its discovery, and the idea of regulating it might naturally have been obtained from the modulated songs of birds. A portion of the song of the blackbird is well known to consist of true diatonic intervals. With the ancients the term music possessed a far wider meaning than it does at present. With them it comprehended not only dancing and acting, but even poetry. And, indeed, everything that was practically considered to emanate from the influence of the nine muses. Aristoxenus tells us that the Athenians understood the term

in this latter sense. The first traces of music were discovered in Egypt, where the art was undoubtedly carried to a high degree of perfection, although Diodorus Siculus asserts that it was prohibited, as not only useless but even noxious, from its tendency to make man effeminate; on the other hand, however, we are assured by Plato and Herodotus, both of whom were travellers in Egypt, that the art was greatly encouraged and the youth instructed in it at an early age; and Diodorus contradicts himself by telling us in another place that music and musical instruments were the inventions of the Egyptian deities Osiris, Isis, Orus, and Hermes. They are also proved to have possessed instruments capable of much variety and expression by representations of them that have been found. One was discovered drawn on an obelisk erected by Sesostris, at Heliopolis: it represented an instrument which, by means of its neck, was capable, with only two strings, of furnishing when tuned by fourths, that series of sounds called by the ancients a *heptachord*, and if tuned by fifths, of producing an octave. Many other drawings of musical instruments have also been found which prove the art to have been in a very flourishing condition. Even after the subjugation of the empire by Cambyses it was not lost, but continued, though in a much less prosperous state, to the time of Cleopatra's misfortunes, an event which terminates the history of the Egyptian empire. Of Hebrew music little is known, except what may be gathered from Holy Writ. Jubal, seventh only in descent from Adam, is spoken of as "the father of all such as handle the harp and the organ." The instrument here meant by the organ was, most probably, a number of pipes joined together, resembling the common Pan's pipe, which is known to be of the remotest antiquity. No mention is again made of music until six hundred years after the Deluge, when Laban says to Jacob, "Wherefore didst thou flee away secretly and steal away from me, and didst not tell me, that I might have sent thee away with mirth and with songs, with tabret and with harp?" It is seldom again alluded to until the time of David, when we find music and musical instruments continually spoken of. According to Eusebius, David carried his harp with him wherever he went; he appointed corps of musicians for the celebration of religious ceremonies, and we find him continually mentioned as playing and dancing before the Lord with songs, harps, psalteries, timbrels, cymbals, cornets, and trumpets. Under Solomon, music received little encouragement, for, unlike his father, he was not a performer, but ranked "men singers and women singers and the delights of the sons of men, such as musical instruments," among the vanities of the world. The Babylonish captivity, lasting sixty-three years, proved a mortal blow to the Jewish music, and, indeed, all their other arts; and in the stormy time which followed, during which they were conquered successively by the Egyptians, Persians, and Romans, it was entirely lost. Since the destruction of the temple, both instrumental and vocal music have been excluded from all the Jewish synagogues, excepting those of the German Jews, as they consider it improper to sing or rejoice before the coming of the Messiah. Music being held in greater estimation by the Greeks than by most other nations, we might naturally expect that our knowledge of it would be considerable. It is, however, quite the reverse; neither the ancient writings nor the researches of modern inquirers give us any idea what the Greek music really was; neither is this very surprising when we consider that the music of a country can be handed down to a remote posterity only by the preservation of actual compositions expressed by a notation capable not only of expressing the sounds with distinctness at the time, but which will continue to be intelligible in latter ages. Now, therefore, as all we possess of Greek music are a few fragments written in a notation which is very far from being understood, we cannot wonder at the small knowledge we have of it as a science, while of its origin and primitive history we can give little else than conjectures, having no more satisfactory accounts than mythological traditions, from which it would seem that the Greeks received their music, or at least great improvements in the execution of it, from Lydia, where Amphion is said to have learned this art, and from Arcadia, where the shepherds practised on the pipe, flute, and cithera. Their different modes, viz., the Phrygian, Dorian, Lydian, Æolian, and Ionian, were derived from various provinces in Asia Minor; hence their names. Most of the ancient philosophers wrote on music, more especially the disciples of Pythagoras, Plato, and Aristotle; from whom we find that music was considered an almost indispensable portion of the education of the higher classes, and that it was employed in their religious ceremonies. They ascribe the invention of various instruments to their gods and goddesses; thus they say Mercury invented the lyre, Pan the syrinx, or Pan's pipes, and Minerva the flute; this latter instrument was held in high estimation. The musical scale of the Greeks consisted, at its greatest extent, of only two octaves, the lowest note of which was A, the first space in the bass of modern music, and resembled that of the present day exactly in the disposition of its intervals; but instead of being arranged in octaves as with us, it was divided into tetrachords. The Greeks are supposed to have possessed no musical rhythm, except in their poetry. Their musical notation was very complicated. Its basis was formed upon the letters of the alphabet, which were multiplied by distorting and mutilating their forms, and by the use of accents, and of arbitrary signs, producing in all above sixteen hundred characters. The question which has been so long contested, as to whether the Greeks possessed any knowledge of counterpoint, or part-music, seems now to be determined in the negative; for although they must, if only by mere accident, have known the effect of simultaneous sounds, it is extremely improbable that what we call harmony formed any part of their music. Prizes were awarded for music and poetry at the Olympic, Nemean, and Isthmian games, the poets reciting their own verses to the strains of music. At the Pythian games, which were of more recent date, prizes were given for instrumental music only. No professors seem to have been more highly honoured than those of the musical profession. Their pay was enormous. Athenæus tells us that a flute-player named Amœbæus received a talent, equal to £193. 15s., for a single performance at the theatre, whilst Xenophon asserts that flute-players lived in a most magnificent manner. The practice of this instrument extended to the fair sex; speaking of whom we cannot omit to mention Lamia, the daughter of Cleanora, mistress to Demetrius Poliorcetes, whose proficiency on the flute, added to her wit and beauty, caused her to be considered almost a prodigy. Inasmuch as the Greeks received their music from the Egyptians, so did the Romans, though in a much greater extent, receive theirs from the Greeks; and although the art was very highly estimated by this warlike people, they made little or no progress in it; indeed, none of the arts seem to have received much attention from them. Dr. Burney says that, even during the Augustan age, they possessed no sculptor, painter, or musician; those, he continues, "who have been celebrated in the arts at Rome, having been Asiatics or Europeans, who came to exercise such arts among the Latins as the Latins had not among themselves." During the reign of Tiberius, comedians and musicians were banished from Rome; and although recalled by Caligula, and encouraged by Claudius, the musical art languished until the reign of Nero, by whom it was restored to its former splendour. He studied the art himself, and spent the greatest part of his time in receiving lessons from Torpius, the most skilful harpist and lyrist of his time. The successors of Nero encouraged public games and musical and dramatic performances to a considerable extent; thus the art continued to flourish until the fall of the Empire, when, in common with all other arts, it disappeared until the period of its revival in modern Italy. Music has been employed in the religious ceremonies of the Christian Church from the earliest ages. Of what it consisted during the first three or four centuries is purely a matter of conjecture, although we may naturally suppose it to have somewhat resembled that employed in the countries in which the early Christians dwelt. There is much controversy amongst musical historians, as to whether they derived their music from the Greeks and

Romans, or from the Hebrews. Father Martini says they received it from the latter people, and Dr. Burney agrees with him so far as to be of opinion that the Greek and Roman secular music was discarded by the Christians, and that we have no remains of it in the traditional melodies which have, through the Church, reached even to these times. It is, however, impossible ever to decide the question, as we possess no *written* remains of either the chants or airs for single voices of the early Christians. About the year 386, St. Ambrose, bishop of Milan, finding the whole system of church music in great confusion, determined upon reforming it, and composed what has been called, after him, the *Cantus Ambrosianus*, or Ambrosian chant, in which he adopted the Greek nomenclature; hence it has been supposed, without sufficient grounds, that he adopted their entire system. However this may be, it is quite certain that he greatly improved music, and the manner of performing it, and that his system formed the foundation of that introduced two centuries afterwards by Pope Gregory, and which has formed in its turn the basis of all that is grand or valuable in modern music. What the distinctive qualities between the two systems were cannot now be ascertained, as we possess no vestiges of the Ambrosian chant sufficient to ascertain its peculiar character. It is to the fact that the chant of Gregory has been retained in its simplicity in the church of Italy, that the Italians owe their pre-eminence in singing. The modern chant, introduced in our cathedrals at the Reformation, is but a poor substitute for that which, confined to nine varieties, has been heard, without satiating the ear, in the Romish church from the time of Gregory to the present day. Many attempts seem to have been made after the death of Gregory to improve musical notation. The practice then in use of placing letters or syllables to indicate sounds, could not have been very intelligible or easy to read. About the end of the 10th century, seven parallel lines were employed, upon which the notes were expressed by dots or points; but it was not until 1022 that the great reformation of the musical scale took place. About this time Guido, a Benedictine monk, born at Arezzo, a small town in Tuscany, reduced the number of lines to four, and placed the points not only *on* the lines, but *between* them. He also added to the ancient system a bass note, answering to the G or *sol* in our *fa* or bass clef: this note he designated by the *gamma* (Γ) of the Greeks; hence this series of sounds in the scale is called the gamut. He also invented the method of counting by hexachords, instead of by tetrachords, and of designating the major hexachord by the syllables ut, re, mi, fa, sol, la. The invention of counterpoint has also been attributed to him by some authors; but this is unjust to his predecessors; for although he was the first to write upon it, and it had made little progress before his time, he is not entitled to the honour of its invention. (*See* COUNTERPOINT.) Up to this period the plain chant consisted of notes of equal value in respect to time: rhythm was unknown. Now, however, musicians began to feel its importance. The first treatise on this branch of the art was written by Franco of Cologne, or, as some say, of Paris, in a work still extant, entitled "Franconis Musica et Cantus Mensurabilis." He considers measured music to be much superior to plain chant; he distinguishes three different notes; viz., the long, the breve, and the semibreve, each of different duration: these may be again subdivided. He divides rhythm into five modes. Descants he defines as the union of several melodies concordant with each other, but composed of different figures, and divides it into four kinds; viz., simple, prolate (prolatus), truncate (truncatus), and copulate. Franco's system, although much improved and extended, is employed to this day. We may therefore consider Guido and Franco as the authors of musical notation; all subsequent changes being merely modifications of their inventions, rendered necessary by the improvements in music. To the introduction of the organ, which took place in France about 757, and which came into general use in England, Germany, and Italy in the 10th century, we owe the invention of harmony. This noble instrument being played with keys, the production of simultaneous sounds became easy, and the beautiful effects of the union of concordant sounds





must soon have been felt, and, once discovered, was diligently cultivated by a succession of eminent men; among whom we may mention Franco, before spoken of, Marchetto of Padua, John de Muris, John Ockenheim, Josquin des Prés, and Claudio Monteverde. The science of harmony continued gradually to progress until the beginning of the 18th century, when it may be said to have reached its greatest refinement. We know scarcely anything of the state of music between the 11th and 15th centuries. Many efforts seem to have been made to improve it; melody was treated with contempt, harmony being the great point of attraction. Rhythmical feet, as determined by Franco, began to be abandoned towards the close of the 14th century, and as many sounds were introduced into the metre or measure as the subdivisions of the different orders of notes would at that time permit, and new forms or figures were found necessary to represent new values of time. The laws of harmony were first fixed and regulated about the middle of the following century, as we find from the writings of several authors of that time, and more particularly in those of John Tinctor, who was first chapel-master to Ferdinand, king of Naples, and afterwards canon and doctor at Nivelle, in Brabant. He wrote the first musical dictionary, and also the first treatise on this art ever *printed* in Italy. This was followed, a few years after (1496), by that of Franchino Gafforio, in which the doctrines we find in John Tinctor are much better developed. In the compositions of the 15th century there was a great want of melody, for which all the display of science and curious combinations which they contain does not atone. In the next century, however, melody and harmony were united by the brilliant genius of Palestrina and some of his contemporaries; while at the same time the art was enriched by the writings of Peter Aaron, Zarlino, Artusi of Bologna, Zacconi of Venice, and others. According to M. Bombet, the oratorio was invented about A.D. 1540 by St. Philip Neri, who established at Rome the congregation of the Priests of the Oratory, and held performances of music at the Chiesa Nuova, or New Chapel, consisting of sacred interludes, written by first-rate poets, for the purpose of turning to pious account the theatrical enthusiasm which then prevailed at Rome. The experiment was successful, and these concerts, or oratorios, as they are now called, although at first only short simple poems, gradually progressed, until, at the present day, they differ very little from dramatic performances. (*See* ORATORIO.) Although sacred dramas and pastoral and secular plays, with choruses and hymns interspersed, were common to all countries, and music was often introduced into tragedies, comedies, and pastorals, before the 16th century, it was not until 1594, or 1597, that the first indication of the modern opera made its appearance. About this time, however, the first one, named "Daphne," was produced in Italy, composed by Giacomo Peri and Count Corsi, and written by Ottavio Rinuccini, a Florentine poet, who soon afterwards wrote two others, called "Euridice" and "Ariadne," the music of the first of these being composed by Peri and Giulio Caccini, and that of the other by Claudio Monteverde. In 1606, the first opera performed at Rome was produced. In the following year the last-mentioned composer wrote his "Orpheo" for the court of Mantua. In 1637 the lyric drama was introduced at Venice, and at Naples in 1645. Venice, however, took the lead of all other places, no less than 350 operas being performed there between 1637 and 1700. A number of these were composed by Cavalli, chapel-master at Venice, who added air to the recitative. According to M. Choron, until the time of Alessandro Scarlatti, the overture to an opera had consisted of meagre obligato symphony produced by certain routine, and frequently with bad taste. This he now reformed, and established it less upon the foundation of the opera than upon the work itself, making it a species of musical prologue or programme of the action. He perfected the obligato accompanied recitative, and was the first to introduce the *da capo*, or ritornel of the symphonies, into the recitatives. For the great reformation of the lyric drama we are indebted to Gluck, whose opera of "Orpheo" was the first ever printed in Italy. In this

end of the last century, the advancement of instrumental music produced a sensible change in that for the drama; several composers endeavoured to introduce the richness of the symphonies into the operatic accompaniments. This brilliant system, upon which Haydn, Mozart, Cherubini, and all their school worked, although possessing many advantages, had one drawback; viz., that of being liable to eclipse the chief or vocal part, and sometimes even to make it appear less important than the accessory part. About 1809, Italian music, which had begun to decline towards the end of the 18th century, received a fresh impulse from the compositions of Gioacchino Rossini, the most popular composer of modern times. He composed his first opera, "Demetrio e Polibio," in 1809, and since that time he has written thirty-four others, the last and best of which was "Guillaume Tell." Contemporary with Rossini were Bellini, who, had he lived, promised to rival the greatest of his predecessors,—his "Sonnambula" and "Puritani" are extremely beautiful, while his "Norma" is one of the finest operas we possess; Weber, who, although often wanting fluency in his vocal writing, is unrivalled in a certain class of passionate expression; Meyerbeer, whose operas of "Les Huguenots," "Le Prophète," "Etoile du Nord," stamp him as a first-rate composer; Donizetti, a wonderfully prolific composer, whose operas of "Lucrezia Borgia," "Lucia di Lammermoor," "La Figlia di Regimento," &c., are great works, and universally admired; and Auber, who, although somewhat resembling Rossini in his earlier compositions, has produced some very fine works. His "Fra Diavolo," and his most celebrated piece, "La Muette de Portici," or "Masaniello," are well known and deservedly popular. The music performed at the opening of the International Exhibition for 1862 was composed by Auber, Meyerbeer, and Professor Bennet; the two first as representatives of the French and German schools, and the last of the English. Verdi is the latest accession to the Italian school. His music, although extremely sweet and pretty, is, as a rule, very sensuous; as, for example, that of "La Traviata" and "Il Trovatore." Although the Italians stand pre-eminent in vocal, the Germans have far surpassed them in instrumental music. Their oratorios possess the greatest beauties; those of Handel are to this day unequalled; while the "Ascension," and the "Israelites," by Bach, and the "Death of Jesus" by Graun, are magnificent compositions; as are also Haydn's two cantatas of the "Creation" and the "Seasons." The masses, the splendid requiem, and, above all, the secular instrumental music of Mozart, have never been surpassed. To Germany we owe Beethoven, who, like Mozart, devoted himself chiefly to the instrumental branch of secular music. His power and genius are best displayed in his symphonies; that in C minor stands alone unrivalled, while his "Sinfonia Pastorale" is, perhaps, the most exquisitely beautiful piece of descriptive music in existence. Mendelssohn also was a German. His overture to the "Midsummer Night's Dream," the concerto in G minor, his octet, and his magnificent oratorios of "St. Paul" and "Elijah," have obtained a world-wide reputation as works of the highest genius. To the German school also belong the names of Spohr, Hummel, and Wagner. The works of this last composer, although exhibiting great power and genius, are not popular in this country. In scientific works on music, the Germans are richer than any other people, as is proved by the names of Fux, Mattheson, Marpurg, Kirberger, E. Bach, Albrechtsberger, Forkel, Koch, and a host of others. Although often called an unmusical people, the English do not seem to have been much behind their continental neighbours. We can boast of masses in four, five, and six parts, written by natives at as early a date as the Italians. At the end of the 15th and beginning of the 16th centuries, we had secular music, written in good counterpoint, by such men as William of Newark, Sheryngham, Turges, Tudor, Banester, &c. Henry VIII. was a composer; Queen Elizabeth was a first-rate musician; Charles I., in order to contribute to the advancement of the art, granted a charter of privileges to eminent musicians. During the Interregnum, music was almost lost. At the Restoration, however, it again began to flourish;



about this time the art was enriched by the compositions of Henry Purcell, to whom we are much indebted for our dramatic music, and of Matthew Locke, whose music to the "Tempest," "Psyche," and "Macbeth," has never been surpassed by any English musician. In 1703, the Italian opera first made its appearance in this country in the shape of a drama of a mixed kind, being sung partly in Italian and partly in English; in 1710, however, one was produced entirely in Italian. This year was rendered memorable by the arrival of Handel in this country; in the following year, he produced his first opera, "Rinaldo." In 1720, the Royal Academy of Music was founded, chiefly under Handel's management; but although many admirable works were produced by him, Buononcini, and Ariosto, and were executed by an unrivalled company, the opera did not become popular, and in 1728 the undertaking proved an entire failure. After this, several attempts were made, chiefly by Handel, to raise the opera in public estimation, but with comparatively no success, and in 1740 he terminated his dramatic career with the opera of "Deidimonia," and soon after applied himself entirely to writing oratorios, in which species of composition he has rendered his name immortal. "Saul," the "Messiah," "Israel in Egypt," can never be forgotten. Although so unsuccessful in his attempts to make the Italian opera popular in London, we are indebted to Handel for its permanent establishment in our capital. Since the production of his last dramatic work, in 1740, operas have been continually represented in this city, with scarcely any noticeable intervals, until the present day, when our Italian opera ranks as the first in Europe. While the Italian opera was thus slowly making its way in public favour, our national opera was made popular by Gay, who, in 1727, produced his "Beggar's Opera," the music of which was composed conjointly by Dr. Pepusch and Jeremiah Clarke (organist of the Chapel Royal); this was quickly followed by his charming little drama of "Acis and Galatea," set to music by Handel. English dramatic music was soon after enriched by the compositions of Dr. Arne, Shield, Busby, Reeve, and Sir H. R. Bishop; but, notwithstanding, does not seem to have made much progress in the good graces of the public. Several attempts were made to establish a permanent English opera, but all proved more or less failures. In 1842, Drury Lane theatre was opened for the performance of English operas, and was attended with more success. Mr. Balfe's "Bohemian Girl" was produced here, and had a run of a hundred nights; a success then so unprecedented, that a piece of plate worth two hundred guineas was presented to him on the stage of "Old Drury." The Princess's and Lyceum theatres also were devoted for some time to the performance of the lyric drama. In 1858, Covent Garden theatre was opened by the English Opera Company, under the management of Miss Louisa Pyne and Mr. Harrison, and since then has been opened every year, and seems now to be permanently established. Some charming operas by Balfe, Macfarran, Wallace, &c., have been produced here. Within the last few years, music has been making rapid progress in this country, and is gradually becoming more popular. For this we are greatly indebted to the introduction of cheap concerts, to the musical festivals which are continually being held in various parts of the country, and to the various musical societies in London; among the chief of which are the Philharmonic, the Sacred Harmonic, and the Musical Union, all of which have, by performing the compositions of such men as Handel, Haydn, Mozart, Cherubini, Spohr, greatly contributed towards creating a taste for the music of the greatest masters. That music has a great power over the passions and mind there is not the slightest doubt, neither is there, we think, the slightest doubt that its effect is good. Of course, if combined with loose or profane songs, it will have quite a contrary effect; but in this case the music does not corrupt the poetry, but the poetry corrupts the music. Thus, we may still say with Montesquieu, "Music is the only one of all the arts that does not corrupt the mind."—Ref. the *Musical Histories* of Burney, Hawkins, Busby, and Hogarth; Choron's *Dictionnaire de Musiciens*; Sutherland Edwards's

*History of the Opera*; Hogarth's *Memoirs of the Opera*, and the *Encyclopædia Metropolitana*.)

MUSICIAN, *mu-zish'-e-an*, a performer of music, or one who understands it scientifically. Musicians may be divided into three classes: the *speculative musician*, the *practical theorist*, and the *performer*. The first of these writes on the laws of sound and harmony; the second is a composer, or one who produces music written agreeably to those laws; and the last is one who with his voice or instrument executes the music when written. All these separate qualities, although so distinct, are sometimes possessed by the same individual.

MUSK, *musk* (Fr. *musc*), a peculiar aromatic substance, found in a sac, or small bag, which hangs from the abdomen of a small male quadruped of the deer kind, which inhabits Tonquin and Thibet. In colour, musk is blackish-brown; it is lumpy or granular, somewhat like dried blood, with which substance indeed it is often adulterated. The only criterion of its genuineness is the intensity of its smell. It loses its odour when thoroughly dried, but regains it when moistened with liquid ammonia. The variety most esteemed is that of Tonquin; it comes to this country in small bags, covered with a reddish-brown hair. All the analyses of musk hitherto made teach little or nothing concerning its essential or active constituents. It is used in medicine, and, when taken in the dose of a few grains, rouses the energy of the digestive organs, and soon afterwards produces sympathetic phenomena, the powers of the whole animal system appearing suddenly increased. Other effects also prove that it acts on the brain, spinal chord, and ganglionic nerves; such as tendency to sleep, convulsive movements, and particularly spasms of the chest and abdomen. Musk, on account of idiosyncrasies, produces very extraordinary effects in some persons; in certain individuals these are so violent that they cannot bear the slightest odour of the substance. In 1857, 10,728 ounces of musk were imported into this country.

MUSK-BEETLE (*Cerambyx moschatus*), a coleopterous insect, belonging to the family *Cerambycidæ* and the group *Longicornes*. The musk-beetle possesses a peculiar scent,—not at all like musk, however, but more like attar of roses. This scent is supposed to attract the male, as it is stronger in the female than in the former. It is found generally on willows in the south of England.

MUSK-CAVY, a species of *Capromys*, a gen. of animals belonging to the class *Mammalia*, ord. *Rodentia* or *Glires*, and fam. *Muridæ*. It is about the size of a rabbit or hare, and is exclusively herbivorous. The musk-cavy is so called from the feet of it emitting a strong perfume of musk. It burrows under ground like the mole, and can be thus traced merely by its scent. It is a native of the West-India islands, in some of which it is called by the natives the *manacou*.

MUSK-DEER (*Moschus moschiferus*), a tribe of ruminant animals belonging to the family *Bovidæ*, and distinguished from the *Cervinæ* by the absence of horns and the presence of long canine teeth in the upper jaw. A pouch containing a secretion, termed musk, is placed under the abdomen of the males of some of the species. (*See* MUSK.) The following description is taken from Baird's Cyclopædia. The animals belonging to this tribe are small and very swift, and elegant in their movements; but little of their habits is known. They are confined to the Old World. The true musk-deer, *Moschus*, is the most celebrated of all the tribe, but at the same time is one of whose habits we know the least. It is about the size and form of a roe-buck, is a shy and timid creature, and inhabits the mountainous regions of Asia, as Thibet and the upper provinces of China. The musk pouch is peculiar to the male, and is about three inches in diameter. The best musk is obtained from Thibet.

MUSKET, *mus'-ket* (Fr. *mousquet*), a description of fire-arm used in war, originally discharged by a match, and afterwards by a spring lock and a flint. The rifle has entirely superseded it as a military weapon, whilst the percussion-lock has taken the place of the flint-lock for sporting and other purposes.

MUSKETOON, *mus-ket-oon'* (Fr. *mousquiton*), a short thick musket, now completely gone out of use.

MUSK-OX (*Bos moschatus*), an animal belonging to the fam. *Bovea*, but it appears to be the connecting link between ozen and sheep. Its countenance and long hair ally it to the latter class of animals, while its horns and other parts of its form claim for it a connection with the former. It inhabits the barren lands of North America that lie above the 60th degree of latitude. When full grown, the size of the animal is nearly equal to that of the Highland bullock, although rather shorter in the legs. Sir William Jardine gives an excellent account of this animal. He says, "The horns are very broad, covering the brow and whole crown of the head; and touching each other for their whole breadth from before backwards. The head is large and broad. There is no vestige of a naked muzzle, the end of the nose, middle part of the upper lip, and a great part of the lower, being covered with a close coat of short white hairs. The remainder of the head anterior to the horns is covered with very dark umber-brown hair, long and bushy towards the root of the nose. The eyes are moderately large. The general colour of the hair on the body is brown, on the neck and between the shoulders long, matted, and somewhat curled; on the back and hips it is also long, but lies smoothly. . . . . The tail is so short as to be concealed by the fur of the hips. The cow differs from the male in being of a less size, having smaller horns, not touching at the base, and with shorter hair on the chest and throat."—(Sir William Jardine, in vols. ix. & x. of the *Naturalist's Library*.) It may be added in conclusion that the musk ox is of a far more placid temper than other members of the family *Bovea*, but it will attack an assailant if wounded. It generally perceives its enemies by means of its sense of smell, which is very fully developed. It has been termed the *musk-ox* in consequence of its flesh, although very palatable for eating, smelling very strongly of musk.

MUSQUASH, *musk'-wash*, a gen. of rodent Mammalia, belonging to the fam. *Castoridæ*, termed variously *musquash*, *musk-beaver*, or *musk-rat*. It is a native of North America, and in its appearance and habits resembles considerably the beaver. It is hunted for its skin, which is much adopted in the manufacture of hats; upwards of a million skins being imported into this country annually.—*Ref.* Baird's *Cyclopædia of the Natural Sciences*.

MUSK-RAT. (*See* MUSQUASH.)

MUSLIN, *muz'-lin* (Fr. *mousseline*), a thin fine cotton fabric. The term is supposed to be derived from Masulipatam, afterwards called Masulipatam, near Madras, from which place such fabrics were first exported to Europe. All the muslin used in Europe, until the early part of the present century, was manufactured in India. The excellence and durability of Indian muslins is not due to the superior quality of the cotton, but to the skill and patience of the spinners and weavers in India. The manufacture of muslin has increased greatly in this country, in consequence of improvements in this branch of industry; and we are now not only able to supply all the demand for it at home, but to export it to all parts of the world, even to the interior of India. Some of the muslins now made by machinery are extremely fine in their texture.

MUSSEL, *mus'-al* (*Mytilus edulis*, Linn.), a well-known mollusk, which is used among the lower class as a species of food, but which is more commonly consumed



MUSSEL.

as bait by fishermen. The shells are ovate-triangular, with a marginal cartilage, and sometimes one or two undeveloped teeth under the umbo. The common mus-

sel is very abundant both in this country and in the Mediterranean, as well as in the North Sea. They frequent mud-banks. It is stated in "A History of British Mollusca and their Shells," by Professor Forbes and Mr. Hanley, that about 400,000 mussels are consumed annually in Edinburgh and Leith, as an article of food, and 4,320,000 for bait. Besides the common mussels, there are also the *Horn Mussels*, distinguished from the former by their habit of digging and burrowing in the sands; besides several other varieties too numerous to mention individually.

MUSSULMAN, *mus'-sul-măn*, a Mohammedan, or follower of Mohammed. The word is derived from *Moslem*, of which it is the dual number, meaning "resigned to God." The appellation is generally said to have been first applied to the Saracens.

MUSTARD. (*See* SINAPIS.)

MUSTER, *mus'-ter* (Ger. *mustern*), in Mil., a collection of troops for review, parade, or exercise.

MUSTER-ROLL, a register of the officers and men in every regiment, troop, or company. This roll is delivered to the inspecting field-officer, or other official, who ascertains, by its means, the condition of the body of troops.

MUTE, *mūte* (Lat. *mutus*), in Law, is a person that stands dumb or speechless when he ought to answer or plead. A prisoner is said to stand mute when, being arraigned for treason or felony, he either (1) makes no answer at all, or (2) answers foreign to the purpose, and will not answer otherwise. In such cases, the ancient law was that a jury be empanelled to inquire whether the prisoner stood obstinately mute, or was mute by the act of God (*ex visitatione Dei*). If the latter appeared to be the case, then the judges were to proceed with the trial, and examine all the points as if he had pleaded not guilty; but, if found to be obstinately mute, then, in treason and in all misdemeanours, it was held as equivalent to conviction. Now, by 7 & 8 Geo. IV. c. 28, it is provided that if any person being arraigned upon, or charged with, any indictment or information for treason, felony, piracy, or misdemeanour, shall stand mute of malice, or will not answer directly to the indictment or information, then it shall be lawful for the court, if it shall so think fit, to order the proper officer to enter a plea of "not guilty," which shall have the same force and effect as if such person had actually pleaded the same. If there be reason to believe him to be insane, the question should be submitted to a jury, and if found to be so, then he shall be ordered by the court to be kept in strict custody till the royal pleasure be known.

MUTE, a small piece of brass, box, or ivory, somewhat resembling in shape a very short comb. When in use, it is placed in an erect position on the bridge of a violin, to deaden or soften the tone, which it does to such an extent as to render it almost inaudible in an adjoining room.

MUTINY. (*See* ARTICLES OF WAR; INQUIRY, COURT OF.)

MYLITTA, *mi-lit'-tă*, in Bot., a gen. of *Fungi*. *M. australis*, called the native bread of Australia, is an edible species, weighing from one to three pounds. It is commonly eaten by the natives. Other species are used in China for food and as medicines.

MYLODON, *mil'-lo-don* (Gr. *mule*, a mill; *odous*, a tooth), a gigantic fossil quadruped included under the family of extinct *Edentata*, by Owen called the *Megatheridæ*. The mylodon is closely allied to the megatherium, and among existing Edentata it holds a place between the ai and the great armadillo. Its food is said to have chiefly consisted of the leaves and tender shoots of forest trees, which the animal's gigantic strength enabled it to tear up by the roots. There have been three distinct species described,—*M. robustus*, *M. Darwinii*, *M. Harlani*. In 1841, an almost complete skeleton of *M. robustus* was discovered about twenty miles north of Buenos Ayres. This specimen is preserved in the museum of the Royal College of Surgeons.

MYOPORACEÆ, *mi-o-po-ra'-se-e*, in Bot., the *Myopora* fam., a nat. ord. of *Dicotyledones*, sub-class *Corollifloræ*. It is sometimes regarded as a subdivision of the *Verbenaceæ*, from which order it only differs essentially in having pendulous seeds and a superior radicle. The species are chiefly natives of the southern hemisphere. The bark of *Avicennia tomentosa*, the white mangrove, and other species, is much used in Brazil for tanning. The order includes but few useful plants.

MYOSOTIS, *mi-os-o'-tis* (Gr. *mus*, mouse; *otis*, the ear, its leaves being hairy, and growing like the ear of a mouse), a gen. of plants included in the nat. ord. *Boragineæ*. The calyx is five-parted, corolla salver-shaped, convolute in the bud; throat closed with scales; limb 5-fid, blunt. Stamen included; filaments very short; style simple. Nuts smooth, convex externally, keeled within, attached by a minute lateral spot near the base. Distinguished from all the other genera by a convolute corolla. Nearly fifty species have been described: eight species are to be met with in Britain. The species are annual or perennial, and are to be found in every quarter of the globe. *M. palustris*, the great water-scorpion grass, or forget-me-not, has the fruit-calyx open, teeth short, triangular, the pubescence of the stem usually spreading. A native of Europe, North America, and Asia, it is generally seen in England in ditches and watery places. It is a beautiful plant, with a large bright blue corolla, having a yellow eye, and, probably on account of its striking appearance, has received its name of forget-me-not. None of the species [illegible] used in the arts, or in medicine.—*Ref.* Babington's *British Botany*. (*See* BORAGINACEÆ.)

MYRIAGRAMME, *mir'-i-ă-gram* (Gr. *muria*, ten thousand; *gramma*, a gramma or weight), in the French system of weights and measures, as well as in the proposed metric system, is a weight of ten thousand grammes, or about 22½ lbs. (*See* METRIC SYSTEM.)

MYRIAMETRE, *mir'-i-ă-me'-tr* (Gr. *muria*, ten thousand; *metron*, measure), in the metric system, a measure of the length of ten thousand metres. (*See* METRIC SYSTEM.)

MYRIAPODA, *me-re-ăp'-o-dă* (Gr. *muria*, ten thousand; *podes*, feet), usually designated by the term *Centipedes*, have been classed by Cuvier in the first order of insects. They are the only animals of the order which possess more than six feet in their perfect state, and which have their abdomen not distinct from their trunk. Their body, destitute of wings, is composed of a number of rings, generally equal in size; each of which—a few of the first excepted—bears two pairs of feet, mostly terminated by a single hook; these annuli, or rings, are either entire or divided into two demi-segments, each bearing a pair of these organs, and one of these only exhibiting two stigmata. In general, the *Myriapoda* resemble little serpents or nereides, their feet being closely approximated to each other throughout the whole extent of the body. The form of these organs even extends to the parts of the mouth. The mandibles are bi-articulated, and immediately followed by a quadruple piece in the form of a lip, with articulated divisions resembling little feet, which, from its position, corresponds to the ligula of the crustacea. Next come two pairs of little feet, the second of which, in several, resemble large hooks, that appear to replace the two jaws as well as the lower lip of insects. The antennæ are two in number, and are short, somewhat thicker towards the extremity, or nearly filiform, and composed of seven joints in some: in others they are numerous and setaceous. Their visual organs are usually composed of a union of ocelli. The stigmata are very small, and their number, owing to that of the annuli, is usually greater than in the latter, where it never exceeds eighteen or twenty. The myriapoda are divided into two families by Cuvier; namely, the *Chilognatha* and the *Chilopoda*; the first of which move very slowly, that is, slide along, and roll themselves into a ball; while the latter possess speedier faculties of locomotion. The Chilognatha are divided by Linnæus into four classes; viz., *Glomeris*, *Iulus*, *Polydesmus*, and *Polyxenus*. The Chilopoda are divided into three classes; comprising *Scutigera*, *Lithobius*, and *Scolipendra*. (*See* also CENTIPEDE.)

MYRICA, *me-rī'-kă*, in Bot., the typical gen. of the nat. ord. *Myricaceæ*. The species *M. cerifera* is known by the names Waxberry, Candleberry, and Wax Myrtle; its fruits when boiled yield the kind of wax known in commerce as *myrtle wax*. The bark of the

root is extensively used in North America as a stimulant astringent in diarrhœa and dysentery. The fruit of *M. sapida* is eaten in Nepaul.

MYRICACEÆ, *me-ri-kai'-se-e*, in Bot., the Gale or Bog-myrtle fam., a nat. ord. of *Dicotyledones*, sub-class *Monochlamydeæ*. Shrubby plants, with alternate, simple, resinous-dotted leaves, and unisexual amentaceous flowers. Male flowers achlamydeous, with definite stamens. Female flowers with a 1-celled ovary, having 1 erect ovule. Fruit drupaceous. The plants of this order are natives of the temperate parts of Europe and North America, of the Cape of Good Hope, and of the tropical regions of South America and India. They are chiefly remarkable for aromatic and astringent properties, and for the waxy substances often contained in their fruits. (*See* MYRICA.)

MYRICARIA, *me-ri-kai'-re-a*, in Bot., a gen. of the nat. ord. *Tamaricaceæ*. *M. germanica* is a common ornamental shrub in our gardens.

MYRISTICA, *mi-ris'-ti-kà*, in Bot., the typical gen. of the nat. ord. *Myristicaceæ*. The most important species is *M. moschata* or *officinalis*, the nutmeg-tree. It is a native of the Moluccs Islands, but is now cultivated in many tropical regions. The well-known spices *nutmegs* and *mace* are derived from this species. The fruit is fleshy and pear-shaped, and commonly about the size of an ordinary peach; it contains a single seed, surrounded by a lacerated envelope, called an *arillode*, which is scarlet when fresh and yellow when dried. Beneath the arillode, which forms the spice called *mace*, we find a hard shell, and within this the nucleus of the seed. This nucleus, or the seed divested



MACE.



NUTMEG.

of its shell and arillode, is our commercial *nutmeg*. The fleshy pericarp is commonly used as a preserve. Nutmegs and mace are largely employed as condiments. They are both used in medicine as stimulants, carminatives, and flavouring agents. Nutmegs, when distilled with water, yield a volatile oil called *volatile* or *essential oil of nutmegs*. Mace treated in the same way yields a volatile oil of nearly similar properties. The substance called *expressed oil of mace, butter of nutmegs*, or *expressed* or *concrete oil of nutmegs*, imported from the Moluccas, is prepared by heating nutmegs and then submitting them to pressure. It consists of a small quantity of volatile oil mixed with two fatty substances. The nutmegs from *M. moschata* are frequently termed the *true* or *round nutmegs*, to distinguish them from those of an inferior quality obtained from other species. The *long* or *wild nutmegs* of commerce are said to be derived from *M. fatua* or *tomentosa*, and *M. malabarica*.

MYRISTICACEÆ, *mi-ris-te-kai'-se-e*, in Bot., the Nutmeg fam., a nat. ord. of *Dicotyledones*, sub-class *Monochlamydeæ*. Trees, with alternate, entire, exstipulate, stalked, and leathery leaves. Flowers declinous. Calyx leathery, 3—4-cleft; in the female flower, deciduous; æstivation valvate. Male flower with 3—12 stamens, or rarely more than 12; filaments distinct or monadelphous; anthers 2-celled, extrorse, distinct or united, with longitudinal dehiscence. Female flower of 1 carpel, or many carpels, each with 1 erect ovule. Fruit non-esculent, seed arillate, with copious oily fleshy albumen; embryo small, with an inferior radicle.

MYROBALANS. (*See* TERMINALIA.)





MYROSPERMUM, *mi-ros-per'-mum* (Gr. *muron*, myrrh; *sperma*, seed), in Bot., a gen. of balsamiferous trees, belonging to the nat. ord. *Leguminosæ*. The species are natives of South America and the West Indies. *M. toluiferum* is the source of balsam of Tolu, and *M. Pereiræ* that of balsam of Peru. The former product is chiefly imported from Carthagena in gourds and other vessels, usually in the solid state; the latter, which is of a viscid syrupy consistence, is imported from Sonsonate, in the state of St. Salvador, Guatemala. Both are obtained by making incisions in the bark of the trees. They are largely used in medicine for their stimulant and expectorant properties. Two other medicinal products are also derived from *M. Pereiræ*; namely, white balsam, which is obtained from the interior of the fruit and seed by cold pressure; and *balsamito*, or tincture of virgin balsam, which is made by digesting the fruit (deprived of its winged appendages) in rum.

MYRRH, *mir* (Arab. *murr*, Lat. myrrha), a fragrant, bitter, aromatic gum-resin, which occurs in tears of different sizes; they are reddish-brown, semi-transparent, brittle, of a shining fracture, and have a greasy appearance under the pestle. Notwithstanding the early knowledge of myrrh, there was no accurate account of the tree which yielded it until the return of Ehrenberg from his travels, during 1820-25, in various parts of Africa and Asia. The tree, of which he brought a specimen, is described, under the name of *Balsamodendron myrrha*, by Nees von Esenbeck. This plant was noticed and described by Humboldt in 1826. Myrrh flows from incisions made in the tree. It consists of resin and gum in proportions, stated by Pelletier as 31 of the former and 66 of the latter. In 1858, the imports of myrrh into this country were 364 cwt.

MYRSINACEÆ, *mir-sin-ai'-se-e* (Gr. *mursine*, myrtle), in Bot., a nat. ord. of *Dicotyledones*, sub-class *Corollifloræ*, consisting of trees or shrubby plants, with smooth, coriaceous, exstipulate leaves and small flowers. They are chiefly natives of the islands of the southern hemisphere. The greater number are unimportant in an economic sense. The fruit of *Myrsine africana* is used by the Abyssinians to mix with the barley given to their mules and asses. The seeds of *Theophrasta Jussiæi* are used in St. Domingo for making a kind of bread.

MYRTACEÆ, *mir-tai'-se-e* (Gr. *murtos*, the myrtle), in Bot., the Myrtle fam., a nat. ord. of *Dicotyledones*, sub-class *Calycifloræ*, consisting of about 1,300 species of trees and shrubs, having the following characters:—Leaves opposite or alternate, entire, exstipulate, usually dotted, and having a vein running just within the margin; calyx superior, 4 or 5-cleft, valvate; petals 4—5, imbricated, rarely absent; stamens usually 8—10, or numerous, rarely 4—5; filaments distinct or polyadelphous; anthers ovate; ovary inferior, 1—6-celled; style and stigma simple; placentæ axile or very rarely parietal. Fruit dry or succulent, dehiscent or indehiscent. Seeds without albumen, usually numerous. The *Myrtaceæ* are natives of the tropics and of the warmer regions of the temperate zones. They are generally remarkable for pungent and aromatic properties, due to the presence of a volatile oil. The fruits of some are edible, as the *pomegranate* and the *guava*. Among the useful products of the order are the well-known spices *cloves* and *allspice*, and the medicinal agents *cajeput oil* and *Botany Bay kino*.

MYRTEÆ, *mir-te'-e*, in Bot., a tribe of the nat. ord. *Myrtaceæ*, distinguished by the fruit being baccate. The other tribe, called *Leptospermeæ*, is characterized by capsular fruit.

MYRTLE. (*See* MYRTUS.)

MYRTLE-BIRD, a bird belonging to the *Sylvicolidæ*, a gen. of the dentirostral tribe of the order *Passeres*. It has a beak extremely straight and slender, and sharp-pointed, with the upper mandible notched towards the point. As the myrtle-birds are somewhat migratory in their habits, they pass from one part of the country to another, according to the seasons. Their food consists of insects and soft fruits, and they are natives of the United States of America. The plumage of this species is black and yellow, spotted with white, and the bird is between five and six inches long.

*Myrtus, mir'-tus* (Gr. *murtos*), in Bot., the typical gen. of the nat. ord. *Myrtaceæ*. *M. communis*, the common myrtle, is the most northern species of that order. It was originally a native of Persia, but is now naturalized in the south of Europe. Its dried flower-buds and unripe fruits were used as spices by the ancients, and are still so employed in Tuscany. The agreeable perfume known as *eau d'ange* is prepared by distilling myrtle-flowers with water.

Mysteries. (*See* Moralities.)

Mysteries, Eleusinian. (*See* Eleusinian Mysteries.)

Mystics, *mis'-tik* (Lat. *mysticus*, a mystic), a sect of Christians which arose in the 2nd century. The system of the Mystics proceeded upon the known doctrine of the Platonic school, which was also adopted by Origen and his disciples, that the divine nature was diffused through the human soul, or that the faculty of reason was an emanation from God into the human soul, and comprehended in it the principles and elements of all truth, human and divine. They denied that men could excite this celestial flame by labour or study; but they maintained that silence, tranquillity, repose, and solitude, accompanied by such acts as might tend to exhaust and attenuate the body, were the means by which the hidden and internal word was excited to produce its latent virtues and to instruct men in the knowledge of divine things. The Mystics increased in number in the 4th century, under the influence of a Greek fanatic, who gave himself out to be Dionysius the Areopagite, one of St. Paul's converts (Acts xvii. 34). A copy of the pretended works of Dionysius was sent by Balbus to Louis the Meek, A.D. 824, which kindled the flame of Mysticism in the western provinces, and filled the Latins with the most enthusiastic admiration of this new system. In the 12th century the Mystics took the lead in their method of expounding the Scriptures; in the 13th they were the most formidable antagonists of the schoolmen; and towards the close of 14th many of them resided and propagated their tenets in almost every part of Europe. In the 15th century they had many persons of distinguished merit in their number; and in the 16th, previous to the Reformation, if any sparks of real piety subsisted under the despotic empire of superstition, they were chiefly to be found among the Mystics. In the 17th century, the radical principle of Mysticism was adopted by many descriptions of religionists without being confined to any particular denomination of Christians. Among the number of Mystics may be mentioned many singular characters, especially Behmen, a shoemaker at Görlitz, in Germany; Molinos, a Spanish priest in the 17th century; Madame Guion, a French lady, who made a great noise in the religious world; and the celebrated Madame Bourignon, who wrote a work entitled "The Light of the World," which is full of mystic extravagances. Fenelon also harboured similar sentiments, for which he was reprimanded by the pope. The Mystics were called *Quietists* in the 17th century.

Mythology, *mi-thol'-o-je* (Gr. *muthos*, a tradition, a fable, and *logos*, a discourse), a term which originally signified any fabulous doctrine. In a more general sense, it now means the whole body of the traditions of a nation respecting its gods or fabulous heroes. The student of history often finds it difficult to distinguish at what time the mythology of a nation may be said to cease, and its true history to begin. Fable is a creation of the human imagination, and derives its origin from that love of the marvellous which is in a manner congenial to mankind. The ordinary events and appearances of nature are too obvious and uninteresting either to gratify curiosity or excite admiration. Hence that powerful propensity in our nature towards the new and surprising, animated by the delight with which the contemplation of them is generally attended, was eagerly laid hold of by legislators, philosophers, theologists, poets, and musicians. Each of these in their turn made use of the fabulous to convey his instructions to the savage tribes. From this arose the allegorical taste of the ancients, and especially of the primary sages of the East. The almost universal propensity towards personification among the Orientals was another fruitful source of fable and allegory. The practice of personifying virtues, vices, religious and moral affections, was necessary to support that allegorical style which universally prevailed in those countries. The first persons, probably who reduced mythology to a kind of system were the Pagan priests, especially those of Egypt. Those priests monopolised all the religion and all the learning, as well as all the arts and sciences, of the country. In order, therefore, to keep the laity in subjection, besides preventing all intellectual improvement, they performed all the ministrations of religion in an unknown tongue, and covered them with a thick veil of fable and allegory. The Ethiopian language became their sacred and mystic language, and hieroglyphics their sacred character. It is singular, however, that in the earliest and most unpolished state of society, the Chinese and Egyptians, the two most ancient nations whose annals have reached our times, were totally unacquainted with fabulous details in the most early and least improved stages of their respective monarchies. As soon as the authentic tradition of the origin of the universe was lost or adulterated by the inventions of men, then fable and fiction began to prevail. In the Chinese mythology, the foundation of their empire was effected about 4,000 years ago, by Fohe or Fohi. This personage was in shape half a man and half a serpent, and to him is ascribed the invention of all the useful arts. In the same manner the Indians ascribe every invention to Budha, or Vishnu, the Japanese to Foe; the Persians to Zerdusht or Zoroaster; the Chaldeans to their man of the sea, Oannes; the Egyptians to Thoth or Thyoth; the Phœnicians to Melicerta; the Greeks to the family of the Titans; and the Scandinavians to Odin. The worship of the idol Foe, together with the doctrine of the transmigration of souls, was transported from India to China in the 56th year of the Christian era. The worship of Foe, once introduced, made a rapid progress over China, Tartary, Siam, Japan, &c. The priests of Foe are called among the Tartars, *Lamas*; among the Siamese, *Talapoins*; by the Chinese, *Ha-Chang*; and by the Japanese, *Bonzes*. An infinitude of fables was invented and propagated by the disciples of Foe, concerning the life and adventures of their master, many of which are absurd and ridiculous, and many others impious and profane. Although the Hindoos appear in the earliest records to have worshipped one god, yet idolatry soon spread over the land. (*See* Hindooism.) The mythology of the Hindoos was surpassed in extravagance by that of the Persians. The adventures of the Persian heroes, however, are full of wild achievements, which bear a resemblance to those recorded of the knights of Gothic romance. The doctrine of enchantments, transformations, and the like, exhibited in both, is a characteristic symptom of one common source. Oannes, the great civiliser and legislator of the Chaldeans, according to Apollodorus, was an amphibious animal of a very extraordinary appearance. His whole body resembled a fish. He was endowed with reason, and conversed with men during the day; but at night he plunged into the sea, and remained there till morning. By him the Babylonians were instructed in the use of letters and the knowledge of all the arts and sciences. The nativity of Venus, the goddess of beauty and love, is another piece of mythology famous among the Chaldeans. It is said that an egg of prodigious size fell from heaven into the river Euphrates; some doves settled upon this egg after the fishes had rolled it to the bank. In a short time the egg produced Venus; and in consequence of the tradition, doves and fishes were considered sacred to the goddess. Amongst the Egyptians, mythology was inseparably mixed up with idolatry and theology. One of the most singular parts of their mythological creed was the representation of certain of their deities by means of brute animals. Hence, Jupiter Ammon was represented under the figure of a ram; Apis under that of a cow; Osiris, of a bull; Pan, of a goat; Thoth, or Mercury, of an ibis; Bubastis, or Diana, of a cat. The Grecian mythology was derived from that of the Egyptians and Phœnicians. The adventures of Jupiter, Juno, Mercury, Apollo, Diana, Mars, Minerva or Pallas, Venus, Bacchus, Ceres, Proserpine, Pluto, Neptune, and other descendants and coadjutors of the Titans, furnish the largest portion of the Grecian mythology. It seems probable that the Phœnicians, then an enlightened and civilized

people, settled in Crete about the time of Moses. The inhabitants of Greece were then a nation of savages, and the arts and inventions, the religion, laws, &c., which the new-comers introduced, so strongly affected the enthusiastic Greeks, that they bestowed divine honours upon them. From this cause arose the inconsistent and irreconcilable fictions of the Greek poets, and the mixture of mightiness and meanness which is displayed in the characters of the *Iliad* and *Odyssey*. The Roman mythology was borrowed from the Greeks, with the exception of some slight fables from the Pelasgi and others. The mythology of the Celtic nations is almost entirely lost. Among the natives of northern Europe, the Norwegians, Danes, Swedes, and Icelanders, the mythology is very curious and interesting. In the Edda and Voluspa is contained a collection of fables which have not the slightest resemblance to those of the Greeks or Romans. They are more of an oriental nature, and seem to have more affinity with those of the Persians before alluded to. (*See* EDDA, HEIMSKRINGLA.) Odin or Othin, Woden or Wadon, was the supreme divinity of these people, and his exploits and adventures furnish the greater part of their mythology. He is represented as the god of battles, and as slaughtering thousands at a blow. (*See* SCANDINAVIAN MYTHOLOGY.) Several theories have been brought forward to account for the origin of mythology, but these may be all divided into four classes:—1. The Scriptural theory, according to which all mythological legends are derived from the facts contained in the Scripture narratives, though the real facts have been disguised and altered.—2. The historical theory, according to which all mythological personages were formerly real human beings, and the fabulous legends merely the additions and embellishments of later times.—3. The allegorical theory, according to which all the myths of the ancients were allegorical and symbolical, and contained some moral, religious, or philosophical truth.—4. The physical theory, according to which the natural elements, fire, air, earth, &c., were originally the objects of religious worship, and the principal deities were personifications of the powers of nature. Not one of these theories by itself is able to account for all the mythology of a nation; but by borrowing from each, a system is obtained which goes deeper than any.—*Ref.* Müller's *Essay on Comparative Mythology*, in Oxford Essays; Kavanagh's *Myths traced to their Primary Source through Language*; Keightley's *Mythology of Ancient Greece and Italy*.

# N.

N, *en*, is a liquid consonant, or semivowel, the fourteenth letter and eleventh consonant of the English alphabet. It is formed by placing the point of the tongue against the root of the upper teeth, and emitting the sound principally through the nose. It is thus a lingual-nasal letter when not affected by the neighbouring consonants. When final after *m* or *l*, it is silent in English; as in *condemn*, *kiln*. This letter readily unites with others, and is frequently omitted or inserted between other letters. In composition, the Latins frequently changed *n* before *p*, *b*, and *m*, into *m*; as in *imprimis*, *imbellis*, *immigrare*; and frequently into *l* and *r* before these letters; as *illudo*, *irrigo*. It is often found associated with the labials *d* and *t*, while in other idioms it is omitted in the corresponding words; as in Latin *findo*, *fidi*; *insula*, Ital. *isola*. It is frequently dropped at the beginning or end of words; thus, *nadder* has become *adder*; Lat. *ordon*, *ordo*. The Latins omitted the *n* from Greek words ending in *on*; as *leon*, *leo*. The Greeks, on the other hand, added an *n* to Latin words which they adopted. It is often interchangeable with *l* or *m*. It is sometimes silent, or dropped, before *s* and *n*, as well as *t* and *th*; as in *censor*, *cesor*; *conventus*, *consent*; *contemporary*, *cotemporary*. Among the ancients, N, as a numeral, denoted 900, and with a dash over it (N̄) 9,000.

NABOB, *nā-bŏb'*, a corruption of the Hindustani word *nuwaab*, which was the title of the governor of a province under the Mogul empire; such as the Nawaab of Arcot, of Oude, &c. During the decline of the empire, several of these governors gradually assumed an independent sovereignty, and became either allies or dependents on the East-India Company's government. The title of nabob, however, is borne by many persons as a mere titular appendage. In England, the word nabob has become proverbial, and is used to signify a person who has acquired great wealth in Hindostan, or lives with peculiar splendour.

NADIR, *nā'-dir* (Arab.).—In Astron., that point of the heavens which is directly over the head of the observer, coinciding with the direction of the vertical, is called the *zenith*; the point corresponding to the prolongation of the vertical in the opposite direction is called the *nadir*. The zenith and nadir are the two poles of the horizon.

NAG-KASSAR (*See* MESUA.)

NAHUM, BOOK OF, *nai'-hum*, is one of the minor prophetical books of the Old Testament, the author of which is believed to have flourished towards the close of Hezekiah's reign, about 705 B.C. The subject of the book is "the burden of Nineveh," *i. e.*, the destruction of Nineveh and the Assyrian empire, as the punishment of its wickedness and oppression. It commences with a sublime description of the justice and power of God, showing how terrible he is to his enemies; then follows an account of the sufferings of Nineveh, until it is utterly destroyed. In freshness and graphic power this author is not behind any of the other minor prophets. He gives evidence of a rich and lively imagination, and his figures are abundant and appropriate: the language is classical throughout. "His prophecy," says Bishop Lowth, "forms a regular and perfect poem; the exordium is not merely magnificent, it is truly majestic; the preparation for the destruction of Nineveh, and the description of its downfall and desolation, are expressed in the most vivid colours, and are bold and luminous in the highest degree."—*Ref.* Horne's *Introduction to the Holy Scriptures*.

NAIADACEÆ, *nai-yā-dai'-se-e*, in Bot., the Pondweed fam., a nat. ord. of *Monocotyledones*, sub-class *Petaloideæ*, consisting of aquatic plants, with jointed stems and inconspicuous unisexual flowers. They have no known uses.

NAIL, NAIL MANUFACTURE, *nail* (Sax. *nægel*), a small pointed piece of metal, generally with a head, to be driven into a board or other piece of timber, and serving to fasten it to other timber. Until a comparatively recent date, nails were made only by hand, but are now largely manufactured by machinery. The making of hand-made, or *wrought nails*, usually retains the character of a domestic manufacture, and forms the employment of a class of blacksmiths, called nailors, who are frequently assisted by the female members of their families. The iron is received by the nailor in the shape of narrow square rods, varying in size according to the kind of nail to be forged from them. The ends of several of these rods are put into the fire at once. When properly heated, one is withdrawn and forged on a steel anvil to a fine tapering point. The pointed end is then cut off at the proper length. In making some kinds of nails, this operation completes the nail, as in horse-shoe nails; but in most cases a subsequent process is necessary in order to form the head. In order to effect this, the red-hot nail is dropped, point downwards, into a hole, in an instrument called a *bore*. The hole fits the upper or thicker part of the nail, so that when dropped into it, a few well-directed blows of the hammer upon the projecting end of the spike or nail, converts it into a head of the required shape. Some nailors acquire great dexterity in their craft. One man has been known to make 34,000 flooring nails in a fortnight, which would require on an average 1,030,666 strokes of the hammer. *Cast nails* have long been used for the same purposes as wrought nails. Although they are much cheaper, they are so clumsy and brittle that they can only be used for a few coarse purposes, as in plasterer's work and the nailing up of fruit-trees. For certain kinds of wood-work, however, a very valuable kind of cast nail, made from a pure metal called malleable cast iron, is now employed. They are, however, as soft as copper, and therefore not suitable for use in hard wood. On account of the cost-

peratively high price of wrought nails, and the insufficiency of cast nails as a substitute for them, many ingenious machines have been invented for forming nails by cutting or stamping out of plates or rods of wrought iron. The first machine for nail-making was contrived by Mr. Trench, of Wimborne, Staffordshire, in 1790. In it, labour was saved by working the hammers by water power. In 1810, a machine was invented in America by which nails were cut and headed at one operation, at the rate of more than 100 per minute. In the ordinary process of nail-cutting at the present day, the nails are cut from sheet iron, of suitable breadth and thickness. The end of the plate is presented to the nail-machine by a workman, who turns the plate over once for every nail. The machine has a rapid reciprocating motion, and cuts off at every stroke a wedge-shaped piece of iron, constituting a nail without a head. When a head is required, the nail in this form is caught at its largest end, and compressed between *gripes*. At the same time, a strong force is applied to a die at the extremity, which spreads the iron sufficiently to form a head to the nail. The great seat of the nail manufacture is at Birmingham. Wrought nails are made in the villages round about that town, and cut nails are produced in large factories by steam power. A short time ago it was estimated that 25,000 persons were engaged in this country in the manufacture of nails. Some of the Birmingham establishments produce 40,000,000 cut nails per week.

NAILS, in Nat. Hist., are the appendages to the fingers and toes of human beings and the quadrumana, which correspond with the claws and hoofs of other animals. The nails are an altered form of the epidermis or outward layer of the skin. Under the microscope, a portion of newly-formed nail is found to consist almost entirely of nucleated cells, which are of exactly the same character as those found in the new layers of epidermal tissue. No distinct structure can be observed as the nail grows older, but when immersed in a weak solution of caustic potash or soda, the cells become visible. The nails of a human being are produced from a fold in the true skin, which has a highly vascular surface, furnished with longitudinal elevated *ridges*, to which blood-vessels are copiously distributed, and between which the soft inner layer of the nail drops down. The growth of the nail is caused by additions to its base; but as it moves, it also receives additional matter from the skin, on which it rests. According to M. Beau, the condition of the nails may be made subservient to the diagnosis of disease. When a nail is injured, it is speedily reproduced, except when the skin beneath has been destroyed.

NAMES, *naimez* (Sax. *nama*, a name; Lat. *nomen*). —A name is that by which anything is called. (*See* NOUN.) When names denote individual objects, such as countries, rivers, towns, men, &c., they are called *proper* or *appropriate* names. More usually, however, the term proper name is applied to those of men. Amongst the Greeks, with the exception of a few families at Athens and Sparta, there were no family names. Among the Romans, each person had three names: first, the *prænomen*, or distinction of the individual; second, the *nomen*, or name of the clan; and third, the *cognomen*, or family name. A surname was sometimes added, which was borrowed from some exploit or remarkable event; as in the case of Scipio Africanus. The *prænomen* was always placed first, and usually written with one or two letters; as M. Marcus, C. Caius, P. Publius, &c. The *nomen* was second; as Julius Fabius, for the Julian and Fabian clan. The *cognomen* came last; as Cæsar, Cicero. Thus, in the name of M. Tullius Cicero, M. is the prænomen, distinguishing him from his brother Quintus; Tullius the nomen, distinguishing the clan; and the cognomen Cicero, which shows the family. Among the Celtic and Germen nations, each person was denoted by one word. This was also the case in the early and primitive states of society. Among the ancient Hebrews, the names of Abraham, Aaron, David, Solomon, were employed individually and singly. In the other nations which preceded European civilization, the same feature is to be observed. One word denoted one person in Egypt, Syria, and Persia. Amongst the Saxons in this country, this primitive system was prevalent not only when they were first established, but during the whole period when they held dominion in Britain. The names of Alfred, Harold, Edwin, &c., each signified a single individual. At the present day, the system of personal nomenclature is to have one name for the individual prefixed to another name which distinguishes the family to which he belongs. Probably one of the oldest methods of distinguishing different individuals of the same name was by adding their father's name to their own. Hence originated many English, Danish, and German names which end in *son*, *sohn*, and *sen*; for example, Williamson, Andersohn, Thorwaldsen. With feudalism in this country, new names were introduced, derived from the districts conferred on the nobles, or from the feudal relations. Another class of names are those of locality, which are either derived from places of generic names, as Hill, Dale, Cliff, &c., or from some specific place, as Burton, Tenby, &c. Everywhere the nobility had family names before the commoners. But amongst the latter is a class of names derived from their occupation and trades; such as Smith, Miller, Fisher, Barber, &c. The number of this class is very great, and includes the names of several lost trades, or trades which have changed their names: thus we have Furbisher, Foster, Fletcher, Pargitter, Taverner, Webster, Page, Reeve, &c. Sometimes striking external peculiarities or mental qualities have given origin to names, which have descended to the posterity of those on whom they were bestowed: such are Swift, Brown, Long, White, Black, Good, Wise, and others. Although the population of this country has increased very greatly, the number of Christian names has rather decreased than otherwise. There are only 53 names of men which can be used without some appearance of singularity. Of these there are 25 of Hebrew origin, 19 derived from the dialects of Western Europe, 5 from the Greek, and 4 from the Latin. Out of the whole there are twelve more in use than any others: these are, Charles, Edward, Francis, George, Henry, James, John, Richard, Robert, Samuel, Thomas, and William.—Ref. *English Cyclopædia*—article Names (Proper); and M. A. Lower's *Essay on Surnames*.

NANKEEN, *năn-keen'* (Chinese), a species of cotton cloth, of a fine texture, and usually of a yellow colour, imported from China. It takes its name from the city of Nankin, where large quantities of it are manufactured. It derives its colour from the peculiar hue of the cotton from which it is made (*Gossypium religiosum*), and not from the use of any dye. A white cloth, of similar texture, called *white nankeen*, is also imported from China. Formerly, nankeen cloth was much used in this country for making gentlemen's summer clothing; it has, however, been supplanted by better fabrics, manufactured at home for a lower price.

NANTES, EDICT OF. (*See* EDICT.)

NAPHTHA, *năf'-thă* (Gr.).—This name is somewhat loosely applied to three different substances: *Mineral naphtha*, or petroleum, which is a mixture of different hydrocarbons; liquid and solid *coal-tar naphtha*, which is obtained from the dry distillation of coal, and resembles the preceding in its composition and properties: and *wood-naphtha*, or *pyroxylic spirit*, which is methylic alcohol more or less contaminated with tarry matter.

NAPHTHALIN, *năf'-thă-lin*, in Chem. ($C_{20}H_8$), one of the innumerable constituents of coal-tar, more especially if obtained from the London gas-works. It forms thin flaky crystals, consisting of rhombic plates, and has an unctuous feel and pearly lustre. It has a peculiar odour and a biting taste. It gradually sublimes at ordinary temperatures, fuses at 174° Fahr., and boils at 428° Fahr. It is insoluble in water, but readily so in alcohol, ether, turpentine, and the fixed oils. The study of its different compounds by Laurent and others has thrown very great light upon the substitution theory. Being in some measure related to aniline, or rather to benzole, great efforts have been made by various chemists to obtain colours from it, but hitherto with but little success. The researches of Roussin and others appear, however, to point out a singular relation between naphthalin and alizarin, the colouring matter of madder.

NAPIER'S RODS or BONES, a set of rods, contrived

by Baron Napier, the inventor of the logarithmic table, for the purpose of facilitating the operations of multiplication and division in arithmetic. They consist of pieces of bone or ivory, in the shape of a parallelopipedon, about 3 inches long and $\frac{1}{4}$ of an inch in width, the faces of each being divided into squares, which are again subdivided, on ten of the rods, into triangles, by means of diagonals, except the squares at the upper ends of the rods; and these spaces are marked like the top horizontal line and left-hand perpendicular line of a multiplication table. When a number is wanted to be multiplied, the rods must be so disposed that the top line represents the multiplicand, and the left hand the rod of units. By selecting, then, the sum of numbers in the different parallelograms on a line with the figures of the multiplier, and setting them down as in ordinary multiplication, the product will be obtained with but little difficulty; only it must be remembered that we take the figures from the right-hand side, and not, as usually, from the left. For instance, if we wanted to multiply 5978 by 937, we would dispose the rods in such a manner that the top lines would consist of the figures 5978; while perpendicularly, on the left-hand side, would be the numbers 1, 2, 3, &c., up to 9. Then selecting first the sum of figures which do not exceed two in the different parallelograms formed by the rods for the figure 7 (the multiplier), taking them, as before stated, from right to left, we put them down in the top line; they amount to 41846. Next we take the parallelograms on the line of the figure 3, the middle figure of the multiplier: these, we find, amount to 17934. Lastly we take the parallelograms on a line with the figure 9, the first in the multipliers, and these make the numbers 53802. Now adding all these together, thus:—

41846
17934
53802

We obtain the result 5601386 as the product of the two numbers 5978 × 937. Although curious, this contrivance is, however, tedious to work, and consequently the results can as easily be obtained by a ready reckoner from the simple rules of multiplication.

NAPOLEON, CODE. (*See* CODE.)

NARCOTICS, *nar-kot'-iks* (Gr. *narke*, stupor), medicines which in small or moderate doses produce temporary excitement, which is generally followed by sleep. Most narcotics have a degree of stimulating power, and this is manifested principally when they are given in small doses, while a full dose generally produces the narcotic effect at once, without any apparent stimulation preceding it. Considerable skill and experience are required in the administration of narcotics, both as regards the cases in which they are to be prescribed and the persons to whom they are to be given. Billing, in his "First Principles of Medicine," says: "Narcotics must be distinguished from stimulants on the one hand, and from sedatives on the other; and the distinction is the more necessary, because, in nature, the narcotic principle is generally combined with one or the other of these: hence the contradictory and unsatisfactory reports of the value of different narcotic remedies, and the difficulty experienced in their application by those who do not know the reason why opium suits one case, hyoscyamus another." A full dose of a narcotic introduced into the stomach will, if the stomach be empty, destroy the desire for food; while, if it contains food, the digestive process is suspended or rendered slower. Their continued or frequent use is therefore injurious to the nutrition of the body, as instanced in the persons of the oriental opium-eaters. The general action of narcotics is modified by a great variety of circumstances, such as the quantity prescribed, the frequency of repetition, also the force of habit, climate, or season, and above all by idiosyncrasy. The amount of action is also largely determined by the age of the person taking the narcotic. To this class of medicines belong opium, hemlock, henbane, belladonna, aconite, stramonium, camphor, digitalis, tobacco, alcohol, ether, nux vomica, leopard's-bane, hop, strong-scented lettuce, and a variety of other substances. Prussic acid has been by some considered as a narcotic, but it does not seem properly referable to this class. It appears, rather, to be a direct sedative, and never to exert any stimulating power.

NARCOTINE, *nar-ko-teen'*, one of the opium alkaloids (which *see*). From not possessing any narcotic properties, as it was formerly supposed, this alkaloid is now called "Anarcotine."

NARDOSTACHYS, *nar-dos'-tā-kis* (Gr.), in Bot., a genus of the nat. ord. *Valerianaceæ*. The species *N. jatamansi* is the true *spikenard* of the ancients, called *nard* by the Hebrews, and *nardos* by the Greeks. It is much esteemed by the Hindoos as a perfume, and also as a remedial agent in epilepsy and hysteria. Its root is supposed to constitute the *sumbul*, or *musk-root*, which is imported into this country from Bombay and Russia. This root has powerful stimulant and antispasmodic properties, and is employed medicinally.

NARWHAL. (*See* WHALE.)

NASCENT CONDITION, *nās'-ent* (Lat. *nascor*, I am born).—Oxygen, chlorine, and many other substances, when in the act of being eliminated from other bodies, manifest more energetic affinities than they show when obtained in an isolated form. For instance, chlorine and cyanogen do not enter directly into combination; but if cyanide of mercury be decomposed by chlorine, the nascent cyanogen will immediately combine with it to form chloride of cyanogen.

NASMYTH HAMMER, *nā'-smith*, is a powerful steam hammer invented by Mr. James Nasmyth in 1833. To the Nasmyth hammer we are indebted for the manufacture and welding of iron upon a scale previously unknown to the workers in that metal. An engine-shaft having been projected a few inches thicker than had ever previously been made, no hammer in England was capable of forging it. The projectors having informed Mr. Nasmyth of this, his attention was drawn to the subject. The result was the rapid production of one of the most perfect of artificial machines, and noblest triumphs of mind over matter, that modern engineering has perhaps developed. The Nasmyth hammer consists of an inverted cylinder, through which a piston-rod passes, attached to the hammer-blade by means of bars and a cross key, which press upon an elastic packing to soften the blow of the hammer, which in heavy forgings and heavy blows, operates severely on the piston-rod. In its vertical descent, the hammer-block is guided by two planed guides or projections, extending the length of the side standards, between which the hammer-block slides. The attendant gives motion to the hammer by admitting steam from the boiler to act upon the underside of the piston. The length of stroke being regulated, the hammer is raised, and then allowed to descend by its gravity upon the work on the anvil, with an energy proportional to the height of the fall. By these simple means there is no practical inconvenience in supplying the power to raise a hammer-block of five or six tons weight to an elevation of seven or eight feet above the anvil. Some idea may therefore be formed of the vast energy of the blows given out by such a mass of metal falling rapidly through so large a space, and discharging the whole of its *momentum* on the work placed on the anvil below. By means of a *trigger*, the attendant can regulate the motion of the hammer with great accuracy. All blows can be stopped through the interception of fresh steam by means of this *trigger*, so as to make the hammer either not strike, or strike most gently. Thus a small nail may be driven home and neatly finished with repeated taps, or a nut cracked without injury to the kernel, by means of this mass, the free descent of which is able to dash a three-inch plank into splinters. No other machine, not even the smallest hand-hammer, is so brought into thorough control.

NASTURTIUM, *nās'-tur'-she-um* (Lat.), in Bot., a genus of the nat. ord. *Cruciferæ*. *N. officinale* is the common water-cress, one of the most wholesome of our popular salad vegetables. It has remarkable antiscorbutic properties, and is interesting in a chemical point of view from containing iodine. The name *Nasturtium* is commonly given to *Tropæolum majus*, the Indian cress, a showy and useful garden plant. (*See* TROPÆOLUM.)

NATATORES, *nā-tā-to'-rees* (from *nato*, I swim), a name applied in Nat. Hist. to such birds as are web-footed, and otherwise adapted to lead an aquatic life.

The order includes no less than five different families, which may be here mentioned; namely, the *Anatidæ*, or ducks; the *Colymbidæ*, or divers; the *Alcidæ*, or auks; the *Laridæ*, or gulls; and the *Pelecanidæ*, or pelicans; all of which will be found fully described under their different headings. Birds of this class vary greatly both in the size of their wings and powers of flight, and they are all easily distinguishable from the rest of the feathered tribes, on account of the peculiar structure of their feet, which are invariably webbed. A thick coat of down also covers the bodies of *natatores* beneath their plumage, and an oily secretion covers the feathers, and saves them from getting wet.

NATIONAL ASSEMBLY. (*See* ASSEMBLY, NATIONAL.)

NATIONAL DEBT, in Pol. Econ., is the debt owing by a nation or state. In this country the national debt has arisen since the time of the Revolution; for though it was customary for the earlier kings to borrow money upon emergencies, the revenues of the crown were pledged for the amount, and which was usually repaid in a few years. The first loans were of the nature of terminable annuities, and in 1693 an act was passed authorising the borrowing of a million on life annuities of 10 per cent. till 1700, and during the lives of the surviving creditors at 7 per cent. In the following year the first loan of a permanent character was effected on the occasion of the chartering of the Bank of England, when its capital of £1,200,000 was lent to government at 8 per cent. interest. The expensive continental wars in which we were then engaged rapidly increased the national debt; so that at the death of William III., in 1702, it amounted to £16,394,702. During the reign of Queen Anne, it was increased by nearly thirty-eight millions; so that at the accession of George I., in 1714, it amounted to £54,145,863. During the reign of George I., this sum was reduced by £2,053,125. From the accession of George II., in 1727, to the peace of Paris, in 1763, a sum of £36,773,192 was added to it. The twelve years' peace which intervened between this and the commencement of the American war, in 1775, enabled upwards of ten millions of this sum to be paid off. The American war added to it not less than £121,267,993; so that at its conclusion, in 1784, it amounted to £249,851,628. During the peace which followed, till the commencement of the French war, in 1793, about ten and a half millions were paid off; but the French war involved us in a debt of upwards of six hundred millions; so that at the conclusion of the war (Jan. 5, 1816), the unredeemed national debt amounted to £885,186,324. Since that time considerable efforts have been made to reduce the debt by employing for that purpose the surplus revenue; but, on the other hand, several large additions have been made to it. Thus, a grant of £20,000,000 was voted by parliament as compensation to the owners of slaves emancipated in the British colonies by the act of 1833; and the Crimean war occasioned an expenditure that created a loan for another £30,000,000. In 1841 the total amount of debt was £788,447,000, and in 1859 it was £866,078,554. At the end of 1861 the total amount of the national debt was £799,940,807, of which £784,420,007 was funded and £15,529,800 was unfunded. Owing partly, perhaps, to the scarcity of money at the time, but more to want of confidence in the security of the government, the rate of interest paid at first was comparatively high; but as the country became richer, and the confidence in the stability of the government was increased, the rate was proportionally reduced. During the reigns of William III. and Anne, it varied greatly; but in that of George II. a different system was adopted. Instead of the interest upon the loan varying according to the value of money at the time, the rate of interest was fixed, generally at 3 or 3½ per cent., and the amount of the principal sum was made to depend upon the value of money. Thus, if the value of money was 4½ per cent., they gave the lender £150 at 3 per cent. for every £100 advanced. In this way, the national debt at present is nearly two-fifths more than the sum actually advanced by the lenders. One of the great disadvantages of this system is that the government is permanently saddled with the high rate of interest at which it is usually obliged to borrow money. Thus if, when money is at 4½ per cent., it gives £150 stock for £100, it is still





paying 3 per cent. on £100, when the value of money may be only 2½ or 3 per cent.—(Ref. *Edinburgh Review*, No. 93.) A scheme for the gradual extinction of the national debt, by means of a sinking fund, was first proposed and partially carried out by Sir Robert Walpole, in 1716; but it was more perfectly developed and carried out by Mr. Pitt, in 1786. The plan was, to set aside a certain sum annually to buy up stock, the dividends on which were afterwards to be uniformly applied to the same object; so that in this way, it was believed, the entire national debt would gradually be swept away. The fallacy of the scheme was that the sums devoted to it were borrowed for the purpose. The system, which cost the country not a few millions of money, was not entirely swept away till 1829, when it was enacted (10 Geo. IV. c. 27) that the sum applicable in future to the reduction of the national debt should be the surplus, if any, of the total revenue over the expenditure of the country. For interest and management of both funded and unfunded debt, there was paid, in 1861, £26,090,360, which was less than that of 1860 by £743,210, the total debt being decreased by £1,527,834. The national debt is part funded and part unfunded; the former being what is secured to the creditors upon the public funds; the latter being not so secured, but generally raised by exchequer bills (which are , and of comparatively small amount. The funded debt is in the form of annuities granted by parliament in perpetuity, and affording a certain rate of interest upon the principal sum due. Though the annuitants have no right to call for payment of the principal, yet the government has a right to insist upon making the payment whenever it may find itself in a condition to do so. These annuities are denominated the public funds, and are not only transferable by the holder, but pass by law to his representatives, as personal property. At first the sums which constitute the national debt were advanced upon the security of some particular tax; but in 1751 an act was passed *consolidating* several stocks bearing an interest of 3 per cent. into one general stock. Thus was formed what is known as the *Three per cent. Consols*, or *Consolidated Annuities*, which now constitute by much the largest portion of the national debt, amounting to about four hundred millions. The *Three per cent. Reduced Annuities* arose in 1757, being formed, as the name implies, of several funds, which had been previously borrowed at a higher rate of interest. The amount is now about one hundred and fifteen millions. The *New Annuities* were formed in 1844, by 7 Vict. c. 4 & 5, which directed certain of the then existing stocks to be converted into a new stock bearing interest at 3½ per cent., till 1854, when it was to be reduced to 3 per cent. Its present amount is about two hundred and twelve millions; besides which there is the debt due to the Bank of England, amounting to £11,015,100. (*See* BANK.) These sums all bear interest at the rate of 3 per cent. The *New 5 per cent. Annuities* were formed in 1830, and amount at present to about £430,000. The *New 3½ per cent. Annuities* were formed in 1853, and amount to about £240,000. The *New Annuities at 2½ per cent.* were formed in 1853, being commuted South-Sea Company's stock, and amount at present to about three millions.

NATIONAL EDUCATION is applied to the means adopted in any particular country, so that the mass of the people in their relative stations may possess the education suitable for performing the duties and carrying on the occupations of civilised life. In every state there are a thousand agencies that really bear upon the education of a people that cannot be distinctly enumerated or calculated. The intercourse of daily life, the form of government and institutions under which they live, the circumstances by which they are surrounded, all tend to educate and develop the various capacities of a people. But there can be little doubt that, in order to an efficient and general education of a people, it is necessary for a state to do more or less for its advancement. In some countries, as in Prussia, the education of the people is entirely and directly under the control of the state; in others, as in some Catholic countries, this power is delegated to the Church. In this country, it was not till about 1833 that the government took any special interest in the subject of national education. About that time,

the lords of the privy council, seeing the great destitution of the country, began to give small grants from the treasury in aid of school-building, through the British and Foreign and the National School societies respectively. In 1839 a committee of council on education was formed, in order the better to regulate and extend the educational grants. Aid was also afforded to normal schools, and from that time to the present a series of developments have been going on; but even yet the system is in a very unsatisfactory state, and various attempts, hitherto unsuccessful, have been made to put it upon a satisfactory footing. The great defect of the English system is that it is denominational and not national. Almost every sect has its schools planted over the country, and to each and all alike government aid is afforded on certain conditions. "Perhaps," says J. D. Morell, "the best idea we can give of the system is this,—that the religious denominations undertake to educate the people, but that the government comes to the aid of all alike, so far as they choose to avail themselves of its assistance." So long as this continues (and, naturally enough, the various sects are equally jealous of any foreign intervention), we cannot have an efficient system. The first, and perhaps the most important, point in a practical system of national education is to have efficient normal schools for the training of teachers. Without these it is impossible to have effective instruction. As regards the different classes of schools necessary for a country like England, first we want in all the large towns a series of *free schools* for the *lowest strata* of society to occupy thoroughly the whole ground that is now very inadequately taken by the *ragged schools*. Next to this come those schools which are at present being so largely established through the country, in which both the nature of the instruction and the entrance-fee are adapted to the wants and resources of the working classes. Thirdly, we should require a series of town schools adapted more peculiarly for the mercantile classes, including, in addition to all that is taught in the primary school, the departments of mathematics, science, and modern languages. Fourthly, we should need a proper number of grammar-schools, answering to the gymnasia of Germany and the royal or municipal colleges in France, and suited to those who intend to embrace a professional life. Lastly, with regard to the teachers themselves, if we expect to keep up an efficient staff, two conditions are necessary,—1st, that they be adequately remunerated; and, 2nd, that their position be made sufficiently independent."—(*Morell.*)—Ref. *Ency. Brit.*

NATIONAL GUARD, an institution in France which has acquired great historical importance in the politics of that country. At the commencement of the Revolution, the popular party were in want of troops on whom they could rely, both for the purpose of maintaining order and of resisting the attempts of the court party if it should be necessary. On the 13th of July, 1789, the day before the Bastille was taken, when great disturbances had occurred in Paris, a municipal committee was formed in the hôtel-de-ville, to provide for the public safety and order. The lieutenant of police was requested to advise with them, and in a few hours a plan was devised for arming the citizens. It was arranged that the force was to be drawn from the electoral districts, and to consist of 48,000 men. On the day following, the Bastille was taken, and on the 15th, Bailly, the president of the Assembly, was made mayor of Paris, and the marquis de Lafayette commandant-general of the militia of Paris. On the 12th of June in the following year, the National Assembly decreed that it was necessary to be a member of the national guard in order to enjoy the rights of citizenship. In 1791, however, the national guards were first organised by law. From that time, a standing municipal and departmental national guard was established, to be raised by voluntary enlistment in the proportion of one to every twenty citizens. The choice of officers was left to themselves, and they received pay, arms, and uniform. Six months afterwards, the number of the battalions of the departmental national guards was fixed at 216. The measures adopted by Austria and Prussia, however, together with the arming of the emigrants on the border, compelled the French government to assume a military attitude; and thus the national guard became of great service to the army, not only by training a number of persons who afterwards joined its ranks, but also by diffusing a military spirit throughout the nation. Bonaparte, on the 5th October, 1795 (13 Vendémiaire), led the troops of the Convention against the national guard of the sections of Paris, who had declared against the system of terrorism. The events of that day caused the dissolution of the staff of the national guard of Paris, and the command was conferred upon the commander-in-chief of the army of the interior. Thus, the original national guard, a body of troops under civil authority, destined to maintain order, was abolished. Shortly afterwards, instead of stationary departmental guards, the Directory introduced movable columns. In 1797, the two legislative councils gave the national guard a new organization, of which Napoleon retained the essential features, but adapted to his military policy. In this new arrangement, a number of legions were formed, in order to guard the coasts and frontiers or to serve in the interior, while the *gendarmerie*, which were entirely distinct from the national guard, formed a powerful and active police, under military surveillance. In 1810, Napoleon formed a regiment of four battalions of the national guard, which had distinguished themselves when the English had landed, and called it the "National Guards of the Guards." On March 13th, 1812, Napoleon issued a decree for the formation of the national guards into three bans, as they were called; the first of these comprised all men capable of bearing arms from twenty to twenty-six years of age; the second all able-bodied men from twenty-six to forty years; and the third, all men fit for service from forty to sixty years. By the correspondence between Napoleon and Joseph, his brother, just before the allies entered Paris, it is evident that the emperor fully relied upon the national guards for the defence of the capital; the want of arms, however, together with the defection of the officers and the dislike of the people to a continuance of the struggle, prevented such an event. Under the Bourbons, the government endeavoured to make the national guard self-dependent. The brother of the king was appointed commander-in-chief of all the national guards of France; in 1818, however, *Monsieur* resigned the chief command, and the staff of the national guards were again dissolved. Once more the national guards were put under the prefect and the minister of the interior. At a review in 1827, the national guards were again dissolved, on account of having ventured to demand the removal of Villèle's ministry and the expulsion of the Jesuits. It was revived during the memorable days of July, 1830. General Lafayette was appointed commander-in-chief, and confirmed in that post by Louis Philippe. By the charter of 1830 it would appear that the national guards had become a fundamental institution of the kingdom, and could not again be constitutionally abolished. They were reorganized during the same year and divided into two classes,—movable and stationary. Corporals, subalterns, and sub-lieutenants were to be elected by the members; the other officers were to be elected by the monarch. The special laws which affect the national guard under the present empire are the decree of the 11th January, 1852, together with some articles of the law of the 13th June, 1851. The election of members of the national guard is in the hands of the police, and the rules and laws concerning the appointments are very stringently carried out.

NATIONAL WORKSHOPS. (*See* ATELIERS NATIONAUX.)

NATIONS, LAW OF. (*See* LAW OF NATIONS.)

NATRON, *nat'-ron* (from Natron, a lake of Soudan, where it was found), in Min., native sesquicarbonate of soda, combined with a proportion of chloride of sodium and sulphate of soda. It is chiefly obtained as an efflorescence on the borders of certain lakes, those of Egypt being the best known. It is also found near the Black and Caspian seas, in Thibet and Siberia.

NATURAL, *nat'-u-ral*, a term applied in Mus. to a certain character used to contradict the flats or sharps placed at the beginning of the stave or elsewhere. It is also applied to the two keys C major and A minor, because they do not require either sharp or flat in the formation of their proper intervals.

NATURAL HISTORY, in its extended signification, is that science which investigates the descriptions and peculiarities of all bodies belonging to nature that we can see; but the term is generally restricted to the external description of objects of nature, whether vegetable, animal, or mineral. It is consequently divided into three separate headings:—1. *Geology* and *Mineralogy*; 2. *Botany*; and 3. *Zoology*. Natural history is indebted to Aristotle for its first organization; and since the days of that philosopher, many and vast improvements have been made in the various branches of the science. Lord Bacon was one of those who did much for natural history, and following in his steps came Gesner, Aldrovandi, Ray, Tournefort, and, greatest of all, Linnæus. Buffon and Cuvier also improved the science, and Professor Owen of the present day likewise enlarged the theories on the subject; thus natural history, in its present development, may be said to be as nearly perfect as possible. The reader will find the subject fully treated under articles BOTANY, &c. &c.

NATURALIZATION, *nät-u-räl-i-zai'-shun*, in Law, is the act of investing an alien with the rights and privileges of a native-born citizen or subject. It is of two kinds,—collective and personal; collective when a country or state is incorporated in another country by gift, cession, or conquest; personal, when the privileges of a subject or citizen are conferred upon an individual by the license or letters patent of a sovereign, or the act of a legislative body, or are obtained by the individual himself under a general law, upon his complying with certain conditions prescribed by the law. The practice of naturalizing foreigners prevailed among the states of antiquity, and is found in the rudest forms of human society. The mode of obtaining naturalization, and the conditions upon which it is granted, differ in different countries. In England, prior to 1844, the only mode by which a foreigner could obtain naturalization was by act of parliament; and even then he was excluded from being a member of the privy council or of parliament, and from having any office of trust, civil or military, or taking lands, tenements, or hereditaments, by grant from the crown; but of course it was within the power of parliament to grant these privileges specifically in any act. The king, however, might grant letters of denisation, conferring certain limited rights, in the exercise of his royal prerogative. At present, naturalization may be done either by act of parliament or (in pursuance of act 7 & 8 Vict. c. 66) by the certificate of a secretary of state. By the former, an alien is put in exactly the same state as if he had been born in the king's liegeance. It has also a retrospective view; for if a man be naturalized by act of parliament, his son born before may inherit. Naturalization by certificate of the secretary of state may be obtained by any alien coming to reside in any part of Great Britain or Ireland, with intent to settle therein. For that purpose, he has to present a memorial to one of the secretaries of state, who may, after receiving the necessary evidence of the truth of the allegations contained in the memorial, issue, if he shall so think fit, a certificate granting to the memorialist, upon his taking the oath of allegiance and abjuration in that act set forth, within sixty days from the date of such certificate, all the rights and capacities of a natural-born British subject, except the capacity of being a member of the privy council or of either of the houses of parliament, and any other rights or capacities that may be specially excepted in and by such certificate. In the United States, the applicant must be a free white person, and have resided in the country for the continued term of five years next preceding his admission, and one year at least within the state or territory where the court is held that admits him. Two years at least before his admission, he must declare, upon oath or affirmation, before a court of record, his intention of becoming a citizen.

NATURAL PHILOSOPHY. (*See* PHYSICS.)

NATURAL THEOLOGY is the name of that science which treats of the being, attributes, and will of God as deducible from the various phenomena of created objects. It is a science of great simplicity, and a vast multiplicity of obvious and decisive evidences is everywhere found for its illustration. No thinking man can doubt that there are marks of design in the universe; and any enumeration of the instances in which this design is manifest, appears at first sight to be both unnecessary and impossible. A single example is as conclusive as a thousand, and he that cannot perceive any traces of contrivance in the formation of the eye will probably retain his atheism at the end of a whole system of physiology. The ancient sceptics appear to have had nothing to set up against a designing Deity but the obscure omnipotency of Chance, and the experimental combinations of a chaos of restless atoms. The task of theistic philosophers was, therefore, easy in those days; and though their physical science was neither correct nor extensive, they seem to have performed it in a bold and satisfactory manner. They appealed directly to the order and symmetry of nature and to the regularity and magnificence of the grand structure of the universe. With the advance of physical science, natural theology was not at first strengthened. Elated with their discoveries, philosophers fancied that they had discovered the great secret of nature, and ascribed imaginary, qualities and energies to different classes of bodies; thus erecting a system of materialism instead of venerating the great Contriver of the whole. This error, however, was soon rectified by the progress of those very speculations by which it had apparently been produced. When men began to reason more correctly upon the appearances and phenomena of nature, they perceived still more wonderful indications of the contrivance and design of the great Creator. This principle of philosophical piety was carried by Boyle and Newton into all their speculations. The microscopical observers caught the same spirit. Ray and Derham successively digested all the physics of their day into a system of natural theology. In the more recent works of Paley and Chalmers, the science has been presented in the most interesting and instructive forms.

NATURE-PRINTING is the name given to a technical process by which printed copies of plants and other objects are produced upon paper in a manner so truthful that their size, fabric, and colour, are represented even to the most minute detail. Although it is only within the last few years that this art has been so far developed as to become practically useful, it is by no means new in idea; a certain Professor Kniphof, of Erfurt, having been in the habit of taking impressions from leaves, &c., which had been coloured with lamp-black or printers' ink, as long back as 1728; and twenty years later, an engraver at Nuremberg published in folio plates figures of several leaves he had reduced to skeletons, and from which he took impressions in red ink. But although this process was made use of at intervals by several ingenious persons, it was not until 1833 that it was recognized as a regular branch of trade. In that year a Danish goldsmith and engraver, who had applied himself for some time to the ornamentation of articles in silver ware, published a description of the method he pursued of taking copies of flat objects of nature and art on plates of metal by means of two steel rollers, and it was at once perceived, by scientific men, that his invention might be applied to the advancement of the arts and science in general. A great difficulty still, however, prevented any extensive application of his invention, consisting in the fact that whilst the extreme hardness of plates of zinc, tin, and copper crushed and distorted the plant subjected to their pressure, the surface of a leaden plate, after the application of printers' ink, could not be cleansed so thoroughly as to allow the printer to take impressions free from dirty stains. To obviate this difficulty, Dr. Branson, of Sheffield, in 1847, commenced a series of experiments, and in 1851 suggested the application of that most important element in nature-printing, which is now its essential feature,—the electrotype. About the same time Professor Leydolt, of Vienna, carried out experiments in the representation of flat objects of mineralogy, such as agates, fossils, and petrifactions. Treating their surfaces with fluoric acid, he then washed them with dilute hydrochloric acid, and when they were dried, carefully blackened them with printers' ink. By placing a leaf of paper upon them, and pressing it down upon every portion of the etched or corroded surfaces with a burnisher,

ns obtained impressions which represented, in the case of agate for instance, the crystallised rhomboidal quartz *black*, and the weaker parts, which had been decomposed by the action of the acid, *white*. As the stone, however, is in most cases too brittle to bear subjection to the printing-press, this process would have been, as in the case of plants, practically useless, had it not been for the aid afforded by the art of electrotyping. Nature-printing, as now practised, and as brought to perfection at the Imperial printing-office of Vienna in 1853, may be described as follows:—The subject, which, if a plant, must be perfectly dry, is placed on a plate of fine rolled lead, the surface of which has been polished by planing. The plate and subject are then passed between rollers, the pressure of which forces the latter into the surface of the former. The leaden plate is then subjected to a moderate heat, which has the effect of loosening the subject from its bed, and enabling it to be easily removed. The mould, which has thus been formed in the plate, is then subjected to the galvano-plastic process, and a second cast obtained, which is its perfect fac-simile. When the subject to be printed is of one colour only, that pigment is rubbed in, and any superfluity removed; but when it is of two or more colours, the plan adopted in the inking of the plate is to apply the darkest colour, which, in the case of plants, generally happens to be that of the roots, first; the superfluous colour is cleaned off; the next darkest colour—such, perhaps, as that of the stem—is then applied, the superfluous colour of which is also cleaned off; and this mode is continued until every part of the plant in the copperplate has received its proper tint. The plate thus charged, with the paper laid over it, is placed upon a copperplate press, the upper roller of which is covered with five or six blankets of compact, fine texture. The effect of the pressure is, that all the colours are printed by one impression, and when the paper is removed, the plant is seen quite perfect, highly embossed, with the roots, stems, and other parts, each of its proper tint.—Ref. *Encyclopædia Britannica*.

NAUTILUS, *naw'-te-lus* (Gr. *nautilos*, from *naus*, a ship).—This class of mollusks, belonging to the fam. *Cephalopoda*, and termed *Argonauta* by Linnæus, is remarkable for the shape of its shell and the peculiar method it has of sailing over the sea by means of employing six of its tentacles as oars, and using the other two membranous ones for sails. If the sea becomes rough, or it perceives any danger, the nautilus withdraws all its arms, concentrates itself into its shell, and sinks to the bottom. The body of the animal does not adhere to the spirals with which its shell is plentifully convolved, and some authors have affirmed that it is a parasite; but as it is always found in the same shell, and as no other animal has been ever found therein, this assertion is highly problematical. The most common species is the *Nautilus pompilius*, which is a native of the Indian seas, especially about the Molucca islands. (*See* also MOLLUSCA.)

NAVAL ARCHITECTURE, *naï'-väl* (Lat. *navalis*).—Shipbuilding may be regarded in two points of view,—in the first as a science, and in the second as an art. It is a science from the fact that it depends on some fixed laws of nature for its integrity, whereas it is an art inasmuch as it depends on the application of rules, which are liable to constant fluctuation. By the aid of various scientific principles, a certain degree of excellence may be attained in a ship, so as to cause some particular quality to preponderate in it; such as stability, speed, and similar points; but, on the other hand, rules are applied which relate to nature; such as, for instance, of elastic and non-elastic fluids, where in fact the very natural laws themselves have been but imperfectly developed. The form of a ship's body need not necessarily remain imperfect because the curve of the solid of least resistance remains unknown, since enough has resulted from the consideration of the nature of that solid to prove that, however applicable it might probably be to the navigation of smooth waters, the perfect solution of the problem of its form would only be desirable to the naval architect as contributing to the general theoretical excellence of the science; as it would be but of little practical utility in its application to vessels intended to brave the powers of the elements in the open seas. There are also other considerations to be borne in mind, which regard the resistance of fluids, the fore and aft form of the body of the ship, the size and rake of the masts, and other spars, &c., which can only be decided by comparison, experiment, and induction, assisted by the knowledge of the natural laws. The great considerations to be regarded in the form of a ship are, that it shall conveniently carry its stores and lading, besides its artillery, if a ship of war; that it shall be moved by wind or steam at a certain determined velocity; that it shall readily obey the rudder; and finally, that it have the proper stability, so as to have a firm grasp of the water, which prevents its being overturned by the wind, or heaving and pitching much from the action of the sea, which generally tends to strain the timbers. One or two of these qualities, however, virtually oppose the rest, and, consequently, the architect has so to assimilate them into one whole that the quality most desirable shall be obtained without erroneously sacrificing too much of the rest. The body of a ship, in the form which unites the several qualities just mentioned in the greatest perfection, has in its middle nearly the form of a portion of a hollow cylinder, with its axis horizontal and its convex surface downwards. Above the surface of the water the sides are curved, so as to cause the head of the ship to have the form of a Gothic arch, more or less acute, in a horizontal direction. Towards the stern, the breadth diminishes gradually, and this part of the ship is either a plane surface, nearly perpendicular to the ship's length, or else so curved as to have nearly the form of a semi-ellipse in a horizontal section. Below the surface of the water, the body of the ship is curved in a similar direction towards the head and stern, so as to terminate at those points in angles, which diminish from the surface downwards; and thus a vertical section, taken perpendicularly to the length of the ship towards either extremity, diverging from the middle, presents on each side the form of a curve of contrary flexure. In merchant ships, as great capacity is more considered than velocity of sailing, the relations between length, breadth, and depth depend less on hydrodynamical principles than in ships of war. The construction of vessels is calculated from three plans, named respectively the *sheer plan*, the *half-breadth plan*, and the *body plan*. The first of these is a projection on a *vertical longitudinal* plane, dividing the ship into two equal parts, the plane passing through the middle line of the vessel from the middle line of the stem, or fore boundary, to the middle line of the sternpost, or after-boundary. The half-breadth plan describes half the widest and longest level section in the ship, or, in other words, that of a horizontal plane, passing through the length of the ship at the *height of the greatest breadth*. The body plan describes the largest vertical and athwart-ship section of the ship, and it forms the boundary of all the other sections delineated within it. These drawings are usually constructed on a scale of ½-inch to a foot, and when they have been fully settled, enlarged copies of them, to the full size of the ship, are traced with chalk on the floor of the *mould-loft*. This operation is technically called *laying off*, and it gives the workmen an exact idea of the position, size, and shape of the principal timbers of the ship. The place where the ship is raised is termed the *building-slip*, situated by the side of a river or other water sufficiently deep to float her when ready to be launched. On the floor of this are arranged blocks of oak, three feet high and four feet apart, in a row, along the direction of the length of the intended ship. On these blocks is laid the keel, which is the lowest timber in the ship, as upon it the whole fabric is raised. It is generally of elm, as that timber possesses strong, tough fibres, and is also not injured by the action of water when immersed. The size of the keel in a first-rate man-of-war is about twenty inches square, and of length proportionate to the size of the vessel. Below the main keel, pieces of elm, some five to six inches thick, are worked in, and the structure they form is termed the *false keel*, whose use is to give the ship greater immersion in the water, and thus prevent leeway. At each extremity of the keel, extending to the middle, pieces of wood, termed the *dead-wood*, are placed, the upper surface of which is cut in a curvilinear

form to adapt itself to the shape of the bottom of the ship. Beyond these, at each extremity of the keel likewise, a post is set up, called respectively *the stern* and *stem-post*. The stern-post is usually of oak, in order to enable it to bear the great strain on it caused by the rudder, and its lower end is inserted in the keel by means of projections or teeth. The frame or *ribs* of a ship is composed of a great amount of timber, technically catalogued as *floors, cross-lines, half-floors, floors short and long-armed, first futtocks, second futtocks, third, fourth, and fifth futtocks*, and *top timbers*. The sides of the dead-wood and keel are cut for the reception of the floor timbers, which are placed across the keel perpendicularly to its length. These pairs of timbers are bolted together by means of iron bolts. When this framing has assumed a certain form, the *ribands* are fixed: these consist of thick narrow planks, at wide intervals, extending the length of the vessel, marking the direction of the frame; they are firmly shored up, and are removed when the planking comes on. Over the keel is laid a second keel, termed the kelson. The timbers of ships are covered always on the outside, and occasionally on the inside,—indeed, generally partly so, with planks of oak from three to six inches thick. The planking is attached to the ribs by means of bolts and trenails; but, before the planks are attached, the intervals between the ribs are filled up with pieces of wood three inches deep, and also with cement, so as to give a certain solidity below the surface of the sea. According to Peake's "Rudiments of Naval Architecture," "it is found in practice, from the form given to the bow and quarters under water being fine and sharp to insure velocity, that these extreme portions of the ship are not waterborne; and that thence the midship volume displaced must, to make up the whole displacement or weight, be on the contrary greater than the weight placed over it. The results which arise from this inequality between the superincumbent weights and the upward pressure of the water, are practically evinced by the falling of the extremes and the rising of the middle of the ship, causing her keel, after she has been some time afloat, to assume a curved form, technically termed *hogging*." The *wales* of a ship are those strong timber planks which rise above the surface of the water, and they are firmly affixed to the ribs, even before the planking is laid on. The *clamps* are thick plankings made to support the beams on which the decks rest. The beams are then masted and are further supported by strong under-timbers termed *knees*, which require to be of great strength, particularly in vessels of war, where the guns impose great pressure. The deck beams being adjusted, the framing of the deck is the next consideration; for many things have to be provided for, as hatchways, mast-holes, &c. The *breast-hooks* are the strong curved pieces of timber which cross the stem and form the bows. In order to bend the wood into the necessary curvature for knees, crutches, and so on, it is steamed in places made for the purpose in dockyards. The joints and seams of the external planking are made water-tight by forcing spun yarn and oakum into them. The oakum is pushed in by means of sharp iron wedges, termed *caulking-irons*. The seams are then closed with melted pitch applied by small mops, and lastly, as high up the side of the ship as the copper sheathing will come, a thread of spun yarn is laid on, and that again covered with a mixture of pitch and tar. The ship is then ready to be launched. After this she has to be sheathed with copper, and to receive her masts and rigging, &c. The remaining processes which she goes through will be found under the article SHIP-BUILDING.

NAVE, *nāv* (from Sax. *naf*), in Arch., the body or middle part of a church, or other large building, between the aisles, and reaching from the rail or baluster of the choir to the chief door.

NAVIGATION, *năv-i-gā'-shun* (Lat. *navigatio*), is the art of conducting a ship from one port to another on the sea; or, in other words, is the application of plane trigonometry to the solution of the various problems in *plane* and *globular sailing*; of which the object is to find the position of a ship at sea, and the direction and distance it ought to sail in order to reach its intended port. The earliest known records of the practice of navigation are those of the Egyptians, who are said to have established commercial relations with India. The Phœnicians, however, were the most distinguished of early navigators, as they traded with nearly every nation known to them. Tyre was their central port, and, in fact, the port of the world during that era, it being the centre of commerce, and well designated as the "mart of nations." They procured wood from Lebanon for the purposes of ship-building, and were masters of a considerable fleet shortly after their first attempts. By the aid of their marine establishment they were able to send out colonies, which soon even rivalled the parent country. Of these Carthage was the chief, and she possessed fleets which sailed along the western coasts both of Europe and Africa, after passing through the straits of Gibraltar. The Greeks were the next to prosecute navigation; the voyage of the celebrated Argonauts is too well known to be here recapitulated. Next, the Romans pursued the art, and by its means were enabled to reduce Egypt, and to raise the port of Alexandria to a position of wealth and commercial activity only second to Rome. After the fall of the empire of the world, navigation received but little impetus for some time, and its resuscitation is doubtless due to the Genoese, although it is sometimes claimed by the French. Venice next devoted herself to carrying over the seas. Contemporaneous with the revival of navigation in the south of Europe, a society of merchants was amalgamated for the further prosecution of commerce, termed the Hanseatic League, which not only extended trade to the Eastern and Western Indies, but also drew up rules for the guidance of mariners, still known under the title of Usages and Customs of the Sea. (*See* HANSEATIC LEAGUE.) The progress of navigation from this period down to the present time may easily be traced, and many and great are the improvements which have taken place, both in the form of the vessels used for the purpose, as well as in the methods employed in working them. In former days, merely galleys were used with rowers; but in the present day rowers have been superseded by the improvements which have been made in the formation of the sails and rigging of ships, which enable them to sail in any direction by means of tacking, even against a contrary wind. Of late years, the use of steam as a propelling power has completely remodelled navigation, and a new era has opened, which constantly brings forth some new improvement or fresh discovery. The ancients were certainly not so skilled in finding their latitudes nor in steering their vessels as the moderns, who possess an inestimable advantage over the former in the discovery of the mariner's compass. (*See* COMPASS.) They used generally to steer by the sun in the daytime and by the north star at night; consequently, when the heavens were overcast, they were deprived of their means of progression, and had, therefore, to leave off prosecuting their voyages until the sky became clear again. For some time after the invention of the mariner's compass, navigation was still very imperfect, in consequence of the inaccuracies of the plane chart, which was the only one then known; and not much was done until the publication of Mercator's chart, which greatly altered former theories on the subject of navigating the ocean. Mercator is not, however, believed to have been the real inventor of this valuable map; that honour being ascribed to Edward Wright, an Englishman. At the first appearance of this chart (*see* MAP), it was not rightly understood; but in the year 1599 its merit was fully allowed, and was further established, some seven years later, by the publication of Wright's treatise on "The Correction of Certain Errors in Navigation," in which he gives various tables of latitude, for dividing the meridian, and other suggestions. (*See* LATITUDE and LONGITUDE.) The next great step in the history of navigation was the invention of logarithmic tables by Baron Napier, and the increased facilities which they gave in making long calculations, thereby insuring greater accuracy. (*See* LOGARITHMS.) Having thus given a brief sketch of the rise and improvement in navigation, it will be now necessary to show how and by what means it is carried on. The instruments needed, besides the compass, are a *quadrant* to measure the altitudes of the heavenly bodies, and a *contant* to

measure the distance between the moon and stars. (See Quadrant and Sextant.) The navigator should also be provided with logarithmic tables, in order to allow him to develop his observations; a copy of the "Nautical Almanack," to give him useful information with regard to the places and declination of the planets and stars; and, finally, he should be provided with the general and local charts applicable to his contemplated voyage. Having left port, the mariner, just when the last land is about to disappear, selects some conspicuous headland, of which the latitude and longitude are known in his tables, and, placing a compass in some elevated position, remote from any iron object, which might disturb its polarity, proceeds to determine the bearing of the headland, and to estimate his distance from it, either by the progress made from it, or by the ready calculation of a practised eye. This is called, in nautical parlance, *taking the departure*, and it is, along with the time of making the observation, carefully noted in the log-book (a journal carefully kept on board, in which entries are made each day of every circumstance connected with the ship, from the date of her leaving harbour until her return). The first thing which the mariner does after making that offing which prudence dictates, in order to avoid the dangers of the land, is to shape a correct course to the port for which he is bound. To commence, he searches in his chart to see if any rocks, shoals, or other obstacles are in the way of a direct route, and if so, he directs his course primarily so as to avoid them; if not, the difference in latitude and longitude between the two ports being taken, the distance and course can be obtained by the aid of trignometry. The shortest way to any two places on the face of the globe is the arc of the great circle passing through those two places. (*See* Meridian.) At the first noon succeeding his departure, the mariner takes his reckoning; and this period being determined by the passage of the sun over the meridian, is therefore well chosen as the beginning of the day. The log-slate (a double slate, on which events are marked down before being copied at the close of the day into the log-book) being marked, he copies the courses and distances run, if, from head-winds or other causes, they have been various. The departure from land is also esteemed a course, as is also the current, if there be any known one. He next proceeds to find the difference in latitude and departure from the meridian corresponding to each course, either by geometrical calculation, or more expeditiously by the tables; then he adds the several differences of latitude and departure, and, if they be of different names,—for instance, some north, some south, some east or west,—he deducts the less from the greater. With the remaining difference of latitude and departure, he not only finds the course and distance made good, but also the latitude and longitude; the difference of latitude being applied to the latitude left, either by adding or subtracting in sailing from or towards the equator, gives at once the latitude of the ship. The most general method of navigating is termed *dead reckoning;* but it is far from being as correct as might be desired. It does very well, however, for short voyages made not far from land; but in long voyages remote errors accumulate so quickly, that the mariner would find himself far from having kept his right course, and, indeed, might be hundreds of miles away from it. The errors which attend navigation by dead reckoning often escape calculation, as they result from bad steerage, leeway, heave of the sea, unknown currents, and many other circumstances which imperceptibly cause the vessel to deviate greatly from her course. It becomes necessary, therefore, for the mariner, in long voyages, to resort to those immovable guides in the heavens that the Deity has placed. All the heavenly bodies are brought by the revolution of the earth daily to the meridian; at which time, if their altitude be measured, their declination, or distance from the equinox, being known, the latitude of the ship may be readily deduced; it may also be obtained from single or double altitudes of bodies not in the meridian, if the times be accurately known. But the meridian altitude of the sun is the one which furnishes the readiest and easiest method for obtaining the latitude.





The method of obtaining the sun's meridian altitude may be described as follows:—Furnished with a sextant, circle, or octant of reflection, the observer goes on deck, and having examined the adjustment of the instrument, proceeds to bring down the image of the sun, reflected by its mirror, until the lower limb just sweeps the horizon. He continues to follow and measure its ascent until it ceases to rise; the moment when it commences to fall, and the lower limb dips in the horizon, the sun has passed the meridian. The altitude marked by the index on the limb of the instrument is then read off, and is next corrected. First, the observer adds the semi-diameter, in order to make the altitude apply to the centre of the object; he next subtracts the dip, to meet the errors caused by the extension of the horizon, owing to the rotundity of the earth and the elevation of his eye; also the refraction of the atmosphere, by which the object, when not vertical, is made to appear higher than its true place; lastly, he adds the parallax (a small correction, inconsiderable from the sun's distance), in order to reduce the calculation from the centre of the earth; from which point all calculations are made, and which is ever supposed to be the station of an observer. Having made all these corrections, which most mariners can easily do in a short time, by adding twelve minutes, the true meridian altitude of the sun will be gained. Taking this from 90°, gives its zenith distance, or distance from that point in the heavens which is immediately over the observer. If the sun were for ever on the equinoctial, the zenith distance would always be the latitude; but as it is only twice a year on it, and as his distance from it increases at times to 20°, it becomes necessary to take this distance (called his *declination*) into the calculation. The sun's declination (*see* article on the subject) is given in the almanack for the noon of each day; by correcting it for the time anticipated or elapsed, according as the sun comes first to him or to the first *meridian*, by his position east or west of it, the observer obtains the declination for noon at his own position. This declination, applied to the zenith distance, by adding when the sun is on the same side, gives the true latitude. The knowledge of latitude is obviously most important to a thorough seaman, and it is desirable to know at once, and to be able to tell at any hour of the day, the position of a ship on the ocean. There are various methods for finding the longitude; but in all of them the great element is time. For, as the earth performs her diurnal revolution in twenty-four hours, from the time any given meridian is brought under the sun until it reaches it again, it follows that twenty-four hours and 360 degrees are both equal to a circle, and that the equator and other circles of longitude may be indifferently estimated by either of these divisions. Consequently, the difference in time between any two places is no other than the difference between the sun's coming to the respective meridians, or, in other words, their difference of longitude; and hence it follows that if we, by any means, simultaneously ascertain the time of the observation at the first meridian and the time on board ship, we shall have obtained the longitude. The easiest way of doing this is by means of a chronometer (*see* article on the subject). To find the longitude by means of it, the mariner has only to take any observation of the sun, or star, when rising or falling, rapidly, and deduce the time of the ship; this, compared with the time at the first meridian, simultaneously given by the chronometer, at once determines the longitude. Ships generally carry three or four chronometers, in order to insure greater accuracy by means of comparing them with one another. The most expeditious plan for obtaining the longitude is undoubtedly by observing the eclipses of Jupiter's satellites. The theory with regard to the times of immersion and emersion at the first meridian is noted in the almanack, and these, compared with the times at which the observer notices the same by means of a good telescope, determine the longitude. The *lunar theory* is another method, and it consists in observing the distance of the moon from the sun and fixed stars, and by comparing the time of observation with that time at which the almanack shows a similar distance at the first meridian. In conclusion, it may be mentioned that there are other

things to be borne in mind by the mariner, as every circumstance occurring in nature should be the means of insuring him guidance and information: the drift of currents, the colour of the sea (an admirable guide near coasts), the flight of birds, and many other simple circumstances. He should likewise ever carefully observe the barometer, in order to learn the changes of the weather. By the means which have been now fully stated, by common care, and by the will of Providence, the trackless ocean has highways upon it as plain to the initiated as the commonest turnpike-roads.

NAVIGATION LAWS is the name usually given to those enactments by which commercial states have endeavoured to regulate the shipping which left or visited their ports, naturally with a view always to favour and promote their own commerce. The origin of the navigation laws of this country may be traced as far back as 1379, in the reign of Richard II., when a statute was passed prohibiting the king's subjects from importing or exporting merchandise except in English ships. Various subsequent enactments of the same nature were passed; but the navigation laws of England, strictly so called, originated in the time of Cromwell. In 1650 an act was passed prohibiting all ships of all foreign nations whatever from trading with the plantations of America without having previously obtained a license; and in the following year (9th October, 1651) the famous "Act of Navigation" was passed, declaring that no goods whatever of the growth, production, or manufacture of Asia, Africa, or America, should be imported either into England or Ireland, or any of the plantations, except in ships belonging to English subjects, and of which the master and greater part of the crew were also English. It further enacted that no goods of the growth, production, or manufacture of any country in Europe should be imported into Great Britain except in British ships, or in such ships as were the real property of the people of the country or place in which the goods were produced, or from which they could only be, or most usually were exported. The great object of these enactments was to strike at the great commercial power of the Dutch. They were also adopted by the government on the Restoration, and formed the basis of the act 12 Car. II. c. 18, which continued down to a recent period to be the rule by which our naval intercourse with other countries was mainly regulated, and has been designated the "Charta Maritima" of England. The first deviation from the system was effected by a treaty concluded in 1815 with the United States of America, by which the ships of the two countries were placed reciprocally upon the same footing in England and the United States, and all discriminating duties chargeable upon the goods which they conveyed were mutually repealed. In 1822, Mr. (subsequently Lord) Wallace, then president of the Board of Trade, introduced several bills into parliament which mitigated, to a large extent, many of the provisions of the law; and in the following year Prussia notified that unless an alteration of our system was made in favour of her vessels, similar heavy duties would be imposed upon British shipping that should enter any of her ports, a proceeding which it was evident would soon be followed by other countries, and thus led to the passing of the Reciprocity Acts (4 Geo. IV. c. 77, and 6 Geo. IV. c. 1). These statutes authorized the crown to permit the importation and exportation of merchandise in foreign vessels at the same duties as were chargeable when imported in British vessels, in favour of such countries as should not levy discriminating duties upon merchandise carried into their ports in British vessels; also to levy upon the vessels of such countries when frequenting our ports the same tonnage rates as were chargeable upon our own vessels. Various subsequent alterations were made, and at length, by 12 & 13 Vict. c. 29, the entire fabric of the restrictive system was swept away in 1850, except the monopoly of the coasting trade, which continued to be secured to British vessels till 1854, when it too was abolished by 17 & 18 Vict. c. 5. The former of these acts declares that ships which are not of British build may become British ships by registry, if wholly owned by British subjects, and that any ships may bring to England any merchandise; excepting, however, that the king or queen of England, by order in council, may interpose such changes, restrictions, or prohibitions upon ships of any country, as will put the ships of that country, when in British ports, on the same footing on which British ships stand in the ports of that country. Thus foreign vessels are now generally allowed a free commercial intercourse with this country upon terms of perfect equality with our own vessels, a concession, however, which may be confined to such nations as, on the other hand, concede to us reciprocal and equal freedom.

NAVY, *naï-ve* (from Lat. *navis*, a ship), a term which, in its more extended sense, is applied both to the military and mercantile marine of any nation; but it is generally restricted to that signification in which it embraces solely the ships and naval material of war possessed by any of the powers. The composition of a navy is divided into separate classes; the first comprising *matériel*, which regards the bare construction, armament, and equipment of ships of war; the second division, or *personnel*, embraces all matters that relate to the various ranks, appointments, and duties of the officers, seamen, and marines. Our first consideration, therefore, shall be the *matériel* of the navy. The history of the British navy, from its first inauguration down to the present time would afford matter to dilate upon much too vast for the article which we purpose giving. It will suffice to say that it may be divided into three periods; the first comprehending all that preceded the reign of Henry VIII., the second ending with the restoration of Charles II., and the third commencing from the end of the last-mentioned period and continuing down to the present day. From the wicker boats of the ancient Britons down to the galleys which Alfred the Great employed against the Danes in their invasion of this country, we have no reliable information as to the growth of knowledge with regard to marine architecture. We are told, however, that Edgar had from three to five thousand ships, which were divided into three fleets, stationed at different parts of the island; and that, having circumnavigated Britain, he named himself "monarch of all Albion and sovereign over the adjacent isles." We are next informed by Sir Walter Raleigh that the Normans introduced a new and improved plan for the building of ships. The Edwards and Henrys did much for the navy of England; but it is to the reign of Henry VII. we must look for any great advance in the construction of the ships of which our navy was composed. Sebastian Cabot, a most skilful seaman, in the reign of this monarch, vastly improved the naval resources. It may be likewise mentioned that in the reign of Henry VII. was built the *Great Harry*, the first vessel possessed by England which can be accurately denominated a ship. Henry VIII. may truly be declared the father of the British navy, as it is indebted to him for the settlement of its whole *régime*, in fact, for its first organized construction. He established the dockyards of Deptford, Portsmouth, and Woolwich; he elected certain commissioners to superintend the civil affairs of the navy; and he also settled the rank and pay of admirals, vice-admirals, and inferior officers. By these means he created a national navy, and raised its officers to a separate and distinct profession. Following an article in the "Encyclopædia Britannica," which is deduced from authentic sources, the great officers of the navy then were the vice-admiral of England, the master of the ordnance, the surveyor of the marine causes, the treasurer, comptroller, general surveyor of the victualling, clerk of the ship, and clerk of the stores. Each of these officers had their particular duties; but they met together once a week at the offices on Tower Hill, to consult and make a report to the lord high-admiral. Henry VIII. also established the fraternity of the Trinity House, for the improvement of navigation and encouragement of commerce; and he also built the castles of Deal, Walmer, Hurst Castle, and many others, for the protection of his fleet and of the coast. On the death of Henry, the royal navy consisted of about fifty ships and vessels, of different sizes, the former varying from 1,000 to 150 tons burden, and the latter down to twenty tons, making an aggregate of 12,000 tons, and manned by 8,000 mariners, gunners, and soldiers. Elizabeth's reign inaugurated a glorious era for the navy of England, as she not only increased the numerical

strength of the fleet, but also proposed many new and important regulations for its preservation and guidance, and likewise secured adequate supplies of timber and other naval stores, the want of which had been before felt. At the end of her reign the navy consisted of about forty-two ships, amounting to 17,000 tons burden, and manned by about 8,300 men. The first real improvements, however, made in the form and construction of ships owe their origin undoubtedly to one of the best shipwrights England ever produced; his name was Mr. Phineas Pett, and he lived in the reign of James I., which monarch was not by any means neglectful of the naval supremacy which we had already acquired. Mr. Pett laid down, in the year 1610, the largest ship that had hitherto been built. She was 114 feet long, and was armed with sixty-four pieces of great ordnance, her burden being 1,400 tons. In the reign of Charles I. the navy was further improved, and was divided for the first time into classes or rates. Cromwell settled these ratings nearly similar to those in existence at the present day. (*See* MAN-OF-WAR.) On the restoration of Charles II., the duke of York was summoned to the post of lord high admiral, and Mr. Pepys was appointed secretary to the Admiralty. Under the able direction of a committee, which was then appointed, the navy was much restored, and increased considerably both in numbers and strength; in the year 1679 it mustered seventy-six ships of the line, all furnished with stores for six months; eight fire-ships, besides a numerous fleet of sloops, carracks, yachts, and smaller vessels; and more than 12,000 seamen; besides which thirty new ships were in progress of being built, and there was a good supply of all necessary stores in the dockyards. On the death of King William III., the navy consisted of 272 ships, measuring 159,020 tons. A war with France and Spain immediately followed the accession of Queen Anne, and in the second year of her reign she had the calamity to lose a greater part of her fleet by a most tremendous storm. However, vast resources were called into play in order to remedy the disaster; and on her death, in 1714, the navy mustered 247 ships, of 167,219 tons; being an increase in tonnage of 8,198 tons, although somewhat less in number than when she ascended the throne. In the reign of George I. the navy was further reduced in number (being only 233 ships); but was again increased in tonnage, measuring 170,862 tons. In consequence of a war with Spain in 1739, during the reign of George II., our ships of the line were greatly increased, and in 1748, on the conclusion of the war with France, it was discovered that our naval strength had risen considerably. On the king's death, in 1760, the fleet mustered 412 ships, measuring 331,104 tons. George III., in the short war of 1762, added no less than twenty sail of the line to our navy; and at the conclusion of the American war, in 1782, the list of it was increased to 600 sail, measuring more than 500,000 tons. At the peace of Amiens the navy had increased to upwards of 700 sail, of which 144 were ships of the line. During the Revolutionary war, the British navy was raised to a magnitude to which the great navies of other European powers bore but a very slight comparison. From 1808 to 1813 there were seldom less than from 100 to 106 sail of the line in commission, and from 190 to 160 frigates, with upwards of 200 sloops, besides bomb-vessels, gun-brigs, cutters, and many other descriptions of small craft; the whole amounting to nearly 1,000 in number, and measuring from 800,000 to 900,000 tons. According to the printed list of the 1st January, 1821, the 609 sail of ships and vessels which the navy mustered at the time appear as under:—

| | | | | | No. |
|---|---|---|---|---|---|
| 1st rates carrying | 120 | to | 100 | guns | ..... 23 |
| 2nd do. " | 66 | " | 80 | " | ..... 16 |
| 3rd do. " | 78 | " | 74 | " | ..... 90 |
| 4th do. " | 60 | " | 50 | " | ..... 20 |
| 5th do. " | 48 | " | 22 | " | ..... 107 |
| 6th do. " | 34 | " | 24 | " | ..... 40 |
| Sloops " | 22 | " | 10 | " | ..... 136 |
| Making a total of | | | | | ..... 432 |
| To which adding gun-brigs, &c. | | | | | ..... 177 |
| The grand total amounts to | | | | | ..... 609 |





The increase in the size of our vessels of war followed, as a natural course, the improvements made in naval architecture, and we were, besides, bound to keep pace with France and Spain; and as those powers increased the size of their ships, we were perforce obliged to do so also. Between the years 1821-39 the navy of England declined considerably in efficiency, and in 1839 was not sufficient to meet any sudden emergency which might arise; consequently the voice of the people aided the discernment and energy of the government, and an immediate change was soon resolved upon. According to the "English Cyclopædia," in an article on the subject, prosperity had proved a dangerous narcotic, and the question of peace or war had been considered as one of mere national income and expenditure, rather than one of vital importance, as involving our defence and safety. A prevalent feeling that a pressing necessity had arisen, led the government to arm and man a few ships, until they rose into a Channel squadron, and Spithead once more showed to a new generation some results of naval preparation. Thus for a time the rulers of England were free, on account of public encouragement, to enter upon a wider course than they had yet adopted, which soon told upon the resources pre-eminently possessed by this country. New requirements of science resulted in immense changes in the form, mode of arming, and propulsion of ships of war. It is a very difficult subject to treat upon the advancement of our navy, as so many changes have been made, that the details of the subject are vast in number, and it is a matter of conjecture what to reject and what retain. During the last fifteen years, the question of naval strength has added largely to its previously large dimensions, being nourished by the stirring activity of our rulers, consequent upon the many and various differences which various causes have produced. Among those causes steam has so deeply influenced all naval matters, so thoroughly reversed all pre-existent theories and rules for practice, that the navy of the present time (1863) cannot easily be compared with that of any previous period; nor is it easy to convey an accurate idea of the extent of the changes we have alluded to in the necessarily narrow limits of this article. For instance, the words *corvette*, *frigate*, *sloop*, or *brig*, applied in the present day to ships of the navy, give no notion of the vessels similarly named some twenty or even ten years back. All things have altered—the lines of construction, the proportions of the extremities, the description of armament, and many other circumstances connected with naval matters, so that the present navy of England is as different from the past as the future will no doubt be from the present. In 1845, the screw was adopted, and the increase in speed which that invention gave over the paddle-wheel was a subject of much comment at the time (*see* SCREW-PROPELLER), as the fleet had, as it were, to be reconstructed on an altogether novel plan, the change being from a sailing fleet to one of mere mechanical propulsion. While England was thus bent on investigating the great powers of naval architecture and naval armament, other countries were also vigorously trying to solve the same queries; and the consequence was, that England was compelled to make vast progress, even against her will, in consequence of the improvements in the navies of Russia and France. Then came the Crimean war, when the fleets of the Baltic and Black Sea were composed of three different species of vessels.

| | | | | |
|---|---|---|---|---|
| *In the Baltic* fleet the | screw squadron | = | 28 | ships |
| " " | paddle " | = | 23 | " |
| " " | sailing " | = | 4 | " |
| Total | | | 55 | ships |
| *In the Black Sea* the | screw squadron | = | 10 | ships |
| " " | paddle " | = | 18 | " |
| " " | sailing " | = | 12 | " |
| Total | | | 40 | ships |

which were thus propelled in three different modes. In the year 1859, the navies of England, with those of other nations, were thus compared by Mr. Hyde Parker: England, grand total, 589 (including three more effective ships of the line than France); France, 359; Russia, 164; Sweden, 311; Norway, 148; Denmark,

130; United States, 79; Holland, 130; Belgium, 7; Spain, 82; Two Sicilies, 121; Austria, 136; Portugal, 37; Sardinia, 29; Prussia, 55; Greece, 22; Turkey, 49; Brasil, 27; Peru, 15; Chili, 5; and Mexico, 9. Making a grand total of the combined fleets of the world amounting to 2,583 ships. Since the year 1859, however, a vast difference has arisen, both in the numbers and form, as well as armament of many of these fleets, particularly those of England, France, Russia, Sardinia, and America; and within the last three years the experiment has been introduced of arming the sides of ships of war with armour-plates, in order to counteract the great improvements made in artillery; but neither sufficient time or opportunity has been yet given for testing the principle effectually. With regard to the armour-plated vessels, we have five already completed, being respectively the *Warrior*, *Black Prince*, *Defence*, *Resistance*, and *Royal Oak*; others being in progress at the various dockyards. From the Navy List of July, 1863, the following returns as to the effective strength of the British navy are given:—Total number of vessels, screw, paddle, and armour-plated, including gunboats (ranging in burden from 209 to 270 tons)=735 in number; of which 127 are sailing vessels; besides 119 brigs, sloops, and cutters, devoted to harbour service. In the speech of Lord Clarence Paget, on the discussion of the estimates for 1863-3, he stated that at home there were in commission 2 line-of-battle ships, 2 frigates and corvettes, and 4 sloops; making a total of 10 ships in the Channel. In the Mediterranean, there were 9 line-of-battle ships, 4 corvettes, and 13 sloops; making a total of 28 vessels. On the American station, there were 8 line-of-battle ships, 10 frigates and corvettes, and 13 sloops; making a total of 31 vessels. On distant stations, England possesses 23 frigates and corvettes, along with 58 sloops, gunboats, and other small vessels; making a total of 80 vessels. The total force, therefore, is 19 line-of-battle ships, 2 iron-cased frigates (since increased to five), 33 frigates and corvettes, and 90 sloops, gunboats, &c. In addition to these, there are (1863) 2 coast-guard ships and 9 block-ships; making 11 vessels in the coast-guard service. Ships, when not in commission, are "dismantled," and they are kept in the state of hulks until they are again required for active service. A ship is "commissioned" by the appointment of a captain or commander to her, and his pendant being hoisted, to show that she is under the Articles of War. In former times, in consequence of the dismantling of vessels already alluded to, great delay arose in fitting them out, and since then, after steam-power was introduced as an auxiliary, what is termed a *steam reserve* has been established for the purpose of having ships in various stages of readiness. The steam reserve is divided into four divisions. The *first* of these comprises all such ships, of every class, as are ready for sea a day or two after being commissioned, so far as masts, rigging, and all fitting are concerned, including guns, anchors, cables, shot, tanks, and all machinery; everything having been tested, either in trial trips or periodical examinations by the proper authorities. But the powder and provisions are only shipped when the ship is about to proceed to sea. The *second* division consists of such ships of every class as are fitted with engines, anchors, cables, shot, and tanks, but have neither masts nor guns on board. These, also, must have been tested in trial trips. The *third* division comprises ships of any class that have their engines on board, but are without other equipments. The *fourth* division includes all such ships as are quite dismantled, being in mere "ordinary," and which are in various stages of advancement. To turn now to the second part of our subject,—the *personnel* of the navy. It may be stated, according to the estimates of 1862-63, that including the naval reserve and coast volunteers, the number of men available for the royal navy, if any sudden emergency should arise, would be 95,000 of all classes. The government of the navy is vested in the lord high admiral, an office which was instituted after the Revolution. The Admiralty Board consists of the first lord (who is, *ex officio*, a member of the cabinet) and five junior lords, besides a secretary, who has a junior under him. By the orders of these officers, all ships of the navy are built, sold, or broken up, commissioned, employed, and paid off. By them, also, are all appointments and promotions made or approved of; and honours, pensions, and gratuities are granted on their recommendation. There are two orders of men in the navy; namely, seamen and marines: there are also commissioned, warrant, and petty officers. The commissioned officers are flag-officers, captains, commanders, and lieutenants. The flag-officers are divided into several grades, and rank in the following order in a descending scale:—admirals of the fleet, admirals of the red, white, and blue; vice-admirals of the red, white, and blue; rear-admirals of the red, white, and blue. There are, also, superannuated and retired rear-admirals, who, although they enjoy the rank and pay of their class, yet do not rise higher into the next class. With regard to the other officers, the captains sometimes take a temporary rank termed commodore, and the commanders rank below the captains; after whom come the lieutenants, then the sub-lieutenants and junior officers. The master of a ship has the charge and stowage of the holds, and navigates the ship under the direction of the captain, besides being superior in rank to the gunner, boatswain, and carpenter. The paymaster has the issuing of supplies to the officers and crew: the gunner has charge of all ordnance stores; the boatswain of the sails, ropes, spars; while the carpenter has charge of all stores coming within his province, besides being obliged to look after the pumps and to sound the well daily. The petty officers are promoted from the best seamen, according as their good conduct deserves promotion. —Ref. *Encyclopædia Britannica*; *Popular Encyclopædia*; *English Cyclopædia*.

NAZARENE, *năz-à-reen'*, a term of contempt frequently applied to Christ and his first disciples, from Nazareth, the place of his residence, a poor town in the despised region of Galilee. The sect of the Nazarenes arose in the 2nd century, and, being Jewish Christians, they set great value upon the law of Moses, and insisted upon the necessity of combining it with the religion of Christ. They disappear about the 4th century. The "gospel of the Nazarenes" was a Hebrew translation of St. Matthew's gospel.

NAZARITE, *năz'-à-rite*, among the ancient Jews, was one who, for a certain period, or for life, devoted himself to the service of Jehovah, by observing a more than ordinary degree of purity. Samson and John the Baptist were Nazarites. During their vow they did not cut their hair, abstained from wine and all manner of strong drinks, and from contact with the dead.

NEAP TIDES. (*See* TIDES.)

NEBULÆ, *neb'-u-le* (Lat. *nebula*, a cloud), a name given in Astron. to certain diffuse cloudy patches of light which have been discovered in all parts of the heavens. These objects appear to be attributable to two totally distinct causes: first, those in which, by the aid of powerful telescopes, we can resolve luminous patches into distinct stars; and second, those which are found to consist of a diffuse substance pervading space. The application of the telescope to astronomical science revealed the nature of the first class of nebulæ, namely clusters of stars; such, for example, as the group of the Pleiades, that of the Hyades, in the constellation Taurus, and that which surrounds $\eta$ Argus, &c. All these clusters have very precise and well-defined forms, and are constituted of stars which are very near each other. For the first examination and analysis of these remarkable objects, astronomy is indebted to Sir W. Herschel, who divided them into the following classes:—1. Clusters of stars in which the stars are clearly distinguishable; 2. resolvable nebulæ, or such as excite a suspicion that they consist of stars, and which any increase of the power of the telescope might be expected to resolve into distinct stars; 3. nebulæ, properly so called, in which there is no appearance of separate stars; 4. planetary nebulæ; 5. stellar nebulæ; and 6. nebulous stars. For several years Herschel maintained that all nebulæ were clusters of stars; but a series of minute and very delicate observations of the most conscientious character induced him to modify his views on the subject. In a memoir of his, written in 1771, he writes, "There are nebulosities which are not of a starry nature." From that time it was understood among astronomers that the stars, the

planets, the satellites, and the comets, were not the only celestial objects to which attention was to be directed. There were also the true nebulæ, the diffuse celestial matter which opened up a new field of philosophical research. The first nebula mentioned in the annals of astronomy is the nebula in the girdle of Andromeda; it was discovered in 1612, by Simon Marius. That astronomer compared the light of the nebula to that of a candle seen through a piece of horn. In 1656, Huygens described, in his "Systema Saturnium," the great nebula in the constellation of Orion, situated near the sword-scabbard around the star marked $\theta$. It would appear, however, that this same nebula was known to Cysatus, the Swiss astronomer, as early as the year 1618. In 1716, Halley having undertaken to enumerate the known nebulæ, found that their number amounted only to six,—the two before cited and four others. In 1755, however, Lacaille, during his residence at the Cape of Good Hope, determined the positions of fourteen nebulæ, in the structure of which his weak telescopes showed nothing definite, and fourteen other nebulæ, which the same telescopes resolved into stars. In 1786, Sir William Herschel published a catalogue of 1,000 nebulæ or clusters of stars, and three years afterwards, to the astonishment of observers, produced a second catalogue quite as extensive as the first, and in 1802 a third catalogue of 500 nebulæ in addition. Those nebulæ which can be resolved into separate stars exhibit a great variety of forms. There are some which, at once very elongated and very narrow, might be even taken for simple luminous lines of a straight or serpentine form. There are others, again, which open in the form of a fan, resembling the jet of light which escapes from a strongly electrified point. In some the centres are not distinguished by any regularity; in others one might expect to see the head of a comet, with its nucleus. The forms of very large diffuse nebulæ, properly so called, do not appear to admit of definition. They have no regular outline; they display all the fantastic figures which characterize clouds carried away and tossed about by violent and often contrary winds. The light of these large milky patches is generally very faint and uniform; but here and there are to be remarked some spaces brighter than the other parts. It is argued by some astronomers, that the phosphorescent matter constituting the diffuse nebulæ is gradually condensed into stars. This bold idea is not so novel as it has been generally imagined to be. As early as 1572, Tycho Brahé regarded the new star of that year as the recent agglomeration of the diffuse matter distributed in space, which he called the celestial matter. The term of *planetary nebulæ* was applied by Sir W. Herschel to those nebulæ which resembled in form the planets of our own system. He also applied the term *nebulous stars* to those stars which were surrounded by a nebulosity depending upon themselves, and constituting an integral part of them; such as the star of the eighth magnitude situated in the left foot of Perseus. Amongst the most singular nebular phenomena are the Magellanic clouds, situated in the southern hemisphere. The larger of these covers 42 square degrees, and the smaller 10 square degrees of the celestial vault. In a fine moonlight night the smaller cloud becomes entirely effaced, and the other loses a large part of its brightness. The latest contributions to nebular astronomy are due to Lord Rosse. One of the most remarkable facts disclosed by his observations consists in the spiral arrangement of several of the nebulæ. It would also appear from these, that several nebulæ which had been considered irresolvable, consist of clusters of stars. This would seem to suggest that all objects of this class are in reality agglomerations of stars, but the subject is one on which there is considerable diversity of opinion.—*Ref.* Herschel's *Outlines of Astronomy*; and Arago's *Popular Astronomy*.

NEBULÉE, *neb'-ü-le*, a term applied in Her. when the line used in dividing the field of the escutcheon is drawn with undulations resembling the form of clouds. It is also applied to a shield or charge divided by several such wavy lines.

NECESSITY. (*See* FREEDOM AND NECESSITY.)

NECK, *nek* (Sax. *necca*), in Anat., is that part of the body which connects the head with the trunk. It is principally made up of the cervical vertebræ, and the numerous muscles which cover them, and are concerned in their different movements and in those of the head and shoulders. The pharynx and œsophagus lie in contact with the front of the vertebral column, and the larynx and trachea in front of these. The large blood-vessels of the head pass through the neck on the front of the spine, and some important nerves take nearly the same course. These several organs, connected together rather loosely by cellular substance and surrounded by integuments, compose the neck.

NECROLOGY, *ne-krol'-o-je* (Gr. *nekros*, dead, and *logos*, discourse), literally signifies a discourse on a deceased person; but, in particular, it was anciently applied to a book kept in the monasteries and churches, in which were registered the benefactors to the same, the time of their deaths, &c.; as also the deaths of the priors, abbots, &c.

NECROMANCY, *ne'-kro-man-se* (Gr. *nekros*, and *manteia*, divination), is the divination of the future by consulting the spirits of the dead. The origin of the pretended art extends far beyond the limits of history. It is generally believed to have arisen in Egypt at a very early period, and to have been from hence carried into most of the other countries of antiquity. The Jews, doubtless, became acquainted with it here, and we find it repeatedly, and in very severe terms, condemned in the Old Testament by Moses and others (Deut. xviii. 11, 12). In 1 Sam. xxviii. 3—8, we have an account of the witch of Endor's pretended raising up of the spirit of Samuel before Saul. In the eleventh book of the "Odyssey," Homer makes Ulysses raise the shade of Tiresias from the infernal regions. In the sixth book of the "Æneid" of Virgil we have an account of the descent of Æneas into Hades, another form which necromancy sometimes took among the ancients. The Greek satirists did not neglect to aim their shafts at this art, and in the "Frogs" of Aristophanes, and particularly in Lucian's "Menippus," we have elaborate and amusing descriptions of the ceremonies attending the invocation of the dead and the entrance of the living into Hades. The priesthood usually claimed to be the medium of communication between the living and the dead, and the art was practised with peculiar and imposing ceremonies, which could not fail to greatly impress the beholder. The necromancer surrounded himself with mysterious emblems; a multiplicity of rites preceded the evocation of the spirit; and, above all, solitude and darkness, so potent in their influence over the imagination, were regarded as essential to success. The Thessalian evokers of spirits performed their rites with many revolting atrocities, and not unfrequently butchered men in order to consult their spirits before they had time to hasten down to the regions of the dead. The establishment of the Christian religion brought necromancy under the ban of the Church; and the emperor Constantine prohibited, under severe penalties, the evocation of the dead. The necromancer of the middle ages seems to have merged in the sorcerer, who, by means of potent spells, summoned demons and infernal spirits to his aid. The latest form of necromancy is the spiritualism (which *see*) which has recently been making some noise in America, and even in this country.

NECROPOLIS, *ne-krop'-o-lis* (Gr. *nekros*, and *polis*, a city), literally signifies the city of the dead, and was the name given to a suburb of Alexandria in Egypt, containing temples, gardens, and superb mausoleums. Hence it has come to be applied to some of the magnificent cemeteries in the vicinity of some of our large cities; as the necropolis of Liverpool, of Glasgow, &c.

NECROSIS, *ne-kro'-sis* (Gr. *nekros*), in Med., is used as synonymous with mortification or gangrene; but it is more commonly used in Surg. to denote the death or mortification of a part or the whole of a bone. Necrosis differs from caries of a bone, inasmuch as in the latter case the vitality of the bone is only impaired, not destroyed, as in the former; in the same way as ulceration of the soft parts differs from gangrene. Necrosis is found in either sex, and at all periods of life, and may be occasioned either by external causes, as fractures, contusions, &c., or by internal or constitutional causes, as a scrofulous or deranged habit of body. When a portion of a bone becomes dead, it is regarded as an extraneous sub-

stance, and its removal from the part, either by the action of absorbents or by a surgical operation, is absolutely necessary. Its detachment and removal become as necessary for the process of reparation and the cure of the patient as the taking away of any other extraneous substance lodged in any part of the human frame, and keeping up irritation, suppuration, and other effects.

NECTANDRA, *nek-tăn'-drä*, in Bot., a gen. of the nat. ord. *Lauraceæ*. The species *N. Rodiei* is the *bibiru* or *bebeerú* tree, a plant of considerable importance. It yields the wood called *greenheart*, which is largely imported into this country from Guiana and the West-Indian islands, for ship-building and other purposes. This timber is heavy, hard, and durable, but rather apt to split; it takes a good polish, and is remarkable for its olive-green colour. The bark of this tree has been used of late years as a substitute for the cinchona barks in medicine. Its tonic, antiperiodic, and febrituge properties are due to the presence of a peculiar alkaloid, called *bibirine*, or *bebeerine*, which may be employed by itself, or in the form of a sulphate, as a substitute for quinine. The seeds of the bibiru contain starch, which is mixed with a species of decayed astringent wood and a certain quantity of cassava starch, and made into a kind of bread by the South-American Indians. *N. cymbarum* yields the substance called *Brazilian sassafras*. The cotyledons of *N. Puchury, major* and *minor*, are imported from Brazil, under the names of *sassafras-nuts* and *pichurim beans*. They are used for flavouring chocolate.

NECTAR, *nek'-tar* (Gr.), a term applied in Grecian mythology to the supposed drink of the gods; and it was believed that this nectar, which they never gave to mortals, contributed much towards their eternal existence. According to the fables of the classic poets, it was a most delicious liquor, with properties far exceeding anything that mortals could imagine, as it gave a beauty, bloom, and vigour to all who imbibed it. Combined with the ambrosia (which formed the solid food of the gods), it repaired all accidental injuries or decays which might assail them.

NECTARINE. (*See* AMYGDALUS.)

NEEDLE, NEEDLE-MANUFACTURE, *ne'-dl* (SAX. *naedl*).—This simple but indispensable adjunct of civilization, however small its size, requires to be manipulated by no fewer than 120 workmen before it is ready for the housewife. The first operation which has to be gone through is to reduce the best steel, by means of a wire-drawing machine, to the suitable diameter of the needle. The steel wire is brought in bundles to the manufactory, where it is tested by being reheated and plunged into cold water, after which it is snapped between the fingers in order to ascertain its quality. The wire that is the most brittle is kept for a peculiar kind of needle, and the rest which has passed the test is calibred, in order to see whether it is equally thick all through and of the required gauge. The coils of wire are then cut by a pair of mechanical shears into pieces of about eight feet long, and again into the requisite needle-length. In order to cut 100 wires, only two successive incisions are requisite, and, consequently, the shears, by striking 31 blows in a minute, cut in 10 hours fully 400,000 ends of steel wire, which produce more than 800,000 needles. After the wires are cut, being more or less bent, they require to be straightened; and the operation is thus performed:—They are inclosed, from 5,000 to 6,000 at a time, in two strong iron rings, and the bundle is placed upon a flat smooth bench covered with a cast-iron plate, which has two grooves in it to receive the projecting circumference of the rings. Above the bundle is then placed another plate or rule, which has likewise two grooves to receive the rings, and by pressing this down two or three times, the wires are immediately straightened. The needles, now in their embryo state, are then taken to the pointing-house, where, by means of some thirty grindstones driven by a water-wheel, they are to be sharpened. The workman seats himself in front of the grindstone (which, on account of the rapidity of its revolutions, is inclosed with iron plates or bands, having slits between for the wire to be applied to the stone), and seizing fifty or sixty wires between the thumb and forefinger of his right hand, presents one end of the bundle to the grindstone, by which means the ends are made conical. This operation is termed *roughing down*, and is performed without the aid of water; by which means the steel-dust seriously damages the eyes and lungs of workmen. There are many inventions for preventing this cause of bad health to the needle-workers; but they seldom adopt any precautions, preferring to go along on the old plan, and to do as their fathers did before them. The wires being thus pointed, are then transferred to the first workshop, and are cut in two, so as to form two separate needles of equal length and quality. For each different size a small copperplate is employed. It is nearly square, and has a turned-up edge on two of its sides; the one is intended to receive all the points, while the other resists the pressure of the shears. On this plate a certain number of wires are put with their points in contact with the border, and they are cut together flush with the plate, by means of a small pair of shears, moved by the knee of the workman. These even wires are now taken to the *head-flattener*. This workman, seated at a table with a block of steel before him about three inches cube, takes up from twenty to twenty-five needles between his finger and thumb, spreading them out like a fan, with the points under the thumb. He lays the heads on the steel block and with a small flat-faced hammer strikes a few successive blows upon them so as to flatten them in an instant. The heads having become hardened by hammering, are now annealed by heating and slow cooling, and are handed to the *piercer*, generally a child, who forms the eye in a second by laying one side of the head upon a block of steel, and by driving a small punch through the other side with a smart tap of his hammer. The eyes are then trimmed by driving the punch through them again, and, after laying the needle with the punch sticking through it upon the block of steel, hammering the head on the sides, which causes it to take the form of the punch. The next operator makes the groove at the eye, and rounds the head, which he does with a small file. The needles being thus prepared, are thrown by the workman, pell-mell, into a sort of drum or box, in which they are made to arrange themselves in parallel lines by means of a few dexterous shakes of the workman's arm. They are now ready to be tempered, for which purpose they are ranged on sheet-iron plates, generally about thirty pounds weight at a time, containing from 250,000 to 500,000 needles, and are placed in a furnace, whence, after being heated to redness, they are removed, and immersed suddenly in a bath of cold water. Some manufacturers heat the needles by means of immersion in melted lead. *Polishing* is the next operation, and it is the longest and most expensive process. This is effected upon bundles containing 500,000 needles, by a machine, under the guidance of one man, who can polish about 30 bundles at once. The needles are rolled up in the bundles, covered with canvas in layers, with quartzose sand interspersed between the layers, which are smeared with rape-seed oil. These packets are then exposed to the to-and-fro pressure of wooden tables, by which the needles are rubbed constantly together on every side, and get finely polished. They are then *scoured by the cask*; that is to say, after being worked during eighteen or twenty hours under the tables, the needles are taken out of the packets, and are placed in wooden bowls, where they are mixed with sawdust to absorb the black grease. They are then put in a cask, which revolves by means of a handle and axis, on which it is supported in its frame, and some more sawdust is added, and the cask revolved rapidly until they are quite clean, and the eyes are clear. *Winnowing* is the next process, and it is achieved by means of a mechanical ventilator, the same as is used for winnowing corn, and the operation leaves the needles bright and clear from all impurity. For the best descriptions of needles, the three operations of polishing, scouring, and winnowing, are generally performed at least ten times. They are then sorted in the order of their polish, and the sorter separates all that have broken points, heads, or other defects. Afterwards they are divided into quantities for packing up in the small blue paper parcels in which they are usually seen, while the defective needles go back to the *pointer*, in order

to be ground again, and be made up into an inferior article. The blue shade observed at the points is done by the *tinter*, who turns twenty-five at a time on a small bone-stock, formed of micaceous schist and mounted on a small lathe. The needles, now complete, are finally wrapped up in papers, inclosed in boxes, and are sent off to the warehouse, whence they are sold to the various consumers.

NEEDLE, DECLINATION OF THE. (*See* DECLINATION OF THE NEEDLE.)

NEEDLE, DIPPING. (*See* DIPPING-NEEDLE.)

NE EXEAT REGNO, *ne ek'-e-at reg'-no* (Lat., that he may not leave the kingdom), in Law, is a writ issued against a person who owes an actually due equitable debt and is meditating a departure from the realm, to prevent his flight without the queen's license. The motion for the writ, except in some special cases, requires to be supported by an affidavit as to the debt, and the defendant's intention to go abroad; and the person when arrested may obtain his liberty by either depositing the amount indorsed upon the writ, or by executing a bond, with two sufficient sureties in double that sum, not to leave the country.

NEGATION. (*See* LOGIC.)

NEGATIVE QUANTITIES, *neg'-a-tiv* (Lat. *negativus*, negative, from *nego*, I deny), those quantities in Algebra which are opposite to *positive quantities*, and which are characterized by having the symbol — prefixed to them. The theory of negative quantities is attended with great difficulty and many obstructions when it ascends to the higher branches of mathematics. In the expression $a-b$, where $a$ is greater than $b$, the quantity can readily be solved; but when we have $a-b$, where $b$ is greater than $a$, the expression is attended with much difficulty, as is also $-a$ by itself. The best definition, and what is most natural, is that given by Newton, and followed by Euler, that negative quantities are less than nothing; the second definition is usually adopted with regard to mechanics, that negative quantities are similar to positive quantities, only that they are taken in a contrary sense or opposite direction. D'Alembert, however, has shown that both these definitions lead to inaccurate notions. He observes: Let there be the proportion $1 : -1 :: -1 : 1$, which is true in its results, because the product of the means must equal the product of the extremes, *or vice versâ*. Now it must be considered that if $-1$ be less than nothing, it will be consequently much more less than the positive number 1. Therefore it can be deduced that the second term is less than the first, and consequently the fourth be less than the third. That is to say, 1 will be less than $-1$; but it has been proved to be greater than $-1$; consequently it will be both less and greater, which is absurd. The only true interpretation which we can attach to a *negative quantity*, is that it is an absolute quantity which does not conform to the system of reasoning by which positive quantities are governed, but that it relates to another system in such a manner, that, in order to render the formulæ for the first system applicable to it, the sign which precedes it must be changed from + to —, or from — to +. For instance, if $y$ represents the difference between $a$ and $x$, it does not follow that by substituting $-y$ for $+y$, the quantity represented by $y$ becomes negative; but merely that of the two quantities $a$ and $x$, the one which was the greater in the case in which $y$ has the sign +, becomes the smaller when the symbol of $y$ is changed into —. (*See* IMAGINARY QUANTITIES.)—*Ref.* Peacock's *Algebra*.

NEGATIVE SIGN, the algebraic sign, consisting of a dash, thus —, also called *minus*.

NEGOTIABLE INSTRUMENTS, or NEGOTIABLE PAPER, *ne-go'-she-a-bl*, in Law, is used to denote such documents as are freely assignable from one to another, as bills of exchange and promissory notes. It is essential to the negotiability of a bill between all persons, except the government, that the words "payable to order," or "to bearer," or other equivalent words, be used, authorising the payee to assign or convey the same to third parties. The mode of transfer depends upon the form in which it is made negotiable. If payable to the bearer, then it may be transferred by mere delivery; but if originally payable to a person or his order, then it is properly transferable by indorsement, because in no other way will the transfer convey a legal title.

NEGRO, *ne'-gro* (Lat. *niger*, black), is a name properly applied to a race or variety of the human species, inhabiting the central portion of Africa, principally between lat. 10° N. and 20° S., on account of one of their most striking characteristics,—their black colour. They do not include the Egyptians, Nubians, Abyssinians, &c., of northern, nor the Hottentots of southern Africa. Their characteristics are: skin black, hair woolly, lips thick, nose depressed, jaw protruded, forehead retiring, proportions of the extremities abnormal. They occupy about one-half of Africa, and out of Africa are found in the United States, the West Indies, Brazil, Peru, the Cape Verd islands, and Columbia, mostly in the condition of slavery. The Egyptians became acquainted with negroes through the conquests of their rulers about 2300 B.C., and represented them on their monuments as early as 1600 B.C.; whence we know that for nearly thirty-five centuries the type has remained unchanged. They were unknown to the Greeks till the seventh century B.C. In Africa the negro tribes have in general elevated themselves considerably above the simple state of nature. Living in settled habitations, practising a rude agriculture, and carrying on certain manufactures. They display considerable ingenuity in the manufacture of weapons, the working of iron, weaving of mats, cloth, and baskets from dried grasses, in the dressing of skins of animals, structure of their huts and household utensils, and the making of various implements. Their religion is a species of fetichism, and they believe in good and evil spirits, witchcraft, charms and spells, omens, lucky and unlucky days, &c. Though cruel to their enemies and prisoners, and setting little value on human life, they are naturally kind-hearted, affectionate, hospitable to strangers, unsuspecting, and communicative of their joys and sorrows. They are of a cheerful disposition and passionately fond of music. Their languages are described as extremely rude and imperfect, almost destitute of construction, and incapable of expressing abstractions.

NEHEMIAH, BOOK OF, *ne-he-mi'-ah*, is the title of one of the books of the Old Testament, whose author Nehemiah, flourished about 444—405 B.C. He was sent by the Persian monarch, to whom he was cupbearer, to rebuild the wall of Jerusalem, after the return from the captivity, and "to seek the welfare of the children of Israel." The book, therefore, contains a narrative of the transactions in which he bore a principal part, and the reforms effected by him. It may be divided into eight parts: — 1. The departure of Nehemiah from Shushan, furnished with a royal commission to rebuild the walls of Jerusalem, and his arrival there (i. ii. 1—11); 2. an account of the building of the walls and gates of the city, notwithstanding the obstacles interposed by the Samaritans (ii. 12—20, iii.—vii. 4); 3. a register of the exiles who first returned from Babylon, and an account of oblations at the temple (vii. 5—73); 4. a solemn reading of the law by Ezra, at the feast of Tabernacles (viii.); 5. a solemn fast and repentance of the people, and renewal of the covenant with Jehovah (ix. x.); 6. a list of those who dwelt at Jerusalem and in other cities, register and succession of the high priests, chief Levites, and principal singers (xi. xii. 1—26); 7. the dedication of the city walls (xii. 27—47); 8. the correction by Nehemiah of abuses which had crept in during his absence (xiii.). This book was once connected with, and formed part of, the book of Ezra; and hence some ancient writers called it the second book of Ezra or Esdras, and even regarded that learned scribe as the author of it. There can be no reasonable doubt, however, that it proceeded from Nehemiah, for its style and spirit, except in one portion, are wholly unlike Ezra's. Nehemiah was unquestionably, and in the strictest sense, the author of the earlier portion down to chapter vii. 4, the greater part of what follows being evidently compiled from records. The canonical character of the work is established by very ancient testimony.

NELUMBIACEÆ, *ne-lum-be-ai'-se-e*, in Bot., the Water-bean ord. of *Dicotyledones*, sub-class *Thalamifloræ*. Aquatic herbs with peltate leaves rising above the water, and large showy flowers. The rhizome is very large, flattened at top, and excavated so as to present a number of hollows. The carpels are distinct and partially imbedded in the large honeycombed

thalamus. *Fruit* formed of numerous 1 or 2-seeded, nut-like bodies. The beautiful plants of this order are natives of stagnant or quiet waters of temperate and tropical regions in the northern hemisphere, being most abundant in India. There is but one genus, namely *Nelumbium*, which includes three species. The most interesting plant is *N. speciosum*, the fruit of which is commonly considered to have been the Egyptian bean of Pythagoras, and the flower the lotus so often represented on the monuments of Egypt and India. The plant, however, is no longer found in Egypt, though common in India. The leaf and flower-stalks contain a large number of spiral vessels. These are extracted and burnt as wicks in the sacred lamps of the Hindoos on great and solemn occasions.

NELUMBIUM. (*See* previous article.)

NEM. CON., *nem kon*, is a contraction of the Latin words *nemine contradicente*, no one opposing, or unanimously.

NEMEAN GAMES. (*See* GAMES, PUBLIC.)

NEMOCERA, *ne-mos'-e-rā* (Gr. *nema*, a thread, and *keras*, horn), a class of dipterous insects, including those which have long filiform antennæ. In this family, the antennæ usually consist of from fourteen to sixteen joints. They are either filiform or setaceous, frequently hairy, particularly in the males, and much longer than the head. The body is elongated, the head small and rounded, the eyes large, the proboscis salient, and either short and terminated by two large lips, or prolonged into a siphon-like tube, with two exterior palpi inserted at its base, usually filiform or setaceous, and composed of four or five joints. The thorax is thick and elevated, the wings are oblong; the halteres are entirely exposed, and are apparently accompanied with alulæ (little wings). The abdomen is elongated, and most commonly formed of nine annuli; it terminates in a point in the female, but is thicker at the end, and furnished with hooks in the males. The legs are very long and slender, and are frequently used as instruments by which the insects can balance themselves. They are found at nearly every season of the year, and usually flit together in the air in numbers. The larvæ are always elongated, and resemble worms. They have a large head, and a mouth furnished with parts analogous to maxillæ and lips. They always change their skin to become nymphs. The latter, sometimes naked and sometimes inclosed in cocoons constructed by the larvæ, approximate in their figure to the perfect insect; they also present the external organs, and complete their metamorphosis in the usual manner. They have frequently, near the head, or on the thorax, two organs of respiration, resembling tubes. The family *Nemocera* is composed of the genera *Culex* and *Tipula* of Linnæus. (*See* MOSQUITO.)

NEOLOGY, *ne-ol'-o-je* (Gr. *neos*, new; *logos*, word), signifies the invention of new words or phrases, for the purpose of expressing ideas which are either new or have hitherto been badly expressed. As progress is made in the sciences, the arts, and the various branches of industry, in any particular country, the extension of its language is a matter of course, and is in itself a complete record of the national advance. There are certain generally recognized etymological rules according to which alone new words may be properly introduced into a language; and when these are observed, the adoption of new words may be regarded as a social benefit.

NEOPHYTES, *ne'-o-fitez* (Gr. *neos*, new, and *phuton*, growth), in the Eleusinean and other mysteries, was a term applied to such as had been newly initiated, and among the early Christians it was applied to those who had newly turned from heathenism and adopted the principles of the Christian church. It was also applied to new priests, or those just admitted into orders, or novices in monasteries or nunneries, and is still by Roman Catholic missionaries applied to converts from the heathen.

NEO-PLATONISTS, *ne'-o-plat'-ton-ists*, a school of philosophers who flourished in Alexandria during the 3rd, 4th, and 5th centuries, and whose founder is by some considered to have been Philo Judæus, who lived in the 1st century, and by others, Ammonius Saccas, who commenced his philosophic teachings about the commencement of the 3rd century. Taking the sublimer doctrines of *Plato* as a basis, this school endeavoured to form a new philosophy, which should not only establish an agreement between Plato and Aristotle on all leading points of speculation, but also harmonize the Grecian and Oriental modes of thought. Writers on the history of philosophy have divided Neo-Platonism into several periods; the simplest division being that which groups them under the head of *Eclectics*, or immediate disciples of Philo Judæus; and *Mystics*, the disciples more or less immediate of Ammonius Saccas. Neo-Platonism sought to blend in one grand system all systems of philosophy, all systems of religion; but after having made a compromise with so much, one enemy remained with whom it would not hear of peace—and this was Christianity; the great offence of Christianity being, in the eyes of the Neo-Platonists, that it was not equally tractable with other religious schemes, but asserted its claims as the only true religion. A fierce conflict, consequently, took place between Neo-Platonism and Christianity; but the former, driven to and fro amid its many and diversified doctrines, had in the latter an opponent which stood strong in oneness of idea, simplicity, and purity of sentiment, and before the middle of the 6th century Neo-Platonism vanished, after having sunk into what was little better than an unqualified scepticism. The value of Neo-Platonism consisted in its endeavour to preserve the whole treasure of every system of philosophy; since it is, in truth, as advance of philosophy, to have gained a large store of different ideas, and a wide review of the different directions of philosophical thought.

NEPENTHACEÆ, *ne-pen-thai'-se-e* (from Gr. *ne*, not; *penthos*, grief), in Bot., the Pitcher-plant fam., a nat. ord. of *Dicotyledones*, sub-class *Monochlamydeæ*. Herbaceous or somewhat shrubby plants. Leaves alternate, and terminated by a pitcher-shaped structure, provided with an articulated lid. Flowers terminal, racemose, dœcious; calyx inferior, with 4 divisions; stamens collected into a column; anthers 2-celled, extrorse, usually 16; ovary superior, 4-angled, 4-celled. Fruit capsular, 4-celled, with loculicidal dehiscence. Seed very minute, numerous, albuminous; embryo with an inferior radicle. There is but one genus, *Nepenthes*, which includes about 14 species, natives of swampy ground in China and India.

NEPENTHE, *ne-pen'-the*, a word adopted from the Greek, signifying a drink calculated to banish the remembrance of grief and enliven the spirits. The first mention of it is in the Odyssey of Homer, who describes Helen as administering it to Telemachus, and states that she had learned the art of making it from Polydamna, wife of Thonis, king of Egypt. Of modern poets, Milton and Pope are the principal who have alluded to it.

NEPHELIUM, *ne-fe'-le-um*, in Bot., a gen. of the nat. ord. *Sapindaceæ*, yielding the delicious fruit of China and the Indian archipelago, known under the names of *Litchi*, *Longan*, and *Rambutan*.

NEPHRITIS. (*See* KIDNEYS, DISEASES OF THE.)

NEPOTISM, *nep'-pot-izm*, a term derived from the Latin word *nepos*, a nephew, first used in Italy in reference to the anxiety generally displayed by the popes to enrich and aggrandize their nephews. Its meaning has gradually become extended, and it is now generally applied to all persons holding public offices, who endeavour to advance the interests of their relations, whether nephews or not, at the public expense. Nepotism has in all ages and all countries excited great indignation, but the famous essayist Addison defends it, on the ground that, as it led to the concentration of great wealth in the hands of certain families, it was the means of enriching Rome with splendid palaces and vast collections of the fine arts.

NEPTUNE, *nep'-tune*, in Astron., a name given to the most remote of the members of our planetary system. The discovery of this planet, by means of an investigation concerning certain perturbations which were observed in the movement of the neighbouring planet Uranus, must always stand forth as one of the most brilliant scientific feats on record. About forty years after the discovery of the planet Uranus by Sir W. Herschel, new tables of that planet were published by Bouvard, the French astronomer. In the Introduction to these tables, an unexpected result was an-

nounced. On comparing the earlier observations of the planet with those of 1781, it was found that both sets of observations could not be included in the same orbit. Bouvard seems to have suspected that this discordance was due to the disturbing influence of some unknown planet. This belief began to be strengthened when it was found, in 1821, that the planet began to exhibit a deviation from Bouvard's tables of 1781. This deviation continued to increase till 1830, when the error in longitude amounted to as much as half a minute of space. In 1843 the subject was closely investigated by Mr. J. C. Adams, of St. John's College, Cambridge, and in October, 1845, he called at the Royal Observatory, and left a paper mentioning the following elements of the planet, which he had arrived at by a close and rigorous calculation.

| | |
|---|---|
| Mean distance from the sun, the earth's distance being represented by unity | 38·4 |
| Mean sidereal motion in 365·25 days | 1° 30·9′ |
| Mean longitude October 1, 1845 | 323° 34′ |
| Longitude of perihelion | 315° 55′ |
| Eccentricity | 0·1610 |
| Mass (that of the sun being unity) | 0·0001056 |

Singularly enough, at the same time, M. Leverrier, in France, was pursuing investigations in the same direction, and had also pointed out that a planet of similar density would be found in the same direction. On the 23rd of September, 1846, M. Leverrier wrote to Dr. Galle, one of the astronomers at the Royal Observatory at Berlin, announcing to him the result he had arrived at, and requesting him to look for the disturbing planet in or near the place assigned by his calculation. He did so, and on that very night actually found it. A star of the eighth magnitude was seen by him and M. Encke, in a situation where no star was marked as existing in Dr. Bremiker's chart, then recently published by the Berlin Academy. The next night it was found to have moved from its place, and was therefore certainly a planet. Neptune is not visible to the naked eye; its sidereal revolution is completed in 164 years and 266 days; and its greatest distance from the sun is 2,895 millions of miles.

NERVES. (*See* NERVOUS SYSTEM.)

NERVOUS DISEASES, *ner'-vus.*—Of the numerous disorders to which the human frame is liable, there are, perhaps, none which exert so extensive an influence, and are at the same time so little understood, as the whole class of nervous diseases. The nervous system is the presiding and governing power of the whole animal machine. Whether the patient sleeps or wakes, eats or suffers, all that he does or feels is through its agency. It not only governs individual parts, but harmonises the action of all, binding together the various portions by the strongest ties of sympathy, so that the well-being of one promotes the general good, and one cannot suffer without affecting all. The sufferings and disorders to which it is liable are so varied in their sources, so uncertain in their nature, degree, and combination,—are attended for the most part with such different lesions, if attended with any, that they are not only difficult to describe when first observed, but even more so to recognize when they recur. Connecting as does this system the mental with the physical, the diseases affecting it are not confined to the body, but invade the province of the mind itself. Nervous diseases are properly divided into structural and functional diseases of the nervous system; the former arising from some morbid change or lesion in the nerve structures, the latter including those in which there is no morbid change or lesion to account for the symptoms. Structural diseases may be divided into—1. Those of the brain and spinal cord, and their coverings or membranes; and 2. diseases of the nerves. The brain and spinal cord are subject to diseases affecting their membranes, their substance, and their blood-vessels. (*See* BRAIN, DISEASES OF THE.) Diseases of the nerves themselves are not numerous. They may arise from inflammation of the delicate fibrous sheath which envelops the nerves, from the development of tumours near the origin or along the course, or amid the ramifications of the nerves; or from the bulbous expansion of the extremities of divided nerves, occurring after amputation, and causing painful stumps. The functional diseases of the nervous system manifest themselves by irregular, depressed, or exalted conditions of the processes and peculiar functions of the system; viz., sense, sensation, and motion. They may be enumerated as follows:—1. The numerous varieties of neuralgia, which are independent of disease of the nerves or their centres (*see* NEURALGIA).—2. The various forms of insanity and general paralysis, where no morbid change occurs in the brain to account for the symptoms.—3. The various exhibitions of mental and moral perversity, constituting the disease known as hysteria, convulsions, paralysis of sensation and motion, &c.—4. Delirium tremens, that derangement of the nervous functions manifested by optical illusions, hallucinations, mania, and muscular trembling, which arises from exhaustion of the nervous power produced by prolonged stimulation by alcohol.—5. Chorea, or St. Vitus's dance, an affection occurring generally in young girls, and consisting in irregular contractions of the voluntary muscles, and which has been graphically described as "insanity of the muscles."—6. The convulsions and paralyses that occur in infancy and childhood, from the irritation of teething, or from gastric and intestinal derangements.—7. Tetanus, or locked-jaw, a rigid spasm of the voluntary muscles, arising from an exalted state of the reflex function of the spinal cord, sometimes spontaneous, but more frequently the result of lacerated wounds. Hydrophobia may be included under this head.—8. The rare and curious derangement known as catalepsy and ecstasy. Epilepsy is sometimes a purely functional, sometimes an organic disease. These several diseases will be found described under their special heads in other parts of this work. It is one of the remarkable features of mental disorders, that they are frequently entailed by mimicry or imitation. The treatment of nervous diseases often embarrasses the scientific practitioner and resists the most skilful applications. The particular nervine medicines which were formerly considered as specific remedies in such complaints have been given up, and the mode of treatment is now more general and rational, being directed to the restoring and strengthening the general system by means of nourishing food, gentle exercise, bathing, tonics, &c. It has been held that the advance of civilization and intelligence has rendered the nerves more irritable, and therefore more liable to be diseased; but a more frequent cause of nervous maladies is to be found in the excessive use of fermented liquors, wine, tea, coffee, &c., which impair the tone of the stomach, and thus give rise to various forms of nervous disease. Besides attention to the state of the body, it is of the utmost importance to strive to maintain a calm and uniform state of mind, one not easily disturbed by the crosses and accidents of life. The mind and the body reciprocally act upon each other and promote each other's health. The elements of mental discipline which, if steadily pursued, fail not to conduce not only to health of mind and body, but also to enduring comfort and happiness, are "the subjugation of gross appetites, the subordination of all turbulent or violent moral and mental emotions; the cultivation of the gentle and contemplative feelings, best cultivated in domestic life and in refined social intercourse; and the regular but moderate application of the intellectual powers to some definite object or set of objects worthy of pursuit."—*Dr. Williams.*

NERVOUS SYSTEM, in Anat. and Physiol., embraces that portion of the organism of man by which the mind is brought into connection with the physical world. The nervous system consists of two portions or constituent systems,—the cerebro-spinal and the sympathetic or ganglionic. The cerebro-spinal system includes the brain and spinal cord, with the nerves proceeding from them, and is denominated by Bichat the nervous system of animal life. It includes those nervous organs in and through which are performed the several functions with which the mind is more immediately connected, as those relating to sensation and volition. The sympathetic or ganglionic system, named by Bichat the nervous system of organic life, consists of a chain of ganglia extending from the cranium to the pelvis along each side of the vertebral column, and from which nerves with ganglia proceed to the viscera in the thoracic, abdominal, and pelvic cavities. (*See* GANGLION.) The several organs of the nervous system are composed

of two different substances, which differ from each other in density, colour, minute structure, and chemical composition. They are the vesicular-nervous and the fibrous-nervous matter, the former being also called the grey or cineritious substance, the latter the white or medullary. The former is distinguished by its dark reddish-grey colour and soft consistence, and is found usually collected in masses and mingled with fibrous structure, as in the brain, spinal cord, and the several ganglia, but never in the nerves. The masses constitute what are termed nervous centres, being the organs in which it is supposed that nervous force may be generated, and in which are accomplished all the various reflections and other modes of disposing of impressions when they are not simply conducted along nerve-fibres. The fibrous nerve-substance, besides entering into the composition of the nervous centres, forms alone the nerves or cords of communication which connect the various nervous centres with the different tissues and organs. The vesicular nervous substance is composed, as its name implies, of vesicles or corpuscles, commonly called nerve or ganglion corpuscles, containing nuclei and nucleoli; the vesicles being imbedded either in a finely granular substance, as in the brain, or in a capsule of nucleated cells, as in the ganglia. Each vesicle consists of an exceedingly delicate membranous wall inclosing a finely granular material, part of which is occasionally of a coarser kind and of a reddish or yellowish-brown colour. The nucleus is vesicular, much smaller than the vesicle, and adherent to some part of its anterior. The nucleolus, which is inclosed within the nucleus, is vesicular in form, of minute size, and peculiarly clear and brilliant. The nerve-corpuscles vary in shape and size; some are small, spherical, or ovoidal, with an uninterrupted outline. The fibrous-nervous matter consists of two different kinds of nerve-fibres, which are distinguished as the tubular fibre and the gelatinous fibre. In most nerves these two kinds are intermingled, the tubular fibres being more numerous in the nerves of the cerebro-spinal system, the gelatinous predominating in the nerves of the sympathetic system. The nerve-fibres vary in size, being largest within the trunk and branches of the nerves, where they measure from $\frac{1}{2000}$ to $\frac{1}{1000}$ of an inch, and becoming gradually smaller as they approach the brain and spinal cord, and usually, also, in the tissues in which they are distributed. In the grey matter of the brain and spinal cord they seldom measure more than $\frac{1}{5000}$ to $\frac{1}{3000}$ of an inch. The tubular fibres, in a perfectly fresh state, present the appearance of simple membranous tubes, perfectly cylindrical, and containing the proper nerve-substance, a transparent oil-like and apparently homogeneous material, but which, shortly after death, undergoes a change, and has the appearance of being composed of two different materials; the internal or central part, occupying the axis of the tube, becomes greyish, while the outer or cortical portion becomes opaque, and dimly granular or grumous, as if from a kind of coagulation. The gelatinous fibres constitute the main part of the trunk and branches of the sympathetic nerve, and are intermingled in various proportions in the cerebro-spinal nerves. They are flattened, soft, and homogeneous in appearance, and when collected together in great numbers, they present a yellowish-grey colour. They differ from the tubular fibres in being only one half or one third of their size, in the absence of the double contour, their apparently uniform structure, and their yellowish-grey colour. The nerves are divided into two great classes,—the cerebro-spinal, which proceed from the cerebro-spinal axis, and are the nerves of animal life, being distributed to the organs of the senses, the skin, and the muscles; and the sympathetic or ganglionic nerves, which proceed from the ganglia of the sympathetic, and are distributed chiefly to the viscera and blood-vessels, and are termed the nerves of organic life. The cerebro-spinal nerves consist almost exclusively of the tubular nerve-fibres, the gelatinous fibres existing only in very small proportion. Each cerebro-spinal nerve consists of numerous nerve-fibres collected together and inclosed in a membranous sheath. A small bundle of primitive fibres so inclosed is called a *funiculus*; and if the nerve is of small size, it may consist only of a single funiculus: but if large, the funculi are collected together into larger bundles or fasciculi, and are bound together in a common membranous investment termed the sheath. Nerves, in their course, subdivide into branches, and these frequently communicate with the branches of a neighbouring nerve; but in these communications the nerve-fibres never coalesce, but merely pass into the sheath of the adjacent nerve, become intermixed with the nerve-fibres, and again pass on to become blended with the nerve-fibres in some adjoining fasciculus. Every nerve-fibre in its course proceeds uninterruptedly from its origin at a nervous centre to its destination; and however long its course, there is no branching or anastomosis, or union with the substance of any other fibres. The communications which take place between two or more nerves form what is called a *plexus*, in which the component nerves divide, then join, and again subdivide in such a complex manner that the individual fasciculi become most intricately interlaced. As the small bundles of nerve-fibres approach their final and minutest distribution in the several tissues, they commonly form delicate "terminal plexuses." The primitive fibres appear to terminate in various ways, as in loops, in plexuses, by branching, by free ends. The central termination of a nerve-fibre is that in connection with a nerve-centre; the peripheral termination, that in connection with the different organs and tissues. The sympathetic nerve consists of tubular and gelatinous fibres intermixed with a varying proportion of filamentous areolar tissue, and inclosed in a sheath of fibro-areolar tissue. The tubular fibres are for the most part smaller than those composing the cerebro-spinal nerves, and their double contour is less distinct. The nerve-fibres both of the cerebro-spinal and sympathetic system convey impressions of a twofold kind,—the one the impressions made upon their peripheral extremities or parts of their course conveyed to the nervous centres, the other the impressions from the brain and other nervous centres to the parts to which the nerves are distributed. For this twofold office two distinct sets of nerve-fibres are provided,—the sensitive, called also the centripetal or afferent nerves, which convey impressions from the periphery to the centre; and the motor, centrifugal, or efferent nerves, which transmit central impulses to the muscles, &c. But with this difference in the functions of the nerves, there is no apparent difference in the structure of the nerve-fibres by which it might be explained. Nerve-fibres appear to possess no power of generating force in themselves, or of originating impulses to action; but they possess a certain property of conducting impressions, but which is never manifested till some stimulus is applied. This property of nerves is called excitability, irritability, or nervous force, and one of its peculiarities is the rapidity with which it travels along the nerve-fibres. In many respects it resembles electricity, but the analogy between the two does not amount to identity. Almost all things that can disturb the nerves from their passive state, act as stimuli, and produce the same kind of effect, though not the same in degree, because that on which they act possesses but one kind of excitable force. All stimuli, internal or external, chemical, mechanical, or electrical, when applied to sensitive nerves, produce sensations, and when applied to motor nerves, excite contractions. There are certain kinds of nerves, however, the irritation of which produces effects that are entirely peculiar to themselves; thus, irritation of the optic nerves causes the sensation of light; of the auditory nerve, of sound, and of the olfactory or gustatory nerves, of smell and taste. It is a remarkable fact, that whatever part of a sensitive nerve be irritated, whether it be the centre, middle, or extremity, the same sensation will be produced. (*See* BRAIN, SPINAL CORD, GANGLION.)—*Ref. Quain's Anatomy*, by Sharpey; Gray's *Anatomy*; Kirke's *Physiology*; Carpenter's *Human Physiology*; Todd's *Cyclopædia of Anatomy and Physiology*; Brown-Sequard's *Physiology of the Nervous System*.

NEST. (*See* BIRDS.)

NESTORIANS, *nes-to'-re-ans*, in Eccles. Hist., were the followers of Nestorius, a bishop of Constantinople in the 5th century. In strenuously opposing certain errors of his time regarding only one nature in Christ, he went to the other extreme, and maintained not

only that he was both God and man, but that the two natures were distinct, and that the actions and sensations of Christ as the Son of God were to be carefully discriminated from those of Christ as the Son of Man. Hence he objected to the Virgin Mary being styled the mother of God, because it was only the human nature of Christ that was born of her, seeing that God could neither be born nor die. His opinions were vigorously combated by St. Cyril, bishop of Alexandria, and were condemned by several councils, Nestorius himself being declared guilty of blasphemy, deprived of his bishopric, and sent into banishment. His followers, however, continued to increase, and his doctrines were propagated throughout the East, particularly in Persia. A famous Nestorian school was established at Nisibis, and before the close of the 6th century the heresy had spread over Chaldea, Assyria, Syria, Egypt, Arabia, &c. In 1551 a dispute arose among them respecting the election of a patriarch; and at that time a section of them became reconciled to the Church of Rome, and their patriarch was consecrated by the pope. These united Nestorians are now commonly known as Chaldean Christians, and are under the patriarch of Babylon. The non-united Nestorians still remain as a distinct body, and inhabit principally the western part of Persia, amounting to about 70,000.

NETTLE. (*See* URTICA.)

NETTLE-RASH, *net'-tl-rāsh* (Lat. *urticaria*), in Med., is a disease characterized by a rash, or eruption of the skin, attended with intense itching, and taking its name from the close resemblance it bears to that produced by the stinging of nettles. The eruption consists of little solid eminences of irregular outline, but generally roundish or oblong, and either white or red, or (which is most common) both red and white; the whiteness occupying steadily the central and most projecting part of the spot, or becoming manifest there when the integuments are put upon the stretch. It is accompanied with intense heat, and a burning or tingling in the affected spots. No part of the body is exempt from nettle-rash. There are two varieties of this disorder, one of which is regarded as acute, the other as chronic, and either persistent or intermittent. The acute form is usually preceded or attended with feverishness, and a feeling of general uneasiness, headache, nausea, and vomiting. In general it appears in the morning, vanishes in the course of a few hours, and perhaps reappears again twice or thrice during the day. It usually disappears entirely in six or eight days. The chronic form of this complaint is intractable and difficult to remove, coming and going for a lengthened period, but with little or no feverishness. In most cases, probably in all, this disease arises from some derangement, manifest or latent, of the stomach, and it may frequently be traced to the use of some particular articles of food; as shell-fish, oatmeal, mushrooms, &c. It is very rarely fatal, and the treatment is simple. The great thing is to ascertain and avoid the offending article of food; and by means of a light diet and mild laxative medicine, the disease may usually be got rid of in a few days. An emetic is frequently of great service in expelling the offending substance. A few grains of rhubarb, or rhubarb and magnesia, taken daily, just before breakfast and just before dinner, have been found to cure chronic cases of long standing. Dusting the itching surface with flour will be found to afford temporary relief.

NEURALGIA, *nu-rāl'-je-ā* (Gr. *neuron*, a nerve, and *algos*, pain), is an increased and perverted sensation in a nerve, arising from some disease affecting the function or structure of the nerve or its centres. It is thus of two kinds,—functional, when unconnected with organic lesion at any part of the nerve's course or at the nervous centres, or, as is more frequently the case, structural, connected with some organic change, acute or chronic, more frequently the latter, at some part of the nerve's course or at the nervous centres. The causes of neuralgia are various, and generally obscure. They may be either constitutional or local; the former arising from some enfeebled state of the body or an impoverished condition of the blood, the latter from inflammation of the enveloping sheath of the nerves, or the development of tumours near or along their course. It may also be caused by the circulation of poisonous secretions, as urea, bile, &c., in the blood, or by the miasm of marshy regions. The pain is intense, but intermittent; sudden in its onset, and abrupt in its departure; shooting or plunging in its character, and often quite excruciating; readily excited by the slightest external impression, but seldom aggravated by firm pressure on the part,—on the contrary, often relieved thereby. The treatment necessarily depends much upon the cause whence it proceeds. When it arises from an enfeebled or impoverished state of body, tonics, nourishing diet, and out-door exercise are to be employed; and in the other cases the treatment has to be directed to removing the causes from which it springs. Where it depends on the pressure of tumours that can be removed, the pain will generally disappear with the removal of the cause. In inflammation of the nerve-sheath, local counter-irritation by cupping, blisters, issues, setons, &c., usually gives relief, and generally effects a cure. Temporary relief in all forms of neuralgia may be obtained by the administration of powerful anodynes, as morphine, used either externally or internally.

NEUROPTERA, *nu-rop'-te-rā* (Gr. *neuron*, a nerve, and *pteron*, a wing), one of the great classes into which the insect world is divided. It comprises the *Dragon-flies*, *May-flies*, and similar species. The *Neuroptera* are distinguished by their two upper wings, which are membranous, generally naked, diaphanous, and similar to the under ones in texture and properties; they are also distinguished by the number of these organs, as well as by their mouth, which is either fitted for mastication or else furnished with mandibles and true maxillæ. The abdomen is destitute of a sting, and is merely furnished with an ovipositor. Their antennæ are usually setaceous, and composed of numerous joints. They have two or three simple eyes, and the trunk is formed of three segments united in a single body, distinct from the abdomen, and bearing six legs; the first of these segments is usually very short, and in the form of a collar. The number of joints in the tarsi varies. The body is usually elongated, and with rather soft, or with slightly squamous teguments; the abdomen is always sessile. Many of these insects are carnivorous in their first state and in their last. Some merely experience a semi-metamorphosis, the rest a complete one; but the larvæ have generally six hooked feet, which they employ to reach their food. Cuvier divides the neuropterans into four different varieties, which he characterizes as follows:—1. Carnivorous insects subject to a semi-metamorphosis, with aquatic larvæ; 2. carnivorous insects subject to a complete metamorphosis, with either aquatic or terrestrial larvæ; 3. carnivorous or omnivorous terrestrial insects, subject to a semi-metamorphosis; 4. herbivorous insects, subject to a complete metamorphosis, with aquatic larvæ that construct portable dwellings. The first family is termed the *Subulicornes*, composed of the order *Odonata* of Fabricius, and of the genus *Ephemera* (which *see*). The second family is composed of the *Planipennes*, composed of the genera *Panorpatæ* of Latreille; and the *Plicipennes*, formed of the genera *Phryganea* of Linnæus, belong to the third family. (*See* DRAGON-FLY, EPHEMERA, MAY-FLY, *&c.*)

NEUTER, *nu'-ter* (Lat., neither), in Gram., signifies that gender of nouns which is neither masculine nor feminine. *Neuter verbs*, also called *intransitive*, are those which represent or give effect in language to a condition or operation,—*I fall, &c.* (*See* also article on GRAMMAR.)

NEUTRAL BODIES, *nu'-trāl*, in Chem., neutral bodies are those which exhibit neither an alkaline nor an acid reaction, and which neither act as bases or as acids. In organic chemistry they are generally distinguished by the absence of the final *e* at the end of the word; such, for instance, as paraffin, naphthalin, stearin, salicin, benzol, and many others. They form their compounds by the displacement of one or more of those atoms by one or more atoms of some other substance.

NEUTRALITY, *nu-trāl'-e-te* (Lat. *neuter*, neither), in International Law, is the impartial position maintained by one nation with regard to others which are at war. A neutral nation may render services to either of the belligerents which do not necessarily tend to assist him in carrying on the war; but it cannot supply him with troops, arms, or ammunition, unless, indeed, it

may be in terms of some treaty entered into before the commencement of the war. A neutral cannot refuse to one belligerent what it has allowed to the other. (*See* LAW OF NATIONS.)

NEWFOUNDLAND DOG, *nu'-found-lând*, a well-known and splendid variety of the canine race, remarkable for its strength, nobility of character, sagacity, and attachment to its master. There is no doubt that this dog derived its origin from the large Spanish dogs which were introduced into America by the early discoverers; and that from thence it was brought over to Europe. The natives of Newfoundland made them draw sledges and carts, and put them to other degrading uses. The rigours of the climate, and the difficulty of procuring food for the dogs, were, however, unfavourable both to the production of numbers and the full development of the frame. The English variety has been so cultivated that it is widely different, both in shape, size, and appearance, from the original stock, which is now extinct in Newfoundland. Many anecdotes are related of the Newfoundland dog's courage in saving lives, so much so that he is esteemed one of the most honourable members of the Humane Society. The following anecdote with regard to his intelligence



NEWFOUNDLAND DOG.

is extracted from Jesse's "Anecdotes of Dogs":—A gentleman of Suffolk on an excursion with his friend, was attended by a Newfoundland dog, which soon became the subject of conversation. The master, after a warm eulogium upon the perfections of his canine favourite, assured his companion that he would, upon receiving the order, return and fetch any article he should leave behind, from any distance. To confirm this assertion, a marked shilling was put under a large square stone by the side of the road, being first shown to the dog. The gentlemen then rode on for three miles, when the dog received the signal from his master to retrace for the shilling he had been seen to put under the stone. The dog turned back; the gentlemen rode on and reached home; but to their surprise and disappointment, the hitherto faithful messenger did not return during the day. It afterwards appeared that he had gone to the place where the shilling was deposited, but the stone being too large for his strength to remove, he had stayed howling at the place till two horsemen riding by, and attracted by his seeming distress, stopped to look at him, when one of them alighting, removed the stone, and seeing the shilling, put it in his pocket, not at the time conceiving it to be the object of the dog's search. The dog followed their horses for twenty miles, to an inn where they stopped, remained undisturbed in the room where they supped, followed the chambermaid into their bedchamber, and secreted himself under one of the beds. The possessor of the shilling hung his trousers upon a nail by the bedside; but when the travellers were both asleep, the dog took them in his mouth, and leaping out of the window, which was left open on account of the heat, reached the house of his master at four o'clock in the morning with the prize he had made free with, in the pockets of which were found, beside the marked shilling, a watch and money, that were returned upon being advertised, when the whole mystery was soon unravelled, to the admiration of all the parties. The Newfoundland dog is, in temper, as generous as he is brave, and never tyrannises over dogs smaller than himself.

NEW JERUSALEM CHURCH. (*See* SWEDENBORGIANS.)

NEW PLATONISTS. (*See* NEO-PLATONISTS.)

NEWSPAPERS, *nuze'-pai-pers*, are a class of literary publications issued at short and stated intervals, and containing intelligence of passing events. Some refer the origin of newspapers to the *acta diurna* (which *see*) of the ancient Romans; but the exact nature of these publications is somewhat doubtful. In modern Europe the newspaper makes its first appearance in Venice during the war waged by that republic against the Turks in 1563, when written sheets of news were circulated by the government; and eventually these were issued regularly once a month. (*See* GAZETTE.) It was formerly believed that newspapers were first established in England about the time of the Spanish Armada, during the reign of Queen Elizabeth; but the specimens preserved in the British Museum, and long regarded as authentic, have recently been proved to be forgeries. The first authentic English newspaper, as far as is now known, was issued on 23rd May, 1622, and entitled "*The Weekly News from Italy, Germany*, &c., London, printed by J. D., for Nicholas Bourne and Thomas Archer." Before this time it had been the custom for great men to have each his news letter-writer, whose duty it was to keep his master or patron well informed, during his absence from court, of all that was transpiring; and this duty at length passed into a calling; and an "intelligence office" established, which, by means of these letters, circulated the news among its various customers. Afterwards, about the beginning of the 17th century, small quarto pamphlets of news began to be occasionally published; as *Newes from Spaine, Newes out of Holland*, &c. The first attempt at parliamentary reporting in a newspaper was made in 1641; the first advertisement was inserted in 1648, and the first paper exclusively devoted to advertisements and shipping intelligence appeared in 1657. At first, newspapers treated chiefly of foreign affairs; but on the breaking out of the civil war, in the time of Charles I., home politics excited attention, and numerous partisan sheets were published advocating the views of one party or another. These chiefly appeared under the titles of Mercuries, Intelligencers, Diurnals; and among the most distinguished of them were the *Mercurius Britannicus, Mercurius Pragmaticus, Mercurius Politicus*, and *Mercurius Aulicus*. Among the most distinguished editors of this period were Nedham, Birkenhead, Digby, and Heylin; the first of whom is said to have been "the Goliah of the Philistines," the writer "whose pen, in comparison of others, was like a weaver's beam." Many of these papers were remarkable for their coarseness and bitterness; but after the Restoration the censorship of the press became more stringent, and a monopoly of newspapers was attempted to be set up in favour of Roger L'Estrange, who was authorized to search for and seize all unlicensed and treasonable books and papers. The first number of the *Oxford Gazette* (the court being then at Oxford on account of the great plague in London) appeared on 14th November, 1665, and became *the London Gazette* with the fourteenth number, issued 5th February, 1666. (*See* GAZETTE.) The excitement which attended the "Popish Plot" and the "Exclusion Bill" largely increased the number of newspapers, without much elevating their character; and increased efforts were made on the part of government to suppress unlicensed publications, while offenders were punished with atrocious severity. The licensing act was not abolished until after the accession of William and Mary. The first commercial newspaper, the *City Mercury*, was published in 1675; the first literary paper, the *Mercurius Librarius*, in 1680; the first sporting paper, the *Jockey's Intelligencer*, in 1683; the first medical paper in 1686. The publishers seem to have been sometimes at a loss for news to fill their sheets, and in some cases portions of the paper were left blank, in order, as was said, that any gentleman

having a mind to oblige a country friend or correspondent, "may therein write his own private business or *the material news of the day.*" One publisher, whenever there was a dearth of news, adopted the expedient of filling up the blank space with a sufficient portion from the Bible. It was not till the reign of Queen Anne that the newspaper press became really eminent for intellectual power and talent. The first London daily newspaper, the *Daily Courant*, appeared in 1702; and soon after Defoe commenced his famous paper the *Review*. Shortly after this, appeared those series of publications the *Tatler*, *Spectator*, *Guardian*, &c., which, though not strictly belonging to the family of newspapers, had much in common with them. In 1710 appeared the *Examiner*, and was followed by the *Whig Examiner*. The same year appeared the *British Mercury*. The increasing popularity and influence of the newspaper press could not fail to be distasteful to the government, and prosecutions were multiplied, but with small success. At length a newspaper tax was suggested as the most effectual way for suppressing libels, and in 1712 a duty of one halfpenny on papers of half a sheet or less, and a penny on those of half a sheet to a sheet, was imposed. Towards the middle of the century the provisions and the penalties of the Stamp Act were made more stringent, and the gaol population largely increased by the number of offences against it. Notwithstanding this, the popularity of newspapers continued to increase. In 1757 the aggregate number of copies of newspapers sold in England was about 7,000,000; in 1760 it was about 9,000,000, and in 1767 upwards of 10,000,000. The *North Briton*, edited by Wilkes, first appeared in 1762; and the same year the *Englishman* was established, which attracted much notice about 1766, on account of several articles in it by Burke. The letters of Junius began to appear in the *Public Advertiser* in 1767, and contributed powerfully to raise the political importance of the newspaper press. During the long reign of George III., the history of newspapers is marked by a series of restrictions and criminal prosecutions; and the severe punishments inflicted upon the writers and publishers served only to extend the influence of the press. In 1766 an additional halfpenny had been added to the tax; in 1789 it was increased to twopence; in 1797 to twopence-halfpenny, in 1804 to threepence-halfpenny; and in 1815 to fourpence, less a discount of 20 per cent. Penalties of all kinds were also enhanced, and obstructive regulations multiplied. About the end of the 18th century the leading London newspapers were the *Morning Chronicle* (founded in 1769), the *Morning Post* (1772), the *Morning Herald* (1781), the *Times* (1785), and the *Morning Advertiser* (1794). The *Morning Chronicle* was begun by William Woodfall, who was succeeded as editor in 1789 by J. Perry, under whose active management it came to be very successful, and numbered among its contributors many youthful aspirants to literary fame. The *Morning Post*, after it passed into the hands of P. and D. Stuart, in 1795, rose to great eminence, and reckoned among its contributors Coleridge, Macintosh, Southey, Lamb, and Wordsworth. The *Times*, which was afterwards destined to eclipse all the other papers, was at this time fighting its way to the front rank. It was commenced by Mr. Walter, on the 18th January, 1785, under the title of the *London Daily Universal Register*, which was, on 1st January, 1788, changed to *The Times, or Daily Universal Register*. In 1813 there were 56 journals circulating in London; of which 8 were published every morning, 7 every evening (the first evening paper having been established as early as 1778), 7 every other evening, 16 every Sunday (the first Sunday paper had appeared in 1788), and 18 weekly on other days. On 29th November, 1814, the *Times* was, for the first time, printed by steam-power, which it announced as "the greatest improvement connected with printing since the discovery of the art itself." In 1815 the number of newspapers in the United Kingdom was 254; viz., 55 in London (15 daily), 122 in other parts of England and Wales, 26 in Scotland, and 49 in Ireland. Cobbett's weekly *Political Register*, established in 1802, was very popular about this time, and enjoyed a large circulation. The cessation of the war led to a greater representation of literature and art in the press; and in 1817 a series of essays, by





Hazlitt and Leigh Hunt, appeared in the *Examiner* under the title of the "Round Table." About the same time Mr. Barnes was called to the editorial chair of the *Times*, and by his talent and ability was one of the chief instruments in raising it to its present position. On the 29th January, 1825, the *Times* came out on a double sheet, composed of eight pages of four eight columns. The Reform excitement greatly increased the sale of the *Times* and of the other papers, and in 1832 there was one newspaper to every 56,000 of the population, as against one to every 90,000 in 1821, and one to every 210,000 in 1783. At this time numerous unstamped papers made their appearance—the *Poor Man's Guardian*, *People's Conservative*, *London Democrat*, &c., mostly of a fiercely revolutionary character, and competing with each other in the ferocity of their writings. The *True Sun*, edited by the Rev. W. J. Fox, subsequently M.P. for Oldham, now counted Laman Blanchard and Leigh Hunt among its writers, and Charles Dickens among its parliamentary reporters. Douglas Jerrold's and Thackeray's newspaper connection also date from this period. In 1835 the number of journals published in the United Kingdom was about 400, and of copies passing through the post-offices of Great Britain and Ireland, nearly 42,000,000. A new stimulus was given to newspaper enterprise in 1836 by the reduction of the stamp-duty from fourpence to a penny, causing, in the first year of the full operation of the new act, an increase of 8,000,000 in the stamps issued, and of 61 in the number of newspapers. The *Economist*, celebrated for its financial and commercial statistics and disquisitions, was established in 1837 by Mr. Wilson, whose ability subsequently raised him to the secretaryship of the Treasury. The *Illustrated London News* was founded in 1842 by Mr. Herbert Ingram. The railway mania produced, in London, many newspapers devoted to railway matters; but only three of them (the *Railway Times*, *Railway Journal*, and *Railway Record*) survived the crisis of 1846. The *Daily News* was established in 1846, under the editorship of Charles Dickens, who published in it his "Sketches from Italy," but soon yielded his place to Mr. Charles Wentworth Dilke. It soon attained a circulation second only to that of the *Times*; but it has since declined. The average daily circulation of the *Times* in 1846 was 28,594; in 1848, 35,225; in 1853, 42,384; and in 1854, 51,648; about double the aggregate of all the other daily morning journals. In 1853 the advertisement duty was abolished. A powerful impulse was given to the press in 1855 by the abolition of the stamp-duty as a tax, making it optional with the publishers to use the stamp as a postage stamp. In 1854, the aggregate number of stamps issued to newspapers was 107,000,000, producing a duty of £446,050. The following, in round numbers, was the circulation of the principal papers during 1854. *London Daily Papers.*—*Times*, 16,000,000; *Morning Advertiser*, 2,400,000; *Daily News*, 1,500,000; *Morning Herald*, 1,160,000; *Morning Chronicle*, 873,000; *Globe*, 850,000. *London Weekly Papers.*—*News of the World*, 5,673,000; *Illustrated London News*, 5,628,000; *Lloyd's Weekly Newspaper*, 5,530,000; *Weekly Times*, 3,900,000; *Reynolds' Weekly Newspaper*, 2,500,000; *Weekly Dispatch*, 2,000,000; *Bell's Life in London*, 1,160,000. *English Country Papers.*—*Liverpool Mercury*, 912,000; *Leeds Mercury*, 756,000; *Stamford Mercury*, 689,000; *Birmingham Journal*, 650,000; *Manchester Examiner*, 636,000; *Staffordshire Advertiser*, 425,000; *Leeds Times*, 421,000. *Scotch Papers.*—Edinburgh, *North British Advertiser*, 406,000; *Scotsman*, 359,000; *Witness*, 297,000; *Glasgow Sunday Post*, 727,000; *North British Mail*, 363,000; *Glasgow Herald*, 541,000; *Aberdeen Journal*, 319,000. *Irish Papers.*—*Dublin Telegraph*, 929,000; *Daily Express*, 748,000; *Saunders's News Letter*, 736,000; *Freeman's Journal*, 480,000; *Belfast Northern Whig*, 362,000; *Daily Mercury*, 210,000; *Cork Constitution*, 208,000. In 1855 (during one half of which the compulsory stamp had been abolished) the number of papers that passed through the post-office amounted to about one-fourth of the aggregate number which had been posted in the preceding year. In 1856 the number of newspapers that passed through the post-office was nearly 71,000,000, and of these about three-fourths bore the impressed stamp, and one-fourth the ordinary postage

stamp. In 1869 the number was only 70,500,000, owing to the greatly increased number sent as parcels by railway. After the abolition of the stamp duty, a number of penny papers started into existence, which the recent abolition of the paper duty has still further increased. On the abolition of the stamp duty, the *Times* reduced its price from 5*d.* to 4*d.*; and on the abolition of the paper duty, a further reduction to 3*d.* was effected. As there is now no record of the number of copies printed, it is impossible to give more than approximations; but it is understood that the daily average of *The Times* exceeds 60,000. Some of the London daily penny papers have an immense circulation. On one occasion the *Standard* asserted that it printed 100,000 copies; and more recently the *Daily Telegraph* announced an issue of upwards of 200,000 copies. In London there now exist a considerable number of halfpenny papers of a local character, and depending in a great measure on advertisements; as the *Clerkenwell News*, *Islington Gazette*, &c. Some of the morning papers also publish second editions as evening papers, under the same names; as the *Evening Star*, *Evening Standard*. There are upwards of 150 weekly papers published in London, including the *Athenæum*, *Saturday Review*, *London Review*, *Spectator*, *Press*, *Punch*; and many devoted to special branches of science or art, as the *Builder*, *Lancet*, *Solicitor's Journal*, *Bell's Life in London*, *Sporting Life*, &c. Among the weekly papers which attain the highest circulation, are the *Illustrated London News* and the *Illustrated Times*. Most of the cheap weekly papers are ultra liberal in politics. There are in all about 600 newspapers published in England, 150 in Scotland, and 130 in Ireland. Before a newspaper can be established, a notice must be given at the Inland Revenue Office, Somerset House, or at the district stamp-office where the contemplated publication is to appear, in the form of a declaration, stating the title of the intended paper, quoted literally; the place where it is to be printed, giving the number of the house, the name of the street, and of the parish in which it is situated; and the like particulars respecting the place of publication, if it differs from the place of printing; the Christian and surnames of the printers and publishers; the number of shares into which the property is divided, whenever the number, exclusive of the printer and publisher, exceeds two; and the Christian and surnames, residences, and occupations of every proprietor, with the number of shares belonging to each, when exceeding two, exclusive of the printer and publisher. This declaration must be made by the proprietor, or two proprietors, or by two of the largest shareholders, where the number exceeds two, who must also furnish two respectable householders as sureties against the publication of seditious, blasphemous, or personal libels, to the amount of £400 in London and £300 elsewhere. The paper, when published, must have across the bottom of the last page, or the last column, the names and residences of the printer and publisher, the place of publication, the date and the price; and a copy of the paper, which is paid for, transmitted to the Stamp-office on the day of publication, or the day after, or within three days, all under a penalty of £20 for each offence. The impressed stamp carries the paper bearing it through the post-office for any number of re-transmissions, within fifteen days of publication. The stamp is one penny to a superficies of print on one side of the paper, not exceeding 2,295 square inches; when with supplement exceeding that quantity, then an additional stamp of one halfpenny for a supplement not exceeding a superficies on one side of more than 1,148 square inches of printed matter. Unstamped newspapers go by post at the book-post rate of a penny for four ounces. Employed upon each morning paper in London, there are an editor, and one or two sub-editors, with salaries ranging from six up to twelve, or even eighteen or more guineas a week; from ten to fourteen regular reporters, at from four to six guineas a week; from thirty to thirty-five compositors in the printing office; one or two readers for correcting proofs; besides clerks, errand boys, &c. Each paper of any standing must also have foreign correspondents in various parts, some of whom are paid as high as eight or ten guineas a week. Besides the regular reporters of a newspaper,





there are what are known as the "penny a line" reporters, who are not attached to any particular newspaper, but furnish articles of intelligence, police reports, &c., to several, at 1½*d.* or 1¾*d.* per line. The aggregate charge for copy furnished by these persons forms a considerable item in the weekly expenditure of a newspaper. The city editor has from four to seven guineas for his daily money article. The salaries paid for theatrical, musical, and other articles on art, are comparatively small, and vary considerably. There must also be subscriptions to a variety of special publications, and a great variety of foreign, colonial, and provincial papers must also be had, either by exchange or subscription. The news at the clubs, especially the Reform and Carlton, must also be had and paid for. The expense of sending reporters and correspondents to distant meetings, and of getting their dispatches, is also heavy, sometimes a special engine being employed at an expense of £25 or £30. The overland mail and the electric telegraph are expensive. Mr. Thornton Hunt, for some time managing editor of the *Daily News*, set down the aggregate weekly expenses of that paper at £520. The chief duty of the editor begins, strictly speaking, upon the publication of the evening papers. He remains at his post till a late hour, prepared to write comments on the foreign news as it arrives (a duty in which he is generally assisted by his sub-editor), and to direct in a leading article attention to any topic of interest before the public. During the sitting of parliament he is compelled frequently to remain in the office until two or three o'clock in the morning; and such is the energy with which the public press in the metropolis is conducted, that frequently a leading article, nearly a column, is written at two o'clock in the morning, on some subject which had been discussed an hour or two previously in the House of Commons. The most extraordinary part of a morning paper is the reporting. During the sittings of parliament, the reporters of the leading papers attend by turns, one succeeding the other, according to previous arrangement, each remaining in the house for half or three quarters of an hour, and, when relieved, arranging his notes in a room appropriated for the purpose. Most of the persons so engaged are gentlemen of education, and frequently law-students. Their notes are generally taken in short-hand; but it has been known that certain gentlemen have acquired dexterity enough to follow a speaker by means of an abbreviated form of long-hand. A speech is seldom printed verbatim, from the impossibility of finding room in a newspaper for all that a member says. Newspapers, in London, are sold by the publishers to newsmen or newsvendors, by whom they are distributed to the purchasers in town and country. The newsmen, who are the retailers, receive for their business of distribution a regulated allowance. In France, nearly one-half of the total number of periodical publications are issued in the metropolis. The number of Parisian journals which treat of politics and public economy, and are consequently under bonds to the government, and liable to a stamp duty of six centimes, is estimated at about forty, and the non-political publications at nearly 600. The principal political daily journals of Paris are the *Moniteur* (official government organ), *Presse*, *Siècle*, *Constitutionnel*, *Pays*, *Patrie*, *Journal des Débats*, *Gazette de France*, *Messager*, *Monde* (ultramontane, successor of the *Univers*, suppressed in 1860), *Opinione Nationale*, and *Union*. *Galignani's Messenger*, established in 1815, is published daily in English, and gives copious extracts from the journals of London as well as of Paris. The principal illustrated newspapers are the *Illustration*, *Le Monde illustré*, *L'Univers illustré*, and *Le Journal pour Tous*. The number of daily journals published in Madrid, in the beginning of 1861, was about thirty, the most important being the *Clamor Publico* and *España*. In Portugal, the government organ, *Diario do Governo*, and some half-dozen others, are published in Lisbon, and a like number in Oporto and other cities. The number of newspapers published in Germany is estimated at about 1,400. In Berlin, the principal are the *Vossische Zeitung* (for the middle classes), *Spenersche Zeitung* (generally conservative and semi-reactionary), *Neue Preussische Zeitung* (the high Tory or feudal party organ), *Volkszeitung* (organ of the working classes, democratic), *National-Zeitung*

(democratic, and distinguished for its foreign correspondence). In Vienna, the *Wiener Zeitung* (the official government organ), *Oestreichische Zeitung, Donau-Zeitung, Wanderer, Ostdeutsche Post, Presse.* In Augsburg, the celebrated *Allgemeine Zeitung.* In Cologne, the *Kölnische Zeitung* (moderately liberal, and conducted with great ability). In Leipsic, the *Deutsche Allgemeine Zeitung.* The first newspaper published in the United States was issued at Boston September 25, 1690. In 1754 the number was 37, and in 1800 it had increased to 200. In 1828 the number had increased to 852, with a yearly issue of 68,000,000 copies. In 1850 the number had risen to 2,800, with an annual circulation of 426,409,978 copies, or an average of 21·81 copies to each person in the population, and of 12·9 journals to every 100,000 inhabitants. The number of daily newspapers in 1850 was 254, with an average circulation of 3,200 copies each. No official statement of the number of journals in 1860 has yet been published; but it is believed that the number does not much exceed that of 1850. The *New York Herald* was commenced in 1835 by James Gordon Bennet, and in 1861 it was stated to have an average daily circulation of 85,000. The *Tribune* was begun by Horace Greeley on April 10, 1841, and in 1861 the daily edition had reached a circulation of 53,500, the semi-weekly of 24,000, and the weekly of 205,000. The *New York Times* was established in 1850 by Henry J. Raymond, and has a circulation of 50,000 daily, 12,000 semi-weekly, and 25,000 weekly. The total circulation of the New York dailies exceeds 300,000 a day. Some of the weekly papers have an immense circulation; as *Harper's Weekly, Frank Leslie's Illustrated Newspaper,* and the *New York Ledger* of Robert Bonner; the last having at times exceeded 400,000 a week.—*Ref.* Alex. Andrews' *History of British Journalism; English Cyclopædia; Encyclopædia Britannica; New American Cyclopædia.*

NEW STYLE, in Chron., the name applied to the days of the year according to the Gregorian calendar, adopted in England by statute in 1752. The errors in the Julian method of computing the year having long attracted the attention of astronomers, Pope Gregory XIII. undertook to reform the Roman calendar, and the alteration made by him in 1582 created what is commonly called the New Style, but which was sometimes called the Roman Style, while the calendar obtained the name, through its creator, of Gregorian. After great consideration, that pontiff published his new calendar, in which ten days were deducted from the year 1582, by calling what, according to the old calendar, would have been the 5th October, the 15th October, 1582. The difference between the old style and the new style is at the present time twelve days; after the year 1900, and until the year 2100, the difference will consist of thirteen days. (*See* CALENDAR.)

NEWT, *nute*, a small reptile, of which there are many varieties, the principal one being termed the great water-newt (*Triton palustris*). This specimen, when it is full grown, measures about six inches in length, and in its appearance greatly resembles the salamander (which *see*). On the back the colour is a dark brown; the sides are speckled with spots, and the under-surface of the body is a bright orange, variegated with black patches. The head is rather small, and the eyes are of a bright golden hue; the tail is flattened in form, and has thin edges at the extremities; and the limbs are short, the fore-feet being divided into four, and the hind into five toes. The newt inhabits shady places and stagnant water, and lives principally on insects, of which it consumes an immense quantity. Besides the great water-newt there is the common water-newt (*Triton aquatious*), which, in its habits and appearance, so closely resembles the former, as not to need a distinct description.

NEWTONIAN SYSTEM. (*See* SOLAR SYSTEM.)

NEW YEAR'S DAY is the first day of the year, and has for many ages, and among various nations, been celebrated as a religious and social festival. With the Jews, the new year began with the autumnal month Tishri, and the first day of it was observed with considerable ceremony, being regarded as that on which Adam was created. Among the Romans, new year's day was a special holiday; sacrifices were offered to Janus, friendly salutations were exchanged, presents





were bestowed, and the success of any affair on that day was regarded as a good omen for the whole year. The presents thus bestowed on some of the emperors formed an important branch of their personal revenue. In ancient Britain, the Druids were accustomed to distribute branches of the sacred mistletoe, cut with particular ceremonies, as new year's gifts among the people; and, according to Bishop Stillingfleet, the Saxons of the north observed the festival with more than ordinary jollity and feasting, and by sending gifts to one another. The Church was very much opposed to these ceremonies, which she regarded as pagan institutions, and various ecclesiastical councils pronounced anathemas against them. Notwithstanding this, however, they continued to be observed, and during the Middle Ages the interchange of presents among kings and their powerful vassals was a distinguishing feature of the first day of the year. Henry III. is said to have been very exact in extorting new year's presents; and Queen Elizabeth, according to Dr. Drake, principally supported her jewel-chest and her enormous wardrobe by levying similar contributions; and while making returns, she always took care that the balance should be in her own favour. Even her household servants, down to the very dustman, are reported to have made presents to her. Under the Tudors and Stuarts, new year's gifts were given and received with mutual wishes of a happy new year among all conditions of the people; but these, together with the ceremonies and superstitious practices which were formerly observed on this day, for an account of which we must refer to Brand's "Popular Antiquities," have now very much declined. In Germany, and throughout the continent of Europe, many ceremonies, derived from old superstitions, are still in vogue. New year's day, as being among the heathen a period of licentiousness and revelry, was observed by the early Christians as a season of fasting and humiliation. In the course of the 7th century it came to be called the festival of the Circumcision, being the eighth day after, or, as it was termed, the octave of the Nativity, though some are of opinion that the name had an earlier commencement. (*See* CIRCUMCISION, FEAST OF.) Among some of the Methodist and other dissenting bodies, a "watch-night" is held, consisting of religious services conducted on new year's eve and concluded a few minutes past twelve.

NEW ZEALAND FLAX. (*See* PHORMIUM.)

NIBELUNGEN-LIED, *nē-bē-lung'-en leed'* (Ger., song of the Nibelungen), is a celebrated ancient German epic poem. The story is, that Siegfried, the son of Siegmund, king of Netherland, the Achilles of Scandinavian and Teutonic legends, having slain a dragon, vanquished the royal race of King Nibelung, in Nibelungen land, and obtained possession of their fabulous amount of treasure, comes to Worms to woo the world-famous Chriemhild, sister of King Günther. She had forsworn marriage in consequence of a dream; but by his valour in vanquishing all the knights who ventured to meet him, he won her heart. Her brother Günther hears of the beautiful and redoubtable Brunehild, queen of Iceland, and resolves to stake his fortune as her suitor. The condition was that he should engage in three combats with her, and if vanquished, be put to death. Siegfried accompanies and aids him, being promised the hand of Chriemhild if he should be successful. The heroes reach their destination, and Brunehild appears in the lists with a shield of beaten gold, so heavy that four of her chamberlains can scarcely bear it. Günther is in despair; but an invisible person by his side bids him take courage, seizes his arm, hurls the spear and flings the stone till the maiden acknowledges herself vanquished. Siegfried, the real winner of the contest, who had rendered himself invisible by his magic cap, is rewarded with the hand of Chriemhild, and the two marriages are celebrated amid the utmost pomp and rejoicing. Dissensions ensue between the queen and her sister-in-law; Siegfried contrives to obtain the girdle of the former and to present it to the latter, who afterwards tells the whole story of her husband's valour, and changes her rival with love for him. The latter vows revenge, and secures the aid of the fierce and covetous Hagen, who sought the Nibelungen treasure, and who, having skilfully drawn from Chriemhild the secret of the spot

where alone Siegfried was vulnerable, treacherously plunges a lance between his shoulders in a royal chase. After the death of her husband, Chriemhild lives in melancholy retirement at Worms, Hagen having sunk all her Nibelungen treasure somewhere in the Rhine. Then Etzel (Attila), king of the Huns, seeks her in marriage, and she consents, in order that she may avenge the death of Siegfried. After seven years of repose in Hungary, she persuades Etzel to invite Günther and his heroes to visit him. They accept, and go with a retinue of 10,006 men. Provided with gifts, they advance into Etzel's land, and are received with great honour; but the queen greets Hagen coldly. A tumult at length ensues, which results in a dreadful battle, in which many heroes on both sides are slain. Günther seeks a reconciliation; but rejects the proffered terms, requiring the surrender of Hagen, and the queen orders the hall in which they were to be set on fire. Six hundred only survive the conflagration, by penetrating deep into the walls. The contest is renewed, until at last, of all the Burgundians, only Günther and Hagen remain, and are delivered in bonds to Chriemhild. She demands of Hagen where the Nibelungen treasure is concealed; but he refuses to betray it so long as one of his lords lives. The head of Günther is struck off; but Hagen then declares that he alone now knows where the treasure is concealed, and will not reveal it. Chriemhild thereupon grasps the sword of Siegfried and beheads him at a blow; but the Hunnish warrior Hildebrand, enraged at seeing a hero fall by a woman's hand, slays the queen. This poem is substantially the work of an age anterior to Christianity. It is regarded as composed of several pieces of unequal antiquity; the origin of the traditions embodied in it being usually attributed to the Scandinavians. The earliest manuscripts belong to the 13th century. The first complete edition of the poem was published by C. H. Müller (1782). A critical edition was published by Lachmann (1826, 3rd edition 1852). There are English translations by Birch (1848) and Letsam (1850).

NICENE OR CONSTANTINOPOLITAN CREED, *ni-seen'*, was chiefly composed by the orthodox fathers of the first general council of Nice, which met A.D. 325, to define the Christian faith, in opposition to the heresy of Arius. As sanctioned by this assembly, it ended with "I believe in the Holy Ghost." The remainder was added by the second general council, held at Constantinople, A.D. 381, in which the heresy of Macedonius with regard to the divinity of the Holy Spirit was condemned. It was received into the Oriental liturgies about the end of the 5th century, and in those of the Western churches at a later period. It is recited in the communion service of the Church of England.

NICKEL, *nik'-el*, in Chem. and Met.,—symbol Ni; equiv. 29·64; spec. grav. 8·82. Nickel is a metal discovered by Cronstedt in 1751, with a singular analogy to cobalt, being always associated with it in nature. Its principal ore is kupfernickel, which is the darsenide of the metal. It is also extracted from nickel speiss, which is an impure arseniosulphide of nickel, left after the manufacture of cobalt-blue from its ores. Nickel is extensively employed in alloys, of which German silver is the most important. The process for purifying it is kept a secret; but the following is generally supposed to be the method adopted at Birmingham. The speiss is first fused with chalk and fluor spar, and the mass obtained reduced to powder, which is roasted for twelve hours to expel the arsenic. The residue is dissolved in hydrochloric acid, the solution diluted, and the iron peroxidised by the addition of bleaching-powder. The iron is then thrown down with milk of lime, and the precipitate well washed. The liquid, which contains all the cobalt and nickel, is treated with sulphuretted hydrogen, which throws down everything but these two metals, which are afterwards separated from it by precipitating the cobalt with the chloride of lime; and, lastly, the nickel with milk of lime. Pure nickel is a brilliant silver-white ductile metal, nearly as infusible as iron. It is magnetic up to 630° Fahr., and becomes oxidised by exposure to a current of air at a high temperature. It is easily attacked by nitric acid and aqua regia, and slowly by sulphuric and hydrochloric acids. Its principal use is as a whitening agent in the manufacture of German silver. Added to aluminium in the proportion of 2 per cent., it hardens





that metal without perceptibly altering its lightness. For chemical purposes it may be obtained in a state of purity by igniting oxalate of nickel in a closed crucible.

NICKEL GLANCE, in Min., a steel-grey ore of nickel, containing equal portions of the diarsenide and disulphide of nickel.

NICKEL, OXIDES OF, in Chem.—With oxygen nickel forms two oxides,—the protoxide (NiO) and sesquioxide ($Ni_2O_3$). The protoxide is obtained as an olive-green powder by igniting the carbonate in a covered crucible, and as a bulky green hydrate by precipitating its salts with potash. The protoxide forms numerous well-defined salts, mostly of an apple-green colour. The sesquioxide is a black powder, procured by treating the hydrated protoxide with chloride of soda. It does not combine with acids, but gives off a part of its oxygen when submitted to their action, and forms salts of the protoxide.

NICKEL, SALTS OF.—The principal salts of nickel are the sulphide, obtained as a black hydrate when a salt of nickel is precipitated by sulphide of ammonium; the chloride, formed by dissolving the oxide in hydrochloric acid—on evaporation, it yields green hydrated crystals, which, when submitted to a high temperature, sublime in crystalline yellow scales; the sulphate, formed by dissolving the oxide in sulphuric acid. It crystallizes in green rhombic prisms, which, on exposure to light, are converted without loss of water into octahedra. It is sometimes used in medicine as a tonic. With potash it forms a double salt. The other salts of nickel are unimportant.

NICKELINE, *nik'-el-een*, in Min., the kupfernickel of the German miners. It is an important ore of nickel, and is found principally in Saxony, associated with cobalt, silver, and copper ores. It also occurs sparingly in Cornwall.

NICOTIANA, *ni-ko-she-a'-nă*, in Bot., a gen. of the nat. ord. *Atropaceæ*. The species and varieties supply the different kinds of *tobacco* now in general use in some form or other all over the globe. Most of the tobacco of commerce, as that of Virginia, is yielded by the species *N. Tabacum*, a native of the warm parts of America, but now cultivated in various countries. The Shiraz or Persian tobacco is obtained from *N. persica*; the Syrian and Turkish from *N. rustica*; Cuba and Havannah from both *N. Tabacum* and *repanda*; and Orinoko from *N. macrophylla*. The genus is named in honour of Nicot, French ambassador to the court of Portugal, whence he brought the tobacco plant. (*See* TOBACCO.)

NICOTINE, *nik'-o-teen*, in Chem., $C_{10}H_7N$, a volatile alkaloid contained in the tobacco plant (*Nicotiana Tabacum*), in which it occurs in combination with malic and citric acids. It is also contained in the smoke of the burning leaves. It is a limpid, colourless, oily liquid, with an irritating and powerful odour of tobacco. It is extremely poisonous, a single drop being sufficient to poison a large dog.

NIELLO, *ne-el'-lo* (Ital.), a kind of engraving of considerable antiquity, and the origin of engraving as it is understood at the present time. During the Middle Ages, when the art was chiefly practised, the method consisted in drawing a design with a style upon gold and silver plates, and then cutting it with a burin. These incised lines were filled with a composition made by heating together quicksilver, lead, and silver, the compound being of a bluish-colour; whence the name. It was the practice to decorate the communion service of the churches, as well as other plate, in this manner. In the British Museum there are some seventy superb silver plates executed in niello. The art having passed out of use, old nielli are exceedingly rare, and are only to be found in the collections of national museums or of wealthy virtuosi.

NIGELLA, *ni-jel'-lă* (Lat.), in Bot., a gen. of the nat. ord. *Ranunculaceæ*. The seeds of *N. sativa*, the common fennel-flower, were formerly employed instead of pepper. It is supposed that these seeds, or those of another species which are used by the Affghans for flavouring curries, are the *black cummin* of Scripture.

NIGHT, *nite* (Lat. *nox*), that period of the earth's revolution on its axis during which the sun is below the horizon. For an account of the division of the twenty-four hours into day and night, *see* DAY.

Night-Blindness, in Med., is a peculiar affection of the eye, in which the patient sees very well during the day, but becomes blind as night approaches. It is generally met with in warm climates, being rarely seen in Britain, and seems to arise from the excessive stimulus to which the eye is exposed during the day by the strong light in warm countries. It usually gives way to mild antiphlogistic treatment, purging, and blistering on the temples.

Nightingale, *nīt'-in-gail* (from Sax. *night*, and *galan*, to sing), (*Philomela luscinia*), a well-known British songster, which, for its talents, is unequalled by any other specimen of the feathered tribe. Its generic characters may be thus briefly described:—Bill of moderate length, straight, upper ridge rounded; the tip of the upper mandible being slightly deflected and emarginated. The nostrils basal, lateral, round, and pierced in a membrane. The wings of moderate size; the tail slightly rounded; the legs long; the toes of moderate length; and the claws rather short. The nightingale usually makes its appearance in this country about the middle of April, and the males arrive before the females. It frequents the market-gardens about London, and is found also in Sussex, Hampshire, Dorsetshire, and the eastern part of Devonshire, along the south coast. It also migrates as far north as Russia and Sweden. The beak is brown; the irides hazel; the head and all the upper parts of the body and wings of a uniform brown colour, tinged with a reddish chestnut; all the under parts dull greyish-white in colour; the chin and the lower part of the breast of a lighter tint than the throat and chest; while the under tail-coverts are a pale reddish-white; and the legs, toes, and claws are brown. The whole length of the bird is about six inches and three-eighths, according to Mr. Yarrell. Isaac Walton remarks on its power of song in the following expressive language:—"But the nightingale, another of my airy creatures, breathes such sweet loud music out of her little instrumental throat, that it might make mankind to think that miracles are not ceased. He that at midnight, when the very labourers sleep securely, should hear, as I have very often, the clear airs, the sweet descants, the natural rising and falling, the doubling and redoubling of her voice, might well be lifted above earth, and say 'Lord, what music hast thou provided for the saints in heaven, when thou affordest bad men such music on earth?'"—*Ref.* Yarrell's *History of British Birds*.

Nightmare. (*See* Incubus.)

Nightshade. (*See* Atropa.)

Nimbus. (*See* Aureola.)

Nisi Prius. (*See* Courts, Nisi Prius.)

Nitraria, *nī-trai'-re-ă*, in Bot., a gen. of trees belonging to the nat. ord. *Malpighiaceæ*, or, according to some botanists, constituting a distinct order, called *Nitrariaceæ*. The species *N. tridentata*, a native of the desert of Sonssa, near Tunis, has fruit of a somewhat intoxicating nature, and is supposed to be the true lotus-tree of the ancients. It takes its name from the Latin *nitrum*, nitre, because it was first found by Schreober near the nitre-works of Siberia.

Nitrate of Silver. (*See* Silver, Nitrate of.)

Nitrates, *nī'-traits*, a term applied in Chem. to a combination between nitric acid and a base. Nearly all the metallic oxides are dissolved by nitric acid; a numerous class of nitrates is thus produced, which if prepared with heat and with excess of acid, generally contain the metal at its maximum of oxidizement. The nitrates are all decomposed by a red heat; they give off oxygen and nitrogen, either separate or combined, and the metallic oxide ultimately remains. They are also decomposed when heated with sulphur, phosphorus, or charcoal, and sulphurous, phosphoric, and carbonic acids are usually expelled. When nitrates are decomposed by hydrated sulphuric acid, nitric acid is evolved, and *sulphates* are formed.

Nitre, *nī'-ter* (Lat. *nitrum*), in Chem., nitrate of potash. (*See* Potash, Nitrate of.)

Nitric Acid. (*See* Nitrogen, Oxides of.)

Nitrils, *nī'-trils*, in Chem., a name applied to artificial bases, consisting of ammonia, in which the three equivalents of hydrogen are replaced by three equivalents of some other substance. Trimethylamine and triethylamine are examples of nitriles.





Nitrogen, *nī'-tro-jen* (Gr. *nitron*, nitre; *gennaō*, I generate),—symbol N; equiv. 14; density 14; spec. grav. 0·9713,—a transparent colourless permanent gas, well known as one of the constituents of the atmosphere, which contains volumetrically about 79 per cent., mechanically united with 23 per cent. of oxygen. Although characterised by its inactivity when in a free state, it enters into combination with the other elements, forming compounds possessed of the most energetic properties. With hydrogen it forms ammonia; with oxygen, nitric acid; with carbon, cyanogen; with carbon, hydrogen, and other elements, an almost infinite number of bodies, known as the vegetable and artificial alkaloids, such as quinine, morphine, aniline, &c. &c. Besides these, most colouring matters contain nitrogen, and it is an essential constituent of the proximate principles of animal and vegetable bodies; such as albumin, fibrin, casein, &c. It was at first called azote, from its incapability of supporting life; but Chaptal named it nitrogen, from its entering into the composition of nitre, nitric acid, &c. It is readily obtained in a variety of ways by abstracting the oxygen from the air. The easiest, perhaps, is by igniting a few pieces of phosphorus floating in a small capsule on water, and then covering the whole with a bell-jar. The remaining gas is then washed from the phosphoric acid with which it is contaminated, and passed over caustic potash, to remove any traces of aqueous vapour and carbonic acid. Thus obtained, it is a colourless uncondensable gas, tasteless, inodorous, and without action on vegetable colours. It is incombustible, and does not support combustion. It may be breathed with impunity as far as itself is concerned, but destroys life by preventing the inspiration of oxygen. Its compounds with the metallic elements are of little importance. Fulminating gold, silver, platinum, and mercury, are supposed to be nitrides of those metals; and a nitride of copper, $Cu_3N$, has been formed. The compounds it forms with the non-metallic elements are most numerous and important. From the similarity of their chemical characteristics, nitrogen, phosphorus, arsenic, antimony, and bismuth, have been formed by Gerhardt into a group termed by him the *Nitrogen group*.

Nitrogen, Bisulphide of, in Chem.—When chloride of sulphur is dissolved in ten times its bulk of bisulphide of carbon, and decomposed by ammoniacal gas, it yields, on filtration, beautiful golden-yellow rhombic crystals. It detonates powerfully by percussion, and explodes if heated to 314° Fahr.

Nitrogen, Chloride of, in Chem.—When a bottle of dry chlorine is inverted over a dish containing one part of sal-ammoniac dissolved in twelve parts of water, the chlorine becomes gradually absorbed, oily drops of terchloride of nitrogen being formed. It is harmless while wet, but the slightest touch with oil, fat, turpentine, or phosphorus, causes it to detonate with fearful violence. It is one of the most violently explosive substances known. Nitrogen forms similar explosive compounds with iodine and bromine.

Nitrogen, Oxides of.—With oxygen, nitrogen forms five well-defined compounds:—

$NO$ —Nitrous oxide, or protoxide of nitrogen.
$NO_2$—Nitric oxide, or deutoxide of nitrogen.
$NO_3$—Nitrous acid.
$NO_4$—Peroxide of nitrogen.
$NO_5$—Nitric acid.

The first of these, nitrous oxide, is commonly known as laughing gas, from the exhilarating effects it produces on the human system when breathed. It was discovered by Priestley in 1776, and minutely investigated by Davy. It is best prepared by heating nitrate of ammonia in a retort to a temperature of 400° Fahr., beyond which the operation becomes dangerous. It may be condensed by powerful pressure into a colourless liquid, which freezes into a transparent solid at —150°. When liquid protoxide of nitrogen is mixed with bisulphide of carbon, and evaporated in vacuo, a temperature of —220° is obtained, which is a lower point than has been hitherto attained by any other means. It is a transparent, colourless gas, soluble in three-fourths of its bulk of cold water, and has a spec. grav. of 1·527. It is neutral and non-combustible, but supports combustion with great energy. Deutoxide of

nitrogen, or nitric oxide, is obtained by pouring nitric acid, diluted with twice its bulk of water, on copper clippings, placed in a retort. The red fumes at first given off are speedily dissipated, and a gas is disengaged, which, if collected over water, is colourless. The gas has a strong, disagreeable odour, and cannot be breathed. It has hitherto resisted all attempts to liquefy it. It is non-combustible, and will not support combustion. It is neutral in its properties, but is at once converted into the red peroxide of nitrogen in the presence of oxygen, for which it has a great affinity. From this circumstance, it is often used as a qualitative test of the presence of oxygen in any gaseous mixture. It is regarded by many chemists as a body acting both as a base and a radicle, and is called by them azotyl or nitrosyl. *Nitrous acid*, or *hyponitrous acid*.—This gas is obtained by mixing in an exhausted flask four vols. of deutoxide of nitrogen and one of pure oxygen; brown fumes are formed, which at a cold of 0° Fahr., condense into a blue liquid. The presence of a small quantity of water converts the blue into a dark green liquid, and a larger quantity decomposes it into peroxide of nitrogen and nitric acid. Although so unstable in its free state, it forms permanent compounds with the alkalies known as nitrites. *Peroxide of nitrogen*.—The red fumes produced on mixing deutoxide of nitrogen with oxygen or atmospheric air consist mainly of this compound. It may be obtained in prismatic crystals by passing four vols. of deutoxide and two of oxygen into tubes cooled down to 0° Fahr. These crystals melt at 16° Fahr., and form an orange liquid, which boils at 71° Fahr. When once melted, it cannot be frozen again. Much speculation has been indulged in as to its real composition. When it reacts on an alkali, equal parts of the nitrate and nitrite of the base are formed. It has the property of replacing one or more equivalents of hydrogen in certain organic compounds; such as benzol, naphthaline, aniline, &c. It is readily absorbed by nitric acid, to which it communicates a deep brown or yellow tinge. It was formerly supposed to possess acid properties, and was called nitrous acid. *Nitric acid*.—Of all the compounds of oxygen and nitrogen, nitric acid is the most important; its power of forming useful compounds with most of the bases, and its powerful oxidising properties, render its uses most manifold, both in the factory and the laboratory. It was known to the alchemists under the name of aqua fortis; but its composition was first made out by Cavendish. It may be formed synthetically by passing a current of electric sparks through a mixture of nitrogen and oxygen; and nitrate of ammonia may be detected in rain-water during stormy weather, the flashes of lightning passing through the moist air producing the same effect. Nitric acid occurs in nature in combination with potash or soda, as an efflorescence on the surface of the earth in tropical countries. Nitrate of potash, nitre, or saltpetre, is imported principally from Tirhoot, in Bengal; and nitrate of soda, or cubic nitre, is found in distinct layers under the surface of the soil in Chili and Peru. Nitric acid is produced for commercial purposes by distilling nitrate of soda and sulphuric acid in large iron retorts lined with fire-clay; the sulphuric acid uniting with the alkaline base, and the nitric acid passing off into a series of stoneware Woulf's bottles containing water. In its most concentrated form, nitric acid contains one equivalent of water, and has a specific gravity of 1·52. It is a colourless, limpid, powerfully corrosive liquid, boiling at 184° Fahr., and freezing into a buttery mass at —40°. The monohydrated acid is a very unstable compound, eliminating peroxide of nitrogen when heated until a tetrahydrated compound is formed, when it distils over unchanged. When weaker acids are boiled, they, on the contrary, lose water until this definite hydrate is formed. Nitric acid with four equivalents of water is a definite and stable compound. It has a specific gravity of 1·434, and distils at 250° without change. Nitric acid, especially when heated, is one of the most powerful oxygenants known, a property which is much increased when it contains peroxide of nitrogen in solution, as in the red fuming acid of commerce, often called *Acid-Nitros*. M. Deville has succeeded in forming anhydrous nitric acid in transparent rhombic crystals by acting on nitrate of silver with dry chlorine gas. These crystals melt at 85° Fahr., and boil at 118° Fahr. They may be preserved in the cold for any length of time. With water they form nitric acid with evolution of heat. Nitric acid combines with one equivalent of the various bases to form neutral salts, known as nitrates. No acid nitrates corresponding to the acid sulphates are known; but several subnitrates may be formed. The nitrates are characterized by deflagrating when thrown on glowing coals, and by decomposing when heated to a high temperature, the oxide of the metal being generally left behind. Nitric acid is not precipitable from solutions of nitrates. The method of detecting its presence is described under the head of TESTS.

NITRO-PRUSSIDES, *ni'-tro-prus'-sidez*, a term given to a very interesting series of new salts, discovered by Dr. Playfair. Their formation arises from the action of nitric acid upon ferrocyanides and ferricyanides. Exhibiting an intimate relation with the salts of the ferro and ferri-cyanids, the general formula of the nitro-prussides would appear to be $M_4Fe_2Cy_6NO_2$. According to this scheme, the formation of the nitro-prussides would consist in the reduction of the nitric acid to the state of binoxide of nitrogen, which replaces one equivalent of cyanigen in two equivalents of ferro cyanide. A number of secondary attend upon the formation of the salts, such as hydrocyanic acid, oxamide, cyanogen, carbonic acid, nitrogen, &c. Perhaps the most important of the series is the nitro-prusside of sodium $Na_4Fe_2Cy_6NO_2+4HO$. (*See* SODIUM.)—*Ref.* Fownes's *Chemistry*, 9th ed., by A. W. Hofmann, and H. Bence Jones.

NOBILITY, *no-bil'-e-te* (Lat. *nobilitas*), in political government, is a term used to denote a class of persons entitled to certain civil honours and privileges above the mass of the people, by no other right but that of birth. This institution is of very remote antiquity, and is to be found existing among almost every people at the dawn of history. The earliest nobility seems to have been priestly in character; as the Brahmins of India. Among the Romans, the patrician families, who formed the nobility, had for a long period the exclusive right to exercise priestly functions. Afterwards, as in Europe during the middle ages, the military chieftains chiefly formed the nobility. Nobility may be said to arise from a natural tendency in human society. If we take half a dozen youths, and place them as nearly as possible upon an equality in every respect, we should at the end of fifty years find them and their families in a state of great inequality; some of them would be found to have acquired more of the good things of this life than others, and by mere force of natural character to have attained position and influence over the others. The family commence life with the advantages secured by the father; and if they also inherit his intellectual faculties, it is evident that their elevation will be higher and their distinction greater. Political consideration and political power will always in some degree follow wealth; and so long as the principle of property is admitted, and every man guaranteed the possession of what belongs to him, there will always be some sort of nobility. Society may by its institutions do something to restrain this tendency as well as to promote it, but it can never entirely destroy it, except by annihilating property. From the mere association of political power with wealth, would naturally follow the guaranteeing of that power, along with the wealth, to the family of him who had once possessed it; and hence would arise an hereditary nobility. After a time, as the number of those that possessed wealth increased, wealth and nobility would come to be viewed as distinct, and political power would come to be sometimes exercised apart from the wealth; while, on the other hand, the mere possession of wealth would not raise a man to the rank of nobility. Hereditary nobility is said to have been confirmed in France by Hugh Capet towards the close of the 10th century, and was fully established in England by William the Conqueror in the 11th century. In this country the orders of nobility are five; namely, dukes, marquises, earls, viscounts, and barons. The privilege of placing a family in the rank of the nobility is vested solely in the sovereign, and is done by letters patent. In the different countries of modern Europe, the nobility are of various ranks and titles, and have

various privileges belonging to them. In the United States of North America, and some other modern communities, there is no nobility in any respect resembling that of Europe, office and wealth alone giving power and influence, so long as the former is held or the latter possessed.—Ref. *English Cyclopædia.*

NOBLE, *no'-bl*, was the name of an English gold coin of the value of 6s. 8d., current in the reign of Edward III. The rose noble, says Knighton, was a gold coin current about the year 1344.

NODE, *node* (Lat. *nodus*, a knot), a term applied in Astron. to the point where the orbit of a planet intersects the ecliptic. The line in which the two circles intersect is called *the line of the nodes*. When the planet is in this line, in the act of passing from the south to the north side of the ecliptic, it is in its *ascending node*, and its longitude at that moment is the element called *the longitude of the node*.

NODE, in Surg., is a hard tumour or swelling upon a bone, usually attended with little pain; but sometimes the pain is considerable, particularly in the night-time. The bones more particularly liable to it are those which are thinly covered with flesh.

NOLANACEÆ, *no-lăn-ăt'-se-e*, in Bot., a small nat. ord. of herbs and shrubs in the class *Dicotyledones*, sub-class *Corolliflorœ*. They are exclusively natives of South America, being most abundant in Chili. Their properties are unknown.

NOLI ME TANGERE, *nō'-li me tăn'-je-re* (Lat., Don't touch me), in Surg., is a disease of the skin, commencing with small ulcerations, which destroy the part. It most frequently attacks the cartilage of the nose, and is very tedious and difficult of removal.

NOLLE PROSEQUI, *nol'-le pros'-e-kwi* (Lat., to be unwilling to prosecute), in Law, is a proceeding by which a plaintiff withdraws from the further prosecution of his suit, when he has either misconceived the nature of the action or mistaken the proper party to be sued. It may be entered as to a part of the suit only, or as to some of the defendants; in which case he is at liberty to proceed as to the rest. If it be entered before judgment, the plaintiff may bring another action for the same cause; but if after judgment, it operates as a restraint, and bars any future action for the same cause. When entered as to the whole declaration, or as to one or more of the defendants in any personal action, every such person is entitled to his costs.

NOMADS, *nō'-mădz* (Gr. *nomades*, from *nomos*, pasture), a generic name given to several nations or peoples, whose sole occupation was to feed and tend their flocks, and who frequently changed their place of abode in search of pasturage. The nomads most prominently mentioned in ancient history were those of Africa, who were called Numidians; those of Asia, dwelling on the coasts of the Caspian Sea; the nomads of Arabia, occupying a territory east of the deserts of Palmyra; and those of Scythia, a country frequently mentioned by ancient writers, but of somewhat uncertain position. How frequently during the first twelve or thirteen centuries of the Christian era, the nomads who possessed the uncultivated plains of northern Asia invaded the eastern frontier of Europe, is matter of history.

NOMENCLATURE, *nō'-men-klat'-ture* (Lat. *nomen*, a name, and *calo*, I call), was originally applied to a catalogue of the more usual words in any language, with their significations, compiled so as to facilitate their retention and use by those that were learning the language. It is now commonly used to denote the language or terms peculiar to any particular art or science; as the nomenclature of chemistry, botany, &c.

NOMENCLATURE, CHEMICAL. (*See* CHEMICAL NOMENCLATURE.)

NOMINALISTS, REALISTS, CONCEPTUALISTS, *nom'-i-năl-ists, re'-ăl-ists, kon-sep'-tu-ăl-ists*, were three prominent and conflicting sects among the scholastic philosophers. The contest turned upon the nature of general terms, or *universals*. While all parties agreed that the object of the science of logic was universals, they differed upon the question as to whether these universals were *real* things, or only *names*. The Nominalists maintained that the so-called universal ideas do not stand for any conception of the mind, still less for any entity out of it, but are merely verbal signs; that there is no such thing as an abstract animal, or a tree in general, but only individual animals and trees; that, in fact, there is nothing in the universe of matter or mind but separate individualities. The Realists, on the contrary, affirmed that universals were not mere figments of language, but that they have an objective existence, are incorporeal realities, the essences or types of things, not to be confounded with the things themselves. Conceptualism was proposed as an intermediate doctrine between the two extremes. It gave to universals a logical or psychological existence, as mental conceptions. The Nominalists cited Aristotle as their authority; the Realists adduced Plato. The former maintained that particulars are the only real substances, and that general ideas are abstractions of the human reason. Plato, on the other hand, believed in the eternal existence of ideas. (*See* IDEA.) Logic with Aristotle was the science of names and notions; with Plato, of names and realities. Roscelinus, a canon of Compiègne, in the 11th century, was the first to give a distinct and complete development to nominalism. His opinions were believed to affect the doctrine of the Trinity, and were condemned by the synod of Soissons (1092). He was attacked by Anselm in a work on the Unity of the Trinity; but Anselm's realism was of an undecided and incomplete character. William of Champeaux, the founder of scholastic realism, maintained that universals, so far from possessing a merely nominal existence, are the only real entities. Thus realism verged towards pantheism, while nominalism inclined towards scepticism. Abelard sought to reconcile the opposing parties, by advancing the doctrine of conceptualism. This, however, rather avoided than solved the problem; but its moderation secured its triumph. John of Salisbury wrote, "that there had been more time consumed in the discussion than the Cæsars had employed in making themselves masters of the world; that the riches of Cræsus were inferior to the treasures that had been exhausted upon it; and that the contending parties, after having spent their whole lives on this single point, had neither been so happy as to determine it to their satisfaction, nor to find in the labyrinths of science, where they had been groping, any discovery that was worth the pains they had taken." Nominalism had become nearly extinct, when it was revived by William of Occam, an English Franciscan of the 14th century. The contest was renewed with the greatest fury in the schools of Britain, France, and Germany; and when words failed to carry conviction, fists, and even clubs and swords, were had recourse to. Afterwards realism became identified with the cause of the pope and the church, and flourished in Italy; while nominalism became associated with the political movement against the power of the papacy, and was generally received throughout the continent of Europe. However, in 1473, Louis XI. of France prohibited the teaching of nominalism, and ordered the books which favoured it to be seized and bound in chains in the public libraries. At length the revival of letters and the advent of the Reformation put an end to the fiercest controversy that has been known to prevail in philosophical speculation.—*Ref. Encyclopædia Britannica; New American Cyclopædia.*

NOMINATIVE CASE, *nom'-e-nă-tiv*, in Gram., is the first case of nouns which are declinable. It is the simple position of a noun or name, designating a substance absolutely, or without relation to any other substance; and is chiefly placed before verbs, as the subject of the proposition or affirmation.

NONAGE, in LAW. (*See* INFANT.)

NONAGON, *non'-ă-gon* (Lat. *novem*, nine; Gr. *gonia*, an angle), one of the regular polygons, possessing nine sides. It will be found, on reference to the article MENSURATION, that when the side of a nonagon is 1, the area of the figure will be 6·181242.

NON-ASSUMPSIT, *non as-sump'-sit* (Lat., he has not promised), in Law, is a plea by way of traverse to the action of *assumpsit* or promises, whereby a man denies the existence of any promise to the effect alleged in the declaration, &c.

NON COMPOS MENTIS, *non kom'-pos men'-tis* (Lat., not of sound mind), in Law, is a phrase used to denote one of unsound mind. (*See* LUNACY.)

NON-CONDUCTOR. (*See* CONDUCTORS AND NON-CONDUCTORS, ELECTRICAL.)

NONCONFORMISTS, *non'-con-form'-ists*, is a general term applied to Protestant dissenters from the Church of England. (*See* DISSENTERS.)

NON EST INVENTUS, *non est in-vent'-us* (Lat., he is not found), in Law, is the term applied to a sheriff's return to a writ of capias, when the defendant is not to be found in his bailiwick.

NON-JURORS, *non-ju'-rors* (Lat. *non*, not; *juro*, I swear).—The rise of the political party known by this name took place at the commencement of the year 1690, when, on the accession to the English throne of William and Mary, new oaths of allegiance and supremacy having been enjoined to be taken by the members of each house of parliament and all public functionaries, certain temporal and spiritual lords, as well as many of the clergy, refused to take them. William expressed his willingness to compromise the matter so far as the clergy were concerned; and in the bill for settling the oaths, as framed by the Lords, it was provided, that whilst all lay functionaries should be required to swear fealty to the king and queen, on pain of expulsion from office, every divine who already held a benefice might continue to hold it without swearing, unless there should appear to be special reasons for calling upon him to do so. The Commons, however, insisted on the introduction of a clause which required every person who held any ecclesiastical or academical preferment to take the oaths by the 1st August, 1689, on pain of suspension. Six months, to be calculated from that day, were to be allowed him for reconsideration; but if, on the 1st February, 1690, he still continued obstinate, he was to be finally deprived. The only lenity shown by the House of Commons in this matter, was by a clause empowering the king to bestow pecuniary allowances on a few non-jurring clergymen out of the revenues of the forfeited benefices. When this measure had been passed, the adherents of the exiled king, James II., hoped that the number of non-jurors would be so considerable as to seriously alarm and embarrass the government; but in this they were disappointed; for the great body of the clergy having long maintained and preached the doctrine of "Non-resistance and Passive Obedience" to rulers (*see* NON-RESISTANCE), now found it peculiarly consistent with their interests, as well as the dictates of their consciences, to carry out their principles by taking the new oaths; and although some of the more timid brethren were perplexed by the fact that he who had the hereditary right to the throne had not the possession, it appeared to most of them that the plain letter of Scripture required them to submit to him who actually grasped the sceptre. The two parties into which the clergy were now divided, came to be called the "swearing clergy" and the "Non-Jurors," and the former class numbered twenty-nine thirtieths of the whole, being especially strong in the metropolis, where almost all the divines gave in their adhesion with every sign of cordiality. The clergymen and members of the universities who incurred the penalty of the law were about 400, including the primate, and the bishops of Ely, Norwich, Bath and Wells, Gloucester, Chichester, and Peterborough. Among the priests who refused the oaths were some men who had distinguished themselves as grammarians, chronologists, canonists, and antiquaries; but if we may believe the famous Dr. Johnson, there was only one man amongst them who could reason,—a certain voluminous political writer named Charles Leslie. The highest in popular estimation, however, at the time was, without dispute, Dr. William Sherlock, distinguished as a scholar, a preacher, a writer on politics, and as a good theologian. The moral character of the non-jurors, as a class, subsequently to their expulsion from their benefices, has been the subject of severe animadversion; and it is very certain that, when they had made their great sacrifice to principle, they were exposed to the severe tests of poverty and idleness. In London and a few other large towns a certain number of Non-Jurors obtained scanty congregations of vehement Jacobites; a few possessed independent means, a few others lived by literature, and two or three by practising as medical men; but the mass became beggars and loungers, and the character of those, even, who became hangers-on of impulent Jacobites, in the character of chaplains, tutors, and spiritual directors, will not bear investigation. The origin of the Non-Jurors, as a class, was more than respectable, the conduct of many of them not even tolerable.

NON-METALLIC ELEMENTS, *non-me-tăl'-lik*, the subdivisions of these bodies is much more difficult than that of the metals. If their arrangement be founded either on their general electrical or chemical relations, or into supporters of combustion and combustibles, or into acidifiable and acidifying substances, difficulties arise in the details which are of great practical inconvenience. The electrical arrangement brings together substances extremely dissimilar in their chemical character, such as oxygen and sulphur, both of which are electro-negative bodies. The chemical arrangement again leads us at one time to class oxygen with sulphur, both being supporters of combustion; and at another to separate them, as oxygen is pre-eminently a supporter of combustion, and sulphur as eminently a combustible. In all these arrangements, also, nitrogen, as an element, stands out as an obstinate exception. It is acidifiable by oxygen, but alkalifiable by hydrogen, it is not combustible nor is it a supporter of combustion. These and other difficulties have caused the electrical and chemical analysis of the non-metallic elements to be rejected as a basis of classification. Berzelius divides them into *oxygen*, which he places by itself as a supporter of combustion, and into inflammable substances in which he includes all the other elements; then adverting particularly to the non-metallic substances, he divides them into three classes; namely,—1. Permanently elastic or gaseous bodies (*Gazo'yta*), oxygen, hydrogen, and nitrogen. 2. Metalloids,—sulphur, phosphorus, carbon, boron, and silicon. 3. Salifying substances (*Halogenia*), chlorine, iodine, bromine, fluorine. (*See* ELEMENTS.)

NON-NATURALS, *non-năt'-u-răls*, in Med., was a term employed by the old physicians to denote certain necessaries of life; because, by their use or abuse, they became either good or evil. They usually reckoned six non-naturals; viz., air, meat and drink, motion and rest, sleep and waking, the passions of the mind, and excretions and retentions.

NONPAREIL, *non'-pă-rel* (Fr., without parallel, matchless), in Printing, is the name given to a very small form of type. These pages are formed of nonpareil type.

NON-RESISTANCE, *non'-re-zist'-ăns* (Lat. *non*, not; *resisto*, I stand against).—The doctrine of non-resistance is a correlative of, and almost identical with, the doctrine of divine right, which maintains that the Supreme Being regards hereditary monarchy with more favour than any other form of government; that the rule of succession in order of primogeniture is a divine institution; that no human power, nor length of adverse possession, can deprive the prince of his rights; and that the laws by which, in England and other countries, the prerogative is limited, are to be regarded merely as concessions, which the sovereign has freely made, and may at his pleasure resume. These doctrines were first adopted as a political creed in the reign of James I., but they had been many years before enunciated by the Anglican reformers as a barrier against the disaffection of those who adhered to the ancient religion, and as a means of exhibiting their own loyalty. Thus, a homily written against disobedience and rebellion in 1569, on occasion of the rising of the northern earls, distinctly enunciates the doctrine of non-resistance, supporting it by the preposterous example, that the Virgin Mary, "being of the royal blood of the ancient natural kings of Jewry, obeyed the proclamation of Augustus to go to Bethlehem; and that this obedience of this most noble and most virtuous lady, to a foreign and pagan prince, doth well teach us, who, in comparison with her, are both base and vile, what ready obedience we do owe to our natural and gracious sovereign." The principle is formally adopted in the Canons of Convocation in 1606; and about 1622, a preacher at Oxford, having thrown out some intimation that subjects oppressed by their prince on account of religion might defend themselves by arms, that university not only censured the preacher, but pronounced a solemn decree, that it is in no case lawful for subjects to make use of force against their princes, nor to appear offensively or defensively in the field against them. At the same

time it should be observed, that the advocates of the doctrine of non-resistance, whilst denying the abstract right of resistance to even the unlawful commands of a sovereign, did not maintain the duty of yielding them an active obedience.

NONSUIT, *non'-sute* (Fr. *non suit*, Lat. *non sequitur*, he does not pursue), in Law, is the renunciation of a suit by the plaintiff or demandant, most commonly upon the discovery of some error or defect, when the matter is so far proceeded in as that the jury is ready at the bar to deliver their verdict. When the jury return to the bar, after having agreed upon their verdict, the plaintiff is bound to appear in court by himself, attorney, or counsel, in order to answer the amercement to which, by the old law, he was liable if he failed in his suit. If he does not appear, no verdict can be given, and the plaintiff is said to be *nonsuit*. It is, therefore, usual for a plaintiff, when he or his counsel perceives that he has not given sufficient evidence to maintain the issue, to be voluntarily nonsuited, as he may then commence the same suit again for the same cause of action, from which he is for ever barred by a verdict, unless the judgment be reversed as erroneous. In a nonsuit, the jury are discharged from finding a verdict, and the plaintiff has to pay the costs of the suit. It is also usual for the judge to direct a nonsuit if, upon the whole case in support of the action, he is of opinion that there is no evidence which would justify the jury in returning a verdict for the plaintiff.

NORMAL or TRAINING SCHOOLS, *nor'-mäl* (Lat. *norma*, a rule or pattern), are schools for the education of teachers. It is not a little surprising, that for the important duty of educating the young, it is only recently that any special training has come to be regarded as necessary. They originated in Germany, and were for a long period confined to that country. The first was organized at Stettin, in Prussia, in 1735; the next by Frederick the Great, at Berlin, in 1748; another was opened in Hanover in 1757; and others followed in various parts of Germany. Since the beginning of the present century they have rapidly increased in number, and been greatly improved in their internal organization. The course of instruction generally extends to three or four years, and in some of the states the great majority of the teachers are graduates of the normal schools. The first seminary for teachers in France was established in 1810; the first in Holland in 1816; and since that time they have been introduced into the other principal countries of Europe. In England, the Borough-Road Institution was originally founded by Mr. Lancaster in 1805, for the training of teachers; and from the earliest part of their career, both the "British" and the "National" societies have devoted much of their attention to the training of efficient teachers for the schools in connection with them. To Sir James Kay Shuttleworth, however, belongs the great merit, if not of creating, at least of having given an extraordinary impulse to, the modern movement for providing training colleges. In conjunction with Mr. Tuffnell, he, in 1840, established an experimental training college at Battersea, which soon gave practical evidence of the immense advantage of the plan. The earliest proceeding of the Committee of Council on Education (1839) was to record their opinion, "that the most useful application of any sums voted by parliament would consist in the employment of those moneys in the establishment of a normal school under the direction of the state." There are now in England and Wales thirty-four training institutions, of which all but two are largely supported by government. The first normal school in America was opened at Lexington in 1839; and now most of the principal cities have their normal schools. There are about ninety such institutions in France, fifty in Prussia, thirteen in Switzerland, and a proportionate number in Saxony, Hanover, and Bavaria.

NORMAN ARCHITECTURE, *nor'-män*, a style of architecture which flourished originally and principally in Normandy, as its name denotes. It afterwards became prevalent in other places wherever the Normans obtained influence or dominion; among others, in this country. The Norman style is allied to the debased Roman examples of the Eastern and Western empires,





and may be with them included in the general title of Romanesque. It cannot, however, be ranked as of equal importance with the Byzantine or Lombardic divisions, of both of which it is a modification. It is not decided at what period the Norman style was first introduced into England. Some persons are of opinion that it was introduced by William the Conqueror; others by Edward the Confessor; while a third party maintain that it was merely a development of the Saxon, or the style immediately preceding. It would seem, however, that the Saxon and Norman were distinct styles emanating from the same grand type; and consequently, to a certain extent, modifications of each other. They are both derived from the Roman, and both developments of the Romanesque; but here they separate, and in the two styles may be traced such a similarity as might be expected in descendants from a common source. While the Saxon style was reared on an uncultivated soil and by rude hands, the Norman was developed amid more advanced civilisation. (*See* ANGLO-SAXON ARCHITECTURE.) The Norman style may be said to have been fully developed in England soon after the Conquest, and flourished from the middle of the 11th century, and prevailed to the latter part of the 12th, or the close of the reign of Henry II. In general it is styled as the architecture of the 12th century, and dates from 1066 to 1170. According to the monkish chronicles, soon after the arrival of the Conqueror and his followers, who were great builders, churches began to spring up in every village, and monasteries were erected in all the towns and cities, designed in a novel style of architecture. In Domesday-book it is recorded that the number of churches had so increased, that at the time of its compilation there were no less than 1,700 in existence. In the larger Norman churches the plans are generally cruciform; at the intersection between the nave, choir, and transepts, there is a low massive tower; and the choir is usually terminated with a semicircular apse. In many cases the aisles of the nave are continued at the sides of the choir, and the high altar is situated between the easternmost piers, with a screen behind stretching between the piers. A space was thus left clear at the back of the altar, which was called the retro-altar, and thus allowed processions to perambulate entirely round the church. The choir, in some cases, was surrounded by chapels, having also apsidal terminations. The width of the aisles was very small, in some cases being not more than four to six feet. In most cases the western façades are flanked by turrets or buttresses, but occasionally by towers. The parish churches were usually small, consisting of a nave, often without either porch or aisles, with a chancel and tower. Small churches, however, often consisted of nave and chancel, only without any tower or other appendage. In the buildings of this period the *walls* were of great thickness, but the masonry was not solid, being composed of two external walls of ashlar-work, having the space between filled up with rubble, gravel, flints, &c. Sometimes, however, the walls were made up of solid rubble-work with quoins of ashlar. The former kind were not durable; but the introduction of buttresses at a later period led to a great improvement in the construction of walls. The *arches* of the Norman style are invariably of the semicircular form, but occasionally stilted, and the only variety in the proportions of arcades depends upon the height of the piers, the height of the opening usually averaging about twice its width. Chancel arches are sometimes deeply recessed and ornamented with a number of rich mouldings. The *piers* which support the principal arches of construction are very massive, and frequently of stunted proportions. The *capitals* are very varied in character, some bearing a more or less close resemblance to the Corinthian and other classic styles. In general, however, they are merely rude and unskilful imitations, and when contrasted with the originals, have a heavy appearance. The foliage is crowded and without regularity, and the capital, on account of its squatness, inelegant. Many, however, are not elaborately carved, several of them being quite plain: the most common of these is the cushion capital, which is of cubical form, being rounded at the lower end to meet the shaft. In the Norman and Lombardic styles, mural

arcades are a common feature: they sometimes cover the greater portion of both external and internal walls, but are most common on the exterior, especially on the façades, the clerestories, and the upper stories of towers. The front of Lincoln cathedral presents little more than a surface decorated by tiers of small columns and arches of the kind known as arcades, which form a very characteristic feature of Norman architecture. The *doorways* in this style are to be found in very great variety, from the most simple to the most elaborate. In this country there still remains a great variety of Norman doorways, even in churches which present no other features of this style. *Windows* in this style were subordinate members of an edifice, and in the earlier examples are nothing more than mere slits, or narrow oblong apertures, often not exceeding a few inches in breadth, and finished with a plain semicircular head. Larger windows are to be found in cathedrals and in the larger churches. After a time, windows began to be decorated with a slight degree of enrichment, and the zig-zag and other mouldings were added round the arch. In the upper stories of towers a more advanced window is sometimes to be found; it consists of two lights, with semicircular heads, separated by a central shaft and having a jamb-shaft on either side; the two lights are inclosed under another large semicircular arch, which is surrounded by a hood-mould. The *mouldings* in the Norman style are of great variety, and in some instances are very elaborately carved. One of the most favourite and characteristic is the *zig-zag*, which is composed of a series of salient and re-entrant angles, recessed or otherwise carved on the surface of the stone, sometimes in a single line, but more frequently in two, three, or more lines running parallel to each other. Other kinds are the *indented* or *trowel-point*, the *beak-head*, *bird's-head*, and *cat's-head* mouldings; the *nail-head*; the *billet*-moulding; the *embattled*, *star*, *medallion*, and *lozenge* mouldings; &c. In the early Norman period the prelates were men of great skill in architecture. No less than fifteen of the twenty-two English cathedrals retain considerable portions which are undoubtedly of Norman workmanship, and of which the dates are ascertained. In the cathedrals of Canterbury, Durham, Winchester, Gloucester, Peterborough, Ely, Norwich, Lincoln, and Oxford, the older parts are all built in the Norman style. The nave and choir of Norwich cathedral, with the exception of pointed windows of later English character inserted in the upper part of the choir, are almost entirely Norman. There are very few examples, however, of the exterior Norman style: the fronts of Lincoln and Rochester cathedrals are almost the only instances; but they display a mixture of several other styles. Many of the churches belonging to the greater abbeys were constructed in the Norman period; but few have escaped the general demolition which took place at the Reformation. As the Normans knew that they could not live in security without building strong places of defence, military structures were, therefore, established or built on every lordship. The leading feature in a Norman fortress was a lofty mound of earth, thrown up in the centre of other works from the excavations necessary in forming the ditch, fosse, or moat. A square or circular tower, of several stories, rose from the upper ballium, or a low circular story of considerable diameter, which was generally approached on the outside by a very steep stone staircase. The gateway, or tower of entrance, was built at the foot of the artificial mount, from which was a sally-port with stone stairs leading to the keep. It contained the portcullis and drawbridge fixed to the archway, and several spacious chambers. The gateway, and the barbican or watchtower, had both of them a communication with the keep. (*See* CASTLE.) From the year 1155, the Norman architecture began to be mixed with new forms and additions, and was at length superseded by the more elegant and lofty style of building usually, but improperly, called the Gothic. (*See* GOTHIC ARCHITECTURE.)—*Ref.* Carter's *Ancient Architecture of England*, and Britton's *Arch. Antiq. of Great Britain*.

NORSE, *norse*, is a corruption of the Danish *Norsk*, Norwegian, and is applied by English writers to the Icelandic, or ancient Scandinavian language. The Norsemen are the Normans. (*See* NORMANS.)





NORTH BRITON NEWSPAPER, was commenced in June, 1762, by John Wilkes, M.P. for Aylesbury, in opposition to Lord Bute's administration. The government quailed before its attacks, and watched for an opportunity of punishing it. This was at length found in the 45th number, which charged the king with having uttered a falsehood in his speech from the throne. A general warrant was issued against the authors, printers, and publishers of the *North Briton*, and Wilkes was seized and committed to the Tower. On obtaining his liberty, he brought an action against the under-secretary of state for the seizure of his papers, and obtained a verdict in his favour, with £1,000 damages. When parliament met, the house resolved, by a majority of 237 against 111, that the *North Briton*, No. 45, was a false and scandalous libel, and that it should be burnt by the common hangman. When the sentence was being carried out in Cheapside, on December 3rd, 1763, a riot ensued, and the hangman only succeeded in burning a part of the paper, the remainder having been carried away in triumph by the mob.

NORTHERN LIGHTS. (*See* AURORA BOREALIS.)

NORTHMEN, or NORMANS, were the ancient inhabitants of Scandinavia, or Norway, Sweden, and Denmark. More particularly the latter term was applied to the inhabitants of these countries, the former to that portion of them who conquered and settled in Normandy. In England they were called the Danes. They were fierce and warlike tribes, who made piratical expeditions to all parts of the European seas, plundering by land and by sea, and often overrunning large tracts of country, in which they practised every enormity. The poverty of their country compelled them to adopt this means of subsistence, while their hardy mode of life taught them daring and endurance, and even their religion spurred them on to these adventures, by representing to them that warriors who had fallen in battle were immediately admitted to the joys of *Valhalla*, their northern paradise. As early as the latter half of the 8th century, they began to make incursions along the English coast. In 835 they were vanquished in a great battle by the Anglo-Saxon king Egbert; but forty years later, in the reign of Ethelred, a footing was established, and the Danes conquered Northumberland and other districts. They were temporarily held in check by Alfred the Great; but the Anglo-Saxon resistance grew feeble, and in 991 the Danes first exacted their tribute tax called *Danegelt*. Four Danish sovereigns, among whom was Canute, reigned in England during the next fifty years, down to 1042, when the Saxon dynasty was restored in the person of Edward the Confessor. A Danish invasion penetrated to the Meuse in 515, but was repelled. The victories of Charlemagne over the Saxons led to a league being formed between that people and the Danes; and Gottfried, king of Jutland, with his piratical bands, ravaged the French and Spanish coast, even within the Straits of Gibraltar. Their great invasion of France, however, did not take place till 841, after which the whole coast of western Europe, from the Elbe to the Guadalquivir, fell a prey to the Northmen. In 837 they had sacked Utrecht and Antwerp, and fortified themselves on the island of Walcheren, spreading themselves on the mainland. Flanders was obstinately defended; but Friesland, Lower Lorraine, and Neustria, fell without resistance. Rollo devastated Holland, and appeared upon the Seine, while Gottfried ravaged the valleys of the Meuse and Scheldt. Hastings, at the head of a band of Northmen, sacked Bordeaux, Lisbon, and Seville; defeated the Moorish conquerors of Spain at Cordova, overran Italy and Sicily, and crossed the straits into Morocco. In 885 they laid siege to Paris, but were at length bought off by Charles the Fat. Rollo, one of the most renowned of the Norman chieftains, after ravaging Friesland and the countries watered by the Scheldt, accepted the hand of a daughter of Charles the Simple, and received with her a tract of Neustrian territory, north of the Seine (the modern Normandy), taking also an oath of fealty, and being baptized (912). His followers received the religion of their leader, and abandoned their roving and piratical habits. Rollo thus became the first duke of Normandy, and his descendant, William, the seventh duke, became the conqueror of England in 1066.

Norwegian Language and Literature, *Norsk Sprog og Literatur*.—The ancient Norwegian tongue was formerly the common language, with only trifling variations of dialect, of Denmark, Norway, and Sweden. With the advent of Christianity, however, about the 10th century, this language was by degrees supplanted by the modern Danish, and only found a permanent abiding-place in Iceland, where it is still spoken in its purity; and hence it is now commonly known as the Icelandic. Norway, in consequence of her remote situation, retained the old tongue longer than either of her sister kingdoms. The few mediæval Norwegian documents that still exist do not exhibit any important grammatical changes until about the time of the annexation of Norway to Denmark, towards the close of the 14th century. But from this time the influence of the governing nation was such that a rapid transformation took place, and soon after the beginning of the 16th century the written language and speech of the higher classes became identical with those of Denmark. At present, the Danish is the language of the people generally; but among the peasantry, and in the more remote districts, the old Norse language is still spoken in various dialects, diverging more or less in their structure from the ancient tongue. The different Norwegian dialects have been classed in three divisions, corresponding to the natural divisions of the country: the *Nordenfjeldsk* group, comprising those spoken in the province of Drontheim and the extreme northern provinces; the *Vestenfjeldsk* group, or those spoken west of the mountains, in Bergen and the western portion of Christiansand; and the *Sondenfjeldsk* group, including those spoken in southern Norway, or to the east of the mountains. Of these three divisions, the second approaches nearest to the Icelandic, while the last-named, lying nearer to Christiana, has been most largely influenced by the Danish. All of them possess some peculiarities in common which distinguish them from the written speech. The earliest literature of the northern countries is of an antiquity vastly remote; consisting of those accounts of their gods and heroes which had been handed down from age to age by a class of poets and oral historians, educated for the purpose, and styled Scalds and Sagamen. This system of oral tradition continued till the introduction of letters with Christianity. But the Christianity which was introduced displayed so great an antipathy to the original literature or traditional lore of the country, as being inseparably mixed with the paganism of the people, that almost every trace of it was rooted out. Fortunately, some of the grand and curious literary monuments of this period were preserved by such of the Scandinavians as had fled to Iceland from the oppression of some of their conquering monarchs, and who there maintained a greater independence of the Romish church. There the ancient order and arts of the Scalds were preserved. Sæmund Sigfusson, surnamed Frodé, or the learned, who flourished in the latter half of the 11th century, wrote down all that remained of the great mythologic and heroic poems of the ancient Scalds, under the name of the Elder or Rhythmical Edda. After him followed Ari Hinn Frodé, who began the chronicles of Iceland in the "Landnama Bok;" and Snorro Sturleson, the author of the Second or Prose Edda and the "Heimskringla," or chronicle of the kings of Norway. These, with a great number of romantic and popular sagas, constitute the mass of the ancient Norse literature, which, escaping the annihilating hands of the Roman priests in that remote island, which remained an independent republic till 1261, astonished the learned world of Denmark and Sweden by their discovery in the middle of the 17th century. (*See* Howitt's *History of Northern Literature*.) During her political connection with Denmark, and as using the language of that country, Norway, though she produced a number of writers, cannot be said to have had any distinct literature of her own. The writings of her historians, poets, and men of science, properly form a part of Danish literature. Her political union with Sweden, a country possessing a different language, and the establishment of an independent government in 1814, gave an impulse to the national spirit, and with the establishment of the university of Christiana (founded in 1811), led to the development of an independent literature. For the first few years, however, as was to be expected in the case of a country which, for more than four centuries, had not possessed a government of its own, attention was chiefly directed to the discussion of subjects connected with political economy and jurisprudence, and the literature consisted chiefly of political essays, legal tracts, treatises on agriculture and manufactures, and text-books for popular instruction. As noted publicists and economical writers, are C. M. Falsen, Sverdrup, Reeder, Marthoe, Petersen, Platau, Dass, Blom, and F. Monrad; the last of whom has recently given to the public a large work on the history of political science. Keyser and Munch have critically and philologically edited the ancient Norwegian code of laws. Schwelgaard has written commentaries upon the present jurisprudence, and among other juridical writers of eminence, are Aubert, Reeder, P. C. Lassen, Smidt, Bull, and Brandt. Besides numerous valuable statistical tables issued annually by the government, J. E. Kraft has published an able topographical and statistical description of the kingdom (6 vols. 1820-35); Tvetbe issued his "Norges Statistik" in 1848; and in the department of social statistics, the treatises of Eilert Sundt are well known. In physics, several Norwegians have achieved a European reputation; as Christopher Hansteen (astronomy and terrestrial magnetism); B. M. Keilhau (geology); Theodor Kjerulf (geology); Jens Esmark (geology and the structure and formation of glaciers); J. C. Hörbye (the erosion of mountains). The leading botanists have been Christen Smith, Sommerfeldt, and Blytt. In zoology, the splendid work of Michael Sars, a Norwegian *Fauna Litoralis*, is widely known; and Halvor Rasch has also written some able treatises on the same subject. In mathematics are the names of N. H. Abel, B. Holmboe, and O. J. Broch. In medical science, Danielsson and Boeck have laid before the world important investigations on elephantiasis, and more recently (1860), Bidenkop has published a valuable treatise on the same subject. Boeck was the first to advocate inoculation in syphilitic diseases; F. Holst has by his writings contributed to the improvement of hospitals and prisons; and Skjelderup has published some volumes of interest. Metaphysics have been but little cultivated, the only names of note being M. J. Monrad and C. Hetberg; but in theology there have been a number of distinguished writers; as W. A. Wexel, S. J. Stenersen, and K. P. Caspari. The history, philology, and antiquities of Norway have been studied with unflagging industry. Jacob Aall has translated the voluminous chronicles of Snorro Sturleson, and also left interesting memoirs of his own time. A. Faye has published a history of Norway; Rudolph Kayser, an account of the religion of the ancient Northmen, and a history of the Norwegian church during the Catholic period; C. A. Lange and C. R. Unger are editing *Diplomatarium Norvegicum*; and Nicolaysen and others have illustrated the ancient remains scattered through the country. P. A. Munch is bringing out a most important national historical work, entitled "Det Norske Folks Historie," of which four volumes have already appeared, and come down to the end of the 14th century. The publication in 1847 of the elder Edda, by Munch, with a grammar and chrestomachy of the old language, led to the formation of the Norwegian school of philology, whose national zeal has led to many warm disputes among the Scandinavian philologists. The dialects of the Lapplanders, who live under the Norwegian government, have been industriously studied by Stockfleth and Friis; and C. A. Holmboe has done good service in the cause of comparative philology, by the publication of his "Comparative Lexicon of several of the Teutonic European Tongues" (Vienna, 1852), and other works. The most popular of living poets is Andreas Munch, a cousin of the historian, who has produced a number of poetical and dramatic works. H. A. Wergeland, (1808-45) was long the favourite poet of the Norwegians, and a complete edition of his works in 9 volumes has recently been published. The poems and dramas of H. A. Bjerregaard (1792–1848) are national in spirit, but lack originality and brilliancy. J. S. Welhaven (b. 1807) has published a great number of lyrics, and several historical dramas, founded chiefly on national subjects; and M. C. Hausen (1794–1843)

produced a number of poems and romances. Among the younger poets, the best known are J. Moe, Kjerulf, Schive, Bentzen, Schwach, and Sivertsen; and the dramatic writers, C. P. Riis, H. Ibsen, and R. Olsen. M. B. Landstad and Sophus Bugge have each edited collections of old popular ballads, and P. C. Asbjörnsen and J. Moe have collected the popular tales, which have been orally preserved by the peasantry for many generations. A literal reprint of the well-known "Flatøyjarbok" (*Codex Flatoënsis*), containing all parts of historical legendary, in prose and verse, is in course of publication, with the assistance of the government. Two novelists have recently been attracting special attention; namely, Björnsterne Björnsen, whose "Synnöve Solbakken," a tale of Norwegian peasant life, has met with great success; and Mrs. Camilla Collet, whose novel, "Amtmandens Döttre" (1854-5), has gone through several editions. Between 1848 and 1854 there were 1,023 works published in Norway,—791 in Christiana, 100 in Bergen, and the rest in other towns; of these 870 were original, 139 translations, and 14 new editions. At the end of 1859 there were 52 daily and weekly journals published in the country, of which 13 issued from Christiana.— Ref. *New American Cyclopædia*, edited by Ripley and Dana.

NOSE, *noze* (Sax. *næse, nosa*), is the organ of smell in vertebrated animals, and in the three highest classes is connected with the respiratory function. In man, the nose forms one of the characteristic features of the face, and has been regarded by physiognomists as a faithful index of character. The nose has always been regarded as a principal element in conferring beauty on the face; but different races have differed greatly as to what form of this organ is to be regarded as the most beautiful. The ancients seem to have had an aversion to small noses; and the Romans esteemed above all the aquiline nose, which Pliny termed, by way of distinction, "royal." According to Plutarch, Cyrus had this form of nose, which thus came to be regarded as beautiful among the Persians. But the aquiline nose was only regarded as beautiful when the curve was gentle and almost imperceptible. The Greeks indeed seem, generally speaking, to have held a straight, or almost straight, line from the forehead to be the *beau idéal* with respect to this feature; and, accordingly, we find it so represented in all their best statues. The short nose is never to be found in Roman sculpture earlier than the times of Caracalla, when the art had evidently declined. In Tartary, the greatest beauties are those who have the smallest noses; and the wife of Genghis Khan is said to have been regarded as an extraordinary beauty, because she had only two holes for a nose. In literature, the term nose is used in a variety of different senses; as, to lead by the nose, to pass under one's nose, to have a nose for errors, to thrust one's nose into the affairs of others, to put one's nose out of joint, &c. The nose, anatomically considered, consists of two large cavities, called nostrils (*nares*), a right and a left, formed by the bones of the face, and separated from each other by a perpendicular flat partition called the *septum narium*. There are fourteen bones which enter into the composition of the cavities of the nose; the principal of which are the nasal bones, which bound the nasal cavities in front, and are attached to the frontal bone above and to the superior maxillary on the sides. The other bones of the nose are the frontal, ethmoid, and sphenoid, which are common to the head and face; and all the bones of the face, excepting the two malar and inferior maxillary; being the two superior maxillary, two lachrymal, two inferior spongy, the vomer, and the two palatal bones. The septum of the nose is formed by the vomer, nasal lamella of the othmoid bone, and an extensive cartilage. The nasal cavities are bounded anteriorly by the nasal bones, superiorly by the frontal bone and the cribriform plate of the ethmoid bone, and posteriorly by the body of the sphenoid. The floor is formed by the superior maxillary and palatal bones, and the outer wall by the ethmoid, the internal pterygoid plates of the sphenoid bone, the lachrymal bone, inferior spongy bone, palatal bone, and superior maxillary. Each nostril is divided by the spongy bone into chambers, termed the *superior*, *middle*, and *inferior meatus*. The openings into these, in addition to the anterior and posterior common openings, are as follows:—In the inferior meatus, the opening from the nasal duct, concealed by a fold of mucous membrane; in the middle meatus, one from the maxillary sinus, one from the frontal sinus, and anterior ethmoidal cells; in the superior meatus, the opening from the posterior ethmoidal cells and sphenoidal sinuses, and the spheno-palatine foramen. The Eustachian tube might almost be said to enter the nostrils, for its anterior aperture corresponds with the posterior part of the inferior spongy bone. The upper wall of the nose is pierced by numerous foramina, through which enter the filaments of the olfactory, or nerve of smell. The mucous membrane lining the nose is called the *Schneiderian*, or *pituitary*, and is continuous with the common integument anteriorly and with the mucous membrane of the pharynx posteriorly. It is, for the most part, well supplied with vessels, especially veins, and presents also numerous glandular follicles, whose secretion is well known. It receives the filaments of the nerves of smell and of common sensation. The nerves of smell arise from the anterior lobes of the cerebral hemispheres, and their bulbs rest on the cribriform plate of the ethmoid bone, which the branches pierce, to the number of fifteen or twenty, on each side, and then, running under the mucous membrane, are distributed principally to the septum and outer wall of the nose, communicating with filaments from the sympathetic cerebral ganglia. Besides smell, the nose has ordinary sensation, like other parts of the face, depending on filaments of the trifacial or fifth pair of cerebral nerves. That those two sensations are distinct is evident from those who have lost the sense of smell still retaining unimpaired susceptibility to the action of snuff and other irritants. The openings of the nose are provided with stiff curved hairs, which prevent the entrance of many particles floating in the air. The external prominent part of the nose, which gives character to the feature, is composed of several cartilages connected to the bones and to each other by strong fibrous tissue, sufficiently firm to preserve the shape of the organ, and so elastic and flexible as to permit the expansion and contraction of the nostrils in respiration. The varying expression given to the face by the movements of the nose depends on the action of its muscles attached to the cartilages, skin, and upper lip; and most of the expressions arising from these movements are disagreeable; indicating contempt, anger, fear, or pain. The motor nerves of the nasal muscles are branches of the facial or seventh pair of cerebral nerves. The arteries are derived from the ophthalmic, internal maxillary, and facial branches of the carotids. The nose is not only the organ of smelling, but serves also as the chief passage of the air into the lungs, and has a considerable influence upon the voice.

NOSOLOGY, *no-sol'-o-je* (Gr. *nosos*, a disease, and *logos*, discourse), in Med., is generally applied to the methodical arrangement and classification of diseases and their nomenclature. Many attempts have, from an early period, been made to classify and arrange under certain groups particular forms of disease; but it is only in comparatively modern times that anything like a scientific system of arrangement has been attempted. One of the earliest of these was that of Sauvage, who distributed diseases into ten classes; viz., *vitia, febres, phlegmasiæ, spasmi, anhelationes, debilitates, dolores, vesaniæ, fluxus, cachexiæ*. Each of these was again divided into orders, &c. The classifications of Linnæus, Vogel, and Sagar, were of the same artificial and strained character, and were all supplanted by that of Cullen, which had the advantage of being more simple, while it was, at the same time, more definite and concise. He had only four classes,—*pyrexiæ, neuroses, cachexiæ*, and *locales*. The chief objection that has been urged against this system is, that it is based upon the symptoms of disease, whereas many of the symptoms are extremely variable, and by no means uniformly express either the nature or the amount of the real derangement of function or structure. Similar symptoms, too, dependent upon the most diverse causes, are associated together, although they may require quite opposite plans of treatment; while diseases really kindred in their nature are widely separated, because they differ in their symptoms. An increased knowledge of pathology and physiology has led to more

accurate and natural arrangements of disease. One of the simplest of these is that of Pinel, who arranges the various forms of disease into five classes; viz., fevers, inflammations, hæmorrhages, neuroses, and organic affections. The following system, that of Dr. William Farr, is the one adopted by the registrar-general; and though not yet in use among the generality of the profession, it is the one that is most commonly referred to:—

Class I. ZYMOTIC DISEASES; such as are either epidemic, endemic, or contagious, induced by some specific body, or by want of food, or by its bad quality. 1. *Miasmatic diseases.*—Small-pox, varioloid disease, chicken-pox, miliaria, measles, scarlatina, hybrid of measles, scarlet fever, dengue, quinsy, diphtheria, mumps, croup, hooping-cough, typhoid fever, relapsing fever, typhus fever, erysipelas, erythema, hospital gangrene, pyemia, metria, plague, carbuncle, boil, influenza, dysentery, diarrhœa, cholera, yellow fever, remittent fever, Crimean fever, Hong-Kong fever, &c., ague, rheumatism. 2. *Enthetic diseases.*—Syphilis primary, syphilis secondary, gonorrhœa, leprosy, yaws, pellagra, radesyge, purulent ophthalmia, glanders, hydrophobia, nerenica, malignant pustule. 3. *Dietic diseases.*—Famine fever, scurvy, purpura, rickets, bronchocele, cretinism, alcoholism, delirium tremens. 4. *Parasitic diseases.*—Thrush, porrigo, scabies, phthiriasis, worms.

Class II. CONSTITUTIONAL DISEASES; sporadic diseases affecting several organs, in which new morbid products are often deposited—sometimes hereditary. 1. *Diathetic diseases.*—Gout, anæmia, dropsy, cancer, melanosis, lupus, canker, mortification, dry gangrene. 2. *Tubercular diseases.*—Scrofula, mesenteric tuberculosis, tubercular peritonitis, phthisis, hydrocephalus.

Class III. LOCAL DISEASES; sporadic diseases, in which the functions of particular organs or systems are disturbed or obliterated, with or without inflammation, —sometimes hereditary. 1. *Diseases of the Nervous System.*—Meningitis, encephalitis, cephalitis, myelitis, apoplexy, paralysis, shaking palsy, chorea, delirium tremens, mania, monomania, dementia, epilepsy, hysteria, tetanus, convulsions, laryngismus, neuralgia (tic doloureux), neuroma. 2. *Heart diseases.*—Carditis, pericarditis, endocarditis, valvular disease of the heart, hypertrophy of heart, atrophy of heart, fatty degeneration of heart, aneurism of heart, aneurism of aorta, angina pectoris, fainting, arteritis, atheroma, phlebitis, varicose veins. 3. *Lung diseases.*—Hæmoptysis, laryngitis, laryngismus, bronchitis, pleurisy, hydrothorax, empyema, pneumothorax, apoplexy of lungs, pneumonia, pleuro-pneumonia, asthma, emphysema of lungs, grinders' asthma, miner's asthma, collier's phthisis. 4. *Bowel diseases.*—Glossitis, stomatitis, pharyngitis, œsophagitis, gastritis, enteritis, peritonitis, ileus constipation, intussusception, dyspepsia, pyrosis, gastralgia, hæmatemesis, melæna, bronzed skin, pancreatic disease, sphenitis, hepatitis, jaundice, gallstones, cirrhosis, ascites. 5. *Kidney diseases.*—Nephritis, ischuria, diuresis, albuminaria (Bright's disease), diabetes, stone, gravel, hæmaturia, cystitis. 6. *Genetic diseases.*—Varicocele, orchitis, hydrocele, hysteritis, uterine tumours, ovarian tumours, ovarian dropsy. 7. *Bone and Muscle diseases.*—Synovitis, ostitis, exostosis, brittle bones, soft bones, spinal curvature, caries, necrosis, muscular atrophy. 8. *Skin diseases.*—Roseola, urticaria, eczema, herpes, pemphigus, rupia, ecthyma, impetigo, acne, mentagra, lichen, prurigo, psoriasis, pityriasis, ichthyosis, phlegmon, whitlow.

Class IV. DEVELOPMENTAL DISEASES; special diseases, the incidental result of the formation, reproduction and nutritive processes. 1. *Developmental Diseases of Children.*—Still-born, premature birth, atelectasis, malformation, cyanosis, spina bifida, imperforate orifices, idiotcy, congenital deaf muteness, teething. 2. *Developmental Diseases of Women.*—Chlorosis, childbirth, paramenia, climacteria. 3. *Developmental Diseases of Old People.*—Old age. 4. *Disease of Nutrition.*—Atrophy, asthenia.

NOSTALGIA, *nos-tăl'-je-a* (Gr. *nostos*, I return; *algos*, pain), in Med. Pathol., a term for an intense longing for return to one's native country; a disease not infrequent among young soldiers, and those whom circumstances have placed in foreign climes. The Swiss are particularly subject to this affection. This vehement home-sickness is attended with melancholy, loss of appetite, and want of sleep.



NOSTOC, *nos'-tok*, in Bot., a gen. of *Algæ* or sea-weeds. *N. edule* is eaten in China and Japan. *N. sputium* is a valuable article of food in the Arctic regions. It is said to be more nutritious than Iceland moss. Other species are edible.

NOTARY, *no'-tă-re* (Lat. *notarius*, from *nota*, a note), was originally applied to one employed in taking notes of trials and other judicial proceedings. This was the case in ancient Rome. The persons who correspond to our modern notaries, under the later period of Roman law, were the *tabelliones*, who were generally employed to draw up wills, contracts, and other instruments. It is uncertain when notaries were first known in England; but we read of some charters of Edward the Confessor being executed by them for the king's chancellor. In the early part of the 14th century they seem to have been commonly employed, and from that time the office has been one of prominence and importance. The power of admitting notaries to practise seems to have been vested in the archbishop of Canterbury by 25 Hen. VIII. c. 21, sec. 4. The term of a notary's apprenticeship, and the manner of his admission to practise, are regulated by 41 Geo. III. c. 79, amended by 3 & 4 Will. IV. c. 70, and 6 & 7 Vict. c. 90. The notary license in England requires a stamp of £30, in Scotland one of £20; besides an annual certificate, costing £9 for London, Edinburgh, and Dublin, and £6 for elsewhere. The recent statutes, 21 & 22 Vict. cc. 77, 85, abolishing the ecclesiastical courts, do not affect the notaries. Formerly they were much employed in drawing up wills and other legal instruments; but now their business is chiefly confined to the attestation of deeds and writings of a mercantile kind, for making them authentic in other countries, and protesting bills of exchange. They also receive the affidavits of mariners and ship-masters, and sign their protests.

NOTATION, *no-tai'-shun* (Lat. *notatio*, from *noto*, I mark), is the art or method of representing abstract numerical magnitudes by means of symbols; and it comprises *scales*, dependent on the symbols or figures employed. In the usually adopted scale, every number can be expressed by the ten characters—1, 2, 3, 4, 5, 6, 7, 8, 9, 0; of which the nine first denote the different numbers of units, ascending in value from right to left, while the figure 0 is the *radix* or scale of the series, and fixes the different values, of which the various figures taken might be equal. Thus, for instance, if we take the number 12345, it is equivalent to $5 + (4 \times 10) + (3 \times 100) + (2 \times 1000) + (1 \times 10000)$; adding all these, we get

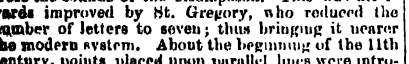
| | |
|---|---|
| | 5 |
| | 40 |
| | 300 |
| | 2000 |
| | 10000 |
| Total ... ... | 12345 |

which exemplifies the rule. The Romans possessed a decimal numerical system, but not a decimal scale of notation; they first adopted the unit I as the commencement of their system, and they brought five of them together with the sign V. They then added two of these V's—equivalent to X. Five tens thus made 50, or L. One hundred was expressed by the letter C, the initial of the word *centum*; five hundred by the letter D, and a thousand by the letter M. It must be observed that the position of one of these signs before another one takes that amount from it; as can be seen in the number IX (9), which is 10 less the unit I. The Greeks had the letters of their alphabet as the symbols of notation: thus, $\alpha = 1$, $\beta = 2$, $\gamma = 3$, and so on to the end; only that they stopped with the figure 9; and the next letter, ι, was 10, $\kappa = 20$, $\lambda = 30$; up to 90, when the hundreds ran on. The thousands were expressed by $\alpha$, $\beta$, $\gamma$, &c., only with the stroke , as $\alpha$, under-neath. In mathematics, occasionally, other scales of notation are adopted, which differ from the usual one in consequence of the *radix* being altered, as the *binary*, *ternary*, &c., up to the *duodecimal* scale, which latter is of much use in calculating *artificers' work*. In conclusion, it may be stated, that in respect to the

advantages and disadvantages of the various scales of notation which originate by ascribing different values to the radix, it would be desirable, in point of practical convenience, to elect one wherein the number of figures expressing any given numerical magnitude might be confined within limits not too widely extended, as this would tend to prevent extensive prolixity in the execution of arithmetical operations.

NOTATION, in Mus., the method which, by means of certain characters called notes, represents the pitch or tone and duration of the various sounds. The notation of the ancients did not at all resemble that at present in use. The Greeks employed the letters of their alphabet placed in various positions, and mutilated and compounded in various ways, producing in all over a thousand signs; thus rendering years of study necessary to obtain anything like a *perfect* knowledge of it. This system was rejected by the Romans, who employed fifteen letters of their own alphabet to express the sounds of the bisdiapason. This was afterwards improved by St. Gregory, who reduced the number of letters to seven; thus bringing it nearer the modern system. About the beginning of the 11th century, points placed upon parallel lines were introduced. These points, however, have been in their turn superseded by other characters, which not only mark the pitch, but the time of the notes; of these the six principal ones are the semibreve, the minim, the crotchet, the quaver, the semiquaver, and the demisemiquaver; each of which are differently formed; thus—

*Semibreve. Minim. Crotchet. Quaver. Semi-quaver. Demisemi-quaver.*



To these may be added the half-demisemiquaver, much used, and often unnecessarily, by modern musicians. The use of varying the forms of the notes is to mark the various degrees of *time*. The longest is the semibreve; the next in duration is the minim, which is one-half its length; the crotchet is ¼, the quaver ⅛, the semiquaver $\frac{1}{16}$, the demisemiquaver $\frac{1}{32}$, and the half-demisemiquaver $\frac{1}{64}$.

NOTES, in Mus. (*See* NOTATION.)

NOT GUILTY, in Law, is a plea by way of traverse, occurring in actions *ex delicto*, and amounts to a denial only of the breach of duty, or wrongful act, alleged to have been committed by the defendant. In criminal proceedings, the plea of not guilty is proper wherever a prisoner means either to deny or to justify the charge in the indictment; as for instance, on an indictment for murder, a man cannot plead that it was done in self-defence, but must plead not guilty, and give this special matter in evidence. By the plea of not guilty, the prisoner puts himself upon the trial by jury.

NOTICE, *nō'-tis* (from Lat. *notitia*), is the making something known that a person was or might be ignorant of. In Law, a notice is either (1) statutory, *i. e.*, made so by legislative enactment; (2) actual, which brings the knowledge of the fact directly home to the party, by a person interested in the property; or, (3) constructive or implied, which is no more than evidence of notice, the presumption of which is so violent, that equity will not allow its controversion. Constructive notice may be subdivided into—(*a*), where there exists actual notice of a matter, to which equity has added constructive notice of facts, which an inquiry after such matter would have elicited; and (*b*), where there has been a designed abstinence from inquiry, for the very purpose of escaping notice. Notice, whether actual or constructive, in order to be binding, must be received during the transaction sought to be effected by it. Whatever is sufficient to put a party upon inquiry (that is, wherever there is reasonable certainty as to time, place, circumstances, and persons), is in equity held to be good notice to bind him; and a clerk who searches the register for judgments against A B, will, in the absence of proof to the contrary, be presumed to have seen a judgment which was at the time registered against A B. The mere registration of a conveyance, however, is not deemed constructive notice to subsequent purchasers; and actual notice must be established against them. A purchaser for valuable consideration, without notice of a prior equitable right, obtaining the legal estate at the time of his purchase, is entitled to priority in equity, as well as at law. A public act of parliament binds all mankind, but a private act is not of itself notice to a purchaser. —*Ref.* Wharton's *Law Lexicon*.

NOUN, *nown* (altered from Lat. *nomen*), in Gram., is the name of one of the parts of speech into which grammarians have distributed the words of a language. A noun is the name of a thing, or, more accurately, the name of a notion or conception, whether general or particular. As we may have conceptions of substance or of attribute, nouns are either *substantive* or *adjective*. Again, as we have particular conceptions, or conceptions of individuals, and general conceptions, or conceptions of classes of individuals, nouns are either *proper* or *common*. In order to express unity or plurality of conception (number), the terminations of nouns undergo certain modifications of form; as, *book, books; liber, libri*. In most languages there are two numbers, the singular and the plural, the former expressing one, the latter more than one; but in some languages, as in Greek, there is an intermediate number,—the dual, used to express the conception of two objects. To express the relations of conceptions to each other, most languages make use of an inflection of the primitive form of the noun, called *case;* but the English language makes use of prepositions or juxtaposition. The number of cases of nouns varies in different languages, but it is rarely more than six.

NOVATIANS, *no vā'-she-ănz*, a Christian sect which arose about the middle of the 3rd century, and were called after their founder Novatian, a presbyter at Rome, and a man of high reputation, who held that those persons who had denied the faith during the persecution of Decius (A.D. 249) ought not to be again received into the Church. When Cornelius was appointed bishop of Rome, Novatian was opposed to him, and was elected bishop by his own party; whence arose an open schism in the Church, which soon spread through almost every province of Christendom. From declaring only against the re-admission of the lapsed, they came to hold that all who had been guilty of gross sins after baptism should be for ever excluded from the Church. They did not, however, exclude them from all hopes of eternal salvation; but they considered the Christian church to be a society of innocent persons, who had abstained from grievous sin since their admission. Hence, they re-baptized all who joined them from the Church. They disappear about the 5th century.

NOVELS, *nov'-elz* (Ital. *novella*, a tale, news).—What is meant by the English novel, however, is called in Italian *Romanzo*. It would take long to show that a taste for fictitious narratives was most early and most generally prevalent in Persia and other Asiatic countries; that from them the infection was caught by the Greeks, and that from these latter it became communicated in turn to the Romans, through translations into Latin of the tales of a certain Aristides, about the time of the civil wars of Marius and Sylla. Still longer to relate the various theories which have been suggested as explanations of the origin of romantic fiction in Europe, and which severally refer it to the Northern Scalds, to the Arabians, to the people of Armorica or Brittany, and to the classical tales of antiquity. Whatever may be the value of such conjectures and theories, it is generally allowed that the *novel* is the only form of composition to which modern invention can lay any claim on the score of originality; and it has been the cause of much speculation why it should have remained untouched by those who carried the drama and history to perfection. Many reasons have been adduced for the fact; but the best appears to be, that whilst antique life afforded abundant matter for the pen of the novelist, there was no antique public to reward its exertions; that it could not, in ancient times, have a fair chance with the drama, because the people could not generally read, and could not, in the absence of the printing-press, have been generally supplied with books. But even when romances, those "military fables of the Middle Ages," came to be widely read, the drama maintained its position in Europe as the medium by which manners might best be portrayed, peculiarities of character set forth in the strongest light, and vice or folly most efficiently denounced. But

as the advance of civilisation to a certain extent modified the peculiarities of manners and the outward manifestations of feeling, the drama became unable to exhibit, with the effect necessary to its existence, those more minute traits of character and traits of sentiment by which men and women were now alone, as a rule, distinguished. The public taste demanded, therefore, and developed, a new species of composition, which should delineate passions and feelings with more or less of verisimilitude, interest the heart by the display of the incidents of common life, and present as a background suitable pictures of natural or artificial scenes. The direct source of the British novel has long been a *vexata quæstio*, but is generally attributed to the example of the Italians, from whose works of fiction our earliest and greatest play-writers borrowed many of the plots for their most popular comedies. That the *novel* succeeded to the historical *romance* is certain; but it is impossible to name an exact time at which the one ended and the other commenced. During the reigns of our Edwards and Henrys, the English nation was chiefly entertained with the fables of chivalry,—such as those relating to King Arthur and his knights. In the age of Elizabeth, Spanish romances were introduced, and were read concurrently with certain native compositions, first introduced by a certain John Lylie, which contained all the faults of the old romances without any of their vigour or brightness of colouring. Early, however, in the 17th century, innumerable translations and imitations of Italian tales supplied the English with a new taste, or one which had hitherto lain dormant, and set English writers to work at those pictures of contemporary life and manners which form so important a portion of the literature of the country. About the middle of the 17th century, a Mrs. Aphra Behn inaugurated, in England, the modern system of making contemporary life the subject of fiction, by writing the story ("Oroonoko") of the sufferings of a *certain negro* with whom she had herself been acquainted; about the same time a Mrs. Manley filled works of fiction with current fashionable scandal; and they were quickly followed by Defoe, whose "Moll Flanders" and "Colonel Jack" may be regarded as types of a large number of the best novels of our own day. The reigns of George I. and II. were rich in five novelists, who are still, and will probably long be regarded, as prominent in the first rank of that class of writers,—Richardson, Fielding, Smollett, Sterne, and Goldsmith. Richardson, famous for three novels, "Clarissa Harlowe," "Pamela," and "Sir Charles Grandison," remarkable for the author's minute dissection of the emotions and sentiments of the female breast when under the influence of passion. Fielding, whose chief work, "Tom Jones," is filled with striking pictures of the English life of the period of every grade, and abounds in touches of satire and of humour. Smollett, whose fame chiefly depends on his "Roderick Random," "Peregrine Pickle," and "Count Fathom," and who sought to excite the reader's interest by the display of eccentric characters, such as could scarcely by any possibility exist, but which were nevertheless sufficiently caricatures of what did exist, as not to revolt the reader's sense of probability. Sterne, who in his "Tristram Shandy" used the form of the novel merely as a means of pouring forth a flood of humour, sometimes brilliant and sometimes pathetic, which has seldom been rivalled either in copiousness or in depth; and Goldsmith, whose "Vicar of Wakefield," in spite of some errors in the construction of its plot, is wonderfully true to life in every or any age. In spite, however, of the well-deserved fame of these great novelists and their imitators or followers, the latter portion of the 18th century witnessed a revival, with certain modifications, of the old taste for romance, first excited, probably, by Horace Walpole's "Castle of Otranto," and gratified during a considerable period by Mrs. Radcliffe, who carried the new species of romance-writing to as great perfection, perhaps, as it is within its nature to attain. The principle on which Mrs. Radcliffe's stories are constructed may be briefly described as an attempt to surround with marvellous and apparently supernatural circumstances, characters who conduct themselves as ordinary mortals. Up to a certain point, she leads her reader to suppose that the strange circumstances she narrates, if they existed at





all, must have been the effect of supernatural causes, and from that point takes pains to show that they were merely due to natural causes. The reign of this school may be said to have lasted about fifty years, from 1770 to 1820. Concurrently with, however, and in every way superior to such fictions, appeared the works of novelists, of whom we may mention as famous examples, Godwin, Miss Burney, and Miss Edgeworth. Godwin, who was one of the first to make the novel the means of enforcing abstract principles, and who, in his most famous novel, "Caleb Williams," avowed that its object was "to furnish a general review of the modes of domestic and unrecorded despotism by which man becomes the destroyer of man;" Miss Burney, whose novels are bright pictures of the more prominent characteristics of middle life and "good society" in the latter half of the 18th century; and Miss Edgeworth, whose novels are so many moral lessons, rendered in the highest degree acceptable by powers of humour, and a knowledge of human nature, which are seldom at fault. It would be beyond our purpose to speak here of the novel-writers of the 19th century; but we may briefly remark that in 1814 Sir Walter Scott commenced the publication of his so-called Waverly Novels, and gave a wide extension to the prose form of fiction, and established the Modern Historical Novel; and that the novels written since the commencement of the Waverley series may be conveniently classed under the following heads:—1. *The Novel of Scottish Life and Manners*, such as those of Galt and Miss Ferrier; 2. *the Novel of Irish Life and Manners*, initiated by Miss Edgeworth, and most successfully attempted by Griffin, Carleton, and Lever; 3. *the Novel of English Life and Manners*, such as Mrs. Gaskell's pictures of artisan life, and specimens of provincial dialect in Lancashire; 4. *the Fashionable Novel*, which professes to describe the habits and feelings of those who form the aristocratic portion of London society; 5. *the Novel in which the Hero is some famous Criminal*, such as the "Paul Clifford" of Sir Bulwer Lytton, and the "Jack Sheppard" of Ainsworth; 6. *the Traveller's Novel*, in which the interest arises in a great degree from imaginary locomotion, and under which head may be classed, the Novel of American Life, Manners, and Society; the Oriental Novel; the Military Novel, and the Naval Novel; 7. *the Novel of Supernatural Phantasy*, in which there is a use of ghostly agency, and of which Mrs. Shelley's "Frankenstein" and Bulwer Lytton's "Zanoni" are distinguished examples; 8. *the Development of Character Novel*, the purpose of which is to exhibit the growth and education of an individual character; 9. *the Historical Novel*, of which, since the commencement of the Waverley novels, there has been an ever-increasing abundance; 10. *the Novel of Metropolitan Life and Manners*, under which may be classed—although the title is almost absurdly inadequate—the novels of Dickens and Thackeray, which have given the greatest impulse to prose fiction in Britain which it has received since Scott; 11. *the Religious Novel*, which is sometimes simply a moral tale inculcating piety, but in which, in general, some particular form of faith, or the tenets of some particular sect, are either ridiculed or supported; 12. *the Political Novels*, of which those of Benjamin Disraeli are, in the present day, noteworthy instances, in which the political doctrines of the day are discussed with more or less of partisanship, and the leading men of the day are portrayed with more or less of truth. The great objection, however, to any attempt at a classification of novels is, that many novels might very properly be said to belong to any one of several classes. In late years especially, for instance, there has appeared a class of novels which may be called *novels of purpose*, or didactic novels, the main purpose of which is sometimes to teach scientific facts, sometimes political or psychological facts, and so on, and which, at the same time, might very fairly be classed under one or several of the above-mentioned classes. It may be mentioned, in conclusion, that the number of novels published in Great Britain in 1820 was 114; in 1830, 101; and in 1856, 69. (*See* Reminiscences of Dr. David Masson's *Novelists and their Styles*.

NOVELS (Lat. *novellæ*), in Law, are those constitu-

tions of the civil law which were made after the completion of the second edition of the Justinian code (*Codex repetitæ prælectionis*), for the purpose of supplying what was deficient in that work. (*See* JUSTINIAN'S CODE.)

NOVEMBER, *no-vem'-ber* (Lat. *novem*, nine), is so called from being the ninth in order of the months when the Roman calendar was first formed. It is the eleventh of our year. It consisted originally of thirty days, afterwards of twenty-nine and thirty-one, but was restored by Augustus to its original number. The early Saxons called this *blot-monath* (the blood month), as at this season they sacrificed many animals to their gods, and also killed many as a provision for the ensuing winter.

NOVICE, *nov'-is* (Lat. *novus*, new), is a term applied to a person of either sex who is living in a monastery, in a state of probation, previous to becoming a professed member of an order. The time of probation is called the novitiate, and must be at least one year; after which, if their behaviour is approved, they are professed; that is, admitted into the order, and allowed to make the vows, &c. During their novitiate, the candidates are bound to conform to the discipline of the house; but they are under no permanent vows, and may leave if they find that the monastic life does not suit them. They are under the direction of a master or mistress of novices, whose duty it is to examine their characters and fitness for the religious state, and to try their strength, by exposing them to the most serious obstacles to perseverance which they are likely to encounter in the order. The novices among the Jesuits are disciplined in a very strict and peculiar manner. (*See* JESUITS, MONACHISM.)

NUISANCE, *nu'-sans* (Fr. *nuire*, Lat. *nocere*, to hurt), in Law, signifies anything that worketh hurt, inconvenience, or damage. Nuisances are of two kinds,—(1) public or common nuisances, and (2) private nuisances. The former, as those which affect the public, and are an annoyance to all the queen's subjects, for which reason they are referred to the class of public wrongs or crimes. The offence consists in an encroachment on the common rights of the whole society; as where one obstructs the common highway, or sets up an offensive trade in the midst of a town. Private nuisance may be defined as anything done to the hurt or annoyance of the lands, tenements, or hereditaments of another, and not amounting to a trespass; as where one projects the eaves of his house over that of his neighbour, or stops or obstructs a right of way. It is a nuisance if a neighbour sets up and exercises any offensive trade, or keeps pigs or other noisome animals near the house of another; and, also, if a man by carelessness in excavating his own ground causes the fall of a house erected on land adjoining. If a ferry is erected on a river, so near another ancient ferry as to draw away its custom, it is a nuisance to the owner of the old one; but it is no nuisance to set up any trade, or a school, in neighbourhood or rivalship with another. Nuisance, whether private or public, is rather a tortious than a criminal act. The injury from it arises rather from a misuse of one's own than from abuse of or aggression on another's right; and it is, therefore, indirect or remote, as distinguished from actual invasion of another's property. It is not committed with force, either actual or implied. The remedy at law for the injury of nuisance is by action of trespass on the cause, in which the party injured may recover a satisfaction in damages for the injury sustained. The party aggrieved has also the right to abate the nuisance by his own act; that is, he may take away or remove it, provided he commits no riot in so doing, nor occasions (in case of a private nuisance) any damage beyond what the removal of the inconvenience necessarily requires. "The reason," says Blackstone, "why the law allows this private and summary method of doing oneself justice is, because injuries of this kind, which obstruct or annoy such things as are of daily convenience and use, require an immediate remedy, and cannot wait for the slow progress of the ordinary forms of justice." The "Nuisances' Removal Act for England, 1855" (18 & 19 Vict. c. 121), authorizes the establishment of local boards of health, with power to examine by its own act, or by a sanitary inspector, premises as to which suspicion exists or complaint is made; and to inspect articles of food exposed for sale, or in the course of carriage or preparation for sale or use; and to obtain an order from two justices of the peace in petty sessions (after summoning the offender before them), for the abatement or discontinuance of any nuisance that may be found on such premises, or for the destruction of any article of food so examined, which the justices may deem unfit for the food of man.

NUMBER, *num'-ber* (Lat. *numerus*, Fr. *nombre*), in Gram., the difference of termination or form of a word, to express unity or plurality. The termination which denotes one, or an individual, is in the *singular number*; the termination that denotes two or more individuals or units constitutes the *plural number*. Hence we say a noun, an adjective, a pronoun, or a verb, is in the *singular* or the *plural* number.

NUMBERS, *num'-bers* (Lat. *numerus*), are units considered in reference to other units; as in counting, or performing the mathematical operations of addition, multiplication, &c. According to Sir Isaac Newton, a *number* is the abstract ratio of one quantity to another quantity of the same species; and, consequently, there are three different sorts; as *integers*, or *whole numbers*; *fractions* of *uneven numbers*; and *surds*, or *irrational quantities*. (*See* article on the same.) *Cardinal* numbers are such as consider the number of units,—as 1, 2, 3; while *ordinals* consider their position, as 1st, 2nd, and 3rd. A *compound* number is such as can be divided by some other number besides unity. A *rational* number is one which can be measured by unity; as an *irrational* one is the reverse. *Prime* numbers are such as are only divisible by unity; as 3, 5, 7, 11, &c. *Perfect* numbers are those, the sum of whose aliquot parts added together forms the whole number. A *square* number is one which is multipled into itself, as 9, which is the square of 3; while a *cubic* number is one which is multiplied twice into itself, as 27 is the cube of 3, which equals $3 \times 3 \times 3$. As the *theory of numbers* is usually contained in most elementary treatises on algebra, it need not be entered into in the present article; suffice it to say, that it owes its perfection to Diophantus, who lived in the 3rd century; to Vieta, Bachet, and Fermat, of the 16th; and to the essays of Euler, Legendre, and Newton, of a later era. (For numeral characters, *see* NOTATION.)

NUMBERS, BOOK OF, is the name of the fourth book of the Old Testament, being a translation of the Greek name given to it in the Septuagint, *Arithmoi*, because it contains an account of the numbering of the people. In Hebrew it is called, after the usual practice, by the word with which it begins, signifying "and he spake;" also by the fifth word in the first verse, signifying "in the wilderness," because it narrates the transactions of the Israelites in the wilderness. It is the history of a period of thirty-eight years in the wilderness, opening with the second month of the second year after the deliverance from the land of Egypt, to the eleventh month of the fortieth year of the same epoch; but it is chiefly confined to the first and last of these years. It may be divided into three parts:—(1) the numbering of the people, as also additions to the laws given in Exodus and Leviticus (i.—x. 10); (2) the further events in the wilderness, beginning with the departure of the people from Sinai down to the commencement of the fortieth year, with the laws promulgated during that time (xii.—xix.); (3) the occurrences and prescriptions in the first ten months of the fortieth year (xx.—xxxvi.). The greatest part of the book is occupied in enumerating the several laws and ordinances not mentioned in the preceding books; such as the office and number of the Levites; the trial by the waters of jealousy; the rites to be observed by the Nazarites; the making of fringes on the borders of their garments; the law of inheritance; of vows; of the cities of refuge, &c. Among the more remarkable events which it records, are the sedition of Aaron and Miriam; the rebellion of Korah and his companions; the murmurings of the whole body of the people; Balaam's prophecy; and the miraculous budding of Aaron's rod. It likewise gives a distinct account of the several stages of journeyings through the wilderness. The authenticity of this book has frequently been called in question; and some critics, while ad-

mitting its genuineness, are disposed to give a mythical character to many of its parts; but its minute and straightforward narratives, and other internal marks, are strong objections to such an hypothesis, and it is received literally by the great majority of biblical students.—*Ref.* Hengstenberg's *Dissertations on the Genuineness of the Pentateuch.*

NUMERATION, *nu-me-ra'-shun* (Lat. *numeratio*), is the art of classing numbers together and expressing them properly according to the general principles of notation. The method of counting by ten no doubt owes its origin to the custom adopted by savage tribes of reckoning on their fingers; while the scale of enumeration by twelve, or the dozen, was originated by a consideration of the heavenly bodies. It is said that the inhabitants of Biscay, in Spain, reckon by *twenties;* and the same method was employed by the Mexicans, according to Humboldt. (*See* NOTATION and NUMBERS.)

NUMERATOR, *nu'-me-ri-tor*, a term applied in mathematical science to that part of a fraction which expresses into how many parts the unit is divided. In the fraction $\frac{5}{8}$, for example, the figure 5 is the *numerator*, as it shows that the denominator has been divided into eight parts, of which only five are taken to constitute the fraction. (*See* FRACTIONS.)

NUMISMATICS, *nu-miz-mat'-iks* (Gr. *nomisma*, Lat. *nummus*, a coin or medal), that science which has for its object the study of ancient and modern coins and medals. *Coins* are pieces of metal on which different marks have been impressed by public authority, to indicate their weight and value, in order to make them a convenient medium of exchange; *medals* are pieces of metal similar to coin, not intended as a medium of exchange, but merely struck to commemorate some important event. The science of numismatics has the same divisions as history. Ancient numismatics extend to the fall of the Western empire; the numismatics of the Middle Ages commence with Charlemagne; and modern numismatics with the revival of learning. The pieces of metal originally used as money were rude and shapeless; and some ancient writers mention money of leather among the Carthaginians, Spartans, and Romans. Wooden money was also used by the Romans, and shells, which are still employed by some tribes in Africa. Gold, silver, and copper, however, are, and have been, the ordinary materials of money. (*See* MINT, MONEY.) The ancient coins which have been preserved are much more numerous than those handed down from the Middle Ages. The principal stores have been found in tombs, or in places where they have been concealed, either through fear, avarice, or superstition. Till the 3rd century the faces on medals were represented in profile. In the coins of the Lower empire, however, there are Gothic front faces filling up the whole field of medals. Both methods are employed by the moderns; but the ancients gave more relief to the figure. The coins of the kings of Macedon are the most ancient of any yet discovered bearing portraits; and Alexander I., who commenced his reign about 500 years B.C., is the earliest monarch whose medals have yet been found. The medals of the sovereigns who ruled in Sicily, Caria, Cyprus, Heracles, and Pontus then succeed. Afterwards comes the series of kings of Egypt, Syria, Thrace, Parthia, Damascus, Cappadocia, Galatia, Sparta, Epirus, Illyricum, Gaul, and the Alps. This series comprises a period of 330 years, and extends from the time of Alexander the Great to the Christian era. A perfect and distinct series of ancient medals is formed by the Roman emperors from Julius Cæsar to the overthrow of the empire by the Goths, and, indeed, still later. In a cabinet, the *Grecian* coins claim the chief place, not only on account of their antiquity but also for their workmanship, the finest examples being those which were struck before the subjection of Greece to the Roman empire. The Roman coins are divided into two classes,—the consular and the imperial. The latter term is specifically applied to those struck after the conclusion of the republican era of Rome down to the fall of the Roman empire. Caius Julius Cæsar was the first Roman who gained permission to put his figure upon medals. The coins of the Middle Ages embrace the *bracteates*, &c., which, after the dissolution of the Roman empire, were circulated in the newly-formed





European states. As a science, numismatics appears to have been entirely unknown to the ancients. The first treatise on the subject was published by a Spaniard, Antonio Agostino, in 1577. As the researches into the different branches of the subject became more extensive, more attention was paid to this matter, and the works of Vaillant, Spanheim, J. J. Gessner, and Pellerin, display immense stores of learning, and are worthy of perusal, although they are not altogether to be relied on. Some of the great public collections of coins in Europe at the present day are of great value. The private collection of the late Lord Northwick's Greek and Roman coins when sold realized £9,138; that of the duke of Devonshire £6,945.

NUNC DIMITTIS, *nunk dim-it'-tis* (Lat., now dismiss thou depart), is the name of one of the hymns appointed to be sung after the second lesson at evening service. It is the song of Simeon, and is so called from the two first words with which it commences in Latin. Thrice employed as a hymn at a very early period.

NUNCIO, *nun'-she-o* (Lat. *nuntius*), properly signifies one who bears news, a messenger; but is usually applied to a person sent by the pope to represent the holiness at a foreign court. A nuncio is, in fact, the pope's ambassador, as an internuncio is his envoy-extraordinary. Strictly speaking, he represents the pope only as a temporal sovereign; but he is often commissioned to treat of spiritual affairs, and to report on the condition of churches and the character of church dignitaries, especially of candidates for the mitre. The nuncio in France is forbidden by law to exercise ecclesiastical jurisdiction, being recognised only as the papal ambassador.

NUNNERY. (*See* NUNS, MONACHISM.)

NUNS, *nunz* (Sax. *nunne*, a nun), those women who devote themselves, in a cloister or nunnery, to a religious life. The name is said by Hospinian to be an Egyptian term, signifying a virgin; and at a very early period in the Church there were women who made public profession of virginity, and were enrolled in the canon or matricula of the Church, but they did not dwell in religious houses. They do not seem to have been absolutely forbidden to marry; but as celibacy and the monastic life rose in the esteem of the Church, the censures against marriage became more stringent. The virgins were of great esteem in the Church, and had some particular honours paid to them. Their persons were sacred, and severe laws were enacted against any that should presume to offer the least violence to them. The consecration was usually performed publicly in the church by the bishop. The virgin made a public profession of her resolution, and then the bishop put upon her the accustomed habit, part of which was a veil, called the *sacrum velamen;* hence the modern phrase, "to take the veil." They seem also to have worn a kind of mitre or coronet, and in some places the head was shaved, a practice condemned by the council of Gangra. Certain canons required virgins to be forty years old before they were veiled; and the imperial laws decreed that if any virgin were veiled before that age, either by the violence or hatred of her parents, she was at liberty to marry. The first nunnery is said to have been founded by one St. Syncletica, a contemporary of St. Anthony, in the 3rd century, and they soon spread throughout Europe. (*See* MONACHISM.) There are various orders of nuns, some devoting themselves entirely to private religious exercises, while others engage in the more active duties of Christian charity. In the Romish church, when a young woman is to be professed, or made a nun, the habit, veil, and ring of the candidate are carried to the altar, and she herself, accompanied by her nearest relatives, is conducted by the bishop. Two ancient venerable matrons attend upon her as bridesmaids. When the bishop has said mass, the arch-priest chants an anthem, the subject of which is that she ought to have her lamp lighted, because the bridegroom is coming to meet her. Then the bishop calls her in a kind of recitative, to which she answers in the same manner. Being come before the prelate, and on her knees, she attends to the exhortation he makes to her with regard to a religious life, and in the meantime the choir chants the litanies. Then the bishop, having his crosier in his left hand, pronounces the benediction. She then rises up, and the bishop consecrates the new

habit, sprinkling it with holy water. When the candidate has put on her religious habit, she again presents herself before the Bishop, and sings on her knees *Ancilla Christi sum, &c.* (I am the servant of Christ). Then she receives the veil, and afterwards the ring, by which she is married to Jesus Christ; and, lastly, the crown of virginity. When she is crowned, an anathema is denounced against all who shall attempt to break her vows. After the communion, the prelate gives her up to the conduct of the abbess, saying to her, "Take care to preserve pure and spotless this young woman, whom God has consecrated, &c."

NURSERY, *nur'-se-re*, a large garden, in which trees and shrubs are reared for commercial purposes. Mr. Loudon, in his "Encyclopædia of Gardening," remarks that there are a number of nursery gardens in England for forming new gardens and plantations, and repairing or increasing the stock of old ones, in which a considerable amount of capital is embarked. They have increased considerably with the spirit, which has gained rapid ground, for the prosecution of gardening. The principal nurseries are near London, but there are many in suburban districts and in the country. (*See* also articles on GARDENING, &c. &c.)

NUT, in Bot. (*See* GLANS.)

NUTMEG. (*See* MYRISTICA.)

NUTRITION, *nu-trish'-un* (from Lat. *nutrio*, I nourish), in Phys., is that complicated process by which a perpetual course of reproduction is going on in every part of the system,—the component particles of the various tissues,—bone, muscle, nerve, &c., which are disintegrated and removed by the vital acts of the organism, being constantly replaced by new matter capable of continuing the functions necessary to life. In order to this, a due supply of proper food is necessary, which, after being digested, its nutritious particles are absorbed, converted into healthy blood, and circulated over the system. The effete matter is removed by the organs of excretion, or modified by the purifying action of the lungs. Of the modes in which the substitution of new tissue takes place, and in which the effete particles are removed in the interior of the system, our knowledge is as yet very imperfect. Each tissue seems to possess an elective affinity for certain constituents of the blood, which it appropriates to its own use in the process of conversion into organized material. (*See* PHYSIOLOGY, DIGESTION, BLOOD, &c.)

NUX-VOMICA. (*See* STRYCHNOS.)

NYCTAGINACEÆ, *nik-täj-e-nai'-se-e*, in Bot., the Marvel of Peru fam., a nat. ord. of *Dicotyledones*, sub-class *Monochlamydeæ*. Herbs, shrubs, or trees, with stems usually tumid at the joints. Leaves generally opposite. Flowers with an involucre. Calyx tubular or funnel-shaped, often coloured, plaited in æstivation, contracted towards the middle, its base persistent, becoming indurated and forming a spurious pericarp. Stamens 1 or many, hypogynous. Ovary superior, 1-celled, with a single ovule; style 1; stigma 1. Fruit an utricle inclosed by the hardened persistent base of the calyx. Seed solitary; embryo coiled round mealy albumen with foliaceous cotyledons and inferior radicle. There are 17 genera and about 100 species, natives exclusively of warm regions. Some are cultivated as garden flowers. (*See* MIRABILIS.)

NYCTALOPIA, *nik-tă-lo'-pe-ă* (from Gr. *nux*, night; *ops*, vision), is the faculty of seeing best at night. A person suffering from this defect of vision sees little or nothing during the day, but in evening and night has his vision tolerably unobscured. It is the total opposite of night-blindness. (*See* NIGHT-BLINDNESS.)

NYCTANTHES, *nik-tăn'-theez* (Gr. *nux*, night; *anthos*, flower), in Bot., a gen. of the nat. ord. *Jasminaceæ*, remarkable for the flowers expanding and smelling only in the night. *N. arbor tristis* is often grown in English hothouses; in India its flowers are used for dyeing yellow.

NYLGHAU, *nil-gaw*, or white-footed antelope, *Antilope picta*, is found in Northern India and the borders of Persia, where it frequents the vast jungles which cover those regions, and it is one of the largest and finest antelopes there. It is dark grey, that colour being composed of thin coats of hair,—black, brownish, and white. The horns are seven or eight inches long, and are curved forwards. The legs, which, like the head, are darker in colour than the body, are commonly marked by a transverse white mark in front, and by a second patch opposite the accessory hoofs on the inner side. The females are of a fawn-colour, are less in size than the males, and are deprived of horns. The nylghau is hunted in the usual manner in which game is taken in the East, by surrounding them in fences, or with nets, and killing them at pleasure.—*Ref.* Sir William Jardine in the *Naturalist's Library*.

NYMPHÆACEÆ, *nim-fe-ai'-se-e*, in Bot., the Water-lily fam., a nat. ord. of *Dicotyledones*, sub-class *Thalamifloræ*, having the following essential characters:—Aquatic herbs with floating leaves. Thalamus large, forming a disk-like expansion more or less surrounding the ovary. Carpels united so as to form a compound many-celled pistil; stigmas radiating on the top and alternate with the dissepiments; ovules numerous, attached all over the dissepiments. Embryo minute, on the outside of farinaceous albumen, inclosed in a vitellus. The plants of this order are chiefly found in quiet waters, throughout the whole of the northern hemisphere; they are, generally speaking, rare in the southern hemisphere. They have bitter and astringent properties. Many contain a large quantity of starch, both in their rhizomes and seeds; hence these parts are often employed as food. They are remarkable for their large showy flowers. (*See* VICTORIA.)

NYSSA. (*See* ALANGIACEÆ.)

## O.

O, the fourth vowel and the fifteenth letter in the English alphabet. It is pronounced by pointing the lips and forming an opening resembling the letter itself. In proportion as the lips are less pointed, yet remain projected, the sound merges into that of *u*; hence in various dialects the letter *o* passes over into *u*. In the English language an *o* is often written where the sound of *u* is heard; as *one, dove, come, some*, &c. There are no less than four sounds designated in the English language by the letter *o*: these are exemplified in the words *go, prove, once, not*. Amongst the French, the sound of *o* (as pronounced in *go*) is indicated by various signs. The Germans have a long and a short *o*; and the Italians a close and an open *o*. Amongst the Greeks there were two different signs for the long and the short *o*: the *o* (*omicron*, or short *o*), and *ω* (*omega*, or long *o*). The use of the vowel *o* is next to that of *a*; it is employed to express admiration, pity, imploring, warning, &c. In Latin inscriptions, O signifies *optimus*; as D.O.M., —Deo Optimo Maximo. O, with an apostrophe after it, signifies *son* in Irish; as O'Connell, *the son of Connell*. As a numeral, O signified 70 among the Greeks: in middle Latin it signified 11; and with a dash over it, 11,000. For the numerous interchanges of which the letter *o* is susceptible, the reader is referred to an article on the subject in the "English Cyclopædia."

OAK. (*See* QUERCUS.)

OAK-APPLE, *oke'-ăp-pl*, a spongy excrescence found upon the twigs of the *Quercus pedunculata*. It is formed by the puncture of a cynips, and rises rapidly, being usually spheroidal in form, and about one to two inches in diameter. The oak-apple must not be confounded with those beautiful little excrescences so common on the underside of the leaves of the oak, and known by the names of *galls* and *spangles*. They are also produced by the puncture of different species of cynips. The oak-apple has some resemblance to the *bedequar* of the eglantine, but is not so rough and fibrous on the surface. Oak-apples are very astringent, containing tannic acid, and are used both for making ink and for dyeing and staining.

OAKUM, *oak'-um* (Sax. *acumbe*).—When the various ropes employed in a ship are worn out and no longer fit for service, they are untwisted and pulled to shreds, and in this state are called *oakum*; its chief use is for stopping or caulking the seams or crevices in a ship's sides or deck, and for stopping leaks. The work of oakum-picking is employed as a punishment in many of our prisons.

OAR, *oar* (Sax. *ar*), a mechanical agent, formed of a

long thin piece of timber, by which boats, barges, &c., are propelled through the water in conjunction with manual labour. An oar consists of three parts,—the *blade*, which is the smooth part dipped in the water; secondly, the *shoulder*, which marks the termination of the blade; and, lastly, the *handle*, which is held in the grasp of the oarsman. The fulcrum, on which the leverage of the oar is exerted, is called the *rowlock* (pronounced *rullock*), and this is inclosed by two pins of timber, termed *thole-pins*, or by brass round-shaped tholes, termed *crutches*. To *ship* and *unship* oars are respectively to fix or unfix them from the rowlocks. To *feather an oar* is, at the end of a stroke, in rowing, to bring the blade horizontal with the water by a turn of the wrist, so as to allow it to shake off its grasp of the water.

OATH, *oath* (Goth. *aith*, Sax. *ath*), is a solemn act by which one calls God to witness the truth of an affirmation or the sincerity of a promise, and imprecates divine vengeance if he be guilty of a falsehood or violate his promise. Perhaps there scarcely exists a nation among whom some form of an oath does not prevail, and men have always agreed in reposing singular confidence in such declarations. The Jews, Greeks, and Romans, made a distinction between greater and lesser oaths. When the Jew took his most solemn oath, he laid his hand on the book of the law and swore by the God of Israel, by him who is merciful and gracious; but the ordinary oaths were by heaven, the altar, the temple, or Jerusalem. The ancient Scandinavians and Germans swore by their gods, and it was usual, while repeating the oath, to lay the hand on some special object; thus, the Scandinavian touched a bloody ring held by the priest; the German swore by his sword or his beard. In early Christian times oaths were administered in chapels and other holy places, at the altars, which occasionally were rendered more sacred by placing upon them holy relics. William the Conqueror, when he made his prisoner Harold swear to aid him in ascending the throne of England, secretly conveyed under the altar on which Harold had agreed to swear, the relics of some of the most revered martyrs; and when Harold had taken the oath, he showed him the relics, and admonished him to observe religiously an engagement which had been ratified by so awful a sanction. The pope is believed by the Catholics to have authority to absolve from the obligation of an oath,—an attribute which gave him a fearful power in the middle ages. Oaths to perform illegal acts do not bind, nor do they excuse the performance of the act. In civil law, oaths are divided into two classes,—(1) assertory or affirmative oaths (*juramenta assertoria*), establishing the certainty of a present or past event; and (2) promissory oaths (*juramenta promissoria*), which refer to a future event, a promise to execute some contract or undertaking. The breach of a promissory oath, whether public or private, is not punishable as perjury. The laws of all civilized countries require the security of an oath for evidence given in a court of justice, and on other occasions of high importance. The acts 7 & 8 Will. III. c. 34, and 9 Geo. IV. c. 32, allowed Quakers and Moravians to give evidence upon their solemn affirmation; and by 3 & 4 Will. IV. c. 82, the like provisions were extended to Separatists. By 17 & 18 Vict. c. 125, any person called as a witness, or required or desiring to make an affidavit or deposition, who shall refuse or be unwilling from conscientious motives to be sworn, may obtain from the court (on its being satisfied of the sincerity of the objection) permission to make a solemn affirmation or declaration instead. Witnesses are allowed to swear in that particular form which they consider binding on their conscience; thus, Jews are sworn on the Pentateuch, Mohammedans on the Koran, &c.

OATH, CORONATION. (*See* CORONATION OATH.)

OBADIAH, BOOK OF, *o-bā-di'-ah*, is one of the minor prophets, and the shortest book of the Old Testament, consisting only of twenty-one verses. Respecting the life and circumstances of the author nothing is certainly known; but in all probability the prophecy was delivered between the taking of Jerusalem by the Chaldeans (B.C. 588) and the destruction of Idumea, which took place a few years later; consequently, he was partly contemporary with Jeremiah. The almost verbal agreement between the first eight verses of this book and a portion of Jeremiah's prophecy (ch. xlix.) has led to the opinion that the former had been borrowed from the latter; but the more probable view (from a comparison of the two passages) seems to be that Jeremiah is indebted to Obadiah. Ewald is of opinion that both writers copied from some earlier prophet. The subjects of the prophecy are the judgments to be inflicted upon the Idumeans on account of their wanton and cruel conduct towards the Jews at the time of the Chaldean invasion; and the restoration of the latter from captivity. The book may thus fitly be divided into two parts; the first containing a reprehension of the pride, self-confidence, and unfeeling cruelty of the Idumeans, and definite predictions of their destruction (1—16); the latter promising that the Jews shall not only be restored to their own land, but possess the territories of the surrounding nations, especially that of Idumea (17—21). The book is characterised by animation, regularity, and perspicuity.

OBELISK, *ob'-e-lisk* (Lat. *obeliscus*), in Arch., a quadrangular pyramid, very slender and very high, erected as a monument in some public place, or to show some stone of extraordinary size. Obelisks are frequently covered with inscriptions of hieroglyphics. Amongst the Egyptians, obelisks were called by the priests *the sun's fingers*, because they served as indexes to mark the hours on the ground. The Arabs call them *Pharaoh's Needles*, and the English, *Cleopatra's Needles*.

OBELUS, OBOLUS, *ob'-e-lus*, *ob'-o-los* (Gr. *obelos*, a spit). —Originally, obelus and obolus were but the same word differently pronounced; but in the course of time *obelus* came to mean, in the language of the ancient grammarians, a little line or stroke, like a needle, by which a spurious word or passage was noted in a manuscript; whilst *obolus* continued to mean a small Grecian coin, so named either because it bore an impression similar to a spit, as some think, or because it was in the form of one; those, however, now in the cabinets of antiquaries are round. The obolus, which was coined in silver, brass, and copper, is generally supposed to have been worth about 1½*d.*; but there is reason to suppose that its value varied at different periods.

OBESITY. (*See* CORPULENCE.)

OBIT, *o'-bit* (Lat., a corruption of *obiit*, he died), is a funeral solemnity or office for the dead, most commonly performed when the corpse lies uninterred in the church; and also on the anniversary of the death of a benefactor. Thus, in many of our colleges, the anniversary of the death of the founder is piously observed. In religious houses they had a register wherein they entered the obits or obitual days of their founders or benefactors, which was thence termed the obituary.

OBJECT and SUBJECT, OBJECTIVE and SUBJECTIVE, *ob'-ject*, *sub'-ject* (Lat. *objectum*, *subjectus*), are two sets of correlative terms much used in philosophy, and not always free from ambiguity. In philosophy there is a grand philosophical distinction, lying at the root of all knowledge, between that which knows (the subject) and that which is known (the object). The former is what is known among philosophers as the *Ego*, or conscious mind; the latter, as the *Non Ego*, or that which is known, with its modes and properties. But this distinction, though at first sight so clear, is not without its ambiguities; for we may find in the mind itself both the object and subject of thought. The feelings and emotions of the mind itself may become as it were objectified and contemplated by the *ego*. Hence Sir William Hamilton proposes that "when we wish to be precise, or when any ambiguity is to be dreaded, we should employ on the one hand either the terms *subject-object* or *subjective-object* (and this we could again distinguish as absolute or as relative); on the other, either *object-object*, or *objective-object*." The terms subject and object were, for a long period, not sufficiently discriminated from each other. Even among the philosophical Greeks, the terms *hupokeimenon* and *antikeimenon* were used ambiguously, the former being used by Aristotle to signify both the subject proper (*id in quo*) and the object proper (*id circa quod*); while the latter he uses in the plural to signify in general the various kinds of opposites. The Latins translated them *subjectum* and *objectum*. It is to the schoolmen of the Middle Ages that we are indebted for drawing a defi-

clear distinction between them; but they gave them significations nearly the reverse of those which they now bear. Thus *subjective* denoted a thing considered as inhering in its subject, whether that subject were mind or matter, as contradistinguished from a thing considered as present to the mind only as an accidental object of thought. Thus the faculty of imagination and its acts were said to have a subjective existence in the mind, while its several images or representations had, as images or objects of consciousness only, an objective. Again, a material thing, as a horse, existed objectively in the mind, and subjectively out of the mind. Even in the present day, in common language, a confusion between the two terms exists. Thus the word subject is used for that which is the object of thought or of discourse, the *materia circa quam* to which the term object ought to be exclusively applied. But a still more intolerable abuse has crept in, and the term object is, in French and English, vulgarly employed for end, motive, final cause.

**Objective Case**, *ob-jek'-tiv*, the case in which the object of an action is put, that is to say, that on arriving at which the action of a verb or preposition is complete and exhausted, is called in English the *objective*. It generally answers to the Latin accusative; but is also of much more extensive application. Thus, in other languages, the cases of nouns governed by prepositions are variously named the *genitive*, *dative*, *accusative*, and *ablative*, and serve to express, accordingly, different relations and shades of meaning, while in English these are represented, if at all, by the preposition alone, and the case of the noun, as expressing simply the bare relation of an object acted upon to a subject or agent, from which the action takes its rise, is invariably the *objective*. Some grammarians, however, still employ the term *dative*, in relation, for example, to the use of the noun of the person (him, me, &c.), without a preposition, after verbs of giving, telling, &c. Now it is certainly correct, historically, to trace such constructions as *give me that; me, miserable! methinks*, to a special Anglo-Saxon case; but the borrowing of the phraseology of classical grammars often leads to confusion, as modern English acknowledges practically no other cases than the nominative, possessive, and objective.

**Oblations**, *ob-lai'-shuns* (Lat. *oblationes*), are offerings to God and the Church, whether in lands or goods. Oblations were at first voluntary, and were given to maintain the church and those who served at the altar; but they afterwards, by continual payment, became due by custom, and at the great festivals every one was obliged to offer something, not only as convenient but as a duty. There were various kinds of oblations; as those which were given at the altar, which were given by the last wills and testaments of persons dying, given at funerals, &c.

**Obligation**, *ob-le-gai'-shun* (Lat. *obligo*, I bind), in Law, is a bond containing a penalty with a condition annexed for payment of money, the performance of a covenant, or the like. It differs from a bill, which is generally without a penalty or condition, though a bill may be made obligatory.

**Obligato**, *ob-le-ga'-to* (Ital.), a term applied in Mus. to all voices or instruments which are indispensable to the just performance of a piece. An instrument is sometimes *obligato* throughout a piece, in which case it would be called a *concerto* for that instrument; but when an instrument is only *obligato* in certain parts, these parts are termed *obligato* or *solo* passages. In its more general acceptation, the word *obligato* refers to those auxiliary *parts* or accompaniments which cannot properly be omitted.

**Oboe.** (*See* Hautboy.)

**Obscene Books, &c.**, *ob'-seen* (Lat. *obscænus*).—The exposing for public sale or view of any obscene book, print, picture, or other indecent exhibition, is, by 14 & 15 Vict. c. 100, punishable with fine or imprisonment, or both, with hard labour, at the discretion of the court; and by 20 & 21 Vict. c. 83, any two justices, on complaint made on oath of the complainant's belief that any obscene books, papers, writings, prints, pictures, drawings, or other representations, are kept in any place within the limits of their jurisdiction for the purpose of being sold, distributed, exhibited, lent for hire, or otherwise published for gain, may issue a special warrant, authorising the entry in the daytime, by force if necessary, of the police of the place in question, and the seizure and destruction of the articles stated, if the owner do not, to their satisfaction, show cause to the contrary.

**Observants**, *ob-zer'-vants*, in Eccl. Hist., were a branch of the Franciscan friars, who, after the departure of the order from the strictness of its first rule, resolved to go back to its original acceptation; while the other party, who were called the Conventuals, preferred adhering to the relaxed regulations. (*See* Franciscans.)

**Observation**, *ob-zer-vai'-shun* (Lat. *observatio*), is the greatest instrument of discovery in mind and matter. It is usual to distinguish between observation and experiment,—the former as having for its object facts which are presented to us by nature without our interference, the latter, facts furnished by artificial contrivances. Thus, astronomy, geology, natural history, &c., are said to be sciences of observation; mechanics, optics, chemistry, &c., sciences of experiment. But in the one case, as in the other, we have observation; for every experiment is made with the view of observing the result. According to M. Comte, there are three modes of observation,—(1), Observation, properly so called, or the direct examination of a phenomenon as it presents itself naturally; (2), Experiment, or the contemplation of a phenomenon more or less modified by artificial circumstances, introduced intentionally with a view to its more complete investigation; (3), Comparison, or the successive consideration of a series of analogous cases in which a phenomenon becomes more and more simple. All men are apt to notice likenesses in the facts that come before them, and to group similar facts together, the faculty by which such similarities are apprehended being called observation. Observation is liable to various kinds of errors, which may arise either from imperfection of our perceptions or of the instruments which we use, or from hasty or otherwise incorrect conclusions. The errors hence arising have been divided into three classes, which may be mixed up or mistaken for one another, and which are termed *fixed*, *personal*, and *casual*. A fixed error is one which is inherent in the instrument or method employed, so that it always must exist, and, all other things remaining the same, have a given magnitude: the only mode of avoiding fixed errors is by making observations under different circumstances, so that the measurements which are too large in one set of results may be as much too small in another. By a personal error is meant one of the same character as a fixed error, but arising from the temperament or habits of the observer, and not from the instrument. Two individuals observing the same phenomenon with the same species of instruments may yet differ sensibly from each other, not once or twice, but nearly always. By casual errors, or errors properly so called, are meant those which are absolutely inexplicable, or of which the cause and tendency are equally unknown: they are equally likely to be too great or too small; so that in a number of observations the results which are too great will be compensated by those which are too small. It is not the case, however, that the greater the number of observations, the less, in the same proportion, is the probable error of the average; for the probable error diminishes only as the square root of the number of observations increases. —Ref. *English Cyclopædia*,—Arts and Sciences.

**Observatory**, *ob-zer'-vai-to-re* (Fr. *observatoire*), a place or building constructed and fitted up with the proper instruments and conveniences for making astronomical observations. Observatories are generally built in the form of a tower, from which there is an unobstructed view of the heavens, and in which the instruments are protected from disturbing influences. For example, there are large astronomical telescopes always placed in the direction of the meridian, and the internal arrangement of the edifice is such as to facilitate astronomical observations. The roof of the observatory is also flat, to favour the view towards the horizon. The principal instruments used in an observatory are quadrants, sextants, and octants; transit, equatorial, parallactic, and circular instruments; achromatic and reflecting telescopes, night and day telescopes, chronometers, &c.; which will be found

described in their respective places. Concerning the institutions established in ancient times for the observation of the heavenly bodies, our information is very scanty. According to Diodorus, the Chaldean astronomers made their observations in the temple of Belus at Babylon. The observatory at Alexandria, however, is the only famous instance in the history of Greek astronomy. It was there that the first observations were made upon which astronomy was definitely founded as a science. With the revival of letters, it was soon found in modern Europe that observatories were necessary to the progress of astronomy. Tycho Brahé, towards the close of the 16th century, erected an observatory under the auspices of Frederick III., king of Denmark. This observatory is famous in the annals of astronomy as having furnished the facts which enabled Kepler to establish his true theory of the elliptical motion of the planets. From that time the Danish monarchs patronized the science of astronomy; and in 1656 the celebrated observatory of Copenhagen was completed, and intrusted to the charge of Longomontanus, the pupil of Tycho Brahé. Towards the close of the 17th century, the advance of practical astronomy was furthered by the invention of the micrometer, and the application of telescopic sights to the observation of the celestial bodies. During this period the observatories of Greenwich and Paris were erected. The Royal Observatory of Greenwich was founded in 1675; Flamsteed being appointed by Charles II. "our astronomical observator," at a salary of £100 a year. The celebrated Edmund Halley was the second director of the Greenwich observatory. His labours were principally confined to observations of the moon. The next astronomer royal was Bradley, who is universally regarded as one of the greatest observers of ancient or modern times. It was from observations made by him that the great discovery of the nutation of the earth's axis was arrived at. The successor of Bradley was Dr. Bliss, who was succeeded by Pond in 1811. Pond retired from office in 1835, and was succeeded by Mr. Airy, who still continues to hold the office of astronomer royal. There are several other public observatories in this country; the principal being those of Cambridge, Oxford, Portsmouth, Durham, Liverpool, Edinburgh, Glasgow, Dublin, and Armagh. Of private observatories there are also a large number; one of the best known of which is that of the earl of Rosse, at Birr Castle, Ireland. The Royal Observatory of Paris was completed in 1671. Its present director is M. Leverrier, one of the independent discoverers of the planet Neptune. The public observatories in Germany are very numerous; that of Gotha had acquired celebrity through Zach, and that of Konigsberg through Bessel. Institutions of a similar kind have been established at Amsterdam, Berlin, Bologna, Brussels, Cape Town, Florence, Genoa, Gottingen, Hamburg, Leipsic, Leyden, Lisbon, Milan, Marseilles, Moscow, Munich, Naples, St. Petersburg, Rome, Stockholm, Vienna, and other places. Great progress has been made in astronomy during the last half-century in the North American States, and several flourishing observatories have been established. The most celebrated of these are the National Observatory at Washington, and the observatory of Harvard College, Cambridge, Massachusetts. Towards the end of the 17th century an observatory was erected in China by the Jesuits, and another has been built at Paramatta, in New South Wales. The principal public observatories, with their latitudes and longitudes (in time), will be found in the *Nautical Almanac*.

OBSIDIAN, *ob-sid'-e-an* (said to be named after Obsidius, a person who first found it in Ethiopia), a vitreous lava, produced in large quantities during volcanic eruptions by the melting of pumice-stone. It is a true glass, closely resembling furnace slag, and consists of silicate of alumina, with varying percentages of soda, potash, lime, and oxide of iron. It is generally black or dark grey, with occasional crystals of felspar dispersed through its mass. It occurs in streams or detached masses near volcanoes, and is used by savage nations for making mirrors, axes, knives, &c. It often graduates into pumice-stone.

OBTAINING MONEY UNDER FALSE PRETENCES, OBTAINING MONEY UNDER.) (*See* FALSE PRETENCES,

OCCIPUT. (*See* BRAIN, ANATOMY.)

OCCULTATION, *ok-kul-tay'-shun* (Lat. *occulto*, I conceal), a term applied in Astron. to the phenomenon which occurs when a star or planet becomes hidden from view by the interposition of the moon or another planet between it and us. Thus, a total eclipse of the sun might be called an occultation of the sun by the moon. The term occultation, however, is generally applied to the eclipse of a fixed star by the moon. When the moon begins to encroach on the sun's limb, or any other body to be eclipsed, the time is called the instant of *immersion*; and the instant when the last portion of our satellite ceases to be projected on the eclipsed body is called the instant of *emersion*.

OCCUPANCY, *ok'-ku-pan-se* (fr. Lat. *occupo*, I occupy), in Law, is the taking possession of things which before did not belong to anybody. According to the law of nature, that which has no particular owner belongs to him who takes possession of it, that is, to the occupant. Thus, where a man finds a piece of land which no other person possesses or has a title to, and enters upon the same, he gains a title by occupancy. But this mode of gaining property of lands has long since passed away in England, and such lands belong to the Crown, and not to him who first enters. There was only one case in which the right of occupancy could be said to have existed by the laws of England, and this was virtually abolished by 1 Vict. c. 26. It was where a person was tenant *pur autre vie*, or had an estate granted to himself only (without mentioning his heirs) for the life of another man, and died without alienation during the life of *cestui que vie*, or him by whose life it was holden; in this case he that could first enter on the land might lawfully retain the possession, so long as *cestui que vie* lived, by right of occupancy. But, by 1 Vict. c. 26, it is enacted, that an estate *pur autre vie*, of whatever tenure, and whether it be an incorporeal or corporeal hereditament, may in all cases be devised by last will and testament; and that if no disposition by will be made of an estate *pur autre vie* of a freehold nature, it shall be chargeable in the hands of the heir, if it come to him by reason of special occupancy, as assets by descent (as in the case of freehold land in fee simple); and should there be no special occupant of any estate *pur autre vie*, it shall go to the executor or administrator of the party that had the estate by virtue of the grant; and in every case where it comes to the hands of such personal representative, shall be assets in his hands, to be applied and distributed in the same manner as personal estate. As regards goods and chattels, where such things are found without any other owner, they for the most part belong to the king by virtue of his prerogative, except in some few cases, wherein the original and natural right of occupancy is still permitted to subsist. Thus, whatever movables are found upon the surface of the earth, or in the sea, and are unclaimed by any owner, are supposed to be abandoned by the last proprietor, and belong, as in a state of nature, to the first occupier or finder, unless they fall within the description of waifs, or estrays, or wreck, or hidden treasure; for these are vested by law in the king, and form a part of the ordinary revenue of the Crown. But the finder is bound to restore the property found to the owner if possible; and if he keeps it when the owner may be reasonably ascertained, he will be guilty of larceny. The goods belonging to an alien enemy are the property of him that seizes them.

OCEAN, or SEA, *o'-she-an* (Fr. *océan*, Lat. *oceanus*), the general name given to the whole volume of water which occupies the lower part of the surface of the world and surrounds the mainland on all sides. The surface of the earth is made up of 148,630,000 geographical square miles, and of these the ocean occupies 109,696,000 geographical square miles, thus covering more than two-thirds of the whole area of the mainland. The bulk of dry land on the surface of the globe is found surrounding the north pole; whilst by far the largest extent of waters is found in the southern hemisphere. In geography, the ocean is comprehended in five principal divisions,—the Arctic Ocean, surrounding the north pole; the Antarctic Ocean, surrounding the south pole; the Atlantic Ocean, between Europe and America, and the Arctic and Antarctic oceans; the Pacific Ocean between America and Asia; and the

Indian Ocean, lying to the south of Asia, and extending between Australia and the Cape of Good Hope. From these larger divisions there branch off a great variety of smaller seas, which receive the name of bays, gulfs, and seas, or when they are of smaller extent, of friths, fiords, creeks, roadsteads, and harbours. The mean depth of the ocean cannot be stated with any certainty. In many of the soundings which have been taken far from land, 30, 40, and even 50,000 feet of line have been run out and yet have failed to give distinct evidence of a bottom having been reached. Four miles is generally regarded as the mean depth. The ocean consists entirely of salt-water. For ages it has been continually receiving the drainage of the land, besides having washed over the disintegrated materials of successive continents; it consequently holds in solution all the saline substances capable of being dissolved in cold water. By far the larger proportion of these, however, consists of common salt (chloride of sodium), the chlorides and sulphates of magnesia and lime being next in regard to quantity. In minute, but still appreciable quantities, also occur various salts of potash and ammonia, the iodide and bromide of sodium, carbonate of lime, silica, and a great number of other substances. The sulphate and carbonate of lime and the silica, although the per-centage of the two latter is small, are of great importance in the economy of animated nature, as they furnish the materials out of which the shells of the molluscs, the structures of the coral and other insects, and the shells and carapaces of the silicious infusoria, &c., are derived. Besides these saline and earthy ingredients, sea-water holds in solution metallic salts in extremely minute quantities. It has been calculated that at least two million tons of silver are held in solution in the whole ocean. The whole of the saline matter contained is between three and four per cent.; and the specific gravity of the water varies, according to the proportion of the saline ingredients, from about 1,026 to 1,030, pure water being supposed to be 1,000. Dr. Marcet, in 1819, made a series of experiments on this subject, and the general conclusions which he drew from them were as follows:—1. That the Southern Ocean contains more salt than the Northern Ocean in the ratio of 1·02919 to 1·02757.—2. That the mean specific gravity of sea-water near the equator is 1·02777, or intermediate between that of the northern and that of the southern hemispheres.—3. That there is no notable difference in sea-water under different meridians.—4. That there is no satisfactory evidence that the sea, at great depths, is more salt than at the surface.—5. That the sea in general contains more salt where it is deepest and most remote from land; and that its saltness is always diminished in the vicinity of large masses of ice.—6. That small inland seas, though communicating with the ocean, are less salt than the ocean.—7. That the Mediterranean contains rather larger proportions of salt than the ocean.—(*Philos. Trans.* 1819.) The saline contents of the ocean are of immense importance in the economy of nature. In fact, so great is their importance, that it is doubtful whether the present order of things could be maintained without them. By their beneficial action the freezing-point of water is lowered, and the tendency to give off vapour diminished. They also communicate a greater buoyancy to water, by which means the waters of the ocean are better fitted for the purposes of navigation. There is also reason to believe that the presence of these saline bodies in solution contributes in no small degree to the stability of sea-water, and that an ocean of fresh water would rapidly undergo changes which would probably render it incompatible with animal life. At the mouths of great rivers the ocean is often superficially freshened to a considerable distance from the shore. This is the case with the Amazon river to such an extent, that fresh water can be taken up from the sea surface when out of sight of land, and the sea itself is rendered sensibly less saline at a distance of two or three hundred miles from its mouth. In the polar seas there are also extensive regions where large accumulations of fresh water from snow or glaciers melting in summer, render the surface water comparatively fresh. The sea is only purely blue in the open ocean, or in very deep water out of the fouling influence of rivers, the washing away of coasts, or such currents as carry mud or impurities along with them. When perfectly clear, a white object, such as a plate, thrown overboard, is seen to become bluer and bluer as it sinks. The blue colour of water, like the blue colour of the sky, has not yet been scientifically explained. The phosphorescence of the ocean—a phenomenon regarded by all with wonder and admiration—prevails largely through the whole extent of the tropical seas, and proceeds from a great variety of minute organisms. They mostly shine when excited by a blow, or when a fish darts along, or an oar dips in the water. Between the tropics, the temperature of the ocean diminishes with the depth; in the polar seas, on the contrary, the temperature increases with the depth. In the temperate seas comprised between 30° and 70° of latitude, the temperature of the water gradually increases, until about the latitude of 70°, where the temperature, as compared with the latitude, begins to rise. Hence, about the latitude of 70°, there exists a zone at which the mean temperature of the ocean is very nearly constant at all depths. As we before stated, the saline matter in solution influences the freezing-point of sea-water. This fact is of great importance in the economy of nature. In its natural state, sea-water freezes at about 28° or 29°; but when it has become concentrated by previous freezing, the congealing point is reduced to 15° or 16°, while water saturated with salt does not freeze at a temperature above 5°. One of the most interesting phenomena connected with the ocean is that presented in the daily ebb and flow of the tide. If it were not for the disturbing influences of the sun and moon, and of the winds, the surface of the ocean would be level, and would assume the form determined by the attraction of the whole mass of the earth, combined with the centrifugal force belonging to its velocity of rotation. This uniformity, however, cannot be established, on account of the tide, which is at different heights in different parts of the ocean at every instant. (*See* TIDES.) Wind-waves are small at their first origin, beginning with a mere ripple; but each, as it advances, acquires increased height by the continued pressure of the wind. The largest waves known are those off the Cape of Good Hope, under the influence of a north-west gale,—the storm-wind of that region, which drifts the swell round the cape, after passing obliquely over the surface of the South Atlantic Ocean. Waves forty feet in height are there met with in such gales; so that two ships in the trough of the sea, with such a wave between them, lose sight of one another from the decks. Waves of thirty-two feet from the trough to the crest have also been observed off Cape Horn. The waves in our own seas rarely exceed eight or ten feet in height. Besides tides and waves, there are other movements in the ocean which are of great importance; namely, the currents. The most remarkable and well-defined oceanic current is the equatorial. The trade-winds, which are analogous currents in the air, have a twofold cause,—the high temperature of the tropics and the revolution of the earth. This great current of water is due to the latter cause, and in part to the impulse of the trade winds, which blow in the direction which it pursues for a large part of its course,—namely, from east to west. This current is very evident, both in the Atlantic and Pacific oceans, between the parallels of 30° on each side of the equator, pursuing an average velocity of from nine to ten miles a day. It is connected with another series of currents, the direction of which is from the poles to the equator. The equatorial current, flowing from east to west, strikes against the vast continent of America, and then branches off into two great divisions. Of these, one flows down the east coast of South America, and, almost describing a circle, passes round the Cape of Good Hope into the hurricane region of the Indian Ocean. The other turns northward, enters the Gulf of Mexico, sweeps round the coast in a powerful current,—now known as the *Gulf Stream*,—as rapid and well-defined as if it were a great river, and proceeds on its course at a rate of about four miles an hour. More northward still, this great current traverses the coasts of North America, sweeps by Newfoundland, passes eastward, and crosses the Atlantic again, extending even occasionally to the British isles. After this it is supposed to bend downwards towards the

western shore of Africa, until its widely circulating waters become once more mingled with those of the equatorial current, from which they originally proceeded. The waters of the gulf-stream are remarkable for their high temperature and their beautiful indigo-blue colour. In the modern ocean, one of the most important circumstances to know is the distribution of life. Until lately it was believed that below a certain comparatively moderate depth all animal and vegetable life ceased, on account of the increased pressure and the want of light and air. However, from the results of the examinations made in 1860, by Dr. Wallich, on the bed of the North Atlantic, it would appear that animal life, in various forms of foraminifera and radiata, if not of higher groups, exists at vast depths —Ref. *The Physical Geography of the Sea, and its Meteorology*, by Captain Maury; Sir J. F. W. Herschel's *Physical Geography;* and A. K. Johnston's *Physical Atlas*.

Ocean Currents. (*See* preceding article.)

Ocelot, *o'-se-lot* (Fr.), (*Felis pardalis* of Linnæus), a species of the feline tribe, which is slightly smaller than the ounce. The general characteristics of the class being stated under the article Felidæ (which *see*), the mere description of the animal need only here be given. Like the jaguar, the ocelot is subject to considerable variety in the form and distribution of the markings of its coat; but, nevertheless, the colouring is always chaste and the assemblage harmonious; the rich red of the ground tint blending finely with the deep brown, or almost black colour, of the borders of the spots. The length of a full-grown ocelot is from three feet and a half to four feet, including its tail, which is between eleven and fifteen inches. Specimens of it have been brought from Mexico, Brazil, Guiana, and Surinam, where it inhabits the forest and climbs trees in search of its prey, which consists of birds and small animals. The *linked ocelot* (*Felis catenata*) is another variety, which differs from the first from its size being only that of a wild cat, and that its markings are more extended, as they are like lengthened spots with an open centre. The *long-tailed ocelot* (*Felis macroura*) is another variety, and is characterized by the length of its tail.

Ochnaceæ, *ok-nai'-se-e* (Gr. *ochne*, the pear-tree), in Bot., a nat. ord. of *Dicotyledones*, sub-class *Thalamiflorœ*, having the following essential characters:—Under-shrubs or smooth trees, with alternate, simple, stipulate leaves. Flowers hypogynous, perfect, regular, and symmetrical, with the pedicels articulated in the middle; calyx and corolla usually with a quinary distribution, imbricated, the former persistent, the latter deciduous; stamens hypogynous, 5, 10, or numerous; anthers 2-celled, with longitudinal or porous dehiscence; style simple, with minute stigmas. Fruit consisting of a number of 1-seeded, indehiscent, succulent carpels, inserted on an enlarged fleshy disk. Seed with very little or no albumen; embryo straight, with the radicle towards the hilum. The *Ochnaceæ* are natives chiefly of the tropical parts of India, Africa, and America. They are generally remarkable for their bitterness. Some, as *Gomphia parviflora*, yield oil suitable for salads.

Ochroma, *ok-ro'-ma* (Gr., pallid hue), in Bot., a gen. of the nat. ord. *Sterculiaceæ*. The species *O. lagopus*, a West-Indian tree, has an antisyphilitic bark, and spongy wood, which is sometimes used as a substitute for cork.

Octagon, *ok'-tă-gon* (Gr. *okto*, eight, and *gonia*, angle), a plane figure in Geom. contained by eight sides, and therefore possessing eight angles. If these angles and sides are equal to one another, then the figure is a *regular polygon*, whose area and side will be found by applying the table given under article Mensuration.

Octave, *ok'-taiv* (Lat. *octavus*), in Mus., the eighth note of the scale, an harmonical interval consisting of seven degrees or twelve semitones, containing the whole diatonic scale; thus forming a complete system or series of sounds, which can only be extended by repeating the same order in a second *octave*, and again in a third, and so on, as high or as low as the compass of the voice or instruments will allow.

Octavo, *ok-tai'-vo* (Lat. *octo*, eight), is employed to designate that size of a book in which each leaf or page constitutes the eighth part of a sheet.

October, *ok-to'-ber* (Lat. *octo*, eight).—In the old Roman year October was, as its name implies, the eighth month. At the present day, it is the tenth. Amongst the Romans it changed its name frequently. Domitian, who was born in this month, gave it his own name; but it lasted only during his life. It was also called Faustinus by Antoninus Pius, in honour of his wife Faustina; and the flatterers of Commodus gave it the name of "Invictus," as one of the epithets of their patron. The year of Romulus began with March,—hence October became the eighth month; but when Domitian transferred the commencement of the year to the 1st of January, several of the months retained their old names. Amongst the Saxons, October was called "Winter-fylleth," or the winter full moon. It was also called *teotha monath*, or the tenth month.

Octroi, *ok-trwaw'* (Fr. *octroyer*, to grant), a custom-duty imposed in France and other countries on certain articles entering large towns, a portion of which is frequently paid into the imperial treasury, whilst the remainder is applied to local expenses. The proportion of this tax paid to the imperial treasury in France has varied at different periods; having been two-thirds, for example, in 1823, and a half in 1860, and in more recent times one-tenth. A decree of the present emperor, however, in 1852, released the various municipalities from the necessity of paying over even this reduced sum. According to a report laid before the French Legislative Assembly in 1851, the octroi produced in 1831 between fifty-four and fifty-five million francs, and in 1847 nearly eighty-nine millions; thirty-six millions of the latter sum being the result of taxes on various kinds of liquor, and twenty-four millions the product of taxes on meat. In 1850 there were 1,426 places, containing a population of 7,655,203 inhabitants, subject to this duty, which produced in that year something over ninety-five million francs. The places where the octroi produces the largest amounts are Paris, where, in round numbers, it amounts to thirty-seven million francs; Marseilles, 4,000,000; Lyons, 3,300,000; Bordeaux, 2,200,000; Rouen, 2,000,000; Toulouse, 1,300,000. There are, however, a hundred places subject to the octroi where it produces less than 500 fr. per annum, and a few in which it does not amount even to 100 fr. There is great inequality in the manner in which the octrois are distributed over the French territory, as well as in their amounts. Twenty departments, for instance, are burdened with 892 octrois,—more than half of the whole number; and whilst the octroi only amounts to the fraction of a penny per head of the population in some places, it is as much as twenty-five francs per head in Marseilles, and thirty-six francs in Paris. Although France is the country in which the system of octrois is carried to the greatest extent, it exists in several other European countries. In Belgium it produces about nine millions of francs per annum, and in Holland it is carried out to a still greater extent. In Prussia there are eighty-three towns subject to an octroi on flour and timber, two-thirds of which are received by the government and one-third by the several municipalities. In the free towns of Germany the octrois produce considerable sums, that of Hamburg amounting to nearly two million of francs per annum; and in the cities of Spain there are octrois on several articles of consumption; the most considerable revenue being derived from that on wine. In Denmark, however, the octroi is unknown, and in England it scarcely exists, save in the case of the coal-tax, levied by the corporation of the city of London.

Ocymum, *o'-se-mum* (Lat. *ocimum*), sweet basil, a gen. of plants belonging to the nat. ord. *Labiatæ*. It is supposed to owe its name to the powerful fragrance for which several of the species are remarkable. The leaves of some of the species are used as an ingredient in savoury dishes, and are objects of general cultivation. The *Ocymum febrifugium* of Sierra Leone is used as a febrifuge.

Od, *od* (*Odin*, the omniscient deity of Scandinavian mythology), is the name given to a supposed all-pervading force in nature, which Baron von Reichenbach

claims to have discovered in 1844, but which is not generally recognised by scientific men. According to the discoverer, it pervades all nature, and is akin to electricity, magnetism, light, &c. It has two poles, like electricity and magnetism,—a positive and a negative, which appear in all organic substances; the human body, for example, being positive on the left side and negative on the right. Its rays pass through all kinds of matter, and can be felt and seen by certain persons called sensitives, who have a peculiar nervous sensibility; but the majority of mankind are non-sensitives, and insensible to odic influences. The meeting of like odic poles causes a disagreeable sensation to the sensitive, while an agreeable sensation follows the pairing of unlike poles. The odic emanation is felt by the touch, as though it were a breath, and it is also seen in the dark, like a luminous vapour, by the sensitive. Od is the agent or force by which mesmerism or animal magnetism operates, and is also that by which the flowing of water underground is discovered by the sensitive: hence the secret of the water-finders and their divining-rods. The earth is strongly od-negative in the northern hemisphere and od-positive in the southern; and this is said to be the reason why many persons in the northern hemisphere cannot sleep on their left sides. We fear that od must be classed with table-turning, clairvoyance, &c.; but those who wish to investigate the subject further, we would refer to Reichenbach's works; the chief of which are *The Dynamics of Magnetism*; *The Odic-Magnetic Letters*; *The Sensitive Man and his relation to Od*.

Odd Fellows, Independent Order of, is the name of a secret charitable society existing chiefly in Great Britain and the United States. Some have attempted to trace the origin of this association to a very early period, as to the Romans, to the Goths, and even to Adam himself. The more probable account, however, is, that it sprang from certain lodges or societies of mechanics and labourers existing in London in the latter part of the 18th century, and calling themselves "Ancient and Honourable Loyal Odd Fellows." Their meetings were for convivial purposes, and were usually held in taverns; but it became the custom for each member among them to contribute a penny a week to form a fund for the relief of the poor among them, and especially to defray burial expenses and to provide for widows and orphans. On the extension of the order to Liverpool and other parts, the lodges united in a general system, under the title of the "Union Order of Odd Fellows," having its seat of government in London. In 1809 attempts were made to reform the order, and to abolish its convivial character; but these were opposed by the majority, and at length, in 1813, a convention of the friends of reform was held at Manchester, when several lodges seceded from the Union Order, and formed the "Independent Order of Odd Fellows." In 1825, a central standing committee was established in Manchester to govern the order in the interim between the sessions of the grand lodge, or national movable committee, as it is termed. Dissensions arose which led to secessions; but the "Manchester Unity" remains to this day the main body of British Odd Fellows, and numbers about 500,000 members in its lodges. The organization of the order bears a general resemblance to that of the Freemasons. The primary body is the subordinate lodge, which derives its power from a charter granted by the grand lodge, and must comprise at least five members who must be males of at least twenty-one years of age. They make their own laws, and manage their own pecuniary affairs, collecting certain fixed dues from their members, paying a weekly allowance to the sick, and granting a stated sum for the burial expenses of a member, a member's wife, or any of his family. After initiation, a member may apply for, and receive, certain degrees by the paying of certain sums. These degrees, in the order in which they are conferred are,—1. the white degree; 2. the covenant degree; 3. the royal blue degree; 4. the remembrance degree; 5. the scarlet degree. The officers of a subordinate lodge are the noble-grand, who presides; the vice-grand, the treasurer, and the permanent and recording secretaries. The grand lodge derives a revenue from fees for charters, dispensations, and a percentage on the revenues of subordinate lodges. Its presiding officer is the grand-master, who is elected annually. There are about 3,500 lodges and nearly 200,000 members in the United States. The first lodge there was founded at Baltimore in 1819.

Ode, *ode* (Gr. *ode*, a song), a short poetical composition proper to be set to music or sung, which was first introduced in what is considered as the second period of Grecian poetry,—that which succeeded the Homeric or epic period. In the earliest period of a national poetry, we can discover but few, if any, peculiarities of thinking or feeling, whilst in the subsequent periods the poet's compositions are, more or less, stamped with the mark of his own character; and this is especially the case with respect to the ode, which is a form of poetry especially suited to the expression of the most passionate or the most tender sentiments. As the effects of music upon the mind are chiefly to raise it above its ordinary state and fill it with high, enthusiastic emotions, or to soothe and melt it into pleasurable feelings, so the ode, which originally was composed with the express purpose of being sung to music, retains that plasticity of character which is music's great charm. There are four species of odes: the *sacred* ode, or lyric, a poem addressed to the Divine power, such as the psalms of David; the *heroic*, such as those of the Greek poet Pindar and the "Alexander's Feast" of the English poet Dryden; the *moral* or *philosophical*, in which the poet celebrates the charms of virtue, the odiousness of vice, and reflects upon the various phases of life,—of which the Latin poet Horace and the English poets Gray and Collins have left some exquisite examples; and the *anacreontic*, or love-songs, so named from one of their earliest authors.

Odometer, *o-dom'-e-ter* (Gr. *odos*, a road; *metron*, a measure), an instrument attached to the wheel of a carriage, and used for measuring the distances passed over in travelling. It generally consists of a box containing a train of wheelwork, with an index, showing the number of turns of the wheel to which it is attached, reduced into miles, furlongs, poles, and yards. Other instruments of a similar kind are known by different names; such as *perambulator* and *wayviser*; but the construction of all is much the same. The object of machines of this sort is to record the distance travelled, as a check upon the honesty of the driver of any hired vehicle. Few, if any, odometers are now in use, as they were found to be inefficacious as a check of this kind.

Odontalgia. (*See* Toothache.)

Odyssey. (*See* Iliad and Odyssey.)

Œcumenical Council, *e-ku-men'-e-kal* (Gr. *oikoumene*, the habitable earth), in Eccl. Hist., was employed to designate such councils as were composed of delegates or commissioners from all parts of the Christian world, as distinguished from mere provincial or national councils. (*See* Council.)

Œdema, *e-de'-mă* (Gr. *oideo*, I swell), in Surg., is a swelling occasioned by the infiltration of serum into the areolar tissue of any portion of the body. It is generally a symptom of some internal disease, the effusion of serum being caused by some obstruction to the return of venous blood to the heart. It hence generally arises from diseases of the heart and blood-vessels, liver, lungs, &c. In all cases, it is simply a symptom produced by different causes, and is to be treated according to the cause by which it is produced.

Œnanthe, *e-nan'-the* (Gr. *oinos*, wine; *anthos*, flower), in Bot., a gen. of the nat. ord. *Umbelliferæ*. The indigenous species *Œ. crocata*, the drop-wort or dead-tongue, and *Œ. Phellandrium*, the fine-leaved water-dropwort, are intensely poisonous in most localities. The roots of *Œ. pimpinelloides* are said to be wholesome. These species are often improperly called hemlock.

Œnotnera, *e-no'-the-ra*, in Bot., a gen. of the nat. ord. *Onagraceæ*. The roots of *Œ. biennis* and other species are edible. The yellow flowers of several species expand in the evening; and hence they have been called evening primroses.

Œsophagus, *e-sof'-a-gus* (Gr. *phago* (*oiso*), I carry, and *phago*, I eat), in Anat., is the gullet, or the membranous tube leading from the pharynx to the stomach, and forming the passage through which the

food, descends into the latter organ. It commences at the cricoid cartilage, opposite the fifth cervical vertebra, and, descending along the front of the spine, passes through the diaphragm opposite the ninth dorsal vertebra, and there ends by opening into the cardiac orifice of the stomach. Its length is about nine inches, and its direction nearly straight, having only two or three slight curvatures. Its walls are composed of three coats,—an external or muscular, a middle or areolar, and an internal or mucous coat. In the neck, the œsophagus lies immediately behind the trachea.

**Offence**, *of-fens'* (Lat. *offensus*, offence), in Law, is an act committed against the law, or omitted where the law requires it. It is used generically, comprehending every species of crime and misdemeanour, as well as specifically, to signify a crime not indictable, but punishable summarily, or by the forfeiture of a penalty. Offences are divided into three classes:—1. treasons; 2. felonies, or major offences; and 3. misdemeanours, or minor offences. (*See* these articles.)

**Offerings**, *of'-fer-ings*, in religious worship, are gifts presented to the Deity. A principal part of the religious service of all the nations of antiquity consisted in offerings to a Divine being, from a feeling of dependence upon him and a desire to propitiate his favour. Such offerings took their character from the mode of life of those who presented them. Herdsmen and hunters offered beasts, husbandmen fruits of the earth; each selecting the choicest of what he possessed. Prisoners taken in war, slaves, and even their own children, were frequently offered by rude and cruel nations to their idols. Among the ancient Hebrews, offerings were of several kinds; some being freewill, others by obligation. The first fruits, the tenths, the sin-offerings, were of obligation; the peace-offerings, vows, offerings of wine, oil, bread, and other things made to the temple or to the ministers of Jehovah, were offerings of devotion. Sacrifices were not commonly included under the name of offerings. In the Christian church, offerings were at first voluntary, but came afterwards by custom to be obligatory. In England they are payable by custom to the parson or vicar of the parish, either occasionally, as at sacraments, marriages, christenings, churchings of women, burials, &c.; or at fixed times, as at Easter, Christmas, &c. The four offering-days enjoined by Convocation (1537), in the Church of England, were Christmas-day, St. John Baptist's day, St. Michael's day, Easter-day.

**Offertory**, *of'-fer-to-re* (Lat. *offertorium*), denotes the offerings of the faithful, or the place where they are made or kept; and it is also applied to the anthem which is sung, or the music which is executed, while the people are making their offerings. Among Roman Catholics it is one of the chief parts of the mass, and in the English church it is part of the communion service.

**Office**, *of'-fis* (Lat. *officium*), in a moral sense, denotes a duty, or that which virtue and right reason direct a man to do. Cicero has written a book on this subject,—"De Officiis." Office is also a particular charge or trust, whereby a person is authorized to do something, whether judicial, ministerial, ecclesiastical, &c. It is likewise applied to a place where business is transacted.

**Offices, Public**, *of'-fis-es*, according to Blackstone, the mal-administration of such high officers as are in public trust and employment, ranks among contempts against the sovereign or his government. This is usually punished by the method of parliamentary impeachment; where such penalties short of death, consisting of banishment, imprisonment, fines, or perpetual disability, are inflicted. The embezzling of public money subjects the committor of it to a fine and imprisonment at common law. The offence of selling public offices ranks with the same class of offences, and constitutes a misdemeanour. Another misdemeanour is the negligence of public officers intrusted with the administration of justice,—as sheriffs, coroners, constables, and the like,—which makes the offender liable to be fined; and in very notorious cases will amount to a forfeiture of his office, if it be a very beneficial one.—*Ref. The New Commentaries on the Laws of England*, by Henry John and James Stephen.

**Official**, *of-fish'-al*, is belonging or pertaining to a public charge. Thus, official managers are persons appointed to superintend the winding up of insolvent companies under the control of chancery; official liquidators are officers appointed to wind up an insolvent limited company; official assignees are persons appointed by the lord chancellor to act in all bankruptcies, receiving the proceeds of the estate, and paying the same into the Bank of England to the credit of the accountant in bankruptcy.

**Official**, *of-fish'-se-nal*, a term applied in pharmacy to those medicines which are ordered by the Pharmacopœia to be kept in the apothecaries' shops ready for use.

**Offing**, *of'-fing*, a nautical term, which signifies out at sea, or at a good distance from the shore, where there is deep water, and no need of a pilot to direct the ship. Thus, if a ship from shore be seen sailing out towards the sea, they say, "She stands for the *offing*."

**Ogee**, or **O-G**, *o-je'*, in Arch., a moulding, consisting of two members,—the one convex and the other concave. It is similar to the moulding called *cymatium*. According to Vitruvius, each member of an ogee is a quadrant of a circle; Scamozzi, however, and some others, make them rather flatter, and strike them from two equilateral triangles. In figure, the ogee somewhat resembles the letter S.

**Ogive**, *o'-jiv*, a word of uncertain etymology, applied in Arch. to arches or branches of a Gothic vault, which, instead of being circular, pass diagonally from one angle to another, and form a cross with the other arches, which make the side of the square of which the ogives are diagonals. The centre, where the ogives cross each other, is called the *key*, and is sometimes carved in the form of a rose or a *cul-de-lampe*.

**Ogre**, *o'-gr.*—There is little doubt that this word, which has long been used to signify a species of fantastic monster disposed to feed on human flesh, was derived from an Asiatic horde called *Ogurs*, which invaded Europe about the middle of the fifth century. The ferocity of their appearance, and the cruelties which they doubtless committed, led the terrified populations whom they threatened, readily to believe the stories which were told of their habits of devouring the flesh of women and children; and the word has been handed down from generation to generation to frighten the nurseries of modern times. From time to time, cases of cannibalism, the result of fearful forms of mania, have occurred in civilized life; and to such the term of *Ogre* is still applied.

**Oil-Gas**, *oil* (Sax. *æl*, oil), in Chem., a compound having the composition $C_4H_8$, discovered by Faraday amongst the products of the dry distillation of oil.

**Oil of Vitriol.** (*See* Sulphuric Acid.)

**Oil-painting.** (*See* Painting.)

**Oils**, in Chem., a name given to three different classes of bodies:—1. The *fixed oils*, such as linseed, sperm, and castor oil; 2. the *essential oils*, as oil of lavender, of rue, of nutmeg, &c.; 3. the *mineral oils*, which are hydrocarbons more or less impure. (*See* Fats, Essential Oils, and Petroleum.)

**Oils, Manufacture of**, the simplest of these varied manufactures is that of animal oils, such as whale-oil. Soon after being taken from the whale, the *blubber* is cut into small pieces, and packed in casks. When it arrives at home, it is in a half-putrid state, and is then emptied into a large receiver. After being allowed to settle for some time, the decomposing fat is conducted into a copper boiler, in which it is subjected to heat. From the boiler the melted oil flows through a sort of filter into coolers, from which, when cold, it can be drawn off into casks. In the South-Sea whale fishery the blubber is boiled on board the ships. In the manufacture of most vegetable oils, the oils are generally procured from the seeds. Olive-oil, however, is an exception, being extracted from the soft fleshy pericarp of the fruit. The manufacture is very simple. The finest oil is obtained by crushing the olives in a mill, the stones of which are so constructed as not to break the stones of the fruit, but merely crush the pulp. The bruised mass is then put into thin cakes of bulrush matting, or of coarse canvas, and subjected to gradual compression in a screw press. The extracted oil flows into casks, or stone cisterns, partly filled with water, on the surface of which it floats, so

that it can readily be collected by skimming: this is the pure virgin oil. When the oil ceases to flow from the press, the mass of pulp is taken out of the bags, mixed with hot water, and subjected to an increase of pressure. The second quality of oil thus obtained is fit for the table when used fresh, but is apt to turn rancid with keeping. A still coarser kind of oil is lastly obtained by crushing the solid residue in a mill, so as to break the stones of the fruit. The manufacture of linseed-oil from the seeds of the flax-plant is an illustration of the manufacture of oils from seeds. Formerly, linseed, rape-seed, poppy-seeds, and other oleiferous seeds, were pounded in hard wooden mortars with pestles shod with iron, and afterwards wrapped up in hair-cloth and subjected to pressure. These mortars and presses constitute what are called Dutch mills, and are still in use in some parts of this country and the continent. On account of the extreme hardness and smoothness of the seeds of flax and hemp, very powerful presses are required in order to extract the whole of the oil. For this reason the wedge-press and Bramah's hydraulic press have been introduced for the purpose. The seeds are first crushed in a powerful mill, sometimes called an *edge-mill*, consisting of a pair of stones, technically called *running-stones*, or *runners*, generally made of granite, resembling grindstones in shape, and from five to seven feet in diameter, so mounted as to roll round in a circular bed of stone or iron. These millstones roll round the bed thirty or thirty-six times in the minute, and soon convert the seeds, through the partial expression of the oil, to a pasty mass, from which a small quantity of very fine *cold-drawn* oil can be obtained by the simple action of the press. In order, however, to obtain the principal supply of oil, heat is necessary before pressing. The processes differ in various manufactories. The oil-cakes are pressed several times, and those cakes which remain after the last pressing are used as food for cattle. According to Mr. Samuelson, in a paper read before the Society of Mechanical Engineers in 1858, there are more than 1,000,000 quarters of linseed pressed for oil annually in England. Two-thirds of this trade is centred in Hull, and the produce comes out as about 14,000 tons of oil-cake and 56,000 tons of linseed-oil. One of the principal uses of linseed-oil is as a vehicle for mixing colour in oil-painting. In America, *lard-oil* is largely manufactured from the fat of hogs. The principal oils manufactured in this country are train-oil, blubber, and spermaceti, olive-oil, and various kinds of seed-oil, cocoanut-oil, and palm-oil. Of the last-mentioned oil the export in 1859 was 686,000 cwt.

OLACACEÆ, *ol-a-kā'-se-e*, in Bot., the Olax fam., a nat. ord. of *Dicotyledones*, sub-class *Thalamifloræ*, having the following essential characters:—Trees or shrubs, with alternate, simple, entire leaves, without stipules. Flowers small, regular, and axillary. Calyx minute, monosepalous, generally enlarging so as to cover the fruit. Petals hypogynous, valvate in æstivation. Stamens definite, partly sterile and partly fertile, the latter being opposite to the petals, and inserted upon, or outside of, a conspicuous disk; the anthers 2-celled, bursting longitudinally. Ovary free, often imbedded in the disk, with ovules pendulous, from a free central placenta. Fruit drupaceous; seed without integuments, solitary and pendulous; embryo minute; albumen fleshy. The plants of this order are natives of tropical or of sub-tropical regions. Some are remarkable for their fragrant flowers. The leaves of *Olax zeylanica* are used in salads, and the wood as a medicine for putrid fevers. The fruit of *Ximenia americana* is commonly eaten in Senegal.

OLDENLANDIA, *old-en-lān'-de-ā* (in honour of H. B. Oldenland, a Danish botanist), in Bot., a gen. of the nat. ord. *Cinchonaceæ*. The root of the species *O. umbellata* forms the so-called *chay* or *che root*, which is occasionally imported from India, and used for dyeing red, purple, and orange-brown.

OLD MAN OF THE MOUNTAIN. (*See* ASSASSINS.)

OLD RED SANDSTONE, a term applied to a geological formation. If the coal-measures be taken as a sort of middle formation, there is generally found in the British islands one set of reddish sandstones lying immediately over them, and another set directly underneath. The upper set was called the *New Red Sandstone*, and the lower set the *Old Red Sandstone*, by the earlier geologists. Although, at the present day, the limits of these terms are considerably modified, they are still sufficiently distinctive and readily remembered. The old red sandstone, or *Devonian system*, as it is called by Sedgwick and Murchison, may be considered as embracing the whole series of strata which lies between the silurian and carboniferous systems. Certain portions of the formation are particularly developed in Devonshire, from which it derives its second name. The lower margin of the system is characterized by strata containing the fossil remains of fishes, and forming a line of separation between it and the silurian system. On its upper margin it is distinguished by the rarity of the vegetation which so remarkably distinguishes the overlying carboniferous rocks. The great bulk of the system consists of a succession of sandstones alternating with subordinate layers of sandy shale and beds of concretionary limestone. The sandstones pass in fineness from close-grained fissile flags to thick beds of coarse conglomerate, and the shales from sandy, laminated clay, to soft flaky sandstone. Oxide of iron tinges the whole of the system more or less with a colour varying from a dull rusty grey to bright red, and from red to a fawn or cream-coloured yellow. The Devonian system, properly so called, the middle and upper portions exhibit an abundance of fossiliferous limestones and calcareous shales, or dark bituminous-looking schists. North of the Bristol Channel, however, these portions are almost wholly wanting, and the term Old Red Sandstone is very appropriate. The whole system is usually divided into three great groups, as follows:—1. UPPER.—Baggy Point sandstone and Morte Bay schists, North Devon; gomatite limestone, Belgium; yellow sandstones of Dura-Den, Fife, with holoptychii and pteraichthys; telerpeton beds, Elgin; cyclopteis beds of Kilkenny; red and white sandstones of Dunse. 2. MIDDLE.—Ilfracombe and Plymouth limestones, Devon, and Eifel limestone, Belgium, both abounding with corals, crinoids, shells, trilobites, and occasional fishes. Red sandstones of Berwick and Roxburgh; red sandstones, marls, conglomerates, and corn-stones of Hereford, Cumberland, Fife, Perth, and Forfar,—the characteristic fossils being gigantic poloptychii. 3. LOWER.—Caithness flags and shales, abounding in fishes, dipterus, osteolepis, coccosteus, cheiracanthus, &c.; North Foreland, Porlock, and Torquay beds, Devon; Spirifer sandstones and shale, Rhine; great pebbly conglomerates and flagstones of Forfar, with cephalaspis, cheiracanthus, and pterygotus; Ludlow and Lanark tilestones, with pterygotus, eurypterus, and other kindred crustaceans.—*Ref.* Page's *Advanced Text-book of Geology*, and Hugh Miller's *Old Red Sandstone*.

OLD STYLE. (*See* CALENDAR and NEW STYLE.)

OLD TESTAMENT. (*See* BIBLE.)

OLEA, *o'-le-ā* (Gr. *elaia*, oil), in Bot., the typical gen. of the nat. ord. *Oleaceæ*. The species *O. europæa* is the olive-tree, one of the most celebrated and useful of plants. It is usually a small tree, with evergreen but dull-looking leaves. The ripe fruit has a very fleshy pericarp, which yields, when pressed, a fixed oil, called *olive-oil*. This valuable product is used for dietetical purposes, in the arts, and in medicine. The finest sorts are produced near Aix, Montpellier, Nice, Genoa, Lucca, and Florence. Olive-oil is also largely produced in the state of Naples, and exported from Gallipoli; hence it is often called *Gallipoli oil*. In medicine, the oil is principally employed externally, either by itself or mixed with other materials, in cerates, ointments, and plasters. When administered internally, it is nutrient, emollient, demulcent, and laxative. The fruit of the olive is esteemed as an article of the dessert, being supposed to be particularly valuable for preparing the palate for choice wines. Olives for dessert are gathered when unripe, soaked in water to get rid of their excessive bitterness, and then preserved in salt and water, slightly aromatized. The wood of the olive is much employed for cabinet-work, being remarkable for its hardness. The leaves and barks have been highly extolled by some medical writers for their tonic and febrifugal properties. The substance called *olive gum*, or *oliveile*, is a resinous exudation from the tree. It was formerly

much employed in medicine, but at the present time it is not applied to any useful purpose. The flowers of the Asiatic species *O. fragrans* are used in China for the scenting and flavouring a particular variety of tea.

OLEACEÆ, *o-le-ai'-se-e*, in Bot., the Olive fam., a nat. ord. of *Dicotyledones*, sub-class *Corolliflorœ*. Trees or shrubs, with opposite leaves. Flowers usually perfect, or rarely unisexual. Calyx persistent, 4-cleft, sometimes obsolete, inferior. Corolla regular, 4-cleft, or of 4 distinct petals—sometimes absent; æstivation valvate. Stamens usually 2, rarely 4. Ovary 2-celled, with 2 suspended ovules in each cell. Fruit fleshy or dry, often 1-seeded. Seeds with abundant fleshy albumen; embryo straight. Most of the *Oleaceæ* flourish in temperate regions, but a few occur in the tropics. There are 21 genera, comprising about 130 species. The barks of many are tonic and febrifugal. The mild purgative called *manna* is obtained from several species. The wood of some is hard and durable. The most valuable product of the order is olive-oil. (*See* OLEA.)

OLEFIANT GAS, *o-lif'-e-ant* ($C_4H_4$, *Elargl Ethylene*), a hydrocarbon obtained by reacting on alcohol with an excess of sulphuric acid in a retort, capable of holding three or four times the bulk of the liquid. On heat being applied, the mixture froths up and gives off a transparent, colourless, inflammable gas, which has a faint sweetish odour, and dissolves in twelve times its bulk of water. It was liquefied by Faraday under great pressure. When mixed with chlorine, it forms an oily body, first discovered in Holland, and thence known as *Dutch liquid*. From this circumstance it has received its name of olefiant gas. Mixed with oxygen, it forms a highly explosive mixture. It burns with a brilliant white flame, depositing a large amount of carbon on cold surfaces, and is a more or less large constituent of ordinary coal-gas. It is the type of a series of homologous bodies known as the olefiant gas series of hydrocarbons, which progress, in regular increments of two equivalents of hydrogen and carbon, from methylene ($C_2H_2$) to paramylene ($C_{30}H_{30}$). It is also known in organic chemistry as ethylene, and its oxide, in the hands of M. Wurtz, an eminent French chemist, has produced a series of compounds of great interest and importance. M. Wurtz looks on it as the connecting link between inorganic and organic compounds.

OLEIC ACID, *o-le'-ik* (Lat. *oleum*, oil), an important fatty acid, which forms with the lean of glycerine, olein, the principal constituent of the fixed oils. (*See* FATS.)

OLIBANUM, *o-lib'-a-num* (Gr. *libanos*, the frankincense-tree), a fragrant gum-resin, chiefly used as a fumigation. Indian olibanum is the produce of *Boswellia thurifera*, but African or Arabian olibanum appears to be derived chiefly from another species,—*B. floribunda*, according to Royle. This resin is the *lebouah* of the Hebrews, and the incense or frankincense of the Bible. (*See* BOSWELLIA.)

OLIGARCHY, *ol'-e-gar-ke* (Gr. *oligos*, few, and *arche*, government), is that form of government in which the supreme power is vested in the hands of a few individuals. (*See* GOVERNMENT.)

OLIVE. (*See* OLEA.)

OLIVENE, *ol'-e-veen*, a semi-transparent olive-coloured mineral, found in grains and crystals in many basalts and lavas. It is a silicate of alumina, with varying proportions of soda, potash, and lime. The transparent varieties form the precious stone known as chrysolite.

OLYMPIAD, *o-lim'-pe-ad* (Gr. *Olumpias*).—The period of four years which elapsed between the celebration of the Olympic games was called an Olympiad, and gradually became a celebrated era among the Greeks, who computed their time by it. The custom of reckoning by Olympiads was first established, it is supposed, with reference to the Olympic games, which were celebrated 776 years before the Christian era, and the computations by them ceased after the 304th, in the year 440 of the Christian era. History has derived much advantage from the Olympiads, as they have served to fix the time of many important events; but they were not an altogether convenient measure of time; for as the games were celebrated at the time of the full moon next after the summer solstice, and as the time of the full moon differs eleven days every year, the Olympiads were of unequal lengths, sometimes beginning the next day after the solstice, and sometimes four weeks afterwards.

OLYMPIC GAMES. (*See* GAMES, PUBLIC.)

OMELET, *om'-let* (Fr. *omelette*), a pancake or fritter made of eggs and other ingredients. Omelets may contain bacon, ham, herbs, fish, shell-fish, cold meat, cold game, or anything else at hand, at the pleasure of the cook.

OMEN, *o'-men* (Lat.), is a sign believed to prognosticate a future event. They have been common among most nations, but are chiefly received in the ruder ages and among the more ignorant of a people. Even in the present day, in many parts of England, a superstitious belief in omens exists. The howling of a dog by night is believed to presage a death in the neighbourhood. The screeching of the owl and the croaking of the raven have, both in ancient and modern times, been regarded as omens of some dire calamity. It is regarded as unlucky to see first one magpie and then more; but two denote marriage or merriment; three, a successful journey; four, an unexpected piece of good news; five, that you will shortly be in a great company. To kill a magpie is to incur some terrible misfortune. When a person goes out on any important business, it is lucky to throw an old shoe after him. To present a knife, scissors, razor, or other sharp or cutting instrument to one's friend is unlucky, as they are apt to divide love and friendship. The falling of salt towards persons at table, the spilling of wine on their clothes, are evil omens. Breaking a looking-glass betokens the death of the best friend of the person to whom it belonged. The itching of the nose implied that a stranger was coming; the burning of the cheeks or tingling of the ears, that others were talking of us; if of the left cheek or ear, ill,—the right, well. The way in which fires, candles, or lamps burned suggested divers omens. Divers presages concerning the weather are taken from the habits of birds, bees, gnats, &c. A sow crossing the road before a person going on a journey, is believed to indicate a disappointment, if not a bodily accident to such person; but if the sow be attended by her litter of pigs, it denotes a successful journey. To stumble is regarded as unlucky, except in going up stairs, when it is considered lucky. Fishermen and sailors are particularly influenced by omens, which they fancy they discover in the most trivial circumstances. To lose a bucket or to throw a cat overboard is believed to be very unlucky. Whistling is supposed to raise the wind. Sneezing, an involuntary tremor in the mind or body, or other nervous affection, particular spots on the body, are among the circumstances from which good or evil is presaged. By a regard to these things, many persons add very considerably to their proper share of human misery without any countervailing amount of good.

OMNIBUS. (*See* VEHICLES.)

OMPHALEA, *om-fai'-le-ä* (from Gr. *omphalos*, the navel,—from the remarkable umbilicated form of the seed-cases), in Bot., a gen. of the nat. ord. *Euphorbiaceæ*. The only remarkable species is *O. triandra*, the juice of which is sometimes employed in Guiana as a substitute for black ink.

ONAGRACEÆ, *on-a-grai'-se-e*, in Bot., the Evening Primrose fam., a nat. ord. of *Dicotyledones*, sub-class *Calyciflorœ*, having the following essential characters:—Herbs or shrubs, with simple, exstipulate, dotless leaves. Calyx superior, 2 to 4-lobed, valvate in æstivation. Petals usually equal in number to the lobes of the calyx, with a twisted æstivation, or rarely absent. Stamens few (usually 2, 4, or 8), inserted into the throat of the calyx with the petals. Ovary inferior, 2 to 4-celled; style simple; stigma lobed or capitate. Fruit dehiscent or indehiscent. Seeds numerous, without albumen. The *Onagraceæ* are chiefly natives of the temperate parts of North America and Europe; many are found in India; but they are rare in Africa, except at the Cape. There are 30 genera and about 450 species. They are unimportant in an economical point of view. The genera *Fuchsia* and *Œnothera* furnish the florist with numerous beautiful plants.

ON-DIT, *awn(g)-de'*, is a term derived from the

French, signifying, literally, people say; and hence it is frequently used to designate a flying rumour.

ONION. (*See* ALLIUM.)

ONOMANCY, *on'-o-măn-se* (Gr. *onoma*, and *mantis*, divination), is a species of divination which foretells a person's good or bad fortune from the letters in his name.

ONOMATOPŒIA, *o-nom'-ă-to-po'-ă* (Gr. *onoma*, a name, and *poieo*, I make), in Gram., is the formation of words in such a way as that the sound shall imitate the sense; as in *buzz*, *crash*, *roar*.

ONOPORDUM, *on-o-por'-dum* (Gr. *onos*, an ass; *perdo*, I break wind), in Bot., a gen. of the nat. ord. *Compositæ*. *O. acanthium* is the Scotch thistle of gardeners. It is also known under the name of the cotton thistle.

ONTOLOGY, *on-tol'-o-je* (Gr. *ontologia*), in Phil., is the science of being. (*See* METAPHYSICS.)

ONYX, *o'-nix* (Lat.), a variety of agate, containing alternate layers of white, brown, and black; much used as an ornamental stone by jewellers.

OOLITE, *o'-o-lite* (Gr. *oon*, an egg; *lithos*, stone), in Geol., a variety of limestone, so called from its being composed of small rounded grains, resembling the eggs or roe of a fish. Each grain has generally some minute fragment of sand as a nucleus, round which concentric layers of calcareous matter have accumulated. The term *roe-stone* is applied to it when the grains are very distinct and well rounded, and *pisolite*, or pea-stone (from Lat. *pisum*, a pea), when the grains are large and pea-like. In certain of the secondary strata of England, the marked occurrence of these oolites, or roe-stones, has given the name to the oolitic system, as now extended by modern geologists.

OOLITIC, or JURASSIC SYSTEM, *o-o-lit'-ik*, in Geol., a formation which derives its name from the prevalence of limestones of an oolitic texture as developed in England, or from the Jura range of mountains, as exhibited typically on the continent of Europe. The oolitic system may be said to comprehend the whole of those peculiar limestones, calcareous sandstones, marls, shales, and clays, which lie between the Chalk formation and the New Red Sandstone beneath. Where the system is perfect and complete, the argillaceous laminated limestone and shales, called the *Lias*, constitute the lowest group; the yellowish granular limestones, calcareous sandstones, sands, and clays, called *Oolite*, the middle group; and the greyish laminated clays, with subordinate layers of limestone, and flaggy ferruginous sandstones, called the *Wealden*, the upper group. These three groups are so clearly defined, that they are sometimes treated as independent systems; and were it not for certain fossil as well as lithological resemblances which pervade them, this method would be preferable. Taking the three divisions, however, as constituting the *Oolitic system*, their subdivisions will be found exhibited in descending order in the following synopsis:—WEALDEN; consisting of—1. *Weald Clay*.—Greyish laminated clays, containing concretions of iron-stone, thin layers of argillaceous limestone, and sandy ferruginous flags. 2. *Hastings Sands*.—Sands and sandstones, often ferruginous, with divisions of clay; beds of clay and sandy shale, more or less calcareous, with subordinate beds of limestone. OOLITE; consisting of—1. *Purbeck Beds*.—Estuary limestones alternating with sands and clays. 2. *Upper Oolite*.—Coarse and fine-grained oolitic limestones, with layers of calcareous sand and concretions; dark laminated clays, with gypsum and bituminous shale. 3. *Middle Oolite*.—Coarse-grained, shelly, and coralline oolite, with calcareous sands and grit; dark blue clays, with subordinate clayey limestones and bituminous shale (*Oxford Clay*); shelly calcareous grit, with blue clays underneath. 4. *Lower Oolite*.—Coarse shelly limestones; laminated shelly limestones and grits; sandy layers, and thick-bedded blue clay (*Bradford Clay*); thick-bedded oolite, more or less compact and sandy; flaggy grits and oolites; marls and clays, with soft marly limestone (*Fullers' earth*); calcareous freestone, irregularly oolitic, and yellow sand. LIAS; consisting of—1. *Upper Lias*.—Thick beds of dark bituminous shale; beds of pyritous clay and alum shale; indurated marl or marlstone. 2. *Lower Lias*.—Dark laminated limestones and clays; bands of iron-stone; layers of jet and lignite; beds of calcareous sandstone. In England, all the members of this system are well developed; but in France, Switzerland, and Italy, the lias and oolite are principally found. The lias and oolite occur in patches in Scotland; in North America and Hindostan the oolite occurs alone; while in Westphalia and Hanover, beds of the Wealden have been observed. The organic remains of the oolitic system are all *mesozoic*, that is, belonging to genera and species differing from those found in the lower rocks; and differing also, though less in general aspect, from those of the tertiary and present epochs. With the exception of the highest mammalia, nearly every existing order is represented in the *fauna* of the oolite; but the forms all died out at the close of the Chalk era. The vegetation of the system is very varied; the highest orders, however, appear to be coniferous, no true example of an exogenous tree having yet been detected. The stems, fruits, and leaves of the *Cycadaceæ*, which are found in great abundance, form one of the most characteristic fossils of the system. The shells of the *Gryphæa*, so plentiful in the lias; innumerable species of *ammonites* and *belemnites*; the *insects* of the lias and wealden; the *pterodactyl*; the fresh and marine *turtles*; and above all, the *ichthyosaurus*, *plesiosaurus*, and other enormous reptiles, are remarkable in the paleontology of the oolitic system. Considered industrially, the system is by no means void of importance. Some of the strata afford excellent building-stone; such as those of Portland, Bath, and Caen. The lias and oolite limestones are largely quarried for mortar; and marbles of various qualities are obtained from the wealden and the coralline and shelly oolites. In Yorkshire, the pyritic clays and shales yield sulphate of alumina (*alum*) when properly treated; and during the monopoly of the sulphur trade, in Sicily, many patents were taken out for manufacturing sulphuric acid from the same pyritic strata. *Fuller's earth* is largely employed in the cleansing and scouring of woollens. Large quantities of iron-stone are obtained from the *lias band* of Yorkshire. The area under which this bed may be worked measures some hundreds of square miles, with an average produce of 20,000 to 50,000 tons per acre. Coal is also worked in the oolitic system.—*Ref.* Page's *Advanced Text-book of Geology*; and *Phillips's Manual of Geology*, chap. X.

OPACITY, *o-păs'-e-te* (Lat. *opacus*, dark), a condition of bodies which renders them opaque, or incapable of transmitting light. This quality appears to depend upon the nature or disposition of the particles of bodies, but its precise cause is not understood. According to the Newtonian theory, opacity arises from the multitude of reflections and refractions caused in the internal parts of natural bodies. It is difficult, however, to conceive the entire absorption of all the light which enters a substance by the multiplied reflections and refractions which it undergoes within the mass. The advocates of the undulating hypothesis ascribe opacity to the unfitness of the pores or intervals between the molecules of a body for permitting the vibrations of the particles of ether without disturbing the molecules, which thus appropriate to themselves the *vis viva* which would otherwise have appertained to the transmitted vibrations.

OPAL, *o'-pil* (Lat. *opalus* or *opalum*), a precious stone, consisting principally of silica, with a small admixture of alumina; much valued as a gem, from the beautiful play of colours it exhibits, caused by an infinite number of minute pores or fissures existing in its mass.

OPENING OF PARLIAMENT, *o'-pen-ing*.—On the day appointed by royal proclamation for the first meeting of a new parliament for despatch of business, the members of both houses assemble in their respective chambers. In the House of Lords, the lord chancellor informs the house, "That her Majesty not thinking it fit to be personally present here this day, had been pleased to cause a commission to be issued under the great seal, in order to the opening and holding of this parliament." The lords commissioners, wearing their robes, being seated on a form between the woolsack and the throne, then order the gentleman usher of the black rod to inform the Commons that "the lords commissioners desire their immediate attendance in this house, to hear the commission read." The clerk of the crown in chancery, during the meanwhile, has delivered to the clerk of the House of Com-

mons a book, containing the names of the members returned to serve in the parliament; after which, on receiving the message for the usher of the black rod, the Commons repair to the House of Lords. Arrived there, the lord chancellor addresses the members of both houses, and informs them that her Majesty has been pleased "to cause letters patent to be issued under her great seal, constituting us and other lords therein mentioned her commissioners, to do all things in her Majesty's name on her part necessary to be performed in this parliament," &c. After some other preliminaries, the Commons withdraw and return to their own house, while the House of Lords is adjourned during pleasure to unrobe. (*See* PARLIAMENT.)

OPERA, *op'-e-ra* (Ital., Sp., Fr., from Lat. *opera*, work, labour), a species of musical drama containing airs, recitatives, choruses, &c., invented by Rinuccini, a Florentine, about the end of the 16th century. The Italians divide their opera into four kinds; viz., the *sacred*, the *serious*, the *semi-serious*, and the *comic opera*, or *opera-buffa*. The French have only two,—the *grand opéra* and the *opéra comique*; while the Germans divide theirs into the *grand*, the *serious*, the *tragic*, the *heroic*, the *romantic*, the *allegorical*, and the *comic opera*, &c. (For the history of the lyric drama *see* MUSIC.)

OPERA-GLASS, a small telescope, so called from its use in theatres, &c. In general it consists of a tube about four inches long, with an object glass, the focal length of which is from four to eight inches. The eye-glass is a double concave, or plano-convex lens, from half an inch to two inches focus; and the distance between the two lenses is equal to the difference between their focal lengths; and the magnifying power is in the ratio of these lengths. The object-glass may be either simple or compound. When a single lens is used, it should be nearly plano-convex, and when a convex lens of plate-glass with concave lens of flint is used to form the compound lens, the former should be nearly plano-convex and the latter plano-concave. The eye-glass should always be single, and the best form is that of the plano-concave. The field of view of the opera-glass is very limited, and for this reason it cannot be used with any high magnifying power. The common opera-glass is precisely similar to the Galilean telescope invented by Galileo in 1609.

OPHELIA, *o-fe'-le-ä* (Gr., useful), in Bot., sometimes called *Agathotes*, a gen. of the nat. ord. *Gentianaceæ*. The species *O. chirata* is the medicinal herb known as chiretta or chirayta, which is used by the natives of India as gentian is employed in Europe. The dried plant and root possess great bitterness, and are used to some extent in this country for the sake of their tonic properties.

OPHICLEIDE, *of'-ik-lide* (Gr. *ophis*, serpent; *kleis*, a key), an inflatile musical instrument invented about 1840, and intended to supersede the serpent. It consists of a conical tube nearly nine feet long, terminating in a bell, like the horn: in this tube are ten holes, all of which are stopped by keys; it has a mouthpiece exactly like that of the serpent, and its compass is from B, the third space below, to C, the fifth additional space above the staff.

OPHIOCARYON, *of'-e-o-kai'-re-on* (Gr. *ophis*, a serpent; *karuon*, a nut), in Bot., a gen. of the nat. ord. *Sapindaceæ*. *O. paradoxum* is the snake-nut tree of Demerara, so called from the large embryo of its seed resembling, in a remarkable degree, a coiled-up snake.

OPHIOGLOSSUM, *of'-e-o-glos'-sum* (Gr. *ophis*, a serpent; *glossa*, a tongue), in Bot., a gen. of ferns, forming the type of a sub-ord. called *Ophioglosseæ*. The species *O. vulgatum* is the common adder's-tongue. It has long been employed as a vulnerary, and in some districts is much used in the preparation of a popular ointment.

OPHTHALMIA, *of-thall'-me-ä* (Gr. *ophthalmos*, the eye), in Med., is an inflammation of the eye. Under this head may be included inflammation of all the various parts that enter into the formation of the eye. General ophthalmia is of very rare occurrence, the disease being in the great majority of cases confined to some one of the parts, and having a distinct name; as conjunctivitis, iritis, or corneitis, denoting inflammations of the conjunctiva, iris, or cornea, respectively. The





most frequent form of ophthalmia is inflammation of the conjunctiva, or white of the eye. It may be caused by the presence of any irritating body, and is frequently produced by cold, when it is known as catarrhal ophthalmia. In it the eyes are bloodshot, the redness being produced by injection of the network of vessels which covers the white of the eye; the lids are swollen, with a good deal of smarting and itching, and a feeling as if there were sand or some foreign body in the eye. There is at first lachrymation, which is soon followed by the secretion of a little muco-purulent discharge, which accumulates at the corners of the eyes. This is ordinarily a mild and manageable complaint, and may, in most cases, be got rid of by rest, a brisk purgative, and the occasional application of tepid water, or milk and water, to the eye. If the inflammation does not subside in a day or two, the eye may be bathed several times a day with a dilute solution of alum or of sulphate of zinc; and, in severe cases, blood-letting, either general, or more commonly local, by means of cupping-glasses or leeches applied to the temples. A much more severe form of conjunctivitis is *purulent ophthalmia*, or as it is frequently called, *Egyptian ophthalmia*, from its having been brought into this country by the army returning from the expedition to Egypt during the wars of the first Napoleon. In this all the symptoms of the preceding are greatly aggravated. The conjunctiva is red and swollen, rising up like a wall round the cornea; the eyelids are tense, livid, and often enormously swollen; a copious secretion of muco-purulent matter is poured out, and there is a burning pain in the eye, with inability to bear the light. It requires prompt and decided treatment, as there is always great risk of permanent injury to the eye, from its tendency to produce thickening and granulation of the conjunctiva of the lids, or ulceration and sloughing. In the severer forms of the disease recourse must be had to bleeding, either general or by means of cupping-glasses or leeches, and purgatives, and the various other anti-phlogistic means employed. The eye should be frequently cleansed with warm water, or a weak warm solution of alum or bichloride of mercury, and one or two drops of a weak solution of lunar caustic (from two to four grains to an ounce of water) should be let fall into the eyes once or twice a day. Infants of a few days old are often subject to a very severe form of inflammation of the conjunctiva, to which the name of *ophthalmia neonatorum* (ophthalmia of new-born infants) has been given. In mild cases, bathing or cleansing the eye several times a day with a weak warm solution of alum may be all that is necessary; in severe cases a leech should be applied to the temples, purgatives administered and a weak solution of nitrate of silver applied to the eye daily. *Strumous* or *scrofulous ophthalmia* occurs in children of scrofulous habit, and is chiefly remarkable for the extreme intolerance of light by which it is accompanied. The child keeps his head down, shelters his eye with his hand, and avoids the light. The eye itself presents little appearance of inflammation, merely a faint blush of redness; but in many cases little pustular elevations form upon the edges of the cornea. In such cases the treatment should be chiefly adapted to the constitutional disorder from which it springs. Pure air and exercise, mild aperients, and tonics, especially bark and iodine should be administered, and the general health carefully attended to. Slightly astringent lotions may also be applied to the eyes, and in the earlier stages a few leeches, or blisters behind the ears, are of great service. In sclerotitis, or inflammation of the sclerotica, when pure (but it is apt to be conjoined with inflammation of the conjunctiva, cornea, or iris), the redness of the eye is of a pink tint, forming, when most marked, a zone round the cornea, and gradually shading off towards the circumference of the eye. There is always considerable pain, of a dull, heavy kind, which often extends all round the orbit, or over the forehead, and is accompanied by an intolerance of the light and a profuse secretion of hot tears. Warm fomentations are of service locally; besides which, a dose of calomel and opium at bedtime, followed by a purgative on the following morning, will generally remove the affection. In severe cases, blood-letting, and counter-irritation by means of blisters, are like-

wise necessary. The other forms of ophthalmia are much less common than the above, and their mode of treatment does not differ materially from that just given.

Opium, *o'-pe-um* (Gr. *opos*, juice), the inspissated juice of a species of poppy (*Papaver somniferum*), originally a native of the East, but now naturalized throughout most of Europe. The best opium is procured by making longitudinal incisions in the green capsules, which contain a prodigious number of seeds. The incisions are made during the evening, and the milky juice which exudes is allowed to remain for twenty-four hours to acquire consistence, when it is removed, and the process repeated. The period of sowing this poppy is in the autumn, when the seeds are the only object, and at the end of the following July, or beginning of August. The root of the plant is annual, and gives out a stem from two to four feet in height, which is glaucous. The flowers are terminal, white or light grey, and three or four inches in diameter. Opium is the most energetic of narcotics, and one of the most valuable of all medicines. In procuring relief from pain at all times, it is invaluable; it is an efficient remedy in cholera, spasmodic affections, convulsions, tetanus, neuralgia, &c. It is most commonly used for the purpose of procuring sleep; but its habitual use is attended with very pernicious effects. A full dose is exhilarating; but if taken in large quantities, it produces dangerous and fatal results. Laudanum is a liquid preparation of opium made with alcohol, and its effects on the human system are similar to those of opium. The principal countries in which opium is prepared are India, Turkey, and Persia. Indian opium is of three kinds; of which the chief are Patna, grown in the provinces of Bahar and Benares, the former of which is most esteemed; the third kind, produced in the province of Malwa, is still less esteemed than that of Benares. The best-esteemed opium, however, is that obtained from Turkey. The opium of commerce is in masses of different sizes. It is rather hard, brown in colour, and possesses a bitter, acrid, and nauseous taste. Its odour is characteristic, and when heated in the air, it kindles, but does not burn readily. Its analysis shows that it contains acidulous meconate of morphia, extractive matter, mucilage, fecula, resin, fixed oil, caoutchouc, a vegeto-animal substance, débris of vegetable fibres, occasionally a little sand, together with a white crystalline salt of opium, known as *nicotine*. There are some valuable papers on the manufacture of opium in the eighth and ninth volumes of the "Journal of Science of the Royal Institution of Great Britain," and in the first volume of the "Edinburgh Philosophical Journal." The opium trade is most important in its relations between India and China. Down to the close of last century it was a legitimate branch of trade in China; but from the year 1796 it has been contraband. Notwithstanding this fact, in little more than forty years the consumption of Indian opium rose from 1,000 to 27,000 chests per annum. Opium constituted about one half of the total value of British imports into Canton just before the opening of other Chinese ports to the British. In selling opium to the Chinese, there are no bills, bonds, or barter; pure solid silver,—Sycee silver, at so much per ounce, is insisted upon as the price. It has been conjectured that the merchants obtain more than a guinea a pound for opium in an average of years; there are no means, however, of estimating this correctly. The retail price in the country is enormous. (*See* Papaver.)

Opium Alkaloids, *morphine*, *codeine*, *papaverine*, *narcotine*, *thebaine*, *narceine*, and *meconine*, all of which form well-marked salts with the acids. It also contains *meconic* and *thebolactic* acids. These principles are very fully described in Miller's "Elements of Chemistry," Part III., to which the student is referred. They are extracted from opium by a very simple process. They exist in the raw drug as difficultly crystallisable meconates. Chloride of calcium is, therefore, added to the aqueous solution, by which means the more easily crystallizable hydrochlorates of the bases are formed in the liquid, and meconate of lime is precipitated. From the clear solution the hydrochlorates of morphine and codeine crystallize first, leaving the others dissolved in the mother liquor. The morphine and codeine salts are separated by solution in water, to which excess of ammonia is added. This throws down the morphine, the hydrochlorates of codeine and ammonia remaining in solution. Morphine is the only base which demands an extended notice. It is found in opium in combination with meconic acid. In the pure alkaline state it crystallises in short rectangular prisms, soluble in 1,000 parts of cold and 400 of boiling water. The solution has an intensely bitter taste, and turns yellow turmeric-paper to a deep brown. Boiling alcohol dissolves it abundantly; but it is insoluble in ether. Morphine is a powerful sedative, and is much used in medicine, either in the form of hydrochlorate, acetate, sulphate, or citrate; the first-named being the most frequently used. The other bases have as yet received no very extended use either in pharmacy or manufactures.

Opopanax, *o-pop'-a-naks* (Gr. *opos*, juice; *panax*, the panacea herb), a fœtid gum-resin, which formerly enjoyed a high repute as an antispasmodic medicine. It is imported into this country from Turkey in irregular-shaped, but usually angular pieces, of a reddish colour. It is not now officinal in our pharmacopœias. It appears to be obtained from incisions made in the root of an umbelliferous plant, to which the name *Opopanax chiron* has been given.

Opossum, *o-pos'-sum* (*Didelphis*), an animal belonging to the family of *Mammalia* in the animal kingdom, and its section *Marsupialia*, and it is a native of the American continent. The opossum is characterised by having ten cutting-teeth above, eight below, and a prehensile tail, besides the peculiar characteristics of the order to which it belongs. (*See* Marsupialia.) The Virginian opossum (*Didelphis virginiana*) is one of the best examples of the tribe, and it may be thus described. The length of its head and body taken together is about 22 inches, and of its tail 15 inches; its fur is long and woolly, with very long hairs interspersed with that on the upper surface of the body; the general colour is dirty white, tinged with a slight yellowish hue; the legs are dusky brown; the eyes are surrounded with the same tint; hair on the upper parts of the body, of a deep brown, or blackish at the tip; the ears are large and naked, and are marked with white at the tip. This opossum is one of the largest species of the genus, and its form is robust, the head very large, and the fur long and woolly. It inhabits North America, and is found from Mexico to the southern provinces, inhabiting principally the states of Virginia, Louisiana, Mexico, and even Brazil and Peru. It is very destructive to poultry, and sucks the blood while eating the flesh, according to Pennant. It also feeds on roots and wild fruits, in the pursuit of which it is very active in climbing trees, from the branches of which it hangs suspended by its prehensile tail, swinging its body, which enables it to throw itself into the branches of neighbouring trees. When pursued and overtaken, the opossum will often feign itself dead, in order by this stratagem thus to escape its enemies. When first born, the young are blind, naked, and shapeless, and scarcely more than a grain in weight, and fasten themselves to the teats in the pouch, to which they continue adhered until fifty days, when they, being now about the size of mice, drop again into the pouch, but return to the teats when they require food. During this time, the female shows great affection for her young, and will rather suffer death than allow her pouch to be opened. The flesh of the old animals is good, its flavour somewhat resembling that of a sucking-pig; but the skin has a very fœtid odour. Besides the Virginian opossum, there are the *crab-eating opossum*, and many others.

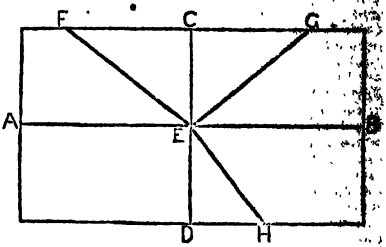
Optics, *op'-tiks* (from Gr. *optomai*, I see), a name given to that branch of science which treats of the nature and properties of light; of the changes which it undergoes in its qualities or in its course when passing through bodies of different kinds and shapes, when reflected from their surfaces, or when passing near them; of the structure of the eye, and the laws of vision; and of the construction of those instruments in which light is the chief agent. (For an account of the nature and general properties of light, *see* Light; and for its physiological action, *see* Eye.) Like the early history of all the sciences cultivated by the An-

ciasts, that of optics is veiled with obscurity; it would appear, however, that soon after the art of glass-making was discovered, lenses and spheres of glass were used as burning-glasses. By referring to the article upon *Light*, the reader will observe a slight sketch of the history of this science, and also a definition of the two hypotheses on which the propagation of light is accounted for,—the hypothesis of *emission*, and the hypothesis of *undulation*. In this article it is our intention to treat of optics principally as a mathematical science, without regard to either theory, merely tracing by mathematical calculation the results of certain experimental laws. From a bright object light emanates in all directions, and this light may be conceived to be made up of *rays*. By the term *ray* we intend to express the smallest quantity of light which can proceed in any direction; and we reason concerning rays as if they were geometrical lines. In the same way an object, in order to be a source of light, must be of finite, though it may be of very small dimensions; thus, a bright point, which is a source of light, is considered as a geometrical point. Any substance which allows the transmission of light through it is called a *medium*; and light can proceed either through a medium or in vacuum. A *pencil* of rays is an assemblage of rays proceeding from a luminous point. In form, pencils are considered conical, and the axis of the cone is called the axis of the pencil. A conical pencil may consist either of convergent or of divergent rays; if the rays are proceeding from some source of light towards a point, the pencil is convergent, and divergent when the rays are proceeding from a luminous point. If rays are parallel, the pencil is neither convergent nor divergent. The direction of a ray of light proceeding in a uniform medium or in vacuum is rectilinear; but when it is incident on the surface of a medium, it is generally divided into three parts. One portion is reflected according to a regular law, and is called the *reflected ray*; another portion enters the medium according to a regular law, and forms the *transmitted* or *refracted ray*; a third portion is *scattered*, that is, reflected in all directions, without any regular law. It is the third portion which renders objects visible. There is also a certain portion of light besides the reflected, refracted, and scattered portions, which is *absorbed* by the medium. In the case of polished metallic surfaces, the reflected ray is the only one which sensibly exists; and generally the relative intensities of the reflected and refracted rays vary with the circumstance of the incidence and also with the nature of the medium. The angle which a ray of light falling upon a plane surface makes with the line perpendicular to the surface, or the *normal*, is called the *angle of incidence*, and the angles which the reflected and the refracted rays respectively make with the same line are called the *angles of reflection and refraction*. When a ray is incident on a curved surface, it is reflected or refracted in the same manner as if it fell upon the plane which touches the surface at the point of incidence; and the angles of incidence, reflection, and refraction, are those which the incident, reflected, and refracted ray, respectively, makes with the normal to this plane. The following are the laws of reflection:—First, *the incident and reflected ray lie in the same plane with the normal at the point of incidence, and on opposite sides of it.* Second, *the angles of incidence and reflection are equal.* And the following are the laws of refraction:—First, *the incident and refracted ray lie in the same plane with the normal at the point of incidence, and on opposite sides of it.* Second, *the sine of the angle of incidence bears to the sine of the angle of refraction a ratio dependent only on the nature of the media between which the refraction takes place, and on the nature of the light.* The true law of refraction was discovered by Willebrord Snell, professor of mathematics at Leyden, in 1613. The discovery was at first erroneously attributed to Descartes. According to the second law of refraction mentioned above, if we call the angle of incidence $\phi$, and that of refraction $\phi'$, we shall have $\sin.\phi = \mu \sin.\phi'$, where $\mu$ is a quantity independent of the angles of incidence and dependent only on the nature of the media and the light. Thus it will have one value for refraction from a vacuum into glass, and another from glass into water, &c.; it will also have one value for blue light, another for red; and so on.





The quantity $\mu$ is called the *refractive index*, and is greater than 1 when refraction takes place from a vacuum into a medium, and, as a general rule, is greater than 1 when the refraction is from a rarer to a denser medium; and less than 1 when the opposite is the case. These laws may be deduced from actual observation by the following experiment, and may be made susceptible of considerable accuracy if proper precautions be taken. Take a rectangular card, and let its opposite sides be bisected by the lines AHB, CHD.




Then immerse the card perpendicularly in water as far as the line AB, and place it in such a position that a very small beam of sunlight, admitted through an opening in a shutter of a darkened room, may be incident along the line FE, on the surface of the water at E. A portion of this ray will then be observed to be reflected in a direction such as EG; and in measuring CF, CG, they will be found to be equal; hence it will be seen that the angles FEC, GEC, are equal; and it is manifest that FE, CE, and GE are in the same plane, as they are all in the plane of the card. Again, the ray EH, transmitted through the water, is the *refracted* ray, which is also manifestly in the same plane with FE and DE. If, also, the lines CF and DH be measured from different angles of incidence, and CE and HE computed from them, it will be found that the ratio CF : EF :: DH : EH, is the same, whatever be the direction of the ray. The ratio will not, however, be the same if another fluid be substituted for water, or if the colour of the light be altered. The names of *prisms* and *lenses* have been given to those transparent bodies which are most useful in optical experiments and in the construction of optical instruments. The different forms of lenses will be found described in the article upon Lens. A prism is a solid piece of glass having three plane surfaces, which are called its refracting faces, the light passing through any two of them. One of the most remarkable and interesting phenomena connected with refraction by prisms is the total reflection which takes place within the transparent medium. The light is far more brilliant than that obtained from polished silver, which gives more reflected light than any other metal. The phenomenon of total reflection may be seen by filling a tumbler with water and holding it above the head, so as to see the image of a candle reflected from the lower side of its surface when at rest. Diamonds and precious stones, and cut-glass ornaments, are often cut so as to return to the eye light that has undergone total reflection. Another remarkable effect produced by refraction by prisms, is the proof that white light is a *compound element*. The constituent parts or colours which compose white light are seven in number,—red, orange, yellow, green, blue, indigo, and violet. The received doctrine of colour depends on the different refrangibility of the rays of light. White light is decomposed into its seven component parts when it is allowed to pass through a prism. A beam of parallel rays is admitted through a small aperture in a window-shutter, and suffered to fall on one side of a prism, through which it passes under peculiar conditions. It does not pass in its original path, but is refracted unequally in its transit; and on leaving the prism it diverges, and casts upon a screen an oblong figure, called the prismatic spectrum, with curved extremities, divided into seven unequal breadths, each breadth occupied by a distinct and separate colour. The order of the colours, taking them from the bottom of the spectrum, is as we have given it above,

—the red rays being least refrangible and the violet most; and the refractions of the intermediate colours increasing from the red upwards. (*See* SPECTRUM.) White light is considered to be composed of at least three primary colours,—red, blue, and yellow; and any one of these is complementary to the other two. Thus, when the eye is strongly impressed with one colour, it becomes, by some physiological action, pre-eminently fitted to see and appreciate the complement of that colour. For instance, if the eye be fixed upon a bright *red* wafer for some time, and then suddenly directed towards a sheet of plain white paper, a spectral image of the wafer will be seen of a *green* colour; green being the complementary colour of red. Orange is the complementary colour of blue, and purple of yellow. (For a description of the various optical instruments, with their construction, *see* MICROSCOPE, TELESCOPE, &c.)—*Ref.* Sir David Brewster on *Optics*, in the *Encyclopædia Britannica*; or Sir John Herschel on *Light*, in the *Encyclopædia Metropolitana*.

OPTIMISM, *op'-tim-izm* (Lat. *optimus*, the best), in Philos., is that doctrine which maintains that this world, considered as a whole, is the best that could have been made. This doctrine, in some form or other, is to be found in almost all the great schools of antiquity; more particularly among the Platonists, the Stoics, and the Alexandrians. Anselm and Aquinas were its chief advocates in the middle ages; but it was most fully developed by the schools of Descartes and Leibnitz in modern times. The scheme of optimism advocated by the latter is expounded in his "Theodicea." According to Dugald Stewart, the optimism of Leibnitz "differed from that of Plato and of some other sages of antiquity in considering the human mind in the light of a spiritual machine, and of consequence, in positively denying the freedom of human actions. According to Plato, everything is right, so far as it is the work of God," and "the permission of evil does not detract from the goodness of God;" but the optimism of Leibnitz, "in the judgment of the most impartial and profound inquirers, leads by a short and demonstrative process to the annihilation of all moral distinctions. Voltaire has made optimism the subject of boundless ridicule in his "Candide."

OPUNTIA, *o-pun'-she-ä* (from *Opuntis* (*opus*), a city of the Locri, near which it flourished), in Bot., a gen. of the nat. ord. *Cactaceæ*. *O. vulgaris* is the prickly pear, a plant remarkable for its thick, fleshy, spiny stems. It flourishes in America and in the south of Europe, and has frequently been drawn in the foregrounds of pictures of Spanish and Italian scenery. Its fruit is edible, and has lately been imported into this country. The fruit of *O. Tuna* is of a carmine colour, and has been employed as a water-colour. *O. cochinellifera*, the Nopal plant, is cultivated in Mexico and other parts for the nourishment of the cochineal insect (*Coccus cacti*).

OR, *or*, the French term for gold, by which this word is expressed in heraldry. In engraving, it is denoted by small points all over the field or bearing. It may be supposed to signify, of itself, generosity, splendour, or solidity; whilst, according to some heralds, if it be compounded with *Gules* (red), it signifies courage; azure (blue), trust; vert (green), joy; *purpre* (purple), charity; and sable (black), constancy.

ORACLE, *or'-a-kl* (Lat. *oraculum*, from *os*, *oris*, the mouth), among the ancients was a response made by some deity in reply to a question on some matter of importance. The name was also applied to the sacred place where these answers were communicated. The credit of oracles was so great that no business of any importance was undertaken without consulting some oracle; and their answers were generally given in dark and ambiguous phrases, so that they might be interpreted to correspond with whatever happened. The responses were given by the priest or priestess of the god, and they frequently consisted of incoherent words uttered in a state of delirium or divine inspiration. Sometimes they were given by signs; as the movement of leaves or the murmuring of the waters of a fountain. Responses were usually given in Ionic hexameters; but on account of the scandal to which their metrical defects occasionally gave rise, they were subsequently given in prose. Apollo was regarded as the great oracular deity, Jupiter being less frequently consulted. The Greeks had no fewer than twenty-two oracles for the consultation of this deity, the most famous being at Delphi. The most important oracles of Jupiter were at Olympia in Elis, and Dodona in Epirus, at both of which he only sent signs for man to interpret. In Italy there were no oracles where the priests spoke by inspiration. The Romans had not recourse to oracles so much as the Greeks. They trusted more to augury and the Sibylline books. The principal Roman oracles were those of Faunus, in the grove of Albunea, and on the Aventine hill, where the inquirer received his answer in sleep in prophetic visions; those of Fortuna, where the responses were given by lot; and that of Mars, which, in early times, existed at Tiora Matiene, and at which the revelation was given through a woodpecker. By degrees these mysterious deliverances lost their hold upon the public faith. The sceptical few had always secretly ridiculed them as the offspring of subtle, unscrupulous priests; but the politicians looked upon them with favour, as a means of advancing their interests, and not unfrequently directed the responses. Aristophanes made them objects of raillery; Demosthenes accused the Pythia of favouring Philip; and Cato of Utica disdained to interrogate Jupiter Ammon. The early Christians attributed the predictions of the oracles to the agency of demons; and Eusebius and others affirmed that they became silent at the birth of Christ; the reason assigned being that Christ then put an end to the power of Satan upon the earth. The Urim and Thummim, and the Bath Kôl (literally daughter of the voice, echo) of the Jews, have been supposed by some critics to resemble the heathen oracles.

ORANGE. (*See* CITRUS.)

ORANGEMEN, *or'-anj-men*, is the name given by the Roman Catholics in Ireland to their Protestant countrymen, on account of their adherence to the house of Orange. Tyrconnel, who had been appointed lord-lieutenant of Ireland by James II., attempted to hold the island for his master, and was supported by the Catholics, while the Protestants declared for William. The battle of the Boyne (1690) gave the superiority to the latter, and the Catholics were exposed to the most cruel treatment, in addition to being subjected to heavy civil and religious disabilities. The first Orange lodge constituted for mutual defence and for supporting church and state, was formed in 1795 in the county of Armagh, and another in 1798 in Dublin, the members of which published a declaration of their principles. They gave rise to great disturbances, and, after a parliamentary inquiry, they were broken up at the request of the House of Commons; but were revived in 1845. In 1857 the lord-chancellor of Ireland ordered that justices of the peace should not belong to Orange clubs. When the Prince of Wales visited Canada in 1860, the Orangemen there behaved in a very rude and excited manner.

ORANGERY, *or'-anj-re*, a hothouse built especially for the culture of the orange in cold climates during the winter. According to McIntosh, in his "Book of the Garden," orangeries are often partially architectural, having the front consisting of Doric, Ionic, or Corinthian columns, though also often plain, with glass casements filling up the space between. The roof is slated, and the back, and often the ends, are solid walls. The trees are grown in large pots, vases, or boxes, in general entire cubes; sometimes they are slightly tapering towards the bottom, and occasionally they are ornamented. For very large trees they are of oak planking two inches thick, and are all very properly elevated upon feet, which keeps them clear of the ground, and admits of drainage and the free circulation of air around them. The majority of the orangeries on the continent have opaque roofs; but glass roofs are evidently better adapted to the climate of England, as the plants are so much longer shut up in them. The orangery, in conclusion, like the conservatory, is to be regarded more as a structure for the display of plants already grown than as one of mere culture; and it follows, therefore, that in all its details it should be rendered an agreeable saloon for promenade, opening out of the mansion to which it belongs. (*See* CONSERVATORY, &c.)

ORANG-OUTANG. (*See* OURANG-OUTANG.)

## Oratorio

ORATORIO, *or-à-to'-ee-o* (Ital.), a kind of musical drama, consisting of airs, recitatives, duets, trios, choruses, &c. The text is usually derived from some Scriptural subject; as, for instance, that of the "Messiah," of the "Creation," and of "Elijah." The origin of the oratorio is somewhat obscure. The most probable account is that which attributes its invention to St. Philip Neri, who, in 1540, organised, at the new chapel at Rome, certain musical performances, consisting of poems on sacred subjects, sung by first-rate singers, accompanied by the best instrumentalists, for the purpose of attracting large congregations, and of creating a zeal for religion. Though a somewhat profane method of effecting so sacred a purpose, it was entirely successful, and these performances, which at first were only poems in four parts, were in less than half a century after the death of Neri, in 1593, developed into those splendid compositions called by moderns oratorios. Italy, although the birthplace of the oratorio, has produced very few of any note. The Germans, on the contrary, excel in this species of composition; as a proof of this, it is only necessary to mention the names of S. Bach, Gaun, Haydn, Beethoven, Mozart, and, greatest of all, Handel. The oratorio was introduced into this country by the last-mentioned composer in 1720, and soon became very popular, and continued until after the death of Handel to be firmly established. About 1784, in consequence of bad management, it began to decline in public favour, and for some time ceased entirely. Of late years, however, it has been revived, and is, chiefly through the exertions of the Sacred Harmonic Society, rapidly regaining its former popularity.

ORATORY, *or'-à-to-re* (Lat., a place of prayer, from *orare*, to pray), is a name given by Christians to certain places of religious worship. In early Christian writers, the term is frequently applied to churches in general; but afterwards it came to be confined to private chapels or places of worship set up for the convenience of private families, yet still depending on the parochial churches, and differing from them in being strictly only places of prayer, and not for celebrating the communion.

ORATORY, ELOQUENCE, RHETORIC, are all words which, in their primary and etymological signification, have reference to public speaking alone. But as most of the rules for speaking are of course applicable equally to writing, an extension of the term has naturally taken place, and we find even in Aristotle, the earliest systematic writer on the subject whose works have come down to us, including in his treatise rules for such compositions as were not intended to be publicly recited. In the present day, taken in their widest acceptation, they comprehend all composition in prose; in their narrowest sense they are limited to what is termed "persuasive speaking." It is to the latter of these, as being more strictly the subject of oratory, that we shall direct attention. Oratory "reposes on psychology;" it is based upon the laws of the human mind. In attempting to persuade, our object is to generate conviction and volition in the minds of other men. Even in its lowest state, it requires a considerable acquaintance with human nature, and soundness of understanding; and, in its higher degrees, it requires also strong sensibility of mind, a warm and lively imagination, joined to correctness of judgment and an extensive command of the power of language. It has been frequently remarked how very few great orators the world has produced. For one great orator we have had hundreds of poets, philosophers, and men of science. The reason apparently is, that in this art a combination of a variety of endowments is required, such as are rarely to be met with in any one person. Foremost among the orators of antiquity stand the names of Demosthenes and Cicero. To which of these masters the palm of superiority is to be assigned is by no means agreed. Each excelled the other in his own particular style; Demosthenes in fire and impetuosity, and power of agitating the fiercest passions in the human breast; Cicero in art and polish, gently and artfully carrying conviction to the mind. The style of Demosthenes exhibits few attempts at philosophical reflection, few prominent ornaments, and has no pretension to wit or humour, and yet, says David Hume, "could it

## Oratory

be copied, its success would be infallible over a modern assembly." It has been described by one of the ancients as inspiring the hearers with all the greatest incident to humanity, and with an agitation as fierce as that which raged among the initiated during the celebration of the mystic rites of Cybele. In Cicero's orations his art is conspicuous. Everything appears in its proper place. In clearness of method he surpasses Demosthenes, and his arguments are arranged with exact propriety. He begins by attempting with much address to prepossess his hearers, and studies to gain their affections. He never tries to move till he has attempted to convince; and in moving, particularly the softer passions, he is highly successful. No one ever knew the force of words better than Cicero. He rolls them along with the greatest beauty and magnificence, and in the structure of his sentences is eminently curious and exact. The ancients distinguished oratory as being either demonstrative, deliberative, or judicial. The first was designed to offer praise or blame with reference to matters of the present time, and included funeral orations, panegyrics, invectives, &c.; the second was to exhort or dissuade with reference to the future, and included moral lectures and all instructive oratory; the third related to accusation or defence of past conduct, and included all pleading. Modern eloquence has been distinguished as that of the senate or popular assemblies, the bar, and the pulpit. The British Parliament has produced comparatively few great speakers; the principal being the two Pitts, Burke, Fox, Canning, and Gladstone. Along with the last of these may be mentioned Bright and Lord Derby, as the greatest speakers of the present day. At the bar, too, as compared with the ancients, we are far behind, owing in great measure to the difference of circumstance. With the ancients, the laws were few and simple, and the decision of causes was left in great measure to the equity and sense of mankind. Now, the system of law has become much more complicated, and except in a few cases, eloquence is confined to arguing from strict law, statute, or precedent. The art of speaking is thus but a secondary accomplishment, the chief object of a lawyer's education being a knowledge of law. In the early church, the most brilliant preacher was Chrysostom, who had diligently studied the Greek orators. His homilies, though sometimes displaying gorgeous imagery, were eminently practical, consisting chiefly of simple denunciations of vice and commendations of virtue. The finest examples of pulpit eloquence have probably been presented by the French preachers Bossuet, Bourdaloue, and Massillon. In England, Whitefield, Chalmers, and Robert Hall, have been most remarkable for power in the pulpit. Whitefield excited the highest interest, not only among the common people, but among courtiers and free thinkers, like Chesterfield, Bolingbroke, and Hume. The effect, however, was chiefly due to his manner; for his published sermons do not display any remarkable degree of power. Dr. Chalmers usually commenced in a slow, drawling, but solemn tone, and rose gradually till towards the close, when he reached the full power of his eloquence; and his power in some parts was likened by those who heard him to that of a tempest. He always bestowed the greatest labour upon his sermons, and eschewed all ornaments of style. The intellect of Hall was eminently acute and comprehensive; his imagination prompt, vivid, and affluent; and his style bore the very impress of these endowments. He was besides possessed of a tenacious memory and great aptitude for the acquisition of knowledge; but above all was his extraordinary and extemporaneous command of all the resources of language. He never delivered his sermons from manuscript, but either committed them to memory or preached extemporaneously. Of works on oratory, that of Aristotle is the earliest, and also the best and most systematic of those which the ancients have left to us. That of Cicero is most pleasant and interesting; but though abounding with excellent practical remarks, it is discursive and deficient in regularity, and hence unsatisfactory to the critical student. The "Institutions" of Quintilian is a philosophical and systematic production; but he has extended to an extravagant degree the province of the art, so that the greater part of his work is a treatise on

the general subject of education. Among the moderns, few writers of ability have taken up this subject. The "Philosophy of Rhetoric," by Dr. Campbell, is marked by depth of thought and ingenious original research, and will be found of much practical utility to the student. Less profound and original, but more popular, is Dr. Blair's "Lectures on Rhetoric." Whately's "Elements of Rhetoric" is a very useful work for the beginner; while to the philosophical student we would specially recommend the treatise on "Rhetoric" in the last edition of the "Encyclopædia Britannica," by the late Professor Spalding. "Every speech," says Campbell, "is intended to enlighten the understanding, to please the imagination, to move the passions, or to influence the will." When a speaker addresses himself to the understanding, he proposes the instruction of his hearers, and that either by explaining some doctrine unknown or not sufficiently comprehended by them, or by proving some position disbelieved or doubted by them. The imagination is addressed by exhibiting to it a lively and beautiful representation of a suitable object; the merit of the work consisting in the dignity, as well of the subject or thing imitated, as in the manner of the imitation, and resemblance in the portrait or performance. But in the third species of discourse, the ultimate object of the orator is not to astonish by the loftiness of his images, or delight by the beauteous resemblance which his painting bears to nature, but to appeal to the passions and emotions of the heart. When properly employed, such tropes and figures have a marvellous efficacy in rousing the passions, and by some secret, sudden, and inexplicable association, awakening all the tenderest emotions of the heart. Finally, and most complex of all, is that style of oratory which is calculated to influence the will and persuade to a certain line of conduct. It is in reality an artful mixture of that which proposes to convince the judgment and that which interests the passions,—the argumentative and the pathetic incorporated together. These acting with united force constitute that vehemence of contention which has always been regarded as the supreme qualification in an orator, and which gives him an irresistible power over the thoughts and purposes of his audience. In general, it may be asserted that each preceding species in the order above exhibited is preparatory to the subsequent; that each subsequent species is founded on the preceding, and that thus they ascend in a regular progression. "Knowledge, the object of intellect, furnisheth materials for the fancy; the fancy culls compounds, and by her mimic art, disposes these materials so as to affect the passions; the passions are the natural spurs to volition, or action, and so need only to be rightly directed." Cicero divides the business and art of an orator into five parts; viz.,—"He ought first to find out what he should say; next to dispose and arrange his matter, not only in a certain order, but with a sort of power and judgment; then to clothe and deck his thoughts with language; then to secure them in his memory; and lastly to deliver them with dignity and grace." These are invention, disposition, embellishment, memory, delivery. Invention, then, is the art of finding means or arguments fitted to inform, convince, persuade, or delight. The first step, however, is to lay down clearly, and in a suitable form (in the author's mind), the proposition or propositions to be maintained, so that he may always keep steadily in view the point he is aiming at, and avoid entering on too wide a field of discussion. Arguments are of various kinds; but there are two great classes, into one or other of which all arguments may be brought; viz.,—(1) such as might be employed to account for the fact or principle maintained, supposing its truth granted; and (2) such as could not so be employed. The former are manifestly arguments *à priori*, or from cause to effect, since to account for anything means to assign a cause for it. The causes from which our arguments are drawn must be such as are either admitted or may be proved to be actually existing or likely to exist. The other class of arguments are subdivided into two kinds, designated by the terms "sign" and "example." As far as any circumstance is what may be called a condition of the existence of a certain effect or phenomenon, be it or it may be inferred from the existence of that effect; and to this species of argument the term sign is applied. If it be a condition absolutely essential, the argument is, of course, demonstrative, and the probability is the stronger in proportion as we approach to that case. Of signs, there are some which, from a certain effect or phenomenon, infer the cause of it; and others which, in like manner, infer some condition which is not the cause. Of these last, one species is the argument from testimony, the premiss being the existence of the testimony; the conclusion, the truth of what is attested. Under the general name of example are comprehended arguments of induction, experience, analogy, &c.; all being founded on the principle that we consider one or more known individual objects, or instances of a certain class, as fair specimens in respect of some point or other of that class; and consequently draw an inference from them respecting either the whole class or other less-known individuals of it. Aristotle has divided examples into real and invented, the one being drawn from actual matter of fact, the other from a supposed case. Disposition is the art of arranging arguments so as to best fit them for producing the intended effect. The following rules are laid down by Whately, to be observed in the use of arguments:—(1) To consider whether the principal object of the discourse be to give satisfaction to a candid mind, and convey instruction to those who are ready to receive it, or to compel the assent, or silence the objections, of an opponent. (2) Matters of opinion are established principally by antecedent-probability (arguments from cause to effect), though the testimony of wise men is also admissible; past facts, chiefly by signs of various kinds; and future events by antecedent-probabilities and examples. (3) When arguments of each of the two formerly-mentioned classes are employed, those from cause to effect (antecedent-probability) have usually the precedence. (4) A proposition that is well known should in general be stated at once and the proofs subjoined; but otherwise it is usually better to state the arguments first, or at least some of them, and then introduce the conclusion. (5) If the argument *à priori* has been introduced in the proof of the main proposition in question, there will generally be no need afterwards of educing causes to account for the truth established; on the other hand, it will often be advisable to do this when arguments of the other class have alone been employed. (6) Refutation of objections should generally be placed in the midst of other arguments, but nearer the beginning than the end. (7) The arguments which should be placed first in order are, *cæteris paribus*, the most obvious, and such as naturally first occur. Persuasion properly so called, *i.e.* the art of influencing the will, requires (1) that the proposed object should appear desirable, and (2) that the means suggested should be proved to be conducive to the attainment of that object. Of the different emotions and springs of action which an orator may find it necessary to call into action, or to contend against, our limits prevent our entering upon; but on the general subject of persuasion, it is important to observe, in an address to any passion, sentiment, feeling, &c., that it should not be introduced plainly or avowedly as such, otherwise the effect may be in a great measure lost. In order to excite the feelings, it is also necessary to employ some copiousness of detail, and to dwell somewhat at large on the several circumstances of the case, being careful at the same time not to weary the hearer with too long a description. Comparison is a powerful means of exciting or heightening any emotion; and the tone of feeling manifested by the speaker himself has a great effect in exciting the same feeling in the minds of his hearers. (For the diction, language, or style of oratory, *see* STYLE; and for the other parts, *see* MEMORY and MNEMONICS, and DELIVERY.)—*Ref.*, more particularly the works on *Rhetoric* of Aristotle, Campbell, Whately, and Spalding.

ORATORY, PRIESTS OF THE, a religious order, founded by St. Philip Neri at Rome, about 1564, and approved by Gregory XIII. in 1577. They devoted themselves to exercises of devotion and charity, and soon made great progress in other parts of Italy. A French branch of this order was originated by Cardinal Bérulle in 1611, and sanctioned by Pope Paul V.,

under the title of the *Oratory of Jesus*. They subsequently made great progress in France and other countries; and within the last few years certain of the "fathers of the Oratory" have established themselves at Brompton, London.

ORB, ORBIT, *orb, or'-bit* (Lat. *orbis*).—Amongst ancient astronomers, orbs were vast crystal spheres, in which the heavenly bodies were supposed to be placed, and with which they revolved. Hence the term came to be applied to a sphere; as when the sun is called the "orb of day." In Astron., an *orbit* is the relative path in which a planet travels round the sun, or a satellite round its primary. The orbits of all the planets and satellites are ellipses; and it would also appear that the orbits of double stars, which revolve about each other, are curves of a similar kind. The orbits of some comets are supposed to be hyperbolic curves.

ORCHELLA WEEDS. (*See* ROCCELLA.)

ORCHESTRA, *or'-kes-trā* (Gr. *orchestra*, from *orcheisthai*, to dance).—In the ancient Greek theatre, the orchestra was that part in which the chorus was situated, and where the dances were performed. At the present day, the term is applied to that part of the theatre in which the instrumental band is placed, and that portion of a concert-room which is allotted to the performers, both instrumental and vocal. Sometimes the term orchestra is applied not only to the place assigned to the musicians, but often used to designate the whole of them collectively. The instrumental performers in our theatres, up to the end of the 17th century, were stationed in a box on the side of the stage, and out of view of the greater part of the spectators. They are now placed just below the stage, in front, so as not to interrupt the sight, and so situate as to enable the singer to have in view the conductor and leader,—a matter of great importance in the musical drama.

ORCHIDACEÆ, *or-kid-ai'-se-e* (from Lat. *orchis*), in Bot., the Orchis fam., a nat. ord. of *Monocotyledones*, sub-class *Petaloideæ*, known by its irregular flowers; by the peculiar form which one piece of the perianth (called the *labellum*, or *lip*) assumes in many cases, so as to cause the flower to resemble some insect, reptile, or bird; by its gynandrous stamens; by its pollen cohering in grains or waxy masses; and by its 1-celled inferior ovary with 3 parietal placentas. The orchids are remarkable for the singularity, beauty, and fragrance of their flowers; and new species or varieties are highly prized by horticulturists. Mr. Darwin has recently thrown much light upon the structure of these curious plants, and revealed many wonders respecting the modes in which they are fertilized by the agency of insects. Orchids are more or less abundantly distributed in nearly every region of the globe. Some are terrestrial, and occur chiefly in temperate regions; others are epiphytal, and are confined to hot climates. According to Lindley, there are about 460 genera and 3,000 species. Vanilla is the most important commercial product of the order.

ORCHIS, *or'-kis* (Lat.), in Bot., a gen. of the nat. ord. *Orchidaceæ*. The roots of several species, as those of *O. mascula* and *O. morio*, when dried, form European or indigenous *salep*. That prepared from the first-named species is said to be the best. Salep contains the principle called *bassorin* and a little starch; it possesses similar properties to those of starchy and mucilaginous substances generally.

ORDEAL, *or-de'-al* (Sax. *ordael*, from *or*, great, and *dele*, judgment), was a manner of trial practised in early times, particularly among our Saxon ancestors, being founded upon the belief of an actual interposition of God to free the innocent and condemn the guilty. Hence it received the name of *Judicium Dei* (God's judgment). Perhaps the earliest trace of this practice is to be found in the "waters of jealousy," mentioned in the book of Numbers (ch. v.), which the Hebrew women suspected of incontinency were required to drink as a test of their innocence. It appears to have been practised also by the ancient Greeks; for in the "Antigone" of Sophocles, a person suspected by Creon of a misdemeanour, declares himself ready "to handle hot iron and to walk over fire;" and Grotius gives many instances of water-ordeal in Bithynia, Sardinia, and other places. The ordeals common in Europe in the middle ages were of two kinds,—viz., fire and water; the former being chiefly confined to persons of high rank, the latter to the common people. Fire-ordeal was performed either by taking up in the hand unhurt a piece of red-hot iron, or else by walking barefoot and blindfold over nine red-hot ploughshares laid lengthwise at unequal distances. If the party escaped unhurt, he was adjudged innocent; but if not, as without collusion was usually the case, he was condemned as guilty. The water-ordeal was performed either by plunging the bare arm up to the elbow in boiling water, and escaping unhurt thereby, or by casting the person suspected into a river or pond of cold water; and, if he floated without swimming, it was evidence of his guilt; but if he sunk, he was acquitted. The judicial combat or duel was a very common mode of appealing to heaven, in Germany, in early times. The *corsned*, or consecrated bread and cheese (*panis ordaceus*), was the ordeal to which the clergy commonly appealed when accused of any crimes. If the culprit swallowed the bread and cheese freely, he was declared innocent; but if it stuck in his throat, he was pronounced guilty. A decree of the fourth Lateran council (1215) was issued, declaring against trial by ordeal, as being the work of the devil; and it was condemned by an order of council in the third year of Henry III. There can be no doubt that much priestly jugglery was practised in connection with ordeals, and that tricks and artful preparations were made use of to enable the suspected to pass through the ordeal without injury.

ORDER, *or'-der* (Lat. *ordo*, Fr. *ordre*), in Nat. Hist., is the subdivision of a class; orders being further divided into genera, which are again subdivided into species.

ORDER, in Bot., a division of a *Class*, comprising *genera* varying in some respect from each other, but having the essential characters of the group. Thus Mustards, Turnips, Radishes, and Cabbages, all belong to different genera, but they all agree in their general structure, and are hence included in the order *Cruciferæ*. Again, Larches, Pines, and Cypresses, are different genera; but they all bear *cones*; and are hence placed in one order,—*Coniferæ*. (*See* BOTANY.)

ORDER, in Eccl. affairs, was originally applied to the laws or rules of a monastic institution, but was afterwards applied, in a secondary sense, to the several monastics living under the same rule or order. Thus, the order of Clugni signifies, literally, the rule of discipline prescribed by Odo; but in its secondary and ordinary sense, the great body of ecclesiastics who subjected themselves to that rule. (*See* MONACHISM.) Besides the monastic, there are usually reckoned among the religious orders in the Romish church, the military and the mendicant orders.

ORDERS, HOLY, is a character peculiar to ecclesiastics, whereby they are set apart for the ministry. This the Roman Catholics make their sixth sacrament. It is evident that in the apostolic and early church there were only three orders of ministers,—bishops, priests, and deacons. Besides these there are, in the Roman Catholic church, four minor or petty orders; viz., door-keepers, exorcists, readers, and acolytes. Those in petty orders may marry without dispensation; but, in effect, they are looked upon as little more than formalities, or degrees necessary to arrive at the higher orders, and are usually all conferred on the same day. For regulations respecting admission to holy orders in the Church of England, *see* Hook's *Church Dictionary*.

ORDINAL, *or'-di-nāl*, is the book which contains the forms of ordination for the various orders in the Church of England.

ORDINAL NUMBERS. (*See* NUMBERS.)

ORDINANCE, *ord'-e-nans* (Fr. *ordonnance*), is a law, rule, or prescript, a command of a sovereign or superior. Thus, statutes or acts of parliament are sometimes called ordinances. Formerly, there seems to have been a distinction made between acts and ordinances; the former being a perpetual law, and not to be altered but by the King, Lords, and Commons; the latter being only temporary, and capable of being altered by the Commons alone. This distinction is now lost.

ORDINANCES OF THE CHURCH, are the rites ordained by God to be the means of grace; as baptism, the Lord's supper, prayer, reading of the word, preaching, &c.

**Ordinary**, *or'-de-nā-re* (Lat. *ordinarius*), in common or canon Law, denotes one who has ordinary or immediate jurisdiction, in matters ecclesiastical, in any place. In this sense, archdeacons are ordinaries; but the term is most frequently applied to the bishop of a diocese, who, of course, has the ordinary ecclesiastical jurisdiction, and the collation to benefices within such diocese. An archbishop is the ordinary of the whole province, having power to visit and receive appeals from inferior jurisdictions. The Roman Catholic writers on canon law call the pope ordinary of ordinaries.

**Ordinary**, a term in Her. signifying a portion of the escutcheon comprised between straight and other lines. It is the simplest species of charge, and many of the oldest escutcheons contain no other bearing. A considerable number of ordinaries are in common use, each of which is usually bounded by straight lines; many of the lines, however, may be diversified in various ways. The chief ordinaries are the pale, fess, bend, bar, saltier, chevron, and cross. An ordinary bounded by serrated lines is said to be *indented*; by undulating lines, *nebuly* or *wavy*. Many other terms are used; as, *ingrailed, invected, raguly, embattled, angled, levelled, escartely*, &c. (*See* Heraldry.)

**Ordinary of Newgate** is the person who is attendant in ordinary upon the condemned malefactors in that prison to prepare them for death. He records the behaviour of such persons; and formerly it was the custom for the ordinary to publish a small pamphlet upon the execution of any remarkable criminal.

**Ordination**, *or-din-ā'-shun* (Lat. *ordinatio*), is the conferring of holy orders, or the act of initiating a person into the priesthood by prayer and the laying on of hands. By the Roman Catholics, ordination is regarded as a sacrament, a doctrine which is repudiated by the English church. The latter regards it as "a solemn ceremony of blessing, and devoting persons to the sacred function," performed by a bishop, in whom alone this power is vested. The candidate is required to be "a man of virtuous conversation, and without crime;" "learned in the Latin tongue, and sufficiently instructed in Holy Scripture." He must be twenty-three years of age before he can be ordained a deacon, and twenty-four before he can be ordained a priest. He must further have an appointment to some cure, bring letters testimonial from three beneficed clergymen, as to his life and doctrine, and subscribe to the Thirty-nine Articles and the Liturgy. In the Presbyterian and Congregational churches, ordination means the act of settling or establishing a licensed preacher over a congregation, with pastoral charge and authority. The great controversy between Episcopalians and Presbyterians is, the authority by which holy orders are conferred. The former hold that this authority is vested only in the bishops; and those of them who maintain apostolical succession, hold that this power or authority has descended in unbroken succession from the days of the apostles to the present time, and deny the validity of orders, or even the existence of a church, where there are no bishops. The Presbyterians, on the contrary, contend that the presbytery, or a body of the clergy, have authority for this purpose.

**Ordnance**, *ord'-nāns*, a military term, applied generally to the great artillery which is used in war; as cannons, mortars, howitzers, carronades, &c. It is probable that the name was derived from the *compagnies d'ordonnance*, or fr[illegible] archers, instituted by Charles VII. of France in 1448. The first important improvements in the construction and use of heavy artillery were effected during the wars of the emperor Charles V. and Francis I.; but it was not till the beginning of the 17th century that artillery began to be extensively [illegible] to be employed between hostile armies. Up to [illegible] arguments [illegible] employment had been in the [illegible] since to account for any [illegible] fortresses. As early as 1632, [illegible] for it. The causes [illegible] and Swedes are said to have [illegible] drawn must be such as [illegible] rather 2,000 pieces; amongst [illegible] proved to be actually [illegible] from six to 24-pounders. [illegible] other class of arguments [illegible] introduced an artillery which [illegible] designated by the terms [illegible] ying the rapid movements of [illegible] any circumstance [illegible] velopment of the horse artil- [illegible] the existence [illegible] principally due to the Prussian [illegible] may be infe[illegible] in the general term ordnance

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were formerly comprised guns of five sorts: shot-guns, shell-guns, howitzers, carronades, and mortars. To these may now be added the shot and shell-guns of the rifled ordnance. (*See* Artillery, Armstrong Gun, Cannon, &c.)

**Ordnance, Board of.** (*See* Board of Ordnance.)

**Oreodaphne**, *o-re-o-daf'-ne*, in Bot., a gen. of trees belonging to the nat. ord. *Lauraceæ*. Several species yield valuable timber; thus, *O. exaltata* yields the *sweet-wood*; *O. fœtens*, the *til* of the Canaries; and an unknown species the *siraballi* of Demerara.

**Ores**, *ōrez* (Sax. *ore*, ore).—Metals when found in combination with other substances, such as oxygen, sulphur, arsenic, &c., are called *ores*. They are usually found in veins of various thickness, and at various depths in the earth. The mode of obtaining them is to penetrate the surface of the earth till the vein is reached, and then to follow it in the direction in which it may lie. The place thus penetrated is called a *mine*, and the workmen engaged are called *miners*. (*See* Mining.) After the ores are drawn up from the mine, they usually go through several processes before they are in a state fit for use. In metalliferous veins, generally, the deposits of ore are extremely irregular and much intermixed with gangue or vein-stone. It is usual, in excavating the lode, for the miner to effect a partial separation of the valuable from the worthless portion. The valuable part is then removed to the dressing-floors, while the other portion is either used for filling up excavations in the mine or sent to the surface to be lodged on the waste heaps. The process known as the *dressing of ores* includes a series of operations. It is chiefly restricted to mechanical treatment in this country, while the smelter performs the chemical manipulation. The usual resources of the dresser include hand-labour, picking, washing, sizing, reducing by machinery, &c. Sometimes, however, he may find it useful to have recourse to the furnace; since it may happen that by changing slightly the chemical state of the substances composing the ore, the earthy parts may become more easily separable. The ores of tin are often calcined in this manner; so that not only is the arsenic separated, but the iron and copper are oxidized, and a much purer oxide of tin produced. These are, however, exceptional cases; in general, the picking, crushing, or stamping processes are immediately succeeded by the washing of the ores. Some ores are first washed in running water to clear them from loose earthy particles; they are then mixed with combustible substances, and burned or roasted, in order to rid them of the sulphur or arsenic with which they may happen to be combined, and which rises from them in the form of a heavy vapour or smoke. When freed from these impurities, they undergo the operation of smelting, in furnaces constructed according to the nature of the various ores, or the ores to which the metals are afterwards to be applied. (*See* Iron Manufacture, Smelting.)

**Organ**, *or'-gān*, the largest and grandest of all musical instruments. Its immense power and solemnity of tone render it supremely adapted to the sacred purposes to which it is usually dedicated. It is of very remote origin, and its early history is very obscure. The first idea of an instrument of this kind was doubtlessly derived from the *syringa* of Pan, which, although at first only consisting of six or seven reeds secured together by wax, was, after several centuries had elapsed and many fruitless attempts to improve it had been made, at last developed into an instrument which bore a slight resemblance in principle to the modern organ. It consisted of a wooden box, having a number of holes bored in the top, into which pipes of progressive lengths were fitted. From the back of the chest a small reed extended, through which the wind was introduced by blowing with the mouth. The tops of those pipes intended to be silent were stopped with the fingers,—a method which was found extremely inconvenient, and was soon superseded by the invention of *sliders* or *valves*, one of which was placed under the aperture of each pipe. Some time after, more pipes were added: this rendered an enlargement of the wind-chest necessary. It now became evident that a greater supply of wind than the human breath could give was

required; this led to the invention of the *bellows*. These, in some instruments, were worked by water, and in others by hand; the two methods being distinguished by the terms *hydraulic* and *pneumatic*. The invention of the hydraulicon is generally attributed to Ctesibius, a mathematician of Alexandria, who lived about 220; while that of the pneumatic organ is unknown, but is generally supposed to have taken place at an earlier date. Vitruvius, in his work on architecture, gives a very curious description of an hydraulic or water-organ: this is the earliest account we possess of any instrument of the kind. The date of the introduction of organs into the church is uncertain. Pope Vitalian is said to have been the first to admit of its use, about 670. The veracity of this statement, however, is open to doubt, and it does not seem at all certain that they were used in the service of the church until 755, when one was sent as a present by Copronymus, the Greek emperor, to Pepin, king of France, who placed it in the church of St. Corneille, at Compiègne. During the reign of Charlemagne, organs became common in most European countries, more especially in France and Germany. Shortly after, they came into general use in England. The instrument was still in a very primitive state; the keyboard had not yet been invented, and the organs of that time seldom possessed more than nine, or at most eleven notes; and when we remember that harmony was still unknown, it is easy to perceive that a larger number was unnecessary. Keys were invented about the close of the 11th century, when an instrument is said to have been erected in the cathedral at Magdeburg, having sixteen keys, each of which was an ell in length and three inches broad: these, of course, were not played with the fingers, as in the modern instrument, but struck down with the fist. In the 12th century more keys were added, and in the 14th they were improved in shape, made much smaller and neater, and again increased in number. Pedals were invented about this time. Organ-building seems to have made little or no progress in this country from the Reformation to the reign of Charles II. The puritanical spirit which then raged abolished all church music, except plain psalm-singing, and destroyed all the organs. After the Restoration, however, they were again employed in the church-service, and the art of building them was once more in a flourishing condition, and has continued to progress until, at the present day, the instruments made by English builders are *not* only equal in tone to those of our continental neighbours, but far surpass them in mechanical skill and delicate finish. Our limited space will not allow us to treat upon the construction of the modern organ; for to do so, even in the most condensed form, would occupy several pages; we must therefore content ourselves with referring our readers to Mr. Hopkins's excellent work on the history and construction of the organ, and to the celebrated work of Bedos de Celles, entitled "L'Art du Facteur des Orgues."

**Organ, Barrel**, an instrument much resembling in most of its effects a small keyed organ. Its keyboard is inside, and is acted upon by means of a cylinder *pinned* or *studded* in a rather curious manner, the studs being used instead of the fingers to strike the keys as the cylinder is made to revolve by turning a handle, which projects through one end of the case. These instruments are extremely common in London; indeed it is next to impossible to walk even a short distance without seeing one or two, often accompanied by monkeys, played by Italians, who are commonly called *organ-grinders*.

**Organic Analysis**, *or-gan'-ik* (Lat. *organicus*).—The connection between organic chemistry and animal and vegetable physiology is so great that it has been the aim of nearly every chemist of eminence to endeavour to perfect, as far as possible, the means of resolving organic compounds into their component parts. This branch of analysis has, therefore, now arrived at a very great state of perfection. Begun by Gay-Lussac and Thenard, and improved by Berzelius, Dumas, Bunsen, and above all by Liebig, the process has reached a degree of precision scarcely to be equalled by any other branch of physical investigation. Organic substances contain all, or some, of the four elements, carbon, hydrogen, oxygen, and nitrogen. The operations of organic analysis consequently have for their end the quantitative determination of these elements. It has been found in practice that the easiest way of determining the amount of carbon and hydrogen in a body is to supply it, while in a state of combustion, with sufficient oxygen to convert the former element into carbonic acid, and the latter into water. This is effected by mixing a known weight of the substance with oxide of copper or chromate of lead, and transferring the mixture to a tube of hard glass closed at one end. The other end communicates with a tube containing chloride of calcium to absorb the water, and a set of bulbs half filled with solution of caustic potash, to retain the carbonic acid. Heat is applied to the tube by means of a gas or charcoal furnace, and when the combustion is completed, the tube containing the chloride of calcium and the potash bulbs are weighed, the increase of weight giving the amounts of water and carbonic acid formed, from which the proportions of hydrogen and carbon are easily calculated. Should the substance contain nitrogen, it is heated with hydrate of soda and quicklime in excess, and the resulting gases conducted through hydrochloric acid, the amount of ammonia formed giving the proportion of nitrogen. The weight of the nitrogen, hydrogen, and carbon, deducted from the original weight of the substance, gives the oxygen. Should saline matter be present, it is determined by calcining a known quantity of the body. Chlorine, bromine, iodine, sulphur, and phosphorus are, if present, determined in the ordinary manner. The apparatus necessary for organic analysis is very expensive, a first-rate balance being an indispensable adjunct.—For a complete account of the apparatus required, and the methods to be pursued, the student is referred to C. G. Williams's *Handbook of Chemical Manipulation*, and Liebig's *Handbook of Organic Analysis*.

Organic and Inorganic Chemistry.—The division of chemistry into organic and inorganic is more arbitrary than real; the line of demarcation between the two becomes every day more and more indefinite. Many distinguished chemists have attempted to define the difference between the two branches of the science. Laurent calls organic chemistry "the chemistry of carbon;" Liebig, "the chemistry of compound radicles." The researches of modern chemists prove that the combination and decomposition of members of each division are regulated by precisely the same laws, both animal and vegetable compounds being now formed in the laboratory, that have hitherto had a purely organic origin. (*See* Synthesis.) In his new Manual of Chemistry, Dr. Odling wisely breaks down the barrier at once, and considers organic and inorganic compounds under the same head, it being impossible to separate them when they are arranged in a typical series. The distinction between *organic* and *organized* bodies is often lost sight of by writers. It will, therefore, perhaps, be as well to define it. Organic compounds are those that have an amorphous or crystalline structure and a definite composition; such as sugar, quinine, and acetic acid. They may, in certain cases, be obtained by the direct synthesis of their components from inorganic bodies. They are often spoken of as the proximate principles of plants and animals. Organized bodies are such as possess a rounded vesicular or fibrous structure, which, when once destroyed, cannot be restored, and form part of the system of the living animal or vegetable body. Starch, lignin, and cellulose, may be adduced as examples. They cannot be formed by synthesis of their components, being the result of vital assimilation. Organic compounds may, however, be formed from them by substitution; such as pyroxylin, xyloidin, and others. (*See* Chemistry.)

Organic Bases, in Chem.—Organic bases are compounds containing nitrogen united with other elements having a more or less alkaline reaction, and capable of forming neutral salts with ammonia. They are generally divided into two classes: 1. Bases obtained by artificial means, such as aniline, ethylamine, &c.; and, 2. bases existing naturally in vegetable or animal substances; as for instance, quinine, strychnine, morphine, krestine, &c. The researches of Hofmann, Wurtz, Cahours, and others, into the artificial organic bases, seem to indicate that no alkaline base can exist

without either nitrogen, or one of the nitrogen group of substances, entering into its composition; and that all bases, including those existing ready formed in the plant, are founded on the ammonia type. Aniline, for instance, has been proved to consist of ammonia, in which one atom of the hydrogen is replaced by an atom of phenyl; and it seems highly probable that quinine, strychnine, coniine, &c. &c., are also ammonias in which one or more of the equivalents of hydrogen are replaced by unknown complex atoms.

ORGANIC RADICLES.—An organic radicle is a group of elements, whether or not isolable, which may be transferred from one compound to another in exchange for one or more atoms of hydrogen or its representatives. They are divided into two principal classes,—those like ethyl, tetryl, &c., which have electro-positive properties, and form bases; and those like acetyl, formyl, &c., which have electro-negative properties, and form acids. Liebig was the first to apply this theory to the explanation of the composition of the alcohols and organic acids; and although his views on the subject were at first vigorously combated, they afterwards received the strongest confirmation from the researches of innumerable experimentors. The first of the alcohol radicles isolated was acetyl; others soon followed, and we daily hear either of the isolation of radicles already known to exist theoretically, or of the formation of new groupings acting as such. The theory of compound radicles has been applied with great success to the explanation of the composition and properties of numerous compounds belonging to inorganic chemistry. Thus the peculiar compound formed by the direct combination of chlorine and nitric oxide is regarded as the chloride of azotyl, $NO_2Cl$, the grouping $NO_2$, azotyl, acting as a metallic radicle; a view confirmed by the existence of at least two sulphates of azotyl. Of late years an important series of compounds, termed the organo-metallic radicles, has been discovered: cacodyl may be taken at the type of them. They are mostly formed by the union of a metal with one of the alcohol radicles, and act in combination precisely in a similar way to the metallic elements. (*See* CACODYL and ZINC METHYL.)

ORGANON, *or'-gă-non* (Gr., method), in Phil. denotes a body of rules or canons drawn up to guide in the investigation of truth. The two best-known works of this class are the *Organon* of Aristotle, and the *Novum Organon* of Bacon. (*See* ARISTOTELIAN and BACONIAN PHILOSOPHY.)

ORIFLAMME, *or'-e-flăm* (Lat. *aurea flamma*).—It was formerly the custom for all Catholic churches of any note to possess a flag or banner, and the one belonging to the abbey of St. Denis was called the *oriflamme*, from its colour; being a piece of red taffeta fixed on a golden spear, and cut into three points, each of which was adorned with a tassel of green silk. When Louis le Gros marched against the emperor Henry V., in 1124, he took this banner to accompany him in his expedition; and from that time, during nearly three centuries, the French monarchs were in the habit, on the commencement of a war, of receiving this banner with great ceremony from the hands of the abbot of St. Denis, to whom, at the conclusion of hostilities, it was returned.

ORIGANUM, *o-rig'-ă-num* (Gr. *oreiganon*, from *oros*, a mountain; *ganao*, I delight; because it grows on the sides of mountains), in Bot., the Marjoram, a gen. of the nat. ord. *Labiatæ*. *O. vulgare*, the common or wild marjoram, has similar properties to the other labiate plants. Its dried leaves have been employed as a substitute for Chinese tea. This, as well as the sweet marjoram (*O. Majorana*, or *Majorana hortensis*), may be used by the cook for flavouring.

ORIGENISTS, *or'-i-jen-ists*, were a Christian sect in the early church, that pretended to draw their opinions from the works of the celebrated Origen. They were founded by one Rufinus, a priest of Alexandria, who had carefully studied the writings of Origen, and been led to adopt many of his Platonic notions on sacred subjects. Among the errors ascribed to the Origenists are, that the souls of men were pre-existent; that our Saviour's soul was united to the Word before his conception; that after the resurrection the bodies of men will have a spherical form, and not, as at present, be erect; that the punishment of devils and of the damned will continue only for a time; and that in future ages Christ will be crucified for the salvation of devils as he has already been for that of men. This heresy spread for a time widely in Egypt, Spain, and other countries.

ORIGINAL SIN, *o-rij'-i-năl* (Lat. *originalis*), according to the ninth article of the English church, "standeth not in the following of Adam (as the Pelagians do vainly talk); but it is the fault and corruption of the nature of every man that naturally is engendered of the offspring of Adam; whereby man is very far gone from original righteousness, and is of his own nature inclined to evil, so that the flesh lusteth always contrary to the spirit; and, therefore, in every person born into this world, it deserveth God's wrath and damnation." By the following of Adam is here meant the imitation of Adam; as the Pelagians and others taught that original sin was not any inherent vice in the race of Adam, but only the propensity of mankind to imitate his transgression. The Scriptures, however, plainly teach that the sin of Adam not only made him liable to death, and changed the upright nature, in which he was originally formed, into one that was prone to wickedness; but that this liability to death and propensity to sin were entailed from him upon the whole race of mankind. This is the common opinion held by all classes of Christians; but beyond this an important difference exists. Some hold that original sin is nothing more than that natural tendency to evil which philosophy, no less than religion, teaches to be inherent in the human mind. Many of the stricter sects of Christians, however, hold with St. Augustine, who was the first to give forth the doctrine; namely, that God made a covenant with Adam, not only by himself, but as representing all his posterity, in terms of which the fruits of his obedience were to be imputed to them, as well as the fruits of his disobedience. Adam, therefore, having fallen, as the federal head of the human race, they are all made partakers of the guilt of his transgression. This is what is termed the doctrine of "imputed guilt;" and it involves the condemnation of children who may have been guilty of no actual transgression, which the other does not necessarily do.

ORIGINAL, or ORIGINAL WRIT, in Law, is the beginning or foundation of a real action at common law. In personal actions, the use of original writs is now abolished, and they are commenced by writ of summons. It is a mandatory letter issuing out of the common law, or ordinary jurisdiction of the court of Chancery, under the great seal, and in the sovereign's name, addressed to the sheriff of the county where the injury is alleged to have been committed, requiring him to command the wrong-doer, or party accused, either to do justice to the complainant or else to appear in court and answer the accusation against him.

ORIOLE, *or'-e-ole* (*Icterus*), a species of bird common in America, and which is, according to the naturalist Wilson, closely allied to the family of the starlings (*Sturnus*); indeed he calls the orioles generally "red-winged starlings." The Baltimore oriole (*Icterus Baltimore*) may be selected as the typical variety of the family. The male is of an orange-colour, with the head, neck, upper part of the back, and greater portion of the wings, black. It passes its time during the winter in South America, but during the spring it makes its appearance in the States, where its arrival is hailed as the harbinger of summer. Their principal food consists of caterpillars, bulbs, and bugs, particularly of one of a glossy green, which, Wilson observes, he often found in their stomachs. Their song is a clear whistle, repeated at short intervals; when alarmed, they give vent to a kind of rapid chirp, very different from their usual note. The Baltimore oriole is full of life and activity, and is constantly seen vaulting amongst the branches of trees, and flitting about in the bright sunshine, its orange plumage bringing it out in strong relief against the green foliage. One of the most peculiar characteristics of this bird is the manner in which it builds its nest, the structure of which consists of a pendulous cylindrical pouch of six or seven inches in depth, usually suspended from the extremity of some lofty branch which has a drooping inclination. The materials of which this nest is composed are wool,

cow-hair, flax, and hemp, which are woven into a complete cloth, the whole sewn strongly through and through with long horse-hairs, several of which measure two feet in length. The bottom is principally of cow-hair, also sewn strongly with horse-hair. So solicitous indeed are these birds for good materials, that the women in the country have to watch their thread, clothes, &c., to prevent the orioles from carrying them off. Besides the Baltimore oriole, there is the *red-winged starling* (*Sturnus praditorius* of Wilson), which is one of the greatest robbers of grain-fields of all similar birds in America. It is found in Virginia, North and South Carolina, Georgia, and Louisiana, in winter, in the vicinity of the large rice and corn fields. In the spring it migrates to the Northern States, where it breeds. The red-winged starling is about nine inches long and fourteen in extent, and its general colour is a glossy black, with the exception of the wing-coverts, which are of a brilliant scarlet.

ORION, *o-ri'-on*, in Astron., one of the ancient constellations founded by Ptolomy. The equinoctial passes nearly through its centre, and it is situated in the southern hemisphere with respect to the ecliptic. Four of the seven stars constituting the constellation are situated in the middle of it, in a straight line. Two of these are of the first magnitude; namely, Betelgueuse or Beltegeux, in the right shoulder, and Rigel in the left foot. In the middle of the square are three stars of the second magnitude, which form what is called the belt of Orion. The constellations which surround Orion are Eridanus, Canis Major, Gemini, Auriga, and Taurus. Near the Sword-scabbard, round the star marked $\theta$, is a remarkable nebula, and within the constellation are thousands of small stars, which are only visible in powerful telescopes.

ORLE and TRESSURE, *orl, tres'-sure* (Fr.).—In Her., orle is one of the ordinaries, and is composed of one or two lines passing round the shield. In vulgar French, *horle* signifies a selvage, which the orle may be said to represent, being nothing more than a border within the shield, at some little distance from the edge. It is, in fact, an inner border of the same shape as the escutcheon itself, and does not touch the extremities of the shield. The *tressure* is usually considered to be half the breadth of the orle, and is generally borne double, and what is called fleury and counter-fleury, as in the royal achievement of Scotland.

ORLOP DECK, *or'-lop*, the lowest deck of a ship, just above the keel, on which the cables are coiled, and the sails and other stores placed.

ORMOLU, *or'-mo-lu'* (Fr. *or*, gold; *moulu*, ground, rubbed), an alloy in which there is less zinc and more copper than in brass, that it may present a nearer resemblance to gold. It is used for the ornamentation of furniture. In many cases a gold lacquer is applied to heighten the colour of the alloy; but in some instances the native colour of the metal is preserved after being properly brought out by means of sulphuric acid. Furniture ornamented with ormolu came into fashion in France in the reign of Louis XV., and was long in favour amongst the wealthy and the great. Even at the present time it retains its attraction with many of the rich virtuosi.

ORNITHOLOGY, *or-ne-thol'-o-je* (Gr. *ornis*, a bird, and *logos*, a discourse), is that department of natural history which treats on all departments of science connected with the feathered race. In the article BIRDS, some slight ornithological sketch has been given, along with a description of the habits, &c., of the members of this branch of natural history; consequently, it is only needed, under the present heading, to characterise the important divisions and subdivisions into which the class *Aves* has been divided. According to the Linnæan system, there are six orders; viz.,—I. *Accipitres*, or *birds of prey*, which have the bill more or less curved, the upper mandible armed with a tooth-like process near the tip, and the feet short and robust, with strong hooked claws. II. *Pica*, having the bill straight on one side and curved on the other, and the feet short and strong: III. *Anseres*, or web-footed waterfowl, the characteristics of which are,—bill smooth, covered with an epidermis, and short at the tip; the toes united with a web, and the legs short and thick. IV. *Grallæ*, waders, or shore birds, the bills of which are cylindrical, and the feet long, and bare above the tarsus, being formed for wading. V. *Gallinæ*, under which name are comprised poultry and other gallinaceous birds. The bill is convex, the upper mandible curved over the lower, and the nostrils arched, with a cartilaginous membrane. The feet have the toes separated and are rough beneath. VI. *Passeres*, the bills of which are conical and sharp-pointed, the feet slender, and the toes separated, being formed principally for perching. In the subdivisions of these, the *first order*, *Accipitres*, contains the genus *Vultur*, or Vultures, of which there are eight separate species; the characteristics are a hooked beak and the head bare. Secondly, there is the genus *Falco*, which comprises all eagles and hawks; the beak is also hooked, but the head is feathered: of the falcons there are thirty-two distinct species. Thirdly, we have the genus *Strix*, or Owls, of which there are twelve species. The beak of these is also hooked, and the feathers at its base directed outwards. Lastly, there is the genus *Lanius* or Shrikes, of which we have twenty-six species: the beak is notched and nearly straight, but not quite so. The *second order*, *Pica*, has many subdivisions, of which the first is the genus *Psittacus*, or Parrots: the beak is hooked, and the upper mandible furnished with a sere: there are forty-seven species. Next comes the genus *Ramphastes*, or Toucans: the beak is very large, hollow, convex, and serrated; both mandibles incurved at the tip; and there are eight species. The next we come to are termed *Buceros*, or Hornbills, which have the beak convex, curved, cultrate, large and serrated, and the forehead covered by a horny plate: of these there are four species. The *Buphaga*, or Beef-eaters, come in the next succession; their beak is straight, and the mandibles bulge out: of this genus there is but one species. The *Crotophaga*, Plantain-eaters, form the next genus: the beak is compressed and arched; and there are two species. The following genus is termed *Corvus*, comprising the Crows: their beak is convex and cultrate, the nostrils covered by recumbent bristly feathers: of these there are nineteen varieties. The genus *Coracias*, or Rollers, follow next: their beak is conical, convex, straight, and acute, the upper mandible being slightly larger than the lower, and indistinctly notched: of these there are twenty species. The *Gracula*, or Grackles, have the beak cultrate, convex, and slightly bare at the base: of these there are eight species. The *Paradisea*, or Birds of Paradise, have the beak covered with the downy feathers of the forehead; the feathers at the sides are long; and there are three species. The genus *Trogon* has the beak shorter than the head, cultrate, hooked, and serrated: there are three species. The genus *Bucco*, or Barbets, have the beak cultrate, laterally compressed, notched at the tip, incurved, and opening to just beneath the eyes: of this class there is but one species. The Cuckoos, *Cuculus*, have the beak roundish; and there are twenty-two species. The Wrynecks, *Yunx*, have the beak roundish and sharp-pointed; the nostrils are concave, and there is but one species. The Woodpeckers, *Picus*, have the beak angular, straight, and the tip wedge-shaped; the nostrils being covered with recumbent bristly feathers: there are twenty-one species. The Nuthatches, *Sitta*, have the beak awl-shaped, roundish, and straight: there are three species. The Kingfishers, *Alcedo*, have the beak three-cornered, short, strong, acute, and long. The family *Todus* have the beak awl-shaped, a little flattened, obtuse, and straight, with spreading bristles at the base: there are two species. The *Bee-eaters*, *Merops*, have the beak curved and compressed: there are seven species. The Hoopoes, *Upupa*, have the beak arcuate, convex, a little compressed, and rather obtuse: there are three species. The Creepers, *Certhia*, have the beak arcuate, slender, and acute: there are twenty-five species. Lastly, the genus *Trochilus*, comprising the Humming-birds, have the beak slender, longer than the head, and the tip tubular: of these there are twenty-two species.—The *third order*, *Anseres*, contains fewer subdivisions than the one last described. In the first place there is the genus *Anas*, comprising swans, geese, and ducks. The beak is lamellated at the margins, and is convex and obtuse: there are forty-five species. The genus *Mergus*, the Merganseers, have the beak cylindrical,

cylindrical, and the tip hooked: there are six species. The Auks, *Alca*, have the beak short, compressed, convex, and furrowed, the lower mandible having a prominent angle: of these there are five species. Next come the Petrels, *Procellaria*, which have the beak a little compressed; the upper mandible being hooked, and the lower channelled and compressed at the tip: there are six species. The Albatrosses, *Diomedia*, have the beak straight; the upper mandible hooked at the tip, and the lower one abrupt: there are two species. The Pelicans, *Pelicanus* (under which head also are enumerated Solan geese and cormorants), have the beak straight, with its tip hooked and unguiculate: there are eight species. The Darters, *Plotus*, have the beak straight, sharp-pointed, and denticulated: there is but one species. The Tropic birds, *Phaeton*, have the beak cultrate and straight: there are two species. The Divers, *Colymbus*, have the beak slender, straight, and sharp-pointed: there are eleven species. The Gulls, *Larus*, have the beak straight, cultrate, and the tip slightly hooked, the lower mandible having an angular prominence: there are eleven species. The Terns, or Sea-swallows, *Sterna*, have the beak slender, nearly straight, acute, and compressed: there are seven species. Lastly, the Skimmers, *Rynchops*, have the beak straight, the upper mandible being much shorter than the lower, which is abruptly terminated.—The *fourth order*, *Grallæ*, contains nearly as many divisions as the second. First of these is placed the *Flamingoes*, gen. *Phœnicopterus*, which have the beak incurvated, as if broken, and denticulate; the feet are webbed, and there is but one species. (2) The Spoonbills, *Platalea*, have the beak flattish, the tip dilated, rounded, and flat: there are three species. (3) The Screamers, *Palamedia*, have the beak conical, the upper mandible being hooked: there are two species. (4) *Mycteria*, Jabiru (a species of stork), has the beak acute, lower mandible trigonal and ascending; upper mandible three-cornered and straight: one species. (5) *Cancroma*, Boat-bills, have the beak bulging, the upper mandible resembling a boat with the keel uppermost: two species. (6) *Ardea*, Herons and Cranes, have the beak straight, acute, long, and a little compressed, with a furrow from the nostrils to the tip: twenty-six species. (7) *Tantulus*, the Ibis, has the beak long, slender, and arcuate: there are seven species. (8) *Scolopax*, Snipes and Curlews, have the beak long, slender, and obtuse; the face is feathered, and there are eighteen species. (9) *Tringa*, Sandpipers, or Shore-larks, have the beak roundish, and as long as the head; nostrils linear, and feet with four toes: twenty-three species. (10) *Charadrius*, Plovers, have the beak roundish and obtuse; feet with three toes: twelve species. (11) *Recurvirostra*, Avocets, have the beak slender, recurved, and pointed, with the tip flexible: one species. (12) *Hæmatopus*, Oyster catchers, have the beak compressed, and the tip wedge-shaped: one species. (13) *Fulica*, Coots, have the beak convex; upper mandible arched over the lower, which has a prominent angle: seven species. (14) *Parra*, Jacanas, have the beak roundish and rather blunt; forehead vaulted, and wings spurred: five species. (15) *Rallus*, Rails, have the beak shorter at the base, compressed, and acute: ten species. (16) *Psophia*, Trumpeter, has one species; the beak is conical, convex, and rather sharp, the upper mandible exceeding the lower in length. (17) *Otis*, or Bustards, have the beak with the upper mandible arched: five species. Lastly, (18) *Struthio*, including the Ostrich and Cassowary, has the beak somewhat conical, and the wings unfitted for flying: there are three species.—Next in consideration comes the *fifth order*, *Gallinæ*. The first genus is termed *Didus* the beak is contracted in the middle, with two transverse rugæ; the tip of both mandibles bent inwards: but one species, which is now extinct. (2) *Pavo*, Peafowl, have the head covered with feathers, those of the rump elongated, with eye-like spots on the entire plumage: three species. (3) *Meleagris*, Turkeys, have the head covered with spongy caruncles; the throat with a longitudinal membranous wattle: three species. (4) *Crax*, Curassoes, have the beak with a sore at the base; head covered with recurved feathers: five species. (5) *Phasianus*, Pheasants and domestic fowls, have the sides of the head bare: six species. (6) *Numida*, Guinea-fowls, have caruncular wattles on each side of the face; head with a horny crest: one species. (7) *Tetrao*, Grouse and Partridges, have bare papillæ near the eyes: twenty species.—The last order, *Passeres*, contains twelve subclasses. (1) *Columba*, Pigeons, have the beak straight; nostrils with a tumid membrane: forty species. (2) *Alauda*, Larks, have the beak slender and pointed; tongue slit; hind claws very long: eleven species. (3) *Sturnus*, Starlings, have the beak slender, pointed, and flattened towards the point: five species. (4) *Turdus*, Thrushes, have the beak subulate, compressed, and notched: seven species. (5) *Ampelis*, Chatterers, have the beak awl-shaped, depressed at the base and notched: seven species. (6) *Loxia*, including Grosbeaks, Bullfinches, &c., beak conical, and bulging at the base: forty-eight species. (7) *Emberiza*, Buntings, have the beak somewhat conical, and lower mandibles broader than the upper: twenty-four species. (8) *Tanagra*, Tanagers, have the beak notched, awl-shaped, and conical at the base: twenty-one species. (9) *Motacilla*, Wagtails and Warblers, have the beak awl-shaped, tongue jagged, claw of the hind toe of moderate length: forty-nine species. (10) *Pipra*, Manakins, have the beak awl-shaped, and the feathers at its base directed outwards; tongue abrupt: fourteen species. (11) *Hirundo*, Swallows, have the beak very small, depressed at the base, and curved; the mouth wider than the head: twelve species. Lastly (12) *Caprimulgus*, or Goatsuckers, have the beak very small, incurved, and depressed at its base; large bristles; the mouth very wide: two species. It will be seen by the above catalogue that, according to the Linnæan system, the amount of different species in his classification exceeds nine hundred. The anatomical description of the feathered race will be found fully given under the article Birds, and therefore need not be here touched upon, and for a more detailed account of the various classes, the reader must consult the various articles on different birds in the present work; as Eagle, &c. Some of the best works on the subject are Bewick's *British Birds*; Audubon's *Ornithological Biography*; Selby's *Illustrations of British Ornithology*; Macgilvray's *Rapacious Birds of Great Britain*; Yarrell's *History of British Birds*, and many other authors of note.—Ref. *Encyclopædia Britannica*.

Ornithorynchus. (*See* Duckbill.)

Orobanchaceæ, *o-ro-bän-kai'-se-e* (Gr. *orobos*, vetch; *ancho*, I strangle), in Bot., the Broom-rape fam., a nat. ord. of *Dicotyledones*, sub-class *Corollifloræ*, consisting of fleshy herbs growing parasitically on the roots of other plants. The stems are scaly, without any true green leaves. (*See* Epiphegus.)

Orontiaceæ, or Acoraceæ, *o-ron-te-ai'-se-e*, *ák-o-rai'-se-e* (the Greek name of a plant now unknown to us, supposed to come from a river called Orontes, in Asia Minor), in Bot., the Orontium, or Sweet-flag ord. of *Monocotyledones*, in the sub-class *Petaloideæ*. Herbaceous plants, having perfect flowers arranged on a spadix, and with or without a spathe. Perianth absent, or composed of scales, which are inferior; stamens equal in number to the scales of the perianth, 4—8, hypogynous or perigynous; ovary superior, 1 or more-celled. Fruit baccate. Seed with an axile embryo, which is cleft on one side, usually with fleshy or mealy albumen. The order is often regarded as a division of *Araceæ*. The plants included in it are found in cold, temperate, and tropical regions. (*See* Acorus.)

Orphan Asylums, *or'-fán* (Gr. *orphanos*), are institutions provided for the bringing up and education of orphans, or children who have been deprived of their parents. Their origin does not go beyond the 16th century, and the first of them were formed in some of the free cities of Germany. One of the most famous was that established by A. H. Franke, at Halle, in 1698. Latterly, and among those best able to judge, a feeling has been growing up against the system of bringing up together large numbers of orphans in great establishments. It is said to be cheaper, as well as better for the morals of the orphans, to put them out and have them brought up in trustworthy families.

Orpiment, *or'-pe-ment* (Lat. *auri pigmentum*), in Chem., the commercial name for the ter-sulphide of arsenic. It is the colouring ingredient in the pigment known as king's yellow.

**Orrery**, *or'-rer-e*, an astronomical machine for representing the motions and relative magnitudes and distances of the heavenly bodies. The first instrument of this kind was invented by George Graham about the year 1700. This machine came into the possession of an instrument-maker named Rowley, who copied it and sent it with some other instruments to the earl of Orrery. Sir Richard Steele, who was unacquainted with Graham's machine, wishing to do honour to the earl and the inventor, called it an *orrery*, which name it has retained ever since. The principal use of the orrery is to illustrate the theory of the earth and moon, and to render it clear and intelligible. It is so constructed as to show all the varieties of the seasons; the changes and lengths of the days and nights; the nature of the eclipses of the sun and moon; together with several other phenomena. An orrery of an improved character was constructed in the latter part of the 17th century by Huygens, who called it *the automaton*. It is still preserved in the University of Leyden. In 1791, an elaborate orrery was exhibited in London, representing all the most remarkable motions, revolutions, and phenomena of the universe. It exhibited the whole phenomena of the solar system, with the satellites of the earth, Jupiter, and the other planets, all preserved in constant and regular motion by a chronometer. This orrery was purchased by the British government, and sent out with Lord Macartney as a present to the emperor of China. Orreries may be divided into four different classes:—the planetarium, the tellurian, the lunarian, and the satellite machine. The planetarium represents the orbital motions, &c. of the planets. The tellurian and lunarian, when connected in their improved form, show the motion of the moon round the earth, and that of the earth round the sun, with the different phenomena which accompany the progress of each. The satellite machine is chiefly intended to illustrate the motions of Jupiter's satellites, with the motions of the planet about the sun. Attempts have been made to produce transparent orreries by means of the magic lantern; but these instruments are more qualified for amusement than instruction.

**Orris-root**, the root of the *Iris florentina*, a white-flowering species of iris, which grows in southern Europe. It is well known in its dried state on account of its exhaling a pleasant odour, resembling that of sweet violets. It is now little valued, except as a perfume; but formerly it was much used in the preparation of medicines. It is exported in considerable quantities from the Mediterranean, and, among its other uses, is employed in the making of tooth-powder.

**Orthite**, *or'-thite* (Gr. *orthos*, straight), a variety of allanite, so called because it is always found in straight layers, generally in felspar. It is obtained in the mine of Finbo, near Fahlun, in Sweden; consisting of cerium, protoxide of iron, protoxide of manganese, &c.: it occurs in long brownish-black, acicular crystals.

**Orthodox**, *or'-tho-doks* (Gr. *orthos*, right, and *doxa*, an opinion), in religious matters, is applied to those who are judged to have right views on religious subjects. To the Roman Catholic, he only is orthodox who believes what the Church enjoins; and all others are heterodox. The true standard of orthodoxy, however, is the Bible, which "containeth all things necessary to salvation; so that whatsoever is not read therein is not to be required of any man that it should be believed as an article of faith."

**Orthoepy**, *or-tho'-e-pe* (Gr. *orthos*, right; *epos*, a word), a term in Gram., which signifies properly the right use of words. By modern writers, the word is used to denote that part of prosody which treats of the manner of uttering words with propriety, or a correct pronunciation of words.

**Orthography**, *or-thog'-rā-fe* (Gr. *orthos*, and *grapho*, I write), is that part of grammar which teaches the natures and properties of letters and the just method of spelling words.

**Orthopædic Institutions**, *or-tho-pe'-dik* (Gr. *orthos* and *paideia*, training), is the name given to establishments devoted to the cure of deformities, more particularly those of the spine, ribs, and pelvis. This is a branch of surgery that has been much cultivated of late, particularly in Germany and France; and many astonishing cures have been effected by perseverance and ingenuity.

**Orthoptera**, *or-thop'-te-rā* (Gr. *orthos*, straight, and *pteron*, a wing), an order of insects which includes all such as have their wings, when at rest, disposed in straight longitudinal folds. The orthoptera undergo a semi-metamorphosis, of which all the mutations are reduced to the growth and development of the elytra and wings, which are always visible in a rudimental state in the nymph; and, as both the nymph and the larva are otherwise exactly similar to the perfect insect, they walk and feed in the same manner. The mouth of the orthoptera consists of a labrum, two mandibles, as many maxillæ, and four palpi; those of the jaws always have five joints, whilst the labials, as in the coleoptera (which *see*), present but three. The mandibles are always very strong and horny, and the ligula is constantly divided into two or four thongs. The form of the antennæ also varies less than in the coleoptera, but they are usually composed of a larger number of joints. Several have two or three smaller eyes besides the reticulated ones. The inferior surface of the first joint of the tarsi is frequently fleshy or membranous. They have a first membranous stomach or crop, followed by a muscular gizzard, armed internally with horny teeth or scales, according to the species. All known members of this family are terrestrial. Some are carnivorous or omnivorous, but the greater number feed on living plants. The species that belong to Europe produce but once a year, and this takes place at the end of summer, which period also marks their final transformation. The orthoptera are divided by Cuvier into two sub-families,—1. the *Cursoria*, which have their legs formed for running, as the cockroaches; and 2. the *Saltatoria*, which have their legs formed for jumping or leaping; as the grasshoppers and locusts.—*Ref.* Cuvier's *Animal Kingdom*.

**Ortolan**, *or'-to-lin* (Ital. *ortolano*), *Emberiza hortulana*, an incessoral bird, a native of the south of Europe, where, as a delicacy, it is much esteemed in the gastronomic calendar. The ortolan is about six inches in length. Its plumage is yellow on the throat and back, and the upper part of the body brown, based with black, the under part being of a reddish bay-colour. The manner in which it is preserved is rather peculiar. In Italy and the south of France, it is fattened with millet-seed and other grain, in a room from which the sun is excluded, but which is lighted up by lamps, which are kept constantly burning. By these means, the birds become mere lumps of fat, when they are packed in casks containing about four hundred, and preserved with spices and vinegar. Four hundred of these casks, it is said, are generally exported annually to all parts of Europe.

**Oryza**, *o-rī'-zā*, n. Bot., a gen. of the nat. ord. *Graminaceæ*. *O. sativa* is the rice-plant, the grain of which is more largely consumed as food than that of any other cereal. Rice is extensively cultivated in India, China, Japan, &c., chiefly on low grounds, near large rivers, which are liable to be annually inundated and enriched by the deposition of mud. In the Southern States of America, it has long been a staple commodity. From forty to fifty varieties of the rice-plant are known and cultivated in different countries and situations. As an article of food, rice appears to be less nutritive than the other cereal grains; it is of a binding nature: hence its use in diarrhœa. Spirits is sometimes distilled from the fermented infusion of rice: this spirit is frequently called *arrack*; but that name is properly applied only to spirit distilled from palm wine. Starch of excellent quality for laundry purposes is now manufactured from rice.

**Oscillation**, *os-sil-lai'-shun* (Lat. *oscillatio*), in Mech., the vibration, or reciprocal ascent and descent of a pendulous body. The problem of oscillation, in its widest sense, includes most of those which occur in astronomy, optics, &c. To their average motions, the moon and planets add small oscillations about their mean places; the tides consist of oscillations of the ocean about the uniform spheroid, which, if it were not for the action of the heavenly bodies, would be carried round in the daily rotation of the earth; the phenomena of light are supposed to result from oscillations in an elastic ether; those of sound by oscillations in the air, &c. In general language, however,

the problem *of* oscillation refers only to the purely theoretical part of the problem of the pendulum. (*See* PENDULUM.) The *centre of oscillation* is that point in a vibrating body in which, if all the matter of the body were collected into it, the vibrations would be performed in the same time as before. The *axis of oscillation* is a straight line passing through the point of suspension, parallel to the horizon.

OSMAZOME, *oz'-mă-zōme* (Gr. *osme*, odour; *zomos*, broth).—If slices of raw muscular fibre be immersed in cold water for some hours, with occasional pressure, and the water then be removed and evaporated, filtered, and treated with pure alcohol, a peculiar animal principle will be dissolved, to the exclusion of the salts. The evaporation of the alcoholic solution leaves a transparent brown extract of a strong odour and flavour, resembling that of dressed meat. It is further distinguished by solubility in water and alcohol, and by yielding a precipitate with infusion of galls, but not gelatinising. To this substance Thenard gave the name of *osmazome*. Later experiments have shown that osmazome is a mixture of several substances. The term is now obsolete.

OSMIUM, *oz'-me-um* (Gr. *osme*, odour), in Chem.,—symbol Os, equiv. 99·41,—one of the platinum group of metals, found in platinum residues. It differs from its congeners by its analogy with the arsenic and antimony group. There are five oxides of osmium known, of which the two highest, $OsO_3$ and $OsO_4$, act as acids. Osmic acid is volatile and very poisonous. The salts of osmium have been but little studied. The metal itself is said to be the heaviest substance in nature.

OSPREY, *os'-pre* (Lat. *ossifraga*, the bone-breaker), (*Pandion haliætus*), one of the most numerous species of the *Raptores*, or birds of prey, and one which is more widely diffused over the face of the globe than any other. It belongs to the *Falconidæ*, and its generic characters are as follows:—Beak strong, short, rounded, and broad, the cutting edge being nearly straight; nostrils of an oblong-oval form, and placed obliquely; wings long, the second and third quill-feathers the longest; legs strong and muscular; tarsi short, covered with reticulated scales; toes five, nearly equal in length, with the outer toe reversible; and all covered with strong, curved, sharp claws; the under surface of the toes being covered with small pointed scales. The osprey generally dwells near the sea-shore, on account of its living nearly exclusively on fish; and it is found in considerable abundance in North America, particulary on Long Island, New York. It catches its prey by sailing at a considerable altitude above the surface of the water, and when it perceives it, suddenly darting down and bearing it off in its claws with triumph. It measures about twenty-two inches in length. The beak is black, the eye blue, and the irides yellow; the top of the head and neck is white, shaded with brown; the whole upper surface of the body brown, with the ends of the primary feathers of the wings black; the under-surface of the body white, and the tail brown. It builds its nest on high trees or rocks, or about old ruins near the sea, or by the margins of lakes and rivers; and it lays three eggs, which are about two inches long, and are blotched and spotted over with reddish spots. The American naturalists, who have every facility for describing the habits of the bird, state that during the period of incubation the male watches near, and supplies the wants of the female, catching fish for her, so that she should not be obliged to leave the nest. The parent birds feed the young until they are perfectly able to fish and provide for themselves. It is stated in Mr. Yarrell's "History of British Birds," that several specimens of the osprey have been obtained in Surrey, Sussex, and Durham; and Sir William Jardine observes, in his notes to Wilson's "Birds of America," that a pair or two of ospreys may be seen about most of the Highland lochs, where they fish and breed every year.

OSSIAN'S POEMS. (*See* GAELIC LANGUAGE AND LITERATURE.)

OSSIFICATION, *os-se-fik-ai'-shun* (from Lat. *os*, bone; *ficio*, I make), the formation of bone.—In the growth of the skeleton of man and the higher animals, this process goes on naturally, and it occurs in the reproduction of new bones after the destruction or loss of old ones. Ossification also occurs as an unnatural or morbid process, and is observed in several tissues of the body. It occurs most frequently in the cartilages of the ribs, where the process is almost constantly going on in advancing years. Bone begins to form in the cartilages of the ribs after the fiftieth year; but in some cases it commences between the ages of thirty and forty. The cartilages of the windpipe are next to those of the ribs in their liability to become osseous. Ossification of the movable joints never occurs. The disease called ossification of the heart is not an affection of the proper substance of that organ, but of its valves, in which earthy matter is sometimes deposited; thus rendering them stiff and unyielding. This substance is composed of carbonate and phosphate of lime, as bone is; but its particles have no definite arrangement.

OSTEOLOGY, *os-te-ol'-o-je* (Gr. *osteon*, a bone, and *logos*, a discourse), is that part of the science of anatomy which treats of the bones. (*See* ANATOMY, BONE.)

OSTRACISM, *os'-trā-sizm* (Gr. *ostrakon*, a shell), a judgment of the Athenian people, by which they were in the habit of condemning to ten years' exile citizens whose wealth and power seemed to them to have reached an extent dangerous to the common liberty. When it appeared necessary to have recourse to this expedient, a space in the Forum was inclosed by wooden balustrades, having as many doors (ten) as there were tribes in the republic; and when the appointed time had come, the citizens of each tribe entered by their own door, and threw into the midst of the open space a shell, or piece of baked clay in the form of one, on which was written the name of the citizen whom it was proposed to banish. The archons and senate presided over the assembly, and counted the votes, and if as many as six thousand were in favour of the banishment of the accused, he had to leave the city within the space of ten days. No disgrace, however, was considered to attach to banishment by ostracism, which was never inflicted as a punishment for crime.

OSTRICH, *os'-tritsh* (Fr. *autruche*).—This, the largest of known birds, distinguished not only for its great size, but for the beauty and value of its plumage, presents the following characteristics:—The true, or African ostrich, is from seven to nine feet high from the top of its head to the ground; the head, which is small, and the neck, which is long, are destitute of feathers, being clothed only with a few scattered hairs; the bill is straight and depressed. The feathers on the body are blackish; those on the wings and tail white, sometimes marked with black. The thighs are as bare as the head and neck, and the legs hard and scaly. The most distinguishing features of the ostrich are the shortness of its wings, which are furnished with spurs, and the peculiar arrangement of their feathers, which utterly unfit the bird for flight. The bird appears to have been known from the earliest times; it was forbidden in the Old Testament as an article of food, and was much prized by the gourmands of the Roman empire. The African ostrich frequents the burning sands of that continent in large flocks. The female lays from ten to twelve eggs, several times a year, in a hole in the sand, and broods over them only in the night, leaving them to be acted on by the sun during the hottest part of the day. As fashion has, for some time since, set a high value on certain feathers in the back or tail of the ostrich, it is frequently hunted, but is caught with difficulty; as by the aid of his wings he is able to run far more swiftly than the fleetest horse. The Arabians and Moors have two methods by which they are enabled to come up with them. In the one case, one of the hunting party pursues the bird, which always runs in a circuitous direction, as long as possible, and then the chase is taken up by another on a fresh horse, and so on, until the bird is worn down. The other method is, for a hunter to cover himself with an ostrich-skin, and thus be enabled to approach the flock sufficiently near to surprise it. The ostrich, in a tame state, and probably also when wild, is apt to swallow with the greatest voracity such indigestible substances as iron, nails, stones, and bits of rag or leather; and is even, in one instance, said to have swallowed leaden bullets hot from the mould without any apparent inconvenience.

There is a species of ostrich found in South America, principally on the great plains in Buenos Ayres and the neighbouring states, which is inferior to the African ostrich in size, whilst its plumage, which is of a uniform grey colour, is almost valueless. The trade in ostrich feathers is divided principally between London and Leghorn. White feathers are worth from £6 to £12 the Tuscan pound (nearly twelve ounces), and black ones from £1. 4s. to £3. 9s.

OSWEGO TEA. (*See* MONARDA.)

OTTER, *ot'-ter* (SAX. *uter*), a genus of carnivorous mammalia belonging to Cuvier's second tribe, or those which walk on their toes. In many particulars they resemble weasels, martins, and polecats; but in other respects they differ from them. They have long flexible bodies, low on the legs; their heads are compressed, and their tongues a little rough; but they differ chiefly from the animals just alluded to, from having their feet webbed and adapted for swimming, and their tails flattened horizontally. They are excellent swimmers, and feed almost entirely upon fish, which they frequently destroy wantonly, when they do not need it for food. The otter is found in many countries widely distant from each other, and they differ in some particulars, according to the climate which they inhabit; the otters of India, for instance, having the hair very rough, whilst, in Kamtschatka, the covering of the otter is very soft and fine. But the coverings of otters of all countries have more resemblance to each other than those of land animals, being all greyish brown, more or less dark on the upper part of the body, and generally white or whitish under the throat. The fur of all of them has the property of the feathers of diving birds, in not becoming wetted; and otters of all species reside in burrows, forming the entrance of their holes under water, and working upwards, making a small orifice for the admission of air in the midst of some neighbouring bush. The period of gestation is about nine weeks, and the litter consists of four or five. They make their appearance about April, and the mother drives them from the nest to shift for themselves about May.—The European, or common otter, is about two feet in length to the insertion of the tail, which is sixteen inches long; it is brown above, and whitish around the lips, on the cheeks, and beneath. The American otter, which is found in the rivers of North America as well as those of the South, is rather larger than the European otter, and is distinguished by having merely a margin of naked skin round the nostrils instead of the distinct naked muzzle of the latter. It is also described as being more social than most of the otters, small troops of this species inhabiting the same places of the rivers, and several females taking up their abode and producing their young in the same nest. Several distinct species of otters have been described as existing in one place or other of Central America; but most of them differ little from the more generally distributed species, except in size and colour. This may be said also of the *Nir-Nayse* and *Barang otters*, found in India. But the *Cape otter*, found in southern Africa, has some distinguishing characters between it and other otters, the most striking of which are found in the feet. The toes of this species are very short and thick, and joined by very soft membranes; they are very unequal in length, the first phalanx on them is soldered to the next in the second and third: there are no claws on any of the toes, except on two large ones on the hind feet, and the general structure of the fore feet would seem to infer that the animal is unable to dig a burrow for itself. Another distinct species of otter is the marine otter, which is found on the north-western coasts of North America and the shores of Kamtschatka, and is much larger than the other species, being about three feet and a half long in the body; the tail, however, being shorter in proportion, and not exceeding fifteen inches. The general colour is a beautiful maroon brown, but the head, neck, and under parts of the fore legs are brownish silver-grey. Its skin is accounted the finest of all furs both in texture and durability, and a single one often brings, in the markets of China and Japan, as much as twenty pounds. As an inhabitant of the sea, it approximates to the seal in its habits, and in some degree in its structure; the hind legs are shorter than in the common otter, and brought nearer to each other; the toes are shorter, and the claws shorter by the webs extending nearly to their points; and at the same time the fore feet are but ill adapted for walking. It frequents sea-washed shores during the winter, living on fish, crustacea, and sea-weed, and in summer ascends the rivers and enters the fresh-water lakes; salt or fresh water being indifferent to the otter as an element in which to perform his operations. In former times otter-hunting was a sport greatly in fashion in England, and is still occasionally practised. The otter, if procured young, may be tamed and taught to catch fish for its master; but the natural fierceness of the animal makes this a difficult task.

OTTO OF ROSES. (*See* ATTAR OF ROSES.)

OUNCE, *owns* (Lat. *uncia*, the twelfth part of anything), in Com., a denomination of weight. The ounce in troy weight is the twelfth part of a pound, and contains 480 grains. In avoirdupois weight, the ounce is the sixteenth part of a pound, and 437½ grains troy. In apothecaries' weight, an ounce is equal to eight drams. The term *ounce* is also applied to a gold coin of Sicily, worth about 10s. sterling, and to a silver coin of Malta, about 3s. 6d. in value.

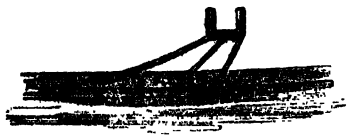
OUNCE. (*See* JAGUAR.)

OURANG-OUTANG, *oo'-rang-oo'-tang* (Malay, wild man of the woods).—The name *Ourang* has been given to a species of monkey found in Africa, and commonly called the black orang; but the ourang-outang is a large monkey, about five feet high, of a reddish-brown colour, a native of Sumatra and Borneo. Its native name in Borneo is "Mias," and it abounds in the low swampy grounds, covered with forests, of the south-western districts. This animal never jumps or springs, and yet progresses at a great pace as it swings from tree to tree. They sleep in a species of temporary nest made from day to day, of leafy branches laid across one another. They are not gregarious, but live in pairs with their young ones. Their food consists of fruits and berries, some of which are intensely bitter. The natives of the districts they frequent assert that the ourang-outang never attacks or is attacked by any animal except the crocodile, which attempts to seize him when he goes to the water's edge; whereupon the mias jumps upon the reptile's back, and after soundly thrashing it, forces open its jaws till he rips up its throat!

OUTLAWRY, *owt'-law-re* (Lat. *utlagaria*), in Law, is the being excluded from the benefits and protection of the law. It is a punishment inflicted for a contempt in neglecting or refusing to appear and answer for a civil or criminal transgression, in obedience to the order of a competent court; and as this is a crime of the highest nature, being an act of rebellion against the state, so it subjects the party guilty of it to forfeitures and disabilities. By the laws of the Anglo-Saxons, an outlaw, or a *laughlesman*, lost his *liberam legem*, and had no protection from the frankpledge in the decennary in which he was sworn. He was also a *frendless-man*, because he forfeited his friends, for if any of them rendered him any assistance, they became liable to the same punishment. An outlaw was said to have a wolf's head (*gerere caput lupinum*), from the fact that he might be killed by any one with the same impunity as a wolf. The law now is, that no one is entitled to kill an outlaw wantonly or wilfully; to do so being to commit murder, unless it be in the endeavour to apprehend him. Outlawry was originally pronounced only in cases of treason or felony. Then it was extended to trespasses of a flagrant character; but was properly limited to those processes in which a *capias* lay, that is, a writ or warrant to take the person of the defendant. In all actions of trespass *vi et armis*, this *capias* lay at common law; but not in actions of debt, detenue, covenant, and such others as are founded upon mere negligence or laches; and therefore, in such cases, outlawry was impossible until introduced by act of parliament. Where outlawry takes place upon a prosecution for treason or felony, it is regarded as a sufficient evidence of the guilt of the party, and is followed by corruption of blood and forfeiture of his estate, real and personal. When it takes place upon criminal prosecutions for misdemesnours or upon civil actions, the profits only of the defendant's lands are forfeited during his outlawry. An outlaw cannot sue in any court, nor has he any legal rights which can be

enforced, while, at the same time, he is personally liable upon all causes of action. An outlawry may be reversed by proceedings in error, or by application to a court.

**Outrigger**, *owt'-rig-ger*, a term applied to all boats in which the rowlocks, instead of being cut in the sides, are made to project outwards by means of iron rods bolted to the sides. These rods are made to approach each other gradually towards the outer end, where they almost meet, and are riveted to a double



OUTRIGGER.

plate, which forms the rowlock. Outrigged boats were first introduced by the celebrated Henry Clasper, of Newcastle, about sixteen years since, and have now almost superseded the inrigged or old style of boat, upon which they are a great improvement, as they not only possess greater leverage, but may be built much narrower; thus lessening the weight to be propelled through the water.

**Outworks**, *owt'-wurks*, a term in Fort. applied to all the works of a fortress which are constructed outside the principal wall, within or beyond the principal ditch. Their purpose is to obstruct the attack upon the principal wall, to intercept the shot against the same, and to afford a lateral defence. Outworks ought, therefore, to be so constructed that the enemy must attack them before he can reach the principal wall, to which they must give lateral defence; they must also completely cover all parts of the principal wall from the enemies' batteries beyond the glacis; and, finally, they ought to be conspicuous from the principal wall. Generally, though not always, outworks are some feet lower than the principal wall.

**Oval**, *o'-vāl* (Lat. *ovum*, an egg), a name originally given, as its name implies, to any such form as the section of an egg presents, that is, round, but not circular. In mathematics, however, the term is applied to any curve, or isolated branch of a curve, which returns into itself.

**Ovary**, *o'-vā-re* (from Lat. *ovum*, an egg), in Bot., that part of the *pistil*, or central organ of the flower, which contains the rudimentary seeds or ovules. These rudimentary seeds are attached to a projection on the walls of the ovary called the *placenta*. The ovary is said to be *compound* when it is composed of two or more ovaries combined together; it is said to be *simple* when it constitutes the lower part of a simple pistil, or of one of the carpels of an apocarpous pistil. (*See* Carpel and Pistil.) The ovary, whether simple or compound, may be either adherent to the calyx or free from it. In the former case, as in the myrtle, it is *inferior* or *adherent*, and the calyx is *superior*; in the latter, as in the lychnis, it is *superior* or *free*, and the calyx is *inferior*. (The different kinds of placentation will be noticed under Placenta.)

**Ovation**, *o-vā'-shun* (Lat. *ovis*, a sheep), an inferior sort of triumph which was granted by the ancient Romans to distinguished military leaders. It was distinguished from the more imposing solemnity (*see* Triumph) by the following circumstances. The general did not enter the city in a chariot drawn by four horses, but on foot; he was not arrayed in the gorgeous gold-embroidered robe, but in the simple *toga pretexta* of a magistrate; round his brow was a wreath of myrtle, not of laurel; he bore no sceptre in his hand; the procession was not heralded by trumpets, headed by the senate, and thronged by victorious troops; but was enlivened by a crowd of flute-players, attended chiefly by knights and plebeians, frequently without soldiers. The ceremonies were concluded with the sacrifice of a sheep, and not of a bull. The ceremony evidently derived its name from that of the victim sacrificed on the occasion. An ovation was granted when the advantage gained was considerable, but not sufficient to constitute a legitimate claim to the higher distinction of a triumph.

**Oven**, *uv'-n* (Sax. *ofen*), an apparatus of iron, stone, or brickwork, employed for baking or drying various substances. There are several kinds of oven. That most in use is the common baker's oven, consisting of a vaulted chamber of brickwork, having an iron door in front, and another at the side opening into a small furnace provided with an iron grating, upon which the fuel (coal) is placed. This fire-chamber is separated from the oven by a partition, at the farthest end of which is a sliding door for regulating the heat. Amongst other kinds of ovens we may mention that of Count Romford, called the perpetual oven, and which, from its ingenuity, originality, and convenience, deserves to be better known; and Hick's economical oven, which produced a great saving in the materials, but appears to have possessed the common defect of the ordinary kitchen ovens,—viz., of scorching up the bread or other article on one side, while the other is comparatively cold.

**Overture**, *o'-vert-yure*, an introductory symphony to an opera or oratorio, or a kind of musical prologue in keeping with the piece which it ushers in. This species of composition is said to have been originated in France, where it was afterwards perfected by Lully. Modern overtures are formed upon the subject of the opera, and generally contain snatches from the leading airs. The Germans have composed overtures to poetical works as Beethoven's overture to Goethe's "Egmont." They are often played separately from the piece to which they belong; but their greatest use is to give a kind of *résumé* (if we may use the term) of the work they precede. As splendid examples of this species of composition, we may mention Mozart's overtures to "Figaro" and "Don Giovanni," Weber's overture to "Der Freischütz," and Rossini's overture to "Guillaume Tell."

**Oviparous Animals**, *o-vip'-ā-rus* (Lat. *ovum*, an egg; *pario*, I am delivered of), those which produce their young from eggs. According to Cuvier, in his "Règne Animal," the hemispheres of the brain of oviparous vertebrata are very slender, and are not united by a corpus callosum (*see* Brain); the crura of the cerebellum do not form that protuberance termed the *pons Varolii*; the nostrils are less complex; the ear has fewer small bones; and the cochlea, when it exists (which it only does in birds), is much more simple. The oviparous animals are divided into three classes,—1. the birds; 2. the reptiles; and 3. the fishes. Oviparous generation consists essentially in the circumstance that the animal is not attached through the medium of a placenta to the parietes of the uterus, or of the oviduct, but remains separted from it by its most external envelope. Its aliment is prepared beforehand, and inclosed in a sac attached to its intestinal canal: this is what is termed the vitellus, or yolk of egg, of which the young animal is a sort of appendage, at first imperceptible, but which is nourished and augmented by feeding on the fluid of that yolk. Those oviparn which breathe with lungs have, in addition to this, in the egg, a vascular membrane, which appears to be subservient to respiration: it is connected with the bladder, and is analogous to the allantoid of the mammalia. It is neither found in flshes nor in frogs, which latter, when young, respire like fishes, by means of branchiæ or gills. The eggs of fishes have a general resemblance to those of birds, and consist of a vitellus and albumen with thin membranes; but in place of being furnished with a shell, they have a tough, or sometimes a horny covering; and some, as the torpedo and shark, are quadrangular in shape. The egg of the serpent is nearly the same with that of the fish, and is inclosed in a flexible membrane. The fœtus is coiled up spirally in it, and the chorion is vascular, as in the egg of the fowl. Those animals which are called oviparous hatch their eggs out of the body, either by sitting on them, as we see in fowls, or by exposing them to the heat of the sun, as the turtle, crocodile, and many species of serpents. Oviparous fishes, which comprehend all those called osseous, expel their ova into the water, where they are fecundated by the male without intercourse. The ova of frogs are likewise fecundated and hatched out of the body. They are enveloped in a glassy matter, which, perhaps contributes to their increase; for during incubation, the egg both enlarges and changes its shape. Many of the cold-

blooded oviparous do not bring forth their young until they are developed and extricated from the shell or other membranes which separated them from the mother. These are called *false oviparous*.

OVULE, *o'-vule* (from Lat. *ovum*, an egg), in Bot., a small rounded or oval pulpy body, borne by the *placenta*, and which, when impregnated, becomes a seed. It is either attached directly to the placenta, in which case it is said to be *sessile*, or indirectly by a stalk, called the *funiculus*, when it is described as *stalked*. The ovule is, in most cases, inclosed in the cavity of the ovary; but all plants of the orders *Coniferæ* and *Cycadaceæ* present exceptions to this rule. In the latter order, the ovules are situated on the margins of leaves in a peculiarly metamorphosed condition; and in the former, at the base of indurated bracts, or open carpellary leaves. Such ovules are said to be *naked*. The number of ovules in the ovary, or in each of its cells, varies. Thus, in the *Polygonaceæ*, *Compositæ*, &c., the ovary contains but a solitary ovule; in the *Rubiaceæ*, *Umbelliferæ*, &c., there is one ovule in each cell. When there are more than one in the ovary, or in each cell, they may be *definite*, or easily counted; as in *Æsculus*, or they may be *indefinite* (too numerous to count easily), as in *Viola*. (*See* PISTIL, PLACENTA.)

OWL, *owl* (Sax. *ula*), a bird belonging to the order *Raptores* and the genus *Strigidæ*. According to Sir William Jardine, owls may be regarded as nocturnal hawks, although of the whole, as a family, but little is known. In Great Britain, the members of it are limited in numbers, amounting only to six or seven species, and some of these even are of extreme rarity, and are only partial or periodical visitors. They fill during the night the same offices which are performed by the bolder hunting falcons in the open day, and they serve to keep in check the increase of mice and other small mammalia which come out at night. For this purpose, the various organs of the owls are beautifully adapted. The vision is acute, although not suited to the light of noon; their ears are contrived to catch sound in the broadest way, and also possess a delicate perception; while their plumage is of the softest texture, falling lightly on the air, so as not to cause any obstruction, and the wings are constructed for light, buoyant, and noiseless flight. In addition to these advantages in the pursuit of their prey, another is found nearly as essential, and without which the others would be useless. The colour of the plumage exhibits a union of tints best suited for concealment, for a chaste and harmonious arrangement of colours renders the owls invisible in the gloomy twilight or grey darkness of night. The tarsi and beak, although not showing any great strength, are finely formed for grasping; for, as in the *Scansores*, the external toe is versatile. The foot can thus be used either in scrambling in the interior of some rent or chimney, or in the hollow of a tree, while it also becomes more complete as an organ of prehension. In their habits, owls may generally be termed arboreal, the dark recesses of the forest, or wooded rocks, affording cover from the too strong light of the day. From these retreats they sally out at nightfall on predatory excursions, seldom returning without something for their nest. Their eggs are of a rounded form, and are always nearly pure white in colour. The geographical distribution of these birds is very extensive. The common white, barn, or screech owl, which may be taken as a type of the family, reaches the North-American continent. The long-eared owl is identical both in North America and Africa. The short-eared owl is not uncommon in the former continent, and it is also common to Asia, several specimens having been obtained from China. The tawny owl, although somewhat resembling the barred owl of North America, yet is peculiar to Europe. The tawny owl inhabits Northern Europe and America, reaching nearly to the polar latitudes. In Great Britain this bird is, however, very rare. The family *Strigidæ* may be divided into three classes,—1. the Typical owls; 2. the Horned owls; and lastly, 3. the Hawk owls. In the first section, the adaptation to nocturnal habits is complete; the members of it also [illegible] a large external ear, and complete discs round [illegible]. In the second, the horned owls have two [illegible] tufts on the head, resembling horns, and the external ear is smaller. In the third, the hawk owls have the external ear very small, and the feathery tufts and the discs round the eyes altogether wanting. The generic characters of the white or barn owl (*Strix flammea*), which we have selected as altogether typical of the family, may be thus briefly described:—Head smooth, not furnished with tufts; beak straight at the base, considerably curved at the point; cutting margin of the upper mandible nearly straight; under mandible notched; nostrils oval and oblique; facial disc large and complete; auditory opening large, and furnished with an operculum; wings long and ample; second quill-feather generally the longest, the first and third equal in length; legs long and slender, clothed with downy feathers to the junctures with the toes, which latter are only furnished on the upper surface with a few hair-like feathers; claws long, curved, sharp, and grooved underneath. The white owl forms its habitation in churches, barns, old ruins, or holes in old trees. It is of the greatest use, as it devours large quantities of rats and mice; whence its services to agriculturists are very considerable indeed. Both owls, male and female, if they have young, sally out in search of these dainties, which they bring in large numbers to their nest. This owl lays from three to five eggs, and it is a common thing for them to be laid at different intervals; so that both eggs and young birds have been discovered in the nest at the same time. The head and upper parts of the body are a clear orange-colour, slightly marked with chestnut spots; the face is white; the wing-covers grey towards their tips; and the under surface of the body also white. It is about fourteen inches in length. Besides the barn or white owl, there are the tawny owl (*Syrnium stridula*), the eagle owl (*Bubo maximus*), the little-horned owl (*Scops Aldrovandi*), the long-eared owl (*Otus vulgaris*), the snowy owl (*Surnia nyctea*), the hawk owl (*Surnia funerea*), and the little owl (*Noctua passerina*); descriptions of which will be found clearly given in Yarrell's *History of British Birds*.

OX, *oks*, Sax. *oxa* (it has been suggested that the derivation of the word is probably from the Greek verb *auxo*, I increase, the prosperity of individuals in early times being estimated by the amount of cattle they possessed), the male of the bovine genus of quadrupeds, castrated and grown to its full size. The fact that the ox, when living, may be a most valuable servant to man as a beast of burden or draught, and that, when dead, every portion of his carcase is capable of administering to the wants or comforts of his owner, appears to have been discovered in the earliest times; and accordingly, in the earliest records which we possess, the ox is mentioned with respect. In Egypt it was long an object of worship; and when the Israelites were disposed to relapse into idolatry after their flight from Egypt, it was in the form of a golden calf (the name of a young ox) that they modelled the object of their impious rites. The ancient accounts of the wild ox describe it to have been an animal of enormous size and great fierceness, and the fossil remains of oxen which are found in this and other countries certainly seem to prove that the oxen of ancient times possessed these characteristics. The history of the ox in this country commences with the account given by the Roman invader Cæsar of the state of the inhabitants when he invaded our island, from which we gather that they relied chiefly on the ox and the sheep for the supply of their wants. From that time to the commencement of the present century, however, it does not appear that any decided steps were taken towards the improvement of this breed of cattle, and its history is, consequently, a blank. The common ox of the present time may be described as an animal which has smooth hollow horns, a thick and heavy body, with a long tail terminated by a tuft of hair. There has been much dispute as to the origin of the British ox, some supposing that it has sprung from the Indian and European buffalo, and some treating them as arising from the *aurochs*, or wild cattle of Germany and Poland. There are several varieties of the ox in its wild state, which may be briefly described as,—the *Bos americanus*, or American bison, the characteristics of which are short black rounded horns, with a great interval between their bases; a vast haunch, consisting of a fleshy substance much elevated; thick and strong fore-

parts of the body; hinder parts sleeker and weak. The *Bos bibulous*, or buffalo properly so called, originally a native of India, from whence it was introduced into Egypt, Greece, and Italy. The *Bos gavæus*, or Hindoo bull, with a dull and heavy aspect, but in reality almost equalling the buffalo in activity and strength. The *Bos Caffer*, or Cape buffalo, distinguished for the size and extent of its horns, its great strength and ferocity. The *American Bison*, and the *Musk Ox*, the latter of which is a most singular animal, clothed with full, long, matted wool, or dense fur, and found in the high latitudes of North America and the lands of the Esquimaux, from the 61st to the 75th degree of latitude. The flesh is strongly imbued with musk, especially at certain seasons; but at other times is tolerable food, and is eaten both by the Esquimaux and the fur-hunters. Of the ancient race of British cattle some remains are yet to be found in several parts of England, and are characterized by creamy-white skins, black muzzles, and white horns with black tips bending upwards. The modern breeds of oxen in Great Britain are remarkable for their numerous varieties, caused by the almost endless crossings of one breed with another; the principal varieties, however, are the North Devon, distinguished for the activity of its movements, its docility, and powers of labour. The Hereford, which are larger than the Devon and fatten to a much greater weight. The Sussex, which has all the activity of the Devon and the strength of the Hereford, the propensity to fatten, and the fine-grained flesh of both. The Welsh, which are stunted in their growth, from the poverty of their pastures; but which thrive where others starve, and which rapidly outstrip most others when they have plenty of good pasture. The Scotch, of which there are many varieties; the principal being the West Highlanders, or Kyloes as they are called; the Argyleshire breed; the cattle of the Shetland Islands, which are dwarfish, ill-shaped, and covered with hair. Fifeshire possesses a breed peculiar to itself, of a very superior description; and the Galloway polled cattle are a fine and valuable breed, from which is descended the celebrated dun cow of Suffolk. Of Irish cattle there are two breeds,—the middle-horns and the long-horns; the former being the original breed, tenanting the forests and most mountainous districts; whilst the latter are descended from an old Lancashire or Yorkshire breed. Almost every part of the ox is of use to mankind. Boxes, combs, knife-handles, and drinking-vessels are made of the horns; glue is made of the cartilages, gristles, and the finer pieces of cuttings and parings of the hides. The skin of the young ox is made into vellum; the hair is valuable in various manufactures, and the suet, fat, and tallow for candles. The value of its flesh as food need scarcely be mentioned.

Oxalic Acid, *oks-al'-ik* (Gr. *oxus*, acid), in Chem., $HO,C_2O_3$, a very powerful organic acid, existing ready-formed in the leaves of the wood-sorrel, in the leaf-stalks of the common garden rhubarb, and in many other plants having an acid taste. It is also found in combination with lime, in crystals, in the juices of many vegetables. It is prepared artificially by oxidising starch or sugar by nitric acid, or by acting on sawdust with a mixture of the hydrates of potash and soda. It crystallizes in fine transparent four-sided prisms, and dissolves in nine parts of cold water. Its solution has an intensely sour taste, and acts as a violent poison, occasioning death in a few hours. Its best antidote is the administration of chalk or magnesia suspended in water, with which it forms an inert and insoluble oxalate. It greatly resembles Epsom salts in appearance, and has been frequently administered for that popular purgative with fatal consequences. It is used in calico-printing as a resist, in the form of binoxalate of potash, and occasionally as a resist in combination with alumina. It is a bibasic acid, and forms acid and neutral salts with the bases, most of which are insoluble. Heated strongly, it splits up into carbonic acid and carbonic oxide, and is much used in the laboratory as a source of the last-mentioned gas.

Oxalidaceæ, *oks-a-lid-ai'-se-e*, in Bot., the Wood-sorrel fam., a nat. ord. of *Dicotyledones*, sub-class *Thalamiflorœ*, distinguished by the following essential characters:—Herbs, or rarely shrubs or trees, usually with compound exstipulate leaves. Stems continuous, and not separable at the joints. Flowers hypogynous, regular, and symmetrical. Sepals, petals, and stamens, with a quinary distribution; the sepals persistent and imbricated; the petals twisted in æstivation; the stamens commonly monadelphous, with 2-celled anthers. Styles filiform and distinct. Fruit 3—5-celled, without a beak. Seeds few, with abundant albumen and a straight embryo. The plants of this order are generally distributed throughout both the hot and the temperate regions of the globe; the shrubby species, however, are almost confined to the tropics. There are 9 genera and about 328 species. They are chiefly remarkable for their acid juice, containing binoxalate of potash. The fruits of some are eaten by the natives in some parts of India, but they are too acid to be acceptable to Europeans, who, however, use them as pickles.

Oxalis, *oks'-ă-lis*, in Bot., a gen. of the nat. ord. *Oxalidaceæ*. The common wood-sorrel, *O. acetosella*, which abounds in our woods, is a well-known species. It has ternate leaves, and is considered by many to be the true shamrock, as its leaves open about St. Patrick's day. When infused in milk or water, it forms a pleasant refrigerant drink in fever. The leaves, taken as salad, are [illegible]tiscorbutic. The species *O. crenata*, called the Ar[illegible]cha, and several others, have edible tubers, which are used as substitutes for potatoes in some districts. *O. anthelmintica*, the Mitchamitcho of Abyssinia, has very acrid tubers, which are employed for their anthelmintic properties, being frequently preferred to kousso. (*See* Brayera.)

Oxford University, *oks'-ford*, is one of the two most ancient and famous of England's seats of learning. Whether this or its sister Cambridge is entitled to be regarded as the more ancient is by no means agreed. The origin of both is lost in the obscurity of early history. There is no satisfactory evidence in favour of the general belief that this university was founded by Alfred the Great; but it is well established that Oxford was a place of study in the time of Edward the Confessor (1041-66). The oldest institutions were, doubtless, schools attached to the convents and other religious houses; but afterwards secular schools were established; and when many of these secular scholars resided in one house, it got the name of hostel, or hall, and had governors or principals appointed to superintend the discipline and affairs of the house. The schools were of various kinds; as grammar-schools, sophistry-schools, schools of art, medicine, law, theology, &c. In 1201, Oxford is said to have contained no fewer than 3,000 scholars. In 1244, Henry III. granted to the university of Oxford the first charter of privileges as a corporate body; and in 1255 confirmed and extended the privileges which he had formerly conferred. Previous to this period, the scholars and students lived in halls rented from the townsmen; and this was one great source of the numerous quarrels that were constantly taking place between them. To remedy this evil, and to encourage learning, several public-spirited individuals purchased or built large houses for the reception of teachers and scholars, and thus originated the English colleges. Additional charters and privileges were granted by Edwards I., II., and III., and succeeding monarchs. Till the passing of the University Act of 1854, their privileges depended upon the act of the 13th Elizabeth, 1570, "Concerning the Incorporations of the Universities of Oxford and Cambridge, and the confirmation of the charters, liberties, and privileges granted to either of them." The object of the late act is declared in the preamble to be "to enlarge the powers of making and altering statutes and regulations now possessed by the university of Oxford, and the colleges thereof; and to make, and enable to be made, further provision for the government, and for the extension of the said university, and for the abrogation of oaths now taken therein, and otherwise for maintaining and improving the discipline and studies, and the good government of the said university and colleges." The statutes of the colleges have hence been revised, and placed more in accordance with the feelings and opinions of the present day; and the restrictions by which many of the fellowships were hampered have been removed. With rare interventions on the part of the Crown, the university was governed by statutes or

its own making; but as these, in course of time, from their number, gave rise to confusion, a digest of the existing statutes was compiled by a committee appointed during the chancellorship of Archbishop Laud, and solemnly ratified by the king, chancellor, and convocation, in 1636, under the title of *Corpus Statutorum Universitatis Oxoniensis*, which forms the basis of the present statute-book. The corporation of the university is styled "the Chancellor, Masters, and Scholars of the University of Oxford;" and its constitution very much resembles that of Cambridge. The highest officer in the university is the chancellor, who is elected by the members of convocation, and now holds his appointment for life. The office is conferred upon noblemen of distinction who have been members of the university. The high steward, or seneschallus, is appointed by the chancellor, with approval of the Convocation, and holds office for life. He defends the rights, customs, and liberties of the university, and at the mandate of the chancellor, hears and determines criminal causes of the gravest kind, such as treason or felony, whenever the prisoner is a scholar, or privileged person resident within the university. The vice-chancellor, who is in effect the supreme judicial and executive authority, is annually nominated by the chancellor from the heads of colleges; but the office is generaly holden for four years. He appoints four deputies, or pro-vice-chancellors from the heads of colleges, who are to exercise his power in case of illness, or necessary absence from the university. The two proctors (*procuratores*) are chosen from the several colleges separately, or halls conjointly, according to a cycle adopted in 1869. The electors are now all those members of the several societies who are, or have been, members of the Convocation of the university, and all those fellows and scholars of a college who are members of Convocation. Any such elector may be elected to the office, provided he has completed four and not completed fifteen years from his admission to regency in arts. Each proctor nominates two masters of arts, of at least three years' standing, to be their respective deputies or pro-proctors. They have under their command the academical constabulary force, and have also an extensive police jurisdiction in the town. Their duties are to preserve the peace of the university, to repress disorders among the students, and to inflict summary academical punishments. The university obtained the privilege of sending two burgesses to parliament from James I., in 1604. The electors are all the members of Convocation. The legislative government of the university is vested in the houses of Congregation and Convocation, and the Hebdomadal Council. The house of Congregation is composed of the chancellor, high steward, vice-chancellor, heads of colleges, and halls, canons of Christ Church, and the members of the Hebdomadal Council, certain university officers, the professors, assistant or deputy professors, public examiners, &c., and resident masters of arts; the chancellor or vice-chancellor being president. The business of the Congregation is confined, almost exclusively, to matters of legislation. When the Hebdomadal Council has framed any new statute, it must first be promulgated, after due notice, in this assembly; and then, after an interval of three entire days, it is to be proposed here for acceptance or rejection. Every question is decided by a majority of votes. A statute approved by Congregation is then submitted to Convocation for final adoption or rejection. The house of Convocation, consisting (as may be said) of all masters of arts, and all doctors of the three superior faculties, who have their names upon the books of some college or hall, embraces all subjects connected with the credit, interest, and welfare of the university. Statutes which have passed Congregation do not become binding until they have had the assent of this assembly; and matters of special or individual concern, and such as require immediate provision, are settled by decree of Convocation. It is in convocation that nearly all elections to offices in the gift of the university take place. The Hebdomadal Council consists of some official and some elected members; the former being the chancellor, vice-chancellor, late vice-chancellor, and two proctors; the latter, six heads of colleges, six professors, and six other members of Convocation, all elected by the Congregation of the





university, for six years. This council has the initiative in all the legislation of the university. In general it considers and discusses every measure to be submitted to the improvement or benefit of the university before it be submitted to Convocation, and deliberates on all matters relating to the maintenance of the privileges and liberties of the university, or to the due observance of its statutes and customs. The chancellor has jurisdiction in almost all causes, whether civil, spiritual, or criminal, in which scholars, or privileged persons residing within the university, are parties; and for that purpose a court is holden every Friday during term, in which the vice-chancellor sits as judge, and appoints some doctor or bachelor of civil law to sit with him as assessor, and to act as judge for him in his absence. The business of the public orator is to write letters and addresses, and to make orations in the name of the university upon public occasions; to present those on whom the honorary degree of master of arts is to be conferred, and to deliver the annual Creweian oration, alternately with the professor of poetry. He is elected by Convocation, and must be a master of arts or a bachelor of civil law. The professorships are of two kinds,—those instituted by the Crown and those established by private endowment. The regius professors are appointed by the Crown, the others, according to the will of the founders. The following is a list of the professorships, readerships, &c., with the date of their foundation:—The regius professors of divinity (1535), civil law (1546), medicine, &c. (1535), Hebrew (1540), Greek (1540), ecclesiastical history (1842), pastoral theology (1842), modern history (1724); Margaret professor of divinity (1502), Savilian professors of geometry and astronomy (1619), Sedleian professor of natural philosophy (1618), Whytes professor of moral philosophy (1621); Camden professor of ancient history (1622), professor of music (1626), Laudian professor of Arabic (1636), professor of botany (1669), professor of poetry (1708), lord almoner's professor of Arabic (1717), professor of experimental philosophy (1749), Vinerian professor of common law (1755), clinical professor (1780), Rawlinsonian professor of Anglo-Saxon (1795), Aldrichian professor of chemistry (1803), professor of mineralogy (1813), professor of geology (1818), professor of political economy (1825), Boden professor of Sanscrit (1830), professor of logic (1839), professor of the exegesis of Holy Scripture (1847), professor of modern European languages (1848), professor of Latin literature (1854), Chichele's professors of international law and diplomacy (1859), and of modern history (1862), Wayniete professor of moral and metaphysical philosophy (1859), Linacre professor of physiology (1854), Hope professor of zoology (1861), Grinfield lecture on the Septuagint version of the Hebrew Scriptures (1859), teacher of Hindustani (1859), teacher of Indian law (1861), and teachers of German, French, Italian, and Spanish. The academical year is divided into four terms:—(1) Michaelmas, from 10th October to 17th December; (2) Hilary (or Lent), from 14th January to the day before Palm-Sunday; (3) Easter, from the Wednesday after Easter-day to the Friday before Whit-Sunday; (4) Trinity (or Act), from the day before Whit-Sunday to the Saturday after the first Tuesday in July. The name of every student admitted to the university is entered on the books of some college or hall. The fees at matriculation are, for a peer, or the eldest son of a peer, £8; for every other privileged person, £5; for every other person, £2. 8s., except a servitor or bible clerk, 10s. The student, on entering his college, is assigned to the superintendence of some one of the tutors. The instructions of the tutors are directed solely to the preparation of the students for taking a degree, and consist of catechetical lectures, reading, and discussion. The private tutors are also largely employed in superintending and directing the studies of the undergraduates, and preparing them for their examinations. The degrees are those of bachelor and master in arts, and of bachelor and doctor in civil law, medicine, divinity, and music. The conditions in the ordinary course required for degrees are residence for time, or standing (as it is commonly called), examination or exercises, and at the time of taking a degree, payment of fees, subscription to articles, and

taking of oaths. Twelve terms of residence are required for the degree of bachelor of arts and for the position of student of civil law or medicine. No further residence is necessary for any degree. A bachelor of arts can proceed to the degree of master in the twenty-seventh term from his matriculation (if privileged, in the twenty-third), provided he has had his name on the books of some college or hall for a period of twenty-six (or twenty-two) terms. A candidate for the degree of B. Mus. must produce a certificate, signed by two or more trustworthy persons, that he has been studying or practising music at Oxford, or elsewhere, for seven years. A B. Mus. wishing to proceed to the degree of doctor, must produce a similar certificate for five years from his admission to his present degree. A student of civil law, or a B.A., may be admitted to the degree of D.C.L. in the twenty-seventh term from his matriculation, an M.A. at the end of three years from his admission to regency. A B.C.L. may be admitted to the degree of M.A. in the twenty-seventh term from his matriculation, and yet retain his former degree. A B.C.L. may proceed to the degree of doctor at the end of four years from his admission to the degree of bachelor, if admitted to it after taking the degree of M.A.; otherwise, at the end of five years. A student of medicine, or a B.A., M.A., or B.C.L., may be admitted to the degree of B.M. in the twenty-eighth term from his matriculation. A B.M. may proceed to the degree of doctor at the end of three years from his admission to the degree of bachelor. In divinity, an M.A. may be admitted to the degree of B.D. at the end of seven years from his admission to regency; and a B.D. may proceed to the degree of doctor at the end of four years from his admission to the degree of bachelor. The fees payable to the university are, for B.A., £7. 10s.; M.A., £12; B. Mus., £5; D. Mus., £10; B.C.L. or B.M., £6. 10s.; B.D., £14; D.C.L., D.M., or D.D., £20. Besides the above, there are certain fees payable on putting down the name for examination, as well as £1. 6s. annually, by each member of the university, as university dues. The fee for tuition varies at the different colleges, but seldom exceeds £20 per annum. The ordinary college expenses, including university and college fees of all kinds, boarding, lodging, washing, &c., varies from £90 to £100 at the different colleges for commoners; and the entire annual expenditure, exclusive of a private tutor's fee, may be estimated at from £150 to £250. Candidates for the degree of B.A. are required to pass three (or practically four) examinations,—(1) responsions before the masters of the schools; (2) the first public examination before the moderators; (3) the second public examination before the public examiners, which must be passed in two schools; viz., that of Literæ Humaniores, and one of the other three schools of mathematics, natural science, or jurisprudence and modern history, selected by the candidate himself. Responsions are held three times every year, and each student is required to offer himself for examination before the end of his fifth term. He is examined in Latin and Greek grammar, one Latin and one Greek author, arithmetic, and either Euclid or algebra. It is conducted partly in writing and partly *viva voce*. In the first public examination, which is partly written and partly *viva voce*, and cannot be taken except by privileged persons before the seventh term, or after the tenth, the candidate is examined in Latin and Greek grammar, either in logic or in algebra, together with three books of Euclid, in the four Gospels in Greek, and in one Latin and one Greek author, at least, one of which must be a poet, the other an orator. Candidates for honours have to answer deeper questions. The second public examination, in ordinary cases, does not take place before the twelfth term. In the classical school every candidate must be examined in divinity (comprehending the Gospels and Acts of the Apostles, in Greek, sacred history, and the books of the Old and New Testament, the Thirty-nine Articles, and the "Evidences of Religion"), and in one Latin and one Greek author, at least, one a philosopher, the other an historian. In the mathematical school, the subjects are the first six books of Euclid, or the first part of algebra; and in that of natural science, the principles of two of these three branches of natural science, viz., mechanical philosophy, chemistry, physiology; and in some one of the particular sciences dependent on mechanical philosophy. In the school of law and modern history, the subjects are a portion of English history, with a portion of Blackstone's "Commentaries," or the "Institutes" of Justinian. In each case, for honours, additional subjects are prescribed. For the degree of master of arts, no further examination or exercise is required. No subscription or declaration, or oath of any kind, is required from any person on taking the degrees of B.A., B.C., B.M., B. Mus., or D. Mus.; but before admission to the degree of M.A., B.D., D.D., D.C.L., D.M., every person is required to subscribe the Thirty-nine Articles, and the three articles in the 36th canon, and take the oath of allegiance and supremacy, and certain others. The following is a list of the several colleges and halls of which the university is composed, with the date of the foundation, and the number of members of the Convocation, and on the books of each, in the end of 1862.

| Names. | Foundation. | Members of Convocation. | On the Books. |
|---|---|---|---|
| University | 1253 | 173 | 306 |
| Balliol | 12[illegible] | 194 | 359 |
| Merton | [illegible] | 100 | 185 |
| Exeter | 1[illegible] | 341 | 632 |
| Oriel | 1[illegible]6 | 204 | 397 |
| Queen's | 1340 | 156 | 275 |
| New | 1386 | 134 | 184 |
| Lincoln | 1427 | 129 | 195 |
| All Souls | 1437 | 101 | 116 |
| Magdalen | 1458 | 163 | 256 |
| Brasenose | 1509 | 277 | 432 |
| Corpus Christi | 1516 | 114 | 199 |
| Christ Church | 1525 | 470 | 861 |
| Trinity | 1554 | 199 | 323 |
| St. John's | 1555 | 234 | 356 |
| Jesus | 1571 | 88 | 165 |
| Wadham | 1613 | 181 | 319 |
| Pembroke | 1624 | 137 | 271 |
| Worcester | 1714 | 184 | 233 |
| St. Mary Hall | 1333 | 47 | 78 |
| Magdalen Hall | 1487 | 153 | 273 |
| New Inn Hall | 1438 | 15 | 39 |
| St. Alban Hall | 1550 | 4 | 25 |
| St. Edmund Hall | 1269 | 33 | 64 |
| Chorley's Private Hall | | 1 | 2 |
| | | 3839 | 6605 |
| Matriculations in | 1862 | 433 | |
| Masters of Arts | ,, | 203 | |
| Bachelors of Arts | ,, | 306 | |

Each college is an independent corporation, governed by its own laws, and subject to the inspection of its own visitor. Each consists of a head, termed provost, master, principal, &c.; a body of fellows, and generally of scholars also; besides various officers or servants. The head and fellows in every college are the governing body, except at Christ Church, where the dean and canons are paramount. In almost every college, the head is elected by the fellows, and he holds office for life. Fellows and scholars are mostly elected by the head and fellows, or by the head and certain fellows after a competitive examination. Fellowships are tenable for life, unless vacated by marriage, by ecclesiastical preferment, or by accession to property of a certain amount. Some are worth £600 or £700 a year, but many of them do not exceed £100. Scholarships are generally tenable for five years only, and vary from £80 or £100 to £20 or less, together with some advantages in the way of board. Many of the restrictions by which certain of the fellowships and scholarships were encumbered have been removed under the recent University Act. The tutors who conduct the education of the students are selected from the fellows. Besides the scholars, there are in nearly all the colleges, exhibitioners, who have exhibitions or annual pensions, given in some instances by the colleges, in others by free and endowed schools, to young men proceeding to the university, or to certain colleges. There are also several classes of inferior students, who are maintained, either wholly or in part, by the endowments, and are known as servitors, bible clerks,

&c.—*Ref. Encyclopædia Britannica*—art. Universities; *Oxford University Calendar*, 1863.

Oxides, *oks'-idz* (Gr. *oxus*, acid), the compounds of oxygen, and a base destitute of acid and alkalying properties.

Oxacids, in Chem., acids such as the nitric, sulphuric, chromic, &c., in which it is supposed that oxygen forms the acidifying principle, as distinguished from the hydracids, in which hydrogen is thought to play that part. The salts formed from them are called *oxysalts*, in opposition to the *haloids*, or hydracid salts.

Oxycoccus, *ok-se-kok'-kus*, in Bot., the Cranberry, a gen. of the nat. ord. *Vaccinaceæ*. *O. palustris* (sometimes termed *Vaccinium Oxycoccus*) produces the British cranberries, used for making tarts, jams, &c. *O. macrocarpa* yields the American cranberries, which are now largely imported into this country for the use of pastrycooks.

Oxygen, *oks'-e-jen* (Gr. *oxus*, acid, and *gennao*, I generate), in Chem.,—symbol O, equiv. 8, spec. grav. (air=1) 1·1057, ditto (hyd.=1) 16, comb. vol. 1; 100 cub. in. weigh 34·203 grains. Oxygen is the most abundant of the elements. It forms $\frac{8}{9}$ of water, $\frac{1}{5}$ of air, and about $\frac{1}{2}$ of silica, chalk, and alumina, the three chief constituents of the earth's surface. It is also the most important element, being essential to the support of animal life. It is met with in nature in mechanical combination with nitrogen, as the atmosphere which surrounds our globe. It is also given off by growing plants, under the influence of direct sunlight. It possesses strong chemical properties, uniting with all the elements, except fluorine, in a large number of proportions. It was discovered by Priestley in 1774, and was obtained by him by the action of heat on red oxide of mercury. It is tasteless, colourless, inodorous, and has hitherto resisted all efforts at compression. It is the least refractive of all the gases, and possesses magnetic properties similar to those of iron. It is sparingly soluble in water, being only absorbed in the proportion 3 per cent. Oxygen is readily procured in a pure state from a great number of compounds. For laboratory use, it is mostly obtained by heating chlorate of potash, finely powdered and mixed with one-eighth its weight of oxide of copper, iron, or manganese. Peroxide of manganese is a cheap source of oxygen when large quantities are required. It should be heated to redness in an iron bottle, to which a tube is attached, when oxygen is given off, and a low oxide of manganese left behind. A patent has lately been taken out for manufacturing oxygen at a cheap rate from oxide of zinc and nitrate of soda. The resulting gas is somewhat impure, and contains about $\frac{1}{5}$ of nitrogen mixed with it. The majority of the metals do not unite spontaneously with dry oxygen or air; but in moist oxygen or air, many of them become slowly oxidized. Other bodies, such as phosphorus, certain metals in a highly-divided state, greasy rags, and damp hay, having a great affinity for oxygen, unite with it at ordinary temperatures, and undergo spontaneous combustion. Many others when heated to redness unite with it with vehemence, giving rise to the phenomena of burning or combustion. Oxygen was so named by Lavoisier from the supposition that it was the acidifying principle, and it was thought by him to be essential to the constitution of an acid. Davy's researches on chlorine disproved this theory, by showing that hydrochloric acid contained no oxygen. The description of the various compounds of oxygen will be found under the heads of the elements with which it is united.

Oxyhydrogen Blowpipe, *oks-e-hi'-dro-jen*, in Chem. —By throwing a jet of oxygen into a flame of coal-gas or hydrogen, the most intense heat known is produced. The same object is attained by burning the mixed gases in a blowpipe of a peculiar form, known as Hemming's jet, in which the tube conveying the gases from the reservoir is filled with pieces of very fine brass wire, packed closely together, in order to prevent the possibility of the flame rushing back into the tube and causing an explosion. M. St. Clair Deville has lately invented an oxyhydrogen furnace, by which large quantities of the most intractable metals, such as iridium and platinum, are melted like lead. In the Exhibition of 1862, an ingot of platinum weighing over two hundredweight was exhibited by Messrs. Johnson





and Matthey, which was melted and cast by M. Deville at their factory. A large piece of melted iridium, a metal until lately thought to be infusible, was also shown.

Oyer and Terminer, *o'-yer ter'-mi-ner* (Fr. *oyer et terminer*), in Law, is a commission, directed to the judges and other gentlemen of the county to which it is issued, by virtue whereof they have power to hear and determine treasons and all manner of felonies and trespasses. The usual commission of oyer and terminer to the judges of assize is general; but when any sudden insurrection takes place or any public outrage is committed which requires speedy reformation, then a special commission is immediately granted.

Oyez, *o-yes'* (Fr., hear ye), in Law, is the term used by a public crier to enjoin silence previous to making any proclamation or announcement. It is thrice repeated, and is usually corrupted into O yes, O yes, O yes.

Oyster, *oi'-ster* (Gr. *ostreon*, from *osteon*, a bone). —The large and important family of *Ostreadæ* includes shells of very various outline and sculpture, constructed by animals varying in several particulars, but having so many important characters in common, that in natural history they are considered to belong to the same group. The genus consists of more than a hundred and thirty species, of which we here propose to confine our attention to one,—the edible oyster (*Ostrea edulis*), which, in the language of science, may be described as a bivalvular testaceous animal; shell variously shaped, inequivalve, more or less inequilateral, often thick and irregular; upper valve most frequently flat or concave, under one, convex; surface foliated, or with radiating furrows; hinge without teeth; ligament lodged in a pit in each valve; the beak behind that of the under valve often produced, and exhibiting a furrowed ligamental area. The oysters were known to, and valued by, the ancients; the Athenians are said to have prized them, and the manner in which such Latin writers as Horace, Juvenal, and Cicero have spoken of them, shows that they were in high esteem among the Romans, who, in the time of Nero, consumed as many annually as are now eaten in London. These, however, were but the small Mediterranean oyster; and it was not until the period when Agricola ruled in Britain that the people of Italy obtained oysters, which they valued beyond all others, from the shores of Kent. The *Ostrea edulis* may, indeed, be said to have its capital in Britain, since, although found elsewhere on the coasts of Europe, both northwards and southwards, in no part of them does it attain such perfection as in our seas. Oysters are found in various places on the coast of France; as at the mouth of the Seine; on the coast of Caen, in Normandy, where there is a bank six miles long by one in breadth; and at Cancale, on the coast of Brittany. Spain has oysters, which are of a red or russet colour. The Dutch have oyster-beds on the coast of Zealand; but their most famous oysters are those which they transport every year from the English coast, and preserve in pits at Petten, in North Holland. The northern part of Germany is supplied with oysters from exceedingly rich banks on the coasts of Holstein and in the neighbourhood of Jutland. Norway and Sweden have oyster-beds on various parts of their coasts. Italy has oysters of various qualities; those found at Ancona being of large size, but not well tasted; whilst those found in prodigious quantities near Tarentum, in the sea called Mare Piccolo, are excellent. In the West Indies, oysters are tolerably abundant, and are frequently found growing on the boughs of mangrove-trees, which, in such places as the heads of harbour harbours, are frequently under water. The largest supply of oysters, in Britain at least, is derived not from natural but from artificial beds. An oyster-bed is a cavity or reservoir, which communicates with the sea by means of a canal, and in such a manner that the water may be kept in or let out at low tide by means of locks or traps. These beds are supplied by men called dredgers, who, in the month of May, when the oysters cast their spawn or spat, proceed to the natural beds, and letting down rakes or scrapers, to which are fastened bags of sail-cloth, leather, or network, drag them along its bottom by boats in full sail, or rowing-

beats. When the nets are drawn to the surface, there are found, together with oysters, pieces of wood, stones, old oyster-shells, &c., technically known as *cultch*, to which the *spat* has adhered, and which, within twenty-four hours of its deposit, has begun to have a shell. The dredgers then gently remove with a knife the small brood from the cultch, and (under a penalty) throw the latter in again, as it is found by experience, that if the *cultch* be removed, the ooze increases, and that the oysters are destroyed, having no convenience for depositing their spat. The oyster-beds from which the principal supply for the London market is procured, are those of Whitstable, Rochester, Milton, Colchester, Burnham, Faversham, and Queenborough, all artificial beds, furnishing a small, ovate, deep-shelled variety, called *natives*. Oysters grown on artificial beds are considered full grown when from five to seven years old; sea oysters at four years. The age being shown by the annual layers or "shoots" on the convex valve. Much labour is required to keep the beds in good order, cleansed from shells and rubbish, and the oyster's enemies, such as star-fishes and barnacles. If carefully attended to, a bed may last any length of time; but if neglected, it will become overgrown with weed and buried in mud, and can only be reclaimed by restocking. The trade in oysters now ranks in importance in England with the herring, pilchard, and other fisheries. As a specimen of the extent to which they are eaten, it may be mentioned that in London, where the chief consumption of the common oyster is from the 4th August to January, and of natives from October to March, about three hundred thousand imperial bushels are consumed. The oyster-fishery of most consequence in Scotland is that of the Frith of Forth, where the oyster-beds are some twenty miles in extent. On both sides of Ireland oysters abound, and in several places are of excellent quality; the Burran oysters (known as Burton Bindon's oysters), brought from the Burran Bank, in Galway Bay, an artificial bed, supplied chiefly from a natural bank near Ochil Head, being especially esteemed. The oyster-beds in Belfast Bay may be also mentioned as supplying oysters of very large size, the shells being in length from five inches and a half to six inches and a half; in breadth from five inches to five inches and a half; and in depth, with the valves closed, two inches and a half. Oysters are of different colours in different places; those of Spain being, as already mentioned, of a red colour; those of Illyria brown; and those of the Red Sea of the colour of the rainbow. The only coloured oysters, however, which are in repute, are green oysters; such as those of the Bay of Biscay, Dieppe, Cancale, and the Marennes, which are in such esteem that other oysters are frequently made to assume their hue by artificial means; namely, by placing them in pits in the salt-marshes, and covering them with salt-water to the depth of about a foot and a half. These pits, from some quality in the soil co-operating with the heat of the sun, will become green and communicate their colour to the oysters that are put into them in four or five days, though they are commonly allowed to remain there six weeks or two months, by which time they will be of a dark green. Oysters are often covered with productions of the coral kind and with barnacles, and are subject to several kinds of parasites, the most remarkable of which is the oyster-worm, which presents the appearance, on the opening of the oyster subject to it, as a sort of shining clammy moisture, like a star of a bluish colour, but which, when drawn out, proves to be a worm nearly half an inch long.

Ozone, *o'-zone* (Gr. *ozo*, a stench), in Chem., a peculiar modification of oxygen, supposed to be that gas in a permanently negative state, and exhibiting very energetic properties as compared with the gas in its ordinary condition. It bleaches the vegetable colours, converting indigo, for instance, into colourless isatin. It oxidates black sulphide of lead into the neutral sulphate, and converts moist iron, copper, and even silver filings, into their respective oxides. There are several methods of forming it; one of the easiest consisting in transmitting a succession of electric sparks through a tube containing pure dry oxygen. Although formed in minute traces only, the characteristic smell of this peculiar body is soon perceived. It may be detected chemically by immersing in a vessel, containing even the smallest trace of it, a piece of paper covered with moistened starch and iodine of potassium. The ozone immediately displaces the iodine, which unites with the starch, giving rise to a blue colour. A temperature a little below 212° is sufficient to destroy the active properties of ozone. It appears to act most beneficially as a disinfectant in the economy of the world; it having been proved that epidemic diseases, such as cholera, fevers, &c., are always accompanied by a decrease, or entire absence, of this agent from the atmosphere. Late experiments seem to show that there are two modifications of oxygen—ozone and antozone; the former being in a negatively electric condition, and the latter in a positive state; ordinary or inactive oxygen being produced by their union. (For a full account of the preparation and properties of ozone, *see* Odling's *Chemistry*, part I. *See* also Permanganic Acid.)

# P.

P *pe*, the sixteenth letter and the twelfth consonant in the English alphabet. It is one of the mutes and labials, and is pronounced by closely compressing the lips till the breath is collected, and then allowing it to issue forth. From the approximation of sound in this letter to that of *b*, it is susceptible of change with that letter in nearly all languages, more especially that of the German. In some parts of Wales in this country, and in Lower Saxony in Germany, the inhabitants seem wholly insensible to the difference of sound in the two letters. P interchanges also in some languages with other letters, such as Polly for Molly. The $\pi$ of the Greeks signified 80; and in low Latin P represented 100. On medals, P stands for various names of persons, places, and qualities; as *pater*, *populus*, *pius*, *pontifex*, &c.

Pachydermata, *pāk-e-der'-mă-tă* (Gr. *pachus*, thick, and *derma*, skin), an order of quadrupeds, mammalians, such as the elephant, hippopotamus, &c., distinguished from others by the thickness of their skins. The *pachydermata* are subdivided into three genera, viz.—1. the *Proboscidea*, which enumerates such as have a long proboscis, and five toes on each foot, enveloped in a thick horny skin: the elephant may be mentioned as a type of this subdivision; 2. the *Pachydermata ordinaria*, in which the feet may have four, three, or two separate toes; as, for instance, the hippopotamus, rhinoceros, tapir, &c.; and 3. and lastly, the *Solidungula*, which possess only one toe and a single hoof to each foot, as in the horse and other *Equidæ*. (*See* Horse, where the peculiar conformation of the metacarpus and metatarsal bones is fully described).

Pachyma, *pāk-i'-mă*, in Bot., a gen. of *Fungi*. The species *P. Cocos* is highly esteemed as a food and medicine by the Chinese, and by the Indians of North America. It is called Tuckahoe, or Indian bread, in America.

Packfong, *pāk'-fong*, in Metal., an alloy of nickel, zinc, and copper, much used by the Chinese for ornamental purposes. It is similar to German silver in composition and appearance.

Padisha, *pād-e-shā'* (from *pad*, protector, or throne, and *shah*, prince), a title which belongs to the Sublime Porte, and also to the shah of Persia. The emperor of Turkey formerly bestowed this dignity on the kings of France only amongst the nations of Europe; but the honour is now likewise shared by the emperors of Austria and Russia as well.

Pæan, or Paeon, *pe'-ăn* (Gr. *paian*, *paion*).—Critics differ as to the etymology and signification of this word. In the hymns that were sung to propitiate the god Apollo during times of sickness, the phrase *Io pæan* was frequently repeated; and hence they came to be termed pæans. Afterwards hymns to other gods, or songs in praise of heroes, begot the term pæan. Before a battle, a pæan to Mars, and after a victory, one in praise of Apollo.

Paganism, *pa'-găn-izm* (Fr. *paganisme*), the religious worship and discipline of pagans, or the adoration of idols and false gods. The name was given to

the heathens by the Christians, when Constantine and his successors forbade the worship of the heathen deities in the cities. At that time they retired to the villages (*pagi*), where they could practise their ceremonies secretly and safely. The theology of the pagans, according to their own writers, Scævola and Varro, was of three kinds. The first may be called the *mythological*, or fabulous, as it treats of the theology and genealogy of their deities, in which they describe such things as are unworthy of deity. In this species of paganism, they ascribe to their gods thefts, murders, adulteries, and all manner of crimes. (*See* MYTHOLOGY.) This kind of theology is, therefore, condemned by the wiser heathens. The writers of this sort of theology were Sanchoniatho the Phœnician, and Orpheus, Hesiod, Pherecyde, &c., among the Greeks. The second sort of paganism, called *physical* or *natural*, was studied and taught by the philosophers, who, rejecting the multiplicity of gods introduced by the poets, brought their theology to a more natural and rational form, and supposed that there was only one supreme God, which they commonly make to be the sun, or at least an emblem of him, but at too great a distance to mind the world's affairs. In consequence of this, they devised certain demons, whom they looked upon as mediators between the supreme God and man. The philosophers who believed in this sort of theology, treated of the nature of these demons and their relations with regard to man. Amongst their writers on the subject were Thales, Pythagoras, Plato, and the Stoics. The third sort of paganism, called *political* or *civil*, was instituted by legislators, statesmen, and politicians: the first among the Romans was Numa Pompilius. Political paganism chiefly respected the gods, temples, altars, sacrifices, and rites of worship; it was properly their idolatry, the care of which belonged to the priests; and this was enjoined the common people to keep them in obedience to the civil powers. The *rites* of paganism were as various as the objects of their worship. As a general rule, however, they had some idea of the necessity of an atonement for sin, and that "without shedding of blood there is no remission." Sacrifices were deemed essential, and in many cases, and in all emergencies, they were apprehensive that the sacrifice must be, at least, of equal dignity with the sinner. Hence, among many nations, both ancient and modern, from the worshippers of Moloch to the South-Sea Islanders, the practice of human sacrifices, which have stained the altars of almost every nation upon earth. In some religions of paganism, for example in those followed by Zoroaster, Plato, and Socrates, there are to be found pure and elevated notions, and precepts of morality, which would not disgrace even Christianity. St. Augustine declared that the virtues of the heathens were only splendid vices; but this assertion is not borne out by facts. Through the influence of Augustine's writings at the time of the Reformation, arose the dogma of the damnation of the pagans, which acquired a new development from the doctrine of predestination. (*See* IDOLATRY.)

PAGE, *paij* (Ang.-Nor.), is a term applied to the boys who, in the Middle Ages, generally attended on the persons of estate, as a sign of their rank more than for the performance of any menial duties. The pages of the sovereign, which are the only ones remaining in the present day, are selected from amongst the sons of the nobility, and after a certain period of service they are usually presented with a commission in the royal guards. The term is also applied to a sort of young footman in the houses of the wealthy, who wears livery and runs on errands, &c.

PAGE OF A BOOK is one side of the leaf. Every sheet in a folio volume consists of 4 pages; a quarto contains 8; an octavo, 16; an octodecimo (18mo), 36 pages; and so on.

PAGODA, *pă-gō'-dă*, a name, probably of Indian origin, which the Portuguese have given to all the temples of the Indians and all the idol-worshippers of the East. These edifices are generally square, built of stone, not very lofty, and surmounted by a cupola. They are very dark within, as they are destitute of windows, and only receive their light through the entrance. In the darkest recess of the temple stands the image of the idol, generally of monstrous shape and of uncouth dimensions, having many arms and hands. Some of these idols have eight and others sixteen arms, with a human body, the head of a dog; with drawn bows and warlike instruments in their hands. Some of them are black, and others of a yellowish hue. The worshippers are accustomed to present offerings to these gods, consisting of flowers, pieces of silk and cotton, and sometimes gold and silver. Everything is laid before the idols and taken care of by the Brahmins, who guard the pagodas day and night. In China, the pagodas are lofty towers, which sometimes rise to the height of nine stories, of more than twenty feet each. (*See* CHINESE ARCHITECTURE.)

PAINS AND PENALTIES, *painz pen'-al-tees*, a bill of an act of parliament to inflict pains and penalties beyond or contrary to the common law, in the particular cases of great public offenders. It is, in fact, a new law formed in order to meet a special case. (*See* ATTAINDER.)

PAINTERS' COLIC. (*See* COLIC.)

PAINTING, *paint'-ing*.—Painting is the art of imitating visible objects by tracing figures on a surface, and applying to them appropriate colours; and as the desire to imitate is one of the natural tastes of man, and the variety of forms and colours one of his chief sources of pleasure, it is not wonderful that traces of the art should be found amongst the remains of every nation, however ancient, and that it should be practised by every existing people, however uncivilised. In the absence of any positive information on the subject, it would be idle to inquire how early in the history of the world painting took a prominent place amongst the arts of life, and we must be content with the knowledge that it was practised by the Egyptians several thousand years before the Christian era. Painting appears to have had its origin amongst all nations as a species of writing; and amongst the Egyptians it scarcely ever became anything more. The specimens which we possess of Egyptian art, executed eighteen or nineteen centuries before Christ, show that the arts were at that period in the highest condition which they ever attained in Egypt; and through the whole course of Egyptian art we find that, as in these specimens, Egyptian painting seldom, if ever, attempted more than an outline of the object, as seen in profile, such as would be obtained by its shadow. To this outline colours were applied, simply, and without mixture or blending, and without the slightest indication of light or shade. As the Egyptians did not practise dissection, they were ignorant of the true form of the bones and the muscles, and in the representation of the human figure, therefore, could only obtain such success as might result from attention to the lengths of the different parts of the body. The chief reason, however, for the low state of Egyptian art, was the fact that, during the larger period of its existence, it was under the domination of the priesthood, who refused to allow the artists, in the religious works which formed almost their sole employment, to depart from certain sacred and conventional forms. The Egyptian artists employed six pigments, mixed up with a gummy liquid; namely, white, black, red, blue, yellow, and green; the three first always earthy, and the remaining vegetable, or at least frequently transparent. With regard to the Hebrews, we have no information as to whether the art of painting was ever practised amongst them; but it may be inferred that a people who were acquainted with the arts of carving in wood and stone, and of chasing gold and silver, would not be wholly ignorant of painting. There has been much discussion as to how far the ancient Greeks were acquainted with the art of painting; but as their ancient writers, who were acquainted with the finest sculptures and the most beautiful architecture, speak in almost extravagant praise of the painters of their day, it may fairly be taken for granted that the art was practised amongst them with distinguished success. The first Grecian painting on record is the "Battle of Magnete," by Bularchus, and purchased by Candaules, king of Lydia, for its weight in gold, or, as some say, a quantity of gold coins equal to the extent of its surface. This was in the year 718 B.C. During later centuries, however, the art had previously flourished in the cities and islands, and especially at Corinth, having

passed through the various gradations of simple skiography, or shadow-painting; the monographic style, consisting of a simple outline; monochromatic compositions, in which one colour only was employed; and polychromatic, where a variety of hue, but without shading, was used. After Bularchus, the art of painting continued slowly to improve until the time of Polygnotus of Thasos, who, in 460 B.C., founded what may be called the Athenian school, and whose pictures were admired several centuries after his death. Even at this period, however, the art was deficient in the most powerful of its means,—the magic of chiaroscuro, and also in its instruments; the ancient paintings being executed with a *cestrum*, a short metal rod, broad at one end and pointed at the other, in the following manner. The tablet, primed in white, was laid over with a varnish of resin mixed with wax, and usually incorporated with a dark reddish colouring matter. Upon this the subject was traced, and the lights worked in with the cestrum. At length, however, the pencil was invented, and a new and glorious period of Grecian art commenced (400 B.C.) with Apollodorus, Parrhasius, Timanthes, and Zeuxis; the latter of whom is the first from whose works we derive explicit statements of the ideal in Grecian painting, and who was the first to discover or practise the grand principle in the heroic style of painting,—to render each figure the perfect representative of the class to which it belongs. There is reason to believe, also, that he was the first to teach the true method of grouping; artists before his time having arranged the figures in lines, without any principal group on which the interest of the event was concentrated. The last epoch of painting in Greece commences with Apelles (about the conclusion of the 4th century B.C.), whose style, as far as we can judge from the descriptions of the ancient writers, must have closely resembled that of Raffaelle, while their choice of subject appears to have been nearly similar. A Venus painted by him was esteemed the most faultless creation of the Grecian pencil, and was purchased, long after the artist's death, for 100 talents, or £20,000, by the emperor Augustus. Contemporary with Apelles was Protogenes, an excellent artist, whose only fault was that he finished too highly; and somewhat later lived Nichomachus, Pausius, Aetion, and others, with whom the art began to decline, through causes connected with the dismemberment of the Macedonian empire. We can never satisfactorily determine what perfection the art of painting attained in Greece; for whilst, on the one hand, the writers of antiquity, whom we know to have been most accomplished critics of poetry, oratory, sculpture, and architecture, speak in the most glowing terms of the works of the Greek artists, there is a great disparity between the means and instruments of the art as described by them, and the excellence of the effects they assert to have been produced by them; and, in fact, in the few and very imperfect remains of ancient paintings which have come down to us, such as in the delineations upon vases, it is observable that whilst the artist evidently well understood the principles common to form, he was but imperfectly acquainted with those peculiar to painting. As far as can be understood from the allusions of ancient writers, the Greek artists practised three principal methods of painting: first, distemper, employed for mural pictures; second, glazing, when the picture, after being finished in water-colours, crayons, or distemper, was covered with a coat of hard and transparent varnish; and thirdly encaustic, when the colouring matters actually incorporated with wax, or preparations of wax, were thus applied in a liquid state, and when finished allowed to dry. It may here be observed that the practice of colouring marble statues was common amongst the Greeks; and that vase-painting was regarded as an art in itself. The Roman school of painting is scarcely worth a thought, the influx of Greek productions having had the effect of almost completely stifling native Italian talent, and the genius of the people leading them to prefer what was ostentatious and glittering to what was pure in design, pathetic in expression, or perfect in form. There are, however, three periods observable in the history of painting in ancient Rome: the first, that of Graeco-Roman art, which may be dated from the conquest of Greece until the time of Augustus, when the artists





were chiefly Greeks; the second, from the beginning of the Christian era until about the latter end of the 3rd century; the third, when Rome, in consequence of the foundation of Constantinople, and the changes it involved, suffered spoliations similar to those which it had previously inflicted upon Greece. During the second period, portrait-painting was very common in Rome, and *Mosaic* was so general as to a great extent even to supersede painting. The fanatic fury of the early Christians against anything that reminded them of paganism, the division of the empire, and the incursions of the Goths and other barbarians, led to the destruction of all traces of the former splendour of the fine arts; and Christianity helped still further to stifle them, by making purity of heart everything, and physical ugliness or deformity nothing, and by inculcating that mankind, being corrupt and born in sin, no Christian painter ought to look at the naked figure whilst he was painting it. In spite of the fact that the popes and emperors at an early period gave orders for the adornment of the churches with pictures, the art continued to decay until the middle of the 11th century, when St. Didier having sent (A.D. 1066) for Greek artists to adorn Monte Casino, at Subiaco, the example was followed by the corporations of Pisa, Venice, Amalfi, and Genoa, who rivalled each other in adorning their native cities with works of art; and painting, having sunk to the lowest barbarism, went on improving, till the taking of Constantinople by Mahommed II. dispersed the Greek artists collected there, and scattered them all over Europe. Hundreds went to Italy, and inoculated Italian artists with some remnant of their taste for beauty, decayed as it was. Soon after their arrival, some of their pupils began to excel them, and Cimabue (A.D. 1240) was one of the first, if not the first, to give indications of attempting something new in painting. He was himself excelled by Giotto, a shepherd boy, whom Cimabue had taken as a pupil, and who may be looked upon as the father of painting in Italy. In the 15th century there were two schools of painting in Europe descended from the Byzantine school, *i.e.* from the Greek artists who had emigrated from Constantinople to various parts of Europe on its capture by Mahommed II.; namely, the Transalpine school and the Italian school; the former being again divided into the *Dutch*, *Flemish*, and *German* schools; and the latter into the *Florentine*, the *Sienese*, the *Roman*, the *Neapolitan*, the *Venetian*, the *Mantuan*, the *Modenese*, the school of *Parma*, the school of *Cremona*, the *Milanese*, the *Bolognese*, the *Ferrarese*, the *Genoese*, and the school of *Piedmont* and the adjacent territory. As few characteristics of a national style are to be found in the history of art in the Dutch and Flemish schools, as distinct from the German school, prior to the close of the 16th century, they may here be considered as one and the same. Its earliest pictures were painted upon wood, usually oak, covered sometimes with canvas, always with a white ground, upon which the outline of the subject was sketched, and the whole overlaid with gilding, the latter forming the real grounding of the picture, which was painted in water or size-colour, with great care and diligence, and with more truth to nature than occurs in any other works of the same age and description. At the beginning of the 15th century, however, John van Eyck discovered, or at any rate brought oil-colours into general use; and the Transalpine school being thus put early into possession of an advantage contributing principally to the distinguishing qualities of fine colouring and exquisite finish, at once took a high position. Of the great masters of this school, we may more particularly mention the Flemish painters, John van Eyck himself, whose paintings are distinguished by brilliant colouring, magic effect of the *chiaroscuro*, carefully laboured though often tasteless drawing, a strong yet natural expression, and boldness in composition. Francis Floris (born 1520, died 1570), called the Flemish Raffaelle; Francis Snyders, whose hunting-pieces are amongst the very best, if not the best, of their kind; and Peter Paul Rubens (born 1577, died 1640), the author of about 4,000 pictures, distinguished for brilliancy of colouring, the play of reflected lights, and splendour of general effect in his historical pictures; and for the freshness, clearness, and variety

of nature in his landscapes; but who, in the former class of pictures, is sadly wanting in the elevation of form and sentiment which ennobles the works of the old masters of the schools of Florence and Rome. Of Dutch painters, the most distinguished during the 16th and 17th centuries were its founder, Luke of Leyden (born 1494); Cornelius Poelenburg, of Utrecht (born 1586, died 1663), who was famous for his skill in painting small landscapes with figures; John Daniel de Heem, of Utrecht (born 1604, died 1674), known for his faithful imitation of flowers, fruits, carpets, and vases; and, greatest of all, Paul Rembrandt van Rhyn, born in 1606, who was master of all that relates to colouring, distribution of light and shade, and the management of the pencil, but who was wanting in many of the characteristics of a true artist; such as composition, perspective, and dignified expression. Of the German branch of the Transalpine school, as it ceased to be a distinct school when it ceased to be Gothic,—*i.e.* after the 15th century, it will be sufficient here to mention Albert Durer, born in Nuremberg, 1471, whose works, although somewhat hard and meagre, excel in truth, originality, simplicity of thought, and good colouring; and Holbein, his contemporary, whose works, chiefly painted in England during the reign of Henry VIII., are excellent examples of the school. Their successors, departing from the national style, became blended with the Italian masters, to whom we must now return.—The great men of the Florentine school painted more in fresco than in oils. After the lapse of a hundred years from the death of Giotto, during which the art had been slowly improving, appeared Tomaso da San Giovanni, nicknamed Masaccio, from his total neglect of personal appearance, who, although he died at the age of twenty-four, advanced the art from a state of infancy far towards the vigour of manhood. Shortly after his death was born Leonardo da Vinci, who, as philosopher, poet, and artist, anticipated three centuries, and who, to the truth and precision of character introduced by Masaccio, added new and most valuable qualities, by introducing the principles of chiaroscuro, and depth of tone in colour. The "Last Supper," painted by him in fresco at Milan, exhibited a dignity and propriety of expression unequalled at the time; and, if seen as originally painted, probably still unsurpassed. After him come two contemporaries, who are regarded as the greatest painters of any age or country,—Michael Angelo (equally famous as a sculptor), born in Florence in 1474, and Raffaelle, born in Urbino in 1483. Although contemporaries, they were most unlike in all the characteristics of genius save in the final result. The former excelled in energy, the latter in beauty. Michael Angelo's conceptions are wonderful, but singular, and remote from nature; the figures on his canvas are a superior order of beings, and there is nothing about them to put us in mind of their belonging to our species. An ideal abstraction of mind was the object of his imitation, to which all living nature, elevated into gigantic forms and energetic modes, was to be moulded in subserviency. The excellency of Raffaelle, on the other hand, lay in the propriety, beauty, and majesty of his characters; his judicious contrivance of composition, correctness of drawing, and purity of taste. The manner of his best pictures is full, harmonious, sweet, and flowing yet bold, learned, and sustained, and composed of such a union of natural grace and antique correctness as meet only in the creations of his pencil. Raffaelle properly belongs to the Roman school of painters; but in speaking of the history of the art of painting, it is difficult not to associate his name with that of Michael Angelo. Of the artists who supported the reputation of the Florentine school after Michael Angelo, we may mention Daniel di Volterra, who imitated him, as did many others, in a somewhat hard and laborious manner; Andrea del Sarto, who followed the style of Leonardo da Vinci; and Carlo Dolce, who is famous for madonnas and small pictures, which he finished with exquisite delicacy of pencil, and which are fraught with the genuine expression of certain affecting emotions. *The Roman School.*—Some lovers of art have doubted the right of the Roman school to that appellation, as most of the artists who flourished at Rome were either natives of the other cities of the Roman states, or from other parts of Italy; however this may be, the Roman school, or academy, appears to have come into existence about the time of the transference of the papal chair from Avignon to Rome, and to have owed its immediate origin to the diligence of the pontiffs in decorating the Vatican. The only master of this school whom we will here mention before Raffaelle is Pietro Perugino, his instructor in the mysteries of the pencil. His style was narrow and contracted, his figures and draperies being pinched up in a very unpleasing manner; but his youthful and female heads were frequently graceful, and it is known that Raffaelle esteemed his works very highly. Raffaelle, whose place of birth we have already mentioned, had at different periods of his life three distinct styles of painting; the first dry and meagre, in imitation of his master, Pietro Perugino, but not without truth, and often great beauty of finishing; the second an intermediate step,—an attempt to escape from a minuteness which he soon found to be unsuitable both to his own fervour and the dignity of art. The third manner solely and exclusively individual, proceeding from the study of nature and the antique, and of which the most wonderful example is his picture of the "Transfiguration." His death, in 1520, proved an irremediable loss to the arts; and that, and the death of Leo, with the inattention of his successors to anything connected with the fine arts, proved most injurious to the Roman school, which still, however, produced some great masters, of whom the most prominent are Michael Angelo Caravaggio (born 1569), who aimed at great simplicity of colour, and generally chose sombre subjects, such as nocturnal skirmishes, treachery, and murder. Salvator Rosa (born 1615), who applied the style of Caravaggio to landscape, and chose as his subjects savage scenery, Alps, broken rocks and caves, wild thickets, and desert plains. His genius, however, was not confined to such compositions, as he painted some altar-pieces, which are well conceived and of powerful effect. Nicholas and Gaspar Poussin, although Frenchmen, are generally classed in the Roman school, as its style was their rule, and Rome was the constant theatre of their efforts. Towards the close of the 17th century, the Roman school had sunk into the last stage of decline; the result of the calamitous events which had afflicted Rome about the middle of that century; the feuds of the nobles, the flight of the Barberini family, and the dreadful plague of 1656. The rudiments of the *Venetian school* of painting appear to date from the 11th century, about the year 1070, when the doge Selvo invited mosaic-workers from Greece, to adorn the magnificent church of St. Mark; a great impulse being given to it by the arrival of an immense quantity of pictures, statues, and bassi-relievi from Constantinople, after its capture in 1204. The Venetian were the first of Italian artists who became acquainted with Van Eyck's method of painting in oils, and George Bellini was the first in Venice, towards the close of the 15th century, to practise and obtain success in it. His pictures are gracefully drawn, and mellow in colour; but his chief merit consists in the fact that he was the master of the three great Venetian painters,—Titian, Giorgione, and Sebastiano del Piombo, from whom the Venetian school may be said to have taken its distinctive characteristics of smooth harmony and brilliancy of colouring. Giorgione, whose real name was Giorgio Barbarelli, the friend and rival of Titian, painted with a certain freedom and audacity of manner of which he may be said to be the inventor, and which he combined with very rich and careful finishing. His works were, for the chief part, executed in fresco; and as these works were generally upon the outside of the walls of houses, scarcely any of them now remain. Many of his oil-paintings, however, are to be found both in Venice and other places, in excellent preservation and full of grace and beauty. Sebastiano del Piombo, who may be considered a disciple, and the most distinguished one, of Giorgione, imitated him very closely in the tone of his colours and the fulness of his forms, and was particularly successful in pictures for private rooms and portraits. It is said that Michael Angelo held him in such esteem as a colourist, that he united with him, in order to oppose the too favourable opinion entertained by the Romans of Raffaelle. Great as were these painters, however,

Titian (born 1477, died 1576) must be regarded as altogether at the head of the school under notice. In expression, he is the most historical of all painters, his portraits being second only to those of Raffaelle; in careful imitation of natural effect, he is equal to the most painstaking of the Dutch school, whilst at the same time preserving great grandeur and breadth of effect. In his pictures, the surrounding colours and objects are delicately reflected by every surface capable of reflecting, even in the eyes of the figures; and the broad shades, instead of being mere dark masses, are composed of those innumerable gradations which mark the shadows of nature. The Venetian masters were unable, after his death, to maintain the reputation which Titian had gained for it; but we must mention Tintoretto, his contemporary, a painter full of fire and sprightliness, who has been called the lightning of the pencil, from his miraculous despatch, and whose pictures are distinguished by wild and fantastical inventions; Bassano, who was particularly expert in the representation of animals; and Paul Veronese, who founded a distinct branch of the Venetain school. His genius was naturally noble, and even magnificent and vast, and whilst his compositions failed in historical correctness and elegance of design, they are exceedingly attractive, from their freshness and magnificence of colouring. In his pictures are to be found splendid banquets, sumptuous edifices, bright aërial spaces, noble vestments, lords and ladies, crowns and sceptres, arms and jewels. In the course of time the masters of the Venetian school became mannerists in colour; but it cannot be denied that during the period of the decline of art throughout Italy, the Venetian school shone peculiarly conspicuous in the number of superior artists it produced. The next school of any importance is the *Lombard school*, which comprehends those of Mantua, Modena, Cremona, and Milan. The art of miniature-painting was practised at a very early period in Mantua; but in regard to pictures, the first known artist is Andrea Montegna, who was a native of Padua, and established his school at Mantua at the end of the 15th century, where he has left some works of great merit; and with him must be mentioned Giulio Romano (born 1492, died 1546), Raffaelle's most distinguished pupil, whose last works at Mantua, chiefly in fresco, place him at the head of that school. Contiguous to the Modenese school is the Parman, which brings us to Correggio (born 1494, died 1534), the most delightful of all painters, and one who, from the bosom of poverty, without master, without patron, burst at once upon the view in all the blaze of original talent. He had come into notice at a time when it was resolved to paint the great cupola of St. John at Parma, and he was selected as the artist. The clearness and relief, the sweetness and freedom of pencil in the works which he thereupon executed, have never been exceeded; whilst the grandeur of design, and the boldness of conception in the foreshortenings, have astonished all succeding generations of artists. In the management of light and shade he was unequalled; and his only defects were a certain want of correctness, and a want of force, which sometimes render the whole effect of his pictures effeminate and monotonous. Parmegiano is the next important name in this school; but he cannot be compared with Correggio. The school of *Cremona* appears to have had its origin in the foundation of the magnificent cathedral in 1107, which was as speedily as possible decorated with all that sculpture and painting could afford; and, indeed, the history of the school is almost identical with the history of its adornment. The *Milanese* school dates from 1335, when Giotto was employed in ornamenting various places in the city, which long continued to be regarded as most beautiful specimens of the art; but the founder of the Milanese school is, however, by many considered to be Vicenzio Foppa, who flourished about the year 1407, and was employed by the celebrated Francesco Sforza. *The Bolognese School.*—Towards the close of the 16th, and early part of the 17th century, the progress of decline in the art of painting in Italy was stayed for a time by the rise of a new school,—the Bolognese, or Eclectic, the great principle of which was to select what was most excellent in the primitive schools,—design from the Florentine, grace from the Roman, from the Venetian colour, and from the Lombard, light and shade. We have spoken of this school at length under the head BOLOGNESE SCHOOL. The most ancient specimens of the art of painting in France are those on glass, many still remaining of considerable beauty. The school of French painting may fairly, however, be supposed to have risen in the reign of Francis I., who, for the improvement of his subjects, brought artists from Italy. The first native painter of France whose name we find recorded, is Jean Cousin; but the first French masters of eminence were Vouet (born in 1582) and Nicholas Poussin (born 1594), who has been already mentioned as belonging to an Italian school, and who had formed his taste by a residence of nearly twenty years in Italy, before he was invited, in 1639, to a pension and an apartment in the Tuileries. He has been called the Raffaelle of France; and the characteristics of his works are extreme correctness of form and costume, great propriety in keeping, and the most enchanting simplicity of design. Louis XIV., who commenced his reign in the year 1643, having resolved to give to France a school of native artists, called into existence a race of painters, of whom the most distinguished were Le Sueur, who, with the the exception of Poussin, is supposed by some critics to be the best painter France ever produced; Le Brun, who had a lively fancy, great dexterity of hand, and sometimes noble conceptions, but who was in all things too artificial. Contemporary with these was Claude Gelée, commonly called Claude Lorraine, who was a master of aërial perspective, as of nearly every other branch of landscape; but though French by birth, he practised his art and passed most of his life in Italy. In the succeeding reign, Antoine Watteau painted *fêtes galantes* with grace and effect; Joseph Vernet was noted as a marine painter; and Jean Baptiste Greuze was famous for his female heads and representations of domestic life. Painting deteriorated in France during the latter half of the 18th century; but was restored to a certain amount of vitality about the time of the French revolution by Jacques Louis David, whose style, known as the "classic," is dry and pedantic; and who was followed by a numerous band of scholars. At length Gros, Gericault, and others, inaugurated the system of painting from nature, and originated the modern French school, of whom a few of the most distinguished ornaments are Paul Delaroche, historical painter; Ary Scheffer, famous for ideal conceptions; Horace Vernet, unrivalled in battle-pieces; Rosa Bonheur, an exquisite painter of cattle and horses; and Troyon, excellent in landscape. The *Spanish school* can scarcely be said to have had an existence previous to the middle of the 15th century, when some Flemish artists gave the native painters their first practical ideas of colour and design. In the 16th century, schools were in existence in Castile, Valencia, Seville, and elsewhere, that of Seville being the most distinguished. Among the eminent men connected with them were Antonio del Rincon, Luis de Vargas, Luis de Morales, Vincente Joanes, sometimes called the Spanish Raffaelle; Pablo de Cespedes, and Juan de las Roelas, most of whom studied in Italy, and flourished in the 16th century; Francisco Zurbaran, a distinguished painter of the naturalistic school of Caravaggio; and Diego Velasquez de Silva, and Bartolomé Esteban Murillo, whose place is in the first rank of the artists of any age or clime. Since the commencement of the 18th century, Spain has produced no painters of eminence. Of the *English school of painting* little can be said previous to the 18th century; since, although Holbein, Rubens, Vandyke, and other distinguished artists had, during the previous two centuries, successfully practised their art in England, their influence failed to form a national school. It may be true that, as has been asserted with much show of credibility, oil-painting was known in England two hundred years before the time of Van Eyck, and that in the 14th century, painting on glass, heraldic emblazonment, and the illumination of manuscripts, were practised amongst us with much success; but it is, nevertheless, very certain that English art, almost crushed in its cradle by the civil wars of York and Lancaster, received another severe blow at the Reformation, when churches and convents, the great reposi-

tories of high art, were ransacked of their rich contents. The wealth and information which began to flow through all classes of English society in the reigns of Elizabeth and James, had begun to create a taste which the predilections of Charles I. were calculated to improve; and his reign appears to have been one of the most favourable periods in our history for the foundation of a British school of art. The fearful concussions, however, which closed that monarch's career, once more postponed it, and until the reign of George III. the British school of painting is only represented by native artists of obscure fame and merits;—as Dobson, who died in 1646, and was brought into notice through the generosity of Vandyke; John Riley, who painted the portrait of Charles II.; Hoskins and Cooper, famous as miniature-painters; and Hudson, the master of Reynolds, with whom the British school first assumes the dignity of higher art; the elevation commencing with the portraits painted by Sir Joshua Reynolds, about 1752. This artist, to whom is attributed the honour of founding the modern English school, was really a great artist, excellent in portraiture, and eminent as a colourist. His contemporary and rival, Thomas Gainsborough, often equalled him in portraits, but is better known as a painter of landscapes, which would adorn the art of any period. They were preceded by Hogarth, whose pictures were powerful satires on the morals, manners, and follies of the age; but he had but little direct effect upon the artists of his time. Among the other painters who flourished during the latter half of the last century, were Richard Wilson, eminent in landscape; Romney and Opie, who were, to a great extent, self-taught artists; Barry, famous for historical paintings; and Sir Benjamin West, who, though born in America, belonged as an artist to England, where he practised his art during the greater part of his career, and where, as an historical painter, he attained the highest eminence. In the first quarter of the present century flourished Sir Thomas Lawrence, whose female heads are most striking, lovely, and highly finished; Hoppner, Raeburn, and Jackson, also portrait-painters; Wilkie, the best painter of humble life England has produced; Haydon, an historical painter of some merit, but a great mannerist; Etty, a vigorous colourist; Turner, the most original and imaginative, perhaps, of landscape-painters; Constable, Callcott, W. Collins, Morland, Nasmyth, Barrington, eminent in the same department; and John Martin, whose pictures are filled with extravagancies of light and shade. During the same period, *genre* was cultivated by Bird, Smirke, Stothard, and many others, and has been continued to the present day by Newton, Leslie, Cooper, Mulready, Maclise, Eastlake, Redgrave, E. M. Ward, Webster, Hamilton, Cope, Dyce, C. Landseer, J. R. Herbert, Horsley, Frith, Ford, and many others; most of whom have also painted history and landscape with success. Among prominent landscape-painters of the present day are Creswick, Stanfield, D. Roberts, James Ward, Linnell, and F. Lee. Sir Edwin Landseer occupies a peculiar and prominent position as a painter of animals.—With regard to painting, considered as an art, it may be said to consist of two chief parts,—outline and design. Outline is a design without colour, and examples of it may be seen in the cartoons of Raffaelle, Retzsch, Flaxman, and others. Design, properly so called, includes outline, representing the contour of objects, together with colour, which gives to the image not only the hue, but also the form and relief proper to the object. The technical processes of painting are oil-painting, water-colour painting, encaustic-painting, miniature-painting, fresco-painting, enamel-painting, &c. There are at least ten branches of the art,—viz., history, grotesque, portraits, fancy, animals, flowers and fruits, sea-scape, landscape, still-life, and battle-pieces. In order to successfully prosecute the art, the painter should be well acquainted with anatomy, as otherwise the living model would be useless to him. Without perspective, he is unable to dispose the objects in his picture properly. Symmetry teaches him to observe the relative proportions of parts to each other; invention assists him in representing the action and expression of the persons employed in his picture; expression tells him how to depict the passions and emotions of the mind. Colouring—that crowning beauty of the painter's art—has also its laws. All trifling, or artful play of little lights, or an attention to a variety of tints, is to be avoided; a quietness and simplicity should reign over the whole work, to which a breadth of uniform and simple colour will greatly contribute. "Grandeur of effects is produced in two different ways, which seem totally opposed to each other. One is by reducing the colours to little more than chiaroscuro, which was often the practice of the Bolognese school; and the other by making the colours very distinct and forcible, such as we see in those of Rome and Florence; but still the presiding principle in both those manners is simplicity." (*See* Encaustic-Painting, Fresco-Painting, Pre-Raphaelitism, and Water-colour Painting.)

Painting, House, is the art of painting the exterior and interior of buildings with colours, either in oil or distemper, with the view of rendering the surfaces less liable to decay, and, at the same time, to admit of their being readily cleaned. Respecting the pigments used, white lead appears to command the greatest value as a cheap and durable white colour: among the earths, sienna, Venetian red, the ochres, and umber, are most generally approved of; the best metallic compounds are chrome-yellow, vermilion, verdigris, verditer, and Prussian blue.

Paladin, *păl'-a-din*, a name applied to the knights-errant of the Middle Ages, so admirably ridiculed by Cervantes in his "Don Quixote," whose general employment was to go over all countries praising their "ladye loves," and defying all to mortal combat who refused to acknowledge the truth of their panegyrics.

Palæography, *pai-le-og'-răf-e* (Gr. *palaios*, ancient; *grapho*, I write), the science or art of deciphering ancient writings, including the study of the various inscriptions, and the knowledge of the characters in use among the writers of different nations, with their abbreviations, initials, &c. The earliest examples of writing occur on stone, metals, wood, baked clay, wax, linen, the bark and leaves of trees, and the prepared skins of goats, sheep, and calves. Much importance was attached in the earlier centuries to the correct transcription of the works of both profane and theological writers. As early as the 5th century, schools, or associations of scribes, were formed for the purpose, who worked under stringent rules. The famous copy of the Scriptures, called the *Codex Alexandrinus*, now preserved in the British Museum, was written by a female scribe in one of these schools at Alexandria. Many distinguished men transcribed important works themselves, and frequently compared and revised the transcripts of professional scribes. In the principal monasteries there was a *scriptorium*, or writing-room, in which the *scriptor*, or scribe, could pursue his avocation in quiet. He was usually assisted by a *dictator*, who read the text to be copied, aloud; the transcript was then revised by a corrector, and afterwards handed to the *miniator*, who added the illuminated capitals and artistic designs. The finest *vellum* manuscripts are all prior to the 8th century. During the 4th and 5th centuries, they were all written in the broad capital letter which has been called the *rustic*. One of the finest specimens of this style is the Vatican Virgil, written in the 4th century. In the 11th century, probably on account of parchment being rare, it became a general practice to erase the ancient and so-called profane manuscripts, in order to transcribe recent theological treatises. The name of *Palimpsests* was given to manuscripts thus erased and again written upon. The handwriting of the 11th century is small and closely written, with a considerable slope. At the close of the 12th century, the clear Roman writing was superseded by the introduction of an angular character, which has been termed the *modern Gothic*, which became universal in the 13th century. The science called *Diplomatics* is a branch of Palæography. (*See* Diplomatics.)

Palæontology, *pai-le-on-tol'-o-je* (Gr. *palaios*, ancient; *onta*, beings; *logos*, a discourse), that branch of natural science which treats of fossil organic remains. Much of the light that has been thrown, of late years, on the formation and constitution of the globe is due to the discoveries and investigations of palæontology.

The geologist, by its means, is able to trace the successive orders of animals and plants which have inhabited the earth at different periods of its existence. All fossiliferous systems may be viewed in two great aspects,—either as regards their mere mineral and physical relations, or as regards the plants and animals found as fossils in their strata. The former constitutes the lithology and the latter the palæontology of a formation. In order, however, to arrive at a knowledge of the cosmical conditions which regulated the deposition of the strata of a system, an acquaintance with botany and geology is indispensable to the geologist, in order that he may be able to apply their general principles to the solutions of those problems that arise out of the science he is investigating.—Ref. *Advanced Text-book of Geology*, by Page.

PALANQUIN, or PALANKEEN, *păl-an-keen'*, a kind of litter or covered carriage, which forms the principal vehicle for personal transport in Hindostan. It is borne on the shoulders of four porters, called *coolies*, eight of whom are attached to it, and who relieve each other. Palanquins are generally provided with a bed and cushions, and a curtain which can be dropped when the occupant is disposed to sleep. The motion is neither violent nor unpleasant, and the travelling by this means is safe and rapid. This mode of conveyance is very ancient, as a similar vehicle was used by the ancient Egyptians, as shown in a representation found at Beni Hassan.

PALATE, *păl'-at* (Lat. *palatum*), the roof or upper part of the mouth. In man it is composed of two parts,—the hard palate, which forms an arch in the anterior part of the mouth, and the soft palate, which lies in the posterior part of the mouth, and consists of a membranous curtain of muscular and cellular tissue, from the middle of which hangs the uvula.

PALE, *pail* (Lat. *palus*, a stake), is the most simple style of ordinary used in heraldry. It incloses one-third of the escutcheon, and is bounded by two vertical lines from the sides of the same. Although sometimes it exceeds that number, it seldom contains more than three charges. The term *pallet* is applied to half the *pale* when borne by itself; occasionally, however, even three pallets are borne together. When a coat is bisected by a vertical line which has a different field on each side of it, it is said to be *party per pale*, or, in other words, *divided* by the pale. It is stated, in books on heraldry, that the pale is one of the most ancient of bearings, as it is likewise honourable.

PALIMPSEST. (*See* PALÆOGRAPHY.)

PALLADIUM, *păl-lai'-de-um*, in Chem.,—symbol Pd, one of the rare metals found in the ores of platinum in the proportion of 1 to ½th per cent. It is a white hard metal, having a spec. grav. of 11·8. It is very infusible, but melts readily in Deville's oxyhydrogen furnace. Its rarity has prevented its application to numerous useful purposes. It forms three oxides, and several other compounds at present little known. It has a stronger affinity for cyanogen than any other metal, and forms a series of double cyanides. It readily combines with gold, forming a peculiarly white alloy, even when present in small proportions. It was discovered by Wollaston in 1803, and was thus named by him from the planet Pallas, discovered the year before.

PALLAS, *păl'-lăs*, in Astron., one of the asteroids or smaller planets discovered by Olbers, at Bremen, on the 28th of March, 1802. The size of Pallas has not been measured with accuracy, but it is known to be exceedingly small. In the "Annuaire du Bureau des Longitudes," the following elements are given of the orbit of Pallas by M. Langier:—Eccentricity, 0·2392280; inclination, 34° 37′ 20″; longitude of the perihelion, 121° 24′ 11″.

PALLIUM, *păl'-li-um* (Lat., a cloak), a square woollen cloak much worn by the Greeks, resembling the *toga* of the Roman citizens. It was formed of woollen cloth cut square, and was worn over the tunic, or sometimes, indeed, over the naked body as the sole covering; being fastened to the shoulder or neck by a fibula or brooch. According to Fairholt, it was the cheapest, most serviceable, and simplest mode of clothing adopted by the Greeks, who are often represented upon ancient vases as clothed with no other article of dress. Apparently it resembled the *himation* adopted by the Arabs, as a soldier could wrap himself at night in its ample folds, and sleep secure from damp and cold. It was sometimes decorated with embroidery, but had usually merely a simple border. The term *pallium* was also applied to a vestment which, according to ancient custom, was sent from Rome to all the archbishops of the Roman Catholic church, and also to the Latin patriarchs of the East, when they assumed their canonical office. This species of pallium was manufactured from the wool of the white lambs which had been blessed at Rome on the festival of St. Agnes, and deposited on the tomb of St. Peter during the eve of his festival. At the present time it is a short white cloak with a red cross, which encircles the neck and shoulders, and falls down the back.—*Ref.* Brande's *Dictionary*,

PALMACEÆ, *păl-mai'-se-e* (Lat. *palma*, palm), in Bot., the Palm fam., a nat. ord. of *Monocotyledones*, sub-class *Petaloideæ*. Trees or shrubs, with simple, or rarely branched trunks, and large terminal sheathing leaves. Flowers perfect or unisexual, arranged generally on a branched spadix, which is inclosed in a spathe. Perianth inferior, in two whorls, each of which is composed of three parts. Stamens 6, 8, or numerous, perigynous. Ovary superior 1—8-celled. Fruit nut-like, baccate, or drupaceous. Seeds with a minute embryo in a cavity of the albumen, which is fleshy or horny, often ruminant. Most of the plants of this order are tropical. Lindley enumerates 400 species, which are referred to 73 genera. Palms rank next to grasses as regards their useful dietetical and economical applications. They yield sugar, starch, oil, wax, wine, resin, astringent matters, and edible fruits and seeds. Their leaves are used for thatching houses, as materials for writing upon, for making hats, matting, &c. Their wood is applied to many useful purposes. The fibres of their petioles and fruits supply the raw materials for cordage, cloth, and various textile fabrics. Lastly, the hard albumen of their seeds is made use of in many ways.

PALM-OIL. (*See* ELAIS.)

PALMS. (*See* PALMACEÆ.)

PALM-SUNDAY, a term applied in the Church to the last Sunday before Easter, which celebrates Christ's entry into Jerusalem, when palms were strewn before him. In former times it was the custom to draw a wooden ass in procession, because our Saviour entered the city of Jerusalem riding on an ass; but now that ceremony is discontinued. Palm-Sunday is still celebrated with great solemnity by the Roman Catholics, the churches of whom are decorated and strewn with branches of palm.

PALO DE VACA. (*See* BROSIMUM.)

PALSY. (*See* PARALYSIS.)

PAMPHLET, *păm'-flet*, a small book consisting of sheets stitched together and sold unbound. The English *pamphlet* is synonymous with the French *brochure* and the German *Flugschrift*, as they all mean publications that are merely written for the moment and for immediate effect. In the last century, and earlier, political pamphlets were common enough in England, and were expressive of the different efforts made by parties and sects to overthrow each other: whence they are of much service to the historian of those times, who must, however, use them with great caution. In France and Germany they are still very general; but they have now fallen almost into disuse in England.

PANAX, *păn'-aks* (Gr. *pan*, all; *akos*, remedy), in Bot., a gen. of the nat. ord. *Araliaceæ*. The species *P. Schinseng* produces the root called Asiatic *ginseng*, which is so highly prized by the Chinese as a stimulant and aphrodisiac, that they will sometimes give for it its weight in gold. It is not much valued in Europe. The root of *P. quinquefolium*, a North-American species, has similar properties.

PANCREAS, *păn'-kre-ăs* (Gr. *pan*, all, and *kreas*, flesh), in Anat., is a single glandular organ, situated transversely across the upper part of the abdomen, at the posterior part of the epigastric region, about on a level with the last dorsal vertebra. It is of an irregular elongated form, from six to eight inches in length, an inch and a half in breadth, and from half an inch to an inch thick. The right extremity or head is curved upon itself from above downwards, and is

embraced by the concavity of the duodenum. Its body tapers towards its left extremity, where it forms a tail terminating at the spleen. The pancreatic duct extends from left to right through the substance of the pancreas, giving off numerous branches, and terminating in the common choledic duct, which conducts its secretions to the duodenum. In structure, the pancreas closely resembles the salivary glands, but it is looser and softer in texture; and the fluid secreted is almost identical with saliva. Its object is believed to be to reduce fatty matters to the state of an emulsion, and thereby promote their absorption by the lacteals. The amount daily secreted by man is from five to seven ounces, and it is most abundant at the commencement of digestion. Its importance is evident from the fact that it is found in all vertebrates, whether carnivorous or herbivorous.

PANDANACEÆ, *păn-dăn-ai'-se-e*, in Bot., the Screw-pine fam., a nat. ord. of *Monocotyledones*, sub-class *Petaloideæ*, consisting of tropical palm-like trees and shrubs. The leaves are sheathing, imbricated, and spirally arranged in three rows, simple or pinnate. Flowers unisexual or polygamous, numerous, arranged on a spadix, with numerous spathaceous bracts. Perianth absent or scaly. Stamens numerous; anthers 2—4-celled; ovaries 1-celled; ovules solitary or numerous, on parietal placentas. Fruit consisting of a number of 1-seeded fibrous drupes, or of many-celled, many-seeded berries; embryo minute, solid, at the base of fleshy albumen. There are 24 genera and about 75 species. None possess any very active properties. The genus *Pandanus* has edible seeds. The juice which flows from the wounded spadices of *Nissa*, when fermented, furnishes a kind of wine. The fruit of *Nissa fruticans* is the *atap* of India. The unexpanded leaves of *Carludovica palmata* furnish the material employed in the manufacture of Panama hats.

PANDEAN PIPES, *pĭn'-de-ăn*, an ancient wind instrument of music, consisting of a number of reeds of progressive lengths joined together, said to have been invented by the god Pan; hence its name.

PANDECTS. (*See* JUSTINIAN'S CODE.)

PANDIT. (*See* PUNDIT.)

PANGIACEÆ, *păn-je-ai'-se-e*, in Bot., a small nat. ord. of arborescent unisexual plants, nearly allied to *Papayaceæ*, but differing principally in being polypetalous, and in the fertile flowers having as many scales as there are petals. There are two genera and four species, natives exclusively of the hotter parts of India. They are all more or less poisonous; but the seeds of one species, *Pangium edule*, after being boiled and soaked, are used for flavouring curry.

PANICUM, *păn'-e-kum*, in Bot., a gen. of Grasses, including several useful species. *P. miliaceum* yields the grain called Indian millet, the *warree*, and *kadi-kane* of the East. *P. spectabile*, a Brazilian species, attains the height of six feet or more, and is an excellent fodder grass. It is commonly known as Angola-grass. *P. jumentorum* is another fodder-plant, known as Guinea-grass. *P. pilosum* yields the grain called *bhadlee* in India. The grain of *P. frumentaceum* is used in the Deccan under the name of *shamoola*.

PANORAMA, *păn-o-ra'-mă* (Gr. *pan*, all; *orama*, a view), a large picture, generally of a town or landscape, so constructed that a spectator in the centre of the room can have a complete view of the objects represented. This ingenious contrivance was invented by an English artist, Robert Baker, about 1791; it was painted *in distemper*, or similarly to the mode employed in scene-painting. The panorama forms the surface of a hollow cylinder or rotunda, in the centre of which is a detached circular platform for the spectators, covered over-head, to conceal the daylight; thus increasing the illusion and adding greater effect to the picture. The latter is painted on canvas like the scenes of a theatre. In painting a panorama, the artist must take from a high point an accurate plan of the whole surrounding scenery as far as the eye can reach. The great objects to be aimed at in panoramas are truthfulness of representation and closeness of imitation. Robert Fulton introduced the panorama into France, and panoramic views of a great number of cities and natural scenes have been exhibited of late years in this and other countries. The *diorama* differs somewhat from the panorama. (*See* DIORAMA.)

PANTAGRAPH, or PANTOGRAPH, *păn'-ta-graf* (Gr. *pan*, all, and *grapho*, I write), an instrument by which drawings, maps, and plans can be copied, reduced, or enlarged. It is formed of a rhombus made of jointed brass and wood, two of whose legs at the nibs stretch out in the form of an isosceles triangle to double their length. One of these legs is divided to correspond proportionately to a division in one of the other sides of the rhombus, and at the point in the latter a pencil is fixed to mark the copy, while a tracer at the extremity of the other elongated side, or leg, goes over the original plan. By these means, a copy can be obtained of the original, nearly geometrically correct, either on a similar, an enlarged, or on a reduced scale.

PANTALOON, *păn-tă-loon'* (Ital. *pantalone*, Fr. *pantalon*), one of the chief actors in a pantomime, who plays the part of foil to the clown, to display his witticisms upon. The name is derived from one of the masks in Italian comedy, who was dressed in wide, long garments similar to those which the modern pantaloon wears. (*See* PANTOMIME.)

PANTHEISM, *păn'-the-izm* (Gr. *pan*, all, and *theos*, God), is a system of philosophical speculation or religious belief, which affirms that all existence, material and spiritual, is only modifications of one eternal self-existent substance, which it calls God. The word pantheism was first used in its present signification by Toland in 1705, and a society was formed who took the name of Pantheists, because they professed worship of all nature as their deity. Pantheism, however, had existed from the earliest times, but was classed under the general name of atheism. It is to be found in the most ancient records of the race, apart from Scripture. The Vedic writings of the Hindus are pervaded with pantheism; their innumerable host of gods being regarded as emanations of the primeval and unchangeable; while in the opposing system of Buddhism, the final object of aspiration is the absorption of man in the great eternal substance. Passing from India to Greece, we find pantheism to prevail in various of the philosophic systems there. Anaximander of Miletus (B.C. 611—547) is regarded as the father of the pantheistic tendencies of Greek speculation, and with him began the disposition to develop the universe from one grand indeterminate abstraction. He was followed by the Pythagoreans and Eleatics. (*See* GREEK PHILOSOPHY.) Many of the Neo-Platonists adopted a system of pantheism; and it also found a place among the Gnostics. In the 7th century, John Scotus Erigena, a man of great learning and original genius, advocated pantheism, and maintained that "all which is truly said to be is God alone;" "that everything is God," and "God is everything." In the 12th century pantheism reappears in the speculations of Amabric de Bena and David de Dinante. Giordano Bruno, who was burned as a heretic at Rome in 1600, may be regarded as the precursor of Benedict Spinoza in the history of modern pantheism. The latter, however, is the one with whose name pantheism is most commonly associated, and whose system is the most able and philosophic that has ever appeared. It is elaborated in his great work the "Ethics," in which he has attempted to deduce, mathematically, from the knowledge of God, the fundamental laws of morality and the principles that should regulate human life. In true geometric fashion, he begins by laying down a series of definitions and axioms, from which he proceeds to evolve, demonstratively, in a set of theorems, each depending on what has gone before, his entire scheme of God and the world. According to him, there can only be one existing substance, which has two modes or properties,—thought and extension; and that of one or both of these all things consist; so that they are modifications of the one infinite substance, which is Deity. All things are modes of extension, all thoughts are modes of thought. This deity is not a conscious or intelligent individual; but whatever of mental faculties it possesses can only be the aggregate of the mental powers and actions of the innumerable beings that possess intelligence. Death is but a returning into the infinite whole, and, consequently, there is no future state. Much has been said against the system and the man; but however we may reprobate the system, the author was an earnest and true

man. As in many other instances, he was much better than his doctrines. Novalis happily designated him as a God-intoxicated man (*Gott trunkener Mann*). His definition of substance, however, is an assumption rather than an axiom; and his modes are not deductions from the definition, but superinduced upon it. The modern systems of Fichte, Hegel, and Schelling, are pantheistic. (*See* GERMAN PHILOSOPHY.) "The total falsehood of all pantheistic systems may be established both directly and indirectly: directly (1) from its misapplication of the laws of thought, and (2) from its violating, *in limine*, the original data of consciousness; indirectly; (3) from its virtually contradicting the intellectual and moral consciousness of mankind, and (4) from its rendering religion impossible." It is destructive of all religious worship; "for, in the first place, the god of the pantheist is not the Deity before whom human nature feels constrained to bow;" and "in the second place, if all things, and myself among the rest, are properly God, what room is there for worship? How can God be said to worship himself." — Ref. *Encyclopædia Britannica*.

PANTHER, *pán'-ther* (Gr. *panther*), *Felis Pardus*, a large quadruped, measuring about six feet and a half from nose to tail, and belonging to the order FELIDÆ (which *see*). It is principally found in Africa, although it is also scattered through the southern parts of Asia and the Indian archipelago. It is fawn-coloured above and white beneath, with six or seven rows of black spots on its flanks. In some, the ground of the fur is black, with spots of a deeper colour; but they are not a distinct species. The tail is about the length of the body deprived of the head. The panther much resembles the leopard; and, indeed, the two species have been often confounded together, as no naturalist in early times ever seems to have taken the trouble to point out the difference between the two animals. According to Mr. Swainson, in his work entitled "Animals in Menageries," "the leopard, as defined by Major Smith, when compared with the jaguar and panther of naturalists, is uniformly of a paler yellowish colour, rather smaller, and the dots rose-formed, or consisting of several dots, partially united into a circular figure in some instances, and into quadrangular, triangular, or other less determinate forms, in others; there are also several single isolated black spots, which more especially occur on the outside of the limbs. The panther, according to Professor Lichtenstein, of Berlin, "resembles the jaguar in having the same number of rows of spots, but is distinguished by having no small dots on the dorsal line." But as Major Smith observes, "it does not appear that full spots on the dorsal line always make a specific character of the jaguar; and the Asiatic leopard is sometimes distinguished by this peculiarity, though it does not in other respects resemble the American animal. When, therefore, it is said that the panther much resembles the jaguar, it is always to be strongly suspected that the type whence the observations have been taken is in reality an American animal." The panthers used to be exhibited in Rome in large numbers on the occasion of the celebration of any triumphal procession; and hence it appears that they were far more numerous in the days of antiquity than in the present time. Pompey is said to have exhibited five hundred and ten, while Augustus Cæsar even eclipsed the latter, by exhibiting no less a number than five hundred and twenty. There is a species termed panther in America, which, however, does not belong to the family; and which will be found described under the article JAGUAR.

PANTOMIME, *pán'-to-mime* (Gr. *pas*, all, and *mimeo*, I imitate), in the largest sense of the word, means the art of expressing action and emotion by gestures, without calling speech into play. According to most authorities on the subject, the word *pantomime*, as we understand it,—that is, meaning a performance based more or less on mimicry and gestures,—was originally invented in Italy; and entire theatrical representations, consisting of gestures merely, were termed *saltatio pantomimorum*. Under the first emperors, this species of performance was particularly developed. The most celebrated rivals at this era in the art were Bathyllus, Pylades, Hylas, and others, in the days of Augustus. The people took the greatest interest in them, and riots were frequent, owing to the crowds who gathered round the doors of the circus long before the hour of performance began. Gibbon says of them: "The vast and magnificent theatres of Rome were filled by three thousand female dancers and three thousand singers, with the masters of the respective choruses. Such was the popular favour which they enjoyed, that in a time of scarcity, when all strangers were banished from the city, the merit of contributing to the public pleasures exempted them [the actors] from a law which was strictly executed against the professors of the liberal arts" (chap. XXI., A.D. 403). In these representations the pantomimes became low and degraded in character to mere wantonness, and some ancient authors ascribe the decadence of Rome as owing in part to their influence. In the Italian masks a trace of the old performance can be found, and most of the characters which we now use in pantomime were then embodied. (*See* DRAMA.) In the modern pantomime, the jesters are, to some extent, permitted the use of dialogue; and the ballet, which formed such an important part in its performance on the Roman stage, is still retained. The pantomimes of the present day, however, appear to depend more upon the burlesques which precede them, and scenic effect, than on the legitimate interpretation of the word pantomime.

PAPACY. (*See* ROMAN CATHOLICISM.)

PAPAVER, *pá-pá'-ver*, in Bot., the Poppy, a gen. of plants belonging to the nat. ord. *Papaveraceæ*. The species *P. somniferum*, the garden or white poppy, furnishes the valuable drug *opium*, used so largely in medicine, and as a narcotic indulgence. Opium is obtained by making incisions into the unripe capsules, and inspissating the milky juice which exudes from them. *P. Rhœas*, the common red or corn poppy, is found in cornfields and on roadsides throughout Europe. Its scarlet petals are officinal in our pharmacopœias, being used to prepare a syrup, which is supposed to have some slight narcotic properties, but which is probably useful only as a colouring ingredient. Many species and varieties of poppy are cultivated in our gardens.

PAPAVERACEÆ, *pá-páv-e-rá'-se-e*, in Bot., the Poppy fam., a nat. ord. of *Dicotyledones*, sub-class *Thalamiflorœ*, having the following essential characters:—Herbs with a milky juice. Leaves alternate and exstipulate. Peduncles 1-flowered; flowers regular and symmetrical. Calyx and corolla with a binary or ternary arrangement of their parts, deciduous, hypogynous. Stamens numerous, hypogynous. Ovary compound, 1-celled, with parietal placentæ, and stigmas opposite to the placentæ. Fruit 1-celled. Seeds numerous, albuminous. The plants of this order are in almost all cases characterized by well-marked narcotic properties; nearly two-thirds of them are natives of Europe, and are mostly annuals. There are 18 genera and 150 species. Many genera are commonly cultivated in our gardens, as *Papaver*, *Argemone*, *Romeria*, *Platystemon*, and *Eschscholtzia*. The latter is remarkable for its enlarged hollow thalamus, from which the calyx separates by transverse dehiscence in the form of a conical cap, resembling the extinguisher of a candle. (*See* PAPAVER.)

PAPAYACEÆ, *pá-pá-á'-se-e*, in Bot., the Papaw fam., a nat. ord. of *Dicotyledones*, sub-class *Caliciflorœ*. Trees or shrubs, sometimes with an acrid milky juice. Leaves alternate, on long stalks, lobed. Flowers unisexual. Calyx inferior, minute, 5-toothed. Corolla monopetalous, without scales in the fertile flowers, 5-lobed. The barren flower has a few stamens inserted on the corolla. The fertile flower has a 1-celled superior ovary, with 3—5 parietal placentæ. Fruit succulent or dehiscent. Seeds numerous, albuminous, with radicle towards the hilum. There are 3 genera and 26 species, natives of South America and of the warmer parts of the Old World.

PAPER, PAPER MANUFACTURE, *pa'-per* (Fr. *papier*). —Paper is a thin flexible leaf, generally white, manufactured from some vegetable substance, and used for writing or printing upon with ink. At a very remote period, a species of paper was manufactured in Egypt from the papyrus or paper-reed (*Cyperus Papyrus*), which grows plentifully on the banks of the Nile. It was made by taking thin plates of bark from the

middle of the paper-rush, and laying them side by side and close together on a hard smooth table; other pieces of the same size were then laid across the first at right angles; the whole was then moistened with water, and pressure was applied for a certain number of hours. By this means, a sheet of paper was formed which required no other finishing than rubbing and polishing with a smooth stone on a round piece of glass, and then drying in the sun. The art of making paper from fibrous matter reduced to a pulp in water seems to have been discovered by the Chinese as early as 95 A.D. In the time of Confucius, the Chinese paper was made from the inner bark of the bamboo. They afterwards made it from cotton and linen rags, and a coarse yellow sort from rice-straw. Several kinds of thin Chinese paper exhibit great skill and ingenuity in their manufacture, and are applied with much advantage to various purposes. One kind especially is particularly celebrated for affording the clearest and most delicate impressions from copper-plates, which are generally termed *India proofs*. The delicate and fragile substance, improperly called *rice-paper*, consists of the inner membrane of the bread-fruit tree. The exact time when the manufacture of paper was first introduced into Europe seems to be a matter of considerable uncertainty. It would appear that the Arabians, in the 7th century, had discovered, or learned from the Chinese, the art of making paper from cotton; and they seem to have carried the art into Spain, where they not only made paper from cotton, but from linen and hemp also. In England, the first paper manufacturer seems to have been a person called Tate, who had a mill at Hertford early in the 16th century. Another mill was established in 1588, at Dartford, in Kent, by John Spielman, for which he was afterwards knighted by Queen Elizabeth, who also granted him a license "for the sole gathering, for ten years, of all rags, &c., necessary for the making of such paper." Up to that time our principal supplies of paper had been from France and Holland. The making of paper progressed very little till 1713, when Thomas Watson, a stationer, introduced some foreign improvements which gave an impulse to the manufacture. The heavy duty, however, retarded the manufacture, and only very common paper, used for wrapping, was made in this country. About 1770, Mr. Whatman, an officer in the Kent Militia, while travelling in the suite of the British ambassador in Holland, where the best papers were then made, acquired the information which enabled him to effect great improvements in the manufacture of paper. Any fibrous substance may be used in the making of paper. In a book written by a German (M. Schäffers), as early as 1771, there are sixty specimens of paper made from different materials. Amongst the substances used are the barks of the willow, beech, aspen, hawthorn, lime, and mulberry; the down of the asclepias, the catkins of black poplar, and the tendrils of the vine; the stalks of the nettle, mugwort, thistle, bryony, clematis, and lily; cabbage-stalks, fir-cones, moss, potatoes, woodshavings and sawdust. Paper has also been made from straw, rice, hop-bine, liquorice-root, the stalks of the mallow, and the husks of Indian corn. In papermaking, the combination of flexible fibres by which the paper is produced, depends on the minute division of the fibres and their subsequent cohesion. In making paper from linen and cotton rags, these materials are first sorted and cut into small pieces. This is principally done by women, each of whom is provided with a large knife to cut the rags. When cut, the rags are thrown into five or six compartments in a large chest, according to their qualities. The finest linen rags are used for the best writing-paper; but cotton, as well as linen rags, are used for printing-paper. In the next process the rags are washed, and afterwards bleached by the action of chlorine, either as a gas or in the form of bleaching-powder (chloride of lime). The washed rags are then subjected to the action of a revolving cylinder, the surface of which is furnished with a number of sharp teeth or cutters, so placed as to act against other cutters placed beneath the cylinder. For several hours the rags are kept immersed in water and subjected to the action of these cutters till they are divided minutely and reduced to a thin pulp. During this process chloride of lime is mixed with the water, which





renders the pulp perfectly white. The pulp is then transferred to a large vat, and is ready to be made into paper, either by hand or by machinery. When paper is made by hand, the workman is provided with a mould, or shallow frame covered with wire-cloth and a little larger than the sheet intended to be made upon it. This wire-cloth is now generally woven in a loom, like cloth. It was introduced by Baskerville in 1760. A beautiful edition of Virgil, printed by him on paper thus made, first called attention to this improvement. Before that, all paper had *wire-marks* upon it. The *deckle* is a thin frame of wood which fits close upon the mould, and is used to retain the pulp, or *stuff*, as it is called, on the mould, and also to limit the sheet. The workman inclines the mould, with the deckle on it, a little towards him, and dips it in the vat containing the stuff, and lifts it up again horizontally. He then shakes it to distribute the stuff regularly, and the water drains off through the wire-cloth. Laying the mould on the edge of the vat, he then takes off the deckle and applies it to another mould. Another workman, called a *coucher*, takes up the mould after it has been allowed to drain for a few minutes, and deposits the layer of pulp upon a felt, or piece of woollen cloth. Thus the two workmen go on till they have produced a file of sheets called a *post*, and containing six or eight quires. These sheets, together with their felts, are then placed in the *vat-press*, and subjected to strong pressure, in order to rid them of superfluous water and to give solidity and firmness to the paper. After this, the felts are removed, the sheets pressed by themselves and hung up in the drying-room five or six together. The next process is finishing. Writing-paper is dipped in size, pressed, and hung up in the drying-room. Printing paper is sized in the pulp. After drying, a large pile of paper is made and pressed with great force. It is then taken down, sheet by sheet, and made into a fresh pile, which is again pressed. By this operation, which is called *parting*, the sheets are rendered very flat and smooth. For the best paper this process is repeated two or three times. The paper is then counted into quires, and packed up into reams. The slow and difficult process of making separate sheets of paper by hand has been greatly superseded by the introduction of machinery at the close of last century. M. Robert, a workman in the employ of M. Didot, at a paper-mill in France, invented a machine for making continuous paper. In 1801, the invention was introduced into England by M. Didot, and three years afterwards came into successful operation at a paper-mill in Hertfordshire. From that period, machinery for paper manufacture rapidly improved. The paper-machine, as a general rule, is constructed in such a manner as to imitate, and in some respects improve, the processes used in making paper by hand. Its chief advantages, however, are, that paper can be made of any practical size and with great rapidity. From the vat the pulp is made to flow into a wire frame or sifter, which moves rapidly up and down, so as to hold back any knots or unsuitable substances. The strained pulp then passes over a ledge in a regular and uniform stream, flowing upon an endless web of wire gauze which presents an uninterrupted surface several feet in length. The movement of the web is so regulated as to determine the thickness of the paper; while to the entire web a shaking motion from side to side is given, which not only serves to spread the pulp evenly, but also assists in draining the superfluous water through the wire gauze. The pulp, by this means, solidifies as it advances, and before it leaves the web is pressed by a roller covered with felt; it is then taken up by an endless web of felt, forming an inclined plane. After this it is seized by a pair of rollers, between which it is pressed; then passing up another inclined plane of felt, it is again pressed between rollers. The pulp is thus converted into paper, and by passing it over the surface of several smooth cylinders, heated by steam, it is rendered dry and smooth. From this process it is wound on a reel, dry and smooth, and ready to be cut off for use. In the improved machinery, the pulp is introduced upon the wire web at one end of the machinery, and delivered in the state of perfect paper at the other end in the space of three or four minutes. Among the English paper-makers who have introduced valuable improvements in paper-machines, may be

mentioned Barrett, Hollingworth, Ibotson, Taylor, and Wilks. Manufactured paper, independently of the various kinds, such as blotting-paper, filtering-paper, and the like, may be divided into three different classes; namely, writing, printing, and wrapping. Writing-paper is divided into five classes,—cream wove, yellow wove, blue wove, cream laid and blue laid. Printing-paper is of two kinds,—laid and wove; and there are four kinds of wrapping-paper,—blue, purple, brown, and whited-brown. In a work by Mr. R. Herring, the different sizes and names of writing, drawing, printing, and wrapping papers are arranged in two groups, according to their fineness or coarseness. The following table shows the principal names and sizes of fine papers:—

| | Inches. | | |
|---|---|---|---|
| Pot | 15 | by | 12½ |
| Foolscap | 17 | ,, | 13½ |
| Post | 18¾ | ,, | 15½ |
| Copy | 20 | ,, | 16 |
| Large Post | 20¾ | ,, | 16½ |
| Medium Post | 23 | ,, | 18 |
| Sheet and third Foolscap | 23 | ,, | 13½ |
| Sheet and a half Foolscap | 24½ | ,, | 13½ |
| Double Foolscap | 27 | ,, | 17 |
| Double Pot | 30 | ,, | 25 |
| Double Post | 30½ | ,, | 19 |
| Double Crown | 30 | ,, | 20 |
| Demy | 20 | ,, | 15½ |
| Printing Demy | 22½ | ,, | 17½ |
| Medium | 22 | ,, | 17½ |
| Printing Medium | 23 | ,, | 18½ |
| Royal | 24 | ,, | 19 |
| Printing Royal | 25 | ,, | 20 |
| Super-Royal | 27 | ,, | 19 |
| Printing Super-Royal | 27 | ,, | 21 |
| Imperial | 30 | ,, | 22 |
| Elephant | 28 | ,, | 23 |
| Atlas | 34 | ,, | 26 |
| Columbia | 34½ | ,, | 23½ |
| Double Elephant | 40 | ,, | 26½ |
| Antiquarian | 53 | ,, | 31 |

The coarser papers are similarly classified.

There are many varieties in paper-making. *Lace-paper*, as it is called, is much used in making ornamental work for fruit-baskets, bouquets, lamp-shades, print-borders, valentines, &c. Plain surface-coloured papers are also much used by bookbinders, printers, buttonmakers, confectioners, &c. Gilt, silvered, and coloured papers are also largely produced. Of late years great ingenuity has been directed towards the manufacture of paper collars, shirt-fronts, wristbands, and even hats and ladies' bonnets. These flimsy imitations seem, however, to have gained what they deserved, —the stamp of vulgarity.—*Ref.* Ure's *Dictionary of Arts, Manufactures, and Mines*, and *The Varieties and Relative Values of Paper*, by Richard Herring.

PAPER-HANGINGS.—Coloured papers were first used to ornament the walls of rooms by the English, who copied the art from the Chinese, amongst whom it has been practised from time immemorial. In the first period of their manufacture paper-hangings were coloured, *i.e.*, a piece of pasteboard having variously figured spaces cut out of it, was laid on the paper, and water-colours were then smeared over its upper surface with a brush. The forms of the spaces were, of course, coloured on the paper; and by repeating the operation it could be made to bear a pattern of any form and variety of colour. In printing paper-hangings at the present day, however, processes similar to those used by the calico-printer are employed.

PAPER MONEY. (*See* BANK, BANKING.)

PAPER TRADE AND DUTY.—The duty on paper until the year 1837, was charged in two classes; that made out of old tarred rope was considered as second-class paper, and paid a duty of 1½*d.* per pound; paper made from any other material was considered first class, and paid a duty of 3*d.* per pound. This distinction was abolished in 1837, and the duty on all kinds of paper was fixed at 1½*d.* per pound. In 1857 and the two following years, the quantity of paper manufactured in Great Britain averaged about 308 millions of pounds. Of this quantity about one-twelfth was exported, and the rest consumed at home. The head-quarters of the paper





manufacture are in Kent; the places next in importance are Hertfordshire and the neighbouring counties, Lancashire, and Devonshire. The chief paper-making localities in Scotland are in Lanark, Midlothian, and Aberdeen. Within the last few years, the abolition of the paper-duty gave rise to considerable discussion in parliament. In 1860, Mr. Gladstone, as chancellor of the Exchequer, moved the abolition of the duty, in connection with an extensive financial scheme, which included a commercial treaty with France, &c. The bill was passed by the House of Commons but rejected by the House of Lords. The only result at the time was the reduction of the duty on foreign paper from 2½*d.* per pound with 5 per cent. additional, to 1½*d.* per pound with 5 per cent. additional. The duty was totally abolished in June, 1861, by the statute 24 Vict. c. 20.

PAPIER MACHÉ, *pāp'-e-ai mdsh-ai*, literally, moistened paper, is the French term applied to a preparation of paper of which many articles are made, both in England and on the continent. *Papier maché* is made in two different ways. In the first it is formed by pasting different layers or thicknesses of paper together, and in the second, by grinding the substance of the paper into a pulp and pressing it into moulds. Trays, millboards, and other articles which require a flat surface, are made by the first plan: the paper, after being glued together, is subjected to so great a power, that the different strata become as one, after which it is polished by means of,—first, a coating of lamp-black and size, and then by the application of a peculiar varnish formed of turpentine boiled down until it becomes black, and mixed with powdered amber. The second, or pulp process, of this manufacture, is adapted for mouldings, ornaments to ceilings, and other things for which that formed on the first principle would be unfit. The pulp is composed of cuttings of coarse paper boiled in water and beaten in a mortar till the mass assumes the consistence of paste, when it is boiled in size or gum-arabic to give it consistency. After this, it is poured into the moulds, and a counter-mould is employed so as to make the cast merely a crust or shell, as in plaster and composition ornaments. It is recorded that a novel use has been made of papier-maché, as a church has been built entirely of the article in Norway, capable of holding nearly a thousand persons. The papier-maché, it is said, was made waterproof, and also fire-proof, by an application of vitriol-water and lime slaked with whey and white of egg. Papier-maché is now generally used for ornamental purposes instead of plaster or composites, as it is adapted for obtaining casts of nearly every subject.—Ref. *English Cyclopædia.*

PAPILIONACEÆ, *pā-pil-yo-nai'-se-e* (Lat. *papilio*, a butterfly, from the resemblance which the flowers bear to this insect), in Bot., a sub-ord. of the large and important nat. ord. LEGUMINOSÆ (which *see*).

PAPILIONIDÆ, *pā-pil-yo-ni'-de* (Lat. *papilio*, a butterfly), a gen. and fam. of lepidopterous insects, belonging to the section of the class termed *Diurna*. This family is the only one which, in the exterior margin of the inferior wings, does not present a rigid scaly appendage, or bridle, for retaining the two superior ones. These latter, and even the former, most frequently are raised perpendicularly when the insect is at rest. The antennæ are sometimes terminated by a globuliform inflation or little club, and are sometimes almost of equal thickness throughout, or even more slender, and form a hooked point at the extremity. According to Cuvier, the *papilliones* properly so called, or those belonging to the Linnæan division of the *Equites*, are connected by one extremity of the genus with the mottled Danaides, and by the other with the Parnassii. From the latter we pass to Thais, and thence to Pieris. The preceding Danaides connect themselves with the Heliconii. From this it follows that we should begin the series of the diurnal Lepidoptera with the Tetrapods, such as Satyrus, Pavonia, Morpho, and Nymphalis, in order to reach the Heliconii through Argynnis and Cetheria. The Diurnæ would be divided thus into two great sections,—those whose chrysalids are suspended vertically, and simply attached by the extremity of the tail, and those where they are not only fixed by that extremity, but also by a silken band surrounding the body like a sling. The first are always tetrapodous; consequently, we

should begin with those of which the caterpillars are naked or nearly so, and generally bifid at the posterior extremity; and then we should work up to those that are spinous. The greater variety of the *Papilionidæ* are tropical; and but one has been found in England, —the *Papilio Machaon*. (*See* BUTTERFLY.)

PAPIST, *pā'-pist* (Ital. *papa*, pope), a term which has long been used in England to denote a follower of the Roman Catholic Church.

PAPPUS, *păp'-pus* (Gr. *pappos*, old man or grandfather,—hence a substance resembling grey hairs), a term applied in Bot. to the calyx of *Compositæ*. It generally exists in the rudimentary stage of a cap or apparently membranous coronet. In some plants it is formed of slender hairs. (*See* AIGRET.)

PAPYRUS, *pă-pī'-rus* (Lat.), in Bot., a gen. of the nat. ord. *Cyperaceæ*, the Sedges. *P. antiquorum*, the bulrush of the Nile, is celebrated on account of the soft cellular substance in the interior of its stems having been in common use by the ancients for making a kind of paper. The uses of the papyrus were not confined to the making of paper alone, but it was also used for making sail-cloth, cordage, and wearing apparel. At the present day it is still used for some of these purposes. In Abyssinia boats are also made by weaving the stems closely together, and covering them with a sort of resinous matter. The roots are also employed for fuel. Its most ancient and important use, however, was for the manufacture of paper. (*See* PAPER, PAPER MANUFACTURE.) *P. sicula*, a Sicilian species, had likewise been employed for making paper. *P. corymbosus* is extensively used in India for the manufacture of the celebrated Indian matting.

PARABLE, *păr'-ă-bl* (from the Greek *paraballo*, I compare), an allegorical representation of something real or apparent in life, from which a moral is drawn for instruction. In Rhet. the word simply means a comparison; but it has gained, by custom, a particular meaning. In the parables of the Old and New Testament, for instance, we find a moral or religious truth conveyed by the recital of short tales, in which we find the objects of hidden sense represented distinctly by parallel types in the external narrative, so as not to be mistaken. Amongst German authors, Herder and Krummacher have especially distinguished themselves by parable-writing; but nowhere do we find such similes drawn and truth conveyed by typical objects as in the Scriptures.

PARABOLA. (*See* CONIC SECTIONS.)

PARACHUTE, *păr'-ă-shute'* (Gr. *para*, against; Fr. *chute*, fall), an instrument made of silk, and shaped like an umbrella, by means of which aeronauts can descend from a balloon at a great height down to the earth in safety. Blanchard made the first successful attempt at descent with a parachute, and other aeronauts have tried it after him; but it is so perilous that few have ventured in it with safety. Garnerin invented a peculiar form of parachute, but it does not appear to have been much adopted.

PARADIGM, *păr'-ă-dim* (Gr. *paradeigma*, an example), in Gram., means the example of a verb conjugated in the vocal moods, tenses, and persons. In Rhet., however, it means a representation or illustration, as a fable or parable. Amongst early writers of theology, those were termed *Paradigmatics* who wrote the lives of religious persons as examples of Christian holiness for the people at large.

PARADISE, *păr'-ă-dise*, a word generally applied to the garden of Eden, in which our first parents dwelt. The name is of oriental origin, and denotes the parks and pleasure-grounds of the Persian monarchs, according to Xenophon. The term is also applied to the future state of eternal bliss, and is synonymous with heaven.

PARAFFIN, *păr'-af-feen*, in Chem., a waxy substance obtained by the distillation, at a low temperature, of coal-tar, peat, petroleum, and other bodies of a similar nature. Its most abundant source is, however, Boghead coal, from which it is now extracted in enormous quantities for the manufacture of candles, which are superior in every way to those made of the finest wax or the finest stearic acid. It is a white, hard, translucent body, melting at 110°, burning with a bright white flame. It is insoluble in water, but is readily dissolved by alcohol and ether. It is unacted on by the strongest mineral acids, chlorine, or the alkalies; hence its name, from *parum affinis*, without affinity. From forming no compounds with any known substance, its atomic constitution cannot be determined; it contains, however, equal atomic proportions of carbon and hydrogen.

PARAFFIN OIL, in Manuf.—The innumerable varieties of burning oils sold under this name consist of a mixture of more or less volatile hydrocarbon oils containing paraffin in solution. They are obtained from the crude coal oils by distillation, and often contain hydrocarbons which are volatile at comparatively low temperatures. Such oils are utterly unfit for use, being dangerous in the extreme. Crude coal oils contain hydrocarbons that are volatile at temperatures varying from 80° to 500°. By careful fractional distillation, they are separated into machinery oil and burning oil, which should be again distilled by steam at a low temperature to insure the separation of its dangerously volatile constituents. It is the neglect of this last operation that has caused such lamentable accidents through the use of these otherwise valuable products. Mr. W. B. Tegetmeier, an eminent authority on the subject, recommends purchasers of these oils to test them by pouring a few drops on a board and applying a lighted match. If the oil lights readily and continues to burn, it is unfit for use. If it ceases to burn as soon as the match is withdrawn, it may be considered safe. The lighter oils, so mischievous when allowed to remain with the oils used for burning, form, when carefully separated, an excellent substitute for turpentine, and the very lightest are said to act as valuable anesthetics. (*See* PETROLEUM.)

PARAGRAPH, *păr'-ă-graf* (Gr. *para*, by the side of, and *grapho*, I write), in modern orthography signifies a small subdivision of a connected discourse. Paragraphs are generally distinguished by a break in the lines, or sometimes by the sign ¶.

PARALLAX, *păr'-ăl-lăks* (Gr. *parallaxis*, aberration), a term used in Astron., signifying the change of place in a heavenly body in consequence of being viewed from different points. The difference between the place of a celestial body as seen from the surface and from the centre of the earth at the same instant is called the *diurnal parallax*. The change of place in a celestial body in consequence of being viewed from the opposite extremities of the earth's orbit is called the *annual parallax*. It is from the parallax in the abstract that we derive all our knowledge of the distance and magnitude of the bodies which are visible in the heavens. The determination of the annual parallax of the stars attracted the attention of astronomers upon the restoration of the true system of the universe by Copernicus.

PARALYSIS, or PALSY, *par-ăl'-i-sis* (Gr. *paralusis*, relaxation), in Med., is the loss of the natural power of sensation or motion in any part of the body. It is owing to some diseased condition of the nervous system, either of the brain or spinal cord, or of the nerves. If the nerves of sensation or their centres be affected, there will be loss of sensation; if of motion, then loss of motion; to the latter of which the term paralysis is by some exclusively applied. Each of these kinds may again be general or partial, or may have various degrees of severity. It may affect only one nerve or muscle, or it may affect a number. The most usual form is when one side or half of the body is deprived of sensation or motion, or both, called *hemiplegia; paraplegia* is when the lower part of the body is paralyzed while the upper retains both sensation and motion; and general paralysis is when the loss of nervous power extends over nearly every part of the body. In hemiplegia, the seat of the disease is one side of the brain, usually that opposite to the affected side of the body; in paraplegia, the lesion is within the spinal cord; and when more limited in extent, the disease usually arises from some abnormal state of a particular nerve. Paralysis frequently follows apoplectic attacks, and this usually in its most severe and dangerous form. The prognosis must be looked on as extremely unfavourable when the attack is sudden, the paralysis extensive and complete, and the loss of consciousness protracted; while, on the other hand, when the paralysis advances gradually, there is more reason to hope for prolonged life, if not for a complete restoration of health. Among the other causes that may give rise to paralysis, are various injuries and diseases of the brain or spinal cord; as tumours, inflammation, external in-

juries, &c. When paralysis takes place without any previous apoplectic attack, the premonitory symptoms are a general torpor or lassitude, occasional giddiness, or a sense of weight and pain in the head, and loss of memory. When it is the result of injury of the spinal cord, then, of course, the paralysis takes place instantly. Paraplegia sometimes lasts for many years without greatly interfering with any function except locomotion; but when it occurs during fevers and advances rapidly, it is of very sinister augury, especially if it involve the sphincter muscles of the anus and bladder. Sometimes there is a gradual loss of power in the muscle or muscles affected; and in many cases the loss of power is preceded by severe pains in the part, cramps, a sense of numbness or tingling, and a curious feeling of coldness. Paralysis is not a disease of itself, but only a sign of some disorder of the nervous system, probably at a distance from the parts affected. In each case, therefore, the cause of the disorder is to be investigated, and the mode of treatment principally directed to its removal. In very many cases, however, little can be done either in the way of cure or of alleviation. Where, as in many cases, it is owing to a deranged state of the general health, attention should, in the first instance, be directed to the best means of re-establishing this. With this view, the bowels should be kept gently open, and light nourishing diet prescribed; and tonic bitters, with, in some cases, small doses of some preparation of iron, have been found useful. Beyond this, regard must be had to the age and condition of the patient. If young and of full habit, bleeding should be had recourse to, more particularly if the head be much affected, and this followed by purgatives. The quantity of blood drawn should always be regulated by the strength of the patient and the degree in which the symptoms approach to those of apoplexy. If the patient be feeble and debilitated, the treatment should be confined to purgatives; and in both cases stimulants, both external and internal, as blisters, hot turpentine liniments, or electricity. In weakly habits warm bathing is sometimes found useful.

PARAPET, *păr'-a-pet* (Ital. *parapetto*, from the Greek *para*, against, and *petto*, a breast), in Fort., a defence or screen on the extreme of a rampart or other work, serving to cover the soldiers and guns from the enemy's fire. The improvements in rifled guns, and the results of the present war in America (1863), render the subject of the strength of stone fortresses one of considerable doubt. As a general rule, however, the parapet should be eighteen or twenty feet thick, and seven or eight feet high, when the enemy has no command above the battery; otherwise, it should be raised high enough to cover the men. Its length depends on the number of guns employed in the battery. In Arch., the *parapet* is a low or breast-high wall, raised on the brinks of platform roofs, terraces, bridges, quays, &c., in order to serve as a stay and prevent accidents.

PARAPH, *păr'-áf* (Gr. *para*, near, and *apto*, I touch), is a particular character, knot, or flourish, which people habituate themselves to make always in the same manner at the end of their name, to prevent their signatures from being counterfeited. Sometimes the paraph is placed by itself, instead of a signature. The paraph of the kings of France in former times used to be a grate, which the secretaries always placed before their own in all letters, &c. The term is seldom used except in reference to law and diplomacy.

PARCHMENT, *parish'-ment*, a term given to the skins of sheep and goats prepared and rendered fit for writing upon. This is done by steeping the skins in pits impregnated with lime, stretching them upon frames, and reducing them by scraping and paring with sharp instruments. Pulverized chalk is rubbed on with a pumice-stone, which smooths and softens the skin, and improves the colour. After being reduced to half its original thickness, it is smoothed and dried for use. Vellum, a similar substance, is made from the skins of young calves. Next to papyrus, the skins of animals in the form of parchment formed the most extensive substance for writing upon among the ancients. About 200 B.C., when Eumenes or Attalus was desirous to found a library at Pergamus that should rival, if not excel, that at Alexandria, the king of Egypt at the time, being jealous, prohibited the exportation of papyrus. On this account, the inhabitants of Pergamus began to manufacture parchment as a substitute; and their library was formed of manuscripts chiefly written on this material; whence it was known among the Romans as *Pergamena*, from which word the term *parchment* is supposed to have been derived. The ancient Hebrews were in the habit of writing on the skins of animals as early as the reign of King David. Herodotus relates that the Ionians, from the earliest period, wrote upon the skins of sheep and goats from which the hair had been scraped off. At the present day parchment is much used for charters and other writings for which great durability is desirable.

PARDON, *par'-don* (Fr. *pardonner*), in Law, is defined to be "an act of grace, which, proceeding from the power intrusted with the execution of the laws, exempts the individual on whom it is bestowed from the punishment which the law inflicts for a crime which he has committed." As used in the canon law, it extends beyond the affairs of this world, being an indulgence granted by the pope to supposed penitents, for remission of the pains of purgatory, which they have merited for the punishment of their sins. Pardon is not an act of justice, but of grace. It necessarily implies guilt, and forgiveness must of course come from the one who is injured, and that in all states is the sovereign. The effect of a pardon is to make the offender a new man (*novus homo*), to acquit him of all corporal penalties and forfeitures annexed to the offence, and not so much to restore his former as to give him new credit and capacity. The statute 27 Henry VIII. c. 24, vested in the king the sole power to pardon or remit any treasons or felonies whatsoever. The crown can pardon in all cases which concern itself, or which it prosecutes for the public, except the offence of committing a man to prison out of the realm, which, by the Habeas Corpus Act (31 Car. II. c. 2), is made a præmunire "incapable of any pardon from the crown." Nor can the crown pardon where private justice is principally concerned in the prosecution of offenders. A pardon may be made conditional.

PARENT AND CHILD, *pair'-ent*.—Based on nature, the law recognizes certain rights and duties as subsisting between parents and children. The first great duty of parents towards their children is to provide for their maintenance; and the statute law has made it compulsory on all parents, whose circumstances enable them to do so, to provide a maintenance for their children, of whatever age, when in poverty, and unable, through infancy, disease, or accident, to support themselves. But only in such cases is the obligation binding, and then only as regards necessaries; for no parent is obliged to maintain idle and lazy children in case and indolence. The poor-law compels the father and mother, grandfather and grandmother, of poor persons not able to work, to maintain them at their own charges, if of sufficient ability; and if a parent runs away and leaves his children, the churchwardens and overseers of the parish shall, upon obtaining an order of the magistrates for the purpose, seize his rents, goods, and chattels, and dispose of them towards their relief. The next duty of parents towards their children is protection, a duty rather permitted than enjoined by law. A parent may maintain and uphold his children in their lawful suits without being guilty of the legal crime of maintaining quarrels. A father is, generally speaking, guardian to his infant children; and though this right ceases in some instances and for some purposes at fourteen, he is always entitled, in his parental capacity, to the control of their persons until the age of twenty-one. The last duty of parents to their children is that of giving them an education suitable to their station in life, which is rather a moral than a legal duty. A father may correct his infant child in a reasonable manner, for this is for the benefit of his education; and his consent to the marriage of his child, if under age, is also required. The mother has no legal power over the child during the father's lifetime (except that by 2 & 3 Vict. c. 54, the lord chancellor or master of the Rolls may, upon the mother's petition, make an order on the father to deliver to her the custody of a child within seven years of age. After the father's death, she is entitled to the custody of the infant until twenty-one.

The father may delegate part of his parental authority during his life to the tutor or schoolmaster of his child, who is then *in loco parentis*, and has such a power of the parent committed to his charge—viz., that of restraint and correction—as may be necessary to answer the purposes for which he is employed. The duties of children to their parents are submission and obedience during minority, and honour and reverence ever after. Those who have sustained and educated their offspring are entitled in return to be supported by that offspring, in case they stand in need of assistance. The misbehaviour of the parent does not relieve a son of his duty; for he is equally bound to maintain and provide for a wicked and unnatural progenitor as for one who has shown the greatest tenderness and parental duty, and is equally justifiable in defending the person or maintaining the cause or suit of a bad parent as of a good one.

PARENTHESIS, *păr-en'-the-sis* (Gr. *para*, near, *en*, and *tithemi*, I place), a sentence, or certain words inserted in a sentence, having no grammatical connection with the words which precede or follow, but serving to explain or qualify the meaning of the principal sentence. A parenthetical form of writing was much more common among ancient authors than among modern. A parenthesis is generally included in hooked or curved lines, thus, [ ], or ( ).

PARHELION, *par-hé'-le-on* (Gr. *para*, near; *helios*, the sun), a mock sun, frequently seen in the polar circle, and one of the finest of the luminous meteors of our atmosphere. It presents the appearance of halos and luminous arcs intersecting with mathematical precision, and studded with solar images. In all descriptions of this phenomenon, it is to be observed that there is a remarkable regularity, although occasionally some parts may be wanting. The circles which most frequently appear are those which surround the true sun, and that one which passes through his disc parallel with the horizon. Besides these, tangental arcs are frequently observed. Occasionally segments of vertical circles render the meteor more complicated. Two appearances of parhelia are recorded by Aristotle; and Pliny mentions their occurrence at Rome. In England the phenomenon is said to have been witnessed in the year 316, when, besides the true sun, four mock suns were visible. Holinshed records the appearance of one in 1199, remarking,—"At length, when the beholders had well wearied their eyes in diligent marking the manner of this strange appearance, the counterfeit sunne vanished awaie." On the 29th of March, 1848, a parhelion occurred which was visible in the south of England and Guernsey. According to Dr. Thomas Young, parhelia, with their accompanying luminous circles and segments, depend on the combined reflections of the solar rays from the facets of snowy prisms floating in the atmosphere. When the snowy crystals are both prismatic and lamellated, the rays suffer both refraction and reflection, and the result is a combination of excentric circles. The *Para-selene* is a similar phenomenon occurring at night when the moon is shining.

PARIAH, (*See* CASTE.)

PARIETARIA, *păr-i-e-tar'-re-ă* (Lat. *paries*, a wall), in Bot., a gen. of the Nettle ord.,—*Urticaceæ*. *P. officinalis* is the wall-pellitory, by many regarded as a valuable diuretic and lithontriptic.

PARINARIUM, *păr-e-nar'-re-um* (so named from *parcnari*, the name of one of the species in Guiana), in Bot., a gen. of the nat. ord. *Rosaceæ*, sub-ord. *Chrysobalaneæ*, including several valuable fruit-trees. *P. excelsum* yields the fruit known in Sierra Leone under the name of the rough-skinned or grey plum.

PARK, *park* (Sax. *parruc*), a considerable space of pasture and wood land, adjoining to, or surrounding, the country residence of a man of wealth, devoted to purposes of recreation or enjoyment, but principally to the support of deer, cattle, and sheep. Originally parks were nothing more than portions of forest scenery appropriated by the lord of the soil for the exclusive use of animals of the chase. At the present day, however, the principal use of a park is to give grandeur and dignity to the mansion. On its extent and beauty, and on the magnitude and architectural design of the house, chiefly depend the reputation and character of the residence. In London, public parks have long





existed, and of late years have largely increased in number. There is also manifest improvement in the manner in which the grounds are laid out. Public parks exist in or near many of the large towns throughout the United Kingdom.

PARK OF ARTILLERY, in Mil., a term applied to the whole train of artillery belonging to an army or division of troops. In action, the term more directly signifies the place appointed by the general of an army to encamp the train of artillery, with the apparatus, ammunition, &c., as well as the battalion appointed for its service and defence. Strict order and a convenient arrangement for breaking up, &c., are very important in a park of artillery.

PARLIAMENT, *parl'-e-ă-ment* (Fr. *parelement*, fr. *parler*, to speak), is the name of the supreme legislature of Great Britain. The term is evidently of French origin, and was first applied to general assemblies of the States under Louis VII., about the middle of the 12th century. In England the term was not used till the reign of Henry III. or Edward I. The institution of parliament, however is of a much earlier date; but its origin is lost in the remote ages of antiquity. It has commonly been traced back to the free councils of our Saxon ancestors, which existed under the names of the *michel-synoth*, or great council; *michel-gemote*, or great meeting; and *wittena-gemote*, or assembly of wise men. As regards the nature of these institutions, Mr. Sharon Turner says, "that after many years' consideration of the question, he is inclined to believe that the Anglo-Saxon *wittena-gemote* very much resembled our present parliament in the orders and persons that composed it, and that the members who attended as representatives were chosen by classes analogous to those who now possess the elective franchise. The popular character of these institutions was subverted for a time by the Norman conquest; but the people of England were still Saxons by birth, in language, and in spirit, and gradually recovered their ancient share in the councils of the state. It is generally agreed that the main constitution of parliament as it now stands was marked out so long ago as the 17th year of King John (1215), in the great charter granted by that prince, wherein he promises to summon all archbishops, bishops, abbots, earls, and greater barons, personally, and all other tenants in chief under the crown, by the sheriff and bailiffs, to meet at a certain place, within forty days' notice, to assess aids and scutages when necessary; and this constitution has subsisted, in fact, at least from the year 1264 (49th Henry III.). There is nothing calling for particular notice in its subsequent history. The parliament of the United Kingdom is composed of the king or queen, and the three estates of the realm; viz., the lords spiritual and temporal, and the commons. Each of these powers enjoys separate rights and powers, and collectively they make the laws of the empire. The sovereigns have ever enjoyed various prerogatives by prescription, custom, and law, which assign to them the chief place in parliament, and the sole executive power; but they are under oath to govern the people "according to the statutes in parliament agreed on, and the laws and customs of the same," the power of parliament over the crown being recognized as an important principle of the constitution. The lords spiritual and temporal sit together and jointly constitute the House of Lords, which is the second branch of the legislature in rank and dignity. The lords spiritual are the English archbishops and bishops of the Church of England and the four representative bishops of Ireland. The two archbishops and twenty-four of the English bishops have seats in parliament; and of the four lords spiritual that represent Ireland, one is always an archbishop. The lords temporal are divided into dukes, marquises, earls, viscounts, and barons, whose titles are of different degrees of antiquity and honour. The temporal lords, who sit by their own right, are the peers of England, the peers of Great Britain created since the union with Scotland, and the peers of the United Kingdom created since the union with Ireland. The old peerage of Scotland is represented by sixteen members of that body chosen for each parliament, and the Irish peerage sends to the house twenty-eight representatives, chosen for life. The present members of the House of Lords are,—3 peers of the blood-royal,

3 archbishops, 20 dukes, 21 marquisses, 131 earls, 28 viscounts, 27 bishops, 225 barons; but of these 17 are minors, making a total of 441, besides 16 Scotch, and 28 Irish representative peers. The House of Commons consists, besides the representatives of the universities, of the members for counties and the members for towns; the former, in England and Ireland, being technically called knights of the shire, the latter burgesses. The first knights of the shire, after the Norman conquest, are supposed to have been the lesser barons, who, after a time, gradually forbore to attend, and selected some of the richest and most influential of their body to represent them. The three estates of the realm appear, originally, to have sat in one chamber; but afterwards, when they were joined by the burgesses, they sat separately. When this separation took place is uncertain. In the reign of Henry VI. there were not more than 300 members of the House of Commons, being about 25 more than in the reign of Edward I., and 50 more than in that of Edward III. The legislature added 27 for Wales, and 4 for the county and city of Chester, in the reign of Henry VIII., and 4 for the county and city of Durham in the reign of Charles II.; while 180 new members were added by royal charter between the reigns of Henry VIII. and Charles II. Forty-five members were assigned to Scotland as her proportion of representatives on the union of that kingdom with England, and 100 to Ireland when her parliament became incorporated with that of the United Kingdom. By these successive additions, the number was increased to 658. By the Reform Acts of 1832, various changes were effected in the mode of representation, and a redistribution of seats took place. The number of members for Scotland was increased from 45 to 53, being 30 representatives of shires and 23 of burghs; and the number for Ireland was raised from 100 to 105, being 64 for the counties, 39 for the cities and boroughs, and 2 for the University of Dublin. To effect these changes 56 boroughs in England and Wales were entirely disfranchised, and 30 which had previously returned 2 members were restricted to 1; while 42 new boroughs were created, of which 22 were to return 2 members each, and 20 1 member. Sudbury, returning 2 members, was disfranchised for bribery by 7 & 8 Vict. c. 58; and St. Alban's, also returning 2 members, was disfranchised for the same offence, by 14 & 15 Vict. c. 106. One of these seats was given to Birkenhead in 1861, another to Lancashire; and after the dissolution of the present parliament, the West Riding of Yorkshire is to be separated into the northern and southern divisions, and each to return 2 members. It is now generally agreed, that as a representative body there is much need of some reforms to be introduced; and various attempts have recently been made to carry through measures for that purpose, but as yet with little success. The measures have generally been directed to lowering the franchise, so as to extend the right of election to classes of persons who are at present excluded, and only secondarily, and in a very slight degree, to effect a redistribution of members. In our view, the latter is the more important of the two; and without attempting to lay down any new scheme, which would be out of place here, we wish to show some of the anomalies which exist in the present system. In any representative body like parliament, whose doings affect the persons and property of the people, it is evident that both of these elements should be represented. It is evident, that if the popular element were only taken into account, there would be a tendency to lay too many restrictions and taxes upon wealth and property; while, on the other hand, if the money element is too predominant, there will be a tendency to lay too heavy burdens upon, and not keep sufficiently in view the interests of, the poorer classes. Further than stating that the people ought to have a much larger voice in the election of their representatives than at present, we give no opinion as to the proportion that each element ought to bear in the representation. By the census of 1861, the population of the United Kingdom was 29,326,751, and the amount of property and income charged under the different schedules of the income tax for the year ending 5th April, 1861, was £301,345,867. The present number of representatives is 656, being 1 M.P. for every 44,095 of the population, or 1 for every £459,268





of annual value. Taking, in the same way, the three great divisions of the empire, England, Scotland, and Ireland, we find that England has 1 M.P. for every 40,293 of her population, or for every £509,331 of her annual value; Scotland 1 for every 57,770, or £470,801; and Ireland 1 for every 55,221, or £216,631. If, then, we take the element of population alone, England, in place of 498, is entitled to only 455 members; Scotland, in place of 53, to 69; and Ireland, instead of 105, to 132. Taking annual value, on the other hand, England is entitled to 551 members, Scotland to 54, and Ireland to 57; or by combining the two elements, England to 503, Scotland to 61, and Ireland to 92. When we come to compare the country and town representation in the three kingdoms, we find much greater anomalies to exist. In the English towns there is 1 M.P. to about 22,000 inhabitants, in the Irish towns 1 M.P. to about 21,300, while the Scotch towns have only 1 M.P. to every 49,000 inhabitants. The English counties, on the other hand, have 1 M.P. for every 68,500 of the population, the Irish counties 1 for every 93,000, and the Scotch counties 1 for every 57,500. It will thus be seen, that the Scotch towns are not half so well represented as those either of England or Ireland; while on the other hand, the Scotch counties are much better represented than those of either of the sister kingdoms. Coming down still further, we find places of a few thousand inhabitants returning two members, while places with ten times that number return no members at all. In the English counties the 40s. freeholders are the foundation of the constituency; the right to vote being, by a statute passed in the 8th year of Henry VI., limited to "persons dwelling and resident in the same counties, whereof every one of them shall have free land or tenement to the value of 40s. by the year at the least above all charges." By the Reform Act, every person who, at the time of the passing of the act, was seized for his own life or the life of another, or for any lives whatever, of a 40s. freehold; or who may be seized subsequently to the passing of the act, provided he be in actual and *bond-fide* occupation, or who may come into such freehold estate by marriage, marriage-settlement, devise, or promotion to any benefice or office, is still entitled to vote as a freeholder; but any person not included in these classes acquiring a freehold subsequently to the act, is only entitled when it shall be "to him of the clear yearly value of not less than 10*l.* above all rents and charges payable out of or in respect of the same." Copyholders having an estate of 10*l.* a year; leaseholders of land of that value whose leases were originally granted for 60 years; leaseholders of 50*l.* with 20-year leases; and tenants at will, occupying lands or tenements paying a rent of not less than 50*l.* a year, have the right of voting conferred upon them by the Reform Act. In cities and boroughs the right of voting was regulated by the ancient custom prevailing in each. With certain modifications, some of the ancient rights were retained by the Reform Act; but all occupiers of houses of the clear yearly value of 10*l.* were enfranchised, and now form the greater part of the constituency of the boroughs. The name of each person claiming to vote, either for the counties or boroughs, requires to be registered in lists prepared by the overseers of each parish; and on certain days courts are held to revise these lists. The property qualification formerly required for members of parliament in England and Wales, was abolished in 1858. No one is entitled to the franchise unless he be of sound mind and twenty-one years of age. A large body of persons in the government employment, chiefly connected with the revenue, are disqualified. No member of the House of Peers is eligible to the House of Commons. The judges of the supreme courts, and generally all the other holders of government offices, are excluded. The clergy of the Church of England and Ireland are also excluded. The disqualifications which formerly operated against lay Roman Catholics, and, till lately, against Jews, have been removed. The legislative authority of parliament extends over the United Kingdom and all its colonies and foreign possessions; but, in the ordinary course of government, it does not legislate directly for the colonies, that being more directly under the queen in council, or local legislatures. There are no limits to the power of parliament

in making or altering the laws or in governing the empire. The constitution has assigned no limits to its authority; but, in familiar language, there are said to be some subjects upon which parliament has no right to legislate. The summoning and dissolution of a parliament, as well as the calling and adjourning of it from time to time, are among the prerogatives of the crown. When a new parliament is to be summoned, the lord chancellor receives a written command from the sovereign in council to that effect, and directs the clerk of the crown in chancery to issue writs to the several electoral districts. (*See* ELECTION OF MEMBERS OF PARLIAMENT.) The demise of the crown is the only contingency upon which parliament is required to meet without summons in the usual form. At the commencement of each session the sovereign delivers a speech, either in person or by commissioners, declaring the causes for which they are summoned; and, until this is done, neither house can proceed with any business. The sovereign may also prorogue parliament at any time, when not only are the sittings at an end, but all proceedings pending at the time are quashed, except impeachments by the Commons, and writs of error and appeals before the House of Lords. Every bill must be renewed after a prorogation, as if it had never been introduced, though the prorogation be for no more than one day. Adjournment is solely in the power of each house respectively. By the Septennial Act (1 Geo. I. c. 38), parliament ceases to exist after seven years from the day on which, by the writ of summons, it was appointed to meet; but the queen may at any time dissolve parliament. The usual form is by proclamation under the great seal, after having been prorogued to a certain day. The first duty of a new parliament is the choice of the speaker of the House of Commons. A commission, with the lord chancellor at its head, announces that the sovereign will state the cause of the calling of parliament, when the members are sworn in, and requests that the gentlemen of the House of Commons will proceed to the appointment of some proper person to be their speaker, and present him for the royal approval. The speaker elect goes to the House of Lords, where he receives the royal approval, making professions of his unworthiness. The speaker, on his return from the Lords, reports to the house his approval by her Majesty, and her confirmation of their privileges, and repeats his most respectful acknowledgments to the house for the honour they have done him. He then takes and subscribes the oath required by law, and is followed by every other member present. When the greater part of the members of both houses are sworn, the causes of summons are declared by her Majesty in person, or by commission. When the royal speech has been read, an address in answer to it is moved in both houses; two members in each house being selected by the administration for moving and seconding the address, and they appear in their places in uniform or full dress for that purpose. The speaker of the House of Commons is said to "have neither eye to see, nor tongue to speak in the house, but as the house, whose servant he is, is pleased to direct him." In adjusting the proceedings and in preserving order, he is guided by precedents which have been established in former parliaments. In enforcing his authority, he looks to the support of the house; and if on any point a majority of those present should be against him, his own personal voice would be ineffective. The speaker of the House of Lords *is* the lord high chancellor, or lord keeper of the great seal. When the great seal is in commission, a speaker is appointed by the crown, generally from the heads of the courts of law. The duties of this office are few and unimportant, except those connected with the putting of questions to the house. He has no right to enforce order, and is invested with no more authority than any other member; and if not himself a member (as is sometimes the case), his duties are limited to the putting of questions and other formal proceedings. He cannot adjourn the house, or do anything else as mouth of the house, without the consent of the Lords first had. A chairman of committees (a laborious and highly responsible office) is appointed for each session. He has the superintendence of all the procedure in private bills, and the function of checking all irregularities and undue practices by their promoters. The proceedings of parliament are regulated chiefly by ancient usage, or by the settled practice of modern times, apart from distinct orders and rules. The orders and resolutions by which proceedings are regulated are divided into (1) standing orders, (2) sessional orders, (3) orders or resolutions undetermined in regard to their permanence. Standing orders are for the permanent guidance and order of proceedings, having been agreed to at various times, and if not vacated or repealed, endure from one parliament to another, and are of equal force in all. Sessional orders are agreed to at the commencement of each session, and are not intended to endure beyond that period. The operation of orders or resolutions of either house of which the duration is undetermined is not settled upon any certain principle; but many of them are practically held good in succeeding sessions and by different parliaments, without any formal renewal or repetition. Every member of parliament is obliged by the constitution to attend the service of the house to which he belongs, though on ordinary occasions this is not enforced by any regulation; but when any special business is to be considered, means are taken to secure their presence. In the upper house, the ordinary way is to order the house to be summoned on a particular day, a notice of which is sent to each lord. When urgent business is to be brought before either house, sometimes the house is ordered to be called over, in which case it is usual to name a day which will enable members to attend from all parts of the country; and if enforced, absent members are liable to fines and imprisonment. A member of the upper house has the privilege of serving by proxy, but in the lower house the personal service of every member is required. After being duly elected, a member cannot relinquish his seat; and in order to evade this restriction, a member who wishes to retire vacates his seat by accepting office under the crown, usually the stewardship or bailiffship of the "Chiltern Hundreds," which are ordinarily given to any member who applies for them. Parliament meets annually, generally in the month of February, but sometimes for a short session, if necessary, before the close of the year. The Lords usually meet for the dispatch of legislative business at five o'clock in the afternoon, and the Commons at a quarter before four, except on Wednesday and on other days specially appointed for morning sittings. The upper house may proceed with business if only three lords be present, but the Commons require forty members, including the speaker, to enable them to sit. Every matter is determined in both houses upon questions put by the speaker, and resolved in the affirmative or negative, as the case may be. There can be but one question at a time before the house, and that question must simply be yea or nay. Every member is entitled to propose a question, called "moving the house," or "making a motion;" but it is customary to state the form of his motion on a previous day, and to have it entered in the order-book or notice-paper. In the House of Lords, a peer addresses his speech "to the rest of the lords in general;" in the Commons, a member addresses the speaker. When a member speaks, it must be to some question before the house, or as introducing a question. No member is entitled to speak twice to the same question, except the mover of a motion, who is permitted to reply to those who have supported any amendment on it before it is put to the vote, or when the house is in committee on a bill. Motions upon public questions require to be seconded before they can be discussed. When all the preliminary debates are disposed of, the question is then read by the speaker, who in the Lords says, "As many as are of that opinion say 'content,' and as many as are of a contrary opinion say 'not content;'" and in the Commons, "As many as are of that opinion say 'aye,' and as many as are of the contrary opinion say 'no.'" The speaker then declares it as his opinion that the "contents" or "ayes," or the "not contents" or "noes" have it. If the house acquiesce in this decision, the question is settled; but if the minority dispute the fact, the house then proceeds to a division. The strangers are then ordered to withdraw, the division-bell is rung, so as to be heard in all parts of the house,

the doors are then locked, and the question again put from the chair. The "ayes" or "contents" are then directed to go into the right lobby, and the "noes" or "not contents" into the left lobby. Two tellers are then appointed for each side, who count the number of members as they return into the house, and their names are recorded by the clerks. When both parties have returned into the house, the tellers on either side come up to the table and report the numbers. In the Lords, the speaker votes with the other peers, and has no casting vote in the case of equality, the question being declared in the negative; but in the Commons, the speaker, who has no vote otherwise, in the case of equality has a casting vote, which is usually given so as not to make the decision of the house final. A committee of the whole house is, in fact, the house itself presided over by a chairman in place of the speaker. A select committee is composed of certain members appointed by the house to consider or inquire into any matters, and to report their opinion for the information of the house. In both cases they are restrained from considering matters not specially referred to them by the house. In form, a bill is, and always was, a petition by parliament, and the act into which it resolves itself is the granting of the petition by the sovereign. No bill passes into law unless it has received three readings in each house, has passed each house, and has received the royal assent. As a general rule, bills may originate in either house; but the exclusive right of the House of Commons to grant supplies, and to impose and appropriate all charges upon the people, render it necessary to introduce by far the greater proportion of bills in that house. Bills are divided into two classes,—public and private, the former relating to matters of public policy, and introduced directly by a member; the latter, for the particular interest or benefit of any person or persons, and founded upon the petitions of the parties interested. In the Lords, any peer is at liberty to present a bill and to have it laid upon the table; but in the Commons, a member must first move for leave to bring in his bill; and if the motion be agreed to, the bill is ordered to be brought in by the mover and seconder. Certain classes of bills require to originate in a committee of the whole house, as those relating to religion or trade, &c. After a bill has been received in either house, the question is put "that this bill be now read the first time," which is rarely objected to. The reading of a bill is merely the reading by the clerk of its short title, as entered in the orders of the day. The next question is "that this bill be read a second time" at some future day, before which time the bill is ordered to be printed, and is distributed to every member. The second reading is regarded as the most important stage through which a bill has to pass; for its whole principle is then at issue, and is affirmed or denied by a vote of the house. A courteous way of dismissing a bill, frequently adopted, is to move the leaving out of the word "now," and adding "three months," "six months," or any other term beyond the session. When a bill has passed the second reading, the next question is "that this bill be committed," which is rarely opposed. When the day named for committing it has arrived, the speaker puts the question "that I do now leave the chair," which, if agreed to, the house resolves itself into committee and proceeds to the consideration of the bill, clause by clause, and line by line, and every blank is filled up. When the bill has been fully considered, the chairman puts the question, "that I do report this bill without amendment," or "with the amendments to the house," which being agreed to, the sitting of the committee is concluded, and the speaker resumes his chair, when the chairman of the committee reports that they had gone through the bill. If no amendments have been made, the bill is ordered to be read a third time on a future day; but if amended, the bill as amended is ordered to be taken into consideration on a future day. Sometimes a bill is recommitted before it is read a third time. On the third reading, the judgment of the house is expressed upon the entire bill; and after the third reading, the question usually is, "that this bill do pass." After a bill has passed one house, the next step is to communicate it to the other. If a bill which has passed the Commons is agreed to by the Lords without amendment, they do not return the bill; but if amended, they return the bill for their concurrence. Every bill received by the Commons from the Lords is returned, whether amended or not, as they have the custody of bills prior to the royal assent. When bills have been finally agreed to by both houses, they only wait the royal assent to become law; and from that sanction they cannot legally be withheld. (*See* ASSENT, ROYAL.) Private bills differ from public in that they affect the interests of only a portion of the community; and hence the mode of dealing with them is somewhat different. In the latter, parliament acts strictly in its legislative capacity; in the former, its proceedings partake also of a judicial character, and many of the formalities of a court of justice are maintained. The persons whose private interests are to be promoted, appear as suitors for the bill, while those who apprehend injury are admitted as adverse parties in the suit. While private bills are examined and contested before committees and officers of the house, and are subject to notices, forms, and intervals unusual in other bills, yet in every separate stage, when they come before either house, they are treated precisely as if they were public bills,—are read as many times, and the same rules of debate and procedure maintained throughout, except when any proceeding is specially directed by standing orders. Apart from their legislative functions, the Lords exercise judicial functions of various kinds; as in the trial of peers, and in claims of peerage and offices of honour, under reference from the crown. In addition to these, they have a general judicature, as a supreme court of appeal from other courts of justice. The judges of the courts of Queen's Bench and Common Pleas, and such barons of the Exchequer as are of the degree of the coif, the master of the Rolls, the attorney and solicitor-general, and the queen's serjeants, are summoned at the beginning of each parliament as the assistants of the House of Lords, to give advice on points of law. The chief officers of the upper house are the clerk of the parliament, the gentleman usher of the black rod, the clerk-assistant, and the sergeant-at-arms. The chief officers of the Commons are the clerk of the house, the sergeant-at-arms, the clerk-assistant, and second clerk-assistant.—*Ref.* May's *Practical Treatise on the Law, Privileges, Proceedings, and Usage of Parliament.*

PARLOUR, *par'-lur* (Fr. *parler*, to speak), in monasteries, is the name given to a room where the religious meet and converse; but in ordinary language it is applied to that room of a house which is fitted up for the reception of visitors.

PARMELIA, *par-me'-le-ĭ*, in Bot., a gen. of lichens. *P. parietina* was formerly regarded as a valuable febrifuge, astringent, and tonic. It contains a yellow crystalline colouring matter, called *chrysophanic acid*, which is identical with the colouring principle of rhubarb. *P. perlata* is employed in the manufacture of orchil and cudbear.

PARMENTIERA. (*See* CRESCENTIACEÆ.)

PARODY, *păr'-o-dē* (Gr. *para*, beside, and *ode*, an ode), in Lit., is a species of burlesque composition, in which the form and expressions of a piece of serious writing are adopted in such a way as to excite ridicule. It had its origin among the Greeks, from whom the name is derived, and it corresponds to what in France is termed *travestie*. The imitation is much more close and exact than in any other species of burlesque writing, sometimes even a very slight change, perhaps only in a word, being sufficient to give a ludicrous turn to the whole piece. One kind of parody is when the defects and absurdities of popular writers are held up to ridicule, or their style and manner imitated and applied to low or mean subjects, as in the "Rejected Addresses;" another is, when a well-known piece, as a poem or song, is, by some changes effected on it, or by a change of subject, made laughable; innumerable instances of which are to be met with in "Punch," and other comic productions of the day.

PAROL, *par-ōl'* (Fr. *parole*, from *parler*, to speak), in Law, is a term used to denote oral, or verbal, word of mouth, and is opposed to written. Thus parol evidence is the oral testimony of witnesses, as opposed to written evidence or records. A parol contract is an agreement by word of mouth, as opposed to a writ-

ten contract. In the strict legal acceptation of the term, however, everything is parol, even in writing, which is not under seal.

PARONOMASIA, *pă-ro-no-mā'-se-ă* (Gr. *para*, near, and *onoma*, a name), in Rhet., is a figure in which different ideas are expressed by words of similar sound, or of the same extraction, in order to make the difference more striking; as, Not friends, but fiends are here. Defence, not defiance.

PARONYCHIACEÆ, or ILLECEBRACEÆ, *păr-o-ne-ke-ā'-se-e, il-le-se-brā'-se-e* (Gr. *para*, near; *onux*, a nail; supposed to cure a tumour which rises near the nail), in Bot., the Knotwort fam., a nat. ord. of *Dicotyledones*, sub-class *Calycifloræ*; consisting of 24 genera of herbs and shrubs, found in barren places in the south of Europe and the north of Africa. None of the plants are of any particular importance.

PAROTID GLAND, *pă-rot'-id* (Gr. *para*, and *ous, otos*, the ear), in Anat., is the largest of the salivary glands, and is so named because it is situated near the ears. It is subject to tumours, which are often difficult to remove. (*See* MUMPS.)

PAROXYSM, *păr'-oks-izm* (Gr. *paroxusmos*), in Med., is a fit or periodical exacerbation of a disease that occurs at intervals, or has decided remissions or intermissions, as in the case of ague, gout, insanity, &c.

PARQUETRY, *par'-ke-tre* (Fr. *parquetage*), inlaid flooring. In most cases of this kind of work, thin veneers are cut into geometrical forms and cemented to the planks which are to form the floors. In some sorts of "solid parquetry" the wood is cut of the required thickness, and ingeniously joined together in geometrical patterns. (*See* MARQUETRY.)

PARRAQUET, *păr-ro-keet'* (Fr. *perroquet*), a bird belonging to the gen. *Palæornis*, of the fam. *Psittacidæ*. It is distinguished by having the bill thickish, with the upper mandible dilated, the culmen rounded, the inferior mandible wide, short, and emarginate, and the tongue thick and smooth. The wings are of mean length, and the three first quill-feathers the longest, and nearly equal; exterior webs of the second, third, and fourth quills dilated near the middle, and tapering towards the apex. Tail graduated, with the two middle feathers slender, and greatly exceeding the rest in length, with their tips rounded. The feet have the tarsi rather short, and the claws strong and falcate. The different species of the genus *Palæornis* known to naturalists are natives of India, the Indian archipelago, and Africa, with one exception,—the *Palæornis Barrabandi*, which is a native of Australia. This latter specimen is also called the Barraband ring-parrasqueet, and it may be as well first described. In size it is about fifteen inches long, of which the tail alone measures over eight. The bill is red; the throat and fore-neck yellow; the space below the bill, eyes, and ear-coverts, grass-green; a red collar round the neck; the upper and under surface of the body green, tinged with blue upon the back part of the head and outer margins of the quill-feathers; the upper surface of the tail green; the under surface of the wings and tail blackish brown; and, finally, the legs are black. The Alexandrine ring-parraqueet (*P. Alexandri*) is another handsome variety of this bird, and it was first brought by the Greeks from the island of Ceylon during the Macedonian expedition. It is very docile, and has a facility of pronunciation not inferior to any other of the parrot family. The Malacca ring-parraqueet (*Palæornis malaccensis*) is another variety, and, as its name implies, is a native of Malacca. The Carolina parraqueet (*Psittacus carolinensis*, Wilson and Audubon) is another member of this family, and is the only variety of the parrot family found in America. This species is about fourteen inches long and twenty-two across the wings. The forehead and cheeks are orange-red, the rest of the head and neck a rich yellow; wings edged with orange-red. The body is of a bright yellowish glossy green colour above, with bluish reflections, which are shaded with yellow on the under part of the surface; the tail long and graduated, with the exterior feathers only half the length of the middle ones; the bill white, the claws black, the feet flesh-colour, and the iris hazel. Audubon describes these parraquests as very destructive to husbandmen and gardeners, as they destroy vast quantities of grain and fruit every year.





PARROT, *păr'-rot* (*Psittacus*), a bird belonging to the ord. *Insessores*, and its division *Scansores*, in accordance with its climbing powers. The family consists of about 170 different species, and is not less remarkable for the peculiarity of their form, and the gay and splendid plumage in which they are attired, than for the intelligence and docility so many of them evince in a state of captivity or domestication, and the peculiar facility possessed by some species of imitating the intonations of the human voice, and learning by rote words and sentences which they remember and repeat with clearness and precision. The general characters of the family may be stated as follows:—Bill convex, large, deflected, thick, and strong, the upper mandible overhanging the under, hooked at the tip, and furnished with a small cere at the base; the under mandible strong, thick, ascending, and forming, when closed, an angle with the upper one. Tongue thick, fleshy, and soft; nostrils round, and placed in the cere at the back of the bill; feet scansorial, and the external toes longer than the inner. With regard to the internal anatomy of the bird, it may be mentioned that the bill is furnished with strong additional muscles, and that the intestinal canal is of great length, and is destitute of cæca. Many of the species appear gregarious, and, except during the breeding season, are always seen in large numbers together: other species, as the cockatoos, are met with only in pairs. They select the hollows of decayed trees for the purpose of hatching their eggs and rearing their young; and they make no nest, but deposit their eggs upon the bare wood: the eggs vary in number from two to five or six. Their natural voice consists of hoarse or shrill piercing screams, with but little modulation. Their power of imitating the human voice is not possessed by all the species, but is confined to a few, particularly to the short even-tailed parrots, which have the tongue large, broad, and fleshy at the tip. They are found in America as far south as the Straits of Magellan, and likewise in Australia and Tasmania; so they are not confined, as Buffon imagined, to the torrid zone, although in that latitude their plumage is more gorgeous than farther south. The first sub-family is that of the Macaws (*Macrocercinæ*), which will be found described under art. MACAW. The next subdivision is termed the family *Palæornina* (*see* PARRAQUET); and next come the *Psittacina*, under which title is comprehended that class of birds which we more strictly denominate Parrots. Wagler, in his "Monographia Psittacorum," has divided these into four genera,—*Eclectus*, *Psittacodis*, *Psittacus*, and *Pionias*. The plumage of these is compact, and the feathers of the neck broad, truncate, and imbricated. With the exception of the grey parrot (*Psittacus erythacus*, Linn.), these are all inhabitants of the continent of America. The prevailing colour of their plumage is green, varied with red, blue, and yellow. First among these is placed, by Mr. Selby, the festive parrot (*P. festivus*), which is a native of Guiana, Cayenne, and the Brazils, in South America. It measures between fifteen and sixteen inches in length, and its plumage is nearly a prevailing green colour. The grey parrot is a native of Western Africa, and is one of the best-known species of the tribe. Its imitative and talkative powers are unequalled by any of the others, and consequently it is much in request as an amusing companion. It is about twelve inches in length, and the whole of its plumage, with the exception of its tail, which is bright scarlet, is ashy grey, which is deepest in colour on the back. The grand eclectus (*Eclectus grandis*, Wagler), the southern Nestor (*Nestor hypopolius*), and several others, might be mentioned as members of this family, if space allowed. The *Loriana* form a separate branch, and are so named on account of their beautiful scarlet colour and their call-note, which resembles their name. The *Lorikeets* are a subdivision of these last-mentioned species, and they present the characteristics of the parraquests mingled with those of the lory. (*See* COCKATOO, MACAW, &c.)

PARSEES. (*See* GUEBRES.)

PARSLEY. (*See* PETROSELINUM.)

PARSNIP. (*See* PASTINACA.)

PARSON, *par'-son* (Lat. *persona ecclesiæ*), in Law, is one that has full possession of all the rights of a parochial church. He is so called because *by* his person

the Church is represented, and is in himself a body corporate, to protect and defend the rights of the Church. He has, during his life, the freehold in himself of the parsonage-house, glebe, tithes, and other dues, except where these are appropriated to the lord of the manor or other patron of the living.

PARSONAGE, *par'-son-aij*, is a rectory, or parish church, endowed with a glebe, house, lands, tithes, &c., for the maintenance of a minister with cure of souls within such parish.

PARTICIPLE, *par'-tis-e-pl* (Lat. *participium*, from *pars*, part, and *capio*, I take), in Gram., is a part of speech which partakes both of the properties of an adjective and of a verb. It may be considered as an adjective with the idea of time added, or as a verb without the idea of affirmation. In English there are two participles, the present and past; the former ending in *ing*, the latter in *en*, *ed*, *d*, or *t*. The modern languages are much inferior to the ancient in the power and expressiveness derived from their participles.

PARTICLE, *par'-te-kl* (Lat. *particula*), in Gram., is applied to such parts of speech as are incapable of any inflection; as prepositions, conjunctions, &c.

PARTITION, *par-tish'-un*, in Law, is a dividing of lands descended by the common law, or custom, among coheirs or parceners. Since the abolition of the inadequate writ of partition at common law by 3 & 4 Will. IV. c. 27, equity enjoys the exclusive jurisdiction of dividing the estates of joint-tenants, tenants in common, and co-parceners, which is effected by first ascertaining the rights of the several persons interested, and then issuing a commission, which is an equitable process, to make the partition required; and upon the return of the commissioners, and confirmation by the court, the partition is finally completed by mutual conveyances of the allotments made to the several parties. —*Ref.* Wharton's *Law Lexicon*.

PARTITION (Lat. *partior*, I divide), in Carpentry, a wall which divides and separates one apartment from another. It may be either of brick, stone, or timber. When a partition wall has no support from below, it ought to be so constructed as to lay no stress on the floor; and therefore a truss partition should be employed to relieve the weight.

PARTNERSHIP, *part'-ner-ship*, in Law, is an agreement voluntarily entered into by two or more individuals to unite their capital, labour, and skill, all or any of them, for carrying on some business or undertaking in common, each deriving a certain share of the profits, and generally bearing a corresponding share of the loss arising therefrom. As commonly used, partnership is only applied to the smaller associations of individuals, comprising usually a few members; where an association, having gain for its object, consists of more than twenty members, it generally takes the shape of a chartered or joint-stock company; otherwise, in general, each partner would be liable, singly, for the debts of the whole partnership. (*See* JOINT-STOCK COMPANIES.) A partnership is commonly constituted by a written instrument, usually by deed, the provisions of which are denominated articles of partnership. It may be either for a certain fixed time, or for an indefinite period, and may be dissolved either by the natural expiration of that period or the mutual agreement of the parties, or, in the event of disagreement, by decree of a court of equity. The mere consent of the parties is sufficient to constitute a partnership; and they may distribute their profits and regulate their affairs in any way they please among themselves; but they cannot, by so doing, limit, defeat, or elude, their responsibility to others. In ordinary partnership, each member, however small his share, is liable for all the debts of the company. To constitute a person a partner, he must be a participator in uncertain or casual profits depending upon the accidents of trade. Where the premium or profit he is to receive is certain and defined, he is not a partner; and if he is only to receive a portion of the profits as payment for his labour as a servant or agent of the company, he is not a partner. A participation in the profits without a participation in the losses, constitutes a partnership as regards third parties. Partners are ordinarily divided into ostensible, nominal, or dormant. Partners whose names appear before the world as such, are ostensible partners; but if they have no actual interest in the concern, then they are only nominal partners: those whose name and connection with a firm are purposely concealed from the world, are dormant partners. A dormant partner is, in all cases, liable for the contracts of the firm during the time that he is actually a partner; and a nominal partner is, in the same manner, liable during the time that he holds himself out to the world as a partner. The rights, duties, and obligations of the partners, *inter se*, are usually laid down in articles of partnership; and each partner has a right to hold his copartners to the specified purposes of their union while the partnership continues. The powers of partners are very extensive, and the contract or other act of any member or members of the associated body in matters relating to the joint concern, is, in point of law, the contract or act of the whole, and consequently binding upon the whole, to the extent of rendering each liable for it individually as well as in respect of the partnership property. This power or authority does not extend to matters extraneous to the joint concern, nor even to matters which, though connected with it, are, by the ordinary usage of business, transacted with the express and formal intervention of each partner. Partners, though they should act in a fraudulent manner as respects their copartners, bind the firm in all matters connected with its peculiar dealings. Should one of the partners enter into a smuggling or other illegal transaction on the partnership account, the other partners are liable for the duty and penalties. When one of the partners has been made liable for the debts of the firm, he has his relief against the others for a due portion of it. Partners cannot be relieved from future liabilities to third parties without notice to them, and the world in general, that the partnership has ceased. Attempts have of late been made in this country to extend the benefits of limited liability to private partnerships, and during last session of parliament a bill was introduced for that purpose. It is believed that it would be of advantage to the trade and manufactures of the country if individuals with capital might be at liberty to advance it to persons of skill and enterprise, but without capital, with the certainty that their loss would not in any case extend beyond the sum invested, not being further responsible for the debts of the company. Of course, in such cases, the nature of the partnership, and the amount of the interest of each, would require to be made public, and entered in a register for that purpose. This system has for some time been common in France and other parts of the continent, and has recently been introduced into the United States of America. It is believed to work well wherever it has been introduced, and there is great probability of its soon being tried in this country.

PARTRIDGE, *par'-tridje* (*Perdix*), a bird belonging to the gallinaceous fam. of birds termed *Tetraonidæ*. The characteristics of the common partridge (*Perdix cinerea*) are as follows:—Bill short, strong, naked at the base, upper mandible convex, deflected towards the tip; nostrils basal, lateral, and the orifice partly concealed by a naked arched scale; wings short, concave, and rounded in form, the first three feathers shorter than the fourth or fifth, which are the longest in the wing; tail short; feet with three toes in front and one behind, and those in front united by a membrane as far as the first articulation. The adult male of the partridge has the beak bluish white; the front of the neck and throat a bright yellowish chestnut; top of the head and back of the neck greyish brown; the back and wing-coverts grounded with wood-brown and shaded with chestnut-brown, the shaft of each feather being conspicuous in a streak of wood-brown; the tail-feathers of a uniform reddish chestnut; the neck and upper part of the breast, the sides, and flanks, light bluish grey, freckled in minute spots with a darker shade of the same colour, and barred with chestnut; the legs and toes bluish white; and, lastly, the claws brown. The entire length of this bird is about twelve inches and a half. The wing is rounded, and its length from the carpal joint to the end is six inches. The female is a little smaller than the male, and the grey feathers on the neck and under surface of the body are more tinged with brown. The birds pair in February, but very seldom commence to lay eggs before April or the beginning of May. Their nest is very simply constructed, as a slight depression of the ground, and a

few leaves and pieces of grass scratched together, serve for the purpose. From twelve to twenty eggs are mostly produced, and they are of a uniform olive-brown colour, and about an inch and five lines in length and an inch broad. The period of incubation lasts twenty-one days, and both the male and female birds exhibit great solicitude for the covey as soon as they



PARTRIDGE.

emerge from the shell. Partridges are carefully reared and preserved for the shooting season; and it is against the game laws to touch them until it commences, which it does on the 1st of September. Besides the common partridge, there are several other varieties; as the red-legged partridge (*Perdix rufa*), the Barbary partridge (*Perdix petrosa*), and the American partridge, called also the Virginian colin (*Perdix virginiana* of Wilson and Audubon, and *Ortyx virginiana* of Macgill). Sir William Jardine observes of partridges generally, in the "Naturalist's Library," that they form one point of connection between the *Tetraonidæ* and the Pheasants, as there are many resemblances in their habits and dispositions, their harsh cry, and their spotted plumage. The guinea-fowl, he alleges (*see* PINTADO), is the link which goes between the two; and, like that bird, the partridge emits a sharp continuous cry at daybreak and at dusk, when the birds assemble to perch on the trees and woods which overhang the rivers. The genus *Perdix* was established by Brisson, taking the common European partridge as typical; but it was made to contain an assemblage of birds some of which will not even rank amongst the family. The partridge is distributed extensively over Europe, and according to Temminck, extends to Barbary and Egypt, where it is migratory. It is also found in India and America; and several which have been sent to Australia by the Acclimatization Society (formed of a committee of scientific gentlemen for the purpose of benefiting the colonies) are doing remarkably well.—*Ref.* Yarrell's *British Birds*; Selby; and the works of other naturalists.

PARTRIDGE-WOOD. (*See* ANDIRA and HEISTERIA.)

PASCH, *pâsk*, the Passover, or feast of Easter. (*See* PASSOVER, EASTER.)

PASCHAL, *pas'-kăl*, pertaining to the Passover, as the paschal lamb, which was offered by the Jews in this festival, and prefigured Christ. (*See* PASSOVER.)

PASHA. (*See* BASHAW.)

PASIGRAPHY, *pă-sig'-ră-fe* (Gr. *pas*, all, and *grapho*, I write), is used to denote an imaginary universal language that will be understood by all nations. However fanciful such an idea may seem, there have not been wanting philosophers of distinction to maintain its possibility, and even to attempt to carry it out. The idea seems to have originated with Leibnits, who laboured a good deal to effect its accomplishment,—"De Arte Combinatoria" (1666). He was followed by Wilkins, in England (1668), and in Germany by Berger ("Plan of a Universal Written and Spoken Language," Berlin, 1779), Wolke ("Means of rendering a Universal Language practicable," 1797), Schmidt (Vienna, 1815). Kant is of opinion that a universal language is within the limits of possibility, and even predicts that it will be established at some future period. "The idea of a universal language," says Wagner, "is founded on the fact that the essence of every language consists in its internal organization, for which a common expression must be possible, since this internal organization of a language can be only the expression of the various relations of ideas, and these relations again only the expression of the real relations of things. If now, a general representation





can be found for these relations, a universal grammar is obtained, and if this can be communicated in common characters intelligible by every one, we have a complete pasigraphy." Various attempts have recently been made to establish a universal alphabet, and a series of conferences were held regarding it at the residence of Chevalier Bunsen, in London, in 1854. It was agreed that the basis of such an alphabet must be a physiological one, *i.e.*, every sound must first be defined physiologically. This physiological system must then be checked and reduced by linguistic observation; the comparative philologist, after discovering which sounds are primary or secondary, simple or compound, fixing the number of letters requisite for a universal alphabet. The graphic system built upon this double basis to be rational and consistent, and answer the purposes of reading and writing, with a particular regard to printing; the alphabet thus constructed to be regarded as the standard alphabet, to which all other alphabets are to be referred, and from which the distance of each to be measured.—*Ref.* Bunsen's *Outlines of the Philosophy of Universal History*.

PASPALUM, *păs'-pă-lum* (from *paspalos*, one of the Greek names for millet), in Bot., a gen. of grasses. *P. exile* yields the smallest known cereal grain, *Fundi* or *Fundungi*, which is used as food on the west coast of Africa. In Sierra Leone, it is commonly called millet. *P. scrobiculatum* also yields a kind of grain known in India as the *Menyo* or *Kodro*.

PASS, *pâss*, in general language, a narrow passage or difficult place of entrance. In a military sense, it signifies a strait or narrow defile, which, when properly defended, renders the entrance into a country very difficult.

PASSANT, *pâs'-sant* (Fr.), a term used in Her. to describe an animal when represented in a walking condition; when depicted walking with the full face towards the spectator, it is said to be *passant guardant*.

PASSENGERS, *pâs'-sen-jurz* (Fr. *passager*), are individuals conveyed for hire from one place to another on board ship. Passage-ships, or those appropriated to the conveyance of passengers, are generally placed under certain regulations, and the extent to which emigration is now carried renders it of the utmost importance that these regulations be properly carried out. The Passengers Act, 1855 (18 & 19 Vict. c. 119), extends generally to every ship carrying more than thirty passengers from the United Kingdom to any part out of Europe, and not being within the Mediterranean, and to every such colonial voyage as therein described. It provides that no such ship shall clear out to sea until duly surveyed and reported seaworthy, nor until the master shall have obtained from the emigration authority at the port of clearance a certificate that the requirements of the act have been duly complied with, and that the ship is in all respects fit to proceed on her voyage. It also makes a variety of regulations calculated to limit the number and to insure the safety and accommodation of the passengers. The Merchant Shipping Act, 1854 (17 & 18 Vict. c. 104), provides that every passenger-steamer (that is, every British steam-ship carrying passengers to, from, or between any place or places in the United Kingdom, excepting steam-ferryboats working in chains, commonly called steam-bridges), shall be surveyed and reported upon to the Board of Trade at least twice in the year, and shall proceed on no voyage with passengers, unless the owner or master has received from the board a certificate applicable to the voyage and showing that the provisions of the act have been complied with; and if the person in charge receives on board any number of passengers greater than the number allowed by the certificate, the master or owner shall incur pecuniary penalties.—*Ref.* McCulloch's *Commercial Dictionary*.

PASSIFLORACEÆ, *pâs-se-flo-rā'-se-e*, in Bot., the Passion-flower fam., a nat. ord. of *Dicotyledones*, sub-class *Calyciflorœ*. Herbs or shrubs, usually climbing by tendrils. Leaves alternate, with foliaceous stipules. Flowers perfect, or very rarely unisexual. Sepals 5, united below into a tube, the throat of which bears a number of filamentous processes; petals 5, inserted in the throat of the calyx on the outside of the filamentous processes, with an imbricated æstivation.

Stamens usually 5, monadelphous, surrounding the stalk of the ovary. Ovary stalked, superior, 1-celled; styles 3, clavate; placentas parietal. Fruit 1-celled, stalked, generally succulent. Seeds numerous, arillate; embryo in their fleshy albumen. The plants of this order are chiefly found in tropical America; but a few also occur in North America and the East Indies, and several in Africa. There are 13 genera and 211 species. Many are cultivated for the beauty of their flowers and foliage. The genus *Passiflora* has long been a favourite with florists, and the remarkable appendages of the flowers, which symbolize the passion of Christ, must always excite wonder and admiration. The fruits of several species of passion-flower are eaten under the name of granadillas. Species of *Paropsis* and *Tacsonia* also bear edible fruit. The name given by the old botanists to the passiflora was *flos passionis* (passion-flower), because the instruments of the Saviour's passion or suffering were thought to be represented in the parts of fructification of this genus. The present name was bestowed upon the genus by Linnæus.

PASSION-FLOWER. (*See* PASSIFLORACEÆ.)

PASSION-WEEK, in the Church of England, is the week immediately preceding the festival of Easter, because in that week our Lord's passion and death happened. It corresponds to Holy Week in the Roman Catholic Church. This week was observed from an early period in the Church, and according to Chrysostom, "in this week many increase their labours, some adding to their fastings, others to their watchings; others give more liberal alms, testifying the greatness of the Divine goodness by their care of good works, and more intense piety and holy living." The Thursday in this week, which was the day on which Christ was betrayed, was observed with some peculiar customs. (*See* MAUNDY-THURSDAY.)

PASSIVE VERBS. (*See* VERBS.)

PASSOVER, *pass'-o-ver* (Heb. *pesach*, a leap or passage), among the Jews, was a solemn festival instituted in commemoration of their coming out of Egypt, because the night before their departure the destroying angel that slew the firstborn of the Egyptians passed over the houses of the Hebrews, because they were marked by the blood of the lamb; hence called the paschal lamb. The passover was observed on the 14th day of the first month (Nisan), and on the 15th day commenced the seven days' feast of Unleavened Bread. Properly the term passover applies only to the 14th day, but it was commonly used to include also the feast of Unleavened Bread which followed.

PASSPORT, *pâss'-port* (Fr. *passeport*), is a letter, license, or document given by an authorized officer of a state, granting liberty to the person or persons therein named to pass or travel either generally, or through a country named, and to remain there for an indefinite or specified period. In general, the bearer then requires to take his passport to the minister or authorized agent of the country which he is about to visit, and have it signed by him. Such a document states the name, surname, age, and profession of the bearer, and entitles him to the protection of the authorities of the countries through which he may pass. On arriving at the outposts or frontier towns of a foreign state, the traveller is obliged to produce his passport for examination, and at any town where he intends remaining for any time, it has to be given up to the police authorities. In some of the European states, even natives cannot travel twenty miles through their own country without a passport. To travellers, the system, as carried out in some parts of the continent, is very annoying, and might, perhaps, be more bearable were it not so silly and illiberal. The practice is defended on the plea of checking dangerous or improper persons from entering the country; but innumerable instances prove that the check is worthless for such a purpose, there being no lack of means of evasion. In France, the passport system has recently been relaxed in favour of English travellers.

PASTE, *paiste*, a glass made in imitation of precious stones. The base of all fictitious gems is a combination of silica, potash, borax, red oxide of lead, and sometimes arsenic. Pure boracic acid and colourless quarts ought to be used, and Hessian crucibles in preference to porcelain. The paste requires to be fused in a potter's furnace for twenty-four hours; and the more tranquil and continued the fusion, the harder is the paste and the greater its beauty. The proportions of paste, &c., for the principal artificial gems are as follows:—*Ruby.*—Paste, 2,880; oxide of manganese, 72. *Emerald.*—Paste, 4,608; green oxide of copper, 42; oxide of chrome, 2. *Sapphire.* Paste, 4,608; oxide of cobalt, 68: fused for thirty hours. *Amethyst.*—Paste, 4,608; oxide of manganese, 36; oxide of cobalt, 24; purple of cassius, 1. (*See* GEMS, ARTIFICIAL.)



PARSNIP.

PASTINACA, *pas-te-nai'-kâ*, in Bot., a gen. of *Umbelliferæ*. The root of *P. sativa* is the nutritious and wholesome culinary root called the *parsnip*. It is cultivated on a large scale for feeding cattle.

PASTOR, *pas'-tor* 'Lat., a shepherd), in Theol., is applied to a bish of a diocese, or the priest of a parish, whose peo are, by the same figure, termed their flock. *A pastoral letter* is a circular letter, addressed by a bishop to his diocesans, for their religious instruction or guidance in matters of ecclesiastical discipline. The *pastoral staff* is the crosier of a bishop's staff, which, in his public ministrations, he is directed to have in his hand, or else borne or holden by his chaplain. (*See* CROSIER.) *Pastoral Theology* is that department of theology which has to do with the practical duties of a clergyman as the teacher and spiritual guide of his people.

PASTORAL, *pas-to-rāl*, in Lit., is the name of a species of poetry, which is devoted to descriptions and delineations of country life. (*See* IDYLL.)

PATCHOULI. (*See* POGOSTEMON.)

PATELLA. (*See* KNEE.)

PATENT, or PATENT RIGHT, *pāt'-ent*, or *pai'-tent* (fr. Lat. *pateo*, I open), in Law, is a privilege granted by the crown to the first inventor of any new contrivance in the manufactures, granting him a monopoly in his invention for a certain number of years. It is so called because the instrument by which it is bestowed is in the form of letters-patent under the great seal. That it is right to hold out inducements to persons to make discoveries and improvements in the useful arts—in machinery, manufactures, &c.—by means of which the interests of the community are more rapidly advanced, and to reward them for the loss of time and money they may have incurred, can scarcely be doubted; and, in general, the most practicable way of doing so is to afford them a monopoly in their invention for a certain number of years, but not for too long a period, which would be detrimental to the progress of improvement, and against the interests of the public. While by the Statute of Monopolies (21 Jac. I. c. 3) the granting of such was declared to be contrary to the laws of the realm, an exception was made in favour of new inventions, which it was held that the crown might lawfully concede for a reasonable period. It therefore excepts "all letters-patent for the term of fourteen years or under, by which the privilege of sole working or making any new manufactures within this realm, which others at the time of granting the letters-patent shall not use, shall be granted to the true and first inventor thereof, so as they be not contrary to law nor mischievous to the state, nor to the hurt of trade, nor generally inconvenient." This law still regulates the granting of patents; but the mode of proceeding has been fixed by various subsequent statutes, more particularly by the "Patent Law Amendment Act, 1852" (15 & 16 Vict. c. 83). The principal classes of patentable inventions seem to be these:—(1) New contrivances applied to new ends; (2) new contrivances applied to old ends; (3) new combinations of old parts, whether relating to material, objects, or processes; (4) new methods of applying a well-known object. Novelty and utility are the two great features of an invention, without which a patent would be invalid. It must be a "new manufacture within this realm;"

and hence its being previously known abroad is no objection to the validity of the patent. The degree of utility need not be great, but it must be something applicable to the production of a vendible article. It must also be a manufacture: a scientific principle, however valuable, cannot form the subject of a valid patent. The grant of a patent is not a matter of right, but of favour, and is applied for by petition to the crown, the applicant declaring that he is the first and true inventor, to the best of his knowledge and belief. The petition and declaration are left at the office of the commissioners of patents for inventions, together with a provisional specification, describing the nature of the invention. The applicant is then referred to one of the law officers of the crown, who is at liberty to call in any scientific or other person to his aid. After his allowance of the same, the next step is for the applicant to give notice of his intention to proceed with his application to the commissioners, who will then advertise it; and any person having an interest in opposing it will be at liberty, within a certain period, to lodge objections. These are then referred to the law officer, who, if satisfied, grants a warrant for the sealing of the letters-patent, which gives the applicant the exclusive right of using the invention within the United Kingdom, &c., for the full term of fourteen years. The condition on which a patent is granted is, that a "complete specification" of the invention be lodged, making a full disclosure of the secret; for the patentee must instruct the public what they are shut out from using, as well as instruct how to work the invention when the monopoly is expired. A book called a "Register of Patents" is directed to be kept at the Specification Office for the public use. The law is very strict regarding the framing of specifications, and many patents are invalidated by errors here; the most common fault being claiming too much, or something that is already public property. A patentee may, in certain circumstances, obtain an additional term of fourteen years for carrying on his monopoly; but such additional period will only be granted on the patentee showing that he has not been adequately rewarded. A patent right is assignable; and a patentee may also grant deeds of license to one or more persons to manufacture the article. A patentee's remedy for infringement of his right is by civil suit, there being no criminal proceeding in such a case; and in prosecuting such suit his rights are subjected to a searching examination; for the defence may be, that no infringement has taken place, or that the patent is void, through some defect. The crown may also repeal any letters-patent, on good grounds being shown, by means of a writ of *scire facias*. Where, however, a patent has been granted to a person believing himself to be the first inventor, and it is discovered that he has been preceded in the invention by some one else, but not generally known to the public, the patentee may petition the queen in council, and receive a new grant, or confirmation of the existing one. The patent business of the United Kingdom is carried on at one office, in London, under the direction of commissioners appointed by the act of 1852, the chief of whom is the lord chancellor. There are a class of persons styled patent agents, who devote themselves to this branch of business, and through whom patents are usually obtained.—*Ref.* Stephen's *Commentaries*.

PATERNOSTER, *pat'-ter nos'-ter* (Lat. *pater*, father; *noster*, our).—1. The Lord's Prayer is thus called from its two initial words in Latin.—2. The chaplet or string of beads which assists Roman Catholics to number their rehearsals of that prayer.—3. In Arch., a sort of ornament cut in form of beads, either round or oval.

PATHOLOGY, *path-ol'-o-je* (Gr. *pathos*, disease, and *logos*, discourse), is the science or doctrine of diseases. As physiology teaches the nature of the functions of the living body in a state of health, so pathology relates to the various derangements of those functions which constitute disease. It is usually divided into general and special pathology. As each disease is marked by certain peculiarities which distinguish it from all others, there must be a pathology of each, or, in other words, a special pathology; and as, on the other hand, many diseases possess certain features in common, the description of these features will no





longer be special, but general pathology. The latter is nothing more than a generalisation of the facts of the former. Special pathology comes first in the order of nature. It is made up of individual facts, carefully observed, arranged, and classified according to some nosological plan. General pathology collects those facts, wherever found, which have a certain similarity, and arranges them according to their natural analogies, so that, whoever examines them in this view, will have no difficulty in appreciating them as phenomena of particular diseases. Disease is a change from the natural condition of the function or structure of the body, and usually involves several elementary functions or structures. A knowledge of the constituent parts or elements of structure and function is necessary to the pathologist, in the study of disease, before he can properly understand their combinations. As in chemistry, some of these elements are ultimate or primary, and cannot be analyzed or divided further, others are proximate or secondary, because occurring so frequently together, yet acting singly in compounding and giving properties to complex matter. The primary or ultimate elements of structure, healthy and diseased, are muscular fibre, nervous matter, vascular fibre, and the elementary tissues of membranes; and there are primary elements of function, healthy and diseased, of these structures,—irritability, tonicity, nervous properties, to which may be added, because at present we cannot analyze it, the power of secretion and nutrition; and, lastly, the constituents of the blood. The secondary or proximate elements of disease are composed of the preceding primary elements, but are still simple in comparison with the complex conditions of disease which they combine to produce. The varieties of disease affecting these several elements may be comprehended under the heads of degree and kind,—*degree*, including excess and defect, or alterations of plus and minus; and *kind*, relating to changes not comprised under these heads, but otherwise expressed by the term perversion. "The primary and secondary elements of disease are the especial subjects of general pathology. By the study of them, we become acquainted with the materials of disease, and their relations to each other; we learn how special diseases arise, and of what they consist; how they produce their phenomena and effects; how they are to be known, distinguished, and classified. Out of such a knowledge, where it is correct, sufficient, and combined with an ample acquaintance with the properties of remedial agents, arises the rational method of relieving, curing, and preventing disease, the great ends of the art of medicine."—(*Williams.*) Following, then, the classification of Dr. Williams, we have, as the first of the primary elements of structure, muscular or contractile fibre, the distinctive property of which is irritability, or the property of contracting on the application of a stimulus or exciting agent. This may become excessive, or too violent for the welfare of the part or system; and will be manifested (1) by an excess of strength and degree, (2) by an inordinate quickness or promptitude, or (3) by the unusual duration of the contractions. Muscular contractility may be defective chiefly in two modes —(1) in force, as in the weakness caused by the exhaustion of previous exertion; or (2) in readiness to contract, as in the sluggish movements of a person under the influence of opium. Tonicity, or tone, is another property possessed by all muscular structures, and keeps the parts in which it resides in a certain degree of tension. With an excess of tonicity the muscles are so firm as scarcely to afford room for supple motion, and the pulse is hard, tense, and often slow. Where tonicity is defective, the muscles are flabby and incapable of exertion, and the pulse soft and yielding. A function of the nerves is sensibility, and a diseased state of a centre will cause disorder of general sensibility of one or more of the nerves—local sensibility. Diseases of sensibility may consist in (1) excessive sensibility, (2) defective sensibility, or (3) perverted sensibility. The function by which certain nerves convey the impulses of the will to voluntary muscles may become disordered, and its phenomena constitute an element of disease. It may be in excess, defect, or perverted. The reflected and sympathetic nervous influences may, in like manner, become diseased. Secretion is regarded as a peculiar property of the secre-

tent structures, as irritability is of muscular fibre; and from the ubiquity of the process it constitutes an important element of disease. It includes recrementitious products (those concerned in digestion, assimilation, and nutrition), as well as excrementitious products. It may be excessive, and weaken, by the drain which it causes from the mass of the blood; but it may also have special effects upon the organ of secretion, the blood from which it comes, or the parts to which it is carried. The most common causes of altered secretion are those which operate on the sanguiferous system and its contents. The effects or defects of secretion are the opposite of those of excess, and may arise from a weakened state of the whole circulation, or of the secreting organ. Perversion of secretion often accompanies excess or defect, as in febrile diseases, when the secretions of the kidneys are altered as well as diminished. The blood, like the solid parts of the body, is composed of sundry elements, which are subject to change, and produce various disorders. The components of the blood are, (1) the red particles,*(2) fibrin and colourless globules, (3) albumen and other dissolved animal matters, (4) oil, (5) salts, (6) water; any of which may be in excess, defect, or alteration. The red particles are proportionally large in persons of sanguine temperament, and excessive in sanguineous plethora, and in hæmorrhagic diseases before much blood is lost. They are defective in persons of lymphatic temperament, and after great losses of blood. An excess of fibrin and of the colourless globules exists in all truly inflammatory diseases. The changes effected in the blood by respiration are liable to variations, and form an important element of disease. They are principally owing to defect of change, as in asphyxia. It is doubtful whether this change is ever carried on in excess. Various changes are effected on the blood by excess or defect, or alteration of secretion of urine, bile, perspiration, &c. Changes are also effected on the blood by the presence of foreign matters, as poisons. The class of proximate elements which have been most generally studied as the subjects of general pathology, are those affecting the circulation of the blood. They comprise at least three of the primary elements,—the condition of the blood and its constituents, the irritability of the organs concerned in its distribution, and their tonicity. Anæmia is the name given to that condition of the system in which the predominant character is a deficiency of blood, usually accompanied also with a remarkable deterioration in quality. The causes which excite anæmia are various circumstances which injure the blood or withdraw portions of it from the system; as excessive bleedings, profuse evacuations of fluids, &c. The excess of blood in the system, or in a part,—hyperæmia or polyæmia, is a frequent cause of disease. Plethora, or general excess of blood, may proceed either from too much blood being made, or from too little being expended; in either case the blood accumulates and fills the heart and blood-vessels beyond the usual degree. The distinction of plethora into sthenic and asthenic depends on the strength and irritability of the motor fibre. In sthenic plethora, the tone and contractility are increased, in asthenic they are diminished. In the latter case, the heart and other organs are oppressed, instead of being excited by the quantity of blood. Local hyperæmia, or excess of blood in a part, when with diminished motion, constitutes congestion, or an accumulation of blood in the blood-vessels of a part, chiefly in the capillaries. There may also be increased motion or determination of blood to a part,—one of the most common cases of which is determination of blood to the head. The results of hyperæmia, general or local, when they reach a certain degree of intensity, are hæmorrhage, flux, dropsy: hæmorrhage, when the vessels are distended to such a degree that their coats give way and blood is effused; flux, when there is an effusion of the watery part of the blood in secreting organs, or upon open surfaces; and dropsy when in closed sacs or in cellular connective tissue. There may also be too much blood in a part, with motion partially increased and partially diminished, constituting what is commonly known as inflammation, and characterized by redness, heat, pain, and swelling. Structural diseases are of various kinds: those of them that more particularly demand our notice are those which arise from alteration of the



function of nutrition of the different structures. These are comprehended under the heads of increased, diminished, or perverted nutrition. Increased nutrition, or hypertrophy, may affect either individual textures or whole organs, being in the former case simple, in the latter complex. Diminished nutrition, or atrophy, may be general, affecting all parts of the body, or partial, affecting only a part. Under perverted nutrition are comprehended all those changes of structural nutrition that go beyond mere *plus* and *minus* influences,—the quality of the fibre being altered, or new tissues, growths, or deposits formed in connection with the normal structure. Besides deposits and morbid growths of various kinds, there may be induration or softening, transformation or degeneration of texture. Many diseases arise from derangements in the mechanism of organs, from dilatation, contraction, laceration, displacements, contortion.—*Ref.* Williams's *Principles of Medicine.*

PATRIARCH, *pai'-tre-ark* (Gr. *patria*, family, and *archon*, ruler), a name originally given to heads of the first families who lived in the earliest ages of the world, as Abraham, Isaac, and Jacob, with his twelve sons, and Seth, Enoch, and others. They exercised the offices of priest and king in their respective families; and it has been supposed that the idea of hereditary power and honours was derived from the authority enjoyed by the patriarchs and their first-born after them. In Jewish history, the term is also applied to a person invested with a dignity, the origin of which has been the subject of much discussion, some maintaining that it is of very ancient institution, and others that it is not older than the time of Nerva, the successor of Domitian. Whenever established, however, the authority of those who held this office came, in time, to be very considerable. Their chief duty being to instruct the people, they established schools in several cities; and having gained a great reputation for learning, zeal, and piety, at length ventured to levy a kind of tribute to support the charges of their dignity, and of the officers under them. They also appointed the principals of the schools and academies, who, in the course of time, were styled chiefs and princes, to imply the great respect due to them from their disciples, and who, at length, became rivals of the patriarchs, and in some cases possessed both dignities at once,—a usurpation which caused great confusion and frequent contests. According to the Jewish rabbin, the patriarchal dignity was in existence, in this sense, from thirty years before the birth of Christ down to the 5th century, when it was abolished. Patriarchs, in the Christian church, are ecclesiastical dignitaries, or bishops, so called from their paternal authority in the Church. The establishment of the grand patriarchates is attributed, by some, to the apostles themselves, whilst others maintain that the name patriarch was unknown at the time of the council of Nice, and that, for a long time afterwards, patriarchs and primates were confounded together as being all equally chiefs of dioceses. A great authority supposes that it was in the 4th century that those prelates who enjoyed a certain degree of pre-eminence over the rest of the episcopal order were distinguished by the Jewish title of patriarchs. The authority of the patriarchs—the chief of whom were those of Rome, Constantinople, Alexandria, Antioch, and Jerusalem—grew by insensible degrees, till at length we find, that about the close of the 5th century, their decrees were executed with the same regularity and respect as those of princes. It must be observed, however, that there were certain districts, both in the Eastern and in the Western empire, which were exempted from their jurisdiction. The Latin church had no patriarchs till the 6th century; and the churches of Gaul, Britain, &c., were never subject to the authority of the patriarch of Rome, whose authority only extended to the nearer provinces. The authority of the patriarchs was not one and the same precisely in all churches, but differed according to the different customs of places and countries, or the pleasure of kings and councils. The patriarch of Constantinople grew to be a patriarch over the patriarchs of Ephesus and Cæsarea, and the patriarch of Alexandria had some privileges which no other patriarchs besides himself enjoyed, such as the right of consecrating and approving every bishop under his jurisdiction. Learned men have reckoned

up thirteen patriarchs as having existed in early times; that is, one in every capital city of each diocese in the Roman empire: the patriarchs of Antioch and Ephesus, in Asia; the patriarch of Cæsarea, in Cappadocia; the patriarch of Thessalonica, in Macedonia; the patriarch of Sirmium, in Illyricum; the patriarchs of Rome and Milan, in Italy; the patriarchs of Alexandria and Carthage, in Egypt; the patriarch of Lyons, in France; the patriarch of Toledo, in Spain; the patriarch of York, in Britain; and the patriarch of Constantinople, styled the œcumenical or universal patriarch. It must be observed, however, that the whole matter is so obscure, and has been so much controverted, that it is no easy matter to discover, in any particular, the truth respecting it. The term patriarch is applied, in the present day, to the chiefs of several churches in the East, who live out of communion with the Church of Rome; such as the four patriarchs of the Greek church; viz., the patriarchs of Constantinople, Alexandria, Antioch, and Jerusalem. The spiritual jurisdiction and dominion of the patriarch of Constantinople are very extensive, comprehending a considerable part of Greece, the Grecian isles, Wallachia, Moldavia, and several of the European and Asiatic provinces that are subject to the Turks. The patriarch of Alexandria exercises his spiritual authority in Egypt, Nubia, Libya, and a part of Arabia. Damascus is the principal residence of the patriarch of Antioch, whose jurisdiction extends to Mesopotamia, Syria, Cilicia, and other provinces. The patriarch of Jerusalem comprehends within the bounds of his pontificate, Palestine, Arabia, the country beyond Jordan, Cana in Galilee, and Mount Sion.

PATRICIANS, *pă-trish'-yănz* (Lat. *pater*, a father).—According to some authorities, the title of *patrician* was given to the descendants of the hundred or two hundred first senators chosen by Romulus, the founder of Rome, and by him called *Patres*, fathers. In considering, however, who were the patricians of Rome, it is convenient to distinguish three periods in the history of that city, the first extending from the foundation of the city down to the establishment of the plebeians as a second order; the second from this event down to the time of Constantine, during which time the patricians were a real aristocracy of birth, and formed a distinct class of Roman citizens, opposed to the plebeians; the third period extending from Constantine down to the middle ages, during which time the patricians were no longer an aristocracy of birth, but were persons who merely enjoyed a title, first granted by the emperors, and afterwards by the popes also. Although the subject is involved in some obscurity, it seems to be pretty clear that during the first period the patricians comprised the whole body of the Roman people who enjoyed the full franchise, the other inhabitants being either freedmen, slaves, or strangers. During the second period, when a distinct class of Roman citizens had grown up, named plebeians, an almost uninterrupted struggle took place between the two classes, in which the patricians exerted every means to retain their exclusive rights, but which ended in the establishment of the political equality of the two orders, and in the rise of a new kind of aristocracy, which was based partly upon wealth and partly upon the great offices of the republic. In their dress and appearance the patricians were scarcely distinguished from the rest of the citizens, unless they held particular offices; the only thing by which they appear to have been distinguished from other citizens being a particular kind of shoe. From the time of Constantine the title of patrician ceased to be hereditary, and was merely a personal title, which conferred on the person to whom it was granted a very high rank and certain privileges; and when, during this period, we read of patrician families, it merely means that the head of such a family bore the title. If actually engaged in the service of the state, these patricians were called *patricii præsentales*; but if they held no office with the title, they were styled *patricii codicillares* or *honorarii*. All of them, however, were distinguished in their appearance and dress from ordinary persons, and generally appeared in public in carriages. When the popes came to power, they assumed, amongst others of the imperial privileges, this right of making patricians; and the sovereigns of certain European king-





doms also imitated the ancient custom of bestowing upon certain favoured subjects the title of *patricius*. Patricians, in ecclesiastical writings, are an ancient sect of heretics, who disturbed the peace of the Church in the beginning of the 3rd century, who were thus named from their founder Patricius. His distinguishing tenet was, that the substance of the flesh is not the work of God, but that of the devil; on which account his adherents bore an implacable hatred to their own flesh, which sometimes carried them so far as to induce them to kill themselves.

PATRICK, ST., ORDER OF, *păt'-rik*, an order of knighthood, established in Ireland in the year 1783, by King George III., who, on the 5th January of that year, directed that letters-patent should be issued under the great seal of the kingdom of Ireland, for creating a society or brotherhood, to be called "Knights of the illustrious order of St. Patrick," to consist of the sovereign, a grand master, who was to be his majesty's lieutenant-general of Ireland for the time being, and fifteen knights. The number of knights was augmented by William IV. in 1833.

PATRISTIC, *pă-tris'-tik* (Gr. *pater*, a father), in Theol., denotes of or belonging to the fathers of the Church; as patristic theology, patristic literature. (*See* FATHERS, THE.)

PATROL, *păt-role'* (Fr. *patrouille*), a term applied in military language to a detachment of from four to eight men, charged to march, under command of a corporal, in a given circuit round the streets of a garrison town, in order to see that all is quiet, and to prevent disorder. The term patrol is likewise applied to the mounted police, who ride round the suburbs of London and provincial towns at night to watch the roads and preserve the peace.

PATRONAGE, *păt'-ro-naj* (Lat. *patronus*, a patron), in Eccl. Law, is the right of presenting to a benefice. The right of patronage seems to have arisen about the 5th century, when those who built and endowed churches acquired a right to present a minister to them. About the 8th century, patronages became general, and the rights of presentation were bought and sold. Prior to the Reformation, joint-stock companies sometimes bought presentations from papal agents in wholesale quantities, and retailed them at great profits. In England, the greatest part of the benefices are presentative. In Scotland, the subject of patronage has led to frequent disputes, and was the great cause of the disruption in 1843. (*See* FREE CHURCH.)

PATRONYMIC, *păt-ro-nim'-ik* (Gr. *pater*, and *onoma*, a name), is a name which designates a person by referring to his father, or some of his ancestors; as Pelides, applied to Achilles, as being the son of Peleus. Such words do not occur in English, but they are common among the classic poets of antiquity.

PAULIANS, or PAULIANISTS, *pawl'-e-ănz*, a sect of heretics that arose in the 3rd century, and took their name from their founder, Paul of Samosata, bishop of Antioch. He taught that the Son and Holy Ghost exist in God in the same manner as reason and activity exist in man, and that Christ was born a mere man, but that the reason or wisdom of God descended into him. These opinions were condemned by a council, and Paul was deposed; but they were for a time upheld by his adherents.

PAULICIANS, *pawl-ish'-e-ănz*, were a sect of heretics which arose in Armenia, but of whose origin little is known. The most probable account is that they were founded by one Constantine, about the year 660, and took their name from the high value which they set upon the writings of the apostle Paul. They rejected all external forms of religion, and maintained various heresies of doctrine. They spread with great rapidity, and were subjected to violent persecution. Milder measures, afterwards resorted to for their conversion, were not more successful, and when the crusades opened up a path into central Europe, many of this sect found their way into Germany, Spain, Italy, and under various names tended to foster that spirit of opposition to the corruptions of the Church which ultimately led to the Reformation.

PAULLINIA, *pawl-in'-e-ă*, in Bot., a gen. of the nat. ord. *Sapindaceæ*. The species *P. sorbilis* is the source of *guarana*, or Brazilian cocoa. The dried seeds are

deprived of their aril, and pounded and kneaded into a mass, which is afterwards made into oblong or rounded cakes. These cakes constitute guarana-bread, which is used precisely in the same manner as we use cocoa and chocolate. The beverage prepared from it is largely consumed in Brazil, on account of its nutritive qualities, and its stomachic, febrifugal, and aphrodisiac effects. It contains an alkaloid, to which the name *guaranine* has been given, but which appears to be indentical with *caffeine*, the active principle of both tea and coffee.

Paul's, St., *pawle*, the cathedral church of London, stands on Ludgate Hill, on the site on which stood old St. Paul's, supposed to have been built A.D. 603, in the time of Ethelbert, and which had itself been preceded on the same spot by several churches, and, according to some antiquaries, even heathen temples. Old St. Paul's was at several times enlarged and repaired, and especially in 1566, when its spire was destroyed by fire, and in 1633, when it was suffering under the vicissitudes and dilapidations of four centuries, and its restoration was undertaken by the celebrated Inigo Jones, who, however, had only had time to furnish it with a splendid portico, before the troubles of the time interrupted his work. During the war between Charles I. and the Parliament, the venerable edifice was converted into quarters for cavalry, the pillars of the portico were hewed and hacked about, the spaces between them were filled with mean shops, and the timbers which had been erected for the support of the roof during the repairs taken away, which led to its fall in many places, and the almost entire ruin of the whole edifice. In 1663, a famous architect of the day, Christopher Wren, received a commission, under the great seal, to make a survey of the cathedral church of St. Paul, and furnish plans for its restoration. Wren's opinion, from the first, was in favour of rebuilding, and making the church worthy of Inigo Jones's portico; but to this scheme the majority of those who were joined with him in the commission was violently opposed, and he therefore gave in a plan for removing the tower, and expanding the centre of the church into a cupola, uniting the transepts of the church by a concave line. But this proposal was also opposed, as well on the part of the commissioners as on the part of the citizens, who were traditionally proud of the old tower; and even after the building was reduced to a mere wreck in the Great Fire of London (1666), two years were wasted in attempts to repair it. At length, however, Wren was authorized to raze the church to its foundations, and to lay the foundation of "the second temple of the Christian world." The plan which Wren himself preferred was not adopted; and that one of the several he sent in which was, underwent several alterations at the instance of the duke of York, who wished that the church should be adapted to the services of the Roman worship, which he intended to revive. The first stone of the present cathedral was at length laid by Sir Christopher in 1675, and the building was completed in 1710. It is cruciform, classic in style, and universally allowed to be singularly grand; the centre of the cross being covered by a dome, which rises from the body of the church in great majesty. Its height, from the pavement of the churchyard to the top of the cross, is 370 feet; its length, from E. to W., 510; and its width, from the entrance of the north to that of the south transept, 250 feet. The ground it covers is upwards of two acres, and its circuit is 2,292 feet. The whole is built of Portland stone, to which time and London smoke have given a hue which adds something to the cathedral's solemn dignity and grandeur. With respect to the interior, the concave of the dome, and the mysterious effects of the opening above, are allowed by all to be grand; but many critics maintain that, with this exception, the interior is unsatisfactory; that the lateral arches of the nave and choir interfere with the continuity of the entablature; and that, upon entering the building, an unpleasant feeling is produced by the discrepancy, which undoubtedly exists, between the low and confined space of the side aisles and the perpendicular altitude outside. It contains monuments to the memory of many illustrious men, such as Dr. Johnson, Howard the philanthropist, Sir Ralph Abercromby, Lord Rodney, General Moore, &c.; but the style of art of some of them is considered very unworthy of such a place; the monument which meets with the most general approval being, perhaps, the simple marble slab placed over the entrance to the choir, in honour of Wren himself, and bearing an inscription consisting of these words: "Si monumentum requiris, circumspice." In the crypt are the tombs of Nelson and Wellington. The affairs of the cathedral are managed by a dean and chapter, consisting of four canons residentiary, four prebendaries, and other officers.

Pavement, *paive'-ment* (Lat. *pavimentum*, derived from *pavire*, to make the earth firm and strong by beating), in Arch., a stratum or layer of stone, or other matter, serving to cover and strengthen the ground of various places, for greater accommodation in walking, or for the traffic of carriages. The paving of streets is one of the most beneficial regulations that have been handed down to us from our ancestors. A number of cities had paved streets before the commencement of the Christian era; nevertheless, those which are at present the ornament of Europe, with the exception of Rome, were destitute of this advantage till nearly the 12th or 13th century. The streets of Thebes, and probably those of Jerusalem, were paved. The first real paved highway was constructed by Appius Claudius, in the year U.C. 188. It was called after him the *Appian way*, and, on account of its excellence, the *Queen of roads*. Streets paved with lava have been found in Herculaneum and Pompeii. The oldest pavement in modern cities is ascribed to that of Paris; but Cordova was paved as early as the middle of the 9th century. In England, the pavements of the principal streets, &c., are made of various descriptions of materials, according to the kind of stone most readily procured. In London, Aberdeen granite, broken stone, &c., have been used. Wood and asphalte have also been employed to a considerable extent; the use of the former, however, has been nearly abandoned.

Pawn, or Pledge, *pawn* (Lat. *pignus*), in Law, is a bailment of goods by a debtor to his creditor, to be kept till the debt is discharged. Things subject to pledge are ordinarily goods and chattels; but money debts, negotiable instruments, and, indeed, any other valuable thing of a personal nature, may be delivered in pledge. It is of the essence of the contract, that there be an actual delivery of the thing to the pledgee, for his right is not consummated except by possession. In virtue of the pledge, he acquires a special property in the thing, and is entitled to the exclusive possession of it during the time and for the objects for which it is pledged. He has a right to sell the pledge when there has been a default in the pledger in complying with the engagement; but the possession of the pledge does not suspend the right to sue for the whole debt or other engagement without selling the pawn, for it is only a collateral security. A pledgee cannot become the purchaser at a sale.

Pawnbroker, *pawn-bro'-ker*, one who lends money on goods which he receives upon pledge. In some countries, the business of lending money on pledges is carried on by the government, in others by private individuals, placed under certain restrictions. In this country, the laws regarding pawnbrokers are more particularly laid down in the Pawnbrokers Act (30 & 40 Geo. III. c. 99, amended by 9 & 10 Vict. c. 98, 19 & 20 Vict. c. 27, and 22 & 23 Vict. c. 14. Pawnbrokers are required to take out an annual license from the Stamp-office (in London £15, otherwise £7. 10s.); and to enable them to receive articles of gold and silver, a second license, costing £5. 15s., is necessary. No license is required in Ireland; but registration is necessary. Pawnbrokers are required to keep books in which all articles taken in pledge are entered and described, with the sum advanced upon them, and the name and address of the pledger. Where the sum advanced on a pledge does not exceed 2s. 6d., then the charge shall be a halfpenny for each calendar month the same is unredeemed; when not exceeding 5s., 1d.; and so on up to not exceeding 42s., 6d., above which the rate is 3d. for every 20s. up to £10. For the duplicate made out and given to the pledger, if the sum is under 10s., ½d. is charged; 10s. and under 20s., 1d.; £1 and under £5, 2d.; £5 and upwards, 4d. If a duplicate be lost or

stolen, the pawnbroker is bound to give another, on affidavit being made before a magistrate by the person claiming to be owner of the articles respecting the circumstances. The owner has a perfect right to sell the duplicate, and the pawnbroker is obliged to deliver up the goods to the holder of the duplicate on receiving the principal and interest due thereon. Pawnbrokers are prohibited from receiving pledges before 8 a.m. or after 7 p.m., between Michaelmas-day and Lady-day; and before 7 a.m. and after 8 p.m. during the rest of the year, except on Saturdays and the evenings preceding Good Friday, Christmas, &c., when the time is extended to 11 p.m. They are also prohibited from taking pledges from intoxicated persons or children under twelve years of age (in the metropolis under sixteen). All goods unredeemed are considered forfeited at the end of a year; but they may be kept for three months longer at the request of the owner, in writing, or before one witness; and any time before they are sold, the owner may demand his goods on tendering principal and interest. Articles pledged for sums of 10s. and not exceeding £10, if not redeemed, must be sold by auction, after being duly advertised and exposed to public view. An account of the sales of articles above 10s. must also be kept, and if they produce more than the principal and interest, the owner is entitled to the surplus, if claimed within three years of the sale. The sale-books are open to inspection on payment of a fee of one penny. Pawnbrokers are prohibited from taking in pledge unfinished goods, linen or apparel intrusted to others to wash or mend, under a penalty of double the value of the goods, besides restoration. Stolen goods, or goods unlawfully pawned, must be restored to the owner by the pawnbroker, and police officers are authorized to search their houses or warehouses for stolen or unlawfully pledged goods. Any person suspecting his goods to have been unlawfully pawned, may, on satisfying a justice, obtain a warrant for searching the house of the person suspected of having received the goods, and if they be found, and the property of the claimant proved, he is entitled to have them restored. Persons unlawfully pawning goods the property of others are liable to a penalty of between £1 and £5, besides the full value of the goods pledged; failing which, three months' imprisonment with hard labour.—Ref. *English Cyclopædia*—Arts and Sciences.

PAYMENT, *pai'-ment*, in Law, is the discharge of a debt by a delivery of the amount due; and this is of course the most direct and proper discharge of it, and the most complete defence against any claim founded upon it. The party entitled to receive the money may give notice that the payment must be made directly to himself, and then no other payment discharges the debt; but without such notice the payment may be made in the ordinary course of business to his general agent or attorney. By the Common Law Procedure Act, 1852, it is declared lawful for the defendant in all actions (except for assault and battery, false imprisonment, libel, slander, and certain others), and by leave of the court or a judge, upon such terms as they or he may think fit, for one or more of several defendants to pay into court a sum of money by way of compensation or amends. When money is so paid into court, and the plaintiff accepts the same in satisfaction, the plaintiff shall be entitled to the costs of the cause up to the time the money is so paid in and taken out.

PEACE, *peese* (Lat. *pax*), in Law, is a quiet behaviour towards the king and all his subjects; and if any man is in danger from another and makes oath before a justice to that effect, the person complained of may be bound by sureties to keep the peace. A breach of the peace is a violation of that peace and security which is guaranteed by the laws to the subjects of this empire.

PEACH. (*See* AMYGDALUS.)

PEACH-WOOD. (*See* CÆSALPINIA.)

PEACOCK, *pe'-kok* (SAX. *pawa*) (*Pavo*), a member of the *Pavonidæ*, a fam. of rasorial birds, whose characteristics are as follows:—Bill convex, rather stout, curved towards the end, and smooth at the base; cheeks partially naked; nostrils basal and open; head plumed, and surmounted with an aigrette-like crest; sixth quill-feather the longest; tail-feathers eighteen in number; tail-coverts very long, large, and extensible in the male.—(*Linnæus.*) There are two species of the peacock known, both inhabiting the continent and islands of India; and they present a plumage which is one of the most splendid in the whole feathered world. The beauty of the peacock attracted notice even at the earliest times; for it is mentioned as having been brought by Solomon's mariners to their royal master. Next we hear of it as having been discovered by the army of Alexander; and hence it found its way into Greece, Rome, and Europe generally. It had, amongst the Romans, to perform an honourable part in their luxurious entertainments; and it was thought worthy of being dedicated to Juno, and of being imprinted on the coinage of the era. At an early period of English history they were known; and there was scarcely any noble feast at which a roast peacock did not make an imposing appearance. They were stuffed with spices and sweet herbs, roasted and served up whole, and covered, after dressing, with the skin and feathers. In our own times, peacocks are reared in our gardens and lawns more for ornamental than for culinary purposes. In their native countries, magnificent dresses are made of peacocks' feathers and trains; and a sunshade of the gorgeous feathers of this bird is thought the great attribute of nobility in the island of Java. The Javanese peacock (*Pavo muticus*, Linn.) is the most splendid of the two species known, although but little is understood of its history. In the voluminous works of Ulysses Aldrovandus the bird is first mentioned; and he sufficiently indicates it by the form of its crest, which, instead of being composed of a naked shafted feather, with a round and eyed tip, as in the common bird, has these plumes of almost uniform breadth. According to Sir William Jardine, this bird is nearly similar in size to the common peacock, but the whole plumage is of a more subdued brilliancy. The bare space upon the cheeks and below the eyes is of a fine gamboge-yellow. The head, neck, and fore part of the breast are of a peculiar greenish tint, being brilliant with golden reflections in some lights, in others appearing dull and subdued. The lower parts are of a dull deep greenish-brown, instead of the rich blue of the well-known bird. The train is not so ample in proportion, and the eyes, or moons, are less numerous: the centre of each is rich blue, encircled with green, brown, and finally with a bronzed ring. The edges of the wing and quills are pale yellowish-red. The bill is of a greyish-brown colour, the iris deep hazel; and the legs strong, naked, reticulated, and dusky black. The Javanese peacock is a native of Java, Sumatra, and Burmah, as well as other parts of India. The common peacock (*Pavo cristatus*) differs but little from the one last described, except in the increased splendour of its plumage and the altered form of its crest. It has been long naturalized in Europe, and in England it may be now looked upon as nearly a native bird.

PEAR. (*See* PYRUS.)

PEARLASH, *perl'-äsh*, in Chem., the calcined *potashes*, or impure carbonate of potash of commerce.

PEARLS, *purlz* (SAX. *pearl*), substances formed by certain bivalve mollusks allied to the oyster, and consisting of alternate concentric layers of membrane and carbonate of lime. The pearl oyster (*Mytilus margaritiferus*) belongs to the genus *Avicula* of Cuvier, has an equivalve shell, nearly semicircular in form, greenish in appearance without, and ornamented with the most beautiful nacre within. The shell is furnished with a rectilinear hinge, frequently extending into rings by its extremities, and furnished with narrow elongated ligaments, and occasionally with small notches near the mouth of the animal. In the interior side there is a notch for the byssus, a little beneath the angle of the mouth. The pearl oysters live in the warm seas of the East and West Indies, and they are found in large clusters, hanging on to rocks and other substances at the greatest depths. The places which they inhabit are termed "pearl-banks," and the most famous of these are off the west coast of Ceylon, at Tuticoreen on the Coromandel coast, at the Bahrein Islands in the Gulf of Persia, at the Sooloo Islands, off the coast of Algiers, off St. Margareta in the West Indies, and in the Bay of Panama. They have also been found off

the Scotch coast, and indeed in various other places, but not in numbers sufficient to be noted, or to cause the fishery to be prosecuted. It used to be a popular superstition, before science was brought into play to destroy the illusion, that pearls are produced by the oyster swallowing the dew early in the morning, and that this dew was then converted by the marine animal into pearls! According to Dr. Baird, it appears, however, that the ultimate cause of the oyster forming this beautiful substance is to get rid of a source of irritation. "Sometimes," he observes, "this happens from a grain of sand, or some such small foreign body, which has insinuated itself between the mantle of the oyster and the shell, and which, proving a great annoyance, the animal covers with a smooth coat of membrane, over which it spreads a layer of nacre. At other times, it is caused by some enemy of the inhabitant of the shell perforating it from the outside to get within reach of its prey. With a plug of this same matter, the oyster immediately fills up the opening made, and shutting out the intruder, baffles it of its nefarious design. In both these cases we find the pearl usually adhering to the internal surface of the shell. The best, however, and the most valuable specimens, are generally found in the body itself of the animal; and the source of irritation is here proved, according to the observations of Sir Everard Home, who has paid great attention to this subject, to be the ovum or egg of the animal, which, instead of becoming ripe, proves abortive, and is not thrown out by the mother along with the others, but remains behind in the capsule in which the ova are generally contained. This capsule being still supplied with blood-vessels from the parent animal, goes on increasing in size for another year, and then receives a covering of nacre, the same as the animal spreads over the internal surface of the shell." The pearls found in the substance of the animal are generally round, but they are occasionally pear-shaped, in consequence of the pedicle by which the egg is attached being covered by the nacre as well as the egg itself. The pearl-fishery forms a source of considerable commercial speculation, and it may be as well here to describe the process by which the oysters are taken. As the Ceylon pearls are the most esteemed in England, a description of the fishery carried on in the Bay of Condatchy will be given. The banks here extend several miles along the coast, from Manaar southwards, off Arippo, Condatchy, and Pomparipoo, the principal bank being opposite Condatchy, lying some twenty miles out to sea. After the banks have been surveyed, and a report made to government on the subject, they are sold for the season by auction to the highest bidder. The banks themselves are divided into five portions, which are fished annually in succession, in order that the oysters may have time to arrive at maturity, which they do in about six or seven years. The season for fishing commences in February, and ends about the beginning of April, the period allowed to the merchants to fish being six weeks, or two months at the utmost, during which time, however, from bad weather and other causes, the divers rarely have forty days clear work. The men employed as divers are natives of the coast of Tuticorem, where they are known by the names of Marawas or Parawas. They are generally Roman Catholics, although belonging to the Malabar caste, and consequently have many holidays during the season, for saints' days, fasts, festivals, and other observances, which seriously interfere with the work. The boats are brought from the Coromandel and Malabar coasts, as they do not belong to Ceylon, and they also rendezvous at Condatchy Bay before sailing out. On the day before the season commences, a signal-gun is fired from Arippo at ten o'clock at night, and the whole fleet sets sail with the land breese, generally arriving at the banks by daybreak, when they commence fishing, in which occupation they continue until noon, when they return to the bay with the sea-breese, which rises about that time. On their arrival at the shore, the cargoes of the boats are immediately taken out; the boats have to be completely unloaded before night-time, and the oysters are sometimes sold by auction, the buyer taking the risk of pearls being in them or not. Each boat carries twenty men, of which ten are divers, and ten row, and further all other necessary operations; as assisting the divers in, &c. &c. Besides these, there is a chief boatman termed the tindal, who acts as pilot, and is placed in authority. Five divers descend at a time, and when they come back to the surface, the other five that have been waiting go down. This gives them time to rest, and keeps the fishing constantly going on. Each diver is provided with a net attached to his waist, in which he puts the oysters as soon as he has gathered them off the rocks, and he has also a stone attached to a loop, made of rope, in which he inserts his foot; this is to facilitate his descent. A rope from the boat is also attached to the stern, and when the diver wishes to ascend, he takes his foot out of the loop, and the stone is drawn up after him by the boatmen. The divers generally fill their ears with cotton, and they hold their nostrils tightly with one hand while under water. They have another rope attached to them, also, which they shake when they have been under the surface long enough, and they are then drawn up by it into the boat. They generally make from forty to fifty plunges a day, remaining under water from a minute and a half to two minutes at a time, and bring up about one hundred oysters each plunge. The chief danger the divers run is caused by the ground sharks; and they will not go into the water until these are supposed to be charmed away by priests or conjurers, known by the name of Pillai Karras, or "binders of sharks," in the Malabar language; one of which fraternity is attached to each boat. During the time that the fishery is being prosecuted, the priests remain on the shore, praying, distorting their bodies in strange attitudes, and using various forms and ceremonies. Occasionally, the conjurer accompanies the boat to which he is attached, and then the diver fears nothing, and will dare anything so long as he remains with them. The priests are paid by the company, and the divers by a share in the quantity of oysters caught or in money, according as they fancy. When the oysters are taken out of the beds, they are buried in deep holes or pits, being covered first with matting and then with earth, and left to die and decompose, when they open naturally, and the pearls are obtained. It is said that the stink occasioned by the putrefying oysters is so great as to taint the atmosphere for miles round. The pearls found at this fishery are whiter than those found elsewhere, and are, consequently, more valuable in the European markets. After being taken out of the oysters, they are cleaned, and then drilled and strung by the black people, who perform these operations very rapidly. A powder is made out of the pearls themselves, to polish them; and doing this creates an extensive trade in and around Colombo, in Ceylon. Pearls are very valuable. The best are of clear bright whiteness, free from spot or stain, and with their surface naturally smooth and glossy. The largest reach the highest prices; and those of a round form are preferred, although those of the pear-shape are extensively used for ear-rings. *Seed Pearls* are those about the size of small shot. These latter are usually exported to China, which does an extensive trade in them. The most valuable pearl that is recorded, is one purchased by Tavernier, at Catifa, in Arabia, the price being £110,000; its diameter was a little more than half an inch, and its length upwards of two inches. The value of pearls has somewhat deteriorated in the present day, in consequence of the improvement made in their artificial manufacture. The best imitation ones are those of a Frenchman named Jacquin, who formed them by covering the inside of glass beads with a peculiar composition termed *essence d'orient*, made out of the scales of the blake and ray.—Ref. *Eng. Cyclopædia.*

PEARL OYSTER. (*See* OYSTER and PEARL.)

PEAS. (*See* PISUM.)

PEAT, *peat* (from Ger. *pfütze*, a bog), an accumulation of vegetable matter found wherever the soil has been long soaked with water which has no outlet, and does not entirely evaporate with the sun's heat. In colour, peat is generally of a black or dark brown colour, or, when of recent formation, of a yellowish brown. It is soft, and of a viscous consistence, but darkens and turns hard when exposed to the air. When thoroughly dried, it may be set fire to, and burns slowly, giving out a gentle heat with little smoke. The

burning of peat destroys the vegetable matter, and leaves a residue of earth and salts. This residue is very valuable as a manure, especially for clovers and herbaceous plants, of which the leaves and stems are the most valuable parts. The smoke from burning peat has a characteristic odour, which it communicates to objects with which it comes in contact. This flavour is highly esteemed by some, in spirits which have been distilled in vessels heated with this sort of fuel. In all parts of the world peat is found; it is, however, more abundant in the cold, moist climates of temperate latitudes. In the western counties of England, in the western part of the Lowlands of Scotland, in the Highlands, and in Ireland, large portions of the country are covered with peat. Of late years great attention has been paid to the subject as to how far peat can be applied in the arts practically. Two great objects would be thus attained: bog-land would be cleared for agricultural purposes, and usefulness obtained from a substance which is now virtually useless. The question is an important one, but hitherto no valuable result has been arrived at. In Ireland alone there are said to be 3,000,000 acres of bog. According to the reports of Sir Robert Kane, this would yield 4,000,000,000 tons of peat, even when dried. Such a quantity has been valued at £1,000,000,000 for fuel.

Pebbles, *peb'-blz* (Sax. *pabab*, a pebble), a general term applied to water worn minerals, and popularly signifying a roundish stone of any kind, from the size of a nut to that of a man's hand. In a scientific sense, pebbles are distinguished from other silicious minerals by their variety of colours. Among opticians, *pebble* is the name given to the transparent and colourless rock crystal, or quartz, which is used instead of glass in the manufacture of spectacles. It is less likely to be scratched than glass, on account of its extreme hardness.

Peccary, *pek'-kē-re* (*Dicotyles*), an animal belonging to the fam. *Suidæ*, and common in South America. According to the description of Cuvier, the intermediate toes are larger than in *Sus* (*see* Hog), and touching the ground. The grinders and incisors are very similar to those of the hog, so called, but whose canines, directed like those of animals in general, do not project from the mouth. There is no tail, and there is a glandular opening upon the loins, where a fœtid odour is secreted. The metatarsal and metacarpal bones of the two great toes are soldered together into a sort of common bone, like those of the *ruminantia*, with which their stomach, divided into several sacs, gives them also a remarkable relation. The dental formula may be thus expressed:—

$$\text{Incisors, } \frac{4}{6} — \frac{1 — 1}{1 — 1}; \text{ canines, } \frac{}{}; \text{ molars, } \frac{6 — 6}{6 — 6}; \text{ total, 38.}$$

Only two species are known, which were discovered by Azzara; namely, *Dicotyles torquatus*, or collared peccary, and *Dicotyles labiatus*, or white-lipped peccary. The first species inhabits the eastern side of South America, and frequents the forests there, living on vegetables and roots. Its hairs are alternately ringed with black and yellowish-white. They are stiff in the dried skin, having the rigidity of bristles; and along the neck and back they are very long, and form a kind of bristly mane, which is erected on the slightest irritation. Fernandez describes the flesh as very like pork, but harder, and not so sweet; and that the food of the animal consists of acorns, roots, and mountain fruits, as well as worms and earth-worms, besides similar insects. The *white-lipped peccary* is considerably larger than the last-mentioned variety, and is conspicuous for the white margin of its lips. The hair on the body is brownish-black, marked with rings; and the mane and hair about the head are nearly so long as to conceal the ears. The white-lipped peccary is an inhabitant of Paraguay, and is often three feet and a half in length, while its weight frequently exceeds 100 lb. They are gregarious, and traverse whole districts, which they lay waste, led by some old male. When any obstacle intervenes to their passage, they stop, and appear to hold a deliberation; but as soon as one has passed, the whole troop follow, swimming rivers, no matter how broad or swift, and climbing banks and hills with ease. When attacked, they readily turn on their pursuers, and, from their numbers, and the power they have both with their tusks and teeth, often prove dangerous enemies.

Peck, *pek*, a dry measure of two imperial gallons, or 554½ cubic inches; in other words, the fourth part of a bushel.

Pectization, *pek-ti-zai'-shun* (Gr. *pektis*, congealed, thickened), a term applied by Graham to the sudden change from the liquid to the solid form which takes place in certain solutions. The solution of hydrated silicic acid, for instance, may be preserved in a fluid state for days and weeks in a sealed tube, but it is sure at last to assume the *pectous* or gelatinous form.

Pectoral, *pek'-to-rāl* (Lat. *pectoralis*, from *pectus*, the breast), in Med., is of or belonging to the breast; as pectoral medicines, those which relieve diseases of the chest. The pectoral muscles, major and minor, in anatomy, are situated on the anterior part of the chest. The pectoralis major arises from the cartilaginous extremities of the fifth and sixth ribs, from nearly the whole length of the sternum, and from more than a third of the anterior part of the clavicle, and is inserted by a broad tendon into the os humeri, above the insertion of the deltoid muscle. Its use is to move the arm forwards, or to raise it obliquely towards the sternum, and it also assists in respiration, by raising the sternum and ribs. The pectoralis minor is situated immediately under the other, and rises from the upper edges of the third, fourth, and fifth ribs, near where they join with their cartilages, by an equal number of tendinous and fleshy digitations, and is inserted by a flat tendon into the upper part of the coracoid process of the scapula. Its principal use is to draw the scapula forwards and downwards, and it also serves to elevate the ribs.

Pectose, *pek'-tose* (Gr. *pektis*, congealed), a peculiar substance contained in the cellular tissue of certain fruits and roots which gives to their juice the property of gelatinizing. Quite insoluble in water, it gelatinizes into *pectin* on the addition of dilute acid.

Pedagogy, *ped'-a-go-je* (Gr. *pais*, boy; *agogos*, leader), is a word borrowed from the German *pedagogues*, meaning the science of education, and is, in modern times, often applied synonymously with the teaching of youth. With the ancient Greeks it designated a slave to whom the care of a boy, from the earliest age after infancy, was intrusted, until he attained his seventeenth or twentieth year. His duties consisted in attending his charge on all occasions, when going from home to the lecture-rooms of masters, to the theatre, &c.; and also to instruct the child in the inferior branches of education and ordinary manners; consequently he was considered as greatly superior to the common order of slaves. The custom of intrusting children to slaves was also common amongst the Romans, and the slave so employed received the title of *custos* or *magister*.—*Ref.* Brande's *Dictionary*.

Pedal, *ped'-āl* (Lat. *pedalis*, from *pes*, *pedis*, foot), a kind of foot-key employed in various musical instruments, as the organ, harmonium, pianoforte, harp, &c., to modify the tone. Pedals were invented in the 15th century, by a German named Bernhard, but their utility was not acknowledged for some years after; and England, although ranking as the first organ-building country in the world, was the last to adopt them. At the present day, however, no organs or pianofortes are considered perfect without them, while no organist is much esteemed unless skilled in their use.

Pedaliaceæ, *ped-āl-e-ai'-se-e*, in Bot., the Pedalium fam., a nat. ord. of *Dicotyledones*, sub-class *Corollifloræ*. They are glandular herbs, found chiefly in the tropics, with entire exstipulate leaves and axillary flowers, usually large and irregular. There are 14 genera and 25 species, chiefly remarkable for their oily seeds. (*See* Sesamum.)

Pedestal, *ped'-es-tāl* (Lat. *pes*, a foot, and Gr. *stulos*, a column), in Arch., the lower part of a column or pillar. It consists of three principal parts; a square trunk or dye, which makes the body; a cornice, the head; and a base, the foot of the pedestal. The *Tuscan pedestal* is the simplest and lowest of all, and is only three modules high. The *Doric pedestal* is from four to five modules high, as made by the moderns. The *Ionic pedestal* is from five to seven modules high. The *Corinthian pedestal* is the richest

and most delicate of all, and is from four to seven modules high.

PEDICULUS, *pe-dik'-u-lus* (Lat.), is a gen. of insects belonging to the ord. *Aptera*. These insects are generally known by the name of Lice, and form the order of *Parasita* of Latreille, and *Anoplura* of Dr. Leach. Each species of mammal and bird has its own particular species of louse, and sometimes even two or three distinct species. (*See* LOUSE.) The Linnæan genus of *Pediculus* is now subdivided into several genera; as *Pediculus*, *Phthirus*, *Hæmatopinus*, *Nirmus*, *Ricinus*, &c.

PEDIGREE, *ped'-i-gre*, lineage. (*See* GENEALOGY.)

PEDIMENT, *ped'-e-ment* (Lat. *pes*, a foot), in Arch., a kind of low pinnacle, serving to crown porticos or finish a frontispiece. It is also placed as an ornament over gates, doors, windows, niches, altars, &c. The pinnacles or roofs of ancient houses first suggested to architects the idea of the pediment. The parts of the pediment are the tympanum and its cornice. The first is the panel or area of the pediment, inclosed between the cornice which crowns it and the entablature, which serves as a base. The heights of pediments are seldom more than one-fifth of the length of their bases. They are frequently ornamented with sculpture.

PEDOMETER, *pe-dom'-e-ter* (Lat. *pes*, the foot; Gr. *metron*, a measure), an instrument constructed so as to register the number of paces taken by a man in travelling or walking. It is generally in the form of a watch, and receives its movement from the motion of the body; so that the index moves forward one division for every step advanced.

PEERS, *peerz* (Lat. *pares*, equals; Fr. *pair*, a peer).—Peers, in law, mean equals; thus it is the law, that those who are tried for any crime shall be tried by their peers, or equals. Although the word, however, is still used in this sense, it more generally refers to the *peers of the realm*, *i. e.* those noblemen who have a seat in the House of Lords, or who belong to either of the five degrees of English nobility,—duke, marquis, earl, viscount, and baron. Peers were so called because they were formerly regarded as the companions of the king. The right of peerage seems to have been originally territorial, that is, annexed to lands, castles, and the like, the proprietors of which were, in right of those estates, allowed to be peers of the realm, and were summoned to parliament to do suit and service to their sovereign. Whenever such territorial possessions were alienated, the dignity passed with them as appendant. Thus the bishops still sit in the House of Lords in right of succession to certain ancient baronies annexed; and thus, in 11 Henry IV., the possession of the castle of Arundel was adjudged to confer an earldom on its possessor. But when alienations became frequent, the dignity of peerage was confined to the lineage of the party ennobled, and instead of territorial became personal. Peers are now created either by writ or patent; and those who claim by prescription must suppose either a writ or patent made to their ancestors, though by length of time it is lost. The creation by writ is the more ancient way, and is a summons to attend the House of Peers by the style and title of that barony which the king is pleased to confer; but a man is not ennobled thereby unless he actually take his seat in the House of Lords; and therefore the most usual, because the surest way, is to grant the dignity by patent, which insures to a man and his heirs, according to the limitation made in the patent, though he should never himself make use of it. On the other hand, creation by writ has this advantage over creation by patent, that a person created a peer by writ holds the dignity to him and his heirs without the necessity of any words to that effect in the writ; but in a patent there must be words to direct the descent of the inheritance, else the dignity only endures to the grantee for life. In criminal cases, a nobleman or peer must be tried by his equals, and so must a peeress, in accordance with a special act of parliament passed in the reign of Henry II.; but it is doubted whether this privilege extends to bishops, who sit in the House of Lords in right of succession to certain baronies annexed, or supposed to be annexed, to their episcopal lands, and are not ennobled in blood. A peer or peeress cannot be arrested in civil cases; and a peer, sitting in judgment, gives not his verdict upon oath, like an ordinary person, but upon his honour: but when he is examined as a witness, either in a civil or a criminal case, he must be sworn. The honour of peers is, however, so highly regarded by the law, that it is much more penal to spread false reports about them than about other men, an offender in this way being liable to peculiar punishments by several ancient statutes. In their legislative capacity, the peers form an estate of the realm intermediate between the Crown and the Commons; and they also form a supreme court of justice, from whose judgment there is no further appeal. Every peer of the realm, being of full age and sound mind, is entitled to take his seat in the House of Peers, and to share in its deliberations and determinations, and cannot be deprived of his dignity, or any of the privileges connected with it, except on forfeiture of the dignity by being attainted for treason or felony. It should be added, that there are peers who are not peers of the realm, as are the Scotch and Irish peers, and that these have not seats in the House of Lords. There are also members of the House of Lords who are not peers of the realm, being the representative peers of Ireland and Scotland, and the bishops and archbishops of England and Ireland. Peeresses generally become so by marrying peers; but there are some few cases in which, in failure of the male line, the peerage descends in the female, and the heiress becomes a peeress *in her own right*; but, nevertheless, she has not the privilege of sitting in the House of Lords. Peeresses generally have the same privileges as peers, whether they are peeresses by birth, creation, or marriage; but if a peeress, who has only become so by marriage, marry a commoner, she loses her privileges.

PEEWIT. (*See* LAPWING.)

PELAGIANS, *pe-lai'-je-ănz*, were a set of heretics that arose in the Church about the beginning of the 5th century. Their founder was Pelagius, a monk, a native of Britain, whose original name was Morgan. He is said to have been characterized by great earnestness of character and moral strictness of life. He was greatly scandalized by the gross sensualities and immoralities that prevailed in the Church, and was of opinion that they arose from a belief in the efficacy of the sacraments and the sufficiency of faith. The remedy for all, he thought, would be a creed holding man's salvation to be dependent on his own exertions. Pelagius went to Rome and afterwards to Carthage, where he was condemned by a council as holding the following heresies:—(1) That Adam was by nature mortal, and would have died whether he had sinned or not; (2) that the consequences of Adam's sin were confined to himself, and did not affect the human race; (3) that new-born infants are in the same condition as Adam was before his fall; (4) that the law qualified men for heaven, as well as the gospel; and that before Christ some men had lived without sin; (5) that a man may keep the commandments of God without difficulty, and preserve himself in a state of perfect innocence; and that the grace of God is given in proportion to our merits. These are the chief errors which are generally reckoned under the name of Pelagianism, though it is doubtful how far they were held by Pelagius himself, as he always expressed himself very cautiously. Pelagius was arraigned before two ecclesiastical councils at Jerusalem and Diospolis, in 415; but with sophistry and equivocation, he succeeded in baffling his accusers. One of his most powerful opponents was Augustine, and Pope Innocent I., in 417, was induced to anathematize the rising heresy. His successor, Zosimus, also condemned the obnoxious doctrine, and the emperor promulgated decrees of confiscation and banishment against them. Pelagius retired into exile, where he died. His followers never formed a sect properly so called; but Pelagianism, as a theological system, has never been without its advocates. The ninth article of the English church is directed against the Pelagian error respecting original sin.—*Ref.* Wigger's *Versuch einer pragmatischen Darstellung des Augustinianismus und Pelagianismus*, 1833; an English translation of which has appeared by Prof. Emerson,—New York, 1840.

PELARGONIUM, *pe-lar-go'-ne-um* (Gr. *pelargos*, a stork, in allusion to the beak of the fruit, which re-

sembles the bill of that bird), in Bot., an extensive gen. of herbs and shrubs belonging to the nat. ord. *Geraniaceæ*. The species and varieties are very numerous, and are commonly, but improperly, termed geraniums. They are chiefly natives of the Cape of Good Hope, and are favourite objects of culture by the gardener, on account of the beauty of their flowers and foliage. In London's "Encyclopædia of Plants," nearly 200 species, besides many garden varieties, are described as being in cultivation in Great Britain. In their properties they are generally astringent. One species, *P. triste*, has tubers which are eaten at the Cape of Good Hope.

PELICAN, *pel'-e-kăn* (Gr. *pelekan*) (*Pelecanus*), a bird, according to Cuvier, belonging to the fam. *Topipalmatæ*, of the ord. *Palmipedes*, a class of swimming birds or *Natatores*. The characteristics, taken from the description of Temminck, are as follows:—Bill long, straight, wide, and very much depressed; upper mandible flattened, and terminated by a very strong hook, or nail, which is compressed and very much bent; lower mandible formed by two osseous branches, which are depressed, flexible, and united at the point, and from which a naked skin, in the shape of a bag, is suspended. The face and throat are naked; the nostrils basal, in the shape of longitudinal slits; the feet short and strong; three anterior toes, the hind toe articulated anteriorly, but on the same plane with the others, and all united by a membrane, the middle claw being without dentilations. The wings are moderate in size; the first quill-feather shorter than the second, which is the longest in the wing; and the greater wing-coverts and the secondaries are, nearest the body, as long as the quills. The pelicans reside on rivers, lakes, and along the seacoasts; they are also excellent swimmers, and are fond of perching on trees and other eminences. They feed on fish, and by means of their pouch they can store up a good deal of provender in one evening, when they return to their favourite haunts and disgorge their prey from their pouch to consume it at leisure. The female feeds her young on food that has been macerated for some time in her pouch. The common pelican (*Pelecanus onocrotalus*) is about five or six feet in length, and the expanse of the wings is from twelve to thirteen feet. The colour of the plumage is generally white, tinted with rose- or salmon-colour, which is brightest in the breeding season. The primaries and spurious wings are black, and the crest at the back of the head yellow. The pouch is yellow, the irides hazel, and the feet flesh-colour; the tail is short. The name of the pelican is derived from its cry, which is loudest during its flight, and which the ancients used to compare to the braying of an ass. It inhabits Asia, Africa, and South America. In September, about the middle of the month, it repairs to Egypt; and in the summer months it takes up its residence along the borders of the Black Sea and the shores of Greece. With regard to its fishing and eating powers, it is said that a pelican will dispatch as many fish at a single meal as would serve for six men; and in confinement it is known to snatch up rats and other small quadrupeds. It reposes at night, standing up with its head leaning on its breast. The absurd idea which used to be prevalent, that the pelican fed its young with its own blood, was doubtless derived from its habit of feeding them from the fish in its pouch. It also carries water in its pouch for the succour of the young pelicans, which are generally two in number at a time.

PELLITORY. (*See* ANACYCLUS.)

PELTIGERA, or PELTIDEA, *pel-tij'-e-rā*, *pel-tid'-e-ā*, in Bot., a gen. of lichens. *P. canina* and *rufescens* are known in the herb-shops of this country under the name of ground liverwort. This was formerly officinal in the London Pharmacopœia, and regarded as a specific for hydrophobia.

PENÆACEÆ, *pen-e-ai'-se-e*, in Bot., the Penæa or Sarcocolla fam., a nat. ord. of *Dicotyledones*, sub-class *Monochlamydeæ*, consisting of evergreen shrubs, with opposite, exstipulate, imbricated leaves, perfect flowers, and a 4-celled fruit. They are only found at the Cape of Good Hope. Their properties are unimportant. The gum-resin called sarcocolla is generally considered to be a product of plants of this order, but its origin is doubtful.

PENAL LAWS, *pe'-năl* (from Gr. *poine*, pain, punishment), in Law, are those laws which prohibit an act, and impose a penalty for the commission of it. They are of three kinds,—*pœna pecuniaria*, *pœna corporalis*, and *pœna exilii*. Penal statutes are made on various occasions, to punish and deter offenders. They ought to be construed strictly, and not extended by equity; but the words may be interpreted beneficially, according to the intent of the legislature.

PENAL SERVITUDE, in Criminal Law, is a mode of punishment which has been recently introduced in place of transportation. A strong feeling having begun to manifest itself against the reception of convicts in the colonies, the system of convict punishment was revised, with the view of reducing the number of those transported, and the statute 10 & 11 Vict. c. 67, was passed, permitting offenders under sentence of transportation to be removed to any prison or penitentiary in Great Britain, to undergo a system of penal discipline before being sent out of the country. This, however, though it may have improved, did not tend to diminish the number of convicts; and the statute 16 & 17 Vict. c. 99, was passed, abolishing the punishment of transportation for less than fourteen years, and substituting penal servitude at home for much shorter periods, giving the courts power in all cases to substitute penal servitude for transportation. Finally, by 20 & 21 Vict. c. 3, the sentence of transportation was entirely abolished, and penal servitude substituted. What penal servitude is, has never been clearly defined, further than that the convict is a public slave in the hands of the secretary of state for the home department. It may be carried into effect either at home or abroad, and may at any time be converted into transportation. It varies from periods of three years up to for life. The secretary of state is also empowered to grant "tickets of leave," upon such conditions as may be thought fit, remitting a portion of the sentence, to such as may be considered to have been well-behaved, such tickets being revocable at pleasure. The whole system, however, at present, is in a very unsatisfactory state, and the general feeling is strongly in favour of a return to transportation.

PENALTY, *pen'-ăl-te* (from Lat.), in Law, is the punishment due for an offence. Penalties imposed by statute are strictly regulated by statute. This term is also applied to the sum of money which a party to a contract agrees to pay in case he violates his engagement. The legal operation of this, however, is not to create a forfeiture of the entire sum, but only so much of it as may be sufficient to cover the actual damages occasioned by the breach of contract. Where the damages actually sustained are larger than the sum named as penalty, the larger amount may be recovered as damages without regard to the penalty.

PENANCE, *pen'-ăns* (Lat. *pœnitentia*), is an ecclesiastical punishment enjoined by the Church for the spiritual good of an offender. The principle of penance may probably be said to be founded on an instinct of our nature, the inward feeling of sorrow for sin seeking its manifestation in some outward act. The idea of penance is to be found among almost all heathen nations. Penances occupied an important place in the ancient Jewish system, and we read not only of individuals, but of whole cities or peoples fasting and performing other acts of humiliation. From the Jews, penance was introduced into the early Church; and it is important to notice, that at first penance related only to such as had been excluded from the communion of the Church; and hence its immediate object was not the forgiveness of the offender by God, but his reconciliation with the Church. It was viewed merely as a sign of repentance (*pœnitentia*). There came to be various kinds of penance. Public penance was that which accompanied the readmission to communion of persons who had been excluded from it for grievous offences. It was frequently very severe, and had to be accompanied with a public confession of their sins in the church. Afterwards penance came to be applied to sins of a private nature, and was enacted in private. Penitentiary priests were likewise appointed for hearing confessions and prescribing penances. The collection of canons which appointed the time and manner of penances for different sins was called the "Penitential." Of solemn penance,

which seems to have originated about the middle of the 3rd century, there were four degrees:—(1) the weepers, who remained at the door of the church, clad in sackcloth and ashes, and begged the prayers of the faithful as they passed in; (2) the listeners, who were permitted to enter the vestibule, and listen to the reading of the Scriptures; (3) the prostrate, who knelt in the outer part of the church; (4) the consistentes, or co-standers, who were permitted to stand with the faithful during the service, but not to receive the eucharist. About the beginning of the 6th century, penances began to be commuted for pilgrimages, works of charity, masses, and prayers. In the Roman church, penance is one of the seven sacraments instituted for the remission of post-baptismal sins, and consists of three essential parts,—*contrition*, *confession*, and absolution. In the English church, penance, although in many cases it has fallen into disuse, and its most degrading forms are dispensed with in all, yet is still regarded as a subsisting mode of punishment, and in the serious offence of incest continues to be occasionally decreed. Formerly, a person convicted of adultery or incest was adjudged to do penance in the church or market, bare-legged and bare-headed, in a white sheet, and was required to make a public confession of his crime, and to express his contrition in a prescribed form of words. It is usual, and it is an ancient privilege of the ecclesiastical judge, to commute the penance for a sum of money to be paid and applied to pious uses.

PENAWAR. (*See* CIBOTIUM.)

PENCILS. (*See* BLACK-LEAD PENCILS.)

PENDANT, or PENDENT, *pen'-dánt* (Fr., from Lat. *pendeo*, I hang), a term possessing several meanings. In Gothic architecture, those pieces of ornamented stone hanging down from the intersections of a groined roof are so termed: some exquisite specimens of these may be seen in St. George's Chapel, Windsor, and in Henry the Seventh's chapel, Westminster. In nautical language, it signifies a long narrow streamer cut at the end into two points, commonly called the swallow's tail, which hangs from the masthead of a ship. In heraldry, it indicates anything hanging down, as the badge of an order pendent to the chain or ribbon. Those ornaments, usually composed of gold or precious stone, worn suspended from the ears by females, and sometimes by men, are also called pendants.

PENDULUM, *pen'-du-lum* (Lat.), denotes a heavy body so suspended that it may vibrate or swing backwards and forwards about a fixed point by the action of gravity, when it is once raised by any external force, to the right or left of its quiescent position. The claim to the invention of the application of the pendulum as the regulator of a clock has been much disputed; Galileo's son, Avicenna, Huyghens, Dr. Hooke, and a clockmaker named Harris, all appearing as rivals for this honour in the early part of the 17th century. It has been asserted, indeed, that the ancient astronomers of the East employed pendulums in measuring the time of their observations, counting their vibrations during the phases of an eclipse or transit; but however this may be, it seems that Huyghens was the first who mathematically investigated the true nature of the properties of the pendulum, and who explained the peculiarly valuable property of the pendulum called *isochronism*, or the disposition to vibrate different arcs in very nearly the same time, provided the arcs are none of them large. In demonstrating the theory of the motion of the pendulum, mathematicians are obliged to assume that there is no rigidity in the cord, no friction at the axis of suspension, no resistance to motion made by the air, and no variation in the total length of the cord, arising from the variable temperature or moisture of the atmosphere; and if these assumptions were strictly correct, a pendulum, once put in motion, would continue to move *ad infinitum*, without a further accession of external force; but when the pendulum is applied as the regulator of a clock, the assumptions just stated require an equal number of mechanical corrections. The wheelwork of a common clock is merely employed to produce a given number of oscillations in the pendulum; and as the period of those oscillations depends on the length of the pendulous body, it will be obvious that one of the first essentials in the construction of a clock is to make the pendulum of a determinate length. It must be observed, however, that the time does not vary as the length, but only as the square-root of the length; *i.e.*, a pendulum to vibrate two seconds must be four times as long as a seconds pendulum. The length of a pendulum to beat seconds in London is 39·14 inches; but as the length of a pendulum increases with heat, and a brass rod equal in length to a seconds pendulum will expand or contract $\frac{1}{10000}$ part of an inch by a change of temperature of one degree in Fahrenheit's thermometer, and since the times of vibration are in a subduplicate ratio of the lengths of the pendulum, an expansion or contraction of $\frac{1}{10000}$ part of an inch will answer nearly to one second daily; therefore a change of one degree in the thermometer will occasion a difference in the rate of the clock equal to one second daily; hence the daily variation of the rate of the clock from summer to winter will be very considerable; and in order to avoid this, several contrivances have been employed; the first being that of a Mr. Graham, who made the rod of the pendulum of a hollow tube, in which was put a certain quantity of mercury, the amount of compensation being determined by the quantity of mercury employed. Another ingenious contrivance for the same purpose was that of the *gridiron pendulum*, composed of any convenient odd number of rods of different metals, as five, seven, or nine, being so connected that the effect of one set of them counteracts that of the other set: this form of pendulum, however, is liable to several objections, and is now almost obsolete. If the expansion of wooden rods could be depended on, or if it were not modified by absorption of moisture, or something else, which renders their action uncertain, the simplest of all compensation pendulums would be a wooden rod with a lead bob fourteen inches long. But all attempts to make the rod damp-proof have failed. The most recent compensation pendulum is one analogous to the *gridiron* pendulum, and composed of zinc and iron, which would probably have been discovered long ago if the mode of working zinc had been known. In these pendulums, the sum of the iron rods must be to the zinc as 17 to 7. After a pendulum is made as nearly as possible of the proper length, it is necessary to have some means of adjusting it, so as to swing exactly in the proper time; and this is done very simply by a nut at the bottom of the rod, or the principal rod, if there are several; by which, of course, you can raise or lower the bob, with the compensation rods if there are any. If the threads of the nut are $\frac{1}{20}$in. apart, and the rod forty-three inches long, one turn of the nut will just alter the clock a minute a day. But as this mode of occasional regulation is inconvenient, especially for large pendulums, a better plan has been invented, which is now used in all turret clocks, and which is the mode of regulating by small weights placed on a collar, fixed at or near the middle of the pendulum, to accelerate it by any given amount. The safest way of finding what these weights should be, is to put on a weight large enough to produce some considerable error in a day, and try what it is by another good clock, and then subdivide it. The clock should be set to lose a little without any of the small weights, so that there may be always some of them on, and ready to be taken off if the clock gain. The best mode of suspending clock pendulums is by a thin spring; not that the elastic force of the spring is of any use; but it has the advantage of being perfectly free from friction. In common clocks, the cock from which the pendulum hangs is screwed to the back-plate of the clock-frame, and has merely a slit in it, through which the spring hangs by a pin or rivet through its top; but in all the better class of clocks, which have heavy pendulums for their size, the spring is screwed fast between two brass or iron chops, and there is a large pin through them and the spring, with shoulders, so that it will just drop tightly into V's in the two sides of the cock. A spring does not bend only at one point, as a string does; and therefore a pendulum-bob hung by a spring does not move exactly in a circle, but in a cycloidal curve; and it was the celebrated Huyghens, already mentioned, who first explained that pendulums swinging in this curve have greater isochronal properties than those vibrating in arcs of a circle. To explain this geometrical curve, however, would here be out of place. As the action

of gravity is not the same in all latitudes, nor yet at all heights above the earth's surface in the same latitude, the vibrations of the pendulum are slower at the equator than the poles, and increase in quickness with the latitudes north or south, as the centrifugal force decreases, and *vice versâ*.

PENGUIN, *pen'-gwin* (Welsh *pen*, head; *gwyn*, white; or from the Latin *pinguis*, fat, a term applied to it on account of its appearance. According to Cuvier, the penguins (*Aptenodytes*) are even less capable of flying than the auks. Their little wings are covered with mere vestiges of feathers, which, at the first glance, resemble scales; their feet, placed further behind than those of any other bird, only support them by bearing on the tarsus, which is widened like the sole of the foot of a quadruped, and in which are found those bones soldered together at their extremities. They have a small thumb directed inwards, and the three anterior toes are united by a membrane. They are only found in the Antarctic seas, never going on shore except to build their nests, which they can only reach by painfully drawing themselves along on the under surface of their bodies. While in the water they move with great swiftness, and they principally feed on fish. The female lays from two to three eggs at a time, which are generally all hatched. The largest of the species is the great Patagonian penguin (*Aptenodytes Forsteri*), which is about two feet long, and weighs upwards of seventy pounds. On the places where they breed, they are seen in countless numbers lining the shore, and at a distance, from their erect attitudes, they might be mistaken for an army ready to meet invasion. They are simple, inoffensive birds, and may be knocked down easily, never stirring on the approach of the destroyer.

PENICILLARIA, *pen-i-sil-laï'-re-ă* (Lat. *penicillum*, a hair-pencil, in allusion to the spikes), in Bot., a gen. of grasses. *P. spicata* is commonly called Caffre corn. It yields a serviceable grain, African millet.

PENICILLIUM, *pen-i-sil'-le-um*, in Bot., a gen. of *Fungi*. Certain moulds found on bread, preserves, &c., are produced by species of this genus. The so-called vinegar-plant, which, by its growth in saccharine liquids at moderate temperatures, converts them into vinegar, appears to be a mycelial state of *Penicillium glaucum*; and the yeast-plant, which, by its vegetation at a high temperature, causes fermentation in bread, beer, &c., would seem likewise to be a mycelial state of a species of this genus.

PEN-MAKING, *pen* (Lat. *penna*, SAX. *pinn*), now forms a very important branch of our manufactures. Pens are made from the best steel procured at Sheffield, as peculiar elasticity is required in them, which would not be obtained if an inferior article were used. The steel is cut into slips, some three feet long by four inches broad, and these strips are then plunged into a pickle composed of diluted sulphuric acid, so as to remove the scales from the surface. Next it is passed between heavy rollers, by which it is reduced to the necessary thickness required, and now it is fit to undergo the first process in pen-making. This is performed by a girl, who, seated at a stamping-press, provided with a bed and corresponding punch, speedily cuts out the blank, which is perfectly flat. The next step is to pierce the hole which terminates the slit, and to remove any superfluous steel which might interfere with the elasticity of the pen. The embryo pens are then annealed in a muffle, and by a small stamp the maker's name is impressed upon them. The pens are next transferred to another class of workmen, who, by means of a press, either make the pens concave, if they are merely to be nibs, or if they are to be barrel pens, they roll the barrel together. The next process is termed hardening, and consists in placing a number of pens in a small iron box, which is introduced into a muffle. After they become of a deep red heat, they are plunged into a tank of oil, and when they get cool, the oil which adheres to the surface is removed by their being agitated in circular tin barrels. Tempering is the next step, by heating to the necessary elasticity in a warm bath of oil; and finally the whole number of pens are placed in a revolving cylinder along with sand, ground crucible, and other cutting substances, which tend to brighten them up to the original colour of the steel. Next, the nib is ground down finely, with great rapidity, by a girl, who picks it up with a pair of pliers, and with a single touch to an emery revolving wheel, perfects it at once. The slit is now made by means of a press; a chisel or wedge, with a flat side, is affixed to the bed of the press, and the descending screw has a corresponding chisel-cutter, which passes down with the greatest accuracy on the pen, which had been placed on the chisel affixed to the bed, and the slit is made, and the manufacture of the pen complete. The last process to be gone through is colouring the pens brown or blue; and this is done by placing them in a revolving metal cylinder, under which is a charcoal stove; and by watching narrowly the different gradations of colour, the requisite tint is speedily attained if they are placed in the hands of a skilled workman. The brilliant polish usually observed on steel pens is imparted next, by means of their being immersed in lac dissolved in naphtha, and being afterwards dried by heat. They are then counted, selected, and placed in boxes ready for sale. The description which has been given here applies more strictly to the manufactory of Mr. Joseph Gillott, in Birmingham, but the processes at other manufactories are nearly identical. Women are mostly employed, the skilled workmen being only required to set the tools. As steel pens corrode under the action of ink, many inventions have been tried to remedy the evil, but as yet with but little success. It has been thought that by coating them with gold or silver by the electrotype process, the corrosive action might be obviated; but as the slight film of metal coating soon wears off, the protection afforded by it to the steel is but slight. Gold pens are made much in the same manner as steel, with this difference, that elasticity is imparted to them by means of hammering, and by rubbing them with a small hard stone and water instead of in the manner described above. The best gold pens are usually tipped with an alloy composed of osmium and iridium. The steel-pen manufacture forms an important branch in the Birmingham trade; and it is wonderful to note how the value of steel pens has gradually decreased since the manufacture has become so enlarged. At first they sold for sixpence each; next they descended to sixpence per dozen; and they can now be had for fourpence a gross, and of far higher excellence!—*Ref.* Ure's *Dictionary*.

PENNISETUM, *pen-ni-se'-tum*, (Lat. *penna*, feather; *seta*, bristle), in Bot., a gen. of grasses. The grains of the species *P. dichotomum* are known in some parts of western Africa as *Rasheia*. They are used there as food. In Egypt and Arabia, this grass is employed for thatching, and as fodder for camels.

PENNY, *pen'-ne* (SAX. *peniq*), the most ancient of all British coin. It was introduced by the Saxons, amongst whom it was the only current coin, and was at first composed of silver, and minted with a cross so deeply as to enable it to be broken into halves and quarters; hence the terms halfpenny and fourth-thing, or farthing. The more modern penny consisted until very lately of a circular piece of copper, equal in value to $\frac{1}{24}$th of a shilling or $\frac{1}{240}$th part of a pound sterling. In 1860, however, the old copper coinage was called in, and a new one minted in bronze issued. This coinage, although of precisely the same value as the old money, is much lighter and prettier. The penny is the radical denomination from which our coin is numbered, the halfpenny and farthing being considered as fractions of a penny.

PENNYROYAL. (*See* MENTHA.)

PENNYWEIGHT, *pen'-ne-wait*, a troy weight, consisting of twenty-four grains, each of which is about equal in weight to a grain of wheat from the middle of a well-dried ear: it derives its name from the old silver penny, which weighed the same amount. Twenty pennyweights are equal to one ounce troy.

PENSION, *pen'-shе-un* (Fr.), literally, an allowance made to any person without receiving an equivalent. According to Dr. Johnson, this term is generally understood, in this country, to mean pay given to a state hireling for treason to his country; a definition which seems to have sorely puzzled the great lexicographer himself when a pension was bestowed upon him in 1762. Although there may be some truth in this definition, there are, undoubtedly, many cases in which pensions have been granted upon liberal and honourable terms.

A pension may, therefore, more justly be defined as an allowance made in consideration of some meritorious action, or for past services; as, for instance, a sum of money allowed annually by any individual to a servant who has grown old or been disabled in his service.

PENTADESMA, *pen'-tă-des'-mă*, in Bot., a gen. of the nat. ord. *Guttiferæ*. The fruit of *P. butyraceæ*, when cut, yields a fatty matter; hence the plant is called the butter- or tallow-tree of Sierra Leone.

PENTAGON, *pen'-tă-gon* (Gr. *pente*, five; *gonia*, an angle), in Geom., a plane figure having five angles, or contained in five sides. It is a *regular* pentagon when the sides and angles are equal, and is consequently inscribable in a circle.

PENTAGRAPH. (*See* PANTAGRAPH.)

PENTAMETER, *pen-tăm'-e-ter* (*Lat.*), a common species of Greek or Latin verse, so called from its containing the number of five complete metres; but it has properly six feet, of which the third and sixth are incomplete. The measure is the following:—

— ⏑ ⏑ | — ⏑ ⏑ | — | — ⏑ ⏑ | — ⏑ ⏑ | —

In the first half, dactyls and spondees are commonly intermixed; but in the second half the two first feet must be pure dactyls. This verse is used only as an appendage to the hexameter, and together they constitute the elegiac verse. Originally it was only employed on mournful or amatory subjects, but in the course of time was turned to lighter topics.

PENTATEUCH, *pen'-tă-tuke* (Gr. *pente*, five, and *teuchos*, a book), is a term applied to the five books of Moses, being the first five of the Old Testament; viz., Genesis, Exodus, Leviticus, Numbers, and Deuteronomy. (*See* these several articles.)

PENTECOST, *pen'-te-kost* (Gr. *pentekoste*, the fiftieth), is the name given to one of the three principal festivals of the Jews, on account of its being celebrated on the fiftieth day after the feast of the Passover; but originally called the "Feast of Weeks," or the "Feast of Seven Weeks." It was observed in commemoration of the law given on Mount Sinai, and was also a thanksgiving for the harvest. At this feast they presented at the temple seven lambs of that year, one calf, and two rams, for a burnt-offering, two lambs for a peace-offering, and a goat for a sin-offering. By Christians this day is observed as a festival in commemoration of the descent of the Holy Ghost upon the apostles, after our Lord's ascension, as recorded in Acts ii.

PENUMBRA, *pe-num'-brâ* (Lat. *pene*, almost; *umbra*, a shade), in Astron., the partial shade or obscurity observed on the margin of the perfect shade in an eclipse. Round each of the larger black spots on the sun's surface there is almost always seen an extensive zone of a less dark tint, the contours of which are well-defined, like those of the dark spot. This zone is also called penumbra.

PEPPER. (*See* PIPER, CUBEBA, CHAVICA.)

PEPSIN, *pep'-sin* (Gr. *pepto*, I digest), a peculiar albuminoid body existing in the gastric juice, to which, in conjunction with the free acid, the solvent powers of that fluid seem owing. It has been lately extracted in large quantities from the gastric juice of the pig and ox, and used in medicine as a digestive. There appears, however, to be some doubt as to its efficacy.

PERAMBULATOR, *per-ăm'-bu-lai-tor* (Lat. *per*, and *ambulo*, I walk), originally a machine for measuring distances on roads. (*See* ODOMETER.) The term is at present chiefly applied to small hand-carriages for drawing about children.

PERCEPTION, *per-sep'-shun* (Lat. *perceptio*, from *per*, and *capio*, I take), in Phil., is that power or faculty of the mind by which we are conscious of external objects. As commonly used, it is not without ambiguity, denoting either—(1) the perceiving faculty, (2) the perceiving act, or (3) the object perceived. The last is the most important, and in order to get rid of ambiguity, it is proposed to employ *percept* in this sense, leaving perception to signify both the faculty and the act, which it is rarely necessary to distinguish. Perception, according to Sir W. Hamilton, "is that act of consciousness whereby we apprehend in our body—(*a*) certain special affections whereof, as an animated organism, it is contingently susceptible; and (*b*) those general relations of extension, under which, as a material organism, it necessarily exists. Of these perceptions, the former, which is thus conversant about a subject-object, is sensation proper; the latter, which is thus conversant about an object-object, is perception proper." In perception proper, there is a higher energy of intelligence than in sensation proper. Every perception proper has a sensation proper as its condition; but every sensation has not a perception proper as its conditionate, unless, indeed, we view the general consciousness of the locality of a sensorial affection as a perception proper. Various theories have been advanced to explain the way in which perceptions are conveyed to the mind. According to some, the nervous fibres are tubular, and filled with a subtile vapour, which conveys impressions to the brain; according to others, the nerves operate by vibrations, like musical chords; while a third class hold that impressions are conveyed by vibrations of the infinitesimally small medullary particles. As to the vexed question among philosophers, as to whether perception be immediate or intuitive, or mediate or representative, we must refer to Hamilton's "Metaphysical Lectures," vol. ii., where the question is fully and ably discussed.—*Ref.* Hamilton's *Reid's Works*, note D*.

PERCH, *perch* (Fr. *perche*, Lat. *perca*), an acanthopterygious fish, belonging to the fam. *Percidæ*. Its characteristics are: two dorsal fins, distinct and separated; the rays of the first spinous, those of the second flexible; tongue smooth; teeth in both jaws in front of the vomer, and on the palatine bones; operculum bony, ending in a flattened point directed backwards; branchiostegous rays seven in number; and the scales rough, hard, and firmly attached. The perch is one of the most common and beautiful of our fresh-water fish. The upper part of the body is of a greenish-brown, subsiding into golden yellow below; the sides ornamented with dark transverse bands; the irides golden; the dorsal and pectoral fins pale brown, and the anal and caudal fins bright vermilion. The perch was known to the Greeks, as Aristotle has described its habits. In England, it is found in nearly every river and lake, and it is common enough in the temperate parts of Europe. It varies in weight from half a pound up to three pounds, although several have been taken over the latter weight.—*Ref.* Yarrell's *British Fishes*.



PERCH.

PERCHLORIC ACID, *per-klo'-rik*, in Chem., $ClO_4$.—This acid is formed by heating chlorate of potash in a tube until one-third of the oxygen contained in it is expelled. The mass assumes a pasty condition at this stage, and contains perchlorate of potash, which may be separated by taking advantage of its sparing solubility, by distilling the perchlorate with twice its weight of sulphuric acid, diluted with one-tenth of water. If the receiver is kept cold within, the first portions of the acid crystallize. It is a very stable acid, forming crystallizable deliquescent salts with the bases. The perchlorates are all decomposable by heat, with the evolution of oxygen, a chloride remaining behind.

PERCUSSION, *per-kus'-she-un* (from Lat. *percutio*, I strike), in Med., is the striking a part of the body in order to determine by the sound the condition of the subjacent organs. This mode of discovering disease was invented by one Avenbrugger, a German, in the middle of the last century, and was subsequently brought into notice by Corvisart. Every one knows that different kinds of substances, when struck, give out very different sounds. A wooden cask containing air only is resonant when struck; fill it half full of water, and the lower part will render a flat sound, and the upper empty portion a hollow sound, less hollow, however, than when the vessel contained no water; fill it with water, and the whole is dull on percussion. It is the same with the human chest: if the blow fall over a portion of the healthy lung, you will produce

a resonant or hollow sound; if the lung has lost its spongy character, or its place is supplied by some more solid or inelastic substance,—by fluid for example, you will hear a dead sound. Some nicety is necessary in the manner of striking the chest, so as to properly elicit the sounds, and various contrivances have been recommended for that purpose; but we believe that none of them are preferable to the fingers when properly used. One or two fingers of the left hand are to be laid flat on the part to be examined, and to be struck lightly, but rather smartly, with the ends of the three first fingers of the right hand, set close together on the same level. It is of consequence to compare the sounds given out by one side of the chest with those given out by the same part on the other; and care should be taken that the blows are always given with the same amount of force, and that they fall perpendicularly on the surface of the organ. The region over the heart emits a duller sound than other parts of the chest. The blows should come from the wrist. Percussion is also of use in determining the state of certain organs of the abdomen.

PERCUSSION, *per-kush'-yun* (Lat. *percussio*, a blow), a term employed in Mech. to signify the striking of one body against another, or the shock ensuing from the collision of two bodies. When an oscillating body vibrates with a given angular velocity, and strikes an obstacle, the effect of the impact will be the greatest if it be made at the centre of percussion (*see* CENTRE OF PERCUSSION); for it is evident, that in such a case the obstacle receives the whole revolving motion of the body, whereas, if the blow be struck in any other point, a part of the motion will be employed in endeavouring to continue the rotation. If a body revolving on an axis strike an immovable obstacle at the centre of percussion, the point of suspension will not be affected by the stroke.

PERESKIA, *pe-res'-ke-ă*, in Bot., a gen. of plants of the nat. ord. *Cactaceæ*, consisting of shrubs and trees. It was so called by Plumier, in honour of Nicholas Fabricius Peiresk, a senator of Aix, in Provence, who was highly celebrated for his botanical knowledge.

PERFECT TENSE. (*See* TENSE.)

PERFECTIBILITY, *per-fek'-te-bil'-e-te*, is the capability of arriving at perfection, and is more particularly applied to the perfectibility of the human race. Some social reformers have entertained very high ideas of the perfectibility of mankind; but the few of them that have attempted to carry their views into practice have miserably failed. That the human race is in a state of progress there can be no doubt; that in future ages they will be vastly improved, physically, socially, and intellectually, we verily believe; but that all the imperfections of their nature, all the evils that affect mind or body, will be entirely removed, is more than doubtful. Human nature has its limits, which it cannot overpass. Life cannot be indefinitely prolonged, pain cannot be banished from the world, reason cannot shun all error, nor can intellect grasp all knowledge; all arrangements for happiness are liable to go wrong. But, on the other hand, as Pascal says, "Not only individual men advance from day to day in knowledge, but men, as a race, make continual progress, in proportion as the world grows older; because the same thing happens in a succession of men as in the different periods of the life of an individual; so that the succession of men during the course of so many ages ought to be considered as the same man always living and always learning."—*Ref.* Mercier, *De la Perfectibilité Humaine*, Paris, 1842.

PERFUME, *per'-fume* (Fr. *parfum*).—The word perfume has two meanings, denoting either the volatile effluvia from any body affecting the organ of smell, or an artificial substance from which the effluvium is emitted. The art of making perfumes is very ancient, being mentioned in the Pentateuch, where the composition of two kinds of perfumes is given, which were to be used in the Temple; whilst perfumes composed of musk, ambergris, and civet, were common amongst the ancient Greeks and Romans, who used them in their religious ceremonies, at their feasts, at funerals, and in their theatres. The art of perfumery, as at present practised, consists in the extraction of the odours of plants, and combining them with inodorous materials, such as grease, spirit, starch, and soaps. The methods of obtaining the odours of plants are three:—1st. By distillation, which, however, can only be beneficially applied by the perfumer to the procuring of certain odours; from woods, such as sandal and cedar; from leaves, such as patchouli and bay-leaves; from various grasses and leaves; and from but two or three flowers, such as orange-blossom, rose, and lavender. 2nd. By enfleurage, a process founded on the fact that greasy bodies readily absorb odorous particles, and will as readily part with them, if in contact with pure alcohol. The enfleurage process is conducted thus:—Square frames, varying in size from 20 to 30 inches, are made, in the centre of which is fixed a piece of stout glass. Each frame is 1½ inch deep from the top edge to the glass; so that, if two frames be placed together, face to face, there is, as it were, a glass box with a wooden frame, having a depth of three inches between each glass. About half a pound of purified grease is then spread upon each side of the glass with a spatule or palate-knife, and the blossoms whose odour it is desired to obtain are sprinkled broadcast over the grease in one frame, and another frame is put over it, so as to inclose the flowers. About every other day, or every third day, the spent flowers are replaced by fresh ones; and this process is repeated as long as the particular plant under treatment continues to bear blossoms, a period usually of between one and two months. When the grease has become saturated with the fragrance of the flowers, it is called pomade. It is scraped off the glass, and being put into vessels, is placed in a warm-water bath, just warm enough to liquefy it, so that it may be poured through fine linen, and cleared of such things as the anthers of flowers, a butterfly, or a moth. 3rd. Maceration, a process which consists in infusing fresh flowers in liquefied grease, then straining them away, and supplying their place with fresh ones; and so on, as in the case of enfleurage. In some cases, especially in the case of violet pomade, it is found advantageous to begin perfuming the grease by maceration, and to finish it by enfleurage. Oils are scented by enfleurage and maceration processes by a slight difference of mechanical arrangement. According to the length of time the enfleurage or maceration occupies, and the amount of blossoms employed in scenting the same grease, the pomade or oil bears numbers respectively; as No. 12 pomade, No. 18 oil, and so on. Scented spirits are produced by four separate plans:—1st. By distilling alcohol with an essential oil, such as the essential oil of lavender, to produce spirit of lavender; 2nd, by simply dissolving the essential oil in the spirit; 3rd, by tincturation,—that is, by putting the fragrant material into the spirit, and allowing it to remain there till the alcohol has extracted all the scent; 4th, by extracting the fragrance of the enfleurage-made pomades and oils, by contact of fine oil and grease with alcohol, the pomade being chopped up very fine and put into the spirit, the two being left together for a month at a summer heat. The result is called an enfleurage essence. Some of the best-known substances used as perfumes are,—frankincense, sometimes called *olibanum*, the incense used in Roman Catholic churches, and is the gum-resin that distils from a tree—the *Juniperus Lycia*—in pale yellow drops, like mastic (when laid upon coals or hot iron, it gives out a sweet-smelling odour); myrrh, a gum-resin that exudes from a small scrubby tree that grows in Arabia Felix, the *Balsamodendra myrrha*; benzoin, a resin extracted from a tree which grows in Siam and the Indian islands; storax, a gum-resin which exudes from a tree called *Styrax officinale*, that grows in countries bordering on the Mediterranean, and in America and India; the Tonquin bean, which is used to perfume snuff; orris, or iris-root, which comes chiefly from Florence: to which might be added the leaves of many shrubs, and the blossoms of all sweet-scented flowers. There are several animal perfumes in use, of which those most generally employed are musk and ambergris. Musk is a concrete substance, found in an animal having a near affinity to the deer tribe, and a native of Thibet, China, and Siberia, the best musk being brought from China. Musk is of a bitter taste, and of an odour more powerful than anything known, and has the property, when employed in very small quantities, of augmenting the scent of other substances

without imparting its own. Ambergris is much used in the composition of perfumes, and is a good deal like amber, but is opaque, fatty, and inflammable, remarkably light, melts readily with heat, and is scarcely soluble in spirits of wine. It is found floating on the sea, or on the seacoast, and is supposed to be a morbid concretion in the spermaceti whale.

**Pericardium**, *per-i-kar'-de-um* (Gr. *peri*, about, and *kardia*, the heart), in Anat., is the membrane that incloses the heart (which *see*).

**Perigee**, *per'-i-jee* (Gr. *peri*, about; *ge*, the earth).—The sun does not describe the great circle in the plane of the ecliptic with a uniform motion. In some parts this motion amounts to rather more than a degree in twenty-four sidereal hours; in other parts it is less. The point in which the proper motion of the sun is greatest is called the *perigee*; the point in which the proper motion is least, is called the *apogee*; it is diametrically opposite to the former.

**Perihelion**, *pe-ri-he'-le-on* (Gr. *peri*, about; *helios*, the sun).—In Astron., the extremity of the major axis of a planet's orbit which is nearest the sun is called the *perihelion*; the opposite extremity bears the name of the *aphelion*.

**Perimeter**, *pe-rim'-e-ter* (Gr. *peri*, about; *metron*, measure), in Geom., is the extent which bounds a figure or body, whether rectilinear or otherwise. In circular figures the term *circumference* is used instead of *perimeter*.

**Period**, *pe'-re-od* (Gr. *periodos*, a circuit), in general language, a division of time, or the events occurring in it. In writing, a *period*, or *sentence*, is a series of passages logically connected. Periods should not be too long; but it is difficult to fix any distinct limit. In some languages, the rules for constructing periods are stricter than in others; in some, great liberty is allowed. The English language belongs to the former; and the Greek, Latin, and German to the latter. In the construction of a period, the chief idea should be made prominent, while secondary ideas should be expressed according to their importance. The subordinate parts should not be too much accumulated, and the ideas should be expressed in a certain gradation, from the weaker to the stronger, from the less distinct to the more distinct, except when the opposite effect is expressly intended. The musical and rhythmical arrangement of a period is also of great importance.

**Periosteum**, *per-e-os'-te-um* (Gr. *peri*, and *osteon*, a bone), in Anat., is the membrane that covers the bone. (*See* Bone, Anatomy.)

**Peripatetic Philosophy**, *per-e-pă-tet'-ik* (Gr. *peripatetikos*), is a term applied to the philosophy of Aristotle, either because it was his custom to teach while walking, or because the place where he taught was a walk planted with trees. (*See* Aristotelian Philosophy.)

**Periphrasis**, *pe-rif'-ră-sis* (Gr. *peri*, about, and *phraso*, I speak), a circuitous form of words much affected by orators, to avoid common and trite modes of expression, and also to make things be conceived which are not proper to name; as when it is polite, for instance, to suppress names, or only proper to intimate or design them. These terms of expression are also peculiarly serviceable in oratory; for the sublime admitting of no direct citations, there must be a compass taken to insinuate the author whose authority is borrowed. A periphrasis, by turning round a proper name to make it understood, amplifies and raises the discourse; but care must be taken that it be not too much swelled, nor extended *mal à propos*; in which case it becomes flat and languid.

**Peristaltic**, *pe-ri-stăl'-tik* (Gr. *peristello*, I contract), in Med., is a term applied to that peculiar vermicular motion of the intestines by means of which their contents are carried onwards. It is a series of contractings and relaxings, the different parts of the bowels rising and falling alternately, so as to resemble the motions of a worm or snake.

**Peritoneum**, *pe-ri-to-ne'-um* (Gr. *periteino*, I stretch round), in Anat., is the thin serous membrane lining the abdominal cavity, and enveloping the contained organs, so as to keep them in their proper places. Like the other serous membranes, it is an inclosed sac, covering, but not containing, the organs in its cavity, with its internal surface smooth and shining, and moistened by a serous fluid for aiding the natural movements of the organs upon each other. The folds which surround the small intestines constitute the mesentery; that which hangs down from the stomach, and is then reflected upwards and backwards to the colon, is the omentum. The peritoneum is liable to inflammation, exceedingly painful and dangerous, from its extent and connection with important organs. Peritonitis may exist either as an acute or chronic disease. In the former, there is usually great pain and tenderness of the abdomen, accompanied with fever, and a frequent, small, and hard pulse. Sometimes, at first, the pain is confined to one spot; but it generally soon extends over the whole of the abdomen. It is very severe, and much increased by any motion, even coughing, sneezing, or drawing a long breath. Even the weight of the bedclothes is sometimes unbearable. It is acute and cutting, and sometimes occurs in paroxysms; and the patient usually lies on his back with his knees drawn up. The bowels are usually constipated, but sometimes the reverse; and commonly there are present nausea, vomiting, and hiccup. Its causes are various, as by cold, mechanical injuries of the peritoneum, the development of tumours, &c. Women in childbed are peculiarly liable to it. After the disease has continued for a certain time, . . attended with tension and swelling of the belly; and if not checked, it usually terminates in from five to ten days. The appropriate treatment, when the state of the patient admits of it, is copious general bleedings, followed by the application of leeches to the abdomen, together with warm fomentations; frequently the latter is all that the state of the patient admits of. As internal remedies, most reliance is usually placed upon mercury and opium. After a time, peritonitis sometimes assumes a chronic form. Here the symptoms are less marked. The pain is slight, or only discoverable on pressure, and the fever low; but the skin is hot and dry, the tongue foul, and appetite impaired. The treatment is local bleedings, with blisters and other counter-irritants applied over the abdomen. A nourishing, but unstimulating diet, and attention to the state of the bowels, are likewise necessary; and some recommend iodine, either taken internally or applied as ointment to the part.

**Periwinkle**, *per-e-win'-kl* (Sax. *pernince*), a marine animal, belonging to the *Littorinidæ*, a fam. of *gasteropodous* mollusks living in the sea or in brackish water. The shell of the periwinkle is not smooth, but is solid, and its whorls are more or less flattened instead of being rounded. Great quantities of this mollusk are sold in London and about the coasts every year.

**Perjury**, *per'-ju-re* (Lat. *per*, and *juro*, I swear), in Law, is the offence of swearing falsely to facts in a judicial proceeding. It is defined to be a crime committed when a lawful oath is administered in some judicial proceeding to a person who swears wilfully, absolutely, and falsely, in a matter material to the issue or point in question. To constitute perjury, in the strictly legal sense, it is necessary that the party be lawfully sworn to speak the truth by some court or magistrate having power to administer an oath. The perjury must also be corrupt (that is, committed *malo animo*), wilful, positive, and absolute, not upon surprise, or the like; it must also be in some point material to the question in dispute. The view taken of perjury by the law of England is not as being the violation of an oath, but as an attempt to defeat the administration of justice. Subornation of perjury is the offence of procuring another to commit perjury, and is equally punishable at law. Anciently, the punishment of either at common law was death; afterwards, banishment or cutting out the tongue; then forfeiture of goods; and now it is fine and imprisonment. Act 2 Geo. II. c. 25, further gives the court a power to order the offender to be sent to the house of correction for a term not exceeding seven years, or to be transported for the same period, for which penal servitude is now substituted. Where a solemn declaration takes the place of an oath, it is equally perjury to declare falsely, and is subject to the like punishment.

**Permanganic Acid**, *per-măn-gan'-ik*, in Chem. ($Mn_2O_7$).—If a solution of manganate of potash be largely diluted with water, it gradually changes from green to violet, from the manganic acid passing to a higher stage of oxidation, and permanganate of potash

is formed. It is, however, best prepared by mixing 4 parts of black oxide of manganese with 3½ parts of chlorate of potash; to this mixture are added 5 parts of hydrate of potash dissolved in a small quantity of water, and the whole is heated to dull redness for an hour. When cold, the permanganate of potash may be separated by treating the excess with a large quantity of water and crystallizing. It crystallizes in fine dark purple prisms, soluble in 16 parts of water, and forming a magnificent crimson solution. Permanganate of potash has lately received a most important application in the hands of Mr. Condy, of Battersea, as a deodorizing and disinfecting agent. From the experiments of this gentleman, it seems to contain oxygen in the ozonic form, which is immediately liberated on the approach of organic matter in the process of decomposition.

PERMUTATIONS, *per-mu-tā'-shunz* (from Lat. *per*, and *muto*, I change), in *Alg.*, the different orders which can be formed out of any number of things, with regard to position, when all are taken at once. It is based upon the following formula:—Since the number of variations of $m$ things taken $r$ together—

$$m\,(m-1)\,(m-2)\ \&c.\quad (m-r+1);$$

and as in permutation, when the things are taken all together, $m=r$ ∴ the permutations of $m$ things will equal the numbers multiplied into one another; or,—

$$P=m\,(m-1)\,(m-2)\,\ldots\ldots\,3.\,2.\,1.$$

For instance, if we want to find the different number of changes which may be rung upon seven bells, taken all together, we multiply the order of bells into one another, and the changes will be equal to—

$$1\times2\times3\times4\times5\times6\times7=5{,}040.$$

PERORATION, *per-o-rā'-shun* (Lat. *per*, and *os*, the mouth), in Oratory, is the concluding part of a discourse. Much depends upon the peroration, and it necessarily varies much according to the nature of the preceding discourse. The great rule is to place last that on which we rest the strength of our cause. Sometimes the whole of the pathetic part comes in most properly at the peroration; sometimes, when the discourse has been argumentative, it is fit to conclude with summing up the arguments, placing them in one view, so as to leave the full impression of them on the minds of the audience. It is of importance in the peroration that we neither end abruptly or unexpectedly, or continue hovering round the conclusion so as to weary or exhaust our hearers, but in such a way as to impress them favourably with the subject and with the speaker. "The peroration," says Aristotle, "is composed of four things: first, of those things that prepare the hearer to have a good opinion of us, and an ill opinion of our adversary; of that which amplifies or extenuates; of that which stirs up the affections of the hearer; and of that which refreshes the memory." (*See* ORATORY.)

PERPENDICULAR, *per-pen-dik'-u-lar* (Lat. *perpendicularis*), in its general sense, means extending in a right line from the centre of the earth towards any point above, or at right angles with the plane of the horizon, in opposition to *horizontal*, which means being parallel with the plane of the horizon. A perpendicular, in geometry, means any line drawn at right angles to another, which is termed the *base*. (*See* GEOMETRY.)

PERPENDICULAR ENGLISH ARCHITECTURE, a style of Gothic architecture which had its origin in this country towards the close of the 14th century, at the latter portion of the reign of Edward III. It prevailed until Gothic architecture sank into disuse. The principal characteristics of this style are the exuberance and redundancy of its ornaments, while it wants the simplicity of the *Decorated* style. In the earlier examples this enrichment is not carried beyond bounds; but in later times it becomes excessive, and the chief aim of the architects seems to have been to employ as much labour as possible on ornamentation. At length this practice proved fatal, and Gothic architecture may date its decline from the commencement of the 15th century. The terms *Third-pointed* and *Florid* are applied by some writers to this style. The term *Perpendicular* was given to it on account of the peculiar arrangement of the tracery in the window-heads, which forms a peculiar characteristic of the style. Some have objected to the name, and suggest the term *Horizontal*, as being more appropriate. This would appear to be the best term, as the style is distinguished by depressed arches, low-pitched roofs, square-headed windows and doorways, square hood-moulds, and horizontal transoms. In this style pointed *arches* of all descriptions are to be found; nor do they materially differ from those of the preceding period; but drop arches are perhaps more prevalent. Towards the close of the style, however, an arch of peculiar kind, which is not to be found in any other, began to come in use. It is described from four centres, two of which are on the springing line, and describe arcs of very small radii, and the other two at some distance below it. This arch is called the *Tudor* arch, and was introduced about the middle of the 15th century. Ogee arches are of constant occurrence, and foiled arches are very frequent in decorative work. The *shafts of piers* are sometimes simple octagons; but clustered piers are very frequent, and their general form is that of a square set diagonally; but the breadth of the pier between the aisles is frequently greater than the depth between the arches. The *capitals* are either circular or octagonal, the bases being mostly plain, but sometimes enriched with foliage of a somewhat conventional form. The *base* mouldings are usually set upon a lofty polygonal plinth, which is sometimes double. The earlier *doorways* of this style have two-centred pointed arches, but the most characteristic form is the four-centred. The doors themselves are frequently covered with panel-work of a rich description. The *windows* of this style are easily distinguished from all others by the perpendicular tracery in the heads; the mullions of the lights, instead of branching out at the springing into flowing lines, are continued vertically to the intrados, and secondary mouldings are continued in the same direction from the centre of each light, and converge once or twice before they reach the arch. The early *roofs* of this style are of a moderate height, but later examples are of very low pitch. The vaulting is more complicated than in the Decorated style. Some of the roofs are very elaborate and beautiful; among others may be mentioned the roof of Henry VII.'s chapel, Westminster; St. George's chapel, Windsor; Peterborough Cathedral; and some few other churches. The wooden roofs of this period are more numerous and more readily defined than those of any previous era. One of the most magnificent of these is the roof of Westminster Hall. The *towers* are frequently constructed on a grand scale, being often devoid of spires, and occasionally surmounted by octagonal lanterns; as at Boston, Lincolnshire, and at Magdalen College, Oxford. The *mouldings* of this period are in general flatter, or of less projection, and consequently less effective, than those of former styles. Among the *ornaments* used, a most characteristic one is the rose, the badge of the houses of York and Lancaster; as is also a lozenge-shaped leaf, known as the "Tudor flower." The *walls* are often covered internally, and sometimes externally, with panel-work tracery, which is a characteristic feature of the Perpendicular style.

PERPETUAL MOTION. (*See* MOTION, LAWS OF.)

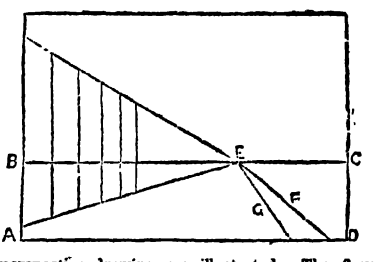
PERSEA, *per'-se-ă*, in Bot., a gen. of the nat. ord. *Lauraceæ*. The fruit of *P. gratissima* forms the much-esteemed avocado pear of the West Indies. *P. indica*, a native of Madeira, yields timber somewhat resembling mahogany.

PERSIAN BERRIES. (*See* RHAMNUS.)

PERSONIFICATION, *per-son'-e-fik-ā'-shun* (Lat. *persona*, a person), a term applied to the speaking of inanimate things as if they were persons. The use of this figure of speech is very natural and extensive. There is a wonderful proneness in human nature, under emotion, to animate all things. Thus, when we say, "the morning *smiles*," or "the ground *thirsts* for rain;" when we speak of a "disease's being *deceitful*," or of "ambition's being *restless*," such expressions show the facility with which the mind can accommodate the properties of living creatures to inanimate things, or to *abstract* conceptions of its own forming. The figure called by rhetoricians *prosopopœia* is, literally, personification.

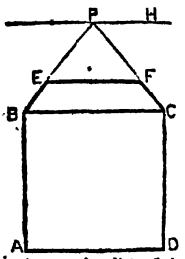
PERSPECTIVE, *per-spek'-tiv* (Lat. *perspicio*, I see), the art of representing objects, on a given surface, in

such a manner as to affect the eye when seen from a certain position, in the same way that the object itself would when the eye is fixed on the point in view. It therefore enables the artist to represent objects on a definite surface, as if that surface were transparent, and the objects were seen through it. Perspective, as an art, owes its origin to painting, and especially to that branch of it which was employed in the decorations of the theatre, where landscapes were principally introduced, which would have looked unnatural if the size of the objects had not been somewhat proportioned to their distance from the spectators. The only ancient writer who gives any account of the antiquity of perspective is Vitruvius, who states that the first writer on the subject was Agatharcus, an Athenian, who wrote on the subject when he prepared a tragic scene for a play exhibited by Æschylus. It seems probable, however, that, long before that time, the principles of perspective were known to the ancients. In the 12th century, John Tzetzes speaks of perspective as if well acquainted with its importance; and the Greek painters who were employed by the Venetians and Florentines in the 13th century seem to have brought some knowledge of it into Italy. The disciples of Giotti, who lived in the 14th century, are commended for observing the rules of perspective more than their predecessors had done. The Arabians did not neglect this art. Alhazar treated of the subject as early as 1100. In this country, Friar Bacon and John Peckham, archbishop of Canterbury, wrote on perspective with wonderful accuracy, considering the period at which they lived. After that time, many works on perspective were written, especially by Italians; and in modern times writers on the subject have been very numerous. Since all the rays of light proceed from objects to our eyes in straight lines, it must be evident that perspective rests on optical principles; and as the drawing of the form of an object is an arrangement of lines and angles according to geometrical principles, perspective may be looked upon as a branch of geometry. This division of the art differs essentially from that portion which relates to the gradation of colours, according to the distance of the observer. The former is called mathematical or linear perspective, and the latter aerial perspective. In drawing an object upon a piece of paper or plane surface, the contour merely represents such an intersection of the visual rays as would result on a glass put in the place of the paper. When the situation of an object on the *other* side of the glass is given, then its delineation on the glass itself wholly depends on the situation of the eye on *this* side of the glass;—that is, on the rules of perspective. If, for example, a spectator be looking at a landscape through a pane of glass, he will perceive the shape, size, and situation of each object apparent on the glass. Those objects which are near the spectator will occupy larger spaces on the glass than when they are at a greater distance; if they are parallel to the window, their shapes will be parallel; if they are oblique, their shapes will be oblique; and so on. If he alter his position, the situation of the objects on the glass will be altered also; if he raises his eyes, the objects will be raised, and the reverse if he lowers them; while in every position the horizon will appear to be on a level with the eye. Now, if the head could be kept fixed, and the objects thus seen on the glass transferred to it by means of a pencil, a true perspective drawing would be the result. As, however, drawing on transparent planes is very seldom practised, it has been found necessary to deduce from optics and geometry certain laws for drawing representations of visible objects on opaque planes. The application of these laws constitutes the art of perspective. In treating of perspective, there are certain technical terms or definitions employed which require explanation. They are as follows:—1. An *original object* is any object whatever which is rendered the subject of a picture. 2. *Original planes*, or *lines*, are the surfaces or lines of original subjects. 3. *Perspective plane* is the surface on which a picture is delineated. Since painters regard the frame of a picture merely as an aperture through which original objects are seen, they consider the perspective plane to be transparent. For this reason, the perspective plane is sometimes called the *transparent* plane. 4. *Ground-plane* is the earth or surface on which stand the objects to be delineated, as well as the spectator. 5. *Ground-line* is the line on which the perspective plane is supposed to rest. 6. *Visual rays* are those rays of light which, passing through the transparent plane, render original objects visible. The visual ray, therefore, is a straight line from the object to the eye. If the object is a point, there is but one visual ray; if it is a line, the visual rays form a triangle; if it is a square, they form a pyramid; if a circle, a cone, &c. 7. The *principal visual ray* is that which passes through the axis or centre of the eye, and the course of which, therefore, from the perspective plane, is shorter than any other, because it is perfectly direct. Its height above the ground-line is of course always the same as that of the eye. 8. The *point of sight* is that fixed point from which the spectator looks upon the perspective plane, when any original object is delineated. 9. The *centre of the picture* is that point of the perspective plane which is exactly opposite the point of sight; that is, where the principal visual ray enters the perspective plane. It must therefore be distinguished from the measured centre of any picture, as it can never exceed the height of the eye from the ground-line. 10. The *distance of the picture*, or *point distance*, is the distance between the eye and the centre of the picture. 11. *Vanishing-points* are those points to which all lines inclined to the picture appear to converge, and which those lines meet when produced. In a finished picture, vanishing-points have no place; they are merely used to facilitate drawing in perspective. 12. The *horizontal line* is a line parallel with the horizon at the height of the eye,—that is, it passes horizontally through the centre of the picture. In the accompanying diagram, some of the essential principles




of perspective drawing are illustrated:—The figure ABCD represents a quadrilateral picture, of which AD is the base. Across the picture, at rather more than a third of the height, is a line BC, representing the *horizontal line*. On the horizontal line, a point E is the *centre of the picture*, corresponding with the *point of sight*, and to this point all objects are diminished in proportion as they approach to it. Thus, a road represented by the two lines F, G, tapers to a point at E; and a row of posts or trees BE diminishes towards the same central point. It will be observed from this diagram, that the horizontal line regulates some important points in pictorial delineations. It may be placed high or low at pleasure, but it is generally regulated in its elevation by the nature of the subject to be drawn. When placed too high up, it leaves too small a proportion of sky, and produces what is called a bird's-eye view; if placed near the ground-line, unless the view be mountainous, the proportion of sky will be too great. As a general rule, the horizontal line should be at about one-third the height of the picture. The centre of the picture corresponding to the point of sight may also be fixed at pleasure; its best situation, however, is removed somewhat from the centre towards one of the sides. When placed directly in the centre, the perspective has too stiff and formal an effect. When an object, such as a box, having angles, stands on a base parallel with the horizon, and two of its sides are visible, that which is farthest from the observer will recede according to the situation of the point of sight. If ABCD be supposed to be a box thus placed, AB is its base, and EF is the farthest edge of its top. The base AD

being parallel to the horizontal line H, P will be the point of sight, and the visual rays from the upper corners of the box will centre in P, because the eye is in front and above the object. If the position of the box or the eye be altered, a corresponding arrangement of the laws of perspective will also be required. It would be impossible to give, in an article like the present, anything approaching to an epitome of the art of perspective, concerning which a vast number of treatises have been written. We can only refer those readers who wish to inquire further into the subject, to the list of books referred to at the conclusion of this article.—*Aerial perspective*, though not founded on equally demonstrable rules with linear perspective, is equally important. It treats of the degree of light which objects reflect in proportion to their distance, and of the gradation of their tints in proportion to the intervening air. It is thus found that only the nearest objects appear in their true colours and full light. As the air changes, the aerial perspective changes; and spring, summer, winter, morning, noon, evening, moonlight, &c., each has a different aerial perspective. Much of the charm and harmony of a picture depends upon a correct application of this branch of art.—*Ref.* Dr. Brooke Taylor's *Treatise on the Theory and Practice of Perspective*; W. Emerson's *Perspective, or the Art of Drawing the Representation of all Objects on a Plane; Prospettiva*, by Eustachio Zanotti; and *Linear Perspective*, by Thomas Bradley.




PERSPIRATION, *per'-spe-rai'-shun* (Lat. *perspiratio*, from *perspiro*, I breathe through), in Physiol., is that watery vapour which is constantly passing off through the pores of the skin, and is distinguished into insensible and sensible; the former passing off in the form of invisible vapour, the latter being more profuse, and collecting in drops on the surface. In either form it is the same, consisting chiefly of water, with a small quantity of acetic acid, of muriate of soda and potash, a small quantity of earthy phosphate, an atom of oxide of iron, and a trace of animal matter. The secreting organs are the extremities of the cutaneous arteries. It is calculated that about three pounds of water are daily conveyed to the surface of the body as insensible perspiration, and this quantity is very considerably increased during violent exercise or in hot weather. It is more or less copious in different individuals, and its quantity is perceptibly in the inverse ratio of that of the urine. More is produced during digestion than during repose. Its use is to eliminate superfluous and noxious matters from the blood, and to moisten the external surface of the body. Its expulsion from the system is very important; for whenever it is diminished or suspended, serious derangements may follow.

PERTURBATIONS, *per-tur-bai'-shunz* (Lat. *perturbatio*, a disturbance), in Astron., are deviations of the planets from their regular course, produced by their mutual gravitation. The law of universal gravitation, discovered by Newton, threw great light on this subject. It was shown by him that all bodies are attracted towards each other; hence, every planet not only gravitates towards the sun, but also towards every other planet; the moon not only towards the earth, but more particularly towards the sun, and even towards Venus and Jupiter. The regular course of the planets in elliptical orbits is effected by the attraction of the sun; the course of the moon by the attraction of the earth; perturbations must, therefore, occur in the motion of the moon and planets, if they are also acted on by other bodies. Part of these deviations was explained and determined by Newton; as, for instance, the precession of the equinoxes and the nutation of the earth's axis. Many articles, however, which require the infinitesimal calculus for their solution, are left undetermined. Laplace afterwards found a formula which was universally applicable, and published it in his *Mécanique Céleste*.





PETAL, *pet'-al* (Gr. *petalon*, Fr. *pétale*), in Bot., a modified leaf forming a part of the corolla. Petals are frequently of the richest colours; by which character, and by their more delicate nature, they may be usually distinguished from the sepals, or parts of the calyx. (*See* COROLLA, BOTANY.)

PETALOIDEÆ, or FLORIDÆ, *pet-al-oi'-de-e*, in Bot., a sub-class of *Monocotyledones*, characterized by permanent leaves with parallel venation; verticillate floral envelopes (sometimes absent), usually coloured, rarely scaly. This sub-class has three subdivisions:—*Epigynæ*, in which the flowers are usually hermaphrodite, the perianths adherent, and the ovaries inferior; *Hypogynæ*, in which the flowers are usually hermaphrodite, the perianths free, and ovaries superior; *Diclines*, in which the flowers are usually unisexual and the perianths either absent or consisting of a few scales. Thirty-seven nat. orders are included by Prof. Bentley in this sub-class; namely:—1. *Epigynæ*.—Orchidaceæ (the Orchis ord.), Apostasiaceæ, Burmanniaceæ, Zingiberaceæ (the Ginger ord.), Marantaceæ (the Arrow-root ord.), Musaceæ (the Banana or Plantain ord.), Iridaceæ (the Iris ord.), Amaryllidaceæ (the Amaryllis ord.), Hypoxidaceæ, Hæmodoraceæ, Taccaceæ, Bromeliaceæ (the Pinesapple ord.). 2. *Hypogynæ*.—Liliaceæ (the Lily ord.), Melanthaceæ or Colchicaceæ (the Colchicum ord.), Gilliesiaceæ, Pontederaceæ, Mayaceæ, Commelynaceæ, Xyridaceæ, Philydraceæ, Juncaceæ (the Rush ord.), Orontiaceæ (the Sweet-flag ord.), Palmaceæ (the Palms), Juncaginaceæ, Alismaceæ, Butomaceæ (the Flowering-rush ord.). 3. *Diclines*.—Pandanaceæ (the Screw-pine ord.), Typhaceæ (the Bulrush ord.), Araceæ (the Arum ord.), Pistiaceæ or Lemnaceæ (the Duckweed ord.), Naiadaceæ (the Pondweed ord.), Zosteraceæ (the Sea-wrack ord.), Triuridaceæ, Hydrocharidaceæ (the Frogbit ord.), Restiaceæ, Eriocaulaceæ, Desvauxiaceæ.

PETARD, *pet-ard'* (Fr.), in Artil., a metallic engine, somewhat resembling a high-crowned hat, which was loaded with powder. It was formerly much used for breaking down gates, bridges, barricades, &c. When about to be used, it was screwed to a thick plank, and suspended before the object to be burst open. Petards were first used by the French Huguenots in 1579, at the siege of Cahors. They are now no longer used in warfare, as gunpowder in loose bags has been found equally efficacious.

PETER-PENCE, *pe'-ter pens*, was originally a voluntary offering by the faithful to the see of Rome; but it came afterwards to be levied as a due. It was at the rate of a penny on each house or family. It was paid in England before the Conquest, was discontinued by Edward III., but subsequently revived, and finally ceased in the reign of Henry VIII.

PETITION, *pe-tish'-un* (Lat. *peto*, I ask); in a general sense, is a formal request, preferred by one person to another. In this country, every subject has the right of petitioning the king, or either house of parliament, for the redress of grievances. By 13 Car. II. st. 1, c. 5, it is declared that no petition to the king or either house of parliament for alteration of matters established by law in church or state shall be signed by above twenty persons, unless the matter be approved of by three justices of the peace, &c.; nor shall any petition be presented by more than ten persons at a time. This statute is held not to be affected by the Bill of Rights (1 W. & M. st. 2, c. 2), which declares that all commitments and prosecutions for petitioning are illegal; but it is being constantly infringed with impunity. Petition, in Law, is an application in writing, addressed to the lord chancellor, narrating certain facts, and praying for the order and direction of the court. Petitions are either *causa* or *ex parte*.—the former when regarding a matter which is already the subject of a suit; the latter, when there is no suit existing about the matter of the petition. Some cause petitions, again, are petitions of course; others are what are called special petitions. *Ex-parte* petitions are also of various kinds.

PETIVERIACEÆ, *pet-e-ve-re-ai'-se-e*, in Bot., a small nat. ord. of *Dicotyledones*, sub-class *Monochlamydeæ*. It is placed by some botanists as a sub-ord. of *Phytolaccaceæ*, with which it agrees in many particulars. The plants are natives of tropical America; most of them are acrid, and some have a strong alliaceous odour.

*Petiveria alliacea* is reputed sudorific and emmenagogue, and its root is much used in the West Indies as a remedy for toothache.

PETREL, *pet'-trel* (*Thalassidroma*), a bird belonging to the ord. *Natatores*, and fam. *Loridæ*. It is one of the smallest web-footed birds known, and is only six inches in length. The *stormy petrel*, which is better known to mariners under the title of "Mother Carey's chicken," may be thus described:—The bill is black; the irides dark brown; the head, neck, back, wings, and tail, sooty black; outer edge of tertial feathers white; chin, throat, breast, and under surface of the body, black; sides of the vent white; and legs, toes, and membranes, black. It breeds on the Lowe Isles, Iceland, and the Scilly Isles, and roves at large over the greater portion of the Atlantic. Its food consists of small fish, and those crustacea and mollusca which are found in the floating seaweed which may be seen over many parts of the ocean. It often keeps in company with a ship for days, not only for shelter, but for scraps of provisions thrown overboard. Sailors superstitiously believe, that when the Mother Carey's chickens are seen flying about, it is a sign that a storm is coming. According to Selby, the following are the characters of the petrels, or family *Thalassidroma*:—Bill shorter than the head, much compressed in front of the nasal sheath, with the tip of the upper mandible suddenly curving, and hooked downwards; and that of the lower one slightly angulated, and following the curve of the upper. The nostrils are contained in one tube or sheath, but show two distinct orifices in front. The legs have the tarsi rather long, slender, and reticulated. The feet have three toes, united by a membrane; the outer and middle toes are nearly equal in length, the hind toe being represented by a small, straight, dependent nail. The wings are long and acuminate, and the tail either square or slightly forked. Besides the stormy petrel, which has been just described, there are other varieties; as Bulwer's petrel (*Thalassidroma Bulwerii*), which is a native of Madeira, and is about ten inches long; Wilson's petrel (*Thalassidroma Wilsoni*), which breeds about Nova Scotia (its length is about seven and a half inches); and, lastly, there is the forked-tailed petrel (*Thalassidroma Leachii*).

PETRIFACTION, *pet'-re-fak'-shun* (Lat. *petra*, a stone; *facio*, I make), a general term, which is used to designate animal or vegetable substances which have been converted into stone. Petrifactions are found in the *aqueous* or *stratified* rocks, and the appearance presented by organic remains or fossils is very various. In some cases, they are found in nearly as perfect a state as when first deposited; in others, the organic matter is more or less destroyed, and has been replaced by a stony matter; and when this has been completely effected, a genuine *petrifaction* is the result. In the consideration of fossil remains, or petrifactions, a great fact becomes apparent; namely, the existence of various epochs in the world's history, each of which possessed its own characteristic Fauna and Flora. In the Silurian and Old Red Sandstone rocks, for instance, the fossils form an organic system of a different order from those found in the coal-measures; while these, again, form a perfectly distinct series when compared with those found in the tertiary formations. It has also been observed that the organic species of one system never reappears in another; that is, when once destroyed, it is never again created. In that period of the ancient world which transpired just before the creation of man, we find fossil remains of the largest size and most perfect organism; and the farther we go back from this period, the petrifactions show the remains of beings less exalted in the scale of creation. In the Pliocene and the Pleistocene beds of the tertiary formation, for instance, there are found the bones of the huge mastodon, the elephant, the rhinoceros, the megatherium, and others. In the Oolitic system, the principal type of existence is the reptile, displayed in the most gigantic forms, such as the ichthyosaurus and plesiosaurus. In the Old Red Sandstone and Silurian groups, the remains of scarcely any higher order of the vertebrata than fishes have been found. It is upon this last circumstance that the development theory of creation has been attempted to be established. (*See* DEVELOPMENT THEORY.)

PETROLEUM, *pe-tro'-le-um* (Gr. *petra*, rock; Lat. *oleum*, oil).—Petroleum, or rock-oil, is a liquid substance, of a dark colour, exuding from the earth, and containing certain liquid and solid hydrocarbons, such as benzol, naphtha, eupion, paraffin, naphthalin, and asphaltum, mixed together in a state of solution in different proportions. It varies considerably in density and colour, according to its composition; some qualities being dark and thick like treacle, while others are perfectly limpid and of a light-brown tint. It is found in different parts of the world, but principally at Baku, on the Caspian Sea, where it has been used for lighting purposes from time immemorial; at Rangoon, in Burmah; at Ammiano, in Parma; in Bavaria; in the island of Trinidad; in the United States, and in Canada. Until within the last few years, but little economic use has been made of petroleum. The managers of Price's Patent Candle Company were the first to avail themselves of the Rangoon product, which was discovered by their agent during a search for new localities from which to draw palm-oil, a substance largely used by them in the manufacture of candles. By distillation at different temperatures, the Rangoon tar yielded solid paraffin, or Belmontine as it is termed by the company, a dense oil for lubricating purposes, an excellent burning oil, and a very light oil resembling benzol, and named by them Sherwoodole. The petroleum found at Ammiano has been used for lighting the city of Genoa. It was not, however, until 1859, that petroleum took anything like a prominent position in the manufacturing industry of the world. In that year some persons, while sinking a brine-well in Ohio, in the United States, struck upon a fissure from which a mixture of salt-water and petroleum issued for many weeks, at the rate of many thousand gallons a day. The discovery gave rise to an oil-fever, and wells were sunk in all parts in thousands, by speculators hoping to amass fortunes by the venture. Since that time, oil-wells have been discovered in other parts of the States, while those in Western Canada, already known by the exertions of Sir William Logan, have been opened up and worked on an enormous scale, and petroleum is now annually exported from the American continent in millions of barrels. It differs greatly in composition, some samples containing solid paraffin and benzol in large quantities, while others contain none. Petroleum is separated into its various products by careful distillation at different temperatures. The crude material is first heated in a retort to a temperature of about 100° Fahr.; this causes a light oil, having a strong odour, to pass over into the condenser. The residue is then distilled at about 120° to 160°, the result being burning oil. When this is distilled off, steam is forced into the retort, and a heavy oil, fit for lubricating purposes, comes over, a black tarry mass being left behind. The light oil is now used as mineral turpentine, and as a grease solvent. It is often of a dark colour, which is easily removed by agitation, first with sulphuric acid and afterwards with soda-lye and water. In the case of the coal-oils (*see* PARAFFIN OIL), this light oil consists almost entirely of benzol, which is used as a source of aniline in the manufacture of the magenta and mauve dyes; the light petroleum oil, however, in the majority of instances, contains no benzol, and cannot be used for this purpose. The burning oil is also frequently coloured; but experience seems to prove that the coloured oil is possessed of a higher illuminating power than that which has been treated with sulphuric acid and soda lye. The heavy lubricating oil, when cooled down to 30° Fahr., often yields paraffin in large quantities, which is separated by straining and pressure. The asphaltum remaining may be used for pavements, or mixed with grease as a lubricant for heavy machinery. The most important product is, however, the burning oil, which is now used as a cheap and efficient illuminating agent in nearly every household in this country. When first the petroleum burning oils were introduced, about two years ago, certain samples contained notable proportions of the light oils, which, evaporating at ordinary temperatures, mixed with the air and formed an explosive mixture. As the operation of filling the lamps used with the oil was generally performed at night with a light close at hand, several lamentable accidents occurred, and an opposition was raised to the use of the American oils, which threatened to extin-

guish the trade altogether, more especially as no such accidents had ever occurred with the coal burning oils. Manufacturers, however, soon saw that it was to their interest to carefully extract the lighter oils from the burning compound; and now petroleum oils, which may be used with as little danger as fish or colza oil, are sold and consumed in millions of gallons under the names of petrolene, saxoline, leucoline, caseline, belmontine, and a hundred other cognomens, more or less euphonious. A simple method of testing the safety of burning oils is given under the head of PARAFFIN OIL. The origin of petroleum is at present under investigation. Sir William Logan, who has attentively studied the oil-bearing strata of Western Canada, which extend over an area of 7,000 square miles, believes that it is of animal origin, the rocks in which it is found consisting of coralline limestone, once containing the jelly-like bodies of marine animals, which, under pressure and heat, have become transformed into the substances constituting petroleum, in the same manner that the forests of the ancient world have been converted into coal. The cause of the petroleum rising to the surface is easily accounted for by the infiltration of water, which, being heavier than the oil, naturally replaces it, causing it to rise to the surface, and exude from the soil. Western Canada yielded in 1862 no less than twenty million gallons of oil, equal in illuminating power to 180 millions of pounds of sperm candles. An average sample of petroleum contains, according to Mr. W. B. Tegetmeier, 20 per cent. of mineral turps, 50 per cent. of burning oil, 22 per cent. of lubricating oil, and 8 per cent. of carbonaceous and tarry matter. Petroleum in the crude state has been used by the Seneca Indians for ages past as a remedy for rheumatism, and has been lately introduced by the surgeons of the United States army for washing gangrenous wounds with very great success. The lighter oils have been employed in America as anæsthetics, under the name of keroselene. (*See* SHALE OILS and PARAFFIN OILS.)

PETROSELINUM, *pe-tro-se-li'-num* (Gr. *petros*, a rock; *selinon*, parsley; in allusion to the habitation of the species), in Bot., a gen. of the nat. ord. *Umbelliferæ*. The species *P. sativum* is the common parsley of our gardens, an herb which plays an important part in English cookery. The delicate green of its curled leaves has made it the favourite herb for garnishing and ornamenting dishes.

PETTY RICE. (*See* CHENOPODIUM.)

PEWTER, *pu'-ter* (Ital. *peltro*), in Metal., a valuable alloy, containing four parts of tin and one of lead.

PHAGEDÆNIC, *fâdj-e-den'-ik* (Gr. *phago*, I eat), in Med., is a term applied to ulcers that eat or destroy very rapidly.

PHALANGES, *fil-ăn'-jeez* (Gr., a battalion), in Anat., is the name given to the small bones of the fingers and toes. (*See* FOOT, HAND.)

PHALANX, *fâl'-ânks* (Gr. *phalagx*), a body of troops among the ancient Greeks, armed with spears, and arranged in the form of a square. It first consisted of four thousand men; but Philip of Macedon doubled that number, and it was afterwards quadrupled. In the Macedonian phalanx, the men stood close together, sometimes with their shields locked, in ranks of several men in depth, displaying in front a row of extended spears. The momentum of the phalanx at the outset of the charge usually decided the battle. It was at length overmatched by the combined strength and activity of the Roman legion.

PHALARIS, *fâl'-â-ris* (Gr. *phalaros*, brilliant), in Bot., a gen. of grasses. *P. canariensis*, Canary grass, is cultivated largely for its grain, which is employed as food for song-birds, under the name of canary seed. Its straw is also valued as fodder for horses.

PHANEROGAMIA, *fân-e-ro-gaï'-me-a* (Gr. *phaneros*, manifest; *gamos*, marriage), in Bot., the name given to the great sub-kingdom which includes plants having evident flowers, and being propagated by seeds containing an embryo with one or more cotyledons. The phanerogamia are also called flowering or cotyledonous plants. (*See* BOTANY.)

PHANTASMAGORIA. (*See* MAGIC LANTERN.)

PHARISEES, *fâr'-i-seez* (Heb. *phares*, division or separation), a celebrated sect amongst the ancient Jews, so called because separated from the rest by the austerity of their life, and by their professing a greater





degree of holiness and a more religious observation of the law. It has been maintained by some good authorities, however, that their name was derived from a Hebrew word signifying to expound, because they were in great repute as expounders of the law. When they first arose has been the subject of much dispute; some placing their origin about the time of Esdras, because it was then that the Jews first began to have interpreters of their traditions, whilst others place it at a period shortly before the time of Christ, and others, again, referring it to the time of the Maccabees. Their doctrines may be thus briefly summed up. They believed that all things were done by destiny, *i.e.*, with God's foreknowledge, and in consequence of his immutable decree; the will of man still remaining free and unaffected. They owned the immortality of the soul, a resurrection, and a future state; and also held the doctrine of angels and separate human spirits. Some have supposed that they believed in a kind of metempsychosis, or transmigration of souls.

PHARMACEUTICAL SOCIETY OF GREAT BRITAIN, *far-mă-sw'-ti-kăl* (Gr. *pharmakeutikos*).—This society was founded in the year 1841 by private individuals. In 1843 it received a royal charter of incorporation, which, although valuable as a proof of recognition on the part of the government, conferred no privileges of a very practical character. In the year 1852 parliament passed the Pharmacy Act, which confirmed to the society its charter of incorporation, and provided that those persons who should pass its examinations should be registered, and have the *exclusive right* to assume the title of "Pharmaceutical chemist." By an act passed in 1862, registered pharmaceutical chemists are exempted from serving upon juries in courts of justice. The house of the society is situated in Bloomsbury Square, London, and comprises an excellent museum of pharmaceutical products, well-arranged laboratories, lecture-rooms, and reception-rooms. In the School of Pharmacy carried on here, courses of lectures on chemistry and pharmacy, and botany and *materia medica*, are delivered every session by competent professors. A course of practical instruction in applied chemistry is also given in the laboratory. The board of examiners meet monthly, and are required by the Pharmacy Act to examine, without reference to where previously trained or educated, "all candidates who may present themselves for examination, in their knowledge of the Latin language, in botany, in materia medica, in pharmaceutical and general chemistry, and to grant certificates of competency." Meetings for the discussion of subjects connected with pharmacy are frequently held by the society, and are reported in the *Pharmaceutical Journal*, the monthly organ of the body. "Pharmaceutical chemists" form but a small section of the class of chemists and druggists. According to the last published list of members, associates, and registered apprentices, the total number of persons connected in any way with the society is below 3,000. The number of members and associates who have passed any examination is about 700 only, the remainder having been connected with the society before the provision relating to examination was made. It is generally admitted that the work done by this society has not been proportionate to its means and opportunities. The exclusiveness of the charter of incorporation, and the illiberal policy of the council in neglecting the interests of the general body of chemists and druggists, account for the unpopularity of the society, and also for the rapid growth of the body called the United Society of Chemists and Druggists, which was founded in 1861. Nevertheless, the Pharmaceutical Society has done good service by upholding the dignity of pharmacy, and by strengthening its scientific foundations. The collection of pharmaceutical products shown by the society at the International Exhibition proved how greatly British pharmacy had been raised by its influence.

PHARMACOPŒIA, *far-mă-ko-pe'-ă* (Gr.), a book of directions for compounding medicines. This term is usually restricted to an authoritative work issued by a medical college, or other governing body, to secure uniformity in the preparations used by its members; the terms *dispensatory* and *formulary* being left for medical receipt-books which have not an authoritative character. The necessity for regulating the strength and

purity of medicines has led to the adoption of pharmacopœias by most civilized countries. In Great Britain we have hitherto had three national standards,—the pharmacopœias of the London, Edinburgh, and Dublin colleges; but a committee of the Medical Council has for some time been engaged in consolidating these works into one British pharmacopœia, which will probably be published before the present year expires (1863). The quantities ordered in the London and Edinburgh works are expressed in *apothecaries'* or *troy weight*, while the Dublin college only uses *avoirdupois weight*. The names of drugs and forms of preparation differ, in numerous instances, in the three works. The publication of the British Pharmacopœia will of course put an end to these differences, and the errors and confusion which result from them. The weights used will be the *imperial* or *avoirdupois* pound, ounce, and grain; the terms "drachm" and "scruple," as designating specific weights, being abolished. The original proposition of the Council to alter the value of the grain has very properly been overruled, as the grain has always been the standard of comparison between the different systems of weights adopted in this country. Latin has hitherto been the language of our national pharmacopœias; but, seeing that most dispensers of medicine make use of English translations, the Medical Council have wisely determined to employ plain English in the new work. In the United States of America, the pharmacopœias published in Great Britain and on the European continent were generally used until 1820, when the first edition of the Pharmacopœia of the U.S. saw the light. In the four decennial revisions of this work, the colleges of pharmacy of Philadelphia and New York have afforded valuable assistance; and the U.S. Pharmacopœia, as it now stands, is all that could be desired. In France, the Paris "Codex" is the chief work of authority. In Germany there are as many pharmacopœias as there are states in the confederation; but the members of the two great German pharmaceutical associations are now earnestly advocating the adoption of one standard. Conciseness and brevity ought to characterize every pharmacopœia. It should indicate in the plainest manner the ingredients, the proportions, and the mode of preparation for every compound. The national works of Great Britain and America are remarkable for their clearness.

PHARMACY, *fär'-mă-se* (Gr. *pharmakeia*, medicament, whether salutary or poisonous), the art of preparing medicines for use in the treatment of disease. The Arabs appear to have been the first people who had distinct pharmaceutical establishments: before their time, the preparation of medicines was left entirely to the physicians. Their remedies, however, were mostly derived from the vegetable and animal kingdoms, and prepared by the simple processes of distillation, infusion, decoction, and preserving by sugar and honey. The first apothecary's shop in Christian Europe was established at Salerno in the 11th century. The introduction of purely chemical compounds as remedial agents by the great Paracelsus opened to pharmaceutists the path for scientific investigation by which they have since made such great progress; and from that time chemistry and pharmacy have been inseparably connected. Of late years, much has been done to raise the art by chemists and botanists of high standing. The modern pharmacopœias have been cleared of much empiricism, and chemicals of definite composition are gradually replacing the crude and unscientific mixtures formerly prescribed. At the present time, there are many colleges and associations connected with pharmacy in existence. In our own country, the Pharmaceutical Society of Great Britain (which *see*) holds a high position among learned bodies, and though it has not perhaps made the best use of its powers, it has undoubtedly done much to promote the growth of scientific pharmacy. The United Society of Chemists and Druggists (which *see*) has not been long enough in existence to have had any material influence on the development of British pharmacy. In America, there are several colleges of pharmacy, the most important being those of Philadelphia, New York, Massachusetts, and Maryland. Notwithstanding the national troubles in 1862, the Philadelphia College contributed to our International Exhibition an extensive collection of drugs derived from plants indigenous, and naturalized in the United States. Connected with this particular college are two pharmaceutists of high reputation; namely, William Procter, the editor of the "American Journal of Pharmacy," and Edward Parrish, the author of a standard work on "Practical Pharmacy." In France, the extension and improvement of pharmacy is promoted by several colleges and many excellent publications. In Germany, again, there are two great pharmaceutical associations,—the North and the South German, the sources respectively of two celebrated journals,—the "Archiv der Pharmacie," and the "Neues Jahrbuch der Pharmacie." Though vendors and mixers of medicines abound, the number of pharmaceutists worthy of the title is probably very small. The practice of pharmacy necessarily implies a thorough knowledge of all the characters both of genuine and adulterated drugs; a knowledge of the various methods of drying, and of protecting from destructive influences the various substances used in medicine; and a practical and familiar knowledge of all the mechanical and chemical operations which relate to the preparation of medicines. To describe in the briefest possible manner the various operations of pharmacy, we should require more space than we can afford to devote to a single article. We will merely note that the object of all those operations is to render medicines more agreeable, more convenient, more safe, and more efficacious than they are in their natural state. (*See* MATERIA MEDICA.)

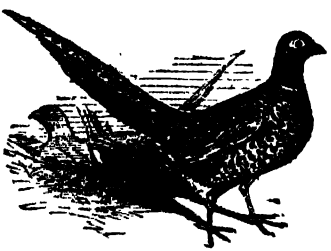
PHARYNX, *fär'-inks* (Gr., the throat, from *phero*, I convey, because it conveys food into the stomach), in Anat., is the muscular funnel-shaped bag at the back part of the mouth, which receives the masticated food, and conveys it to the œsophagus. It is broadest about the middle, being constricted at either end, more particularly below, where it terminates in the œsophagus. Pharyngitis is inflammation of the pharynx; pharyngotomy, the operation of cutting into the pharynx for the purpose of extracting any foreign body.

PHASEOLUS, *fă-zē'-o-lus* (Lat. *phaselus*, a little boat, from the form of the pods), in Bot., a gen. of the nat. ord. *Leguminosæ*. The species are commonly known as kidney-beans, scarlet-runners, and haricots. In this country the green pods are usually eaten, but on the continent the ripened seeds form an important article of diet. Most of these plants are climbers; the few which do not climb are called dwarf-beans. The roots of the scarlet-runner (*P. multiflorus*) are poisonous.

PHASES, *fāi'-zez* (Gr. *phasis*, from *phaino*, I shine), a term used in Astron. to signify the various appearances of the moon and the superior planets at different ages; also the appearance of the sun or moon during an eclipse. By historians, the term is used to designate various stages and appearances of one great historical event, such as a revolution.

PHEASANT, *fez'-zănt* (Lat. *phasianus*, Fr. *faisan*) (*Phasianus*).—The generic characters of the pheasant, according to Mr. Yarrell, are as follows:—Bill of moderate length and strong, the upper mandible being convex, naked at the base, and with the tip bent downwards; nostrils basal, lateral, and covered with a cartilaginous scale; cheeks, and the skin surrounding the eyes, destitute of feathers, and with a red varicose covering. Wings short; the first quill-feather narrow towards the tip; the fourth and fifth the longest in the wing. Tail long, wedge-shaped, graduate, and containing eighteen feathers. Feet with three toes in front and one behind; the three anterior toes united by a membrane as far as the first joint, and the hind toe articulated upon the tarsus, which, in the male birds, is furnished with a horny conical and sharp spur. The pheasant was originally a native of the banks of the Phasis, a river of Colchis, in Asia Minor; whence it was brought by the Greeks into Europe, where it speedily began to be held in high request, both for the beauty of its plumage and its succulent qualities as an article of food for the table. The pheasant is extensively diffused through England, and has become naturalized even so far north as Northumberland. Mr. Selby observes, however, that the cause of its preservation is not so much due to the wildness of its nature, as to the trouble and expense bestowed on

it by noblemen and other considerable landed proprietors, without which the breed would most likely be now extinct. The favourite resorts of pheasants are woods that are thick at the bottom, with long grass kept up by brambles and bushes, and thick plantations, or moist grounds, and marshy islands overgrown with rushes and osiers. They can seldom be induced to remain for any length of time on any ground bare of shelter, as wood and water are indispensable to them, on account of their habits. The females begin to lay their eggs in April, and hatch them by the end of May.



PHEASANT.

They lay generally from ten to fourteen, and the eggs are of a uniform olive-brown colour, and nearly spherical in shape. The pheasant chiefly feeds, in a wild state, on grain, seeds, green leaves, and insects, as well as some berries, of which they are fond; as blackberries, &c. They seldom use their wings, except to get away from an enemy; but generally run along; and the speed with which they get over the ground is somewhat surprising. The ordinary weight of a pheasant is from two pounds to two pounds and a half, although many of heavier weight have been killed. The whole length of the male is about three feet, while that of the female is about two, although the length greatly depends on that of the middle feathers of the tail, which often exceed two feet. The colour of the adult male is much varied. The ears are surrounded by a naked skin of bright scarlet, speckled with bluish-black; the irides hazel; the head and neck steel-blue, reflecting brown, green, and purple in different lights; the ear-coverts dark brown, upper part of back orange-red tipped with black; tail-feathers very long, of pale yellow-brown colour, with narrow transverse bands of black, about an inch apart; the breast and under surface of the body golden-red; and finally, the legs, toes, and claws of a brownish lead-colour. The females have a dull brownish earth-colour plumage,, and sink far below the male in appearance; but it is to this that they owe their escape from the sportsman; whence they can rear and bring up their broods in safety, without running those risks which the male has to undergo. It may be remarked, in conclusion, that the pheasant has a marked inclination to breed with other gallinaceous birds; as the common fowl of our poultry-yard, the turkey, &c.—*Ref.* Yarrell's *British Birds*.

PHENOMENON, *fe-nom'-e-non* (Gr. *phainomai*, I appear), is generally applied to some sensible appearance, more particularly those of nature, the causes of which are not immediately obvious; as the phenomena of light, of electricity, &c. In mental philosophy, it is applied to the various and changing states of mind. In the philosophy of Kant, it is an object such as we represent it to ourselves or conceive of it, in opposition to *noumenon*, or a thing as it is in itself.

PHILADELPHACEÆ, *fil-ă-del-fā'-se-e* (from *philadelphus*, one of the gen.), in Bot., the *Syringa* fam., a nat. ord. of *Dicotyledones*, sub-class *Calycifloræ*. Shrubs with opposite, deciduous, exstipulate leaves and perfect flowers. Calyx superior, persistent, 4—10-lobed, with a valvate æstivation. Petals equal in number to the divisions of the calyx and alternate with them. Stamens numerous, arising from the calyx. Ovary inferior; styles united or distinct; stigmas several. Capsule half-inferior, 4—10-celled, with axile placentas. Seeds numerous, with fleshy albumen. There are four genera and 25 species, natives of the South of Europe, North America, Japan, and India. (*See* DEUTZIA, PHILADELPHUS.)

PHILADELPHUS, *fil-ă-del'-fus* (Gr. *phileo*, I love; *adelphos*, a brother, because it attaches itself to whatever is near, by its roughness), in Bot., the *Syringa*, the typical gen. of the nat. ord. *Philadelphaceæ*. The species *P. coronarius*, a native of the South of Europe, is commonly cultivated in our shrubberies, and known as the *syringa*. The flowers somewhat resemble those of the orange in appearance and odour; hence the plant is called the mock-orange in America. The odour is due to the presence of a volatile oil, which may be readily obtained from the flowers by distillation with water. The leaves have a cucumber flavour.

PHILANTHROPY, *fil-ăn'-thro-pe* (Gr. *phileo*, I love; *anthropos*, a man), denotes a general feeling of love towards the whole human race.

PHILEMON, EPISTLE TO, *fi-le'-mon*, is the title of one of the books of the New Testament, written by the apostle Paul to Philemon, evidently a person of some note, as well as worth, and most probably a converted gentile. From the brevity of the epistle, and its private nature, it is not often alluded to by the early ecclesiastical writers; and some fastidious persons even showed an inclination to expunge it from the sacred canon, as being a private letter, and consequently of little importance to the Christian church. As to the authenticity of this book, we have no stronger external testimony in favour of any portion of sacred writ. The occasion of the epistle was the sending back to Philemon his runaway slave Onesimus, who, through the instrumentality of the apostle, had been converted to Christianity. After the usual salutation, and alluding to the good reputation which Philemon, as a Christian, enjoyed, and to the joy which this afforded him, he gently and gracefully introduces the main subject of his epistle by a reference to the spiritual obligations under which Philemon lay to him, on the ground of which he might utter as a command what he preferred urging as a request. Onesimus is then introduced; his change of mind and character stated; his offence in deserting his master is not palliated; his increased worth and usefulness are dwelt upon; and Philemon is entreated to receive him back, not only without severity, but with the feeling due from one Christian to another. The apostle then delicately refers to the matter of compensation for any loss which Philemon might have sustained through Onesimus, and pledges himself to make good that loss, though, as he says, he might justly hold him debtor for a much larger amount, seeing that he owed to him his own self. The epistle concludes with some additional expressions of friendly solicitude. The style of this epistle has been universally admired as a model of graceful, delicate, and manly writing. "It is a voucher," says Eichhorn, "for the apostle's urbanity, politeness, and knowledge of the world. His advocacy of Onesimus is of the most insinuating and persuasive character, and yet without the slightest perversion or concealment of any fact." The general opinion is, that Philemon not only pardoned Onesimus, but gave him his freedom, in compliance with the apostle's insinuation that he would do more than he had asked.

PHILESIACEÆ, *fil-e-se-ai'-se-e*, in Bot., the *Philesia* fam., a small nat. ord of twining shrubs, natives of Peru. This order belongs to the class *Monocotyledones*, sub-class *Dictyogenæ*.

PHILIPPIANS, EPISTLE TO THE, *fil-lip'-e-ănz*, is the name of one of the books of the New Testament, written by the apostle Paul to the Philippians. Christianity was first planted at Philippi by the apostle Paul in A.D. 50; and of all the churches planted by him, this one seems to have cherished the most tender concern for him, and to have frequently ministered to his necessities. When they heard of his confinement at Rome, they sent Epaphroditus to him with money, and this epistle was written to the church on the return of Epaphroditus. The scope of the epistle is to confirm the Philippians in the faith; to encourage them to walk in a manner becoming the Gospel of Christ; to caution them against the intrusion of Judaizing teachers, and to testify his gratitude for their Christian bounty. The epistle may be divided into three parts. In the first of these, after the usual salutation, and an outpouring of warm-hearted affec-

tion towards the Philippian church, the apostle refers to his own condition as a prisoner at Rome; and, lest they should be cast down at the thought of his afflictions, he assures them that these had turned out rather to the furtherance of the great cause (i. 1—24). He then exhorts them, in a strain of the most sublime and pathetic eloquence, to maintain a conduct worthy of the Gospel, to cultivate humanity and brotherly love, and to work out their own salvation with fear and trembling, and concludes by an appeal to their regard for him as an apostle, and promises to send to them Timothy, as well as Epaphroditus (i. 21—ii. 30). In the second part he strenuously cautions them against Judaizing teachers, who preached Christ through envy and strife, referring to his own standing as a Jew, and declaring that, however he once valued these, he now counted them "all but lost for the excellency of the knowledge of Christ." He then exhorts them to advance in the service of Christ, and cautions them against unnecessary contention, and against those who walk disorderly (iii.). In the third part, after some admonitions to particular persons, and some general exhortations to Christian moderation, cheerfulness, and prayer, he proceeds to recommend virtue in its most extended sense; thanks the Philippians for their seasonable and liberal aid, and concludes with salutations from himself and friends at Rome, and a solemn benediction (iv.). This epistle is written throughout in a very animated and elevated style, and is full of the most sublime thoughts and the most affectionate exhortations. It is remarked that this is the only one of St. Paul's epistles to the churches in which no censure is expressed or implied against any of its members. The genuineness of this epistle was never questioned till modern times, and then only on the most trivial grounds.

Philippics, *fil-lip'-iks* (Gr. *Philippikoi logoi*), a name which is given to the orations of the Grecian orator Demosthenes (born about 380 B.C.) against Philip of Macedon, when the latter was attacking the liberties of Greece. Many good and patriotic men of the time despaired of their country, and were only anxious to make favourable terms with the masters whose sway they believed it impossible to escape from; but a course of active resistance recommended itself to the more sanguine temperament of Demosthenes; and to stir up his countrymen to this, he delivered his famous Philippics, which, of all his many orations, are reckoned the masterpieces. During two thousand years, in every enlightened age, with scarcely a dissent, Demosthenes has been declared the greatest of all orators, ancient or modern. The term *philippics* is also applied to the orations of the great Roman orator Cicero, which he delivered against Marc Antony; this title having been given to them by the orator himself in his epistles to Brutus; and having been found so just by posterity, that it has been continued to the present time. Cicero's philippics cost him his life, Marc Antony having been so irritated by them, that, when he arrived at the triumvirate, he had Cicero murdered, and stuck up his head in the very place where the philippics had been delivered. From these famous orations the term *philippic* has come to be applied to any invective declamation.



Philology, *fil-ol'-o-je*, is a term derived from the Greek *philologia*. Once it carried a far different as well as a far wider signification than it does at the present time. With the Greeks it comprehended, in a vague sense it is true, all literature and some science; and thus we find history, poetry, oratory, criticism, biography, grammar, logic, rhetoric, all included within the term. Suetonius tells us that Eratosthenes, who lived in the second century before the Christian era, was the first who was denominated *philologus*. The Romans accepted the term, together with its ancient and broad signification, from the Greeks; and Cicero, an ardent lover of Greek literature, himself divided his writings into two classes; his orations constituting one class, and all his other works the other, which he called philological. After the revival of letters in Europe, the word philologus came to bear a different sense from that which it had in ancient Greece and Rome. With the Greeks, a philologus was one who was learned in the literature, grammar, and criticism of his mother tongue; with the Romans, the signification was the same. When Europe, however, began to awake from the deep dream of ignorance that had fallen upon her, and at the revival of letters began to turn her eyes to Greece and Rome, those quarters whence only learning could come, a philologus was one who, possessing no source of learning in his own mother tongue, was compelled to know two foreign languages in order to be distinguished above his fellows as a scholar. The case was far otherwise with the old Greeks and Romans; they gave little thought towards acquiring a foreign language. Why should they? All the outer world were, to these leading peoples, barbarians. By the way, this contempt for any other than one's own native tongue appears as a prevalent idea all the world over; for, just as we find the old Greeks calling the barbarians *Aglossoi* (speechless), so we see the Germans calling their neighbours the Celts *Walh*, the modern *Welsh*, and supposed to have come from the Sanskrit *mlechha*, a person who talks indistinctly. To revert to the causes why the term philology should be applied to the science of language. We must admit the science, no less than the name given to it, is of very modern date. The various titles of Comparative Philology, Scientific Etymology, and Phonology, have been applied to it; and the late Sir John Stoddart proposed the terms Glossalogy and Glossagraphy; but as these excluded the grammatical portion of the science, they have not found favour enough to become accepted. In France, the science is called *Linguistique*; yet as a man may be a good linguist without troubling himself as to the genealogy and philosophy of language, or as to the relationship which one language bears to another, this word has been driven out before the more comprehensive and appropriate — Philology. Hence a philologist, or philologer, as we understand at the present time, designates him who studies language with the view to trace their analogies and relationship, whilst the allied Philology is the name for the science. If it be admitted that each living speech has its history; that it has a fellowship and affinity with another; that it is capable of being grouped and classed, just as animals are grouped and classed by the zoologist; that it is an aid towards the solution of important questions in ethnology and history; if all these weighty considerations are allowed to appertain to language, then philology must be allowed to have as wide a scope and as great a human interest as any of the other sciences. Like the other sciences, the origin of philology arises from a few facts obtained by empirical observation; and it was not until a large mass of facts obtained in a similar manner was collected, that the process of digesting and bringing the whole into shape commenced. What retarded the progress of the science for a long time, was the idea that the ancestral language of mankind was the Hebrew, from which language, therefore, it was maintained all speech must be derived. St. Jerome, Origen, and the fathers of the Church, clung firmly to this belief. Even in our own day we find the Rev. Dr. Cumming, a divine who maintains no weak grip upon English credulity, asserting "that Hebrew is that magnificent mother-tongue from which all others are but distant and debilitated progenies." If one could push back this divine to the 4th or 5th century, we should be placing him in his proper chronological position, so far as philology is concerned. What says Leibnitz, the contemporary of Newton? "There is as much reason," he says, "for supposing Hebrew to have been the primitive language of mankind, as there is for adopting the view of Goropius, who published a work at Antwerp in 1580, to prove that Dutch was the language spoken in Paradise." "Of the language of Adam we know nothing," says Prof. Max Müller; "but if Hebrew, as we know it, was one of the languages that sprang from the confusion of tongues at Babel, it could not well have been the language of Adam or of the whole earth, when the whole earth was still of one speech." The great rival of Newton demanded that the principle of sound inductive reasoning should be applied to the subject. He exhorted princes, ambassadors, travellers, and missionaries, to aid him in collecting a great body of facts. Leibnitz did not make a vain appeal; and at the commencement of the present century the results of the researches he had inaugurated were embodied in

two great works,—the "Catalogue of Languages," by Hervas, and the "Mithridates" of Adelung. But, perhaps, the greatest service rendered to philology by the plan suggested by Leibnitz was to animate the mind of Catherine the Great, empress of Russia, with the notion of compiling a universal dictionary. The great Cesarina of the North found many able assistants; and in 1787 appeared the first volume of the "Imperial Dictionary." In it were contained 285 words translated into 51 European and 149 Asiatic languages. But after all, these different works were only collections of languages and dialects, without the principle of scientific classification. Something was wanted to show that these dialects were related to each other,—had an affinity each to each,—were capable of being arranged into groups and families. The discovery of Sanskrit, according to Max Müller, like an electric spark, caused the floating elements of speech to crystallize into regular forms. Sanskrit, the language of the ancient Hindus, ceased to be spoken at least 300 B.C.; but its existence, as well as its being the repository of a copious literature, was well known from a very remote date. The Greeks and Romans, when they spoke of persons and places in India, used the pure Sanskrit terms in almost every instance. Buddhist missionaries carried Sanskrit with them to China as early as the 3rd century B.C.; but the secret of that sacred language, which contained the tenets of their religion, was jealously guarded by the Brahmins. The zeal and devotion, however, of Francis Xavier, Roberto de' Nobili, and other intrepid missionaries, overcame the wily custodians of the precious foundation of European philology; and when, in 1784, the Asiatic Society was founded at Calcutta, gathering together the illustrious names of Sir William Jones, Carey, Wilkins, Forster, and Colebrooke, the language and literature of the Brahmins came to be opened up to the world. The extraordinary similarity, in some instances absolute identity, of the grammatical forms of Greek, Latin, and Sanskrit, soon excited the surprise of scholars. Neither divines, classical scholars, nor philosophers, appeared ready to acquiesce in the conclusions this discovery placed before them. There was one, however, who was prepared to see the immense importance of the discovery. Lord Monboddo, when he was not engaged in deriving all mankind from a couple of apes, could bring to bear upon matters all that acuteness which should properly belong to a Scotch judge. This eccentric lawyer at once saw, and hastened to tell the world of his conviction, that, because of the resemblance betwixt the Greek and the Sanskrit, the one must be a dialect of the other, or both of some original language. In 1808 Frederick Schlegel's work on the "Language and Wisdom of the Indians" appeared. Schlegel, together with Lassen, Rosen, Burnouf, and Bopp, had come to England, where, with the assistance of Wilkins, Colebrooke, Wilson, and other eminent Indian scholars, they had sunk shafts into the mine of Sanskrit learning. In 1833, Francis Bopp gave to the world the first volume of his great work, "Comparative Grammar of Sanskrit, Zend, Greek, Latin, Lithuanian, Slavonic, Gothic, and German." In 1852, this work, which is accounted the solid foundation of comparative philology, was completed. Among the other founders of the science may be named Wilhelm von Humboldt, Grimm, Rask, Burnouf, Dr. Prichard, Max Müller. During the last ten years, Germany has had a journal specially devoted to comparative philology, whilst London has a philological society of its own, which publishes a yearly volume of its transactions. "When," says Prof. Max Müller, "Sanskrit had once assumed its right position, when people had once become familiarized with the idea that there must have existed a language more primitive than Greek, Latin, and Sanskrit, and forming the common background of these three as well as of the Tutonic, Celtic, and Slavonic branches of speech, all languages seemed to fall by themselves into the right position." We have not space sufficient, in this popular view of the science of philology, to give more than a few examples of the great likeness and close affinity that exist between the several languages constituting the Indo-European, or, as it is now termed the Aryan family of language. To exhibit a vocabulary of primitive words:—





MAN.

| | | | |
|---|---|---|---|
| Sanskrit..... | Virah, a hero. | Gothic ..... | Vair. |
| Zend ..... | Vairya. | Irish ..... | Fear. |
| Lithuanian | Vyras. | Welsh ..... | Gur. |
| Latin ..... | Vir. | Greek ..... | Geros. |

FATHER.

| | | | |
|---|---|---|---|
| Sanskrit..... | Pitar. | Gothic ..... | Fadrein. |
| Zend ..... | Paitar. | Old High German ..... | Vatar. |
| Persian ..... | Pader. | German ..... | Fader. |
| Greek ..... | Pater. | Irish ..... | Athair. |
| Slavonian ... | Bat. | | |

It has been shown that the initial consonant in the Irish *athair* has been lost.

MOTHER.

| | | | |
|---|---|---|---|
| Sanskrit..... | Mater. | Slavonian ..... | Mater. |
| Zend ..... | Matar. | Lithuanian ... | Motina. |
| Persian .... | Mader. | German ..... | Mutter. |
| Greek ..... | Meter. | Irish ..... | Mathair. |
| Latin ..... | Mater. | | |

SON.

| | | | |
|---|---|---|---|
| Sanskrit..... | Sunus. | Gothic ..... | Sunus. |
| Lithuanian | Sunus. | German ..... | Sohn. |
| Slavonian ... | Syn. | | |

DAUGHTER.

| | | | |
|---|---|---|---|
| Sanskrit..... | Duhiter. | Lithuanian ... | Dubter. |
| Zend ..... | Dughdhar. | Gothic ..... | Dauhtar. |
| Persian ..... | Dokhter. | German ..... | Tochter. |
| Greek. ..... | Dygater. | Irish ..... | Dear. |
| Slavonian ... | Dotcher. | | |

TOOTH.

| | | | |
|---|---|---|---|
| Sanskrit..... | Dantas. | Gothic ..... | Thuntus. |
| Persian ... | Dendan. | Danish ..... | Tand. |
| Lithuanian | Dantis. | Irish ..... | Dend. |
| Greek..... | Odontes. | Welsh ..... | Dant. |
| Latin ..... | Dens. | | |

SUN.

| | | | |
|---|---|---|---|
| Sanskrit..... | Hadis. | Lithuanian ... | Saule. |
| Greek..... | Helios. | Gothic ..... | Sauil. |
| Latin ..... | Sol. | Irish ..... | Saule. |
| Slavonian ... | Solzne. | Welsh ..... | Haul. |

SEA.

| | | | |
|---|---|---|---|
| Sanskrit..... | Mirah. | Gothic ..... | Marei. |
| Latin ..... | Mare. | German..... | Meer. |
| Slavonian .. | More. | Irish ..... | Muir. |
| Lithuanian | Mares. | Welsh ..... | Mor. |

The same strikingly close likeness might, did space permit, be shown at a glance to exist with regard to personal pronouns, verbs, and particles. The reader is referred to the works of Bopp and Prichard for examples of the relationship of the verb forms *to die, to be born, to stand, to eat, to live, know, see, hear, think, drink, thirst*, &c. &c. Besides the Aryan there are two other families of language,—the *Semitic* and the *Turanian*, both of which have been established upon the same strict principles of genealogical classification. With respect to the term Aryan. The name for this group of languages was, first of all, Indo-Germanic, next Indo-European; but Professor Bopp, deeming these titles inadequate, proposed the term Sanskritic; whilst, last of all, Professor Max Müller chooses to adopt the term Aryan as the most appropriate. Max Müller, following in the track of the great continental philologers, propounds the theory that, in the most elevated table-land of Central Asia, there existed, in times far beyond the reach of history or tradition, a country, to which he gives the name Aryana. This nation, a nomadic one, betook itself to distant migrations; one section of it proceeding in a south-eastern direction across the snows and glaciers of the Himalayas to people Hindostan, and another in a north-westerly direction to people Western Asia and Europe, as far as Spain and Britain. Before that time the soil of Europe had not been trodden by either Celts, Germans, Slavonians, Romans, or Greeks. The language of these ancestral wanderers was the Aryan, from the roots of which sprang all the languages composing the family bearing its name. (*See* INDO-GERMANIC FAMILY OF LANGUAGES.) The classification of

human speech is based entirely on the form and manner in which certain elements of language, called "roots," are put together. Roots, the constituent elements of language, are words which, in any language, or family of language, cannot be reduced to a simpler or more original form. Let us illustrate our meaning by borrowing an example from Professor Max Müller:—"I take the root AR, the source of the word *arya*, and we shall thus, while examining its ramification, learn at the same time why that name was chosen by the agricultural nomads, the ancestors of the Aryan race. This root Ar means *to plough*, to open the soil. From it we have the Latin *ar-are*, the Greek *ar-oun*, the Irish *ar*, the Gothic *ar-jan*, the Anglo-Saxon *er-jan*, the modern English *to ear*. Shakspeare says, 'To ear the land that has some hope to grow.'" What is termed the growth of language comprehends two processes, which have been called respectively Dialectic Regeneration, Phonetic Decay. By the second of these processes, language is constantly being worn down and ground to fragments; whilst, on the other hand, dialects act as the feeders and life of speech. Proofs of this incessant mutation might be given, did space permit. To select one illustration of the revolutions which human speech has undergone:—A thousand years ago a resemblance amounting to mutual intelligibility existed among the languages of Anglo-Saxon England, of Upper and Lower Germany, and of Holland; yet now, whatever radical affinity scientific dissection may reveal among English, German, and Dutch, it is well known that a person speaking only one of these needs an interpreter for the other two. Both phonetic decay, as well as the dialectic growth of language, are beyond the control of man, who furthermore obeys these laws without knowing of their existence. The earnest student of language who may be desirous of following out to the fullest extent the various theories and arguments of the great philologers, cannot be better employed than in consulting Professor Max Müller's lectures on the "Common Origin of Language," together with his expositions as to roots, as to what language is, &c.—Ref. *Lectures on the Science of Language*, by Max Muller; and the various works mentioned in this article.

Philosopher's Stone. (*See* Alchemy.)

Philosophy, *fil-os'-o-fe* (Gr. *philosophia*, from *phileo*, I love, and *sophia*, wisdom), literally signifies a love of wisdom or knowledge, and a philosopher is a lover of wisdom. The origin of the term is attributed to Pythagoras, who, in place of calling himself *sophos*, a wise man, assumed the more modest title of a lover of wisdom. The term was commonly used to include the three great branches of knowledge; viz., physics, ethics, and dialectics, or metaphysics. In the present day, philosophy is used rather indefinitely in several senses. All philosophy is knowledge, but all knowledge is not philosophy. Knowledge is of two kinds,—(1) the knowledge of a thing is called historical or empirical knowledge,—the knowledge of the fact; and (2) the knowledge why or how a thing, is called philosophical, scientific, rational knowledge,—the knowledge of the cause. Philosophical knowledge, then, in its widest sense, is the knowledge of effects as dependent on their causes; and hence all sciences occupied in the research of causes may be viewed as so many branches of philosophy. In a more limited sense, the term philosophy is used to denote the science of mind by way of pre-eminence, as being the highest of all knowledge. In fact, there are not a few of the special sciences that can only be considered as the science of mind, in particular aspects, or in special applications; and there are none of them that do not suppose it as their preliminary, and borrow from it their light. Thus logic is the science of the laws of thought; ethics, the science of the laws which govern our moral nature; politics, the science of man in his social and civil relations. The fine arts have their foundation in the theory of the beautiful; and even religion, theology itself, is not independent of the same philosophy. With us, the term philosophy is used in a much greater variety of connections than among other nations. Thus we have not only natural philosophy or physics, the philosophy of history, &c.; but also the philosophy of manufactures, of agriculture, of cookery, &c.; and thus have given occasion to the sarcasm that while Socrates brought down philosophy from the clouds, the English have degraded her to the kitchen. (*See* Metaphysics, Ethics, Logic, and the various special sciences taken up in different parts of this work.)

Philydraceæ, *fil-e-dra'-se-e* (Gr. *phileo*, I love; *udor*, water), in Bot., the Water-wort fam., a small nat. ord. of *Monocotyledones*, sub-class *Petaloideæ*, consisting of herbs with fibrous roots, sword-like sheathing leaves, and flowers surrounded by spathaceous persistent bracts. They are natives of China and Tasmania.

Phlebotomy, or Venesection, *fle-bot'-o-me, ve-ne-sek'-shun* (Gr. *phleps*, a vein, and *temno*, I cut), in Surg., is the opening of a vein for taking away blood. (*See* Bleeding.)

Phlogiston, *flo-jis'-ton* (Gr. *phlogizo*, I burn), is the supposed combustible matter of Stahl, by means of which he attempted to explain the phenomena of combustion. It was pure fire, which, being combined with certain bodies, rendered them combustible. The existence of oxygen was not then discovered, on the absorption of which combustion is now known to depend.

Phœnix, *fe'-niks*, is the name of a fabulous bird of antiquity, which is described as being, in outline and bulk, very like an eagle, and as having part of his plumage gold-coloured and part crimson. It was said to live five hundred years in the wilderness, and then return to Egypt, where, having built itself a nest, it was consumed, and from the ashes of the old bird sprang a successor. The phœnix has been a fertile subject for the imagination of the poets of all ages; and even by some of the early Christian writers this myth was advanced as evidence of the resurrection.

Phœnix (the Greek name of the date), in Bot., a gen. of palms. *P. dactylifera* is the date-palm, one of the most important food-bearing plants. In some parts of Africa and Arabia, dates may be said to form the daily bread of the inhabitants. They are imported into this country, and are here used as an article for the dessert. About ten tons are annually received. This tree is the palm commonly referred to in Scripture. Sugar and toddy are prepared from its juice. *P. sylvestris*, the wild date-palm, is the plant from which most of the palm sugar used in the East is obtained. It is a native of India, where it is said 130,000,000 lbs. of sugar are obtained from it annually. *P. farinifera* yields an inferior kind of sago, used as food in some parts of India.

Phonography, *fo-nog'-ra-fe* (Gr. *phone*, a voice; *grapho*, I write), a method of writing short-hand, invented by Isaac Pitman, of Bath, in 1837; since that time, however, it has been considerably modified. The system professes to be founded on the analysis of the sounds of the English language; from which circumstance it derives its name. All the consonants are represented by straight lines and curves. In the table given by Mr. Pitman, the first sixteen consonants are in pairs, represented by light and by heavy straight lines and curves, corresponding with their relative sounds. Thus the sounds of *p* and *b* at the commencement of the words pin and bin are made by the same articulations, the lips being first compressed together, and then thrown suddenly apart by the expulsion of the breath. The first is a whispered sound, the latter is sub-vocal, in which the muscles of the larynx are called into play. In phonography, the *p* is represented by a light line, inclining from left to right; and a *b* by a similarly sloping heavy line. The same principle is applied to the other pairs; *t* and *d* being represented by perpendicular lines, one thin and the other thick. The articulations of the next pair, *ch* and *j*, resemble each other in a similar manner, as in chest and jest; the same holding good for *k* and *g*, as in Kate and gate; for *f* and *v*, as in feel and veal; of the pair marked *th*, as in thought and thus; of *s* and *z*, as in seal and zeal; and of *sh* and *zh*, as in sure and azure. The vowels are represented by dots and short dashes, which are made heavy and light, to represent long and short vowels. For a full explanation of the method of writing short-hand by phonography, the reader is referred to Pitman's *Manual of Phonography*.

Phormium, *for'-me-um* (Gr. *phormos*, a basket, alluding to the use made of the plant in its native

country), in Bot., a gen. of the nat. ord. *Liliaceæ*. *P. tenax* is a native of New Zealand. The fibre obtained from its leaves has great strength, and is much used for cordage, and, to a limited extent, for linen. It is called New Zealand flax.

PHOSGENE GAS, *foz'-jen*, in Chem., COCl, chlorocarbonic acid. It has received its name from the circumstance of its being formed by the action of light on a mixture of carbonic oxide and chlorine.

PHOSPHORESCENCE, *fos-for-es'-ens* (either derived from its resemblance to slowly oxidizing phosphorus, or directly from the Gr. *phos*, light; *phero*, I bring), a property which certain bodies possess of becoming luminous under certain conditions, without undergoing combustion. This luminosity is usually faint, and emitted continuously rather than by flashes, for a period varying from a small fraction of a second to several minutes, or even hours. Phosphorescence is observed not only among organized matter, living and dead, but also among a large number of mineral bodies in the solid state, after they have been exposed to extraneous sources of light. Two pieces of quartz on being rubbed together emit light; and a phosphorescent light is seen when two pieces of loaf-sugar are rubbed together in the dark. A variety of blende (sulphide of zinc), on being scratched with a knife, emits a fine yellow light. It has been found that the phosphorescent light of minerals has the same properties as the direct light of the sun. Amongst those mineral substances which emit light in consequence of the action of extraneous light, the most powerful is Canton's phosphorus. It is formed by mixing three parts of powdered oyster-shells with one part of sulphur, and ramming the mixture into a crucible, and igniting it for about half an hour. On exposure to sunlight, or to ordinary daylight, or to an electrical explosion, the bright parts will acquire the property of shining in the dark, so as to illuminate the dial of a watch, and make its figures legible. When an electric discharge is passed along the surfaces of certain bodies, or a little above them, phosphorescence is produced. Thus sulphate of barytes gives a bright green light; acetate of potash also a bright green light; and rock crystal first a red, and then a white light. Sir David Brewster found that the following fluids were phosphorescent when poured into a heated iron vessel. Albumen (white of egg), diluted with water; isinglass in solution; saliva; soap and water; solution of rhubarb, common salt, and nitrate of potash; tallow, alcohol, and olive-oil. Several cryptogamous plants have been observed to be luminous in the dark. The *Rhizomorpha phosphorea*, found in the mines of Hesse, exhibits light when the extremities of the plant are broken. Of all luminous organisms, however, the marine animals are the most remarkable; and to them in chief is attributable the general phosphorescence of the ocean. In warm regions and more southerly latitudes, this phenomenon often attains a high degree of brilliancy and beauty; and it would appear that all this light emanates from vast numbers of light-giving animalcules. Certain land insects also, such as the lightning-bug and the glowworm, emit light. Another kind of phosphorescence is that which appears during the decomposition of animal and vegetable matter; and especially observable during the putrefaction of fishes. The subject of phosphorescence has of late years been closely studied by M. Edmond M. Becquerel, and an exhaustive paper of his on the subject occupies the entire number of the *Annales de Chimie et de Physique* for January, 1859.

PHOSPHORIC ACID, *fos-for'-ik* (from *phosphorus*), in Chem., $PO_5$.—This acid is produced by the rapid combustion of phosphorus in oxygen or atmospheric air. When the oxygen is perfectly dry, it is obtained as a mere white flocculent, but very deliquescent powder, hissing when thrown into water, and forming with it hydrated phosphoric acid. When once dissolved, it cannot again be deprived of its water of hydration, except it be combined with a base. There are three different hydrates of phosphoric acid, each of which forms separate salts with the bases. The first of these, $HO.PO_3$, is the monobasic or metaphosphoric acid. It forms with the bases only one class of salts, of which metaphosphate of soda may be taken as the type, $NaO.PO_3$. The second, $2HO.PO_3$, is dibasic, and is known as *pyrophosphoric acid*. It forms two classes of salts with the bases; the soda salts being $NaO.HO.PO_3$ (acid pyrophosphate) and $2NaO.PO_3$ (neutral pyrophosphate). The third acid is the *tribasic*, or *ordinary phosphoric* acid, $3HO.PO_5$. It forms three classes of salts,—the neutral, common, and acid tribasic phosphates. The soda salts are $3NaO.PO_5$ (neutral tribasic phosphate), $2NaO.HO.PO_5$ (ordinary tribasic phosphate), and $NaO.2HO.PO_5$ (acid tribasic phosphate). Besides these three, there are other modifications of phosphoric acid, which cannot be described here.—*Ref.* Miller's *Elements of Chemistry*, Part III. p. 601.

PHOSPHOROUS ACID, *fos'-fo-rus*, $PO_3$.—This acid is produced by placing sticks of phosphorus in tubes open at both ends, the lower aperture being contracted to prevent the phosphorus from falling through. A number of these tubes being placed in a funnel, the acid, which is highly deliquescent, gradually drains through into the vessel placed beneath. Phosphorous acid is obtained in a pure hydrated form by sending a stream of chlorine through a layer of phosphorus melted under water. Terchloride of phosphorus is formed, and is decomposed at once into hydrochloric and phosphorous acids. Phosphorous acid forms two classes of salts, of which the following are the soda representatives: $2NaO.HO.PO_3$ (neutral phosphate), $NaO.2HO.PO_3$ (acid phosphate). According to Wurtz, an equivalent of water is essential to its composition. He accordingly looks on it as $H_3PO_3$.

PHOSPHORUS, *fos'-for-us* (Gr. *phosphoros*), in Chem.,—symbol P, equiv. 32, spec. grav. of vapour, 4·355.—Phosphorus is found in nature only in a state of combination, chiefly in the form of phosphate of lime, which forms the principal constituent of apatite, phosphorite, coprolites, &c. It seems to be essential to the life of plants, and is found to be concentrated in their seeds. It exists in large proportions in the bodies of animals; in the blood, in the urine, in the hair, in the nervous tissues, and in the bones, of which phosphate of lime forms a large constituent. It was first discovered in urine by Brandt, in 1669. It is now, however, extracted from *bones*. The bones are burned to whiteness in an open fire, and 3 parts of the bone-ash are mixed with 2 of concentrated sulphuric acid, and 18 or 20 of water. The mixture is allowed to stand for two or three days, after which the acid liquid is separated by filtration and pressure. The acid solution, which contains acid phosphate of lime, is evaporated to a syrup, mixed with charcoal, and heated to low redness in an iron pot. When dry, the mass is distilled in an earthen retort, the combustible gases passing out by an opening, and the phosphorus passing through another into water, in which it collects in yellow drops. It is purified by being melted under water and ammonia, and lastly under a solution of bichromate of potash in sulphuric acid. Phosphorus is a soft waxy-looking solid, burning in the air, and emitting white vapours having an alliaceous odour. Its specific gravity is 1·83 at 50° Fahr. It fuses at 111·6°, and may be distilled unchanged, in close vessels, at 550°. It is insoluble in water, slightly soluble in ether, but more so in naphtha. It is freely dissolved in bisulphide of carbon and chloride of sulphur. It becomes luminous from slow combustion in dry air, and frequently inflames spontaneously. Great care should be taken in handling it, as the slightest friction, when dry, causes it to burst into flame. It may, however, be cut and handled with impunity under water. Phosphorus is capable of assuming several allotropic forms, the most important of which is that generally known as *amorphous phosphorus*. This form may be procured by the process of the discoverer, Professor Schrötter, of Vienna, by heating ordinary phosphorus to 450° or 460° for thirty or forty hours in a current of carbonic acid. Amorphous phosphorus is of a dark purple or brilliant red, according to the temperature at which it is prepared, and differs from the ordinary kind in being uninflammable by the strongest friction, by being inodorous, unchangeable in the air, and insoluble in the ordinary solvents of phosphorus. If rubbed with chlorate of potash, peroxide of lead, or peroxide of manganese, the slightest friction is sufficient to inflame it. It is restored to the ordinary variety by

heating it up to 450° or 500°, when it immediately bursts into flame. It has been applied, with perfect success, to the manufacture of lucifer-matches. The method adopted by Messrs. Bryant & May in the manufacture of their "safety lights," under Lundström's patent, is to tip the match with a mixture of chlorate of potash and oxide of lead or manganese, the friction-tablet on the box being composed of powdered amorphous phosphorus, mixed with fine sand or powdered emery. By this means, the elements necessary for frictional combustion are separated, and the danger arising from the accidental inflammation of the match is entirely done away with. The fearful effects produced on the human frame by the vapour of phosphorus are also obviated; the workpeople engaged in the manufacture being free from the attacks of caries of the jawbone, so frequent amongst makers of lucifer-matches by the ordinary process. The making of matches with the ordinary form is, however, still carried on on a very large scale, many tons of phosphorus being annually consumed for the purpose. Owing to its great affinity for oxygen, a solution of phosphorus in bisulphide of carbon is used to reduce silver upon objects about to be electrotyped. Phosphorus is occasionally used in medicine in the form of the hypophosphites of the different bases. It unites with oxygen in four proportions, forming oxide of phosphorus, hypophosphorous acid, phosphorous acid, and phosphoric acid. The two latter are described under their respective headings. Oxide of phosphorus, $P_2O$, is an unimportant compound, formed in a small quantity when phosphorus is burned in air.—*Hypophosphorous acid*, PO, or more probably $HO.PH_2O_2$, has never yet been obtained in an anhydrous form. It is procured, in a hydrated condition, by boiling phosphorus with baryta and water. Hypophosphate of baryta is formed, which may be afterwards decomposed by cautiously adding sulphuric acid. Hypophosphorous acid forms an uncrystallizable syrup, with feebly-marked acid properties. It is interesting from forming a series of salts much used in medicine. A mixture of the hypophosphites of lime, soda, and iron, is known in America as "chemical food." The acid itself has a remarkable action on sulphate of copper. If an excess be added to a solution of the last-named salt and warmed to about 130° Fahr., a solid insoluble hydride of copper is precipitated. With chlorine, phosphorus forms a terchloride and a pentachloride; with iodine, a biniodide and teriodide. It also forms a compound with nitrogen, which has not been investigated. It also forms several compounds with sulphur, one of which is remarkable as containing twelve equivalents of sulphur to one of phosphorus. With methyl, ethyl, and several other bodies, phosphorus seems to play the part of nitrogen, forming with them substances analogous to the compound ammonias, ethylamine, diethylamine, &c.

PHOSPHURETTED HYDROGEN, *fos'-fu-ret-ted*, in Chem.—There are three substances known under this name, having the following formulæ:—$P_2H$ (solid), $PH_3$ (liquid), and $PH_2$ (gaseous). The latter only need be described. It may be obtained by boiling fragments of phosphorus in milk of lime, heated in a flask to which a delivery-tube is attached. As soon as the gas escapes, it inflames spontaneously in the air, and may be collected over water. It owes its spontaneous inflammability to the formation of a small quantity of the liquid gas ($PH_3$), which becomes decomposed by keeping. Its spontaneously inflammable properties may also be destroyed by hydrochloric acid, and restored by an oxidizing agent, such as binoxide of nitrogen. The analogy of this substance to ammonia is remarkable. It unites with hydriodic acid, forming a compound similar to chloride of ammonium. It also unites with the higher oxides of tin, antimony, and other metals, forming white saline compounds. It is frequently called phosphamine from this property.

PHOTOGRAPHY, *fo-tog'-ra-fe* (Gr. *photos*, light; *grapho*, I describe), is the art of impressing images upon metal or other surfaces, by means of the actinic or chemical rays of the sun's light. The principal photographic processes in use are—1. *the Daguerreotype*; 2. *the Talbotype*, or *calotype*; 3. *the waxed paper*; 4. *the albuminized glass*; 5. *the positive, negative, and dry collodion processes*; 6. *the various paper-printing processes*.

*The Daguerreotype process* was discovered in 1839, by M. Daguerre, an eminent French *savant*, and consists in submitting a plate of silver, or silvered copper, to the vapour of iodine and bromine in the dark. A compound of iodide and bromide of silver sensitive to light is thus formed on the surface of the plate, which is immediately exposed to the image of an object in the camera obscura. The image is latently impressed on it, and remains invisible until it is exposed to the vapour of mercury, when the details become gradually developed upon those parts of the sensitive layer which have been acted on by the light. The amount of white mercurial deposit formed is in exact proportion to the strength of the light which has fallen from the different parts of the object, giving perfect gradation of light and shade, from pure white to deep black. The unaltered sensitive layer is then removed with a solution of hyposulphite of soda, and the plate is washed and dried. It is finished by receiving a thin transparent film of metallic gold, by a solution of the chloride of that metal being passed over it; after which, it is once more washed and dried, and the process is ended. Daguerreotypes are often coloured to represent nature, with powder colours, which takes away much of the death-like character so much complained of. They are seldom taken now-a-days, being almost entirely superseded by the easier, healthier, and less expensive collodion process.

*The Talbotype*, or *Calotype process*, was invented in 1839, by Mr. Fox Talbot. A piece of good paper, free from water-mark, is saturated with a solution of iodide of potassium, dried, and laid in a bath of nitrate of silver. Iodide of silver is formed on the surface, and the paper is washed and dried. It is rendered sensitive by being laid on a solution of nitrate of silver, mixed with certain proportions of gallic and acetic acids. It is dried, exposed to the image in the camera, and developed with a saturated solution of gallic acid to which a few drops of aceto-nitrate of silver are added. The picture is washed, the unaltered iodide of silver is dissolved out by means of a solution of hyposulphite of soda, or "fixed," as it is technically termed. The hyposulphite is then well washed out, the picture dried once more, and waxed, to render it transparent. The result differs from the daguerreotype, inasmuch as the lights of the picture are dark instead of light, or, in other words, the light has blackened the sensitive layer instead of whitening it. A picture in which the lights and shadows are reversed is called a "negative;" a "positive" being one in which the lights and shadows are as in nature. The waxed talbotype is laid on a piece of sensitive paper, and exposed to the light, which, passing through the *transparent* shadows, and being intercepted by the *opaque* lights, reverses a negative and produces a positive.

*The Waxed paper process* is a modification of the talbotype, in which the paper is waxed before being sensitized. Both of these processes have been superseded almost entirely by the collodion process.

*The Albuminized glass process* is now practised principally to obtain transparent positives of stereoscopic views. Albumen, or pure white of egg, is mixed with a certain proportion of iodide of potassium or chlorides of sodium, and beaten into a froth. The clear liquor obtained after settlement is poured on a glass plate, drained off, and dried spontaneously or by artificial heat. The plates are rendered sensitive by immersion in nitrate of silver, washed, dried, and exposed to the light, with the negative superposed. They are developed with gallo-nitrate of silver, to which a few drops of acetic acid have been added; after which they are washed and fixed with hyposulphite of soda or cyanide of potassium. There are a very great number of modifications of this process.

*The Collodion process* was discovered by Mr. F. Scott Archer, in 1850. Collodion photographs are of two kinds,—positive and negative. In the former process, the image is developed by protosulphate of iron, which gives a bright silvery deposit, the picture being backed with black varnish or velvet. On holding up a positive to the light, however, it will be found to be a weak negative, the parts which are silvery white when looked

*at*, being dark grey when looked *through*. A negative is developed either by pyrogallic acid alone, or by that substance used in conjunction with protosulphate of iron, the deposit being dense black by transmitted light, and dirty yellow, or brown, by reflection. Every good positive, then, is a bad negative, being too weak to print, and every negative a bad positive, from being too strong and of the wrong colour. Positives are taken by pouring on a clean glass plate a small quantity of collodion, to which an alkaline or metallic iodide has been added. The excess of collodion is run off at the corner, leaving behind a thin film or skin. As soon as the film of iodized collodion has set, which generally occurs in a few seconds, it is plunged into a bath of nitrate of silver. Iodide of silver is formed, and the plate is exposed in the camera while still wet. It is then developed with a solution of protosulphate of iron, to which acetic acid has been added to decrease its developing power, washed and fixed with hyposulphite of soda or cyanide of potassium. A negative is taken in precisely the same manner, except that a thicker and more highly iodized collodion is used; and the picture is developed sometimes with protosulphate of iron, succeeded by pyrogallic acid, and sometimes with pyrogallic acid alone. The exposure in the camera and development are continued much longer, and the plate is coated with transparent varnish.

*The Dry Collodion process* has of late received great attention, from its simplicity and good results. Its advantages are that the plates, when sensitized, will keep for any length of time, and may be developed several days after taking the picture. It would be impossible to give an account of the thousand and one dry collodion processes at present practised. For full directions for working the best of these, the reader is referred to the last edition of Hardwich's "Photographic Manipulation."

Of the various paper-printing processes, the ordinary albumen process is the easiest and best. The paper is first floated on a bath of albumen, in which is dissolved a quantity of chloride of sodium or ammonium. The paper is dried spontaneously or by artificial heat, and presents a highly glossy surface. It is sensitized by being floated on a solution of nitrate of silver, and dried. It is exposed to direct light under a negative until much overprinted, the toning and fixing baths having the effect of lightening it considerably. It is then washed and immersed in a solution of chloride of gold, to which carbonate of soda has been added, to insure alkalinity. After remaining in this solution for a few seconds, the print begins to change, passing from red to black, through the intermediate stages of chestnut, purple-brown, purple, and black, at any of which it may be stopped, according to the taste of the operator. It is then washed and plunged into a solution of hyposulphite of soda, to which carbonate of soda has been added. The hyposulphite of soda removes the chloride of silver, which has not been acted on by the light, and the picture is so far fixed. It is now washed for at least twenty-four hours, the water being changed many times, in order to remove every particle of the hyposulphite of soda, without which the print will infallibly fade. The finished picture should be mounted with *fresh* starch or gum. Some operators omit the albumen altogether, from the gloss being objected to by artists who colour photographs. There are many other printing processes, but none of them obtain so largely as the ones described. The carbon printing process has lately attracted great attention. Although not equal in its results to those obtained by the use of albumen and silver, it has reached very great perfection in the hands of Messrs. Walker & Son, of Norwood. The process consists in covering the surface of the paper with a solution of bichromate of potash and gelatine, to which a certain amount of carbon in a finely divided condition is added. The blackened paper is exposed to the light, under the plate from which an impression is to be taken, and washed in plain water. Wherever the light has struck, the chromic acid enters into combination with the gelatine, forming a hard mass, insoluble in water, the rest being easily dissolved out.

***Photogalvanography*** is the invention of Herr





Pretsch, of Vienna. A glass plate is coated with gelatine and bichromate of potash, to which have been added certain ingredients to produce what is technically termed "a grain." An image is impressed in the usual manner, and when water is applied to the film, the parts not acted on by light swell up, whilst those upon which it has acted become hardened, and remain as before; the image is therefore in intaglio, as in an engraved plate. From this a gutta-percha cast is taken, upon which copper is deposited to the required thickness by the electrotype process. The copper-plate thus obtained may be used in the ordinary manner. Photolithography, in the hands of Colonel Sir Henry James, has reached a position of great importance. A lithographic stone is covered with gelatine and bichromate of potash, and a photographic impression printed in the usual manner. The stone is then damped with water, which is absorbed by those portions upon which the light has not acted. The greasy ink being passed over the wet stone, adheres to the sunned portions forming the image, and a print is pulled in the ordinary way. This process is mainly used for reducing and enlarging maps, many thousands being saved to the country annually by its employment in connection with the Ordnance Survey. Various processes of engraving by light, on steel and copper plates, have been devised, but none of them have as yet succeeded. It would take up too much space to give full directions for the successful practice of all the various processes used. For any information on the subject, other than is contained in the following paragraphs, the reader is referred to the "Manual of Photographic Chemistry," by F. Hardwich. Churchill, New Burlington Street. *7s. 6d.*

*Negative and Positive Collodion Processes.*—The glass to be used should be patent plate, and slightly ground at the edges. It is to be cleaned with a paste of common whiting and water, to which common washing soda has been added, in the proportion of one ounce to a pint. Use plenty of water to wash off, and wipe clean with a glass-cloth, kept for the purpose. Before using the plate, it should be brushed with a camel's-hair pencil, to remove any flue which may have remained on it from the cloth. Thomas's, Rouch's, or Ponting's collodion should be used, home-made collodion being generally worthless. The collodion is poured on the plate while held in a horizontal position, a slight inclination to each corner being given, to insure the coating of the whole surface. The excess is poured back into the bottle, and a rocking motion is given to the plate, to prevent the formation of ropy lines. The plate is then plunged into one of the following baths:—*Negative bath.*—Pure neutral nitrate of silver, 30 grains; distilled water, 1 ounce. Dissolve, and add pure iodide of potassium until the precipitate formed is no longer redissolved; filter, and add to each 4 ounces 1 drop of glacial acetic acid and 1 drachm of alcohol. *Positive bath.*—Nitrate of silver, as above, 40 grains; distilled water, 1 ounce; nitric acid, 1 drop. Saturate with iodide of potassium, as above, and filter. The coated plate is steadily plunged into the bath the moment it begins to set, and allowed to remain therein until the greasy surface is no longer perceptible on its withdrawal. It is drained carefully, and placed in the carrier, exposed to the light in the camera by one or other of the following solutions:—1. Pyrogallic acid, 4 grains; glacial acetic acid, 1 drachm; alcohol, 1 drachm; water, 4 ounces. 2. Protosulphate of iron, 1 drachm; glacial acetic acid, 2 drachms; alcohol, 1 drachm; water, 4 ounces. No. 1 should be used for negatives in fine clear warm weather. No. 2 is a positive developer. In winter it is used as a negative developer, the details being fully strengthened by continuing the development with No. 1, with a few drops of nitrate of silver added. As to the length of exposure and development, it is a matter which can only be learned by practice, and by printing with a few good negatives taken by a proficient. When all the details are fully out, the plate is washed, and a solution of cyanide of potassium, of the strength of 8 or 10 grains to the ounce, is poured over it. This dissolves out the iodide of silver, which has remained unacted on by the light, and clears the picture. It is once more well washed, dried, and varnished. The best transparent varnish is that made by Soehnée, of Paris. The plate

should be warmed, and the varnish poured over it in the same manner as the collodion in the first part of the process. As soon as the varnish has been poured off, the plate should be again slightly warmed; otherwise, the varnish will chill and become opaque. If a negative, this ends the process; if a positive, a piece of black velvet should be placed behind the picture, to throw up the details. The plate should be sensitized, and developed in a room to which only yellow light is admitted. This is easily effected by tacking up a few thicknesses of yellow calico to the window, and carefully excluding all accidental rays of white light proceeding even from the smallest crevices. All the other operations ought to be done in the ordinary light of day.

*Printing Process.*—Albuminized paper should be bought, and not made. To sensitize it, it should be laid down carefully on the surface of the following solution, contained in a flat dish:—Nitrate of silver, 80 grains; distilled water, 1 ounce. Leave the paper on the solution for five minutes; drain, and dry in the dark. When dry, lay it under the negative in the pressure-frame provided for the purpose, and expose to the light until the print is many shades darker than is ultimately intended. Wash well in water for twenty minutes, and plunge in the following solution until it has reached a full greyish-black:—Chloride of gold, 1 grain; distilled water, 10 ounces; carbonate of soda, 2 grains. In cold weather, the warmth of boiling water will be necessary. When fully toned, wash well, and fix in a solution of 6 ounces hyposulphite of soda to 1 pint of water, to which has been added a lump of common washing soda the size of a walnut. When fixed, wash for twenty-four hours in a stream of running water, or in a large vessel, taking care to change the water at least six times in the first three or four hours.

PHOTOMETER, *fo-tom'-e-ter* (Gr. *phos*, light; *metron*, a measure), an instrument intended to indicate the different quantities of light, as on a cloudy or a bright day, or for measuring the relative intensities of light or illumination. Photometers have been invented by Count Rumford, M. de Saussure, Professors Leslie, Ritchie, Wheatstone, and others. The essential principle of Leslie's instrument is a glass tube, like a reversed siphon, whose two branches should be equal in height, and terminated by two balls of equal diameter, one of which is of black enamel, and the other of glass, into which some liquid is placed. The use of this instrument depends upon the principle, that, when light is absorbed by a body, it produces a heat proportional to the absorption of light. The rays of light absorbed by the dark colour heat the interior air, which reacts upon the liquid; and the motion of the liquor is measured by a graduated scale, the zero of which is placed towards the top of the branch that is terminated in the enamelled ball. Wheatstone's photometer is a small sphere with a reflecting surface, which, being placed between the two lights to be compared, the spectator sees each light on it, the two being reflected from different points in the sphere's surface. By an ingenious contrivance, a rapid looped motion is given to the ball, and, by the principle of the *persistence of impressions*, the spectator immediately sees two looped curves of different degrees of brightness. The brighter light is then removed till both the curves seem of equal brightness, when the intensities of the luminous points are as the squares of the distances.

PHRASEOLOGY, *frai-ze-ol'-o-je* (Gr. *phrasis*, speech, and *logos*, discourse), is, properly, the science of language or expression; but it is commonly used to signify the peculiarities of style of a writer, class of persons, &c.

PHRENITIS, *fre-ni'-tis* (Gr. *phrenes*, from *phren*, the mind), in Med., is inflammation of the brain, or any of its membranes. (*See* BRAIN, DISEASES OF THE.) The term phren or phrenic was anciently applied to the diaphragm, as being the supposed seat of the soul. From the same root we have the term *phrensy*.

PHRENOLOGY, *fre-nol'-o-je* (Gr. *phren*, the mind, and *logos*, discourse), signifies, literally, a discourse on mind, or the science of mind; but is applied exclusively to that system of philosophy which professes to find in the outward configuration of the skull an index of the faculties of the mind. The founder of this system was Dr. Gall, a German physician (1758—1828). He was a man of undoubted ability, and independently of his labours in the cause of phrenology, rendered unquestionable service to the cause of anatomy and physiology, more particularly in connection with the brain and its functions. Many of the principles which he was the first to advance are now generally acknowledged by scientific men. To such a degree of perfection did he bring the science of phrenology, that up to this time his successors can scarcely be said to have done more than popularize it. The two who have been chiefly distinguished in this way are Dr. Spurzheim and the late George Combe, of Edinburgh. Gall's attention is said to have been first called to this subject when a boy at school, by observing that one of his companions, who always overmatched him in the power of committing words to memory, had a marked prominence of the eyes. Extending his observations, he found that others who were remarkable for their word-memory, likewise possessed prominent eyes; and hence he was confirmed in his opinion that some correspondence existed between the two. He was also led to believe that other mental faculties might have their outward manifestations in the same way; and set himself to examining heads, and studying marked features of character. He was soon struck with t[he] remarkable differences in form and size that existed in different skulls; promiuences and hollows existing in some that were not to be found in others. These he came to associate with certain marked features of character in the individuals, and thus, at length, he constructed a system of mental philosophy, which professes to ascertain the mental character of individuals from the outward configuration of the skull. It is now generally agreed that the brain is that part of the body by means of which the various powers or faculties of the mind are manifested. Phrenology further maintains that each faculty of the mind has a particular part of the brain for its organ; and that, *cæteris paribus* (other things being equal), the strength or power of each faculty depends upon the size of the part of the brain appropriated to it. Further, they hold that the brain is double, each organ existing in both hemispheres of the brain. In judging of the organs of various individuals, there are other elements besides size to be taken into account; as, for instance, the temperament of the individual, general health, education, &c. With a nervous or sanguineous temperament, the mind will act much more vigorously than with a lymphatic or bilious one; in vigorous health, the brain, like the other physical organs, is in general more active and capable of greater exertion; while an educated or exercised brain acts more vigorously than one that has been little cultivated. Phrenology also asserts the principle that the exercise of an organ improves the nature of the organ, and also increases it in size. (*See* BRAIN.) The rules laid down by phrenologists by which to determine what mental powers are to be considered as primitive or original, and to have separate organs for their manifestation, are the following:—(1) That it exists in one kind of animal and not in another; (2) that it varies in the different sexes of the same species; (3) that it is not proportionate to the other faculties of the same individual; (4) that it does not manifest itself simultaneously with the other faculties, *i.e.*, that it appears or disappears earlier or later than they; (5) that it may act or repose singly; (6) that it is individually propagated in a distinct manner from parents to children; and (7) that it may singly preserve its proper state of health, or be affected by disease. In accordance with these rules, Gall enumerated nearly thirty primitive mental faculties, which have since been augmented by his successors to thirty-five. These faculties are divided into three classes,—the intellectual or perceptive, the sentiments or emotions, and the animal propensities. To the first of these is assigned the anterior portion of the head; the second occupies the middle and upper; while the posterior region and the cerebellum are assigned to the third and lowest division. The several organs are:—1. *Amativeness*, or the propensity to physical love. 2. *Philoprogenitiveness*, or love of offspring. 3. *Concentrativeness*, or the power of continuing impressions or ideas; or, according to others,

*Inhabitiveness*, which produces love of home, and leads each species of animal to seek that place of abode and mode of life that is best suited for it. 4. *Adhesiveness*, or the desire to attach ourselves to particular persons or objects. 5. *Combativeness*, or the natural disposition which persons feel in various degrees to quarrel and fight. 6. *Destructiveness*, or the propensity to destroy. 7. *Secretiveness*, or the propensity to act in a secret or clandestine manner. 8. *Acquisitiveness*, or the proponsity to acquire or accumulate. 9. *Constructiveness*, the faculty which leads to construction of all kinds, and creates a desire to apply oneself to the mechanical arts. 10. *Self-esteem*, which leads an individual to have a high opinion of himself, and produces pride and arrogance. 11. *Love of Approbation*, or the pleasure we derive from the commendations which we receive from others. 12. *Cautiousness*, the disposition of mind which leads one to take precautions in what he is going to do. 13. *Benevolence*, or that disposition of mind which induces compassion, kindness, mildness, charity. 14. *Veneration*, regarded by Dr. Gall as the organ of religion, but now viewed in a much more general sense, so as to include respect in general, whether extended to the Supreme Being, or to human beings, or inanimate objects. 15. *Firmness*, or the faculty which gives constancy and perseverance to the other powers. 16. *Conscientiousness*, that innate principle of the human mind which disposes one to do and to look for justice. 17. *Hope*, which disposes men to believe in the possibility of that which their other faculties desire. 18. *Wonder*, the sentiment which leads men to believe in the marvellous and supernatural. 19. *Ideality*, which confers a poetical or ideal disposition. 20. *Wit* disposes men to view everything in a gay or joyful manner; and, according as it is affected by the other faculties, produces wit, good-humour, irony, sarcasm, caricature, &c. 21. *Imitation*, the faculty by which an individual is led to imitate the voice, gesture, manners, &c., of others. 22. *Individuality*, or the faculty which recognizes the existence of individual things. 23. *Form* or *Configuration*, by which we take cognizance of the forms and figures of external objects. 24. *Size*, that faculty which measures the size of bodies as distinguished from their form. 25. *Weight*, by which we estimate the weight, density, resistance, &c., of bodies. 26. *Colour*, or the faculty of perceiving colours. 27. *Locality*, the power of recollecting localities. 28. *Calculation* or *Number*, the power of calculation. 29. *Order*, the faculty which gives a disposition to arrange and put things in order. 30. *Eventuality*, or the faculty of attending to events, or whatever happens around them. 31. *Time*, or the faculty which judges of duration. 32. *Tune*, or the perception of musical tone. 33. *Language*, the faculty by which we learn artificial signs. 34. *Comparison*, the faculty which compares sensations and ideas excited by the other faculties, and points out their difference, similitude, identity, &c. 35. *Causality*, the faculty by which men study the causes and origins of things. Perhaps the first thing that will occur to one on turning his attention to this system, will be its great simplicity. The science of mind is the most complex and incomprehensive of all sciences; and of the many difficult problems of physiology, there are none more difficult than those connected with the functions of the brain. Yet, if phrenology be true, mental philosophy is so simple, that he that runs may read; and the physiology of the brain is more advanced than that of any other organ of the body. When we come to examine it more minutely, we find it redundant in some faculties and deficient in others. For instance, the organs for form and size, combativeness and destructiveness, are, if not identical, at all events very closely allied: whilst, on the other hand, we have no organs for jealousy, love of power, self-preservation, &c. That distinct faculties of the mind have different parts of the brain as their organs there is every reason to believe. The various other functions of the body are manifested by distinct organisms, each organ performing its separate function in the animal economy. The eye, the ear, the heart, &c., are all made up of distinct parts, each having their separate office to perform. Even the nerves, which are apparently simple, are found, on examination, to be composed of distinct parts, performing distinct functions. Further, we find





the several mental functions manifested in different degrees by different individuals, some having a propensity or aptitude for one kind of pursuit, others for another. It is difficult to suppose how this could be the case did the manifestation of each faculty depend upon the whole brain. In insanity, too, we frequently find that one function only of the mind is deranged, the others remaining in a normal condition. Some of the faculties, again, are most vigorous in youth, and decay towards middle life; while others retain their full strength, and even increase in power, down to old age. The great objection to phrenology applies to the mapping out of the different faculties, which is both unphilosophical and not established by sufficient proofs. Sir William Hamilton asserts that the phrenological system "is the result, not of experience, but of conjecture,—that Gall, instead of deducing the faculties from the organs, and generalizing both from particular observation, first of all excogitated a faculty *à priori*, and then looked about for an organ with which to connect it. In short, phrenology was not discovered, but invented." There can be little doubt that this is, in a great measure, true; for even phrenologists themselves are by no means agreed as to the situation and functions of various of the faculties, nor, indeed, as to their number. In the "Daratellung" of Fromess, a favourite pupil of Gall, under whose eye the work was published in 1800, twenty-two organs are given, of which the greater proportion are now either translated to new localities, or altogether thrown out. Even the uncertainty of the means of judging of an organ must very much lessen its value and deprive it of confidence. The means taken to determine the size of an organ are of a very rude and imperfect description—tape-line and compasses; while such elements as the hair, thickness of the skull, &c., they have no means of accurately determining. Besides the size of an organ, there are a variety of other things to be taken into account in judging of the quality of it; as temperament, texture of brains, culture, &c., which are more or less unknown quantities; but yet upon them very much depends. Brains differ much in texture; and a small brain of fine compact texture will be found superior to one which is much larger, but the reverse. It is probable that the other conditions are fully as important as size, and yet the general practice of phrenologists is only to refer to these when they find that taking size alone does not correspond with their views. Besides, a portion of the brain may be as liable to be of finer quality than another, as to be of larger quantity than another,—a circumstance which local diseases of the brain seem to prove. In many cases where the size of particular organs does not correspond with the apparent energy of the functions usually allotted to them, the discrepancy is accounted for by the excess or defect of some other organ. A man with combativeness large may yet be a most peaceable and amiable person, merely because his self-esteem, love of approbation, benevolence, or some other faculty, happens to be larger. This overlapping and interfering with each other, of the different faculties, affords an easy escape from errors, and must, in an equal degree, deprive the system of general confidence. Further, there are no divisions on the brain to correspond with the organs of phrenologists. When we come to apply phrenology to the lower animals, we find that it entirely fails. This was a point on which, at first, phrenologists greatly depended, but which they have now given up, maintaining that only the brains of different individuals of the same species can be compared together; for, though the lower animals possess many of the faculties of the human species, yet, from peculiarities of form and structure, they do not admit of comparison. This is manifestly contrary to what we observe in other instances, and of itself calculated to excite suspicion. Where we have the same organs in the lower animals as in man, we invariably find them performing the same functions. The ear, the eye, the mouth, &c., are all formed upon the same principles. The part of the brain that is found decreasing as we descend in the scale of vertebrate animals is not, as might be supposed, the anterior, the seat in man of the intellectual faculties, but the posterior, in which are placed the organs of the animal propensities. The phrenological

function of the cerebellum is almost equally powerful in all species of animals; and yet we find the absolute and proportionate size of the cerebellum to regularly diminish as one descends through the various species of vertebrata. Taking all these circumstances into account, we are of opinion that sufficient evidence has not yet been advanced in support of phrenology. But, while we thus withhold our assent to it as a science, its advocates are deserving of all praise for their efforts in diffusing sound views on the subject of physical health; for it is to the credit of phrenology that it is eminently practical.

PHTHISIS, or CONSUMPTION, *ti'-sis* (Gr. *phthio*, I consume), in Med., is a disease which, unfortunately, is but too prevalent and fatal in this country, as in most others, though, perhaps, there is no country where its ravages are so great as in England. It spares neither age nor sex, and its attacks, at first so insidious as almost to escape notice, but too frequently lead to a fatal issue. It is the result of the formation and development of tubercles in the lungs. These first appear in the form of small grey semi-transparent granulations, which gradually enlarge and become opaque, and after a time empty themselves into the bronchial tubes, and thus gradually destroy the substance of the lung. The causes of this disease are divided into remote and exciting: of the former, the most important is hereditary predisposition. It is not, however, an actual cause of the disease; and hence there are many cases in which the children of consumptive parents do not fall a prey to this disease; but it renders those who are in that condition much more liable to be affected by the exciting causes. Whatever weakens the strength of the system, or interferes with the oxygenation of the blood, tends to the production of this disease. Hence living in bad air, insufficient and unwholesome food, and sedentary pursuits, tend to it. Among the more exciting causes, are exposure to cold or damp, especially after the body has been previously heated, intemperance of any kind, profuse evacuations, and exposure to the reception of dust into the lungs, as in the case of certain artificers, needle-pointers, stone-cutters, and the like. The earliest symptom of consumption that usually manifests itself is a short dry cough, exciting no particular attention, being attributed to a slight cold. It, however, continues, and after a time increases in frequency. The breathing is more easily hurried by bodily motion, and the pulse becomes more frequent, particularly [after meals and towards evening. Towards evening, there is also frequently experienced a slight degree of chilliness, followed by heat and nocturnal perspirations. The patient becomes languid and indolent, and gradually loses strength. After a time, the cough becomes more frequent, and is particularly troublesome during the night, accompanied by an expectoration of a clear frothy substance, which afterwards becomes more copious, viscid, and opaque, and is most considerable in the morning; the *sputa* are often tinged with blood, or hæmoptysis occurs in a more marked form, and to a greater extent. As the disease advances, the breathing and pulse become more hurried; the fever is greater, and the perspirations more regular and profuse. The emaciation and weakness go on increasing, a pain is felt in some part of the thorax, which is increased by coughing, and sometimes becomes so acute as to prevent the patient from lying on the affected side. All the symptoms increase towards evening: the face is flushed; the palms of the hands and soles of the feet are affected with a burning heat; the feet and ankles begin to swell; and in the last stage of consumption there is nearly always profuse diarrhœa. The emaciation is extreme; the countenance assumes a cadaverous appearance, the cheeks are prominent, the eyes hollow and languid. Usually the appetite remains entire till the end, and the patient flatters himself with the hope of a speedy recovery, often vainly forming distant projects of interest or amusement, when death puts a period to his existence. Tubercular deposits are also usually found in other organs of the body; the liver is enlarged and changes in appearance, and ulcerations occur in the intestines, the larynx, and trachea. These are so frequent and uniform as to lead to the belief that they form part of the disease. It is of





the utmost importance to be able to destroy the earliest approach of this disease. The constitutions that are most liable to its attack are generally characterised either by a fair, delicate, rosy complexion, fair hair, clear skin, and great sensibility, or by dark complexion, large features, thick and sallow skin, and heavy general expression. The development of the disease is preceded by a peculiar form of indigestion, known as "strumous dyspepsia." It is specially characterized by a dislike of fatty food, sometimes also of sugar and alcohol, and is accompanied with heartburn and acid eructations after taking food. Unlike inflammation, tubercles almost invariably commence at the apex of the lungs, and it is here that they are usually most advanced. It is here, then, that the skilful physician, by means of auscultation and percussion (which *see*), is able to detect the first direct symptoms of the incipient disease. The treatment of this disease is of two kinds,—the one directed to strengthening the system for its prevention in those predisposed to it, or overcoming it in its incipient stages; the other to arresting its progress after the tubercles have manifested themselves. The former class comprises a proper attention to the digestive organs, with wholesome diet, exercise in the open air, regular habits, attention to the skin, and, if necessary, change of air. The diet should be nutritious, but not stimulant, and e exercise not violent or too prolonged. Sea va ages, or residence at the sea-side, are generally found to be very beneficial; and, as a general rule, those places that are least subject to variations of temperature are recommended. In this country, Hastings, Torquay, and the Isle of Wight; abroad, Madeira, Nice, Algeria, are the places chiefly recommended to consumptive patients. The practice, however, of sending patients in the last stage of consumption to a foreign country cannot be too strongly reprobated. Of the more directly curative remedies unquestionably the most valuable is cod-liver oil. It should be taken in small quantities at first, probably a tea-spoonful three times a day, during, or immediately after meals; and the effect is greatly to improve the appearance of the patient, and to counteract the progress of the disease. If taken early, the tuberculous deposit may be arrested, and the patient restored to a state of health; and, even where this is not the case, the progress of the disease will at least be retarded. Tonic medicines, such as bark, sarsaparilla, iron, and iodine, are also very beneficial in the treatment of phthisis; at least in those cases where inflammation or much febrile excitement does not exist. Where inflammation already exists, it may be subdued by small bleedings repeated at intervals of a few days or a week, by leeches applied over the site of the tubercular deposits, or by counter-irritants to the upper parts of the chest. These are the general remedies to be employed; the more prominent special features of the disease require particular medicines. One of the most distressing and harassing of these is the cough, which may be alleviated by the application of sinapisms or stimulating plasters to the chest, or by the internal use of mucilaginous mixtures, squills, conium, opium, ether, &c. The night perspirations, when very copious, are best checked by the use of mineral acids; as sulphuric acid given with quinine, or nitric acid in a decoction of sarsaparilla. Diarrhœa commonly subsides by a strict regulation of the diet, and the avoidance of all stimulating food and medicine; otherwise small doses of chalk and opium, or rhubarb and opium, may be administered. When the pulse is very frequent and the palpitation distressing, digitalis may be used. (*See* HÆMOPTYSIS, for the treatment of that symptom.) The duration of this disease depends upon a great variety of circumstances, and varies from a few months up to four, five, or more years; the average, however, may be taken at about two years; but many of the cases terminate fatally between the fourth and ninth month. The question as to whether phthisis be contagious has often been discussed, and medical men are by no means unanimous on the subject. The majority are probably in favour of its being non-contagious; though there are not wanting weight and numbers on the other side, to which, indeed, the present writer believes that he has had evidence for adhering. At all events, no one should be allowed to

sleep with a consumptive patient after the disease has fully manifested itself.

PHYLACTERY, *fe-lăk'-te-re* (Gr. *phulakterion*, a protection, preservation), is generally applied to an amulet, or preservative against infection. The phylacteries of the Jews consisted of slips of parchment, on which were written portions of the law, and which were inclosed in cases and worn on the arms and between the eyes during prayer. Some of the Christian fathers apply this term to the sacraments.

PHYLLOTAXIS, *fil'-lo-tăk'-sis* (Gr. *phullon*, a leaf; *taxis*, arrangement), in Bot., the arrangement of leaves on the stem. The laws which regulate the development of leaves have been carefully studied, and botanists have arrived at the conclusion that all leaves and their modifications have normally a spiral arrangement on the stem. This arrangement is not evident when the *internodes* (*see* LEAF) are suppressed; but in *alternate* leaves it can generally be made out. We may here state that leaves are said to be *alternate* when a single leaf is produced at a *node*, and the nodes are separated, so that each leaf occurs at a different height on the stem. The spiral growth of such leaves was first noticed by Bonnet, nearly a century ago. He observed that if a line were drawn from the bottom to the top of a stem, so as to touch in succession the bases of the different leaves, it would describe a spiral; he found, also, that the relation of the leaves to each other was constant, each being separated from the other by an equal distance; so that if he started with a particular leaf and waited till another leaf was reached which corresponded vertically with it, the next would also correspond vertically with the one next above that from which he started; and so on, each leaf in succession above would be placed in a vertical line over one of the successive leaves below. Thus, in a branch of apple- or cherry-tree, if we commence with any particular leaf, which we number 1, and proceed upwards, we shall find that we pass leaves 2, 3, 4, 5 before we reach a leaf corresponding vertically with 1. Proceeding upwards, we shall find that 7 will be directly over 2, 8 over 3, 9 over 4, 10 over 5, and 11 in a line with both 6 and 1. In this case, it is evident that five leaves are required to complete a series or *cycle*. This *five-ranked*, or *pentastichous* arrangement, is by far the most common in dicotyledonous plants. When a cycle consists of only two leaves (3 over 1, 4 over 2, and so on) the arrangement is *two-ranked*, or *distichous*. This is the normal arrangement in the grasses, and is also seen in the lime-tree. The *three-ranked*, or *tristichous* arrangement (4 over 1, 5 over 2), may be noticed in the greater number of monocotyledonous plants. The *eight-ranked*, or *octastichous* arrangement (9 over 1, 10 over 2), occurs in the holly. In a case where a cycle is composed of a great number of leaves, or modifications of leaves, placed close together, as in the pine-apple or the fir cone, the spiral arrangement is at once evident. The suppression of the internodes, or spaces between the nodes, may render the spiral arrangement of some leaves obscure; but it can be proved that all leaves are developed in this way. When two leaves are produced at a node, they are usually placed on opposite sides of the stem, in which case they are said to be *opposite*. When three or more leaves arise from the stem, so as to be arranged round it in a circular manner, they are said to be *verticillate*, or *whorled*, and each circle formed by them is termed a *vertical* or a *whorl*. Only one leaf can arise from the same point; but it sometimes happens that a number of leaves are brought into contact by the suppression of the internodes of a branch; in which case they form a *tuft* or *fascicle*, and are themselves said to be *tufted* or *fascicled*.

PHYSICAL FORCES, CORRELATION OF THE. (*See* FORCE, FORCES.)

PHYSICAL GEOGRAPHY, *fiz'-e-kăl* (Gr. *ge*, the earth, and *graphe*, a description), is, strictly, a description of the physical features of the earth; but it has come to receive a much wider signification, so as to include, also, the climate, temperature, &c., of the globe, and its various animal and vegetable productions. It is understood to be limited chiefly to general views, deducted from the various observed phenomena, and is an attempt to reduce to a few general principles the infinite variety of appearances presented to us by nature. This science is of very recent origin, and is still in a very imperfect condition. Comparatively few of the physical phenomena of this earth are yet known to us. There are still great tracts of country that have been visited by no traveller, large portions of the ocean over which a ship has never sailed; man has only penetrated a small portion of the crust of the earth, has only ascended a very little way into the atmosphere above. Few appearances has he yet been able to account for or classify. Many of the animal and vegetable products are yet unknown. Astronomy teaches us that the earth which we inhabit is only one of a number of globes or planets, that revolve, at different distances and in different periods, round the sun as a common centre. Its orbit is elliptical, but it differs little from a circle, its mean distance from the sun being about ninety-five millions of miles; but it is about 3,200,000 miles nearer that luminary at one period of the year than another. It performs its revolution in 365 days, 5 hours, 48 minutes, 50 seconds; the mean rate at which it travels being 68,000 miles an hour. Besides this motion round the sun, the earth has a rotatory motion round its axis, which it completes every 24 hours, or, more strictly speaking, every 23 hours, 56 minutes, 4 seconds. To the former of these motions we are indebted for the changes of the seasons; to the latter for the alternation of day and night. The form of the earth is not strictly spherical, but is a little flattened at each of the two poles, being what is termed an *oblate spheroid*. Its mean diameter is 7,913 English miles, the equatorial exceeding the polar by 26 miles. For more conveniently and accurately determining the position of places on the earth's surface, geographers have supposed certain lines or circles upon it, known as lines or degrees of latitude and longitude. (*See* LATITUDE and LONGITUDE.) All places lying in the same latitude have equal length of day and night at the same time; while all places in the same longitude have mid-day at the same time. The equator is a line passing round the earth, equally distant from the poles, and dividing it into the northern and southern hemispheres; while another line, at right angles to it, passing through the poles, forms the eastern and western hemispheres. The earth revolves round the sun with its axis constantly inclined to the plane of its orbit at an angle of 66° 32′; and hence the sun is vertical at different parts of the year to all that portion of its surface lying between 23° 28′ N. and 23° 28′ S. of the equator. The ecliptic is an imaginary circle, marking the sun's vertical position as regards the earth. It crosses the equator obliquely at two points, termed the equinoctial points, or nodes. The vernal equinox happens on the 21st of March, the autumnal on the 21st of September. The summer and winter solstices are when the sun is at the greatest distance from the equator, or on the parallel of 23° 28′ N. or S.; the former on 21st June, the latter on 21st December. When the sun is vertical to the equator (*i.e.*, during the vernal and autumnal equinoxes), day and night are of equal length all over the world; and half of the northern and half of the southern hemispheres have day and night at the same time. During the summer solstice the days are longest and the nights shortest in the northern hemisphere, and within the arctic circle it is continual day; while during the winter solstice the reverse of this is the case, and the days are longest and the nights shortest in the southern hemisphere. This region, being thus subject to the greatest amount of heat, is named the torrid zone, and is bounded on the N. by a circle termed the tropic of Cancer, and on the S. by another called the tropic of Capricorn. From this inclination of the earth's axis it also happens that the whole region within 23° 28′ of either pole, or, in other words, above 66° 32′ of N. or S. latitude, has, for a certain period of the year, continual day or continual night. Being least under the sun's influence, they are termed the N. and S. frigid zones, the former being bounded by the Arctic, the latter by the Antarctic circle. Between the torrid and frigid zones lie the N. and S. temperate zones. The earth is surrounded on all sides, and accompanied in all its movements, by an invisible and highly elastic fluid, termed its atmosphere, which is densest upon the surface of the earth, diminishing gradually as it ascends till it entirely ceases. (*See* ATMOSPHERE.)

This is the great sustainer of animal and vegetable life, the diffuser of light and heat, and the vehicle of sound and smell. Whatever disturbs the equilibrium of the atmosphere causes a current of air or wind. The principal cause of winds is solar heat. When a portion of the earth's surface is heated by the solar rays, the column of air resting upon it expands, and rises till it reaches a part of the atmosphere of lower temperature than itself, when it becomes condensed. The air in the equatorial regions, being thus heated by the sun's rays, ascends, while the colder and denser air of the poles rushes in to supply its place. Were the earth motionless, these currents would blow due north and south; but, on account of its rotatory motion, they increase in velocity towards the equator, where they become the N.E. and S.E. trade-winds. (*See* WINDS.) The land and sea breezes are caused by the unequal heating of the land and sea, the land becoming more heated during the day, while at night it gives off a greater amount of heat by radiation than the sea. They are chiefly experienced in tropical sea-coasts. The climate of a country is determined by various causes; as distance from the equator, altitude, proximity to the sea, &c. (*See* CLIMATE.) The different phenomena of rain, snow, ice, thunder, lightning, clouds, &c., come under METEOROLOGY. The entire superficies of the globe is estimated at about 196½ millions of square miles, of which the land occupies about 50½ millions and the water 146 millions, or nearly three-fourths. The greater part of the land is towards the north pole, while the greatest extent of water is in the southern hemisphere. (*See* OCEAN.) The waters of the ocean are kept in constant motion by winds, tides, and currents. The bed of the ocean, like the land, has its hills, mountains, valleys, and plains, and has its inhabitants peculiar to each district. It was formerly believed that all animal and vegetable life ceased below a comparatively moderate depth, on account of the want of light and air, and the increased pressure; but recent investigations have shown that animal life, in its lower, if not in its higher forms, exists at very great depths. Of the depth of the ocean little is known, except that it varies from a few feet up to several miles. To this part of the science belongs also the consideration of lakes, rivers, and springs. The land on the surface of the globe is arranged in the form of large compact masses termed continents, or smaller isolated portions called islands. It lies chiefly in the eastern hemisphere, and north of the equator, there being in the eastern hemisphere about 36,000,000 of square miles, and in the northern about 37,000,000. There are only two large masses of land to which the term continent can properly be applied, being the eastern or old continent, and the western or new continent; the former comprising Europe, Asia, and Africa; the latter, North and South America. Australia may more properly be regarded as the largest of our islands than as a continent. The surface of the land is extremely irregular, sometimes elevated into mountains, sometimes depressed into valleys, and not unfrequently stretched out into plains, varying in extent and elevation. Hills and mountains generally appear in chains or ranges, connected together by a continued base, and forming a line or belt. Several chains connected together by a common centre constitute a group, and several groups form a system. In general, the great mountain-chains of the Old World run from W. to E.; of the New, from N. to S. Compared with the size of the earth, the height of the loftiest mountain (29,000 feet) is quite insignificant, being only about $\frac{1}{745}$ of the earth's radius. Valleys are of different kinds, sometimes wide and open, sometimes deep and narrow, and sometimes basin-shaped, surrounded by an amphitheatre of hills or mountains. Table-lands or plateaus are extensive tracts of country, whose general elevation is considerably above the level of the sea. Plains are extensive tracts of level country only slightly elevated above the sea-level. In different countries, and according to their nature or productions, they are known as deserts, steppes, landes, prairies, savannahs, pampas, llanos. When we come to examine the structure of the earth itself, we find it not, as one at first sight is apt to imagine, a confused congeries of mineral matter without any order or particular arrangement; but that a large portion of its solid materials is arranged in beds or layers, lying parallel to each other, and varying in extent and thickness. Such beds are termed strata, and the science which deals with them is GEOLOGY. These strata are the formation of ages, and a number of them abound in fossiliferous remains of plants and animals, many of which are now extinct. The study of these belongs more particularly to PALÆONTOLOGY. Earthquakes and volcanoes are among the great physical agents still at work in producing change. The surface of the earth is covered with vegetation, varying in nature and character, according to climate and locality. Some plants are very generally distributed over the globe, others occur only in particular countries, and are sometimes confined within very narrow limits. We occasionally meet with what are called centres of plants, where the maxima of a genus or species occur, the numbers diminishing as we recede from these centres. Heat is the great agent in the distribution of plants, some requiring great heat to bring them to perfection, others flourishing best in cold situations. Some require a long winter for repose, and come to maturity in a few weeks of continuous warm weather; others succeed only where both seasons are moderate. Moisture is another agent that exerts a powerful influence in the distribution of plants, and one absolutely necessary to vegetation. The luxuriance of tropical vegetation is in no small degree owing to the great quantity of moisture that prevails; very dry regions being deficient in vegetable products. The character of the soil regulates the distribution of plants, and light is also of the utmost importance to vegetation. The total number of species of plants is estimated at about 200,000, of which only about one-half are known and described. Various attempts have been made to arrange plants into zones or belts, and as heat is the great agent in their distribution, we naturally regard it as the best guide, though it must necessarily be imperfect from the other agents that are also at work. That most commonly adopted divides each hemisphere into eight zones; viz., (1) the equatorial, characterized by the palm and banana, and extending to 15° on both sides of the equator; (2) the tropical, or region of the tree fern and fig-tree, from lat. 15° to the tropics; (3) the sub-tropical, or region of myrtles and laurels, from the tropics to lat. 34°; (4) the warmer temperate, or region of evergreen trees, from lat. 34° to 45°; (5) the colder temperate, or zone of European trees, from lat. 45° to 58°; (6) the sub-arctic, or region of the pine, fir-tree, and willow, from lat. 58° to the polar circle; (7) the arctic, or region of rhododendrons, from the polar circle to lat. 72°; and (8) the polar, or region of alpine plants, beyond lat. 72°. The varieties of vegetation are similarly marked as we ascend from the plain to the top of a mountain. Tournefort was particularly struck with this in ascending Mount Ararat: at the base was the flora of western Asia; as he ascended higher, he reached that of the countries on the north of the Mediterranean; then that of northern Europe; and on reaching the summit, he found the plants of Lapland. Animals are distributed over the globe on principles similar to those which regulate the distribution of plants. Certain species of animals are peculiar to certain districts, and some are much more widely distributed than others; they are, however, not so confined as plants, having the power of locomotion, and having to seek their food. Some animals, though pretty generally diffused, yet attain their greatest development in certain regions. Animal life, like vegetable, is more abundant in tropical regions, and decreases gradually towards the poles. Heat, light, and moisture, each play an important part in determining the distribution of animals. Man also greatly modifies the distribution of animals by extirpating or driving away the larger and more noxious species, and collecting around him those that may be serviceable either for food or labour. By his agricultural operations he removes the food of some, and thus destroys or banishes them; while he provides the natural aliment of others, and thus collects them around him. Such are some of the causes that regulate the distribution of plants; but there are various others, less known and less understood. The total number of existing species of animals has been estimated as follows; viz.:—

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|---|---|---|
| Vertebrata, 17,500. | Mammifers, or those that suckle their young | 1,200 |
| | Aves, or Birds | 6,800 |
| | Reptiles and Amphibia | 1,500 |
| | Pisces, or Fishes | 8,000 |
| Annulosa, 552,500. | Insects | 550,000 |
| | Vermes, or Worms | 2,500 |
| Mollusca, 7,500. | Radiata, or Starfish | 1,000 |
| | Polypi, or Corals | 1,500 |
| | Mollusca — naked, 600; with shells, 4,400 | 5,000 |
| | | 577,500 |

Man is the only species of animal that can exist in any latitude, and under any circumstances, where the higher forms of life can be maintained. He is to be found at home both in equatorial and polar regions; on the burning soil of Africa and the eternal snows of Greenland; in the midst of the civilization of temperate countries, or roaming in the trackless paths of the forest or desert. By reason of his superior wisdom, he is able to suit himself to the circumstances of each particular case, and guard against the colds of winter as well as provide against the dangers of excessive heat. There are various races of man, as will be seen from the article ETHNOLOGY. Their numbers are variously given; and, as may readily be supposed, there is no means of arriving at anything like certainty on the subject. The following are a few of the estimates by persons who may be regarded as best able to form an opinion:—Malte Brun (1810), 640,000,000; Graberg (1813), 686,000,000; Balbi (1816), 704,000,000; Hassel (1824), 638,000,000; Stein (1833), 872,000,000; Bernouilli (1840), 764,000,000; Berghaus (1842) 1,272,000,000; Balbi (1843), 739,000,000; Cannabich (1847); 1,065,000,000; Somerville (1851), 800,000,000; Roon (1855), 961,000,000; Kolb (1857), 970,000,000; Von Klöden (1859), 1,360,000,000, of which he attributes 273,000,000 for Europe, 777,000,000 for Asia, 250,000,000 for Africa, 56,000,000 for America, and 4,000,000 for Australia.—*Ref.* The *Physical Geographies* of Traill, Somerville, and Herschel; *G. A. Von Klöden's Handbuch der physischen Geographie*, Berlin, 1859.

PHYSICIAN, *phiz-zish'-ăn* (Gr. *phusikos*, from *phusis*, nature), originally denoted a natural philosopher, one who investigated the laws and operations of nature; but it is now applied exclusively to those who practise the art of healing, called in Greek *iatroi*, and in Latin *medici*. Among all rude nations, the healing art is practised by the priests, as was the case among the early Egyptians and Greeks. Among the latter, however, medicine soon rose to the rank of a distinct science, and its practitioners were highly honoured and well remunerated. There are still extant several medals struck by the people of Smyrna in honour of different persons belonging to the medical profession; and it seems to have been not uncommon for states to maintain physicians, who were paid at the public cost. A law is said to have existed among the Locrians to the effect that if any one should, during illness, drink wine contrary to the orders of his physician, he should be put to death, even though he should recover, for his disobedience. In the earlier days of Rome, medicine, like all the liberal arts, was despised and its practice confined to slaves and persons of inferior station, and it was only after the Greek arts and letters were cultivated at Rome, that physicians obtained a more honourable standing. Julius Cæsar bestowed the rights of Roman citizenship on foreign physicians practising at Rome; and Augustus, on recovering from a dangerous illness, made his physician an *eques*. The Roman armies, during the empire, were attended by regular surgeons, and many of the stamps with which they sealed their preparations have been found in England and on the continent. Of the previous education necessary to qualify a physician to exercise his profession in early times nothing is known. It was probably under the Christian emperors that physicians were first required to undergo an examination by competent persons before they were permitted to practise. The archiatri, or chiefs of the physicians, were authorized to examine all those that were desirous of practising, and to license them if competent; and if any practised without being so licensed, they were





heavily fined. The title of archiater is said to have been first borne by Andromachus the elder, the physician of Nero, and was probably at first a mere title of honour; but afterwards, the archiatri came to acquire a certain degree of superintendence over the medical profession. There were two kinds of archiatri,—those that were attached to the household of the emperor, and those that were established in the different cities, where they were charged with the care of the public health. The latter were exempted from taxation, and were, besides, remunerated by the cities for gratuitous attendance upon the poor, and authorized to take fees from the rich. Under the Christian emperors, about A.D. 400, we first find mention of a class resembling our apothecaries, physicians previously either preparing their medicaments themselves, or having them prepared by their pupils or servants. In the general barbarism which followed the fall of the Roman empire, medicine, as a science, was completely lost, and the rewards of those who practised it must have depended upon their own good fortune and the rank of their patients. Internal medicine came to be practised exclusively by the clergy; and as they were forbidden to shed blood, operative surgery fell into the hands of an inferior class,—the barber-surgeons. During the Middle Ages, indeed, the general practice of surgery was reduced to the lowest ebb. Among the Arabs, however, medicine was practised to some extent, and its professors were held in high esteem. The degree of Bachelor of Physic was known at Oxford soon after the Conquest, and in the 14th century the degree of Doctor of Medicine was not uncommon. In 1422, the universities proposed that parliament should enact that no one should practise medicine unless he had studied at one of the universities, and was at least a Bachelor of Physic; but it is doubtful whether it ever became law. In the 3rd year of Henry VIII. (1511), an act was passed "for the appointing of physicians and surgeons," in which, after reciting the inconveniences and grievous hurt, damage, and destruction of many of the king's liege people, forasmuch as common artificers,—as smiths and weavers, and women, boldly take upon them great cures, in which they partly use sorcery and witchcraft, it is enacted that "no person within the city of London, nor within seven miles of the same, shall take upon him to exercise or occupy, as a physician, except he be first examined, approved, and admitted by the bishop of London or by the dean of St. Paul's for the time being, calling to him or them four doctors of physic;" or beyond these limits without license from the bishop of the diocese, or his vicar-general, similarly assisted. It further provided that neither this act nor anything therein contained be prejudicial to the universities of Oxford and Cambridge, or either of them, or to any privileges granted to them. In 1522 another act was passed, by which the examination of physicians was taken from the persons appointed for that purpose by the former statute and reposed in the newly-constituted College of Physicians (*see* PHYSICIANS, COLLEGE OF), and since that time the legislature has seldom interfered on the subject. The universities of Oxford, Cambridge, Dublin, Edinburgh, &c. (*see* these articles), possess the *right of conferring* degrees in medicine; and by 17 & 18 Vict. c. 114, bachelors and doctors of medicine of the University of London can, by virtue of their degree, without any further examination or license, practise physic as fully in all respects as may be done by any bachelor or doctor of medicine of either of the universities of Oxford or Cambridge. Provided, however, that the privileges thereby conferred shall not be construed so as to extend to the practice of *surgery*, pharmacy, or midwifery. In 1858, a new medical act was passed for consolidating the various medical corporations of the United Kingdom, and enabling persons requiring medical aid to distinguish qualified from unqualified practitioners. The general council consists of one person chosen from time to time by the various universities, the Royal Colleges of Physicians and Surgeons of London, Edinburgh, and Dublin, &c., and six persons nominated by the queen in council, four for England, one for Scotland, and one for Ireland; and a president to be elected by the general council. The council appoints a registrar, who acts as secretary and treasurer. Branch councils are also

appointed for Scotland and Ireland, who have each a registrar and other officers and clerks. The duty of the registrar is to keep a correct register of all persons holding or possessed of one or more of the qualifications described in the act, and every person possessed of one or more of such qualifications is entitled to have his name entered upon the register, on payment of a fee not exceeding two pounds. The several colleges and bodies in the United Kingdom whose graduates, members, or licentiates are entitled to be registered, are required from time to time to furnish the general council with such information as to the courses of study, examinations, &c., required to be gone through by candidates; and if it shall appear to said council that such course of study or examinations are defective or insufficient, it shall be lawful to represent the same to her majesty's privy council; and it shall be lawful for the privy council, if it should see fit, to order that any qualification granted by said college or body shall not confer right to registration. A correct register of the names and addresses of qualified practitioners to be published annually. Every person registered under this act is entitled to practise medicine and surgery, or medicine or surgery, as the case may be, according to his qualification or qualifications, in any part of her majesty's dominions, and to demand and recover in any court of law, with full costs of suit, reasonable charges for professional aid, advice, and visits, and the cost of any medicines, or other medical or surgical appliances, rendered or supplied by him to his patients; but it shall be lawful for any college of physicians to pass a by-law to the effect that none of their fellows or members shall be entitled to sue in manner aforesaid in any court of law. None but registered persons can recover charges in any court of law; nor can any unregistered person hold any public appointment as medical officer. No certificate required by any act from a medical practitioner shall be valid unless such person be registered under this act. The general council shall also cause to be published a general pharmacopœia, containing a list of medicines and compounds, and the manner of preparing them, together with the true weights and measures by which they are to be prepared and mixed, with such other matters and things as the general council shall see fit.

Physicians, Royal College of.—In the tenth year of Henry VIII., a royal charter was granted for erecting a corporation of physicians in London, which was confirmed by 14 & 15 Henry VIII. c. 5. In virtue of such act and charter, a perpetual college of physicians was established, with a constitution of eight *elects*, to be renewed as need should require, of whom one was to be annually elected president; and it was ordained that this college should choose four physicians annually, to superintend all others within London and seven miles thereof, "as also their medicines and receipts," so that such as offended should be punished with fines, imprisonment, or other means; and that no person should be at liberty to practise within that circle, except by the license of the college, under the penalty of £5 per month; also all persons were forbidden to practise even beyond that circle unless they should have been first examined and approved by the president and three elects, or should be graduates of Oxford or Cambridge. The statute 32 Henry VIII. provides that the president, commons, and fellows, yearly, and at such time as they think fit, elect and choose four persons of the best-learned, wisest, and most discreet, to search and examine apothecaries' wares, &c. Subsequent charters and acts of parliament extended and confirmed the privileges of this body. The constituted officers of the college are the eight elects, one of whom is president, and the four censors or governors. The duties of the elects are very slight, being chiefly confined to filling up vacancies in their own number and electing one of themselves to be president. The examiners for membership are the president and censors. The government of the corporation is vested in the president and fellows only, and the members of the college are alone eligible to the fellowship. The examination for membership takes place four times a year. All persons who have been admitted as licentiates, or extra-licentiates of the college, are entitled to be admitted members of the college, provided they have obeyed the by-laws, and do accept such membership according to the by-laws. Every candidate for membership is required to be at least twenty-five years of age, to have been engaged during five years in the study of medicine at some recognized college or school, and to produce satisfactory evidence of having studied the necessary branches. He is required to give fourteen days' notice to the registrar of his intention to present himself for examination, accompanied with the certificates and testimonials required by the by-laws. No candidate can be admitted to examination who is engaged in trade, or dispenses medicine, or is under engagement with any chemist for the supply of medicine, &c., nor who uses for the sake of gain any remedy which he keeps secret. The examinations are both *viva voce* and written. Every candidate approved by the censors' board is proposed at the next general meeting of fellows, and admitted by voice of the majority, the voting being by ballot. The fee for membership is £31. 10s. Members have the use of the library and museum, subject to certain regulations, and are admitted to all the lectures. Every candidate for the college license is required to be of twenty-one years of age, of moral character, and produce certificates of having studied medicine for four years at some recognized medical school, and to have passed a preliminary examination in general education. The examination extends over the various branches of a medical education, and the fee for license is £15. 15s. There is also a class of extra-licentiates, who are examined by the college, and entitled to practise throughout England and Wales. They were held to have no right to practise their profession within seven miles of London; but by the passing of the Medical Act of 1858, they enjoy the same right in that respect as the other licentiates. That act has considerably modified the position and character of the college, by giving the right to practise, according to their qualifications, to all practitioners registered under the act; thus abolishing the exclusive privileges of this institution. The new Medical Act declares that it shall be lawful for her majesty to grant to the corporation of the Royal College of Physicians a new charter, and make such alterations in the constitution as may seem expedient; and it shall be lawful for said corporation to accept such charter under their common seal, and such acceptance shall operate as a surrender of all charters heretofore granted to said corporation, except the charter granted by Henry VIII., &c. Act 21 & 22 Vict. c. 90 (1860), further declares that such new charter should not in any way affect or alter the rights, powers, authorities, qualifications, liberties, exemptions, immunities, duties, and obligations granted, conferred, imposed, continued, or preserved, to said corporation. Lands, and other real and personal property, are to be continued to the college; but it has not yet applied for its new charter.—*Ref. English Cyclopædia; London and Provincial Medical Directory.*

Physics, *phiz'-iks* (Gr. *phusikon*, natural, fr. *phusis*, nature).—In its most general signification, this term is applied to the science of nature; but in a more restricted sense it signifies those sciences which treat of *matter*. By this means it stands apart from the mental sciences on the one hand, and from mathematics, or the science of quantity, on the other. In this country the term physics thus becomes synonymous with *Natural Philosophy*. But, according to Auguste Comte, in his "Cours de Philosophie positive," physics have for their object the discovery of the general laws of the inorganic world. "In physics," he remarks, "we study the laws which govern the general properties of bodies ordinarily viewed in their mass, and constantly placed in circumstances capable of maintaining intact the composition of their molecules, and most frequently even their state of aggregation." Physics, however, considered as natural philosophy, deals with matter in its integrant forms, and points out those properties which belong to matter universally, and those laws the operation of which is understood when we make use of the term *matter*. The whole science may be divided into two great heads,—abstract physics and concrete physics. The former treats of mechanical philosophy, including under it mechanics, hydrostatics, and hydraulics, together with chemical philosophy, optics, electricity, and magnetism. The latter com-

prises descriptive and philosophical natural history, physiology, geology, and physical astronomy, together with concrete chemistry, both analytical and explanatory. It also includes zoology, botany, descriptive astronomy, meteorology, mineralogy, and physical geography. Each of these divisions of physical science will be found explained in their respective places. Natural philosophers are not agreed with regard to the theory of matter. One set affirms that all bodies are composed of continuous matter, the different states of which are owing to the contending action of two opposite powers,—attraction and repulsion; another set maintains that matter is composed of minute particles or atoms of unchangeable form; and that these primitive forms produce modifications of the natural powers. In the earliest periods, the Egyptians, the Chaldeans, and the Phœnicians, were celebrated for their knowledge of mechanical, chemical, astronomical, and physical science. As a rule, however, the ancients were wholly unacquainted with any science of natural investigation that was based upon experience; hence, their philosophical speculations upon the world in general, and upon the rise and origin of all material objects, are nothing but confused conjectures, and possessed of little value. Among the Greeks, Thales, the founder of the Ionic school, was the first who separated natural philosophy from mythology; but the later Greek philosophers retarded the progress of science by indulging in metaphysical speculations. This is apparent in the works of Plato and Aristotle, though the writings of the latter are not so faulty in this respect as those of the former. The works of Theophrastus, Hippocrates, and Aristotle show that the Greeks, notwithstanding their metaphysical bent of mind, did not neglect observation. The poem of Lucretius, "De Rerum Natura," the "Quæstiones Naturales" of Seneca, and the "Historia Naturalis" of Pliny, are the most celebrated works on physical science among the Romans. In the Middle Ages, the natural sciences remained in darkness, partly because the human mind was directed in other channels, and partly because the Aristotelian philosophy was held in such high esteem, that all inquiries and progress were alike checked. Galileo was the first to enter the path of practical experiment, and Bacon showed that there was no other road that would lead to a knowledge of the laws of nature. During the period of the dark ages, natural science was not entirely neglected by the Arabs. After the discovery of the laws of the fall of heavy bodies, and of the pendulum by Galileo, the barometer was invented by Torricelli; Kepler explained the laws of the motions of the planets, and laid the foundation of optics; and Guericke invented the air-pump. While Descartes was trying to demolish the physics of the schools, natural science was being successfully studied by Boyle and Hooke in England; by Borelli and Grimaldi in Italy; and by Pascal, Mariotte, and Picard in France. At the same period were founded the Royal Society in London, the Academy of Sciences in Paris, and the Accademia del Cimento in Florence. These institutions materially advanced the progress of physical science. Lastly appeared Sir Isaac Newton, the founder of modern natural philosophy. Since that time, physics have advanced rapidly and brilliantly. In quick succession came the improvements in the thermometer, the discovery of the gases, and the discoveries in electricity and galvanism, Lavoisier's substitution of oxygen for the phlogiston of Stahl, the reduction of the alkalies and earths, the discovery of chlorine and iodine, the polarization of light, &c.; each of which subjects are treated of separately in other parts of this work. The great increase of institutions and societies established for the purpose of promoting the prosecution of science and the diffusion of philosophical information, during the last and present centuries, has been a striking feature, equally demonstrative of a taste for the extended diffusion of natural science, and efficacious towards its further progress.—*Ref.* Playfair's *Dissertation on the Progress of Mathematical and Physical Science since the Revival of Letters*, in the *Encyclopædia Britannica*; Herschel's *Preliminary Discourse on the Study of Natural Philosophy*; Johann Mueller's *Principles of Physics and Meteorology*; and Baden Powell's *History of Natural Philosophy*.





PHYSIOGNOMY, *phiz-e-on'-o-me* (Gr. *phusiognomonia*, from *phusis*, nature, and *gnomon*, a rule or measure), is the art of determining the inward character of an individual from his countenance. That the mental character of an individual tends to stamp itself upon the countenance there can be little doubt; though it is very difficult, or perhaps impossible, to lay down any fixed rules upon the subject. In the ordinary business of life, all men are more or less influenced by the belief that the character and disposition of a person may, in some measure, be judged of by his physical appearance, and more particularly by his features; and none have more confidence in this way of judging than those who have most frequent occasion to act upon it. Young children are also striking physiognomists, and it is very remarkable how very early they manifest likings and dislikings to individuals, judging intuitively, as they must do, from their appearance and manner. Certain feelings and passions of the mind manifest themselves by certain expressions of the face; and as these come to be frequently indulged in, they come to give a permanent cast to the countenance. Where these passions are of a bad or gross nature, most people endeavour to conceal them; and hence the difficulty of laying down rules that will apply to every case. Some persons, too, may receive a peculiar expression of countenance from their parents, or they may unconsciously acquire it from the imitation of others; all of which causes tend to interfere with all attempts to raise physiognomy to the rank of a science. "Every one," says Addison, "naturally forms to himself the character or fortune of a stranger from the features and lineaments of his face. We are no sooner presented to any one we never saw before, but we are immediately struck with the idea of a proud, a reserved, an affable, or a good-natured man, and upon our first going into a company of strangers our benevolence or aversion, awe or contempt, rise naturally towards several particular persons before we have heard them speak a single word, or so much as know who they are." "With submission, I think we may be better known by our looks than by our words, and that a man's speech is much more easily disguised than his countenance." The great writer on this subject is Lavater, to whose curious and interesting work we would refer those who wish for further information on this subject.

PHYSIOLOGY, *phiz-e-ol'-o-je* (Gr. *phusis*, nature, and *logos*, discourse), is literally the doctrine or science of nature, comprehending a knowledge of all the physical and natural sciences; and this was the meaning which it originally bore. But as these, in course of time, came to be more particularly studied, they received distinct names, as natural philosophy, chemistry, astronomy, zoology, geology, &c. To the science which treats of the functions of living beings the term physiology is still applied, though its meaning is becoming more and more restricted as its various branches become better defined. It is divided into animal, or comparative physiology, which treats of animals, and human physiology, which deals with man. By physiology, as at present used, is generally understood a knowledge of vital actions in a state of health, as distinguished from pathology, which is a knowledge of the same functions when diseased. It is, indeed, impossible to lay down exactly the boundaries which separate health from disease; for we even find that what is health to one man may be disease to another; yet the general features are sufficiently marked. Physiology, then, is generally considered to embrace a description of the various vital functions of the parts composing the human body, as well as the more intimate structure of the parts themselves; the relations of these parts to each other being referred to descriptive anatomy, and their chemical composition to animal chemistry. The modern science of histology deals with the elementary textures of the human body and their several functions, and is the recognised basis of physiological knowledge. The ultimate or elementary tissues are arranged as—(1) molecule-tissues, (2) cell-tissues, (3) fibre-tissues, and (4) tube-tissues. Molecules are minute bodies, presenting to the microscope the appearance of minute dots or points. All fluids out of which the higher tissues are formed are rich in molecules. When we examine living structures under high magnifying powers, nume-

rous tissues, but especially the fluids, are seen to contain multitudes of minute vesicles or shut sacs, termed cells, which vary greatly in shape, size, and function, and are distinguished into permanent cells and cells of transition. Cells undergo a variety of changes; sometimes they gradually dissolve and perish, or the cell-wall bursts and liberates its fluid contents; and they unite in various ways to form complex tissues. A fibre is a solid elongated body like a thread, varying in thickness from $\frac{1}{2500}$ to $\frac{1}{1200}$ of an inch. The functions of the fibrous tissues are manifold; the most important, however, is that of contractility. The tubular tissues are distinguished from fibres by being composed of distinct walls, with contents, as in the nerve-tubes, and the blood-tubes or capillaries. These are the four great elementary tissues of living beings, on which depend the vital endowments of growth, contractility, and sensibility. Organized beings present us with only twenty of the sixty-two elementary substances known in chemistry; and of these the principal are oxygen, hydrogen, carbon, and nitrogen, the others being found only in small quantities and in particular tissues. The chemical principles that are to be found more or less associated together in every texture and fluid of living beings, some prevailing in one, others in another, are (1) the albuminous, (2) the fatty, (3) the pigmentary, (4) the mineral principles. The albuminous principles consist of albumen, fibrine, and casein. Fatty matter consists of carbon, hydrogen, and oxygen in various proportions. The pigmentary principles give colour to the various textures, and are evidently allied to oily constituents of living beings. Of mineral principles the most important are carbonate and phosphate of lime. The various functions of the more complex organs of the human body are distinguished as those of nutrition, innervation, and reproduction. The function of nutrition consists of five stages,—(1) the introduction into the stomach and intestinal canal of appropriate aliment; (2) the formation therefrom of a nutritive principle, the blood; (3) the transformation of the nutritive qualities of the blood into the tissues; (4) the reabsorption of the transformed tissues into the blood; (5) the excretion of the various effete matters from the body. The subject of appropriate alimentary matters is treated under the head of FOOD AND DRINK. The digestive processes,—including mastication, or the chewing of the food; insalivation, the mixing it with saliva; deglutition, or the swallowing of it; chymification, or the action of the stomach; chylification, or the action of the intestines; and the absorption of the chyle,—are treated of under the head of DIGESTION. The chyle in the intestines is taken up by the lacteals, and by them conveyed to the mesenteric glands, where it is supposed to undergo some change. From thence it makes its way to the right side of the aorta, in the lumbar region, where it is finally discharged into an elongated pouch, called the receptaculum chyli. From this pouch the thoracic duct conveys the chyle upwards to the left side of the neck, where it is poured into the left subclavian vein, at its junction with the internal jugular; and, being thus mixed with venous blood, is carried to the lungs, and there converted into arterial blood. The circulation is carried on by means of the heart, arteries, veins, and capillaries. The blood is propelled by the heart through the arteries to all parts of the body; and from the extremities of the arteries it is taken by the capillaries to the extremities of the veins, by means of which it is again conveyed to the heart. (*See* CIRCULATION.) The impure blood returned by the veins to the heart is by it propelled into the lungs, where it is purified by being exposed to the action of the air, and again conveyed to the heart for circulation through the body. The lungs are so constructed as to expose a large surface, covered with capillary bloodvessels, to the action of the atmosphere. (*See* RESPIRATION.) We thus see how nutritive matter is converted into blood, and how the blood circulates through all parts of the body. It is from the blood that all the different tissues derive their nourishment, each possessing a vital property of attraction and selection, whereby the necessary materials are drawn through the delicate membranous walls of the capillaries, and converted into tissues. Hence a sufficient supply of nutritious blood is necessary to health, depending, as it does, upon the various processes of digestion, circulation, respiration, &c.; and also a healthy state of the parts to be nourished, so as to be able to attract and select the proper materials. A healthy state of the nervous system is also necessary, for on this, too, the various functions of the body depend. While the blood is constantly supplying matter to build up the various tissues, it is also at the same time receiving from these tissues the matter which has fulfilled its appointed functions. The new material takes exactly the place of the old, so that the general configuration of the body is preserved. The blood is thus a wonderfully complex fluid, made up partly of organic materials derived from the alimentary canal, and partly of organic materials derived from the tissues. (*See* BLOOD.) The latter are carried to various excretory organs, where they are separated and discharged; as by the intestines, kidneys, skin, lungs, and liver. The function of innervation is dependent on the brain, spinal cord, and nerves. (*See* BRAIN, NERVOUS SYSTEM, SPINAL CORD.) The third and last of these functions is that of reproduction, a subject of much interest, but comparatively little understood. It is said that the human fœtus passes through various stages of growth resembling in turn the different inferior beings of the animal scale; at first a zoophyte, then a mollusk, then a worm, a fish, a reptile; and so on. Some, however, regard this theory as being more fanciful than real, and founded merely upon loose analogies.—Ref. *Encyclopædia Britannica*; Carpenter's *Human Physiology*.

PHYSOSTIGMA, *fi-sos-tig'-mă* (Gr. *phusa*, a bladder, and *stigma*, a stigma), in Bot., a gen. of the nat. ord. *Leguminosæ*. The species *P. venenosum* produces the Calabar ordeal-bean, so called from being used as a poisonous ordeal, to determine the guilt or innocence of accused persons. Taken internally, the beans, unless rejected by vomiting, produce fatal paralysis. It has recently been ascertained that the extract of the bean possesses a most extraordinary power over the iris, causing contraction of the pupil to such an extent that the aperture becomes completely obliterated. Its effect is, therefore, exactly contrary to that produced by belladonna. It will doubtless prove a valuable agent for the treatment of some diseases of the eye.

PHYTELEPHAS, *fi-tel'-e-fas*, in Bot., a gen. of palms. The hard albumen of the seed of *P. macrocarpa* constitutes the vegetable ivory of commerce; it is extensively used by turners. The fruit which contains the seed presents some resemblance to a negro's head. It is so named from two Greek words,—*phuton*, a plant, and *elephas*, elephant, because it affords a milk which hardens into a substance like ivory.

PHYTOCRENE, *fi'-to-kreen*, in Bot., a gen. of the nat. ord. *Artocarpaceæ*. The species are termed water-vines, on account of the large quantity of watery juice they yield when wounded. By many botanists this genus is considered to constitute a distinct nat. ord. called *Phytocrenaceæ*. The plants are climbing shrubs, natives of the West Indies, with dichlamydeous unisexual flowers, and seeds with a large quantity of albumen.

PHYTOLACCACEÆ, *fi-to-lak-kai'-se-e* (Gr. *phuton*, a plant, and *lakha*, gum-lac), in Bot., the *Phytolacca* fam., a nat. ord. of *Dicotyledones*, sub-class *Monochlamydeæ*. Herbs or under-shrubs. Leaves alternate, entire, exstipulate. Flowers perfect, racemose. Calyx 4—5-parted. Stamens nearly or quite hypogynous, either equal in number to the divisions of the calyx, and alternate with them, or more numerous; anthers 2-celled. Ovary superior, composed of two or more carpels; styles and stigmas distinct and equal in number to the carpels. Fruit dry or succulent, each carpel of which it is composed containing 1 ascending seed; embryo curved round mealy albumen, with radicle next the hilum. The plants of this order are natives principally of America, India, and Africa. The most noteworthy of them is *Phytolacca decandra*, commonly called poke, or pocan, in North America. Its roots are emetic and purgative. Its ripe berries have been used medicinally in chronic rheumatism and syphilitic affections. Its young shoots are sometimes boiled and eaten as asparagus by the Americans.

PIA MATER (Lat., pious mother), in Anat., is the

name given to the innermost of the three investing membranes of the brain. (*See* BRAIN.)

PIANOFORTE, *pe-ăn'-o-for'-tē* (Ital.), a musical stringed instrument, so called from its possessing equal facilities for the production of soft and loud sounds. Its tones are elicited by means of small hammers made to act upon tightly-stretched elastic strings by striking corresponding keys in the finger-board. It is superior to all others in tone, sweetness, and variety, and, although of comparatively modern invention, it is the most popular instrument of the present day. No drawing-room is considered perfect without a pianoforte, and there are few ladies of even moderate education who cannot perform on it. Its origin may be traced to a very early period. Instruments upon a somewhat similar principle were known before the 15th century. The first of which we have any account was the dulcimer, consisting of a small box strung with brass and steel wires, and played with little wooden rods or hammers. Out of this arose the *clavichord*, which was followed by the *virginal*, so named in compliment to Queen Elizabeth, who is said to have been very partial to it. Next came the harpsichord, of similar form to the modern grand piano, being literally a horizontal harp played by keys, with jacks and quills, and which merits some veneration when we remember that many of the greatest works of Handel, Haydn, Mozart, Scarlatti, &c., were developed upon it. Thus, the instrument gradually progressed; but it was not until 1716 that the pianoforte *par excellence* was invented. About this time, however, a Parisian manufacturer, named Marius, presented a harpsichord in which hammers had been substituted for the old plectrums or quills, to the Académie des Sciences at Paris. This was a very great step in the right direction, and so entirely altered the quality and tone as to make it an entirely new instrument; in fact, the embryo, so to speak, of the piano. This improvement was afterwards greatly advanced by a Florentine named Christofali; and his instrument was the first to receive the modern name. During the following half-century little notice seems to have been taken of the new instrument. About 1760, however, two manufactories were established; one in London by Zumpe, and the other by Silbermann, in Germany. Both were successful, but that of Zumpe pre-eminently so. Shortly after, M. Sebastian Erard commenced the manufacture of pianofortes in France, and it is to him that we are indebted for many of the most important improvements in the instrument. At the commencement of the present century, pianoforte-makers were multiplying rapidly all over Europe; the firms of Zumpe, Kirkman, Longman, the predecessors of Collard & Collard, Broadrip, Broadwood, Erard, and Clementi, were now flourishing. Every year important improvements were being made in the instrument. In 1809, Sebastian Erard invented the upward bearing of the strings, and in 1821 his nephew, Pierre Erard, produced his first repetition action. These were followed, in 1824, by a complete method of metal bracing for the grand piano; and in 1827 he brought out a new repetition action. At the same time great progress was made by Broadwood, Collard, Kirkman, and a few other makers; every effort was made to perfect the instrument; its popularity was increasing every day; patents were being continually taken out for new improvements. The upright piano was invented by an Englishman named Hancock, who also produced several others; as the *organized* pianoforte, the portable grand, &c. The upright instrument was afterwards improved by Southwell, an Irishman, who gave it the name of cabinet pianoforte. The *unique* pianoforte was next introduced by Messrs. Wilkinson & Wornum. This instrument, although suited to the taste of the day, did not content its inventor, Mr. Wornum, who soon after produced the *piccolo*, which, in a short time, exceeded all its predecessors in popularity. The compass of the pianoforte at this period was very limited, being only five octaves, from F below the lowest note on the violoncello to F in alt.; it soon, however, was extended to C above, and then to F, still higher, making six octaves; thus the key-board has been gradually extended until, at the present day, many instruments





have a compass of seven, while some possess as many as eight octaves. During the first part of the present century, two systems prevailed with regard to the manufacture of the grand piano. The older one, called the English system, followed by the London makers, and the newer one of the Germans, termed the Vienna system. The difference which existed between these two methods consisted chiefly in the action; that of the London makers giving a more powerful blow and producing a fuller tone; while that of the Germans, by its lightness of touch, gave far greater facilities of expression. At the present day, however, we have an action, the invention of Sebastian Erard, which combines the advantages of both systems. The grand pianoforte was first brought before the public as a concert instrument in 1782, by Clementi, who played on one of Broadwood's at the Pantheon, in Oxford Street, in that year. One of the greatest of modern improvements in the pianoforte was the introduction of pedals, by means of which the rich and lengthened tones, before possessed by the violin alone, may be produced. Many foreign instruments have several pedals; but those of English manufacture seldom or ever have more than two; the one for *piano*, and the other for *forte* effects. Besides those we have mentioned, many other kinds of pianofortes have been invented; as, for instance, Mr. Riley's *transposing* instrument, Mr. Kirkman's *octave string*, Mr. John Trotter's alternated key-board, &c.; all of which, though very ingenious, have given way to others, and are almost entirely unknown to the present generation of musical people. During the last hundred years, the manufacture of pianofortes has been carried on to an immense extent in all parts of Europe. In 1851 the number of instruments manufactured annually in the United Kingdom was estimated at 23,000. Between the years 1771 and 1851, Messrs. Broadwood made 103,750. Of these, 60,382 were constructed between 1824 and 1850, making an annual average for that period of about 2,236. From 1831 to 1851, Messrs. Collard sold 32,000 instruments, or 1,600 per annum. Now, if we estimate the annual business of these two firms alone at 4,000 instruments, and at the average price of 60 guineas, which must be much below the mark, it gives the enormous gross return of upwards of a quarter of a million. Therefore, as the estimated number sold annually is about 23,000, we may not unreasonably fix the gross returns of this branch of manufacture at considerably above a million sterling. Although we are indebted to the Germans for introducing the art of harpsichord-making, it is in this country that most of those improvements which have produced the modern pianoforte have had birth; and England, at a very early period, surpassed all other countries in this branch of manufacture, and has maintained her pre-eminence ever since. The Great Exhibition of 1862 showed that great progress has been made since 1851, not only in the touch and construction, but in beauty of the exterior. The most important exhibitors were Messrs. Broadwood & Co., Hopkinson & Co., Collard & Co., Kirkman & Co., Oetzman & Co., Wornum & Co. Some excellent specimens were exhibited by these firms, Messrs. Broadwood adding to their collection a series of models illustrative of the construction of their grands, as well as four grand concert pianofortes, which show all the newest inventions, and for softness of tone and durability excelled all others in the building. Mr. Wornum, besides several specimens of grands and cottages in walnut, exhibited a new instrument, which he called a "folding piano," being, in fact, a small square piano, without legs, supported upon pivots, between two uprights; so that, when required for use, it can be placed horizontally, and, when done with, turned into a vertical position.—*Ref.* Dr. Rimbault's *Pianoforte, its Origin and Construction*; M. Talberg's *Remarks on the Pianoforte*, published in the *Jury Reports* of the Great Exhibition of 1851; the *English Cyclopædia*; the *Encyclopædia Britannica*.

PIASSABA. (*See* LEOPOLDINIA.)

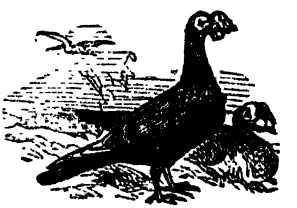
PICOTENS. (*See* DIANTHUS.)

PICRASMA, or PIERRASMA, *pi-kräs'-mă, pi-e-re'-mă* (Gr. *pikros*, bitter), in Bot., a gen. of the nat. ord. *Simarubaceæ*. The species *P. excelsa*, a native of Jamaica, yields the officinal *quassia-wood* of the Materia Medica.

It is much used as a tonic, febrifuge, and stomachic. It is said to be largely employed by dishonest brewers as a substitute for hops. The large quantity annually imported into this country cannot well be accounted for, unless we accept the statement of certain chemists, that most of it *is* consumed by bitter-ale drinkers. Cups formed of quassia-wood are used to impart agreeable bitter to liquids which have been allowed to remain in them for some time. An infusion of quassia, sweetened with sugar, is much used as a fly-poison. The active properties of quassia-wood are due chiefly to the presence of an intensely bitter crystalline substance called *quassin*. In Jamaica, the plant is known as the bitter-ash or bitter-wood. (*See* QUASSIA.)

PIETISTS, *pi'-e-tists* (Lat. *pietas*, piety), was the name given to certain reformers that arose in the Lutheran church in Germany, towards the end of the 17th century, and occasioned great dissensions in that body. They did not separate themselves from the Church, but instituted meetings, and preached against the coldness and formality that were then prevalent. After a time, the movement subsided; but the term Pietist is still used in Germany contemptuously, in something the same way as Methodist is used here.

PIGEONS, *pij'-unz* (Fr.), one of a nat. fam. of birds comprising the pigeons, doves, and turtles. Much doubt seems to prevail as to the proper place of the pigeons in the system; some ornithologists having placed them among the *Insessores*, or perching birds, and others among the *Rasores*, or gallinaceous birds; whilst others again group them as a separate order between the two. Their food, habits, internal economy, and the formation of their bills, identify them with the *Rasores;* while, on the other hand, the characters which bring them near the *Insessores*—their divided toes and comparatively short legs—are weakened by the resemblance which those members bear to the same parts of the contiguous order in their general structure. The distribution of the family is very extensive, the family occurring almost everywhere except within the frigid zones. The species are most abundant in southern Asia and the great Indian archipelago. Its general characteristics are,—bill moderate, compressed, covered at the base of the upper mandible with a soft skin, in which the nostrils are pierced, and more or less curved at the point; feet with three divided toes in front and one behind. One part of the internal organization of the pigeon is worthy of special notice. The crop, in the state which is adapted for ordinary digestion, is thin and membranous, and the internal surface smooth; but by the time the young are about to be hatched, the whole, except that part which lies on the trachea, becomes thicker and puts on a glandular appearance, having its internal surface very irregular. In this organ it is that the food is elaborated by the parents before it is conveyed to the young; for a milky fluid of a greyish colour is secreted and poured into the crop among the grain and seeds undergoing digestion, and a quality of food suited to the nestling is thus produced. The fluid coagulates with acids and forms curd; and the apparatus forms amongst birds the nearest approach to the mammæ of warm-blooded animals. The number of vertebræ amounts to 13 cervical, 7 dorsal, 13 sacral, and 7 caudal =40. The sternum is narrow, with a deep keel, the inferior border convex, and the anterior one curved forwards, thin, and trenchant; the manubrial process is strong and bifurcated, the costal processes short. The posterior margin is cleft by two fissures on either side of the mesial plane, the lateral and superior fissures being the deepest; the mesial ones are occasionally converted into a foramen. The costal surface of the lateral margin is, as in the gallinaceous birds, of very little extent. The domestic pigeon is supposed to be derived from the œnos or stock-dove, and has been the companion of man from a very early period, the ancient Greeks having been well acquainted with them; whilst the breeding of them amongst the Romans was quite a science. The same attention to them has been given by modern nations, and the adepts in the art of breeding them pretend that the almost innumerable varieties may be bred to a feather. The names bestowed on those varieties are indicative of their peculiarities; as *tumblers, croppers, runts, carriers, &c.* In their wild state, pigeons—then called in England wood-pigeons—live on high trees, sometimes in flocks. They feed on seed, though sometimes on fruit, retaining their food in the crop for some time. The greater proportion of the species build on elevated situations, forming a loose nest of small twigs, and wide enough to contain both sexes; the female lays two eggs several times a year. They pair for life, though they assemble in flocks. They have no song, their note being a simple cooing. The prevailing colour of the pigeon is bluish-grey, of various intensities and shades, frequently embellished upon the neck with feathers having a metallic lustre and peculiar form, and which exhibit various tints of colour according to the light in which they are viewed. Their flesh is sapid and nutritious, being of a warm and invigorating nature. Their flight is powerful, very rapid, and can be long sustained; and many species are in the habit of making distant periodical migrations. The numerous varieties of the pigeon existing in England are supposed by the best authorities to have originated, not from any cross of the common pigeon with other species, but from a few accidental varieties of the common pigeon; such accidental varieties as have occasionally occurred having been separated from the parent stock, subjected to captivity and domestication, and assorted and paired together as fancy or caprice suggested. Our limits will not permit us to describe them fully. The *carrier*, however, deserves notice, if it were only for the fact that it is honourably noticed by some of the most famous writers of classical antiquity. Anacreon, the great Greek lyric poet, has mentioned it as the bearer of epistles; Pliny, the famous Roman naturalist,



CARRIER PIGEON.

speaks of the communication kept up between Hirtius and Decimus Brutus at the siege of Mutina (Modena); and there is recorded an instance of their having been employed during the crusade of St. Louis. It was at a very early period employed in this country as a conveyor of messages. Another prominent species of pigeon is the *passenger*-pigeon, a native of North America, over nearly the whole of which immense continent it occasionally rambles, the country to the west of the Rocky Mountains only excepted. It arrives in the fur countries in the latter end of May and departs in October. It annually attains the sixty-second degree of latitude in the warmer central districts, but reaches the fifty-eighth parallel, on the coast of Hudson's Bay, in very fine summers only. They migrate in huge flocks, which have sometimes been known to be considerably over two hundred miles in length, and to consist of two thousand millions of pigeons. Their roosting-places are always in the woods; and when they have frequented one of these places for some time, the appearance it exhibits is surprising. The ground is covered, to the depth of several inches, with their dung; all the tender grass and underwood is destroyed; the surface is strewed with large limbs of trees broken down by the weight of the birds collecting one above another; and the trees themselves are killed through an extent of thousands of acres as completely as if they had been cut down by an axe. The marks of their desolation remain for many years on the spot, and long after they have departed scarcely a vegetable makes its appearance.

PIGMENT, *pig'-ment* (Lat. *pigmentum*), in Anat., is a name given to the mucous substance which covers the surface of the iris, and gives it its beautiful variety of colours; also the black or brownish mucus which covers the anterior surface of the choroid membrane contiguous to the retina and the interior surface of the ciliary processes. (*See* EYE.)

PIG, *pig*, the young of swine. Under the article

## Pike

Hog, the distinctive features of this pachydermatous family will be found described. For its size, the pig is one of the most useful animals in creation, as nearly the whole of its body is used for food, and there is no part of it which cannot be turned to account. Its fat is made into lard, which is not only used by housekeepers, confectioners, &c., but also largely in medicine. The flesh is eaten both fresh and salted. The skin, when not eaten with the flesh, is tanned for saddle-seats, shoes, pocket-book covers, &c. The bladders are prepared as ox-bladders. The bristles are used for making brushes. The abdominal fat, the blood, and even the intestines, are used for food. Lastly, the pig multiplies its species in a degree proportional to its usefulness. The principal breeds of English pigs have been generally named from the counties or localities where they have for the most part been reared. Those approved on account of their superior size, and consequently reared for the purpose of making bacon, are the Berks, Hants, Hereford, Salop, Norfolk, and Chester breeds. The breed best adapted for table pork is the small white Chinese. Particular breeds are, however, preferred by different individuals.

Pike, *pike* (*Esox Lucius*).—The generic characters of this fish are,—head depressed, large, oblong, blunt; jaws, palatine bones, and vomer, furnished with teeth of various sizes; body elongated, rounded on the back; sides compressed, covered with scales; dorsal fin placed very far back over the anal fin. It is a well-known inhabitant of the principal rivers and lakes of Europe, and has long been common in many of the rivers, and almost all the lakes and ornamental waters of Great Britain, where, in the Middle Ages, it was held in high estimation; its value in the 13th century, for instance, being estimated at ten times that of the best turbot or cod. The pike is strong, fierce, and active; swims rapidly, and occasionally darts along with the rapidity of lightning. The spawn is deposited among weeds early in April; and at this season the spawning fish is found in narrow creeks and ditches connected with the larger waters they at other times inhabit. The young are said to reach the length of eight to ten inches the first year; twelve to fourteen the second; eighteen to twenty inches the third; and there are proofs on record that from this last size the pike, if well supplied with food, will grow at the rate of four pounds' weight a year for six or seven successive years. One of the chief characteristics of the pike is its extraordinary voracity; anecdotes respecting which are almost innumerable. In default of a sufficient number of other fishes to satisfy them, they will seize upon moor-hens, ducks, and, indeed, any animals of small size, whether alive or dead; and it is by no means unusual for them to destroy themselves by endeavouring to swallow prey too large for their throats. They are also remarkable for their length of life and the great size they frequently attain. They are known to attain, in some instances, the age of a hundred years; and pike of sixty or seventy pounds' weight, although not common, are by no means extraordinary. The flesh of the pike is of good quality; and those of the Medway, when feeding on the smelt, acquire excellent condition, with peculiarly fine flavour. Among the various localities in England famous for the quality as well as the quantity of their pike, are Horsea Mere and Heigham Sounds, two large pieces of water in the county of Norfolk, a few miles north of Yarmouth. The colour of the head and upper part of the back of the pike is dusky olive-brown, becoming lighter, and mottled with green and yellow, on the sides, passing into silvery white on the belly; pectoral and ventral fins pale brown; dorsal and caudal fins darker brown, mottled with white, yellow, green.



THE PIKE.

## Pilchard

Pilchard, *pil'-tshard* (*Clupea Pilchardus*), is the name of a fish belonging to the family of the *Clupeidæ*, and much resembling the herring. It is about nine inches in length, with large scales; the back is bluish, and the sides and belly silvery; the head is compressed, and the mouth without teeth. The upper angle of each of the gills is marked with a large black spot. The length of the head is to the whole length of the body as one to five, the depth of the body equal to the length of the head; the transverse thickness of the body equal to half its depth. The older naturalists considered the pilchard, like the herring, as a visitor from a distant region, and assigned to it the same place of resort as that fish; but to this it is objected that the pilchard is never seen in the Northern Ocean; and that, though they frequent the French coasts and are seen on those of Spain, they appear on neither in considerable numbers or with much regularity. On the coast of Cornwall they are found through all the seasons of the year; but in January they keep near the bottom, and, although in March they sometimes assemble in great numbers, it is not until July that they regularly and permanently congregate. The season and the situation for spawning, and the choice of food, are doubtless the chief causes which influence the motions of the great bodies of these fish; and when these are thoroughly known, the variations which have been noticed in the actions of the pilchard will probably no longer be a mystery. The pilchard feeds with voracity on small crustaceous animals, and especially on a minute species of shrimp, not larger than a flea. It is probable, also, that they devour the roe of fish. When the pilchards assemble off the Cornish and Devonshire coast, they resemble, says Mr. Yarrell, a mighty army, with its wings stretching parallel to the land, and the whole composed of numberless smaller bodies, which are perpetually joining together, shifting their position, and separating again. There are three stations assumed by this great body,—one to the eastward of the Lizard, the most eastern extremity reaching to the Start Point in Devonshire; a second between the Lizard and the Land's End; and a third on the north coast of Cornwall, the chief station being about St. Ives. Sometimes one of these districts is full of fish, whilst there are none in the others; but towards the end of the season they often move from one station to another. Their subordinate motions are much regulated by the tide, against which they rarely go; and sometimes, after they have remained parallel to the coast for several weeks, at a distance of several leagues, a strong tide will bring them close to the shore. The fishery for pilchards, which commences in July, and continues until the short days and stormy weather of the equinox render its prosecution impracticable, is carried on by drift- or driving-nets, and with seans; the former consisting of a number of nets, commonly about twenty, each from eighteen to twenty fathoms long and seven fathoms deep, and sometimes reaching three-quarters of a mile. The fishery begins a little before sunset, and the nets are drawn in about two hours, to be again shot as morning approaches, pilchards entering the nets better at these seasons than at others. The number of fish taken by a drift-boat varies exceedingly. From 5,000 to 10,000 is considered moderate; but the number often amounts to 20,000. 150,000 is considered a fair number for the season's fishing. For the sean-fishing three boats are provided, of which two are about 40 feet long and 10 wide at the beam, with flat timbers and a sharp bow. The first is termed the sean-boat, and is furnished with a sean 220 fathoms in length and 12 fathoms deep, which is buoyed along the head-rope with corks and weighed down with leads. The second boat, called the volyer (a corruption, probably, of follower), has a sean from 100 to 120 fathoms in length, and 18 fathoms in depth in its deepest part, and termed the tuck-sean, differing from the stop-sean, as the former is called, as well in shape as in dimensions, the middle being formed into a hollow or bunt. A third boat, called a lurker, is less than the others, and has no sean. The crew attending a sean consists of eighteen men and one or two boys. Seven of these are assigned to each of the larger boats, and the remaining four, including the master, to the lurker. This fishery com-

mences three weeks or a month after the drivers. The three boats proceed in the afternoon to some sandy bay and cast anchor, waiting for the appearance of the fish. When this is discovered, the lurker proceeds to the place to make observations, and when everything is favourable, a warp from the end of the sean is handed to the volyer, whose place it is to keep all taut, the lurker continuing on the fish to watch their motions, and to point to the sean-boat what is to be inclosed. The sean-boat is rowed by four men, the other three being employed in throwing the net. The sean at first forms a curved line across the course of the fish; and, while the two larger boats are employed in warping the ends together, the lurker's station is the opening, where, by dashing the water, the fish are kept away from the only place of escape. When the sean is closed, and the ends are laced together, if the body of fish be great, and the sea or tide strong, the net is secured by heavy grapnels, which are attached to the head-ropes by hawsers. When the evening has closed in and the tide is low, the men proceed to take up the fish. For this purpose, leaving the stop-sean as before, the volyer passes within it, and lays the tuck-sean round it on the inner side; it is then drawn together, so as gradually to contract the limits of the fish and raise them from the bottom, stones being repeatedly thrown into the water at the part where escape alone is practicable, until the fish are supported in the hollow or bunt of the sean. When brought to the surface, the voices of the men are lost in the noise made by the fish as they beat the water. The seaners fix themselves in pairs on the gunwales of the boats, with flaskets to lade the fish on board. When the quantity inclosed in the stop-sean is large, the tuck-sean is made to inclose no more than the boats can carry, and a week may possibly elapse before the whole of the capture is secured, part being taken up every night. As an object of adventure, the pilchard fishery is popular in Cornwall, and the inhabitants are greatly benefited by it; but the pursuit of pilchards is a species of lottery, some seans obtaining a considerable profit, whilst the greater part obtain no more than is sufficient to defray their expenses. The profit of the men depends on the share of the fish, which is divided into eight parts, of which the boat has one eighth part, the nets three, and the men four. The boy that accompanies them is rewarded with the fish that may fall into the sea as the nets are drawn up; to secure which he is furnished with a bag-net at the end of a rod, termed a keep-net. The quantity of pilchards taken is sometimes enormous; 3,000 hogsheads having been taken in one sean; and 10,000 hogsheads—25,000,000 fish—have been taken in one port in a single day. The average amount of the export of these fish from England is about 30,000 hogsheads. The term pilchard is said to be derived from *peltzer*, a name by which this fish was known to some early northern continental writers.—*Ref.* Yarrell's *History of British Fishes.*

Pile, *pile*, in Her., is one of the ordinaries representing the piles upon which bridges and other buildings are erected, in order to strengthen the foundations. The pile, if borne plain, should contain one-third part of the chief in breadth; but, when charged, two-thirds, tapering to a point like a wedge; it should issue from the chief with the point downwards, unless particularly noticed to the contrary, and it admits of no diminutive; for if three are borne in the same shield, they retain the same name.

Piles, in Mech., are beams of timber or stakes of wood driven firmly into the ground for various purposes; such as forming the foundation for buildings, piers of bridges, &c. Piles may be either round or square, and formed of any timber which is not likely to rot under water. They are generally made of fir; but oak and elm are also largely employed. The end of the pile which enters the ground is pointed and shod with iron, while the top is bound with a strong iron hoop to prevent the wood from splitting under the violent blows required to drive it home. Amsterdam, and some other cities, are entirely built upon piles. Foundations are never constructed with piles unless the ground is suspected of being unsound, or the weight to be borne is exceedingly great. Piles of cast iron were first employed by Mr. Matthews in the formation of Bridlington harbour. Mr. Ewart, however, was the first who brought this kind of piling into general notice: he took out a patent for his invention in 1822.

Piles. (*See* Hæmorrhoids.)

Pilgrimage, *pil'-grim-aij* (Lat. *peregrinus*, a stranger), is a journey taken for the purpose of visiting holy places, or places hallowed by religious associations. The custom of making pilgrimages appears to have originated very early, probably about the 3rd or early in the 4th century. Helena, Constantine's mother, we are told, proceeded on a pilgrimage to Jerusalem, and built the church of the Holy Sepulchre; and towards the end of the 4th century the practice became common. In course of time it greatly increased, and other places besides Palestine became objects of pilgrimage; as Rome, Loretto in Italy, and Compostella in Spain. From the custom of celebrating festivals in honour of martyrs at their graves, many of these became noted places of pilgrimage. The pilgrim's garb was a grey or brown gown and a broad-brimmed hat, with a long staff, round at one end and pointed at the other, and his pouch was a hollowed gourd. The notoriously disorderly and immoral conduct of the pilgrims frequently called forth the animadversions of the Church. The difficulties that presented themselves to pilgrims to the Holy Land, after it had come into the hands of the Saracens, and the cupidity of the rulers, led to the Crusades. In 1064, 7,000 pilgrims accompanied Siegfried, archbishop of Mentz, and other German and French bishops, on a pilgrimage to the Holy Land, and of these only 5,000 returned. Pilgrimages have long been encouraged and recommended by the Roman Catholic Church, and have frequently been enjoined by way of penances. Since the jubilee was instituted in 1300, Rome, on such occasions, has been much frequented by pilgrims. With the Mohammedans, also, pilgrimages are an important religious service; and it is enjoined in the Koran, on every good Mussulman who possibly can, to make at least one pilgrimage to the tomb of the Prophet at Mecca. There are other holy places, particularly in Persia, which annually attract immense crowds of pilgrims. The Hindoos have, likewise, their places of pilgrimage, the most celebrated of which is that of Juggernaut; the statue of the idol being, at certain periods, brought out mounted on an enormous car, and dragged along amidst crowds of pilgrims who resort hither on such occasions from all parts of Hindostan.

Pillory, *pil'-lo-re* (Fr. *pillorie*), is a mode of public punishment which has been in use in most countries of Europe. The machine on which the offender was pilloried was of different kinds. The most common form in this country was a wooden frame or screen, raised several feet from the ground, behind which the culprit stood supported on a platform, his head and hands been thrust through holes in the screen so as to be exposed in front. Thus, usually in the market-place, the offenders were exposed to the outrages of the mob, and were often in no small danger from the missiles by which they were assailed. The pillory was abolished by statute in Britain in 1837, and in France in 1832.

Pilot, *pil'-lot* (Fr. *pilote*), in nautical language, is the steersman or person on board a ship who has charge of the helm and the ship's course. In this country, however, the name is usually restricted to a person taken on board at a particular place for the purpose of conducting the ship through an intricate channel, river, road, &c., or into or out of port. The rules and regulations affecting pilots are numerous and complicated, so that we cannot enter upon them here, but must refer to M'Culloch's "Commercial Dictionary," where they are given at some length, or the Merchant Shipping Act, 17 & 18 Vict. c. 104. Pilots require to be found properly qualified and licensed. After a pilot is taken on board, if the master is by law obliged to do so, the master has no longer any command of the vessel till she is safe in harbour, and the owners are not responsible for any loss or damage that may arise from her mismanagement, unless it appear to have arisen from the neglect or misconduct of the master or crew in obeying the orders of the pilot. There are, however, cases in which it is lawful, and even necessary, for the

master to interfere with or supersede a pilot; in which cases, of course, the responsibility of the pilot ceases. But if it be optional for the master to take on board a pilot and he do so, the pilot is regarded as the servant of the owners, who are responsible for his conduct. If a pilot shall negligently lose a ship under his care and be convicted, he shall be for ever incapacitated from acting as a pilot. The rates payable for pilotage are fixed by act of parliament.

PIMENTO. (*See* EUGENIA.)

PIMPINELLA, *pim'-pi-nel'-là*, in Bot., a gen. of *Umbelliferæ*. The species *P. Anisum* is the anise so much esteemed for its carminative fruits or seeds. (*See* ANISE.)

PIN, *pin* (Lat. *spina*, a thorn, or Dan. *pinne*, an iron spike), a small pointed instrument, commonly made of brass wire blanched and headed, used chiefly in fastening articles of dress. On account of its universal use as well as on account of the number of persons employed in its manufacture, the pin has a prominent position in the history of trade. Its manufacture furnishes employment for a large number of persons, and is one of the greatest prodigies of the division of labour, each pin passing through fourteen pairs of hands before it is ready for use. The wire used by the pin-maker, as obtained from the drawing-frame, is wound about a bobbin or barrel about six inches diameter, and has to be straightened by the following process:—Six or seven nails having been fixed upright in a waving line on a board, so that the void space measured in a straight line between the first three nails may have exactly the thickness of the wire to be trimmed, and that the other nails may make the wire take a certain curve line, which must vary with its thickness, the workman pulls the wire with pincers through among these nails on to a low wooden bench or trough twenty feet long, which serves as a measure of the lengths into which the wire is to be cut. These lengths are then cut by shears into shorter lengths, each about sufficient for six pins. A day's work of one man employed in this work amounts to eighteen or twenty thousand dozen of pin-lengths. The pin wires thus obtained are pointed at each end at a machine called a mill, consisting of a circular single-cut file and a fine grindstone, thirty or forty of them being applied to the grindstone at once, arranged in one plane between the thumb and fingers of the grinder, who at the same time dexterously gives them a rotatory motion. One pin is next cut from each end of the wire thus pointed, the intermediate pieces being again handed over to the pointer. The fourth process in the manufacture of pins consists in the twisting of the wire for the pin-heads, when they have separate heads; but some manufacturers make the heads by submitting the end of the pin wire to a die, which forces it into the required shape. When the heads are not made in this manner, the pins have to be fitted with heads,—a process which is effected in the following manner:—A boy takes a number of heads in his apron, and, taking up a few headless pins in his fingers, plunges them into his lap, and works them about among the heads with a sort of threading motion. Most of the wires in this way catch up a head, and the heads are then fixed by being submitted to the action of a small punch, raised by means of a pedal lever and a cord. An expert workman will fasten the heads of about fifteen hundred pins per hour. Having been thus manufactured, the pin is subjected to several other operations to fit it for use and make it bright and clean. Having been first cleaned by being boiled for half an hour in sour beer, wine lees, or a solution of tartar, and then washed, it is whitened or tinned by being boiled in a solution of cream of tartar and tin. After tinning, it is polished by agitation in a leather sack filled with bran, and is then taken with its fellows to the *paperer*, who is seated in front of a bench, to which is attached a horizontally hinged piece of iron, the edge of which is notched with a corresponding number of marks to the number of pins to be stuck; the small catch which holds together the two parts of the iron is released, the paper introduced, and a pin inserted at every mark; the paper is then released and examined, that it may be freed of any pins which are defective, and supplied with others in their place. A skilful paperer is able to put up 36,000 per day. Several machines have been invented for the manufacture of pins, and the mode of action of one of them may be thus described:—"The rotation of a principal shaft, mounted with several cams, gives motion to various slides, levers, and wheels, which work the different parts. A slider pushes pincers forwards, which draw wire from a wheel at every rotation of the shaft, and advance such a length of wire as will produce one pin. A die cuts off the said length of wire by the descent of its upper chop; the chop then opens a carrier, which takes the pin to the pointing apparatus. Here it is received by a holder, which turns round while a bevel-edged file-wheel rapidly revolves, and tapers the end of the wire to a point. The pin is now conducted by a second carrier to a finer file-wheel, in order to finish the point by a second grinding. A third carrier then transfers the pin to the first heading-die, and by the advance of a steel punch, the end of the pin wire is partially swelled out. A fourth carrier removes the pin to a second die, where the heading is perfected. When the heading-bar retires, a forked lever draws the finished pin from the die and drops it into a receptacle below." A pin has recently been introduced manufactured of iron or steel wire instead of brass. The consumption of pins in Great Britain is calculated at fifteen millions daily, and there are many establishments where upwards of two tons, containing about twenty million in number, are made weekly.



PINACEÆ, *pi-nai'-se-e* (Lat. *pinus*, the pine), in Bot., a synonyme of *Coniferæ* (which *see*).

PINE. (*See* PINUS.)

PINE-APPLE. (*See* ANANASSA.)

PINGUICULA, *pin-gwick'-u-la* (Lat., from *pinguis*, fat), in Bot., a gen. of the nat. ord. *Lentibulariaceæ*. The herb called the butterwort, from its property of coagulating milk, is a species (*P. vulgaris*).

PINION, *pin'-yon*, in Mech., an arbor, or spindle, in the body of which are several notches to catch the teeth of a wheel that serves to turn it round; or a pinion in a small wheel which plays in the teeth of a larger.

PINUS, *pi'-nus* (Gr.), in Bot., a gen. of coniferous trees, distinguished from allied genera by the male catkins being crowded and racemose, and by the scales of the cones being thickened and angular at the end. Several species are valuable timber trees; as *P. sylvestris*, the Scotch fir, which yields the timber known as Dantzic or Riga fir and Russian deal; *P. strobus*, yielding the white pine or deal of the United States; *P. mitis* and *palustris*, yielding the yellow pine or deal; *P. rigida*, *P. Lambertiana*, and many more. Pine timber is used to an enormous extent in this country and elsewhere for house-carpentry, joinery, &c. Many valuable products besides timber may be traced to this genus. *P. sylvestris*, the Scotch fir, or wild pine, is the source of common turpentine; this yields, by distillation, the useful liquid known as oil, spirits, or essence of turpentine. When subjected to destructive distillation, the wood yields wood-tar and pitch. The inner bark is used in Norway for making the remarkable alimentary substance called bark-bread. From the leaves of this species the fleecy substance termed pine-wool, or fir-wool, is prepared; it is used for stuffing mattresses, and is said to be repulsive of vermin. An oil called fir-wool oil, said to be obtained from this substance, has lately been introduced into this country from Germany, and recommended as an external application in rheumatism, neuralgia, &c. *P. pinaster*, or *maritima*, the cluster-pine, yields Bordeaux turpentine, galipot tar, and pitch. *P. palustris*, the swamp or long-leaved pine, furnishes the greater proportion of the turpentine, tar, &c., consumed in the United States, or exported thence to other countries. *P. tæda*, the frankincense-pine, also yields turpentine. *P. pinea*, the stone-pine, has edible seeds, which are used as a dessert under the name of pine-nuts. *P. cembra*, the Siberian stone-pine, has also edible seeds; its young shoots, on being distilled, furnish the so-called Carpathian balsam. *P. pumilio*, the mugho or mountain pine, yields, by spontaneous exudation, an oleo-resin, called Hungarian balsam. *P. geradiana*, a native of Thibet and Affghanistan, has seeds which are edible. *P. longifolia*, which flourishes in the Himalayas, yields a remarkably fine turpentine.

PINY RESIN. (*See* VAGERIA.)

PIPER, *pi'-per* (from Gr. *pipto*, I digest; because it promotes digestion by its stimulating qualities), in Bot., the typical gen. of the nat. ord. *Piperaceæ*. The dried unripe fruits of *P. nigrum*, the pepper-vine, constitute the black pepper of the shops. White pepper is the same fruit in a ripened state, divested of its external pulpy covering. The former is the more pungent and acrid, as the peculiar acrid resin, upon which the properties of the pepper partly depend, disappears to some extent in the process of ripening. Besides this acrid resin, both black and white pepper contain the alkaloid called *piperine*. Both kinds of pepper are extensively employed as condiments, and medicinally as stimulants and correctives. A spoonful of black pepper mixed with a little water and swallowed, generally gives relief in cases of flatulency. The pepper-vine is a native of India and the Indian islands. The pepper used in this country is imported from the Malabar coast, also from the Malay peninsula and Sumatra. *P. trioicum*, and some other species, also produce good pepper.

PIPERACEÆ, *pi-per-a'-se-e*, in Bot., the Pepper fam., a nat. ord. of *monochlamydeous Dicotyledones*. Herbs or shrubs with jointed stems. Flowers spiked, perfect, without floral envelopes, bracteated; stamens 2 or more; anthers 1—2-celled; ovary simple, 1-celled, with 1 erect orthotropous ovule; stigma sessile. Fruit more or less fleshy, 1-celled, 1-seeded; seed erect, embryo in a distinct fleshy sac at the apex of the seed, and on the outside of abundant albumen. The peppers are exclusively natives of tropical regions, especially in America and the Indian archipelago. There are 20 genera and 600 species. They are remarkable for acrid, pungent, aromatic, and stimulant properties. (*See* ARTANTHE, CHAVICA, CUBEBA, MACROPIPER, and PIPER.)

PIPES, *pipes* (Sav.).—This term is applied to several things very different in their nature. Thus, a cask or measure of wine equal to two hogsheads is called a pipe. In law, a roll in the Exchequer, otherwise called the great roll, bears this name; in music, it is a wind instrument, consisting of a long tube of wood or metal; and in mining, a pipe is where the ore runs forward endwise in a hole, and does not sink downwards or in a vein. In its general signification, however, a pipe means a tube used as a conductor of water, gas, steam, smoke, &c., made of lead, iron, stone, pottery, wood, india-rubber, gutta-percha, &c. The large water- and gas-pipes are made principally of cast iron, and are called *mains*; the smaller ones of some alloy, of which lead is the base, and are called *services*. Tobacco-pipes are generally made of a fine-grained plastic white clay, to which they have given the name (pipe-clay), which is obtained (in England) from Purbeck in Dorsetshire, and at Teignmouth in Devonshire, in large lumps, which are purified by dissolving in water in large pits, where the solution is well stirred up, by which the stones and coarse matter are deposited; the clayey solution is then poured off into another, where it subsides and deposits the clay. The water, when clear, is drawn off, and the clay at the bottom is left sufficiently dry for use. When thus prepared, it is divided into pieces of the proper size to form a tobacco-pipe, and each piece is rolled out into a slender cylinder, with the palms of the hand, upon a plank, to form the stem. The workman then sticks a small lump to the end of the cylinder to form a bowl, and lays the pieces aside for a day or two, to enable them to gain more consistence. After that time, the workman takes a long iron wire, with its end oiled, and pushes it through the soft clay in the direction of the stem, to form the bore, directing its path by feeling with his left hand the progress of its point. He then places the pipe between two moulds of brass or iron, each of which is impressed with the figure of one half of the figure it is intended to bear, and, having brought them smartly together, unites them by a clamp or vice. A lever is next depressed, by which a tool enters the bulb at the end, and compresses it into the form of a bowl; the wire in the pipe being thrust backwards and forwards to carry the tube perfectly into the bowl, and the redundant clay being removed by a knife. After drying for a day or two, the pipes are scraped, smoothed, or polished with a piece of hard wood; and, the stems having been bent into the form desired, taken to the baking-kiln. Notwithstanding the number of processes which each pipe has to go through, a good moulder will produce 600 pipes a day. We may here mention that baked clay has so strong an affinity for water, that when a new pipe is put into the mouth, it absorbs the moisture of the lips, and adheres to the skin with unpleasant force; to obviate which, clay pipes are generally tipped at the end with sealing-wax, varnished or polished. Many of the most highly-prized pipes are made of a substance called meerschaum, a hydrated silicate of magnesia, obtained chiefly from Asia Minor, soft enough to be indented by the thumb nail, and yielding readily to the knife. In forming the bowl of a meerschaum pipe, the meerschaum is prepared for the operation by soaking in a composition of wax, oil, and fat, and is then carved by a knife. We may add, that considerable numbers of pipes for smokers are made of various kinds of woods; such as cherry-wood, pear-wood, and brier-root.

PIQUET, *pe-ket'* (Fr.).—This game is of French origin, and is named from the French word *pique*, equivalent to the English "point." It is played by two persons with thirty-two cards; namely, ace, king, queen, knave, ten, nine, eight, and seven, of each suit; and these cards rank according to the succession in which they are here named,—the ace being higher than the king, the king than the queen; and so on. In reckoning what is called the point, the ace counts eleven, the king, queen, knave, ten each; and the other cards according to the number of their respective pips. In cutting for the deal, he that cuts the lowest piquet card deals; and having shuffled the pack, he presents it to his adversary, who, if he pleases, may shuffle it also. Should he do so, the dealer may shuffle again; and, having done so, places them before the other, who cuts them. The number of points in each game is now one hundred; fifty saves the lurch. The cards are to be dealt two by two, and in no other numbers. In this manner each player is to have twelve cards dealt him, and there will then remain eight cards, which are called the stock, and are to be placed on the board directly before the two players. From this, the elder hand has the right to draw five cards in their natural order, and must then discard the same number from his own hand. It is imperative for the elder hand to discard at least one card; but not the whole five. If he discard less than five, he has the privilege of looking at the cards left. His own discard is optional with the dealer, and if chosen, follows after every other hand. Tricks are taken in the usual manner by the superior cards of the same suit. The various denominations of the score are as follows:—1. *Carte Blanche*, which is when a hand dealt contains no picture-card. This hand enables the holder to count ten, and is counted before any other. 2. *Point*, which is reckoned by the player who has the greater number of cards in any suit, or, if both have an equal number, by the one who has the greater number of pips. Whoever has point counts one for each card he holds. 3. *Sequence*, which is several cards in the same suit following consecutively, as ace, king, queen, or knave; ten, nine, eight, &c. 4. The *Quatorze*, which occurs when a player has four cards of equal value in the four different suits; that is to say, four aces, kings, queens, knaves, or tens, no lower cards counting. Whichever player holds the highest quatorze counts fourteen; those which are highest taking precedence, and preventing any inferior quatorze from being of value. 5. The *Cards*. Two cards, one from each player, make a trick; if each player has six tricks, the cards are divided; but if either wins seven or more tricks, he has "the cards;" that is, he counts ten beyond the number he has already scored. 6. The *Capot*. Whichever player wins all the tricks, wins what is called a capot, and instead of ten, adds forty to his score.

PIRACY, *pi'-rā-se* (Lat. *pirata*, Gr. *peirates*), by the common law, consists in committing those acts of robbery and depredation upon the high seas, or other places where the Admiralty has jurisdiction, which, if committed upon land, would have amounted to felony there. There are some other offences which are made piracy by statute; as by 8 Geo. I. c. 24, the trading with known pirates, or furnishing them with stores or ammunition, or fitting out any vessel for that purpose,

or in anywise consulting, combining, confederating, or corresponding with them; also by 5 Geo. IV. c. 113, if any British subject shall, within the jurisdiction of the Admiralty, knowingly convey, or assist in conveying, persons as slaves, or to be dealt with as slaves, or ship them for that purpose, he shall be deemed guilty of piracy, felony, and robbery, and be liable to penal servitude for life, or for any term not less than fifteen years; or to be imprisoned for any term not exceeding three years. The piratical spirit was very prevalent in early times, and, indeed, it is only recently that the ascendancy of the law has been secured, and this plague rooted out of Europe. By the law of nations, every one has a right to pursue and exterminate pirates without any previous declaration of war; but it is not lawful to kill them without trial, except in battle. Those who surrender, or are taken prisoners, must be tried and dealt with according to law. Until lately, by the law of England, the punishment for piratical offences in general was death; but this severity has been relaxed, and now, whoever shall be convicted of any offence amounting to piracy, and made punishable with death, is liable to be sentenced to penal servitude for life, or any term not less than fifteen years; or to be imprisoned (with or without hard labour) for any term of not more than three years.

PIRACY, LITERARY. (*See* COPYRIGHT.)

PISCES. (*See* ICHTHYOLOGY, FISH.)

PISTACIA, *pis-tay'-she-a* (Lat.), in Bot., a gen. of the nat. ord. *Anacardiaceæ*. The concrete resin called *mastic* or *mastich*, much used, dissolved in alcohol or turpentine, as a varnish and cement, is obtained from the species *P. Lentiscus*. It is principally imported from the island of Chio, where the plant is much cultivated. The liquid oleo-resinous matter called *Chian turpentine* is produced by the species *P. Terebinthus*, and is imported from the same island. *P. vera* produces the fruit known as *pistachio* or *pistacia nut*, the kernels of which are of a green colour and have a very agreeable flavour. They are highly esteemed by the Turks and Greeks, and are occasionally imported into this country.

PISTIACEÆ, or LEMNACEÆ, *pis-te-ai'-se-e*, in Bot., the Duckweed fam., a nat. ord. of *Monocotyledones*, sub-class *Petaloideæ*. Floating aquatic plants with lenticular or lobed leaves or fronds. Flowers 2 or 3, inclosed in a spathe, monœcious, placed on the margin or the surface of the frond, or in the axils of leaves. Perianth none. Male flower with 1, or a few stamens, often monadelphous. Female flower consisting of a 1-celled ovary with 1 or more erect ovules. Fruit 1- or more-seeded, membranous or baccate, indehiscent, or sometimes dehiscent. Embryo straight, cleft, in the axis of fleshy albumen. The plants of this order inhabit cool, temperate, and tropical regions. Their properties are unimportant.

PISTIL, or GYNŒCIUM, *pis'-til, ji-ne'-se-um* (Lat. *pistillum*; Gr. *gune*, a woman), the female system of the flower, or the *ovary*, *style*, and *stigma*, taken together. It occupies the centre of the flower, the stamens and floral envelopes being arranged around it, when they are present; the envelopes alone in the unisexual pistillate flower; or it stands by itself when the flower is pistillate and naked. It consists of one or more modified leaves called *carpels*, which are either distinct from each other, as in the columbine and stonecrop, or combined into one body, as in the primrose and tobacco-plant. When there is but one carpel, as in the pea, the pistil is said to be *simple*; when there is more than one, as in the examples cited above, it is *compound*. Each carpel consists essentially of a hollow inferior part called the *ovary*, which contains the *ovules*, and a cellular part called the *stigma*, to which the *pollen*, or fertilizing dust from the *anthers*, adheres. The stigma is either placed directly on the ovary, in which case it is said to be *sessile*, as in the barberry, or it is elevated on a stalk prolonged from the ovary, called the *style*, as in the primrose. At the period of fecundation, the stigma becomes moistened by a viscid fluid, which renders the surface more or less sticky, and thus admirably adapted to retain the pollen-grains, which are thrown upon it at the time of the dehiscence of the anther. The style is traversed by a very narrow canal, which communicates below with the cavity of the ovary, and above with the stigmas. The walls of this canal are formed of a loose humid tissue, called the *conducting tissue*, from its function of conducting the pollen to the ovules. The terms *apocarpous*, *syncarpous*, &c., are used, when describing the pistil, in the same sense as when they are applied to the fruit, which is in fact the mature pistil. (*See* CARPEL, FRUIT, OVARY, OVULE, and PLACENTA.)

PISTOL, *pis'-tol* (Fr.), a small fire-arm, suitable for carrying about the person or in holsters at the saddle-bow, named (it is supposed) from the city of Pistoja, in Tuscany, from pistols having been first made there. Mention is made of their use as early as the reign of Francis I. of France (1544), and in the time of his successor, Henry II. The horsemen who carried them were called pistoliers. Pistols, until recent times, were very imperfect weapons, as a rule; but, nevertheless, some pistols were produced at an early period, in which the peculiar principles of the best instruments of the present day were more or less perfectly embodied. A Spanish pistol made about the end of the 17th century could be fired twenty-six times without a failure, and with one supply of ammunition; and in the Museum of Artillery in Paris there are revolving pistols which were produced more than two hundred years ago. Although these pistols, however, had four, five, or six large chambers, they never came into general use, in consequence of their unavoidable clumsiness, each chamber having its own hammer and pan, and the inconvenience of keeping these primed. To trace the improvements gradually introduced into the manufacture of pistols would, to a great extent, be simply to repeat the history of the gun manufacture; but the distinctive characteristics of revolving pistols, as used in the present day, deserve some separate notice. An American gentleman, Samuel Colt, having directed his attention to the improvement of pistols, in the first place increased the number of discharges by arranging several barrels in one cylindrical group around a central spindle, and caused these to turn by each cocking of the lock sufficiently far to bring another barrel under the hammer. All the barrels being first loaded, they might then be discharged as rapidly as the hammer could be raised and the trigger pulled. The plan finally adopted by Colt, however, was to make a revolving-chambered breech for the charges, and use a single barrel; in connection with which each chamber was brought in succession, by drawing back the hammer to the full catch. At half-cock, the chamber is free to be turned round by hand, and in this state the receptacles are loaded by pouring in powder and placing a ball in each directly upon the powder, without wadding. A ramrod is permanently attached to the under side of the barrel, and is so contrived that, by bringing down its free end, it acts as a lever, and strongly presses a short rod into one of the receptacles, driving the ball home and effectually shutting in the powder. Percussion-caps being then placed on the nipples with which the piece is provided, it is ready for service. But great as was the efficacy of these pistols, they failed to give entire satisfaction, on account of the necessity of stopping at every fire to cock the piece for the next shot; and in several English and American pistols devices have been introduced for meeting this defect. In those of the English manufacturer Mr. Dean, for instance, the pulling of the trigger raises the hammer to the full cock, when it is suddenly let go, and the action being repeated, the same motion brings round another chamber, which is immediately discharged. This form of lock is again objected to, however, on the ground that by the sudden liberation of the mainspring as it is pulled up, the aim is disturbed, and the fire cannot be made with the accuracy of other pistols. The discussions of manufacturers and of amateurs respecting the best kind of pistol are as various as the kinds of pistols themselves, which exist in all gradations between the pocket-pistol which can be hid in a lady's glove, to the horse-pistol used by the American cavalry, which approaches the size of a carbine.

PISTON. (*See* STEAM-ENGINE.)

PISUM, *pi'-sum* (Lat.), in Bot., the Pea, a gen. of the nat. ord. *Leguminosæ*. The species *P. sativum* is the common pea, the most valuable of culinary legumes. Like most domestic plants of great antiquity, its native country is unknown, though it is commonly

referred to the South of Europe. The different varieties of garden pea and the grey pea, which is cultivated in fields, are all regarded as varieties of *P. sativum*.



Pea.

Pitch, *pitch*, a term applied in Mus. when speaking of the acuteness or gravity of any particular sound or instrument. For instance, if we wish to express that any sound is less acute, or lower, than another, we should say it is of a lower pitch, and *vice versâ*. The opera pitch is much higher than the common *concert pitch*.

Pitch, the residuum which remains after tar has distilled or boiled in an open pot, so as to drive off the volatile matter. It is largely used in shipbuilding, &c.

Pittosporaceæ, *pit-tos-po-rai'-se-e* (Gr. *pitta*, pitch; *sporos*, seed), in Bot., a nat. ord. of *thalamiflorous Dicotyledones*, having the following essential characters:—Trees or shrubs, with simple, alternate, exstipulate leaves and regular flowers. Sepals and petals 4 or 5, hypogynous, imbricated, deciduous. Stamens 5, hypogynous, alternate with the petals, with 2-celled anthers. Ovary superior; style single; stigmas equal in number to the placentas, which are 2 or more, and either axile or parietal; ovules anatropal, horizontal or ascending. Seeds numerous, with a minute embryo in copious fleshy albumen. The *Pittosporaceæ* are chiefly Australian plants, but are occasionally found in Africa and some other parts of the globe. Lindley enumerates 12 genera, which comprise 73 species. They are remarkable for resinous properties. Some, as certain species of *Billardiera*, have edible fruits, and some are cultivated in this country on account of the beauty of their flowers.

Pivot, *piv'-ot* (Fr.), in Mech., the extremity of the axle round which a body revolves. In military language, the *pivot* is that officer or soldier upon whom the different wheelings are made in the course of the various evolutions of drill.

Placenta, *plă-sen'-ta* (Lat.), a projection on the inner wall of the ovary, to which the ovules or rudimentary seeds are attached. The arrangement of the placentas, or *placentation*, is a very important character in distinguishing plants. In the *simple ovary*, the placenta is situated at the ventral suture, or that point which corresponds to the union of the two margins of the carpellary leaf; such a placenta is therefore termed *marginal*, or more commonly *axile*, from its being turned towards the axis of the plant. In *compound ovaries*, the placentation is of three kinds; namely, *axile*, *parietal*, and *free central*. The *axile*, or *central* of some botanists, occurs in all compound many-celled ovaries, because in these each of the component carpels is placed in a similar position to the simple ovary; and hence the placentas situated at their ventral sutures will be arranged in the centre or axis, as in the lily and campanula. The other two kinds of placentation occur in the compound 1-celled ovary. That termed *parietal* consists in the attachment of ovules to placentas, either placed directly on the wall of the ovary, as in the mignonette and cactus, or upon incomplete dissepiments, formed by the partially-enfolded carpels, as in the orchis and poppy. In parietal placentation, the number of placentas corresponds to the number of carpels of which the ovary is formed. What is called a *free central* placenta is formed when the placentas are not attached to the walls of the ovary, but are situated in the centre of the cavity, and perfectly unconnected with those walls. The pink and primrose families furnish examples of this kind of placentation. It sometimes happens that none of these regular kinds of placentation can be discriminated, the ovules being placed irregularly in the cavity of the ovary. (*See* Ovary, Ovule, Pistil.)

Plagiarism, *plaï'-je-ă-rizm* (Lat. *plagium*), in Lit., is the stealing the works or thoughts of another and publishing them as one's own. Among the Romans, *plagium* was the crime of stealing the slave of another, or kidnapping a free person, in order to make him a slave. Thomasius has written a work *de plagio literario*, wherein he lays down the laws and measures of right which authors have to another's writings. "Dictionary writers," says that patriarch of encyclopædia writers, Ephraim Chambers, "at least such as meddle with arts and sciences, seem in this case to be exempted from the common laws of *meum* and *tuum*; they do not pretend to act upon their own bottom, nor to treat the reader at their own cost. Their works are supposed, in great measure, compositions of other people; and whatever they take from others they do it avowedly. In fact, their quality gives them a title to appropriate everything that may be for their purpose, wherever they find it, and they do no otherwise than as the bee does for the public service. Their occupation is not pilfering, but collecting contributions; and if you ask their authority, they will produce you the practice of their predecessors of all ages and nations."

Plague, *plaig* (Gr. *plege*, a stroke), a contagious fever, generally of a very severe kind, rapid in its progress, and accompanied by buboes, carbuncles, and petechiæ. It spreads rapidly by contact, and is usually fatal to two-thirds of those whom it attacks. The first symptoms are headache in the forehead and occiput, sometimes accompanied by violent and short tremors, alternating with heat. The eyes become red, and assume a ferocious aspect; the headache increases, and the pain extends to the spine, to the joints, and to the limbs. Then follow vertigo and delirium, at first mild, but afterwards fierce. The tongue is dry and yellowish, but without thirst. There is nausea, with ineffectual attempts, in most cases, to vomit, or if anything is brought up, it is green bile. The respiration is laborious, with general uneasiness. There is nothing particular in the alvine excretions, although they are sometimes liquid. The urine is often turbid, with an oily aspect. The smell of the patient is occasionally nauseous; but if the disease has lasted a few days, the perspiration has often a sweetish, disagreeable smell. The disease varies in duration from three to seven days; but the patient often dies within a few hours of the attack. Some die at periods from three to four days, without any outward symptoms beyond a peculiar physiognomy, sparkling eyes, and an expression of countenance resembling that of a person under hydrophobia. On dissection, the gall-bladder has been found distended with greenish-black bile, the inside of the intestines and stomach covered with a yellow mucus, and the conglobate glands indurated; but dissections have not, for obvious reasons, been numerous. The medical treatment of the plague has hitherto been of an empirical character; no treatment attempted having been proved to be of real use. In the French army at Jaffa, bark, tamarinds, coffee, and camphor were employed, as well as sudorifics, emetics, and blisters, but without success. It has been asserted that bleeding and laxatives are of great efficacy; but it is known that in many cases they have proved utterly ineffectual. Sweating, the use of cold water, and the use of oil, have, in turns, been loudly advocated as remedies for this disease, but apparently on the very vaguest grounds. The plague is of Egyptian origin; the great plague of Athens, which took place 430 B.C., and which is the first instance on record of its appearance in Europe, having been imported from the borders of that country by a circuitous route through Libya. Its first introduction into modern Europe was by means of the Crusades; and since then it has appeared in various places, and by many different courses, but always imported from some part or other of the Turkish empire. It has frequently appeared in London, where, in 1665, it destroyed, on the smallest calculation, 68,600 inhabitants; but since that year, quarantine laws, added to many improvements in the state of

society, have protected Great Britain from its calamitous visitations. Various estimates have been given of the frequency of plague epidemics in the principal towns of Egypt, Syria, and Turkey; but the general opinion appears to be that it recurs, in those places, at intervals varying from seven to ten years; and that, whilst it is both endemic and contagious in Lower Egypt, from the marshy lands of which it springs, it is merely contagious in Upper Egypt, as well as in Syria, and all the more distant countries to which it may be conveyed. According to the general accounts, the plague would seem seldom to occur in Egypt in the months of September, October, November, December, and January; but if it do begin in September or October, is more terrible than if it appear later. Scientific men have frequently discussed the question why the same disorder does not originate in other countries, in the same or similar regions, that appear to be in the same circumstances; as in southern and middle Africa, which are subject to the most destructive of the fevers produced by marsh miasmata, but where the plague is unknown. The answer generally given to this question is, that the course of the Nile is peculiar; that it traverses fifty or sixty lakes and marshes in Abyssinia and Sennaar, where it thus flows through Upper Egypt, charged with putrescent matter; and that, when it arrives in the lower country, it deposits these, and thus produces the plague. But the reply to this is, that there are many other rivers in precisely similar circumstances, which produce fever enough, but never the plague; and that the fevers produced by them are epidemic, and not, as in the plague, contagious. Although it is now generally acknowledged that the plague is contagious, many persons formerly stoutly denied that it was so; and the arguments on either side may be thus briefly summed up:—In support of the doctrine of contagion, it is argued, that the attack of plague is not simultaneous, but successive; that it commences in one part of a town or district, and gradually spreads to the rest, though under a similar atmosphere, and influenced by the same predisposing causes; and that in many cases it has been distinctly traced to communication with infected persons, or to clothes or goods which have been handled or worn by persons so affected. On the other side, it is alleged that numerous instances have occurred of persons who have slept in the same bed with patients who have died of the plague, and of others who have worn the clothes of the deceased, without receiving the disease; that during the invasion of Egypt, at the commencement of the present century, the Turkish soldiers dug up the dead bodies of those who had fallen victims to the plague, and appropriated the clothes stripped off them without receiving or communicating the disease; and that the doctrine of contagion is not alluded to by Hippocrates, Celsus, and other eminent medical writers among the ancients. It has also been much disputed whether, having once passed through plague renders a person unsusceptible of re-infection; and if it does not afford absolute security against more than one attack, in what proportion of cases a second or more frequent recurrence takes place. Some authors have denied the possibility of a second attack; whilst, on the other hand, a Greek padré, who took care of the Greek hospital at Smyrna for fifty years, declared to an English physician that he had had it twelve times. Another question of much importance, from its connection with the subject of quarantine, is, as to what length of time may elapse between a person's exposure to plague-poison and the appearance of the disease; but on this point, also, the information is very vague and uncertain; some physicians declaring that there are no instances of the disease appearing later than the ninth or tenth day after the day of shutting up, in those who adopted that precaution; and others asserting that persons have continued well until the seventeenth day after having been placed in quarantine, and have even then fallen sick of it. It is a question how far a person who has received the contagion, but in whom the disease has made no progress, can communicate it; and it appears that the body alone, if washed and shaved, does not readily communicate it, except when actually suffering from the disease, in a febrile state, or in a perspiring one. Some of the most remarkable visitations of the plague have been that which occurred in Britain, A.D. 430, and which carried off such multitudes that the living were scarcely sufficient to bury the dead; that which destroyed 200,000 of the inhabitants of Constantinople, A.D. 746. In Germany, 90,000 persons died of it in 1348; in Ireland, great numbers died of plague in 1466 and 1470; in London, 30,578 persons perished of plague alone in 1603-4, and 35,417 in 1625. The plague carried from Sardinia to Naples in 1656 (being introduced by a transport with soldiers on board) raged with such violence as to carry off 400,000 of the inhabitants in six months. In Egypt, more than 800,000 died of plague in 1792; and at Malta it committed great ravages in 1813.

PLAICE, *plaise* (Fr. *plie*, Sp. *platija*) (*Platessa vulgaris*).—This fish belongs to the fam. of the Flounders or Flat-fish (*Pleuronectidæ*), the characteristics of which are a want of symmetry in the form of the head, the position of both eyes on the same side of the head, one higher than the other, and frequently not in the same vertical line, and often unequal in size; the frequent want of uniformity in those fins that are in pairs, the pectoral and ventral fins of the under or white side being in some species smaller than those of the upper, and the whole colour of the fish confined to one side, while the other side remains perfectly white. The plaice (as well as the flounder and the dab) is known from the other flat fish by each jaw having a single row of obtuse teeth, a spine at the beginning of the anal fin, and a rounded tail. Preferring muddy or sandy shores, and unprovided with swimming-bladders, the plaice generally keep close to the ground, where they hide their bodies horizontally in the loose soil at the bottom, with the head only slightly elevated, or swim slowly in the same position. The plaice spawns in February or March, and is considered to be in the finest condition at the end of May. Plaice feed on the soft-bodied animals generally, with young fish and soft crustacea, and have been known to attain a weight of fifteen pounds; but one of seven or eight pounds' weight is considered a plaice of large size. The length of the head compared to the whole length of the head, body, and tail, is as two to nine; the depth of the solid part of the body, without including the dorsal or anal fins, rather more than one-third of the whole length; the form subrhomboidal; the mouth and teeth rather small; the upper eye the larger, and placed rather more backwards than the lower eye, with a strong and prominent bony ridge between the orbits, and several tubercles, forming a curved line from the posterior part of the ridge to the commencement of the lateral line. The body is smooth on both sides, the scales small; the colour of the upper or right side a rich brown, with a row of bright orange-red spots along the dorsal and anal fins, and other spots of the same colour dispersed over the body; the under side entirely white. Young fish have frequently a dark spot in the centre of the red one. On the English coast the plaice is taken in abundance, generally wherever either lines or trawl-nets can be used, and is sometimes taken in almost incredible numbers.



PLAICE.

PLAN, *plân* (Fr., Ger., Du.), a representation of a plane section of any building, country, &c. The term is usually applied to the horizontal section, the word *section* or *elevation* being applied to the vertical plans. In Arch., a plan is used for a draught of a building, such as it appears, or is intended to appear, on the ground, showing the extent, division, and distribution of its area into apartments, passages, &c. In order to render plans intelligible, it is customary to distinguish the massive parts with a black wash. The projectures on the ground are drawn in full lines, and those supposed over them in dotted lines. The enlargements or

alterations are distinguished by a different colour from that used in delineating the portions already built; and the tints of each plan are made lighter as the stories are raised. In large buildings it is usual to have three several plans for the first three stories. A *geometrical plan* is that in which the solid and vacant parts are represented in their natural proportion. A *perspective plan* is one that is conducted and exhibited by degradations or diminutions, according to the rules of perspective. A *raised plan* is one where the elevation or upright is shown upon the geometrical plan, so as to hide the distributions.

PLANE, *plain* (Lat. *planus*), a surface without curvature, or one that lies evenly between its bounding lines; and as a right line is the shortest extension from one point to another, so a plane surface is the shortest extension from one line to another. The term plane is frequently used in astronomy, conic sections, &c., to signify an imaginary surface supposed to cut and pass through all solid bodies; and the whole doctrine of conic sections is based on this foundation. In Mech., planes are either horizontal,—that is, parallel to the horizon, or inclined to it. In optics, the planes of reflection and refraction are those drawn through the reflected or refracted rays. In carpentry, the *plane* is a tool used to produce straight, flat, and even surfaces upon wood.

PLANET, *plăn'-et* (Gr. *planetes*, a wanderer), a term originally applied to those stars which have a perceptible motion. In modern Astron., however, the word is confined to those stars which shine by reflecting the light of the sun, around which they revolve. Amongst the ancients, five planets were known,—Mercury, Venus, Mars, Jupiter, and Saturn; since that time upwards of sixty others have been discovered by means of the telescope. Most of these are called asteroids, the orbits of which are all situated between those of Mars and Jupiter. Most of them, if not all, have, like the earth, a motion of rotation on their axes, from which arise day and night. They have also a common motion round the sun, revolving from west to east. The nearest planet to the sun is usually said to be *Mercury*; but recent observations have shown that there is a small orb between that planet and the sun, to which no distinctive name has yet been given. It would seem that this new planet has a diameter of about 900 miles, and revolves round the sun in about twenty days. The distance of Mercury from the sun is about 36,470,000 miles. (*See* MERCURY.) Next to this planet is placed *Venus*, at a distance of 68,734,000 miles. Mountains have been observed in it, the height of which has been calculated to exceed eighteen miles. Mercury and Venus both exhibit phases similar to our moon; and, being nearer to the sun than the earth, are called the *inferior* planets; while those more distant than the earth are called the *superior* planets. (*See* VENUS.) Next to the earth, with its moon, is *Mars*, distant about 144,000,000 miles from the sun. (*See* MARS.) Between this planet and *Jupiter* is a vast distance, which early led to a supposition that there was some body between them. At the beginning of the present century this conjecture was verified by the discovery of four new planets in succession,—*Ceres*, *Pallas*, *Juno*, and *Vesta*. Since then, as mentioned above, a large number of other asteroids have been discovered. The largest of all the known planets is *Jupiter*, which revolves round the sun at the distance of about 494,000,000 miles. (*See* JUPITER.) At nearly twice the distance of Jupiter, or 906,423,000 miles from the sun, *Saturn* passes through its orbit, 5,760,000,000 of miles in length, in 29 years and 169 days, accompanied by seven moons, and surrounded by a remarkable double ring. (*See* SATURN.) In 1781 Herschel discovered *Georgium Sidus*, or *Uranus*, which is 1,822,807,000 miles distant from the sun, and accompanied by six moons: it accomplishes its revolution in about eighty-four years. Lastly, the planet *Neptune*, discovered in 1846, independently, by Adams and Le Verrier. It is distant from the sun about 2,854,247,000 miles, and forms the extreme known limit of our solar system. (*See* NEPTUNE.)

PLANISPHERE, *plăn'-e-sfere* (Lat. *planus*, plain, and sphere), a term applied to a projection of the sphere and its various circles, on a plane surface, as, upon paper, maps of the earth or of the heavens. Maps showing the meridian or circles of the sphere may, in this respect, be called planispheres. The term is not much used now, and at present, in astronomy more especially, designates any contrivance in which plane surfaces, moving on one another, fulfil any of the uses of a celestial globe.

PLANTAGINACEÆ, *plăn-tăj-i-nā'-se-e* (from Lat. *planta*, the sole of the foot; resemblance in the leaves), in Bot., the Ribworts, a nat. ord. of *Dicotyledones*, subclass *Corollifloræ*,—herbaceous plants, generally without stems. Leaves commonly ribbed, and radical. Flowers usually spiked and perfect, or rarely solitary, and sometimes unisexual. Calyx persistent, 4-partite, imbricated. Corolla dry and membranous, persistent, 4-partite. Stamens equal in number to the divisions of the corolla, and alternate with them; filaments long and slender; anthers versatile. Ovary simple, 2- or 4-celled, from the prolongation of processes from the placenta; style 1. Capsule membranous, with transverse dehiscence; placenta free, central. Seeds 1, 2, or more, with a mucilaginous testa; embryo transverse, in fleshy albumen. These plants abound in cold and temperate climates, but are more or less diffused over the whole globe. There are three genera and 120 species. The seeds of *Plantago Psyllium*, *arenaria*, and *Cynops*, are demulcent, and have been used like those of flax (linseed) in the preparation of mucilaginous demulcent drinks. The order is unimportant in an economic point of view.

PLANTAIN. (*See* MUSA.)

PLANTS, DISTRIBUTION OF, *plants* (Fr. *plante*, Ger. *Pflanze*).—It is a matter of common observation that the localities and soils in which plants grow vary much. Some species grow in the shade, while others thrive best in a full glare of light; some prefer alpine districts, others the plains; some are found in dry, others in marshy places; some are submersed in lakes or in the sea, while others live on muddy banks or on sandy shores. It is equally well known that climate exercises a powerful influence on vegetation, modifying the Floras in different regions of the globe. Some plants are fitted to bear the rigour and duration of an arctic winter with a moderate summer heat, others require the heat and light of the torrid zone; and between these two extremes there are all varieties of gradation. Thus does vegetation extend over the whole globe from pole to pole, from the summit of the loftiest peak to the depths of the ocean. Palms, bananas, tree-ferns, and orchideous epiphytes, are chiefly confined to the tropics; cruciferous and umbelliferous plants are found in temperate regions; some coniferous and amentaceous plants flourish in more northern countries; while saxifrages and lichens extend to the arctic regions. Schouw divided the globe into twenty-five botanical *regions*, in each of which at least one-half of the known species, a quarter of the genera, and some individual families, were peculiar to that region, and found nowhere else. These regions are scattered variously over the globe, but, as shown by Meyen, they admit of an arrangement into zones; each zone surrounding the earth and including regions in which, although the plants are distinct, yet they are more like and more nearly allied to each other than those of other zones. Starting with the *equatorial zone*, there are, on each side of it, a *tropical*, *sub-tropical*, *warm-temperate*, *cold-temperate*, *sub-arctic*, *arctic*, and *polar zone*. Not only are the regions of plants in each of these zones similar to each other, but there is another kind of similarity in those of corresponding zones in the opposite hemisphere; so that the plants may be said to be, although entirely distinct, representative of each other. The evergreen forest-trees, for instance, of the northern warmer temperate zone are represented by other evergreen forest-trees in the southern warm-temperate zone, each zone still having its distinct regions of plants. Then, if we regard the vertical distribution of plants, and start from the level of the sea in the equatorial zone, up the sides of a great mountain-chain, we pass in succession through spaces answering to these zones, finding *belts* of vegetation as we ascend, either the same as, or representative of, all the latitudinal zones, till we reach the representative of the polar one, at the margin of perpetual snow. Similarly in all other zones, as we ascend from the level of the sea, we pass successively in altitude through the repre-

sentatives of all the zones that interpose in latitude between the lower one and the pole. In Britain, for instance, the tops of our mountains are clothed with arctic and sub-arctic plants. The distribution of plants is a great subject, and can only be imperfectly sketched in a work like the present. The following list of books and papers indicates the best sources of information on botanical geography.—*Ref.* Johnston's *Physical Atlas*; Schouw's *Earth, Plants, and Man*; Meyen's work, printed by the Ray Society; Hooker's treatise in Murray's *Encyclopædia of Geography*; Humboldt's *Cosmos* and *Aspects of Nature*; Forbes's paper in the *Reports of the Geological Survey of Great Britain*; Balfour's *Manual of Botany*; and Juke's *Manual of Geology*.

PLANTS (FLOWERLESS), or CRYPTOGAMIA, in Bot.—These plants form one of the two great subkingdoms into which botanists have divided the vegetation of the globe. They have no flowers; hence they are termed *cryptogamous*: they are without true seeds, being propagated by spores; hence they are said to be acotyledonous. (*See* ACOTYLEDONS, and the scheme of classification given under BOTANY.)

PLASTER, PLASTERING, *plast'-er* (Sw. *plaster*, Ger. *Pflaster*).—Plaster is a composition of lime, sometimes mixed with hair, sometimes with sand, &c., to parget or cover the nudities of a building. Plastering, or the act of covering the walls and ceilings of a house or other edifice with plaster, is of various kinds. Amongst other methods may be mentioned white lime-and-hair mortar laid upon bare walls; the same upon laths, as in partitioning and plain ceiling; renewing the insides of walls or double partition-walls; rough-casting on heart laths; plastering on brickwork with finishing mortar, in imitation of stonework, and the like upon heart-laths; modelling and casting plain and ornamental mouldings, and making and polishing the scagliola for columns of wood or brick. Lime forms an extensive article in all the operations of plastering, as it pervades the whole. Most of the lime used in London for this purpose is prepared from chalk, and brought from Purfleet, in Kent. For stuccoing, and other work requiring strength and permanency, the lime procured from Dorking, in Surrey, is preferred. In the ordinary process of plastering, the workman recognizes the following technical divisions:—1. *Lathing*, which consists in nailing laths on the ceiling or partition. 2. *Laying*. This consists in spreading a single, even coat of lime and hair all over a ceiling or partition. 3. *Pricking up*. After the plaster is laid on, it is crossed all over with the end of a lathe, to give it a key or tie for the coat that is to be laid on it. 4. *Lathing, laying, and set*, is when the work, after being lathed, is covered with one coat of lime and hair; and when that is sufficiently dry, a thin and smooth coat is spread over it, consisting of lime only. 5. *Lathing, floating, and set*, differs from the preceding in having the first coat pricked up to receive the set, which is called *floating*. This last operation is performed with a substantial straight-edge. Good plastering is known by its exquisite appearance, both as to its regularity and correctness and its solid effect, having no cracks nor indications of them visible.

PLASTER OF PARIS. (*See* GYPSUM.)

PLATANACEÆ, *plăt-ă-nā'-se-e* (Gr. *platanos*), in Bot., the Plane fam., a nat. ord. of *Dicotyledones*, sub-class *Monochlamydeæ*. Trees or shrubs with a watery juice. Leaves alternate, with deciduous sheathing stipules. Flowers unisexual, monœcious, in globular amentiferous heads, achlamydeous; male flowers with 1 stamen and a 2-celled linear anther; female flowers consisting of a 1-celled ovary and a thick style; ovules 1—2, suspended. Fruits arranged in a compact rounded head, and consisting of clavate nuts, each with a persistent style. Seeds 1—2, pendulous; embryo in very thin albumen, with an inferior radicle. The Planes are chiefly natives of America and the Levant. There is but one gen., namely *Platanus*. Being large, handsome trees, they are commonly grown in our parks and squares. The leaves in form resemble those of the sycamore-tree, or mock-plane (*Acer Pseudo-platanus*).

PLATE-GLASS. (*See* GLASS.)

PLATING, *plăt'-ing*, the art of covering copper and other metals with silver or gold, either for use or ornament. It is effected in various ways. Sometimes the silver is attached to and rolled out with the copper; and sometimes one metal is precipitated from its solution upon the other. Of late years, manufacturers have availed themselves of electro-chemical decomposition for the purpose of plating different mptals. (*See* ELECTRO-PLATING.)

PLATINUM, *plăt'-i-num* (Sp. *platina*, from *plata*, silver), in Chem. and Metall.,—symbol Pt, equiv. 98·56, spec. grav. 21·5. This valuable metal is found in nature in small flattened grains, alloyed, more or less, with palladium, rhodium, osmium, ruthenium, and iridium. It occurs chiefly in certain of the alluvial districts of Mexico, Brazil, and the Ural Mountains. The excessive infusibility of platinum renders its purification a very complicated matter. The method generally employed is that devised by Dr. Wollaston. The ore is digested in aqua regia until solution takes place; sal-ammonia is then added, and the greater part of the platinum is precipitated in the form of a yellow double salt, which is sparingly soluble. The mother-liquor still retains a portion of the metal, which is redissolved in aqua regia, after precipitation, by iron, sal-ammonia being added as before. The double salt is washed and heated to redness, to drive off the chlorine and ammonia, and the platinum is left behind in the metallic state in a spongy mass. This is thoroughly washed and levigated, and afterwards squeezed in a powerful press until it acquires the specific gravity of about 10. It is next exposed to the heat of a powerful wind-furnace, and the ingot is forged by hammering on the ends, the heating and forging being repeated until the mass becomes homogeneous and ductile. Platinum, or platina as it was formerly called, from a Spanish word signifying little silver, is a white metal possessing properties which render it most valuable in the arts. It is susceptible of a high lustre, and possesses considerable hardness. It is the most ductile of all metals, and is nearly as malleable as gold. It resists heat with great obstinacy, yielding only to the highest temperature obtainable by Deville's oxyhydrogen furnace. At high temperatures it possesses the property of welding. Its power of conducting heat and electricity is inferior to gold and silver. It does not oxidize in air at any temperature, and no single acid has any effect on it. Aqua regia dissolves it slowly. Heated in air with the alkalies or alkaline earths, it becomes corroded, owing to the formation of a double oxide. Its properties in a minute state of subdivision are interesting. If the protochloride is dissolved in a strong solution of caustic potash, and alcohol added, carbonic acid escapes, and the metal becomes reduced in the form of a fine black powder, known as *platinum-black*. In this finely-divided state it greedily condenses oxygen from the air, absorbing many times its bulk of that gas. If moistened with ether or alcohol, it imparts this oxygen to them, forming new compounds and glowing with the heat produced. The great infusibility and resistance to ordinary chemical agents possessed by platinum render it invaluable to manufacturing and experimental chemists; the advance in chemical science during the last forty or fifty years being due in no small degree to its introduction as a material for the construction of crucibles, tubes, and retorts. In the purification and concentration of sulphuric acid, large platinum stills are used. It is used in Russia for coinage. It is easily alloyed with other metals. It combines with carbon, silicon, and the haloids,—with oxygen, sulphur, cyanogen,—and it is supposed nitrogen in fulminating platinum.

PLATINUM, CHLORIDES OF.—There are two chlorides of platinum,—the protochloride ($PtCl$) and the bichloride ($PtCl_2$). To obtain the former, the solution of platinum in aqua regia is evaporated and the residue exposed to a heat of 450° Fahr., until chlorine ceases to be expelled. It is an olive-green powder, insoluble in water, but dissolving easily in caustic potash. It forms double salts with the bichloride of platinum and with the alkaline chlorides. The *bichloride* is obtained by evaporating the solution of the metal in aqua regia at a temperature not exceeding 212° Fahr. It is readily soluble in water, ether, and alcohol, forming a deep orange solution. By careful evaporation, it may be obtained in deliquescent prisms. Heated to 450° Fahr., it gives off half its chlorine and is converted into the protochloride; and if the temperature be further raised, the whole of the chlorine is eliminated. With the

chlorides of the alkalies, both natural and artificial, it forms double salts. With ammonia and its chloride, it forms a multitude of salts, of which Miller enumerates no less than twelve. Bichloride of platinum is invaluable in organic chemistry in determining the formulæ of the artificial alkalies, by the formation of the double chlorides.

PLATINUM, OXIDES OF.—There are two oxides of platinum,—the protoxide ($PtO$) and the binoxide ($PtO_2$). The protoxide is known only as a hydrate, obtained as a black powder, by decomposing the protochloride with potash. The anhydrous binoxide is obtained as a black powder, by heating the hydrate, which is thrown down by adding excess of potash to bichloride of platinum, and decomposing the platinate of potash thus formed with acetic acid. The hydrate is a red-brown powder, resembling sesquioxide of iron, and playing the part of an acid and a base. With potash and soda, crystallizable platinates may be formed; while with nitric and sulphuric acids it forms the nitrate and sulphate of the binoxide.

PLATINUM, SULPHIDES OF.—Platinum forms two sulphides,—the protosulphide ($PtS$) and the bisulphide ($PtS_2$); but they are of no practical interest.

PLATONIC PHILOSOPHY, *plă-ton'-ik*, is that system of ancient Greek philosophy which was established by Plato; "a philosophy," says Professor Butler, "which, whether regarded in itself, or with reference to its influence upon the history of reflective man, rises before us in all the dignity of the mightiest and most permanent monument ever erected by unassisted human thought exercised upon human destinies." "Whatever opinion we may justly form regarding the details of its reasoning, and however we may be disposed to criticise their legitimacy, there is in the body of the system itself a something which finds its echo in the heart, and its reflection in the reason of universal mankind; and they suggest that even its errors, if they exist, are, from their peculiar complexion and character, likely to be better worth investigation than the truths of narrower theories." The writings of Plato are numerous, and have reached us in a state of unusual completeness and textual purity. The genuineness of many of the pieces which bear his name has been disputed, but on such slight and unsatisfactory grounds as to be entitled to little weight. Their composition extended over a large part of his life, and they are to be regarded rather as marking different stages of his philosophical development than as expositions of a perfectly matured and developed system. They are all in the form of dialogues, in nearly all of which Socrates is the chief speaker, and the exponent of the author's sentiments. Not the least remarkable feature of the writings of Plato is the form in which they are communicated. In him we find the scientific intellect combined with the dramatic imagination in a degree which has never been equalled. He is at once poet and philosopher, and spreads the charms of an exhaustless fancy over the subtlest controversies of the dialectician. "In place of a formal refutation of sophistry, we are introduced to living sophists; in the room of an elaborate system of philosophy, we meet the greatest philosophers of his day, reasoning and conversing with disciples eager in the pursuit of knowledge." They are dialogues not merely in form but in spirit, conducted with all the freedom and animation of a real conversation between intelligent and highly-gifted men. The stern dialectic processes with which the student has constantly to grapple, are relieved by picturesque representation or elaborate and gorgeous fable, characterized by a light, buoyant humour, and interspersed with irony, sarcasm, banter,—now broad and now delicate; with a thousand other life-like touches interspersed, giving the whole an air of perfect truthfulness. The style, which seems so natural and easy, when closely examined is found to be elaborated with the greatest taste and fastidiousness. "Every word seems chosen with care, and every clause of his periods made to flow with its proper rhythm," and "the result is an exquisite composition, in regard to which we are at a loss to pronounce whether the depth and the elegance of the thought, or the grace and propriety of expression, most prevail."—(*Hampden.*) The leading characteristic of Plato's mind is its comprehensiveness. The ultimate unity of all knowledge, properly so called, and the mutual dependence of all its parts on each other, is the fundamental idea of his philosophy. Dialectics with Plato was the science of sciences, physics and ethics being sciences only in so far as they connect themselves with dialectics. This science *par éminence* deals only with the absolute and invariable. Its subject-matter consists of those transcendental spiritual essences known as ideas, mere abstractions or generalizations of the mind, having no objective reality (as some have held), and answering to the intuitions and general truths of modern science. (*See* IDEAS.) The soul could only have arrived at a knowledge of these in a state anterior to the present; and hence he resolved all knowledge into reminiscence of a state anterior to the present. In order to establish the doctrine of pre-existence, he distinguishes between ideas drawn from the senses and those conceptions which sense could never furnish, but which exist in the mind from the very commencement of conscious existence. By thus establishing the existence of the soul before coming into the body, he establishes its independence of the body, and, in consequence, its immortality. From these ideas of the soul, it followed naturally that its residence in the body is an evil, and that the phenomena of sense interposed between the mind and these absolute existences, are constantly deceiving and alluring it from its proper element. The great business of the philosopher, therefore, is to emancipate himself as far as possible, not only from the dominion of the animal appetites, but also from the illusions of sense, and to retire into that interior world of reflection in which his mind can commune with its kindred eternal essences. The ideas, however, are not all of equal excellence, supreme above all others being the forms of the true, the beautiful, and the good. The noblest of that triad is the last, the great end of all philosophic striving. This earth was created out of a formless chaotic mass, after the model of a perfect archetypal world existing in the mind of the Creator, and is as perfect as the untractable and essentially evil nature of matter admits. Plato, however, applied himself much less to physical investigations than to those of an ethical or dialectic character, and, indeed, only attended to them in his later years. It is difficult to say what idea Plato had of the Deity. It seems, however, that his idea of the good and He were identical; but whether he regarded Him as a personal being, it is impossible to say. Plato distinguishes two components of the soul,—the divine or rational, that which partakes of a divine principle and participates in the knowledge of the eternal, and the mortal or irrational, that which participates in the motions and changes of the body, and is perishable. The two are united by an intermediate link, which he calls *thumos*, or spirit. He believes in future retribution; exonerates God from responsibility for sin and suffering, and sets forth in elaborate myths the blessedness of the virtuous and the punishments of the vicious. In ethics the grand idea is the good in its various forms of development. He retains the fourfold division of the virtues into wisdom, courage, temperance, and justice; wisdom being the proper virtue of the reason, courage of the spirit, and temperance of the sensual part of our nature; justice being the principle that pervades and regulates the whole. True virtue always carries with it its own enjoyment, and the virtuous man always finds his highest happiness in communion with and assimilation to the good and the divine. Closely allied to ethics was politics. The State he regarded only as the individual on a larger scale—the individual as a miniature state. Hence his analysis of a state is but an enlargement of his psychological analysis. The governing class represents the intellect, the soldiers on guard the spirit element, and the labourers and handicraftsmen the sensual part. The virtue of the first class is wisdom, of the second courage, and of the third temperance; while justice is the principle that ought to run through, regulate, and harmonize the whole. He makes the interests of the state supreme, and merges in it all the interests of the family and the individual. The education and the employments of the citizens are all to be regulated by the state. The governing class of a state should consist of philosophers, of men who have risen to the contemplation of the real and the true. It is a well-

known expression of his, that the state can only attain its true end when either philosophers become its rulers, or when its present rulers have learned so far as to unite philosophy with a superintendence of public affairs.—*Ref.* Ritter's, Lewis's, Schwegler's, Butler's, Hampden's *Histories, &c., of Philosophy.*

PLEA, in Law. (*See* PLEADINGS.)

PLEADINGS, *plead'-ings* (Ang.-Nor.), in Law, are the alternate allegations by plaintiff and defendant in an action, of those matters of fact which constitute on the one hand the ground of action, and on the other the ground of defence. The Common Law Procedure Act, 1852, has introduced considerable changes in the course of pleadings as now followed. Pleadings always relate to matters of fact, and of fact only; for all matters of law are judicially noticed by the court. Pleaders are also required to abstain from any statement of the evidence by which the fact is to be established; the object of pleading being merely to ascertain whether the question is matter of fact or matter of law, and if the former, to develop it in a shape sufficiently precise to show its general nature and import. The first object in an action is to procure the defendant's appearance, in order that he may have an opportunity of being informed of the plaintiff's demand or complaint, and of encountering it in such manner as he may think fit. This is done by a summons or writ, issued in the queen's name, out of the court in which the action is brought, directed to the intended defendant, and commanding him to cause an appearance to be entered for him in that court in an action at the suit of the plaintiff within eight days after the writ is served upon him. If the defendant fails to appear, the plaintiff obtains judgment by default. If he appears, he is entitled to receive from the plaintiff a detailed statement of the nature of his complaints, which is called the declaration (*narratio*). If the declaration be so framed as to prejudice or embarrass the fair trial of the action, the defendant may apply to the court to have it struck out or amended; or if he denies the sufficiency of the facts as cause of action, he may lodge a demurrer, and call upon the court to give judgment in his favour upon that state of facts. Otherwise, the defendant's course is to plead or deliver a plea, the general object of which is to make answer in point of fact to the declaration. The plea may be either dilatory or peremptory. Dilatory pleas are founded on some matter of fact not connected with the merits of the case, and are either to the jurisdiction, showing that the case is not within the jurisdiction of the court, or pleas of suspension, showing some matter of temporary incapacity to proceed with the suit; or in abatement, showing some matter for abating or quashing the declaration. The effect of a dilatory plea is, if successful, to defeat the particular action, leaving the plaintiff at liberty to commence another in a better form. Peremptory pleas, or pleas in bar, are founded on some matter tending to impeach the right of action itself, and their effect is to defeat the plaintiff's claim altogether. Pleas in bar are of various kinds. In general issues, there is a denial of the whole matter of the declaration, or at least of the principal fact upon which it is founded; as that the defendant is not guilty, not indebted, did not promise as alleged, &c. All other pleas in bar are distinguished by the name of special pleas. Pleas in bar are also distinguished according to their subject-matter; as pleas in justification or excuse, and pleas in discharge; the former tending to show that there never was any right of action, the latter that the cause of action, though once existing, has been barred by matter subsequent. As regards all pleas in bar, it is a fundamental rule that they must either traverse (*i.e.* deny) the matter of fact in the declaration, or confess and avoid it. The plea being delivered, it then has to be met by the plaintiff within the proper period, upon peril that if he fail to do so, the defendant is entitled to judgment by default. In encountering the plea, the plaintiff has the same right to have it struck out or amended, if its frame be objectionable, as the defendant had with regard to the declaration; he may also demur or plead some matter of fact. If the plaintiff pleads, he is said to reply, which he does by delivering a replication; and this, also, as the plea, must either traverse the last pleading or confess and avoid it. Upon the same principles are constructed all the subsequent allegations that may occur on either side until the pleading is exhausted. To the replication the defendant may rejoin, or deliver an answer called a rejoinder; the plaintiff may answer the rejoinder by a surrejoinder; the defendant may, upon that, deliver a rebutter, and this may be followed by a surrebutter on the part of the plaintiff; beyond which pleadings seldom happen to extend, and are not distinguished by any particular names; for it is evident that the parties must at length arrive either at some exception by way of demurrer to the sufficiency of the last pleading, which is an issue in law, or at the denial on one side of some matter of fact alleged on the other, which is an issue in fact. Issues in law are referred to the decision of the judges of the court; issues in fact are decided by trial and evidence.—*Ref.* Stephen's *Commentaries on the Laws of England.*

PLEBEIANS, *ple-be'-yinz* (Lat. *plebs* or *plebes*).—The plebeians were the body of commons, or commonalty, of ancient Rome, and thus constituted one of the two great elements of which the Roman nation consisted, and which gave to the earlier periods of Roman history its peculiar character and interest. The ancient writers themselves do not agree respecting the time when the plebeians began to form a part of the Roman population; but if we are to believe those accounts which represent them to have formed a portion of the Romans as early as the time of Romulus, and the clients of the patricians at that time; they were, probably, the original inhabitants of the districts occupied by the new settlers, who, after their territory was conquered, were kept in that state of submission in which conquered nations were so constantly held in early times. Whatever may be thought of the existence of plebeians at Rome in the earliest times, however, they first of all appear as a distinct class of Roman citizens, in contradistinction to the patricians, in the reign of Tullus Hostilius. Alba, the head of the Latin confederacy, having been in his reign taken and razed to the ground, the most distinguished of its inhabitants were transplanted to Rome and received among the patricians, whilst many of the inferior citizens were also transferred to Rome, and, combined perhaps with the subdued original inhabitants, formed the plebeians. The same system was pursued on the conquest of other Latin towns, and the order of plebeians which was thus gradually formed by the side of the patricians, far exceeded them in number. The plebeians were citizens, but not *optimo jure*; they were perfectly distinct from the patricians, and were excluded from the comitia, the senate, and all civil and priestly offices of the state. The only point of contact between the two estates was the army; the plebeians being obliged to fight and shed their blood for their fellow-citizens, without being allowed to share any of their rights and privileges, and without even the right of intermarriage. In all judicial matters they were entirely at the mercy of the patricians, and had no right of appeal against any unjust sentence. Their citizenship resembled, in fact, the relation of aliens to a state in which they were merely tolerated on condition of performing certain services. Servius Tullius, however, put an end to this state of things, by dividing the city into *four*, and the subject country around, which was inhabited by plebeians, into *twenty-six regions* or local tribes, appointing to each tribe a prefect, called *tribunus*, and permitting them to have their own sacred ceremonies, festivals, and meetings. This division into tribes, with tribunes, at their head, certainly conferred upon the plebeians no right to interfere in any way in the management of public affairs, but it was preparatory to another measure, by which Servius Tullius divided the whole body of Roman citizens, plebeians as well as patricians, into five classes, according to the amount of their property, and formed the whole body of citizens thus divided into a great national assembly called *comitatus maximus*, or *comitia centuriata*, in which the plebeians met the patricians to a certain extent on a footing of equality, although the votes were arranged in such a way that it was always in the power of the wealthiest classes to decide a question before it was put to the vote of the poorer. During the reign of the Tarquins, the plebeians lost all they had gained by the legislation of Servius Tullius; but during the republic they gradually gained some

advantages, a number of laws, in particular, being carried, by which the relations between plebeians and patricians were more accurately defined than they had previously been. In the course of time, however, the patricians began to encroach upon the rights granted by these laws to the plebeians, and the latter, becoming convinced that it was impossible to retain what they possessed without acquiring more, entered upon a struggle with their oppressors, which resulted in their gradually gaining access to all the civil and religious offices, and in the union of the two classes into one great body of Roman citizens with equal rights.

PLEDGE. (*See* PAWN.)

PLEIADES, *plī'-ă-dēz*, in Astron., a group of stars in the constellation Taurus, the Bull. The stars are so close together that it is difficult to say how many are seen by the naked eye. Says Higenus, "They are called seven, but no one can see more than six;" and six seems to be the number generally visible, though there are many more in the cluster. There is a supposition, that some one of the stars once visible has disappeared or changed its magnitude. According to mythology, the Pleiades were the seven daughters of Atlas, who, being pursued by Orion, were changed by Jupiter into doves. They were afterwards translated to the heavens, where they formed the assemblage of the Seven Stars in the neck of Taurus.

PLEIOCENE. (*See* next Article.)

PLEISTOCENE, *plī'-sto-seen* (Gr. *pleistos*, most; *kainos*, recent), in Geol., a term applied by some to the most recent formations of the tertiary system. By the term *Pleiocene* or *Pliocene*, Sir Charles Lyell characterizes that portion of the tertiary strata which lies between the Miocene and the Post-tertiary. The newer pleiocene, or pleistocene, is represented in Britain by the glacial drift, or boulder formations of Norfolk, of the Clyde in Scotland, and of North Wales. Other examples are also to be found in the cave deposits of Kirkdale, about 25 miles from York. In one cave there were found the remains of 300 hyenas, belonging to individuals of every age. According to Dr. Buckland, they must have lived there. The remains of the ox, young elephant, hippopotamus, rhinoceros, horse, bear, wolf, hare, water-rat, and several birds, were also found. No less than thirty-seven species of mammalia are enumerated by Professor Owen as having been discovered in the caves of this period in the British islands.—*Ref.* Page's *Advanced Text-Book of Geology*.

PLESIOSAURUS, *ple-se-o-sawr'-rus* (Gr. *plesios*, near; *sauros*, a reptile), the name given to a genus of extinct amphibious saurians, principally remarkable for their length of neck. Their remains are found in the formations from the muschel-kalk to the chalk inclusive; but are most common in the lias and Kimmeridge clay beds. They are closely allied to the *Ichthyosaurus*, and their general appearance must have been very hideous. The head was that of a monstrous lizard, furnished with teeth like those of a crocodile; its neck was of enormous length, resembling the body of a serpent; while the trunk and tail had the proportions of an ordinary quadruped, the ribs of a chameleon, and the paddles of a whale. The remains of five or six species of plesiosaurians have been found.

PLETHORA, *pleth'-o-rā* (Gr. *plethora*, fulness), was by older medical writers employed to signify a superabundance of any of the fluids of the body, but, as now used, to express a redundancy of blood.

PLEURITIS, or PLEURISY, *plu-rī'-tis*, *plu'-re-se* (Gr. *pleuron*, the side), in Med., is inflammation of the pleura, or investing membrane of the lungs. (*See* LUNGS.) Among the causes of pleurisy, the more common are exposure to cold, especially after violent exercise, blows on the chest, fracture of the ribs, tubercles in the lungs. It is most prevalent in winter, and, next to that, in autumn. Old persons are most subject to it, but it may occur at any period of life. It is usually distinguished as acute and chronic. The former usually commences with chills, rigors, and the ordinary symptoms of inflammatory fever, accompanied or followed by a sense of weight in the chest, which in a few hours becomes acute pain, usually referred to a point directly below the nipple. There is usually a short dry cough, and the breathing is frequent, short, and anxious; the pain being increased by a deep inspiration or the act of coughing. Sometimes the patient can only lie upon the affected side, sometimes only upon the opposite one; but usually he prefers lying upon his back. The pulse is frequent and hard, skin hot, cheeks flushed, urine scanty and high-coloured, and tongue white. These symptoms are not always so well marked, and the pain is sometimes more diffuse and less severe. In most cases, the acute pain, as well as the fever, subsides on the third or fourth day, and the cough and difficulty of breathing abate, though the pleura still continue in a state of inflammation. By means of auscultation and percussion, the nature of this disease can be much more accurately determined than formerly. The respiratory movements and murmur will be found to be diminished, and sounds of friction will accompany the motions of respiration. Dulness on percussion will be first heard in the most depending part of the chest, afterwards gradually extending over the side affected. In the treatment of this disease, the object is to reduce the local inflammation and prevent effusion. Hence, bloodletting, either local, by means of leeches or cupping, or general, from the arm, followed by doses of tartar emetic, brisk aperients, and strict antiphlogistic treatment, are recommended. In chronic pleuritis the symptoms are usually those of the acute form in a mitigated state. It may succeed the acute, or it may come on gradually without any of the more marked features of that disease. There is usually more or less of fever, an acceleration of the pulse, emaciation, difficulty or hurry of breathing, increased by exertion, more or less of pain or soreness, and inability to lie on the healthy side. The treatment of this form of the disease differs from that of the other, the object being to promote the absorption of the effused matter, and also to support the patient's strength. For promoting the absorption of the effused fluid, as well as for preventing its further secretion, counter-irritants are used, as blisters, eruption liniments, tincture of iodine: the last painted over the part, or exhibited internally, will be found to act very beneficially in removing the effusion. The general health is to be improved by a nutritious, but not heating or stimulating diet, and by the cautious exhibition of such tonics as the strength of the patient is able to bear. Change of air will often be found to act most beneficially in such cases, and is frequently found to be efficacious when most other remedies have failed. When other means fail, recourse is sometimes had to the operation of *paracentesis thoracis* for setting free the effused matter; but the operation is attended with considerable danger and is rarely productive of more than a temporary relief.

PLINTH, *plinth* (Gr. *plinthos*, a brick), in Arch., a large square member, in the form of a brick, and sometimes called *the slipper*. It is employed as the foot or foundation of columns; being that flat square table under the mouldings of the base and pedestal, at the bottom of the whole order. According to the idea of Vitruvius, the plinth seems to have been originally intended to keep the bottom of the primitive wooden pillars from rotting. The *plinth of a statue* is a base or stand, flat, round, or square, serving to support a statue. The *plinth of a wall* is a term applied to two or three rows of bricks advancing out from the walls; or, in general, from any flat high moulding, serving in a front wall to mark the floors, or to sustain the eaves of a wall and the larmier of a chimney.

PLOCARIA. (*See* GRACILLARIA.)

PLOUGH, *plow* (Sax. *plow*, Dan. *ploegh*), one of the most ancient and most valuable of all agricultural implements for turning up the soil preparatory to receiving the seed. There are traces of the use of the plough in the earliest of all written authorities on agriculture; and, judging from its importance in farming operations, it seems scarcely possible that large systems of cultivation could have been carried on without its assistance in any period or country. Amongst the ancient Hebrews it was the practice to plough with two oxen (Deut. xxii. 10); their plough had also a coulter and a ploughshare (1 Sam. xiii. 20). From other passages, it would appear that they were early aware of the advantages of a winter's fallow. Wheels are a modern invention in comparison with the other parts of a plough, but we find represents-

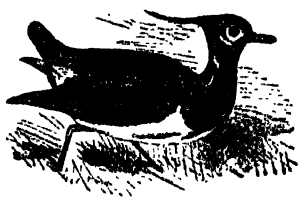
tions of ploughs with wheels in early Greek drawings. The Roman ploughs were of very simple form, and closely resembled the ploughs used by the Hindoos and Chinese even at the present day. The ploughs in use in different countries in Europe underwent little change for many centuries, and it is only in late years that any attempt has been made to change their form. In England, the ploughs of the early cultivators were rude and imperfect, for every ploughman made his own plough. It was a law among the early Britons, that no one should guide a plough till he was able to make one. Among the Saxons it was the custom to fasten the horses to the plough by their tails. This barbarous practice was not abolished till the reign of Charles II., at which period it was largely practised in Ireland. The Norman plough, like that of the later Saxons, was furnished with wheels; and for a long period this implement was drawn by oxen only. One of the first representations of a horse employed in the plough is given in the Bayeux tapestry (A.D. 1086). The Dutch were amongst the first to introduce improvements into the shape of the plough. This improved Dutch plough found its way into the north of England and south of Scotland. It was constructed chiefly of wood; the draught-irons, share, and coulter, with the additional plating of iron to the mould-board and sole, being the only parts made of iron. For a plough of this sort a patent was obtained in 1730 by Walter Blythe, author of several works on husbandry. James Small, a Scotchman, next constructed a plough on true mechanical principles, and was the inventor of the cast-iron turn-furrow, commonly called the mould-board; and although more than a hundred years have passed, Small's plough may be referred to, in most respects, as a standard in the manufacture of ploughs. Until 1785 ploughshares were made of wrought iron; at that time, however, a patent was taken out by Robert Ransome, of Ipswich, for making shares of cast iron; and in 1803 he obtained another patent for case-hardening cast-iron shares. The different parts of a plough are now usually cast; so that if any one fails or wears out, it can easily be replaced by removing a few screws or bolts. In modern ploughs the handles should be sufficiently wide apart to permit the ploughman to walk in the furrow, and long enough to give him a full command of the plough, so that he can lift or depress it readily, or turn it to the left or right hand at pleasure. The beam should be of such a length that its end, usually called its *head*, shall cut at the point of draught upon a line drawn from that part of the collar to which the traces are fastened to that part of it where it first raises the soil. Much of the steady working of the plough at its proper depth depends on the right arrangement of the point of draught. The beam should be curved upwards at the coulter and throat of the plough to clean itself of rubbish. The *ploughshare* is the apex of the sole, as the hind part is called the heel. It varies in shape for different purposes. The upper part over the box of the share forms the first part of the rise of the mould-board. After the coulter and share have made the vertical and horizontal cuts for the depth and width of the furrow, the mould-board turns over the slice and leaves it in its proper position. Much, if not all the beauty of ploughing, depends on the precision with which this part of the plough does its work. The *coulter* is an iron blade or knife inserted into the beam of the plough for the purpose cutting the ground and facilitating the separation of the furrow-slice by the ploughshare. In practice there are several methods of ploughing. In trench-ploughing, the plough passes twice along the same furrow. It can only be employed when the subsoil is naturally dry and of good quality, or when it has been rendered so by draining and subsoil-ploughing. Increased interest has been given of late years to ploughmen and plough-boys by ploughing-matches; and in many cases the aspect of the country has greatly improved by the change which sound ploughing has effected.—Ref. *The Implements of Agriculture*, by J. Allan Ransome.

PLOVER, *plov'er* (Fr. *pluvier*, the water-bird), the common name of several species of birds that frequent the banks of rivers and the sea-shore, belonging to the genus *Charadrius*. One species, known by the name of the *Great Plover*, Norfolk Plover, or Stone Curlew,





is a summer visitor to this country, arriving here in April, and leaving again at the end of September or in October. As it comes from the south, it is much more numerous in the southern and south-eastern counties of England than far to the west or to the north; but its powers of wing allow it a wide range of flight. Their breeding-season commences about the second week in April, the female depositing its pair of eggs upon the bare ground, without any nest whatever. The eggs are pale clay-brown, blotched, spotted, and streaked with ash-blue and dark brown, two inches two lines in length, by one inch seven lines in breadth. The large and prominent eye in this species indicates a bird that moves and feeds by twilight, or later. Their food is worms, slugs, and insects; and they are also believed to kill and devour small mammalia and small reptiles, their stout frame and large beak being sufficiently powerful to enable them to do so. The great plover annually visits Germany, and is abundant in France, Spain, Italy, and, southward, to Africa, Madeira, and even to Southern Africa; eastward it is found in Corfu, Turkey, and the Grecian archipelago. It has also been found on the plains between the Black and Caspian seas and in India. Its generic characters are, a strong, straight, stout beak, a little depressed at the base. Nostrils placed in the middle of the beak, extending longitudinally as far forward as the horny portion, open in front, pervious. Legs long, slender; three toes only, directed forwards, united by a membrane as far as the second articulation. Wings moderate; second quill-feather the longest in the wing. Tail graduated. In the adult bird the top of the head and back of the neck are a pale wood-brown, each feather with a streak of black in the centre; the fea-



PLOVER.

thers of the back, wing-coverts, tertials, and upper tail-coverts, pale brown, each feather with a dark brownish-black longitudinal streak in the line of the shaft; the tail-feathers with the basal halves mottled with two shades of brown, the third portion white, the ends black. The chin and throat white; the neck and breast brownish-white; belly, sides, and flanks, almost white. The whole length is seventeen inches; the wing, from the carpal joint to the end, nine inches and three-quarters. The golden plover (*Charidrius pluvialis*), which is considered by ornithologists to be the true plover, is a bird of great powers of flight, and has, consequently, great geographical range. Some of the species are remarkable for assuming in the spring, and retaining during the summer, a plumage differing considerably from that which distinguishes them from the time of the autumn moult, through the winter to the following spring; and in the golden plover this alteration consists of a decided change from a dull greyish-white to black. The golden plover is found during summer breeding on the high hills and swampy grounds of the North of England and Scotland; Sutherland appearing to be one of the great breeding-stations. They annually visit Sweden, the Faroe Islands, Iceland, and Greenland; and numbers linger on the muddy shores of Hudson's Bay, and on the sandy beaches of lakes and rivers in the interior, until the hard frosts of September and October drive them away. The golden plover of Great Britain lays four eggs, which are large in proportion to the size of the bird, and very handsome, of a yellowish stone-colour, spotted and blotched with brownish-black; the length two inches, by one inch four lines in breadth. The nest is but slightly constructed, a small depression in the ground amidst the heath being usually taken advantage of, and lined with a few dry fibres and stems

of grass. The young, when excluded, are covered with a beautiful particoloured down of yellow and brown; they quit the nest as soon as hatched, and follow their parents till able to fly and support themselves, which is in the course of a month or five weeks. The generic characters of this bird differ in several particulars from those of the *great plover*, the legs of the golden plover being but of moderate length, and the outer toe alone being slightly connected at the base with the middle toe, whilst the first quill-feather of the wing is the longest, instead of, as in the great plover, the second. The adult bird in its summer plumage has the beak black; the irides very dark brown, almost black; on the forehead a band of white; the top of the head, the nape of the neck, the back, wing-coverts, greyish-black; the edges of all the feathers varied with triangular-shaped spots of gamboge-yellow; the wing-primaries almost black; tail-feathers obliquely barred with shades of greyish-white and brownish-black; the lore, chin, sides of the neck, throat, breast, and all the under surface of the body as far as the vent, jet-black, bounded on the sides with a band of white below the wing; axillary plume elongated, and pure white; under tail-coverts white. The whole length of the bird is about eleven inches.

PLUM. (*See* PRUNUS.)

PLUMBAGINACEÆ, *plum-bā-jin-ai'-se-ē* (from Lat. *plumbum*, lead), in Bot., the Leadwort or Thrift fam., a nat. ord. of *Dicotyledones*, sub-class *Corollifloræ*. Herbs, or under-shrubs, with entire exstipulate leaves and regular flowers. Calyx tubular, plaited, persistent, 5-partite. Corolla membranous, 5-partite, or in 5 separate petals. Stamens 5, opposite the petals, to which they are attached in the polypetalous corolla, or hypogynous, and opposite to the divisions of the monopetalous corolla. Ovary 1-celled; ovule solitary, suspended from a long cord, which arises from the base of the cell; styles usually 5, sometimes 3 or 4. Fruit utricular, or dehiscing by valves at the apex. Seed solitary; embryo straight; albumen mealy, and small in quantity. The plants of this order are chiefly found growing on the sea-shore and in salt marshes, in various parts of the globe; but the majority inhabit temperate regions. The roots of several species of the genus *Plumbago* are acrid and vesicant when fresh; as those of *P. europæa*, the toothwort, *P. ceylanica*, and *scandens*. *P. toxicaria* is used as a poison in Mozambique.

PLUMBAGO, or GRAPHITE, *plum-bai'-go* (Lat. *plumbum*, lead), is a valuable mineral found in various parts of the world; the most remarkable deposit being at Borrowdale, in Cumberland. In colour, it is iron-black or dark steel-grey, with a metallic lustre. It is combustible when subjected to a high degree of heat, leaving a residue of oxide of iron; but is infusible either alone or with fluxes. Plumbago is chiefly used in the manufacture of blacklead pencils and for crucibles. A great deal of the mineral is, however, used for polishing iron stoves and railings, as well as for diminishing the friction of machinery. *Plumbago crucibles* are made of graphite mixed with clay, and are used in metallurgical operations where a very high temperature has to be borne, and where a slight admixture of carbon with the matter to be melted is of no consequence. The manufacture of these crucibles is now principally carried on in England by the Patent Plumbago Crucible Company, at Battersea, who supply nearly every imperial and royal mint in the world with these articles. The graphite used by them is the Ceylon variety, which, although somewhat impure, answers the purpose better than the purer kinds. It is first ground into an almost impalpable powder in mills specially constructed for the purpose; after which it is mixed with certain proportions of China clay and water. The crucibles, which are of every conceivable size and shape, are made on a wheel, in the same way as ordinary articles of pottery. They are then gently dried, and afterwards fired. The crucibles made by the company bear the highest temperature without softening, and may be used for forty or fifty meltings before they become useless. The master of the Paris mint states that they will bear being plunged into cold water when at a white heat without cracking. For assaying purposes, brass-casting, and in the manufacture of cast steel, they are daily superseding all other kinds. The composition of which these crucibles are made has also been employed for the tuyans of blast and Bessemer furnaces with very great success. (*See* BLACKLEAD, BLACKLEAD PENCILS, and GRAPHITE.)

PNEUMATICS, *nu-mat'-iks* (Gr. *pneuma*, air), that branch of physical science which treats of the mechanical properties of elastic fluids, and principally of atmospheric air. To a certain extent the mechanical properties of the air seem to have been known to the ancients. Not only does Aristotle mention that a bladder filled with air weighs more than when it is empty, but Ctesibus, who lived 130 years B.C., appears to have invented a species of forcing-pump for raising water, and of instruments for producing sound by the passage of air through orifices in tubes.—(*Vitruvius*, lib. ix. x.) These inventions are proof that the elastic force of compressed air was then comprehended. For a long time the ascent of water in pumps, upon raising the piston, was ascribed to nature's abhorrence of a vacuum. When, however, it was found that the height of the column of water raised never exceeded a certain quantity—about thirty-four feet—this idea was gradually exploded. The explanation of the true cause of the phenomenon—the vacuum between the piston and the surface of the column, and the pressure of the atmosphere on the external water—was first determined by Torricelli; the same philosopher also calculated the pressure of the atmosphere by the weight of the column of mercury supported in a tube closed at the upper extremity. (*See* BAROMETER.) The next result of the study of pneumatics was the discovery of the thermometer, soon after the commencement of the 17th century. Steam began to be used as a moving power for pumps and other machinery, in the beginning of the 18th century. The law of the resistance of the air to bodies moving in it was first discovered by Sir Isaac Newton; but the intensity of this resistance against military projectiles was first determined for the inferior projectiles by Robins, in 1740. Dr. Hutton afterwards obtained a formula which is sufficiently correct for any velocity. Robins, Euler, and Hutton, by their researches, determined the expansion of fired gunpowder; and that of steam was investigated by Dalton in England, and Prony and Arago in France. (The different forms of pneumatic apparatus will be found described under the articles AIR-PUMP, BAROMETER, PUMP, &c.)

PNEUMONIA, or PNEUMONITIS, *nu-mo'-ne-a*, *nu-mon-ī'-tis* (Gr. *pneumon*, the lung), in Med., is inflammation of the substance of the lungs. It may be occasioned by any of the causes which produce inflammation in general,—vicissitudes of temperature, the application of cold, violent exercise of the body, exertions of voice, &c. It occurs most frequently in the winter and spring months. It is characterized by fever, difficulty of breathing, cough, dryness of the skin, heat, anxiety, thirst, and a sense of weight and pain in the chest. The pain is dull, deep-seated, and rarely acute, unless the pleura be likewise affected. At first the cough is frequently dry and without expectoration; but after one or two days matter is brought up, viscid and rusty-coloured, and often streaked with blood. In favourable cases, this disease may decline on the third or fourth day, but more frequently it is protracted to ten days or a fortnight. In unfavourable cases the symptoms increase on the third or fourth day, and become more and more aggravated, until at length the patient dies exhausted or asphyxiated. A high degree of fever, attended with delirium, great difficulty of breathing, acute pain and dry cough, denote great danger; while, on the contrary, an abatement of the febrile symptoms and of the difficulty of breathing and pain, taking place on the coming on of a free expectoration, or other critical evacuation, promise fair for recovery. The treatment in the early stage of the disease is by free bleeding from the arm, followed by a brisk purgative and tartar emetic to bring about immediate resolution. When more advanced, local bleeding by cupping or leeches, with counter-irritation, must take the place of general bleeding. During convalescence, or after suppuration, tonic medicines, and a nourishing but not stimulating diet, are necessary to support the strength of the patient.

POA, *po'-a* (Gr.), in Bot., a gen. of grasses.—The most important species is *P. abyssinica*, an Abyssinian

corn-plant, known by the native name of *teff*. The grains are sometimes employed in the preparation of *Bouza*, or millet beer.

POACHING. (*See* GAME LAWS.)

POD, or LEGUME, *pod* (SAX. *pod*, a covering), in Bot., a superior 1-celled, 1- or many-seeded fruit, dehiscing by both the ventral and dorsal sutures, so as to form two valves, and bearing its seed or seeds on the ventral suture. Examples occur in the pea (figured under ANGIOSPERMS), the bean, the clover, and in most plants of the order *Leguminosæ*, which derives its name from this character.

PODOPHYLLUM, *pod-o-fil'-lum* (Gr. *pous*, a foot; *phullon*, a leaf,—from the shape of its leaf), in Bot., a gen. of the nat. ord. *Ranunculaceæ*, or, according to American botanists, of a distinct order termed *Podophyllaceæ*. *P. peltatum*, the May-apple, or wild-lemon, is a common herb throughout the American States. Its fruit is a berry, about the size of an egg, of a light-yellow colour, and having a pleasant sub-acid taste. The Indians of North America have employed a decoction of the leaves and stalks for ages in diseases requiring a cathartic. Latterly, this plant has attracted much attention, in consequence of the discovery of its active resinous principle, which, under the name of *podophyllin*, is now coming into use as a cathartic, and as a therapeutic substitute for mercury.

PODOSTEMACEÆ, *po-dos-te-mat'-se-e*, in Bot., the *Podostemon*, or River-weed fam., a nat. ord. of *Dicotyledones*, sub-class *Monochlamydeæ*. They are aquatic herbaceous plants, having much the appearance of mosses and liverworts. There are 21 genera, including about 100 species, principally natives of South America. Some species of the genus *Lacis* are used for human food on the Rio Negro, and other plants of the order are eaten by cattle and fish.

POET LAUREATE. (*See* LAUREATE, POET.)

POETRY, *po'-e-tre* (Gr. *poiesis*, from *poieo*, I create or produce).—So many unsuccessful attempts to give a complete and satisfactory definition of poetry have been made by writers on taste, and even poets themselves, that we are warned against endeavouring to circumscribe, within the boundary of a few words, so vast and comprehensive a subject. One of the most popular definitions was furnished by Lord Jeffrey, who said:—"The end of poetry is to please; and the name, we think, is strictly applicable to every metrical composition from which we derive pleasure without any laborious exercise of the understanding." Another writer and poet, Coleridge, says:—"Poetry is not the proper antithesis to prose, but to science. Poetry is opposed to science, and prose to metre." Definitions such as these, even if true, amount only to illustrations or explanations. In an article like the present, it would far exceed our limits to enter into an exposition of a variegated subject like this, which is so closely interwoven with all the activities of the human mind. When, however, we speak of actions, or the creations of genius, as poetical, we not only mean that they peculiarly affect the imagination and the feelings, but we also imply, further, that they had their origin in conceptions in which the imagination and the feelings were chief agents. It is on this account that we find the poetical preponderates in the language and conceptions of ancient nations. As an art, poetry is imitative; and like all such arts, its object is to give pleasure by imitation. In this respect, music, painting, sculpture, and poetry agree; but they differ in the means by which they affect the imitation. While music attains her object by harmony and melody, painting by colour, and sculpture by form, poetry works by means of words arranged in metre. In poetry, as an art, the metre answers a double purpose. In itself it affords pleasure by its rhythm, and powerfully assists the sense merely conveyed by the words. Above all, the metre preserves the essence of art by acting as a perpetual barrier against any approach to reality. By means of it, the poet is enabled constantly to avow that his is a work of art, and thus makes the reader aware of the relation in which he and the author stand with regard to one another. Poetry and music differ from painting and sculpture in the mode in which they imitate. In the two latter, outward forms are copied; the former, being restricted to instruments of a different kind, endeavour to imitate the effect of those



forms; that is, they aim at producing the pleasurable emotion in the reader, though they cannot imitate the means. While painting and sculpture can only represent one moment of action or expression, poetry and music can supply a succession of images and sentiments. The great advantage, however, which poetry possesses over all the sister arts, is its power to assert, as it is the only art which employs words for its instruments. The history of poetry may be divided into two great periods; one before, and the other after, the birth of Christ. Perhaps the oldest poetry that has been handed down to modern times is the Indian. "Owing," says Lassen, in his work on Indian antiquities, "to the originally noble characteristics of the Arian race, and the possession of superior mental endowments, in which lay the germ of all the nobleness and greatness to which the Indians have attained, the aspect of external nature gave rise, in the minds of these nations, to a deep meditation on the forces of nature, which has proved the means of inducing that contemplative tendency which we find so intimately interwoven in the most ancient poetry of the Indians. The all-powerful impression thus produced on the minds of the people is most clearly manifested in the fundamental dogma of their belief,—the recognition of the divine in nature." Amongst the most ancient Indian poetry are the *Vedas*, which constitute most valuable memorials of the civilization of the east Arian nations. The main subject of these writings is the veneration and the praise of nature. The great heroic poems of "Ramayana" and "Mahabharata" are of more recent date than the "Vedas," but more ancient than the "Puranas." The name of Kalidasa was early and widely known among the western nations. This great poet flourished in the highly-cultivated court of Vikramadhtya, and was, consequently, the contemporary of Virgil and Horace. There are both English and German translations of the "Sacontala" written by this poet. It is remarkable for its tenderness of feeling and its richness of fancy. The most ancient monuments of the poetry of the West Arians, or Persians, have perished. It was not until the country had been subjugated by the Arabs and had lost its original characteristics, that it again acquired a national literature. The flourishing period of their poetry, extending from Firdusi to Hafiz and Dschami, scarcely lasted more than four or five hundred years, and hardly reaches to the time of the voyage of Vasco de Gama. Persian literature, in fact, belongs to the Middle Ages. The religious poetry of the Hebrews is of very ancient date, and possesses a solemn character, very different from that of any other nation of antiquity. At first it was descriptive of nature; then of a warlike character; then, in the time of David, it assumed the form of sacred songs; and lastly it was prophetical. In classic antiquity, the most ancient poetry is that of the Greeks, which may be divided into three periods. The first of these extends from the earliest times of Greece to the Persian war. It was during this period that the "Iliad" and "Odyssey" were written. The second period extends from the Persian war to the time of Alexander the Great. It constituted the flourishing period of dramatic art and of cultivated Greek poetry in general. During the third period Greek poetry declined under the successors of Alexander, and at the same time was revived in Alexandria. Among the Romans, language was not employed in poetry till a late period; and until the time when they became closely allied to the Greeks, only rude essays in poetry were made. The golden age of Roman poetry was during the time of Augustus and Tiberius; from which period it declined until the introduction of Christianity and the irruption of the barbarians. It is singular that, notwithstanding the exquisite climate and the beautiful scenery of Greece and Italy, in all the ancient classic poetry there is very seldom any description of natural scenery. Their interest was entirely occupied with human life, and its actions and relations. During the dark ages, poetry seemed to die out in Europe. The first poetry of the Middle Ages may be considered to be the epos of the Minnesingers among the Germanic nations. However, in neither the "Niebelungen," nor the "Gudrun," are there any descriptions of natural scenery. The first change in this respect after the writings of the early Christian fathers, arose in Italy,

When the glory of the Aramaic, Greek, and Roman dominion had passed away, in the grand old Tuscan poet Dante Alighieri, are to be found occasional manifestations of the deepest sensibility to the charms of the terrestrial life of nature, whenever he abstracts himself from the passionate and subjective control of that despondent mysticism which constituted the general circle of his ideas. After him, in Italy, may be mentioned Petrarch, Ariosto, and Tasso; all of whom followed in the same vein. Next we may mention the poetry of Portugal, in which, according to Friedrich Schlegel, "the 'Lusiad' of Camoens far surpasses Ariosto in richness of colour and luxuriance of fancy." The Spanish poetry appears originally the sister of the Provençal, but mingled with an oriental character. The Provençals, or Troubadours, sprung up about the 11th century; and in their poetry, devotion, valour, love, and the spirit of chivalry, are apparent. The origin of English and Scottish poetry is lost in the distant period of the bards: it was refined by the Norman-French poetry. The flourishing period of English poetry, however, is usually placed in the time of Queen Elizabeth, although Chaucer is usually looked upon as the father of modern English poetry. To Spenser and Shakespere, and afterwards to John Milton, England is indebted for the finest poetry in the language. The northern or Scandinavian poetry, since the 13th century, presents chivalry tinged with the peculiar northern characteristics: at that period the German "Heldenbuch," or Book of Heroes, was introduced into Norway, and foreign and native traditions became blended together. For a notice of modern poetry, the reader is referred to the various articles on the *literature* of the different countries in their respective places in this work.—(*See* Ballad, Drama, Epic Poetry, Lyric Poetry.)

Pogostemon, *po-go-ste'-mon* (Gr. *pogon*, beard; *stemon*, stamen), in Bot., a gen. of labiate plants. *P. patchouli* the pucha-pat or patchouly, is a native of Penang and the Malayan peninsula; the dried tops are imported, and yield by distillation a strongly-scented volatile oil called *oil of patchouli*, which is much employed in perfumery.

Point, *point* (from Lat. *punctum*, from *pungo*, I prick).—A point in Geom., as defined by Euclid, is that which has position but not magnitude. Hence, points are the ends or extremities of lines; and if a point be supposed to be moved any way, it will, by its motion, describe a line.

Pointer, *point'-er*.—This member of the canine family is a remarkable instance that the acquired propensities of the different varieties of dog are transmitted from parent to progeny; for, requiring, as it must have done, a long and persevering education to produce even a moderate approach to the excellence of the present breed of pointers, these sagacious dogs will now, almost without education, or, in technical phraseology, with very little breaking, exhibit a strong tendency to the peculiarity of their race, and stand at game of every kind, and that even when they are puppies. The peculiar characteristic of the pointer is, that he will stand motionless, as if converted into a statue, on coming into contact with the slightest scent of game; and it would be difficult to controvert the argument that this instinct, or the power to acquire this habit, was given to the pointer for the purpose of aiding men to capture or kill game. The pointer is probably originally a native of Spain, and the Spanish pointer was formerly well known as a stanch, strong, and useful, but heavy and lazy dog. The English breed, however, is now very much preferred, being exceedingly beautiful, good-tempered, stanch, and patient of fatigue; and at the same time light and active in its appearance and habits. Pointers about the middle of the 17th century were scarcely ever to be seen but entirely white, or variegated with liver coloured spots, except the then duke of Kingston's celebrated pack, which were black and white; they are now, however, to be met with of every description, from pure white and a kind of bluish-grey, to a universal liver-colour and a perfect black. The most perfect pointers, according to some authorities, are those which have in them, to one part of Spanish blood one-eighth of the foxhound and one-sixteenth of the bloodhound; but other authorities on the subject maintain that the farther any dog is removed from the original Spanish pointer the worse the dog is; that all attempts to cross the pointer with any other blood must necessarily deteriorate the breed; and that whilst a cross will produce handsome dogs, they will necessarily possess some quality not belonging to the pointer; a cross with the hound, for instance, giving the propensity to trace hares, if not



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to give tongue. Pointers are never considered complete unless they are perfectly stanch to bird, dog, and gun; which implies, first, standing singly to a bird or covey; secondly, to backing (or pointing instantaneously likewise) the moment they perceive another dog stand; and, lastly, not to stir from their point upon the firing of any gun in company, provided the game is neither sprung nor started at which the original point was made.

Points of the Compass. (*See* Compass.)

Poison, *poy'-zon* (Fr.), any substance which, when administered in small quantities, is capable of acting deleteriously on the body. In general language, however, the term is applied to those substances only which destroy life in small doses. In medical jurisprudence it is found very difficult to lay down the exact boundary-line between medicines and poisons. Dr. Taylor suggests the following definition:—"A poison is a substance which, when taken internally, is capable of destroying life without acting mechanically on the system." The law, however, never regards the manner in which the substance administered acts. If it be capable of destroying life, or injuring the health of an individual, it is of little consequence, so far as the responsibility of a prisoner is concerned, whether the action on the body be of a mechanical or a chemical nature. The words of the statute on poisoning (1 Vict. c. 85, sec. 2) are very general, and embrace all kinds of substances, whether they be popularly or professionally regarded as poisons or not. Thus it is laid down that "whoever shall administer, or cause to be taken by any person, any poison, or other destructive thing, with intent to commit murder, shall be guilty of felony, and being convicted thereof, shall suffer death." Poisons have been divided into three classes, according to their mode of action on the system; namely, *irritants*, *narcotics*, and *narcotico-irritants*. The narcotics and narcotico-irritants may, however, be regarded as one large class,—the *neurotics*, as their special action is to affect directly one or more parts of the nervous system. Narcotic poisons can also be subdivided into cerebral, spinal, and cerebro-spinal, according to whether the substance affects directly the brain, the spinal marrow, or both of these organs. Irritant poisons, when taken in small doses, speedily occasion violent vomiting and purging. These symptoms are either accompanied or followed by intense pain in the abdomen. As their name implies, their action is to irritate and inflame. Many substances belonging to this class of poisons possess corrosive properties; such as the strong mineral acids, caustic alkalies, bromine, corrosive sublimate, and others. Some irritants do not possess any corrosive action;

such as arsenic, the poisonous salts of baryta, carbonate of lead, cantharides, &c., which are called pure irritants; they exert no destructive chemical action on the tissues, they simply irritate them.

POISON-FANG. (*See* SERPENT.)

POISON-GLANDS. (*See* SERPENT.)

POLARIZATION OF LIGHT, *po-lar-i-zai'-shun*.—Light which has undergone certain reflections or refractions, or been subjected to the action of material bodies in any one of a great number of ways, acquires a certain modification. In consequence of this change, it no longer presents the same phenomena of reflection and transmission as ordinary light. This modification is called the *polarization of light*; its rays being supposed to have acquired *poles*, like the magnet, or sides with opposite properties. Polarization may be effected in various ways, but principally by the following:—1. By reflection at a proper angle from the surfaces of transparent media; 2. by transmission through crystals possessing the property of double refraction; 3. by transmission through a sufficient number of transparent uncrystallized plates placed at proper angles, 4. by transmission through a number of other bodies imperfectly crystallized,—as agate, mother-of-pearl, &c. (For further particulars concerning this subject, the reader is referred to the article on LIGHT.)

POLE, POLARITY, *pole, po-lar'-i-te* (Lat. *polus*, the end of an *axis*). Literally, the word *pole* signifies that which turns, or on which something turns; but in Physics, the term is applied to the extremities of the axis about which a body revolves, or is supposed to revolve; thus, the *poles of the earth* are the extremities of the imaginary axis round which the world is supposed to revolve. The zenith and the nadir are also looked upon as the poles of the horizon. In a *magnet*, the poles are two points corresponding to the poles of the earth, one pointing to the north and the other to the south. In a *voltaic pile*, or *battery*, the poles are the extremities of the two wires that connect the opposite ends of the pile or battery. The term *polarity* is used in Physics to denote that property of bodies which enables them, when allowed to move freely, to arrange themselves in certain determinate directions, or point, as it were, to given poles. Thus we speak of the polarity of the magnet or magnetic needle. In order to account for certain phenomena in optics, it is necessary to assume that the particles of light possess *polarity*. this simply signifies that the opposite sides of each particle possess different physical qualities.

POLECATS, *pōle'-kats*.—The polecats belong to a subgenus of the *Mustelidæ*, or Weasel tribe, a family of digitigrade carnivorous animals; the animals arranged under this sub-genus being the the polecat, the ferret, the Siberian polecat, the weasel, and the stoat or ermine-weasel. Another species, remarkable for its amphibious habits, and known under the name of mink, or polecat of the northern seas, is very common in Finland and other parts of the north and east of Europe. The polecat, which is found throughout Europe, is stouter in proportion than either the common weasel or the ermine, and the head broader. Nose rather pointed, ears round and not conspicuous; back comparatively short; tail, including the body, rather more than a third of the length of the body and head. The fur is sometimes fulvous and woolly, and sometimes long, black, and shining, and, although inferior to the fur of the sable or marten, is nevertheless esteemed; a considerable importation of the skins annually coming to this country from the north of Europe under the name of *Fitch*. The length of the head and body is about seventeen inches, and that of the tail about six. It exhales a strong and disagreeable odour. The polecat is most destructive to the poultry-yard and the preserve; its appetite for slaughter seeming never to be satiated as long as any living thing remains within its reach; and its courage being, at the same time, very great. Its nest is generally made in some rabbit-burrow, in the crevice of a rock, or where the tangled herbage and brushwood overgrow loose heaps of stones, and there the female drops from four to six young in May or early in June. *Polecat* has been supposed to be a corruption of *Polish cat*; but this is probably a mere guess.

POLEMICAL, *po-lem'-i-kal* (Gr. *polemikos*, from *polemos*, war, battle), is a term applied to works of a controversial character, particularly those in divinity; hence, polemical divinity is controversial divinity.

POLEMONIACEÆ, *pol-e-mo-ne-ai'-se-e* (Gr. *polemos*, war; Pliny says the polemonium gained its name from having caused a war between two kings, each of whom claimed the honour of first discovering its virtues), in Bot., the Phlox fam., a nat. ord. of *Dicotyledones*, sub-class *Corollifloræ*. Herbs with opposite or alternate leaves. Calyx 5-parted, persistent, and generally regular. Corolla 5-lobed, with contorted, or occasionally imbricated æstivation. Stamens 5, alternate with the segments of the corolla; pollen usually of a blue colour. Ovary 3-celled, style 1; stigma trifid. Fruit capsular, 3-celled, 3-valved; placentas axile. Seeds few or many; embryo straight, in the axis of copious horny albumen; cotyledons elliptical, foliaceous. There are 17 genera, comprising 104 species. They abound in the temperate parts of North and South America. Many species are cultivated in our gardens on account of the prettiness of their flowers. None have any claim to the extraordinary healing virtues of the unknown plant after which the typical genus has been named.

POLICE, *po-leese'* (Gr. *politeia*, government, from *polis*, a city).—The primary object of a police is the preservation of order and the enforcement of the laws; but, besides that, it is usually made subservient to a variety of other purposes. "Police, in general," says Bentham, "is a system of precaution either for the prevention of crimes or of calamities. Its business may be distributed into eight branches:—1. Police for the prevention of offences; 2. police for the prevention of calamities; 3. police for the prevention of endemic diseases; 4. police of charity; 5. police of interior communications; 6. police of public amusements; 7. police for recent intelligence, and information; 8. police for registration." In Athens, and some of the other states of ancient Greece, there appears to have been something analogous to a police; and in Rome there were several classes of officials who shared the duties of the policeman; as the lictors, sub-prefects, &c. In England, as early as the time of the Saxon kings, there existed a peculiar organization of a partially voluntary character, for the suppression of crime and the maintenance of good order, the principal of each hundred and tithing being responsible for the conservation of peace within his jurisdiction. After the Normans came to be established in power, this system fell into disuse, and eventually the high sheriff of the county, his deputies, and the constables, came to be substituted for the voluntary officers of the earlier period. The Statute of Winchester, 13 Edw. I. (1285), regulated the office of constable, and directed what measures were to be taken for preventing crime and keeping the peace. In small towns and rural districts the system seems to have worked tolerably well; but in the metropolis it had little effect in the repression of crime. As late as 1751, Fielding, the novelist, then police-magistrate at Bow-street, stated, as matter of public notoriety, that the streets of London were not safe for citizens after nightfall; and that highway robberies, murders, and other flagrant crimes, were of common occurrence, and their perpetrators were seldom or never detected or arrested. He suggested a paid police, under orders of the acting magistrate at Bow-street; and in 1753 such a force, of very moderate extent, was established, in accordance with an act passed in that year; but such was the fear of the people lest this measure should lead to an encroachment upon their liberties, that it met with violent opposition, and was soon repealed. In 1792, an act was passed for the increase of the police courts, the employment of salaried magistrates, and the enlargement of their jurisdiction. Under this act, eight police-offices or courts were established, and the magistrates received a salary of £100 each, afterwards raised to £600. In 1800 there were only six police constables attached to each of the metropolitan offices, or 48 in all; 80 other constables, under the chief magistrate at Bow-street, patrolled the principal metropolitan roads; 41 formed the civil force of the Thames police establishment; 40 stipendiaries were employed in the city of London under the corporation; and there were, in addition, 943 parochial officers, &c., serving without pay. The nightly watch and patrol in the city of London comprised 803 men, gene-

rally old, often infirm, and the honest among them half-starved upon wages varying from eightpence halfpenny to one shilling and sixpence per night. This state of things continued, with little amelioration, till 1829, when Sir Robert Peel's "Act for improving the Police in and near the Metropolis" was passed; a measure which, more than any other of the kind, has tended to the consolidation of peace and the protection of life and property. Further improvements were introduced by 2 & 3 Vict. c. 47 (1839), which extended the metropolitan police district to a radius of fifteen miles from Charing Cross, and giving jurisdiction over the river Thames, and the quays and docks thereon. The city of London, however, was exempt from the operation of these statutes; but similar provisions were made for it by 2 & 3 Vict. c. 94, under a special commissioner, and subject to the control of the city authorities. Various attempts have since that time been made to unite the two forces, and last session a bill was laid before parliament for that purpose, but it met with violent opposition from the city authorities, and had to be withdrawn. Under the Municipal Corporations Act, or under local acts, a similar police force has been established in almost all of the cities, boroughs, and towns of England and Wales. The city or borough police is a charge upon the borough funds, aided, in a majority of instances, by a police-rate. One fourth, however, of the cost of pay and clothing is repaid from the public revenues to all cities and boroughs having a population exceeding 5,000, and to all boroughs having a less population, provided the police force be amalgamated with that of the county; such repayment, however, to be in all cases subject to the certificate by the [illegible] secretary, upon annual report from her Majesty's inspector, that the force is efficient, both as respects number and discipline. The first step towards the establishment of a county constabulary was made by 2 & 3 Vict. c. [illegible], and 3 & 4 Vict. c. 88, which empowered the magistrates of any county in England or Wales to appoint [illegible] and petty constables for such counties, in such numbers and under such apportionment to the several districts as they might deem advisable. These acts were simply permissive; but by 19 & 20 Vict. c. 69, it was made compulsory on the magistrates of every county where no police force had yet been constituted, to proceed therein forthwith. Provision was also made for imposing one-fourth of the expense of the force, whenever it was efficient, on the consolidated fund. In this way the whole country has been placed under the protection of a well-devised and efficient system of police. Similar provisions were made for Scotland by 20 & 21 Vict. c. 72, entitled "An Act to render more effectual the Police in Counties and Burghs in Scotland." The institution of county constabularies is, by this act, made compulsory on the commissioners of supply for each county; and provision is also made for the consolidation of independent bodies of police, and for the establishment of police for neighbouring districts and burghs jointly; and for charging one-fourth of the expense of any burgh or county constabulary reported to be efficient for the year, in number and discipline, on the consolidated fund. In Ireland, the police force was in a perfectly chaotic state till 1814, when an act was passed (54 Geo. III. c. 131) which led to improvements of detail by the appointment of superintending magistrates, as well as to an increase of the constabulary force. Other acts followed of a similar tendency, all of which were consolidated by 6 Will. IV. c. 13 (1836), which empowered the lord-lieutenant to appoint officers and constables in the several towns, baronies, and counties of Ireland, and in the proportions prescribed by the act. This act was amended by 11 & 13 Vict. c. 78, and again by 20 & 21 Vict. c. 17. The Irish constabulary is organized on military principles, the men being armed and occupying barracks. In the United States the provisions for the repression of crime and the detection and arrest of criminals have been copied from Great Britain. Under despotic governments, the police are often invested with very oppressive functions.

**Policy and Polity**, *pol'-e-se, pol'-e-te* (Gr. *polis*, a city), are two terms which are apt to be confounded, but which are yet quite distinct. Policy is generally used to denote the line of conduct pursued by the rulers of a state upon particular questions, more especially with regard to foreign countries. Polity, on the other hand, is synonymous with principles of government.

**Policy**, in Insurance. (*See* Insurance.)

**Political Economy**, *po-lit'-e-kal e-kon'-o-me* (Gr. *oikos*, a house or family, and *nomos*, a law), may be said literally to be that to a state which domestic economy is to a family. Various definitions of the science have been given, some allowing it a wider, others a narrower sphere. By some, particularly by earlier writers, it is regarded as the science of government, and the organization of civil society. According to M. Say, it is "the economy of society; a science combining the results of our observations on the nature and functions of the different parts of the social body;" and M. Sismondi considers the physical welfare of man, so far as it can be the work of government, as the object of political economy." English writers, however, particularly of recent times, regard political economy as the science of the wealth of nations, dealing with those laws which regulate the accumulation and distribution of wealth among a people. "It is," says McCulloch, "the science of the laws which regulate the production, distribution, and consumption of the products and services necessary, useful, or agreeable to man, which it requires some portion of voluntary labour to produce, procure or preserve." This definition excludes all reference to what exists independently of man, and may be obtained in unlimited quantities without any laborious exertion. The earliest treatise on an economic subject is believed to be "The Erxias; or about Wealth," erroneously attributed to Æschines Socraticus, one of the disciples of Socrates, about 427 B.C. "Plato," says M. Say, "has with tolerable fidelity (*Republic*, [illegible]) sketched the effects of the separation of social employments, but solely with a view to point out man's social character, and the necessity he is in, from his multifarious wants, of uniting in extensive societies, in which each individual might be exclusively occupied with one species of production." To Aristotle, however, the honour is due of being founder of political economy in its wider acceptation. The expression was first used by him, and is to be found in the "Economics," book ii. ch. 1. [illegible] "Ethics," he treats of the regulation of the individual man; in his "Politics," of the relation of man towards others in a social capacity, both in the family and to the state; and in his "Economics," of the relation of man towards property:—the three constituting, to a measure, a connected work, each being dependent on, and interwoven with, the others. But little attention was paid to economic studies for many centuries after the time of Aristotle; industrial occupations of any kind being regarded by the ancients as degrading and unworthy of free men. During the Middle Ages, the same ignorance and mistaken notions prevailed; and it was only after the successful enterprises of the Spanish and Portuguese and others in the 15th century that the attention of philosophers came to be directed to the theory of wealth. These investigations originated in Italy; and "as far back as the 16th century," says M. Say, "Botero had been engaged in investigating the real sources of public prosperity." The earliest general treatise on this subject in modern times is the "Traité de l'Economie politique," by Antoine de Montchrétien (4to. Rouen, 1615). This work treats of the utility of the mechanical arts, and the regulation of manufactures, employment of men, the trades most important to communities, commerce, transportation, money, &c. About the same time appeared treatises on money by Antonio Serra and Gian Donato Turbulo, of Naples; and on commerce and the prohibitive system by Duarte Gomez and Juan de Castaflares. In England, Hobbes seems to have been one of the first that had anything like a distinct notion of the real source of wealth; for in his "Leviathan" (ch. 24), published in 1651, he says "the nutrition of a commonwealth consisteth in the plenty and distribution of materials conducing to life." Locke, however, had a much clearer apprehension of this doctrine; and his "Essay on Civil Government," published in 1689, is, in fact, the earliest work in which the true sources of wealth and value are distinctly pointed out. Various special treatises on trade, money, &c., had appeared before this time: as Misselden's "Circle of Commerce" (1623); Mun's "England's Treasure by

Foreign Trade" (1664); Sir Josiah Child's "New Discourse of Trade" (1668); and Andrew Yarranton's "England's Improvement by Sea and Land: to outdo the Dutch without fighting, to pay Debts without Moneys, to set at Work the Poor of England with the Growth of our own Lands" (1677). A most important era in the history of political economy, as well as of industrial development, was the appointing of Colbert to the position of comptroller-general of the finances of France, by Louis XIV., in 1662. He reduced the national finances to system and order, and instituted a complete plan of checks and balances; reformed abuses in this department, and punished those that had been guilty of them; increased the revenues of the state, while, at the same time, he decreased the burdens of the people, and developed agriculture, the manufactures, arts, and sciences. In 1691 Sir Dudley North published his "Discourses on Trade." The first attempt, however, to produce a systematic treatise on political economy was made by M. Quesnay, a French physicopher distinguished for the subtlety and originality of his understanding and the integrity and eloquency of his character. His great work, Tableau économique et Maximes générales du gouvernement économique," was published at Versailles in 1758. He assumed, as the basis of his system, that the earth is the only source of wealth; and was hence led to the conclusion that agriculture is the only species of industry which contributes to the riches of a nation. He grounded that the value which merchants and manufacturers add to the raw material of the commodities they manufacture or carry from place to place is barely equivalent to the value of the capital or stock consumed by them during the time that they are engaged in these operations. He likewise maints that the interests of all classes would be best promoted by a system of perfect freedom and unrestricted trade with all countries. Among the most distinguished of the followers of Quesnay was Turgot, afterwards comptroller-general of finances, who, in 1771, published his "Reflexions sur la Formation et la Distribution des Richesses," the ablest of the treatises of the school. Hume's Political Essays" of David Hume were published in 1752; and although he did not enter systematically into the science of political economy, his essays on interest, commerce, balance of trade, public credit, the populousness of ancient nations, &c., are characterized by sound, enlightened, and liberal views, and exposed many of the prevailing errors and prejudices of the time. In 1767 there was published in London, in two vols. 4to, "An Enquiry into the Principles of Political Economy, being an Essay on the Science of Domestic Economy in Free Nations," by Sir James Stewart. This was the largest and most elaborate work that had yet appeared on the subject; but his statements and reasonings, even when sound, are singularly tedious and perplexed. In 1776 appeared, in London, the first edition of the great work of Adam Smith, entitled "An Enquiry into the Nature and Causes of the Wealth of Nations;" a work which has done more to diffuse sound views on political economy and legislation than all that had preceded it. The science is for the first time treated in its full extent. He shows that labour is the real source of wealth, and that not only when employed in the cultivation of the land, but also when employed in manufactures and commerce. He also shows, in opposition to the popular opinions of his time, that wealth does not consist of gold and silver, but of the various necessaries, conveniences, and enjoyments of human life; that it is in every case sound policy to leave individuals to pursue their own interest in their own way, and that when they prosecute branches of industry advantageous to themselves, they are necessarily also prosecuting such as are advantageous to the public; all regulations intended to force industry into particular channels, or to throw restrictions in the way of commerce or manufactures, being impolitic and pernicious. Mr. Malthus's "Essay on the Principle of Population" (1798) was the next considerable contribution to the science. He demonstrated that an increase in the means of subsistence is the only sure criterion of a permanent and beneficial increase in the numbers of a people; that the danger in every country is an excess of numbers as compared with the means of subsistence, and that were population not kept down by



moral restraint or prudence in matrimonial connections, vice, want, and misery must be the result. In 1803 M. J. B. Say published his "Traité d'Economie politique," a work which, while it did not advance much that was new, was yet characterized by its scientific, clear, and methodical treatment of the subject, and did more in the way of diffusing a knowledge of the true principles of the science on the continent and in America than perhaps any other work of the kind either before or since. The "Principles of Political Economy and Taxation," by David Ricardo, appeared in London in 1817, and is generally considered as the most able, profound, and original work on the science since the time of Smith. The doctrines for which the work is principally noted, are the theory of rent, and the consequent theory of value. In 1821 James Mill published his "Elements of Political Economy;" and in 1825 J. R. McCulloch his "Principles of Political Economy." Archbishop Whately published "Lectures on Political Economy," delivered at Oxford in 1831; and Nassau W. Senior's treatise on Political Economy appeared, in the *Encyclopædia Metropolitana*, in 1836, and has since been published in a separate form. The last is an able and comprehensive essay, but the objects of the science are confined within too narrow limits. One of the most distinguished political economists of the present day is John Stuart Mill. He is a full believer in the views of Say, Hume, and Smith, in regard to money; in those of Ricardo on rent, and of Malthus on population. "The production of wealth," he says, "the extraction of the instruments of human subsistence and enjoyment from the materials of the globe, is evidently not an arbitrary thing. It has its necessary conditions. Of these some are physical, depending on the properties of matter, or rather on the amount of knowledge of those properties possessed at particular place and time. These political economy does not investigate but assumes, referring for the grounds to physical science or common experience. Combining with these facts of outward nature other truths relating to outward nature, it attempts to trace the secondary or derivative laws by which the production of wealth is determined, in which must lie the explanation of the diversities of riches and poverty in the past and present, and the ground of whatever increase of wealth is reserved for the future. Unlike the laws of production, those of distribution are partly of human institution, since the manner in which wealth is distributed in any given society depends on the statutes or usages therein prevalent." "In so far as the economical condition of nations turns upon the state of physical knowledge, it is a subject for the physical sciences and the arts founded on them; but in so far as the causes are moral or psychological, dependent on institutions and social relations, or on the principles of human nature, their investigation belongs not to physical but to moral and social science, and is the object of what is called political economy."—The several departments of this science will be found treated of, under their own heads, in other parts of this work; so that all that is necessary here is to give a sort of connected summary of the whole, in order to show their dependence upon each other. Political economy, then, is the science of the wealth of nations, or the science which treats of the production, distribution, and consumption of wealth. By wealth is meant anything necessary, useful, or agreeable, and at the same time possessed of exchangeable value. Some objects, as air or light, are useful and necessary, but are incapable of being exchanged; others again, as food, fuel, &c., are necessary, and at the same time are objects of exchange. It is only to the latter that the term wealth is applied. That quality of any object which renders it capable of gratifying our desires is called its value: thus the value of air is its power to support life; of water, to slake thirst, &c. What is termed the intrinsic value of an article is measured solely by its utility to man, or its capacity to gratify human desire; extrinsic or exchangeable value, on the other hand, is measured by its capacity to procure us something else in exchange. Things which are everywhere abundant, and require no labour to render them useful to man, have only intrinsic value; things, again, which derive their power to gratify human desires from labour, and which are only found in particular places, have always exchangeable value. That which gives exchangeable

value to an article is labour, which is the only source of wealth. Thus, if by my labour I have given value to an article which had no value before, I will not part with it to any one unless he give me something in exchange which has cost him a similar amount of labour. When men exchange silver for gold, they give a much larger amount of silver than of gold, because the former is procured with much less labour than the latter. Hence the exchangeable value of any article is, in general, as the labour which it costs to procure it. There are, however some laws that may come in and interfere with this condition. Sometimes a larger quantity of any product may be created than there is demand for, and then the producer, in order to induce persons to buy, is under the necessity of offering it for sale at a reduced price: and in this way, when the supply of any article is too abundant, the exchangeable value will fall. On the other hand, when there is not enough of any given product to satisfy the demand, the buyers, in order to obtain it, will bid more than its natural price; and thus its exchangeable value will rise. These disturbing causes, however, are only temporary, the constant tendency of any article being to maintain its exchangeable value. Thus when the value of any article falls below its cost of production, in consequence of too great a supply, the tendency is for the producers to turn their labour into more remunerative channels, while, on the other hand, when the value rises, the labour of other producers will be attracted to this line. Wealth and value vary inversely, the one increasing as the other diminishes, and *vice versa*. Wealth is greatest where the facility of production is greatest, and value is greatest where the difficulty of production is greatest. By production in this science is not meant the production of matter, but of utility by appropriating and modifying matter so as to make it satisfy our wants and contribute to our well-being. Production, then, is the act by which we give to any object its particular value. The substance to which any value has thus been imparted is called a product. There are three circumstances whose conjoint operation is necessary to stimulate and improve the productive powers of industry: (1) security of property; (2) the introduction of exchange or barter, and the consequent division of labour; and (3) the accumulation and employment of the produce of previous labour, or, as it is more commonly termed, of capital or stock. Capital is defined to be "that portion of the accumulated produce of labour which may be directly employed to maintain productive labourers, or to facilitate production." The fitness of any article to serve as an instrument of production, or to support those engaged in industrial undertakings, is the only criterion by which to decide whether it is or is not capital. There are only three classes of individuals directly concerned in the production of commodities,—labourers, capitalists, and owners of land. Between these three classes the whole produce of the land and labour of every civilized society is always in the first instance divided. That portion of the produce of the earth which is paid by the occupier to the landlord for the use of the *natural and inherent* powers of the soil, is denominated rent. When, in addition, money has been expended in the improvement of the soil, buildings, &c., the money paid on this, though commonly included under rent, is strictly remuneration for the use of capital. Hence, after deducting rent, the remaining produce of the land and labour of every country must primarily be divided between the two great classes of labourers and capitalists. Profits consist of that produce or its value which remains to the capitalists after their necessary payments to others have been deducted, and after the capital wasted or used in industrial undertakings have been replaced. Profits are not measured by the proportion which they bear to the rate of wages, but by the proportion which they bear to the capital by whose agency they have been produced. The consumption of any article is not the consumption or annihilation of matter, but only the consumption of those qualities which render them useful or desirable. Consumption is thus the opposite of production, and is to deprive an article of the value communicated to it by labour. Commodities are produced only that they may be used or consumed. Productive consumption is when the advantage or benefit, whether material or otherwise, accruing in consequence to their possessors, exceeds their value; and they are consumed unproductively when such advantage or benefit is less than their value. The prosperity and decay of nations depend upon this balance.—*Ref.* The works on this subject, of McCulloch, Mill, Senior, Ricardo, and others, already mentioned.

Politics, *pol'-e-tiks* (Gr. *polis*, a city), in its widest acceptation, is both the science and the art of government, or the science whose object is the regulation of man in all his relations as the member of a state, and the application of this science; but it is more commonly used to signify the course pursued by the government of a country, particularly in its relations with foreign states. (*See* Diplomacy.) As a state is a body of men united together for mutual benefit and the better to carry out the ends of life, politics extends to the various means by which these purposes are effected, and includes whatever is the subject of positive laws. It includes the various branches of international law, constitutional law, political economy, diplomacy, police, &c. The political sciences are usually divided into the abstract, or purely philosophical, and the historical and practical.

Poll. (*See* Election of Members of Parliament.)

Pollen, *pol'-len* (Lat.), in Bot., the fertilizing powder contained in the anther. When mature, each pollen-grain is a cellular body, having two membranous coverings,—an internal or *intine*, and an external or *extine*. The intine is thin and transparent, and possesses great power of extension; it is uniform in different kinds of pollen. The extine is a firm membrane, which defines the figure of the pollen-grain and gives colour to it, it is either smooth or covered with numerous projections, granules, points, minute hairs, or crested reticulations; the colour is generally yellow, and the surface is often covered with a viscid or oily matter. Within these coverings a granular semi-fluid matter, called the *fovilla*, is contained; this matter is, without doubt, the essential part of the pollen-grain. At the period of fecundation, or, in other words, when the dehiscence of the anthers takes place, the pollen-grains are thrown upon the stigma, which has become moistened by a sticky juice. The effect of the moisture on the pollen-grain is very remarkable; the intine protrudes through one or more of the pores or slits of the extine, in the form of a delicate tube filled with the fovilla, and called the *pollen-tube*; this penetrates through the tissue of the stigma and the style to the ovules. This tube frequently attains the length of several inches.

Polychrome Printing, *pol'-e-krome* (Gr. *polus*, many; *chroma*, colour), is the name sometimes applied to the reproduction of paintings and coloured drawings by mechanical means. The effects sought by polychrome printing may be obtained both by lithography and wood-cut printing, although the former process is, up to the present time, the one most generally adopted. The imitation of drawings and paintings by means of lithography is usually termed chromo-lithography. In this case the fac-simile of the original is produced by means of an almost infinite variety of tints, obtained by numerous impressions. An outline of the subject is first of all obtained, after which a number of stones, each charged with a particular tint, are impressed, until the desired harmonious blending of colour is effected. The sequence of these impressions, the charging of the stones with primary or secondary colours, the application of the sharp dark touches, and the final glaze or finishing wash, together make up an operation requiring the nicest eye for artistic effect. Many of the more elaborate designs—the "Venice," and the "Ulysses deriding Polyphemus," of Turner, for instance—require from thirty to forty stones to produce a finished print. In the printing of wood-cuts, the process, so far as the use of a great variety of impressions is concerned, is precisely analogous to chromo-lithography. In this latter instance, however, the impressions can be taken by the neatlier and more economical mode by which ordinary printing-types are struck off. Certain broad effects are capable of being produced; but, as yet, the process of polychrome printing by means of a succession of wood

blocks is in a very incomplete and crude condition. Nevertheless, a few years back the idea of copying pictures by mechanical means was deemed to be an impossibility. Fortunately, the practice of multiplying designs has now become an art of great importance and utility, acting, as it does, as a pioneer for original works, and spreading a taste for the fine arts among the public generally.

POLYCHROMY, *pol'-e-kro-me* (Gr. *polus*, many; *chroma*, colour), a term applied to the art of painting works of sculpture and architecture with different colours. This art was well known to the ancients under a different name. It was the universal custom among the earliest civilized nations not only to decorate their temples and palaces with colours, but also the statues with which they were adorned. Amongst the Egyptians nearly every part of their buildings, together with the sculpture on their walls, was covered with gilding or brilliant colours. Traces of colour and gilding were distinctly apparent on the relics and carved slabs of Assyrian architecture when first discovered. The attention of artists and archæologists has more particularly been directed towards the polychromy of the ancient Greeks. There is very little notice of the practice of colouring architecture in any of the ancient authors. In Vitruvius and Pausanias there are some remarks; but the systems which have been laid down by modern writers are only founded upon conjecture. In most of the architectural ruins of Greece, travellers have found the remains of colour upon ornamental work. Dodwell, Stuart, Chandler, Brondsted, and others, discovered traces of colour upon the principal monuments of Athens; upon the Temple of Theseus, the Parthenon, the Propylæa, the Erechtheum, &c.; and by Mr. Newton upon the remains of the great Mausoleum at Halicarnassus. There is, however, considerable difference of opinion as to the extent to which the Greeks carried out polychromy. By the majority it is believed that in marble buildings the colouring was confined to the capitals of columns, the mouldings and other ornaments, the friezes, the metopes, and the tympana of the pediments. Some excellent authorities, however, hold that their buildings were entirely covered with colour. At first, polychromy was confined to religious subjects, but in time it passed to all kinds of architecture and sculpture. The latter is frequently alluded to by almost all the ancient writers, and Pausanias describes many statues of this kind minutely. From the Greeks polychromy passed to the Romans. Pillars and outer walls of buildings, painted with various colours, are found in the remains of Pompeii and Herculaneum. Trajan's Pillar, at Rome, was celebrated for its brilliant and tasteful colouring. During the Empire, the painting of walls, and more especially of scene-painting, and the painted copies of architectural pieces on wall surfaces, came into fashion; so that a sort of polychromy arose which was quite remote from the simple system of the Greeks. Among the later Romans, however, gold decorations, and facings of white and variegated stone, appear to have been used instead of colour. Among the Greeks the most ancient images in c'ay and wood, and the first marble statues, were painted in bright colours; but these were afterwards modified to softer shades. Phidias and Praxiteles both painted their statues. In the Museo Borbonico, at Naples, is a statue of Apollo with yellow hair, the lower drapery being marked with red stripes and white flowers. In the Glyptothek, at Münich, there is also preserved a statue of Leucothea, in which the gilded hair is discernible, and the green and red colour of the long drapery. Besides this colouring, eyes of precious stones were often inserted in the ancient statues, as in the Roman bust of Antinoüs, in the Louvre at Paris. Mr. Gibson's tinted Venus, which was exhibited in the International Exhibition of 1862, is the principal attempt to introduce polychromy of late years. It excited considerable curiosity and criticism, but its reception is not likely to advance polychromy in sculpture.

POLYGALA, *po-lig'-a-lă* (Gr. *polus*, much; *gala*, milk), in Bot., the typ. gen. of the nat. ord. *Polygalaceæ*. The species *P. vulgaris*, the common milkwort, is an inconspicuous but beautiful plant, with blue, pink, or white flowers, found in our dry pastures and peaty fens. This and many other species have bitter properties; they have been used medicinally as tonics, stimulants, diaphoretics, &c. *P. Senega*, the Senega snake-root, is a most interesting species. Its root was first introduced into medicine as an antidote to the bites of snakes, but it is now considered useless in such cases. It is, however, a valuable drug, and is officinal in this country, being used either in large doses as an emetic and cathartic, or in small doses as an expectorant, diaphoretic, diuretic, and emmenagogue. Its principal virtues are due to the presence of a very acrid solid substance, which has been called *senegin*, *polygalin*, and *polygalic acid*. Many other species, American, European, and Asiatic, possess very similar properties, and one species, *P. venenosa*, a native of Java, has the acrid principle in so concentrated a state as to render the whole plant poisonous. An Arabian species, *P. tinctoria*, is used for dyeing.

POLYGALACEÆ, *po-lig-a-las'-se-e*, in Bot., a nat. ord. of *Dicotyledones*, sub-class *Thalamifloræ*, having the following essential characters:—Herbs or shrubs with exstipulate leaves. Flowers complete, hypogynous, irregular, and unsymmetrical. Sepals and petals imbricated, not generally corresponding in number, and usually arranged so as to form a *falsely* papilionaceous flower; odd petal anterior, odd sepal posterior. Stamens 8, hypogynous, usually combined; anthers generally 1-celled, with porous dehiscence. Fruit flattened, usually 2 celled and 2-seeded. Seeds with abundant fleshy albumen, and with a caruncula next the hilum. Some genera of the order are found in almost every part of the globe. The individual genera are, however, generally confined to particular regions, with the exception of the genus *Polygala*, which is very widely distributed, being found in almost every description of station, and in both warm and temperate regions. A few species have edible fruits, but the order generally is characterized by bitterness and acridity. There are 20 genera, and nearly 500 species. (*See* POLYGALA.)

POLYGAMY, *pol'-e-ga-me* (Gr. *polugamia*, from *polus*, many, and *gamos*, marriage), is the state of a man having more wives than one, or a wife having more husbands than one, at the same time. The latter is sometimes, for the sake of distinction, called polyandry. This is a condition which seems alike contrary to nature and reason. From the equality that exists in the two sexes, and from God having originally created but one male and one female, the intention of Providence clearly is that one man should only have one woman; "for," says Dr. Paley, "if to one man be allowed an exclusive right to five or more women, four or more men must be deprived of the exclusive possession of any, which could never be the order intended." Among Eastern nations, however, polygamy has existed from time immemorial. It prevailed before the Flood, and was common among the patriarchs. It was tolerated by the laws of Moses; but the custom appears to have died out; for in the New Testament we meet with no trace of it, and the passages which refer to marriage seem to imply that monogamy alone was lawful. The Mohammedan religion allows a man to have four wives; but the permission is rarely used except by the rich, and the Arabs scarcely ever have more than one wife. In Thibet and a few other places polyandry prevails. Among the ancient Greeks, at least of later times, polygamy was never practised, although in the Homeric age it seems to have prevailed to some extent. In republican Rome it was unknown, but it afterwards was not uncommon; Marc Antony being mentioned as the first that took two wives. Montesquieu, Voltaire, and others, attempt to account for the prevalence of polygamy in the East on the ground of the premature old age of the female sex in those regions; the former, also, on the ground of the proportion of females being there greater than of males,—an assertion which, though supported by the authority of several travellers, is by no means proved; and even if true, is not at all unlikely to be the result of polygamy. The Germans, according to Tacitus, were almost the only barbarous people that were content with a single wife. Polygamy has not been without its defenders in modern times; most of them grounding their defence on the absence of any express prohibition in Scripture. One Bernardus Ochinus, general of the order of Capuchins, afterwards a Protestant, published in the 16th century, "Dialogues in favour of Poly-

gamy," to which Besa replied. An abler and more artful treatise was published by John Leyser, a Lutheran divine, London, 1692, under the title of "Polygamia Triumphatrix." The boldest and most plausible advocate of the system in modern times, however, is the Rev. W. Madan, a clergyman of the Church of England, whose work entitled "Thelyphthora, or a Treatise on Female Ruin, its Causes, Effects, Consequences, Prevention, &c.," appeared in 1780. From St. Paul's direction that bishops and deacons should have only one wife, he infers that it was lawful for laymen to have more; while, singularly enough, the Mormons (the only Christian sect that maintain polygamy) explain this passage as meaning that bishops and deacons should have one wife *at least*. (*See* MORMONS.) In England the punishment of polygamy was originally in the hands of the Church. A statute of Edward I. made it a capital offence; but it does not seem to have come entirely under the civil power until a statute of James I. made it punishable with death, like other cases of felony. (*See* BIGAMY.)

POLYGLOT, *pol'-e-glot* (Gr. *polus*, many, and *glotta*, a tongue), denotes a book with versions of its text in several languages; but is commonly applied to the Bible. Origen is regarded as the first who attempted to carry out this idea, though his "Biblia Hexapla" is only in two languages. The Complutensian polyglot is the earliest of the polyglots properly so called (1522, 6 vols. fol.). The Antwerp polyglot was printed by Christopher Plantin, at Antwerp (8 vols. fol., 1569-72), with the sanction of Philip II. of Spain. A third was published at Paris by Antoine Vitré (10 vols. fol., 1628-45). A work superior to any of these, however, is the London polyglot, edited by Brian Walton, in 6 vols. fol. (1654-57). Portions of the work are printed in seven different languages, which open at one view; and in the course of the work nine languages are used; viz., Hebrew, Chaldaic, Samaritan, Syriac, Arabic, Persian, Ethiopic, Greek, and Latin. The polyglot, however, best known, and that which is most accessible to scholars, is Bagster's, published by the London bookseller of that name, in 1 vol. fol., London, 1831. It gives the Old Testament in eight different languages, and the New in nine; viz., Hebrew, Greek, English, Latin, German, Italian, French, Spanish and Syriac, the New Testament being given in the last by way of appendix. The eight languages are exhibited at one view.

POLYGON, *pol'-e-gon* (Gr. *polus*, many; *gonia*, an angle), in Geom., a plane figure of many angles, and consequently of many sides. The term is more particularly applied to a figure the perimeter of which consists of more than four sides. A polygon of five sides is called a *pentagon*; of six sides, a *hexagon*; and so on. When the sides of a polygon are all equal, it is said to be a regular polygon, otherwise it is irregular. Every regular polygon can be circumscribed by a circle, or have a circle inscribed in it. In Mech., when a series of more than three forces act in equilibrium in one point, they may be represented in direction and intensity by a polygonal figure; this figure is termed the polygon of those forces. The discovery of the theorem of the *polygon of forces* is attributed to Leibnitz.

POLYGONACEÆ, *pol-e-go-nai'-se-e*, in Bot., the Buckwheat fam., a nat. ord. of *Dicotyledones*, sub-class *Monochlamydeæ*. Usually herbs with alternate leaves and ochreate stipules. Flowers perfect, or sometimes unisexual. Calyx free, more or less persistent; imbricated. Stamens hypogynous or perigynous; anthers dehiscing longitudinally. Ovary superior, 1-celled; styles and stigmas 2—3; ovule solitary and orthotropous. Fruit usually a triangular nut. Seed solitary, erect; embryo usually with farinaceous albumen, inverted with a superior radicle. There are about 34 genera and 500 species, generally diffused over the globe, but particularly abundant in temperate regions. They are chiefly remarkable for the presence of acid, astringent, and purgative properties. Rhubarb, sorrel, buckwheat, and bistort-root are some of the useful products of this family. (*See* POLYGONUM.)

POLYGONATUM, *po-lig-o-nai'-tum* (Gr. *polus*, many; *gonu*, joints; it has numerous knots), in Bot., a gen. of the nat. ord. *Liliaceæ*. The rhizomes of *P. officinale* are sold in the herb-shops under the name of *Solomon's seal* and are employed as a popular application to remove the marks from bruised parts of the body.

POLYGONUM, *po-lig'-o-num* (Gr. *polus*, many; *gonu*, joint; it has many joints or knots), in Bot., the typical gen. of the nat. ord. *Polygonaceæ*. The roots of *P. Bistorta*, commonly called bistort-root, are a powerful astringent. The leaves of *P. Hydropiper* are very acrid; hence the common name of water-pepper, which is given to this plant. Blue and yellow dyes are obtained from different species.

POLYMORPHISM, *pol-e-mor'-fizm* (Gr. *polus*, many; *morphe*, a form).—In Crystallography, it has been observed that some substances crystallize in two incompatible forms, that is, in forms belonging to two different systems; such forms have been called *dimorphous*, and the phenomenon itself *polymorphism*. It has been noticed by Laurent, and particularly by Pasteur, that the forms of dimorphous crystals almost always occur near the boundary-lines, as it were, of the two systems. The two forms of crystallized sulphur, carbonate of lime, arsenious anhydride, iodide of mercury, &c., are mutually related in this manner. Polymorphism frequently enables us to recognize an isomorphism (which *see*) that would otherwise be overlooked. Thus, the salts of potassium and sodium are for the most part isomorphous, but nitrate of potash usually crystallizes in right rhombic prisms, and nitrate of soda in rhombohedrons. It appears, however, that both salts can crystallize in both systems, and that the corresponding forms are isomorphous. In fact, the two salts are iso-dimorphous, only that nitrate of potash most commonly affects the one form, and nitrate of soda the other. In a similar manner, the carbonates of lead and lime are iso-dimorphous, the ordinary form of the one corresponding to the rare form of the other. A few substances, such as titanic acid, are trimorphous; and, according to Mitscherlich, the sulphates and seleniates of zinc are iso-trimorphous.

POLYPE, POLYPI, *pol'-eep*, *pol-e-pi* (Gr. *polupous*, having many feet), the 13th class of the invertebrate animals, and one of the largest and most remarkable in the animal kingdom. In this class are comprehended gelatinous animals, with elongated contractile bodies, and an alimentary sac with only one opening. They have distinct terminal mouths, surrounded with tentacula or radiated lobes. The greater part of these beings adhere together and form compound animals. They are all of the simplest kind, and possess so low an organization that they appear nearly incapable of reproducing their species. Without heads and without eyes, they have neither organs suited for circulation, respiration, nor locomotion. In appearance their bodies are only a homogeneous mass, consisting of a gelatinous and irritable cellular tissue, in which the vital fluids move slowly. In form, the body is generally cylindrical or conical, and of a transparent texture; and there is no opening but the mouth, which is surrounded by tentacula, varying in their number and size. Some very remarkable facts are related concerning these strange animals. It would appear that the principle of life is so universally diffused through their simple structure, that portions of them may be cut or broken off; and these portions, if allowed to remain in their native element, will soon become perfect animals, with all their functions fully developed. Sometimes the hydra will split in two of its own accord, and each division becomes an independent animal, growing to the same size as the original hydra. In the lowest race of polypi, the distinctive characters of animal life are so slightly developed that there is great difficulty in distinguishing them from the cryptogamic families of the vegetable kingdom. From the egg of these polypi is formed a bulb, from which a stem, sending out branches, shoots up; there is also a root which only serves as an organ of attachment, and not for nourishment. They supply themselves with food by means of their long tentacula, which are the only members capable of voluntary motion. For a long time they were called *animal plants*. The animal structure of polypi in corals had been observed by Imperati and Gesner in 1699; and in 1727 Peyssonnell first discovered the living inhabitants of these stony or horny structures. These discoveries were afterwards confirmed by Trembley, whose treatise on the structure and animal functions of the phytoid *Hydræ* and *Plumatellæ* of fresh water opened a new field of research into the nature and relations of many neglected forms of life. The term *Polypus* had been applied by

Aristotle and Pliny to a cephalopod; this name was subsequently borrowed by the systematic naturalists who followed Linnæus, and applied by them to many really animalized masses in the form of plants. The subject was particularly investigated by Reaumur, Jussieu, Donati, Ellis, Pallas, Lamouroux, and Cuvier. Linnæus placed all the animals of this class as an order of his class *Vermes*, distinguishing them as *Lithophytæ*. Nearly every kind of polypi is attached by the root of the stem or base to submarine rocks or other extraneous bodies. The reproduction of all the adhesive polypi depends on the formation of gemmules (Lat. *gemma*, a bud), or imperfectly formed portions of their soft substance. Each of these gemmules is endowed with active powers of locomotion, apparently for the sole purpose of selecting a place whereon to raise its future residence: the situation once being chosen, it is fixed to that spot during its life. When the gemmules first appear on the surface of the parent animal, they are in the form of small black spots; after a few months, they enlarge, each becoming pyriform, and protruding from the sides of the internal canals of the parent, adhering by their narrow ends. This form particularly applies to the young of sponges. Shortly afterwards they are freed, one after the other, and are borne along by the currents of fluid, which issue quickly from the larger openings. Upon microscopic examination, these gemmules are found to be about two-thirds covered with short cilia, which are in rapid and constant motion. When they become adherent, it is by the narrow end, which soon expands and forms a broad base of attachment. In some polypi the cilia are very numerous. Dr. Grant has estimated that in a single *Flustra foliacea* there are about four hundred millions of cilia! Lamarck classified these creatures in the following manner:—1. *Polypi nutantes*; polypi provided with tentacula united in a common fleshy mass, placed in an axis, free and floating in the water.—2. *Polypi tubifera*; tentaculated polypi united in a common fleshy body, without any solid axis, and covered with tubiform cylinders.—3. *Polypi vaginati*; polypi with tentacula always fixed in an inorganic covering, and forming in general compound animals.—4. *Polypi denudati*; tentaculated polypi not forming a common envelope, fixed either constantly or spontaneously. —5. *Polypi ciliati*; polypi without any tentacula, but, instead of them, vibratile cilia at or near the mouth. —*Ref.* Johnston's *History of the British Zoophytes*.

POLYPODIUM, *pol-e-po'-de-um* (Gr. *polus*, many), in Bot., a gen. of Ferns, characterized by the sporangia being in circular clusters and naked, and by the edge of the frond being flat, not reflexed. There are SIX species found in the United Kingdom, but most of them are rare plants, except in certain localities dear to the fern-collector. *P. vulgare*, the common polypody, found on shady banks, walls, and old trees, is a beautiful fern. The fronds are deeply pinnatifid; the lobes linear-oblong, somewhat serrate, all parallel, the upper ones becoming gradually smaller. The rhizomes of some species of this genus are used medicinally in Peru, and are said to possess sudorific, diuretic, febrifugal, and anti-venereal properties. (*See* FILICES.)

POLYPORUS, *po-lip'-o-rus*, in Bot., a gen. of *Fungi*. One species has been named *P. destructor* from the circumstance that the development of its spores in timber is one of the causes of *dry rot*. From various species, *Amadou* or *German tinder*, as noticed in another part of this Dictionary. *P. officinalis*, the *larch*, or *whi'- agaric*, has been employed medicinally, externally as an astringent application, and internally to check perspiration, also as an emetic and cathartic. (*See* AMADOU.)

POLYTECHNIC SCHOOL. (*See* ECOLE POLYTECHNIQUE.)

POLYTECHNICS, *pol-e-tek'-niks* (Gr. *polus*, many; *techne*, an art), a term applied throughout Europe, and particularly in Germany, to the science of all the mechanical arts, aided or unaided by machinery. The Polytechnic Institution of London is a well-known place of scientific amusement.

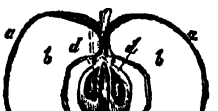
POLYTHEISM, *pol-e-the'-izm* (Gr. *polus*, many, and *theos*, god), is the doctrine of a plurality of gods, and is opposed to monotheism, which maintains the existence only of one. The two extremes of polytheism may be regarded as *dualism*, or the belief in two supreme





beings—a good and an evil, and pantheism, which regards all nature as but God. (*See* PANTHEISM.) Some consider polytheism as having originated in a corruption of monotheism; others regard it as a deification of the powers of nature. Polytheism differs from idolatry in not of necessity including the notion of forms, which the latter always does, whether it refers to one god or several. There is no evidence in Scripture to show that polytheism existed before the Flood, nor have we any means of knowing when it was introduced; but it is evident that in the time of Moses the Egyptians were polytheists, and not a few of the provisions of the law were directed against this form of error. The Greeks and Romans acknowledged one supreme being,—Zeus or Jupiter, as over all others; but they had numerous lesser deities whom they worshipped as gods. Cudworth has laboured very ingeniously to show that the ancient philosophers in general worshipped only one supreme being under different names; but even accepting the truth of his arguments, they only the more strongly prove that the people in general were polytheists; and polytheism in the mind of the ignorant is atheism.

POME, *pome* (Lat. *pomum*), in Bot., the inferior syncarpous fruit, well known under the forms of apple, pear, quince, medlar, haw, &c. It is indehiscent and fleshy, 2 or more celled, and few-seeded. The *endocarp* is papery, cartilaginous, or bony; this is surrounded by a fleshy mass, consisting of *mesocarp* and *epicarp*, which is usually considered to be formed by the cohesion of the general parenchyma of the ovary with the tube of the calyx. In the apple, for example, the separable skin (*a*) is the epicarp; the fleshy part, which is eaten (*b*), is the mesocarp; and the core (*c*, *d*), containing the seeds (*f*), is the endocarp. According to some botanists, the outer fleshy portion of the pome is an enlarged concave receptacle, and the bony or cartilaginous cells are distinct carpels, the walls of which are formed of the three layers of the pericarp, completely united and indistinguishable. The pome characterizes the sub-ord. *Pomeæ*, of the nat. ord. *Rosaceæ*. (*See* FRUIT.)




POMEGRANATE. (*See* PUNICA.)

POMERANIAN DOG, *po-me-rai'-ne-an*.—The characteristics of this dog, which is well known in England, are a pointed nose, erect ears, and a bushy tail curled over the back. Its fur, which is usually long and soft,



POMERANIAN DOG.

is white, white and brown, or buff. They are commonly used by the Dutch and inland navigators to protect property on board vessels, and they are frequently found as watch-dogs on German farms.

**Pontederaceæ**, *pon-te-de-rā'-se-e*, in Bot., the *Pontederia* fam., a nat. ord. of *Monocotyledones*, subclass *Petaloideæ*, consisting of aquatic plants, natives of the East Indies, Africa, and America. They are unimportant.

**Pontoon**, *pon-toon'*, a term applied in this country to those large flat-bottomed boats which are used in the formation of floating bridges for military purposes. In France, a pontoon, or *ponton*, signifies any barge or flat-bottomed boat. In military tactics, the conveyance of an army, with its artillery, &c., over the rivers which intersect its march, is one of the most important operations. Much depends upon the rapidity with which the river can be crossed, and upon the removal or destruction of the bridge immediately afterwards. During an active war, it is seldom possible to erect stationary bridges of any magnitude. In all ages, bridges consisting of timber platforms supported on floating vessels have been used. Among the ancients, the most famous works of this kind were those thrown by Darius over the Bosphorus, and subsequently across the Danube; also the pontoon-bridge that was built across the Hellespont by order of Xerxes. Herodotus, in his description of the latter bridge, states that 360 vessels, anchored both at the head and stern, were disposed in parallel directions across the strait, with their keels in the direction of the current, in order to diminish the strain on their cables; and that parallel to this line, but nearer to the Archipelago, was another, consisting of 314 vessels, similarly disposed. The vessels were connected together by cables, over which was laid a platform of planks covered with a bed of earth, and there was a rail on either side. During the war against Napoleon I., the pontoons employed differed very slightly from those used by the ancients. They were of metal over a light framework of wood framed inside. Their length was about twenty feet, and their breadth from four to five feet; their depth was from two feet to two feet three inches. Many improvements have been made in pontoons since that time. One of the latest is that of Capt. Fowke, R.E. It is a *boat-pontoon*, the boat consisting of canvas on wooden frames. The principal advantages claimed by Captain Fowke for his pontoons are smaller cost, less weight, less bulk on the march, more buoyancy, and less liability to damage from shot.

**Poor Laws**, *poor* (Lat. *pauper*).—Until the reign of Henry VIII., the poor of England were dependent upon private benevolence and the charity of well-disposed Christians; but, during the reign of that monarch and his children, numerous statutes were passed for providing for the poor and impotent, occasioned, doubtless, by the destruction of the monastic institutions, which supported and fed a very numerous and very idle poor. (*See* Beggars.) The statute 43 Eliz. c. 2, however, is generally considered as the foundation of the modern poor-law system, and provides for the appointment of overseers of the poor in every parish. Their office and duty were principally to provide work for all able-bodied persons who had no means of maintaining themselves, and to raise competent sums for the necessary relief of the lame, impotent, blind, and such as were poor and not able to work. This system continued in operation for above two centuries and a quarter,—from 1601 to 1834, without any material modification or alteration. The provision for setting the able-bodied to work was rendered more effectual by 9 Geo. I. c. 7, which enabled every parish to provide, or combine with others in providing, a workhouse. The statute 22 Geo. III. c. 83, commonly called Gilbert's Act, authorised parishes to appoint guardians to act in lieu of overseers in all matters relative to the relief and management of the poor, and also to enter into voluntary unions with each other for the more convenient accommodation, maintenance, and employment of paupers. At length, in 1833, parliament recommended the issuing a royal commission for inquiring into the state and administration of the laws relating to the poor, which led to the passing of the act 4 & 5 Wm. IV. c. 76, commonly called the "Poor-Law Amendment Act." The chief provisions of this act were the placing of the management of the poor throughout the country, and the administration of the parochial funds, under the superintendence and control of a central board, called the "Poor Law Commissioners," who had power to





make such regulations as they thought proper for the guidance and direction of the parochial authorities; they had also the power of uniting several parishes for the purpose of a more effective and economical administration of relief. The powers and duties of this board were, by 10 & 11 Vict. c. 109, transferred to a new board, under the title of "Commissioners for administering the Laws for the Relief of the Poor in England," consisting of the lord president of the council, the lord privy seal, the principal secretary of state for the home department, and the chancellor of the exchequer, for the time being, in virtue of their offices, and of such other persons as her majesty, by letters patent or commission, should appoint. They are directed to appoint a certain number of inspectors, for the purpose of exercising a visitorial power over workhouses, and of being present at meetings of guardians, or other local meetings held for the relief of the poor; and are also directed once in every year to submit to both houses of parliament a general report of their proceedings. As the law now stands, a settlement in a parish is acquired—(1) by birth, for wherever a child is first known to be, that is always *prima facie*, until some other can be shown, the place of its settlement; (2) by parentage, for all legitimate children take the last settlement of the father, and after him of the mother; an illegitimate child, on the other hand, follows the settlement of the mother; (3) by marriage, for a wife may claim the settlement which belongs to her husband, and she retains it after his death; (4) by renting a tenement (for the sum of £10 a year at least, for one whole year) coupled with residence in the same parish for forty days; (5) by being bound apprentice under indenture or other deed, and inhabiting for forty days under such binding; (6) by having an estate of one's own, of whatever value, in a parish, a settlement of a temporary kind is gained there; (7) by being charged to and paying the public taxes and levies of the parish, a settlement may be gained. Whenever a person has gained a settlement in a parish, he is considered to retain it until he has acquired a new one in some other place. All who in any parish stand in need of relief, and apply for it, are entitled to be relieved there. If settled there, they constitute its *settled* poor; if not settled, its *casual* poor. As regards the latter, they may in general be removed, by order or warrant, to the parish where they have a settlement, and they are entitled to relief only till such removal can be effected. The parish, however, will be immediately exonerated from the burden of maintaining any pauper who has any relation competent, or by law compellable, to maintain him. The relations so compellable are the father and grandfather, mother and grandmother, or children of the pauper. They are liable to maintain him at such rate as shall be assessed by an order of the justices at their general, quarter, or petty sessions, and, on refusal to obey such order, the sums so assessed are recoverable by a summary proceeding before two justices of the peace. Further, by 5 Geo. IV. c. 83, persons able wholly or in part to maintain themselves or families by work or other means, and refusing or neglecting to do so, whereby they become chargeable on a parish, may be punished by a single justice, on the oath of one witness, by imprisonment in the house of correction, with hard labour.

**Pope**, *pops* (Lat. *papa*), is the title assumed by the supreme head of the Roman Catholic church. It comes from the Greek *papas*, signifying father; and in the early church was generally applied to presbyters and bishops. About A.D. 655, when the influence and authority of the Church began to predominate in the West, the patriarch of Rome laid claim to the exclusive appellation of pope; and in 1076, Gregory VII., in a council held at Rome, decreed that the title of pope should be given only to the bishop of Rome, the several offices or dignities united in the person of the Roman pontiff—(1), primate or head of the Roman Catholic world; (2) bishop of Rome and metropolitan of its province; and (3), temporal sovereign of the Papal States. On the subject of the pope's power, authority, fallibility, &c., even Roman Catholics themselves are by no means agreed. The pope derives his power from being said to be the successor of St. Peter, the rock they say upon which Christ was to build the Church. (As to the mode of electing a new pope, *see* Conclave.)

**Popery.** (*See* Roman Catholicism.)

Poplar. (*See* Populus.)

Poppy. (*See* Papaver.)

Population, *pop-u-lat'-shun* (Lat. *populus*, a people), in Polit. Econ., is the most important branch of the science, being both the means and the end of national wealth; it is, at the same time, one of the most obscure and difficult subjects to understand, and has given rise to a large amount of discussion. It was formerly a maxim in politics, that a country could not be over-peopled, as it was supposed that the means of subsistence increased in proportion to the increase of the population, and that this could never be a cause of it's falling into want and misery. Some states, therefore, as that of ancient Rome, took means to encourage matrimony by relieving from taxation and preferring to public offices those that married and had children. Others, again, have maintained that it is the policy of states to check the increase of population. Malthus asserts that the increase of the population of a country beyond a certain limit, depending on the means of subsistence, is an evil, which will augment year after year, as the disproportion between the population and the means of subsistence increases. He further asserts that all civilized countries are either at the point, or more or less near it, where as much food is produced from the soil as in any possible way can be obtained from it; and suppose more could be gained by greater efforts and more industry, it will never be in such proportion as the yearly increase of the population; and thus want and misery are approaching in all civilized countries, against which there is no other remedy than that the government either check the increase of population or remove from the country the yearly arising surplus by means of colonies and other measures conformable to this purpose. Every species of plant or animal which is capable of increase, either by generation or by seed, increases in a geometrical ratio, depending on the average power of reproduction and the average period of existence of the individuals of which it is constituted. He further asserts, that population, when unchecked, increases in a geometrical progression of such a nature as to double itself every twenty-five years; at which rate the inhabitants of every country would, in the course of five centuries, increase to above a million times their present number, which, as regards England, would not allow the people even standing-room. There are, however, so many elements to be taken into account, which are entirely lost sight of in these arguments, as to deprive them of any weight or importance. A single instance of a state which has suffered in this way cannot be produced, and the resources of nature are so bountiful and manifold as to afford little reasonable fear for such an issue. Nature has provided a thousand ways to prevent the increase of the human race beyond the means necessary for its subsistence. Like a careful mistress, she deals out her bounties with a sparing hand, but ever, as the necessities of her dependents increase, she finds means to supply their wants. Much of the earth still remains uncultivated or untouched by the hand of man, and much of that which is touched is very imperfectly dealt with; for who can say what may be yet done by more improved means of cultivation, by machinery, chemistry, &c.? Finally, the extension of the principles of commerce and free trade will open up to each other the extreme parts of the earth. Nature has also, for wise ends, implanted in man a moral sentiment which forbids him to produce children before he is able to supply their wants. Further, Mr. Doubleday, in his "True Law of Population," lays it down as a great law in nature, that wherever, either in the animal or vegetable kingdom, the existence of a species or genus is endangered, a corresponding effort is invariably made for its preservation and continuance by an increase of fecundity or fertility; and that, on the other hand, a state of repletion is unfavourable to fertility. In the vegetable kingdom, for instance, it is a well-known fact that if a tree, plant, or flower be placed in mould either naturally or artificially too rich for it, a plethoric state is produced, and fruitfulness ceases. Cattle-breeders also know and act upon the same law, particularly in the cases of the mare, the cow, and the ewe, with which leanness is indispensable to conception. In society, in the same way, he maintains that a constant increase is going on among that portion of it which is the worst supplied with food, namely, the poorest; that among those in a state of affluence, and well supplied with food and luxuries, a constant decrease goes on; while among those that form the mean or medium between these two states, those that are tolerably well supplied with good food, and not over-worked, nor yet idle, population is stationary. This view is so far borne out by statistical observations, which show that a greater increase of population takes place in towns than in rural districts, as it were to provide for the greater mortality in the former.

Populus, *pop'-u-lus*, in Bot., the Poplar, a gen. of the nat. ord. *Salicaceæ*. All the species are rapid-growing, soft-wooded timber trees, some of which attain a great size. *Populus alba* is, perhaps, the most valuable of the British species; it is a highly ornamental tree, and furnishes a soft, white, stringy timber, which is employed to make all sorts of wooden vessels and utensils; being especially valued for butchers' trays and turners' ware. Several species have tonic, astringent, and febrifugal bark, containing the active principle *salicine*.

Porcelain, *por-sel'-lane* (Port. *porcellana*, a cup). —Porcelain, in its more general sense, includes all kinds of earthenware which are white, semi-transparent, and have some degree of a vitreous texture; but in its more limited sense it denotes only the finer kinds; and as this kind of ware has been, from the earliest times, manufactured most perfectly in China, it has been called Chinese porcelain, or China-ware. The first porcelain seen in Europe was brought from China and Japan, and having excited great admiration by its fineness of texture, transparency, and its beautiful colours, many attempts to imitate it were made by European manufacturers, and were first successful in Saxony. The manufacture was afterwards introduced into France, and successively into England, Germany, and Italy, where it has arrived at various degrees of perfection, but is still inferior to the production of eastern countries. The finest and best porcelain of China is made in a village called King-te-tching, in the province of Kiang-si, a town of not less than 1,000,000 inhabitants, and which is said to have furnished the emperors of China with porcelain since the year 412 of the Christian era. The chief ingredients which enter into the composition of Chinese porcelain are petuntse and kaolin, two kinds of earth, from the mixture of which the paste is obtained; the petuntse being of a pure white, and when fully prepared, in the form of an impalpable powder, whilst the kaolin is intermixed with small shining particles. The petuntse originally consists of the fragments of rock dug from certain quarries; the colour of the stone which answers the purpose best, inclining, according to the Chinese, somewhat to green. It requires many operations to fit it for the purpose of the manufacturer, whilst the kaolin, on the other hand, is found in nature in a state almost ready for him, in small lumps, in mines, the external strata of which are composed of a kind of red earth. Chinese porcelain owes its fabric and texture to the kaolin, which endows it with the property of resisting the most powerful heat, whilst its strength and consistency is obtained by fusion with the petuntse, which enables it to resist the action of the more powerful agents. It is said that the Chinese have latterly discovered a substitute for kaolin in a stone called hoa-chè, which is of a saponaceous quality, and enables them to manufacture porcelain of a much more beautiful kind than formerly; but as it is scarce and dear, it is *rarely employed in the fabrication* of the body of the porcelain, the workmen being content with making it into a fine ware, and immersing the vessel into it, that it may receive a coat before it is painted and glazed. After a piece of porcelain has been properly formed, it passes into the hands of the painters, who divide the labour between them; one tracing out the first coloured circle which ornaments the brim of the vessel; another designing the flowers; and a third painting them; and so on. One of the kinds of varnish employed, called tsou-you, is procured from white flint, and has the peculiar property of making those pieces of porcelain upon which it is laid, appear to be covered with an infinitude of veins in every direction. After the porcelain has received its proper form, its colours and all the intended ornaments, it is trans-

ferred from the manufactory to the furnace. The small pieces of porcelain, such as teacups, are inclosed in cases about four inches in height; each piece being placed upon a saucer of earth about twice as thick as a crown piece, and equal in breadth to its bottom. These small cases are also sprinkled over with the dust of the kaolin, and having been placed in the furnace on a bed of coarse sand, half a foot in thickness, are exposed to the action of the fire until the workman observes that all the cases are red hot, and that the colours of the porcelain appear with full lustre, when he judges that it is in a proper state. Manufactories for the fabrication of porcelain are now established in almost all the states of Europe; but in no state have such attempts been made to discover the best method of manufacturing porcelain, or so many manufactories of it been established, as in France. The porcelains of Chantilly, Villeroi, and Orleans have a distinguished merit; but the porcelain produced at Sèvres has long held the first rank, from its shining white, its beautiful glazing, its coloured grounds, and the regularity and elegance of its forms. In England, but little progress was made in the manufacture of porcelain until towards the end of the last century. At an earlier period there was a manufactory carried on by some Germans at Chelsea, afterwards removed to Derby, of porcelain of a very superior quality; but whence they derived their materials is now uncertain. About the year 1768, however, the discovery in Cornwall of mines of clay and stone, similar to those used in France and Germany, and which are believed to be the kaolin and petuntse of the Chinese, soon enabled English manufacturers to improve their porcelain, by discontinuing the use of frit or glass as a component part of the basis or body of the ware, and substituting a mixture of the fusible and infusible earths as the basis of their porcelain, as had been done at a much earlier period in Germany and France. After all, the most perfect porcelain is nothing else than a fine white stone-ware; and if the earths of which stone-ware is made were free from heterogeneous colouring matters, which prevent their whiteness and semi-transparency; if vessels were properly formed; if all the proper attention were given; and if these vessels were covered over with a fine glazing, they would form as perfect porcelain as that of Japan. There are two kinds of porcelain,—one called hard, the other tender. Hard porcelain is composed of a clay containing silica, which is infusible, and preserves its whiteness in a strong heat, and of a flux consisting of silica and lime. The glaze of this ware is earthy, and admits of no metallic substance or alkali. Tender porcelain consists of a vitreous frit, which is rendered opaque by the mixture of a calcareous clay. It is glazed with artificial glass, into the composition of which silica, alkalies, and lead enter. The materials of which the glazing is composed are previously prepared by fusing together all the substances of which they consist, and thus forming a vitreous mass. This mass of vitrified matter is then ground in a mill, and the powder thus obtained mixed with a sufficient quantity of water until it becomes of the consistency of cream. The pieces of porcelain are dipped hastily into this liquid and withdrawn; and as they greedily imbibe the water, there remains on the surface a uniform coating of the glazing materials. When they are dry, they are replaced in the furnace, and kept there until the glazing is perfectly fused. Unglazed porcelain, said to be in a state of biscuit, has the appearance of white marble; and, for particular purposes, the porcelain is sometimes allowed to remain in this state, and particularly when it is employed in smaller and finer pieces of sculpture, as the fineness of the workmanship and the sharpness of the figures would be greatly injured by a coat of glazing. (*See* POTTERY.)

PORCUPINE, *por'-ku-pine* (Fr. *porc-épic*).—Porcupines are of the family of the *Hystricidæ*, belonging to the order *Rodentia*, which has a very wide geographical range, having representatives in the four quarters of the globe. The common porcupine, sometimes called the Italian or African porcupine, when full grown, is about two feet in length; its general colour being a grizzled dusky black, resulting from an intermixture of various shades of white, brown, and black. The upper part of the head and neck is furnished with a long crest of thick bristles, capable of being erected or depressed at pleasure, from which the animal derives its name. The hair on the muzzle and limbs is very short, and almost black on the limbs, whilst that of the neck and under parts is brownish, and of considerable length. On the fore part and sides of the neck there is a whitish band; all the remaining parts of the back and sides, including the rump and upper parts of the hinder legs, are armed with spines, which are longest on the centre of the back, being there about nine inches in length, very sharp at the ends, and varied with white and black. These spines are about the thickness of a goose-quill in the middle, and their usual position is lying nearly flat upon the body, with their points directed backwards; but when the animal is excited, they are raised, by means of the subcutaneous muscles, almost at right angles with the body, and then present a very formidable appearance; the story of these animals being able to dart their quills is, however, fabulous. It digs large burrows, divided into many compartments, and brings forth from two to four young. It is a nocturnal animal; sleeping in its burrow during the day, and going forth at nightfall to seek its food, which usually consists of roots, fruits, and tender leaves. It is found wild in Italy and Spain, and is bought in the markets of Rome for the table. Porcupines are found in India, the sand-hills to the south-west of the Caspian Sea, Southern Tartary, Persia, and Palestine, all parts of Africa, in Mexico and Brazil, and in many parts of North America.

POROSITY, *po-ros'-e-te* (Gr. *poros*, a passage), that condition of material bodies in which the molecules are not in absolute contact, but separated by intervals called *pores*. It is an essential property of all bodies,—that is, there are none known in which the particles are contiguous to one another. In some bodies the pores are not manifest, and their existence is proved by various circumstances. Many of the metals become more compact by hammering, and all of them contract by reduction of temperature. In trying to compress water in a sphere of gold, the Florentine philosophers forced the liquid through the pores of the metal. The porosity of many substances is inferred from their elasticity and the sounds which are heard when the molecules are made to vibrate. In transparent bodies, porosity is inferred from the capability of the substance to transmit light. The porosity of the human skin is of such a character that it has been calculated that there are a thousand holes, or pores, in the length of an inch. The whole surface of the body of a middle-sized man being estimated at sixteen square feet, it must contain no fewer than 2,304,000 pores. The permeability of all solid bodies by any fluid depends upon its peculiar structure and upon its relation to the fluid. A compact substance will sometimes oppose the entrance of a thin fluid, while a gross one passes freely through it; thus a cask which holds water will allow oil to ooze through it, while mercury may be carried in a small cambric bag which could not retain water for a moment.

PORPHYRA, *por'-fi-rā* (Gr. *porphura*, purple), in Bot., a gen. of *Algæ*, or sea-weeds. *P. laciniata* and *vulgaris* are employed as food in the form of a sauce or pickle, which has received in different parts of Britain the names *sloke*, *slokan*, and *laver*. Though this preparation has a very repulsive appearance, it is remarkably wholesome and savoury. *P. vulgaris* is commonly eaten in China as a relish to rice, being known as *Tsz-Tsai*, or the purple vegetable.

PORPOISE, *por'-pus* (Ital. *porco pesce*), the most common of all the *cetacea* on the British coasts. The porpoises swim in shoals, and drive the herrings, mackerel, and salmon before them, pursuing them up the bays with the same eagerness as a dog does a hare. In some places they almost darken the sea as they rise above water to take breath; they not only seek for prey near the surface, but often descend to the bottom in search of sand-eels and sea-worms, which they root out of the sand with their noses. They go up rivers in pursuit of salmon and other fish, and have been seen at a considerable distance inland. In fine weather they leap, roll, and tumble, and appear heedless and blind to all danger. The oil procured from the fat surrounding the body of the porpoise is of the purest kind, and the skin, when carefully tanned and dressed, is used for

wearing-apparel and for coverings of carriages. As an article of food, its flesh was anciently esteemed, and in Henry VIII.'s time was even a royal dish, appearing to have been generally presented as a roast, with a sauce made of fine white bread-crumbs mixed with vinegar and sugar. At a later period the porpoise kept its ground on the tables of Roman Catholics on fish days and during Lent. Its length is from five to eight feet.

PORT ROYAL is the name of a celebrated convent of Cistercian nuns, situated near Chevreuse, about five leagues from Paris. It was founded in 1204, and the nuns were of the order of St. Bernard de Citeaux. In 1625 they removed to Paris, where, in the faubourg St. Jacques, they had a house, known as the Port Royal de Paris, while the house which they left received the name of Port Royal des Champs, and became occupied by a number of pious and learned men, who wished to lead a pious and secluded life, and were known as "Les Solitaires de Port Royal." The most distinguished of this company were Claude Lancelot, the grammarian; Antoine le Maistre, an advocate and one of the most distinguished orators of his time; Simon Lécreourt, a distinguished officer; De Sacy, the eminent translator of the Bible; the two Arnaulds; Pierre Nicole, Blaise Pascal, and Nicolas Fontaine. The mode of life in the Port Royal was distinguished for its austerity. They rose at three o'clock in the morning, and after the common morning prayer they kissed the ground as a sign of their self-humiliation before God; then they read, kneeling, a chapter from the Gospels and one from the Epistles, and concluded with another prayer. Two hours in the morning and two in the afternoon were devoted to manual labour in the grounds adjoining the convent, and they observed with the greatest strictness the season of Lent. They established a school, which was to consist of five classes, of five pupils each, the teachers being chiefly Arnauld, Lancelot, De Sacy, Nicole, and Fontaine, and they published a series of famous class-books on Logic, Grammar, Greek, Latin, and Geometry, which bear the name of the society. The fame that they acquired for their learning and sanctity aroused the jealousy of the Jesuits and was the cause of a long contest that prevailed between the two parties, which at length led to the suppression of the Port Royal des Champs, by a bull of Pope Clement XI. in 1708. The special subject of the controversy was the Jansenistic opinions held by the Port Royalists. (*See* JANSENISTS.)

PORTULACACEÆ, *por-tu-la-kai-se-e* (Lat. *portula*, a little gate,—its leaves resemble little doors), in Bot., the Purslane fam., a nat. ord. of *Dicotyledones*, sub-class *Calycifloræ*. Succulent herbs or shrubs, with entire exstipulate leaves and unsymmetrical flowers. Calyx consisting of 2 sepals coherent at the base. Corolla with usually 5 petals, distinct or united. Stamens perigynous or hypogynous, varying in number, sometimes opposite to the petals; filaments distinct; anthers 2-celled, versatile. Ovary superior, or rarely partially adherent. Fruit capsular, usually dehiscing transversely, or by valves; sometimes indehiscent; placenta free, central. Seeds numerous or solitary; embryo curved round farinaceous albumen. The plants of this order are found in waste dry places in various parts of the world, but especially at the Cape of Good Hope and in South America. There are 12 genera, which comprise 184 species. *Portulaca oleracea*, purslane, has been used from the earliest times as a potherb and in salads. It has cooling and antiscorbutic properties. The fleshy root of *Claytonia tuberosa*, another plant of this order, is edible. Many *Portulaceæ* have large showy flowers.

POSITIVISM, *poz'-i-tiv-izm*, or POSITIVE PHILOSOPHY, is the name given to the system of philosophy inaugurated by the late Auguste Comte. Humanity, according to him, has three stages of development,—the theological, the metaphysical, and the positive. In the theological state man is disposed to regard all effects as supernatural, as signs of the pleasure or displeasure of some superior being or beings. In the metaphysical stage the supernatural agents give place to abstract forces supposed to be inherent in the substances themselves and capable of producing the phenomena. In the positive stage, the mind, convinced of the folly of inquiring into causes and essences, applies itself to the discovery of those laws which regulate effects, or those invariable relations of succession and similitude which exist throughout nature. The mission of positivism is said to be "to generalise science and to systematize sociality." "It is a doctrine capable of embracing all that can regulate humanity; not a treatise on physical science, not a treatise on social science; but a system which absorbs all intellectual activity." All sciences, of whatever kind, physical or social, are but branches of one science, to be investigated on one and the same method. The natural sciences are of two kinds,—the one abstract, the other concrete, special, descriptive. The first are the fundamental sciences; the latter are secondary. General physiology and chemistry are abstract sociology; botany and mineralogy, concrete. It is only the abstract sciences with which Comte deals. These he divides into two great classes,—the first comprehending all the phenomena of inorganic bodies, the second those of organized bodies. The latter are evidently more complex and special than the former. Inorganic physics are divided into two distinct sections, according as they refer to the general phenomena of the universe or specially to those which are presented to us by terrestrial matter. Hence we have celestial physics, or astronomy, geometrical and mechanical, and terrestrial physics; the latter being subdivided into two distinct portions according as the bodies are considered under a mechanical or physical point of view. Astronomical phenomena being the most general, simple, and abstract of all, are the first of his fine fundamental sciences, followed by physics proper and chemistry. Organic physics are, in the same way, divided into physiology, or biology, and sociology; the former relating to the individual, the latter to the species. There is thus a natural gradation from the simplest to the most complex of the sciences. The system is not without merits as well as defects, and, as may be seen, it is wrought out with a considerable degree of skill and ingenuity. An exposition of the principles of the system has been published by G. H. Lewes (Bohn, 1853), and a condensed translation of the *Cours de Philosophie positive*, by Harriet Martineau.

POSSE COMITATUS, *pos'-se kom'-i-tai-tus* (Lat., the power of the county), in Law, is the power of the county which the sheriff is empowered to raise in case of invasion, rebellion, riot, &c., and comprising all able-bodied males within the county between the ages of fifteen and seventy. All such persons are bound to attend, on being charged by him to do so, under pain of fine and imprisonment. It is also lawful for any peace-officer to raise the posse for the purpose of opposing and suppressing enemies, rebels, &c., within the county.

POSTMASTER-GENERAL, the chief officer of the Post-office department, whose duty it is to make contracts for the conveyance of public mails, and see that they are properly executed. He also receives the moneys arising from the postage of letters, pays the expenses, keeps the accounts of the office, and superintends the whole department. (*See* POST-OFFICE.) The Postmaster-General is now an officer of high consideration in the government. He is always a *member* of the privy council, usually a peer, and sometimes a cabinet minister. His salary is £2,500 per annum, and he is appointed by patent. The present Postmaster-General (1863) is Lord Stanley of Alderley.

POST-OBIT, *post o'-bit* (Lat. *post obitum*, after death), in Law, is a bond given for the purpose of securing a sum of money after the death of some particular individual.

POST-OFFICE, POSTAL SYSTEM.—The commencement of the English postal system is to be observed as early as the 14th century, during the reign of Edward III. It was not, however, at that period a public institution. By Edward IV., post-houses were placed at intervals of twenty miles; and in the North a military post was established to communicate with the army during the Scottish war. There is no certain information as to what time the general public availed themselves of the benefits of this institution; but it is positive that, for a long time, it was very limited. Long before the reign of Charles I., merchants, tradesmen, and professional men, either resorted to less secure methods of conveyance or employed expense messengers at great

expense. In the principal cities and universities there were messengers who performed long journeys, on horseback or on foot, and returned with answers to the letters. In the middle of the 16th century, a post existed by which letters were carried from London to Edinburgh within four days; this, however, only lasted for a brief period. In 1581, one Thomas Randolph is mentioned by Camden as the chief post-master of England; but there are reasons for concluding that his duties were to superintend the posts, and had no immediate connection with letters. Under the superintendence of Matthew le Quester, James I. set on foot a system of forwarding letters intended for foreign lands. Before that time this had been done by private persons. In 1632, Charles I., by a proclamation, forbade letters to be sent out of the kingdom except through the post-office; and three years afterwards he established a system of posts for England and Scotland, which was conducted according to careful and judicious regulations. This was followed by the abolition of all local and private posts, and the income of the post-offices was claimed by the king. The newly-constructed post-office was placed under the control of Thomas Witherings. About the same time, Charles, in connection with Louis XIII. of France, established an international post between London and Paris; while the private post which had hitherto existed between Rye and Dieppe was abolished. During the period of the civil wars, these institutions suffered severely; but whenever tranquillity was restored, a commission was appointed and a new system established under Edmund Prideaux, a member of the House of Commons. "He first established a weekly conveyance of letters into all parts of the nation, thereby saving to the public the charge of maintaining postmasters to the amount of 7,000*l.* per annum."—(*Blackstone.*) In fact, so profitable had the institution of a post-office become, that the posts could now be leased for £10,000. The most complete step, however, in the establishment of a post-office was taken in 1650, when an act was passed "to settle the postage of England, Scotland, and Ireland." One of the principal points in this act was, that it enacted that "there shall be one general post-office and one officer stiled the Postmaster-general of England and Comptroller of the Post-office." The arrangements of this act were confirmed in the first year of the Restoration, by an act which was repealed in Queen Anne's reign. A metropolitan penny-post was first started in 1683; and from 1711 to 1833 more than 150 acts affecting the regulations of the post-office were passed. For the great radical change which took place in our postal system we are indebted to Sir (then Mr.) Rowland Hill, who first gave an intimation of his plan in a pamphlet, in the year 1837. He there clearly showed that the post-office system as it stood was costly and inefficient; that partly from franking privileges and partly from impolitic charges on payable letters, it had fallen into a weak state; and the outlay was enormous, while the returns were disproportionately small. The average cost for all letters in Britain was about 6¾*d.*, while all packet and ship-letters cost about 2*s.* For a single-sheet letter sent 15 miles and under, the charge was 4*d.*; 15 to 20, 5*d.*; 20 to 30, 6*d.*; 30 to 50, 7*d.*; and so on. Mr. Hill summed up the result of these charges thus:—"From 1815 to 1839 the annual gross revenue of the Post-office department was £2,180,597; from 1832 to 1837 it amounted to £3,251,424. The positive increase in seventeen years was £90,827, averaging only £3,578 yearly, or little more than one and one-half per thousand: although in these seventeen years the increase of population has been 25 per cent., or 250 per thousand, and the advance in trade, industry, intelligence, in short, of every species of material and intellectual activity, was still greater." The principal feature of Mr. Hill's magnificent plan was that of a uniform penny postage for all inland-borne letters and packets not exceeding a certain weight, beginning at half an ounce. The legislature, to a large extent, adopted Mr. Hill's plan, and on August 17th, 1839, the important act 2 & 3 Vict. c. 52, was passed, which empowered the lords of the Treasury "to take the necessary steps to give effect to such reduction, and to make orders and regulations for the same." On the 10th of January, 1840, the uniform rate of 1*d.* per



half-ounce for pre-paid letters came into operation, and has so remained. The statistics of the Post-office are anything but complete. Previous to the year 1716, only a few scattered accounts can be found. In 1653 it was leased for £10,000; in 1659, for £14,000; in 1663, for £21,500; in 1674, for £43,000; and in 1685, for £65,000. From that period up to 1793 the average yearly net revenue was £97,540. In the Postage Reports of 1838 are accounts showing the gross receipts, charges of management, &c., from 1758 to 1837. The following selections will show its progress:—

| Year ended April 5. | Gross Receipts. | Charges of Management. | Net Receipt (returns deducted). | Rate p'cent. of Collection. |
|---|---|---|---|---|
| 1758 ... | £222,075 | £148,345 | £73,730 | £66 15 11 |
| 1769 ... | 305,058 | 140,298 | 164,760 | 45 19 9 |
| 1779 ... | 402,918 | 263,670 | 139,248 | 65 8 9 |
| 1799 ... | 1,012,731 | 324,787 | 687,388 | 32 1 4 |
| 1816 ... | 2,193,741 | 594,045 | 1,598,537 | 27 1 6 |
| 1837 ... | 2,206,736 | 609,220 | 1,511,028 | 27 12 1 |

The first entire year of the penny postage was 1840; but then letters might be paid or stamped, or were charged double. During that year, 191,931,395 letters passed through the post-offices of the United Kingdom. The revenue derived from the Post-office had been £1,649,088 in 1839; in 1840 it only amounted to £695,514. In 1845 the number of letters amounted to 329,161,811, and the revenue was £760,588. The number of letters and the amount of revenue increased rapidly, and in 1848 the additional advantage was given of a book-post, by which single books could be sent, open at the ends, at a uniform rate of 6*d.* per pound, a privilege which was gradually extended to the colonies. In 1855 the rate of postage for printed sheets was reduced to 1*d.* for a quarter of a pound, 2*d.* for a half-pound, and 2*d.* extra for each fraction above half a pound. In 1857 it was decided that packets could be sent by post containing any number of sheets, written or printed, but the written matter must not be of the nature of a letter, and may consist of bound books, or maps or prints on rollers; such packets, however, not to exceed two feet in length, depth, or width, and all must be open at the ends or sides. Regulations were also made by which such packets could be forwarded to any of the colonies. In the seventh Report of the Postmaster-General on the Post-office, for 1861, it is stated that the present number of receptacles for letters in the United Kingdom is 14,000, as compared with little more than 4,500 before the establishment of penny postage. The total number of letters delivered in 1860 was 564,000,000; of which 463 millions were in England and Wales, 54 millions in Scotland, and 48 millions in Ireland. As compared with 1859, the total shows an increase of 19 millions. Nearly 71,000,000 newspapers were delivered in 1860, and about 11,700,000 book packets. In the London local post there was an increase of about 300,000 newspapers. There were about 300,000 newspapers and 2,000,000 letters that, through various causes, could not be delivered. There are now 2,595 money-order offices, exclusive of colonial money-order offices. The money orders issued during the year in the United Kingdom amounted to £13,855,401. The gross revenue of the Post-office in 1860, adjusted with reference to the balance due to and from the colonies and foreign countries, was £8,382,900; to which must be added, for impressed stamps on newspapers, £141,810; making a total of £3,524,710. The cost of management, including such portion of the cost of mail packets as may fairly be charged against the Post-office, was £2,422,231. The net revenue was £1,102,479. The staff of officers employed in 1860 was 25,282, the expenditure for whose salaries, pensions, &c., amounted to £1,042,000. This staff consisted of one postmaster-general, 5 secretaries, assistant secretaries, and secretaries for Ireland and Scotland; 19 other superior officers; viz., heads of departments, chief clerks in the metropolitan offices, &c.; 14 surveyors; 11,428 postmasters; 1,634 clerks, &c.; 195 mail guards and porters; 11,869 letter-carriers, messengers, &c.; 7 marine mail officers; 23 postmasters, clerks, &c., in the colonies; 63 agents in foreign countries for the collection of postage, &c. Of the above staff, about 1,573 belong to the chief

office in London, and (including this number) about 3,850 to the London district.

Posts, an important institution in civilisation, by means of which letters or travellers are transported with rapidity and ease from place to place. The name is supposed to be derived from the Latin *positus*, placed, because horses were *placed* at certain distances on the routes. Posts seem to have had their origin among the Persians. Darius I., son of Hystaspes, caused couriers with saddle-horses to be always ready at different stations throughout the empire, at a distance of one day's journey from each other, in order that there might be no delay in getting reports from the provinces. During the empire an institution similar to the modern posts was established by Augustus among the Romans. In Germany, France, and Italy, during the 9th century, there existed messengers who travelled on horseback; they were, however, only employed for the government. The use of carrier-pigeons, introduced from the East, had only a short duration in Europe. With the progress of commerce, however, the necessity of having posts made itself felt, and in all the larger cities of Germany mounted messengers and stage-coaches began to be established. Letters were also placed in the charge of travellers, merchants, and butchers who rode about the country to buy cattle. Pedestrian messengers, who took charge of letters and money for the students, were maintained by the university of Paris in the beginning of the 13th century. In the 15th century, Louis XI. established, for his own use, mounted messengers, and instituted post-stations at intervals of four French miles on the principal roads of France. During the next century Charles VIII. extended this institution for the use of the court. The first post was established in Germany by Roger I., in the latter part of the 15th century. In 1516 another was established by his son between Brussels and Vienna, by the wish of the emperor Maximilian. Charles V., on account of the vastness of his estates, desired to have news as quickly as possible, and caused a permanent riding-post to be established from the Netherlands through Liège, Treves, Wurtemburg, Augsburg, and Tyrol, to Italy. After the death of Charles V., Leonard of Thurn and Taxis, who had constructed the post, was appointed postmaster-general to the empire. As long as the empire existed, this post lasted. In Germany, at the present day, there are post establishments of different kinds. Austria and Prussia, in 1850, formed an international post compact, in which, after a time, Bavaria, Saxony, and some other German states, joined. At first, the stage-coaches were united with the post-offices; but this arrangement was in that country, as well as in others, greatly altered and modified by the introduction of railways. In France, shortly after the beginning of the 17th century, the system of posts began to receive a more regular form, a controller-general of posts being appointed. The post was then farmed out to private speculators till the expiration of the last lease in 1791, when the establishment reverted to the king at a time when it produced a clear income of more than 11,000,000 francs. Till the Revolution, which took away all privileges, the postmasters enjoyed great immunities with regard to landed property, the quartering of soldiers, the military duties of their sons, &c. The present rates in France, as regards letters, were established by the decree of 1854; and with respect to other postal matter, not of ordinary correspondence, by the decree of 1856. (*For* English posts, *see* Post-Office, Postal System.) The Russian internal postage is very moderate, the charge for each letter in that large empire amounting to not more than ten copecks, about 2½*d.* sterling. In Denmark, the post is on the German model, and managed very much with a view to revenue; and the same is the case in Sweden. In Norway there is an independent post, carried on especially by steamboats, which visit the whole coast. In the Netherlands, the English system of posts seems to be followed; and in Holland, the French. Posts were first established in the English colonies of North America in 1639. The celebrated Benjamin Franklin was appointed postmaster-general to the American colonies in 1753; he remained in that situation till 1774, when the British government dismissed him. Many improvements were introduced during his superintendence. The postal charge upon ordinary local letters is one cent (½*d.*); upon letters not exceeding half an ounce in weight, addressed to any distance within 3,000 miles, three cents (1½*d.*); and when sent upwards of that distance, ten cents (5*d.*); and all letters to be prepaid.

Postulate, *pos'-tu-lait* (Lat. *postulo*, I demand), in Log., is something assumed or taken for granted, in order to prove something else. Kant's postulate is a proposition whose certainty is incorporated with that of another, so that you must reject that other or admit at the same time what it necessarily supposes. His three postulates of practical reason are freedom, immortality, and God.

Potash, Potassa, *pot'-ash*, *po-tăs'-să* (KO).—Anhydrous potassa can only be obtained by heating the hydrate with an equivalent weight of potassium in an atmosphere free from oxygen. It is a hard grey solid, fusible at a red heat, and convertible into vapour at a high temperature. When thrown into water, it seizes an equivalent of that substance with such violence as to become red-hot during the process. It has received no important application. Its hydrate, ordinary caustic potash, KO.HO, is a compound of very great importance. It is generally prepared by dissolving one part of the carbonate in ten of water, and adding from time to time to the heated solution small quantities of milk of lime until the clear liquid ceases to effervesce on the addition of an acid. The mixture is boiled for a quarter of an hour, after which it is allowed to stand until all the solid particles have settled. The clear liquid is then drawn off by decantation and evaporated to a syrupy consistence in a silver basin, when it is poured on a clean iron plate and allowed to solidify. Hydrate of potash when perfectly pure is a hard white solid, generally met with in commerce in the form of cast sticks. It fuses at a red heat, and rises in vapour if the temperature be raised. The water it contains cannot be separated by heat alone. Thrown into water, it dissolves with disengagement of heat, accompanied by a hissing sound. Exposed to the air, it deliquesces into a syrupy liquid, which gradually absorbs carbonic acid. It is the most powerful alkali known. It forms well-defined salts with all the acids, all of which are soluble in water. Its uses in the laboratory and manufactory are manifold both in the solid and liquid conditions. The solid hydrate, from having a great affinity for water, is used by the chemist for drying gases, for decomposing silicious compounds, and various organic substances. It is used in surgery as a caustic, and in manufactures for the production of soft soap. Its solution is used in medicine as an antacid, and in analysis as an absorbent of carbonic acid. The solution should be preserved in green glass bottles, glass containing lead being dissolved by it. It should be kept from contact with the air, as it greedily absorbs carbonic acid, passing into the form of carbonate.

Potash, Bitartrate of, KO, HO, $T_2H$.—This substance exists in considerable quantities in the juice of the grape, and is left as a deposit in wine-casks, forming a crystalline incrustation called *argol*, or *crude tartar*. It is purified by solution and crystallization, which renders it perfectly white. When in fine powder, it is called *cream of tartar*.

Potash, Carbonates of.—There are two carbonates of potash,—the ordinary carbonate and the bicarbonate. Carbonate of potash, $KO.CO_2$, exists in the ashes of inland plants, from which it is extracted by lixiviation. The lye thus obtained is evaporated to dryness, and calcined till all the volatile organic matter is burnt off. The mass left is known in commerce as *crude potashes*; and contains about 60 per cent. of alkaline carbonate. Crude potash is partially purified by solution in a small quantity of water, filtering and evaporating, the sulphate of potash being allowed to crystallize out. Further evaporation produces a crystalline impure carbonate of potash, known commercially as *pearlash*. Still further purified, it forms *salt of tartar*. It is employed largely in the manufacture of soap and glass. It is also used as a detergent and as the source of most salts of potash. In rectifying spirits of wine, it is employed in a fused state to abstract the water. The *bicarbonate*, $KO.CO_2.HO.CO_2$, is prepared by passing carbonic acid through a saturated solution of the mono-

carbonate, when, being less soluble, it is precipitated. It is occasionally used in medicine. The carbonates of potash are both alkaline to test-paper.

Potash, Chlorate of ($KO.ClO_5$).—There are various ways of forming this salt, the best of which is by passing chlorine through a mixture of solution of *caustic potash* and hydrate of lime. If the proportions be properly observed, the whole of the potash is converted into chlorate, and the lime into chloride of calcium,—the former salt being easily separated by crystallisation. Chlorate of potash crystallizes in colourless rhomboidal tables, containing no water of crystallization, and unalterable by exposure to the air. Heated, they decrepitate, fuse, and give off oxygen. They are soluble in 17 parts of cold and 1½ parts of boiling water. This salt possesses powerful oxidizing properties, and is thence used in the manufacture of lucifer-matches, for certain detonating powders in pyrotechny, and in calico-printing. It is occasionally used in medicine as a sudorific and diuretic.

Potash, Nitrate of, in Chem., *Nitre, Saltpetre.*—This useful salt occurs as an incrustation on the surface of the earth in hot climates, more especially in India, Arabia, and South America. In more temperate countries, especially in those not favourably situated for the importation of this salt, it is obtained by artificial processes. Refuse animal matters, mixed with lime rubbish, are exposed to the air in heaps, and watered from time to time with stale urine and stable-runnings. At certain intervals, the impure salt is extracted from the top layer of the heap by lixiviation. Various modifications of this process are in use in Prussia and Sweden, in which latter country every landed proprietor is compelled to pay a tax to the government in saltpetre. Full details of the various methods employed will be found in Regnault's "Cours élémentaire de Chimie," vol. ii. Besides the natural and artificial sources of nitre above mentioned, it also occurs in the juices of certain plants. The theory of natural nitrification is but little understood, although it has been the subject of much investigation and discussion amongst chemists. The principal use of nitre is in the manufacture of gunpowder. For this purpose, it is necessary that the smallest portions of other salts, with which it is liable to be contaminated, should be removed. The process of nitre-refining is therefore a very important one. The reader will find it fully described in Abel and Bloxam's "Handbook of Chemistry." It is also used in salting meat, and in medicine. The fused salt is known in pharmacy as *sal prunelle*. Nitre is a dimorphous salt, crystallizing in colourless hexagonal prisms with dihedral summits, and in flattened rhombohedra, both of which are anhydrous. Water is, however, generally contained in the interstices of the crystals, causing them to decrepitate when heated. If the temperature be raised above 660° Fahr., the salt fuses and gives off oxygen, becoming converted into the nitrite. If the heat be continued, nitrogen and oxygen are both evolved. Nitrate of potash has a cool saline taste; it dissolves in five parts of cold water with considerable depression of temperature, and in less than its own weight of boiling water. It is but very slightly soluble in alcohol. At high temperatures, it acts as a very powerful oxidising agent, and is greatly used for this purpose, both in the manufactory and the laboratory. Even silver, gold, and platinum become oxidized under its influence. A mixture of 3 parts of nitre, 2 of dry carbonate of potash, and 1 of sulphur, intimately mixed and heated on an iron shovel until fusion takes place, explodes suddenly with a loud report. Nitrate of potash was formerly much used in the manufacture of nitric acid; but nitrate of soda, being a much cheaper salt, is gradually superseding it.

Potash, Prussiate of, a term applied in ordinary language to the ferrocyanide of potassium. It is prepared by gently igniting carbonate of potash with animal matter, such as horns, hoofs, or dried blood, in iron vessels, by which means cyanide of potassium and some cyanide of iron are formed. The soluble parts are then washed out with water and sulphate of iron added, until the Prussian blue which is formed ceases to be decomposed by the free potash contained in the solution. The ferrocyanide of potassium is then set to crystallise and separated from sulphate of potash by repeated crystallisation. It is then obtained in truncated octohedral crystals, of a semitransparent yellow colour. Prussiate of potash obtained in this way is much used in chemistry as a test for the presence of metals, especially of iron, the peroxide of which is precipitated from its solutions in the form of *Prussian blue.* The animal substances used in this manufacture are those which condense the most azotised matter in the smallest bulk; and among all the substances used for the preparation of the lixivium, blood deserves the preference when it can be got cheap enough. It ought to be evaporated to perfect dryness, reduced to powder and sifted. The substance called *red prussiate of potash* is ferridcyanide of potassium, prepared by passing chlorine gas through a solution of the ferrocyanide of potassium till it ceases to give a precipitate of Prussian blue with a per-salt of iron.

Potash, Sulphates of.—There are two sulphates of potash,—the ordinary sulphate and the acid bisulphate. Sulphate of potash, $KO.SO_3$, is an anhydrous salt, crystallizing in six-sided prisms, with pyramidal heads, or in four-sided oblique rhombic prisms. It requires 16 parts of cold water for solution. It forms double salts with the protoxides, which are isomorphous with magnesia, and another series with the sulphates of the sesquioxides, isomorphous with alumina. The latter are the different varieties of alum. Bisulphate of potash, $KOSO_3+HOSO_3$, is formed on a large scale during the manufacture of nitric acid from saltpetre, and is the *sal enixum* of the older writers. It is sometimes used as a flux in soldering metals. It crystallizes in rhomboidal tables, which deliquesce in the air and are very soluble in water.

Potassium, *po-tăs'-se-um*, in Chem.,—symbol K, equiv. 39·96, spec. grav. 0·865, melting-point 130°.—This remarkable metal, which is the base of the alkali potash, was discovered in 1807, by Sir Humphrey Davy, and its isolation marks an important era in the progress of philosophical chemistry. Up to this time the alkalies and earths had long been suspected to be compound bodies, but had resisted every endeavour to decompose them. Sir Humphrey Davy, however, having succeeded in decomposing potash by the voltaic current, the decomposition of the other alkaline bodies followed, as a matter of course. Not only this, but potassium itself, from its powerful affinity for oxygen, formed a valuable decomposing agent. Potassium is a silver-white metal, with a slight bluish tint; at 32° Fahr. it is brittle, and has a crystalline fracture; at temperatures above freezing-point, it gradually becomes malleable, until it reaches 60°, when it is pasty. Exposed to the air, it becomes covered with a film of oxide almost immediately, and when thrown into water, its affinity for oxygen is so great that sufficient heat is produced to volatilize and fire the metal, which burns with a beautiful rose-coloured flame, until the whole is oxidized. Potassium decomposes nearly all gases which contain oxygen, if heated in contact with them; and at a high temperature it will remove oxygen from all bodies containing it. Hence its use in gasparing the metals of the alkaline earths. From its affinity for oxygen, it is necessary to preserve the metal either in hermetically sealed exhausted tubes, or beneath the surface of some liquid containing only carbon and hydrogen; such as naphtha. The method of procuring the metal by the voltaic current is troublesome and expensive; it is now prepared by decomposing carbonate of potash by charcoal. Acid tartrate of potash is fused in a capacious iron crucible, until it ceases to emit inflammable vapours; a porous mass of carbonate of potash, mixed with finely-divided charcoal, is thus obtained. The mass is broken into lumps, and introduced into an iron retort, connected with a receiver of a peculiar shape. The retort is heated nearly to a white heat, when vapours of potassium rise, and are condensed in the receiver. The potassium thus obtained is not pure, and requires re-distillation to render it available for chemical purposes. In commercial operations, such as the manufacture of aluminium, metallic sodium is used, being more easily prepared, and having a smaller atomic weight; 23 parts doing as much work as 39 parts of potassium. Potassium forms two compounds with oxygen; the oxide, KO, which has been fully described under the head of Potash, and the binoxide, $KO_2$, which is formed when

the metal is burned in a silver spoon. It is a yellowish-brown mass, fusible at a red heat, and showing a crystalline structure as it cools. The combinations of potassium with the elements are most important. The uses of hydrate, nitrate, chlorate, and carbonate of potash have already been described. Potash is present in all fertile soils; the great sources of the alkali being in the various clays, which contain 2 or 3 per cent. of it, derived from the disintegration of the felspar. Hence its presence in the ashes of plants. A process has been lately patented by Mr. F. O. Ward, for the extraction of potash from felspar, which, if it can be carried out on a large scale, promises to be as important, with regard to potash, as the process of Leblanc for extracting soda from a mineral source.

Potassium, Bromide of (KBr).—This salt is prepared by adding bromine to a solution of caustic potash until it assumes a slight yellow tinge. Bromide of potassium and bromate of potash are formed, and the latter salt is decomposed by a current of sulphuretted hydrogen. It crystallizes in cubes and is very soluble. It is used in photography and pharmacy.

Potassium, Chloride of.—This salt is largely extracted from kelp, and is used principally as a source of potash in the manufacture of potash alum. It is remarkable for forming definite compounds with sulphuric acid and chromic acid, which may be represented by the following formulæ:—$KCl.2SO_3$ and $KCl.2CrO_3$. They are both decomposed by water.

Potassium, Iodide of.—This important salt is obtained in two ways. By adding iodine to a solution of potash until the solution begins to assume a brown tint, iodide of potassium and iodide of potash are formed, the latter salt being converted into the former by gently igniting the residue obtained by evaporation. A better plan is to digest 2 parts of iodine and 1 of pure iron filings in 10 parts of water in a stoppered vessel. Protiodide of iron is formed, and carbonate of potash added until carbonate of iron ceases to be thrown down. The filtered liquid by evaporation yields cubical crystals of iodide of potassium. The salt is much used in photography as an iodizing agent, and in medicine as an alterative. For both these purposes it is necessary that it should be free from carbonate and iodate of potash. The former salt may be detected by the solution effervescing on the addition of an acid; the latter, by its turning brown under the same treatment.

Potassium, Sulphides of.—Potassium combines with sulphur in at least five different proportions,—$KS$, $KS_2$, $KS_3$, $KS_4$, and $KS_5$. The protosulphide is formed when hydrogen is passed over sulphate of potash at a red heat, or by heating to bright redness three parts of sulphate of potash and one of finely-divided charcoal intimately mixed. Protosulphide of potassium, when heated in the air, absorbs oxygen, and becomes coated with a film of sulphate of potash. Exposed to the air, at ordinary temperatures, it deliquesces. It dissolves readily in water, forming a colourless caustic solution. Saturated with hydrosulphuric acid, its solution yields a peculiar compound of sulphide of potassium and hydrosulphuric acid, or the hydrosulphate of the sulphide of potassium. This is a definite compound, and may be obtained in deliquescent colourless prisms by evaporating the solution in an atmosphere of sulphurated hydrogen. The higher sulphides of potassium may be obtained by fusing the sulphide with the proper proportions of sulphur. *Hepar sulphuris*, or liver of sulphur, was formerly used in medicine, and is now employed as a source of milk of sulphur. It is prepared by fusing equal weights of carbonate of potash and sulphur at a temperature of 500° Fahr. This resulting compound contains protosulphide of potassium and hyposulphite of potash, from which milk of sulphur is precipitated on the addition of an acid.

Potato. (*See* Solanum.)

Potato-Fly (*Cantharis vittata*, or striped cantharis), a kind of cantharides found in North America. It is of a dull tawny yellow, or light yellowish-red colour above, with two black spots on the head and two black stripes on the thorax and on each side of the wing-covers. The under side of the body, together with the legs and antennæ, are black, and covered with a grayish down. Its length is somewhat more than





half an inch. Great depredations are committed by this insect in potato-fields and gardens, where it not only eats up the leaves of the potato, but also those of many other vegetables.

Potent, *po'-tent*, in Her., is a line which resembles the head of a crutch, anciently called *potent* or *potun*. *Potent, Counter-potent, Potency, Counter-potency*, or *Potency in point*, is considered one of the furs used in heraldry.

Potential, *po-ten'-shе-al* (Lat. *possum*, I am able), in Gram., is that mood of the verb which expresses an action conceived as possible, expressed by *may* or *might* in English.

Potentilla, *po-ten-til'-lā* (Lat. *potens*, powerful), in Bot., a gen. of the nat. ord. *Rosaceæ*. The rhizome and root of the species *P. Tormentilla* possess astringent and tonic properties. They are employed for tanning leather in the Orkney and Feroe Islands, and for the preparation of a red dye in Lapland.

Pottery, *pot'-ter-e* (Fr. *poterie*, from *pot*).—The art of forming vessels or utensils of any sort of clay, kneaded with water and hardened with fire, is extremely ancient, mention being made of it in the Mosaic writings, and it being known that the ancient Greeks possessed it at a very early period. It is, indeed, one of the arts first cultivated by every nation of the world, and its productions have proved of the highest value as an aid to historical research; since not only may the domestic manners of nations long since passed away be learnt from them, but also the extent of ancient Greece and its colonies, and the limits of the Roman empire. The extent of the Mahomedan empire in the Old World, and the Aztec dominion in the New, would alike be clearly pointed out by their pottery, if no other record had been transmitted to us. Pottery may be conveniently divided into two classes of baked stoneware:—1st. Porcelain, consisting of a fusible earthy mixture, along with an infusible, which, when combined, are susceptible of becoming semi-vitrified and translucent in the kiln; and pottery, properly so called, which consists of an infusible mixture of earth, which is refractory in the kiln and continues opaque. Porcelain is of comparatively recent origin in Europe, but was known in China a century before the Christian era. When porcelain was introduced into Europe in 1518, it was at first supposed that the fine clay necessary for the production of good porcelain, called by the Chinese kaolin, was peculiar to their land, and that no country in Europe could attain eminence in this manufacture; but many attempts were made at its imitation, and about the commencement of the 18th century, an earth was discovered in Saxony, by means of which an ingenious workman was enabled to imitate the porcelain so closely that the most experienced eye can scarcely detect the difference. For about thirty years the secret was kept; but at the end of that time it was divulged, and spread to Vienna, Munich, &c. Great efforts were at the same time made in France to promote a similar manufacture, and in 1768 an abundant supply of fine porcelain earth was discovered in a ravine at St. Yrieix, near Limoges, which enabled it to produce porcelain equal, if not superior, to that manufactured in any part of the world. In the same year, certain mineral substances were found in Cornwall, possessing similar properties to the porcelain earths of China; and since then the manufacture of porcelain in England has attained a high state of perfection. Porcelain may be considered as a substance between pottery and glass. Though the various kinds of pottery and porcelain differ from each other in the details of their manufacture, yet there are certain general principles and processes which are common to them all. The first belongs to the washing of the clay, and consists in dividing and washing it till it acquires the necessary fineness. It is necessary that the clay should be mixed with a certain quantity of siliceous earth, the effect of which is to increase its firmness and render it less liable to shrink and crack on exposure to heat. In common clay there is naturally a sufficient quantity of silica, but in the finer kinds an artificial admixture of silica is necessary. The clay having been reduced to a smooth pulp, and the silica (pounded flints) to a creamy mixture, the two are mixed in proportions varying according to the kind of ware to be

made. This mixture is then passed through several sieves of hard-spun silk, and having been thus thoroughly strained and purified, is boiled for the purpose of evaporating the superfluous moisture and reducing it into a doughy consistence for the use of the potter. The clay being thus brought into the requisite state, is next shaped into articles of earthenware by one of three processes, named *throwing*, *pressing*, and *casting*. Of these, throwing is the most ancient, and is performed at the potter's wheel or lathe, which consists of an upright shaft, about the height of a common table, on the top of which is fixed a disk of wood, of sufficient diameter to support the largest vessel which is made. The thrower, seated with one foot on each side of the wheel-head, with his elbows supported on his knees, when his hands require to be kept steady, takes a lump of clay, dashes it down upon the centre of the revolving disk, and, with both hands kept wet by occasional dipping in water, squeezes up the clay into a high conical lump, and again forces it down into a mass, to get rid of any superfluous air-bubbles. With one hand, or finger and thumb, in the mass, he then gives the first rude form to the vessel, and with a piece of horn, shell, or porcelain, which has the profile of the shape of the vessel, he smooths the inner surface, giving it the proper shape, and removing the inequalities left by the fingers. The vessel is now lifted off the wheel, placed on a board, and carried into the open air or a warm room, where it parts with its moisture sufficiently to allow of the operation of *turning*, which, in the case of earthenware, does not much differ from the turning of wood, ivory, or metal. When the vessel has been wrought to the required thickness by this process, its handle (if it require one), which has been moulded in a metal tube of the required shape is affixed to it by a little clay and silicate paste. The processes of pressing and casting are simply processes of moulding. We now come to the process of firing, by which articles of pottery are made to lose their friability, and acquire solidity and density. The temperature at which they are fired has a great influence on their texture and character; and as the novel effect of the first firing is to convert the article into a hard, sonorous substance, having the appearance of biscuit, by which name it is known, and which is more or less porous, a second firing is necessary to remove the porosity, and to give a durable smooth surface, not very liable to tarnish. When the article has been withdrawn from the kiln, it is either simply glazed, or printed, painted, or ornamented in some way, and then glazed, the glaze, in either case, consisting of the ingredients of some kind of glass, fritted or melted together in a furnace, reduced to a powder, and stirred up in water. When the article in biscuit has been dipped into this, it is passed through the glaze or glass-oven; the powder melts into a glass, and reveals the pattern, which, being a white opaque powder, it had temporarily concealed. The glaze we have mentioned is the one most commonly used; but there are many kinds of glazes, which may be distinguished as transparent, opaque, and coloured, and which are severally used, according to the kind of ware to be glazed, and the ingredients of which are very various. The felspars and certain volcanic scoriæ are used where the point of fusion is required to be high. A second class of non-metallic glazes includes common salt, potash, boracic acid, phosphate of lime, and sulphate of baryta. A third class of glazes consists of earthy and metallic substances simply mixed together, &c. All articles of pottery which have a variety of colours are ornamented either by the pencil or by impressions taken from copper-plates, both processes taking place whilst the article is in its biscuit state, and prior to its being glazed. Painting on earthenware and porcelain is performed with a camel's-hair pencil, and with colours such as are used in enamel painting, being all metallic oxides, and ground up with substances which vitrify by heat; such as glass, nitre, and borax, in certain proportions. Oil of turpentine is the usual vehicle for the colour and flux; and while painting, the appearance of the colours is often dingy and unpleasing; but when the oil and other matters have been driven off by the heat of the furnace, the colours are revealed in their natural brilliancy. When an article of pottery is to be printed, the printer, having first melted the oily colouring substance by laying it on a hot iron plate, transfers it with a leathern muller to a copper-plate engraved with the required pattern, also made hot. The superfluous colour is carefully cleaned off; the plate is covered with a piece of unsized paper, which has been first brushed over with a lye of soft soap, and then the whole is passed through a press, the heat of the plate drying the paper, and enabling it the more readily to take up the colour. The impression thus taken is received by a girl, called the "cutter," who cuts it into the required form, and hands it to the "transferrer," who puts it on the biscuit, and rubs the surface till it is completely attached to the clay. The article is then left for a short time to imbibe the colouring matter, after which the paper is washed off with clean water, and the process completed. Of the subsequent operation of glazing we have already spoken. England holds the first place in the production of earthenware; then France; then Germany; the last being far behind the other two; whilst the immense continent of America has not produced, to this day, anything of the kind worth mentioning. The annual production of the English potteries is valued at as much as £2,000,000; and they consist of 185 factories, of which 133 are in North Staffordshire, where 60,000 persons are engaged in this branch of industry; the other 52 being scattered over the country, at Leeds, Stockton, Glasgow, Swansea, &c. As many as 84,000,000 pieces are frequently exported from them; representing a value of £1,122,000, and proceeding to almost every part of the world. The most celebrated wares of different times and countries are distinguished by distinctive names; as *Majolica* ware, Sèvres, Chelsea, Palissy, &c.; and of these, the latter—the work of a certain Bernard de Palissy, of Agen in France (born about 1534)—deserve some special notice; since their manufacture raised the potter's art to an eminence hitherto unknown. This is not the place in which to tell the story of Palissy's life and labours; and it will be sufficient, therefore, briefly to say that, having resolved to discover a method of enamelling stoneware, he succeeded, after 16 years' efforts, and proceeded to manufacture pottery characterized by a peculiar style and many singular qualities. It is not decorated with flat painting, but with figures and ornaments, which are generally pure in form, and are all executed in relief, and coloured. Palissy's colours are usually bright, but not much varied; being generally confined to yellows, blues, and greys; though sometimes we find him using green, violet, and brown. The back of his pieces is never of a uniform colour; but is generally mottled with two or three different colours; such as blue, yellow, and brown. The natural objects which he represents in his pottery are very true in form and colour; since, with the exception of certain leaves, they were all moulded from nature. The fossil shells with which he has ornamented his different pieces, are the tertiary shells of the Paris basin, and their species can be clearly recognized; whilst the fish are those of the Seine, and the reptiles and plants those of the environs of Paris. The most remarkable of the works of Palissy are his "Pièces rustiques," a designation given by him to dishes ornamented with fishes, snakes, frogs, cray-fish, lizards, shells, and plants, admirably true to nature in form and colour. Other favourite productions of Palissy appear to have been large stands or flat basins, having a rock in the centre, sometimes with a fountain. He made, also, a great many statuettes, some of which are still in existence, full of life and truthfulness. Palissy ware may be distinguished from imitations by the fact that Palissy moulded only the fossil shells, reptiles, and plants of Paris, whilst his imitators introduced recent shells and other objects of natural history.

POULTRY, *pole'-tre* (from Fr. *poule*, a hen), a general term, which includes every kind of domestic fowl that is reared about the house or farm-yard; as cocks and hens, ducks, geese, turkeys, &c. Although poultry constitutes part of the stock of every farmer in this country, the rearing of it is not often productive of any pecuniary advantage. Notwithstanding the fact that fowls are looked upon chiefly as articles of luxury, and sell at high prices in the market, they seldom or ever repay the value of the corn which they have consumed, especially if such grain has to be pur-

chased. There are many different breeds of fowls. Those best known are the *game* breed, the *white* or *English* breed, the *black* or *Polish* breed, the *Dorking* breed, the large or *shakebag* breed, the *Malay* and the *Cochin-China* breeds. The two first are much smaller breeds than the others. This kind of stock affords profit in the eggs as well as the chickens; therefore such as are the best layers and sitters should be chosen, which are in general the game and Polish breeds. The game and white breeds are considered the most delicate as food.

POUND, *pownd* (Lat. *pondus*, weight), an English measure of weight, of several denominations; such as *avoirdupois*, *troy*, *apothecaries'*, &c. The pound avoirdupois is divided into 7,000 grains troy, the other pounds into 5,760 grains. The former is divided into 16 ounces, and the latter into 12.

POUND, a denomination of English money. The pound sterling is equal to 20 shillings, or 240 pence. In ancient times, 240 pence were equivalent to a pound weight of silver; hence the origin of the word

POWER, *pow'-er* (Lat. *potestas*, Fr. *pouvoir*), in Mech., denotes any force, whether of a man, a horse, wind, water, steam, &c., which, being applied to a machine, tends to produce motion. By the term *mechanical power* is signified one of the six simple machines; viz., the lever, the inclined plane, the screw, the wheel-and-axle, the wedge, and the pulley. In optics, *power* generally expresses the effect produced by any optical instrument,—as *magnifying power*, *illuminating power*, &c.

POWER is usually regarded by philosophers as of two kinds,—as active power, or the principle of acting or making any change; and passive power, or the principle of bearing or receiving any change. According to Hume, we have no proper notion of power, but merely of the relation which the mind conceives to exist between a thing going before and a thing coming after; all that we observe being merely antecedent and consequent.

POWER, in Law, is an authority which one man gives to another to act for him, and is commonly applied to a reservation made in a conveyance for persons to do certain acts, as to make leases, or the like. Powers deriving their effect from the Statute of Uses, are either given to a person who has an estate limited to him by the deed creating the power, or who had an estate in the land at the time of the execution of the deed, or to a stranger to whom no estate is given, and the power is for the benefit of others.

POWER, HORSE. (*See* HORSE-POWER.)

POWER OF ATTORNEY. (*See* ATTORNEY.)

PREMUNIRE, *pre-mu-ni'-re* (Lat., a corruption of *præmonere*, to forewarn), in Law, the first word of an ancient writ, by which a party was summoned before the king to answer a charge of contempt against him, by doing some act in derogation of the allegiance due to him. As now used, the term is both applied to the writ itself and to the offence for which it is applicable. This is an offence which forms the subject of many stringent statutes still unrepealed, though long since dormant. Terrible penalties are denounced by statute against this offence; yet such prosecutions are unheard of in our courts. There is only one instance of such a prosecution in the State Trials, in which case the penalties of a præmunire were inflicted upon some persons for refusing to take the oath of allegiance in the reign of Charles II.

PRAGMATIC SANCTION, *prăg-măt'-ik* (Gr. *pragma*, a deed or act), is a solemn decree or ordinance of a monarch or legislature on some matter of importance. The phrase seems to have originated with the Byzantine monarchs, but was early introduced into France, and is now more particularly applied to several of the more important state decrees. The principal of these are—1. The ordinance of Louis IX. in 1269, by which the liberties of the Gallican church were established.—2. That of Charles VII. of France, in 1438, occasioned by the schism in the Church between the council of Basel and Pope Eugenius IV. It confirmed the decrees of the council of Basel and declared its supremacy over the pope.—3. The ordinance confirming the decrees of the same council, adopted in Germany in 1439 by the diet of Mentz.—4. The instrument by which Charles VI., emperor of Germany, in 1723, endeavoured to secure his dominions, failing male issue, to his daughter, the archduchess Maria Theresa.—5. The instrument by which Charles III. of Spain, in 1759, settled the right of succession to the throne of the Two Sicilies upon his third son and his descendants.

PRAIRIE, *prai'-ir-e* (Fr., a meadow), a term used in North America to designate the vast natural meadows or plains which are found principally in the valley of the Mississippi. These prairies or savannahs, as they are also called, are divided by Flint, an American writer, into three classes:—1. The *heathy* or *bushy* prairies, which have springs, and are covered with small shrubs, bushes, grape-vines, &c.; very common in Indiana, Illinois, and Missouri.—2. *Dry* or *rolling prairies*, which are generally destitute of water and almost all vegetation, except grass. They are the most common and extensive; the traveller may wander for days in these vast and nearly level plains without wood or water, and see no object rise above the horizon. In this kind of prairies roam immense herds of bisons.—3. The *alluvial* or *wet* prairies, which form the third and smallest division. They are covered with a rich vegetation of tall rank grass. The soil is deep, black, friable, and fertile, and abounding with pools left by the floodings of the rainy season. Herds of bisons are also found in these prairies; stags, or more properly wapitis, are also very numerous; and between the Arkansas and Red rivers there are droves of wild horses. Along the border of the Missouri, above the Platte or Shallow River, the antelope is found in herds of several hundreds; and along the banks of the Mississippi, in summer, wild goats are seen in vast numbers. Grizzly bears are met with above the Mandan villages, and badgers, beavers, otters, foxes, wolves, racoons, opossums, squirrels, porcupines, and skunks, inhabit the same region. According to Lyell, the jaguar is also met with in these regions. Alligators and tortoises abound in the waters, and millions of migratory water-fowl, which perform their annual voyage between the Canadian lakes and the shores of the Mexican gulf, haunt the pools. The prairie region of the West occupies a vast extent of territory, extending over the eastern part of the Ohio; Indiana; the southern portion of Michigan; the southern part of Wisconsin; nearly the whole of the states of Illinois and Iowa; and the northern portion of Missouri, gradually passing, in the territories of Kansas and Nebraska, into the arid or desert region, which lies at the base of the Rocky Mountains, called in America "The Plains." In the opening chapters of Mr. James Hall's "Report on the Geological Survey of the State of Iowa," published by authority of the legislature of that state in 1858, there is some very valuable information concerning the extent and peculiar characters of the prairies.

PRAIRIE-DOG, a small rodent animal, the *Spermophilus ludovicianus*, allied to the marmot, and found on the prairies west of the Mississippi. It is about sixteen inches in length, the tail being about two inches and three-quarters. The colour of the upper parts of the body is a light, dirty reddish-brown, mingled with grey, and with a few black hairs above, the under parts being a dirty white; the whiskers moderately long and black. It has been named *Prairie-dog* by the Anglo-Americans, from the supposed resemblance of its warning cry to that of a small dog; but the resemblance is by no means close. They live in burrows, many of which are congregated together in one district, and which sometimes cover an area of many miles. These burrows are sometimes level, or nearly so, with the ground; but more commonly form little mounds in the form of truncated cones, about a foot or a foot and a half in height, with a base of two or three feet, and about 20 feet apart. The whole external surface is well-trodden and very compact, and the entrance is either at the top or at one side; whence the hole descends vertically for a foot or two, and then runs obliquely downwards. Within this hole, which sometimes contains as many as seven or eight tenants, they form a globular cell of fine dry grass, in which they remain asleep during the winter, having carefully closed up the entrance, in order to resist the severity of the cold. In fine weather, they delight to play about the entrances to their burrows, into which they instantly drop on the appearance of any imminent danger; but if it be not too imminent, they remain at the edge, sitting erect, or flourishing their tails

and barking, whilst on the look-out. The animal is known to the Indians by the name of the *Wish-ton-Wish*.

PRAWN, *prawn*, is the name of a crustaceous animal, belonging to the genus *Palæmon*. The common prawn (*Palæmon serratus*) has the following specific character:—Rostrum extending considerably beyond the antennal scale; turned upwards anteriorly; bifid at the extremity; above, armed with seven or eight teeth, the anterior third unarmed; beneath, with five or six teeth. The eyes are large and round; and the external antennæ very long, being half as long again as the animal, from the tail to the extremity of the rostrum. The ordinary length is between three and four inches; the colour bright grey, spotted, and lined with darker purplish-grey. It is well known as a favourite article of food, and is found in vast numbers on all the coasts of Great Britain. In the adult condition they frequent rocky parts of the coast, delighting in still transparent water, where they disport amongst the long fuci which wave in the tide. They are sometimes taken in bag-nets, suspended from a circular ring of iron at the end of a pole; but in many parts the finest are caught in pots, resembling lobster-pots, but smaller, and made of a closer fabric. They are chiefly obtained for the London market off the Isle of Wight and the coast of Hampshire.

PRAYER, *prayr* (from Lat. *precari*, to beseech), is said to be "the offering up of our desires unto God, for things agreeable to his will, in the name of Christ, by the help of his spirit, with confession of our sins, and thankful acknowledgment of his mercies." The necessity of prayer is instinct in our nature, and is practised alike by idolater and Christian. The practice of it is clearly enjoined in Scripture, and the necessity of it is universally admitted by all who profess and call themselves Christians. It implies faith in the particular providence of God, and is either public or private. It is said to consist of adoration, confession, supplication, intercession, and thanksgiving. By adoration, we express our sense of God's infinite perfections, and acknowledge our constant dependence upon him; by confession, we acknowledge our manifold transgressions, and our unworthiness of benefits; in supplication, we entreat him not to deal with us according to our deserts; in intercession, we petition for others, for friends, enemies, all men; and by thanksgiving, we express our gratitude to God for the benefits he hath bestowed upon us. As reasons for prayer, Dr. Paley says,— (1) "A favour granted by prayer may be more apt, on that very account, to produce good effects upon the person obliged;" (2) "it may be consistent with the wisdom of the Deity to withhold his favours till they are asked for, in order thereby to keep up and circulate a knowledge and sense of dependence upon Him;" (3) "Prayer has a natural tendency to amend the petitioner himself, and thus to bring him within the rules which the wisdom of the Deity has prescribed to the dispensation of his favours." When, however, we pray for what is requisite and necessary for the body or the soul, we are at the same time to use every exertion to obtain it; for, while exertion without prayer is presumption, prayer without exertion is a mockery to God.

PRAYER-BOOK. (*See* LITURGY.)

PREACHING, *preetch'-ing*, literally and strictly signifies the announcing or proclaiming as a herald. The modern system of preaching was unknown in the early Church. The general mode then was for the priest to read portions of the Old or New Testament, and explain or enforce the precepts which they contained. Generally, sermons were delivered whenever the Scriptures were read, and sometimes several by different persons at the same meeting. Some of Chrysostom's sermons occupied two hours in the delivery, though this was the time generally allotted to the whole service. About the 13th century, the scholastic divines of this country directed their chief attention to the study of the Sacred Scriptures, and hence called Bible Divines, and honoured with the pompous titles of profound, sublime, wonderful, seraphic, angelic doctors. They introduced a new and artificial mode of preaching, called declaring. Before this time, the clergy generally adopted postulating or expounding a large portion of Scripture, sentence by sentence. By the new method, the preacher read a text out of some book and chapter of the Old or New Testament, dividing it into several parts and expounding them; and, generally, the more numerous the divisions and subdivisions, the better and more highly was he esteemed. The opposition to this textual mode of preaching continued for upwards of a century, but at length it came generally to prevail. The divisions or parts of a modern sermon are usually the introduction, the proposition, the illustration, and the application.

PREAMBLE, *pre-ăm'-ble* (Lat. *præ*, before; *ambulo*, I walk), in Law, the introductory part of a statute, which states the reasons and intent of the law. A preamble is often admissible in argument in order to show the meaning or intention of an act of parliament.

PREBEND, *preb'-end* (Lat. *præbenda*), is the stipend which a prebendary receives from the revenues of the cathedral or collegiate church with which he is connected. Prebends are distinguished as simple and dignitary, the former having no more than the revenue for its support, the latter having always a jurisdiction annexed to it.

PRECEDENCE, *pre-se'-dens* (Fr. *précéder*, Lat. *præcedere*, to go before), is a place of honour or rank to which a person is entitled either by right or by courtesy. The former is settled by authority, and when broken in upon, gives an action at law; the latter is due to age, estate, and the like, and is regulated by custom and civility. In England, precedence is no mere conventional arrangement, but is part and parcel of the law established by acts of parliament, decisions of courts of justice, or public instruments proceeding from the crown. Amongst the leading principles of our system of precedence are primogeniture and seniority, priority of birth and dates of patents and commissions, determining the precedence which individuals of the same rank take among each other. All ranks and honours are either hereditary, official, or personal. The order of baronets, the five ranks of the peerage, and the sovereignty of the realm, constitute the hereditary distinctions in British society. The discharge of public duties, civil, military, and ecclesiastical, imparts official dignity, while a seat in the House of Commons, or in the Privy Council, the honour of knighthood, patents of precedence of the bar, &c., confer distinctions which may fairly be comprehended under the third of these classes.

PRECEDENTS, *pres'-e-dents*, in Law, authorities to follow in determinations in courts of justice. Precedents have always been greatly regarded by the sages of the law. The precedents of the courts are said to be the laws of the courts; and the court will not reverse a judgment contrary to many precedents. It has been held that there can be no precedent in matters of equity, as equity is universal truth; but, according to Lord-Keeper Bridgman, precedents are necessary in equity to find out the reasons thereof for a guide.

PRECENTOR, *pre-sen'-tor*, in Church matters, is the leader of a choir. In almost all the old cathedrals of England, and very generally on the Continent, he was the first dignitary in the chapter, ranking next to the dean, and superintended the choral service and choristers.

PRECESSION OF THE EQUINOXES, *pre-sec'-shun* (Lat. *præ*, and *cedo*, I go), in Astron., a slow retrograde motion of the equinoctial points from east to west, or contrary to the order of the signs. The pole, the solstices, the equinoxes, and all the other points of the ecliptic, have a retrograde motion, and are constantly moving from east to west, or from Aries towards Pisces, &c., by means of which the equinoctial points are carried farther and farther back at the rate of about 50½" each year; consequently, as the stars are immovable, and the equinoxes go backward, the stars appear to have an eastward motion with respect to them; for this reason, the longitudes of all the stars, which are reckoned from the first point of Aries, or the vernal equinox, are constantly increasing. It is in consequence of this *precession of the equinoxes* that the constellations seem to have changed the positions assigned to them by the ancient astronomers. The equinoctial points during the time of Aristarchus and the oldest astronomers were fixed to the first stars of Aries

and Libra; but the signs do not answer now to the same points. The stars, also, which were then in conjunction with the sun when he was in the equinox, are now a whole sign, or thirty degrees, to the eastward of it. In consequence of this, the first star of Aries is now in the portion of the ecliptic called Taurus, while the stars of Taurus are in Gemini; those of Gemini in Cancer; and so on. The stars, moreover, which rose or set at any particular season of the year in the times of Eudoxus, Hesiod, Virgil, Pliny, &c., do not answer their descriptions at the present day. This apparent motion of the stars was first observed by Hipparchus of Rhodes, about 128 B.C. He noticed that the longitudes of the stars were greater than had been observed by Timochares, and than they were in the sphere of Eudoxus, who wrote 380 years before Christ. The gradual change in the longitude of the stars was also observed by Ptolemy; but he understated the quantity, making it only one degree in a hundred years, which is only equal to 36″ per year. The quantity of this change was calculated by Y-hang, a Chinese astronomer, in the year 721, to be one degree in eighty-three years, which is at the rate of 43½″ per year. The precessions have been made even more than this by some modern astronomers; but it is more usually taken as we have given it above, at 50½″ per year. The true explanation of the cause of precession is one of the most difficult problems in physical astronomy. Even Sir Isaac Newton was unsuccessful in solving the problem in a perfectly satisfactory manner; more modern astronomers, however, such as D'Alembert, Euler, Laplace, and Simpson, have succeeded in it. According to their theory, the phenomenon is owing to the spheroidal figure of the earth, which itself arises from the rotation of the earth. Since more matter has thus been accumulated round the equatorial parts than anywhere else on the earth, the sun and moon, when on either side of the equator, by attracting this surplus matter at every return, bring the equator sooner under them than if no such accumulation of matter existed.—*Ref.* Herschel's *Outlines of Astronomy*; and D'Alembert's *Récherches sur la Précession des Equinoxes.*

PRECIPITATE, *pre-sip'-e-tait* (Lat. *præceps*, headlong), in Chem., any substance which, having been dissolved in a fluid, is *thrown down* in a solid form, on the addition of some other substance capable of decomposing the compound. Precipitates are generally in a finely-divided or flocculent state.

PREDECESSORS, *pre-de-ses'-sorz* (Fr. *prédécesseur*; from Lat. *præ*, and *decedo*, I depart), in Law, is a person who has preceded another in the same office. The king, the president, the judge, and the magistrate, occupy the place vacated by their predecessor. Predecessor is distinguished from ancestor, who is of the same blood; but it may, perhaps, be sometimes used for it. (*See* ANCESTOR.)

PREDESTINATION, *pre-des'-ti-nai'-shun* (Lat. *præ*, and *destino*, I appoint), in Theol., is applied to the supposed decrees of God, by which he hath, from all eternity, unchangeably appointed whatsoever comes to pass; more especially fore-ordaining certain individuals of the human race to everlasting happiness, and fore-ordaining the rest to everlasting misery. According to Article XVII. of the English church, "Predestination to life is the everlasting purpose of God, whereby (before the foundations of the world were laid) he hath constantly decreed by his counsel, secret to us, to deliver from curse and damnation those whom he hath chosen in Christ out of mankind, and to bring them, by Christ, to everlasting salvation, as vessels made to honour," &c. The Westminster Confession further declares that "although God knows whatsoever may or can come to pass, upon all supposed conditions; yet hath he not decreed anything or because he foresaw it as future, as that which would come to pass upon such conditions." Yet, "neither is God the author of sin, nor is violence offered to the will of the creatures, nor is liberty, or contingency of second causes, taken away, but rather established." This doctrine is not peculiar to Christianity, but is to be found among the Stoics and other ancient sects, and is one of the chief points of Mohammedanism. The controversy concerning it first made its appearance in the Christian church about the beginning of the 5th century. Pelagius and others, about this time, denied the doctrine of predestination, and were strenuously opposed by Augustine, who was the first to expound and work this doctrine into a system. After the time of Augustine, his opinions were very generally adopted, and were maintained by the whole of the earlier Reformers. The Lutherans, however, afterwards abandoned them; and they are now generally known as Calvinistic doctrines, from John Calvin, of Geneva, who maintained them with great vigour and clearness. The opponents of the doctrine of predestination among the Protestants came subsequently to receive the name of Remonstrants, or Arminians, from James Arminius, professor of theology at Leyden in 1602. There are two kinds of predestinarians,—the supralapsarians, who maintain that God did originally and expressly decree the fall of Adam, in order to display his justice and mercy; and the sublapsarians, who maintain that God only permitted the fall of Adam; but the distinction is now little observed. In the Roman Catholic church, the Jansenists were the great maintainers of the Augustinian doctrine. This is one of the doctrines of Christianity which is beyond the sphere of our finite faculties. The difficulty is not got rid of by denying the doctrine: it is only removed to another position. The difficulty which relates to the character and moral government of God presses as hard upon the Arminian as the Calvinist; and Sir James Macintosh has shown, with his usual luminous and dispassionate power, how dangerous it is to reason as to the moral consequences which the opponents of this and similar doctrines may impute to them.

PREDICAMENTS, *pre-dik'-a-ments* (Lat.), in Log., are the same as CATEGORIES (which *see*).

PREDICATE, PREDICABLE, *pred'-i-kait*, *pred'-i-kā-bl* (Lat. *prædicare*, to affirm).—In Log., a predicate is that which is actually affirmed of one; as patience of Job. A predicable is that which may be affirmed of many. Logicians commonly recognize five predicables, or rather, classes of predicables,—genus, species, differentia, proprium, accidens. Whatever term can be affirmed of several things, must express either their whole essence, which is called their species, or a part of their essence, which, when the material part, is called the genus; when the formal and distinguishing part, the differentia. Whatever is necessarily joined to the essence (*i. e.* universally to every individual of it), is called a property (*proprium*); or merely contingently (*i. e.* to some individuals only of the species), it is an accident (*accidens*).

PREFACE, *pref'-ais* (Lat. *præ*, before; *fari*, to speak), an introduction, or series of preliminary remarks, prefixed to a work or treatise, intended to inform the reader of the main design, or, in general, of whatever is necessary to the understanding of its plan and peculiarities.

PREFACES are short occasional forms in the Communion service of the Church of England, which are introduced by the priest on particular festivals, immediately before the anthem beginning, "Therefore, with Angels and Archangels," &c.

PREFECT, *pref'-fekt* (Lat. *præfectus*, from *præ*, before; *factus*, made), in Roman Antiq., the prefect was a chief magistrate, who governed a city or province in the absence of the king, consuls, or emperor. In modern France, the prefect is an important political functionary; he superintends a department of the kingdom, and has the actual direction of the police establishment within that department, together with extensive powers of municipal regulation. The arrondissements, or districts into which the departments are subdivided, are under *sous-préfets* appointed by them. The power of the prefect is considerably controlled by the council of the prefecture, which acts in some measure as a court of appeal from the decisions of the prefect.

PRELATE, *prel'-ait* (Lat. *prælatus*, preferred), is literally one preferred or advanced before another, but it is now confined to a particular species of preferment or advancement among the clergy. Anciently, the name was applied to priests or members of the clerical body in general, but now it is applied only to those of them who have obtained the very highest dignity, namely, bishops and archbishops, and, in the Eastern church, patriarchs.

**Premium**, *pre'-me-um* (Lat., a reward), is a consideration, something given to invite a loan or bargain, to encourage some art or manufacture, to cover the risk upon insurances, &c. (*See* Bounty, Insurance.)

**Preposition**, *prep'-o-sish-un* (Lat. *praepositum*, placed before), in Gram., is a word used to express a relation between different words, and generally placed before a noun. Grammarians generally class them with relational words, or those which express a relation between different things, which are expressed by notional. According to Horne Tooke, all prepositions were originally either verbs or nouns. Harris defines a preposition to be "a part of speech devoid itself of signification, but so formed as to unite two words that are significant, and that refuse to coalesce or unite of themselves." There are 18 prepositions in Greek, about 50 in Latin, and about 40 in English.

**Pre-Raphaelitism**, *pre'-raf'-fa-lite'-izm.*—An English school of painting, which has in recent years sprung into existence, has been thus named, in accordance with an erroneous idea, that its earliest members were mainly anxious to imitate the mannerisms of the artists who painted before the time of Raphael. The fact was, that they imitated no pictures, and painted from nature only, but accepted the title of Pre-Raphaelites because it was their object to oppose that system in art which had grown up since the time of Raphael; one of the main characteristics of which was the pursuit of beauty at the expense of truth; whilst another was a servile obedience to traditional conventionalisms. On their first appearance, the Pre-Raphaelites were hotly assailed in many quarters and on many grounds, the statements against them coming generally under the three following heads:—1. That they imitated the errors of the early painters; 2. that they did not draw well; 3. that they had no system of light and shade. That there might be some amount of extravagance in their earliest efforts may be conceded; but it is now generally acknowledged that the foremost Pre-Raphaelites stand in the first rank of modern painters, and have very beneficially influenced English art.

**Prerogative**, *pre-rog'-a-tiv* (Fr. *prérogatif*, from Lat. *praerogare*, to ask before), is an exclusive or peculiar privilege vested in some particular person, or class of persons; thus we speak of the prerogative of the House of Commons or House of Lords, the royal prerogative, &c. Most commonly the term is used in the last of these connections, to denote the special preeminence which the sovereign hath over and above all persons, and out of the ordinary course of the common law, in right of his regal dignity. In its highest sense, it consists in the consent of the king or queen being necessary before any new law be made, or any existing law altered. All the other features of the royal prerogative may be understood as comprised in, or as necessarily flowing from this; as the right to pardon offenders, of making war or peace, of laying embargoes, of sending ambassadors, of bestowing honours, commissioning officers in the army and navy, &c.

**Presbyterianism**, *pres-by-te'-re-an-izm* (Gr. *presbuteros*, an elder), is that form of ecclesiastical polity in which the chief power is vested in a court of presbyters, or teaching and ruling elders. Presbyterianism differs from Episcopacy in refusing to acknowledge any such succession to the apostleship on the part of bishops as would constitute them an office separate from, and superior to, presbyters; and from Independency, in claiming for presbyters the official authority which it lodges in the common membership of the Church, and in asserting such a connection between the different congregations of a church as renders them amenable to a common jurisdiction. The three elements existing in the presbyterian system are, (1) the authority of the presbyters, more especially as subordinate to no office-bearer of higher rank in the Church; (2) the representation of the laity in its government; and (3) the provision made for its external unity in courts of review. Presbyterians agree with episcopalians in denying that private members of the Church have a right to share directly in the government of it; for it is not competent for any member of the Church to assume at pleasure the functions either of teaching or ruling in it; but they deny that all church power rests exclusively in the clergy. They further admit to each congregation the right of jurisdiction within itself. In all churches where the state does not interfere, the privilege of choosing the minister is left with the people. The teaching elders are the ministers of the word and sacraments, and are all on an equality; the ruling elders are the representatives of the people, and form a part of all ecclesiastical bodies, in which they have equal authority with teaching elders. A series of judicatories, rising one above another, secures to each church the watch and care of its appropriate judicatory, and to the whole body an efficient system of review and control. Without going into the arguments advanced by Presbyterians in support of their views, or attempting to follow out the traces of the system that are to be found in the early Church, we content ourselves with stating that after the Reformation, the Lutheran churches mostly adopted the consistorial system, the Reformed churches the presbyterian. The system of church polity drawn up by Calvin when invited to assume the post of ecclesiastical legislator for the city of Geneva has ever since been recognized as the basis of the presbyterian system. The various presbyterian bodies of the present day differ very much in details and minor points, but their leading principles are the same. The most noted of the presbyterian churches is that of Scotland, John Knox having on his return from Geneva brought with him the system of Calvin, and introduced it into his native country about 1560. (*See* Scotland, Church of.) The lowest court of judicature is what is called the Kirk Session, being composed of the minister and lay or ruling elders of a parish or congregation; the minister being *ex officio* chairman or moderator. Its duty is to superintend the internal discipline of its particular church. Next in authority is the Presbytery, consisting of all the ministers of a district, and one ruling elder from each parish, deputed by his brethren as their representative. One of the ministers is chosen moderator; and the jurisdiction of this body extends over the churches of the district, and includes the examining, ordaining, and censuring of ministers, the licensing of candidates, investigating of heresies, directing sentences of excommunication, &c. All the presbyteries of a province meet twice a year, as a provincial synod, and exercise an authority over the presbyteries within the province similar to that which each presbytery exercises over the several kirk sessions within its district. The supreme ecclesiastical court of the Church of Scotland is the General Assembly, which meets annually at Edinburgh, and is composed of delegates from the several presbyteries, &c. (*See* Assembly, the General.) The ministers are ordained by the imposition of hands of the clerical part of the presbytery; and the ruling elders are set apart to their office, with solemn prayer and exhortation, in presence of the congregation. Various secessions have from time to time taken place from the national church of Scotland, by bodies holding presbyterian views, but differing on other points, more particularly on the subject of patronage and the undue interference of the civil power. The principal of these bodies are the Free Church (which *see*), which seceded in 1843, and the United Presbyterian Church, being an amalgamation of the Secession Church and the Relief Synod, effected in 1847; the former having separated from the establishment in 1732, the latter in 1752. At present an effort is being made to effect a union between the Free and the United Presbyterian churches, which there is every appearance of being carried out. The Westminster Confession of Faith is the standard of the several Presbyterian bodies in Scotland.

**Prescription**, *pre-skrip'-shun* (Lat. *praescribo*, I set down authoritatively), in Law, is a title acquired by use and time, and allowed by law. This title applies only to incorporeal hereditaments; lands and corporeal rights being provided for by the Statutes of Limitation. (*See* Limitation.) The title of prescription was well known to the Roman law by the name of *usucapio*. It is founded upon the presumption, that he who has had the quiet and uninterrupted enjoyment of a thing for a long period of years may be supposed to have a just right to it. The period which gives prescriptive right has varied at different times. Anciently, the law required that the right claimed should have

existed undisturbed from time immemorial, or, as the phrase is, "from time whereof the memory of man runneth not to the contrary." (*See* LIMITATION.) The difference between prescription, custom, and usage is, that prescription hath respect only to one person, or a few; custom is local, and applied always to a certain place; while usage may apply either to persons or places. A custom and prescription are in the right, usage is in the possession. Prescription is subdivided into (1) that which has been exercised by a person and his ancestors, or by a body corporate and their predecessors, and is a personal right; and (2) that which has been attached to the ownership of a certain estate, and is only exercisable by those seized of the fee simple of such estate, technically denominated a prescription in a *que* estate. The common law laid down the following rules regarding prescription:—(1) It must be founded on actual usage or enjoyment; for a mere claim, however long-continued, will not establish the right.—(2) The use or enjoyment must have been continuous and peaceable, though a wrongous interruption for a short period will not destroy it.—(3) The usage must have been from time immemorial.—(4) The prescription must be certain and reasonable.—(5) A prescription cannot be for a thing that cannot be raised by grant.—(6) That which arises by matter of record cannot be prescribed for, but must be claimed by grant entered on record.—(7) Where a man prescribes for anything in himself and his ancestors, the prescription will descend only to the blood of that line of ancestors in whom he so prescribes; but if he prescribes for it in a *que* estate, it will be inheritable, precisely in the same manner as that estate. The statute 2 & 3 Wm. IV. c. 71, entitled "An Act for shortening the Time of Prescription in certain cases," is intended to obviate the injustice and inconvenience resulting from the doctrine of immemorial usage, and to allow an enjoyment for a certain period to constitute a direct and intrinsic right. This statute declares that rights of common and other profits or benefits to be taken and enjoyed from or upon any land (except rents, tithes, and services), are prescribed by unuterrupted enjoyment for thirty years. Where, however, the adverse party labours under disability,—an infant, idiot, &c.,—the thirty years are to reckon from the ceasing of such disability; but in no case is the entire period to exceed sixty years, when the claim becomes absolute and indefeasible. As regards any way, or other easement, or any watercourse, or the use of any water to be enjoyed upon, over, or from any land or water, and the access or use of light to and from any dwelling-house, workshop, or other building, the periods are twenty and forty years respectively, in lieu of thirty and sixty. In Scots law the term prescription has a much wider signification than in English, including, also, limitations. The prescription establishing a right of property is forty years, known as the long prescription. There is a twenty years' prescription, applicable to holograph writings, not attested with the usual solemnities of deeds. An obligation of caution or suretyship is limited to seven years. Bills of exchange and promissory notes lose their privileges after six years. The quinquennial prescription affects all right of action on contracts provable by witnesses; while the three years' prescription cuts off claims on open account, or for services, &c., the three years counting from the last item of the account.

PRESENTATION, *prez-en-tai'-shun*, in Eccl. Law, is the offering of a clerk, by the patron or proprietor of an advowson, to the bishop or ordinary. It differs from nomination in this, that while presentation signifies the offering a clerk to the bishop for institution, nomination signifies offering a clerk to the patron, in order that he may be presented. Formerly, presentation might have been done either by word or writing; but since the Statute of Frauds (29 Car. II. c. 3), it is necessary that all presentations be in writing; and a presentation in writing is a kind of letter, not a deed, from the patron to the bishop of the diocese in which the benefice is situated, requesting him to admit to the church the person presented. No person can present himself, and the person presented must be in priests' orders. When the ordinary declares his approval of the presentee as a fit person to serve the church to which he





is presented, he is said to be admitted; after which follows his institution or collation.

PRESENTATION AT COURT.—When English subjects or inhabitants of other countries, entitled to the privilege by rank and honour, pay a visit to her Majesty on one of the stated public occasions, they are said to be *presented at court*. At a *levée*, the gentlemen alone appear; but at the *drawing-room*, both ladies and gentlemen are presented. At the levées, no persons are allowed to remain in the throne-room after having passed her Majesty, except the ministers, the great officers of the household, the foreign ministers, and the officers of the household upon duty. At the drawing-rooms, those who are allowed to remain are the ladies of the ministers, of the great officers of the household, and of the foreign ministers.

PRESERVATION OF FOOD. (*See* FOOD, PRESERVATION OF.)

PRESIDENT, *prez'-i-dent* (Lat. *præses*, from *præsideo*, I am set over), is an officer appointed or elected to preside over an assembly, a tribunal, or a republic. The chief executive officer of the United States bears this title, and the second executive officer, the vice-president, is by virtue of his office president of the Senate, and succeeds to the office of president on the death or disability of the regular incumbent during his term. The president holds office for four years, from the 4th of March next after his election. He must be a native of the United States, at least thirty-five years of age, and is chosen by electors who are themselves chosen by the people of each state, the numbers of electors being equal to the number of senators and representatives to which the state is entitled. The president is invested with great powers, which are fixed by the constitution. He is commander-in-chief of the army and navy of the United States, and of the militia of the several states when called into the actual service of the Union. Every bill which passes Congress must obtain the president's signature, unless confirmed by two-thirds of each house after his objection. He has power, by and with consent of two-thirds of the Senate, to make treaties, and he nominates, and with their consent appoints, ambassadors, and other public ministers and consuls, judges of the Supreme Court, and all other officers whose appointments are not otherwise provided for. He receives ambassadors and other public ministers, and takes care that the laws are faithfully executed. He may convene both houses on extraordinary occasions, and in case of disagreement between them as to the time of adjournment, may adjourn them to such time as he shall think proper. He can be removed from office on impeachment for and conviction of high treason, bribery, or other high crimes and misdemeanors. His salary is £5,200.

PRESS, LIBERTY OF THE, *press*, is the liberty of a citizen to print and circulate whatever he pleases; and it is not inconsistent with this liberty that a man should be made amenable to justice for the abuse of it. The press is a mighty engine for good or evil, and of its very nature requires to be kept under some restraint. In this country, the restrictions are of a very mild nature, the object mainly being to ascertain in every instance by whom the publications are issued, so as to make the printer or publisher amenable, whenever the case so requires, to the civil remedy of injured parties, or to the correction of criminal justice. The laws for punishing abuses are generally directed against attacks upon the government or its officers, upon the reputation of individuals, and upon good morals and religion. By 39 Geo. III. c. 79, every person possessing a printing-press or types must deliver notice thereof to the clerk of the peace of the county or other division where the same is intended to be used, according to a prescribed form, under a penalty of £20. And a similar notice is required to be given by every letter-founder and printing-press maker. Every person who shall sell types for printing, or printing-presses, shall keep an account of all persons to whom the same are sold, to be produced when required to any justice of the peace. A subsequent statute provides that every person who shall print any paper or book whatsoever, which shall be meant to be published or dispersed, and who shall not print upon the front of every such paper (if the same be printed upon one side only), or upon the first or last leaf of

every paper or book which shall consist of more than one leaf, in legible characters, his name and usual place of abode or business, shall be liable to a penalty not exceeding £5 for every copy so printed. (*See* Newspapers.) In every other country of Europe, the laws are much more stringent than here, and in several of them printed matter is subjected to a rigorous censorship before being published. Liberty of the press follows naturally from, and is intimately connected with, liberty of speech,—the one being in every free government as necessary as the other. But as liberty of speech does not admit of one slandering his neighbour, or promoting sedition, neither does liberty of the press. We may, however, observe that the freer any government and people are, the less sensitive they are to charges affecting their character.

Press-Gang, *press'-gäng*, is a term applied to a detachment of seamen, who, under the command of a naval officer, were formerly empowered, in time of war, to take any seafaring men, and oblige them to serve on board the king's ships.

Pretender, *pre-ten'-der*, is an epithet applied to the son and grandson of James II., who pretended to the throne of England.

Price Current, *price kur'-rent* (Fr. *prix*, price), is a list or enumeration of the various articles of merchandise, with their prices, the duties (if any) payable thereon, drawbacks, &c. Lists of this description are published periodically in most of the great commercial cities and towns, generally once a week, or oftener.

Prickles, *prik'-ls* (Sax. *priccian*, to prick), is a term used in Bot. to designate those sharp prominences arising from the body or epidermis of any part of a plant, and thereby distinguished from the thorn, which grows from the wood of a plant. They originate in the cellular system, have no connection with the wood, and may be peeled off with the bark. The scientific term of the prickle is aculeus, from Lat. *acus*, a needle.

Prickly Ash. (*See* Xanthoxylon.)

Prickly Pear. (*See* Opuntia.)

Priest, *preest* (Fr. *prêtre* or *prestre*, from Lat. *presbyter*, Gr. *presbuteros*, elder), is one set apart for the performance of religious offices and ceremonies, and, in particular, for the performance of sacrifices. The corresponding word in Latin is *sacerdos*, in Greek *hiereus*. The necessity of a priesthood, or a class of persons set apart for the performance of religious rites and ceremonies, and to stand, as it were, intermediate between the people and Deity, has been believed and acknowledged by almost every people, pagan as well as Christian. The patriarch of the primitive world was priest as well as king in his own house; and when the state was developed from the family, the royal and priestly offices still continued, for a time, to be united in the same person. As states enlarged, and the duties of the kingly office increased, a separate order for the priesthood grew up, in some countries elective, in others hereditary, and, by the reputation of superior wisdom and secret communion with the gods, inspired the mind with awe, and acquired great honour and influence. The Mosaic law established a special priesthood, consisting of three orders,—the high-priests, the priests, and the Levites; all of them taken from one tribe,—that of Levi. The priesthood was made hereditary in the family of Aaron; and the firstborn of the oldest branch of that family, if he had no legal blemish, was always high-priest. Among the ancient Greeks there was no general priesthood, but only the priests of the several deities, who slaughtered the victims, and who often secured a powerful influence, as interpreters of the will of the deity which they served. Among the Hindoos of India, the priestly system is very fully developed; the Brahmins, who preside over sacrifices and divine services, being possessed of great power and influence. In the Christian system, Christ is represented as the one priest, who, for the redemption of the world, offered the one sacrifice,—that of himself. In the primitive Church this doctrine was fully adhered to, and the duty of the priest was only to expound the divine word and exercise a paternal care over his people, without the performance of any pompous rites or ceremonies. As the distinctive features of Romanism came to spring up, the character of the priesthood changed, and the mass acquired the character of a propitiatory sacrifice. The Roman Catholics and the Eastern churches maintain that the sacrifice of the cross was to be continued and kept present in the Church, through appointed representatives and vicegerents of Christ, who, for that purpose, continue and partake in the priestly character of Christ and his mediatorial office between God and man. The other Christian denominations deny that there is any other real priest but Christ, and only regard the clergy as the teachers and servants of the Church, who, being divinely called and properly appointed, possess certain ecclesiastical rights, and undertake certain duties, which they derive partly from divine and partly from human law. In the English church, the word priest denotes the second degree of ministers, for admission to which the candidate must be twenty-four years of age complete.

Primary Colours. (*See* Chromatics.)

Primate, *pri'-mait* (Lat. *primus*, first), in the Christian hierarchy, is a title of honour given to certain bishops of a province who preside over the rest. In the English church the archbishop of Canterbury is styled Primate of all England, the archbishop of York Primate of England; while in Ireland, the archbishop of Armagh is Primate of all Ireland, the archbishop of Dublin Primate of Ireland.

Primer, *prim'-er* (Lat. *primarius*), is a book of primary or elementary instruction. As at first used, it seems to have generally conveyed the notion of religious instruction; and the earliest primers contained lessons taken from the Creed, the Lord's Prayer, the Ten Commandments, or from some other common formulary, with short and easy explanations, for the use of young beginners, or for private devotion.—Hence the term came to be sometimes used as analogous with prayer-book. In 1627 the "Prymer of Salisbury Use" was published; in 1535, "A Goodly Primer in English;" in 1539, "Manual of Prayers, or the Primer in English;" and in 1545, "Henry VIII.'s Primer."

Primogeniture, *pri-mo-jen'-e-ture* (Lat. *primogenitus*, firstborn), in Law, is priority of birth; in virtue of which the firstborn son in a family is among most nations entitled to a certain superiority or preference among his brethren. Among the ancient Jews, the eldest son was consecrated to the Lord, had a double portion of the inheritance, and succeeded in the government of the family or kingdom. Among the Romans, the "insolent prerogative of primogeniture," as Gibbon terms it, was unknown, the sons and daughters being all entitled to share equally in the patrimonial estate. Among the states of Europe which, after the decline of the Roman empire, adopted the laws of that country, a similar system prevailed; and hence in France we find that under the first two races of kings the eldest son shared equally with his brothers; and it was not until the Capets came to the throne, that the prerogative of succession to the crown was reserved exclusively to the firstborn. The lords promptly imitated the kings, and secured their fiefs to their eldest sons, and thus founded in France the *droit d'aînesse*. The system of primogeniture as it at present exists doubtless is mainly owing to the feudal system. It was found necessary, in order to preserve the dignity of the nobility and to render the military service, which was the basis of the system, certain and efficient, to have the feuds or fees indivisible.—Thus the eldest son came universally to succeed to the whole of the lands in all military tenures. The feudal system was established in England by William the Conqueror, before whose time the descent of land was to all the sons alike; remains of which we find still existing in Kent and a few other parts of the country. The right of primogeniture does not exist in the case of personal property, nor among females, except as to the inheritance of the crown. In France and Belgium primogeniture has been abolished, and in most European countries except England the tendency is to abolish the system. According to the law of England, if a man dies seized of real estate of which he had the absolute ownership, without having made any disposition of it by will, the whole descends to the heir-at-law, who by primogeniture is the eldest male person of those who are in the same degree of kindred to the person dying, or the representative of such eldest male.

Primroses. (*See* next article.)

**Primula**, *prĭ'-mu-lă* (Lat. *primus*, first, in allusion to its early flowering), in Bot., the Primrose, the typical gen. of the nat. ord. *Primulaceæ*. Calyx tubular, 5-cleft; corolla salver-shaped, tube cylindrical up to the insertion of the stamens; stamens 5, inserted and included in the tube of the corolla; capsules many-seeded, 5-valved, with 10 teeth. Five species of this gen. grow wild in Britain:—*P. vulgaris*, the primrose found in woods and hedges, its rich green leaves and delicate brimstone-yellow flowers being often seen long before nature has lost her wintry aspect. *P. veris*, the cowslip, found in pastures and meadows; a fragrant and pretty plant, easily distinguished from the primrose by the smallness of its flowers, and by their forming an umbel. *P. elatior*, the oxlip, found in clayey woods and meadows in the eastern counties. *P. farinosa*, the bird's eye primrose, a rare plant, found in the north of England and south of Scotland, with flowers usually pale lilac with yellow centre. *P. scotica*, the Scottish primrose, a still rarer plant, with bluish-purple flowers, found on the sandy heaths of the extreme north of Scotland. The beautiful garden-flowers called *polyanthuses* and *auriculas* have been produced by the cultivation of species of this genus. The flowers of the cowslip are sedative and diaphoretic, and are sometimes employed in the manufacture of a soporific wine. (*See* Auricula and Polyanthus.)

**Primulaceæ**, *prĭ-mu-lā'-se-e*, in Bot., the Primrose fam., a nat. ord. of *Dicotyledones*, sub-class *Corollifloræ*. Herbs with simple exstipulate leaves and regular perfect flowers. Calyx 4—5-cleft, persistent, inferior, or partly superior; corolla 4—5-cleft, very rarely absent; stamens equal in number to the segments of the corolla, and opposite to them; ovary superior or partly inferior, 1-celled; placenta free, central; style 1; stigma capitate. Fruit capsular, with transverse or valvular dehiscence. Seeds numerous, with fleshy albumen; embryo placed transversely to the hilum. The *Primulaceæ* principally inhabit cold and temperate regions in the northern hemisphere. They are very rare in the tropics, being found only on the sea-shore or in mountainous districts. These plants are of little economic value, but many are cultivated for the modest beauty of their flowers. (*See* Primula.)

**Prince**, *prins* (from the Lat. *princeps*, first, leader, or foremost).—This designation was used originally to denote the *princeps senatus* of the Roman state. In the course of time the name became a title of dignity, and Augustus and his successors having adopted it, it was employed henceforward to denote the master of the Roman world. By-and-by the term prince came to be applied to individuals having personal pre-eminence, such as the princes of Wales; and it is now, in England, entirely restricted to persons of the blood-royal. On the continent, the term is employed in a somewhat arbitrary manner, possessing none of the definiteness which belongs to such words as king, duke, marquis, &c., but rather to denote persons of eminent rank; and in Germany this title ranks below that of duke.

**Principia**, *prin-sip'-i-ă* (Lat., first principles), the contracted title of Sir Isaac Newton's celebrated work "Philosophiæ Naturalis Principia Mathematica," the publication of which formed the most remarkable period in the annals of science. It would appear that Newton first turned his attention to the subject on which this work treats in 1666. It is generally said that Newton's observations were first led in this direction by noticing the fall of an apple from a tree. However that may be, we find that a letter from Hooke, written in 1679, caused him to resume his old thoughts, the subject of which was the curve in which a falling body descends to the earth, taking into account the motion of the earth. This new attempt was successful, but Newton did not write nor publish any treatise; he placed his papers to one side, and traced out the foundation of his system. Halley, at the beginning of 1684, had deduced from the third law of Kepler that the centripetal force on the planets was as the inverse square of the distance. Finding himself unable to proceed further, he made application to Hooke and Wren. The latter of these astronomers said that he had long given up the subject from inability to succeed; while Hooke professed to have solved the whole problem, but would communicate nothing. During





the same year, Halley visited Newton at Cambridge, who told him that he had solved the problem, but was not able at that moment to lay his hands upon the papers. On Halley's departure, he again worked out the theorems, and transmitted them to him. On receiving this communication, Halley again went to Cambridge to gain more information, and to induce Newton to continue the inquiry. About the middle of February in the following year, the Royal Society received a communication, which was similar to that previously made to Halley enlarged. It was entitled "Isaaci Newtoni Propositiones de Motu," and was entered upon the register of the society. In this communication were contained what were afterwards the main theorems of the early sections of the Principia, direct and inverse, relating to centripetal forces. On the 21st of April, 1686, Mr. Halley announced to the Royal Society that Mr. Newton "had an incomparable treatise on motion almost ready for the press." The book was printed in quarto, Mr. Halley undertaking the business of looking after it and printing it at his own charge. The Royal Society would themselves have paid, but that their funds were so exhausted by bringing out a work of Francis Willughby, "De Historia Piscium," that their very officers had to be paid in copies of this work on fishes, instead of money. In the meanwhile there arose a controversy with Hooke, who asserted that he had discovered the law of the inverse squares, and had communicated that and other discoveries to Newton. For an account of this controversy with that universal claimant Hooke, the reader is referred to the article on "Principia," in the *English Cyclopædia*. The third book of the Principia was presented to the society April 6th, 1687. The order of the council of the society to license the book was made on June 20, 1686, and the imprimatur of Pepys was dated July 5. Too much praise cannot be bestowed upon Halley for the part which he had in this affair. Having found out the ability of Newton to write such a work, he prevailed on him to do it, took charge of the publication, prevented him from materially mutilating it in disgust, paid the expenses of printing when he could ill afford it, and gave a clear and lucid explanation of it in the "Philosophical Transactions." It is also generally admitted that for a long time he was the only person in Europe who showed that he thoroughly appreciated the value of the work, and knew the position that in time it must gain in scientific history. The principal contents of the Principia of Newton are the dedication to the Royal Society; a short preface; some verses in honour of Newton written by Halley; definitions, axioms, a first book on unresisted motion; a second on resisted motion; and a third on the system of the universe. Much interest is attached to the second and third editions of the Principia, with reference to the alterations made in them by Newton.

**Prinos**, *prī'-nos*, in Bot., a gen. of the nat. ord. *Aquifoliaceæ*. The leaves of *P. glaber*, a native of North America, are dried and used as a substitute for China tea, under the name of *Appalachian tea*. The bark of *P. verticillatus*, called *black alder-bark*, or *winter berry*, is employed in North America, in the form of a decoction, as a tonic and astringent. Prinos is the Greek name of the holly, which the present genus much resembles.

**Printing**, *print'-ing*, in a general sense, denotes the art or practice of making impressions of letters, characters, or other figures, with ink, upon paper, cloth, or any similar substance. In a more restricted sense, printing is the art by which, with single movable letters or types, any piece of literary composition is converted into a book. In the most commonly received meaning of the term, printing is the same as *typography*, or the art of printing on paper with movable metal types. The history of the origin of this important art is lost in antiquity; it would appear, however, to be certain that the Chinese made the first approximation to it. In the middle of the 10th century, the art was practised in China, and is said to have been the invention of a minister of state, Foong-taon. The method then used is practised there now. The page of writing to be multiplied is pasted down on the surface of a prepared block, commonly of pear-tree, on which it leaves an impression of the characters in an inverted form; then the block so marked is prepared for printing

from by cutting away all the blank parts on the face of the wood, thus leaving in relief the lines forming the characters. At what time the Chinese style of printing was introduced into Europe, if it was introduced at all, is not known. Block-printing with single pieces of wood can be traced back as far as the 13th century. It seems to have been first applied to the fabrication of playing-cards and manuals of devotion; the latter for the most part consisting of a single page, but in some cases taking the form of a little book of several pages. These little books closely resembled Chinese books in one point; namely, that each leaf was printed from a single block of wood. Printing was thus fettered and cramped until the great discovery of the utility and practicability of employing *movable types* gave to the art a ductility and power beyond all previous conception. Who the discoverer of this vast improvement was, is a matter of dispute. The claims which have been adduced are many; but the names of four men have figured principally in the controversy: John Gutenberg (paternally Gänsfleisch), of Strasburg; John Fust (or Faust), of Mainz; Peter Schöffer (in Latin Opilio), of Gernsheim; and Lawrence Koster (or Janszoon), of Haarlem. According to the opinion of the most numerous and competent judges, the credit belongs to Gutenberg of having first employed movable metal types in the production of books. (*See* GUTENBERG, in vol. I. of this work.) Shortly after conceiving the idea of his invention, he went to Mainz, where, with the aid of Peter Schöffer, he first brought the art into practical use. Shortly afterwards, about 1450, Gutenberg allied himself with John Fust, a rich citizen of Mainz, who advanced the capital necessary to prosecute the business of printing. To Schöffer belongs the merit of inventing *matrices* for *casting* types, each individual letter having been hitherto *cut* in wood or metal. This constituted one of the most valuable improvements in the history of printing. Schöffer, who died about 1492, printed during his lifetime upwards of fifty works. Gutenberg's Latin Bible, which was called the *forty-two lined Bible*, because in every full column it has 42 lines, is the oldest work of any considerable size printed in Mainz. Faustus, having separated from Gutenberg, undertook, in connection with Peter Schöffer, larger typographical works. He was particularly engaged in printing the Latin and German Bible. Up to that time the monks had gained considerable sums by copying the Bible; and as they could not understand this rapid production of copies, and their astonishing uniformity, they ascribed the whole transaction to the devil. About 1462 Faustus went to Paris with his Bibles, for the purpose of selling them there; but the priesthood raised such an outcry that he was obliged to decamp hurriedly. The old tradition that the devil carried off Dr. Faustus probably arose from this circumstance. Four years later Faustus made another journey to Paris, and died there of the plague; after which the printing business was carried on at Mainz, by Schöffer. When the town of Mainz was taken and sacked by Adolphus, count of Nassau, a number of the workmen engaged in printing were dispersed and obliged to seek employment elsewhere. Passing into other countries, they carried their knowledge of printing with them, and from that period the art made rapid progress throughout Europe. Before the year 1500 there were printing-offices in upwards of 230 places. In the earliest printed books the character of type employed was the old *Gothic* or *German*. Sweynheim and Pannartz first introduced the *Roman* type, at Rome; and Aldus introduced the *Italic*. William Caxton first introduced the art of printing into England, between 1471 and 1474. He established a printing-press in Westminster Abbey, and not only was the first who successfully established the art in this country; but by his learning, application, and ingenuity, effected much towards its improvement and extension. In 1464 Caxton was appointed ambassador at the court of the duke of Burgundy, and during his residence in the Low Countries he perfected his knowledge of the French language, studied Flemish, imbibed a taste for literature, and made himself master of the art of printing, at great trouble and expense. It is not known when he returned to England; but the first evidence of his typographical labours in the "Game of Chess," printed in 1474. The two most distinguished successors of Caxton were Wynkin de Worde and Richard Pynson; and before the middle of the 16th century printing had attained a flourishing condition in England. Perhaps the most satisfactory way of explaining the art of letter-press printing will be to divide the subject into several processes, treating of them in the order in which they occur in a modern printing-office. These are type-founding, composing, printing-presses, and printing-machines. Although Caxton and Wynkyn de Worde had, while English printing was yet in its infancy, been distinguished as type-founders, this branch of the typographic art fell, after their death, into a very depressed state in England. Until early in the 18th century the types used by London printers were cast in Holland and other continental towns. About the year 1720, however, William Caslon, who had originally been employed as an engraver on gun-barrels, was engaged by the Society for Promoting Christian Knowledge to cut a set of punches, from which a fount of Arabic types was cast. Caslon's types were so well executed as to put a stop to the importation of Dutch founts; and, in a few years, English ingenuity was so far stimulated by the publishers as to render our countrymen not only independent of the continental founders, but to raise them to an equality with the best foreign cesters of printing-types. It is necessary to explain that, with one or two exceptions, every letter, point, and mark used in printing a book, newspaper, or other article, is cast on a distinct and separate body or stalk. This letter is termed a type. In type-founding, the formation of the punches constitutes the initial step. A punch is an exact prototype of the cast letter, so far as the face of it is concerned, except that the letter is reversed. After this original has been formed by the means of cutting, punching, and filing, it is hardened, and its face being struck into a piece of copper, a matrix is formed. This matrix is fitted with the greatest nicety into a carefully-adjusted piece of mechanism called a mould. An alloy, consisting most commonly of three parts of lead to one of antimony, is poured, in a molten state, into this mould, and when the metal sets, the type is dexterously and quickly removed. Although these operations are sufficiently complicated, an expert workman will cast in an hour five hundred types. When the letters leave the mould, several operations have to be performed upon them in order to render them fit for the printer's purpose. A collection of types, such as is necessary in ordinary circumstances for the printing of a work, is called a "fonte," or "fount" (Fr. *fonte*, a casting), and should contain Roman and Italic letters, points, figures, spaces, and other peculiarities. The several letters of the alphabet are required in very different proportions. In printing English works they are about as follows:—a 8,500, b 1,600, c 3,000, d 4,400, e 12,000, f 2,500, g 1,700, h 6,400, i 8,000, j 400, k 800, l 4,000, m 3,000, n 8,000, o 8,000, p 1,700, q 500, r 6,200, s 8,000, t 9,000, u 3,400, v 1,200, w 2,000, x 400, y 2,000, z 200, ff 400, fi 500, fl 200, ffi 150, ffl 100, æ 100, œ 60 (these last seven are called logotypes, or types containing two or more letters on one body), , 4,500; ; 800; : 600, . 2,000. In addition to these there are dotted and accented letters, in quantities from 100 to 250; numerals 0 and 1 to 9, ranging from 1,000 to 1,300 each; brackets, parentheses, marks of reference, &c. The types consist of the letters of the alphabet, of three kinds:—

*Capitals.*—A B C D E F G H I J K L M N O, &c.
*Small capitals.*—A B C D E F G H I J K L M N O, &c.
*Lower-case.*—a b c d e f g h i j k l m n o p q r s, &c.

The above are called Roman letters.

*Capitals.—A B C D E F G H I J K L M N O*, &c.
*Lower-case.—a b c d e f g h i j k l m n o p q r s t*, &c.

These two last are Italic letters.

The number of capitals in a fount range, for the several letters, from 80 to 800; small capitals about the same. Spaces are pieces of metal formed like the bodies of letters, and are used for separating the words. They are cast of different thicknesses; hair spaces are extremely thin,—about 3,000 of them are required; of thin spaces, 8,000; of middle spaces, 12,000; and of thick spaces, 18,000, are the numbers required with a fount of the above extent. En-quadrats are spaces equal in

thickness to the letter n, of which 5,000 are supplied; an em-quadrat has a body exactly square, and equal to the shank of the body of the letter m, of which 2,500 are required. There are, also, larger quadrats, used for filling up blank lines and the spaces at the ends of paragraphs, or in pieces of poetry. Types are of various sizes. Beginning with the largest, the subjoined specimens show the various sizes commonly used in bookwork by British printers:—

*English.*

Our Father, which art in h

*Pica.*

Our Father, which art in hea

*Small Pica.*

Our Father, which art in heaven, H

*Long Primer.*

Our Father, which art in heaven, Hall

*Bourgeois.*

Our Father, which art in heaven, Hallowed

*Brevier.*

Our Father, which art in heaven, Hallowed b

*Minion.*

Our Father, which art in heaven, Hallowed be t

*Nonpareil.*

Our Father, which art in heaven, Hallowed be thy Na

*Pearl.*

Our Father, which art in heaven, Hallowed be thy Name. Thy

The size of the type used for this work is *Nonpareil*.

*Composing.*—When a work is to be printed, and the size of the page and type decided upon, the author's manuscript, called in a printing-office "copy," is given to the compositor. The types lie before him in a receptacle termed a "case." Cases are always in pairs; the one called the upper case is divided into ninety-eight boxes, of equal size, in which are contained the capitals, small capitals, figures, accented letters, &c. The lower case is divided into fifty-three compartments, of unequal size, in which are deposited the small letters, spaces, &c., the types most in use having the largest recesses assigned to them. The compositor holds in his hand a little brass or iron frame, called a "composing-stick," which, having one side movable, is capable of being adjusted to the required width of the page or column. With the copy placed before him, the workman begins to gather his types, letter by letter, until he has formed a word; this word he separates from the next by a space; and so he goes on until he has composed a line. Arrived at the end of his line, he proceeds to "justify" it, that is, he increases or lessens the space between the words until the line is tolerably tight in his composing-stick; in doing this he has to equalize the spacing as much as possible, uniformity of spacing forming a distinctive characteristic of a good compositor. When he has filled his composing-stick, in other words, has set up as many lines as his stick will hold, he dexterously takes up the lines as if they were a piece of solid metal, and places them upon a ledged board, termed a "galley." When in this manner he has composed a whole page, he secures the types by tying a cord round them. A sufficient number of pages having been composed to form a sheet, an impression from them, called a "first proof," is taken, and submitted to the inspection of a corrector, called a "reader," whose duty it is to detect and point out, by marginal references, all the errors that the compositors may have made. When these necessary alterations have been made, a second impression, called a "revise," is taken. After undergoing the inspection of the reader, this revise is forwarded to the author, whose corrections being attended to, the pages are deemed fit for the press.

*Composing-Machines.*—Many attempts have been made during the last twenty years to supersede manual labour in the composition of types: hitherto these attempts have been unsuccessful. It would be unnecessary here to describe the various contrivances the object of which was to act as substitutes for the fingers of the compositor. The best composing-machine was shown in the French Exhibition. It was stated that a Copenhagen newspaper had for some time been printed by its means; and it was said that it could "set up" and "distribute" 50,000 types daily: this gives a rate of about 6,000 an hour, which is treble that of the ordinary compositor's rate.

*Distributing* is a part of the compositor's art for which he receives no pay. Before he can proceed with the setting-up of the types, it is necessary that the workman should have all the receptacles of his cases filled with types. This the workman effects as follows.—Having washed free from dirt a quantity of type which has been already printed from, he takes up a certain number of the lines of types; these he rests upon the middle finger of his left hand; keeping the faces of the letters towards him, he takes up one or two words between the fore-finger and thumb of his right hand, and drops the letters each into its proper receptacle or "box." A good compositor will in this way "distribute," or return to their proper places, 50,000 letters a day.

It should be stated that the pages, when prepared for printing, are secured, or "locked up," as the phrase is, in a rectangular frame of iron, called a "chase." The pages thus wedged up constitute what is called a "form." Each side of a sheet has its own form, which may be carried about with as much ease as if it were composed of solid plates instead of being made up of forty, fifty, or even a hundred thousand separate and movable pieces. In this state the form is ready for—

*Printing.*—Originally, all impressions from types were taken by means of the hand-press, the inventor of which is unknown. The earliest form of it bore a very close likeness to the common screw-press, as the cheese or napkin-press, with the addition of a contrivance for running in the forms when inked under the pressure, and out again when the impression had been taken. This rude piece of mechanism was improved upon by William Janssen Blaew, an assistant to the illustrious astronomer Tycho Brahé. At the commencement of the present century, the best form of printing-press was that invented by Lord Stanhope, and called after his name. This press is still used in the British printing-offices; but the better and more generally employed are the Columbian and the Albion press. The great labour required for the working of the hand-press, the slowness of the process,—two workmen being unable to produce more than 250 impressions in an hour,—acted as a spur to the inventive faculty for the production of some other and more expeditious and easy means of taking impressions from types. It was owing to these causes that attempts were made to supersede the old and slow hand-press by the application of machinery.

*Printing-Machines.*—One of the grand points of difference between the old hand-presses and the steam printing-machines is that, in the first case, the impression is obtained by means of a flat surface, called a "platen," whilst in the latter the impression is obtained by passing the sheet of white paper under a cylinder. Indeed, without a cylinder we should never have a fast printing-machine. The merit of introducing this valuable feature is due to Mr. Nicholson, who, as early as 1790, took out a patent for a printing-machine. He used types of a wedge shape; these he placed upon a cylinder, where they were locked tightly up and retained in this position, like the voussoirs of an arch. Another valuable feature, and one retained to the present time in the best form of printing-machines, was also due to Mr. Nicholson. This was the mode of inking the surface of the types by means of rollers. Ten years later, a printer named König, living in Saxony, turned his attention to the production of a fast printing-machine. Meeting with no encouragement in his native land, the ingenious Saxon came to England in 1804, and ten years subsequently, that is, on the 28th November, 1814, the reader of the *Times* newspaper was informed that he held in his hand a paper

printed by machinery moved by the power of steam. Although it is commonly believed that this was the first specimen of a paper printed by steam-machinery, such is not really the fact; for in 1811 a sheet of the *Annual Register* for 1810 was printed in this way. There are two kinds of printing-machine,—the single and the double. In the single machine, only one side of the paper is printed; in the double one, both sides receive an impression before leaving the machine. Single machines are mostly used for newspapers, and in other cases where it is not essential that the two sides of print should "register,"—that is, be exactly at the back of each other. Books are always printed by the double-cylinder machine, on account of the necessity of obtaining perfect register. As a rule, single machines are the faster; double machines the better adapted for fine work. At the present time, so great has been the march of improvement with regard to printing-machines, that beautiful specimens of typography are daily produced by their means. Perhaps the best specimens of these machines are the double-cylinder perfecting machine and Napier's patent platen machine. Until the introduction from America of Hoe's type-revolving fast printing-machine in 1850, the best example of a fast printing-machine was that of Applegath. It was in use in the offices of the *Times*, the *Illustrated London News*, and other newspapers having a large circulation. The *Times* machine could throw off from 10,000 to 13,000 copies per hour, printed on one side. In the case of Applegath's machine, the types were firmly secured on a cylinder of large diameter, standing vertically; in the other machines, the types are placed upon a bed, which travels to and fro beneath horizontal impression-cylinders. In Hoe's machines the types are placed upon a horizontal cylinder of about six and a half feet in diameter. When put in motion, this cylinder, with the types thereon, is in succession carried to the corresponding horizontal impression-cylinders, where the sheets take the image of the letters which, by a number of ingenious movements, have been previously smeared with ink. A large machine upon this principle was placed in the *Times* office in 1869. It has ten impression-cylinders, and throws off at the rate of 18,000 impressions per hour. The *Daily Telegraph*, *Lloyd's Newspaper*, and some others of the daily and weekly press, are printed by Hoe's machines, possessing even greater powers of production. (*See* Stereotyping, Copperplate Printing, Lithography, Nature-Printing, Anastatic Printing.) —*Ref.* Hansard's *Typographia*; Dr. Dibden's *Typographical Antiquities*; *English Cyclopædia*.

Printing-Ink. (*See* Ink.)

**Prior**, *pri'-or* (Fr. *prieur*), is the head of a convent of monks, but inferior in dignity to an abbot. His convent is called a priory. Where he is under an abbot, he is called a claustral prior.

**Prism**, *prizm* (Gr. *prisma*, a prism), in Geom., is a solid body whose two ends are any plane figures which are similar, equal, and parallel. The base of every prism, therefore, is equal and similar to any section parallel to the base; and the prism may be considered as generated by the parallel motion of this plane figure. Names are given to particular prisms according to the figure of their bases; as a *triangular* prism, a *square* prism, an *octagonal* prism; and so on. A cylinder, even, may be considered as a *round* prism, or one that has an infinite number of sides. Prisms are also said to be *regular* or *irregular*, according as their bases form regular or irregular polygons. The line supposed to be drawn from the centre of one end of a prism to the centre of the other is called the *axis of the prism*. When the sides and axis of a prism are perpendicular to its ends, it is called a *right* prism; when the sides and axis are oblique to the ends, it is called an *oblique* prism. In Optics, a prism is an instrument used for showing the properties of solar light, and consists of a triangular prism of glass, which separates white light into its component coloured rays while passing through it. (*See* Prismatic Colours, Spectrum.)

Prismatic Colours are the colours manifested when a ray of white light is decomposed by passing through a glass prism. They are,—violet, indigo, blue, green, yellow, orange, and red. (*See* Spectrum, Solar.)

**Prisons, and Prison Discipline**, *priz'-on* (Fr., from *pris*, taken), are terms of ever-widening import, and now occupy nearly every department of punishment in this country and throughout Europe. The reformatory is a species of prison, and transportation is now almost unknown, imprisonment being adopted in its stead. The true object of punishment is the prevention of crime; and there exists a great latitude of choice in the means by which this object is to be attained. In ancient, and even in more recent times, and among the most civilised of nations, the punishments enforced were characterized by undue severity, and carried out with little regard to the feelings or reformation of the criminal himself. There was no regular system of punishment established as we now have it; civil liberty was held cheap, and even life itself was not set high value upon. The prison, as we now know it, is entirely an institution of modern Europe, like the church, the school, and the poor-house. Long after the period of the middle ages, the cruelties enacted against unfortunate prisoners were of the most revolting character. To the philanthropic labours of John Howard the world is indebted for inaugurating a better state of things. Nor did he confine his exertions to his own country, but extended his labours throughout the length and breadth of Europe. One of the first fruits of Howard's labours was the passing of an act, in 1773, for improving the sanitary condition of gaols. Another act, of the same year, abolished the payment of prison fees. The prisons were found to be badly ventilated and very filthy, and to be very frequently the seat of that terrible disease the gaol-fever; the gaol-keepers often, for money, permitted the grossest crimes to be committed within the prison walls; and the most hardened criminals and those comparatively innocent, and even persons falsely accused, were placed together, without employment, in a common room. Attempts were made to remedy these evils by building better-arranged gaols, which, by isolation of the prisoners, ventilation, and thorough purification, should prevent such disastrous results; but the improvement was of slow growth. Early in the present century, Mrs. Elizabeth Fry commenced her mission to the female prisoners in Newgate; and in 1818, Mr. (afterwards Sir T. F.) Buxton published his "Inquiry whether Crime and Misery are produced or prevented by the present system of Discipline." From this work it appears that, notwithstanding the exposures of Howard and Mrs. Fry, many of the abuses complained of still continued, and some of them had even increased. The Millbank Penitentiary, which has now accommodation for 1,300 prisoners, was begun in 1819; and in 1822 a committee was appointed to revise the whole of the law relating to gaols in England and Wales; and the act 4 Geo. IV. c. 64, which is still the leading statute for English local prisons, was passed. It provides that there shall be maintained one common gaol at the expense of every county of England and Wales, and at least one house of correction at the expense of every county, and of every riding or division of a county having a distinct commission of the peace; and one gaol and one house of correction in the several cities, towns, and places specified in the said act. Every prison must have a resident keeper, and a resident matron to superintend the female prisoners; the keeper, as far as practicable, to visit every ward and see every prisoner, and inspect every cell, at least once in every twenty-four hours. Provision is made for the religious instruction, and instruction in reading and writing, of prisoners of both sexes. The male and female prisoners are confined in separate parts of the prison, and not allowed to see or hold any intercourse with each other; and the prisoners of each sex are further divided into distinct classes, which are not allowed to intermix with each other. Provision is also made for each prisoner having as much air and exercise as may be deemed proper for the preservation of health. Due provision is also made in every prison for the enforcement of hard labour for those sentenced thereto, and for the employment of the other prisoners. A surgeon is appointed to each of the prisons, whose duty it is to visit the same at least twice in every week, and oftener if necessary, and to see every prisoner therein. In 1835, 5 & 6 Wm. IV. c. 38, was passed, giving the secretary of state power to revise and alter the rules of all prisons, and

providing for the appointment of inspectors to inspect and report periodically upon all places in which persons can be legally confined. The Parkhurst prison, for juvenile offenders, was erected in 1838. In 1842, after much deliberation and inquiry, the plan of the prison of Pentonville was determined upon, as calculated to meet all the requisites of prison discipline which the science of the age had devised. Government prisons have since been erected at Portland, Portsmouth, Dartmouth, Chatham, and Brixton. The hulks of men-of-war laid up in ordinary were, for a time, used as prisons, but have now been abandoned as every way objectionable. Scotland, once much worse than England in the abuses of her prisons and the laxity of their discipline, has, since 1839, been thoroughly reformed. In Ireland, great improvement has been effected since 1826, in consequence of the passing of the act 7 Geo. IV. c. 74. The questions which have been more particularly agitated of late years, in regard to prison discipline, are chiefly respecting solitude, silence, and labour. The Friends in Philadelphia, in their endeavour to abolish some of the more cruel and injudicious modes of punishment then practised, and to do away with capital punishment, had recourse to the system of solitary confinement, without occupation or intercourse with any person. The idea was gladly seized upon by the other states, and prisons on this system were erected in various parts; the most celebrated of which was that of Auburn, in the state of New York. The solitary system was here carried out with the most disastrous results, resulting in ill-health and insanity, and driving several to commit suicide. This having failed, the second great experiment in prison discipline was resorted to,—the silent system. The principal establishment where this system was carried out to its full extent was the penitentiary of Sing Sing, in the state of New York. The prisoners were still confined in separate cells at night, but during the day they worked together in large rooms, without, however, being allowed to exchange a single word or even a glance with any of their companions. Any infringement of these rules was followed by the immediate infliction of corporal chastisement, and the humblest officer in charge of the criminals was vested with the power of inflicting it; and against their acts no appeal was allowed to any of the prisoners. It was, however, found impossible to prevent communications from passing among the prisoners, even by the utmost strictness and watchfulness; and hence the system has generally been given up. The value of labour as an element of prison discipline is so great that it is matter of wonder that it was not adopted long ago. In some countries, the labour is what is termed productive, but in this country it is generally unproductive. The "hard labour" of our prison discipline was formerly the treadmill,—a great cylindrical wheel turned on its axis by the tread of a number of prisoners. Now the crank is generally adopted,—a small flaked wheel, a little like the paddle-wheel of a steam-vessel, revolving within a box, which is partly filled with gravel, and turned by the prisoner with a handle outside. The advantage of this over the old treadmill is that it can be regulated to the strength of the individual, and it has a register for recording the number of revolutions. The system now generally adopted in this country is a combination of the labour, and a modification of the solitary system, known as the separate system, which provides a cell or room for each prisoner, where he is visited from time to time by the teacher, clergyman, discipline officers, &c., the object chiefly being to secure the criminals from contaminating each other. One of the most hopeful signs of modern criminal legislation is the increased attempts made for the reformation of the criminal. (*See* REFORMATORIES, PENAL SERVITUDE, TRANSPORTATION.)

PRIVATEER, *pri-vā-teer'*, is a vessel of war, owned and equipped by private individuals, to seize or plunder the ships of an enemy. Such vessel, however, must be licensed by government to that effect, or she is a pirate. Privateers are in naval warfare much the same as volunteer corps are in the land service. In both cases, the commissions proceeding from the sovereign make those who bear them the instruments and servants of the state. (*See* LAW OF NATIONS.)

PRIVY COUNCIL, *priv'-e*, is an assembly of state advisers, unlimited in number, and appointed by the will of the sovereign, on whose nomination alone, after taking the prescribed oath, the appointment is completed. The sole qualification required is that the party to be appointed should be a natural-born subject of Great Britain. The dissolution of the privy council, or the dismissal of any individual member of it, depends upon the will of the sovereign. Its natural duration is for the life of the sovereign, and is continued for six months longer, unless dissolved by the successor. The privy council seems to have been intended at one time as a sort of check upon royal authority, and at first it consisted of about twelve members. The number is now unlimited, and it comprises most of the principal officers of state; but the usage is for no member to attend the deliberations of the council that has not been specially summoned for that purpose. The duties of a privy councillor are, to the best of his ability, truly and impartially to advise the sovereign, and for his honour and the public good; to keep the sovereign's counsel secret; to avoid corruption; to keep and strengthen the execution of what shall be there resolved; to withstand all persons that would attempt the contrary; to observe, keep, and do all that a true and good councillor ought to do to his sovereign. Under various acts of parliament, parliament has delegated to the queen in council the power of making certain orders and regulations, which have the force of laws. In colonial matters, the authority of the queen in council is very extensive; and nearly every important act done by the sovereign in person is done in council. A considerable proportion of the ordinary business of the council is transacted by committees of council, to which petitions and other matters are referred by the queen in council. The members of the privy council are entitled to the prefix of "Right Honourable," and rank next after the knights of the Garter, and above the judges and baronets.

PRIZE, *prize* (Fr. *priser*, from *prix*, price), is applied to anything captured in virtue of the rights of war, but more especially to captures made at sea. The right of belligerents to capture the property of their enemies upon the sea is admitted, as well as their right to prevent any frauds or violations of the law of nations on the part of neutrals. The rights, however, are limited, and must be so exercised as not to intrench upon the independence or rights of other nations. It is evident that many nice questions must in such cases necessarily arise between different states; and hence arises the necessity of having some tribunals to whom they may be referred. Accordingly, it is settled as a part of the law of nations, that every belligerent has a right to establish prize courts to examine into all maritime captures, and judicially to decide upon their validity. The prize courts of the captors have exclusive jurisdiction over all matters touching captures made under the authority of their sovereign; and the courts of other nations have no jurisdiction or authority to inquire into, or to adjudicate upon them. The final sentence, when pronounced, is deemed the act of the sovereign, and he becomes responsible to all foreign nations for its correctness. (*See* LAW OF NATIONS.)

PRIZE-MONEY, *prize-mun'-e*, is the name given to the proceeds of property captured from an enemy. By 2 & 3 Wm. IV. c. 53, all former acts relating to army prize-money have been repealed and the law consolidated and amended. This statute enacts that all captures hereafter made by the army shall be divided according to such general rules of distribution as the sovereign shall direct. Deserters are not to be entitled to prize-money, and shares not claimed within six years after being paid, as directed by the act, to the treasurer of Chelsea Hospital, are declared forfeited, unless upon good cause shown and allowed. The prize-court of the Admiralty is the proper court for deciding on matters captured by naval forces.

PROBABILITY. (*See* THEORY OF PROBABILITY.)

PROBATE, *pro'-bāt* (Lat. *probatio*, from *probo*, I prove), in Law, is the proof before competent authority that an instrument purporting to be the last will and testament of a person deceased is indeed his last act. The granting of probate of the wills of testators, and of letters of administration of the effects of persons dying intestate, were formerly the pro-

rogative of the ecclesiastical courts, but have been recently vested in a newly-established court (20 & 21 Vict. c. 77), called the Court of Probate.

**Probate, Court of**, is a tribunal recently established by 20 & 21 Vict. c. 77, amended by 21 & 22 Vict. c. 10, exercising functions which formerly belonged to the ecclesiastical courts. It being found, that in matters of wills and intestacies, the ecclesiastical courts did not act so effectively, expeditiously, and cheaply, as the interests of justice required, this new court was instituted with, in general, and except as otherwise provided by the act, the same powers and duties in those matters as had antecedently belonged to the principal court for wills and administrations. Its duties are thus confined to judging of the authenticity of wills, and deciding upon the proper persons to whom letters of administration are to be granted where there is no will. The court is presided over by a single judge, described as the "Judge of the Court of Probate," who sits at Westminster, and from whose decisions there lies an appeal to the House of Lords. In connection with this court, and under its control, there are district registries established throughout the country, over each of which a district registrar presides; and wills may be proved, and administrations granted, at the registry of the particular district where the testator or intestate had a place of abode at the time of his death, without resorting to the principal court, where the business is in *common form*, involving no contention as to the right of proof or grant.

**Problem**, *prob'-lem* (Gr. *problema*, from *proballo*, I put forward), is strictly and literally something put forward or proposed. In Geom., it denotes something which requires to be done, in opposition to a theorem, which is something to be proved. In Log., it is a proposition that appears neither absolutely true nor absolutely false, and consequently may be asserted either affirmatively or negatively; and hence it has come in general to be applied to any question involving doubt or uncertainty, and requiring further evidence for its solution.

**Proboscis**, *pro-bos'-is* (Gr. *pro*, before; *boskо*, I feed), the term applied in Nat. Hist. to the snout or trunk of an elephant and other analogous animals, and particularly of insects. An elephant's proboscis is a flexible muscular pipe or canal, of about eight feet in length, and, correctly speaking, is an extension of the nose. It is with this instrument that he takes his food, and carries it to his mouth. The proboscis of an insect is either used for sucking blood from animals or juices from plants. In conchology, the term proboscis is applied to the tongue of certain gastropods, such as shell-snails, when it is so long as to be capable of being protruded for some distance from the mouth. In such cases the proboscis is used for boring the shells of other testacea and of destroying by suction the soft parts of the animal.

**Process**, *pro'-sess* (Lat. *processus*, from *procedo*, I go forth), in Law, in its original and most comprehensive sense, denotes the whole of the proceedings in any action, civil or criminal, real or personal, from the beginning to the end. In its more ordinary and limited sense, it is applied to the writs which issue out of any court for the purpose of compelling the parties to a suit, or others, to do some act connected with the progress of the suit. In civil suits, the process was, till recently, divided into three classes; the original process, now known as writ of summons; the mesne, or intermediate process, which issues between the first writ and final judgment; and the final process, a term applied to express writs of execution.

**Procès Verbal**, *pro'-sai ver'-bâl*.—In French jurisprudence, this term signifies a memorandum or instrument drawn up and attested by officers of justice, containing a detailed statement of the circumstances which have taken place upon the execution of a commission, upon an arrest, upon a preconguition or preliminary examination of a party accused, or in the course of other legal investigations, and set forth in the order in which they have occurred. The term is now frequently applied to a contemporaneous detailed minute or note of any formal proceeding, though not occurring in the course of any legal inquiry; such as a note of the discussions which are taking place during the negotiation of a treaty.

**Prochein Amy**, *pro'-shain(g) a-mi'* (Lat. *proximus amicus*), in Law, is the nearest friend or next of kin to a child in his nonage, who in that respect is allowed to act for him, and be his guardian, &c.

**Proclamation**, *prok-lâ-mai'-shun* (Lat. *proclamatio*, from *proclamo*, I proclaim or give forth), is a notice publicly given of anything of which the sovereign thinks proper to advertise his subjects. By the law of England, the issuing of proclamations is an exclusive prerogative of the crown, and they are binding upon the subject, where they do not either contradict existing laws or tend to establish new ones, but only to enforce those already in existence. Royal proclamations are of several kinds. Some are merely authoritative promulgations of matters of state, or of acts of the executive government, which it is necessary to make publicly known; others declare the intention of the crown to exercise some prerogative, or to enforce the execution of some law.

**Proctor**, *prok'-tor* (Lat. *procurator*, from *pro*, for, and *cura*, care), in Law, in a general sense, denotes one who is commissioned to manage the affairs of another; but it is strictly applied to those who, in the Ecclesiastical and Admiralty courts, conduct the business of their clients, as attorneys and solicitors in the other courts. Recent acts of parliament have taken away the exclusive rights of this body and opened up to barristers, attorneys, and solicitors the practice of the Ecclesiastical and Admiralty courts. (For proctors in the universities, *see* Oxford and Cambridge.)

**Procurator Fiscal**, *prok-u-rai'-tor*, is the public prosecutor in the inferior or sheriff courts in Scotland, under the instructions of the lord-advocate, who is the principal public prosecutor.

**Profit**. (*See* Political Economy.)

**Prognosis**, *prog-no'-sis* (Gr. *pro*, before; *gignosko*, I know), in Med., is the opinion formed respecting the future course of a disease from particular symptoms; as how long it is likely to continue; whether it is likely to terminate in recovery or in death, &c. In one sense, it is not essential to the treatment of the disease, because it relates only to the future; but its value is often great as it affects the civil and domestic relations of the patient himself. It demands great skill and experience, and even the most skilful, however anxious to allay the fears and anxieties of the patient and his friends, require to speak on such subjects with caution, for no human sagacity can anticipate the numberless influences for good or evil that may come into play during the course of a disease. The principal sources from which the elements of prognosis may be derived are; (1) the disease itself; (2) the peculiarities of the patient; and (3) the external influences modifying both of the foregoing.

**Programme**, *pro'-grim* (Gr. *programma*, a public proclamation), the syllabus or outline of any entertainment, public address, or ceremony. Although now used, however, in this general sense, it was formerly only a university term, applied to an outline of the orations to be delivered on a particular occasion.

**Prohibition**, *pro-hib-tish'-un* (Lat.), in Law, is a writ to prohibit a court and parties to a cause then depending before it, from further prosecution thereof. This writ issues properly only out of the court of Queen's Bench; but in certain cases it also issues out of the courts of Chancery, Exchequer, and Common Pleas; and is addressed to any inferior court of common law, or to the courts of the counties palatine, to the county courts, or courts baron, or to the courts Christian or Ecclesiastical, the university courts, the court of Chivalry, or the court of Admiralty, where they concern themselves with any matter not within their jurisdiction, or where they transgress the bounds prescribed to them by the laws of England. The party aggrieved in the court below applies to the superior court, setting forth the nature and cause of his complaint; and this used formerly to be done by filing, as of record, what was called a suggestion, containing a formal statement of the facts; but now (by 1 Wm. IV. c. 21) an application for a writ of prohibition may be made by affidavit only; that is, in the way of an ordinary motion, by a rule to show cause; upon which, if the matter alleged appear to the court to be sufficient, the writ of prohibition immediately issues, commanding the judge not to hold, and the party not to prosecute, the plea.

PROJECTILES, THEORY OF, *pro-jek'-tils* (Lat. *projicio*, I throw forward). — A projectile is a heavy body which is thrown or driven by an impelling force from the surface of the earth, and acted on by gravity and the resistance of the air. Examples of projectiles are a stone thrown from the hand, a bullet from a gun, &c. The theory of projectiles is a part of high mechanics, and very important in the study of the science of gunnery. Projectiles may move either perpendicularly, horizontally, or obliquely, and, as stated above, are acted upon by the force of projection and the force of gravity; the path which they describe must, therefore, depend upon the ratio of these forces. The resistance of the air must also be taken into account. When the direction of the impelling force is perpendicular, the path of the projectile is a straight line. Gravity causes the motion to be accelerated when the direction is downward; but when the direction is upward, the motion is retarded and finally destroyed, at which point the projectile falls by its gravity alone. When a projectile passes in a horizontal or oblique path, so that the direction of the projecting force forms an angle with the force of gravity, a curvilinear motion is the result; and, according to Galileo's discovery of the laws of falling bodies, the path of the projectile, setting aside the resistance of the air, is a parabola. The theory of the parabolic motion of projectiles, in which they are supposed to move in a non-resisting medium, is based upon principles deduced from the law of Galileo. The resistance of the air is, however, of great importance, and the problem to determine its effect was first solved by the Prussian general Georg Friedrich von Tempelhoff.

PROLEGOMENA, *pro-le-gom'-e-nă* (Gr.), in Lit., are preliminary observations prefixed to a book or treatise, serving as an introduction, and with the view of enabling the reader the better to understand the book, or to enter deeper into the science.

PROLOGUE, *pro'-log* (Gr., from *pro*, before, and *logos*, discourse), in dramatic poetry, is a short poem or address, sometimes prefixed to plays, explaining the subject of the piece, and not unfrequently apologizing for the shortcomings of the poet. Among the ancients, the player who delivered this address was called the *prologus*.

PROMISSORY NOTE, *prom'-is-so-re* (Lat. *promissum*, a promise), is a promise, in writing, made by one person to pay another, absolutely and unconditionally, a certain sum of money at a time specified. It is rarely made payable only to the person named therein, but also to order or bearer, by which it becomes negotiable. The person who grants the note is called the maker; the person to whom it is payable, the payee, who becomes the indorser, when he negotiates it by indorsement; and the person to whom it is transferred is the indorsee.

PRONOUN, *pro'-nown* (Lat. *pro*, for, and *nomen*, a name), in Gram., is the name given to a class of words which are used as substitutes for the names of persons and things. Pronouns are of several kinds; personal relative, demonstrative, &c. Personal pronouns indicate directly a person or thing,—as I, thou, it; demonstrative pronouns relate to a present subject,—as this, that; relative refer to some subject previously mentioned,—as who, which, that; interrogative ask a question,—as who? which? what? possessive indicate possession,—as mine, thine, his.

PROOF. (*See* EVIDENCE.)

PROPAGANDA, *prop-a-găn'-dă* (from Lat.), is a designation given to those institutions by which Christianity is propagated in heathen countries; but is more particularly applied to certain institutions established by the papacy for the extension of its religion and power throughout the world. The Propaganda, strictly so called, or *Congregatio de propaganda Fide* (Congregation for propagating the Faith), was founded at Rome in 1622, by Gregory XV., having for its object the extension of the Catholic faith and the extirpation of heretics. It consists of a board of cardinals, and has a secretary, who is generally a bishop or archbishop, and a number of priests, adjuncts, and under-secretaries, who meet for consultation weekly. The cardinal prefect of the propaganda is the pope's representative in all matters relating to foreign missions. In 1627, Pope Urban VIII. added to the congregation a college for the education of priests for the missionary work; and here young men from all parts of the world (except Catholic countries) are educated. Connected with the Propaganda is a printing establishment, celebrated for the number of works in different languages which it has sent out.

PROPELLER, *pro-pel'-ler* (Lat. *pro*, forward; *pello*, I drive).—In Mech., the term signifies an arrangement by which motion is given to a carriage bearing a portion of the working gear required to traverse regularly in a horizontal direction. The term is also very generally applied to a peculiar mechanism set in motion by some mechanical power in vessels or ships, which causes them to advance by the resistance of the water itself. Oars and sails were the only propellers used before the steam-engine was applied to purposes of navigation. The use of wheels bearing floats, working in the water by the side of the boats to which they were attached, had been known for a very long period; but it was not till the steam-engine was applied as a motive power to them that they became generally used as propellers. The majority of steamboats at the present day, whether intended for still water or the deep-sea packet service, are provided with paddle-wheel propellers. When paddle-wheels are used as propellers, they are placed upon a horizontal shaft or axis, and in front of the centre of gravity of the vessel. There does not, however, seem to be any uniformity amongst steamboat-builders as to the exact position of these parts of the machinery. The screw-propeller has occasionally been used for many years; but it was not till 1836, when the *Archimedes* was built by Mr. Smith, that the use of the screw became sufficiently understood to allow of its being commercially applied. The practical difficulties of the application of this kind of propeller were first overcome, however, by Captain Ericsson. In all ordinary deep-sea goods traffic, and in steam transport on canals and narrow rivers, this kind of propeller will ultimately supersede all others used for a like purpose. For war vessels, the sheltered position of the screw and of the engines gives that description of propeller an incomparable advantage over the exposed engines and wheels of those vessels which are propelled by paddles. Most of the screws used in the merchant service are made of cast iron, and are cast solid. In the Royal Navy they are frequently made of brass. The forms of the screw-propeller vary very greatly. The late Mr. Brunel, in conjunction with Mr. Scott Russell, in making the *Great Eastern*, tried the experiment of uniting both the paddle-wheel and the screw propellers.—*Ref.* Tredgold on the *Steam-Engine*; and Bourne's *Screw-Propeller*, and *Treatise on the Steam-Engine*.

PROPERTY-TAX. (*See* TAXATION.)

PROPHECY, *prof'-e-se* (Gr. *propheteia*, from *prophemi*, I predict), is defined to be "a knowledge and manifestation of secret things, which a man knows not from his own sagacity, nor from the relation of others, but by an extraordinary revelation of God from Heaven." It is thus generally and properly restricted to those predictions which are to be met with in the Sacred Scriptures. In Hebrew, the word translated prophet properly signifies inspired, and a prophet was, therefore, one who spoke by Divine inspiration. The principal function of the prophets of the Old Testament was to keep up the intercourse between God and his people; and hence their prophecies are frequently called the words of Jehovah. They announced the will of God towards his people, directed them on the right path, reproved their iniquities, and pointed out to them in the future the consequences of their transgressions. The language in which they predicted future events is necessarily in general obscure, for their object was not to gratify human curiosity with respect to the future, but rather to give weight to their teaching, so that when the time of their fulfilment came, people might know that their inspirations were of God. The ways by which the Deity made known his will were various; as by dreams, visions, angels, symbolic representations, impulses on the mind. Many writers, especially within the last hundred years, have attempted to explain away the divine character of the prophecies, by attributing them to a high degree of religious enthusiasm and ecstasy, or a kind of spiritual clairvoyance. Others, again, as Dr. Williams in the "Oxford Essays

and Reviews," deny their prophetic character, and maintain that the very few cases that can claim to be strictly prophetic "tend to melt, if they have not already melted, in the crucible of free inquiry," leaving only certain "deep truths and great ideas." These views, however, are rejected by the great majority of theologians, who maintain that it is contrary to the plain intent of the Old Testament, and opposed by the testimony of Christ and his apostles in the New. "The very course of history," says Tholuck, "has impressed upon these declarations the stamp and confirmation of an objective and supernatural inspiration." The great prophetic era extends from the time of Samuel to the Baylonian captivity, during which time hardly an important event happened in which they do not appear as performing a leading part. Schools of the prophets are mentioned as existing in various places, and Samuel, Elijah, and Elisha, as principals of such institutions; their pupils being frequently designated the "sons of the prophets." About a hundred years after the return from the Babylonian captivity, the prophetic profession ceased, and Haggai, Zechariah, and Malachi are uniformly mentioned by Jewish tradition as the last of the prophets. The New Testament mentions the power of prophecy as one of the gifts of the Holy Spirit, and the Book of Revelation bears a marked prophetic character.

PROPHETS, BOOKS OF THE, *prof'-ets*, form an important part of the Old Testament Scriptures. The Jews included in this class the books of Joshua, Judges, Samuel, and Kings, but excluded the book of Daniel, as he did not strictly belong to the class of the prophets. Modern biblical critics, however, exclude these four books, and include that of Daniel. They are divided into the four great and twelve minor prophets; the former being Isaiah, Jeremiah, Ezekiel, and Daniel; the latter, Hosea, Joel, Amos, Obadiah, Jonah, Micah, Nahum, Habakkuk, Haggai, Zechariah, Zephaniah, and Malachi.

PROPORTION, *pro-por'-shun* (Lat. *proportio*), in Math., is the equality of two ratios. There are two methods by which the comparison of two magnitudes may be effected. First it may be determined by how many units one is greater than the other (*difference*); secondly, one magnitude may be taken as the measure of the other, and it may be determined how many times it is contained in it (*quotient*). The former relation is called an *arithmetical proportion*, and the latter a *geometrical proportion*. In the arithmetical proportion, the difference, and in the geometrical, the quotient, are called the *ratio* of the proportion. Each proportion consists of four terms,—two *extremes* and two *means*. In every arithmetical proportion the sum of the extremes is equal to the sum of the means; and in every geometrical proportion the product of the extremes is equal to the product of the means. Thus in an arithmetical proportion either extreme or mean can be found by subtracting the given extreme or mean from the sum of the given means or extremes; and in a geometrical proportion by dividing the product of the means or extremes by the given extreme or mean.

PROPOSITION, *prop'-o-zish'-un* (Fr., from Lat. *propositio*), in Log., is a part of an argument in which some quality, either negative or positive, is attributed to a subject. It consists of two terms, the one that of which we affirm or deny, called the subject, the other the thing affirmed or denied, called the attribute, or predicate. These two are either joined or separated by the intervention of some copula or disjunctive. Thus, in the proposition, God is just, *God* is the subject, *just* the attribute, and *is* the copulative. A syllogism consists of three propositions,—major, minor, and conclusion.

PROROGATION. (*See* PARLIAMENT.)

PROSCENIUM, *pros'-se-ne-um* (Gr. *pro*, before, and *skene*, a scene).—This term is at present applied to the frontispiece or part in a theatre where the drop-scene separates the stage from the audience, and beyond the orchestra; but in the ancient theatre it comprised the whole of the stage.

PROSE, *prōze* (Fr.).—All literary composition belongs to one or other of the two great classes of prose or poetry. As to what constitutes the distinction between the two, writers are by no means agreed. Many





contend that the difference lies in the form, and that metre is essential to poetry; others, that it is in the character; and that in poetry the imagination and feelings prevail, while prose is mainly addressed to the understanding. The distinguishing feature of poetry is not the metre but the character or style. Poetry deals with the emotions, prose with the reason and understanding.

PROSELYTE, *pros'-e-lite* (Gr., a stranger, new-comer), is one who changes his religion, giving up one and adopting another. The term is not classic Greek, but it occurs in the New Testament and in the Septuagint, and was used almost exclusively among the Jews. They distinguished two kinds of proselytes,—the proselytes of the gate and the proselytes of justice or righteousness. The former feared and worshipped the true God, without adopting circumcision or any of the other ceremonies of the law. They were allowed to dwell in the land of Israel, and through holiness might have hope of eternal life. The latter received circumcision and observed the whole law of Moses, and were admitted to all the prerogatives of the people of God.

PROSODY, *pros'-o-de* (Gr. *prosodia*, accent).—The word *prosody*, although originally merely signifying accent, now includes not only the doctrines of accent and quantity, but also the laws of metre and versification. If we take the first words of the sentence here written, count the syllables, and note those that are accented (the word prosody is derived from a Greek word signifying accent), we find that there is no regularity in the recurrence of the accent; whilst if we take the same course with the following line,—

"The way was long, the wind was cold,"

we find that every second syllable is accented. Now, the extract where there was no regularity in the recurrence of the accent was prose; and the line in which the accent recurred at regular intervals is metrical; metre being a general term for the recurrence, within certain intervals, of syllables similarly affected. The syllables in the above-quoted line are similarly affected, being similarly accented. At the same time, accent is not the only quality of a syllable which, by its periodic return, can constitute metre, the classical grammarians determining the character of their metre not by accent, but by *quantity*. The metres wherein quantity plays its chief part are those of the Latin and Greek languages; and to define what quantity was in languages the proprietors of which have long since passed away, is somewhat difficult, from the fact that not only were there fifteen vowel sounds represented by six letters, but that each of these was again susceptible of one of the three accents,—the acute, the grave, or the circumflex. The matter may be thus briefly explained. There is a difference between the length of *vowels* and the length of *syllables*. The vowel in the syllable *see* is long; and long it remains, whether it stand as it is or be followed by a consonant, as in *seen*; or by a vowel, as in *see-ing*. The vowel in the word *sit* is short. Followed by a *second* consonant, it still retains its shortness; *e.g.*, *sits*. Whatever the comparative length of the syllables *see* and *seen*, *sit* and *sits* may be, the length of their respective *vowels* is the same. Now, if we determine the character of the syllable by the character of the vowel, all syllables are short wherein there is a short vowel, and all are long wherein there is a long one. Measured by the quantity of the vowel, the word *sits* is short, and the syllable *see* in *seeing* is long. But in the eyes of a classical scholar, the *see* (in *seeing*) is short, and in the word *sits* the *i* is long; for he measures his quantity not by the length of the vowel, but by the length of the syllable taken altogether. To a Roman, the word *monument* consists of two short syllables and one long one; to an Englishman, it contains three short syllables. Another subject which comes within the consideration of prosody is *rhyme*,—unknown or neglected by the Ancients,—which is the correspondence of sounds in the terminating words or syllables of two verses, one of which succeeds the other immediately, or at no great distance. A full and perfect rhyme consists in the recurrence of one or more final syllables equally and absolutely accented, wherein the vowels and the parts following the vowel shall be identical, whilst the parts preceding the vowel shall be artic-

lately different. Rhymes may consist of a single syllable, as *told, bold;* of two syllables, as *water, daughter;* of three, as *cheerily, wearily.* The rhyme begins where the dissimilarity of parts, immediately before the main vowel, begins. Then follows the vowel, and, lastly, the parts after the vowel, the latter of which must be absolutely identical. Syllables may be similar in their sound, and yet fail in furnishing full, true, and perfect rhymes; as in the case of *eye* and *I;* whilst, on the other hand, there may be rhymes only to the eye—in the case of words where the letters coincide, but the sounds differ; as in the case of *cease* and *ease* (eaze). If, however, the sounds coincide, the difference of the letters is unimportant; and thus, according to the laws of prosody, *rules* is a good rhyme to *fools. Rhythm* and *metre* are also subject to the rules of prosody, and each may be thus defined or explained. *Metre* is an arrangement of syllables and *feet* according to certain rules, and, in this abstract and general sense, comprehends indiscriminately either an entire verse, a part of a verse, or any number of verses. But a metre, in a specific sense, means a combination of two *feet*, and sometimes only one *foot* (a *foot* in poetry signifying a certain number of syllables constituting a portion of a line of poetry). Rhythm, however, respects the *time* only, and is a general name, expressing the proportion that subsists between the parts of time employed in the pronunciation of different feet, the least division of which is that which is employed in the pronunciation of a short syllable. Finally, we may observe that *blank* verse is poetry without rhyme; that *heroic* verse usually consists of ten syllables, or five feet, containing each an accented syllable, and one or two unaccented ones; and that *alliterative* verse is a kind of verse in which two successive lines usually commence with the same initial letter, or in which two words in the first line of each couplet, and one in the second, begin with the same letter; this kind of verse being an especial characteristic of Anglo-Saxon and Scandinavian poetry.

**Prosopis,** *pro-so'-pis* (Gr. *prosopon,* a mask), in Bot., a gen. of the nat. ord. *Leguminosæ,* sub-ord. *Mimoseæ.* The legumes of *P. pallida* and some other South-American species are remarkable for their astringency, and have been successfully employed for tanning. In commerce they are known under the names of *algaroba* and *algarobilla.* From the fruit of *P. algaroba* a drink called *chica* is prepared. The name *chica* was first given to a fermented drink prepared from the maize; but it is now used in South America as a common term for several intoxicating liquors.

**Protaceæ,** *pro-te-ai'-se-e* (after the Gr. divinity Proteus), the *Protea* fam., a nat. ord. of *Dicotyledones,* sub-class *Monochlamydeæ.*—Shrubs or small trees, with exstipulate leaves and perfect flowers. Calyx inferior, 4-partite, or consisting of 4 sepals; æstivation valvate. Stamens perigynous, equal in number to the divisions of the calyx and opposite to them; anthers bursting longitudinally. Ovary simple, superior, 1-celled, with one or more ovules, ascending. Fruit dehiscent or indehiscent. Seeds exalbuminous, with a straight embryo and an inferior radicle. The plants of this order are chiefly natives of Australia and the Cape of Good Hope, and are generally remarkable for the beauty or singularity of their flowers, and their rich evergreen foliage. The wood of *Protea grandiflora* is used at the Cape for waggon-wheels; hence the plant is called by the Dutch settlers *wagenboom.* The number of genera is 46; of species, 650.

**Protectionists,** *pro-tek'-shun-ists,* in the political history of this country, is a name given to a section of the Conservative party which opposed the repeal of the corn-laws. A society established for the "protection of agriculture," as a counteractive of the "Anti-Corn-law League," gave rise to the name of this party. They separated from Sir Robert Peel in 1846, and their leader, till his death in 1848, was Lord George Bentinck. The society was dissolved in 1853.

**Protein,** *pro'-te-in* (Gr. *proteno,* I am first), a peculiar yellowish, horny, semitransparent substance, produced by neutralising an alkaline solution of any albuminoid compound; such as albumin, fibrin, or casein. According to Mulder, the substance produced from either of these bodies is identical in composition, and he therefore looks upon it as the fundamental principle of the group, giving rise to albumin, fibrin, casein, globulin, vitellin, and legumin, by uniting with various proportions of sulphur and phosphorus. Liebig, and many other chemists of great renown, deny the correctness of this view, and assert that no such body as protein exists. Gerhardt, and some others, consider the so-called protein group as being compounds of a single principle, which presents the character of a weak acid, with various bases and saline bodies. Neither of these hypotheses has as yet been proved to be true; and, in the present state of chemical science, these bodies must be looked on as distinct substances, which are convertible into each other by vital processes taking place in the living organism. The substance obtained by Mulder's process is destitute of taste and smell, insoluble in water, alcohol, and ether, and soluble in the alkalies, which dissolve it on the addition of an acid, re-precipitating it without alteration. The mineral acids cause it to swell up and form a jelly, which retains a portion of the acid employed.

**Protest,** *pro'-test* (Lat. *protester*), is a solemn declaration of opinion usually against something, and is commonly a formal and solemn declaration, in writing, of dissent against certain proceedings, as by a minority of any body against the proceedings of a majority. The paying money, performing a duty, &c., under protest reserves to the protestor his right of recovery, and frees him from other consequences of his act. If a vessel be wrecked or meet with other injury from any peril of the sea, the master, on his arrival at port, appears before a notary public and enters his protest, *i. e.* details the circumstances that occasioned the damage, and protests that it did not arise through his misconduct or neglect. A foreign bill of exchange, if not accepted, or if not paid when at maturity, must be protested, in order to hold all the parties to it; and inland bills are often protested in the same way.

**Protestant,** *prot'-es-tănt,* is a general name applied to all classes of Christians except the Roman Catholic and the Eastern churches. The name originated in Germany in 1529, when at the diet of Spire the reformed party protested against a decision of the majority that no changes should be introduced into the doctrine, discipline, or worship of the established religion till a council should be held and its determination made known. They protested against the authority of secular or ecclesiastical boards to compel obedience in matters of faith. The total number of Protestants in the world is estimated at eighty-eight millions.

**Proteus,** *pro'-te-us* (after Proteus, the ever-changing sea-god), one of the genera of those *Batrachides* which preserve their branchiæ throughout life, and which are the sole vertebrated animals that are truly amphibious. The proteus has four feet; there are three toes on the anterior feet, and two only on the posterior feet. The skeleton bears considerable resemblance to that of the salamander; but the proteus has many more vertebræ than the salamander, and less of the rudiments of ribs; and its bony head is entirely different from theirs in its general conformation. But one species appears to be known,—the *Proteus anguineus,* which is described by Cuvier as more than a foot long, of the size of a human finger, with a tail vertically compressed, and four little *legs;* the muzzle elongated and depressed; both of its jaws furnished with teeth; tongue with but little motion, but free in front; eyes excessively small and hidden by the skin, as in the rat-mole; the ears covered by the flesh, as in the salamander; its skin smooth and whitish. At first view, the animal might be supposed to be a lizard; but it has the motions of a fish. Its head and the lower part of its body and tail bear a strong resemblance to those of the eel; but it has no fins, and its branchial organs form a curious vascular structure, almost like a crest round the throat, which, as the animal is likewise furnished with lungs, may be removed without occasioning its death. Its fore-feet resemble hands, but they have only three claws or fingers, and are too feeble to be of use in grasping or supporting the weight of the animal; the hinder feet have only two claws or toes, and in the larger specimens are found so imperfect as to be almost obliterated. It has small points in place of eyes, as if to preserve the analogy of nature; its two nasal organs, however, are large, and as it is about

dantly furnished with teeth, it may be concluded that it is an animal of prey, although, in their confined state, they have never been known to eat, and have been kept alive for many years by merely changing the water in which they have been placed. They were first discovered by a Baron Zöig in subterranean pools in Illyria.

PROTOCOCCUS, *pro-to-kok'-kus* (Gr. *protos*, first; *kokkos*, berry), in Bot., a gen. of *Algæ*, including several species, which are remarkable for imparting colours to water, snow, &c. *P. atlanticus* gives a red colour to certain portions of the Atlantic; *P. viridis* gives a green tint to snow, and *P. nivalis* a red colour. The blood-red stains produced by the development of the last-named plant are regarded with terror by the superstitious inhabitants of alpine regions. The plants of this genus are all microscopic.

PROVENÇAL POETRY. (*See* FRENCH LANGUAGE AND LITERATURE.)

PROVERB, *prov'-erb* (Lat. *proverbium*, from *pro*, and *verbum*, a word), is a short pithy saying embodying some well-known truth. According to Erasmus, "a proverb is a well-known saying, remarkable for some elegant novelty;" and Cervantes describes it as being "a short sentence drawn from long experience." Proverbs, the traditionary wit and wisdom of antiquity, are perhaps as oft as any species of writing known to us. Aristotle regarded proverbs as remnants of an ancient philosophy saved from the ruin which had overtaken the rest of the system by their elegance and brevity. Aristotle, Theophrastus, Chrysippus, and others, according to Laertius, made collections of proverbs; and with the works of Plutarch a collection of 181 proverbs with explanations are given. Cicero made frequent use of proverbs from the Greek. Zenobius and Diogenianus, who lived in the 2nd century, made collections of proverbs; the former 552, the latter 775. Michael Apostolius of Byzantium, who lived about the middle of the 15th century, collected two thousand ancient proverbs, which were printed at Leyden 1653. Since that time numerous collections of proverbs of different countries have been published. Spain is celebrated above any other country for the number, originality, and elegance of its proverbs. The best collection is that of Repulles in 6 vols., containing in all about 30,000. John Ray, the naturalist, published in 1670 his collection of English proverbs, with a number belonging to other countries; and a valuable collection was also published by Oswald Dykes in 1708. Ray's work has frequently been reprinted, and recently with additions by H. G. Bohn in his Antiquarian Library, under the title of "A Handbook of Proverbs." Scotland ranks perhaps next to Spain in the number and elegance of her proverbs. Kelly, who flourished in the beginning of the 18th century and made a collection of Scottish proverbs, boasts that while Ray had only been able to gather about 1,000, he had been able to collect 3,000. The most recent collection of Scottish proverbs is by Alexander Bishop (1861), amounting to about 4,500.

PROVERBS OF SOLOMON is one of the sacred books of the Old Testament, ascribed to Solomon. The Hebrew term translated proverbs means literally a similitude or comparison of two objects, and this is the form that most of them take. Solomon, we are told, uttered 3,000 proverbs; but it has been doubted whether he ever made any collection of them in writing; and it is expressly stated that the latter part of the book, beginning with chapter XXV., was written and added by order of king Hezekiah. The title shows the author rather than the compiler. It has hardly ever been contended that a large share in the composition of the book is to be ascribed to the wise king; and the divine authority of the book is sufficiently proved by the quotations made from it in the New Testament. In all ages this book has been regarded as a great storehouse of practical wisdom. It naturally divides itself into several parts. The first seven verses of the first chapter may be regarded as a heading to the rest of the book. Then begins the first part, which constitutes a sort of proem or exordium, and closes with the end of the ninth chapter. It may be described as a series of connected admonitions in a sententious form, written in the highest style of poetry, and adorned with apt, beautiful, and striking illustrations. Wisdom in here personified with indescribable majesty and grace, the love of her inculcated, and her rewards set forth, together with the pernicious consequences that follow her rejection. The second part, which constitutes the chief portion of the book, and is the strictly proverbial portion, extends from ch. x. to xxii. 16. The proverbs, about 400 in number, contain moral precepts and rules of life for every age and class of men, in a clear, sententious form. Generally, one proverb is comprised in one short verse of two members or clauses, forming a parallel opposition to each other. Except in a few cases, the grouping appears to be accidental. "They may be compared to so many jewels put together without any visible order or connection, but each shining with its own peculiar beauty; a beauty which is increased rather than obscured by this apparently accidental association of one with another." With ch. xxii. 17, a kind of appendix begins, introduced by a separate heading. The proverbs of this section generally consist of two verses, and sometimes of three, are constructed with less regularity, and often without any parallelism. A second appendix begins at ch. xxiv. 23, denoted by the heading, "These things also belong to the wise." The second main collection begins with ch. XXV., introduced with the heading "These are also proverbs of Solomon, which the men of Hezekiah, king of Judah, copied out." The proverbs here, as in the former part, generally consist of one verse of two parallel opposing members; but they are less plain and intelligible, and frequently obscure. They extend over five chapters. The thirtieth chapter contains the words of Agur, and the thirty-first the counsels addressed to king Lemuel by his mother. Who these persons were is not known. That Lemuel is another name for Solomon is a conjecture that has little of probability to support it.

PROVIDENCE, *prov'-i-dens* (Lat. *providso*, I see before), in Theol., denotes not merely foresight, but rather the superintending care with which God watches over his whole creation, more particularly the human race. This universe constantly depends upon the Deity for its conservation, as it did at first for its creation. The arguments, therefore, for a providence are similar to those for the existence of the Deity, and are derived from the order which we find to prevail in all parts of the material universe, and the adaptation of means to ends. Providence also interposes in human affairs in a manner which is quite unintelligible to us. Various divisions of providence are adopted; as general, common or ordinary, that by which God governs and sustains the world; special, which regards the church; particular, which is exercised for the benefit of individuals.

PROVINCE, *prov'-ins* (Fr., from Lat. *provincia*, usually supposed to be formed from *pro*, and *vinco*, I conquer), in Geog., a division of a kingdom or state, comprising several cities, towns, and districts, all under the same government, and usually distinguished by the extent either of the civil or the ecclesiastical jurisdiction. A province, amongst the ancient Romans, was a district of conquered country, governed by a pro-consul or pro-prætor, and called, therefore, provincia consularis or prætoria. But this name was only applied to lands lying beyond the boundaries of Italy. In the time of Augustus, they were divided into the provinciæ senatoriæ or populares (the people's provinces), and the provinciæ imperatoris (the emperor's provinces). The latter comprised those that were most exposed to hostile inroads, and the administration of which was left entirely to the emperor. In modern times, the term has been applied to colonies, or to dependent countries at a distance from the metropolis, or to the different divisions of the kingdom itself. Thus, the Low Countries belonging to Austria and Spain were styled provinces; and the different governments into which France was divided previously to the Revolution were also called provinces. The word province is also used in reference to ecclesiastical affairs. The Church distinguishes its provinces by archbishoprics; and in this sense England is divided into two provinces; namely, Canterbury and York.

PROVOST, *prov'-ost* (Sax. *profost*; Lat. *præpositus*, placed before), is the name given to the chief municipal magistrate in the cities and corporate towns of Scotland, corresponding to the mayor in English towns. In England the term is rarely used, except as applied to

the heads of certain colleges,—as King's College, Cambridge, Eton, &c. Provost-marshal is the title of a military officer whose duty it is to attend to offences committed against military discipline, to bring the offenders to punishment, and to see that the sentences passed upon them are executed. In the navy, this officer has the custody of prisoners at a court-martial, and till the execution of the sentence of the court.

PROXY, *proks'-e* (Lat. *proximus*, nearest or next), is a person appointed instead of another to represent him. A peer is entitled to vote by proxy, but not a member of the House of Commons. The stamp duty on a proxy to vote at a meeting of a joint-stock company is reduced to 6*d*. by 19 & 20 Vict. c. 81.

PRUNUS, *pru'-nus* (Lat.), in Bot., the Plum, a gen. of the nat. ord. *Rosaceæ*, sub-ord. *Amygdaleæ* or *Drupaceæ*. The species *P. domestica* and its varieties produce the well-known fruits called plums, greengages, and damsons; *P. spinosa*, the common sloe or black-



PLUM.



DAMSON.

thorn, is a true native of Britain; *P. institia* is the bullace; *P. Armeniaca* the apricot. The bark of *P. spinosa* has febrifugal properties; the leaves are sometimes used to adulterate China tea. It is said that a mixture of sloe-leaves and the leaves of *Fragaria collina* or *F. vesca*, in the proportion of one-third of the former to two-thirds of the latter, forms a really good substitute for black tea. Plums, when dried, are termed *prunes* or *French plums*.

PRUSSIC ACID. (*See* HYDROCYANIC ACID.)

PSALMODY, *sam'-o-de* (Gr. *psalmos*, the art of singing psalms), in its widest sense is applied to sacred hymns or psalms set to music and sung; but is commonly restricted to the metrical versions of the Psalms of David. The practice of psalm-singing may be traced at least to the time of our Saviour; for we are told that after the last supper he and his disciples "sung an hymn," or "psalm" as the margin has it. For centuries afterwards it formed a regular and important part of divine service. About the 4th century the psalmistæ were instituted, an inferior order of the clergy, whose duty seems to have been to encourage and regulate the practice of psalmody. By degrees a more refined and scientific mode of singing was introduced, and the great body of the people were incapable of taking part in the performance. Trained performers thus came to conduct the whole of the musical service of the Church. One of the results of the Reformation was to restore to the people their share in this service. Metrical versions of the Psalms were made in various languages, and tunes were composed or adapted to them. Luther in particular was distinguished for his efforts in this way, and himself composed and adapted many psalm tunes. The first fifty psalms were translated into French verse by Clement Marot, and being adapted to popular airs, became exceedingly fashionable, and the singing of psalms became a favorite amusement at the court. Beza subsequently completed the translation of the Psalms, melodies being chiefly by Claude Goudimel and Claude de Jeune, native composers, though, according to some, they were chiefly German. About the time of Marot's publication appeared the English translation of the Psalms by Sternhold and Hopkins, to which were adapted many of the best German and French tunes. Subsequently Thomas Ravenscroft, John Playford (whom Sir John Hawkins considers as "the father of modern psalmody"), Dr. Croft, Handle, Miller, and others, made valuable additions to English psalmody; and in 1696 the version of Tate and Brady took the place of that of Sternhold and Hopkins. Recently the number of psalm tunes has increased almost beyond calculation.

PSALMS, *sams* (Gr. *psalmoi*, from *psallo*, I strike lightly, and hence play on a stringed instrument), is the name of one of the canonical books of the Old Testament, comprising a copious collection of sacred songs. They are usually styled the "Psalms of David;" and though he was doubtless the largest and most eminent contributor, there are many that were clearly composed by different hands, and at very different periods. To David are ascribed seventy-three psalms in the Hebrew text, and at least eleven others in the Septuagint. There can be little doubt, however, that some, even of those that bear his name, belong to a later date; and on the other hand, the contents and style of some that do not bear his name show him to have been the author. The other authors, to whom certain of the psalms are ascribed, are Asaph, one of David's chief musicians, 12; the sons of Korah, another family of choristers, 11; Heman and Ethan, two of the chief singers, 1 each; Solomon, 2; Moses, 1. Some of these, however, evidently do not belong to the time at which their reputed author lived. David's compositions are generally distinguished by sweetness, softness, and grace, and his prevailing style is plaintive. The date of the Psalms ranged from the time of Moses to that of the Captivity, a period of nearly 1,000 years; and the collection as it at present stands was probably formed by Ezra and his contemporaries. Particular collections, however, must have existed as early as the time of David, and the singers who were appointed by David for the service of the sanctuary sang psalms. In the time of Hezekiah, the Psalms of David and Asaph were sung at religious solemnities; and the same is recorded to have taken place in the second temple after the captivity. The Book of Psalms is, according to the analogy of the Pentateuch, divided in Hebrew into five books, each of which closes with a doxology. Various classifications, more or less arbitrary, have been proposed of the Psalms. According to De Wette, they may be arranged as follows:—(1) Hymns in praise of God, as the Creator, Preserver, and Governor of the world, and, in particular, as the Protector of his chosen people.—(2) National psalms, referring to the history of the people, and the many favours which, in former times, they had received from Jehovah, especially in the time of Moses.—(3) Psalms of Zion and of the temple.—(4) Psalms relating to the king, in which he is held up as the representative of Jehovah, and the assistance of God invoked for him.—(5) Psalms containing the supplications and complaints of the pious in distress.—(6) Religious and moral psalms. This division, however, is too complex and indefinite for practical purposes. Tholuck divides them, according to their subject-matter, into songs of praise, of thanksgiving, of complaint, and of instruction. The inspiration and canonical authority of the Psalms are established by the most abundant and convincing evidence, and in every age of the Church they have been extolled for their excellence and their use for pious purposes. On account of its beauty and significance, this book has called forth a greater number of commentaries than any other. In particular is the theological literature of Germany rich in works of this class; among which we may mention De Wette, Hitzig, Hirzel, Ewald, Hengstenberg, Delitzsch, and Hupfeld.

PSEUDONYMOUS, *su-don'-e-mus* (Gr. *pseudos*, false, and *onoma*, a name), in Lit., is applied to an author who publishes a work under a false or feigned name, and also to the work itself, in the same way as anonymous is applied to one who publishes a work without any name, or to the book so published. (*See* ANONYMOUS.)

PSIDIUM, *sid'-e-um* (*psidiak*, of the ancient Greeks), in Bot., a gen. of the nat. ord. *Myrtaceæ*. Various species yield excellent dessert fruits, much used in tropical countries, and known as *guavas*. The most important are *P. pyriferum*, *pomiferum*, *dulcissimum*, *albidum*, and *pygmæum*. The first of these bears fruit the size of a hen's egg, yellowish, with a peculiar smell. The rind is brittle, the pulp full of bony

seeds, flesh-coloured, sweet, and aromatic. It is commonly eaten raw in the West Indies in the dessert, and also preserved with sugar. *P cattleyanum* is considered to be one of the best of the guavas, the fruit is of a fine deep claret-colour, and the pulp in consistence and flavour bears some resemblance to the strawberry Guava jelly is imported into this country, and is much prized as a confection Guava pulp is employed in the preparation of some of the Indian chutnies or chatnies

**Psoas Muscle**, *so'-as* (Gr *psoa*, the loins), a large muscle upon the fore part and sides of the lumbar vertebræ. It bends the thigh forwards, and assists in turning it outwards

**Psychology**, *si-kol'-o-je* (Gr *psuche*, the soul, and *logos*, discourse), is the science of the soul or spiritual principle in man It deals with the laws and relations of the various changes and phenomena which take place in the mind during the intellectual operations, and traces the causes of these phenomena, in order to discover the nature of mind and its relations to the universe; or, in short, to treat the mind either as it manifests itself, or as it is in itself Investigations of the latter class, which have for their object that which cannot be discovered by observation, constitute rational or transcendental psychology, while those of the former class, in which the various manifestations of the soul are subjects of observation, constitute empirical or experimental psychology Empirical psychology may, therefore, be defined to be the scientifically conducted observation of the operations and changes of the human soul As a science, it includes all the phenomena of the intellectual activity, taking for granted the distinction of the spiritual part of man from the body, as a matter of consciousness, and therefore not attempting to explain it In this country, the science of psychology, strictly so called has not received so much attention as in some of the continental countries, particularly in Germany, where among the recent writers on this subject, are Schubert ('Geschichte der Seele'), Carus, Rosenkranz, Michelet, Beneke, Drobisch, Waitz, Fichte, &c

**Psychotria**, *si-kot'-re-a*, in Bot, a gen of the nat ord *Cinchonaceæ*. The root of *P emetica* is called *black* or *striated ipecacuanha*, and possesses similar properties to those of the officinal root (*Cephaëlis Ipecacuanha*) but is less active The roasted seeds of *P herbacea* have been used as a substitute for coffee

**Ptarmigan**, *tar'-mi-gan* (Gaelic *tarmachan*) —The ptarmigan is the smallest in size of the British grouse, and, as a British bird, is now only found on the summits of some of our highest hills, chiefly in the central and northern parts of Scotland, in the Hebrides and Orkneys, and now and then on the lofty hills of Cumberland and Wales. It pairs early in spring and lays eight or ten eggs, frequently on the bare ground, among stones, of a yellowish-white colour, sparingly spotted with light brown, and in length one inch eight lines by one



PTARMIGAN.

inch two lines in breadth Its food consists of the various species of Alpine berries, seeds, and the tender shoots of Alpine plants, and its note or call is not unlike that of the missel thrush, but rather more harsh in sound. It is found on most of the elevated mountain-ranges of the continent of Europe, even to Italy, as well as in Greenland and the northern part of North America, but is nowhere more plentiful than over all the more northern parts of Scandinavia, where it sometimes perches in such numbers in the birch-trees that the latter seem to be altogether clothed in white In comparatively temperate climates, such as that of Scotland, these birds seem to prefer the bare and stony sides or summits of the highest mountains, but in more rigorous climates, such as that of Greenland, they are chiefly found in the vicinity of the sea-shore, by the banks of rivers, and among the willow and other copse-woods of the lower and more sheltered vales A remarkable peculiarity of the ptarmigan is the difference between the colour of its plumage in winter and that which it bears in summer In the latter season, its predominant colours are speckled black, brown, or grey,—the male being of a much darker colour than the female, but in winter, the plumage of the male is almost all pure white, and that of the female quite so The male is about fifteen inches in length, and the female about an inch less The ptarmigan has been reared in confinement without difficulty, and has been known to breed in a tame state

**Pteris**, *ter'-is* (Gr *pteron*, a wing, from the resemblance of its leaves), in Bot, Brakes, a gen of ferns. *P aquilina* is the common branched fern of our woods and heaths The fronds are tripartite, annual, 1—5 feet high very much divided with spreading branches. The capsules (*sori*) are attached to the marginal vein, lying upon a fine membrane and covered by the membranous continuation of the epidermis This fern is the only British species of *Pteris*, it possesses anthelmintic properties

**Pterocarpus**, *ter-o-kar'-pus* (Gr *pteron*, a wing; *karpos* fruit), in Bot, a gen of the nat ord *Leguminosæ*, sub ord *Papilionaceæ* The species *P draco* is one of the plants that yield the *dragon's blood* of commerce This is a red resin much used for colouring varnishes and for staining marble *P dalbergioides* is said to furnish the valuable dye stuff called *Adamas red wood* *P santalinus* yields the *red sandal* or *sanders wood*, which contains a peculiar colouring matter called *santalin*, and is used in medicine as a colouring agent, and by the dyer for red and scarlet dyes The bark of *P flavus* is used in China to produce a yellow dye *P Marsupium* is the source of the officinal *kino* of our pharmacopœias, which is known under the names of *gum kino*, *East Indian*, *timboyna*, and *Malabar kino*. It is one of the most powerful vegetable astringents known *P erinaceus* a native of West Africa, yields a similar astringent substance, called *African kino*.

**Pterodactyl**, *ter-o-dak'-til* (Gr *pteron*, a wing; *daktulos*, a digit), the name of a genus of extinct flying reptiles From the fossil remains of this animal, it would appear that the second digit of the hand was of great length, and it is believed that this prolonged digit supported a wing formed expansion of the skin. In speaking of the fossils of the Solenhofen district, where the remains of pterodactyls are found, Cuvier observes that there formerly lived in that canton crocodiles, *Lamiæ*, and other animals, whose geographical distribution is now confined to the torrid zone Together with them were these flying saurians, which flitted about by means of the membrane, sustained by a single finger, suspended themselves, and perhaps crept by the aid of the other three fingers, stood upon their hind legs only, and had their enormous crocodile-shaped mouth armed with small pointed teeth, fit only for seizing insects and small animals

**Ptolemaic System of Astronomy**, *tol-e-mā'-ik*, a term applied to the ancient system of astronomy established by Claudius Ptolemy, a celebrated Egyptian astronomer, who lived at Alexandria during the reigns of Marcus Antoninus and Adrian. He is considered the first astronomer of antiquity Through him the observations and principal discoveries of the ancients were preserved and handed down. He corrected Hipparchus' catalogue of the fixed stars, and formed tables by which the motions of the sun, moon, and planets might be calculated and regulated. He was the first who collected the scattered and detached observations made by the ancients, and digested them into a system; thus he called the *Megale Suntaxis*, or Great Construction, divided into thirteen books. In this work he adopts and exhibits the ancient system of the world, which placed the earth in the centre of the universe; and this has been called from him the Ptolemaic System, to distinguish it from those of

Copernicus and Tycho Brahé. The *Megale Suntaxis* was translated by the Arabians into their language about 827, and from this translation, which bears the title of *Almagest*, a Latin version was made by command of the emperor Frederick II., in 1230. Of this principal work of the great astronomer of the ancients, it may in general be observed, that the work is founded on the hypothesis of the earth's being at rest in the centre of the universe, and that the heavenly bodies, the stars and planets, all move round it in solid orbs, whose motions are all directed by one, which Ptolemy called the *Primum Mobile*, or first mover, of which he discourses at large. This great work of Ptolemy will always be valuable on account of the observations he gives of the places of the stars and planets in former times, and according to ancient astronomers that were then extant; but principally on account of the large and curious catalogue of the stars, which being compared with modern catalogues, enables astronomers to deduce the true quantity of their apparent slow progressive motion according to the order of the signs, or of the precession of the equinoxes.

Puberty, *pu'-ber-te* (Lat. *pubertas*), is that period of life in which boyhood or girlhood ceases and youth begins. The precise period differs in different countries, being much earlier in southern than in northern climates. The usual period in this country is from the twelfth to the fourteenth year in females, and from the fourteenth to the sixteenth in males. In colder regions, as Sweden, Russia, &c., it does not occur for two or three years later. Various physiological and intellectual changes manifest themselves at this period. The organs of respiration and voice acquire their full tone, the muscles their due proportion, and the cerebro-spinal nervous system its beautiful organization. The child puts away childish things and begins to look upon the world with, as it were, new senses; the mind becomes stored with new ideas, and hope shines over the future. The changes that take place at this period render the individual liable to a variety of diseases, more particularly of an inflammatory nature.

Publishing Trade. (*See* Book Trade.)

Puccinia, *puk-sin'-e-ä* (in honour of Puccinius, a Florentine anatomist), in Bot., a gen. of *Fungi*. The only noteworthy species is *P. graminis*, which produces the mildew of wheat. To prevent the growth of this and other parasitic fungi, wheat is often steeped in some poisonous solution before it is sowed. A solution of sulphate of copper (blue vitriol) has been specially recommended for this purpose.

Puccoon. (*See* Sanguinaria.)

Puddling, *pud'-dling*, in Metall., a process for the conversion of cast iron into wrought iron. (*See* Iron, Manufacture of.)

Pudding-stone. (*See* Conglomerate.)

Puffin, *puf'-fin* (*Fratercula arctica*).—The generic characters of this singular bird, sometimes called the sea-parrot and coulternab, are, bill shorter than the head, higher than long, very much compressed; both mandibles arched, transversely grooved, notched towards the point; the culmen as high as the top of the head, and with a cutting edge. Nostrils lateral, marginal, linear, naked, almost entirely closed by a naked membrane. Legs short, abdominal. Feet with three toes only, all in front, united by membranes; claws curved. Wings and tail short. Its size is about that of a pigeon or jackdaw, with the upper parts dusky, the lower white, a broad black band round the neck; the bill red, with three grooves across each mandible. It abounds on the northern coasts of Europe and America, where it breeds in burrows formed by itself in the soil of unfrequented islands, making no proper nest. It is only a summer visitor to the British islands, making its appearance early in April, and departing by the end of August. It visits the Isle of Man, the coast of Anglesey, the high cliffs of the Isle of Wight, between the Needle Rocks and Freshwater Gate, the Yorkshire coast, the Fern Islands, many of the Scottish islands, and the Scilly Islands, which, in the 14th century, were held under the king as earl of Cornwall, by Ranulph de Blanc-minster, for an annual payment of six and eightpence, or three hundred puffins at Christmas. Early in May, these birds deposit a single large egg, sometimes in fissures and crevices on the perpendicular surface of the cliffs, at the depth of three or four feet from the front, and sometimes in burrows, for the possession of which they have previously contended with their proper owners, the rabbits. It is two inches three lines in length, by one inch and seven lines in breadth, and when first laid is white, sometimes spotted with pale cinereous, but soon becomes soiled and dirty from its contact with the earth. The young are hatched after a month's incubation, and at the end of a month or five weeks, the long blackish down with which they are at first covered having given place to the feathered plumage, they are able to follow their parents to the open sea. Soon after this, or about the second week in August, the whole leave our coasts. Puffins walk with a waddling gait, but fly rapidly for a moderate distance, and can swim and dive well. They feed on marine insects, small crustacea, and young fish. An example of the species wanders occasionally, as if by accident, to Sicily and Malta.

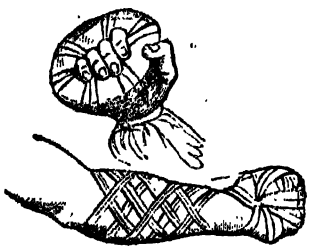
Pugilism, or Boxing, *pu'-jil-izm*, is the art of defence and attack with the hands alone, without any other weapon. In the schools and by amateurs, it is practised with the gloves; in the prize-ring with the naked fist. Man being instinctively a pugnacious animal, and the fist being the simplest and most natural weapon, it may be taken for granted that pugilism, as a mode of settling differences, is coeval with man himself. It formed one of the earliest of the athletic games of the Greeks; and we find the Greek poets describing their heroes and gods as excelling in the *pugne*. Boxing, for men, was introduced in the Olympic in the 23rd Olympiad, and for boys in the 37th Olympiad. With the exception of a girdle about the loins, the ancient pugilists fought nude, precisely after the manner of the annexed illustration, copied from the antique, and showing the fashion in which they "settled their differences." There was one



ANCIENT MODE OF BOXING.

feature, however, which bore no analogy with the pugilism of modern days; this consisted in the use of the cæstus, a weapon formed of thongs or bands of raw ox-hide tied round the hands, and frequently as high as the elbows, of the boxers. Even in its simplest and most primitive form, it was a fearful weapon enough; but when "improvements" crept in, in the shape of knobs of lead or iron, and, still later, when it assumed the form of a disc of bronze, it came to be a murderous piece of mechanism, fraught with despair and death to the less skilful fighter. Both forms of the cæstus are shown in the accompanying woodcut: the original of the circular cæstus was found at Herculaneum. As the head was exposed to great danger through the use of the cæstus, *amphotides*, or armour for the head, by which the temporal bones, arteries, and ears, were protected, were invented; altogether, they were not unlike helmets. Properly speaking, the ancient boxing appears to have had three distinct eras. In the first, practised during the heroic age, the head and hands were both naked; in the second, the heads were armed with bands of leather, while the head was left uncovered; in the third era, the head was clothed with the

amphotidæ, whilst the hand battled with the most deadly form of the cæstus. During the first and second periods,—the amphotidæ being apparently never used in the great public games of the Greeks,—the boxers stood before each other unflinchingly, he who possessed the greater skill standing on the defensive, and seeking to wear out his adversary; and the boxer who purchased victory without any wounds



THE CÆSTUS.

was held to be the better pugilist and the conqueror. Both ancient Greeks and Romans used the right arm in attacking, chiefly, the left being reserved as a protection for the head and upper portions of the body. Owing to the employment of the bronze cæstus during the third era of ancient boxing, blows were dealt of such force as to dash out teeth, break bones, and often to cause death. It was the weapon rather than the skill of the combatants that did this; anyhow, the disfigurements the ancient boxers underwent were such that frequently they were damaged beyond recognition by their friends, a fact which excited some rather grim raillery at the expense of the boxers on the part of the poets Lucian and Lucilius. But it is more than doubtful whether any ancient athlete could, with all his pugilistic paraphernalia, deliver so telling a blow as can a modern professor of the art with his naked hand,—clean, quick, effective, from the shoulder. Like all the other athletic games of the Greeks, boxing was regulated by certain rules; the principal of these was that the pugilist was bound to fight until wounds, fatigue, or despair compelled him to desist. Although the natives of the British islands are said to be inherently prone to batter each other's person with the fist, as a mode of settling their private quarrels, still it was not until a century ago that pugilism came to be in a manner appropriated by the English. During the reigns of Elizabeth and James, and perhaps during the Restoration, we hear nothing of boxing, either as a national sport or as a national mode of defence. "Clubs," the rallying-word of the "flatcaps," or apprentices, were the weapons of the English artisan, mechanic, or peasant; the sword, of those whose rank entitled them to wear that distinctive feature of dress. Pugilism was, however, firmly established in this country during the reign of the first princes of the house of Brunswick. Henceforth we find it the usual mode of deciding all disputes with the middle and lower classes, while noblemen and gentlemen practised it as the best system of gymnastics, as the best means of attack and defence, and as the best mode of making the body pliant, flexible, and firm. Clearly enough, in the year 1740 the "manly art of self-defence" was encouraged by the highest of the nobility, and tolerated by the magistracy. The broad principle upon which pugilism was in those days based, was to give and take. He who hit the hardest, and at the same time took the most punishment, was the usual victor. Fig was the greatest professor of the art in those days; he fitted up a booth, in which fencing, cudgelling, and boxing were shown, and afterwards opened an amphitheatre, in which he set up an academy for teaching boxing. Broughton succeeded Fig as the leading English pugilist, and besides becoming more popular, advanced far beyond his predecessor in the scientific use of his hands as weapons of attack and defence. His name is written in the pugilistic annals of his country as the "Father of the Science of Self-defence." In 1743, he opened an edifice in Hanway Street, Oxford Street, called Broughton's New Amphitheatre. Here the first pugilists of the day met and contended in the fistic duello. Besides the stage for the combatants, there were seats corresponding to the boxes, pit, and gallery of a theatre. Broughton held the championship during eighteen years, and was patronized by the duke of Cumberland and others of the highest rank. Mendoza and Humphries were the great successors of Broughton, and in 1786 the prince of Wales, the duke of York, and other distinguished persons, were present at a contest between the latter-named pugilist and another named Martin, at Newmarket. The combatants fought on a stage, a guinea being charged for admission. The founder of the modern school of boxing, in which strength is subordinated to science, was Mr. John Jackson, who combined in himself all the requisites for a great athlete. He reckoned amongst his patrons and pupils some of the most spirited noblemen and gentlemen of his day, and gave lessons to Shaw, the life-guardsman, who was killed at Waterloo, but not before he had dispatched or disabled ten Frenchmen. The art has been brought down to the present day, through a succession of pugilistic champions, although now it is no longer universally admired and patronized by the highest personages in the land. Society now sets its face against the active and practical part of boxing, whilst magistrates imprison the pugilists and their "seconds" for a breach of the public peace. It is brutal and debasing in the eyes of a majority of the modern community. Nevertheless, those who are the defenders of pugilism allege that the prize-ring is guided by certain rules, to transgress which is regarded as infamous; as to strike below the waist, to strike a man when he is down, to bite, kick, or inflict any injury except with the shut hand. It encourages individual and consequently national courage; it conduces to a general sense and sentiment of fair play and honour; it discourages and renders odious the use of the knife, stiletto, or of deadly weapons, setting aside those unmanly, barbarous, and savage practices which passion and motives of revenge might otherwise suggest. Lastly, that as it is not in the nature of man to submit tamely to injury, and as quarrels must arise between man and man which cannot be decided by law, the best way is to fight it out fairly, and then shake hands and become better friends than ever. Such are the views and arguments of those who advocate the use of the human hand as a weapon of defence or of attack. In one thing we may all safely agree with the pugilist,—we may all learn from him with advantage the use of our hands, clothed after the manner termed "gloved." Boxing, as practised under a scientific teacher, and with the gloves on, ranks second to no other as a gymnastic exercise. It invigorates the frame by expanding the chest; gives confidence and a quick eye to those who are of natural courage; and should one ever be attacked by a cowardly "bully," we may be enabled to teach him that it is not good or safe for him to maltreat one who has been taught to consider his hands as weapons of defence. Those who desire to become acquainted with the rules of the prize-ring, with the manner of making a match between two professors of pugilism, as well as with the subsequent details, may refer to Blaine's *Encyclopædia of Rural Sports*.

PULLEY, *pull-le* (Fr. *poulie*), one of the simplest of the mechanical powers. In its plainest form, it consists of a small wheel turning on a pin in a block, with a furrow or groove cut in its circumference, over which passes the rope that turns it. Pulleys are made either of wood or metal, the former being almost exclusively used for ship-building. In wooden pulleys, the blocks are generally made of elm, the sheaves of lignum vitæ, and the axles either of wood or of iron. In metal pulleys, the blocks are made of iron, the sheaves of brass, the axles of iron or of steel, and the bushes of brass. The term pulley is also applied to some of the narrow band-wheels used for the purpose of driving machinery gearing.

PULMONARY, *pul'-mo-ni-re* (Lat. *pulmo*, a lung), denotes of or belonging to the lungs; as pulmonary consumption. (*See* PHTHISIS.)

PULQUE. (*See* AGAVE.)

PULSE, *pulse* (Lat. *pulsus*), in Physiol., is the

alternate expansion and contraction of an artery, occasioned by the propulsion of the blood by the heart, in the form of waves. The pulsations of an artery are nearly synchronous with the contractions of the left ventricle of the heart, the difference, in a state of health, being only from $\frac{1}{3}$ to $\frac{1}{5}$ of a second, depending on the distance of the part from the heart. The state of the pulse is therefore an indication of the action of the heart and the whole arterial system, of the condition of the blood, and the physical functions in general. It may be felt in any artery, but most conveniently in the radial at the wrist. The pulse varies at different ages and in different states of the system. In the newly-born infant it averages 130 to 140 beats a minute, while in mature life it ordinarily averages from 70 to 75. It is slower during sitting than standing, and slowest during lying; while by inflammatory or acute disease it may be raised to 120 or even 160 in the adult. Mental excitement, the digestive process, alcoholic drinks, and elevation above the sea, accelerate the pulse. Besides the number of pulsations, their character and the regularity or irregularity of their occurrence are important diagnostic signs. It may be strong or weak, hard or soft, full or small, &c. Galen first drew attention to the pulse as a sign of disease, and enumerated more than thirty different conditions of it.

PUMA, *pu'-mâ* (*Felis concolor*, Lin.).—This animal, known also as the American lion, is found not only over a great portion of South America, but extends northwards to the province of Pennsylvania, even making occasional inroads into the state of New York. It is equal to its prototype neither in size, fierceness, nor colour; differing from it especially in the smallness of the head, the want of mane and tufted tail. It measures about five feet in length, and its tail is long and trailing; its limbs are strong but short, and therefore it stands low. The upper part of the neck and body, and the outside of the legs, are of a deep yellow, tinged with black on the upper parts, by the tipping of the hairs being black; the forehead and upper parts of the head dingy yellow, mingled with grey and black; the under part of the throat, chest, and inside of forelegs, yellowish white; belly white, tinged with yellow; inside of the thighs white, shaded with red and ash; tail yellow, with a black tip and some black hairs on the upper part. Whiskers long, part black and part white; the part of the upper lip on which they are placed, black; the remainder of it, the lower lip, and the throat, beautifully white. The younger animal is marked with indistinct spots, of a deeper tint than the general colour; but these disappear as the animal increases in age. It rather inhabits plains than forests, and approaches near to the habitations of man. It is a cowardly animal, flying at the sight of a human being, and in the north, where it is more timid than in the south, even from the attacks of a dog; but it is at the same time almost the only animal against which the charge of wanton or unnecessary cruelty can be fairly maintained; habitually killing more animals than it can devour, for the sake of sipping a little of the blood of each. It ascends trees, and its usual method of taking its prey is by lurking in one, and dropping from it as the unsuspicious animal passes by. When taken young, it may be tamed and domesticated like a cat. The Indians employ its coat, which is soft, for clothing, and from it also are made boots and shoes.

PUMICE-STONE, *pum'-is* (Lat. *pumex*, supposed to come from *spuma*, foam), in Min., a porous substance found in volcanic districts. It is a light spongy lava, of a whitish-grey colour, and consists of silica and alumina, with certain per-centages of potash and soda. It is so light that it will float upon water. It is used by painters to smooth the surface of their work; it is also employed, in a powdered state, as a polishing material in different branches of trade.

PUMP, *pump* (Dan. Fr. *pompe*), in the ordinary acceptation of the term, a machine either for raising water or for forcing it through pipes. Occasionally pumps are used for dealing similarly with other aqueous fluids, their construction being slightly modified. Three kinds of pumps are used for raising water, the simplest of which is the suction or household pump. The *suction*-pump consists of a hollow cylinder of wood or metal which contains a piston stuffed so as to move up or down in the cylinder easily, and yet be air-tight. A rod is attached to this piston, which reaches to the top of the cylinder at least when the piston is at the bottom. There is a valve opening upwards in the piston, and another valve, also opening upwards, at the bottom of the cylinder; this valve covers the opening of a tube fixed in the bottom of the cylinder, and reaching to the well or reservoir from which the water has to be raised. Supposing the piston to be at the bottom, there can be very little air between it and the valve of the cylinder; for as the piston was pushed down, the valve in it would allow the air to escape. On raising the piston again, the pressure of the air causes the valve to remain closed; hence a vacuum is formed within the cylinder when the piston is raised to the top. By this means the pressure on the valve in the cylinder is very much less than that of the external atmosphere on the surface of the water in the reservoir; therefore the water will be pressed up the pump to a height not exceeding 32 or 33 feet. On lowering the piston again, the valve in the cylinder is closed, so that the water is prevented from returning; and the same operation being repeated, the water may be raised in any quantity to any height not exceeding 32 or 33 feet, the height of a column of water equal to the pressure of the atmosphere. The *lifting*-pump, like the suction-pump, has a piston and two valves, both opening upwards; but the valve in the cylinder is placed in the body of the pump at the height where the water is intended to be delivered, instead of at the bottom of the cylinder. The bottom of the pump is placed a considerable way into the well, and, supposing the piston to be at the bottom, as the valve opens upwards, there is no obstruction to the water rising in the cylinder to the height which it is in the well, since water always rises to its level. On raising the piston, the valve in it closes, and the water in the cylinder is lifted up; the valve in the cylinder then opens, and the water passes through, and cannot return, as the valve opens outwards. By another stroke of the piston the process is repeated, and the water is raised from the well. In the case of the lifting-pump, the height is not limited to 32 or 33 feet. The *forcing*-pump is unlike the two pumps just described. The piston has no valve, but there is a valve opening upwards at the bottom of the cylinder. Immediately above this valve, in the side of the cylinder, there is another valve opening outwards into a tube which is bent upwards to the height at which the water is to be delivered. On raising the piston, the valve in the bottom of the pump opens, and the water is pressed up into the cylinder, on the principle of the suction-pump. On pressing down the piston, the lower valve closes and the upper one opens, and the water is forced up the tube. When the piston is raised again, the upper valve shuts, retaining the water, and the lower valve opens. The same process is repeated, and the water is thrown out at every descent of the piston; the discharge, therefore, is not constant. In this and other varieties of pumps an air-vessel is frequently fixed to the top of the eduction pipe, in order that the discharge of water may be continuous. This air-vessel consists of a box, in the bottom of which there is a valve opening upwards. This valve covers the top of the eduction pipe. A tube is fastened to the top of the box, which reaches nearly to the bottom; it rises out of the box, and is furnished with a stop-cock. When the water has been forced into the vessel by the action of the pump till it reaches the end of the tube, all communication is cut off from the external atmosphere, and every additional quantity of water forced into the vessel tends more and more to compress the air within it, which, pressing on the surface of the water, forces it upwards through the tube in a continuous stream. Large air-vessels are now employed in blowing-engines. The ordinary fire-engine consists of two force-pumps working into one common air-vessel. (*See* FIRE-ENGINE.) The *chain-pump* used in the navy consists of a continuous chain, to which are attached a series of pistons or buckets, for raising the water in a continual stream. Chain pumps are used when a large quantity of water is to be raised, and must be worked rapidly. Pumps of various other descriptions are now in use, both in the navy and the merchant service. Besides the pumps mentioned, there are several other descriptions of machines used for

raising water; such as Archimedean screws, scoops, bucket-wheels, Persian wheels, flush-wheels, rotary pumps, &c. Rotary or centrifugal pumps are those in which a rectilineal vertical motion is given to the water to be raised, by means of a wheel rotating with great velocity in a close drum, and receiving its supply through the apertures in the side of the drum close to the axis. (*See* ARCHIMEDEAN SCREW.)

PUMPKIN. (*See* CUCURBITA.)

PUN, *pun* (Welsh *pun*, equal), is a play upon words, the wit of which depends on a resemblance in sound between two words of different signification, or the same word used in different senses. Addison says (*Spectator*, No. 61) that "the seeds of punning are in the minds of all men, and though they may be subdued by reason, reflection, and good sense, they will be apt to shoot up in the greatest genius, that is not broken and cultivated by the rules of art." Aristotle (Rhetoric) describes two or three kinds of puns, which he calls paragrams, among the beauties of good writing, and produces instances of them out of some of the greatest authors in the Greek tongue. Cicero quotes abundance of sayings as pieces of wit, which are mere puns. The age, however, in which the pun chiefly flourished was the reign of James I., when the greatest authors in their most serious works made frequent use of them. The sinner was punned into repentance, and in the theatres tears were solicited and got at no higher price. "Puns," says Leigh Hunt, "are banished from good company at present, though kings once encouraged, and Cæsar and Bacon recorded them, and Cicero and Shakespeare seem to have thought them part of the common property of good spirits. They are tiresome when engrossing, and execrable if bad; at least, if not very and elaborately bad, and of malice prepense. But a pun may contain wit of the first water." The power of Hood in this way was very remarkable; as—

"They went and *told* the sexton,
And the sexton *tolled* the bell."

or—

"His head was turned, and so he chewed
His pigtail till he died."

The court fool's pun upon Archbishop Laud was a good one, "Great praise to God, and little *laud* to the devil." "What is (m)ajest(y)," asked some one, "when deprived of its externals, but *a jest?*"

PUNCH, or PUNCHINELLO, *punsh*, is the name of the principal character in a well-known puppet-show, which is exhibited about the streets. The name is supposed to be a corruption of Policinella or Pulcinella, who is usually the leading character in Neapolitan puppet-shows. According to Galiani, the name is a corruption of Puccio d'Aniello, a vintager, characterized by a very large nose and grotesque appearance, and remarkable for his wit and drollery. He subsequently went on the stage, and became extremely popular, and was personated all over the country. On being transported into Britain, the name became Punchinello, and for shortness Punch. The puppet-show of "Punch and Judy" embodies a domestic tragedy, treated in a broadly farcical manner. Punch himself is represented as a short obese personage, with an enormous hump on his back, a wide mouth, long chin, and hooked nose; and his wife Judy is in most respects his counterpart, while his dog Toby is an important character in the performance.

PUNCTUATION, *punk'-tu-ai'-shun* (Lat. *punctus*, a point), in Gram., is the art of pointing, or of dividing written or printed composition into sentences and parts of a sentence, for the purpose of indicating by pauses the closer or more remote connection of the several parts. Punctuation is not, as some assert, a modern art, but was, in some measure at least, known and practised by the ancients. There is reason to believe that some system of punctuation was known to the Greeks in the time of Aristotle; and Jerome, in his translation of the sacred Scriptures, in the 4th century, made use of signs, which he called *commata* and *cola*. The invention of the modern system of punctuation has been attributed to Aristophanes, a grammarian of Alexandria; but it did not come into general use until after the invention of printing, the celebrated Venetian printers Manutii, about the close of the 15th century, being the first to adopt it systematically. The principal points used in English composition are the comma (,), semicolon (;), colon (:), period (.), note of interrogation (?), note of exclamation or admiration (!), dash (—), and parenthesis (). Of these, the first four are marks of punctuation, strictly so called, regulating the length and character of the pauses to be made in reading; the others are chiefly rhetorical or syntactical aids, regulating the modulation of the voice. The comma marks the smallest division of a sentence, separating nouns from nouns, verbs from verbs, and such other parts as are not necessarily joined together. The pause here is very short, and it may be remarked that sometimes the construction requires a comma where no pause is necessary in the reading, and *vice versâ*; as, "He was a man patient, sober, honest, and industrious," where, in reading, the pause ought to be after "man," but where the construction requires that there be no comma. The semicolon is used when a longer pause is required than at a comma, the disjoined parts being less closely connected; while with the colon the pause is still greater, being used when a member of a sentence is complete in itself, but is followed by some additional remark or illustration of the subject. A period, or full stop, is placed at the end of a sentence, to close up the sense and construction, and to release the voice. It is also used after every abbreviated word, after headings, titles of books, &c., and generally after Roman numerals. The note of interrogation, as its name implies, is placed at the end of every question; and in Spanish it is also put in an inverted form at the beginning of a question. The note of exclamation or admiration is placed at the end of such words or clauses as express any strong passion or emotion of the mind. The dash is used where the sentence breaks off abruptly and the subject is changed, or where the sense is suspended and is continued after a short interruption. The parenthesis incloses a word or phrase introduced into the body of a sentence, with which it has no grammatical connection. Other marks in frequent use, and generally treated under the head of punctuation, though not strictly included in it, are the apostrophe (’), used to indicate the omission of a letter or letters, and also as a sign of the possessive case; the hyphen (-), placed between the constituent parts of a compound word, and at the end of a line where a word is divided; marks of quotation (“ ”), placed at the beginning and end of extracted passages of speeches, &c.; brackets or crotchets [ ], generally inclosing an explanatory phrase or passage inserted by one writer in a quotation from another; and the various marks of reference, as asterisk or star (*), dagger (†), double dagger (‡), section (§), parallel (‖), and paragraph (¶), or figures or letters smaller than those of the text, pointing to notes correspondingly marked at the foot or margin of the page, or at the end of the book.

PUNDIT, or PANDIT, *pun'-dit*, *pân'-dit* (Pers. *pand*, learning), in Hindostan, is a Brahmin who consecrates his life to the study of religion and science, and is a title nearly equivalent to our doctor.

PUNICA, *pu'-ne-kâ*, in Bot., the Pomegranate, a gen. of the nat. ord. *Myrtaceæ*, or, according to some botanists, the type of a distinct nat. ord. named *Granateæ*. *P. Granatum*, the pomegranate, is the *rimmon* of the Bible; it is repeatedly mentioned in the sacred writings. The leaves, the flowers, and the fruit were all used by the ancients for their astringent properties, and the juice of the fruit also in the preparation of cooling acidulous drinks. The rind of the fruit and the bark of the root are commonly used as medicinal agents in this country. They are chiefly employed for their astringent properties, which are due to the presence of



POMEGRANATE.

tannic and gallic acids. The bark of the fresh root also contains a peculiar acrid principle called *punicine*. The fruit is the only example of the kind, called by botanists the *balausta* (*see* this word).

PUNISHMENT, *pun'-ish-ment* (Lat. *punire*, to punish), in Law, is the penalty due for an offence. The original idea of punishment was the infliction of pain on the offender, corresponding to the amount of pain or suffering which he had inflicted upon others, in consequence of his offence. Hence arose the *lex talionis*, or retaliatory principle of punishment, which demanded an *eye* for an eye, a tooth for a tooth, &c. With the spread of Christianity it came to be seen that the infliction of pain as satisfaction for an offence was a vindictive proceeding, contrary to the spirit of Christianity, and that the proper end of punishment is not to avenge the past, but to prevent future offences. All punishment is an evil, and a penal system ought to aim at economizing pain by diffusing the largest amount of salutary terror at the smallest expense of actual punishment. A punishment ought, as far as possible, to be certain, and, as far as the different conditions and circumstances of individuals will permit, to be equal. In this country, the laws for the punishment of offences have of late years been placed upon a much more satisfactory footing than formerly; a characteristic feature of it being the great efforts that are made for the reformation of the criminal. (*See* PRISON, CAPITAL PUNISHMENT.)

PUNKAH, *pun'-kah* (Indian), a name given in India to feather fans of various sizes. The punkah which is considered of the greatest importance is one of large size, suspended by silken cords from the ceiling, and used for cooling the atmosphere in rooms. When the apartment is occupied by company, and more especially during meal-times, the punkah is kept swinging overhead by a servant in an adjoining room, who pulls a series of regulating cords.

PUPA. (*See* INSECT-TRANSFORMATIONS.)

PUPIL. (*See* EYE.)

PUPPETS, PUPPET-SHOWS, *pup'-pets* (Fr. *poupée*).—The term puppet signifies a small image in the human form, moved by wires or otherwise, in a mock drama. Amongst the French, the commonest kind of puppets are called *marionettes*: these are moved by wires or threads upon a stage. In the ordinary performances of Punch and Judy, however, the exhibitor puts his fingers in the figures. Among the ancient Greeks, puppet-shows were common, and from them they passed to the Romans. Mention is made of their exhibition by Xenophon, Aristotle, Gellius, Horace, and others. Since that period, at different times, puppet-shows have passed through various degrees of perfection. At Paris, there was a great puppet-opera in 1674, which was very popular for a time. Puppet-shows of considerable size are still performed in several of the large cities of Italy. There are also some very excellent puppet-shows in Germany; but they are mostly itinerary, and not so much patronized as in Italy. A few years ago, a marionette theatre was started in London, which had only a short-lived success. The only puppet-show which is popular in this country is the old-established performance of Punch and Judy.

PURGATORY, *pur'-gă-to-re* (Lat. *purgare*, to cleanse), is literally a place of expiation, and is the name given by Roman Catholics to an intermediate state after death, where the souls of those that die in communion with the Church, and penitent, expiate certain offences which do not merit eternal condemnation. The Church does not profess to teach what is the nature or duration of the punishment of purgatory, nor that it is situated in any particular place; but she believes that indulgences, masses, and the prayers of friends on earth, have the power of abridging the sufferings of souls in this state. The Roman Catholics build their doctrine of purgatory upon the proposition that every sin, however slight, as it is an offence against God, is deserving of punishment from him, and will be punished hereafter if not cancelled by repentance here. Few, they say, depart this life so pure as to be totally exempt from every kind of debt due to God's justice, and as such small sins do not deserve eternal punishment, there must be some third place for their expiation; since only the clean and the pure can be admitted into heaven. Broughton has endeavoured to prove that this notion was held by the Jews, pagans, and Mohammedans; and there is no doubt that in the days of the Maccabees, the Jews believed that sin might be expiated by sacrifice, after the death of the sinner. No mention of purgatory occurs in the Christian church before the time of Augustine, who, in some of his works, speaks of it in a doubtful sort of a way, as a thing that "may be possibly found so, and possibly never." The doctrine is said to have been first inculcated as a matter of belief by Gregory the Great, in the end of the 6th century. The Greek church, like some of the eastern sects, prays for the dead, but does not believe in purgatory; and when efforts were made to effect a reconciliation between the two parties in the 15th century, the Greeks demanded an explanation of what purgatory was, and the subject was fully discussed at some of the councils of the period, particularly that of Florence, 1439. Protestants reject the doctrine of purgatory as being derogatory to the doctrine of Christ's having made a complete satisfaction for sin.

PURITANS. (*See* DISSENTERS.)

PURPURE, *pur'-pure* (Fr.), in Her., is the term used to express the colour purple. It is said to be derived from a shell fish called *purpura*, which gave materials for that colour. In engravings, it is expressed by diagonal lines drawn athwart from the sinister chief to the dexter base point.

PURSER, *pur'-ser*, a title originally given in the navy to the paymaster of a ship. The word now signifies an officer who has charge of the provisions of a ship of war, and attends to their preservation and distribution among the officers and crew.

PURSUIVANT OF ARMS, *pur-swe'-vănt* (Fr. *poursuivant*), in Her., those officers who are the lowest in degree in the corporation of kings heralds and pursuivants of arms. As their name implies, they were followers, marshals, or messengers, attendant upon the heralds. Formerly pursuivants were created by the nobility with great ceremony. The appointment of heralds and pursuivants by the nobility has long been discontinued, and there are now only four pursuivants belonging to the College of Arms; viz.,—*Rouge Croix*, the first in point of antiquity, is so called from the red cross of St. George, the patron saint of England. *Blue Mantle*, so called by Edward III., in honour of the French coat, which he assumed, being blue. *Rouge Dragon*, so styled from the red dragon, one of the supporters of the royal arms of King Henry VII., who created this pursuivant. *Portcullis*, also instituted by Henry VII., and so named from a badge worn by him. The duties of pursuivants are similar to those of heralds; they assist at all public processions or ceremonies, such as royal marriages, funerals, &c., and have certain fees for attendance on such occasions. They also receive fees upon creations of peers, baronets, and knights.

PUTREFACTION, *pu-tre-fak'-shun* (Fr., from Lat. *putrefactio*), a process in nature, or species of spontaneous fermentation, by means of which animal and vegetable substances are decomposed and reduced either to their original separate elements, or to much more simple compounds. When nitrogenous organic bodies are exposed to air and moisture at a moderate temperature, they begin to combine with OXYGEN, and are said to undergo decay. All organic bodies, when life ceases, begin to putrefy with more or less rapidity, according as they contain more or less nitrogen. This putrefaction of animal substances is usually attended by more fœtid and noxious exhalations than those arising from vegetable products, owing principally to the excess of nitrogen in the former. In most cases of animal putrefaction, the formation of ammonia, or of ammoniacal compounds, is a characteristic feature; while other combinations of hydrogen are also formed, particularly carburetted hydrogen, together with several other complicated and often infectious vapours or gases, containing sulphur and phosphorus. By means of chlorine, however, these putrefactive effluvia are easily decomposed or rendered harmless. The process of putrefaction can be counteracted by the abstraction of the air and water, or humidity, or by means of cold, salt, sugar, spices, &c.

PUTTY, *put'-ty* (Sp. and Port. *potea*), a kind of paste used by glaziers for fastening window-glass in the frames and by carpenters and others for filling up

holes in their work. It is composed of whiting and linseed-oil. The whiting is dried, pounded, and sifted, and stirred into a tub containing the oil. When the mixture has acquired sufficient consistency, the mass is taken out, placed on a board, and worked by hand, more whiting being added from time to time. Lastly, it is beaten with a mallet to make it smooth and uniform. It becomes hard and durable by exposure to the atmosphere.

PUTTY-POWDER, in Manuf.—This substance is ignited melostannic acid, or binoxide of tin. It is much employed for polishing glass and metals, and for giving whiteness to enamels. It is made by treating metallic tin with nitric acid, by which the metal is converted into a white crystalline mass, insoluble in water. By ignition it becomes anhydrous and of a pale buff-colour, and falls to a fine powder.

PYRAMID, *pir'-á-mid* (Gr. *puramis*), in Geom., is a solid standing upon a triangular, a square, or a polygonal base, and terminating in a point at the vertex; or it is a solid, having any plane figure for its base, and triangles for its sides, all terminating in one common point or vertex. When the base of a pyramid is a regular figure, the solid is called a *regular* pyramid, which then takes particular names according to the number of its sides, similarly to a prism; as triangular, square, hexagonal, &c. The solid is also called a *right* pyramid when a perpendicular from its vertex falls on the centre of the base, and an *oblique* pyramid when the perpendicular does not fall in the centre.

PYRAMID, in Arch., a term applied to elevated mounds of stone or brickwork, corresponding in form to the geometrical definition of the solid. The most remarkable structures of this kind are the colossal pyramids erected by the ancient Egyptians in the plain of Gizeh. In the opinion of Herodotus, the pyramidal form was looked upon by the Egyptian people as emblematical of human life. The beginning was signified by the broad base, and its termination by the point, or the end of our earthly existence. The exact derivation of the name is hid in considerable obscurity. Some derive the word from *puros* (wheat, grain), believing that it originally signified granaries such as those built by Joseph; others suppose that it comes from *pur* (fire), because the shape of the pyramid is like an ascending flame. It seems probable that the name is derived from an old Egyptian word. Pyramids are to be found among the Egyptians, Babylonians, Indians, and Mexicans. The Egyptian pyramids are sloped or symmetrical mounds placed over the graves or sepulchres of the monarchs and other great personages of the earliest Egyptian dynasties. After the twelve dynasties, the use of pyramids was discontinued. The pyramids are situated in the vast plain or cemetery lying between Dagshoor, and extending by Sakhara and Memphis, almost to 30° N. lat.: they are supposed to be sixty-nine in number altogether. As before stated, the most remarkable of these are the pyramids of Gizeh. The largest of them is said by Herodotus to have been built by Cheops. He also states that another pyramid close by covers the remains of Cyphrenes, his brother. According to that ancient writer, 100,000 men laboured, without interruption, for twenty years in building this enormous mound. About 1776, when Savary, the French traveller, visited Egypt, he inspected the pyramids, having obtained a guard from the governor of the district to defend him against the Arabs. On reaching the great pyramid, the travellers laid aside part of their clothes, and each taking in his hand a torch, began the descent. After descending a long passage, which at length became so narrow that they were obliged to creep on their hands and knees, they were obliged to ascend in a similar way. Upon traversing this second passage, they came upon a much more spacious apartment, lined with granite, at the end of which Savary saw an empty marble sarcophagus without a lid; while on the floor were scattered fragments of earthen vessels. After exploring another smaller chamber beneath, they emerged and ascended the pyramid on the exterior. They counted about 200 stone steps, varying from two to four feet in height, and from the summit had a most extensive view. The form of this large pyramid does not admit of a very exact measurement. According to Herodotus, it was 800 feet high, and the length of its base on each side was the same. Strabo makes it 625; Diodorus, 600. Modern measurements make its extreme height only 450 feet. There is no doubt that the pyramid has decreased considerably in size by the continual spoliation of the sides in order to build the city of Cairo. According to Herodotus, who is confirmed by Diodorus and Pliny, the two large pyramids were originally covered with white marble, a statement which is confirmed by present appearances. Napoleon Bonaparte caused the great pyramid at Gizeh to be examined by 300 men, among whom was Denon, the celebrated French traveller. He narrates that the visitors, having landed, ascended a small elevation of rubbish and sand, which led to the entrance of the pyramid. According to Denon's calculation, this opening was about sixty feet from the ground, and concealed by a stone wall, which formed the third and innermost of the walls surrounding the pyramid. On either side of the entrance were placed large stones, horizontally, and above those others of enormous size, so placed as to make their fall or removal a matter of great difficulty. At this point the first entrance began, which led to the centre and ground floor of the building. With great difficulty, and only by cutting their way by steps, they succeeded in ascending to a landing-place in which was a deep well, forming the entrance to a horizontal passage leading to an apartment called the queen's chamber. From the above landing-place, an opening led in a perpendicular direction to the principal passage. This gallery ended in a second room, where the third and last partition was found. This apartment is built with greater care than the queen's chamber. Lastly, they came to the king's chamber, which contained a sarcophagus. Since that time this pyramid has been examined by various other travellers. The pyramid of Cyphrenes, the next in size to that of Cheops, was first opened and visited by Belzoni, in 1818. It closely resembled the larger structure in its passages, chambers, &c. In a third pyramid, built by Menkare, the third king of the fourth dynasty, the entrance was discovered by Colonel Howard Vyse, in 1837. The sarcophagus found in the sepulchral chamber was removed by Colonel Vyse, but lost at sea off Carthagena. It is generally agreed that the pyramids of the Gizeh group are all of the age of the fourth dynasty, that is, older than 2000 B.C. All the Egyptian pyramids are constructed in a uniform manner. A rectangular sepulchral chamber was first hollowed in the rock, with a passage sufficiently large to admit the sarcophagus, communicating with the surface. A cubical course of masonry was erected over this, which served as a nucleus for the pyramid. If the king died during the year, the masonry was covered with a polished casing in the shape of a small pyramid; if the king survived a year, another course of masonry was added to the height of the nucleus, and the length of the base increased by courses of stones on each side. As long as the king lived, additions on the same plan were made every year. When the king died, this ceased; the edifice was cased by filling up the angles of the masonry with smaller stones, placing oblong blocks one upon the other, so as to make a series of steps from the base to the top. A smooth surface was then given to each side of the pyramid, rendering it a perfect triangle, while, owing to each stone overlapping the other, no vertical joint was left. Among the principal groups of pyramids besides those of Gizeh, are others of less magnitude at Abousir, Sakhara, and Dashour. In Mexico there are some singular monuments of the ancient inhabitants, of a pyramidal form; they are called *Teocallis*. (*See* MEXICAN ANTIQUITIES.) Near Benares, and other places in the East Indies, there are temples of a pyramidal form. They are said to be copies of the sacred mount *Meru*, and are called *Meru Sringas*, or "Peaks of Meru." Pyramidal temples have also been found in Java.—*Ref.* Sir G. Wilkinson's *Topography of Thebes*; Belzoni's *Researches and Operations in Egypt and Nubia*; Howard Vyse's *Operations carried on at Gizeh, in* 1837; Bunsen's *Egypt's Place*.

PYRITES, *pe-ri'-teez*, in Min.—The sulphides of iron, copper, cobalt, &c., are termed by mineralogists pyrites, from emitting fire when struck forcibly, or from decomposing spontaneously with the production of heat. Used alone, the term is generally applied to the sulphide of iron, or iron pyrites,

**Pyro**, *pi'-ro* (Gr. *pur*, fire).—In Chem., the word *pyro* prefixed to any substance signifies that its composition has been altered by the application of heat; thus we have pyrogallic, pyrophosphoric, pyromucic, and an infinite number of other acids produced from the original acids by submitting them to the action of an elevated temperature.

**Pyrogallic Acid**, *pi-ro-gil'-ik*, in Chem. and in Phot.—This important acid is formed from gallic acid by the action of heat. Gallic acid, or any vegetable extract containing it, is placed in a shallow iron pan, and covered with a cap of bibulous paper, over which a cover of writing-paper is fixed. Heat is applied to the vessel containing the gallic acid, care being taken not to exceed a temperature of 420° Fahr. The pyrogallic acid sublimes, passing through the bibulous paper cap, and condensing on the outside, being prevented from passing away by the writing-paper cover. Pyrogallic acid has but feebly acid properties,—in fact, it is supposed by some chemists to be a neutral body. It forms, when sublimed, brilliant plates, which are freely soluble in water, alcohol, and ether. The solution has a bitter taste, but does not redden litmus-paper. The solution speedily becomes brown from absorbing oxygen from the air, a property so much increased by the addition of free alkali, that a mixture of pyrogallic acid and caustic potash is used for eudiometrical purposes. The principal use of pyrogallic acid is in photography, as a developing agent in the collodion process.

**Pyrolace.e**, *pi-ro-lai'-se-e*, in Bot., the Winter-green fam., a nat. ord. of *Dicotyledones*, sub-class *Corollifloræ*. Herbs or under-shrubs, with naked or leafy stems. Leaves simple, evergreen. Sepals 5, more or less distinct, persistent, inferior. Corolla hypogynous, with 4—5 petals, scarcely united at their base. Stamens twice as numerous as the petals, hypogynous; anthers 2-celled, with porous dehiscence. Ovary superior, 4—5 celled. Fruit capsular, dehiscent; placentas axile. Seeds numerous, with a loose testa; embryo minute, at the base of fleshy albumen. There are five genera, which comprise 20 species, natives of North America, Europe, and the northern parts of Asia. They are chiefly remarkable for their tonic, astringent, and diuretic properties. The *Chimaphila umbellata*, winter-green, or pipsissewa, is an important plant of this order. It has the characteristic properties of the whole family; the fresh leaves are acrid, and when applied to the skin, act as a rubefacient.

**Pyroligneous Acid**, *pi-ro-lig'-ne-us* (Gr. *pur*, fire; Lat. *lignum*, wood), in Chem., a name formerly given to acetic acid, produced by the dry distillation of wood.

**Pyroligneous Ether**, in Chem., a name sometimes used for methylic ether, $C_2H_3O$.

**Pyrometer**, *pi-rom'-e-ter* (Gr. *pur*, fire; *metron*, a measure), an instrument for the measurement of temperatures above those which can be estimated by means of the mercurial thermometer. As mercury boils at 660°, it is incapable of measuring heat above that point. In most common processes, many temperatures are greatly above this point; as, for example, the heat of an ordinary fire and the melting-points of gold and silver. Mr. Wedgwood was the inventor of the first pyrometer. It consisted of small cylinders of Cornwall clay, moulded into fixed sizes and baked at a low red heat. The size of these pieces was such as just to admit them between two square brass rods, fixed on a brass plate, 24 inches long, half an inch asunder at one end, and ·3 of an inch at the other. The brass rods were divided into inches and tenths, making altogether 240 divisions or degrees. On exposing to heat pieces of clay baked in Wedgwood's manner, they contract, and the degree of contraction was believed to be proportional to the temperature. The amount of contraction on exposure to heat was measured on the brass rods, and this indicated the temperature. Thus, if exposed to the heat at which silver melts, it contracted and advanced between the brass rods to 22°, or 2·2 inches; if to the melting-point of gold, 32°; and so on. Wedgwood's pyrometer has, however, been long in disuse, as it was found that the small cylinders of clay, when exposed for a length of time to a low heat, contracted as much as if they had been exposed for a short time to a very high heat. Guenton de Morveau, in 1803, presented to the French Institute a pyrometer of platina, which measured high temperatures by the expansion of the metal; and in 1831 an improvement of this instrument was brought forward by Professor Daniell, of King's College, London. It consisted of a small bar of platina placed in a tube of blacklead or earthenware. The difference of the expansion between the platina bar and the tube is indicated on a circular scale. In this pyrometer, one degree of Daniell is equal to seven degrees of Fahrenheit.

**Pyrosis.** (*See* Heartburn.)

**Pyrotechny**, *pi-ro-tek'-ne* (Gr. *pur*, fire; *technæ*, art). In its proper sense, this term signifies the science which teaches the management and application of fire. In its more popular sense, however, the word chiefly refers to the art of making fireworks. The principal ingredients used are purified saltpetre, sulphur, and charcoal. Gunpowder is also used in the composition of fireworks: for this purpose it is first ground, or, as it is technically termed, *mealed*. In different fireworks, the proportions of the materials differ very much, and great care and precaution are necessary in mixing and working them into a proper state for use. Camphor, alcohol, antimony, and other substances, are employed when it is required to produce coloured stars. When gold or silver rain is required, brass-dust, steel-dust, sawdust, &c., are used. Steel-filings and cast-iron borings contain carbon and give a brilliant fire with wavy radiations. Copper-filings give a greenish tint; zinc a fine blue; sulphide of antimony a greenish-blue, with much smoke; amber affords a yellow fire, with colophony and common salt; but the last must be very dry. All the salts of copper tinge the flame green; those of strontian, red; those of baryta, a peculiar green. Lycopodium burns with a magnificent rose-coloured flame; it is principally used in theatres to represent lightning. All fireworks are divided into three classes,—those which are let off upon the ground, as *jets of fire* and *revolving wheels*; those which are shot up into the air, as *sky-rockets* and *Roman candles*; and lastly, those which act upon or under water.

**Pyroxylin**, *pi-rok'-se-lin* (Gr. *pur*, fire; *xulon*, wood), a substitutive compound of explosive character, discovered by Schönbein, formed by immersing cotton, tow, linen, sawdust, or any other form of cellulose, in a mixture of equal measures of oil of vitriol and nitric acid. No apparent change of form takes place, but a very remarkable chemical alteration ensues; a certain number of equivalents of hydrogen are abstracted, and their place supplied by an equal number of equivalents of peroxide of nitrogen; in fact, $C_{36}H_{20}O_{20}$ becomes $\left.\begin{matrix}C_{36}H_{21}O_{29}\\ 9(NO_4)\end{matrix}\right\}$. In undergoing this change, the fibre is increased in weight 82 per cent., and acquires new properties. Pyroxylin is specially characterised by its explosibility and solubility in a mixture of ether and alcohol. The former property has caused it to be used in blasting operations, under the name of gun-cotton; the latter has rendered it one of the most important materials used by the photographer. Dissolved in a mixture of ether and alcohol, and mixed with a certain proportion of some soluble iodide, it forms ordinary photographic collodion. The preparation of this important material requires attention to so many minute details, which could not be given here, that the reader is referred to Hardwich's "Photographic Manipulation" for a full account of the precautions to be used. Collodion is also used in surgery to form an artificial skin to excoriated surfaces. For this purpose the following process may be employed:—Take of fuming nitric acid and sulphuric acid of each four fluid ounces. Thoroughly saturate half an ounce of clean carded cotton in the mixed acids, having first allowed them to become cool. Macerate for twelve hours, and then wash the cotton in a stream of running water. This quantity of pyroxylin should be dissolved in three parts of ether, to which about two ounces of alcohol have been added. If the film formed is too contractile, a few drops of castor-oil should be added.

**Pyrus**, *pi'-rus* (Celt. *peren*, a pear), a gen. of the nat. ord. *Rosaceæ*, sub-ord. *Pomeæ*. Our principal orchard trees belong to this genus. *Pyrus Malus* and its varieties produce the different kinds of apples. (*See* Apple.) *P. communis* and its varieties produce the different kinds of pears. The Romans cultivated

thirty-six varieties of pears, and at the present time there are many hundreds. The Jargonelles, Bergamots, Chaumontelles, and other choice sorts, are delicious dessert-fruits. The wood of the pear-tree is often used instead of boxwood for the coarser wood-engravings. *P. Aucuparia* is the mountain-ash, or rowan-tree; *P. Aria* is the beam-tree, the timber of which is used for axletrees and other purposes; *P. domestica* is the service-tree, and *P. torminalis* the wild service-tree.

PYTHAGOREANS. (*See* GREEK PHILOSOPHY.)

## Q.

**Q**, *ku*, is the 17th letter and 13th consonant of our alphabet. It corresponds with the Hebrew and Phœnician *koph*, but it has no place in the Greek, old Latin, or Saxon alphabets. In old Latin, the words that are now spelled with a *qu* had a *c*; as *colidie* for *quotidie*. Q is never sounded alone, but in conjunction with *u*, and most grammarians are disposed to regard it as a superfluous letter, whose place could be supplied by *k*. The letters with which it interchanges are *c* and *k*. As a numeral, it stands for 500, or, with a dash over it, for 500,000.

QUADRANT, *kwod'-rănt* (Lat. *quadrans*, a quarter of a circle), an astronomical instrument used for measuring an arc of a great circle of the heavens, in order to determine the altitude of a celestial body. As its name indicates, it consists of an arc of ninety degrees, which are subdivided into smaller divisions. The quadrant is provided with glasses, attached to a straight rod, through which the heavenly body is to be observed, and the position of which in the graduated arc determines the altitude of the body. As an astronomical instrument, the quadrant has been so completely superseded of late years by the entire circle, that it would be unnecessary in this place to describe particularly either its construction or adjustments. (*See* also SEXTANT.)

QUADRANT, in Geom. (*See* CIRCLE.)

QUADRATURE OF THE CIRCLE, *kwod'-rā-ture* (Lat. *quadratura*, squaring), a speculative problem of great celebrity in the annals of mathematical science. As the whole area of a circle is equal to the rectangle contained by the radius and a straight line equal to half the circumference, the quadrature could be obtained if the length of the circumference were assigned. In attempting to square the circle, therefore, the particular object aimed at, is the determination of the ratio of the circumference to the diameter. From the earliest periods, this problem attracted the attention of philosophers, and at the present day, even, there are persons who spend their time and their energies in attempting to overcome the difficulty. The truth is, that such persons do not comprehend the difficulty of the subject. Archimedes, in his book on the Mensuration of the Circle, is the first of the ancients who made any approach even to a practical determination of the question. By inscribing and circumscribing a polygon of 96 sides in and about a circle, he shows that the excess of the circumference over three times the diameter must be less than 10·70 parts, and greater than 10·71 parts. This statement is correct, and pretty accurate; for, according to his calculation, a circle of 4,970 feet diameter would have a circumference lying between 15,610 feet and 15,620 feet; the truth being, that such a circle would have a circumference of 15,613⅛ feet very nearly. Among the Hindoos the calculation was made much more correctly than by Archimedes.

QUADRUMANA, *kwod-ru'-mă-nă* (Lat. *quadra*, *quatuor*, four; *manus*, a hand), the name of an order of mammalia, comprehending those in which the four extremities are each terminated by a hand; as the ape, baboon, &c. The term four-handed does not, however, apply correctly to all the animals thus called. In the monkeys of the western hemisphere, the thumb in the hands or front extremities is wholly, or in part, wanting. Amongst all the species of the quadrumana, there are strongly-marked differences as to the degree in which they resemble man in their general conformation. In some, there is a strong resemblance to him, both in structure, aspect, and gait; whilst others are very slightly removed from the ordinary mammalia. There is, moreover, great variety in their food and habits of life. The larger proportion are gregarious, but some live solitary and others in pairs. Some species dwell on the ground, others inhabit rocky heights, while others live altogether among the branches of trees. With regard to the order of quadrumana, Cuvier remarks that independently of the anatomical details which distinguish them from man, they differ from him in the very striking character arising from their hind feet having free thumbs, which are opposable to the other fingers, whilst those fingers are long and flexible like those of the hand. Consequently, they climb trees with facility; but they do not hold themselves or walk erect except with difficulty; their foot in such cases not resting on the sole, but on its external edge, and their narrow pelvis not favouring equilibrium in that quarter. The whole of the quadrumana are divided into three families or tribes; namely,—1. *Simiadæ*, or monkeys of the Old World; 2. *Cebidæ*, or monkeys of the New World; 3. *Lemuridæ*, or the Lemur tribe. (*See* APE, BABOON, CHIMPANZEE, GORILLA, OURANG-OUTANG, &c.)

QUADRUPED, *kwod'-ru-pede* (Lat. *quatuor*, *quadra*, four; *pes*, a foot), a name formerly given in Nat. Hist. to all vertebrate land animals having four extremities fitted for progressive motion on the earth. The scaly reptiles were called oviparous quadrupeds, to distinguish them from the hairy, warm-blooded, viviparous four-footed mammals. As, however, animals of both these classes, although agreeing in having four legs, differ essentially in many other respects, the term quadruped is no longer scientifically employed to distinguish any particular group of animals.

QUAGGA, *kwăg'-gă* (*Equus Quagga*).—This animal, which is an inhabitant of the southern parts of Africa, and bears a great resemblance to the zebra, belongs to one of the six distinct, though nearly allied, species which constitute the genus *Solidungula*, or Horse tribe. It is less than the zebra, with the hinder parts higher and the ears shorter. It measures about four feet in height at the withers. The head, neck, mane, and shoulders are deep blackish-brown, striped with greyish-white lines; the other parts being of a clearer brown, paler beneath, and almost white upon the belly. A black line runs along the spine to the tail. It is a social animal, living in large troops on the karoos or flats of Southern Africa, and frequently pastures in company with the zebra; but no third or intermediate variety has sprung up between them. It is much more docile than the zebra, and is said to be sometimes used at the Cape of Good Hope as a beast of draught or burden. On its native plains, however, it is exceedingly fearless, contending with beasts of prey with much courage and frequent success. Its name *Quagga* is said to be derived from its voice, which resembles the barking of a dog.

QUAIL, *kwāle* (Ital. *quaglia*).—The characteristics of the common quail (*Coturnix vulgaris*) are:—Beak strong, shorter than the head; upper mandible curved. Nostrils basal, lateral, half closed by an arched membrane. Feet with four toes; those anterior connected by a membrane as far as the first articulation. Tail short, rounded, recumbent, almost hid by the tail-coverts. This bird has generally been considered as a summer visitor to England; but recent observations have led to the opinion, that although it is to a certain extent a migratory bird, many of the species remain in England and Ireland throughout the year. Quails arrive from Africa in large numbers on the islands of the Mediterranean and the Grecian archipelago about April, and thence spread over Southern Europe, migrating as far north as Scandinavia and Russia. They arrive in Great Britain in May, and seem more partial to the open country than to that which is inclosed. No individual of the gallinaceous order is so widely distributed over the Old World as the common quail: it is abundant in North Africa, most parts of India, and, there is reason to believe, China; while the whole of the southern portions of Siberia, and every country in Europe, except those approximating to the polar circle, are visited by it annually, or adopted for a permanent abode. In England, however, this bird is not very abundant, and the supply for the London market

comes principally from France. The males arrive in England and France before the females, and, betraying themselves by their thrice-repeated whistle, are frequently lured within reach of the fowler by the imitation of the female's note on a quill pipe. The flesh of the quail is delicate, and very little inferior to that of the landrail, and consequently it is in great request, as many as three thousand dozen having been sold in London in a single season. Though very like a partridge, and resembling those birds also in several of their habits, quails do not pair, the males being polygamous. For a nest, the female scrapes out a small cavity on the ground, usually amongst wheat, but sometimes in a piece of clover or grass, into which she collects a few bits of dry grass, straw, or clover-stalks. The eggs are of a yellowish or dull orange-coloured white, speckled or blotched with umber-brown, from six to twelve or fourteen in number, and one inch one line in length, by eleven lines in breadth. Upon these the female sits about three weeks; the young are able to follow her soon after they are excluded from the shell, and learn to feed on seeds, grain, insects, and green leaves. The quail is about seven inches in length, and the general colour of the upper part of the plumage is dark brown, mottled and streaked with lighter brown, which is also the colour of the upper part of the breast, whilst the lower part of the breast, the belly, and the under tail-coverts are yellowish white. This bird is historically interesting from the circumstance that there is the strongest ground for believing that it is the identical species which supplied the Israelites with food in the wilderness. There are several other species of quail; such as the rock quail, of Deccan, used for quail-fights by the natives; and the Virginian or Maryland quail, which is a general inhabitant of North America, from the northern parts of Canada and Nova Scotia to the extremity of the peninsula of Florida, the flesh of which is peculiarly white, tender, and delicate.

QUAKERS, *kwaik'-erz*, or, as they style themselves, the "Society of Friends," are a religious sect which originated in England about the middle of the 17th century. Their founder was George Fox, a native of Drayton, in Leicestershire, born in 1624, and who early took to the reading and meditation of God's Holy Word. At the age of 22 he believed that he had received a divine call to preach the gospel, and accordingly commenced his ministerial labours. The purity of his life and the earnestness of his preaching carried conviction to the hearts of multitudes, who embraced the doctrines which he taught. He travelled much on foot, and from conscientious motives not only refused to receive any compensation for preaching, but defrayed his own expenses. In a few years meetings were settled in nearly all parts of the kingdom; and notwithstanding the persecutions to which they were subjected, they continued to increase, while the zeal, devotedness, and love towards each other manifested among them, excited the admiration even of their enemies. The principal subjects, on account of which they were persecuted, were their testimony against oaths; their objections to a paid and man-appointed ministry, to war, to tithes and other ecclesiastical demands; the use of singular pronouns when addressing only one person; their refusal to take off their hats as a compliment to men. Among the most eminent ministers of the society were George Fox, William Penn, Robert Barclay, George Whitehead, Stephen Crisp, Isaac Pennington, John Crook, Thomas Story, &c. The ministers were not deterred from preaching their doctrines publicly and privately by the severest punishments. A large number of Friends emigrated from the mother country and settled in Pennsylvania, under the patronage of William Penn. In England the Friends were permitted to substitute an affirmation for an oath by James II.; and the Toleration Act of William & Mary accorded to them more fully the rights of conscience. Subsequent acts legalised their marriages, and placed them otherwise on an equality with their fellow-citizens; but they still suffer from their conscientious refusal to pay tithes and church-rates, for which their goods are distrained to the amount of about £11,000 annually. The doctrines which Fox taught, and which are still held as the true faith by the society, are principally the following:—1. The





doctrine of the inward light, which is the great foundation and chief corner-stone of Quakerism, founded upon the passage of Scripture, "Christ is the true light which lighteth every man that cometh into the world." — 2. From this root springs the spiritual character of Christianity, and the non-essentiality of ceremonies. They therefore have no fixed liturgy, no stated forms of prayer, nor any regular preaching. Hence their sole outward act of worship consists in meeting together, and sitting down in silence, without any singing, or stated prayers, or sermon.—3. They hold that there can be no preaching unless the preacher immediately feel himself moved to speak; and, therefore, that there can be no election of particular persons by the church, or education of them for the work of the ministry.—4. Their doctrine of the inward light necessarily implies the doctrine of repentance, and a new life; and another consequence of it is perfection from sin; "but they never held a perfection of wisdom and glory in this life, or from natural infirmities or death, as some have, with a weak and ill mind, imagined and insinuated against them."—5. Their belief in the entire spirituality of the gospel leads them to regard the rites of baptism and the Lord's supper, as practised by other bodies of Christians, as non-essential, being received spiritually. They believe in the Trinity, but confine themselves to what is laid down in Scripture on this mysterious subject. Further, they regard all men and both sexes as on an equality, God having "made of one blood all the nations of the earth;" hence they despise all titles, honours, and empty flatteries, refuse titles to persons of rank, taking off the hat or bowing to superiors, and adopt the utmost simplicity of dress and manners. They reject the common ceremony of marriage, and the customs of mourning and burial, as not in accordance with the simplicity of the gospel. War is anti-Christian; and they believe that the command "swear not at all," extends to all oaths. They reject the names of the months and days of the week, as originating in mythological idolatry, and use instead simple numerals. They use *thee* and *thou* when speaking to one person, possibly because formerly *you* was applied to a rich person, and *thou* to a poor one. Various practices and social indulgences—as singing, dancing, music, the frequenting of theatres and other places of public amusement, playing at games of chance for money, drinking of healths, horse-racing and field sports—are renounced and discouraged, as incurring waste of time, or as inconsistent with the serious hopes and duties of Christians. What, however, the bitter winds of adversity and persecution could not effect, the genial influences of liberality of sentiment and social intercourse have brought about, and the Quakers of to-day differ materially from those of twenty, or even ten, years ago. A series of movements, more particularly since 1856, led to the taking up and discussing in a free and liberal spirit the peculiarities of speech, dress, and behaviour which separated them from their fellow-citizens; and these have been relaxed so far that every one is now at liberty to adopt for himself in these matters whatever he deems consonant with the great principles of simplicity and Christian propriety. Wherever the Friends have a meeting-house, they hold once a month, after the meeting for worship is over, a meeting for discipline, or, in other words, for all the civil and ecclesiastical affairs of the body. They hold it a Christian duty to support their own poor, and to educate their children; and though they do not pay their ministers, they deem it right to defray their expenses when they travel in the ministry. For these purposes they raise the necessary funds by voluntary contributions, at meetings preparative to the monthly meetings. It is contrary to the rules of the society for one member to go to law with another, and all differences are settled by arbitration. Several monthly meetings compose a quarterly meeting, which generally embraces one or two counties; and from the quarterly meetings representatives are sent to the yearly meeting in London in the month of May. In 1827 a schism took place in their body in America, and a numerous party, known as the Hicksites, from their leader Elias Hicks, seceded from the main body. Whatever one may think of their peculiarities, it cannot be denied that they have been among the noblest and most unwearied philanthropists the world has ever

seen. They were the first to enter the crusade against negro slavery, and since that time they have never ceased their efforts in that cause. They have been no less zealous in diffusing their opinions against war; and in the improvement of prison discipline, the labours of Elizabeth Fry and others are well known.

QUANTITY. (*See* PROSODY.)

QUARANTINE, *kwor-in-teen'* (Ital. *quarante*, forty), is a regulation to prevent the introduction of infectious diseases into a city or country, by obliging ships, goods, or persons leaving a place suffering from infectious disease, to remain a certain time before entering another place. Quarantines are said to have been first adopted in Italy in the 15th century; and the name is derived from the period of detention having been fixed at forty days. The period is now regulated according to circumstances, and special laws are prescribed regarding it. Ships ordered on quarantine must repair to the place appointed, and continue there during the time prescribed, carrying a yellow flag at the main, and having no intercourse with the shore, except for necessary provisions, which are conveyed with every possible precaution. When the time expires, and the goods have been opened and exposed to the air as directed, they are admitted to port.—*Ref.* MacCulloch's *Commercial Dictionary*.

QUARRY, *kwor'-re* (Fr. *quarré*, quadrated), an excavation in the ground from which stone is extracted. The name appears originally to have been applied to such excavations from the circumstance that the materials obtained from them were quadrated, or formed into rectangular blocks. Great Britain abounds with quarries of nearly every different kind of stone that can be employed with advantage in architecture. The quarries of Aberdeenshire supply large quantities of granite to London every year, for bridges, quay walls, and every other work where strength and durability are most needed. In England, granite is chiefly quarried in Cornwall. In Yorkshire, Lancashire, and Derbyshire, both red and white sandstone are worked. In England, Wales, and Ireland, there are also extensive slate-quarries. The most common stone that is quarried in England and Ireland is that which is called limestone, and which, from the facility it affords for working, is generally called freestone. It is said that more than 40,000 tons of this kind of stone are annually exported to London from Portland. The marble and limestone quarries which were opened near Plymouth in 1812 furnished the material which was used in building the breakwater of that place.—Ref. *Report concerning the Qualities of Stone with reference to the New Houses of Parliament*. 1839.

QUARTER, *kwort'-er*, in Her., is an ordinary of quadrangular form, resembling a banner, and laid as a charge upon the field, of which it contains one-fourth part, as the term implies. In the corrupt Latin of ancient times it was rendered by *quartera*, and by Uredus, *pars*, which might apply to any other part; but the latter author also uses the word *quadrans*. The quarter is formed by two lines, one drawn from the side of the shield in traverse, to the centre, and the other perpendicularly from the chief to meet it in the same place.

QUARTER DAYS are the days which begin the four quarters of the year; viz., Lady-day, or the 25th of March; Midsummer-day, or the 24th of June; Michaelmas-day, or the 29th of September; and Christmas-day, or the 25th of December.

QUARTERING, *kwort'-er-ing*, in Her., is the marshalling, or regular arrangement or disposal, of various coats in one shield, thereby to denote the several alliances of one family with the heiresses of others. Unless they are sovereign queens or princesses, women, by the rules of heraldry, bear their paternal arms in a lozange or shield of that shape; and when they marry, and are not heiresses, it has been the custom to impale their arms with those of their husbands, in order to show the alliance, which is called *baron* and *femme*.

QUARTER SESSIONS, COURT OF. (*See* COURT OF QUARTER SESSION.)

QUARTETTO, *kwor-tet'-to* (Ital.), a musical composition in four parts, for either four voices, with or without an accompaniment, or instruments, generally of the stringed kind; *i.e.*, two violins, one viola, and one violoncello. Some splendid specimens of instrumental quartettos may be seen in the works of Haydn, Mozart, Beethoven, the two Rombergs, Spohr, Bies, Onslow, Fesca, and Mendelssohn.

QUARTZ, *kworts* (Ger.), a mineralogical term for crystallized silica. As a mineral, it is properly colourless; but it occurs also in various shades of colour, forming the amethyst when purple, topaz when yellow, cairngorm when smoke-coloured, and passing by mixture with other siliceous minerals into jasper, hornstone, chert, flint, chalcedony, agate, and numerous others. Quartz crystallizes in hexagonal prisms with pyramidal summits.

QUASSIA, *kwosh'-yă* (*Quassi*, a slave who first used it as a remedy in malignant fever at Surinam), in Bot., a gen. of the nat. ord. *Simarubaceæ*.—The wood of *Q. amara*, a native of Surinam, is intensely bitter, and was formerly much used as a febrifuge and tonic. It is the original quassia of the shops; but it is no longer imported, having been replaced by the wood of *Picræna excelsa*, a native of Jamaica. The two products are sometimes distinguished as Surinam quassia and Jamaica quassia. The flowers of *Q. amara* are stomachic. (*See* PICRÆNA.)

QUAVER, *kwa'-ver* (Welsh *cwibiaw*, to quaver, to trill)), a character or note, equal in duration to ½ of a semibreve, ¼ of a minim, or ⅛ of a crotchet.

QUEEN, *kween* (Sax. *cwaan*, wife), is the wife of a king, or a female sovereign. In this country, a queen regnant differs in no respect from a king, as regards the political rights vested in the dignity. (*See* KING.) The queen-consort is possessed of peculiar privileges granted to no other woman, whether married or single. (*See* CONSORT.) The queen dowager is the widow of a deceased king, and enjoys most of the privileges which belonged to her as queen-consort.

QUEEN ANNE'S BOUNTY. (*See* BOUNTY, QUEEN ANNE'S.)

QUERCITRON BARK. (*See* QUERCUS.)

QUERCUS, *kwer'-kus* (Lat.), in Bot., the Oak, a gen. of the nat. ord. *Corylaceæ*, having male flowers in a long pendulous catkin, with 5—10 stamens, and perianth 5—7-cleft; female flowers solitary, with a cup-shaped scaly involucre, 3 stigmas, and a 3-celled ovary. Nut 1-celled, 1-seeded, surrounded at the base by the enlarged cup-shaped involucre. The timber of several species of *Quercus* is extensively employed for ship-building and for other important purposes. *Q. Robur* is the common British oak: there are two varieties of this noble tree, by some regarded as distinct species, called *Q. pedunculata* and *Q. sessiflora*. Besides the British oak, there are the important timber-yielding trees *Q. cerris*, the Turkey or Adriatic oak; *Q. alba*, the white oak; *Q. rubra*, the red oak; *Q. tinctoria*, the black oak; and *Q. virens*, the live oak. The bark of several species is astringent and largely employed for tanning purposes, and to some extent in medicine: that of *Q. pedunculata* is most esteemed. The outer bark of *Q. Suber*, the cork-oak, constitutes the *cork* of commerce, an invaluable article, for which there is no fitting substitute. The bark obtained from the younger branches of the same tree is imported into this country from Spain, and employed in tanning, under the name of *European alcornoque bark*. The inner bark of older stems is also imported as *cork-tree bark*, and employed for similar purposes. The acorn-cups of *Quercus Ægylops* are called *valonia*; the dried half-matured acorns, *camata*; and the very young ones, *camatina*. These three articles are very valuable for their tanning properties, and are imported in large quantities from the Levant. The bark of *Q. tinctoria*, the black-oak, is called *quercitron bark*, and is much used for tanning; its inner portion is also extensively employed in this country for dyeing yellow. *Q. coccifera*, the Kermes oak, has its young branches attacked by a species of *coccus*, which forms little reddish balls upon their surface. These were formerly much used as a crimson dye. Oak-trees are especially liable to be attacked by insects, and the excrescences which are produced are commonly called *galls*. The more important galls are the *nut-galls* of commerce, and the large *Mecca* or *Bassorah galls*, called also *Dead-Sea apples*, *mad apples*, and *apples of Sodom*. The latter are produced by the *Cynips insana* on the *Q. infectoria*. The former are also produced on the branches of the same tree by the *Cynips galla tinctoria*, or gall-insect,

They are extensively employed in tanning, for making ink, and for other purposes in the arts. The best come from the Levant. Two kinds are specially distinguished, —the *blue* and the *white*. The dark-coloured imperforate galls are the most valuable. The acorns of some species of *Quercus*, as *Q. Ballota*, *esculenta*, and *Hindsii*, are edible.

QUESTION. (*See* TORTURE.)

QUICKSILVER. (*See* MERCURY.)

QUIETISTS, *kwi'-et-ists*, a term applied to certain religious sects, who held the doctrine that the essence of religion consisted in the devout contemplation of the being and attributes of God, so as to absorb all human passions and sentiments. A sect of this class existed under the name of Hesychasts, among the religious of Mount Athos, in the 14th century. A Spanish priest, Michael Molinos, published a work entitled "The Spiritual Guide" (1675), in which he advocated this doctrine, and obtained many followers. His work was condemned, and he himself obliged to abjure his errors and terminate his life in acts of penance in a Dominican convent at Rome. His opinions, however, spread, and works of a similar nature appeared in Germany, France, and other countries. In France, the great advocate of the doctrine was Madame Guyon, a lady of great piety, but with more imagination than judgment. Fenelon took up and advocated the system, which brought him into controversy with Bossuet. Quietism was condemned by papal bull in 1699, and since then has gradually ceased.

QUILLAIA, *kwil-lai'-ya*, in Bot., a gen. of the nat. ord. *Rosaceæ*. The bark of *Q. saponaria* and other species contains a large proportion of *saponine*, and is employed in some parts of America as a substitute for soap. It has lately been used in this country as a detergent in cases of scurfiness and baldness of the head.

QUINCE. (*See* CYDONIA.)

QUINIC ACID. (*See* KINIC ACID.)

QUININE, or QUINIA, *kwin-neen'*, *kwin'-e-a*, in Chem., an alkaloid found in the bark of trees belonging to the Cinchona or Peruvian Bark family. Besides quinine, these barks yield five other similar alkaloids; but as they are not used to any extent either in medicine or manufactures, it will be necessary to only enumerate them. They are cinchonine, cinchonidine, cinchonicine, quinidine, and quinovine. Besides these, the bark of the *Cinchona ovata* yields *aricine*, or *cinchovatine*. Quinine occurs most in the yellow bark, or *Cinchona cordifolia*, in which it occurs with cinchonine, in combination with kinic and kinotannic acids. The quantity varies, in different specimens of bark, from 3 to 5 per cent. The bases are extracted by boiling the pulverized bark in 8 or 10 parts of water, acidulated with 1 part of oil of vitriol and 1 of hydrochloric acid. The liquor is strained through a cloth, and again treated with acidulated water. As soon as the liquors are cold, milk of lime, or carbonate of soda, is added, the precipitates formed being submitted to pressure and treated with hot alcohol. If cinchonine be present in any quantity, it crystallizes as the liquid cools, and the two alkaloids are further separated by the addition of dilute sulphuric acid and crystallization, the sulphate of quinine crystallizing out first. The alkaloid is thrown down by the addition of ammonia, and may be formed into the different salts at will. Quinine being very insoluble in water, it is generally used in medicine in the form of disulphate, which dissolves readily in alcohol and water. Quinine is one of the most valuable febrifuges and antiperiodics that we possess, and is yearly becoming more scarce, from the wasteful method employed by the Peruvians in gathering the bark. Cinchona plantations have, however, been formed in various parts of British India, and there is every reason to believe that, in the course of a few years, we shall obtain an unfailing supply from our own possessions. (*See* CINCHONA.)

QUINOA. (*See* CHENOPODIUM.)

QUINSY, or CYNANCHE, *kwin'-se* (corrupted from Fr. *esquinancie*, Lat. *cynanche*), in Med., is an inflammation of the throat. Medical men distinguish it into different kinds, according to the nature of the inflammation, or the part chiefly affected; as croup, diphtheria, pharyngitis, tonsilitis, &c. The two former are noticed under their proper heads, the latter are those that commonly come under the head of quinsy. They do not differ materially from each other either in character or in the mode of treatment, but in the one case the pharynx is the principal or sole seat of the disease, in the other, the tonsils. The inflammation is brought on by cold, and it usually commences with cold chills and other febrile symptoms. There is fulness, heat, and dryness of the throat, with a hoarse voice, difficulty of swallowing, and shooting pains towards the ear. The inflammation may be confined to the pharynx, or it may spread from it over the soft palate and the tonsils, and into the cavities of the nose. On examination, the back of the mouth and fauces will be found unnaturally red and swollen, and often covered with a tough mucus. In general, a common sore throat does not require much treatment, the inhaling of the vapour of hot water, or a large poultice round the throat, with gentle purgatives, and the avoidance of stimulating food, being usually all that is necessary for its removal. Frequently, however, the swelling continues for some time, and occasionally the disease takes the form of relaxed sore throat, which requires to be treated with stimulating gargles, as hot wine, very diluted mineral acids, &c., and tonics, if the general health be not good. In more severe cases, the difficulty of swallowing is much increased, and to avoid the pain the patient usually allows the saliva to flow from his mouth, and liquids attempted to be swallowed return through the nose. The inflammation may also extend to the Eustachian tube, producing deafness, and to the parts around the larynx, occasioning difficulty of breathing. With these symptoms there is usually a considerable degree of fever, with headache, loss of appetite, &c. In such cases, strong purgatives are required, with a blister outside the throat, and warm poultices, the inhaling the steam of hot water, stimulating gargles, and if the throat be much swollen, leeches applied to the sides. Sometimes an abscess is formed in one or both tonsils, from which the patient suffers greatly. This will in time burst; but it will materially shorten the patient's sufferings if it be opened as soon as the matter is distinctly formed. After the inflammatory symptoms have subsided, a generous diet and tonic medicines are necessary. Where the tonsils have become permanently enlarged, or where other means fail, it is sometimes necessary to reduce them by cutting to their natural dimensions. In malignant or putrid sore throat there is great prostration of strength, accompanied with a low typhoid state, requiring the remedies used in low typhus, with astringent gargles, leeches, and nutritive diet, &c.

QUINTETTO, or QUINTET, *kwin-tet'-to*, *kwin-tet'* (Ital.), a musical composition, in five parts, each of which is obbligato, and performed by a single voice or instrument.

QUOITS, *koits* (Dan. *coits*), an English out-door game, somewhat resembling the ancient pastime of throwing the discus. The game is played with "quoits," which are round flat metal rings, varying in internal diameter from two or three inches to a foot. Two iron pins, or *hobs*, as they are called, are placed in the ground, which is generally puddled with clay, at a distance of about fifteen or twenty yards. The game is usually played by two or four persons, who choose sides, and play in regular succession. The endeavour of the players is to throw their quoits from one hob over the other, or as near to it as possible. The quoits nearest to the hob score to the player, and the game is won by the side which makes a given score first.

QUORUM, *kwore'-um* (Lat., of whom), in Law, is a term used in commissions, from the Latin expression *quorum A. B. unum esse volumus* (of whom we wish A. B. to be one). Thus, in commissions of justices of the peace, it is usual to name certain of them as a quorum, without the presence of whom no business can be done. In legislative and other assemblies, a quorum is a certain number of members who are required to be present before any business can be transacted.

QUOTIENT. (*See* ARITHMETIC.)

QUO WARRANTO, *kwo-wor-ran'-to* (Lat., by what warrant), in Law, is a writ in the nature of a writ of right for the crown, issuing out of the court of Queen's Bench, against one who claims or usurps any office, franchise, or liberty, calling upon him to show by what

warrant he exercises the office, franchise, or liberty in question. This writ has fallen into disuse, and a more expeditious mode of proceeding has been adopted, by filing an information by the the attorney-general, in the nature of a *quo warranto*, in which the person usurping is considered as an offender, and consequently punishable by fine.

## R

R, *ar*, is the 18th letter and 14th consonant of our alphabet. It is to be found in all languages except the Chinese, and some of the tongues of the North American Indians. The Romans borrowed it from the Greek *rho*, which is derived from the Hebrew and Phœnician *resh*. It is a lingual and a liquid consonant or semivowel, being formed by a guttural expulsion of the breath, vibrated through the mouth with a sort of quivering motion of the tongue, drawn back from the teeth, and advanced with the tip a little elevated towards the palate. It is one of the last which children learn to pronounce, and is frequently exaggerated by the Irish and softened down by the English. In pronunciation it is frequently confounded with *w*, as *rubbish*, pronounced *wubbish*, and an *r* is frequently substituted for a *w* at the end of a word, especially if the next word begins with a vowel; as *winder* for *window*, *piller* for *pillow*. It is interchangeable with the letters *l*, *n*, *rs*, and *s*, and is apt to place itself at one time before and at another time after a vowel. It is also apt to disappear from words in the neighbourhood of several consonants. As a Roman numeral, R stood for 80, and with a dash over it for 80,000. In Greek, with a mark over it it stands for 100, and with a mark under it for 100,000. In medical prescriptions, R or ℞ stands for *recipe* (take).

RABBI, *răb'-bi* (Heb., my teacher, lord, or master), is a title of respect given by the Jews to the teachers of their law, and seems to have been introduced only shortly before the time of Christ. It was frequently applied to Christ by his disciples. It was originally used in three forms,—*rab*, or master; *rabbi*, or my master; and *rabban*, great master, or *rabboni*, my great master. Rab is still used by the Jews of eastern Europe and others, both in conversation and writing, in the sense of Mr.; and the title rabbi or rabbin is given to the modern religious heads of Jewish communities or congregations. The term rabbinical is applied to all the Jewish writings composed after the Christian era. (*See* HEBREW LANGUAGE AND LITERATURE.)

RABBIT, *răb'-bit* (said to come from the Belgic *robbe, robbeken*), (*Lepus cuniculus*).—This animal, now so common throughout the southern and temperate parts of Europe, is supposed to have been of African origin, and first imported into Spain. It belongs to the same genus as the hare, and resembles it in form, but differs from it considerably in its gregarious habits, its subterranean life, its whiter flesh, and less perfect state of the young when produced, these being blind at their birth and nearly naked. It is very prolific, breeding seven times a year, and bringing five young ones each time. The rabbit affects a temperate and warm climate, and bears great cold with difficulty. In Sweden, they are obliged to be kept in houses. In England, they are most plentiful in the counties of Lincoln, Norfolk, Suffolk, and Cambridge, where the soil is sandy, and whence they are brought in immense numbers for the supply of the London market. Rabbits have been known from the earliest periods of history, and the first or earliest accounts which we have of them represent them as inhabiting the warm and sandy places of southern climates, especially those near the shores of the sea. It has been introduced in recent times into America, and having found in the more southerly portions of that country a climate very congenial to its constitution, has increased rapidly. The rabbit in a natural state has the ears shorter than the head, and the tail is not so long as the thigh. The general colour is a state of nature is yellowish-grey, with reddish on the neck and brown on the tail, with the throat and belly whitish. The ears are grey. There are four varieties of rabbits, differing somewhat in their characteristics and habits; namely, the *warreners*, *parkers*, *hedgehogs*, and *sweethearts*. The first kind, as their name implies, are in the habit of making their homes or burrows in open grounds or warrens; the *hedgehogs* are found in thick hedgerows and wood covers in parts where the soil is not sufficiently sandy to be made a subterranean dwelling, and the coat of them is less furry than that of the others; the *parkers* live on the upland also, as in gentlemen's parks, pleasure-grounds, and broad open grazing grounds, and breed in any convenient spot, and, except to the eye of a professional warrener, are undistinguishable from the last variety. *Sweethearts* are the tame varieties, and now multiplied into innumerable varieties of size, colour, and character, from the oldon to the long-eared, and from the middle-sized to the monster of ten pounds weight. When only five or six months old, rabbits are capable of breeding, their term of gestation being thirty or thirty-one days. If the dam does not find a hole suited to her purpose previously to her bringing forth, she digs one, not in a straight line, but in a zig-zag direction, enlarging the bottom of it every way, and pulling from her own body a quantity of hair, with which she makes a warm and comfortable bed for her young. When she ventures abroad, she covers up the hole very carefully, scarcely leaving any perceptible mark of it, and conceals her charge from the male, it is said, lest he should devour them. She continues these attentions for about a month, when the young are able to provide for themselves. The ordinary term of a rabbit's existence is from seven to ten years. As rabbits cannot articulate sounds, and are formed into societies living under ground, their method of giving an alarm is very peculiar; for when any danger threatens, they thump the earth with one of their hinder feet, and produce a sound which can be heard by animals near the surface at a considerable distance. They are very sensible to any changes of the weather, and seldom go abroad unless it be settled and calm.



RABBIT.

RACEME. (*See* INFLORESCENCE.)

RACEMIC ACID, *rā-se'-mik* (Lat. *racemus*, a bunch or cluster), a peculiar modification of tartaric acid, found in certain species of grape growing in the Vosges mountains, and in one or two other localities. It differs from tartaric acid in certain minor particulars, although its composition is precisely similar.

RACEMOSE CYME. (*See* INFLORESCENCE.)

RACES, *rai'-sees* (Fr.), in Bot., those permanent varieties of species which can be propagated by seed. Familiar examples are afforded by our cereal grains (wheat, oats, barley, &c.), and by our culinary vegetables (peas, lettuces, radishes, cabbages, cauliflowers, &c.). Such permanent varieties, however, require to be kept up by cultivation, for if left to themselves, or sown in a poor soil, they will soon lose their peculiarities, and either perish or return to their original specific type.

RACES OF MANKIND. (*See* ETHNOLOGY.)

RACING, HORSE. (*See* HORSE-RACING.)

RACK, *răk*, is an instrument of torture furnished with pulleys, cords, and other appliances for extorting confessions from criminals. It was in use at an early period in the south of Europe, where it was applied to the early Christians, and in later times was an instrument of the Inquisition. It is unknown to the law of England, though once, in 1423, when the dukes of Exeter and Suffolk, and other ministers of Henry VI., had designed to introduce the civil law into the kingdom as the rule of government, they caused a rack to be erected for torture, which in derision was called "the Duke of Exeter's Daughter," and still remains in the Tower of London. Upon the assassination of Villiers, duke of Buckingham, by Felton, in 1628, it

was proposed in the privy council to put the assassin to the rack, in order to discover his accomplices; but the judges being consulted, declared unanimously that no such proceeding was allowable by the laws of England. (*See* TORTURE.)

RACKETS, *rák'-ets* (Fr. *raquette*, Ger. *Racket*), a game played by striking a ball against what is called a head-wall, and returned to the same wall at the bound, each player endeavouring to strike it against the wall in such a way that his adversary may not be able to return it. The player who does not return it loses a point, or has his "hand out," that is to say, he forfeits the situation in which he would be able to add to his score of the game. Great skill is required in order to play the game of rackets well. There are several open racket-courts in London. One of the most celebrated courts, where many a man became a racket-player *malgré lui*, is now closed; namely, that in the Queen's Bench prison.

RACOON, *rák-koon'* (*Ursus Lotor*).—This animal is a fox-like creature with the gait of a bear. The head is round, with a narrow tapering nose, projecting beyond the mouth, black at the end, and flexible; the lips black. Eyes moderately large and round, with a circular pupil. Elliptical ears, low but erect, with rounded tips, dirty-white. Whiskers strong. Short-haired muzzle, dirty-white, the colour extending round the cheek and over the eyes. Back grizzled. Belly paler than the back. Tail bushy; not unlike a fox's brush, dirty-white, annulated with dark rings. Length of head and body, two feet; of tail (*vertebræ*), 9½ inches. It is a native of the north of America, and, according to some authorities, extends as far south as Paraguay. In a state of nature, it sleeps throughout the day, prowling during the night in search of fruits, roots, birds' eggs, and insects. At low-water, it frequents the sea-shore, where it preys on crustacea and shell-fish. It climbs trees with great facility. Its sagacity is considerable; but as it is not very powerfully armed, it is not very courageous, and seldom approaches dwellings with the same hardiness as animals decidedly carnivorous. Another species, the crab racoon (*Procyon cancrivorius*), is an inhabitant of the warmer parts of South America, and is rather a larger animal than the common racoon; but the characteristics of each are very similar.

RADIATION, in Nat. Phil. (*See* HEAT and LIGHT.)

RADICALS, *rád-i-kals* (Lat. *radix*, a root), is the name given to a political party in England who are opposed to half-measures, and wish to have all the abuses that may have crept into our constitutional system completely rooted out, and our institutions re-modelled. This party is by no means so powerful or numerous as it was some years ago, the people seeing the impracticability and danger of attempting at once great constitutional or social changes.

RADICLE, in Bot., that portion of the embryo from which the root is developed.

RADICLE THEORY, *rád'-i-kl* (from Lat. *radix*, root), in Chem.—The theory of compound radicles in organic chemistry, first proposed by Liebig, may be best illustrated and explained by considering the composition of the alcohols. Thus, in the case of ordinary vine alcohol, $C_4H_6O_2$, Liebig assumed that it was a derivative of a radicle $C_4H_5$, which he named ethyl. In like manner he considered ether, $C_4H_5O$, also to be derived from the same radicle. Upon this theory, which, as soon as it was started, received the fullest confirmation from thousands of experimenters, the compound group ethyl, $C_4H_5$, performed a similar function to potassium, silver, or any of the other elements. Taking potassium as an example, the compounds of the two radicles would run as follows:—

| | | | |
|---|---|---|---|
| Oxide of potassium, | KO | Oxide of ethyl, | $(C_4H_5)O$ |
| Chloride of do. | KCl | Chloride of do. | $(C_4H_5)Cl$ |
| Iodide of do. | KI | Iodide of do. | $(C_4H_5)I$ |
| Sulphide of do. | KS | Sulphide of do. | $(C_4H_5)S$ |
| Hydrated oxide of do. ..... | KO.HO | Hydrated oxide of do. ..... | $(C_4HS)O.HO$ |

The theory was at first strongly objected to by many eminent chemists, from the circumstance of the assumed radicles being hypothetical; but as experiment went on, first one and then another of these radicles were isolated, until at last a very respectable list was shown. Similarly, the theory was extended to the organic acids, acetic acid having been shown to be a hydrated oxide of the radicle, thus assimilating them to the inorganic acids, as shown below:—

Formic acid, $HO(C_2H)O_3$, or hydrated teroxide of formyl ($C_2H$).

Acetic acid, $HO(C_4H_3)O_3$, or hydrated teroxide of acetyl.

Sulphuric acid, $HO.SO_3$, is hydrated teroxide of sulphur.

RADISH. (*See* RAPHANUS.)

RADIUS, *rá'-de-us*, in Geom., the semi-diameter of a circle, or the straight line drawn from the centre to the circumference. It is implied in the definition of a circle, and it is apparent from its construction that all the radii of the same circle are equal.

RAFT, *raft*, a species of float, consisting of a number of logs or planks fastened together side by side for the purpose of being moved from one place to another with greater facility. In some of the tributary rivers of the Rhine, there are numbers of rafts, some of which are so large as to resemble floating villages. They consist of a platform of oak and deal timber, upon which are erected about twelve or fifteen little wooden huts; many of them are from 800 to 900 feet long, and 60 or 70 broad, and often carry as many as 700 or 800 persons on board. To these several smaller rafts are attached, besides a string of boats loaded with anchors and cables, and used for sounding the river and going ashore.—*Ref.* Brande's *Dictionary*.

RAGGED SCHOOLS. (*See* SCHOOLS.)

RAGULEY, RAGULED, or RAGULATED, *rág'-u-le*, a term in Her. applied to any ordinary that is notched or jagged in an irregular manner.

RAILWAYS, *rail'-waiz*, roads constructed by placing smooth lines, called *rails*, of wood, iron, stone, or other suitable material, on which the wheels of carriages roll. They are made for the purpose of obviating much of the friction which occurs on ordinary roads, and thus enable wheeled vehicles to be drawn at higher velocities. The power by which the carriages are drawn does not affect the definition; they may be drawn by horses or by locomotive steam-engines; they may be drawn along levels and up inclines by stationary machinery, or may descend inclines by their own gravity; in all cases, the principles upon which railways are constructed are nearly alike. Railways are therefore of various kinds, and have been in use for a considerable time for the purpose of transporting minerals and other heavy goods at a diminished cost. The requirements of the coal traffic in Northumberland gave the first origin to railways. As early as 1676, coals were conveyed from the mines to the river near Newcastle-upon-Tyne, "by laying rails of timber exactly straight and parallel; and bulky carts were made, with four rollers fitting those rails, whereby the carriage was made so easy, that one horse could draw four or five chaldrons of coal." The rapid wear of the timber led to the structure of cast-iron rails to replace the wooden ones, and being limited in length, they were formed with a continuous flange or ledge on their inner edge to keep the wheels on the track. These roads were called *tram-roads*. The leading objection to this system was, that the rail was liable to be covered with dust or gravel. In order to obviate these disadvantages, in 1789 Jessop laid down, at Loughborough, cast-iron "edge rails," from which the guiding ledges were removed, and applied round the edges of the wheels, forming flanges, the rails being elevated sufficiently to allow the descending flange to clear the ground. This system of rails seems to have been the first that was laid on cast-iron chairs and on sleepers. In 1820, Birkenshaw patented the "fish-belly" rail, and thus substituted rolled wrought-iron rails for cast rails. This form of rails advanced in public estimation, and was employed in the construction of the Liverpool and Manchester Railway, which was opened in 1829, and intrusted to the charge of George Stephenson. Until the year 1810, the only power used on railways was animal power; yet, although the application of steam in this direction is comparatively modern, the efforts of mechanists had long been directed towards it. For more than forty years, Watt, Symington, Trevethick, Blenkinsop, and others, had endeavoured to discover a method of pro-

pelling carriages by steam on common roads or railways. It began, however, to be a fixed belief of all machine-makers, that a simple band-wheel could not meet enough friction on a road-surface to cause the carriage to advance. In consequence of this belief, rachet-wheels, jointed levers, mechanical legs of every shape and form, were introduced, to the detriment of the roadway and the diminution of the motive power of the engine. A change, however, was at hand. In 1814, or thereabouts, George Stephenson constructed, for the Killingworth Colliery, in Northumberland, a steam-engine bearing two cylinders, seated on a boiler mounted on wheels, and immediately above the axles of those wheels, which bore cranks connected with the piston-heads of the cylinders, and were made to revolve in unison by means of vaucanson chains working over barrels on their axles. At first the engines made upon Stephenson's principles were not held in high estimation, and a considerable period elapsed before they came into general use. In the colliery districts, however, they came gradually into favour; and about 1826 Stephenson applied one of them for passenger traffic on the Stockton and Darlington line. The velocity of these engines was about five miles per hour for goods traffic, and nine miles for passengers. During the design and execution of the Liverpool and Manchester Railway, before mentioned, the projectors were for a long time in doubt as to what description of motive power they should adopt. They soon felt that horse-power would not furnish them with the necessary velocity; but the result of the experiment on the Stockton and Darlington Railway had not been sufficiently decisive to induce them to try the new engines. After consulting some of the best engineers of the day, they resolved upon applying locomotives, and offered a premium for the best engine which should fulfil certain conditions. It would be superfluous to give any description in this place of the celebrated competition which took place. Suffice it to say that the premium was won by the *Rocket* engine of Messrs. Stephenson and Booth; a circumstance which inaugurated one of the most important revolutions in material civilization. (*See* STEPHENSON, GEORGE, in vol. I. of this work.) In the mean time the French had not neglected the advantage offered by *edge-rails* in heavy goods traffic, and in 1826 had constructed railways on that principle from Roanne to St. Etienne, and from St. Etienne to Lyon and to Andrezieux. To M. Sequin, the engineer of these lines, is due the first introduction of small tubes passing from the fire-box to the chimney. This plan was adopted by Messrs. Stephenson and Berry in constructing the boiler of the *Rocket*. The weight of this now celebrated little engine was only 4 tons 5 cwt.; it had four wheels, not coupled; with a gross load of 17 tons it attained an average speed of 14 miles, and in some instances a speed of 17 miles. At the present day the weight of some of the engines employed on the Great-Western Railway is not less than 31 tons! while on the Continent, on the Semmering line, there are locomotives having six coupled wheels, and weighing 48 tons! A comparison of these figures will give some notion of the great changes that have taken place since the days of the *Rocket*. In railways, as in all other roads, the first consideration is the use to which they are to be applied, and the weight on the wheels to be run over them. The next consideration is, that the road should be thoroughly well drained, in order that all rain-water falling on the line may run off the surface without soaking in; and also that all running water crossing the line may be provided with culverts to pass under it. The *gauge* or measure of a railway is taken at the distance apart of the upper surfaces or treads of the two rails forming a line of way. There are two gauges known in England,—the *narrow gauge*, 4 feet 8½ inches wide, and the *broad gauge*, 7 feet between the rails. The narrow gauge is the most generally used; but the broad gauge was adopted by the younger Brunel on the Great Western Railway. In Ireland, the gauge is 6¾ inches wider than the English narrow gauge. For the most part, the European gauge is the same as the English; but the Spanish is 5 feet 6 inches. This is looked upon as a political expedient, in order that there may be a break of gauge with the French railways; commercially, the alteration is inconvenient. The Indian gauge is 5 feet 6 inches. In America the gauge varies from 4 feet 8½ inches to 6 feet. All the rails used in the laying down of railroads may be divided into two classes:—first, those which are single-headed and flat-footed, forming their own support on the sleepers or ballast; secondly, those which are double-headed, and need chairs or other methods of support on the sleepers. The second class may be again subdivided into—rails on cross sleepers of timber; rails on longitudinal sleepers of timber; rails on cast-iron sleepers, without timber; rails on wrought-iron sleepers, without timber. In planning the work of a railway, the engineers endeavour to arrange in such a manner that the earth to be excavated shall be equal to the embankment, so that the material is redistributed instead of being removed. A straight and horizontal line is the standard of perfection; and the engineer tries to effect this as nearly as the finances of the company will permit him. The earthwork of a railway is the foundation and support of the whole superstructure, and as such must be uniformly firm, and carefully considered with respect to material, preparation, form, and drainage; of free width, easy slopes, ample ballast, and thorough drainage. The slopes of cuttings vary according to stratification, soil, direction of the vein, and moisture. The relative cost of tunnelling is not more than cuttings through clay. There are more than 70 miles of tunnelling in Great Britain; and the cost of tunnelling has averaged about £102 per yard. The longest tunnel is on the Manchester, Sheffield, and Lincolnshire Railway; it is 3 miles and 60 feet in length. It is estimated that there are about 55 miles of viaducts in the United Kingdom. The different inclines of the level are matters of great importance in railway engineering. (*See* GRADIENT.) The *stations* are the great theatres of the operations incidental to the transfer from place to place of persons and goods. They are either *terminal* or *intermediate*. Some of the terminal stations in the metropolis are very extensive. King's Cross station, one of these, covers 26 acres of ground, and contains 18½ miles of lines of rails. The ground from King's Cross to Holloway, 1¼ mile long, comprising the ground covered by the passenger and the goods station at King's Cross, cost about £470,000. In estimating the total length of *sidings* on the whole railway system, it should be known that in 1858 there were, in England, Scotland, and Ireland, upwards of 2,050 railway stations for 9,082 miles open for passenger traffic in that year; being about at the average rate of one station for every three miles of railway. The extent of siding is calculated at one mile for each station. At the stations, sidings are not only provided, but also *switches* and *crossings*, in order to form a link between one line of rails and another, of which many are required at and about stations and at junctions. *Turn-tables* are also necessary. These are of two kinds,—either for turning carriages and waggons, or for turning engines and tenders together. Nearly every railway differs in its system and code of *signals*. This is a matter much to be regretted. The "semaphore" is now largely employed, and has greatly superseded the use of the "disc" as a mode of signalling. But even in this the railway companies do not all work by the same code. In one case it is used to give two signals, in another three; in another case, it will have an auxiliary or distant signal, placed at 500 or 600 yards from the station, to act as a repeating signal. At night, it is necessary to supply the place of semaphores by large and powerful lamps, showing lights of three colours,—a white light, a blue or green light, and a red light; signifying respectively, safety, caution, danger. The *carriage stock* on a railway comprises all the vehicles concerned in the conveyance of passengers and their luggage, and of private carriages and horses. The *waggon stock* comprises the vehicles employed in the conveyance of merchandise, minerals, and live stock. Carriages for passengers are generally divided into three classes, in order to meet the requirements of the travelling public. At the beginning of 1858, there were 9,116 miles of railway in the United Kingdom, all in the hands of ninety-three companies; 6,777 miles were in England and Wales, 1,269 in Scotland, and 1,070 in Ireland. Of the total, only 740 miles were broad gauge. At the present time (1863) there are more than 10,000 miles of railway in operation. On December 31, 1857, the total amount of capital raised for the construction of railways was about £315,000,000,

representing an expenditure of about £35,000 per mile. The average cost per mile then was :—

| | |
|---|---|
| England and Wales | £39,275 |
| Scotland | 28,225 |
| Ireland | 15,604 |
| Total average | £34,950 |

Taking this estimate roughly as £35,000, the following may be taken as an approximate analysis of the average cost of these railways :—

| | *Per mile.* | | *Per ct.* |
|---|---|---|---|
| Law and Parliamentary expenses... | £2,000 | or | 6 |
| Land and compensation ..... ..... | 7,000 | ,, | 20 |
| Works of construction and stations complete ..... | 17,500 | ,, | 50 |
| Locomotive and carrying stock ..... | 3,000 | ,, | 9 |
| Interest on stock, discount, bonuses, dividends from capital, contingencies ..... | 5,500 | ,, | 15 |
| | £35,000 | ,, | 100 |

From this it would appear that the cost of land and compensation is £7,000 per mile, or one-fifth of the entire cost. According to the report on the railways of Great Britain, issued by the department of railways, the length of line open on December 1st, 1860, was 10,433 miles; the maintenance of ways cost £2,137,362; the locomotive power, £3,801,282; the rates and taxes, £517,307; government duty, £363,171; the total expenditure, £13,187,368; the total receipts, £27,748,486; and the net receipts, £14,561,118. The number of locomotives in use at the same time was 5,801. With regard to *Railway legislation*, a vast number of laws have been placed by parliament on the statute-book; in the case of the London and North-Western Railway, no less than 200 different acts have been passed! A great number of these statutes, moreover, are irreconcileable in detail. At various times also select committees have reported against the possibility of maintaining competition between railways, and to this principle parliament has as often assented. Notwithstanding this, the practical working of the laws which have received the sanction of the legislature has been to negative this principle, by almost invariably permitting competition to be obtained whenever it has been sought. The competition, however, which parliament permitted, whatever its effect for the time, has generally terminated in combination. In many cases the expenses incurred in getting an act of parliament are enormous, and, in general, excessive. The blame for this extravagance rests with three parties,—the legislature, the landowners, and the railway companies themselves. According to a return called for by Mr. Hadfield, in 1855, it was shown the expenses incurred by existing railway companies in obtaining the acts of parliament by which they are incorporated, were no less than £14,000,000. Amongst the chief sources of the excessive expenditure has been the adherence to expensive and useless forms by parliamentary committees, in what are called the standing orders, or general regulations for the observance of the promoters of railway bills. On the other hand, the expenses are increased by the desire of rival railway companies, to resist imaginary inroads upon vested rights. In 1859, by a return of Colonel Wilson Patten, it was shown that the parliamentary expenses alone incurred by railway companies owning £283,000,000 capital amounted to about £8,500,000, or 3·2 per cent. On this subject a writer in the *Edinburgh Review* remarks :—"Once the greatest obstacles to railway enterprise, owners of estates have, of late years, been among its chief promoters. Since the Liverpool and Manchester line was first defeated by landed opposition, and succeeded with its second bill only by keeping out of sight of all mansions, and avoiding all game preserves; since the time when the London and Birmingham company, after seeing their project thrown out by a committee of peers, who ignored the evidence, had to conciliate their antagonists by raising the estimate for land from £350,000 to £750,000; since the time when parliamentary counsel bolstered up a groundless resistance by the flimsiest and absurdest excuses—even reproaching engineers with having trodden down the corn of widows and destroyed the straw-





berry-beds of gardeners; since then, a marked change of policy has taken place. Nor was it in human nature that it should be otherwise. When it became known that railway companies commonly paid for land and compensation sums varying from £4,000 to £8,000 per mile; that men were indemnified for supposed injury to their property, by sums so inordinate that the greater part has been known to be returned by the heir as conscience-money; that in one case £120,000 was given for land said to be worth about £5,000; when it was bruited abroad that large bonuses, in the shape of preference shares and the like, were granted to buy off opposition; when it came to be an established fact that estates are greatly enhanced in value by the proximity of railways, it is not surprising that country gentlemen should have become active supporters of schemes to which they were once the bitterest enemies." Up to the year 1846, the Eastern Counties Railway Company had paid a sum for land and compensation which was equal to £12,000 per mile. In more recent times, one of the most glaring cases of excessive expenditure in parliamentary litigation, as well as in land and compensation, is furnished in the Great Northern Railway Company. In 1844, the preliminary expenses of surveys, notices to landowners, &c., commenced. In 1845 it was introduced into the House of Commons, and opposed by the London and North-Western, the Eastern Counties, and the Midland railways. It was also opposed by two other schemes, called the London and York, and the Direct Northern. For eighty-two days the contest lasted in the House of Commons, more than half that time having been taken up with opposing the bill, which was allowed to stand over till the next year. It then went before a committee of the House of Lords on account of its magnitude. For three or four weeks the bill remained before the upper house, after which it was granted. The promoters of the rival schemes were paid off, and all their expenses paid, including the costs of the opposition of the neighbouring lines already named, before the Great Northern bill was passed. After the end of two years' litigation, the company found that their "preliminary expenses" were more than half a million sterling. After that time up to the 31st December, 1857, a further sum of £172,722 was expended for "law and engineering expenses in parliament." Altogether, £703,077 was expended on parliamentary charges for obtaining leave to construct 245 miles of way, being at the cost of £3,115 per mile. The payments made during the same period for land and compensation amounted to nearly two millions sterling! Thus the two charges together made a sum of £2,664,448, or £10,875 per mile! During the summer and autumn of 1845, and the earlier portion of 1846, a most gigantic railway speculation arose and developed itself. This commercial feature is generally known as the *railway mania of* 1845. During that year most branches of industry were in a more than ordinarily flourishing condition, and large dividends (whether really derived from profits is questionable) being paid by some of the principal lines, their stock rose rapidly to a high price. As in the case of the South-Sea bubble and other similar schemes, the cupidity of the public was aroused, and it was believed that speculation in railways was a short and easy method of acquiring wealth. An enormous number of schemes and projects were almost instantaneously devised, the great majority of which were founded on plans which could not be executed, or which, if executed, would be ruinous. These were all got up by persons whose only object was to profit by the credulity of the public. It would be difficult to conceive any more disgraceful exhibition of fraud and quackery on the one hand, and of folly and voracity on the other, than was displayed during the autumn of 1845 and the spring of 1846 by the manufacturers and buyers of railway shares. It has been stated that from 700 to 800 new schemes, requiring a capital of about as many hundred millions, were projected during this period. Many of the crafty projectors made money out of their dupes; but many others over-reached themselves and fell in their own pitfalls along with their victims. (*Ref.* MacCulloch's *Dictionary of Commerce.*) With regard to *Railway accidents*, the evidence brought before the select committee of the House of

Commons in 1858 led to the conclusion that accidents on railways arise from three causes:—Carelessness of servants; defective material, either in the works or in the rolling stock; and excessive speed. During 1857 there were twice as many accidents by collision between trains as by running off the line. Of the accidents by collision, five-sixths took place between passenger trains and goods trains. A very small proportion of the accidents—not one in twenty—arose directly from excessive speed, but in every case in conjunction with imperfections in the permanent way. The greater proportion of all railway catastrophes arises from the crowding of trains timed for unequal speeds, and the want of punctuality, which naturally result in an accident. Many accidents also occur through a want of perfect manifestation or apprehension of signals. The best methods for the prevention of railway accidents are the free use of the electric telegraph, in order to give full information of the exact positions and circumstances of the trains on the line; and the use of the most powerful brakes for bringing up the trains in the shortest possible time. A train going at a rate of 50 miles an hour, with the usual amount of braking power, may now be stopped within 900 or 1,200 yards. Good brakes are greatly to be desired on all railways; instantaneous brakes are not wanted; but 200 yards appears to be the shortest desirable space within which a train at 50 or 60 miles an hour should be stopped. This distance must be allowed in order to avoid the risk of carriages overriding each other, or of violence to the passengers. Steam brakes applied to the locomotives, and extended to the tenders, and even to the brake-vans, have been found to answer well, so as to be able to stop a train within half the ordinary distance. A simple method of communicating between the guard of the train and the driver of the engine is a great desideratum; and considering the immense extent of railways in this country, and the vast number of travellers conveyed by them, the subject seems worthy of the attention of the legislature. In the *Continental railways*, which have made great progress in late years, and especially in those of France, a large amount of English capital has been invested, and some of them have been constructed by English engineers. Belgium has numerous railways; and they have been extended in Germany, Italy, and even Spain, to an unanticipated extent. In Russia, also, some very extensive railways are being constructed. In the North American States the railways are very numerous, and some of them are of great length. Generally speaking, however, they are not so substantially constructed, nor have they been so expensive as those in this country.

RAILWAY, ATMOSPHERIC. (*See* ATMOSPHERIC RAILWAY.)

RAIN, *rain* (Sax. *regn*).—When the air can no longer retain the moisture blended with its particles, the water descends in drops upon the earth, purifying the atmosphere through which it falls. The vapour thus condensed is called rain. The moisture in the atmosphere is derived from the evaporation of water, partly from land, but principally from the surface of the ocean. Continual evaporation goes on from the surfaces of lakes, pastures, corn-fields, and forests; and as much moisture will be supplied to the air by a ploughed field as by a sheet of water of equal dimensions. Through this surface-evaporation the air becomes quite damp; but in being transported to a warmer situation it may afterwards become dry. This is the case with a sea-breeze in summer. When it touches the shore, it is cold and moist; but as it proceeds inland it grows milder and drier. When moisture is deposited by a body of air in minute globules, which remain suspended or subside gradually in the air, it is termed a *cloud*; when it comes near us and hovers on hill-tops and hangs in valleys, it is called a *mist* or *fog*. The true theory of the production of rain was first discovered by Dr. James Hutton, of Edinburgh, in 1787. Rain-water, or melted snow, is the purest of all natural waters, though, in consequence of its solvent powers, it generally contains some extraneous ingredient. The amount of rain which falls upon the earth is greatest in the tropics, and decreases as we approach the poles. The quantity of rain falling at a certain place, however, is considerably influenced by the physical features of the locality. Thus there is a striking difference between Kingston, Jamaica, and St. Domingo, both in the West Indies; between Liverpool and Kendal; between Glasgow and Greenock; and generally between the opposite coasts of Great Britain. On account of this fact, together with the action of prevailing winds and seasonal peculiarities, the surface of the globe has been divided by meteorologists into *hystographic* regions. Thus between the tropics of Cancer and Capricorn there is a zone of *periodic rains*, and external on either side zones of *constant precipitations*. Within the tropics, also, there is the striking peculiarity of dry and rainy seasons, depending on the position of the sun and the direction of the wind.—*Ref.* H. K. Johnston's *Physical Atlas*.

RAINBOW, the brilliantly coloured bow or arch which appears in the region of the sky opposite to the sun when rain is falling and the sun shining at the same time. When perfect, this well-known meteor presents the appearance of two concentric arches, the inner being called the *primary*, and the outer the *secondary rainbow*. In each arch are to be seen the colours of the solar spectrum; the tints, however, are arranged in reverse order. In the primary arch the red forms the exterior ring, and in the secondary the interior ring. So early as the 16th century a scientific explanation of the rainbow was proposed by Maurolycus of Messina; but the theory was correct only as far as to attribute the phenomenon to the reflection of the sun's rays by the rain-drops falling from the clouds upon which the arch is projected. About two centuries before that time, however, a Dominican friar named Theodoric anticipated Maurolycus: his manuscript bears the date of 1311. For the production of the rainbow the co-existence of the following circumstances is always necessary:—The sun's rays must impinge on the falling rain; the sun's altitude must be less than 45°, and the spectator must be interposed. A line from the sun to the centre of the arc passes through the head of the spectator; consequently each views his own rainbow. In the phenomenon of the rainbow, the rain-drop represents the prism (which *see*) and the dark background the screen upon which the spectrum is projected. Besides the primary and secondary rainbows, we sometimes meet with *supernumerary* or *supplementary arcs*, depending upon the peculiarities in the atmosphere favourable for their development. *Lunar rainbows* do not differ in the theory of their formation from solar rainbows, but they are less bright, of a whitish colour, and occur seldom.

RAIN-GAUGE, an instrument for measuring the quantity of rain that falls. It is constructed in various ways; but one of the best is a hollow cylinder, having within it a cork ball having attached to it a wooden stem, which passes through a small opening at the top, in which is placed a wide funnel. When placed in a free situation in the open air, the rain that falls within the circumference of the funnel flows into the cylinder, and causes the cork to float; and the quantity of water in the cylinder may be seen by the height to which the stem of the float is raised. The stem of the float is so graduated that its divisions show the number of perpendicular inches of water which fell on the surface of the earth since the last observation. In fixing these gauges, care must be taken that the rain may have free access to them. For this reason the tops of buildings are the best places. The following short table will show the annual depth of rain in different latitudes, as taken by rain-gauges:—

| | Lat. N. | Fall of Rain. |
|---|---|---|
| Grenada | 12° | 126 inches. |
| Calcutta | 22° 23′ | 81 ,, |
| Rome | 41° 54′ | 39 ,, |
| England | 50° to 55° | 31 ,, |
| St. Petersburg | 59° 16′ | 16 ,, |

RAISINS. (*See* VITIS.)

RAJAH (Sanskrit, king), is a title applied to the hereditary princes among the Hindoos.

RAMADAN. (*See* BAIRAM.)

RAMBUTAN. (*See* NEPHELIUM.)

RAMENT, *rā-men′-tă* (Lat., scrapings, shavings), in Bot., the scale-like hairs so abundant on ferns. They consist of cells combined so as to form brownish flattened scales attached by their base to the surface of the epidermis.

## Ramification

RAMIFICATION. (*See* BRANCH and BUD.)

RAMPANT, *rămp'-ănt* (Fr.), in Her., a term applied to the lion, leopard, or other animal, when represented standing on his hind legs, rearing up his fore feet in the attitude of climbing, and showing only half his face. It differs from *salient*, in which the animal appears to be springing forward.

RAMPART, *rămp'-art* (Fr.), in Fort., an elevation or mound of earth round a place, constructed in such a manner as to be able to resist the guns of an enemy. It is formed into bastions, curtains, &c. Pieces of artillery are planted on the ramparts, to defend the place, and soldiers continually keep guard there.

RANTERS, *rănt'-erz*, a name sometimes applied to the Primitive Methodists, on account of the manner in which they were wont to parade the streets in large numbers, singing hymns, &c. (*See* METHODISTS.)

RANUNCULACEÆ, *rā-nun-ku-lā'-se-e* (Lat. *rana*, a frog, because it grows where frogs abound), in Bot., the Crowfoot or Buttercup fam., a nat. ord. of *Dicotyledones*, sub-class *Thalamifloræ*. Herbs with alternate or radicle leaves, or in one genus climbing shrubs with opposite leaves, the leaf-stalk in both cases generally dilated at the base, without stipules, the leaf often much divided, and the flowers solitary or in terminal racemes or panicles. Calyx of 3—6 (usually 5) distinct sepals. Corolla of 3—15 distinct petals (usually 5), generally regular, but sometimes irregular, very minute or altogether wanting. Stamens indefinite, usually numerous, inserted in the receptacle. Carpels numerous, distinct, 1-celled, or united below so as to form a compound many-celled ovary; one or many ovules attached to the ventral suture; style simple. Fruit consisting of a number of achænia, or of several follicles, or a 1- or more seeded berry. Seed containing copious horny albumen, with a minute embryo at base. The plants of this order are widely diffused over the globe, but more especially in temperate or cool climates. Within the tropics they are, with the exception of the genus *Clematis*, almost confined to high mountain-ranges. According to Lindley, there are 47 genera, including about 1,000 species. At least 13 of the genera are represented in the flora of Great Britain. An acrid principle is common to all the *Ranunculaceæ*, and a narcotic principle is sometimes present in addition. When these principles are in excess, the plants containing them are poisonous. Many of these plants are conspicuous ornaments of our fields and hedges. Many are cultivated in our gardens, as various species of *Clematis*, *Anemone*, *Ranunculus*, *Eranthis* (winter aconite), *Helleborus* (Christmas rose), *Aquilegia* (columbine), *Aconitum* (monkshood), *Pæonia* (pæony), &c. The *Moutan officinalis*, or tree pæony of China, is specially remarkable for its very large and numerous showy flowers. Fortune mentions one of these plants growing in the neighbourhood of Shanghai, which produced annually from 300 to 400 flowers. From the *Ranunculaceæ* the important drugs aconite, black hellebore, staves-acre seeds, and podophyllin, are derived. (*See* ACONITUM, RANUNCULUS, &c.)

RANUNCULUS, *rā-nun'-ku-lus*, in Bot., the typical gen. of the nat. ord. *Ranunculaceæ*, composed of annual [or perennial herbs, sometimes aquatic. The flowers are usually yellow or white. Sepals 5, very rarely reduced to 3. Petals 5, or sometimes more, each with a thickened hollow spot at the base, often covered by a minute scale (nectary). Stamens usually numerous. Carpels numerous, without awns, in a globular or oblong head, each containing a single ovule attached near its base. The indigenous species of this extensive genus are commonly known as buttercups. The showy *double ranunculus* of our gardens belongs to a Levant species; namely, *Ranunculus asiaticus*. Double-flowered varieties of several others, especially of our common yellow buttercups, are known to gardeners under the name of *batchelor's buttons*. *R. sceleratus* (the celery-leaved buttercup) and *R. Flammula* (the spearwort) are very acrid. *R. Ficaria* (the lesser celandine) has thickened roots, which contain a good deal of starch, and have, on this account, been used as food.

RANZ DES VACHES, *rongs da vash*, the name of a celebrated national air, sung or played by the herdsmen of the Alps, in Switzerland, when they drive out their herds to the mountains. It consists of a few simple intervals, and is adapted to their instrument, the *Alpen horn*, or horn of the Alps, and has a beautiful effect in the echoes of the Swiss mountains. This simple air is greatly cherished by the natives, who are said to be seized with irrepressible home-sickness when they hear it played in foreign countries.

RAPE, *rāpe* (Lat. *raptus*), in Law, is the violation of a woman, forcibly and against her will. Every civilised code has declared against this offence, and affixed to its commission the severest penalties. By the Jewish law, to ravish a damsel betrothed to another was punishable with death; and in case she was not betrothed, the offender was compelled to take her to wife, and pay her father a fine of fifty shekels. By the Roman law, rape was punishable with death and confiscation of goods. Among the Saxons it was also esteemed a felony, and punished with death, though the woman, if single, might redeem the offender by accepting him as her husband, and he willing to be so redeemed. By William the Conqueror, emasculation and loss of the eyes was substituted for capital punishment in this offence. In the reign of Edward I. (Westm. I. c. 13), the punishment of this offence was much mitigated; but it led to a fearful increase of the crime, and ten years afterwards it was again made punishable with death. Capital punishment was abolished [in 1841 by 4 & 5 Vict. c. 56, and transportation for life (now penal servitude) substituted. An assault with intent to commit rape is a misdemeanour punishable by imprisonment for any term not exceeding two years, and with or without hard labour.

RAPE-SEED. (*See* BRASSICA.)

RAPHANUS, *răf'-ă-nus* (Gr. *raphanis*, a radish), in Bot., the Radish, a gen. of the nat. ord. *Cruciferæ*. The species *R. sativus* is the well-known salad root. Several varieties are in cultivation, some having spindle-shaped, and others globular roots. The latter



RADISHES.

are commonly distinguished by the name of turnip radishes. Like most of the salad plants derived from the ord. *Cruciferæ*, radishes are antiscorbutic and pungent: owing to the excess of woody tissue, they are somewhat indigestible. To attain a large size they require a deep sandy soil.

RAPHIDES, *raf'-i-deez* (Gr. *raphis*, needle), in Bot., the term now commonly applied to crystals of any form found in the cells of plants. In some plants they occur in such enormous quantities, that they exceed in weight the dried tissue in which they are deposited: this may be especially observed in some *Cactaceæ*. The root of Turkey or Russian rhubarb commonly contains from 35 to 40 per cent.; hence, when chewed, it appears very gritty; and as this kind of rhubarb commonly contains a larger proportion of raphides than any other, this grittiness has been employed as a distinguishing test. Cells containing raphides are very beautiful and interesting microscopic objects.

RAREFACTION, *rair-e-fik'-shun* (Lat. *rarus*, rare; *facio*, I make), in Nat. Phil., the process of expanding or distending bodies. By means of rarefaction a body is made to possess more room, or to appear of larger bulk, without accession of any new matter. The rarefaction of the atmosphere is so enormous, that Newton considered that it was inconceivable, on any other principle than an inherent repelling force in the air itself, in consequence of which its particles fly from each other mutually.

RASPBERRY. (*See* RUBUS.)

RAT, *răt* (Sax. *rat*; gen. *mus*), a gen. of rodent mammalia, numerous in species, and beyond all possibility of numbering them. Taken to the full extent which is included by Cuvier, the rat family comprehends not fewer than 14 or 15 genera, which have all some resemblances to each other, but most of them

differing so much from the true rat in their dispositions and manners, that the same general description cannot be made to apply to them all. The true rats belong to a vegetable-eating family, and yet are all more or less fond of animal substances, and some of them attack living animals, without much regard to size; but when they *do* so, it is still in accordance with the general gnawing character of the Rodentia. They do not kill, but begin to eat the living body; and there are instances of rats having in this way inflicted terrible lacerations upon infants and persons otherwise helpless. At the same time, there is little doubt that rats destroy a vast number of offensive substances, and it is tolerably certain that in cities, where is an underdrainage by sewers, the brown rats, which make the sewers their principal haunts, contribute not a little both to cleanliness and health. The general characters which distinguish the genus from the other Rodentia may be stated thus:—The teeth consist of two incisors, two canines, and three cheek-teeth in each side of each jaw. The crowns of the cheek-teeth are tuberculated, and thus bruising teeth rather than grinding ones, and the incisors are firm, strong, hard in their enamel, sharp in their edges, and well adapted for gnawing. The ears of the genus are generally long, of an ovate or rounded form, and well developed, and it is understood that the sense of hearing in all is very acute. The ears are nearly naked, as are also the feet, which are plantigrade. The fore feet have only four toes fully developed, the one answering to the thumb being merely a rudimental tubercle, though it is furnished with a little flat nail; the nails on the other four toes are well adapted for digging. The hind feet have all the five toes fully developed. The tail varies in length, but is generally long, naked, except a few short hairs, and is covered between them with a sort of scales, which are not true scales, however, but merely little hardened plates of the epidermis, which easily fall off, and are replaced by others. The principal fur is very soft; but it is generally interspersed with larger and thicker hairs, which are shining in their lustre. Many of them take the water readily, and preserve their fur dry; but there are some which are easily wetted. They are all very fond of drinking, which operation they perform by lapping with the tongue. In all the species the tendency to production is very great; and where they have food and shelter, and moderate warmth, it is not confined to any one season. The number of young in a litter is often considerable, exceeding that of the teats of the female, and in some cases double the number of these. The teats are six in number, and the young are often twelve. There are two species of rat in this country,—the brown rat and the black rat. The brown rat (*M. Decumanus*) is but a recent importation into this country, or even into Europe, or the north of Asia, and nothing certain is known of its origin. It is asserted by some good authorities, however, that it is an Eastern animal, and that it first made its appearance in the western countries of Europe only during the earlier half of last century. They are properly ground animals, and in those places where the two species of this country are found together, they are called ground rats or flax rats, in distinction from the black ones, which are roof rats. The brown rat makes burrows with great vigour and expedition, if it cannot find any ready made, and loves to burrow under the foundations of walls and houses. It is partial to drains of foul water, swims with great facility, abounds in seaport towns, and frequently establishes itself on board of ship. They often undermine the foundations of granaries and storehouses, of manufactories which abound in offal, and of mills; and, in the last case, they sometimes mine through the dams of the ponds, and let out the water. In poultry-yards and preserved grounds they commit considerable depredations on the eggs and the young birds, and carry off considerable quantities of grain from ricks and barns. The brown rat is the largest of the genus to be met with in Britain, being ten inches long in the head and body, of which the head occupies two and a half. The ears are about two-thirds of an inch long, which is less than the length of those of the black rat. The tail is also shorter in proportion, and both they and the muzzle are nearly naked. The upper colour of the fur is greyish-brown, and the under colour whitish-grey. The body is thick and strong, and the expression of the animal is a mixture of cunning and sulkiness. The black rat (*M. Rattus*) is a smaller animal, of a darker colour, a more elongated head, and sharper muzzle than the preceding. It is equally omnivorous, but less productive. It is sometimes called the "old English rat," from the fact of its being known in England long before the appearance there of the brown rat. Its original country is extremely doubtful; ancient authors make no mention of it; and the prevailing belief is, that it made its way into Europe during the middle ages. Although it is still the prevailing species in many parts of Europe, it is now somewhat rare in Great Britain, and a belief has long prevailed that the brown rat has eaten up the black one; but there is no authentic evidence on the subject, and the fact that the localities chosen by the two species are different—the brown rat loving low-lying, cold, and damp places, whilst the black rat is a murine animal, and dwells in holes of walls and crevices of roofs, seems to lead to an opposite conclusion. The black rat is very considerably smaller than the brown one, seldom measuring so much as seven inches and a half in length; and though its muzzle is larger, its head is altogether shorter. Its ears are also larger and rounder, and its tail is longer than its body, while that of the other is not so long; the ears and tail are naked; the eyes rather large; the fur on the body shaggy; the whiskers and tufts of stiff hairs over the eyes very long; and the whole expression more rough and fierce than that of the brown rat. It is also more rapid in its motions and a better climber. The colour is black, with a tinge of grey above and ash-colour on the under part; often whiter on the breast and throat. Foreign countries produce various species of the rat tribe unknown to Europe; as the Malabar rat (*Mus giganteus*), a species of enormous size; its length, including the tail, which is nearly a foot long, being thirty inches. It is found in many places on the Coromandel coast, in Mysore, and several parts of Bengal. The bite of this species is considered dangerous. The *Pilori*, or musk-rat of the Antilles, is another large and destructive rat, measuring fifteen inches, exclusive of the tail. There are also the *Sumatra rat*, the *Caraco rat*, the *Alexandrian rat*, and the *Iceland rat*; the distinguishing characteristics of which are too slight to deserve particular notice. The *Water-rat* is an animal respecting which naturalists are by no means agreed; for while some say that it is simply the common brown rat, others declare that it is a distinct species. The fact is that there is a distinct species of amphibious rat, but that the common brown rat often imitates its habits. The water-rat (*Mus major aquaticus*), or water-vole, as it is frequently called, is intermediate in size between the brown rat and the black one; the head is thick and short, and the muzzle is blunt, not indicating that keenness of scent which is possessed by the land-rat. The ears are less than half an inch in length, and almost entirely hidden in the fur, which is very closely set and is of that shining character which, in the hairy animals, has a strong repulsion to water, so that it does not get matted, or even wet, when under water. The colour of the upper part is mixed brown, showing both a greyish and a reddish tinge; and the under part is grey, having in some individuals a yellowish tinge. The tail is not naked, like those of the land rats, but has fine short fur on the upper surface and pretty long hairs on the under. The fore feet have four complete toes, the last phalanx only of the thumb being conspicuous beyond the skin; hinder feet with five toes, not webbed, though connected for a short distance from the base. The water-rat is said to be one of those gentle Rodentia that would not, under any circumstances, hurt anything living. It inhabits the banks of rivers, streams, ponds, and even ditches, in the banks of which it burrows and breeds. The opening to its burrow is never very far above the level of the water, and if that level be subject to variations from floods, there are generally two openings,—one higher and the other lower. As already observed, it is a vegetable feeder, and the fleshy and bulbous roots of plants form the chief part of its food. The water-rat is a very cleanly animal, and generally has but one brood, consisting of five or six: these are generally born in May or June, when the

vegetation is well forward; but the young are sometimes produced as early as April; in which latter case there is a second litter towards the end of summer or beginning of autumn. When the animal is alarmed by any one treading on its burrow, or suprised on the grass at the entrance, it takes to the water as a means of safety, and gets down till it is quite submerged; but it has not the same power of continuing below as the otter and other mammalia which prey in the water. It is found in all parts of Britain, and also of continental Europe, where the waters and their banks are suited to its habits, and is always most abundant where the banks are of a rich or loamy character.

RATES AND TAXES. (*See* TAXES AND RATES.)

RATION, *rā'-shun* (Fr., from Lat. *ratio*, proportion), in the army, a certain allowance, which is given in bread, meat, forage, &c., for an officer or soldier when troops are on service. A daily ration consists of one pound of bread or biscuit, one pound of meat, either fresh or salt, three-sevenths of a quart of wine or one-seventh of a quart of rum. The rations of officers vary according to the number of servants in their pay. The number of servants for which regimental officers are allowed to draw rations is as follows:—Colonels, 4; lieutenant-colonels and majors, 3; captains, paymasters, and surgeons, 2; all other ranks one servant each.

RATIONALISM. (*See* GERMAN THEOLOGY.)

RATTLESNAKE, *rāt'-tl-snaik* (*Crotalus*), a gen. of American serpents, famous for the danger of their bite and the peculiar appendages to their tail, consisting of several horny membranous cells, of an undulated pyramidal figure, articulated one within the other, so that the point of the first cell reaches as far as the basis or protuberant ring of the third, and soon; which articulation being very loose, gives liberty to the parts of the cells that are inclosed within the outward rings to strike against the sides of them, and so produce the rattling noise which is heard when the snake shakes its tail, and from whence it derives its name. The head is broad, triangular, and generally flat in its entire extent; the eyes are very brilliant, and generally provided with a nictitating membrane; the mouth very large, the tongue forked at its extremity. The body is robust, elongated, cylindrical, covered above with carinated scales. The tail is short, cylindrical, and somewhat thick. The number of the little bells which terminate it increases with age, an additional one being formed with every casting of the skin. The noise made by them resembles that made by crumpled parchment, or by two quills of a goose rubbed against each other. Their fangs, which are two in number, one at each end of the upper jaw, are traversed by a canal for the emission of the poison, and when not used, remain concealed in a fold of the gum. The fangs are very sharp at the points, rather slender in proportion to their length, and awl-shaped, or adapted for inflicting punctured wounds only, and not for tearing or lacerating. The poison is secreted by a considerable gland, situated on each side of the head, immediately under the eye; and the same muscular action which forces the tooth into the body of the prey, compresses the reservoir of venom, and so forces it through the canal of the fang into the wound. The smell of these serpents is exceedingly offensive, even when they are alive, arising, it is supposed, from the rapidity with which the flesh of those animals on which they feed putrefies, from the action of the virus upon it. Their chief food is birds and squirrels; but they also devour rats, hares, and small reptiles. Their glance has been said to have the power of fascinating their prey, so as to make it drop into their mouths; but there can be little doubt, that if this power exists, it has been greatly exaggerated. That a suddenly surprised animal should be arrested by terror, and easily fall a victim to the serpent, is highly probable; but that it should descend to its destruction from the top of the loftiest trees is almost incredible. The movements of the rattlesnake are slow, and it never appears to use its weapons unless when compelled thereto, either by necessity or fear. As they are no climbers, and their motions on the ground are so slow, and so much in a straight line that they would have little chance of capturing any prey by pursuing it, they usually rest twisted in a spiral form in the usual path of wild animals, particularly in those which lead to the water. They will not spring upon any large animal they are unable to swallow, unless they are reduced to extremities by impending hostilities; and most of those persons who have been bitten by them, have thus suffered in consequence of treading unawares upon them, or making an unskilful attack. The remedies employed against the bite of the rattlesnake are suction, ligatures, caustics, and internal medicines. Till the month of July, their bite is comparatively harmless. All the species of *Crotali* whose country is well known are natives of the American continent; and some of them, though the winter is much colder than in the same parallel of Europe or Asia, are found much farther north than any serpent of nearly the same deadly venom is met with in the Eastern continent. Those which are found far to the north are torpid during the winter; whilst those in the tropical parts of the country are never torpid, though they remain in hiding-places during the rains. Rattlesnakes are viviparous, and live a long time, some having been found, it is said, with from forty to fifty pieces in their rattles, and from eight to ten feet in length. They traverse with ease rivers and lakes by swimming.

RAVELIN, *rāv'-lin* (Fr.), in Fort., a detached work raised before the counterscarp, on that side of the ditch which is next the camp facing the body of the place. Ravelins are composed of two faces, forming salient angles.

RAVEN, *rā'-ven* (Sax. *hræfn*, probably from Sax. *hreflan*, to plunder, to rob), (*Corvus Corax*).—The generic characters of the raven are, beak straight at the base, compressed at the sides, curved towards the point, and sharp at the edges. Nostrils basal, open, hid by stiff feathers directed forwards. Wings pointed, the first primary of moderate length, the second and third shorter than the fourth, which is longest. Feet, three toes before, one behind, almost entirely divided; tarsus longer than the middle toe. The great geographical range of the raven north of the equator causes it to be exceedingly well known, and it is as universally recognized in many other parts of the world as it is in this country. It is, in fact, a universal species, found both in the old and new continents,—from Greenland to the Cape of Good Hope in the one, and from Hudson's Bay to Mexico in the other. It is one of the few birds that are capable of braving the severity of an arctic winter and the scorching rays of a tropical sun, without any change being produced in its plumage by the extremes of climate. It is by far the largest specimen of the genus to which it belongs (*Corvidæ*), and being bold as well as sagacious, is always an object of suspicion to shepherds and husbandmen; for no sooner does an animal show any signs of weakness than the raven is on the watch for an opportunity to satisfy his appetite. If no interruption occurs, he makes his first attack upon the eye of the defenceless animal, afterwards feeds at his leisure, retires to digest his food, and then returns to feed again. Like the other birds of its genus, it is not particular as to its food, eating indiscriminately small animals, such as rabbits, birds or their eggs, reptiles, insects, grain, or carrion, and any dead fish or other animal substance which may be washed ashore by the tide. Its favourite abodes are high rocks on the sea-shore, extensive woods, mountains, or open plains. The female breeds early in the season, and by the beginning of February the ravens may be seen visiting and repairing their nest of the previous year, which is usually placed in a very high tree, in the fork of a branch. It is formed on the outside of sticks, with a lining of wool and hair; the eggs are four or five in number, two inches in length, by one inch four lines in breadth, of a pale green ground-colour, spotted and speckled with darker greenish-brown. The incubation lasts twenty days, during which the male feeds the female as she sits upon the nest, and occasionally takes her place. When the young appear, they are for a time tended with great assiduity by their parents, but are driven away as soon as they are able to provide for themselves. Ravens live to a great age, and are considered to pair for life, and to occupy the same spot until driven away from it. Should both occupiers of any locality be killed, it is almost certain to be occupied by another pair. The raven measures fully two feet in length, and at least four feet in the stretch of the wings, and has the tail

very firmly feathered, and equal in length to half the body. The plumage over the whole body is black, but glossed with blue reflections, which, in certain lights, give a very peculiar appearance. Cuvier and some authors mention, that in the extreme North it is frequently found more or less white; but other authorities, including the famous explorator Sir James Ross, strenuously deny this. In former times, ravens were by no means rare birds in Great Britain; and, indeed, there used to be an allegorical saying in most parts of the country, that "every rock has its raven;" but they are now comparatively rare in England and in the south of Scotland. Ravens make no defence against any attempt by men or boys to rob their nest, but against the attacks of other birds they display great power as well as courage, and, at close quarters, are said to be a match for the more powerful falcons. There are several interesting peculiarities about the raven, one of which is its thievish habit of carrying off shining metallic substances, and other articles, totally unfit for food or to be used in the construction of its nest; and another, its aptitude for imitating the human voice. The well-authenticated anecdotes in proof of its possession of this power are almost innumerable.

Ravenala, *rā-ven'-ā-lā*, in Bot., a gen. of the nat. ord. *Musaceæ*. *R. speciosa*, a tropical plant, has been called the water-tree, in consequence of its petioles yielding, when cut, a quantity of watery juice. Its seeds are edible.

Ray, *ray* (Fr. *raie*, Sp. *raya*), (*Raiida*).—The rays, or skate, are a very remarkable family of cartilaginous fishes, resembling in their physiology the shark family much more than any other, and following in their forms the angel-fish, or monk-fish, of that family. The generic characters are:—Form of the body rhomboidal, very much depressed; tail long and slender, generally armed on the upper surface with one or more rows of sharp spines; two small fins near the end of the tail, and sometimes a small terminal or caudal fin; the eyes and temporal orifices on the upper surface of the head, nostrils, mouth, and branchial apertures, beneath; teeth flattened, lozenge-shaped, the inner angle elongated in old males. The rays, or skate, as they are popularly called, are remarkable for the breadth of their bodies, contrasted with their long, narrow tails; the great breadth of the body being produced by the expansion of what are called the pectoral fins, the base of each of which is equal to the whole length of the side of the fish. The ray may almost be considered as having no true head or neck, the sides of both being included, and thus protected by the expanded anterior margin of each pectoral fin. Their mode of progression is performed by a slight undulating motion of the pectoral fins, something between swimming and flying. They defend themselves, it is said, by bending the point of the nose and the base of the tail upwards towards each other; the upper surface of the body being then concave, the tail is lashed about in all directions over it, and the rows of sharp spines frequently inflict severe wounds. The rays are very voracious. Their food consists of any sort of fish they can catch, with molluscs, testaceous or naked, and crustacea. Their jaws and muscles are so powerful that they are able to crush the strong shell of a crab with ease. As in the sharks, the females are larger than the males. The young are produced during the latter part of spring or during summer, and are deposited by the parent fish in thin horny cases, which are also called purses, and which, on the coast of Cumberland, bear the name of skate-barrows, from their resemblance in shape to a four-handed machine by which two men carry goods. As the young ray increases in size, the angular parts of the body curve over for a time, till the fish ultimately escapes to provide for itself. The eleven species of true rays which are found on the coast of Great Britain may be arranged in two divisions; the first of which contains seven species, having the skin perfectly smooth; whilst the second division contains two species with rough skins, and two which are furnished with numerous short, sharp spines on various parts of the surface of the body. The ray, or skate, as food, is held in very different degrees of estimation in different places. In London, large quantities are consumed, and the flesh is much esteemed; but on some parts of the coast it is seldom devoted to any purpose but as bait for catching crabs and lobsters. The ray is in best condition for the table during autumn and winter. In spring and the early part of summer they are usually maturing their eggs or young, and their flesh is then soft and woolly.

Razors. (*See* Cutlery.)

Realism. (*See* Nominalists, Realists.)

Real Property, *rē'-al* (Lat. *res*, a thing), in Law, is property in lands, tenements, or hereditaments. Things real, or realty, consist of things substantial and immovable, and of the rights and profits annexed to or issuing out of these, as distinguished from things personal, or personalty, consisting of goods, money, and all other movables, and of such rights and profits as relate to these. Lands include any ground, soil, or earth whatsoever, as arable, pasture, woods, water, moors, &c.; tenements whatever may be holden, or the subject of tenure, as, besides land, houses, &c., rents, commons, and other rights and interests issuing out of or concerning land; and hereditaments, not only lands and tenements, but whatever may be inherited, be it corporeal or incorporeal, real, personal, or mixed. The common law of real property is founded on the rules and customs which in the feudal period governed the nature of lands. All the land of the realm is holden mediately or immediately of the sovereign. Even a freeholder has no absolute ownership of land; he has only an estate. The chief estates in lands originated, no doubt, in the various forms of feudal tenure. (*See* Feudal System.) Tenements and hereditaments came under the same law because they possess some of the characteristic qualities of lands; as they may be holden on tenure or are inheritable.

Ream, a bundle or package of paper. A ream of writing-paper consists of 20 quires, of 24 sheets each; but a *ream* of printing-paper, commonly called a *printer's ream*, contains 21½ quires, or 516 sheets.

Reason, *rē'-zon* (Lat. *ratio*, from *reor*, I think), in Phil., is most commonly used to denote that highest faculty of the human mind which distinguishes man from the brutes, and constitutes his rational nature. According to Dugald Stewart, it "denotes that power by which we distinguish truth from falsehood and right from wrong; and by which we are enabled to combine means for the attainment of particular ends." More correctly, and apart from its use for cause, motive, argument, &c., it is employed in the five following senses:—(1) As denoting an intellectual nature generally, and comprehending—(*a*) conception or simple apprehension; (*b*) judgment; (*c*) reasoning, or the discursive faculty; (*d*) intellect or intelligence proper.—(2) In close connection with the preceding signification, from which perhaps it ought not to be separated, is the sense in which it is used to characterize the legitimate employment of our faculties in general.—(3) It is also used to denote the third and fourth of the above-mentioned functions, viz., the reasoning faculty and the intellect.—(4) It has been used very generally for the third of the above special functions; reason and reasoning being thus confounded.—(5) It signifies the reasoning, in contradistinction to the intellect or understanding, and is thus used by Kant and his followers, who separate reason (*Vernunft*) distinctly and emphatically from understanding (*Verstand*). (*See* Metaphysics.)—*Ref.* Note A. in Hamilton's edition of *Reid's Works*.

Reaumuriaceæ, *rē-mure-ē-ā'-sē-ē* (in honour of Reaumur, the celebrated French philosopher), in Bot., the *Reaumuria* fam., a small nat. ord. of thalamiflorous *Dicotyledones*, resembling *Hypericaceæ* in most essential characters, and only distinguished from that ord. by having a pair of appendages at the bases of the petals and shaggy seeds, with small mealy albumen. There are three genera and four species, natives of the Mediterranean coast and the salt plains of Northern Asia. They contain much saline matter. A decoction of the leaves of *Reaumuria cernuculata* is used as an internal medicine, and the bruised leaves as an external application for the cure of the itch.

Rebellion, *rē-bel'-le-on* (Lat. *rebellio*, from *re*, and *bellum*, war), as originally used by the Romans, denoted the rising again, and making a second resistance, of those who had formerly been overcome in battle and yielded their submission; but with us it is commonly

used to denote the taking up of arms traitorously against the crown, whether by natural subjects or others, when once subdued. It also signifies disobedience to the process of the courts. The great rebellion of England commenced with the revolt of the Long Parliament against the authority of Charles I., in 1642, and ended with the submission of the king to the Scots, in April, 1646; but sometimes the period is extended so as to include the Commonwealth, or Protectorate, under Cromwell, down to the restoration of Charles II. in May, 1660.

Rebus, *re'-bus* (Lat.).—This word in English has several significations.—1. A peculiar kind of enigma or riddle; an old and quaint mode of expressing words or phrases, by the pictures of objects whose names bear a resemblance to the words, or to the syllables of which they are composed. A rather pretty example of this kind of wit is mentioned by the famous antiquarian Camden. A gallant expressed his love to a woman named *Rose Hill*, by displaying on the border of his coat a rose, a hill, an eye, a loaf, and a well; which, in the style of the *Rebus*, reads, "*Rose Hill I love well.*" —2. In *Heraldry*, a coat of arms which bears an allusion to the name of the person; as three castles for Castleton; a kind of bearings which are of great antiquity.—3. Rebus is a word used by chemical writers, sometimes to signify sour milk, and sometimes for what they call the ultimate matter of which all bodies are composed.

Receiver of Stolen Property, *re-seev'-er* (Fr. *recevoir*, to receive).—By 7 & 8 Geo. IV. c. 29, it is provided that if any one shall knowingly receive any chattel, money, or valuable security, or other property, the stealing or taking whereof shall amount to felony, either by common law or by act of parliament, every such receiver shall be guilty of felony, and may be indicted, either as an accessory after the fact or for a substantive felony, and liable, at the discretion of the court, to penal servitude for from seven to fourteen years, or imprisonment for not more than three years.

Receptacle. (*See* Thalamus.)

Rechabites, *rek'-a-bites*, among the ancient Jews, were a religious order instituted by Jonadab, the son of Rechab, and comprehending only the family and posterity of the founder. The principal rules observed by them were, not to drink wine, not to build any houses, but to dwell in tents, and not to sow corn or plant vines. These rules they observed with great strictness, as appears from Jeremiah xxxv. 6, &c. At present there exists a body of teetotallers under this name.

Recipe, *res'-e-pe* (Lat., take), is a name sometimes applied to a medical prescription, from the symbol ℞, denoting recipe, with which it begins. According to some, this character is the astrological symbol for Jupiter, the planet whose ascendancy was regarded as favourable for the collection and preparation of medical herbs.

Recitative, *res-e-ti-teev'* (Ital.), a species of musical recitation (hence the name), or, in other words, a kind of artificial declamation adapted to musical notes, forming a sort of medium between common recitation and measured air or song. It was first introduced at Rome, in the year 1600, by Emilio del Cavaliere, and was soon after adopted throughout Europe. Recitatives differ from airs in having no fixed time or measure, the singer regulating the length of the notes according to his own conception of the degree of emphasis and expression required. They are written in common time, of four crotchets in a bar, and have no fixed or permanent key; indeed, they generally begin in one key and end in another, modulating frequently *ad libitum*. In this species of composition, strict attention must be paid to all the rules of prosody, as to long and short syllables, accent, emphasis, punctuation, &c. The words are never repeated, and only one note is sung to each syllable; thus all grace notes are excluded, except in some *passionate* passages, where an occasional rapid flight of notes may be introduced to connect distant intervals. A simple or *unaccompanied* recitative is written with no accompaniment, but a bass part, consisting of a few occasional chords, generally played on the pianoforte. Accompanied recitative, on the other hand, has, besides the bass, parts for other instruments, as the violins, hautboys, flutes, &c. The great use of recitative consists in its capabilities for passing quickly from subject to subject, serving for dialogue, and to prepare important changes in great musical pieces. Some of the most splendid specimens of recitative may be found in the works of Gluck, Haydn, Mozart, and Beethoven.

Reckoning, *rek'-o-ning*, in nautical affairs, is the name of a process by which the exact position of a vessel may be ascertained at any time. (*See* Navigation.)

Recognizance, *re'-kon-e-zins* (Lat. *recognosco*, I acknowledge), in Law, is an obligation of record entered into before some court of record, or magistrate duly authorized to take it, with condition to do some particular act,—as to appear at the assizes, to keep the peace, to pay a debt, or the like, upon the performance of which condition the obligation becomes null and void; but upon failure, the amount of the recognizance is forfeited. It differs from a bond, in that the latter is the creation of a new debt, while a recognizance is an acknowledgment upon record of a former debt. The state or person to or in whose favour the recognizance is made, is called the cognizee, and the person who enters into it the cognizor. A recognizance may be entered into either to the crown, as where a person enters into recognizances to appear to answer a criminal charge, or to a subject, as where bail is given. A recognizance by statute is either founded on a statute merchant or statute staple, or is in nature of a statute staple under 23 Hen. VIII. c. 6. These last, however, have long fallen into disuse, having been superseded by more convenient and efficacious modes of proceeding.

Recoil, *re-koil'* (Fr. *reculer*, to draw back), the starting backwards or rebound of a fire-arm when discharged. The term is particularly applied to pieces of ordnance, which are always subject to a recoil according to their sizes and the charges which they contain. To lessen the recoil, the platforms are usually made to slope towards the embrasure.

Reconnoitring, *re-kon-noy'-ter-ing* (Fr. *reconnoitre*), a term used in military language, which signifies the obtaining of information by ocular inspection of the situation of an enemy or the nature of a position. Reconnoitring is one of the most essential departments of military art, and is requisite before every important movement. It frequently brings on an engagement, and large bodies of troops are called out to cover the reconnoitring party and to make prisoners.

Recorder, *re-kor'-dor*, in Law, is the chief judicial officer of a city or borough, appointed under the sign manual by the crown, and having civil and criminal jurisdiction within the city or borough, with precedence next to the mayor. He must be a barrister of at least five years' standing, and holds office during good behaviour. Formerly, the appointment of recorder was in the hands of the corporation. His court is a court of record.

Records, Public, *rek'-ords* (Lat. *recordor*, I call to mind).—Authentic memorials of all kinds, as well public as private, may be considered in one sense as records; but the term *public records* generally refers to the contents of our Public Record Office. In a popular sense, the term is applied to all public documents preserved in a recognized repository; and as such documents cannot conveniently be removed, or may be wanted in several places at the same time, the courts of law receive in evidence examined copies of the contents of public documents so preserved, as well as of real records. Sometimes mere private memoranda have been elevated to the dignity of public records on the sole ground of their official custody, and on the other hand, numbers of documents which were originally compiled as public records have strayed from their legal repository to the British Museum, and have thereby lost their character of authenticity. By far the greater part of our records are kept as rolls written on skins of parchment or vellum, averaging from nine to fourteen inches wide, and about three feet in length. Two modes of fastening the skins or membranes were employed,—one, that of attaching all the *tops* of the membranes together, bookwise, which is employed in the Exchequer and courts of common law, and the other, that of sewing each skin or membrane consecutively, which was adopted in the Chancery and Wardrobe. The rolls of the common law, after the time of Henry VIII., contain so many skins that they

cease to be rolls, and are simply oblong books, and, unlike the early rolls of the same series, are exceedingly ill-adapted for preservation and inconvenient for use. On the other hand, membranes may be fastened together after the chancery fashion in any numbers, and yet remain a legitimate roll, though imposing much bodily labour in the consultation. The Land-Tax Commissioners Act of 1 Geo. IV. extends, it is said, to 900 feet when unrolled. Domesday Book, the oldest and most precious of our records, counting eight centuries as its age, and still in the finest preservation, is in the form of a book. Records are generally written on parchment; but one is in existence written on paper as early as the reign of Edward II. *Tallies* were records of wood. Records in ancient times were written in a peculiar hand called *court hand*, which was well adapted for preservation; but in later times, the writing, as well as the ink, has much degenerated. All the great series of our records, except those of parliament, are written in Latin, the spelling of which is much abbreviated. During the Commonwealth, English was substituted; but soon after the Restoration, Latin was restored, and the records of the courts continued to be kept in Latin until the reign of Geo. II. In certain branches of the Exchequer, Latin continued in use until the abolition of the offices in very recent times. Many of our statutes, from Edward I. to Henry V., and the chief part of the rolls of parliament, are written in Norman-French. Great numbers of records were formerly kept in pouches or bags of leather, which were hung against the walls, and which, when they escaped damp, preserved their contents in all their pristine freshness and cleanliness. Others were kept in chests, coffers, small wooden boxes, and "hanapers," or baskets made of twigs. A very important step was taken by the legislature at the commencement of her present Majesty's reign, to provide for the better custody and preservation and more convenient use of the public records, and an act was passed (1 & 2 Vict. c. 94) by which the master of the rolls is made guardian of the public records, having power to appoint a deputy, and, in conjunction with the Treasury, to do all that may be necessary in the execution of this service. The act contemplated (and what it contemplated has been, or is being, carried out) the consolidation of all the records from their several unfit repositories into one appropriate receptacle; their proper arrangement and repair; the preparation of indexes or calendars, which were more or less wanting to every class of records; and giving the public more easy access to them.

**Recovery**, or **Common Recovery**, *re-kuv'-e-re* (Fr. *recouvrer*, to get back), in Law, was a suit or action, either actual or fictitious, but generally the latter, in which lands were recovered against the tenant of the freehold. There were at least three persons concerned in a writ of common recovery,—the recoverer, the recoveree, and the vouchee. The recoverer was the plaintiff or demandant that brought the writ of entry; the recoveree, the defendant or tenant of the land, against whom the writ was brought; and the vouchee, he whom the defendant or tenant vouched or called to warranty of the land in demand, either to defend the right or to yield him other lands in value, according to a supposed agreement. The recoverer sued out a writ or precipe, as it was called, against the recoveree, who appeared to the writ, but instead of defending his title, he vouched (vocavit) a third person, who was supposed to be bound to warrant the tenant's title, and the vouchee having appeared, undertook the defence of the tenant's title, but purposely failed to do so, and allowed judgment to go on default. Common recoveries were invented by the ecclesiastics, to elude the statutes of mortmain, and afterwards encouraged by the *finesse* of the courts of law, in order to put an end to all fettered inheritances, and bar not only estates tail, but also all remainders and reversions expectant thereon. It was a supposed adjudication of right, binding all persons and vesting a free and absolute fee-simple in the recoverer. By 3 & 4 Wm. IV. c. 74, recoveries were abolished.

**Recruiting.** (*See* Enlistment.)

**Rector**, *rek'-tor* (Lat., a governor), in the Church of England is a clergyman that has the cure of a parish, and possesses all the tithes, &c. A rector differs from a vicar, in that he has the right to all the ecclesiastical dues in his parish, whereas the vicar has generally an impropriator over him, who is entitled to part of the profits, and to whom he is in effect only perpetual curate. The name rector is also given to the chief elective officer in some of the foreign universities, and also to the head-master of large schools or academies. The Jesuits likewise give this name to the superiors of their seminaries or colleges.

**Rectum**, *rek'-tum* (Lat., straight), in Anat., is the name given to the last portion of the large intestines, so called from an erroneous notion among the old anatomists that it was straight. It commences at the sigmoid flexure of the colon, and terminates in the anus. It is cylindrical in shape, and not sacculated like the colon, and is narrow at its upper part, becoming gradually dilated towards its termination, just above which the dilatation is considerable.

**Recusants**, *rek'-u-zants* (Lat. *recuso*, I refuse), are persons who refuse or neglect to attend divine service on Sundays and holidays, according to the forms of the established church. Prior to the Reformation, ecclesiastical censures were, from time to time, directed against those who absented themselves from the services of the Church; and in 1534, when the English parliament set aside the pope's supremacy, and declared Henry VIII. head of the Church, those who refused so to acknowledge the king were called popish recusants, and subjected to severe penalties. During the reign of Elizabeth, several statutes were passed, imposing fines, &c., upon such as neglected to attend their parish church. A recusant, after conviction, was called a "recusant convict." The laws against popish recusants convict were of a very severe character, subjecting them to a variety of disabilities, penalties, and forfeitures. They were considered as persons excommunicated, could hold no office or employment, were not allowed to keep arms, could bring no action at law or suit in equity, were prohibited from coming within ten miles of London, and were not permitted to travel above five miles from home unless by license. Protestant dissenters were relieved from the penalties of recusancy by the Toleration Act (1 Wm. & Ma. c. 18), which, however, excepted papists and such as denied the doctrine of the Trinity. The former were subsequently relieved by 31 Geo. III. c. 32, and the latter by 53 Geo. III. c. 160; but, with these exceptions, the statutes against recusancy still subsist, though never enforced.—Ref. *English Cyclopædia*.

**Redan**, *re-dan'* (Fr.), in Fort., a sort of rampart placed in advance of the principal works, to defend the most exposed parts. The redan usually consists of a rampart of earth, and is generally looked upon as the simplest kind of field fortification.

**Redbreast**, *red'-brest* (*Erytheca rubecula*).—This bird, which is commonly called the robin, or robin redbreast, is generally diffused over England, Ireland, and Wales, and is also an inhabitant of the most northern counties of Scotland. It also visits Denmark and Sweden in the breeding season; and amongst the summer visitors to the latter country, it is said to be one of the first to arrive and last to go. It is a constant resident throughout the year in the temperate and warmer parts of Europe, abundant in Spain and Italy, from the last of which it passes over by Sicily and Malta to North Africa. In the adult bird, the beak and irides are black; upper part of the head, neck, back, upper tail-coverts and tail-feathers, a yellowish olive-brown; quill-feathers rather darker, the outer edges olive-brown; greater wing-coverts tipped with buff; over the base of the beak, round the eye, the chin, throat, and upper part of the breast, reddish orange; encircling this red is a narrow band of bluish-grey, which is broadest near the shoulders; lower part of the breast and belly white; sides, flanks, and under tail-coverts, pale brown; under surface of wing and tail-feathers dusky-grey; legs, toes, and claws, purple-brown. The whole length of this bird is nearly six inches. The length of the wing, from the carpal joint to the end of the longest quill-feather, three inches; the first quill-feather but half the length of the second, which is not quite so long as the sixth; the third, fourth, and fifth, nearly equal, and the longest in the wing. The female is not quite so large as the male, and her colours are less bright. The redbreast is subject to variation in the colouring of the plumage. White, and partly white,

varieties are not uncommon. During summer, it feeds indiscriminately on earthworms, insects, fruit, and berries. In winter, when pressed by hunger, it hovers round human habitations, both in town and country, and becomes a welcome pensioner. The redbreast, in common with some other birds, is remarkable for the peculiarity of the situation in which it sometimes builds its nest; one pair, for instance, having built theirs in a sawpit, whilst it was in constant use. But stories of this sort are almost innumerable. The robin breeds early in spring; its nest is formed of moss, dead leaves, and dried grass, lined with hair, and sometimes a few feathers; the nest is frequently placed on a bank sheltered by brushwood, or a short distance above the ground in a thick bush or lane-hedge, sometimes in a hole in the wall, partly covered with ivy. The eggs are from five to seven in number, white, spotted with pale reddish-brown; the length nine lines and a half, by seven lines and a half in breadth. The song of the robin is sweet and plaintive, but not powerful.

REDEMPTION, *re-demp'-shun* (Lat. *re*, again, and *emo*, I buy), in Theol., is used to denote our recovery from sin and death by the obedience and sacrifice of Christ, who is on this account called the "Redeemer." Man having by sin fallen from the pure and upright state in which he was created, fell under the wrath and curse of God; but Christ interposed himself in our behalf, offered himself as a sacrifice to satisfy Divine justice, suffered the punishment due for sin, and thus redeemed man and restored him to the divine favour.

REDEMPTORISTS, *re-demp'-to-rists*, is the name of a religious order among the Roman Catholics, founded by Alphonsus de Liguori, in the city of Scala, in 1732, and secured the approval of Pope Benedict XIV. in 1740. Besides the usual monastic vows, they bind themselves to labour for the propagation of the Catholic faith, more particularly among the loose and abandoned in towns and villages. They have several houses in England, and of late have been busily pursuing their mission in various parts of Ireland.

RED LEAD. (*See* MINIUM.)

REDOUBT, *re-dout'* (Fr.), a term applied in Fort. to nearly every kind of work intended to fortify military positions. It is also used to signify works constructed within others, so as to prolong their defence, and to detached works used to secure some portion of ground which would be of advantage to the besiegers.

REDUCTION. (*See* ARITHMETIC.)

REED. (*See* ARUNDO.)

REEF. (*See* CORAL REEF.)

REFORM ACT, *re-form'* (from the Lat.), is the 2 & 3 Wm. IV. c. 45,—"An Act to amend the Representation of the People in England and Wales," 1832. Before that time, various attempts had been made to carry measures for a reform in parliament. Mr. Pitt introduced a bill for that purpose in 1782, and again in 1783 and 1785; but was on each occasion defeated by considerable majorities. Sir Francis Burdett's plan was negatived by a majority of 59, on 15th June, 1809, and Mr. Daniel O'Connell's measure for introducing triennial parliaments, universal suffrage, and the ballot, was rejected by a majority of 306. The first ministerial measure of reform was during Earl Grey's administration, and was brought into the House of Commons by Lord John Russell, 1st March, 1831. On 22nd March, a majority of 1 declared in favour of the second reading; but on the motion for a committee, an amendment by General Gascoyne, "that the number of representatives for England and Wales ought not to be diminished," was carried by a majority of 8, and the bill was consequently abandoned, and parliament dissolved 22nd April. A new parliament was assembled, and the bill was again introduced on the 24th June. It passed the Commons with large majorities, but was rejected in the Lords on the second reading by a majority of 41. A new bill was introduced by Lord John Russell on 12th December, and passed its first reading without a division. The second and third readings were carried by majorities of 162 and 116 respectively. In the House of Lords the bill was read a first time on 26th March. The second reading was carried by a majority of 9; but on a motion in committee by Lord Lyndhurst, "that the question of enfranchisement should precede





that of disfranchisement," the ministry were in a minority of 35, and in consequence resigned on 9th May. The public excitement was now very great, but the ministers were induced to resume their offices on receiving power from the king to create a sufficient number of new peers to secure a majority in the House of Lords. The bill passed the Lords' committee 30th May, and it passed the third reading on 4th June by a majority of 84, 106 being for, and only 22 against. It received the royal assent on 7th June. By this act, 36 boroughs in England and Wales were disfranchised, 30 were reduced to one member only, 22 new boroughs were created, with two members each, and 20 with one member; while various other important changes were made. (*See* PARLIAMENT, ELECTION OF MEMBERS OF PARLIAMENT.) The Scotch Reform Act (2 & 3 Wm. IV. c. 65) obtained the royal assent on the 17th July, and that of Ireland (2 & 3 Wm. IV. c. 88) 7th August, 1832. Several attempts have since been made to introduce further reforms in parliament, but without success. Lord John Russell obtained leave to bring in a new reform bill 13th February, 1854; but in consequence of the war with Russia it was withdrawn 11th April. Mr. Disraeli's reform bill was thrown out on the second reading by a majority of 39, on 31st March, 1859; and the new reform bill introduced by Lord John Russell 1st March, 1860, was withdrawn on 11th June following; since which time no further measures have been brought forward.

REFORMATION (Lat. *re*, and *formo*, I form), is in general the act of reforming or correcting an error or abuse in religion, discipline, or the like. It is, however, commonly applied to that great religious revolution which took place in Europe in the early half of the 16th century. Various attempts had been made at earlier periods to reform the Church, but they had either failed, or their influences were very circumscribed. The intimate connection which the papacy maintained with all established authorities had defeated every serious attempt at opposition. The people, too, were sunk in the deepest ignorance and superstition. At length, however, men's minds, after a slumber of so many centuries, awoke to see the errors and corruptions that had crept into the Church, and seemed as if they would redeem, by extraordinary activity, the time they had lost. "On every side signs might be observed, and events were pressing onward, which threatened to subvert what had been the work of ages of darkness, and to usher in among mankind a new time." "Everywhere, alike above and beneath, a hollow noise seemed to reverberate, and to harbinger the thunder-storm that was about to burst forth." "The art of printing had given wings to speech, which bore it as the wind bears certain seeds to the most remote places. The discovery of the two Indies had enlarged the world. All announced a great revolution."—(*D'Aubigné*.) The sale of indulgences and the abuses to which it gave rise, was the spark which, without design or premeditation on the part of any concerned, set this combustible mass in a blaze. Pope Leo X., in order to replenish the pontifical exchequer, had, in 1516, granted to Albert, elector of Mentz and archbishop of Magdeburg, the right to sell indulgences within his own jurisdiction, on condition of his receiving a share of the proceeds. In this business the archbishop employed, among others, John Tetzel, a Dominican monk, remarkable for his boldness and impudence, and whose conduct aroused the deepest opposition. He represented his indulgences as unconditional promises of forgiveness of sins, even of the deepest dye, in time and in eternity, and disposed of them for a few pence among the ignorant multitude. Luther, at this time professor of theology and a preacher at Wittemberg, boldly declared against this abuse, first in his sermons and afterwards, according to long-established academical usage, by affixing to the door of the great church of the town ninety-five theses or questions, and appointed a day for their discussion; but no opponent made his appearance. His sermons against indulgences were published, and together with his theses were soon spread over Germany. He further urged his spiritual superiors and the pope to put a stop to the traffic in indulgences, and to reform the corruptions of the Church in general, in letters at once bold and respectful. His efforts, however,

met with little success; on the contrary, the most absurd libels were put forth against him. The severe replies in which he exposed the weakness of the arguments for indulgences, and his "Resolutiones," by which he illustrated his theses, gained him new converts to the truth. Luther was summoned to Rome, to plead his own cause; but the elector of Saxony interposed, and obtained permission for him to be examined within the bounds of the empire; and accordingly Cardinal Cajetan was ordered to examine him. The cardinal, however, instead of arguing with him, assumed an imperious tone, and demanded his submission to the pope. This, however, Luther declined to do, and suddenly quitted Augsburg. In the same year a papal bull was issued, declaratory of the doctrine of indulgences. A new legate, Miltitz, was appointed to endeavour to bring Luther to a reconciliation, and a conference took place at Altenburg in the beginning of 1519. The conciliatory measures of Miltitz had so far their effect that Luther was induced to write a submissive letter to the pope, acknowledging that his zeal had carried him too far, and promising to observe silence upon the points in dispute in future, provided his adversaries did the same. The contest, however, was renewed by Eck, who challenged Carlstadt, one of Luther's disciples, to a public disputation at Leipsic concerning free will. The discussion was continued by Luther, and lasted for several weeks, embracing the supremacy of the papal see, purgatory, indulgences, absolution, &c. Though nothing was decided, a more general attention was attracted to the works of Luther, who continued to send forth pamphlets and printed sermons. The fulness and power of his style, his merciless humour, his acuteness and learning, and the irresistible force of his reasoning, made his works popular, and gained him the public adherence of men like Melancthon and Hutten. As he began to see more clearly, he attacked other doctrines of the Church; as absolution, auricular confession, purgatory, &c.; and in June, 1520, published his famous "Appeal to his Imperial Majesty, and to the Christian Nobility of the German nation, on the Reformation of Christendom." Rome, at length, began to bestir itself in earnest, and a papal bull was issued against Luther, and immediately after appeared his work on the "Babylonian Captivity of the Church." Ulrich Zwingli, the Swiss reformer, now comes into the field, and published a work replete with wisdom and dignity, and recommending the adoption of conciliatory measures towards Luther. Luther replied to the bull in his publication entitled "Against the Bull of Antichrist" (Nov., 1520). He protested against the pope's proceeding, and appealed to a general council. While his works were burned in Mentz, Cologne, and Louvain, he publicly committed to the flames the papal bull, with the canons and decrees, amid the rejoicing of the students at Wittemberg. Luther now formally separated himself from the Church of Rome, and many of the principal nobles, men of learning, scholars at the universities, and others, publicly declared in his favour. The emperor, Charles V., was urged by the pope to punish Luther as a heretic; but the elector of Saxony prevailed so far as to have Luther tried by an imperial diet. The diet assembled at Worms in April, 1521, and Luther, notwithstanding the remonstrances of his friends, made his appearance, declaring that he would attend the diet "if there were as many devils in Worms as there were tiles on the houses." He pleaded his cause with ability; but the emperor and majority declared against him, and he was placed under the ban of the empire. He found an asylum in Wartburg, where he remained for ten months, while the war with France, and other political matters, withdrew the emperor's attention from the religious affairs of Germany, and Luther lived in safety under the protection of the elector of Saxony. One of the fruits of his retirement was his translation of the New Testament, which was soon after followed by that of the Old, and his Liturgy. Already, in almost every part of Germany, the Reformation had its champions. Melancthon had published his "Loci Communes," the first, and for a long time the best, exposition of the Reformed doctrines. "In many parts of Northern Germany and the adjacent countries, it obtained the ascendancy; in East Friesland, since 1519, in some towns of Pomerania and





Livonia, and in Silesia since 1522, in Prussia and Mecklenburg since 1523. In Denmark and Sweden the number of converts was already considerable. It met with equal success among the people in the free towns. Thus, by the decision of the townsmen, it prevailed at Frankfort-on-Maine, in Swabian Halle and Magdeburg in 1523; in Ulm, Strasburg, Bremen, and Nuremberg, in 1524. But there were few towns in which it did not stir up a hazardous struggle against the old constitution of the Church."—(*Gieseler.*) Translations of the Bible into French and Dutch now appeared, and in the very heart of France, at Meaux, a Lutheran church was organized. In vain did the Sorbonne condemn the principles of Luther; in vain was the execution of the edict of Worms against religious innovations resolved upon at the diet of Nuremberg in 1524, and the convention of Ratisbon; in vain did George duke of Saxony, Henry duke of Brunswick, Austria, France, Spain, and the spiritual princes of the empire, labour, by persecution, to suppress the Reformation. In 1525, John, successor of Frederick in the Saxon electorate, Philip, landgrave of Hesse, and Albert of Brandenburg, duke of Prussia, publicly declared themselves Lutherans. The absence of the emperor during this period contributed to the spread of the Reformation with such astonishing rapidity. In 1528, rumours of a secret alliance of the Catholic states against the Protestant led to their uniting themselves more closely, and forming a distinct political party. Melancthon was employed to draw up a full exposition of the Lutheran doctrines, which was subscribed by the several Protestant princes, and transmitted to the emperor, at the diet of Augsburg, in 1530, where it was solemnly read before a full assembly; and hence was called, the "Augsburg Confession" (which *see*). The German Protestants were united by common political interests, and a common creed, contained in the "Augsburg Confession" and its "Apology," and illustrated by the articles of Smalcald and the two catechisms, and finally confirmed in 1580, by the "Form of Concord." The same need of reformation in the Church, which excited the zeal of Luther in Germany, induced many distinguished and learned men in Switzerland and the Netherlands, in France and England, to take up the same cause. Among the Swiss, Ulrich Zwingli and John Œcolampadius were the most prominent. In Switzerland, the Franciscan Bernard Samson proclaimed the efficacy of his indulgences in the same gross and shameless manner as Tetzel had done; but when he came to Zürich, where Zwingli was a religious teacher, the latter attacked him, and the council of Zürich seconding his zeal, Samson was driven out of the city. In vain did a papal nuncio labour to put down the reformer, and in vain did the Swiss confederacy threaten him. In 1523 he published his sixty-seven propositions in German, and a public disputation was held at Zürich respecting them, when he maintained his ground with ability, and gained a number of adherents. At the diet of Lucerne, 1524, the confederacy threatened to exclude Zürich from the council; but she stood firm, and the town of Muhlhausen soon declared in favour of the new doctrines. Capito (Koeflin) introduced the Reformation into Basle, and Œcolampadius continued the work. In 1526 a religious disputation took place, when Œcolampadius maintained the contest against a large number of vehement Catholics, among whom John Eck was most prominent. Berne resolved upon another disputation in 1528, though against the will of the other cantons; but nothing was settled beyond diffusing the doctrines of the Reformation. These spread more and more, notwithstanding all the resistance of the Catholic cantons, who at length, in 1531, renounced all connection with the Protestants. At the diet of Augsburg, in 1530, Zwingli also presented his confession of faith, generally known as the "Confession of Strasburg," which was one of the cities represented by him. He and his adherents, however, refused to sign the Confession of Augsburg, and did not join the league of Smalcald. The disputes between Luther, Zwingli, and their followers, were carried on with great animosity and obstinacy on both sides, and for a time threatened seriously to retard the work of the Reformation, more particularly respecting the presence of the body of Christ in the sacrament. The followers of Zwingli

came to be known as the Evangelicals, or *Reformed* Church. After the death of Zwingli and Œcolampadius a greater than either rose up to take the lead of the reformed party; namely, John Calvin, who, being obliged to flee from France on account of his opinions, found an asylum in Geneva, where he speedily acquired the greatest influence. In some of his doctrines he differed somewhat from Zwingli, but gradually the two systems merged together. (*See* CALVINISM.) The war between the emperor and Protestants of Germany at length terminated in the peace of Augsburg, 1555, which gave to the Protestants of Germany who followed the Confession of Augsburg perfect liberty to enact laws for themselves relating to their religious sentiments, discipline, and worship, and entire freedom from the authority and jurisdiction of the Roman pontiff. The peace that was thus established was many years after broken by the Thirty Years' War (1619-48), but the treaty of Westphalia, by which it was terminated, confirmed the conditions of the peace of Augsburg, and extended its benefits to the Reformed as well as the Lutheran church. The doctrines of the Reformation penetrated to some extent into France, as well as into Spain and Italy; and at the time of their separation, the seven United Provinces proclaimed liberty of conscience, and declared for the doctrines of the Reformed church. Lutheranism was adopted as the state religion of Denmark and Norway about 1536. In England, Lutheranism was established in 1547; in Scotland, Presbyterianism in 1560. In Transylvania the Lutheran confession prevailed; in Hungary, Calvinism entered with it; and in Poland, where the Reformation had found numerous adherents, the two Protestant parties concluded a convention at Sendomir in 1570, which united them in one political body, under the name of Dissidents. Whatever opinions may be formed respecting the truth or falsehood of the Reformed doctrines, it is indisputable that the Reformation has been of incalculable benefit in the cause of civil and religious liberty, of enlightenment, and of morality. The human intellect was bound down with fetters to a church which was itself sunk in profligacy and gross immorality. The change was effected not only on those who left, but even on those who remained connected with the Church of Rome. "The desire of equalling the reformers in those talents which had procured them respect; the necessity of acquiring the knowledge requisite for defending their own tenets or refuting the arguments of their opponents; together with the emulation natural between two rival churches, engaged the Roman Catholic clergy to apply themselves to the study of useful science, which they cultivated with such assiduity and success, that they have gradually become as eminent in literature as they were in some periods infamous. The same principle occasioned a change, no less considerable, in the morals of the Romish clergy. Many of them have in consequence been distinguished for all the accomplishments and virtues which can adorn their profession, and differ greatly from their predecessors before the Reformation both in their maxims and in their conduct."—*Ref.* Ranke's *History of Germany during the Reformation*; D'Aubigné's *History of the Reformation*; Gieseler's *Church History*.

REFORMATORIES are training institutions established with the view of reforming juvenile offenders. Robert Young, the founder of the Philanthropic Society, commenced his efforts on behalf of the children of criminals in 1788, and took in succession four small houses at Hackney for their reception, placing in each a mechanic or artisan to instruct them in useful labour. The first reformatory proper, however, was founded by Johannes Falk, a native of Dantzic, about the year 1813, being avowedly a refuge for criminal children and the children of criminals. Other small establishments of the same kind followed in different parts of Germany, and in 1824 the "Society for the Education of Children Morally Neglected" was founded in Berlin. In 1826 the state legislature of New York passed an act for "incorporating the Society for the Reformation of Juvenile Delinquents in the city of New York," and the refuges soon became an important feature in the United States. In 1839 the famous reformatory of Metrai, near Tours, in France, was established by M. De Metz, formerly a counsellor at Paris, and who was warmly seconded in





his beneficent work by the vicomte de Courcelles, who gave the estate on which the establishment is placed. The reformatory of Redhill, near Reigate, Surrey, was established by the Philanthropic Society, the foundation-stone being laid by the Prince Consort, 30th April, 1849. The number of boys in the establishment at one time is usually about 260; and they are divided into five sections or families, each having a separate house, and a master, or "father." The boys learn and work alternately, one half being at school while the other half are at work. Besides farm-work, they are employed as shoemakers, tailors, brickmakers, &c. The farm extends to about 240 acres. The articles required for the establishment are, as far as possible, home-made; besides which a considerable quantity are made or produced for sale. In 1852 the North-west London Preventive and Reformatory Institution, in the New Road, was established; and here all kinds of trades are taught. Various provisions are made for the establishing or licensing of reformatories, and authorizing judges and magistrates to send juvenile offenders there, by acts 17 & 18 Vict. c. 106, 18 & 19 Vict. c. 87, 19 & 20 Vict. c. 109, and 20 & 21 Vict. c. 55. The secretary of state for the Home department is authorised, upon application made to him, and after inspection by one of her Majesty's inspectors of prisons, to certify under his hand and seal that a school or institution for juvenile offenders is suitable for that purpose, and it is lawful for any court, magistrate, or justice of the peace to send any person under sixteen years of age convicted before him of any offence to such institution, for a period not less than two, nor more than five years, in addition to the legal punishment. But no offender can be sent to any such institution unless the sentence be one of imprisonment for fourteen days at the least; and, further, the parent or step-parent, if of sufficient ability, shall be liable to contribute to his or her support or maintenance such sum, not exceeding five shillings a week, as the justices or magistrate may think reasonable. In 1854 an act was passed authorizing magistrates in Scotland to commit vagrant children whose parents do not find security for their good conduct to certified reformatory schools. At the commencement of 1861 there were 51 reformatories in England and Wales, having, in all, 2,870 youthful offenders; and during that year 1,237 had been committed, 802 had been discharged, either on completion of their sentence or by order of the secretary of state, 60 had absconded, 30 were committed to prison for refractory conduct, 127 removed to other reformatories, and 20 had died. The number remaining was 2,586 boys and 613 girls. The sum paid by government for each offender was seven shillings per week, being in all £52,395, of which only £2,338 had been recovered from parents.

REFORMED CHURCH, in Eccl. Hist., comprises in its most general sense all those bodies of Christians which have separated from the Church of Rome since the Reformation; but in a more restricted sense it is applied to those Protestants who separated from the Church of Rome at the time of the Reformation, but who did not adopt the principles of Luther, being followers of Zwingli, Calvin, &c. (*See* REFORMATION.)

REFRACTION, *re-frăk'-shun* (Lat. *re*, and *frango*, I break), in Opt., the turning of a ray of heat, light, or other imponderable substance, from its direction when it falls obliquely on the surface of a medium differing in density from that through which it had previously passed. (*See* HEAT, LIGHT.) In Astron., the term *refraction of the stars* signifies an inflection of the rays of those luminaries in passing through our atmosphere, by which the apparent altitudes of the heavenly bodies are increased. Atmospheric refraction of the rays of the sun after sunset, combined with subsequent reflection, is the cause of twilight, and also of the light thrown on the moon's surface when eclipsed by the earth.

REFRACTION OF LIGHT. (*See* LIGHT.)

REFUGEE, *ref'-u-jee'* (Fr., from Lat. *refugio*, I flee), one who flees to a place for shelter or protection; one who, in times of persecution or political commotion, flees to a foreign country for safety. The term was first applied to the French Protestants who, by the revocation of the edict of Nantes, were constrained to fly from persecution and take refuge in foreign countries.

REGALIA, *re-gai'-le-ă* (Lat., from *rex*, king), in gene-

ral language, the privileges connected with the sovereign power. Politically, the term signifies the privileges, prerogatives, and right of property belonging in virtue of office to the ruler of a state. These regalia are also called *regalia majora*, comprehending that which relates to the sovereign's power and dignity; and *regalia minora*, that which relates to his *fisc* or pecuniary prerogatives; as, in some countries, waifs, strays, newly-formed land, &c. As states and governments have advanced in civilization, the exact idea of regalia has been largely influenced both by ignorance on the one side and force on the other. In some of the German states, the precious metals and stones were formerly looked upon as the exclusive property of the sovereign; and at the present day, a citizen has not, in all countries, the right to work mines on his own property. In *English heraldry*, the term *regalia* signifies the royal insignia,—the sceptre with the cross, the sceptre with the dove, St. Edward's staff, four different swords, the globe, the orb with the cross, together with the crown jewels, and other articles used at coronations.

Regatta, *re-gät'-ta* (Ital.), a term originally used in Venice, signifying a grand *fête*, in which the gondoliers contested for the superiority in rowing their gondolas on the canals which intersect the city. The term has been received into nearly every European language, and signifies a day set apart for the diversion of boat-racing, either on fresh or salt water. During the summer months, in all parts of England, regattas are of frequent occurrence.

Regelation, *re-jel-ai'-shun* (Lat. *rego'lo*; from *re*, and *gelo*, I freeze).—It was noticed by Professor Faraday, a few years ago, that when two pieces of ice with moistened surfaces were placed in contact, they froze together; if, however, the surfaces were dry, they did not cohere. The phenomenon of the freezing of the moistened surfaces has been designated *regelation*. It is owing to this circumstance that, during a thaw, the particles of snow cohere into a solid lump, whilst, during a frost, it is difficult to form the dry particles into a compact mass. Regelation will take place between the surfaces of blocks, even when the temperature of the surrounding atmosphere is as high as 30° or 32°. Certain solids, such as flannel, hair, or cotton, will freeze to ice even in a warm atmosphere; though others, such as saline substances, gold-leaf, and the metals generally, will not freeze to it. Professor Tyndall accounts for regelation, upon the theory that heat is the result of vibratory motion; the liquefaction, therefore, of ice when perfectly homogeneous, must necessarily take place more easily upon the surface than within the mass. Conversely, the freezing of a thin layer of water between two masses of ice should occur more readily than upon the surface of a single mass. This explanation is insufficient; for if true for ice, it ought to be true for all substances solidifying after fusion, when two portions of the solid are brought in contact beneath the still liquid mass. Besides, it offers no explanation of the freezing of ice to flannel, which certainly appears to arise from the same cause as the freezing of ice to ice. Other theories have been started to account for regelation, none of which are satisfactory; the phenomenon, therefore, at the present time requires further elucidation.

Regent, *re'-jent* (Lat. *rego*, I rule), a ruler who governs a kingdom during the minority, absence, or disability of the king. In most hereditary monarchies, the doctrine is that the office belongs to the nearest relation of the sovereign capable of undertaking it. Regent also signifies a teacher of arts and sciences in a college, having pupils under his care; but is generally confined to the lower classes, the teachers of the higher being called *professors*. In the English universities, the term is applied to masters of arts under five years' standing, and to doctors under two, as non-regent is to those above that standing.

Regicide, *rej'-e-side* (Lat. *rex*, a king; *cædo*, I slay), a king-slayer. The word is used also for the act of slaying a king. The term is most generally employed in reference to the persons concerned in the trial, condemnation, and execution of Charles I.

Regiment, *rej'-ment* (Fr.), in military language, a body of troops, either horse or foot, forming the third subdivision of an army. A brigade is formed by uniting two or more regiments or battalions; and two or more brigades form a *corps d'armée*. Every regiment is commanded by a colonel, a lieutenant-colonel, and a major; and when a regiment is divided into two or more battalions, each of them has, when complete, its own lieutenant-colonel and major. It is not certain at what time the term regiment was first applied to bodies of troops, but it seems to have been in general use in France after the middle of the 16th century. In this country, from Queen Elizabeth's reign, the English army has been invariably divided into regiments; and this practice has been followed by most of the nations of Europe. At present the arrangement of regiments in the English army is as follows:—Cavalry: 2 regiments of life-guards, 1 royal horse-guards, 7 regiments of dragoon guards, and 21 other regiments of cavalry. The infantry consists of 3 regiments of foot-guards, and 109 regiments of the line, the rifle brigade, and the following colonial regiments: 3 West-India regiments, the Ceylon rifle corps, the Cape mounted rifles, royal Canadian rifle regiment, St. Helena regiment, royal Newfoundland companies, Gold Coast artillery corps, and the royal Malta fencible regiment.

Regimental Schools, *rej-men'-tal*, have been but recently in existence in the English army, having been established since 1846. When it was first proposed to establish them much opposition was made to the project by some military men, who asserted that if the schoolmaster were brought into cantonments or garrisons, there would be an end of military discipline in a year. In spite of this, however, a training institution for regimental schoolmasters was attached to the Royal Military Asylum at Chelsea, from whence the various regiments of the army have been supplied with schoolmasters; and experience has shown the groundlessness of the alarm with which the undertaking was at its outset received. Not only has discipline not been relaxed in the army; it has been braced up. Crime is less frequent than it used to be; men's manners are softened, their very language taking a different tone in proportion to the progress of education among them; and to be educated has grown into a fashion with them. The quality of the instruction given in regimental schools is high. In the first place, it is rudimental for children; and after the rudiments, it goes on to history (sacred and of all other descriptions), geography, geometry, arithmetic, mathematics, as high up as algebra, and even into higher branches; mensuration and fortification.

Register, Annual. (*See* Annual Register.)

Registration of Births, Deaths, and Marriages, *rej'-is-trai'-shun*.—The first known public injunction respecting the keeping of parish registers was issued by Lord Cromwell, secretary to Henry VIII., in 1538, directing that every clergyman shall keep a register-book of his parish, wherein he shall enter every Sunday a written record of the dates and names of the weddings, christenings, and burials of the preceding week. In 1547 (1 Edw. VI.) a similar injunction was issued, and visitors appointed to go through the different dioceses, and see that and other orders were complied with. In the first year of Queen Elizabeth a similar injunction was issued. In 1597 an institution was made by the archbishop, bishops, and clergy of the province of Canterbury, and approved by the queen, remarking on the very great utility of parish registers, and giving minute directions for keeping them, and for the transmission of a transcript yearly to the diocesan register. In 1653 an act was passed, directing that in every parish a register-book should be provided for registering all marriages, births, and burials in the parish; and that the duty of registration devolve on a person to be called the parish registrar, appointed by the parishioners chargeable to the poor, and approved by a justice of the peace. This act was not confirmed at the Restoration, and during the reigns of Charles II. and James II. nothing further was done. The act 6 & 7 Wm. III. c. 6 (1694), entitled "An Act for granting to his Majesty certain Rates and Duties upon Marriages, Births, and Burials, and upon Bachelors and Widowers for the term of five years, for carrying on the war against France with vigour,"—was passed merely for purposes of revenue. The 53 Geo. III. c. 146 (1812), was for "the better regulating and preserving parish and other registers," and directed that the registers of each parish shall be kept by the officiating

clergyman, in books to be provided by the king's printer, at the expense of the respective parishes. These provisions being found to be very inadequate, a select committee of the House of Commons was appointed in March, 1833, and, in accordance with their report, a bill was brought before parliament, and became law, 6 & 7 Wm. IV. c. 86. The act, entitled "An Act for registering Births, Deaths, and Marriages in England," came into operation on 1st July, 1837. Among the most important provisions of this act was the providing a general register-office in London, presided over by an officer named the registrar-general, and having general superintendence over everything relating to registration. The registrar-general is appointed under the great seal, and has the direction and superintendence of the entire system. A superintendent registrar is appointed for every district, which is usually identical with a poor-law union, and is generally the clerk of the guardians. He receives quarterly from each registrar within his district certified copies of births, deaths, and marriages registered by him, and, having verified their correctness, transmits them to the registrar-general. He has also the charge of all the register-books within his district, when filled. The registrar of births and deaths is a local officer, appointed in poor-law unions by the board of guardians. The registrar of marriages is a local officer, appointed by the superintendent registrar, and acts solely within his district, which is the same as that of the superintendent registrar by whom he is appointed. He registers marriages not solemnized according to the forms of the established church, either in registered places of worship or in the district register office. Two inspectors are constantly employed in visiting every district, to see that the duties of the various registration officers are properly performed. Registrars are required to inform themselves carefully of every birth and death which shall happen within their district, and register the same, with the various particulars required, according to the forms laid down for that purpose. Every entry must be signed by the informant and registrar; the former, in the case of a birth, is required to be one of the parents, or the occupier of the house in which the birth took place; in the case of a death, it must be some one who was present at the death, or in attendance during the last illness; failing whom, the occupier or an inmate of the house in which the death occurred. Marriages according to the forms of the established church are registered by the officiating clergyman,—according to the ceremonies of the Quakers or Jews, by the registering officer of the Quakers or secretary of the synagogue respectively. They are registered in duplicate, and every entry requires to be signed by the clergyman, or the registering officer, by the persons married, and by two witnesses. Certified copies are delivered quarterly to the superintendent registrar of the district for transmission to the registrar-general. The certified copies of all the registers, which are transmitted to the General Register Office in London, and there arranged and indexed, so that a copy of an entry of any registered birth, death, or marriage, in any part of England or Wales, may be obtained here at the trifling cost of 3s. 6d. One of the most important features of the present system is in registering the causes of death; and in order to secure as far as possible uniformity of nomenclature, a particular nosological classification of diseases is observed. (*See* Nosology.) The annual reports of the registrar-general, which are laid before parliament, contain a vast mass of information upon various subjects connected with vital statistics. Besides detailed abstracts of the births, deaths, and marriages of each year, are given tables of the fatal diseases, classified in combination with ages, comments upon the salient points of the year's registration accompanying the whole. From 1st July, 1837, when the present system came into operation, down to the end of 1858, no fewer than 28,600,392 names have been registered; viz., 6,083,906 of persons married, 12,209,383 of children born, and 8,307,103 of persons who had died. In 1860, there were 684,048 births registered (being nearly 5,000 less than in 1859); of whom 349,709 were males and 334,249 females, 54 of the whole being illegitimate; marriages were 170,166 (exceeding by 2,433 the number





of the previous year), 137,370 of which were performed according to the rites of the established church; deaths numbered 422,731 (a decrease of 17,350 from 1859), being 215,298 males and 207,433 females. Quarterly reports are also published relating to England and Wales, and a weekly report relating to London. The cost to the country of the registration system is about £100,000 per annum, of which about £65,000 are defrayed from the poor-rates, and the remainder out of the public revenue. In Scotland, the institution of parish registers dates from 1551. Various orders of the General Assembly and acts of the Scotch parliament were passed on this subject; but the system was in a very inefficient state till the passing of 17 & 18 Vict. c. 80, entitled "An Act for the better Registration of Births, Deaths, and Marriages in Scotland." It established a general registry-office in Edinburgh, with a registrar-general and other provisions similar to those existing in England, with this important distinction, that those on whom the duty devolves are required to furnish the registrar with the necessary information respecting any birth, death, or marriage, under a penalty, whereas in England there is no legal obligation upon any one to give notice of a birth or a death to the registrar. In Ireland, the want of a complete measure of registration is still felt, though various representations have been made to parliament on the subject. In 1844, an act was passed for the registration of marriages, but it is of little practical value, as the marriages of Roman Catholics, who form the majority of the population, are excluded from its provisions.—Ref. *Encyclopædia Britannica.*

Registration of Deeds.—The act 2 & 3 Anne, c. 4, provided for the public registry of all deeds, conveyances, and wills affecting any lands in the West Riding of Yorkshire; 6 Anne, c. 35, established a similar register for deeds and wills in the East Riding of Yorkshire and the town of Kingston-upon-Hull; 7 Anne, c. 20, established such a register for Middlesex; and 5 Geo. II. c. 6, one for the North Riding of Yorkshire. These registers are not so useful as they might be made, on account of deficiencies and irregularities. A registration of wills has been long established; and the act for abolishing fines and recoveries (3 & 4 Wm. IV. c. 74) substitutes for them a deed which is enrolled in the court of Chancery. The act 1 & 2 Vict. c. 110, provides that no judgment or decree shall affect lands until registered in the court of Common Pleas. The want of a general system of registration, however, has been much felt in England. The new "Transfer of Lands Act" (25 & 26 Vict. c. 53) establishes a registry for the registration of the titles to estates, freehold tenure, and leasehold estates in freehold lands. It declares that persons described in the record of title shall be deemed to have the property therein named absolutely and indefeasibly, subject to such exceptions or qualifications as are mentioned in the record of title. Before final registration, the applicant, and his solicitor or agent, are to make oath that all deeds, charges, incumbrances, &c., have been, to the fullest extent of their knowledge, made known to the registrar, who may call for further evidence or refuse to register. The registrar is required to give notice of registration to persons entitled to any charge or incumbrance, the owner of which has not had notice of the application. The registrar is also to deliver, on request, to the owner of an estate, a land certificate, containing a description of the lands, with all the entries relating thereto, every such land certificate to be evidence of the matters therein contained; and estates described in such certificate may be conveyed or charged by endorsement in a prescribed form; and the deposit of a certificate is to create a lien, in the same way as the deposit of title-deeds.

Regium Donum, *re'-je-um do'-num* (Lat., royal gift), is a sum of money voted annually by parliament, out of the national exchequer, to aid certain bodies of Presbyterians in Ireland in providing stipends for their ministers. It was first granted in 1672 by Charles II., who gave £600 out of the "secret service money" to be distributed annually, in equal portions, among the Presbyterian ministers. It was discontinued towards the end of his reign, and during that of James II., but was renewed by William III., who augmented it to £1,200 a year. Since then, it has been increased from

time to time, till it now amounts to upwards of £40,000 per annum, distributed in sums of £100 and £75 (late Irish currency) to each minister. It is divided among six different bodies of Presbyterians; viz.—(1) the General Assembly, comprising the two bodies formerly known as the Synod of Ulster and the Synod of Seceders; (2) the Secession Synod; (3) the Remonstrant or Unitarian Synod of Ulster; (4) the Presbyterian Synod of Antrim; (5) the Synod of Munster. The Reformed Presbyterian Synod does not participate in this grant.

REGIUS PROFESSOR, *re'-je-us* (Lat., royal professor), in the universities, is a professor appointed by royal authority.

REGRATING. (*See* FORESTALLING.)

REGULAR BODIES. (*See* BODIES, REGULAR.)

REGULAR FIGURES, *reg'-u-lar* (Lat. *regularis*), in Geom., are those whose sides and angles are equal; as a square, a cube, or an equilateral triangle.

REINDEER, *rain'-deer* (Sax. *hrana*, Dut. *rendeir*, Ger. *Rennthier*), (*Varaudus rangifer*).—This animal has a multitude of synonyms, and by English writers is called, indiscriminately, the reindeer, caribou, and Greenland buck. It is a native of the Arctic circle in Europe, Asia, and America. It is about the size of our stag, and has the horns elongate, subcylindrical, and with the basal branches and tip dilated and palmated. It varies exceedingly in size; some of the specimens in the British Museum being 41 inches, and others 50 inches high, at the withers. There are several varieties. In the fur countries, there are two varieties, one confined to the woody and more southern district, and the other retiring to the woods only in winter, and passing the summer on the coast of the Arctic seas. A large variety occurs in Siberia, which the Tungusians use for draught. In Newfoundland, also, there is a large variety, nearly as large as a heifer, which has very large and heavy horns. In the north of Europe the reindeer is domesticated, and its services are invaluable. Possessing the reindeer, the Laplander can dispense with the services of horses, sheep, and oxen; for it will carry him in his sledge over the snow thirty, forty, or fifty miles a day. Its milk provides him with cheese; its flesh supplies him with food; and its skin furnishes him, not only with clothing, but with tents and bedding. In winter, the hair of the reindeer is long, thick, grey-brown; neck, rump, belly, ring round the hoof, and end of nose, white. In summer, the same animal has short, dark, sooty-brown hair, with the parts which are white in winter, being rather paler grey-brown. The hair of the body is so thick that the skin cannot be seen when it is put aside; for it stands erect, as in other animals of the same genus, but is much thicker. The size of the reindeer, as already stated, varies considerably, and increases in proportion to its proximity to the pole; the reindeer of Norway and Sweden being small when compared to those of Finmark and Lapland, which, in their turn, yield to those of Spitzbergen, while these again fall short of the more polar races. The reindeer, when wild, travel in herds, varying in number from eight or ten to two or three hundred; their daily excursions being generally towards the quarter from which the wind blows. The Indians kill them with bows and arrows. They also take the reindeer in snares, or spear them as they are crossing rivers or lakes. The Esquimaux take them in traps ingeniously formed of ice and snow. The reindeer has been known to travel at the rate of nineteen English miles an hour, and on one occasion, one travelled 800 English miles in 48 hours.

REINDEER MOSS. (*See* CLADONIA.)

REINECKE, or REINECKE DER FUCHS, *ri'-nek-ke(r) der fuks* (Ger., Renard the FOX), is the name of a celebrated German epic poem, which was first printed at Lübeck in the Frisian dialect in 1498, under the title of "Reynke de Vos." It has long enjoyed great popularity, and been translated into, probably, every language of modern Europe. It is a satire on the intrigues practised at the court of a weak prince. The characters are animals, the arch rogue being the fox, called Renard, who, by hypocrisy and cunning, contrives to gain the favour of his sovereign king Noble (the lion), who loads him with honours. Nothing is known with certainty respecting the author, who, by some, is said to have been Henry Von Alkmaar, schoolmaster and tutor of the duke of Lorraine, and is said to have translated it from the French. Poems of a similar nature were common in the 11th and 12th centuries, and Meon published at Paris, in 1823, the "Roman du Renard," written in French in the 13th century. One of the earliest works issued from the English press was "The History of Reynard the Fox," by Caxton, London, 1481.—Ref. *Reinhart Fuchs*, von Jacob Grimm, Berlin, 1834; *Sendschrieben an Karl Lachman von Jacob Grimm ueber Reinhart Fuchs; The History of Reynard the Fox*, from the edition printed by Caxton in 1481, with notes and an introductory sketch of the literary history of the romance, by W. J. Thoms; London, 1844.

REINSCH'S TEST FOR ARSENIC (*rinesh'e*).—This important test consists in acidulating the suspected solution with hydrochloric acid, and throwing into it some pieces of bright copper foil or gauze, and boiling for half an hour. If arsenic is present, it will be deposited on the copper, from which it is sublimed by heating the metal in a glass tube, octahedral crystals of arsenious acid being found on the cool portion of the tube.

RELEASE, *re-lease'* (Fr. *relaisser*), in Law, is a discharge of a right, which may be either in lands or tenements, or actions, or things personal. The former is a conveyance of a man's right in lands or tenements to another that has some vested estate in the lands. The person who quits or renounces the right is the releasor; he in whose favour the right is renounced is the releasee; while the operative words of the deed are "remit, release, renounce, and for ever quit claim." There can be no release unless the releasee has some estate in or right to the thing which is the object of release. Releases may enure in various ways:—1. By way of enlarging an estate, as where there is a tenant for life or years, with remainder to another in fee, and he in remainder releases all his right to the particular tenant and his heirs: this gives him the estate in fee.—2. By way of passing an estate, as where one of two coparceners releases all his right to the other: this passes the fee simple of the whole. In both these cases there must be privity of estate between the releasor and the releasee, *i.e.*, one of their estates must be so related to the other as to make but one and the same estate at law.—3. By way of passing a right, as if a man be disseised and releases to his disseisor all his right.—4. By way of extinguishment, as if a lease be made to two persons, one may release the other before entry, and the release does not operate by enlargement, but by extinguishment of a right.—5. By way of entry and feoffment, as if there be two joint disseisors, and the disseisee release to one of them, he shall be sole seised, and shall keep out his former companion. A release may also be the giving up or discharging of a right of action or suit which one man has against another. This may be either by act of law or by deed. A release "of all demands" is good against all sorts of rights, titles, actions, &c., that exist at the time of the release; but it does not extend to anything which is not a demand at the time, but afterwards becomes one.

RELICS, *rel'-iks* (Lat. *reliquiæ*, things left), in the Roman Catholic church, is a name given to the remains of the bodies or clothes of saints and martyrs, which are held in great reverence. Many of them are believed to have performed the most extraordinary miracles, and they are therefore preserved with the greatest respect near the altars of their churches. Veneration for relics appears to have originated in the practice adopted in the early church, of assembling from time to time for acts of worship at the tombs of the saints or holy men, and frequently erecting chapels or sanctuaries on the spot. Hence it came to be common to deposit relics under the altars of churches, and Ambrose refused to consecrate a church because it had no relics. The [illegible] for relics became so excessive that the emperor Theodosius the Great had to pass a law forbidding the digging up of the bodies of martyrs, or the trafficking in their remains. The veneration for relics became a kind of worship. Numerous miracles were given out as having been wrought by them; and long pilgrimages were performed to them. Pope Gregory I. displayed a great veneration for relics; and from that time, all through the middle ages, they be-

came the objects of the most absurd superstitions and the most shameless traffic. Legs, arms, bones, skulls, teeth, &c., of saints were multiplied without end; and pieces of the holy cross were to be found in all parts of Christendom. Among the relics exhibited were a quill from the wing of the angel Gabriel; a piece of the apron of the butcher who killed the fatted calf on the return of the prodigal son; a branch of the tree on which Absalom was suspended by the hair; a piece of the fishing-net of St. Peter. The Church of Rome still countenances the veneration of relics, and maintains that miracles are still wrought by them.

Relief, *re-leef'* (Lat. *relevium*, from *relevare*, to raise up), in Law, was a sum of money paid to the lord of a feudal tenure on the admission of a fresh tenant, who was thus said to take up the fief, which had fallen to the lord by the death of his predecessor. It was a relic of the ancient system, when the succession depended upon the will of the lord, who, for the renewal of the feud, exacted a fine or acknowledgment, in horses, arms, money, or the like. This continued after the succession became matter of right, and, with the other incidents of feudal tenure, was abolished by the statute 12 Car. II.

Relief Synod. (*See* United Presbyterians.)

Relievo, *re-le'-vo* (Ital. *rilievo*), a term applied to sculptured work which is raised above a surface with which it is connected. There are three gradations of relievo:—*basso-relievo*, in which the figures project only slightly from the ground on which they are sculptured; *mezzo-relievo*, in which the figures stand out about half their natural proportions, the other half appearing immersed in the groundwork; and finally, *alto-relievo*, in which the figures stand completely out from the ground, being attached to it only here and there, while in most places it is worked entirely round, as in single statues. Relievo, with the Greeks, was originally very flat. Phidias brought it to perfection; and the cornices and metopes of the Parthenon, and the temple of Apollo at Bassæ, near Phigalia, in Arcadia, preserved by a fortunate accident, are still unrivalled models of relievo. Amongst the ancient Romans, who strove to cover want of spirit in their art by workmanship, the high relievo (*altissimo-relievo*) was adopted; in this style, the figures stood almost entirely out from the ground, which was covered with other figures. The best examples of relievo in England are the Elgin marbles in the British Museum.

Religion, *re-lij'-un*, according to Cicero, is derived from *re-legere*, to recousider; but according to Servius and most modern grammarians, from *religare*, to bind fast. It is based upon a belief in the existence of a Supreme Being, and is the feeling and knowledge of our relation to him. It is usually divided into natural and revealed. By natural religion is meant that knowledge, veneration, and love of God which are discoverable by the right exercise of our rational faculties, from considering the nature and perfections of God and our relation to him. By revealed religion is understood that discovery which he has made to us of his mind and will in the Holy Scriptures. The varieties of religions in the world are almost innumerable; but they may be reduced to four great classes,—the Jewish, Christian, Mohammedan, Pagan. The following is the estimate of the number of adherents of each, given by Dieterici (1861):—

| | | | |
|---|---|---|---|
| Jews ..... | 5,000,000 | Mohammedans | 160,000,000 |
| Christians | 505,000,000 | Pagans ..... | 800,000,000 |

Remainder, *re-main'-der* (Lat. *remanere*, to be left behind).—In Law, an estate in remainder is defined to be "an estate limited to take effect and be enjoyed after another estate is determined." Thus, if a man seised in fee-simple grants lands to A. for twenty years, and after the determination of the said term, then to B. and his heirs for ever, here A. is tenant for years, and the remainder falls to B. A remainder differs from a reversion, in that the former is created by the act of parties, the latter by act of law. The estate which precedes the estate in remainder is called the particular estate, as being a *particula* or portion; the two being equal only to one estate in fee. There must first necessarily be some particular estate precedent to the estate in remainder, in order, as is said, to support it. The remainder must also commence or pass out of the grantor at the time of the creation of the particular estate, and must be limited to take effect in possession immediately upon the determination of the particular estate, and neither sooner nor later. Remainders are of two kinds,—vested or executed, and contingent or executory. Vested remainders are where the estate is invariably fixed to remain to a determinate person after the particular estate is spent; contingent remainders, on the other hand, are limited either to an uncertain person or upon an uncertain event; *i. e.* to a person not *in esse* or not ascertained, or upon an event which may not happen at all, or not happen until after the particular estate is determined.

Remittent Fever. (*See* Fever.)

Renaissance Architecture, *re-nais'-son* (*g*) (Fr., new birth), a term applied to that period of the *Revival* when the classical began to be again introduced after the mediæval styles. The term is not confined to architecture alone, but is also used in ornamental art and sculpture. The architectural renaissance had its origin in Italy, where the Gothic style never had a strong footing. With the revival of old Roman literature, there arose a strong desire for the study of classic art, which was soon followed by an attempt to imitate it; and as early as the 14th century may be observed traces of the imitation of Roman architectural forms. The Renaissance, properly so called, however, dates from the early part of the 15th century, when it began to assume consistency and character: in the following century it attained its full development. Every country had its peculiar renaissance, although each was derived from that of Italy; these were named respectively after the different nations in which they appeared; as French, German, English Renaissance. The latter style is usually called Elizabethan architecture. (*See* Elizabethan Architecture.) They all bear a general family likeness, but each exhibits characteristic features of its own. The Renaissance in general was founded upon the Roman *antique*; not upon the style of the temples, but upon that of their triumphal arches, baths, and other edifices. Neither the portico nor the continuous colonnade were taken as models, but such buildings as the Coliseum, where several orders are introduced, principally for purposes of decoration. Both in the Renaissance and Cinque-cento styles, entire orders are merely used as embellishments. In structures where columns are employed for actual support, it is only in combination with arches springing from them, the columns serving to the arches in the place of piers. Much of the Italian renaissance is *astylar*, with either a full entablature or a cornicione crowning, and proportioned to the rest of the edifice. This broad and simple method of treatment was greatly affected by the Roman and Florentine architects during the period of the Revival, and contrasts strongly with the Renaissance in France and other countries, which is characterized by multiplicity of parts and numerous divisions and breaks. In English Renaissance, one deviation from the Italian was the frequent employment of coupled columns or pilastres, which was, in some cases, caused by the necessity for wider piers between the windows, which retained their Tudor or English character. In the Italian Renaissance generally, the detail is somewhat dry and meagre, the entablatures, even to Corinthian columns, consisting of plain mouldings. In our country and in France a much more florid style was adopted. These species of the style are marked by a profusion of enrichment and carvings in mouldings, panels, and friezes, by arabesque foliage and medallions, which frequently cover considerable surfaces. The carvings generally consist of grotesque animals, foliage, &c., extended into scroll-work, and interlaced curiously and capriciously. A similar kind of sculpture, only purer and more graceful, is to be met with in the Italian style. One of the most characteristic features of the Renaissance style is the profusion of minute ornament in building, furniture, and decoration generally. French Renaissance dates from the reign of Louis XII., who employed Italian artists and architects. There are several magnificent specimens of this style of architecture in France; among others may be mentioned the interior, at least, of the palace of Fontainebleau. The Renaissance is considered by French writers to have risen to its highest point of excellence under Philibert Delorme, in the reigns of Henry II. and

Francis II. The palace of Heidelberg, if completed, would have been the most splendid specimen of the Renaissance in Germany. In general, the German Renaissance was more extravagant in construction and decoration than even the French. There are many interesting specimens of the Renaissance style in Spain, which exhibit much elegance and taste.

RENT. (*See* POLITICAL ECONOMY.)

REPEATING CIRCLE, *re-peat'-ing* (Fr. *répéter*, to iterate), one of the most complicated and ingenious of modern astronomical instruments. It was invented by the Chevalier de Borda in 1787, and obtained an immense reputation through having been the only instrument employed in the geodesical and astronomical observations of the great measurement of an arc of the meridian, on which the modern French system of measures, weights, and money is founded. The prime objects of the repeating circle are to diminish the effect of errors of graduation, and to obtain very correct measurements by means of comparatively small instruments. The principle of repetition consists in moving the telescope successively over portions of the graduated limb, corresponding to the angle to be measured, and reading only the multiple arc. Borda's repeating circle consists of a graduated circle, supported on a tripod that allows of its being placed in all possible directions, and furnished with two telescopes, having reticules at their foci. The whole circle turns round on a vertical column, which has an inner axis of steel, with good fittings at the top and bottom. The top of the column flushes in a square bar, to which the upper works and circle are firmly screwed. The chief objections to Borda's instrument are that it is heavy and rickety, and not sufficiently portable; but it possesses two valuable properties: mere errors of division may be diminished by sufficient patience, and the fatigue of reading off the divisions, the most ungrateful part of an observer's task, is greatly reduced.

REPLEVIN, *re-plev'-in* (Fr. *re*, and *plevir*, to give a pledge), denotes the re-delivery of the pledge or thing taken, and is a remedy granted on a distress, by which the first possessor has his goods restored to him again, on his giving security to the sheriff that he will try the right of the distress, and restore it if the right be adjudged against him. In a replevin, the person distrained becomes the plaintiff, and the person distraining the defendant or avowant, and his justification an avowry.

REPRIEVE, *re-preev'* (Fr. *reprendre*, to take back), in Law, is the withdrawing of a criminal's sentence for an interval of time, by which means the execution is suspended. It may take place,—(1) at the mere pleasure of the crown; (2) at the pleasure of the judge, for every court which has power to award execution has also power, either before or after judgment, to grant a reprieve; (3) of legal necessity (*ex necessitate legis*), as where a woman is capitally convicted, and pleads her pregnancy; (4) if the criminal become *non compos mentis*. The cases in which a judge usually grants a reprieve are where he is not satisfied with the verdict, or the evidence is suspicious, or the indictment insufficient, or if any favourable circumstances appear in the criminal's character, in order to give time to apply to the crown for either an absolute or a conditional pardon.

REPRISALS, LETTERS OF. (*See* MARQUE, LETTERS OF.)

REPRODUCTION, *re-pro-duk'-shun* (Lat. *reproduco*, I reproduce).—This term is sometimes used in Physiol. to signify generation; it is, however, more especially employed to denote those processes in organic beings by which the individual being is produced, developed, and maintained. In this way it has been employed to denote several processes which are functionally distinct or have very different ends in the economy of nature. The result of the ordinary processes of nutrition is the constant reproduction of the same tissue in the same parts, and is therefore the means by which the form of a being is maintained during life. Through the whole of the animal and vegetable kingdoms, this function is carried on until the death of the whole or part of the being. However, this power of reproducing the same tissues varies in different beings; and while a lost limb can be restored to the lower animals, no such power belongs to the more highly-organized animals or plants. The origination of the germ from which individual animals and plants grow is sometimes called reproduction. In this way, the production of cells, by which the life of the individual is maintained, is called *reproduction*; while the arrangement by which its existence as an individual is insured is called *generation*. In the ordinary reproduction of the tissues of animals and plants, each cell has the power of producing other cells, or a large number of the same kind of cells are produced simultaneously; in generation, on the contrary, it is necessary that two cells should take part. The two cells thus engaged have been termed the *germ*-cell and the *sperm* cell. The former is that in which the process of growth of the new being commences, whilst the latter is that which communicates the growing tendency to the former. In the animal and vegetable kingdoms, these cells are of different sizes and forms, and placed in various positions relative to other organs; the means also by which they are brought together vary; but they perform the same fundamental functions in all cases. The most profound mystery in the generation of animals and plants is the reason why the same apparent combination of elements should assume a particular form. Between the cells of the flowers of the oak and the apple no difference can be discerned; nevertheless, one always produces oak-trees and the other apple-trees. In animal life it is the same: there is no appreciable external difference in the cells; but one set will produce one species of animal form and another set another species. This fact has led some physiologists to assume the existence of a *vital principle*; that is, of a distinct and independent essence, giving to each species its definite form and character. Three conditions must be regarded in studying the phenomena of reproduction and generation. First, the *formative force*, which is peculiar in every species, and similar in all the generative cells produced in that species. Secondly, the *physical conditions* in which the generative cells are placed: these are more especially heat and light, and the condition of the membranes of the cell, through which absorption goes on. Thirdly, the *elements* which are supplied for the nourishment of the new being, and which, by their chemical properties, are capable of exercising an influence on the form and development of the animal or plant. (*See* PHYSIOLOGY.)

REPTILES, *rep'-tiles* (*Reptilia*), a class of animals belonging to the sub-kingdom *Vertebrata*, and embracing the creatures usually known as crocodiles, lizards, turtles, tortoises, and serpents, and placed, in zoological arrangement, between birds and fishes. The species are not so numerous as those of mammalia and birds, and the numbers found in cold and temperate climates are few in comparison to those existing in hot climates. The word *reptile* is derived from a Greek word signifying to crawl or creep; but this is not very descriptive of the whole of the order, neither is it expressive of a kind of motion which is peculiar to those animals which the order includes. Among reptiles, too, there is to be found every kind of motion which is found among any of the other three orders of vertebrated animals; but it is not performed by means of organs exactly similar, or in exactly the same style. Thus, for instance, many reptiles walk, run, or leap, but their limbs are not articulated like those of the mammalia. Some reptiles are capable of performing a sort of flight; but they do it by means of membranes, and not of any organs resembling wings, properly so called. Again, those that swim—and many of them are excellent swimmers—do not perform the motion by anything resembling fins, but by the flexure of the body or the action of the limbs. Reptiles are distinguished from the other classes of vertebrated animals by their having neither hairs on their body nor teats, like the mammalia; by their body being never covered with feathers, like birds; whilst their possessing feet and a tail, in form resembling those of quadrupeds, separate them from fishes. They are air-breathing animals, and cold-blooded. The skin is clothed with horny imbedded plates, or imbricated scales, which are covered with a thin and often deciduous epidermis. Their lungs are cellular, and their heart is trilocular. With only one or two exceptions, they are oviparous, and the young undergo no transformation after birth. Reptiles, by

the latest systematic zoologists, have been divided into two sub-classes: 1. those, the bodies of which are covered with overlapping scales, such as the lizards and serpents—*Squamata*, the scaly reptiles; and 2. those the bodies of which are covered with square imbedded plates, as the tortoises and crocodiles, &c.—*Cataphracta*, the shielded reptiles. Formerly the frogs and toads, &c., which have the skin naked and covered with mucus, formed a third sub-class, under the name of *Batrachia*; but they are now considered to form a separate class, under the name *Amphibia*. Reptiles are very tenacious of life, and in many of them a limb, or a part of a limb, will sprout again and grow, and come to be useful after it has been completely taken away; being in this particular completely unlike the other vertebrata, and assimilating to some of the animals that have no skeletons, and nothing that can be called a centre of organization,—to the crustacea, for instance. The bones of the small reptiles are of the same structure throughout, without any cells for containing marrow; but in the larger *sauria* there are such cells, though comparatively few in number. The cranium, or bony protection of the brain, is very small in all reptiles, although the vast projection of the jaws in some species makes the head appear large. The vertebral column varies much in reptiles; in some of them there being hardly any distinction of articulated parts, whilst in others there are some of the most varied and perfect motions in the whole mechanical structure of animals. Though the muscles of reptiles have great irritability, and this continues long after death, it does not appear that they have much sensibility, properly so called, or that their motions and the effects of external impressions upon them are productive of as much pleasure or pain as those of birds. They have some of the organs of local sense well developed, and others very imperfect. Sight appears to be their most perfect local sense; the eyes of most being well formed and ready in use. As to hearing, on the other hand, there are few or none of them that have external ears except the crocodile, and although never entirely wanting, the internal parts of the ear in all of them are somewhat imperfect. The organs of tasting and smelling are also not of the most perfect kind.

REPUBLIC, *re-pub'-like* (Lat. *respublica*).—A republic or commonwealth is a form of government in which the people, or at least a portion of them, are acknowledged the source of power, and have the direct appointment of the officers of the legislature and executive. When the body of the people is possessed of this supreme power, this is called a *democracy*; when the supreme power is lodged in the hands of a part of the people, this is called an *aristocracy*. The celebrated republics of antiquity are those of Athens, Sparta, Rome, and Carthage. When several sovereign and independent states unite themselves together by a perpetual confederacy, whilst each of them continues to be a perfect state, they will form together a federal republic. Of this kind were formerly the cities of Greece, and in later times, the seven United Provinces of the Netherlands. To this class might likewise be referred the federal government of the United States. There are but few republics at present in existence; the only republics worthy of the name in Europe being those of the Swiss cantons, each of which is a territory of small extent, and inhabited by a few thousands of people, generally engaged in husbandry. These republics, centring in a general diet or congress, are greatly under the influence of Austria and other powers, by which, indeed, they are in a great measure tolerated only from mutual jealousy, and because the country is in some places almost inaccessible to invasion. On the continent of America, various republics have been founded on the wreck of the colonial institutions of Europe, the principal being the United States of America, now upwards of half a century old. The form of the legislature and executive is very nearly that of England, the main difference being an elective president as chief magistrate, instead of an hereditary sovereign, and the appointment of judicial and other functionaries by the people instead of by the crown. As already stated, the country is not one, but an aggregation of republics, each state being independent of the others as regards internal management. The power of legislation for the States in their united character is vested in a House of Representatives and a Senate, jointly forming a Congress. The House of Representatives is composed of members chosen every second year by the people of the United States. Representatives are appointed among the several states according to their respective populations; the House of Representatives consisting of one member for every 77,700 persons in each state. A person to be eligible as representative must have completed his twenty-fifth year, have been seven years a citizen of the United States, and, when elected, resident in the state for which he is chosen. The Senate of the United States is composed of two senators from each state, elected by the legislature thereof for six years. One third of the Senate goes out, and is replaced by a new election every two years. A senator must be thirty years of age, nine years a citizen, and resident in the state for which he is elected. The president is elected by the whole people for a term of four years, and at the close of that period he may be re-elected. A person is unable to hold this office unless he be a natural-born citizen, thirty-five years of age, and fourteen years resident within the United States. The principle of electing representatives to the state legislatures is almost that of universal suffrage; in most instances, every male citizen above twenty-one years of age, who has resided a year in the state, being an elector. According to some authorities, the only instance of a true and genuine republic, where all men were presumed equal, and where universal suffrage was reduced to actual practice by a great nation, is to be found in France in 1849; but it is admitted that the existence of that form of organization was too short to prove anything either in favour of republicanism or against it. It may be observed, in conclusion, that republicanism, properly speaking, has not been tried in this country; nothing having been further from the thoughts of the leading men during the period of the Commonwealth than the idea of giving political power to the lower classes of society.

REQUIEM, *re'-kwe-em* (Lat. *requies*, rest), the name of a mass sung in the Romish church for the repose of the dead, beginning *Requiem æternam*; and in the Roman Catholic liturgy called *Missa pro defunctis*.

RESCUE, *res'-ku* (Lat., *recursus*), in Law, is a species of resistance against lawful authority; as the delivery of one arrested out of the hands of those who have the legal custody of him; or the taking away and setting at liberty against law a distress effected. When a distress is taken without cause, or contrary to law, the tenant may lawfully make rescue before it is impounded, for then it is not deemed to be in the custody of the law. A rescue of one apprehended for felony is felony, for treason is treason, and for a misdemeanour is a misdemeanour.

RESEDA, *re'-se-dâ* (Lat. *resedo*, I assuage), in Bot., the typical gen. of the nat. ord. *Resedaceæ*. *R. odorata* is the mignonette plant, which is so much cultivated in gardens and window-boxes for the delicious fragrance of its inconspicuous flowers. *R. luteola*, usually known under the name of *weld*, is a common plant in Britain: it yields a yellow dye.

RESEDACEÆ, *re-se-dâ'-se-e*, in Bot., the Mignonette fam., a nat. ord. of *Dicotyledones*, sub-class *Thalamifloræ*, having the following essential characters:—Herbs (usually) with alternate leaves and unsymmetrical flowers. Disk large, hypogynous, one-sided. Stamens definite, not tetradynamous. Ovary sessile, 1-celled; placentas 3—6, parietal; stigmas 3, sessile. Fruit usually opening at its apex long before the seeds are ripe. Seeds usually numerous, reniform, exalbuminous. There are six genera, including about 40 species, chiefly natives of Europe and the adjoining parts of Africa and Asia. (*See* RESEDA.)

RESERVOIR, *rez'-er-vwor* (Fr.), a pond or tank in which water is collected and preserved, in order to be conveyed through proper channels for the supply of a town. The term is also applied to any place where water is collected and preserved for the regular supply of a fountain or drinking-trough, in situations where water is not naturally abundant.

RESIDENCE, *rez'-e-dens* (Fr., from Lat. *re*, and *sedeo*, I settle), in Eccles. Law, is the continuance of a person or vicar on his benefice. This is enjoined by the common law of England as well as by many statutory enactments.

The Act 1 & 2 Vict. c. 106, consolidates the previous enactments relating to residence, and declares that (with certain exceptions therein specified) every spiritual person holding any benefice shall keep residence on his benefice, and in the house of residence (if any) belonging thereto; and if any such person shall, without any such license or exemption as is in this act allowed for that purpose, or unless he shall be resident at some other benefice of which he may be possessed, absent himself from such benefice for any period exceeding the space of three months together, or to be accounted at several times in any one year, he shall, when such absence does not exceed six months, forfeit one-third of the annual value of the benefice; exceeding six, and not exceeding eight months, one-half; exceeding eight months, two-thirds; and extending to the whole year, three-fourths of such annual value.

**Residue**, *res'-e-du*, in Law, is what remains of a testator's estate after payment of the debts and legacies; and the person to whom this is bequeathed is called the residuary legatee.

**Resin**, *rez'-in* (Fr *résine*), in Chem.—When common turpentine is distilled with water, a residue of resin, or rosin, is left, amounting to 70 to 90 per cent. of the turpentine used. There are two kinds of resin in the market,—the brown, which is obtained from the *Pinus Abies*, and the white, or gallipot, which is furnished by the *Pinus maritima*. The former consists almost entirely of pinic and sylvic acids, and the latter of pionaric acid. Resin is used in the manufacture of yellow soap, in which it is present in the form of pinate and sylvate of potash. It is considered by many to be an adulteration; but it seems to increase the lathering quality of the soap.

**Resins**, an important class of vegetable substances, extensively used in manufactures, obtained from various trees by making incisions in their bark, from which they exude in the form of a mixed liquid, consisting of the essential oil of the plant holding the resin in solution. They are mostly formed by the exudation of the essential oils contained in the trees. They are mostly insoluble in water, but dissolve readily in alcohol, forming varnishes. They mostly consist of one or more acid resins, which form, with potash and the other alkalies, solutions similar to soaps. Physically they are transparent, or translucent, brittle solids. They are insulators of electricity, and become electrical by friction. They fuse at a moderate temperature, are very inflammable, but burn with a dense smoky flame. Heated in close vessels, they undergo decomposition, and furnish various forms of hydrocarbon. The resins most extensively employed in the formation of varnishes are copal, mastic, sandarac, lac, elemi, anime, and some few others. The principal solvents employed are oil of turpentine, wood naphtha, methylated spirits, and spirits of wine. When varnish is spread over any surface, the spirit evaporates, leaving the resin behind as a hard transparent layer.

**Respiration**, *res'-pe-rai'-shun* (Lat. *re*, and *spiro*, I breathe), in Phys., is the alternate inspiration and expiration of atmospheric air. The blood which circulates through the system requires for its purification and the restoration of its vital qualities, to be brought into contact with the atmospheric air; and this is effected in the lungs. The air brought into contact with the blood is decomposed, its oxygen uniting with the blood, while its nitrogen is returned by expiration unchanged, with an additional quantity of carbonic acid gas. The mechanical part of the function of respiration is effected by the action of the ribs and diaphragm. About twenty respirations take place in a minute, and from thirty to forty cubic inches of air are inhaled at each inspiration. (*See* Lungs.)

**Response**, *re-spons'* (Lat. *respondeo*, I answer), in the Church service, is an answer made by the people speaking alternately with the minister. Responses are said to be of four kinds: (1) those which consist of "Amen" after the prayers; (2) those which follow the versicles or suffrages; (3) those which are repetitions of what the minister has said, as in the Confession, some parts of the Litany, &c.; and (4) the short prayers or anthems interposed between each commandment in the Communion service.

**Rhizacæ**, *rez-is-ai'-se-e* (Lat. *rastix*, cord), in Bot., the *Rastic* fam., a nat. ord. of *Monocotyledones*, sub-class *Petaloideæ*. Herbs or undershrubs. Leaves absent or narrow. Stems either naked, or more commonly with slit equitant leaf-sheaths. Flowers with glumaceous bracts, spiked or aggregated, generally unisexual. No true perianth, its place being usually supplied by glumes. Stamens 2—3, adherent to 4—6 glumes, or the latter sometimes absent; anthers generally 1-celled; ovary 1—3-celled, with 1 pendulous ovule in each cell. Fruit capsular or nut-like. Seeds albuminous, without hairs; embryo lenticular and terminal. The plants of this order are principally natives of South America, South Africa, and Australia. There are 25 genera and 171 species. Their properties are unimportant. The wiry stems of some species have been used for basket-making, thatching, rope, &c.

**Restitution**, *res-ti-tu'-shun* (Lat *restitutio*), in Law, in general, is the restoring anything unjustly taken from another; also the putting him in possession of lands or tenements, who had been unlawfully disseised of them. A writ of restitution lies where a judgment has been reversed, in order that the plaintiff may be restored to all he has lost by the judgment. By 7 & 8 Geo. IV. c. 29, it is provided that if any person guilty of a felony or misdemeanour under that act, in stealing, converting, or receiving any property, shall be indicted for such offence by the owner or his executor, and convicted, the property shall be restored to the owner, and the court before whom the person shall be convicted shall have power to award a writ of restitution for the property, or order it to be restored in a summary manner. Provided, however, that if it shall appear that any valuable security shall have been *bond fide* paid or discharged by some person liable to pay it, or, being a negotiable instrument, shall have been *bond fide* taken or received by transfer or delivery by some person for a valuable consideration, without any reasonable ground to suspect that it had been stolen, &c., then the court shall not order the restitution of such security.

**Restoration**, The, *res-to-rai'-shun* (Fr. *restauration*).—In an historical sense, this term refers to the accession of King Charles II., in 1660, after the civil wars, to the throne of England, after an interregnum of eleven years and four months, from 30th January, 1649, when Charles I. was beheaded, to 29th May, 1660. The latter day has been appointed, in the Liturgy of the Church of England, as an anniversary festival in commemoration of the restoration of the monarchical form of government in these realms.

**Rests**, *rests*, characters of silence, each of which denotes a cessation of the sound, equal in duration to the note which it immediately succeeds and after which it is named: thus a semibreve *rest* is equal in length to a semibreve, a minim *rest* to a minim, a crotchet *rest* to a crotchet; and so on through all the different characters of notation.

**Resurrection**, *res-u-rek'-shun* (Lat. *resurgo*, I rise again), denotes the rising again from the dead, and is sometimes applied specially to the resurrection of Christ, sometimes to the resurrection of mankind at the last day. The resurrection of Christ is detailed with much fulness by the Evangelists, and is frequently referred to in the other books of the New Testament. In fact, it is presented as a chief argument for the truth of Christianity; for, says the apostle, "if Christ be not risen, then is our preaching vain, and your faith is also vain;" and, adds, "He that raised up Christ from the dead shall also quicken our mortal bodies by his spirit."

**Resuscitation**. (*See* Drowning.)

**Retainer**, *re-tain'-er*, in former times, was applied to a class of servants or dependents, who wore their master's livery, but were only employed in his service on particular occasions, being, however, retained by him, and liable to be called upon to serve him at any time. In legal phraseology, a retainer, or retaining fee, is a fee given to a counsel to secure his services in a cause, in order to prevent the opposite side from engaging him. It is special when given for the purpose of securing the counsel's services for a particular case; general, when for securing his services generally.

**Rete mucosum**. (*See* Skin.)

**Retina**. (*See* Eye.)

**Retort**, *re-tort'* (Lat. *retorqueo*, I bend back, from the curvature of its neck), a chemical vessel in which

distillation is effected by means of heat. Retorts are made of glass, earthenware, or metal, according to the purposes for which they are intended. Glass retorts are employed for the preparation of those substances which do not require any extraordinary degree of cold for their condensation; such as nitric acid. Glass retorts are made of various sizes, capable of holding four or five ounces to several gallons, and both flint and green glass are used in their manufacture. They are usually heated either by spirit-lamp, by gas, or by sand-bath. When higher temperatures are required, earthen retorts are used. In making hydrofloric acid, a lead retort is necessary; and in concentrating sulphuric acid, platinum retorts are largely employed. Very large earthenware retorts are used in the manufacture of coal gas.

RETURN, *re-turn'*, in Law, is commonly applied to the recital by the sheriff, or other officer to whom a writ has been directed, requiring him to do something, of the manner in which the order has been executed. This is indorsed on the writ, which is then returned to the court from which it issued on the "return day," or day when it is returnable.

REVEILLÉ, *re-val'-ye(r)* (Fr. *réveiller*, to awake), a term applied in military language to the practice of beating the drum at daybreak to awaken the soldiers and notify to the sentries to cease challenging.

REVELATION, *rev-e-lat'-shun* (from Lat. *revelatus*), is the act of revealing or making a thing known which was before unknown, and is usually applied in theology to the preternatural communications of his mind and will made by the Deity to man, more particularly as contained in the books of the Old and New Testaments. As, in consequence of sin, man has fallen from the upright state in which he was created, he is by nature without a sufficient guide to lead him in the right path; and hence the necessity of a revelation to supply what is wanting in his own nature. This is proved by the fact that we do not find mankind, when left solely to the light of nature, to have made any considerable progress towards a more perfect state. To deny the possibility of a revelation is to limit the providence of God. The evidences of a revelation are external and internal, the former being derived from the external circumstances which attended them, the latter from its contents as being eminently fitted for building up man and raising him to a higher and more perfect state of existence. (*See* BIBLE, CHRISTIANITY, MIRACLES, PROPHECY, &c.)

REVELATION, BOOK OF. (*See* APOCALYPSE.)

REVENUE, *rev'-e-nu*, or *re-ven'-u* (Fr. *revenu*), in Law, is the income or annual profit received from land or other funds, but is more particularly applied to the income of a state derived from the customs, excise, taxes, &c., and devoted to the payment of the national expenses. The public revenue of this country was anciently derived mainly from the rents of the crown property; but as the national expenditure increased, recourse was had to a system of taxation, which has by degrees superseded the earlier mode. The public revenue of England at different times was as follows:—Under William I., £400,000; Henry VIII., £800,000; Charles II., £1,800,000; George I., 6,700,000; George IV., £58,000,000; William IV., £56,000,000; Victoria (1855), £63,000,000, (1862) £69,000,000. The following is a list of the sums yielded by the several branches of the revenue for the year ending 30th September, 1862 — Customs, £23,863,000; Excise, £17,130,000; Stamps, £8,824,945; Taxes, £3,160,000; Property tax, £10,532,000; Post-office, £3,560,000; Crown lands, £296,521; Miscellaneous, £2,919,074.

REVENUE ACCOUNT.—Whenever traffic commences on a railway, there begins a new account, called a *revenue account*, which is kept in the same or a different bank, and has no connection with the capital account. From the revenue account are drawn all payments for wages, rates and taxes, coke, oil, and other petty furnishings; also repairs of carriages and locomotives, maintenance of way, and general management. That which remains is the fund from which are paid, first the interest on debentures, and second the dividend to shareholders. All other outlays are drawn from the capital account.

REVEREND, *rev'-e-rend* (Lat. *reverendus*, to be revered), is a title of respect given to the clergy. In Roman Catholic countries, the religious are styled reverend fathers, and the abbesses and prioresses reverend mothers. In England, deans are styled very reverend, bishops right reverend, and archbishops most reverend. In Scotland, the principals of the universities, when ecclesiastics, and the moderator of the General Assembly, are styled very reverend. At the time of the Reformation, and more particularly during the great rebellion, there were many of the more zealous Protestants and dissenters that objected to the title, as implying too much; but now there are few that refuse it.

REVERSION, *re-ver'-shun* (Lat. *re*, and *verto*, I turn), in its widest acceptation, is applied to a right of property, the enjoyment of which is to commence at some future time, either fixed or depending upon some contingency. In Law, it is the residue of an estate in lands, tenements, or hereditaments left in the grantor to commence in possession after the determination of some particular estate granted out by him. Thus, if a man seised in fee-simple conveys lands to A. for life, or in tail, he retains the reversion in fee-simple. A reversion is never created by deed or writing, but arises from construction of law; but when actually vested, it is transferable like an estate in possession.

REVETMENT, *re-vet'-ment* (Fr.), in Fort., a strong wall, built round the lower part of a rampart to support and retain the earth, and prevent it rolling into the ditch; it is also applied to the wall retaining the earth which forms the other side of the ditch. The exterior faces of these walls are considered as the scarp and counter-scarp of the ditch.

REVIEW, *re-vu'* (Fr. *revue*), in a literary sense, an essay on any book, showing its value or worthlessness, analyzing its contents and examining its statements; also, a periodical work devoted to such essays. The first review, properly so called, was the "Journal des Savans," commenced at Paris on the 30th May, 1665. The most noted modern French journals of this class are the "Revue Française" and "Des Deux Mondes." The first publication of this kind in England was the "Monthly Review," begun in 1749; but it was about the beginning of the present century that the *Review* became the favourite organ of all sects and parties for disseminating their peculiar views on religion, politics, or literature. The "Edinburgh Review," commenced in 1802, and the "Quarterly Review," commenced in 1809, inaugurated a new era in this department of literature, and are still generally considered at the head of their class. For the most part, the leading reviews appear quarterly; but within recent times the tendency seems to have increased of having monthly, and even weekly reviews; good specimens of the latter class being the "Saturday Review" and the "London Review." In Germany, the oldest and still highly-prized review, is the "Göttinger Gelehrte Anzeige."

REVIVAL, *re-vi'-val* (Lat. *re*, and *vivo*, I live), in Religion, is applied to the spiritual awakenings that have from time to time manifested themselves in the Christian church. In England, Ireland, Scotland, and the United States of America, various revivals have taken place. The last of them commenced in America in 1858, immediately after the great commercial panic. Meetings for prayer were held often during business hours in churches, stores, theatres, and places of public resort, and were attended by persons in every condition of society. In the following year it extended to the north of Ireland, attended with frequent meetings for devotional exercises. In various parts of Scotland, England, and Wales, the same movement was carried on. It is a frequent characteristic of such revivals, that persons are "struck down" into convulsions or an ecstatic state. Whatever opinions may be formed of the permanent benefits that result from revivals,—and this is a subject on which much difference of opinion exists, few can doubt as to the pernicious effects that result from these physical manifestations, producing permanent nervous weakness, and even in many cases insanity. John Wesley, in his "Journal," has some very pertinent remarks on this subject. On one occasion, a man came to him and fell into a fit; but instead of singing over him, he left him to recover at his leisure, which he soon did; and on another occasion a girl fell into convulsions, when

he ordered her to be carried out; on which she immediately found her legs and walked off. Once, he said, "before I began to preach, I gave public notice that whosoever cried so as to drown my voice, without any man's hurting or judging them, should be gently carried to the farthest corner of the room; but my porters had no employment the whole night." These physical manifestations are, no doubt, in their first beginnings at least voluntary, and may be put down by reason, and by not being encouraged.

REVOLUTION, *rev-o-lu'-shun* (Fr., from Lat. *revolutus*).—A revolution, in politics, is a material or entire change in the constitution or government of a country, accomplished in a short time, whether by legal or illegal means. The Assyrian empire was destroyed, and that of the Medes and Persians founded, by Cyrus the Great, 558 B.C. The Macedonian empire was founded on the destruction of the Persian, on the defeat of Darius Codomanus, by Alexander the Great, 331 B.C.; and the Roman empire was established by Julius Cæsar, 47 B.C. The dates of the revolutions which have occurred in more modern times are as follows:—In Portugal, 1640; in England, 1649 and 1688; in Poland, 1704, 1795, and 1830; in Russia, 1730 and 1762; in Sweden, 1772 and 1809; in North America, 1775; in France, 1789, 1830, and 1848; in Holland, 1795 and 1813; in Venice, 1797; in Rome, 1798; in the Netherlands, 1830; in Brazil, 1831; in Hungary, 1848; in Italy, 1859-60; in the United States, 1860-1. The deposition of monarchy and execution of Charles I., and the establishment of a commonwealth, with Cromwell as dictator, formed the greatest revolution which has occurred in England, though it is never spoken of under that term; the change of dynasty in 1688, with the guarantee of a constitution, being referred to as *the Revolution*, and having been, no doubt, the commencement of a new system of government. The revolution of 1688 has been termed glorious, and with good reason. It terminated the struggle, which had continued from the reign of John, between the crown and people of England. The Stuarts, with inferior abilities, had striven to retain the almost despotic power acquired by the Tudors, and the result was a civil war, the shedding of royal blood on the scaffold, and a military despotism. Untaught by experience, the restored Stuarts laboured to free their authority from all constitutional check, and the result was that the nation rose and drove them from the throne. One of the most singular characteristics and merits of this revolution is, that it was effected with little or no violence. It cost no blood, it violated no right, it was hardly to be traced in the course of justice; and the formal and exterior character of the monarchy remained nearly the same, whilst its spirit was completely regenerated. And yet this revolution, of all revolutions the least violent, has been of all revolutions the most beneficent, finally deciding whether the popular element, which had, ever since the age of Fitzwalter and De Monfort, been found in the English polity, should be destroyed by the monarchical element, or should be suffered to develop itself freely and to become dominant. It cut up by the roots all that theory of indefeasible right, of paramount prerogative, which had put the crown in continual opposition to the people; and from 1688, the assertion of passive obedience to the crown grew obnoxious to the crown itself. The highest eulogy which can be passed on *the Revolution* of 1688 is that it was our last revolution, and that since it the means of effecting every improvement which the constitution requires may be found within the constitution itself.

REVOLVER. (*See* RIFLE and PISTOL.)

RHABDOMANCY, *rāb'-do-mān-se* (Gr. *rhabdos*, a rod, and *manteia*, prophecy), is properly divination by a rod or wand, and is generally applied to the power supposed to be possessed by some persons, of discovering things hid in the bowels of the earth, especially metals, ores, and bodies of waters, or the art of discovering these substances by means of a divining-rod (which see).

RHAMNACEÆ, *rām-nā'-se-e* (from *Rhamnus*), in Bot., the Buckthorn fam., a nat. ord. of *Dicotyledones*, subclass *Calycifloræ*. Small trees or shrubs, with simple leaves, and small, regular, usually perfect flowers; rarely unisexual. Calyx 4—5-cleft, valvate. Petals and stamens distinct, perigynous, and equal in number to the divisions of the calyx; occasionally the petals are wanting; the stamens alternate with the divisions of the calyx, and opposite the petals when these are present. Ovary more or less superior, surrounded by a fleshy disk. Fruit dehiscent or indehiscent, 2-, 3-, or 4-celled, with one erect seed in each cell. Seeds usually albuminous, without an aril. The *Rhamnaceæ* are distributed over the globe, except in the very coldest regions. There are 42 genera and 250 species. Some are acrid and purgative; others bitter, febrifugal, and tonic. A few are used in the preparation of dyestuffs, and a few have edible fruits. (*See* RHAMNUS.)

RHAMNUS, *rām'-nus* (Gr. *rhadamnos*, a young branch or sprout, because divided into many branches), in Bot., the typical gen. of the nat. ord. *Rhamnaceæ*. It includes many interesting and useful species. *R. catharticus*, the buckthorn, produces a fruit which has been for ages employed medicinally as a cathartic; at the present time it is seldom used, on account of its violent and unpleasant operation. The colour called *sap-green* is prepared by evaporating the juice of buckthorn-berries, previously mixed with lime. The bark of *R. Frangula*, the black alder, possesses purgative and alterative properties, and is reputed to be efficacious in various cutaneous affections, rheumatism, secondary syphilis, &c. A greenish or yellowish dye is made from the leaves. The unripe fruit of *R. infectorius* is known in commerce as *French berries*, or *grains d'Avignon*; while those of *R. amygdalinus* constitute *yellow* or *Persian berries*. Both kinds are used to produce a beautiful yellow dye, chiefly applied to morocco leather. The Chinese green dye (*Lo-vao*), now much used in Europe, is prepared from *R. chlorophorus* and *utilis*. A blue dye is prepared from *R. alaternus*. In Abyssinia, the leaves of *R. pauciflorus* and the fruit of *R. Staddo*, both of which possess bitter properties, are used in place of hops in the preparation of beer.

RHAPSODIST, *rap'-so-dist* (Gr. *rhapsodos*, from *rhapto*, I string together, and *ode*, a song), is strictly one who strings songs together, and is usually applied to a class of persons in ancient Greece, who earned their living by reciting the poems of Homer. It is believed that to these persons we are chiefly indebted for preserving the Homeric poems. In the present day, a rhapsodist is one who composes rhapsodies or collections of poetical effusions, descriptions, &c., strung together without any natural connection or necessary dependence.

RHATANY. (*See* KRAMERIACEÆ.)

RHEA FIBER. (*See* URTICA.)

RHETORIC. (*See* ORATORY.)

RHEUM, *re'-um* (said to be derived from *Rha* (now Wolga), from whose banks it was first brought), in Bot., Rhubarb, a gen. of the nat. ord. *Polygonaceæ*. The species of this genus are all more or less remarkable for their purgative and astringent properties; and their roots, which contain the largest proportion of the active principles, are largely used as medicinal agents. The exact source of our officinal rhubarb has not been definitely ascertained. Dr. Royle states that the rhubarb country, whence Turkey or Russian rhubarb is derived, is in the heart of Thibet, within 95° of E. long. and 35° of N. lat.; and as no naturalist has visited this part, and as neither seeds nor plants have been obtained thence, it is as yet unknown what species yields the rhubarb. It is known that the greater part of the rhubarb of commerce is grown in this district, and is obtained in summer from plants six years of age. When dug up, it is cleaned, pealed, cut into pieces; these are bored through the centre, strung on a string, and dried in the sun. In the



RHUBARB.

autumn, the rhubarb is conveyed to Ninin, where the Bucharian traders reside, and thence to the Russian frontier town of Kiachta, and to Pekin, Canton, and Macao. This is, unquestionably, the best kind of rhubarb. Chinese, or East Indian rhubarb, is the produce of an unknown species of *rheum*, cultivated in the Chinese empire. Himalayan rhubarb is obtained from several species, particularly *R. Moorcroftianum*, *Webbianum*, and *Emodi*. English rhubarb is the root of *R. Rhaponticum*; it is now extensively employed in the hospitals of this country and in America, but it is not so active as the officinal rhubarb. The so-called "genuine Turkey rhubarb," sold in the streets by turbaned hawkers, is almost invariably English rhubarb. The leaf-stalks of *R. Rhaponticum* and other species are largely employed as a substitute for fruit in pies and puddings. Their pleasant acidity is due to the presence of oxalic and malic acids. The leaf-stalks of *R. Ribes* are used in the East in the preparation of sherbet. Crystals of oxalate of lime occur abundantly in the roots of the species of this genus. (*See* RAPHIDES.)

RHEUMATISM, *ru'-mă-tizm* (Gr. *rheumatismos*, a defluxion), in Med., is one of the most common and painful diseases of this country. It is characterized by an inflamed state of the fibrous tissue,—and wherever fibrous tissues are found there may be rheumatism; but it principally affects the larger joints and places covered by muscles, as the wrists, elbows, knees, hip-joint, back, and loins. When the joints about the back and loins are affected, it is called lumbago: when the pain is in the hip-joint, sciatica; and when the muscles of the chest are affected, pleurodyne. Rheumatism may occur either with fever or without it, being in the former case termed acute, in the latter chronic. Acute rheumatism, or rheumatic fever, may happen at any time, but occurs more particularly in autumn, and affects chiefly such as are in the prime of life. It is generally occasioned by exposing the body to cold air immediately after having been heated, and commences with chilliness and shivering, which are soon followed by heat, restlessness, and other feverish symptoms. An acute pain is soon after felt in one or other of the limbs. This quickly increases, and in a short time is accompanied with swelling and great tenderness of one or more of the large joints, with much constitutional disturbance. The patient's sufferings are now of the most agonizing character. He is restless, and yet dare not or cannot move; even the weight of the bed-clothes can scarcely be borne. The pulse is full and bounding, the skin is generally bathed in perspiration of a disagreeable sour odour, the bowels are constipated, the urine scanty and high-coloured, loaded with uric acid or urates. This disease varies considerably in intensity and duration, and may terminate in a few days or endure for several months. Its average duration, however, when uncomplicated with other diseases, is from ten to eighteen days. One remarkable feature of it is its tendency to move from one part to another, often suddenly leaving one joint and making its appearance in another, and again going back to its original seat. It is seldom, if ever, a fatal disease, except when it attacks some vital organ, as the heart, which in severe cases it is very apt to do. It is a constitutional disease, arising from a poison circulating in the blood. This poison constitutes that predisposition to the disease without which it would not occur, and the cold probably exercises its injurious influence by checking the elimination through the skin, and other emunctories, of the poisonous principle as it forms, and by thus accumulating it in the blood. Medical men are by no means agreed as to the treatment best adapted for this complaint. In general, however, when the patient is young and robust, and when the inflammatory fever is high, bleeding from the arm is recommended. Wherever the pain is very acute, opium will be found to be a very useful and necessary remedy. The free administration of active purgatives, particularly at the outset of the disease, is found to be very beneficial. Alkaline drugs are by many strongly recommended in this disease, as being chemical antagonists of the poison. "Alkalies, or the alkaline salts," says Dr. Watson, "are always, in my opinion, fit remedies to be employed in the treatment of acute rheumatism. They may be added largely to the common effervescing saline draught, or they may be simply dissolved in water. Together with them, blood-letting, calomel, purgatives, opium, and colchicum, may be variously combined, according to the special circumstances of the case." The favourite remedy of the late Dr. Golding Bird in this and in some other blood diseases, was the acetate of potass, in quantities of half an ounce, administered largely diluted, in divided doses in twenty-four hours; and "I do not hesitate to declare," he says, "that I have never seen the disease in question yield with so much facility to any other remedy." The chronic form of rheumatism is sometimes the sequel of the acute, but it is more commonly a separate constitutional affection, coming on independently of any previous acute attack. There is commonly little constitutional disturbance, but the sufferer is constantly annoyed, and his existence made miserable, with chronic pains, which destroy his comfort by day and render him restless by night. In some instances, the pains are worst at night, being aggravated by the warmth of the bed; in others, warmth affords the greatest relief. The cure of this complaint is tedious, and often very difficult. It frequently involves and cripples some of the smaller joints, especially those of the knuckles and fingers, rendering them nobby, and distorting their form and position. It is of the utmost importance in such cases that the patient be protected from the vicissitudes of the weather by warm clothing; and those who can afford it do well by taking up their residence in a warm climate. Warm bathing, vapour, and hot-air baths, with frequent friction and the use of the flesh-brush, are of great service, and stimulating internal medicines, as turpentine, are often of use. Cod-liver oil is also sometimes recommended, with bark, wine, iron, and other tonics, for invigorating the system. Persons subject to chronic rheumatism should also be very careful in their diet, as there is little doubt that many of the paroxysms of this disease are brought on by a disordered state of the digestive organs.

RHINOCEROS, *ri-nor'-e-ros* (Gr. *rinokeros*), the name of a genus of pachydermatous quadrupeds, having each foot divided into three toes, and furnished with one or more horns on the snout. They were well known to the ancients, and are frequently alluded to by the writers of past ages. The first rhinoceros, however, seen by modern Europeans, appears to have been a one-horned rhinoceros sent from India to Emmanuel, king of Portugal, in 1513. No two-horned rhinoceros seems to have been brought alive to Europe in modern times. The bony framework of the animals of this genus approximates to that of the *hyrax*, the tapir, and the horse, among living genera; but, although a general resemblance pervades the entire skeleton of the animals of this genus, there are certain differences, in the skull especially. The rhinoceros, generally speaking, is a clumsy and deformed-looking animal; the upper lip is very large, and overhangs the lower, and being furnished with strong muscles, is employed by the animal somewhat as the elephant uses his trunk. The ears are large, erect, and pointed. The skin is naked, rough, and extremely thick,—about the neck it is gathered into large folds; a fold also extends between the shoulders and fore legs, and another from the hinder part of the back to the thigh. The tail is slender, flat at the end, furnished at the sides with very stiff black hairs. The legs are very short. The rhinoceros lives in shady forests adjoining rivers, or in swampy jungles. Though possessed of great strength, and more than a match for either the tiger or the elephant, it is quiet and inoffensive unless provoked. Its chief food is canes and shrubs, roots and small branches of trees. Its senses of smelling and hearing are very acute, but its sight is by no means vivid. The female produces one at a birth. The growth of the young is very gradual, and at the age of two years it scarcely attains half its height. There are several species of rhinoceros; of which we may particularize the Indian rhinoceros (*R. indicus*), which has only one horn, and is a native of India, and particularly of that part which lies beyond the Ganges; and the African or two-horned rhinoceros (*R. africanus*), which is a native of Africa, and resembles the preceding in many particulars, but

*differs* in being provided with an additional horn, of a smaller size, situated nearer the forehead; in the fact that the horizontal contour of the bones of its nose is rounded, whilst in the one-horned species it is pointed; and that its skin is not thrown into the folds, so remarkable in the latter. The two-horned rhinoceros was the one best known to the ancients, and is frequently represented on their coins, especially those of Domitian. Strabo, however, gives a clear description of one that was one-horned. When full-grown, the Indian rhinoceros is about eight or nine feet in length, whilst the African rhinoceros is found as long as twelve feet or more. The rhinoceros of Java (*R. sondiacus*) is another species, with only one horn, and is even smaller than the Indian species, its length from the membrane of the tail to the tip of the nose being about eight feet, and its height not more than four. Its horn always appears to be much used by the animal in some operation or other, for it is ground or rubbed down, and is sometimes reduced to little more than an inch in length. The skin of this species is very much plaited behind the shoulders, under the neck, and on the outsides of the legs, and is roughened by prominent tubercles, for the most part in the shape of regular pentagons, well defined. The Indian and Java rhinoceros are the only one-horned species which are now to be found in the living state; and as the greater part, if not the whole, of those which are found fossil in the colder latitudes, appear to have had two horns, the one-horned species would seem to have been, in all ages of the world, confined to the localities in which they are now found. It is worthy of notice that the skin of the two-horned ones is more free from plaits and tubercles, and more plentifully covered with hair, than are those which inhabit the most equatorial climates. Another species, the Sumatran rhinoceros (*R. sumatrensis*), is a smaller species than the two-horned rhinoceros of Africa, but, like that, is more an animal of the interior of the country than the Indian species, or that of Java. In the specimens that have been seen by Europeans, it is only five or six feet in length, and between three and four in its greatest height. Its skin is without the decided folds which mark the single-horned ones, and also the wrinkles which more or less pucker the skin of the African species, and is altogether softer and thinner than that of the others. Though there are considerable differences of size among the living species of the genus, they are all large animals, and powerful in proportion to their size; and, as existing, are all natives of the eastern continent, and the most tropical parts of it. As now existing, the rhinoceros may be considered as the most aquatic of all the *pachydermata*, excepting the hippopotamus, and the ones which, next to it, feed upon the rankest and coarsest vegetation. They have a little tendency to be gregarious, but never assemble in such herds as the elephants. Their aspect cannot be said to be absolutely ferocious; but the pointed form and motion of the upper lip, which projects considerably beyond the lower lip, gives them a snarling appearance.

**Rhizobolaceæ**, *ri-zo-lo-lai'-se-e* (Gr. *rhiza*, a root), in Bot., the Souri-nut fam., a nat. ord. of *Dicotyledones*, sub-class *Thalamifloræ*. Large trees, natives of the forests of the hottest parts of South America. Leaves opposite, digitate, exstipulate, with articulated stalks. Flowers regular, hypogynous. Petals equal-sided, and inserted with numerous stamens into a hypogynous disk. Styles very short. Seeds solitary, exalbuminous, with a very large radicle, and two small cotyledons. There are but two genera, including eight species. Some are valuable for their timber; others yield an excellent oil; and some edible nuts. (*See* Canyocar.)

**Rhizogens**, or **Rhizanthem**, *ri'-zo-jens*, *riz-an'-the-e* (Gr. *rhiza*, a root: *gennao*, I produce; *anthos*, a flower), in Bot.—These names have been given by some botanists to a group of nat. orders (*Balanophoraceæ*, *Cytinaceæ*, and *Rafflesiaceæ*) supposed to constitute a distinct class between the *Cryptogamia* and *Phanerogamia*. The special characteristics of the rhizogens are said to be the acotyledonous embryo, the fungoid texture, and the peculiar parasitic habit of such plants. Professor Bentley, whose scheme of classification has been adopted in this Dictionary, thinks that as one or more of such characters occur in several orders of *Dicotyledones*, there are no sufficiently valid reasons for separating the rhizogens from that class.

**Rhizome**, or **Root-stock**, *ri'-zome* (Gr. *rhizoo*, I support by roots), in Bot., a thick fleshy stem, lying on the surface of the earth or partly beneath it, giving forth roots from its lower side, and shooting forth leaves every spring. It is commonly mistaken for a root. It is conspicuous in the plant called the iris and in Solomon's seal.



ROOTSTOCK OF IRIS.

**Rhizophora**, *ri-zof'-o-rā* (Gr. *rhiza*, a root; *phero*, I bear or carry), in Bot., the typical gen. of the nat. ord. *Rhizophoraceæ*. The species *R. mangle* is the mangrove-tree of tropical sea-shores. It is remarkable for the aërial roots thrown off from the stem, which, fixing themselves into the mud, act as props to keep the tree in an erect position. It frequently happens that these aërial roots form the entire support of the stem, in consequence of this decaying at its lower part. The bark of the mangrove-tree is sometimes imported into this country as a tanning material. The fruit is sweet and edible, and its juice, when fermented, forms a kind of wine.

**Rhizophoraceæ**, *ri-zof-o-rai'-se-e* (from Rhizophora), in Bot., the Mangrove fam., a nat. ord. of *Dicotyledones*, sub-class *Calycifloræ*. Trees or shrubs with simple opposite leaves (dotless, or rarely dotted), having deciduous interpetiolar stipules. Calyx superior, 4—12-lobed, with a valvate æstivation, the lobes sometimes united so as to form a calyptra; petals arising from the calyx alternate with the lobes, and equal to them in number; stamens on the calyx twice or thrice as many as its lobes, or still more numerous; ovary inferior, 2-, 3-, or 4-celled, each cell with two or more pendulous ovules. Fruit indehiscent, 1-celled, 1-seeded, crowned by the calyx. Seed pendulous, exalbuminous, usually germinating while the fruit is still attached to the tree. The plants of this order are natives of the muddy sea-shores in the tropics, and are generally remarkable for their astringent properties. There are five genera and 20 species. (*See* Rhizophora.)

**Rhizopoda**, *riz-op'-o-dā* (Gr. *rhiza*, root; *pous*, foot), in Nat. Hist., a name given by M. Dujardin to a new class of animals of lower degree than the *Radiata*, possessing a power of locomotion by means of minute tentacular filaments. The rhizopoda comprise the animals which constructed the *miliola* shells found in such large quantities in the strata of many quarries near Paris. The class also includes some other microscopic foraminiferous shells.

**Rhodium**, *ro'-de-um* (Gr. *rhodon*, a rose, on account of the red colour of some of its salts),—symbol Ro or Rh, equiv. 52·16, spec. grav. 11·2. Rhodium is one of the rare metals found in platinum ores. It is very hard, white, and brittle, and, with the exception of iridium, one of the most infusible of metals. When pure, it is insoluble in acids, but when alloyed with platinum, bismuth, or copper, it is dissolved with them in aqua regia. Heated in contact with chloride of sodium in a current of chlorine, the double chloride of rhodium and sodium is formed. The only use to which rhodium has been applied is to form the nibs of metallic pens, for which it is extremely well fitted, from its hardness and unalterability. It forms two definite oxides,—RoO and $Ro_2O_3$. The latter only forms salts. Rhodium forms two sulphides,—RoS and $Ro_2S$, and three chlorides, —RoCl, $Ro_2Cl_3$, and $Ro_2Cl_6$. The sesquichloride forms double salts with the soluble chlorides, which crystallize in octahedra or cubes of a delicate rosy hue; hence the name of the metal.

**Rhododendron**, *ro-do-den'-dron* (Gr. *rhododendron*, from *rhodon*, a rose; *dendron*, a tree), in Bot., a gen. of shrubs belonging to the nat. ord. *Ericaceæ*. Many species are largely cultivated in this country on ac-

count of the beauty of their flowers. The narcotic properties which characterize the whole genus are particularly evident in the flowers of *R. arboreum*, which are eaten by the hill people of India, and in all parts of *R. chrysanthum*, a Siberian plant. The powdered leaves of *R. panulatum* are used as snuff in some parts of India. The brown pulverulent substance found on the petioles of some rhododendrons and kalmias is also used in the American States as snuff. (*See* ERICACEÆ.)

RHODOMENIA, *ro-do-me'-ne-a* (Gr. *rhodos*, red; *humen*, a membrane), in Bot., a gen. of *Algæ*, or sea-weeds. *R. palmata* is an article of food in Scotland, Ireland, and Iceland. It is the *dulse* of the Scotch, and the *dillesk* of the Irish. It is very nutritious and wholesome.

RHODORIZA, *ro-do-ri'-zŭ*, in Bot., a gen. of the nat. ord *Corcolrulaceæ*. The volatile oil called *oil of rhodium* is obtained from species of this genus. The powdered wood is used for fumigation and as snuff.

RHOMBOID, RHOMBUS, *rom-boid'*, *rom'-bus* (Lat).—In Geom. these terms have been used by various writers with different significations. The former term was generally applied to a parallelogram, and the latter to an equilateral parallelogram. At the present day, when either of the terms is used, it signifies an equilateral oblique parallelogram.

RHUBARB. (*See* RHEUM.)

RHUS, *rus* (Gr. *rhous*, the Attic contracted form of *rhoos*, a stream, from the wide-spreading of its roots), in Bot., the Sumach, a gen. of the nat. ord. *Anacardiaceæ*. The species are generally characterized by poisonous properties and a milky juice, which becomes black on exposure to the air. *R. Toxicodendron* is the poison-oak of North America. Its leaves contain a peculiar acrid principle, and are thought to be useful in the treatment of old paralytic cases and chronic rheumatism. This plant is, by some botanists, considered as merely a variety of *R. radicans*, which has similar properties. *R. venenata*, the poison-ash, or poison-elder, like the two former species, is extremely poisonous. When in a fresh condition, all parts of the above plants require to be very carefully handled, as their juices frequently excite violent erysipelatous inflammation. The bark of *R. Coraria* is a powerful astringent, and is used for tanning; its fruit is acidulous, and is eaten by the Turks. The dried and powdered leaves of the *R. Cotinus* constitute the well-known tanning and dyeing agent called *shumac*, or *sumach*, which has been in use for ages. The wood of the same species is also known in commerce as *young fustic*, or *Zante fustic*. It is used in dyeing to produce a rich yellow. *R. Metopium*, a native of Jamaica, furnishes the *hog-gum* of that island, which is said to be astringent, diuretic, and purgative, when used as an internal medicine, and to act as a vulnerary when applied externally to wounds and bruises. The substance called *Japanese wax*, now largely used as a candle material, is obtained from the fruits of *R. succedaneum* and other species.

RHYME, *rime* (Sax. *rim*, Germ. *Reim*), in Poetry, the consonance of sounds in the last syllable or syllables of verses. In the former case it is called *male* rhyme, in the latter *female*. Rhyme is a comparatively modern invention, and the product of a Gothic age. According to some good authorities, rhyme finds its proper place in the middle, but not in the higher regions of poetry. (*See* PROSODY.)

RHYTHM, *rithm* (Gr. *ruthmos*, measure), in Prosody, is the metrical arrangement of speech, denoting the measure of the feet, or the number and combination of long and short syllables, called also *metre* and *quantity*. But the most common application of this term is to express the *time* or duration of many sounds heard in succession, whether these sounds are musical, and such as are produced by voices and instruments, or without a determinate tone, as in the strokes of a hammer upon an anvil, and in the articulations of the voice in common speech in repeating poetry or pronouncing an oration.

RIBBON OR RIBAND MANUFACTURE, *rib'-bon* (Irish *ruibin*, Fr. *ruban*).—Ribbon or riband signifies at the present day a long narrow web of silk, worn for use or ornament; but formerly narrow strips of linen, worsted, and gold or silver thread, were included in the term. The manufacture of ribbons commenced at an early date, having formed a branch of the silk manufacture during its progress from Greece to Sicily, and from thence to Italy and Spain; but the ribbon-trade seems to have first assumed distinct importance in France; Paris, Tours, Lyons, and Avignon being its chief seats. The head-quarters of the English ribbon trade are Coventry, where the weaving is done on several systems, the differences between which chiefly consist in the state in which the weaver receives the silk from the manufacturer. These systems are known as the *undertaking system*, the *journey-work system*, the *hand-factory system*, and the *steam-factory system*. The profitable application of steam to silk-weaving was long considered impossible, so large a portion of time being consumed in the trimming and handling of the silk, in proportion to the time that the loom is in motion, and a consequent waste of power. Ultimately, however, steam power was applied to the manufacture of ribbons; the gain consisting not in a more rapid motion of the shuttle, the delicacy of the material not allowing of this; but in the shooting down being seldom interrupted during the picking up, as in hand-loom weaving (*see* SILK MANUFACTURE); in the greater regularity of the fabric, the same number of shoots to the inch being regularly maintained; and also in the addition of more shuttles, for which one workman suffices, the loom being so constructed as to enable him to reach from the front over the batten to the warps behind. Italian organzine silk, either thrown in Italy or England from Italian raw silk (and principally the last), is used for the warp of the best English ribbons; Bengal and China for inferior qualities. China, Bengal, and Broussa singles are used largely for shoot. Much of the silk-throwing and dyeing is done at Coventry. When the silk is dyed *soft*, that is, when the gum is boiled off, it comes from the dyer with a loss of four ounces out of sixteen in weight; when it is dyed *souple*, the gum being partly retained, it loses only one ounce and a half in sixteen. The fineness of the silk is determined by the number of warp-lengths, measuring seventy-two yards, in the ounce; fine warp silk, for instance, runs about eight score threads to the ounce of that length. One ounce in twenty is allowed for waste in the manufacture of silk into ribbons. The work is ordinarily given out in *sets of grosses*, consisting of two warps for each shuttle, each warp containing two pieces of thirty-six yards. The ribbons are cut out in pieces of thirty-six yards, if they are of satin, and in half-pieces of eighteen yards if they are sarsenets or gauzes above the narrower widths. A set of pieces cut out of a loom is called *a length*, and a set of half-pieces a *half-length*. Ribbons are made according to a fixed standard of width, designated by different numbers of pence, which once, no doubt, denoted the price of the article, but at present have reference only to its breadth. The French distinguish their widths by simple numbers. Thus the English ribbons from a quarter of an inch to about four and a half inches wide are called from *penny* width to *forty-penny* width; while the French have figures from No. 1 to No. 60. All dressed ribbons, as satins, gauzes, &c., are made in the loom one-twelfth of an inch wider than sarsenets, in order to allow for the diminution of breadth which results from the lengthwise stretching they receive in the operation of dressing; fine gauzes require an allowance of two-twelfths. *Sarsenet* and *lutestring* ribbons are made by the simple and regular alternation of the warp and shoot, as in plain cloth, called technically *ground*. In *satin* ribbon the glossy appearance is given by the threads of the warp being laid chiefly on the surface, each thread of the warp being crossed by the shoot only once in five times. The transparency of *gauze* ribbons is produced by the kind of silk of which they are made,—the fine, hard-twisted *Marabout*, which leaves the interstices clear. The figures on ribbons are frequently produced in a different colour from the ground by the mixture of colours in the warp, the colours being warped separately. In brocades, the figure is made by small additional shuttles, thrown in partially across the ribbon, as the pattern may require, the connecting threads of shoot being cut off. In *shot* ribbons, the warp and shoot are of different colours. The *pearl-edge*, so frequently seen on ribbons, is formed by the shoot passing over

horse-hairs placed outside the warp parallel with it, and raised in like manner by the lines; as the hairs are drawn out, the silk is left in loops at the edge. To smooth and stiffen *satin* ribbons, they are *calendered* or pressed between heated steel cylinders, and afterwards dressed or passed over a small cylinder covered with flannel, which is moistened with size made from buffalo-hides, and then over a large one of heated steel. Ribbons are *blocked* or wound on cylindrical pieces of wood at the warehouse of the manufacturer. *Galloons* and *doubles* are strong thick ribbons used for bindings, shoe-strings, &c.; *ferrets* are coarse narrow ribbons shot with cotton, used for similar purposes. (*See* WEAVING and SILK MANUFACTURE.)

RIBES, *ri'-beez* (Arabic name, properly belonging to an acid-leaved species of *Rheum*, but which, for about two hundred years, has, by mistake, been applied to the currant and gooseberry tribe), in Bot., a gen. of the nat. ord. *Grossulariaceæ*. Some of the species are remarkable for their agreeable and wholesome acid fruits, and are on this account much cultivated in our gardens. *R. Grossularia* is the source of the numerous varieties of gooseberries, so much used both in the unripe and ripe condition for tarts and puddings, for making wine, and for dessert. *R. rubrum* yields both red and white currants, and *R. nigrum* black currants. These are used for the same purposes as gooseberries, and are particularly adapted for making jams and jellies. An infusion of black currants is much used under the name of *black-currant tea* as a cooling drink in fevers



CURRANTS.

RIBS, *ribz* (SAX.), in Anat., are the long curved bones which form the walls of the chest. They extend in an oblique direction from the vertebræ of the back to the sternum in front. They are usually twelve on each side; but in some rare cases thirteen have been found, in others only eleven. They are distinguished into true and false; the former being the seven upper ribs, which are articulated to the sternum; the latter the five lower ones, which are not immediately attached to that bone. The use of the ribs is to cover and defend the lungs and heart; and their articulations with the vertebræ and sternum admitting of a slight motion, they assist in respiration. (*See* ANATOMY, THORAX.)

RICE. (*See* ORYZA.)

RICE-PAPER. (*See* ARALIA.)

RICHARDSONIA, *ritch'-urd-so'-ne-ă*, in Bot., a gen. of the nat. ord. *Cinchonaceæ*. *R. scabra*, or *brasiliensis*, contains the active principle *emetina* in its root, which is used in some parts as a substitute for the true ipecacuanha, under the names of *undulated*, *white*, and *amylaceous ipecacuanha*.

RICINUS, *rit'-e-nus* (Lat. *ricinus*, a tick, which its seed resembles), in Bot., a gen. of the nat. ord. *Euphorbiaceæ*. *R. communis* is the Palma Christi, or castor-oil plant, a native of India. Castor-oil is obtained from the seeds, either by expression with or without the aid of heat, or by decoction, or sometimes by the aid of alcohol; that employed in England is obtained by expression solely. Castor-seeds, when taken whole, are extremely acrid, and have produced death; but the expressed oil is a mild and most efficient non-irritating laxative. Its valuable properties are principally owing to the presence of an acrid resin. The so-called *concentrated castor-oil*, which is sold in gelatine capsules, is adulterated with croton-oil; and hence may produce serious effects when administered in certain cases. The Palma Christi has been recently cultivated in Algeria for the purpose of feeding silk-worms on the leaves.

RICKETS, or RACHITIS, *rik'-ets* (Gr. *rachitis*), is a disease of the bones, in which they are of unnatural softness, and become bent under the weight of the superincumbent parts of the body. It is confined to the young, and commonly makes its appearance between the first and third year. As soon as the weight of the body is thrown on the limbs, they become bent and twisted in the most extraordinary manner; the joints become enlarged, the chest and pelvis deformed, and the head large and swollen. The bones in this disease are found to be soft and cellular, and deficient in earthy matter. In addition to this, the muscles are always pale and weak, with other signs of general debility; besides which the brain and organs contained in the chest and abdomen are liable to suffer. The nature of this disease requires that its treatment be directed chiefly to strengthening the general constitution by a good and well-regulated diet, pure air, warm clothing, bathing, and such active exercise as may be borne without fatigue.

RICOCHET, *rik'-o-shai'* (Fr. *ricochets*, ducks and drakes), in Mil. language, a term applied to the repeated rebounding of a shot or shell. *Ricochet-firing* is a method of firing with small charges from pieces of ordnance elevated at small angles. It is very destructive in its nature, as the rebound causes the shot or shell to pass along a considerable space, almost on a level with the ground, destroying all that it meets with in its path. The practice of ricochet-firing was first tried by Vauban at the siege of Philipsburg and Mannsheim in 1688. According to his own letters, its success was very great on the first trial; but it was much greater at the siege of Ath, which was conducted by Vauban during the same war. From experiments made at Woolwich in 1821, it would appear that the best elevation of ordnance for ricochet-firing is that in which the axis of the piece is directed at an angle varying from 6° to 9° above a line drawn from the chamber of the gun to the crest of the parapet over which the projectile is to pass. In the rifled ordnance now so much employed, the rotation of the shot causes it to be deflected immensely when it touches the ground, so that hitherto very little good ricochet practice has been made with them. However, the service of artillery is now so precise, that when guns in an enemy's work can be seen, they can be as readily dismounted by direct firing as by the ricochet.

RIDEAU, *re-do'* (Fr. *rideau*, a curtain), in Fort., a rising ground, or elevation of earth, extending itself lengthwise on a plain, serving to shelter a camp from the approach of the enemy, or to give some other advantage to the position.

REFACIMENTO, *re-fath-e-men'-to*, a re-making or re-establishment, a term most commonly applied to the process of recasting literary works, so as to adapt them to a changed state of circumstances; as when a work written in one age or country is modified to suit the circumstances of another.

RIDING. (*See* HORSEMANSHIP.)

RIFLE, *ri'-fl*, a musket with its barrel grooved in a spiral form. At what period rifles were first used in warfare is unknown; but it would appear that a German mechanic about 1567 first hit upon the plan of grooving the bore of pieces used for sporting purposes, in a direction parallel to their axis. In so doing, however, he had no other intention than to facilitate loading; the grooves being merely devised for the purpose of containing the residuum of the combustion of the gunpowder. A large number of guns seem to have been so grooved from that time. An ingenious gunmaker of Nuremberg, called Koster, about the commencement of the 17th century, first proposed making these grooves describe a circle, or indeed more than a circle, between the breech and the muzzle. The ball was also cast larger than the bore, so that it might forcibly receive indentations caused by the grooves in the act of loading. It was not long before those who used weapons of this description found that their bullets attained far greater accuracy than when fired from a smooth bore. Nearly a century, however, elapsed before the true reason for this was discovered by Robins, who showed that the spinning of a rifle-ball, like the rotation of an arrow, kept the axis of either in the same direction throughout their flight. After the system of spiral grooving had been adopted, nearly three hundred years elapsed before any important change was made in the construction of the rifle. Moreover, as a weapon, it was held in very low estimation by every European government; one of the

principal objections to its use being the difficulty experienced in loading it. The French, indeed, for some time abandoned its use altogether; until, during the war in Algeria, they found that their own weapons were inferior to the long Arab muskets. A number of experiments were immediately commenced by the French, the object of which was to improve the rifle. The first important results were gained by M. Delvigne, an infantry officer in the French service. To him is due the merit of having devised a method of loading a rifle almost as quickly as an ordinary smooth bore. In 1838, the duke of Orleans, before going to Africa, organized a battalion of the *Tirailleurs de Vincennes* (then called *Chasseurs d'Afrique*) to take with him. The weapon which they carried was of a very superior kind, as the following circumstance will show. On arriving in Africa, the duke was reconnoitring, and was annoyed at the pranks played by an Arab sheik at a distance of nearly 650 yards. He then offered five francs to any one who would put a stop to the Arab's performance. Instantly a soldier stepped out of the ranks of the Chasseurs d'Afrique, and shot the sheik through the heart. Many improvements were made in M. Delvigne's rifle; and in 1842 there were ten battalions of these tirailleurs provided with what was then thought the perfection of a rifle. In 1846 great changes were again made, and the "1846 model rifle" was introduced, which proved to be a very precise and murderous weapon with a cylindro-conical hollow ball. In the British army, rifles were first used during the time of the American revolutionary war. Until within comparatively late years, however, the British service, with the exception of those regiments called rifle corps, was entirely armed with the smooth-bored musket, familiarly called "Brown Bess." This weapon is now entirely superseded by the Enfield rifle, which was introduced shortly after the invention of M. Minié, in France. That gentleman proposed an expanding bullet of a conical form, with an iron cup or plug in its base. By this means the bullet could be easily rammed down, and the iron cup having a less specific gravity than the lead, was driven forward by the explosion, and thus assisted in expanding the bullet. It is, however, only just to Captain Norton, of the British service, to state that he proposed an expanding bullet on the same principle many years previously. A rifle on the Minié principle was adopted into the English army in 1851. Lord Hardinge appointed a committee to investigate the subject of rifled arms in 1852; and during the following year they adopted a modification of the rifle and bullet proposed by Mr. Pritchett. This weapon, altered and improved, is the Enfield rifle now in use. It is, undoubtedly, the best arm that troops have been armed with as yet, although it may not be as good as some that have been invented. It is altogether made by machinery, at least all those manufactured at the government factory at Enfield, which gives its name to the rifle. Large quantities of the same weapon, however, are made at Birmingham and London. With this species of rifle good practice can be made up to 900 yards, up to which distance it is sighted. The whole weight of the long Enfield rifle, with its bayonet, is 9 lb. 3 oz.; its trigger draws 7 lb. to 8 lb.; its charge of powder is 2½ drams F. G.: and the weight of 60 rounds of ammunition, with caps, is 5 lb. 8 oz. The old smooth-bore musket weighed 11 lb. 3 oz., and the ammunition 6 lb. 10 oz. The prime cost of a finished Enfield rifle is said to be about £2. 5s. A short Enfield is also used by the rifles and other regiments. Instead of the ordinary bayonet with the short Enfield, a sword bayonet is used. Most of the English cavalry are provided with Sharp's breech-loading carbine. Another very admirable rifle is that invented and patented by Mr. James Whitworth, of Manchester. The great peculiarity of Mr. Whitworth's rifles consists in the polygonal form of the bore, the gauge number of which is about 48; the length of the barrel 39 inches, and the pitch of rifling one turn in 20 inches; so that the ball makes nearly two complete revolutions before it leaves the muzzle of the gun. In some of the rifles manufactured by Mr. Whitworth, the bullet makes six or seven complete turns in the barrel. At the Hythe School of Musketry, in 1857, a trial came off between the Whitworth and the Enfield rifles, with the following result:—





| Rifle. | Range, in Yards. | Elevation, Degrees. | Figure of Merit. |
|---|---|---|---|
| Whitworth... | 500 | 1·15 | 0·37 |
| Enfield ..... | | 1·33 | 0·24 |
| Whitworth... | 800 | 2·22 | 1·00 |
| Enfield ..... | | 2·45 | 4·11 |
| Whitworth... | 1,100 | 3·45 | 2·41 |
| Enfield ..... | | 4·12 | 8·04 |
| Whitworth... | 1,400 | 5·00 | 4·63 |
| Enfield ..... | | 6 20 to 7° | No hits. |
| Whitworth... | 1,830 | 6·40 | 11·62 |
| Enfield ..... | | — | — |

The *figure of merit* is the mean radial distance in feet from the centre of ten shots fired from a rest-table. Descriptions of the JACOB RIFLE and the HENRY RIFLE will be found in their respective places in this work. The Lancaster rifle has a gaining twist, the section of the bore is an ellipse, and the bore is formed by this ellipse moving along the axis of the barrel at the same time that it rotates about it; the rotation being more rapid on approaching the muzzle of the gun. The Royal Engineers are armed with rifles constructed on this principle. The ammunition employed is the same as that used in the Enfield, and good practice can be made with the rifles at a thousand yards. The volunteer rifle corps throughout the United Kingdom are all armed with the long Enfield at the expense of the government. (*See* VOLUNTEER MOVEMENT.) In conclusion, we may mention a weapon of very great importance, namely, Colonel Colt's REPEATING RIFLE. This gun is constructed mainly on the principle which was introduced by the same officer in his "revolver" pistols. It differs, however, from the pistols and the early revolving rifles, in its internal structure. The catch which causes the breech cylinder to revolve, instead of acting against rachet-teeth and on the cylinder itself, works in teeth cut on the circumference of the cylinder end of the base-pin, in such a way that the base-pin rotates with the cylinder itself, being locked by a small mortise in the cylinder, the stop-bolt *gears into corresponding notches, also cut in* the end of the base-pin, and thus locks it when necessary. This arrangement is an improvement in these weapons, and by a simple adjustment, the small spring catch, which by means of a circular groove in the front end of the base-pin keeps it in place, is immediately released by pressing in a small stud, and the cylinder can be instantaneously removed or displaced. The rifle is provided with two sights; the ordinary leaf-sight is also provided. The back sight can be adjusted for long or varying ranges; and the front sight is generally known as the *bead-sight*; it consists of a small steel needle, with a diminutive head upon it, like the head of an ordinary pin. In taking an aim, the eye is directed through a minute hole in the sliding piece of the back sight to the small bead in front, so as to make it cover the mark aimed at. This sight affords great accuracy in shooting. Altogether this rifle is a useful-looking weapon, and, according to the length of the barrel, varies in weight from 8 lb. to 10 lb., with five and six shots.

RIFLED ORDNANCE.—About ninety years ago, rifled guns of iron were proposed by Captain Blair, to be used as field artillery. The guns were to be cast hollow, and the grooves were to be formed during the same operation. The balls were to be of lead, with knobs on them to fit the grooves, and they were not to weigh more than two pounds. The next attempt in this direction was made by the French, who, about the beginning of the present century, tried to introduce into their service cannon-shot of a cylindro-spherical form, the cylindrical part being in contact with the charge, and a ring of lead surrounding the shot near its middle, so as to render this part rather greater than the bore of the gun. When the shot was rammed down into the gun, the circumference of the ring was scraped down by the edge of the muzzle; by this means the shot came in close contact with the surface of the bore, and thus left no windage. After trial, the new gun was spoken favourably of; but the invention was not accepted, on account of the time and labour required in loading the gun. Cavilli, a major in the Sardinian army, invented a rifled gun in 1840; at the same time another was proposed by Baron Wahrendorff, a Swede.

Both these guns were two-grooved breech-loading pieces. They were tried in 1850, at Shoeburyness, against the service 32-pounder of 56 cwt. The weight of the elongated projectile for each gun was about 65lb. The Cavalli gun failed, after four rounds had been fired, but the Wahrendorff gun stood well. Very little material result arose out of these experiments; but in the following year the rifle gun of Mr. Lancaster was tried in the same place. (*See* LANCASTER GUN.) In 1854 Sir W. Armstrong brought forward a breech-loading rifle gun; his plan was accepted, and a gun of small calibre having been made according to it, was tried at Shoeburyness. With several modifications, this gun has been adopted in the British service. (*See* ARMSTRONG GUN.) The other important English rifled gun is the Whitworth, which, like the rifle, has a hexagonal bore, with the angles of the hexagon rounded off. (*See* WHITWORTH GUN.)

RIGGING, *rig'-ging* (Sax. *wrigan*, to put on, to cover), in nautical language, a general term applied to all the ropes by which the masts are supported, and the sails extended, taken in, or arranged to the disposition of the wind. It is consequently divided into *standing rigging* and *running rigging*. The standing rigging is that which is used to sustain the masts, and remains in a fixed position,—as the shrouds, stays, and back-stays; the running rigging is that which is fitted to arrange the sails, by passing through different blocks, in various places about the masts, yards, shrouds, &c.; as the braces, sheets, halliards, clew-lines, &c.

RIGHT, *rite* (Sax. *riht*, Lat. *jus*), in its strictly legal signification denotes whatever may be maintained or enforced by law. It hence follows that every right presupposes the existence of positive law. Rights may be acquired in a variety of ways, as by contract, gift, succession, &c. Rights are also of several kinds; as personal rights, or such as regard a man's own person; rights of property, regarding his dominion over the external and sensible things by which he is surrounded; rights in private relations as a member of a family; and public rights, regarding his social condition as a member of the community. Rights necessarily imply duties; for whatever is due to one man, or set of men, is necessarily due from another. Rights are further distinguished as natural, or those which a man has a natural or just claim to, as his life, liberty, the produce of his labour, &c.; and adventitious, or those derived from human appointments, as the right of a king over his subjects, of a general over his soldiers, &c. Every one, when he becomes a member of a civil community, alienates a part of his natural rights. Right is also sometimes used in a secondary sense, to signify not legal but moral claims; *i. e.*, such as are enforced by moral sanction, but are of no legal obligation.

RIGHT ASCENSION. (*See* ASCENSION, RIGHT.)
RIGHT, DIVINE. (*See* DIVINE RIGHT.)
RIGHT, PETITION OF. (*See* PETITION.)
RIGHT OF SEARCH. (*See* SEARCH, RIGHT OF.)
RIGHTS, BILL OF. (*See* BILL OF RIGHTS.)
RIGHTS, CONJUGAL. (*See* CONJUGAL RIGHTS.)
RINGS, FAIRY. (*See* FAIRY RINGS.)

RINGWORM, *ring'-wurm* (Lat. *porrigo*), in Med., is an eruptive disease of the skin, more particularly on the head, and of which there are several kinds. The most common kind commences with clusters of small light-yellow pustules, which soon break and form thin scabs, which, if neglected, become thick and hard by accumulation. When removed, they appear again in a few days; and by these repetitions the incrustations become thicker, and the area of the patches extends, so as, if unchecked, to affect the whole head, and extend also to the forehead and neck. The patches are of an irregular circular form. This disease occurs generally in children of three or four years and upwards, and often continues for several years. It is said to occur spontaneously in children ill-fed and uncleanly, and is readily propagated by contagion. The principal local treatment, when the patches are in an inflamed and irritable condition, consists in regular washing or sponging with warm water or some emollient fomentation. When the inflammatory state is diminished, and a dry scaly scab appears, active stimulants are required to effect a change in the disorder. Further, a nutritious diet, warm clothing, tonics, and regular exercise are necessary.

RIOT, *ri'-ot* (Nor. *riotti*), is defined to be "a tumultuous disturbance of the peace, by three persons or more assembling together, of their own authority, with an intent mutually to assist one another against any one who shall oppose them in the execution of some enterprise of a private nature, and afterwards actually executing the same in a violent and turbulent manner, to the terror of the people,—whether the act intended were of itself lawful or unlawful." As offences of a similar kind, though differing from riots, are routs and unlawful assemblies. A rout is a disturbance of the peace, by persons assembling together with an intention to do a thing which, if executed, would make them riotors, and actually making a motion towards the execution thereof. An unlawful assembly is any meeting of great numbers of persons, with such circumstances of terror as cannot but endanger the public peace and raise fears and jealousies among the subjects of the realm. The Riot Act (1 Geo. I. st. 2, c. 5) enacts generally, that if any twelve or more persons are unlawfully assembled to the disturbance of the peace, and any one justice of the peace, sheriff, undersheriff, or mayor of a town, shall think proper to command them by proclamation to disperse, if they contemn his orders and continue together for one hour afterwards, such contempt shall be felony, punishable by penal servitude for life, or not less than fifteen years, or imprisonment, with or without hard labour or solitary confinement, for not more than three years; further declaring that if the reading of the proclamation be by force opposed, or the reader be in any manner wilfully hindered from the reading of it, such opposers and hinderers, and all persons to whom such proclamation ought to have been made, and knowing of such hindrance and not dispersing, are felons, and liable to the like punishment. The act also contains a clause indemnifying the officers and their assistants in case any of the mob be unfortunately killed in the endeavour to disperse them. Where the number of rioters is under twelve, the punishment is fine and imprisonment, to which hard labour may be superadded; while fine and imprisonment is the punishment attached to the offences of routs or unlawful assemblies.

RITUAL, *ri'-tu-al* (Lat. *ritus*, a rite), in ecclesiastical matters, is a book or manual, in which are given the order and forms to be observed in the celebration of divine service, the administration of the sacraments, &c., in any particular church.

RIVER DEFENCES, *riv'-er* (Lat. *rivus*, Fr. *rivière*).—The practical rules of all river-engineering vary with the nature of the stream and the physical characteristics of the country through which it flows. Even if no direct commercial benefit is anticipated from such operations, it is always desirable that the flow of water should be kept as regular as possible, and the bed of the stream should be made to render the greatest amount of service as an outfall for the surface-drainage. The principal objects to be aimed at are: to retain the waters in their beds, to regularize the conditions of the flow of the water in the channels, and generally to prevent inundations. This latter object, which in many districts is of vast importance, may sometimes be effected by establishing artifically a system of reservoirs in the upper portion of a river's course. These reservoirs fulfil the same purpose as the Swiss lakes with regard to the rivers coming down from the Alps; that is to say, they store up the storm-waters during the winter months for the purpose of distribution during the summer. In the East, works of this description have been constructed, and they have been recommended for France. It would also appear that similar reservoirs, if introduced into South Africa and Australia, would be of very great advantage. When rivers become of such volume as to cause dangerous inundations, there seems to be less danger when the banks of the river are dressed off at the height of the ordinary winter flood-lines, so that the water, when above that level, may at once flow over the country. This method is found to be superior to that of confining the waters within narrow banks, raised above the level of the adjacent land. The banks of the river Po, which is very subject to floods, are defended by two kinds of banks,—*in froldi*, when they are raised to the requisite height at once, and on the margins of the river; and *in golene* when they are raised at a great

## Rivers

distance from the margins, so as to interfere as slightly as possible with the flow of the waters. The former is constructed when the valley of the river is narrow and the foundations good; when the valley is wide, and there is any fear of undermining the banks, the latter mode is adopted. Embankments thrown up on the side of the river to protect the district from inundation should be made of great thickness and with every possible precaution to insure their stability and tightness. The surface exposed to the current ought to be protected, if the embankment is composed of substances easily washed away, by stone pitching, planking, concrete, watting, crib-work, or by fascines, tunnages, or clayonnages, as used by the French, German, and Dutch engineers. Generally, the tops of these banks are made wide enough to carry a road. —For further information on the subject of river defences and engineering, the reader is referred to Brooke's, Calver's, and D. Stevenson's treatises on *River and Canal Engineering*.

RIVERS, inland currents of water, which bring down to the sea, to a lake, or to another river, the waters which are collected within a certain portion of the earth's surface. Rivers can be traced either to springs or to the gradual melting of the ice and snow which perpetually cover the summits of all the most elevated mountain-ranges on the earth. The union of several springs, or of these meltings, forms rivulets; these flow down and meet with other rivulets, till they reach one great channel, when the stream is called a *river*. The country through which a river runs is called its *basin*, as the stream runs in the lowest part of it, and the country on all sides rises with more or less steepness, similarly to the sides of a basin. Nearly all large rivers have their sources in lofty mountains or elevated table-lands, in descending from which a great difference with respect to the rapidity of their course is observed. In physical geography, therefore, the course of such rivers is divided into three parts,—the upper, middle, and lower course. The size of a river depends upon three circumstances,—the surface of its basin, the abundance of that surface in springs, and the degree of humidity of the region from which it draws its supplies. From these causes arises the vastness of the South American rivers. The peculiar situation of the Andes with regard to that continent, the fact that by far the largest portion of its running water is drained off towards the Atlantic, the great number of streams that intersect the country, together with the humidity of the climate, all combine to form large rivers. As the Andes are placed so near the Pacific, the rivers which flow into that ocean are small, while those which flow into the Atlantic, having such an immense space to traverse, are swelled into an enormous volume. In the Old World, the physical circumstances are not of a similar character; hence there are no vast rivers like those of the New World. Europe is too small, Africa for the most part is an arid, sandy desert, while in Asia generally the climate is not so moist, and capacious inland lakes form natural reservoirs for holding the streams which fall into them. After leaving its source, the water of a river, by following a descent, receives an impulse which is sufficient to keep the stream in motion, even when there is no longer a declivity on the ground. The only effect produced is that the course of the stream becomes gradually slower in flowing over a level. The declivity of many rivers is much less than might be conjectured. The Amazon has a descent of only ten and a half feet in two hundred leagues, that is, only one twenty-seventh part of an inch for every thousand feet of that distance. In France, between Pouilly and Briare, the Loire falls one foot in 7,500, but between Briare and Orleans, only one foot in 13,596. The Rhine itself in some parts has not a descent of more than four feet in a mile. In flowing through mountainous districts, rivers frequently fall over precipices, and form *cataracts*, many of which are of great depth. When the water descends with great velocity over an inclined plain of rock, it is said to form a *rapid*. The most celebrated waterfalls in the world are those of Niagara, in North America. Most of the rivers in the tropics are subject to periodical overflowings of their banks, in consequence of the rains which fall every year in such abundance during the wet season.

## Roads

Amongst the ancients, the overflow of the Nile was looked upon as one of the greatest mysteries in nature, as in Egypt rain scarcely ever falls. It is now understood that the phenomenon occurs through the rains which descend on the mountains in the interior of Africa, where the Nile rises. Some rivers disappear mysteriously underground for a certain distance. This is caused by a river being impeded in its course by a bank of solid rock, at the bottom of which it finds a bed of softer soil; having washed and worn away the latter, it works for itself a subterranean passage. In this way can be explained the sinking of the Rhone between Seyssel and L'Ecluse, and the formation in Virginia of the celebrated rock bridge. In Spain, the waters of the Guadiana are dispersed in sandy and marshy grounds, from whence they afterwards emerge in greater abundance. At their junction with the sea, rivers present several features worthy of note. The opposition which takes place between the tide and their own currents frequently causes the collection at their mouths of banks of sand or mud, which are commonly called "bars," on account of the obstacles which they present to navigation. Many of the largest rivers flow into the sea with only one outlet, while others, before their termination, divide into several branches. Among the latter may be mentioned the Nile, the Ganges, the Rhine, the Volga, and the Orinoco. This feature depends partly upon the nature of the country through which the river flows, and partly upon the diminished velocity of the current. In the following table are given the lengths of some of the principal rivers in the world:—

| | Eng. miles. | | Eng. miles. |
|---|---|---|---|
| Amazon | 4,095 | Don | 1,350 |
| St Lawrence | 1,050 | Dnieper | 1,390 |
| Mississippi | 3,420 | Danube | 1,770 |
| Plata | 2,430 | Vistula | 760 |
| Nile | 2,330 | Elbe | 820 |
| Kang-kiang, or great river of China | 3,870 | Po | 400 |
| Amour | 2,880 | Loire | 720 |
| Lena | 2,430 | Rhine | 810 |
| Indus | 2,070 | Thames | 180 |

According to Baron Humboldt, the area of drainage of the Amazon river measures 3,000,000 square miles. The area of the basin of the Thames is 6,500 square miles.

ROACH, *roatch* (SAX. *hreoce*), (*Leuciscus rutilus*). —The roach is a fish about twelve or fifteen inches in length. The length of the head, compared with the whole length of the fish, is as 1 to 5; the depth, at the commencement of the dorsal fin, is to the body alone (without the head or tail) as 2 to 5. The scales are large. The colour of the back and the upper part of the head is bluish-green or dusky-green, becoming lighter on the sides of the body, and shaded into silvery white on the belly. The dorsal and caudal fins are dusky, tinged with red; the anal, pectoral, and ventral fins, are bright red; the irides bright yellow. The roach is common in most parts of Europe; swims in large shoals, and frequents rivers, lakes, &c., preferring somewhat still and deep waters, feeding upon worms and aquatic vegetables. The roach spawns at the end of May or the beginning of June, and the scales are then rough to the touch. It is in little estimation generally for the table, but is best for food, as well as finest in colour, in October. The proverb, "As sound as a roach," is probably derived from the French; for in the older ichthyological works, this fish was called *roche*; and the meaning stands confessed, if we admit the pun upon the word, and we ought then to read "as sound as a rock."



ROACH.

ROADS, *roads* (SAX. *rade*, a road), as affording the means of communication between distant places, are of the utmost importance to commerce, and tend perhaps

more powerfully than anything else to the progress of improvement. They have been denominated national veins and arteries, and the latter are not more indispensable to the existence of individuals than improved communications are to a healthy state of the public economy. The Peruvians, of all ancient nations, seem to have been the greatest road-makers. Remains of the roads are still to be seen in sufficient preservation to attest their former magnificence. The most considerable were two which extended from Quito to Cusco, and again diverging from the capital, continued in a southern direction towards Chili. One of these passed over the grand plateau; the other along the lowlands on the borders of the ocean. The former was much the more difficult achievement of the two. "It was conducted," says Prescott, "over pathless sierras buried in snow; galleries were cut for leagues through the living rock; rivers were crossed by means of bridges that swung suspended in the air; precipices were scaled by stairways hewn out of the native bed; ravines of hideous depth were filled up with solid masonry; in short, all the difficulties that beset a wild and mountainous region, and which might appal the most courageous engineer of modern times, were encountered and successfully overcome." The length of the road is variously estimated from fifteen hundred to two thousand miles, while its breadth scarcely exceeded twenty feet. It was built of heavy flags of freestone, and in some parts at least covered with a bituminous cement, which time has made harder than the stone itself. Stone pillars, in the manner of milestones, were erected at stated intervals all along the route. In Europe the ancient Romans were specially distinguished for the vast extent and solid construction of their roads. In Italy alone they are said to have made upwards of fourteen thousand miles of roads, while every country which was brought under their sway was more or less intersected by these channels of communication. Many of these still remain to attest the skill and energy of their constructors. Very extensive works, as excavations, bridges, tunnels, were frequently necessary to overcome natural obstructions. Particularly careful were they to obtain a solid basis for their roads. The loose earth was first of all removed, and the excavation continued until a solid foundation was reached; or if the nature of the ground did not admit of this, then an artificial basis was formed by means of piles. The first stratum above this consisted of stones not smaller than the hand could just grasp; above which was rubble-work, consisting of a mass of broken stones, cemented with lime, and rammed down hard, being nine inches thick. Above this was a stratum composed of fragments of bricks and pottery, cemented with lime, and six inches thick. The uppermost stratum was composed of large polygonal blocks of the hardest stone, irregular in form, but fitted and jointed with the greatest nicety, so as to present a perfectly even surface, free from any gaps or irregularities. In the great roads the breadth was from thirteen to fifteen feet, in others eleven, in others eight. The centre of the way was a little elevated, to allow the water to run off easily; and regular footpaths were raised upon each side, and strewn with gravel, and the different parts strengthened and bound together with stone wedges. (*Ref.* Smith's *Dictionary of Greek and Roman Antiquities.*) The earliest artificial roads in Britain were formed by the Romans during their occupation of the country. The principal of these were Watling-street, Ermine-street, Foss-way, and Ikonild-street. Watling-street commenced at Richborough, in Kent, passed through London in a N.W. direction, and extended to Chester. Ermine-street commenced at London, and, passing through Lincoln, was carried through Carlisle, and thence into Scotland. The Foss-way branched off in a S.W. direction from Ermine-street to Bath. Ikonild-street extended from Norwich in a southern direction to Dorsetshire. From each of these main lines branches extended in different directions through the country. The first legislative enactment in England with regard to roads is the statute of the 28th of Philip & Mary, which, after declaring that the roads were tedious and noisome to travel on, enacts that in every parish two surveyors of the highways shall be annually chosen, and the inhabitants of all parishes obliged, according to their respective ability, to provide labourers, carriages, tools, &c., for four days each year, to work upon the roads under the direction of the surveyors. This system continued in operation till the reign of Charles II., when, owing to the increase of carriages, particularly about London, it became necessary to adopt more efficient measures for the formation and repair of roads, and the plan of imposing tolls upon those who made use of them began to be adopted; but the measure was not carried into full effect and placed upon a solid footing until about 1767, when it was extended to the great roads in all parts of the country, and the contributions of labour, under the Act of Philip & Mary, appropriated entirely to the cross or country roads. The contribution of labour is now very generally commuted for a payment in money. The total length of the different paved streets and turnpike roads in England and Wales amounts to about 23,000 miles; while the length of the cross roads and other highways is estimated at about 100,000 miles. In the system of road-making which takes its name from Mr. MacAdam, hard stones, as granite, flint, &c., are taken and broken up with hammers into small pieces not exceeding six ounces in weight. These fragments are spread loosely upon the ground to the de[illegible] of from six to ten inches. At first the roads thus m[illegible] are heavy and laborious to pass; but in time the [illegible]stones become consolidated, and form a mass of great hardness, smoothness, and permanency. The distinguishing feature of the system adopted by the late Mr. Telford consists in the use of a rough pavement of hand-laid stones on the bed of the road to support the small broken stones of which the surface is composed. In the streets of towns and other places where the traffic is very considerable, paved roads are generally adopted, formed of blocks of stone ten inches in depth, from ten to fifteen inches in length, and from six to eight inches in width. Some years ago blocks of wood, in place of stone, were adopted as pavement in some parts of London and other places, but they have since generally fallen into disfavour. Asphaltum roads have also been tried, applied in a liquid state over a course of concrete, and then covered with sand or sharp grit. It answers tolerably well where the traffic is not considerable, but is liable to soften under a hot sun, and to exhale a very disagreeable odour.

ROBBERY, *rob'-be-re*, in Law, is the unlawful taking away of money or goods of any value from the person of another, or in his presence, either by violence or by putting him in fear. Hence, in order to constitute robbery there must be, (1) an unlawful taking; (2) the thing must be of some value, but it is immaterial, as constituting the offence, whether it be a penny or a pound; and (3) the taking must be by force or a previous putting in fear. It is this last which distinguishes robbery from other larcenies, and makes the violation of the person more atrocious than private stealing. The taking must also be either directly from the person, or in his presence, or it is not robbery. The thing taken must have been in the possession of the thief, and if he once has it in his possession, even though he immediately restore it, he is still guilty of robbery. Formerly robbery was a capital offence, but by 7 Wm. IV. & 1 Vict. c. 87, it is made punishable by transportation (now penal servitude) for life, or for any term of not less than seven years, or by imprisonment for any term not exceeding three years. Assaulting, with intent to rob, or demanding any property of a person by menaces or force, is made punishable by imprisonment for any term not exceeding three years; and upon an indictment for robbery, or any other offence which includes assault, the jury may acquit of the felony and find guilty of assault, for which the party indicted may be sentenced to imprisonment for any term not exceeding three years. Where the crime of robbery is attended with, or immediately followed by stabbing, cutting, or wounding, it is still a capital offence.

ROBES, MISTRESS OF THE, *robes*, the office of *mistress of the robes* is ancient, and is of high dignity, since the holder of it not only presides over the ladies of the household of the queen, but has the superintendence of all duties belonging to the bedchamber. She regulates the rotation and times of attendance of the ladies; she has the custody of the robes; on state occasions sees that the ceremony of robing the queen

is properly performed; and on such occasions rides in the same carriage with her. Her salary is £600 per annum.

Robin Redbreast. (*See* Redbreast.)

Robinia, *ro-bin'-e-ă* (after Jean Robin, botanist to Henry IV. of France), in Bot., a gen. of the nat. ord. *Leguminosæ*. The species *R. pseud-acacia* is known as the locust-tree, and frequently cultivated in this country on account of its flowers, and its hard and durable wood. It must not be confounded with the useful West-Indian locust-tree (*see* Hymenæa), or with the plant producing the so-called locust-bean (*see* Ceratonia).

Rocambole, *rok'-ăm-bole*, the common name for *Allium Scorodoprasum*, a plant closely resembling the garlic, *A. sativum*. The bulbs, which are cultivated for the same purposes as those of the latter species, are said to have a more delicate flavour.

Rocella, *ro-sel'-lă*, in Bot., a gen. of lichens. The species are known under the common name of *Orchella weeds*, and are extensively used in this country and elsewhere in the manufacture of the purple and red dyes called *archil* or *orchil*, and *cudbear*. In Holland, the blue dye-stuff called *lumus* is also prepared from these lichens. Orchella weeds are imported from various parts of the world; as the Canary and Cape de Verd Islands, the Azores, Angola, Madagascar, Mauritius, Madeira, South America, and the Cape of Good Hope. In commerce, the different kinds are distinguished by the names of the countries whence they are derived. It is remarkable that there is no colouring matter ready formed in these lichens; it is produced by the combined action of air and ammonia upon some colourless principles contained in them. (*See* Archil, Lecanora, Litmus.)

Rock Crystal, *rok*, a term applied in Min. to a very fine variety of quartz. (*See* Quartz.)

Rocket, *rok'-et* (Dan. *raketten*), in Pyrotechny, a cylindrical case of pasteboard or metal, attached to one extremity of a light wooden rod, and containing a composition which, being fired, by the force of the combustion the whole of the arrangement is shot through the air. As signals between persons who were unable to communicate with each other on account of darkness or some other cause, rockets have long been employed. They were also used for the important service of determining the difference of longitude between two places. Rockets have also been constructed so as to be used in warfare; they were first so used in 1809, at the siege of Copenhagen. In signal-rockets, the composition with which the case is filled consists generally of saltpetre, sulphur, and charcoal, or gunpowder; the whole is reduced to a *mealed* state, and well mixed together, the annexed being the proportions:—saltpetre, 4 lbs., sulphur, 1 lb.; and charcoal, 1 lb. 8 oz. The mixture for producing rockets with stars, consists of, saltpetre, 8 lbs.; sulphur, 2 lbs.; sulphide of antimony, 2 lbs.; mealed powder, 8 oz.; and isinglass, 3½ oz. The last ingredient is dissolved in a quart of vinegar, after which 1 pint of spirits of wine is added, and then the mealed composition is mixed with the liquid till the whole mass comes to be of the consistency of a thick paste. After being moulded into short cylinders and carefully dried, these cylinders are packed into the head with a small bursting charge. As soon as the rocket is shot off and burned out, the bursting charge opens the head and sets free the lighted stars. The force by which a rocket ascends is similar to that by which a gun recoils when it is fired. The rod serves to guide the rocket in its flight, the common centre of gravity of the rocket and rod being a little below the top of the latter. The distance at which signal-rockets can be seen varies between thirty-five and forty miles; and the times of ascent from seven to ten seconds. As military projectiles, rockets were first introduced in the British army by Sir William Congreve. When fired in volleys against troops, they are likely to produce great disorder, and when fired amongst buildings are very destructive.

Rocking-Stones, *rok'-ing*, a term applied to certain large detached rocks or stones, also called *logging stones*, which are found picturesquely situated in many parts of Britain. In general, they present the appearance of a huge mass of rock loosened in some convulsion of nature, with a slightly rounded base resting on a flat surface of rock below, and so evenly balanced that it can be moved or rocked by a single individual. Antiquaries have accounted for the occurrence of these rocks in various ways. According to Dr. Hibbert, "as they (rocking-stones) are products of every country where loose detached rocks of a particular structure have been submitted to the operation of atmospheric agents, it is to be expected that the fables assigned to their origin would be regulated by the peculiar mythology of the people among whom they have become the object of notice and wonder."

Rocks. (*See* Geology.)

Rod, *rod*, an English measure of length, containing sixteen feet and a half. Throughout many districts the word is used for *pole* or *perch*.

Rodentia, *ro-den'-she-ă* (Lat., gnawers), an order of animals belonging to the class *Mammalia*, embracing the rats and mice, hares, rabbits, guinea-pigs, and other well-known animals. These animals have two great incisor teeth in each jaw, separated from the molar by a wide space, with which they could hardly serve a living prey or rend flesh; they could not even cut aliments, but they might serve for reducing them, by continued labour, into fine molecules—in a word, for gnawing them; whence the term Rodents, or Gnawers, applied to this order. As these incisors have enamel in front only, their posterior border wears away more than their anterior edge, so that they are always kept set like a chisel, and enable their owner to attack the hardest vegetable productions, and frequently to feed on wood and bark. Their prismatic form causes them to grow from the root in proportion to the wearing down of their cutting edge; and this disposition to grow or push forward from the root is so strong, that if one of them is lost or broken, its antagonist, meeting with no opposition to keep it within bounds, develops itself so as to become monstrous. The lower jaw has no horizontal movement except from behind, forwards, and *vice versâ*, convenient for the action of gnawing; the molars consequently have flat crowns, the enamelled eminences of which are always transversal, so as to be in opposition to the horizontal movements of the jaw, and to be better adapted for trituration. In some genera these eminences are simple lines, the crown of the tooth being very flat, and these are more exclusively frugivorous; in others the eminences are divided into blunt tubercles, and these are omnivorous; whilst, in a few others again, the teeth have points, and the animals belonging to these genera more willingly attack other animals, and approximate to the *carnivora*. The hinder parts of the body of the rodents in general exceed their anterior ones, and this gives them a disposition to leap rather than walk. The brain of the rodent is nearly smooth, and without convolutions; the eyes are entirely directed laterally; the jaws are weak, and the forearms have scarcely any rotatory motion, and their two bones are nearly united. In the greater part of the details of their organization the inferiority of the animals is displayed; but some of them enjoy a certain dexterity, using their fore feet for carrying their food to their mouth; whilst others, again (the squirrels), climb trees with facility. Rodents are most abundant in temperate regions. In Europe and the north of Asia there are 81 species, 16 genera; in North America, 99 species, 19 genera; in Africa, 53 species, 16 genera; in India and its islands, 58 species, 10 genera; in South America and West India islands, 89 species, 25 genera. About six species of rodents are found in Australia, and they all belong to the family *Muridæ*.

Roebuck, *rō'-buk* (Dan. *raabuk*), (*Capreolus Caprea*).—This, the most light and handsome of all our deer, is about 3 feet 9 inches in length, about 2 feet 3 inches in height in front, and about 2 feet 7 inches in height behind. Weight, from about 50 to 60 lbs.; length of horns, from 8 to 9 inches. The horns are cylindrical, with a small antler on the middle of the horn, pointing forward, and a second one higher up, and turned to the rear. Their lower part is deeply furrowed longitudinally. Those of a young buck in its second year are simple; in the third year a branch appears; the head is complete in the fourth year. The colour of the hair is a greyish yellow, varying more to reddish or brownish, but always with a large white disk on the buttocks. The lower part of each hair is ash-coloured;

there is a narrow bar of black near the end, and the tip is yellow. On the face the hair is black, tipped with yellow. The summer and winter clothing differ a little, both in colour and texture: in summer the coat is short and smooth, and of a bright reddish colour; whilst in winter the hair thickens and hardens, and the colour deepens, especially on the upper part. The roebuck is pretty generally distributed, being found in all the temperate parts of Europe and Asia, and even, it is said, in India. The roebuck was formerly very common in Wales, the north of England, and in Scotland, but at present the species no longer exists in any part of Great Britain except in the Scottish highlands, where they are not met with in exactly the same places as the red deer, but rather where there is an admixture of hill and rock and copse. The roebuck does not keep in herds, but only congregates in families in the lower coverts and less wild woods. The male is monogamous, and remains attached to one female for life, the two keeping company, or at least being near to each other, all the year round; and the rutting season is not accompanied with that violent excitement which takes place in the others, more especially in the stag. Rutting time is in the beginning of November, and the female goes little more than five months, while the fallow-deer goes eight months, and the hind a little more. The pairing is thus about two months later than the others, and the fawns are dropped about two weeks earlier. The female produces two fawns at a birth, and these she conceals from the male. They are said to live twelve or fifteen years, and to be able to reproduce the species at the age of eighteen months. Herbage and tender shoots of underwood are the food of the roebuck in summer, and in winter, when the ground is covered with snow, it feeds on the tender branches of the fir and the birch. As it prefers the tender twigs and buds of young trees to grass, it is very destructive to young plantations. The male sheds his horns soon after the rutting season, and acquires the new ones during the winter, so that he is in his apparel for a much longer period of the year than the hart or the fallow-buck.

ROGATION DAYS, *ro-gā'-shun* (Lat. *rogo*, I ask), in the Church, are three days immediately before the festival of the Ascension. In former times, it was a general custom for the people to accompany the bishop, or some of the clergy, into the fields on one of the three days preceding Holy Thursday, to implore the mercy of God, that he would avert the evils of plague and pestilence, that he would send good and seasonable weather, and give in due season the fruits of the earth. In the injunctions issued in the reign of Queen Elizabeth, the curate and people are ordered to walk about the parish with willow wands, the former, at certain and convenient places, admonishing the people to give thanks to God for his benefits. In the Church, these days are continued as private fasts for "abstinence" and "extraordinary acts and exercises of devotion."

ROLLS, MASTER OF THE. (*See* MASTER.)

ROMAN ARCHITECTURE, *rō'-mān*.—It can hardly be said that the early Romans had any style of architecture of their own, since they borrowed their ideas of building first from the Etruscans and afterwards from the Greeks. In the time of Romulus, their dwellings were of the rudest description, being chiefly composed of straw; and at a later period, their temples were only small square buildings, scarcely large enough to contain the statues of their deities. The first king who constructed works of a larger class requiring architectural skill was Ancus Martius. His first attempt was the building of the city and port of Ostia, at the mouth of the Tiber. During the time of Tarquin the Elder, the city was much improved by the skill and enterprise of the Etruscans, the great circus was built, and the walls of the city constructed of large hewn stones. The great cloaca, or public sewer, was also commenced, together with the temple of Jupiter Capitolinus. The decoration and improvement of the city was greatly increased during the reign of Tarquinius Superbus; but the Capitol was not finished till after the expulsion of the kings. During the two first Punic wars, many temples were erected; but they do not appear to have been of great magnificence. Altogether, very little taste had been shown in the Roman buildings till their conquests extended, and they became intimate with the more





costly buildings of their enemies. Metellus Macedonicus, the contemporary of Mummius, the victor of Corinth, was the first who built a temple of marble at Rome: but from that time, most of the larger edifices were built of that material. Grecian art and architects were also introduced about the same period. Under Julius Cæsar, many new and magnificent buildings were erected; and during the golden age, under Augustus, most of the finest edifices were built: architects flocked from all quarters, and especially from Greece, to beautify the city. It was said of Augustus, "that he found Rome built of brick, and left it of marble." Under Vespasian and the Antonines, architecture flourished, as the remains of the Coliseum and the temple of Antoninus and Faustina testify. After this period, however, architecture declined till Constantine transferred the seat of government to Byzantium, when a new style was introduced. (*See* BYZANTINE ARCHITECTURE.) In comparing Greek and Roman architecture, there can be no doubt that the former greatly excels in matter of taste. Amongst the Greeks, moreover, religion was almost the sole purpose for which architecture seemed to exist; whilst among the Romans, the temples were neither so extensive nor so numerous as their buildings of public utility or convenience. Besides a large number of engineering works, there are still the remains in Rome of fora, baths, palaces, circi, theatres, amphitheatres, libraries, halls of justice, triumphal arches, commemorative columns, mausolea, and similar buildings. The requirements of such edifices as these naturally led to the practice of composition and grouping, as one uniform plan of building would not have been suitable for such a variety of purposes. Another cause of variety lay in the employment of the arch, which allowed much greater latitude in composition than the entablature of the Greeks. The semicircular form of the arch next led to quite a new feature in architectural design; namely, the dome, a feature which gave a totally distinct character to the buildings in which it was employed. The Pantheon is the most remarkable example of this arrangement. The circular plan of building became also a favourite one for tombs and mausolea. Amongst the most noted of these was the mausoleum of Hadrian, the remains of which form the well-known castle of St. Angelo. A characteristic feature in Roman architecture, and one that entered largely into the system, is the employment of order above order in the same building. While this arrangement is faulty, for it is incompatible with the requirements of the highest standards of taste, yet still, at the same time, it proves the Roman aptness of invention and versatility of design. The ordinance of architecture called the *Roman order* was invented by the Romans from the Ionic and Corinthian orders; and hence it is sometimes called the Composite order.

ROMAN CATHOLICISM is the name given by Protestants to that system of Christianity which regards the bishop or pope at Rome as its infallible spiritual head, and which assumes to itself the title of Catholic or Universal. It professes to have been founded by St. Peter, and maintains that the popes are his lawful successors. Its history, therefore, ascends to the earliest period of Christianity. Little is known of the history of the Church for some centuries after the time of the apostles. The earliest Christians were subjected to great persecutions, and obliged to carry on their services with great secrecy. With the conversion of Constantine the Great, in the early part of the 4th century, an entirely new state of things was ushered in. Now churches were built and liberally endowed, and riches and honours largely conferred on the clergy. The government of the Church was arranged so as to correspond as nearly as possible with that of the State. Bishops were made to correspond with the chief magistrates of cities, metropolitans with the proconsuls or presidents of provinces, primates to the emperor's vicars, each of whom governed an imperial province, while the emperor himself claimed the power of regulating its external affairs. The bishop of Rome had come to acquire a pre-eminence over the other prelates; but at first this pre-eminence was one of order, not of power or authority; hence, when pretensions to supremacy were put forth by the Roman bishops, they were firmly resisted by all the eastern churches. On the death of Liberius, bishop

of Rome, in 366, a violent contest arose between Damasus and Ursicinus, regarding the see, and was the occasion of much bloodshed and cruelty, terminating in the success of Damasus. A variety of circumstances after this time concurred to augment the power and authority of the Roman pontiff, though he had not yet assumed the dignity of supreme lawgiver and judge of the whole Christian church. Leo the Great advanced the pretensions of the Roman see with greater vigour and success than any of his predecessors; but even during his pontificate, the council of Chalcedon, in 451, declared the see of Constantinople to be equal to that of Rome in all respects except precedency. His successor, Hilary, styled himself vicar of St. Peter, and claimed the keys of the kingdom. Pope Gulatius pushed his demands still further, and about 496 began to claim the right to govern kings. "There are two authorities," he says, in a letter to the emperor, "by which the world is governed,—the pontifical and the royal; the first is the greater, having the charge of the sacraments of life." In fact, he advanced on behalf of the papacy all those claims which have since been admitted. He asserted the supremacy of the Roman see, as delegated to it by Christ himself; affirmed the infallibility of the Church of Rome; drew up a list of the canonical books, which included several of the apocryphal; and issued a rescript condemning heretical writers and their books, including in the list some of the works of Tertullian and Lactantius. The claims of the Roman bishops were formally confirmed by the emperor Justinian in his judicial code, and in a decretal epistle to the pope in 533. The emperor Phocas, in 606, issued a decree confirming that of Justinian, and placing the bishop of Rome above the patriarch of Constantinople and all other prelates and churches. The accession of Gregory the Great to the papal chair in 590 is the commencement of one of the most important eras in the history of the Roman church. The ancient Roman empire had finally disappeared, and new-born nations were struggling into life, and waiting for new institutions. Gregory saw the opportunity and embraced it, and the religion of Rome became in consequence the religion of the whole of western Europe. The supremacy of the pope was acknowledged by all the sovereigns of the western nations. A system of ecclesiastical rule, complete and perfect in all its parts, was devised. The clergy were subjected to the bishop, the bishop to the metropolitan, the metropolitan to the papal vicar or legate, and he to the pope. The claims advanced by the papal see led to frequent contests with the secular powers; but the result invariably was the triumph of the Church and the depression of the secular power. To Gregory, the Church of Rome is indebted for the completion of the monastic system. He also sanctioned the doctrines of purgatory, image-worship, pilgrimages, and the veneration of pious relics. New rites and methods of devotion hitherto unpractised were introduced. Litanies were addressed to the saints and martyrs; churches were built innumerable, and became asylums for the criminal from the arm of the law, and a safe resting-place for the bodies of the departed, where no evil spirit could intrude. These dogmas were much more implicitly received by the northern and Gothic nations than by the more cultivated people of the South. As pagans, they had been accustomed to pay to their priests and Druids an implicit obedience, and they now transferred their submissiveness to the ministers of the new religion. In the 7th century, the sovereigns of western Europe submitted implicitly to the Roman see; in the 8th, the war of the Iconoclasts broke out, which eventually led to the separation of the Eastern and Western churches. The patriarch of Constantinople had caused images to be removed from the churches, and an imperial edict was issued forbidding their worship; the consequence being that the people, led on by the monks, broke out into insurrection over the whole empire. Lombardy was still subject to the Greek empire, and its king, taking part with the emperor, forbade the use of images in the churches. Pepin, of France, marched with a numerous army across the Alps to the assistance of his spiritual sire, defeated the king of the Lombards, and compelled him to deliver up a part of his territories to the





Roman pontiff. Thus was laid, in 755, the foundation of the temporal sovereignty of the pope. The Lombards becoming troublesome to the Roman pontiff, he again supplicated the aid of France, and Charlemagne entered Italy in 774, at the head of an army, reduced them to subjection, visited the pope at Rome, and ratified and confirmed the donations of his father Pepin. A second time he had to march to save the papacy from apparent destruction, and he conferred on the Roman see the territories which he subdued, including Corsica, Sardinia, Sicily, &c. In a council held at Rome, Adrian I. conferred upon Charlemagne and his successors the right of electing the popes, but this power was exercised with great forbearance; and in 800, Leo III. proclaimed Charlemagne emperor of the West, and placed the crown upon his head. Even at this time, however, the authority of the pope was not supreme, for upon all religious questions of dispute, he was obliged to convene a council, whose decisions were held to be final upon the points at issue. Provincial synods also met by their own authority, and discussed the questions before them with the utmost freedom, often voting in direct opposition to the Roman see. Further, the power of convening councils, and the right of presiding in them, were the prerogatives of the sovereign in whose dominions they were held, and their decrees required to be confirmed by the civil power before they obtained the force of laws. The popedom, however, was now too powerful to submit patiently to such controls, and struggled incessantly, and at length with success, to throw them off. The 9th and 10th centuries were the midnight of the Dark Ages, when ignorance and superstition held their undisputed sway. Every kind of virtue seemed banished from the earth, and wickedness supplied its place. The popes were in general men of infamous lives, so that the best Roman Catholic writers themselves speak of their conduct with abhorrence and disgust. From the time of Eugenius III. (884), the election of the pope was conducted for a century with little regard to law or decency, and often with tumult and bloodshed. The violence and intrigues which now prevailed may be gathered from the fact that from the death of Benedict IV. (903) to the elevation of John XII. (956), an interval of fifty-three years, thirteen popes in succession held the pontificate. The poisoned cup and the assassin's knife opened a ready path to St. Peter's chair. Even the forms of religion were scorned, and Rome was again familiar with all the crimes which it had known in pagan times under the worst of the Cæsars. The ascent of Gregory VII. to the papal chair in 1073 inaugurated a new era in church history. The grand object of his life was to reduce the whole territory of Christendom to a feudal subjection to the Holy See, coupled with a desire to effect a total reform of the Church, which was now sunk in the lowest state of degradation. No sooner was he seated upon the papal throne, than he began to carry out his intentions. Simony and the concubinage of the clergy were the two evils to which he directed his attention. Having demanded of the emperor Henry IV. of Germany to abandon the right of disposing the sees within his dominion, and the emperor having refused, he called together a council and excommunicated him, declaring the thrones of Germany and Italy vacant. From every sovereign of Europe he endeavoured to exact some new concessions, and wrote circular letters commanding them to make a grant of their kingdoms to St. Peter, in order to receive them back as gifts from the papal see. The audacity of his conduct struck terror into the hearts of all, and the proud emperor of Germany, deserted by his subjects, was obliged to make his way over the Alps in the middle of winter, and submissively ask pardon of the pope. The arrogance of Gregory produced a natural recoil. Henry's subjects rallied round him, and he led an army into Italy and fought several battles, with various success. The war continued for several years. The pope declared Rodolph emperor of Germany, and Henry nominated Guibert, archbishop of Ravenna, to the papal chair. Rome was besieged and taken, and Gregory retired to Salerno, where he died 1085. Guibert was nominated his successor, under the name of Clement III.; but his opponents nominated

another pope, under the name of Victor III. The latter soon abdicated in favour of Urban II.; but both popes died in 1099, and Pascal II. became sole possessor of the papal chair. The war of the "Investitures," thus commenced, continued to distract Europe for many years. Gregory protested against the clergy receiving investiture from the sovereign; while his successor, Urban II., not only forbade the clergy from receiving the investiture, but even from swearing allegiance to the sovereign; thus rendering them accountable only to the Roman see. The war of the investitures closed in 1123, with a compromise between the emperor and Calixtus II., by which the election of the bishops was to be free, and their investiture was conceded to the Church. The secular power henceforth inducted them into their temporalities only; and the changes thus introduced tended still further to enlarge the power of the Roman pontiff. Both swords, the spiritual and the temporal, were now in the hands of the Church; the one wielded for the benefit of the Church, the other by the Church itself. The crusades of the 12th and 13th centuries show the power and influence which the papacy had then attained, and no doubt tended greatly to enhance them. In the person of their legates, the popes commanded the armies, and the Church came into possession of vast estates, the owners of which had perished in the enterprise. The kingdoms of northern Europe were, however, now gradually emerging from barbarism, and the Church was beginning to lose its hold. The crusades were scarcely at an end, when the Paulicians and the Waldenses appeared. Innocent III., who bowed the craven spirit of King John, was inferior only to Gregory VII. in courage and ambition. He asserted new dogmas, as transubstantiation and auricular confession, and introduced a multitude of new ceremonies into the Church. He introduced various measures of reform among the clergy, more particularly the monks, and formed the mendicants, or begging friars, who then began to be numerous, into a regular body, and bestowed on them many marks of his favour; so that Europe in a short time was overrun with them. They were looked upon by the people with the deepest reverence, and restored the papacy from that state of decrepitude into which it had fallen. The most powerful of these orders were the Dominicans and Franciscans; and for three centuries these governed, with almost absolute and universal sway, the states of western Europe, and even the Vatican itself. They were employed as ministers of state, undertook negotiations, formed alliances for sovereigns, declared war, concluded peace. Innocent III. also enacted new laws against heresy, and established the court of the Inquisition. The wars against the Albigenses raged for a time with great fury, and closed only with their destruction. The revival of letters in the beginning of the 14th century seemed to promise the prevalence of milder and more liberal measures. Colleges were built, academies formed, and libraries collected; but it was long before their influence was felt in the Church. During this century the Spanish inquisition manifested great activity, and grew to an enormous height of power. In the beginning of this century, Clement V. removed the seat of the Roman see to Avignon, to oblige the French king, Philip le Bel, a proceeding which tended to impair the authority of the see. Factions appeared, and insurrections broke out in Rome and other parts of Italy, and led at length to the great schism which broke out on the death of Gregory XI., in 1378. The Romans elected Urban VI., a Neapolitan; the French, Clement; the one residing at Rome, the other at Avignon. The one sought the protection of France, the other of the king of Naples. The council of Pisa interdicted both pontiffs, and elected in their room Alexander V. Thus there were three popes at one time, anathematizing each other and demanding the allegiance of the Church. The civil power was at length compelled to interfere; the council of Constance was summoned (1414); Pope John was deposed; Gregory sent in his voluntary resignation, and subsequently Benedict himself was also deposed, and Martin V. elected sole pope. During the whole of the 15th century, the one great subject which absorbed the attention of the Church of Rome was the progress of heresy and the means of its suppression. In the Church itself, there was a large party who were conscious of its faults, and longed for reformation. The acts of several councils show how strong and general this feeling for reform was; but the pope and cardinals determined that severity was the method by which the peace and unity of the Church were to be preserved. The opinions, more particularly, of Wickliffe and Huss spread wide, and exerted their influence in the Church. With the dawn of the 16th century, everything seemed peaceful and serene, and the Church was indulging in pleasing visions of a long repose. The complaints against the papal see, we are told, seemed absolutely to be appeased, and all the kingdoms of western Europe were not only in communion with Rome, but in strict subjection to her. "A few Waldenses lingered on the sides of the Alps and Pyrenees,—impious and obscure men, from whom nothing was to be feared." The Picards and Hussites of Bohemia are spoken of with similar contempt, while the Lollards of England seemed to be too insignificant for notice. But, underneath this smooth surface, fearful elements of opposition were concealed, which only required a spark to set them blazing throughout the Church. In a short time, the dawn of the Reformation was ushered in, and shook to its foundations the power of the Church. (*See* Reformation.) The celebrated council of Trent met in 1545, and the same year saw the massacre of 4,000 unresisting Waldenses at Cabriers and Merindolo. The council sat, with intervals, for eighteen years, and drew up what are regarded as the statutes of the Roman Catholic Church. Having attempted, as far as our limits will permit, to sketch the growth and development of the Roman church, we must here leave it. Its subsequent history presents little of general interest beyond what will be found in the numerous articles bearing upon the subject, throughout this work; as Jesuits, Monachism, Jansenists, Gallican Church, &c. For several centuries after the Reformation, the Roman Catholics in England were subjected to much persecution and hardship. The Act of Toleration (1688), which relieved Protestant dissenters from many disabilities, brought no relief to the Roman Catholics. As the spirit of the times grew milder, however, many of the penal laws ceased to be enforced. In 1778, the first remedial act was passed, enabling Catholics to take lands by descent. In 1791, Mr. Pitt (having obtained a unanimous opinion from the chief continental universities that the pope cannot absolve subjects from their allegiance to a sovereign, and that the principles of the Roman Catholic faith do not excuse or justify a breach of faith with heretics) procured the passing of a bill, by which, upon taking a form of oath prescribed, Catholics were secured against most of the penalties pronounced by former acts. In 1828, the Test and Corporation Acts were abrogated, and the following year, the Catholic Emancipation Act bestowed on Roman Catholics substantially the same amount of toleration which was enjoyed by Dissenters. According to the Roman Catholics, the pope is the successor of St. Peter, and vicar of Christ upon earth. He is the supreme ruler over the entire Church, and from him the various bishops of the Church receive their authority. He is elected by the College of Cardinals in conclave (which *see*); and they, in their turn, are appointed by the pope, and form the executive council of the Church. (*See* Cardinal.) They are divided into boards or congregations for the transaction of business; but their decisions are subject to the approval of the pope, without which they are of no value. On occasions of high importance,—as the election of bishops, &c., they are all summoned together by the pope, and then form a consistory. The manner of appointing bishops varies considerably in different countries. Most frequently it is regulated by concordat, or special agreement between the pope and the civil government, the presentation being usually in the crown, and the appointment emanating from the pope. Where this is not the case, the clergy of the diocese meet in chapter and select three names, which are forwarded to the pope, who then appoints one of them to the charge. The powers of the bishops are regulated by the canon law, and in most Catholic countries they are possessed of some degree of civil jurisdiction. In some parts, vicars-apostolic take the place of bishops, generally with more extensive powers than those of ordinary bishops, from being usually in non-Catholic countries,

where the ordinary laws of the Church cannot be fully observed, or at a great distance from the papal see. The bishop usually has the appointment of the parochial clergy within his diocese. Besides the parochial clergy, or those who supply their place, there is a large body of the secular clergy engaged in education, attending charitable institutions, instructing the poor, &c. Besides these, there are the regular clergy or monastic orders, a very numerous class. The clergy are under a vow of celibacy, not formally made, but implied in their ordination as sub-deacons. The clerical orders are of two classes,—the sacred and minor; the former consisting of sub-deacons, deacons, and priests; the latter of doorkeepers, exorcists, readers, and acolythe. The principal courts of the Church are diocesan synods, composed of the parochial and other clergy of a diocese under a bishop; the provincial synods, consisting of the bishops of a province under the metropolitan; and a general council, composed of all the bishops of the Church, who may attend either in person or by deputy, under the presidency of the pope or his legates. One of the principal doctrines of the Roman Catholic Church is its own infallibility; hence the obligation of receiving implicitly its doctrines independently of one's own private judgment; and hence, too, the authority of tradition, having, as they say, been handed down uncorrupted from the time of the apostles. The Catholics thus receive the Holy Scriptures as explained and interpreted by the Church in her traditions, acts of councils, decretals, &c. They believe in seven sacraments instituted by Christ, and necessary for salvation, though not every one for each; namely, baptism, confirmation, the eucharist, penance (including contrition, confession, and satisfaction), extreme unction, holy orders, and matrimony. They believe that in the eucharist, the bread and wine are really, truly, and substantially changed into the body and blood of our Lord, which change is called "transubstantiation." They regard the mass as a true, proper, and propitiatory sacrifice to God for the living and the dead. They believe in purgatory, and that the souls therein are benefitted by the prayers of the faithful; that the saints with Christ are to be honoured and invoked, and that they offer up prayers to God for us; that images of Christ, the Virgin, and other saints, are to be had in the churches, and due honour and veneration given to them, and that the relics of saints are to be had in veneration; that the power of indulgences was left by Christ in his Church, and that the use of them is very salutary to Christian people. The holy Catholic and Apostolic Church of Rome they acknowledge to be the mother and mistress of all churches, and that out of her no one can be saved. Roman Catholicism has still a vast number of adherents in all parts of the world, estimated to amount to about 165,000,000. In Europe, Italy, Spain, Portugal, France, Belgium, Austria, Poland, Hungary, Bavaria, and the Rhenish provinces of Prussia, are Roman Catholic. In America, all the countries which once formed part of the Spanish dominions; the empire of Brazil; the West-India islands belonging to Spain or France; Lower Canada; many tribes of Indians in North and South America, are, for the most part, Roman Catholic; many of whom are also to be found in the United States. In Asia, there is hardly any nation professing Christianity which does not contain large communities of Catholics. In Africa, the islands of Mauritius and Bourbon are Catholic, as are the Portuguese settlements on the coasts, as well as the Azores, Madeira, the Cape Verd and the Canary Islands. It may perhaps be correct to say that the numerical power of the Roman church is at present as great as ever it was before the Reformation; but never since that period has it possessed the same influence over the minds of men, over the rulers of nations, that it had before. The spell was then broken.—*Ref.* Mosheim, Neander, and Giesseler's *Church Histories*; Ranke's *History of the Popes*; Elliot's *Roman Catholicism*; Riddle's *History of the Papacy*; Marsden's *History of Christian Churches*.

ROMAN CATHOLIC EMANCIPATION ACT.—A famous measure passed on the 13th of April, 1829, by which all the laws against Roman Catholics in this realm were repealed. Up to that period the laws affecting Roman Catholics were very severe, and rose quite as much from





political tyranny as from religious rancour and fanaticism. The Emancipation Act itself was also effected by a change in the political rather than in the religious views of the ruling party. Penal laws existed by which a Roman Catholic priest could be transported if he celebrated matrimony between two persons, knowing that both or either was of the Protestant religion. No Catholic could sit in the House of Peers or in the House of Commons. No Catholic could vote for a member of parliament. No Catholic could hold a corporate office. In James I.'s reign, Catholics were prohibited from practising physic, or of exercising the trade of apothecary. In William III.'s reign, they were prohibited from keeping any horse of a value exceeding £5. Under George I., they were prohibited from keeping schools, or procuring the education of children at home. Perhaps, however, the most demoralizing enactment of all was that which justified a son, conforming to the established religion, to force his parent to surrender his estate under an allowance. The subject of Catholic Emancipation began to be taken up warmly by the press about 1813; and, a Catholic association was formed to prepare petitions to parliament. Daniel O'Connell rapidly became a leading power, and the subject was felt to be of so much importance, that Sir Francis Burdett introduced a relief bill as early as 1825. It passed through the Commons with a majority of 27 in a house of 509. The bill was, however, rejected by the Lords. O'Connell's return for Clare, notwithstanding the oaths which precluded him from taking his seat in the house, was followed by other events in rapid succession, till the 5th of March, 1829, when Mr. Robert Peel brought forward the Catholic Emancipation Bill. This time it passed through the Lords with a majority of 106.

ROMANCE, *ro-mánz'* (Ital. *romanzo*, Fr. *roman*), originally signified any composition in the Romance language, or dialects which superseded the Latin after the fall of the Western empire; but as, in the course of time, the *Troucères* of France composed a number of poems containing fictitious narratives of love and war, and their lays became popular all over France and the neighbouring countries, the name of romance was applied to all compositions, whether in verse or prose, in any language, which treated of marvellous or uncommon incidents, and the name has been retained to this day in several European languages; the Italians and French, for instance, calling a novel *un romanzo*, *un roman*; but the French call an historical ballad *une romance*, in the feminine gender. The distinction between a romance and a novel may be briefly described as follows. A *romance* is a fictitious narrative, in prose or verse, the interest of which turns upon marvellous or uncommon incidents; whilst the novel is a fictitious narrative, the events of which are accommodated to the ordinary train of human affairs and the modern state of society. The earliest *romances* known to exist are short narratives or ballads, which were probably sung on solemn or festive occasions, recording the deeds and praises of some famed champion of the tribe and country, or perhaps the history of some remarkable victory or signal defeat, calculated to interest the audience by the associations which the song awakens. The song on the battle of Brunnanburgh, preserved in the Saxon Chronicle, is a genuine and curious example of this aboriginal style of poetry. It must be observed that at as early a period as the 8th century, a distinction existed between what may be called the *temporal* and the *spiritual* romances; the first destined to the celebration of worldly glory, the second to recording the deaths of martyrs and the miracles of saints. Most nations possess, in their early species of literature, specimens of both kinds of romance; but the proportion of each, as might naturally be expected, differs according as the genius of each nation leaned towards devotion or military enterprise. Thus, of the Saxon specimens of poetry which manuscripts still afford us, a very large proportion is devotional, whilst there are very few indeed of those respecting warfare or chivalry. On the other hand, the Norman language, though rich in examples of both kinds of romances, is particularly abundant in that which relates to battle and warlike adventure. Still, however different the spiritual romance might be from the temporal in scope and tendency, the nature of the two compositions did not

otherwise greatly differ. The structure of verse and style of composition was the same, and the induction, even when the most serious subject was undertaken, exactly resembled that with which minstrels introduced their idle tales, and often contained allusions to them. The vast subject of romantic literature, in its general and more extended sense, may be divided into the following branches:—1. Romantic ballads and traditional songs, which appear to be the oldest form, and which have existed amongst most nations in their primitive state.—2. The narrative romances of chivalry concerning the deeds of Arthur and the peers of the round table.—3. The romances concerning the supposed wars of Charlemagne against the Saracens.—4. The Spanish and Portuguese romances concerning the fabulous exploits of Amadis and Palmerin.—5. The classic romances concerning Jason, Hercules, and Alexander; those heroes having been transformed into knights of chivalry.—6. The epic romances of the Italians in the 15th and 16th centuries.—7. The spiritual or religious romances concerning the miracles of saints and the death of martyrs; such as the "Contes dévots" of the French, the "Golden Legend," &c.—8. The pastoral romance, which Cervantes ridiculed, and which afterwards gave rise in the 17th century to the interminable and dull romances of Madame de Scudery and others, in which perfection of beauty and pure spiritual love are the chief ingredients.—9. The comic romances, which were written chiefly as parodies of the heroic and chivalrous romances; such were those of Rabelais, Mendoza, Scarron, &c.—10. The political romances, such as "Télémaque," "Icthos," &c. (*See* Novel.)

Romanesque Architecture, *ro-min-esk'*, a term applied to several styles of architecture by various writers. The most useful and consistent application appears to include all the various kinds of building which originated from the Roman and which appeared after the decline of art in that country, but with this distinction, that they still retain the semicircular arch. Under this general title will therefore be included the debased Roman, the Byzantine, Lombardic, Saxon, Norman, and the several varieties of the same class. For further information, *see* the articles referring to the above styles of architecture.

Roman Language and Literature. (*See* Latin Language and Literature.)

Roman School of Painting. (*See* Painting.)

Romans, *Epistle to the*, is one of the books of the New Testament, written by the apostle Paul, and addressed to the Christian church at Rome. It is the fifth in order of time, though placed first among the epistles, either from the predominance of Rome, or because it is the longest and most comprehensive of the apostle's epistles. It is generally agreed to have been written about A.D. 58, after he had passed through a lengthened period of experience. That it is the genuine and authentic production of the apostle has rarely been called in question, and is supported by the strongest evidence. It was written from Corinth, and sent to Rome by one Phœbe, a servant or deaconess of the church at Cenchres. The occasion of it was, doubtless, the disputes that began to prevail among the Christians at Rome. The church there was composed of both converted Jews and Gentiles, and the former, attached to the Mosaic institutions, were desirous of imposing upon their Gentile fellow-worshippers many of the Mosaic rites and ceremonies, especially that of circumcision. The Gentiles, on the other hand, despised the prejudices of the Jews; and hence the divisions and contentions among them which called forth the admonitions and cautions contained in this epistle. His object clearly is to restrain the presumption of both parties, by showing that neither could pretend to merit, or had reason to glory or boast of their calling, which proceeded from the mere grace and mercy of God. He lays down the grand position that the gospel is the power of God unto salvation to every one that believeth, to the Jew first and also to the Gentile. He opens his argument by a clear statement of the obligations which mankind are under to God their Creator, as manifested in the works of creation, and of the deplorable condition of the gentile world, who had apostatized from him (ch. i.). He then proceeds to evince that though the Jews were blessed with a written revelation of the Divine will, they had treated it in much the same way that the Gentiles had done the law of nature (ch. ii.); hence he infers the universal sinfulness of both Jew and Gentile, and the consequent impossibility of any of the fallen race of Adam being justified by their own obedience (ch. iii.). He then proceeds to exhibit the revealed way of deliverance, through the redemption effected by the Son of God, and the doctrine of justification by faith in his blood, which he proves and illustrates very fully (ch. iv., v.). He next shows that this way of justification by faith in the blood of Christ is intimately connected with sanctification and evangelical obedience (ch. vi.); expatiates on the inefficiency of the law, compared with the gospel, to aid the believer in his experience and conflicts (ch. vii.); and from a review of the exalted privileges of Christians, and the motives and aids to holiness thence derived, he leads our reflections back to the source of all these spiritual blessings, which he traces to the eternal gratuitous election and sovereign love of God (ch. viii., ix.). Having stated, proved, and answered objections to his doctrine, and discussed several questions respecting the calling of the Gentiles and the rejection of the Jews (ch. x.), he foretells the ultimate conversion of both to Christianity in the millennium, and closes his great argument with a wful adoration of God's magnificent designs, and practical improvement of the whole discourse by various exhortations, instructions, and precepts (ch. xi.). In chapters xii.—xv. the apostle particularly gives the rules of Christian morality, and advice concerning mutual harmony, mutual forbearance, and reciprocal condescension to infirmities, for fear of scandalizing or offending one another by indiscreet liberties. He describes false teachers, and exhorts believers to avoid them. The last chapter (xvi.) contains salutations and commendations addressed to particular persons. The last chapter appears to have been added, at later and different times, to the epistle, probably while waiting for an opportunity of sending it off; but there is no reason for supposing, as some do, that it is by another hand. In order fully to understand this epistle, it is necessary to read at least the first eleven chapters at once, uninterruptedly, keeping in view at the same time the characters and circumstances of the two parties addressed. "It is a writing," says Dr. Macknight, "which for sublimity and truth of sentiment, for brevity and strength of expression, for regularity in its structure, but above all, for the unspeakable importance of the discoveries which it contains, stands unrivalled by any mere human composition; and as far exceeds the most celebrated writings of the Greeks and Romans, as the shining of the sun exceeds the twinkling of the stars." Numerous commentaries have been written on this book, and more particularly would we refer to those of Moses Stuart, Tholuck, Knight, Pardue, and Brown.

Rondo, or Rondeau, *ron-do'* (Fr.), a musical composition, either vocal or instrumental, consisting of three strains, the first of which closes in the original key, while the others are so constructed with respect to modulation, as to reconduct the ear easily and naturally to the first strain.

Roof, *roof* (Sax. *hrof*), in Arch., the cover or top of a building, generally consisting of two sloping sides, though occasionally of other figures. Roofs were made quite flat by the Egyptians, Babylonians, Persians, and other eastern nations. The first people who seem to have made roofs sloping each way from the middle to the edges were the Greeks. The declination, however, was very gentle. In northern climates, subject to heavy falls of rain or snow, the ridge must be very considerably elevated. In most of the old buildings in Britain, the equilateral triangle appears to have been looked upon as the standard, both in public and private buildings, and so continued till Gothic architecture fell into disuse. High-pitched roofs have some advantages; they discharge rain with greater facility, the snow continues for a shorter time on their surface, and they are less liable to be stripped in heavy winds. Low-pitched roofs require large slates and great care in construction; they have, however, the advantage of being much cheaper, since they require shorter timbers, and much less scantling. When executed well, the roof is one of the principal

ties to a building, as it binds the exterior to the interior walls, and to the partitions.

**Rook**, *rook* (Sax. *hroc*), (*Corvus frugilegus*).—This well-known gregarious and familiar bird, which is to the inhabitants of well-cultivated countries the most interesting of the whole family of the *Corvidæ*, is spread over the greater part of Europe, but is nowhere more abundant than in Great Britain and Ireland. Wooded and cultivated districts are its favourite haunts. There are few in the more northern parts of Scotland, none in Orkney and Shetland, and they do not appear to be numerous either in Denmark, the southern districts of Sweden, in Russia, or Northern Asia. In Italy it is common and permanent, and abounds in France; but it appears to be migratory over a part of the continent of Europe. The rook is about twenty inches *long*, and forty in the stretch of the wings. It is distinguished from the raven and the crows by having a bill of an entirely different character from theirs, it being nearly straight, and having much less of the predatory character. Its bill is bluish-black, with a portion of the skin at the base bare of feathers in the full-grown birds, and covered with a scaly scurf of a whitish colour; but in the young birds this portion is covered with feathers, which are projected a little way over the base of the bill. The whole of the plumage is black, but glossed with reflections of purple, violet, and blue, which are very rich and beautiful when the bird is in good condition. The legs and claws are also generally of a black colour. Specimens, are sometimes, but rarely, met with which are white, piebald, or yellowish. Every spring the rooks resort to breed on the same trees, preferring the loftier branches, and building sometimes ten or twelve nests, which : : one above another on the same tree, whilst a gre : many trees, thus furnished, occur in the same forest, or rather in the same district, and form what is called a *rookery*. As soon as rooks have finished their nest, and before they lay, the males begin to feed the females, and continue to do so through the whole season of incubation. The stick-built nest contains four or five pale greenish eggs, blotched with dark greenish-brown. Both the male and female are very assiduous in feeding their young, and the skin under the tongue may, at this season, be often seen dilated into a kind of pouch by the collected food. Grain and insects especially form the food of the rook, and it repays the farmer for the seed by the assiduity with which it clears his land of wireworms and the larvæ of the cockchafer.

**Root**, *root* (Dan. *rod*), in Bot., the descending axis, or that portion of the axis of the plant which passes at its first development in an opposite direction to the stem or ascending axis. The extension of this organ is effected by the addition of new matter, not at its base, or point of junction with the stem, but at that portion which adjoins the apex. Roots are usually subterranean; but some merely float in water, and others hang loosely in the air. They have no leaves, and generally no buds, and they appear to divide and subdivide irregularly, unlike stems, which always ramify in a symmetrical manner. There are two classes of roots,—the *primary* or *true*, and the *secondary* or *adventitious*. The primary root is produced by the direct elongation of the radicle. The part where the stem and primary root unite is termed the *collum*, or *neck*; the portion of the latter organ adjoining this is called the *base*, and the opposite extremity the *apex*. The secondary root does not proceed from any definite point, and its development may be said to depend upon favourable external circumstances. The branches from a primary root, and the roots produced from the different modifications of the stem—as the rhizome, the sucker, and the runner—are all of the secondary class. (*See* Adventitious and Aerial Roots.) According to the duration of their existence, all roots have been divided into *annual*, *biennial*, and *perennial*. Annual roots are produced by those plants which spring from seed, flower, and die in the space of one year; as the oat and the balsam. Biennial roots are those of plants which live two years; as the carrot and the turnip. Perennial roots are those of plants which live for many years; in some such plants, as the dahlia and orchis, the roots are the only perennial portions, the stems dying every year. The root assumes various forms, which are distinguished by special terms in descriptive botany. When the central axis of a plant goes deep into the ground without dividing, a *tap-root* is produced; the root of the common stock illustrates this generic form. If, instead of descending in a direct line, the tap-root takes a crooked course, it is said to be *contorted*, or *twisted*, as in the bistort; if it ends abruptly, as though bitten off, it is termed a *truncated* or *præmorse* root, as exemplified in the devil's-bit scabious. The *conical* root may be described as a tap-root, rather broad at the base, and tapering towards the apex; the roots of the horseradish, parsnip, and carrot, are familiar examples. The *fusiform* or *spindle-shaped* root is another variety of the tap-root. It swells out a little below the base, and tapers upwards and downwards: it is seen in the common radish. The *napiform* or *turnip-shaped* root has a globular form, being much swollen at the base: the common turnip is its type. When the descending axis is very short, and at once divides into slender branches or rootlets, a *fibrous* root is produced, as in many of the grasses. When the branches are short and fleshy, as in the dahlia, the root is said to be *fasciculated*, and when some of the divisions are so swollen as to become egg-shaped, as in many orchids, and especially in the jalap-plant, the root is *tuberculated*. To roots which expand only at certain points, the terms *moniliform*, *annulated*, and *necklace-shaped*, have been applied. A few other forms have received separate names, but they are unimportant.

**Rope Manufacture**, *rope* (Sax. *rap*), the process of twisting together several strands or strings of hemp, so as to form a flexible and tenacious cord or band. The term rope is usually applied to all cordage above one inch in circumference, made of hemp spun into yarns or threads of a certain length. In rope-making by hand, the first part of the process is that of spinning the threads or yarns, which is effected in a similar manner to that employed in ordinary spinning. Round his waist the spinner carries a bundle of dressed hemp, the two extremities of the bundle being in front. After drawing out a number of the fibres with his hand, he twists them with his fingers, and then attaches the twisted portion to a whirl, which is driven by a wheel, set in motion by an assistant. The spinner then walks backwards down the rope-walk, the twisted part of the hemp serving to draw out more fibres from the bundle round his waist. The principal care of the spinner is to see that the fibres are equally supplied, and that they always enter the strand by their ends, and not by the middle. On reaching the termination of the rope-walk, another spinner takes the yarn off the whirl and transfers it to another person, who puts it on a reel, while he himself attaches his own hemp to the whirl. When the reel to which the first spinner's yarn is fixed is turned, he holds the yarn firmly at one end, and proceeds slowly up the walk, winding the yarn regularly and compactly on the reel. He then waits till the second spinner's yarn is removed from the whirl, when the two ends are joined, in order that one may follow the other in the reel. The next process is that of warping or stretching the yarns to one length, which is generally about 200 fathoms, and also in putting a slight turn or twist in them. The yarn is next tarred; and the last process consists in laying the cordage. In order to effect this, two or more yarns are attached at one end to a hook. The hook is then turned in a contrary direction from the twists of the individual yarn, thus forming a *strand*. Besides a central one, three strands, and sometimes four, are then stretched at length, and attached at one end to three separate hooks, and at the other end to a single hook. By turning the single hook in a contrary direction to the other three, the strands are made to combine together, the progress of the twists of the strands being so regulated that the three strands individually receive at the opposite ends exactly as much twist as is taken out of them during the process of combination, by their twisting the contrary way. There are two classes of large ropes, which are called respectively *cable-laid* and *hawser-laid*. The former consists of nine strands, or rather of three strands, each of which is composed of three smaller strands, containing an equal number of primitive yarns or threads. A hawser-laid rope consists of three strands, each composed of a number of

primitive yarns, according to the size of the rope. It is generally calculated that 36 fathoms of yarn are equivalent in length to 18 fathoms of rope cable-laid, and to 20 fathoms hawser-laid. Ropes are often formed by *plaiting* instead of twisting, where great pliability is required; as for sash-lines or clock-lines, or generally where ropes have to pass over small pulleys. For mining purposes, flat ropes are frequently used. They are generally formed of two or more small ropes, pieced side by side, and united by sewing, lapping, or intertwining with thread or smaller ropes. The Rev. E. Cartwright, in 1792, first invented a rope-making machine, which he called a *cordelier*. This piece of mechanism did not excite much attention till 1805, when it was partly incorporated in some rope-making machinery invented by Captain Joseph Huddart. This machinery was introduced into the royal dockyard at Chatham, and it was found that three of the machines were able to provide sufficient cordage for the British navy. For a full description of Huddart's rope-making machinery, the reader is referred to a paper by Mr. John Miers in the fifth volume of "Papers on Subjects connected with the Duties of the Corps of the Royal Engineers," 4to, London, 1844. Since the date of Huddart's invention, many patents have been taken out for rope-making machines. The manufacture of *wire-ropes* has of late years become a most important one. Ropes of this description are not only used in most of the extensive coal-mines of this country, but for winding generally, for the standing rigging of ships, and for numerous ordinary purposes. One of the most important uses of wire rope has been in the construction of electric cables.

Rosa, *ro'-zā* (*Gr. rhodon*, a rose), in Bot., the Rose, a gen. of the nat. ord. *Rosaceæ*. The species and varieties are well known for the beauty and fragrance of their flowers. They are shrubs ranging from one foot to six or eight feet in height. The flowers in the wild species are usually single, but in the cultivated varieties semi-double or double. The colours are red, white, purple, and rarely yellow, in numberless shades and mixtures. Botanists are not agreed as to the number of original species of *rosæ*; formerly all the European roses were supposed to have a common origin, but they are now generally regarded as the descendants of numerous distinct species. *R. gallica*, a native of the south of Europe, is the species from which the greater number of garden varieties have been developed, particularly those with dark red and purple petals. *R. damascena*, the damask rose, a native of the Levant, is another prolific species, having given the florist some lovely blush, white, and red roses. The so-called monthly roses, the earliest to flower, are varieties of this species. The British species *R. spinosissima*, or Scotch rose, is the source of numerous choice double roses, blush, red, marbled, white, and yellow. *R. centifolia*, the hundred-leaved Provence, or cabbage rose, a native of the south of Europe, is known under from fifty to sixty varieties, of which the beautiful moss-rose is an especial favourite. *R. indica*, the Chinese rose, *R. semperflorens*, the ever-blowing rose, and other species from China, have also yielded beautiful varieties under the hand of the florist. In the culture of roses, much use is now made of the Dutch invention of forming standards, by budding on hardy woody stocks of the dogrose, *R. canina*, or the tree-rose, *R. villosa*. The standards are budded at different distances from the ground, according to taste and the purposes in view, and form, after a few years, handsome round heads, which flower freely and preserve the variety a longer time than in plants raised from cuttings or layers. They are particularly valuable for shrubberies and lawns, where the culture of the root required by dwarf roses could not be given, and, if omitted, would occasion the degeneracy of the variety. New varieties of the rose are obtained from seed; but the usual mode of propagation is by layers. All will grow by cuttings, and some, as *R. sempervirens*, freely; but this mode is seldom resorted to. For preserving delicate varieties, the best plan is decidedly that of budding on hardier sorts. Most species of the rose in the wild state grow in sandy and rather poor soil, except such as are confined to woods, where the soil is comparatively rich and moist; but all cultivated roses, and especially the double-flowered kinds, require a rich loamy soil, inclining to clay rather than sand. The species *R. rubiginosa*, or sweetbrier, so remarkable for its sweet-scented foliage, is a native of Britain. The dogrose or brier, *R. canina*, is the commonest British species, being found in hedges and thickets in most parts of England, Ireland, and Scotland. The fruits commonly called *hips* are employed in medicine for their refrigerant and astringent properties. The dried petals of the unexpanded flowers of *R. gallica* constitute the *red-rose leaves* of the shops; they are used medicinally as mild astringents and tonics. *Rose-water* is prepared by distilling the fresh petals of *R. centifolia*, with water to which a little spirit of wine has been added. The mode of obtaining the fragrant volatile oil of roses is described in an early part of this work. (*See* Attar of Roses.)

Rosaceæ, *ro-zā'-se-e*, in Bot., the Rose fam., a nat. ord. of *Dicotyledones*, sub-class *Calycifloræ*, having the following essential characters:—Trees, shrubs, or herbs, with alternate leaves and regular flowers. Calyx 4—5-lobed; when 5, the odd lobe posterior. Petals 5 or none. Stamens perigynous, distinct; anthers 2-celled. Carpels 1 or more, usually distinct, or sometimes united, generally superior, or occasionally more or less inferior. Seeds 1 or few, exalbuminous; embryo straight. Professor Bentley divides the order into five sub-orders as follows:—

Sub-ord. 1, *Chrysobalaneæ*.—Trees or shrubs, with simple leaves and free stipules. Carpel solitary, cohering more or less on one side with the calyx; ovules 2, erect; style basilar. Fruit a drupe. Seed erect. Example: *Chrysobalanus*.

Sub-ord. 2, *Amygdaleæ* or *Drupaceæ*.—Trees or shrubs, with simple leaves and free stipules. Calyx deciduous. Carpel solitary, not adhering to the calyx; style terminal. Fruit a drupe. Seed suspended. Examples: *Amygdalus, Prunus, Cerasus*.

Sub-ord. 3, *Roseæ*.—Shrubs or herbs, with simple or compound leaves, and adherent stipules. Carpels 1 or more, superior, not united to the tube of the calyx, distinct or sometimes more or less coherent: styles lateral or nearly terminal. Fruit either an etærio, or consisting of several follicles. Seed usually suspended, or rarely ascending. Examples: *Rosa, Rubus, Fragaria*.

Sub-ord. 4, *Sanguisorbeæ*.—Herbs or undershrubs. Flowers often unisexual. Petals frequently absent. Carpel solitary; style terminal or lateral. Fruit an achenium inclosed in the tube of the calyx, which is often indurated. Seed solitary, suspended or ascending. Example: *Alchemilla*.

Sub-ord. 5, *Pomeæ*.—Trees or shrubs, with simple or compound leaves and free stipules. Carpels 1 to 5, adhering more or less to each other and to the sides of the calyx, and thus becoming inferior; styles terminal. Fruit a pome, 1—5-celled, or rarely spuriously 10-celled. Seeds ascending. Examples: *Cydonia, Pyrus, Crataegus*.

By some botanists the above sub-orders are considered to be distinct nat. orders. The order *Rosaceæ* comprises about 90 genera and 1,000 species, of which about one half belong to the sub-ord. *Roseæ*. The *Chrysobalaneæ* are principally natives of the tropical districts of America and Africa. The *Amygdaleæ* and *Pomeæ* are confined to the cold and temperate regions of the northern hemisphere. The *Roseæ* and *Sanguisorbeæ* are chiefly natives of cold and temperate climates, though a few flourish within the tropics. The plants of the order are remarkable for their astringent properties, and for their succulent edible fruits (peaches, plums, cherries, raspberries, strawberries, apples, pears, &c.). The seeds, flowers, leaves, and young shoots of many of the *Amygdaleæ* and *Pomeæ*, when moistened with water, yield hydrocyanic acid; hence the parts of such plants are sometimes poisonous. All other *Rosaceæ* are entirely devoid of poisonous properties.

Rosaniline, *rose-an'-e-leen*, an alkaloid derived from aniline by the action of certain ordinary agents upon that body. Rosaniline is the base of the magnificent crimson dye known as "magenta," and is generally manufactured commercially by acting on crude aniline with dry arsenious acid. The salt used in dyeing is the acetate, which is the most soluble of them all. The

alkaloid itself is colourless, but the slightest touch of the weakest acid is sufficient to produce the brilliant crimson now so well known. The salts of rosaniline are all remarkable for the facility and beauty with which they crystallize the acetate, especially forming magnificent crystals, which exhibit, by reflected light, the splendid green and gold metallic lustre seen on the wings of the rose-beetle. The crowns of this beautiful salt exhibited at the International Exhibition will be fresh in the reader's recollection. All the salts, when crystallized, exhibit a similar appearance. Rosaniline has been chemically examined with great care by Dr. Hofmann, who states its formula to be $C_{20}H_{19}N_3$.

ROSARY, *ro'-zé-re* (Lat. *rosarium*, a rosebed), among Roman Catholics is a string of beads employed by them to count their prayers. It consists of fifteen large and one hundred and fifty small beads, intermixed, the large ones being for the Paternosters, the small ones for the Ave-Marias. It is said by some to have been instituted by St. Dominic, but others give it a higher antiquity.

ROSE. (*See* ROSA, ROSACEÆ.)

ROSE-APPLES. (*See* EUGENIA.)

ROSE-BEETLE (*Cetonia aurata*), a common coleopterous insect, about three-quarters of an inch in length, and of a bright green, and sometimes copper-like colour, with two white irregular fasciæ towards the latter part of the elytra, and extending from the side inwards. It feeds upon rotten timber when in its larva state, and is frequently found in ants' nests, where it seems to feed on the pieces of wood of which they are composed. As a perfect insect, it is seen very commonly in the south of England flying about in the sunshine in the months of May and June, frequently settling on roses, the leaves of which it greedily devours.

ROSEMARY. (*See* ROSMARINUS.)

ROSE OF JERICHO. (*See* ANASTATICA.)

ROSES, WARS OF THE, a term applied to the civil wars which occurred in England between the reigns of Henry VI. and Henry VII. The two contending factions were the houses of York and Lancaster; the ensign of the former was a white rose, and that of the latter a red one; circumstances which gave the name to the wars which from 1460 to 1486 deluged the kingdom with blood.

ROSETTA STONE, *ro-zet'-tà* (so called from Rosetta, a village of Egypt, where it was discovered), is the name of a celebrated stone found by the French in Egypt in 1799. On the capitulation of Alexandria, it came into the hands of the British, and was brought to England in 1802; being now in the British Museum. It is of black basalt, and the surface is about three feet in length by about two and a half in breadth; but it is much mutilated. It contains three (or rather parts of three) distinct inscriptions,—in hieroglyphic characters, in enchorial, or the characters of the country, and in Greek; and is celebrated for the light which it has thrown on the ancient hieroglyphics, by affording a comparison with the Greek. Unfortunately, however, the Greek only gives the substance of the inscriptions, and the hieroglyphical portion is much mutilated. It bears to have been erected by Ptolemy Epiphanes (B.C. 193), and narrates his deeds, his piety, liberality, victories, &c. (*See* HIEROGLYPHICS.)

ROSEWOOD. (*See* TRIPTOLOMEA.)

ROSICRUCIANS, *ro'-se-kru'-she-ans*, the name of a sect of philosophers, called hermetical philosophers, who were members of a secret society, which arose, or at least first became conspicuous, in Germany in the beginning of the 14th century. The existence of this society first became known to the public in the 17th century, by means of several publications which have been attributed to John Valentine Andreæ, a German scholar, born in 1586, who was a man of a mystical turn of mind, and had conceived the idea of effecting a general reform of mankind. He wrote many works, chiefly on mystic subjects. One of them, entitled *Fama Fraternitatis des löblichen Ordens des Rosenkreutz*, describes how a certain Christian Rosenkreutz, a German noble of the 14th century, after travelling long in the East, returned to Germany, and there established a fraternity or secret society of a few adepts, under certain regulations, living together in a building which he raised under the name of Sancti





Spiritus, where he died at the age of 106 years. The place of his burial was kept a profound secret by the adepts, and the society renewed itself by the admission of successive new members, in silence and obscurity, according to the last injunction of its founder. The Rosicrucians appear to have pretended to know all sciences, and chiefly medicine, of which they professed themselves the restorers. They also asserted that they were masters of important secrets, and amongst others, that of the philosopher's stone, all which they affirmed that they had received by tradition from the ancient Egyptians, Chaldeans, the Magi, and Gymnosophists. They have been distinguished by several names, accommodated to the branches of their doctrines. As they pretended, for instance, to protract the period of human life by means of certain nostrums, and even to restore youth, they were called *Immortales*; as they pretended to know all things, they were called *Illuminati*; and because they have made no appearance for some time, they have been called the *Invisible brothers*. Their society is frequently signed by the letters F. R. C., which by some are translated *Fratres Roris cocti* (Brothers of Concocted Dew), because it was pretended that the matter of the philosopher's stone is dew concocted or exalted. Others have asserted that the name is derived from the arms of the reformer Luther, which were a cross placed upon a rose. Some writers on the subject maintain that the Rosicrucians are but a branch or affiliation of the Freemasons.

ROSMARINUS, *ros-ma-ri'-nus* (Lat. *ros*, dew; *marinus*, bordering on the sea), in Bot., the Rosemary, a gen. of the nat. ord. *Labiatæ*. *R. officinalis*, the common rosemary, is a well-known herb, formerly much used in domestic medicine as a remedy for the headache. It was supposed to have the power of strengthening the memory; hence the allusion of the poet:—"There's rosemary, that's for remembrance." The flowery tops contain a volatile oil, which imparts to them stimulant and carminative properties. These are, however, seldom used medicinally at the present time, but are largely employed in perfumery. The flavour of Narbonne honey is said to be due to the bees feeding on the flowers of this plant. The dried leaves are occasionally used by country folk as a substitute for China tea. *Rosmarinus* is so called because, growing on the shore, it is said to appear early in the morning like dew.

ROT, DRY. (*See* DRY ROT.)

ROTATION OF CROPS, *ro-tā'-shun* (Lat. *rotatio*), the order in which different crops are made to succeed each other. Some crops exhaust the soils on which they grow much less than others, as is the case with many of what are termed *green* crops, when compared with the *white* or *corn* kind; it therefore becomes highly advantageous to alternate them. It is also well known to farmers that certain kinds of green crops are well suited, by the shade of their leaves and the sort of culture they require while growing, for keeping the ground clear from weeds, and in a mellow and suitable state for more valuable crops of grain. The importance of a scientific rotation of crops did not attract the attention of farmers till the middle of last century. In agriculture, the rotation of crops is now looked upon as a matter of vast importance, and great improvements have been made in it within the last century. The ordinary course under which the light lands of England are commonly cultivated is either on what is called the four-course or shift system, or five-course or shift. The *four-shift* system generally consists of fallow, manured; 1. turnips, fed off; 2. oats or barley; 3. grass-seed; 4. wheat. In the *five-shift* system, which in many situations is the more advantageous method, the course is commonly fallow; 1. turnips; 2. oats or barley; 3. clover; 4. peas; 5. wheat. On clays and other soils the course varies exceedingly.

ROTATORIA, *ro-tā-to'-re-ā* (Lat. *rota*, a wheel), a fam. of the *Infusoria*, which has the mouth surrounded by a corona of vibratile hairs, which represent a kind of wheel. (*See* ROTIFERA.)

ROTIFERA, *ro-tif'-e-rā* (Lat. *rota*, a wheel; *fero*, I bear), wheel-animalcules, a class of animals placed by Ehrenberg among the *Infusoria*, under the name *Rotatoria*. They have acquired these names on account of the apparent rotation of the wheel-like organs which

surround their mouths, and which are covered by cilia. They are extremely minute, but some of the larger forms can be seen with the naked eye. Their existence, however, was first discovered by Leeuwenhoek. He first gave a description of their structure and habits in the "Philosophical Transactions" for 1702. The *Rotifera* are very widely diffused on the surface of the earth. They inhabit both salt and fresh waters, and are found in the cold, temperate, and tropical parts of the earth. Although capable of swimming freely, they are generally found near or attached to the leaves of plants. They have no true circulating or respiratory organs, though in most of the species minute vessels can be seen which terminate in blind sacs or cæca.

ROTTLERA, *rot-lo'-rä* (after Dr. Rottler, a Danish missionary), in Bot., a gen. of the nat. ord. *Euphorbiaceæ*. The fruit of *R. tinctoria* is covered by a red powder, which has long been employed as a dye for silk: it produces, with suitable mordants, a beautiful orange or flame-colour. It is found in the Indian bazaars under the name of *kamala*, and is known at Aden by the names *warus* or *wurrus*. Kamala is also used medicinally in India as an anthelmintic, and as a remedy for cutaneous diseases.

ROUGE, *rüzhe* (Fr., red).—Jewellers' rouge is made by calcining protosulphate of iron until nothing is left but the anhydrous sesquioxide, which is afterwards submitted to fine levigation. It is extensively used for polishing glass and for cleaning polished metal-work. The cosmetic known as rouge is made by mixing carmine with calcined salt in various proportions. In some instances it is replaced by spreading the colouring matter of cochineal or safflowers on thick paper, and is applied to the lips and cheeks with a piece of moistened cotton wool. Common theatrical rouge is made from Brazil-wood, lake, or bole armenian.

ROUNDHEADS, *rownd'-heds*, a name given to the Puritans in England during the time of the civil wars, because they wore their hair cut close; but it was afterwards applied to the whole republican party. The Cavaliers, or royal party, wore their hair in long ringlets.

ROUND-ROBIN (Fr. *rond ruban*), a written petition, memorial, or remonstrance, signed by names in a ring or circle, so as not to show who signed it first. The phrase is also sometimes used to signify an act by which a certain number of persons bind themselves to pursue a certain line of conduct.

ROUND TABLE.—According to tradition, there reigned in Britain, towards the end of the 5th century, a Christian king, the British Uther-Pendragon, who had for a counsellor a powerful, wise, and benevolent enchanter, named Merlin, who advised him to assemble all his knights distinguished for piety, courage, and fidelity towards him, at feasts about a round table, which should be sufficiently large to receive fifty knights, but at which at first only forty-nine should be seated, room being left for one yet unborn. This was Arthur, or Artus, son of the king by Igerne, whom the king by the magic power of Merlin was permitted to enjoy under the form of her husband. Merlin had exacted a promise that the education of the prince should be intrusted to him; and he accordingly instructed him in everything becoming a brave, virtuous, and accomplished knight. Arthur in due time occupied the empty seat at the round table, and under him it became the resort of all valiant, pious, and noble knights; admission to it becoming the reward of the greatest virtues and feats of arms. According to another account, Arthur himself established the round table at York. In the year 1344, Edward III., anxious to attract around him the most noble knights from all parts of Europe, proclaimed, as well in Scotland, France, Germany, Hainault, Spain, and other foreign countries, as in England, that he designed to revive the round table of King Arthur, offering free conduct and courteous reception to all who might be disposed to attend the splendid jousts to be held upon that occasion at Windsor Castle. This solemn festival, which Edward proposed to hold annually, excited the jealousy of Philip de Valois, king of France, who not only prohibited his subjects to attend it, but proclaimed an opposite round table to be held by himself in Paris. In consequence of this





interference, the festival of Edward lost some part of its celebrity and splendour; and this induced the English monarch to establish the memorable order of the Garter.

ROWING, *ro'-ing* (Sax. *rowan*, *reowan*, to row), may be defined as the propulsion of a boat through the water by means of sculls or oars, the water being the fulcrum, the rowlock the weight to be moved, and the hand giving the power. Rowing, as befits a nation whose ancestors were water-bred, is one of the most popular of English sports. Annually, a couple of crews, one from each of the universities of Oxford and Cambridge, contend for the palm of superiority on the Thames. These crews are formed of the most skilful oarsmen the universities can produce. Every year there is holden at Putney the Royal Thames National Regatta, and at Henley the Royal Regatta, at both of which prizes amounting to several hundred pounds are contended for by watermen and amateurs. The gentlemen residing in the metropolis and upon the banks of the Thames enrol themselves, in great numbers, in clubs established for practising rowing as an art. The scholars at Westminster and Eton are taught to handle an oar, and the "Wingfield Sculls," carrying with it the amateur championship of the Thames, is held to be a prize worth contending for by some of the best and most spirited gentlemen athletes of the day. The championship of the Thames, now held by Robert Chambers, a Newcastle oarsman, is an honour eagerly sought after by the best watermen in the United Kingdom. Wherever throughout England there is water accommodation, there, as a rule, is rowing practised as an English sport.

ROXBURGH CLUB, *roks'-burg*, a club which took its name from that of a celebrated bibliomanist, John 3rd duke of Roxburgh. He possessed a library of 9,353 works, particularly rich in old romances of chivalry and early English poetry, which was sold by public auction in London in 1812. The prices paid for some works were enormous. A copy of the first edition of Boccaccio (Venice, 1471, folio) was bought by the marquis of Blandford (duke of Marlborough) for £2,260; and a copy of the first edition of Shakespeare (1623, folio) for 100 guineas. The Roxburgh Club, formed in commemoration of this triumph of bibliomania, celebrated its anniversary on the 17th of June, the day on which the Boccaccio had been sold. One of the members was required every year to be at the expense of the impression of some rare book, of which only copies enough for the club were struck off.

ROXBURGHIACEÆ, *roks-bur-ge-ai'-se-e*, in Bot., the *Roxburghia* fam., a nat. ord. of *Monocotyledones*, subclass *Dicoryogeneæ*. Twining shrubs, with tuberous roots; broad, leathery, net-veined leaves; and large showy flowers. The order includes but one genus, *Roxburghia*, of which there are four species, all natives of the hotter parts of the East Indies.

ROYAL ACADEMY OF ARTS, *roy'-äl*, a corporation instituted in London in 1768, by George III., for the advancement and cultivation of drawing, painting, engraving, sculpture, modelling, and architecture. The first president of the Royal Academy was Sir Joshua Reynolds. It was originally established in Somerset House, but was afterwards removed to Trafalgar Square. The apartments, which comprise the whole of the east wing of the National Gallery, were put into the possession of the Royal Academy in 1836, and they are still occupied by the Academy, although formal notice has been several times given by the government of their intention to resume possession of them, in order to appropriate them to the use of the National Gallery. The Royal Academy consists of forty academicians,—painters, sculptors and architects. There are also twenty associates, forming a second order of members, from whom done are supplied the vacancies among the academicians. In order to make the election of an academician valid, the approbation and signature of the queen is necessary. Besides these two classes, there are six associate engravers, and a treasurer, a librarian, a keeper, and a secretary, all of whom are academicians. There are four professors, who read lectures on painting, sculpture, architecture, and perspective; and a professor of anatomy. There are three schools,—a school for study from casts from celebrated antique works, a

school for study from living models, and a painting school. There are also several honorary members of the Royal Academy, including a professor of ancient history, a professor of ancient literature, a chaplain, an antiquary, and a secretary for foreign correspondence. The other academies of Europe which have been established for the advancement of the fine arts are altogether supported at the expense of their respective governments; as, for example, the Academy of Paris, founded about a century before the Royal Academy. The latter institution is essentially different from all others, as it originated in the munificence of the reigning monarch, and since the first few years of its existence has been entirely supported by the proceeds of an annual exhibition The *National Gallery*, in which the Royal Academy is situated, first originated in the collection formed by Mr. Angerstein, and purchased by order of George IV., as the foundation of a national collection. Amongst other pictures, it cotains the "Vision of a Knight," by Raffaelle; "the Raising of Luzarus," by Sebastian del Piombo; "the Woman taken in Adultery," by Rembrandt; and several beautiful specimens of Cuyp, Vandyck, Annibal Carracci, Claude, Poussin, Rubens, Titian, Domenichino, Correggio, and others. Additions are made to the paintings from time to time.

ROYAL ASSENT. (*See* ASSENT, ROYAL.)

ROYAL HOUSEHOLD.—The principal officers and attendants of the royal household of the sovereign of Great Britain are as follows:—*A private secretary.* —The *keeper of the privy purse*, whose office is, comparatively speaking, newly created, no such thing as a privy purse having been known before the reign of George III. The privy purse is entirely limited to the personal expenses, charities, &c., of the sovereign.— The *lord steward of the household*, whose office is one of great trust, dignity, and antiquity, and whose authority extends over all the other officers and servants except those of the chapel, chamber, and stable; he is also judge of all crimes committed within the court or the verge.— The *treasurer of the household* is the officer next in rank to the lord steward in that department, and has power, with certain other officers, in the lord steward's absence, to judge offenders within the verge of the palace.—The *comptroller of the household* is next to the treasurer, and checks and examines all the accounts of the Board of Green Cloth for the expenses of the household.—The *master of the household* is next to the comptroller; his office is to survey the accounts of the house, and he has a special charge and oversight over the household with regard to their behaviour and the manner in which they perform their duties —The *knight marshal*, or *marshal of the household*, is a deputy to the lord steward, and his duties may be said to be to superintend the police of the palace.—The *lord chamberlain of the household* was formerly intrusted with the responsible duty of indorsing upon all petitions presented to the sovereign his majesty's answers; but his duties are now confined to the superintendence and control of all the officers and servants of the household above stairs, and of the wardrobe and state band; he has also the licensing of dramatic entertainments, besides other duties.—The *vice-chamberlain* is his deputy. —The *lords-in-waiting* are what their name implies; they attend in rotation, form part of the ordinary court of the sovereign, and are present on all state occasions: their appointments are political.—The *grooms-in-waiting* attend in like manner.—The *gentlemen ushers of the privy chamber* are in constant attendance, and conduct the sovereign in the absence of the higher officers.— The *gentlemen of the privy chamber* hold now merely honorary appointments, no services of late years having been required of them.—It may here be remarked, that the office of *groom of the stole* during the present female reign is in abeyance; his authority was exclusive in all matters relating to the bedchamber, and is now possessed by the mistress of the robes. (*See* ROBES, MISTRESS OF.)—The *yeomen of the guard* and the *gentlemen-at-arms* are the ancient guards of the household. The former corps consists of a captain, lieutenant, ensign, four exons, and one hundred yeomen; the latter, whose duties consist of attendance at drawing-rooms, levees, and state ceremonials, consists of a captain, lieutenant, standard-bearer, and forty gentlemen, the latter obtaining their appointments by purchase.—The *master of the horse* is considered the third great officer of the household, and, as his title implies, has the government of the royal stables, horses, &c.—The *clerk marshal* and *chief equerry* has authority next to the master of the horse in the same matters.—The *master of the buckhounds* is another ancient office connected with this part of the household, but his duties are now restricted to the management of the royal hunt. The last-named three offices are political.—There remain to be mentioned four equerries and four pages of honour, who are the personal attendants upon the queen, and form part of the state of her court.

ROYAL INSTITUTION (LONDON), a corporation founded in 1800 by Count Rumford. It was destined primarily for the promotion of original discovery, and secondly for the diffusion of a taste for science amongst the educated classes. The plan of the institution was conceived with the sagacity which characterized Rumford; and its success has been greater than could have been anticipated. Sir Humphry Davy was there first brought into notice; and he and Mr. Faraday have given to the institution a celebrity which has continued without intermission for more than half a century. The Royal Institution is situated in Albemarle Street. It has a very fair library, and the current periodical literature of the day, for the use of the members.

ROYAL MARRIAGE ACT, an act passed in the year 1772, in consequence of the marriage of the duke of Gloucester, the king's brother, with the widow of the Earl Waldegrave, and of the duke of Cumberland with the widow of Colonel Horton, and daughter of Lord Irnham. By this statute none of the descendants of George II., unless of foreign birth, can marry under the age of twenty-five, except with the king's consent; at and after that age, the consent of parliament is necessary to render the marriage valid. The marriage of the duke of Sussex with Lady Augusta Murray, which took place in 1793, was declared illegal, and the claims of their son, Sir Augustus d'Este, pronounced invalid, in 1844, by the House of Lords.

ROYAL SOCIETY OF LONDON, a society incorporated by Charles II. in 1622-3, under the title of "The President, Council, and Fellows of the Royal Society of London for promoting Natural Knowledge." From the time of the charter being granted, the business of the society assumed much importance, and in 1664 Mr. Hooke was elected curator, with a salary of £80 a year. The first number of the "Philosophical Transactions," as the work which the society published was called, appeared in March, 1665. Originally the council met at Gresham House, and continued to prosper till about 1673, when it fell off in numbers. At that time, in order to encourage the society, lectures illustrated by experiments were given. In pursuance of this plan, the first lecture was delivered by Sir William Petty, in 1674. At present every candidate for admission into the society must be recommended by a certificate in writing signed by six or more fellows, of whom three at least must certify that the recommendation is from personal knowledge; and the name, qualifications, &c. of the candidate must be entered in a book kept for the purpose.

RUBBLE, *rub'-bl*, a local term, use by quarrymen and miners for loose angular gravel, or a slightly compacted brecciated sandstone.

RUBEFACIENTS, *ru-be-fai'-she-ints* (Lat. *rubefacio*, I make red), in Med., is a name given to certain substances which, when applied to or rubbed upon the skin, cause redness.

RUBEOLA. (*See* MEASLES.)

RUBIA, *ru'-be-a* (Lat. *ruber*, red), in Bot., a gen. of the nat. ord. *Galiaceæ*. The species *R. tinctorum* is extensively cultivated in France, Holland, and the Levant for the sake of its root, which constitutes the important dye-stuff *madder*. The entire roots are imported from the Levant, and called Turkey roots; the French madders are found in commerce in a state of very fine powder, packed in large casks. In the living state, madder-root contains only a yellow colouring principle, but no less than five distinct colouring matters, called respectively *madder purple*, *red*, *orange*, *yellow*, and *brown*. The first two, which have received the chemical names *purpurin* and *alizarin*, are by far

the most important. Besides being used as a dye-stuff, madder has long been employed in medicine as a tonic and diuretic, and has been regarded as a valuable emmenagogue. The roots of *R. cordifolia* or *munjista*, a native of India, are employed for dyeing in Bengal, and are occasionally imported into this country under the name of *munjeet*. The roots of *R. Relboun* are similarly employed in Chili.

RUBRIC, *roo'-brik* (Lat. *ruber*, red), is applied in a general sense to any writing or printing in red ink, a practice more frequently adopted formerly than now, for the sake of distinction. In this way, titles and matters deserving special notice were set down; and hence, in certain ancient law-books, the titles of the chapters were called rubrics. More particularly is the word applied in the present day to the rules and directions laid down in the Book of Common Prayer, for regulating all matters connected with the performance of divine service. In most editions of the Prayer-Book the rubrics are now printed in Italics.

RUBY, *roo'-be* (Fr. *rubis*).—This term is applied popularly to two distinct minerals,—the pyrope and the spinelle ruby, both of which are much valued as gems. The pyrope is a silicate of magnesia and alumina, with varying admixtures of iron, chromium, manganese, and lime. It occurs chiefly at Zoblitz, in Saxony; at Mittelgebirge, in Bohemia; and at Elie, in Fifeshire. The *spinelle ruby* and its varieties, the orange-red *rubicelle*, and the violet or brown *almandine*, are aluminates of magnesia, with different proportions of iron and chromium. They mostly occur in Ceylon, at Ava, and in other parts of the East Indies.

RUBUS, *roo'-bus* (Lat. *ruber*, red), in Bot., the Bramble, a gen. of the nat. ord. *Rosaceæ*. Several species yield edible fruits. *R. Idæus* is the raspberry plant, a native of these isles, greatly improved by cultivation. Raspberries are either red or amber-coloured, and have an agreeable sub-acid taste: they are much used for preserves and tarts, either alone or mixed with currants. *R. fruticosus* produces the blackberries which children seek with such eagerness in hedges and thickets; *R. cæsius* yields the dewberry; *R. Chamæmorus*, the cloudberry. All these fruits are examples of the *etærio* (which *see*). The root of *R. villosus* is much employed as an astringent in some parts of the American continent.



RASPBERRY.

RUE. (*See* RUTA.)

RULE, *rule* (Sax. *regal*), in Law, is an order of one of the three superior courts of common law. Rules are either general or particular; the former relating to matters of practice, and laid down by the court for the general guidance of the suitors; the latter are such as are confined to a particular case. Of these last, some are "of course," others "on the motion" or application of the party interested.

RULE OF EQUATIONS. (*See* EQUATIONS.)

RUM, *rum*, a spirit distilled from the sugar-cane, that is, from cane-juice, or the scummings of the juice from the boiling-house, or from the treacle or molasses, or from *dunder*, the lees of former distillations. The following is the process employed in Jamaica:—Equal parts of scummings, dunder, and water having been mixed together, fermentation soon begins; and in twenty-four hours the liquor is fit for the first charge of molasses, which is added in the proportion of three gallons for every hundred gallons of the liquor. Another charge is added in a day or two, or afterwards. The heat in fermentation should not exceed 90° or 94°. The fermentation falls in six or eight days, and the liquor grows fine and fit for distillation. In about two hours after lighting the fire, the spirit begins to run (in a still of 1,200 gallons), and it is collected as long as it is inflammable. The first spirit is called *low wines*, and it is rectified in a smaller still to the Jamaica proof, which is that in which olive-oil will sink. The proportion of molasses made in crystallising a cwt. of sugar varies from fifty to ninety gallons, and depends both upon the climate and the season, being lowest in the Leeward Islands, which have a dry climate, and highest in Demerara and Trinidad. Nearly one gallon of proof rum may be made from one gallon of molasses.

RUMEX, *roo'-meks*, in Bot., a gen. of the nat. ord. *Polygonaceæ*, including the different kinds of sorrel and dock. Several species possess acid properties, owing to the presence of oxalic acid, especially *R. Acetosa*, the common sorrel, *R. Acetosella*, *R. scutatus*, and *R. Patientia*. They have been employed as potherbs and for salads. In France the first species is largely cultivated, a sauce made from it being a regular addition to many dishes. It is sometimes used medicinally for its refrigerant, diuretic, and antiscorbutic properties. The root of *R. Hydrolapathum*, the great water-dock, is astringent and antiscorbutic; that of *R. alpinus* is purgative, and was formerly used as a substitute for rhubarb, under the name of *monk's rhubarb*.

RUMINANTS, *roo'-me-nints* (Lat. *ruminantia*), the name given by C[illegible]ier to his eighth order of *mammifères*, indicating the singular faculty possessed by the animals belonging to it of masticating a second time their food, which they return into the mouth after a previous deglutition,—a power which is the result of the structure of their stomachs, of which they always have four. The animals belonging to this order have nearly all the air of being constructed on the same model, the camels alone presenting some small exceptions to the common character. The first of these characters, according to Cuvier, is the possession of incisor teeth in the lower jaw only, these being nearly always eight in number, and replaced above by a callous rim. Between the incisors and the molars is a wide space, where are found, in one or two genera only, one or two canines. The molars, nearly always six in number, on each side of the upper and lower jaws, have their crown marked with two double crescents, the convexity of which is turned inwards in the upper and outwards in the lower teeth. The four feet are terminated by two toes and two hoofs, which oppose to each other a flattened surface, so that they have the appearance of a single hoof which has been split. The first stomach is much the largest in the adult animal, but not so in the recently-born calf or lamb. It is divided outwards into two bag-like appendages at its extremity, and it is slightly separated into four parts on the inside. The internal coat of the stomach is beset with innumerable flattened papillæ. It is very capacious, and fitted to receive a large quantity of grass or other matter on which the animal feeds; but no gastric fluid, or any other solvent fluid, enters it; and thus it is simply a receptacle. From this stomach the herbage, rudely broken up by the first mastication, is transferred to the second stomach, or "king-hood," which is of a very peculiar construction. It is very muscular in its walls, and the interior of it consists of cells, which are larger or smaller, according to the size of the animal and the nature of the food upon which it habitually subsists. The walls of these cells have the faculty of standing erect, at the same time that there is a vermiform or twisting motion of the entire organ. By means of these cells and this motion the food is compressed into small balls, which are one by one returned to the mouth for remastication. During this operation, the animal remains in a state of repose, until all the herbage swallowed has undergone the action of the molar teeth a second time. The aliment thus remasticated is passed into the third stomach, or "manyfold," so called because it consists of parallel laminæ, bearing some resemblance to the leaves of a book, which lie lengthwise and vary in breadth, in regular alternate order, amounting to some forty in the sheep and about a hundred in the cow. This is the stomach in which the drink of the animal mingles with its food. From the manyfold, the food and drink combined, and reduced to a pulp, upon which the real digestive process can be exercised, are conveyed to the fourth, or truly digestive stomach of the animal, which is the only one that secretes gastric juice, and is commonly

known by the name of "the red." It is next in size to the first stomach or paunch, of an elongated pyriform shape, and with an internal villous coat, similar to that of the human stomach, with large longitudinal wrinkles. Cuvier makes ruminants consist of two divisions; first, those without horns, and second, those with horns. The first division embraces the camels, the llamas, and the chevrotains. Secondly, all the rest of the ruminants, of the male sex at least, have two horns or prominences, more or less long, projecting from the frontal bones.

RUMP PARLIAMENT, *rump*, in English Hist., is the name given to the remnant of the Long parliament. After the Long parliament had declared in favour of the king, Colonel Pride, at the head of two regiments, blockaded the house, 6th December, 1648, and seizing in the passage forty-one members of the Presbyterian party, sent them to a low room, known as "hell." Above 160 members were excluded, and none were allowed to enter but the most furious and determined of the Independents, in all not exceeding sixty. This proceeding was known by the name of "Pride's Purge," and the remaining members were called the "Rump." It voted the transactions of the house a few days before to be entirely illegal, and the late treaty with the king dishonourable and dangerous. It then decreed that the king should be tried for treason against the people; and on the Peers refusing their concurrence, the Commons passed the ordinance for the trial (6th January, 1649). They voted that the concurrence of the House of Lords was unnecessary, as the people were the origin of all just power, and that the house itself was "useless and dangerous." It passed acts abolishing the office of king and the peerage, &c., and at length Cromwell entered the house with a strong guard, and terminated its existence by expelling the members, 20th April, 1653. After Richard Cromwell abdicated the government, a council of officers seized the supreme authority, and again called together the Rump parliament, May 1659. The vigour which it soon began to display, more particularly in cashiering some of the officers, gave offence to its constituents, and they accordingly dissolved it on the 13th October in the same year. A military government was then established; but such proceeding being unpopular, the Rump was again assembled on the 26th of December. It once more assumed absolute authority; but after a time General Monk declared against it, and resolved to restore the excluded members, thus throwing the members of the Rump into a minority. The restored members thus proceeded to repeal many of the orders that had been already passed, and then dissolved parliament, giving orders for the immediate assembling of a new one.

RUNES, *runes* (Gothic), are the letters of the ancient Goths, Danes, and other northern nations. The word *rune* is said by some authorities to be derived from a word in the ancient Gothic language, signifying *to cut*, whilst others assert that it is derived from either *ryn*, a furrow, or *ren*, a gutter or channel: and others, again, derive it from *rounan*, to whisper. The time when this alphabet began to be used is only matter of conjecture; and while some have advanced the opinion that Runic characters were used by the Germanic nations long before the Christian era, others suppose that they were the invention of a much later age. The alphabet consisted of only sixteen letters, and the fact that some of them bear a great similarity to the Greek and Roman characters, supports the opinion entertained by some philologists, that this alphabet was originally introduced among the inhabitants of the coasts of the Baltic by Phœnician merchants, and that, with some modifications, it was kept a secret by their priests, and applied to various magic purposes. The Runic characters are found cut on stones, which were either sepulchral monuments or landmarks, and which are frequently met with in all countries inhabited by nations of the Teutonic race during the fourth and fifth centuries of our era. All Runic characters are divided into three great classes:—1. the Northern or Scandinavian; 2. the German, in the limited sense of the word; 3. the Anglo-Saxon: the second being, it is supposed, a modification of the first, and the third a modification of the second. In Scandinavia, Runes seem to have been in use earlier than in other countries, and were written there as late as the middle of the 15th century. Runic characters consist almost entirely of straight lines in the shape of little sticks, either single or put together; and as such sticks were in early times used by the Germans for the purpose of ascertaining future events, it is at least very probable that the alphabet was derived from that practice.



RUPEE, *ru-pee'* (Persian), a gold and a silver coin which is current in several parts of Asia and in the islands of the Eastern archipelago. Its value not only varies with the course of exchange, but is altered in different localities. In calculation, however, the silver rupee current in the East Indies may be taken as representing 2*s.* sterling, the *sicca* rupee of account as 2*s.* 6*d.*, and the gold rupee as 29*s.* 6*d.* A *lac* consists of 100,000 rupees.

RUPTURE. (*See* HERNIA.)

RURAL ECONOMY, *ru'-ral* (Lat. *ruralis*, pertaining to the country), a general term applied to the management of landed property, either by the proprietor or his agent. The term includes whatever conduces to the improvement of land for purposes of agriculture or grazing, either by the arrangement of the crops, or by fertilizing the soil by manure, or by the management of the produce. Rural economy also comprehends the keeping of agricultural animals and their breeding; the general management of domestic fowls, geese, ducks, pigeons, &c; also the management of the garden. (*See* GARDENING.) One of the most interesting and important divisions of rural economy is bee-keeping. When properly conducted, the culture of bees becomes a source of considerable pecuniary profit. It only requires a moderate degree of attention and care; the expense is trifling, consisting of the first outlay in procuring a swarm, and providing suitable accommodation in the shape of hives or boxes. The return is very considerable, and may be regarded as clear gain. The old method of bee-keeping in England was that of annual destruction and renewal. Although this cruel practice is still followed in some parts of the country, it is decreasing. In other parts of Europe, the plan is, and has been, never to destroy the bees, but to take away a portion of their produce, and leave them the remainder for winter sustenance. Of late years many excellent inventions have been introduced, by means of which the honey can be removed from the hives without injuring the bees.—Ref. *Rural Economy for Cottage Farmers and Gardeners*, in vol. i. of the *Economic Library*.

RUSCUS, *rus'-kus*, in Bot., a gen. of the nat. ord. *Liliaceæ*. The species *R. aculeatus*, commonly called butcher's-broom, has aperient and diuretic roots, which were formerly much employed medicinally in visceral diseases. The roasted seeds have been used as a substitute for coffee.

RUSHES. (*See* JUNCACEÆ.)

RUST, *rust* (Sax.), a general term applied to the yellowish coat of peroxide which forms on the surface of iron exposed to a moist atmosphere. To prevent the rusting of iron utensils, oil, paint, varnish, plumbago, grease, or any substance which will protect the metal from the moist air, may be employed. Under all ordinary circumstances, iron decomposes water, abstracts the oxygen, and combines with it; thus forming rust.

RUSTICATED OR RUSTIC WORK, *rus'-tic-kat-ted* (Lat. *rusticus*, pertaining to the country), in Arch., is where the stones in the face of a building, instead of being smooth, are hatched or picked with the point of an instrument. The most coarse or common kind of *rustic* work is that where the edges are simply cut about one-half or two-thirds of an inch round the margin, so as to be in the plane of a wall, and the intermediate part is broken with the hammer, so that the protuberant parts may project generally about an inch beyond the margin. The term *Rustic* is generally applied to a mode of building in imitation of simple or coarse nature, rather than according to the rules of art.

RUTA, *ru'-tă*, in Bot., a gen. of the nat. ord. *Rutaceæ*. *R. graveolens* is the common rue, a native of Europe. It has a very powerful, disagreeable, peculiar odour, which is due to the presence of a volatile oil. Its taste is bitter and nauseous. It is used in medicine as an antispasmodic, anthelmintic, emmenagogue, stimulant, and carminative. This plant is sup-

posed to be identical with the *peganon* of the New Testament (Luke xi. 42). The species *R. montana* possesses very acrid properties.

RUTACEÆ, *ru-tā'-se-e*, in Bot., the Rue fam., a nat. ord. of *Dicotyledones*, sub-class *Thalamiflorœ*, distinguished by the following essential characters:—Herbs, shrubs, or trees, with exstipulate dotted leaves and perfect flowers. Calyx and corolla with a quaternary or quinary distribution of their parts, the former with an imbricated æstivation, the latter twisted or valvate, and sometimes wanting; stamens equal in number, or twice or thrice as many as the petals, rarely fewer (by abortion), inserted on the outside of a hypogynous disk; ovary of from 2—5 carpels, separate or combined, either sessile or elevated upon a stalk; ovules sessile. Fruit capsular; embryo with a superior radicle; albumen present or absent. The *Rutaceæ* have been divided into two sub-orders, as follows:—

Sub-ord. 1, *Ruteæ*.—Seeds containing albumen; fruit with sarcocarp and endocarp combined. Example: *Ruta*.

Sub-ord. 2, *Diosmeæ*.—Seeds exalbuminous; fruit having the sarcocarp separate from the endocarp when ripe. Example: *Barosma*.

The plants of the first sub-order are chiefly found in the southern part of the temperate zone; the genera *Diosma* and *Barosma* abound at the Cape of Good Hope; other genera are found in Australia, and others in equinoctial Africa. The plants of the order are generally characterized by a powerful odour and a bitter taste. Several are employed medicinally. (*See* GALIPEA, BAROSMA, RUTA.)

RUTH, BOOK OF, *rūth*, is the name of one of the books of the Old Testament, according to the English arrangement, inserted between the book of Judges and the books of Samuel, as forming a sequel to the former and an introduction to the latter. Among the ancient Jews, it formed part of the book of Judges; but the modern Jews separate it, and make it the second of the five Megilloth. It takes its name from Ruth, a Moabitess, who, having married a Jew and lost her husband by death, proceeds with her mother-in-law to Bethlehem, where she leads a blameless life of poverty, and becomes the wife of a relative named Boaz, through whom she is an ancestor of David. It consists of four chapters, and may be divided into three sections:—(1) An account of Naomi from her going into Moab with her husband, Elimelek, to her return to the land of Israel with her daughter-in-law, Ruth (ch. i.); (2) Boaz's interview with Ruth, and their marriage (ii.—iv. 12); (3) the birth of Obed, the son of Boaz by Ruth, from whom David was descended (iv. 13—18). The genealogy with which it concludes is evidently incomplete, probably because the leading members only are mentioned. The date and authorship of this book are alike unknown. It was evidently written some time after the events to which it refers, for the expression "when the judges ruled," evidently implies that in the writer's time the kings had begun to reign. The general opinion is that it was written by Samuel. The canonical authority of the book has never been questioned, Ruth, the Moabitess, being mentioned in the genealogy of Christ (Matt. i. 5). The scope of the book is evidently to show how a heathen, belonging even to the hated Moabitish stock, was honoured to be the progenitor of the great king David because she placed her reliance on the God of Israel.

RYE. (*See* SECALE.)

RYOTS, *rī'-ots* (Hindoo), in the policy of Hindostan, the name by which the renters of land are distinguished. They hold their possessions by a lease, which may be considered as perpetual, and at a rate fixed by ancient surveys and valuations. The standard for the regulation of the rates is lost, but it is known that it was never to exceed a fourth part of the gross produce of the soil. This arrangement has so long existed, and so well accords with the ideas of the natives concerning the distinction of castes and the functions allotted to each, that it has been invariably maintained in all the provinces, subject either to Mahomedans or Europeans; and to both it serves as the basis on which their whole system of finance is founded. The precise mode in which, however, the ryots of Hindostan hold their possessions is a subject on which very different opinions have been formed by persons who have resided long in the country and filled some of the highest offices in its government. Some have imagined that grants of land were made by the sovereign to the villages or small communities, the inhabitants of which, under the direction of their own chiefs or headmen, tilled it in common, and divided the produce of it among them in certain proportions; whilst others maintain that the property of land has been transferred from the crown to hereditary officers of great eminence and power, denominated *Zemindars*, who collect the rent from the ryots and parcel out the land among them.

# S

S *es*, the nineteenth letter and fifteenth consonant of the English alphabet. It is the chief sibilant, or hissing letter, being sounded by forcing the breath through a narrow passage formed between the palate and the tongue elevated near it, while at the same time the lower jaw and teeth are brought towards the upper jaw. Hence, from the tongue being essential to its pronunciation, [illegible] as sometimes been reckoned among the linguals; and as the teeth co-operate in producing the hissing sound, it has sometimes been classed among the dentals. It is also one of the semivowels, as it can be pronounced without the assistance of a vowel. It has two sounds, a hard and a soft; as in *this, these*. It is generally doubled at the end of words, giving them a hard and sharp sound, as *loss, kiss*. In some words it is silent, as *island, viscount*. It frequently interchanges with other letters, more particularly with *d, th, t, x, sh, c, g, h, n*, and *r*, and *ks* with *g*. *Sp* is also interchangeable with *ps*, *sk* with *ks*, and *sd* with *ds*. *S* is often dropped; of which numerous examples are to be found in the French language, as *Aisne* or *Aine*. It often appears before an initial consonant, where it is doubtful whether the older form be with or without the *s*, as *melt, smelt; tumble, stumble*. Among the Greeks, *s*, with a mark over it, stood for 200, with a mark under it, for 200,000. (*See* ABBREVIATIONS.)

SABAISM, *sā'-bā-izm* (Heb. *saba*, lord), is that religion which worships the heavenly bodies, especially the sun and moon. The connection of these with the constant changes in nature, and their influence on the physical world, doubtless led to their being regarded in the character of deities. This religion prevailed in the East, particularly in Arabia, before the time of Mohammed.

SABBATARIANS, *sāb-bā-tā'-re-ănz*, a term applied to such Christians as observe the seventh day of the week, as others do the first. They maintain that the seventh day of the week is of divine institution, and that Christians had no authority for changing it to the first. Some of the Baptists hold this view; but they are more numerous in America than in this country.

SABBATH, *sāb'-bāth* (Heb., *rest*), is the name given in the Jewish economy to the seventh day of the week, being ordained as a day of rest, or total cessation from labour, and for the service of God, in memory of God's having rested on the seventh day, after the six days of creation. It also signifies, in the Bible, the eternal rest of God; also holy days in general. There is reason to believe that, from the earliest period of the race, man was required to consecrate at least one-seventh part of his time to the special and exclusive service of his Maker. It is the opinion of some "that immediately after the Fall, when Adam was restored to favour through a mediator, a stated form of public worship was instituted, which man was required to observe, in testimony, not only of his dependence on the Creator, but also of his faith and hope in the promise made to our first parents, and seen by them afar off." It is not unnatural to suppose that when the sentence went forth that man was to earn his bread with the sweat of his brow, a period of rest should also have been instituted, which physiology teaches us to be required by nature, and religion to be necessary to the building up of the inner man. In the ten commandments given from Mount Sinai, that respecting the observance of the Sabbath holds a place in what is commonly called the first table. Its strictest observance was enjoined in the most solemn manner, under the severest penal-

ties; and, with the exception of idolatry itself, there was no sin threatened with heavier punishments than Sabbath-breaking. Like other festivals, it was celebrated from evening to evening, beginning at six o'clock on the Friday evening and ending at the same time next day. Among the Jews of the present day, there are none of the institutions of their divine Lawgiver which they more highly honour. Christians still observe, as a day of rest, and for religious services, one day in seven, but without considering that it requires to be observed with the same degree of strictness that the Jews do. In general, Calvinists take a much more strict view regarding its observance than Lutherans. Further, Christians regard it as commemorative of the resurrection of Christ and the outpouring of the Holy Spirit, and that it is no longer the seventh, but the first day of the week, which is to be observed. (*See* LORD'S DAY.)

SABBATIA, *sáb'-bai-shé-á* (after Sabbatia, an Italian botanist), in Bot., a gen. of the nat. ord. *Gentianaceæ*. The herb and root of the species *S. angularis* are employed medicinally in North America for their tonic and febrifugal properties. The plant is commonly known as American centaury.

SABIACEÆ, *sáb-e-ai'-se-e*, in Bot., a small nat. ord. of *Dicotyledones*, sub-class *Calyciflorœ*, containing but two genera, which were formerly placed among the *Anacardiaceæ*, but which differ from the latter in their stamens being opposite to the petals, in their distinct carpels, and in other characters. They are natives of India.

SACCHAROMETER, *sák-ká-rom'-e-ter* (Lat. *saccharum*, sugar; Gr. *metron*, a measure), a variety of hydrometer used in the process of brewing, in order to ascertain the density of the liquid extracted from malt. The same instrument is used to indicate the degree to which the juice expressed from the sugar-cane is concentrated previously to undergoing the process of crystallization. (For a description of the instrument, *see* HYDROMETER.)

SACCHARUM, *sák'-ká-rum* (Lat.), in Bot., the Sugar-cane, a gen. of the Grasses, nat. ord. *Graminaceæ*. *S. officinarum*, the common sugar-cane, is a native probably of India, the Indian islands, or of China; it is now extensively cultivated in the East and West Indies, and in the warmer regions of the American continent. It flourishes best where the mean temperature is from 75° to 77° Fahr.; but it thrives where the mean temperature does not exceed 66° to 68° Fahr.; hence it is grown far beyond the tropics. The plant attains the height of from six to twelve feet, and has a jointed stem, hard and dense externally, but juicy in the inside. It is cultivated from cuttings, and takes about a year to come to maturity. It is then cut down close to the earth, topped, stripped of its leaves, and crushed between heavy iron rollers in a mill. The juice is first mixed with lime to saturate the acid which is present, and then heated. The clear liquor is separated, and evaporated till it becomes granular. It is then put into casks, and the uncrystallizable part (*molasses* or *golden syrup*) having drained off, the sugar is left in the state of the *raw sugar* of commerce. The quantity of molasses is diminished, and that of the sugar increased, by evaporating the juice at a lower temperature *in vacuo*. Sugar undergoes purification in various ways: by solution in water, refining with albuminous matter, filtration through animal charcoal, evaporation, and re-crystallization. When white and pure, it forms *refined* or *loaf-sugar*. The uncrystallizable portion, formed in the process of refining, constitutes treacle. The total quantity of sugar annually extracted from the sugar-cane over the whole globe has been estimated at 4,527 millions of pounds.

SACK, *sák*, a species of dry wine first extensively used in this country in the 16th century. Some writers assert that the sack used at the time of Falstaff consisted of a mixture of sherry, cider, and sugar; this is, however, doubtful, and it seems to have been nothing but another name for the wine now called sherry. The difficulty as to determining what sack was, arose from the term being applied to all wines of a sweet kind at the time when they were first imported from Malaga and the Canaries; as Malaga sack, Canary sack, &c.

SACRAMENT, *sák'-rá-ment*, is derived from the Latin *sacramentum*, which signifies an oath, particularly the oath taken by soldiers to be true to their generals and to their country. It hence came to be used by the early ecclesiastical writers to denote those ordinances of religion by which Christians came under a sacred obligation to observe their part of the covenant of grace, and in which they had the assurance of Christ that he would fulfil his part of the same covenant. In strict conformity with this signification, it is used by Protestants to signify baptism and the Lord's supper. It afterwards came to signify any religious ordinance, and in general to stand for that which in Greek is expressed by the word *mysterion* (mystery), any emblematical notion of a sacred import, any external act having an internal or secret meaning. It is in this sense that the Church of England acknowledges other rites to be sacraments besides baptism and the Lord's supper (as the holy sacrament of matrimony); but it speaks of "two only as generally necessary to salvation." In either case the Roman Catholics are wrong in having seven sacraments; for in the large acceptation of the word there are many more than seven, and in its strict acceptation there are only two. The Church Catechism defines a sacrament to be "an outward and visible sign of an inward and spiritual grace given unto us, ordained by Christ himself as a means whereby we receive the same, and a pledge to assure us thereof." The sacraments of the Roman church are Baptism, Confirmation, the Eucharist, Penance, Ordination, Marriage, and Extreme Unction. The Eucharist is by way of eminence called the holy sacrament. The number of seven sacraments was first decreed by Eugenius in the 15th century.

SACRIFICE, *sák'-re-fise* (Lat. *sacer*, sacred, and *facio*, I make), is an offering made to an object of religious worship. Co-extensive with the feeling of religion, with the belief in the existence of a Supreme Being, who superintends the affairs of mortals, is the desire to secure his favour and avert his displeasure. Hence we find the idea of sacrifices existing in all times, and among, probably, every people. It is generally supposed that sacrifices were instituted immediately after the fall of Adam, when God made with him the "covenant of grace." This supposition is founded on the fact that God clad Adam and Eve with the skins of beasts. In the next generation we find Cain and Abel offering sacrifices unto God. Hence, some account for the universal prevalence of sacrificial worship in some form or other. Sacrifices formed a prominent part of patriarchal worship, and the sacrificial code was at length consolidated by Moses. In the Jewish religion we have a complete system of sacrificial rites, and strict rules laid down regarding them. Animal sacrifices were of four general kinds; viz., burnt-offerings, sin-offerings, trespass-offerings, and peace-offerings. The first three had an expiatory virtue, that is, they made atonement for those that offered them; the last were more particularly expressive of gratitude for mercies received, or supplication for mercies desired. As a sacrifice was not only intended to represent the offerer, but also to convey his deepest feelings on the occasion of the offering, the selection of the object was upon the ground of its nearness of relation and preciousness to the offerer. It must be his own, the first and best of its kind; it must be what he values and loves. Another peculiarity of a sacrifice consisted in destroying, in whole or in part, the offering presented. In the heathen world, human sacrifices have been very generally prevalent, apparently from a notion that human life is the most precious thing that can be offered to a Divine Being. Christians regard the sacrifices of the Jewish economy as typical of the death of Christ, whom they regard as the one great sacrifice, which has for ever made atonement for the sins of men.

SACRILEGE, *sák'-re-leje* (Lat. *sacrilegium*), is the crime of violating or profaning sacred things, or things offered to God, or of alienating to laymen, for common uses, what was given to religious persons, or for pious purposes. In Law, it is defined to be "the felonious taking of any goods out of any parish church, or other church or chapel." By the common law, sacrilege was punished with greater severity than other thefts, &c. the benefit of the clergy was denied to the offender; but by statute it was put on a footing with other felonies. By 7 & 8 Geo. IV. c. 29, it is enacted that

"if any person shall break and enter any church or chapel, and steal therein any chattel, or, having stolen any chattel in any church or chapel, shall break out of the same, every such offender, being convicted thereof, shall suffer death as a felon." By 5 & 6 Wm. IV. c. 41, capital punishment for this offence was abolished, and transportation for life or not less than seven years, or imprisonment not exceeding four years, substituted. Act 6 & 7 Wm. IV. c. 4, limited the term of imprisonment to three years. By 24 & 25 Vict. cc. 95, 96 (1861), previous acts were repealed, and penal servitude for life, or not less than three years, or imprisonment not exceeding two years, substituted.

SACRUM, Os, *os sai'-krum* (Lat., sacred bone, so called probably from being offered in sacrifices by the ancients), in Anat., is the bone which forms the basis of the vertebral column, being articulated above by the last lumbar vertebra, while laterally it is firmly united by a broad irregular surface to the ossa innominata or hip-bones, and united below to the os coccygis. In young subjects, it is composed of five or six pieces, united by cartilage, but in more advanced age it becomes one bone, in which, however, we may still easily distinguish the marks of the former separation. It is pyramidal in form, flattened before and behind, with its basis towards the lumbar vertebræ and its point terminating in the coccyx. Like the vertebræ, it presents various processes, and holes affording passage for the nerves.

SADDUCEES, *sâd'-du-sees* (Gr. *zaddoukaioi*), one of the principal of the Jewish sects in the time of Christ. It is said to have been founded by Sadoc, a disciple of Antigonus Sochos, president of the Sanhedrim at Jerusalem, and teacher of the law in the principal divinity school of that city. This system was a natural reaction from the doctrines of the Pharisees. The latter were enamoured with forms and ceremonies, the other despised and contemned them. They denied the existence of any spiritual beings except God, maintained that there was no resurrection, and that the soul died with the body; hence that there could be no rewards and punishments beyond this life. They rejected the traditions of the Pharisees, and according to some, they rejected also all the books of the Old Testament, with the exception of the Pentateuch. They denied the providence of God, and held that men were left to pursue their own courses without any divine interference. Though thus opposed to the Pharisees, they were equally opposed to the doctrines of our Saviour. They were less numerous and popular than the Pharisees, and seem for the most part to have comprised men of wealth and station.

SAFE-CONDUCT, *saif-kon'-dukt*, a convoy or guard granted by sovereign authority to certain persons to enable them to pass through certain places unmolested. In most cases, passports have now superseded special safe-conducts. They are sometimes given by judges to delinquents to enable them to act in their affairs, while in Germany they are sometimes given to enable an accused person to defend himself without having the disadvantages of a prosecution.

SAFETY-LAMP, *saif'-le*, a lamp used by miners, and so constructed as to reduce greatly the risk of an explosion. The dangerous accumulation of fire-damp in some mines renders this necessary. The contrivance of a *steel mill* was long known, and it afforded a tolerable gleam of light. It consisted of a small frame of iron, mounted with a wheel and pinion, which gave rapid rotation to a steel disc placed upright, to the edge of which a piece of flint was applied. The attention of the scientific was more particularly called to the subject when an appalling colliery explosion occurred at the Felling colliery, in Durham, in 1812; ninety-two lives were then instantaneously destroyed. The first safety-lamp was that of Dr. Clanny, of Sunderland. It consisted of an air-tight lamp with a glass front, the flame of which was supported by blowing fresh air from a small pair of bellows through a stratum of water in the bottom of the lamp, while the heated air passed out through water by a recurved tube at the top; by this means the air within the lamp was completely insulated from the surrounding atmosphere. Various other schemes for safety-lamps were brought forward, but they were all superseded by the invention of Sir Humphry Davy, founded on his fine researches into the nature of flame. This lamp consists of a common oil-lamp surmounted by a covered cylinder of wire gauze. Davy had ascertained that the explosions of inflammable gases were incapable of being passed through long narrow metallic tubes, and that this principle of security was still obtained by diminishing their length and diameter at the same time. Ultimately, this fact led him to trials upon sieves made of wire gauze, or metallic plates bored with numerous small holes, and he found that it was impossible to pass explosions through them. About the same time George Stephenson, with that peculiar aptitude for mechanical design which always distinguished him, and without any knowledge of the researches of the chemist, devised a lamp by which air was admitted to the flame through "apertures of wire gauze." Hence among the pitmen in the north of England at the present time safety-lamps are distinguished as either "Davies" or "Geordies."

SAFETY-VALVE. (*See* STEAM-ENGINE.)

SAFFLOWER. (*See* CARTHAMUS.)

SAFFRON. (*See* CROCUS.)

SAGA, *sai'-ga* (old Norse, a saying, report, tradition), is the name given to those ancient Norse historical and mythological compositions which have come down to us. The sagas were the prose recitations of the Sagamen, as the poems and lyrics were of the Scalds. The historical of them treat principally of the history of Norway from the 9th to the 13th century. Many of them are collected in the celebrated Heimskringla, by Snorre Sturleson (which *see*; also NORWEGIAN LANGUAGE AND LITERATURE.)

SAGAPENUM, *sâg-a-pe'-num* (Gr.), a fœtid gum-resin, imported into Europe from the Levant, and also from Alexandria, in amygdaloidal masses of a brownish-yellow or olive colour, sometimes in tears. It is probably a Persian product, and has been supposed to be obtained from the root of the umbelliferous plant *Ferula persica*. It is employed medicinally as an antispasmodic, but is considered to be less powerful than asafœtida. It is included in the Materia Medica of the London Pharmacopœia.

SAGE. (*See* SALVIA.)

SAGITTARIA, *sâj'-it-tai'-re-â* (Lat. *sagitta*, an arrow), the arrow-head, an indigenous, aquatic, perennial herb, flowering in July or August (*Sagittaria sagittifolia*). Its root is tuberous, nearly globular, with many long fibres. In China it is much cultivated for its esculent properties, its mealy nature making it easily convertible into starch or flour. The floating leaves are very variable in size, and in form resemble the head of an arrow, from which circumstance the plant derives its name. The leaves also are very cooling when applied to the skin; they have consequently been used, and may be serviceable, as a dressing to inflamed sores. Arrow-head, as a food, is much relished by most cattle.

SAGITTARIUS, *sâj'-it-tai'-re-us* (Lat., the archer), a name given in Astron. to one of the signs of the zodiac, situated below Aquila, between Scorpio and Capricornus. Its figure is that of a centaur drawing a bow: this constellation must not be confounded with Centaurus. The mythological account of Sagittarius is very meagre. According to some, the constellation represents the centaur Chiron, and according to others, Crocus, whom the Muses requested after death to be placed among the signs.

SAGO, *sai'-go*, a well-known form of starch, obtained from the stems of various plants, particularly those of the botanical genera *Sagus* and *Saguerus* (*see* these words). Sago is produced chiefly in the Moluccas and in Sumatra; but it is first imported into Singapore, in very large quantities, for granulation and re-exportation. It is obtained by cutting and splitting the palm-stem, and washing it with water. The fecula subsides from the washings, and forms a powder like arrowroot, but of a dirty-white colour. This constitutes *meal sago*, of which 500 or 600 lbs. may be yielded by a single tree. This, when imported into Singapore, is well washed, partially dried, granulated, sifted, and roasted. The sago of commerce was formerly in grains about the size of coriander-seeds, of a reddish or brownish-white colour, and mixed with some of the meal. The Chinese settled at Singapore some time since introduced their methods of rolling and granulating, which gave a sago in small grains,

about the size of a pin's head, hard, whitish, of a pearly lustre, sometimes even translucent, without odour, and with very little taste. This kind is now called *pearl sago*. Sago is nutrient and demulcent, and well suited for invalids. It may be boiled with water, with milk, or in soups, or made into puddings with eggs and milk.



SAGO PALM.

SAGUERUS, *sāg-u-e'-rus* (from *sagu*, the Malay name of various palms), in Bot., a gen. of Palms. *Sug. saccharifer* is the Gommuti palm, which supplies the greater part of the sugar produced in the Moluccas and Philippines. Palm sugar, called *jaggery* in India, is generally obtained from the juice which flows out from the different palms upon wounding their spathes and surrounding parts. The saccharine juice of the Gommuti palm is transformed into an intoxicating liquor or *toddy* by fermentation. This is termed *nera* in Sumatra, and a kind of arrack is distilled from it in Batavia. From the trunk of this palm, when exhausted of its saccharine juice, a good deal of our commercial sago is obtained, a single tree yielding from 150 to 200 lbs. The juice of the fruit is very acrid. Besides sugar, toddy, and sago, this palm yields the stiff, strong fibre known in commerce as *Gommuta* or *Ejow fibre*.

SAGUS, *sa'-gus* (Malay *sagu*), in Bot., a gen. of Palms. From the trunks of *S. laevis*, *S. genuina*, and other species, the principal part of our *sago* is obtained. (*See* SAGO.)

SAILS, *sailz* (Sax. *segel*, a sail), are certain breadths of canvas sewed together and extended on or between the masts of a ship to receive the impulse of the wind and propel a vessel through the water. The several breadths of which a sail is composed are sewed together with a double seam, and the whole is bound round the edges with a cord called a bolt-rope. There are several kinds of sails used in ships; the principal of which are the courses or lower sails, the top-sails, the top-gallant sails, and the top-gallant royal sails, each of which are suspended one above the other. Another sail is sometimes added above these, called a *sky-scraper*.

SAINT IGNATIUS'S BEANS. (*See* IGNATIA.)

SAINT JOHN'S BREAD. (*See* CERATONIA.)

SAINTS, *saints* (Lat. *sancti*, holy persons), is applied by the Church to persons who have been distinguished for their pious and holy lives. The apostles, in their epistles, use the word simply for all baptized believers, that is for all Christians. Early in the history of the Christian church, persons eminent for their holiness or piety came to be regarded with great veneration, and their memory cherished after their death; and these came in an especial manner to be dignified with the name of saints. Hence, days came to be observed in honour of them; and in course of time it came to be the custom to ask their prayers and intercessions with the Deity in favour of the living. This increased to such an extent, that in the 9th century the Church declared that no departed Christian should be considered as a saint to whom prayers might be addressed until the Church had pronounced him worthy of that honour. According to the doctrines of the Roman Catholic church, "the name of saint is given to a person who is not only much attached to the worship of the true God, but who is exempt from every considerable vice, and who practises the Christian virtues in an exalted degree; and as the bliss of heaven is the certain reward of such a life, we often understand by saints those who enjoy eternal felicity. When the Church is convinced that an individual has led such a holy and pure life, when God has deigned to attest it by miracles, it places him among the number of the saints by a decree of canonization, and authorises the faithful to render him public worship." (*See* CANONIZATION, INVOCATION OF SAINTS, BOLLANDISTS.)

SAINT SIMONIANS, *saint si-mo'-ne-ăns*, the followers of Claude Henri count de St. Simon, a descendant of one of the most illustrious families of France, claiming connection with the emperor Charlemagne. From his youth he had entertained ideas of greatness, but without any settled purpose; and, after some time spent in the army, he pursued various unsettled wanderings in France and Spain. At length he came to the conclusion that something must be done for "the advancement of human civilization;" and accordingly, when near the age of forty, he commenced a ten years' course of study, in order to put himself thoroughly abreast of the knowledge of his time. He attended classes and lectures, established at his house assemblages of the learned and scientific, assuming the position of generalizer, and employing them as his workers in the several details. Further, in order to understand humanity in its every phase, he gave himself up to all manner of self-indulgence. All the appliances of science and art were laid under contribution in order to the gratification of pleasure or the production of pain. He practised all the vices, alternating them in proper scientific rotation with their several virtues. He courted contagious diseases and physical suffering, and even, on a later occasion, attempted to commit suicide, but only succeeded in blowing out one of his eyes. Poverty at length stared him in the face, and he was glad to accept a clerkship at £40 a year; but his genius still beckoned him on, and in 1812 he gave to the world his first publication, "Letters from an Inhabitant of Geneva to his Contemporaries." This was followed by various others, expounding his system: his last and principal work being the "Nouveau Christianisme," published after his death, in 1825. He regarded Christianity as progressive. First came Catholicism, next Protestantism, and lastly, St. Simonianism. The basis of his system was the great Christian maxim, "Love one another." "Moses had promised it to men, Jesus Christ had prepared it, and St. Simon realized it." His aim was the rapid amelioration, physical and moral, of the condition of the poor and most numerous class of society. To effect this, every one was to have a vocation according to his capacity, and every capacity a recompense according to its works. It was a religion in which all things were to be subservient to one supreme head—himself, and after him the ablest of his disciples. Property, and all other conflicting institutions, were to be abolished, and nothing was to interfere with the will of the father or supreme leader, whose authority was thus great and absolute. The abolition of competition, and the organization of labour on such a more fitting and effective scale as the superior wisdom of the priesthood would naturally suggest, was a portion of the system. The transmission of property as well as of offices was to be abolished; industry was to be regulated in obedience to a self-constituted authority, and its advantages portioned out in the ratio of merit. The unholy bond of matrimony was to be abolished, and there was to be substituted for its restraints obedience to the sacred instincts of inclination, as directed by the unerring wisdom of the Supreme Father. The empire of society was to be substituted for that of the family. Among the disciples of St. Simon were Olinde Rodrigues, Augustin Thierry, Auguste Comte, Bazard, and Enfantin. On the death of St. Simon, Bazard announced himself as his successor, and in a short time collected a number of adherents, who formed themselves into a society, and dwelt together in the Rue Monsigny. They started a weekly journal,—*L'Organisateur*, and soon after gained an able coadjutor in Pierre Leroux, editor of *Le Globe* newspaper. A schism afterwards occurred among the leaders as to certain points of doctrine, and a number of the society seceded. A government prosecution led to the dissolution of the society in the Rue Monsigny, and *Le Globe* became extinct. Enfantin and about forty others retired to a country house in the neighbourhood of Paris, and instituted a sort of monastery; but this establishment was broken up, and the inmates dispersed, by public prosecution, in 1832,

and since that time Saint Simonianism has been virtually extinct.

SAL, *sal*, in Chem., this word was formerly used as a prefix to signify a crystallizable compound; as, for example, *sal-ammoniac*, or chloride of ammonium; *sal enixum*, acid sulphate of potash; *sal prunella*, fused nitrate of potash; *sal acetosellæ*, oxalate of potash; *sal volatile*, carbonate of ammonia, or liquid ammonia; *sal gem*, or rock salt.

SALAMANDER, *săl'-ă-măn'-der* (Lat.).—Any description of the few harmless reptiles which belong to the family *Salamandridæ* would be incomplete if no notice were taken of the ignorant superstitions which made them the "daughters of fire," and gave them the faculty of poisoning vegetables. It is difficult to trace the manner in which these superstitions arose; but their origin, doubtless, had some relation to the extraordinary metamorphoses which salamanders undergo. The salamanders are a genus of batrachian reptiles, having some slight resemblance to the lizards in their external shape, but very properly separated from them by more modern naturalists, since their structure came to be better understood. The general characters may be described as follows:—The body lengthened, with four feet of equal dimensions, and a long tail; the head is flat, and the ear entirely imbedded in the flesh, and without any distinct tympanum, and only a small cartilaginous plate on the opening; both jaws are furnished with numerous small teeth, and there are two parallel rows of such teeth along the bones in the upper part of the mouth, which represent the vomer; the ribs are merely rudimental, though they are not wholly wanting as in the frogs; but there is no sternum of bone; the sternum is very imperfectly developed, and suspended to the spine by ligaments; the legs are of nearly equal length, and without any webs on the toes or claws of them; and there are always four toes on the fore feet, and, generally speaking, five on the hind ones. In the adult state they breathe in the same manner as tortoises and frogs, but in their early state they breathe in the water by means of gills. Salamanders are, technically speaking, ovoviviparous; that when the ova or eggs have arrived at the state in which, in the other batrachia, they are wont to be expelled, in these they are retained for some time after their development. A peculiar property of the salamanders is, that when repeatedly deprived of an important portion of their body, that portion is as frequently renewed. An eye, for instance, may be extracted, and speedily a new and perfect one is found to have supplied its place. Salamanders are usually divided into land species and water species; but it must be observed that the land ones inhabit humid places, and the aquatic ones breathe air, and are not wholly confined to the water.

SAL-AMMONIAC. (*See* AMMONIA CHLORIDE OF.)

SALARY, *săl'-ă-re* (Lat. *salarium*), is an annual allowance or recompense made to a person for his pains and industry in another person's business. It is derived *from sal*, salt, as being the most necessary thing to support human life; and among the Romans, *salarium* included all the provisions with which the officers of the army were supplied, as well as their pay in money.

SALE, *sail* (Sax. *sal*), is the act of selling, that transaction by which the ownership of property is transferred from one person to another, in consideration of a money payment made by the buyer to the seller. It it be a commutation of goods for goods, it is more properly an exchange. In order to the validity of a sale, it is necessary that the parties act in good faith; for it is a maxim in law, that fraud vitiates all contracts. Neither is a sale valid if the subject matter of it is illegal or prohibited, or if an essential part of it involves an illegal act. In order to constitute a sale, the consent of each of the parties is required; and hence each must be legally qualified to consent. (*See* BARGAIN AND SALE.)

SALE, BILL OF. (*See* BILL OF SALE.)

SALVE. (*See* EULOPHIA and ORCHIS.)

SALICACEÆ, *săl-e-kā'-se-e* (Lat. *salix*, the willow), in Bot., the Willow fam., a nat. ord. of *Dicotyledones*, sub-class *Monochlamydeæ*. Trees or shrubs, chiefly natives of cold and temperate climates. Leaves simple, alternate, stipulate. Flowers unisexual, amentaceous, naked, or with a membranous or cup-like calyx. Male flowers with 1—20 distinct or monadelphous stamens; female flowers with a superior 1-celled ovary; ovules numerous, erect. Fruit 1-celled, 2-valved. Seeds numerous, covered with long silky hairs, exalbuminous; embryo ovoid, with an inferior radicle. Many of the species are valuable for their timber, and some for their tonic and febrifugal bark. The hair investing their seeds has been employed for stuffing cushions. There are but two genera,—*Salix* and *Populus* (which *see*), and about 250 species.

SALICIN, *săl'-i-sin*, in Chem., a neutral bitter principle found in the bark of willows. It is procured by adding to an aqueous infusion of the bark hydrated oxide of lead, by which the tannin and colouring matters are precipitated. Salicin has been made the subject of a series of interesting and valuable researches by Piria of Turin, which have thrown considerable light on the compounds known as glucosides. Mixed with synaptase (a peculiar ferment), it splits up into glucose and saligenin. Heated with bichromate of potash and sulphuric acid distilled, a fragrant oily liquid comes over, which has exactly the same physical and chemical characteristics as the essential oil of meadow-sweet.

SALIC or SALIQUE LAW, *săl'-ik* (Lat. *lex Salica*), is an ancient fundamental law of France, supposed to have been made by Pharamond or Clovis, in virtue of which, daughters were excluded from the inheritance, and sons alone considered capable of succeeding to it. The term *mos*, probably is taken from the name of the ancient Franks,—Sali, or Salici, so called from Sala, a river of ancient Germany. The Salic law is said to have been made for the Salic lands, which were given to the Salic Franks who settled in Gaul, and held their lands upon condition of their personal service in war. It was, however, extended even to the throne; and from the earliest periods of the French monarchy, no princess succeeded to the throne, except by force of some law different from the ordinary usage. The Salic law was first alleged against Edward III. of England, in his contests with Philip VI. about the French throne, and has continued in force since that time.

SALICORNIA, *săl-e-kor'-ne-ă*, in Bot., a gen. of the nat. ord. *Chenopodaceæ*. The species were formerly much used in making *barilla* (which *see*).

SALIVA, *sa-lī'-vă* (Lat., from *sal*, salt), is that which the mouth and tongue are constantly moist in their natural state, and which is supplied by which form it, called the salivary glands. There three pairs of salivary glands—the parotid, the maxillary, and the sublingual. The saliva itself neither colour nor smell, and is tasteless; for although it contains a little salt, the nerves of the tongue are accustomed to it, that it is imperceptible. Its gravity is somewhat greater than that of water, and it is supposed that about twelve pounds are secreted in twelve hours. From the mechanical pressure of the muscles upon the salivary glands, the secretion is much augmented during speaking and mastication. In hungry persons, too, it is largely secreted at the sight of agreeable food. Its uses are to augment the bulk of food by the evolution of sapid matter, to moisten, dissolve, and resolve into its principles, the food in mastication, so as to change it into a pultaceous mass fit to be swallowed; to moderate thirst, by moistening the cavity of the mouth and fauces. In the healthy state, it consists of at least four-fifths of water, comprising, besides, mucilage, albumen, muriate of soda, phosphate of lime, and phosphate of ammonia.

SALIVATION, or PTYALISM, *săl-e-vā'-shun*, *tī'-ăl-izm* (Gr. *ptualizo*, I spit frequently), in Med., denotes an increased and involuntary flow of the saliva. This may be caused in a variety of ways. It may be occasioned by strong mental emotions, by the use of certain medicines, and it is also symptomatic of various diseases of the mouth and neighbouring parts; as in dentition, scarlatina, small-pox, &c. Mercury is by far the most common agent in the production of salivation. The quantity required to produce salivation differs in different persons, and consequently its effects require to be watched to prevent excessive action. It acts whether used externally or internally, and generally after a short time, and even with a small quantity. At first, the mouth feels uncommonly hot, with a coppery or metallic taste; the flow of saliva is much increased, the breath becomes fetid, the gums red and tender, and at length

the whole mouth, tongue, and throat become sore and swollen; and ulcers and sloughs quickly form on the mucous membrane. In the treatment of mercurial salivation, a nutritive diet, pure air, and mild purgatives are required. Cold is to be particularly guarded against, as well as the other extreme of heat. Gargles of chlorate of soda or lime are useful in cleansing the mouth and correcting the fœtor of the breath. If the constitutional irritation is excessive, opiates require to be administered, and the best for this purpose is Dover's powder in small doses.

SALIX, *sa'liks* (Lat.), in Bot., the Willow, a gen. of the nat. or. *Salicaceæ*. The species found in Great Britain are commonly known as willows, osiers, and sallows. Their timber, though wanting in strength and durability, is applied to many useful purposes; it is well adapted for the manufacture of charcoal. The wood of the flexible branches and twigs is largely employed for basket-work, hoops, &c. A peculiar crystalline alkaloid, resembling quinine in its properties, called *salicine*, has been obtained from the bark, leaves, or flowers of about twenty species of this genus.

SALMON, *sām'-un* (Lat. *salmo*, Fr. *saumon* (*Salmo Salar*)), a celebrated fish, belonging to the family of the *Salmonidæ*, the generic characters of which are as follows:—Head smooth; body covered with scales; two dorsal fins, the first supported by rays, the second fleshy, without rays; teeth on the vomer, both palatine bones, and all maxillary bones; branchiostegous rays varying in number, generally from ten to twelve, but sometimes unequal on the two sides of the head of the same fish. The general length of the salmon is from two and a half to three feet, but sometimes much more; the male is principally distinguished by the curvature of the jaws; both the lower and upper mandible bending towards each other more or less in different individuals and at different seasons. The general colour of both sexes is a silvery grey, of a much darker cast on the back; the sides of the male are marked with numerous small, irregular, dusky and copper-coloured spots, while those of the female exhibit only several large, distant, roundish or somewhat lunated spots of a dark colour. Besides these differences, the male is of a somewhat longer or more slender shape than the female. The scales in the salmon are of middle size, and not very strongly adherent. The salmon is a fish of great elegance, combining a form fitted alike for strength and swiftness, and occupies a foremost place in the estimation of both sportsman and epicure; its red flesh being regarded by the latter as a delicacy, in spite of its being somewhat indigestible. The salmon inhabits the seas around Great Britain, and extends to the north of Europe and Asia.



SALMON.

Enters the rivers sooner or later in the spring or summer months to spawn, but generally delays entering them until the streams become somewhat swollen by rains. When this has occurred, they enter them usually in large bodies, swimming in the middle of the stream, and near the surface, and seldom resting in their course as long as the water remains discoloured. In the first part of their course, they are easily frightened either by a sudden noise or floating timber, and on such occasions frequently turn aside and return to the sea. When farther advanced, however, they make the most determined efforts to surmount rapids and cascades, and will leap a fall of twelve or fifteen feet in perpendicular height. If they fail in their attempt and fall back into the stream, it is only to remain a short time quiescent, and thus recruit their strength to enable them to make new efforts. The fish having at length gained the upper and shallow pools of the river, preparatory to the important operation of depositing the spawn in the gravelly beds, its colour will be found to have undergone considerable alteration during the residence in fresh water. As the process of milting and roeing advances, extreme pressure appears to injure the vital functions; the animal oil and all interstitial matter are absorbed, and the fish becomes thence lean in flesh, and what remains is not only in a great measure colourless and insipid, but frequently unwholesome also. The male becomes marked on the cheeks with orange-coloured stripes; the lower jaw elongates, a cartilaginous projection turning upwards from the point; the body receives a golden-orange tinge, and the fish in this state is called a *red fish*. The female seems to suffer even more than the male, and as it turns dark in colour, is frequently termed a black fish. The manner in which salmon deposit their spawn is as follows. A pair of fish make a furrow by working up the gravel with their noses, rather against the stream, as a salmon cannot work with his head down stream; for the water then going into his gills the wrong way drowns him. When the furrow is made, the male and female retire to a little distance, one to the one side, and the other to the other side of the furrow; they then throw themselves on their sides, again come together, and rubbing against each other, both shed their spawn into the furrow at the same time. This process is not completed at once; it requires from eight to twelve days for them to deposit all their spawn; and when they have done, they betake themselves to the pools to recruit themselves. They finally redescend to the sea by easy stages, where their former condition and silvery lustre are soon regained, and their strength invigorated. The ova continue covered by the gravel during the winter, and begin to vivify from about the end of March to the commencement of April. The fry remove from under the gravel when about an inch in length, with the ovum still attached, the head and eyes large, and the colour of the body pale brown, with nine or ten dusky grey marks across the sides. The young salmon fry, or parr, as it is called as long as it retains the brown marks on its sides, may remain a whole year in the fresh water. On the eve of descending to the sea, it assumes a more brilliant dress, and becomes a smolt. At this time it is from four to six inches in length, of a greenish-grey above, silvery below, the scales extremely delicate and very deciduous. From the time the smolts reach the sea, for two months or ten weeks we lose sight of them, and can only infer their growth from the fact, that after the lapse of that period we find them again ascending the rivers, with a weight of from two and a half to four pounds. They are then known under the name of *grilse* or *grilse*; and their size, as they ascend from the sea, increases with the advance of the season. The grilse, which thus ascend, spawn during the ensuing winter, and are then entitled to the name of salmon. Descending in a weak state, they return in the following summer some ten or fifteen pounds in weight. The size of grilse or salmon does not depend on age, but on capacity for growth, or the length of time they remain at sea, and on the quantity and quality of food they find there. There are rivers in which salmon never attain the weight of ten pounds; others in which grilse are often of that weight, and salmon of the weight of fifty pounds. That the food sought for to produce and sustain the rapid growth in size of the young salmon must be very considerable in quantity as well as most nutritious in quality, cannot be doubted; whilst the fact that the salmon is a voracious feeder, may equally be inferred from the degree of perfection in the arrangement of its teeth, and from its own habits; and yet, strange to say, of the many observers who have examined the stomach of the salmon to ascertain the exact nature of that food which must constitute their principal support, few have been able to satisfy themselves. At sea they are taken with small fish and sand-eels within them; but in our rivers they are seldom observed to have anything within their stomachs but mucus, a peculiarity which probably arises from their having, like herrings, a very quick digestion, and from their taking in their food in very small quantities at a time, and thus leaving the stomach in a constant state of capacity or fitness for immediate digestion. The regulation of salmon-fisheries has, during many centuries, been, in this country, the subject of much controversy, legislation, and litigation. It forms a prominent clause in Magna Charta; was legislated for by Edward I. of

England and by Robert the Bruce in Scotland; has never since been allowed to rest, and during the last fifty years has been stirred up almost perpetually by commissions, committees, or bills; and has almost perpetually been before the law courts in one shape or another. It is, in fact, a very valuable fish, fetching a considerably higher price, pound for pound, than any kind of butcher's meat; and, as it consumes nothing of value to men, is, to use Franklin's phrase, a bit of silver pulled out of the water. In former times salmon were very plentiful both in Scotland and England; they were in large request, as salted fish, for the religious houses during the winter; and in Rymer's *Fœdera* we have an order given by Edward II. to provide 3,000 dried salmon for the sustenance of his men. But in recent times the supply has much decreased, from, it is supposed, the following causes:—In the first case, the increase of land-drainage, especially of the open sheep-drains of the pastoral districts, is supposed to have proved injurious, by bringing the surface-water more rapidly, and in greater volume, into the river, and hastening its descent into the sea. Salmon prefer travelling upwards when the water is full, but by no means clayey; and the increase of land-drainage not only has a strong tendency to keep it in the latter state, but also, by the production of sudden floods, to alter the character and structure of the spawning-beds, by shifting the gravel. Many of the more lowland streams, again, are deteriorated in their nature by the increase of human settlements along their banks, and the consequent increase of various manufacturing works, the operations of which produce refuse abhorrent to the tastes of salmon. Another alleged cause of decrease is the killing of spawning fish in close time; but although it is admitted by all interested in the subject that this is a great evil, it is argued, on the other hand, that this cannot be a cause of the decrease, as diligent inquiries have corroborated the opinion that this practice is not new and increasing, but old and decreasing. Another cause alleged for the decrease has been the *brevity or mistiming of the close season*, and *over-fishing*. As, however, acts have recently passed—for England in 1861, and for Scotland in 1862—to remedy the more glaring evils complained of in these respects, it is scarcely necessary, at present, to discuss the subject.

SALSAFY. (*See* TRAGOPOGON.)

SALSOLA, *sal-so'-lă* (Lat. *sal*, salt; *solus*, alone; from its saline qualities), in Bot., a gen. of plants belonging to the nat. ord. *Chenopodiaceæ*. The species inhabit salt-marshes, and contain much soda. (*See* BARILLA.)

SALT (COMMON), *sault* (*chloride of sodium*), is one of the most important British minerals, and is procured in immense quantities, both from fossil beds and brine-springs, in Cheshire and Worcestershire. A rocky bed is the source of nearly all our inland salt; but as subterranean streams flow over this bed and become saturated with salt, the original form is changed, and it is simply a question of manufacturing convenience whether to raise the common salt and purify it, or to raise the liquid brine and operate upon that. Previously to the discovery of the fossil beds in the 16th century, and subsequently, a good deal of salt continued to be made by the evaporation of sea-water in salt-pans, at Lymington and other places; but the works at these places are now all but abandoned. It is estimated that about a million and a half tons of salt are manufactured in Cheshire, Worcestershire, and Ireland annually; of which quantity about half (chiefly that manufactured in Cheshire) is exported. There was formerly a duty on salt, which originated as a war tax in the ninth year of William III., and was not removed till the year 1823, and raised the price of salt from 6d. a bushel to more than 20s. The brine-springs, so abundant in the great plain of the red marl and sandstones of Cheshire, occur at various depths; in some places being within ten or twelve yards of the surface, and at others from fifty-five to sixty. They were worked there as early as the time of Edward the Confessor. The strata passed through in sinking for either brine or rock salt are usually clay or gypsum, mingled in various proportions, the latter predominating in nearing the brine or rock salt. The rock salt of Cheshire is found in considerable masses, differing in form and purity. These are separated by blasting





and with the aid of the usual tools. The purer rock is called Prussia rock, from its being largely exported to the shores of the Baltic. The cavity formed in working a salt-bed, when lighted by candles, presents a brilliant and striking appearance. There are vast deposits of rock salt at Bochina and Vielicska, in Galicia, and others equally important along each side of the great Carpathian range, extending at various intervals from Moldavia to Suabia. In countries situated near the sea-coast, common salt is frequently obtained by the evaporation of sea-water, in which it is usually found as about two per cent. In the preparation of salt from sea-water, the water is exposed in a series of shallow pools, called *salt-gardens* or *salterns*, to the action of the sun and air. The salterns are laid out on a clay soil on the sea-coast, and are protected from the influence of the tides; they are worked during the warmer months, from March to September. The repeal of the duty on salt enabled the Cheshire manufacturers to sell the article at so low a rate that the proprietors of salterns could not compete with them, and they can now only flourish in countries which have no natural deposits of salt or brine, and where foreign salt is excluded by a high protective duty. Salt is the only mineral food of man, and forms an essential constituent of the blood, the loss of saline particles therefrom by the secretions, the tears, the bile, &c., being repaired by the use of common salt as a condiment. Salted provisions are unwholesome; but this is almost certainly due rather to their hardness and indigestibility than to the salt with which they are impregnated. All animals appear to be more or less fond of salt, and even bees will sip a solution of it with avidity. (*See* SODIUM).

SALTPETRE. (*See* POTASH, NITRATE OF.)

SALTS, in Chem.—A salt may be defined as a compound containing either a metallic oxide or alkaloid in combination with an acid or a metal, or pseudo-metallic grouping in combination with a halogen. The advocates of Gerhardt's theory reverse his well-known definition of an acid; namely, "a salt whose basis is hydrogen," and describe a salt as any metallic compound that is obtainable from an acid by the substitution of a metal or pseudo-metallic grouping for hydrogen. When first Lavoisier proposed his admirable scheme of chemistry, it was supposed that an acid could not exist without containing oxygen. As the science advanced, Sir Humphry Davy discovered the true composition of hydrochloric acid, and found that there were acids whose acidifying principle was hydrogen, which, when entering into combination with metallic oxides, gave up their hydrogen to the oxygen to form water. Taking the union of hydrochloric acid and soda as an example, it was found that the chlorine united directly with the sodium, the water formed at the time being readily driven off by heat. To meet this difficulty, salts were divided into two classes,—oxy-salts, formed by the union of a base and an acid, and haloid salts, formed by the union of a metallic and a halogen. Sir Humphry Davy advanced a theory, however, which is now almost universally received as the correct one. He assumed that when acids were rendered anhydrous they lost their acid properties, an assumption provable by direct experiment. Sulphuric acid he looked on not as $SO_3$, the anhydrous acid, but as $HOSO_3$, or rather $HSO_4$. This at once brought the two classes of salts into harmony, the grouping $SO_4$ being equivalent to the halogen in HCl, HI, HBr, &c. A few examples of salts and acids will render this more intelligible:—

| | | | |
|---|---|---|---|
| Hydrochloric acid, | H.Cl | ... Potash salt, | K.Cl |
| Hydrobromic acid, | H.Br | ... ,, | K.Br |
| Sulphuric acid, | $H.SO_4$ | ... ,, | $K.SO_4$ |
| Nitric acid, | $H.NO_3$ | ... ,, | $K.NO_3$ |
| Sulphurous acid, | $H.SO_3$ | ... ,, | $K.SO_3$ |

This theory is accepted in its entirety by the advocates of the new school. Salts being looked on as the union of an acid radicle with a metal, the name in a few cases has been necessarily altered. Thus, we now constantly meet with carbonate of *potassium*, nitrate of *sodium*, sulphate of *ammonium*, &c., in chemical publications. Salts are generally divided into three classes:—*Basic salts*, in which the amount of base predominates over the acid; *neutral salts*, [illegible] these are

united, equivalent for equivalent in protosalts, or one of base to three of acid in sesquisalts; and *acid salts*, where the acid is in excess. These terms must be taken in their chemical sense, and not as meaning the effect that certain salts have on litmus or turmeric paper. Thus, carbonate of potash, which is chemically a neutral salt, reddens turmeric-paper, and sulphate of alumina, also neutral, reddens litmus. Numerous examples of each of these classes will be found throughout this work. *Double salts* are those whose acid apparently combines with two bases to form a crystalline compound; but the real union appears to take place between the two salts: thus we have the double chloride of platinum and potassium, $KCl\ PtCl_2$; the double sulphate of potash and alumina, or ordinary alum, $KOSO_3\ Al_2O_3 3SO_3$; the double sulphate of potash and magnesia, $KOSO_3$, $MgOSO_3$, &c. For a masterly exposition of the principles concerned in the formation of salts, the student is referred to Miller's *Elements of Chemistry*, part II. p. 702.

SALUTATION, *săl-u-tā'-shun* (Lat. *salutatio*, from *salus*, safety), is the act or ceremony of saluting or paying respect or reverence to any one. Among the Romans, *salutatio* was the daily homage paid by clients and dependents to their superiors. The women, too, had their crowds of salutors attending them every morning. In the reception of those who came to pay their respects, the better sort were honoured with a kiss, the poorer had a small entertainment set before them, and were even feasted by those who wished to be thought very liberal. It is not a little interesting to observe the different modes of salutation that prevail in different countries. In most civilized countries, bowing, uncovering the head, pressing the hand, embracing, and kissing, are the usual modes in which good-will, esteem, and love, are expressed; but not unfrequently what is regarded as an act of civility in one country would be out of place, or even considered as rude, in another. In some parts of Germany, it is considered an act of politeness to *kiss* the hands of ladies; in Italy, this is a familiarity only permitted to nearest relatives. In the East, the salutations are generally of a very slavish character; as the throwing oneself on the ground before persons of distinction, and repeatedly kissing their feet. In Sumatra, the saluting person bows, begs the left foot of him whom he addresses, kneels on the ground, and applies this foot to the crown of his head, forehead, breast, and knee; finally, he touches the ground with his head, and remains for some moments stretched out on his belly. In the Pelew Islands, a person seizes the hand or foot of him whom he wishes to salute, and rubs his face with it. In the Philippines, they bend their body very low, place their hands upon their cheeks, raise one leg, and bend the knee. In Siam, the inferior throws himself on the ground before his superior. In Japan, the inferior takes off his sandals, puts his hands into the opposite sleeves, bends slowly, till they reach his knees, and thus with short and measured steps, and with a rocking motion, passes his superior crying, "Do not hurt me." In China, the forms of salutation are various. The Turk crosses his hands, places them upon his breast, and bows; the Laplanders rub noses; the Franks are said to have pulled out a hair, and presented it to the person saluted; an Ethiopian takes the robe of another and ties it about his own waist, leaving his friend half naked. In some parts, they show their humility by presenting themselves naked before the person whom they salute; in others, they scratch the hand slightly, and reciprocally suck a drop of blood from the wound, or, as a peculiar mark of esteem, they open a vein and present a goblet of blood as a beverage for their friend. The Baron von Seaken, when recently travelling in Africa, was obliged, in order to gain the friendship of one of the chiefs, to propose and perform the ceremony of drinking blood with him. Several negro nations take each other's hands and pull the fingers till they crack.

SALUTE, *sĭ-lute'* (Fr. *salut*, from Lat. *salute*).—In Mil. language this term denotes a discharge of artillery or small arms, or of both, in honour of some person or event: it is also applied to the ceremony of presenting arms, &c. A colonel is saluted by the guards of his regiment turning out and *presenting* arms *once* a day. If they turn out again, it is with *shouldered* arms. Lieutenant-colonels and majors are saluted by their own guards *once* a day with *shouldered* arms; at other times they *stand* to their arms. Officers wearing their hats are not, on any occasion, to take them off in saluting; but when their swords are not drawn, they are to salute by bringing up the right hand to the forehead, horizontally on a line with the eyebrow. When the command of a regiment devolves on a lieutenant-colonel, major, or captain, when guards present their arms, the officers, with the exception of those bearing the colours, on all occasions salute with their swords. In the *navy*, a salute is a testimony of respect or homage rendered by the ships of one nation to those of another, or by ships of the same nation to a superior or equal. This ceremony is performed in various ways, according to the circumstances, rank, or situation of the parties. It consists, like the military salute, of firing a certain number of cannon or volleys of small arms, and also in striking the colours or top-sails, or in three general cheers of the whole ship's crew, mounted on the yards and rigging for that purpose. A royal salute consists of twenty-one guns.

SALVADORACEÆ, *săl-vă-do-rā'-se-e*, in Bot., the *Salvadora* fam., a small nat. ord. of *Dicotyledones*, sub-class *Corollifloræ*, consisting of shrubs and small trees, with leathery leaves and minute panicled flowers. The species are natives of India, Syria, and North Africa. The only one of any importance is *Salvadora persica*, which Dr. Royle has shown to be the mustard-tree of Scripture. Its fruit is edible, and resembles in taste the garden cress. The bark of its root is acrid, and is employed in India as a blistering agent. Its leaves are said to possess purgative properties.

SALVAGE, *săl-vaj*, in Mercantile Law, is an allowance made to persons other than the crew, by whom ships or goods have been saved from the sea, fire, pirates, or enemies. The officers and crew of a ship cannot claim salvage in respect of services rendered to it, unless, indeed, their duty to its owners had ceased by the master's *bonâ fide* abandonment of it at sea, without hope of recovery. No fixed positive rule or rate is laid down fixing the amount of salvage, but the general principle is, that a reasonable compensation be made. The ingredients that are to be taken into account in determining the amount of salvage are —(1) enterprise in the salvors in going out in tempestuous weather, to assist a vessel in distress, risking their own lives to save their fellow-creatures, and to rescue the property of their fellow-subjects; (2) the degree of danger and distress from which the property is rescued, and whether it was in imminent peril and almost certainly lost, if not at the time rescued and preserved; (3) the degree of labour and skill which the salvors incur and display, and the time occupied; (4) the value. Where all these circumstances concur, a large and liberal reward ought to be given; but where none, or scarcely any, take place, the compensation can hardly be denominated a salvage compensation; it is little more than a mere remuneration for labour. "Looking to the current decisions, it will be found that it (the amount of salvage) is rarely less than *one-third* or more than *one-half* of the property saved, unless the services have been very inconsiderable, or the amount of the property has been very great." Sometimes, however, a fifth, sixth, or tenth only has been awarded. By the common law of England, the salvor is entitled to retain possession of the goods saved until the proper compensation is made to him for his trouble. Acts 3 & 4 Vict. c. 65, and 17 & 18 Vict. c. 104, give jurisdiction to the High Court of Admiralty to decide upon all claims relating to salvage. By the latter of these acts, a variety of regulations are made respecting wrecks and salvage, and the Board of Trade is authorized to appoint receivers of wreck for particular districts, whose duty it is, in the case of any vessel stranded or in distress on shore, to proceed to the place and take command of all persons present, and issue such directions as should be thought fit; and any person wilfully disobeying such directions forfeits a sum of £50. All cargo and other articles belonging to a vessel in distress that may be washed on shore are to be delivered to him.

SALVATION, *săl-vā'-shun*, in general, denotes deliverance from some great evil or danger. Thus God's conducting the Israelites through the Red Sea, and

delivering them out of the hands of the Philistines, is called a great salvation. But salvation, by way of eminence, is applied to the deliverance wrought out by Christ for mankind, saving them from the consequences of their sins. This last is the sense in which it is commonly used in the New Testament, as by the apostle Paul, when he says, "How shall we escape if we neglect so great salvation."

SALVIA, *săl'-ve-ă* (Lat. *salvus*, well, in good health, because it was esteemed capable of curing many diseases), a gen. of the nat. ord. *Labiatæ*, consisting of herbs and undershrubs, with aromatic leaves, which have generally a rugose appearance, and flowers commonly in spikes. The species best known is *S. officinalis*, the common or garden sage, so much used by the cook as a flavouring agent, particularly in the stuffing for pork, goose, and duck. An infusion of sage was formerly used, under the name of *sage-tea*, as a substitute for that of China tea; it is still largely employed in North America as a gargle in common sore-throat and when the uvula is relaxed. Many of the *salvias* are very ornamental plants, and are favourite objects of culture with the florist.



SAGE.

SAMARA, *săm'-ă-rȧ* (Lat., the seed of the elder-tree), in Bot., a superior two or more celled fruit, each cell being dry, indehiscent, few-seeded, and having its pericarp extended into a winged expansion. Each cell of the *samara* is, in fact, an achænium, with a winged margin. Examples of the *samara* occur in the so-called sycamore, the ash, and the elm.

SAMBUCUS, *săm-bu'-kus* (Lat., a musical instrument formed of this tree), in Bot., the Elder, a gen. of the nat. ord. *Caprifoliaceæ*. *S. nigra* is the common elder, well known on account of its fruit, from which the elder-wine of old-fashioned folk is manufactured, a liquor which is now chiefly used for adulterating port wine. Several parts of this plant are used in medicine. Its flowers contain a volatile oil, which renders them mildly stimulant and sudorific; they are employed in the preparation of a cooling ointment, and to make elder-flower water. The inner bark and leaves have more or less purgative and emetic properties. The fruit is mildly aperient and diuretic.

SAMPHIRE. (*See* CRITHMUM.)

SAMUEL, BOOKS OF, are two of the canonical books of the Old Testament, called after the prophet Samuel, their reputed author. They were anciently reckoned as one book by the Jews, the present division into two being derived from the Septuagint and Vulgate. Various attempts have been made to determine the age and authorship of these books, with more or less of probability. The common opinion, founded on 1 Chron. xxix. 29 ("Now the acts of David the king, first and last, behold they are written in the book of Samuel the seer, and in the book of Nathan the prophet, and in the book of Gad the seer"), is that the first twenty-four chapters were written by Samuel himself, and the remainder by Nathan and Gad. There is no reason to believe, however, that these documents were identical with the present books of Samuel. From Samuel and Kings being sometimes called the four books of Kings, Jahn is of opinion that they were all written by the same person and at a date so recent as the thirtieth year of the Babylonish captivity. This hypothesis, however, will not stand the test of criticism. The language and style of the books are very different, denoting different periods and different authors. The books of Samuel bear the impress of a hoary age in their language, allusions, and mode of composition. The insertion of odes and snatches of poetry, to enliven and verify the narrative, is common to them with the Pentateuch. They appear to have been made up from documents contemporary, or nearly so, with the events to which they refer, and wrought into their present form by some later hand. Some portions are more fully detailed and warmly coloured than others, and the minute and vivid sketches with which they abound prove that their author speaks what he knows, and testifies what he has seen. With respect to the person who compiled and brought them together in their present form, all that can be affirmed with probability is that he lived not long after the time of David. The historical character of the books is abundantly supported both by external and internal evidence. Portions of them are quoted or referred to in the New Testament, and allusions to them also occur in the book of Psalms, to which they often furnish historical illustration. Much has been made of discrepancies and contradictory statements that are said to occur in these books. Many of these are not contradictions. Several of the older objections of Hobbes, Spinoza, Simon, and Le Clerc, are satisfactorily disposed of by Carpzovius; the more recent by Hävernick, Keil, Hengstenberg, and Dr. Davidson. Granting that some remain, neither the inspiration of the compiler, nor the credibility of the general history, is ruinously affected. Discrepancies in minor matters of chronology and small points of history are of little moment. In these books we have biographies of Samuel, Saul and David. They may be divided as follows:—1. (*a*) Samuel's birth, call, denunciation of Eli by the command of God, and establishment in the prophetic office (i.—iii.); (*b*) the death of Eli, loss of the ark and its restoration, Samuel's activity as judge and conqueror of the Philistines (iv.—vii.); (*c*) the Israelites' desire of a king, the anointing, choice, and inauguration of Saul in the kingly office, with Samuel's parting address to the people (viii.—xii.). —2. The history of Saul's reign, comprehending—(*a*) his first attack on the Philistines and victory over them through Jonathan's valour (xiii.—xiv. 46); (*b*) his other wars and victories, his children and relations (xiv. 47—52); (*c*) his disobedience to God in his war against Amalek, and his rejection (xv.); (*d*) the anointing of David to be king, his playing before Saul, his victory over Goliah, and other relations to Saul and Jonathan (xvi.—xviii.); (*e*) his flight from before the king (xix.—xxvii.); (*f*) Saul's last undertakings and defeat in a war with the Philistines, with David's fortunes and victories during his stay in the territory of the Philistines (xxviii.—xxxi.).—3. The second book is taken up with an account of David's reign, comprising—(*a*) his lament over Saul and Jonathan's death (i.); (*b*) his return to the land of Israel, Ishbosheth's exaltation by Abner to the kingdom of Israel (ii.); (*c*) Abner passes over to the side of David, Ishbosheth murdered, and David anointed king of Israel (iii.—v. 5); (*d*) David's increasing power and dominion, the arrangement of the public worship of God, and divine confirmation of his kingdom (v. 6—vii.); (*e*) his victories over all external foes, his officers and servants (viii.—ix.); (*f*) the troubles of his reign, by adultery with Uriah's wife (x.—xii.); (*g*) the misconduct of his sons, Ammon's incest, Absalom's rebellion (xiii.—xix); (*h*) Sheba's insurrection (xx.); (*i*) famine, wars with the Philistines (xxi.); (*j*) thanksgiving psalm and last words (xxii.—xxiii. 7); (*k*) list of his mighty men and numbering of the people (xxiii. 8—xxiv.). The whole time occupied is 152 years.—*Ref.* Horne's *Introduction*.

SAMYDACEÆ, *săm-e-dā'-se-e*, in Bot., a nat. ord. of *Dicotyledones*, sub-class *Monochlamydeæ*, consisting of trees and shrubs, exclusively tropical and principally American. Leaves alternate, simple, evergreen, stipulate, usually with round or linear transparent markings. Flowers perfect. Calyx inferior, 4—5-partite. Stamens perigynous, two, three, or four times as many as the segments of the calyx. Fruit superior, capsular, leathery, 1-celled. Seeds numerous, arillate, with oily or fleshy albumen and large embryo. The plants are of little economic value.

SANCTIFICATION, *sănk'-tif-e-kā'-shun* (Lat. *sanctus*, holy, and *facio*, I make), is the work of the Holy Spirit on the soul of the regenerate man, by which it is made "meet for the inheritance of the saints in light." It is to be carefully distinguished from justification, which is the divine pardon and acceptance of the sinner. It is the progressive conformity of the heart and life of the Christian man to the will of God, from his justification to his final salvation.

SANCTUARIES, *sănk'-tu-ă-reez* (Lat. *sanctus*, holy).—Among the ancient Jews, a sanctuary was the innermost chamber of the tabernacle,—afterwards of the temple, in which was kept the ark of the covenant, and was never entered, except by the high-priest once a year. It was also called the Holy of Holies. In the Christian church, the bema or inner portion of the church, immediately round the altar, was called the sanctuary. From the sacred character of the churches and from the rising power of the clergy, they came to be resorted to as asylums by fugitives from the hands of justice, and afterwards certain churches were set apart specially for that purpose, and were termed sanctuaries. The gross abuses to which this system gave rise, as tending entirely to defeat the ends of justice, led to its abolition in all Protestant countries, and it has also fallen into disuse in most of the Roman Catholic states. Formerly in England a person accused of any crime (except treason and sacrilege), if he fled to any church or churchyard, and within forty days after went in sackcloth and confessed himself guilty before the coroner, and thereupon took the oath that he abjured the realm and would depart from thence forthwith, he saved his life, but forfeited his goods and chattels. By 27 Hen. VIII. c. 19, and 32 Hen. VIII. c. 12, the immunities of these privileged places were very much abridged; and by 21 Jac. I. c. 28, all privilege of sanctuary and abjuration, consequent thereupon, is utterly taken away and abolished.

SAND, *sănd* (Sax.).—Both common, river, and sea sands are composed of finely-divided silicious matter; particles of other substances are mixed with it, and sometimes it becomes calcareous through the presence of carbonate of lime. Pure silicious sands are very valuable for the manufacture of glass, for ameliorating dense clay soils, for moulding, and many other purposes.

SANDAL-WOOD. (*See* SANTALUM.)

SANDBAGS, in Mil. art, are bags filled with earth, and employed in order to repair breaches and embrasures; they are also used to form revetments of parapets and cover of infantry.

SANDEMONIANS. (*See* GLASSITES.)

SANDSTONE, *sănd'-stone*, a general term applied in Geol. to all stones composed of agglutinated grains of sand, which may be silicious or calcareous.

SANGUINARIA, *săng-gwin-ar'-reeă* (Lat. *sanguis*, blood, because used to stop hemorrhage), in Bot., a gen. of the nat. ord. *Papaveraceæ*. The most interesting species is *S. canadensis*, the puccoon, a native of North America. Its root, often called *blood-root*, from its containing a red juice, is used internally in large doses as an emetic and purgative, and in small doses as a diaphoretic and expectorant. When applied externally, it is said to exhibit marked escharotic properties, and has been tried combined with chloride of zinc as an application to check cancerous growths. Its efficacy as an external application has been doubted by those who have employed it in this country.

SANGUISORBEÆ, *săng'-gwis-sor-be-e*, in Bot., a sub-ord. of the Rose order. (*See* ROSACEÆ.)

SANHEDRIM, or SANHEDRIN, *săn'-he-drim* (Gr. *synedrion*, a council or assembly), was the name given by the Jews to the great council of the nation, instituted in the time of the Maccabees, and composed of seventy-two members. Moses, indeed, established in the wilderness an institution composed of seventy-two members, whose functions are commonly believed to have been of a judicial nature; but this is supposed not to have been of long continuance, as we have no further account of it in the Old Testament. The members who were admitted to a seat in the Sanhedrim were—(1) the *chief priests*; (2) elders; that is, the princes of tribes and heads of families; and (3) scribes, or men of learning. Of the latter two classes, those only had a seat who were elected or nominated by the ruling executive authority. The high-priest generally filled the office of president; besides whom there was a vice-president, who sat on his right hand, and according to some, a second vice-president, who sat on his left hand. The other members sat in such a way as to form a semicircle. According to the Talmudists, they assembled in a chamber within the precincts of the temple; but according to Josephus, it was in a room on the east side of Mount Zion, not far from the temple; and at the trial of Christ we read that they assembled in the high-priest's house. The authority of this council was very extensive. It decided on all the great affairs of the nation, and it was also a court of appeal from inferior tribunals. The right of judging in capital cases and pronouncing sentence of death belonged to this court alone. In the time of Christ, its power had been much limited by the interference of the Romans. It still retained the right of passing sentence of death, but the power of executing it rested with the Roman procurator.



SANITARY SCIENCE, *săn'-e-tă-re* (Lat. *sanitas*, health), is that department of human knowledge which regards the laws of the human body, and of the agents by which it is surrounded, with a view to the preservation of health and the warding off of disease and death. The practical application of these laws constitutes *hygiene*, or the art of preventing disease. This is commonly divided into public and private hygiene, the former having regard to the healthy condition of persons in communities, in camps, barracks, workhouses, &c.; the latter to the health of individuals. Even as early as the time of Moses we find numerous stringent sanitary laws and regulations laid down and enforced among the ancient Jews. The Greeks and Romans also had various regulations and provisions for the preservation of health and the prevention of disease; but among modern nations little was done till very recent times in this matter. It was not till 1831, when the cholera visited this country, that the public mind became awakened to the importance of paying greater attention to the laws of health; and it was not till 1845 that the "Nuisances' Removal Act" was passed, which became permanent in 1848. By 11 & 12 Vict. c. 63 (called the Public Health Act, 1848), amended and continued by subsequent acts, a "General Board of Health" was constituted, the members of which were a president appointed during her Majesty's pleasure, the principal secretaries of state for the time being, and the president and vice-president for the time being of the Board of Trade, with power to appoint for its assistance a medical council and a medical officer. Provision was also made for the establishment of local boards of health, having power to appoint officers, and charged with a variety of duties relating to the removal of nuisances; control over streets, water and gas works; the regulation of slaughter-houses, common lodging-houses, &c.; the construction of sewers, drains, privies, and other matters of a like nature. After ten years of successful operation, the Public Health Act was repealed in 1858, and the General Board of Health abolished, and a new Public Health Act passed, which placed the power formerly exercised by the General Board of Health in the hands of the Privy Council. In 1855, the Diseases' Prevention Act and the Nuisances' Removal Act were passed. By means of these and similar enactments, a variety of causes of disease are brought within the operation of the law, the local authorities being empowered to give notice for the removal of any nuisance, and if not attended to, a summons can be issued, and the offending parties brought before a magistrate. By the recent Vaccination Extension Act, all persons are required to have their children vaccinated within three months of their birth, under a penalty of £10 for neglect. When we regard mankind in general, we find that the external agents by which we are surrounded act very differently on different individuals, arising from temperament, age, idiosyncrasy, habit, hereditary tendency, &c., all of which it is of importance to keep in view in any application of hygienic rules. Thus, the conditions which would insure the health of an Englishman are not applicable to the Esquimaux or Hindoo. There are certain diseases to which youth is most liable, others to which age; and persons of different temperaments exhibit very different tendencies with respect to disease; and so with other peculiarities. Of external agents influencing health, the principal are the atmosphere, light, heat, electricity, water, and soil. The atmosphere is subject to a variety of physical and chemical changes, which more or less affect the health of man. The quantity of moisture which it contains, the amount of pressure, its various movements (winds), all exercise important influences on the health of man, and demand the careful study of the sanitarian. Light,

heat, and electricity also exert important influences upon life. Water, if not free from impurities, is very apt to engender disease, and is liable to be contaminated by the presence of decomposing animal and vegetable substances. Soil is also an important agent in regard to health, some soils retaining moisture and giving rise to malaria, others rapidly absorbing damp. The internal agents, or those which act more directly on the functions of the body, are generally included under the heads of food, clothing, exercise, mental occupation, sleep. The object of food is to repair the waste that is constantly taking place in the body, and to maintain its temperature; hence it ought to be suited respectively to the powers of digestion and to the wants of the system for nourishment and warmth. The object of clothing is to maintain, as far as possible, an equal degree of heat all over the body, and in the different seasons, so as to promote the free action of the different functions of the body and circulation of the blood: inattention to this subject is the cause of an immense deal of suffering, and even of death. Exercise is the calling into play the various organs of voluntary motion; when regular and moderate, it is of the greatest benefit to health, promoting the general circulation and strengthening the system; but when excessive, it tends to waste and destroy life. To diminish the destruction of life by over-exertion, and to supply such exercises as will maintain health, are the objects of the sanitarian. The due exercise of the mind is necessary to health, as well as of the body. Here, as in the other case, a partial or excessive culture of the functions of the nervous system is likely to engender disease. Exercise requires rest, and a period of exertion should be succeeded by a time of rest. The grand rest provided for the system is sleep. In general, a healthy hard-working man requires eight hours in bed out of the twenty-four,—many do with less, and some require nine; but that may be taken as the average. Public hygiene has for its object a particular knowledge of all the circumstances affecting the health of a community, and the application of rules and remedies to the many unwholesome influences that spring out of a social existence. It takes cognisance of the geographical position of towns, the arrangement of streets, the situation and construction of houses (warming, lighting, &c.), the cleansing of the public way (draining, sewering, &c.), supply of pure water, offensive and injurious trades, burial of the dead, disinfectants, and antiseptics. It also concerns itself with the adulterations of food, the origin and spread of epidemics, the specific and general causes of endemic diseases, &c.—Ref. *Encyclopædia Britannica*.

Sanscrit Language and Literature. (*See* Hindoos, Literature of the, and Hindostan, Languages of.)

Sans Culottes, *son(g) ku-lot'* (Fr., without breeches), was a term first applied in derision by the aristocrats to the popular party in France at the beginning of the Revolution of 1789; and as in several cases of a like kind, it came afterwards to be regarded by them as a title of honour. In the republican calendar, the five supernumerary days (each month having only 30 days, and therefore making 360 in the twelve) were at first called *jours sans-culottides*.

Sanseviera, *sân-se-ve-e'-rà* (in honour of M. Sanseviet, a Swedish botanist), in Bot., a gen. of the nat. ord. *Liliaceæ*. *S. zeylanica*, and other species, have strong and tough fibres, which constitute the *Africas hemp*, or *bowstring hemp* of commerce.

Santa-Fé Tea. (*See* Symplocos.)

Santalaceæ, *sân-tâ-lâs'-se-e* (Arab. *sandal*), in Bot., the Sandal-wood fam., a nat. ord. of *Dicotyledones*, sub-class *Monochlamydeæ*. Herbs, shrubs, or trees, with entire alternate leaves, and flowers usually perfect. Calyx superior; 4—5-cleft, valvate in æstivation. Stamens perigynous, equal in number, and opposite the segments of the calyx. Ovary 1-celled, inferior; ovules 1—4, usually suspended; placentation free-central. Fruit indehiscent, 1-seeded. Seed with a quantity of fleshy albumen; embryo straight, minute; radicle superior. The *Santalaceæ* are natives of various parts of the world. Those of North America and Europe are inconspicuous herbs; while those of India and Australia are trees or shrubs. The genus *Thesium* is parasitic on the roots of other plants. Some of the plants are remarkable for their fragrant wood: a few produce edible seeds. (*See* Santalum and Fusanus.)

Santalum, *sânt'-tâl-lum* (Arab. *sandal*), in Bot., the typical gen. of the nat. ord. *Santalaceæ*. The fragrant wood called *sandal-wood* is obtained from *S. album*, a native of India. It is employed in perfumery, and is used by the Indian doctors as a sedative and refrigerant. *S. Freycinatium* and *paniculatum* furnish the sandal-wood of the Sandwich Islands.

Sap, *sâp* (Fr. *super*, to undermine), in Fort., a trench for undermining, or an approach made to a fortified place by digging under gabions, &c.

Sap, in Bot., the nutrient fluid which circulates in plants. As it rises in the stem it is of a watery nature, and contains the various inorganic matters absorbed by the roots, also some sugar, dextrine, and other organic substances which it has dissolved in its upward course. In its passage to the leaves it becomes more and more altered from the state in which it was absorbed by the roots; but when it reaches the leaves it is still unfitted for the requirements of the plant, and is hence termed *crude sap*. Through the action of the light and air, it undergoes important changes in the leaves and other green parts, and becomes adapted for the nourishment of the plant. In this state it is termed *elaborated sap*. In Dicotyledons, this elaborated fluid descends through the internal bark and cambium layer towards the root, and is transmitted laterally inwards by the medullary rays. (*See* Botany.)

Sapacayan Nuts. (*See* Lecythis.)

Sapajous, *sâp'-à-joos*, a name given to those South-American monkeys which have prehensile tails.

Sap-Green. (*See* Rhamnus.)

Sapindaceæ, *sâp-in-dai'-se-e* (from Lat. *sapo Indicus*, Indian soap), in Bot., the Soapwort fam., a nat. ord. of *Dicotyledones*, sub-class *Thalamifloræ*, consisting of large trees and climbing shrubs, with the following essential characters:—Flowers unsymmetrical, hypogynous. Sepals and petals 4—5, imbricated, the latter commonly with an appendage. Stamens never agreeing in number with the sepals and petals, and inserted on a fleshy or glandular disk, or upon the thalamus; anthers bursting longitudinally. Fruit usually consisting of 3 carpels. Seeds commonly 2, sometimes 1 or 3, or very rarely more, exalbuminous, usually arillate and without wings; embryo almost always curved or spirally twisted. The plants of this order flourish chiefly in tropical regions, especially in South America and India. There are no European species,—the well-known horse-chestnut having been introduced into Europe from Asia and America. The presence of a saponaceous principle is one of the most prominent properties of the order. Many of these plants are poisonous in all their parts; but it more frequently happens that, while the roots, leaves, and branches are dangerous, the succulent fruits are innocuous, or in some cases even valuable articles of dessert. The useful products of the order are timber, edible fruits, starch, and the soapy matter above referred to. (*See* Æsculus, Nephelium, Paullinia, Sapindus.)

Sapindus, *sâp-in'-dus* (fr. Lat. *sapo Indicus*, Indian soap), in Bot., a gen. of the nat. ord. *Sapindaceæ*. The most important species is *S. saponaria*, the fruits of which are employed in the West Indies instead of soap for cleansing linen. The fruits of *S. inæqualis* contain the same saponaceous principle, and are used for the same purpose.

Saponaria. (*See* Caryophyllaceæ.)

Saponification, *sâ-pon-e-fê-kai'-shun* (Lat. *sapo*, soap), the term applied to the separation of the fatty acids from their glyceric base, by the addition of an alkali or other metallic base, which unites with them. (*See* Soap.)

Saponin, *sâp'-o-nin* (Lat. *sapo*, soap), a substance resembling soap, contained in a large number of plants, such as the *Saponaria officinalis*, in the root of the common pink, and in the fruit of the horse-chestnut. It is easily extracted from these sources by boiling alcohol. It is soluble in water in all proportions, and froths strongly on agitation. The juice of soapwort is often used as a detergent for cleansing the finer varieties of wool from grease. Powdered, it forms a powerful sternutatory. Boiled with dilute acids, it forms saponic acid.

SAPOTACEÆ, *sāp-o-tā'-se-e*, in Bot., the *Sapota* or *Sapodilla* fam., a nat. ord. of *Dicotyledones*, sub-class *Corollifloræ*. Trees or shrubs, often having a milky juice, with alternate, simple, exstipulate, coriaceous leaves and hermaphrodite flowers. Calyx usually with 5 divisions, sometimes 4—8; corolla with as many divisions, or twice or thrice as many; stamens definite, in a single row, half of them sterile and alternating with the fertile ones, the latter being opposite to the segments of the corolla; ovary 4—12-celled, with a solitary ovule in each cell; style single. Fruit fleshy; seeds large, with bony surface. The plants of this order are natives of the tropical parts of Asia, Africa, and America; many yield edible fruits. The seeds of some contain fatty oils. The valuable substance gutta-percha is a product of this order.

SAPPAN-WOOD. (*See* CÆSALPINIA.)

SAPPERS AND MINERS. (*See* ENGINEERS, ROYAL.)

SAPPHIC, *sāf'-fik*, is the name given to a species of Greek verse, after the celebrated poetess Sappho, by whom it is said to have been invented. It consists of eleven syllables, or five feet; the first being a trochee, the second a spondee, the third a dactyl, and the two last trochees; as follows:—

Grāndī | nīs mī | sīt pătĕr | ĕt rū | bentē

This measure was afterwards introduced into Latin, and received great improvements at the hands of Horace and Catullus.

SAPPHIRE, *saf'-fire* (Gr. *sappheiros*), a precious stone, next in hardness to the diamond: it consists of nearly pure alumina or clay, with a minute portion of iron as the colouring matter. It is found of various colours; the blue variety being generally called *sapphire*, the red the *oriental ruby*, and the yellow the *oriental topaz*. The finest varieties of sapphire come from Pegu, where they occur in the Capelau mountains, near Sgriau. Sapphires have also been found in France, Saxony, and Bohemia.

SARCOPHAGUS, *sar-kof'-ā-gus* (Gr. *sarx*, flesh; *phago*, I eat), a term which originally signified a species of limestone found in the neighbourhood of Assos, in Mysia, which had, according to Pliny, the property of destroying within forty days the corpses put into it, so that nothing remained entire except the teeth: hence the name. On account of this quality, the stone began to be much used for coffins, and finally the term began to be applied to all coffins made of stone, though often used for a contrary purpose to that which the word expresses. Among the earliest sarcophagi is the Egyptian, called *teba* or chest in the hieroglyphics, and found from the time of the pyramids to the year 100 A.D. The earliest form is that of a square stone chest, either plain or simply ornamented with two lotus-leaves. Those of the 18th and subsequent dynasties were of different shapes, the most ordinary being that of a mummy swathed, dividing into two parts longitudinally, the cover being formed by the front, and the chest by the back, of the figure. The stone used at this period was generally red granite, and the exterior of the coffin was ornamented with descriptions of scenes relating to the myth of Osiris, or the passage of the sun through the regions of night and darkness. During the 26th dynasty, the sarcophagi were usually made of basalt; but coarse red granite and black and white marble were occasionally employed. The hieroglyphics of this period are frequently chapters transcribed from the ritual of the dead. The coffin of Nectanebes I., in the British Museum, is the last of the royal sarcophagi. It is made of a fine breccia, and sculptured with scenes of the passage of the sun. This sarcophagus was formerly at Alexandria, and for a long time was believed, on insufficient grounds, to be the tomb of Alexander the Great. Many sarcophagi have been founded in Asiatic and European Greece, but very few of earlier date than the Roman empire, and generally of the 1st and 2nd centuries A.D. The remains of Christian sarcophagi have been found, many of them sculptured with scenes taken from the Old and New Testaments.

SARDONYX, *sar'-do-niks* (Gr. *sardonux*), a reddish-yellow or orange-coloured silicious stone or gem, nearly allied to the onyx. In Her., the marry colour in the coat of noblemen.

SARGASSUM, *sar-gās'-sum*, in Bot., a gen. of the nat. ord. *Algæ*. *S. bacciferum* is the gulf-weed of the Atlantic. Its stems are much employed in South America, under the name of *goitre-sticks*, in the treatment of goitre. Their beneficial effects are due to the large proportion of iodine existing in the plant.

SAROS, CHALDEAN, *sā'-ros kăl-dē'-an*, a period of time, so termed by the Chaldean astronomers. By a long series of observations of eclipses, they discovered the cycle of 223 lunations or eighteen solar years, which, by bringing back the moon to nearly the same position with respect to her nodes, her perigee, and the sun, brings back the eclipses in the same order. This is supposed to be the period which they named Saros.

SAROTHAMNUS, *sā-ro-thăm'-nus*, in Bot., a gen. of the nat. ord. *Papilionaceæ*. *S. scoparius* is the common broom, one of the most elegant of our native shrubs. Its seeds and tops are diuretic and laxative in small doses, purgative and emetic in large doses. They appear to owe their properties to a peculiar alkaloid discovered by Stenhouse, and termed *sparteine*.

SARRACENIACEÆ, *săr-rā-se-ne-ā'-se-e*, in Bot., the *Sarracenia*, Water-pitcher, or Side-saddle flower fam., a nat. ord. of *Dicotyledones*, sub-class *Thalamifloræ*, consisting of perennial herbs growing in the bogs of North America. They have pitcher- or trumpet-shaped leaves. Calyx permanent, imbricated; carpels united so as to form a compound ovary, and a 3-celled dehiscing fruit, with large axile placentæ. A decoction of the root of *Sarracenia purpurea* has been recommended as a remedy for small-pox; but the opinions of medical men differ widely as to its efficacy.

SARSAPARILLA. (*See* SMILAX.)

SARTORIUS, *sar-tō'-re-us* (Lat. *sartor*, a tailor), in Anat., is a flat and slender muscle, but the longest of the human body, extending obliquely from the upper and anterior part of the thigh to the upper anterior and inner part of the tibia. It serves to bend the leg obliquely inwards, or to roll the thigh outwards, and at the same time to bring one leg across the other; on which account it has received the name of *sartorius*, or tailor's muscle.

SASSAFRAS, *săs'-să-frăs* (*Sassafrass*, an American river, on whose banks it grows), in Bot., a gen. of the nat. ord. *Lauraceæ*. The root and wood of *S. officinale*, a North-American tree, are employed medicinally in this country and elsewhere, being stimulant, diaphoretic, and alterative. Volatile oil of sassafras, obtained from the wood, bark, and root by distillation, is also employed as a stimulant. Sassafras pith is used in America as a demulcent, in place of quince-seeds.

SASSAFRAS NUTS. (*See* NECTANDRA.)

SATAN, *sāt'-tăn*, is a Hebrew term, meaning enemy or adversary, and is used in several instances in this sense in the Old Testament. Generally, however, it is applied to the devil, as being the great adversary and enemy of mankind.

SATELLITE, *sāt'-e-lite* (Lat. *satelles*, an attendant), a term applied in Astron. to certain secondary planets moving round the other planets, as the moon does round the earth. They are so called because always found attending them, for rising and setting, and completing the orbit round the sun together with them. The words moon and satellite are sometimes used indifferently; thus, Jupiter's moons, or Jupiter's satellites, are spoken of; but the term moon is generally applied to the Earth's attendant, and the term satellite to the small moons round Jupiter, Saturn, and Uranus.

SATIN, *sāt'-in* (Fr. *satin*), a soft, closely-woven silk cloth, with a glossy surface. In making other silk stuffs, each half of the warp is raised alternately, but in weaving satin, the workman only raises the fifth or eighth part of the warp; thus the woof is hidden beneath the warp, which, presenting an even, smooth, and close surface, is better able to reflect the rays of light. In France, the chief seat of the satin manufacture is at Lyons, and in Italy at Genoa and Florence.

SATIRE, *sāt'-ire* (Lat. *satira*), in Lit., is the representation of follies or vices in a ridiculous form, either in discourse or dramatic action. The Romans were the first to distinguish themselves in this species of literature. The Roman satire was at first a kind of rude dramatic composition, filled with various matter and written in various kinds of verse, and took its

name of satura, or satira, from the lanx satura, a dish filled with various kinds of fruits and herbs, which was carried in procession at the feasts of Ceres as the first-fruits or gatherings of the season. These satires were set to music and repeated with suitable gestures, accompanied with the flute and dancing. They contained much ridicule and smart repartee; and hence poems characterized by these marks, and written to expose vice, got the name of satires. Lucilius was regarded by the Romans as the father of this species of composition, and was the first to introduce those principles of art which came afterwards to be regarded as essential to it. His poems formed the models of the satires of Horace, the great master in this art, and whose humorous and playful raillery of the follies and foibles of mankind are ever fresh and ever true. He reproves with a smiling aspect, and while he moralizes like a philosopher, he discovers at the same time all the politeness of a courtier. Juvenal is much more serious and declamatory. He has more strength and fire, and more elevation of style than Horace, but is at the same time greatly inferior to him in gracefulness and ease. Persius, the only other satirist of note whose works have come down to us, is a nervous and lively writer; but has more of the fire and force of Juvenal than of the politeness of Horace. Though the name satire usually is confined to poetical compositions, prose works of a satirical character are frequently included under the same head. Modern nations have not generally furnished many distinguished satirists. Among the French may be mentioned Rabelais, Montaigne, and Voltaire, and in this country, Swift, Fielding, and Thackeray, and the "English Bards and Scotch Reviewers" of Lord Byron.

Saturday, *sät'-ur-dā* (Lat. *dies Saturni*), is the seventh day of the week, and receives its name from being dedicated by the Romans to Saturn. It is the sabbath of the Jews.

Satureya, or Satureja, *sāt'-ur-e-gyä* (Gr. *saturon*, satyrs), in Bot., Savory, a gen. of the nat. ord. *Labiatæ*. It includes the two well-known flavouring herbs *S. montana*, winter savory, and *S. hortensis*, summer savory.

Saturn, *sāt'-urn*, in Astron., the name given to one of the old planets and the largest of the celestial bodies in the solar system, except the Sun and Jupiter. This planet was known from the earliest times. It shines in the heavens like a star of the first magnitude, is of moderate brightness, and never exhibits traces of scintillations. The slow proper motion of Saturn among the constellations had led astronomers correctly to place it at the extreme limits of our system, at a much greater distance than Mars or Jupiter. The time in which Saturn traverses its entire orbit, or the time of its sidereal revolution, is 29 years, 5 months, and 16 days. Its motion is effected in an elliptical orbit, the plane of which makes with the plane of the ecliptic an angle of 2° 29′ 28″. The inclination of the orbit of Saturn to the terrestrial equator is 22° 38′ 44″. The excentricity of the orbit is 0·056. In magnitude, it is not much inferior to Jupiter, being 79,000 miles in diameter, exceeding the earth in bulk nearly 1,000 times. This stupendous globe, besides being attended by seven satellites or moons, is surrounded by two broad, flat, extremely thin rings, concentric with the planet and with each other. Both these rings lie in one plane, and are separated by a very narrow interval from each other throughout their whole circumference, as they are from the planet by a much wider. The interval between the two rings is estimated at 1,791 miles; and the interval between the planet and the interior ring at 19,000 miles. Seen through the telescope, the ring is observed to throw its shadow on the body of the planet on the side nearest the sun, and on the other side to receive the shadow of the body. From this observation, the fact has been ascertained that Saturn is not self-luminous, but shines only by the reflected light of the sun. The planet itself revolves on its axis in 10h. 29m. 17s., and the rings rotate in their own plane in 10h. 32m. 15s.—(*Sir John Herschel.*) To an inhabitant of Saturn in those regions which lie above the enlightened sides, these rings must present a magnificent spectacle; appearing as vast arches spanning the sky from horizon to horizon, and holding an almost invariable situation among the stars. On the other hand, in the regions beneath the dark side, there must be a solar eclipse of fifteen years' duration, the only light received being the faint illumination of the satellites.

Saururaceæ, *saw-rur-ai'-se-e*, in Bot., a small nat. ord. of *Dicotyledones*, sub-class *Monochlamydeæ*, consisting of marshy herbs, with alternate stipulate leaves and spiked achlamydeous flowers. They are natives of North America, Northern India, and China. They are of no economic importance.

Sauvagesia, *saw-vā-ge'-se-ä*, in Bot., the *Sauvagesia* fam., a small nat. ord. of *Dicotyledones*, sub-class *Thalamiflorœ*, by some botanists regarded as a sub-ord. of *Violaceæ*, but distinguished by several minor characters. The plants of this order are natives of South America and the West Indies. Their properties have not been investigated. *Sauvagesia erecta*, the species best known, contains much mucilage, and has been used internally as a diuretic, also externally in diseases of the eye.

Savings Banks, *sāi'-vings* (from Lat. *salvo*, I keep safe), are institutions of very modern date, and are established for the purpose of encouraging provident habits among the poorer classes, by enabling them to deposit small sums of money at liberal interest, and returnable on demand. The value of such institutions can scarcely be over-estimated. They enable those who have anything to spare, not only to deposit it in safety, but also to receive interest upon it, while the sum itself can be received back at any time it may be required. By this means, provident habits are fostered, and in general such habits require only a beginning; and a sum is thus secured against a time of sickness, distress, or old age. The earliest savings banks, properly so called, of which we have any account, are those of Hamburg, founded in 1778, and of Berne about nine years afterwards. Both of them were restricted, more or less closely, to the use of domestic servants, mechanics, and the like; but they seem to have attracted very little attention in England. The first institution of this kind in this country was established by Mrs. Priscilla Wakefield at Tottenham, in the county of Middlesex, and opened in 1804. Six years before she had opened a "children's bank," the success of which had induced her to extend her operations. At first the accounts were kept by Mrs. Wakefield, who was assisted by six gentlemen, who undertook to receive each a part of the sums deposited, and to allow five per cent. interest on the same, to depositors of twenty shillings and upwards, who should leave their money for at least a year in their hands. As the deposits increased, additional trustees were chosen. In 1808, a savings bank for domestic servants was opened at Bath, and interest allowed upon deposits at the rate of four per cent. per annum. The direct founder of savings banks in Britain, however, was the Rev. Henry Duncan, minister of Ruthwell, in Dumfriesshire, who founded the "Parish Bank Friendly Society" there in 1810. It was the first institution of the kind regularly and minutely organized, and in the course of four years the benevolent and energetic founder had the satisfaction of seeing in his bank a fund amounting to £1,160, and bearing interest at five per cent. In 1813 a savings bank was established in Edinburgh, and at the end of the year 1816 there were seventy savings banks established in England, four in Wales, and four in Ireland. In July, 1817, the first parliamentary enactments for the regulation of savings banks were passed, the one being 57 Geo. III. c. 130, intituled "An Act to encourage the Establishment of Banks for Savings in England;" the other, 57 Geo. III. c. 105, intituled "An Act to encourage the Establishment of Banks for Savings in Ireland." Under these acts, the trustees and managers were prohibited from receiving any profits, and the rules of each bank were required to be deposited with the clerk of the peace. The moneys received were to be paid into the Bank of England or Ireland respectively, to the account of the commissioners for the reduction of the national debt, and as "the Fund of the Banks for Savings." The commissioners were to invest the moneys so received in the Three per Cent. Bank Annuities, and were to issue debentures bearing interest at 3*d.* per cent. per diem (£4. 11*s.* 3*d.* per annum), payable twice a year, in May and November. The next session, 58 Geo. III. c. 42, intituled "An Act to amend

an Act passed in the last session of Parliament to encourage the Establishment of Banks for Savings in England," was passed, by which the forms of the debentures were altered, and power given to the justices at sessions to reject the rules deposited with the clerk of the peace. In March, 1818, 164 banks in England and Wales had paid to the account of the national debt commissioners sums amounting in all to £857,197, with which stock had been purchased to the amount of £816,547; and seven banks in Ireland had similarly invested £12,553, producing in stock £132,322. An act of 1820 (1 Geo. IV. c. 83) abolished the issuing of debentures, and directed that the interest should be calculated twice in the year and carried to account as additional principal; and in 1824, 5 Geo. IV. c. 62, was passed, restricting the sum deposited by each person to not more than £50 in the first year and £30 in each subsequent year, and that at no time should the whole amount exceed £200, exclusive of interest; neither could deposits be made in more than one savings bank. On the 20th November, 1824, when the new law came into force, the total amount of stock standing in the commissioners' names on the savings bank account was £13,894,350, the actual cost of which had been £11,544,017. In 1828, an act (9 Geo. IV. c. 92) was passed, repealing all the statutes previously in force, and consolidating and amending the laws relating to savings banks. It provides that the rules of every bank shall be entered in a book to be deposited with the clerk of the peace for the county in which such bank is held, and be then submitted to a barrister appointed by the commissioners, to be by him certified and laid before the justices in quarter sessions, who may reject the same, or any part thereof. If admitted, the rules become binding on the depositors and officers. It contained various other enactments. In 1833, 3 Wm. IV. c. 14, was passed, "to enable depositors in savings banks and others to purchase government annuities through the medium of savings banks," &c.; and by 5 & 6 Wm. IV. c. 57, the provisions of the above acts were extended to Scotland. In 1841, the total number of savings banks in the United Kingdom was 555; being 428 in England, 23 in Wales, 28 in Scotland, and 76 in Ireland; the number of current accounts was 841,204, and the total amount deposited was £24,474,680. In 1844, 7 & 8 Vict. c. 83, intituled "An Act to amend the Laws relating to Savings Banks, and to the purchase of Government Annuities through the medium of Savings Banks." It reduces the interest of all moneys invested by the trustees of savings banks in the national funds to the rate of £3. 5*s.*, and declares that the maximum of interest to be allowed to depositors shall not exceed the rate of £3, 0*s.* 10*d.* per cent. In 1857, the total number of banks was 597, with 1,341,752 depositors; of whom 1,139,910 had sums not exceeding £50, and the total amount deposited was £32,964,023. In 1861 there were 590 savings banks in England and Wales, with 1,377,479 depositors, and £36,896,067 deposits; 53 in Scotland, with 143,906 depositors, and £2,538,143 deposits; and 55 in Ireland, with 70,214 depositors, and £2,153,211 deposits. In the end of last session, a new act, consolidating and amending the previous acts relating to savings banks, was passed; but the alterations are not very material, and it has not yet come into force. In 1861, savings banks were established in connection with the Post-office, and have since been largely taken advantage of. They afford greater facilities than other savings banks for the depositing and withdrawing of money, and the government holds itself directly responsible for it. Interest is allowed at the rate of £2. 10*s.* per cent. There are now upwards of 3,000 of these establishments throughout the country. In September, 1863, there were 334,355 depositors, and £2,648,341 of deposits. During the two years that they had been in existence, £3,730,885 had been received, and £1,088,544 paid.

SAW, *saw* (Sax. *saga*), a cutting instrument, formed from a plate of sheet steel, and toothed by means of a press and tools. Circular saws have the advantage of being very accurately divided in their teeth by means of a division-plate: this prevents irregularity of size, and imparts smoothness and uniformity of action. All saws are hardened and tempered in oil. The forms of the teeth do not depend on taste, but are those best fitted for cutting through the particular section, quality, or hardness of the substance to be cut. Iron bars, shaftings, &c., are cut to length by a steel circular saw, which revolves very rapidly. The iron is presented to the saw red-hot. A bar two inches in diameter can thus be cut through in a few seconds.

SAW-MILL, a mill for sawing timber, in which the motive power is either wind, water, or steam. According to Beckman, saw-mills driven by water were erected as early as the 4th century in Germany. They do not, however, appear to have become common till the 14th or 15th century. The operation of sawing by hand is very laborious; hence saw-mills rapidly came into very general use.

SAX HORN, *saks horn*, a brass instrument, invented by Mr. A. A. J. Sax, constructed in such a manner that the large portion, after passing under the arm of the performer, repasses over his shoulder, presenting the bell to the front. The advantage of this shape is that it avoids the elbows, which would otherwise impair the progress of the sound. They have great power, more especially the contra bassos in E and B flat; the latter of which has *forty-eight feet* of development in its tube.

SAXIFRAGACEÆ, *saks-e-fri-gai'-se-e* (Lat. *saxum*, a stone; *frango*, I break, because supposed to break or dissolve stones in the bladder), in Bot., the Saxifrage fam., a nat. ord. of *Dicotyledones*, sub-class *Calycifloræ*, having the following essential characters:—Herbs with alternate leaves and unsymmetrical flowers. Calyx inferior, or generally more or less superior, 4—5-partite. Stamens perigynous or hypogynous. Ovary superior, or more or less inferior, composed of 2 carpels, united at the base, and diverging at the apex; styles distinct, equal in number to the carpels. Fruit capsular, 1—2-celled. Seeds numerous, small, with fleshy albumen. The plants of this order are all natives of northern regions, and usually inhabit mountain districts, being sometimes found at a height of 16,000 feet above the sea. They are generally characterized by astringency. This is particularly the case with *Heuchera americana*, which, under the name of *alum-root*, is much used as an astringent in North America.

SCABIOSA, *skāb-e-ō'-sā* (Lat. *scaber*, rough, from its hairy surface), in Bot., a gen. of the nat. ord. *Dipsaceæ*. *S. succisa* is said to yield a green dye. It is called the Devil's-bit scabious, on account of its abruptly-terminated root, which appears as though a piece had been bitten off.

SCAFFOLDING, *skăf'-fold-ing* (Fr. *échafaud*, a scaffold), a temporary erection of timber-work, by the means of upright poles and horizontal pieces, usually for the purpose of supporting workmen and materials during the progress of a building. In ordinary buildings, poles are erected in a vertical position a few feet from the walls, their lower ends being inserted in the ground. Wherever a platform is required for the workmen, a horizontal pole is tied to the uprights, parallel with the wall; and from this horizontal pole cross-pieces extend to the wall, into which their ends are received to support a flooring of planks. Ladders are used to afford access to the platforms, of which, in some stages of the building, there are several; and bricks and mortar are carried up in hods on the shoulders of workmen, or in baskets raised by a rope passing over a pulley. The scaffolding used for carrying up buildings on the continent has, until very recently, been much superior to that used in this country; but latterly our builders have appeared more anxious to construct their scaffoldings scientifically and solidly.

SCAGLIOLA, *skăl-ye-ō'-lă* (Ital.), a term applied to ornamental plaster-work, made of finely-ground calcined gypsum worked into a paste with glue. It produces the most perfect imitation of marble, from which it can scarcely be distinguished either by the eye or the touch, as it takes an equally high polish, and is equally hard and cold to the touch. In Italy, scagliola has long been in use, where it was invented by Guido del Conte or Fassi (1584—1649), an ingenious mason of Carl, near Correggio, in Lombardy. It was first introduced into this country in the latter half of the last century, and the earliest application of it was in the columns of the Pantheon in Oxford Street, London, built by James Wyatt. It has been brought into more general use since that time, and the manufacture

has not only improved considerably, but can be executed upon a comparatively small outlay. For columns and other interior decorations, it has to a considerable extent superseded the use of coloured marbles, being far less costly and quite as durable. In the process of manufacture, the purest of gypsum is first broken into small pieces, and after being calcined, is reduced to powder. It is then passed through a fine sieve, and mixed with Flanders glue, isinglass, &c. While in this condition, it is mixed with different colouring matters, according to the shades of colour required in the variety of marble to be imitated. In this state it is laid on like cement. After hardening, the next process is to polish it: this is effected first by rubbing with pumice-stone, and afterwards by rubbing it with tripoli and charcoal on a piece of fine linen, and afterwards with felt dipped in tripoli and oil, and lastly with oil alone. One of the chief advantages of scagliola-work is that it can be applied to columns made of wood and hollow, or else filled with a plaster core. Columns of this kind do not require that support in the floor beneath which is necessary when solid shafts of marble are employed. The use of scagliola is not confined to columns and pilasters only; it can be applied to other ornamental purposes, such as table-slabs, pedestals, borders of floors, &c. By means of scagliola, some of the rarest and most costly stones can be imitated; such as porphyry, verde antico, giallo antico, and others.

SCALDS, or SKALDS, *skâlds*, were the poets of the ancient Scandinavian race. They were the companions and chroniclers of their kings and princes, attended them on their martial expeditions, and resided at their courts in times of peace. They sang the praises of the gods and the exploits of their mighty men. They were often richly rewarded for their songs, and sometimes even permitted to marry the daughters of princes. A sacred character was also attached to them, and they performed the office of ambassadors between hostile tribes. (*See* NORWEGIAN LANGUAGE AND LITERATURE.)

SCALE, *skail* (Lat. *scala*), in Mus., is a series of sounds, rising or falling from any given pitch or tone to the greatest possible distance through such intermediate degrees as make the succession most agreeable and perfect, and which contains all the harmonical divisions most commodiously divided. "The scale," says Dr. Busby, "may be simple, as comprising only the notes of one octave, or compound, as embracing a series of octaves. Taken in the former sense, it presents a limited course of contiguous degrees of different dimensions, as tones and semitones; received in the latter sense, it implies a series of equal degrees, consisting of equal degrees or semitones, and bounded only by the powers of instrumental expression. Again, in its former sense, the scale signifies a measured course of tones and semitones, taken in certain order, as that order which constitutes the *major mode*, or that which forms the *minor mode*; but in its latter sense, it neither has nor requires any diversified arrangement whatever." The modern scale, consisting as it does of an enumeration of all the diatonic sounds of our system, arranged in order, is very properly termed the *universal system*, in the same manner as the Greeks combined their three scales (viz., the Diatonic, Chromatic, and Enharmonic, each consisting of four sounds only), under the name of *Tetrachord*. (*See* MUSIC.)

SCALPING, *skalp'-ing*, a barbarous custom which prevailed among Indian warriors of taking off the scalps of their enemies, which they preserved as trophies of victory.

SCAMMONY. (*See* CONVOLVULUS.)

SCANDAL, *skan'-dil* (Lat. *scandalum*), in Law, is defined to be "a disadvantageous rumour or report, or an action whereby one is affronted in public." It is said that formerly no actions were brought for words unless the slander were such as, if true, would endanger the life of the object of it. But too great encouragement being thus given to false and malicious slanderers, it is now held that for scandalous words that may endanger a man at law, by impeaching him of some heinous crime; exclude him from society, by charging him with having an infectious disease; impair his trade by calling him a bankrupt, and such-like, an action on the case may be had without proving any particular damage to have happened. With regard to words that do not thus appear to be injurious, it is necessary to aver some particular damage to have been sustained. If the defendant be able to prove his words to be true, no action will lie for any words of defamation whatever, whether special damage has ensued or not; for the law then deems them to be justifiable. *Scandalum magnatum* denotes a scandal or wrong done to any high personage, as peer, prelate, judge, &c., by false or scandalous news or tales, an offence held to be particularly heinous, even though not to the extent that would render it actionable in the case of a common person. The remedy is by an action on the case founded on many ancient statutes; but no resort having been had to it in modern times, it is now in a manner forgotten.

SCANDINAVIAN MYTHOLOGY, *skân-din-ai'-ve-ân*.—The Scandinavian mythology, in the form in which we possess it, is the work of those northern minstrels of Denmark, Sweden, Norway, and Iceland, called Scalds. It is characterized by wild imagination. Some of its features are: there were originally no heavens above or earth below, but only a bottomless deep and a world of mist, in which flowed Hwergelmer, the fountain that strove to devour everything. Twelve rivers issued from this fountain and flowed so far from their source as to stop and become frozen into ice, until one layer accumulating above another, the great deep was filled up. Subsequently, Ymir, the ice-giant, was created. Descended from Bure, another ice-giant, were Odin, Wile, and Ve, who became the rulers of heaven and earth. The creation of seas and rivers, rocks and stones, and the clouds, are each described, the whole cosmogony being stamped with a northern view of nature. The chief god is Odin; he is the first and oldest of all, and lives for ever. From him and his wife Frigga are descended the gods, on which account he is called Alfader (Father of all). Their sons are Thor, god of thunder, the symbol of physical strength, the strongest of gods and mortals, whose hammer crushes the hardest objects, and Balder, the youthful and beautiful god of eloquence. Iduna is the wife of Braga, a son of Thor. She preserves the apples of immortality, which she presents in vessels of gold to the heroes at their entrance into Valhalla. The residence of the gods is Asgard, where there are twelve heavenly palaces of such extraordinary splendour that the light of the sun and moon is, unnecessary. Asgard is protected by an abyss spanned by the bridge Bifröst, formed of water, air, and fire, and strong enough to bear the weight of the gods, but which will break under the weight of the giants. In the centre of Asgard, in the valley of Ida, is the place where the gods administer justice. Gladheim, the hall of joy; Wingolf, the palace of friendship and love; and Glasor, the golden forest, are here situate. Valhalla is a separate palace, with groves and beautiful environs; it is the dwelling of heroes who have fallen in battle. Here life is passed in war and revelry; but all wounds received in the fray are healed as soon as the trumpet sounds for the feast. Opposed to Asgard is Niflheim, whence will come the wicked Loke, superhuman son of the giant Forbaute. From him come the wolf Fenris and the terrible serpent Jormungandu, which surrounds the whole earth. The powers of destruction that will issue from Niflheim will bring about the end of the world, which will be destroyed by cold, snow, bloody wars, ultimately falling into the jaws of Fenris. At the same time, Asgard is to be stormed by the giants. The gods will all perish, even the all-powerful Odin and the mighty Thor. A new sun will then shine upon the earth, and Lift and Liftrasor, a human pair, who have escaped destruction, and have been nourished on morning dew, will perpetuate the human race. (*See* EDDA, HEIMSKRINGLA, NORWEGIAN LANGUAGE AND LITERATURE.)—*Ref.* Jacob Grimm's *Deutsche Mythologie*; Mallet's *Northern Antiquities*; *English Cyclopædia*.

SCANNING, *skin'-ning*, in Poetry, is the measuring a verse by feet, in order to see whether the quantities be duly observed. Thus a hexameter verse is scanned by reducing it into six feet, a pentameter into five, and so on. It is chiefly used in regard to Greek and Latin verses.

SCAPULA, *skip'-u-lâ* (Lat., the shoulder-blade), in

**Anat.**, is the name given to that flat triangular bone passing from the shoulder-joint in a direction towards the vertebral column, and extending, when the arms hang loosely, from the first to about the seventh rib. It presents various irregularities, and is so thin in some places as to be transparent. The outer surface is slightly convex, and divided into two unequal parts by a very prominent ridge or plate of bone, termed the "spine." The use of this bone is to afford a movable fulcrum for the motions of the arm, as well as an extensive surface for the attachment of the muscles which effect the movement.

SCARABÆIDÆ, *skăr-a-bē'-e-dē*, a large family of pentamerous *Coleoptera*, belonging to the group *Lamellicornes*. They possess antennæ, generally terminated by a club, made up of leaflets, capable of being shut up, but sometimes of box-like joints. The species are about 3,000, and this immense group has been subdivided into several distinct families.—The *Copraphagi*, or dung-feeding beetles. The type of this family is the sacred beetle of the Egyptians. (*See* ATEUCHUS.)—The second family, the *Arenicoli*, contains those specimens in which the elytra entirely cover the abdomen. They make deep burrows in the earth, fly about after sunset, counterfeit death when alarmed.—The third family is that of the *Xylophili*, the males of which have peculiar horns or tubercles on the head or thorax.—The fourth family, *Phyllophagi*, contains a number of beetles, called chafers, which feed on the leaves of trees.—The fifth family, *Anthobiæ*, contains species which feed upon leaves and flowers.—The sixth family, *Meletophili*, are also beetles which live upon the juices of flowers.

SCARF-SKIN. (*See* SKIN.)

SCARIFICATION, *skă-re-fe-kai'-shun* (Lat. *scarificatio*), in Surg., is the operation of making small cuts or punctures in the skin by means of lancets or other cutting instruments, particularly the cupping instrument.

SCARIFIER, *skăr'-e-fi-er* (Fr. *scarifier*, to scratch), an implement used for stirring and loosening the soil, without bringing up a fresh surface. Under the same head may be included the grubber, the cultivator, and the scuffler, all of which act on the combined principles of the plough and harrow at the same time. Some of these implements have wheels, by the raising or lowering of which the tines or prongs may be made to sink more or less into the earth.

SCARLET FEVER, or SCARLATINA, *skar'-let skar-lă-tē'-nă* (Lat.), in Med., is a contagious febrile disease, almost always attended during a part of its course by a rash and by sore throat. Sometimes only one of these features is well marked, sometimes both. Though persons of all ages are susceptible of it, it is eminently a disease of children. Like small-pox or measles, it rarely attacks a person more than once. It usually comes on with shiverings and a feeling of lassitude, followed by more or less of fever, restlessness, loss of appetite, headache, nausea, and occasionally vomiting. Then, generally on the second day, the eruption begins to come out, though in some of the worst forms it may be deferred to the fourth. In the most regular and favourable cases, the eruption stands out for three or four days, and then begins to fade and decline, becoming, by degrees, indistinct, and disappearing altogether in the majority of instances before the end of the seventh day. The tongue is often covered at the outset with a thick white cream-coloured fur, which gradually cleans away, and the surface becomes preternaturally red and raw-looking. There is a sensation of stiffness and pain on moving the neck, with pain on swallowing: the voice is thick, and the throat feels rough and straitened. Physicians distinguish three different varieties of scarlatina; viz., scarlatina simplex, in which there is a florid rash and little or no affection of the throat; scarlatina anginosa, in which both the skin and the throat are decidedly implicated; and scarlatina maligna, in which the stress of the disease falls upon the throat. In malignant cases, the eruption, if it appear at all, is livid and partial, and fades early, and is attended with a feeble pulse, a cold skin, and extreme prostration of strength. Sometimes the patient sinks at once, and irretrievably, under the virulence of the poison, and life is extinguished in a few hours. The chance of recovery is much greater in anginosa, when the eruption is florid and stands out well; but even here there are various ways in which it may prove fatal. The state of the throat is full of peril, becoming foul and sloughy, and many cases prove fatal in the second week of the diporder. Scarlatina simplex is a very mild form of the disease, and deviates only slightly from a state of health. Scarlatina is also dangerous from its tendency to give rise to other complaints, as boils or strumous ulcers, various forms of scrofula, dropsy, &c. In treating the simplest form of scarlet fever, little else is required than confinement to the house, regulation of the bowels, and the avoidance of all stimulating substances in the matter of diet. In anginosa, frequently, all that is necessary is to keep the bowels open by moderate laxatives, and watch the progress of the complaint. If the heat of the surface is great and distressing, cold or tepid sponging may be adopted; and if the pulse is hard and strong, some leeches may be applied behind the ear. If delirium come on, the scalp may require to be shaved and cold applied to it; and if the fever and delirium are violent, blood may have to be taken cautiously from the arm. In the worst form of this disease, all efforts to save the patient will often be unavailing. When the system seems to be overwhelmed with the strength of the poison, a liberal administration of wine and bark will be required to sustain the flagging powers until the deadly agency has in some measure passed away. As gargles for the throat, a weak solution of chloride of soda or of nitrate of silver is very useful. A solution of chlorate of potass in water (a drachm to a pint) is recommended as a drink in this disease. The bowels also require to be carefully watched; and great care is necessary to avoid cold during the period of convalescence.—Ref. Watson's *Lectures on the Principles and Practice of Physic*.

SCENERY, *sē'-ne-re*, is a term applied to the decorations of a stage of a theatre, by means of which the different places in which the action is supposed to go on are represented. In the theatres of the ancients there was no change of scene, the walls of the stage being painted some quiet colour, with the most simple forms of decoration. The theatres established in Europe had at first no side walls, and were not provided with movable scenery. When the mysteries were represented on the stage, the actors all took their seats on benches ranged along the sides. When called upon to make his appearance in the piece, the actor rose from his seat, and took it again at his exit. At a later period, the representation of a tragedy was indicated by black hangings round the stage, and the changes of the scene were shown by simply fixing up inscriptions, upon which was written the name of the place represented in the action of the piece. This was the mode adopted in Shakspere's time, and, indeed, till the invention of the Italian architect Serlio reached England. Serlio first placed movable scenes on the sides and back of a stage, so as to leave intervals between them, affording a free passage. Garrick introduced from France an improved mode of lighting the stage. Scene-painting is conducted chiefly in water-colours. At the present day, so great has been the advance made in this department of art, that some of the most beautiful and striking effects are to be witnessed at even the minor theatres.

SCEPACEÆ, *skē-pai'-se-e*, in Bot., the *Scepa* fam., a small natural order of *Dicotyledones*, sub-class *Monochlamydeæ*, only distinguished from *Euphorbiaceæ* by its flowers being amentaceous. There are but three genera and six species, all natives of India. The wood of *Lepidostachys Roxburghii* is called *cocus* or *lokra*, and, being very hard, is employed for flutes and similar musical instruments.

SCEPTICISM, *skep'-te-sism* (Gr. *skepsis*, doubt), is a term applied to "that negative system of philosophy which by doubting of everything beyond the region of phenomena, doubts the possibility of all speculation;" or, according to Sextus Empiricus, it is "the power of opposing in all their contradiction the sensuous representations and the conceptions of the mind, and thus to induce perfect suspension of judgment." The sceptic in general accepts of the phenomena of nature as he finds them, and, convinced of the impossibility of diving beneath the appearances to the real causes of things, contents himself with

a spirit of doubt and indifference. The ten topics of argument used in the schools of the sceptics were:—1. That on account of the variety that exists in the organism of different animal bodies, it is probable that the same external object presents different images to different animals, and man has no reason for asserting that his perceptions are more conformable to the real nature of things than those of inferior animals.—2. That even among men there is a great diversity both of mind and body, which necessarily occasions a great variety of opinions, every one judging according to his particular apprehension, while no one is able to determine the real nature of things.—3. That the different senses give different reports of the same thing; and hence bodies may have different properties from those which the senses lead us to suppose.—4. That the same thing appears differently according to the different disposition or circumstances of the person who perceives it; whence it is impossible for any one man to pronounce that his judgment concerning any object is agreeable to nature.—5. That things assume a different aspect according to their distance, position, or place, and no reason can be assigned why one of these aspects should agree with the real object rather than the rest.—6. That no object offers itself to the senses which is not so connected and mixed with others that it cannot be distinctly separated and examined.—7. That objects of sense appear exceedingly different when viewed in a compound and in a decomposed state, and that it is impossible to say which appearance most truly expresses their real nature.—8. That every object being always viewed in its relation to others, it is impossible to determine what it is simply in its own nature.—9. That our judgment is liable to uncertainty from the circumstance of frequent or rare occurrence, that which happens every day appearing in a very different light from that in which the same thing would appear if new.—10. That mankind are continually led into different conceptions concerning the same thing through the influence of custom, law, fabulous tales, and established opinions. On all these grounds they held that every human judgment is liable to uncertainty, and that we can only say concerning anything that it seems to be, not that it is what it seems. They likewise maintained that every proposition requires some previous proposition to support it, *in infinitum*, or supposes some axiom which cannot be proved, and is therefore taken for granted without demonstration; that in argument, the point assumed and that which is to be proved may often be alternately used in each other's place, both being equally uncertain; and lastly, that nothing can be understood by itself, as appears from the endless disputes of philosophers concerning the nature of things, nor by means of something else whilst itself remains unknown. This perpetual uncertainty and indecision on every point, this entire abnegation of man's proudest faculty, reason, is contrary to the manifest purposes which man has to serve upon earth, and but little accords with the prodigious activity and creative power of the mind. The most celebrated thinkers, if we may so call them, of this class in ancient times, were Pyrrho, Timon, Œnesidemus, and Sextus Empiricus; in modern times David Hume. The scepticism of Hume was beyond all doubt the most thorough and wide-reaching that philosophy had yet witnessed. He starts with the popular theory of experience, and proceeds with surprising coolness to bow down every intellectual principle for which his theory was incapable of accounting. In open argument, in candid statement, and in solid attack, the Scottish sceptic is greatly in advance of his Greek predecessors. The scepticism of Hume called forth a host of assailants, and has more or less influenced philosophical thought and opinion since that time, more particularly in the cases of Reid, Stewart, and Hamilton in Scotland; of Royer-Collard, Jouffroy, and Cousin in France; and of Kant, Fichte, Hegel, and Schelling in Germany.—Ref. *Encyclopædia Britannica*.

**Sceptre**, *sep'-tr* (Gr. *skeptron*, a staff), is a staff or rod used by princes and others as an emblem of sovereign or judicial power. It is said to have been originally a simple staff, used as a support for the aged and infirm; and hence it came to be an emblem of experience, wisdom, and authority. Among the ancient Greeks, the sceptre was not only borne by kings, princes, and leaders of the people, but likewise by judges, heralds, priests, &c. It thus came to be a highly emblematic, and was likewise made a very ornamental instrument. The Roman kings and consuls bore an ivory sceptre, and their deities Jupiter and Juno were likewise represented with sceptres, to denote their authority over the rest. Through the Roman emperors, the sceptre passed to the western monarchs, and it now forms one of the chief insignia of sovereign power.

**Scheele's Green**, *sheels*.—The delicate and beautiful green colour known under this name is composed entirely of arsenite of copper. Its manufacture and use are so dangerous to health that they are forbidden in France, and should be so in this and other countries.

**Schism**, *sizm* (Gr. *schisma*, a rent), in its literal signification denotes a rent or rupture in an object, or, figuratively, a diversity of opinion among persons constituting one body. In its common acceptation, however, it is used in the sense of separation, more particularly a separation or division among persons of the same religion or faith. Among ecclesiastical writers, the great schism of the West is that which happened after the death of Gregory XI. (1378), when Urban VI. and Clement VII. were set up as rival popes. It continued for nearly forty years, till the council of Constance elected Martin V.

**Schizandraceæ**, *skiz-an-drā'-se-e*, in Bot., the *Schizandra* fam., a natural order of *Dicotyledones*, sub-class *Thalamifloræ*, consisting of trailing shrubs, with alternate, exstipulate, simple leaves, and unisexual flowers. Sepals and petals imbricated. Stamens numerous, hypogynous. Ovules pendulous; embryo very minute, with abundant homogeneous albumen. There are but five genera and one species, natives of India, Japan, and the southern parts of North America. Some have edible fruits. The genera *Schizandra* and *Sphærostema* are represented by two scrambling shrubs, cultivated in our conservatories.

**Scholastics**, *sko-las'-tiks* (Gr. *scholastikos*), is the name given to a class of philosophers who flourished in the Middle Ages, and taught a peculiar kind of philosophy, which consisted in applying the ancient dialectics to theology. "The scholastic theology," says Mr. Hallam, "was in its general principle an alliance between faith and reason; an endeavour to arrange the orthodox system of the Church, such as authority had made it, according to the rules and methods of the Aristotelian dialectics, and sometimes upon premises supplied by metaphysical reasoning;" and scholastic philosophy "seems chiefly to be distinguished from this theology by a larger infusion of metaphysical reasoning, or by its occasional inquiries into subjects not immediately related to revealed articles of faith." The name is derived from the circumstance that it originated in the schools instituted by and after Charlemagne for the education of the clergy. It probably arose from the necessity felt of combating heretics with their own weapons, and establishing the doctrines of the Church upon a rational and scientific basis. The founder of the system is generally regarded to have been Scotus Erigena, a native of Ireland, who flourished in the 9th century. The first era of its history is considered to come down to Roscellinus, in 1089, or the contest of the Realists and Nominalists (*q. v.*); the second to Albertus Magnus, who died in 1280, when the metaphysical works of Aristotle were more generally known and commented on; and the third to the revival of learning in the middle of the 15th century, and the consequent improvement in philosophy. Among the most distinguished Scholastics, besides those already mentioned, were Abelard, Thomas Aquinas, Duns Scotus, and William of Ockam.

**Scholia**, *sko'-le-ă* (Lat.), are notes and explanations annexed to Greek and Latin authors by the early grammarians or critics, who are hence called scholiasts.

**School**, *skool*, is formed from the Latin *schola*, which, according to Du Cange, signifies discipline and correction, and was anciently, he says, used in general for all places where several persons met together either to study, to converse, or do any other matter. Formerly the word school was used in a larger acceptation than

at present, and signified places of instruction, not only for children, but for those of more advanced age. It was applied generally to what are now called universities. Thus Shakespeare, in Hamlet, speaks of being at school at Wittenberg, that is, at the university. The places in the universities where exercises for degrees are performed, and lectures read, are still called schools in England, and at least in the older continental universities; and academical degrees were often called degrees of school. The school is one of the institutions of civilized life. In early times, and among rude races, education and instruction are matters of domestic concern. Among the ancient Jews, parents were strictly enjoined to instruct their children in the precepts of the law, the fear of God, and in the history of the people. That reading and writing constituted a part of their education may be inferred from their being instructed to write the precepts of the law upon their door-posts, so that they might be read by all. Schools were not established among them until after their return from the Babylonish captivity, when Ezra, their language and law being in great measure forgotten, gathered round him learned persons and trained a number of public teachers, some of whom were established in Jerusalem, and others sent into the provincial towns of the country. Schools were first instituted for educating the higher classes of society; the great mass of the people were left to ignorance, or what of instruction their parents could impart. In particular this seems to have been the case in ancient Egypt, Persia, &c. In Greece, private schools for instructing in reading, writing, and arithmetic, were established as early as 500 B.C.; and afterwards young persons eager for knowledge resorted to the instructions of the philosophers and sophists; but still the great mass of the people remained in ignorance. The same was the case with the Romans, who from 300 B.C. had schools for boys in the cities; and from the age of Cæsar, who conferred the rights of citizenship on teachers, the higher institutions of the grammarians. The emperor Vespasian was the first who established public professorships of grammar and rhetoric with fixed salaries attached to them, for the education of young men for the public service; and in A.D. 150, Antoninus Pius founded imperial schools in the larger cities of the Roman empire. There was still, however, no general system of education. With the diffusion of Christianity, the importance of education came to be seen in a new light. Schools were instituted in the cities and villages for catechumens, and in some capitals, catechetical schools for the education of clergymen, of which that in Alexandria was the most flourishing from the 2nd to the 4th century. From the 5th century, however, these higher establishments seem to have been discontinued, and the episcopal or cathedral schools to have taken their place, in which the young men intended for the clerical profession learned, besides theology, the seven liberal arts; viz., grammar, logic, rhetoric (the *trivium*), arithmetic, geometry, astronomy, music (the *quadrivium*). The imperial schools declined, and finally became extinct in the confusion which followed the irruptions of the barbarians, and cathedral and parochial schools for boys and young men of all classes were established in the cities, in which the learning of reading and writing was followed by the *trivium*, and which hence received the name of trivial schools. The conventual schools began to be established in the 6th century, and from being at first intended only to prepare persons for the monastic life, they came to be resorted to by laymen, and at length became very famous. It is one of the noblest traits in the character of Charlemagne, that in that age of gross ignorance he laboured with zeal for the instruction of the people under his sway. He decreed (789) that not only every bishop's see and every convent, but that every parish, was to have its school; the two former for the instruction of clergymen and public officers, the latter for the lower classes of the people. At his court he established an academy of distinguished scholars, to whom he himself resorted for instruction, and whom he employed to educate his children and capable boys belonging to the nobility. Charlemagne's decrees were forgotten during the disputes of his grandsons about the government, under whom, also, the court school was abandoned. In the 12th and 13th centuries,





the inactivity and luxury of the clergy led to the neglect of the cathedral and conventual schools, and they rapidly declined. But at length, with the increasing power of the cities, the citizens became more independent, and the magistrates began to take care of the instruction of youth, which was being so much neglected by the clergy. They established schools, in which reading, writing, and the *trivium* were taught, and itinerant monks and students were employed as teachers. It was the commencement of a new system. The teachers, though, indeed, still belonging to the clerical order, now formed a separate class. They were, however, generally ignorant, frequently immoral, and wandered about from place to place. From the 14th to the 16th century, Germany was overrun with bands of these vagrants, who, as Luther says, though they had hardly seen a university, received appointments as teachers, because they were generally the only persons who could be hired as schoolmasters, since the more learned youths were ambitious of clerical benefices and academical professorships. The Reformation in the 16th century exercised a most decided and beneficial effect upon the schools, more particularly in Germany. The property of the convents and of the Church in general, which had been confiscated by the governments, was in most cases applied to the use of schools, the number of which was now very much increased, their character elevated, and a higher class of teachers established in them. The corporations of cities founded gymnasia and lyceums with permanent teachers; schools for girls were also founded, and in the villages instructors were appointed to teach the catechism. Soon after this, the rise of the Jesuits, and their devotion to education, effected a great improvement on the old Catholic system. In this country there were many schools connected with religious foundations, and also many private endowments for education. Immediately after the Reformation, a number of new schools were established, more particularly by Edward VI., out of the tithes that formerly belonged to religious houses or chantry lands, and which are now commonly known as King Edward's schools. A large proportion of the grammar-schools were founded in the reigns of Edward VI. and Elizabeth; and since that time comparatively few have been founded, while the number of endowed schools has largely increased. It was only, however, towards the close of the last century that any special efforts came to be made for the education of the mass of the people. The first Sunday-school was established by Mr. Raikes, of Gloucester, in 1781, and the popular day-school dates from 1798, when the youthful Quaker, Joseph Lancaster, began, in his father's house in Southwark, to instruct the children of the poor. In 1792, Dr. Bell, superintendent of the Military Orphan School, Madras, introduced the monitorial system, or the plan of making the elder children in a school teach the younger; and four years later, on his return to this country, he warmly urged the adoption of the system, as the most effectual means of rapidly extending popular instruction. The efforts of Lancaster led to the formation of "the British and Foreign School Society" in 1808, and of Bell to the establishment of "the National Society for promoting the Education of the Poor in the Principles of the Established Church." The work of education now advanced with some rapidity, and conspicuous among those who laboured in the cause of its popularization was Lord Brougham. Up to 1833, the whole of what had been accomplished in the work of popular education was the fruit of private liberality, incited mainly by religious zeal, and acting, in the matter of daily education, principally through the medium of these two societies, the British and Foreign and the National. From 1833 to 1839, an annual sum of £20,000 was voted by parliament for educational purposes, and has since been increased from year to year, till in 1860 it amounted to £789,167 for Great Britain and £270,723 for Ireland. From the recently published reports of the Royal Commissioners on Education, it appears that there were in 1858, in England and Wales, 58,975 week-day schools, containing 2,536,462 scholars; of these, 24,563 schools, containing 1,675,156 scholars, were public, and 34,412, containing 860,304 scholars, were private. In the former, 911,152 scholars were males and 764,006 females; in the latter, 289,607 were males and 470,697 females. Of the public schools,

22,647 were supported by religious denominations, including 19,549 connected with the Church of England, and 1,131 British schools; 387, including 192 ragged schools, were not specially connected with any religious denomination; 999 were entirely, or almost entirely, supported by taxation; and 560 were collegiate and superior or richer endowed schools. In speaking of the different classes of schools, *infant schools* are designed to receive children at the very earliest age at which they are capable of receiving any instruction, and imparting to them the elements of education, as well as training them in the practice of virtue and good-feeling. They are of great utility as places of security as well as of education, and are particularly of use to those who are unable or unwilling to take proper care of their offspring. They have been found to be of great service to the humbler classes of society, and are slowly extending themselves among the middle ranks. It is asserted that if two children enter an elementary school at the age of seven, the one from an infant school, the other uneducated, the former will make as much progress by the age of ten as the latter by the age of twelve.—*Ragged schools* are established for educating children of the very lowest class of society, who receive their instruction gratuitously, and are not required to be decently clothed. In 1844, when the "Ragged School Union" was established, there were only 16 ragged schools, with 2,000 children, and about 200 teachers (all voluntary). In 1851, there were in England and Wales 132 schools, with 12,337 scholars; and in 1861, 192 schools, with 20,909 scholars, of whom 10,308 were males and 10,601 females. In many schools the children are fed as well as educated, and in some a limited number are both fed and lodged. In due time, efforts are made to get them suitably employed, and some of the best-behaved and industrious of them are assisted to emigrate. (For *Reformatories* see that article.)—*Industrial schools* have as their object to reclaim "children who, from the circumstances of their homes or from neglect, are in danger of becoming criminals; and this object is accomplished by separating them from their connections, and giving them instruction in some honest means of getting a living. In a few cases, the industrial instruction is given, though the separation of the child from its home is not enforced; but in most cases, the children are boarded and lodged as well as fed." The number of these schools in 1858 was 36, with 2,822 children.—*Endowed schools* are schools which have been established, and are supported by funds given and appropriated for that purpose, either by the sovereign or by private individuals. They afford a gratuitous, or nearly so, education to pupils either generally or such as live within certain defined limits, and are hence frequently also called free schools. A number of these are what are termed grammar-schools, or schools where the elements of the Latin and Greek languages are taught. A number of the endowed schools are incorporated, and the lands and other property vested in the corporation; others are under trustees, whose duty it is to preserve the school property, and apply it to the purposes intended by the founder. The amount of money thus vested in endowed schools is so great that, if properly laid out, it would go far to establish a system of national education.—The *National* schools are such as have been established by the National Society for the promotion of education; the *British*, such as have been founded by the British and Foreign School Society. In the former, religious instruction is given according to the tenets of the Church of England; in the latter, no peculiar religious tenets are inculcated, the Bible, without note or comment, being the only religious school-book. Both have been the means of much good in diffusing education over the country, and at a very low rate. Up to 1859, the former society had expended on education £734,599, the latter £150,063.—*Evening schools* were established with the view of extending the benefits of education to persons engaged in business during the day. From the advantages which might be expected to result from such institutions, it is not a little remarkable that they are not more common. It is indeed said that the previous toil unfits one for study; but a well-conducted school might easily make study so attractive as to be in truth a recreation. According to the census of 1851, the number of adult evening





schools was only 1,545, with 39,783 scholars; of whom 27,829 were males and 11,954 females. Since then, however, the number has greatly increased, and in 1858 there were 2,036 evening schools, with 80,000 scholars, of whom 54,571 were males.—The *Sunday schools* are primarily religious institutions; but reading is incidentally taught, or the habit of reading kept up in them, and in a few cases instruction in writing is also given. There are usually two school attendances each Sunday; one commencing about 9 or 9.30 o'clock in the morning, the other about two in the afternoon; and upwards of 300,000 persons are employed as teachers. In 1858 there were 33,872 Sunday schools, with 2,411,554 scholars; being 1,189,725 males and 1,221,829 females. (*For Normal schools* see that article.)

SCHOOLS, ARMY. (*See* ARMY SCHOOLS.)

SCHOOLS, MILITARY. (*See* MILITARY SCHOOLS.)

SCHOOLS OF DESIGN. (*See* DESIGN, SCHOOLS OF.)

SCHOONER, *skoon'-er* (Du. *schoner*), a small vessel with two masts, whose main and fore sails are suspended by gaffs, reaching from the mast towards the stern, and stretched out below by booms, the foremost ends of which are hooked to an iron, which clasps the mast so as to turn therein as upon an axis, when the after-ends are swung from one side of the vessel to the other. The schooner is generally a fast sailer, and principally employed in trade by those who make speculations where dispatch is a particular object.

SCIATICA, *si-at'-e-ka*, is a name often applied to all rheumatic affections about the hip-joint and back of the thigh, but in strictness it is applied only to a disease of the sciatic nerve. This is sometimes an inflammatory complaint, requiring for its treatment cupping and blistering; sometimes it is clearly rheumatic, and then requires the mode of treatment adapted for such cases; sometimes it results from irritation within the pelvis, affecting the nerve before it emerges externally, and sometimes it is purely nervous and neuralgic.

SCIENCE, *si'-ens* (Lat. *scientia*, from *scio*, I know), in its strictly literal sense, means simply knowledge. This was probably the only sense in which it was at first used; but we are told that "by the middle of the sixteenth century the word science had begun to appear as denoting connected and demonstrated knowledge, in opposition to art, which signified digested rules of operation, not connected with each other by deduction from common first principles;" and "by the middle of the seventeenth century the term science was freely used in the sense which it has never since lost; namely, that in which it is opposed to literature." Science, as distinguished from art, is a body of organized knowledge, whose phenomena are arranged so as to exhibit the reasons or causes by which they are influenced in their legitimate connection and interdependence. A science which deals with the succession of reason and consequent is entitled an *abstract* science; while that which deals with causes and effects is called for the most part a *natural* or *physical* science. Those sciences which are supposed to be complete are called *exact* sciences; as geometry. The great majority of what are commonly known as sciences hardly deserve the name, being mere bundles of theories or facts, connected with more or less of exactness, but which a fresh discovery may any day untie. Science, as opposed to literature, has for its business the discovery and applying of first principles.—Ref. *English Cyclopædia*.

SCIENCE AND ART, DEPARTMENT OF, a department of the Committee of Privy Council on Education, which owes its origin to suggestions in the second report of the commissioners for the Exhibition of 1851. The suggestions were favourably regarded by the government; and as a part of the "comprehensive scheme for the advancement of the fine arts and of practical science," announced from the throne at the commencement of the session of 1852-53, the lords of the Treasury in March, 1853, gave their formal concurrence to the proposed arrangement of the Privy Council, to "unite in one department, under the Board of Trade, with the departments of Practical Art and Science, the kindred and analogous institutions of the Government School of Mines and Science, the Museum of Practical Geology, the Geological Survey, the Museum of Irish Industry, and the Royal Dublin Society, all of which are in part supported by parliamentary grants." The

immediate intention of this amalgamation was to bring the whole of these institutions under one common superintendence, to establish a Central Metropolitan School of Practical Science, as well as of art, and to encourage the formation of minor local institutions in connection with the central institution. The whole of these united departments, it will be observed, belonged to England and Ireland; in 1854, however, the necessary steps were taken for the formation of an industrial museum for Scotland, similar to those of London and Dublin. A site was purchased by the government near the University of Edinburgh for the building, and the museum belonging to the town council, and the valuable collection of models, minerals, &c., belonging to the Highland Society, were transferred to the Crown; thus forming an excellent basis for the proposed museum. The department of Science and Art, as mentioned above, was originally a section of the Board of Trade; but in February, 1856, it was transferred to the Committee of Privy Council on Education. It now forms a distinct division of that committee, and consists of two sections, —a school of science with its connected museums and affiliated institutions, having its head-quarters at Jermyn Street; and a school of art, with its various collections and associated schools, having its head-quarters at South Kensington, where the head offices of the department are also. In the eighth report of the department, the total expenditure of the several divisions for the period from the 1st of April, 1860, to the 31st of March, 1861, is stated at £99,784. 17*s.* 10*d.* The inspectors of the Metropolitan School of Science grant certificates to any teachers who pass a satisfactory examination in—1. practical and descriptive geometry, with mechanical and machine drawing; 2. physics, mechanical and experimental; 3. chemistry; 4. geology; 5. natural history; and those who are successful receive certificate allowances of £20, £15, or £10, in each, while engaged in teaching. The art schools, which are of older date than those of science, appeal to a wider circle. In the words of the official programme, the objects of this department are:—"1. To train male and female teachers to give instruction in art; to certify them when qualified, and to make them annual fixed payments, varying according to their acquirements.—2. To aid and assist committees in the provinces desirous of establishing schools of art.—3. To hold public inspections and examinations, and to award medals and prizes to the most deserving candidates.—4. To collect together works of art, pictures, &c., in the central museum, and books and engravings in the central library.—5. To circulate among the schools of art objects from the museum, and books and engravings from the library." Amongst the buildings at South Kensington are included the offices of the department, the Training School for Masters and Mistresses, the Normal Central School of Art, the Art Library, and the Museum.

SCIRE FACIAS, *sī'-re fai'-shē-às* (Lat., give notice), in Law, is a judicial writ, directing the sheriff to give notice to a party to show cause to the court whence it issues, why execution of a judgment passed should not be made out. In some cases, however, it is an original and independent proceeding, as where used for repealing a patent. Its use, however, is much more confined now than formerly, being supplanted by what is termed a writ of *revivor* in all cases in which it becomes necessary to revive a judgment by reason either of lapse of time or change of parties. It is still, however, the proper writ in several other cases of a like kind, to which a writ of revivor would not apply; as that of proceeding against bail on their recognizance, or for restitution after a reversal in error.

SCIRPUS, *skir'-pus* (Lat., a bulrush), in Bot., a gen. of the nat. ord. *Cyperaceæ*. Various species, commonly known as club-rushes or bulrushes, are much employed for mats, chair bottoms, baskets, &c., and by coopers for filling up intervals in the seams of casks.

SCLERANTHACEÆ, *skle-ran-thā'-se-ē* (Gr. *skleros*, hard; *anthos*, a flower), in Bot., a small nat. ord. of *Dicotyledones*, sub-class *Monochlamydeæ*, consisting of inconspicuous herbs found in barren places in temperate regions. They are placed by some botanists among the *Paronychiaceæ*.

SCORE, *skore*, the original and entire draught of any composition in parts, in which all the parts are arranged upon staves one above the other, so as to present to the eye of a skilful musician the effect of the entire band during performance. The term score originated from a bar or line, which was formerly drawn through all the parts.

SCORPION, *skor'-pe-on* (Lat. *scorpio*), a formidable insect allied to the spider, but differing greatly in form, being distinguished from it by having the abdomen articulated with a curved spur at the extremity, under the point of which are two small orifices, which serve to give passage to a poisonous fluid. The anterior pair of feet or palpi are very large, resembling those of the lobster in form. The other feet do not differ essentially in form from those of spiders. On the under side of the thorax are two comb-like appendages, the use of which is not well understood. Scorpions inhabit the hot countries of both hemispheres, live on the ground, conceal themselves under stones and other bodies, and not unfrequently taking up their abode in houses. When disturbed, they run rapidly with the tail over the back, ready to turn it in any direction, either for attack or defence. They feed on insects and their eggs. The species of the south of Europe are little more than an inch in length, whilst some of the tropical species exceed five inches; and the sting of the latter produces serious symptoms, which are said frequently to result in death. The young scorpions are produced at various intervals, and are carried for several days upon the back of the parent, during which time she never leaves her retreat. The genus is divided by naturalists into sub-genera, depending upon the number of the creature's eyes, whether six or eight.

SCORZONERA, *skor-zon-e'-rā* (*scorzo*, an old Spanish word for viper, because it was held to be effectual against the bite of venomous animals), in Bot., a gen. of the nat. ord. *Compositæ*. The roots of *S. hispanica*, *glastifolia*, *delicciana*, and *tuberosa*, are eaten in different parts of the world, being boiled or stewed in the same manner as carrots or parsnips.

SCOTLAND, CHURCH OF.—According to some historians, the gospel was introduced into Scotland by the Culdees as early as the 2nd or 3rd century. Persecuted by the savage people among whom they came, they took refuge on the small island of Iona, off the west coast, which afterwards became a centre of missionary labours among the Picts, Scots, and Irish. Romanism, however, subsequently came to gain ground in the country, and after a struggle of some centuries, the Culdees finally disappear about the 12th century. (*See* CULDEES.) Though again and again the Scottish clergy asserted their independence in disputes with the Roman see, long before the time of the Reformation, they were sunk into the deepest subserviency to that power, and the people steeped in the deepest ignorance and superstition. The wealth and corruptions of the church, says Dr. McCrie, in his "Life of Knox," had grown to a greater height in Scotland than in any other nation within the pale of the Western church. Henry VIII., having seceded from the Church of Rome, used his influence with his nephew, James V. of Scotland, to break off all connection with that church. It was arranged that James should marry Elizabeth, Henry's daughter; but Beaton and the priests secured his marriage with the daughter of the French king. The first Scottish martyr in the cause of the Reformed church was Patrick Hamilton, a noble and godly youth, cousin of James V. While travelling on the continent, he had become acquainted with the principles of the Reformation, and had taken counsel with Luther and Melancthon at Wittenberg. On his return to Scotland, he proclaimed the new doctrines, and through the influence of Cardinal Beaton, he was condemned for heresy, and burnt at St. Andrew's, 28th Feb., 1528, at the age of twenty-four. A bitter persecution ensued, and other victims followed; but the cause of the Reformation continued to spread; for, as one of the bystanders said, "the reek (smoke) of Patrick Hamilton's fire infected as many as it blew upon." On the death of James V., Hamilton, earl of Arran, was elected regent during the queen's minority, and was at first well disposed to the reformers. An act was passed, allowing the Scriptures to be read in English, and a treaty was concluded with Henry VIII. for effecting a marriage between his son Edward and the infant queen. A change, however, suddenly took place, the treaty was

broken off, and the young queen given in marriage to the dauphin of France. Beaton and the priests were again in power, and the persecution raged afresh. The cardinal's last victim was George Wishart, a gentleman of family, who perished at the stake in St. Andrew's, 2nd March, 1546. A few months later, a body of conspirators contrived to take possession of the castle, and the cardinal was put to death. The conspirators held the castle for some time; but were at length obliged to surrender to a French armament, and were taken to France. Among those who were thus carried away was John Knox, although not one of the conspirators. Knox resided for some time at Geneva, where, in the society of Calvin, his principles were strengthened. He still maintained a correspondence with the leaders at home, and in 1557 a bond or covenant was drawn and signed by a number of the lords and gentry, pledging themselves to stand by each other in defence of the principles of the Reformation. These were afterwards known as the "Lords of the Congregation." In 1559, Knox returned to Scotland, and the enthusiasm of the people could no longer be restrained. It broke out, in opposition to the admonitions of Knox and others, in acts of violence. On the 1st August, 1560, a parliament was held at Edinburgh, and a confession of faith, drawn up by Knox and others, laid before it, and declared to be the standard of the national faith in Scotland. Other acts were passed, abolishing the power and jurisdiction of the pope in Scotland, repealing all acts made in favour of the Church and against the Reformation, and ordaining that all who said mass, or were present at the celebration of it, should be punished. The first General Assembly of the Church of Scotland met on the 20th December, 1560, and consisted of only twelve ministers and thirty lay members. In 1567 it had increased to 257 ordained ministers, 151 exhorters, and 455 readers. Immediately after the meeting of the first assembly, Knox and five other ministers drew up the "First Book of Discipline," containing the principles of the Church of Scotland, which was approved by the General Assembly and the Privy Council. It was modified in some respects by the "Second Book of Discipline," of 1578, which was ratified by parliament in 1592, and still continues to be received as an authority in the Church. (*See* DISCIPLINE, BOOKS OF.) The deposition of Mary was favourable to the Reformation. The young king was crowned, and the earl of Murray, a Protestant, was appointed regent. The General Assembly expressed its determination to support the lords hostile to the queen; and the parliament which met in 1567 repealed the acts of Mary in favour of popery, and declared the Protestant church to be "the only true and holy church of Jesus Christ within the realm." From this time the Protestant religion, though it passed through many conflicts, was firmly established, and the Reformation was complete. John Knox expired on the 20th of November, 1572, and after his death a long struggle of a quarter of a century took place,—the court and the old nobility attempting the establishment of episcopacy against the remonstrances of the clergy and the indignant protests of the citizens and middle classes. In 1580, the General Assembly passed an act for the abolition of episcopacy; while the "Second Book of Discipline" declared the government of the Church to be by kirk sessions, presbyteries, synods, and general assemblies. James VI., on his accession to the English throne, gave vent to his natural preference for episcopacy, which was at length fully established in Scotland. After the death of James, in 1625, the spirit of the burghers and middle class began to revive; the prelates were odious and the nobility unpopular, while the courageous sufferings of the persecuted ministers gained their esteem. Charles I. followed in the footsteps of his father, and was at no pains to conceal his contempt for presbyterianism. In 1637, a liturgy was drawn up for the use of public worship, and on its introduction in Edinburgh a violent tumult broke out, which in a few days spread all over Scotland. A kind of provisional government was formed at Edinburgh, called the Four Tables or Houses, of the nobility, gentry, burgesses, and ministry respectively, pledging themselves to support the ancient doctrine and discipline of the Church, and declaring the recent innovations to be entirely contrary thereto. A general assembly





was soon after held, which deposed the bishops and declared episcopacy to be abolished in the kingdom. In 1643, delegates were sent by the Church of Scotland to the assembly of divines at Westminster; and in 1647 the Confession of Faith, and larger and shorter catechisms, prepared by the Westminster Assembly, were approved and ratified by act of the General Assembly, and subsequently by act of parliament in 1649, and again in 1690. These still continue to be the authoritative standards of doctrine in the Church. During the supremacy of Cromwell, the Church of Scotland enjoyed full liberty, except that the General Assembly was not allowed to meet; but on the restoration of Charles II., episcopacy was re-enacted, presbyteries were prohibited from meeting, and some hundreds of ministers were driven from their charges. (*See* COVENANTERS.) After the accession of William and Mary, the presbyterian form of government was restored, and prelacy declared to be contrary to the principles of the Church of Scotland. The Act of Security passed in 1707 declared presbyterianism to be "the only government of the Church within the kingdom of Scotland;" and in 1712 the Patronage Act became law, by which the rights of lay patrons were restored. This last has been the cause of frequent disturbances in the Church, and given rise to several secessions. After the Revolution, two parties arose gradually within the Church, the one distinguished for their attachment to popular interests and liberties, and regarded by their opponents as inclined to Antinomianism; the other characterized by moderate views, supporting the interests of the higher classes, and in favour of lay patronage. The "Marrow Controversy" which raged with great acrimony for some time, took its rise in the republication of an old English work of Calvinistic theology. It was regarded as evangelical by the popular party, and Antinomian by the moderates. The latter party were the more numerous, and obtained the mastery. They strictly prohibited all ministers from recommending the said book, "either by preaching, writing, or printing," and enjoined and required them to warn and exhort their people not to read or use the same. A dispute regarding the settlement of a minister at Kinross against the wishes of the parishioners called forth remonstrances from several of the clergy; and the Rev. Ebenezer Erskine having in a sermon before the synod of Fife denounced the corruption of the Church, was sentenced to a rebuke for his conduct, and with three other brethren protested and left the Church in 1733. This gave rise to the formation of the Secession Church. In 1752, the Rev. Thomas Gillespie was deposed for contumacy in refusing to assist in the ordination of an unacceptable presentee at Inverkeithing, and the Relief Church arose in consequence. These two secession bodies united together in 1847, and became the United Presbyterian Church. The events which led to the "Disruption" of 1843 have been already noticed at length, under the head FREE CHURCH. According to the census of 1851, the established church had 1,183 places of worship in Scotland, with 787,080 sittings, and the attendance was, morning 351,454, afternoon 184,192, and evening 30,763. Of late years, the work of church extension has been carried on with great zeal and energy, and a number of new churches have been built. According to Sir James Graham's act, any chapel of ease or *quoad sacra* church may be raised to all the privileges of a parish church on the concurrence of a majority of the heritors, when a competent endowment has been secured. The subject was taken up with great zeal by the late Professor Robertson, of Edinburgh, and to his labours it is mainly owing that the large sum of about £400,000 has been collected for the endowment of such churches. The constitution and government have already been noticed under PRESBYTERIANISM; and the doctrinal standards are simply the Westminster Confession of Faith. In some acts of assembly, the larger and shorter catechism receive ecclesiastical sanction; and there are also the First and Second Books of Discipline, though the exact amount of authority due to these latter documents has sometimes been matter of dispute. In 1707, the form of process for the regulation of discipline became the law of the Church. Candidates for the office of the ministry

are required to attend all the classes necessary to obtain the degree of M.A. at one of the Scotch universities, and also to attend a theological course extending over four sessions.

Screw, *skrew* (Dan. *skrue* or *skru*), in Mech., one of the six mechanical powers. The elementary idea of the form of the screw is obtained by regarding it as a continuous circular wedge; and it is readily modelled by wrapping a wedge-shaped piece of paper round a cylinder; the line of the screw is then represented by the edge of the paper. A screw may be formed either on the outside or the inside of a cylinder; the former is called an *exterior* or *male* screw, and the latter an *interior* or *female* screw.

Screw Propeller. (*See* Propeller.)

Scribe, *skribe* (Lat. *scribo*, I write), is a word frequently used in Scripture, and in various significations. In its original signification it denotes a writer, and was first applied to an officer of the king answering to our secretary of state. It came afterwards to be applied to such as were skilled in the use of the pen, and then simply a learned man, or one learned in the Jewish Scriptures. In New Testament times, the scribes were a numerous class, and were generally of the tribe of Levi. They were the "doctors of the law," whose office was to explain the law, and a number of them had seats in the Sanhedrim.

Scripture, *skrip'-tsher* (Lat. *scriptura*, a writing), denotes, in its literal sense, anything written, but is commonly applied by way of eminence to the books of the Old and New Testaments, as being the most important of all writings. They are frequently called the sacred or holy Scriptures, from the character of the doctrines which they teach. (*See* Bible.)

Scrofula, or King's Evil, *skrof'-u-lă*, is a tedious and multiform disease, hereditary in its nature, and one of the most characteristic marks of which is a tendency to swelling of the glandular parts, which sometimes suppurate and discharge a curdy mixed matter, and are very difficult to heal. The name is said to be derived from the Latin *scrofa* or *scrophæ*, a sow, probably from the fancied resemblance of the swellings to a pig; and the term king's evil has been given to it from its being long believed to be curable by the royal touch. (*See* Evil, King's.) The persons in whom scrofulous disease is most apt to manifest itself are marked during childhood by pale and pasty complexions, large heads, narrow chests, protuberant bellies, soft and flabby muscles, and a languid and feeble circulation. It however often accompanies a variety of the sanguineous temperament also, and is indicated by light or red hair, grey or blue eyes, with large and sluggish pupils, and long silky lashes, a fair transparent brilliancy of skin, and rosy cheeks. This red colour is, however, easily changed by cold to purple or livid, and the extremities are subject to chilblains. Such children are often extremely clever, and ready of apprehension, of eager tempers and warm affections, lively, ardent, imaginative, and susceptible. It is frequent, also, though less common, in what is called the melancholic or bilious temperament, *i.e.*, in persons of dark, muddy complexion and harsh skin, in whom the mental and bodily energies are more sluggish and dull. The disease, however, frequently occurs in persons who do not exhibit any of these symptoms. It is one of those diseases that are in a very marked degree hereditary. Like other hereditary tendencies, it may sometimes skip *over* a generation or two, and reappear, just as family likenesses do. The tendency may be so strong that no care will prevent its manifestation, or so faint as never to break out into actual mischief, if the exciting causes be warded off. Among the exciting causes are insufficient nutriment, exposure to wet and cold, impurity of the atmosphere, the want of natural exercise, and mental disquietude. Climate exercises a very marked influence upon it, and there is none more favourable for its development than our own. A moist, cold, and variable climate is particularly favourable to its development, while, on the other hand, a hot or a very cold climate protects against it. Scrofula usually manifests itself in indolent glandular tumours, frequently in the neck, at first free from pain and inflammation, but proceeding slowly to an inflammatory state, and gradually and generally, after a long time, forming an ulcer, which is extremely difficult to heal. In some cases the eyes and eyelids are the principal seat of the disease, having constantly a very inflamed aspect. The bones of scrofulous persons are also liable to disease, especially those of the spine; and generally the diseases and accidents that happen with comparatively little inconvenience to others, are productive of very troublesome and alarming consequences in scrofulous constitutions. The lungs are particularly liable to attack in such cases, giving rise to the formation of tubercles in that organ, which are so marked a feature in Phthisis (which *see*). The treatment consists chiefly in raising the tone of the system by moderate exercise in the open air, with suitable nourishment, sufficient clothing, and attention to the state of the bowels. Sea-bathing, if it can be borne, or sponging the skin with tepid salt-and-water, followed by diligent rubbing with coarse towels and the flesh-brush, are very beneficial. Much good is frequently derived from the use of cod-liver oil; and iodine is often found to be of benefit.

Scrophulariaceæ, *skrof-u-li-re-ai'-se-e*, in Bot., the Figwort fam., a nat. ord. of *Dicotyledones*, sub-class *Corollifloræ*, thus defined by Miers and Bentley:—Herbs or rarely shrubby plants, with opposite leaves (generally). Inflorescence axillary. Flowers anisomerous, irregular. Calyx persistent, 4—5-partite. Corolla more or less irregular, 4—5-partite; æstivation imbricate. Stamens 2, or 4 didynamous, rarely 5, with introrse anthers. Ovary usually 2-celled, its component carpels being placed anterior and posterior; style 1. Fruit usually capsular, rarely baccate, generally 2-celled; placentas axile. Seeds generally numerous, albuminous; embryo straight or slightly curved. The plants of this order are found in all parts of the globe, and a great number are cultivated in our gardens on account of the beauty of their flowers. (*See* Antirrhinum and Calceolaria.) Some are powerful poisons, and all must be regarded with suspicion. The most important medicinal plant of the order is the foxglove. (*See* Digitalis.)

Sculpture, *skulp'-tsher* (Lat. *sculptura*), strictly speaking, is the art of cutting or carving any material, so as to represent form. If taken in a broad acceptation, the term might be applied to gem-engraving, casting in metal or otherwise, modelling, and carving generally. Sculpture may be broadly divided into *Relievo* and the *Round*. In the former, single figures or groups are represented as more or less raised, but without being entirely detached from a back-ground. According to the latter method, insulated figures, such as statues, or collections or groups, are made, so as to be entirely independent of a back-ground. There are various opinions as to which is the more ancient of the arts, of painting and sculpture. If we place credence in Pliny's story, as recorded in his Natural History, relating how the daughter of Dibutades formed the outline of her lover's profile from its shadow thrown upon a wall, an outline which was subsequently filled in with clay by the lady's father, we must allow that drawing is the older art. Indeed, it is more reasonable to suppose that the drawn design from which sculpture is worked must have been the prior process. It is clear, however, that attempts at forming the representation of natural forms by means of clay or other plastic substance must have been among the earliest efforts of man's ingenuity. Pliny and Pausanias both tell us that clay, stucco, wax, and plaster, were employed by the ancients to form works in sculpture. Clay was used for architectural ornaments, figures, tiles, lamps, which, when baked, were called *terra-cotta*, or baked earth. For carved works, granite, porphyry, basalt, ivory, bone, alabaster, and wood of many kinds were used. In short, nearly every material, hard or soft, was employed to perpetuate the memory of great events, or to do honour to the actions of heroes. Scattered through even the most ancient records, we may glean that men from the earliest times venerated blocks and carved stones. In the 23rd century B.C., Laban possessed images of his domestic gods (in Hebrew *terephim*). Sculptured works have been found in the most ancient Hindoo cavern and grotto temples. It has been declared that the history of sculpture is almost the history of religion. In the inspired writings, the Israelites are repeatedly exhorted to turn away from

the worship of images, the sculptured works of their own hands. The idols of Egypt, the monstrosities of Hindooism and of Buddhism, owe their origin to the superstition of the people of India, China, and of Egypt, striving as they did to give to sculptured forms the symbolical attributes of divinity. This superstitious feeling was the force that actuated those ancient sculptors to exhibit in the human form combined with the brute, the symbols of intelligence and strength. As to the Hindoos, although their fancy was exuberant, they never reached a standard of pure art. In the ruins of Persepolis there are many examples attesting to the fact that the Persians possessed many works of sculpture. Yet, as this ancient people never carved the semblance of the human form, they never gained a just conception of the majesty of nude humanity. Sculpture flourished in Assyria. The researches of Messrs. Layard and Botta have stocked the museums of London and Paris with a number of colossal slabs, the dates of which range from the time of Sardanapalus, B.C. 930, to the destruction of Nineveh, B.C. 625. In these colossal emblems of the sculptured arts of a great and ancient people, we find human-headed winged bulls and lions, and representations of battles, sieges, and the chase. Probably because their creators were bound by rigid conventional rules, these slabs show a total ignorance of perspective, together with exaggerated and inaccurate drawing. The Egyptians were the first who elevated sculpture almost to pure art. This ingenious, wealthy, and wise people, nevertheless, were never able to shake off a heavy uniformity and stiff ugliness which characterized all their works, and rendered them vastly inferior to the Greeks. This inferiority is held by some writers to arise from the want of beauty in the natives of Egypt; others declare that it was owing to the absence among this nation of any public games, where the human form in its proper development might be studied. The true cause would appear to be, that the Egyptian sculptors always wrought under the direction of the priests, who, according to Plato, never suffered them to innovate anything in their art, or to invent any new subjects or any new habits. Hence the art remained at a standstill—the rules of it at a standstill. Stiff, limited action, drapery without folds, flat eyebrows, thick lips, and projecting eyeballs, are the prevailing characteristics in all Egyptian sculpture, albeit there is a peculiar sweetness of expression in many of their heads. A notable instance of this latter quality is exhibited in the head known as the Young Memnon, contained in the British Museum. Another remarkable feature is the fine surface and neat execution of the Egyptian sculptures, proving that this nation were exceedingly skilful in the arts of tempering and hardening steel. When this statue of the Young Memnon was set up in the Museum, it became necessary to cut holes in it, to unite the fragments; and although the masons' tools were hardened to an unusual degree, it was found that after half a dozen blows they were rendered uselessly blunt. Some authorities hold that the Etrurians taught the Greeks, while others declare that the Greeks were the instructors of the Etrurians. Certain it is that the sculptured remains of the Etrurians were closely connected in style with the Greek, pointing to the fact that there must have been some connection between the two nations. The distinguishing signs of Etruscan sculptural art are,—exaggeration of attitude, meagreness in dealing with details, and an unnatural position of the hands. They were mostly skilled in the making of vases. Their sculptured works were chiefly in bronze, stone, and terra-cotta. To turn to Greece, a land where the art of sculpture soon rose superior to all those impediments which trammelled and restricted its advancement in other countries. "It was here that the conceptions of sublime and glowing fancies were embodied in the productions of what may be truly termed a race of poet-artists. Writers have endeavoured to account, in various ways, for this universally admitted superiority of the Greeks over every other nation by whom the fine arts had been practised, and usually have attributed their success to such physical causes as a fine climate, or the prevalence of beautiful forms, or to the public exercises so general in that country."—(*English Cyclopædia.*) Nevertheless, these accidents alone will not account for their excellence as sculptors. Rather may we attribute the perfection of Greek art to her sculptors having made nature in her best and most happy forms their model. Still, it must never be forgotten that the Greeks had an intuitive sympathy with beauty, either in poetry, painting, or sculpture. Did the Greek sculptor desire to typify brawny strength, he sought in the gymnasia for the deep, spacious chest, the well-knit joints, the broad shoulders, the massy muscles of the wrestler, for the elements that should be combined together to form his mighty Hercules. Did he wish to carve the semblance of the messenger of the gods, he selected from the victor in the foot-race the clean limbs and the elegant proportions, and from many well-selected athletes, made up a form of ideal beauty, combining the strength and agility we see personified in the statue of Mercury. Sculpture in Greece, as elsewhere, had its beginning in very rude forms. At first, the symbols of divinity were little more than rude quadrangular blocks of stone. Between the 9th and 7th centuries B.C., the Greeks had frequent intercourse with the commercial Phœnicians. From this nation the Greeks borrowed their Hermæ, or god of roads and travellers; at first mere stone pillars. Upon these pillars a head was afterwards placed, thus forming the origin of busts. Progressing still further, sculpture was called upon to assist in the decoration of temples. Hands and feet were next added, a shield and spear were placed in the hands of the statues; and thus the first semblance of Pallas originated. Until the time of Dædalus of Athens, the bodies or trunks of large statues were a mere cylindrical pillar, as in the colossus of the Amyclean Apollo. Dædalus inaugurated a new era; and of his divine genius the Greeks said,—that he made statues walk, see, and speak. After this great master it was, that all artists were symbolically termed *Dædalides*, the sons of Dædalus. Henceforth ancient Greek art may be divided into three styles,—the Old Attic, the Æginetic, and the Etrurian. Statues, thrones embellished with figures, shields, vases, and coffers, were the productions of the art. Smilis, the father of statuary, lived at Ægina about 1400 B.C.; and in 700 B.C. Rhœcus of Samos invented the art of moulding and casting in brass. The famous brazen bull was made by Perillus, for Phalaris, who reigned in Sicily 564 B.C. But the true ideal style of Greek art was not inaugurated until the time of Phidias of Athens. This great genius lived in the time of Pericles, the age of classic models. For the Parthenon at Athens, Phidias wrought the statue of Minerva, and at Elis he set up his other great masterpiece, the famous Olympian Jupiter. Both were executed in ivory and gold. The god Jupiter was forty feet high, his face bore the expression of power, wisdom, and benevolence; and an epigrammatist, speaking of his majestic proportions, said: "The statue of Jupiter would have thrust off the roof of the temple like a thin shell if it had ever risen from its golden throne." This statue of the Olympic Jupiter existed till the year 475 of our era, when it was destroyed by fire at Constantinople. Besides these great works, he made a statue of Pallas, in brass, for Athens, the Venus Urania, the Nemesis, in the temple at Marathon, and an Amazon, famed throughout Greece for the beauty of her limbs. Alcamenes of Attica, and Agoracritus of Paros, were his favourite disciples. The most famous works of Alcamenes were his Mars, Cupid, Venus, and Vulcan. It was said that Agoracritus was even superior to Alcamenes, and when he contended with the latter in the execution of a statue of Venus, the Athenians only adjudged the prize to Alcamenes out of partiality for their fellow-citizen. According to Varro, the Venus of Agoracritus was the finest ever wrought. Polycletus of Argos was the author of the work deemed worthy of being ranked as the companion to the Jupiter of Phidias. This was the celebrated statue of Juno. Tenderness and softness were the characteristics of this master. He excelled in portraying the beautiful positions of the boys of the gymnasia, and of the sports of youth. His works were chiefly in metal, and he was the author of the celebrated ideals of youthful beauty,—the Diadymenus, a placid youth; who winds the wreath of victory round his brow; and the warlike Doryphorus, holding the lance. This last formed the celebrated "canon."—the model of all proportions.

Myron of Eleutheræ, in Bœotia, was the great rival of Polycletus. Despising the soft and graceful forms which his contemporary sculptor loved to represent, Myron sought his models in the brawny athlete. He sculptured the ideal Hercules, the Discobolus throwing the discus. He was no less famous for his animal forms, the most celebrated of which were the Heifer and the Sea Monster. In one quality, however, he was surpassed by Pythagoras of Rhegium, who executed the ideal of Apollo, who, as an archer, has just shot the serpent Python. The finest statue possessed by the moderns is an imitation of this great work,—the Apollo Belvedere. It is to be regretted that we do not possess any of the greatest works of the greatest sculptor of this period, Phidias; but there is no doubt that the sculptured decorations of the Parthenon were many of them executed by his own hand, whilst the remainder were produced by his disciples, under his immediate direction. These slabs, taken from the ruins of the Parthenon, sacred to Minerva, were, through the public spirit of Thomas, earl of Elgin, collected for the British nation between the years 1802 and 1812. High spirit and graceful action characterise all the animals carved upon these beautiful slabs; and for purity of style and graceful expression, they form the finest specimens of ancient art in existence in our own times. (*See* ELGIN MARBLES.) The British Museum is, fortunately, also in possession of another beautiful series of Greek marbles,—the Phigalian sculptures. They consist of a series of alti-relievi, depicting the battle of the Lapithæ and the Centaurs, and of the Greeks and Amazons. They are supposed to have been executed by the scholars and less skilful followers of Phidias, which fact is held to account for their inferiority as works of art. With all its beauty and simplicity, Greek sculpture made use of devices, which, perhaps, from insufficient knowledge of the subject, the best of modern fine art critics have condemned as being derogatory to the essential qualities of art. From an early period, and even during the best era of Greek art, the age of Phidias, the Greeks were accustomed to combine different marbles in the same work. This was called polylithic sculpture. Frequently, head, hands, and feet were formed of different stones, while wood and metal were employed for the draperies and accessories. The Greeks also painted their statues. The hair was often gilt, and even coloured sometimes; the backgrounds of alti-relievi were painted, in order to heighten the effect, and occasionally eyes of glass or silver were introduced. With Socrates, the sculptor of the draped Graces, and Athenodorus and Naucydes, commenced the third epoch of Greek sculpture. It is generally known as the beautiful style, and Scopas, Lysippus, and Praxiteles, because they united beauty and grace, brought the art to its highest perfection. The finest works of Scopas were the furious Bacchante, his Venus (the original, perhaps, from which the Venus de' Medici was copied), and the Triumph of Achilles, together with a number of charming combinations of Nereids and sea monsters. Forsaking the severe, grand, and sublime for the tender, flowing, and graceful, Praxiteles wrought in bronze and marble. Until this sculptor ventured to carve a Venus nude, all statues of female divinities had been draped. It is supposed that the Sleeping Faun at Munich, the Cupid contained in the Vatican at Rome, the Apollo Sauroctonus, and the celebrated Venus of Cnidus, together with the group of Niobe, are imitations of some of the great works of this master. The rival and contemporary of Praxiteles was Lysippus of Sicyon, who was the great master of portrait sculpture. He is said to have executed in bronze exclusively. Alexander the Great would permit no other artist to carve his likeness. He represented Alexander from his childhood to his manhood. Pliny declares that Lysippus executed as many as six hundred and ten works. His horses were very beautiful. The other great sculptors of this period were Euthycrates and Eadas, sons of Lysippus; Xenocrates, who wrote a treatise on sculpture; Chares of Lindus, who cast the famous colossus of Rhodes; Agesander of Rhodes, and his three sons, who executed the celebrated group of Laocoon; Glycon of Athens, who formed the Farnese Hercules at Naples; and Apollonius and Tauriscus, who made the Farnese





Bull, also at Naples. The beautiful fragment known as the Torso of the Belvedere, at Rome, and the Hermaphrodite at Paris, also belong to this era of Greek art. The victorious Romans destroyed the existence of the arts in Greece; but, as if in revenge, all the sculptors of Rome were Greeks; all the great works in painting and sculpture were taken to Rome, and with these masterpieces the artists emigrated to the capital of their conquerors. The celebrated realising statue of the dying Cleopatra was executed in the reign of Augustus, and a son of Cleomenes the Athenian made a statue which is held by some to be a figure of Germanicus. This work is now in the Louvre at Paris. Visconti is of opinion that it is intended to represent some distinguished Roman orator. Julius Cæsar was devoted to the fine arts, and even the most remote provinces of the Roman empire reaped the fruits of his refined taste. He embellished the cities of Gaul, Spain, and Greece, as well as Rome. Augustus embellished all the public places of Rome with statuary, and Agrippa employed an Athenian sculptor to decorate the Pantheon, as well as causing an aqueduct to be embellished with three hundred pieces of statuary in bronze and marble. Nero invited from Cisalpine Gaul, Zenodorus, who executed a colossal bronze statue of his patron, 110 feet high. It was during the reign of the last-mentioned emperor that the Romans began to introduce the practice of making statues in different coloured marbles. They went so far as to imitate, by means of white and black stones, the colours of the eyes in a statue of an Ethiopian. The times now became too disturbed for sculpture to flourish; but it revived under Trajan, in whom, as well as in his successors, Adrian and the Antonines, the art found a munificent patron. Adrian was especially conspicuous for his fine taste. He caused to be restored all the old public edifices that had fallen into decay, besides erecting many new and magnificent buildings. The remains of one fine work remain to this day to attest to his munificence—the grand villa near Tivoli, about eighteen miles from Rome. After this prince, sculpture began to decline, and when the seat of imperial government was established at Constantinople, Constantine could find no artists worthy to decorate his new imperial residence. After Rome had been destroyed by the several inroads of the Northern nations, the finest productions of ancient art were demolished, and this work of destruction was consummated by the religious zeal of the primitive Christians, who swept away what remains there were of the statues of the Greek and Roman divinities. Sculpture awoke to renewed life about the 10th or 11th century, in Italy. In the 11th century mention is made of a sculptor named Buono; Bonanno, of Pisa, lived during the 12th; whilst Niccolo Pisano, who died 1270, is esteemed the father of modern sculpture. Two of his finest compositions are the "Taking down from the Cross," in front of the Duomo of Lucca, and the "Last Judgment and Punishment of the Wicked," in the cathedral of Sienna. Both these masterly works are bassi-relievi. Andrea Orcagna, poet, painter, and sculptor, died in 1389. Lucca della Robbia covered his beautiful *terra-cotta* models with a varnish which gave them the hardness of stone. He never disclosed the secret of his process; but there is a tradition which declares that he inclosed an account of the varnish in some of his models before they were baked; so that it could never be known until many of his beautiful works were destroyed. Lorenzo Ghiberti and Donato di Betto Bardi were distinguished masters of sculpture. Michael Angelo declared that the bronze gates made by the former were worthy of being placed at the entrance to paradise. Donatello, who died in 1466, enriched Florence, Genoa, and Venice with his works. During the 15th century, Andrea Verocchio, Andrea Ferracci, the two Pollajoli, and Mina di Fiesole, were great masters. Michael Angelo Buonarotti, born in 1474, exhibited at an early age the fortress of his wonderful genius. He became the protégé of Lorenzo de' Medici, who assigned him apartments in his own palace. His colossal statue of Moses is a great effort of genius, as are also the allegorical figures of Day and Night, and of Dawn, Morning, and Evening, in the chapel of the Medici at Florence. Others of the masterpieces of this great and powerful master are, the statue of Christ at Rome, the statue of David at

Florence, the half-drunken Bacchus in the same city. A profound knowledge of anatomy, mastery of execution, originality, combined with a vast store of energy, are the principal characteristics of Michael Angelo. Jacopo Tatti, or Sansovino, as he is more commonly termed, was more distinguished as an architect than as a sculptor. Baccio Bandinelli, born at Florence in 1487, attempted to become the rival of Michael Angelo. A great anatomist, his style was rude and energetic. He restored the right arm of the Laocoon. Benvenuto Cellini was a painter, goldsmith, and sculptor. He was born at Florence in 1500. Most of his finest large works, which were cast in bronze, are preserved in his native city. The one celebrated female sculptor is Propozia di Rossi, of Bologna, who died at an early age, in 1530. An accomplished painter, a musician, as well as sculptor, she is said to have become inspired with an affection for a young artist who did not return her love. Her last work was a basso-relievo representing the story of Potiphar and Joseph, in which she depicted herself as the wife of Potiphar, with the object of her affection flying from her. Guglielmo della Porta, Bernini, Alessandro Algardi, of Bologna, Il Fiammingo, a native of Brussels, who excelled in portraying the forms of childhood, Francesco Mocchi Faggini, and other names, mark the different eras of Italian sculpture down to the present century. Properly speaking, there was no British school of sculpture until the commencement of the 19th century. It is said that there are no examples of a sepulchral statue earlier than the Norman invasion; and to this era, therefore, some critics are disposed to assign the first practice of this department of the sculptor's art in England. The beautiful chapel of Henry VII. in Westminster Abbey is said to have been originally adorned with three thousand figures; but although this number is most probably an exaggeration, there is little doubt that the statues, whatever their number, were the work of native artists, an Italian artist, Torrigiano, being employed only on the tomb. Sculpture in England languished until the reign of Charles I., in whose day we find Christmas carving a monument to Sir William and Lady Pitt at Strathfieldsaye; and Stone, another native artist, executing a monument to Sir George Holles in Westminster Abbey. The sculptured work upon the Monument of London, raised during the reign of Charles II., is but a poor example of sculptured art. The art was chiefly practised by foreigners after this time. Italians, Frenchmen, Flemings, brought to England only a poor reflection of the genius of the Italian sculptors; but when, early in the present century, a national collection of sculptures was commenced to be formed, the art revived. To Flaxman are we indebted for founding, upon true principles, the English school of sculpture; and he has had worthy followers in Sir R. Westmacott, Chantrey, Baily, Carew, and Foley. In France, Jean Goujon, of Paris, is the first distinguished sculptor. The brothers Marsy, who cast the statues of Bacchus and of Latona, and the famous group of horses at the Bath of Apollo at Versailles, was distinguished in the 17th century. Baptist Pigalle executed a Mercury and a Venus for the King of Prussia; and the celebrated tomb of Marshal Saxe at Strasburg is by this master. Albert Durer, whose genius embraced various departments of the fine arts, was among the first great German sculptors, his genius having been transmitted through many worthy followers to the greatest among modern German sculptors, Christian Rauch and Danneker. As Canova emancipated modern Italy from those false perceptions which had so long diverted the current of pure taste, so Thorwaldsen, the Danish sculptor, was superior to all his contemporaries in the grandeur of his forms and in strength of expression, besides placing his native land among the list of those countries that have given rise to artistic genius. To describe the mechanical process of sculpture:—the artist having conceived and well-ordered his subject, he either makes a preliminary sketch of it upon paper, or else proceeds at once to model it, on a small scale, in clay or wax. By this means, he is enabled to improve the general arrangement of his figure or group of figures. The genius of the artist is altogether displayed in this perfected original model; for the subsequent process of copying it in stone is chiefly mechanical. When a large clay model is made, a skeleton or frame of wood or iron is constructed whereon to place a proper quantity of wet clay. This clay is moulded by the hand, and by tools of wood and ivory. The figure is thus built up in clay, and whether it is subsequently to be draped or otherwise, it should always be modelled naked, so that the true proportions of the form may be attained, also that the drapery may have a natural curve and fall. If the design be in relievo, a plane is prepared upon which the design is drawn. Upon this sketch, bounded by the outlines, the wet clay is laid; afterwards the clay is modelled by the sculptor. In either case, whether in the "round" or in "relievo," the clay must be kept damp by wet cloths, in order to prevent the shrinking or cracking of the model. To obtain a "cast" of this model is the next process. The model is covered with a mixture of plaster of Paris and water, and when this has become hardened, the clay model within is carefully picked out. The plaster of Paris matrix is then washed; the interior is brushed over with a composition of oil and soap, and a fresh supply of plaster of Paris poured in. When this sets, the matrix is struck off, piece by piece, with chisels, and a cast of the model, which has not adhered to the mould by reason of the oily compound with which the latter had been smeared, is obtained. This cast is the exact fac-simile of the original model, and if it is intended to execute the work in bronze, another mould is taken from it by the founder. (*See* FOUNDING.) If it is intended to copy the work in marble, a block of marble is marked with a number of pencil-points, to correspond to the chief elevations and cavities in the figure to be imitated; these forming a series of guides to the workmen engaged in carving a rough outline of the original work. A superior workman next copies the nicer details of the work by means of chisels, rasps, and files, the pencil-points acting as his guide. Finally, the sculptor himself gives the finishing touches, and goes entirely over his work, improving each detail, until the realization of his idea is obtained. When required, the surface is polished with pumice-stone and putty-powder.—Ref. *English Cyclopædia.*

SCURVY, *skur'-ve* (Lat. *scorbutus*), in Med., is a disease which two centuries ago was endemic in all the northern countries of Europe, but which has been now almost entirely extinguished. It is still a disputed point whether this disease was known at all to the ancients; but of its prevalence in the Middle Ages there is abundant testimony. It appears to have existed in the north of Europe from the most remote antiquity, resulting from the imperfect state of agriculture and the frequent famines that prevailed. Even as late as 1836-8 the reports of inspectors of prisons abound with instances of the occurrence of scurvy in our gaols and prisons, owing to the prolonged use of a diet in which fresh succulent vegetables formed no part. It was, however, more particularly at sea that the fearful ravages of this scourge prevailed. Even as recently as the time of Lord Anson, scurvy was so fatal that, during the first two years of his voyage, he lost more than two-fifths of his original crew. The first indication of scurvy is usually a change in the complexion, from its naturally healthy hue to a pale, slightly sallow, and dusky appearance, attended with great languor and despondency, and aversion to every kind of exercise. The patient is readily fatigued, and complains of pain in the muscles, especially of the legs and loins, similar to those produced by over-exertion. The gums soon become sore, and apt to bleed on the slightest touch, and on examination are found to be swelled and spongy, and of livid redness. As the disease advances, all these symptoms become more marked, the complexion acquires a more dingy and somewhat brownish hue; the debility increases, so that the least exertion causes breathlessness and palpitation, and not unfrequently an alarming syncope; the gums become more swelled and more livid, forming, in some cases, a black spongy mass, completely concealing the teeth, which frequently become loose, and drop out without undergoing decay; and the breath is remarkably offensive. The patient is also subject to hemorrhages, more particularly from the gums and nose, but often also from the intestines, lungs, or stomach. Ecchymoses also appear on the skin, in the form of petechial spots, particularly on the lower extremities, but frequently occurring also on

the arms and trunk. Effusions of blood also take place under the skin in various parts, especially in the lower extremities and around the seat of an old injury. These parts are painful when pressed or moved, and are much swollen. Their most common seat is the ham, where the swelling is often considerable, and always attended with stiffness and contraction of the knee-joint. Sometimes old wounds break out afresh, and a broken bone will become disunited, though it has been consolidated for some time. The natural secretions are scanty, the skin is dry and rough, and there is a suppression of perspiration. The appetite, however, continues good, and the powers of digestion are unimpaired; the intellect is unaffected, and in early stages the patients generally sleep well. The tendency to swoon, however, is very great, and sometimes even the slightest motion produces fainting, which sometimes proves fatal. Scurvy is most common in winter or the beginning of spring. It is not contagious, neither is it caused by cold weather, by impurity of air, nor by the continued use of salt provisions, all of which have frequently been alleged. It is owing solely to the privation for a considerable length of time of fresh succulent vegetables, and is infallibly and rapidly cured by the administration of these or of lemon-juice. The latter is really a specific against scurvy, whether it be employed as a preventive or as a remedy. It supplies something to the blood which is essential to its healthy properties. As for the rest, fresh animal food, with wine, porter, or ale, is of advantage; but bleeding, blistering, or mercury in any form, should be religiously avoided.—*Ref.* Dr. Budd on *Scurvy*, in the *Library of Practical Medicine*.

Scurvy-Grass. (*See* Cochlearia.)

Scythe, or Sythe, *sithe* (Sax. *sithe*), an implement of agriculture which has been known from the earliest ages. It consists of a curved steel blade fixed at right angles to a long crooked handle, to which are fastened two other smaller handles. Scythes are used for cutting grass and corn; when for the latter purpose, a piece of wicker-work, called a cradle, is generally attached. By the ancients scythes were employed as weapons of war.

Sea. (*See* Ocean.)

Sea-Defences.—When a sea-shore is attacked either by the action of the tide or the littoral currents, it becomes necessary to protect the shore from the gradual abrasion that results. The sea-defences thus required are constructed on principles which depend not only upon the destructive action to be operated against, but also on the nature of the materials to be used. When the shores are rocky, and of the granitic and crystalline formations, the sea acts generally by direct impact or by tidal currents. In such cases, and especially when deep water comes close in shore, the best and most economical mode of defence is to build a solid masonry wall, of large hard stones, with a curvilinear batter of about one in forty from the sea. The sudden interference with the translation of a deep-sea wave should always be avoided in sea-defences, especially when it has been driven for a short distance over an inclined fore-shore, and has been exposed to the action of winds or currents able to increase the velocity. In some cases, this velocity has been observed to attain as much as seventy feet per second. The spray has sometimes been dashed over the top of the Bell Rock, on the east coast of Scotland, a height of 117 feet. Another kind of sea-defence is that used in order to guard against the tendency of breaking waves to undermine the footings on the seaward face by the receding wave, or *undertow*, as it is technically called. In the more movable strata, this object is effected by constructing a kind of flat wall, presenting the same inclination as the natural line of the fore-shore. The sea-slope at the Plymouth breakwater was paved with large blocks of marble or granite, dovetailed and cramped together at an enormous cost. On the Dutch coast, where the inclining angle of the shore is very flat, the apron-walls of sea-defences are often made of brickwork, set with trass mortar in wooden frames. At Cherbourg, the sea-slope is protected by huge blocks of rubble masonry set in Portland cement. Where shores consist of soft alluvial formations, their defence is effected in various manners, according to the skill of the engineers and the natural outlines formed by the action of the currents.

Sea-kail. (*See* Crambe.)

Seal, *seal* (Fr. *sceau*), an impression made on paper, clay, wax, or other substance, by means of a die of metal or other material. Among the Egyptians, seals were in use; the kings and high dignitaries of the state using gold, silver, or precious stones, and the common people employing porcelain or vitrified soapstone, for the purpose of obtaining impressions on clay, or fine Nile mud; afterwards coloured wax and lead came to be used. These seals bore engraved representations of gods, mottoes, emblems, and the names of royal and other persons. The ancient Hebrews used engraved onyx rings and bracelets to seal documents with. The Assyrians and Babylonians were likewise accustomed to use seals of various forms, as did also the Phœnicians. The earliest seals of the Greeks consisted of impressions of wormeaten pieces of wood; but so early as the 6th century B.C., signet-rings worn on the fourth finger of the left hand came into fashion. Impressions from these were made on a fine clay, and were attached to doors or to anything of value in the house, as a protection against the pilferings of slaves. The Romans most probably borrowed the use of seals from the Etruscans. The state provided ambassadors with a gold signet; but for private use they were only permitted to use an iron ring. Under Tiberius freedmen were permitted to employ a seal. Doors of female apartments, bags of money, granaries, papyri, and other objects of value, were secured by a seal. A law was passed during the reign of the emperor Nero, by which it was ordered that wills should be secured by a cord passed three times round them, and afterwards secured with the signum, or seal, the seals of seven witnesses being required to make a will valid. The impression made by the seal of Julius Cæsar was the likeness of the goddess Venus; of Augustus, first of all, a sphinx, and later, the head of Alexander the Great. The subsequent emperors used a variety of similar devices. In the days of the empire leaden seals were employed for private purposes; and with Constantine there came into use a disc of gold or silver, called bulla, which was attached to documents by a woollen or silken bond. The great dignitaries, as well as private individuals, during the Byzantine epoch, had seals bearing either the heads of Christ or the Virgin, or their names only; and with the fall of the empire of the West, the popes commenced the use of the leaden bulla. In the 12th century, the papal bulla became of larger size, bearing the heads of Saints Peter and Paul, with a cross between. In addition, the popes used the seal of the fisherman, upon which was shown St. Peter fishing. Gold and silver seals were employed by Charlemagne, the Venetians, and others; and the famous treaty of the Cloth of Gold made between Henry VIII. and Francis I., of France, had gold seals appended. Wax seals slowly superseded all other kinds; and when writing was not a common accomplishment, seals, as a rule, took the place of the name. The Normans introduced wax seals into England, and every person above the rank of knight had his seal with its characteristic effigy. Seals bearing armorial bearings were in use in the 12th and 13th centuries, and in the 15th century the middle classes began to assume coats of arms for their seals, till, at length, the seal, no longer acting as a substitute for the signature, degenerated into a legal formality. All legal instruments whereby real estate is conveyed must bear a seal. In England there are three royal seals, the great, held by the chancellor; the privy seal, held by the *lord keeper*; and the privy signet, held by the principal secretaries of state. The first-mentioned seal is attached to letters patent, grants of inheritance, offices in fee, and writs at common law; the second is valid for the issue of treasure, &c.; the third authenticates the sign-manual and the writ *Ne exeat regno*.—Ref. *English Cyclopædia*; the Benedictines' *Traité de Diplomatique*; De Wailly, *Eléments de Paléographie*; *Proceedings of the Archæological Institute of London*.

Seal (*Phoca*), a gen. of the fam. of marine carnivorous mammalia named *Phocidæ*. The genus *Phoca* comprises a great amount and a considerable diversity of species. The members of it resemble a quadruped in some respects and a fish in others. Their feet are so short and so encompassed in the skin, as to render their terrestrial movements very awkward, and their

terrestrial motion is effected by a sort of shuffling, jumping motion, in which the spine and the muscles of the body are principally employed, though the extremities are used in getting, or rather climbing, out of the water upon a rock or other projecting body; but as the intervals of their toes are filled by membranes admirably adapted for swimming, their swimming powers are nearly inexhaustible, and they pass the greater portion of their lives in the water. The form of the body is elongated, the spine extremely flexible, the muscles very powerful, and the fur close and short. Considered as regards their structure, their principal place of abode, and their motions, they hold a place between the land mammalia and the cetacea, or whales. They have all the three kinds of teeth, and in this particular resemble the land carnivora, and there is little doubt that their chief food is fish, caught alive in the water, an operation in which they are very expert. The head is round, and the nose, which is broad, is like that of a dog, with the same look of intelligence and mild expressive physiognomy. It has large whiskers, oblong nostrils, and black sparkling eyes. The arms and fore-arms of the seal are very short, and wholly concealed under the skin of the shoulder and breast; the fingers, as already said, being united by a membrane into a sort of paw or paddle. The hind legs are still more concealed, and have less of independent motion than the fore ones; but the toes are more webbed, and they are altogether more efficient in swimming. The brain of the seal is well developed, and the degree of sagacity and attachment which they show in domestication is evidence of superior intelligence. Seals have the power of opening or closing their nostrils at pleasure, and the interval between their respirations is very long; the closing being effected by sphincter-like muscles acting upon valvules, which close the aperture most effectually. The auditory nerve is very large, and though the auricular opening is closed by a mechanism somewhat similar to that which shuts the nostrils, it is evident that seals hear very well even under water. The members of the seal family are amongst the most numerous of all mammalia that attain anything like an equal size. On some parts of the British coasts they are plentiful, especially on the more northern ones; but in other places they literally swarm. Estuaries and straits are their favourite grounds, evidently because the fishes, which are more dispersed in the open seas, congregate in greater numbers in the currents of these narrow places. They are excellent swimmers and ready divers. Their heads in swimming are always above the water, in the manner of that of a dog. They have their dens or lodgments in hollow rocks or caverns near the sea, but out of the reach of the tide. They sleep and bask on rocks surrounded by the sea, or on the less accessible parts of cliffs left dry by the ebb of the tide, and if disturbed by anything, at once make for the water; and they are said to be so watchful and wary that they never sleep for more than a minute or two at a time, frequently raising up their heads to see if there is any chance of danger. The *Common seal* (*Calocephalus vitulinus*), the typical one of the genus, is found upon the shores of all the colder places in Europe. It is usually about five or six feet in length. The ground-colour of the hair or skin, when the animal is alive and dry, is pale whitish-grey, with a very slight tinge of yellow; when just out of the water and wet, it is ash-colour. After death, and as seen in museums, the ground-colour is pale yellowish-grey; the oil having penetrated the skin and rendered the hair of a more yellow hue. The body above is clouded and marbled with blackish-grey. Space round the eyes and muzzle, sides of the body, and all the lower parts and the feet, pale greyish, becoming nearly white beneath. There is some brown on the muzzle and upper part of the tail; whiskers moderate, undulated; claws black and rather strong; length from three to five feet. It inhabits the northern seas generally, the coasts of England, France, &c. It is comparatively scarce on the southern coasts of Britain now, but still haunts the estuary of the Tees, where it is still captured for the sake of its skin and the oil its fat yields.—The *Harp seal* (*Calocephalus grœnlandicus*) has hair that is drier, closer to the touch, and more free from wool than that of the





other species; each hair flat and lustrous. This species is very numerous in the deep bays and the mouths of the rivers in Greenland, where they live in vast herds among the floating ice-islands, among which they are sometimes seen swimming in great numbers, under the guidance of one who seems to act as leader and sentinel for the whole. Their food consists of all kinds of fish, shell-fish included. To the Greenlander they are all in all, giving him light, food, and clothing. He goes to hunt it in his canoe, which is in the form of a weaver's shuttle. When he perceives a seal, he endeavours to surprise it unawares, with the wind and sun at his back, that he may be neither heard nor seen. He approaches it rapidly, but silently, till within three or four fathoms. He then takes hold of the oar in his left hand, and with his right throws the harpoon. If it is fixed, the Greenlander throws the attached buoy overboard on the same side that the seal dives, and he dives upon the instant. The struck victim often carries the buoy under water; but, wearied and wounded, it must at last come up to breathe. The hunter, who is on the watch, now attacks it with his long lance, till the animal is exhausted, when he releases it from its sufferings with his short lance. The seals belonging to the sub-genus *Stenorhynchus* are distinguished by the great elongation and the slenderness of the muzzle, which is the foundation of the name. The claws on the toes are very small, and altogether they have a much more aquatic air about them than the common seal. They are found about the Falkland Islands and New Georgia; but of their natural history little or nothing seems to be known. The seals belonging to the subdivision *Pelagius* have the muzzle elongated, but very much enlarged towards the extremity; and the claws on the hind feet are sometimes altogether wanting. One of the species, *Pelagius monachus*, the monk-seal, a native of the Adriatic and the coasts of Sardinia, is supposed to be that whose skin was always carried everywhere by the emperor Augustus, as a protection against lightning, in accordance with a general Roman superstition. The seals belonging to the subdivision *Stemmatopus* consist of only one species, the *crested seal*, *Stemmatopus cristatus*, which has the head surmounted by a peculiar organ, which is erectible at the pleasure of the animal, and the use of which is not known. This species, which is about eight feet long, is found on the coasts of Greenland and of North America, down to the United States. Its bite is formidable, and its voice is said to resemble the bark and whine of a dog. It is one of the species most generally pursued, and together with the rough seal, *Calocephalus hispidus*, furnishes the greatest number of the seal-skins brought to Great Britain. The seals belonging to the subdivision *Macrorhinus* differ widely from those belonging to the other subdivisions. The *Macrorhinus proboscideus*, or elephant seal, which belongs to this subdivision, is remarkable for the nose of the male being prolonged into a kind of proboscis, which respires violently when the animal is excited. This seal, which is enormous when compared with the ordinary seal, as it sometimes attains a length of twenty-five feet and upwards, is found in the southern hemisphere, both in the Atlantic and Southern oceans, South Georgia, Juan Fernandez, South Shetland, and the Falklands. It is fond of wallowing in fresh-water swamps, and resorts to rivers and lakes, whose waters it drinks with apparent pleasure. The cry of the female and young is said to resemble the lowing of an ox, whilst the voice of the male is described as being a hoarse gurgling sound, which is heard to a great distance, and is wild and frightful. They are a harmless race, never attacking man unless in defence of themselves and their young, and readily tamed by kind treatment. Their tongues, when salted, are considered savoury and wholesome, but the flesh is black, oily, and indigestible. The skin, though not valued for its fur, is extensively used for carriage and horse harness, on account of its great strength, but its oil is the great object for which the animal is hunted. There are also two more species which remain to be noticed,—one named the *Sea Bear*, the other the *Sea Lion*.

Sealing-wax.—The best receipt for the manufacture of this useful substance is that given by Lewis, and consists in melting, at a gentle heat, 48 parts of

shellac, 12 of Venice turpentine, and 1 part of balsam of Peru, and incorporating with them 36 parts of the best vermilion.

Sea Mouse, *see'-mouse* (*Holothuria scabrella*).—This animal, which belongs to the division of animals named *Annelida* (*see* Annelida), is very beautiful, and most richly coloured. It is oval, six or eight inches long, and two or three inches wide. The scales of the back are covered and hidden by a kind of flocky down, which springs from the sides, and from which issue groups of strong spines, that pierce in part the flocky covering, and bundles of flexuous bristles, glittering like gold, and changing into all the colours of the rainbow. Lower down is a tubercle, out of which come spines in three groups and of three different sizes, and finally a fleshy cone. There are forty of these tubercles on each side, and between the first two are two small fleshy tentacles.

Sea Perch. (*See* Bass.)

Search, Right of, *serch* (Fr. *chercher*, to seek), in the Law of Nations, is the right of belligerents, during war, to visit and search the vessels of neutrals for contraband of war. Some powerful nations have, at different times, refused to submit to this search; but all the highest authorities upon the law of nations acknowledge the right in time of war, as resting on sound principles of public jurisprudence, and upon the institutes and practice of all great maritime powers. The duty of self-preservation gives belligerent nations this right; and as the law now stands, a neutral vessel refusing to be searched would, from that proceeding alone, be condemned as a lawful prize. The right of search, however, is confined to private merchant vessels, and does not apply to public ships of war. The exercise of this right must also be conducted with due care and regard to the rights and safety of the vessels. A neutral is bound not only to submit to search, but to have his vessel duly furnished with the necessary documents to support her neutral character; the want of which is a strong presumptive evidence against the ship's neutrality, and the spoliation of them a still stronger presumption. There may be cases in which the master of a neutral ship may be warranted in defending himself against extreme violence threatened by a cruiser grossly abusing his commission; but, except in extreme cases, no merchant vessel has a right to say for itself, nor any armed vessel for it, that it will not submit to visitation or search, or be carried into a proximate port for judicial inquiry. If, upon making the search, the vessel be found employed in contraband trade or in carrying enemies' property, or troops, or dispatches, she is liable to be taken and brought in for adjudication before a prize court. (*See* Prize.)

Search Warrant is a document, procured from a justice of the peace, to search for stolen goods.

Sea Serpent, a term applied to a huge animal like a serpent, which is supposed to inhabit the sea. The appearance of a huge monster of this kind has been frequently reported by creditable persons in late years; but in general the sea serpent is looked upon as a fabulous animal. (*See* Kraken.)

Seasons, *se'-zons* (Fr. *saison*), the four quarters of the year,—spring, summer, autumn, winter. They are considered as commencing when the sun enters Aries, Cancer, Libra, and Capricorn, respectively. Thus, spring commences about the 21st of March; summer about the 22nd of June; autumn about the 23rd of September; and winter about the 23rd of December.

Secale, *se-kal'-le* (Lat.), in Bot., a gen. of the nat. ord. *Gramineæ*. *S. cereale*, the common rye, is much cultivated in the northern parts of the world for its grains. Rye-bread is very wholesome, and retains its freshness for a much longer time than wheaten bread. *Quass*, or *rye beer*, is a favourite drink in Russia. Rye is subject to a disease called *ergot*, produced by the attack of fungi (*see* Coniocete), when its grains assume an elongated and curved form. These diseased grains are commonly known as *ergot of rye*, or *spurred rye*, and are used medicinally to excite uterine contractions in labour; in certain doses, they are poisonous.

Second, *sek'-ond* (Lat. *secundus*), the sixtieth part of a minute, whether of time or of angular measure. In the old treatises on astronomy, the sixtieth part of a second is similarly called a *third*.

Second Sight is a power believed to be possessed by some persons in the highlands and islands of Scotland of foreseeing future events. Things distant or future are seen as if actually present, with all their circumstances and surroundings. Accidents are said to be thus foreseen, funeral processions, marriages, the arrival of strangers, and such-like. This faculty is neither voluntary nor constant, and is said to be rather troublesome than agreeable to the possessor of it. Though the belief in the second sight is rapidly disappearing, it still lingers in the remoter parts of the north of Scotland. The stories that are reported of it can scarcely be regarded as sufficiently supported by evidence. "It is not wonderful," says Dr. Beattie, "that persons of a lively imagination, immured in deep solitude, and surrounded with the stupendous scenery of clouds, precipices, torrents, should dream (even when they think themselves awake) of those few striking ideas with which their lonely lives are diversified, of corpses, funeral processions, and other subjects of terror, or of marriages and the arrival of strangers, and such-like matters of more agreeable curiosity." Dr. Johnson, who was himself a believer in it, affirms that the Islanders of all degrees, whether of rank or understanding, universally admit it, except the ministers, who, according to him, reject it in consequence of a system against conviction. Sir Walter Scott has made good use of the second sight in several of his works, particularly the "Lady of the Lake" and the "Legend of Montrose."

Secretary, *sek'-re-ta-re* (Fr. *secrétaire*, from Lat. *secretum*, a secret), is strictly one intrusted with the secrets of his office or employer; but more generally he is a person employed in a public office, who writes letters, dispatches, and other instruments, by his master's orders. Secretaries are of various kinds. Secretaries of state are officers of the crown, who have under their management and direction the most important affairs of the kingdom. The origin of the office of secretary of state is lost in antiquity. In early times, the lord chancellor was the king's chief secretary, and had custody of the king's signet, with, under him, several clerks, who were called the "king's clerks of the signet." A second secretary was first appointed in the reign of Henry VIII., the two officers being equal in authority, and having the like duties; and in the reign of Edward VI. it appears that there were three principal secretaries of state. In the reign of James I. there were two secretaries of state, and Clarendon says that they "were not in those days officers of that magnitude they have been since, being only to make dispatches at the conclusion of councils, not to govern or preside in those councils." On the union with Scotland in 1708, a third secretary of state was appointed for the affairs of that country; but in 1748 this officer was discontinued, and there were again only two secretaries of state, till 1768, when a third was appointed for the increasing business connected with our colonies. In 1782 this additional secretary was abolished; but in 1794 the War department was established, and a secretary of war appointed. In 1801 the business of the colonies was transferred from the Home department to the secretary at war, who was then styled Secretary of State for the Colonies. On the commencement of the Russian war, in 1854, a new War department was created, and a fourth secretary of state appointed for this department. A fifth secretary of state was appointed for Indian affairs in 1858, when that possession came into the hands of the government. The duties and responsibilities of the home secretary comprehend the maintenance of the internal peace of the United Kingdom, the security of the laws, and the general supervision of matters relating to the administration of criminal justice. The secretary for foreign affairs has the exclusive charge of the interests of the British empire and British subjects in foreign countries. He negotiates all treaties, leagues, and alliances with foreign states, either directly with the foreign ministers at this court, or through the British ambassadors abroad; and is the official organ and responsible adviser of the crown in all communications between its government and foreign powers. The colonial secretary has under his control all matters connected with the government of our extensive colonial possessions; and the secretary for war has the general control and

direction of the army, in which he is assisted by the commander-in-chief. The secretary of state for India has the control of all matters connected with that empire. Each of these, with the exception of the last, is assisted by two under-secretaries of state, nominated by himself; the one being usually permanent, the other dependent upon the administration then in power. The secretaries of state are members of the privy council and have seats in the cabinet, and personally attend upon the sovereign on all public ceremonies and state occasions.

SECRETION, *se-kre'-shun* (Lat. *secretio*), in Physiol., is that process by which materials are separated from the blood, and from the organs in which they are formed, for the purpose either of serving some ulterior office in the animal economy or of being discharged from the body as excrement. Secretion is one of the natural functions of the living body, and is as necessary to health as nutrition. Where the secreted materials have some ulterior purpose to serve, they are known as secretions; where they are discharged from the body, excretions. Most of the secretions seem to consist of substances not pre-existing in the same form in the blood, but requiring special organs and a process of elaboration for their formation. Excretions, on the other hand, commonly or chiefly consist of substances existing ready formed in the blood, and are merely extracted therefrom. In general, however, the structure of the parts engaged in eliminating excretions is as complex as that of the parts concerned in the formation of secretions. The secretions may be arranged into three sorts: (1) exhalations, (2) follicular secretions, and (3) glandular secretions. The exhalations take place as well within the body as at the skin, or in the mucous membranes, and are thus divided into external and internal. The follicles are divided into mucous and cutaneous, and into simple and compound. In almost all the points of the skin little openings exist which are the orifices of small hollow organs with membranous sides, generally filled with an albuminous and fatty matter. The consistence, colour, odour, &c. are variable, according to the different parts of the body, and which is continually spread upon the surface of the skin, rendering it less impervious to moisture, &c. The small organs are called the follicles of the skin. The glands, however, are the principal organs to which the office of secreting is more especially ascribed, and the number of them is considerable. The glandular secretions are of seven different sorts; namely, the tears, saliva, bile, pancreatic fluid, urine, semen, and milk.

SECRETIONS, in Bot.—In consequence of the action of air and light upon the watery contents of the green leaves of plants, the materials within them are subjected to a very active chemical condition, by which various substances are formed,—as protein matters, gum, sugar, starch, &c., all of which are essentially necessary to the growth of the plant. Besides these are other matters, such as colouring substances, numerous acids, various alkaloids, &c., which, after their production, perform no further active part in the plant, and are hence removed from the young and vitally active parts, to be stored up in the older tissues of the plant as *secretions*, or removed altogether from them as *excretions*.—*Ref.* Bentley's *Manual of Botany*.

SECRET WRITING, or CRYPTOGRAPHY, *se'-kret* (Gr. *kruptos*, secret; *grapho*, I write), the art or act of sending secret information by means of writing which is intended to be illegible to all except the person for whom it is particularly designed. The ancients had several very imperfect methods of secret writing. Ovid teaches young women, in order to deceive their guardians, to write to their lovers in new milk, and to make the writing legible by means of coal-dust or soot. The same means are proposed by Ausonius to Paulinus. It is now known that several metallic solutions may be used for the purpose of secret writing: these inscriptions, on being exposed to the action of heat or certain vapours, &c., become visible. In its stricter meaning, cryptography signifies writing with signs which are only legible to him *for* whom the writing is intended, or who has a key of the signs employed. One of the simplest methods is that of using for every letter of the alphabet some sign, or only another letter. This sort of secret writing is, however, easily deciphered without a key; on this account various ingenious illusions are used, and various keys are employed, according to rules agreed upon beforehand.

SECTIONS, CONIC. (*See* CONIC SECTIONS.)

SECTOR, *sek'-tor* (*Fr. secteur*), in Geom., literally, that which cuts; that, for instance, which, being applied to a circle, cuts off part of it. The term sector is also applied to a mathematical instrument, consisting of two rulers, representing the radii of a circular arc, and movable round a joint, the middle of which forms the centre of the circle: various scales are drawn on the faces of the rulers for this centre, which are useful in making diagrams, laying down plans, &c. In Astron., the *sector* is an instrument for determining with great accuracy the zenith distances of stars passing within a few degrees of the zenith, when the effect of refraction is small.

SECULAR, *sek'-u-lar* (Lat. *secularis*; from *seculum*, an age), is used as opposed to spiritual or ecclesiastical, denoting what relates to the affairs of this life. Among the Roman Catholics, secular is applied to such clergy as are not bound by monastic rules, which the regular clergy are.

SECULARISM, *sek'-u-lā-rizm*, is a system of belief which professes to regard only this present life, and to disregard the future world and all that concerns it. Its capital principle are,—1. That attention to temporal things should take precedence of considerations relating to a future existence; 2. that science is the providence of life, and that spiritual dependency in human affairs may be attended with material destruction; 3. that there exist, independently of scriptural religion, guarantees of morality in human nature, intelligence, and utility.

SECULARIZATION is the act of rendering secular, or appropriating to secular uses, the property of the clergy. In most European countries such appropriations have taken place. In England, the great secularization took place in the reign of Henry VIII. In Germany, the first great secularization took place in 1648, on the occasion of the peace of Westphalia; the second in 1801, after the peace of Luneville.

SEDATIVE, *sed'-ā-tiv* (Lat. *sedatus*, calm), in Med., an agent which produces a direct depression of the action of the vascular system with little sensible evacuation. Inasmuch as their depressing effects are not preceded by any obvious excitement or increased movement of the heart or arteries, they differ from narcotics. It is not clearly ascertained whether they act primarily on the heart itself or by a previous influence on the nervous system. The medical employment of sedatives should only be had recourse to under competent medical authority and superintendence.

SEDITION, *se-dish'-un* (Lat. *seditio*, a tumult or insurrection), in Law, is a general term, understood to comprise within its meaning all offences against the crown and the government which are not capital and do not amount to the crime of treason. Thus, where there is no actual design against the queen or the government in contemplation, a charge of sedition, or of speaking, writing, or doing anything seditiously, will not amount to a charge of treason. It includes all offences of the like tendency with treason, but without any such direct intent or overt act of the party formed or executed, so as to bring it within the more serious offence. By the civil law, sedition was ranked as treason, and in many of our ancient common-law writers, treason is sometimes expressed by this name. The acts 39 Geo. III. c. 79, and 57 Geo. III. c. 19, were passed to prevent seditious meetings and assemblies, the former of these being more particularly directed against the once famous corresponding societies. (*See* RIOT.)

SEDUM, *se'-dum*, in Bot., a gen. of the nat. ord. *Crassulaceæ*. *S. acre* is the common yellow biting stonecrop often seen growing on walls. It is of an acrid nature, as its name implies, and is reputed to possess emetic and purgative properties. Lindley states that in Ireland the leaves of *S. dasyphyllum* rubbed among oats are regarded as a certain cure for worms in horses.

SEE, *sē* (Lat. *sedes*, a seat), denotes the seat of episcopal dignity and jurisdiction, where the bishop has his throne or cathedra, or his diocese.

SEED, *seed* (Sax. *sæd*), in Bot., the mature or fecundated ovule. It consists essentially of the young plant

or embryo, inclosed in integuments, of which there are usually two. It varies much in form; thus, it may be *rounded*, as in the watercress; *reniform*, as in the poppy; *obconic*, as in the isatapur, &c.; similar terms being employed in describing these forms to those applied to like modifications of other organs. The outer integument or seed-coat is termed the *testa* or *episperm*. It is usually of a brown or somewhat similar hue, as in the almond; but it frequently assumes other colours. It varies in texture, being soft, fleshy, membranous, coriaceous, &c. It is often curiously marked with furrows, ridges, &c., and often furnished with hairs, spines, wings, and other appendages. The inner integument is called the *tegmen* or *endopleura*: it is generally of a soft and delicate nature. A third integument, more or less complete, is occasionally found on the surface of the others. (*See* ARILLUS.) The inner portion of the seed, called the *nucleus* or *kernel*, may either consist of the *embryo* alone, as in the wallflower and the bean, or of the embryo inclosed in *albumen* or *perisperm*, as in the pansy. When the nourishing matter called the albumen is present, the seed is said to be *albuminous*; when it is absent, to be exalbuminous. (*See* ALBUMEN, EMBRYO, OVARY, OVULE, PLACENTA.)

SEGMENT, *seg'-ment* (Lat. *segmentum*), in Geom., a term applied to a part of a figure cut off by a line or plane. The term is, however, more particularly applied to that part of a circle which is comprised between a chord and an arc of that circle, or so much of that circle as is cut off by the chord. A *segment of a sphere* is that portion of it which is cut off by a plane.

SEISIN, *se'-zin* (Fr. *seisine*, Lat. *seisina*), in Law, is a right to lands and tenements. In common law, seisin signifies possession; as to seize is to take possession of a thing. Seisin is properly applied to estates of freehold only, so that a man is said to be seised of an estate of inheritance, but to be possessed of a chattel interest. There is a seisin in deed, or in fact, when an actual possession is taken, and a seisin in law where the lands have descended to a person but he has not yet actually taken possession of them. Seisin in deed is obtained by actually entering into the lands. (*See* FEOFFMENT.)

SEISMOLOGY, *size-mol'-o-je* (Gr. *seismos*, an earthquake; *logos*, a discourse), a term applied to a branch of knowledge which has for its object to discover the laws which regulate the occurrence of earthquakes.

SELAGINACÆ, *se-lá-jin-as'-se-e*, in Bot., the *Selago* fam., a nat. ord. of *Dicotyledones*, sub-class *Corollifloræ*, consisting of herbs or shrubs, with alternate exstipulate leaves, and irregular, sessile, bracteated flowers. They are chiefly natives of the Cape of Good Hope; the most interesting genus, however, is European. (*See* GLOBULARIA.)

SELENITE, *sel'-e-nite* (Gr.), in Min. — Crystallized sulphate of lime, occurring in numerous localities in transparent rhomboidal crystals, is known to mineralogists under this name.

SELENIUM, *se-le'-ne-um* (Gr. *selene*, the moon), in Chem.,—symbol Se, equivalent 39·62, spec. grav. 4·8.—This rare elementary body was first discovered by Berzelius in the refuse of a sulphuric-acid factory at Fahlun, in Sweden; since then it has been found in various other localities. It is chiefly interesting from its great resemblance to sulphur in many of its physical and chemical characteristics. It is a dark metallic-looking brittle solid, with a glassy fracture. It has neither taste nor smell, is insoluble in water, and is a non-conductor of heat and electricity. It may be obtained like sulphur both in an amorphous and a crystalline form. Heated in the air, it takes fire with difficulty. It burns with a blue flame, but part of it volatilizes. It forms with *oxygen* three compounds, $SeO_1$, $SeO_2$, and $SeO_3$. The last two are selenious and selenic acid. Selenious acid forms *selenites* with the bases, which are all insoluble in water, with the exception of those formed with the alkalies. Selenic acid is very similar in character to sulphuric acid, its salts being isomorphous with the sulphates of the same bases. Seleniuretted hydrogen resembles its sulphur analogue very closely. Its odour is, however, very much more offensive. Berzelius found that the inhalation of a bubble the size of a pea deprived him of the sense of smell for several hours. Selenium, like sulphur, forms a compound with cyanogen.

SELENOCYSTEMA, ARNOTT, *se-lee-no-sis'-tem-ah*, in Bot., belongs to the nat. ord. *Asclepiadaceæ*, or Milkwort order, the plants belonging to which are chiefly remarkable for their bitter acrid juice. The leaves of *Selenostemma arnoti* have been much employed to adulterate Alexandrian senna.

SEMAPHORE, *sem'-ah-fore* (Gr. *sema*, a sign; *phero*, I bear), is a term very frequently used synonymously with telegraph; but which may be applied to any system of communicating intelligence by signals.

SEMECARPUS, *sem-e-kar'-pus* (Gr. *semeion*, I mark; *karpos*, fruit), in Bot., a gen. of the nat. ord. *Anacardiaceæ*. *S. Anacardium* yields the *marking-nuts* of India, which are employed, with the fruits of *Holigarna longifolia*, in preparing the celebrated *black varnish of Sylhet*. This is extensively used for lacquer-work and for marking linen. The seeds are edible, like those of the cashew. (*See* ANACARDIUM.)

SEMIBREVE, *sem'-e-breev*, the longest note employed in modern music, much resembling in shape a large O lying on its side. It is the starting-point of our measure of time.

SEMICOLON. (*See* PUNCTUATION.)

SEMI-NORMAN ARCHITECTURE, a term principally used in Ecclesiastical Architecture, and applied to those buildings in which the Norman and Gothic styles were mingled, and which date between 1170 and 1230 A.D., during the reigns of Henry II. and John. The architecture of this period, and even up to 1300, is exceedingly beautiful and chaste, simple and elegant in design, and excellent and delicate in execution, equally applicable to the modest village church and the noble abbey or cathedral. In the one case, it is remarkable for its unobtrusive simplicity, and in the other for its solemn and majestic grandeur. (*See* GOTHIC ARCHITECTURE.)

SEMIQUAVER, *sem'-e-kwaf-ver*, a musical character, formed of a crotchet with two hooks affixed to the end of its tail, equal in length to $\frac{1}{16}$th of a semibreve.

SEMITIC FAMILY OF LANGUAGES, *se-mit'-ik*, is divided into three branches,—the Aramaic, the Hebraic, and the Arabic. The Aramaic occupies the north, including Syria, Mesopotamia, and a portion of the ancient kingdoms of Babylonia and Assyria. It is known to us chiefly in two dialects, the Syriac and the Chaldee. A translation of the Bible was made in this dialect in the 2nd century: Christian literature dating from the 4th century is rich in it, and it is still spoken, albeit in a very corrupt form, by the Nestorians of Kurdistan, as well as by some Christian tribes in Mesopotamia. The language adopted by the Jews during the Babylonian captivity had the name of Chaldee given to it. The Jews adopted this language from their conquerors, both for conversation and for literary purposes, yet they always retained a knowledge of their sacred language. The Aramaic was a dialect transplanted from Babylonia to Palestine: it was the dialect spoken by Christ and his disciples. This language remained the literary idiom of the Jews till the 10th century. A little later the Jews adopted the Arabic as their literary language, retaining it till the 13th century; after which they returned to a form of modernized Hebrew, which they still continue to make use of for learned discussions. The Arabic, or Southern class of the Semitic family of languages, includes the Ethiopic, and the Himyaritic inscriptions, both being dead languages, whilst the living languages belonging to this class are the Arabic and the Amaric. The Hebraic, or middle class of the same family, includes Biblical Hebrew, the Samaritan of the 3rd century, the Carthaginian, and the Phœnician inscriptions, among its dead languages; its living dialects being represented by the modernized Hebrew of the Jews. The Aramaic, or Northern class of the Semitic family of tongues, has only one living representative, the Neo-Syriac; the Chaldee, the Syriac of the 2nd century, and the cuneiform inscriptions of Babylon and Nineveh being all dead languages.—*Ref.* Max Müller's *Lectures on the Sciences of Language*.

SEMITONE, *sem'-e-tone*, literally, half a tone, the smallest of all the intervals admitted in modern music, of which there are two species, viz. *major* and *minor*. The first is produced by rising a degree, as from G natural to A flat, and the latter by passing from a natural note to its sharp.

**Senate**, *sen'-āt* (Lat. *senatus*, an assembly of elders), the deliberative assembly of the Roman people; but the term has been applied to very different powers and constitutions in different countries. In the Greek republics, as well as among the Romans, the number of senators was regulated by the number of tribes into which the state was divided. Accordingly, whilst Attica was divided into four tribes, the number of senators was 400; and when the number of tribes was increased to ten, the number of senators was also enlarged to 500. The Roman senate, during the primitive days of the city, participated in the judicial and executive powers of the king, and even in the management of military affairs. Romulus was said to have originated the senate; but in doing this, he only imitated all the civilised nations dwelling on the shores of the Mediterranean, who all deemed it necessary to have an assembly of the elder citizens of the state, besides a popular assembly. Under Tarquinius Priscus, the number of senators was increased to 300, each of the 300 houses (*gentes*), which composed the three tribes, having its *decurio*, or representative head, in the Senate. Subsequently, the election of the senators was made by the censor reading aloud once in every lustre (five years) the names of the senators, the worthiest first, the one first named being styled *princeps senatus*. Those who were deemed unworthy of the dignity were degraded by the omission of their names. The senators were chiefly drawn from the ranks of the equestrian order. In the days of the republic, a senator was required to possess property to the value of about £4,600, and in the days of Augustus of about £6,500. The Senate was assembled by the supreme officers of government, deciding the propositions laid before it, article by article, by a majority of voices. A decree of the Senate was called *senatus consultum*. If the decree was opposed by the tribune, or if the Senate was not full, the act was termed *senatus auctoritas*, and was submitted to the people, whose tribunes could reject every proposition by their vote. The Senate had within its jurisdiction all matters of public administration, questions of peace or war, the choice of public officers, and the financial concerns of the republic. Under the Empire, the Senate gradually lost its political consideration, but until the time of Constantine the Great many of its decrees took the place of the laws enacted by the people. In the end, it became so submissive to the will of the emperor, that it often decided upon the propositions of the ruler, without deliberation and with acclamation. The French senate came into existence after the revolution of the 18th Brumaire, which placed Bonaparte at the head of the country. He drew up a fresh constitution, which, besides three consuls, of which he was the first, the tribunate, and the legislative body, established a conservative senate, consisting of eighty members of at least forty years old. Each senator had a yearly allowance of 25,000 francs, afterwards increased to 30,000. This body soon came to be a mere tool in the hands of Bonaparte for the conversion of the government into an empire. Under the Empire, the French senate was composed of the imperial princes, the dignitaries of the empire, and 136 members. The new constitution granted by Louis XVIII. substituted an hereditary chamber of peers for the imperial senate. The Senate of the United States forms the higher branch or house of the legislature; it is composed of two senators for each state of the federation, chosen for a term of six years. The presiding officer is the vice-president of the United States. In the university of Cambridge the senate is equivalent to the convocation at Oxford, and consists of all masters of arts, and higher graduates, being masters of arts, who have each a voice in every public measure; as in the election of members of parliament, in granting decrees, electing a chancellor, &c. In the Scotch universities the senate is composed of the principal and professors.

**Senecio**, *sen-e'-shi-o*, in Bot., Groundsel, a gen. of the nat. ord. *Compositæ*, consisting of numerous species, natives of all parts of the world. The common groundsel, *S. vulgaris*, which is sold about the streets as food for cage-birds, is the best-known species. It was formerly much employed in the form of a poultice as a domestic remedy for spitting of blood.

**Senega Snake-root.** (*See* Polygala.)

**Senna.** (*See* Cassia.)

**Sensation**, *sen-sā'-shun* (Lat. *sentio*, I perceive), in Philos., is the mental impression, feeling, or state of consciousness resulting from the action of external things on some part of the body, said, on that account, to be sensitive. The sensations are classified according to the bodily organs concerned in their production. Thus, we have sight by the eye, hearing by the ear, touch by the skin, smell by the nose, and taste by the mouth. The difference of the mental feeling or consciousness in the various senses is very strongly marked, so that we never confound a taste with a sound, or a touch with a smell. In addition to these, physiologists commonly distinguish a sixth sense, of a more vague character, under the title of common or general sensibility, including the several feelings of pleasure and pain, comfort and discomfort, warmth, chilliness, hunger and thirst, &c. An important subject connected with our senses is their education. "Our senses have to be educated, *i. e.* to be drawn out, developed. We have to learn to see, to hear, and to touch." "Many hundred repetitions are necessary before what we call a sensation (*i. e.* a distinct feeling, corresponding to that which the object will always produce upon the developed sense) can be produced. Many sensations are necessary to produce a perception: a perception is a cluster of sensations with an ideal element added. On the educated sense, objects act so as instantaneously to produce what we call their sensations; on the uneducated sense they act only so as to produce a vague impression, which becomes more and more definite by repetition."—(*G. H. Lewes.*) The effects of education upon the senses are seen in the acute taste of the wine or tea-taster, the hearing of the musician, the touch of the pianist, &c.—*Ref.* Bain's *Senses and Intellect*.

**Sensationalism**, or **Sensualism**, *sen-sai'-shun-al-izm*, in Philos., is a term applied to those systems which either directly or indirectly deduce all our knowledge from sensation, or from the experience which sense affords. The 18th century was particularly rich in sensational philosophers, the principal of whom were Condillac in France, and Hartley and Darwin in this country. Condillac, in his celebrated work, "Traité des Sensations" (1754), attempts to show that "all our knowledge and all our faculties are derived from the senses, or, to speak more accurately, from sensations." He was a professed follower of Locke, and imagined that he was only following out his principles to their legitimate consequences. Though Locke, indeed, does not sufficiently distinguish between sensation and reflection as separate sources of ideas, yet he clearly recognizes the two as being perfectly distinct. The opposite of sensationalism is intellectualism or idealism.—*Ref.* Lewes's *History of Philosophy*.

**Senses.** (*See* Sensation.)

**Sentence**, *sen'-tens*, in Law, is the decree or judgment of a court in a cause or criminal proceeding.

**Sepal.** (*See* Calyx.)

**Sepoys**, or **Sipoys**, *se'-poiz* (corrupted from Hindoo), the name given in India to native soldiers disciplined in the European manner. The Sepoys now in the pay of the English government form a large and well-trained army. In general, the men composing this army are somewhat smaller than European soldiers; but they are brave, hardy, and active, capable of undergoing much fatigue, and of sustaining great privations. Previous to the mutiny of the Bengal army in 1857, the East-Indian army consisted of a far greater number of native than of European troops; and to them Great Britain is chiefly indebted for her Indian empire. The French were the first to see that the transportation of troops would be too expensive, and that Europeans would perish in great numbers by the exposure at sea, and in the climate of India. In consequence, they took Hindoos into their pay, and the same policy was adopted by the English. In 1858, the native army, with the whole of the East-India Company's troops, were transferred with the government of India, and placed under the crown. Since that time, the native army has been greatly reduced, the government seeking the recruits for its coloured army chiefly from the Sikh population, and not, as formerly, from the Hindoo.

**September**, *sep-tem'-ber* (Lat. *septem*, seven; Fr. *septembre*), the ninth month in the year. It derives its name from having been the seventh month in the year

established by Romulus, which began with March. Although several Roman emperors gave names to this month in honour of themselves, it has to the present day retained its original appellation.

SEPTUAGINT, *sep'-tu-ă-jint* (Lat., seventy), is the name given to a Greek translation of the Old Testament, made at Alexandria, for the benefit of those Jews who had lost the use of the Hebrew tongue. It is said to have been made by seventy or seventy-two translators; and hence the name. (*See* BIBLE.)

SEPULTURE, RITES OF. (*See* BURIAL.)

SEQUESTRATION, *se-kwes-trā'-shun* (Lat. *sequestratio*), in Law, is the separating or setting aside of things in controversy from the possession of both the parties that contend for it. It is also a kind of execution for debt, especially in the case of a beneficed clerk, of the profits of the benefice, to be paid over to him that hath judgment till the debt is satisfied. It issues, in all cases, from the bishop, but may be founded upon proceedings commenced either in his own court or in the temporal courts. The most usual sequestration of a benefice is upon a vacancy, for the gathering up the fruits of the benefice to the use of the next incumbent, the churchwardens being usually appointed by the bishop for that purpose. Sequestration in chancery is "a writ issuing out of the court, directed to four or more commissioners, empowering them to enter into a defendant's real estates, and to sequester into their own hands not only the rents thereof, but also all his goods, chattels, and personal estate whatsoever, to keep the same until the defendant has fully answered his contempt." It issues on a contempt of court in failing to perform a decree, to put in an answer, escaping from custody, &c. In Scots law it is the process by which the whole of a bankrupt's estate, heritable and movable, is collected and distributed among his creditors. It is granted, on application, to the Court of Session, whence it issues, and is remitted to the sheriff of the county, who, to some extent, fulfils the functions of the English commissioner. It is also a form of process used where two or more persons are disputing respecting the right to a landed estate.

SERAGLIO, *se-ral'-yo* (Ital.), literally, the palace of an Eastern prince, but in its more common application, that in which women are lodged. The seraglio of the Grand Seignior of Constantinople is a long range of building, containing apartments for himself and the officers and dependents of his court, as well as for the females of his harem.

SERENADE, *ser-e-nād'* (Ital. Sp. *serenata*), music performed at night in the open air, under the window of the person it is intended to entertain. It was quite a common thing in Spain for gentlemen to entertain their mistresses in this manner.

SERF, *serf* (Lat. *servus*), was the name given in France to those persons who, in the dark ages, were in the lowest condition of slavery. They were attached to the soil, and transferable along with it. Their emancipation was extremely gradual, commencing about the time of the Crusades, and not fully accomplished till the time of the Revolution. Russia is the only country in Europe where this species of bondage still exists. A decree was indeed passed in 1861 for their emancipation in two years; but it is very doubtful if this will be effected in the present state of that empire.

SERGEANT, *sar'-jent* (Fr. *sergent*), formerly an officer in England, nearly answering to the more modern bailiff of the hundred; also an officer, whose duty was to attend on the king, and on the lord high steward in court, or arrest traitors and other offenders. In Mil., a non-commissioned officer, who instructs recruits in discipline, forms the ranks, &c. It is also a title given to lawyers of the highest rank, and answers to the doctor of civil law. The term is sometimes applied to the queen's servants.

SERGEANT-AT-ARMS, in legislative bodies, an officer who executes the commands of the body, in preserving order and punishing offences.

SERGEANT-MAJOR, a non-commissioned officer, who acts as assistant to the adjutant.

SERGEANTY.—In England, sergeanty is of two kinds, —*grand sergeanty* and *petit sergeanty*. Grand sergeanty is a particular kind of knight service, or tenure, by which the tenant was bound to do some special or





honorary service to the king in person. Petit sergeanty was a tenure by which the tenant was bound to render to the king, annually, some small implement of war.

SERIES, *se'-reez* (Lat.), in Chem.—The first chemist who arranged organic substances in series whose numbers differed by equal increments or decrements of carbon, hydrogen, or oxygen, was Dr. James Schiel, of St. Louis, in the United States, although the credit of having originated this important method of classifying organic compounds is generally given to Gerhardt. It would be impossible to give a list of all the series which have been established of late years in organic chemistry: the most important of them will be found under HOMOLOGOUS SERIES and ISOLOGOUS SERIES.

SERMON, *ser'-mon* (Lat. *sermo*), a religious discourse pronounced by a divine from the pulpit. (*See* PREACHING.)

SERPENTARY. (*See* ARISTOLOCHIACEÆ.)

SERPENTINE, *ser'-pen-tine*, in Min., a hydrated silicate of magnesia, found in compact masses, tinged with black, red, and green spots. It takes a high polish, and is coming into very general use for ornamental purposes. It is found chiefly in Cornwall, where there are several extensively-worked mines. It takes its name from the resemblance it bears to the skin of certain serpents. The rougher portions are used as a source of the salts of magnesia.

SERPENTS, *ser'-pents* (Lat. *serpens*, creeping).—The third order of reptiles, of Cuvier, is thus named; and as they are without feet, they are more deserving of the name of reptiles than any other order. The general form of a serpent consists of a head, a body, and a tail, in one lengthened bone, without any extremities, though there are sometimes membranes to the head or neck, which admit of being inflated at the pleasure of the animal. The skeleton is simple in them, consisting chiefly of the skull, the spinal column, and the bones of the head. The skull is small, and the brain is also small, and very imperfectly developed, a fact which renders naturalists averse to the idea that the serpent is a good emblem of cunning or wisdom. The mouth is in every case merely a prehensile instrument, and not a killing or even wounding one; for, although the stroke of the poison-fang of a serpent is often of the most deadly character, it is only so through the poison which it discharges. The teeth of serpents are adapted for piercing and holding, but not for dividing or bruising; and consequently the animals belonging to this order swallow their prey whole; the jaws of serpents being united by ligaments, a conformation which gives them the power of dilating their jaws to such an extent as to swallow bodies larger than themselves. Serpents are divided into venomous and non-venomous; and the former are divided again into venomous with many maxillary teeth and venomous with isolated fangs. In the non-venomous, the branches of the upper jaws are furnished throughout their length, as well as those of the lower jaw and of the palatine branches, with fixed teeth, which are not pierced. The venomous serpents with isolated fangs present a very peculiar structure in their organs of manducation. Their superior maxillary bones are very small, carried on a long pedicle, analogous to the external pterygoid apophysis of the spheroid bone, and very movable. Here is fixed a pointed tooth, pierced with a small canal, which gives issue to a liquor secreted by a considerable gland situated under the eye. It is this liquor which, when shed into the wound made by the bite of the serpent, produces effects more or less fatal, according to the species which has inflicted the wound. The fang is concealed in a fold of the gum when the serpent does not wish to use it; and there are behind it many germs destined to fix themselves in their turn, in order to replace it if it should be broken in the wound it makes. In the non-venomous, the branches of the upper jaw are furnished throughout their length, as well as those of the lower jaw and the palatine branches, with fixed teeth which are not pierced; there are, therefore, four nearly equal rows of these teeth in the upper part of the mouth and two in the lower. All the venomous species bring forth their young alive, in consequence of the egg being hatched internally before it is laid; whence their general name of vipers, a contraction of viviparæ. The

venomous serpents with many maxillary teeth have the jaws organized and armed nearly as in the non-venomous; but the species have the first of their maxillary teeth greater than the others, and pierced so as to conduct the venom in the same manner as is effected in the venomous serpents with isolated fangs. The serpents, with one exception (the *Dasypeltis*, which feeds on the eggs of birds), subsist on living prey, and, whether venomous or non-venomous, have their teeth, as might be expected, admirably constructed and arranged for the purpose of securing their prey and assisting in deglutition. The trachea of the serpents is very long; their heart situated very far backwards, and the greater number have only one very long lung, with the vestige of a second. The tongue has great powers of mobility and extension, and terminates in two cartilaginous points. The skin in different genera is annulated, coriaceous, or granulated, or most frequently covered with scales. The powers of digestion are so slow that one meal, in many cases, serves for weeks, or even for months. The structure of the vertebral column of the serpents is different from that of any other animal; the most perfect specimens being found in the great crushing serpents which kill their prey by compressing it in their folds, and so constructed as to give them the fullest latitude of action. The shell of the egg in the oviparous serpents is soft, like the eggs of the common hen when she has not enough calcareous aliment; are often more than thirty in number, and are connected by a sort of viscous matter, which coagulates and joins them in a kind of chain. The surface of the brain of serpents is nearly smooth and without sinuosities or circumvolutions. Their organs of touch, taste, smell, and hearing appear to be dull, if not defective, whilst that of sight is sufficiently acute. Serpents can creep, glide, grasp, suspend themselves, erect themselves, leap, dart, bound, swim, and dive. Cold latitudes do not agree with them; it is in warm climates that their numbers, their venom, and their volume, attain their maximum.

SERVANT. (*See* MASTER AND SERVANT.)

SERVICE, *ser'-vis* (Lat. *servitium*), in Law, is the duty which a tenant, by reason of his fee or estate, oweth unto his lord. It is divided into various kinds; as personal and real, free and base, continual or annual, casual and accidental, intrinsic and extrinsic, &c.

SERVITUDE, *ser'-ve-tude* (Lat. *servitus*), in CIV. LAW, is the right to the use of a thing, without property in the same, for all or for some particular purposes. It consists either in the right to do some act, as to gather fruit from the estate, or to prevent the owner of the property from doing certain acts; as building walls beyond a certain height, blocking up a window, &c. They were variously distinguished and divided.

SERVITUDE, PENAL. (*See* PENAL SERVITUDE.)

SESAMUM, *se'-sā-mum*, in Bot., a gen. of the nat. ord. *Pedaliaceæ*. *S. orientale* has oily seeds, which yield by expression the product known in India as *teel*, *gingely*, or *gingillie oil*. It is rarely imported, as it soon becomes rancid; but it is said to be largely employed for adulterating almond-oil.

SESSION, *ses'-shun* (Lat. *sedeo*, I sit), in LAW, is the period during which any court sits for the transaction of judicial business. The term sessions is commonly used to signify the meeting of the justices of a county, or other district having a separate commission of the peace, for carrying out the powers which have been conferred upon them. A meeting of the justices, convened for acting judicially for the whole district comprised within their commission, constitutes a court of general session of the peace; and as these are by statute required to be held once at least in every quarter of the year, they are commonly known as the "Court of Quarter Session" (which *see*). When a meeting of justices is held for the purpose of transacting magisterial business arising within a particular district or part of a county, it is called a petty session; and if it be convened for no'ne particular or special business, it is called a special session. Borough sessions are courts held in boroughs under the Municipal Corporations Act, resembling quarter sessions in counties. (*See* COURTS, BOROUGH.)

SESSION, COURT OF, a term given to the supreme judicial court of Scotland in all civil matters, being both a court of original jurisdiction and also a court of appeal. It was constituted by an act of the Scottish parliament in 1537, being intended to supply the place of a judicial committee of parliament called the "lords of session." Since that time it has undergone various changes, and at the union, the House of Lords was constituted a court of appeal against its decisions. Down to 1808, the whole of the judges, fifteen in number, sat together in one court; but they were then separated into two chambers,—the "First division," consisting of seven judges, presided over by the lord president, and the "Second division" of six judges, presided over by the lord justice clerk; while the two remaining judges sat as "lords ordinary." Since that time, the number of the judges has been reduced to thirteen, and the number of lords ordinary increased to five; so that there are now four judges in each of the two divisions. The lords ordinary constitute what is termed the "Outer House;" the others forming the two divisions of the "Inner House." The Outer House is the court of first instance, whence litigations pass to the Inner as a court of review. Each of the lords ordinary holds a separate court, and before one or other of them an ordinary cause is first brought. The judgment of the lord ordinary may then be taken for review to one of the divisions of the Inner House, where a decision is a decision of the Court of Session. It is practicable, however, when occasion demands, to have the judgment of the whole court upon a point. Cases are brought from the inferior courts to the Court of Session by a process called "advocation." In 1815, trial by jury in civil cases was introduced in Scotland, a separate tribunal being established for these cases; but in 1830, the practice of jury trial was united with that of the Court of Session. (*See* JUSTICIARY, HIGH COURT OF.)

SESSION, KIRK. (*See* PRESBYTERIANISM.)

SETARIA, *se-tā'-re-ā*, in Bot., a gen. of the nat. ord. *Gramineæ*. *S. germanica* and *italica* yield respectively German and Italian millet, varieties of grain which are largely used as food.

SET-OFF, *set'-off*, in Law, is the amount of a debt due by the plaintiff to the defendant in a cause which the defendant is entitled to set off, in answer either to the whole or part, as the case may be, of the plaintiff's claim. Thus if the plaintiff sues for ten pounds, due on a note of hand, the defendant may set off nine pounds due to himself, for merchandise sold to the plaintiff, and in case he pleads such set-off, must pay the remaining balance into court. The set-off, however, must be a determined and specific sum, for a mere claim for damages not ascertained cannot be set off against a specific debt, neither can a debt due to the defendant personally be set off to a demand against him as a trustee.

SETTER, *set'-ter* (*Canis familiaris Index*), a mongrel dog produced by crossing, chiefly between spaniels and pointers. The principal varieties of the setter are the English and the Irish. The English setter does not



SETTER.

differ from the pointer, but is more loosely made, so as to admit of more rapidity of motion, with less dimi-

nution of the continuance of that motion. It is equalled by few hunting-dogs in sagacity, and excelled by none in docility and personal attachment. In colour it may be met with of almost every tint and marking common to hounds and spaniels, and the colour has little to do with its qualities, although the contrary is frequently asserted. Their hair is, in general, beautifully curled. The habits of the setter and the pointer are much the same (*see* POINTER); but its cheerful obedience, extreme hardihood under exertion, and quickness, render it, under certain circumstances, more valuable than the pointer to the sportsman. The hairy protection of the setter's feet enables it go through a long day's journey over moss and moor, without injury, whereas most pointers would be knocked up. On the other hand, the setter, in most cases, requires more breaking than the pointer. As it too frequently happens that its enthusiasm leads it to forget the instructions it has received, a small sample of re-breaking is often required before the shooting practices of each season commence. The Irish setter dog is a large red dog, of very commanding mien, great powers, and excellent sporting qualities.

SETTLEMENT, *set'-tl-ment*, in Law, in its most general sense, denotes a disposition of property of any kind made by the owner for certain purposes. It may be made either by deed or will; but commonly the term is only applied to those made by deed, and in fact only to a certain kind of these; namely, marriage settlements. Settlement is also the right which an individual acquires to parochial relief in a certain parish or district. (*See* POOR LAWS.) The Act of Settlement in English history is act 12 & 13 Wm. III. c. 2, which settled the succession to the crown, on the death of King William and Queen Anne without issue, on the Princess Sophia, electress and duchess-dowager of Hanover, being the youngest daughter of Elizabeth, queen of Bohemia, daughter of James I., and the heirs of her body being Protestants. The duchess died before Queen Anne, and her son, George I., consequently came to the throne.

SEVEN YEARS' WAR, in European Hist., is the name given to a war carried on in Germany between 1756 and 1763. The principal contending parties were Frederick II. of Prussia and the Austrians; the latter being at one time assisted by Russia, France, the German empire, and Sweden; while the only fast ally of the former, during the struggle, was England. The war raged with varying success; but at length Frederick seemed brought to the verge of ruin, when, in 1762, the empress of Russia died, and her successor, Peter III., made peace with Prussia, and thus led to the termination of the war, a peace being concluded at Hubertsburg on 15th February, 1763. This disastrous war devastated Germany, and cost Europe a million of lives, without yielding material advantages to any party.

SEWERS, *su'-erz* (said to be from old Fr. *asseour*), underground excavations for the purpose of draining towns and domestic residences. These, in ancient Rome, were executed at great expense. The repairing of them is mentioned among the great works of Agrippa, who is said to have turned the course of seven rivers into these subterranean passages, to have made them navigable, and to have actually passed in barges under the streets and buildings of Rome. Until within the present century, the common sewers of London received surface-water alone. Cloacal matters were not admitted into them; but human ordure and other dejecta fell or were thrown into cesspools dug deep in the ground; and as London in the 18th century hardly extended beyond the limits of the dry gravel-bed, the fluids were in a great degree absorbed, and the more solid matters were removed, under the name of night-soil, by hand labour, and carried away in carts and applied as manure. But as the clay-land became building-ground, and as the water-closet came into general use, the gravelly subsoil could not take up the increased quantity of fluid matter, and the clays, of course, refused to receive them at all; so that it became necessary to provide for the discharge, in a fluid state, of the matters dejected all together. This is done by drains into the common sewers, which have thus become cloacal vents as well as conduits for waste and surface-water. As more capacious sewers are found necessary for this double duty, such have been built, and are constantly in the course of building, and at such depths that houses may be relieved by their drains of waste-water, and of refuse soluble in water, while the roads are kept drained, by the same conduits, of their surface-water. The result of such deepening, however, is that, to a large extent, the outfall of the sewers is below the level of high tide in the Thames and its confluent creeks, so that the commingled waters in the sewers are penned back to await the ebb, when the sand, silt, &c., which the surface-water brings from the roadways, deposit and form a concrete, which no force of any back-water will totally remove and carry out at the reflux. On this account, passages are generally made, extending from the side of the sewer to the foot-pavement, through which persons may at any time enter to cleanse it. The bricks and cement in the London sewers are of the best quality; but the form of the sewers varies greatly, some engineers preferring one form, some another. Nearly all the modern sewers, however, have an inverted arch at the bottom, and curved forms are also generally given to the sides and top. The practicability of applying sewage refuse to the purposes of manure has of late years been much discussed, and is the subject of much difference of opinion.

SEXTANT, *seks'-tint* (Lat. *sextans*, a sixth), an instrument principally used at sea for measuring the altitudes of heavenly bodies, and ascertaining their apparent angular distance. It is constructed on a similar principle to that of the quadrant; but the arc, containing the sixth part of a circle, may be taken to 120°. A sextant is generally fitted with apparatus for ascertaining the angular distances, &c., in lunar observations.

SHAD-BERRY. (*See* AMELANCHIER.)

SHADDOCK. (*See* CITRUS.)

SHAKERS, *shak'-erz*, are a religious sect which originated in a secession from the Quakers, in Lancashire, in 1747, and received their name from the violent shaking of their bodies in religious worship. In their ordinary meetings they often engaged in a regular dance, jumping, turning round rapidly, falling on their knees, and assuming numerous other ridiculous postures. At other times they marched in order round the room in harmony with songs sung on the occasion, shouting and clapping their hands. They had also intervals of shuddering, as if in a fit of ague. They were joined, in 1758, by Ann Lee, who subsequently became the leader of the sect, giving herself out to be inspired, and the woman alluded to in Rev. xii. In consequence of persecution, she, and a number of her followers, left England for New York, where they arrived in 1774. Their numbers rapidly increased, and they formed themselves into communities called "families," each holding property in common. There still exist a considerable number of them in the United States, and it is said a few of them in England; but they have given up the more violent of their exercises, and are generally distinguished as peaceful and well-conducted in ordinary life.

SHALE-OILS, *shail*, mineral oils found in shale or slate-clay. At Rangoon and several other localities in Burmah, naphtha is obtained from a pale blue clay soaked with oil, which rests upon roofing-slate, beneath which is coal containing iron pyrites. Messrs. De la Rue and H. Müller have made the petroleum from this locality the subject of examination. It is obtained by sinking wells about sixty feet deep, in which the liquid is collected as it oozes from the soil. At ordinary temperatures it has the consistence of goose fat; it is lighter than water, and has usually a greenish-brown colour, and a slight and peculiar, but not unpleasant, odour. The term is also applied to the oils distilled from bituminous shale found in the island of Portland and other localities.

SHALLOT. (*See* ALLIUM.)

SHAMROCK, *shăm'-rok* (Irish), in Bot., a ternate-leaved plant, adopted by the Irish as their national emblem. Many and warm have been the disputes to determine the veritable shamrock. Some writers contend for the *Oxalis acetosella*, or wood-sorrel, the leaves of which unfold about St. Patrick's day; while others maintain that the *Trifolium repens*, or white clover, is the favoured plant. Legends make out that St. Patrick, when preaching the gospel to the benighted inhabitants

of Ireland, illustrated the great doctrine of the Trinity by the tripic leaf of the shamrock. Whether he *plucked* the bright green leaf of the wood-sorrel or the more familiar herbage of the white clover cannot now be determined. The latter is, however, now generally worn by enthusiastic Irishmen on St. Patrick's day.

SHARK, *shark* (*Squalus*), a fam. of cartilaginous fishes allied to the rays, but easily distinguished from them by the peculiar rhomboidal form of the latter. In the shark the form of the body is elongated, and the tail thick and fleshy. The muzzle is rounded or pointed, depressed, and projects over the mouth, which is large, and armed with several rows of compressed, sharp-edged, and sometimes serrated teeth. The nostrils are situated on the under side of the muzzle, in the form of oblique openings, which vary somewhat in figure according to the species. The fins generally consist of two dorsals, two large pectorals, two ventrals, an anal fin, and a caudal. The portion of the tail of the shark which supports the tail fin is almost always bent upwards at an obtuse angle with the body. The water penetrates to the gills by means of several transverse openings, which are situated on each side of the neck. The skeleton is usually cartilaginous. The skin is usually very rough, covered with a multitude of little osseous tubercles; and that of some species forms a substance called *shagreen*. The eggs of the shark are flue and large in comparison with those of bony fishes, and are enveloped in a hard, horny, semi-transparent shell, terminated at the four angles with long filaments. These are deposited by the parent shark near the shore in the winter months. The convoluted tendrils hanging to the sea-weed, or other fixed bodies, prevent the cases being washed away into deep water. Two elongated fissures at each end allow the admission of seawater; and the young fish ultimately escapes by an opening at the end, near which the head is situated. A curious peculiarity has been observed in the young of the sharks during a very early stage of their existence. From each of the branchial apertures branchial filaments project externally; each filament contains a single minute reflected vessel, in which the blood is then submitted to the action of the surrounding medium. The appendages are only temporary, and the blood of the fish is afterwards aërated by the true gills. Sharks are the most formidable and voracious of all fishes, pursue all other marine animals, and seem to care little whether their prey be living or dead. They often follow vessels for the sake of picking up any offal which may be thrown overboard, and man himself often becomes a victim to their voracity. The teeth of the shark are movable at the will of the animal, and are usually laid down and directed backwards, but become erect at the moment the animal is seizing its prey. They are arranged in several series, one within the other, of which the outermost row is that in use; the other rows serving to replace the foremost when injured. Their form varies much in the different species, and even those of the upper and lower jaw are often very dissimilar; but although thus variable, they most commonly exhibit modifications of a triangular form, are sharply pointed, and have the lateral edges sharp and frequently serrated. Yet terrible as these teeth are, and well as they are fitted for inflicting the most fearful lacerations, their chief action is seizing and swallowing, not killing and dividing their prey. As is the case in fishes generally, the stomach of the shark is fitted for performing the whole work of assimilation without any preparation of the food by the mouth, and if it can be obtained without a struggle, the largest prey that the shark can swallow goes to the stomach entire. Large fishes, seals, the bodies of various animals of considerable size, and even an entire human body, have been found whole in the maws of the more formidable specimens of the shark family. The sharks form several natural genera, distinguished by the presence or absence of blow-holes, or of the anal fin; by the form of the head, nose, teeth, &c. The *Basking shark* (*Squalus maximus*), so called from its habit of remaining occasionally at the surface of the water almost motionless, as if enjoying the influence of the sun's rays, is one of the largest of the true fishes, and has been known to measure thirty-six feet in length. From the month of June to the commencement of winter, it is to be found on various parts of the coasts of Great Britain and Ireland, and frequently wanders from our southern coast as far to the eastward and south as the coast of France. It is said to exhibit but little of the ferocious character of the sharks in general, and to have the smallest teeth in proportion to its size of any of them.—The *White shark* (*S. Carcharias*) is an inhabitant of most quarters of the globe, though preferring the warmer to the colder latitudes, and of all the species is one of the largest and most voracious.—The *Hammer-headed shark* (*Zygæna malleus*) is one of the most strange in form of the whole class of fishes, its head being dilated to a great extent on each side, in the form of a double-headed hammer; the eyes, which are very large, being placed on each side. It is said to be extremely ferocious, to frequent deep water, and to measure from seven to eight feet in length. It is found in the Mediterranean, on the shores of the various countries of Europe, in the ocean, and on the coast of Brasil.—The *Blue shark* (*Carcharias glaucus*) is an inhabitant of the Mediterranean, but frequently visits several parts of our coasts, and being very bold and voracious, inflicts great injury on our fishermen, cutting their lines and nets, and sometimes passing along the whole length of a pilchard drift-net, cutting out, as with shears, the fish and the net that holds them, and swallowing both together. It is of a slender and elegant shape, and its colour, which is blue-green above and white beneath, is particularly handsome.—The *Spinous shark* (*Echinorhinus spinosus*) is so called from having the surface of the skin, both on the body and fins, more or less sprinkled with strong bony-looking spines, with large circular and flattened bases, which vary in size as well as in form, some being hooked, others quite straight, in some places disposed in clusters, in others solitary, and on the extremity of the muzzle nearly wanting.—The *Greenland shark* (*Scymnus borealis*) is a native of the northern seas, and is one of the foes of the whale, which it bites and annoys while living, and feeds on when dead. It attains a length of twelve or fifteen feet, and a circumference of six or eight. It appears almost insensible to pain, and its body, though separated into any number of parts, gives evidence of life for several hours.

SHARP, *sharp*, a character employed in music, the power of which is to raise the note before which it is placed one half-tone. It was originally meant to represent, by its four cross lines, the four commas of the gamut.

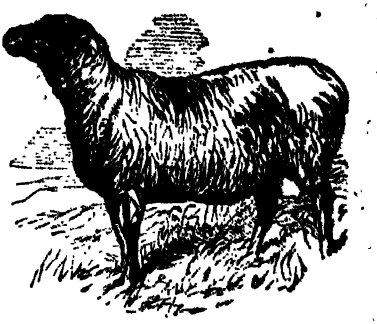
SHEEP, *sheep* (*Ovis Aries*).—Naturalists are by no means agreed as to what was the original breed of this invaluable animal, which is, in modern farming, almost equally important for furnishing the farmer with a dressing of manure and the community at large with mutton, clothing, and other necessaries of life. Of the several varieties of wild sheep which have by naturalists been considered entitled to the distinction of being the parent stock may be mentioned,—1. the Musmon (*O. Musimon*), still found wild in the mountains of the larger islands of the Mediterranean and European Turkey; 2. the Argali (*O. Ammon*), or wild Asiatic sheep, which are the tenants of the highest mountains of central Asia, and the elevated inhospitable plains of its northern portions; 3. the Rocky Mountain sheep (*O. montana*), which is found on the mountains of North America; 4. the bearded sheep of Africa (*O. tragelophus*), found on the high lands of Egypt and in Barbary. The leading fact in the geographical history of this genus is, that it occurs both in the new and the old world, whereas the goat tribe are naturally unknown in America. It is usually regarded by naturalists as being not only specifically but generically distinguished from the goat tribe; but some authorities, on the other hand, are inclined to believe that the generic separation is founded chiefly upon characters which have arisen from the influential power of man. In a state of nature the sheep is scarcely less active or energetic than the goat; its dimensions are greater, its muscular strength at least equal both in force and duration. It is also an Alpine animal, and amongst its native fastnesses bounds from rock to rock with almost inconceivable swiftness and agility. The main characteristics of the four unabridged races of sheep mentioned above are as follows:—The *Musmon*

measures about three feet and a half in length, and its height at the highest part of the back is about two feet six inches. The neck is large, the body thick, muscular, and of a rounded form. The limbs are robust and the hoofs short. The horns of the male are nearly two feet long. The body is protected by a short, fine, grey-coloured wool, of which the filaments are spirally twisted, and by a stiffish silky hair, of no great length, yet sufficient to conceal the wool beneath. It is gregarious in a state of nature, and seldom descends from the highly-elevated portions of the mountains on which it dwells. The general opinion of naturalists is that it is from this species that we have obtained our domestic breeds. The *Bearded sheep* of Africa has the hair on the lower part of the cheeks and upper jaws extremely long, so that it forms a double or divided beard. The hairs on the sides and body are short, those on the top of the neck somewhat longer, and rather erect. The whole under parts of the neck and shoulders are covered by coarse hair, not less than fourteen inches long; and beneath the hair, on every part, there is a short genuine wool, the rudiments of a fleecy clothing. The tail is very short; the horns, which are about two feet long, approach each other at their base, and diverge outwards.—The *Argali*, or wild sheep of Asia, measures about three feet in height at the shoulder, and five feet in length. His horns are nearly four feet long, and placed on the summit of the head, so as to cover the occiput. They nearly touch each other in front, bending backwards and laterally, and then forwards and outwards. The female is of smaller size, and her horns are nearly straight. The name of *Argali*, applied to this species, is the Mongali name of the female; the male is called *Guldschak*.—The *Ovis montana*, or Rocky Mountain sheep of America, is larger than the largest varieties of our domestic breeds. The horns of the male are of great dimensions, arising a short way above the eyes, and occupying almost the entire space between the ears, but without touching each other at their bases. The hair in this species resembles that of a deer, and is short, dry, and flexible in its autumn growth, but becomes coarse, dry, and brittle as the winter advances. It is doubtful whether sheep are indigenous to this country, but they are mentioned as existing in Britain at a very early period, and it is known that the Romans, during their occupation of it, established a woollen manufactory at Winchester. The many varieties of sheep which tenant Great Britain and Ireland may be conveniently divided into two classes; the first consisting of sheep without horns, and the second of sheep with horns. Of the first class are, the *New Leicester sheep*, the characteristics of which are fineness and fulness of form; in the same apparent dimensions, greater weight than any other sheep; an early maturity and a propensity to fatten, a diminution in the proportion of offal, and the return of most money for the quantity of food consumed; the wool not so long as in some breeds, but considerably finer.—The *Cotswold sheep*, which have been long celebrated for the fineness of their wool, and which have been gradually improved by crossing with the Leicester sheep. It is this half-bred Leicester and Cotswold sheep which now chiefly tenants the Gloucestershire and Worcestershire farms. Their mutton is fine-grained and full-sized.—The *Dartmoor sheep*, which have white faces and legs, some with and some without horns, small in the head and neck, and generally small-boned, carcase narrow and flat-sided.—The *South-Down sheep*, which takes its name from a tract of down extending more than sixty miles in length through part of the counties of Sussex, Surrey, and Kent. The wool is short, close, and curled, and free from spiry projecting hairs. The flesh is finely grained and of good flavour. The breed has been much improved during the last few years, not from crossing with other breeds, but by the system of sorting the flocks.—The *Romney-Marsh sheep*, which have long but coarse wool, much internal fat, and much hardihood, and require no artificial food during the hardest winter but a little hay.—The *Cheviot sheep* are a peculiar breed which are kept on the extensive range of the Cheviot hills. They have the face and legs generally white, and the body long; their wool is short, thick, and fine; they possess



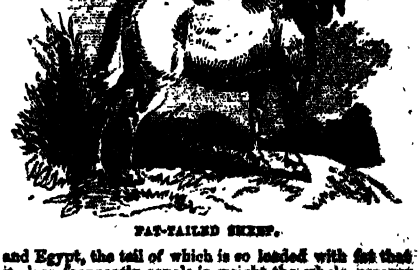


very considerable fattening qualities, and can endure much hardship both from starvation and cold.—Of the *Horned sheep*, the chief varieties are:—



SOUTH-DOWN EWE.

The *Dorset sheep*, which are principally bred within a circle of twelve miles round Dorchester. They are a good folding sheep, and their mutton is well-flavoured, but their principal distinction and value is the forwardness of the ewes, who take the ram at a much earlier period of the year than any other species, and thus supply the market with lamb at the time when it fetches the highest price.—The *Norfolk sheep* (now nearly extinct), a peculiar variety of heath sheep, which has been found in the localities of Norfolk and Suffolk from time immemorial. Their peculiar characteristics give them a greater resemblance to the deer than has been observed in any other species.—The *Merino sheep*, which was introduced into England by George III. from Spain, and which may now be considered to be acclimatized to a certain extent; but as it was ascertained that though the fleece of the Merino did not much degenerate in England, it did not much improve, and the carcass, which naturally affords little weight of meat, did not improve, our farmers have found it to their interest to return to their native breeds, and to give up the Spanish sheep.—The *Irish sheep* were formerly ugly and ill-formed, but have been much improved by the importation of English rams.—The *Shetland sheep* are small and handsome; hornless, hardy, feeding on even sea-weed, and with soft and cottony wool.—The *Hebridean sheep* is the smallest of its kind, even when fat weighing only twenty pounds.—As a contrast to these, we subjoin a drawing of the *Fat-tailed sheep*, common in Tartary, Arabia, Persia,



FAT-TAILED SHEEP.

and Egypt, the tail of which is so loaded with fat that it alone frequently equals in weight the whole carcass of an Hebridean sheep.—Of the other remarkable varieties of the genus *Ovis* in different parts of the globe, we may mention the *Many-horned sheep* of Iceland and the most northern part of the Russian dominions, which has three, four, or five horns, sometimes

placed with great regularity, and sometimes differing in proportion and situation.—The *Cretan sheep*, chiefly found in the island of Crete, but kept in many parts of Europe on account of the strangeness of the appearance of its horns, which are remarkably large, long, and spiral; those of the male being upright, and those of the female at right angles to the head.—The *Fat-rumped tailless sheep*, met with in all the deserts of Tartary, and which have long legs, a somewhat arched visage, horns, in the male, like those of the domestic sheep, large pendent ears, and a tail so enveloped in fat as to be scarcely visible.—The *African* or *Guinea sheep*, a native of all the tropical climates, both of Africa and the East. Its distinguishing characteristics are—a rough hairy skin, short horns, pendulous ears, a kind of dewlap under its chin, and a long mane which reaches below the neck. Different names are given to the sheep in this country, according to its sex and age. The male is called a *ram* or *tup*. After weaning, he is said to be a *hog*, *hogget*, or *hoggerel*, a *lamb hog* or *tup hog*, or *teg*; and if castrated, a *wether hog*. After shearing, he is called a *shear hog* or *shearing*, or *dinmont* or *tup*. After the second shearing, he is a *two-shear ram*; and so on. The female is a *ewe* or *gimmer lamb* till weaned, and then a *gimmer* or *ewe hog*, or *teg*. After being shorn, she is a *shearing ewe* or *gimmer*, or *theave* or *double-toothed ewe*; and after that a *two*, or *three*, or *four shear ewe*, or *theave*. The age of the sheep is reckoned, not from the period of their being dropped, but from the first shearing.

Sheikh, *sheek*, a name given by the Arabs to the elders or chiefs of their tribes, who are very proud of their long line of noble ancestors. The Mohammedans apply this term to the heads of their monasteries.

Shekinah, *she-ki'-na*, was the name given by the Jews to the Divine Presence which rested in the form of a cloud over the mercy seat, or between the cherubim of the ark. The rabbins affirm that it descended on the day of the consecration of the ark by Moses in the wilderness, and afterwards passed into the sanctuary of Solomon's temple on the day of its dedication, continuing there till the destruction of Jerusalem and the temple by the Chaldeans, and not afterwards seen.

Shell, *shell*, a term applied in the Military art to a hollow globe of iron, containing gunpowder and a tube or fuse, in which is deposited a composition for the purpose of igniting the gunpowder. The fuse is fixed in the shell in such a way that it ignites the contents at the proper instant; whereupon the shell bursts in pieces, which fall upon or near the object to be destroyed. Before the introduction of monster artillery, in the shape of Armstrong, Whitworth, Lancaster, and other guns of English manufacture, the diameter of shells varied for guns from ½ inch to 10 inches, the weight of the last-mentioned missile being 70 lbs. For howitzers and mortars, shells had a diameter varying from 4½ to 13 inches. The diameter of shells for carronades ranged between 3½ to 8 inches. Notwithstanding a five years' monopoly, as well as an expenditure of five millions of money, expended in the instance of Sir William Armstrong's gun and shells, we have not at the present day (1863) a gun or a shell superior, or as some authorities aver, equal to those of foreign manufacture,—the American and Russian notably; the Parrot gun in America, and the Krupp gun possessed by the Russians, being each more effective than the favourite gun of the English navy and army. A very destructive form of light shell, is the shell invented by Major Shrapnell, R.A., and called after him. It is for use against infantry and skirmishers. It consists of a thin bulb of cast iron, in which are deposited a small charge of powder and a number of musket-balls, which, upon the bursting of the shell, are scattered around. This form of missile was afterwards much improved by Captain Boxer, of the Royal Artillery, who invented a shell in which the charge of powder was kept separate from the bullets by means of a thin iron diaphragm. The effect of this invention was to enable the shells to be projected with an increased charge of powder from a longer piece of ordnance, as, without the diaphragm, the shell is liable to be burst in the gun.

Shell, in Nat. Hist. (*See* Mollusca.)

Shepherd's Dog (*Canis familiaris domesticus*).—The shepherd's *dog*, which is probably the most extensively diffused of the race of dogs, everywhere preserves some personal characteristics which mark his adherence to the original type. One of these is his



SHEPHERD'S DOG.

quantity of covering, which is in every case great, particularly about the neck: in temperate climates his coat is frequently long and shaggy, in cold ones coarse and crisped, in arid regions long and shaggy, but fine. In England, there are two varieties, the one smooth, short-haired, generally black-coloured on the back, white on the belly, breast, feet, and tip of the tail, with tan-coloured spots on the face and legs; the other being a larger animal, with long hair of different colours, and long flowing tail. The former is sagacious, slow, easily broke and trained, and well suited to work in an inclosed and low country, such as that in which graze the Leicester sheep; whilst the latter are more suited to the country of the Cheviot and black-faced sheep. The sheep-dog of Scotland, known as a "colly," is smaller than either of those above mentioned, and has a more pointed face. The shepherd's dog is asserted by the best authorities to be the least removed from the natural type of the dog, and to live and maintain its proper characteristics while other races often degenerate.

Sheriff, *sher'-if* (Sax. *scyr-gerefa*, reeve or officer of the shire), is an officer of very great antiquity in this country, as well as in most other countries in Europe, where he is known by corresponding names. In Anglo-Saxon times, the scyr-gerefa "was the official appointed by the king, whose province it was to carry into execution the judgments of the courts presided over by the earldorman and other high dignitaries, to levy distresses, exact the imposts, contributions, and tithes; he had also the custody of prisoners."—(*Lappenberg.*) They seem, however, to have been frequently, if not generally, chosen by the inhabitants of the several counties, for the statute 28 Edward I. c. 8, which ordains that the people should have the election of sheriffs in every shire where the shrievalty is not of inheritance, is evidently declaratory of a custom. It is very probable, however, that this election required the royal approbation. By 14 Edward III. c. 7, it is enacted that no sheriff tarry in his bailiwick more than a year, when another shall be ordained on the morrow of All Souls (now of St. Martin), by the chancellor, treasurer, and chief baron of the Exchequer, with the chief justices of either bench, if they be present. The usual custom now is for the lord chancellor, first lord of the Treasury, and chancellor of the Exchequer, together with all the judges of the three courts of common law, to meet in the Exchequer chamber on the morrow of St. Martin (12th Nov.), the chancellor of the Exchequer presiding; when the judges report the names of three fit persons in each county. These are afterwards reported, if approved of, to the queen, who then appoints one of them to be sheriff. Where the appointment is legal, and there is no sufficient excuse for not accepting it,

it is a misdemeanour to refuse to serve. The powers and duties of a sheriff are various and extensive, being as a judge, as the keeper of the king's peace, as a ministerial officer of the superior courts of justice, or as the king's bailiff. In his judicial capacity, he has to hear and determine a variety of civil causes. As keeper of the peace, he is bound to pursue and take all murderers, traitors, felons, and other misdoers, and commit them to gaol for safe custody; he may apprehend and commit to prison all persons who break the peace, or attempt to break it; and is also to defend his county against any of the king's enemies when they come into the land; for which purposes he may at any time summon the *posse comitatus*, or power of the county (which *see*). During office, he is the first man in the county, and superior in rank to any nobleman therein. In his ministerial capacity, he is bound to execute many of the writs issuing from the superior courts, and all writs of execution, and he is also responsible for the execution of criminals. As king's bailiff, he has to preserve the rights of the king within his bailiwick; must seize all lands devolving to the crown by escheat or attainder, must levy all fines and forfeitures, must seize and keep all waifs, wrecks, estrays, and the like. To assist him in his duties, the sheriff appoints an undersheriff, by whom, in fact, the duties of the office are principally performed; besides whom he has bailiffs and gaolers. In Scotland, the sheriff, formerly called sheriff depute, is an officer whose functions are chiefly of a judicial character. In each county there is at least one sheriff court, and in these a large portion of the general litigation of the country is carried on. The immediate business of each court is conducted before a sheriff substitute, who resides within the county, and whose decisions may in general be brought before the principal sheriff for revision. The sheriffs principal (with the exception of those of Edinburgh and Lanark) reside in Edinburgh, and carry on ordinary business before the courts there, but cannot act as counsel in any cause coming from their own county. Each is, however, required to hold eight courts in the year in his county. He is appointed by the crown, and holds office *ad vitam aut culpam*, and must be an advocate of at least three years' standing. The sheriff appoints his substitutes, who must be advocates, writers to the signet, solicitors before the supreme courts, or procurators before sheriff courts of at least three years' standing, and approved of by the lord president and lord justice clerk; and, once appointed, they cannot be removed unless with the consent of these judges. No sheriff substitute can act as law agent, conveyancer, or banker, and he must not be absent from his county more than six weeks in one year, or more than two weeks at a time, unless he obtain the consent of the sheriff. There is no pecuniary limitation to civil cases that may be tried in the court of the sheriff within his own county, but his authority does not extend to questions regarding heritable or real property, or actions which are declaratory of rights. The proceedings in the ordinary sheriff's court are chiefly conducted by written pleadings, and without the aid of a jury; but for the recovery of small debts (under £12), he has a separate court, where the procedure is oral and summary. By railway statutes and other acts, the sheriff is sometimes called upon to empanel a jury to assist him in making valuations, &c. In criminal matters the sheriff has also an extensive jurisdiction, except the four great crimes of murder, rape, robbery, and wilful fire-raising. He tries such criminal cases as it is not thought necessary to bring before the Court of Justiciary, and in important cases he is assisted by a jury. As his authority does not extend beyond his own district, he has not power of transporting or sentencing to penal servitude. Anciently he had the power of passing sentence of death upon conviction before a jury, but this has fallen into disuse. Further, the sheriff is the sovereign's immediate representative within the county, enforcing the decisions of the courts of law generally, and superintending everything done under the authority of what is called the "executive."

SHERRY. (*See* WINES.)

SHIBBOLETH, *shib'-bo-leth* (Heb., an ear of corn), was the word by which the Gileadites tested the Ephraimites after the battle narrated in Judges xii. The latter, being unable to sound the aspirate, called it *sibboleth*, and were thus *detected*. The term is now sometimes applied to a watchword, or epigram on which all the members of a party are agreed.

SHIELD, *sheeld* (Sax. *scyld*), in Heraldry, is the escutcheon on which the armorial bearings are depicted. The ground of the shield, as well as of banners, bearing various figures, termed ordinaries and charges, is called the field. There are also upon the shield various points or locations, each having their especial and appropriate name. These are described and figured in the article HERALDRY (which *see*). The shield, together with its charges and ordinaries, bears five colours, together with the tints of two metals, gold and silver, called respectively *or* and *argent*. Red, called in heraldry gules; blue, termed azure; black, entitled sable; green, called vert; and purple, named purpure. Heraldry also admits two colours, which are rarely seen in English armorial bearings, called Tenne, an orange tint and a dark blood-red, approaching to purple, called sanguine or murrey. Tenne is shown on the shield by perpendicular lines crossing from right to left; sanguine is depicted by transverse lines from each side of the escutcheon. (*See* HERALDRY, CROSS, AZURE, GULES, PURPURE, OR, ARGENT, VERT.)

SHIELD, a very ancient piece of armour designed to ward off the sword and missiles of an enemy. The Greeks and Romans made use of shields of many shapes. (*See* ARMOUR and BROADSWORD.)

SHILLING, *shil'-ling* (Sax. *scilling*), an English silver coin equal to twelve pence, or the twentieth part of a pound.

SHIP-BUILDING, *ship-bild'-ing*, the art of constructing vessels for navigation. In the article on NAVAL ARCHITECTURE there is a full description of this art up to the period when the ship is ready to be launched. The process of launching is the triumph of the shipbuilder, and is a very nice operation. When there are no ways in the *slip*, which is an inclined plane descending to the water, they are immediately prepared. Two parallel platforms of solid timber are laid one on each side of the keel, at the distance of a few feet from it, and carefully and firmly blocked and supported throughout their length. This double platform is called the *ways*, and upon it a second system of timber is loosely laid, and well greased between. The space between these and the ship's bottom is filled with wedges of soft wood fashioned to its curves; and the whole is called the *cradle*. In launching, the supports are removed, and the ship slides down the greased ways into the water. When a ship leaves the land, she passes into the control of seamen. The rudder is then shipped, and the vessel is rigged and sparred. There are particular rules for sparring ships, all founded on their length and breadth, which are the main elements of stability. (*See* NAVAL ARCHITECTURE.)

SHIP-MONEY, was a tax imposed by Charles I. without the authority of parliament, and one of the causes which brought about the civil war. It was first imposed in 1634, each county being required to provide a ship for the king's service, or a sum of money instead. Hampden particularly distinguished himself by his opposition to this tax. The question was brought before the court of Exchequer, and argued at great length, but was decided in favour of the crown. One of the first acts of the Long Parliament was to annul this obnoxious tax.

SHIRE, *shire* (Sax. *sciyran*, to divide), the name given to districts into which the whole of Great Britain is divided. It was originally a division of the kingdom under the jurisdiction of an earl or count, whose authority was intrusted to the *shire-reeve*, or sheriff, on which officer the government ultimately devolved. (*See* COUNTY.)

SHOES. (*See* BOOTS.)

SHOOTING STARS. (*See* FALLING STARS.)

SHOREA, *sho'-re-a*, in Bot., a gen. of large trees, belonging to the nat. ord. *Dipterocese*. The most important species is *S. robusta*, a native of India, which furnishes the valuable timber known by the name of *sal*. It also yields a balsamic resin, called *sal, dhoona*, or *dammar-pitch*, which is employed for incense.

SHOT, *shot* (Sax. *scyt*), generally, that which is discharged or cast forth, as a ball or bullet. The usual method of making the small shot used in numbers at a

time for killing game and other small animals, resembles, in some respects, the natural process by which rain is converted into hail. Melted lead is made to fall through the air from a considerable elevation, and thus leaden rain becomes cooled and solidified into leaden hail, or shot. Watts, a plumber of Bristol, is said to have invented the method in 1782. It is stated that he dreamed he was out in a shower of rain, and the clouds rained lead instead of water, and the drops of lead were perfectly spherical. His mind became so possessed with the idea, that he poured some melted lead from the tower of St. Mary Redcliffe church into some water below; the plan succeeded, and he shortly afterwards sold his invention for a large sum of money. In order to carry out this invention, shot-towers and shot-wells had to be constructed. At the top of the towers melted lead is poured through a colander, and the drops are received into a vessel of water below. The colanders are generally hollow hemispheres of sheet iron, about ten inches in diameter. The size of the holes varies in different colanders, according to the size of the shot required. When the shot are taken out of the water, they are dried upon metal plates heated by steam. The imperfect shot are afterwards separated from the spherical in the following manner:—A polished iron plate is tilted at a certain angle, and the mixed shot are strewed along the upper part of the inclined surface; the spherical shot roll down the plane in straight lines, and fall into a receptacle placed for them about a foot from the bottom of the iron plate; the imperfectly-formed shot roll with a zig-zag motion, and more slowly, and then fall, without any bound, into a bin placed for them immediately at the bottom of the iron plate. The perfect shot are then polished, and made black with plumbago, and then tied up in canvas bags, containing 28 lbs. each, when they are ready for sale. The shot discharged from guns, howitzers, or carronades, are mostly solid, and made of iron. They are generally cast, and vary in shape, dimensions, and weight, according to the purposes for which they are required. *Bar-shot* is a double-headed shot, consisting of a bar with a ball at each end. *Hollow* shot have latterly been introduced into the service, principally in the navy. They are very effective for short or ordinary ranges, as from their large size and small comparative weight, they are capable of producing very destructive effects, especially on shipping.

SHRIKE. (*See* BUTCHER-BIRD.)

SHRIMP, *shrimp* (*Crangon vulgaris*), a small crustaceous animal allied to the lobster and craw-fish, which frequents shallow waters along the sea-coast. In shape, it resembles those animals, but is much more elongated in proportion, and is destitute of the large anterior claws, and it is distinguished from the prawn by the absence of the long anterior serrated spine. The shrimp has ten feet; the tail is as long as the body, and terminated at the extremity with scale-like appendages, which unfold somewhat in the manner of a fan. Whilst alive, the body is of a greenish-grey colour, dotted with brown, and semi-transparent. It is common on the coasts of England and France, and is one of the most delicious of the malacurous crustaceans. The shoals of these creatures which frequent our shores give employment to a great number of persons, who are employed in catching them. They are abundant at the mouth of the Thames, whence the London market is chiefly supplied. They are caught by a large open net, which is attached to a long stick, and pushed through the water.



SHRIMP.

SHROVE TUESDAY, *shrove*, the Tuesday following Quinquagesima Sunday, and immediately preceding Ash Wednesday, and is called also Confession Tuesday, because the Roman Catholic Church enjoins confession to be made on that day in preparation for the fast of Lent. Although a day of confession, Shrove Tuesday was also formerly a day of sport and pastime, being considered the last day of Christmas, and was celebrated with plays, masques, cock-fighting, &c.

SIBYL, *sib'-il*, is the name by which several prophetic women were designated, all of whom belong to the mythical ages of ancient history; but the name has also been applied to female soothsayers of historical times.

SICILIAN VESPERS, *sis-il'-yăn*.—Charles of Anjou, the fourth son of Louis VIII., king of France, having been selected by the pope for the throne of Naples, in opposition to Manfred and Conradin, the last of the Hohenstauffen, he proceeded to take possession of it by force of arms, and when he had succeeded, made a most cruel use of his power. An accident at length, however, set fire to the disaffection of his unwilling subjects. It was on Easter Monday, in the year 1282, a day consecrated in Catholic countries to a mixture of gaiety and religion, that the citizens of Palermo set out according to custom to hear vespers at the church and village of Montereale, not far distant. The French soldiers whom Charles kept about him joined the procession, and one of them grossly insulting a young girl, her betrothed lover instantly pierced the Frenchman with his own sword. This act was a signal. It corresponded so fully to the feelings of all present, that "Death to the French" ran from mouth to mouth, and the deed accompanied the word, every Frenchman in the procession being assassinated while the vesper-bell was still tolling. Excited by blood, the assassins rushed back to Palermo to complete their massacre. Not a Frenchman, save one, escaped,—all, to the number of 4,000, were butchered; and even Sicilian women who had married Frenchmen suffered the same fate, in order that the progeny of the hated strangers might be eradicated from the island.

SIDEREAL, *si-dē'-re-ăl* (Lat. *sidus*, a constellation), a term used in Astron. in order to distinguish that which has reference to the fixed stars from that which relates to the sun, moon, planets, or comets. Thus a sidereal day is the time during which the whole body of fixed stars appears to revolve round the earth. It is found by observing two successive passages of the same star over the meridian. The time for one passage to another consists of twenty hours, each of sixty minutes, each of sixty seconds, &c. Sidereal time is not suited for the purposes of every-day life; but on account of its uniformity, it is very useful in astronomical observations.

SIDEREAL CLOCK, a clock used by astronomers for ascertaining the sidereal time. The sidereal day, and of course each subdivision of it, is shorter than the solar day, because the sidereal time is determined simply by the rotation of the earth on its axis, and the day is completed as soon as this rotation is performed; but in the case of the solar day, the earth's revolution round the sun also requires to be taken into account. Every day the earth advances in its orbit nearly a degree; and to bring the sun to any particular meridian, it has to make so much more than a complete rotation on its axis as will counterbalance its advance in its orbit. The average amount of this daily advance is 59′ 8″. The mean solar day is 24 hours, 3 minutes, 56 seconds, sidereal time; or the sidereal day is 23 hours, 56 minutes, 4 seconds, mean solar time.

SIEGE, *seej* (Fr. *siége*), the act of besetting a fortified place with an army, for the purpose of making the garrison surrender, or the investing or surrounding a place by an army, and approaching it by passages and advanced works, which protect the besiegers from the garrison's fire. In a siege properly so called, the fortress is first blockaded, so as to cut off all intercourse from without; the nature of the fortification is then closely examined, to discover if possible the strength of the garrison, the means of defence, and the weakest place for an attack. It is necessary that the engineer who directs the operations should accurately calculate his time, the resistance to be expected, as well as the means at his disposal. The capture of all detached works before the fortress becomes necessary before the trenches are opened at a distance of 500 to 900 paces from the covered way. When these are properly traced out, several columns of pioneers, furnished with fascines and instruments for digging, and protected by regular troops, advance towards the fortress, and on reaching the spot marked out, immediately begin to

open a trench. This proceeding usually takes place under the cover of night. Placing his fascine before him, each pioneer throws the ground over it, thus forming a kind of breastwork, which constitutes the first parallel, when the attacking forces may be collected. In the mean time, the besieged parties, by sallies and counter operations of various kinds, try to harass the labourers and destroy their work. On the other hand, the attacking party endeavour to establish themselves more and more securely; they raise batteries and construct trenches, by means of which they form new parallels, which encircle the fortress more narrowly every time. During the progress of this operation, the artillery from the batteries is kept constantly firing on the garrison, guns, and works of the besieged. The last parallel approaches closely to the moat of the fortress, and from this situation the besiegers prepare to cross the moat and make breaches in the walls. *Mining* operations are continually being carried on throughout a siege. The crossing of the moat is effected by *sapping*, and when filled with water, by means of bridges, rafts, &c. When the breaches are made practicable, the fortress impaired, and the garrison distressed, then follows the storming or scaling of the walls. When an attacking party compels an enemy to retire from a fortress, the siege is said to be *raised*. The most noted siege in modern times was the siege of Sebastopol, in 1854-5, by the combined armies of England and France. The town was held by the Russians for eleven months.

SIGHT, *site* (*i.e.* the faculty of seeing), in Phys., is one of the five human senses, having for its organ the eye, which has been already described. (*See* EYE.) In this organ, then, we have the retina, an expansion of the optic nerve, to receive and transmit to the brain the impressions of light; certain refracting media for so disposing the rays of light traversing them as to throw a correct image of an external body on the retina; and a contracting diaphragm, with a central aperture for regulating the quantity of light admitted into the eye. When the eye is directed to any object, an image of that object is depicted on the back of the eye by means of the rays of light entering the pupil, and duly refracted by the different humours. The image, which is inverted, produces, somehow, an impression upon the retina with the assistance of the choroid coat, and this impression passes inwards to the nervous centres, whence the optic nerve takes its rise. No satisfactory explanation has yet been given to account for the fact that we see objects erect the images of which are presented to us inverted on the retina. According to Müller, the mind really perceives the objects inverted; but as this inversion is uniform, it is not perceived. The subject of binocular vision, or that with two eyes we only perceive one object, was long a perplexing subject to philosophers, until it was satisfactorily explained by Prof. Wheatstone in 1838, and illustrated by means of that now well-known instrument the stereoscope. The power of adapting the eye to vision at different distances has received the most varied explanations; but the opinion now generally entertained is that it depends mainly on some alteration, either in position or form, which takes place in the crystalline lens. Some persons possess this power of adaptation in a very slight degree, and thus labour under defective vision, of which there are two kinds, the person in the one case only seeing distinctly those objects which are near, in the other, only such as are distant. Near-sightedness is caused by anything—such as undue convexity of the cornea—which increases the refracting power of the eye, and so causes the image of an object to be formed at a point anterior to the retina, and is remedied by the use of concave glasses. Long-sightedness, on the other hand, is owing to conditions the reverse of this, and is remedied by the use of convex glasses, which diminish the focal distance of an image formed in the eye. In order to distinctness of vision, the following conditions are necessary: (1), A sufficiency of light or illumination in the object viewed; (2) the formation of the image exactly on the retina, and not either before or behind; and (3) the minute size of the ultimate divisions of the retina capable of independent sensation. The great superiority of the eye as a medium for perceiving the outer world, lies in this power of independent sensibility to minute points. We judge of the motion of an object partly from the motion of its image over the surface of the retina, and partly from the motion of our eyes following it; and of the form of bodies, partly from the mere sensation, and partly from the association of ideas. There is none of the senses capable of affording so large an amount of instruction and delight as the eye; none in which the judgment has to play so important a part; and none so susceptible of education. The account of the young man who was suddenly restored to sight by Cheselden, through the operation of couching, shows how much our sight depends on our judgment. The eye is educated slowly, and if educated fully, its powers are almost boundless. The great majority of mankind do not and cannot see one fraction of what they were intended to see. The sailor on the look-out can see a ship where the landsman sees nothing; the Esquimaux can distinguish a white fox amidst the white snow; and the shepherd can distinguish the face of every sheep in his flock. Truly "the eye sees what it brings the power to see."

SIGNALS, *sig'-nals* (Fr.), a term applied to certain signs agreed upon between persons at a distance, in order to communicate intelligence. At sea, signals are of very great importance, and they may be divided into three classes:—First, those which are made by the sound of any particular instrument, such as a trumpet, horn, or fife; and to these may be added striking the bell and beating the drum. Second, signals made by displaying pendants, ensigns, and flags of different colours, or by lowering or altering the position of sails. Third, signals which are executed by rockets of various kinds, by firing cannon or small arms, by artificial fireworks, or by lanterns. Very few subjects have engaged the attention of nautical men more than the arrangement of signals. They are numerous and important, and are all communicated in the instructions sent to the commander of every ship of the fleet, or squadron, before putting to sea. In the army, signals are generally made by the firing of cannon or the sound of trumpet. Balloons and rockets are also used. The subject of *railway signals* is one of great importance in its relation to the saving of life and property. The most valuable of these are the signals transmitted by telegraph. (*See* RAILWAYS.)

SIGN MANUAL, *sine man'-u-al*, is the royal signature, which is superscribed at the top of royal grants, letters patent, &c. It consists of the name with the initial letter of the title, and sometimes the name also in full initial; as Victoria R., or V.R. It is usually placed at the top left-hand corner of the instrument, the privy signet, or the great seal, as the case may be, being usually necessary to complete its validity. It requires to be countersigned generally by a principal secretary of state, or by the lords of the Treasury; but where it only directs some other act to be done, as letters patent to be made out, it may be countersigned by some other person.

SIGNS OF THE ZODIAC. (*See* ZODIAC.)

SILENE, *si-le'-ne*, the Catch-fly, or Campion, a wild plant, flourishing in hedges and dry pastures. It flowers from June to autumn, and rises to the height of a foot and a half, with round hairy stalks and oval-shaped leaves, growing two at every joint. The colour of the leaf is dusky-green; the flowers are large, red or white, growing at the top of the branches in small clusters. The flowers are useless, but are given by ignorant country people in weakness of every kind.

SILHOUETTE, *sil'-oo-et*, in the Fine Arts, is the representation of the outlines of an object filled with black colour, in which the inner lines are sometimes finely drawn in white. The name comes from Etienne de Silhouette, a French minister of finance in 1759, who strove to enforce severe economy in the administration. Whilst he was in power, all the fashions in Paris took the character of parsimony. Coats without folds were worn; snuff-boxes were made of plain wood; and instead of painted portraits, outlines only were drawn in profile, and filled with Indian ink. All these styles were called *à la Silhouette*.

SILICA, SILICIC ACID, *sil'-e-ik* (*Lat. silex*, flint, because it constitutes the chief part of that substance), $SiO_2$.—Silica only forms a single oxide, which has caused a difficulty in deciding on the number of equivalents of oxygen it contains. The theory generally

adopted at the present time is, that silicic acid is a binoxide and not a teroxide, as represented by Berzelius, making the equivalent of silicon to be 14·24, instead of 21·36. This view has lately received confirmation at the hands of Wöhler, who has formed a siliciuretted hydrogen, exactly corresponding to carburetted hydrogen. Pure silica occurs in nature, crystallised in six-sided prisms, terminated by six-sided pyramids in rock crystal and some other forms of quartz. It enters largely into the composition of agate, calcedony, flint, opal, sandstone, felspar, and a vast number of other minerals. In a perfectly pure state it is quite transparent and colourless. Its hardness is next to that of the precious stones, and it has a specific gravity of 2·6. It fuses in the oxy-hydrogen blowpipe, and may be drawn into threads like glass. It is insoluble in water when anhydrous, and in all acids except the hydrofluoric. When heated alone, silica is not volatile, but when heated with water, it undergoes partial sublimation at a high temperature. Silica presents the general characters of an earthy base, but acts as an acid, forming with the bases compounds known as *silicates*. These are very abundant in nature; clay, felspar, mica, hornblende, and a large number of other common minerals, are compounds of this description. Silica may be obtained pure by fusing one part of finely-powdered quartz or sand in a platinum crucible, with 2½ parts of a mixture in equivalent proportions of the carbonate of potash and soda, the mineral being added to the fused mass from time to time, until the whole of the carbonic acid is driven off. The fused mass is allowed to cool, and is dissolved in very dilute hydrochloric acid, and filtered. It is then evaporated to dryness, and the residue is again heated with hydrochloric acid, and thrown on a filter, washed with hot water, dried, and ignited. In this state it forms a finely-divided gritty white powder, insoluble in water and acids, with the exception of hydrofluoric acid. It may be precipitated in a gelatinous form by the decomposition of fluoride of silica by water, being considerably soluble in that liquid. The history of the hydrates of silica is somewhat complicated. The industrial applications of silica are very numerous. Glass and pottery are compounds of silica, with various metallic oxides. It is extensively used in metallurgical operations, as a flux for effecting the decomposition of ores by the formation of a light glassy slag, which floats on the top of the molten metal, carrying with it the impurities contained in the mineral.

SILICON, *sil'-e-kon*, in Chem.,—symbol Si, equiv. 14·24.—The base of silica was discovered by Berzelius in 1823. It was at first supposed to be a metal, and received the name of silicium; but from its close analogy to carbon and boron, it is now considered to be a non-metallic element. It is in the form of its only oxide silica, the most abundant solid element in nature. It is obtained in a state of purity by igniting the double fluoride of silicon and potassium with sufficient potassium to combine with the whole of the fluorine. The mass is then washed first with cold and then with hot water. Silicon thus obtained is a dull brown powder, sinking in water, in which it is insoluble. It soils the fingers when touched, is a non-conductor of electricity, and is insoluble in all acids but the hydrofluoric. Heated in oxygen or air, it burns with a brilliant flame, being converted into silica, its only oxide. If heated in a closed platinum crucible, its properties become changed. It is now insoluble in hydrofluoric acid, it is decreased in bulk, and may be heated strongly in air and oxygen without taking fire. Deville describes a kind modification of silicon which has the appearance of platinum filings. It is formed by acting with hydrochloric acid on silicide of aluminium, procured by electrolysis of the double silicide of sodium and aluminium. Silicon unites with hydrogen, forming a gas spontaneously inflammable in air or oxygen. It also forms compounds with sulphur, chlorine, bromine, fluorine, and one or two other elements; but they possess no practical interest.

SILIQUA, *sil'-i-kwâ* (Lat.), in Bot., a kind of fruit resembling the *silique* (which see) in every respect except its length, the silique being long and narrow, the siliqua broad and short. Examples occur in the shepherd's purse, the watercress, and other cruciferous plants.

SILIQUA, *sil'-e-kwâ* (Lat.), in Bot., a superior 1- or 2-celled, many-seeded, long, narrow fruit, dehiscing by two valves separating from below upwards, and having the seeds attached to two parietal placentas, which are commonly connected together by a spurious



SILIQUA.

vertical dissepiment, called a *replum*. The placentas are opposite to the lobes of the stigma instead of alternate, as is the case in all fruits which are regular in structure. When the replum extends entirely across the fruit, the latter is said to be 2-celled; when only partially, it is 1-celled. Examples occur in the wallflower, stock, cabbage, and in many other plants of the nat. ord. *Cruciferæ*. When a fruit possesses the general structure of the siliqua, but with the lobes of the stigma alternate with the placentas, as in the celandine, it is termed a *ceratium*, or *siliquiform capsule*. (*See* SILICULA.)

SILK, SILK MANUFACTURE, *silk* (Sax. *seole*).—Silk is a well-known species of glossy thread, spun by a caterpillar called the silkworm (*Phalæna Bombyx*). The threads as spun by the silkworm, and wound up in its cocoon, are all double, in consequence of the twin orifice in the nose of the insect through which they are projected. These two threads are laid parallel, and are glued together by a sort of varnish which envelops them, and constitutes 25 per cent. of the weight of the silk. The thickness of the double thread is about the one thousandth part of an inch. It is much the strongest of all textile fibres, a thread of it of a certain diameter being nearly three times as strong as a thread of flax, and twice as strong as a thread of hemp. The colour of raw silk is generally bright yellow, but in some varieties it is nearly white. The art of making the fibrous substance of the cocoon available for textile purposes seems to have originated with the Chinese, and to have been practised by them from a very early period. According to the written records of this nation, the art seems to have been known and practised by them 2,700 years before the Christian era. Until the reign of the emperor Justinian, the silkworm was only cultivated in China, but the raw material was purchased and manufactured for a long time before by the inhabitants of Persia, Tyre, and other places. Until the reign of Augustus, however, silk was very little used in Europe. In the 6th century, two monks brought some eggs of the silkworm from China and India to Constantinople, and the emperor Justinian encouraged them to breed the insect and cultivate its cocoons. Within a short period afterwards, silk manufactures were established at Athens, Thebes, and Corinth, not only for rearing the worm upon mulberry-leaves, but for unwinding its cocoons, for twisting their filaments into stronger threads, and weaving them into cloth. At that time, and for a long period afterwards, the Venetians became the only channel through which the silk produce of the Greek empire was transferred to the Western; and they derived great wealth from the trade. The silk manufacture remained in this state for six centuries; but in 1146, Roger I., king of Sicily, in his conquest of Greece, took many of the people engaged in this branch of industry, and compelled them to continue their avocations in Palermo and Calabria. From these places the silk industry spread throughout Italy, and ultimately reached Spain, from which country it was introduced into France during the reign of Francis I. The cultivation of the silkworm was not commenced in France till 1564. The mulberry plantations for their propagation were greatly encouraged by Henry IV., and since that period they have been the source of most beneficial employment to the French people. James I. was very anxious to introduce the breeding of silkworms into England; but it would appear that this country is not well adapted for this species of husbandry, on account of the cold east winds which are so prevalent in April and May, a time when the silkworm

requires an abundant supply of mulberry-leaves. The manufacture of silk, however, in London advanced rapidly. In 1661, 40,000 persons were engaged in the manufacture in the city and suburbs. After 1685, the revocation of the edict of Nantes caused a number of skilled French workmen to come over to England; they settled in Spitalfields, and in 1730 English silk goods bore a higher price in Italy than those made by the Italians. For many years there was a prohibition on the importation of foreign silks into this country; in 1824 this prohibition ceased, and the silk manufacture immediately made rapid progress. In 1845 the duties upon raw and thrown silk were totally abolished, and the 30 per cent. *ad valorem* duty on the importation of foreign manufactured silk goods was reduced to 15 per cent. The value of the silk goods produced in the United Kingdom, and exported therefrom in 1856, was £2,962,056; in 1857, £2,889,829; in 1858, £2,096,591. In the process of silk manufacture the first operation is the unwinding of the cocoons, the thread being coiled upon a reel. Before reeling, the floss silk has to be disengaged, and the cocoons have likewise to be parted, as different classes require different treatment. The factory in which the reeling is performed is called a *filature*, and the silk thread produced is called *raw silk*. In this operation several of the cocoons, which are immersed in hot water in order to soften the natural gum on the filament, are wound off on a common reel, thereby forming one smooth even thread. When the skein is dry, it is taken from the reel and made up into hanks; but before it is fit for weaving, and in order to enable it to undergo the process of dyeing without furring up, or separating the fibres, it is converted into one of three forms; namely, *singles*, *tram*, and *organzine*. The silk called *singles* is formed of *one* of the reeled threads, being twisted in order to give it strength and firmness. *Tram* is formed of two or more threads twisted together: in this state it is generally used in weaving as the *shoot* or *weft*. *Thrown silk* is composed of two, three, or more singles, according to the substance required, being twisted together in a contrary direction to that in which the singles of which it consists are twisted. This process is called *organzining*; and the silk so twisted *organzine*. The throwing-machine has been greatly improved both in accuracy and produce, by assimilating it in principle to the cotton throstle. Since the improvements introduced by Messrs. Fairbairn, Ritson, Lillie, and others, the speed of the spindles has been raised from 1,200 to 4,500 revolutions in the minute. Much of the machinery used in the spinning and weaving of silk is similar in construction to that used in the manufacture of cotton. (*See* COTTON MANUFACTURE, SPINNING, WEAVING.)

SILK-COTTON. (*See* BOMBAX.)

SILKWORM, *silk'-wurm*, the ordinary name of the caterpillar of a lepidopterous insect belonging to the section *Nocturna* and family *Bombycidæ*. It was originally from China, and is of a white or cream colour, with a brown fascia and two or more waved lines of a deeper colour crossing the upper wings. In this country, the eggs of this moth hatch early in May. The caterpillar silkworm is at first of a dark colour, but soon becomes light, and in its tints much resembles the perfect insect. Its proper food is the mulberry, though it will sometimes eat the lettuce and some few other plants. The silkworm is about eight weeks in arriving at maturity, during which period it changes its skin four or five times. For about three days before casting its skin, it is lethargic, refusing its food. On the termination of this period, the old skin opens at the anterior end, the fore legs are disengaged, and the new and delicately-attired worm escapes forth. Immediately after this renewal, the body of the worm appears grey and somewhat wrinkled, the new coat being made of full size to admit of future growth; but the latter attribute speedily disappears. After the fourth or fifth casting of its skin, it measures from an inch and a half to two inches long; and for a continuous period of about ten days it eats voraciously, and increases greatly, both in length and thickness. On the expiry of this last-mentioned period, it has attained the full size of a silkworm, being from two and a half to three inches long. Its desire for food abates; it nibbles and wastes its leaves; then ceases to eat, and becomes restless and uneasy, seeking a quiet haven in which to spin its silken shroud. In the course of about twenty-four hours from the time of its having ceased to feed, the silky fluid becomes abundantly supplied to the interior reservoirs; the body becomes of a soft yellow, and somewhat transparent towards the neck. The beautiful silken covering, or cocoon, as it is called, is generally completed in three or four days. It is commenced by the formation of a loose, decomposed structure, of an oval form, made of what is denominated floss silk. Within this, in the course of the ensuing days, the firmer cocoons are constructed. These are rounded somewhat oval balls, varying in tint, some being of a golden tint, some of a straw-colour, and others again white. The included worm, having finished its labour, casts its skin once more, but never appears again as a caterpillar, as it now assumes that rounded, shapeless form termed chrysalis. In the chrysalis state it remains a fortnight or three weeks. It then bursts its horny case, coming forth as a moth into the hollow chamber of the cocoon. The moth subsequently emits a fluid, which has the effect either of dissolving the gum or the threads at one end of the cocoon. The length of the thread in a cocoon varies from six hundred to a thousand feet. The perfect insect is remarkable for its dull and stationary habits.

SILURIAN SYSTEM, *si-lu'-re-in*, a name first applied by Sir Roderick Murchison to a series of fossiliferous strata lying below the Old Red Sandstone, and occupying that part of Wales, and some contiguous counties of England, which once constituted the kingdom of the Silures, a tribe of ancient Britons. It comprises the oldest fossiliferous strata as yet known to geologists. During the last twenty years they have undergone a most minute and careful survey. The system, although consisting in the main of alternate flagstones and sandstones, of argillaceous and calcareous shales, of clayey limestones and limestones of a concretionary character, has been divided into lower and upper groups, which have been subdivided in the typical district into the *Llandeilo*, *Wenlock*, and *Ludlow* series. Abundant traces of invertebrate animal life have been found in the series, and numerous species of zoophytes, echinoderms, mollusca, annelida, and crustacea, have been observed and described. In the upper beds, remains of fishes have also been found; but these only mark the commencement of the Old Red Sandstone period. The Silurian strata are extensively developed in nearly every country in the world. Everywhere it may be divided into two great zones. The *upper zone* contains limestones and numerous forms of invertebrate animal life,—trilobites, orthocerata, phragmocerata, crinoides, cystides, &c. The *lower zone* is without limestones, and contains few forms of life, especially linguæ, paradoxides, conocephalæ, of species perhaps entering, and of genera mostly distinct from, those of the upper zone.—Ref. *The Silurian System*, and *Russia in Europe*, by Sir R. Murchison.

SILVER, *sil'-ver* (Sax. *seolfer*, silver),—symbol Ag. (*argentum*), equiv. 108, spec. grav. 10·53.—This beautiful metal has been known from the earliest ages, and has always been highly valued for its rarity, beauty, lustre, and permanence. It is of a white colour, with a slight tinge of red. It is between iron and copper in point of hardness, and is very tenacious. It may be hammered into thin leaves and drawn into very fine wire. It fuses at about 1873° Fahr., expanding forcibly at the moment of solidification. It is one of the best-known conductors of heat and electricity, and is not oxidized at any temperature, even in the presence of moisture. When perfectly pure, it has the property of absorbing oxygen mechanically at its melting-point, giving it off with effervescence at the moment of solidification; hence the bubbly appearance of the surface of ingots of the pure metal. It has a powerful affinity for sulphur, speedily turning black in atmospheres containing notable portions of sulphuretted hydrogen. Alloyed with certain proportions of copper, to give it increased hardness and tenacity, it is adopted by all civilized nations for purposes of coinage and for articles of plate. From its purity of colour, it is the most perfect reflector known, and is always employed for reflecting-surfaces when practicable. Silver occurs in nature in the native state, crystallized in cubes and

*forms* derived therefrom. It is generally alloyed with gold, arsenic, and antimony. The most abundant silver ore is the sulphide, which is the principal material occurring in the silver-mines of Mexico, Peru, Norway, Bohemia, and Hungary. It is also found as a sulphide in argentiferous galena and pyrites. Nearly all galena contains sulphide of silver. When the proportion amounts to 3 or 4 ounces per ton, it may be extracted from the metallic lead with profit. The process is described under the head of LEAD. In the case of argentiferous copper, it is found with a certain amount of lead. The alloy is heated gradually, so that the lead melts out and flows away, carrying with it the silver, and leaving behind a spongy mass of copper. The argentiferous lead is then submitted to cupellation. The rich ores, such as the sulphides already mentioned, are reduced by the process of amalgamation. The sulphide of silver is converted into chloride by mixing the ore in a finely-divided state with chloride of sodium and roasted copper pyrites. The chloride of copper formed acts on the sulphide of silver, converting it into chloride. Mercury is added to the mass, which decomposes the chloride of silver, and the amalgam so formed is distilled. There are several other methods of separating silver from its ores, for an account of which the reader is referred to Abel and Bloxam's "Handbook of Chemistry." The only alloy of silver worth noting is that used for coinage, the standard for which in this country, as fixed by law, is 11·1 parts of silver and 0·9 of copper. To increase the beauty and usefulness of many articles made of the baser metals, they are often covered with a coating of silver by different processes. *Plating*, properly so called, consists in covering a clean sheet of copper with a thin film of silver by washing over it a solution of lunar caustic. A plate of silver rather larger than the plate of copper is then laid upon it, and the edges turned over. The two are heated to dull redness, and passed through powerful rollers. The process of electro-plating has already been described under that head. Of late years, silver has been substituted for mercury in the silvering of glass in numerous instances. The deposition is effected by pouring over the glass a mixture of alcohol, nitrate of silver, carbonate of ammonia, and ammonia to which has been added a few drops of essential oil of cloves. A gentle heat is applied for two or three hours, until the whole of the surface is coated, after which the residue is poured off, and the film of silver is dried and varnished. Grape sugar and Rochelle salt are sometimes added instead of the essential oil. Copper and brass are *silvered* either by rubbing over their cleaned surface a mixture of cream of tartar, chloride of silver, and corrosive sublimate, or by agitating them in mercury in which silver is dissolved. By the application of heat, the mercury is expelled, leaving the silver behind as a very thin film. Chemically pure metallic silver may be obtained by dissolving standard silver in nitric acid; the solution is filtered, and pure chloride of sodium added until the whole of the silver is thrown down. The precipitate is then washed in distilled water until the washings are tasteless. The chloride is then mixed with one-fourth of its weight of oil of vitriol, and bars of zinc are placed in the mass. The zinc gradually reduces the chloride to the metallic condition. It is then washed with sulphuric acid, and lastly with water, until the washings give no precipitate with nitrate of silver. The reduced silver thus obtained is not absolutely pure: it is therefore once more dissolved in pure nitric acid, precipitated by pure hydrochloric acid, and reduced by fusion in a deep clay crucible, with 70·4 per cent. of chalk and 4·2 per cent. of powdered charcoal for an hour and a half.

SILVER, ACETO-NITRATE OF, in Phot.—The so-called aceto-nitrate of silver, used in photography, is made by adding 1½ drachm of glacial aceto-acid to 50 grains of nitrate of silver dissolved in one ounce of water.

SILVER, AMMONIO-NITRATE OF, in Phot.—The so-called ammonio-nitrate of silver, used in photography, is made by adding strong liquor ammoniæ to a solution of nitrate of silver, until the precipitate formed is re-dissolved.

SILVER, BROMIDE OF, in Chem., $AgBr$.—Bromide of silver may be formed by precipitating a solution of the nitrate with bromide of potassium. It is of a light





yellow colour, is insoluble in water, and less soluble in ammonia than the chloride. It dissolves readily in bromide of potassium and other soluble bromides, forming with them double salts, and in hyposulphate of soda. It is one of the constituents of the sensitive film used in the collodion process. It occurs in nature as *bromite*, at Santa Fiora, in Mexico, and in combination with chloride of silver as *embolite*, in Chili, Mexico, and Honduras.

SILVER, CHLORIDE OF, in Chem.—There appear to be two chlorides of silver,—the ordinary chloride, $AgCl$, and the sub-chloride, $Ag_2Cl$. Chloride of silver is formed as a dense white flocculent precipitate, by adding hydrochloric acid, or a solution of any soluble chloride, to a soluble salt of silver. It is insoluble in water and dilute acids. It is dissolved by boiling hydrochloric acid, and by strong solutions of the alkaline and earthy chlorides, with which it forms double salts. It melts at 500° into a horny mass; hence its old name of *horn-silver*. It is easily reduced by hydrogen, when heated, and by zinc, iron, and most of the easily-oxidizable metals when moist. Cyanide, iodide, and bromide of potassium dissolve it with the formation of double salts. It is also soluble in solutions of the hyposulphates, forming compounds having an intensely sweet taste. In combination with organic matter, it possesses the property of being blackened by light; hence its use in photography. It is found native in most silver-mines, as *kerate*, or *horn-silver*. The sub-chloride is obtained by digesting leaves of pure silver in chloride of copper or perchloride of iron. It forms black scales, which are not acted on by nitric acid.

SILVER, IODIDE OF.—Iodide of silver is formed by precipitating the nitrate by iodide of potassium. It is a pale yellow substance, insoluble in acids, and nearly so in ammonia. It dissolves readily in iodide and cyanide of potassium, forming double salts. Its sensitiveness to light renders it of great use in photography. It occurs in nature as *iodite*, in thin flexible plates, in Mexico, Chili, and Spain.

SILVER, NITRATE OF.—This important salt is made by dissolving silver in strong nitric acid. It crystallizes in square anhydrous colourless tables, and dissolves in an equal weight of water. It fuses when heated, and may be cast in cylindrical moulds, in which form it is used by surgeons as an escharotic, under the popular name of lunar caustic. When perfectly pure, it undergoes no alteration when exposed to light; but if the smallest portions of organic matter be present, it darkens perceptibly. When exposed to light in contact with organic matter, as in the ordinary photographic processes, it forms a dark brownish-purple compound of an organic nature, whose composition is at present but little understood. For photographic purposes, it must be perfectly neutral and pure, free from contaminations of nitric acid and organic matter. For this purpose, the ordinary so-called pure nitrate should be carefully fused and re-crystallised. It is also used as a source of silver in the electrotype process, in silvering glass and in marking-ink.

SILVER, OXIDES OF.—There are three oxides of silver,—the sub-oxide, $Ag_2O$, is a dark powder, formed when nitrate of silver is heated in a current of hydrogen; the protoxide, $AgO$, procured by adding a solution of potash or soda to the nitrate when it falls, as a brown hydrate; and the peroxide, $AgO_2$, a compound formed in grey circular crystals when a dilute solution of nitrate of silver is decomposed by the voltaic current. The protoxide is a powerful base, combining with the acids to form neutral salts. It is soluble to a slight extent in water, to which it communicates a feeble alkaline reaction.

SILVER PHOSPHATES.—Silver forms several phosphates, but they are unimportant.

SILVER, SULPHATE OF.—When the metal is boiled in sulphuric acid, a portion of the acid is decomposed, and sulphate of silver is formed. It may be obtained in rhombic prisms, which dissolve in ninety parts of water. It is a very stable salt, requiring a greater heat for its decomposition than the sulphates of copper and iron.

SILVER, SULPHIDE OF.—This compound is the principal ore of silver, and is found native, crystallised in cubes and octahedra, as well as in massive concretions.

It has a metallic lustre, from which it derives its mineralogical name, *silver glance*. Sulphide of silver is also found in combination with other sulphides, especially those of copper and silver. Metallic silver has a very powerful affinity for sulphur, the metal becoming blackened by exposure to an atmosphere containing sulphuretted hydrogen in the gaseous state, even though largely diluted with air. Sulphide of silver may be prepared chemically by transmitting a current of sulphuretted hydrogen through a solution of the nitrate, or by fusing metallic silver with excess of sulphur in a crucible. In a massive form, sulphide of silver is to a certain extent malleable, and will take impressions from a die.

SIMABA, *sim-ai'-bâ* (its native name), in Bot., a gen. of the nat. ord. *Simarubaceæ*. The seeds of the species *S. Cedron* are highly esteemed throughout Central America for their *febrifugal* properties, and are believed to be a specific against the bites of venomous snakes. They have been used lately in this country for the latter purpose without any sensible effect.

SIMARUBA, *sim-â-ru-bâ*, in Bot., the typical gen. of the nat. ord. *Simarubaceæ*. The species *S. amara* is a native of South America and the West-Indian islands, being known in Jamaica as the mountain damson. The bark of the root acts as a tonic, and has been employed medicinally in diarrhœa, dysentery, &c. It contains *quassine*, the same principle which has been found in Jamaica quassia-wood.

SIMARUBACEÆ, *sim-â-ru-bai'-se-e* (*simarouba*, its Caribbean name), in Bot., the Quassia fam., a nat. ord. *Dicotyledones*, sub-class *Thalamifloræ*, having the following essential character:—Trees or shrubs, with alternate exstipulate leaves, without dots. Flowers hypogynous, regular, symmetrical, with imbricated æstivation. Calyx, corolla, and stamens with a quaternary or quinary distribution of their parts; each of the latter arising from a hypogynous scale, and with anthers bursting longitudinally. Ovary stalked, 4- or 5-celled; style simple; stigma 4- or 5-lobed. Fruit of 4 or 5 indehiscent 1-seeded drupes, placed round a common axis. Seeds pendulous, exalbuminous; radicle superior. With the exception of one plant, which is a native of Nepaul, they are all found in the tropical parts of India, America, and Africa. A bitter principle is the most remarkable characteristic of the order. (*See* PICRASMA, QUASSIA, SIMARUBA.)

SIMIADÆ, *sim'-e-ai-de* (Lat. *simia*, an ape), the name of a quadrumanous fam. of mammalian animals, which embraces the most highly-developed forms of the monkeys. They are all of them inhabitants of the Old World. The nostrils are divided by a narrow septum; they possess opposite thumbs on their fore and hind feet; the callosities on the rump are generally naked. Some of the species only are furnished with cheek-pouches. They usually possess a tail.

SIMILE, *sim'-e-le* (Lat.), in Rhet., is a figure by which two things are considered with regard to a third that is common to both. Similes serve two purposes: when addressed to the understanding, their purpose is to instruct; when to the heart, their purpose is to please. To have a just notion of similes, they must be distinguished into two kinds: one common and familiar, as where a man is compared to a lion in courage, and another more distant and refined, as where two things which have in themselves no resemblance or opposition are compared with respect to their effects; as where a comparison is instituted between a flower and a song, with reference to the emotions they produce in the mind.

SIMONY, *sim'-o-ne*, in Eccles. affairs, is the corrupt presentation of any one to a benefice for gift, money, or reward; and is so called from Simon Magus, who, as narrated in the Acts of the Apostles, attempted to purchase the gifts of the Holy Spirit with money. Simony, by the canon law, was considered a very grievous offence, being the more odious because accompanied by perjury; for the presentee is sworn to have committed no simony. A statute was passed in the 31st year of Elizabeth, laying down the various ways in which simony may be committed, with the penalties annexed thereto; and in the 12th of Queen Anne another act was passed on the same subject. As the law now stands, it is simony for any person to purchase the next presentation while the church is vacant; it is simony for a spiritual person to purchase for himself the next presentation, although the church be full; it is simony for any person to purchase a next presentation, or if the purchase be of an advowson, the next presentation by a purchaser would be simoniacal if there is any agreement or arrangement between the parties at the time of the purchase for causing a vacancy to be made. If a person purchase an advowson while the church is vacant, a presentation by the purchaser for that vacancy is simony.—*Ref.* Cripp's *Law relating to Church and Clergy*.

SIMOOM, *si-moom'*, a noxious hot wind which occurs in most countries situated at no great distance from sandy deserts, and which always blows from that quarter in which the desert is situated. In Senegambia and Guinea, it blows from the north-east, in the delta of the Nile from the south-west; on the eastern shores of the Gulf of Suez from the north-east, in Syria from the south-east; at Mecca from the east, at Bagdad from the west, and at Surat from the north. The approach of the simoom is indicated by terrible appearances. The eastern horizon is pervaded by a dull yellow hue; a thick sulphurous exhalation rises from the ground, which is first hurried round in rapid gyrations, and then ascends into the air, covering the whole heavens. Hissing and crackling sounds are heard, and a hot current of air rushes over the ground. There is generally a considerable quantity of fine sand in the hot air, and the wind generally affects the human body very powerfully, producing great feebleness, and sometimes even death.

SINAPIS, *si-nai'-pis* (Lat.), in Bot., Mustard, a gen. of the nat. ord. *Cruciferæ*. The seeds of two species of this genus are commonly used for culinary and medicinal purposes. The seeds of *S. nigra* are of a dark reddish-brown colour, and are known as *black mustard-seeds*; those of *S. alba* are of a yellowish colour, and are termed *white mustard-seeds*. The flour of mustard, so extensively used as a condiment, is prepared from a mixture of the two kinds, usually in the proportion of two parts black and three parts white. The seeds are pounded, and the husks then removed from the flour by sifting. Both the black and white mustard-seeds contain a large quantity of bland fixed oil, resembling rape, which is readily obtained by submitting them to pressure. It is remarkable that the pungent principle for which mustard is valued does not exist in the seeds, but is produced when the constituents of the seeds are brought together under the influence of water. The acrid and pungent *volatile oil of mustard* is obtained by distilling black mustard-seeds with water. Internally, flour of mustard is used as a stimulant, diuretic, and emetic; externally, as an irritant and rubefacient. White mustard-seeds are often taken in an entire state as stimulants in dyspepsia. The young herbs with their seed-leaves are commonly used in salads.

SINECURE, *si'-ne-kure* (Lat. *sine cura*, without care or charge), is an ecclesiastical benefice without cure of souls; as where a rector of a parish has a vicar under him, endowed and charged with the cure, so that he is not obliged either to duty or residence; or when a church has fallen down, and the parish becomes destitute of parishioners. In a more general sense, it is applied to any office with no duties attached to it.

SINE DIE *si'-ne di'-e* (Lat., without day), is a term usually employed in connection with meetings or assemblies, which are adjourned or prorogued, without a day being specified for reassembling.

SINISTER, *sin'-is-ter*, in Heraldry, signifies the left-hand side of the escutcheon, or anything that is used in armoury; that is, the object being placed immediately before the spectator, the side opposite the right hand is the *sinister*, and that opposite the left hand the *dexter*.

SINKING FUND. (*See* NATIONAL DEBT.)

SIPHON, *si'-fon* (Lat. *siphe*), a bent tube or pipe, having one limb shorter than the other, by means of which a liquid can be transferred from one vessel to another, without inverting or disturbing the vessel from which the liquid is withdrawn. It is generally supposed that this machine was invented about the 2nd century, by Hero of Alexandria, who, in his works, mentions its employment for the purpose of conveying water from one valley to another over the

intervening ground. The method or principle on which the siphon acts, is by exhausting the tube of the air which it contains, or at least, so rarefying it, that the pressure of the atmosphere on the surface of the water will force the liquid up beyond the highest point of the curve of the siphon, when it will descend by the other limb. The siphon is principally used for decanting; it may, however, be used to discharge water at the upper extremity, by means of an air-vessel at that place. Instead of exhausting the siphon of air, it may be inverted and filled with water; if both ends are then stopped, and the shorter limb immersed in the water to be decanted, on removing the plugs the water will flow. In the *Wirtemberg siphon*, the two ends are turned up, so that when once filled, it will always remain so, and act at once when one end is immersed in a liquid.

Siphon Aqueducts.—In canal-making it is frequently necessary to cross streams. When the natural level of the stream is above that of the canal, an aqueduct must be employed. But generally, it is found necessary to pass the water under the canal, by means of a culvert, or of a siphon aqueduct. Great difficulties usually accompany the execution of the latter, for they are at all times difficult to repair; there is also great danger of their leaking, in consequence of the hydrostatical pressure acting upon their lower surfaces; and through the accumulation of silt or alluvial matter, there is a tendency to choke up the passage. Siphon aqueducts, therefore, should only be used for the most limpid waters, and under all circumstances, settling reservoirs should be formed at their entrances.

Siphonia, *si-fo'-ne-a*, in Bot., a gen. of the nat. ord. *Euphorbiaceæ*. *S. elastica*, a native of Brazil and Guiana, is the plant from which nearly all the India-rubber, or caoutchouc, now used in this country is derived.

Sir, *ser* (Fr. *sieur*), is a word of respect used in addressing men, as madam is in addresses to women. It is likewise the title of a knight or baronet. Shakespere sometimes used it synonymously with man. It is prefixed to loin, in sirloin, a practice which is said to have originated in the knighting of a loin of beef by one of the English kings in a fit of good humour.

Siren, *si'-ren*, a gen. of reptiles belonging to the perennibranchiate Batrachians, declared by Cuvier to be one of the most remarkable of the class of reptiles, and, indeed, of the whole animal kingdom, from the anomalies of its organization and its apparent relationship with different families, and even classes. It has the following characters:—Form elongated, nearly like that of the eel; branchial tufts three on each side; no posterior feet, nor any vestige of a pelvis; head depressed; gape of the mouth not wide; muzzle obtuse; eye very small; the ear concealed; lower jaw armed with a horny sheath and several rows of small teeth; the upper jaw toothless; but numerous small pointed retroverted teeth occur on the palatal region.

Sirius, *sir'-e-us*, in Astron., the most brilliant of the fixed stars, and the largest in the constellation of the Great Dog. It is very frequently called the Dog Star. Its name is obtained from Siris, one of the Egyptian appellations of the river Nile, because its heliacal rising gave warning that the overflow of the river was about to commence.

Sirocco, *se-rok'-ko* (Ital.), a term applied in Italy to a hot, relaxing, and oppressive south-west wind. It is supposed by some to be identical with the simoom, tempered by its passage across the water.

Sisters of Charity, is an institution of females in France, whose business it is to minister to the indigent in sickness and distress. They originated from a noble lady, Louise le Gras, and received the approbation of Clement IX. in 1660.

Sizars, *si'-zars*, is a name given to a class of students at the University of Cambridge of limited means, and who enjoy certain advantages over the others. The name is said to be derived from size, which, in university language, denotes an allowance of provisions. Sizars have usually their commons free, and receive various emoluments. Formerly, they were required to perform certain menial offices; but that has long been done away with, and sizars are now almost entirely on the same footing as independent students. A like class of students at Oxford are called servitors.

Size, in Manuf.—Size is a weak solution of impure gelatine evaporated until it forms a stiff jelly. (*See* Glue.)

Skate. (*See* Ray.)

Skating, *skait'-ing* (Du.), one of the finest exercises and most healthful out-of-door pastimes in winter, when rivers and ponds are frozen, and offer a clear surface of ice. The art consists in poising the body on a sharp ridge of iron beneath the sole of the foot, and advancing on the ice in that position, one foot relieving the other. The skate itself is a well-known apparatus, generally made of wood and iron, with straps and buckles to attach it to the foot. The iron should be about a quarter of an inch thick, and not deeper than three-quarters of an inch, and smooth or flat along its under edge. The edges should be smooth, free from rust, and sharply ground. The best skaters are found in Holland, where men and women skate to market, Germany, and Russia. In the "Edda," written 600 years ago, skating is mentioned. The god Uller is represented as being distinguished for his beauty, arrows, and skates. In speaking of skating, Klopstock says that man, "like the Homeric gods, strides with winged feet over the sea transmuted into solid ground." Goethe, Herder, and other German poets, have also sung its praises.

Skeleton, *skel'-e-ton* (Gr. *skello*, I make dry), is the dry osseous framework of an animal body preserved in its natural position. It usually consists of various parts, and when these are connected together by their natural ligaments, it is said to be a natural skeleton, and when they are artificially connected by wires or the like, it is said to be an artificial skeleton. In some of the lowest class of animals, the skeleton consists only of a single piece, in others it is external, in the form of a case. In man, however, and all the higher animals, the skeleton is internal, and composed of numerous pieces adapted to give strength and beauty to the body, and to admit of motion in various directions. (*See* Anatomy, § Osteology.)

Skew Bridge, *skew* (Dan. *skiev*, oblique), a bridge in which the passages under and over the arch intersect each other obliquely. There are cases of frequent occurrence in which various sorts of passages and courses necessarily cross each other obliquely, as well as on different levels, and where it would be difficult or impossible to construct a square bridge which should both have sufficient strength and at the same time leave the lower passage quite clear. In such cases, recourse must be had to a different form of arch, placed obliquely to the abutments, and yet exerting its thrust in the direction of the upper passage. Such a structure is called a *skew* bridge, and is frequently required on lines of railway, which it is important to keep as straight as possible. Very little is known respecting the origin of skew bridges, but it is very certain that George Stephenson was the first to construct them—on the Liverpool and Manchester railway—on true scientific principles. The difficulty of building skew bridges increases with the obliquity of the angle from 90° to 45°, which is supposed to be the most hazardous angle for a semicircular arch; but beyond that limit, instead of increasing it rather diminishes to about 25°, which appears to be about the natural limit for a semi-cylindrical arch. Elliptical oblique arches are deficient in stability, more difficult to execute, and more expensive than semicircular or segmental arches.

Skin, *skin* (Sax. *scin*), in Anat., is that membrane of variable thickness which covers the whole body externally, and extends inwards into all the natural openings, where it changes its properties, becoming soft and moist, and hence known as mucous membrane. The skin is generally described as composed of three layers,—the cuticle, the *rete mucosum*, and the *cutis vera*, the last being the most internal. The cutis (*dermis*), or true skin, consists of two layers, of which the deeper is called the *corium*, and the more superficial the papillary layer. The corium is composed of numerous fibres closely interlaced, and forming a smooth surface for the support of the papillary layer. It varies in thickness, being, as a general rule, thick on the exposed parts and thin on the protected. The papillary layer is soft, and formed by numerous papillæ, which cover its whole surface. It contains the

expansions of the sensitive nerves. The rete mucosum (mucous network) lies immediately over the cutis, and in some measure diminishes the inequalities of its surface, being thicker between the papillæ and thinner on their summits. It is composed of minute nucleated cells, and is almost pulpy in consistence. It is very slightly developed in the white races, but is very distinct and thick in those that are darker, the cells, which are filled with a pigment, being that which gives the dark colour to their skin. The cuticle, scarf-skin, or epidermis, is a disorganised scaly substance, serving to protect from injury the more delicate cutis. It is thickest on the most exposed parts; and on the palms of the hands and soles of the feet it consists of several layers. The skin performs various important functions. It is the seat of common sensation, and is furnished with numerous pores or openings, which give passage to the sweat and other exhalations. It is in this way the great regulator of the heat of the body.

Skin, Diseases of the, are of very different kinds and of very different degrees of importance. Some are dangerous to life, others are attended with no danger; some are attended with fever and rapid in their course, others are chronic and obstinate; some are disfiguring, some contagious; and so on. Various attempts have been made to arrange and classify the different diseases of the skin. Dr. Hillan divides them into eight orders, distinguished from each other solely by the appearances upon the skin, as follows:—1. *Papulæ*, or pimples, little elevations of the cuticle, of a red colour, and not containing any fluid, as in the earliest stage of small-pox.—2. *Squamæ*, or scales, small hard, thickened, opaque, whitish patches of unhealthy cuticle, as in leprosy.—3. *Exanthemata*, or rashes, superficial red patches, varying in figure and size, and irregularly diffused over the surface, as in measles, scarlet fever, &c.—4. *Bullæ*, blebs or miniature blisters, as sometimes occur in erysipelas.—5. *Pustulæ*, or pustules, circumscribed elevations of the cuticle, containing pus, and having red inflamed bases, as in the eruption of small-pox when at its height and maturity.—6. *Vesiculæ*, or vesicles, small elevations of the cuticle, covering a fluid usually at first clear and colourless, but becoming afterwards opaque and whitish, or pearly, as in cow-pox and chicken-pox.—7. *Tuberculæ*, tubercles, small hard superficial tumours, circumscribed and permanent, or, if they suppurate at all, it is only partially.—8. *Maculæ*, spots or patches, arising from excess or deficiency of the colouring matter of the skin, and frequently occurring congenitally, or connected with some slight disorder of the digestive organs or of the general health. Such a classification as this is very useful for the purpose of distinguishing the different appearances, but it is of little further service. They are almost all more or less important manifestations in the cutaneous tissues of disordered or diseased conditions of one or more of the vital functions. Besides, a complaint which is papular to-day may be vesicular to-morrow, and pustular the day following. Some arrangement directing the attention more entirely to the relations and constitutional and visceral dependencies of these affections, and leading to rational and successful methods of cure, is still wanted.

Skull, *skull* (Sw. *skalle*, Lat. *cranium*), in Anat., is that hard bony case which incloses the brain and forms the head. It consists of eight bones, closely joined together; namely, the *frontal* bone in front, the occipital bone behind, the two parietal bones on each side, the two temporal bones forming the temples, and the sphenoid and ethmoid bones below, going to the formation of the orbits and nose.

Skunk, *skunk* (*Mephitis americana*), a carnivorous quadruped belonging to the fam. *Mustelidæ*, inhabiting America; one species being found in the north and another in the south. The skunk is about as large as a cat; it is low on its legs, with a broad fleshy body, white forehead, and the general aspect rather of a wolverene than of a marten; eyes small, ears short and round. A narrow white mesial line runs from the tip of the nose to the occiput, where it dilates into a broad white mark. It is again narrowed, and continues so until it passes the shoulders, when it forks, the branches running along the sides and becoming much broader as they recede from each other. They approach posteriorly, and unite on the rump, becoming at the same time narrower. The upper lip is furnished with long whiskers; the fur is long and thick, composed of silky and woolly hairs intermixed; the colour is white and blackish brown, in large masses. The skunk is a nocturnal animal, leaving its burrow at twilight in search of small quadrupeds and the young and eggs of birds. One of its most distinguishing characteristics is its capability of discharging an intolerable stifling stench when threatened with danger,—a stench equally intolerable to men, dogs, and cattle. The skunk has one litter a year, of from six to ten young.

Skye Terrier, *ski*, the largest species of "toy" dog, the smallest seldom weighing less than ten or twelve pounds. A thorough-bred "Skye" has very short legs and a very long body; its neck is strong,



SKYE TERRIER.

and head elongated, while its body and limbs are covered with long straight hair of a slightly wiry texture, which hangs so thickly over its face as to render the eyes and nose almost invisible. These dogs are very clever at learning tricks, and display considerable affection.

Slander, *slandˈer* (Nor. *esclaunder*), in Law, is the malicious defamation of a man's character by spoken words, as libel is by written words. (*See* Libel.) Slander is of two kinds,—one which is actionable, as necessarily importing some general damage to the party slandered; the other actionable only when some special damage has been actually caused. The former includes such words as impute to a person crimes or misdemeanours that are legally punishable in a court of law; such as tend to injure him in his profession, trade, or calling by which he gains his livelihood, as imputing to him malpractice, incompetence, &c.; such as tend to his exclusion from society or to disparage him in an office of public trust. In the other case, the words, though untrue and maliciously spoken, are not in themselves actionable, unless the party aggrieved is able to prove that he has sustained some certain actual loss therefrom. The words require to be maliciously spoken; and hence, if spoken in a friendly manner, or by way of advice, they are not actionable. There are certain kinds of communications which are regarded as privileged, and therefore not actionable; as when a master is called upon to give the character of a servant, or where a man communicates to another circumstances which it is right that he should know in relation to a matter in which they have a mutual interest. If the defendant be able to prove the words to be true, no action will lie for defamation, whether special damage has ensued or not, for the law holds them to be justifiable.

Slate, *slait* (Fr. *éclater*, to split), an argillaceous stone which readily splits into plates. The structure of slate is eminently foliated or schistose, splitting, as in the case of roofing-slate, into leaves as thin as pasteboard. Grey, of various shades, is its prevailing

colour; but it is also bluish, reddish, and greenish. It varies considerably as to hardness. It is extensively used for building purposes, for the making of billiard-tables, water-tanks, and for the "slates" of schoolboys. Slate-quarries are worked extensively in North Wales, Westmoreland, Yorkshire, Cornwall, and Devonshire. A valuable variety of slate used for whetstones comes from Sonnenberg, in Meiningen, from Saalfeld, and from the Levant. The slate which is made use of for pencils, in drawing upon the schoolboy's "slate," comes from Spain, Italy, and Bayreuth, in Thuringia. Ehrenberg discovered that the polishing slate found near Zwickau, and near Bilin, which is extensively used as a polisher of metals, was entirely composed of skeletons of infusoria.

SLAVERY, *slaiv'-er-i* (Dan. *slave*, a slave), is that state or condition in which one man becomes the absolute property of another, and may be sold by him like a beast of burden in the market. Repugnant as such a state of things may appear to nature and reason, there can be no doubt that it prevailed to a great extent among all the great nations of antiquity. The Latin name *servus*, which is usually translated servant, properly signifies a slave, and is derived from *servare*, to preserve; the *servi*, or slaves, being such persons as were taken in war, and their lives preserved, on condition of their becoming the absolute property of their masters. In like manner, the Hebrew word in the Old Testament, which in our version is translated servant, properly signifies slave; and from the curse which Noah denounces upon Ham and Canaan, immediately after the Deluge, we have reason to believe that the state existed even in antediluvian times. Slavery was authorized by the Jewish law, which lays down many directions as to how slaves are to be treated. Foreign slaves might be obtained by capture, purchase, or by being born in the house; and over these the masters had entire authority to sell, exchange, judge, punish, or even to put them to death. A Hebrew might also fall into slavery in various ways: if reduced to poverty, he might sell himself for a slave; a father might sell his children for slaves, or creditors might sell their debtors; but in such cases the slave was not to be treated as a slave, but as a hired servant, and was to be restored to freedom at the year of jubilee. In Egypt, Chaldea, Arabia, and all over the East, slavery existed to a very great extent, and a large traffic in slaves was carried on. Among the Greeks, even as early as the time of Homer, we find slavery a recognized institution; and none of the Greek philosophers seem to have regarded it as other than a regular and natural state of things. Aristotle lays it down that a complete household comprises both slaves and freemen, and defends the institution on the ground of diversity of races; and even Plato, in his perfect state, only desires that no Greeks should be made slaves by Greeks. At Athens, as well as in the other states of Greece, there was a regular slave-market, called the *kuklos*, because the slaves stood round in a circle. The number of slaves in all the Greek states was very great, far exceeding the number of free men. According to a census made during the archonship of Demetrius Phalereus, there were in Attica 21,000 free citizens, 10,000 strangers, and 400,000 slaves. Even those who doubt the accuracy of these figures, admit that there must have been three or four slaves to one of the free population. At Athens, even the poorest citizen had a slave to take care of his household; and Plato remarks that some had fifty, or even more. At Athens, and in Greece generally, slaves are said to have been more humanely treated than in Rome, where they could be tortured, and even put to death, at the discretion of their masters. Afterwards, a spirit of greater humanity began to prevail, and a succession of edicts were enacted by Claudius, Hadrian, and Antoninus Pius, by which the jurisdiction of life and death was taken away from the masters, and referred to the magistrate, and the *ergastula*, or dungeons of cruelty, were abolished. Hume, in his "Essay on the Populousness of Ancient Nations," says that some great men among the Romans possessed to the number of 10,000 slaves; and Mr. Blair, in his "Inquiry into the State of Slavery among the Romans," assigns as many as three slaves to every free person in Italy in the time of the emperor Claudius. Slaves were not only employed in the usual domestic offices, and in the





labours of the field, but also as mechanics, artisans and in every branch of industry, some of them even filling offices of honour and trust, as factors or agents for their masters in the management of business. The spread of Christianity did much to ameliorate the condition of the slave, though the possession of them was for a long time not regarded as contrary to Christian principles; and down to the age of Theodosius, wealthy persons continued to keep as many as two or three thousand of them. Justinian did much to promote the ultimate extinction of slavery; but the number of slaves was again increased by the invasion of the barbarians; and finally the slaves became merged in the villeins and serfs of the Middle Ages. The personal servitude which grew out of the abuses of the feudal system, and to which the Germans had been accustomed, even in their primitive settlements, was exceedingly grievous, but it is not supposed to have equalled, in severity or degradation, the domestic slavery of the ancients, or among the European colonies on the other side of the Atlantic. The feudal villein of the lowest order was indeed subjected to the most ignoble services; but in the eye of the law, in England, he was regarded as a villein only to his own master, to all other persons he was a free man, and he was even protected against excessive injuries at the hands of his master, who might be made answerable at the king's suit. That Africa was free from the blot which stained more advanced countries, even at a very early period, it is impossible to suppose, and is fully confirmed by what glimpses we obtain of its early history. There is no truth therefore in the statement that Europeans were the first to introduce that trade; for it has been proved that a great trade in slaves was carried on from the coast of Guinea by the Arabs some hundreds of years before the Portuguese embarked in the traffic. The Portuguese began to transport negroes from their possessions in Africa to Spanish America in 1501. In 1517 the emperor Charles V. legalized the slave-trade, and granted a patent to certain persons to carry it on. The French under Louis XIII., and the English under Queen Elizabeth, formally permitted this trade. The most important markets for slaves in Africa were Bonny and Calabar, on the coast of Guinea, and they still remain among the principal. Here the slaves who come from the interior were exchanged for rum, brandy, toys, iron, salt, &c.; and the number of those beings who have been thus torn from their country during three centuries is calculated to amount to above forty millions. The sufferings of the slaves during the passage were, and still are, horrible, it being estimated that from 15 to 20 per cent. perish on it. Almost from the very time that this traffic was established, there were persons who more or less powerfully declared against it; but the honour of having systematically and successfully taken up the cause of the slave belongs emphatically to the Quakers, and the movement began more particularly about 1727. In 1751 the Quakers entirely abolished it among themselves; and in 1772 Granville Sharp obtained a decision of the English judges, in the famous case of the negro Somerset, that a slave as soon as he sets his foot upon English ground becomes free. In 1783 a petition for the abolition of the slave-trade was addressed to parliament by the Quakers, and supported by Sir Cecil Wray; and in 1787 a society for the suppression of the slave-trade was established in London, and numbered among its members Wilberforce, Sharp, Dillwyn, and Thomas Clarkson, then a young graduate of Cambridge, to whose enthusiasm and energy the cause is probably more indebted than to the labours of any other man. The subject was again brought before parliament in 1788, and an order obtained for a committee of the privy council to inquire into it. On the 13th May, 1789, Wilberforce made his first speech in the house on the subject, and was ably supported by Burke, Fox, Granville, and Pitt; but it was not till 1791 that he was able to move for leave to bring in a bill for preventing the further importation of slaves into the West-Indian colonies. After a stormy debate the motion was lost by 88 to 163. In April, 1792, 330 petitions were received from England and 187 from Scotland, and Wilberforce moved that the trade ought to be abolished. An amendment for its gradual

abolition was carried by a large majority, and a few days afterwards the house passed a resolution for its abolition in 1796; this measure was, however, defeated in the house of Lords. Various subsequent attempts were equally unsuccessful, being generally defeated in the house of Commons. At length a bill passed both houses successfully, and received the royal assent on the 25th March, 1807. In 1811 Mr. Brougham introduced a bill, which unanimously passed through both houses, declaring the trade in slaves to be felony, and punishable with fourteen years' transportation; and an act of 1824 made slave-trading a capital offence, by the name of piracy,—in 1837 mitigated to transportation for life. During the agitation against the slave-trade, the abolitionists studiously kept out of view the question of the emancipation of the slaves; but immediately on the passing of the act of 1807 they formed a new association, called the "African Institution," which afterwards became merged in the Anti-Slavery Society. Clarkson renewed his agitation throughout the country; local societies were formed everywhere, and tracts and other publications circulated on behalf of the slave. At length, in March, 1823, Wilberforce presented a petition to parliament for the extinction of slavery, and soon after, a motion by Mr. Buxton, to the same effect, was defeated by Mr. Canning. From that time various measures were introduced, till at length, in 1833, the ministry was induced to bring forward a measure which was introduced by Mr. Stanley, then secretary for the colonies. After much discussion and considerable opposition, it passed both houses, and obtained the royal assent on the 28th August, 1833. In terms of this act, slavery was to cease throughout the British empire on the 1st August, 1834; slaves, however, of six years old and upwards were required to become "apprenticed labourers" to those who had been their owners in slavery, one class being required to serve for four years, the other for six. Further, the sum of twenty millions was to be raised and distributed as compensation-money among the different slave-owners. On the 1st August, 1834, nearly 800,000 negroes became nominally free; and their average value over eight years being taken in the several places, gave a total of £15,281,738. Several of the colonies declined having to do with apprentices at all, and emancipated their slaves at once. In the spring of 1838 the question of immediate emancipation was agitated, and the colonists forthwith proceeded to carry it into effect; so that by the 1st August, 1838, there was not a slave left in any British colony, except the Mauritius alone, which followed soon after. The slave-trade is now prohibited by the laws of every European state except Portugal, by which it is still continued within certain geographical limits; and all of them have agreed to enforce the strictest measures in regard to the right of search, and to regard those engaged in the trade as pirates. In the southern states of North America slavery still exists; and if not directly, has at least indirectly, been the cause of the present unhappy war. There they are regarded, in many respects, as things or property, rather than persons, and are vendible as personal estate. They are assets in the hands of executors for the payment of debts, and cannot be emancipated by will or otherwise to the prejudice of creditors; they cannot take property by descent or purchase, and all they find and all they hold belongs to the master; they cannot make lawful contracts, and they are deprived of civil rights. Some of the states also manifest great jealousy of any influence that might tend to render them discontented with their condition; and severe penal restrictions exist against their being educated or instructed.

SLEEP, *sleep* (Ger. *Schlaf*), is that natural state or condition of unconsciousness in animals which alternates with a period of activity. In this state, the involuntary functions, such as those of nutrition, secretion, &c., go on as usual, but the voluntary powers are quiescent. All action in the living economy produces waste of tissue; and hence rest is necessary in order that the deficiency may be made up. Hence it is that we feel refreshed after sleep; the muscles possess greater strength, the nerves have attained a higher sensibility, and the powers of the mind are more active. The poet well speaks of "Tired nature's sweet restorer, balmy sleep." Many hypotheses have been advanced by physiologists to account for the phenomena of sleep, but all more or less unsatisfactory. According to some, it arises from mere exhaustion of the sensorial powers, the brain ceasing to act because it is fatigued and cannot act further until restored by rest. "In many cases, however, we find excessive fatigue, either of mind or body, to be an effectual preventive of sleep. Others, again, refer sleep to changes in the cerebral circulation, regarding it as arising from congestion or a retarded movement of the blood in the cerebral vessels, especially the veins, or, according to some, from a diminished flow of arterial blood to the brain. It is not improbable that several of these causes may be at work in producing sleep,—the nervous power being enfeebled by its expenditure during the waking state, and the circulation becoming slower, the vessels become, in consequence, congested, and there is a deficient supply of arterial blood, leading to a suspension of the powers of attention and voluntary motion. According to Sir Henry Holland, sleep is not a single state, but "a succession of states in constant variation; this variation consisting not only in the different degrees in which the same sense or faculty is submitted to it, but also in the different proportions in which these several powers are under its influence at the same time." The approach of sleep is announced by diminished activity of mind, and loss of the power of attention. The senses become blunted to external impressions, and we feel an unconquerable desire for stillness and repose. Our ideas grow more confused, our sensations more obscure, our sight fails us, and if our ears still perceive sounds, they are indistinct and seem as though distant. The eyelids close, the joints relax, and we instinctively assume an easy position and fall into a sleep. As a general rule, the senses and reasoning faculties sleep first, while the imagination and lighter ones remain longest awake. Sleep is at first deep, then soft and gentle, and becomes gradually less sound as the time for waking approaches. There is usually an intermediate state between sleep and waking, in which the sleep is very light, and from which persons can be aroused with the greatest facility. The amount of sleep required by a person varies according to age, temperament, habit, and previous fatigue. The new-born infant sleeps almost continuously, and very old persons also require a great deal of sleep. Middle life is the period when the system requires the least sleep; and women usually require less sleep than men. The average amount of sleep required by a healthy person is about eight hours; but it varies greatly in different individuals, some persons being able to sustain nature with only four hours, while some sluggish persons spend nearly half their time in sleep. Not one of the least strange of the phenomena of this state is the power that some persons have of awaking at a particular hour predetermined on.

SLOE. (*See* PRUNUS.)

SLOTH, *sloath* (Sax. *slowth*), (*Bradypus tridactylus*), an herbivorous edentate animal of South America,



SLOTH.

remarkable for the extreme slowness of its motions and the awkward appearance of its proportions. The arm and fore-arms taken together are nearly twice as

long as the leg and thigh; so that if the animal attempts to walk on all foure, it is obliged to trail itself painfully and slowly on its elbows, and if it stands upright on the hind legs, the arms are so long that the fore-fingers touch the ground. It is, accordingly, exceedingly helpless when upon the ground, and at home only when on trees, and resting or moving suspended beneath their branches. It feeds on leaves. The head of the sloth is soft, the face small and round, its hair coarse and shaggy, and generally resembling in colour dry withered grass or moss.

SLUG, *slug* (*Limax*), a gen. of air-breathing naked gastropodous molluscs. They have an elongated body, and for a mantle a fleshy compact disk, which occupies the anterior part of the body alone, and covers the pulmonary cavity only. This disk contains, in many species, a small oblong and flat shell, or, at least, a calcareous secretion in lieu of it. They feed on herbs and fruits, to which they do much damage. They deposit their ova at any time of spring or summer, when the weather is moist, and bury themselves in the earth during drought and frost.

SMALL-POX, *smawl poks* (Lat. *variola*), is an eruptive febrile disease, which, happily, is not now nearly so prevalent as it once was. It seems very doubtful whether this disease was at all known to the ancients; and, according to some Arabic historians, it came first from Ethiopia into Arabia about A.D. 572. The wars which were carried on in the East, and particularly the Crusades in the 12th and 13th centuries, introduced it into Europe, first into Spain and France, and then into other countries. This disease commonly commences with the usual febrile symptoms; as rigors, pain in the back and loins, great prostration of strength, followed by heat and dryness of the skin, a hard and frequent pulse, loss of appetite, pain in the epigastrum, with nausea, vomiting, headache, and sometimes delirium or convulsions. About the third day, an eruption of small hard red-coloured pimples makes its appearance about the face and neck, and gradually extends over the trunk and extremities. The pimples gradually ripen into pustules, which, on the eighth day, generally begin to break, and crusts or scabs form, these last falling off in four or five days more. The severity of the disease varies much in different instances, but is almost always in direct relation to the quantity of the eruption. When the pustules are numerous, they run together, and form an irregular outline; when fewer, they are distinct, and of a regularly circumscribed circular form. The former is technically called *variola confluens*, the other *variola discreta*; the former being never free from danger, the latter seldom or ever dangerous. The most important difference between the two forms is in the secondary fever, which sets in about the eighth day of the eruption, or just when the maturation of the pustules is complete. It is slightly marked in the distinct small-pox, but generally very intense and perilous in most instances of the confluent; being the period at which death oftenest occurs. Both kinds are accompanied by sore throat, salivation, and frequently diarrhœa. A peculiar disagreeable odour also usually proceeds from the body of the patient. Like measles and scarlatina, this disease frequently gives rise to others of a troublesome or dangerous nature; as glandular swellings, abscesses, pleurisy, loss of sight, consumption, &c. Small-pox is the effect of specific contagion, communicated by contact, or through the air. There is no disease of which the contagion is so sure, and which operates at a greater distance, than that of small-pox; but it rarely attacks the same individual more than once. It is not a little remarkable that a small quantity of the matter taken from a pustule and inserted beneath the skin of a healthy individual gives rise to a much milder form of the disease than would arise in the natural way, i.e., by inhaling the contagious poison; and to this fact are we indebted for the great means of guarding against the disease. (*See* INOCULATION, VACCINATION.) The treatment required in small-pox does not differ particularly from that of ordinary fever; the bowels requiring to be kept moderately open, free ventilation established, and the skin, if necessary, kept cool by sponging it with tepid vinegar and water. Small doses of mercury are often serviceable in moderating the febrile symptoms. The strength requires to be attended to, and, if much reduced, quinine, wine, and nourishing diet are to be employed. Blood-letting is almost always attended with very great danger, and not to be had recourse to if it can possibly be avoided. The complications of this disease require to be carefully watched; and if the throat be much affected, a blister should be applied to the neck, and gargles of infusion of roses used.

SMELL, *smell*, in living animals, is the power or faculty of perceiving odours. For that purpose, the animal is provided with a special nerve, called the olfactory nerve, in which alone this faculty resides. In man, the filaments of this nerve are distributed in minute arrangements in the mucous membrane covering the interior and upper cavities of the nose. (*See* NOSE.) The branches are distributed principally in close plexuses, but the mode of termination of the filaments is not yet satisfactorily determined. Besides the sense of smell, the nasal cavities are endowed with common sensibility by the nasal branches of the first and second divisions of the fifth nerve, as is proved by those cases in which the sense of smell is lost, while the party still remains susceptible of sensations of cold, heat, itching, tickling, &c. The olfactory nerve is susceptible of an infinite variety of states, dependent on the nature of the external stimulus by which it is brought into a state of activity. All animals do not perceive the same odours in an equal degree. Carnivorous animals, for instance, have the power of detecting by the smell the special peculiarities of animal matters, and of tracking other animals by the scent, but apparently no sensibility to the odours of plants and flowers; while, on the other hand, herbivorous animals are peculiarly sensitive to the latter, and have little sensibility to animal odours. Man is inferior to many animals in respect of the acuteness of smell, but his sphere of susceptibility to various odours is more uniform and extended. Odours in the case of animals living in the air arise from substances suspended in a state of extremely fine division in the atmosphere, or gaseous exhalations, often of so subtile a nature that they can be discovered by no other agent than the sense of smell itself. The odorous matters also require to be transmitted in a current through the nostrils, which is effected by the respiratory organs; and hence our perception of them is increased by repeated quick inspirations, as in sniffing. They are in all cases dissolved in the mucus of the mucous membrane before they affect the olfactory nerve; and hence this membrane must not be either too moist or too dry. The cause of the difference in the effect of different odours is unknown. Great differences in this respect exist among different individuals, many odours which are generally thought agreeable being to some persons intolerable; and different persons describe differently the sensations which arise from the same odorous substances. Further, the acuteness of this sense differs greatly in different individuals, and there seems to be in some persons insensibility to certain odours, and in the case of sight, to certain colours. Linnæus has divided odours into seven different classes:—(1) Aromatic, as the carnation; (2) fragrant, as the lily; (3) ambrosiac, as musk; (4) alliaceous, as garlic; (5) fœtid, as the rag-wort, valerian; (6) virulent, as Indian pink; (7) nauseous, as the gourd. Professor Bain attempts a more philosophical classification; viz. — (1) Fresh odours, or such as have the effect of stimulating and reviving the system, as eau-de-Cologne; (2) close or suffocating odours, which have a damping and discouraging effect upon the powers of life, as the smell of a pastrycook's kitchen; (3) disgusting or nauseous odours, that pervert the action of the alimentary canal, as sulphuretted hydrogen gas; (4) sweet or fragrant odours, which convey to the mind a perfectly pleasurable sensation, as many of the flowering and fruit-bearing plants; (5) bad odours, or such as are repulsive by their action on the olfactory nerves alone, as assafœtida; (6) pungent odours, as that of ammonia; (7) ethereal odours, as of alcohol and the ethers; (8) appetizing smells, or such as excite the appetite, as that of flesh among carnivorous animals.—*Ref.* Kirke's *Physiology*; Carpenter's *Physiology*; Bain's *Senses and Intellect*.

SMELT, *smelt* (SAX.), (*Osmerus*), a small but de-

lacious fish, allied to the salmon. It inhabits fresh water from August to May. After spawning in March or the beginning of April, it returns to the sea. Their length is generally six or seven inches. Their generic characters are: Body elongated, covered with small scales; two dorsal fins, the first with rays, the second fleshy without rays; ventral fins in a vertical line under the commencement of the first dorsal fin; teeth on the jaws and tongue very long, two distinct rows on each palatine bone, none on the vomer except at the most anterior part; branchiostegous rays 8. The smelt, as a British fish, appears to be almost exclusively confined to the eastern and western coasts of Great Britain. Their food is small fish, with crustaceous and testaceous animals.



SMELT.

SMELTING, *smelt'-ing* (Dan. *smelter*, to fuse or melt), is the term applied to the extraction of metals from their ores by roasting and calcination. Under the articles IRON MANUFACTURE, SILVER, &c., a description of this process will be found. With regard to copper-smelting:—The principal seat of copper-smelting in Great Britain is at Swansea, in South Wales, which furnishes annually over 20,000 tons of refined metal. Two-thirds of the ore is sent from Cornwall, the rest from Cuba, Chili, and South Australia. Most of these ores contain copper and iron, in combination with sulphur and arsenic, the Chili ores often containing a large quantity of silver. After the ore is raised from the mine, it is freed from its matrix and sorted, the purest portions being broken into pieces the size of a nut. The first calcination is effected in a reverberatory furnace, the heat not being raised too high. At the end of twelve hours, the ore is converted into a black powder, containing sulphide of copper, oxide and sulphide of iron, and earthy impurities. The roasted ore is next fused with a quantity of silicious slag, by which means it is converted into a fusible slag consisting of silicate of iron and sulphides of iron and copper, which sink through the slag, forming at the bottom a heavy mass, termed a *matt*. The matt thus procured is, while melted, run into water, by which it is granulated. The product obtained is called *coarse metal*. It is roasted once more for twenty-four hours, by which means the larger proportion of the sulphide of iron is converted into oxide. It is then calcined with some copper ore known to contain oxide of copper and silica. The oxide of copper transforms any remaining sulphide of iron into oxide, which is taken up by the silica to form a slag, through which the sulphide of copper sinks. This matt contains about 80 per cent. of copper, and is known by the name of *fine metal*. It is cast into pigs, the lower portions of which contain most of the impurities, the metal extracted from the upper portions being known in the market as best selected copper. The *fine metal* has now to be freed entirely from sulphur by a final calcination at a heat just short of that required to fuse it. During the process, the metal becomes oxidized at the surface. The oxide thus formed decomposes the rest of the sulphide, sulphurous acid escaping, and metallic copper remaining behind. The metal obtained is run off into moulds, forming ingots full of bubbles, from the escape of the sulphurous acid gas. These ingots, which are known as *pimple or blistered copper*, from their peculiar appearance, have now to undergo the process of refining. They are placed in a reverberatory furnace, and kept in a melted state for upwards of twenty hours, to oxidate the last traces of foreign metals. Slags are formed on the surface and skimmed off, and a great deal of oxide is produced, which is absorbed by the metal. To reduce this oxide, the surface of the melted metal is covered with anthracite or charcoal, and towards the last a young tree is thrust in. This process, which is called *poling*, disengages the whole of the oxygen from the oxide diffused through the mass. The above is as nearly as possible the method of copper-smelting as employed in this country, the processes adopted in Saxony and North America being nearly identical with it, the difference merely being modifications to suit the various impurities contained in the ore. (*See* Percy's *Metallurgy*.) When the ore consists of oxide or carbonate of copper only, it is reduced to the metallic state by simple fusion with charcoal and subsequent poling.

SMILACEÆ, *smi-lai'-se-e*, in Bot., the Sarsaparilla fam., a nat. ord. of *Monocotyledones*, sub-class *Dictyogenæ*. Herbs or shrubs, more or less climbing. Leaves petiolate, net-veined, articulated. Flowers regular, unisexual, and dioecious or hermaphrodite. Perianth inferior, 6-parted, with all its divisions alike. Stamens 6, perigynous or rarely hypogynous; anthers introrse. Ovary superior, 3-celled; stigmas 3. Fruit a berry, few or many-seeded. Seeds with a minute embryo, albuminous. The species are distributed over various parts of the world, both in tropical and temperate climates, being most abundant in tropical America. (*See* SMILAX.)

SMILAX, *smi'-laks* (Gr.), in Bot., Sarsaparilla, the typical gen of the nat. ord. *Smilaceæ*. The roots of several species or varieties constitute the sarsaparilla of the Materia Medica, and are so largely used in this country that upwards of 130,000 lbs. require to be annually imported. Sarsaparilla is regarded as an alterative in venereal and skin diseases, rheumatism, &c. The kind most valued is that known as Jamaica sarsaparilla, obtained from the species *S. officinalis*. It is not the produce of Jamaica, but of Central America and the northern parts of South America. Other kinds distinguished in commerce are "Lima," "Lean Vera Cruz," "gouty Vera Cruz," "Lisbon" or "Brazilian," and "Honduras." Among the European species is *S. aspera*, the roots of which form Italian sarsaparilla.



SARSAPARILLA.

SMOKE, *smoke* (Sax. *smeca*), the exhalations, visible vapour, or substance that escapes, or is expelled, in the process of combustion, from the substance burning. Under the articles COMBUSTION, FLAME, and FUEL, the principle of combustion is fully explained. Those fuels which consist chiefly of fixed carbon, as anthracite and the coke of bituminous coal, evolve no smoke, for the first movement of the carbon into the air is when it combines with the oxygen to form the invisible carbonic oxide, from which it is not again set free. In nearly every process of combustion, whether the object be the attainment of light or heat, the formation of smoke should be guarded against as a waste of fuel. In large cities, where bituminous coal is consumed as the common fuel, the atmosphere is constantly charged with clouds of smoke, which is diffused over everything. In England this was deemed a nuisance so far back as the time of Queen Elizabeth, when the smiths, brewers, and others were just commencing to use "pit coal." Since that period the nuisance has increased in magnitude, and many attempts have been made to mitigate the evil by compelling manufacturers to adopt improved methods of combustion, or the use of smokeless fuel. In this way coke has come to be universally used upon the railways of Great Britain. Several plans, at once efficient and economical, have been supplied to manufacturers. The object of these plans has been either to prevent the production of smoke by effecting complete combustion in the furnace, or to consume the smoke after it has been evolved from one fire by causing it to pass over another supported by smokeless fuel. It has been ascertained that the great mass of smoke is sent forth from fuel freshly thrown on a fire, and that when the fire becomes better the smoke diminishes; this is owing to the sweeping off of the carbon before it could be fairly exposed to the further action of the heat and air. This leads to the method which adds the fuel gradually and spreads it over the

front portion of the grate, so that the smoke shall have to pass over the fire behind, and thus be consumed as it mixes with the excess of air carried along with it; hence this method of preventing smoke, by consuming it in the furnace, has been adopted very generally. So far back as 1785, James Watt took out a patent for consuming smoke and increasing the heat of furnace-fires. His plan was to pass the products of combustion through very hot pipes, or among, through, or near to fuel which is intensely hot, and which has ceased to smoke. C. W. Williams, in a prize essay on the prevention of the smoke nuisance, asserts that the use of hot pipes, or indeed of any extra heat besides that afforded by the fuel itself, is altogether needless, the properly-arranged admission of air being all that is required. Williams's method is to admit an abundant supply of cold air through the door and front plate of the fire through a large number of small perforations. An improvement upon this plan consists of heating the air before it is admitted. Ivison's plan for preventing smoke consists in the introduction of steam by minute jets over the fire, which is thus greatly increased in intensity without the production of smoke, and with a saving of fuel. In Jucke's arrangement, the grate-bars of a furnace are replaced by an endless chain web, which is carried round upon two rollers, the fuel being thoroughly consumed in the passage. Other inventions are based on supplying fuel to the fires from beneath, so that the products of combustion must pass through the incandescent coals above before escaping.—*Ref.* Charles W. Williams *On the Combustion of Coal and the Prevention of Smoke*; Pridreaux's *Rudimentary Treatise on Fuel*; and Fairbairn's *Useful Information for Engineers*.

**Smuggling**, *smug'-gling* (Du. *smokkelln*, to smuggle), in Law, is the offence of importing or exporting prohibited articles, or articles without paying the duties imposed thereon by the laws of the customs and excise. Under this head, however, the customs laws comprise various offences not strictly included in the above definition. Thus, smuggled goods comprise "dutiable goods unshipped in the United Kingdom, on which customs or other duties have not been paid or secured; prohibited goods imported into any part of the United Kingdom; goods clandestinely or illegally removed from any warehouse or other place of security in which they may have been deposited for home consumption or exportation; goods prohibited to be exported, put on board any ship, or brought to any quay or other place to be shipped for exportation; goods prohibited to be exported found in any package produced to any officer as containing goods not so prohibited; goods subject to duty or restriction on importation, or prohibited to be imported, found concealed on board any ship or boat within any port of the United Kingdom; goods of the latter class found, either before or after landing, to have been so concealed on board in such port." In all these cases the goods, together with any goods found packed with, or used in concealing them, are liable to forfeiture. Any officer of customs, &c., employed in the prevention of smuggling, may search any person on board ship, or who shall have landed, if he has good reason to suppose that such person has uncustomed or prohibited goods about him; but before search such person may require to be taken before any justice or the collector, or other principal officer of customs, who shall determine the reasonableness of the cause, and either discharge such person, or order him or her to be searched. Any person just landed from a ship, who, upon being questioned, shall deny having any foreign goods in his possession, and such be afterwards discovered, they shall be forfeited, and the person shall also forfeit thrice the value of the goods. If any persons, to the number of three or more, armed with firearms or other offensive weapons, shall, within the United Kingdom, or any of the ports, harbours, or creeks thereof, be assembled in order to be aiding, or shall aid, in the illegal landing, running, or carrying away of prohibited goods, or goods liable to any duties which have not been paid or received; or in rescuing or taking away such goods after seizure; or in rescuing any person apprehended for any offence made felony by any act relating to the customs; or in preventing the apprehension of any person guilty of such offence, every person so offending, and every person aiding therein, shall be guilty of felony, and is liable to penal servitude for life, or not less than fifteen years, or to be imprisoned for not exceeding three years. If any person (in company with more than four other persons) be found with any goods liable to forfeiture under any act relative to the customs or excise; or (in company with one other person within five miles of the coast or of any tidal river) be found carrying offensive arms or weapons, or disguised in any way, he shall be adjudged guilty of felony, and may be sentenced to penal servitude for not more than seven or less than three years. And persons assaulting or obstructing any such officers as above mentioned (or their assistants) in the performance of their duty, by force or violence, are punishable with penal servitude for not more than seven or less than three years, or with imprisonment with hard labour for not more than three years. These and the other enactments bearing upon the subject are principally contained in act 16 & 17 Vict. c. 107 (commonly called the Customs Consolidation Act, 1853), as amended by 18 & 19 Vict.

**Snails**, *snailz* (Sax. *snegel*, a snail), (*Helicida*), a fam. of gasteropodous molluscs living on the land, and breathing air by means of lungs, and possessed of a well-developed external shell. They respire free air in a closed chamber lined with pulmonic vessels, usually placed on the front of the back of the animal, and covered by the shell, and having an opening closed by a valve on the side. They are hermaphrodite, with reciprocal impregnation. The teeth are numerous, and placed in many cross series on the lingual membrane; the head is furnished with four retractile tentacula, the two upper possessing eyes at the apex. The whole body is very glutinous.

**Snake-nut.** (*See* Ophiocaryon.)

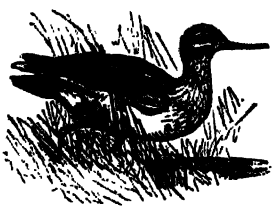
**Snakes**, *snaiks* (Sax. *snaca*, a snake), (*Anguis*), a gen. of *Ophidian reptiles* differing much in their structure and most of their characters from the true serpents. The animals which are included in this genus are among the most harmless on the face of the earth. There are several species, or rather genera, varying from the common blind-worm of Britain (*Anguis fragilis*) to the Acoritias of warmer climates; but they are all equally harmless. The external characters are, the scales on the back and belly alike in size, whereas the true serpents have those on the belly larger and free at their posterior edge. The upper jawbones are articulated immediately to the skull and the intermaxillary bones, so that on opening the mouth the animals cannot raise the upper jaw; and as they can depress the lower jaw only a little way, their gape is very narrow. Their motion is not that of the serpents, but consists of a series of alternate archings and straightenings.

**Snake-wood**, a beautiful fancy wood obtained from *Piratinera guianensis*, a plant belonging to the Bread-fruit order. Owing to the peculiar markings upon it, it is sometimes called *letter-wood*.

**Sneezing**, *sneez'-ing* (Goth. *sneva*), is a convulsive motion of the muscles of respiration. It is preceded by a deep inspiration that fills the lungs; the air-passages are then closed at the fauces, a sudden and violent contraction of the muscles of expiration takes place, and the passages by the mouth and the nasal canal are suddenly opened simultaneously, or the nasal canal alone. It is always occasioned by some irritation affecting the inner membrane of the nose, or, at least, it is always felt there, though it may exist in some other part, and may be produced by very different causes. The irritation must possess a certain degree of acuteness; for every one must have felt that when this is not the case, the disposition to sneeze suddenly passes off, though the act had been desired, and had seemed on the point of being accomplished. In several respects it resembles coughing. Various superstitious notions and customs have been associated with the act of sneezing. The custom of blessing people when they sneeze is mentioned by various ancient authors, and is so ancient that Aristotle professes ignorance of the origin of it. Among the Greeks, it was generally regarded as a good omen. Sneezing has been known to cause death; and it is reported that in the time of Gregory the Great an epidemic distemper prevailed in Italy, which carried off by sneezing all who were

seized by it. It is, however, very rarely dangerous, and is frequently regarded as a favourable symptom.

SNIPE, *snipe* (Du. *snip*).—The snipes belong to the family of the *Scolopacidæ*. There are several species; those most familiar to the English sportsman and ornithologist being the common snipe, the jack snipe, and the solitary snipe. The common snipe (*Scolopax Gallinago*) is indigenous to this country, breeding in small numbers in most, if not in all, the counties along the southern line of the English coast; but producing its eggs and young much more frequently in the northern counties of England, in Ireland, in Scotland and its islands, than in the south. In addition to our native snipes, great flights come annually from Norway and other parts of northern Europe; seldom remaining long in one situation, but moving from place to place. Towards the end of March or the beginning of April, snipes have nearly perfected their nuptial plumage, and select appropriate places for nidification. The nest is very slight, consisting only of a few bits of dead grass or dry herbage, collected in a depression on the ground, and sometimes upon or under the side of a tuft of grass or bunch of rushes; the eggs four in number, of a pale yellowish or greenish-white, the larger end spotted with two or three shades of brown; the length of the egg about one inch six lines, by one inch one line in breadth. Marshes, moist meadows, and, in frosty weather, the edges of rushy rills, are the haunts of the snipe. In such situations they have been seen pushing their bills quite up to the base, in search of their food, which consists of worms, insects, and small molluscs. The whole length of the common snipe is about ten inches and a half; the length of the beak about two inches and three-quarters. In winter, the beak is dark-brown at the end, pale reddish-brown at the base; all the upper part of the head very dark brown, divided along the centre by a single pale brown streak; the back dark brown, slightly spotted with pale brown; the throat white; the cheeks, neck, and upper breast mottled with black and light ferruginous patches; lower breast and belly white; the quills black, the upper ones being tinged with white, and those next the body striated and barred with light ferruginous; the tail consists of fourteen black feathers, barred and spotted with dull orange-red towards the end. The colours of the plumage after the spring moult are brighter and more brilliant than after the autumnal moult. The jack snipe (*Scolopax Gallinula*) is a winter visitor only to this country. It is smaller than the common snipe, and is rather a rare bird; is usually found alone, and will frequently almost allow itself to be trodden on before it will rise. When it does, it wings its way so heavily as to discompose the sportsman as much by its sluggish flight as the larger variety often do by their rapid unsteady dartings. It feeds on bare boggy ground; but when not searching for food, it chooses sheltered situations among strong rushes, or coarse long grass. The solitary snipe (*Scolopax major*) is a very rare bird in England, and is sometimes called the great snipe, being from fourteen to sixteen inches in length. The head-quarters of this bird is the north of Europe. It requires solitude and perfect quiet, and is seldom found except where there is a great extent of marshy meadow. There are two other snipes which exceed this in size, found in the hilly districts of India; and a third from Mexico, whose size is superior to that of a woodcock.



SNIPE.

SNOW, *sne* (SAX. *snaw*).—When the temperature of the atmosphere falls below the freezing-point of water, the particles of moisture are precipitated in the form of flaky crystals of ice, called snow. These crystals are united together in such a manner as to reflect light to the eye in great abundance from all; thus producing a sensation of whiteness. Under the microscope, these crystallised particles present every variety of shape. Dr. Nettis, of Middlesburg, was the first to describe them in 1740. Dr. Scoresby also, in his account of the Arctic regions, states that he collected as many as ninety-six varieties of snow; these he arranged in five separate classes, of which the three leading forms were the lamellar, the pyramidal, and the spicular. The presence of air in snow renders it opaque, otherwise it would be transparent like ice and other crystallized bodies. Regular crystals of snow are only found where the air is still and the temperature very cold; they do not, therefore, often occur in temperate regions. In the polar regions, snow has been seen of red, orange, and salmon colour. This phenomenon occurs both in the fixed and floating ice, and seems to result in some cases from vegetable and in others from animal matter suspended in the water and deposited upon the surrounding ice. In some cases, snow-storms have been known to present a luminous appearance, covering every object with a sheet of fire. In general, the electricity of snow is positive, and by chemical analysis it has been found that snow-water contains a greater proportion of oxygen than rain or river-water,—a fact which accounts for its superior activity in causing iron to rust, &c. In the economy of nature, snow answers many valuable purposes. By its gradual melting in high regions, it serves to supply streams of running water, which a sudden increase in the form of rain would convert into destructive torrents or standing pools. In many countries snow tempers the burning heat of summer, by cooling the winds which pass over it. On the other hand, in colder climates snow serves as a defence against the severity of winter, where it protects plants against the frost, and serves as a shelter to animals, which bury themselves in it. An open, snowless winter is destructive to vegetation even in more temperate regions, and Alpine plants have perished in the mild winter of England for want of their usual protective covering of snow. The elevation at which mountains are covered with perpetual snow is called the *snow-line*, or plane of perpetual snow. The snow-line on the northern side of the Himalayan mountains is about 17,000 feet; on Chimborazo, 15,802 feet. The altitude of perpetual snow under the equator was fixed by Humboldt at 15,748 feet: towards the poles it is considerably lower. The snow-line of the Alps under 46° north latitude is only 8,860 feet, and that of the Pyrenees about 8,850 feet. At the North Cape, in latitude 71°, it is only 2,240 feet. The position of the snow-line in all mountains, however, depends so much on variable causes, such as the form of the summits, the comparative altitude, and other physical features of the surrounding country, the particular exposure of the mountain, &c., that no general rule can be laid down for determining the altitude of perpetual snow.—*Ref.* Dr. J. D. Hooker's *Himalayan Journals*, and Mr. W. Hopkins's paper *On the Causes of Changes of Climate*, in the 8th vol. of the "Journal of the Geographical Society."

SNUFF. (*See* TOBACCO.)



SOAP, *sápe* (SAX. *sape*).—Strictly speaking, a soap may be defined as a salt consisting of a fatty acid in combination with a metallic base. In common parlance, however, it is applied to the soluble salts formed by the union of the fatty acids with the alkalies. If oil and water be shaken together, mechanical union will take place; but on allowing the mixture to rest, the oil will gradually separate and float on the surface of the water. If a small quantity of caustic soda or potash be added to the mixture, and it be then agitated, union will take place between the three bodies, a milky fluid being formed. If a sufficient quantity of alkali has been added, and the solution be boiled, it gradually becomes clear, giving rise to a soapy fluid, which froths strongly on agitation, presenting all the properties of a solution of soap. If to a portion of this clear liquid a strong solution of common salt is added, a peculiar curdling is produced. The liquid separates into a clear fluid, containing glycerine, while the curdy portion rises to the surface. This substance is the fatty acid of the oil, in combination with the alkali used and a certain proportion of water, and if pressed and dried, exhibits the properties of ordinary soap. Ordinary soap is freely soluble in both hot and cold water;

but if any of the earths, such as lime, be present, an insoluble compound is immediately formed; or, in common language, the soap curdles, from the water being hard. Ordinary soaps are of two kinds,—*soft* and *hard*. Soft soap is a combination of some fatty or oily substance with potash, and contains an excess of alkali; hence it is used for cleansing purposes where very highly detergent powers are required. The hard soaps are combinations of the fatty acids with soda; the principal varieties being *yellow soap*, made from tallow and palm-oil, and containing a certain proportion of resin to give it lathering properties; *curd soap*, which is made from tallow, only a small portion of olive-oil or lard being added to give it softness; *mottled soap*, which is prepared from tallow, palm-oil, and kitchen stuff, and contains a portion of insoluble iron soap, giving it a marbled appearance. Marseilles and Carlisle soaps are made of olive-oil and soda, a small quantity of sulphate of iron and sulphuretted lye being added to them while in a pasty condition. The object of marbling soaps with an insoluble matter is to show that they contain but little moisture, since, if too large a proportion of water were present, the colouring matter would sink to the bottom and remain there, instead of being diffused through the mass. The manufacture of the different soaps is very similar, differing only in minor details. An alkaline lye is first prepared in large iron boilers, called *coppers*, heated by steam, by boiling in them a mixture of soda, ash, lime, and water. After boiling for some time, the steam is turned off, and the lye is allowed to cool, carbonate of lime being deposited. The clear lye is then drawn off, weakened by the addition of water, and added to the tallow, fat, or oil, in the proportion of 160 gallons of weak lye to one ton of fat. When ebullition takes place, stronger lyes are added by degrees until the soap feels no longer greasy. Common salt is then added, which separates the glycerin and other impurities derived from the grease. These are drawn off and thrown away, stronger lyes being added, and the boiling continued until the whole of the soap separates. It is then transferred to frames to cool, a small portion of the lye contained in the soap gradually separating and accumulating in the lower part of the frame. This portion is poured off and added to the next charge. When perfectly hard, which occurs in three or four days, the soap is cut up into bars with wires. *Curd soap* is generally remelted and forcibly stirred or *crutched* to break up the grain. It is the purest commercial soap. *Fancy soaps* are made from pure curd soap, scented with various perfumes, and coloured with a variety of tints to suit the prevailing fashion. *Honey soap* contains no honey. It is made of good yellow soap, scented with oil of citronella. *Real old Brown Windsor soap* is curd soap which has turned brown by age. It is now, however, made artificially, by mixing caramel with white soap. *Transparent soap* is made by dissolving white soap in spirit and evaporating. Besides being used for ordinary domestic purposes, soap is employed in various manufactures as a detergent for cleansing silk, wool, and the different fabrics made from them.

Soap-Test, Clark's, in Chem., a ready method of testing the hardness of water, devised by the late Dr. Clark, of Aberdeen. It is founded on the fact of the hardening constituents of water possessing the property of destroying the lathering powers of a solution of soap. Potash in soda soap is therefore dissolved in water until a certain strength is obtained. This is determined by means of a solution of sulphate of lime, in water of known hardness, the soap solution being weakened or strengthened until a certain measure, say an ounce, indicates 1 grain of carbonate of lime, or 1° of hardness. A pint of the water to be examined is then taken, and the standard soap solution is added until the mixture lathers on agitation, the amount used indicating the degree of hardness. Thus, supposing 2½ ounces to have been required, it would indicate 2½ grains of hardening salt per pint, or 20 grains per gallon, *i. e.* 20° of hardness of Clark's scale.

Sobralia, *so-bral'-e-a*, in Bot., a gen. of the nat. ord. *Orchidaceæ*. One species is said to yield in Panama a kind of vanilla, which is called *chica*.

Social Contract, *so'-shc-al*, is a term applied by philosophers to a supposed contract, which is the foundation of authority in every government. "Men," says Locke, "being by nature all free, equal, and independent, no one can be put out of his estate and subjected to the political power of another, without his own consent. Whosoever, therefore, out of a state of nature, unite into a community, must be understood to give up all the power necessary to the ends for which they unite in society, to the majority of the community;" "and this is done by barely agreeing to unite into one political society." "This is that, and that only, which did or could give beginning to any lawful government in the world." We have, however, no evidence of any government having been formed in this way; but, on the other hand, we have evidence of not a few having originated without any pretence of a fair consent, or voluntary subjection of the people.—*Ref.* Locke's *Essay on Civil Government*; Hume's *Essay on the Original Contract*.

Socialism, *so'-shc-al-izm*, the doctrine taught by an enthusiast named Robert Owen, who proposed to reorganize society by banishing old motives of action, including religion in any of its special forms, and to establish the social edifice on the basis of co-operation and mutual usefulness.

Society, *so-si'-e-te* (Lat. *socius*, a companion), is a number of persons associated together for some purpose, religious, benevolent, literary, political, &c. (*See* Association.) When formed for convivial or social purposes, they are commonly denominated clubs. (*See* Club, Friendly Societies, Building Societies, Asiatic Societies, Insurance, &c.)

Socinians, *so-sin'-e-anz*, in Church Hist., are a sect of Christians, named after their founder, Faustus Socinus, a native of Sienna, born in 1539, and died 1604. The Socinians maintain that the Father alone is truly and properly God; that Jesus Christ was a mere man, who had not existence before he was conceived by the Virgin Mary, and that the Holy Ghost is no distinct person. They own that the name of God is given in Scripture to Jesus Christ, but contend that it is only a deputed title, investing him, however, with an absolute sovereignty over all created beings, and rendering him an object of worship to men and angels. They deny the doctrines of satisfaction and imputed righteousness, and regard original sin and predestination as scholastic chimeras. They likewise maintain the sleep of the soul after death, and they say that it will be raised again with the body at the resurrection. In the present day, the term Socinian is commonly applied to such as hold the Unitarian doctrines, which are similar, but not exactly the same. (*See* Unitarianism.)

Socratic Philosophy, *so-krät'-ik*, is the name given to that system or rather method of reasoning, which had Socrates for its author (born B.C. 468, died 399). This "Father of Philosophy" did not attempt to evolve any perfect system of doctrine. He wished rather to divert men's minds from the vanity of setting themselves up as philosophers, and make them employ their thoughts in learning and investigating, instead of prematurely commencing at once to expound and instruct, with crude and superficial notions and principles. He saw the errors and defects of the systems around him, and probably also foresaw that the taste for inquiry into truth, which he was ever awakening, must soon lead to the formation of a philosophical literature at Athens. It is common to compare Socrates with Bacon, and there is much in common between the two philosophers; neither of them left behind him any definite system upon specific articles of philosophy; and each rather showed the way to think, than the results of thought. The object of each was not to think for men, but to teach men to think for themselves; and their purposes were alike directed to "utility," to the profitable, as distinguished from the merely formal and the practically inapplicable. The physical theorists of his time were to Socrates what the schoolmen were to Bacon; and hence their paths lay in opposite directions, Bacon conducting science into the world of matter, while Socrates led her into the heart and actions of man. (*See* Baconian Philosophy.) The labour of Socrates was "directed to the establishment of true moral and religious principles, in opposition to the false and mischievous principles which he observed were commonly acted upon and avowed in the world. The excellence and

supremacy of self-knowledge is what he was ever inculcating; and of self-knowledge, not as a matter of intellectual curiosity, or for its value as a science, but in order to self-government and to happiness." "His first effort then was to open the minds of men to a perception of the value of this knowledge and of their own need of it." He did not value particular studies, because they ministered to the necessities or conveniences of human life; hence, he was no utilitarian, in the modern signification of that term. He disparaged physical science and all merely physical knowledge, in comparison with that which was useful for human life. Aristotle informs us, that in the sphere of general philosophy, two discoveries are justly attributed to Socrates,—the inductive method of inquiry and the practice of seeking general definitions. There may be some ground for supposing that Plato has improved upon the conversations which he reports of his master; but the Socrates of Xenophon proceeds on the same plan. He is said never to have been weary of investigating. Professing to know nothing himself, he put his questions so as to show the ignorance of others. He proceeded very much as the skilful investigator of nature in the present day does with his experiments, by a strict system of analysis. Having obtained an answer, he proceeds to found on that another question, studiously directed to elicit the answer which might serve for further inquiry; and so on, until he had reduced the first proposition to some simple elements, clearly showing its truth or falsehood. "He, far beyond all I ever knew," says Xenophon, "when he spoke carried conviction to his hearers." Vast as nature, all minds could find their systems in him; and, accordingly, from his teaching, with new and regulated energies, we find philosophy giving birth to various systems; the most prominent of which are those of Plato and Aristotle.—*Ref.* Hampden's *Fathers of Greek Philosophy*; Butler's *Lectures on Ancient Philosophy*; Ritter's *History of Philosophy*; Grote's *History of Greece*.

SODA, *sō'-dă*, in Chem., NaO, the protoxide of the alkaline metal sodium. It may be procured in an anhydrous state by burning the metal in dry air or oxygen. It is of a white colour, greedily abstracting water from the air, which cannot be expelled by heat. In this state it forms hydrate of soda, or caustic soda. It is so similar in its properties to hydrate of potash, that it need not be fully described here. Its commercial manufacture is detailed under the head of SODA MANUFACTURE.

SODA, CARBONATES OF.—There are three of these,—the ordinary *mono-carbonate*, or common washing-soda, $NaO.CO_2$, which, in its crystalline form, contains ten equivalents of water; the sesquicarbonate, $2NaO.3CO_2 + 4aq$, which occurs in the mineral kingdom as *trona* and *urao*; and the bicarbonate, $NaO.CO_2$, $HO.CO_2$, which is prepared by passing carbonic acid through a concentrated solution of the carbonate until saturation takes place. It is also prepared by exposing the crystallized mono-carbonate to the action of a current of carbonic acid; but in this method of making it, only the outside portions of the converted crystals should be used, the inner parts being only partially changed. It is ground and dried at a very gentle heat, care being taken to avoid a high temperature, which would cause the formation of the sesqui-carbonate. Bicarbonate of soda crystallizes in prisms. It occurs in commerce as a white crystalline powder, which is gradually converted into the sesquicarbonate by exposure to the air. It is much used in medicine, having a much less unpleasant taste than either the mono- or sesquicarbonate, from which it is readily distinguished by giving no precipitate with the magnesia salts. The properties of the mono-carbonate are described under SODA MANUFACTURE.

SODA, HYPOSULPHITE OF.—This important salt is now manufactured in tons for photographic purposes and as an *antichlore*, to extract the last traces of chlorine from paper pulp. It is prepared by fusing equal weights of carbonate of soda and flower of sulphur, and transmitting sulphurous acid through the solution of impure sulphide of sodium thus formed. The liquid is evaporated, and hyposulphite of soda crystallises from the solution in bold prisms.

SODA MANUFACTURE.—The preparation of carbonate





of soda, or soda as it is commonly called, is the most important chemical manufacture of Great Britain. The unlimited stores of coal, chalk, salt, and sulphur existing in this country have been the means of placing us at the head of the soda trade, some notion of the vastness of which may be gained by the fact that the annual manufacture of this article has reached nearly 2,500,000 tons, made in fifty different manufactories by over 10,000 workmen. Previous to the establishment of the French republic in 1793, soda was obtained almost entirely from the ashes of certain plants growing on the seaboards of Spain, Sicily, Scotland, and Ireland. The French revolution having cut off all the supplies of alkali from France, a commission of chemists was appointed by the republic to consider the best means of supplying the want from French sources. About four years before, a simple chemist and druggist, named Leblanc, had established a manufactory for making soda from common salt; but, owing to revolutionary troubles, his experiments had been discontinued. Through the exertions of the commission, however, the manufactory was re-established at the national expense. Leblanc's process, strange to say, has never been improved, its simplicity being so great as to resist the endeavours of the most eminent chemists, both practical and theoretical, to alter even its details. For at least twenty years, the heavy duty of £30 per ton on common salt prevented the use of the process in this country; the impost, however, was removed in 1823, and the soda manufacture has progressed since that date until it has assumed its present gigantic proportions. The preparation of carbonate of soda from common salt may be divided into three principal operations:—1. the production of *salt-cake*, or crude sulphate of soda; 2. the transformation of the sulphate of soda into black ash, or impure carbonate mixed with sulphide of sodium, by roasting with chalk and coal; 3. the extraction of *soda ash*, or dry carbonate, by lixiviation with water and evaporation to dryness. The first process is performed by placing about 6 cwt. of ordinary salt in a strong iron pan, and mixing it with an equal weight of oil of vitriol. The mixture is then removed to a reverberatory furnace, and the flame allowed to play on its surface until the whole of the hydrochloric acid is driven off, and the chloride of sodium transformed into a dry mass of sulphate of soda, or salt-cake, as it is termed. The salt used is obtained from the salt-springs of Cheshire, and the sulphuric acid is made from iron pyrites from Lancashire, Wicklow, Spain, or Portugal. The hydrochloric acid produced is condensed, and used either for the production of chlorine in the manufacture of bleaching-powder, or for extracting the copper from the iron pyrites used in making the sulphuric acid. The second process, the making of the *black ash*, or impure carbonate of soda, is effected by mingling the sulphate of soda, or salt-cake, formed in the first process, with chalk and powdered coal in the proportions of three parts of sulphate of soda, three of chalk, and two of coal. The mixture is thrown into a reverberatory furnace in quantities of two hundredweight and a half at a time, and frequently stirred until melted. Towards the conclusion of the operation, a violent effervescence takes place, carbonic oxide escaping in large quantities, and burning with a green or yellow flame; the products being carbonic oxide, which burns; sulphide of lime, which remains behind; and carbonate of soda, with which it is mixed. This intermediate action is the foundation of the whole process. In practice, an excess of coal and chalk is employed, as much of the coal burns away, and an excess of lime is required in order to prevent the formation of any of the soluble sulphides of calcium. The amount of carbonate of soda contained in black ash is about 20 per cent. It is extracted from the mass by breaking it into small fragments, and digesting it with warm water for several hours in large vats provided with false bottoms, the last and weakest washings being used to act on fresh portions of black ash. When the lixivium is sufficiently concentrated, it is transferred to evaporating pans. The residue left behind is known as *soda waste*, and consists of a mixture of oxysulphide of calcium and unburnt coal. The efforts of numerous chemists have been fruitlessly employed for the last fifty years in endeavouring to utilise this waste pro-

quet, which collects gradually near all soda-works, and ultimately forms large mountains. The solution of crude carbonate of soda is generally of a dark green colour, from the accidental admixture of iron or manganese, and contains certain proportions of hydrate and sulphate of soda, which are converted into carbonate by mixing the evaporated salts with small coal and sawdust, and in heating in a reverberatory furnace. The resulting salt, which is the soda-ash of commerce, is then once more dissolved in water, the solution evaporated to crystallization, when large rhomboidal crystals of ordinary washing-soda are obtained. These consist of carbonate of soda, with ten equivalents of water. Hydrate of soda is made by boiling soda-ash solution with milk of lime, the operation being conducted by Messrs. Roberts, Dale, and Co., of Manchester, in their ordinary steam-engine boilers; by which means they not only causterize their soda for nothing, but keep their boilers perfectly clean and supply their engines with steam at an increased pressure. Hydrate of soda, or caustic soda, as it is termed commercially, is used largely by soap-makers in the manufacture of hard soaps. The crude carbonate is employed in glass-making, and soda crystals, or common washing-soda, for detergent purposes. Various experiments have been tried to improve Leblanc's process without effect, the only alteration of it since his days being the manufacture of the sulphuric acid from pyrites instead of sulphur. About ten years since, Mr. Longmaid patented a process for obtaining the sulphate of soda by fusing common salt and iron pyrites together in a reverbatory furnace; but it has not come into general use. A mixture of the carbonates of soda and potash fuses at a lower temperature than either of its constituents. It is therefore much employed as a means of decomposing silicious minerals in the laboratory.

Soda, Nitrate of, in Chem.—This salt occurs (like nitrate of potash) as an incrustation on the earth in certain hot districts, more especially in Chili and Peru, where it is found in layers of considerable thickness. It crystallizes in large rhombohedral masses—whence its commercial name of cubic nitre. Exposed to the air it deliquesces, and therefore cannot be substituted for nitre in the manufacture of gunpowder. It is largely used in the manufacture of nitric acid, being cheaper than nitrate of potash, and yielding a larger per-centage of acid. It was exported in large quantities during the Russian war (the trade in sulphate being interdicted, that article being contraband of war) for the manufacture of nitre by double decomposition with carbonate or sulphate of potash.

Soda, Phosphates of.—With phosphoric acid, soda forms a large number of crystallizable salts, the most important of which is the rhombic phosphate. It forms large transparent efflorescent rhombic prisms, which have a cooling saline taste, and are very soluble in water. It is used medicinally as a purgative, and is employed in analysis.

Soda, Sulphate of.—Purified sulphate of soda, popularly known as Glauber's salt, is used medicinally as a purgative. In its crude state it is manufactured in enormous quantities from common salt and sulphuric acid, forming *salt-cake*, one of the steps in the soda manufacture (which *see*). In its anhydrous condition, it sometimes forms an incrustation on the surface of the soil, in which state it is known to mineralogists as Thenardite. It is also a large product in the manufacture of nitric acid from nitrate of soda.

Soda, Sulphite of.—This salt is made on a large scale by passing sulphurous acid over moist soda crystals. By careful evaporation, it may be obtained in transparent five- or six-sided prisms, which, when exposed to the air, become covered with an opaque crust of sulphate of soda. It has been lately much employed as an *antiseptic*, for the preservation of wines and in refining beetroot sugar.

Sodium, *so-di-um*, in Chem.,—symbol Na (natrium); equiv. 23·97; spec. grav. 0·972; fusing-point 194° Fahr.,—the alkaline metal of which soda is the oxide. It was discovered in 1807 by Sir Humphry Davy. It occurs in large quantities in nature, chiefly in combination with chlorine, as *rock-salt*. It is also found united with oxygen in certain common minerals, such as albite, analcime, labradorite, and cryolite. It also occurs in the form of nitrate, carbonate, biborate, and sulphate. It is found in the ashes of plants, especially those which grow near the sea, such as the *Salsola Soda*, formerly the great source of sodium and its compounds, now principally obtained from sea- and rock-salt. Sodium has lately become an article of commerce, in consequence of the demand which has arisen for it for the manufacture of aluminum. M. Deville recommends the following method of manufacturing this valuable metal:—Dried carbonate of soda 717 parts, powdered charcoal 178 parts, and finely-powdered chalk 108 parts, are mixed intimately, and kneaded into a stiff paste with oil, and calcined in a covered iron pot. The mass is then introduced into a retort, and distilled with the same precautions as those used in the manufacture of potassium (which *see*). This mixture generally yields one-third its weight of sodium. Sodium is a yellowish-white lustrous metal, resembling silver more closely than potassium. It is soft, and may be readily cut with a knife or moulded with the fingers. Exposed to the air, it tarnishes immediately, becoming covered with a film of soda: it is therefore preserved in petroleum or some other hydrocarbon. Heated in the air or oxygen, it burns with a bright yellow flame, and is converted into soda. Thrown upon water, it decomposes it rapidly, but without eliminating sufficient heat to kindle the hydrogen formed. It is much used in chemical operations for the reduction of the elements having a great affinity for oxygen, such as boron, silicon, calcium, barium, magnesium, &c.; and in the arts for the reduction of aluminium. Its amalgam with mercury, from not requiring to be kept under naphtha, is frequently used for this and other purposes, when a strong deoxidising agent is required. Mercury is placed in a strong glass flask, and heated to about 300°; the sodium is then dropped in pieces the size of a pea. When the whole of the sodium is added, the amalgam is poured out in a flat dish until cold, when it is broken up in small pieces, and kept in a stoppered bottle.

Sodium, Bromide and Iodide of.—These two salts occur sparingly in sea-water and in the ashes of sea-plants, and are the principal commercial sources of iodine and bromine. Like the corresponding salts of potassium, they crystallize in anhydrous cubes, which deliquesce on exposure to the air.

Sodium, Chloride of.—This important substance constitutes the rock-salt of commerce, or common table-salt. (*See* Salt, Common.)

Soil, Cultivation of. (*See* Cultivation of the Soil.)

Soils, *soils* (Ang.-Sax.), a term applied in Agr. to the primitive earths in a state of mixture with organized matter fit for the growth of plants. The chemical examination of the soil affords to the farmer more certain and more valuable information for the improvement of its fertility than any other method of investigation. In this examination, it may be as well to mention that four earths are almost always the chief constituents of all cultivated soils; namely, silica, or flint; alumina, or clay; carbonate of lime, or chalk; and carbonate of magnesia. These substances are mixed together in an endless variety of proportions, and are interspersed with animal and vegetable remains, salts, &c., to an equally varying extent. In analysing soils, the most necessary and valuable object of the farmer is to ascertain the presence and extent of these substances. In every country, the surface of the land on which plants have grown and decayed is properly called *soil*; while the earth at a foot or more beneath the surface is usually called *sub-soil*. It is comparatively destitute of organized matter, and is called earth, clay, sand, gravel, lime, rocks, stones, &c., as it may be constituted.

Soja, *so'-ja*, in Bot., a gen. of the nat. ord. *Leguminosæ*. The legumes of *S. hispida* form the principal ingredient of the sauce called *soy*, which is imported from India in large quantities.

Solanaceæ, *so-la-na'-se-e*, in Bot., the Potato fam., a nat. ord. of *Dicotyledones*, sub-class *Corollifloræ*, thus defined by Bentley, according to the views of Miers, who places many genera usually included in this order in a distinct order called *Atropaceæ*:—Herbs or shrubs; leaves alternate, often geminate. Inflorescence axillary, or more frequently extra-axillary. Flowers inconstant.

Calyx with 5, or rarely 4 divisions. Corolla regular, or nearly so, 5-, or rarely 4-partite; estivation valvate, or subplicate-valvate. Stamens equal in number to the lobes of the corolla, with which they are alternate, the fifth stamen very rarely sterile; anthers introrse, with longitudinal or porous dehiscence. Ovary usually 2-celled, rarely 3—5-celled; style simple; stigma clavate, or 2-lobed. Fruit capsular or baccate, 3 or more celled. Seeds numerous, albuminous, with the embryo straight, or curved in a more or less annular or spiral form. The plants of this order are scattered over various parts of the globe, except the polar circles, but are most abundant in the tropics. They frequently possess narcotic properties, but not by any means to the same extent as the plants belonging to the *Atropaceæ* of Miers. (*See* Capsicum, Solanum.)

Solanum, *so-lai'-num*, in Bot., the typical gen. of the nat. ord. *Solanaceæ*. The tuber of *S. tuberosum* is the common potato, so largely used as food in temperate climates. The potato-plant is supposed to be a native of South America. It appears probable that it was first brought into Spain from the mountainous parts of South America, in the neighbourhood of Quito, early in the 16th century. From Spain, where the tubers were called *battatas*, it found its way to Italy, and thence to Vienna. The potato was first brought to England from Virginia, by the colonists of Sir Walter Raleigh's expedition, who returned in 1586. Starch is largely obtained from potatoes, and is used for food under the names of *English arrow-root*, *nutritious farina*, &c. It is also employed in the preparation of *dextrine*, or *starch-gum*, which is much used in the arts. A decoction of the stem and leaves of the potato-plant has been used as an alterative in cutaneous diseases, and an extract of the herb has been also employed as a narcotic and antispasmodic. The medicinal properties of the plant are chiefly due to the presence of an alkaloid, called *solanine*, which has powerful narcotic properties. This has been detected in all parts of the plant; but in the tuber only traces of it are found, and these are entirely removed by the process of boiling and preparing potatoes for the table. Another interesting species of *Solanum* is *S. nigrum*, the black nightshade, which possesses alterative and narcotic properties. The fruit is said to be edible; but if this be the case, its use for food requires caution, as it contains solanine. The fruits of several other species are, however, eaten in various parts of the world; as those of *S. Melongena* and *ovigerum*, called egg-apples; those of *S. quitoense*, called Quito oranges; and those of the Australian species *S. laciniatum*, commonly known as kangaroo apples. The species *S. marginatum* has astringent properties, and is employed in Abyssinia in the process of tanning. *S. Pseudo-quina*, a Brazilian species, is used medicinally in South America as a febrifuge.



POTATO.

Solar Cycle, *so'-lar*, a term applied to one of those artificial periods made use of in chronological researches. It comprehends a period of 28 years, compounded of 7 and 4, the number of days in a week and the number of years in the interval of two leap-years. This cycle will remain undisturbed until the end of the present century; but in consequence of the year 1900 not being reckoned as a leap-year, the whole cycle will then be overthrown. It may, however, be reconstructed after 2000, that year being reckoned as leap-year; it will then last until 2100.

Solar Eclipse, is a phenomenon arising from the moon passing between the sun and the earth, the sun's rays being thereby intercepted, and the body of the luminary disappearing. In the case of a lunar eclipse, the phenomenon arises from the earth intercepting the light which its satellite ought to receive. On the other hand, an eclipse of the sun is due to the passage between earth and sun of the lesser body. During an eclipse of the moon, the phenomenon is the same wherever the moon is visible; but in the case of a solar eclipse, *it* depends essentially on the position of the spectator whether there be any eclipse at all. Suppose two persons placed at different parts of the earth during a solar eclipse, one may, in consequence of his position, see the whole body of the luminary obscured, whilst the other person may see nothing in the appearance of the solar body to denote that the moon is near it. A familiar illustration may explain this clearly. A screen placed before a candle may eclipse the candle from one person in the room, but not from another. Very often eclipses of the sun are only partial; frequently the eclipse is not total, through the moon not being near enough to hide the entire body of the sun. In this particular instance, a portion of the bright disc of the sun appears behind the dark body of the moon as a bright ring: this is called an annular eclipse. Throughout the ancient literature of Greece and Rome there are many allusions to total eclipses of the sun, and the records of modern astronomy furnish many accounts of the same interesting phenomena. To notice some of the most imposing appearances arising during total eclipses of the sun. The luminous circle which surrounds the dark body of the moon when the sun is totally eclipsed is a most striking phenomenon. It forms a crown or corona of bright glory, of a pale silvery colour, similar in shape to that which painters love to draw round the heads of saints and angels. After observation, another appearance has been observed by astronomers. These are remarkable flame-like protuberances, which appear to issue from the moon's disc. Professor Airey states that one of them reminded him of a boomerang. Lastly, there is a phenomenon which, perhaps, owes its origin to an optical delusion. This singular appearance has been named "Baily's Beads." They were first observed at Jedburgh, in Roxburghshire, in 1836, by Mr. Baily, late president of the Royal Astronomical Society. He described them thus:—"When the cusps of the sun were about forty degrees asunder, a row of lucid points, like a string of bright beads, suddenly formed round that part of the circumference of the moon that was about to enter on the sun's disc. Its formation was so rapid that it presented the appearance of having been caused by the ignition of a fine train of gunpowder. These luminous parts increased in magnitude, some of the contiguous ones appearing to run into each other like drops of water. Finally, as the moon pursued her course, their dark intervening spaces were stretched out into long, black, thick parallel lines, until all at once the long threads suddenly broke and wholly disappeared, leaving the circumference of the sun and moon in these points, as in the rest, comparatively smooth and circular." No confirmation of the existence of Baily's Beads has been obtained, except in a few doubtful instances, during recent times. Appearances so extraordinary as these presented by an eclipse could not fail to excite terror and astonishment in the imaginative minds of the ancient inhabitants of our globe; but although during recent times we have never witnessed any of these awful effects described by the ancients as produced throughout nature during the time of a total obscuration of the sun, yet even in the last observation the effect of totality upon the bystanders was most remarkable. "Until the beginning of totality, the murmur of conversation of many tongues had filled the air; but then in a moment every voice was hushed, and the stillness was so sudden as to be perfectly startling." So speaks Mr. Warren de la Rue, who observed the total eclipse of the sun, July 18, 1860, at Rivabellosa, in Spain. This gentleman succeeded in obtaining several splendid portraits of the phenomenon, which were shown in the International Exhibition of 1862, and are at the present time in the South Kensington Museum.

Solar Spectrum. (*See* Spectrum.)

Solar System signifies the sun, the planets which revolve round it, their satellites, together with those periodic comets whose returns have been successfully predicted. The solar system, according to the modern view, includes the Sun as a governing body, yet not as a fixed centre; Mercury, Venus, the Earth, with its one satellite the *Moon*, Mars, the group of minor planets, amounting at the present time to eighty-four, *Jupiter* and its four satellites, Saturn and its triple ring, Uranus with its four satellites, Neptune

with its one satellite, and a large number of periodic comets. All these planets, accompanied by their satellites, together with numerous asteroids, move, as do also the comets, in elliptical orbits round the sun, which is situate in a focus common to them all; and by its mighty power of attraction, retains them in their orbits. The satellites, while revolving round the sun, likewise describe elliptic orbits round the primary planets. There is nothing more extraordinary in the whole phenomena of our system than the admirable regularity with which the planets are distributed in space. Before the discovery of the planets Ceres, Vesta, Juno, and Pallas, it had been ascertained that the distance of planets then known increased according to the following series:—Mercury 4, Venus 7, the Earth 10, Mars 16, supposed planet (Asteroids) 28, Jupiter 52, Saturn 100, Uranus 196, Neptune 388. In this series, the wanting number, 28, led to the supposition that a planet between Mars and Jupiter was missing. This supposition was confirmed by the discovery of a large number of little bodies, whose mean distance from the sun fills up its place in the series as well as that of any other planet. (*See* ASTEROIDS.) The formula by which those distances are shown was discovered by Bode, and is consequently called BODE'S LAW (which *see*). Our solar system is thus described by Sir John Herschel:—

| Planet. | Object representing it. | Representation of its Distance from the Sun. |
|---|---|---|
| Sun ..... | Globe of 4 feet diameter | |
| Mercury | Grain of mustard-seed... | 164 feet. |
| Venus ... | A pea ..... | 284 feet. |
| Earth ... | A pea ..... | 430 feet. |
| Mars ..... | A rather large pin's head | 654 feet. |
| Ceres, &c. | Grains of sand ..... | 1,000 to 1,200 ft. |
| Jupiter... | A moderate-sized orange | ½ mile. |
| Saturn ... | A small orange ..... | ⅘ of a mile. |
| Uranus... | A full-sized cherry, or small plum ..... | 1½ mile. |
| Neptune | A good-sized plum ..... | 2½ miles. |

Supposing the radius of the sun to be divided into 1,000 parts, there would be in the radii of the several planets:—Mercury 3½, Venus 8½, Earth 9, Mars 4½, Jupiter 97½, Saturn 85, Uranus 39. Supposing the bulk of the sun to be divided into a *million* parts, Mercury would be somewhat less than one-twentieth of one of the parts, Venus two-thirds of a part, the Earth three-quarters of a part, Mars one-tenth of a part, Jupiter 925 parts, Saturn 720 parts, Uranus 58 parts, Neptune 120 parts. Respecting the moon, it is nearly the third part of Mercury in bulk. With regard to the masses of the planets, Cavendish declares that if we take the Earth to be at mean five-and-a-half times the density of water, or about half that of lead, the density of the Sun may be considered as equal to asphaltum, or rather heavy coal; Jupiter the same, Uranus and Neptune both of a substance somewhat heavier, Saturn of maple-wood, the Moon of topaz or diamond; Mercury has been ascertained as having three times the density of the Earth, Venus nearly the same, and Mars about three-quarters as dense as the Earth. The period of time occupied by the Sun in making a revolution about its axis is 25½ sidereal days. Mercury, Venus, the Earth, and Mars, all revolve in from 23½ hours to 24½; Jupiter revolves in about 10 hours, Saturn in about 10½ hours. As to the revolution upon their axes of Uranus and Neptune nothing is known. Respecting the distances of the planets from the sun:—Mercury is 37 millions of miles, Venus 68 millions, the Earth 91,328,000 miles, Mars 143 millions, Vesta 225 millions, Juno 254 millions, Ceres 263 millions, Pallas the same, Jupiter 490 millions, Saturn 900 millions, Uranus 1 billion 900 millions, Neptune 2 billions 483 millions. Until a short time since, the distance of the earth from the sun was set down as being 95 millions of miles. The distance of the moon from the earth is 240,000 miles. The great French astronomer Laplace, with the view of giving a possible explanation of the resemblance existing between the motions of the several planets,—they all revolving in one direction round the sun, their satellites moving





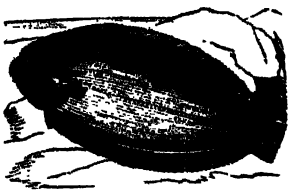
in the same direction round themselves,—promulgated the idea called the NEBULAR THEORY. He supposes that our solar atmosphere might once have extended to the limits of the system, and that the planets were thrown off successively in the form of nebulous rings, subsequently condensed into spheres from the equatorial parts of this vast revolving mass during its contraction. He ascribes to Saturn's ring a like origin. There is very little difference between the hypothesis of Laplace and that of Herschel, as will be presently shown, except the latter more prudently reserved his hypothesis for sidereal objects, and did not deduce from it a planetary cosmogony. Sir William Herschel supposes that starry matter was once in a state of indefinite confusion; that during an eternity of past duration it has been breaking up by condensation towards centres more or less remote; that the Milky Way, or at least the nebulous parts which it contained, and the dispersed nebulæ, are the relics of this former state of things. Briefly, that a completely-formed star may be assumed to be merely consolidated nebulæ. He also believes that this condensation must be accompanied by rotation, due to the originally irregular distribution of the gravitating particles. With respect to the stability of the system under which we live, the history of astronomy tells us that it has not undergone any change for upwards of two thousand years. Nevertheless, in consequence of certain discoveries, it was the popular belief, about the middle of the last century, that the whole of the planetary system would ultimately be absorbed by the vast mass of the sun. This view was taken principally in consequence of the labours of Lagrange, who ascertained that the elements of the planetary orbits are in a state of perpetual change. It next came to be a question how far such variations were likely to be continuous, and ultimately so great as to modify altogether the forms of the orbits, and even endanger the separate existence of the planets. Without attempting to deeply probe a subject too abstruse to be dealt with here, it will be necessary to explain that the stability of a planet previously depends on the stability of its major axis; for if the major axis and mean period increase or diminish without limit, the planets will diverge into infinite space, and after myriads of ages, rush to utter annihilation in the burning embrace of the sun. The first astronomer who probably perceived the stability of the major axis and mean motions was Laplace, who gave a demonstration that both are invariable. Therefore, we may regard the whole solar system as being subject to law and impassable limits; and thus permanence arises in the midst of change. Perhaps there is not in the whole range of modern astronomical discovery a more interesting and valuable fact than that many of the stars called fixed are subject to movement. The elder Herschel having examined the subject, announced that, like the stars, the sun and its attendant planets were also subject to a translation in space. He announced that the solar system was moving towards a point in the heavens near the star A Herculæ. These views have been confirmed by the subsequent researches of Sir William Herschel, Strave, Argelander, and others. The very latest view of the subject gives the motion of the sun and its planets as being at the rate of 150,000,000 miles yearly; and swift as this translation in space may appear, it is slow when compared with the motions of some of the hitherto considered fixed stars. The true theory of the revolutions of the solar system is due to Copernicus. The Copernican system is founded upon the opinions of the Pythogorean school of astronomers, and adopts the ideas of that ancient school. According to it, the earth is not the centre of the world, but has a double motion of rotation about its own axis, and of revolution round the sun, which body is the common centre of the orbits of all the planets which revolve around it. Although the Copernican system, in consequence of its great simplicity and beauty, rapidly found favour with the most philosophical of the astronomers living at the period of its promulgation, Tycho Brahe could never be brought to adopt the supposition of the motion of the earth. He therefore put forth another system, in which, while retaining the most essential advantages of the Copernican system, he at the same time maintained the stability of the

earth. It is needless to observe that at the present day the Tychonic system has become quite exploded. —*Rel. English Cyclopædia*; Herschel's *Outlines of Astronomy*; Arago's *Popular Astronomy*.

SOLAR TIME. (*See* TIME.)

SOLDIER. (*See* ARMY.)

SOLE, *sole* (*Solea vulgaris*).—The sole is distinguished from the flounder by having the mouth turned in an opposite direction with respect to the eyes, seemingly deformed, with teeth only on one side, and the front of the head almost always projecting. It inhabits the sandy shores all round our coast, where it keeps close to the bottom, feeding on the smaller testaceous animals and the spawn and fry of other fishes. As they seldom take any bait, they are caught almost entirely by trawling. The form of the body is a long oval, widest at a short distance behind the head; the colour on the upper side a dark brown, on the under side white.



SOLE.

SOLECISM, *sol'-e-sizm* (Gr. *soloikismos*), in Gram. and Rhet., is a violation of the rules of syntax, in the speaking or writing of a language. It is said to have received its name from a town in Cilicia, whose inhabitants spoke a barbarous Greek. A solecism differs from a barbarism, inasmuch as the latter denotes the use of a word or phrase not belonging to the language. Quinctilian specifies four different kinds of solecisms: (1) the addition of a superfluous word; (2) the leaving out one that is necessary; (3) perverting the order of the words in a sentence; (4) using an improper form of a word.

SOLFAING, or SOLMIZATION, *sol-fa'-ing*, *sol-mi-zai'-shun*, the art of sounding the notes and syllables of the gamut together. This preparatory exercise, which is of the highest importance in sight-singing, was adopted at a very early period. The Greeks used four syllables, *te*, *ta*, *the*, *tho*, to denominate the four sounds of their *tetrachord*. When Guido *D'Arezzo* substituted his *hexachord* in place of the ancient tetrachord, he adopted, at the same time, the syllables *ut*, *re*, *mi*, *fa*, *sol*, *la*, for his solmization, which he derived from the following stanza of a hymn to St. John the Baptist:—

> "*Ut* queant laxis
> *Re*sonare fibris,
> *Mi*ra gestorum
> *Fa*muli tuorum,
> *Sol*ve polluti
> *La*bii reatum,
> Sancte Joannes."

These six syllables are still employed by the French, with the addition of *si* for the seventh; the Italians have, however, changed the *ut* into *do*, as softer and more euphonious. This alteration has also been adopted in England; the seven notes are, therefore, now named as follows:—

| *Do* | *Re* | *Mi* | *Fa* | *Sol* | *La* | *Si* |
|---|---|---|---|---|---|---|
| C | D | E | F | G | A | B. |

SOLICITOR, *so-lis'-e-tor*, in Law, is the designation of persons admitted to conduct suits, &c., in the court of Chancery, as attorneys in the courts of common law. (*See* ATTORNEY-AT-LAW.)

SOLICITOR-GENERAL is an officer of the crown, who ranks next to the attorney-general, with whom, indeed, he is associated in conducting the legal business of the crown. (*See* ATTORNEY-GENERAL.) Usually, when the one has been selected from the common law, the other is chosen from the equity bar. When the office of attorney-general is vacant, or its holder otherwise engaged, the solicitor-general supplies his place; and when that office is vacant, the solicitor-general almost always succeeds.

SOLOMON'S SEAL. (*See* POLYGONATUM.)

SOLSTICE, *solf'-tis*, in Astron., denotes that time





when the sun is in one of the solstitial points; that is, when it is at its greatest distance from the equator; and is so called because he then appears to stand still, and not to change his distance from the equator for some time. There are two solstices in each year,—the summer and the winter solstice. The former is when the sun seems to enter the tropic of Cancer, which is on June 22, the longest day; the latter solstice is when the sun enters the first degree, or seems to describe the tropic of Capricorn, which is on December 22, the shortest day. This is only to be understood of the northern hemisphere; as in the southern, the sun's entrance into Capricorn makes the summer solstice, and into Cancer the winter solstice.

SOLUTION, *sol-u'-shun* (Lat. *solvere*, to untie).—If a liquid be poured on a solid, it often happens that their mutual attraction is sufficiently powerful to overcome the cohesion of the solid; its particles, thus become disunited, combine with those of the liquid, and entirely disappear: this constitutes the chemical process of *solution*. Certain liquids are also soluble in other liquids, gases in other gases, and gases in liquids. In the case of the solution of a solid in a liquid, the latter is usually called the *solvent*, but sometimes the *menstruum*. Particular solutions have also particular names; thus, a solution of sugar is called a *syrup*, and a solution of a solid in alcohol a *tincture*. A liquid is said to be *saturated* when it can no longer dissolve farther portions of a solid, that is, when the force of cohesion is exactly equal to that of adhesion. In most cases, however, an increase of temperature, by diminishing the cohesion, increases the solvent powers of the liquid. The uses of solution are many: through its means a body can be purified by filtration or crystallization, so that one substance can be separated from another, either by crystallization or the use of such fluids in succession as have a solvent power over any of the substances present.

SOMNAMBULISM, *som-nam'-bu-lism* (Lat. *somnus*, sleep, and *ambulo*, I walk about), literally and strictly signifies the walking in one's sleep; but it is commonly used in a wider sense, to denote that state of sleep or unconsciousness in which the mind retains its power over the limbs, but has no influence over its own thoughts. The controlling power of the will over the current of thought is entirely suspended, all the actions being directly prompted by the ideas which possess the mind. In some cases there is a coherent sequence in the succession of ideas, through which some one dominant impression may be traced, while in other instances it is more or less completely determinable by external suggestions. "In the first of the phases just referred to, a train of reasoning is often carried out with remarkable clearness and correctness, and its results expressed in appropriate language, or otherwise acted on. Thus, a mathematician may work out a difficult problem, an orator may make a speech appropriate to the occasion on which he supposes himself to be called up, or an author may compose and commit to writing poetry, or prose, upon the subject which occupies his thoughts. But it is a frequent defect of the intellectual operations, carried on in this condition, that through the complete absorption of the attention by one set of considerations, no account is taken of others which ought to modify the conclusion." "The second of the phases above mentioned, which is especially seen in the artificial somnambulism induced by the so-called mesmeric process, or by the fixed gaze at a near object (as practised under the name of *hypnotism*), is essentially the same as that of the biological condition, save in the different relation which they respectively bear to the waking state; for there is the same readiness to receive new impressions through the senses (the visual sense, however, being generally in abeyance), and the same want of persistence in any one train of ideas, the direction of the thoughts being entirely determined by the suggestions which are introduced from without." (Carpenter's *Human Physiology*.) (*See* MESMERISM.) Among the various curious phenomena connected with this state, not the least remarkable is the peculiar power which suggestions derived from the muscular sense have in determining the current of thought. Thus, if the face, body, or limbs be brought into an attitude that is expressive of any particular emotion, the corresponding mental

state is called up in correspondence to it; as, for instance, if the angles of the mouth be gently separated from one another, as in laughter, a hilarious disposition is immediately generated; and this may be made to give place to moroseness by drawing the eyebrows towards each other, and downwards upon the nose, as in frowning. In somnambulism proper, the individual gets out of bed, dresses himself, if not prevented; goes out of doors; walks frequently over dangerous places in safety; sometimes escapes by a window, and gets to the roof of a house; after a considerable interval returns, and goes to bed; and all that has passed conveys to his mind merely the impression of a dream. Frequently, during the paroxysm, the individual recollects circumstances which occurred during a previous attack, though there was no remembrance of them during the interval. It is unnecessary to speculate regarding the nature and cause of phenomena so obscure and so little understood.—*Ref.* Abercrombie's *Intellectual Powers*; Carpenter's *Human Physiology*.

Song, *song* (Sax.), is applied in general to a piece of music, whether contrived for the voice or an instrument. In poetry, it is a short composition consisting of easy and natural verses, set to a tune in order to be sung. In a song, the poetry and music are agreeably joined together, the verses are easy, natural, and flowing, and contain a certain harmony which neither shocks the reason nor the ear. A song has been defined to be a soft and amorous, or a brisk and Bacchic thought, expressed in *few* words; but this is to restrict it within too narrow limits; for we have devout songs, satirical songs, panegyrical songs, &c. According to Dr. Aikin, a song may "be largely defined a short poem divided into portions of returning measure, and turning upon some single thought or feeling." At all times, and in all places, songs have afforded amusement and consolation to mankind. Every passion of the human breast has been vented in song, and the most savage as well as the most civilized inhabitants of the earth have delighted in these effusions.

Song of Solomon. (*See* Canticles.)

Sonnet, *son'-net* (Ital. *sonetto*), is a species of poetic composition, consisting properly of fourteen iambic verses of eleven syllables. It is divided into two chief parts, each consisting of two divisions, in the former each comprising four lines (*quadrain*), in the latter three (*tersine*). The quadrains have two rhymes, each of which is repeated four times; and in the common Italian form the rhymes are the first, fourth, fifth, and eighth verses, and the second, third, sixth, and seventh; but several other forms are also adopted. In the two tersins, there are either three rhymes each twice repeated, or two rhymes thrice repeated in all positions. The sonnet generally contains one principal idea pursued through the various antitheses of the different strophes, and adorned with the charm of rhyme. Italy and Spain are the countries in which the sonnet is most cultivated, the lightness and flexibility of their languages being eminently suited for such compositions. England, on the other hand, has furnished few good sonnet writers; the principal being Milton, Drummond of Hawthornden, and Wordsworth.

Sophism, *sof'-izm* (Gr. *sophisma*), in Logic, is a syllogism which contains some fallacy apt to be overlooked at first sight. Most errors are sophisms, but usually the latter term implies also that the person using it is in some measure conscious, and endeavours to conceal it by subtlety. It is so constructed as to seem to warrant the conclusion, but does not, and is faulty either in form or argument.

Sophists, *sof'-ists* (Gr. *sophistes*, from *sophia*, wisdom), was the name given to a class of philosophers who arose in ancient Greece about the 5th century B.C. They went about discoursing and debating, and taught for hire the youth of rich and noble families. Hence they came to be regarded as pursuing philosophy more for the sake of gain than from any proper love of it. They cultivated the various arts of persuasion, and in their attacks upon each other, labouring to expose and lay bare the delusions of appearance, they acquired great dexterity in the use of terms, and frequently attempted to secure victory by the use of specious fallacies. Some of them, indeed, professed to instruct in the art of making all sorts of questions, and how to speak for or against any cause whatever. Hence they were frequently held up to ridicule by Socrates and Plato; but there can be no doubt that their labours were of service in tending to improve the language. "The very circumstances," says Ritter, "that their rules were intended to be subservient to the ends of fallacy and deception must have afforded a stronger motive to the philosophical spirit to bring under investigation the true forms of thought and expression which had been neglected by earlier philosophers; and, accordingly, we find that they occupied much of the attention of Socrates." The most distinguished of the sophists were Protagoras of Abdera, Hippias of Elis, Gorgias of Leontium, Prodicus of Ceos, and Brithydemus of Chios.

Sorbonne, *sor-bon'*, was the name of a celebrated college of France, founded by Robert de Sorbonne, an ecclesiastic of the 13th century. It was originally intended for the support of secular priests who should devote themselves wholly and gratuitously to the work of instruction in theology. The members of the college were all either doctors or bachelors of theology, and the high reputation which they enjoyed caused them to be continually appealed to on questions of theology or morals. Not less inimical to the Jesuits than to the Reformation, the Sorbonne steadfastly maintained the liberties of the Gallican church, and in the Jansenistic disputes, though not taking part with the Port Royalists, it was always opposed to the Jesuits. Afterwards the name of Sorbonne was applied to the whole theological faculty of the Parisian university.

Sorghum. (*See* Holcus.)

Sorosis, *so-ro'-sis*, in Bot., a collective fruit, formed of a number of separate flowers, firmly coherent into a fleshy or pulpy mass with the thalamus upon which they are situated. The pineapple is an example; each hexagonal division represents a flower, while the crown of leaves above consists of empty bracts. The bread-fruit, jack-fruit, and mulberry, are other examples. At first sight the mulberry appears to resemble the raspberry, but is totally different in origin and structure. (*See* Etærio.)

Souari Nut. (*See* Caryocar.)

Soul, *soul* (Gr. *psuche*, Lat. *anima*), in Philos., is applied to the inner or spiritual principle of man. According to Aristotle, the soul is that by which we live, feel, will, move, and understand. Among modern philosophers in Germany, a distinction is made between soul (*Seele*) and spirit (*Geist*), the former being the inferior part of our nature, that which shows itself in the phenomena of dreaming, and is connected with the brain; the latter, that part of our nature which tends to the purely rational, the lofty, and divine. There is believed to be evidence for this distinction in Scripture, where the apostle Paul speaks of the Word of God as dividing asunder the soul and spirit,—the former being regarded as the sentient or animal principle in our being, the latter the rational. This twofold division of man's inner nature was common among the ancient Greek philosophers, the soul being regarded as the principle of life, the spirit the principle of intelligence. When, however, it is unnecessary to make a distinction between the two, the term soul is used for both.

Soulamea, *soo-lai'-me-a*, in Bot., a gen. of the nat. ord. *Polygalaceæ*. *S. amara*, a native of Moluccas, is intensely bitter, and is said to be a valuable febrifuge, and also a valuable remedy in cholera and pleurisy.

Sound, *sownd* (Sax. *son*).—Sound is produced by causing the air or any other elastic body to assume a vibratory motion. No body can produce a sound unless its parts be put in rapid motion. The string of a musical instrument, a tuning-fork, or the parchment head of a drum, are not sonorous, unless their particles be caused to assume a state of vibration. It is likewise necessary that there should be an elastic substance, whether solid or fluid, between it and the ear, or the sound will not be appreciable. For instance, a bell rung under the exhausted receiver of an air-pump will yield scarcely any sound. Although air, from its being the medium most commonly in contact with the membrana tympani of the ear, is the most general conductor of sound, yet other agents are capable of transmitting sound. A bell rung under the waters of Lake Geneva was heard across the whole extent of the

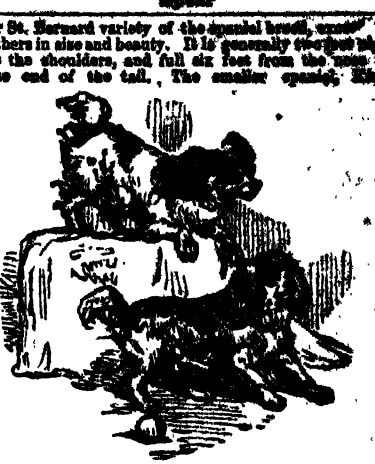
water, a distance of nine miles. With respect to its production in the air, Sir John Herschel has shown that in round numbers, sounds of every intensity travel, at the temperature of 62° Fahr., at the rate of 1,125 feet per second, equal to 12¾ miles per minute, or 765 an hour. The velocity with which sound travels through different bodies varies greatly. Assuming its velocity in air as = 1, the rate at which sound travels through other substances is,—distilled water, 4·8; sea-water, 4·7; tin, 7·5; silver, 9; cast iron, 10; brass, 10·5; wood, 11 to 17; copper, 12; hammered iron, 17. The intensity of sound is much augmented if the vibrations be confined in tubes and cavities of any kind. By means of a speaking-pipe, sounds, however slight, may be transmitted from one part of a building to another, whilst the stethescope conveys to the ear the slight but ominous sounds that are generated in the chest. Biot ascertained that the slightest sound can be heard through an iron pipe 3,120 feet in length. Sound is reflected like light; reflected sound being termed an echo. In some localities of Switzerland, the mountaineers so contrive to sing their Ranz des Vaches, that the echo forms an agreeable accompaniment to the air itself. Some sounds are different only in intensity or loudness, as the reports of a musket and of a cannon; other sounds differ in musical pitch, as two notes from the same instrument; while others again are different in character or tone,—what the French call *timbre;* as, for instance, the same note sounded upon a trumpet and upon a flute. We have seen that sound is produced by a certain vibratory force being transmitted through air, producing what is termed a wave of sound. The ear is designed to take cognisance of these pulses of force, waves, or tremors within certain limits. The nature of things prevents a single wave of sound from ever coming alone. The more nearly alone a wave comes, the more sharp and sudden the sound. When several nearly equal waves come at irregular intervals, the sound is called a noise. When the waves are equal, and at equal distances, the sound is called a musical tone. The middle C between the bass and treble clef is produced by waves about 8 ft. 10 in. apart; waves at half that distance apart produce a tone one octave higher. If the distance apart of the waves of one note bears a simple ratio (½ ⅔ ¾ ⅘ ⅚ ⅞ ⅛ or ⅑) to the distance apart of the waves of another note, the two notes harmonize; otherwise they are discordant. The gravest musical sound is produced by about 16, and the sharpest by about 12,000 vibrations in a second; but this statement must be taken with some qualification; for, as Dr. Wollaston has shown, the power of appreciating sounds differs greatly in different persons.—Ref. *English Cyclopædia;* Golding Bird's *Natural Philosophy.*

SOUR-SOP. (*See* ANONA.)

SOY. (*See* SOJA.)

SOYREIDA, *soy-me-da*, in Bot., a gen. of the nat. ord. *Erythroxylaceæ. S. febrifuga* is the rohuna or red-wood tree. Its bark is tonic, febrifugal, and astringent.

SPANIEL, *spān-yel* (Fr. *épagneul*), (*Canis familiaris extrarius*), a dog of much antiquity, and one whose breed has been particularly attended to in various countries, particularly the Eastern. All the varieties of the spaniel are more or less elegant; and the spaniel has been divided into more varieties than any other dog. The distinguishing characteristics of the race are,—a rather broad muzzle, remarkably long and full ears, the hair plentiful and beautifully waved, particularly that of the ears, tail, and hinder part of the thighs. The prevailing colour is liver and white; sometimes red and white, or black and white; sometimes deep brown or black on the face and breast, with a tan spot over each eye. The true English-bred spaniel, called a springer, differs but little in figure from the setter, except in being not so tall. Their form is also more delicate, their ears longer, very soft and pliable, and covered with a coat of long waving and silky hair; the nose is red or black; the tail bushy and pendulous. The cocker, so called from his appropriation to woodcock-shooting, is a still smaller spaniel, still more compact in its frame, and his hair still more waved and curling than that of the springer. The water-spaniel (*Canis aquaticus*) is a sturdy spaniel with crisped hair, and with head rather larger and rounder than those of the land-spaniels. The Alpine, or St. Bernard variety of the spaniel breed, exceeds others in size and beauty. It is generally twenty-four inches at the shoulders, and full six feet from the nose to the end of the tail. The smaller spaniel, King



KING CHARLES'S SPANIEL.

Charles's dog (*Canis brevipilis*), is a small variety of the spaniel used as a lapdog. The Maltese dog and the lion-dog (*Canis leoninus*) are small species of spaniel. The first is supposed to have sprung from the intercourse of the little spaniel with the smaller water-dog. It has the hair all over the body very long and silky, and generally pure white. The other has long silky hair about the head, neck, shoulders, and extremity of the tail, but on the other part short, giving the little animal a leonine appearance. The Newfoundland dog is placed by most authorities in the spaniel group, to which its form, its coat, and its hunting propensities, evidently entitle him.

SPARROW, *spăr-ro* (Sax. *speara*), (*Fringilla domestica*).—This well-known bird, the constant attendant of civilized man wherever it is found, is common over the whole of the United Kingdom, including the islands of Orkney and Shetland, as also in Denmark, Norway, and Sweden, being more numerous in the last country, if possible, than with us. From thence, southward, its range is extended to Spain, Portugal, and North Africa; in the south-east it is found in Italy, Corfu, Dalmatia, and the Ionian islands. It is found, in fact, almost throughout the eastern continent, supporting equally well severe cold and extreme heat. Its voracity is extreme; and it is sometimes so numerous as to do great injury to the grain-fields. The beak of the adult male in summer is a bluish lead-colour; the top of the head a bluish-grey; over the ear-coverts, nape of the neck, back and wings, rich rufous brown, the centre of each feather nearly black; tail nearly square; the throat and chin black; the cheeks and sides of the neck greyish-white; breast dull greyish-brown, spotted with black; belly and under tail-coverts greyish-white. The whole length is rather more than six inches. The female has a brown beak; the head and neck of a uniform brown colour; the chin, throat, breast, and all the under surface of the body pale wood-brown. The sparrow forms its nest under the eaves of houses, in holes in the walls, or in any cavity which will afford sufficient space for it. Two or three sets of eggs are produced in the season.

SPASM, *spāsm* (Gr. *spasmos*, from *spāo*, I draw), in Path. is an involuntary contraction of muscular tissue, or that state of contraction of the muscles which is not spontaneously disposed, to alternate with relaxation. When the contractions alternate with relaxation, and are frequently and preternaturally repeated, they are called convulsions. Spasms are distinguished as clonic and tonic; the contractions in the former alternating with relaxations, as in *epilepsy*, but in the latter remaining fixed, as in *lockjaw*.

SPEAKER. (*See* PARLIAMENT.)

SPEAR, *spēer* (Sax. *speare*), a weapon employed both in war and in hunting, consisting of a long wooden

handle, having at one end a sharp spike of steel. It is sometimes called a lance.

SPECIES, *spē'-shēz* (Lat.), a term used in scientific classification to denote a group of such individuals as have an essential identity in all qualities proceeding from their alternate constitution or nature. The term employed to designate a collection of individuals which resemble each other more closely than they resemble any other plants, and which can be reproduced by seed. The following illustration is given by Professor Bentley:—"If we walk into a field of wheat, barley, or oats, we observe thousands of individuals, which, though differing to a certain extent in size, and in some other unimportant characters, we at once associate together under a common name. In a like manner, we commonly observe around us, in the gardens and fields, similar collections of individuals. Such collections of plants thus seen to resemble each other in all their important parts, constitute our first idea of species; and that idea is at once confirmed, if, by taking the seeds of such plants and sowing them, we obtain other plants resembling those from which such seeds have been obtained." Species under certain circumstances are liable to variations, but all varieties have a tendency to revert to their original specific type. A species is generally considered as a permanent production of nature, which is capable of varying within certain limits, but in no cases capable of being altered so as to assume the characters of another species. Sir David Brewster, Darwin, and his followers, hold a different opinion, and contend that species, so far from being immutable, are liable to change of almost any extent; in fact, that plants, by the operation of causes acting over a long period of time, may become so altered that they preserve scarcely any apparent resemblance to those from which they sprung.—*Ref.* Darwin *On the Origin of Species*.

SPECIFIC, *spe-sif'-ik* (Lat.), in Med., is a remedy which acts on a particular organ, or uniformly checks any particular disorder. Thus, cinchona is a specific in certain kinds of intermittent fever.

SPECIFIC GRAVITY, or SPECIFIC WEIGHT, *spe-sif'-ik*, a term used to express the weight of a given bulk of any solid, liquid, or gas, as compared with some body taken as a standard; thus, taking a given bulk of water to consist of 1,000 atoms, an equal bulk of platinum will contain 23,000; of copper, nearly 9,000; of iron, about 8,000; and of glass, about 3,000; these numbers being in proportion to the specific gravity of the respective substances. The specific gravity of all substances, except the gases, is determined by a ready mode of weighing them in distilled water, after the celebrated principle of Archimedes. (*See* ARCHIMEDES, PRINCIPLE OF.) The specific gravity of a solid is ascertained by weighing the substance in air and in water. If the solid be heavier than water, it is first weighed in air, next immersed in water, it will appear to have lost weight,—this, too, being carefully ascertained. The weight of the substance in water is subtracted from its weight in air, the latter being divided by the difference, the quotient affording the specific gravity desired. If the substance be lighter than water, it is sunk in the water by being fixed to a solid heavier than water,—the weight of this heavy solid both in air and water being known. The compound is weighed both in air and water, the loss of weight being ascertained. Find the difference between this loss and the loss sustained by the heavy body when weighed alone in water; with this number divide the weight of the light body: the result will afford its specific gravity. The specific gravity of a fluid may be readily ascertained by comparing the weights of equal bulks of distilled water and of the fluid whose specific gravity is sought; for on dividing the weight of the fluid by that of the water, the quotient will give the specific gravity. The specific gravity of a gas is ascertained in a manner similar to that of a liquid, except that atmospheric air is taken as the standard of unity. If a copper or glass flask, provided with a good stopcock, be weighed, firstly when filled with air, and secondly when exhausted as perfectly as possible by means of an air-pump, the difference of these weights will give the weight of air contained in the flask. If the flask be now filled with the gas under examination, and carefully weighed, this weight, after deducting the weight



of the flask, will give the weight of the gas. The weight of the gas divided by that of the same bulk of air will afford the specific gravity of the gas as compared to air. The water used in determining the specific gravity of bodies should be taken at the convenient standard of 60° Fahr.—Ref. *English Cyclopædia; Natural Philosophy*, by Dr. Golding Bird and Mr. Brooke.

SPECTROSCOPE. (*See* SPECTRUM ANALYSIS.)

SPECTRUM, *spek'-trum* (Lat. *specto*, I behold), is the term given to the coloured image of the sun when the light proceeding from it is transmitted through a prism and permitted to fall upon a screen. This fact of a decomposition, or separation into a system of pencils, of a single pencil of light, was first discovered by Newton, who admitted into a dark chamber through a small aperture in a shutter, a pencil of white or undecomposed light. This pencil was refracted by means of a prism of glass, the image being thrown upon a screen in the shape of an elongated stripe of colours, called the prismatic spectrum. This stripe is made up of seven successive bands, of different colours, the lowest of which, or the least refracted portion, is red; orange, yellow, green, blue, indigo, and violet following. Between these different tints it is impossible to point out any distinct line of demarcation, the whole melting into each other. Dr. Wollaston was the first to discover lines in the spectrum. He observed two of these, and subsequently counted nearly a thousand. The relative positions of these lines had names assigned to them by Professor Fraunhöfer, whose name they bear. The sun, the planets, and almost every fixed star, have each their own system of lines. In the solar spectrum, the intensity of light appears to be greatest in the yellow band. The calorific powers of the spectrum increase from the violet to the red extremity. The chemical action of the solar spectrum appears to be greatest in the violet band, and in the dark space beyond.—Ref. *Natural Philosophy*, by Dr. Golding Bird and Mr. Brooke.

SPECTRUM ANALYSIS, a method of determining the chemical constituents of substances by examining the spectra of their flames, as shown in an instrument devised for the purpose, called a spectroscope. It consists essentially of a tube, at one end of which is a convex lens, at the other an adjustable slit. Near the lens is placed a triangular prism, in such a position that the rays of light passing through the slit and convex lens may fall upon it at a certain angle, varying according to the refractive power of the prism. On the other side of the prism is a telescope of low magnifying power, which receives the rays refracted by it. A lamp of great heating power, but giving off little light, being placed before the slit, a portion of the substance under examination is burned in the flame upon a piece of platinum wire. The substance in burning gives the flame certain colours; these are refracted into their proper places on the spectrum by the prism, and examined by the telescope. It has been found that almost every element when burnt gives off light of a tint peculiar to itself. Thus sodium gives an orange light, refrangible into two lines of nearly equal colour. Potassium, which burns with a purple flame, produces, as might be expected, red and blue lines. Lithium also gives red and blue lines, but of a different tint, and in a different part of the spectrum. Calcium gives red, yellow, green, and blue; barium an almost infinite number of green; and so on. Spectrum analysis affords the means of detecting almost infinitesimal portions of various elements. Sodium, for example, may be detected in quantities not much more than the millionth of a grain. Since the practice of this branch of analysis has obtained amongst chemists, no less than three, perhaps four, new elements have been added to our already numerous list. Messrs. Bunsen and Kirchhoff, on examining the evaporated residue of a certain mineral water, noticed a new light blue line, which did not belong to any element with which they were acquainted. They rightly conjectured that it was caused by a new elementary substance, which they named cæsium, and which they shortly afterwards obtained in bulk from the same and other sources. In the same manner they discovered rubidium; and our own countryman, Mr. W. Crookes, F.R.S., added thallium to the list of elements. A good manual of spectrum analysis is much wanted,

the information on the subject being scattered throughout the scientific periodicals of Europe and America. The last edition of Fowne's "Chemistry" contains an excellent *résumé* of what is at present known of the matter. Dr. Roscoe has also translated an unfinished article of Bunsen and Kirchhoff on the subject.—See also *Silliman's Journal*, the *Philosophical Magazine*, and the *Chemical News*, passim.

SPECULUM, *spek'-u-lum* (Lat.), in Optics, a reflector formed of polished metal, in distinction to one made of glass, to which the term *mirror* is generally applied. The earl of Rosse, who has been very successful in the production of large specula, says, in a paper published in the *Transactions of the Royal Society*:—"Tin and copper, the materials employed by Newton in the first reflecting telescope, are preferable to any other with which I am acquainted, the best proportion being 4 atoms of copper to 1 of tin (Turner's numbers); in fact, 126·4 parts of copper to 57·89 of tin." Copper in excess imparts a reddish tinge, while zinc in excess renders the fracture granulated and less white. When speculum metal is perfect, it should be white, glassy, and flaky.

SPERMACETI, *sper-mā-set'-te*, a crystalline solid fat obtained from the oil found in the brain of the sperm whale, from which it readily crystallises, especially in cold weather.

SPERMATOZOIDS, *sper-ma-to-zoids'* (Gr. *sperma*, seed; *zoon*, an animal), in Bot., small cells containing moving filaments, which have been detected in antheridia. They are also called *phytozoa* (Gr. *phuton*, a plant; *zoon*, an animal). Each spermatozoid is formed in a special cell, is rolled upon itself in a spiral manner, and escapes either by a pore or by a dissolution of the wall of the cell. Similar moving spores have also been observed in the theca and sporangia of many cryptogamia.

SPERM OIL, *sperm*, in Man., the liquid portion of the fat of the spermaceti whale. The crude oil contains a small quantity of a peculiar oil, termed phocenin by Chevreul, which gives it a very disagreeable odour and taste, and traces of gelatinous matter. These impurities are removed by adding to the oil a solution of chloride of lime and a small quantity of decoction of oak-bark, after which it is agitated with a small quantity of sulphuric acid, clarified by subsidence, and washed to remove adhering sulphuric acid. Sperm-oil becomes semi-solid at 45° Fahr.

SPERM WHALE, or SPERMACETI WHALE (*Physeter macrocephalus*), a species of whale found chiefly in the South Seas. In length, it comes next to the *Balæna Physealis*, but generally exceeds it in bulk. In commercial value it is nearly equal to the *Balæna Mysticetus*; for, although it does not possess the valuable whalebone of that animal, it furnishes us with the substance called *spermaceti*, and is rich in abundance with the finest oil. The sperm whale is also the source of the perfume termed *ambergris*. Its usual length is about eighty feet, and its circumference between thirty and thirty-five feet; although some have been caught exceeding even these dimensions.

SPIDER, *spi'-der* (*Arachnida*), an insect destitute of a distinct head, and wanting antennæ, in which one-half of the body is suspended from the other by a very slender peduncle, in which the integuments are so soft as not to bear the least pressure, whose limbs are so slightly attached to the body that they fall off at a very slight touch. The palpi resemble small feet without a claw at the tip, terminated at most in the females by a small hook, but in the males supporting various appendages, more or less complicated, connected with the function of reproduction in this family. The frontal claws are terminated by a movable hook, which curves downwards, and has on its under side a little slit for the emission of a poisonous fluid, which is secreted in a gland of the preceding joint. The thorax has upon it a like impression, indicating the region of the head: it consists of a single piece, to which is attached behind a movable and soft abdomen. This part of the body is furnished with four or six nipples, fleshy at the tips, round or conical, jointed, placed close together, and pierced at the extremity with an immense number of minute orifices, or spinnerets, for the discharge of silken threads, which are produced from matter formed in internal reservoirs. The internal apparatus for secreting the silk is lodged within the abdomen near its posterior extremity, and consists of a small number (four or six, according to the species) of twisted, elongated, and unequal-sized vessels, being thickest at the middle, at the extremity of which are a great number of similar vessels, but of much smaller size, and considerably shorter, and which are pressed against each, uniting in a common base, which is in connection with the external apparatus. The matter discovered in the internal vessels is analogous to a gum or transparent paste. It is not soluble in spirits of wine or in water; it breaks when it is attempted to be bent, and, like glass, can only be made flexible when it is divided into very thin threads. This matter is discharged from several series of minute bristles, like points (spinnerules), surrounding the spinnerets, about one thousand to each spinneret. From these points there exude as many little drops of the above-mentioned liquid, which, becoming dry the moment it reaches the air, forms so many delicate threads. The threads of each spinneret first unite together, and then with those of the neighbouring spinnerets, to form a common thread; so that the thread of the spider, when it suspends itself from any object, is composed of an immense number of minute filaments. The first object which the spider has to accomplish is to attach her thread to some object as the commencement of a groundwork for her future operations. In doing this, it appears that she extends her spinnerets as widely as possible, presses them against the object to which it is intended that the thread should be attached, and then discharges a thread from each of the spinnerules. The insect uses her hind legs as a reel to draw the threads out of her body. The spinnerets of the same spider differ in structure, one set of spinnerets being employed in producing threads which are glutinous, whilst another set produces threads which are smooth. It is by means of these threads that spiders construct the various webs which they throw from one object to another for the purpose of entrapping their prey, the glutinous threads being arranged in circles and the smooth threads being used as radii. (*See* also BIRD-CATCHING SPIDER.)

SPIGELIA, *spi-je'-le-a*, in Bot., a gen. of the nat. ord. *Loganiaceæ*. The most important species is *S. marylandica*, the Carolina pink, wormseed, or perennial wormgrass. Its root and leaves are much employed in North America as anthelmintics. In larger doses they operate as irritant cathartics, and in poisonous doses as narcotics.

SPINACH, *spin'-dj* (Lat. *spinacia*), a well-known pot-herb, extensively cultivated throughout Europe. (*See* CHENOPODIACEÆ.)

SPINE, SPINAL CORD, *spine* (Lat. *spina*, a thorn).—The spine, in Anat., is the long articulated bony column at the back of the trunk, extending downwards from the head its entire length. It forms the basis of support of the trunk, and connects all the other parts of the frame. Its interior is hollow, and contains the spinal cord; its lower end rests on the pelvis. It is usually divided into two portions, a superior and inferior; the former flexible, and composed of twenty-four bones, or true vertebræ; the latter more fixed, and composed of nine bones, or false vertebræ. The true vertebræ are divided into cervical, dorsal, and lumbar; the false form the os sacrum and coccyx. Each vertebra consists of two parts, the body of the bone and the arch; the former being solid, convex before and concave behind; the latter being formed of two pedicles and two laminæ, supporting seven processes; namely, four articular, two transverse, and one spinous process. The bodies of the vertebræ are piled one upon another, forming a strong pillar for the support of the cranium and trunk; the arches forming behind a hollow cylinder for the protection of the spinal cord. Between each pair of vertebræ apertures exist, through which the spinal nerves pass from the cord. The several vertebræ are united together by means of a substance compressible like cork, which is firmest and hardest externally, and gradually becoming thinner and softer, till at length in the centre it is in the form of a mucous substance. There are likewise many strong ligaments which unite the bones of the spine to each other. The form and

character of the different vertebræ differ considerably in the different parts: those of the neck are smaller in the body, and of a firmer texture, than those of the other parts; the dorsal vertebræ are of a middle size between the cervical and lumbar, the upper ones more nearly resembling the cervical, the lower the lumbar, which last are larger than the dorsal. The first and second cervical vertebræ differ from the other vertebræ of the spine, to allow of the various movements of the head. The first is called the atlas, from its supporting the head, and forms a kind of bony ring; the second the dentata, from the tooth-like process on the upper part of its body, which articulates with the former. The spinal cord is that portion of the cerebro-spinal nervous system which is contained in the spinal canal. Its length is usually about sixteen or seventeen inches, terminating in the adult in a slender filament of grey substance about the lower border of the body of the first lumbar vertebra. It does not nearly fill the canal, its investing membranes being separated from the surrounding walls by areolar tissue and a plexus of veins. Its membranes are three in number. The most external is the dura mater, a strong filamentous membrane, which forms a loose sheath round the cord. The most internal is the pia mater, a cellulo-vascular membrane, which closely invests the entire surface of the cord; while between the two is the arachnoid membrane, an intermediate serous sac, which envelops the cord, and is then reflected on the inner surface of the dura mater. The surface of the cord is marked by two enlargements,—an upper, or cervical, which is the larger, and extends from the third cervical to the first dorsal vertebra; the latter being situated opposite the last dorsal vertebra. In form, the cord is a flattened cylinder. Its anterior surface presents along the middle line a longitudinal fissure, called the anterior median fissure; and its posterior surface another, called the posterior median fissure. These fissures divide the cord into two symmetrical halves, which are united in the middle line throughout their entire length by a transverse band of nervous substance called the commissure. There are besides several lateral fissures very slightly defined. When cut transversely, the spinal cord is seen to consist of white and grey nervous matter. The former is situated externally, and constitutes its chief portion; the latter occupies its centre, and is so arranged as to present two crescental masses placed one in each lateral half of the cord, united together by a transverse band of grey matter,—the grey commissure. The posterior horn of each crescental mass is long and narrow, and approaches the surface at the posterior lateral fissure, near which it presents a slight enlargement; the anterior is short and thick, and does not quite reach the surface. The grey commissure connecting the two crescentic masses consists of a transverse band of grey matter, and of white fibres derived from the opposite half of the cord and the posterior roots of the nerves. The nerves of the spinal cord consist of thirty-one pairs issuing from the sides of the whole length of the cord, their number corresponding with the intervertebral foramina through which they pass. Each nerve arises by two roots, an anterior and a posterior, the latter being the larger. The roots emerge through separate apertures of the sheath of dura mater, and directly after their emergence a ganglion is formed on the posterior root, the anterior root lying in contact with the anterior surface of the ganglion, but none of their fibres intermingling. Immediately beyond the ganglion the two roots coalesce, and by mingling their fibres form a compound or mixed spinal nerve, which after issuing from the intervertebral canal, divides into an anterior and posterior branch, each containing fibres from both roots. The spinal cord is a nervous centre, or rather an aggregate of many nervous centres, and has the power of conducting impressions or states of nervous excitement. Through it the impressions made upon the spinal sensitive nerves are conducted to the brain, where alone they can be perceived by the mind; and through it also the stimulus of the will applied to the brain excites the action of the muscles supplied from it with motor nerves. As a nervous centre, it has the power of communicating impressions from sensitive to motor nerve-fibres independent of the will, which is usually termed the reflex function of the spinal cord. Thus the movements of the pharynx and œsophagus are involuntary, for the will cannot arrest or modify them. A portion of food being conveyed by voluntary efforts into the fauces, is carried by successive involuntary contractions of the constrictors of the pharynx and muscular walls of the œsophagus into the stomach. These contractions are excited by the stimulus of the food on the sensitive nerves of the pharynx and œsophagus conducted to the spinal cord, and thence reflexed through the motor nerves to these parts. The spinal cord, like other parts of the body, is subject to various diseases, one of the most common of which is inflammation, which may be either acute or chronic, affecting the cord itself or its membranes. It is characterised by pain more or less acute, extending throughout the length of the spine, or confined to a certain portion of it. It is much increased by every movement of the spine, and in many cases is more or less intermittent. It frequently also gives rise to spasmodic or paralytic affections of various parts. It is always a highly dangerous disease, and in general requires similar treatment with inflammation of the brain. (*See* BRAIN, DISEASES OF THE.) *Spina bifida*, or divided spine, consists in an imperfection of the posterior part of the spinal canal, and is almost always accompanied by an excessive secretion of the spinal fluid. It is almost always characterised by a tumour situated over the defective vertebræ, and varying in size according to the extent of the fissure in the spinal canal. It commences when the spine is being formed in fœtal life, and may continue for ten, or even twenty years, without affecting the general health; but the tumour is liable to inflame and ulcerate by friction, and thus produce death. A gentle pressure on the tumour, so as to resist the effusion of the fluid, is recommended.

SPINET, *spin-et'* (Ital. *spinetta*), an instrument of the pianoforte kind. The date of its invention is unknown, but it was, according to Marot, in common use in France during the reign of Francis I. (A.D. 1515-46). It succeeded the *virginale*, from which it seems to have differed very little, and consisted of a case, sounding-board, keys, jacks, and a bridge. Queen Anne possessed one of the finest spinets ever made, which she valued so highly that, just before her death, she gave special directions that it should go to the master of the children in the Chapel Royal, and regularly descend to his official successors. The spinet seems to have gone entirely out of use since the middle of the last century, the pianoforte having superseded it and every other instrument of its kind.

SPINNING, *spin'-ning*.—In order to reduce the fibres of cotton, wool, flax, &c., to fine threads of uniform size, for the purpose of being woven, they are subjected to the well-known process of spinning. Up to the middle of last century, this process was performed by hand, with the assistance of the common spinning-wheel. To a rapidly revolving spindle, driven by a large wheel, locks of cotton or wool previously carded were attached, and the fibres were stretched or drawn out by the hand, at the same time that they were twisted by the spindle upon which they were afterwards wound. This primitive method of spinning is still extensively practised in the East, and is not entirely superseded in some remote districts of Scotland. By its means the spinner can only produce one thread at a time; but with the spinning machinery, which has been called into existence by the cotton manufacture, one individual may produce nearly two thousand threads at the same time. (*See* COTTON MANUFACTURE.) In Sheffield and Birmingham there is a peculiar branch of manufacture, which may be termed *metal-spinning*, in which articles of use or ornament are produced without forging, casting, stamping, or cutting, but merely by bringing into action the ductility of the metal. The metal employed is generally one of the soft mixed white metals, such as Britannia metal. Teapots and similar articles are made in this metal, almost entirely by the process of spinning. A wooden mould is first prepared, of the exact size and shape of the article required; and this mould is fixed upon a lathe. A circular piece of thin metal is then fixed temporarily in contact with the bottom of the lathe. While the mould is rotating, burnishers and smooth tools are then pressed continuously against the metal,

and made to conform to all its curvatures, stretching out somewhat to cover the convexities, and somewhat compressing to cover the concavities. This is effected solely by the ductility of the metal, and the bending takes place gradually, in order to make the particles of the metal accommodate themselves to their altered position. A large quantity of cheap Birmingham jewellery, together with plated candlesticks, dish-covers, teapots, bell-mouths of musical instruments, &c., are made by a variety of processes, of which metal-spinning is the principal.

SPIRÆA, *spi-rē'-a*, in Bot., a gen. of the nat. ord. *Rosaceæ*. The species *S. ulmaria* is the herb familiarly known by the name of meadow-sweet. Its flowers are remarkable for their fragrance, its roots for their tonic properties.

SPLEEN, *splen* (Gr. *splen*), in Anat., is a spongy viscus, of a livid colour, oval in figure, and situated in the left hypochondriac region, between the eleventh and twelfth false ribs. It is convex externally and concave internally, and its weight in the healthy adult is from four to ten ounces. It is largely composed of cells, but its internal structure is not well understood, neither have its uses been ascertained; but it would seem to be in some way of use to the stomach during the process of digestion. The ancients regarded it to be the seat of all ill-humours, as anger, melancholy, &c.; and hence the term splenetic applied to such as are cross and crabbed.

SPONDIAS, *spon'-de-as*, in Bot., a gen. of the nat. ord. *Anacardiaceæ*. The species *S. purpurea*, *S. Mombin*, and others, produce the fruits called hog-plums in the West Indies and Brazil. The fruit of *S. cytherea*, or *dulcis*, a native of the Society Islands, rivals the pine-apple in flavour and fragrance.

SPONGES, *spunj'-es* (Lat. *spongia*, a sponge), certain marine productions, the family of *Spongiadæ*, or *Porifera*, a division of animals of the class called *Protozoa*. For a long period it has been a disputed point as to whether sponges are animals or vegetables. In the "Principles of Zoology," by Agassiz and Gould, published in 1848, they are said to belong to the vegetable kingdom; but the most recent authorities are decidedly in favour of their animal nature. The texture of the ordinary sponge (*spongia*, Linn.) is cavernous and porous. Its great elasticity, and its property of imbibing and as readily parting with a large quantity of water, render it useful. In choosing sponge, it should be selected as light as possible, and free from stone, of as pale a colour as possible, with small holes, and fine and soft to the touch. The sponges of commerce are procured chiefly in the Mediterranean and the Bahama islands; they are mostly obtained by diving, to which persons are trained from childhood in the Greek islands. The adhesion of the sponge to the bottom is generally firm and the growth slow. The coarse sponges used for horses and carriages are chiefly obtained from the Bahamas.

SPONTANEOUS COMBUSTION. (*See* COMBUSTION.)

SPORES, *spores*, in Bot., the reproductive bodies formed by cryptogamous or flowerless plants, instead of seeds. A spore generally consists of a single cell, composed of two or more membranes, inclosing granular matter. Having no embryo, it can have no cotyledon, which is an essential part of the embryo; consequently, plants producing spores are said to be *acotyledonous*.

SPRAT, *sprāt* (Ger. *Sprotte*), (*Clupea Sprattus*). — This fish was formerly confounded by naturalists with the young of the herring; it is now, however, generally admitted to be a good and distinct species. Its characters are as follows: — Proportions nearly the same as those of the herring, but the depth of the body is greater in proportion than in the young of that species; the gill-covers are not veined; the teeth of the lower jaw are so minute as to be scarcely perceptible to the touch. The dorsal fin is placed farther back, and the keel to the abdomen is more acutely serrated than in the herring. They inhabit the deep water round our



SPRAT.

southern coast during the summer months, and, like the other species of the genus *clupea*, they are wanderers: the shoals are capricious in their movements, and extremely variable in their numbers. Fishing for them begins early in November, continuing through the winter months; and the largest quantities are taken when the nights are dark and foggy. They are a cheap and agreeable food during all the winter months of the year, but are sometimes so plentiful as to be sold for manure to the farmers, who distribute about forty bushels of sprats over an acre of land, and sometimes manure twenty acres at a cost of twenty shillings an acre. A full-sized sprat measures six inches in length, and rather more than one inch and one-eighth in depth. The tail is deeply forked; the scales are round, large, and deciduous. The upper part of the head and back are dark blue, with green reflections, passing into silvery white on the gill-covers, sides, and belly.

SQUARE ROOT OF A QUANTITY, *skwāre*, a quantity which, being taken twice as a factor, will produce the given quantity. Thus the square root of 25 is 5, because $5 \times 5 = 25$. When the square root of a number can be expressed in exact parts of 1, that number is a perfect square, and the indicated square root is said to be commensurable. All other indicated square roots are incommensurable.

SQUINTING, *skwint'-ing* (Lat. *strabismus*), in Med., is a disease of the eyes, in which they do not move in harmony with each other; hence the optic axes are not parallel, and a disturbance of vision is the consequence. Squinting may be confined to one eye, or it may affect both, and it may be in any direction. If the sight of both eyes is equally good, or nearly so, then all objects are seen double; but if the sight of one is much better than that of the other, the mind only attends to the more vivid impression, and disregards the weaker. Squinting is owing to some affection of the nerves or muscles of the eye. In most cases, it admits of cure by the operation of dividing the muscle by which the distortion is produced.

SQUIRREL, *skwir'-rel* (*Sciurus*), a genus of quadrupeds belonging to the *Rodentia*, or Gnawers, and distinguished from most animals of the tribe by the compressed form of the lower incisors. The upper lip is cleft, the fur soft and silky; the molar teeth are four on each side of the lower jaw, and five in the upper, the first of which is only a small tubercle, often shed with age; the incisors are two in each jaw; the toes are armed with hooked nails, by means of which they are enabled to climb trees, in the midst of which



SQUIRREL.

they pass their lives, feeding on fruit. They have fine full eyes, an elegant contour, great activity, and a long bushy tail. They are furnished with powerful canines, and possess the use of the forearm and paws in great perfection. The hardest nuts serve them for nutriment, and they cut through the shells with re-

markable facility. They generally build nests of sticks and leaves in the tops of trees, and sometimes in hollow trunks. Previous to the approach of winter, they lay up large hoards of nuts and grain for future use. In feeding, they sit upon their haunches, and hold their food between their paws, while they work at it with their teeth. The group of squirrels has been divided by some naturalists into ground squirrels (*Tamias*), flying squirrels (*Pteromys*), and tree squirrels (*Sciurus*). The ground squirrel has been separated by other naturalists from the true or tree squirrels, on account of its having cheek-pouches. Its manners also differ altogether from those of the tree squirrels. It burrows in woody districts, in small hillocks, or near the roots of trees; but never makes its nest in the trunks or branches, although, when frightened, it climbs them with ease. The nest is reached by a winding tunnel, which is often of considerable extent. The head is longer than that of the common squirrel, and the roundish hairy tail is seldom turned up. (*See* FLYING SQUIRREL.)

STACKHOUSIACEÆ, *stăk-how-se-ā'-se-e*, in Bot., a small nat. ord. of *Dicotyledones*, sub-class *Calyciflorœ*, consisting of two genera of herbaceous plants natives of Tasmania. The calyx is 5-cleft, with an inflated tube; the petals 5, united below into a tube, which arises from the top of the tube of the calyx. The properties of these plants have not been studied.

STAFF COLLEGE, *staff*.—About the year 1800, the English government first established a special school for the purpose of instructing officers in the art of surveying ground, in connection with that part of tactics which relates to the selection of routes and of advantageous positions for troops. These officers were first employed in Egypt, where they rendered considerable service; and the school was afterwards united to the Royal Military College. At that institution, under the name of the Senior Department, or Staff College, a limited number of officers continue to be instructed in the duties of the staff, and in the sciences connected with the military art.

STAG, *stăg*, the male of the red deer; the male of the hind.

STAG, among stockbrokers, is one who deals as a jobber or broker in stock shares, &c., without being a member of the Stock Exchange, and who carries on his transactions without the house.

STAGHOUND.—The staghound and the largest foxhounds are said by good authorities to be identical species. However this may be, it is very certain that the modern staghound has been crossed with the foxhound, and that to this fact he owes a portion of his speed. In former times, the English staghound



STAGHOUND.

was a large and stately animal, equal, or little less than the bloodhound; and originally, like that race, slow, sure, cautious, and steady. The modern hound is, perhaps, still handsomer, though somewhat smaller. It is still the largest hound in Britain. It has a large and rather short head, with a wide nose, loose,



hanging, broad, and long ears, muscular hams, round small feet, and a rush tail, carried high. They were formerly rufous-coloured or glaucous, but are now invariably white, with some black and fulvous about the ears and on the sides or back, distributed in two or three large spots.

STAG-BEETLES (*Lucanidæ*) derive their name from the large and powerful mandibles with which the males are furnished. The English stag-beetle (*Lucanus Cervus*) is the largest and most formidable-looking of all the British coleoptera. It inhabits the interior of oaks and beeches for several years before assuming its final transformation; and its larva is supposed by some to be the *cossus* of the Romans, a vermiform larva esteemed by them as a great delicacy. Stag-beetles remain hidden during the day and take flight at dusk. The females are sluggish, and not so numerous as the males, which fight with great ferocity amongst themselves for possession of their mates. When full-grown, the larva forms a cocoon of the dust of wood which it has ground down by its jaws, and after remaining some time as a pupa, undergoes its final transformation, to pass a very brief portion of its life as a perfect insect. Some of the foreign genera of stag-beetles are very brilliantly coloured.

STAIRCASE, *stār'-kās*, in Arch., a term applied to the whole set of stairs with the walls supporting the steps leading from one story to another. The same staircase frequently conducts to the top of the building, and thus consists of as many stories as the edifice itself. There is little or no information to be gained with regard to the staircases of the ancients. In fact it may be almost taken for granted that the houses of the ancients had nothing corresponding to the modern staircase. In this country it was not till about the time of Elizabeth that staircases began to be planned more commodiously, and were made a decorative feature in the interior of a mansion. The planning of a staircase is generally considered one of the most difficult matters in internal architecture. In contriving a grand edifice, particular attention must be paid to the position of the space occupied by the stairs, so as to give them the most easy command of the rooms. The architectural effect of a staircase greatly depends on the mode of lighting it; a skylight, or rather lantern, is the most appropriate method; for the light thus admitted is powerful, and the design admits of greater elegance. In all cases where the staircase does not adjoin the exterior walls, this is the only method by which light can be admitted. The position of the staircase in small buildings is indicated by the general distribution of the plan; but in larger edifices this is not so obvious, but must be determined by closely considering its connection with the other apartments.

STAMEN, *stā'-men* (Lat.), the male reproductive organ of a flowering plant. It consists essentially of a case or bag, called the *anther*, containing a powdery substance, called the *pollen*, which is discharged at certain periods through little holes or slits. The anther is generally supported on the summit of a little column or stalk, called the *filament*. This is not an essential part of the stamen, being often wanting; in which case the anther is said to be sessile. The stamens constitute the whorl or whorls of organs situated on the inside of the corolla.

STAMMERING, *stăm'-mer-ing* (Ang.-Sax.), is a term which is commonly used in a somewhat wide and indefinite sense to signify all kinds of defective utterance. Strictly, however, it denotes a difficulty or inability to enunciate certain elementary sounds; while stuttering is an inability fluidly to enunciate words and sentences. The former may be regarded as mainly an organic or symptomatic affection, the latter chiefly an idiopathic or functional one. Defective utterance may arise from malformation of the organs of speech, inflammation or enlargement of the tonsils, or such-like, or from some general or local affection of the nerves of the vocal organs. Frequently, also, it is the result of bad habit or imitation. In stuttering, the stoppage generally takes place at the first syllable of a word, but sometimes it may be at the second or third. It is not a little remarkable that most stutterers can sing without difficulty; the reason being that no frequent changes do not take place in the vocal

organs. Hence we have an important means for the cure of this intractable affliction. The stutterer should commence by giving leisurely and fully every word. To aid in this, some have recommended motions of the hands or feet to accompany each sound. In fact, the art of speaking has to be really learned from the beginning, from syllables up to words and sentences. Cheerful society, healthy mental occupation, athletic sports, and attention to the general laws of health, are of the utmost importance in such cases. As a general rule, everything that increases the control of the mind over the muscles improves the speech, and *vice versâ*.—Ref. *Encyclopædia Britannica*; Hunt's *Treatise on the Cure of Stammering*.

Stamp-Duties, *stămp*, are a tax imposed upon the parchment or paper on which many legal proceedings or private instruments are written. The stamps are various, according to the nature of the thing stamped or taxed, and always denote the price of the particular stamp, and sometimes also the nature of the instrument itself. This mode of taxation is said to have been first used by the Dutch, who offered a reward for the invention of a tax which would press lightly upon the people and yet yield a considerable revenue to the government. It was legally introduced in 1624, and gradually imitated by other governments. In this country it was first introduced in the reign of William & Mary, the act 5 Wm. & Mary, c. 21, imposing stamps upon grants from the crown, diplomas, contracts, probates of wills, and letters of administration, and upon all writs, proceedings, and records in courts of law and equity. Since that time the stamps have formed an important source of revenue, and have been subject to almost constant change, scarcely a session of parliament passing without some alteration in them. During the year ending 31st December, 1862, they yielded £8,913,945. An unstamped document is deprived of all legal force; but in almost all cases instruments requiring stamps may be stamped subsequently, on payment of the proper stamp-duty and a certain additional sum by way of penalty. Bills and notes, however, cannot be stamped after they are made.

Stand of Arms. (*See* Arms, Stand of.)

Staphyleaceæ, *stăf-il-e-ai'-se-e*, in Bot., is the Bladder-nut fam., a nat. ord. of *Dicotyledones*, subclass *Calycifloræ*. Shrubs with opposite, or rarely alternate leaves, pinnate, and furnished with deciduous stipules. Calyx 5-parted, coloured. Petals 5, alternate with the divisions of the calyx. Stamens 5. Ovary superior, composed of 2 or 3 carpels; ovules numerous; styles 2 or 3, cohering at base. Fruit fleshy or membranous. There are but 3 genera and 14 species, which are scattered irregularly over the globe. The bark of some species is bitter and astringent; the seeds of others are oily and purgative.

Staple, *stai'-pl* (Fr. *estape*, Belg. *stapel*), is properly a public mart, whither merchants are obliged to bring their goods for sale. Formerly in this country merchants were obliged to carry their wool, cloth, lead, &c., and expose them by wholesale at certain places, as York, Lincoln, Norwich, &c. Each of these had a court of the mayor of the staple, for deciding differences, according to the law merchant, in a summary way. Afterwards, the word staple was applied to the merchandise itself which was sold at these places. At present the term is frequently used to designate the principal products or manufactures of a country or town.

Star, *star* (Sax. *steorra*), a general term applied to any celestial body, including the planets. In Astron., however, the word is used to designate only those self-shining bodies which are situated beyond the limit of solar attraction. They are also called *fixed stars*, to distinguish them from the planets, comets, satellites, &c. Astronomy inquires into the distance, number, magnitude, nature, and motion of the fixed stars. In appearance, the magnitudes of the stars seem to differ greatly; but this variation is attributed to that of their distances. It is impossible to tell the number of the fixed stars. In order to establish a gradation among them, and for convenience in description or reference, astronomers divide them into classes or orders, called magnitudes. The most brilliant are called stars of the *first magnitude*; those less brilliant are styled of the *second magnitude*; and so on, to the sixth or seventh, when they become invisible to the naked eye. The stars are very irregularly distributed throughout the heavens; in some parts considerable regions are to be found with scarcely a single star, while other portions, like the milky way, are crowded. (*See* Milky Way.) In all ages, the distance of the fixed stars from the earth has been a subject of interest and inquiry. In determining the question of *parallax*, the star 61 Cygni was selected as being a star with a large proper motion. The experiment turned out favourably, and the parallax was discovered, and with it roughly the distance of the star from the solar system. This was estimated at about 592,000 times the mean radius of the earth's orbit.

Starch, *starch* (Sax. *steare*).—Chemically speaking, starch consists of $C_{12}H_{10}O_{10}$. It is readily distinguished from other similar substances by the deep blue colour it assumes on the addition of free iodine to its solution. Boiled with dilute sulphuric acid, is becomes converted into dextrine, or British gum, without any change in its chemical composition. It then gradually assumes the elements of water, becoming changed into *glucose*, or *grape sugar*. Starch consists of a number of ovoid grains, built up of a series of skins, one over the other, like an onion. With cold water starch forms only a granular paste, but with hot water the granules burst and dissolve, giving rise to a glutinous viscid solution, which, when dry, forms a translucent horny mass. Hence its use in stiffening linen. In the manufacture of starch from potatoes and cereal grains, advantage is taken of its insolubility in cold water. The material most used in starch-making is rice, which contains between 80 and 90 per cent. of amylaceous matter.

Star Chamber, Court of the (Lat. *camera stellata*), was a tribunal which figures largely in certain parts of English history. It is said to derive its name from the room in which it sat, the old council chamber of the palace of Westminster, because the roof was at first garnished with gilded stars. This court was of very ancient origin, and was remodelled by 3 Hen. VII. c. 1, and 21 Hen. VIII. c. 20. It was under the direction of the chancellor, and consisted of divers lords, spiritual and temporal, being privy councillors, with two judges of the courts of common law. It had jurisdiction in cases of forgery, perjury, riot, conspiracy, fraud, libel; but its power came afterwards to be much extended, so as to render it a most odious and unjust instrument in the hands of a despotic administration. Its process was summary and often iniquitous, and the punishment which it inflicted often arbitrary and cruel. It became particularly odious in the reign of Charles I., and was at length abolished by 16 Car. I. c. 10, to the great joy of the people.

Star-fish (*Asterias*).—This animal has a suborbicular depressed body, its circumference divided into lobes or rays, each of which has a longitudinal furrow on its lower side; and this furrow is pierced laterally with small holes, through which pass the feet or tentacula, which are membranous, cylindrical, and each of them terminated with a little disk, which performs the office of a cupping-glass. By shortening or elongating these numerous little organs, the progressive motions of the star-fish are regulated. Its powers of reproduction are considerable; for if by any violence a ray be broken off, a new one will shortly be produced. The mouth is armed with bony teeth, with which the animal seizes and crushes the shell-fish on which it feeds. Some of the species attain an enormous size.

Star Fort, a species of redoubt, the ramparts or parapets of which are built upon a plan exactly resembling the form in which a star is usually represented; hence the name. This form of construction possesses great advantages over a simple redoubt, for the fires which cross each other from the faces seriously impede the advance of an enemy, and render it impossible for the attacking force to pass the ditch without exposing themselves to the fire of the defenders. Star forts are generally employed to hold the slopes of an army, or to protect some important position; for instance, during the Seven Years' war, a star fort was erected in the Prussian camp at Jauernick, on a rising ground, from which the movements of the Austrians could be

seen. Again, when Marshal Soult, in 1813, took up his position on the Nivelle, while the English army was acting in the south of France, he protected it by a strong star fort.

STARLING, *star'-ling* (*Sturnus*), a genus of birds belonging to Cuvier's great order *Passeres*. The characters of the genus are these: the bill straight, conical, depressed; four toes on the feet, three to the front and one to the rear; the wings long, the first quill little more than rudimental, and the second and third the longest in the wing. The starlings are noisy but social birds, being generally found together in flocks, more or less numerous, and they can be taught to articulate. The common starling (*Sturnus vulgaris*) is about eight or nine inches in length. The upper parts of the plumage are black, with reflecting glosses, which vary from green to purple, according to the light in which they are seen. The quills and tail-feathers are blackish, with ash-coloured borders, and the under coverts of the tail have broad borders of a whitish colour. They are partly migratory and partly not.

STAR OF INDIA, ORDER OF, an order of knighthood instituted by her majesty Queen Victoria, in order to commemorate her resolution of taking upon herself the government of the territories of India. It was also intended as a reward for conspicuous merit and loyalty, and was designated "the Most Exalted Order of the Star of India." The order consists of the sovereign, a grand master, twenty-five knights, together with such extra and honorary knights as her majesty, her heirs and successors, shall from time to time appoint. The viceroy and governor-general of India for the time being is the grand master and principal knight of the order. The order was instituted on the 25th of June, 1861, and the Right Hon. Charles John, Earl Canning, was appointed first grand master. Among the first knights created were Viscount Gough, Lord Harris, General Lord Clyde, Sir George Clerk, Sir John Lawrence, Sir James Outram, and Sir Hugh Rose. Several native princes were also made knights; amongst these were the Nizam of Hyderabad, the Maharajah of Gwalior, Maharajah Duleep Singh, the Maharajah of Cashmere, the Begum of Bhopal, with some others. His Royal Highness the Prince Consort and His Royal Highness the Prince of Wales were also appointed each a knight of the order.

STATICS, *stat'-tiks* (Lat. *statics*), that subdivision of mechanics which treats of bodies at *rest*, in opposition to *dynamics*, which treats of bodies in *motion*. The two great propositions of statics are the principle of the *lever*, and the principle of the *composition of forces*. Archimedes demonstrated the first, namely, the equilibrium of a straight horizontal lever loaded at its extremities with weights which are reciprocally proportioned to their distances from the fulcrum. The second general principle consists in this, that any two forces acting together upon the same point of a body are equivalent to a single force, represented in intensity and direction by the diagonal of a parallelogram, of which the two given forces are represented by the sides. This principle was not known to the ancients. Newton proved it to be true generally, and shows how the laws of equilibrium may be deduced from it, in the second corollary to the third law of motion. (*See* GRAVITY, MECHANICS, FORCE, PHYSICS.)

*Ref.* Whewell's *Mechanics*; Lagrange's *Mécanique Analitique*; Biot's *Notions de Statique*.

STATIONERS' COMPANY, *stat'-shun-erz*, a corporation consisting, not of vendors of stationery in the present sense, but of booksellers and printers. The Company of Stationers is of great antiquity. They were formed into a guild or fraternity in the year 1403, the fourth year of Henry IV., and had their ordinances made for the good government of their fellowship. Their first hall was in Milk Street. About 1550 the company removed to a new hall, a certain St. Peter's College, the site of which cannot be precisely ascertained. The Company of Stationers do not appear to have had any authority granted them with relation to printed books, as an incorporated body, till they received their first charter in 1557, by the title of "The Masters and Keepers, or Wardens and Commonalty of the Mystery or Art of Stationers of the City of London," by which they obtained a right over all literary compositions, and might search houses for any books which they deemed obnoxious to the state or their own interest. The company then began to keep a register at their hall, in which were entered the title of every new book, the name of the proprietors, and the successive transfers of the copyright. By-laws were enacted by the company; fines were levied on members acting in contravention of their regulations; and at length, in 1662, these resolutions of the association were confirmed by the Licensing Act, which prohibited the publication of any book unless first licensed by the lord-chamberlain, and entered in the Stationers' register. In 1684 a new charter was granted to the company, *for the purpose of securing the property* in books, the chief object of which was to interpose the royal interdict on any publication at variance with the government of Charles II. In 1691 this act was repealed; but whilst the liberty of the press was restored, the door was thrown open to infractions of literary property; and an owner of a copyright had no other protection than common law, and could only recover to the extent of the damage proved; that is, he could not adduce evidence of the tenth or twentieth part of the damage suffered, as he could not prove the sale of one copy out of twenty. In 1709, however, an act was passed, the chief features of which were,—first, an obligation to deliver nine copies of any printed book to as many public libraries: and next, a provision for guarding, by severe penalties, the property of copyright for fourteen years. For a century and a half, the two universities of Oxford and Cambridge and the Stationers' Company held the monopoly of printing almanacs by letters patent of King James I. The company abused its privilege, and issued almanacs full of profligacy, ignorance, and imposture. In 1779 a bill was introduced into parliament to confirm this monopoly, but it was opposed by Erskine, the famous lawyer, and the monopoly was abolished. The chief duties of the Stationers' Company at present are to enter the titles of all new publications on their books, and to register all assignments of copyrights.—*Ref.* Nichols's *Literary Anecdotes*; Knight's *London*; *Encyclopædia Britannica*.

STATISTICS, *stă-tis'-tiks*, is derived from the German *Staat*, a state or body of men existing together in social union, and is that department of political science which is concerned in collecting and arranging facts illustrative of the condition and resources of a state. We cannot by *à priori* reasoning discover the laws which regulate the complex fabric of human society. In order to this, we must proceed by induction from well-ascertained facts; and hence the value of that science which takes upon itself the collection and arrangement of facts from which these laws may be deduced. To reason upon such facts, and to draw conclusions from them, is the business of the statesman and political economist. The statesman learns from them those principles on which the well-being and happiness of the people depend; the political economist, those laws that regulate the production and distribution of wealth. But while the statist collects materials for the politician and political economist, he must from them learn in what directions to pursue his investigations, and how to arrange his facts so as to bring out the truths which they are calculated to convey. Facts collected in ignorance of the manner in which they are to be applied, or of the principles which they tend to illustrate, are in most cases of little value. On the other hand, the labours of the historian and geographer are of the utmost importance to the statist, for it is his business to take up and shew the practical bearings of the facts of history and geography on the condition of man. Thus while history narrates the long series of occurrences that are to be found in the annals of a country, statistics only deals with those of them that may have contributed to form the character and fix the social and political condition of the people. The historian, too, usually travels over an extended period, while the statist brings his facts to bear upon a particular time. Hence it has been said that "Statistics is history at a stand; history, statistics in a state of progression." With geography the science of statistics is still more intimately connected; for the physical features of a country, its climate and productions, its mountains, valleys, plains, &c., exert an important influence in

determining the condition of the people. But, indeed, every science that bears upon the condition of man enters more or less into the science of statistics, and, on the other hand, derives valuable aid from it. Law, medicine, chemistry, botany, zoology, geology, meteorology, ethnology, anthropology, &c., all contribute facts that are of value in statistics. Numbers constitute an important part of the science of statistics, being that which gives precision and accuracy to its statements, and without which it would be little else than a mass of generalities and uncertainties. But to limit the science, as some do, to such facts as may be reduced to numerical calculation and exhibited in tables, is to deprive it of all that is most interesting and instructive, and to render it of little practical value. Figures are the mere dry bones of statistics, which require to be systematically arranged and explained, and the principles which they illustrate pointed out, before they can be of real value. It is by being thus restricted that statistics has been so frequently made the means of promulgating or upholding gross errors, and brought into disrepute. When every one is left to explain or arrange figures in his own way, there is scarcely a theory however, wild, or an error, however palpable, to which an ignorant or designing person may not by means of them give an air of truth. Statistics, like every other science, has its principles, which require to be known, and in accordance with which its facts are to be expounded. The first duty of the statist is to ascertain what reliance is to be placed upon the facts or figures which are to form the basis of inquiry. There is no more frequent cause of error than that of regarding as complete what is only a partial statement of facts. His next duty is to arrange them so as to find out what inferences may be legitimately drawn from them, and by a careful analysis and comparison of the facts, attempt to ascertain the nature and force of the various laws that have been acting upon them, bearing in mind that every one of the social phenomena is not the result of one only but of a multitude of causes, and "amounts precisely to the sum of the effects of the causes taken singly." But while we cannot know all the causes that have been at work in producing a certain result, there are certain of them that are readily recognizable, and it is to these that the statist principally directs his attention. Having, for instance, ascertained the average duration of human life in a country at a particular time, he arranges the figures by which that result has been obtained according to the circumstances that tend more immediately to shorten or prolong life, and thus ascertains how far each of them affects the general result. In dealing with large numbers, too, an important principle comes into play, which gives precision and accuracy to his investigations; namely, that the influence of minor disturbing causes diminishes as the area of investigation increases, until we are justified in disregarding them altogether. It is upon this principle that insurance companies are based. On the other hand, when dealing with small numbers, some of the disturbing causes will always be found in excess, and will greatly affect the result when many times multiplied. This is the case, for instance, in attempting to estimate the production, &c. of a whole country from that of a small portion of it. In the comparison of similar facts under different circumstances, as of different countries at the same time, or of the same country at different times, the greatest care is required in taking into account the various conditions. As the astronomer by finding a discrepancy between his calculations and observations is led to conclude the existence of some undiscovered disturbing cause, so the statist, in comparing facts of a similar nature, and after making allowance for difference of circumstances, if he finds a marked disagreement still to exist, may readily infer the existence of other causes of which he is yet ignorant. Among the errors frequently fallen into is that of attributing a social fact to one only of its many antecedents, without any process of elimination or comparison. The confounding of cause and effect, and the considering of two circumstances as cause and effect, which are both the result of common causes, are also frequent sources of error. Many persons also err in drawing conclusions from one state of society, and applying them to others in which





many of the elements are not the same. The value of statistics is now beginning to be appreciated in this country, though we are still, in this respect, far behind some of the continental countries. In 1833, a statistical department was established in connection with the Board of Trade, for the collection and publication of statistical information respecting our own and other countries. In 1833, the statistical section of the British Association for the Advancement of Science was formed, and in 1834 the London Statistical Society was founded; both of which have done much in the way of collecting and collating important statistical information, and of diffusing a knowledge of the principles and value of this science.—Ref. *Encyclopædia Britannica.*

STATUE, *stăt'-yew*, are works of plastic art, executed in marble, bronze, clay, or other suitable material, so as to represent the whole figure of a hero or other personage. There are both ideal and portrait statues. The ancient Greeks excelled in their ideal statues, wherein they represented their gods as serene and superior to all sensual impulses. Portrait statues appear to have been first set up at Athens to the memory of Harmodius and Aristogiton, the avengers of liberty and destroyers of the Pisistratidæ. During the decline of the Roman empire, as servility and adulation became more and more common, a great number of statues were produced. The Romans called statues in Greek costume *statuæ pallinatæ*; in Roman costume, *togatæ*. There were, as there are now, three forms of statues,—the sitting statue, the standing statue, and the statue on horseback, or equestrian statue. The practice of ornamenting buildings with statues was common with the ancients.

STATUTE, *stăt'-ute* (Lat. *statuo*, I establish), is an act of parliament made by the king, by and with the advice and consent of the Lords and Commons in parliament assembled, and thus made part of the *leges scriptæ*, or written laws of the kingdom. Statutes are either public or private,—the former a universal rule that regards the whole community, the latter only affecting particular persons or private concerns. (*See* PARLIAMENT.) Of private acts, some are local, as affecting only particular places; others personal, as confined to particular persons. Statutes are also sometimes described as declaratory, or penal, or remedial, according to the different nature of their object or provisions. A statute begins to operate from the time when it receives the royal assent, unless some other time be specified. Statutes are to be construed, not according to their mere letter, but the intent and object with which they were made. It is also an established rule that remedial statutes are to be more liberally, and penal more strictly construed. The statutes of each session are numbered consecutively as chapters of one volume or collection, and each is divided into sections. Each volume is distinguished by the number of the year of the reign of the sovereign. Thus, 24 & 25 Vict. c. 12, s. 4, is the fourth section of the 18th act of the session held in the 24-25 year of the reign of her majesty Queen Victoria. Much inconvenience is felt from the great number of statutes that may be in force at the same time respecting the same subject, and of late years much has been done in the way of consolidating into one act all the previous statutes bearing on a particular subject.

STEAM and STEAM-ENGINE, *steem* (Sax.)—Steam is the vapour given off by water when its temperature is raised to such a degree as to cause it to pass into a state of ebullition. The mechanical properties of steam are similar to those of gases in general. In its natural state it is transparent and colourless; its visibility in air is caused by its partial condensation. In the case of steam, the most important mechanical property to be considered is the elastic pressure. When confined in a close vessel, a gas or vapour will press upon the interior surface of the vessel with a power arising from the elasticity of the fluid. This pressure is uniformly distributed over every part of the inner surface of the vessel in which the fluid is contained. All the mechanical force of steam arises from this property. The following general laws affect the formation of steam:—First, the temperature of the boiling-point of a liquid is the same at all times under the same pressure, and in a vessel of the same substance. Second, the

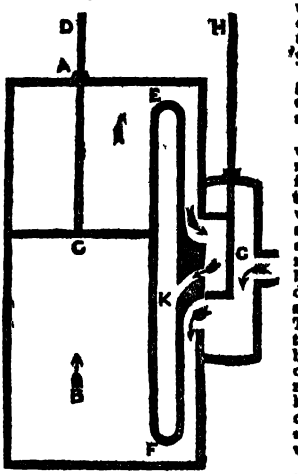
temperature of the liquid remains constant during ebullition, provided the pressure remain the same; and if a greater quantity of heat be applied to the vessel containing the liquid at one time than another, the only result will be that a larger quantity of steam will be given off: the temperature of the liquid will not be increased. Third, the volume of the steam will be much greater than that of the liquid which supplies it, and the volume of the vapour of water will be about 1,700 times greater than that of the water itself. Water evaporates at all temperatures; but the law with respect to ebullition was ascertained by Dalton. It lays down that "the elastic force of the vapour given out during the process is equal to the external pressure. This allows us to calculate the elastic force of the steam from the temperature at which ebullition takes place, from tables showing the elastic force of steam at different temperatures. The boiling-point of a liquid is not affected by substances held in suspension; but when substances are held in solution they produce very decided effects. Salts dissolved in water retard its ebullition. The boiling-point of water is 212°; while that of sea-water, containing $\frac{1}{30}$ of its own weight of chloride of sodium, boils at 213·2° in the open air. After the production of steam, it acts according to fixed laws. First, under ordinary atmospheric pressure, a cubic inch of water is converted into a cubic foot of steam. Second, under the same pressure, a cubic inch of water, evaporated, gives a mechanical force equal to that which would raise a ton weight to the height of one foot. The following facts have also been ascertained within very small limits of error. Under the pressure of 35 lbs. on the square inch, and at the temperature of 201°, steam exerts a force equal to a ton weight raised one foot; under the pressure of 15 lbs., and at 213°, it is 2,086 lbs., or nearly seven per cent. less; and under 70 lbs., at 300°, it is 2,382 lbs., or nearly 6½ per cent. more than a ton raised a foot. The relations between the elasticity, temperature, and density of steam, have long been important subjects of philosophical research. *Steam boilers*, or vessels in which water is converted into steam for the purpose of supplying steam-engines, or some other purpose in the arts, are so intimately connected with the subject of the steam-engine, that they will be treated of further in our description of that machine. Our space prevents us from going more particularly into the important matter of steam-boilers; but the reader who is interested in the subject is referred to Mr. W. Fairbairn's papers in the *Transactions* of the Royal Society. When an efficient mechanical power is produced by the generation, or generation and condensation, of the steam or vapour of any liquid, the combination of vessels and machinery for that purpose is called a STEAM-ENGINE.—For a considerable period after its invention, this machine was called a fire-engine; and not improperly, for the principal agent is heat or fire. Steam-engines vary in their size, in their proportions, and in their form, as well as in the mechanical details by which the power of steam is adapted to their action. The fact that the application of heat would generate steam from water, and that the steam so generated would issue with much force from a small aperture in the vessel employed to generate it, must have been known at a very early period. The *eolipile* of Hero of Alexandria was a small machine in which a motion of continued rotation was given to an axis by the reaction of steam issuing from lateral orifices in arms placed at right angles to the revolving axis. The date of this machine is about 100 B.C. Some other similar instruments were well known among the Egyptians, Greeks, and Romans. The idea of employing the impulsive force of the eolipile seems to have been the only one which had been formed for using steam as a source of motion before the time of the marquis of Worcester. In a little work published in 1663, entitled "A Century of the Names and Scantlings of Inventions," he describes a method of employing the pressure of steam for raising water to great heights. Towards the close of the 17th century, Papin, a French engineer, who was professor of mathematics at Marbourg, began to observe the properties of steam, and conceived the idea of obtaining a moving power by introducing a piston into a cylinder and producing a vacuum under it by the gradual condensation of steam by cold. The steam, however, in this engine was to be generated in the cylinder by the action of fire, and not to be condensed by the application of cold substances to the cylinder, but to cool gradually of its own accord. There is no evidence to show that Papin ever constructed a model even of this engine, and the details of the project were so imperfect that it was practically useless. Thomas Savery, an Englishman, has the credit of having made the first actual working steam-engine of which we have any account. He obtained a patent for it in 1698, and Papin himself relinquished his project for that of Savery. These machines were only *pumps* for raising water, and were employed for a long period in this country. Passing over a number of the earlier steam-engines, which are unimportant, we come to that of Newcomen, a smith of Dartmouth, who, in conjunction with Cawley, a plumber in the same place, obtained a patent for a steam-engine in 1705. The novelty of this construction consisted entirely in condensing the steam below an air-tight piston, in a cylindrical vessel having an open top; and the idea was probably taken from the idea of Papin; for it appears that Newcomen was in correspondence with Dr. Hook on the subject, to whom the speculations of Papin were well known; but the mode of effecting the condensation was entirely different from Papin's. It consisted in admitting steam below a piston, and at first the steam was condensed by applying cold water to the outside of the cylinder; but it was soon found that injection of cold water by a jet into the interior was a much more effective method, and is said to have been discovered by accident. This engine was called the "atmospheric engine," and was improved by Beighton, Smeaton, and other engineers, previous to Watt's time. It was in general use during last century, but was only used for pumping water. James Watt was a mathematical instrument maker in Glasgow, and in 1763 it chanced that the lecturer upon natural philosophy at the university intrusted to him, for repairs, the model of an *atmospheric engine*. In making experiments with this model, Watt was struck with the fact that the quantity of steam it consumed for each stroke of the piston was many times more than the contents of the cylinder. This led him to further observations, by which he soon arrived at some of the most important phenomena connected with the evaporation of water. Full of astonishment at his own researches, he repaired to Dr. Black, then professor of natural philosophy in the university, and communicated his discoveries to him. From this meeting dated Watt's improvements of the steam-engine. The first and most important of these consisted in effecting the condensation in a separate vessel communicating with the cylinder, and called the *condenser*. This vessel being filled with steam from the boiler at the same time with the cylinder, the jet of cold water, admitted into the former only, effected the condensation of the whole volume of steam, both of that in the cylinder, as well as of that in the condenser, in conformity with the principle in physics that an action originated in any part of a homogeneous fluid is almost instantaneously communicated throughout its mass. Watt also placed his condenser in a cistern, in order to further still more this separate condensation. The temperature of this cistern was kept constant by a fresh supply of cold water; for otherwise, the heat given out by the condensing steam would, by heating the vessel and the water surrounding it, have retarded the rapid condensation necessary for the effective work of the engine. The second of Watt's improvements in the atmospheric engine consisted in closing the cylinder at the top, the piston-rod being made to pass through a cylindrical neck in the top, called a "stuffing-box," from the passage being rendered steam-tight by a stuffing of tow saturated in grease, by the lubrication of which the additional friction was lessened. This alteration had for its object the admission of the elastic force of steam, in order to impel the piston downwards, instead of the simple pressure of the atmosphere. To effect this, steam was admitted from the boiler above the piston at the same moment that the condensation took place in the condenser. For this purpose the steam passage was made double, so that the communication with the condenser could be cut off when that with the cylinder was opened, alternately. As in the atmo-

spheric engine, when the piston had descended to the bottom of the cylinder, the counterpoise raised it again; but to permit this motion, it was necessary to remove the steam which was above the piston; and this was effected by causing it to pass under the piston and into the condenser by a passage opened at the exact time for this purpose. Such constituted the principal features of Watt's single-acting steam-engine. Not long afterwards, the counterpoise at the end of the pump-rod was done away with, an arrangement which had added much to the unproductive work of the engine, since this weight had to be raised in addition to that of the water. The stroke of the piston upwards was now produced by admitting the steam underneath to act by its elasticity; and the engine became *double-acting*. This principle it has ever since maintained, although in detail it has been considerably improved by other engineers. Watt's changes and improvements created the necessity for two pumps, and sometimes three, which are worked by rods attached to the beam. The hot-water or air-pump is intended to remove the air, condensed water, and steam from the condenser, which would otherwise accumulate and stop the action of the engine. The second is a force-pump, used to force back to the boiler the water drawn from the condenser by the first pump. The third is the cold-water pump, used for supplying the cistern containing the condenser. In a patent taken out in 1782, Watt included many contrivances for regulating the power of the double-acting engine. He also obtained letters patent in 1784 for the parallel motion, and other contrivances; and in the next year for a smoke-consuming furnace, the governor, steam-gauge, condenser-gauge, and indicator. Cartwright was the next engineer who proposed an important modification of the steam-engine. His proposal was to condense the steam, by means of cold water applied to the external surface of the condenser. His condenser consisted of two cylinders, one inclosed in the other, the cold water flowing through the inner and enveloping the outer. The valves to change the steam were placed in the piston, so that the condenser was always open. Although this engine was ingenious, it did not come into use. We are, however, indebted to Cartwright for the metallic piston used in his engine; it may fairly take its place as one of the greatest improvements in the steam-engine. One of the next important advances was the four-way cock, originally invented by Leupold, a German, and afterwards improved by Bramah and others; it was introduced as a substitute for the valves, the cock always turning in one direction. As early as 1720, Leupold had also proposed a high-pressure engine, and Watt had afterwards projected a similar machine; but it was not till 1802 that the principle was tried with success in the high-pressure engine of Trevithick and Vivian. The principal object of this invention seems to have been the formation of a simple and portable engine, where fuel was expensive and water scarce. In order to explain the general principles of the steam-engine, we will consider it briefly as a hydrostatical machine, and taking it at the period when it was completed by James Watt. The accompanying diagram, taken from Goodwin's "Mathematics," will explain the general action:—C is a piston working in a cylinder, AB; the rod, CD, which communicates the motion of the piston to the machinery, passing through a steam-tight collar at A. Two pipes are situated at E and F, which communicate with the boiler, and here enter the cylinder. If one of these pipes be supposed to be open to the boiler and not the other, as in the diagram, where the lower pipe is open, then the steam rushing in through F, below the piston, will drive it up; when the piston is at the highest point of its stroke, suppose this arrangement to be reversed, that is, E to be opened to the boiler and F not, then the steam rushing in above the piston will *drive* it *downwards*, and the steam which is below the piston will escape through F, either into the outer air or into a vessel provided for the purpose, it being so contrived that the arrangement which opens E to the boiler cuts off the communication of F. If this alternate opening of the pipes be effected by any means, it must be obvious that the result will be a continuous oscillating motion of the piston C. This oscillatory motion is converted into a rotatory in the following manner:—The extremity



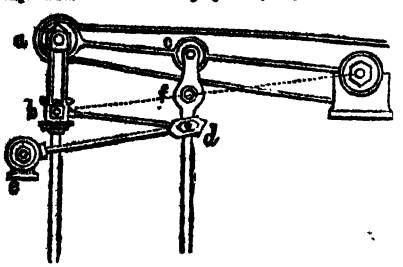


D is connected by means of a system of rods with one end of a beam, which works in a vertical plane, about a horizontal axis through its middle point. This system of rods, to which we will afterwards refer, is known




under the name of *parallel motion*, and was devised by Watt. — The great ingenuity of the contrivance consists in the way in which a connection is effected between the point D, which moves in a straight line, and the extremity of the beam, which describes the arc of a circle. The other extremity of the beam, by means of a crank, is made to turn a heavy wheel, called the *fly-wheel*. This wheel performs a very important function, for its momentum is such as to carry the machinery past certain positions, known as the *dead points*, and also to equalize the motion throughout. The use of fly-wheels is not peculiar to the steam-engine, but is applied to many common engines; such as the turning-lathe and the knife-grinder's wheel. The motion of the rod HG is produced by an excentric crank on the axis of the fly-wheel. This excentric is so arranged that the axis of the shaft and the centre of the wheel do not coincide. When the steam is allowed to pass through the pipe K from the cylinder, it may be permitted to escape either into the outer air or else to flow into the condenser. In the former case, the pressure of the atmosphere is allowed to act on the piston, and must be overcome by the greater pressure of the steam on the opposite side; hence, in order to produce a given effect, the elastic force of the steam, and consequently the amount of fuel employed, must be much greater than when the steam is allowed to pass into a condenser. In general language, engines constructed on the former principle are termed *high-pressure*, and on the latter, *low-pressure engines*. High-pressure engines have this disadvantage, that the interior of the cylinder is cooled by being open to the air; so that when the steam is again admitted, some portion is condensed and rendered ineffective. Thus far our remarks have referred to the general principle of the steam-engine; we now come to regard some of its important details. The *piston*, from its great importance and the vast difficulties to be overcome in its formation, claims the first place. It is absolutely necessary, in hydraulic machines, that all vessels, pipes, valves, &c., should be water-tight; and to secure this object the utmost perfection in skill and workmanship is required; and when steam or gases are the fluids to be dealt with, the difficulty is greatly increased. It is necessary that the piston of a steam-engine should be steam-tight, and yet that it should move with the smallest amount of friction in the cylinder. This is effected in common pistons by their being made somewhat less in diameter than the cylinder, having a projecting flange at the bottom, which, together with a top-plate bolted to them, fits the cylinder accurately. Round the body of the piston tow or soft rope, saturated in oil, is carefully wound between the top-plate and the lower flange, both of which are drawn together by screws, the intervening packing being compressed until it entirely fills the cylinder, and yet allowing itself, by its elasticity, to be adapted to all surface inequalities. Metallic pistons

are now much used; the body of these pistons is made in pieces and segments of metal, acted on by springs radiating from a centre. These pistons last for a long time, and do not require the constant repacking necessary for the common piston. In Newcomen's engine, before referred to, the steam was admitted to the cylinder, and the communication again cut off by an ordinary stop-cock; but more complicated arrangements are necessary for engines when the steam is admitted both above and below the piston alternately, and also to the condenser. We have before mentioned Leupold's *four-way cock*, afterwards improved by Bramah. For this purpose Watt employed flat conical valves, which were raised or closed by cranks, acting on a guide-rod at right angles to the plane of the valve, which, therefore, did not turn on a hinge, like the common *clack-valve* of a pump. In nearly all engines at the present day, the *slide-valve*, as it has been called, has superseded all other arrangements of this sort, except in large pumping-engines. In the slide-valve, a perfectly flat surface slides on another, terminating the orifices which are to be opened and shut. This is the general principle of this arrangement, but the different forms and arrangements are too numerous to be mentioned in a work of this kind. The production of the rotary motion from the direct up-and-down motion of the piston-rod, before alluded to, has occasioned some of the most ingenious mechanical inventions. The principle on which the arrangements are founded is such that a system of simple rods or levers is so combined that one point may move nearly in a straight line. The most important of these various combinations is that of Watt, called the *parallel motion*. In the annexed diagram, this arrangement may be thus explained. The two *hanging-links*, *ab*, *cd*, are each




double, with the beam between the pair. Their lower ends are connected by the single piece *bd*, and two radius-rods, like *de*, nearly equal to *ce*, are applied one on each side of the whole, and move on a fixed centre at *e*. Therefore the middle of *ed* is the point to which to attach the air-pump rod, and an imaginary line from *e*, through the joint *f*, fixes the place *b* for the attachment to the head of the piston-rod, which passes down between the two bars, of which *de* is the visible one. With regard to this portion of the steam-engine, M. Arago says:—"Among the parts comprising the steam-engine, you have doubtless observed a certain articulated parallelogram. At each ascent and descent of the piston, its angles open and close with the sweetness, I had almost said with the grace, which charms you in the gestures of a consummate actor. Follow with your eye alternately the process of its successive changes, and you will find them subject to the most curious geometrical conditions. You will see that of the four angles of the jointed parallelogram, three describe circular arcs, but the fourth, which holds the piston-rod, is moved nearly in a straight line. The immense utility of this result strikes mechanicians with even less force than the simplicity of the means by which Watt has attained it." Besides the fly-wheel before named, which is always requisite in every steam-engine employed to drive machinery, there is also the *rod and crank*, a contrivance which converts the alternating motion of the beam into a continuous circular one in the fly-wheel. This piece of mechanism is of such frequent occurrence that it is unnecessary to describe it. (*See*





CRANK, FLY-WHEEL.) In all cases where the steam-engine is employed to execute any work which is variable in its quantity or intensity, it is necessary to have some method of adjusting the force of the engine to this varying resistance. If the engine were to be suddenly relieved of half its regular resistance, as for example, if half the machinery it was driving were thrown out of gear, then the engine, if worked by the same quantity of steam, would instantly move with a rapidly increasing velocity, until that velocity were doubled. This would be prejudicial to the engine itself and to the rest of the machinery, as well as a waste of force and fuel. By means of that beautiful piece of mechanism called the *governor*, the engine is enabled to regulate the supply of steam admitted to the cylinder, or, in other words, to adapt the force it has to transmit to the resistance which it has to overcome. The governor is a well-known apparatus, by which the axle of the fly-wheel is made to regulate the throttle-valve, so that the moment that the axle begins to increase its velocity, it shifts the position of the throttle-valve, so as to limit the supply of steam from the boiler, and by that means to check the increase of speed. On the other hand, whenever the velocity of the axle is diminished by the action of a lever, the passage for the steam is opened more fully, and thus the motion of the engine is accelerated. The governor is generally so adjusted as to make thirty-six revolutions per minute when in uniform motion; but when the velocity is increased to thirty-nine revolutions, the balls will fly to the utmost extent allowed them, being the limitation of the grooves in which their rods move. On the contrary, if the speed be diminished to thirty-four revolutions per minute, they will close up to the lowest extent of their motion. The exact duty of the governor is to correct casual derangements of the velocity; but by other changes it may be made capable of regulating those smaller changes to which the speed of the machine is liable. Having thus considered the general principles of the structure and action of the steam-engine in its ordinary forms, we would endeavour to point out the amount of mechanical energy which it can furnish. Under ordinary circumstances, the steam from a cubic inch of boiling water at 212° occupies one cubic foot, or, in other words, the steam fills about 1,700 times the space previously occupied by the water from which it was formed. Suppose, for instance, that a cubic inch of water were put into a hollow cylinder, the area of which was one foot square in the base and twelve inches high, the content of such a cylinder would be one cubic foot, or 1,728 cubic inches. If heat were then applied to the bottom of the cylinder, and the water made to boil, the steam from that water would fill the whole of the interior of the cylinder. Again, suppose that a piston were fitted into the cylinder, so that the piston must rise before the steam could fill the cylinder, and that no weight pressed down the piston, then it must be evident that the piston would be pressed up to the top of the cylinder with an energy or force equal to the force of the steam on its under surface, which at 212° temperature is equal to the pressure of the atmosphere, or 15 lbs. on the square inch. Consequently, in order to calculate the effect of one cubic inch of water converted into steam, we have only to multiply 144 square inches, or one square foot, the surface of the piston acted on by the pressure, which is 15 lbs. on each square inch, and the product 144 × 15 = 2,160 lbs., through the height of one foot, by the steam formed from one cubic inch of water. But this number 2,160 comes so near to the number of pounds in a ton,—namely 2,240 lbs.—that for the sake of round numbers, we may consider that one cubic inch of water converted into steam at a temperature of 212° will raise one ton weight one foot high. This is *low*-pressure steam, and no more *force* can be obtained from high-pressure steam obtained from the same quantity of water. The effects from the high and the low pressure steam, when formed from the same quantity of water, are equal; for it is practically the same thing to raise one ton one foot, or two tons through half that height. The power of an engine, therefore, depends on the quantity of water converted into steam, to supply it for a given time. In the following tables, Mr. Tredgold gives an estimate of the

loss of power which takes place in high-pressure and condensing engines. In an engine which has no condenser:—

| | | |
|---|---|---|
| The pressure on the boiler being ..... | | 10·000 |
| 1. The force necessary for producing motion of the steam in the cylinder | ·069 | |
| 2. By cooling in the cylinder and pipes | ·160 | |
| 3. Friction of piston and waste..... | 2·000 | |
| 4. The force required to expel the steam into the atmosphere ..... | ·069 | |
| 5. The force expended in opening the valves, and friction of the parts of an engine..... | ·623 | |
| 6. By the steam being cut off before the end of the stroke ..... | 1·000 | |
| Amount of deductions —— | | 3·920 |
| Effective pressure..... | | 6·080 |

The loss of power in an engine which has a condenser is also given as follows:—

| | | |
|---|---|---|
| The pressure on the boiler being..... | | 1·000 |
| 1. By the force required to produce motion of the steam into the cylinder | ·007 | |
| 2. By the cooling in the cylinder and pipes ..... | ·016 | |
| 3. By the friction of the piston and loss | ·125 | |
| 4. By the force required to expel the steam through the passages ..... | ·007 | |
| 5. By the force required to open and close the valves, raise the injection-water, and overcome the friction of the axes ..... | ·063 | |
| 6. By the steam being cut off before the end of the stroke ..... | ·100 | |
| 7. By the power required to work the air-pump ..... | ·050 | |
| Amount of deductions —— | | ·368 |
| Effective pressure..... | | ·632 |

The whole of the steam-engine, the cylinder with its passages and valves, the piston-rod, the parallel motion, the beam, the connecting-rod and crank, together with the condenser, air-pump, and other appendages, must be looked upon as having no source of moving power in themselves, but as mere instruments by which the mechanical effect developed by the furnace and the boiler is transmitted to the working-point, and so modified as to be adapted to the uses to which the machine is to be applied. The moving power of the steam-engine is, in fact, stored up in the *boiler*. The boiler and its furnace thus become essential portions of the steam-engine, the construction and operation of which claim especial attention. The forms of boilers which have been proposed as the most convenient for the attainment of all the requisite purposes have been very various. The spherical form would be decidedly the best if strength alone were to be considered; and the early boilers were very nearly hemispheres, placed on a slightly concave base. The form adopted by Watt, called the *waggon-boiler*, consists of a semi-cylindrical top, flat perpendicular sides, flat ends, and a slightly concave bottom. In boilers of this description, the steam intended to be used did not exceed the pressure of the external atmosphere by more than from 3 lbs. to 5 lbs. per square inch; and the flat sides and ends, though unfavourable to strength, could be made sufficiently strong for this purpose. The air and smoke in a boiler of this description pass through the flues that are carried round it, and are in contact with the boiler only at one side. The flue must therefore be constructed of materials which are non-conductors of heat, so that they may not absorb any considerable portion of heat from the air passing in contact with them. Whatever the form of the boiler may be, its magnitude and proportions, as well as those of the furnaces and their appendages, must be determined by the rate at which the steam is required to be produced, and in some degree also by the quality of the fuel employed. It is a matter of regret that the proportions of the various parts of steam-engines, including their boilers and furnaces, have not been determined by any exact or satisfactory experiments. In general, each engine-maker follows his own rule,





and the rule thus followed, in very many cases, is merely founded on conjecture, unsupported by any experimental evidence. It was considered by Watt that from eight to ten square feet were sufficient to produce the evaporation of one cubic foot of water per hour. It is unknown whether this opinion was arrived at on experimental grounds; but the practice of engine-makers since that time has been to increase the allowance of heating surface for the same rate of evaporation. Engine-builders have varied very much in this respect, some allowing twelve, fifteen, and even eighteen square feet of surface for the same rate of evaporation. In all boilers, the surface of the water should always be above the range of the flues; and as the water by which the boiler is fed has always a much lower temperature than that at which the boiler is maintained, the supply of the feed will have a constant tendency to lower the temperature of the water; and this tendency will be determined by the proportion between the magnitude of the feed and the quantity of water in the boiler. Different methods have been from time to time suggested for indicating the level of the water in the boiler. This is usually effected by means of *water-gauges*, which require the frequent attention of the engine-man. Self-acting and regulating feeders are now much used in steam-boilers. For ascertaining the pressure of the steam which is used in working the engine, several methods are employed. In the mercurial steam-gauge, a bent tube containing mercury is inserted into some part of the apparatus which has free communication with the steam. The excess of the pressure above that of the atmosphere is found by observing the difference of the level of the mercury in the two limbs of the bent tube. One of the most important parts of a steam-boiler is the *safety-valve*. This valve is used in order to secure the boiler from accidents arising from the steam contained in it acquiring an undue pressure. The magnitude of this valve should always be such that when open the steam should be capable of passing through it as rapidly as it is generated in the boiler. In low-pressure boilers the steam is generally limited to five or six pounds pressure per square inch; and consequently the load over the safety-valve, in pounds, would be found by multiplying the superficial magnitude of its smallest part by these numbers. It would be inconvenient to place the necessary weight upon the safety-valve of a boiler maintained at a high pressure. In such cases a lever is used, the shorter arm of which presses down the valve, and the longer arm is held down by a weight capable of adjustment, so that the pressure on the valve may be regulated as required. As a precaution, there should always be two safety-valves on all boilers, one of which should be locked up, so that the persons in care of the engine should not be able to increase the weight upon it. Many great improvements have been made of late years in the construction of boiler-furnaces. The principal advantages gained by these have been the economising of fuel and the consumption of smoke. In the locomotive boiler, the limited magnitude renders the construction of the extensive flues used in stationary boilers impracticable. In the early engines a large quantity of heat was thus wasted. At length an expedient was adopted which saved both heat and fuel. The boiler was traversed by a considerable number of small tubes of brass or copper running parallel to each other from end to end, the furnace being at one end of the boiler and the chimney at the other. The flame and heated air from the furnace were compelled to pass through these tubes. By this means the water was exposed to a very large heating surface in a very small space. (*See* RAILWAYS.) In an article like the present it would be impossible to enter into the formulæ for determining the dimensions of an engine and its boiler, the pressure at which it must be worked, the velocity of the piston, &c.—For further information on the subject, therefore, the reader is referred to Tredgold *On the Steam-engine*; Farey *On the Steam-engine*; De Pambour, *Théorie de la Machine à Vapeur*; and Galloway *On the Steam-engine*.

STEAM-GUN.—A contrivance invented by Mr. Jacob Perkins, shortly after the general peace which followed the battle of Waterloo. By means of the steam-gun, balls and other projectiles used in warlike operations

were to be projected by the expansive force of steam. Although the steam-gun has been frequently tried and experimented upon since that period, the invention has not proved useful or successful up to the present time. To explain the principle on which the gun was formed, let us suppose a strong close iron vessel having two valves, one opening inwards and the other outwards, the latter being loaded with some fixed pressure. If the vessel be then completely filled up with water, it may be heated to the temperature corresponding to the pressure on the valve, without permitting any of the water to be converted into steam. To make this more apparent, let it be supposed that the valve is loaded with a pressure of fifty atmospheres. Under that pressure, the temperature of the water evaporated being 510°, the vessel may be raised to any temperature not exceeding 800°, without having any of the water contained in it converted into steam. If the temperature to which the water is raised be 800°, and a cubic inch of water of ordinary temperature be forced in through the valve opening inwards, a cubic inch of water at a temperature of 800° will be forced out at the valve opening outwards. As this water is no longer subjected to the pressure which retained it in a liquid state, it suddenly expands and flashes into steam; but in expanding, the pressure will be diminished in nearly the same proportion as the volume into which it swells shall be increased. The close vessels used by Mr. Perkins, in which water was raised to a high temperature without being converted into steam, were called *generators*. If we suppose the valve through which the heated water is ejected to be in communication with the barrel of a gun, in the same way that the barrel of an air-gun is in communication with the air reservoir, it is plain that a ball can be projected by the expansive force of the water ejected from the valve. As the water may be ejected from the valves either in a constant stream or in a rapid succession of jets, the balls may be discharged from the barrel as rapidly as it is possible for them to be brought under the action of the steam.

STEAM-HAMMER.—The name of steam-hammer has been given to various powerful machines worked by steam, for dealing heavy blows with rapidity and precision. The steam-hammer of Mr. James Nasmyth, the introducer of this machine, is particularly deserving of mention, as greatly economising time and labour, and for its successful employment in iron-making, the forging of anchors, pile-driving, &c. (*See* NASMYTH HAMMER.)

STEAM NAVIGATION, a term applied to the art of propelling vessels by means of the steam-engine. The first feasible suggestion of the employment of the steam-engine for marine purposes appears to be due to Jonathan Hulls, who published a tract in 1737, entitled, "A Description and Draught of a new-invented Machine for carrying Vessels or Ships out of or into any Harbour, Port, or River, against Wind or Tide, or in a Calm." The work contains a plate, representing a boat, with a paddle-wheel at the stern, propelled by a steam-engine, and towing after it a vessel of war. He took out a patent for his project, but soon found his path so beset with difficulties, that he abandoned the whole scheme. Hulls' suggestion, however, was practically tried by the marquis de Jouffroy, who constructed a steamboat in 1782, with which he made numerous experiments on the Soane, at Lyons. These experiments were also unsuccessful, and Watt's rotary engine was not applied to the purposes of navigation until after the expiry of his patent in 1800. In 1787, Mr. Patrick Miller, of Dalswinton, in Scotland, published a pamphlet descriptive of a new species of vessel he had invented, which was to be driven by paddle-wheels. The engine to work these wheels was made by William Symington, a young engineer of great ingenuity. This engine was introduced into a pleasure-boat, which was frequently tried with considerable success on the Lake of Dalswinton. A larger vessel was constructed in the following year by Mr. Miller. This boat was tried in 1789 on the Forth and Clyde, and attained a speed of nearly seven miles an hour. Nothing further was done in the matter till 1801, when Symington was employed by Lord Dundas to construct a steamer for the purpose of towing barges on the Forth and Clyde canal. Watt's patent having expired by this time, the vessel was furnished with a rotative engine on Watt's principle. The boat was found to answer its purpose admirably, but the proprietors of the canal objected to its use, from a belief that the wash of the paddle-wheels would injure the banks. The boat was consequently abandoned in 1803, after an outlay of about £3,000. Shortly after the construction of this vessel, which was called the *Charlotte Dundas*, an experiment was made on the Seine with a steamboat by an American engineer, named Fulton. The weight of the engine, however, broke the vessel in two, and the whole was precipitated to the bottom. Having, however, visited the *Charlotte Dundas*, and having received a full explanation of the machinery and working of the vessel from Symington, he was enabled to return to his native country with full information on the subject. Arrived there, in conjunction with a Mr. Livingston, he obtained a patent for what was called their "invention of steamboats." They made their first attempt on the Hudson river in 1807, with a steam-engine which had been sent from England, and made by Messrs. Boulton and Watt; the plan of the wheels and the gearing being similar to that introduced by Symington six years before. This vessel attained a rate of about five miles an hour. Messrs. Fulton and Livingston built several steamboats on a large scale for carrying goods and passengers. In this country it was not till 1812 that a regular steam passage-boat made its first appearance. This vessel was called the *Comet*, and was built for Mr. Henry Bell, the proprietor of the Helensburgh baths, on the Clyde. She was 40 feet long and 10 feet beam, with a steam-engine of four-horse power. From this period, the importance of steam-vessels was admitted on all hands. In 1819 another vessel, called the *Comet*, was first introduced into the royal navy. She measured 115 feet in length, 21 feet beam, and drew 9 feet of water, being propelled by a pair of engines of 40-horse power each. Steam communication was first established between London and Leith in 1821. The first steamer which crossed the ocean was the *Savannah*, an American vessel of 300 tons. She made the voyage to Liverpool from the United States in twenty-six days; but though assisted by the agency of steam, her principal progress had been made as a sailing vessel. The same may be said of two voyages made by the *Curaçoa* in 1829, between Holland and her West-Indian colonies. The first English steamer which crossed the Atlantic was the *Sirius*, which started from London in 1838, and arrived in New York, after a passage of seventeen days. Other steamers were then rapidly constructed, and established as means of transport between this country and New York. The project of the Cunard line of steamers for carrying the mails between Liverpool and Boston, touching at Halifax, is supported by an annual subsidy from the government. Since the successful demonstration of the possibility of crossing the Atlantic, the system of ocean steamers has been largely extended. Between Great Britain and the West Indies, North and South America, Australia, the Mediterranean, and the various parts of the continent, regular lines of steam-packets are now maintained.

STEARIC ACID, *ste'-ar-ik* (Gr. *stear*, fat).—This fatty acid is liberated during the saponification of most animal and many vegetable fats. (*See* FATTY ACIDS.) It may be obtained pure by saponifying mutton suet and decomposing the hot solution of the soap with hydrochloric acid. The oily and fatty acids separated are next submitted to pressure between hot plates, by which means the oleic acid is separated. Recrystallization from alcohol and ether, three or four times, gives the pure acid separate from its congeners. The stearates of the alkalies are soluble in water. Stearate of soda is the basis of ordinary hard soap; stearate of potash, on the contrary, is soft. The other stearates are insoluble. Stearate of lead is one of the constituents of lead or diachylon plaster. Stearic acid is insoluble in water, but is soluble in ether and alcohol, from which it crystallizes in beautiful colourless transparent rhombic plates. Its solution reddens litmus. Ordinary so-called stearic candles consist of stearic acid, combined more or less with palmitic acid, according to the raw material used in their manufacture.

STEARIN, *ste'-ar-in* (Gr. *stear*, tallow), a white crystalline neutral fat, existing in most oils and fats

It forms the largest constituent of mutton tallow, from which it may be separated by heating that substance with ten times its volume of ether. When cool, the olein and palmitin are held in solution, and the stearin crystallizes out in pearly scales. These must be pressed between blotting-paper or dissolved in ether, and re-crystallized until the melting-point is constant. Stearin exists under several modifications, each having a different melting-point. Its average melting-point is 144° Fahr. Stearin is a salt composed of three equivalents of stearic acid united with one of the base of glycerine.

STEEL MANUFACTURE, *steel* (SAX. *style*).—Steel may be defined as iron chemically combined with sufficient carbon to give it extreme amount of toughness and hardness without brittleness. According to one of our greatest authorities on the subject, steel should contain from 0·833 per cent. of carbon to 1·67 per cent., the numbers given belonging to the softest and hardest varieties. If the latter quantity be exceeded, ordinary cast iron will be the result. The formation of steel is effected in two ways: (1), by cementation, which consists in adding carbon to iron containing little or none of that substance; (2), by separating the necessary amount of carbon from fine cast iron, containing two per cent. or more of that element. The former process yields the best steel for the making of all fine instruments, the latter an excellent rough steel, fit for agricultural implements and springs for machinery. In India and some of the continental states, more especially in Westphalia, Styria, Siegen, and Sweden, steel is made directly from the ores of iron found in those localities. In these places charcoal is used as a fuel. In Germany, a variety called puddled steel, prepared by a process similar to that used for puddling iron, is much in request as a material for axles, tires, rails, and other work where great strength and hardness are required. The celebrated Indian *wootz* is prepared by a rude process, from a very rich magnetic oxide of iron. *Damascus steel* consists of a very highly carburetted metal, which, by careful cooling and annealing, separates into two distinct compounds of iron and carbon, giving it the peculiar appearance known as "*damascening.*" The wonderful perfection of the Indian and Damascus blades is due as much to careful and patient manipulation as to their chemical composition. The most characteristic property possessed by steel is that of becoming intensely hard when made red-hot and plunged into cold water. If the heat be intense and the cooling very sudden, an arrangement of particles takes place, so as to give the steel a hardness sufficient to scratch glass. If, on the contrary, the metal be allowed to cool gradually, it will become soft. Between these two points of extreme hardness and brittleness on the one side, and extreme softness and toughness on the other, intermediate stages exist, giving the metal properties fitting it for a variety of purposes. These different degrees of hardness are obtained by the process known as "*tempering.*" The steel is first heated to the maximum and plunged into cold water, by which means the greatest hardness and brittleness are obtained. It is then partially or wholly polished and carefully reheated, and allowed to cool again gradually. The degree to which the temperature is raised in the second heating regulates its ultimate hardness, and is indicated by the colour assumed by the polished portion. The first perceptible tint is a light straw-colour, which makes its appearance when the heat reaches 430° to 460° Fahr. This gives the metal a maximum of hardness, with a certain amount of elasticity, fitting it for lancets, razors, and surgical instruments; at 470° a full yellow is produced, which is the temper employed for penknives, scalpels, and fine cutlery. The temperature of 490° gives a brownish-orange, the temper for shears and chisels used for cutting iron. At 510° the brownish-yellow becomes flecked with purple, the tint for pocket-knives. 520° gives a bluish-purple, fit for table cutlery; while the different shades of blue from 530° to 570° indicate a temper proper for watch-springs, sword-blades, saws, and instruments requiring great elasticity. Beyond this temperature the metal becomes too soft to be used for cutting-instruments. The surfaces of articles manufactured from soft iron, such as the wearing parts





of gun-locks, are converted into steel by heating them in boxes, in contact with carbonaceous matter, or by sprinkling them while red-hot with powdered ferrocyanide of potassium. This process is termed case-hardening. Within the last few years, great attention has been paid to the investigation of the chemical composition of steel. The researches of Despretz, Fremy, and others, tend to the conclusion that nitrogen exercises a very important influence over the phenomena of steeling, and that carbon plays a less necessary part, while those of MM. Caron and St. Claire Deville still refer the formation of steel to the chemical combination of iron with carbon.

STEELYARD, *stil'-yard*, in Mech., a sort of balance or weighing-machine, consisting of a lever with unequal arms. The short one supports the substance to be weighed, and an invariable weight is made to slide along the other till the two forces are in equilibrium; the weight required is then indicated on the graduated edge of the long arm of the steelyard.

STEELYARD, MERCHANTS OF THE, a body of aliens who enjoyed various commercial privileges in England from an early period to the middle of the 16th century. They had a factory, which was called the Steelyard, or Steel-house, which was situated between Thames Street and the river, a little east of Dowgate. Edward IV., in 1475, entered into a treaty with the Hanseatic League, under which, and their old charters, the merchants of the Steelyard were enabled to monopolise certain branches of trade. They were ultimately deprived of their privileges in 1551.

STELLARIA, *stel-lair'-re-â* (Lat. *stella*, a star, from the appearance of its flowers), in Bot., a gen. of the nat. ord. *Caryophyllaceæ*. Many of the species are common weeds, being known as stickworts. *S. media* is the chickweed.

STEM, *stem* (Sax. *stefn* or *stemn*), the ascending axis of a plant, or that part of the axis which at its first development takes an opposite direction to the root. Stems have usually considerable firmness and solidity, but sometimes they are too weak to support themselves. When they trail on the ground, they are said to be *procumbent;* when they cling to other bodies by means of suckers, *climbing* or *scandent;* and when they twist in a spiral manner round their supports, *twining* or *volubile*. The four principal kinds of stem are:—1. the *caulis*, common to plants which are herbaceous, or die down annually,—examples may be seen in most garden and roadside plants; 2. the *trunk*, the woody and permanent stem of a tree,—it always springs from a dicotyledonous embryo; 3. the *culm*, common to most grasses and sedges,—it is usually a slender tube, having joints or partitions at the points where the leaves arise; 4. the *stipe*, a fibrous stem, straight and cylindrical, being almost as thick at the summit as at the base,—it is peculiar to acotyledonous plants, and may be observed in any of the palms or tree-ferns. (For descriptions of the principal modifications of the stem, *see* BULB, CORM, RHIZOME, TUBER.)

STENOGRAPHY, *sten-og'-räf-e* (Gr. *stenos*, contracted, and *graphein*, to write), the art of writing in abbreviations and with many arbitrary signs to denote whole syllables, words, and phrases, so that the writing may occupy but little room, and be executed with much more rapidity than is possible in the common mode. The invention of stenography has by some authorities been ascribed to Cicero, the famous Roman orator. The first English treatise on stenography was published in 1588, by Dr. Timothy Bright, and dedicated to Queen Elizabeth. It consisted entirely of arbitrary characters, each of which represented a word. But this system was crude and difficult of attainment; as, for its practical application, it required a remarkable tenacity of memory; and it was not until 1753, when the well-known reporter, Mr. Thomas Gurney, published his system, that stenography became an art calculated to be extensively useful. Since then many other systems have been published; and we may mention that during the last two centuries 100 works on the subject have appeared in England alone. We subjoin a few of the principles of stenography, according to one of the systems now in use:—The vowels are represented by points, a period standing for *a*, *e*, and *i*, and a comma for *o* and *u*. The single consonants of the short-hand alphabet amount only to sixteen, *c* and

*a* being rejected, the former having both a hard and a soft sound similar to *k* and *s*, which are therefore used for it; *f* and *v* being similar in sound, are represented by the same character; as are *g* and *j*, and also *k* and *q*. The vowels are distinguished from each other by their position; for instance, should the period be placed over the top of a consonant, it signifies *a*; if placed against the side of a consonant, it becomes *e*. The various characters of the alphabet represent, when placed by themselves, a number of small words; the character which represents *g*, for instance, representing *God*, *give*, *go*, *good*. The characters of the alphabet also represent the first and last syllables of words; thus the character which represents the letter *b* also represents the first syllables *abs*, *obs*, &c., and the terminations *ble*, *ible*, and *bly*. In stenography, also, a mode of spelling is adopted which consists in omitting all the silent letters.

STERCULIA, *ster-ku'-le-ä*, in Bot., the typical gen. of the nat. ord. *Sterculiaceæ*. The most interesting species is *S. acuminata*, the seeds of which, under the name of *Kola-nuts*, are used in Africa to sweeten water which has become more or less putrid. They contain a large amount of mucilage. *S. Tragacantha*, a native of Sierra Leone, received its specific name from yielding a gum resembling flaky tragacanth. *S. urens*, a native of Coromandel, yields a gum of a similar nature, which is known as *gum kuttera*. The seeds of all the species contain fixed oil, and many are eaten in different parts of the globe.

STERCULIACEÆ, *ster-ku-le-ai'-se-e*, in Bot., the Silk-cotton fam., a nat. ord. of *Dicotyledones*, sub-class *Thalamifloræ*, consisting of trees and shrubs, easily recognised by their valvate 5-parted calyx, contorted corolla of 5 distinct petals, numerous perfect stamens united by their filaments into a column, and 2-celled extrorse anthers. There are 37 genera and 128 species, all natives of the tropics, or of very warm climates. In their properties they resemble the *Malvaceæ*, being generally mucilaginous, demulcent, and emollient. Some produce seeds with a hairy or cottony covering, and others yield useful fibres. Many are remarkable for their prodigious size, height, and apparently enormous age. (*See* ADANSONIA, BOMBAX, DURIO, STERCULIA.)

STEREOSCOPE, *ste'-re-os-kope* (Gr. *stereos*, solid; *skopeo*, view), an instrument by means of which two pictures, taken from different points of view, are shown as one picture of that object, having the almost magical appearance of solidity. The theory of the stereoscope was first explained by Professor Wheatstone, who showed that the image of every solid object painted on the retina is different with every different position of the eye. To illustrate this by means of the common camera obscura:—If the image of a *picture* be formed in this instrument, it is of no consequence in what position the instrument is fixed with regard to the picture, the relative position of all its points will be the same; but when a *solid object*, as a castle or a tree, is depicted in the camera, the case is far different. It will then be observed that the relative position of the several points of the solid image will vary every time the instrument is shifted. It is precisely similar with the eye; a different picture is painted on the retina every time the position of the eye is changed. In obedience to this law, two slightly different pictures of any solid object will be simultaneously impressed on the two eyes. That this is actually the case, we may convince ourselves by placing a lighted candle about three feet in front of the face, and holding up the fore-finger between the candle and the nose; the finger and candle will appear on the contrary sides of each other when seen by each eye separately. Professor Wheatstone showed that the combination of two dissimilar visual images, simultaneously depicted on the two retinæ, conveyed to the mind the perception of relief or solidity, and this fact he proved by explaining that if two pictures of an object be taken in the direction in which it would be viewed by the two eyes separately, upon these pictures being presented to the two eyes in such a way that their images might fall on corresponding portions of the retinæ, then the two views would be combined into one, and carry to the mind of the beholder the impression of actual solidity. These principles as first explained in a paper read before the Royal Society, June 21st, 1838, called "Contributions to the Physiology of Vision. Part I.—On some remarkable and hitherto unobserved phenomena of binocular vision." In this paper, which was afterwards printed in the "Philosophical Transactions," he described his reflecting stereoscope. The refracting stereoscope was subsequently described by Sir David Brewster, in a paper communicated to the Royal Society of Edinburgh. It would appear, however, that the dissimilarity of the pictures, as observed by each separate eye, is not a modern discovery. Two thousand years ago, it was recognised by Euclid and described by Galen. In 1593, Porta revived it; it was known to Leonardo da Vinci and Harris in 1775, and later Drs. Smith and Porterfield were aware of the fact. But it was not till photography and the binocular camera were invented that accurate pictures, as seen by each separate eye, could be properly united so as to afford the idea of solidity. There are two kinds of stereoscope. Professor Wheatstone's original instrument, the reflecting stereoscope, is a very simple instrument. It consists of two small plane mirrors, placed vertically and at right angles to each other in the middle of a horizontal board at the ends of which are fixed two vertical frames provided with grooves for holding two pictures drawn on cardboard. The eyes of the spectator are placed in front of the mirrors, so as to observe one of the pictures reflected from each, the cardboards being so adjusted in the grooves that the images shall exactly overlap each other, upon which the stereoscopic effect will be discovered. The refracting stereoscope consists of a pyramidal box of wood, metal, or other opaque material, blackened on the inside, and having a lid for the admission of light. The bottom of the box is usually formed of ground glass. The top of the box consists of two portions, in one of which is the right-eye tube, containing a semi or quarter-lens; the other, or left-eye tube, containing also a semi- or quarter-lens. These lenses should be made to draw out, in order to suit long- and short-sighted eyes. The stereoscopic pictures, or "slide," are generally mounted upon a thick card, and are fitted into a groove at the bottom of the box. Upon looking through the eye-tubes at the two dissimilar pictures upon the slide, they are found to be united into a single picture, possessing the appearance of relief and solidity.—Ref. *Natural Philosophy*, by Dr. Golding Bird and Mr. Brooke; *English Cyclopædia*.

STEREOTYPING, *ste'-re-o-ti-ping* (Gr. *stereos*, firm, or fixed; *tupos*, a type), consists in casting, by means of a mould, a representation of the face or superficies of a collection of types arranged in a page. Stereotyping intervenes between the work of the compositor, who sets up or arranges the movable types into a page, and the operation of taking an impression from the page by means of a hand-press or steam-driven machine. The method of setting up the separate types has been treated of under the article PRINTING; it will here be necessary to speak of what is done with regard to taking a cast of the face of a page of properly arranged types. But first of all, as to the history of the art. Among the many schemes for printing from a solid block or plate, is that of Van der Mey, a Dutchman, who about the beginning of the 18th century cast some blocks of type-metal, from which a quarto Bible was printed. His plan consisted in soldering together at the back the ordinary types, after they had been arranged in a page in the usual manner. The great expense, together with the inconvenient bulk and weight, prevented this mode from becoming general. About the year 1725, William Ged, a goldsmith of Edinburgh, invented a process for casting whole pages of type, and he associated himself with others, in order to strike off by his process Bibles and Prayer-books for the university of Cambridge. The university, however, soon removed their countenance from the scheme; and this was mainly owing to the prejudice of the compositors, who artfully introduced errors into the "forms" from which the plates were cast, thereby bringing the plates into discredit as so many pieces of perpetuated blunders. The next step towards perfecting the art of *stereotyping* was made by Mr. Tilloch, editor of the "Philosophical Magazine," who was acquainted with the earlier efforts of Ged. Together

with Foulis, the printer to the Glasgow university, he produced several works printed from solid plates. Almost simultaneously with these experiments of Tilloch and Foulis, the French were seeking to arrive at the same end. The celebrated French printers MM. Didot printed, towards the close of the 18th century, a number of publications, as well as some of the Latin classics, by means of stereotyped plates. Their plan was to "set up" the work in movable types of a harder substance than is usual, and with these to obtain a matrix by striking upon a mass of soft metal in an intermediate state between perfect fusion and perfect solidity, after the manner called at the present time in France *clichapd*. Senefelder, the inventor of lithography, endeavoured to discover a means of stereotyping; but although he met with some success, he was compelled to abandon his experiments for want of pecuniary resources. Perhaps the general adoption of stereotyping in this country may be said to be solely due to the liberal patronage of Earl Stanhope. Mainly to the encouragement accorded by this nobleman, Messrs. Tilloch, Foulis, and Andrew Wilson, a printer of London, were enabled to perfect the process so far as to gain, early in the present century, the patronage of the universities of Oxford and Cambridge. The first work printed after the stereotype process was issued from Cambridge in 1807; whilst the earliest production of the Oxford press bears date 1809. To now briefly describe the process of stereotyping as at present practised. After the setting up of a page, or a number of pages, of movable types, according to the method described under the head PRINTING, the types are passed on to the stereotyper, who proceeds to take a mould from them. He first of all moistens the surface by rubbing over it an oily composition to prevent the mould from adhering to it. The page is then fixed in a brass frame, and plaster of Paris in a liquid state is poured evenly over the whole surface. The plaster soon sets into a solid mass, upon which it is carefully removed from the surface of the types. Supposing it to be a good and perfect matrix, it is now fit for the baking. It is placed in an oven heated to about 400° Fahr., and then baked thoroughly dry and hard. After the baking, the mould is placed face downwards upon a plate of iron termed a *floating-plate*. This last is contained in a cast-iron box; the cover of this box being placed above the back of the mould and firmly secured there by a screw. It should be observed that the corners of the lid of the casting-box are cut off, in order that the metal may enter. The whole apparatus is next plunged into a large iron vessel containing melted metal, and the metal forced by hydrostatic pressure insinuates itself, through the open spaces at the corners of the casting-lid, into every hollow of the mould. After ten minutes' immersion, the casting-box is raised, and when cold, the contents are removed, and a cast plate, the face of which is a perfect fac-simile of the types from which the mould was taken, is obtained. In order to insure the proper thickness, as well as an even surface, the back of the plate is turned in a lathe, in which the plate revolves against a cutting tool, the superfluous parts being cut away in a series of concentric circles. The most careful casting cannot prevent occasional defects in a plate, and it is the duty of *the picker* to remove small globules of metal, which occasionally adhere to the letters, or to replace those letters that have been broken, by dexterously soldering in new ones. This process, although long deemed the best, is now being rapidly superseded by another, which has been introduced into this country from Paris. According to this latter method, instead of plaster of Paris, six or seven sheets of moistened unsized tissue-paper, slightly pasted together, are placed upon the surface of the types; upon these a sheet of stouter paper is superposed. The whole is then struck with a heavy brush, till the soft paper has taken a perfect impression of the type. This paper mould is next dried and hardened by being placed upon a hot iron plate. From this mould a cast can be taken by simply pouring in molten metal. Several casts can be taken from the same mould. On account of the simplicity and rapidity of this paper process, many newspapers and publications having a large circulation have adopted it as the means of supplying a plurality of machines with plates, for



the production of the requisite number of copies. The benefits afforded by stereotyping are many: in the production of works of reference, of standard authors, and of books for which there is a continued demand, the process is of the greatest utility. Indeed it is essential to the production of cheap books in large numbers, as it saves the publisher from printing more copies at a time than he needs; and when a new demand arises, there is no necessity to undergo a fresh expense in the new composition of the types.—*Ref. English Cyclopædia.*

STERNUM, *ster'-num* (Ger. *sternon*), is the breastbone, an oblong, flat, irregularly-shaped bone, placed at the forepart of the thorax. In the young subject, it consists of a number of bones, which become united in the adult, when it consists of three, and sometimes of two, or even of one bone. It serves for the articulation of the seven upper or true ribs on each side, is of use in aiding respiration, and defends the heart and lungs.

STETHOSCOPE, *steth'-os-kope* (Gr. *stethos*, the chest, and *skopeo*, I explore), in Med., is the name of an instrument invented by M. Laennec, of Paris, in 1823, and is of valuable aid in the process of auscultation (which *see*). It consists of a tube about ten inches in length, made of wood, or sometimes of gutta-percha, widening considerably at one end, and but slightly at the other. The wide end is applied to the chest or other part of the patient, the physician putting his ear to the other end; and from the sounds emitted by the heart, lungs, &c., the state of these parts may be ascertained.

STEWARD, LORD HIGH, OF ENGLAND, *stu'-ard* (Ang.-Nor.), one of the ancient great officers of state. It was an hereditary office under the Norman kings. It passed from Hugh Grentmesnil, who held the office during the reign of Henry II., through different hands, until it reached the second Simon de Montfort, who was slain at the battle of Evesham, in 1265. Thereupon the high office reverted to the crown, but was at once granted by Henry to his third son, Edmund, whose descendants, the earls of Lancaster and Leicester, held it till the accession to the crown of Henry, duke of Lancaster, as Henry IV., upon which it was absorbed into the regal dignity. Since that period, the high dignity has never been invested upon any person, except upon some special occasion, and then only while certain business is being transacted. (*See* next article.)

STEWARD, COURT OF LORD HIGH.—In former times the lord high steward of England was an officer who had the supervision and regulation, next under the king, of all affairs of the realm, both civil and military. Since the time of Henry IV. no person has been invested with this high dignity as an heritable possession, but only for some special occasion, the office to cease when the business which required it was ended; and this occasion has usually been to try some person before the House of Peers. Before this court of the lord high steward, a peer may be impeached for treason, felony, misprision of treason, and misprision of felony; but a commoner only for high misdemeanours, and not for any capital offence. The lords are summoned to appear, and a majority of twelve or more is decisive. The spiritual lords can be present, but they are not allowed to vote. It has been the practice of late years to appoint the lord chancellor high steward on these occasions. The peers having assembled, his commission is read, and a white rod, his emblem of office, is put into his hands with great ceremony; and then his grace, for so he is then styled, takes the seat allotted for him as lord high steward, and proceeds to the trial of the person or persons before him. When the trial is over, his grace breaks the rod, which ends the commission.

STICKLEBAT, *stik'-el-bit*, the common English name for certain small fishes constituting the genus *Gasterosteus* of Linnæus, and containing both fresh and salt-water species. The *rough-tailed three-spined sticklebat* is one of the smallest, as well as the most common of our fishes, being found in every river, brook, and lake, and being common all round the coast. It is active in its movements, pugnacious in the extreme, and extremely voracious. Their food consists of worms, insects, and the minute fry and roe of other fishes. They spawn in summer; the females, generally paler

in colour than the males, depositing their ova, which are large but few, on the leaves of aquatic plants. They are so numerous that they are frequently strewed over the land as manure. This species seldom exceeds two and a half inches in length, and is distinguished by having its sides defended by a series of bony plates, arranged vertically along their whole length. The colour of the back is green; the cheeks, sides, and belly, silvery-white. Another species of stickleback is the *fifteen-spined stickleback*, which seldom, if ever, is found in fresh water, and sometimes attains the length of six inches.

STICTA, *stik'-tă*, in Bot., a gen. of lichens. *S. pulmonaria*, commonly known as tree lung-wort, or oak-lungs, possesses tonic and nutritious properties. In Siberia it is used instead of hops for imparting bitterness to beer. A brown dye is produced from it in France.

STILAGINACEÆ, *stil-ă-jin-ai'-se-e*, in Bot., the *Stilago* fam., a nat. ord. of *Dicotyledones*, sub-class *Monochlamydeæ*, consisting of trees or shrubs, with alternate simple leathery leaves, having deciduous stipules; minute unisexual flowers, growing in scaly spikes; and drupaceous fruits. There are five genera and about 20 species, natives of Madagascar and India. Their fruits are commonly sub-acid and edible. No injurious properties are know to exist in the plants of this order.

STILAGINEÆ, *stil-ăj'-se-e*, in Bot., a small nat. ord. of *Dicotyledones*, sub-class *Corolliflorœ*. There are three genera and seven species, natives of the Cape of Good Hope. They are shrubby plants, without any known uses.

STILL, *still* (Lat. *stillo*), a large vessel employed in the process of distillation. The common *still* consists of a large copper boiler, set in masonry over a furnace, having a head or capital of a globular form which connects it with the *condenser* or *worm-pipe*.

STILLINGIA, *stil-lin'-je-ă*, in Bot., a gen. of the nat. ord. *Euphorbiaceæ*. The species *S. sebifera* is called the Chinese tallow-tree, from its seeds being covered by a white sebaceous substance, which, when separated, is found to be a pure vegetable fat: it is used for making candles. *S. sylvatica*, queen's root, is employed in North America as an emetic, cathartic, and alterative.

STIPULES. (*See* LEAF.)

STOCK EXCHANGE, *stok*.—The term *stocks* is applied to the several *funds* which constitute the national debt; and the *Stock Exchange* was originally the building in London where the stock-brokers assembled to do their business. At present each proprietor of stock may transfer his interests to others by sale. When a broker effects the transfer, he must be authorised by a power of attorney for his principal, the stamp duty on which is 2*l*s. 6*d*.; and the document may be so drawn as to empower him both to buy and to sell stock, and to receive the dividends from the person by whom he is commissioned. As a general rule, stock is bought and sold through a broker, but the proprietors generally receive their dividends themselves. Bargains in stock are transacted in the Stock Exchange, in Capel Court. All the more respectable brokers are members of the Stock Exchange, into which association they are every year elected by ballot. The governing body is composed of a committee of twenty-four, also elected by ballot. The established rate of brokerage is one-eighth per cent. upon the amount of stock transferred. *Time bargains* form a very important portion of the business of the Stock Exchange. They consist in agreements to deliver stock on a certain day at a certain price, the buyer believing that the price will rise, and the seller that it will fall. When the appointed day arrives, the matter is usually settled without any payment of stock, the losing party merely paying the difference in price. Dr. Hamilton, in his "History of the National Debt," says:—"These bargains are usually made for certain days fixed by the Committee of the Stock Exchange, called *settling days*, of which there are about eight in the year; namely one in each of the months of January, February, April, May, July, August, October, and November, and they are always on Tuesday, Wednesday, Thursday, or Friday, being the days on which the commissioners for the reduction of the national debt make purchases. The settling days in January and July are always the first days of the opening of the Bank books for public transfer; and these days are notified at the Bank when the books are shut to prepare for the dividend. The price at which stock is sold to be transferred at the next settling day is called the price *on account*. Sometimes, instead of closing the account on settling day, the stock is carried on to a future day, on such terms as the parties agree on. This is called a *continuation*." A person who is a defaulter in the Stock Exchange is called a "lame duck," and his name is posted for a certain period of time in the great room. Persons selling time bargains are called "bears," and the buyers "bulls," probably on account of the interest of the former being to beat down prices, while that of the latter is to raise them. The name of Stock Exchange is also applied in other countries to the place where stock is bought and sold. The great stock exchanges of Europe are those of Amsterdam, London, Paris, and Frankfort-on-the-Maine, which decide the price of stocks all over the world. The stock exchanges of St. Petersburg, Berlin, and Vienna, are of less importance.

STOCKS, a wooden machine, formerly much used to put the legs of offenders in, for the restraining of disorderly persons, or as a punishment for certain offences. The time when stocks were first used in England is not known; but they were in existence in 1350, during the reign of Edward III., as appears from a statute then issued; and in 1376 the commons prayed the king for their establishment in every village. In some country places the stocks are still to be seen, and they have not wholly fallen into disuse.

STOICS, *sto'-iks*, is the name of a philosophical sect of ancient Greece, so called from *stoa*, a porch in Athens, where the founder of the sect, Zeno, expounded his doctrines (B.C. 300). Alarmed at the scepticism which seemed inevitably following speculations of a metaphysical kind, Zeno, like Epicurus, fixed his thoughts principally upon morals. His philosophy boasted of being eminently practical, and connected with the daily duties of life. The aim of man's existence is to be virtuous, and virtue consists not in a life of contemplation but of action. The Stoics of ancient times had to do battle with the sceptics of their time, very much as the Scotch philosophers of common sense had to oppose the scepticism of Hume. They, too, took their stand upon common sense, and showed that reason was unable to distinguish between appearance and certainty. Sense, they maintained, furnished all the materials of our knowledge, and by reason these materials were fashioned. Nature they regarded as composed of two elements,—the primordial matter from which things are formed, and the active principle by which they are formed; *i.e.*, Reason, Destiny, God. As reason was the great moving power in the outer world, to live conformably with reason, or to live harmoniously with nature, was, with them, the great law in morals. Hence the pleasures and pains of the body are to be despised as unworthy to occupy the attention of man. To be above pain they thought to be manly; and hence they despised pain, and despised death. Stoicism as a reaction against effeminacy may be applauded; but as a doctrine it is one-sided and false. Apathy, which by them was considered as the highest condition of humanity, is, in truth, its lowest.—*Ref.* Lewes's *History of Philosophy*.

STOMACH, *stum'-ăk* (Gr. *stomachos*, also *gaster*), in Anat., is the large membranous receptacle which receives the food from the œsophagus, and within which it is acted upon by the gastric juice and converted into chyme. It is situated in the left hypochondriac and epigastric regions, and when distended, it has the shape of an irregular cone, having a rounded base and being curved upon itself. The left extremity is the larger, and is called the greater splenic end of the stomach, the right or small end being called the pyloric. The œsophagus terminates in the stomach two or three inches from the great extremity by the cardiac orifice; while by the pyloric orifice at the other end the digested matter enters the duodenum. When moderately filled, the stomach is about ten or twelve inches in length, and its diameter at the widest part about four inches. The walls of the stomach consist of four distinct coats, held together by fine areolar tissue, and named, in order from without inwards, the

serous, muscular, areolar, and mucous coats. By some the areolar is not reckoned a distinct coat. The first of them is a thin, smooth, transparent, elastic membrane derived from the peritoneum. The muscular coat is very thick, and composed of three sets of fibres, the longitudinal, circular, and oblique, which form three layers. The areolar and fibrous coat is a tolerably distinct layer placed between the muscular and mucous coats, and connected with both. The last is a smooth, soft, rather thick and pulpy membrane, loosely connected with the muscular coat, and covered with exhaling and inhaling vessels. At the pyloric orifice leading from the stomach into the duodenum there is a sphincter muscle which contracts the aperture and prevents the passage of any matter into the intestines until properly digested. The food is propelled along the œsophagus, and enters the stomach in successive waves through its cardiac orifice. It is there subjected to a peculiar peristaltic motion, having for its object to produce a thorough intermixture of the gastric fluid with the alimentary mass, and to separate that portion which has been sufficiently reduced from the remainder. This motion causes not only a constant agitation or churning of the contents, but also moves them slowly along from one extremity to the other. These revolutions are completed in from one to three minutes, being slower at first than after chymification has more advanced. The passage of the chyme or product of the gastric digestion through the pyloric orifice into the commencement of the intestinal tube is at first slow; but when the digestive process is nearly completed, it is transmitted in much larger quantities. (*See* Digestion, Gastric Juice.)

Stone, *stone* (Sax. *stan*), a general term applied to a hardened mass of earthy matter. In the building art there are very few subjects of greater practical importance than the selection of stones naturally fit for the purposes required. A good building-stone ought to possess great powers of resistance against crushing and breaking weights; it should be of even grain, and capable of furnishing large blocks; its constituent parts should not be susceptible of decomposition by the action of the atmosphere, or by their mutual reaction upon one another; it should neither absorb either water or vapour, except to a certain extent; and, as far as possible, it should be of an homogeneous nature. The denser stones, as a general rule, are more durable than the lighter ones. (*See* Quarry.)

Stone, in Med. (*See* Calculus.)

Stone, Artificial, a manufactured substance made to resemble stone, and used for statuary and other decorations of architecture. M. Feilner, at Berlin, has for several years made artificial stone with great success. His materials are almost similar to those used in making English pottery, and the plastic mass is either formed in moulds or by hand. The kilns in which the mixture is baked are peculiar in form, and are built so as to economise the fuel. Many other ingenious arrangements have been made for the construction of artificial stone; but of all the numerous plans which have been devised, very few have been successful. In Ransome's patent silicious stone, the general proportions of materials employed are as follows:—Ten pints of sand, one pint of powdered flint, one pint of clay, and one pint of alkaline solution of flint. These ingredients are first well mixed in a pug-mill, and kneaded till they are thoroughly incorporated, and the whole mass becomes of a uniform consistency. When well worked with clean materials, the compound possesses a putty-like consistence, and is capable of receiving sharp and delicate impressions. The mixture is afterwards baked in kilns constructed for the purpose. This kind of artificial stone can be used for a great variety of purposes.—*Ref.* Ure's *Dictionary of Arts, Manufactures, and Mines.*

Stone, Building. (*See* Building-Stone.)

Stone, Preservation of.—Stone, in common with every other material used in construction, is liable to either failure or decay from chemical or mechanical causes. Granite, though the hardest of building-stones, is, in several of its varieties, liable to serious decomposition. Many qualities of granite suffer rapid decomposition by the sea. Limestones also suffer from the same cause. Changes of temperature have a great effect upon stones containing iron, though some varieties containing iron in a high state of oxidation, as rosso-antico, porphyry, and others, are not readily acted upon by the atmosphere. It was once believed that the magnesian limestone were characterised by an extraordinary degree of durability, the work at Southwell Minster, built in the 11th century, being pointed to as illustrative of the fact. Truly enough, the magnesian limestone there employed had proved so durable that it bore even the marks of the mason's tool, against all the effects of a changing temperature, during eight hundred years. On this account magnesian limestone was chosen for the construction of the new Houses of Parliament. It was soon found, however, that the smoke of London had a powerfully decomposing effect upon it, because of the affinity which magnesia has for the sulphurous acid contained in such large quantities in the smoke of the metropolis. Stone suffers greatly by disintegration, the principal cause being the freezing of the minute particles of water which insinuate themselves into the pores and laminæ of stones. These particles of water swell slowly as crystals of ice are formed, and so burst open the pores or split the grain of the stone. The simplest and readiest mode of preserving stone is to paint it in oil-colours, and this expedient has indeed been adopted in the case of the stone frontage of Buckingham Palace. Nevertheless, the coating of stone with paint can never be regarded otherwise than as a poor method of escaping from a difficulty. The application of a soluble solution of silica applied after the manner of a varnish is, perhaps, the best preservative yet known. When this solution comes to be acted upon by the atmosphere, a chemical change takes place, the result being that silicic acid is left filling up the pores of the stone, thereby preventing the ingress of moisture or other disintegrating medium. Ransome's patent is a modification of this process, and consists in giving the already silicated stone a supplementary varnish of chloride of calcium. The external applications proposed (besides the soluble silica) for protecting the surface of stones are numerous. The most promising of these seem to be oily, fatty, resinous matters, which the stone is made to imbibe, sometimes by being boiled in them. Gutta-percha, quick-lime, copperas, and various other substances, have also been introduced into the preparations. Patents were taken out in 1856 for applications first of a solution of sulphate of zinc or of alum, followed by one of sulphur in oil; and another for a solution of wax in coal-tar, naphtha, &c.

Stoneware, *stone'-waire.*—Stoneware of the ordinary kinds, such as we see in jars, drain-pipes, and a variety of chemical utensils, is constituted of plastic clay, united in various proportions with some felspathic mineral sands of different kinds, and in some cases with cement-stone or chalk. These mixtures are then subjected to a heat sufficiently great to cause a partial fusion of the mass. This condition of semi-fusion is the distinguishing character of stoneware. The finer varieties of stoneware are made from carefully selected clays, which when burnt will not have much colour. These are united with some fluxing substance, by which the particular state of semi-fusion above mentioned is brought about. Formerly the glaze of stoneware was always a salt glaze; recently, however, it has been customary to glaze with a mixture of Cornish stone, flint, &c., as in the manufacture of earthenware.

Storax. (*See* Styrax.)

Storms. (*See* Wind.)

Strabismus. (*See* Squinting.)

Strangulation, *străng-gu-lai'-shun*, the act of killing by intercepting the breath. It is produced by forcibly compressing the anterior of the windpipe, or by drawing a rope tightly round the neck. (*See* Hanging.)

Stratum, *strai'-tum* (Lat. *sterno*, I spread or lay), a term used in Geol., and applied both to the separately deposited layers of rock and the rocks composed of these similar layers accumulated together. In special and local descriptions of rocks, the several beds are usually called *strata*. In geological classifications the following is the rank assigned to the different terms, according to size:—1. Systems; 2. formations; 3. strata; 4. beds; 5. laminæ.

Strawberry. (*See* Fragaria.)

STRENGTH, ANIMAL. (*See* ANIMAL STRENGTH.)

STRENGTH OF BEAMS, PILLARS, &c. (*See* MATERIALS, STRENGTH OF.)

STREPSIPTERA, *strep-sip'-te-ra* (Gr. *strepho*, I twist; *pteron*, a wing).—These insects were discovered by Kirby, living parasitic in the abdomen of some Andrenæ. At first nondescript, and not referrible to any order, they were afterwards placed in an order by themselves. The larvæ live in the bodies of bees, wasps, &c. Only the males undergo perfect metamorphosis, the females, even when adult, being without legs, wings, or eyes, and continuing to live parasitic within the bodies of the hymenopterous insects within which they were born. About ten or twelve different species are known, forming a small family called *Stylopida*, of which the genus *Stylops* is the type.—*Ref.* Baird's *Cyclopædia of the Natural Sciences.*

STRIKES, *strikes*, in Pol. Econ., are a means adopted by workmen in order to obtain higher wages or some amelioration in their working circumstances, and in which they leave their work in a body and refuse to resume it until their demands are complied with. Such proceedings are always attended with great hardships, and usually give rise to much bad feeling on both sides. The object of the workmen evidently is to force their masters into compliance by taking advantage of their necessity to have the work carried on or completed, and the knowledge of this naturally makes the masters the more inclined to resist. Perhaps, however, the chief objection to strikes is the all but impossibility of their being carried out without a system of tyranny being maintained towards a number even of those who are parties to it. A strike without unity among a number of workmen is a failure; and to obtain this, usually a number of persons are forced into it most unwillingly, while, as is often the case, when workmen are brought from a distance, these are subjected to the most wanton outrages and cruel treatment. We notice these objections the more readily, because, apart from them, we consider strikes to be perfectly fair, as they are quite legal. We can see no reason why any man, or any body of men, should be compelled to sell their labour, that which is most particularly their own, at what they consider a disadvantage. Capitalists may form themselves into combinations or companies, taking their measures in common, and why not workmen. Indeed, the taking advantage of the circumstances of workmen as a means of oppressing them, which is too often done, is most iniquitous and unjust. Many circumstances frequently combine to render it matter of great hardship for a workman to have to leave perhaps his place of abode, or it may be to change his trade; and hence he will often be obliged to work, even at a disadvantage. Besides, masters are very likely to disregard the claims of one or a few workmen; and hence it is only by a number of them combining and acting simultaneously, that their demands are likely to be listened to. Formerly, very severe laws were in force against strikes or combinations of workmen to raise their wages or against their reduction; but these have all been swept away by 5 Geo. IV. c. 95, and 6 Geo. IV. c. 129. Now, therefore, combinations among workmen to raise wages or to limit the hours of labour are perfectly legal, if unaccompanied by threats or violence; but any attempts at intimidation or preventing masters from employing other workmen, or other workmen from taking employment at any wages they please, are illegal. In strikes, the workmen always suffer more than their masters; and the privations to which they voluntarily expose themselves "form a strong presumption that they are honestly impressed with a conviction that the advance of wages which they claim is fair and reasonable, and that the strike has been forced upon them by the improper resistance of the masters."—(J. R. M'Culloch's art. "Combination," in *Ency. Brit.*) Hence the great advantage that would arise from the establishment of some tribunal to which disputes between masters and workmen might be referred, and in whose decisions both parties could confide.

STRONTIA, *stron'-she-a*, in Chem., SrO, an alkaline earth very similar in character to baryta. It receives its name from having been discovered in the mineral *strontianite* found at Strontian, in Scotland. It may be readily prepared from the native carbonate by dissolving it in nitric acid, and heating the resulting nitrate to redness in a crucible, until no more fumes are evolved. It is similar to the corresponding alkaline earth baryta in most of its properties. It combines with water with great energy to form hydrate of strontia. The *crystallized hydrate* has the formula SrOHO+9Aq. *Carbonate of strontia* constitutes the mineral known as *strontianite*. *Nitrate of strontia* is easily prepared by dissolving the carbonate in nitric acid, and crystallising. The crystals are anhydrous octahedra, which decrepitate when heated. They are soluble in five parts of cold and considerably less of hot water. Nitrate of strontia is much employed in the preparation of "*red fire*" for the theatres. A good mixture for this purpose may be made of forty parts of nitrate of strontia, thirteen of flowers of sulphur, ten of chlorate of potash, and four of sulphide of antimony. *Sulphate of strontia* is found native as *celestine*, crystallised in rhomboidal prisms. It may be prepared artificially by a solution of nitrate of strontia with sulphuric acid.

STRONTIUM, *stron'-she-um*, in Chem., the metal of which the alkaline earth strontia is the protoxide. It greatly resembles barium in its properties and combinations, but is not so abundant in nature. It occurs principally as carbonate (*strontianite*) and sulphate (*celestine*). It is a metal of a pale yellow colour, and is procured in the same way as barium. Heated in air, it burns with a yellowish flame, emitting sparks. Water is decomposed by it with evolution of hydrogen. It dissolves readily in dilute nitric acid, but the concentrated acid is without action on it. It forms two oxides,—the protoxide, strontia, which has already been described, and the binoxide, which is deposited as a hydrate in crystalline scales, when a solution of binoxide of hydrogen is added to a solution of strontia. *Chlorids of strontium* crystallises in needles, which deliquesce in the air; hence the nitrate of strontia is used for pyrotechnic purposes. It dissolves in alcohol, and burns with a brilliant red flame. The sulphides are similar in properties and character to the corresponding sulphides of barium.

STRYCHNINE, *strik'-neen* (Gr.), in Chem., one of the alkaloids found in the *Strychnos nux-vomica*, and the *Strychnos Ignatii*, or Ignatius's bean, in company with *brucine* and *igasurine*. In the former, strychnine and brucine are found in the form of lactates. The method of extraction is the following:—The rasped seeds are boiled with four times their weight of alcohol acidulated with one per cent. of sulphuric acid. The alcoholic liquid is neutralised with milk of lime in slight excess; the acid and colouring matters being thus precipitated, the basis remaining in solution. The alcohol is distilled off, and the residue treated with acidulated water, from which the two alkaloids are afterwards precipitated by ammonia. They are then converted into nitrates and crystallised, the nitrate of strychnine crystallising out first. Strychnine is one of the most powerful of the vegetable bases, precipitating many of the metallic oxides from their salts, and in many cases forming compounds with them, of which the double sulphate of strychnine and copper may be taken as an example. Strychnine crystallises from dilute alcohol in anhydrous octahedra, or in square prisms, which do not fuse on the application of heat. It is insoluble in absolute alcohol, ether, and the caustic alkalies; but it dissolves in the essential oils and in chloroform. It dissolves in 7,000 parts of cold water, giving an intensely bitter solution, which is still retained even when diluted with 100 parts of water. With the acids it forms well-defined salts, which are mostly crystalline and soluble. In minute portions, from the twelfth to the sixth of a grain, it is used as a tonic in medicine, with a special action on the nerves of motion. In doses of two or three grains, it is a most powerful and fatal poison; it is therefore frequently used in cases of murder and suicide. Its principal action seems to be on the motory nerves, producing lockjaw and paralysis of the heart and lungs.

STRYCHNOS, *strik'-nos* (Gr.), a gen. of the nat. ord. *Loganiaceæ*, containing some of the most poisonous plants known. *S. nux-vomica*, the koochla-tree of India, produces *nux-vomica* seeds. These are imported into this country from Coromandel and Ceylon. They

are extremely poisonous, from containing the alkaloids *strychnia*, or *strychnine*, and *brucine*. Three-quarters of a grain of the former alkaloid has been known to produce death: it is, however, a valuable stimulant of the nervous system, and has been frequently employed in paralysis. Nux-vomica seeds are largely used by gamekeepers and farmers to destroy vermin. The bark of the koochla-tree is also very poisonous. It was formerly confounded with cusparia or angustura bark; hence it is sometimes termed *false angustura bark*. An aqueous extract of the bark of *S. tieuté* is the terrible Java poison called *upas tieuté*. The juice of *S. toxifera* is the basis of the celebrated *Wourali* or *Curari* arrow-poison of Guiana. The wood of some Asiatic species is employed as an antidote to the bites of poisonous snakes, and on this account is generally called *lignum colubrinum*, or snake-wood. It has been used medicinally in intermittent fevers. The bark of *S. Pseudoquina*, which contains neither *strychnine* nor *brucine*, is extensively employed in Brazil as a substitute for cinchona bark. It is frequently erroneously called *copalchi bark*. The dried ripe seeds of *S. potatorum* are called *clearing-nuts*, from being employed by the Hindoos to clear muddy water.

STUCCO, *stuk'-ko* (Ital.), in Arch., a term frequently applied to various kinds of lime or cement renderings on masonry. It signifies more strictly, however, a species of plastering, in ordinary cases worked up by hand to a fine face adapted to receive paint. In superior buildings this stucco is made by the addition of other materials than the lime or plaster usually employed, in order to resemble marble. In point of fact, common stucco is nothing more than plastering which has received an additional amount of manipulation. Marble stucco is made with fine lime, mixed with calcareous powder, chalk, or other similar substances, in such proportions and worked in such a way as to produce a hard uniform substance, which admits of being coloured, painted, and polished, so as to resemble various coloured marbles.

STURGEON. (*See* STURIONIDÆ.)

STURIONIDÆ, *stu-re-o'-ne-de* (Lat. *sturio*, an icicle, because the snout tends to a point like an icicle), a fam. of fishes belonging to Cuvier's division called *Chondropterygians*, or cartilaginous fishes, the skeletons of which are made up of cartilage instead of true bone. Four genera are contained in this family,—*Accipenser*, *Spatularia*, *Chimæra*, and *Callorhynchus*. To the first of these belongs the common sturgeon. The general form of this fish resembles that of the shark; but it is distinguished by longitudinal rows of bony plates or bones implanted on the skin; the head is defended by similar plates; the mouth is small, and, as in sharks, placed below the snout; while the mouth is capable of some degree of projection, by its position on a style with three articulations. Instead of teeth, the mouth is furnished with a sort of horny process on the jaws. The lower jaw is furnished with a sort of beard of soft fibres. The eyes and nostrils are placed laterally and wide from each other. There is no vestige of an external ear, but the labyrinth is perfect within the bones of the head. The tail is forked, the upper lobe being much the longest and pointed. Sturgeons are mostly large, and inhabit the shores of the temperate latitudes rather than either the torrid or the cold. They are marine fishes, and at certain seasons ascend in vast numbers particular rivers, where they are the subject of extensive fisheries, particularly in the large rivers which disembogue themselves into the Black Sea and Caspian, and the rivers of France and Prussia; they abound also in the large rivers of North America, where the species appear to be peculiar to that continent. The common sturgeon (*Accipenser Sturio*) is generally about seven or eight feet in length. Its whole body is very gelatinous; and the air-bag, when freed from fat and oil, is the purest gelatine that is obtained in the animal kingdom, and forms the genuine isinglass of commerce. Its flesh is white and delicate, resembling veal. The roe forms common *caviar*. When caught in the Thames, within the jurisdiction of the lord mayor, it is considered a royal fish; the term being intended to imply that it ought to be sent to the sovereign; and it is said that the sturgeon was exclusively reserved for the table of Henry I. of England.



STURGEON.

STUTTERING. (*See* STAMMERING.)

STYLE, *stile*, is the manner of writing with regard to language, or the choice and arrangement of words. What is called the style of a writer or speaker is his characteristic manner of expression, determined principally by the man's own intellect and character. Style, in order to be ranked as good,—that is, to be fit for serving the uses to which language is put,—should obey the fundamental laws of grammar and rhetoric. Style should be characterised by perspicuity, animation, and elegance. Language is held to be perspicuous when it has not each of three faults:—it must not be obscure, that is, convey no meaning clearly; it must not be ambiguous, that is, convey more meanings than one; it must not be unintelligible, that is, convey no meaning at all. When language is adequate for the purpose of persuasion, it is said to be animated. Language, when elegant, gratifies the taste while exciting imaginative pleasure. In order to attain perspicuity, animation, and elegance in writing, the choice of words or phrases, the number of them, and the putting of them together, must be particularly studied. —Ref. *Encyclopædia Britannica*.

STYLE, OLD AND NEW. (*See* CALENDAR.)

STYLIDACEÆ, *sti-li-dai'-se-e*, in Bot., a nat. ord. of *Dicotyledones*, sub-class *Corolliflorœ*, consisting of herbs or undershrubs found in the swamps of Australia. Their properties and uses are unknown.

STYRACACEÆ, *sti-ri-kai'-se-e*, in Bot., the Storax fam., a nat. ord. of *Dicotyledones*, sub-class *Corolliflorœ*. Trees or shrubs, with simple, alternate, exstipulate leaves and axillary flowers. Calyx inferior or superior, 4—5-parted, persistent. Corolla of 5—10 petals, either united at base or distinct. Stamens equal in number to the petals, or twice or thrice as many, more or less coherent at base; anthers 2-celled. Ovary superior or inferior; style simple. Fruit drupaceous and fleshy. Seeds usually one in each cell; embryo in abundant fleshy albumen, with a long radicle. There are 12 genera and about 120 species, which are sparingly distributed in warm and tropical regions. They are principally remarkable for yielding stimulant balsamic resins. (*See* STORAX.)

STYRAX, *stí'-riks*, in Bot., the typical gen. of the nat. ord. *Styracaceæ*., *S. Benzoin*, the benjamin-tree, yields the well-known concrete balsamic exudation commonly called *gum-benjamin*. (*See* BENZOIN.) *S. officinale*, a native of Greece, the Levant, and Asia Minor, was the source of the original and classical *storax*, which has in modern times wholly disappeared from commerce. The product now called *liquid storax* comes from a species of the genus *Liquidambar* (which *see*).

SUBERIC ACID, *su'-be-rik*, in Chem., a fatty acid originally found amongst the products of the oxidation of cork by nitric acid; hence its name, from *suber*, cork. It is contained in this substance in but small proportions, and is most readily obtained by the oxidation of the fats, more especially those of the stearic series. It forms a crystalline white powder destitute of odour, but having a slightly acid taste. It is soluble in 100 parts of cold and in 2 parts of boiling water. It is also soluble in alcohol and ether. Heated to 280° Fahr., it melts, and runs up the sides of the vessel in which it is treated. The suberates of the alkalies and earths are soluble and crystallisable, and form white precipitates with the salts of the metals.

SUBLIMATE, CORROSIVE. (*See* MERCURY, CHLORIDES OF.)

SUBSTITUTION THEORY, *sub-sti-tu'-shun*, in Chem., the formation of compounds by displacement of portions of their constituents by others possessing similar properties. The simplest example of substitution may be cited in the case of iron rusting in damp air, the metallic iron gradually replacing the hydrogen of the water which is set free. Oxide of iron may therefore be re-

garded as a substitution compound of water, in which hydrogen is replaced by iron. In organic chemistry, substitution compounds are most numerous and interesting. They are mostly substances in which hydrogen is replaced by a metal, a halogen, a hydrocarbon, or even by a complicated group. They are generally formulated so as to show the original body from which they are formed; sometimes, however, for the sake of shortness, their empirical formula is given. Ammonia may be taken as a type of the infinite number of compounds of this kind that may be prepared. Ammonia may be represented as consisting of $\left\{\begin{matrix}H\\H\\H\end{matrix}\right\}N$. Each of the three H's may be replaced by a metal or a hydrocarbon; thus we have ethylia $\left\{\begin{matrix}(ethyl)\ C_2H_5\\H\\H\end{matrix}\right\}N$; diethylia $\left\{\begin{matrix}(ethyl)\ C_2H_5\\(ethyl)\ C_2H_5\\H\end{matrix}\right\}N$; triethylia, methylia, dimethylia, and so on almost *ad infinitum*. With the metals, we obtain potassamine $\left\{\begin{matrix}K\\H\\H\end{matrix}\right\}N$; trimercuramine $\left\{\begin{matrix}Hg\\Hg\\Hg\end{matrix}\right\}N$, and so on; with the halogens and acid radicles we get $\left\{\begin{matrix}I\\I\\H\end{matrix}\right\}N$, diiodamide, and another almost infinite series. The process does not alone take place with the H's, but also with the N's, which can be replaced by phosphorus, antimony, and other bodies. The acids also form a large number of substitution compounds, of which chloracetic acid may be given as an example:—

| Acetic acid. | Chloracetic acid. |
|---|---|
| $HO,C_2H_3O_2$ | $HO,C_2Cl_3O_2$ |

Neutral bodies also produce substitution compounds, of which benzole may be taken as a specimen:—

| Benzole. | Chloro-benzole. | Nitro-benzole |
|---|---|---|
| $C_{12}H_6$ | $C_{12}H_5Cl$. | $C_{12}H_5(NO_4)$ |

The discoverer of substitution organic compounds was Gay-Lussac, who, in endeavouring to bleach bees-wax with chlorine, found that certain of the equivalents of hydrogen contained in that body were replaced by the halogen, a compound being formed, which, when burnt, emitted hydrochloric acid. The study of substitution compounds has always been most attractive to organic chemists. The researches of Laurent, Gerhardt, Hofmann, and others in this direction, have exerted a very important influence on chemistry, both as a theoretical and practical science. The whole series of coal-tar dyes, for instance, resulted entirely from the study of the substitution compounds of ammonia. In the hands of Berthelot and others, the theory has resulted in the synthetic formation of organic compounds, and the day does not appear to be far distant when numerous substances which are now obtained in minute quantities from plants and animals, will be formed from their ultimate elements in the laboratory.

Succinic Acid, *suk-sin'-sik*.—This acid, as its name imports, was originally obtained from amber (*succinum*) by destructive distillation. It may, however, be obtained by several other methods, perhaps most readily by diffusing crude malate of lime through warm water, a small quantity of decayed cheese being added as a ferment. The mixture is kept at a temperature of about 100° for a week, carbonic acid being disengaged, carbonate and succinate of lime crystallising out, and acetate of lime remaining in solution. The succinate of lime is washed, decomposed with hydrochloric acid, and the succinic acid crystallised from the solution. Succinic acid crystallises in large, regular, rhombic tables. It dissolves in 5 parts of cold and 2 parts of boiling water. Alcohol dissolves it readily, but ether only sparingly. At a temperature of about 347° to 356° it melts, and if suddenly heated to 455°, it melts, boils, and sublimes completely. It forms with the bases three sets of salts, most of which crystallise readily. The succinates are characterized by giving a bulky brown precipitate with the neutral salts of sesquioxide of iron.

Succinic, *suk-sin'-ik*, an ord. in Ent., so designated





on account of their sucking propensities. The genus, *Pulex* of Linnæus constitutes the entire order. The mouth consists of a sucker of three parts, contained between two articulated blades, forming by their union a trunk or beak. The order is not numerous in species. The *Pulex irritans* is the common flea (*see* Flea); the *Pulex penetrans* is the Chegoe (which *see*).

Suffocation, *suf-fo-kai'-shun*, is the act of choking or producing death by the interruption of the breath. The three ordinary ways in which suffocation may be effected are hanging, drowning, and the respiration of fixed air, or carbonic acid gas. (*See* Hanging, Drowning.) In suffocation by carbonic acid gas, whether arising from mines, lime-kilns, vats of fermenting liquor, &c., death takes place very rapidly. In every case of suffocation, our attempts at re-animation should be directed to renew respiration by inflation of the lungs; to restore the animal heat by exposure to warm pure air, and by assiduous frictions of the surface; to rouse by stimuli, and by brushing the soles of the feet and palms of the hands; and when necessary, to relieve cerebral congestion by moderate and cautious bleeding.

Sugar, *shug'-ar*. n Chem. and Manuf.—Chemically speaking, there are four principal varieties of sugar:—1. *Cane sugar*; 2. *Fruit sugar*, or *fructose*; 3. *Glucose*, *grape*, or *starch sugar*; 4. *Milk sugar*. Although differing but slightly in chemical composition, these varieties of sugar possess very different sweetening powers, cane sugar being at the head of the list in this respect. The first three occur in the juices of plants, the fourth being exclusively found in the milk of animals; whence its name.

*Cane sugar*, or *Sucrose*.—This variety of sugar is, as its name implies, obtained principally from the sugar-cane. In Canada, however, the sugar-maple, and in many parts of Europe the beetroot, furnish the chief supplies. It also exists in carrots, turnips, pumpkins, chestnuts, and a large number of tropical fruits. Cane sugar has a specific gravity of 1·6; it is soluble in one-third of its weight of cold water, forming the thick liquid commonly known as syrup. It is also somewhat soluble in alcohol, which, however, requires to be heated before it takes up any quantity. By evaporating the aqueous solution, large four-sided rhomboidal prismatic crystals are formed, as seen in sugar-candy. Loaf sugar consists of a mass of small crystals; the more numerous the crystals, the more dazzlingly-brilliant is the sugar. When two pieces of sugar are rubbed together in the dark, a pale violet light is emitted. The chemical composition of cane sugar is $C_{12}H_{22}O_{11}$. If a solution of cane sugar be kept boiling for some time, it becomes less sweet, the elements of water being assimilated, and uncrystallisable *fruit sugar*, $C_{12}H_{12}O_{12}$, is formed. If the boiling be continued for some hours, two more equivalents of water are taken up, the *fruit sugar* becoming converted into *grape sugar*, $C_{12}H_{14}O_{14}$. To counteract this, a small quantity of lime is always added to the solution of cane-juice before it is boiled. Sugar forms an important article of food, entering largely into all vegetable aliments. Alone, it does not seem capable of supporting life, although, by preventing the waste of the tissues, it may be used as a temporary palliative of hunger. Mixed with nitrogenous matter, it appears to have a fattening tendency. It is a powerful antiseptic, as exemplified in its preservative action on meat and fruit. Solution of sugar has the peculiar property of dissolving many of the metallic oxides; lime, baryta, oxide of lead, forming strong solutions when boiled with it. It exercises a powerfully reducing action on several of the metallic salts; the chromates, for instance, being reduced to sesquioxide of chromium when heated with a solution of sugar. Cane sugar, under the influence of yeast of beer, undergoes the process of fermentation (*see* Fermentation), becoming converted first into fruit sugar, and then into carbonic acid and alcohol. Treated with strong sulphuric acid, sugar parts with its water, carbonic and formic acids being eliminated, and a carbonaceous matter being left behind. Heated to 320° Fahr., sugar melts into an amorphous transparent solid, which, if kept, gradually loses its transparency and returns to the crystalline form. A solution of cane sugar exercises right-handed rotation on a ray of

polarised light. Heated to about 420°, sugar loses two equivalents of water, becoming converted into a brown deliquescent and almost tasteless substance, much used by cooks and confectioners as a colouring matter, under the name of caramel. It differs from sugar in not being susceptible of fermentation. If the heat be carried further, inflammable gases are emitted, a friable mass of pure charcoal being left behind. Caramel appears to be a definite compound, uniting with baryte and basic acetate of lead. It is soluble in water, and is separable from its solution as a brown powder by alcohol.—*Fructose*, or *fruit sugar*, exists ready formed in ripe acidulous fruits and honey, which owe their sweetness to its presence. It may be made artificially from starch and woody fibre by the action of dilute sulphuric acid, continual boiling transforming it into grape sugar. Fruit sugar does not crystallise. It often assumes the elements of water when fruits are dried, giving rise to the formation of crystalline grape sugar.

*Grape sugar*, *Starch sugar*, or *Glucose*.—Grape sugar exists ready formed in the grape, and in many fruits and vegetables. It may be made artificially from starch by allowing a mixture of that substance, with a sufficient quantity of water to render it liquid, to flow gradually into a vat containing water acidulated with one per cent. of sulphuric acid, which is kept continually at boiling-point. After the whole of the starch liquor has been added, it is kept boiling for half an hour, by which time the whole of the starch has become converted into sugar. The liquid is then neutralized with chalk, concentrated by evaporation, drawn off carefully, and set aside to crystallise. Grape sugar may be made from ligneous fibre by the same means, substituting a stronger solution of sulphuric acid than the one above mentioned. It is said by Bernard to be a normal constituent of the liver. It is also met with as a morbid constituent of the urine in diabetes. It may be readily distinguished from cane sugar by being considerably less soluble in water. Its sweetening power is only $\frac{3}{5}$ths of that possessed by cane sugar. It crystallizes in hard warty concretionary masses, which consist of hard transparent cubes. It forms a crystalline compound with common salt, the corresponding cane sugar compound being non-crystalline and deliquescent. Sulphuric acid transforms it into sulpho-saccharic acid. It forms definite but unstable compounds with the alkalies, which decompose, giving rise to a peculiar uncrystallizable acid,—*glucic acid*, which remains in combination with the base.

*Sugar of milk*, or *Lactose*.—This sugar is obtained solely from the milk of the mammalia. It is manufactured on a large scale for the use of homœopathists, who consider it as the only natural sugar fit for the food of man. The milk is coagulated, and the curd separated. The whey is concentrated by evaporation, and small sticks of wood are inserted in the liquid, around which the sugar crystallizes in mamillated masses, consisting of four-sided prisms, terminated by four-sided pyramids. It possesses the least sweetening power of any of the sugars. By continued boiling with dilute acids, it may be converted into fruit sugar. When pure, it does not ferment under the action of yeast, although milk may be fermented and made to yield a spirituous liquor. Lactose unites with several of the bases in a similar manner to its congeners. The following table of the sugars will assist the student in following their transformations one into another by losing or gaining certain proportions of water.

Cane Sugar (*Sucrose*), $C_{12}H_{11}O_{11}$.

Fruit Sugar (*Fructose*), $C_{12}H_{12}H_{12}$.

Grape, or Starch Sugar (*Glucose*), $C_{12}H_{11}O_{12}+2aq$.

Milk Sugar (*Lactose*), $C_{24}H_{24}O_{24}$.

Starch, $C_{12}H_{10}O_{10}$.

*Manufacture of sugar*.—The chief source of sugar in this country, in the state in which it is offered for sale, is the sugar-cane. The plant, of which there are several varieties, is a solid-jointed reed, growing to a height of from six to fifteen feet. It flourishes best in the tropics, although it has been grown in the warmer parts of the temperate zones. The canes are cut down to the roots just before the period of inflorescence, stripped of their leaves, and submitted to powerful pressure between grooved iron cylinders. The juice, which if left to itself would ferment, is immediately mixed with $\frac{1}{100}$th of its weight of lime, and heated to 140° in large copper or iron pans. By this means the albuminous parts of the juice rise in scum to the top, and any free acid is neutralized by the lime, which also prevents the transformation of the cane sugar into grape or starch sugar. After being allowed to cool, the clear juice is drawn off for concentration by boiling. When the syrup has reached a sufficient consistence, it is run into shallow coolers, and allowed to rest for twenty-four hours. It is then briskly stirred to favour crystallisation, and transferred to casks with perforated bottoms, which allow the molasses, or the liquid uncrystallisable portion of the syrup, to drain off. The crystals are dried in the sun, and form the raw brown sugar of commerce. *Maple sugar* is obtained by the American Indians from a species of maple, the *Acer saccharinum*, by making perforations into the wood of the tree when the sap is rising. This source of sugar is unfortunately unavailable, from a peculiar and disagreeable flavour remaining in the manufactured article, no matter how far the refining process has been carried. Were it not so, Canada could easily grow sufficient sugar to supply half the world. The experiments of certain chemists, however, seem to indicate that the objection may to a certain extent be overcome. *Beetroot sugar* is manufactured in large quantities in France, Prussia, and Austria. The manufacture of beetroot sugar was called into existence in the former country by the wars of Napoleon, which cut off the ordinary colonial supplies of cane sugar. The roots employed are those of the white beet, and are gathered in October. The fresh expressed juice contains theoretically 10 per cent. of crystallisable sugar; not more, however, than from five to seven per cent. is extracted in practice. The juice is mixed with a small quantity of lime, and boiled; the albuminised constituents rise to the top as a scum, which is carefully removed. The clear syrup is then filtered through animal charcoal, which, in fact, extracts the colour from it; it is again concentrated, and filtered a second time through the charcoal and coarse cloth bags; after which it is evaporated to crystallising-point. The crystals of beetroot sugar are somewhat longer than those of cane sugar, but in no other respect is there any difference between the two substances. Visitors to the continent always find that it takes apparently more beetroot sugar to produce a given amount of sweetness than the ordinary cane sugar used in England. The reason of this is not that the sweetening power of beetroot sugar is small, but that the French sugar-refiners employ a peculiar method of crystallisation, by which the crystals of sugar are very loosely aggregated together, giving the appearance of intense whiteness and great bulk.

*Refining of sugar*.—Both cane and beetroot sugar are refined on the same principle, by mixture with lime-water, boiling with animal charcoal, and filtration through twilled cotton. In some establishments, bullock's blood is used to aid in the clarifying. The albumen of the serum becomes coagulated on the application of heat, forming a network, which rises to the top of the liquor, carrying with it a great part of the impurities. The reddish syrup obtained by the first filtration is next passed through filters into large vats, twelve or fourteen feet deep, upon which are laid coarse ticking, coarsely-ground animal charcoal, and a second layer of ticking. The syrup is allowed to flow over the surface of the filter, and runs slowly through the charcoal, coming out perfectly colourless. The concentrated syrup is then boiled *in vacuo*; by which means two important results are arrived at. The viscid liquid would boil in air at 230° Fahr., at which temperature a quantity of uncrystallisable sugar would be formed. By performing the operation in a vacuum-pan, the boiling-point is brought down to 150° or 160°, no formation of uncrystallisable sugar taking place, and a great saving in fuel being effected. When the concentration reaches a certain point, the syrup is transferred to a vessel heated by steam to 170°, and forcibly agitated with wooden beaters, until it becomes thick and granular. From the heating-vats it is transferred into inverted conical moulds of the well-known shape, at the bottom of each of which is a movable plug. The syrup is well stirred to prevent the formation of air-bubbles, and then left at rest for several hours, at the end of which

time the plug is removed, and the uncrystallised syrup runs out. The loaves are further freed from all coloured matter, by a portion of perfectly colourless syrup being run through them. They are then dried in a stove, and finished for market by being turned in a lathe. *Crushed or crystallised sugar* is made by causing the granular syrup to revolve in a perforated drum, by which means the uncrystallisable portion is separated from the crystals by centrifugal force.

SUGAR OF LEAD, in Chem., the popular name for acetate of lead; so called from its sweet taste.

SUICIDE, *sui-o-cide* (Lat. *suicidium*), self-murder. (*See* FELO-DE-SE, HOMICIDE.)

SUIDÆ, the Hog family (which *see*).

SUIT, *sewt* (Fr. *suite*), denotes a set or number of things corresponding one to the other, or one following or coming after another, and is used in various senses. In law it is used in the same sense as action, and is divided into real and personal. *Suit of court* is an attendance which the tenant owes to the court of his lord. *Suit covenant* is when a man hath covenanted to do suit in the lord's court. *Suit custom* is where a person and his ancestors owe suit time out of mind. Suit is also used for a petition made to the king or any great personage; and is likewise the following one in chase, as fresh suit, suit of the king's peace, *i. e.*, the pursuing a man for the breach of the peace.

SULPHATES.—These important compounds are fully described under the head of SULPHURIC ACID.

SULPHIDES, *sul'-fides*.—The combinations of the metals with sulphur are hardly less important, both in a chemical and economical point of view, than the oxides. A large number of these occur in nature, having a high metallic lustre, and forming valuable ores. Sulphur generally combines with the metals in varying proportions, and it generally happens that the number of oxides and sulphides of a given metal are equal. Exceptions to this, however, occur in the case of the alkalies and alkaline earths; thus there are but two oxides of potassium, sodium, and barium, whilst there are no less than five sulphides of these metals. All the metallic sulphides are solid at ordinary temperatures; most of them fuse at a red heat, and some sublime unchanged. If air be admitted to the heated sulphides, they are all decomposed, the sulphur becoming oxidised, and either passes off, leaving the oxide of the metal behind, or unites with the base forming the sulphate, which, if the heat be continued, decomposes in certain cases, leaving the oxide behind. The sulphides of the noble metals part with the whole of their sulphur, the pure metal remaining. The sulphides are all insoluble in water, with the exception of those of potassium, sodium, strontium, barium, and calcium. Sulphide of magnesium is only slightly soluble. Sulphides are prepared in a number of ways:—By heating the metal or its oxide with sulphur; by decomposing the sulphates; by heating them with charcoal or in a current of hydrogen; by passing a stream of sulphuretted hydrogen through their solutions, or by adding to them a solution of an alkaline sulphide. The preparation of particular sulphides will be found described under the heads of their bases. Certain of the higher sulphides, as for instance the pentasulphides of arsenic and antimony, act as acids, forming soluble and crystallisable salts with the alkaline protosulphides. The sulpharseniate and sulphantimoniate of sodium are examples of this.

SULPHION, *sul'-fe-on*, a hypothetical radicle, supposed, according to the binary theory of salts, to be the base of sulphuric acid, which is regarded as its hydride, $HSO_4$. Sulphion would thus fall into the same category as chlorine and bromine, sulphuric acid being its hydride, as hydrochloric acid is the hydride of chlorine, the sodium salts being $NaSO_4$ and NaCl the sulphionide and chloride of sodium. The name sulphionide *of* sodium, as proposed for sulphide of soda, has not as yet come into use, although the followers of the binary theory mark the change of view by using the terms sulphate of sodium, calcium, magnesium, &c. These remarks equally apply to the other oxy-acids.

SULPHITES. (*See* SULPHUROUS ACID.)

SULPHO-SALTS, *sul'-fo-saults*, salts in which the oxygen appears to be replaced by sulphur, both in the base and the acid, as in pulpit-antimoniate of soda,—$2Na_2S, Sb_2S_5 + 18aq$.



SULPHUR, *sul'-fur* (Fr. *soufre*, Du. *solfer*), symbol S; equiv. 16.—Sulphur, or brimstone, has been known and used from the earliest times. It is found native in mechanical combination with various earthy impurities in most volcanic districts, more particularly in Sicily and the countries bordering on the Mediterranean. The Sicilian sulphur, which is largely imported into England, occurs in beds of a blue clayey formation. It is found native in two forms,—in transparent amber crystals, as virgin sulphur, or in opaque, lemon-yellow crystalline masses, as volcanic sulphur. It is found in combination with the different metals, forming metallic sulphides, in nearly every portion of the earth. Zinc blende, iron and copper pyrites, galena, cinnabar, grey antimony, and realgar, are a few instances of the valuable ores containing sulphur. In its oxidised condition as sulphuric acid, it is also very largely distributed over the mineral kingdom. Sulphur also exists in many organic bodies; for example, it is always contained in albumen and the various protein compounds. The sulphur of commerce in this country is now obtained principally from iron and copper pyrites, of which large mines exist in the north of England, in Ireland, and in Spain. Native sulphur is purified from the foreign substances mixed with it by distillation in, first, long brick furnaces containing earthen retorts communicating with receivers of the same material, and afterwards in iron retorts communicating with chambers of brickwork, in which the sulphur condenses in light flocks, known as flowers of sulphur. When melted and cast, these form the roll brimstone of commerce. Sulphur is made from pyrites by roasting this mineral and condensing the sulphur volatilised by the heat. At ordinary temperatures, sulphur is a brittle, insoluble, inodorous solid, of a lemon-yellow colour, a bad conductor of heat, and a non-conductor of electricity. By friction with silk or wool, it becomes negatively electrified. It is a highly inflammable substance, burning readily in the air at about 450° or 500° Fahr., and giving off suffocating fumes of sulphurous acid gas. At 239° Fahr. it melts, forming a yellow liquid, and slightly increasing in bulk. Provided the above temperature is not exceeded, it remains nearly transparent on cooling, but becomes gradually opaque from interior molecular changes. In close vessels, it may be distilled by raising the heat to about 838° Fahr. Sulphur is very remarkable as affording a striking instance of the occurrence of the allotropic condition of matter. The first form is that of native sulphur in the crystalline state. It may be obtained artificially by evaporating a solution of sulphur in bisulphide of carbon. It is semi-transparent, of an amber-yellow colour, and has a density of 2·05. Its crystals undergo no change in the air, and it fuses at 239° Fahr. It is distinguished from the other forms as Sα. The second variety, Sβ, is obtained by melting ordinary sulphur in a ladle, and allowing the surface to solidify. The solid crust is then pierced and the melted sulphur beneath is run out. The underneath portion of the solid crust is found to be covered with transparent brownish-yellow needles, having a specific gravity of only 1·98. Sir B. C. Brodie states that it melts at 248° Fahr. In a few days the transparency of the crystals disappears, and an opaque crumbling mass is formed. The third variety, Sγ, is even more remarkable. Ordinary sulphur is melted, the heat being increased till it reaches 350°, when it becomes viscid and brown. The temperature is still further raised until 500° Fahr. is attained, when it gradually returns to a fluid condition. If now suddenly poured into cold water, a tenacious mass is produced, which may be drawn out into elastic threads. Magnus states that this condition is due to the formation of a certain amount of another modification, which he calls black sulphur. Sγ gradually returns to the form Sα if left to itself. Sα and Sβ both dissolve readily in bisulphide of carbon, but Sγ is insoluble in this liquid. The black sulphur of Magnus is also insoluble in bisulphide of carbon. Magnus has also succeeded in forming a red variety by heating the black modification to 220° or 230° Fahr. A blue modification has also been formed when solutions of hydrosulphuric acid and perchloride of iron are mixed together. Sulphur dissolves readily in bisulphide of carbon and chloride of sulphur. Boiling oil of tur-

pentine also dissolves it freely, depositing it again as it cools, but retaining 1½ per cent. Vitreous sulphur and the black modification of Magnus sulphur may be made to combine directly with most of the elements. Hydrogen and sulphur vapour, when burnt, form sulphuretted hydrogen. Burnt in oxygen, heated with chlorine, bromine, and iodine, it unites with them, forming well-known compounds. The vapour of sulphur passed over red-hot charcoal forms bisulphide of carbon. Nearly all the metals combine with it at ordinary or increased temperatures. With oxygen, sulphur forms seven different compounds:—

| | |
|---|---|
| Sulphurous acid | $SO_2$ |
| Sulphuric acid | $SO_3$ |
| Dithionous or hyposulphurous acid | $S_2O_3$ |
| Dithionic or hyposulphuric acid | $S_2O_5$ |
| Trithionic acid | $S_3O_5$ |
| Tetrathionic acid | $S_4O_5$ |
| Pentathionic acid | $S_5O_5$ |

Sulphur unites with chlorine in two proportions, forming a dichloride and a chloride. The dichloride, $S_2Cl$, is prepared by transmitting a current of chlorine over melted sulphur, the resulting dichloride being collected in a perfectly dry receiver. It is a dark yellow liquid, very volatile, and possesses a peculiar penetrating disagreeable odour. It emits fumes when exposed to moist air, and when dropped into water gradually decomposes into hydrochloric and sulphurous acids and free sulphur. It has a specific gravity of 1·658, and boils at 280° Fahr. It is used for vulcanising India-rubber goods. By saturating dichloride of sulphur with chlorine, a dark red liquid chloride is formed. There is reason to suppose that a bichloride exists, but it has not yet been isolated. The corresponding bromides are liquids analogous to the chlorides. The iodide is a crystalline brittle grey solid. With nitrogen, sulphur forms a bisulphide, which crystallizes in beautiful golden-yellow rhombic crystals. It detonates powerfully by percussion, or when heated to 314° Fahr. Bisulphide of carbon dissolves it readily, alcohol, ether, and oil of turpentine sparingly, and water not at all.

Sulphuretted Hydrogen, *sul-fu-ret'-ted*, the familiar term for hydrosulphuric acid, under which head its properties are described.

Sulphurets, *sul'-fu-rets*. — These compounds are now generally known as *sulphides*, that word being more in unison with the corresponding *chlorides*, *iodides*, *cyanides*, &c.

Sulphuric Acid, *sul-fu'-rik*, in Chem. and Manuf., *oil of vitriol*, *vitriol*, $SO_4$.—This important acid occurs in nature in large quantities, both in the vegetable and mineral kingdoms, in combination with the various bases, more particularly the alkalies, alkaline earths, and the oxides of iron, copper, lead, zinc, alumina, &c. Its mineral combinations are generally known as *vitriols*, a name which, in the case of the sulphates of iron, copper, and zinc, has been transferred to the manufactured products. Sulphuric acid, $SO_4$, is formed by the oxidation of sulphurous acid, or some other oxide of sulphur. In its perfectly anhydrous condition, it occurs as a white crystalline fibrous mass, somewhat resembling asbestos in appearance. It can be moulded in the fingers like wax without charring the skin; it fumes in the air, and is very deliquescent, hissing violently when thrown into water; thereby becoming sulphuric acid. It chars wood, paper, sugar, and other similar substances, by abstracting water from them. It melts at 65° Fahr., and boils at 110° Fahr., forming a colourless vapour. It possesses no acid properties whatever, and is not regarded as such by the followers of Gerhardt, by whom it is called sulphuric anhydride. The vapour, when passed through a red-hot tube, is resolved into a mixture of one volume of oxygen with two volumes of sulphurous acid. With sulphur it forms several more or less definite compounds, of a brown, green, and blue colour respectively, which have not as yet received sufficient investigation. It may be prepared in several ways:—1. By distilling Nordhausen sulphuric acid at a gentle heat in a retort to the neck of which is fitted very perfectly a receiver surrounded with ice; 2. by heating sulphuric acid with anhydrous phosphoric acid. There are two varieties of sulphuric acid in commerce. The first of





these, "fuming or Nordhausen sulphuric acid," is obtained by the distillation of the basic sulphate of iron formed by heating crystals of common green vitriol. It is a somewhat viscid liquid, generally of a light brown colour, from containing traces of organic matter, and has a spec. grav. of 1·896. It is believed to be a combination of equal parts of the anhydrous and monohydrated sulphuric acid, and may be represented by the formula $2SO_3HO$. It solidifies at 32° Fahr. into a mass of transparent colourless crystals. It is chiefly used in the arts for dissolving indigo. The second variety is the ordinary English sulphuric acid, or oil of vitriol of commerce. It is prepared in enormous quantities in this country, to the extent of 100,000 tons per annum, by burning sulphur or roasting pyrites, and oxidising the resulting sulphurous acid by means of aqueous vapour and certain oxides of nitrogen, a process differing but little from that devised by Dr. Roebuck in 1720, although it has of course undergone various improvements and modifications since that time. The process depends upon the property possessed by peroxide of nitrogen of yielding up sufficient oxygen to sulphurous acid in the presence of atmospheric air and aqueous vapour to convert it into sulphuric acid. The binoxide of nitrogen resulting from the decomposition speedily absorbs oxygen from the air, which it again yields up to a fresh portion of sulphurous acid, the nitrogen compound acting as a vehicle for the convection of oxygen without being decomposed. Four substances are consequently required in the manufacture:—1. Sulphurous acid, obtained by burning sulphur in a furnace; 2. nitric acid vapour, procured by the action of sulphuric acid on nitrate of soda; 3. aqueous vapour, or steam; 4. atmospheric air. These are admitted from their sources, by properly constructed flues, into a large chamber, the bottom of which is lined with lead, and which contains water to the depth of three or four inches. The upper part of the chamber generally contains a number of incomplete leaden partitions, in order that intimate mixture may take place between the vapours. The water on the floor of the chamber continues to absorb the sulphuric acid formed, until it reaches a specific gravity of about 1·5, when it is drawn off and replaced by a fresh supply. Theoretically, nothing should pass from the exit-flues of the chamber but nitrogen and binoxide of nitrogen; but in practice a certain amount of sulphuric acid vapour always escapes. The mixed gases coming from the flue are therefore generally conveyed into subsidiary chambers supplied with steam, or through towers filled with coke, through which water is constantly falling. A weak acid is thus formed, which is used instead of water for the large chamber. Gay-Lussac devised a plan for saving the nitric oxide escaping from the flues, by taking advantage of the property possessed by the concentrated acid of absorbing this gas. The waste vapours are passed through coke towers through which sulphuric acid is falling, which completely absorbs the nitric oxide gas. The charged acid is then pumped into a second tower, when it yields up its nitric oxide to a stream of sulphurous acid. Gay-Lussac's process is but little used in this country. The acid withdrawn from the leaden chambers is concentrated by evaporation in leaden pans, until it reaches a specific gravity of 1·7. This acid contains a trace of organic matter, and is known in commerce as "brown," or "pan acid." Its further concentration is effected in glass or platinum retorts, until its specific gravity is 1·842. This is the ordinary strong oil of vitriol of commerce, and contains an equivalent of anhydrous sulphuric acid, united to an equivalent of water, $SO_3HO$. When pure, it is a heavy, oily, colourless, inodorous liquid, and having a specific gravity of 1·842. It is intensely caustic, and chars almost all organic substances, by abstracting water from them. Its affinity for water is very great, doubling its weight by the absorption of vapour from the air, if left exposed in any open vessel for several days. It mixes with water in all proportions. It freezes at −29° Fahr., and boils at 620° Fahr., its vapour being colourless and very suffocating, forming dense fumes in moist air. When mixed with water, it evolves considerable heat. Sulphuric acid is the starting-point of nearly every important chemical manufacture. Acetic, nitric, and hydrochloric acids are made by its means; and it will be only necessary to

allude to the important part it plays in the manufacture of soda from common salt to appreciate the saying of Liebig, "that the amount of sulphuric acid made in a country is a sure index of its wealth and prosperity." In the hands of the chemist it has numerous and important uses. Its salts, the sulphates, are amongst the most important chemical agents in the laboratory. In its concentrated form it is in daily use by the scientific chemist to promote the crystallisation of deliquescent substances in vacuo, from its intense avidity for water. Besides the monohydrate above described, sulphuric acid forms several other well-marked hydrates; amongst which may be noticed the *bihydrate*, a colourless liquid, having a specific gravity of 1·78, and solidifying in transparent colourless prisms at about 40° Fahr.: hence it is often called glacial sulphuric acid. It may be easily formed by mixing the monohydrate with water, until the proper specific gravity is reached. If a very dilute acid be evaporated in vacuo until it ceases to lose weight, a definite terhydrate is formed, having a density of 1·632. The oil of vitriol of commerce is never pure, but contains lead, derived from the leaden chambers in which it is made, arsenic, and nitric acid. The first impurity is detected on dilution, sulphate of lead (which is less soluble in dilute than in strong acid) falling down as a milky precipitate. Arsenic gives a yellow precipitate with sulphuretted hydrogen, and nitric acid a purplish-red coloration when a solution of green vitriol is added to the suspected acid. In its concentrated form, it acts but feebly on metallic bodies. When water is present, the more easily oxidizable metals are dissolved with the evolution of hydrogen. The sulphates are a numerous and important class of salts. They are mostly composed of an equivalent of acid and an equivalent of the metallic oxide. They vary somewhat in the numbers of atoms of water of crystallisation, some being anhydrous, others containing as much as twelve equivalents. Sulphuric acid also forms acid bisalts, of which the bisulphate of potash may be taken as an example, $KO.HO.2SO_3$. In a few instances, basic salts are formed; as, for instance, the basic sulphate of copper, $3CuOSO_3$. Sulphuric acid and its salts are easily recognized by giving a white precipitate with a soluble salt of barium, insoluble in nitric acid.

Sulphurous Acid, in Chem., $SO_2$, an acid formed by the union of an equivalent of sulphur with two of oxygen in a variety of ways, the most familiar being its production during the combustion of sulphur in the open air or in oxygen. The gas produced is endowed with the properties of a weak acid, and is the sole product of the combustion, provided the air or oxygen be perfectly dry. It has a pungent suffocating odour, and when in a concentrated form, cannot be breathed with impunity. It is not inflammable, and extinguishes burning bodies. It dissolves freely in water, which takes up between forty and fifty times its bulk of the gas. The solution has the smell and taste of the gas itself, and becomes gradually converted into sulphuric acid, from absorbing oxygen from the air. Crystalline hydrate, $SO_2.9HO$ and $SO_2.HO$, may be obtained at a low temperature; the former melts at 46°F. Sulphurous acid gas is much used for bleaching straw and wool, the articles being moistened and suspended in a chamber in which sulphur is burning. It appears to act by forming a colourless compound with the colouring matter; for woollen goods which have been thus bleached become yellow on being washed with an alkaline soap. It is also used for preserving certain animal substances, such as vellum and catgut. It has also been employed as a disinfecting agent. At ordinary temperatures, sulphurous acid is a gas; but it may be readily condensed into a liquid by a pressure of three atmospheres, or by a freezing mixture of ice and salt. When the liquid acid is evaporated under the air-pump, part of it solidifies from the cold produced. The liquid acid boils at 14°F., and if poured into water, the cold produced by its reconversion into the gaseous state is so intense that the water is frozen. When required perfectly pure for laboratory purposes, sulphurous acid is made by the deoxidation of sulphuric acid. The mode generally adopted is to boil sulphuric acid with metallic copper or mercury, an equivalent of oxygen, leaving one portion of the acid to form an oxide with the metal. Sulphurous acid is a powerful reducing agent, liberating iodine from iodic acid, and precipitating tellurium and selenium from their acids. The sulphites are somewhat weak salts, presenting considerable analogy to the carbonates, the salts of the same metals being often isomorphous. With the alkalies it forms a double set of salts, containing respectively one and two equivalents of acids. Bisulphite of soda was formerly much used as an antichlore, and bisulphite of lime is extensively employed in the manufacture of sugar. The sulphates are readily formed by passing sulphurous acid gas through water in which the carbonate or oxide of the metal is dissolved or suspended. They are decomposed by nearly all the acids, with the exception of the carbonic and boric, with the liberation of sulphurous acid. The acid sulphates of baryta, strontia, lime, and magnesia, and the neutral and acid sulphates of the alkalies, are soluble in water. Most of the others are insoluble, and may be precipitated by the addition of a soluble sulphate to their solutions.

Sumach. (*See* Rhus.)

Sumbul. (*See* Nardostachys.)

Summer, *sum'-mer* (Fr. *sommier*), that season of the year comprising the months of June, July, and August, during which time the sun, being north of the equator, shines more directly upon this part of the world, making the days longer, and rendering this the hottest period of the year.

Summons, or Writ of Summons, *sum'-mons*, in Law, is a writ issued in the queen's name out of the court in which an action is to be brought, directed to the intended defendant, described as of the county and place where he is supposed to reside or be, commanding him to appear, or to cause appearance to be made for him, in that court, in an action at the suit of the plaintiff, within eight days after the said writ shall be served upon him. It remains in force for six calendar months, at any time before the expiration of which, if it has not been served, it may be renewed for a similar period; and such renewal may be repeated as often as there may be occasion, being effected merely by having a stamp impressed upon it by the proper officer. The service requires to be a personal one, by leaving a copy of it with the defendant in person; but if this be found to be impracticable, then the plaintiff is entitled to apply to the court out of which the writ issued, or to a judge, for an order to be at liberty to proceed as if personal service had been effected, which order the court or judge is empowered to make, on being satisfied that reasonable efforts have been made to effect personal service. If such order has been obtained, or personal service effected, and no appearance made for the defendant, then, if the writ bears a special indorsement of particulars, as in a claim for a debt, the plaintiff is forthwith entitled to sign final judgment.—*Ref.* Stephen's *Commentaries on the Laws of England*.

Sun, *sun* (Sax. *sunna*), is the great central body of the solar system, and the grand source of light and heat. It has an apparent motion among the stars from west to east, along a great circle, called the ecliptic, making a complete circuit of the heavens in 365 days, 6 hours, and 9 minutes, though the period from midsummer to midsummer is some twenty minutes less, owing to the precession of the equinoxes. (*See* Precession of the Equinoxes.) Until quite recently, it was the belief of astronomers that the distance of the earth from the sun was in round numbers ninety-five millions of miles; but the researches of M. Leverrier and of Mr. Hind have corrected this view, their statement being that the actual distance of the heat- and light-giving luminary is 91,328,600 miles. Its diameter is 850,100 miles, upwards of 107 times the mean diameter of the earth. The circumference of the sun is 2,671,000 miles; its solid contents or bulk exceeds that of the earth 1,405,000 times; that is to say, it would require that number of earths to make one globe of the magnitude of the sun. Its mass exceeds that of the earth 356,000 times. The sun rotates upon its axis in the same direction as the earth,—from west to east, in about 25 days 8 hours. By way of assisting the mind to comprehend the vast disparity there is in size between the sun and earth, as well as of its vast distance from us, a familiar illustration may be useful. A railway-train continuously maintaining

a speed of thirty miles an hour would arrive at the moon in eleven months, but would take 352 years to reach the sun; so that in order to reach the sun in 1864, the train must have been started in 1512, the third year of Henry VIII.'s reign. Supposing the train to have reached the edge of the sun, and the vast luminary to have been tunnelled through, the train would take three years and a quarter in passing through, and it would take ten years and one-eighth in passing round it. The same train would pass through the earth in eleven days, and circumscribe it in thirty-seven days. With respect to the figure of the sun, the observations of Littrow and Maskelyne make its form that of a prolate spheroid; the researches of Carlini and Bianchi, on the other hand, make it an oblate spheroid, with a greater equatorial than polar diameter, like the earth. These different views being both doubted by other equally competent astronomers, it was proposed to prepare an apparatus for the purpose of examining the form or figure of the sun's disc; but the astronomer royal has observed, in effect, that what we know of the sun's diameter must lead us to the conclusion that the sun is a perfect sphere. If such be the truth, we have in the great centre of our solar system the only example of a perfect sphere; though it may be assumed as a possibility that the stars, the far-off suns of other systems, are like the sun in this respect. When the sun is examined through a telescope, its surface is found to be marked by black spots, edged with a penumbral fringe of uniform shade. Sometimes these spots appear singly, sometimes in groups. They are not permanent, but undergo changes of form from day to day, or even from hour to hour, which is believed to indicate a gaseous form of matter. They seldom last longer than six weeks, and often only a few hours. When they disappear, the black centre or nucleus always vanishes before the penumbra. Schwabe, of Dessau, having perseveringly studied these spots for more than a third of a century, arrived at a remarkable law of periodicity affecting them. He found that they gradually increased in number up to a certain period, then decreased to a certain period, then increased again; and so on. According to this investigator, the cycle is completed in ten years. These spots, which are believed by some philosophers to have an influence upon the climate of the earth, were among the earliest discoveries of the telescope. Recent experiments with the spectrum indicate the presence in the sun's atmosphere of familiar elements. Fraunenhofer discovered in the solar spectrum a series of dark lines which are hence known as "Fraunenhofer's lines." Recently Kirchoff, by following out the elegant process called spectrum analysis, discovered in the atmosphere of the sun several metals, including sodium, calcium, lithium, iron, &c. (*See* SPECTRUM AND SPECTRUM ANALYSIS.) Many theories have been put forth to account for the supply of the prodigious amount of heat constantly radiated from the solar surface. One theory is that the sun is now giving off the heat imparted to it at its creation, and that it is gradually cooling down; another ascribes it to combustion; a third to currents of electricity; a fourth to the compression of matter from the nebular state, the condensation going on continually without altering the weight of the body. Newton and Buffon conjectured that comets might be the aliment of the sun, and at the present time a nearly similar theory finds favour; viz., that a stream of meteoric matter, constantly pouring into the sun from regions of space near it, supplies the fuel for the evolution of its heat. According to the best received hypotheses of the physical constitution of the sun, it is a solid body surrounded by three atmospheric strata. The first of these is an elastic medium bearing a dense bed of vaporous clouds. Above this floats a luminous stream of photosphere, composed of unconnected phosphoric clouds, and subject to continual fluctuations both from local causes of agitation and from the subjacent vapour acting by its elasticity to burst through the photosphere above it; thus producing the appearance seen as spots in the disc. Above all is a third envelope of perfect transparency and great depth, containing, in a vaporous condition, iron, sodium, lithium, and other metals.

SUNDAY. (*See* LORD'S DAY, SABBATH.)

SUNDIAL, *sun'-di-al*, an instrument to show the time of day by means of the shadow of a style on a plate. Up to comparatively recent times, the science of constructing sundials, under the name of *Gnomonics*, was an important part of a mathematical course. As long as watches were scarce and clocks not very common, the dial was in ordinary use as a timekeeper. A large number of mathematical works of the 17th century are on the subject of dialling. The sundial consists of two parts; first, the style, the shadow of which points out the time, and the dial, which is a plate of metal, horizontal or otherwise, on which are marked the direction of the shadow for the several hours, and their divisions and subdivisions.

SUNFLOWER. (*See* HELIANTHUS.)

SUN-STROKE, or COUP DE SOLEIL, *sun'-stroke*, is a disease affecting those who are exposed to the direct beams of a hot sun, particularly during any labour or active exercise. It is not uncommon among our troops in India in long marches. They fall down insensible, and often die in a very short time. The nature of this complaint is not well understood. According to some, it is a sort of apoplexy, while others hold that it is more of the nature of concussion. It would appear that the sun's rays act upon the brain like a shock, suddenly and extensively influencing the nervous system, and arresting the movements of the heart. The natives of India adopt the system of pouring cold water upon the head in such cases. Stimulants, as rum-and-water, are also found to be of benefit, while bleeding, on the other hand, is not recommended.

SUPERPHOSPHATE OF LIME, *su-per-fos'-fait*.—This term is applied to a mixture consisting of burnt bones 2 parts, sulphuric acid 1 part, and water 3 parts, allowed to stand for a few days in a warm situation. It is largely used as a manure for land. (*See* MANURES.)

SUPPLY. (*See* DEMAND AND SUPPLY.)

SUPPORTERS, *sup-port'-ers*, in Her., those figures which are placed on each side of the shield of arms of sovereigns, noblemen, knights of the Garter, Bath, baronets, &c., and appear, as the term implies, to support or hold up the same. According to most writers on the subject, supporters had their origin from tilts, tournaments, and joustings, where it was customary for the knights who engaged in these military exercises to have the shield of their arms adorned with helmets, mantlings, wreaths, crests, and devices hung upon the barriers, trees, tents, and pavilions near the place of contest. By the sides of these shields they were accustomed to place their pages, armour-bearers, and servants, clothed in fancy dresses, sometimes making them appear like savages, Saracens, Moors, Sirens, &c., and sometimes disguising them in the skins of lions, bears, &c., in order to guard the shield and take an account of the name and arms of the knight who accepted the challenge. From these attendants, thus disguised and placed on guard, as keepers of their master's shields, heralds derive the use of supporters, which they say every one being noble or gentle by father and mother's side, and who was admitted to a tourney, had afterwards a right to carry. The grant of supporters is by Garter principal king of arms solely, and with which the other kings of arms have nothing to do. It is limited to peers of the realm, knights of the Bath, and princes of the blood royal at installations, unless granted by royal license from the monarch. King Edward III. was the first English monarch who used supporters to the royal arms. He bore, *dexter*, a lion guardant, crowned, or; *sinister*, an eagle, or falcon proper, crowned, or. The unicorn was first used as the sinister supporter of the royal arms by King James I.

SURETY, *shure'-te* (Fr. *sureté*), is one who undertakes to be answerable for the acts or non-acts of another, who is called the principal. Such undertaking requires to be in writing, and it may either be by bond or by simple writing. Where a surety has had to pay the sum in which he became bound, it may be recovered against the principal; and where there are several sureties, and one of them has paid the entire sum, he is entitled to come against his co-sureties for their shares. *Surety of the peace and of good behaviour* "is the acknowledging of a recognizance or bond to the queen, taken

by a competent judge of record for keeping the peace;" and every justice of the peace may take and command this by a twofold authority;—1. as a minister commanded thereto by a higher authority, as when a writ *of supplicavit*, directed out of the Chancery or Queen's Bench, is delivered to him; 2. as a judge, and by virtue of his office derived from his commission. Any private person, if he has "just cause to fear that another will burn his house, or do him a corporal injury, by killing, imprisoning, or beating him, or that he will procure others to do so," may demand surety of the peace against such person; and every justice of the peace is bound to grant it, if he make oath to that effect, and show that he has just cause so to fear. If the party so accused does not find such sureties, he may be committed to prison until he does, but not for a longer period than twelve months.

**Surgery**, or **Chirurgery**, *sur'je-re* (Gr. *cheir*, the hand, and *ergon*, work), is that branch of the healing art which employs manual procedure, whether by instruments or not, in the reparation of injury or cure of disease, as distinguished from the practice of medicine, which treats disease by the administration of drugs or other substances of a sanative tendency. This distinction, however, exists more in name than in reality, for the two are indissolubly connected, and the successful practice of the one is, of necessity, dependent on a knowledge of the principles of the other. Surgery may well be regarded as coeval with man in his fallen state; for the human body becoming then susceptible of injuries, the ingenuity of the sufferer would be excited to remedy them, and appliances for that purpose would be resorted to. Among the early Egyptians it must have existed in a considerably advanced state; for the scientific manner in which they embalmed their dead shows that they must have possessed a considerable knowledge of the human body and of the nature of drugs. The Greeks probably derived their medical knowledge from the Egyptians. The father of surgery is said to have been Chiron the Centaur, a native of Thessaly, and celebrated for his skill in the application of soothing herbs to wounds and bruises. His pupil Æsculapius was still more celebrated, and is believed to have flourished half a century before the Trojan war. He was fabled to be the son of Apollo, and after his death became the god of physic. His two sons, Podalirius and Machaon, occupy a distinguished place among the heroes of the Iliad. For upwards of 600 years, little or no progress appears to have been made in this art, the practice of which was confined to the Asclepiades, or reputed descendants of Æsculapius. Hippocrates did more for the improvement of surgery and medicine than all who had preceded him, and freed them from many of the absurdities with which they had been invested. So correct were his observations, and so accurate his descriptions, that they are referred to as authoritative even at the present day. His operations appear to have been conducted with boldness and decision, and indicate a considerable acquaintance with the art. Some of his discoveries, which had fallen into disuse, have been revived in modern times as new inventions. After the death of Hippocrates (B.C. 361), surgery made little progress in ancient Greece. Among the more distinguished of his followers were Ctesias, Diocles, Carystus, and Praxagoras. Of the Alexandrian school, the two great heads were Herophilus and Erasistratus, who, according to some accounts, were the first who practised human dissection. Among their followers were Xenophon of Cos, Mantius, Andreas of Carystus, and Ammonius. For nearly the first 600 years of its existence, Rome had no regular practitioner of medicine, and they trusted for cures mainly to spells and incantations. A Greek, Archagathus, of the Alexandrian school, having established himself at Rome as a surgeon during the consulates of Lucius Æmilius and Marcus Livius, was, after a time, on account of the prejudice existing against his profession, obliged to leave the city. Shortly after, however, Asclepiades, a native of Bithynia, established himself at Rome, and contrived so to ingratiate himself with the people that he was not only tolerated, but acquired some degree of popularity, and paved the way for future practitioners. Rome itself did not produce any medical man of note before the time of Celsus, the contemporary of Horace, Virgil, and Ovid. He is worthy to be compared with Hippocrates for his sound practical knowledge; and many of his surgical operations and remarks are far from being obsolete, impressing us with a high idea of his ingenuity and judgment. He has left us a complete and excellent digest of the medical and surgical knowledge of his time. Between Celsus and Galen, a period of upwards of 150 years, the only practitioners of note at Rome were Aretæus, a native of Cappadocia, Heliodorus, Antyllus, Rufus, and Archigenes. Galen was born at Pergamus, in Asia Minor, A.D. 131, and after studying at Smyrna, Corinth, and Alexandria, he ultimately settled at Rome, where he acquired great reputation both as a practitioner and public lecturer. Being a man of great erudition, brilliant genius, and indomitable industry, he produced works which exerted a most powerful influence over the practice of medicine, and rescued it from many of the errors with which it was encompassed. Indeed, for a period of 1,300 years, his opinions were received as oracular in the schools of all civilized countries. Passing over Oribasius, Aëtius, and Alexander of Trallis, we come to Paulus Ægineta, who flourished about the middle of the 7th century, and made both large and important contributions to surgery. His remarks are the more valuable from being no mere theories, but the results of practical observation and experience. The Arabs first became acquainted with medicine through translations of the Greek authors, and a flourishing medical school was established at Bagdad, under the fostering care of the celebrated caliph Haroun al Raschid, in the 9th century. The first Arabian surgeon of note was the celebrated Rhazes, who presided over an hospital at Bagdad, about the beginning of the 10th century. In the earlier part of the 11th century flourished Avicenna, whose works remained for nearly 600 years of great authority on medical subjects. More distinguished, however, in the department of surgery was Albucasis, who died in 1122. He was very skilful as an operator, and introduced a number of new instruments. To the Arabs, about the middle of the 12th century, we are indebted for the distinct separation of medicine and surgery. Up to this time they had been both practised indiscriminately. A knowledge of the Greek and Arabian systems of medicine was introduced into Italy, at Salerno, in the beginning of the 11th century, and this school soon acquired great celebrity as a seat of medical learning, whence knowledge was slowly diffused over the different countries of Europe. Among the early Christians, the practice of physic was viewed by the clergy as their peculiar province. The council of Tours, however, in 1163, prohibited the clergy from in any way causing the effusion of blood in the healing of disease, and surgery was in consequence abandoned to the uneducated laity, and sunk to a deplorable state of prostration, being in the hands of barbers, farriers, cobblers, and such-like. Down then to the middle of the 16th century, we meet with no name of note in this science. Amboise Paré, a Frenchman, was among the first to raise surgery from its prostrate condition, and his works exerted a most powerful and beneficial effect upon his followers. In the 17th century, Italy produced Cæsar Magatus, Tagliacotius, Marcus Aurelius Severinus, and Fabricius Aquapendente; Germany, Hildanus, Scultetus, Aurmann, and Heister; Holland, Bau, who is said to have been perhaps the most successful lithotomist that ever lived; and England, Wiseman, surgeon to Charles II. In the following century, we have in France the two great names of Petit and Desault, and in England the not less distinguished names of Perceval Pott and John Hunter, followed by Cheselden, Douglas, White, and Sharp. In Italy, during this century, flourished Lancisi, Morgagni, Bertrandi, Troja, and Scarpa; and in Germany, Schmucker, Richter, and Haller. It would be invidious, if it were not impossible, to name the most distinguished surgeons that this 19th century has produced, and in no country are they more numerous or more distinguished than in our own. Abernethy, Cooper, Liston, and Syme, with Dupuytren, Roux, and Lisfranc, are among the names that are best known. In no branch of medical science is progress more marked than in that of surgery, the rude and imperfect instruments that were formerly in use having been superseded by others of the most perfect form and delicate struc-

ture; red-hot irons and boiling pitch are no longer applied to stanch a bleeding wound, while the knowledge of when an operation is necessary, and when it ought to be performed, not among the least important qualifications of the surgeon, was never before in so advanced a state. The discovery of chloroform has, moreover, been of the greatest benefit to the suffering patient. The skilful surgeon requires to be possessed of some of nature's choicest gifts. He requires to be possessed of a strong steady hand, a clear quick sight, and great coolness and courage. Dexterity in the use of the instruments is also of the utmost importance, and this is best acquired by diligent practice in the dissecting-room, which is further of use in giving him a minute acquaintance with the anatomy of the different parts. It is of great advantage to the surgeon to be ambidextrous, or to possess the power of using either hand equally well. Hence, in order to be an eminent surgeon, requires a combination of gifts, natural and acquired, such as falls to the lot of few men. The various divisions of surgery will be found noticed in other parts of this work. (*See* AMPUTATION, DISLOCATION, LITHOTOMY, &c.)—Ref. *Encyclopædia Britannica*.

SURIANACEÆ, *su-re-an-ai'-se-e*, in Bot., a nat. ord. of *Dicotyledones*, sub-class *Monochlamydeæ*. There is but one known species, which is common on the sea-coast in the tropics. It resembles in many respects the order *Phytolaccaceæ*, but is at once distinguished by the the possession of petals and by the stamens being opposite to the sepals.

SURNAME. (*See* NAMES.)

SURVEYING, *sur-vai'-ing* (Nor. *surveoir*, to survey), the art of determining the boundaries and superficial extent of tracts of ground, the plans of towns, the courses of roads and rivers, &c. In surveying, a representation of all the above-named objects is made, and frequently the slopes of the hills are delineated as the whole would appear if projected on a horizontal plane. When railways or canals are to be constructed, a survey of the ground is combined with the operations of levelling, in order to obtain, besides a horizontal plan, the forms of vertical sections of the ground along the proposed course of the railway or canal, and thus to ascertain the quantities of earth to be removed. In England, the standard unit of land-measure is the acre, which contains 4 roods; and a rood is subdivided into 40 poles or perches, each pole containing 30¼ square yards. In surveying, however, for linear measurements, a chain is used, consisting of 100 links; and its entire length is such that one *square chain* is equal to the *tenth* part of an acre. Surveyors usually set down their measurements in links; there are 100,000 square links in an acre. As the measurement of angles is in general less liable to error than the measurement of linear distances when the surface to be surveyed is extensive, the surveyor only uses the chain in order to obtain the requisite data for a trigonometrical computation. For this purpose the theodolite is the most convenient instrument: it is universally used for the measurement of angles in land-surveying; and from the nature of its construction gives the angles reduced to the plane of the horizon, and consequently renders a calculation for that purpose unnecessary. For the purposes of sketching and filling in the details of a map, the plane table and the prismatic compass are also used; and a compass and needle accompany the theodolite, in order to determine the bearing of the several objects observed from any station with reference to the points of the horizon. In *maritime surveying*, the forms of coasts and harbours, the entrances of rivers, with the position of islands, rocks, and shoals, are to be determined; also the soundings or depths of water in as many different places as possible. In *military surveying*, representations are made on paper of the general features of a country, such as the roads, rivers, hills, and marshes, in order to ascertain the positions which may be occupied as fields of battle or as quarters, together with the facilities which the country may afford for the march of troops or the transit of artillery or stores.

SURVEY, ORDNANCE, *sur-vay'* (Nor. *surveoir*, to inspect), an important trigonometrical survey of Great Britain, at present being carried out by the English government. In England the principal triangulation was begun about 1791. The maps at first produced were on the scale of one inch to the mile; and this scale was adhered to until 1840, when the remainder of the survey was made on the six-inch scale, principally on the recommendation of the duke of Wellington, and was so continued. In the report of the progress of the ordnance survey to the 31st December, 1860, it is stated that the six northern counties of England had been ordered to be surveyed on the scales of six inches and twenty-five inches to the mile, but that the progress of the survey had been greatly retarded by the wet summer and severely cold winter. In the return of the sale of the ordnance maps, including the value of those supplied to public departments in 1860, the amount is stated at £7,762. 19*s*. 4½*d*. The number of royal engineers employed in the survey was 370, in England, Scotland, and Ireland.

SUSPENSION BRIDGE, *sus-pen'-shun*, a kind of bridge in which the roadway, instead of being carried over the supports, is suspended from them by means of chains or other flexible materials. This kind of construction is perhaps the simplest and most easily erected of all bridges. We find examples of it spoken of in remote times, and there are few countries in the world where it may not be seen in some form or other. Suspension bridges, however, were not constructed to any great extent till the commencement of the present century; up to that period they were of rather a primitive character. Among the first iron suspension bridges put up in this country was the Winch bridge, crossing the river Tees near Middleton. It was merely intended for foot-passengers, being only two feet in width, although 70 feet long. In 1816 a wire suspension bridge was built over the Gala Water of upwards of 100 feet span, at a cost of only £40; and another over the Tweed, at Peebles, in the following year, also of iron wire, and about the same span, for £160. The first long suspension bridge was that designed and carried out by Captain Sir Samuel Brown in 1820. This bridge, of a novel and ingenious construction, was built close to Berwick-upon-Tweed, and had a span of 449 feet. Its cost was £50,000. The same engineer, in the following year, constructed the pier at Newhaven, which was constructed on the same principle, and afterwards the Chain Pier at Brighton, which runs out into the sea a distance of upwards of 1,000 feet, having four openings, each of which has a span of 225 feet. In 1825 Telford completed the far-famed suspension bridge over the Menai Straits. This bridge took six years to construct. It consists of one opening of 570 feet span; and the roadway is 100 feet above the level of high water.

SUTTEE, *sut-tee'*, in the Sanscrit or sacred language of the Hindoos, a female deity, but in Hindustan it ordinarily signifies the act of a widow, who voluntarily burns herself on her deceased husband's funeral pile, or the widow who thus immolates herself; the word is also used by the Brahmins for various rites of religious purification.

SWALLOW, *swol'-lo* (Sax. *swelgan*). — This is the only species of the group Hirundo, which with us is called a swallow, the others being either martins or swifts. The chimney or house swallow, as it is frequently called, is supposed to hatch and breed in Africa, probably to the south of the equator, and is a periodical visitor to this country, generally arriving about the 10th of April, and remaining six months. The general colour of the swallow is black, with reflections of greyish-blue; the throat and forehead are deep reddish-brown, and there is a white spot on the inner web of each of the tail-feathers, with the exception of two in the middle, which are the shortest; the lateral tail-feathers are very long, and give a remarkable forked appearance to the tail. The upper part of the breast is black, the lower part and belly white; the whole length is about eight inches and a half, of which the elongated tail-feathers measure nearly five inches; the wings are long and pointed, reaching beyond the end of the second tail-feather. On reaching this country, they form their nests in chimneys, under the eaves of houses, old ruins, &c. The nest is formed of small portions of moist earth, which the bird may be seen collecting at the edges of ponds or the margins of puddles by the road-side. The nest is made in an open saucer-shaped form, and is lined with feathers,

The eggs are generally from four to six in number, white, speckled with ash-colour and dark red. Two broods are produced in the season. Swallows are very active, gliding and darting about with great lightness, and apparently very little motion of the wing, every stroke apparently sending them forward as if shot from a bow. The note of the adult swallow is a soft and sweet warble.

SWAN, *swon* (SAX. *swan*), (*Cygnus*), a gen. of web-footed swimming birds, found on the rivers and small pools of fresh water, and are distinguished by their graceful and majestic appearance. In some of the species the swans approach the geese in many of their characters, whilst the typical ones differ considerably. The leading characters of the swans, considered as a genus of *Anátidæ*, are these:—The bill as wide at the tip as at the basal part, and higher than wide at the base; the nostrils are pierced about the middle of the length of the bill, and the neck is very long, as compared with that of the other web-footed birds. The colour of the plumage is in general pure white, but a black species exists. They swim rapidly, and their flight is powerful and long-continued; they live in society, but in the breeding time they are strictly monogamous, and the pairs take up their nesting-grounds at some distance from each other. They make their nests near the margin of the water, upon the ground, and attain a great age. They feed generally upon seeds, roots, and other parts of aquatic plants which are blanched and succulent by being under the water; but it is asserted by some writers that they also eat frogs, insects, and worms. Their flesh is hard, black, and rank in the old ones, and not very good in the young ones. Their skins, feathers, and down, and especially the latter, are used for several purposes. There are several species, and one, the black swan of Australia, was long regarded as a bird impossible to be found. The wild swan, whistling swan, or hoopoe (*Cygnus ferus*), so called on account of the peculiar note uttered by this bird, is a winter visitor to the British islands; they also visit Holland, France, Provence, and Italy, and sometimes go as far south as Egypt and Barbary. It is a native of the northern parts of both the Eastern and Western continents, and is the first of all the Anatidæ to return north. The bill is black, and depressed in its anterior part, whilst the posterior is quadrangular and yellow. The plumage is white, but with a yellowish tinge on the head and upper part of the hind neck. The length of the full-grown bird is rather more than four feet and a half. The tame swan, or mute swan, is one of the most graceful and largest of British birds, and differs from the wild swan in that it has the anterior portion of the beak yellow and the base black, with a prominent black tubercle or knob on the upper part in front of the forehead. It is rather shorter than the whistling swan, but longer in the wings.

SWEDENBORGIANS, or NEW JERUSALEM CHURCH, *swe-den-bor'-je-ans*, is the name of a sect of Christians, called after their founder, Emanuel Swedenborg, born at Stockholm in 1688. The earlier period of his career was devoted to physical and mathematical studies, particularly mineralogy, in which he acquired great distinction, not only at home, but also in foreign countries. Indeed, the origin of many subsequent discoveries is attributed to his investigations. His first spiritual manifestation is referred to the year 1745, when he obtained a glimpse of the unseen world, and was enabled to converse with spirits and angels. From that time he relinquished his scientific pursuits, and began to print and publish various unknown *arcana*, which he says "have been either seen by me or revealed to me, concerning heaven and hell, the state of men after death, the true worship of God, the spiritual sense of the Scriptures, and many other important truths tending to salvation and true wisdom." His works are numerous, and contain many singular revelations. He died at London, 1772, but the idea of founding a sect never seems to have occurred to him, and he left no instructions as to its formation, or rules for its guidance. Among the first disciples to the new faith, were two clergymen of the "Church of England; and in December, 1783, an advertisement brought five persons together for reading and conversation. In 1787, the number had increased to thirty, and the formation of a definite religious society was commenced. In 1851 the number of congregations of them was fifty, principally in Yorkshire and Lancashire; but it is asserted that besides these, numbers hold their doctrines, but remain in connection with other churches. The principal societies for disseminating their views are the Swedenborg Printing Society, established in 1810, and the Missionary Tract Society, established in 1821. Their mode of worship resembles in general that of most other Christian bodies, and the sacraments of baptism and the Lord's supper are administered. Among the main tenets of this body are, that the last judgment has already been accomplished; namely, in 1757; that the former heaven and earth are passed away; that the New Jerusalem, mentioned in the Apocalypse, has already descended in the form of the "New Church;" and that consequently the second advent of the Lord has even now been realized in a spiritual sense, by the exhibition of his power and glory in the New Church thus established. They believe that the Father, Son, and Holy Spirit, are one in the person of Christ, comparatively as soul, body, and proceeding operation are one in each individual man. The doctrines of justification and imputed righteousness are rejected, salvation being obtainable only by a combination of faith and good works. They believe in a kind of purgatory for the purification of the spirit, and that the resurrection will not be of the material body, but of a spiritual body.

SWIETENIA, *swe-ten'-e-a*, in Bot., a gen. of the nat. ord. *Cedrelaceæ*. The species *S. Mahogani* supplies the well-known valuable wood called *mahogany*, which is so largely employed for household furniture and cabinet-work. It is imported chiefly from Honduras and Cuba, and also to a certain extent from other West-Indian islands. Its bark possesses febrifugal properties. The genus is named after Gerard Van Swieten, a Dutch botanist and author.

SWIMMING, *swim'-ming* (SAX. *swimman*, to swim), the act or art of moving through the water by means of the limbs. It is one of the most important branches of gymnastics, and although easily acquired, depends somewhat on the natural buoyancy of the body. The best place for learning to swim is in deep water. The learner should always bear in mind that the stroke which is to sustain and propel him must be compound; that is, the action of the legs and arms should be simultaneous. It must not be made on the surface of the water, nor must the individual kick up his heels in the air behind him. The sweep of the arms and legs should always be made under water, and rather deeply so with the legs. The back should never be allowed to rise with the stroke, except as the whole body rises, but should be kept hollow, slanting, and steady. In making the stroke, the palms of the hands are placed together, and pushed straight forward like the bow of a boat, about an inch under the surface; at the same moment the knees are drawn up widely beneath the body. In the next motion the hands sweep back the water in such a manner as to bring the whole of the arms into action from the shoulders to the hands; at the same moment the legs are thrown back, and the feet vigorously pushed against the water beneath. The hands ought to be swept out as far as possible without straining the shoulders and blade-bones. After this motion is made, the action is relaxed, and a fresh stroke is commenced. It should be remembered by the learner, that the principal propelling power is in the legs, the arms and hands being principally used for sustaining the head above the surface. In general the use of corks, bladders, &c., should be avoided, as they frequently interfere with the learner's confidence in the natural buoyancy of his body. Of the many methods of teaching swimming, one of the most excellent is that introduced in the swimming schools of Prussia by General Pfuel The teacher stands on a platform on the edge of the water, behind a strong oak rail, which runs horizontally to the extent of about 25 feet, and about four feet high from the level of the platform. In his hand he carries a staff about nine feet in length, to the top of which a rope is attached, which descends towards the water, and is inserted in the ring of a belt fixed under the arms of the learner, who lies along the water. Thus the staff is a lever, and the wooden rail

becomes the fulcrum. The staff rests upon the rail, and is easily managed by the teacher with one hand. Supported by the rope, the learner is then carefully instructed in the various movements, and is made to repeat them till they are perfectly familiar to him. The pupil is not considered safe until he is able to swim for half an hour without resting or receiving assistance. By General Pfuel's method, it is said that a person may become a very good swimmer in a very short time. Individuals have been known who could not swim a single stroke, and who by taking daily one, and sometimes two lessons, have been enabled in three weeks to swim for half an hour; while some have attained this proficiency in a fortnight. When the learner has mastered the elements of the art, turning in the water, swimming on the back, and floating, are of comparatively easy acquirement. The ordinary speed of a swimmer ought to be about three miles an hour. Men have been frequently known to swim thirty miles a day; and Il Pesce, the famous Neapolitan diver, swam fifty miles in twenty-four hours, on the coast of Calabria. Among modern feats of swimming, may be mentioned the crossing of the Hellespont by Lord Byron and a Mr. Ekenhead. Lord Byron accomplished the feat in an hour and ten minutes, and Mr. Ekenhead in an hour and five minutes, with the tide not in their favour. All animals in swimming do not vary much from their motion in walking, but man is obliged to change his motion altogether. The Russians, Poles, and other Sclavonic tribes, swim in a manner somewhat resembling the motion of dogs in the water, making a separate effort with each of the four extremities.

Swing Bridge, *swing*, a movable bridge, consisting of two parts, which meet midway between the abutments, each turning upon a centre pivot, so as to allow a ship or vessel to pass when necessary.

Sword, *sord* (Sax. *swörd*), an offensive weapon of steel, worn at the side, used either for cutting or thrusting, which has been known under different forms from the earliest ages. The manufacture of this weapon has been carried on to a great extent in this country for many centuries; but the swords of Italy, Spain, and more especially those of most Eastern nations, took the first rank. The Damascus blades are most noted for their extraordinary keenness of edge and flexibility, but there is no doubt that their quality, although of the greatest excellence, has been greatly exaggerated. Since 1786, the sword manufacture has been greatly improved and extended in this country. The process at present employed is as follows:—The steel of which the blade is to consist is first heated in the fire, and then drawn out upon an anvil by two workmen, alternately striking it with hammers; if the sides are required to be concave, it is hammered between steel bosses. It is then hardened by heating in the fire to a warm heat, and plunging it downwards into cold water, and then tempered by passing through the fire several times, until a bluish oxidation is produced on the surface. It is then set to the required shape, by placing it in a kind of fork on the anvil, and wrenching it with tongs. After this it is sharpened by grinding; and as this process somewhat impairs the uniformity of temper, it is again heated, and then polished with emery, or if the blade be of particularly fine quality, with *crocus martis*.

Sword-Fish (*Xiphias gladius*), a gen. of fishes remarkable for having the upper jaw prolonged somewhat in the form of a sword, and constituting at least one-third of the total length. The body is elongated, nearly round behind, but little compressed; upper part of the head nearly flat, slightly descending to the base of the sword, which is formed by an extension of the vomer, maxillary and intermaxillary bones. There are no proper teeth and no true tongue. The whole of the body is covered with a rough skin. The gills are peculiar, not consisting of fringes in the form of the teeth of a comb, as is usual among bony fishes, but each consisting of two large parallel laminæ, with reticulated surfaces. The whole of the under part of the body is of a fine pure silver-colour, shaded with bluish-black on the upper part. Very young specimens, of twelve or eighteen inches long, have the body covered with small tubercles, which disappear as the fish increases in size, first on the back and afterwards on the belly, and by the time it attains the length of three feet, are no longer apparent. The sword-fish is sometimes more than twenty feet long, the beak included. It swims with greater swiftness than almost any inhabitant of the deep, and is possessed of vast muscular strength. It attacks and puts to flight the smaller cetaceous animals, notwithstanding its food is usually vegetable. The flesh of the adult is said to be hard but good, that of the young fish white, agreeable, and nourishing. The sword-fish is very abundant in the Mediterranean, where it has attracted much notice from very early times; but though longest and best known to naturalists as an inhabitant of the Mediterranean, it often roams into the ocean, generally taking a direction either northward or southward of the Straits of Gibraltar. From the time of the very earliest authentic notice of British fishes, it has been included in the number, though only as an occasional straggler. In the Mediterranean it approaches the shore in May, and remains for about three months.

Sycamore. (*See* Acer.)

Sycamore-Fig. (*See* Ficus.)

Syconus, *si'-ko-nus* (Gr. *sukon*, a fig), in Bot., a collective fruit, formed of an enlarged and more or less succulent receptacle, which bears a number of separate flowers. The fig is an example; the flowers are almost entirely inclosed by the enlarged hollow pear-shaped receptacle, and what are commonly called seeds are in reality one-seeded fruits resembling achænia.

Sympathetic Ink. (*See* Ink.)

Symphony, *sim'-fo-ne* (Lat. *symphonia*), with the ancients, indicated a union of concerted sounds, and was used in contradistinction to *antiphony*, which was employed when half the concertants were in the octave, or double octave, to the other half. In modern music, however, the word *symphony* is applied to certain instrumental compositions, containing various movements, and designed for a full band. As specimens of this species of composition, we may mention Beethoven's "Sinfonia Pastorale," and his symphony in *C minor*. Mendelssohn, Mozart, and Haydn also excelled in the composition of symphonies.

Symphytum, *sim'-fi-tum* (Gr. *sumphuo*, I unite, because believed to agglutinate the lips of wounds), in Bot., a gen. of the nat. ord. *Boraginaceæ*. *S. officinale* is the herb comfrey, which has always been reputed vulnerary. The young leaves and shoots are sometimes eaten as table-vegetables. When bruised, comfrey forms an excellent bandage for broken limbs, on account of the starch and mucilaginous matters it contains.

Synagogue, *sin'-ä-gog*, a congregation, a gathering together, at present understood in special sense of a Jewish congregation; the house appropriated to the religious worship of the Jews; the court of the seventy elders among the Jews, called the *great synagogue*.

Synclinal, *sin-kli'-näl* (Gr. *sun*, together; *klino*, I bend), in Geol., when strata dip towards a common line of depression, the axis is termed synclinal, and the depression so formed is described as a trough or basin. —*Ref.* Page's *Handbook of Geology*.

Syncope. (*See* Fainting.)

Synod, *si'-nod* (Gr. *sunodos*), an ecclesiastical convention or council for consulting on religious matters. A Presbyterian synod is composed of the ministers and elders of the congregations of several presbyteries.

Synod of Dort. (*See* Dort, Synod of.)

Synonym, or Synonyme, *sin'-o-nim* (Lat.), a name, noun, or other word having the same signification with another.

Syntax. (*See* Grammar.)

Synthesis, *sin'-the-sis* (Lat.), in Chem., a term applied to the putting together of different bodies to form new ones possessing distinct properties. It is directly opposed to analysis, which is the process of separating bodies into their proximate or ultimate constituents. The synthetic production of inorganic compounds, such as sulphuric acid and sulphate of iron, from their elementary constituents, are every-day instances of the practice of this part of chemical science. Of late years, the researches of Kolbe, Wöhler, Streckar, Berthelot, and a number of other eminent chemists, have shown that the synthesis of numerous organic compounds, hitherto of a purely organic origin, may be formed from their elementary constituents. Thus

Kollie has succeeded in forming acetic acid, Wöhler urea, Strecker, Saurin, Berthelot, alcohol, formic acid, and a number of other substances, of more or less complicated composition.

SYRINGA, *si-rin'-gă*, in Bot., a gen. of the nat. ord. *Oleacea*. *S. vulgaris* is the beautiful early-flowering shrub known as the lilac; it is a common ornament of shrubberies and suburban gardens. The shrub commonly known as the syringa is a distinct plant. (*See* PHILADELPHUS.)

## T.

T, *te*, is the twentieth letter and sixteenth consonant of our alphabet. It is formed by a quick and strong expulsion of the breath through the mouth upon a sudden drawing back of the tongue from the fore part of the palate, with the lips at the same time open. The strength with which the breath is emitted in pronouncing *t* is all that distinguishes its sound from that of *d*. As *t* and *d* are so nearly related, it is natural that they should take each other's places, as is the case also with *t* and *s*, on account of the similarity of their pronunciation. *T* is also interchangeable with *th* and *st*, with *c*, *p*, *l*, and *nd*. It is frequently dropped at the end of words and also in the middle of words when flanked with vowels. *Ti* before a vowel has the sound of *si*, or rather *shi*, and is often changed to *s*, *sh*, *ch*, &c. When, however, *ti* is preceded by *s*, as in *question*, it retains its proper sound. *T*, as a numeral, stood for 160, and with a dash over it for 160,000. For the abbreviations of this letter *see* ABBREVIATIONS.

TABASHEER, *tăb'-ă-sheer* (Pers.), a silicious deposit in the joints of the bamboo. (*See* BAMBUSA.) It is remarkable for its low refractive power. Thus Sir D. Brewster has shown that in a sphere of tabasheer one inch in diameter the focal distance for parallel rays of light is four feet, while in a similar sphere of glass it is but half an inch from the surface of the sphere.

TABERNACLE, *tăb'-er-năk-l* (Lat. *tabernaculum*, a tent), properly signifies a tent; and hence the patriarchs are said to have dwelt in tabernacles or tents. In a stricter sense, there were in the camp of Israel under Moses two tabernacles,—the tent of the congregation, in which the people assembled for the dispatch of their ordinary secular affairs, and the tabernacle of the Lord, or the tent of testimony, or simply the tabernacle. This last was an oblong square structure, ten cubits in breadth, ten in height, and thirty in length, set up by the express command of God for the performance of religious worship, sacrifices, &c. by the Israelites during their wanderings in the wilderness, and was used by them for the same purpose in the land of Canaan till the building of the temple. The sides and west end were composed of boards or planks of shittim-wood, overlaid with plates of gold, having bases of brass; while the east end, at which was the entrance, was covered by a curtain of fine linen richly ornamented with needlework, and above it was also covered with curtains. The whole was so constructed that it could be readily taken down and carried away. It was divided into two parts, the first called the holy place, twenty cubits long and ten wide, in which were the table of shewbread, the golden candlestick, and the golden altar of incense; the other the sanctuary, or holy of holies, in which was the ark of the covenant. Around the tabernacle was a large oblong court one hundred cubits in length and fifty in breadth, encompassed by pillars overlaid with plates of silver, on which hung curtains of fine linen. This was the "court of the tabernacle." The "Feast of Tabernacles," or of tents, was designed to commemorate the dwelling in tents in the wilderness, and it was also a feast of thanksgiving for the harvest. It was the last of the three great annual feasts which required the presence of all the people at Jerusalem, and it lasted for eight days, from the 15th to the 23rd of the seventh month (Tisri, corresponding to our October). During its celebration the people dwelt in tents or arbours made of the leafy branches of certain trees. It was observed with great demonstrations of joy, and numerous sacrifices were offered up during its continuance.

TABOO, *tă-boo'*, is a word used among the South-Sea Islanders to express something consecrated, sacred, not to be touched. Hence it has come to be applied in this country to something prohibited or interdicted.

TABOR, *tā'-bor*, a small drum, usually forming an accompaniment to the *pipe*. They are both played by the same performer, the tone of the pipe being regulated by the fingers of the left hand while the tabor is played with the other. They were at one time very popular amongst the lower classes in most European countries.

TACCACEÆ, *tăk-kā'-se-e*, the *Tacca* fam., a nat. ord. of *Monocotyledones*, sub-class *Petaloideæ*, consisting of perennial herbaceous plants with fleshy roots, parallel-veined stalked leaves, and regular flowers. The perianth is tubular and 6-parted. The stamens, six in number, have petaloid filaments hooded at the apex; the anthers are 2-celled, and are placed in the concavity below the apex of the filament. There are two genera and eight species, natives of damp places in the hot parts of India, Africa, and the South-Sea Islands. The most interesting plant of the order is *Tacca oceanica*, the roots of which yield the starch known as Tacca starch, Tahiti arrowroot, or Otaheite salep. Cakes made of this product are much eaten by the natives of the Society Islands. (*See* ARROWROOT.)

TADPOLE, *tăd'-pole* (Sax. *tad*, toad, and *pola*, a young one), a young frog before it has disengaged itself from the membranes that envelop it in its first stage of life.

TAJ MAHAL, *tāj mă-hăl'*, a mausoleum erected at Agra, a city which is now the seat of the government of the North-western provinces of Bengal, by the emperor Shah Jehan, to commemorate the virtues of his favourite consort, whose original name was Arjemmed Banoo, which, according to oriental usage, was changed on her elevation to that of Mumtazee Yumanee, signifying *the paragon of the age*. The Taj Mahal, of white marble, with four tall minarets of the same material rising at each of its angles, is placed on an elevated terrace, also of white and yellow marble. The interior, consisting of a central hall, in which are the tombs of the emperor and his queen, is remarkable for its exquisite finish, the pavement being laid with alternate squares of marble, and the walls, screens, and tombs crowned with flowers and inscriptions, executed in beautiful mosaic of cornelian, lapis lazuli, and jasper, the whole appearing as fresh and almost as perfect as when completed. The Taj is surrounded by a lofty wall of red stone, with cupolas and pillars of marble.

TALBOTYPE. (*See* PHOTOGRAPHY.)

TALC, *tălk*, in Min., a magnesian mineral occurring in crumbling, laminated, and foliated masses of a greenish or yellowish white. It resembles mica, but is much softer, and although flexible, is not elastic. It is used in the manufacture of crayons, for crucibles, as a grease absorbent, and in making porcelain. Much of the so-called commercial talc is mica. Talc also enters into the composition of many rocks; such as talc-schist, chlorite-schist, steatite, serpentine, &c. Chemically considered, it consists principally of silicate of magnesia.

TALE, *tail* (Fr. *conte*; Ger. *Mährchen*), in Lit., is a term used somewhat indefinitely, but may commonly be said to signify a simple fictitious narrative either in prose or verse, usually comprising only a single adventure, or group of incidents, with little plot or variety of character. Our common nursery tales are found to exist in the popular traditions of all Teutonic nations, and seem to be of much higher antiquity than works of greater pretensions. The brothers Grimm have thrown much light on this class of literature in their *Kinder und Haus Mährchen*.

TALISMAN, *tăl'-is-măn* (Arab.), among Eastern nations, is a figure cut in metal, stone, &c., and made with certain superstitious ceremonies, and under certain astrological circumstances. They were believed to be possessed of certain virtues protecting the wearer from disease, rendering him invulnerable in battle, and the like. (*See* AMULET.)

TALLOW, *tăl'-lo* (Dan. *talg*), the melted and purified suet of the ox or sheep, used in the manufacture of common candles. It consists of various portions of

stearin, palmitin, and olein, according to its origin. Mutton tallow is of a much firmer consistence than that of the ox, from containing less olein and more stearin. It is prepared for use by the process of *rendering*. In England this is effected by melting the tallow in an open copper pan, exposed to the action of the fire. After it has remained in a liquid state for some time, the fleshy particles rise to the surface, and are skimmed off and pressed. The pressed cake is commonly known as "cracklings," or "greaves," and is used for feeding dogs. On the continent and in Ireland, however, D'Arcet's method is generally adopted. The raw tallow is melted by steam heat, with a small portion of very dilute sulphuric acid; by which means the cellular tissue is destroyed. This method yields from three to five per cent. more tallow than the older process.

TALLY TRADE, *tăl'-le*, is a system of dealing carried on in London and other large towns, by which customers are furnished with articles on credit, by agreeing to pay the stipulated price in weekly or monthly instalments. It is remarkable how many of these shops exist in all the great centres of manufacture, the customers being mostly wives of labourers, mechanics, &c., servant girls, and females of loose character. The facility with which goods are thus obtained, and the supposed ease with which they will be paid in instalments, lead persons to overlook the badness of the articles and the exorbitant prices charged for them. Habits of improvidence are thus generated, which usually involve the parties in irretrievable ruin. Payments are rarely made at the shops, but certain days of each week are set apart for the collector going his rounds among the different customers, and receiving their instalments. It is estimated that in London alone nearly £1,000,000 is annually returned in this trade.—*Ref.* McCulloch's *Commercial Dictionary*.

TALMUD, *tăl'-mud* (Heb., doctrine), among the Jews, is a work which contains those rules and institutions by which, in addition to the Old Testament, the conduct of that people is regulated. It is in fact the interpretation which the ancient rabbins have affixed to the law of Moses. It is called the traditional or unwritten law, as distinguished from the written law given to Moses. They are, however, both regarded as of the like antiquity, both having been given to Moses on Mount Sinai. After the second destruction of Jerusalem under Adrian, and the consequent dispersion of the Jews, fears were entertained lest the oral traditions should be lost; and hence arose the necessity of committing them to writing, in order to their preservation. It is generally agreed that Rabbi Jordah, surnamed the Holy, made the first permanent record of them about A.D. 190, and 120 years after the destruction of Jerusalem. This was the Mishna, or text, and to this a twofold commentary, or series of commentaries, were subsequently added, the one called the Babylonian Gemara, the other the Jerusalem Gemara. The former was begun by Rabbi Asche, who died 427, and completed by Rabbi Jose some 50 years later. The Gemara of Jerusalem embodied the notes of the Palestinian Jews, and proceeded from the Academy at Tiberias. It is believed to have been written about the close of the 4th century. Thus we have the Babylonian and Jerusalem Talmud having the same text but different notes. The former is far more abundant and copious in its notes than the latter, and is the one that is always preferred by the Jews, being the one that is meant when the Talmud is spoken of. Christians, however, generally prefer the Jerusalem Talmud, as being more free from the absurdities and fables of the other; but on account of its greater brevity and succinctness, it is more difficult to understand. The Jews set a high value upon the Talmud, generally placing it above the inspired law. The celebrated Maimonides made a digest of all the laws and ordinances contained in the Talmud, in the 12th century.—*Ref.* Davidson's *Biblical Criticism*; Kitto's *Biblical Cyclopædia*.

TAMARICACEÆ, *tăm-ă-rik-ai'-se-e*, in Bot., the Tamarisk fam., a nat. ord. of *Dicotyledones*, sub-class *Thalamifloræ*, having the following essential characters:—Shrubs or herbs, with alternate entire scale-like leaves. Calyx 4—5-parted, imbricate, persistent. Petals distinct and attached to the calyx, withering, imbricate. Stamens hypogynous; anthers introrse. Ovary superior, with distinct styles. Fruit dehiscing by 3 valves, each of which bears a placenta at its middle or base. Seeds numerous, comose, without albumen, and having a straight embryo, with the radicle towards the hilum. The plants of this order usually grow by the sea-side, and are most abundant in the basin of the Mediterranean. There are three genera and 43 species. *Tamarix mannifera* produces a saccharine substance, which is known under the name of Mount Sinai manna. This is supposed to be an exudation produced by an insect which inhabits the plant.

TAMARIND. (*See* TAMARINDUS.)

TAMARINDUS, *tăm-ă-rin'-dus*, in Bot., a gen. of the nat. ord. *Leguminosæ*. The well-known tamarind is the fruit of the species *T. indica*. It contains an agreeable acidulous, sweet, and reddish-brown pulp, which is employed medicinally in the preparation of a cooling laxative drink. When the pulp is mixed with sugar, it forms a delicious preserve.

TAMUS, *tăi'-mus*, in Bot., a gen. of the nat. ord. *Dioscoreaceæ*. *T. communis* is the common black bryony, a beautiful twining hedge-plant. It has a large fleshy root, which is sometimes used as a topical application to bruised parts to remove the marks. Taken internally, it acts as a diuretic, and also it is said as an emetic and cathartic.

TANNIN, *tăn'-nin*, in Chem.—This term was formerly applied to the various forms of the astringent principle contained in the materials used for tanning leather. The most important of them have been examined and found to possess an acid reaction, and to differ considerably in their properties, according to their source. The best known of them is gallo-tannic acid, which is generally known by the name of tannin or tannic acid, as its name signifies. It is obtained from the nut-gall of the oak, which contains two-thirds of its weight of this acid. The nut-galls are reduced to powder, and digested with an equal weight of washed ether. The decanted liquid separates on standing into two portions, the denser of which is of a yellow colour, and consists of ether, holding gallo-tannic acid and various colouring matters in solution. On evaporation, it yields a pale buff residue of amorphous gallotannic acid. It is freely soluble in water, it reddens litmus-paper, and dissolves the carbonates with effervescence. With the bases it forms salts known as the gallotannates, none of which are crystalline. The basis of ordinary writing-ink is gallotannate of iron. Its most remarkable compound is that which it forms with *gelatin*, which constitutes the basis of leather. Gallotannic acid is used as a mordant in dyeing and in photography. The other varieties of tannic acid are *moritannic acid*, found in fustic (*Morus tinctoria*); *quercitannic acid*, existing in oak-bark; *quinotannic acid*, contained in cinchona-bark; *caffeotannic acid*, found in coffee; and a few others of little importance.

TANNING. (*See* LEATHER MANUFACTURE.)

TANTALIC ACID. (*See* TANTALUM.)

TANTALUM, *tăn'-tă-lum*, in Chem., symbol Ta,—a very rare metal, also known as *columbium*, found in certain minerals, the *tantalites* and *yttrotantalites*. Being so rare, and occurring in such small quantities, its characteristics as a metal have not been much studied. It is obtained by decomposing the chloride at a red heat with ammonia. It is a black infusible powder, which assumes a metallic lustre when burnished. Heated in air it burns, becoming converted into tantalic acid. Tantalum forms two oxides,—the protoxide, TaO, and tantalic acid, $Ta_2O_5$. Tantalic acid is a white infusible substance, uniting with the bases to form salts, known as tantalites. A sesquichloride and a sesquisulphide of tantalum have been obtained.

TAPESTRY, *tăp'-es-tre* (Fr. *tapisserie*), a species of woven hangings of wool and silk, frequently raised and enriched with gold and silver, representing figures of men, animals, landscapes, historical subjects, &c. This species of curtain covering for walls was known among the inhabitants of eastern countries at an extremely remote era. The most grotesque compositions and fantastic combinations were commonly selected for the display of the talents of workmen in this department of oriental art, which was afterwards imported into Greece. At length, the refined taste of

Athens became visible in the structure of tapestries. The old grotesque combinations no longer, as formerly, covered their surfaces, but were confined to the borders only; and the centre received more regular and systematic representations. In modern times, this description of embroidery has been executed with very great success, and has often employed the talents of the greatest masters in the art of painting. In Flanders, particularly at Arras (whence the term *arras*, signifying *tapestry*), during the 15th and 16th centuries, the art was practised with uncommon skill, and tapestries were executed there after the designs of Raffaelle in his cartoons. The art was introduced into England by William Sheldon, near the end of Henry the Eighth's reign. In 1619, a manufacture was established at Mortlake, in Surrey, by Sir Francis Crane, who received £3,000 from James I. to encourage the design. The first manufacture of tapestry in Paris was established under Henry IV., in 1606 or 1607, by several artists whom that monarch invited from Flanders. Under Louis XIV., the manufacture of the Gobelins was instituted, which has introduced very beautiful tapestries, famous for their strength, elegance of design, and happy choice of colours. The finest paintings are copied, and eminent painters have been employed in making designs for the work. Tapestry-work is distinguished by the workmen into two kinds,—that of high and that of low warp; the looms, and consequently the warps, being differently situated in the one case from what they are in the other; those of the low warp being placed flat and horizontal to the horizon, and those of the high warp erected perpendicularly. The English anciently excelled all the world in the tapestry of the high warp, and they still retain their former reputation, though with some little change. The high warps, on the other hand, are quite laid aside by the French. The piece of tapestry known as the Bayeux tapestry is a web or roll of linen cloth, worked in coloured woollen thread, preserved at Bayeux in Normandy, upon which is a representation of the events connected with the invasion and conquest of England by the Normans. (*See* Bayeux Tapestry.)

Tapioca. (*See* Manihot.)

Tapir, *tā'-peer* (*Tapirus*), a pachydermatous animal belonging to the ord. *Ungulata* and fam. *Elephantidæ*. There are three known species of the tapir, two of which inhabit South America, while the third is found in Sumatra and on the peninsula of Malacca. The characteristics of the genus are as follows: the muzzle is prolongated into a short proboscis, which is simple at the end; the skin is covered with hair; the skull is of a sort of pyramidal form, resembling that of the pig, and the nasal bones are much arched, so as to give support to those muscles from which the proboscis depends; the tail is extremely short; the jaws are furnished with six incisors and two canines (very small) in each, and the upper jaw has seven, and the under six molars on each side; the feet have four toes on the front feet and three on the posterior ones; the neck is high, and is furnished with a sort of mane formed of upright bristles; and in their form, generally, they are not at all unlike the hog family, with the exception that the legs are usually longer. The best-known species is the common American tapir (*Tapirus terrestris* or *americanus*). This is a large animal, nearly six feet long, and measuring about three feet and a half high. The skin is very thick, and covered with short brown hair, and it is found in nearly all parts of Southern America, from Panama nearly to the extreme south. It inhabits the most tropical forests, near water, in which it often bathes, and is more of a nocturnal than a diurnal animal. Altogether it is a harmless animal, and when attacked generally seeks safety in flight, although it is said to frequently crush its most cruel enemy, the jaguar, with its body against the limbs of trees, when that animal assails it. The diet of the tapir is purely vegetable, and it often inflicts great loss on planters by its predilection for various roots, which it digs up in large quantities, laying waste large tracts of ground. The other South-American species (*Tapirus*) is but little known, and is distinguished from the former by the greater length of its hair. It is principally found inhabiting the Andes, at a height of some 3,000 to 3,600 feet above the level of the sea. The remaining variety—*Tapirus malayanus*, or Indian tapir—is much larger than either of the species just described, as it measures some seven or eight feet in length, and is of proportionate height. It is of a very heavy, massive appearance, and is remarkable for the peculiar colouring of its body, its fore quarters being of a glossy jetty black, while its hind quarters, back, and sides, are pure white. The proboscis or trunk is also developed more than in the American varieties, as it measures some eight inches in length. The eyes are very small and round, and the ears are also round, and are tipped with white. In habits and disposition the Indian tapir greatly resembles those of America; so they call for no special description. It is said to exist abundantly in China, but hitherto it has only been found in Borneo, Sumatra, and Malacca.

Tar, *tar*, in Manuf., a black viscid substance, consisting of a mixture of hydrocarbons holding solid matters in solution, formed during the distillation of wood or coal. Wood tar, or Stockholm tar, as it is often called, is largely used in shipbuilding. It is produced by a process of rough dry distillation of the resinous wood of the pine. When heated, the more volatile constituents evaporate, leaving behind the hard, black, shining substance known as *pitch*. *Coal tar* is similar in characters and composition to wood tar, but contains in addition many compounds not existing in the vegetable product. Of late years, coal tar has risen from a nearly useless incumbrance to the manufacturer to be one of the most important of our raw materials. The distillation of coal tar forms a separate branch of trade, and is conducted on a very extensive scale. Tar is also obtained from slate, peat, and seaweed during the dry distillation of these substances, closely resembling wood and coal tar in its composition.

Tarantula, *tă-rănt'-tu-lă* (Ital.) (*Lycosa Tarantula*), a spider belonging to the fam. *Araneidæ*, the third order of the class *Arachnida*. The tarantula is a native of the south of Europe, and its bite is supposed by the natives of Italy to be only cured by the patient being made to dance violently to the sound of music. It lives on the ground, generally under stones or in holes in the earth, and does not construct regular webs to catch its prey, but lays in wait for it, or issues forth on predatory excursions, rushing back to its hole when it has secured it. (*See* also Spider.)

Taraxacum, *tă-răks'-ă-kum* (Gr. *tarasso*, I change, from its supposed effects on the blood), a gen. of the nat. ord. *Compositæ*. *Taraxacum officinale* (the *Leontodon taraxacum* of some botanists) is the common dandelion. The root of this plant is very extensively employed as a medicinal agent, and is believed to possess aperient, diuretic, and alterative properties. It contains a bitter crystalline principle, to which it seems to owe its medicinal power. When roasted, dandelion-root is sometimes employed instead of chicory as an addition to coffee.

Tare, *tair* (Ital. *tara*, from *tarare*, to abate), in Com., is an abatement or deduction made from the weight of a parcel of goods, on account of the chest, cask, bag, &c., in which they are contained. It is usually distinguished into real, customary, and average. The first is the actual weight of the chest, &c.; the second the supposed weight as fixed by custom; and the last is the average weight taken from a number.

Target, *tar'-get* (Sax. *targ*), literally, a mark to shoot at. The best practice-targets are made of cast iron, about six feet high, twenty-four inches wide, and two to three inches thick. There are many other kinds of targets, some of which, by means of electricity, show where the balls strike them upon the face of a dial at the side of the person firing.

Targum, *tar'-gum* (Chal., interpretation or version), is the name given to the Chaldee paraphrases or versions of the Old Testament. The origin of these paraphrases is much disputed. During the Babylonish captivity, the Jews had adopted the Chaldee language, and upon their return to their own country they could not understand the language of their sacred books; and hence, when Ezra and the Levites read the law to the people, they were obliged to add an explanation of it in Chaldee. These explanations were afterwards committed to writing, and hence probably originated the Targums. They are rather comments and explanations

of the text than literal translations of it, and hence their name. The oldest Targums extant are believed to be at least as early as the time of Christ. At present eleven Targums are known to us. That of Onkelos on the Pentateuch is highly valued by the Jews. The author is mentioned in the Babylonian Talmud as a disciple of Hillel, who died 60 B.C. The style is pure, approaching that of Daniel and Ezra, and the rendering always very literal; and hence it is of great use in explaining Hebrew words. The Targum of Jonathan the son of Uzziel contains the Prophets, *i.e.*, Joshua, Judges, Samuel, Kings, Isaiah, Jeremiah, Ezekiel, and the twelve minor prophets. The style is inferior to that of Onkelos, and the rendering is much more free, many additions being made for which there are no corresponding words in Hebrew. A targum on the Pentateuch was formerly ascribed to this same Jonathan; but the style and character of the work show this to be impossible, and it is now known as that of Pseudo-Jonathan. The language is impure and barbarous, and it contains a number of fables, legends, and allegories. It is believed to have been written about the 7th century. The Jerusalem Targum is on the Pentateuch, and is so called either because it was made at Jerusalem, or from its being in the dialect of that place. It is both a corrupt and incomplete work. The other targums are, that of Joseph the Blind, or One-eyed, on the Hagiographa (Job, Psalms, Proverbs); that on the five Megilloth (Ruth, Esther, Ecclesiastes, Song of Solomon, and Lamentations); one on 1st and 2nd Chronicles; three on Esther; and the Jerusalem Targum on the Prophets. None of these, however, are of much value.

TARIFF, *tăr'-rif* (Ital. *tariffa*), in Com., is a table giving the various duties, drawbacks, bounties, &c., charged or allowed on the importation or exportation of various articles. The simplicity of our present tariff is one of the triumphs of recent statesmanship. Formerly, hundreds of articles were loaded with duties which brought little revenue to the state and presented formidable obstacles to commerce, while many more were wholly prohibited. More particularly to the late Sir Robert Peel and the present chancellor of the Exchequer, Mr. Gladstone, belongs the honour of sweeping away many hundreds of these obnoxious duties. (*See* CUSTOMS.)

TARTAR, *tar'-tar*, a whitish crust deposited from wines upon the insides of the casks in which they are stored. It consists essentially of the sparingly soluble bitartrate of potash. When purified, it crystallizes in oblique rhombic prisms of snowy whiteness, forming ordinary cream of tartar. Crude tartar, or argol, forms the chief source of tartaric acid (which *see*).

TARTARIC ACID, *tar-tăr'-ik*, an organic acid obtained principally from the crude tartar formed on the insides of the casks in which wine is stored. It also occurs in the berries of the tamarind and of the mountain ash. In order to prepare the acid, the crude tartar, which consists mainly of bitartrate of potash, is dissolved in boiling water, and chalk is added until effervescence ceases. Insoluable tartrate of lime is precipitated, and neutral tartrate of potash remains dissolved. The tartrate of potash remaining in solution is then decomposed into tartrate of lime and chloride of potassium, by chloride of calcium. The product of the two operations is well washed and digested with dilute oil of vitriol at a gentle heat. The tartaric acid is thus set free, insoluble sulphate of lime being thrown down. When cool, the liquid is filtered, evaporated in leaden vessels to the consistence of syrup, and allowed to crystallise, the formation of the crystals being favoured by the presence of sulphuric acid. The acid thus obtained crystallizes in large colourless transparent rhombic prisms, which are permanent in dry air. Tartaric acid dissolves readily in water, alcohol, and wood spirit. It is much used in dyeing and in medicine. Tartaric acid is a dibasic, and exhibits a strong tendency to form double salts, of which there are several varieties. The most important salts of this acid are the following:—*Bitartrate of potash*, or pure cream of tartar. It is sparingly soluble in cold water, requiring about 180 times its own weight for solution. It is used in medicine as an aperient, and when heated to redness in a covered crucible, it forms the mixture of carbon and carbonate of potash known in the laboratory as *black flux*. Calcined with twice its weight of water, it forms *white flux*. In its impure state it forms the chief source of tartaric acid. Its composition may be represented by the formula $KO.HO.C_4H_4O_{10}$. The equivalent of basic water may be replaced by different bases; such as soda, sesquioxide of iron, and teroxide of antimony.—*Tartrate of potash and soda*, or *Rochelle salt*, forms large hexagonal prismatic crystals. It is much used in medicine as an aperient. The double tartrates of iron and potash, and of iron and ammonia, are also used for the same purpose.—*Tartrate of potash* and *antimony*, or tartar emetic, has long been extensively used in medicine. It may be prepared by mixing three parts of teroxide of antimony with four parts of cream of tartar, into a thin paste, with water, and allowing it to digest for several hours. It is then boiled with water, filtered while hot, and allowed to crystallize. Internally administered in doses of two or three grains, it acts as a powerful emetic; in doses of one grain and under, as a sedative and expectorant. It is very much prescribed in a great variety of diseases. A compound, similar in character to tartar emetic, may be formed with arsenious acid. Boracic acid will also replace the equivalent of water in the bitartrate of potash; thus acting as a pseudo base. It forms the borotartrate of potash, a soluble tartar used in medicine as a purgative.

TASTE, *taist*, in Physiol., is one of the five special senses by which are perceived certain impressions made by particles of bodies, dissolved by the saliva in the mouth. The object clearly is to take cognisance of matters about to be swallowed, and to act as sentinels to the alimentary canal, at the entrance of which they are situated. The tastes of bodies are very different and varied; but in order to have a taste, a substance must be either liquid or soluble in the mouth. The organ of taste is the tongue, and the seat of sensibility is the mucous covering of its surface. It is dependent on the lingual branch of the fifth, and the glosso-pharyngeal nerves,—the former distributed to the two anterior thirds, and the latter to the posterior third of the tongue. This organ is covered over with minute prominences, which, when magnified, present four principal forms; viz., 1. simple papillæ; 2. conical or filiform papillæ; 3. fungiform papillæ; 4. circumvallate, or calciform papillæ. It is supposed that the two former are more especially concerned in the sense of touch, with which the tongue is also highly endowed; while the two latter, but particularly the last, constitute more especially the apparatus of taste. Sapid bodies pressed against these papillæ give rise to impressions, which, when transmitted to the brain, occasion the peculiar sensation. The conditions for the perception of taste are,—1. the presence of a nerve with special endowments; 2. the irritation of this nerve by the sapid matters; 3. the solution of these matters in the secretions of the organ of taste. The precise mode in which the nerves of the tongue are stimulated is not understood. This sense is much more acute in some persons than others, and may be much improved by education, as in the case of wine-tasters. It is diminished or lost in febrile or other disorders which alter the condition of the mucous surface of the tongue and mouth. Professor Bain classifies the different kinds of tastes as follows:—1. Relishes, or the agreeable feelings arising from the stimulus of food on the organs of mastication and deglutition,—they are of an intense and massive kind; 2. disgusts, or the opposite of relishes; 3. sweet tastes, as that of sugar; 4. bitter tastes, as that of quinine or bitter aloes; 5. saline, as that of common salt; 6. alkaline; 7. sour or acid; 8. astringent; 9. fiery, as that of alcoholic liquors.

TASTE, in Æsthetics, is that faculty of the human mind by which we judge of the beautiful and proper, and distinguish them from the ugly and unsuitable. Much difference of opinion has prevailed respecting the nature of this faculty. By some it has been regarded as the result of caprice or fashion, without any uniform or permanent principles on which to ground its decisions; by others, a compound of various complex elements, in the resolution of which into its component parts several ingenious attempts have been made. It seems, however, to be, as stated by Burke, "a separate faculty of the mind;" "a species of instinct, by

which we are struck naturally and at the first glance, without any previous reasoning, with the excellencies *or defects* of a composition." It is, however, highly susceptible of improvement by being made habitually and attentively conversant with a particular class of agreeable objects. This faculty exercises an important and highly beneficial influence in such a state of society as ours, not only over the pursuits of those who devote themselves to the study of literature and the fine arts, but over the enjoyments of every individual who partakes of the general refinement of manners.

TAURUS, *taw'-rus* (Lat.), in Astron., the Bull, one of the twelve signs of the zodiac, and the second in order.

TAXACEÆ, *tăks-ai'-se-e* (Lat. *taxus*, the yew-tree), in Bot., the Yew fam., a nat. ord. of *Dicotyledones*, sub-class *Gymnospermia*. Trees or shrubs, with continuous branches. Leaves usually narrow, rigid, and veinless; sometimes broad with forked veins. Flowers unisexual, naked, bracteated. Male flowers several together, each with one or several stamens, which are united or distinct; anthers bursting longitudinally. Female flowers solitary, and consisting of a single naked ovule, which is either terminal or placed in the axil of a bract. Seed small, enveloped in a cup-shaped mass; embryo straight. The plants of this order are natives of temperate regions, and of the mountains of tropical countries. There are nine genera and 50 species. (*See* TAXUS.)

TAXATION, *tăks-ai'-shun* (Lat. *taxo*, I estimate, appreciate, value, also charge with), is defined to be the taking a portion, or the value of a portion, of the property or labour of individuals, and disposing of it by government. In every system of government taxation is necessary, and every good government will endeavour to make the burden as light or as little felt as possible. In fact, there is, perhaps, no branch of legislation so important as the adoption of wise and just measures in the matter of taxation. Upon this, in no small degree, the wealth, happiness, and even the morals of the people depend. The four following general maxims laid down by Adam Smith cannot be too much kept in view in regard to this subject:—"1. The subjects of every state ought to contribute towards the support of the government as nearly as possible in proportion to their respective abilities; that is, in proportion to the revenue which they respectively enjoy under the protection of the state.—2. The tax which each individual is bound to pay ought to be certain and not arbitrary. The time of payment, the manner of payment, the quantity to be paid, ought all to be clear and plain to the contributor, and to every other person.—3. Every tax ought to be levied at the time or in the manner most likely to be convenient for the contributor to pay it.—4. Every tax ought to be so contrived as both to take out and keep out of the pockets of the people as little as possible over and above what it brings into the public treasury of the state." "Equality of taxation," says J. S. Mill, "means apportioning the contribution of each person towards the expenses of government, so that he shall feel neither more nor less inconvenience from his share of the payment than every other person experiences from his. This standard, like other standards of perfection, cannot be completely realised; but the first object in every practical discussion should be to know what perfection is." Taxes are either direct or indirect. "A *direct* tax is one which is demanded from the very persons who it is intended or desired should pay it;" an *indirect* tax, one which is "demanded from one person in the expectation and intention that he shall indemnify himself at the expense of another," as in the excise or customs. Direct taxes are generally on income, indirect on expenditure. Though most governments have had recourse to direct taxes, indirect taxes have generally been viewed with the greatest favour both by princes and subjects. Being generally paid, in the first instance, by the producers, the purchasers confound them with the natural price of the commodity; and hence their effects are not so readily felt and appreciated. They have also the advantage of being paid by degrees, in small portions, and at the time when the commodities are wanted for consumption. Indirect taxes, however, have the disadvantage that they not only increase the price of the articles by their amount, but also, being advanced by the producers before they are finally paid by the consumers, the former must necessarily have a profit upon them. As the income of individuals must be derived from one or more of the three sources of rent, profit, or wages, all taxes which do not fall upon capital, must, however imposed, ultimately fall upon one or other of these sources. Of the first of these we have two kinds in this country,—taxes on the rent of land, and taxes on the rent of houses. The existing *land-tax* was first imposed in 1693, on a rude valuation of the lands of the kingdom made in the previous year. No change has since been made on the valuation, but the rate has been raised from time to time, till in 1798 it was made perpetual at the rate of 4*s.* a pound, leave being at the same time given to the proprietors to redeem it. Taxes on houses have been for a lengthened period among the ordinary sources of revenue of this country, having been introduced by 7 Will. III. c. 18. The existing *house-tax* was imposed in 1851. It affects only houses worth £20 a year and upwards, which are subject to a duty of 3½ per cent., or 9*d.* per pound on their annual value, provided they be not farm-houses or in part occupied as shops, in which case the duty is only 2½ per cent., or 6*d.* per pound. There seems to be no good reason why this tax should not be brought down lower, say to £10 of rent, more especially as such rent confers the important privilege of the franchise. It appears that in 1861 there were 4,138,683 inhabited houses in Great Britain, of which only 544,388, or two in fifteen, paid duty. Were the present duty then charged on houses of £10 and upwards, its produce would be more than doubled. The *window-tax*, which was finally abolished in 1851, was in every way a very objectionable tax, because the number of windows in a house forms no criterion of its value, or of the probable means of those by whom it is occupied. Taxes on profits are objectionable in so far as they rarely fail to obstruct improvement and to promote fraud. If an equal and universal tax could be imposed upon the net profits realized in all departments of industry, such a tax would be unobjectionable. But this is impossible. There are no means whatever by which to measure the rate of profit in different businesses, or even in any single business. At best it could only be guessed at, or some supposed average taken, the effect of which always is that those engaged in successful businesses pay too little, while those engaged in unsuccessful speculations, on the other hand, have to pay too much. In fact, profits never have been, and never can be, taxed according to their amount. And the same remark applies to taxes on wages. No government has ever attempted to lay direct taxes on wages, and any such attempt would be sure to fail, inasmuch as the tax could neither be assessed nor collected. Though all incomes are derived from rent, profits, or wages, there is another class of taxes which differs from any of these taken singly, in so far as it forms a kind of combination of them; namely, taxes on property and income. *Taxes on property* are in most respects highly objectionable, differing but little from taxes on capital, about the worst that can possibly be devised. And even though such were not the case, insuperable difficulties stand in the way of establishing it on any fair basis. An *income-tax* is at first sight apparently the fairest of all taxes, but in its practical operation it is "the most unequal, oppressive, and vexatious of any that it is possible to imagine."—(*McCulloch.*) The difficulties in the way of assessing incomes are of two sorts; 1st, the difficulty of ascertaining the incomes of different individuals; and 2nd, the difficulty of laying an equal tax on incomes derived from different sources. Incomes arising from rents of land, houses, mortgages, funded property, &c., are very different from those arising from trade, business, or profession. Mr. J. S. Mill lays down three rules to be kept in view in the carrying out of an income-tax: 1. that incomes below a certain amount should be altogether untaxed; 2. that incomes above that limit should be taxed only in proportion to the surplus by which they exceed the limit; 3. that all sums saved from income and invested should be exempt from the tax. The difficulties attending an income-tax have led to the proposition of a similar tax on expenditure instead of it, it being be-

loved that the returns which persons would furnish of their expenditure would be more trustworthy than those which they make of their incomes, and from being more public, that misrepresentations here would be more readily detected. The present income-tax was first proposed by Sir Robert Peel in 1842, on the plan of a previous one introduced by Mr. Pitt about the end of last century. Since it has been imposed, it has undergone various changes, and notwithstanding repeated assurances to that effect, there seems to be little prospect of its repeal. The two great branches of indirect taxation are the *excise* and *customs*, which have been already noticed (*see* also STAMP DUTIES). The following table, giving the gross revenue of the United Kingdom, shows the amount produced by the various taxes during the years 1861 and 1862:—

| | 1861. | 1862. |
|---|---|---|
| Customs | £23,774,000 | £24,036,000 |
| Excise | 18,161,000 | 17,534,000 |
| Stamps | 8,488,170 | 8,913,945 |
| Taxes | 3,119,000 | 3,148,000 |
| Property and Income-tax | 9,982,000 | 11,104,000 |
| Post-office | 3,500,000 | 3,600,000 |
| Crown Lands | 293,479 | 298,521 |
| Miscellaneous | 1,306,203 | 2,381,963 |
| Total | £68,603,851 | £70,996,429 |

Under the head "Taxes," are included land-tax, yielding £1,135,000; house-tax, £826,600; servants, £200,000; horses, £368,800; carriages, £332,700; dogs, £196,500; &c.—The total charges of collection of the revenue, exclusive of the post-office, in 1861, was £2,578,096; and in 1862, £2,511,180.—*Ref.* J. R. McCulloch's *Taxation and Funding*, 1863.

TAXES and RATES belong to the general head of local taxation, being levied in particular districts of the country, and expended for the purposes of those districts. They are of various kinds, and are denominated with reference to the objects to which they are applied. The more important of these are the poor and church-rates, the poor-rate raised under the 43 Eliz. c. 2, by taxation of every inhabitant, parson, vicar, and other, and of every occupier of lands, houses, tithes, &c., in the parish. Church-rates are payable by the parishioners and occupiers of land within a parish, for the purpose of repairing, maintaining, and restoring the body of the church and belfry, the churchyard fence, the bells, seats, and ornaments, and of defraying the expenses attending the service of the church. Among the others are the county-rate, hundred-rate, highway-rate, sewers-rate, police-rate, borough-rate, watch-rate, &c. Some of these, however, are only for particular occasions, or for particular places; while, in other cases, several of them are included under one head and collected together. The total amount of the local taxes in England and Wales is about £15,000,000; and if we add those of Scotland and Ireland, the total amount will be above £18,000,000. The Local Taxation Act of 1860 (23 & 24 Vict. c. 51) directs that returns shall be made to the Home Office for all boards, corporations, or bodies of any kind empowered to levy taxes, of the sums so levied. Hence we may expect in future more accurate returns of these local taxes.

TAXIDERMY, *tăks'-i-der-me* (Gr. *taxis*, arrangement; *derma*, skin), a term originally used to designate the methods for preserving skins, so as to retain their natural appearance, but is now applied to the art of preserving the whole animal body for collections of natural history,—the method best applicable to the preservation of small quadrupeds, reptiles, crustacea, most of the insects, though not the lepidoptera, the skins of the larger animals, &c. The object to be preserved should, if small, be suspended in a glass jar containing alcohol; in the case of specimens of large size, copper cans, or wooden kegs, made with a large mouth, with a cap or bung fitting air-tight. The vessels should be completely filled with alcohol, in order to prevent injury by motion. Insects are commonly preserved by fastening them down with pins thrust through their bodies, into a lining of cork or soft wood, forming the bottom of paper boxes. As collected, they may be placed in small wide-mouthed phials, containing a





little camphor, or better still, a sponge soaked in ether, which soon kills them. Large animals should be skinned, and the skins placed in alcohol, or smeared on the inside with arsenic, and then dried. If arsenic cannot be procured, immersion in a strong brine of alum and salt is very efficacious. Insects are kept from the skins by sprinkling in the hair powdered green or blue vitriol. The skins should be stripped from the animals with especial care. Before setting up in the natural position, with wires, &c., all parts liable to decomposition should be carefully removed, and arsenic or arsenical soap applied freely over the skin. The arsenic may be applied either in a state of dry powder or mixed with alcohol and water to the consistency of treacle, and applied with a brush. For detailed directions for the preservation of every specimen of natural history, consult Swainson's *Taxidermy*, forming a volume of Lardner's *Cabinet Cyclopædia*.

TAXUS, *tăks'-us* (Lat.), in Bot., the yew, the typical gen. of the nat. ord. *Taxaceæ*. *T. baccata*, the common yew, is an evergreen tree, which often attains a great size. Specimens of remarkable antiquity are commonly seen in old churchyards. The timber is extremely durable and valuable, and was formerly much used for making bows. Its leaves and young branches act as narcotico-acrid poisons when eaten by man or the lower animals. Professor Bentley is of opinion that the pulp surrounding the seed is harmless, but that the seed itself is very poisonous.—*Ref.* Bentley's *Manual of Botany*.

TEA. (*See* THEA.)

TEAK, *teak* (*tekku*, its name in Malabar), the name given to two kinds of hard and durable timber. East-Indian teak, which is so extensively employed for shipbuilding, is the wood of *Tectona grandis*, a tree belonging to the nat. ord. *Verbenaceæ*. African teak is the produce of *Oldfieldia africana*, one of the *Euphorbiaceæ*.

TEAL, *teal* (Du. *taling*), a bird belonging to the family *Anatinæ*, or true ducks, the characteristics of which are given in a former article. It is the smallest of the wild ducks which visit this country in the winter, and has a black bill, with the head and upper parts of a bright bay colour. It arrives in this country very late in the autumn, and is found principally along the southern and westward coast of England and Ireland.

TEARS, *teers* (Lat. *lachrymæ*), in Phys., are the limpid fluid secreted by the lachrymal glands, and flowing on the surface of the eyes. They serve to prevent the friction of the eyelids on the eyes, to keep the cornea moist, and to wash away any extraneous bodies that may have fallen into the eye. (*See* EYE.)

TEASEL. (*See* DIPSACUS.)

TECHNOLOGY, *tek-nol'-o-je* (Gr. *techne*, art, and *logos*, discourse), is that science which treats of the arts, more particularly the mechanical. It is properly the science of the arts. "Its object is not art itself, *i.e.* the practice of art, but the principles which guide or underlie art, and by conscious or unconscious obedience to which the artist secures his ends." In its ordinary acceptation, however, it includes only the utilitarian arts, and in fact only some of these. Painting, sculpture, music, poetry, do not come within its sphere. It deals only with the industrial or necessary arts,—those which are necessary to man in his savage as well as his civilized state. "Half of the industrial arts are the result of our being born without clothes; the other half, of our being born without tools." A simple division of this extensive subject is into mechanical and chemical arts, according as they relate mainly to physics or to chemistry. The term technology was first used in its modern signification by Prof. Beckmann, of Göttingen, who, in 1772, delivered a course of lectures on the industrial arts, under the head of Technology. Since that time the name has become common in Germany, and chairs for the subject have been established in several of the universities. The word has only recently been naturalized in this country, and in 1855 a chair of technology (the first in this country) was established in Edinburgh university; but since the death of its professor, Dr. George Wilson, it has been given up.—*Ref.* Wilson's *What is Technology? The Objects of Technology and Industrial Museums*.

TE DEUM, *te de'-um* (Lat. Thee, O God), is the name given to a celebrated hymn, from the first words of the original Latin, *Te Deum laudamus*, Thee, O God, we praise. It has been ascribed to Ambrose and Augustine; but the more probable opinion seems to be that it was composed by Nicetus, bishop of Tiers, in Gaul, who flourished about 535, and is said to have composed it for the use of the Gallican church.

TEETH, *teeth* (Sax. *tith*; Lat. *dentes*; Gr. *odontes*), in Anat., are certain hard bodies attached to parts of the mouth or beginning of the alimentary canal, and peculiar to vertebrated classes of animals. They are principally adapted for seizing, tearing, dividing, pounding, or grinding the food; but in some they are modified to serve as weapons of offence and defence; in others as aids to locomotion, means of anchorage, instruments for uprooting or cutting down trees, or for the transport and working of building materials. They are characteristic of age and sex; and in man they are also subservient to beauty and speech. In man every tooth consists of two hard parts; one external, white, uniform, somewhat like ivory; the other internal, somewhat like the compact structure of bone. The former, which is armed enamel, is very close in texture, perfectly uniform and homogeneous, yet presenting a fibrous arrangement. It is seen only at the crown of the tooth, the upper and outer part of which consists of this substance. The internal portion of the tooth and the root consists of close-grained bony matter, as dense as the compact walls of the long bones. In the interior of the bony part of each tooth is a cavity, which descends into the root and communicates at its extremity with the outer surface by openings corresponding to the number of branches into which the tooth is divided. This cavity, which is large in young or newly-formed teeth, and small in those which are old, contains a delicate vascular membrane, which has been named the pulp of the tooth. It presents two surfaces,—an exterior, adhering to the bony surface of the dental cavity by minute vessels, and an interior, free, and, so far as can be determined, of a body as minute, resembling a closed sac. In the child, the teeth usually begin to cut through the gum about the sixth or seventh month after birth, and the temporary or deciduous set of teeth, twenty in number, are generally completed by the end of the third year. The period of dentition is usually a time of disordered health to children, especially if anything occurs to prevent the ready yielding of the gum to the pressure of the tooth below. The deciduous teeth begin to fall out about the age of seven or eight, and are replaced by the adult or permanent set. These are 32 in number, or 16 in each jaw; namely, four incisors or front teeth, two cuspidati or canine teeth, four bicuspidati, and six molars. The last two molars are called *dentes sapientiæ*, or wisdom teeth, on account of their not making their appearance till about the age of eighteen or twenty, or later, when one is supposed to have reached the years of discretion. The teeth are subject to decay, and require to be kept clean by frequent brushing. (*See* TOOTHACHE.)

TEETOTALLERS. (*See* TEMPERANCE SOCIETIES.)

TELEGRAPH, TELEGRAPHY, *tel'-e-graf* (Gr. *tele*, afar off; *graphein*, to write).—Telegraphy may be defined as the art of conveying intelligence to a distance by means of certain signals, previously agreed upon between the parties. Telegraphs may be divided into those worked by mechanism and those worked by electricity. Long before telegraphy attained its present perfection by the introduction of voltaic electricity as its motive power, individuals and nations were in the habit of communicating information of battles, defeats, and victories by means of beacon-fires. These continued in use from the time of the ancient Greeks and Romans down to the commencement of the present century, when the threatened invasion of England by Napoleon was to have been telegraphed from one end of the kingdom to the other in a very short space of time. Towards the end of the last century, a French engineer, M. Chappé, invented, or rather improved, the semaphore telegraph, which was at once taken up by the French government. They erected a series of telegraph-stations between Paris and Lille in 1794, and two minutes only were occupied in communicating intelligence from one city to the other. The aërial telegraph now spread, and before many years every country in Europe had its system of telegraphy between its capital and the important ports in its seaboard. Many persons of no great age will recollect the aërial telegraph between London and Portsmouth, and most Londoners must have seen the telegraph on the top of the Admiralty, throwing its arms about in the air. An excellent description of the various forms of aërial telegraph will be found in the "English Cyclopædia," art. Telegraphs. Although for ordinary purposes, the aërial semaphore is entirely superseded by the electric telegraph, it is still employed for certain purposes. The signals used on railways, and Admiral Fitzroy's storm-signals, are examples of its present employment. The idea of utilizing electrical force for the transmission of signals to a distance was almost coeval with the discovery of the conductivity of the electric current, and of the exceeding velocity with which it travels. The first electric telegraph on record is that established by Mr. Lesage, at Geneva, in 1782. It consisted of twenty-four wires, insulated from each other, and communicating with pith-ball electrometers, marked with the letters of the alphabet. On sending a current of frictional electricity along any of the wires, the pith-balls diverged and indicated the letter or symbol desired. The next we hear of is that of Lomond, which consisted of only one wire and one electrometer, the signals being made by the number and variation of the divergencies. In 1794, Reizen made a telegraph in which frictional electricity was also used. The current was conveyed to the distant station by thirty insulated wires, communicating with strips of tinfoil placed on glass breaks, in the form of the different letters and figures, being made so that, in the passage of the electricity, a bright spark would be seen at each break. Several other electricians constructed telegraphs involving similar principles, but most of them were mere philosophical toys. It was not until the discovery of Oersted, in 1819, that a delicately suspended magnetic needle has a tendency to place itself at right angles to a conductor through which a current of voltaic electricity was passing, that the idea of the electric telegraph as now worked out began to be developed. Previous to this, in 1809, Sömmering employed voltaic electricity, and was the first who utilized that power for the transmission of signals. His plan was to lay insulated wires to the distant station, the ends of which terminated in gold, and dipped into tubes containing acidulated water. The tubes were lettered and numbered, and the signal was made visible by the escape of bubbles of gas, when the current was passed, and decomposed the acidulated water. In 1816, and the following years, Mr. Ronalds, of Hammersmith, devoted much time to the construction and perfection of the electric telegraph. He put up a telegraph on his lawn, which communicated with eight miles of insulated wire, and used frictional electricity for the production of signals. He employed the ordinary electrical machine, and a pith-ball electrometer. Two clocks, going synchronously, were placed at different stations. They were of peculiar construction, and as the dials moved round, they displayed the letters of the alphabet in regular order. The clocks were each provided with an electrometer, the pith-balls of which diverged when the current was passed. The transmitter of the signals caused a constant current to flow through the wire and operate on the electrometers. The pith-balls therefore remained separate during the transmission of the message, collapsing as the desired letter was shown by the clock dials, by the transmitter discharging the electricity from the wire. All that was required in this form of telegraph was that the clocks used should go synchronously only during the time the message was being transmited, a matter which could be easily managed by a preconcerted signal between the parties before commencing operations. The first great step in advance was made by Ampère in 1820, a year after the discovery of Oersted. Its principle of action was the same as that afterwards employed by Cooke and Wheatstone in the needle-telegraph, now so extensively used in this and other countries. Ampère's telegraph had as many needles as there were letters in the alphabet, and the needles were surrounded by cords of wire. It was consequently easy to move any needle that was re-

quired by the passage of the current. Although a number of wires and needles was required in this instrument, it was the first good needle-telegraph. Some twelve years afterwards, Baron von Schilling invented two telegraphs, which were modifications of Ampère's, in one of which he employed five needles, in the other a single needle only. In 1833, Gauss and Weber constructed a telegraph, which worked through a mile of wire at Göttingen. The needles in this case were deflected by a current of electricity, developed by the magneto-electric machine. This telegraph was afterwards improved upon by Steinheil. By this arrangement either sounds could be employed, or permanent marks made upon paper, passing in front of the needles. Steinheil's was the first perfect instrument invented, and came into operation in July, 1837. It was twelve miles long, and had three intermediate stations in circuit. About the same period Professor Moon in America invented his telegraph. It consisted of one wire, and the power was furnished by a battery at the transmitting station, which rendered magnetic an electro-magnet at the receiving station. The armature of the electro-magnet drew down a pricker on a piece of moving paper, printing on it dots or dashes according to the length of time the current was transmitted. This telegraph is still in constant use throughout the American continent, and is employed by the United Kingdom and London District Telegraph companies. The instrument was subsequently improved, so that it would print letters, by Professor Vail. I would be impossible to describe the numerous instruments invented about this time. For a description of them the reader is referred to an excellent little manual by Mr. E. Highton, published by Weale, from which much of the above information has been taken. Messrs. Cooke and Wheatstone were the first inventors of a thoroughly practical system, as far as this country is concerned. Their patent for improvements in telegraphs was taken out in June, 1837. Five needles and coils were used, and by causing any two of the former to converge, they pointed to one of the letters of the alphabet. They also improved the means of striking the alarum to call the receiver's attention to the coming message, by employing the attractive force developed in soft iron by passing a current round it, to release the detent of a wound-up clock. Some time later, they reduced the number of needles used to two, and subsequently to one. In 1840 they took out a patent for the letter-showing telegraph. A disc, bearing in its circumference all the letters of the alphabet, was fixed on an axle provided with an escapement similar to that of a clock, the place of the pendulum being supplied by an iron armature, which was attracted backwards and forwards as often as was required to show the desired letter. Modifications of both these instruments are now in daily use by the different companies in this country. Besides utilising the current from the voltaic battery, numerous inventors have used the magneto-electric machine, in which the current is produced by the rotation of a horse-shoe armature covered with coils of wire in front of a large permanent magnet. In 1846 the Electric Telegraph Company purchased Cooke and Wheatstone's patents, and laid down several lines along the railways then existing. They long had the entire monopoly of sending messages in this country, and paid no less a sum than £170,000 for different patents, since the long-continued high prices for telegrams in England. The exertions of the United Kingdom and London District companies have so much reduced the price of telegrams as to place this wonderful invention, or rather mass of inventions, at the service of everybody. A message not exceeding twenty words can now be sent from one part of London to another for 6d.; from London to Liverpool or Manchester for 1s., or to Dublin for 5s. In 1849 an English company obtained a charter from the French government, granting them the exclusive right of sending telegrams to certain defined points of the French coast for a term of ten years, and the first submarine line was laid across the Channel successfully in August, 50. This was soon worn away by the action of sea and spoke. In September, 1851, another wire, covered with gutta-percha and encased in a galvanized rope,





was laid, and worked most satisfactorily for a long time. Submarine cables have since been laid in all parts of the inhabited globe, connecting nearly every country in the world. The failure of the Atlantic Company is fresh in every one's mind. Ignorance of the conditions of success, and want of experience in laying long lines, were the causes which led to this unhappy failure. These causes have now to a great extent disappeared; but the American war has of course put a stop to any further progress being made in this important work. A few weeks since six ships carrying cables and stores, under the charge of a competent staff of engineers and electricians, set sail for Bombay. Thence they will proceed to the Persian Gulf, where they will connect, by a series of submarine cables, the stations of Bagdad and Kurrachee, the former being at present in communication with the whole of Europe, the latter with the extreme network of telegraphs existing throughout our Indian empire. It is expected that this great work will be accomplished by April, 1864. When once Ceylon and London are in telegraphic *rapport*, our spirited Australian colonists will set about connecting themselves with the end of the line; so that, within a year or two at the utmost we shall be in almost momentary communication with our antipodes. So far the history of the electric telegraph. To understand the means by which electricity is converted into motion at a distance, it will be necessary to bear in mind two facts; one is, that whenever a current of voltaic electricity is sent above and below, or in front of and behind a freely-suspended magnetized needle, the needle moves to the right or left, according to the direction in which the current passes. That is to say, supposing the needle to be suspended perpendicularly, with the N. pole pointing upwards, a current passing *up before* and *down behind* will cause the needle to be deflected to the observer's left; if, on the contrary, the current passes *up behind* and *down before*, it is deflected to the right. The following diagrams show this principle put into practice. For the sake of clearness, the diagram has been drawn with simple lines only. In the real needle-machine the construction is much more complicated; perspective drawings of it may be seen in Lardner's "Electric Telegraph," and numerous other works. In Fig. 1, B is a single cell of a battery containing a

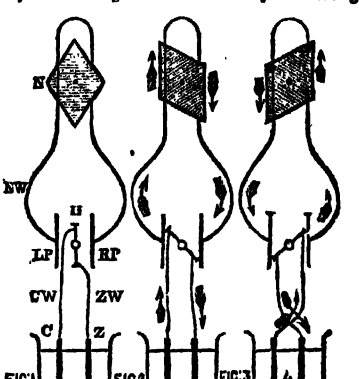



plate of copper, C, and a plate of zinc, Z, immersed in sulphuric acid and water. H is the handle of the instrument, turning from left to right, and *vice versâ*, like the handle of a door, consisting of two pieces of brass insulated from each other by being inserted in an axis of ivory. To the ends of the two pieces of brass are fixed the wires CW and ZW, leading from the copper and zinc ends of the cell respectively. Fixed on each side of the handle are two plates of metal, which may be called LP the left plate, and RP the right plate. They are connected with the needle wire NW, which passes before and behind the magnetised needle N, suspended perpendicularly on its

axis, with its north pole upwards. As long as the wires CW and ZW remain insulated from each other, no current passes from the cell; but as soon as the handle H is turned, so that the copper end touches the left plate (Fig. 2), and the zinc end touches the right, communication is established between the plates of the cell, and the current commencing at the copper passes along CW, the top half of H, into LP, along NW, travelling *up before* and *down behind* the needle, causing it to deflect to the observer's left, according to the rule given above. Reaching RP, it passes downwards to the cell to Z, and so on to C, continuing its travels and keeping the needle deflected as long as the handle remains in contact with the plates. If it is required to deflect the needle to the right, the handle is turned to the right, bringing its copper end in contact with the right plate, causing the current to travel in the opposite direction. By following the current from the copper to the zinc, as indicated by the arrows in Fig. 3, it will be seen that it now travels *up behind* and *down before* the needle, deflecting it to the observer's right. Thus, by causing a current of voltaic electricity to pass alternately *up before* and *down behind*, and *up behind* and *down before*, the needle is moved to the left or the right at will. The way in which the current is made to act on a distant needle is now simple. The following figure shows the arrangement. The left portion of the figure represents an instrument at London, that on the right an instrument at York. The needle-wire, instead of being continued

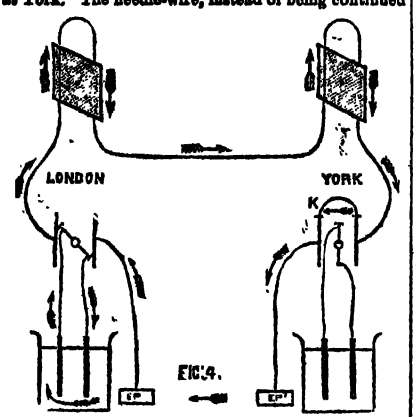



FIG. 4.

directly to the zinc plate of the battery, passes away from the needle over poles to York, where it joins an instrument similar in all respects to that at London. It passes similarly before and behind a magnetized needle, joining the right plate of the instrument. As long as the two plates are unconnected, no current can pass. The current is therefore completed by a contrivance which may be represented by the semicircular piece of metal K. In practice the two plates or springs, which, when not in use, are always pressed against the connector K, which is a cross-piece on the top of the handle, keeping the London needle in circuit with the York battery, and *vice versâ*. As soon as London uses his handle, it presses the spring-plate, and puts his needle out of the York circuit, the current he sets up sending York needle to the right or left, as the case may be. The second wire connecting the left York plate with the right London plate is, it will be seen, not carried along like the first wire. Use is made in this case of the conducting power of the earth itself, plates from the wires being buried many feet below the surface at London and York. When London wishes to speak to York, he first signifies his intention of so doing by ringing York's alarum. This he effects by sending a current through an electro-magnet placed above York's instrument. The armature is attracted, and frees the detent of the alarum, setting it ringing until York signals ready. London then stops the bell, and commences his message. By following the direction of





the current, when the handle is turned to the left, as in Fig. 4, it will be readily seen how this is effected: commencing with London's copper, LC, it passes up before and down behind London's needle, flowing along the wire between the two cities to York's needle, up before and down behind which it travels, sending it also to the left. It then passes to York's right plate, through the connector to the left plate, and so on to earth at York, coming to the surface again at London, passing through London's right plate and through the lower part of the handle to the zinc of the battery. The reverse current may be easily followed. Any number of instruments with similar needles may be interposed along the course of the wire. When the operator wishes to speak to any particular one, he rings all the bells for attention, and then signals Derby or Nottingham, as the case may be. They all then throw their instruments out of current except the one required. The mode by which the needle movements are converted into language is simple. *A* is signalled by causing the needle to vibrate once to the right, *B* once right and once left, *C* once right and twice left; and so on. In the Moon instrument no needle is used. The signals are indicated by causing a pricker to make dots and dashes upon a piece of paper travelling by clock-work at a certain rate, the dots being formed by a momentary passage of the current, the dashes by one perceptibly longer. Under this system, *a* is represented by . —; *b* — . . .; *c* — . —. and so on, the letters most in use being formed of the least number of dots and dashes. Instead of dots and dashes, bells of different tones may be used; in which case the operators *hear* the message. Supposing the two bells to be tuned to A and E, E representing the dash, *a* would be A E; *b*, E A A A; *c*, A A A, &c. A good Morse operator is able, by making long and short taps on the table, to converse. One of the greatest obstacles with which the telegraphic engineer has to contend is the loss of electric power through defective insulation of the conducting wires. To remedy this, many systems have been proposed, but none seem to be absolutely perfect. The wires used for open-air communication are galvanised iron, and are suspended from posts, insulation being effected by passing the wire through porcelain insulators screwed into the posts. For town communication, gutta-percha-covered wires laid in pipes beneath the pavement are used. When broad rivers have to be crossed steel wire is substituted for iron. For submarine communication copper wires are used, imbedded in gutta-percha, and surrounded by iron wires, so as to form a cable of great strength. The most perfect submarine cable yet manufactured is that made by C. Hurley, of North Woolwich, for the Indian Government. The wire consists of five segments drawn into one, and is made of the best copper. Four distinct layers of gutta-percha come next, between each of which is a coating of India-rubber compound, possessing powerful insulating properties. Around this are two servings of hemp; these are succeeded by a series of galvanized iron wires of great strength and thickness, followed by two more servings of hemp well soaked in a mixture of mineral pitch, Stockholm tar, and ground flint. The system of telegraphic communication is extending daily in every direction, its last development in this country is the private telegraph. The Universal Private Telegraph Company undertake to fit up and connect distant stations throughout London, and provide the necessary instruments, capable of being used by anybody, for a few pounds per annum. Most firms having more than one place of business have adopted this means of communicating between them. There are now in Great Britain six telegraph companies in full working order, whose wires extend over 15,000 miles of line, and in different parts of Great Britain and Ireland. The yearly average of their receipts being £350,000. In other parts of Europe, about 30,000 miles of wire are at work, and in America nearly 50,000. The above account of the Electric Telegraph must be accepted by the student as being necessarily meagre; for additional details on the subject he is referred to Highton's *History and Progress of the Electric Telegraph*; Lardner's *Electric Telegraph*; Culley's *Electric Telegraph*; and De la Rive's *Treatise on Electricity*.

TELEOLOGY, *te-le-ol'-o-je* (Gr. *teleo*, end, and *logos*, discourse), is the doctrine of final causes. (*See* FINAL CAUSES.)

TELESCOPE, *tel'-es-kope* (Gr. *tele*, afar off; *skopeo*, I view), an optical instrument, consisting of a tube which contains a system of lenses, designed to aid the eye in viewing distant objects, causing them to appear magnified by enlarging the angle under which they are seen, and at the same time increasing their brightness by collecting into the eye a greater number of rays than would naturally enter it. There are two classes of telescopes,—*refracting* telescopes and *reflecting* telescopes. The former consist of a combination of glass lenses only; the latter, of a concave speculum, combined with a convex lens, and frequently with a second reflecting surface. In the case of a refracting telescope, the light from the object received is received by a convex lens, called an *object-glass*, which is usually made achromatic, and in the case of a reflecting telescope by a concave speculum; and in each case is so deviated as to form an inverted image of the object in or very near the focus. This image, or an image formed by the light, being further deviated by reflection or refraction, is seen magnified through a convex or a concave lens, or an achromatic combination of lenses, called the *eye-piece*. The object-glass and the object-speculum are made large, in order to collect a great quantity of light; so that the image formed may not become faint and indistinct when magnified. An achromatic telescope is one in which chromatic aberration, or the errors consequent on the dispersion of light into its primary colours, is got rid of, by employing different kinds of glass having a different dispersive power. A combination of crown glass and flint glass lenses effects this object. The ordinary astronomical or refracting telescope consists of two convex lenses, an object-glass having a long focal distance, and an eye-glass having a short focal distance. The inverted image formed by the object-glass is seen by the eye magnified through the eye-glass. The magnifying power is equal to the focal length of the object-glass divided by the focal length of the eye-glass. Galileo's telescope was constructed like the opera-glass at present in use. It consisted of a convex object-glass and a concave eye-glass. The rays refracted by the object-glass, which would form an inverted image, are made to proceed slightly divergent by a concave lens, and form an erect, magnified image, seen by the eye. The Newtonian telescope has a plane speculum, placed in the axis at the inclination of half a right angle, which intercepts the rays from the concave speculum about to form an image, and deviates them into the focus of an eye-glass, fixed in the side of the tube, through which the image is seen magnified by the eye. The plane speculum employed by Newton was a rectangular prism of glass, which produces total reflection. Sir William Herschel constructed a reflecting telescope, having a speculum four feet in diameter, and it collected so much light as to allow the application of a power of 6,450 in examining the stars. Lord Rosse's telescope is the largest and most powerful reflecting telescope ever constructed, the speculum being six feet in diameter, and the focal distance being fifty-three feet. The speculum is parabolic in form, and is thus rendered almost free from spherical aberration. The rays reflected by the object-speculum are deviated as in the Newtonian telescope, by a rectangular glass prism, and form an image in the side of the tube, which is seen magnified in an eye-glass. The equatorial telescope is contrived so as to keep the star under observation constantly within the field of view. (*See* EQUATORIAL TELESCOPE.) The precise epoch of the invention of the telescope, as well as the name of the inventor, is unknown. It is certain that prior to the end of the 13th century, glass lenses were in use for the purpose of assisting the eye in obtaining distinctness of vision. From some expressions in his "Opus Majus," it would seem that when Roger Bacon died, in 1292, spectacles were employed. Dr. Dee, in the preface to an edition of Euclid, published by him in 1570, mentions "perspective glasses" as being used to ascertain the numerical strength of an enemy's force at a distance. It is true that the claim of inventorship has been allowed by some writers in favour of





Baptista Porta; but in fact he appears to have gone no farther than perceive that a small object is magnified when viewed through a convex lens. Perhaps the only certain conclusion that we can now arrive at is, that these astronomical instruments were known in England and Holland towards the end of the 16th century. Galileo, while at Venice in 1609, heard from a German that these wonderful tubes were being made in Holland, and the great Italian philosopher wrote to a friend at Paris for further information concerning it. It has not been ascertained whether he received in answer more than the bare description of the instrument, as a tube with glass lenses in it. Certain it is that he proceeded to construct telescopes, by which he was enabled to make many of the great discoveries upon which the science of astronomy stands as a foundation.

TELLURIUM, *tel-lu'-re-um*, in Chem.,—symbol Te, equiv. 64, spec. grav. 6·65. Tellurium, although generally classed and described as a metal, belongs to the sulphur and selenium group, to which bodies it presents a strong analogy. Tellurium is a brilliant crystalline, brittle metal, resembling bismuth in colour, and fusing between 800° and 900° Fahr., above which temperature it may be distilled in a current of hydrogen. According to Mitscherlich, it crystallises in a rhombohedral form. It conducts both heat and electricity, though imperfectly. Like sulphur and selenium, it dissolves to a slight extent in sulphuric acid, from which it may be precipitated unchanged by dilution. When strongly heated in the air, it takes fire, burning with a brilliant blue flame edged with green, emitting a peculiar characteristic odour and producing fumes of tellurous acid. Tellurium is a very rare substance, occurring in nature in combination with gold, silver, bismuth, copper, and lead, in certain mines of Hungary and Transylvania. It was first identified as a distinct metal by Klaproth in 1798. It is prepared from it by a long and tedious process, which cannot be detailed here. With oxygen, like sulphur and selenium, it forms two combinations,—$TeO_2$, tellurous acid, and $TeO_3$, telluric acid. The former may be prepared by dissolving tellurium in nitric acid, and pouring the solution into water, when hydrated tellurous acid falls down as a bulky white precipitate. It is slightly soluble in water, reddens litmus, and combines with the alkaline bases. Its salts are said to act as emetics. It also has basic properties, forming soluble salts with oxalic and tartaric acids. *Telluric acid* is obtained by heating tellurium with nitre. Tellurate of potash is formed, from which tellurate of baryta may be procured, the baryta being afterwards separated by sulphuric acid. It crystallizes as a terhydrate, in hexagonal striated prisms. Heated to redness, they become anhydrous, and assume an orange-yellow colour. Telluric acid has but a feeble affinity for bases, forming salts which contain 1, 2, and 4 equivalents of acid. Two chlorides, TeCl and $TeCl_2$, have been formed. Tellurium forms tellurides with bismuth, gold, silver, lead, and most other metals. The tellurides belong to the class of metallic alloys. With hydrogen it forms telluretted hydrogen, or hydrotelluric acid, TeH$_2$, a compound analogous to the combinations of sulphur and selenium with that element. It is obtained by decomposing telluride of zinc or tin with hydrochloric acid. The gas which escapes has an odour singularly similar to sulphuretted hydrogen, and has a faintly acid reaction. It dissolves in water, forming a colourless solution, which turns brown by the oxidation of the hydrogen and separation of the tellurium. Tellurium also forms two sulphides, corresponding to its two oxides. Tellurium is interesting as being the connecting link between the metals proper and the metalloids.

TEMPERAMENT, *temp'-er-a-ment* (Lat. *temperare*, to mix together), in Physiol., is literally a tempering or mixing together, and is defined to be "a peculiar state of the system, common to several individuals, which results from the various proportions in which the elementary parts of the human body are mixed up together, and which gives rise to a tendency to certain phenomena." The ancients paid considerable attention to the subject of temperament, of which they distinguished four kinds, according to the preponderance of one or other of what they regarded as the four primary

component parts of the human body; namely, blood, phlegm, yellow bile, and black bile; hence the sanguineous, phlegmatic, choleric, and melancholic or atrabilious temperaments. Various attempts have been made to improve upon this classification, but it still continues to be that generally adopted by medical writers. The sanguineous temperament is characterized by a florid complexion, soft skin, blue eyes, red or auburn hair, large arteries, and frequent pulse. They are of great sensibility and mobility, easily elated and quickly depressed, ardent and full of hope, unsteady in their pursuits, pursuing their objects keenly for a time, but soon changing them for others. Persons of this temperament are peculiarly liable to diseases of excitement, fevers, inflammation, hæmorrhages, &c. The melancholic temperament is marked by a greater rigidity of the solids, dark complexion, black hair, small arteries, slow circulation, not easily moved, but of great steadiness of purpose. They are subject to hypochondriasis, apoplexy, and diseases of the liver. The choleric or bilious temperament is distinguished by black curling hair, dark eyes, a swarthy and at the same time a ruddy complexion, a hard, lean, slender body, a full, quick, strong pulse, large veins, an obstinate and violent temper. The phlegmatic or pituitous temperament is distinguished by great smoothness of the skin, a white, soft, full, plump body, small and almost imperceptible veins, and light thin hair growing sparingly. Some writers introduce a fifth, which they call the nervous temperament. Rarely do we meet with any of these temperaments in a pure form, but usually with two or more of them in combination.

TEMPERANCE, *temp'-er-ăns* (Lat. *temperantia*, moderation), in Morals, is that virtue which a man is said to possess who moderates and restrains his sensual appetite; but it is often used in a much more general sense as synonymous with moderation, and is then applied indiscriminately to all the passions. Temperance is one of the best means of preserving health. "It," says Addison, "is a kind of regimen into which every man may put himself, without interruption to business, expense of money, or loss of time." "It may be practised by all ranks and conditions at any season or in any place." Since attention has been called to the pernicious effects of intemperance in the use of alcoholic liquors, the term has come to be frequently used to denote a temperate use of these, and by a somewhat singular manipulation, to denote even total abstinence from them. (*See* TEMPERANCE SOCIETIES.)

TEMPERANCE SOCIETIES are institutions established for the purpose of extending the principles of total abstinence from the use of spirituous liquors. The evils that result from drunkenness are unfortunately too well known to require any special notice. It is only within recent times, however, that any attempt has been made to grapple with this monster evil. Formerly, the raising of the excise duties may have done something to that effect, for we can scarcely now form a conception of the state of things when such inducements were inscribed on boards at alehouses as that "You may here get drunk for one penny, dead drunk for twopence, and have clean straw for nothing." The first united effort made to check the progress of intemperance was by the formation of an association for that purpose in Massachusetts, North America, which held its first meeting in 1813. It collected facts and statistics from year to year, exhibiting the nature and magnitude of the evil, with the view of calling public attention to it, and of directing efforts for its removal. Next year, a similar institution was organized in Connecticut, with various branches, and in 1818 the number of these societies was above forty. A new impulse was given to the movement by the formation, at Boston, on a much more extensive plan, of the American Society for the Promotion of Temperance. In 1829 the number of auxiliary associations had increased to upwards of 1,000, no state of the Union being without at least one. In 1831 there were 2,200 societies, including 170,000 members, in connection with the parent association; and since then the numbers have very largely increased. They did much in the way of diffusing their principles by circulating tracts and employing travelling agents to deliver addresses. The principle of total abstinence appears to have been introduced among the members by an association formed at Andover, in September, 1826. Soon after their establishment in the United States, temperance societies began to be formed in England and Scotland, and spread, so that in 1831 there were several hundreds of them in these countries. In Ireland, the cause of temperance was advocated with much success by the Rev. Father Mathew, a Roman Catholic clergyman, who affirmed that in three years (1839-41) he had made more than a million of converts to that principle. Of late years, the advocates of total abstinence have much increased, and they now form a large and influential portion of the community. They are still actively employed in the diffusion of their principles, and with much success. Whatever views may be held on the subject of total abstinence, every one must admit that these societies have been the means of effecting an incalculable amount of good, and every right-thinking person must heartily wish them "God's speed." The attempt made by some of them of late years to have recourse to legislative measures, as by the introduction of a Main liquor law, is very questionable policy.

TEMPERATURE, *temp'-e-ră-ture* (Lat. *temperatura*), a definite degree of sensible heat as measured by the thermometer. Thus we say a high temperature, a low temperature, to denote a manifest degree of heat or cold. Temperature, in general, denotes the degree of free caloric which a body appears to possess when compared with other bodies, or, in other words, the state of a body in relation to its capability of producing in other bodies the effects arising from the presence of free caloric. There are two methods of measuring the temperature of bodies; namely, by our sensations, or by the different degrees of expansion produced in bodies on being subjected to different degrees of free caloric. The first of these is so imperfect that no dependence can be placed upon it as a measure of temperature; but the second is much more regular and extensive. When two bodies produce the same increase or diminution of volume in a third body, to which they are equally applied, they are said to be of the same temperature; and any body is said to be at a higher or lower temperature, as it produces a greater or less expansion in another body with which it is in contact.

TEMPLARS, KNIGHTS TEMPLARS, or KNIGHTS OF THE TEMPLE, *temp'-lars*, were a religious order of knights founded in the beginning of the 12th century, for the defence of the holy sepulchre and the protection of Christian pilgrims. They were established in Jerusalem by Baldwin II., who gave them a part of his palace, and their rule was confirmed by Honorius II. in 1128. The order soon became very distinguished, and numbers sought to join it from the chief families of all parts of Christendom. Legacies and donations in lands and of money were also showered upon it. After the overthrow of the kingdom of Jerusalem, about 1186, they spread themselves over Germany and other countries of Europe, to which they were invited by the liberality of the Christians. They continued to flourish for a time, and acquired great wealth and military renown; but their vices at the same time multiplied, and at length their arrogance, luxury, and cruelty increased to such a length that their privileges were revoked, and their order suppressed with the most terrible circumstances of severity and cruelty. Their destroyer was Philip IV. of France, who came to the throne in 1285, at the age of seventeen. It is said that Pope Clement V. purchased his elevation to the papal chair, in 1305, by promising, among other things, to aid the king in the destruction of the Templars. The following year a series of accusations was brought against the order, of all sorts of immoralities, comprising some of the most absurd charges of heresy, idolatry, and infidelity. The year following, secret letters were issued by the crown to all of the governors of towns, &c., throughout the kingdom, in consequence of which, on 13th October, 1307, nearly all the Templars in France were in custody, and their houses and goods everywhere seized. In 1308, Clement issued a bull, calling upon all Christian princes and prelates to aid him in inquiring into the guilt of the order, and in 1312 the whole order was suppressed by the council of Vienne. Many of the knights were put to death,

others languished and died in prison. They originally wore a white habit, with red crosses sewed on the cloaks, as a mark of distinction. At the head of the order was the grand master, elected by the chapter or general body of the knights. The grand master had under him his seneschal or lieutenant; and other high military officers were marshals and bannerets. For purposes of government, there were in the several countries where the order had possessions, a resident chief, called grand prior, grand preceptor, or provincial master. Under these were the priors, or masters over districts; and under these, preceptors over single houses of the order. Besides the knights there were esquires, servitors, and chaplains.—(*Ecf.* Addison's *History of the Knights Templars.*) When the Knights Templars were abolished by Pope Clement V., in 1312, Dionysius of Portugal, who objected to the measure, allowed the order to exist in his dominions, with all its rights, privileges, and possessions,—a proceeding which naturally led to misunderstandings between the two powers. The matter was at length compromised by Pope John XXII., successor of Clement, consenting in 1319 to the existence of the order in Portugal under another name,—"the Knights of Christ," and likewise reserving to himself and his successors the right of creating a similar order in the Papal States, of which his successors have availed themselves. In Portugal, the members of this order rendered important services to the kings of that country in their crusades against the infidels, and accompanied them in their adventurous expeditions to Africa and India. In acknowledgment of these services, the knights' possessions were from time to time largely increased, and at length, as an encouragement to adventure, they were promised the independent possession, under Portuguese protection, of all countries which they might discover. The grand prior of the order also received from Pope Calixtus III. an investment of power equal to that of a bishop. Their wealth and power, however, excited the jealousy of subsequent monarchs, who began to limit and curtail the concessions made by their predecessors, and at length even the territories in their actual possession were declared to be crown domains, and the functions of administrator and grand master were transferred to the crown. The members were originally bound to make the three vows of chastity, poverty, and obedience; but Pope Alexander VI. released them from the two first, on condition that they should apply the third part of their revenues to the building and support of the Tomar cloister, the priests of which he bound to the three vows. Noble descent and three years' military service against the infidels were necessary to admission. Since 1789 the order consists (besides the grand master and great commander) of six knights of the grand cross, 450 commanders, and an unlimited number of knights. Catholics only of noble descent can be admitted to the order. The *Papal* order of Christ is composed only of one class, and the candidates are not obliged, as in the Portuguese order, to prove their noble descent.

TEMPLE, *temp'-l* (Lat. *templum*), is a building dedicated to the service of some deity. The most celebrated temple of ancient or modern times was that of Solomon, at Jerusalem. We are told that in the 480th year after the departure from the land of Egypt (B.C. 1012), and in the fourth year of the reign of King Solomon, he began to build the house of the Lord. It was 30 cubits in length, 20 in breadth, and 30 in height. It was built of hewn stone and cedar-wood, all prepared beforehand; so that neither hammer nor axe, nor any tool of iron, was heard in the house while it was a building. The whole house was overlaid with gold, and all the walls round about carved with figures, and cherubims, and palm-trees, and open flowers, within and without. The whole of the interior and the furnishings were in the like gorgeous and costly fashion, an account of which is to be found in 1 Kings vii., viii.; 2 Chronicles ii.—iv. It was 7½ years in building, and during this time 183,000 persons were employed on the work. Of these, 30,000 were Jews, serving by rotation of 10,000 a month, and 153,600 Canaanites, of whom 70,000 were labourers, 80,000 hewers of wood and stone, and 3,600 overseers of others. Divines and architects have repeatedly endeavoured to represent this building, but with no great amount of success. The temple only retained its pristine splendour for forty years, when its treasures were plundered by Shishak, king of Egypt. After undergoing various other profanations and pillages, it was finally destroyed by the Chaldeans under Nebuchadnezzar, B.C. 588, after it had stood for 417 years. It was rebuilt after the return of the Jews from captivity, on the same plan, but with greatly diminished splendour. This building existed for nearly 500 years, when, in order to propitiate the Jews, Herod the Great, shortly before the birth of Christ, undertook to rebuild it on a larger scale and with greater magnificence. In nine years, during which 80,000 workmen were constantly employed, he succeeded in accomplishing his design. For many years after, however, workmen were employed in extending and beautifying the pile, and it had only been finished for a short time when it, together with the entire city, was involved in one common ruin by the army of Titus, A.D. 70.

TEMPLES (Lat. *tempora*, literally, times), in Anat., are the lateral and flat parts of the head above the ears; so called because time, or the age of an individual, is denoted by the hair becoming first grey here. The temporal bones are two irregular-shaped bones, one on each side of the head, connected with the occipital, parietal, and sphenoid bones. The temporal muscle is situated in the temple, and inserted into the coronoid process of the lower jaw, its principal use being to draw the lower jaw upwards, as in biting. The temporal artery is a branch of the external carotid, which runs on the temples and gives off the frontal artery.

TENAILLE, *ten-ile'* (Fr.), in Fort., a rampart raised in the main ditch immediately in front of the curtain between two bastions. In its simplest form, it consists of two faces, coinciding in direction with the faces of the bastions, and consequently forming with each other a re-entering angle. A tenaille, however, usually consists of three faces, of which two have the directions above stated, while the third forms a curtain, which is parallel to that of the enceinte.

TENAILLON, or GREAT TENAILLE, *ten-ile'-yon(g)* (Fr.), in Fort., a species of exterior work constructed on each side of the ravelins, like the lunettes, to increase the strength of the ravelins, procure additional ground beyond the moat, or cover the shoulders of the bastions. The objections to tenaillons are, that the besieger would experience little difficulty in establishing a lodgment on that part of the covered way or glacis which is immediately in front of the ravelin. In this situation he would be able to reach the faces of the two half-bastions in four places, by fires of artillery directed along the ditches of the ravelin and those on the side faces of the tenaillon.

TENANT, *ten'-ant* (Lat. *teneo*, I hold), in Law, is literally one who holds lands or tenements of another. According to the feudal system, no land was without a lord, but was held either of a mesne tenant or of the crown The thing holden was called the tenement, and the mode of holding the tenure. Tenants are thus of various kinds, according to the nature of their estates; as in fee simple, in fee tail, for life, for years, at will, and at sufferance. (*See* LANDLORD AND TENANT.)

TENANT BY THE CURTESY. (*See* CURTESY, TENANT BY THE.)

TENCH, *tensh* (*Tinca vulgaris*), a common and well-known fish in these islands, belonging to the Carp family, or *Cyprinidæ*. Like the carp, the tench is extremely tenacious of life. It is distinguished, in common with the family, by having no adipose dorsal fin, a scaly head, and a small mouth destitute of teeth. (*See* CARP.)

TENDER, *ten'-der* (Lat. *tendo*), in a general sense, is an offer to perform some act. In Law, it is an offer to pay a debt, or to make pecuniary compensation to a party injured. A tender must be in money, and if above the sum of £40, in gold, or in Bank of England notes, which are legal tender for every sum above [illegible]. A tender, however, of country bank-notes, or a large amount of silver, if not objected to at the time, is valid. The money must also be produced and shown, or the bag or other thing in which it is contained, otherwise the tender is not valid. The offer must also be absolute, without any conditions; for even the offer with the request of a receipt, or of a larger amount

with the request of change, is not legal; but the offer of a larger sum absolutely, without a request of change, is good.

**Tenement**, *ten'-e-ment* (Lat. *teneo*, I hold), in Law, in its largest acceptation, denotes anything that may be holden in the legal sense; viz., all corporeal hereditaments, and incorporeal hereditaments of a permanent nature issuing out of the same, as lands, houses, right of common, franchises, offices, &c. In its more narrow and popular signification, it is applied only to houses and other buildings.

**Tenné**, *ten-ne* (Span. *tanetto*, a chestnut), in Her., a colour not often used in coat armour: it is the same as *tawny*, and is composed of red, yellow, and brown, which, when mixed together, form a kind of chestnut-colour. By some heralds it is called *brusk*, and in engraving it is expressed by diagonal lines, drawn from the sinister chief point, and traversed by horizontal ones.

**Tennis**, *ten'-nis* (Fr. *tenir*, to hold), is a game in which a ball is kept up, or driven continuously to and fro, by several persons striking it alternately, either with the hand or a small bat, called a racket, the object being to keep the ball in motion as long as possible, without allowing it to fall to the ground. This game was very popular with the English nobility in the 16th century, and continued to be so down to the reign of Charles II.

**Tenor**, *ten'-or* (Ital.), the commonest of all adult male voices, or that which lies between the alto and bass. Its compass extends from C, the second space in the bass, to G, second line in the treble. The name of the *tenor* is also applied to a large species of violin.

**Tense**, *tens* (Lat. *tempus*), in Gram., is that particular modification of a verb which expresses the time at which an action is conceived as taking place. The three primary or simple tenses are the present, past, and future; but these admit of various modifications in different languages. In English there are six tenses usually recognized; namely, the present, imperfect, perfect, pluperfect, future, and future perfect.

**Tent**, *tent* (Fr. *tente*), a kind of portable room, constructed of canvas, supported by poles, and secured by ropes fastened to stakes in the ground, chiefly employed by soldiers when on active service. The ordinary tents of private soldiers, either infantry or cavalry, are of a conical form, with circular bases. These are supported by means of a pole about 10 feet high, called the standard, placed in the centre, and the canvas kept stretched outwards in its place by means of ropes. The diameter of one of these tents at the bottom is about 13 feet, and they will hold fifteen infantry or twelve cavalry soldiers. Besides these, there are other kinds of tents, as the hospital and laboratory tents, and the marquees of officers, which are oblong in form, and are supported by two standards connected at the top by means of a *ridge-pole*, six or seven feet in length.

**Tenths**, *tenths*, are the tenth part of all yearly benefices, which was anciently paid with the first fruits (which *see*) to the pope. At the Reformation, the tenths were transferred to the crown. By 1 Eliz., the archbishop of Canterbury and the bishop of London were exempted from tenths; as were also, by 6 Anne, c. 24, all benefices under the annual value of £50. Queen Anne gave up the revenue arising from tenths, as well as from first fruits, to the augmentation of poor livings. (*See* Bounty, Queen Anne's.)

**Tenure**, *ten'-ure* (Fr. *tenir*, to hold), in Law, the manner of holding lands or tenements of a superior, or the feudal relation which subsists between lord and vassal in respect of these. All land in England is held mediately or immediately of the crown, and thus, ultimately, all land is held of the king, who is lord paramount. Tenants holding immediately under the king, when they granted out portions of their lands to inferior persons, became, with respect to these, lords, as they were tenants with respect to the king; thus partaking of a middle nature, and hence called mesne or middle lords. Blackstone reduces the different kinds of tenure to four; namely, 1. Tenure by knight service, which was the most honourable, now abolished; 2. tenure in free socage, or by a certain and determinate service, which may be either free and honourable, or villein and base; 3. tenure by copy of court-roll, copyhold, or pure villenage; 4. tenure by privileged villenage or ancient demesne. (*See* Feudal System.)

**Tephrosia**, *te-fro'-ze-ä* (from Gr. *tephros*, ash-coloured, grey), in Bot., a gen. of the nat. ord. *Leguminosæ*. *T. Apollinea* and *toxicaria* are used in Africa for the preparation of a blue dye resembling indigo. The latter, as well as other species, are used as fish-poisons; they stupefy the fish, which are then readily taken by the hand. The leaflets of *T. Apollinea* are sometimes employed in Egypt to adulterate Alexandrian senna.

**Teratology**, *ter-ä-tol'-o-je* (Gr. *teras*, a monster; *logos*, a discourse), a name given by Geoffroy St. Hilaire to the doctrine of congenital deformities. (*See* Deformity.)

**Term**, *term* (Gr. *terma*, Lat. *terminus*, a boundary), denotes generally the limit, boundary, or extremity of a thing, or the time for which a thing lasts. The law terms, during which the superior courts of law and equity sit, are Hilary (from 11th to 31st January), Easter (from 15th April to 8th May), Trinity (from 22nd May to 12th June), and Michaelmas (from 2nd to 25th November). The four term days of the year which are appointed for the settling of rents, &c., are Lady-day, 25th March; Midsummer, 24th June; Michaelmas-day, 29th September; and Christmas, 25th December. In Logic, a term is an act of apprehension expressed in language; also the subject or predicate of a proposition. A proposition consists of two terms,—the subject, or that which is spoken of, and the predicate, or that which is spoken of it. They are so called because they form the terms or extremes, the subject being first and the predicate last, and the two connected by the copula. Terms are of various kinds; as abstract, concrete, simple, complex, &c.

**Terminalia**, *ter-min-ai'-le-ä*, in Bot., a gen. of the nat. ord. *Combretaceæ*. The fruits of *T. Chebula* are largely imported into this country under the name of *Myrobalans* or *Myrabolams*. They form good durable yellow and black dyes, and are also used in tanning. The leaves are in bunches at the end of the branches; hence the name, from Lat. *terminus*, end.

**Ternstrœmiaceæ**, or **Camelliaceæ**, *tern-strem-ai'-se-e*, in honour of Ternstrœm, a Swedish naturalist, in Bot., the Tea or Camellia fam., a nat. ord. of *Dicotyledonous*, sub-class *Thalamifloræ*, having the following essential character:—Trees or shrubs, with alternate, usually exstipulate leaves. Sepals and petals usually imbricated in æstivation, and having no tendency to a quaternary arrangement. Stamens numerous, hypogynous; anthers versatile or adnate. Ovary superior; styles filiform. Seeds solitary, or very few, attached to axile placentæ; albumen wanting, or in very small quantity. The plants of this order are ornamental trees or shrubs, natives chiefly of South America, a few being found in the East Indies, China, and North America, and one only in Africa. Some species from China and North America are cultivated in Europe. The *Camellia japonica* and the China tea-plants belong to this order. (*See* Camellia and Thea.)

**Terra Japonica.** (*See* Catechu.)

**Terrier**, *ter'-re-er* (Fr., fr. Lat. *terra*, earth), a small variety of domesticated dog or hound, so called from its propensity to pursue and attack its prey in subterranean retreats. If not indigenous in England, it was very early introduced by the primitive inhabitants. Even a considerable mixture with other breeds does not impair its boldness, hardiness, fidelity, vivacity, and vermin-hunting propensities. There are two well-marked varieties, the result of fancy or accident. One, the English terrier, is smooth, rounded, elegant in shape, usually black, with tan spots over the eyes, and the same tint on the legs and the lower parts; it is occasionally white; the nose is sharp, the eyes bright, ears pointed or slightly turned down, and the tail carried high and bowed over the back. The other, the Scotch terrier, the oldest and purest breed, has shaggy and wiry hair, a shorter and fuller muzzle, bearded snout and face, stouter limbs, less elegant form, and a pale sandy or ochre colour. The terrier has an acute sense of smell, and is a good attendant on a pack of hounds, forcing foxes and other game from their coverts and dens. In England the terrier blood is visible in most sheep and cattle dogs. The Maltese terrier is a species of dog

about the size of a ferret or weasel, found in Malta and other islands in the Mediterranean, generally a great favourite with ladies. They are very faithful and affectionate to their owners, while they are very ill-tempered towards strangers.

TERROR, REIGN OF, *ter'-ror*, in French Hist., is generally applied to that period of the Revolution when the executions were most numerous and the people living in constant terror, in consequence of the ferocious conduct of their governors. It applies more properly to that period between October, 1793, when the revolutionary tribunal first came into permanent action, and the overthrow of Robespierre and his party, in July, 1794.

TERTIARY SYSTEM, *ter'-she-ā-re* (Lat.).—In dividing the stratified crust of the earth into primary, secondary, and tertiary formations, the early geologists regarded as *tertiary* all that occurs above the chalk. In geology the term is still retained, but the advance of the science has rendered it necessary to restrict and modify its meaning. At the present day, even, the limits of the tertiary may be said to be undetermined; some geologists embracing under that term all that lies between the chalk and boulder-drift, while others include the drift and every other accumulation in which no trace of man or his works can be detected. Taking the formations as they occur in Europe, and especially in Britain, the general arrangement of the tertiary system is as follows:—*Post-Tertiary*, which includes the recent and superficial accumulations occurring above the boulder-drift. In the second place comes the *Tertiary System*, properly speaking, which includes the *Pleistocene*,—boulder or glacial drift; the *Pliocene*,—mammaliferous, red, and coralline crag of Suffolk, &c.; the *Miocene*,—Faluns of Touraine, Molape of Switzerland, and part of Vienna basin; and the *Eocene*,—strata of London and Paris basins. The organic remains of the Tertiary system are all of recent types. In their mineral constitution these groups present great variety, consisting of clays, sands, marls, calcareous grits, limestones, gypsum, and beds of lignite, with evidences of frequent alternations from marine to fresh-water conditions. The principal formations, however, are clays and limestones. The tertiary formations of England, France, Switzerland, and Italy, are those which have been most fully investigated, and in each country have been divided as we have described above. Amongst the Fauna of the period, the most characteristic feature is decidedly the abundance of gigantic quadrupeds. In European tertiaries we have elephants, mammoths, dinotheriums, palæotheriums, rhinoceroses, &c.; in South America, of megatheriums, megalonyxes, glyptodons, &c.; and in Australia, of animals allied to the marsupials of that continent, but of more gigantic proportions. During the Tertiary period, the whole of the plants and animals presented greater distinctions and separations than during the periods of the chalk, oolite, or coal. It would appear, however, that in the latitudes now occupied by England and France, a warm or tropical climate prevailed; and that, at the close of the *pliocene* strata, these conditions were followed by those of an arctic or boreal character, which gave rise to the boulder or drift formation.—*Ref.* Page's *Advanced Text-Book of Geology*.

TEST AND CORPORATION ACT, *test*, in English Hist., is the name commonly given to 13 Car. II. c. 2, which provides that all magistrates in corporations should take the oaths of supremacy and abjuration, and should have received the sacrament, according to the forms of the English church, within a year before their election. By 25 Car. II. c. 2, these provisions were extended to all persons who should bear any office or offices, civil or military. These acts were not finally repealed till 1828, by 9 Geo. IV. c. 17.

TESTAMENT, NEW AND OLD. (*See* BIBLE.)

TESTIMONY. (*See* EVIDENCE.)

TESTS, *tests* (Lat. *testa*, trial, examination).—To discover the chemical constituents of a mixture of several substances requires the operator to have gone through a course of practical analysis under a competent instructor. The following general tests are therefore only intended for the detection of one or two of the most prominent components of any substance. *Alkaline metals.*—Taken generally, the absence of a precipitate on the addition of a solution of an alkaline carbonate denotes the salts of the alkaline metals. The salts of potash give a purple tinge to the flame of a spirit-lamp; those of soda give orange, and those of lithia a crimson. *Ammonia* may be detected by mixing the powdered salt with quicklime, when the well-known smell of the gas will be perceived. The *alkaline earths* are difficult of detection. *Lead*, *mercury*, and *silver*, are all precipitated by hydrochloric acid. Chloride of silver is distinguished by dissolving in liquid ammonia. *Mercury* is distinguished from either of the others by giving a red or dirty green precipitate with an iodide. *Iron* gives a blue precipitate with ferrocyanide of potassium, if a few drops of dilute nitric acid be added to the solution beforehand. The test may be confirmed by gallic acid giving with the clear solution a deep inky-purple precipitate. *Copper* is precipitated in the metallic form by clean iron or steel. The test is confirmed by the solution giving a chocolate precipitate with ferrocyanide of potassium, or by turning deep blue on the addition of liquid ammonia. *Gold* gives a brown precipitate of metallic gold with protosulphates of iron, and a purple precipitate with a mixture of protochloride and prochloride of tin. *Zinc* is detected by fusing the salt on charcoal with the blowpipe, when the metal becomes gradually reduced, giving off white fumes of the oxide. The small portions of the oxide left in the charcoal are yellow while hot, and white when cold. *Cobalt* salts may be recognized by giving a deep blue bead with borax before the oxidating flame of the blowpipe lamp. *Nickel* gives a pale apple-green precipitate with ferrocyanide of potassium. *Tin* salts give malleable globules of the metal on charcoal before the blowpipe. *Arsenic* and *antimony* are both very difficult metals to distinguish. Many of the popular tests given for the former are most fallacious. The remaining metals are either too rare or too difficult of detection to be noticed here. (*See* ANALYSIS.) The tests for the acids and halogens contained in the more common salts are the following. *Sulphuric acid* is detected by giving with chloride of barium a white precipitate of sulphate of baryta insoluble in nitric acid. *Carbonic acid* effervesces on the addition of hydrochloric acid, or any other strong acid, to the solution containing it. Should the effervescing solution smell of rotten eggs, *hydrosulphuric acid* is present. *Boracic acid* is tested for by moistening the suspected salt with a little sulphuric acid and alcohol, and inflaming the mass. A flame having a green tinge strongest at the edges indicates boracic acid. *Chromic acid* is detected by boiling the solution with a little sugar and sulphuric acid; if present, it turns green. *Hydrochloric acid* gives a white precipitate with nitrate of silver, soluble in ammonia and insoluble in nitric acid. *Hydriodic acid* is known by its salts giving a light yellow precipitate with nitrate of silver, a deep yellow with nitrate of lead, and a bright red with nitrate of mercury. To detect *nitric acid*, add half its volume of sulphuric acid to the solution, and drop in a crystal of protosulphate of iron; if nitric acid is present, the liquid round the crystal will become tinged with brown. *Chloric acid* is detected by its salts giving off oxygen when heated to fusing-point.

TESTUDINARIA, *tes-tu-di-nā'-re-ā* (Lat. *testudo*, a tortoise), a gen. of monocotyledonous plants, belonging to the nat. ord. *Dioscoraceæ*. One species, viz. *T. elephantipes*, the tortoise-plant of the Cape, or elephant's-foot, is pretty generally known in collections, from its having a very peculiar short thick stem, resembling an elephant's foot; from the top of this thick stem a climbing stem is sent, which bears leaves and flowers. It is covered with a soft corky bark, which is rugged and rough.—*Ref.* Baird's *Cyclopædia of the Natural Sciences*.

TETANUS, *tet'-ā-nus* (Gr. *tetanos*, from *teino*, I stretch), is a disease characterized by a violent and rigid spasm of many or all of the muscles of voluntary motion. Persons of all ages and of both sexes are liable to its attack, but it occurs much more frequently in warm than in cold climates. It frequently arises from some irritation of the nerves, in consequence of local injury by puncture, incision, or laceration. In some instances it comes on suddenly and with great violence, but more frequently its attack is gradual,

beginning with a slight stiffness in the back part of the neck, which, in a short time, is considerably increased, and, at length, renders the motion of the head difficult and painful. An uneasy sensation is felt at the root of the tongue, which increases and causes a difficulty of swallowing, at length preventing it altogether. A great tightness is perceived about the chest, with a violent pain at the lower part of the sternum, shooting into the back. A stiffness also takes place in the jaws, which soon increases to such a height that the teeth become so closely set together as not to admit of the smallest opening. This is the most common form of the disease, and is known as locked jaw. Frequently, however, the disease extends farther, and the muscles of the spine become affected, so as to bend the body forcibly backwards, or, on the other hand, the muscles of the abdomen are affected, and the body bent forwards; and sometimes the muscles both before and behind are affected. These spasms are attended with the most severe pain, but seldom with any fever. This disease is frequently fatal, and, unfortunately, it too often resists every mode of treatment. The modes of treatment indicated by the disease are,—1. the removal of any local irritation which may appear to have excited it; 2. lessening the general irritability and spasmodic tendency; and 3, restoring the tone of the system. Opium is the remedy which is most frequently resorted to in such cases, which must be given in very large doses, repeated at short intervals. Some recommend purgatives given in large doses, and continued for some time. When the jaws have become locked, it is necessary to administer food or medicine in the form of clysters, or sometimes to draw some of the front teeth.

TÊTE DU PONT. (*See* BRIDGE-HEAD.)

THALAMIFLORÆ, *thăl-ă-mĭf'-lo-re* (Gr. *thalamos*, a bed), in Bot., a sub-class of *Dicotyledones*, characterized by flowers usually furnished with both calyx and corolla, the latter composed of distinct petals inserted on the thalamus, and by the stamens being hypogynous, or adherent to the sides of the ovary. Seventy nat. orders are included by Professor Bentley in this sub-class.

THALAMUS, *thăl'-a-mus* (Gr., a bed or couch), in Bot., the apex of the peduncle or floral axis, upon which the different whorls of a solitary flower are arranged. In the majority of plants the thalamus is a little flattened surface or point, in no way remarkable; but in some plants it becomes much enlarged, and then assumes a variety of shapes, and thus modifies to a considerable extent the form of the flower. In the pineapple it is nearly cylindrical; in the raspberry it is conical; in the rose it forms a concavity upon which the carpels are placed. Sometimes the thalamus becomes prolonged beyond the ovary, as in the *Geraniaceæ* and *Umbelliferæ*: this prolongation is termed a *carpophore*. Sometimes it becomes prolonged beyond the calyx, and forms a stalk to the ovary, as in the passion-flower, the pink, &c.: to the stalk thus formed the term *gynophore* has been applied.

THALLIUM, *thăl'-le-um* (Gr. *thallos*, a green twig), a rare metal, discovered in March, 1861, by W. Crookes, F.R.S., in some seleniferous deposit from the Silkeroda sulphuric acid works on the Hartz mountains. Since then it has been found in the flue deposits of many other sulphuric acid factories where pyrites are used, in this country and on the continent. It is a heavy metal, having a specific gravity of 11·9, or rather higher than that of lead. Its equivalent is roughly 203, and its true position amongst the elements is by the side of mercury, lead, and silver. It has a high metallic lustre when freshly scraped, but oxidises readily in the air. It is the softest metal known, admitting of a free exposure to the air, being easily scratched by soft lead. These two latter characters have induced Dumas and other chemists to give it a false position amongst the alkaline metals, but its chemical and physical relations are totally at variance with this idea. In the spectroscope, this metal gives a single green line of great brilliancy; hence the name bestowed on it by Crookes, in allusion to its having been first detected by him through this means. On the 12th of May, 1862, rather more than a year after Crookes' discovery, thallium was rediscovered by M. Lamy, a French chemist residing at Lille. As is only too frequent in such cases, a section of the French





Academy, headed by MM. Dumas and Balard, and assisted by certain foreign chemists domiciled in this country, endeavoured to rob Crookes of his discovery, and give the fame of it to M. Lamy, who had himself given up all claim to it, with the honourable feeling of a true man of science. A disgraceful attack on Crookes was made in the organs of the French Academy, but it was at last proved, by indisputable facts, that Crookes had not only detected the element, but had obtained it, and exhibited it in the metallic form, months before M. Lamy had even suspected its existence, a conclusion in which M. Lamy's friends appear to have agreed, by their subsequent very judicious silence. For fuller accounts of the discovery and properties of this metal, see *Philosophical Journal and Chemical News for* 1861-2-3, *et passim*.

THALLOGENS, or THALLOGENÆ, *thăl'-lo-jenz*, *thăl-lo-je-ne* (Gr. *thallos*, a green leaf; *gennao*, I produce), in Bot., a sub-class of *Acotyledones*, consisting of plants without stomata, and having no distinction between stems and leaves. The orders *Lichenes*, *Fungi*, and *Algæ*, are included in this sub-class.

THANE, *thane* (Ang.-Sax. *thegn*, to serve), was originally applied to the minister or servant of a king or chief; and as these were often persons of influence and power, it came to signify a particular rank or dignity. It seems at one time to have been applied to all landed proprietors below the rank of earl and above that of alderman. There were also superior and common or inferior thanes. In Scotland, the title seems to have been higher than in England, being attached to the territory of a county.

THEFT. (*See* LARCENY.)

THEINE. (*See* CAFFEINE.)

THEISM. (*See* DEISM.)

THEOBROMA, *the-o-bro'-mă* (Gr. *theos*, a god; *broma*, fruit; from the delicious quality of its fruit), in Bot., a gen. of the nat. ord. *Byttneriaceæ*. *T. Cacao*, the cacao or cocoa-tree, is a native of Mexico, and is now more or less extensively grown throughout Central America, Brazil, Peru, Venezuela, Caracccas, Ecuador, Grenada, Demerara, Essequibo, Guayaquil, and Surinam, with some of the West-India islands, foremost among which stands Trinidad. The various kinds of cocoa and chocolate are prepared from the seeds. The pods containing the seeds are gathered when ripe, and after having lain for a day and a night, are opened, and the seeds, which are taken out by hand, are submitted to what is termed the *sweating* process. They are first placed on a sloping floor or in baskets, so that the chief part of the pulp in which they are enveloped may drain off, and are then shut up in a close box, and left for 24 to 48 hours, according to the season and weather, after which they are turned out in the sun to dry. Upon a nice performance of the sweating process, which may be likened to *malting*, the value of the seeds greatly depends. When quite dry, the seeds are packed in barrels or bags, and are ready for shipment. The process of *roasting* is effected in a metal cylinder, with holes at each end, through which the vapour generated is allowed to escape. When the aroma is sufficiently developed, the seeds are cooled, and then passed to a mill, which removes the husks from the *nibs*. To prepare *chocolate*, the cocoa-nibs are ground in a mill consisting of stone or metal rollers, which are usually heated either by charcoal fires or by steam, so as to soften or melt the natural fat. The warm smooth paste which passes from the mill is then placed in a mixing-mill, and incorporated with *refined sugar*, and usually *vanilla* or other *flavouring substance*. The trituration is continued until the whole paste is converted into an entirely homogeneous mass, which is finally shaped, by means of suitable moulds, into various forms; as blocks, loaves, tablets, lozenges, &c. The article known as *soluble cocoa* is prepared from cocoa-nibs and arrowroot, or other starch, ground together. The addition of starch gives the article the property of readily forming an emulsion with boiling water. Cocoa seeds contain a peculiar alkaloid called *theobromine*, which resembles *caffeine*, the principle common to coffee and tea. To this alkaloid, and the peculiar fat called *butter of cocoa*, the beverages prepared from the seed owe their exhilarating and nutritious properties. According to Johnston, the annual consumption of cocoa in one form or another is about

100,000,000 lbs. The cocoa-tree must not be confounded with the cocoa-palm (*Cocos nucifera*), from which we obtain the cocoa-nut.

THEOCRACY, *the-ok'-rā-se* (Gr. *Theos*, God, and *krateo*, I rule), is a term applied to that form of government established by Moses among the Jews, as being under the direct control of God. Their chief magistrates or judges were appointed under the express direction of Jehovah, and governed under him. When they came, therefore, to demand a king, it was expressly declared to be an act of rebellion against God.

THEODOLITE, *the-od'-o-lite* (Gr. *theaomai*, I view; *dolos*, stratagem), in Surveying, an instrument used for measuring the angular distances between objects projected on the plane of the horizon. In its simplest form the theodolite consists of a divided circle, which has to be set parallel with the horizon, and a telescope, which has so much motion in a vertical plane as to enable the observer to view any object which he may require, above or below the horizon.

THEOGONY, *the-og'-o-ne* (Gr. *Theos*, and *gonē*, generation), in Classical Lit., deals with the descent and relationship of the various deities. Hesiod has left a poem under this title, in which he gives an account of the birth and parentage of the Grecian deities.

THEOLOGY, *the-ol'-o-je* (Gr. *theologia*, from *Theos*, God, and *logos*, discourse), is literally a discourse concerning God, and is commonly employed to designate "that science which treats not only of the divine existence and attributes, but also of the relations which exist between God and his intelligent creatures, the duties which consequently devolve upon the latter, and the arrangements which God has entered into for their advancement and benefit." Theology stands to religion in the same relation as that in which any other science stands to its subject, being, in fact, the truths of religion arranged in a scientific form. Among the ancient Greeks, *theologia* denoted the philosophy of the divine existences, and included all questions relating to the nature, origin, and service of the gods. The word is now found in the New Testament, but was employed by the earliest Christian writers, who styled the author of the Apocalypse, by way of eminence, the *Theologus*, or divine, and the doctrine of Christ *theologia*. Theologians came to be applied as a title of honour to those who defended well the doctrine of Christ's divinity and Trinity. The first who uses the term in its modern signification was Peter Abaelard, who flourished in the early part of the 12th century, and wrote a system of scholastic divinity, to which he gave the name of "Theologia Christiana." Theology, in the form in which it now exists, is comparatively a modern science. Among the Christian fathers we find all the great doctrines of our faith asserted and defended; but there are few, and these very imperfect efforts, to present them in a complete and systematic form. The science began with the scholastic divines of the middle ages, as Anselm, Abelard, Albertus Magnus, Thomas Aquinas, Bonaventura, Duns Scotus, and others. Since the Reformation, it has been assiduously cultivated, and many digests of it have been published. This science is commonly divided into two branches,—*natural*, and *revealed* or *positive* theology, the former being that knowledge of God, his character and works, which the light of nature furnishes; the latter, that positive knowledge of him that is revealed in the sacred Scriptures. Though the distinction between these two is clear and well-founded, any attempt to deal with the entire body of Christian theology necessarily involves the consideration of both natural and revealed truth. "Nothing can be more groundless than the jealousy sometimes felt, but oftener professed, of natural religion by the advocates of revealed." Another division of this subject is into theoretical and practical theology. The former of these includes—(1), *Exegetical* theology, or the knowledge of the revealed writings, the evidence of their authority, and the explanation of their meaning; (2), *Systematic* theology, or the investigation, arrangement, and discussion of the truths so revealed; (3), *Historical* theology, or the workings and changes of religion among those who have professed it. *Practical* theology, on the other hand, deals with the duties of practical religion, together with the various modes of enforcing them on men, including—(1), *Homiletics*, or preaching; (2),





*Catechetics*, or teaching; and (3), *Pastoral* theology, or the care and government of a church. Another division is into—(1), *Theology*, strictly so called, or a scientific exposition of the nature, attributes, works, and claims of God; (2), *Anthropology*, or a scientific development of the truths concerning man, especially in his relation to God, and the estrangement between God and him, its nature, extent, source, and consequences; (3), *Christology*, or what the Scripture unfolds concerning the medium of reconciliation between God and man, especially as respects the person of the Mediator, the nature of his work, and the results of his official constitution and agency; (4), *Soteriology*, or the doctrine of human redemption, what Scripture teaches concerning the salvation of men, the nature of salvation, the grounds, means, agent, ultimate cause, and manifested results of it, both in this life and that which is to come.—Ref. *Encyclopædia Britannica*.

THEOREM, *the'-o-rem* (Gr. *theorema*, from *theaomai*, I perceive), is properly a thing to be looked at or seen, and is used in mathematics to signify something that requires to be proved, in opposition to a problem, which is something that requires to be done.

THEORY, *the'-o-re* (Gr. *theoria*, contemplation, speculation), in its scientific sense, is used to denote the real or hypothetical approaches which are made to the discovery of some law of nature, real or supposed. It is frequently used in the sense of mere knowledge, as opposed to practice, or the application of it. Theory and hypothesis are thus distinguished. "A hypothesis is a guess or supposition made concerning the cause of some particular fact, with the view of trying experiments or making observations to discover the truth. A theory is a complete system of suppositions put together for the purpose of explaining all the facts that belong to some one science. Theoretical is sometimes used as synonymous with conjectural; but this is incorrect.

THERAPEUTICS, *ther-ā-pew'-tiks* (Gr. *therapeuo*, I attend the sick), is that department of medical science which deals with the way of curing disease. It treats of the symptoms of disease and the conclusions to be drawn from them, of the power of nature, and how far it may be relied on; of the modes of operation of the various remedies, &c.

THERMOMETER, *ther-mom'-e-ter* (Gr. *thermos*, heat; *metron*, a measure), an instrument for measuring heat, founded on the principle that solid, liquid, and gaseous bodies always expand in exact proportion to the temperature to which they are subjected. Thermometers are of various constructions, according to the purpose for which they are intended. The first kind of thermometer invented was the air thermometer, which consisted simply of a bulb of glass, with a narrow stem dipping into a coloured liquid. As the air expanded or contracted in the bulb, the liquid fell or rose in the tube. This form of instrument was too much affected by atmospheric changes to be of much service. A modification of it is much used under the name of the *differential thermometer*, which consists of a tube bent to a U shape, and terminating in two bulbs. A liquid is introduced into the stem, which rises or falls according to the difference of temperature of the two bulbs. It can, of course, be only used to detect differences of temperatures. The thermometer, as at present constructed, consists of a bulb of glass, to which a tube is attached, sealed at the end, and containing mercury or spirits of wine. The operation of filling is conducted in such a manner that the mercury or spirit is at its boiling-point when the tube is sealed, in order that it may have a vacuum above it when it contracts. The mercurial thermometer is used for all purposes where the temperature to be measured vary from 39° Fahr. to 630° Fahr. Spirit is used for temperatures below 39° Fahr. A good mercurial thermometer should bear the following tests:—When immersed in melting ice, it should indicate 32° Fahr.; when suspended in the steam of water boiling in a *metallic* vessel, the mercury should remain stationary at 212° Fahr. When suddenly inverted, the mercury should fall with a sharp metallic click, showing that a perfect vacuum exists in the tube. The bore of the tube may be tested by separating a short column of mercury, which should occupy the same number of degrees in any part of the tube. The thermometric scale is unfortunately dif-

*ferently* divided in different countries. In England, Fahrenheit's scale is used, the difference between freezing and boiling points being 180°; the former being 32°, the latter 212°. In the Centigrade, which is used in France and on the continent generally, this interval is divided into 100°, while in that of Réaumur, which is still used in Germany and Russia, the same distance is divided into 80°. In all these systems the degrees below the zero 0° of the scale are indicated by the sign *minus* −. In England, at the present time, most chemists use the centigrade scale, the meteorologists holding fast to Fahrenheit's system. In most chemical books, tables are given, showing the value of the degrees on one scale in those of another. The following formula may be used for the purpose:—

F into C = $\frac{5}{9}$(F−32) = C. C into F = $\frac{9}{5}$(C+32) = F
R into F = $\frac{9}{4}$(R+32) = F. F into R = $\frac{4}{9}$(F−32) = R

For meteorological purposes the most useful form of instrument is the maximum and minimum self-registering thermometer. The maximum instrument is an ordinary mercurial thermometer, arranged horizontally, in the bore of which is placed a small piece of steel wire, in the empty part of the tube. The instrument is set by drawing the wire down to the mercury with a small magnet. As the mercury expands, it pushes the index along, leaving it behind when it contracts. The minimum instrument is arranged in a similar manner, spirit being used instead of mercury, and a little enamel tube containing an atom of steel wire forming the index. This is placed below the surface of the spirit, and is drawn back by it when it contracts, but is not pushed forward when it expands. There are numerous other maximum and minimum instruments, but of too complicated a nature for description here. For meteorological use the scale is generally marked in an ivory, boxwood, or enamelled slab, placed behind the tube, but for chemical purposes the degrees are marked on the tube itself with a diamond, a piece of white enamel being often let in to the glass to form a background. For the measurement of degrees of heat beyond 600° Fahr. pyrometers are used. The most exact of these is that devised by Professor Daniel. A good pyrometer is, however, a desideratum.—For a description of it see Miller's *Elements of Chem.*, vol. i.

THESIS, *the'-sis* (Gr., position, from *tithemi*, I lay down), in the schools, is a general proposition, which a person advances and offers to maintain. In logic, every proposition may be divided into thesis and hypothesis, the former containing the thing affirmed or denied, the latter the conditions of the affirmation or negation.

THESSALONIANS, EPISTLES OF ST. PAUL TO THE, *thes-sa-lo'-ne-ins*, are two books of the New Testament, the authenticity and canonical authority of which have been admitted from the earliest ages by all who have received any of Paul's epistles. The first epistle was written by the apostle from Corinth, and not from Athens, as the subscription imports, about A.D. 52. Its design was to confirm the Thessalonians in the faith, and to encourage them to a patient and consistent profession of Christianity. It may conveniently be divided into two parts. The former, comprising the three first chapters, is occupied chiefly with statements of a retrospective character, detailing the apostle's experience among them, his confidence in them, and his efforts and prayers on their behalf. The two remaining chapters are mostly of a hortatory character, exhorting them to grow in holiness, brotherly love, and industry, and not to sorrow immoderately for their brethren who had died in the faith, but to take comfort in the prospect of Christ's second coming. In his second epistle, which was evidently written soon after the first, and from the same place, the apostle endeavours to dissipate a mistaken notion, that the coming of Christ, which he had referred to, was near at hand. On the contrary, he assures them that much is to happen before that can take place, and exhorts them to hold fast the traditions which they had received, whether by word or epistle, and commends them to the consoling and sustaining grace of God. The rest of the epistle consists of expressions of affection to the Thessalonians, of confidence in them, prayers on their behalf, and exhortations and directions suited to the circumstances in which they were placed.





THIGH, *thi* (Sax. *theyh*, Lat. *femur*), in Anat., is that part of the upper extremity between the lower part of the trunk and the leg. It is articulated to the pelvis, and to the bones of the leg at the knee. The thigh-bone is the longest of all the bones of the body, and consists of a body or shaft and two extremities. The body is compressed, but nearly cylindrical towards the centre, and expands superiorly and inferiorly. At its superior extremity is the neck, which is directed upwards and inwards, so as to form an obtuse angle with the shaft; and at its point of union with the latter are two eminences, called the trochanters. The neck is so called from its constricted appearance, as well as from its supporting the head. This last is globular, forming a considerable segment of a sphere, and in the fresh state is coated with cartilage. It articulates with the *acetabulum*, or cup-shaped cavity of the os innominatum, so as to admit of a variety of motions. The inferior extremity of the bone is much thicker and broader than the superior, and is terminated by two eminences separated posteriorly by a deep fossa, and named the external and internal condyles. The articular surfaces of both condyles are covered with cartilage, and are connected inferiorly with the tibia and anteriorly with the patella. This bone is well covered with muscles, and through the thigh pass large blood-vessels and nerves connected with the foot and leg. (*See* ANATOMY.)

THIRST, *thirst* (Sax. *thurst*), in the animal economy, is that peculiar sensation which attends the desire to drink. During the operations of the animal functions, a great quantity of moisture is consumed, the loss of which must be supplied; and thirst is the voice of nature calling upon the animal to supply the place of the lost moisture by drinking. Water is the proper object of this desire; and the quantity necessary for this purpose varies greatly according to the different circumstances of age, sex, and temperament; and still more according to the nature of the food taken, the state of the atmosphere, the mode of life, and the custom of the individual. The sensation of dryness of the mouth and throat, which most strongly characterizes thirst, is not always the result of these parts being actually deficient in moisture, nor is it removed by supplying the mouth alone with fluid. An outward application of moisture is found to diminish thirst; and sailors have been able to sustain life by bathing in the sea. Thirst is a sensation much more difficult to bear than hunger, leading from restlessness to anxiety, despair, and madness.

THIRTY-NINE ARTICLES. (*See* ARTICLES, THE THIRTY-NINE.)

THIRTY YEARS' WAR, *thir'-ti*, in Germany, was a memorable struggle which was carried on between 1618 and 1648. Its origin is to be traced to the changes which resulted from the Reformation, and was conducted between the emperor and Roman Catholic states of Germany, and the Protestant states with their allies, Denmark, and afterwards Sweden and France. It is renowned for the victories of Wallenstein and Gustavus Adolphus of Sweden, and was terminated by the peace of Westphalia.—*Ref.* Schiller's *History of the Thirty Years' War.*

THISTLE. (*See* CARDUUS.)

THISTLE, ORDER OF THE, *this'-l* (Sax. *thistel*), an order of knighthood, dating at least as far back as the time of Robert II., although the badge of the order was never worn until the reign of James III. This order was suppressed by the Reformers, but was re-established during the reign of James II. of England (VII. of Scotland). No amount of merit has ever been able to procure a commoner admission to this order; for although three commoners did once belong to it, their claims were that they were heirs presumptive to dukedoms.

THORAX, *tho'-raks* (Gr., from *thorso*, I leap, because the heart leaps in it), in Anat., is the chest, or that part of the body which is situated between the neck and the abdomen. It is composed of bones, cartilages, and ligaments, which form a large conical cavity for the lodgment of the heart, lungs, and large blood-vessels. Its walls are formed posteriorly by the dorso-thoracic vertebræ and the ribs as far outwards as their angles, laterally by the bodies of the ribs, and anteriorly by the anterior extremities of the ribs, the

sternum, and the costal cartilages. It is separated from the abdomen below by the diaphragm. The thoracic duct lies upon the dorsal vertebræ between the aorta and the vena azygos, and extending from the opening of the diaphragm to the angle formed by the union of the left subclavian and jugular veins, into which it opens and pours its contents. It is the great trunk of the absorbents, which pour their contents into it from almost every part of the body.

THORN-APPLE. (*See* DATURA.)

THOROUGH BASS. (*See* BASS.)

THOUSAND AND ONE NIGHTS. (*See* ARABIAN NIGHTS.)

THRASHING, THRASHING MACHINE, *thrash'-ing* (Sax. *tharscan*, to thrash).—Thrashing is the act of beating out the corn from grain or other crops. In former times, the hand-flail was the only implement used for thrashing corn; it separated the grain from the husks and straw very effectively; but that method has now become expensive, and it was found that the flail always bruised a large number of seeds. Proper machines, provided with a large number of flails, or other parts answering the same purpose, and moved by the power of water, wind, or horses, were soon introduced. It was found that by this means the process of thrashing could be effected more cheaply, more quickly, and with less damage to the health of the thrasher, than by the old means. To the farmer on an extensive scale, the thrashing machine is an absolute necessity. In the present ordinary thrashing machine in its improved form, a rapid motion is given to a hollow cylinder round a horizontal axis; on the outer surface there are projecting ribs, parallel to the axis, at equal distances from each other: the width of these is from two to six inches. Round one half of the cylinder is a case, the inner surface of which is lined with plates of cast iron, grooved in the direction of the axis. Since the beaters, or ribs, come quite close to these ribs, an ear of corn or other grain cannot well pass through them without being flattened. After being unbound, the sheaves of corn are spread upon a slanting table, and in some machines are drawn in between two iron rollers, one of which is fluted and the other plain. The motion of these rollers is slow, while that of the cylinder is rapid. As the straw comes through, the beaters act upon it, and thrash out most of the corn; that which remains is carried in between the beaters and the fluted cases, and on making half a revolution, all the grain has been beaten or rubbed out. It falls on a shaker, which allows the grain to pass through, but tosses off the straw. On very large farms thrashing machines worked by steam power have been erected; and over considerable portions of England, travelling steam-machines thrash out the largest quantity of the corn grown in this country.

THREAD-WORM, or FILARIA, *thred-worm*, a gen. of worms belonging to the class *Entozoa*, ord. *Nematoidea*, so called from their form, which is long and slender, resembling that of the Gordii among the annelida, but with mere marks on the body instead of rings. Their extremities are cylindrical and attenuated. They inhabit various animals, both large and small, while some are found in the subcutaneous cellular tissue of man; as the guinea-worm, *Filaria medinensis*, so common in hot climates, more especially on the coast of Africa, where the natives are infested with it. It penetrates the skin and raises a painful tumour, but may be easily extracted by seizing the extremity, and drawing it a little way out, when the extracted portion is twisted round a small stick, which is rotated each day until the worm is pulled gradually out. Two other species are found in man, the one infesting the eye and the other the bronchial tube. Birds, reptiles, and fishes, as well as insects and molluscs, are also subject to its attacks.

THREATS and THREATENING LETTERS, *threts, thret'-en-ing* (Ang.-Sax.), are a species of injury recognized and punished by the law of England. The demanding of any property from a person by menaces, with intent to steal the same, is made felony, and punishable by imprisonment for any term not exceeding three years. The sending of threatening letters, whether anonymously written or with a fictitious name, demanding money, or threatening to kill a person, or fire his house, is a felony, and was formerly punishable by death, but now by penal servitude for life, or not less than three years, or imprisonment for any term not exceeding four years.

THRUSH, *thrush* (Sax. *thrise; Turdus*), a fam. of dentirostral birds, of the ord. *Inessores*. Thrushes, or birds bearing considerable resemblance to thrushes, are found in almost every part of the world. Those which inhabit high latitudes, and places which are otherwise very seasonal in their character, are in general migratory, and those which inhabit places of more mild and uniform character are in general stationary. The generic characters are, — beak of moderate size, straight, convex above; point of the upper mandible compressed, notched, and slightly curved downwards; the gape furnished with a few hairs, the nostrils oval, lateral, half concealed by membrane; middle toe not so long as the tarsus, and the outer toes joined to it at the base. As the number of species that have been described amount to between 140 to 150, we can only give an outline of a few of them. The missel thrush (*T. viscivorus*) is one of the largest of the European species, measuring eleven inches in length and about sixteen or seventeen in the stretch of its wings. It is rather a shy bird, frequenting small woods and the high trees in hedges bounding large meadows, but during the breeding season it becomes bold and quarrelsome, driving away the smaller birds in all directions from its haunts. It is resident in England all the year, and the male commences his song as early sometimes as February. It begins to build in April, and fixes its nest in the fork of a branch of a tree, frequently that of an apple-tree in an orchard. The external part is made of sticks, coarse vegetable fibres, moss, and an admixture of earth, and lined with finer vegetable matter and with wool. The eggs are of a greenish white, or sometimes of a reddish white colour, spotted with red-brown, and are four or five in number. The song thrush (*T. musicus*) is "the thrush" by way of eminence in England. In Scotland it is the *mavis*. It is considerably smaller than the missel thrush. The length is about nine inches, the extent of the wings about thirteen and a half. As is the case with the missel thrush, the general colour above is brownish grey, and that below whitish red, mottled with dusky spots. It frequents small woods, plantations, and shrubberies, and seeks its food in meadows, lawns, and gardens. In the grape countries of Europe it feeds luxuriously during autumn on ripe grapes, and at that time is in great request for the table. The nest is a compact structure, formed externally of moss and fibres, and strengthened with an admixture of mud. It is generally in the corner of a hedge or bush, or of a thick tree, but seldom at any considerable elevation above the surface of the ground. The eggs are usually four or five in number, of a beautiful light blue colour, with a few small well-defined black spots over the larger end. The song of the thrush is very sweet, and has considerable compass. The solitary thrush (*T. solitarius*) has also been called the blue thrush from its colour. It inhabits the mountainous parts of the south of Europe. The general colour is blue, with grey margin to the feathers, the size rather smaller than the common blackbird, but the habits a good deal the same. The rock thrush (*T. saxatilis*) frequents the wildest parts of rocky countries, and is found in summer on the Uralian mountains, the Alps, and Pyrenees. It is a very shy bird, and makes its nest among fragments of rock or loose rough stones, of hair lined with moss. It is about seven inches and a half in length.

THRUSH, *thrush* (Lat. *aphthæ*), in Med., is a disease common to infants who are ill fed, and consists of an eruption of small white or ash-coloured ulcers on the tongue and inside of the mouth, and not unfrequently extending to the throat and fauces. It is caused by irritation of the bowels, and is almost always attended with diarrhœa. It is rarely dangerous; and in its treatment the disordered state of the bowels is to be corrected by the administration of some anti-acid and astringent mixture, and the system strengthened by preparations of iron and cod-liver oil. A dilute solution of nitrate of silver should be applied to the eruptions of the mouth.

THUG, *thug* (Hindu *thagna*, to deceive), is literally a deceiver, and was applied to an association of secret

murderers in India, which some years ago excited much attention in that country. They went about in gangs of from ten to two or three hundred, sacrificing to their tutelary goddess Kali every victim they could seize, and dividing the plunder among themselves. They generally assumed the appearance of merchants, the better to entrap their unsuspecting victims, whose relations took little interest in the matter. The origin of the system is referred to the remotest antiquity, but it was little known to the English before 1810, when measures were taken for its suppression; but it was not till about 1830 that an effectual stop was put to it. —Ref. *English Cyclopædia.*

THUJA, *thu'-ja* (Gr. *thuon*, a sacrifice), in Bot., the *Arbor Vitæ*, the resin of the Eastern variety of which is used instead of incense at sacrifices. Why it is called Arbor Vitæ is not known, unless it be on the supposed medicinal qualities of its berries. In the East the cypress is called the tree of life, and its berries are considered a cure for all diseases. In this country the species of Arbor Vitæ can only be considered ornamental low shrubs or trees, well worthy of being cultivated, especially the *Thuja pendula*, which, on account of its long slender pendulous shoots, ought to be in every collection.

THUNDER, *thun'-der* (Ger. *Donner*), the loud noise which is heard after a discharge of lightning from the clouds. The character of the sound of thunder is variable; sometimes it resembles the report of a single piece of ordnance; at other times it reverberates as if several large guns were being fired in succession; while at others it resembles the sound of file-firing in musketry. In general, when the lightning is near, the thunder commences with a violent crash; when more distant, a rumbling, irregular, and recurring sound is heard. The character of the sound in all places not only varies with the force and the distance of the explosion, but with the situation of the observer and the nature of the adjacent country. The identity of lightning with the electric fluid was first demonstrated by Benjamin Franklin, and is now well known; but the physical cause of the noise which accompanies the flash is still an object of conjecture. It is generally supposed that lightning by its heat causes a partial vacuum in the atmosphere, and that the sudden rushing of air into the void space produces the sound; a variety of reasons, however, have been brought forward to account for its prolongation. According to the observations of several meteorologists, it appears that neither thunder nor lightning has been known to take place beyond 75° north latitude, and that these phenomena are rare even as low as 70°. (*See* LIGHTNING.)

THUNDER-STORM, a storm accompanied by lightning and thunder. In all thunder-storms shelter should not be taken under trees or hedges, which will probably act as conductors; at the same time, however, a person is in greater safety at a distance of 30 or 40 feet from such objects than in an open plain. The safest position in a house is the middle of the room, and the security may be increased by sitting in a feather bed, a hair mattress, or a thick woollen rug, all of which are non-conductors. The most dangerous places are near the fireplace and in the cellar. Large metallic surfaces, gilt furniture, bell-wires, &c., all being conductors, should be avoided from the same reason.—Ref. *Introduction to Meteorology*, by D. P. Thomson, M.D.

THURSDAY, *thurz'-dai*, the fifth day of the week, so named by the Saxons in honour of their god Thor, to whom this day was consecrated.

THURSDAY, HOLY. (*See* HOLY THURSDAY.)

THYMELACEÆ, *thim'-e-lai'-se-e*, in Bot., the Mezereon fam., a nat. ord. of *Dicotyledones*, sub-class *Monochlamydeæ*. Shrubs or very rarely herbs. Leaves entire, exstipulate. Flowers perfect or rarely unisexual. Calyx inferior, coloured, tubular, 4—5-lobed. Stamens perigynous, twice as many as the divisions of the calyx, or equal in number to them, or fewer. Ovary superior, simple, 1-celled. Fruit dry and nut-like, or drupaceous. The plants of this order inhabit most parts of the world, but are especially abundant in Australia and the Cape of Good Hope. They are chiefly remarkable for the toughness and acridity of their bark. The fruit of *Dirca palustris* is narcotic, and that of the plants generally poisonous or suspicious; however, the seeds of *Inocarpus edulis* are said to resemble chestnuts when roasted. Several species of *Daphne* and *Pimelea* are handsome shrubby plants.

THYROID CARTILAGE, in Anat. (*See* LARYNX.)

TIBIA. (*See* LEG.)

TIC DOULOUREUX, *tik-dol-o-roo'* (Fr., painful spasm), is a very painful affection of a facial nerve, most commonly that branch of the fifth pair which comes out of the infra-orbitary foramen. It comes on in sudden and excruciating attacks, attended with convulsive twitchings of the muscles, and continues from a few minutes to several hours. The nature of this affection is unknown, and no definite mode of treatment has been discovered. Sometimes a division of the nerve has been recommended, otherwise the general treatment resorted to in other cases of neuralgia may be adopted. (*See* NEURALGIA.)

TICKS, *tiks* (*Ixiodidæ*), a species of minute animals of a parasitical nature, belonging to the general division *Acaridæ*. Ticks have the mouth shaped like a sucker, and they are found in thick woods hanging on low plants, and ready to attach themselves to the coats of horses, cows, dogs, and other animals which approach them. They bury their sucker deep in the skins of the animals they attack, and work their way down into the flesh, preying upon the blood. They attach themselves so firmly to the victims, and multiply so fast, that many horses and cattle often perish from exhaustion, on account of the blood of which they have been deprived. The sheep-tick, *Ixiodes reticulatus*, when inflated with blood, is about half an inch long. The water ticks, *Hydrachnidæ*, form another variety of the species, and live in the water always; but in habits and mode of life resemble the others in nearly every particular.

TIDES, *tidez* (Ang.-Sax.), the alternate rising and falling of the waters of the ocean which is to be observed on all its coasts and estuaries. The rising is designated as the flood, and the highest elevation as high water; the falling is termed the ebb, and the lowest depression low water. The duration of high and low water without apparent change of level is known as the stand; and the cessation of the ebb and flood streams, or tidal currents, is called slack water. The popular explanation of the tides, as depending upon the law of gravitation, is sufficiently simple. If the earth be conceived to be wholly or in a great degree covered with water, and subject to the attraction of the sun, the force of which is inversely as the square of the distance, it will be obvious that while the whole earth will fall towards the sun with a velocity proportioned to the aggregate attraction upon its solid portions, the water nearest to the sun, being accelerated with a greater force, will approach the sun more rapidly than the solid core; it will thus run from all sides into a protuberance beyond the form of equilibrium of the earth's attraction and rotation, until the pressure of the elevated mass equals the difference in the attraction of the sun. Moreover, a similar protuberance will be formed on the side opposite to the sun, since the particles of water, being solicited by a less force than the solid core, will fall more slowly towards the sun, and, as it were, remain behind. The same considerations hold good in regard to the attraction of the moon upon the earth and the waters surrounding it; for although we are in the habit of considering the moon as simply revolving round the earth, it must be remembered that the attraction is mutual; that both bodies describe orbits about their common centre of gravity, and that while the moon obeys the attractive force of the earth, the latter equally follows that of the former, by which it is at every instant of time drawn from the path it would pursue if that influence did not exist. As a necessary consequence of the elevation of the water in the regions nearest to and most remote from the attracting body, there must be a corresponding depression below the mean level of the sea at points distant 90° from the vertices of the protuberances, or at the sides of the earth, as seen from the sun or moon. It will be seen, therefore, that, taking the whole earth into view, there are always two high tides diametrically opposite to each other, and two low tides also, midway between the high ones. The high tides are two great waves or swells, of small height, but extending each way through half a right angle: these waves follow the moon in its monthly motion round the earth, while the earth,

turning on its axis, causes any given place to pass through each of these swells and the intervening depressions in a lunar day, or 24 hours 50 minutes. At new and full moon, when the sun's and moon's actions conspire, the tides are highest, and are called *spring tides*; but at the first and last quarters of the moon the action on one body tends to counteract that of the other, and the tides, both at ebb and flow, are smallest, and are called *neap tides*.

TIGER, *ti'ger* (Lat. *tigris*), (*Felis Tigris*, Linnæus), an animal which, like the lion, is considered to be a distinguive type of the family *Felidæ*. It is a most ferocious and bloodthirsty animal, and ranks next to the "king of beasts," although in ferocity it may be fairly considered his superior. There is only one species, and that is termed the *Royal tiger*. His colour is principally of a bright orange; his throat, face, and under portion of the body nearly white; and the whole surface of his coat banded with transverse stripes of a jet-black colour. Although somewhat less than the lion, the tiger is scarcely inferior in strength, while in the splendour of his coat and the general beauty of his form and appearance, he is greatly superior. He has no mane, and his average length is about eight or nine feet, while his height from the ground is between three and four feet. Some specimens have occurred of from fifteen to eighteen feet in length, and of proportionate height; but the dimensions above given may be taken as the average size of the generality of the animals. In strength and activity the tiger exhibits the most stupendous powers. The distance he clears in his bound, and the wonderful celerity with which he accomplishes it, is marvellous, and hardly any beast, even the elephant, can resist the impetus of his attack. He can carry off a man with ease in his mouth, and has been seen to drag away a large buffalo apparently without effort. Tigers are not found on the African continent, but they abound in India, and are found in China; while in Sumatra, even at the present day, they exist in such large numbers that they are a positive scourge to the natives, whole villages being depopulated by their ravages, and all the cattle in the neighbourhood destroyed. In India, however, the largest varieties are found; and there, as well as in Sumatra, the superstitious natives worship him through fear. Sir Stamford Raffles, the eminent naturalist, gives various accounts of the superstitious fears of the natives in reference to the tiger. He mentions that while he was in Sumatra, "one of the villagers, in the vicinity of Bencoolen, told me that his father and grandfather were carried off by tigers; and there is scarcely a family that has not lost some of its members by them. In many places the inhabitants appear to have resigned the dominion to the tigers, and take few precautions against them, regarding them as sacred. The natives hold the transmigration of souls, and call the tiger their *nene*, or grandfather, upon the supposition that the souls of their ancestors are dwelling in the tigers. On the banks of one of the rivers, above a hundred persons were devoured by the tigers in a single year. When the tigers enter a village, the people prepare rice and fruits, and place them at the entrance, supposing that the tigers will be pleased with this hospitable reception, and pass on without doing them any harm." In a volume lately published by a celebrated Anglo-Indian hunter, termed "The Hunting-Grounds of the Old World, by the Old Sheckary," it appears that this superstitious regard for the tiger by the natives has not by any means died out, but is still as common as ever. In India, hunting the tiger is a very popular sport, and has done much good, by partially getting rid of the animal; for as the European dominion has become extended, the race of tigers has as proportionately decreased. The sport is carried on principally by hunters mounted on elephants, as no horse will face the tiger even on coercion. Formerly the East-India Company offered about ten rupees, *i.e.* forty shillings, a head for every tiger killed.

TIGER-BEETLES (*Cicindela* or *Cicindelidæ*), a gen. and fam. of coleopterous insects, remarkable for their rapid and vigorous flight. They are generally found in dry meadows, sandy plains or heaths, and on the banks of rivers. The common green tiger-beetle is a very beautiful insect, being, as its name implies, of a bright grass-green colour, having five small round cream-coloured spots to mark the *elytra*, black and prominent eyes, with head, thorax, and limbs, which are long and slender, of a rich gilded cast.

TIGER-CAT. (*See* CAT.)

TIGER-MOTH, the type of the *Arctiidæ*, a fam. of nocturnal insects belonging to the order *Lepidoptera*. The common tiger-moth (*Arctia Caja*) is a very beautiful insect, measuring about three inches across the expanse of its fore wings, which are of a rich brown colour, with numerous irregular strokes and spots of creamy white; while the hind wings are of less size, and are diffused with bluish-black spots. The larvæ of these insects are covered with thick long hair, and present a most peculiar appearance. The *Arctia chrysorrhœa* is another variety, and its larvæ are very destructive to trees, particularly fruit-trees. They are gregarious, and sometimes appear in large numbers, so as to really become a minor plague. It is mentioned that in the year 1782 they were so very destructive about the neighbourhood of London, that subscriptions were opened in the metropolis for the purpose of employing the poor in collecting their webs; and it is asserted that no less a quantity than eighty bushels of them were collected and burnt in the parish of Clapham in one day.—*Ref.* Baird's *Dictionary of Natural History*.

TILES, ENCAUSTIC. (*See* ENCAUSTIC TILES.)

TILIA, *til'e-a*, in Bot., a gen. of the nat. ord. *Tiliaceæ*. *T. europæa* is the common lime or linden tree. The inner bark is used in the northern parts of Europe, more particularly in Russia, for making mats, which are commonly known as *bast mats*. This bast is one of the substances used by gardeners for tying up plants. The flowers of the lime are very fragrant when fresh, and an infusion of them is used medicinally on the continent for its expectorant and antispasmodic properties. The wood of this and other species is very white and smooth, and is much employed for carving.

TILIACEÆ, *til-e-ai'-se-e*, in Bot., the Lime or Linden fam., a nat. ord. of *Dicotyledones*, sub-class *Thalamifloræ*. It resembles in many respects the *Malvaceæ*, *Sterculiaceæ*, and *Bytneriaceæ*, but may be at once distinguished from them by having a glandular disk; by the stamens not being monadelphous, and by the authers being 2-celled. From all other thalamifloral orders it may be known by its alternate, entire, stipulate leaves, valvate æstivation of calyx, floral envelopes in four or five divisions, hypogynous stamens, 2-celled authers, hypogynous glandular disk, and many-celled fruit with axile placentas. There are 34 genera and 350 species. A few are found in the northern parts of the world, where they form large trees; but the majority are tropical herbs, shrubs, or trees.

TILING, *til'-ing* (Sax. *tigil*, a tile), a term applied to the process of covering a roof with tiles. A tile is a very thin brick, or plate of baked clay, principally used for covering roofs, but occasionally for paving floors, constructing drains, &c. The clay used for making tiles is purer and stronger than that used for making bricks. When too adhesive, the clay is mixed with sand before passing it through the pug-mill. In general, the clay is exposed to the atmosphere and frost if possible, in layers. This process is called *weathering*. Exposure to sunshine, however, is said to answer equally well; but what weathering is remains a mystery; it is technically said "to open the pores of the clay." After being allowed to "mellow" under water, the clay is passed through the pug-mill and well kneaded or tempered; after undergoing the process of moulding, the tiles are then baked in a kiln or furnace.

TILLAGE, *til'-laj* (Ang.-Sax.), the art or practice of tilling or cultivating the soil. Lands kept under the plough, that is, cropped with annual or biennial plants, which require a continual change of the surface soil by stirring and turning with the plough, are called *tillage lands*.

TILLANDSIA, *til-land'-se-ä*, in Bot., a gen. of the nat. ord. *Bromeliaceæ*. *T. usneoides*, the tree-beard or old-man's beard, appears as a mass of dark-coloured fibres hanging from the tree on which it grows. It is a common plant in South American forests. The hanging fibres form the article known in commerce

Spanish moss, and employed for stuffing cushions, bird-skins, &c.

TIMBER, *tim'-ber* (Sax.), a term employed in carpentry to denote that sort of wood which is suitable for buildings, or for ships, furniture, utensils, tools, carriages, fences, &c. The term is applied to standing trees which are suitable for any of these purposes, or to the beams, scantlings, rafters, boards, &c., which are hewed or sawn from such trees. The timber-trade is one of very great extent and importance. Owing to the reduction of freight and duties, and the greater facility of transportation, the price of timber has fallen very materially since 1815.—*Ref.* MacCulloch's *Dictionary of Commerce.*

TIME, *time* (Sax. *tim*, Lat. *tempus*), is the general relation in which all things perceptible stand to each other in regard to their origin, continuance, and dissolution. It is a form necessary to enable the mind to unite successive periods of existence. It is not an external object, nor a mere relation of individual things to each other; but is infinite, like the phenomena which are submitted to this form in our perceptions. Accordingly, we also distinguish the past, present, and future as its component parts, which pass continually into the succeeding. In order to measure the succession and duration of particular things and events, the great motions of the heavenly bodies, which always remain the same, particularly of those bodies which are most closely connected with the earth, have been taken as standards; hence the physical or astronomical time. Such a measure of time is afforded by nature herself in the rotation of the earth on its axis. This gives rise to the sidereal time; but as the sidereal time will not serve for the purposes of common life, it was necessary to resort to the solar time. The latter, indeed, is unequal, and neither agrees with the sidereal time nor with that indicated by a clock; but this evil is remedied by the equation of time, through which the true solar time is changed into mean time.

TIME, in MUS., is the measure of sounds with regard to their duration, and is of the greatest importance. It may be divided into two principal divisions,—common and triple; these may be again divided into simple and compound. Simple common time is expressed by the letter C, either plain or with a line drawn through it, and generally contains four crotchets in a bar. Sometimes, however, there are only two; in which case it is marked thus $\frac{2}{4}$, the 4 showing the measure note to be a crotchet, and the 2 indicating that there are two crotchets in a bar. Compound common time takes place when two triple bars are joined in one, and is divided into four kinds, marked thus, $\frac{6}{4}$ $\frac{6}{8}$ $\frac{12}{8}$ $\frac{12}{16}$. Simple triple time is of three kinds, marked by the figures $\frac{3}{2}$ $\frac{3}{4}$ and $\frac{3}{8}$; while of compound triple time there are only two species, viz. $\frac{9}{8}$ and $\frac{9}{16}$. The speed of a movement is also regulated by certain Italian words placed at the beginning; as for example, *presto*, quickly, or *andante*, slowly. Maelzel's metronome is of the greatest use in determining the speed of a movement, as it does so with much greater accuracy than any words or combination of words. (*See* METRONOME.)

TIMOTHY, EPISTLES OF ST. PAUL TO, *tim'-o-thy*, is the name of two books of the New Testament, of whose authenticity there has never been any reasonable cause to doubt, and it has only been called in question by the hypercriticism of modern Germany. The dates of these epistles are uncertain and much disputed, but probably the first may be referred to about the year A.D. 64, the second to 65. The design of the first epistle is partly to instruct Timothy in the duties of that office with which he had been intrusted; partly to supply him with credentials to the churches which he might visit; and partly to furnish through him guidance and direction to the churches themselves. In the concluding portion, the apostle discourses against some vices to which the Christians at Ephesus seem to have been prone. The second epistle was written when the apostle was a prisoner at Rome; and its design is partly to inform Timothy of his circumstances, and partly to utter his last warning voice against the errors and delusions which were corrupting and disturbing the churches. It contains a series of exhortations to Timothy to be faithful in his zeal for sound doctrine, under affliction and persecution, careful to maintain a deportment becoming his office, and diligent in his endeavours to counteract the erroneous doctrines of false teachers.

TIN, CHEMISTRY OF, *tin* (Sax.).—Tin is a white, malleable, easily fusible metal, not much affected by exposure to dry or moist air at ordinary temperatures, but becoming oxidized superficially when heated, burning with a brilliant flame if the temperature be raised sufficiently high. It dissolves in hydrochloric acid, with the evolution of hydrogen, forming hydrated chloride of tin. Strong nitric acid acts on it violently, producing an insoluble hydrated binoxide of the metal, a considerable amount of ammonia being formed at the same time by the decomposition of the water and nitric acid present. Cold dilute sulphuric acid has no action on it, but if the concentrated acid be used, the metal is converted into the sulphate, while sulphurous acid escapes. Hot dilute sulphuric acid also converts it into sulphate of tin, hydrogen being evolved. The tin which is imported from Banca is nearly pure; that made in England generally contains small quantities of arsenic, copper, iron, and lead. In its chemical characteristics, tin has but few alliances. In some of its properties, however, it seems related to tantalum and titanium. Its chemical combinations are numerous and important, and its resistance to oxidation and to the action of vegetable acid renders it extremely useful for domestic purposes.

TIN, CHLORIDE OF.—There are two chlorides of tin,—the protochloride and the per- or bi-chloride. The protochloride, $SnCl_2$, may be prepared in the anhydrous state by the action of dry hydrochloric acid on tin at a gentle heat. The hydrated chloride is obtained by dissolving the metal in hydrochloric acid diluted with an equal bulk of water. It crystallizes in transparent needles, containing two equivalents of water. It is a powerful reducing agent, and is much used by dyers for altering reducible colouring matters, such as sesquioxide of iron and peroxide of manganese. It is also used as an antichlore. It forms crystallizable double salts with the alkaline chlorides. The bichloride, perchloride, or fuming liquor of Libavius, $SnCl_4$, is made by passing chlorine over an inclined tube, fitted to a receiver, and containing pieces of tinfoil rolled up. When pure, it is a colourless liquid, evolving suffocating white fumes in the air. Dropped into water, it forms a hydrate, crystallizing with five equivalents of water. It forms salts with the alkaline chlorides. It is used to a considerable extent in solution in dyeing. It absorbs sulphuretted and phosphuretted hydrogen, and forms a compound with ammonia. In some respects it plays the part of an acid—chlorostannic acid.

TIN, METALLURGY OF.—Tin is a white metal, with a slight yellowish tinge and a brilliant metallic lustre. It is wanting in tenacity, but is extremely malleable at a temperature of 212°. It has a great tendency to crystallize, and its crystalline form may be easily shown by rubbing a piece with a little dilute nitric or hydrochloric acid, when it assumes the appearance known as *moire métallique*. By slow cooling it may be procured in octahedral crystals, and on bending a piece of tin backwards and forwards, a peculiar crackling or grating sound is heard, from the friction of the internal crystals. It fuses at 442° Fahr., but it is not sensibly volatilized at that or any higher temperature. If it is stirred while melted until it cools, it may be obtained in a state of powder. Its brilliancy, and power of resisting atmospheric changes, render it exceedingly useful in the arts as a covering for other metals. What is ordinarily called "tin" in domestic language, is sheet iron covered with a layer of tin, a process which is explained farther on. Copper is also very well fitted for being coated with this metal. In India, it is applied instead of steel and iron to articles by way of ornament, and there is no reason why our art workmen should not take pattern by their more artistic Eastern brethren. For the manufacture of tin plate, the best soft charcoal iron is obliged to be used. After it has been rolled and cut to the requisite size, its surface is made chemically clean by immersion for a few minutes in dilute sulphuric acid. The sheets are then heated to a red heat in a reverberatory furnace, withdrawn, allowed to cool, hammered flat, and passed between polished rollers, and are now washed in dilute acid. This preparation is needed to free the surface of the iron from the slightest portion of oxide, to which the

tin would not adhere. In order to tin them, they are plunged one by one into a vessel of tallow, from which they are transferred to a bath of tin. From this they are taken, after a certain time, allowed to drain, and dipped again. The superfluous tin at the edge of the plate is removed by dipping it in the melted tin once more, and detaching it by giving the plate a sharp blow. The tin and iron form a perfect alloy with each other. The appearance known as *moire métallique* is given by sponging the surface of the tin with dilute nitrohydrochloric acid, washing with water, and afterwards varnishing with plain or coloured varnish. Copper is tinned in the same way, but with greater ease, it being so much less difficult to clean the surface of that metal than iron. Tinfoil is made by beating pure tin to the requisite thinness. The alloys of tin are numerous and important. The principal of these are Britannia metal, consisting of equal parts of brass, tin, antimony, and bismuth; pewter, 4 tin and 1 lead; queen's metal, 9 tin and 1 each of antimony, bismuth, and lead; the various solders; bell-metal, 78 copper, 22 tin; bronze, copper, with 4 to 0 per cent. of tin; gun-metal, 78 copper and 22 tin; and several others. Speculum metal, used for the mirrors of reflecting telescopes, is a steel-white hard brittle alloy, of 1 part of tin and 2 of copper. An amalgam of tin and mercury is used for silvering looking-glasses. A sheet of tinfoil is laid on an edged slab of stone carefully levelled, and mercury is poured on it until it forms a layer ⅛ inch thick. Glass is laid down on this, and the table is tilted to let the superfluous mercury run off, weights being gradually placed on the glass to facilitate the operation. Tin ores are met with but in few localities. Cornwall, Banca, Mexico, and some parts of Australia, are the only important tin-yielding districts. The most celebrated tin-mines are those of Cornwall, which have been worked uninterruptedly from the earliest historic periods. The Cornish tin-veins are generally found associated with copper, and almost invariably run from east to west. The ore is frequently found in alluvial soils, whither it has been carried by the action of water. Hence the name applied to the ore found under such circumstances—stream tin. By following the deposit to its source, the richer seam is generally found. The only ore of importance is tinstone, a hard dark-brown crystalline body, consisting of the binoxide in a crystalline condition. To extract the metal, the ore is first stamped and washed, to get rid of the lighter particles of sand or earth adhering to it. It is then roasted, to free it from arsenic and sulphur, and again washed to carry off the sulphate of copper and oxide of iron. The washed ore is mixed with from one-fifth to one-eighth its weight of powdered anthracite or charcoal, and a small portion of lime to form a fusible slag with any of the remaining gangue. The charge is placed on the hearth of a low-crowned reverberatory furnace, and the doors are closed up. Heat is applied very gradually for five or six hours, care being taken to raise the temperature high enough to cause the carbon to reduce the tin without melting the silicious gangue, which would form with the binoxide an enamel troublesome to remove. When nearly all the tin is reduced, the heat is raised considerably, the slags being thus rendered fluid and capable of floating on the top of the melted metal. The tin is then run off into cast-iron pans, from which it is ladled off into moulds to form ingots. The tin thus procured is far from being pure; it is therefore submitted to the process of ligniation, which consists in heating the ingots to incipient fusion. By this means the purer tin, which fuses at a comparatively low heat, separates, running down and leaving the impure portions behind. The less fusible portion, when remelted, forms *block tin*, and the part which has run out is again melted and agitated with wet stakes. The steam thus formed bubbles up to the surface, carrying with it all the mechanical impurities contained in the tin. The mass is then skimmed and allowed to cool. When just about to set, the upper half is ladled out, the other metals and impurities having sunk into the bottom half, from the tendency that this metal has to separate from its alloys. The finest quality of tin is frequently heated to a temperature just short of its melting-point. At this heat it becomes brittle, and is broken up into masses, showing the crystals of the metal, and forming what is known as *grain tin*. The formation of crystals is to some extent a guarantee of its purity, since impure tin does not become brittle in this way. English tin generally contains small quantities of arsenic, copper, iron, and lead.

TIN, OXIDES OF.—There are two oxides of tin,—the protoxide and the binoxide. The protoxide is prepared in a variety of ways, too troublesome for description here, and is only interesting in a chemical point of view. When heated in air, it burns like tinder, and is converted into the binoxide, which is described under the head of STANNIC ACID. The only ore of tin, tinstone, is a form of the binoxide.

TIN, SULPHIDES OF.—There are two sulphides of tin,—the protosulphide, formed by fusing together metallic tin and sulphur. The bisulphide, when prepared in the dry way, is known by the name of *aurum musivum*, or mosaic gold, and is used as bronze-powder in coarse decorative works. It is prepared by fusing together seven parts of flowers of sulphur and six of sal-ammoniac, with an amalgam made of twelve parts of tin and six of mercury. The ingredients are kept in a melted condition until no more white fumes issue from the flask, and the bisulphide is found as a yellow crystalline layer at the top. A second sublimation is necessary to give it its greatest degree of brilliancy.

TISSUE, *tis'-shoo* (Lat.), in Anat., texture, or organization of *parts*. The peculiar intimate structure of a part is called its *tissue*. A part of a fibrous structure is called a *fibrous tissue*. The organs of the body are made up of simpler elements, some generally diffused through the body, and others peculiar to particular organs. These simpler structures are called the *tissues* of the body; as the cellular *tissue*, the mucous *tissue*, &c. The *cellular tissue* is the cellular membrane.

TISSUE, ADIPOSE. (*See* ADIPOSE TISSUE.)

TISSUE, EPIDERMAL. (*See* EPIDERMAL TISSUE.)

TISSUES, *tis'-shooz*, in Bot., compound structures formed by the combination of different kinds of cells. The principal tissues may be classed under two heads; namely, *Parenchyma*, or *cellular tissue*, and *Prosenchyma*, or *woody tissue*. Tissues of the former class constitute the entire structure of the lower plants, as *Algæ*, *Fungi*, and *Lichens*. The higher plants are made up of tissues of both classes.

TITANIUM, *ti-tai'-ne-um*,—symbol Ti, atomic number 25, spec. grav. 5·3,—a metal occurring in the somewhat rare minerals rutile, anatase, brookite, and titanic iron. The first three consist almost entirely of the binoxide of titanium or titanic acid. Riley and others have found this metal largely diffused throughout nature in most clays. Stourbridge clay has been found to contain 1½, and London clay ½ per cent. It forms a protoxide, a sesquioxide, and a binoxide, the latter acting as an acid. In many of its reactions it closely resembles tin. The metal has as yet only been obtained as a greenish-grey powder. In many respects it is a very singular metal. Its affinity for nitrogen is extraordinary. The red copper-coloured cubical crystals found in the hearths of blast-furnaces were at one time supposed to be the metal, but are now found to be a compound of the cyanide and nitride of the metal. At the highest temperature of the blast-furnaces this compound volatilizes without decomposition. M. Mushet has assumed that titanium alloys with iron, producing steel of superior quality; but from the experiments of Deville, Riley, Percy, and others, it appears that no such alloy exists. It is, however, certain that ores containing titanic iron produce steel of excellent quality, but it is very possibly on account of their freedom from other impurities, and not from their containing titanium.

TITHES, *tithes* (Lat. *decimæ*; Sax. *teotha*, i. e. tenth), in Eccl. Law, are defined to be "the tenth part of the increase yearly arising and renewing from the profits of lands, the stock upon lands, and the personal industry of the inhabitants;" the first species being usually called *predial*, as of corn, grass, hops, and wood; the second *mixed*, as of wool, milk, pigs, &c., consisting of natural products, but nurtured and preserved in part by the care of man, and of these the tenth must be paid in gross; the third *personal*, as of manual occupations, trades, fisheries, and the like, and of these only the tenth part of the clear gains and profits

due. Under the Mosaic economy, the tenth part of the yearly increase of their goods was due by the children of Israel to their priests; but the system has evidently an earlier and more extended origin, for we read of Abraham, on his return from his expedition against the five kings, giving the tenth part of his spoils to Melchisedek, king of Salem, and traces of the same custom are to be found among several of the nations of antiquity. It is generally believed that tithes first began to be generally settled upon the Church in the 4th century. In this country, they were probably introduced at the time when Christianity was planted among the Saxons by Augustine the monk, about the end of the 6th century. The payment of tithes in the Christian Church was for some time at first voluntary; but as the influence and power of the Church increased, it came to be claimed as a right, and the power of enforcing it conceded by the temporal sovereigns. The first recorded instance of this in England occurs towards the end of the 8th century, when Offa, king of Mercia, gave the Church a civil right to collect and recover tithes. By the original law, all the land of the country was tithable, except such as belonged to the Crown and to the Church itself. From various causes, however, a large portion of England and Wales is now tithe-free. Much of the church lands, which at the Reformation were disposed of to laymen, and would thus have become tithable, were specially exempted; some are exempted by special arrangement entered into with the parson or vicar, with consent of the ordinary and the patron of the living; and some are exempted by prescription, which supposes a composition. By 13 Eliz. c. 10, however, all subsequent compositions are limited to a period of three lives, or twenty-one years. Tithes were originally paid in kind; and, notwithstanding the inconveniences and vexations of such a system, no regular attempt was made till very recently to remedy it. By Act 6 & 7 Will. IV. c. 71, a board of commissioners was appointed for the purpose of converting the tithes into a rent charge, payable in money, but varying in amount according to the average price of corn for the seven preceding years. The amount of the tithes was to be calculated on an average of the seven years preceding Christmas, 1835, and the quantity of grain thus ascertained was to remain for ever as an annual charge upon the parish; and the annual money value was to be ascertained from the returns of the comptroller of corn, who publishes annually in January the average price of an imperial bushel of wheat, barley, and oats, computed from the weekly averages of the corn returns during the seven preceding years. The principles of this act, improved and extended by certain subsequent ones, have been of great benefit. A voluntary agreement between the owners of the land and of the tithes is first promoted; failing which, a compulsory commutation is effected by the tithe commissioners. An improvement has also been made in the mode of recovering tithes consequent upon the commutation.

TITS, TITMICE, *tits, tit'-mise*, are a sub-fam. of birds belonging to the dentirostral tribe of the ord. *Passeres* and fam. *Luscinidæ*. They are distinguished by short conical bills, which have their tips entire, and their base covered with a few short stiff bristles. The wings are short and the tail long; the tarsi rather long and thick; the inner toe the shortest; and all the toes furnished with strong curved claws. The titmice are active little birds, and are commonly known in England under the names of tits, titmice, and tomtits, and many are distinguished for the beautiful colour of their plumage. They inhabit principally countries abundant in wood, and they feed on the insects and larvæ which they find on the bark and leaves of trees and shrubs. In this pursuit they exhibit their gracefulness and activity to great advantage, and may be seen clinging round the branches and twigs of trees in the most sprightly manner. There are seven species known in Great Britain, of which the largest is the great tit (*Parus major*), which is about five inches in length. It frequents houses, and is said to be very mischievous to thatched houses, as it pulls out the straw in pursuit of insects and grain. It is also said to kill birds even bigger than itself, in order to feed on its brains, which it obtains by splitting their skulls by repeated strokes of its own little beak. The blue tit (*Parus cærulæus*) is another variety, and is so termed from the colour of its plumage. It builds its nest in the hollows of trees, and when disturbed by men makes a buzzing noise and pecks at the intruder; whence it has attained its name of "Billy Biter" in some counties, as mentioned by Mr. Yarrell. Besides these, there are the crested tit (*P. cristatus*), the coal-tit (*P. ater*), the marsh tit (*P. palustris*).

TOAD, *toad* (Sax. *tade*), a tailless Batrachian reptile, belonging to the gen. *Bufo*. It is harmless, and resembles the frog, but is less active. The frog leaps, the toad crawls. The toad feeds upon insects, flies, ants, &c.; it is preyed upon by owls, buzzards, snakes, &c.; otherwise the toad attains to a considerable age, some remarkable instances of which have been recorded. (*See* FROG.)

TOBACCO, *to-bák'-ko*, is the common name of the plants comprised in the monopetalous genus *Nicotiana*. According to Humboldt, the term tobacco was used by the Carribbees to designate the pipe in which they smoked; which term having been transferred by the Spaniards from the pipe to the herb itself, it has been adopted by other countries. Other accounts say that the name is derived from the province of Tabaca in St. Domingo, whence it was introduced into Europe in 1559 by a Spanish [illegible]ondeo. Afterwards, through the agency of Jean Nic[illegible], French ambassador at Lisbon, it was taken to Paris where, in the form of a powder, it was used by Catherine de' Medici. It was some time after the use of tobacco as snuff that the smoking of it began. It is generally believed that tobacco was introduced into England by Sir Walter Raleigh and his companions after their return, in 1586, from their unsuccessful attempt to colonize Virginia. Very shortly after its appearance in the New World, the herb was prohibited both in England and many other parts of Europe. The physicians declared it hurtful to health, the priests denounced its use as sinful. Pope Urban VIII. issued a bull excommunicating all persons found taking snuff whilst in church. Sultan Amurath made smoking a capital offence; whilst the penalty paid for smoking in Russia was to have the nose cut off. The strenuous way in which it was opposed by James I. of England is a matter of curious history. Without the consent of his parliament, he raised the duty on the weed from 2*d.* to 6*s.* 10*d.* per pound; and his famous "Counterblaste to Tobacco" declared smoking "loathsome to the eye, hurtful to the nose, harmful to the brain, dangerous to the lungs, and in the black stinking fume thereof nearest resembling the horrible Stygian smoke of the pit that is bottomless." But kingly and priestly wrath were futile against the far and wide extension of the use of the herb, and at the present day it has become perhaps the most generally diffused luxury in existence; for according to an estimate made by Mr. Crauford, the average consumption of tobacco by the whole human race, of 1,000 millions, is seventy ounces a head per annum. The largest growers of tobacco are the Southern States of America. It is raised early in spring on beds, and when the plants have acquired four leaves, they are set in the fields, a distance every way of three feet being preserved between the plants. It is very sensible to frost, and in consequence of the destructive invasion of a certain worm which infests it, the plant has to be examined every morning and evening. When the plant has put forth eight or nine leaves, and is prepared to have a stalk, the top is nipped off, so that the leaves may grow larger and thicker. When the leaves become brittle, they are considered fit for cutting. After being cut, they are allowed to lie for some time, afterwards being conveyed to a shed, when they are hung up to sweat and dry. When perfectly dry, the leaves are stripped from the stalks, and made up into small bundles. These are laid in heaps in the open air, and covered with blankets. After being allowed to carefully heat for some time, they are stowed in casks for exportation. The herb is manufactured into three different forms, usually by three distinct classes of traders. It is cut into shreds for smoking in pipes, its leaves are rolled up into compact cylindrical bundles to be smoked as cigars, and a compound, partly of the leaves and partly of the stalks of the leaves, is ground into a state of powder to be taken as snuff. In manufacturing the different varieties of tobacco to be smoked in a pipe, the

stalks are stripped from the leaves, and the leaves are pressed in large quantities into the form of a cake, being often moistened during the process, and finally they are cut into shreds by knives moved by machinery. In the case of that variety of cut-tobacco known as *bird's-eye*, a portion of the stalks is cut up with the leaf. *Shag* tobacco is manufactured from the darkest-coloured leaves; *pig-tail* tobacco is spun into long cords. Snuff is made sometimes from the stalks only, or from the leaves only, or from a mixture of both stalk and leaf. Scotch snuff is either entirely of stalk, or with a very slight admixture of the leaf. The peculiar qualities of "high-dried" snuffs are owing to a degree of drying, which imparts a scorched flavour to them. In making snuff, various matters are added for giving it an agreeable scent. The tobacco derived from the Southern States of America is the kind most frequently smoked in the pipe; the produce of Havannah and Manilla is more generally made up into cigars and cheroots. Although the high duty of 5*s.* per pound (until 1863 9*s.* per pound) upon imported foreign cigars makes it expedient to import and manufacture the leaf in England, the cigars of Havannah are largely consumed on account of their superior flavour. The cigar is composed of two distinct parts,—the inside and the cover, the leaf for the latter being of a finer texture than that made use of for the inside. The leaves are damped the night previous to their being made up. The cigars are rolled into shape by enveloping the inner leaves within an outer covering. One end is then screwed up to a point, whilst the other is cut off to a particular gauge of length. Of the best common cigars, a workman can make a thousand a day, of the finest Regalias six hundred. The best cheroots come from Manilla, and women only are employed in making them. A cheroot has both its ends cut off. Cigars are at the present time largely imported from Germany, Switzerland, and many other parts of the continent, as well as from Havannah, Manilla, and Bengal. The growth of tobacco is prohibited in England; but it is extensively cultivated in France, Prussia, Holland, Belgium, the southern provinces of Russia, in Turkey, in Syria, and in India. Very little is grown, in Canada and in the British West Indies. The finest tobacco is derived from the island of Cuba; the produce of Manilla is perhaps the next in excellence, whilst the Southern States of America produce the greatest quantities of the herb.

TODDY, *tod'-de*, the name usually given to the fermented juice of the palm-tree. The juice is commonly procured by cutting the spathe or flower-head. As it flows from the wounded tree, it is very sweet; but after standing some hours, it spontaneously ferments and becomes intoxicating. Most of the palms furnish toddy. In the islands of the Indian Archipelago, the Moluccas and the Philippines, it is prepared from the sap of the Gommuti palm (*Saguerus saccharifer*). In India generally, it is the palmyra palm (*Borassus flabelliformis*) which is chiefly bled for toddy. In Bahar, the date-palm (*Phœnix dactylifera*) is preferred, because the sap ferments more readily. Palm wine of the best quality is said to be furnished by the Guinea-oil palms (*Elais*) and the cocoa-nut palm (*Cocos nucifera*). It is also produced in great abundance by the beautiful Indian palm *Caryota urens*, which, according to Roxburgh, will often yield a hundred pints of toddy in twenty-four hours. The strong spirit called *Batavian arrack* is prepared by distilling toddy.

TOGA, *to'-gă* (Lat.), the name given to the principal outer garment worn by the Romans. As only free-born citizens were allowed to wear the toga, it was considered an honorary garment, and at the same time distinguished the Romans from other nations. For this reason the Roman people were called *Gens togata* and *Togati*. The toga was thrown over the left shoulder, and passed under the right arm, which thus remained free. It was sewed together from the breast downwards, and as the Romans wore no pockets, the hollow in the folds of the breast, called *sinus*, was used to put small articles in. The rank of the citizen was indicated by the colour, the fineness of the wool, and the ornaments attached to his toga. It was generally white. Rich persons wore wide, and poor persons narrow togæ. A pure white toga was always worn by the candidate for an office; a black toga was worn for mourning. The *toga prætexta* was worn by all superior magistrates and priests; it was ornamented with a purple stripe. This toga was also worn by boys and girls; by the former till they were seventeen years of age, and by the latter till their fourteenth year; after which periods the former changed it for the toga *virilis*, which was the simple white toga. A conqueror, or other distinguished person celebrating a triumph, wore a toga adorned with gold and purple. The material of which the toga was generally made was woollen cloth. Under the Empire, persons of rank used to have their togas made of silk.

TOLERATION, ACT OF, *tol'-e-rai'-shun*, an act passed in the reign of William and Mary, by which the dissenters were relieved from all penalties for not attending the parish church, and for going to their separate meetings. The Socinians were excepted, but not so much because they were nonconformists, as because their opinions were considered as militating against the essential doctrines of the Gospel. The benefit of the act was extended in a special manner to the Quakers.

TOMATOES. (*See* LYCOPERSICON.)

TON. (*See* WEIGHTS AND MEASURES.)

TONE, *tone*, in Mus., is literally a fixed sound of a certain pitch; but the term is often used incorrectly to signify the distance between two sounds; as in the *major* and *minor tones*. In speaking of the sound or voice of any instrument, with reference to its quality, the word tone is also used; as a rich *tone*, a full *tone*, or a mellow *tone*.

TONGUE, *tung* (Sax. *tung*), in Anat., an organ found in most animals. The human tongue is a soft fleshy viscus, situated interiorly in the cavity of the mouth, very movable in every direction, and constituting the organ of taste (which *see*). Its movements are chiefly subservient to speech and the prehension and swallowing of food; and besides taste, it is also highly endowed with the sensation of touch. The sensitive power of the tongue resides in the membrane which covers it, the motor power in the interior. Indeed almost the entire substance of the tongue is composed of muscular fibres running in different but determinate directions, many of which belong to muscles which enter at its base and under-surface, and attach it to other parts. Hence the great variety and regularity of its movements, and its numerous changes of form. Between the several layers and bundles of muscular fibres, there is always found a considerable quantity of soft fatty tissue, and also a very fine areolar web. It is abundantly supplied with arteries, veins, and nerves, the last being,—(1) the lingual or gustatory branch of the fifth pair; (2) the sublingual branch of the glosso-pharyngeal; and (3) the hypo-glossal nerve. The upper surface of the tongue is covered all over with numerous projections or eminences named papillæ. Towards the tip and free borders they gradually become smaller, and disappear on the under surface. These are doubtless chiefly concerned in the special sense of taste, but they also possess in a very high degree that of touch.

TONNAGE, *tun'-naij*, expresses the capacity of burden possessed by a vessel.

TONQUIN BEAN. (*See* DIPTERYX.)

TONSILS, *ton'-silz* (Lat. *tonsillæ*), in Anat., are two complex glands, situated one on each side of the fauces, between the anterior and posterior arches of the soft palate. In relation to the surface of the neck, the tonsil corresponds to the angle of the lower jaw, where it may be felt beneath the skin when it is enlarged. They are of an elongated oval form, usually about six lines in length, and four in width and thickness, but they vary much in size in different individuals. Each is composed of a number of smaller glands, and presents a number of orifices opening on the surface of the mucous membrane. The nature of the secreted fluid is not certainly known, but it bears a general resemblance to saliva, and doubtless serves a similar purpose. The tonsils are largely supplied with blood-vessels and nerves.

TONSURE, *ton'-shure* (Lat. *tondeo*, *tonsus*, to shave), the act of clipping the hair or shaving the head. In the Romish church tonsure is the first ceremony for devoting a person to the service of God

term is also applied to the corona or crown worn by the priests of that church, as a mark of their order or rank.

TOOTH. (*See* TEETH.)

TOOTHACHE, *tooth'-ak* (Lat. *odontalgia*), is a well-known and very painful disease, situated in the teeth, most frequently in the molars, and more rarely in the incisors. The pain sometimes reaches up to the eyes, and sometimes backwards into the cavity of the ear. It may arise from various causes, but most frequently it is owing to some decayed tooth. Often, however, it is a mere rheumatic affection arising from cold. It attacks persons in all periods of life, but is most frequent in the young and plethoric. When the pain takes place in a decayed tooth, it is owing to the admission of cold air irritating the exposed nervous fibrils in the hollow or carious part. Hence a frequent cure of toothache is by destroying the nerve by touching it with a hot iron or oil of vitriol. The application of opium, chloroform, or oil of cloves to the part, often affords relief. When there is much inflammation, bleeding the gums, blisters behind the ears, and purgatives, are necessary. When the disorder proceeds from rheumatism, which will be known by the pain being more diffused, and affecting the muscles about the jaw, fomentations, blisters behind the ears, and the other remedies for rheumatism, are to be employed. Frequently, however, every means fails, and the only remedy left is to draw the tooth. Stuffing the tooth with gold, gutta-percha, or such compositions as dentists use, is very serviceable in protecting the nerve from injury, and preventing further decay; but this should never be had recourse to when there is any pain or inflammation present, as its tendency, by pressing upon the nerve, is to aggravate them.

TOPOGRAPHY, *to-pog'-raf-e* (Gr. *topos*, a place; *grapho*, I write), a term applied to the science of describing a country, a place, &c., going into details into which geography does not enter. Rivers, rivulets, mountains, hills, forests, rocks, roads, especially inhabited places, bridges, &c., are considered proper subjects for topography. Maps which treat of all these subjects, and even show the variety of the soils, &c., are called topographical maps.

TORPEDO, or ELECTRIC RAY, *tor-pe'-do* (*Torpedo gymnotus*), a fish belonging to the *Ratidæ*, or Ray fam., a gen. of fishes belonging to the ord. *Chondropterygii*, or cartilaginous fishes, the characteristics of which are given under a former article. (*See* RAY.) The name of this fish is derived from the Latin, and signifies a numbness or torpor, and was given in consequence of the electric shock which the fish diffuses through any one who touches it. The torpedo inhabits the Mediterranean and other European seas, and is not unfrequently found on our coast, especially on sandy bottoms, in which it buries itself by the flapping of its tail and fins. The torpedo, like the skate, is a flat fish, and it is sometimes mistaken for that by many people, who are much discomforted on touching it. It is of a nearly cylindrical form; the skin is smooth, and of a dark brown colour above and light beneath; and the tail is short, with the dorsal fins placed in close proximity. The electrical apparatus with which this creature is endowed is formed of two organs lodged on either side of the head, and encompassed by the gills and the anterior border of the pectoral fins. Cuvier describes these organs as composed of little membranous tubes, placed close to each other, like a honeycomb, and subdivided into minute cells, abundantly supplied with nerves, which branch off in all directions. Each organ is about five or six inches in length, and three or four inches in breadth. All the perpendicular columns of which they are composed pass through the fish from the upper to the under surface of the body. It is reported that an Italian physician, of the name of Redi, was the first to discover the electric power of the torpedo. On once seizing this fish, and grasping it with his hand, he felt a pricking sensation, which extended along the arm to the elbow, and from thence to the shoulder, which was followed by a sort of tremor of the muscles and a sharp oppressive pain in the chest, which caused him instantly to drop the fish. But if he touched it, the same sensation returned, but in a less degree after each shock, till at the end of three hours, when the fish died, and the electric power of course ceased to exist along with it. It has been ascertained that the power of this fish is of a purely electrical character, as repeated shocks have been obtained from it by precisely the same means as we should employ to receive the shock from a galvanic battery or an electrifying machine; that is, it is carried on by means of regular conductors, and the contact of bodies with them. Forty or fifty shocks have been given in this way by the torpedo in the space of about two minutes; each shock being produced by an evident effort on the part of the fish, with marked depression of the eyes, which sank in their orbits as the shock was given, though at other times they were prominent enough.

TORT, *tort* (Lat. *tortus*, twisted), in Law, is used to denote any injury or wrong, because it is twisted or crooked, and contrary to that which is right and straight.

TORTOISE, *tor'-tus*, a reptile belonging to the fam. *Testudinidæ*, and ord. *Chelonia*, a gen. of reptiles belonging to the section *Cataphracta*, or shielded animals. The shell of the tortoise is solid, thick, and covered, in the adult state, with horny studs. The feet are short, stout, and somewhat clubbed, and the toes are almost entirely concealed under the skin, and are terminated by bent nails, of which there are generally five upon each of the anterior and four upon each of the posterior feet. In form, the head is rather small, and is covered with studs, and the jaws are horny, and are destitute of lips. The head, limbs, and tail can be completely retracted within the cavity of the shell; and consequently the tortoise can bid defiance to a good number of its enemies, with the exception of man. Most of the species are inhabitants of warm climates, and those which do exist in colder regions always burrow in the ground, and remain in a lethargetic state during the winter. In habits, the tortoise is a great cumbersome animal, and is remarkable for its longevity and tenacity of life. Its food is purely vegetable, and its movements slow and awkward in the extreme. The tortoise is a terrestrial animal, although some species live when immersed in the water. The common tortoise (*Testudo græca*) is a native of the south of Europe, although it is found more abundantly in Greece than in any other part of the Mediterranean. It is from six to eight inches long, and weighs about three pounds. The largest variety is the Indian tortoise (*Testudo indica*), which often attains a length of three feet. It is a native of India, and is very abundant in the Galapagos islands. The flesh of the Indian tortoise is said to be very delicate, and the natives employ it largely, both salted and when fresh. A very thin oil is likewise obtained from its fat. It may be mentioned, in conclusion, that many fossil varieties of the tortoise have been found in this country in the red sandstone, where their footprints have been discovered also. A gigantic species, too, has been discovered in India in the tertiary formation. It has been termed the *Colossochelys Atlas*, and measured probably about 16 feet in length.—*Ref.* Dallas's *Animal Kingdom*.

TORTURE, *tor'-tshur* (from Lat. *torqueo*, I twist), in a legal sense, designates the application of bodily pain in order to extort confession from a suspected person or condemned criminal. Sometimes, however, although improperly, the term has been used to signify the torments to which condemned criminals have submitted, as part of their punishment. With the ancient Romans, it was only practised upon the bodies of slaves. Judicial torture formed part of all the legal systems of Europe wherein the Roman law was adopted; still, it does not appear to have been generally had recourse to until the 13th century. But when this severe form of punishment received the ecclesiastical sanction, its employment became painfully general. By the Inquisition it was resorted to upon every occasion, and under its most terrible forms. It would appear that torture was unknown in England until 1468, when one Hawkins was put to the rack, and in consequence of the confession extorted from him was afterwards executed. Henceforth it was almost uninterruptedly practised until the year 1640, when one Archer, who was suspected of being concerned in an attack upon Archbishop Laud's palace at Lambeth, was racked in the Tower to make him confess his companions. This was the last instance of its

practice in England. In France it was partially abolished by a decree of Louis XVI. in 1780; but it was not until the Revolution that it was finally swept away. Human ingenuity seems to have been boundless in the invention of instruments capable of inflicting the most exquisite and prolonged sufferings by means of torture. The *rack* was a large open frame of oak, in shape somewhat resembling a mangle, upon which the examinant was laid upon his back, with his wrists and ankles attached by cords to two rollers at the end of the frame. Questions were put, and if not satisfactory, the extremities were gradually strained till the bones started from the sockets. This fearful instrument is said to have been introduced into England under Henry VI., by the duke of Exeter; whence it was called "the duke of Exeter's daughter." The "Scavenger's daughter" was another dreaded engine of torture. It was introduced by Sir William Skevington, a lieutenant of the Tower, during the reign of Henry VIII. It was a broad hoop of iron, consisting of two parts fastened by a hinge. The examinant was placed upon his knees on the ground, and the executioner having introduced the hoop under the prisoner's legs, compressed him together till the extremities were fastened over the small of the back. There were other "lesser tortures," such as the pincers, thumbscrews, and manacles. In Scotland and in France, "the boot" was a common instrument of torture. Here, the victim had tight iron rings placed upon his legs, and between the flesh and the rings wedges were driven by a mallet. These and other diabolical instruments remained in use in Scotland until the final abolition of torture in that country in 1708.

TORY, *to'-re*, a term which, for two centuries, has served to designate one of two principal political parties in England. As well as the term "Whig," it dates from the reign of Charles II., for it was in the year 1679 that the words whig and tory were first heard in their application to English factions. The first definition given by Dr. Johnson, in his dictionary, is, "a cant term derived, I suppose, from an Irish word, signifying a savage." Respecting the principles of a Tory, the lexicographer adds:—"One who adheres to the ancient constitution of the state, and the apostolical hierarchy of the Church of England." The early Tories opposed the Exclusion Bill, and gave their adherence to Charles II. in his attempts to prevent a renewal of the attack upon James II., by successive prorogations of the parliament. As indicative of an existing party, the word tory is now almost obsolete. —Ref. *English Cyclopædia;* Cooke's *History of Party.*

TOUCH, *tutsh.*—The sense of touch is not confined to any particular part of the body, like the other senses, but, on the contrary, exists in all parts capable of perceiving the presence of a stimulus by ordinary sensation. It is, in fact, a modification or exaltation of common sensation or sensibility. It properly belongs to the outward covering of the body, the skin, but is also shared in a minor and modified degree by parts of the mucous membranes, which are, indeed, continuous prolongations of the same substance. In no essential particular, however, is it to be distinguished from the common sensibility which resides in the deeper organs of the body. The nerves on which it depends are the same as those which confer ordinary sensation on the different parts of the body. There are certain parts in which the sense of touch is much more acute than others; as the tongue, lips, hand, soles of the feet, &c. These are more abundantly than other parts studded with numerous papillæ, on which this sense mainly depends. Each papilla is abundantly supplied with blood, and also contains one or more terminal nerve-fibres, on which its exquisite sensibility depends. The papillæ do not come into direct contact with external objects, but, like the rest of the surface of the skin, are covered with one or more layers of epithelium, forming the cuticle or epidermis. By the sense of touch the mind is made acquainted with the size, form, and other external characters of bodies. The distinctness and intensity of a sensation in the nerves of touch depend in great measure on the degree in which the mind cooperates with the feeling; for if the mind does not thus co-operate, the sensation remains unperceived, and, on the other hand, a painful sensation becomes more intolerable the more the attention is directed to it. The mind has a remarkable power of exciting sensations in the nerves of common sensibility, so that the idea of pain gives rise to the actual sensation of it in a part predisposed to it. Subjective sensations, or such as are occasioned by internal causes, are in no sense more frequent than in that of touch. Professor Weber made a series of experiments with a pair of compasses (having the points blunted with pieces of cork), in order to determine the tactile power of different parts of the skin. He found this to be most acute at the point of the tongue,—the two impressions were distinctly felt when only half a line apart, and on the other hand, on the middle of the back, a separation of thirty lines was necessary to the distinction.

TOURNAMENT, TOURNEY, or JOUST, *toor'-nă-ment, toor'-ne, jowst*, are words derived from the French, which, in the days of chivalry, were applied to a kind of combat, wherein warriors engaged for the purpose of exhibiting their courage and skill in arms. The parties were not animated by enmity, as in open warfare, or by the desire to wipe away a dishonourable imputation, as in the modern duel. Von Hammer derives the origin of tournaments from the Arabians; but Virgil, in his Æneid, in his description of the games of Troy, pictures something not unlike what the tournament must originally have been. In any case, it is clear that the introduction of the tournament into England was due to the Normans, who brought it with them from France, where it reached its full perfection as early as the 9th and 10th centuries. The Normans were passionately fond of this amusement. Under Stephen it is said to have been first practised in England; but although forbidden by Henry II., it revived again, and became firmly established during the reign of Richard Cœur-de-Lion. The most flourishing era of the tournament was, both in England and France, during the 13th and 14th centuries, and it was not altogether abandoned till near the close of the 16th century. In the tournament blunted weapons were used, and heralds were frequently dispatched to different courts, inviting all brave knights to prove their chivalry. Certain qualifications of birth were required to gain admission to the tournament. The place of combat was the lists, a large open space surrounded by ropes or a railing. Around the lists galleries were erected for the spectators, among whom sat the ladies, the supreme judges of tournaments. The regulations of the sport and announcements of the prize were then read by heralds. Upon entering the lists, the arms of the knights were examined by the constable. Lances with the points removed, or covered with pieces of wood, and swords blunted, were the weapons allowed. Everything being ready, the heralds shouted "Laissez aller," and the knights dashed from opposite sides of the lists to the encounter. Each knight was attended by his squires, who furnished him with weapons, or raised him if unhorsed. At the conclusion of the sports the prizes were delivered to the successful knights by the queen of beauty, who had been chosen by the ladies. The joust differed from the tournament in being a single combat between two knights, whilst the tournament was carried on between two parties of cavaliers. There were two kinds of jousts,—the *jouté à l'outrance*, or the joust to the utterance, or mortal combats, usually between two knights of different nations, and the *jouté à plaisance*, or joust of peace, which frequently took place after a tournament. As chivalry declined, and as gunpowder revolutionized the art of war, tournaments gradually died out.—Ref. *Popular Encyclopædia;* Mills's *History of Chivalry.*

TOURNIQUET, *toor'-ne-kai* (Fr.), an instrument made use of in the practice of surgery to stop bleeding; it can, however, only be applied to the limbs, and its use is only intended to be temporary. It consists of a strong band, about an inch and a half wide, upon which there is a movable leather pad, capable of being adjusted immediately over the artery on which it is desired to apply the chief pressure. The rest of the band is passed round the limb, and is secured by a buckle. The whole is tightened or loosened by means of a brass bridge.

TOUS LES MOIS. (*See* CANNA.)

TRACHEA, *trăk'-kel-ă* (Gr. *trachéia*, from *trachus*, rough), in Anat., is the cartilaginous and membranous

canal through which the air passes into the lungs, commonly known as the windpipe. Its upper part is called the larynx, the uppermost and smallest part of which is called the epiglottis, being placed over the glottis, or mouth of the larynx, and serving to close the passage to the lungs in the act of swallowing. (*See* LARYNX.) From the lower end of the larynx the canal takes the name of trachea, *or aspera arteria*, and extends as far down as the fourth or fifth vertebra of the back, where it divides into two branches, which are the right and left bronchial tubes. Like the larynx, it is formed of cartilages, united to each other by means of very elastic ligamentous fibres. It is also furnished with fleshy or muscular fibres, some of which pass through its whole extent longitudinally, while others are carried round it in a circular direction; and hence it may shorten or lengthen itself, or contract or dilate its passage. Thus a passage for the air is constantly kept open, and we are enabled to receive and expel it in greater or less quantity, or with more or less velocity, as in singing and declamation. It is supplied with a great number of small glands which discharge a mucous fluid on its inner surface.

TRACHEOTOMY, *trăk-ke-ot'-o-me* (Gr. *trachcia*, and *temno*, I cut), in Surg., is the operation of cutting into the trachea, for the purpose of admitting air into the lungs when the upper part of the air-passages is obstructed, or for the extraction of foreign bodies from the trachea. It is necessary in many diseases, and, though not without danger, it is often the means of affording instant relief. After the opening is effected, a small silver tube is introduced, through which the operation of breathing is carried on.

TRADE, *traid* (Ital. *tratta*; Ang.-Sax. *treadan*, the way or path traded or trod), is the past participle of the verb to tread, and denotes "a way or course *trodden* and *retrodden*, passed and repassed; a way or course pursued or kept; a concourse or intercourse; a regular or habitual course of practice; employment, occupation in merchandise or commerce; intercourse for buying, selling, or bartering; commerce, traffic." — (*Richardson.*) Generally it denotes the buying, selling, exchanging, &c., of commodities, bills, money, and the like. Dr. Adam Smith divides the wholesale trade of a country into three different sorts; namely, the home trade, the foreign trade of consumption, and the carrying trade. The home trade is employed in purchasing in one part of the same country, and selling in another, the produce of the industry of the country, and it comprehends both the inland and coasting, or that which is carried on both by land and sea. The foreign trade of consumption is employed in purchasing foreign goods for home consumption. The carrying trade is employed in transacting the commerce of foreign countries, or in carrying the surplus produce of one to another. (*See* COMMERCE.)

TRADE, BOARD OF, or COMMITTEE OF THE PRIVY COUNCIL FOR TRADE, is a department of the British government, whose origin dates from 1660, when Charles II. erected two separate councils, one for trade and one for foreign plantations. These two councils were in 1673 superseded by a united council for trade and plantations, for superintending the affairs of the colonies and plantations, together with the trade navigation of the kingdom. After various changes, the present board was established, by order in council, for the consideration of all matters specially relating to trade and the colonies. It is in fact a permanent committee of privy council, constituted for that purpose. It consists of a president and vice-president, appointed by the queen in council; and the other members of the board similarly appointed are the lord chancellor, first lord of the Treasury, principal secretaries of state, chancellor and under-treasurer of the Exchequer, speaker of the House of Commons, chancellor of the duchy of Lancaster, paymaster of the forces, master of the Mint, and such officers of state in Ireland as are privy councillors in England. The president and vice-president, however, ordinarily exercise all the duties, and the other members rarely interfere. The duties of this board have of late years been considerably extended, and are now of a very varied nature. It has the general superintendence of all matters relating to merchant ships and seamen, and





the carrying into execution of the statutes in force regarding them. It also exercises a supervision over railways, both in the original formation and subsequent working. It has to do with the government schools and museums of science and art, the registration of joint-stock companies, &c. It also collects and publishes tables of the revenue, trade, commerce, wealth, population, &c., of the United Kingdom and its dependencies, as well as of foreign countries.

TRADE WINDS. (*See* WIND.)

TRADITION, *trā-dish'-un* (Lat. *traditio*, from *trado*, I give or deliver), in its widest signification denotes whatever is handed down to us concerning the past; and in this sense all history is tradition. In its more limited sense it is applied to any knowledge handed down from one generation to another by oral communication. In the early ages of mankind, before the art of writing was introduced or practised, all history was thus handed down by oral communication. When these came to be written down long after the events had occurred, they partook more or less of the opinions and judgments of those who had handed them down, as well as of those who had written them out. They differ materially, therefore, from events recorded by eyewitnesses, or written down at or soon after the time when they occurred. Historians, therefore, distinguish between the two, calling the former tradition, the latter history. Those who have observed how much facts are distorted, even in the present day, in passing from mouth to mouth, will understand how carefully the historian has to criticise the accounts that are founded upon tradition. The Jews believed that besides the written law contained in the Old Testament, Moses had delivered an oral law, which had been handed down from father to son, and constituted their traditions, and is contained in the Talmud (which *see*). In the Roman Catholic Church, the term tradition is applied to the doctrines supposed to have been communicated by Christ to his apostles, and handed down by them orally to their successors. The writings of the Fathers are regarded as containing these traditions; and hence they are considered as equally binding with the doctrines of the New Testament.

TRAGACANTH. (*See* ASTRAGALUS.)

TRAGOPOGON, *trā-gop'-o-gon* (Gr. goat's-beard), a gen. of the nat. ord *Compositæ*. The roots of *T. porrifolius*, the salsafy, or oyster-plant, are eaten. When cooked, they are thought to have the taste of oysters.

TRAJECTORY, *trāj-ek'-to-re*, that curve which a body describes in space when projected. When applied to rifle-shooting, it indicates the course of the bullet, which, instead of being straight, forms a complete curve, which increases more and more in proportion as the distance from the muzzle increases.

TRANSCENDENTAL, *trăn-sen-den'-tăl* (Lat. *transcendere*, to go beyond), in Phil., is used to express whatever transcends or goes beyond actual experience. This meaning is somewhat restricted by Kant, who further draws a distinction between *transcendent* and *transcendental*. By the former he seeks "to denote what is wholly beyond experience, being neither given as *a posteriori* nor *a priori* element of cognition—what, therefore, transcends every category of thought. Transcendental he applied to signify the *a priori*, or necessary cognitions, which, though manifested in consciousness, as affording the conditions of experience, transcend the sphere of that contingent or adventitious knowledge which we acquire by experience. — Ref. *Reid's Works*, by Sir W. Hamilton.

TRANSEPT, *trăn'-sept* (Lat. *trans* and *septum*), in Arch., signifies the cross part of a cathedral, or the two arms, as it were, of the cross upon which the plan is laid out, extending on the north and south sides of the area between the nave and the choir.

TRANSIT, *trăn'-sit* (from Lat. ), in Astron., the culmination or passage of any celestial body across the meridian of an observer. The determinations of the exact times of such transits is one of the most important operations of practical astronomy. (*See* TRANSIT INSTRUMENT.) The term *transit* is also applied when Venus or Mercury, in their revolution round the sun, pass between the sun and the eye of the observer on the earth, and appear to move like black spots over the sun's disk. If this phenomenon be noted by different

observers at points considerably distant from one another, it will not be of equal duration at all these points; and since the difference of time depends on the parallax of the planet, as well as of the sun, the latter can be estimated by means of the former. On June 3rd, 1769, a transit of Venus occurred, and was carefully observed. By the Royal Society of London it was observed at Hudson's Bay and Otaheite, by the French in California, by the Danish government in Lapland, and by the Swedish in Finland. The sun's parallax, which is one of the most important elements of astronomy, was determined with great exactness by these five observations. The next transits of Venus take place in 1872 and 1894.

TRANSIT INSTRUMENT, an astronomical instrument which serves to determine the instant of the passage of the celestial bodies across the plane of the meridian. It consists essentially of a telescope, the horizontal axis of which rests upon two pivots, supported by vertical pillars. The telescope is so placed that its optical axis may assume all possible directions in the plane of the meridian of the place where it is established. In the focus of the eye-piece is placed a system of three, five, or sometimes even seven vertical and equidistant wires or threads, generally crossed by two horizontal ones, between which it is convenient that the passage of objects over the vertical wires should be observed. The diaphragm to which the wires are attached is brought by means of adjusting screws to such a position that the middle vertical wire intersects the optical axis of the telescope, in which position it is permanently fixed. The middle wire thus becomes a visible representation of that part of the meridian to which the telescope is directed; and, when a star is seen to cross this wire, it is in the act of culminating or passing the celestial meridian. The exact instant of the transit is noted on a clock or chronometer, which is an indispensable accompaniment of the instrument. For astronomical uses it is indifferent that the sidereal day should commence when any particular star passes across the meridian. Astronomers, without doubt, foresaw this when they selected for the origin of the sidereal day, for the initial hour-circle, the circle corresponding to a point of the equator determined by a striking astronomical phenomenon, the hour-circle passing through the point of the equator which the sun meets with in its passage from the south to the north of this plane; that is to say, the *vernal equinox*. By combining the observation of the sidereal clock with that of the transit instrument, the distance of the object from the initial hour-circle can be determined; namely, the distance between the hour-circle of the first meridian and the hour-circle corresponding to the transit of the object. The distance is the *right ascension* of the body.—*Ref.* Herschel's *Outlines of Astronomy;* Arago's *Popular Astronomy.*

TRANSPIRATION, *trănz-pi-rā'-shun* (Lat. *trans*, through, and *spiro*, I breathe), means the diffusion of liquids, vapours, and gases through a capillary tube. The transpiration of liquids was first examined by Poiseville, but little was discovered beyond the fact that when different liquids were pressed through tubes of equal size, with identical forces, the times of the passage of similar quantities differed considerably, but no connection could be traced between these differences. Graham has, however, lately made a series of experiments on the transpiration times of certain acids, salts, and other substances, in different stages of dilution. Thus nitric acid, with three equivalents of water, is found to have a lower rate of transpiration than when diluted more or less, and a certain steadiness was observed on each side of the maximum of retardation. With sulphuric acid the maximum of retardation occurred when one equivalent of water had been added, or, in other words, when the crystallizable hydrate had been formed. Acetic acid gradually rose until the bihydrate was formed, which is the characteristic hydrate of that acid. With hydrochloric acid the retardation seemed to take place when the dodecahydrate was reached. The transpiration time of ordinary alcohol reached its maximum as the hexahydrate. The different alcohols and ethers were also tried against each other, and their transpiration times were found to increase with their boiling-points. From these facts a distinct rotation appears to exist between the transpirability of liquids and their chemical compositions. Temperature has a great influence on the transpirability of fluids; for example, water at 113° Fahr. escapes through the same tube with 2¼ times the rapidity that it does at 41° Fahr. The rates of transpiration are entirely independent of their rates of diffusion. No connection has as yet been found between these differences or similarities. Thus the velocities of nitrogen, binoxide of nitrogen, and carbonic oxide, are equal. Equal weights of oxygen, air, nitrogen, and carbonic oxide, are transpired in given times. The velocity of hydrogen, a light gas, and the heavy vapours of ether are equal. The laws regulating the transmission of gases and vapours through capillaries have yet to be investigated.

TRANSPORTATION, *trănz-por-tā'-shun* (Lat. *trans*, across, and *porto*, I carry), in Law, is removal or banishment to some fixed place. The origin of this mode of punishment is to be found in 39 Eliz. c. 4, anent rogues and vagabonds, who may be sentenced by the justices at quarter sessions to be banished out of the realm, and be conveyed to "such parts beyond the seas as shall be at any time hereafter for that purpose assigned by the privy council unto her majesty." The earliest known enforcement of this law was in 1619, when James I. addressed a letter to the treasurer and council, commanding them "to send a hundred dissolute persons to Virginia, whom the knight marshal shall deliver unto them for that purpose." The term transportation, however, does not occur in any statute prior to 18 Car. II. c. 3, when power was given to the judges either to execute, or transport to America for life, the moss-troopers of Cumberland and Northumberland. Afterwards an act of 1718 authorized the criminal courts, in clergyable offences, or those which were nominally but not really punishable with death, to give over the offenders to contractors, who engaged to transport them to the American colonies, and thus obtained a vested property in their labour for seven or fourteen years, which was generally sold by auction. These convicts became valuable to the planters, and the traffic in them continued to be vigorously prosecuted till the American war of independence in 1776. After some time spent in finding out a suitable place of transportation, Australia was at length determined upon, and in May, 1787, the first band of convicts left England for that country. New South Wales, Van Diemen's Land, and Norfolk Island, became the principal receptacles for convicts. At length the reception of convicts became distasteful to the colonists, and the statute 10 & 11 Vict. c. 67, was passed, permitting offenders under sentence of transportation to be removed to any prison or penitentiary in Great Britain; and, finally, 20 & 21 Vict. c. 3, abolished transportation altogether as a punishment, and substituted in its place penal servitude (which *see*).

TRANSUBSTANTIATION, *trăn-sub-stăn-se-ā'-shun* (Lat. *trans*, through, and *substantia*, substance), in the Romish church, is applied to the supposed conversion of the bread and wine in the eucharist into the body and blood of Christ, immediately on its consecration by the priest. This dogma has taken its rise in the Church since the 9th century, when it was first advocated by Paschasius, abbot of Corbey, in Picardy. Though then condemned, it gained ground during the darkness of the 10th century, and at length became an established tenet of the Church. It was not propounded as an article of faith by the authority of any council till the beginning of the 13th century. At the time of the Reformation this doctrine was much disputed, and Luther adopted a modification of it, known as impanation (which *see*). In England, Ridley and Cranmer opposed this doctrine, the latter of whom published a work on the subject in five books, 1549.

TRAPA, *trāp'-ă*, in Bot., a gen. of floating aquatic plants, belonging to the nat. ord. *Halorageaceæ*, remarkable for their horned fruit and large amygdaloid edible seeds. *T. natans* is the *marron d'eau*, or water-chestnut; *T. bicornis* is the Chinese *ling*; *T. bispinosa* is the *Singhara nut* of Cashmere.

TRAVERSE, *trā-vers'* (Lat. *transversus*), in Law, is the name given to a plea contradicting some matter of fact alleged by the opposite party. In any stage of the pleadings, when either side traverses or denies the facts pleaded by his antagonist, he usually tenders an

issue, as it is called, and "puts himself upon the country," or refers the matter to the decision of a jury. A traverse to a material point cannot be waived and another traverse tendered by the other party. In criminal proceedings, not guilty is a general traverse, which throws on the prosecutor the necessity of proving the material facts.

TRAVERSE, *trā-vers'* (Fr.), in Fort., are masses of earth raised at intervals across the terreplein of a rampart, or across the covered way of a fortress. They serve to protect the men and guns against the effects of a ricochoting or enfilading fire, besides being used as intrenchments behind which the defenders may pour forth an annoying fire upon the besiegers.

TREADMILL. (*See* PRISONS.)

TREASON, *trē'-zon* (Fr. *trahison*, Lat. *proditio*), in Law, imports a betraying, treachery, or breach of faith. It is used to denote not only offences against the king and government, but also that accumulation of guilt which arises whenever a superior reposes confidence in a subject or inferior, between whom and himself their subsists a natural civil or even spiritual relation, and the inferior so abuses that confidence, and so forgets the obligations of duty, as to destroy the life of such superior or lord. Hence the twofold division of treason into petit and high treason. For a wife to kill her lord or husband, a servant his lord or master, an ecclesiastic his lord or ordinary,—these being regarded as breaches of private and domestic faith, were denominated petit treasons. Since 1828, however, petit treason has been abolished and reduced to the simple head of murder. High treason, as defined by the Statute of Treasons (25 Edw. III. c. 2), embraces the following heads:—(1) Compassing or imagining the death of the king, the queen consort, or their eldest son and heir; (2) violating the king's companion (*i.e.*, the queen consort), or the king's eldest daughter unmarried, or the wife of the king's eldest son and heir; (3) levying war against the king within his realm; (4) being adherent to the king's enemies in his realm, giving them aid and comfort in the realm or elsewhere; (5) counterfeiting the king's great or privy seal; (6) counterfeiting the king's money, or knowingly bringing false money into the realm counterfeit to the money of England, to merchandise and make payment withal, in deceit of the king and his people; (7) slaying the chancellor, treasurer, or the king's justices of either bench, justices in eyre, justices of assize, or any other justices assigned to hear and determine, during their offices. The sixth species of treason was reduced to a felony by 2 Will. IV. c. 34. Some other offences were made treasonable by subsequent statutes. Formerly the punishment of high treason was that the offender be drawn to the gallows, hanged by the neck, cut down alive, his entrails taken out and burned before him while yet alive, his head cut off, and his body divided into four parts, to be at the king's disposal. By 54 Geo. III. c. 146, the sentence now is, that he be drawn on a hurdle to the place of execution, and there be hanged until dead, the head to be then severed from the body, and the body to be divided into four quarters, to be disposed of as the king may see fit.

TREATY. (*See* DIPLOMACY, LAW OF NATIONS.)

TREES, AGE OF. (*See* AGE OF TREES.)

TREES, CULTURE OF. (*See* ARBORICULTURE.)

TREMANDRACEÆ, *tre-man-drā'-se-ē*, the Porewort fam., a small nat. ord. of *Dicotyledones*, sub-class *Thalamifloræ*. They are slender heath-like plants, all natives of New Holland.

TRENCH, *trensh* (Fr.), in Fort., an excavation in the ground. The depth is usually three feet, the width eighteen feet; the length is often considerable. The excavated earth is thrown up on one side to serve as a kind of parapet to protect the defenders from the view and the fire of the enemy.

TRENT, COUNCIL OF, *trent* (Lat. *concilium Tridentinum*), in Eccles. Hist., is the name of a celebrated council convoked by Pope Paul III., for the purpose of defining and illustrating the doctrines of the Church, condemning heresies, and reforming abuses that had crept into the Church both in doctrine and discipline. It met in 1545, and was continued during twenty-five sessions to the year 1563, under the pontificates of Julius III. and Pius IV. It was intended to serve as a foil to Protestantism, by reforming the abuses of the Church, determining and establishing its doctrines, and conforming them to the spirit of the time. Hence the decrees of this council, together with the creed of Pope Pius IV., contain a complete summary of the doctrines of the Church. Attempts were also made to restore discipline and to reform the lives of the priests; but they utterly failed to produce the effect. The decrees were subscribed by 255 clergy, including four legates, two cardinals, three patriarchs, twenty-five archbishops, and 169 bishops, and were confirmed by a papal bull, dated 26th January, 1564. All the Roman Catholic states accepted the decrees of the council, and promulgated them in their territories, with the exception of France, which persisted in asserting its independence. (*See* GALLICAN CHURCH.)—Ref. *Histories of the Council of Trent*, by Sarpi, Pallavicino, and Bungener.

TREPANNING, *tre-pān'-ning* (Gr. *trupao*, I perforate), in Surg., is the operation of perforating the skull by means of a circular saw, when the head is so injured that it is necessary to remove a part of the bone. The instrument is called a trepan or trephine. The operation is not dangerous, but care requires to be taken not to injure the soft parts underneath. When the bone is nearly sawn through the piece is then raised with the elevator, the projecting angles of the bone being afterwards removed with a saw, and all other irregularities of the cut surface destroyed. The cut edges of the bone afterwards throw out granulations, which become ossified; but there is always a small interval which does not ossify, in or about the centre.

TRESPASS, *tres'-pās*, in its largest and most extensive sense, signifies any transgression or offence against the law of nature, of society, or of the country in which we live, whether it relates to a man's person or his property. Hence it includes beating any person, taking or detaining his goods; also non-performance of promises or undertakings, and, in general, any misfeasance or act of one man whereby another is injuriously treated or damnified. Whenever the act itself is directly and immediately injurious to the person or property of another, and therefore necessarily accompanied with some force, an action of trespass *vi et armis* will lie; but if the injury is only consequential, a special action of trespass *on the case* may be brought. But in the more limited and confined sense in which it is commonly used, it signifies no more than an entry on another man's ground without lawful authority, and doing some damage, however inconsiderable, to his real property. The law of England regards every entry upon another's lands (unless by the owner's leave, or in some very particular cases) as an injury or wrong, for satisfaction of which an action of trespass will lie; but determines the *quantum* of that satisfaction by considering how far the offence was wilful or inadvertent, and by estimating the value of the actual damage sustained. A man is not only answerable for his own trespass, but that of his cattle also, and besides his common remedy by action, the law gives the injured party the power to distrain the cattle thus doing damage (*damage feasant*), till the owner shall make him satisfaction. The action that lies in either of these cases of trespass is that of trespass *vi et armis*, the law always coupling the idea of force with such intrusion upon the property of another. In some cases, entry on another person's land or house is not accounted trespass, as where a man comes thither to demand or pay money there payable, or to execute in a legal manner the process of the law. A man may justify in an action of trespass, on account of the freehold and right of entry being in himself; and this defence brings the title of the estate in question. In order to prevent trifling and vexatious actions of trespass, as well as other personal actions, various enactments were passed, which, however, were all consolidated, and their provisions extended by 3 & 4 Vict. c. 24, as explained by 4 & 5 Vict. c. 28. Now, therefore, if the plaintiff, in any action of trespass, either to person or property, or for libel, slander, or malicious prosecution, brought in any of her majesty's courts at Westminster, shall recover less damages than 40*s.*, he shall not be entitled to recover any costs whatever, unless the judge or presiding officer shall certify on the back of the record that the action was really

brought to try a right besides the mere recovery of damage, for which the action was brought. In all cases, however, where it shall appear that the trespass was wilful and malicious, and it be so certified by the judge, the plaintiff shall recover full costs.

TRIAL, *trí'-ál* (Aug.-Sax.), in Law, is the examination of the matter of fact in issue, of which there are several different species. Blackstone enumerates seven species of trial in civil causes; viz. (1) by record; (2) by inspection or examination; (3) by certificate; (4) by witnesses; (5) by wager of battel; (6) by wager of law; and (7) by jury. Of these, trial by wager of battel and trial by wager of law are abolished, and trial by inspection, by certificate, and by witnesses, are all very unusual. Trial by wager of battel was when the matter was decided by single combat between the champions of the parties, and by wager of law, when the defendant came into court, attended by eleven of his neighbours, called compurgators, and then solemnly swore that he did not owe the sum charged, &c., and the eleven compurgators swore that they believed him. Trial by inspection or examination is when the point in dispute is submitted to the inspection or examination of the judges of the court, thereupon to decide according to the testimony of their own *senses*. Trial by certificate is allowed where the evidence of the person certifying is the only proper criterion of the point in dispute. Trial by witnesses is where the judge is left to form his own judgment upon the evidence of witnesses examined. This is now followed in the new county courts, but elsewhere the trial by jury is followed in almost every case. There thus remain but two other kinds of trial,—by record and by jury. Trial by record is where a matter of record is pleaded in any action, as a fine, a judgment, or the like, and the opposite party pleads that there is no such matter of record existing. This issue is tried by the court itself, which decides according as this record is or is not produced. Trial by jury, called also *per pais*, or by the country, has also been the one most in use both in civil and criminal matters. (*See* JURY.) A trial at bar resembles an ordinary trial by jury, except that instead of being presided over by a single judge, all the judges of the court in which the action is brought are in attendance. It is now only granted in cases of great difficulty and importance. New trials are granted when the court in which the action is brought sees reason to be dissatisfied with the verdict on the ground of its being against evidence, excessive damages, misdirection, discovery of fresh evidence, or some other cause.

TRIASSIC SYSTEM, *trí'-ás-sik*, a system which derives its name—*Trias*, or triple system—from its being composed, in Germany, where it is very fully developed, of three main members; viz., the *Keuper*, the *Muschelkalk*, and the *Bunter Sandstein*. These, as far as they may be compared, are the equivalents of the upper New Red Sandstone of England. The Trias has been separated from the lower New RED, or PERMIAN, because its flora and fauna are essentially *Mesozoic*, and akin to those of the oolite and chalk, while those of the Permian are essentially *Palæozoic* in their fossils, and related to those of the coal-measures below. The Flora embraces equisetums, calamites, ferns, cycadaceous and coniferous plants; the Fauna, corals, star-fishes, shell-fish, crustaceans, reptiles, foot-prints of birds, and indications of marsupial mammals.

TRIFOLIUM, *trí-fó'-le-um* (Lat. *tres*, three; *folium*, leaf), in Bot., a gen. of the nat. ord. *Leguminosæ*. The species are the useful fodder plants known as clover.

TRIGONELLA, *trig-o-nel'-lá* (diminutive of Lat. *trigon*, a triangular place, from its small triangular flower), in Bot., a gen. of the nat. ord. *Leguminosæ*. The seeds of the species *T. Fœnum græcum* are much used in veterinary medicine, under the name of *fenugreek*.

TRIGONOMETRY, *trig-o-nom'-e-tre* (Gr. *trigonos*, a triangle; *metron*, a measure), that branch of mathematics which treats of measuring triangles. The exact meaning of the term, however, has been much extended; so that it includes the determination of the situation and distance of all the points in a given space, in which the distance and situation of some points are given. A plain triangle consists of six parts; namely, three sides and three angles; the numerical value of any of these parts being given, and one of these three being a *side*, the value of any of the other three may be found by trigonometry. In an article like the present, it would be impossible to go into all the details of trigonometry; below, however, the reader will find a list of works on the subject. Trigonometry is divided into plane and spherical. The science owes its origin to the Greek astronomers of Alexandria. From the time of Hipparchus, the solutions of the most useful cases of spherical triangles have been known, and the fundamental formulæ are to be found in the *Analemma* of Ptolemy. The chords of the double arcs, however, were used by the Greeks in place of the *sines*, which were introduced by the Arabians, to whom the science is indebted for other improvements. *Tangents* were introduced by Regiomontanus, by means of which the calculations were greatly simplified. The present compact and elegant form in which the solutions appear is the result of the improvements introduced by modern analysis.—*Ref.* Davidson's *Practical Mathematics*; Hall's *Trigonometry*; the Introduction to Dr. Hutton's *Mathematical Tables*; Fischer's *Manual of Plane and Spherical Trigonometry* (in German); and Lacroix's *Traité élémental de Trigonométrie rectiligne et sphérique*.

TRILLIACEÆ, *tril-le-ai'-se-e*, in Bot., the *Trillium* or Paris fam., a nat. ord. of *Monocotyledones*, sub-class *Dictyogenæ*. Unbranched herbaceous plants, with rhizomes or tuberous root-stocks. Leaves whorled, not articulated, net-veined. Flowers large, solitary, hermaphrodite. Fruit succulent. There are four genera and 30 species, natives of temperate regions. They are said to have narcotic, acrid, and purgative properties.

TRILOBITE, *trí'-lo-bite* (Gr. *treis*, three, and *lobos*, lobe), an extensive family of palæozoic crustaceans, deriving their name from the obvious three-lobed-like aspect of their bodies. The trilobites, in numerous generic forms, as *anaphus*, *ampyx*, *calymene*, *homalonotus*, *ilænus*, &c., are especially characteristic of the Silurian system. About a dozen genera range through the Devonian epoch; only three or four appear in carboniferous strata; and not a single specimen has been found in later formations.

TRINITY, *trin'-e-te*. — The doctrine of the Trinity received by the greatest part of the Christian world, teaches that in the unity of the Godhead there are three persons, of one substance, power, and eternity,—the Father, the Son, and the Holy Ghost. The word trinity does not occur in the Scriptures, nor in the Apostles' creed, nor in the Nicene creed, but is found in the Athanasian creed.

TRINITY-HOUSE.—The society of the Trinity was founded in 1515, for the promotion of commerce and navigation. It is a corporation, consisting of a master, four warders, eight assistants, and thirty-one elder brethren, selected from commanders in the navy and merchant service; but, as a compliment, some of the nobility are occasionally admitted. They examine the naval pupils in Christ's Hospital and the masters of queen's ships, appoint pilots for the Thames, settle the rates of pilotage, erect lighthouses and sea-marks, hear and determine complaints of officers and men in the merchant service, and all business connected with the Thames. The revenues of the Trinity-House are supposed to exceed £150,000 a year, derived from lighthouses, dues, pilotage, &c.

TRIPE DE ROCHE. (*See* GYROPHORA.)

TRIPTOLEMEA, *trip-to-lo'-me-á*, in Bot., a gen. of the nat. ord. *Leguminosæ*. The *rose-wood* of the cabinet-makers is said to be obtained from several species of this genus, natives of South America.

TRITICUM, *trit'-e-kum* (Lat., wheat), in Bot., Wheat, a gen. of grasses (*Graminaceæ*). *T. vulgare* and its varieties supply the inhabitants of many civilised countries with their most important article of food. The cultivated varieties are very numerous; as *T. æstivum*, spring or summer wheat; *T. hybernum*, winter wheat; *T. compositum*, Egyptian or many-eared wheat; *T. Spelta*, spelt; *T. polonicum*, Polish wheat, &c. In this country wheat is the grain commonly used for the manufacture of bread. It is largely employed for making the finest starch. The farinaceous articles of diet known as semolina, manna-croup, vermicelli, macaroni, and Italian paste, are prepared from wheat.

TRIUMPH, *trí'-umf* (Lat. *triumphus*), a solemn pro-

cession for the purpose of celebrating a victory. Although common to all warlike nations from the very earliest periods of history, those great assemblages never formed so prominent a feature in the annals of any people as among the Romans. There were two kinds of triumph,—the great triumph and the inferior triumph, or ovation (which *see*). Neither could be celebrated save by order of the Senate. During the time of the Empire, the emperor only, as the chief general, could claim a triumph. Upon being decreed a triumph, the general appeared before Rome at the head of his army. The triumphing general, in his robes, consisting of a purple tunic embroidered with gold, bore a laurel branch in his hand, and upon his way distributed bracelets, lances, garlands, and other marks of honour, among his soldiers. The Senate then went out to meet him, and the whole procession moved through the streets of Rome to the Capitol. The conquering general was preceded by musicians, by choice victims, by the spoils and emblems of conquered provinces and cities, and by the captive princes or generals in chains. Lastly followed the victorious army on foot. On reaching the Capitol, the general rendered public thanks to the gods for the victory, caused the victims to be slaughtered, and dedicated part of the spoils to Jupiter.

Triumphal Arch. (*See* Arch, Triumphal.)

Triuridaceæ, *tri-u-re-dai'-se-e*, in Bot., a small nat. ord. of *Monocotyledones*, sub-class *Petaloideæ*. Tropical plants closely allied to the *Naiadaceæ*.

Trochilidæ. (*See* Humming-Birds.)

Tropæolaceæ, *tro-pe-o-lai'-se-e*, in Bot., the Indian Cress fam., a nat. ord. of *Dicotyledones*, sub-class *Thalamifloræ*. Smooth trailing or twining herbs, with alternate exstipulate leaves and axillary unsymmetrical flowers. Sepals more or less valvate in æstivation; the upper one spurred. Petals convolute in æstivation. Stamens more or less perigynous, distinct. Ovary superior, of 3 or 5 carpels, with 1 pendulous ovule in each; style single. Fruit without a beak, usually composed of three pieces, each being indehiscent, and containing one large exalbuminous seed. There are four genera and about 40 species, chiefly natives of South America. They are generally acrid, pungent, and antiscorbutic.

Tropæolum, *tro-pe'-o-lum*, the typical gen. of the nat. ord. *Tropæolaceæ*. *T. majus* is the showy Indian cress or garden nasturtium, a well-known plant, with bright yellow flowers and smooth peltate leaves. Its unripe fruit is frequently pickled and employed by housekeepers as a substitute for capers. Several beautiful species and varieties are now cultivated in borders.

Tropic Bird. (*See* Frigate-Bird.)

Troubadours. (*See* French Language and Literature.)

Trout, *trowt* (Sax. *truht*), the name applied to a fam. of fishes belonging to the sub-gen. *Salar*, of the fam. *Salmonidæ*. The only distinctive feature which separates this fish from the remainder of the *Salmonidæ* is the fact of its possessing two rows of teeth in the vomer, instead of having nine, as in the genus *Salmo*. The common trout (*Salmo fario*) is a well-known freshwater fish, which inhabits the rivers and lakes of Europe. It is a fish greatly prized by anglers, on account of its being very shy at taking bait, and being excellent for the table. Specimens have been taken which have been more than two feet long, and exceeding fifteen pounds in weight. Like the salmon, it deposits its ova in a hole or nest in the sand at the bottom of the river. It is a shorter and stouter fish than the salmon, and the colour of its back is a yellowish brown, its sides yellowish, which verges into a glossy white on the belly. The back is also yellowish brown, and the sides with bright red, giving it a very pretty appearance. The grey trout is in larger variety than the former, but its flesh is considerably inferior in quality. It is termed the *Salmo ferox*. (*See* also Salmon.)

Trover, *tro'-ver* (Fr. *trouver*, to find), in Law, is a species of action invented for the purpose of trying a disputed question of property in goods and chattels. Originally it was an action for the recovery of damages against such person as had found another's goods, and refused to deliver them on demand, but converted them to his own use; and hence it is called an action of *trover* and *conversion*. By a fiction of law, actions of trover were at length permitted to be brought against any man who had in his possession, by any means whatsoever, the personal goods of another, and sold, used, or refused to deliver them up when demanded; but the form of the declaration was still maintained, that the goods had been casually lost, and were afterwards found by the defendant, who converted them to his own use, and for which the plaintiff claimed damages. These fictions are not now used, the fact of conversion now only requiring to be proved by showing that the defendant refused to deliver up the goods on request, or has destroyed them. In this action the plaintiff recovers damages equal to the value of the thing converted, but not the thing itself, which requires another form of action,—detinue or replevin.

Troy Weight, *troy*, an English weight containing only 12 ounces, or 5,760 grains, to the pound, being four ounces less than a pound avoirdupois, used chiefly in weighing gold, silver, diamonds, and other articles of jewellery.

Truck System, *truk*, in Pol. Econ., is used to signify the payment of the wages of workmen in goods instead of money, a system which formerly prevailed to a very considerable extent, particularly in the mining and manufacturing districts of the country. The plan was for the employers to establish warehouses or shops where the workmen in their employment either got their wages accounted for to them in supplies of goods, without receiving any money, or they received the money on the understanding that they were to purchase from these shops such articles as they might require. This system was necessarily productive of many evils, and at length 1 & 2 Will. IV. c. 36 & 37 (1831), commonly known as the Truck Act, was passed, declaring all contracts for the hiring of artificers, after enumerated, by which wages are made payable wholly or in part, otherwise than in the current coin of the realm, or which contain regulations as to the expenditure of wages, to be illegal, null, and void. Agricultural labourers and domestic servants are exempted from the operation of the act. Though very specific and minute, and well adapted for protecting the workmen from this species of oppression by the master, its provisions are said to be extensively violated and evaded.—*Ref.* M'Culloch's *Commercial Dictionary*; *English Cyclopædia*.

Truffle. (*See* Tuber.)

Trumpet, *trump'-et* (Fr. *trompette*), a musical instrument of brass or other metal, which has been common in most nations under different forms from the remotest ages. The term, as at present used, is somewhat vague, it being employed not only to designate a special instrument but in a generic manner as comprehending the whole family of brass instruments. The trumpet *par excellence*, however, consists of a tube eight feet long, expanding at the end at which the sound issues into a bell-like shape, and is doubled into a parabolic form. It is played by means of a mouth-piece nearly an inch in width. Its compass extends from G below the staff to E above.

Trumpet, Ear. (*See* Ear-Trumpet.)

Truss, *truss* (from Fr. *trousse*), a frame of timbers so disposed that if suspended at two given points, and charged with one or more weights in certain others, no timber would press transversely upon another except by timber exerting equal and opposite forces. When one or more exterior timbers of a frame, suspended from two given points, are propped by the disposition of interior timbers at certain points in each of the exterior pieces, so as to receive the pressures of several weights, each acting upon one of the said points without any tendency to bend or break any timber employed in the construction, the frame is called a *truss*, and each of the exterior timbers so propped in their length is said to be *trussed*. Trusses are very extensively used in building operations.—*Ref.* Nicholson's *Encyclopædia of Architecture*.

Truss-Bridge, is a timber bridge built of a system of framework arranged after the manner termed *trussed* (*see* preceding article). On account of the facility of executing them, as well as for economical considerations, these wooden bridges are often had recourse to. One of the commonest forms of truss-bridge is that termed a *lattice-bridge*. It is a kind of bridge much used

in America for spanning rivers of great breadth. It derives its name from the peculiar formation of the bearing-beams, or girders, that run throughout its length from end to end, and form supports for the transverse beams on which the joists and flooring are laid that form the roadway. This singular and ingenious kind of truss-bridge was patented by Ithiel Town, an American engineer, in 1835, and has since been adopted in the construction of railway bridges in that country. There are two trusses on either side of the roadway, which are firmly bolted together. The trusses are formed of planks or scantlings, about eight or nine inches in breadth, which are inclined diagonally to each other at an angle of rather more than 15°, like the laths which compose a piece of trellis-work, and fastened together by trenails of hard wood at every point where the planks cross each other.

TRUST and TRUSTEE, *trust, trust-ee*.—In Law, a trust is defined to be "a confidence reposed in some other, not issuing out of the land, but as a thing collateral annexed in privity to the estate of the land, and to the person touching the land, for which *cestui que use* has no remedy but *subpœna* in Chancery." In principle, a trust is now much the same as a use was before the Statute of Uses,—a *fiduciary* or beneficial interest distinct from the legal estate. The trustee is the person in whom the trust is vested, the *cestui que trust* the person who trusts or enjoys a beneficial interest in the objects of trust. It corresponds to the *fidei commissum* of the Romans, and, under the name of *uses*, was introduced into England by foreign ecclesiastics in the reign of Edward III. They had recourse to it to evade the statutes of mortmain, by obtaining grants of lands, not to their houses directly, but to others for their use. The idea once introduced, came afterwards to be applied to a number of civil purposes, and at length it became almost universal. It spread particularly during the civil commotions between the houses of York and Lancaster, *as a* means of securing estates from forfeiture. The system having been found to produce many inconveniences, 27 Henry VIII. c. 10, commonly called the "Statute of Uses," was passed, the general effect of which was to change the use into possession, thereby making *cestui que use* complete owner of the lands and tenements, as well at law as in equity. The real ownership would thus become subject to all the liabilities incident to the legal title. This statute did not put an end *to* the system of uses, but led to the introduction of certain modifications in it. A further alteration was made in it by the Statute of Frauds (29 Car. II. c. 3), which required that all declarations of trusts, or confidences of lands, tenements, or hereditaments (which might formerly have been created by parol), should be manifested and proved by writing signed by the party by whom it is declared. The courts now consider a trust estate as equivalent to the legal ownership, governed by the same rules of property, and liable to every charge in equity which the other is subject to in law. The trustee is considered merely as the instrument of conveyance, and can in no shape affect the estate unless by alienation for a valuable consideration to a purchaser without notice. The estate of the trustee is at law subject to all the incidents which attend the ownership of land, and is usually called the trust estate, in contradistinction to the legal estate. Trusts are generally either to protect the interests of married women and children, by placing in the hands of trustees for them the legal rights which they would be incapable of exercising, or to secure the rights of those in remainder, by severing from the usufruct of property for a life the power of disposing of the whole. Frequently trusts involve the sale or purchase of lands or other property, the investment of funds, &c.; in which cases the trustee has to exercise due caution, or he may be rendered liable for any loss that may arise. The duties of trustees are very various, and depend in great measure upon the nature of the particular trust.—*Ref.* Sanders *On Uses and Trusts*; Lewin's *Law of Trusts and Trustees*.

TUBER, *tu'-ber* (Lat.), in Bot., a subterranean branch arrested in its growth and excessively enlarged by the deposition of starch in its tissue. It has upon its surface a number of little buds, or eyes as they are commonly called, from which new plants are formed the succeeding year. The potato and Jerusalem artichoke are good illustrations of this peculiar modification of the stem.

TUBER, in Bot., the Truffle, a gen. of *Fungi*. The species are subterranean, and dogs are trained to discover them by the smell. They are highly esteemed as seasoning or flavouring agents. Several occur in England, but the best are imported from France, Algeria, and Italy, preserved in oil. *T. æstivum, cibarium*, and *melanosporum*, are the species commonly used.

TUBULAR BRIDGE, *tu'-bu-lar*.—The real objects in view in the first construction of a tubular bridge were, to devise a beam of strength sufficient for its ultimate use as a bridge, and, at the same time, of sufficient independent rigidity as to retain its form when in place as well as during its erection. These requirements were obtained by very simple means. "A tubular bridge simply means a pair of girders with their top and bottom flanges of sufficient horizontal extension to meet and combine, forming a rectangular tube or trough, through the interior of which, or on the top of which, the roadway may be laid."—(*Encyclopædia Britannica.*) The principal examples at present in existence of tubular bridges of any magnitude are the Conway bridge, the Britannia bridge, the Brotherton bridge over the river Aire, the bridge over the Nile, and the Victoria bridge over the Saint Lawrence. As those bridges are, in most respects, similar in construction to the Britannia tubular bridge, which has been already described, it will not be necessary to again supply the details. (*See* BRITANNIA TUBULAR BRIDGE.)

TUDOR ARCHITECTURE, *tu'-dor*, in its general signification is that style of architecture which prevailed in England during the Tudor dynasty. The styles, however, to which this term is applied are many and widely different, including the Late Perpendicular Gothic, the Mixed or Elizabethan style, in which Italian details were introduced in buildings otherwise Gothic, and the Italian, as practised by Inigo Jones and his contemporaries. Some writers would divide the style thus denominated into early and late Tudor, the former term including the Late Perpendicular style, in which ornamental details were profusely introduced, and of which Henry VII.'s chapel at Westminster forms a characteristic example; whilst the latter is applied to those in which Italian details are introduced, and which are otherwise distinguished as Elizabethan. The reign of Henry VII. introduced a new *mode of* living, and a new style of domestic architecture. With his marriage the feuds between the houses of York and Lancaster came to an end, and, with a prospect of peaceful times before them, men began to look for convenience rather than strength in their private mansions. The thickness of the walls was reduced, size of the windows enlarged, and the battlements retained rather for ornament than use. The plan of the larger mansions of this period was quadrangular, comprising an inner and base court, between which stood the gate-house. On the side of the inner court, facing the entrance, the principal apartments were placed, and were connected with a gallery for amusements, running the whole length of another of the sides of the quadrangle. The materials of which such mansions were built were either brick or stone, and sometimes both combined; the main building being of brick, and the dressings of freestone. Among the more striking peculiarities may be mentioned the gate-houses, the numerous turrets and chimneys, the beautiful bay and oriel windows, the roof, ceiling, and panelled wainscot round the internal walls. Our constant intercourse with the continent had considerable influence on the arts in this country; and during the reign of Elizabeth the Italian style of art began to make rapid strides, and to produce a style of architecture in which Italian details were mingled with Gothic features and designs.

TUESDAY, the third day in the week, named after Tiw, the SAXON god of war.

TULIP. (*See* TULIPA.)

TULIPA, *tu'-lip-a* (Lat.), in Bot., a gen. of the nat. ord. *Liliaceæ*. The species are few, but the varieties are endless, and are the beautiful bulbous plants called tulips. In the middle of the 17th century there was quite a mania for cultivating tulips in the Netherlands, and most extravagant sums were given for bulbs of new

varieties. At the present time Holland supplies all Europe with bulbs.

TUMOUR, *tu'-mur* (Lat. *tumor*; from *tumeo*, I swell), in Surgery, in its widest acceptation, denotes a swelling of any kind on any part of the body; but it is commonly restricted to a swelling of a permanent nature, while such as arise from inflammation and disappear along with the cause, are usually known as *tumefactions*. Tumours are commonly distinguished into *sarcomatous*, or such as are firm and of a fleshy consistence, and *encysted*, consisting of a sac containing matter more or less pulpy or fluid. Of each of these surgeons distinguish several kinds.

TUNGSTEN, *tung'-sten* (Sw. & D. *tung*, heavy, and *sten*, stone),—atomic weight 92, spec. grav. 17·6. Tungsten is a metal found in small quantities in the form of an acid in Scheelite or tungstate of lime, and wolfram, a tungstate of iron and manganese. The metal itself, which is of an iron-grey colour, is procured from the tungstate of lime by a process interesting only to the scientific chemist. Its alloys are unimportant. Steel containing tungsten is said to have remarkable properties, but it is questionable whether they are due to the presence of this metal. It forms two oxides,—a binoxide, a heavy black powder, and the teroxide, or tungsten acid, its only important compound. Mr. Versmann was the first to discover the valuable nature of the salts of this acid. This acid is readily procured in an impure condition, by heating Scheelite or wolfram with hydrochloric acid, which dissolves the metals, leaving the tungsten acid behind as an insoluble residue. The anhydrous acid is of a beautiful lemon-yellow colour, insoluble in water, but soluble in solutions of the alkalies, with which it forms soluble salts. The most important of these is the tungstate of soda, now extensively used as an antiflammable agent in starch. It is both cheap and easy of application, but the records of the coroners' courts do not show any appreciable diminution in accidents by burning since it has come into use. The tungstate of lead appears to offer decided advantages as a white pigment; in fact, if tungsten acid could be procured in sufficient quantities, we should have a number of valuable pigments from this source. Tungstic acid itself is of a fine yellow colour; tungstate of tungsten is blue, tungstate of tungsten and soda is saffron, with beautiful golden spangles distributed through its mass; tungstate of tungsten and potash is magenta, with the same crystalline appearance; and a mixture of the two last gives a very beautiful violet. With both chlorine and sulphur, tungsten forms two compounds corresponding to its oxides. Both the chlorides are volatile; an oxychloride, having the properties of an acid, may also be formed by passing dry chlorine over the heated binoxide. It is obtained in volatile yellow scales, and is sometimes called chlorotungstic acid. The compounds of this metal, as a rule, are not poisonous; they resemble those of molybdenum very closely, and it is worthy of note, that the atomic number and specific gravity of tungsten are nearly double those of molybdenum.—For a more extended account of tungstic acid and its uses, see *Jurors' Report of the International Exhibition*, 1862, Class 2.

TUNIC, *tu'-nik* (Lat. *tunica*), a garment made of cloth, worn by the ancient Romans and in the East. It extended to, or below the knees, and was fastened round the waist with a girdle slightly ornamented. It was also used by the Saxons; indeed tunics were commonly worn in this country until the end of the 15th century. The term is still applied to the military surcoat.

TUNING, *tu'-ning*, the art of adjusting the several sounds of a musical instrument, so as to produce as nearly as possible a correct scale, as well as that of making two or more instruments agree with each other, and thus enable them to be played in concert. All instruments are liable to change their tone; this, however, in some, such as the horn, lute, &c., is of little importance, as all the parts, if changed at all, change together, and the whole effect of temperature can be corrected by lengthening the pipe of which the instrument consists. Others, however, as violins, harps, drums, &c., require tuning every time they are played; thus it is necessary for the performer to understand the art of tuning himself. Organs, harmoniums, pianofortes, are extremely liable to alter their tone; wet, cold, heat, removing from one room to another, all these causes will tend to put them out of tune, more especially the latter instrument; and even if exposed to none of these evils, they will require tuning at certain intervals, owing to the various parts being unconnected and subject to separate accident and unequal wear.

TUNING-FORK, a steel instrument consisting of a handle and two prongs, which, when struck against the table or some hard substance, produces a certain fixed note by which the pitch of voices or instruments is determined. It was invented by Mr. John Shore, sergeant trumpeter to George 1. There are forks of various tones, but the A and C forks are most commonly used.

TUNNEL, *tun'-nel* (Fr. *tonnelle*), in Civil Engineering, an arched passage formed under-ground to conduct a canal or a road on a lower level than the natural surface. Long tunnels are usually made through hills in order to avoid the inconvenience and loss of power occasioned by conducting a canal, road, or railway over elevated ground, and also the expense of effecting the excavations which would be necessary in order to preserve the requisite level. Those of less extent are frequently constructed to avoid the opposition of land-owners, or to afford uninterrupted passage under a road, canal, or river. Rocky strata, if the stone be of a nature to work freely, are usually the cheapest for tunnelling, owing to the absence of lining and the power of saving labour by the use of gunpowder. Tunnelling in clay is usually attended by difficulties which render it very expensive. It is, when tough, a difficult material to remove, blasting being of no use, and spades and pickaxes being almost inapplicable. Tunnels formed through chalk are often impeded by faults or cavities filled with wet gravel or sand, which pour a flood of semi-fluid matter into the excavations as soon as they are cut into. The construction of tunnels is by no means of recent origin, although it is only of late that they have become common. The outlet for the lake Copais in Bœotia is one of the oldest monuments of the labour of man. The great tunnel in Samos, which was seven stadia, was driven through a mountain 900 feet high, for the purpose of serving as the bed of a channel to convey water from a natural source to the city of Samos. With regard to the adoption of tunnels in railway works, it may be observed that the ground should be examined by numerous borings, because sudden breaks or faults in the strata, which may occasion great difficulty and expense in tunnelling, may otherwise escape notice.

TURANIAN FAMILY OF LANGUAGES, *tu-ra'-ne-an*.—One of the three great families of languages into which modern philology has divided all the spoken and dead dialects of the world. The term Turanian is used in opposition to Aryan, and is applied to the nomadic races of Asia as opposed to the agricultural or Aryan races. The Turanian group of languages consists of two great divisions, the northern and the southern. The northern comprises five sections of dialects,—the Tungusic, Mongolic, Turkic, Finnic, and Samoyedic. The southern, which occupies the south of Asia, comprises the Tamulic, or the languages of the Deccan; the Bhotiya, or the dialects of Tibet and Bhotan; the Taic, or the dialects of Siam, and the Malaic, or the Malay and Polynesian dialects.—Rof. Max Müller's *Lectures on the Science of Language*.

TURBAN, *tur'-ban*, a kind of head-covering worn by most eastern nations, consisting of a piece of cloth wound round a cap in plaits. Turbans vary in form in different nations, and in the different classes of the same nation. That of the Turkish sultan contains three heron's feathers, and is enriched with diamonds and other precious stones. The care of it is intrusted to a particular officer called *tulbend aga*. That of the grand vizier has two feathers, and those of the other officers but one.

TURBINE, *tur'-bein* (Fr.), a water-wheel attached to a vertical revolving axis. It consists of a drum, upon which are a number of vanes curved in such a way as to allow the water leaving them to go off with the minimum of velocity or power. Comparatively with their small bulk, turbines possess a high degree of power. Professor Rankine divides them into three classes:—(1) "Parallel-flow turbines," or those in which the

water is supplied and discharged in a direction parallel to the axis; (2) "outward-flow turbines," or those in which the water is supplied and discharged in currents radiating from the axis; (3) "inward-flow turbines," or those in which the water is supplied and discharged in currents converging towards the axis.—Ref. *English Cyclopædia*—Arts and Sciences; Prof. Rankine on *Prime Movers*; Armengaud's *Traité pratique des Moteurs Hydrauliques*; General Morin's *Leçons de Mécanique pratique*.

TURBOT, *tur'-bot* (Fr.), (*Rhombus maximus*), the name of a fish belonging to the gen. *Rhombus*,, of the fam. *Plagionectidæ* (Gr., "side-swimmers") of the ord. *Anacanthini*, or those which have no spines in the fins. The family are generally known by the name of flat-fish, and are rendered peculiar amongst vertebrated animals from the fact of both eyes being placed on one side of the head, which side is always uppermost when the fish is swimming. The body of the turbot is very compressed, and is of a brown colour, and beset with tubercles, which, indeed, seem to distinguish it from the brill, which it much resembles. A long dorsal fin fringes the whole extent of the back, and the under surface of the body is white. The turbot is found generally in deep water along our coasts, and its flesh is much esteemed for the table; consequently its fishery is an object of some importance to the maritime population. The number brought to the London market alone every season exceeds, on an average, 80,000, and it is said by Dr. Baird that a sum of £15,000 is annually paid to Denmark for lobsters in order to make sauce for them. They are caught by means of hooks and lines, and by trawl-nets during the warm months of the year. Mr. Yarrell mentions that the largest he has heard of measured about six feet across, and weighed about 190 pounds. The halibut, another species of turbot, greatly exceeds these proportions; many specimens of which exceeding 300 pounds in weight having been taken.—Dallas's *Animal Kingdom*.

TURKEY, *turk'-e* (*Meleagris*), a gen. of birds belonging to the ord. *Gallinæ*, tam. *Phasianidæ*, and sub-fam. *Meleagridæ*. The type of the genus is the well-known common turkey, *Meleagris gallopavo*, which has been proved, by the eminent naturalist Mr. Gould to be of Mexican origin, and to be the true parent of our common domestic species. Bonaparte, in his "History of American Birds," has given us a very forcible description of the turkey in its wild state. He mentions that when full-grown, the male wild turkey is nearly four feet in length, and about five feet in extent from wing to wing, while the colour of the feathers is of dark grey, and other colours, bordered on the edges with gold and similar vivid hues, presenting a splendour of plumage which we look in vain for in the domestic turkey. The wild turkeys do not confine themselves to any particular species of food, eating anything which comes across their path;—mice, all sorts of berries, fruits, grapes, beetles, tadpoles, and even young frogs and lizards, being found in the crops on dissection. They are particularly fond of acorns, however, and when a large crop of these is produced in any part of the country, there will the wild turkeys be found congregated in immense numbers. The month of October is termed, in fact, amongst the Indians, the "turkey month," from the fact of their assembling in considerable flocks in order to gather the mast from the trees. The males are termed gobblers, and associate together in flocks of from ten to a hundred, and seek their food separately from the females, who also go in families by themselves. These latter are always intent on avoiding the old males, which always kill the young turkeys whenever they can get hold of them. All parties, however, travel in the same direction, and their migrations present the most extraordinary effect. When about to cross a river, they ascend to the greatest eminences, that their transit, which is by flight, may be more safely and speedily accomplished across; but before commencing their flight, they wait a day or two, apparently in deliberation and consultation; during which time the young males gobble and strut about, evidently all trying to animate their companions before setting out. At last, when every point has been settled, and their courage wound up to a proper pitch, the assembled multitude mount the highest trees, and, at a given signal from their leader, they wing their way across the opposing stream. When the turkeys have arrived in the land of abundance, they disperse in small parties, composed of all ages and sexes, intermingled, devouring all the mast from the trees as they advance. This happens about the middle of November. After these long journeys, they become so familiar as to venture on the plantations, and even enter the stables and corn-ricks of the proprietors in search of food. In this way they pass the autumn and part of the winter, during which season great numbers are killed by the inhabitants, who preserve them in a frozen state in order to transport them to distant markets. Early in the month of March they begin to pair, and the noise they then make is something extraordinary. The sexes roost apart, but at no great distance; so that when the female utters a call, every male within hearing responds, rolling note after note in rapid succession, in a tone resembling that of the domestic turkey, when an unusual sound reaches its ear. Where the turkeys are numerous, the woods, from one end to the other, sometimes for hundreds of miles it is said, resound with this remarkable noise thus caused. At sunrise it ceases, and all descend from their perches. At this season, too, fearful battles take place between the males, and numbers are killed by this means. When the females begin to lay, they separate from the males, as the latter invariably break the eggs when in their power. The young turkeys grow rapidly, and in the month of August go into the forest, and get their own subsistence, until the autumn, when they again congregate, and go through their migration in search of the mast. The domestic turkey, in this country, is a stupid heavy bird, and is so well known as hardly to call for any special description. The name of turkey is said to have been given it from a mistaken opinion that it was a native of that country. The plumage is much inferior to that of the wild turkey, but by some authorities it is considered a handsome bird. Great numbers are reared in England, principally in Norfolk, whence large quantities reach the London market about Christmas time. A second species of the turkey is found in Honduras, termed the ocellated turkey (*Meleagris ocellata*), which is much more brilliant in plumage than the common variety. It is nearly of the same size, but its feathers are of a beautiful metallic green, or bronze colour, variegated with black, gold, and azure-blue.

TURMERIC. (*See* CURCUMA.)

TURNERACEÆ, *tur-ner-a'-se-e*, in Bot., a nat. ord. of *Dicotyledones*, sub-class *Calycifloræ*, consisting of herbaceous or shrubby plants, confined to South America and the West Indies. They have little economic interest. Some are said to be astringent, others tonic, and a few aromatic.

TURNING, *turn'-ing*, the process by which a circular form is given to wood and other materials by means of a lathe and cutting tools, as in wood or metal turning; or by the thrower's wheel, which is a species of lathe, with shaping instruments, and in the manufacture of earthenware. The lathe by which ordinary wood turning is effected is a machine for moving the material to be wrought in such a manner that, being fixed opposite to the tool, any point in the circumference will act upon the whole circle in exactly the same manner.

TURNIP. (*See* BRASSICA.)

TURNIP-FLY, *turn'-nip* (*Haltica nemorum*), a well-known species of the *Galeruoidæ*, a family of leaf-eating beetles. The turnip-fly is of very small size, and its colours very obscure. The body is of an elongated ovate form, and very convex; the head is short, and immersed in the thorax up to the eyes; the antennæ are short and filiform; the maxillæ bilobed at the apex, with the outer lobe jointed and palpiform, and the palpi short. It is a very destructive insect, and is named from the great injury it inflicts on turnip-fields, feeding on the interior of the leaves, where they take up their abode, and in fact undergo their transformation. In Devonshire it is stated that the effects of the ravages of this insect in one instance alone were estimated at £10,000 sterling; and another variety—the *Haltica oleracea*—inflicted such damage on the vines at Montpellier in one year that fears were entertained for the commercial prosperity of the town, and religious exercises were ordered in order to exorcise the insects. The striped

cucumber-beetle (*Galeruca vittata*), an American species, inflicts great damage on the leaves of melons, cucumbers, and such-like plants, whereon it lives.—*Ref.* Baird's *Dictionary*.

Turpentine, *terp'-en-tine*, a semi-solid resinous substance, which exudes from various species of pine on cutting incisions in the bark. There are several kinds of turpentine known in commerce; that obtained from the *Pinus Abies* constitutes *common turpentine;* that from the *Pinus Larix*, or common larch, is known as *Venice turpentine;* that from the *Pistacia Lentiscus* forms *Chian turpentine;* and *Canada balsam* is obtained from the *Abies balsamea*. They all consist of various portions of resin, dissolved in the oil or essence of turpentine. If the turpentine of the *Pinus Abies* is distilled with water, it yields about one-fourth of its weight of the essence, oil, or spirits of turpentine, as it is variously called. The oil passes over with the vapour of the water as a volatile limpid inflammable liquid, of a peculiar penetrating well-known balsamic odour, the residue in the retort being common resin or rosin. Oil of turpentine is a hydrocarbon, $C_{20}H_{16}$, having a specific gravity of 0·86½, and boiling at 320°. It mixes freely with alcohol and ether, but not with water. It dissolves the fixed and essential oils, resins, sulphur, phosphorus, and india-rubber. In its purified form it constitutes the burning fluid known as *camphine*. Being a ready solvent of the gum resins, it is largely employed in the manufacture of varnish, also in oil-paint, as a diluent of the oil. Several substitutes for turpentine for the latter purposes have been proposed, owing to its having risen in price on account of the American war. Only two of these have come into use,—*turpenzine*, which consists of the lighter hydrocarbons, obtained from paraffin oil and petroleum, and *methylated rum*, which is allowed to be imported duty free. Oil of turpentine is a powerful grease-solvent; but only the fresh oil should be used for this purpose, as, when kept for any length of time, it gradually oxidizes into a resin, which becomes dissolved in the remaining oil. Oil of turpentine is remarkable in a chemical point of view, on account of the number of singular compounds that may be obtained from it. With hydrochloric acid it forms an artificial camphor, crystallizing in flattened rectangular prisms, which have an aromatic odour resembling oil of thyme. With water it forms crystalline hydrates, and with oxygen a crystalline hydrated oxide. The monohydrate of turpentine, or terpinol, is an oily liquid, boiling at 334° Fahr., and having an odour like hyacinths. The oils of bergamotte, neroli, lemon thyme, caraway, and several others, contain hydrocarbons isomeric with oil of turpentine, but they differ in their physical and chemical properties. (For a fuller account of the properties of oil of turpentine, the reader is referred to Miller's *Elements of Chemistry*, vol. iii.) Oil of turpentine is used as a burning fluid in Deville's lamp-furnace for obtaining high temperatures. (*See* C. C. Williams's *Chemical Manipulation*.) It is used in medicine as a rubefacient. It has also vermifuge properties, and stimulates the urinary organs very powerfully. *Canada balsam*, which is a very white resin dissolved in oil of turpentine, is employed in varnish-making and mounting microscopic objects. The other turpentines are occasionally used in medicine.

Turret Clock, *tur'-ret*.—The first and most important difference between a turret clock and an ordinary house-clock consists in the increased size of the hands and in the weight of the hammers; and as by increasing the weight of clock machinery there is also an increase of friction, it forms the principal duty of the clock designer to construct his timekeeper in such a way that it shall overcome its own friction in an uniform and constant manner. As a correct timekeeper, the Westminster clock, designed by Mr. E. B. Denison, Q.C., has proved itself an admirable piece of horological machinery. The frame of this clock is 15½ feet long by 7½ wide, of which the going part occupies a width of 2 feet. The clock is in a room 28 feet by 18 feet, the shaft, or well, for the weights being 17½ feet deep. The pendulum, perhaps the heaviest in the world, weighs in all 685 lbs. About twenty minutes are required to wind up the going part of the Westminster clock. The dials, which are 23½ feet in diameter, have a cast-iron framework, filled in with a valuable kind of opal glass: the price paid for these dials and hands was £5,334. The minute-spaces upon the dial-faces are 1 foot square, while the figures for the hours are 2 feet long. The length of each minute-hand is 14 feet, and, with the internal and external counterpoise, weigh somewhat less than 2 cwt. The hour-hands are considerably longer, and more than proportionately heavier. The clock has a valuable set of hour- and quarter-bells, which are very musical, although, unfortunately, "Big Ben," the hour-bell, is cracked, like its predecessor. The weight of Big Ben is 3 tons 18 cwt., its diameter 6 feet; the weight of its hammer, 175 lbs.—*Ref.* Denison's *Rudimentary Treatise on Clocks, Watches, and Bells*.

Turtle, *tur'-tl*, a reptile similar to the tortoise, and belonging to the fam. *Chelonidæ*. The body of the turtle is short, swollen, and inclosed in a case formed of two shields, united by their margins, and composed of a crust of imbedded plates, which leave the neck, limbs, head, and tail free. These parts are usually covered with a scaly skin. They have four legs, which are short and thick, and the tail is short and conical. They respire by means of lungs at all ages, and are viviparous; and their brain and senses are but very indifferently developed. These characteristics are shared by the tortoises as well; but in the turtles the limbs are connected with fin-like organs, as their habits are purely aquatic. The turtle feeds on grass, seaweed, and other marine plants, and in some instances on small molluscs. The female produces her eggs about the month of April, to the number of one hundred or more, which she buries in the sand, where they soon become invigorated with life. The turtle is closely allied to the tortoise, and differs only in its specifically different habits and habitats. In their external appearance they bear a close resemblance to each other, except in size, in which the turtle greatly exceeds and outweighs the land animal. As to their habits, the tortoise readily takes to the water, and appears at ease in that element, especially in sultry weather, and the turtle, on the other hand, often comes on shore, and inhabits the warm sand on the sea-coasts, where it dwells when about to deposit its eggs. They consequently much resemble each other, and have been rightly classed by naturalists together, although one is essentially terrestrial and the other a marine reptile. As an article of food, however, the turtle is much prized, whereas the flesh of the tortoise is quite coarse and unestable; and this constitutes another distinction between them. The best-known variety of the edible species of turtle is that termed the green turtle (*Chelonia viridis*), which is found in the seas of most warm climates, and of which large numbers are annually imported into Europe for the purposes of the table, no great banquet being considered complete without this dish making its appearance. This variety attains a length generally of five or six feet and of from five to six hundred pounds weight. The flesh of this turtle is peculiarly delicate, and the eggs are likewise esteemed a great dainty. They are generally taken by watching them when they come on shore on moonlight nights for the purpose of depositing their eggs, when their captors secure them by turning them on their backs, so that they cannot escape by running off. The green turtle abounds in the West Indies, off the Bahamas, and at the island of Ascension, which latter place, in fact, seems to be their head quarters. They are also often met with in the Atlantic, sometimes seven hundred or eight hundred leagues from land, when they are easily captured when asleep on the surface of the water. The hawk's-bill turtle (*Chelonia imbricata*) is another variety, and does not attain so large a size as the one just described, seldom being found to exceed two hundred pounds in weight. This variety is found in the Atlantic and also in the Indian Ocean, but it is not much thought of, as its flesh is very coarse and inferior to that of the green turtle. It is called the hawk's-bill turtle from the curved and pointed form of the upper jaw, which, however, presents but very little resemblance to the beak of any bird of prey. This turtle is much sought after for the value of its shell, which is converted into the best "tortoise-shell" of commerce. The largest species is termed the loggerhead turtle (*Chelonia caretta*), which is found in the Mediterranean Sea not unfrequently, besides the Atlantic and other tropical seas. This

variety generally feeds on mollusca, and its flesh is consequently unfit for food, besides being highly poisonous. The shell, too, is not worth much, and the only thing which it is valued for is a large quantity of oil which it yields, and which burns very well in lamps. Some specimens of the loggerhead turtle have been found which exceeded sixteen hundred pounds, and some of between seven and eight hundred pounds weight have been found thrown up even on the coast of England. Allied to the turtles are the soft tortoises, which inhabit the rivers and lakes of Asia and Africa, and also the waters of North America. These are active animals, feeding principally on fish, but occasionally on birds and small reptiles. Of these the *Trygonix ferox*, or snapping turtle, is one of the most remarkable, as it destroys large numbers of young alligators in North America annually. They seize their prey by suddenly darting at their long neck and clutching it in their bite, which is very strong. The flesh of the snapping turtle is superior to that of any other of the varieties of the turtle known, and on that account it is much hunted. This species have their shells covered with a hard cartilaginous skin, usually expanded and flexible on the edge, and a long neck, which they can retract at pleasure under the carapace. They swim with much ease, and at night-time seek repose in quiet nooks, where they will be undisturbed. They are caught in North America by angling for them with a hook and line baited with small fish or any living animal. (*See* also TORTOISE.)

TUSSILAGO, *tus-sil-ai'-go* (Lat. *tussis*, a cough), in Bot., a gen. of the nat. ord. *Compositæ*. *T. Farfara* is the colt's-foot, an herb which has long been employed as a popular remedy in chronic coughs and other pulmonary complaints.

TWELFTH-DAY, *twelfth*, the festival of the Epiphany, or Manifestation of Christ to the Gentiles, being the twelfth day exclusive from Christmas. For customs peculiar to this day in England, *see* Brande's *Popular Antiquities*.

TYPE FOUNDING. (*See* PRINTING.)

TYPES, *tipes* (Lat. *typus*, a form, likeness).—The illustrious chemists Gerhardt and Laurent were the first who called attention to the fact that chemical substances might, like the members of the animal and vegetable kingdoms, be arranged in classes according to a fixed type. To take the simplest example, hydrochloric, hydrobromic, and hydriodic acids are all formed on the same *type, model*, or *pattern*, and consist of an atom of hydrogen united with an atom of halogen. On going further into the subject, it will be found that other acids may be formed on the same model by substituting for the halogen some radicle having a similar function. Thus we have hydrocyanic acid H ($C_2N$), in which the grouping ($C_2N$) plays the part of a halogen. Pursuing the matter further as regards the halogen atom, we can replace it by still more complicated groupings, such as sulphocyanogen ($S_2C_2N$), and many others. With respect to the other atom of the type, H, it may be replaced by hundreds of bodies having similar functions; such as the metals, giving rise to chlorides, like NaCl, KCl, AgCl, &c. Or compound groupings may be brought in, as in the case of the halogen, and we get ($C_4H_5$)Cl, or ($C_2H_3$)Cl, the chlorides of ethyl and methyl. We may even double and treble the type without hurting the typical relationship between the bodies. Thus by doubling we can form hydroferrocyanic acid, $H_4$ ($Fe\,C_6N_6$), the compound grouping being the radicle ferrocyanogen. By trebling, we may obtain $H_3$ ($Fe_2C_{12}N_6$), hydroferridcyanic acid. Of course, in the two last examples, the double and triple atoms of hydrogen may be replaced by double and triple atoms of metal or alcohol radicle, such as methyl, ethyl, amyl, &c. The substances formed on this type are extremely numerous, the representatives of hydrogen and chlorine which are capable of replacing them being almost endless. The next type is the water type; to show the relations of which it will be necessary to double the primitive atom, thus, $H_2O_2$ or $HHO_2$. It includes the hydrates, oxides, oxacids, oxysalts, alcohols, ethers, mercaptans, and a large number of other compounds, too numerous to be detailed here. Commencing with the duplicate atom $HHO_2$, we can, as in the first type, replace the hydrogen by a metal; but as there are two atoms of hydrogen to deal with, we can take them one at a time; thus we can get first $KHO_2$, or KOHO, hydrate of potash; by replacing both, we get $K_2O_2$, or two atoms of potash. The oxacids are formed in the following manner: sulphurous acid, (SO)$HO_2$, or $HSO_3$; sulphuric acid, ($SO_2$)$HO_2$, or $HSO_4$; nitric acid, ($NO_2$)$HO_2$, or $HNO_3$; and so on. The oxysalts are formed in the following manner from their oxides, which we have already seen belong to the water type: $KKO_2$ becomes $K(SO_2)O_2$, or $KSO_4$; and $KKO_2$ is transformed similarly into $K(NO_2)O_2$, or $KNO_3$. The oxysalts, however, may be also formed on the hydrochloric acid type; thus HCl is transformed into $KSO_4$ by considering $HSO_4$ to represent sulphuric acid. The bringing of oxides, such as KO, AgO, FeO, and so on, under the water type, is simple enough; but there are certain oxides, such as the sesquioxides, which require a little consideration. The experiments of numerous chemists have placed it beyond a doubt that iron, platinum, and several other metals, have, so to speak, a double atomic power, being more powerful in certain compounds than in others; thus, in protoxide of iron, FeO, we find a single atom of iron holding in combination a single atom of oxygen, balancing its power, as it were. But in sesquioxide of iron, $Fe_2O_3$, we find the atom of iron half again as powerful, and balancing the power of an atom and a half of oxygen. The assumption is then, there are two states or conditions of iron, a rich one and a poor one, so to speak, which may be symbolized by Fe and Ffe, the latter being half as strong again as the former. The two oxides of iron are consequently represented as being formed in the following manner:—protoxide of iron from HHOO, FeFeOO, or FeO, and sesquioxide of iron from HHHOOO, FfeFfeOOO, or $Ffe_2O_3$. The ethers and alcohols belong to this type. One example of each will suffice to show how this classification is arrived at. It will be remembered that the radicle ethyl, Et ($C_4H_5$) has the power of replacing hydrogen like a metal. Ether, therefore, is formed from $HHO_2$, thus, $EtEtO_2$, or EtO; oxide of ethyl and alcohol, from $HHO_2$, in the same way that hydrate of potash was formed above; $HHO_2$ is transformed into EtHO, or EtOHO, hydrated oxide of ethyl. According to the followers of Gerhardt, the equivalent of oxygen is doubled, and the water type, formulated thus, $H_2O$, are at one of oxygen being considered to have a double power, or a power of balancing two atoms of hydrogen or a metal. The third type, the ammonia type, $NH_3$, is by far the most important, from the almost infinite number of valuable and interesting compounds capable of being formed upon its model. In this type each equivalent of the hydrogen in the single, double, treble, and even quadruple atom of ammonia, may be replaced by atoms of almost any element or grouping. To make this clear it will be necessary to take a few examples. When bromide of ethyl is mixed with a solution of ammonia in alcohol, placed in a sealed tube, and exposed to a heat of 212° Fah., a reaction occurs, in consequence of which, as the liquid cools, crystals of the hydro-bromate of a new base are formed, which, when distilled with potash, yields the base in a state of purity, if the proper proportions have been observed in its preparation. Analysis shows that the new base consists of ammonia in which one of the atoms has been driven out and replaced by its analogue, ethyl; thus NHHH has become NHHEt. If a portion of this base, which is termed ethylamine, or ethylia, be treated with another portion of bromide of ethyl in a sealed tube, another still more complicated base may be formed by the replacement of another hydrogen atom by an atom of ethyl; and if the process be repeated a third time, the third and last atom of hydrogen will suffer the same fate. Thus the new compound, triethylamine, has been built up by the gradual removal of its hydrogen until the whole of it has been replaced, the steps being NHHEt, ethylamine; NHEtEt, diethylamine; and NEtEtEt, triethylamine. These three compounds are all similar to ammonia in their reactions, being alkaline gases capable of being absorbed by water, and forming, with the acids and halogens, crystallizable salts. Instead of ethyl, the whole of the organic radicles may be employed to displace the hydrogen. The metals, too, of course,

may be the replacing substances, and different radicles or elements may be congregated together in place of the three, six, nine, or twelve atoms of hydrogen. It will be easily seen from this that compounds having the most complicated formulæ may be formed, all referrible to the simple type $NH_3$. The compounds formed on this type are named respectively amines and amides, according as the replacing elementary or compound radicles are basic or acid in their nature: those with both are called amin-amides, or alkaloamides. Amides and amines are primary, secondary, or tertiary, according as one, two, or three atoms of hydrogen have been replaced. Many of the amines are of the greatest importance in commerce, most of the coal-tar colours being salts of bases built up on the type $NH_3$; thus aniline is, properly speaking, phenylamine, $NHH'Ph$ (*Ph* representing *phenyl*); and the numerous useful substances which are formed from it have resulted solely from the practical carrying out of the theory of types. The analysis of the various natural, vegetable, and animal alkaloids shows that they are all constructed on the ammonia type; but the way in which they are built up, or, in other words, the compound radicles which have replaced the hydrogen in each instance, have yet to be discovered. In certain instances as yet, however, they are but few; the nitrogen may be replaced by one or two elements, for example, phosphorus and arsenic. $PH_3$ and $AsH_3$, although having no alkaline properties, have certain analogies with ammonia; and numerous compounds have been formed from the former (phosphamine); and there is reason to suppose that $AsH_3$ (arsenamine), at least in its methyl and ethyl derivatives, forms salts corresponding to those formed by ammonia. The other members of the nitrogen group, antimony and bismuth, are still less capable of forming compounds corresponding to the amines and amides. The fourth and last type is $CH_4$; but as its existence has not long been acknowledged, we have as yet few compounds referrible to it. The most interesting of those yet discovered are the silicum compounds of Wöhler and others, of which only one need be mentioned,—silicetted hydrogen, $SiH_4$, a spontaneously-inflammable gas.—For further details of the theory of types, the reader is referred to the last edition of Fowne's *Chemistry*, edited by Bollman and Bence Jones; and to Odling's *Manual of Chemistry*.

Typhaceæ, *ti-fai'-se-e*, in Bot., the Bulrush fam., a nat. ord. of *Monocotyledones*, sub-class *Petaloideæ*, consisting of herbs with rigid linear leaves and monœcious flowers, arranged on a spadix or in heads. They grow in watery places, chiefly in the northern parts of the world. The young shoots of *Typha latifolia* and *angustifolia* are sometimes boiled and eaten like asparagus. Their rhizomes are also edible. A kind of bread is prepared from the pollen of some species.

Typhoid Fever, *ti-foyd'*, resembles in its main features that of typhus; and until very recently the two were generally regarded as but two stages of the same affection. There appears good reason, however, for believing them to be essentially distinct disorders. Typhoid fever usually commences more insidiously and more gradually than typhus; the sufferer is less dull and stupid, but more anxious, and during the delirium decidedly more active, and even vivacious. Diarrhœa is almost always present in typhoid fever (often accompanied with hæmorrhage), very rarely in typhus. In the former the eruption consists of rose-coloured spots thinly scattered, and often entirely absent. Typhoid fever is most common in youth, and rarely attacks persons after forty; while typhus may occur at any age; and the former does not reach its height for a week later than the latter. In general the treatment required in both cases is alike, except in one or two particulars. At the commencement of typhoid, emetics are of service, but aperients should rarely be given, in consequence of the tendency to diarrhœa. The intestinal irritation and diarrhœa require for their treatment astringents, combined with opium, which may be administered either by the mouth or rectum. If there be hæmorrhage from the bowels, cold ought to be applied carefully over the abdomen. During convalescence, the patient requires to be carefully attended to, as relapses are apt to occur; and the return to a generous diet must be very gradual.

Typhus, *ti'-fus* (Gr. *typho*, I smoulder, or burn and smoke without vent), in Med., is a kind of continued fever, characterized by the ordinary symptoms of fever, with debility in the nervous and vascular systems, and a tendency in the fluids to putrefaction. It is so called because it burns not in open violence, as an inflammatory fever does, but with a sort of concealed and smothered flame. Any of the ordinary causes of fever may give rise to typhus, the typhoid form being often dependent on the state of the constitution on which the cause is acting. Hence cold, intemperance, mental agitation, &c., which, in strong and sanguineous habits might generate an inflammatory fever, will often in a debilitated and nervous constitution give rise to typhus. By far the most common cause of typhus is contagion, or febrile miasm, the activity of which is much increased by the crowding in close and ill-ventilated places, filth, insufficient nutriment, and other causes tending to depress the vital power. It is eminently contagious and infectious, and often prevails epidemically. It does not always commence in the same way, and sometimes it may be several days before the disease assumes its proper aspect, during which the patient may continue his ordinary occupations, but complaining of chilliness, nausea, thirst, loss of appetite, languor, and headache. Frequently, however, the precursory stage is short, or altogether wanting, and it commences with symptoms which are common to many acute diseases. Sometimes it sets in with a shivering fit or a severe headache, accompanied with great prostration and muscular pains in various parts. There are also dryness and heat of skin, thirst, constipation, and rapid pulse, with great irritability and restlessness towards the evening. Sometimes, even during the first stage of the disorder, the prostration of strength is so great that the patient lies on his back motionless, and insensible to all that is going on around him. Towards the end of the first week the eruption peculiar to typhus begins to show itself. It consists of irregular spots of a dusky or mulberry hue, disappearing on pressure, and feeling as if slightly raised above the skin. They may be few and single, or numerous and large, owing to the coalescence of several of them; their number and depth of colour being in proportion to the depth of the attack. In a day or two they become of a brick-dust colour, and only slightly fade on pressure, while each patch of eruption remains permanent till the end of the fever. It is rarely absent in adults, but in children, particularly in mild cases, it does not appear perhaps in more than three out of every four instances. During the second week the pulse becomes more frequent, weaker, and more compressible, the tongue darker and browner, and the voluntary movements very much weakened. The voice becomes feeble, and the patient can scarcely utter an audible sound; perhaps he may be unable to swallow, which is always regarded as a very bad symptom. It is at this period that delirium is most apt to ensue, and the patient generally loses his headache. During this stage there is great deficiency of sensation and insensibility to impressions. It is in the course of the second week that the disease is most apt to terminate fatally. As it approaches this termination, a peculiar fœtor is exhaled by the patient's body; his tongue becomes dry, black, and fissured; his teeth are covered with dark sordes; sloughs form on different parts, and in extreme cases the toes have mortified. During the third week the patient's chance of recovery improves; in which case the more formidable symptoms begin gradually to diminish and abate. He begins once more to take an interest in what is going on around him, the temperature of his skin becomes more natural; the tongue moist and cleaner; and the frequency of the pulse much less. In many cases the amendment is so gradual that it is impossible to say when it begins; in others it is preceded by a marked aggravation of most of the former symptoms. In the early stages of this disease it is best not to interfere much with nature's operations; the principal aim ought to be to keep the patient alive until the fever poison has expended itself. When seen early, however, it is often of advantage to administer an emetic or a purgative; and the patient's uneasy sensations will be much soothed by sponging the surface of the body with tepid water. Directly the powers of life begin to fail, a stimulating course of treatment should be commenced; as strong beef or

chicken tea, with wine or brandy frequently administered, taking care that it does not aggravate the febrile symptoms. When there is much general irritability and sleeplessness, a dose of opium may be given. As the patient begins to recover, a course of tonics will expedite his restoration to health.

# U.

**U**, *yu*, is the twenty-first letter and fifth vowel of the English alphabet. It bears a close resemblance to the vowel *o*, being pronounced like it by a round configuration of the lips, but in the case of *u* with a greater extrusion of the under lip. The sound of *u* is short in *tun, tub, must*, but long in *tune, tube*, &c. In some cases it is acute rather than long, as in *flute, brute;* in others it is obscure, as *nature, venture*. At the beginning of words it is often sounded as if preceded by *y*, as in *union, university*. It frequently interchanges with *a, e, i*, and *o*. *U* and *V* were long regarded as one letter, and were used indiscriminately the one for the other; but in the beginning of the 16th century they came to be distinguished, and *u* has since been regarded as a vowel, and *v* as a consonant. (*See* ABBREVIATIONS.)

UKASE, *yu-kaize'* (Rus.), is an ordinance of the emperor of Russia, which has the force of law in his dominions.

ULCER, *ul'-ser* (Lat. *ulcus*), in Med., is a purulent solution of continuity of the soft parts of the body, either opening to the surface or any internal cavity, and attended with a secretion of pus or some kind of discharge. Ulcers may arise from a variety of causes, as from wounds, specific irritations of the absorbents, from cancer, scurvy, scrofulous virus, &c. Wounds in the flesh, if at all deep, are very likely to pass into ulcers; and persons in whom, from any cause, the circulation has become sluggish, are more liable to ulcerations, and those of an unhealthy kind, than others. The immediate cause of ulcers is an increased action of the absorbents, while at the same time the arteries by a specific action separate a fluid from the blood upon the ulcerated surface. In simple ulcer almost all that requires to be done is to keep the surface clean by putting on a little dry lint and a pledget over it, covered with some simple ointment. Where the part or the constitution is too weak to carry on the healthy action, general as well as local treatment is required, and the system has to be strengthened by nutritious diet, tonics, &c. In indolent ulcers, the applications require to be principally of a stimulating nature, as basilicon ointment and occasional sprinkling with red precipitate.

ULEMA, *yu-le'-ma* (Arabic, pl. of *alim*, wise), signifies literally the wise men, and is applied to the collective body of learned men in Turkey. They form a distinct corporation, composed of three classes,—the Mukreji, the Mudaris, and the Moultazims. The mufti is at the head of the Ulema.

ULMACEÆ, *ul-mai'-se-e* (Lat. *ulmus*, the elm), in Bot., the Elm fam., a nat. ord. of *Dicotyledones*, sub-class *Monochlamydeæ*, consisting of trees and shrubs with alternate scabrous leaves and perfect or unisexual flowers, chiefly natives of the northern regions of the world. There are nine genera and about 60 species, some being valuable timber trees. (*See* ULMUS.)

ULMUS, *ul'-mus* (Lat.), in Bot., the Elm, the typical gen. of the nat. ord. *Ulmaceæ*. The species *U. campestris* is the common English elm; *U. montana*, the Scotch or Wych elm; and *U. fulva*, the slippery elm of the United States. The timber of the first two species is not readily acted upon by water, and is on this account much valued for certain purposes. The inner bark of the slippery elm is employed in America as a demulcent for both internal and external use. When ground, it forms an excellent emollient poultice.

ULTIMATUM, *ul-te-mai'-tum* (Lat.), in Diplom. denotes the final conditions or terms offered by a government for the settlement of a dispute between it and another.

ULTRAMARINE, *ul-trŭ-ma-reen'*, a blue pigment, highly valued for the purity, delicacy, and permanency of its colour, formerly obtained exclusively from the precious stone *lapis lazuli*, by a tedious process. The stone was first calcined, and broken into pieces the size of a nut, the heated fragments being quenched in vinegar, by which they were rendered more friable. They were next levigated for many days, with a thin syrup of honey and dragon's blood, after which a rosinous paste was formed, and the ultramarine extracted by suspension in hot water. True ultramarine is but rarely used in the present day, being almost entirely superseded by the artificial pigment, which is manufactured in large quantities in France and Germany. At the International Exhibition of 1862, Messrs. Winsor & Newton exhibited specimens of real ultramarine to the value of several thousand pounds. They were of three different shades, and were made from *lapis lazuli* from Persia, Siberia, and South America. They were, however, almost equalled in splendour of colour by the artificial material. True ultramarine is worth from £3 to £1 per ounce, but the manufactured pigment can now be procured for a shilling per pound. The principal seat of the manufacture is in Germany and France. The ingredients used by different makers are trade secrets; they, however, consist mainly of china-clay, sulphate of soda, carbonate of soda, sulphur, and carbon, in some form or other, the proportions differing according to the shade of colour desired. The mixture is placed in crucibles, and calcined, great care being taken to regulate the heat. A green mass is at first obtained, which is finely pulverized, and heated once more in cast-iron boxes. It is then powdered again, washed to remove soluble salts, and reheated, should the colour not be of the desired tint. The grinding of the pigment requires great attention, fineness of division being an indispensable quality. The chemical composition of ultramarine still remains in great obscurity. Many analyses have been published, but all widely differing in their results. One thing, however, seems pretty certain, that the tone of colour depends mainly on the amount of combined sulphur in the pigment, the light blue variety containing 6 to 8 per cent., the darker, as much as 10 to 12 per cent. The most probable conclusion come to as to its composition seems to be that of Brunner, who, from very exact analyses of the real and artificial material, considers it to consist of silicate of alumina, coloured with variable proportions of sulphide of sodium. Green ultramarine is said to be blue ultramarine which has not been roasted.

UMBELLIFERÆ, *um-bel-lif'-e-re* (Lat. *umbella*, an umbel; *fero*, I carry), in Bot., the Umbelliferous fam., a nat. ord. of *Dicotyledones*, sub-class *Calycafloræ*, having the following essential characters:—Herbs or shrubs. Leaves alternate, usually compound and sheathing at the base, or sometimes simple, exstipulate. Flowers almost always arranged in a more or less umbellate manner. Calyx superior. Petals and stamens 5, inserted on the outside of a double fleshy disk, which crowns the ovary. Ovary inferior, 2-celled, with a solitary pendulous ovule in each cell; styles 2. Fruit consisting of two indehiscent carpels, which separate when ripe from a common axis or carpophore. Seeds pendulous, one in each carpel, with a minute embryo at the base of abundant horny albumen. The order comprises nearly 300 genera and upwards of 1,500 species, the greater number being confined to the northern parts of Europe, Asia, and America. Their properties are extremely variable: some are edible; others are aromatic and carminative, and in some cases stimulant and tonic, from the presence of a volatile oil; others contain a narcotico-acrid juice, which renders them more or less poisonous; while others again are antispasmodic and stimulant, from the presence of a fœtid gum-resin. The carrot and parsnip, parsley, celery, and fennel, belong to this order; so also do the poisonous hemlock, cowbane, and fools'-parsley. The caraway, coriander, and anise, well known for their aromatic fruits (commonly called seeds), are umbelliferous plants.

UMIRI BALSAM. (*See* HUMIRIACEÆ.)

UNIFORMITY, ACT OF, *yu-ne-for'-me-te*, was passed for the purpose of securing uniformity in public worship throughout the Anglican church. The present Act of Uniformity is the 13 & 14 Car. II. c. 4, and regulates the form of public prayers, administration of the sacraments, and other rites of the Church. There was a previous act of uniformity passed in the first year of Elizabeth.

UNIGENITUS, *yu-ni-jen'-e-tus* (Lat., only-begotten), in Eccl. Hist., is the name of a celebrated papal bull issued by Clement XI. in 1713, and so called from its commencing *Unigenitus Dei Filius*. It was directed against the "Moral Reflections on the New Testament," by Père Quesnel, a celebrated Jansenist, and produced a great commotion in France, many of the clergy refusing to accept of it.

UNION, THE, *yu'-ne-on* (Lat. *unio*, I join), denotes the act by which the two separate kingdoms of England and Scotland were incorporated into one under the title of the kingdom of Great Britain. Attempts had been previously made to effect this object; but it was not till 1707, by 5 Anne, c. 8, that it was actually accomplished. Twenty-five articles were drawn up and agreed to by the parliaments of both countries; the principal conditions of which being that there should be a communication of rights and privileges between the subjects of both kingdoms, except where otherwise agreed; that the laws relating to trade, customs, and the excise, should be the same in Scotland as in England; that there should be one parliament, and sixteen peers should represent Scotland in the House of Peers, and forty-five members in the House of Commons. Among the fundamental conditions of the union is that the Church of Scotland and the four universities of that kingdom be established for ever. The union of Great Britain and Ireland took place in 1800, by 39 & 40 Geo. III. c. 67. It admitted four Irish lords spiritual and twenty-eight temporal to the House of Peers, and 100 commoners to the House of Commons. (*See* PARLIAMENT.)

UNISON, *yu'-ne-zon* (Lat. *unus*, one; *sonus*, sound), the exact agreement of two sounds, proceeding from an equality in the number of vibrations made in a given time by two sonorous bodies.

UNITARIANS, *yu'-ne-tai'-re-anz* (Lat. *unus*, one), are a sect of religionists who believe in the existence of only one great and supreme Being, possessed of the glory and attributes of divinity, as opposed to the Trinitarians, or those who hold that there are three persons in the Godhead. The Unitarians differ greatly in the opinions which they hold regarding the nature of Christ. Some believe him to be the greatest of all created beings, endowed with great power and dignity, and existing before all worlds; others consider him to have had no existence previous to his birth on this earth, and to have been simply a man approved of God by miracles and wonders and signs, which God did in him. From a very early period of the Church's history, differences of opinion existed respecting the nature of Christ. Sabellius in the 3rd, and Arius in the 4th century, held and propagated Unitarian notions. In the 16th century again, Faustus Socinus was very successful in diffusing similar doctrines; and in 1553, Servetus was burned by the instigation or consent of Calvin, for holding such views. In England, in the 16th and 17th centuries, similar sentiments prevailed, and in the beginning of the 18th many of the Presbyterian ministers embraced these opinions. In a short time their congregations generally adopted the same views, and thus many of the old Presbyterian chapels and endowments have become the property of Unitarians. Their origin as a distinct community in England dates from about 1730; and in 1851 they had in England and Wales 229 places of worship, with 68,554 sittings, and in Scotland 5 places of worship, with 2,437 sittings. Their form of government is essentially congregational, each congregation ruling itself, without regard to courts or synods. The modern Unitarians differ from the earlier chiefly in attributing to Christ less of the divine, and more of the human nature; many of them regarding him as "constituted in all respects like other men." His mission, they consider, was to introduce a new moral dispensation, and his death they look upon, not as a sacrifice or atonement for sin, but as a martyrdom in defence of truth. They thus deny the necessity of an atonement, and hold that good works alone are sufficient to secure salvation. Many of the modern Unitarians hold that all mankind will ultimately be saved.

UNITED BRETHREN. (*See* BOHEMIAN BRETHREN.)

UNITED PRESBYTERIAN CHURCH, THE, OF SCOTLAND, *yu-ni'-ted*, was formed in 1847, by the union of the United Secession and the Relief churches. The





original secession from the Church of Scotland took place in 1733. Ebenezer Erskine, one of the ministers of Stirling, having in a sermon denounced certain acts of the General Assembly as arbitrary and tyrannical, was rebuked and admonished by that tribunal. He and three others protested against this decision, and were deposed. These being joined by four more brethren, constituted themselves into a separate presbytery under the name of the Associate Presbytery. Having now given up all hopes of a réunion with the national church, they earnestly set about extending and perpetuating their principles, and provided means for educating candidates for the ministerial work. The presbytery speedily expanded into a synod, and held its first meeting at Stirling in 1745-6. Unfortunately, about this time a dispute arose respecting the religious clause of an oath taken by burgesses in certain towns, one party holding that no seceder should be allowed to swear this oath, while the other urged that it should be made matter of forbearance. So fiercely was the contention carried on, that a separation took place in 1747, those who were against swearing the oath being called "Antiburghers," while the other party were designated "Burghers." The Antiburghers not only refused to maint[illegible] any friendly intercourse with the opposite party, [illegible] even went the length of passing sentence of deposition and excommunication on all the ministers opposed to their views, including Ebenezer and Ralph Erskine, and others. In 1751, an unpopular minister having been presented to the church and parish of Inverkeithing, the great body of the parishioners protested against his settlement, and the presbytery refused to induct him. The General Assembly took up the matter, and peremptorily enjoined the presbytery to induct him; a proceeding which offended certain of the ministers of the presbytery, and one of them, Mr. Thomas Gillespie, was deposed. He continued his ministrations, however, and in a few years was joined by several others, and founded the "Relief Synod," formed for the purpose of giving *relief* to oppressed Christians, from the yoke of patronage and the tyranny of the church courts. The seceders continued to increase in numbers, and not only planted churches in different parts of Scotland, but sent preachers to England, Ireland, and even to America. In 1773, the congregations of the different seceders in Scotland amounted to 190. Towards the close of the 18th century, a controversy arose respecting the power of the civil magistrate in matters of religion, when a great majority of both synods abandoned the old ground held by the Covenanters, and adopted what was called "New Light" views. A small party, known as the "Old Lights," seceded, and formed themselves into a distinct presbytery. A few years earlier, a small party seceded from the Burgher synod, and formed themselves into a distinct presbytery, becoming thus the founders of the "Original Burgher Synod," which in 1839 returned into the bosom of the national church, and at the "Disruption" most of them connected themselves with the Free Church. At length, in 1820, seventy-three years after their separation, a union was effected between the Burghers and Antiburghers. At the breach, the secession numbered thirty-two congregations; at the union, it comprised 262 (139 Burgher and 123 Antiburgher). Ten ministers of the Antiburgher synod refused to concur in the union, and soon after formed a junction with the Old Light party, the two constituting the "Associate Synod of Original Seceders." Afterwards, in 1847, as already stated, a union was effected between the United Secession and the Relief churches, when they took the name of the United Presbyterian Church. It now comprehends thirty-one presbyteries, with about 600 churches, and numbers among its adherents about a fifth part of the population of Scotland. It has a divinity hall, which is usually attended by about 200 students; and has long been distinguished for its labours in the field of missions. Its form of government is Presbyterianism (which *see*), and its doctrines do not differ materially from those of the Free Church (which *see*). At present, active steps are being taken to bring about a union between the United Presbyterian and the Free churches; and from the cordial reception which the proposal has met with from both parties, there seems every probability that it will speedily be effected. In

1852, the Associate Synod of Original Seceders, by a narrow majority, united themselves with the Free Church, while the minority still continue a distinct body, under the name of the "Synod of United Original Seceders." At present they comprehend four presbyteries and twenty-nine congregations.—For an account of the Reformed Presbyterian Church, *see* CAMERONIANS.

UNIVERSAL, *yu-ne-ver'-sil* (Lat.), in Log., is applied to a proposition in which what is predicated is declared to apply to everything comprehended in it; as, All men are mortal. A universal proposition may be either affirmative or negative; as, All men are subject to death, No man is perfect. It is opposed to a particular, which asserts or denies something of some, implying that the others are, or may be, left unspoken of; as, Some men are handsome; some animals cannot live in this country.

UNIVERSALIST, *yu-ne-ver'-sil-ist*, in Theol., is a term applied to such as maintain the universality of the atonement, or that all men will finally be saved, as opposed to those who hold the doctrine of eternal punishment. Otherwise their views are very dissimilar, some believing in a remedial punishment of limited duration, terminating in a universal restoration to happiness, while others deny the existence of any future punishment, but only different degrees of happiness. The term is also applied to those that hold that Christ died for all, and not merely for an elect number, as the Calvinists teach, and that all may partake of salvation by belief in Christ.

UNIVERSITIES, *u-niv-er'-se-teez* (Lat. *universitas*, the whole of anything, as contrasted with its parts), in its modern signification, usually denotes an establishment for the purpose of instruction in some or all of the most important branches of science and literature, and having the power of conferring certain honours or dignities termed degrees. This term, like many others, has undergone various modifications of meaning until its original signification has quite disappeared. The oldest word for an institution of higher education was *studium*, or *studium generale*, terms employed in the 12th and 13th centuries; and *universitas* was applied to a corporation, or a number of persons associated together for a common purpose. In its proper and original meaning, then, university "denotes simply the whole members of a body (generally incorporated body) of persons teaching and learning one or more departments of knowledge, and not an institution privileged to teach a determinate circle of sciences, and to grant certificates of proficiency (degrees) in any fixed and certain departments of that circle (faculties)." (*Sir W. Hamilton.*) In the same way, the term *studium generale* did not originally mean that all was taught, but that what was taught was taught to all. The oldest universities arose spontaneously during the 12th and 13th centuries. About the beginning of the 12th century, Paris became the resort of learned men, who, by means of teaching and public lectures, infused new life into the existing schools. The brilliant lectures of Abelard and Lombardus attracted immense crowds from all parts of Europe, and local immunities and other advantages came to be accorded to the teachers and pupils by the town, which well appreciated the advantages of this great resort. The continually increasing number of teachers and students rendered it expedient to adopt some form of government, in order that their labours might be carried on with some degree of regularity; and accordingly, the university appears to have been incorporated towards the end of the 12th century. At first it comprised only the faculty of arts; but subsequently those of divinity, canon law, and medicine arose. The papal and royal privileges subsequently conceded did not create the faculties which they then publicly protected; but in this way the universities came to form integral parts of the Church and State, and subject to their control. Philip Augustus, by his ordinance of 1200, granted to the university exemption from the ordinary tribunals, and prohibited the citizens, under the severest penalties, from molesting the students. Subsequent kings of France conferred additional privileges, and by various enactments, teachers and students were exempted from all customs, taxes, or personal burdens; were not liable to arrest, to seizure or confiscation of goods,





and were especially exempted from being summoned out of Paris on any legal process. Nor were the popes behind the kings in their gifts to the university, and Innocent IV. declared that no sentence of excommunication, suspension, or interdict against the university, or any of its members, should have effect without special license of the Apostolic see. It thus soon became the most distinguished seminary of education in Europe, and was resorted to by students from all parts. In 1453 the number of students amounted to 25,000, and when Joseph Scaliger was a student, it had reached 30,000. When the teachers and students came to form one body, the division into *nations* originated. Each nation comprised all the professors and students from certain countries, and formed an independent body by itself, having its own laws, funds, and government. At the head of each nation was a procurator selected from among themselves, whose duty it was to protect their rights and privileges, and see that all its regulations were duly observed. This institution must have been of great benefit at the time when students came from all parts of Europe to one university; and in some of the continental and Scotch universities the system is still kept up, even to the original number of four. The four nations of the Paris university were—(1) the French, including Spaniards, Italians, Greeks, &c.; (2) the Picard, comprising the north-east of France and the Netherlands; (3) the Norman; and (4) the English, called afterwards the German, including English, Scotch, Irish, Germans, Poles, &c. *Degrees* are believed to have originated in Paris about the second half of the 12th century. The first teachers had taken office without invitation or permission from any one; but subsequently the members of the university were careful that their lecturers should be persons well qualified. Hence examinations were instituted, and those who were found qualified received a formal permission to lecture publicly. The oldest degrees were those in arts. The first or lowest academical degree was that of *Bachelor*, the second that of *Licentiate*. If the licentiate afterwards received the cap of *Magister* or *Master*, he became a colleague of his former teachers, and participated in all their privileges. The title magister in Paris corresponded to that of doctor at Bologna. Such examinations and solemn distributions of academical honours (*promotiones*) were customary in Paris as early as the beginning of the 13th century. At first the teaching in the university was confined to the seven liberal arts, known as the *trivium* and *quadrivium*; the former comprising grammar, logic, and rhetoric, the latter music, arithmetic, geometry, and astronomy. In 1259, the mendicant orders and secular clergy united and formed a sort of corporation of teachers of theology, and thus originated the theological faculty. In 1260, the teachers of medicine followed their example, as did also those of civil law; and thus arose the four faculties of arts, theology, law, and medicine. The faculties elected *deans* from among their number, and these, with the procurators of the nations, represented the university. The *chancellor*, from being the officer appointed by the bishop to preside over the courts of his diocese, came to obtain power in the university, and became the officer by whose authority degrees were conferred. The *rector* was chosen by the different nations, and was the head of the university in everything except the conferring of degrees. He presided in the general meetings, took charge of the registers and public money, and administered generally the government of the university. At first the teachers delivered their lectures in such rooms as they could for hire or otherwise obtain the use of; but afterwards halls or schools for the use of their teachers were provided by the several faculties. Originally the teachers were supported entirely by the fees received from the students, and those that were in high repute sometimes made large sums. Afterwards teachers sometimes received presents from the magistrates of the town to induce them to remain in it, and at a later period a fixed salary was given to them. The great concourse of students in early times rendered it difficult for them to obtain lodgings, and gave rise to exorbitant demands on the part of the townsmen with whom they resided. To remedy this inconvenience, taxers were appointed to determine the amount of rent to be paid, and subsequently charitable individuals

were induced to provide houses in which a certain number of indigent students might be lodged free of charge. In some cases they also received their board gratis, or had other allowances. This was the origin of the *collegia* or colleges, which in the two old English universities have risen into such importance. In the German universities something similar was introduced, namely the *burse* (charitable establishments in which students could live for a very low rent). The name burse was also given to certain boarding-houses established by the professors for the use of the students. Those who lived in such burse were called *bursarii*; whence the German *Bursch*. The university of Bologna contests the palm of antiquity with that of Paris. It first became famous through the teaching of Irnerius in the early part of the 12th century. His lectures on Roman law attracted a great number of pupils, and he is considered to have originated a grand revolution in the legislation of Europe. His successors were men of ability, and for several centuries after, the university of Bologna continued to be celebrated for its legal learning, and to be flocked to by students from all parts. About 1220 it had 10,000 students, and in the middle of the 17th century the numbers had increased to 13,000. As in the case of Paris, the citizens conferred certain rights and privileges upon the universities, others being subsequently granted by the emperor and the pope. In Germany, as also in England, the earliest universities were founded on the model of that of Paris. The first universities founded in Germany were those of Prague, 1348, and Vienna, 1365. Universities were now expressly established, and not left to grow up of themselves, as before. For several centuries the popes continued to erect these institutions, and exercise the right of protecting and superintending them. Monarchs who wished to establish a university requested the papal confirmation, and submitted to the authority which the Roman see arrogated over them. The unhappy Thirty Years' war did much injury to the German universities; but since that period they have made rapid advances, beyond those of any other country. The character of life at the German universities is such that the student ever after recalls it with fondness. An amount of freedom and liberty is enjoyed there to which they are afterwards strangers, and the students are very jealous of their privileges. The liberal principles which have from time to time animated Germany have been manifested in a particular degree by the students at the universities; and there have not been wanting attempts on the part of the governments to curtail their liberties. In a German university there are usually ordinary and extraordinary professors, and *docentes* or licentiates. The ordinary professors are those who form the great body of the teaching staff. In most universities they are appointed by the government, have general jurisdiction over the students, and make the provisions respecting instruction. They divide themselves into four faculties, each having a dean chosen by themselves from their own number. The whole constitute the senate, at the head of which is the rector, who is chosen annually. The extraordinary professors are usually persons who have distinguished themselves in some particular branch or branches, and whose services the government wishes to retain. They receive small salaries, and are the persons looked to to fill vacancies among the ordinary professors. The *docentes* are those who, after undergoing an examination, have obtained liberty to teach. Any person may request to be examined in this way, and if found qualified is entitled to be licensed. The docentes receive no salaries; but from among them the extraordinary professors are usually selected. Every person in these three classes can lecture upon whatever subject he pleases, the professors being only obliged to deliver lectures also in the branches for which they are specially appointed. Hence very often three or four courses of lectures are delivered on the same subject, and theologians will be found lecturing on politics, philosophers on questions in theology, and so on. The German student is usually left at full liberty to choose the lectures which he will attend; and he is subjected to no official examination during his term of study. The only regulation is that, in case of most sciences, he is required to attend certain lectures, and to study full three years, if he wishes





to practise a profession, &c. The student's examinations commence after he has finished his course of study, or on entering on a profession; and particularly in Prussia the examinations are very severe for one wishing to become a clergyman, physician, lawyer, statesman, or teacher of a superior school. These examinations are both oral and written, and the successive steps of promotion are attended with new examinations. The universities of France (twenty-three in all) were swept away during the Revolution, and for a time education was entirely neglected. At length, in 1808, an imperial university was established by Napoleon I. It embraces the whole system of national education in France, and is composed of seventeen academies, each of which comprehends two, three, or more of the departments into which the kingdom is divided, and contains one or more imperial lyceums. In the following table we give a list of the principal of the other continental universities, with the date of their foundation, and the number of students and professors at each.

| Country. | Name. | Date of Found. | Students. | Professors |
|---|---|---|---|---|
| Austria | Vienna | 1365 | 2,100 | 85 |
| ,, | Prague | 1348 | 1,100 | 89 |
| ,, | [illegible]th | 1465 | 1,200 | 52 |
| ,, | Padua | 1228 | 1,000 | 45 |
| ,, | Pavia | 1361 | 1,060 | 47 |
| Baden | Heidelberg | 1387 | 600 | 49 |
| Bavaria | Munich | 1826 | 1,390 | 75 |
| Belgium | Brussels | 1837 | 453 | 47 |
| ,, | Louvain | 1426 | 750 | 48 |
| Denmark | Copenhagen | 1470 | 900 | 41 |
| Greece | Athens | 1837 | 520 | 45 |
| Hanover | Göttingen | 1737 | 700 | 67 |
| Holland | Leyden | 1575 | 520 | 28 |
| ,, | Utrecht | 1636 | 500 | 22 |
| Papal States | Rome | 1303 | 700 | 50 |
| ,, | Bologna | 1119 | 530 | 40 |
| Prussia | Berlin | 1809 | 1,500 | 70 |
| ,, | Halle | 1694 | 650 | 50 |
| ,, | Breslau | 1702 | 770 | 51 |
| ,, | Bonn | 1808 | 770 | 58 |
| Russia | Moscow | 1755 | 1,750 | 90 |
| ,, | Dorpat | 1632 | 550 | 84 |
| ,, | St. Petersburg | 1819 | 700 | 82 |
| ,, | Kiev | 1833 | 900 | 95 |
| Sardinia | Turin | 1412 | 1,300 | 84 |
| ,, | Genoa | 1812 | 420 | 38 |
| Saxe-Weimar | Jena | 1558 | 380 | 50 |
| Saxony | Leipsic | 1409 | 850 | 75 |
| Sicilies, Two | Naples | 1224 | 1,500 | — |
| ,, | Palermo | 1394 | 1,100 | 50 |
| Spain | Valladolid | 1346 | 1,300 | — |
| ,, | Valencia | 1410 | 1,600 | — |
| ,, | Saragossa | 1474 | 1,100 | — |
| ,, | Santiago | 1532 | 1,000 | — |
| Sweden & Norway | Upsala | 1476 | 1,450 | 31 |
| ,, | Lund | 1668 | 650 | 28 |
| ,, | Christiania | 1811 | 500 | 32 |
| Tuscany | Pisa | 1338 | 580 | 45 |
| Wurtemberg | Tübingen | 1477 | 670 | 50 |

For an account of the universities of Oxford, Cambridge, Edinburgh, Dublin, Durham, and Glasgow, see under these several heads; for that of London see below.

University College, London, originated in a scheme for establishing a university in the metropolis, first promulgated by Thomas Campbell, the poet, and others, in 1825. Their objects were—(1) to afford the inhabitants of London, at a moderate rate, the means of giving their sons a complete education; (2) to afford the benefits of a university education to the various classes of society in England who, not being members of the Church of England, were excluded in a greater or less degree from Oxford and Cambridge; and (3) to establish in the metropolis extended and systematic courses of education for professional pursuits, in laws, medicine, and civil engineering. Within a few months after the scheme was announced, sufficient funds were raised for setting it on foot, by subscriptions for £100 shares, and donations of £50. The foundation-stone of the building was laid 30th April, 1827, and before the close of 1828 the classes in the faculties of arts, law, and medicine were in full operation. The exclusion of theo-

logy from the course of instruction gave rise to much opposition, and it was not till 1836 that it obtained a charter of incorporation. The entire management and direction of the affairs of the college are vested in the general meetings and council; the former consisting of the proprietors and donors (who are members for life), and the latter consisting of a president, vice-president, treasurer, and from sixteen to twenty-four other members elected by a general meeting. The senate is composed of all the professors of the college, and a president selected by them, out of three persons presented to them for that purpose by the general council. It has two faculties,—one of arts and law, the other of medicine. In the former, there are professorships of Latin, Greek, English, German, French, Italian, Hebrew, Arabic, Persian, Gujarati, Hindustani, Hindu Law, Sanscrit, Chinese, Comparative Grammar, History, Political Economy, Philosophy of the Mind and Logic, Jurisprudence, English Law, Mathematics, Natural Philosophy and Astronomy, Architecture, Civil Engineering, Chemistry, Practical Chemistry, Physiology, Zoology, Botany, Geology, Mineralogy; in the latter, professorships of Anatomy and Physiology, Practical Anatomy, Comparative Anatomy, Practice of Medicine, Clinical Medicine, Surgery, Clinical Surgery, Midwifery, Materia Medica, Chemistry, Practical Chemistry, Botany, Medical Jurisprudence. The professors are dependent upon the fees which they receive from their pupils. The session in arts commences in the middle of October and terminates at the end of June. The medical session is divided into two terms —the Winter, from the beginning of October to the end of March, and the Summer, from the beginning of May to the end of July. Students are admitted without reference to their religious opinions, and without previous examination, except in the case of those under fifteen years of age. At the end of each session, examinations by means of printed papers are held, according to which the honours and prizes are awarded. Connected with the college are two Andrews scholarships, of £85 each, tenable for one year only,—one for Latin and Greek, the other for mathematics; two Joseph Hume's scholarships of £20, for three years, one for jurisprudence, the other for political economy; one Ricardo scholarship of £20, for three years, for political economy; a Jews' commemoration scholarship; and various prizes. The number of students in the faculty of arts and law during 1861-2 was 215; medicine, 188; besides 85 attending the evening classes, and 363 pupils in the junior school in connection with the university. —Ref. *University College Calendar*, 1863.

UNIVERSITY OF LONDON was created by royal charter of William IV. in 1836, confirmed by a new charter granted by Victoria in 1837. A supplementary charter was granted to it in 1849; and in 1858 a new charter revoked the previous ones, and established it on a more definite and extended basis. Its object was to encourage a regular and liberal course of education, by presenting the means to all classes and denominations of her majesty's subjects, without any distinction whatever, by offering to persons who prosecute or complete their studies in the metropolis or other parts of the kingdom, such facilities, and conferring upon them such distinctions, as may incline them to persevere in their laudable pursuits; and for the purpose of ascertaining by examination the persons who have acquired proficiency in literature, science, and art, by the pursuit of such course of education, and of rewarding them by academical degrees as evidence of their respective attainments, and marks of honour proportioned thereunto. It is, in fact, a great literary incorporation legalized for the purpose of testing the qualifications of young men who present themselves as candidates for literary or scientific honours, and of conferring the same on those found possessed of the necessary qualifications, irrespective of where or how acquired. It thus differs from the other universities, which only confer degrees on those who have been educated within their walls. The body politic, or corporate, consists of a chancellor, vice-chancellor, 36 fellows appointed by the crown, and by the members of the senate, and all persons holding any of the degrees of LL.D., M.D., M.A., LL.B., M.B., B.A. The chief officers are the chancellor, vice-chancellor, registrar, chairman of convocation, with the queen as visitor. There are two





courts,—the Senate and the Convocation. The former consists of the chancellor, vice-chancellor, and fellows, and is invested with the entire management and superintendence of the affairs, concerns, and property of the university. The Convocation consists of the graduates of the university; but those graduates only are entitled to vote whose names appear upon the register. Their powers are very limited, being chiefly confined to discussing and declaring their opinion upon matters connected with the university, but without having any right to interfere therein. The university is empowered to receive into connection with it such educational institutions in the United Kingdom and British colonies as furnish sufficient evidence that they communicate to young men such a course of instruction as to justify their being taken on examination. The senators also have the power (with consent of one of the principal secretaries of state) to admit persons not educated in any of the institutions connected with the university for matriculation, and as candidates for any of the degrees other than medical, on such conditions as shall from time to time be determined. The senators have the power, after examination, of conferring the several degrees of bachelor, master, and doctor in arts, laws, science, medicine, and music, and also in such other departments of knowledge, except theology, as they shall from time to time determine. The examinations are held at least once a year, and embrace such branches in the several departments as they shall consider necessary. All the examinations are conducted by means of printed papers, and the successful candidates are, except in the matriculation examinations, arranged in two divisions, those of the first division being admissible to examination for honours. The matriculation examination takes place twice a year, on the second Monday in January and the first Monday in July, and candidates are required to transmit beforehand to the registrar a certificate of their having completed the sixteenth year of their age. The subjects include arithmetic and algebra, geometry, natural philosophy, chemistry, classics (one Greek and one Latin subject), English language, outlines of English history, and the French or German language. Examinations are simultaneously conducted in such provincial cities, towns, and colleges, as have obtained the sanction of the Senate. Fee, £2. Any candidate who has passed may be examined for honours in mathematics and natural philosophy, classics, chemistry, and natural history; and the highest candidates in the two former classes may each receive an exhibition of £30 for two years; and the highest in the two latter each a prize of £10. After matriculation, candidates for the degree of B.A. are required to pass two subsequent examinations. The first commences on the third Monday of July, and only those who have obtained honours can be admitted to it within one academical year of the time of his matriculation. The subjects are arithmetic and algebra, geometry, plane trigonometry, Latin and Roman history, Latin language, English language, literature, and history, and the French or German language. Fee, £5. Candidates may be examined for honours in—(1) Mathematics and mechanical philosophy; (2) Latin; (3) English, and for prizes in the French and German languages. The highest candidates in mathematics and Latin may each receive an exhibition of £40 a year for two years; the highest candidate in English £30 for two years; and the highest candidates in French and German each a prize of £10. The second B.A. examination commences on the fourth Monday of October, and no candidate can be admitted to it within one academical year of the time of passing the first B.A. examination. The subjects are mechanical and natural philosophy, astronomy, animal physiology, classics, history, logic, and moral philosophy. Fee, £5. Any candidate who has passed may be examined for honours in mathematics and natural philosophy, classics, logic and moral philosophy, chemistry, animal physiology, and vegetable physiology and structural botany. The highest candidate in each of the first three branches may receive £50 a year for the next three years, with the title of University Scholar; and the highest candidate in the other three branches each a prize of £10. The B.A. and B.Sc. examination, like those for matriculation, are carried on simultaneously in other cities, towns, and colleges. The M.A. exami-

mation commences on the first Monday in June, and is of a stricter and more extensive character than any of the preceding. One academic year at least must elapse after taking B.A. The subjects include classics, mathematics, and natural philosophy, logic and moral philosophy, political philosophy, history of philosophy, and political economy. The most distinguished candidate in each branch receives a gold medal of the value of £20. Fee, £10. Scriptural examinations take place once a year in the Hebrew and Greek texts of Scripture, the evidences of Christianity and Scripture history; and the highest candidate in each class receives books to the value of £5. Candidates for the degree of B.Sc. (Bachelor of Science) are required to have matriculated, and to pass two subsequent examinations; but bachelors of arts and graduates who have passed the first examination for M.B. are only required to pass the second of these. Fee for each examination, £5. Honours may be taken in both of these examinations, and the highest candidate in each branch may receive exhibitions of £40 and £30 for two and three years. The examination for D.Sc. takes place after the expiry of two years from B.Sc.; and the fee is £10. The candidate is examined on some one of a number of branches selected by himself; but he is expected also to show a general acquaintance with the subsidiary subjects. The LL.B. examination cannot take place till the expiry of one academic year after B.A. Honours may also be taken, and the most distinguished candidate may receive an exhibition of £30 a year for the next three years. Fee, £10. No candidate is admitted to the degree of LL.D. under thirty, until after the expiry of two years from his obtaining LL.B. For persons above thirty, no interval is required, and the candidate who most distinguishes himself may receive a gold medal of the value of £20. Fee, £10. Candidates for the degree of M.B. are required to have been engaged during four years in their professional studies at one or other of the schools recognized by the university, and to pass two examinations. In the former of these, candidates are examined in anatomy and physiology, in chemistry, and in materia medica, and may receive £30 for two years. Fee, £10. The second M.B. examination cannot take place within two years of the first, and includes physiology, general pathology, general therapeutics, hygiene, surgery, medicine, midwifery, forensic medicine. Honours may be obtained in physiology and comparative anatomy, in surgery, in medicine, and in midwifery; and the most distinguished candidate in each of the three first branches may receive an exhibition of £50 for two years. Fee, £5. Candidates for the degree of M.D. are required to furnish various certificates of qualifications, including one of having been engaged for five years in the practice of their profession; and the candidate who distinguishes himself most at the examination may receive a gold medal of the value of £20. Fee, £10.—Ref. *London University Calendar*, 1863.

**Upas**, or **Antsjar**, *yu'-pŭs*, the poison-tree of Java (*Antiaris toxicaria*), concerning which so many fabulous stories are related. The milky juice is extremely poisonous, but there is no foundation for the belief that the tree poisons the air. The active principle contained in the juice has been named *antiarin*.

**Uranium**, *yu-rai'-ne-um*, a metal somewhat sparingly distributed over the surface of the earth in the minerals *pitch blend*, which consists of the black oxide mixed with silica and oxide of iron; *uran-mica*, or *chalcolite*, which is a double phosphate of copper and uranium; and *uranite*, in which lime takes the place of the copper. Uranium was discovered by Klaproth, and the metal was first isolated by Peligot, the substance originally supposed to be the metal having been proved by him to be the protoxide. The metal is obtained by several processes, the most simple being by heating the protochloride with potassium. Uranium thus obtained is of a white colour, to a certain extent malleable; it is not oxidized by water at ordinary temperature; but if heated in the air, it burns brilliantly like magnesium. Sulphuric and hydrochloric acids dissolve it, with the evolution of hydrogen. It forms three oxides,—the suboxide, $U_4O_3$; the protoxide, UO; and the sesquioxide, $U_2O_3$. The suboxide is little known. It is a green powder, obtained by heating the black oxide in a current of oxygen. It is soluble in dilute acids, but does not form salts. The protoxide is made by heating the oxalate of uranium in a current of hydrogen in close vessels. It is a black powder, which takes fire spontaneously on exposure to the air. It was formerly supposed to be the metal. In its anhydrous state, it is insoluble in acids, but as a hydrate precipitated from its salts by ammonia, it is readily soluble, forming numerous salts of an interesting character. The sesquioxide is the most important of the oxides of uranium. It is somewhat difficult to prepare in a pure state. It combines readily with the acids, forming crystallizable salts of great beauty. The nitrate is the source from which all the compounds of uranium are procured. It is prepared from pitch blend by solution in nitric acid, the lead, arsenic, iron, and other impurities, being extracted by well-known means. It forms fine yellow crystals, with a peculiar green bloom running through them, and contains an equivalent of nitric acid united to an equivalent of the sesquioxide of uranium. It will be remembered that all other sesquioxides require three equivalents of acid to form neutral salts; the use of nitrate of uranium can therefore be only explained by supposing, with Peligot, that a radicle *uranyl*, $U_2O_2$, exists, of which the supposed sesquioxide is a protoxide. The nitrate has been used as a photographic material, but without any very great success. Sesquioxide of uranium, when combined with glass, gives it a peculiar greenish-yellow colour of great beauty. Besides the oxides named, there appears to be another, the black oxide, or protosesquioxide, which is much used as a black pigment in porcelain-painting. It is formed by heating the protoxide to redness, or by igniting the pronitrate. The protochloride of uranium is a volatile deliquescent substance, crystallizing in dark-green octahedra, which is decomposed by water. A volatile subchloride is also obtainable. When chlorine is passed over the protoxide at a red heat, a yellow deliquescent crystalline compound is formed, which has the composition $U_2O_2Cl$, or *chloride of uranyl*, strengthening the hypothesis of the existence of such a radicle. The other salts of uranium are very interesting to the scientific chemist, from their anomalous composition and behaviour with re-agents, but cannot be described here. The sesquioxide seems capable of playing the part of an acid, and forms compounds with potash and soda. The facility with which many of the sesquisalts of uranium are transformed into protosalts by exposure to the sun's rays has caused them to be greatly used in actinometric experiments. In many of its reactions, uranium greatly resembles iron and manganese. Like them, its sulphate combines with sulphate of potash, forming a double salt, which, however, is not an alum.

**Uranus**, *yu-rai'-nus*, in Astron., the remotest known planet belonging to our system. It was originally denominated the *Georgium Sidus*, and then *Herschel*, from the name of its discoverer. The motion of Uranus is direct, or from west to east, during the greater part of the year. He is stationary for some time before opposition, and for some time after, and his motion is retrograde during the intermediate interval. His motion attains its maximum value on the day of opposition. The arc of retrogradation included between the annual station which precedes opposition and the annual station which follows it, is 3° 45′. The time of a synodic revolution of the planet, or the time which elapses between two consecutive conjunctions, is 369 days. The mean distance from the sun of Uranus is 19·18239, that of the earth being considered as unity. The apparent diameter of Uranus (which, on account of the great magnitude of its orbit in comparison of that of the earth, undergoes very little variation), is about 4″; whence the real diameter of the planet must be about 35,000 miles, or nearly four and a half times that of the earth, and its bulk about eighty times that of the earth. Uranus presents the appearance of a small, round, and uniformly illuminated disk, without rings, belts, or discernible spots. From analogy, we infer that it revolves about its axis, but of this there is no direct proof. Four satellites, at least, are known to attend Uranus; Sir William Herschel thought that he could discern six; but the existence of more than four has not been clearly made out. The illuminating and calorific power of the sun being represented as unity on the surface of the earth, their

numerical value at the surface of Uranus amounts only to 0·003. In other words, the light and heat of the sun fall upon the surface of Uranus with an intensity amounting to $\frac{1}{370}$, the intensity at the surface of the earth being represented by unity. Uranus was discovered by Sir William Herschel at Bath, on the 13th of March, 1781. It had been previously observed by other astronomers, but, owing to the inferiority of their telescopes, they never suspected it to be a planet.

Urea, *yu-re'-a*, one of the few organic bases of animal origin. It forms an essential constituent of the urine of all animals, and is most abundant in that of the mammalia, particularly so in the case of the carnivora. It is the principal outlet of nitrogen from the system after the materials which compose the animal tissues have experienced oxidation under the influence of inspired air. A person in good health secretes about an ounce of urea daily. Dumas made several fruitless attempts to form urea from the azotized constituents of the body, but Bechamp has recently succeeded in doing so, by subjecting albumen to the oxidizing action of permanganate of potash. Urea does not appear to be formed in the kidneys, these organs appearing to act more as filters in separating it from the mass of blood in which it is formed before it reaches them. Urea may be formed artificially in several ways, and was one of the first organic products made from inorganic materials. Cyanate of ammonia, $H_4NO,C_2NO$, is metameric with urea, whose formula is $C_2H_4N_2O_2$, and is converted into it by evaporating at a gentle heat. It is also formed by the action of oxidizing agents in uric acid, and by a number of other processes which cannot be detailed here. It is isomeric with carbamide, if not identical with it. The easiest method of procuring it is by heating together 50 parts of ferrocyanide of potassium with 28 of black oxide of manganese, and washing the residue obtained. The cyanate of potash thus formed is transformed into the ammonia salt by dissolving in it 41 parts of sulphate of ammonia. The cyanate of ammonia may be dissolved out by alcohol, and slow evaporation converts it into urea. It crystallizes in white slender striated prisms, which are slightly deliquescent. Its solution has a cool bitterish taste, and is neutral to test-paper. It is very soluble in water and hot alcohol, but sparingly so in ether. It does not appear to form a definite hydrate. It melts at about 248° Fahr., and at a temperature a little above this it is decomposed into ammonia, carbonate of ammonia, and metameric acid. A solution of urea heated in a sealed tube takes up four equivalents of water, and is converted into carbonate of ammonia. The same change takes place in stale urine; hence its ammoniacal odour after keeping it a few days. Although forming salts with certain of the acids, urea does not possess well-marked basic properties. With nitric and oxalic acids it forms crystallizable salts. With certain metallic oxides and salts, such as the oxides and nitrates of silver and mercury, it forms definite crystalline compounds. Urea constitutes about one and a half per cent. of the urine of a healthy person, or about one-third of its solid constituents. The hydrogen in urea may be replaced by compound radicles, such as ethyl, phenyl, &c., giving rise to numerous compounds, known as the compound ureas. It also combines with other radicles, forming *ureides*.—For a fuller account of these and the almost numberless series of compounds capable of being formed from this very interesting body, the reader is referred to Miller's *Elements of Chemistry*, part iii.

Uredo, *yu-re'-do*, in Bot., a gen. of Fungi, the species of which produce the diseases of corn and other cultivated plants, called blights, rusts, &c.

Urethra. (*See* Bladder.)

Uric Acid, *yu'-rik*.—This very important excrementitious product occurs in small quantities in human urine, to the extent of rather less than one per cent. of the solid matter contained in it. It is met with in much greater abundance in the excrement of birds and reptiles, that of the boa consisting almost entirely of urate of ammonia. Guano also contains large quantities of it, and has been most extensively employed as its source in the now almost extinct manufacture of murexid dyes. When excess of uric acid is secreted in the system, it deposits hard crystalline grains in the bladder, which, if retained, gradually form concretionary calculi, and growing into the disease known as gravel or stone. In gouty patients, uric acid accumulates round the joints, forming white friable concretions, known improperly as *chalk-stones*. Uric acid is generally prepared by dissolving the dried excrement of the boa in water, and convertiug the urate of ammonia into nitrate of potash by adding excess of potash, and boiling until the whole of the ammonia has been set free. Hydrochloric acid is then added, and the acid separates in minute crystals, which are thoroughly washed and dried. Pure uric acid is a white crystalline powder, requiring 10,000 parts of water for solution, to which it imparts a very feeble acid reaction. It is insoluble in alcohol and ether, but dissolves in concentrated sulphuric acid, which deposits it in a hydrated condition on dilution. The urates of the alkalies are much more soluble than the acid itself. Uric acid is dibasic, giving rise to acid and neutral salts. By being submitted to heat, uric acid breaks up into a number of compounds; but the remarkable number of definite and crystallizable substances which it gives rise to when treated with various oxidating agents present the highest physiological interest, inasmuch as the great changes which occur in the animal economy under the influence of vitality are always accompanied by oxidation. Liebig and Wöhler have studied these substances minutely, and descriptions of most of them are given in Miller's *Elements of Chemistry*, part iii., to which the reader is referred.

Urim and Thummim, *yu'-rim, thum'-mim* (Heb., light and perfection), among the ancient Jews were the means by which Jehovah vouchsafed to communicate his mind and will to the high priests. What these were is much disputed among critics. The most common opinion, however, is that they were precious stones on the high priest's breastplate, which revealed the will of God, by appearing of unusual lustre when favourable, and dim when unfavourable.

Urine, *yu'-rin* (Lat. *urina*), is a highly complex fluid, secreted from the blood by the kidneys. In a healthy person, when recently voided, it is a clear limpid fluid, of a pale yellow or amber colour, with a peculiar, faint aromatic odour, which becomes pungent and ammoniacal when decomposition takes place. Often, however, as it cools, it becomes opaque and turbid, from the deposition of part of its constituents previously held in solution; and this may be consistent with health. Healthy urine may, however, be nearly colourless, or of a brownish or deep-orange tint, and may present every shade of colour between these extremes. The quantity secreted in twenty-four hours depends upon the amount of fluid drunk, and the quantity secreted by the skin; but generally it is about from thirty to forty fluid ounces. Its specific gravity varies in health from 1·015 to 1·030; but 1·020 is the average standard. It is acid in its reaction, and contains some mucus and epithelium. In 1,000 parts of ordinary urine there are 933 parts of water and 67 parts of solid matter. The following analysis is given of the solid contents of urine, but the proportion of the materials is liable to very great variation, depending on food, exercise, and other conditions:—Urea, 49·68; uric acid, 1·61; extractive matters, ammoniacal salts, and chloride of sodium, 28·95; alkaline sulphates, 11·58; alkaline phosphates, 5·96; phosphates of lime and magnesia, 1·50. Medical men distinguish three kinds of urine,—(1) *urina sanguinis*, or that which is secreted from the blood at times when neither food nor drink has been recently taken, as in the morning before breakfast; (2) *urina potûs*, or that which has been secreted after any considerable quantity of fluid has been taken into the body; and (3) *urina cibi*, or that secreted during the period immediately succeeding a meal of solid food. The last of these contains a larger quantity of solid matter than either of the former, both of which are largely diluted with water. The first, or morning urine, is the best for analysis: it is from it that we are best enabled to learn the state of the kidneys, and the system in general.

Urn. (*See* Vases.)

Ursa Major, *ur'-sa ma'-jor* (Lat.), the Great Bear, one of the most remarkable of the northern constellations, situate near the pole. It contains the stars which form "the Dipper," or "Charles's Wain."

Ursa Minor, *mi'-nor* (Lat.), the Lesser or Little

Bear, the constellation nearest the north pole. It was called by the Greeks Cynosura, or the Dog's tail, and may be easily distinguished by seven stars in the same form, but in a contrary position to those in Ursa Major. The pole is in this constellation at the extremity of the tail.

URTICA, *ur'-te-kă* (Lat.), in Bot., the Nettle, the typical gen. of the nat. ord. *Urticaceæ*. The species are well known from their stinging hairs. Some yield useful fibres; thus Caloee hemp, or Rhea fibre, is obtained from two Asiatic species.

URTICACEÆ, *ur-te-kā'-se-e*, in Bot., the Nettle fam., a nat. ord. of *Dicotyledones*, sub-class *Monochlamydeæ*. Herbs or trees with a watery juice. Leaves alternate, usually rough or with stinging hairs. Flowers small, unisexual, or rarely perfect, scattered or arranged in heads or catkins. There are 23 genera and 300 species distributed over the globe.

USANCE, *yu'-zăns* (Fr.), in Commercial Law, is the time, according to the usage or custom of different countries, which is allowed to elapse between the date of a bill and the time of its payment. The length of the usance, or time which it includes, varies in different countries from fourteen days to one, two, or even three months. Double or treble usance is double or treble the usual time; and half usance is half that time.

USE, in Law. (*See* TRUST.)

USHER OF THE BLACK ROD, *ush'-er* (from the Fr.), belongs to the order of the Garter, and has the custody of the chapter-house of the order. He is also the chief gentleman usher to the sovereign, and is appointed by letters patent from the crown. His chief duties are connected with the ceremonies of the houses of parliament. He attends upon the House of Lords during its sittings, and carries the messages of the house to the Commons. He executes orders for the commitment of parties guilty of breaches of privilege and contempt, assists at the introduction of peers, &c.

USUFRUCT, *yu'-zhoo-frukt* (Lat. *usus*, use, and *fructus*, fruit), in Civil Law, is the right of using and reaping the fruits of things belonging to others, without destroying or wasting the subject over which such right extends.

USURY, *yu'-zhoo-re* (Lat. *usura*), in Commercial Law, is interest, or money given for the use of money. (*See* INTEREST.) Commonly, however, it is used to denote excessive or exorbitant interest, or the taking of a higher rate of interest than that established by law. The legal enactments against usury were all repealed by 17 & 18 Vict. c. 90. Where, however, there has been no special agreement respecting interest, five per cent. still remains the legal interest recoverable at law.

UT, *ut*, in Mus., the first of the monosyllables employed by Guido, and is still used by the French. The Italians, however, have substituted that of *do* for it, as much softer; an alteration which has also been adopted in this country. (*See* SOLFAING.)

UTILITARIANISM, *yu-til-e-tā'-re-ăn-izm*, is a name applied to that philosophical creed which regards utility, or the greatest happiness principle, as the foundation of morals, holding that actions are right in proportion as they tend to promote happiness, wrong as they tend to produce the reverse of happiness. The standard here is not the individual's own greatest happiness, but the greatest amount of happiness altogether, the greatest happiness of the greatest number. By happiness is intended pleasure and the absence of pain; by unhappiness, pain and the privation of pleasure. Many persons are apt to look upon this as a very mean and grovelling idea of human life, from the fact of pleasure and pain being most commonly associated with our physical nature, while there can be no doubt that the pleasures of the intellect, of the feelings and imagination, and of the moral sentiments, have a much higher value as pleasure than those of mere sensation. With his usual clearness and accuracy, Mr. J. S. Mill explains the greatest happiness principle by saying that "the ultimate end, with reference to, and for the sake of which, all other things are desirable (whether we are considering our own good or that of other people), is an existence exempt as far as possible from pain, and as rich as possible in enjoyments, both in point of quantity and quality; the test of quality and the rule for measuring it against quantity being the preference felt by those who, in their opportunities of experience, to which must be added their habits of self-consciousness and self-observation, are best furnished with the means of comparison. This being, according to the utilitarian opinion, the end of human action, is necessarily also the standard of morality, which may accordingly be defined the rules and precepts for human conduct, by the observance of which an existence, such as has been described might be, to the greatest extent possible, secured to all mankind; and not to them only, but, so far as the nature of things admits, to the whole sentient creation." Jeremy Bentham is generally regarded as the founder of this sect, and the most distinguished of his disciples is Mr. Mill.—*Ref. Utilitarianism*, by John Stuart Mill, 1863.

UTOPIA, *yu-to'-pe-ă* (Gr. *outopos*, no place), is a name given by Sir Thomas More to an imaginary island which he represents as discovered by a supposed companion of Amerigo Vespuccio, who describes it to More. By representing the inhabitants of this island as in the enjoyment of the utmost happiness, and living under the most perfect laws, he attempts to exhibit the defects of those laws, political institutions, &c., which then existed. The views which he advocates are often far in advance of his time, and the vices and absurdities of the period keenly satirized. The work was first printed in Latin, in 1516; but a more correct edition appeared in 1518. The word *Utopia* has now passed into most civilized tongues as denoting a state of ideal perfection; and Utopian is used as synonymous with fanciful or chimerical.

UVULA, *yu'-vu-lă* (Lat. *uva*, a grape), in Anat., is a small fleshy protuberance which hangs at the middle of the posterior margin of the soft palate. In the case of sore throat, it frequently becomes enlarged and inflamed, and is to be treated by the application of stimulants and astringents in gargles. When other means fail, it may be amputated, an operation neither painful nor dangerous.

## V.

V *ve*, is the twenty-second letter of our alphabet, and *v* is properly a consonant, being placed before vowels, as in *vacant*, *vibrate*, *venal*, &c. It is formed by the junction of the upper teeth with the lower lip, and a gentle expiration. It is the middle labial aspirate, bearing the same relation to *f* that *p* does to *b*. The letters *u* and *v* had always two distinct sounds, but they had only one form till about the beginning the 4th century, and it was not till about the 16th century that the two letters came to be definitely distinguished. The Romans probably pronounced *v* like our *w*, which would account for the fact of there being no *w* in their language. In German, *v* has the sound of *f*, and *w* of *v*. *V* is interchangeable with *b* and *m*, and also with *f*. As a numeral it denotes 5, and with a dash over it 5000. (*See* ABBREVIATIONS.)

VACCINATION, *vāk-sin-ā'-shun* (Lat. *vacca*, a cow), in Med., is the artificial production of a disease known as the cow-pox, by inserting some of the matter of the disease under the skin. The cow-pox was so called from being communicated to the human subject from certain specific sores on the teats and udders of cows. Milkers were thus particularly liable to this disease, and among the great dairy farms in Gloucestershire there was a popular belief that no person who had had the cow-pox could afterwards take the small-pox. This having excited the attention of Dr. Jenner, he satisfied himself of the truth of it by inoculating with small-pox matter several individuals who had had the cow-pox; and at length conceived the great and happy idea of propagating the cow-pox from one individual to another, and so preventing in all cases the dangerous distemper of the small-pox. The birthday of vaccination was the 14th of May, 1796, when matter was taken from the hand of Sarah Nelmes, and inserted by incisions into the arm of James Phipps. He went through the disease in an apparently regular and satisfactory manner; and on the 1st of July following, variolous matter was similarly inserted, but no disease followed. In six years from its first promulgation, the discovery was known through all parts of the world. The great advantage of vaccination

over inoculation is that it only produces a slight disorder, which is attended with no risk, and not communicable except by direct engrafting. By inoculation the virus and the disease is conveyed wherever it is used, and the country filled with contagion. On the other hand, when vaccine matter is used, the contagion of small-pox need never come, and if rightly used, it affords the means of perhaps eradicating this most loathsome pestilence from every well-regulated community. The operation is usually performed by making an oblique puncture through the epidermis and introducing a portion of the virus on the point of the lancet or needle. If the operation has been successful, a small inflamed spot is discernible about the third or fourth day. This increases in size, becomes hard and elevated, and about the sixth day a small quantity of fluid may be distinguished in the centre. About the eighth day, when the pustule is fully formed, the constitutional effects begin to appear,—headache, shivering, loss of appetite, &c., which gradually subside in one or two days. Afterwards the fluid dries up, and a dark brown scab forms, which remains for about a fortnight, and on disappearing leaves a depression. It is a disputed point whether the effects of vaccination are permanent or whether they disappear after a certain time. The majority seem to be in favour of the latter opinion, at least to the extent of recommending that persons who have been vaccinated in infancy should be re-vaccinated on attaining maturity. From the operation being imperfectly performed, or from other causes not well understood, vaccination does not in all cases afford absolute immunity from the disease; but in those cases in which it does occur it is almost always in a very mitigated form.

VACCINIACEÆ, *văk-sin-e-aï'-se-e*, in Bot., the Cranberry fam., a nat. ord. of *Dicotyledones*, sub-class *Corolliflorœ*. Shrubs or small trees remarkable for their astringent leaves and bark, and for their edible subacid fruits. There are about 200 species, chiefly natives of the temperate regions of the globe; they are comprised in thirteen genera. (*See* VACCINIUM.)

VACCINIUM, *văk-sin'-e-um*, in Bot., the typical gen. of the nat. ord. *Vacciniaceæ*. The fruits of several species are edible; thus *V. Myrtillus* yields the bilberry or blackberry; *V. uliginosum*, the bog or black whortleberry; and *V. Vitis-idœa*, the red whortleberry or cowberry. The bog whortleberry is said to be narcotic, and to be employed for making beer "heady." The species of cranberry, once included in this genus, are now placed in a distinct genus. (*See* OXYCOCCUS.)

VACUUM, *văk'-yu-um* (Lat.). in Phys., a space devoid of all matter. Whether there be any such thing in nature as an absolute vacuum, or whether the universe be completely full, is a question that has given rise to disputes among philosophers in all ages. The ancients distinguished a *vacuum coacervatum* and a *vacuum interspersum* or *disseminatum*. By the former they understood a place destitute of matter, such as would exist if God were to annihilate all the air and other bodies within the walls of a chamber; by the latter they designated the space supposed to be naturally interspersed in and among bodies, and in the interstices between different bodies.

VADE-MECUM, *vaï'-de me'-kum* (Lat., go with me), was first chosen as the title of an ascetic work published at Cologne, 1790, entitled "Vade-mecum piorum Christianorum." It is now not unfrequently applied to manuals or handbooks on scientific subjects, or works of entertainment. It is also used to denote a favourite author whom a person constantly carries with him.

VAGRANT. (*See* BEGGAR.)

VAIR, *vair*, one of the furs used in Heraldry, which formed the doublings and linings of the robes of kings and queens in former times. The colours are argent and azure.

VALENTINE DAY, *văl'-en-tine*, is the 14th of February, and sacred to St. Valentine, who, according to the legend, was put to death at Rome under the emperor Claudius. The custom of sending valentines on this day is very ancient, but there is no circumstance, so far as is known, in the life of the saint from which it could have originated. There is, however, a very old notion that "birds choose their mates and couple to this day." Judging from the post-office returns, the observance of this day in England is still very general.

VALERIAN. (*See* VALERIANA.)

VALERIANA, *văl-le'-re-aï'-na'* (from *Valerius*, the first who described it), in Bot., a gen. of the nat. ord. *Valerianaceæ*. The root of *V. officinalis*, a plant common in ditches and damp places throughout Europe, is the *officinal valerian* of the British pharmacopœias. It is much employed as a nervous excitant and antispasmodic. The roots of other species have similar properties, and are used in different parts of the world.

VALERIANACEÆ, *văl-le'-re-ăn-aï'-se-e*, in Bot., the Valerian fam., a nat. ord. of *Dicotyledones*, sub class *Corolliflorœ*. Herbs with opposite exstipulate leaves and cymose flowers. They are chiefly remarkable for the presence of a strong-scented volatile oil, which renders them medicinally active as stimulants, antispasmodics, and tonics. Some are highly esteemed in the East as perfumes, but they are not generally considered agreeable by Europeans.

VALERIANELLA, *văl-le'-re-ăn-el'-lă*, in Bot., a gen. of the nat. ord. *Valerianaceæ*. The species *V. olitoria* is occasionally used as a salad plant, both on the continent and in Britain. The young leaves are alone eaten; in France they are known by the name of *mâche*, and in England by that of Lamb's lettuce.

VALHALLA, or WALHALLA, *văl-hăl'-lă*, *wăl-hăl'-lă* (Norse), in Scandinavian Myth., is the palace of immortality inhabited by the souls of heroes killed in battle. Hence a magnificent marble temple, erected by Ludwig I., king of Bavaria, near Regensburg, and adorned with statues of Germany's greatest men, is called by this name.

VALONIA. (*See* QUERCUS.)

VALOREM, AD. (*See* AD VALOREM.)

VALUE. (*See* POLITICAL ECONOMY.)

VAMPIRE, *văm'-pire* (Gr. *vampur*), an imaginary demon, which was fabled to suck the blood of persons during the night. Adelung believes the word vampire to be of Servian origin. The belief in blood-sucking spectres, also called vampires, is very old. In 1732 great commotions were caused in Hungary, and particularly in Servia, by the general belief in human vampires, so that investigations were instituted by the government. The common people believed that the bodies of persons who died under sentence of excommunication, for sorcery or other crimes, did not decay, but devoured their own flesh, and, during the night, left their graves, and sucked the blood of persons with whom they had been connected, so as to kill them.

VANADIUM, *van-aï'-de-um*, a rare metal found in certain Swedish and English iron-ores, in bauxite, in many clays, and in the form of vanadrate of lead. It is a white metal, forming a blue solution with nitric acid, but not dissolving readily either in sulphuric or hydrochloric acids. Could it be found in any quantity, it would be extremely valuable in the arts as a pigment in china-painting, and as a material for making an almost indelible ink in conjunction with tannogallic acids. It forms three oxides, VO, $VO_2$, and $VO_3$. The second dissolves in acids, forming crystallizable salts which have a blue colour; the third has acid properties. It has a yellow colour, and fuses at a red heat; as it cools, it resolidifies with evolution of light. With the alkalies it forms acid neutral soluble salts. It also combines with the other oxides of vanadium to form several compounds of a green or purple colour. It also has basic properties, forming crystallizable salts with most of the acids. The other compounds of vanadium are unimportant. In many of its characters it appears to be closely allied with chromium and its compounds.

VANGUARD. (*See* ADVANCED GUARD.)

VANILLA, *vă-nil'-lă* (Spanish), in Bot., a gen. of the nat. ord. *Orchidaceæ*. The species are remarkable for their fragrant odoriferous fruit, which constitutes the vanilla or vanile of the shops, so much used for flavouring chocolate and in perfumery. On the continent, vanilla is occasionally employed as a medicinal agent in hysteria, &c. The fruits of *V. planifolia* and *V. aromatica* are the most fragrant.

VAPOUR, *vaï'-por*, an invisible elastic fluid, rendered aeriform by heat, and capable of being condensed or brought back to the liquid or solid state by cold.

VAPOUR-BATH. (*See* BATH.)

VARIATIONS, *văr-e-aï'-shuns*, are certain circumstantial

repetitions of an air or subject constructed so as to show through a florid veil of execution the beauty and character of the parent melody.

VARNISHES, *var'-nish-ez* (Fr. *vernis*, varnish).—Varnishes consist of resins dissolved in oil of turpentine, wood-naphtha, spirits of wine, or some other solvent, which on evaporating leaves the resin behind in a thin, transparent, highly-polished film. The resins most extensively employed in varnish-making are copal, mastic, dammar, sandarach, cowrie, lac, amber, and occasionally elemi and anime. The solvents used are oil of turpentine, spirits of wine, wood-spirit, methylated spirit, and lately, the lighter portions of the coal and petroleum oils. The manufacture of varnishes is one requiring great experience; for if too much spirit is used, they crack in drying. To remedy this, oil of turpentine and linseed or poppy oil are added, to prevent too hasty evaporation; if, however, too much is added, the varnish takes too long to dry. The best varnish for photographic purposes is that made by Soehnée frères, of Paris, the composition of which is a secret. Amber dissolved in chloroform also makes a very good photographic varnish; but it is very expensive, and unless *true* amber is used, it generally scales off during use. The black varnish used for backing positive photographs is made by dissolving ½ a drachm of caoutchouc in 10 ounces of coal-tar naphtha, and adding to it 4 ounces of asphaltum. The picture should be previously varnished with a clear varnish, made by dissolving 40 grains of soft copal in 1 ounce of benzol.

VARRONIAN ERA, *var-ro'-ne-an.*—M. Terentius Varro, a celebrated Roman author, born B.C. 116, in a work entitled "Antiquitatum Libri," made the legends regarding the arrival of Æneas in Italy serve as an introduction to the early history and chronology of Rome, and by means of them determined the era for the foundation of that city (B.C. 753). This era usually passes by his name, and is called the *Varronian Era.*

VASES, *va'-zez* (Lat. *vas*, a vase), in the widest acceptation of the term, means vessels intended to contain fluids or other substances, and made of various materials, the shapes varying from a cup or saucer to that termed a vase or urn, in the narrowest acceptation of the word. Vases were made use of for bowls, jugs, cruets for holding wine or oil, or for mixing wines, &c.; as well as, in the instance of the urn, for containing the ashes of the dead. Large vases of the precious metals, embellished with figures of animals or flowers, were manufactured by the Egyptians. The Assyrian vases were very similar in form to the Egyptian. In Greece, the artists gave to every vase the shape best adapted to its use and most agreeable to the eye. Very rich and precious substances were employed by those who could afford such profusion. Vases were frequently set up as prizes in the public games. A great number of these vases have been preserved to the present day, and offer to the artist the model of the most beautiful forms. The paintings upon these ancient Greek vases are extremely interesting, on account of the subjects represented, and of the beauty of the workmanship. The subjects are, most frequently, sacrifices, processions, and representations which bear relation to the mysteries of Bacchus and Ceres; as well as, occasionally, of family feasts, or of public games. Sometimes the myths of the heroic ages are represented. They did not serve as the receptacles of the ashes of the dead, but were most probably sacred vases used at the festivals of Ceres and Bacchus. While their possessors were alive, it is probable that they were placed in the halls or vestibules of their houses, and after death they accompanied their owners to the tomb, whence they have been disinterred after the lapse of ages. Numerous specimens of the most general forms of the ancient vase—that made of baked earth—have been found all over Greece, Italy, and, indeed, throughout the settlements of Greece. Some were apparently for containing the ashes of the dead, others were for cups and vessels to hold liquids, whilst some were designed only for ornament. The Greeks also possessed, from the earliest ages, vases of gold, silver, and precious stones. Etruria was celebrated for its bronze lamps and candelabra; Pompeii for its bronze vessels. The Etruscan vases were of clay turned upon a lathe and baked at a low temperature. Etruscan black ware was made of a clay mixed



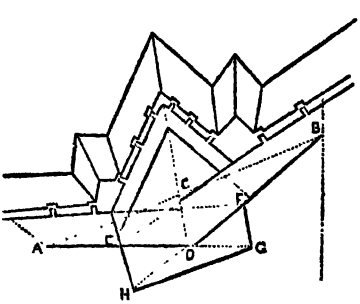


with oxide of iron and manganese, and polished upon the outside. As to the beautiful painted vases found in Etruria, they are wholly upon a Greek model, both the design and the execution being imitative of Grecian art. In the finest of these vases, a perfect mastery of the human figure is exhibited, and Raffaelle himself could not have exceeded the purity of form expressed by them in drapery or figure. The subjects of many of the most beautiful specimens of Etruscan vases are taken from the Greek mythology. Early Rome borrowed the model of her vases, as well as the mode of making them, from Etruria. Later, vases upon the Greek model were universally used by the Romans for bowls, bottles, cups, dishes, urns for the ashes of the dead. Upon these were sometimes stamped statues of Roman gladiators, amusements of the circus, as well as grotesque and floral ornaments. The red Samian or Roman ware had a bright red coralline colour, glazed externally with a mere polish; but a few of the Roman vases were made of a lustrous black ware. (*See* POTTERY, PORCELAIN.)—Ref. *English Encyclopædia*; Birch's *History of Ancient Pottery.*

VASSAL, *vās'-sal* (Fr. *vassal*), in Feudal Law, was a tenant, feudatory, or other person who vowed fidelity and homage to a lo[illegible] on account of some land, &c., held by him in fee. [illegible] was likewise applied in a more general sense to all the dependents of a lord or prince. (*See* FEUDAL SYSTEM.)

VATERIA, *vā-tē'-re-ā*, in Bot., a gen. of the nat. ord. *Dipteraceæ*. The most interesting species is *V. indica*, the source of the oleo-resinous substance known in India as *piny resin* or *piny dammar*, and used as a varnish and for making candles.

VAUBAN'S FIRST SYSTEM OF FORTIFICATION.—The great French engineer divided his first system into three parts,—the *little*, the *intermediate*, and the *great*. He constructed small forts, horn-works, crown-works, and citadels upon the first method. His intermediate method was adapted for the defence of towns of all sizes. The great method was never adopted for all the sides of a place, but only when one side happened to be near a river or a marsh. A plan of fortification is usually described upon a polygon, which must be a regular figure, or as near a regular figure as possible. In the accompanying illustration the angle of an oc-




tagon is taken; upon this the front of the fortification, extending from the flanked angle of one bastion to the corresponding angle of the next, as AB. These lines are bisected, and a perpendicular DC is laid down, drawn from the point of bisection towards the place, its length being proportional to the extent of the exterior side and adjacent angle of the polygon. AEG, BEH show the "lines of defence," which are drawn from the extremities of the exterior sides through these points, and upon these lines are marked the shoulders of the bastion EF. The distance between these points is laid along the continuation of each line of defence, a line being drawn to connect them. This line forms the curtain GH. The flanks of the bastions are drawn from lines extended from GH. According to this mode, the whole front of a fortification is drawn, and upon being repeated around the sides of a polygon, the works of the *enceinte* or body of the place are completed.—Ref. *Encyclopædia Britannica*, art. Fortification.

VAUDEVILLE, *vode'-veel* (Fr.), a species of ballad or song invented about the time of Francis I., by Oliver Bassell, a native of Vaudevere, a town in Normandy; hence the name. It is, according to M. Meusnier de Querlon, synonymous with the *passacaille* or *passacalla* of Spain.

VEDAS, *ve'-das* (Sans., knowledge, from *vid*, to know), is the name given to the four principal sacred books of the Hindoos, believed to have been revealed by Brahma, and to be the fountain of all knowledge, human and divine. They are the Rigveda, Yajurveda, Samaveda, and Atharvaveda. They consist chiefly of prayers, hymns, tales, directions about sacrifices, &c., and are variously subdivided. They are believed to have emanated from Brahma at the creation, and to have remained for a long time scattered about in confusion until, about 5,000 years ago a number of vyasas or compilers arranged them in their present form. Their antiquity is matter of much dispute.—(*See* a long and interesting article on this subject in the *English Cyclopædia*, sect. Arts and Sciences.)

VEGETABLE ALKALOIDS. (*See* ALKALOIDS, VEGETABLE.)

VEGETABLE, ETHIOP'S. (*See* FUCUS.)

VEGETABLE IVORY. (*See* PHYTELEPHAS.)

VEGETABLE KINGDOM, *vej'-e-tá-bl* (Fr., from Lat. *vigeo*, I grow), the term commonly applied to one of the three primary divisions of nature. It includes all those organized beings which are called plants. The distinctions between plants and animals are considered in the article ANIMAL KINGDOM, and a tabulated statement of the systematic arrangement of plants is included in the long article BOTANY.

VEGETABLE MARROW. (*See* CUCURBITA.)

VEGETABLE WAX. (*See* WAX.)

VEHICLE, *ve'-he-kl* (Fr.), is a term which includes any kind of carriage moving on land, either on wheels or runners, but more especially those on wheels. The most ancient vehicles are generally called *chariots*, and were chiefly used in war. They were called by the several names of *iuga*, *trigæ*, or *quadrigæ*, according to the number of horses used to draw them. It is asserted that they were so strongly built that they lasted for several generations. Of the other species of chariots mentioned by the Greek and Roman historians, the *Benna* seems to have been a chariot used rather for travelling than for war; whilst the *Corinus* was a war chariot, armed with sharp scythes and hooks, for cutting and tearing all who happened to come within its reach. In the modern sense of the term, a chariot is only a half-coach, having only a seat behind, with a stool before. Of modern vehicles, we may first mention *carts* and *waggons*, the distinction between which appears to be, that whilst the former is generally constructed to run on two wheels, the latter has four wheels, and generally a fixed or movable covering of tarpauling or rough woollen blanketing, supported on a broad framework of wood. A third species of vehicle, used for the conveyance of burdens, is the *dray*, a low cart without wheels, drawn by one or more horses. The simplest form of cart is the common Irish car, which consists of a framework, to which planks are nailed to form a bed, with a pair of shafts projecting in front. Large pieces of wood are fastened to the lower part of the frame, with holes in them to admit the ends of the axle. This is square in form, and revolves with the wheels, which consist of thick circular pieces of wood, surrounded and strengthened with an iron tire. The wheels are under the bed of the cart, inside the pieces of wood into which the ends of the axle are fitted. Of the many vehicles in use for the conveyance of persons, we may first mention the *stage carriage* and the *hackney carriage*. The former group comprises *stage coaches* and *omnibuses*, for the use of which passengers pay at the rate of so much per journey; whilst the latter group comprises *hackney coaches* and *cabs*, for which passengers pay, either at so much per mile, or so much per quarter of an hour. The derivation of the word hackney as applied to a class of public conveyances, has occasioned much speculation; but it is evident that it was first applied to horses let for hire, and then, by a very natural transition, extended to coaches. The coach is distinguished from other vehicles chiefly as being a covered box hung on leathers. They are said to have been invented in Hungary, and their





name, which in the language of that country signifies *covered*, is also of Hungarian origin. They are said to have been first introduced into England in 1564, but they were in common use in London in 1625. In 1823, *cabriolets* were introduced for public use. The new species of vehicle was a hooded chaise, drawn by one horse, and carrying only one passenger besides the driver, who sat in the cabriolet (or, as more commonly called for brevity, *cab*) with his fare. An improved build was soon introduced, by which room was provided for a second passenger, and the driver was separated from his fare. The hackney carriages of the metropolis are now regulated, as to vehicles, drivers, and fares, by the act 16 & 17 Vict. c. 33. Every owner of a stage carriage must be licensed; and the police commissioners are empowered, at any time deemed by them proper, to order an inspection of metropolitan stage and hackney carriages and horses, and if any are found in improper condition, notice thereof is sent to the proprietor, whose license is suspended if, after this warning, he neglects to put them in a proper state. Stage coaches are those public vehicles which run regular stages or routes, and which charge by the journey, not by the mile or the hour. Until about the year 1830, in the metropolis, a few slow and unpunctual stages were the only means of transit provided for the citizens to convey them to their suburban residences; but about that period a coach-builder named Shillibeer started a long-bodied carriage called an *omnibus*, to run between Greenwich and Charing Cross, at fares considerably lower than those of the old stage coaches; and since that time such vehicles have been in common use in the metropolis and other parts of Great Britain. Having thus alluded to "carriages for the public service," it remains to refer, even more briefly, to "carriages of luxury." The names and forms of these, depending as they do on individual taste and on fashion, are almost infinite. There is the *phaeton*, a light open carriage upon four wheels, and drawn by two horses; the *landau*, a carriage which opens and closes at the top, and is so called from having been first made at a German town of that name; the *barouche*, a four-wheeled carriage, with a top that can be raised or depressed, with seats as in a coach; the *drag*, a gentleman's four-horse coach, built in the manner of a stage coach; and many others too numerous to mention.

VEHMIC COURTS. (*See* FEMGERICHTE.)

VEINS, *veins* (Fr. *veine*, Lat. *vena*, a vein), in Anat., are those organs of circulation by which the blood is taken up from the arteries and conveyed to the heart. (*See* CIRCULATION OF THE BLOOD.)

VENIAL SINS, *ve'-ne-ál* (Lat. *venia*, leave), in the Catholic Church, are applied to such sins as are of a light nature, not bringing spiritual death to the soul like mortal sins, but only weakening sanctifying grace. Protestants reject all such distinctions, regarding all sin as hateful in the sight of God, and deserving his wrath and curse.

VENIRE FACIAS, *ve-ni'-re fish'-she-as* (Lat., cause to come), is the name of a writ addressed to the sheriff or other officer, to cause the parties set forth in the writ to come to the place named. Formerly it was principally used in the summoning of juries to serve for the ordinary trial of civil causes; but now the jurors are summoned by the sheriff in virtue of a precept issued to him for that purpose by the judges of assize.

VENTRILOQUISM, *ven-tril'-o-kwism* (Lat. *venter*, the belly, and *loquor*, I speak), literally signifies speaking from the belly; but it is commonly applied to the art of making the voice appear to come from some distant place or object. It seems to consist in filling the lungs with air, and then employing the vocal organs of the throat in pronunciation with as little movement as possible of the lips, mouth, or tongue. It requires considerable powers of mimicry, and a good ear for sounds, and with these, and a little practice, any one may acquire considerable dexterity in this art. The imagination of the hearers has a good deal to do with the deception, for it is to be observed that the ventriloquist almost always indicates, either directly or indirectly, the direction from which he wishes the audience to believe that the sound is coming; and hence they naturally look for it there.

VENUE, *ven'-yu* (Lat. *vicinetum*, neighbourhood), in

Law, is the county in which an action is to be tried. Anciently the practice was to summon jurors from the immediate neighbourhood where the event happened, so that they might decide from their own knowledge; but this has gradually ceased since juries have come to be guided by the evidence of witnesses. In local actions (*i.e.* actions relating to real estate), the county in which the subject-matter is situated is the venue; but in transitory actions (*i.e.* of debt, contract, personal injury, &c.), the plaintiff is at liberty to bring his action in any county in which he pleases. The courts, however, exercise an authority of changing the venue if it be made to appear that great inconvenience would arise from trying it in the original county.

**Venus**, *ve'-nus*, the name of the planet which is nearest to the earth, and, with the exception of Mercury, nearest to the sun. Venus, like Mercury, from the orbit being entirely within that of the earth, is never more than a certain angular distance from the sun; her greatest angular distance or elongation being from 45° to 47° 12′. Her mean apparent diameter is 16·9″, but varies from 9·6″ to 61·2″. The real diameter is ·975 that of the earth, or about 7,700 miles, and the volume is ·927 of that of the earth. This planet revolves on its axis in about 23h. 21m. 7s. Its light and heat are to that of the earth as 1,911 to 1,000. The density is very nearly that of the earth. The velocity with which it moves in its orbit is about 80,000 miles an hour. It exhibits phases like the moon, and its variations in brightness in different parts of its orbit are very remarkable. The transits of Venus are of very rare occurrence, taking place alternately at the very unequal but regularly-recurring intervals of 8, 122, 8, 105, 8, 122, &c., years in succession, and always in June or December. As astronomical phenomena, they are extremely important, since they afford the best and most exact means we possess of ascertaining the sun's distance, or its parallax.

**Veratrum**, *ve-rai'-trum*, in Bot., a gen. of the nat. ord. *Melanthaceæ*. *V. album* is the white hellebore, a medicinal plant, the rhizomes of which contain the alkaloids *veratria* and *jervine*. White hellebore is a narcotico-acrid poison; it has been employed externally as an errhine and for destroying vermin; internally, as a purgative and anodyne in gout. The rhizome of *V. viride*, American, green, or swamp hellebore, is now much employed in North America as an arterial sedative in inflammatory affections. *V. Sabadilla* is thought by some to be one of the sources of sabadilla.

**Verb**, *verb* (Lat. *verbum*, a word), in Gram., is that part of speech in which a subject is conceived under certain relations of mood or mode, and tense or time. The verb is the most interesting, as it is also the most important, of the parts of speech. By means of changes or modifications, it expresses the various conditions of voice, mood, tense, number, and person. Verbs are active, passive, or neuter, according as they express doing, suffering, or a mere state or condition. They are transitive or intransitive, according as the action expressed by the verb passes, or does not pass, to an object. The latter comprise neuter and passive verbs. The moods or modes are the ways in which the predicate is brought into relation to the subject, whether it is given as necessary, real, or possible. These are the indicative, subjunctive, and imperative. The infinitive and participles are not strictly moods, though often classed as such. The tenses are those modifications of the verb by which time is denoted. The simple tenses are the present, past, and future; but most languages admit of other tenses, as the imperfect, pluperfect, *paulo-post* future, &c. The numbers are the singular and plural (in Greek also the dual); and the persons are the first, second, and third, in both numbers; as I, thou, he, she, or it; we, you, they. As respects their origin, verbs are primitive or derivative. They are also regular or irregular, according as they conform to or deviate from certain rules.

**Verbascum**, *ver-bla'-kum*, in Bot., a gen. of the nat. ord. *Scrophulariaceæ*. *V. Thapsus* is commonly called the great mullein: its leaves have emollient, demulcent, and slightly narcotic properties; its seeds, and those of the species *V. nigrum*, are said to be employed by poachers to stupefy fish, in order that they may be readily taken.

**Verbenaceæ**, *ver-be-nai'-se-e*, in Bot., the Vervain fam., a nat. ord. of *Dicotyledones*, sub-class *Corollifloræ*. Herbs, shrubs, or trees, with exstipulate leaves; calyx persistent, tubular; corolla 2-lipped, or more or less irregular; stamens 4, usually didynamous, or in some instances only 2; anthers 2-celled. Ovary 2- or 4-celled; style 1, terminal; stigma simple or bifid. Fruit dry or drupaceous, composed of from 2—4 nucules. The plants of this order are found both in temperate and tropical regions. There are 45 genera and 663 species. Some are valuable timber trees. The fleshy fruits of some species are edible. The leaves of two or three are used as substitutes for China tea. Many are cultivated in our gardens for the beauty of their flowers and for their fragrance; as the different species and varieties of *Verbena*; the *Aloysia*, or *Lippia citriodora*; the sweet verbena, or lemon-plant, &c.

**Verdict**, *ver'-dikt* (Lat. *verum*, truth, and *dico*, I speak), in Law, is the answer of a jury given to the court concerning the matter of fact in any cause committed to their trial. (*See* Jury.)

**Verdigris**, *ver'-de-gris* (Fr., green-grey), a rust of copper formed by a corrosion of the metal by acid. It is chemically a diacetate of copper, and is very poisonous. It is used in an impure state as a green pigment, and when pure as a medicine.

**Verditer**, *ver'-di-ter* (Fr., green earth), a blue pigment formed from a sulphate or nitrate of copper by lime, the precipitate being ground up with an excess of lime; green verditer is formed by sea-salt and blue vitriol, or sulphate of copper.

**Vermifuge**, *ver'-me-fuje* (Lat. *vermis*, a worm; *fugo*, I drive away), a medicine made use of to expel intestinal worms, an anthelmintic (which *see*).

**Vernation**, or **Præfoliation**, *ver-nai'-shun*, *pre'-fo-le-ai'-shun*, in Bot., the arrangement of the leaves in the bud. The different modes in which the unexpanded or rudimentary leaves are disposed in the bud constitute important characters. Considering first the disposition of each leaf, we find that it may be *bent* or *folded* in various ways, or *rolled* in various ways. Of bent leaves there are three varieties,—the *reclinate* or *inflexed*, in which the upper part of the leaf is bent upon the lower; the *conduplicate*, in which the right half is folded on the left; and the *plaited* or *plicate*, folded up like a fan by a number of plaits. Of rolled leaves there are four varieties,—the *circinate*, rolled up on the axis towards the base like a crosier; the *convolute*, rolled up from one margin into a single coil; the *involute*, rolled up inwards from the two margins towards the midrib; and *revolute*, rolled up outwards from the two margins. Considering next the relation of the several leaves of the same bud, taken as a whole, to each other, we have three varieties of vernation, in which the component leaves are plain or slightly convex; namely, *valvate*, in which the leaves are placed nearly in a circle, and are in contact by their margins, without overlapping; *imbricate*, in which the leaves are at different levels, and the outer successively overlap the inner to a greater or less extent by their margins; and *twisted* or *spiral*, in which, as in imbricate vernation, the margin of one leaf overlaps that of another, while it in its turn is overlapped by a third. Again we have four varieties of vernation, in which the component leaves are bent or rolled; namely, *induplicate*, when involute leaves are applied together in a circle without overlapping; *equitant*, when the leaves are conduplicate, and the outer successively embrace and sit astride of those next within them, as if on a saddle; *half-equitant* or *obvolute*, when half of one conduplicate leaf receives in its fold the half of another folded in the same manner; and *supervolute*, when a convolute leaf incloses another which is rolled up in the same way. (*See* Bud.)

**Vernier**, *ver-neer'*, a contrivance attached to the graduated limb of an instrument for the purpose of measuring with accuracy the aliquot parts of the smallest spaces into which the instrument is divided. It is named after its inventor, Peter Vernier, of Brussels.

**Verse.** (*See* Poetry.)

**Verse, Blank.** (*See* Blank Verse.)

**Vert**, *vert*, the French term for green, and in Her. the term used for that colour. It is expressed in engraving by diagonal lines drawn from the dexter chief to the sinister base.

VERTEBRÆ. (*See* SPINE.)

VESPIDÆ, *ves'-pi-de*, is the scientific term applied to the Wasp fam. of insects. It is composed of aculeated hymenopterous insects, comprising the species of the Linnæan genus *Vespa*, and to which the wasps and hornets belong. (*See* WASP and HORNET.) — *Ref.* Baird's *Cyclopædia of the Natural Sciences.*

VESSEL, *ves'-sel*, in Bot., is generally considered synonymous with the term *duct*, but by some authorities a distinction is drawn between a *vessel* and a *duct*, the former term being used to represent a long tubular cell with tapering ends, having spiral deposits in its interior; while the latter is used to indicate an elongated tubular body, which is formed of a row of cylindrical cells applied end to end, the partitions between the cavities of which have become absorbed, so as to form a continuous canal. There are several varieties of vessels or ducts, the nature of which depends upon the modifications which their walls undergo by secondary deposits in their interior.

VESTRY, *ves'-tre* (Lat. *vestiarium*), is the room attached to a church in which the ecclesiastical vestments are kept; and from the meetings of parishioners for parochial purposes being usually convened in these rooms, such meetings have received the same name. A general vestry is one to which every person paying church-rates is admissible of common right; a select vestry, one composed only of certain individuals chosen in different ways, in many cases by their co-vestrymen. The powers of the vestry extend to the management of the parish funds, the repairing and ornamentation of the church, election of parish officers, &c.

VETO, *ve'-to* (Lat., I forbid), in Politics, is the power possessed by some legislative body, which has not the power of originating any measure, of rejecting such as may be submitted to it by another body. In most constitutional monarchies, the sovereign possesses a veto over the enactments of the legislature.—(Regarding the "Veto Act" in Scotland, *see* FREE CHURCH.)

VIADUCT, *vi'-à-dukt* (Lat. *via*, way; *duco*, I lead), a bridge, or series of arches, erected for the purpose of conducting a road or railway over a valley or a thickly-inhabited district, where it may be necessary to avoid interference with previously existing lines of communication. As in roads designed to accommodate rapid traffic, inclines of 1 in 12 are inadmissible under any circumstances, and inclines of 1 in 30 are objectionable, a road across a valley with steep sides, intended for such traffic, must be led across either a viaduct or an embankment. Many circumstances, such as the value of the land and the quantity furnished by neighbouring excavations, must be taken into account in calculating the comparative expense of elevating a road or railway to a given height by an embankment or by a viaduct. An embankment is generally the cheaper up to a certain limit; but beyond that limit a viaduct is the cheaper, and its economy will increase in an accelerating ratio with every further increase of elevation. When the adoption of a viaduct has been determined on, it remains to ascertain, by a careful comparison of local and other circumstances, what material it may be most advisable to employ, and what proportions it may be most economical to adopt for the arches and piers; and on these points engineers are much divided in opinion.

VIBURNUM, *vi-bur'-num*, in Bot., a gen. of the nat. ord. *Caprifoliaceæ*. The species *V. Tinus* and *V. Opulus* are much cultivated in shrubberies, the former being known as the laurustinus, and the latter as the guelder-rose. *V. Lantana*, the mealy guelder-rose or wayfaring tree, has a very acrid inner bark, which is sometimes employed as a vesicant. The leaves of *V. cassinoides* mixed with those of *Prinos glaber* are employed in North America as a substitute for tea, under the name of Appalachian tea.

VICAR, *vik'-ar* (Lat. *vicarius*), is literally one who is appointed as deputy to another, to perform his functions in his absence and under his authority. Hence in the German empire the imperial vicars were princes who had the right of representing the emperor in case of absence or interregnum; and the pope is sometimes styled Christ's vicar on earth. Commonly, however, it denotes the priest of a parish, the predial tithes of which are impropriated or appropriated, that is, belong either to a chapter, religious house, &c., or to a layman. The priest of every parish is called rector, unless the predial tithes are appropriated, and then he is styled vicar, as acting instead of the rector; and when rectories are appropriated, vicars are to supply the rectors' places. The vicar is entitled only to a certain portion of the ecclesiastical dues, the best part of which are absorbed by the appropriator, to whom, if appropriations had continued as in their origin, he would in effect be perpetual curate with a fixed salary.

VICTORIA, *vik-to'-re-à*, in Bot., a gen. of the nat. ord. *Nymphæaceæ*. *V. regia* is a native of equatorial America, and has been introduced into this country. The flowers when fully expanded are more than a foot in diameter, and the leaves, which are curiously turned up at their edges, vary from four to eight feet in diameter. The plant is commonly known in this country as the Victoria water-lily, and in South America as the water-maize, from its edible seeds, which are commonly roasted with maize or Indian corn.

VICTUALLING BILL, *vit'-tling* (from Fr. *victuaille*, victuals), or bill for the shipment of stores in over-sea voyages, has the following clauses in relation to it. The master of every ship of the burden of fifty tons or upwards, departing from any port in the United Kingdom upon a voyage to parts beyond the seas, the duration of which, out and home, shall not be less than forty days, shall, upon due application made by him, and upon such terms and conditions as the commissioners of customs may direct, receive from the searcher an order for the shipment of such stores as may be required and allowed by the collector or comptroller for the use of such ship, with reference to the number of the crew and passengers on board, and the probable duration of the voyage on which she is about to depart; and all demands for such stores shall be made in such form or manner as such collector or comptroller shall require, and shall be signed by the master or owner of the vessel; and after such stores are duly shipped, the master or his agent shall make out an account of the stores so shipped, together with any other stores already on board, and the same, when presented to the searcher, signed by him, and countersigned by the collector or comptroller, shall be the victualling bill; and no stores shall be shipped for the use of any ship, nor any articles taken on board any ship be deemed to be stores, except such shall be borne upon such victualling bill.

VILLEIN, or VILLAIN, *vil'-leen'*, *vil'-lân* (Lat. *villanus*), in English Law, was a man of base or servile condition, a bondsman or servant; one who held by a base service. Of these, there were two sorts in England,—one a villein in gross, who was immediately bound to the person of his lord and his heirs, the other a villain regardant to a manor, being bound to his lord as a member belonging to, and annexed to a manor, whereof the lord was owner. Villenage was a base tenure of lands or tenements, of which there were two sorts, one pure, when a man held upon doing whatsoever was commanded of him; and second, privileged, otherwise called villein socage, held on the condition of performing certain services agreed upon between the lord and tenant.

VINE. (*See* VITIS.)

VINEGAR, *vin'-e-gar* (Fr. *vin*, wine; *aigre*, sour).—This well-known condiment is a weak acetic acid of different strengths, and either brown or colourless, according to the source from which it is procured. The vinegar principally consumed in this country is made from stale beer or infusion of malt, which is exposed to the air in large open vats. The best vinegar, however, for domestic purposes, is that made in France from the more acid qualities of wine. Large casks, of a capacity of 100 gallons each, are ranged in rows in a shed, at a temperature of about 85° Fahr. The upper part of the casks is allowed to remain open, and a few gallons of hot vinegar are poured in; wine is afterwards added, a few gallons at a time, at intervals of several days, until the casks are two-thirds full. At about the end of a fortnight the acetification is complete, and a certain quantity is drawn off, more wine being added to keep up the supply. After a time, a peculiar confervoid growth takes place, called the *mother of vinegar*, which has the property of converting alcohol, or even sugar-and-water, into vinegar. Vinegar prepared in either of these ways has a quantity of

organic matter in it which gives it a peculiar softness not found in dilute acetic acid. In countries where alcohol is cheap, vinegar is sometimes made by allowing dilute spirits to trickle over wood shavings, by which means it becomes oxidized, and converted into acetic acid. It is a fact little known, that good white-wine vinegar may be used to extract the flavouring matter from herbs valued at the table for their properties; such as chervil, tarragon, thyme, marjoram, garlic, &c. &c.

VINEGAR-PLANT. (*See* PENICILLIUM.)

VIOL, *vi'-ol* (Fr. *viole*), a stringed instrument of music, which may be traced back to the 8th century, and which was, in all probability, the parent of all instruments of the violin kind. There were three kinds of viols; viz., the treble viol, which was somewhat larger than our violin; the tenor viol, which in length and breadth was about the size of the modern viola, but had a thicker body; and the bass viol, which as nearly as possible resembled in size our violoncello. Each of these was fretted, possessed six strings, and was played on with a bow.

VIOLA, *vi-o'-la*, in Bot., the Violet, a gen. of the nat. ord. *Violaceæ*. The species *V. odorata* is the March or sweet violet, the flowers of which have always been highly esteemed for their fragrance. An infusion of the syrup is a useful chemical test, as the violet or purplish colour is changed red by acids, and green by alkalies. *V. canina* is the dog-violet, and *V. tricolor*, the pretty little plant from which all our cultivated varieties of pansy or heart's-ease have been derived.

VIOLACEÆ, *vi-o-lai'-se-e*, in Bot., the Violet fam., a nat. ord. of *Dicotyledones*, sub-class *Thalamifloræ*, having the following essential character:—Herbs or shrubs. Leaves simple, stipulate, and with involute vernation. Flowers regular or irregular. Sepals, petals, and stamens, 5 each, hypogynous. Stamens all perfect; anthers introrse, with the filaments prolonged beyond them. Ovary 1-celled, with 3 parietal placentas opposite the 3 outer sepals; style and stigma single. Fruit 1-celled, dehiscing by 3 valves, each valve bearing a placenta in its middle. Seeds having a straight erect embryo in the axis of fleshy albumen. There are 15 genera and about 300 species.

VIOLEÆ, *vi-o-le'-e*, in Bot., a sub-ord. of the *Violaceæ*, containing those genera which are distinguished by irregular flowers and appendaged anthers. (*See* ALSODEÆ.)

VIOLET. (*See* VIOLA.)

VIOLIN, *vi-o-lin'* (Ital. *violino*), an instrument of music played on by means of a bow, vulgarly called a fiddle, used at the present day in most parts of the world. Of its origin no certain knowledge can be obtained, some writers believing it to have existed at a very early period, while others assert it to be a comparatively modern invention. Dr. Burney affirms that the method of producing sounds by means of a bow was entirely unknown to the ancients. The truth of this assertion is however doubtful, and the Abbé Le Beuf has produced strong proof that an instrument called the Rebec, acted on by a bow, was known in France in the 8th century. Be this as it may, it is certain that the modern violin is an improved descendant of the old viol, so popular with our forefathers, and that it was in common use in Italy at the end of the 16th century. The first players of any note were Italians. Of these the first was Baltazarini, who introduced the instrument into France in 1577; from whence it came into this country in the reign of Charles II., and although at first treated with the greatest contempt, its great powers soon raised it to the highest rank amongst stringed instruments. The history of the violin for the last two hundred years has been a [illegible] contradiction to the doctrine of progress, for spects that time, notwithstanding many attempts have They are de to improve it, none have succeeded, and the conform to of the early makers, especially those of VERRARIO's Amati and Stradnarius, at Cremona, are ord. *Scrap*red by connoisseurs to be much finer both in the great construction than those of modern makers. cent, au[illegible] three chief parts,—the neck, the those o[illegible] board; on the belly is a bridge to by poachers to [illegible] which are four in number, and are readily taken. extremity, called the tail-piece, to VERBERATE, he heady where they are secured to movable pegs, by which they may be tightened or loosened *ad libitum*. According to M. Otto (treatise on the Construction, &c. of the Violin), there are 59 distinct pieces employed in the construction of a first-rate instrument. These he enumerates as follows:—2 pieces for the back, 2 for the belly, 6 for the sides, 12 for lining the sides, 1 for bass bar, 12 for purfling, 1 for rest of tail-piece, 1 for neck, 1 finger-board, 1 for tail-piece, 4 pegs, 1 nut, 1 for button of tail-piece, 1 for sound-post, 4 strings, 1 catgut or wire to connect the tail-piece with button, 1 bridge, and 6 blocks at top, bottom, and four corners. So many pieces are not, however, indispensable, for in many common instruments the side linings and corner blocks are left out, while even in some good violins the back and belly each consist of one piece instead of two pieces joined together. The strings of the violin are tuned in fifths, E, A, D, G: its compass extends three octaves; but as the high sounds are anything but agreeable, being often harsh and squeaky, violinists would do well to confine themselves to a more limited scale. The violin is adapted to every kind of music, and in the hands of a skilful performer is one of the most beautiful instruments we possess; but it is also one of the most difficult to beginners, and requires years of study and practice to become even moderately proficient in its use. Amongst the most distinguished violinists we may mention Corelli, Tartini, Viotti, Baillot, Spohr, Paganini, Sivori, Vieuxtemps, Ole Bull, and Lotto; Paganini and Sivori ranking far beyond all others.

VIOLIN STRINGS. (*See* CATGUT.)

VIOLONCELLO, *ve-o-lon-tshel'-lo* (Ital.), an instrument of the violin kind, having four strings, the two lowest of which are covered with silver wire, and are tuned in fifths, A, D, G, and C. A violoncello is intermediate between the viola, or tenor violin, and the double bass, being an octave lower than the former, and an octave higher than the latter. Its tone is rich and expressive, and although properly adapted to concerted music, it is, in the hands of first-rate performers, an effective solo instrument.

VIPER, *vi'-per* (Lat. *vipera*), the type of the *Viperidæ*, a fam. of poisonous reptiles belonging to the ord. *Ophidia*, or snakes. The *Viperidæ* consist of two sub-families; namely, the *Crotalidæ*, or rattlesnakes, which will be found treated of in their proper place, and, secondly, the true vipers of the Old World, which differ from the former by their not having pits in the sides of the face. The common viper known in Europe (*Vipera Berus*) is found in all countries from the north of Russia and Sweden down to the shores of the Mediterranean Sea. As it is the only venomous reptile found in Great Britain, it is deemed worthy of some especial notice. In some parts of this country it is found in considerable numbers, inhabiting generally stony places, heaths, and other dry districts. Its length rarely exceeds two feet, although some specimens have been found of three feet, and it can be easily distinguished from the common snake, for which it is often indeed mistaken, by its broad head of triangular shape, and short tail. Its colour is generally yellowish-brown, or olive-tinted, and marked with a double row of black spots; the sides are somewhat paler in the hue of their ground-colour, but possess the same markings as the back. The nose is bluntly shaped, and the eyes, small and brilliant, are bordered with black; the tongue is very long in comparison with the size of the body, and is protractile and forked at the extremity. Vipers are viviparous, bringing forth young instead of eggs; and their general food consists of young birds, field-mice, worms, insects, shrews, and such-like small animals. Although the poison of the viper is less virulent in its nature than is the case with similar reptiles found in warm countries, yet it is often attended with the most alarming effects, ending sometimes even in death. When it is about to inflict its bite, it generally throws itself, in the first place, into a coil, which is more or less close, and thus is enabled to raise the upper part of the body on a base formed of the lower extremity. The neck is then bent backwards abruptly, and the head fixed horizontally towards its victim. Then in an instant the head is violently directed forwards, and the fang, which is erected by means of a very small muscle, is implanted into the object of its anger. The remedy which is

generally used is to rub the part affected with olive-oil while it is held over a chafing-dish of coals. Another species, called the horned viper (*Cerastes Hasselquistii*), is found along the valley of the Nile and the warmer parts of northern Africa: it is, in fact, the viper which is seen usually depicted on Egyptian obelisks and monuments. By some critics, the horned viper is supposed to be the same as the asp, with which Cleopatra is said to have terminated her existence; but the supposition is open to some objections. The short-tailed viper, or puff-adder, of the Cape of Good Hope (*Vipera inflata*), is another variety, and is the most deadly of the snakes of South Africa. It is of a brown colour, and is larger than the former. The natives are said to render its bite innocuous by chewing certain roots, and washing the part bitten with a vegetable decoction. The death-adder of Australia (*Acanthophis antarctica*) is the last of the family, and is the most dangerous and fatal of smaller reptiles. Persons are asserted to have died of a bite from the death-adder in less than a quarter of an hour afterwards, so sudden have been the effects of the poison. In appearance and general characteristics this variety is nearest to the typical species.

VIRTUE. (*See* ETHICS.)

VISCUM, *vis'-kum*, in Bot., a gen. of the nat. ord. *Loranthaceæ*. *V. album* is the common mistletoe, which is parasitic on many trees; as willows, thorns, limes, elms, oaks, firs, and especially apple-trees, in this country. The mistletoe of the oak was an object of superstitious veneration by the Druids. The fruit has a viscid pulp, which is employed for making bird-lime. Mistletoe is still regarded as a sacred plant, and is much used at Christmas in certain mysterious rites instituted by St. Cupid.

VISION. (*See* LIGHT.)

VITACEÆ, *vi-tai'-se-e*, in Bot., the Vine fam., a nat. ord. of *Dicotyledones*, sub-class *Thalamifloræ*, with the following essential character:—Shrubby plants, usually climbing, with simple or compound leaves, which are opposite below and alternate above. Flowers small, green, regular. Petals and stamens corresponding in number, 4 or 5, the latter opposite to the petals, both inserted on a hypogynous disk; æstivation of petals induplicate; anthers opening longitudinally. Ovary superior, with a very short simple style and stigma; placentas axile. Fruit a nuculanium. Seeds few; testa bony; embryo erect, in horny albumen. There are probably eight genera, including some 260 species, which are exclusively natives of warm and tropical regions. (*See* VITIS.)

VITALITY. (*See* PHYSIOLOGY, DROWNING, HANGING, &c.)

VITAL STATISTICS. (*See* REGISTRATION OF BIRTHS, MARRIAGES, AND DEATHS.)

VITIS, *vi'-tis*, in Bot., the Vine, a gen. of the nat. ord. *Vitaceæ*. *V. vinifera*, the plant commonly known as the grape vine, is supposed to be a native of the shores of the Caspian, but is now completely naturalized in the south of Europe, and cultivated in almost every region of the globe where the temperature does not rise too high or fall too low. The varieties which have been developed by cultivation are very numerous, more than 300 being distinguished. The fruits, under the name of grapes, are too well known to need description. They have been in use for the making of wine for at least 4,000 years. Dried grapes are generally called *raisins*. Of the many commercial varieties of raisins, the more important are Valentias, Malagas, Muscatels, Sultanas, and Smyrnas. The Muscatels, or raisins of the sun, are considered the finest. The Sultanas are remarkable for the absence of seeds. About 12,000 tons of the above varieties are annually imported. Besides the raisins named, there is the small dark variety of raisin, commonly known as the currant, this name being a corruption of Corinth, where the small grape was originally grown. About 20,000 tons of "currants" are annually imported from Zante and other Greek islands. The leaf of the vine is astringent, and has been used in diarrhœa. *V. vulpina* and *V. Labrusca*, natives of North America, yield inferior fruits, which are known as fox-grapes.

VITRIOL. (*See* SULPHURIC ACID.)

VIVIANIACEÆ, *viv-e-ăn-e-ai'-se-e*, in Bot., a small nat. ord. of *Dicotyledones*, sub-class *Thalamifloræ*. The species are herbs or undershrubs, inhabiting Chili and South Brazil, and are readily known by their regular flowers, valvate 10-ribbed calyx, permanent withering corolla, 10 hypogynous stamens with distinct filaments, 2-celled anthers with longitudinal dehiscence, 3-celled capsule with loculicidal dehiscence, and albuminous seeds with curved embryo, and radicle next the hilum.

VIZIER, or VIZIR, *viz-eer'*, is a title of honour borne by certain high functionaries of the Turkish empire, civil as well as military. At first the title was confined solely to the prime minister of the empire, but afterwards the number was gradually augmented, and, at length, the title came to be conferred on certain governors of provinces. It is now borne by all the pachas of three tails, or the highest order of pachas. The grand vizier is chief of the other viziers, and is the representative of the sovereign, receiving the solemn visits of all high functionaries and conducting the deliberations of the divan.

VOCHYSIACEÆ, *vok-e-se-ai'-se-e*, in Bot., the *Vochysia* fam., a nat. ord. of *Dicotyledones*, sub-class *Calycifloræ*, consisting of trees and shrubs, with entire, usually opposite leaves, which are furnished at the base with glands or stipules. Flowers very irregular and unsymmetrical; fruit usually capsular, 3-cornered and 3-celled. The plants are all natives of equinoctial America; some are said to furnish useful timber.

VOICE and SPEECH, *voise* (Lat. *vox*).—In most air-breathing vertebrate animals, there are certain provisions made for the production of sound in some part of the respiratory apparatus. In many animals, the sound thus produced admits of being variously modified and altered,—to the greatest extent in man, so as to constitute speech. Voice and speech, however, are different things, and depend upon different parts of the human organism; the former being produced in the larynx, the latter chiefly by the tongue and mouth. The sound of the human voice is produced by the inferior laryngeal ligaments or vocal cords, which are thrown into vibrations by currents of expired air impelled over their edges. They contain a large quantity of elastic tissue, which enables them to vibrate like tense membranes, and are likewise so attached to the cartilaginous parts of the larynx that they can be made tense either by the depression of the thyroid cartilage towards the cricoid by means of the crico-thyroid muscles, or by the retraction of the arytenoid cartilages, which are moved backwards by the posterior crico-arytenoid muscles, at the same time that they are approximated by the posterior arytenoid. (*See* LARYNX.) For the deepest notes, the vocal cords are much relaxed by the approximation of the thyroid to the arytenoid cartilages; for the middle notes of the natural voice, the cords are neither relaxed nor stretched, but in a medium state; while the higher notes are produced by the lateral compression of the cords, and narrowing the space between them by means of the thryo-arytenoid muscles, and also by increasing the force of the current of air. Voice is of three kinds:—(1) Monotonous, in which the notes have nearly all the same pitch, as in ordinary speaking; (2) discordant, or the successive transition from high to low notes, and *vice versâ*; and (3) musical, in which each sound has a determinate number of vibrations, and accords with others, as in singing. The first of these constitutes the speech voice, the last the song voice. Vocal sounds are divided into vowels and consonants, the former being continuous tones modified by the form of the aperture through which they pass out; while in sounding consonants, the breath suffers a more or less complete interruption in its passage through parts anterior to the larynx.

VOIDERS, *voy'-derz*, in Her., is an ordinary resembling a flanch, but is not quite so circular towards the centre of the field. The *flanch* is formed on each side of the shield by a segment of a circular superficies, for they are always borne double or in pairs. The *flasque* is similar to the flanch, but it is not so circular. (*See* HERALDRY.)

VOLCANOES, *vol-kai'-noze* (Ital., from Vulcan, the god of fire), are openings in the crust of the earth, whence there issue from time to time jets of burning substances and currents of melted matters, which bear the name of *lava*. These openings are generally on the summit of isolated mountains, and have the form

of a funnel, which is called the *crater*. The quantity of material sometimes ejected by volcanoes is very enormous. Volcanoes occur in all quarters of the globe, and one remarkable feature of them is their tendency to observe a lineal direction. The number of volcanoes certainly known to have been in activity within the last 160 years amounts, according to Humboldt, to 225, and the total number of volcanic vents, extinct and active, to 407. Europe contains but few active volcanoes, the principal being Ætna, on the coast of Sicily; Vesuvius, on the opposite coast of Italy; Stromboli, Vulcano, and Vulcanello, in the Lipari islands; and Hecla, in Iceland.

VOLTAIC ELECTRICITY. (*See* ELECTRICITY, VOLTAIC.)

VOLUME, *vol'-yume* (Lat. *volumen*, from *volvo*, I roll), is literally something rolled or convolved, and is commonly applied to a book, from the ancient custom of having books written on long rolls of parchment. Long works are with us divided into several volumes, and the same seems to have been the case with the ancients, each of the books into which the longer of the ancient works are divided having probably formed a separate roll. The French *tome* (from Gr. *temno*, I cut) is properly applied to the single volumes of a work comprising more than one. Volume is also sometimes used by us to signify the bulk, size, or solid contents of anything.

VOLUME, ATOMIC. (*See* ATOMIC VOLUME.)

VOLUMETRIC ANALYSIS, *vol-u-me'-trik.*—By volumetric analysis is understood the method of determining the amount of any substance known to be contained in a certain quantity of liquid, by observing the number of measures of test liquid capable of producing a certain effect. The test liquid, of course, contains a known quantity of the test to be used. Thus, a drachm of solution of chloride of sodium, containing a little more than one-sixth of a grain of the salt, will precipitate exactly half a grain of nitrate of silver in the form of chloride. Suppose, then, it were required to determine the amount of nitrate of silver per ounce in any solution of that salt. A drachm of the silver solution would be poured into a clean bottle, and a quantity of the standard chloride of sodium solution into a measure carefully graduated in drachms. The test solution would then be added gradually to the silver solution, until, on shaking up the contents of the bottle, allowing them to rest, and adding a drop or two of the test solution, no more chloride of silver would be thrown down. The operator, by looking at his measure, would know the exact amount in drachms of test solution he had used, which would be also the precise number of half-grains of nitrate of silver contained in the drachm of solution to be tested. This method of analysis has become almost universal where a ready means of quantitative testing is required. It has been objected to all methods of volumetric analysis, that it is impossible to measure with accuracy; but the reply to this is, that the liquids used are so dilute that a few drops more or less affect the result only in an infinitesimal degree. Not only this, analyses of substances may be made by this method in cases where the amount of matter to be acted upon is so small as to be inappreciable by the finest balance. It would be impossible to give even the slightest sketch of the process to be used in volumetric analysis, as every salt of course requires a solution of a definite strength. The reader is therefore referred to Sutton's *Volumetric Analysis*, which contains the fullest and newest information on the subject.

VOLUNTARY, *vol'-un-tă-re*, a term applied to a composition for an extempore performance upon the organ for the purpose of relieving and embellishing divine service. The voluntary is so called because its performance or non-performance was formerly at the option of the organist.

VOLUNTEER MOVEMENT, *vol'-un-teer'* (Fr. *volontaire*, a volunteer).—A volunteer is literally one who enters into service of his own accord, or who in time of war offers his services to the country. By a circular issued from the War Office, May 12, 1859, her majesty's government permitted the organisation of volunteer rifle corps under the provisions of 44 Geo. III., as well as of artillery corps in maritime towns in which there may be forts and batteries. The most important provisions of the act are,—that the corps are formed under officers bearing the commission of the lieutenant of the county; that every volunteer must take the oath of allegiance before a deputy-lieutenant or justice of the peace; that the corps are liable to be called out in case of actual invasion or appearance of an enemy in force on the coast; that while thus under arms its members are subject to military law, and entitled to be billeted and receive pay in like manner as the regular army; that all commissioned officers disabled in actual service are entitled to half-pay, and non-commissioned officers and privates to the benefits of Chelsea Hospital, and widows of commissioned officers killed in service, to such pensions for life as are given to widows of officers of her majesty's regular forces; that members cannot quit the corps when on actual service, but may do so at any other time by giving fourteen days' notice. The members also undertook to provide their own arms and equipments, and to defray all expenses attending the corps, except in the event of its being assembled for actual service. The government, however, agreed to furnish each member with a rifle, which, in the first instance, could only be used while at head-quarters, or during drill, or upon the march; and should the volunteer leave the corps, he was required to make good any damage that might have been sustained by his weapon. At the present time the efficient volunteer rifleman is permitted to have possession of his rifle, but is obliged to take it to be examined at an appointed spot periodically. The government also now make an allowance of £1 per annum per man towards defraying the expenses of every corps. The universities of Oxford and Cambridge were among the first to respond to the call to arms, their example being speedily followed by all the large towns throughout the kingdom; and so readily and intelligently did the members acquire a knowledge of drill, that in a very brief space a large and creditable body were found ready to operate in masses in the field. All this was done under very slight encouragement, and without the outlay of a farthing by the government. The volunteer movement of 1859 has its precedents in English history. In 1794, and subsequently in 1803, over 400,000 citizen soldiers were under arms, under the apprehension of a French invasion. The organization now (1864) comprises 150,000 well-equipped and carefully-drilled men, enrolled in all parts of the kingdom.

VOLUTE, *vo-lute'* (Fr.), in Arch., a kind of spiral scroll appended on each side to the capital of the Ionic order, of which it is the principal ornament. The Corinthian and Composite orders are also decorated with volutes; but their character is different, their size smaller, and they are always diagonally placed.

VOLVOCINEÆ, *vol-vo-sin'-e-e*, in Bot., a sub-ord. of *Algæ*, consisting of microscopic bodies swimming in fresh water. The members of this group are frequently regarded as infusorial animalcules; but in all essential characters they closely resemble confervoids.

VOTE. (*See* ELECTION OF MEMBERS OF PARLIAMENT.)

VOW, *vow* (Lat. *votum*), is a promise made to a divine power to perform some future act or to pursue some future line of conduct, and calling upon that power to be propitious or unpropitious to him according as he keeps or breaks his word. In most cases the vow partakes of the character of a bargain; a piece of service is asked and a reward promised in the event of its being performed. The use of vows is to be found in most religions, made either under some pressing necessity for the success of some enterprise, or in consequence of some deliverance. Among the Jews they were very common. In the Roman Catholic Church a vow "is a promise made to God of a thing which we think to be agreeable to him, and which we are not on other grounds obliged to render to him." "To promise to God to do what he commands, or to avoid what he forbids, is not a vow, because we are already obliged so to act." This idea of vows is intimately connected with good works, and is rejected by Protestants.

VOWEL, *vow'-el* (Lat. *vocalis*), in Gram., is a letter which can be pronounced by itself; and is thus distinguished from a consonant, which cannot be sounded without the aid of a vowel. The sound of the vowels can be continued as long as the breath lasts; and hence

they predominate in all natural expressions of the emotions. A diphthong consists of two vowels, the sounds of which run into one another. The harmoniousness of a language depends in great measure upon the proportion of vowels to consonants.

VULCANISED INDIA-RUBBER, *vul'-kăn-ized*, a modification of india-rubber, discovered independently by Mr. Thomas Hancock in this country and by Mr. Charles Goodyear in America. If a sheet of ordinary caoutchouc be immersed in a bath of melted sulphur at a temperature of 250° Fahr., it imbibes a certain quantity of that substance, but experiences no alteration in its chemical or physical properties; if, however, the same operation be performed at about 300° Fahr., a great change takes place. Its elasticity becomes greatly increased; it is tougher and somewhat harder; it is less soluble in most of its solvents; it no longer becomes sticky to the touch when heated, and does not soften by heat or harden by cold. It has, however, lost its property of uniting when the freshly cut surfaces are pressed together. The quantity of sulphur absorbed during the process of vulcanisation is about four or five per cent.: if more be introduced, the india-rubber becomes brittle and rotten. The process is performed in different ways. One is to knead the rubber in masticators with the requisite amount of sulphur; another is to immerse the articles to be vulcanised in a mixture of chloride of sulphur and bisulphide of carbon. In certain cases where great weight and solidity are required, certain mineral substances, such as carbonate and oxide of lead, are kneaded up with the rubber; but their effect is simply mechanical, and has no power as vulcanising agents, as was at one time supposed. If the amount of sulphur is increased to 10 per cent., and the operation is performed in close vessels at a higher temperature, another variety of india-rubber is formed, known as—

VULCANITE, or EBONITE.—It is a black, hard, elastic substance, resembling horn in its texture and appearance, and capable of taking a very high polish. It is of great use in the arts, and is largely manufactured for making combs, door-handles, and hundreds of articles hitherto made in ivory or bone. Its electrical properties are very great, a small piece a few inches long giving off very perceptible sparks on being merely drawn through the fingers. An electrical machine made of this substance, the plate being two feet in diameter, is capable of giving off sparks several inches in length.

VULGATE, *vul'-gait* (Lat. *vulgata versio*, common version), is the name given to the Latin translation of the sacred Scriptures, the only one which the Church of Rome regards as authentic. At a very early period of the Church's history there existed a Latin translation of the Old Testament, made from the Septuagint, and called *Itala*. St. Jerome found this translation to be in some cases inaccurate, and made a new one from the Hebrew, which, however, was only partially adopted by the Church. Afterwards the two translations were combined, and form what is now known as the Vulgate. It received the sanction of Pope Gregory I. in the 7th century; and the council of Trent, in the 16th century, conferred upon it an authority even superior to that of the original texts, by declaring that "it alone should be held as authentic in all public lectures, disputations, sermons, and expositions; and that no one shall presume to reject it under any pretence whatsoever." In 1590 a revised edition of the Vulgate, issued from the press of the Vatican at Rome, by command of Sixtus V.; but it was found to be so full of errors that it was speedily suppressed, and a new edition issued under the authority of Gregory's successor, Clement VIII., and is now the authorized edition. The former is known as the Sixtine, the latter as the Clementine edition. Most of the Catholics themselves now admit that the Vulgate cannot be regarded as a perfect translation, and many of them have often represented the necessity of a new one. The fact is, that the translation was made when Scriptural philology was at a very low ebb, and is far behind the present advanced state of philology and archæology; besides, in many passages it does not give the true sense of the original. (*See* BIBLE.)

VULTURE, *vul'-tshur* (Lat. *vultur*), the type of the *Vulturidæ*, a fam. of rapacious birds belonging to the



order *Accipitres* and sub-fam. *Diurni*. The characteristics of the family are as follows:—Bill rather elongated, occasionally slender, but generally strong, and always straight in its basal portion, but rather suddenly hooked at the tip; the eyes placed on the sides of the head, but not, as in the *Falconidæ*, shaded by the bony ridge of the beak; wings long and pointed; tarsi short, stout, and curved, with reticulated scales; and the toes of moderate size,—the hinder one short and rather elevated, and all armed with strong blunt claws. The habits of the vulture tribe differ from those of the eagle in this respect, that the eagle, unless violently pressed by hunger, will not stoop to carrion, loving to kill and catch for itself; whilst the vulture is indiscriminately voracious, though not so frequently attacking living animals, as its wants can readily be supplied by the putrid bodies of those that are dead. It appears to delight in loathsomeness, and is sometimes found uprooting new graves in order to satisfy its longing appetite with their contents. In these habits, too, the wisdom and the goodness of the Deity are strikingly observed, by his creating a bird of so filthy and disgusting habits in those countries where, from the heat of the sun, dead bodies almost immediately putrefy, and but for these birds might frequently be the source of great pestilential diseases. The vultures are consequently the scavengers of hot climates, and as such are often venerated and treated with respect rather than abhorred and despised, as their habits might lead an unthinking observer to suppose. The species of the vulture is not very numerous, and their distribution seems to be wisely regulated according to their usefulness. They are sparingly scattered over Europe, are more numerous in Egypt, and abound in tropical America, on an increasing scale, in proportion to their sphere of action. There are two principal groups or families,—the *Vulturidæ*, or true vultures, which are characterized by their possession of strong bills, and their nostrils being placed perpendicularly; and the *Sarcoramphinæ*, or condors, characterized by their having slender, lengthened bills, and longitudinal exposed nostrils. As the latter sub-family has been fully explained under the heading CONDOR, our present article only refers to the *Vulturidæ*, or family of the vultures. Of the European species, the griffin vulture (*Vultur* (*Gyps*) *fulvus*) may be taken as the type. This bird is found inhabiting the provinces of Silesia, Dalmatia, Spain, the Tyrol, the Alps, the Pyrenees, Turkey, the Grecian Archipelago, and also the north of Africa and Persia. It is about four feet in length. Its head and neck are thickly covered with white down, except at the crop, where the skin is naked and tinged with blue. Round the lower part of the neck there is a sort of ruff, made of pure white slender feathers, and the rest of the plumage is generally a greyish or yellowish-brown, with the exception of the feathers of the inside of the upper parts of the legs, which are, like the ruff, pure white. The food of the griffin vulture consists almost entirely of carrion; for although it has been known to prey on living animals, yet its blunt and curved talons unfit it for attacking any but such as are incapable of making any resistance to it. It always builds its nest upon the highest and most inaccessible rocks, or upon the tops of lofty trees in mountainous regions. The sociable vulture (*Otogyps auricularis*) is one of the largest species, measuring sometimes ten feet in the extent of its wings. This variety is a native of South Africa, and is appropriately named from the fact of the species always congregating in large numbers together, when not even in pursuit of prey. The flight of this bird is said to be grand and powerful in the extreme, as it soars so high in the air as to have its body lost to sight, which is somewhat remarkable, considering its extreme size and the weight of its body. Although it remains at so high an elevation, however, no sooner does an animal fall dead to the ground on the earth below, than the keen sight of the vulture instantly enables it to detect its prey, and it at once flies direct to it. The king vulture (*Sarcorhampus papa*), of the sub-fam. of the Condors, may be mentioned as the most elegant specimen of the whole family of the *Vulturidæ*. It is an inhabitant of South America, and by its remarkable habits has greatly attracted the notice of travellers.

# W.

W is the twenty-third letter of our alphabet, and is, as its character and name both indicate, a double letter, its character being a double *v*, its name a double *u*, these two letters being identical in the Latin and in the more early form of the English language. It was not in use among the Greeks, Romans, or Hebrews, neither in the present day has it properly any place in French, Italian, Spanish, or Portuguese. It belongs chiefly to the Teutonic and Sclavonic tongues. It is pronounced by opening the mouth with a rounding of the lips, and a somewhat strong emission of the breath. The sound of the French *ou* in *oui* pretty closely resembles the English *w*. In German, the sound of *w* resembles our *v*, as *warm*, pronounced *varm*; while with them *v* takes the sound of *f*, as *von*, pronounced *fon*. *W* partakes both of the character of a vowel and a consonant, being regarded as a consonant at the beginning of words and syllables, and a vowel in all other positions. (*See* Abbreviations.)

Wager, *wai'-jer*, in Law, is something staked by each of two parties in support of his opinion concerning a future or unknown event, the party whose opinion is found to be correct receiving the stakes of both. A wager is not strictly fair unless the point in dispute is clearly the same to both parties, there being no concealed knowledge in the possession of either; nor unless the odds are proportional to the probabilities of the event happening or failing. Thus if A bets B that a certain event will happen, having at the time private knowledge that the chances are greatly in favour of its happening, then the bet is not fair; and, in the same way, if the odds be four to one against the happening of an event, to lay three to one or five to one is not fair. Formerly, wagers were not illegal in this country, and the amount won could be recovered in a court of law, unless the wager operated as an incitement to breach of the peace or of morality, or was *contra bonos mores*, or affected the feelings or interests of a third party, or disturbed the peace of society. But now, by 8 & 9 Vict. c. 109, it is declared that all contracts (whether by parole or in writing), by way of gaming or wagering, shall be null and void, and that no suit at law or in equity shall be brought to recover from a stakeholder a deposit on a wager; with a proviso, however, that this enactment shall not be deemed to apply to any subscription towards a plate or prize at any lawful game, sport, pastime, or exercise. (*See* Gambling.)

Wager of Battel. (*See* Battle, or Battel.)

Wages, *wai'-jes* (Ang.-Nor.), are the reward or compensation paid to labourers, by those who employ them, in return for their services. The labour of man, like other objects of purchase and sale, has its market price, depending in general upon the ratio which the capital applied to the employment of labour bears to the number of labourers. Competition among capitalists for labourers raises wages, competition among labourers for employment lowers them. Among the other circumstances that tend to raise or depress the wages of persons engaged in particular employments are,—(1) the agreeableness or disagreeableness of the occupations; (2) the easiness or cheapness, or the difficulty and expense of learning them; (3) the probability or improbability of succeeding in them; (4) their constancy or inconstancy; (5) the small or great trust that must be reposed in those who carry them on. Wages, like other things, have their laws, according to which they rise or fall; and any attempts to interfere with them, either by legislative enactments or otherwise, are always productive of mischief.—(*See* Political Economy; Strikes.)

Waifs, *waifs* (Nor. *weif*; Lat. *bona waviata*), in Law, are goods stolen, and *waived* or thrown away by the thief in his flight, for fear of being apprehended. These, by law, were given to the king as a punishment upon the owner for not himself pursuing the felon and taking away his goods from him; and therefore, if the party robbed made fresh suit, that is, did his diligence immediately to follow and apprehend the thief, or convict him afterwards, or procure evidence to convict him, he could have his goods again. Waived goods, however, did not belong to the king till seised by some one for his use; so that if the party robbed could seize them first, though at the distance of twenty years, the king could not have them. The royal right to waifs was done away with by 7 & 8 Geo. IV. c. 29.

Waits, *waits* (Ger. *wachen*, to watch), is the name given to those itinerant musicians who, in London and some of the other large towns of England, go about at night for some weeks before Christmas, and play two or three tunes, call the hour, and then remove to another place, and so on, from perhaps twelve to four or five o'clock in the morning. They are believed to represent the ancient musical watch, that in some of the larger towns were employed in piping the watches; and afterwards the term was applied to the bands of musicians that were kept by some of the larger cities and towns.

Wakes, *waikes*, are certain holiday festivals or vigils that are held once a year in some of the rural parts of England, and were once very popular. They are the remains of certain religious vigils or eves, which were formerly held once a year in every parish, and followed by a festival. The church of each parish was dedicated to some particular saint, and the day set apart for him, or sometimes the day on which the church was dedicated, was that appointed for the celebration of this annual festival. In 1536, Henry VIII. abolished the festival of the patron saint, and ordered that the dedication day be in all cases observed on the 1st of October. The saint's day, however, still continued to be the favourite festival of the people, and the dedication day came to be little observed, and at last was entirely discontinued. The observation of the festival commenced about six o'clock on the preceding evening, when the people repaired to the parish church, and joined in the religious services, while the following day was devoted to festivities, little pavilions of boughs being constructed, and the people in them indulging in hospitality and mirth. These festivals gradually deviated from the purpose for which they were originally intended, and became, as in most cases they are still where observed, scenes of dissolute indulgence.—*Ref.* Brand's *Popular Antiquities*.

Wall-plate, *wawl-plait*, in Arch., is a piece of timber placed in or upon a wall to receive the ends of joists or rafters.

Walnut. (*See* Juglans.)

Walrus, *wol'-rus* (Ger. *Wall*, a whale; *Ross*, a horse), a species of the *Phocidæ*, or Seals, a fam. of marine animals, belonging to the class *Mammalia*, ord. *Feræ*. The characteristics of the walrus are as follows:—Skull large and heavy, and the facial portion much more elongated than in the true seals; nose broad and obtuse; teeth, six incisors in both jaws of the very young animals; but in the adults all these fall out with the exception of two, which remain in the upper jaw; the upper canines extremely long, forming a pair of pointed tusks, which pass downwards between the small canines of the lower jaw, and project a considerable distance below the chin; the molars variable in number, as they fall out as the age of the animal increases; and the body of the animal, in conclusion, is bulky; but in its general form, and in the position of its legs, it resembles the seals. The walrus is said sometimes to attain the length of twenty feet, and even upwards, and often weighs as many hundredweights. Its skin, it may be likewise mentioned, is covered with a thick crop of short brown hair. It is a native of the Northern Ocean and the North Pacific; and from the observations of voyagers appears generally to feed on sea-weed. It is most abundant about the Sea of Kamtschatka, and is hunted chiefly for its oil and tusks, the latter of which measure from fifteen to thirty inches in length, and weigh from five to ten pounds, and are composed of a beautiful, white, hard species of ivory. The oil is but scanty, but is far superior to that of the whale in excellence. Its flesh is coarse and unpalatable to Europeans, but is eaten by the Esquimaux, and its skin is highly serviceable in the manufacture of ropes, &c. The tusks of the walrus, it may be mentioned, are said to be principally used by him for the purpose of assisting him to climb on the ice-floats, even more so than as defensive or offensive weapons, as he is a great harmless animal.

Waltz, or Valz, *waults* (Fr.), a name applied to

one of the most popular dances of the present day. It is usually written in ⅔ or ⅜ time, and played moderately slow, or, at the quickest, *allegretto*. Although comparatively new in this country, the waltz has long been a favourite in Germany: it is frequently introduced in overtures, concertos, sonatas, &c.

WAPENTAKE, *wâp'-n-taik* (Sax. *waepen*, arms, and *tac*, touch), is a term applied to a territorial division of a county in Yorkshire, and corresponding to what is otherwise called a hundred. The name is said to be derived from the custom that prevailed of the chief men of each division assembling before their chief or high constable, and touching their lances in token of their submission to him.

WAR, ARTICLES OF. (*See* ARTICLES OF WAR.)

WAR, CONTRABAND OF. (*See* CONTRABAND OF WAR.)

WAR, COUNCIL OF. (*See* COUNCIL OF WAR.)

WAR, HONOURS OF. (*See* HONOURS OF WAR.)

WARDIAN CASE, *ward'-e-ân*, so called after the inventor, Mr. N. B. Ward, a closely-glazed case, by means of which the cultivation of ferns and other delicate plants can be carried on in large towns. Many forms have been given to the Wardian case; but in each the essential parts are—(1) a tray or box in which the bed of mould is formed, and (2), a closely-fitting glazed framework to protect the growing plants from smoke and dust. The most popular form of fern-case at the present time consists simply of a glass dish containing the mould, and a bell-glass cover. A Wardian case requires but little attention, and scarcely any watering after its first preparation. The moisture of the earth rises under the influence of heat, in the form of vapour; but it is condensed upon the cool surface of the glass cover, down which it trickles back to the soil.

WAREHOUSING SYSTEM, *wair'-houze-ing*, in Com., is a provision made for lodging articles imported, in public warehouses at a moderate rent, so as not to be chargeable with duty until taken out for home consumption, and being exempt from duty if re-exported. Formerly merchants were obliged to pay the duties on their goods immediately on importation, or to grant a bond with approved security for the amount; while they were often put to great trouble in obtaining drawbacks on such as were re-exported. This was very detrimental to trade, and tended largely to increase the price of commodities. Notwithstanding the manifest advantages of this system, the proposal of Sir Robert Walpole to introduce it in 1733 met with the strongest opposition, evidently from the facilities which the existing system afforded for defrauding the revenue. The advantages of the warehousing system were most forcibly pointed out by Dean Tucker, in his "Essay on the Advantages and Disadvantages which respectively attend Great Britain and France with respect to Trade," 1748; and afterwards by Adam Smith in his "Wealth of Nations;" yet it was not till 1803 that it was adopted (43 Geo. III. c. 132). Various subsequent acts were passed, which were at length embodied in the Customs Consolidation Act (16 & 17 Vict. c. 107), which comprises the existing regulations on the subject. Certain ports only of the United Kingdom are warehousing ports, nor can all sorts of goods be warehoused in every warehousing port. The time is also fixed during which goods are to be allowed to remain in the warehouse, the remission of duties in case of loss by accident, and the allowances for waste. The commissioners of the customs, under the authority and direction of the lords of the Treasury, are empowered to carry out the provisions of the act.

WARRANT, *wor'-rânt* (Ang.-Nor.), the delegation of the power or authority to do some act, by the person in whom it is vested, to another. In this way a person gives a warrant of attorney to another to act on his behalf, or a sheriff grants warrant to his bailiff to arrest some one for him. But it is more frequently used in criminal matters to denote the authority issued by a justice of the peace for the apprehension of some one. The warrant should be under hand and seal of the justice; should set forth the time and place of making it, and the cause for which it is made; and should name the person against whom it is granted. It is good for the county in which it is issued, but cannot be enforced in another without being backed by a justice of that county. The officer is justified in apprehending the party at any time, and even in breaking open the doors of a house in pursuit of him.

WARRANTS, BACKING. (*See* BACKING WARRANTS.)

WARRANTS, DOCK. (*See* DOCK WARRANTS.)

WARRANTY, *wor'-rân-te* (Lat. *warrantia*), in Law, is a promise or covenant by deed, made by the bargainer for himself and his heirs, to warrant and secure the bargainee and his heirs against all men for enjoying the thing agreed on or granted between them. Warranty of lands formerly constituted an important part of law, but it is now of comparatively little importance. It was of feudal origin, and arose from the obligation of the lord to defend his tenant's title against all claimants; and if he failed to do so, he was bound to make him a recompense by giving him lands of equal value. The statute *Quia Emptores* (18 Edw. I.), which put an end to the *homage ancestral*, did away also with implied warranty; and hence it became usual to insert an express clause of warranty in the deed, whereby the grantor did for himself and his heirs warrant and secure to the grantee the estate so granted. Various statutes limiting the effects of warranty were subsequently passed; and by 3 & 4 Will. IV. c. 74, all warranties made after 31st Dec. 1833, by any tenant in tail, shall be absolutely void against the issue in tail, and all persons whose estates are to take effect after the determination of the estate tail. As respects things personal, by the civil law, an implied warranty was annexed to every sale, as to the vendor's title; and so too by our law a purchaser may have satisfaction from the seller of goods and chattels, who sells them as his own, but whose title is deficient, without any express warranty. But with regard to the quality of the goods so purchased (unless they be articles of human food), the seller is not bound to answer, unless he expressly warrants them to be sound and good, or unless he knew them to be otherwise, and used any art to disguise them. No particular form of words is necessary to constitute warranty, and an implied warranty may be established by the custom of any particular trade, the presumption being that the transaction was regulated by the usual custom of the trade, in the absence of evidence to the contrary.

WARREN, *wor'-ren* (Fr. *garenne*, Ger. *wahren*, to preserve, protect), in Law, is a place privileged for the keeping of beasts and fowls of warren, which are hares and rabbits, partridges and pheasants, though some add quails, woodcocks, and waterfowl. The right of free warren could only be conferred by royal grant or prescription, which implied a grant, and vested in the owner of the franchise a property in the game, and excluded all other persons from hunting or taking it. The franchise of free warren has fallen into disuse since the introduction of the modern game-laws (which *see*).

WARTS, *waurts* (Sax. *weart*, a wart), are hard unsightly excrescences or tumours that form on the cuticle or outer skin, usually of the hands or some other conspicuous place. They are of slow growth, small, insensible, and generally conical in form. The best application for their removal is some caustic or escharotic; as nitrate of silver, caustic potash, or strong acetic acid.

WASHHOUSES. (*See* BATHS AND WASHHOUSES.)

WASP, *wosp* (Sax. *wasp*), the type of the *Vespidæ*, a fam. of aculeated hymenopterous insects. Its chief character is taken from its wings, which are folded throughout their entire length when it is at rest, forming a pair of long narrow organs running along the back. The tongue is also very long; the maxillæ long, and in texture coriaceous (*i. e.*, having the consistence of leather); and the eyes notched. The common wasp (*Vespa vulgaris*), which we have taken as the type of the family, is otherwise known by the appellation of the *social wasp*, on account of its generally living in extensive communities, inhabiting a nest formed in the ground. These nests are formed of a paper-like material, prepared by the insects from vegetable substances that they find, masticate until it has acquired a pulpy consistence, and then apply towards the formation of the structure of their habitation. The outside is composed of layers of a rather coarse species of paper, and the interior is subdivided into a series of transverse combs, composed of hexagonal cells, with the mouths

placed in a downward direction. Little pillars of a similar substance unite the combs, and in the cells the eggs are laid, and the larvæ constantly fed by the working wasps in a similar manner to the bees, only that instead of laying up a store of honey like them, they feed them from day to day. Each nest is generally occupied by about a hundred females, and these are the only members of the community that survive the winter, the others dying off at the first frost. These, being previously impregnated by the males, lie in some protected spot during the duration of winter, and, as soon as the spring sets in, they set to work to build a new habitation for the hatching of their eggs. As soon as these are brought into life, the community is re-established, and their labours divided as before by the workers, the males and females, whose province it is to repopulate the hive, never being found to engage in any work whatever with regard to the establishment. The larvæ are little fleshy grubs, destitute of feet, but they are supplied with lateral tubercles. These are fed daily, as before observed, by the workers with food, which is previously half-digested in their stomachs. Another English variety is the tree wasp (*Vespa britannica*), which builds its nest of a thin paper-like substance, and suspends it from the branches of trees.

WASSAIL-BOWL. (*See* DRINKING USAGES.)

WASTE, *waist* (Lat. *vastum*), in Law, is whatever tends to the destruction or depreciating the value of an inheritance. It may be either voluntary, or a crime of commission, as the pulling down of a house; or permissive, by omission only, as by suffering it to fall, for want of necessary repairs. It is not waste if the loss arises from an act of Providence, as by tempest, lightning, or the like. The remedy for waste is granted by a court of equity, which will issue an injunction to restrain the waste, and for an account of the profits made; and such injunction will be granted at the suit, not only of a remainder-man in fee simple or fee tail, but also of a remainder-man for life, or of trustees to preserve contingent remainders. Ecclesiastical persons may be proceeded against for waste either in the ecclesiastical or civil courts, and may be brought by the successor to a benefice either against his predecessor or his personal representatives.

WATCH. (*See* HOROLOGY.)

WATCH, DEATH. (*See* DEATH-WATCH.)

WATER, CHEMISTRY OF, *waw'-ter* (Sax. *water*).—Water is presented to us in nature in three forms, solid, liquid, and gaseous. Large masses of ice exist around the poles; and water holding in solution certain mineral and gaseous matters constitutes the seas, rivers, and lakes of the temperate and torrid zones. It also exists in large quantities in the air, either dissolved in invisible vapour, or deposited in the form of clouds. In temperate and warm climates, the surface of the earth, at least, is more or less damp; while the interior of the earth itself contains numberless springs, and the minerals which exist in it contain more or less water chemically combined with them. Besides this, it is essential to all vegetables and animals in a living condition, and constitutes nearly seven-eighths of the human body. Chemically speaking, water consists of hydrogen and oxygen, united in equal equivalents by weight, of eight parts of oxygen to one of hydrogen; or by measure, one part of oxygen to two of hydrogen. The most variously contrived experiments into the composition of water always give the same result, —88·889 per cent. of oxygen, and 11·111 per cent. of hydrogen. Cavendish was the first to discover its real composition. The analysis of water is performed in a variety of ways, the simplest of which is, by allowing the galvanic current to pass through a vessel of acidulated water; the poles of the battery being terminated by platinum plates, which are introduced into the bottom of the latter in such a manner that they pass up into two separate graduated tubes, in which the gas is collected as it is generated at each pole. It will be found that the tube over the negative pole is filled with gas, while that over the positive pole is only half-filled. On examination of the gases evolved, it will be found that the gas evolved at the positive pole is pure oxygen, while that collected at the negative pole is pure hydrogen. The proof of the composition of water has also been sought in synthesis, by exploding carefully-measured proportions of oxygen and hydrogen in a eudiometer. The circumstances under which oxygen and hydrogen unite with each other to form water are peculiar. At ordinary temperatures, unlike other gaseous mixtures, a mixture of the two gases undergoes no alteration even when exposed to direct sunlight. Sudden compression has been known to produce their combination, but this was doubtless caused by the heat produced, a greater degree of compression gradually exercised having had no effect. Many substances, however, apparently chemically unlike, have the property of causing the union of these two gases merely by their presence. For instance, on introducing spongy platinum, or platinum-black, into a mixture of oxygen and hydrogen, it is instantly exploded. Faraday has shown that a perfectly clear surface of platinum will have precisely the same effect. The efficiency of the metal in this instance seems directly proportionate to its amount of surface and to its temperature, which, when the mass is small, becomes rapidly augmented by the heat evolved by the constantly accelerated combination of the gases. If thin platinum-foil or wire is used, the combination takes place without noise. With platinum sponge the action is at first silent, but afterwards the heat evolved by it raises the temperature, and explosion takes place. Finely-divided iridium, palladium, gold, silver, and some other metals and even charcoal, pumice-stone, and crushed glass, exert, especially at elevated temperatures, a catalytic action, similar in kind, though different in degree, to that exercised by platinum sponge. The combination is constantly effected by a solid heated to dull redness by the electric spark and by flame. This instantaneous combination of the gases when in considerable quantity takes place with a loud explosion. It is also accompanied by the production of the most intense heat known. If the mixed gases are allowed to burn from a jet, a bluish flame of small illuminating power, but of intense heating properties, is produced, forming the oxyhydrogen blowpipe, which is capable of melting platinum, pipeclay, silica, and other substances infusible in the hightest heat of the blast-furnace. When an infusible solid, such as pure lime, is introduced into the flame, powerful incandescence takes place. The light thus produced is known as the Drummond light, and has been seen during daylight at a distance of upwards of 108 miles. At ordinary temperatures water is a transparent mobile liquid, tasteless, inodorous, and, except when in large masses, colourless. In nature, the waters of seas, rivers, and lakes, assume every shade of brown, yellow, green, &c., from the presence of contaminating substances; but the proper colour of water in large masses appears to be blue. Water is a perfectly elastic fluid, but its range of elasticity is limited. According to Regnault, it undergoes a compression amounting to forty-seven millionths of its bulk for every pressure of an atmosphere. The density of water at the mean temperature for this country is taken as the standard to which the specific gravities of liquids and solids are referred. A cubic inch of water at 60° Fahr. weighs 252·456 grains. At its point of maximum density, it is 770 times heavier than air. The specific heat of water is very great; in order, therefore, to effect any elevation or diminution of its temperature, a large quantity of heat is necessary: hence large masses of water act as great equalizers of local temperature. At 32° Fahr. water solidifies into ice. It may, however, if kept perfectly still, be cooled down to several degrees below freezing-point without congelation taking place; but if it be agitated in the slightest degree, solidification at once takes place, the temperature rising to 32° Fahr. Although water may be cooled down to below 32° Fahr. without freezing, yet it cannot be heated above that point without melting. The freezing-point of water is lowered by the presence of saline matter and other substances in solution. When a saline solution is exposed to cold, pure water crystallizes out, while the salt remains dissolved in the mother liquor. This property is taken advantage of by arctic navigators, who use melted ice as drinking-water. The temperatures of freezing and boiling water are taken as the two standards of the thermometer scale. The cooling of water is attended by a phenomenon which does not belong to any other liquid. As the temperature decreases, it contracts

regularly until cooled down to 39·2° Fahr., but every decrease in temperature beyond this causes it to expand, and that to almost the same amount per degree as it had previously contracted. This singular phenomenon, although for a long time suspected, was only proved positively by Hope in 1804. This property of water has a very important effect in the economy of nature. When the cold weather sets in, water becomes chilled at the surface, and immediately descends, on account of its increased specific gravity, the warmer water at the bottom of the pond or river replacing it. This movement goes on until 39·2° Fahr. is reached, when the surface water becoming lighter as it becomes colder, remains in its place until it is frozen. The ice thus increases slowly in thickness, as no heat can be abstracted from any portion of the water except that in immediate contact with the frozen layers. The water below, therefore, remains permanently at 39·2° Fahr., a temperature not destructive to the lives of the fish and other animals inhabiting it. Although water expands very gradually between 39·2° Fahr. and 32° Fahr., when it reaches the latter point, expansion takes place suddenly, and with a force sufficient to burst the strongest wrought-iron vessels. The specific gravity of ice in relation to water is variously stated at 0·9184 (Abel and Bloxam), and 0·94 (Miller and Odling), or, in other words, water in freezing expands from 1,000 volumes to 1,083. The action of freezing on the disintegration of rocks, the transference of masses of mineral matter from place to place, &c., constitutes it one of the most important forces at work in nature. Ice is a crystalline body, and formed by the interlacing crystals, which may be seen in running or turbid water. They belong to the rhombohedral systems, and occur in rhomboids, short hexagonal prisms, and pyramidal dodecahedra. Snow crystals frequently occur in this country during winter. On examination with a microscope, they are found to consist of triangular prisms, united together in six-rayed stars. Hexagonal plates may also be noticed. Hailstones also have a distinctly crystalline form. Ice is colourless and transparent, and a bad conductor of heat. Hence the inhabitants of the arctic regions use snow as a covering to keep themselves warm when they sleep in the open air. At temperatures below 32° Fahr., ice may be crushed to a fine non-adherent powder, but at 32° Fahr. it may, by pressure, be caused to adhere together in a solid transparent mass. This adhesion together of snow or powdered ice, at temperatures near freezing-point, is known as regelation, and the investigation of the circumstances under which it takes place has thrown great light on the phenomena of the formation of glaciers. The latent heat of water has been determined by Provostaye and Dessains at 142·2° Fahr.; so that a pound of ice in becoming converted into water, would reduce a pound of water from 142·2° Fahr. to freezing-point. At a temperature of 212° Fahr., with a barometer pressure of 29·92 inches, water boils and becomes converted into an invisible elastic vapour, occupying 1,696 times its space. The space occupied by the vapour entirely depends upon the temperature, or, in other words, superheated steam exerts additional force for every degree of temperature which it is raised. The converse of this is also true; any attempt to compress a certain bulk of vapour at its proper temperature simply results in the condensation of a sufficient bulk of the vapour to restore the proper tension. An example may render this fact clear. A cubic inch of water at 212° Fahr., when converted into steam at the ordinary pressure of the air, occupies a space of 1,696 cubic inches. Were an attempt made to condense this amount of vapour into say half its bulk, half of it would be condensed into water. The temperature being kept up, and the pressure being removed, vaporization would continue until the former bulk was filled. The specific gravity of water vapour is 0·623, air being 1·000. In common with all volatile liquids, water has its fixed vapour-tension for every degree of heat; therefore no increase of heat can possibly raise the temperature of a liquid beyond its boiling-point, provided the pressure is unaltered. Diminished pressure consequently decreases the boiling-point of water, which, in vacuo, will boil at about 70° Fahr. The contrary, of course, is also true; steam at 212° Fahr. exerting a force equal to an





atmosphere (15 lbs. on the square inch), whilst at 356° it exercises a pressure of ten atmospheres; and so on. Water vaporizes at all temperatures, even when in the state of ice. Hence the disappearance of small masses of ice during the winter, and the constant vaporization of water at all periods of the year. In the consideration of water vapour, it must not be confounded with the visible *cesicular vapour* seen in the clouds, and in masses of steam escaping into the air, which consists of minute vesicles of water floating in true aqueous vapour. The latent heat of steam is very great, the heat absorbed by the conversion of water at 212° Fahr. into steam of the same temperature, being 966·6° Fahr., or, in other words, the condensation of a pound of steam at 212°, by 5½ lbs. of water at 32°, will yield 6½ lbs. of water at 212°. A very high temperature will decompose water into its constituent gases. A melting-button of platinum plunged into water will disengage oxygen and hydrogen. Graham, however, is inclined to think that the decomposition takes place rather from the intense light than from the heat evolved. It has been stated above that water boils at 212° Fahr. This, of course, is only true of water in a state of perfect purity, and heated in a metallic vessel at the mean barometer pressure. If the vessel used is of glass, or is lined with shell-lac, a temperature of several degrees above 212° will be reached before ebullition takes place; the bubbles bursting from the sides of the vessel with such force as to break it very frequently, the introduction of a piece of platinum-wire will soon restore the normal temperature at which ebullition takes place. The presence of soluble salts in water raises the boiling-point. The presence of air in water has a great effect on its boiling-point. According to Donny, water deprived of air, and heated in an open glass vessel, acquired a temperature of 360° Fahr., and then suddenly burst into vapour, shattering the vessel to pieces. It would be useless to enlarge upon or even detail the infinite uses of water in the economy of the world. Its value to the chemist, however, is not so apparent. As a solvent it is invaluable, being a perfectly neutral body, and by its decomposition in a thousand different ways he easily obtains the two gases oxygen and hydrogen in a nascent condition, without which it is almost impossible to take a single step in the laboratory or manufactory. Although perfectly neutral, it enters into combination with numberless bodies, both acid, neutral, and basic, at one time apparently playing the part of a base, at another that of an acid. Thus we find sulphuric acid and water uniting in every proportion. If, however, the dilute acid be heated to boiling-point, aqueous vapour gradually passes off until a certain point is reached, when the acid begins to evaporate also, the water and acid distilling over together. On analyzing the distillate, an equivalent of sulphuric acid will be found united to an equivalent of water. This equivalent of water is called *basic* water, and can only be separated by decomposition. In the same way water combines with the powerful bases potash and soda, and cannot be expelled by heat alone. Such compounds are known as hydrates; the water appears in some sort to play the part of an acid. With neutral salts water enters into combination in two ways,—as water of crystallization and water of constitution, the former of which is expelled with ease, the latter with difficulty. The water of constitution is generally formulated HO, while that of crystallization is symbolised by the contraction Aq. (*See* SALTS.) Water has the property of dissolving an immense number of substances, solid, liquid, and gaseous. The alcohols, most of the acids, and some other liquids, dissolve in water in indefinite proportions; others again, such as ether, carbolic acid, &c., in minute and determinate quantities; while others, like oil, seem perfectly insoluble. The solvent power of water in various solids is widely different. Water dissolves gas to a greater or lesser extent, varying from one-seventieth in the case of nitrogen to 783 times its bulk with ammonia. The solvent power of water for certain substances may be increased by pressure and heat. Water, as found in nature, is never pure, being always contaminated with foreign matter. Rain, which is the purest form of natural water, always contains carbonic acid and carbonate and nitrate of ammonia, and other constituents, depending on the locality in which it falls. That produced by melting fresh-water ice is free from

every contamination except small traces of carbonic acid and ammonia. Pure water is alone obtained by distillation. If required for special purposes, it should be redistilled first from phosphoric acid, to retain any volatile alkali, and secondly with hydrate of potassium, to hold back any volatile acid. River water is very variable in its composition, according to the mineral constituents of the country through which it has flowed. Ordinary Thames water (which generally flows through alluvial soil), collected near Hampton, contains 18 grains of solid matter to the gallon, while the Dee, near Aberdeen, which flows through a granite country, contains only 3 grains of saline matter in the same quantity. Spring water is subject to the same variations as river water; the amount of saline matter is, however, much greater. Most waters obtained from natural sources contain soluble salts of lime, which on boiling incrust the sides of the vessels in which they have been heated. In the boilers of steam-engines these incrustations are attended with great danger to the safety of the boiler, and a hundred different nostrums have been sold for their prevention at exorbitant prices. They mostly consist of chloride of ammonium mixed with some colouring matter to disguise it. Plain chloride of ammonium is a most efficient remedy for these incrustations. It acts by forming chloride of calcium with the carbonate and sulphate of lime, which, with the carbonate and sulphate of ammonia, also formed, are very soluble salts. Alkaline carbonates are also very efficacious, and many manufacturers use nothing but a lump or two of crude caustic soda occasionally thrown into the boiler. Waters are generally divided into hard and soft. The former contain salts which form insoluble compounds with soap, and have to be neutralized before the detergent is available; washing soda is consequently much in use where such waters abound, when the foreign matter is present in such quantities as to give the water a peculiar taste or smell, or to give it medicinal properties. The principal varieties of mineral waters are divided into the *saline*, or such as contain neutral salts, like those of Cheltenham and Leamington; the *chalybeate* or *ferruginous*, or those containing salts of iron, like those of Tunbridge or the Isle of Wight; and lastly the *hepatic* or *sulphuretted*, of which the springs at Harrogate and Aix-la-Chapelle are examples. There are, besides, the *calcareous*, containing lime salts, like the Bath waters, and those which contain carbonate of soda as their chief constituent, and are usually effervescent with carbonic acid, like the Vichy and Selters waters. *Sea-water* has a pretty uniform composition. It has a specific gravity of about 1,027, and contains on an average about 2,500 grains of dissolved matter to a gallon, of which about 1,900 grains are common salt, and 400 chloride of magnesium and sulphate of magnesia. The quantity of saline matter is continually, although imperceptibly, increasing; for pure water is always being drawn from it by the process of evaporation, and being returned to it by the rivers charged with saline matter. Thus the sea is the recipient of the whole of the soluble matter washed away from the crust of the earth. Water was long supposed to be an element, until Cavendish separated it into its constituent gases.

WATER-COLOUR PAINTING. — The ancients used water as the only medium to bind their colours. When they painted in temper or distemper, glue or some other gelatinous binder was used; in fresco-painting, the colours moistened with water were laid upon a ground of gesso, or plaster of Paris. Miniatures were also usually painted in water-colours. Water-colour painting, which was in general use until the 15th century, was abandoned when Van Eyck, about that period, introduced oil as a medium for mixing his colours. Nevertheless water-colours, by reason of the convenience in working them, were retained for mural paintings or frescoes, as well as for theatrical scenery. In its strictest and modern sense, water-colour painting means the painting on paper with colours diluted with water. Now, although the Dutch and Italian masters used water-colours to make their sketches, and to produce their finished cartoons, they never employed this method for their completed pictures. We have preserved to us examples of this use of water-colours in the cartoons of Raffaelle and of Mantegna, at Hampton Court; these paintings having been executed as models, either for the weaving of tapestries or for the preliminary studies for large pictures afterwards painted in oil-colours. With respect to the rise of the English school of water-colour painting, the first works of Paul Sandby claim to be considered the precursors of all others in this line. In the early exhibitions of the Royal Academy they were called in the catalogues "stained drawings." The practice was at first to make out the entire drawing in light and shade, by successive washes of Indian ink, or of a neutral tint. Afterwards, the various local colours were passed over this ground, in thin washes of transparent colours. Finally, the sharp outlines and minute details were put in with a reed pen. Though these early works had frequently a cold, feeble appearance, yet they were distinguished when they came from the hands of Turner, Girtin, Prout, and Cozens, for their charming atmospheric effects. Under the improved system, the principle of which is still observed in all the water-colour paintings of the present time, the first neutral ground-tint was dispensed with, every object being painted in its appropriate local colour at the outset. The picture was finished by the modification of its crudities under the touch of the artist. This plan is supposed to have originated with Turner, Prout, and the other early landscape-painters, who at once endeavoured to p ce upon paper the evanescent beauties of the sky. After the general adoption of this new method, the progress of the art came to be very rapid. The foremost water-colour artists of the day established themselves into a "Society of Painters in Water Colours" in 1805; and every year a display of the members' works was given, at their rooms in Pall Mall. So rapidly did this body grow, that another association sprang from it in 1832, under the name of the "New Society of Painters in Water Colours." This latter body has likewise its yearly exhibition. This pre-eminently British branch of art was splendidly represented at the Manchester Art Treasures Exhibition of 1857, as well as at the International Exhibition of 1862.—Ref. *English Cyclopædia*.

WATER IN THE HEAD. (*See* HYDROCEPHALUS.)

WATER-MOLE. (*See* DUCKBILL.)

WATERSHED, *waw'-ter-shed*.—The margin of a river-basin usually lies contiguous to the basin of another river, and therefore constitutes the boundary-line of two basins, the waters descending on both sides into their respective basins. From this cause it is that the whole line of these margins has been called a *watershed*. According to the Rev. C. G. Nicolay, the word watershed implies the line by which any waters are divided from each other, and the watershed of any country is no doubt such a line; but as every slope sheds water, and many rivers have their rise on slopes below the main watershed, some further division of the word seems desirable. Dr. Beke, again, substitutes *water-parting* for watershed, for this reason: the line of division and separation between the contiguous basins of two rivers, called by the ancients *divortia aquarum*, the parting (or flowing in opposite direction) of the waters, is in German called *die Wasserscheide*, which means literally the same. The term *watershed* of the geographers is evidently a corruption of this German term; but it is objectionable, because to the mere English scholar it appears to be a native compound of the words "water" and "shed," as if to say, that the water is *shed* in opposite directions, and hence leads to the belief that the side of the basin of a river, rather than the division between the adjoining basins of two rivers, is intended. By many English geographers, therefore, the substitution of the word *water-parting*, as being the correct translation of, and not the corruption of the German *Wasserscheide*, has been advocated.—Ref. *English Cyclopædia*.

WATERSPOUT.—It has been urged that the meteorological phenomenon called by this name is of the same nature as the whirlwinds which draw up pillars of sand in the deserts of Africa. At sea during the production of a waterspout, the waters at first appear greatly disturbed, beneath a dark cloud, the waves tending rapidly towards the centre of the agitated mass. Presently a vast conical column of water rises, the whole column extending from the level of the sea to the clouds. Waterspouts appear to move with the wind. While some waterspouts are rapidly absorbed,

or fall to the earth in copious showers of rain, others have been known to preserve their condition for an hour.

Water Supply.—London is supplied with many excellent springs of fresh water, but they proved long since quite inadequate to the wants of the citizens, and conduits were then adopted as a substitute. In 1236 water was brought to public reservoirs in the city by means of conduits or pipes, from Tyburn, from Highbury in 1438, from Hackney in 1535, from Hampstead in 1543, and from Hoxton in 1546. Waterworks were formed at London Bridge in 1582, with waterwheels turned by the ebb and flow of the river. The first effort to supply water on a great scale was made in 1608, by Sir Hugh Middleton, who undertook to convey a river of fresh and good water to the city. At present there are nine metropolitan water companies, which derive their supplies from the Thames at some point beyond the influence of the tidal wave; from the river Lea, the river Ravensbourne, from springs near Hampstead and Artesian wells, and a chalk-well near Woolwich. All the London water companies now use cast-iron mains to convey the water beneath the streets, leaving the builders to employ small lead pipes to convey the water to the houses.

Waters, Aerated. (*See* Aerated Waters.)

Water-wheels. (*See* Waterworks.)

Waterworks.—The use of water as an impelling power, both for the turning of machinery and other purposes connected with the useful arts, appears to have been known at a very early period. The earliest of such machines of which we have any record appear to have been used to raise a portion of the fluid by which they were impelled. The most simple method of applying this element as a mechanical agent evidently consisted in the construction of a wheel, the periphery of which was composed of float-boards. This, on being exposed to the action of a running stream, was afterwards employed to give motion to a variety of mills, and is at the present time employed to give motion to almost every species of machinery. Two of the most simple but yet most important machines used in waterworks are, the undershot waterwheel and the overshot water-wheel. The ratio of power expended in comparison with that of the effect produced is as follows:—

| | *Power.* | *Effect.* |
|---|---|---|
| Undershot water-wheel ..... | 9 | 3 |
| Overshot ditto ..... | 10 | 8 |

The undershot water-wheel is that in which a running stream operates against a series of float-boards or plane surfaces ranged round its circumference, so shaped and placed that the water may fall upon them, and may by its pressure cause the wheel to rotate upon its axis. In the *overshot* wheel the construction and action are somewhat more complex, and afford more scope for the exercise of the engineer's judgment. This wheel has a number of buckets instead of float-boards ranged round its circumference, so as to receive the water delivered from a spout; so that one side of the wheel is loaded with water while the other is empty. The consequence must be that the loaded side must descend. By this motion the water runs out of the lower buckets, while the empty buckets of the rising side of the wheel come under the spout in their turn, and are filled with water. It is plain that much of the efficacy of this machine depends upon the power of the bucket to retain the water until it reaches near the bottom of the wheel. Besides these wheels, there are also breast-wheels and horizontal wheels employed in waterworks. A breast-wheel presents its axis almost on a level with the surface of the water. The wheel has float-boards instead of buckets. The water is delivered at an intermediate point between the upper and under part of the wheel. It is generally delivered at a point below the level of the axis, but sometimes at one higher than the axis. Horizontal water-wheels are of two kinds,—those in which the float-boards are in the same position with reference to the axis as in the common water-wheel, and those which have them placed obliquely. The principal object of these forms of water-wheels is to save machinery, by placing the millstone directly on the vertical shaft of the wheel. The water-wheel must therefore move with a great velocity in order to enable the millstones to perform their work. The water is turned into a horizontal direction before it strikes the float-boards. It is demonstrable, by the theory of hydrodynamics, that if the velocity of the stream be given, the effect on any of the wheels will be as the water expended; and that if the expenditure of the water be given, the effect will be as the square of the velocity. Under the name of waterworks, in the modern sense of the word, may be classed almost every hydraulic structure or contrivance; such as canals, conduits, locks, mills, water-engines, &c. But they may be conveniently classed under two general heads: 1st, Works which have for their object the conducting, raising, or otherwise managing of water; and 2nd, works which derive their efficacy from the impulse or other action of water. The first class comprehends the methods of simply conducting water in aqueducts or pipes for the supply of domestic consumption or the working of machinery; the methods of procuring the supplies necessary for these purposes by means of pumps, water or fire engines, and the subsequent management of the water thus conducted. The second class of waterworks is of much greater variety, including almost every kind of hydraulic machine, and, of course, the wheels above mentioned.

Wax, *wikes* (Sax. *wax*, wax).—The term wax is applied to several substances of very different composition and origin. Thus, we have the true vegetable wax or tallow from the *Stillingia sebifera*, the so-called Chinese vegetable wax, which is the secretion from an insect (a *coccus*), resembling spermaceti in appearance, and ordinary bees'-wax, a true animal secretion, formed by the common honey-bee. At one time it was supposed that the bee collected the wax ready formed from the plants on which it alighted; but the experiments of Dumas and others fully prove that it can secrete it when fed on sugar alone. Wax has been used as a candle material from the earliest ages. It is, when first collected, of a more or less deep yellow colour; it consequently has to be bleached before use. This is effected by first melting the wax with a small portion of sulphuric acid, which facilitates the separation of certain of the impurities which subside in the acidulated water. As soon as by subsidence the wax is bright, it is cut up into ribbons and bleached by exposure to the sun and air for several days; after which it is once more melted, cut into ribbons, and exposed to the sun. Should it still have a yellow tinge, it is subjected to the same process again. The wax is not only whitened in the bleaching process but hardened. The best wax is that collected in England, after which comes that from other parts of Europe, Africa, and America; the worst being the Gambia wax, which, however, forms the largest portion of the wax imported into this country. Although candle-making has reached such perfection, and we have every reason to be satisfied with the stearic and paraffin and spermaceti candles at present in use, none of them come up to the pure wax candle in beauty, luminosity, hardness, and high fusing-point. Wax does not mould well; wax candles are consequently made by dipping and rolling on a smooth marble slab. The true nature of wax was long unknown; but the investigations of Brodie have explained its composition in a most satisfactory manner. By solution in boiling alcohol, a substance known as *ungricin* separates; as the alcohol cools, *cerin* or *cerotic acid* crystallizes out, leaving *cerolein* in solution. Wax is a very interesting material, from the number of interesting substances that may be formed from it. Yellow wax may be bleached by the action of chlorine, but it cannot be used for candles, in consequence of a chlorine compound being formed, which, on burning, gives off fumes of hydrochloric acid. It was in investigating this process that Gay-Lussac discovered the process of substitution.

Way, *wai* (Lat. *via*), in Law, denotes either the right which one or more persons have of passing over the land of another, or the space over which such right is exercisable. Ways are of various kinds; as a foot-way, for persons passing on foot only; a horse-way, for persons also passing on horseback; a drift-way, for driving cattle; a carriage-way, for driving carriages and other vehicles. All these may be either public or private ways, the former open to all, the latter only to particular persons or classes of persons. A private

right of way may be grounded on a special permission, as where the owner of the land grants to another the liberty of passing over his land; in which case it is confined to the grantee alone, and cannot be assigned or conveyed to another. It may also be to the grantee, his heirs and assigns, being owners of such a house or close; in which case the right passes with the ownership of such property. The grantor may also impose such restrictions upon his grant as he thinks proper. A private right of way may be also constituted by prescription, as where all the owners and occupiers of such a farm, or all the inhabitants of such a hamlet, have from time immemorial used to cross such ground, such usage supposing an original grant. Act 2 & 3 Will. IV. c. 71, declares that no claim of right of way uninterruptedly enjoyed for twenty years shall be defeated by showing that such way was first enjoyed at any time prior to such period of twenty years, but such claim may be defeated in any other way; but where there shall have been an enjoyment for forty years, the right shall be deemed absolute and indefeasible, unless it shall appear that there was some agreement expressly made for the purpose by deed or writing. A highway is a way over which the public at large have a right of passage, and may originate in a continual use of the land by the public in traversing it without interruption from the owner, or from an express dedication of it by him to their use. By the common law, the duty of keeping highways in repair is thrown upon the occupiers of lands and tenements within the parish; but particular persons may by prescription or tenure be liable to repair a highway. The mode in which the various occupiers in a parish are to contribute to the maintenance of highways is regulated by various statutes. (*See* Roads.)

Wealth, Distribution of. (*See* Political Economy.)

Weasel, *we'-zel* (Sax. *weasle*), the type of the *Mustelidæ*, a fam. of carnivorous animals of the ord. *Feræ*. They are distinguished by their long and slender bodies, by which they are enabled to worm themselves through the smallest apertures in search of their prey. They can run with considerable swiftness, notwithstanding the great length of their bodies and comparative shortness of their legs; but they more frequently take their prey by surprise, and are of a very sanguinary disposition, having a wonderful thirst for blood. Hence they make dreadful havoc amongst poultry, killing scores in a night sometimes; not for the purpose of eating the flesh, but merely piercing the throats of their victims and drinking their blood. They are equal enemies to rats, mice, and other vermin, however; so that there are never any of these found in the locality where a weasel frequents. The weasel usually found in this country (*Mustela vulgaris*) measures about seven inches from the tip of the nose to the insertion of the tail, which is about two inches long. Its height is about three inches. The colour is a pale reddish brown on the back and sides, but a beautiful white beneath, and the tail is bushy. The eyes are small and black; the ears round and short; and the nose furnished with long whiskers like a cat. It moves along by unequal leaps, and is capable of springing several feet from the ground at a bound, and can easily climb up a wall. It is of a bold and ferocious disposition, being used to attack animals of apparently double its strength. It can go also a long time without food, as its means of subsistence is precarious, and is known sometimes to resort to a vegetable diet when an animal one cannot be procured by it. Like other varieties of its family, as the polecat and ermine, it carries a fœtid odour about with it, arising from some glands secreted below the abdomen. The weasel generally inhabits the temperate parts of Europe.

Weaving, *weev'-ing* (Sax. *wefan*, to weave), the art of producing cloth by the combination of flexible fibres, is performed upon a frame called a loom, the invention of which is ascribed to the Egyptians. Among all barbarous nations weaving consists of warping and crossing grasses, and such simple materials as are most easily attainable, and is purely darning. The long threads running from end to end of the piece are called the warp; the cross ones interlacing from side to side, the weft. In the method of weaving by darning, every alternate thread of the warp must be lifted by itself to put in the weft-shot, and that process is therefore very tedious; but when a method is employed for lifting up a certain portion of the warp at once, which is called shedding the *web*, to receive the weft-shot, this effects a great saving of time, and is weaving in its second stage. Weaving in this state has existed from time immemorial, amongst the Egyptians, East Indians, Chinese, and others. The art of weaving was unknown in Britain before the Roman invasion, and very little is known relative to its progress in this country till the reign of Edward III., when several laws were enacted in favour of the woollen manufacture, and every encouragement given to foreigners acquainted with it to settle in Britain. Plain weaving, where the weft threads pass alternately over and under those of the warp, is performed at a loom, of which the essential parts are—1st, an arrangement for stretching the warp; 2nd, a contrivance for raising every alternate thread, or half the threads of the warp, and depressing the other half, so as to open a space or shed for the shuttle which carries the weft; 3rd, a contrivance for striking each weft thread close up to the one previously thrown. In weaving with the common loom, the warp is wound upon a cylindrical beam or roller. From this the thread passes through a harness composed of movable parts called the *heddles*, of which there are two or more, consisting of a series of vertical strings, connected to *frames*, and having loops through which the warp passes. Each of these heddles receives its portion of the alternate threads of the warp, so that when they are moved reciprocally up and down, the relative position of the alternate threads of the warp is reversed. Each time that the warp is opened by the separating of its alternate threads, a shuttle containing the woof is thrown across it, and the thread of woof is immediately driven into its place by a frame called a *lay*, furnished with thin reeds or wires, placed among the warp like the teeth of a comb. In *twill*, which comprises an extensive variety of woven fabrics, such as satin, bombazine, kerseymere, the threads of the warp and woof do not cross each other alternately, but only the third, fourth, fifth, sixth, &c. cross each other. In twilled fabrics, the points where the threads of the warp cross each other form diagonal lines parallel to each other, across the face of the cloth, the degree of obliquity varying with the number of warp threads flushed. In the coarseet or blanket-twill, every third thread is crossed; in finer fabrics, the threads intersect each other at intervals of 4, 5, 6, 7, or 8 threads. Twills are frequently used by the silk weaver for the display of colour, and also for the sake of strength, thickness, and durability. In fabrics where the threads cross each other at distant intervals, there are fewer deviations from the right line, and therefore less liability to chafe and to wear. In *pile-weaving*, in addition to the usual warp and weft threads, a third thread is introduced in the course of the weaving, and is thrown into loops by being woven over wires of the breadth of the cloth. In the *Brussels carpet* these wires are simply drawn out and the loops left standing; but in the *Wilton carpet*, and the various kinds of velvet, velveteen, fustian, &c., they are cut out by passing a sharp knife along a groove in their upper surface. In gauze-weaving, the two threads of warp which pass between the same splits of the reed are crossed over each other, and partially twisted, like a cord, at every stroke of the loom. They are, however, twisted to the right and left alternately, and each shoot or insertion of the woof preserves the twist which the warp has received. About the latter portion of the 18th century a loom to go by machinery was eagerly sought after, and was supposed to be an impossibility. Several were constructed and failed, and the cause of their failure, although apparently a trifling one, was, in reality, very important in weaving by power. It was the want of a means to prevent the breakage of the yarn by the accidental stoppage of the shuttle in the shed. A Mr. Miller, however, at length invented a means, called a *Protector*, by which this difficulty is obviated; and the power-loom is now enabled to perform all the motions of weaving uninterrupted by accidents of this sort. Weaving, of cotton especially, consists of two processes,—weaving properly so called, that is, the motions for interlacing the warp and the weft, and the preparation or dressing of the yarn for being woven

The rapid rotation of the spindle on its axis in twisting the thread throws out, by the centrifugal force of the motion, the ends of the fibres on its whole surface; the threads are, therefore, very rough, and if brought in this state to be woven, they would entangle each other in the shedding, and the whole web in a short time would be a mass of breakage. The object of dressing is to lay these fibres along the surface of the thread, and thereby strengthen it to stand the process of weaving. This process was formerly done by hand in the power-loom, by the weaver who had the charge of it, while the loom was going on; the yarn, therefore, was sustaining the action of two processes at once, and the breakage thereby was not only greatly increased, but the work, likewise, was imperfectly done. The only gain in weaving by power is by enabling one person to manage more than one loom. When one individual was indispensable to each loom, it would have been better to have allowed the weaver to dispense with the machinery altogether, and weave by the common method; and this is the result which must have taken place but for the invention of the dressing-machine about the commencement of the present century, and which enables one man to dress yarns for about twenty looms; it should be observed, however, that the number of looms that this machine may supply depends a good deal on the kind of goods made. In the weaving of silk, the preparation of the yarn is merely that of picking it off the knots, and spreading over it a small quantity of thin glue; the dressing-machine, therefore, in this manufacture is useless, as well as in the woollen; in the linen manufacture, however, it may frequently be used as advantageously as in the cotton. Figure-weaving requires considerable preparation in mounting the loom, and differs from plain weaving in the number and arrangement of the heddles, and the method of moving them. As the number of heddles was in general too great to be moved by the feet of the weaver, an apparatus called the *draw-loom* was in general use until the introduction of the Jacquard loom. In the draw-loom the warp threads are passed through loops formed in strings, arranged in a vertical plane, one string to every warp thread; and these strings were so arranged in separate groups, that when an attendant called, the draw-boy pulled the handle which united one group, he drew up all those warp threads which in the order of the pattern required to be raised for the passage of the shuttle. The order in which the threads are grouped is determined by a pattern-paper or design; it is divided by lines into small squares, so as to represent a woven fabric, and upon it the pattern is drawn and coloured; it thus guides the weaver in arranging and grouping the various threads; and the order in which the handles are to be pulled is also arranged, so that the weaver and his draw-boy may work with ease and certainty. The *Jacquard apparatus*, or *loom*, as it is called, is not really a loom, but only an appendage to one, designed to effect the above operations with greater ease and certainty. It was invented by Joseph Marie Jacquard, a straw-hat manufacturer of Lyons, born in 1752.

WEDGWOOD WARE, *wij'-wood*, a kind of semi-vitrified pottery, without much superficial glaze, but capable of receiving all kinds of colours by means of oxides and ochres. It is named after its inventor, Mr. Wedgwood.

WEDNESDAY, *wenz'-dai* (Sax. *Woden's day*, Lat. *dies Mercurii*), is the fourth day of the week, dedicated by the ancient Scandinavians to their god Woden, supposed to correspond to the Mars of the Romans. The Romans named this day from the planet Mercury.

WEEK, *week* (Sax. *wece*), is a well-known division of time, which appears to have prevailed very extensively over the world from the very earliest times. It constitutes the fourth part of a lunar or natural month; and it is also more nearly than any other short term would be an aliquot part of the solar year of 365 days. Its origin is generally attributed to the Egyptians. It is not a little remarkable, that the several days of the week were named after the sun and six planets, not only among the ancient Greeks, Romans, and Egyptians, but also the Indians and Chinese. The Ptolemaic system arranged the heavenly bodies according to their distances from the earth, in the following order:—Saturn, Jupiter, Mars, the Sun, Venus, Mercury, Moon. Each of these heavenly bodies was supposed to preside successively over each hour in the above order. In this way Saturn would preside over the first hour of the first day, the Sun over the first hour of the second day, the Moon over the first hour of the third day, Mars the first hour of the fourth day, Mercury the first hour of the fifth day, Jupiter the first hour of the sixth day, and Venus over the first hour of the seventh day. Hence the several days of the week were called *dies Saturnii* (Saturday), *dies Solis* (Sunday), *dies Lunæ* (Monday), *dies Martis* (Tuesday), *dies Mercurii* (Wednesday), *dies Jovis* (Thursday), *dies Veneris* (Friday).

WEEK, HOLY. (*See* HOLY WEEK.)

WEHRGELD, or WERGILD, *vair'-gelt*, *vair-gilt* (Lat. *weregildus*), was a fine for manslaughter, wounds, &c., by paying which, the offender escaped from punishment. This system was in early times common among all northern nations, and in this country the laws of King Athelstan determined the several wehrgelds that were to be paid for homicides, from the death of the ceorl or peasant up to that of the king himself. The wehrgeld of a subject was paid to the relations of the party slain; that of a king, one half to the public, the other to the royal family.

WEIGHING-MACHINE, *way'-ing* (from Sax. *weg*, to weigh), a term generally applied either to the machine constructed near a turnpike, for the purpose of ascertaining the weight of the loads on waggons and carts which pass along the road, or to the weighing-machine for goods in use at railway stations. Weighing-machines for the former purpose have been so constructed that the carriage may be lifted off the ground, and hooks attached to a large steelyard, of which the fulcrum is raised by a combination of tooth-and-pinion work, moved by a winch handle. The weighing-machine for goods in use at railway stations consists of a compound lever, or a composition of levers.

WELLS, WELL-SINKING, *wellz* (Sax. *wel*, a well).—Wells are holes dug under-ground, below the level of the water collected in the strata. They are usually of a cylindrical figure, and commonly walled with stone or brick, and lined with mortar. The antiquity of wells in rural economy, as well as for domestic purposes, is so great, that the earliest records extant speak of this mode of perforating the earth for the use of man. In sinking wells, it is a rule almost universally established, that if begun with sand, gravel, or other such matters, it need seldom be hoped to find water until clay is come to; and that if clay be begun with, none can be hoped for in abundance till sand, gravel, or porous rock is met with. Hence, as the doctrine of wells is so much and so intimately connected with the nature of the strata and the springs afforded by them, it may be observed, that in cases where differently formed strata of sand, to a considerable depth, rest upon beds of clay, and have a free issue at the lower ends of them, if wells were sunk into the sand-beds higher up, no water could be there permanently found until they penetrated quite through the strata of sand, and went to some depth into the beds of clay that lie below them. In such cases the water could never rise in the well much higher than a certain point; because whenever it rose as high as the porous sand, it would flow along through it until it made its escape below; and if the beds of clay should extend backwards under the ground a great way, and at a great depth below the surface, so as to form an abundant and never-ceasing stream under the beds of sand, it must necessarily follow that the wells will continue constantly at the same height, exactly as in the case of a basin at a fountain into which a pipe of water constantly flows, so as to keep it running over. In the execution of the work of digging wells, there is no great difficulty, the person employed in the business chiefly working down by means of a small short-handled spade, and a small implement of the pickaxe kind; the earthy materials being drawn up in buckets by the hand, or a windlass, fixed over the opening for the purpose. When persons conversant with this sort of business are employed, they usually manage the whole of the work, bricking round the sides with great facility and readiness; but in other cases it will be necessary to have a bricklayer to execute this part of the business. There are two methods of building the stone or

brick within the wall. In one of these a circular ring is formed, of the same diameter as the intended well; and the timber of which it is composed is of the size of the brick courses with which the well is to be lined. The lower edge of this circle is made sharp and shod with iron, so that it has a tendency to cut into the ground; this circular kerb is placed flat upon the ground, and the bricks are built upon it to a considerable height, like a circular wall. The well-digger gets within this circle, and digs away the earth at the bottom; the weight of the wall then forces the kerb, and the brickwork with which it is loaded, to descend in the earth; and so fast as the earth is removed, it sinks deeper, and the circular brick wall is increased or raised at the top as fast as it sinks down; but when it gets very deep, it will sink no longer, particularly if it passes through hard strata. In this case, a second kerb of a smaller size is sometimes begun within the first. Well-diggers experience sometimes great difficulty from the noxious air which fills the well, and suffocates them if they breathe it, and it is necessary, accordingly, in such cases, to supply them with fresh air by artificial means.

**Wen**, *wen* (Sax. *wenn*), an encysted tumour varying exceedingly in size and character, and commonly situated immediately under the skin; but occurring also in some of the internal viscera. The causes of their formation are unknown, but a strongly marked tendency to such swellings exists in particular individuals, leading to the belief in constitutional causes. At its commencement it is always exceedingly small and perfectly indolent, and it is often many years before it attains any considerable size. It is comprised in a membrane called a cyst, and its contents sometimes resemble fat or suet, at other times it contains serum or a thin fœtid brown or black fluid. Sometimes the cysts become very bad from the deposition of cartilaginous or even osseous matter. Frequently the cyst, especially when small, may be punctured, and its contents pressed out; but sometimes this gives rise to very severe inflammatory action. The other and safer mode of treatment is to dissect them out with the knife wherever their position will admit of it, care being taken to remove the whole of the cyst.

**Westminster, Assembly of Divines.** (*See* Assembly of Divines, Westminster.)

**Whale**, *wail* (*Balæna*), a gen. of animals belonging to the class *Mammalia*, and ord. *Cetacea*. The whale is a marine animal, it is also viviparous, and suckles its young like other mammals It also respires by means of lungs, and has distinctly separate blowholes; it has warm blood, and one species, the true *Balæna*, has no teeth, but instead, large plates of baleen or whalebone attached to the upper jaw. The respiratory apparatus of the whale is peculiar in the extreme; the larynx is produced into a conical form, and when the creature is breathing, projects into the cavity of the posterior nares, where it is met and embraced by the muscles of the palate, and thus a free passage is opened through the nostrils from the lungs direct to the external air, although at the same time the whole head and mouth may be under water. In order to get rid of the water which is taken into the mouth, the whale performs the act of deglutition, but at the same time closes the pharynx to prevent the passage of the water beyond the necessary point. By these means it is forced up the nasal passages, and by a sudden contraction of the muscles about these parts, is finally expelled in a jet of water, which rises to some height. The head of the whale is disproportionately large in comparison with the size of the body, generally being one-third, and often one-half, the size of the latter. The skull is generally unsymmetrical. The arrangement of the baleen or whalebone in the most of the Greenland whales (*Balæna mysticetus*) is very peculiar. A strong bony keel runs along the centre of the palate, on each side of which is a very broad depression, along which the plates of baleen are attached. These are long and flat, and are attached to the palate by their bases, hanging down into the mouth. From these being placed transversely, their sides are parallel, and at a very small distance from each other, the base of each, as well as the outer edge, being composed of solid whalebone, while the inner edge terminates in a fallament of fibres which fill up the whole interior of the mouth like a curtain across it. The object of this is entirely owing to the arrangement of the stomach of the whale, which is so small in comparison with his great bulk that his food consists only of the smallest of the swimming mollusca, a herring being the largest fish he can swallow. To procure his prey he is thus obliged to engulf a whole shoal in his mouth at once, where they become entangled in the fibres of the balæna. The water is then strained off, and poured through the blowholes, while the animal can pass his diminutive prey into the œsophagus as he requires. It may be thus seen that the balæna serves the purpose of a sort of sieve, and separates the food which the whale feeds on from the water which he cannot but take in at the same time that he seizes his prey. The baleen plates are generally from eight to ten feet long, and number about 600. The substance of which they are composed is a well-known and valuable article of commerce, termed whalebone, and the produce from a single whale often sells for from between £200 and £300. The Greenland whale is one of the best-known species, and is a native of the northern seas. It is about sixty feet in length and forty in circumference, and its average weight has been estimated to be about 500,000 pounds. The back and sides are covered with fat, of an exceedingly unctuous character termed "blubber;" and so oily is this substance, that a hundred barrels of blubber will produce nearly ninety-six barrels of oil; so that the refuse and waste is but very slight. The whole body of a whale of this species, of the full size, will yield from fifty to sixty puncheons of oil, each puncheon containing seventy-four gallons; the whole value of such a fish is therefore about a thousand pounds sterling. The young ones produce about fifty barrels of oil when they are only a year old; but at that time they are particularly fat. The female produces her young alive, after a gestation of about nine or ten months, and is even more attached than the generality of animals to her young, many instances of her being known to sacrifice her life rather than leave them. The Greenland whale is found generally in the Arctic seas, but principally in Baffin's Bay, where the whale-fishery is carried on. The southern whale (*Balæna australis*) is another variety found in the southern seas, principally about Australia and New Zealand. The head of this variety is smaller in comparison than that of the Greenland whale, but its size altogether is about the same. The *Balænoptera*, or fin-backed whales, are another family, which differ from the preceding by possessing a soft dorsal fin. These are even larger than the Greenland whale, but are not so valuable, as their yield of oil is much less, and it is not by any means worth so much. The *Cachalot*, or *Sperm whale*, is described elsewhere. (*See* Sperm Whale.) The *Narwhal* may be lastly mentioned as one of the most curious members of the *Delphinidæ*, or third family of the *Cetaceans*. (*See* Cetacea.) The Sea Unicorn or Narwhal (*Monodon monoceros*) has no teeth in the lower jaw, but has the upper jaw armed with generally one, and sometimes two, projecting spinal teeth. It is a native of the North Sea, and often reaches the length of from twenty to thirty feet. The *narwhal* feeds generally on fish of the skate and turbot kind, which it captures by means of its tusk. This peculiar weapon is from six to ten feet long, and is of very fine hard pure ivory, which renders it valuable to capture. It is said sometimes that this peculiar fish has driven its tusk through the bottom of a ship. The blubber of the narwhal is valuable, but not much in quantity, and yields a very fine oil.—The Grampus (*Phocæna orca*) is another example of the *Delphinidæ*, which may be mentioned under the present heading. It is a native of the North seas, but is often found in the Atlantic, and is by no means an unfrequent visitor to the British coasts and the shores of France. It is generally classed amongst the porpoises. Its characteristics will be found given under the article Porpoise.

**Wheat.** (*See* Triticum.)

**Wheel**, *weel*, a mechanical contrivance, by means of which the intermittent and limited action of the lever is extended to any distance, and made to act continuously and uniformly. Wheels are either of the kind known as *carriage-wheels*, or *friction-wheels*, or *toothed*

*wheels*; including, under the second division, *band-wheels*; and, under the third, the various kinds of *cog, trundle, spur, crown*, and *bevilled-wheels*. The efficiency of a carriage-wheel consists in the length of the lever it offers (or, in other words, upon its diameter); upon the direction in which the power is applied to it; and upon the small extent of surface producing friction, provided that the surface be sufficient to prevent the load from forcing the wheels into the material on which they run. *Friction-wheels* are introduced into mill-work for the purpose of facilitating the horizontal or vertical movement of traversing beds, of guide-rods, &c.; and the conditions they are required to fulfil are, that they should revolve freely on their own axles, and present smooth surfaces (able to retain a lubricating fluid) to the bodies moving over them, or over which they may move. *Driving-band-wheels*, on the contrary, are fixed on their bearing-shafts, and have their surfaces formed in such a manner as to cause the bands, or straps, to adhere to them by their mere friction upon the asperities, and thus to produce motion in the secondary band-wheels of the machinery to which they are applied by the rotation of the first wheels. In *toothed wheels*, a series of projections, or teeth, are formed on the outer rim of one wheel, which work into corresponding projections upon the outer rim of the wheel connected with it, in such a manner as to allow the former to communicate their motion by the sliding or rubbing of their surfaces upon the surfaces of the teeth of the second wheel. *Cog-wheels* are those in which the teeth are made of a different material to the wheel itself; but the cogs are nevertheless of the same outline in principle as ordinary teeth.—(*See* Water-wheel.)

Wheel, Breaking on the (Sax. *hweol*, a wheel), is a cruel mode of punishment, first employed in Germany on the murderers of Leopold, duke of Austria, in the 14th century. In carrying it out, the criminal was laid on a cart-wheel, with his arms and legs extended, and his limbs, when in that position, broken with an iron bar. In France, the criminal was stretched on a frame-work of wood resembling a St. Andrew's Cross, being scooped out above and below the elbows and knees, where the criminal was struck by the iron bar, and his limbs broken. This punishment was abolished in France at the Revolution, but in Germany it is still occasionally put in force against very great criminals.

Wheel, Fly. (*See* Fly-wheel.)

Whelk, *welk* (*Buccinum undatum*).—The common whelk is a gastropodous mollusc belonging to the fam. *Buccinidæ*, which contains upwards of a hundred fossil, and as many as twenty existing species. It is commonly found along the British coasts, and in the Atlantic, even lying as far north as Greenland. It is dredged for as an article of food, and is taken usually in deep water, being found as low as a hundred fathoms from the surface. It is said that the ancients extracted the celebrated "Tyrian dye" from some of the members of the whelk family.

Whig, *wig*, is the well-known designation given to a political party in this country. It came from Scotland, but its exact derivation is by no means certain. According to some, it is from whig, corrupt or sour whey, and was originally applied to the Covenanters; according to others, it was a contraction of whigamore, *i.e.* get on, a word used by the western peasants in driving their horses, and was first applied to the insurrection which broke out after the duke of Hamilton's defeat at Preston, which was known as the "Whigamores' raid." It came to be applied to that party in the country who were opposed to the king, and from Scotland it soon passed into England. Indeed, the origin of the party may be dated from the reign of James I., when the long struggle between the king and the parliament had its commencement. It was first assumed as a party name by that body of politicians who were most active in placing William III. on the throne of England. They have generally been regarded as the friends of reform or change, and generally speaking their measures have been popular, as tending to increase the democratic element in the constitution.

Whip-poor-Will, *wip-poor-will* (*Caprimulgus vociferus*), a well-known species of the Goatsucker or Night-jar, common in N. America. It is about nine inches in length, and eighteen in the extent of its wings, and its plumage and characteristics strongly resemble the European goatsucker. The name of this bird is derived from the peculiar cry which it emits, composed as it is of three distinct notes, sounding exactly like the words *whip-poor-will*, with the emphasis laid strongly on the first and last words. The noise these birds make at night is perfectly astounding to one previously unacquainted with them; and the Indians assert that they are the spirits of departed warriors, and that their perching on any house is a token of the approaching death of one of its inhabitants. (*See* Goatsucker.)



Whirlpool, *wirl'-pool*, when two opposite currents of almost equal force meet, they sometimes, especially in narrow channels, turn upon a centre and assume a spiral form, giving rise to eddies or whirlpools. The most celebrated whirlpools are the Euripus, near the island of Eubœa, in the Grecian Archipelago; Charybdis, between Sicily and Italy, and the Maelstrom off the coast of Norway.

Whirlwind. (*See* Wind.)

Whiskey, *wisk'-e* (a corruption of the Gaelic *usquebaugh*, water of life), is the name of a well-known liquor distilled from barley, oats, and other grains. It is much used both in Scotland and Ireland, and is considered as the national beverage of both these countries.

White Ants. (*See* Ant, White.)

Whitebait, *wite'-bait* (*Clupea alba*), a well-known fish of the ord. *Malacopterygii*, and a member of the *Clupeidæ*, or Herring family. Formerly the whitebait was considered to be only the young of the shads and sprats, but later naturalists have determined it to be of a distinct genus of its own. It is the young whitebait which are so largely taken in the Thames, and used in the celebrated whitebait dinners particular to Greenwich and Blackwall. But the larger and adult fish, which seldom exceed six inches in length, are taken in large quantities off the Kent and Essex shores during the winter. The whitebait fishery is also pursued in the Firth of Forth.

White Brethren. (*See* Brethren, White.)

White Swelling, in Surg., is a disease of the joints, so called from being unattended by any discoloration of the skin; and it occurs most frequently in scrofulous constitutions. The knee-joint is that most subject to its attack. It is the result of chronic inflammation in the bones, cartilages, or membranes constituting the joint, and is always attended with swelling, the part being sometimes hard, at other times soft and yielding. In some cases there is little or no pain, and the motions of the joint are but little impeded; in others the pain is considerable, and motion entirely destroyed. After a time the joint becomes of very great size, while the skin appears of a pale shining colour, with a number of large veins running over it. The limb, above and below the knee, is much wasted, and the general health impaired, but not seriously. At length collections of matter form round the joint, and gradually make their way outwards by various openings. The constitution is now seriously disturbed; the health fails, the appetite and sleep are bad, the pulse small and frequent, with obstinate diarrhœa and profuse night sweats, till, unless speedy relief is obtained, the patient is carried off. In the treatment of this disease counter irritants and leeches should be applied to the joint, and splints placed behind it so as to prevent all motion. Particular attention should be paid to the state of the stomach and bowels, the patient being allowed generous diet and a free use of good air. These measures, however, are chiefly useful in the inflammatory stage of the disease; when it has reached an advanced stage there is nothing left for it but amputation.

Whiting, *wi-ting* (*Merlangus vulgaris*), one of the smaller varieties of the Codfish fam., of whose peculiarities it strongly partakes. (*See* Gadidæ.) The whiting rarely reaches a pound and a half in weight, but as its flesh is very delicate, it is much esteemed as an article of food, and in consequence is in much request in the market. It abounds on all the coasts of Britain, and generally approaches the shore in large numbers during the months of January and February for the purpose of depositing its spawn. It is generally caught by hook and line, baited with common molluscs and

pieces of fish. Long lines, which are left out all night, are used, as well as hand-lines, by the fishermen. And whiting, cod, hake, &c., are caught indiscriminately.

WHITLOW, *wit'-lo* (Sax. *hwit*, white; *low*, a flame), is a very painful inflammation of one of the fingers, or sometimes, though very rarely, of the toes, and usually proceeding to suppuration. It is divided into four kinds, according to the depth of the inflammation, the most superficial taking place immediately under the skin, the deepest lying underneath the periosteum. In the more superficial cases the application of leeches and warm fomentations to the part will in general give relief, and sometimes cause the resolution of the inflammation. Where any matter is formed, as is generally the case, it requires to be discharged with the point of the lancet, when the disease usually subsides. When seated in the sheath of the tendons, the symptoms are much more urgent, and the pain most excruciating, and of a throbbing character, extending up the arm even to the shoulders. It is much aggravated by the finger being in a dependent position, and usually there is a considerable degree of fever, and the patient suffers from want of rest. With all this pain, there is but little redness or swelling, and even when matter is formed, it may not be perceptible from being deep-seated. Leeches, warm fomentations, and poultices should be used in the early stages; but should this prove ineffectual, a free incision should be made down through the sheaths of the tendons, which usually affords relief, a small quantity of pus being discharged, and the disease subsiding in a few days by the use of warm fomentations and poultices. Sometimes the inflammation will extend into the palm of the hand and fore-arm, forming abscesses and sloughing, in which case free incisions will require to be made into the different inflamed parts to give exit to the matter and sloughs, and poultices afterwards applied. Occasionally the use of the fore-arm and hand may be lost, and not unfrequently amputation may be required. The remarks also apply to those cases in which the periosteum or membrane covering the bone is affected. Frequently, as the disease advances, the bone itself becomes affected with caries, and early and deep incisions are required quite down to the bone.

WHIT-SUNDAY, *wit'-sun-dai* (Lat. *Dominica alba*), in the calendar, is the seventh Sunday or 40th day after Easter. It is said to have received the name of *Dominica alba* (white Sunday) in the early Church, from being one of the favourite seasons for baptizing, and all on whom the rite was conferred being required to appear in white on that day. It represented the Jewish feast of Pentecost, where the apostles were baptized with the Holy Ghost and with fire, and themselves commenced their public ministry by baptizing 3,000 persons. In early times, the whole of the seven weeks after Easter were celebrated as Pentecost, and were observed as a time of great joy; divine service was performed daily, the places of worship were decorated with evergreens, alms were freely distributed, slaves set free, &c. By degrees, however, the attention of the Church came to be concentrated upon one day. With our ancestors Whitsuntide was a season of great rejoicing, and all kinds of exercises and amusements engaged in. In many parishes, a house or barn, called the church-house, was set apart for feasting, &c.; ale was brewed, called Whitsun ale, and sold to the parishioners, the profits being applied to the repair of the church, or similar purposes.

WHITWORTH GUN, *wit'-wurth*.—Under the article RIFLE a brief sketch was given of the principle upon which Mr. Whitworth's rifle is constructed. The Whitworth cannon is a mere development of the Whitworth rifle. About 1857 this gentleman commenced to apply the principle to rifled ordnance. The Whitworth gun has an hexagonal bore, an elongated grooved projectile, is loaded at the breech, and has a twist sufficient to turn the projectile three times before it emerges from the muzzle of the piece. The inventor employs mild steel in homogeneous masses as the best, because the toughest material for his cannon, and in order to obtain additional strength, steel hoops are forced on by hydraulic pressure, which bind the inner tube of the gun with a tension proportioned to the stretching they undergo in the process of fitting.

WILD BOAR. (*See* HOG FAMILY.)

WIFE. (*See* HUSBAND and WIFE, DIVORCE, MARRIAGE, &c.)

WILL, *will* (Sax. *willa*), is that innate intellectual energy of the human mind, "which, unfolding itself from all the other forces of the mind, like a flower from its petals, radiates through the whole sphere of our activity,—a faculty which we are better able to feel than to define, and which we might perhaps most appropriately designate as the purely practical faculty of man (*Feuchtersleben*). Though a distinct power or energy of the mind, it blends itself with every other power, associating itself with our intellectual decisions on the one hand, and our emotional attachments on the other, but containing an important element which cannot be resolved into either or into both combined. The other powers, such as reason, conscience, sensibility, may influence the will, but they cannot constitute it nor yield its peculiar workings. (*See* FREE WILL.)—Ref. Bain's *Emotions and Will*.

WILL, or TESTAMENT (Lat. *testamentum*), in Law, was, by the Roman writers, defined to be the declaration, in proper form, of what a man wills to be performed after his death. Testaments are of very high antiquity, being in use at least as early as the time of the patriarchs; for we are told that Jacob bequeathed to his son Joseph a portion of his inheritance double that of his brethren. Solon is said to have been the first legislator that introduced wills into Athens. In this country, the power of bequeathing is coeval with the first rudiments of the law, for we have no traces or memorials of a time when it did not exist. But this power of bequeathing did not originally extend to the whole of a man's personal estate, for we are told that by the common law, as it stood in the reign of Henry II., a man's goods were to be divided into three equal parts, of which one went to his heirs or lineal descendants, another to his wife, and the third was at his own disposal. If he died without a wife or without children, then the half was at his own disposal; the other half going to them; if neither wife nor issue, then he might dispose of the whole. This continued to be the law of the land down to the reign of Charles I., but since that time it has changed by imperceptible degrees, until now the deceased may by will bequeath the whole of his goods and chattels. Before Act 1 Vict. c. 26, was put in force (1838), a will might be either written or verbal, and with regard to personal property, it was not required to be attested by any witness, if the handwriting of the testator could be satisfactorily proved. Devises of land, however, were ineffectual against the heir-at-law, unless attested by three witnesses. But now by that and the subsequent statute 15 & 16 Vict. c. 24, the law relating to wills has been consolidated and amended. All wills, whether of real or personal estate, must be in writing, and signed at the foot or end thereof by the testator, or by some person in his presence, and by his direction, in the presence of two witnesses at least, present at the time, who must subscribe and attest the will in his presence. "The signature must be so placed at, after, following, under, or beside or opposite the end of the will, that it shall be apparent on the face of the will that the testator intended to give effect by such his signature to the writing signed as his will." In general, all persons who have sufficient understanding are capable of disposing by will of both real and personal estate; but no will made by any person under the age of twenty-one is valid; neither can a married woman make a will except of the property settled to her separate use. Lunatics, idiots, persons under undue influence, or under duress, nor criminals convicted of such offences as subject their property to forfeiture. A will is a revocable instrument, and is revoked by marriage either in the case of a man or woman, but it is not revoked by any other change of circumstances. It may, however, be revoked by another will or codicil subsequently executed, or by a writing declaring the intention to revoke, or by burning, tearing, or otherwise destroying the will with the intention to revoke it. A revoked will may be revived by re-execution, or by a codicil showing an intention to revive it. No obliteration, interlineation, or other alteration in a will, is valid, except so far as the words or effect of the will before the alteration shall not be apparent unless with such alteration. But if the signature of the

testator and subscribing witnesses be made in the margin opposite or near the alteration, or at the foot or end, referring to the alteration, it will be valid. A will takes effect as if executed immediately before the testator's death, unless a contrary intention be shown by the will; and lapsed and void devises fall into the residue unless the will shows a contrary intention.

WILLOW. (*See* SALIX.)

WIND, *wind*, a sensible current of the atmosphere, and as such distinct from that motion of the atmosphere which is the consequence of the diurnal and annual movements of the earth, and is not perceptible. The motions of the atmosphere are subject in some degree to the same laws as those of the denser fluids. If we remove a portion of water in a large reservoir, we see the surrounding water flow in to restore the equilibrium, and if a portion, being rarefied by heat, or condensed by cold, ascends in the one instance and descends in the other, a counter-current is the visible and natural result; and similar effects are found to follow the same causes in the atmospheric fluid. The immediate effect of the solar radiation, communicating heat to any portion of the earth's surface, is to generate an ascensional movement in the incumbent atmosphere, a bodily overflowing of its material above, and a relief of barometrical pressure below. The air of the cooler surrounding region, not being so relieved, will be driven in by the difference of atmospheric pressure so arising, and thus originate two distinct winds,—an upper one setting outward from the heated region, a lower inwards or towards it. These effects upon the earth, together with the rotary motion of the earth, are the primary causes of all the phenomena of the winds. No wind can arise without a previous derangement of the general equilibrium, and the general causes of this may be stated as follows:—1. The ascent of the air over certain tracts heated by the sun; 2. evaporation, causing an actual increase in the volume of the atmosphere; 3. rain, snow, &c., causing an actual decrease in its volume, by the destruction of the vapour. Currents thus produced may be permanent and general, extending over a large portion of the globe; periodical, as in the Indian Ocean; or variable and occasional, or, at least, uncertain, as the winds in temperate climates. General or permanent winds blow always nearly in the same direction, and are called *trade-winds;* so called because they promote more than any other circumstance trade and navigation. These trade-winds occur in all open seas on both sides of the equator, and to the distance of 30° north and south of it. To the north of the equator they blow in the eastern parts of the ocean from the north-east, seldom from the eastward of east-north-east, or from the northward of north-north-east. In proceeding farther west, they become more easterly, and often they blow from due east, and sometimes from the south of east, but generally they are one or two points north of east. To the south of the equator, the trade-winds in the eastern part of the ocean blow from south-east, and usually between south-east and east. They do not occur in the vicinity of the continents, but are chiefly separated from them by a tract of sea, in which either periodical or variable winds prevail. The origin of them is this,—the powerful heat of the torrid zone rarefies, or makes lighter, the air of that region; the air, in consequence of this rarefaction, rises, and to supply its place, a colder atmosphere from each of the temperate zones moves towards the equator. But (as in the case of the polar currents in the ocean) these north and south winds pass from regions where the rotatory motion of the earth's surface is less to those where it is greater. Unable at once to acquire this new velocity, they are left behind, and, instead of being north and south winds, as they would be if the earth's surface did not turn round, they become north-east and south-east winds. There are two instances of the interruption which the trade-winds experience in the neighbourhood of large masses of land. In the Indian Ocean the south-east trade-wind prevails between 28° and 10° of south latitude; but, from 10° of south latitude to the northern shores of that ocean, the uniformity of the tropical movements of the atmosphere is destroyed by the monsoons, which belong to the class of periodical winds. These blow half the year from one quarter, and the other half from the opposite direction. When they shift, variable winds and violent storms prevail for a time, which render it dangerous to put to sea. (*See* MONSOONS.)

WINDMILL, *wind-mill*, is a building containing machinery for grinding corn, pumping water, sawing wood, or for any purpose depending on wheel-work, to which motion is communicated by the impulse of the wind. The building is a wall of timber, brickwork, or stone, in the form of a frustum of a cone; and the smaller kind of mill when formed of timber is capable, by means of a lever, of being turned round horizontally on an axis, in order that the plane in which the radii, or arms of the sails, revolve, may be placed perpendicularly to the direction of the wind, for the purpose of allowing the latter to act upon the sails in the most advantageous manner.

WINNOWING MACHINES, *win'-no-ing*, were originally introduced into Great Britain from Holland, and are in use for cleaning corn in most of the improved districts. The common winnowing machine consists of an apparatus of sieves, on which a current of air is directed from a revolving fan, and above which is a hopper containing the mixed seed and chaff which are to be separated. The contents of the hopper drop upon the sieve, and during their fall, and while being operated upon in the riddles, the winder carries away the lighter portion; and of the heavier part, that which passes through the meshes of the sieve is the clean result of the process, which thus separates both light and bulky matter from the good grain.

WIRE ROPES, *wire*.—Ropes formed of iron wire have been within the last few years introduced to a considerable extent, and have been found to effect a great saving of expense, from their durability and superior lightness. As early as the year 1830 they were employed in the silver-mines of the Hars mountains, and had been found so advantageous as almost entirely to supersede ropes of hemp in the mines of Hungary and the Austrian dominions. Patents have at various times been taken out in this country for the manufacture of wire ropes, which are formed in various ways, according to the uses to which they are to be applied. For standing rigging, straight untwisted wires are bound round with cloth or small hempen cordage, saturated with a solution of caoutchouc, asphaltum, or other preservative against rust. Flat ropes are made of straight wires, or wires with a slight twist, interwoven or wrapped with hempen yarn, or sewed between canvas. Other wire ropes are manufactured as follows. The bobbins containing the wire are mounted in frames set in the periphery of a larger frame like a cage. The larger frame revolves round an axis, on the bottom of which is fixed a spur-wheel, and the lower end of the vertical axis of each bobbin-frame carries a spur-wheel gearing into this. There is thus obtained a sun-and-planet motion; the large frame carrying the bobbins round the central axis, and each bobbin-frame revolving also round its own axis. The wires from the bobbins pass through holes in the top of the central axis, and are there united to form the strand or rope, as the case may be. The apparatus for small strands or ropes is sometimes arranged so that the bobbins revolve round a horizontal, in place of a vertical axis. In joining the wires, the ends should be twisted together, or even soldered or welded. Wire ropes may be secured at their ends by passing them through the small end of a conical collar, and doubling up or *upsetting* the ends of the wires, which may then be welded into a solid mass, and secured by running melted brass or solder among them. The collars may then be attached to the hook, eye, or joint with which it is required to connect the rope, or they may be screwed together so as to form several lengths of rope. Copper, brass, and other metals are also used for wire ropes, some of which are made of small size for hanging pictures, &c.

WIT, *wit* (Ger. *Witz*), is one of those words that have passed through a variety of significations since they first came into use. Originally wit was synonymous with wisdom; and hence the Saxon parliament was called the *witenagemote*, or assembly of wise men. Even now we speak of a person being out of his wits, who is of unsound mind. 'According to Locke, "Wit lies most in the assemblage of ideas, and putting those

together with quickness and variety wherein can be found any resemblance or congruity, thereby to make up pleasant pictures and agreeable visions in the fancy:" to which Addison adds, by way of explanation, "that every resemblance of ideas is not that which we call *wit*, unless it be such an one that gives delight and surprise to the reader: these two properties seem essential to wit, especially the last of them." Wit is produced—(1) by debasing things pompous or seemingly grave; (2) by aggrandizing things little and frivolous; (3) by setting ordinary objects in a particular and uncommon point of view, by means not only remote, but apparently contrary. "Sometimes," says Dr. Barrow, "it lieth in pat allusion to a well-known story, or in seasonable application of a trivial saying, or in forging an appropriate tale; sometimes it playeth in words and phrases, taking advantage from the ambiguity of their sense, or the affinity of their sound; sometimes it is wrapped in a dress of humorous expression; sometimes it lurketh under an odd similitude; sometimes it is lodged in a sly question, in a smart answer, in a quirkish reason, in a shrewd intimation, in cunningly diverting or cleverly retorting an objection; sometimes it is couched in a bold scheme of speech, in a tart irony, in a lusty hyperbole, in a startling metaphor, in a plausible reconciling of contradictions, or in acute nonsense; sometimes a scenical representation of persons or things, a counterfeit speech, a mimical look or gesture passeth for it; sometimes an affected simplicity; sometimes a presumptuous bluntness giveth it being; sometimes it riseth from a lucky hitting upon what is strange; sometimes from a crafty wresting obvious matter to the purpose; often it consisteth in one knows not what, and springeth up one can hardly tell how."

**Witchcraft**, *witsh'-kraft* (Ang.-Sax.), is a supernatural power which some persons were formerly supposed to obtain possession of by entering into compact with the devil. It is not a little remarkable that this power has been almost always associated with the female character, and has from that circumstance received its name. The belief in the possibility of mortals being endowed with supernatural powers for accomplishing their ends appears to have prevailed in almost every age and country. "Thou shalt not suffer a witch to live," in the language of the law as given by Moses to the children of Israel; and subsequently we have an account of Saul's consultation with the witch of Endor, and of her raising up Samuel. Among the Greeks a general belief prevailed in magical practices and incantations, and Thessaly was the region most celebrated for the pursuit of these arts. The same superstitions were equally prevalent among the Romans. The modern idea of witchcraft, however, denoting a regular paction with the Evil One, dates from the rise of Christianity, and obtained its highest development in the Middle Ages. The early Christians regarded the gods of the heathen in the character of demons, and there is no doubt that many of the supposed meetings of witches and devil-worshippers were the secret assemblies of the worshippers of the pagan deities to celebrate their sacred rites. At a later period the Waldenses and other early seceders from the Church of Rome, who were compelled to hold their religious assemblies in secret, were accused of the like practices. St. Augustine speaks of magicians as living in society with devils, and having a compact with them. The Church, however, seems for a time not to have attempted to put down the various popular superstitions that were connected with this subject; at least we meet with no general denunciation against witchcraft as a crime of itself down to about the end of the 12th century. Trials and persecutions were now introduced, which, in the course of two centuries, came to assume a regular system, and to be characterized by every feature of cruelty. The famous bull of Innocent VIII. on this subject appeared in 1484, narrating the popular superstitions on the subject, and appointing a commission to examine and punish witches. From this time it became a crime especially recognized by the ecclesiastical authorities in the Roman Church. In the 16th and 17th centuries the prosecution of witches was actively carried on all over Europe, and an incredible number of unfortunate creatures lost their lives. In England alone it is computed that no fewer than 30,000 of them suffered at the stake. Down even to the end of the 17th century, the learned men of Europe generally were believers in witchcraft. In the beginning of the following century a better state of feeling began to prevail, and by degrees the legislative enactments began to be repealed; but even in this country, among the lower classes, particularly in rural districts, a belief in witchcraft still prevails to a very great extent. The ideas that had come to be connected with this subject are not a little remarkable. The witch was believed to have entered into a regular engagement with the Evil One, who delivered over to her an imp or familiar spirit to be always at her call, and to do whatever she desired of it; she, on the other hand, agreeing that she should be his after death. The witch was believed to have the power of transporting herself through the air on a broomstick; of transforming herself into various shapes, particularly those of dogs and cats; of inflicting diseases on whom she pleased, and of punishing her enemies in a variety of ways. Objects that were naturally horrid and loathsome were regarded as the chosen instruments of the witches; as dead bodies, toads, frogs, lizards, serpents, scorpions, &c. Cats, from their silent and mysterious movements and midnight wanderings, were regarded as particularly sacred to witches, who often assumed their shape. A power over the elements of raising storms or producing calms, and of casting malign influences over the fruits of the earth or beasts of the field, were among the gifts most commonly ascribed to them. The suspected persons were put to the most cruel tortures, in the agonies of which confessions were extorted from them which had little foundation in fact. Some confessions were no doubt voluntarily made which were the result of imagination. Among the various kinds of ordeals which were resorted to to discover suspected witches water was the most common in this country; the suspected person was cast into some water, and if she swam she was regarded as a witch, and if she sank as not one; so that not unfrequently it was death either way. The acts 9 Geo. II. c. 5, and 56 Geo. II. c. 138, abolished all prosecutions for witchcraft in this country.

**Witenagemote**, *wit'-e-nai-je-mote* (Sax. *witan*, to know, and *gemoth*, an assembly), literally signifies an assembly of wise men, and was the name given to the great national council or parliament among our Anglo-Saxon ancestors, consisting of the nobles or chiefs, the largest landholders, and the principal ecclesiastics. The powers of this council were very extensive. They had the power of electing and deposing the king, of making new laws, of concluding treaties. They had also the power to regulate ecclesiastical matters, appoint fasts and festivals, and control the levying of the ecclesiastical revenue. This council was of course abolished at the Conquest, but the idea of it was preserved, and subsequently developed till it assumed the form of our present parliament (which *see*).

**Witherite**, *with'-er-ite*, a mineral from which the compound called baryta or barytes is obtained.

**Witnesses**, *wit'-nes-ses* (Sax. *witan*, to know), in Law, are persons who give evidence in judicial proceedings. In civil cases witnesses are compelled to attend by a process of *subpœna ad testificandum*, in criminal cases by subpœna, or by recognizance by the magistrate before whom the information is given. The witness is sworn not only to tell the truth, but also the whole truth, and nothing but the truth. All witnesses, of whatever religion or country that have the use of their reason are to be received and examined, provided they believe in a God and in a future state of rewards and punishments. Formerly infamy, or conviction of an infamous crime, and interest in the event of the cause, were grounds of incompetence; but act 6 & 7 Vict. c. 85, enacts that no person offered as a witness shall hereafter be excluded, by reason of incapacity from crime or interest, from giving evidence in any action civil or criminal.

**Wolf**, *wulf* (Sax. *wulf*), (*Canis Lupus*), a variety of the *Canina* or Dog fam., of whose characteristics and general structure it strongly partakes. (*See* Canina.) At one time the common wolf was a native of this country, and there was a period when its ravages were so great that the month of January was called by the Saxons the *wolf month*, because numbers of people, as

well as cattle, sheep, and other animals, were devoured by flocks of them at that time of the year. It is found at the present time in the northern portions of Europe and Asia, residing principally in mountainous regions, whence it descends in the pursuit of prey. In structure the wolf is about the size of a large dog, but it is leaner and more gaunt in appearance, its height being from two feet and a half to three feet, while its length varies between three and four feet. The colour of its coat is a mixture of black, brown, and grey, the hair being rough and hard, and mixed at the base with a sort of under-coat of ash-coloured fur. Its eyes have a most peculiar obliquity, which gives it a very fierce appearance, being directed upwards in a line with the nose, and the colour of the eyeballs being a fiery green, the ferocity inherent in the animal appears increased. The breath of the wolf is very offensive, and his flesh is said to be rejected by all other carnivorous animals, with the exception of those of his own species. The female goes fourteen weeks with young, and produces five or six cubs at a litter, which she tends and trains with the greatest assiduity for the space of some twelve months, after which she leaves them to shift for themselves. In disposition the wolf is a cruel, cowardly animal, generally attacking such as are unable to resist it; but when pressed by hunger, it will even attack man. The wolves generally hunt and pursue their prey in packs; and in hilly countries, where precipices abound, they often destroy far swifter animals than themselves, by encompassing them in a semicircle, and driving them over some great declivity, where they are dashed to pieces. The wolves then descend by some path, and feast on their victims. The most common variety of the wolf is that found in North America, and termed the black wolf (*Canis nubilus* or *Canis acidulatus*), which is very common throughout the northern and western regions of that continent. The prairie wolf, or prairie dog (*Canis latrans*), is another variety, which has been already described. (*See* PRAIRIE DOG.) The Indian wolf, or laudgah, is a native of Nepal, but is not so numerous. The pouched wolf is another genus belonging to the marsupial classes of animals.

WOOD, *wud*, is that portion of a plant to be found between the pith and the bark. Some of the best known are—*oak*, distinguished for great strength but coarse-grained, and prone to warp and crack under changes from moisture to dryness. *Walnut*, strong and tenacious, but apt to decay when exposed to the weather, and liable to the attack of worms. *Ash*, strong, elastic, tough and light, durable and permanent in its dimensions. *Elm*, which is tough, and does not readily split. *Locust*, one of the hardest, strongest, and most valuable of American native trees. *Beech*, smooth-grained, but liable to decay when exposed to alternate moisture and dryness. *Maple*, smooth, compact, and hard, much used for cabinet furniture and gun-stocks. *Birch* (*Betula papyracea*), with properties similar to those of the maple. *Pine*, remarkably exempt from decay in the open air, and therefore employed for most of the common purposes of timber. *Larch*, strong, elastic, and durable. *Willow*, light and spongy. *Mahogany*, beautifully coloured, hard, and not liable to warp or crack. *Box*, smooth, compact, tough. *Lignum vitæ*, dark-coloured at the heart, strong, exceedingly hard, and so heavy as to sink in water.

WOOD-ENGRAVING.—The art of producing raised surfaces by excision on blocks of wood, from which impressions can be transferred to other surfaces, was undoubtedly known to the Egyptians; but they appeared to have used their wooden stamps solely for the purpose of stamping on clay or other ductile material, and the earliest application of wood-engraving to the production of a book is supposed to have been in China, about the middle of the 10th century. In Europe, the first application of the wood-engraving took place in Germany, about the close of the 14th or the beginning of the 15th century, and was probably first used for the production of playing cards, the outlines of which were formed by impressions from woodcuts, and the colouring filled up by hand. The art made rapid progress; and the next great step was the production of books printed from wooden types, and illustrated with pictorial wood-cuts. Towards the close of the 15th century, the art had attained an excellence which induced artists of celebrity and talent to select it as the means of conveying their designs to the world. From the end of the 16th century the art to a great extent declined; but at the close of the 17th century, a certain Mr. Bewick devoted himself with enthusiasm to the art, and from that time it has continued to flourish. Originally, various kinds of wood, such as plum-tree, beech, mahogany, and pear-tree, were employed for wood-engravings, and are still frequently employed for coarse work; but there is no wood so suitable for this purpose as box, as it combines all the qualities necessary to admit of the most delicate execution. Upon a good piece of the small close-grained English box, the finest line can be preserved in unbroken smoothness. The tools of the wood-cutter consist exclusively of gravers, small gouges, and chisels. The block is placed on a small circular leathern cushion filled with sand, which affords not only a firm rest to the smooth wood, but permits it to be freely turned in all directions. The graver is held and used in a manner peculiar to this kind of engraving. The butt of the handle rests against the palm of the hand, three of the fingers closing round it, while the thumb is projected forward upon the block, serving at once as a rest for the blade and a check to regulate the force in cutting, the motions of the tool being regulated by the fore-finger. When an engraved block is damaged, or a serious error made, the only remedy is to drill out the part to the depth of about half the thickness of the wood, and to insert a tight-fitting plug, tapered at the bottom to insure its being driven *home*. The top of the plug is made level with the surface of the block, and the part re-drawn and engraved. The comparative merits of wood and steel engraving have sometimes been much discussed. The fact appears to be, that each is best suited for the production of certain effects. There is a certain mellow richness of tone about a highly finished line print which cannot be rivalled by an engraving on wood; and on the other hand, the latter is unrivalled for the production of broad bold contrasts and sparkling sketchy effects. The special advantage, however, which wood-engraving possesses over all other forms of graphic art, is its applicability to the purposes of book-illustration in the form of *text-cuts*, that is, cuts inserted and printed in the pages of type.

WOOL, ALPACA. (*See* ALPACA WOOL.)

WOOL, WOOLLEN MANUFACTURE, *wull*, *wul'-len* (SAX. *wul*, wool).—The term *wool* is used somewhat indefinitely, but is most generally applied to the fine hair of the sheep. The covering of the original sheep consisted of a mixture of hair and wool, the wool being short and fine, and forming an inner coat, and the hair of greater length, projecting through the wool and constituting an external covering. Wool has always formed the principal material of the clothing of mankind in most temperate regions. The filaments of wool taken from a healthy sheep present a beautifully polished and even glittering appearance. The fibres of wool are either straight or crooked. The division into locks, formed by the coherence of the single fibres, varies in every species of wool, and forms what is called the *staple*. The body of wool which is shorn in connection from one animal is called a *fleece*. The wool of the same animal differs much on the various parts of the body; that on the back and sides is the best. The great difference in the wool of different sheep depends in general upon their descent, the crossing of breeds, climate, food, and manner of living; and among the individual animals of the same breed, upon age, sex, and outward circumstances; the wool is, therefore, divided into coarse wool, which is long, either straight or irregularly curled, and fine wool, which is regularly curled. Eight or ten different kinds are frequently found in a single fleece. The qualities which mainly govern the classification and commercial value of wools are:—1. The fineness of the fibre; 2. its softness and elasticity; 3. soundness of staple; 4. colour; 5. cleanness; 6. length of staple. The average diameter of the coarsest of the wools used in the arts is $\frac{1}{440}$th of an inch, whilst that of the fine sorts of wools ranges from $\frac{1}{1000}$th to $\frac{1}{2500}$th of an inch in diameter. If a lock of wool be held up to the light, it will be perceived that all its fibres are twisted into

corkscrew-like ringlets; and if the fibres be subjected to a powerful microscope, they will be seen to consist of central stems, from which spring circlets of tiny leaf-shaped projections. In the finer sorts of wool these projections present at first the appearance of minute serrations, like the teeth of a saw, but on closer inspection they resolve themselves into leaves or scales. These imbrications form an important element of the felting properties of wool. In weight of fleece, the ordinary short-woolled sheep of Great Britain vary from 1½ lb. to 3½ lb.; and the ordinary long-woolled breeds from 3 lb. to 16 lb. It is not easy to form any very trustworthy estimate of the number of sheep, or of the quantity of wool produced in Great Britain, but we shall probably be near the truth if we state that there are about 50,000,000 sheep, producing about 600,000 packs of wool. The quantity of wool (sheep, lamb, and alpaca) imported into the United Kingdom from various countries was, in 1859, as follows:—

| | | |
|---|---|---|
| 1. Spain | 153,874 | lbs. |
| 2. Germany | 12,036,125 | ,, |
| 3. Other countries of Europe | 27,145,518 | ,, |
| 4. British possessions in South Africa | 14,369,343 | ,, |
| 5. British possessions in East Indies | 14,363,403 | ,, |
| 6. British settlements in Australia | 53,700,542 | ,, |
| 7. South America | 9,759,779 | ,, |
| 8. Other countries | 1,856,050 | ,, |
| Total | 133,284,634 | ,, |

From 1660 to 1825 the export of wool from Great Britain was strictly prohibited; but at present about 40,000,000 lb. of British, foreign, and colonial wool are annually exported from these islands.—*Manufactures of Woollens.* In England the arts of spinning wool and manufacturing the yarn into cloth were undoubtedly introduced by the Romans. The manufacture of broad-cloths was established soon after the year 1200, if not previously. In 1337, an act was passed prohibiting the wearing of any cloths made beyond seas, and from that period the manufacture has always been regarded as of primary importance. The annual value of the woollen manufacture of Great Britain is estimated at about twenty millions sterling. Wool grown in England is but little used in the manufacture of the ordinary broad-cloth, being chiefly used for flannel and coarse cloth, such as that employed for coachmen's great coats. The three varieties of wool principally employed in the manufacture of broad cloth are the *German wool*, the *Australian wool*, and the *Cape wool*. After the bags of wool are delivered at the manufactory, they are first *sorted*, or divided into various qualities, generally called *prime*s, *seconds*, and *thirds*. The wool is then scoured or washed, to get rid of the animal grease. This is done at the dye-house, with stale urine, heated to about 120°, and which is afterwards washed out in running water. The wool is now fit for dyeing, or it may be deferred until the cloth is woven: in the one case, the cloth is said to be *wool-dyed*; in the other, *piece-dyed*. After the wool is dyed, it is passed through the *twilly-devil*, or *tucker*, which consists of a large wooden cylinder, having strong iron spikes, about three inches long, projecting from it, in a spiral direction, round its circumference. The wool, passing between feeding-rollers, is exposed to the action of the spiked cylinder, which, revolving with great rapidity, tears apart the fibres of the wool, and allows any dust or dirt to fall through a grating beneath. After this, the wool is picked over, in order to remove seeds, pieces of string, or other substances. This process is now generally performed by what is called the *burring machine*. After the wool has been picked, it is oiled, previous to passing through the *scribbler* and *carder*, which is very similar in principle to the carding-machine used in the cotton manufacture. The rovings produced by the carder are the first commencement of the thread; but in order to obtain strength, they require to be twisted, and for this purpose are submitted to the action of the *slubbing-billy*. The threads are now ready for weaving into cloth. The first operation which the cloth undergoes after it is woven is *braying*, the object of which is to get rid of the oil used preparatory to spinning. The cloth is then *milled*, *i.e.*, the fibres of the cloth are felted together, and the whole surface of it covered with a thick, fulled face, by means of being submitted to the action of soap and water. After this process, comes that of *teazling*, by which the cloth is roughed both ways by the prickly flower-heads of the teazle. The filaments drawn out by teazling are of unequal length, and require to be shorn to make them level. The next of the finishing processes is to arrange the cloth in regular folds, and submit it to the action of a hydrostatic press.

WOOLSACK, *wool'-sak*, is the name given to the seat of the Lord Chancellor of England, in the House of *Lords*, on account of its being a large square bag of wool, without back or arms, and covered with red cloth.

WORLD, AGES OF. (*See* AGES OF THE WORLD.)

WORM, EARTH. (*See* EARTH-WORM.)

WORMS, *wurmz* (Sax. *wyrm*, a worm) parasitical animals which infest the intestinal canal of man. They are of five different kinds,—the *Ascarides*, or small thread-worms, varying from an eighth of an inch to one and a half inch in length, and have usually their seat in the rectum, or last gut; the *Lumbrici*, or long round worms, from two or three, to ten or more inches in length, and usually occupy the small intestines, and sometimes the stomach; the *Trichuris*, or long, hair-tailed thread-worm, occupying the cæcum; and the *Tænia*, or tape-worm, of which there are two kinds, occupying the whole tract of the intestines, and sometimes thirty or forty feet in length. Worms appear most frequently in those of a relaxed habit with weak digestive organs. An excessive use of fruit and vegetables, or sugar, or any other highly nutritive substance, favours the generation of worms. From the highly organized and sensitive parts which they occupy, worms give rise to great constitutional derangement, and produce a variety of symptoms, more particularly affecting the stomach and head. Among these are, variable appetite; fœtid breath; picking of the nose; hardnes and fulness of the belly; sensation of heat and itching in the anus; preternaturally red tongue, or alternately clean, and covered with a white slimy mucus; grinding of the teeth during sleep; short, dry cough; frequent slimy stools; emaciation; slow fever, with an evening acerbation; irregular pulse; and sometimes convulsions or fainting-fits. The treatment must be of a tonic and strengthening character, together with an avoidance of vegetable and saccharine food. For the removal of the smaller kinds of worms, purgatives of the submuriate of mercury, scammony, aloes, rhubarb, &c., are recommended. For the removal of the tape-worm, turpentine has been found to be the most useful remedy. It is best given alone, in a dose of half an ounce, on an empty stomach, followed, after an interval of two hours, by an ounce of castor-oil, or a full dose of any brisk aperient.

WOUND, *woond* (Sax. *wund*), is defined as "a solution of the continuity of a soft part of the body, effected by some external agent, and attended with a greater or less amount of bleeding." Wounds are of various kinds, and are generally distinguished as incised, lacerated, contused, and punctured. An incised wound is a simple division of the fibres made by a sharp cutting instrument. A lacerated wound is one in which the fibres, in place of being cleanly divided by a sharp instrument, are torn asunder by violence, the edges of the wound being in this case jagged and uneven. A contused wound is one made by a violent blow from some blunt instrument, the part being bruised as well as torn. A punctured wound is one made with a narrow pointed instrument, as a sword or bayonet. Wounds are dangerous, according to the extent of soft parts which they involve, the parts they occur in, and the state of health of the individual. In incised wounds the first thing to be attended to is to stop the hæmorrhage. This is usually accomplished by simply bringing the edges of the wound together; but if any of the larger blood-vessels have been injured, pressing the trunk, by means of a bandage or tourniquet, will be necessary; and should this not succeed, the vessels must be secured with liga-

tures. Next, care should be taken that all extraneous substances are removed from the wound. Then the edges of the wound are to be brought together, and retained either by straps of adhesive plaster, or in some situations by one or two stitches. Generally such wounds heal very quickly, without any suppuration taking place, or, as it is said, "by the first intention." When, however, this is not the case, and suppuration comes on, all attempts to procure union by the first intention should be abandoned, the plasters and bandages removed, poultices and warm dressings had recourse to to remove inflammation, and afterwards healing ointments applied. Lacerated and contused wounds require to be similarly treated; but they heal less kindly, and suppuration almost always takes place. The swelling and inflammatory symptoms which commonly attend contused wounds are to be diminished by cooling lotions or emollient poultices. Punctured wounds are dangerous from their depth, and the internal effusion of serum and blood which usually attends them. They are frequently also followed by severe inflammation and suppuration. The same general principles apply in this case too. Sometimes it may be necessary to enlarge the wound a little, so as to remove the stretching of the parts; and to lessen the inflammation, leeches and fomentations are often required. (*See* GUNSHOT WOUNDS.)

WRANGLER, *răng'-gler*, a contentious disputant, and, in the university of Cambridge, the term is applied to students who have passed their mathematical examination for B.A. with honour, from the circumstance of their having at one time to oppose or defend a thesis in public. The students who pass their B.A. examination with honour are divided into three classes,—junior optimes, senior optimes, and wranglers,—constituting the mathematical tripos. The first in merit of the wranglers is known as senior wrangler, and is the most distinguished mathematical student of his year. (*See* CAMBRIDGE, UNIVERSITY OF.)

WRIT, *rit*, in Law, properly signifies a writing under the king's seal, conferring some right or privilege, or commanding something to be done. Writs are either *patent* (open) or *close* (sealed up), or supposed to be so; the former addressed to all persons indiscriminately, the latter to some particular officer or other person. More commonly, however, it is a writing issuing out of some court, directed to the sheriff or other officer, commanding or commissioning something to be done in relation to a suit or action. In civil actions, writs are either original or judicial; the former issuing out of the court of Chancery, and summoning the defendant to appear; the latter issuing out of the court where the original is returned, after the suit is begun. There are a variety of other kinds of writ; as writ for the election of members of parliament, writ of habeas corpus, writs of subpœna, writ of inquiry, &c. The act 3 & 4 Will. IV. abolished a great number of different kinds of writ.

WRITER, *ri'-ter*, in Scots Law, is a general term applied to all legal practitioners who do not belong to the bar, and corresponds to attorney in England. In each county they generally form a society among themselves, with their own by-laws, and regulating the terms of admission to their body. They enjoy the right of practising before the sheriff and other courts in their own county. *Writers to the Signet* (W.S.) are a legal body in Edinburgh, who enjoy the privilege, along with one or two similar bodies, of conducting cases before the Court of Session. Their peculiar privilege, however, is the preparing of all writs requiring to pass the royal signet, as summonses in all ordinary actions to be brought before the Court of Session, though a member of one of the other privileged bodies may conduct the case. They have likewise the right of preparing the warrants of all charters of lands flowing from the crown, &c.



## X.

X, *eks*, is the twenty-fourth letter of our alphabet, and is a double consonant, having the sound of *ks*. We have derived it from the Greek through the Latin. The Italians never use it, but employ instead *s*, or when it immediately precedes *c*, another *c*, as in *eccellente*. The Germans commonly in place of *x* use *ks*, *gs*, or *chs*; as *fuchs*, a fox. In French *x* has a variety of pronunciations, as *s*, *cs*, *gs*, and *z*. This letter interchanges with *c*, *cc* or *ck*, *g*, *ge*, *h*, and *s*. By the Romans denoted 10, as being composed of two Vs; when placed thus ⋈ it signified 1,000, and with a dash over it 10,000. (*See* ABBREVIATIONS.)

XANTHORRHŒA, *zăn'-tho-re'-ă*, in Bot., a gen. of the nat. ord. *Liliaceæ*. The species are natives of New South Wales, where they are commonly known as grass-trees. Their tops afford fodder for cattle, and their young leaves and buds are eaten as a table vegetable. Two fragrant balsamic resins are obtained from species of this genus; the one is known as yellow resin of New Holland, or Botany Bay resin; the other as red resin of New Holland, or Black-boy gum.

XANTHOXYLACEÆ, *zăn-thoks-e-lā'-se-e*, a nat. ord. of *Dicotyledons*, sub-class *Thalamifloræ*, closely allied to *Rutaceæ*. The plants of the order are trees or shrubs, most abundant in the tropics, but especially in tropical America. They are generally characterised by pungent and aromatic properties, and have been employed medicinally as stimulants. The species of the typical genus *Xanthoxylon* possess in a remarkable degree the aromatic and pungent properties common to the order; hence they are popularly known as peppers in their native countries. In America they are also known under the name of prickly ash. The fruit of *X. piperitum* is employed by the Chinese and Japanese as a condiment, and as an antidote against all poisons. In commerce it is called Japanese pepper.

XYLOPIA, *zi-lo'-pe-ă*, in Bot., a gen. of the nat. ord. *Anonaceæ*. *X. aromatica*, commonly known as *Piper æthiopicum*, has aromatic fruit, which when dried is used medicinally by the African negroes on account of its stimulant and carminative effects, and also as a condiment. *X. undulata* has nearly similar properties. *X. glabra* yields the bitter-wood of the West Indies, which has tonic properties.

XYRIDACEÆ, *zi-ri-dā'-se-e*, in Bot., the *Xyris* fam., a nat. ord. of *Monocotyledones*, sub-class *Petaloideæ*, consisting of sedge-like herbaceous plants found in tropical and sub-tropical regions.

## Y.

Y, *wi*, is the twenty-fifth letter of the English alphabet, and is used sometimes as a vowel and sometimes as a consonant. It is a consonant at the beginning of words, when it is produced by the emission of the breath, whilst the root of the tongue is brought into contact with the hinder part of the palate, and the edges of the tongue pressed against the roof of the mouth. At the end of words it is a vowel, and has exactly the sound of *i*. In the middle of words it usually takes the place of *y*; but where it occurs it has the same sound. In English the sound of *y* is usually given to a word beginning with a long *u*, as *union*, *unify*. In numerals *y* represented 150, and with a dash over it 150,000. (*See* ABBREVIATIONS.)

YACHTING, *yot'-ing*, is one of the great national pastimes of the people of Great Britain; the whole circle of our coast being dotted with the club stations of the many yachting societies. These fine specimens of naval architecture may be broadly divided into two classes,—the racing and the sea-going yacht. The first has the finest imaginable lines, but comfort is subordinated to speed. In the sea-going yachts, every precautionary appliance against the wars of the elements is to be met with. France, following the example of England, has, within the last few years, become possessed of a fleet of pleasure and racing yachts, whilst the Emperor Napoleon's sea-going yacht, the "Queen Hortense," is second only to Her Majesty's vessel, the "Victoria and Albert," as a specimen of brilliant naval architecture. A semi-official list for 1860 records the names of 1,195 decked club-yachts owned by the peers and wealthy commoners of Great Britain. These yacht clubs, which have now been in existence during more than thirty years, have vastly contributed to the improvement of the lighter class of sea-going vessels.

YAMS. (*See* DIOSCOREA.)

YANKEE, *yăn-ke'*, is said to be a corruption of the word English, pronounced by the Indians *Yengeese*, and is now the popular name for the New Englanders in America, but frequently applied in this country to all inhabitants of the United States. *Yankee-doodle* is the name given to the national air of the United States. It originated in 1755, when the British colonies in America contributed their several quotas of men to aid the British army in reducing the French power in Canada. Their rawness and awkwardness became the sport of the British army, and an English physician named Shackburg composed a tune and recommended it, by way of joke, to the Americans, and it immediately became celebrated.

YARD. (*See* WEIGHTS AND MEASURES.)

YAWNING, *yawn'-ing*, in Phys., consists of a deep and slow inspiration and expiration, attended with an involuntary opening of the mouth. It is generally produced by weariness or an inclination to sleep; sometimes by hunger, sympathy, &c. It often precedes the fit in some intermittent fevers, and in some instances its recurrence is as frequent as to become a real disease. It is generally supposed to be occasioned by some obstruction in the pulmonary circulation, and may frequently be got rid of by a deep inspiration.

YAWS. (*See* FRAMBOSIA.)

YEAR, *year*, in Chron., is that period comprised in the revolution of the earth around the sun. In ancient times, when it was believed that the sun moved about the earth, this period was termed the *solar year*. Accepting the authority of Herodotus, the Egyptians were the first who ascertained the length of the solar year. They divided it into twelve months, each month consisting of thirty days. The Greeks more accurately divided the year into 365¼ days, and the Grecian astronomer Sosigines made this the foundation of the Julian calendar. (*See* CALENDAR.)

YEAST, *yeest* (SAX. *gist*), a peculiar substance, of a vegetable nature, formed when the juices of plants or fruits containing sugar are kept at a temperature of 70° or 80° Fahr. for some hours. Upon examining a fermenting liquid under the microscope, it is seen to contain myriads of minute vesicles or cells of about the three-thousandth of an inch in diameter, containing a nucleus and some granules. All these globules will be seen to enlarge until they attain a certain size. They will then throw out a projection at some point of the cell-wall, which will grow larger and larger until it reaches the size of the parent cell. When fully developed, it separates and goes through the same process of germination. The rapidity of the growth depends on the temperature; with the thermometer at 78° sixteen cells have been seen to develop from one. The plant thus formed has the singular property of transforming sugar into alcohol and carbonic acid during its growth. Its efficacy in this respect may be easily proved by adding a little yeast to a solution of sugar-and-water. If the mixture be exposed to a temperature of about 80°, carbonic acid will be liberated in an hour in great abundance. Yeast, when in an active condition, always exhibits an acid reaction. If thoroughly washed, its power is lessened and it is checked entirely by the presence of the vegetable and mineral acids, certain metallic salts, some of the alkaloids, small quantities of creosote, and the essential oils and spirits of turpentine. Mascherlich, to whom we owe much of our information on this subject, states that there are two kinds of yeast,—*surface yeast* and *under yeast*, which are propagated in different ways and produce specific effects on the fermenting liquid. The surface yeast is developed at a temperature of from 70° to 80°, and is longer in producing its effect than the other form. It develops itself by throwing off buds, as has already been described. The under yeast is the ferment used in making Bavarian beer, and is formed slowly at a temperature between 45° and 32°. No lactic or acetic acid is formed at this temperature; the beer produced by its means is therefore much milder than when the surface yeast is used. Under yeast consists of isolated globules of various sizes, which are propagated by throwing out spores from the large cells, and not by buds and offshoots, as in the former case. The existence of these two varieties of yeast is questioned by several very acute observers. The theory of the action has not yet been clearly made out, and is still in a very unsatisfactory condition. The yeast-plant seems to be closely connected with the vinegar-plant, and several similar forms of fungi, which produce fermentation, if not precisely identical with them.

YEAST-PLANT. (*See* PENICILLIUM.)

YELLOW FEVER, *yel'-lo*, is a disease peculiar to warm countries, more particularly in low-lying districts near the sea-coast, and is of frequent occurrence on the east and west coasts of America, in the West Indies, and in Africa. The most marked characteristics of this disease are a yellowness of the skin, general or partial, and the vomiting of a black or dark-coloured fluid when about to terminate fatally; but these features are not always present. Otherwise it has the character of a common remittent fever. The mortality from this disease is always very great, more particularly among the young and robust; and hence it is very fatal among armies and navies. Its attack is sudden, but it is usually preceded by a feeling of weakness and restlessness, followed within a few hours with faintness, giddiness of the head, with a small degree of chilliness, and sometimes actual shivering. This is immediately succeeded by a high degree of fever, with great heat and strong beating in all the arteries of the body, particularly observable in the carotid and temporal arteries; flushings in the face, gaspings for cool air, white tongue, but tinged with yellow, after the retchings have commenced; excessive thirst, redness, heaviness, and burning in the eyes; heaviness and darting pains in the head and small of the back, and often down the thighs; pulse quick, generally full and strong, but sometimes low and vacillating; skin hot and dry; sickness of stomach, followed by retchings, in which bilious matter is brought up; soreness and intense heat about the præcordia; anxiety, great restlessness, heavy respiration, sighing, scanty and deeply-coloured urine. This is the first or inflammatory stage of the fever, and may continue from 24 to 48 or 60 hours. It is succeeded by a sudden abatement of most of the preceding symptoms, and sometimes there is a deceiving tranquillity. The retchings are still violent, but the pulse flags; the heat subsides, the skin is soft and clammy; the urine small in quantity, and of a dark croceous colour; a yellow tinge is observed in the eyes, neck, and breast, which afterwards extends itself over the whole body; the tongue, in some cases, is dry, harsh, and discoloured, in others furred and moist; there is confusion in the head, and sometimes delirium, with the eyes glassy. This stage may continue from 12 to 48 hours, but never longer. In the third and last stage, the pulse sinks, and becomes unequal and intermittent, sometimes very quick; the vomiting is frequent, with great straining and noise, and latterly is of a dark and mucous-looking fluid, which has been called the black vomit. The countenance becomes more and more collapsed; the eye loses its full and prominent character; dark-coloured blotches and petechiæ occur on the body; the exhaustion becomes greater; the respiration hurried and noisy; the surface and extremities cold and covered with a general clammy perspiration, till at length death supervenes. Sometimes the disease proceeds with fearful rapidity, and the patient is carried off in four-and-twenty hours. With respect to the treatment of this disease, much difference of opinion prevails. It may, however, be safely stated that the remedies should be directed to meet the particular forms of the disease, — antiphlogistic in the inflammatory, and stimulant in the exhausted stages. Hence, at the commencement of the attack, blood-letting is recommended wherever the patient will bear it. All the depurative functions require to be kept in activity by doses of mercury, purgatives, and diuretics. Mercury indeed is spoken of as one of the most important remedies in this disease. Many also speak very highly of morphine as a remedy; but it requires to be administered with great caution, particularly where there is any tendency to suppression of urine. Gum-water is recommended for lubricating, defending, and soothing the raw surfaces. Cupping, leeching, and blistering have been found useful in relieving the primary head symptoms, and irritability of stomach, when applied respectively to the nape of the neck or epigastrium.

YEW. (*See* TAXUS.)

# Z.

*Z, zed*, is the twenty-sixth and last letter of the English alphabet. It is a sibilant or hissing letter, and the only difference in pronunciation between it and *s* is, that the breath is emitted more forcibly in the case of the latter,—the organs of the mouth are in the same position in both cases. This letter is derived from the Greek, in which language it occupies the sixth place in the alphabet, and some have supposed that with them it had the sound of our *g*; as we find in the Scotch name Menzies, pronounced *Ming-es*. In German the *z* has a compound sound, corresponding to our *ts*; and in Italian it is sounded sometimes like *ts*, sometimes like *ds*. In Spanish it has the sound of *th*; and in French, when sounded at all, like a forcible *s*. It interchanges with *d, g, i, j, s, t, y*. As a numeral it signifies 2,000, and with a dash over it 2,000,000.—(*See* ABBREVIATIONS.)

ZEA, *zē'-ă*, in Bot., a gen. of grasses. *Z. Mays* is the Indian corn or maize-plant, the grain of which is extensively used in warm countries. It is the most fattening of all the cereals, but it frequently produces diarrhœa. Maize-meal is sold under the name of *polenta*, and maize-starch under the names of *corn-flour, maizena*, &c. In South America, a kind of beer, called *chica* or *maize beer*, is prepared from this grain, and in Western Africa a favourite fermented beverage called *pitto* or *peto*.

ZEBRA, *zē'-brā*, a peculiar variety of the gen. *Equus*, which is found in South Africa. The eminent naturalist Buffon described the zebra as being the best-made and most beautifully clad of all the quadrupeds. To the figure and gracefulness of the horse it adds the elegance and swiftness of the stag, whilst its skin is as smooth as satin, and beautifully adorned with black and white bands, arranged with wonderful regularity and beauty. These bands are narrow, parallel, and exactly separated, and, unlike the case in the quagga, extend not only over the body, but over the head, ears, thighs, and legs. In the female, they are black and white, but in the male they are black and yellow; but always of a brilliant tint, so as to enable them to stand out, as it were, from the coat. The ground-coat is composed of fine hair, which adds to the general effect by giving it a satin or velvety appearance. The zebra is closely allied to the ass, having its tail furnished with long hairs only at its tip, and being destitute of a mane like the horse. They also, according to Dr. Gray, come more strongly under the sub-family *Asinus* by being deprived of horny warts inside the hind legs. There are three varieties of the family, one of which, the quagga, has already been noticed. Of the remaining two, the common or hill zebra (*Equus Zebra*) is the handsomest, having the stripes on all parts of its body. It inhabits the rocky and mountainous districts of South Africa, and is rarely seen on level land. In disposition it is very wild and untameable, seeking inaccessible crags where to grase, and having sentinels posted on commanding eminences so as to give warning of the approach of any suspicious object; and, no sooner is an alarm given than the herd sets off, galloping over the crags with a swiftness which sets pursuit at defiance. The remaining variety is termed Burchell's zebra (*Equus Burchelii*), which, like the quagga, inhabits the plains which stretch across the table-land contiguous to the Cape. This is covered with brown and white stripes, the brown ones being seemingly double, having a greyish one within them, and the legs are white, unlike those of the mountain zebra. In swiftness and beauty of appearance all these varieties, however, closely agree, and all live in vast herds, and roam about the country together. It is said they go as far north as Abyssinia; but this has not been exactly proved, and is consequently open to doubt.—The remaining characteristics of the family will be found given under the general article EQUUS.

ZECHARIAH, BOOK OF (*zek-ă-rī'-ă*), is one of the canonical books of the Old Testament Scriptures; being the eleventh in order of the minor prophets. The author, Zechariah, began his prophecy in the second year of the reign of Darius, shortly after the return from Babylon, where he is generally supposed to have been born. The book consists of four general divisions: 1. The introduction, or inaugural discourse (ch. i. 1—16).—2. A series of nine visions, extending onwards to the end of chapter vi., communicated to the prophet in the third month after his installation.—3. In chapter vii., the Jews inquire whether they are still to observe the fasts that had been instituted on account of the destruction of Jerusalem, and the prophet takes the opportunity of enforcing upon them the weightier matters of the law.—4. The four following chapters contain a variety of prophecies unfolding the fortunes of the people, their safety in the midst of Alexander's expedition, and their victories under the Maccabees, including the fate of many of the surrounding nations; while the remaining three chapters portray the future condition of the people, especially in Messianic times. The style of this book is deficient in the purity and freshness of a former age, and the figures and symbols are frequently obscure, though, with the exception of Isaiah, his allusions to the Messiah, and his kingdom, are the most clear and direct of any of the prophets. Many of the modern critics have denied the authenticity of the last six chapters, though there seems to be little force in their objections.—*Ref.* Horne's *Introduction to the Holy Scriptures*.

ZEND-AVESTA, *zend-ă-vest'-tă* (Pers., living word), is the name given to the sacred books of the Parsees, the descendants of the ancient Persians. The authorship of the books is ascribed to Zoroaster, the founder of their religion. The Zend language, in which they are written, is very ancient, and bears a great affinity to the Sanscrit. The general opinion is, that the Zend-avesta, as it at present stands, is a collection made about A.D. 220, of the remains of more ancient writings respecting their religion; though how far these are to be attributed to Zoroaster it is of course impossible to say. The Zend-avesta consists of five books, the greater part of which are said to have been revealed by Ormuzd, the good spirit, to Zoroaster. They treat of the creation of the world; of the two antagonistic principles, Ormuzd, or the good spirit, and Ahriman, the evil spirit; of the various kinds of genii or inferior evil spirits; of a future state of rewards and punishments, &c. Another part consists of a collection of short prayers and hymns, addressed to the different genii, moral sentiments, &c.

ZENITH, *zen'-ith*, an Arabic word used in astronomy, denoting the point of the heavens directly over the head of the observer. The zenith is called the "pole" of the horizon, as it is 90° distant from every point of that circle. The zenith distance of a heavenly body is the arc intercepted between the body and the zenith, being the same as the co-altitude of the body.

ZENITH SECTOR, an instrument which is a portion of a divided circle, and is employed in measuring the zenith distances of stars. The origin of the beautiful instruments now made use of by astronomers was a piece of mechanism devised by Picard in his celebrated operation for determining the figure of the earth. For drawings and descriptions of this instrument, the student is referred to the *English Cyclopædia*, and to Pearson's *Practical Astronomer*, vol. ii.

ZEPHANIAH, BOOK OF, *zef-ă-nī'-ă*, is one of the canonical books of the Old Testament, the ninth in order of the minor prophets. The author is believed to have flourished during the earlier portion of the reign of Josiah. The book contains only three chapters. In the first the sins of the nation are severely reprimanded, and a fearful day of retribution menaced. In the second repentance is pointed out as the only means of averting the divine vengeance; and the ungodly and persecuting states in the neighbourhood of Judæa are doomed. In the third chapter, the captivity of the Jews by the Babylonians is foretold, together with their final restoration, and the ultimate prosperous state of the Church. The style is pure and poetical, but not characterised by any striking or uncommon beauties.

ZEUGLODON, *zoog'-lo-don* (Gr. *zeugos*, yoke; *odous*, tooth), a tertiary mammal of the whale kind, so named by Professor Owen, from the peculiar form of its molar teeth. Dr. Harlan described the remains of a

skeleton, between seventy and eighty feet in length, first discovered in the eocene strata of Arkansas and Alabama, and under the supposition that it belonged to an enormous reptile, called it Basilosaurus (king of the lizards); but the more correct investigations of Professor Owen having shown it to be a tertiary mammal of the whale kind, the term Zeuglodon was given to it.

*Zinc, sink* (Ger.).—Zinc is a bluish-white lustrous metal, having a crystalline lamellar structure, moderate hardness, a somewhat low melting-point. To obtain it pure, commercial zinc, or spelter, as it is termed, is dissolved in pure dilute sulphuric acid; a cement of sulphuretted hydrogen is then passed through it, and it is filtered from any precipitate formed. The solution is then boiled to expel any sulphuretted hydrogen that may remain in it, and the zinc is precipitated in the form of carbonate by pure carbonate of soda. The carbonate is then ignited to transform it into oxide of zinc, which is distilled in a porcelain retort with charcoal prepared from loaf-sugar. Zinc is brittle at ordinary temperatures, but is possessed of considerable malleability and ductility at a temperature of between 200° and 300°, and may be wrought and rolled with ease. A little above this it becomes brittle again, and may be pulverized in a mortar. It fuses at 773°, and at a bright red heat it may be volatilized. If its vapour is exposed to the air, it burns with great splendour, becoming converted into oxide, which is deposited in loose flocculi. At the ordinary temperature it is not acted on by the air, but when exposed to moist air or oxygen, it becomes covered with a tenacious grey coating of hydrated oxide, which impedes the further oxidation of the metal beneath. In this respect zinc rust differs from iron rust, which seems to accelerate the oxidation of the subjacent metal. By the conjoint action of oxygen and carbonic acid, zinc roofing becomes converted into a mixed oxide and carbonate. When melted in the air, the oxide is formed much more rapidly. The metal is readily dissolved by the mineral and vegetable acids. Boiling solutions of potash also act on zinc, hydrogen being liberated, and oxide of zinc remaining dissolved in the alkaline solution. The difficultly oxidizable nature of zinc, its cheapness, the ease with which it is extracted from its ores, and the ready way in which it may be worked, are bringing it daily more and more into use. Neither the vapour nor its oxide is poisonous. It is of the greatest use in the laboratory, for the precipitation of certain metals and for the formation of hydrogen. For voltaic purposes it is indispensable, and its principal alloy, brass, is too well known to need description. It forms alloys with iron and several other metals. The so-called galvanic iron is iron covered with a protective coating of zinc. It also enters into the composition of German silver. The origin of the term *zinc* is lost in obscurity; it was first employed by Basil Valentine, but the great Paracelsus was the first to associate the word with a metal possessing the characters of zinc. It hardly seems probable that zinc was known to the ancients. An obscure passage in Strabo seems to show that a certain stone was found to drop *false silver* when melted, but there is little to show that this *false silver* was zinc. It is positive, however, that its alloys were known to the later Romans, for numerous coins have been found containing copper and zinc nearly in the proper proportions to form brass. It was not until the beginning of the last century that zinc was commercially extracted from its ores in Europe. Before this, however, it was imported by the Portuguese and others from the East Indies and China, under the name of *tutenag* and *spelter*. It seems first to have been made in this country by Mr. Champion, of Bristol, about the year 1743. Long before zinc was known as a metal, brass was made in large quantities by heating metallic copper embedded in a mixture of calcined calamine and carbonaceous matter. This was effected in large crucibles, which were exposed to a long-continued heat in furnaces constructed for the purpose. The zinc immediately on its liberation from the calamine of course united with the copper without giving any notice of its presence. The only use to which zinc was applied for many years after its discovery was for mixing with copper to form brass; and it was comparatively of late years that the fact of its becoming ductile and malleable when heated was made known. A patent was granted to the discoverers of this property, Sylvester and Hobson, in 1805, since which period the zinc manufacture has made steady progress. Zinc has a considerable power of dissolving iron; in consequence of which the iron pots in which it is melted soon become corroded and unfit for use. Its specific gravity varies, according to the closeness of texture of the sample, from 7·03 to 7·2, or even 7·3. Zinc is abundantly distributed in the form of various ores throughout the whole known world. Its principal ores are *red zinc ore*, which is found and worked in New Jersey, United States. It consists of oxide of zinc, coloured with binoxide of manganese; *carbonate of zinc*, or *calamine*, found extensively in the Devonian and carboniferous formations of most countries. The calamine-mines in this country are nearly worked out, only 285 tons having been raised in 1859, the amount in 1860 being 1,500 tons. *Hydrated silicate of zinc*, which is worked extensively in the United States; *sulphide of zinc, blende*, or *black jack*, which is met with in large quantities in various parts of England and Europe. The amount raised in England in 1859 was about 13,000 tons. In the extraction of zinc from its ores, the blende or calamine is first crushed between rollers and roasted. In the case of the blende this is a tedious process, and requires great care. The result in either case is oxide of zinc, which is mixed with half its weight of powdered coke or anthracite, and introduced into crucibles of peculiar construction. A circular furnace is employed, within which the crucibles are ranged. In the bottom of each crucible is an opening, to which a short iron pipe is attached, passing through the bottom of the furnace. To the end of this is affixed a removable tube communicating with a sheet-iron vessel. The hole in the bottom of the crucible having been partially plugged with coke, a charge of ore and coal is introduced, and the top of the crucible luted down. The tube connected with the iron vessel is lowered so as to leave the crucible tube open, and the heat is raised. As soon as the flame at the mouth of the short iron tube begins to turn from white to blue, connection is made with the tube leading to the iron pan, and the zinc gradually distils downwards, partly in powder and partly in stalactitic masses. The crude metal is remelted, skimmed, and cast into ingots. In Silesia and Belgium retorts are used instead of crucibles, or *per ascensum* instead of *per descensum*. Zinc is often known in commerce as *spelter*, the derivation of which term is unknown. The equivalent of zinc, as determined by Erdmann, is 52·53. Its symbol is Zn.—*Oxide of zinc*. Zinc only forms one oxide, ZnO, which occurs in nature as *red zinc ore*. The anhydrous oxide is formed when zinc is burnt in air, and has been occasionally found in four and six-sided prisms in the flues of zinc-furnaces. It is best prepared in the laboratory by calcining the precipitate produced by mixing solutions of sesquicarbonate of ammonia and sulphate of zinc. On the large scale, when it is required as a pigment, it is made by distilling zinc in clay retorts, passing into chambers through which a current of air is maintained. The volatilized metal burns at the high temperature to which it is exposed, and the oxide is deposited in the condensing chambers. As a pigment, it has not met with great success, as it does not wear so well as white lead, from its lesser specific gravity. In situations where it is exposed to sulphurous fumes, it stands perfectly, and being harmless in its nature, it is not open to the objections raised against its poisonous congener. Oxide of zinc forms a light white powder, which becomes yellow when heated, regaining its whiteness when it cools. It is a permanent oxide, even at the greatest heat. When exposed to the air, it becomes converted into a carbonate. It dissolves readily in acids, and its salts have the same form as those of magnesia and oxide of iron, with which it is isomorphous. Its salts, though neutral in composition, have an acid reaction. It is not easily dissolved in solutions of potash and soda, but if fused with them in a silver crucible, it forms compounds soluble in water, in which the oxide of zinc appears to play the part of an acid. The hydrated oxide is formed by adding a solution of potash to the sulphate of

zinc. It is readily soluble in excess of alkaline solutions. In medicine, oxide of zinc is used in ointments as an astringent and desiccant, and by itself as a tonic, especially in cases of nervous debility brought on by drinking. Zinc is said to be a bimoxide, but it requires confirmation. *Nitrate of zinc* is prepared by dissolving zinc in dilute nitric acid. It forms deliquescent four-sided prisms, soluble in water and alcohol. *Sulphate of zinc*, or *white vitriol*, is manufactured on a large scale by roasting native sulphide of zinc (blende), extracting the mass with water, and evaporating to the crystallizing-point. It is generally sent into commerce in white fused masses. Generally speaking, it contains six atoms of water of crystallization; but compounds containing less have been formed. It crystallizes ordinarily in four-sided prisms. It is used in medicine as an emetic, and very largely by calico-printers. It is soluble in 2½ parts of water, but insoluble in alcohol. Several basic sulphates are said to exist. It combines directly with ammonia, forming a definite compound. It also forms double sulphates with those of potassa, ammonia, magnesia, and protoxide of iron. *Carbonate of zinc*, or *calamine*, occurs in nature in large amorphous masses, and occasionally in crystals of the same form as those of carbonate of lime. It is the chief ore of zinc, and is employed in its impure state in medicine as an exsiccant, and in healing cerates. The anhydrous carbonate may be prepared in the laboratory by placing a tube containing carbonate of soda in a strong tube containing sulphate of zinc, sealing the outer tube hermetically, heating it to 320° Fahr., and inverting it so that the solutions may mix: crystalline grains of the anhydrous carbonate are gradually deposited. No neutral carbonate of zinc can be obtained from its salts by double decompositions. *Chloride of zinc* is prepared by dissolving granulated zinc in hydrochloric acid, and evaporating, when it is obtained in a semi-solid hydrated mass, known as *butter of zinc*. If this be further heated, it fuses, becomes anhydrous and solid. It is deliquescent, fuses easily, and may be distilled. It is remarkably soluble in water, and its strong affinity for that substance renders it of great use as a desiccating agent in organic research. In solution it forms Burnett's disinfecting fluid. It is a powerful escharotic when applied to the skin, and is used in surgery for that purpose. It fuses above 700° Fahr., but does not decompose unless more strongly heated; hence, a bath of it is sometimes used for maintaining objects at a high temperature. Its solution absorbs ammoniacal gas with avidity. It forms double salts with the chlorides of the alkaline metals. Its solution is also much used in soldering zinc, iron, and copper. Its solution is also much used for preserving objects for dissection, as it does not corrode the instruments in the same way as corrosive sublimate. Several oxychlorides are said to exist. *Sulphide of zinc*, or *blende*, is found native contaminated with a large number of the other metals. It may be prepared by the direct combination of its elements. The hydrated sulphide is obtained as a white precipitate, by adding an alkaline sulphide to a solution of some zinc-salt. There are several oxysulphides of zinc. The *trisilicate of zinc*, or *electric* calamine, is found native in several parts of the world. Heat develops electricity in it; hence its name. *Valerianate of zinc* is used in medicine in combating nervous disorders.

ZINC ETHYL, a colourless transparent mobile liquid refracting light strongly, boiling at 244° Fahr., and remaining uncongealed at —8° Fahr. It may be distilled unchanged in vessels filled with hydrogen or carbonic acid. It has a powerful but penetrating odour, bursting into flame in the air, and emitting fumes of oxide of zinc. Its evaporation is represented by the formula $ZnC_4H_5$. It is made by digesting iodide of ethyl and hydrous ether and granulated zinc in a sealed glass tube at 266° Fahr. for 12 or 18 hours. (See *Proceedings of the Royal and Chemical Societies.*) The discovery of this singular compound by Frankland has opened up a new field of organic research, and similar compounds have been formed with the other alcohol radicles and several of the metals. Zinc methyl and amyl have also been formed, and resemble zinc ethyl in their properties and preparation. The latter, however, does not inflame in the air. There is hardly any substance known which has so intense an affinity for oxygen and chlorine as *zinc ethyl*.

ZINCOGRAPHY, *zink-og'-ra-fy*, is the art of obtaining impressions from plates of zinc. The practice of the art differs from that of lithography only in this, that in the latter German stones are made use of, whilst in the former method plates of zinc are employed. (*See* LITHOGRAPHY.)

ZINGIBER, *zin'-ji-ber*, in Bot., a gen. of the nat. ord. *Zingiberaceæ*. *Z. officinale* is the ginger-plant, the rhizome of which constitutes the so-called ginger-root, or ginger of the shops. The rhizomes when very young, or the young shoots of old rhizomes, are used for preserving, and form in this state preserved ginger. The ginger of the shops is found in two conditions,—as *white*, or *uncoated ginger*, and as *black*, or *coated ginger*. The former is prepared from the rhizomes by washing, scalding, scraping, and drying; the latter is prepared in a similar manner, but the scraping process is omitted. The essential distinction between the two consists therefore in white ginger having the epidermis removed, while in black ginger it remains as a shrivelled membrane. Ginger is extensively used as a condiment, and in medicine as a stimulant and stomachic.

ZINGIBERACEÆ, *zin-jib-e-rai'-se-e*, in Bot., the Ginger fam., a nat. ord of *Monocotyledones*, sub-class *Petaloideæ*, consisting of aromatic herbaceous plants, with creeping rhizomes, and broad, simple, stalked sheathing leaves, with parallel veins springing from the midrib. The flowers are arranged in a spiked or racemose manner, and arise from spathaceous bracts. There are 31 genera, which comprise about 250 species, mostly tropical. Ginger, turmeric, grains of paradise, and the various cardamoms, are among the products of this order.

ZIRCONIUM, *zir-ko'-ne-um*, the metallic basis of the earth zirconia, contained in the rare minerals zircon and hyacinthon, which are silicates of the earth. It has yet only been obtained as a black powder, which does not conduct a feeble voltaic current. It has not been fused, and only assumes a weak metallic lustre under the burnisher. Heated in air, it forms zirconia of ivory whiteness. Zirconia ($Zr_2O_2$) is its only oxide. It is a white infusible powder, which after ignition is only soluble in sulphuric acid. It forms several salts, of which the sulphate is somewhat interesting. If a solution of sulphate of potash and sulphate of zirconia are mixed together, *sub-sulphate* of zirconia and *bisulphate* of potash are formed. The *chloride of zirconium* forms needles, which effloresce in the air, losing water and hydrochloric acid, and leaving behind a soluble oxychloride. Svanberg says that zirconia is not a pure earth, but a mixture of three.

ZIZYPHUS, *ziz'-i-fus*, in Bot., a gen. of the nat. ord. *Rhamnaceæ*. Many of the species have edible fruits; thus *Z. vulgaris*, *Z. Jujuba*, and others, yield the fruits called jujubes; *Z. Lotus*, the fruit supposed to be the lotus of the ancients, from which the Lotophagi received their name. The latter is much esteemed by the Arabs.

ZODIAC, SIGNS OF THE, *zo'-de-ak* (Gr. *zodia*, animals, because the constellations comprising it are represented under the figures of animals). In Astron., the planets all make their revolutions within an imaginary ring or belt in the heavens, which cuts the equator obliquely, and makes with it the same angle as the ecliptic. The zodiac is divided into twelve equal parts, of thirty degrees each, which are called the *signs of the zodiac*, being so named from the constellations which anciently occupied them.

ZONE, *zone*.—The whole earth is divided into five zones,—the torrid, northern and southern temperate, and northern and southern frigid zones. The torrid zone extends 23½° north and south of the equator, and twice a year the sun shines vertically on its inhabitants. The two temperate zones extend from the tropics to the polar circles. The distance from the tropics to the polar circles or the breadth of the temperate zones, both in the northern and southern hemispheres, is 43°. All beyond the polar circles, to the poles, is called the frigid zone. It was long supposed that there was no land in the southern zone; but this has been disproved, particularly by the discoveries of Sir John Ross. The northern is habitable, but produces only mosses, lichens, and a few bushes.

**Zoology.** (*See* Animal Kingdom.)

**Zoophytes,** *zō'-o-fīts* (Gr. *zoon*, an animal, and *phuton*, a flower), a name of marine animals belonging to the division *Radiata*. These are divided into five classes, of which the first (*Polypi*) and second (*Discophora*) come more especially under the term *Zoophytes*. The peculiar faculty possessed by these animals is their power of emitting phosphorescence in the dark, especially when disturbed or irritated, and it is to this power that the apparent luminosity of the sea in warm climates is due. This phenomenon is described by Mr. Dallas in the following manner:—"The whole surface of the ocean is suffused with a pale light, which acquires the greatest brilliancy when the water is in any way disturbed. The passing ship leaves a brilliant illumination in its wake; the waves, in their gentle heavings, break into sparks and flashes of light; the oars of rowing boats are seen dripping with living jewels when taken out of the water, and each stroke produces a sparkling streak. This general luminosity is due to innumerable minute animals, amongst which larger and more brilliant species may be seen swimming in splendour, some like balls of living fire, others like waving bands of flame. The majority of these creatures belong to this division (the *Radiata*), and principally to the class of *Discophora*, well known to most of us as *Medusæ*, or jelly-fishes." The phosphorescence observed in these animals is generally supposed to be occasioned by the slimy fluid with which their bodies are usually covered. (*See* Polype and Medusa.)

**Zostenacem,** *zos-ter-ā'-se-e*, in Bot., the Sea-wrack fam., a nat. ord. of *Monocotyledones*, sub-class *Petaloideæ*, comprising a small number of marine plants, having the habit of sea-weeds. The most interesting





species is *Zostera marina*, the sea-wrack, which is in common use for packing, and for stuffing chairs and mattresses. Its fibres have been recommended as a substitute for cotton.

**Zygophyllaceæ,** *zī'-go-fil-lā'-se-e*, in Bot., the Bean-caper or Guaiacum fam., a nat. ord. of *Dicotyledones*, sub-class *Thalamifloræ*, having the following essential character:—Herbs, shrubs, or trees, with opposite stipulate leaves, without dots. Calyx and corolla with a quaternary or quinary distribution; the former convolute in æstivation, the latter with unguiculate petals and imbricated. Stamens 8—10, hypogynous, usually arising from back of scales. Ovary 4—5-celled; style simple. Fruit 4- or 5-celled. Seeds few, with little or no albumen; radicle superior; cotyledons foliaceous. The plants of the order are generally distributed throughout the warm regions of the globe, but chiefly beyond the tropics. (*See* Guaiacum, Zygophyllum.)

**Zygophyllum,** *zī-go-fil'-lum*, in Bot., a gen. of plants of the nat. ord. *Zygophyllaceæ*. *Z. Fabago*, the bean-caper, derives its common name from the circumstance of its flower-buds being used in some parts of the world as substitutes for common capers. This plant is reputed to possess valuable anthelmintic properties.

**Zymotic Diseases,** *zi-mot'-ik* (Gr. *zumoo*, I ferment), in Med., is a designation recently introduced, and applied to diseases which are epidemic, endemic, or contagious, as well as such as result from the scarcity and the deterioration of the necessary kinds of food, or from parasitic animals. They are divided into four orders,—miasmatic, enthetic, dietic, and parasitic, of which, fever, syphilis, scurvy, and worms, may be taken as the respective types.

THE END.

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